No. 783,291. PATENTED FEB. 21, 1905.

R. L. LEACH.

ROTARY ENGINE.

APPLICATION FILED NOV. 10, 1904.

3 SHEETS—SHEET 1.

Fig 1.

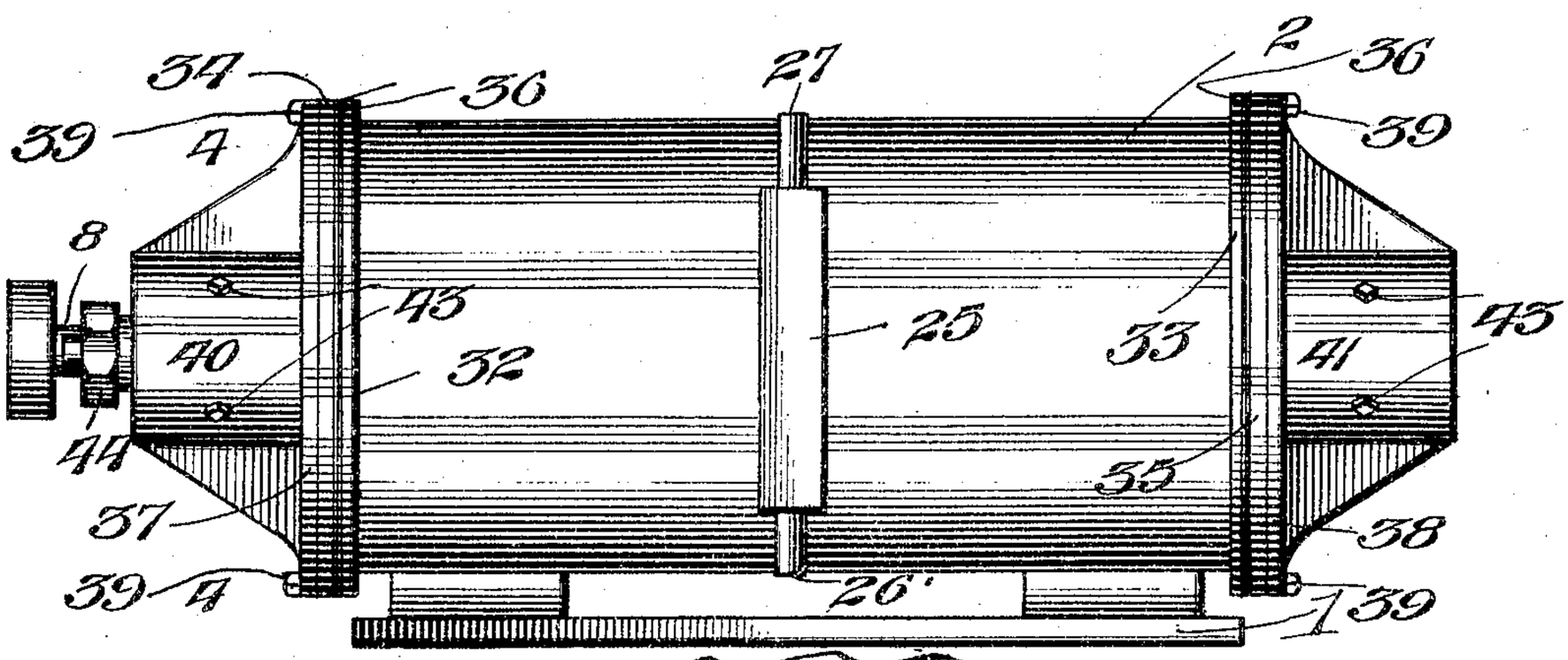
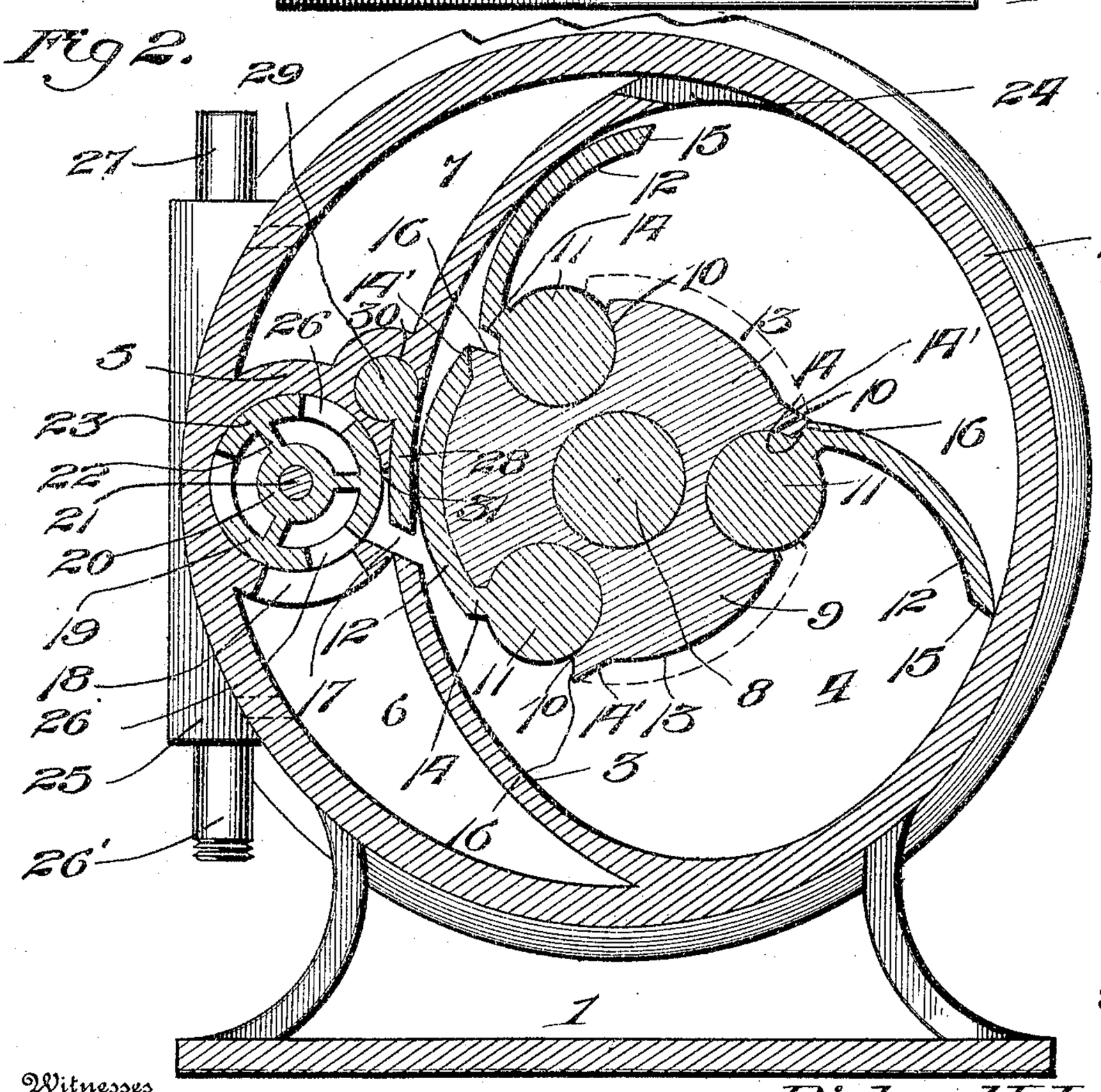


