P. W. HODGKINSON.

ENGINE STARTER.

APPLICATION FILED APR. 20, 1911.

1,066,014. Patented July 1, 1913.

Fig. 1.

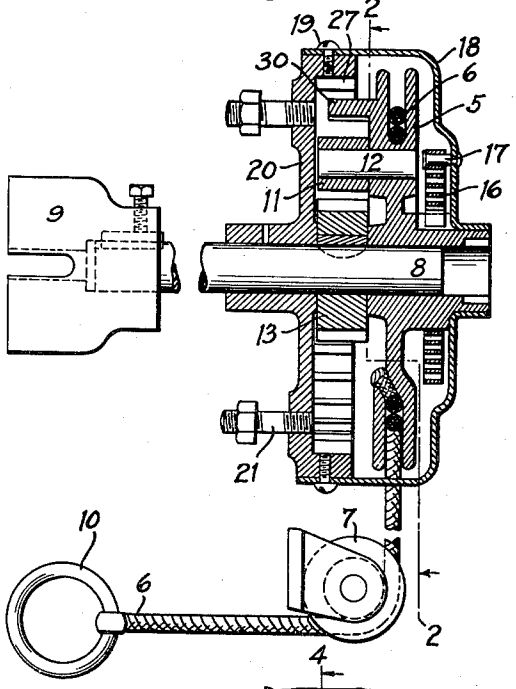


Fig. 2.

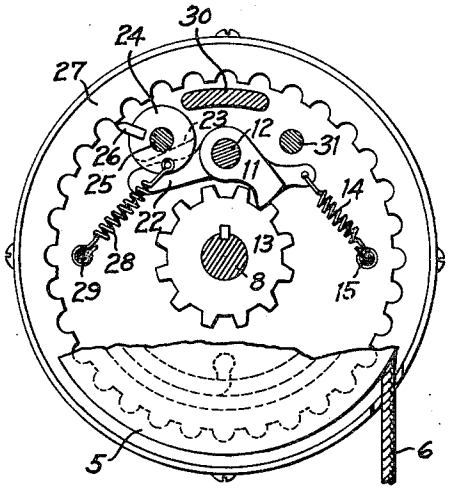


Fig. 3.

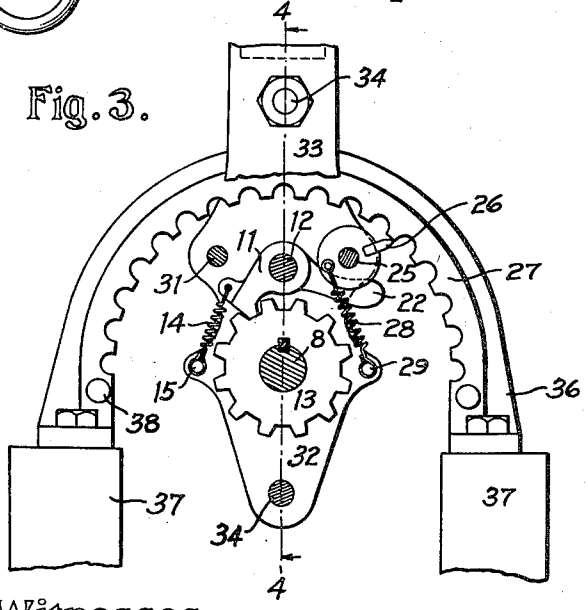
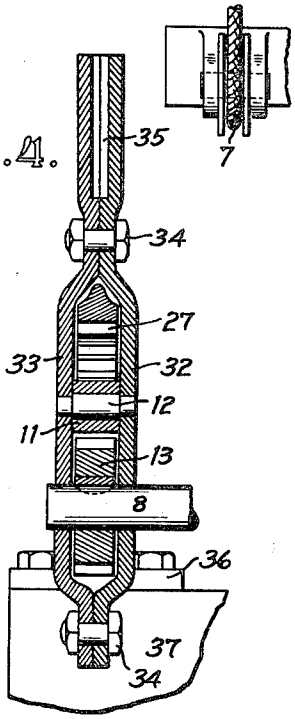


Fig. 4.



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UNITED STATES PATENT OFFICE.

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ENGINE-STARTER.

1,066,014. Specification of Letters Patent. Patented July 1, 1913.

Application filed April 20, 1911. Serial No. 622,418.

To all whom it may concern:

Be it known that I, PERCY W. HODGKINSON, a citizen of the United States, and resident of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Engine-Starters, of which the following is a specification.

