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H. N. RATHJEN, W. L. POOL & J. D. FINLEY.

ROTARY ENGINE.

APPLICATION FILED JULY 14, 1904.

3 SHEETS—SHEET 1.

Fig. 1.

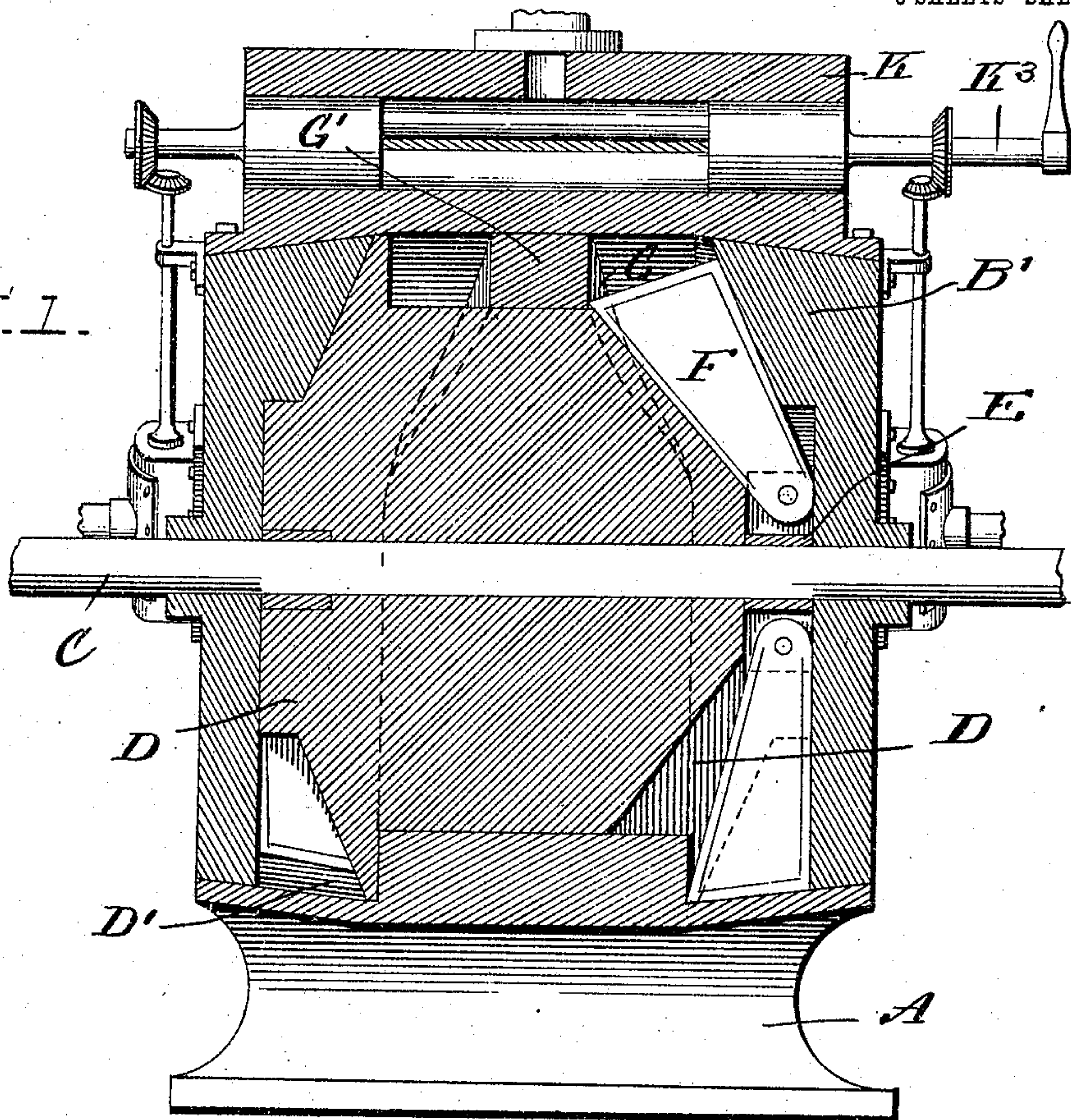
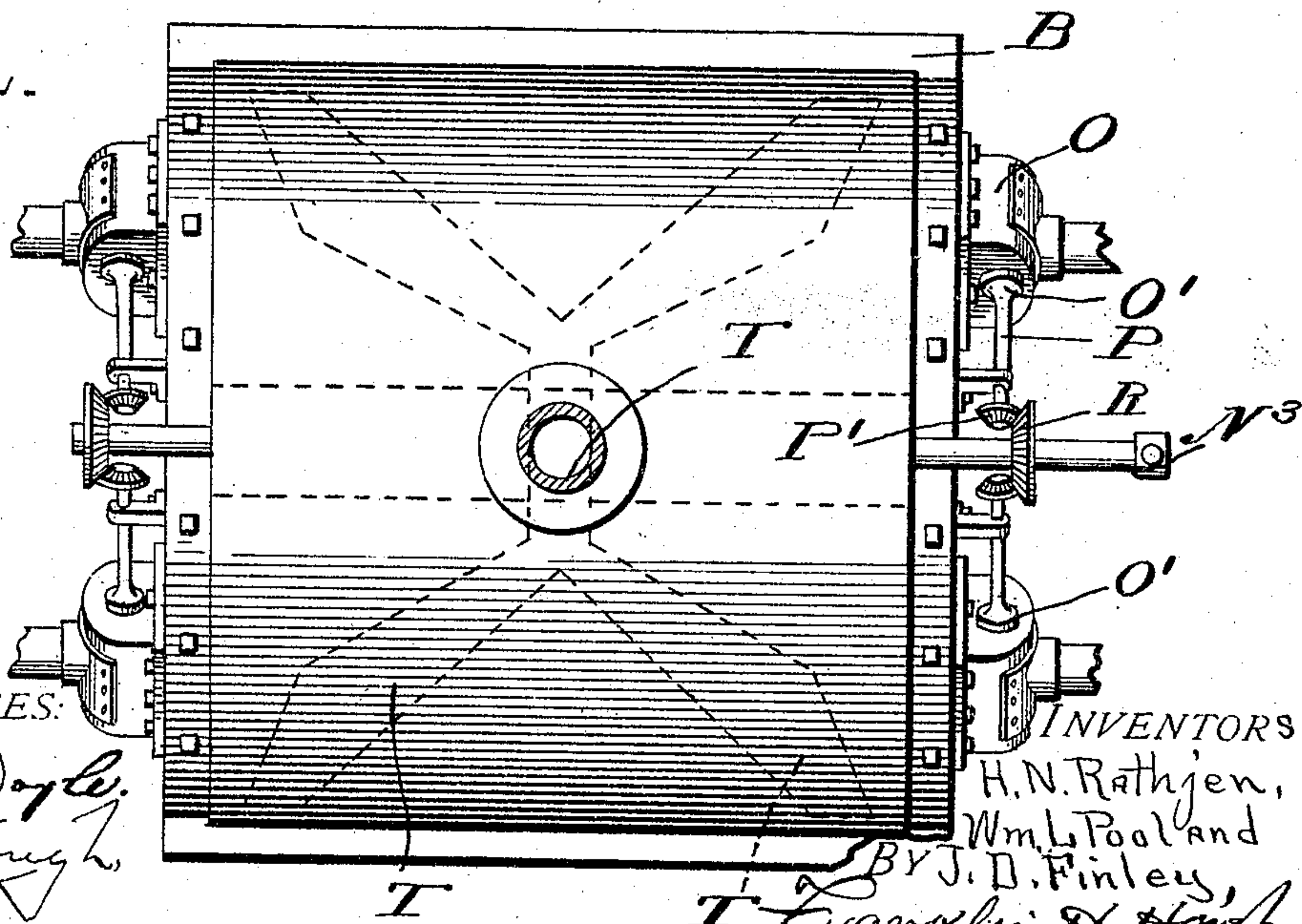


