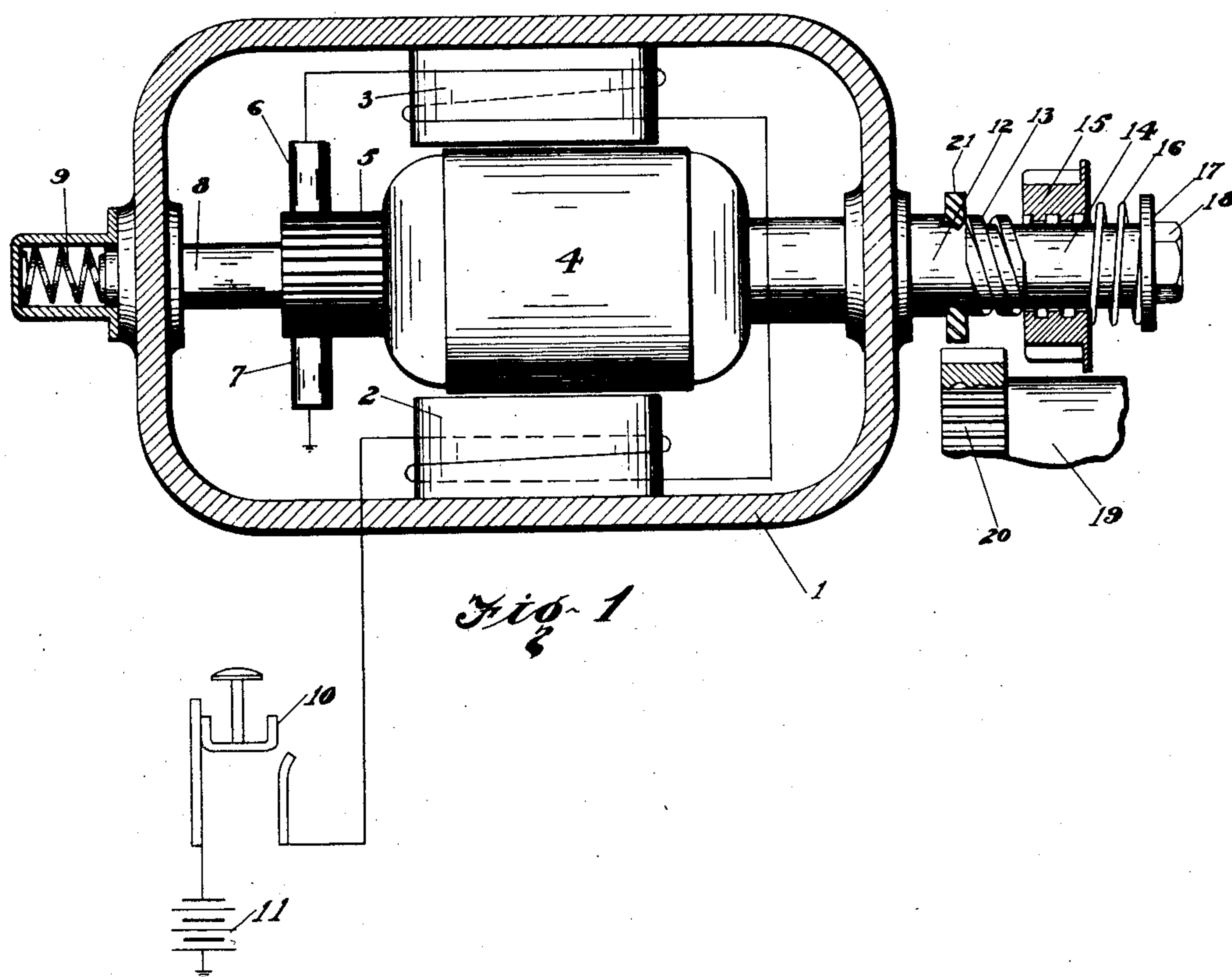


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J. H. RICHARDS.
ENGINE STARTER.
FILED DEC. 2, 1919.

1,440,697.



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UNITED STATES PATENT OFFICE.

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ENGINE STARTER.

Application filed December 2, 1919. Serial No. 342,024.

To all whom it may concern:

Be it known that I, JULIUS H. RICHARDS, a citizen of the United States, residing at Springfield, in the county of Hampden, State of Massachusetts, have invented certain new and useful Improvements in an Engine Starter, of which the following is a description, reference being had to the accompanying drawing, and to the figures of reference marked thereon.

My invention relates to means for starting engines, particularly of the internal combustion type, wherein the engine member is provided with gear teeth which are adapted to be engaged by a driving member operated by an electric motor. My invention is especially adapted for use in connection with a starter or engagement, such as shown in Rushmore Patent #1,235,162, issued July 31, 1917.

In drives or starters of this type full engagement of the driving member with the engine member is brought about by the longitudinal movement of the armature of the electric motor or some portion of its drive shaft. The motors used for this purpose are of the series type and when the starting switch is closed the amount of current flowing through the motor for a short period of time is from three to five times the current required for cranking the engine after the "break away" of the engine is effected and during this interval of heavy current flow the motor generates a very high torque and the armature is pulled into its normal running position, wherein the magnetic part of the armature is centrally located with respect to the field poles, with tremendous force and with considerable clashing of the driving pinion with the gear teeth on the engine member. It frequently happens that the driving gear does not immediately mesh with the gear teeth on the engine member and some of the teeth will be broken off even though the teeth on the engine member and on the pinion are beveled off to assist in making the engagement.

