No. 803,693. PATENTED NOV. 7, 1905.

W. M. HOFFMAN.

ROTARY ENGINE.

APPLICATION FILED MAR. 25, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

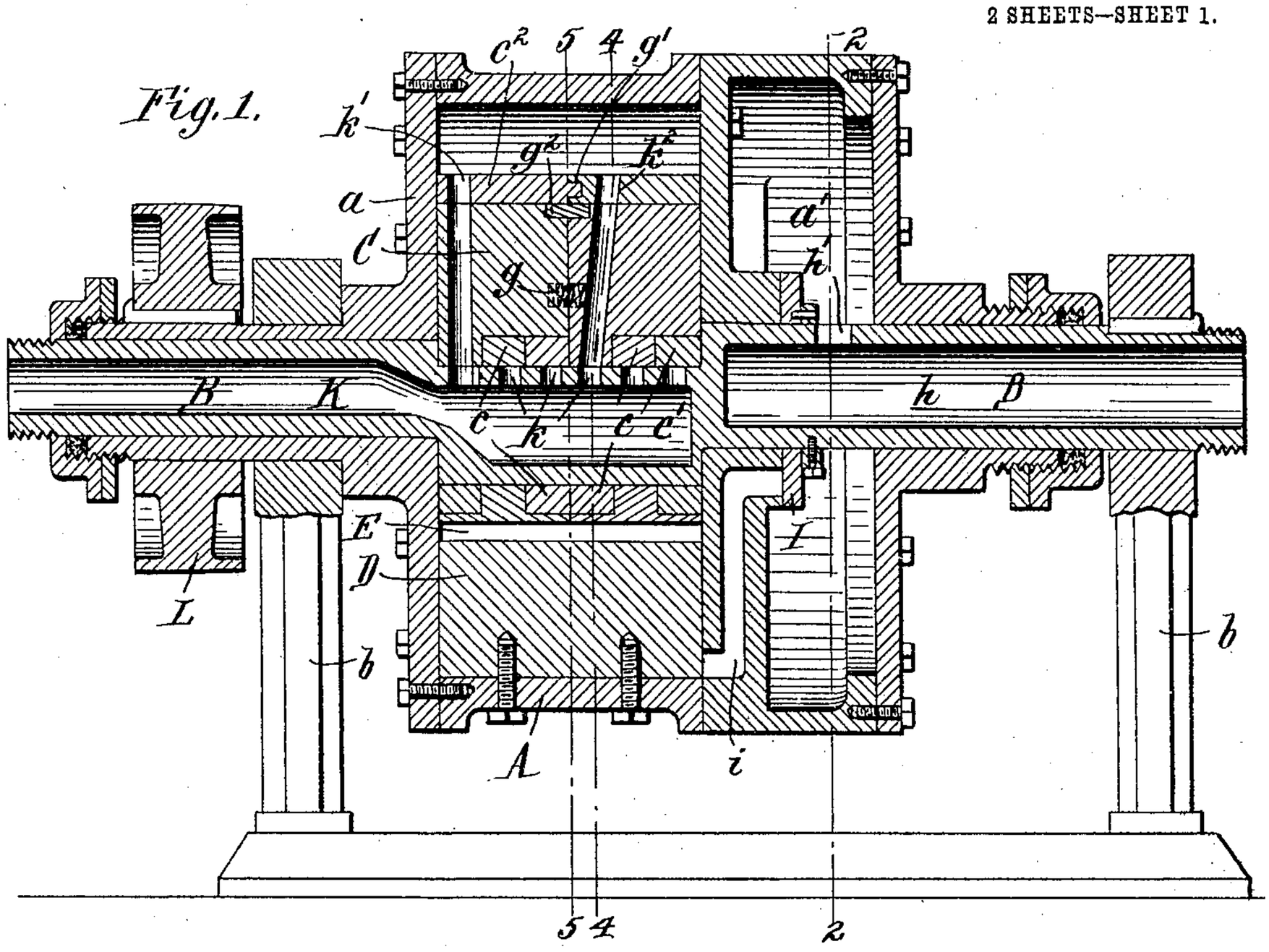


Fig. 2.

