J. E. DESMOND.

STARTER FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED MAY 27, 1916. RENEWED OCT. 31, 1917.

1,250,569. Patented Dec. 18, 1917.

2 SHEETS—SHEET 1.

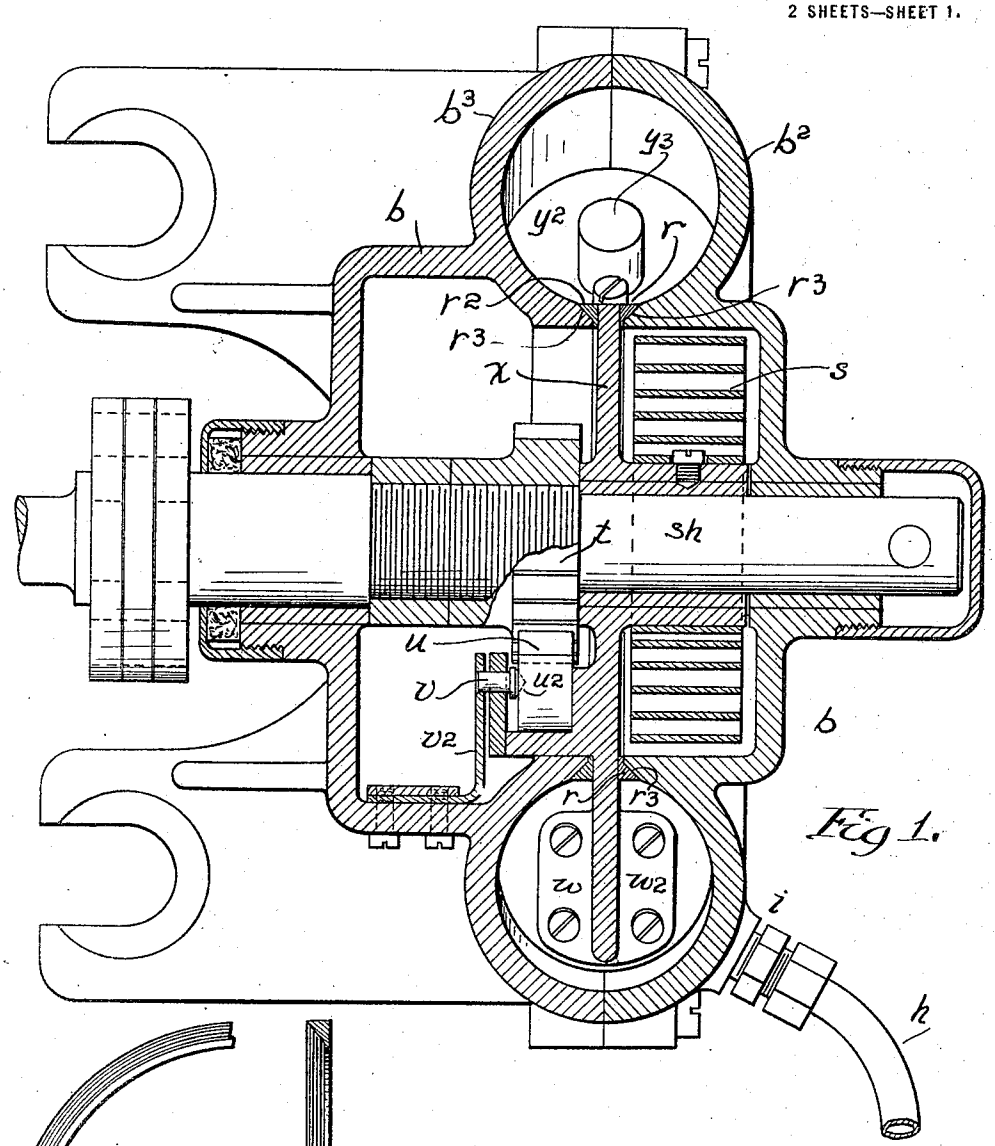


Fig. 1.

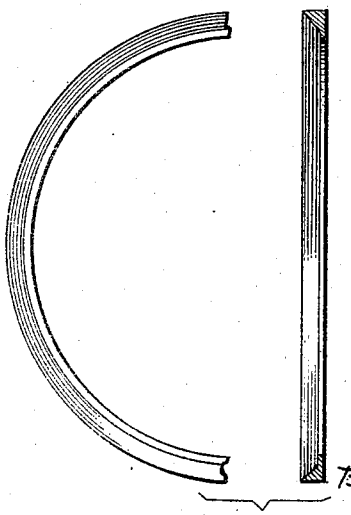


Fig. 3.

