

Nov. 6, 1923.

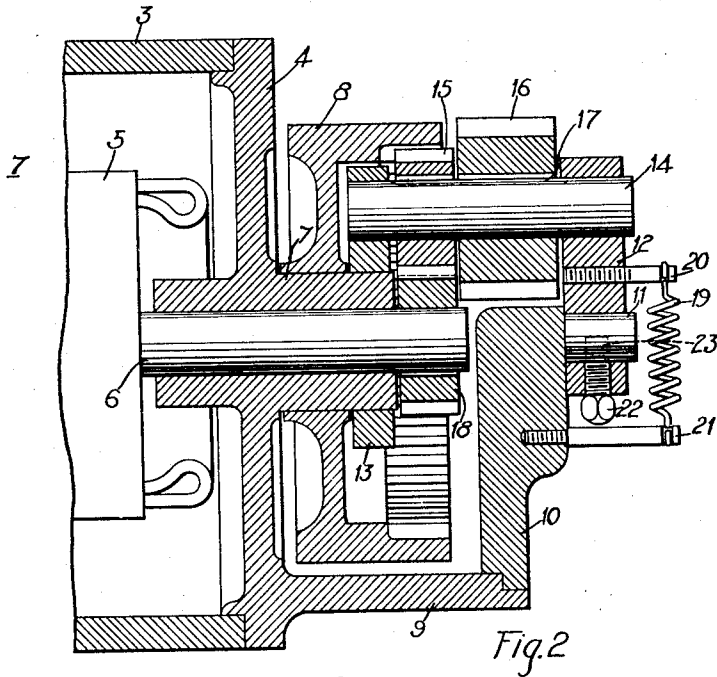
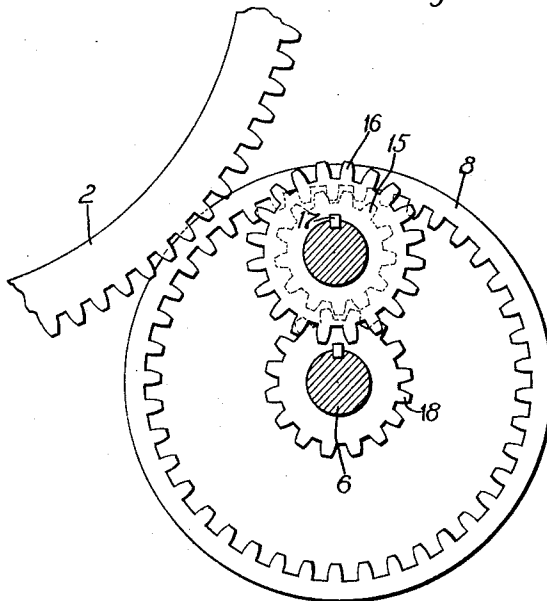
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C. H. KINDL

STARTING MECHANISM FOR AUTOMOBILES

Filed April 2, 1920

2 Sheets-Sheet 1



WITNESSES:

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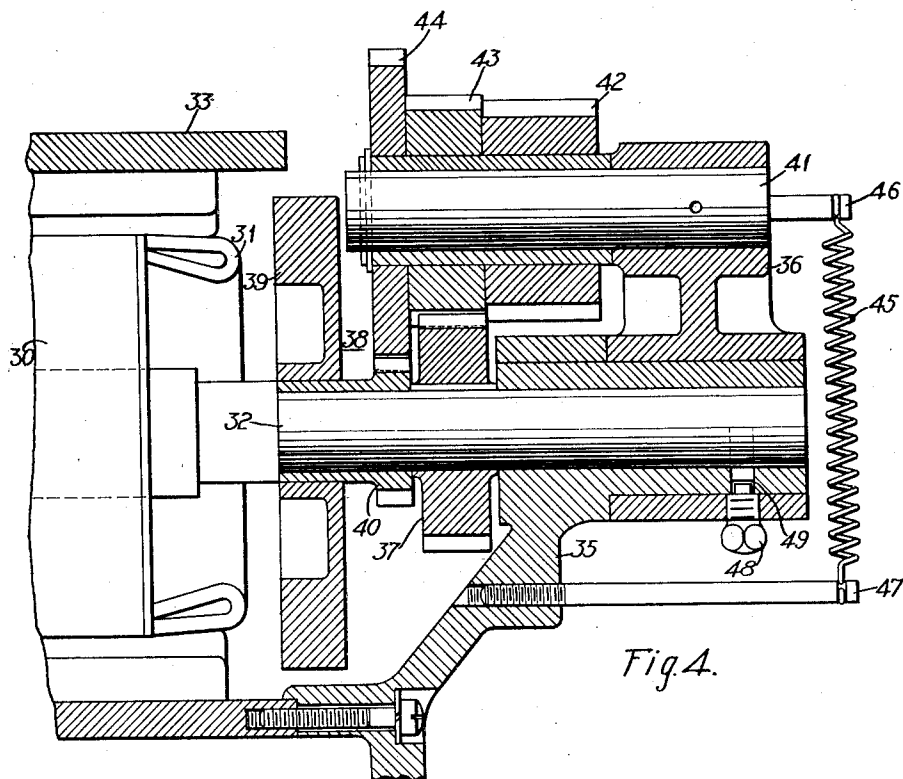