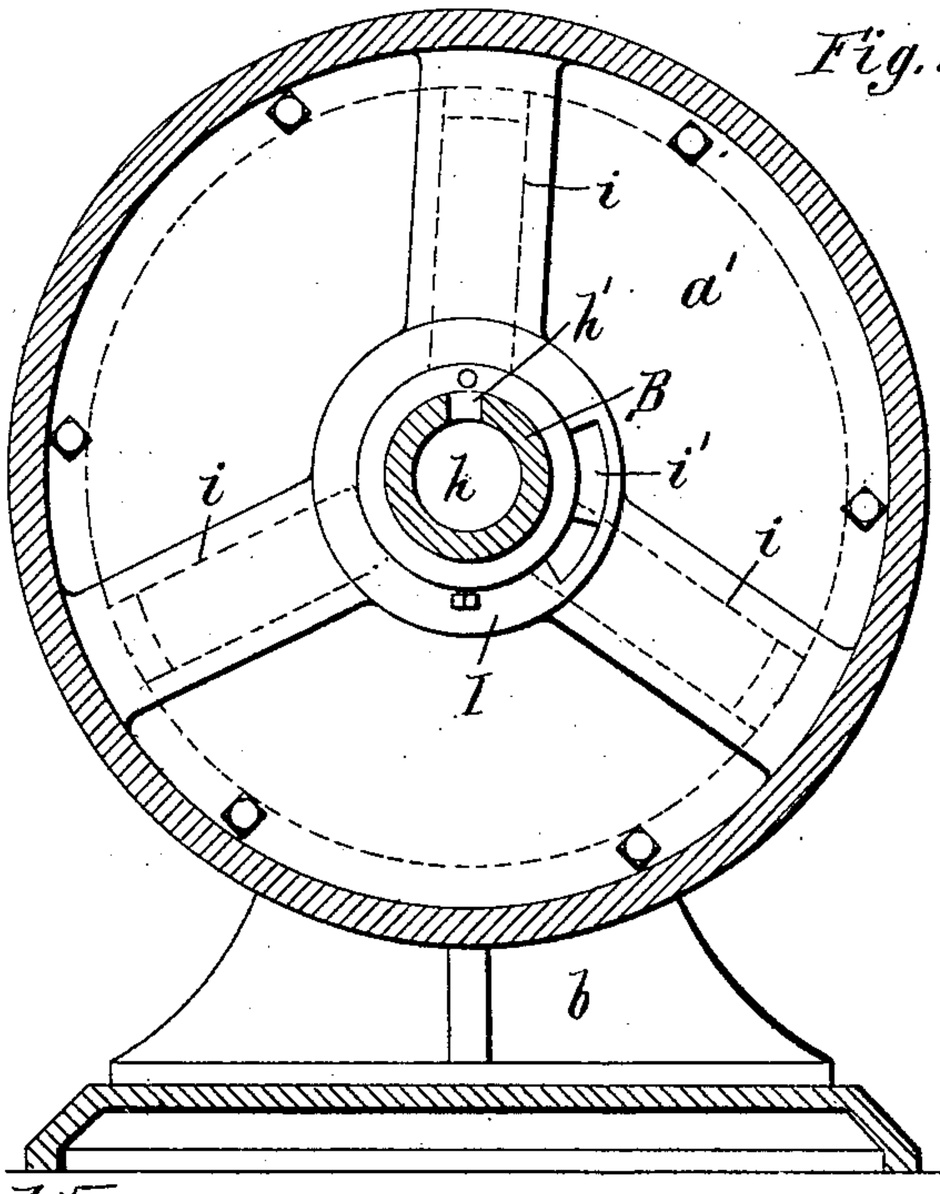
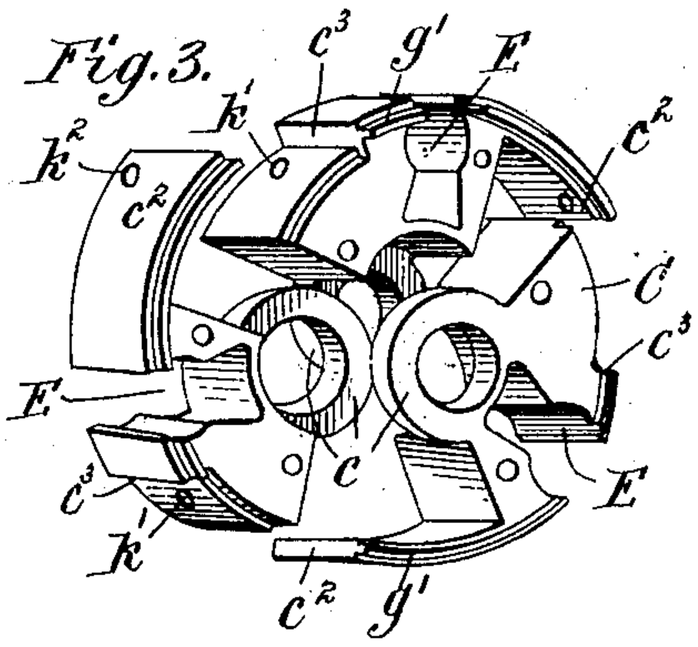