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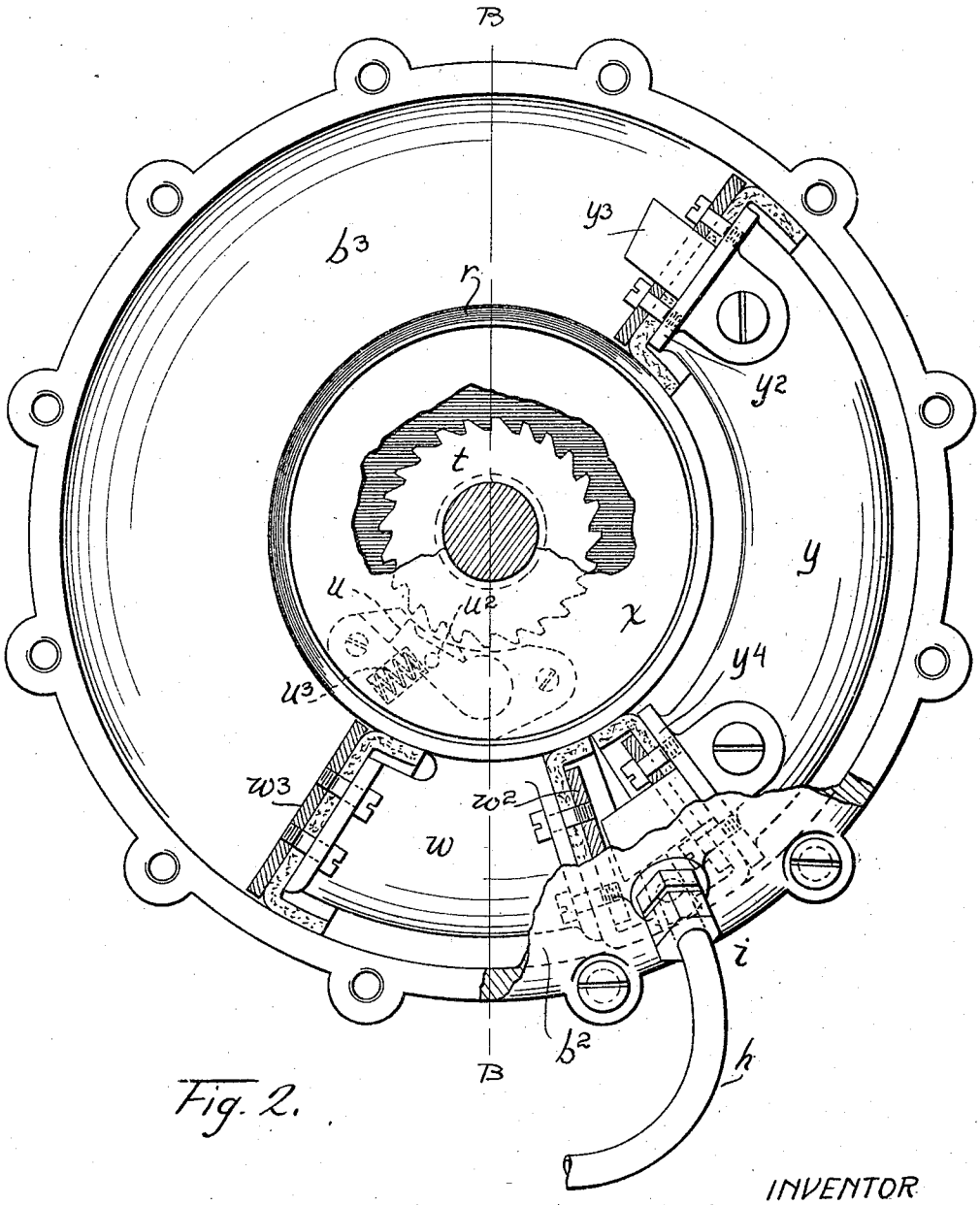


Fig. 2.

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UNITED STATES PATENT OFFICE.

JOHN E. DESMOND, OF DETROIT, MICHIGAN, ASSIGNOR TO GRAY MOTOR COMPANY, OF HIGHLAND PARK, MICHIGAN, A CORPORATION OF DELAWARE.

STARTER FOR INTERNAL-COMBUSTION ENGINES.

1,250,569. Specification of Letters Patent. Patented Dec. 18, 1917.

Application filed May 27, 1916, Serial No. 100,209. Renewed October 31, 1917. Serial No. 199,610.

To all whom it may concern:

Be it known that I, JOHN E. DESMOND, a citizen of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Starters for Internal-Combustion Engines, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to starters for internal combustion engines and my improvements have specifically in view providing an improved starter and one especially adapted to a Ford automobile.

I accomplish this object in the device illustrated in the accompanying drawings in which,

Figure 1 is a detail sectional view of an apparatus embodying my invention.