This invention relates to engine-starting devices of the type in which a manually-operable member is employed to rotate an engine-shaft, automatic coupling-mechanism being provided between this member and the shaft whereby movement of the manually-operable member in one direction causes rotation of the shaft, while reverse rotation of the shaft, such as may result from a premature impulse in the engine, results automatically in disconnecting the shaft and the manually-operable member.

The object of the invention is to produce an engine-starter of the type above referred to, in which the construction is simple and inexpensive and the operation positive and reliable, and to these ends the invention consists in the construction and arrangement of parts hereinafter described, as they are defined in the succeeding claims.

In the accompanying drawings:—Figure 1 is a side-elevation, partly in vertical median section, of an engine-starter embodying the present invention; Fig. 2 is a vertical section on the line 2—2 in Fig. 1; Fig. 3 is a front-elevation, with parts broken away, of a modified form of the invention; and Fig. 4 is a vertical section on the line 4—4 in Fig. 3.

The embodiment of the invention illustrated in Figs. 1 and 2 comprises a rotary driving-member in the form of a pulley 5, which is provided with a narrow, deep slot in which a cord or cable 6 is wound. This cable may pass around one or more pulleys 7 to a convenient point for manual operation, and it terminates in a suitable handle 10 by which it may be pulled to start the engine. This arrangement is particularly adapted for use in starting an automobile engine from the driver's seat, or in starting a marine engine from a point adjacent the steering-wheel.

The pulley 5 is loosely journaled upon a shaft 8, which may be either the engine-shaft itself or a short counter-shaft coupled to the engine-shaft. Where the latter arrangement is employed a coupling member 9 is fixed on the shaft 8 to connect it with the engine-shaft.

When the device is in use the pulley 5 is temporarily connected with the shaft 8 by means of a pawl 11 which is pivoted on a stud 12 fixed in the pulley. This pawl cooperates with a toothed wheel 13 keyed to the shaft 8. A spring 14 is connected at one end to the pawl, and at the other end to a pin 15 fixed in the pulley, and this spring tends to throw the pawl into engagement with the wheel 13, as in Fig. 2. When the cable 6 is pulled, accordingly, the rotation of the pulley causes the pawl to engage and drive the wheel 13, and thus to rotate the shaft 8 and the engine-shaft through one or more rotations, according to the amount of cable which is unwound from the pulley. After the device has been employed to start the engine in this manner it is returned to initial position, with the cable rewound on the pulley, by the action of a spiral spring 16. The inner end of this spring is fixed to the hub of the pulley, while its outer end is attached to a pin 17 fixed in the front of a sheet-metal casing 18. This casing incloses the moving parts of the mechanism, and is removably secured, by screws 19, to a disk 20 through the center of which the shaft 8 passes loosely.

The disk 20 is fixed against rotation, being for this purpose provided with studs 21. These studs may be employed to secure the disk and the casing to the front frame-member of an automobile, or to any suitable fixed support adjacent to the engine with which the device coöperates.

When the starter is not in use it is desirable to have the pawl 11 held out of engagement with the toothed wheel 13 to prevent noise and the wear, as the latter rotates constantly during the running of the engine. To this end a trip 24 is pivoted on a stud 25 fixed in the pulley 5. This trip is provided with a cam-surface 23 which coöperates with an arm 22 on the pawl. The trip is provided with a lug 26 which engages a circular rack 27 integral with the disk 20. A spring 28 is connected, at one end, with the trip, and at the other end with a pin 29 fixed in the pulley 5. This spring tends constantly to rock the trip from either extreme position

toward a median position, so as to throw the lug 26 into engagement with the spaces between the teeth of the rack.

When the cable is pulled as above described, the right-hand rotation of the pulley moves the trip along the rack and the lug is caused, by the spring 28, to enter the space between two of the teeth of the rack, so that the teeth swing the lug 26 and the trip to the left against the action of the spring 28 and into the position of Fig. 2, in which the lug drags across the rack-teeth as the driving-member continues to move. In this position of the trip the pawl is free to engage the toothed wheel 13 under the influence of the spring 14. When the cable is released, however, and the spring 16 imparts a left-hand return rotation to the pulley, the lug 26 again enters one of the spaces between the rack-teeth and is then swung to the right by the action of the rack, so that the cam-surface 23 engages the arm 22 and lifts the pawl out of engagement with the toothed wheel, while the lug 26 again drags across the rack-teeth. In the normal position of the parts the trip thus acts to maintain the pawl in inoperative position. A lug 30, projecting rearwardly from the pulley, acts as a stop to engage the lug 26 and limit the right-hand movement of the trip.

