R. S. WHITE, Jr.

ROTARY ENGINE.

APPLICATION FILED AUG. 31, 1910.

991,576.

Patented May 9, 1911.

4 SHEETS—SHEET 1.

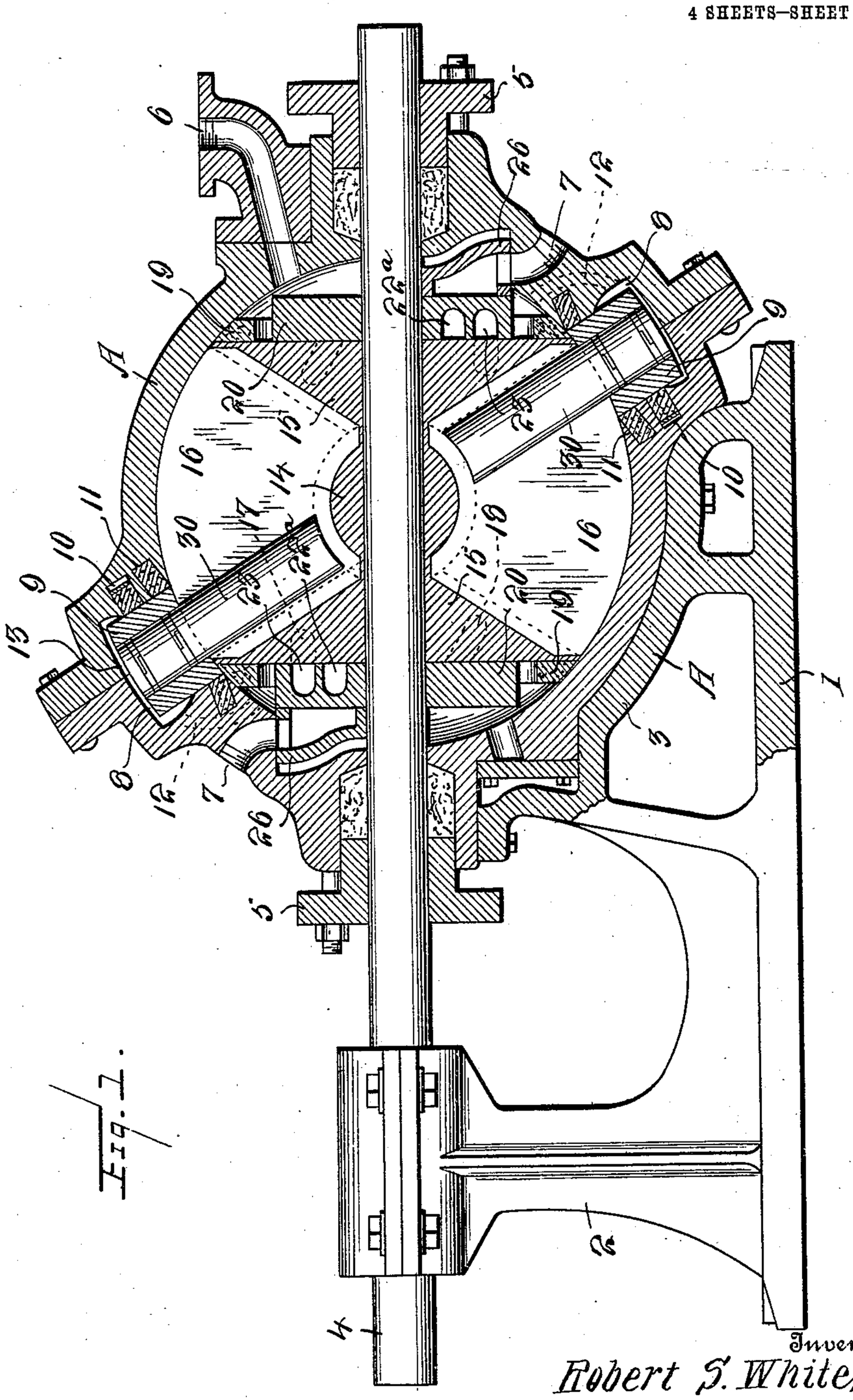


Fig. 1.

Witnesses
E. R. Ruppert.
C. B. Hillyard.

