

May 19, 1931.

T. J. ROBERTS

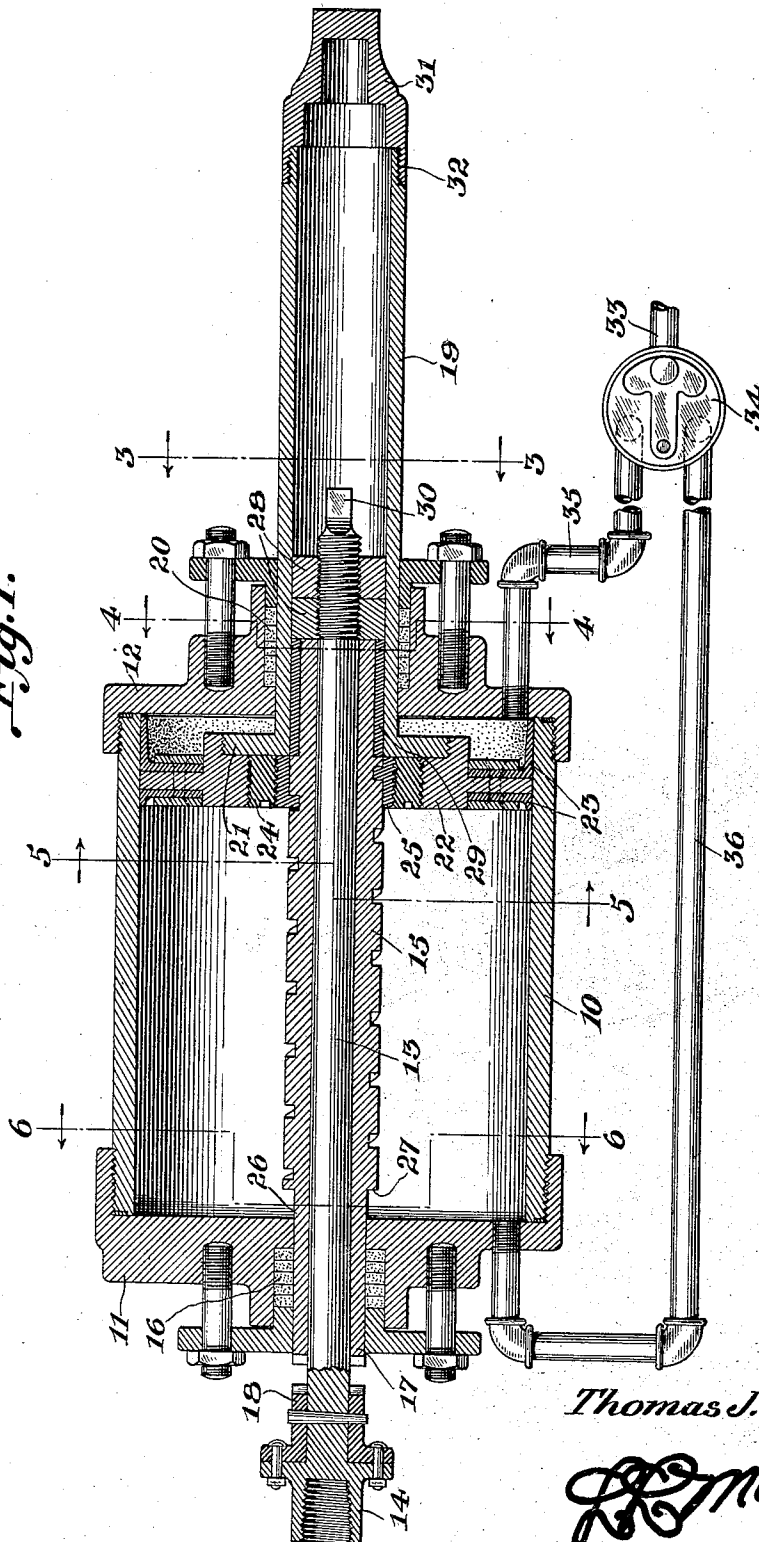
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FLUID PRESSURE STARTING MECHANISM

Filed Nov. 21, 1927

3 Sheets-Sheet 1

Fig. 1.