Fig. 2.



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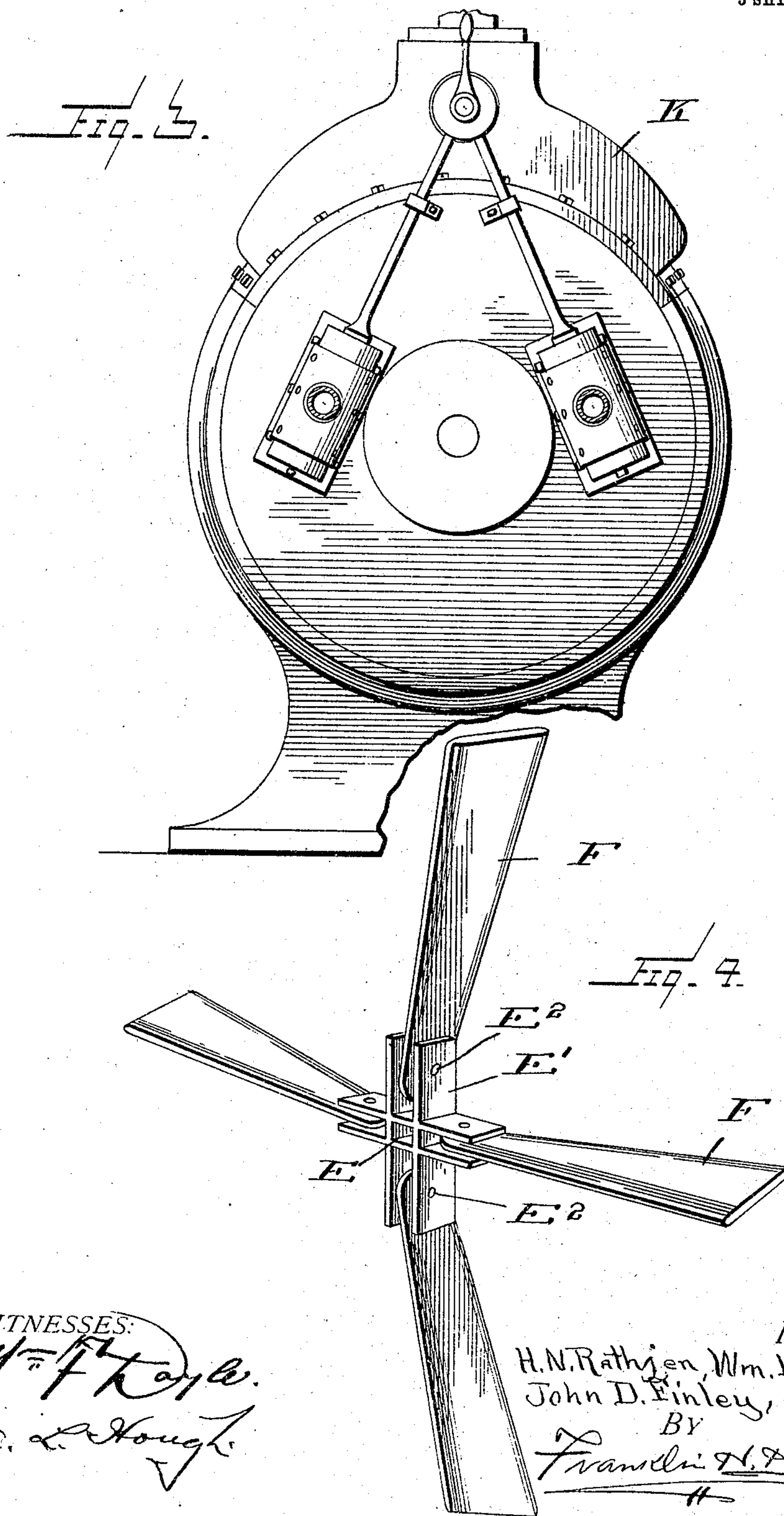
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