Fig. 3.



Witnesses:-
R. W. Rimer.
E. A. Yoke.

Inventor.
W. M. Hoffman,
by Wilkinson, Parker & Hard
Attorneys.

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2 SHEETS—SHEET 2.

Fig. 4.

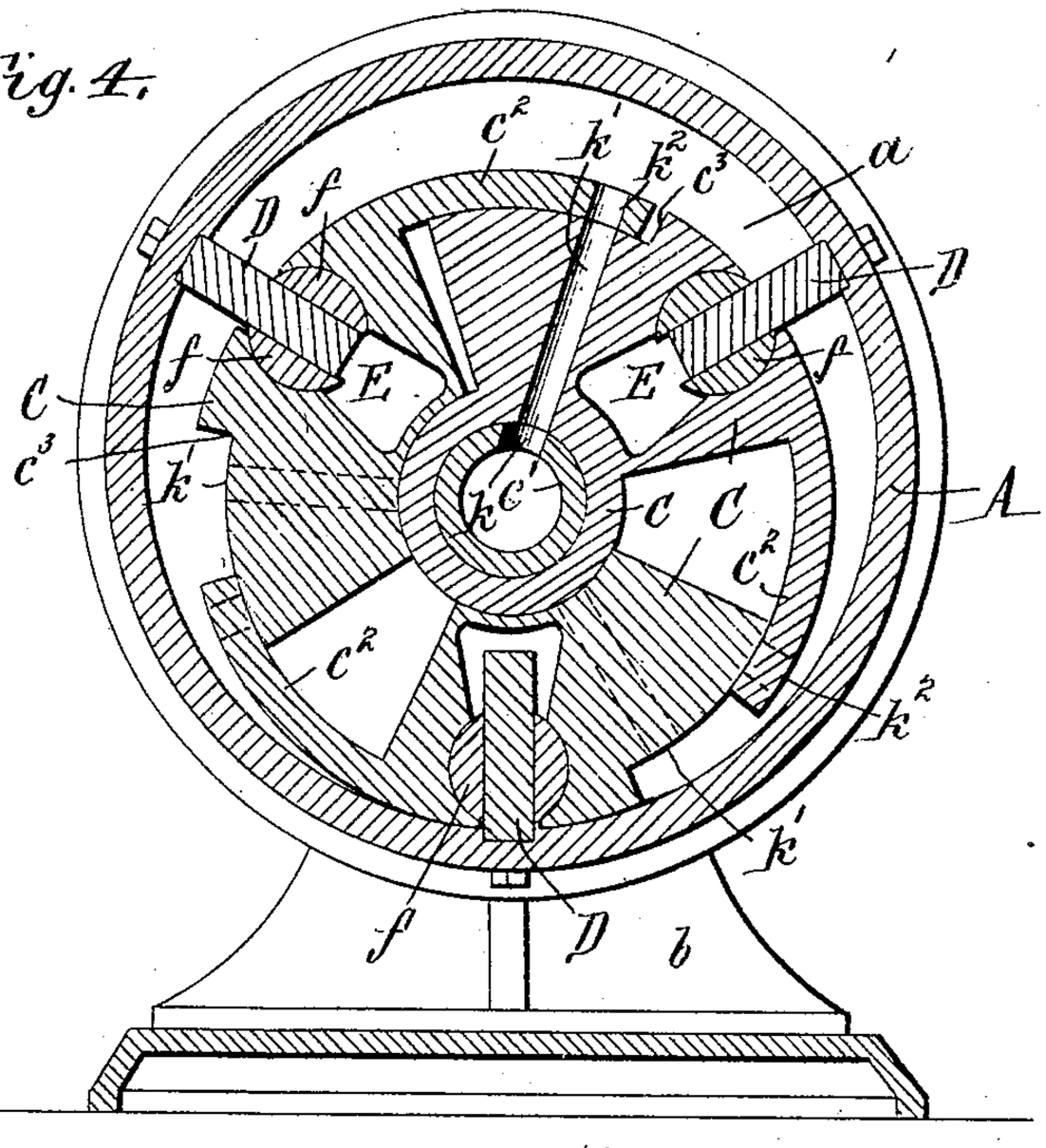
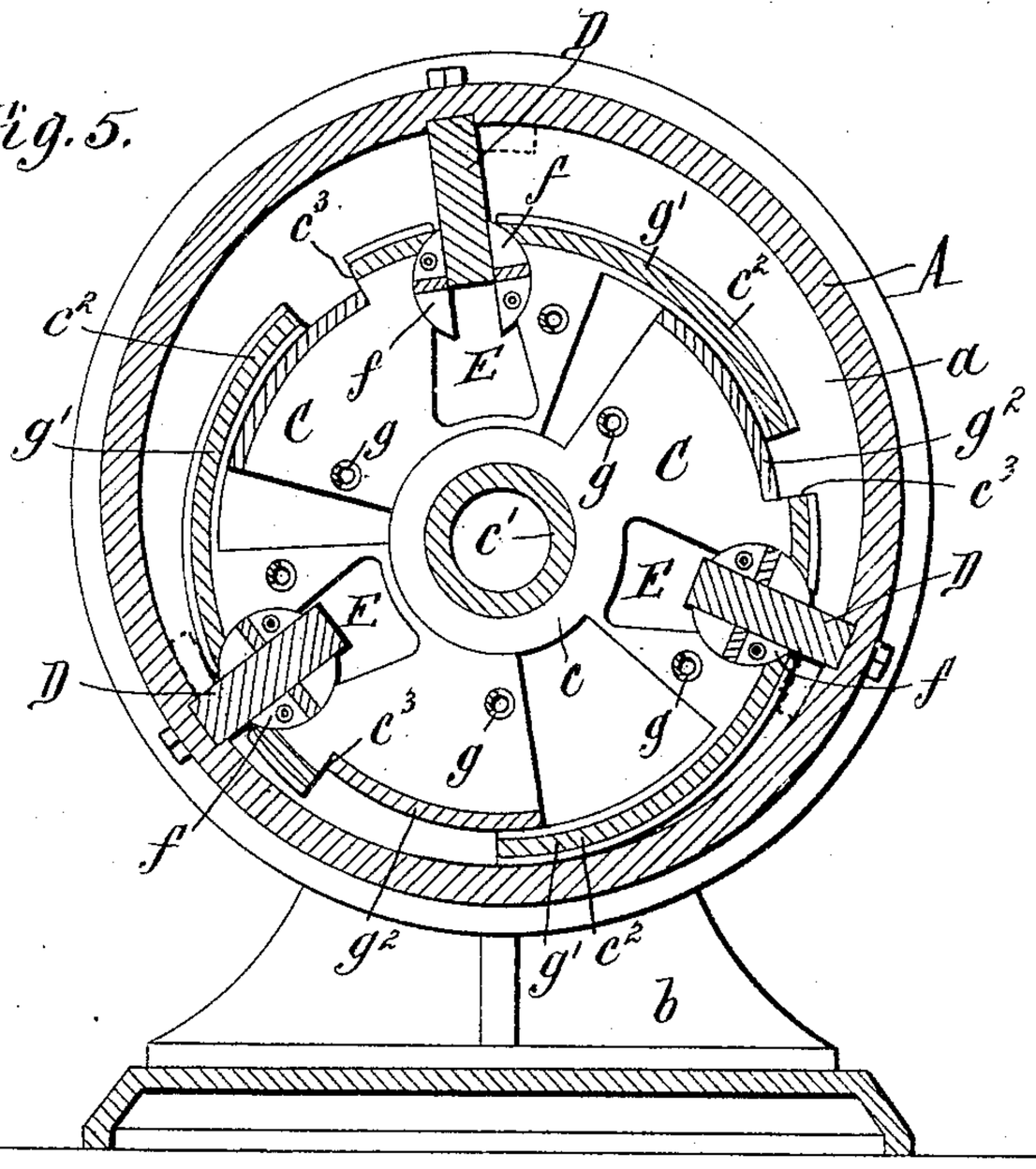


