

(No Model.)

D. D. HARDY.  
ROTARY ENGINE.

No. 260,678.

Patented July 4, 1882.

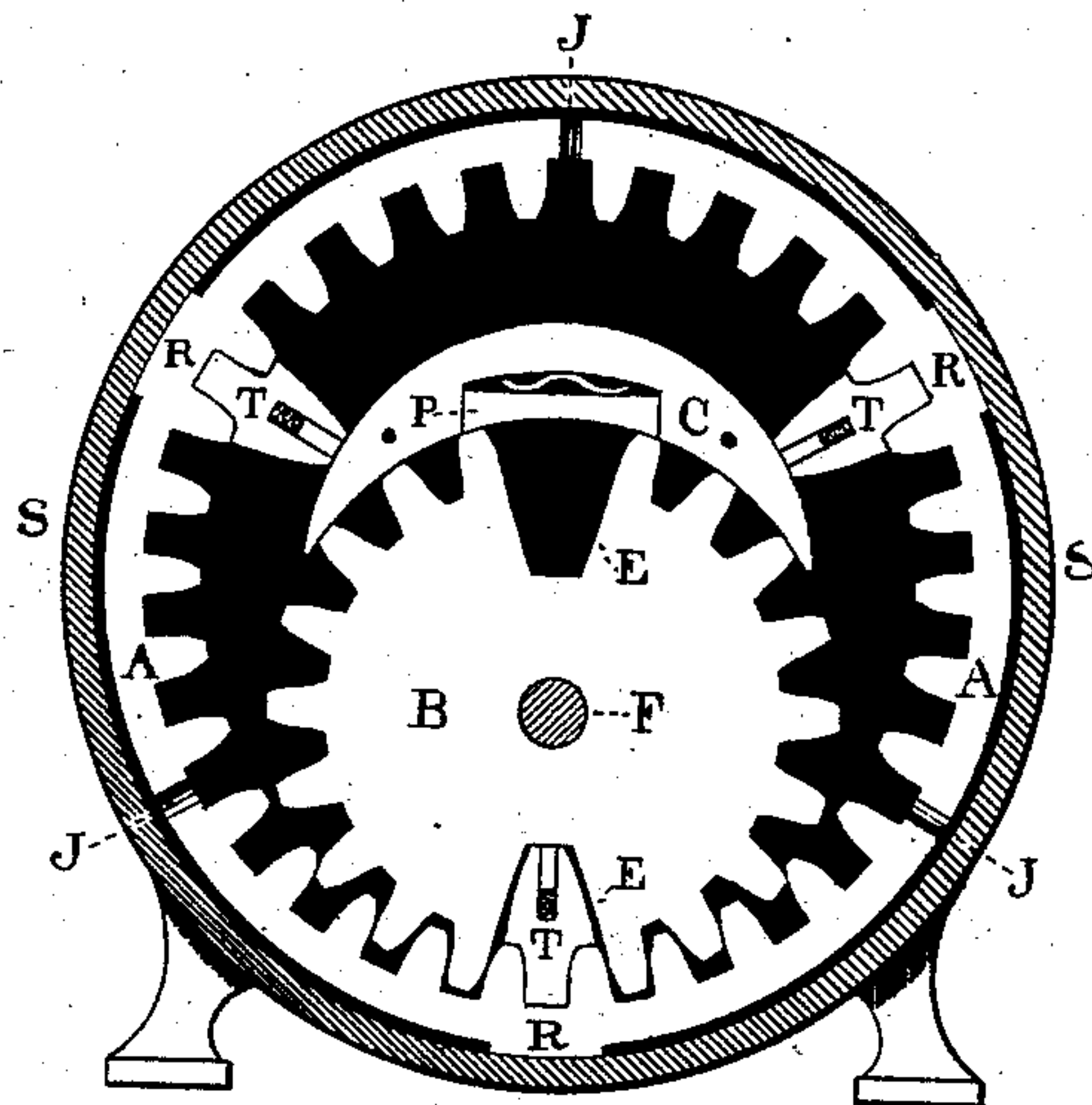


Fig. 1.

