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STARTING MECHANISM FOR AUTOMOBILES

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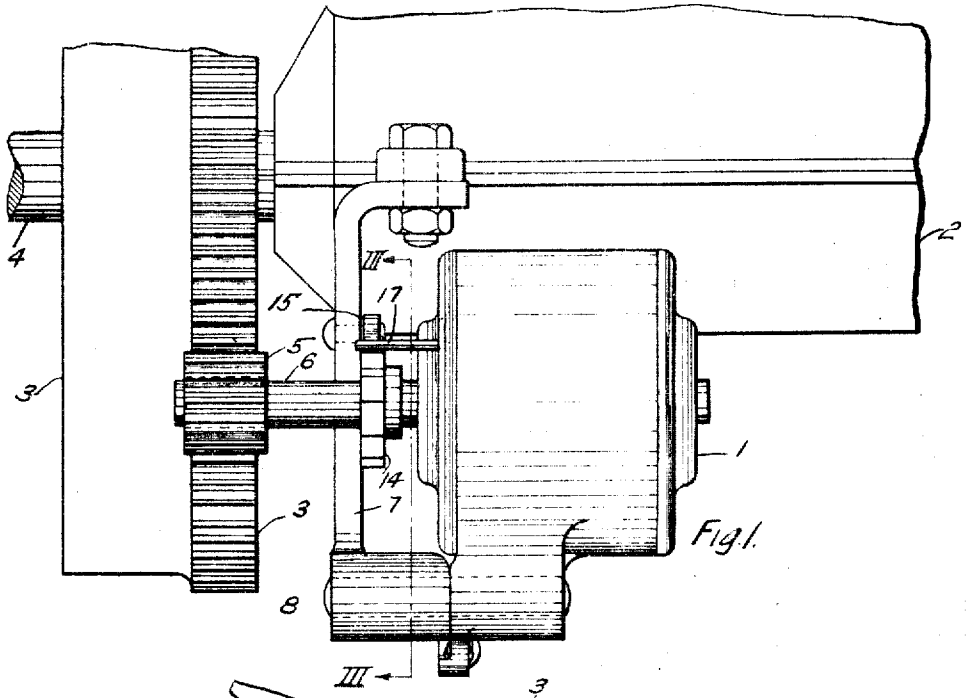


Fig. 1.

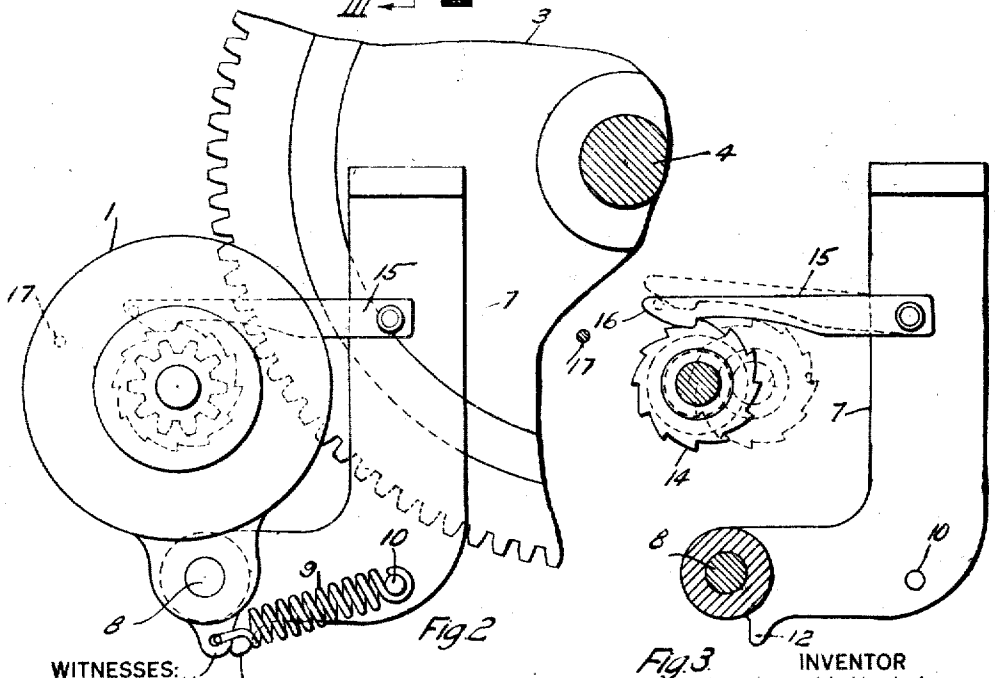


Fig. 2

Fig. 3.

