W. L. McGRATH.

ENGINE STARTER.

APPLICATION FILED APR. 9, 1919.

1,330,326. Patented Feb. 10, 1920.

Fig. 1.

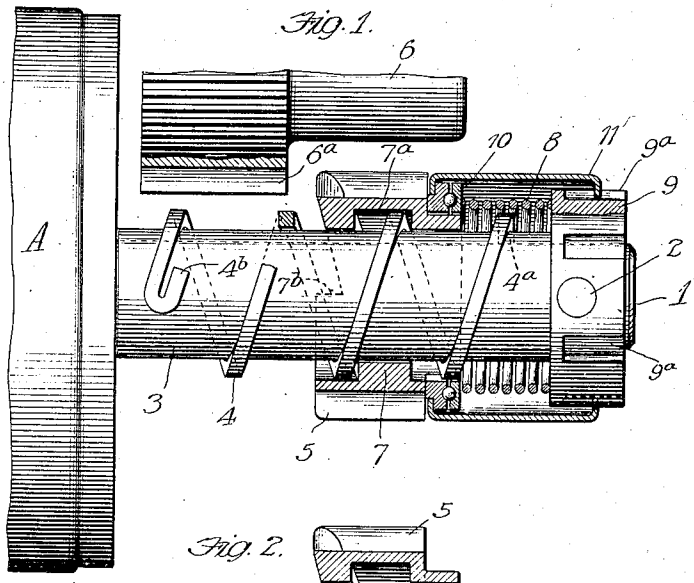


Fig. 2.

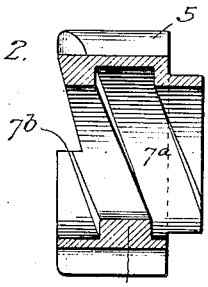
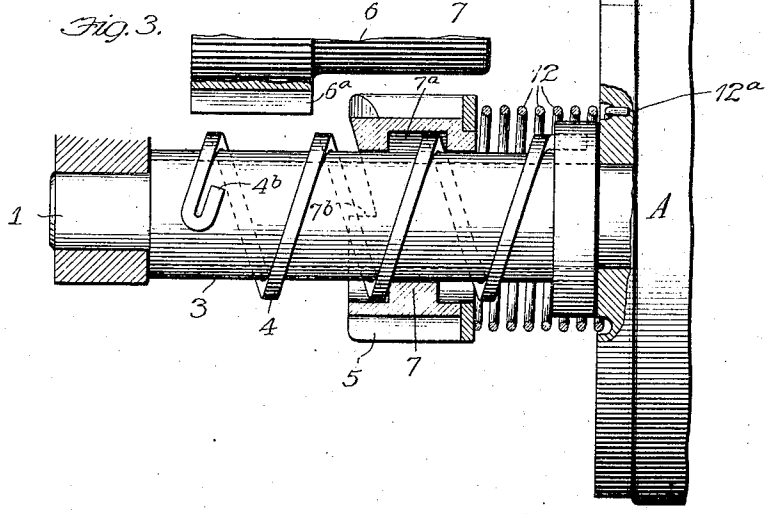


Fig. 3.



Witnesses

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ENGINE-STARTER.

1,330,326. Specification of Letters Patent. Patented Feb. 10, 1920.

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To all whom it may concern:

Be it known that I, WILLIAM L. McGRATH, a citizen of the United States, residing at Elmira, in the county of Chemung and State of New York, have invented certain new and useful Improvements in Engine-Starters, of which the following is a specification.

My invention relates to a starter for an engine such as an internal combustion engine, and pertains to the drive or transmission thereof for automatically connecting a starting motor or other sources of power to a member or part of the engine to be started, and for thereafter transmitting the power thereto for the starting of such engine, after which the drive is automatically disconnected from the engine as an incident to the starting of the latter on its own power.