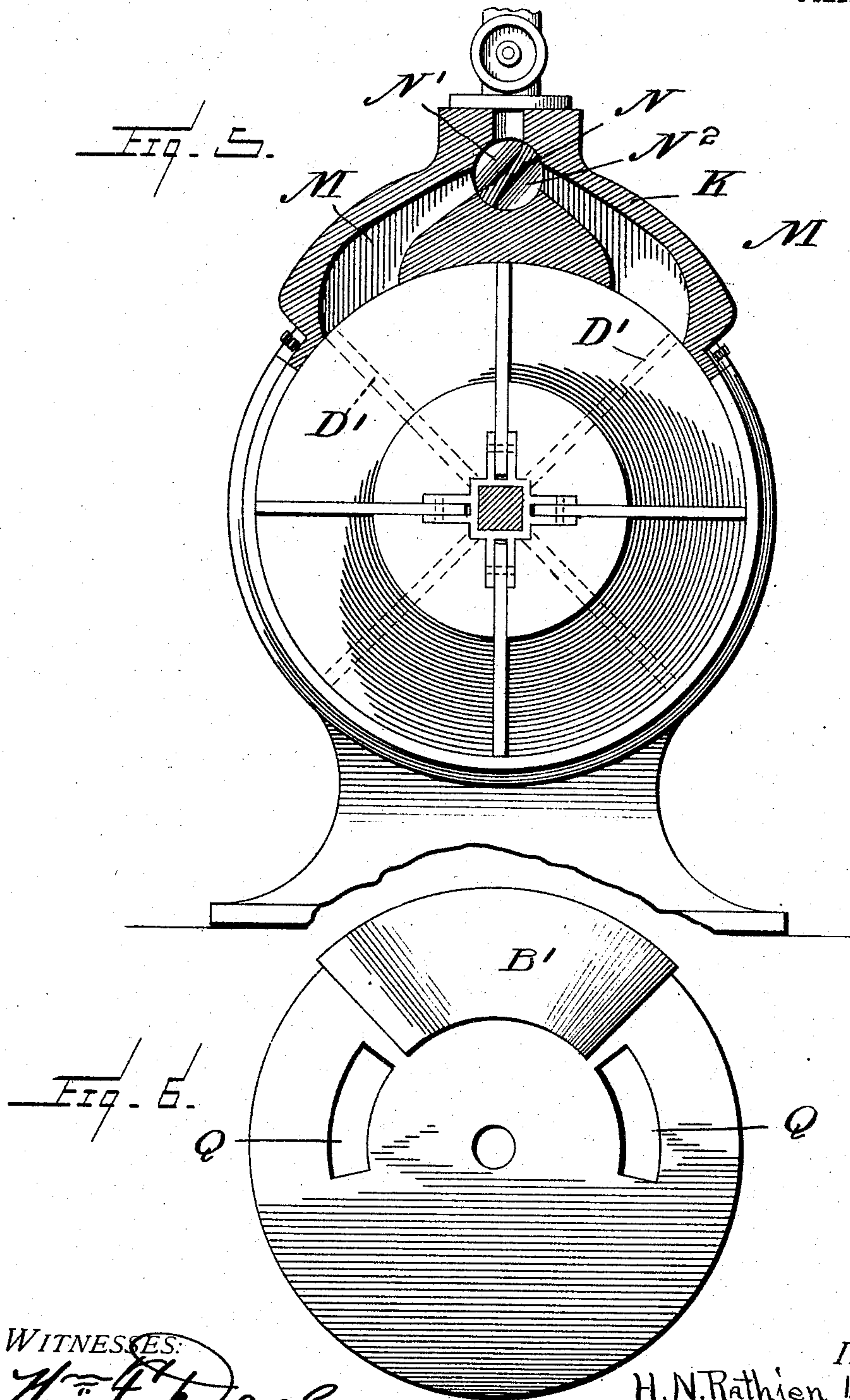
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3 SHEETS—SHEET 3