Fig. 4.

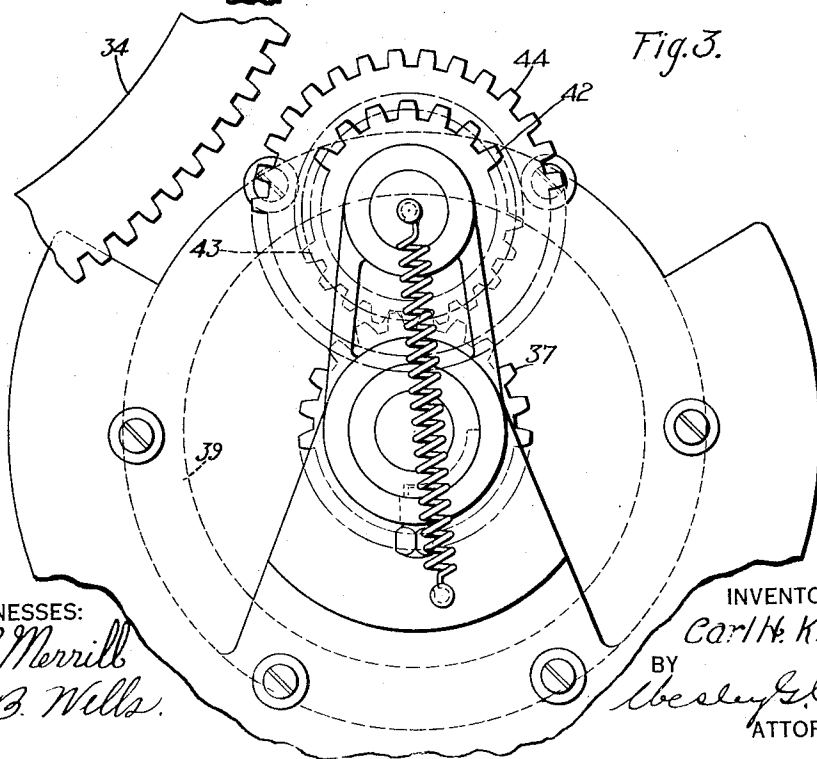


Fig. 3.

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UNITED STATES PATENT OFFICE.

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STARTING MECHANISM FOR AUTOMOBILES.

Application filed April 2, 1920. Serial No. 370,878.

To all whom it may concern:

Be it known that I, CARL H. KINDL, 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 Mechanisms for Automobiles, of which the following is a specification.

My invention relates to starting mechanisms for automobiles and particularly to starting mechanisms for connecting electric motors to internal-combustion engines.

One object of my invention is to provide a starting mechanism of the above-indicated character that shall actuate a pinion radially into mesh with an engine gear wheel in a simple and an efficient manner and that shall produce a retarding effect upon such pinion to maintain it in any desired position relatively to the motor shaft while being moved into engagement with the engine gear wheel.

A second object of my invention is to provide an inertia device for retarding the rotation of a bodily movable driven member without increasing the inertia with respect to movement bodily thereof.

It is customary, according to modern practice, to start the internal-combustion engine of an automobile by means of an electric motor and to provide means for connecting the motor to the engine before starting it and for automatically disconnecting the motor from the engine after it is in operation. In many types of such starting mechanisms, the motor pinion is moved longitudinally along the armature shaft into mesh with the engine gear wheel. However, such method of connecting the starting motor to the internal-combustion engine necessitates the rotating of the motor 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 being suddenly stopped upon meshing of the pinion with the gear wheel.