Inventor
Robert S. White, Jr.

By Victor J. Evans
Attorney

R. S. WHITE, Jr.

ROTARY ENGINE.

APPLICATION FILED AUG. 31, 1910.

991,576.

Patented May 9, 1911.

4 SHEETS—SHEET 2.

Fig. 3.

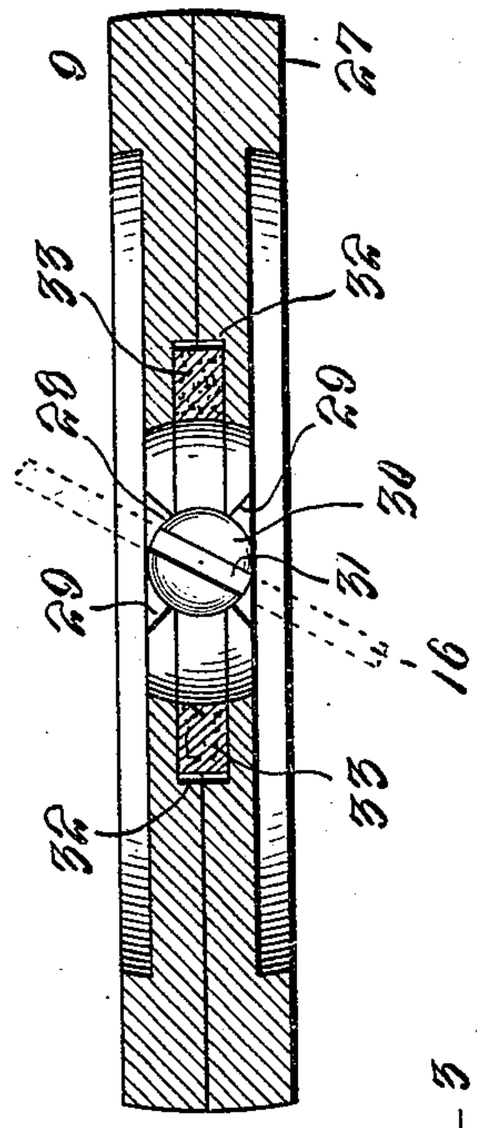


Fig. 4.

