(No Model.) 4 Sheets—Sheet 1.

J. ARNER.

ROTARY ENGINE.

No. 366,643. Patented July 19, 1887.

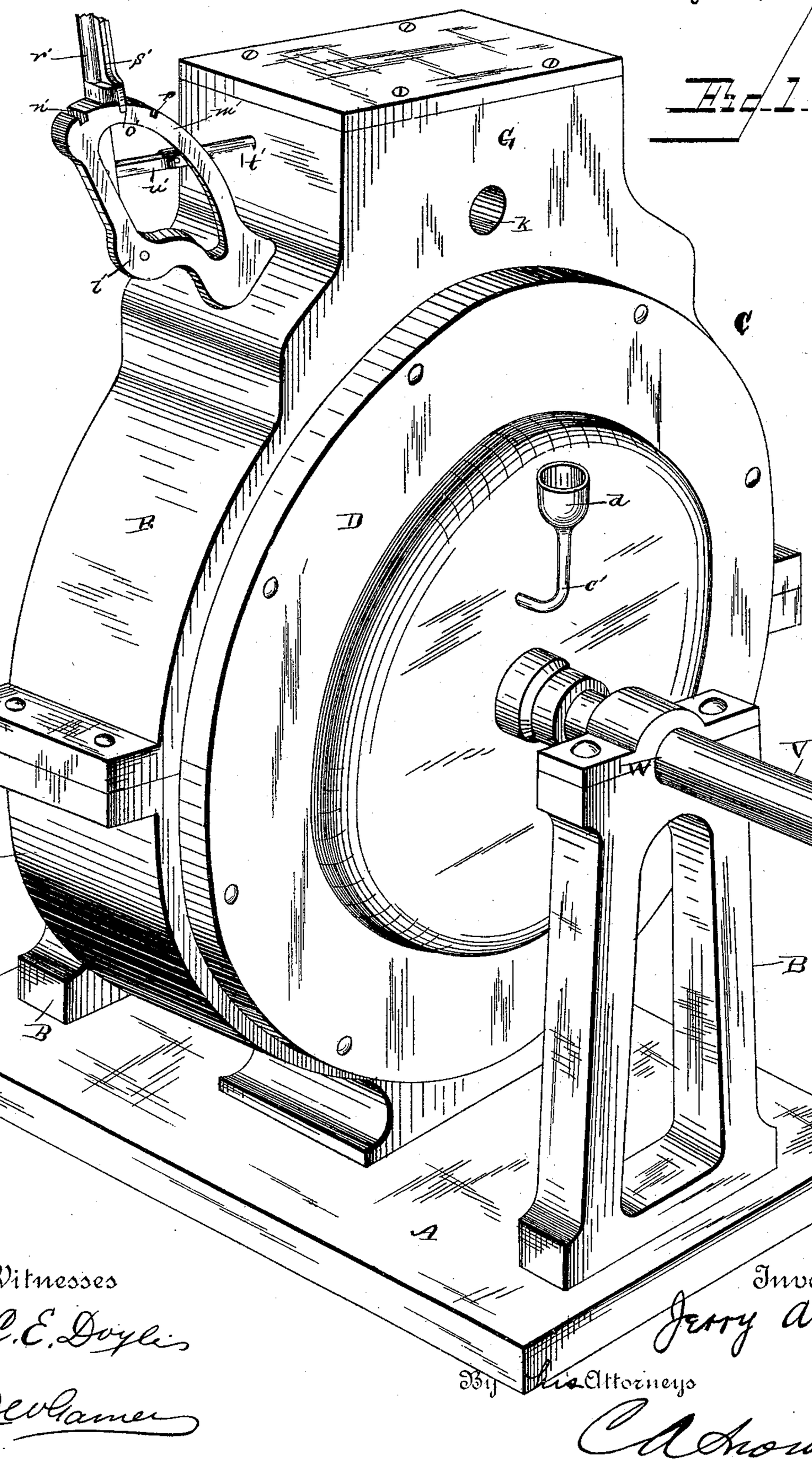

Fig. 1.

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Fig. 2.