In a starting mechanism constructed in accordance with my invention, the motor pinion is so swung into engagement with the engine gear wheel as not to necessitate operating the pinion at any predetermined speed to prevent so-called clashing

of the gear teeth. The motor pinion is meshed with the engine gear wheel when the former is not rotating so that the starting motor is not subjected to severe shock upon the meshing of the pinion with the gear wheel. Moreover, if the pinion is accidentally meshed with the engine gear wheel the motor, the pinion, and the gear wheel are not subjected to severe shock.

The preferred embodiment of my invention comprises a pinion which is rotatably mounted on an arm that, in turn, is rotatably mounted concentric with the armature shaft of the starting motor. The pinion meshes with a second pinion which is fixed to the armature shaft. A third pinion, which is rigidly connected to the first pinion, meshes with a weighted gear wheel which is rotatably mounted, either on the armature shaft or on the frame of the starting motor. The weighted gear wheel is adjusted to have such inertia that, when the motor is started, it actuates the first pinion into mesh with the engine gear wheel either without causing substantially any rotation of the pinion or while the pinion is rotating at a predetermined rate. After the engine is started, the engine gear wheel exerts a force to swing the pinion away from such gear wheel. At this time, the weighted gear wheel is rotating and its inertia is not effective to again move the pinion into mesh with the engine gear wheel. A spring is preferably provided for biasing the pinion either toward an operative position or toward an inoperative position.

In the accompanying drawings, Figure 1 is a partial end view of a starting mechanism constructed in accordance with my invention; Fig. 2 is a partial sectional view of the mechanism shown in Fig. 1; Fig. 3 is an end view of a modification of my invention, and Fig. 4 is a partial sectional view of the mechanism shown in Fig. 3.

Referring to Figs. 1 and 2, an electric motor 1, the circuit of which is controlled in any suitable manner, is provided for operating an engine gear wheel 2 which is connected, in any suitable manner, to the internal-combustion engine (not shown) of an automobile. The motor 1 comprises a frame 3 having an end bracket 4 and an armature 5 having a shaft 6 provided with a bearing in the bracket 4. The bracket 4 is provided with a boss 7 which serves as

a bearing for a weighted gear wheel 8, and a projecting portion 9 upon which is mounted a supporting bracket 10. The supporting bracket 10 is provided with a short shaft 11 which rotatably supports an arm 12.

A supporting arm 13, which is rotatably mounted upon the portion 7 of the bracket 4, coacts with the arm 12 to support a shaft 14 for a purpose to be hereinafter set forth. Two pinions 15 and 16 are mounted upon the shaft 14 and are fastened to it in any suitable manner, as by means of a key 17. The pinion 16 is adapted to mesh with the engine gear wheel 2, in a manner to be set forth hereinafter, when the motor 1 is started.

The weighted gear wheel 8 is annular in form and is provided with a web portion which supports the gear wheel upon the boss 7. The inner periphery of the annular portion is provided with teeth which mesh with the teeth of the pinion 15. A spring member 19 is connected to two pins 20 and 21 which are respectively mounted on the arm 12 and the supporting bracket 10. The spring member 19 serves to bias the arms 12 and 13 and the pinions mounted on the shaft 14 either toward an operative or toward an inoperative position. A screw 22 is attached to, and projects through, the lower portion of the arm 12 into a slot 23 which is formed in the shaft 11. The screw 22 serves not only to limit the rotative movement of the arms 12 and 13 but, also, to maintain the arm 12 in position upon the shaft 11.

If the parts are in the positions shown in Figs. 1 and 2, and the motor 1 is energized, the armature 5 and the pinion 18 will start rotating in a counter-clockwise direction as viewed in Fig. 1 or as viewed from the right in Fig. 2. Such rotation of the pinion 18 would freely rotate the pinions 15 and 16 in a clockwise direction if the pinions were unaffected by any outside influences, such as excessive friction or the inertia of some moving part. However, if the pinions 15 and 16 were locked in any manner to prevent their rotating, it is apparent that the pinion 18 would cause them and the shaft 14 to revolve in a counter-clockwise direction about the armature shaft 6 as a center. Inasmuch as it is desired to give the pinion 16 a movement of revolution about the armature shaft 6 in order to effect meshing of its teeth with the teeth of the engine gear wheel 2, the inertia of the weighted gear 8 is utilized to prevent rotation of the pinions 15 and 16 until the pinion 16 is meshed with the engine gear wheel 2. The inertia of the gear wheel 8 may be adjusted either to prevent any rotation of the pinions 15 and 16 when the latter is being moved into mesh with the engine gear wheel 2