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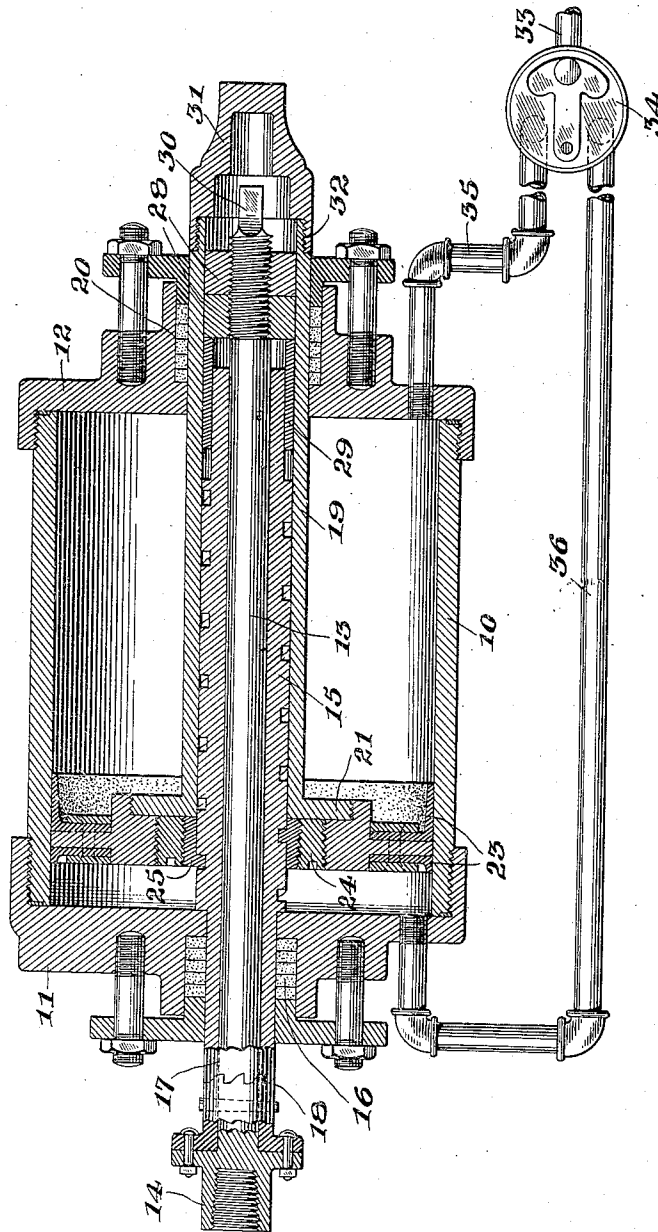
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## FLUID PRESSURE STARTING MECHANISM

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Fig. 2.



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Fig. 4.

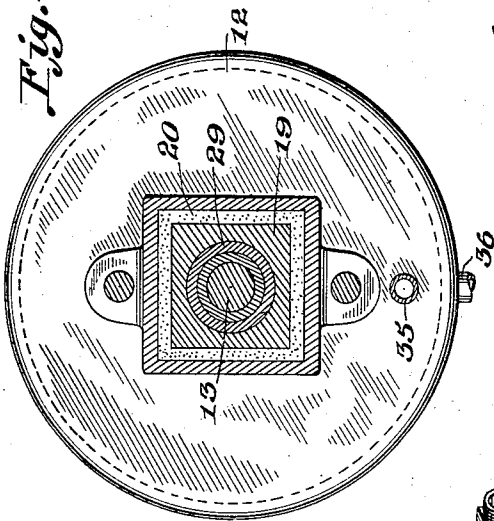


Fig. 6.

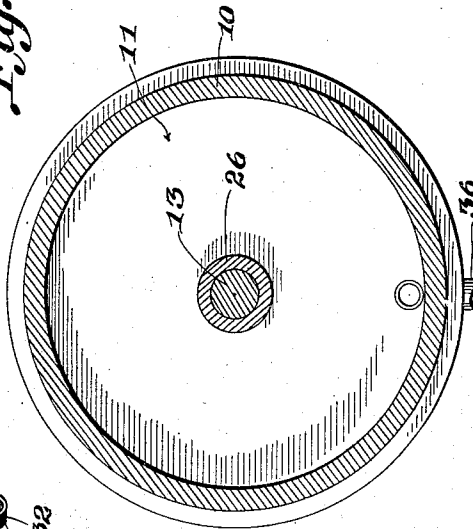


Fig. 7.

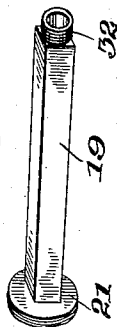


Fig. 3.