Fig. 5.



Witnesses:-
R. W. Ramser.
E. A. Volk.

Inventor:
W. M. Hoffman
By Wilkinson, Parker & Hard
Attorneys.

UNITED STATES PATENT OFFICE.

WILLIAM M. HOFFMAN, OF BUFFALO, NEW YORK.

ROTARY ENGINE.

No. 803,693. Specification of Letters Patent. Patented Nov. 7, 1905.

Application filed March 25, 1905. Serial No. 251,964.

To all whom it may concern:

Be it known that I, WILLIAM M. HOFFMAN, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Rotary Engines, of which the following is a specification.

This invention relates to rotary engines of that kind comprising a rotatable cylinder or casing, a core arranged within the cylinder or casing to rotate with the cylinder about an axis eccentric to the axis of the cylinder, and pistons or blades which cross the space between the cylinder and core and against which the steam or other motive fluid exerts its pressure to drive the engine.

The object of the invention is to produce a rotary engine of great efficiency and economy in which friction and wear are reduced to the minimum and to simplify the construction and reduce the number of necessary parts of a rotary engine.

In the accompanying drawings, consisting of two sheets, Figure 1 is a longitudinal sectional elevation of a rotary engine embodying the invention. Fig. 2 is a transverse sectional elevation thereof in line 2 2, Fig. 1. Fig. 3 is a perspective view of three sections of the core, the sections being separated somewhat to better show their shape. Fig. 4 is a transverse sectional elevation of the engine in line 4 4, Fig. 1. Fig. 5 is a transverse sectional elevation thereof in line 5 5, Fig. 1.

Like characters of reference refer to like parts in the several figures.

A represents the cylinder or hollow cylindrical casing, which may be of any suitable construction and is rotatably mounted in any desired manner. The cylinder shown consists of a cylindrical shell or body and heads a a', bolted to the ends of the body, one of the heads a' being hollow and serving as a steam-chest. This cylinder is journaled centrally on and rotates about a stationary shaft B, supported in bearing-standards b or in any other desired way.

C represents the core, which is located in the cylinder, extending from head to head thereof, and is journaled to rotate about an axis eccentric to that of the cylinder. The core consists of sector-shaped longitudinal sections provided with hubs or bearing-rings c at their inner ends which encircle the eccentric journal c' for the core. This journal may be formed, as shown, by an eccentric or crank portion of the stationary shaft B. The bearing-rings c are located at different points longitudinally on the several sections, so that they bear side to side against each other on the journal. The core-sections are narrow enough to oscillate toward and from each other on their journal as they rotate about the same, and each core-section has at its outer portion a segmental tail or extension c^2, which overlaps and slides on the next core-section, thus closing the sector-shaped space between the core-sections. The circular outer face of each core-section is recessed at c^3 for the reception of the extension of the adjacent section.