or to permit any suitable rate of rotative movement of the pinions in a forward or in a reverse direction. Thus, the inertia of the weighted gear wheel 8 is sufficient to ensure a movement of revolution of the pinions 15 and 16 about the armature 6 of the motor 1 to effect engagement of the pinion 16 with the gear wheel 2. Upon meshing of the pinion 16 with the engine gear wheel 2, the pinion 18 upon the armature shaft will effect rotation not only of the engine gear wheel 2 to start the engine but also rotation of the weighted gear wheel 8.

When the engine starts under its own power, the speed of the engine gear wheel 2 exceeds the speed of the pinion 16, and the component of force, which formerly maintained engagement between these members, is reversed to automatically return the pinion 16 to its normal position. Thus, the pinions 15 and 16 are swung, concentrically with the armature shaft 6, to their initial positions away from the engine gear wheel 2. Inasmuch as the weighted gear wheel 8 is rotating at the time the pinion and the engine gear wheel are demeshed, it is apparent that the inertia of such weighted gear wheel is ineffective to again effect meshing of the pinion 16 with the gear wheel 2. Engagement cannot again be effected between the pinion 16 and the engine gear wheel 2 until the motor armature again accelerates the system.

Referring to Figs. 3 and 4, a motor 30, comprising an armature 31, a shaft 32 and a frame 33, is provided for rotating an engine gear wheel 34 to start an engine (not shown). The frame 33 of the motor is provided with an extended portion 35 which serves not only as a bearing for the armature shaft 32 but, also, as a bearing for an arm 36 for a purpose to be hereinafter set forth.

A pinion 37 is rigidly secured to the armature shaft 32, and an inertia member 38 is rotatably mounted on such shaft. The inertia member 38 comprises a weighted portion 39, which may be varied in accordance with the operative position desired, and gear teeth 40. A short shaft 41 is rigidly connected to the arm 36 and carries three pinions 42, 43 and 44. The pinions 42, 43 and 44 are rigidly connected together in any suitable manner. The pinion 42 is adapted to be actuated into engagement with the engine gear wheel 34. The pinion 43 meshes with the pinion 37 which is connected to the armature shaft 32, and the pinion 44 meshes with the teeth 40 on the weighted member 38.

A spring member 45 is connected to two pins 46 and 47 which are respectively mounted on the shaft 41 and the supporting bracket 35. The spring member 45 serves

to bias the pinion 42 either toward or away from engagement with the engine gear wheel 34. A screw 48 projects, through the lower portion of the arm 36, into a slot 49
5 formed in the supporting bracket 35 for limiting the rotative movement of the arm 36 and, also, for maintaining the arm 36 in position on the bracket 35.

10 If the weighted member 38 is stationary, when the motor 30 is energized, the pinions 42, 43 and 44 will be prevented from rotating in accordance with the speed of the pinion 37 by reason of the inertia of the member 38. Consequently, the arm 36 will
15 rotate about the axis of the motor shaft to swing the pinion 42 into mesh with the engine gear wheel 34. The further operation of this modification is similar to the starting mechanism shown in Figs. 1 and 2.
20 Modifications in the mechanism and 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.

25 I claim as my invention:

1. In a starting mechanism, the combination with an engine gear wheel, a motor, and a pinion revolubly mounted concentric with, and geared to, the shaft of said motor,
30 of rotatable means for retarding the rotation of said pinion to actuate it into engagement with the engine gear wheel when the motor is started, said pinion being revoluble independently of said retarding means.

35 2. In a starting mechanism, the combination with an engine gear wheel, a motor, and a pinion geared to said motor with its axis eccentric to the motor shaft, of means for revolubly supporting said pinion for
40 movement about the axis of the motor shaft and an inertia device rotatable with said pinion whereby said pinion is actuated into mesh with the engine gear wheel when the motor is started, said pinion being bodily
45 movable relatively to said inertia device.

50 3. In a starting mechanism, the combination with a motor and an engine gear wheel, of a pinion operatively connected to said motor, and an inertia device for actuating
said pinion transversely of its axis into engagement with the engine gear wheel when
55 said motor is operated, said pinion being bodily movable relatively to said inertia device.