Fig. 2 is an elevation, the near side of the casing being removed and parts partly broken away to show the interior construction.

Fig. 3 includes two views of a portion of a packing ring, one in the plane of the ring and the other in a plane at right angles to the plane of the ring.

b is a casing for containing an angularly moving piston. h is a pipe or conduit connected at one end at i, with the casing b. w (Figs. 1 and 2) is a piston having end faces w^2 and w^3 properly packed and adapted to travel in an annular chamber in the casing b. The piston w is rigidly connected to or is integral with a circular disk x which disk has a hub at its center and is sleeved to oscillate or turn about the engine shaft sh. y (Fig. 2) is a stationary abutment having end faces y^4 and y^2 properly packed and fitting into the annular passage in the casing b. y^3 is a buffer extending from the face y^2 of the abutment y. The conduit or pipe h communicates with the casing b and the annular chamber therein between the heads w^2 and y^2.

s is a helical spring secured at one end to the hub of the disk x and adapted to turn said disk in the reverse direction to that of the hands of a clock, as shown in Fig. 3.

t is a ratchet wheel rigidly connected with the shaft sh. u is a pawl carried by the disk x and adapted to engage the teeth of the wheel t when said disk is actuated in the direction of the hands of a clock, as shown in Fig. 2. u^2 is a cavity in the lateral face of the pawl u, and v is a latch having a conical inner end and actuated by a spring v^2 to engage in the cavity u^2 in the pawl u to hold said pawl out of engagement with the teeth of the wheel t when the disk x and pawl u are in their initial positions. There is a spring u^3 tending to force the pawl u into engagement with the teeth of the wheel t.

The casing b is made up of two parts b^2 and b^3, having machined edges, fitting together at their outer edges to form the annular cavity in said casing which is of circular form in cross section. The inner edges of the halves b^2 b^3 of the casing do not meet but are somewhat separated from each other and parallel so as to leave an annular opening through the inner wall of the casing as shown in Fig. 2. The edges bordering the annular opening just described are chamfered off inwardly, as shown in r^3 r^3 Fig. 2. r r^2 are steel rings having flat plane inner surfaces adapted to fit against the sides of the disk x and having chamfered or conical surfaces adapted to fit against the chamfered or conical surfaces r^3. The upper or outer surfaces of the rings r r^2 are cylindrical and finished to form a smooth surface against which the piston w fits and turns.

The operation of the above described device is as follows:

To start the engine the operator puts a compressed air reservoir (not shown) into communication with the casing b through the pipe h. The compressed air rushing through this connection into the cavity of the casing b between the head y^4 of the abutment y and the head w^2 of the piston w forces the piston forward carrying with it the disk x and the pawl u. As soon as the pawl u has passed away from the latch v and therefore has disengaged itself from said latch, it is forced by the spring u^4 into engagement with a tooth of the ratchet t and carries such ratchet with it and consequently turns the shaft sh of the engine thus starting the engine.

When the piston w has made its stroke the air is released and the spring s retracts the disk x and piston w to its normal position. the pawl u being again engaged by the latch v to hold it out of engagement with

the ratchet t until the piston w shall have made another stroke. Of course, any number of such strokes may be made by repeatedly operating the lever k.

It will be observed that as the piston progresses in its travel the pressure of the air comes upon the rings r r^2 and acts to force them inward and into closer contact with the surface of the disk x and with the chamfered edges r^3 of the casing b so that a tight joint is secured in this place, such as will continue to hold the air even after having been subjected to wear in the operation of the device.

What I claim is:

1. In combination, an annular chamber, a piston adapted to fit and reciprocate in said annular chamber, an annular opening through the wall of said chamber, a disk extending through said opening and connected with said piston, an edge bounding said opening being chamfered so that its cross section shall diverge inwardly from the adjacent surface of said disk, a packing ring having a wedge shaped cross section fitting against said edge and the adjacent surface of said disk so that a pressure in said chamber upon said ring shall tend to force it against said edge and adjacent surface of the disk.

2. In combination, an annular chamber, a piston adapted to fit and reciprocate in said annular chamber, an annular opening through the wall of said chamber, a disk extending through said opening and connected with said piston, an edge bounding said opening being chamfered so that its cross section shall diverge inwardly from the adjacent surface of said disk, a packing ring having a wedge shaped cross section fitting against said edge and the adjacent surface of said disk so that a pressure in said chamber upon said ring shall tend to force it against said edge and adjacent surface of the disk, said ring having an approximately cylindrical surface, and said piston being adapted to fit against the surface of said ring.

In testimony whereof, I sign this specification.

JOHN E. DESMOND.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."