My invention pertains to that specific type of automatic drive or transmission exemplified in Bergmann Patent No. 1,254,196, dated January 22, 1918, in which a spring mounted on a rotatable shaft forms, in effect, yielding threads on such shaft and receives a driving member which, as a result of the rotation of such shaft, is advanced longitudinally thereof into mesh with the engine member such as the fly wheel, and thereafter partakes of the rotation of this shaft and thereby starts the engine. In the present instance the driving member is a pinion, and such pinion directly engages the fly wheel, although in the broader aspect of my invention it is immaterial whether this driving member is a pinion for such direct connection or acts as an indirect means for driving a pinion.

The object of my invention is to improve the construction of this type of drive, particularly by so forming the threads of the driving member as to coöperate more readily with the spring thread of the shaft and to accommodate all variations or inaccuracies that may exist originally in said spring thread or which might occur during the use of the drive.

In the drawing Figure 1 is a sectional elevation of the starter embodying my invention; Fig. 2 a section of the driving member detached; and Fig. 3 a sectional elevation of a modified form of construction of starter.

Referring to the embodiment of my invention selected for a clear and definite description thereof, I have shown what is known as a direct drive, that is a drive which is driven directly by a source of power, although it will be understood that the drive may be indirect driven in the now well-known manner. Also it will be understood that any source of power may be employed, although I have shown a starting motor.

Referring to the construction illustrated in Fig. 1, the starting motor indicated at A has an extended armature shaft to which is secured in suitable manner, as by the pin 2, a sleeve 3. This is the preferred construction, although it will be understood that if desired the sleeve may be entirely omitted and the extended shaft 1 be employed as the driving shaft to take and support the other parts now to be described.

Upon the sleeve 3 there is mounted a spiral spring 4 which is fastened thereto at its outer end at 4^a, the other end of which extends toward the motor and terminates in a clutch jaw 4^b by reason of a return bend at the extreme end. This spring forms a yielding thread for the driving member which, in the present instance, is a pinion 5. The bore of this pinion is screw-threaded so that when the sleeve and its spring thread are rotated the pinion will be advanced longitudinally into mesh with the teeth 6^a of the fly wheel 6 of the engine to be started. However, the threads of the pinion are specially made in that the groove 7^a between the thread or threads 7 thereof is made of comparatively great width, being materially in excess of the width of the spring 4 as clearly indicated in Fig. 1. As a result the pinion has considerable freedom of movement on the spring thread and can accommodate itself to any inequalities or inaccuracies of such spring thread, and at the same time effectually coöperate therewith in its longitudinal movements with respect to the sleeve, and also in its clutching action at the end of the advance longitudinal movement at the time of the driving operation. In order to thus engage the spring thread the pinion has a clutch jaw 7^b which is adapted to engage the clutch jaw 4^b of the spring thread.

In order to hold the pinion threads into contact with the spring thread by means which is mounted upon the sleeve I employ the following construction: A comparatively light coiled spring 8 is interposed

between the collar 9 (which is secured to the sleeve and driving shaft by the pin 2) and an anti-friction bearing 10, one member of which bears against the outer end of the pinion 5. The spring and bearing are held assembled and in position by means of the shell 11, the inner end of which is flanged to contain the anti-friction bearing and the outer end of which is flanged and grooved so as to engage with the longitudinal grooves 9^a of the collar 9. As a result this shell and the bearing are permitted a longitudinal movement and the spring 8 is permitted to expand and contract. The shell and its bearing, as well as the spring 8, are limited in their left-hand movement by the inner ends of the grooves or slots 9^a, which are adapted to be contacted by the flanged outer ends of the shell whenever the pinion has been advanced longitudinally into mesh with the fly wheel and therefore becomes separated from said bearing. When the pinion is automatically demeshed by the fly wheel and returned to normal position, its return movement is cushioned by means of the spring 8 inasmuch as the pinion in such movement will contact the bearing 10 and tend to move the same to the right. It will be understood that inasmuch as the bearing 10 rotates in unison with the sleeve there is no tendency to impart any frictional resistance to the pinion beyond that due to the contact of the same thereagainst.

In case the pinion teeth and fly wheel teeth should abut end to end, the pinion will stop momentarily while the screw action continues (this being permitted by reason of the wide space between the pinion threads) but against the tension of spring. Thereupon, the pinion will be slightly rotated into register with the flywheel teeth and full mesh obtained.