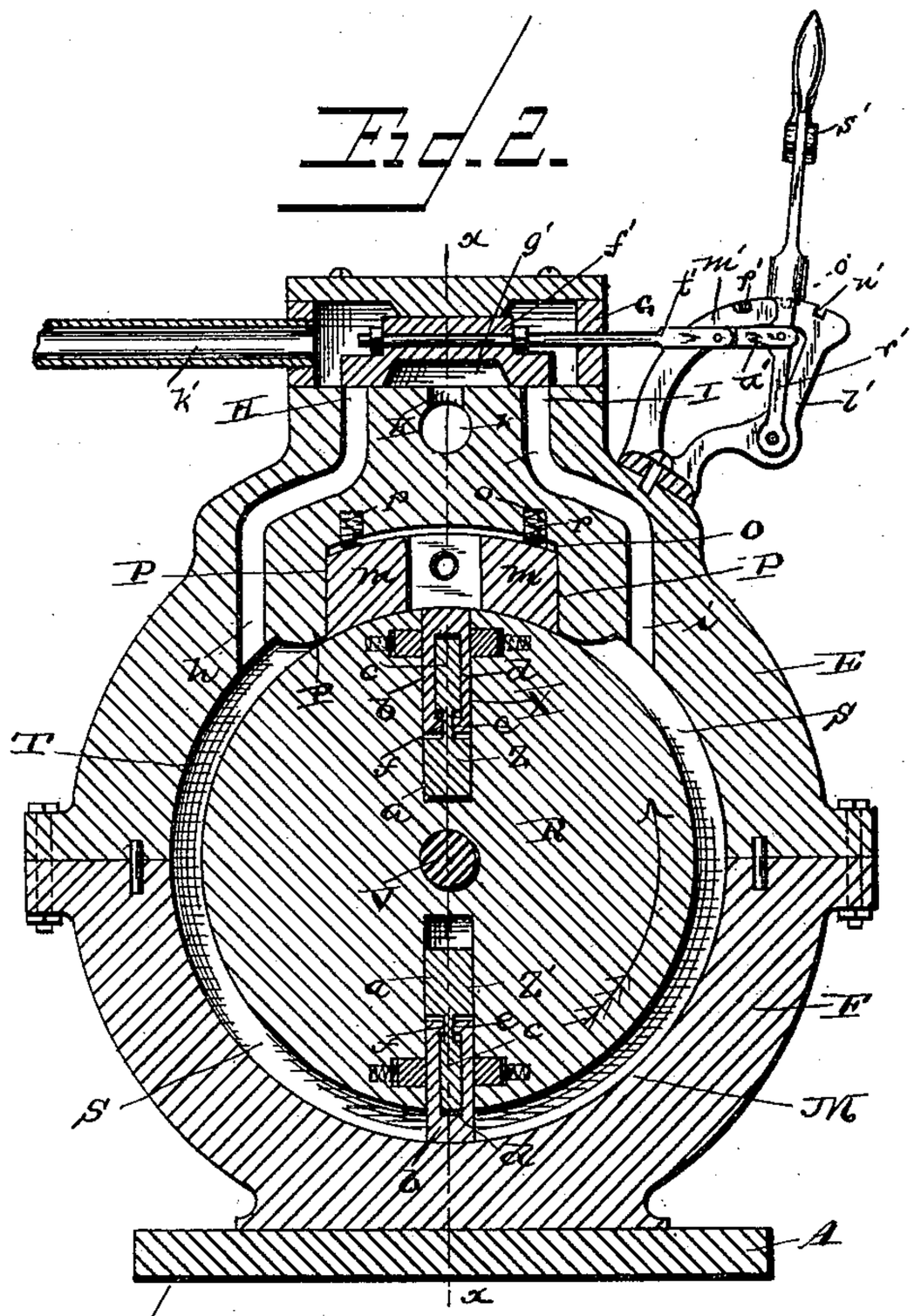
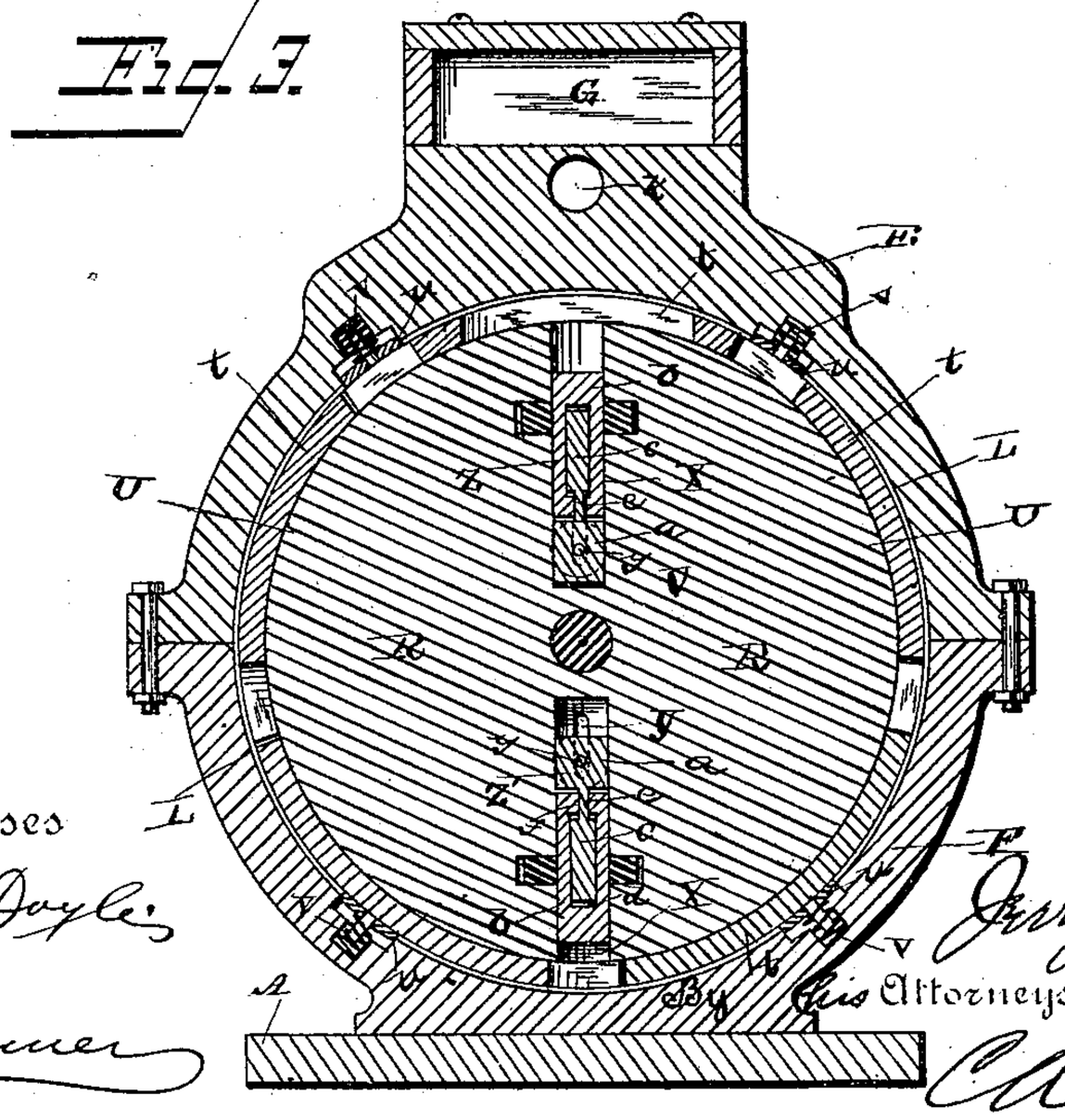