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UNITED STATES PATENT OFFICE.

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ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 782,359, dated February 14, 1905.

Application filed July 14, 1904. Serial No. 216,562.

To all whom it may concern:

Be it known that we, HERMAN N. RATHJEN, WILLIAM L. POOL, and JOHN D. FINLEY, citizens of the United States, residing at Aztec, in the county of San Juan and Territory of New Mexico, have invented certain new and useful Improvements in Rotary Engines; and we do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to new and useful improvements in rotary steam-engines; and the object of the invention is to produce an apparatus of this nature in which a rotary piston fixed to a suitable shaft and mounted within a suitable cylinder is provided with a series of radial slots in the opposite ends thereof and in which swinging blades carried by the shaft are adapted to be thrown, by means of cams on the ends of the cylinder, into a steam passage-way by suitable mechanism, to receive the impact of steam being fed to the engine and in the provision of suitable means for regulating the admission of the steam and the exit for the exhaust.

The invention consists in various details of construction and in combinations and arrangements of parts, which will be hereinafter fully described and then specifically defined in the appended claims.

Our invention is illustrated in the accompanying drawings, which, with the letters of reference marked thereon, form a part of this application, and in which—

Figure 1 is a central vertical sectional view through our improved rotary engine. Fig. 2 is a top plan view of the same. Fig. 3 is an end view of the engine, parts being shown in elevation. Fig. 4 is an enlarged detail view of one of the sets of blades which are carried by the shaft and adapted to receive the impact of the steam. Fig. 5 is a vertical transverse section through the engine, and Fig. 6 is an enlarged detail view of the inner face of one end of the cylinder.

Reference now being had to the details of the drawings by letter, A designates the base, upon which the cylinder B is mounted, and C designates a shaft which is mounted to rotate in the cylinder-heads.

D designates a piston which may be made either in one piece or more than one, as desired, and is fixed to rotate with said shaft. The opposite faces or ends of said piston are provided each with four radial slots D', the bottom walls of said slots tapering from their inner ends toward the central portion of the circumference of the piston, the shape of said slots being clearly shown in Fig. 1 of the drawings. As will be observed by reference to Fig. 5 of the drawings, the slots in the opposite ends of the piston are arranged alternate to one another, said view showing in dotted outlines the slots in the opposite end of the piston, while the slots in the near end of said piston are engaged by blades about to be described.

Mounted upon a collar E, which has a central aperture which may be either square or round, are blades. In the drawings said aperture in the collar is shown as square in outline and fitted to the shaft C, an enlarged detail view of said collar being clearly shown in Fig. 4 of the drawings, in which series of arms E' project in pairs at right angles to one another and spaced apart, each pair of arms carrying a pin E², upon which the inner end of a blade or paddle F is pivoted. There are four blades of similar construction carried by each of said collars. There are two of said collars each fixed to the shaft and one positioned adjacent to each end of the piston. Each cylinder-head is provided with a cam projection B', a detail view of which in elevation is shown in Fig. 6 of the drawings and in section in Fig. 1. Said cams are formed on the arc of a circle and taper from both ends toward the center and are provided for the purpose of throwing the blades back into the slots at a certain predetermined moment. In Fig. 1 the upper of the two blades at the right of the figure is shown as being thrown back into the slot by means of one of said cams. Intervening between the ends of

the piston and the adjacent faces of the ends of the cylinder is a space comprising a steam passage-way and into which space the blades are successively thrown by their inner edges coming in contact with the inclined wall G of a projection upon the inner circumference of the cylinder-shell. In Fig. 1 of the drawings said projection is shown in section at G', which is its contracted portion, while the dotted outlines illustrate the marginal edge of said projection throughout the rest of said circumference. As the inner edge of each blade contacts with the inclined edge of said projection it will be observed that the blade will be thrown toward the cylinder-heads, the inclined portion of said projection corresponding to the inclined surface of said cam projection. Thus it will be seen that as a blade passes by the contracted portion of said projection and is driven outward toward the end of the cylinder by the inclined edge of said contracted portion the blade will be thrown into the position shown by the lower blade at the right hand of Fig. 1 or in the steam passage-way and in a position to receive the impact of steam. Both ends of the piston being equipped with series of blades, as described, and positioned in alternate relation to one another, it will be observed that there is no possibility of a dead-center being struck, as the steam will be acting continuously upon certain blades at one end or the other of the piston, thus serving to balance and equalize the pressure upon the opposite end thereof.

A steam-chest K is positioned upon the top of the cylinder and is provided with a suitable valve N, having two passage-ways N' and N'', through which steam may be directed to either one or the other of the two steam-ports M or M', accordingly as it might be desired to cause the engine to be driven forward or reversed. Suitable exhaust-ports Q (shown in Fig. 6 of the drawings) are provided, one being positioned adjacent to each end of said cam near the inner marginal edge thereof, and a valve mechanism (clearly shown in Figs. 1 to 3, inclusive) is provided for regulating the exhaust-ports when the engine is driven in one direction or the other. In said figures, O O designate valve-casings having valves O' positioned therein which open and close the exhaust-ports Q, and each valve O' has a stem P, with a beveled pinion P' upon the end thereof, which is in mesh with a beveled gear R, fixed to the stem N'' of the valve N, whereby as said stem N'' is turned in one direction or the other the live steam may be admitted to drive the engine in one direction or the other and the exhaust-valves correspondingly operated to allow for the exhaust to one port or the other. Each end of the cylinder is equipped with a similar valve mechanism, as shown clearly in the drawings, and each operated by means of a handle upon the stem N''.