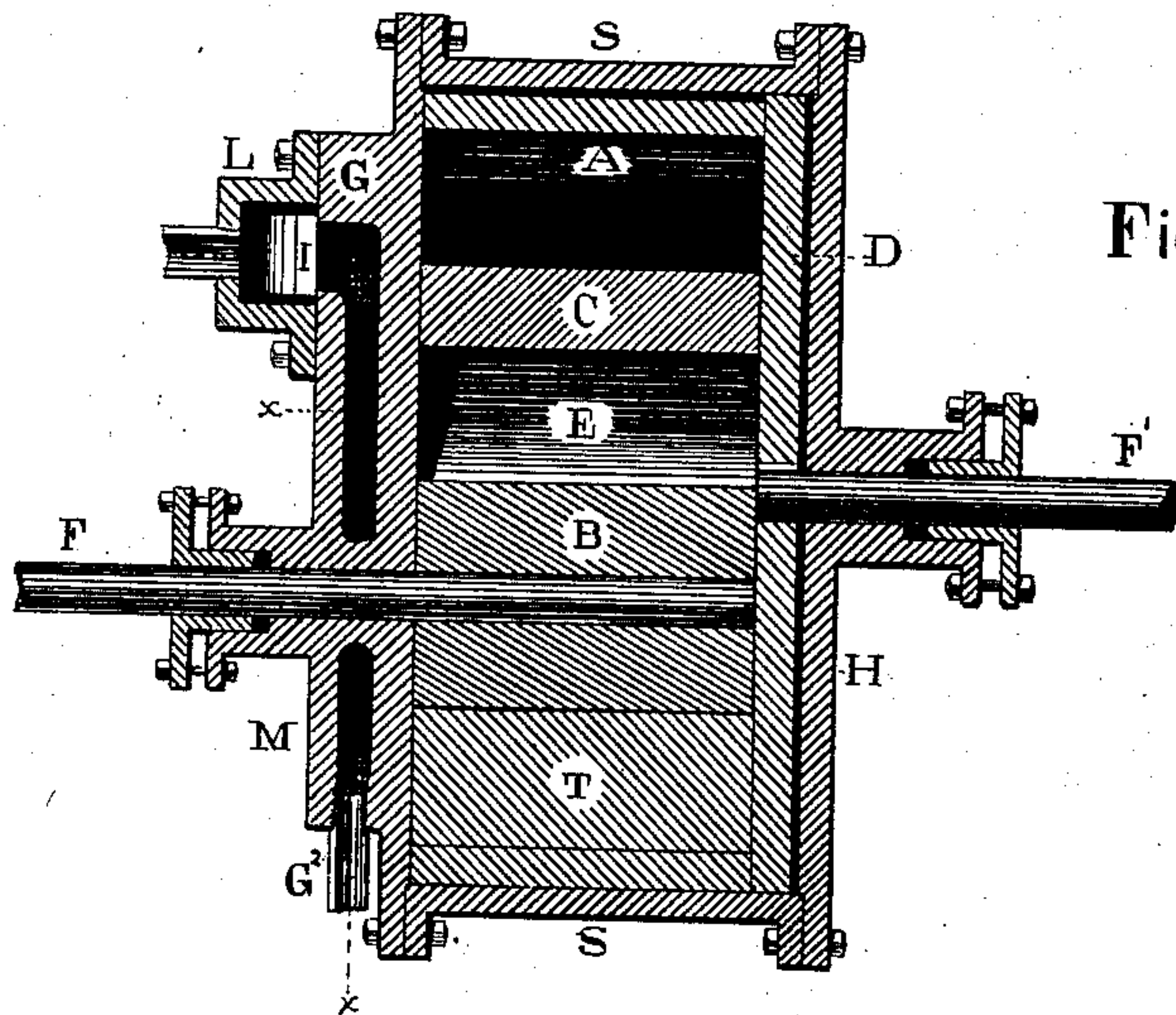


Fig. 2.