60 4. In a starting mechanism, the combination with an engine gear wheel, a motor, and a pinion operatively connected to said motor, an inertia device for swinging said pinion concentric with the armature shaft into
engagement with said engine gear wheel, said
65 pinion being bodily movable relatively to said inertia device.

5. In a starting mechanism, the combination with an engine gear wheel, a motor,
and a pinion revolubly mounted concentric

with, and geared to, the shaft of said motor, of means for utilizing inertia to prevent rotation of said pinion without increasing the inertia of movement bodily thereof
70 when the motor is operated to swing the pinion into mesh with the engine gear wheel.

6. In a starting mechanism, the combination with an engine gear wheel, a motor, and a pinion geared to, and revolubly
75 mounted concentric with, the armature shaft of said motor, of means comprising a gear wheel connected to said pinion for retarding its rotation to actuate it into mesh with the engine gear wheel when the motor is
80 started, said pinion being bodily movable relatively to the second-named gear wheel.

7. In a starting mechanism, the combination with an engine gear wheel, a motor, and a pinion geared to the armature shaft of
85 said motor, of means for revolubly supporting the pinion concentric with the armature shaft, means comprising a weighted gear wheel mounted on the armature shaft for
90 retarding the rotation of said pinion to swing it into mesh with the engine gear wheel when the motor is started, said engine gear wheel when in rotation serving to throw said pinion out of mesh.

8. In a starting mechanism, the combination with a motor, a pinion connected to the
95 shaft of the motor armature, a second pinion meshing with said first pinion and revolubly supported concentric with the armature shaft, and a third pinion rigidly connected
100 to said second pinion, of an annular member having teeth on its inner periphery, said teeth meshing with the teeth on said second pinion, and an engine gear wheel meshing
105 with the teeth on said third pinion when the pinion is moved radially by the operation of the motor.

9. In a starting mechanism, the combination with a motor having a pinion geared to,
110 and revolubly supported concentric with, the armature shaft of said motor, and an engine gear wheel, of an annular member rotatably mounted concentric with the shaft of said motor, and means for connecting
115 said pinion to the annular member to move the pinion into mesh with the engine gear wheel when the motor is started and for disengaging the pinion from the gear wheel when the engine is started.

10. In a starting mechanism, the combination with a motor having a pinion geared to,
120 and revolubly supported concentric with, the armature shaft, and an engine gear wheel, of an idler gear wheel mounted concentric with the armature shaft, and means for connecting said pinion to the idler gear
125 wheel to force the pinion into mesh with the engine gear wheel upon starting of the motor.

11. In a starting mechanism, the combination

tion with an engine gear wheel, a motor, and a pinion operatively connected to the armature shaft of the motor, of means for pivotally supporting said pinion, an inertia
 5 device operatively connected to said pinion, said pinion being bodily movable relatively to said inertia device for swinging it into engagement with the engine gear wheel
 10 when the motor is started, said engine gear wheel when in rotation serving to throw the pinion out of mesh, and a spring member for biasing the position of the pinion.

12. In a starting mechanism, the combination with an engine gear wheel, a motor,
 15 and a pinion geared to, and revolvably mounted concentric with, the armature shaft of the motor, of means comprising a weighted gear wheel, rotatably mounted concentric
 20 with the armature shaft and geared to said pinion for producing a retarding effect to actuate the pinion into mesh with the engine gear wheel when the motor is started, the inertia of said weighted gear wheel being
 25 adjusted to produce any desired condition of the pinion when it is meshing with the engine gear wheel.

13. In a starting mechanism, the combina-

tion with a motor and a pinion operatively connected thereto and arranged to be moved
 30 bodily transversely to said motor, of an inertia device for retarding the rotation of said pinion to effect its movement bodily without increasing the inertia of said movement of said pinion.

14. In a starting mechanism, the combination with a motor, and a pinion operatively
 35 connected thereto and arranged for movement bodily circumferentially relatively to said motor, of an inertia device for retarding the rotation of said pinion to effect its
 40 movement bodily without increasing the inertia of said movement.

15. In a starting mechanism, the combination with a motor and a pinion operatively
 45 connected thereto, of an inertia device operatively connected to said pinion for retarding its rotation, whereby said pinion is actuated circumferentially relatively to said motor
 50 and to said device upon the starting of said motor.

In testimony whereof, I have hereunto subscribed my name this 18th day of March 1920.

CARL H. KINDL.