

P. W. HODGKINSON.
ENGINE STARTER.
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1,056,417.

Patented Mar. 18, 1913.

Fig. 1.

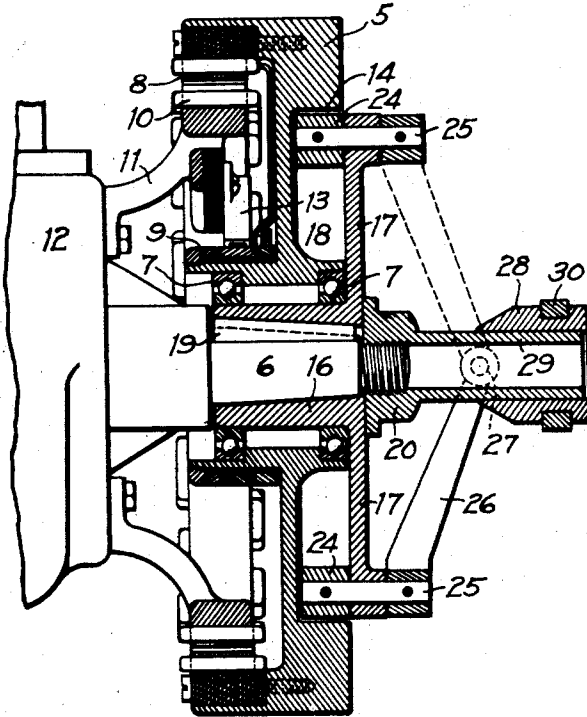


Fig. 2.

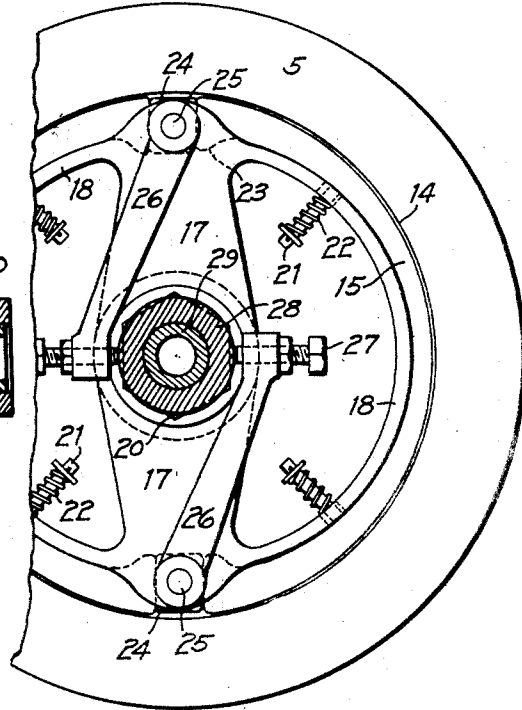
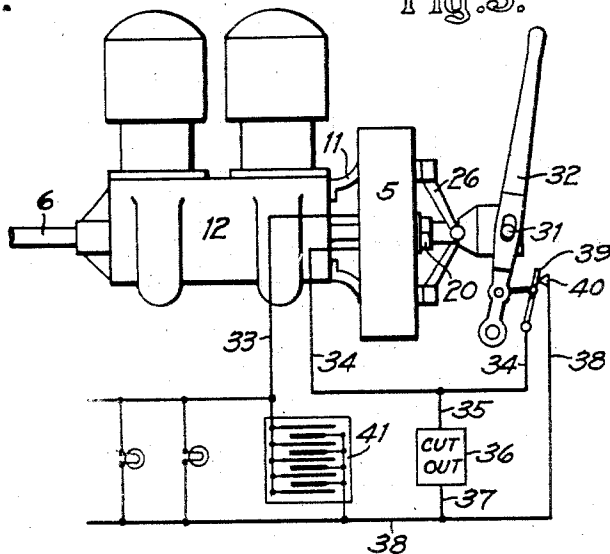


Fig. 3.



Witnesses:

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UNITED STATES PATENT OFFICE.

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ENGINE-STARTER.

1,056,417.

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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 an electric-motor is employed, this motor having a rotary element or armature which is combined with the fly-wheel of the engine, while the latter is connected with the crank-shaft of the engine by means of a clutch which permits the fly-wheel to be thrown into rapid rotation while the crank shaft is stationary, and then coupled with the crank-shaft so as to start the engine by means of the momentum which the fly-wheel has acquired.

The object of the invention is to produce an apparatus of the type in question which shall be simple, compact in construction, and efficient in operation, and in which the fly-wheel is journaled concentric with and supported upon the crank-shaft in the usual position, so as not substantially to modify the general form and operation of the engine.

To the foregoing end the invention consists in the engine-starter hereinafter described, as it is defined in the succeeding claims.

In the accompanying drawings:—Figure 1 is a vertical section of an engine-starter embodying the present invention; Fig. 2 is an end-elevation thereof, looking from right to left in Fig. 1; and Fig. 3 is a diagram, illustrating particularly the electrical connections by which the electric motor employed as a prime-mover is controlled.