Fig. 3.



Witnesses

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(No Model.) 4 Sheets—Sheet 3.

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Fig. 4.

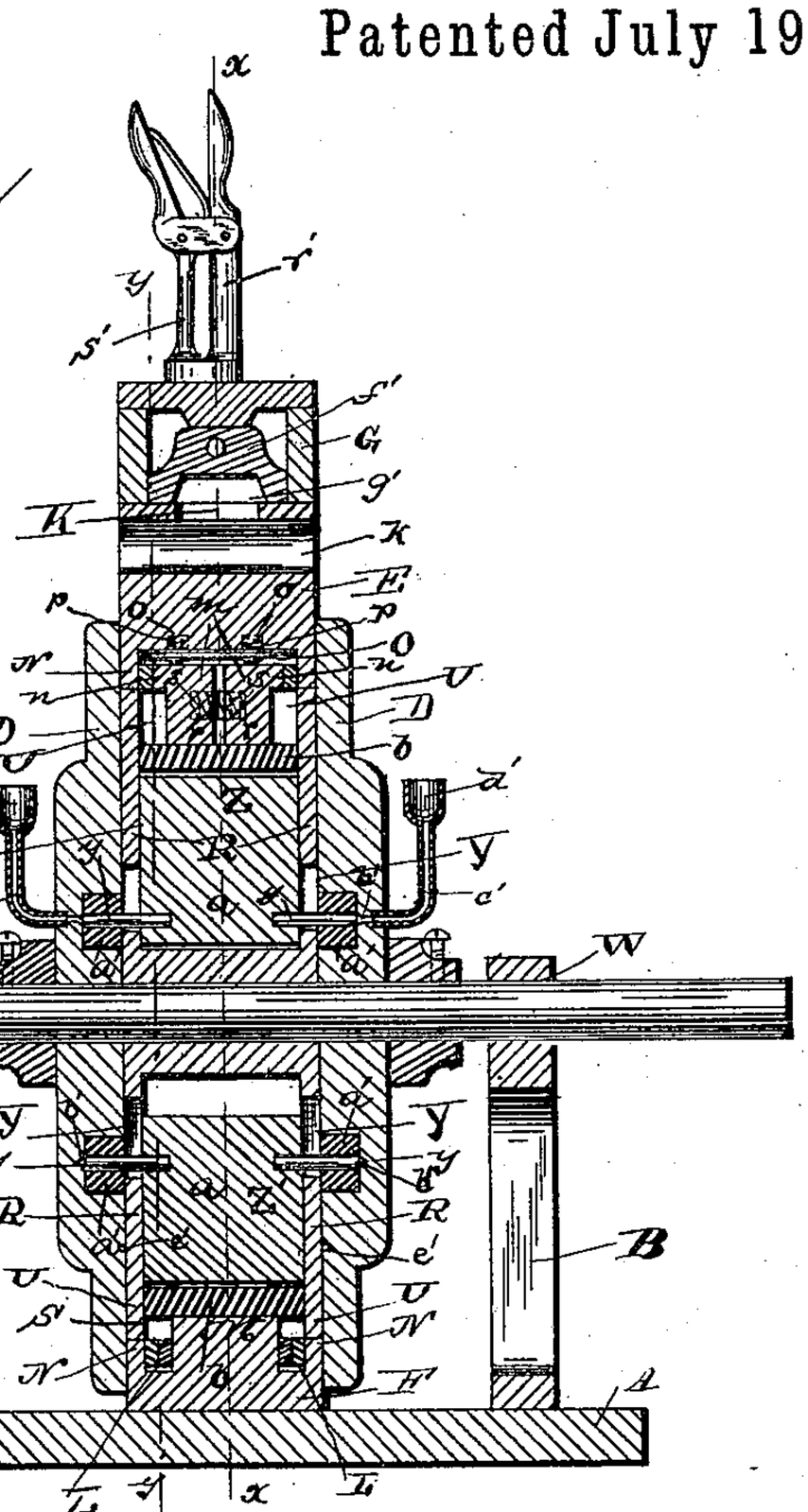

Fig. 5.

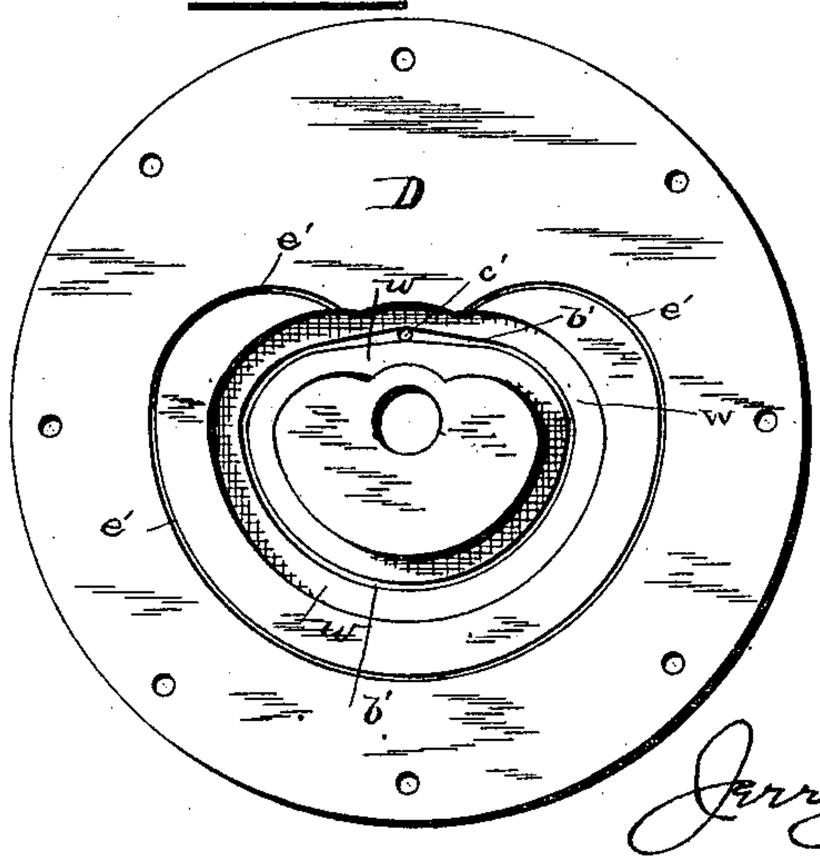

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Fig. 6.