Fig 2.



Witnesses

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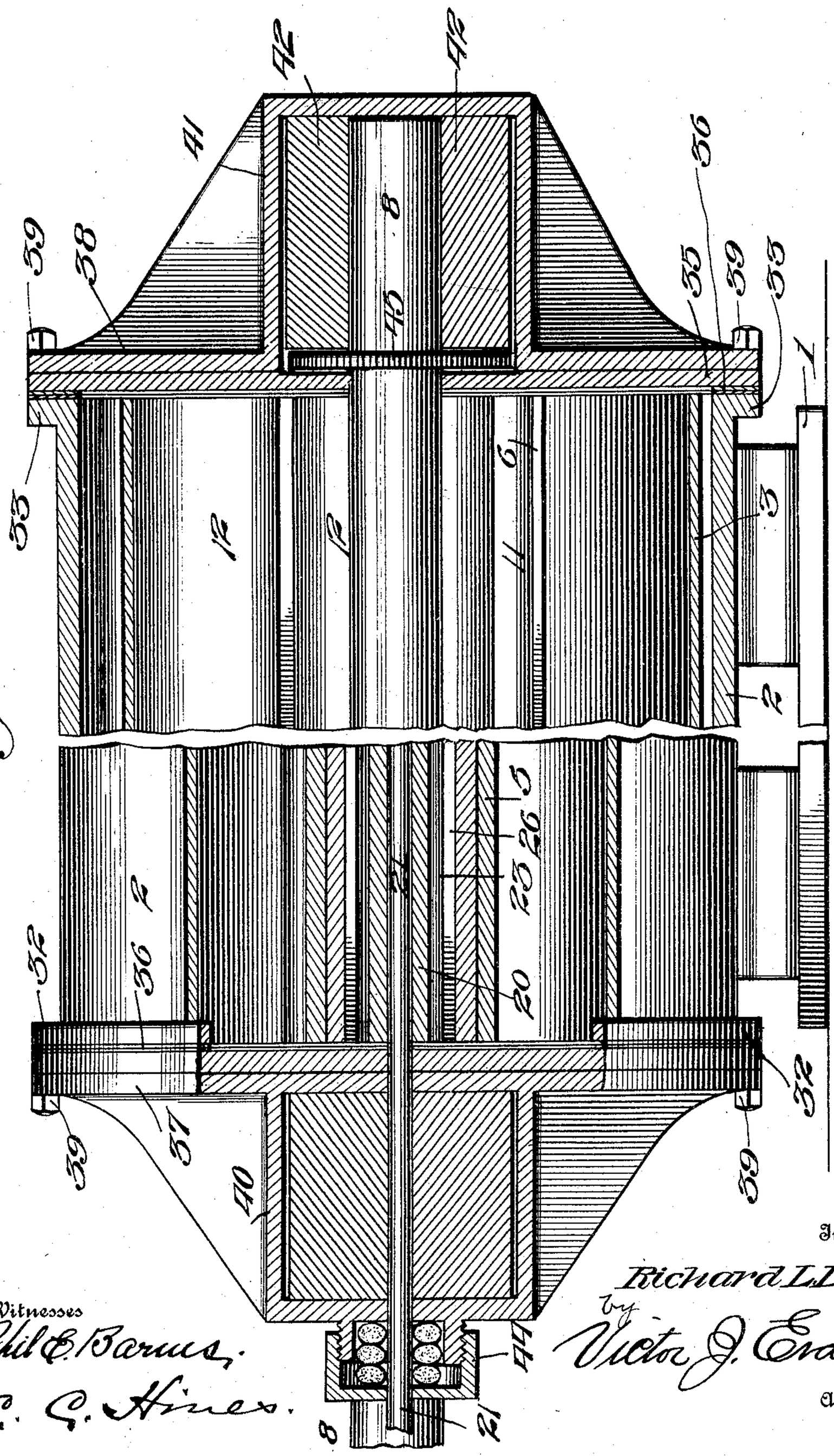
3 SHEETS—SHEET 2.

Fig. 3.



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3 SHEETS--SHEET 3.

Fig. 5.