In the illustrated embodiment of the invention the element of which the momentum is employed to produce the starting-movement of the crank-shaft is in the form of a fly-wheel 5, which is mounted upon the crank-shaft 6 of the engine in the position of the usual fly-wheel. This fly-wheel is not, however, rigid with the crank-shaft, but is mounted upon ball-bearings 7, so that during the starting-operation it may rotate freely while the crank-shaft remains at rest. Fixed to the rim of the fly-wheel 5 is the armature 8 of the multi-polar electric motor employed as a prime mover. The form and construction of the armature and of the

other parts of the electric motor are not particularly illustrated and described, as any ordinary or suitable type of motor may be used, but the armature is illustrated as connected with a commutator 9 mounted upon the hub of the fly-wheel, while a field-member 10 is located within and adjacent to the polar extremities of the armature, this field being supported by arms 11 fixed to the end of the crank-case 12 of the engine. Commutator-brushes 13 of any ordinary or suitable form are also supported by one of the arms 11, as shown in Fig. 1.

By means of the electric motor the fly-wheel 5 may be caused to rotate freely with increasing velocity, until it has accumulated sufficient momentum to start the engine. It is then necessary to connect the fly-wheel suddenly and firmly to the crank-shaft, to impart the momentum of the fly-wheel thereto, and to this end I employ, in the preferred embodiment of the invention, a friction-clutch of the expanding-ring type. The rim of the fly-wheel is provided with an annular clutch-surface 14, which coöperates with a divided clutch-ring 15. Secured to the crank-shaft 6 by a key 19 and a nut 20 is a hub 16, from which project two arms 17, connected by a rim 18 upon which the two members of the clutch-ring 15 are carried. Each member 15 is provided with two pins 21, which pass loosely through openings in the rim 18 and are surrounded by compression-springs 22 which tend normally to draw the clutch-members 15 inwardly, away from the surface 14. The members 15 are provided, at their adjacent ends, with shoulders 23, between which are square cams 24. Each cam is fixed to a rock-shaft 25 journaled in one of the arms 17, and an arm 26 is fixed to each rock-shaft and projects inwardly, being provided at its inner end with an adjusting-screw 27. The screws 27 coöperate with a conical member 28, which is slidably mounted on a sleeve 29 projecting from the nut 20. By means of a ring 30, seated in an annular groove in the member 28, the latter may be shifted in a left-hand direction from the position shown in Fig. 1, in which case the screws 27 and the arms 26 are swung outwardly, thus rocking the cams 24 and forcing the clutch-members 15 outwardly and into frictional engagement with the clutch-surface 14. By this action the fly-wheel is firmly connected with the crank-

shaft, so that its momentum is suddenly transferred to the latter. During the normal operation of the engine the clutch remains in the operative condition just described, so that the fly-wheel performs the usual functions.

As shown in Fig. 3, the ring 30 is provided with pins 31 engaging slots in a lever 32, this lever constituting a manually-operable device by which the starting-apparatus may be thrown into and out of operation. In this figure one terminal of the electric motor is shown as connected, through a wire 33, with a terminal of a storage-battery 41, by which current is supplied to operate the motor. The other terminal of the motor is connected, through wires 34 and 35, with an automatic cut-out 36, of any ordinary or suitable form which normally prevents return-flow of current from the battery through the motor. As devices of this kind are well known, the construction is not particularly illustrated and described. The circuit through the battery, the motor, and the cut-out is completed by wires 37 and 38, leading to the other terminal of the battery. This arrangement permits the motor to operate normally, that is, during the normal operation of the engine, as a generator by which the storage-battery may be recharged; and the arrangement is also adapted for use in connection with an electric lighting-system or any other translating devices energized by the storage-battery. When the engine is to be started the operation of the automatic cut-out 36 is interrupted by closing a short-circuit around it, thus permitting current from the battery to flow through the motor. To this end the wires 34 and 38 are shown as connected, respectively, with the contact-finger 39 and the fixed contact 40 of a circuit-closer, the contact-finger being connected with the hand-lever 32. Accordingly, when this lever is shifted to the position shown in Fig. 3, so as to disconnect the fly-wheel from the

crank-shaft, the short-circuit in question is closed, and the electric motor thereupon operates to rotate the fly-wheel, as above described. When the hand-lever is shifted back to normal position the short-circuit is opened. In case the starting-operation is not successful at the first attempt, it may be repeated indefinitely.

My invention is not limited to the embodiment thereof hereinbefore described and illustrated in the accompanying drawings, but may be embodied in various other forms within the nature of the invention as it is defined in the following claims.

I claim:—

1. An engine-starter comprising, in combination with the crank-case and the crank-shaft of the engine, a wheel of substantial weight journaled concentric with and supported by said shaft but free to rotate with respect thereto, said wheel including the rotary element of an electric motor, clutch-mechanism for connecting said wheel with the crank-shaft whereby the wheel is adapted to operate as a fly-wheel for the engine, and a fixed element for said motor mounted upon the crank-case and coöperating with the rotary element.

2. An engine-starter having, in combination with the crank-case and the crank-shaft of an engine, a wheel of substantial weight journaled concentric with and supported by said shaft, but free to rotate with respect thereto, said wheel including at its rim-portion the rotary element of an electric motor, a clutch coöperating with the rim of the wheel and adapted to connect it with the crank-shaft so that the wheel may operate as a fly-wheel for the engine, and a fixed element for said motor mounted upon the crank-case and coöperating with the rotary element.

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