D represents the pistons or blades against which the steam or other motive fluid admitted to the space between the cylinder and core exerts its pressure to drive the engine. These pistons project inwardly from the circular wall of the cylinder in substantially radial lines and extend from head to head of the cylinder, to which they are bolted or otherwise immovably fixed. Each piston extends into a pocket E in one of the core-sections and has a rocking bearing therein, preferably formed by segmental cylindrical blocks f, arranged at opposite sides of the piston and confined in correspondingly-shaped seats in the piston-pocket E of the core. The pistons cause the core to rotate with the cylinder, and the rocking bearing-blocks f allow the core-sections to approach and recede from each other and also to approach and recede from successive portions of the inner periphery of the cylinder as the core and cylinder revolve. The blades being fixed to the cylinder can be tightly fitted, and no packing is required between the pistons and the cylinder, and the rocking blocks f for the pistons are wedged in their seats against the opposite faces of the pistons by steam-pressure thereon and efficiently pack the pistons, so as to prevent leakage of steam into the piston-pockets E in the core.

In the engine illustrated in the drawings the several core-sections are divided transversely into halves 1 and 2, (see Fig. 1,) which are forced oppositely into close contact with the heads of the cylinder by springs g between the halves. This construction avoids the necessity for packing the ends of the core. The halves of the core-sections are tongued and grooved together, as shown at g', and are recessed inside of the tongues and grooves to receive packing-strips g^2, Figs. 1 and 5. This making of the core-sections in halves, while deemed preferable, is in no sense a necessary

feature of the construction of the core, the sections of which could manifestly be continuous from head to head of the cylinder. It has not been thought necessary to further describe the manner of packing the several parts of the engine, as this may be accomplished in different ways, and a description thereof would not aid in understanding the construction claimed.

The steam or other motive fluid can be admitted to the space between the core and cylinder in rear of each piston when it reaches a certain point in its revolution and exhausted in advance of the piston at the proper time by various controlling means, and the means about to be described is merely an example selected to enable an understanding of the engine.

The steam is admitted to the steam-chest a' through a passage h and port h' in one end of the stationary shaft B. The inner wall of the hollow head or steam-chest is provided with inlet-passages i, opening at one end into the steam-chest and at the other end into the cylinder just in rear of the pistons D. I is a disk-valve which is located in the steam-chest and held from turning on the stationary shaft, but is movable longitudinally on the shaft and held by steam-pressure against the inner wall of the steam-chest a', which has the inlet-passages i. The valve-disk has an admission-port i' of suitable length, with which the inlet-passages successively register as the cylinder rotates and which admits steam to each inlet-passage i during a part revolution of the cylinder or while the passage is passing the port in the valve.

K represents an exhaust-passage in the stationary shaft, and k ports in the eccentric journal for the core connecting with said passage. Each core-section is provided with one or more exhaust-passages k', extending radially therethrough and adapted in the rotation of the core to register with the ports k in the journal to connect the steam-space between the core and cylinder with the exhaust-passage K. The tail of each core-section, which slides over the exhaust-passages k' in the adjacent core-section, has a hole k^2 to register with the passages k', so as not to close them. As each core-section is forced inwardly and held in close contact with the journal by the steam-pressure, there is no leakage or escape of the steam through the exhaust-passages k' of the core-sections until they register with the exhaust-ports of the journal. The cylinder of the engine is the driving part, and power may be transmitted therefrom by a pulley L, secured to one of the hubs of the cylinder, which is extended for this purpose, or in any other suitable way.

The operation of the engine is as follows: The cylinder A and core C rotate together in the same direction, but about their eccentrically-disposed axes, so that the point of contact between the peripheries of the two parts shifts around the core and causes the space between the core and cylinder to increase and decrease in rear of each piston during each rotation of the cylinder. Steam or other motive fluid is admitted to this space just behind each piston when its inlet-passage i registers with the admission-port of the valve I, which occurs, preferably, when the piston is about in the position of the piston at the right in Fig. 5. Live steam is admitted for a part revolution from this point and is then cut off by the movement of the inlet-passage i past the port of the admission-valve and acts expansively until the exhaust-passage k' in the core-section with which the piston connects registers with an exhaust-port k in the core-journal. This occurs somewhat before the pistons reach the position shown at the upper portion of Fig. 4 and allows the steam in advance of the pistons to exhaust before it can exert back pressure on the pistons. By thus admitting the steam successively behind and exhausting it in advance of the pistons the engine is driven continuously in one direction—for instance, to the left—as indicated by the arrows in Figs. 4 and 5.