WITNESSES:

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UNITED STATES PATENT OFFICE.

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STARTING MECHANISM FOR AUTOMOBILES.

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To all whom it may concern:

Be it known that I, CHARLES H. HODGKINS, a subject of the King of Great Britain, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Starting Mechanisms for Automobiles, of which the following is a specification.

My invention relates to starting mechanisms and, particularly, to starting mechanisms for automobiles, wherein pinions are actuated radially into mesh with engine gear wheels.

One object of my invention is to provide a starting mechanism of the above-indicated character that shall so support the starting motor and control the motor armature as to quickly and efficiently swing a pinion into mesh with the engine gear wheel upon energization of the motor.

In starting an internal-combustion engine by means of an electric motor, it is desirable to provide means for automatically connecting the motor to the engine upon energization of such motor. In many systems now in service, a motor pinion is moved longitudinally along the armature shaft into mesh with the engine gear wheel, upon energization of the motor. Such longitudinal movement of the pinion along the armature shaft is generally effected by means of a screw-threaded shaft or any other suitable means. However, such method of connecting the starting motor to the internal-combustion engine necessitates the rotating of the pinion within certain speed limits to effect meshing of the pinion teeth with the teeth of the engine gear wheel. Moreover, the motor, which is operating at a considerable speed before meshing of the pinion with the gear wheel, is subjected to considerable shock by the sudden application of the load upon meshing of the pinion with the gear wheel.

In a starting mechanism constructed in accordance with my invention, a pinion is mounted upon the shaft of the starting motor and the motor is pivotally supported to permit the swinging of the pinion into mesh with the engine gear wheel, upon energization of the motor. In order to effect such movement of the motor and the pinion, a latch and ratchet wheel are provided for so locking the motor armature as to limit its movement until meshing between the pinion and the gear wheel has been effected. Upon meshing of the pinion with the gear wheel, the latch is disengaged from the ratchet wheel to permit the free rotation of the motor armature for cranking the internal-combustion engine. During the swinging movement of the pinion towards the engine gear wheel, the pinion effects a small movement of rotation in order to insure the meshing of the gear teeth.

In the accompanying drawing—

Figure 1 is a side elevational view of a starting mechanism constructed in accordance with my invention;

Fig. 2 is an end elevational view of the mechanism shown in Fig. 1; and

Fig. 3 is a sectional view along the line III—III of Fig. 1.

Referring to the drawing, an electric motor 1 is provided for cranking an internal-combustion engine 2. The engine 2 is provided with an engine gear wheel 3, which is mounted upon a shaft 4. A pinion 5, which is mounted upon the motor shaft 6, is moved radially into mesh with the engine gear wheel 3 in a manner to be hereinafter set forth.

An arm 7 of substantially L-shape, which is bolted to the internal-combustion engine 2 or to any other suitable support, carries a small shaft 8 which pivotally supports the starting motor 1. A spring 9 is connected between a pin 10 on the arm 7, and a lug 11 which extends from the frame of the motor. Such spring member serves to bias the motor to its inoperative position in which the lug 11 engages a lug 12, which extends from the arm 7, as shown in Fig. 2 of the drawing.

A ratchet wheel 14, which is fixedly mounted upon the armature shaft 6, is engaged by a latch 15 for limiting the movement of the motor armature when the motor is started from rest to effect the movement of the motor about its pivotal support and thereby actuate the pinion into mesh with the engine gear wheel.

The latch member 15 is pivotally mounted upon the arm 7, as shown in Figs. 2 and 3 of the drawing, and is provided with a cam surface 16 near the end thereof to be engaged by a pin 17. The pin 17 is mounted upon the frame of the motor 1 and serves to

disengage the latch member 15 from the ratchet wheel 14 when the pinion 5 is in mesh with the engine gear wheel 3.

Assuming the starting mechanism to be in the position shown in the drawing, with the pinion 5 out of mesh with the engine gear wheel, the motor circuit is completed by any suitable means (not shown). The armature tends to rotate in a counter-clockwise direction, as viewed in Fig. 2, but such action is prevented by the latch member 15 and the ratchet wheel 14. Accordingly, the reaction of the torque between the motor parts causes the motor 1 to be moved bodily, in a clockwise direction, about the shaft 8. The latch 15 also acts as a fulcrum for the armature shaft, and the torque applied to the armature shaft assists the movement. Inasmuch as the latch member 15 is mounted upon the stationary arm 7, it is apparent that the motor armature and, accordingly, the pinion 5 effect a small movement of rotation while the pinion is being swung into mesh with the engine gear wheel.