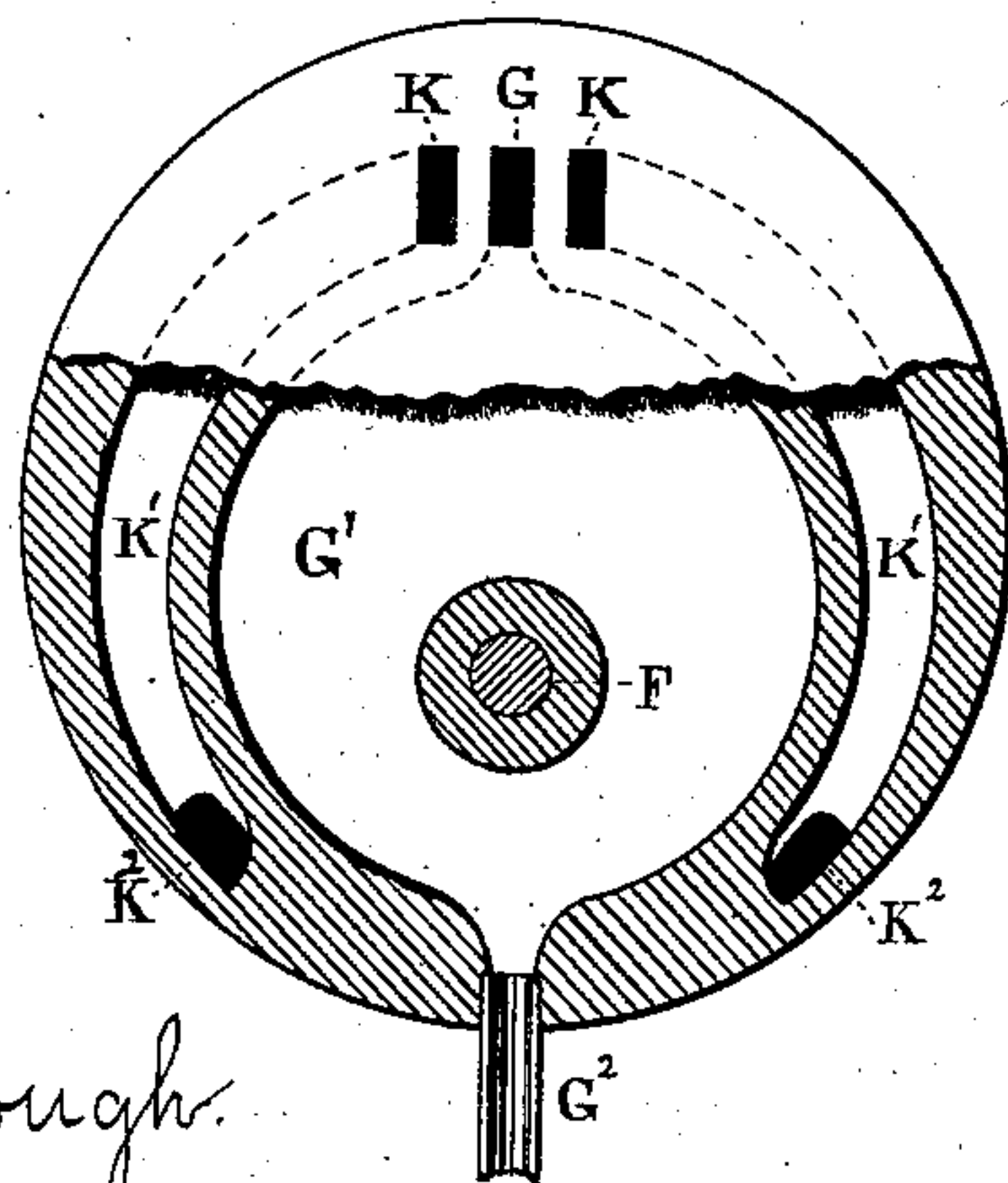


Fig. 3.

Witnesses:

*H. W. Wells*

*Richd. A. Goldsborough*

Inventor,

*Dexter D. Hardy.*

*per A. B. Upham,*

*Attorney in fact.*



# UNITED STATES PATENT OFFICE.

DEXTER D. HARDY, OF HAVANA, ASSIGNOR TO THE HARDY ROTARY ENGINE COMPANY, OF CHICAGO, ILLINOIS.

## ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 260,678, dated July 4, 1882.

Application filed November 29, 1881. (No model.)

*To all whom it may concern:*

Be it known that I, DEXTER D. HARDY, of Havana, in the county of Mason, in the State of Illinois, have invented an Improved Rotary Engine; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the annexed drawings, making a part of this specification, in which like letters of reference refer to like parts, and in which—

Figure 1 represents a side elevation with the head M removed; Fig. 2, a sectional view through center; Fig. 3, view of head M with the part in front of *xx* broken away.

This engine is an improvement over one patented by me November 14, 1876, No. 184,284.

S is the outer case or shell, and is provided with the heads H and M.