In Fig. 3 I have shown a modified form of construction which is of the outboard type of drive as compared with the inboard type, as shown in Fig. 1. Moreover the construction differs in that the spring for holding the pinion threads and the spring thread into engagement does not rotate but is fixedly secured at one end. As shown this spring 12 is a coiled spring with its inner end 12^a anchored in the frame of the starting motor, and with its outer end bearing against the inner end of the pinion. In this construction this outer end of the spring 12 will impart some frictional resistance to the pinion, but not to the detriment of its operation, although the construction of Fig. 1 is preferred in that an anti-friction bearing is provided so that the frictional resistance between the parts will be reduced to a minimum. In other respects the two constructions are the same and the mode of operation is the same.

I claim:

1. An engine starter drive comprising a rotatable shaft, a spiral spring threaded thereon, and a driving member mounted on the thread and shaft and provided with threads having a space between them materially greater than the width of the spring thread to permit of longitudinal movement of the driving member on the shaft.

2. An engine starter drive comprising a rotatable shaft, a spiral spring thread thereon, and a driving member mounted on such thread and shaft for longitudinal movement thereof and rotary movement therewith, and also capable of a longitudinal movement independent of said thread.

3. An engine starter drive comprising a rotatable shaft, a spiral spring thread thereon, and a driving member mounted on the thread and shaft and provided with threads having a space between them greater than the width of the spring thread, said driving member and one end of the spring thread having complementary clutch jaws.

4. An engine starter drive comprising a rotatable shaft, a spiral spring thread thereon, and a driving member mounted on such thread and shaft for longitudinal movement thereof and rotary movement therewith, and also capable of a longitudinal movement independent of said thread and yielding means for resisting said independent longitudinal movement of the driving member.

5. An engine starter drive comprising a rotatable shaft, a spiral spring thread thereon, and a driving member mounted on such thread and shaft for longitudinal movement thereof and rotary movement therewith, and also capable of a longitudinal movement independent of said thread, and a spring for resisting said independent longitudinal movement of the driving member.

6. An engine starter drive comprising a rotatable shaft, a spiral spring thread thereon, and a driving member mounted on such thread and shaft for longitudinal movement thereof and rotary movement therewith and also capable of a longitudinal movement independent of said thread and a spring acting on the driving member until it engages a member of the engine to be started.

7. An engine starter drive comprising a rotatable shaft, a spiral spring thread thereon, and a driving member mounted on such thread and shaft for longitudinal movement thereof and rotary movement therewith and also capable of a longitudinal movement independent of said thread and a yielding device mounted on the shaft and acting on the driving member, such device including a spring and an anti-friction bearing between it and such member.

8. An engine starter drive comprising a rotatable shaft, a spiral spring thread thereon, and a driving member mounted on such

thread and shaft for longitudinal movement thereof and rotary movement therewith and also capable of a longitudinal movement independent of said thread, and a yielding device carried by the shaft and acting on the driving member, such device including a spring, an anti-friction bearing between it and such driving member, and a shell connecting with the shaft and supporting the bearing.

9. An engine starter drive comprising a rotatable shaft, a spiral spring thread thereon, and a driving member mounted on such thread and shaft for longitudinal movement thereof and rotary movement therewith and also capable of a longitudinal movement independent of said thread, and a yielding device carried by the shaft and acting on the driving member, such device including a spring, an anti-friction bearing between it and such driving member, and a shell connecting with the shaft and supporting the bearing such shell being mounted on the shaft for rotary movement therewith and limited longitudinal movement thereon to follow up the driving member in its initial longitudinal movement.

10. An engine starter drive comprising a rotatable shaft, a spiral spring thread thereon, and a driving member mounted on such thread and shaft for longitudinal movement thereof and rotary movement therewith and also capable of a longitudinal movement independent of said thread, and a yielding device carried by the shaft and acting on the driving member, such device including a spring, an anti-friction bearing between it and such driving member, and a shell connecting with the shaft and supporting the bearing, said shaft having a collar with longitudinal grooves, and such shell having a notched flange to engage and slide in such grooves.

WILLIAM L. McGRATH.