It is the principal object of my invention to eliminate breakage of teeth on the engine member as well as on the engaging gear itself, although the breakage usually comes on the teeth of engine member.

It is another object of my invention to shorten the construction of certain parts

entering into a starter of this type thereby to reduce the cost of manufacture of the same.

Other and further objects will be apparent to one skilled in the art after a study of the annexed drawing and specification. My invention will best be understood by reference to the drawing, wherein—

Figure 1 is a part sectional view of an engine starter including a diagrammatic illustration of the wiring.

Since the Rushmore type of drive is well understood or as may be obtained from the patent heretofore referred to, the general operation will not be described in detail, except as it is used in connection with my improvement.

In the drawing, 1 illustrates the frame of a starting motor having two-pole pieces 2 and 3 fastened thereto. It will be understood that the motor may have as many pairs of poles as required, the usual practice being to use two pairs. Positioned between the poles 2 and 3 is an armature 4 having a commutator 5 with brushes 6 and 7 resting thereon. The armature shaft 8 is shown as being acted on at one end by a spring 9, in such manner that the armature 4 is normally held in a displaced position with reference to the pole pieces 2 and 3 and commutator 5 is made long enough to allow for the armature 4 to move horizontally in its running position when current is sent through the motor by means of the switch 10 which is connected in circuit with a battery 11. Motors of this kind are usually of the series type, as indicated. The armature shaft 8 has extension 12 which is made up of two portions, a threaded portion 13 and a smooth portion 14. A driving member or pinion 15 is normally positioned on the smooth portion 14, being held closely adjacent the threaded portion 13 by a yielding member or spring 16 that is in turn held in position by any suitable means, such as washer 17 and nut 18. An engine member 19 carries gear teeth 20 that are adapted to receive the teeth of the driving member 15. It is the usual practice to make these engagements on the flywheel of the engine and a section of the flywheel is therefore indicated at 19.

In the operation of my device when electric current is passed through the armature by the closure of the switch 10, the arma-

ture or its shaft immediately moves horizontally bringing the driving member 15 into what I term initial engagement with the gear teeth 20, and if no obstruction is encountered the member 15 will immediately pass from initial to full engagement against the stop 21 which may be a collar on the shaft end 12, by means of the screw threads 13, as will be well understood. Should, however, an obstruction be encountered the pressure applied against the member 15 by the longitudinal movement of the armature shaft will allow the smooth portion of the shaft to slip freely through the member 15 and compress the yielding member 16. Immediately the obstruction has passed the member 16 will force the member 15 forward on the smooth portion 14 of the shaft and into initial engagement with the teeth 20 and the full engagement will then be completed by the screw threads 13, as previously described for engagement when no obstruction is encountered.

It will be understood by one skilled in the art that a yielding initial engagement is obtained by the construction described which will prevent the gear teeth 20 from being broken as often happens when the member 15 is solid or non-yieldingly mounted on the motor shaft. It will also be seen that the armature 4 moves longitudinally only a short distance since a certain percentage of the engagement movement is accomplished automatically by the screw threads 13, therefore considerable length of commutator and detail length of motor is saved by my construction. Another advantage obtained is that the screw threads 13, coacting with the threads on the driving member 15 serve to automatically disengage the member 15 from the engine member before the armature 4 is returned to its normal non-running position by the spring 9; that is to say, in previous devices of this kind the disengagement of the driving member with the engine member is dependent on the reduced torque of the motor armature caused by the starting of the engine thereby removing torque effort from the motor armature but in this case, as explained, the member 15 is disengaged automatically from the engine member whenever the engine member begins to turn faster than it is being turned by the starting motor. I consider this one feature of my invention a considerable improvement over the type of starter described in said Rushmore patent.

It will be apparent that various changes may be made in the detail arrangements without departing from the spirit of my in-

vention and the scope of the appended claims.

Having thus described my invention, what I claim is:—

1. An engine starter drive including a rotatable shaft having a smooth portion and a screw threaded portion, a driving member normally positioned on such smooth portion, and having a threaded bore to engage said screw threaded portion, and means for normally holding such member on the smooth portion adjacent said threaded portion for engagement therewith when the shaft is rotated.

2. An engine starter drive including a rotatable shaft having a smooth portion and a screw threaded portion, a driving member normally positioned on such smooth portion, and having a threaded bore to engage said screw threaded portion, and yielding means for normally holding such member on the smooth portion adjacent said threaded portion for engagement therewith when the shaft is rotated.

3. An engine starter drive including a rotatable shaft having a smooth portion and a screw threaded portion, a driving member normally positioned on such smooth portion, and having a threaded bore to engage said screw threaded portion, said shaft having a stop at the outer end of such smooth portion, and a spring interposed between the stop and driving member for normally holding such member adjacent said threaded portion.

4. An engine starter drive including a rotatable shaft having a smooth portion and a screw threaded portion, a driving member normally positioned on such smooth portion, and means for normally holding such member on the smooth portion adjacent said threaded portion for engagement therewith when the shaft is rotated, said shaft being mounted for bodily endwise movement to carry said driving member into initial engagement with a member of the engine to be started.

5. In a starter for gas engines and the like the combination of, an engine member; a driving shaft, a driving member carried on said shaft and free to move longitudinally thereon and rotarily thereof, means for moving said shaft longitudinally of its axis to produce initial engagement between the engine member and driving member and means on said shaft for automatically completing the initial engagement to full engagement.

In testimony whereof, I affix my signature.

JULIUS H. RICHARDS.