The internally-toothed cylinder A is immovably fastened to the disk D. Said disk D is keyed to the shaft F', which passes through suitable bearings and packing at the center of the head H. Said cylinder A is furnished with three extra-sized teeth or lugs T, placed at equal distances apart. Said cylinder A is made smaller in diameter than the inside of said shell S, and three or more ribs, R, are made upon the outside of said cylinder, so that it will just fit said shell. One or two holes, J, are drilled through this cylinder A between the ribs R. The pinion B, made two-thirds of the diameter of said cylinder A, measuring on the pitch lines, has made in it two recesses, E E, to receive the lugs T, and is keyed to the shaft F. This shaft passes through suitable bearings and packing in the head M. The crescent C, made of just the right size to fill the space not swept over by the lugs T or the pinion B, is bolted at one end to the head M. Within said head M are cored out three cavities, K', G', and K', of the thickness shown in Fig. 2 and the dimensions shown in Fig. 3. K' K' open outwardly through the rectangular orifices K K into the steam-chest L and in through the ports K<sup>2</sup> K<sup>2</sup> at their other ends into the inside of the cylinder A. The cavity G' opens through the rectangular orifice G into the steam-chest L, and at its other extremity terminates in the exhaust-pipe G<sup>2</sup>. Over said openings K G K in the steam-chest L slides the cup-shaped valve I, moved by a rod and lever. This valve I is for reversing and stopping the engine.

In the concave side of the crescent C is made a cavity fitted with a rectangular piece of metal, P, pushed outward by a spring. This is to serve as a packing to prevent any steam from passing between the pinion B and the crescent C. In the same way the teeth T are provided with a packing consisting of a strip of steel pressed outward by a spring. A pin or two prevents said strip of steel from being pressed out too far.

The operation of this engine is as follows: The valve I being drawn to one side, the steam enters through the open port K, cavity K', and port K<sup>2</sup> into the space included between the one side of the pinion B, cylinder A, and lug T. The other side of the pinion B being open to exhaust through the port K<sup>2</sup>, cavity K', and orifice K at its side, and from thence through the hollow of the valve I through the orifice G, cavity G', and exhaust-pipe G<sup>2</sup>, the lug T, at the side where the steam is entering, will be forced over toward the side of the exhaust-port. The cylinder A will therefore be kept revolving in the same direction by the pressure acting successively upon each lug T as it comes up into position. By shifting the valve I over to the other side the cylinder A is made to rotate in the opposite direction, and is held stationary when said valve is held at the center. The pinion B is caused to revolve by the cylinder A in the same direction, but at a higher rate of speed. When the steam is let into the engine it passes through the hole J into the space between the cylinder A and shell S, and thus prevents the friction that would otherwise result from the steam pressing said cylinder against the shell S.

The object of having the cylinder A attached to the disk D is twofold: First, it takes up the end wear of the cylinder A, crescent C, and pinion B against the head M by being pressed inward either by steam, springs, or by set-screws applied against a shoulder upon the shaft F'; second, shaft F' can also be used from which to derive power. The shaft F will revolve more rapidly than F'; but the latter gives the most power. This makes my rotary engine valuable for use as a motor for street-cars. By means of clutch-pulleys, a lever F' is used to start the car till it has got under headway, when F is used instead. In going up grade F' is also used in place of F.

As I have previously obtained a patent upon



nearly the same machine, I do not claim the combination broadly; but

What I do claim, and for which I desire Letters Patent, is as follows, to wit:

5 1. In a rotary engine, the combination of the internally-toothed cylinder A, having lugs T, ribs R, and holes J, with the disk D, shaft F', and the case S, substantially as and for the purpose set forth.

10 2. The combination, with the shell S, having heads H and M, of the internally-toothed cylinder A, having ribs R, holes J, and lugs T, with strips of metal at their extremities pressed outwardly by springs, the crescent C, 15 having metal packing P, and the pinion B, having recesses E, and shaft F, substantially as and for the purpose specified.

20 3. The internally-toothed cylinder A, having lugs T, disk D, and shaft F', the crescent C, bolted to the head M, the pinion B, having recesses E, and shaft F, in combination with the shell S, head H, and head M, having sys-

tem of ports K<sup>2</sup> K<sup>2</sup> K G K and cavities K' G' K', substantially as and for the purpose herein set forth.

25 4. A rotary engine having an internally-toothed cylinder, A, made to revolve within a stationary outside shell, with recesses between said cylinder and said outside shell to receive steam through suitable passages from the in- 30 side of said cylinder, and for the purpose of counterbalancing the steam-pressure on the inside of said cylinder and preventing the friction that would otherwise result from the steam pressing said cylinder against the outside shell, 35 substantially as specified.

In testimony that I claim the foregoing invention I have hereunto set my hand this 16th day of November, 1881.

DEXTER D. HARDY.

Witnesses:

JAMES WOLCOTT,  
H. W. WELLS.