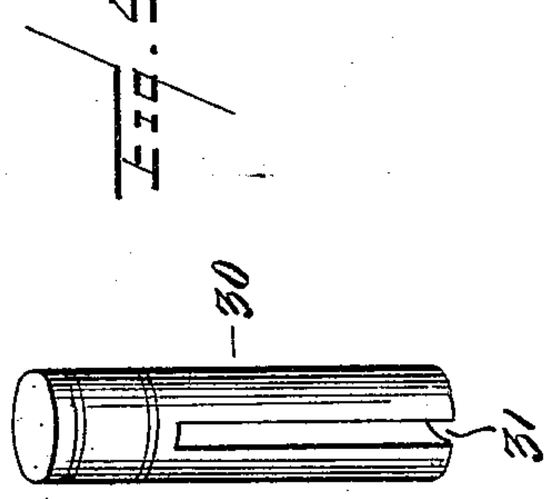
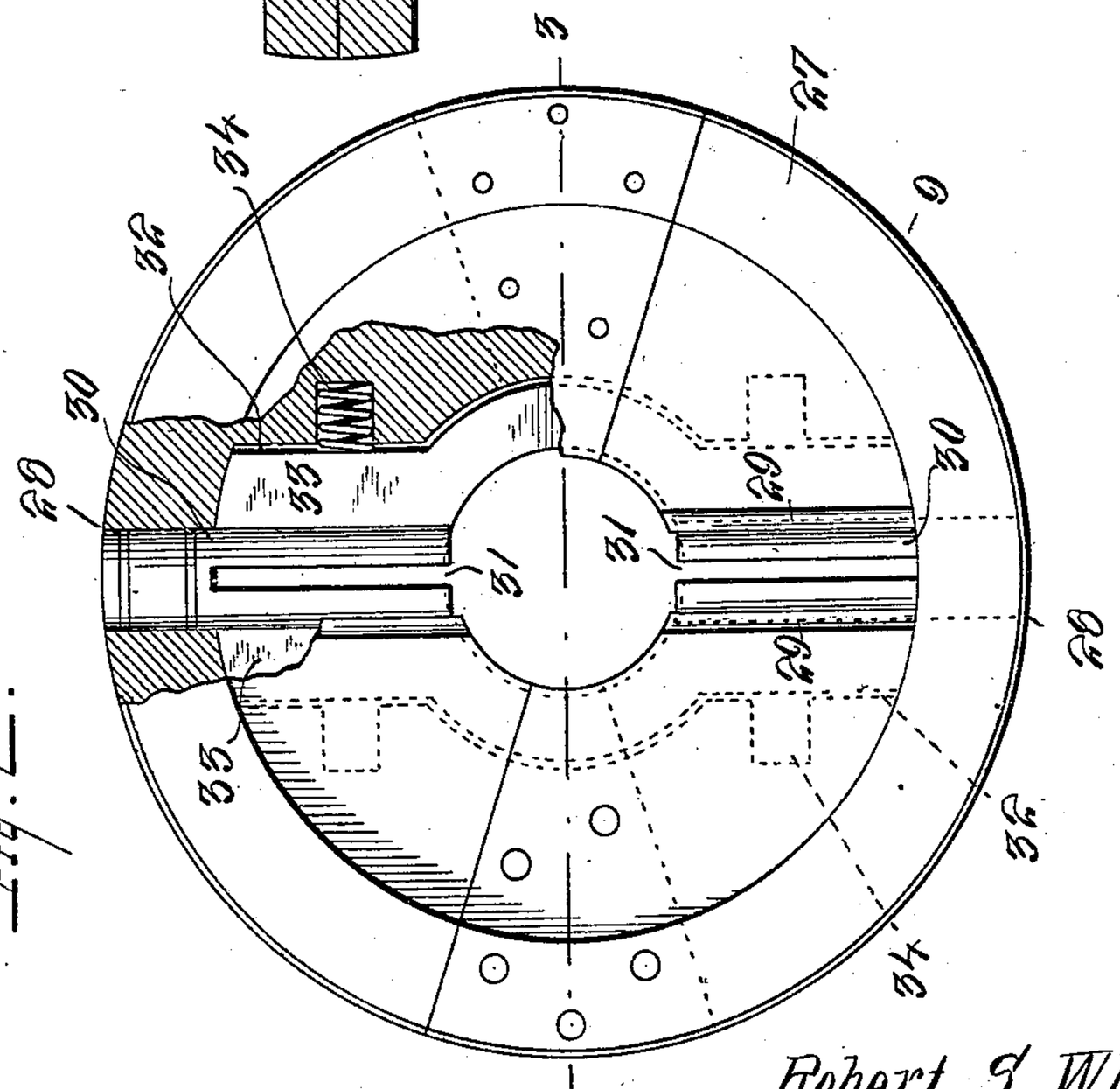


Fig. 2.



Inventor

Robert S. White, Jr.

Witnesses

E. R. Redpath.

V. B. Hillyard.

By Victor J. Evans

Attorney

R. S. WHITE, Jr.

ROTARY ENGINE.

APPLICATION FILED AUG. 31, 1910.

991,576.

Patented May 9, 1911.

4 SHEETS—SHEET 3.

Fig. 7.

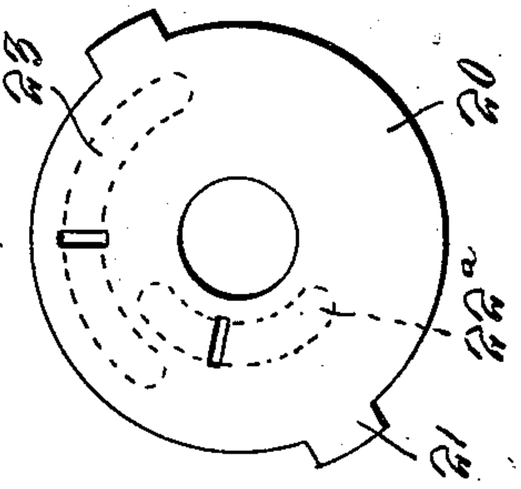


Fig. 8.

Fig. 6.