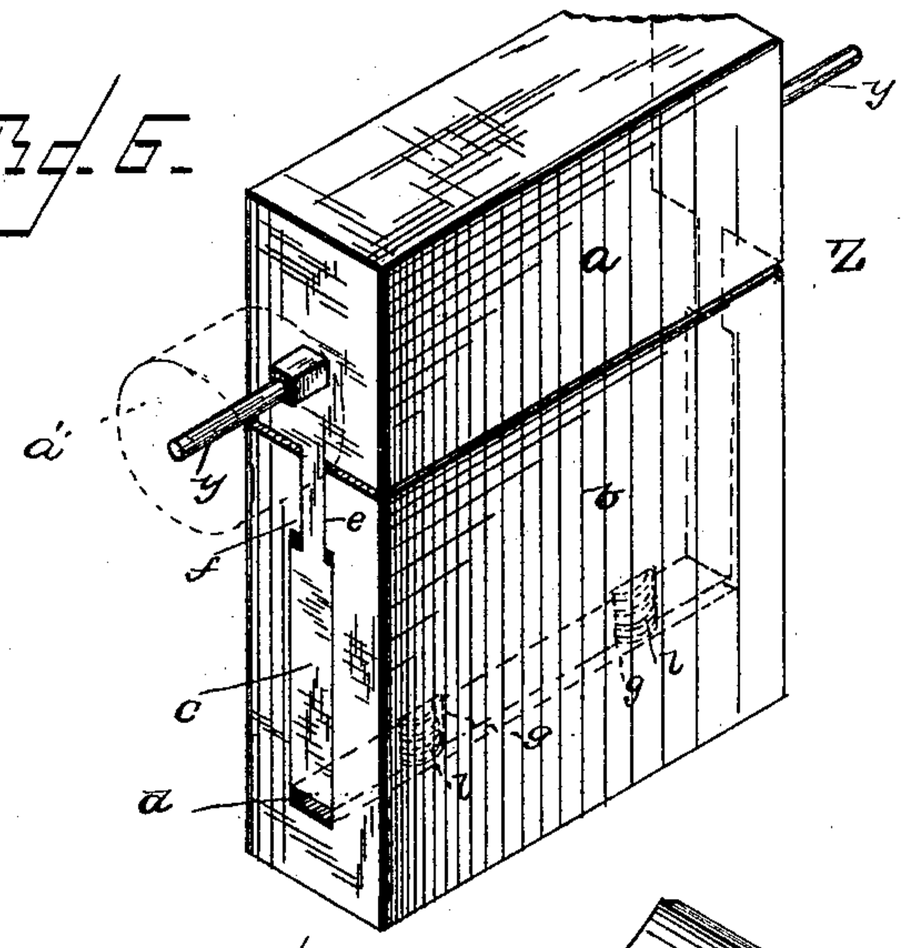


Fig. 7.