In Fig. 2 of the drawings, the steam-ports, through which steam is directed to drive the engine in one direction or the other, are illustrated by letters T, which ports communicate with the central opening T', as will be readily understood.

In order to cause the blades to swing freely and with as little friction as possible, their free ends are made preferably in the form illustrated in Figs. 1 and 4 of the drawings, with their long angled ends adapted to rest upon the bottoms of the slots, while the edges of the blades, to reduce friction, are tapered slightly, as shown in Fig. 4 of the drawings.

From the foregoing it will be observed that by the provision of a rotary engine embodying the features of our invention a simple and efficient mechanism is employed, whereby the pressure will be equalized upon the opposite ends of the piston, and by the provision of the arrangement of the blades they will be thrown automatically into the steam passage-way at predetermined moments, and the steam will be continuously acting upon one set of blades or the other, thus avoiding the possibility of a dead-center, and owing to the simplicity of construction of our invention the various parts may be easily replaced in case of wear.

While we have shown a particular construction of rotary engine embodying our invention, it will be understood that we may vary the details of construction of the same, if desired, without in any way departing from the spirit of the invention.

Having thus fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. A rotary engine comprising a cylinder, inlet and exhaust ports therefor, a shaft journaled in the ends of said cylinder, a piston fixed to said shaft, a series of swinging blades, cams mounted upon the inner faces of the cylinder-heads and adapted to throw said blades into inclined slots in the piston as the latter is rotated, means for throwing the blades out of said slots, valve-regulated mechanism for directing steam against said blades, and valves for regulating the exhaust-ports of the engine, as set forth.

2. A rotary engine comprising a cylinder, inlet and exhaust ports therefor, a shaft journaled in the heads of said cylinder, cams projecting from the inner faces of said cylinder-heads, a piston fixed to said shaft and provided with radial slots in the ends thereof, the bottoms of said slots being inclined, a series of pivotal blades fixed to said shaft and adapted to be thrown by said cams into said slots, means projecting from the inner circumference of the cylinder for throwing said blades out of said slots, valve-regulated mechanism for directing steam against the blades, and valve mechanism for regulating the exhaust-ports of the engine, as set forth.

3. A rotary engine comprising a cylinder, a

shaft journaled in the heads thereof, a piston fixed to said shaft, the opposite ends of said piston having radial slots, the bottoms of which are inclined, said slots being arranged in the 5 opposite ends of the piston alternate to one another, cams on the inner faces of said cylinder-heads and tapering toward the ends thereof, a series of pivotal blades fixed to rotate with said shaft and piston, cams adapted 10 to throw the blades into said slots, a projection on the inner circumference of the cylinder having a contracted portion, the opposite edges of which are beveled and designed to throw said blades out of the slots and into a 15 steam-chamber intermediate the end of the piston and the adjacent cylinder-head, and valve mechanism for regulating the feeding and exhaust of the steam, as set forth.

4. A rotary engine comprising a cylinder, a 20 shaft journaled therein, cams on the inner faces of the cylinder-heads, a piston rotating with said shaft, a collar fixed to said shaft, pivotal blades mounted upon said collar adapted to rotate with the shaft in the steam-chamber, the opposite ends of said piston having 25 radial slots, the bottoms of which are inclined, a projection on the inner circumference of the cylinder provided with a contracted portion, the opposite walls of which are inclined and 30 adapted to throw said blades out of the slots,

and valve mechanism for regulating the inflow and exit of steam, as set forth.

5. A rotary engine comprising a cylinder, a shaft journaled in the heads of the cylinder, 35 cams projecting from the inner faces of the cylinder-heads, collars fixed to said shaft and each provided with arms, pins carried between each pair of arms, a blade pivotally mounted upon each of said pins and adapted 40 to be thrown by said cams into a slot in the end of the piston, a projection from the inner circumference of the cylinder intermediate the ends of the piston and having a contracted portion, the side walls of which are beveled and against which the inner edges of said 45 blades are adapted to contact, whereby the latter may be thrown out of the slots and into a steam-chamber intermediate the end of the piston and the cylinder-heads, and valve-regulated mechanism for regulating the supply 50 and exhaust ports of the engine, as set forth.

In testimony whereof we hereunto affix our signatures in presence of two witnesses.

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WILLIAM L. POOL.
JOHN D. FINLEY.

Witnesses:

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ALEX. HART.