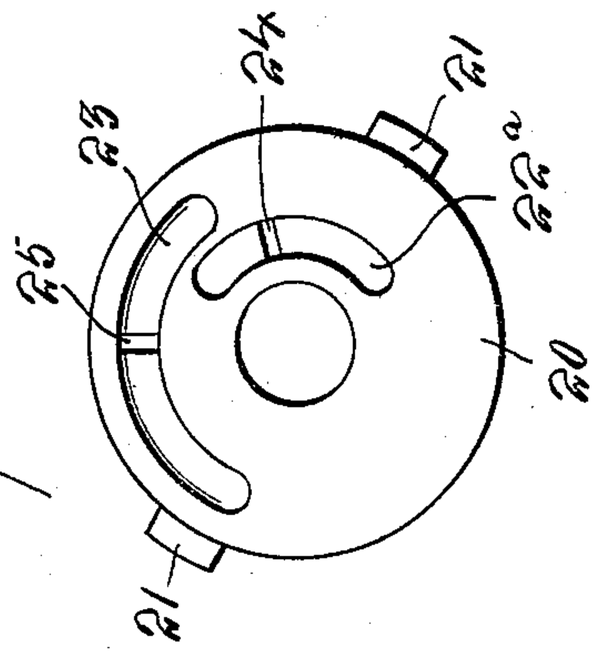
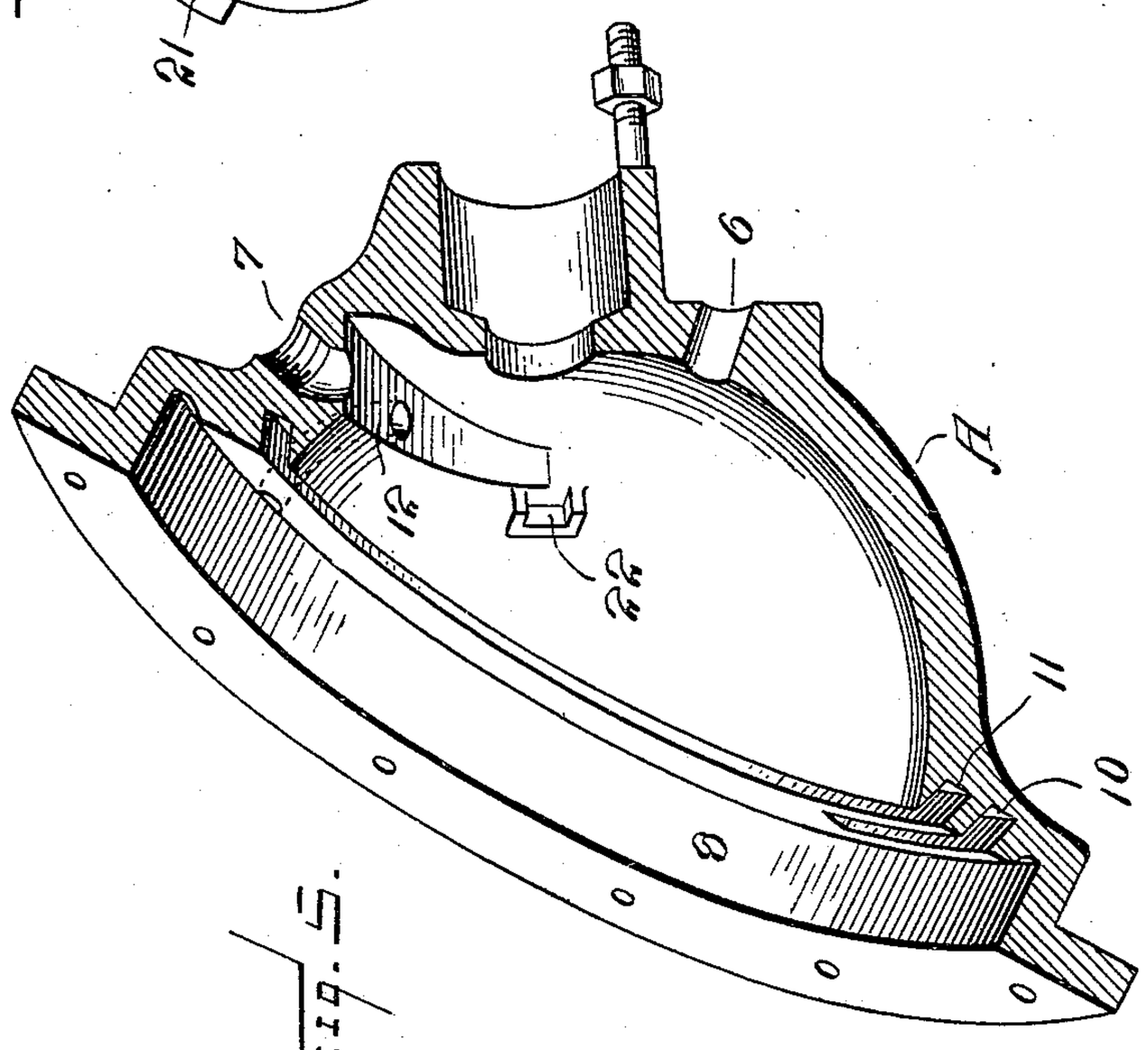