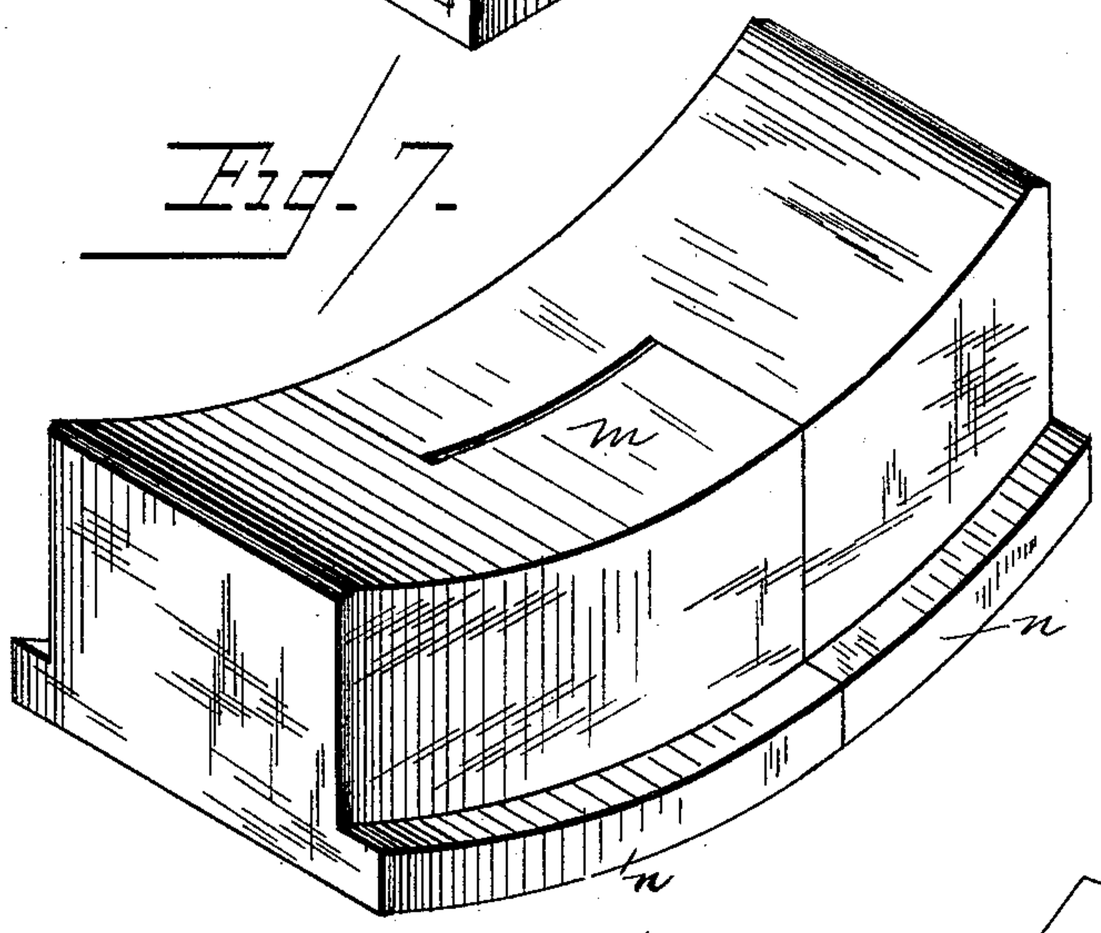
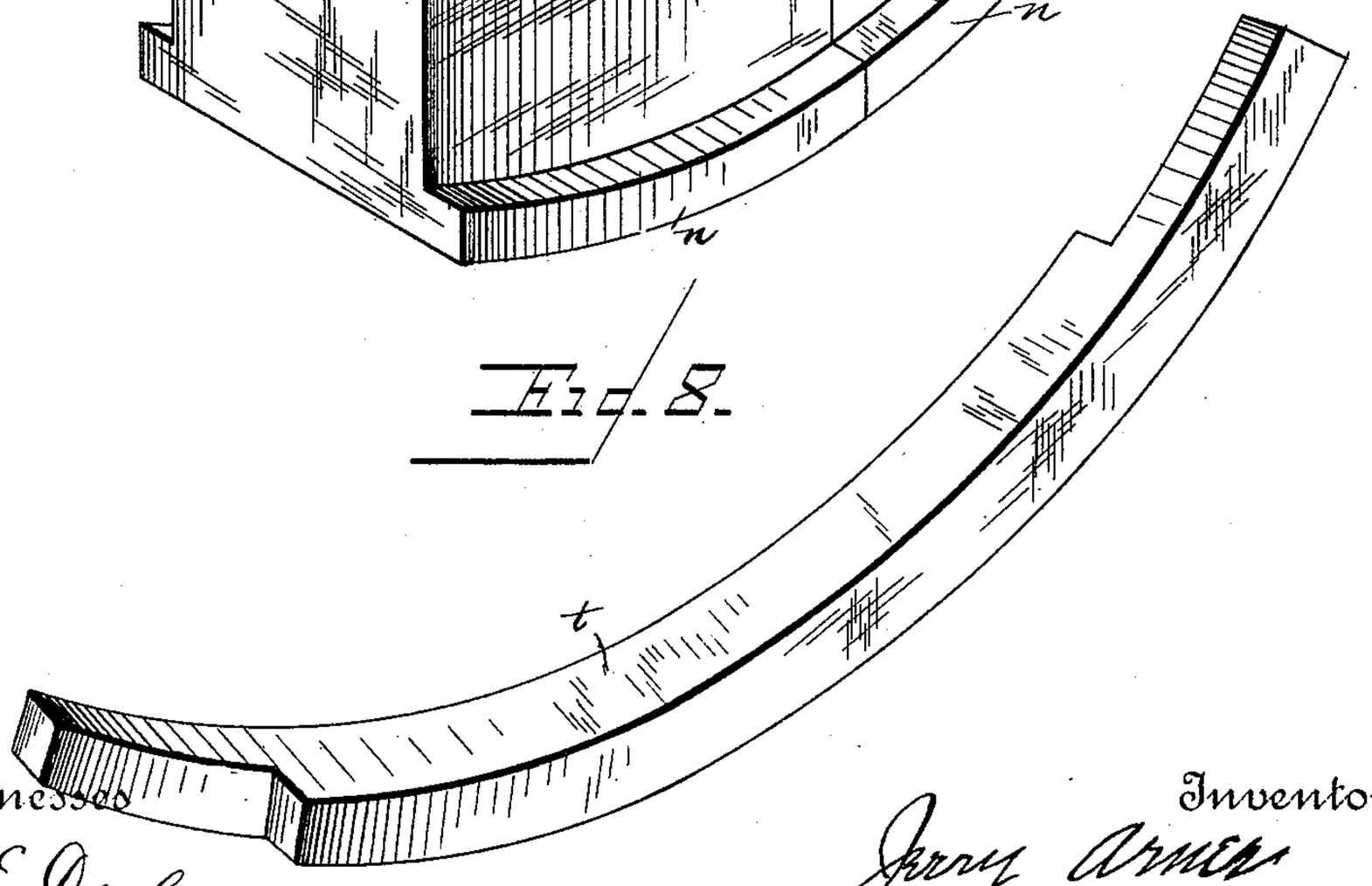


Fig. 8.



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UNITED STATES PATENT OFFICE.

JERRY ARNER, OF ESROM, MISSOURI.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 366,643, dated July 19, 1887.

Application filed November 1, 1886. Serial No. 217,701. (No model.)

To all whom it may concern.

Be it known that I, JERRY ARNER, a citizen of the United States, residing at Esrom, in the county of Barton and State of Missouri, have invented a new and useful Improvement in Rotary Engines, of which the following is a specification.

My invention relates to an improvement in rotary engines; and it consists in the peculiar construction and combination of devices, that will be more fully set forth hereinafter, and particularly pointed out in the claims.

In the drawings, Figure 1 is a perspective view of a rotary engine embodying my improvements. Fig. 2 is a vertical longitudinal sectional view of the same, taken on the line *x x* of Fig. 1. Fig. 3 is a similar view taken on the line *y y* of Fig. 4. Fig. 4 is a vertical transverse sectional view taken on the line *x x* of Fig. 2. Fig. 5 is an elevation of one side of the case, showing the cam-groove and the oil-feeding grooves therein. Fig. 6 is a detail perspective view of one of the piston-valves. Fig. 7 is a similar view of the abutting-block. Fig. 8 is a similar view of one of the annular packing-rings.