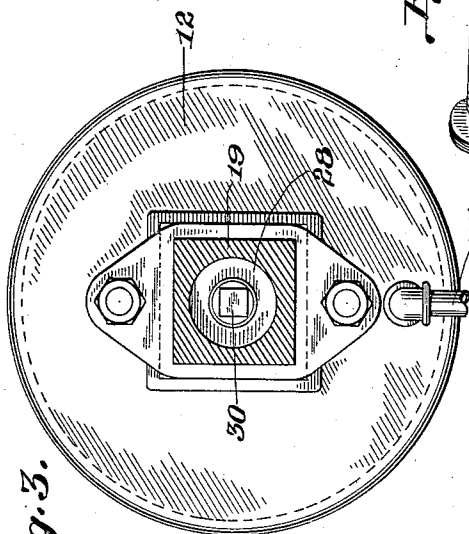
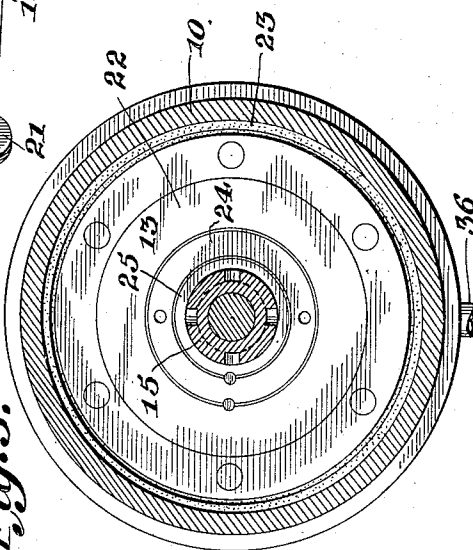


Fig. 5.



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## UNITED STATES PATENT OFFICE

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## FLUID PRESSURE STARTING MECHANISM

Application filed November 21, 1927. Serial No. 234,868.

This invention relates to starters for internal combustion engines and has for an object to provide a device of the piston and cylinder type with new and improved features of operation and construction.

A further object of the invention is to provide a starter having a cylinder and piston with a worm operated by the piston and an envelope enclosing the worm to properly retain the operating fluid and prevent rotation of the piston.

A further object of the invention is to provide a starter comprising a cylinder with piston reciprocating therein and carrying therewith an envelope, which latter envelope encloses the worm which is rotated by the reciprocation of the piston, the envelope being angular in cross section to prevent rotation of the piston.

With these and other objects in view, the invention comprises certain novel parts, elements, units, combinations, constructions, interactions, mechanical movements and functions as disclosed in the drawings together with mechanical and functional equivalents thereof, as will be hereinafter more fully described and claimed.

In the drawings:

Figure 1 is a view of the starter in substantially vertical longitudinal section with the piston located at the position of initiating movement.

Figure 2 is a similar section with the piston shown substantially at the limit of its movement.

Figure 3 is a transverse sectional view taken on line 3—3 of Figure 1.

Figure 4 is a transverse sectional view taken on line 4—4 of Figure 1.

Figure 5 is a transverse sectional view taken on line 5—5 of Figure 1.

Figure 6 is a transverse sectional view taken on line 6—6 of Figure 1.

Figure 7 is a perspective view of the envelope.

Like characters of reference indicate corresponding parts throughout the several views.

The starter which forms the subject matter of this application is primarily intended for

the initial actuation or turning over of internal combustion engines wherever located, but may obviously be used for other purposes, and in other locations, and is not in any way limited in its utility to association with such an engine.

It comprises in its essential features a cylinder 10 which is mounted in any approved position and by the use of any approved devices to properly associate with the mechanical devices to be operated thereby. The cylinder is provided at its opposite ends with heads 11 and 12 which are attached thereto by being screw-threaded directly upon the exterior of the cylinder, but it is to be understood that any means of attaching the heads is within the scope of the invention.

Located axially within the cylinder is a shaft 13 which may be the regular shaft ordinarily found upon internal combustion engines to apply a crank or other starter thereto, or may be an extension thereof, but in any case it performs the function of the ordinary shaft and the showing of the coupling 14 is only intended to indicate that it may be a separate shaft attached to a shaft already found upon the engine.

Mounted upon the shaft 13, also axially within the cylinder, is a worm 15 which extends outwardly through the stuffing box 16 in the head 11 and carries one member 17 of a clutch, the other member 18 being rigidly secured to the shaft 13 in any approved mechanical manner.

Embracing the worm 15 is an envelope 19 which according to the present showing is square upon the exterior in transverse section and cylindrical upon its interior to fit the worm 15. The envelope 19 slides through a stuffing box 20 in the cylinder head 12, the opening and stuffing box being, of course, square to correspond to the exterior of the envelope 19 and to prevent rotation of the parts as will be hereinafter more fully described.