Fig. 5.



Witnesses

E. R. Ruppert.

V. B. Hillyard.

Inventor

Robert S. White, Jr.

By Victor J. Evans

Attorney

R. S. WHITE, Jr.

ROTARY ENGINE.

APPLICATION FILED AUG. 31, 1910.

991,576.

Patented May 9, 1911.

4 SHEETS—SHEET 4.

Fig. 10.

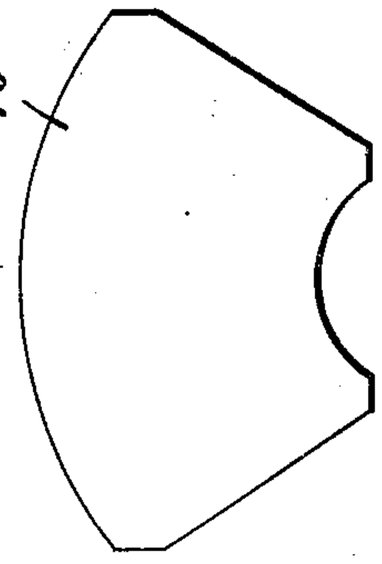


Fig. 11.

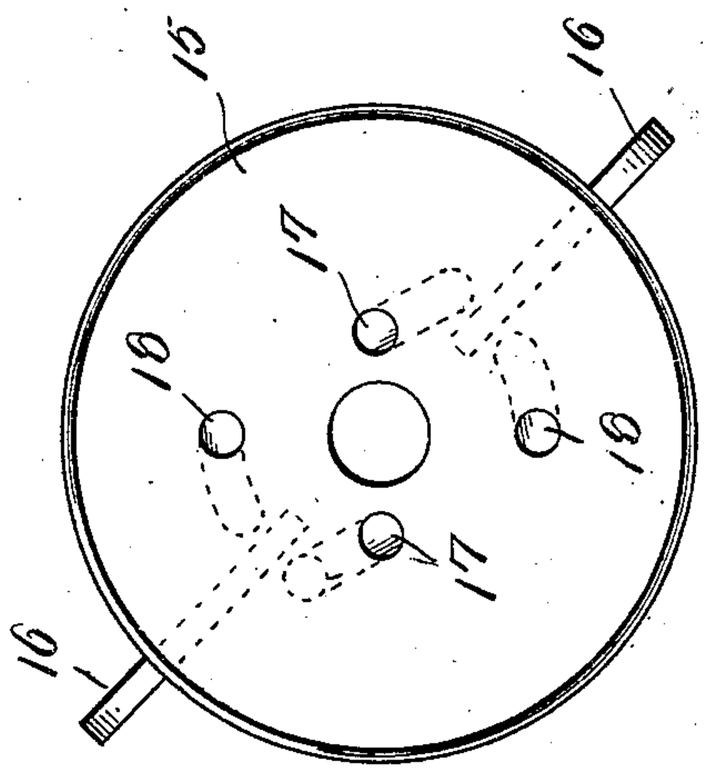
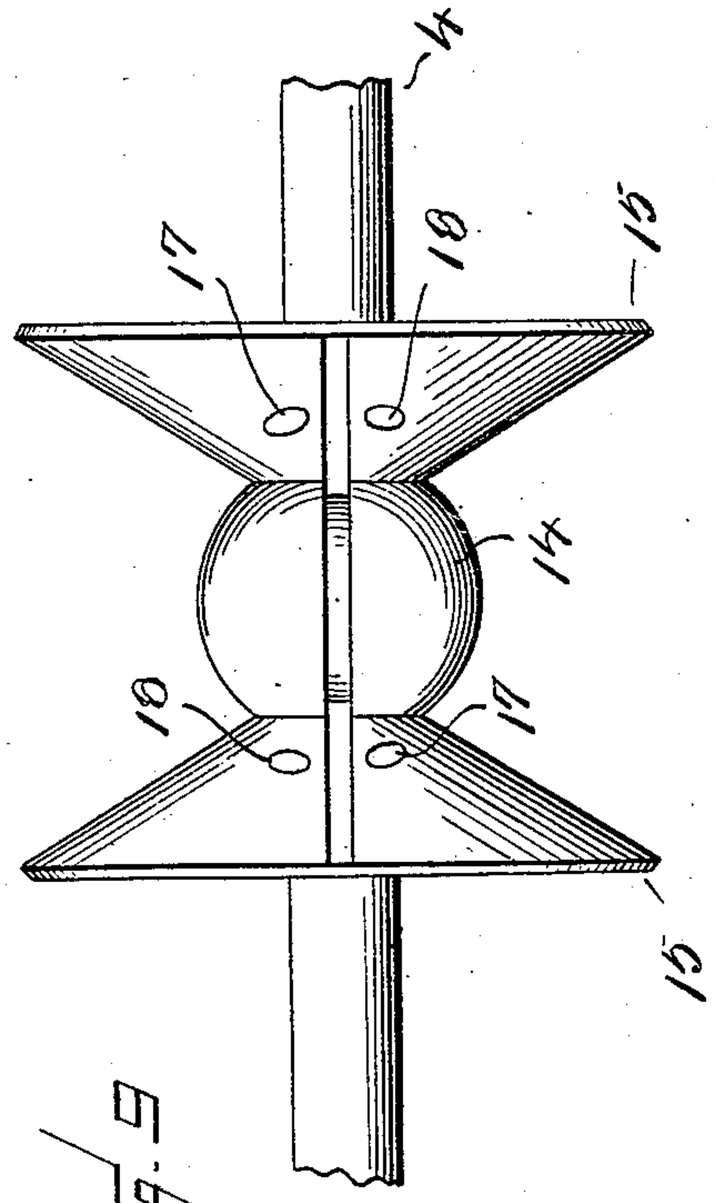


Fig. 9.



Witnesses

E. Q. Rupfurt.

U. B. Hillyard.

Inventor

Robert S. White, Jr.

By Victor J. Evans

Attorney

UNITED STATES PATENT OFFICE.

ROBERT S. WHITE, JR., OF BICKFORD, OKLAHOMA, ASSIGNOR, BY MESNE ASSIGNMENTS, OF ONE-HALF TO CHARLES N. BANCROFT, OF BICKFORD, OKLAHOMA.

ROTARY ENGINE.

991,576. Specification of Letters Patent. Patented May 9, 1911.

Application filed August 31, 1910. Serial No. 579,925.

To all whom it may concern:

Be it known that I, ROBERT S. WHITE, Jr., a citizen of the United States, residing at Bickford, in the county of Blaine and State of Oklahoma, have invented new and useful Improvements in Rotary Engines, of which the following is a specification.

The present invention has relation to rotary engines of the variety embodying a cylinder and a rotary piston located within the cylinder and comprising a centrally disposed spherical portion, conical end pieces and intermediate wings, the latter arranged to operate through openings formed in an obliquely disposed disk or partition.

The purpose of the invention is to devise a novel construction and arrangement of parts whereby an efficient engine is provided and which will involve a comparatively simple construction and compact arrangement of parts, with the result that the motive medium is utilized to the best possible advantage and repairs and adjustments minimized.

The invention consists of the novel features, details of construction and combination of parts, which hereinafter will be more particularly set forth, illustrated in the accompanying drawings, and pointed out in the appended claims.