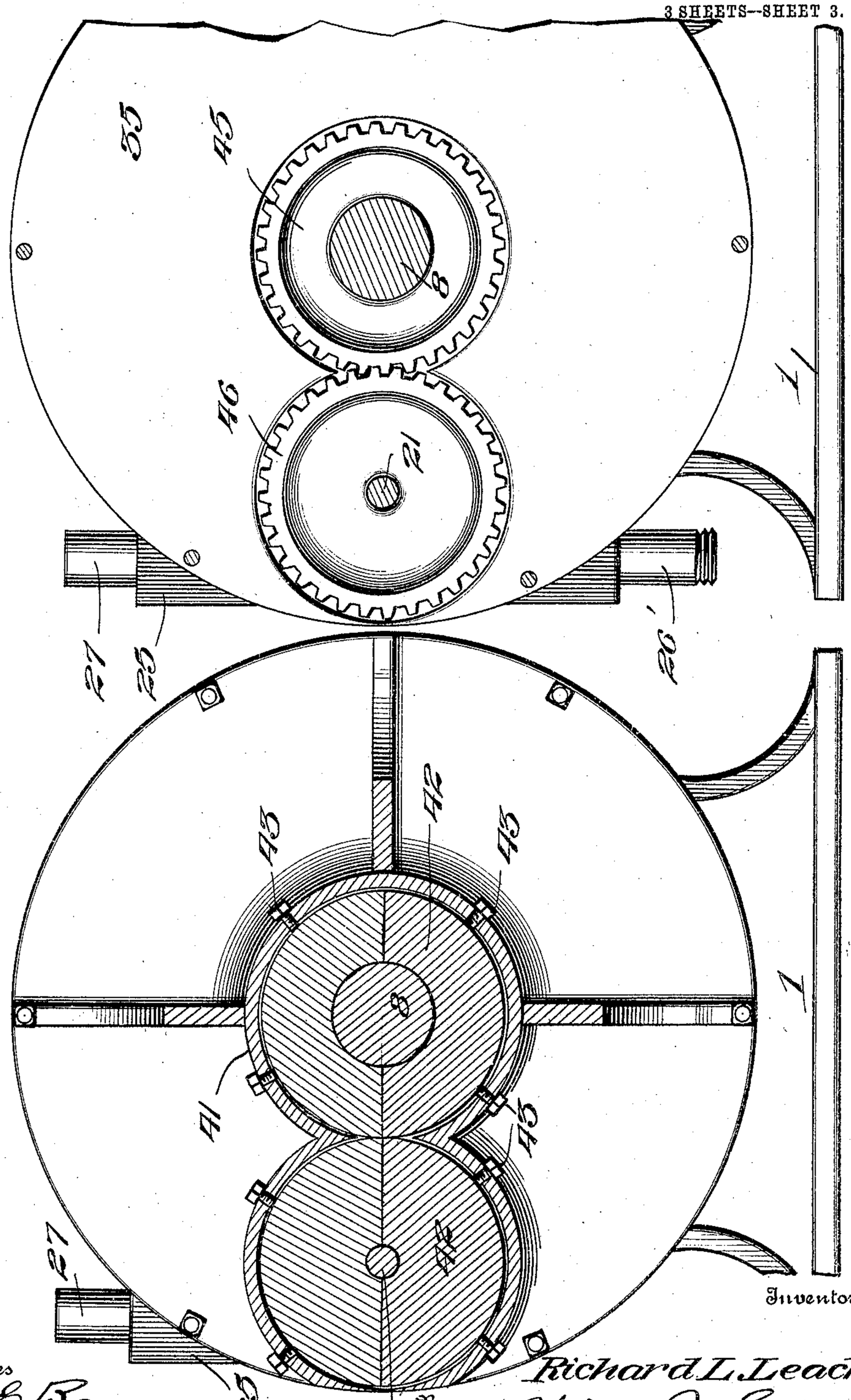

Fig. 7.

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UNITED STATES PATENT OFFICE.

RICHARD L. LEACH, OF HORSEBRANCH, KENTUCKY.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 783,291, dated February 21, 1905.

Application filed November 10, 1904. Serial No. 232,242.

To all whom it may concern:

Be it known that I, RICHARD L. LEACH, a citizen of the United States, residing at Horsebranch, in the county of Ohio and State of Kentucky, have invented new and useful Improvements in Rotary Steam-Engines, of which the following is a specification.

This invention relates to certain new and useful improvements in rotary steam-engines, the object of the invention being to provide an engine of this character which is simple and inexpensive of construction, durable and efficient in use, and adapted to utilize the impact and expansive force of the steam.

Other objects and advantages are also contemplated and appear in the course of the subjoined description.

In the accompanying drawings, Figure 1 is a side elevational view of a rotary engine embodying my invention. Fig. 2 is a central vertical transverse section of the same. Fig. 3 is a vertical longitudinal section of the engine, taken through one half of the engine on the line of the valve-shaft and through the other half of the cylinder on the line of the engine-shaft. Fig. 4 is a cross-section, on an enlarged scale, on the line 4 4 of Fig. 1; and Fig. 5 is a view looking toward one end of the cylinder, the adjacent bonnet or outer head being removed to show the valve-actuating gears.