The trip acts not only to maintain the pawl normally out of operative position, but also acts to disengage the pawl from the toothed wheel, while the starter is being used, in case a back-kick from the engine tends to rotate the pulley reversely against the tension of the cable. In this case the trip acts in the manner above described, being swung to the right by the rack, so that except for a short initial movement, during which the trip is operating, a back-kick can not be communicated from the engine to the hand of the user, and thus injury to the user is effectually prevented.

A stud 31, similar to the stud 25, is fixed in the pulley, this stud being located on the opposite side of the stud 12. The studs 25 and 31 and the pins 29 and 15 are all symmetrically located on opposite sides of the device, so that in case it is necessary to start the engine with a left-hand rotation the trip may be transferred to the stud 31 and the pawl and the springs 14 and 28 may be reversed in position, and in this manner the direction of operation is reversed without alteration in the construction of the device.

Owing to the employment of a narrow slot in the pulley, of a width sufficient to receive only a single thickness of the cable, the cable is wound spirally in this slot, and thus in using the device the first portion of the cable which is unwound therefrom has the greatest leverage upon the shaft, while the last turns, being of less diameter, have less leverage but tend to rotate the pulley faster and thus an accelerating rotation is imparted to the engine-shaft.

In the case of a large engine it may be desirable to employ a lever in place of the cable and pulley, in order to impart greater rotative force to the engine-shaft. In such a case the modified form of the invention shown in Figs. 3 and 4 is employed. Here the mechanism is similar in general construction and mode of operation to that already described, but the pulley is replaced by a device comprising two members 32 and 33 which are loosely journaled on the shaft 8 and embrace the toothed wheel 13 and the rack 27. These members are secured together by bolts 34, and at their outer extremities a socket 35 is provided between them, in which a lever of any convenient length may be inserted. In this form of the device the casing and the spring 16 are dispensed with, the parts being returned to normal position, after the engine has been started, by means of the same lever by which the starting operation is performed. In this form of construction the rack 27 is semi-circular in form, and constitutes a portion of a U-shaped member 36 of which the ends are fixed to any convenient stationary supports 37, such as portions of the foundation or frame upon which the engine is mounted. In this form also of the invention the pawl and the trip are reversible in position, and they are illustrated as arranged to start the engine with a left-hand rotation.

I claim:—

1. An engine-starter having, in combination, a toothed driven member adapted to be connected with an engine-shaft, a pulley journaled coaxially with the driven member, a cable wound upon the pulley for rotating the pulley in one direction to start the engine, a spring for rotating the pulley in the opposite direction to rewind the cable, a pawl carried by the pulley and coöperating with the driven member when the pulley is rotated by the cable, a fixed rack concentric with the pulley, and a trip actuated in opposite directions by the rack and coöperating with the pawl to move the pawl into and hold it in inoperative position when the pulley is rotated in a direction to rewind the cable.

2. An engine-starter having, in combination, a toothed driven member adapted to be connected with an engine-shaft, a rotative driving member journaled coaxially with the driven member, a pawl carried by the driving member and coöperating with the driven member when the driving member is rotated in one direction, a rack concentric with the driving member, a trip pivotally mounted on the driving member and having a tooth engaging the rack and adapted to swing freely between the teeth of the rack so as to assume a dragging position in

either direction of rotation of the driving member, and a spring connected with the trip and tending to move it to an intermediate position in engagement with the rack, the trip being freely movable over the rack in either direction and coöperating positively with the pawl to throw the pawl out of engagement with the driven member during a return movement of the driving member.

3. The combination with an engine shaft, an actuating element therefor, means connecting the element with the shaft for rotating the shaft, said means embodying pawl and ratchet mechanism, a member pivotally supported by said element and bodily movable therewith, means embodying a fixed toothed member for moving the pivoted member about its pivot by the movement of said element in either direction, a cam connected with the pivoted member and operating to disconnect the pawl and ratchet mechanism when the pivoted member is moved about its pivot, and means operable from the vehicle for imparting movement to the said element.

4. The combination of an engine shaft, an actuating element therefor, means connecting the element with the shaft for rotating the shaft, said means embodying pawl and ratchet mechanism, a member pivotally supported by the said element and bodily movable therewith, means embodying a fixed toothed member for moving the pivoted member about its pivot by the movement of said element in either direction, a cam connected with the pivoted member and operating to disconnect the pawl and ratchet mechanism when the pivoted member is moved about its pivot, means operable from the vehicle for imparting movement to the said element, and elastic means for controlling the pivotal movement of said member.

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Witnesses:
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