A represents the bed-plate. B represents vertical standards which rise from the ends thereof.

C represents the engine-case, which comprises the two circular sides D and the upper and lower peripheral sections, E and F, which are bolted between the sides, as shown, and are secured together by dowel-pins. On the upper side of the section E is formed a steam-chest, G, in the lower side of which are made steam-ports H and I. Between the said ports and midway between the ends of the steam-chest is an exhaust-port, K.

The peripheral sections are provided on their inner sides, near their outer edges, with annular grooves L, thereby forming an annular shoulder, M, between the said grooves, which projects inwardly toward the center of the case a slight distance beyond the annular flange N, which is formed on the outer sides of the grooves L.

In the under side of the upper section, E, directly below the steam-chest, the annular shoulder M is cut away to form a recess, O, having vertical end walls or abutments, P. A steam-channel, *h*, leads from the port H to the shoulder M, beyond one end of the recess O, and a similar channel, *i*, leads from the port I to the shoulder beyond the opposite end of the said recess. A channel, *k*, extends transversely through the upper peripheral section and below the exhaust-port K, and communicates therewith.

R represents a circular rotary piston which is adapted to fit in the engine-case. The said piston has a peripheral groove, S, of sufficient width to receive the annular shoulder M in the case. The depth of the said groove is greater than the depth of the said shoulder, thereby forming an annular channel, T, which surrounds the rotary piston. Annular flanges U are formed on the sides of the annular groove S in the piston, and the said flanges bear between the sides of the shoulder M and the sides of the case, the peripheries of the said flanges bearing against the flanges N, and thereby covering the grooves L. A horizontal shaft, V, extends transversely through the center of the rotary piston, and is made fast thereto, and the ends of the said shaft are journaled in the sides of the case C and in bearing-boxes W on the upper ends of the standards B. The lower peripheral section of the case C is provided with a projecting base, which is bolted to the base-plate, and thereby the engine-case is rigidly held in position.

The rotary piston is provided on opposite sides with radial recesses X, the outer ends of which are open and communicate with the grooves S, the said recesses being arranged transversely across the said grooves. In the sides of the rotary piston are made radial slots Y which communicate with the recesses X.

Z and Z′ represent valves or abutments which are arranged in the recesses X and fit snugly therein. Each of the said valves is made of two sections, *a* and *b*. The section *a* fits in the inner end of the recess, and has projecting trunnions *y* at its ends, which work in the slots Y and project beyond the sides of the piston. The outer end of the section *a* has a projecting tongue, *c*, which enters a corresponding recess, *d*, made in the outer section, *b*. The inner end of the tongue is provided with transverse grooves *e*, of considerable width on opposite sides, and from opposite sides of the recess *d*, at the inner end thereof, project transverse shoulders or flanges *f*, which are of less width

than the grooves *e*, and enter the said grooves. The outer section, *b*, is thus detachably secured to the inner section, *a*, and may be moved longitudinally thereon, the valves or abutments Z and Z′ being thus adapted te be lengthened and shortened. In the outer ends of the tongues *c* are made recesses *g*, in which are located coiled extensile springs *l*, which bear against the outer sides of the sections *b*, and thus keep the latter normally extended from the sections *a*.

In the recess O, on the under side of the upper section, E, is located a block, *m*, made in two sections, which are fitted together by a lap-joint. This block is segmental in shape and its lower side bears in the peripheral groove with which the rotary piston is provided. At the upper edge of the block, on opposite sides thereof, are formed flanges *n* which extend slightly beyond the sides of the block and bear upon the flanges U on the upper side of the piston, but do not extend entirely across the said flanges. Recesses *o* are made in the upper peripheral section of the engine case, and in the said recesses are placed coiled extensile springs *p*, which bear upon the upper side of the block *m* and press it firmly against the upper side of the rotary piston, so as to effect a tight joint therewith. In the opposing sides of the members of the lap-joint of the said block are made recesses *r*, in which is placed a coiled extensile spring, *s*, the function of which is to move the sections of the block laterally from each other, and thus effect tight joints between the sides of the block and the sides of the peripheral groove in the piston.

Annular packing-rings *t* are located in the annular grooves L of the engine-case, and the said packing-rings entirely surround the rotary piston and bear against the flanges U thereof. The packing-rings are made in separable sections secured together by lap-joints, whereby they may be contracted and expanded.

Bearing-plates *u* are recessed in countersunk openings which are made in the grooves L of the engine-case, and coiled extensile springs *v* are located in recesses which communicate with the countersunk openings and bear against the rear sides of the plates *u*, thus forcing them against the packing-rings and contracting the latter tightly around the annular flanges of the piston.

From the foregoing it will be observed that the piston is packed tightly in the case and is free to rotate therein.