The numeral 1 in the drawings represents the engine-base supporting the engine-cylinder 2, which is of oval or elliptical form in cross-section, as clearly shown in Fig. 2. On the interior of the cylinder is a curved longitudinal partition 3, subdividing the cylinder longitudinally to form two portions or chambers, one of said portions forming a piston-chamber 4, the other being divided intermediately by a longitudinal valve-casing 5 to form a steam-chest 6 and exhaust-chamber 7. Extending through the piston-chamber 4 is the engine-shaft 8, to which is keyed or otherwise secured a piston-head 9, the said shaft and head being eccentrically mounted in the chamber 4. The head 9 is provided at equidistant points around its periphery with bearing-recesses 10, receiving journals 11 upon the inner ends of piston-wings 12, which wings may be varied in number as occasion requires and are adapted to fold within recesses 13, formed in the periphery of the piston between the bearing-recesses 10. Each wing 12 is curved to lie when folded in its receiving-recess 13 concentric with the shaft 8 and complete the peripheral bearing portion of the piston and is joined to the journal 11 by an angular neck 14 and is provided with a beveled face 15 at its free end. The outer end of each wing-receiving recess 13 is formed with a beveled or inclined end wall 14′ to adapt the said beveled end 12 of the piston-wing to fit steam-tight against the same, and adjacent to the said wall 14 of each recess is a shoulder 16, against which the neck 14 of the piston-wing adapted to fold in the next succeeding recess in the course of revolution of the piston-head is adapted to contact to limit the outward movement of the wing. The beveled outer or free end 12 of each wing forms a point end or edge at the extremity of the wing, which is adapted to engage the wall of the piston-chamber and held in steam-tight contact therewith by the pressure or impingement of the steam on the inclined face.

The partition or diaphragm 3 has its concaved side forming one of the side walls of the piston-chamber 4, thus giving the same a pronounced oval or elliptical formation in cross-section and serves additionally as an abutment coacting with the wings to form a pocket for the reception of the steam supplied to act upon the wings to rotate the piston. In the partition 3 is formed a steam-supply port 17, projecting at a slight downward angle and communicating with the valve-casing 5, which is provided with an inlet-port 18 for the supply of steam from the chest 6 to and through the controlling-valve 19 to the said port 17. The valve 19 is of the rotary type and comprises a central hub 20, mounted on a shaft 21 and having radial arms 22, carrying a cylindrical valve-body 23, fitting steam-tight against the inner wall of the casing 5 and provided with steam ports or passages 26 equal in number to the wings upon the piston 9. The shafts 13 and 20 are geared, as hereinafter described, to rotate in timed relation, so that at each point or period in the path of revolution of the pis-

ton 9 when one of the piston-wings passes port 17 steam will be gradually and proportionately admitted to said port and thence to the cylinder behind the piston-wing as the latter gradually unfolds from its recess 13, the port 26 being fully in register with the port 17. When the piston-wing is fully unfolded, its outer or free edge bears against the wall of the cylinder 2 to form a chamber receiving the admitted steam whose impact and expansion are utilized against the surface of the wing to rotate the piston. As the piston 9 rotates to the left, or in the direction of the arrow shown in Fig. 2, each wing on coming in contact with the concave side of the wall or diaphragm 3 gradually folds into its receiving-recess 13, and thus becomes inoperative until it passes the port 17, when it gradually unfolds through the combined force of gravity and the steam-pressure behind it until it is fully projected and the full working force of the steam is utilized. In the first part of the course of travel of the piston-wing the impact of the steam is used, after which the steam gradually expands behind the piston-wing, and its combined forces are thus utilized until the end of the stroke or course of travel of the piston, when the steam exhausts from the chamber 4 through a port 24 in the upper end of the partition 3 into the exhaust-chamber 7. On the exterior of the cylinder is a base or enlargement 25, which is chambered and partitioned to provide steam supply and exhaust passages communicating, respectively, with the chest 6 and exhaust-chamber 7 and with a steam-supply pipe 26 and exhaust-pipe 27.

Above the steam-supply port 17, leading into the chamber 4, is a gate or movable abutment 28, having at its upper end a journal 29, fitting in a bearing-recess 30 in the valve-casing 5 and adapted to close within a recess 31 in said casing, so that its outer surface, which is properly curved, will conform to the curvature of the concaved face of the partition 3. This gate or abutment when folded within the recess 31 partially projects into the passage 17 and is thus subjected to the pressure of the steam feeding through said passage and forced thereby against the surface of the adjacent piston-wing, thus maintaining a steam-tight connection with said wing and preventing the upward passage of live steam between the wing and partition 3 and the exhaust and loss of the same through the exhaust-passage 24.