The friction and wear in an engine constructed as described are comparatively little, because as the core and cylinder revolve together there is only the slight sliding of the one on the other, due to the eccentricity of their axes, and this is infinitely less than it is where one part rotates while the other is stationary. Thus the friction and wear both on the ends and circular walls of the cylinder and core are greatly reduced. The cylinder and core both rotate on relatively small central journals, and the reduced speed and area of the surfaces of the core and cylinder sliding on the journals result in decreasing the friction and increasing the leverage of the rotary cylinder. There is no part in the engine which slides on a surface having any considerable length and speed. As before explained, the pistons being fixed to the cylinder require no packing at their ends and outer edges, and the only packing necessary—that is, where the pistons join the core—is effected by the rocking bearing-blocks.

I claim as my invention—

1. In a rotary engine or the like, the combination of a cylinder and a core rotatable in the same direction about different axes, said core comprising sections which approach and recede from each other during the revolution of the core, pistons fixed to one of said rotatable parts and loosely connected to the other part, and means for admitting fluid to and exhausting it from the space between the core and cylinder, substantially as set forth.

2. In a rotary engine or the like, the combination of a cylinder and a core rotatable in the same direction about different axes, said core comprising sections which approach and recede from each other during the revolution

of the core, pistons fixed to said cylinder and movably connected to said core-sections, and means for admitting fluid to and exhausting it from the space between the core and cylinder, substantially as set forth.

3. In a rotary engine or the like, the combination of a cylinder and a core rotatable in the same direction about different axes, said core comprising sections which oscillate relative to each other about their axis of rotation, pistons fixed to said cylinder and each having a sliding and rocking connection with one of said core-sections, and means for admitting fluid to and exhausting it from the space between the core and cylinder, substantially as set forth.

4. In a rotary engine or the like, the combination of a cylinder and a core rotatable in the same direction about different axes, said core comprising sector-shaped sections which oscillate relative to each other about their axis of rotation and each of which has a segmental extension overlapping the adjacent section, pistons fixed to said cylinder and movably connected to said core-sections, and means for admitting fluid to and exhausting it from the space between the core and cylinder, substantially as set forth.

5. In a rotary engine or the like, the combination of a cylinder and a core rotatable in the same direction about different axes, said core comprising sections which approach and recede from each other during the revolution of the core, pistons fixed to said cylinder and extending into pockets in said core-sections, segmental cylindrical blocks which are confined in correspondingly-shaped seats in each core-section on opposite sides of and bear against the piston, and means for admitting fluid to and exhausting it from the space between the core and cylinder, substantially as set forth.

6. In a rotary engine or the like, the combination of a rotary cylinder, a core arranged eccentrically in said cylinder and comprising separate sections, a stationary journal eccentric to the axis of the cylinder on which said core-sections are mounted to rotate with the cylinder and oscillate relative to each other, pistons connected to the cylinder and to each of said core-sections, and means for admitting fluid to and exhausting it from the space between the core and cylinder, substantially as set forth.

7. In a rotary engine or the like, the combination of a cylinder and a core which rotate in the same direction about different axes, said core comprising sections which oscillate relative to each other about their axis of rotation, and each core-section consisting of halves, means for pressing said halves of the core-sections against opposite heads of the cylinder, pistons connecting said cylinder and core-sections, and means for admitting fluid to and exhausting it from the space between the cylinder and core, substantially as set forth.

8. In a rotary engine or the like, the combination of a rotary cylinder, a journal arranged eccentrically in the cylinder, a core in the cylinder comprising sections provided with bearing-rings mounted side by side on said eccentric journal whereby said core-sections can rotate with the cylinder and also oscillate relative to each other on said eccentric journal, pistons secured to said cylinder and connected with said core-sections, and means for admitting fluid to and exhausting it from the space between the cylinder and the core, substantially as set forth.

Witness my hand this 22d day of March, 1905.

WILLIAM M. HOFFMAN.

Witnesses:
C. W. PARKER,
E. C. HARD.