Upon meshing of the pinion with the engine gear wheel, the pin 17, which is mounted upon the frame of the motor, engages the end of the latch member 15 and releases the motor armature for cranking the engine. The disengaged position of the latch member 15 is indicated by dotted lines in Fig. 3 of the drawing.

The pinion remains in mesh with the fly wheel gear by reason of the reaction upon the motor during the application of torque to the engine. This reaction tends to revolve the motor in a clockwise direction about its point of pivotal support.

When the engine starts and the speed of the fly wheel gear exceeds that of the pinion, the fly wheel gear exerts a force upon the pinion which causes the motor to revolve in a counter-clockwise direction about the shaft 8 and thereby disengage the pinion from the fly wheel gear. The spring 9 also tends to return the motor to its normal or inoperative position.

When the rapidly rotating motor returns to its inoperative position, the pin 17 permits the latch 15 to fall, but, by reason of the curved surface of the latter, it does not engage the ratchet wheel 14 until the speed of the latter has fallen to a safe minimum rate. The starting mechanism is then in readiness for the succeeding operation.

The starting mechanism above described is very simple in construction and operation and is operated automatically upon energization of the motor for quickly meshing the motor pinion with the engine gear wheel. Moreover, the limiting of the rotative movement of the motor armature until after the meshing operation insures the gear teeth against damage.

Modifications in the mechanism and in the arrangement and location of parts may be made within the spirit and scope of my invention, and such modifications are intended to be covered by the appended claims.

I claim as my invention:

1. In a starting mechanism, the combination with a motor, a motor pinion, and an engine gear wheel, of a pivotal support for said motor to permit said pinion being actuated radially into mesh with the engine gear wheel, and a latch member for engaging the motor armature to positively lock it against rotation when the pinion is out of mesh with the engine gear wheel.

2. In a starting mechanism, the combination with a motor, a motor pinion, and an engine gear wheel, of a pivotal support for said motor, and means for positively locking the armature of said motor against rotation when the motor pinion is out of mesh with the engine gear wheel.

3. In a starting mechanism, the combination with a motor, a pinion mounted on the shaft of said motor, and an engine gear wheel, of means for pivotally supporting said motor, means for positively locking the motor armature against rotation to swing said pinion into mesh with the gear wheel upon energizing the motor, and means for releasing the locking means upon meshing of the pinion with said gear wheel.

4. In a starting mechanism, the combination with a motor, a pinion mounted on the shaft of said motor, and an engine gear wheel, of means for pivotally supporting the motor, means comprising a ratchet wheel and a latch member for so locking the motor armature as to swing the motor pinion into mesh with the engine gear wheel upon energizing the motor, and means for releasing the armature upon meshing of the pinion with said gear wheel.

5. In a starting mechanism, the combination with a motor having an armature, a pinion mounted on the armature shaft, and an engine gear wheel, of means for pivotally mounting the motor to permit the radial movement of said pinion into mesh with the engine gear wheel, a ratchet wheel mounted on the armature shaft, a latch member for engaging said ratchet wheel, and means for releasing the ratchet wheel from said latch member upon meshing of the motor pinion with the engine gear wheel.

6. In a starting mechanism, the combination with a motor having an armature, a pinion mounted on the armature shaft, and an engine gear wheel, of means for pivotally supporting said motor, a ratchet wheel mounted on the shaft of said armature, and a latch member for engaging said ratchet wheel to limit the rotative move-

ment of said armature when the said pinion is out of mesh with the engine gear wheel.

7. In a starting mechanism the combination with a motor having an armature, a pinion mounted on the armature shaft, and an engine gear wheel, of a supporting arm, means for pivotally mounting the motor upon said arm to permit the radial movement of the motor pinion into mesh with said engine gear wheel, a ratchet wheel fixedly mounted on the shaft of said armature, a latch member pivotally mounted on said arm for engaging said ratchet wheel, and means comprising a pin mounted on the motor for moving said latch member out of engagement with the ratchet wheel upon meshing of said pinion with the engine gear wheel.

In testimony whereof, I have hereunto subscribed my name this 10th day of December, 1920.

CHARLES H. HODGKINS.