The cylinder 2 is provided at each end with a circumferential flange 32 and 33 and closed by the heads 34 and 35, between which and said flanges are placed one or more packing-rings 36 to effect a steam-tight connection. These heads 34 and 35 are apertured for the passage of the ends of the shafts 8 and 20, and upon the outer sides thereof are arranged outer heads or bonnets 37 and 38, through which pass fastening screws or bolts 39, which also project through the heads 34 and 35 and packing-ring 36 and enter the flanges 32 and 33 of the cylinder, thus securely fastening the heads upon the ends of the cylinder. The outer heads or bonnets 37 and 38 are formed or provided with boxes 40 and 41, receiving bearing-brasses 42, in which the ends of the shafts are journaled, said bosses being held in place by set-screws or analogous fastenings 43, passing through the boxes and impinging against the outer sides or surfaces of the brasses. The boxes 40 on the head 37 are apertured for the passage of the ends of the shafts 8 and 20 and may be provided with stuffing-boxes 44 to prevent the escape of steam and access of atmospheric air. On the ends of the two shafts which extend into the box 41 on the head 38 are spur gear-wheels 45 and 46 of uniform diameter and provided with a corresponding number of gear-teeth. The gear 45 receives motion from the piston-shaft 8 and meshes with the gear 46 and transmits motion thereto to rotate the valve-shaft 20 and valve 19 at a proper rate of speed and in timed relation to the speed of the piston to admit steam through the ports 26 upon the passage of each piston-wing beyond the port 18, thus insuring the application of steam to each piston-wing at proper periods in the path of revolution of the piston and utilizing the force of the steam in the most effective manner to rotate the piston. The time or period in the course of rotation at which the ports 26 are brought into register with the supply-port 17 may be varied by using gears of different diameters and having a varied arrangement of intermeshing teeth, as will be readily understood.

From the foregoing description, taken in connection with the accompanying drawings, the construction and mode of operation will be apparent without a further extended description of the invention.

Changes in the form, proportions, and minor details of construction may be made within the scope of the invention without departing from the spirit or sacrificing any of the advantages thereof.

Having thus described the invention, what is claimed as new is—

1. In a rotary engine, a cylinder having a longitudinal partition forming on one side a piston-chamber, a valve-casing subdividing the space on the other side and forming a steam-chest and an exhaust-chamber, said partition being provided with an exhaust-passage connecting the piston-chamber with said exhaust-chamber, and a steam-supply passage communicating with the valve-chamber, a rotary valve in said valve-chamber, a piston eccentrically mounted within the piston-chamber and provided with folding piston-wings, the said partition forming an abutment to fold said wings, and means for driving the valve in timed relation from the piston.

2. In a rotary engine, a cylinder having an interior horizontal valve-chamber and an arcuate partition disposed mainly on one side of the vertical center of said cylinder and dividing the interior of the cylinder into two portions, one forming an oval or elliptical piston-chamber and the other subdivided by the valve-chamber and forming a steam-chest and a superposed exhaust-chamber, said valve-chamber having a passage in its lower side communicating with the chest and said partition having a supply-port communicating intermediate of its length with the valve-chamber, and an exhaust-passage through its upper end connecting the piston-chamber to the exhaust-chamber.

3. In a rotary engine, a cylinder provided with a partition forming a piston-chamber, a steam-chest and an exhaust-chamber, an inlet-valve chamber separating said chest from said exhaust-chamber, and a piston in said piston-chamber having gravity-opening, folding wings, said partition serving as an abutment for engagement by the wings to hold the same against the piston.

4. In a rotary engine, a horizontal engine-cylinder divided vertically into two chambers, one serving as a piston-chamber having a steam-inlet and an exhaust-outlet, and the other having a valve-casing subdividing it to form a steam-chest and an exhaust-chamber, a piston arranged in the piston-chamber, and a gravity-gate adapted to engage the surface of the piston, said gate being forced against the piston by steam-pressure from the steam-inlet.

5. In a rotary engine, a cylinder having a partition therein forming a piston-chamber and serving as an abutment, said partition being provided with a steam-inlet and an exhaust-outlet, a piston eccentrically mounted in the piston-chamber and provided with wings, and a pivoted gate mounted upon the partition and subjected to the pressure of the steam flowing through the steam-inlet and mounted in steam-tight engagement thereby with the wings of the piston.

6. In a rotary engine, the combination of a cylinder, heads or bonnets upon the ends of the cylinder provided with inclosed boxes, bearing-brasses disposed in said boxes, a piston in the cylinder, a steam-supply valve, shafts carrying said piston and supply-valve and journaled in the said brasses in the boxes, and gearing between the two shafts whereby the valve-shaft is operated in unison with the engine-shaft, said gearing being inclosed by one of said boxes, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

RICHARD L. LEACH.

Witnesses:
C. P. AUSTIN,
T. C. PIRTLE.