In the opposing inner sides of the engine-case are made heart-shaped cam-grooves *w*, which are arranged around the central openings through which the shaft extends. These cam-grooves are arranged eccentrically with relation to the said openings, the upper sides of the grooves being nearest the springs, and the "pitch" or eccentricity of the grooves corresponds to the depth of the peripheral groove in the rotary piston.

On the outer ends of the trunnions *y*, with which the piston valves or abutments Z and Z′ are provided, are journaled anti-friction rollers *a′*, which work in the cam-grooves *w* and fit snugly in the same. When the piston rotates, the valves or abutments, as they reach the block *m* at the upper side of the case, are withdrawn by the cam-grooves and the anti-friction rollers, so as to enable the valves or abutments to pass the said block, as will be readily understood.

In the faces of the cam-grooves, and arranged concentrically therewith, are feeding-grooves *b′*. Curved pipes *c′* extend through the sides of the case and communicate at their inner ends with the upper sides of the feeding-grooves, and to the outer ends of the said pipes are attached oil-cups *d′*, which are adapted to feed oil to the feeding-grooves, and thereby lubricate the anti-friction rollers. Communicating at their upper ends with the cam-grooves and made in the opposing faces of the sides of the engine-case are feeding-grooves *e′*, which surround the cam-grooves, and are adapted to convey oil from the latter to the outer sides of the piston, thereby lubricating the same and enabling it to turn easily in the case.

In the steam-chest is located a slide-valve, *f′*, which is of sufficient length to close both the ports H and I, and has a recess, *g′*, on its under side, which covers the port K. The top of the steam-chest bears against the upper side of the valve, thus seating the latter firmly on the bottom of the steam-chest. A steam-supply pipe, *k′*, communicates with the steam-chest to admit steam thereto.

On the upper side of the case C, near one end of the steam-chest, is secured an arm, *l′*, which has a segment, *m′*, that is provided with three notches or recesses, *n′*, *o′*, and *p′*, arranged at suitable distances apart. A lever, *r′*, is pivoted to the arm *l′*, and is adapted to sweep over the segment, and has a spring-actuated locking-bolt, *s′*, that is adapted to engage either of the notches in the segment, so as to secure the lever thereto. A valve-rod, *t′*, extends through one end of the steam-chest and is attached to the valve, and the outer end of the said rod is connected to the lever *r′* by means of a link, *u′*. When the lever is turned so that the locking-bolt engages the recess *n′*, the valve is moved so as to uncover the port H and cover the ports I and K and establish communication between the said latter ports. This admits steam from the steam-chest through the port H and channel *h* to the annular channel T around the piston. The steam is prevented from expanding rearwardly by the abutment P nearest the channel *h*, and consequently presses against one of the valves or abutments of the piston—say the valve or abutment Z′—and thus causes the piston to rotate in the direction indicated by the arrow in Fig. 2. When the valve or abutment Z′ passes the channel *i*, the steam escapes through the said channel under the valve *f′* and through the exhaust-port K. By this

time the valve or abutment Z' has passed beyond the block *m* and is receiving the impulse of the live steam, so that the steam is constantly acting upon one of the piston valves or abutments, and the piston is thus run at a high rate of speed and with maximum power at every point of its revolution. When the valve *f'* is moved so as to uncover the port I, the same becomes the inlet-port, and the piston is rotated in the contrary direction to that indicated by the arrow in Fig. 2, the steam expanding through the channels *h* and *k*. When the valve *f'* is caused to cover both the ports H and I, steam is entirely cut off from the piston and the engine ceases to operate.

Having thus described my invention, I claim—

1. In a rotary engine, the combination of the case, the rotary piston, and the annular packing-rings, made in separable sections and secured together by lap-joints and arranged around the periphery of the piston, substantially as described.

2. The radial piston valve or abutment comprising the section *a*, having the tongue *c*, and the section *b*, having the groove *d* to receive the tongue, in combination with the springs arranged between the two sections to force them normally apart, for the purpose set forth, substantially as described.

3. In a rotary steam-engine, the combination of the case having recesses on its inner side, the rotating piston in the case, having the annular packing-rings, and the spring-actuated plates *u*, located in the recesses in the case and bearing against the packing-rings, for the purpose set forth, substantially as described.

4. In a rotary engine, the block *m*, for the purpose set forth, made of two sections lap-jointed together, and the spring to normally press the said sections apart laterally, substantially as described.

5. In a rotary steam-engine, the combination of the case having the annular interior opening, the abutments P, and the recess O between the said abutments, and the channels *h* and *i* to convey steam to and from the case, the rotary piston journaled in the case and having the radially-movable valves, and the spring-pressed block *m*, located in the recess O and bearing on the piston, the said block being made of two sections jointed together, and having the spring to normally press the said sections apart laterally against the sides of the recess, substantially as described.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in presence of two witnesses.

JERRY ARNER.

Witnesses:
D. A. BEAMER,
R. H. SCOFIELD.