At the end within the cylinder 10 the envelope 19 is provided with an enlarged annulus 21 to which the piston is attached, preferably by screw-threaded connection, the piston 22 being screwed on to said annulus 21.

The piston 22 is provided with any usual type of packing, indicated at 23, and, while the cup type, as indicated, is found a desirable form of packing, the invention is in no way limited thereto.

The piston 22 also carries a ring 24 connected by screw threads with a nut 25 in turn connected with the ring 24. The nut 25 engages the spiral furrows of the worm 15, so that as the piston advances the worm 15 is rotated. Another movement of the worm 15 is also provided for so that the clutch members 17 and 18 may properly engage. This movement is a limited longitudinal movement and is provided for by the reduced part 26 integral with the worm providing a shoulder 27 which engages against the cylinder head 11, as shown at Figure 2. The opposite movement of the worm is limited by means of nuts 28 adjustably secured to the shaft 13, and a packing 29 is introduced between the worm 15 and the envelope 19 to permit longitudinal sliding movement, and at the same time prevent the passage of the compressed fluid employed to operate the device. The shaft 13 is provided with an angular extremity 30 to receive a crank or other manual means for operating the shaft under certain conditions, and a cap 31 is normally screwed upon the threaded shank 32 of the envelope to make a complete closure.

Fluid under pressure is supplied to the device from any source through the pipe 33 and controlled by a valve 34 which may be of any usual and ordinary three-way valve type controlling the passage of the fluid to pipes 35 and 36.

In the use of the device, the normal inoperative position will be that shown at Figure 1 with the piston at the end indicated as the righthand end in that figure, and the clutch members 17 and 18 disconnected. When the device is to be employed for starting any mechanical device which may be attached at 14, the fluid under pressure present in the pipe 33 will be directed to the pipe 35 by the proper manipulation of the three-way valve 34. In the usual well known practice of such valves, the pipe 36 will, therefore, be open to the atmosphere and the fluid under pressure will be introduced back of the piston 22 to force the piston from the position shown at Figure 1 to that shown at Figure 2. The first movement of the piston in the direction indicated will serve to move the worm 15 in the same direction until the shoulder 27 engages against the piston head 11 and the clutch members 17 and 18 interengage. Further longitudinal movement is, therefore prevented and the continued movement of the piston results in a rotary movement of the worm 15 and the parts connected therewith by the clutch members 17 and 18 which parts are the shaft 13 and any connected parts. As will be noted, the movement of the piston 22

also carried therewith the envelope 19 which slides through its stuffing box in the piston head 12, the angular formation preventing rotation, also sliding over and embracing the worm 15. The interposition of this envelope 19 prevents the escape of the motor fluid from the cylinder through any parts and confines it back of the piston to perform its work. When the piston has reached the limit of its motivating movement, the valve is manually reversed to open the pipe 35 to the atmosphere and admit air from the pipe 33 to the pipe 36 whereupon the piston returns to normal, moving therewith the several parts in the opposite direction to that described in the motivating movement.

What I claim to be new is:

1. A starter comprising a cylinder, a piston mounted to reciprocate therein, an envelope carried rigidly by the piston and extending outwardly through one head of the cylinder and having an angular cross section and removable cap, a shaft extending longitudinally and axially through the cylinder and having one end enclosed within the envelope, means to apply a manual implement to the enclosed end when the cap of the envelope is removed, a worm mounted axially within the cylinder and rotating about the shaft and within the envelope, means carried by the piston to rotate the worm, separable clutch members, one of which is carried by the worm and one by the shaft, and means connecting the piston and worm providing an initial longitudinal movement of the worm for interengaging the clutch members.

2. A starter comprising a cylinder, a piston mounted to reciprocate within the cylinder, an envelope rigidly connected with the piston and extending outwardly through one piston head, said envelope being angular in external cross section, a shaft extending axially through the cylinder and having one end enclosed within the envelope, means to apply a manual implement to said end for rotating said shaft independently of other elements, a worm mounted to rotate upon the shaft and within the envelope and journaled axially within the cylinder, means carried by the piston for actuating the worm, a clutch member carried by the shaft, a second clutch member carried by the worm, means providing limited longitudinal movement of the worm for the interengagement of the clutch members, and means carried by the shaft for limiting the return movement of the worm.

In testimony whereof I affix my signature.

THOMAS J. ROBERTS.