Referring to the drawings, forming a part of the application, Figure 1 is a vertical central longitudinal section of an engine embodying the invention. Fig. 2 is a view in elevation of the disk or partition, parts being broken away. Fig. 3 is a section on the line 3—3 of Fig. 2. Fig. 4 is a detail perspective view of one of the oscillatory fillers for the piston wings. Fig. 5 is a sectional perspective view of one of the parts of the cylinder. Fig. 6 is a view in elevation of the stationary valve for controlling the supply and the exhaust of the motive medium of the engine. Fig. 7 is a view in elevation of the reverse side of the valve shown in Fig. 7. Fig. 8 is a detail view of the movable valve whereby the engine may be reversed. Fig. 9 is a top plan view of the piston turned so as to present the upper piston wing in edge view. Fig. 10 is a view in elevation of one of the piston wings. Fig. 11 is an end view of the piston.

Corresponding and like parts are referred to in the following description, and indicated in all the views of the drawings, by the same reference characters.

The engine is mounted upon a base 1, which comprises a standard 2 and a bed portion 3, the latter having the cylinder secured thereto and the standard 2 having a bearing at its upper end in which the shaft 4 of the engine is mounted. The cylinder is formed of similar parts A, which are approximately of semicylindrical form and have their meeting faces obliquely disposed with reference to the axis or shaft of the engine, the parts or sections having outer flanges in which openings are formed to receive the bolts or other fastening means employed for connecting the parts or sections A. The cylinder when the parts are assembled and secured presents the appearance of a globe or sphere having stuffing boxes at opposite points in which the shaft 4 is mounted, the glands 5 of the stuffing boxes being secured to the parts of the cylinder by means of bolts to admit of compressing the packing to maintain a close fit between the cylinder and the engine shaft. The motive medium is admitted at 6 and exhausted at 7. The outer edge portions of the parts A of the cylinder are recessed, as indicated at 8, to form a circumferential groove to receive the outer portion of the disk or partition 9, which latter has an oblique arrangement corresponding to the joint formed between the parts A of the cylinder. Grooves 10 and 11 are formed in the side walls of the recessed portions of the parts A and are adapted to receive suitable packing to insure the formation of a close joint between the walls of the peripheral groove and the outer portion of the disk or partition 9. Passages 12 establish communication between the peripheral groove and the end spaces of the cylinder and serve to admit of the motive medium entering the peripheral groove, which latter for convenience is designated in its entirety by the reference numeral 13.

The rotary piston comprises a central portion 14, end pieces 15 and wings 16, the latter being of sector-shape and movable radially in grooves formed in the inner faces of the end pieces 15 and across the outer face of the part 14. The wings 16 are radially movable so as to be thrown outward by centrifugal action, whereby their outer edges

are held in close contact with the inner walls of the cylinder. The middle part 14 is approximately of ball or spherical shape and the end pieces 15 are of conical form and arranged with their apices facing inward and joining the ball-shaped part 14. Passages 17 and 18 are formed in the end pieces 15 and extend therethrough and serve to supply the motive medium and to carry off the motive medium after its energy has been expended. Two passages are had for each wing and extend through the end pieces upon opposite sides of the plane of the wings, as indicated most clearly in Figs. 9 and 11.

A packing ring 19 is had for each end portion of the cylinder and is expansible and its outer edge is made to conform to the inner wall of the cylinder so as to fit close thereagainst and the face adapted to lie against the outer side of an end piece 15 is made straight to obtain a close bearing thereagainst throughout its extent. The packing rings 19 insure a close fit or joint between the ends of the piston and the inner walls of the cylinder and by constructing the packing rings so as to be self-expansible they automatically compensate for wear and preserve a steam tight joint between the piston and cylinder.

When the piston is in place spaces are formed between its ends and the end portions of the cylinder and these spaces constitute steam chests, the ports 6, 7 and 12 communicating at their inner ends therewith. Stationary valves 20 are located in the end spaces or steam chests and are held against rotation and are pressed against the outer faces of the piston heads. The shaft 4 extends through the valves 20 and the latter have lugs 21 at opposite points, which enter recesses 22 formed in projecting portions of the cylinder sections so as to hold the valves stationary. Grooves 22ª and 23 are formed in the inner faces of the valves 20 and communicate at a middle point with ports 24 and 25, which extend from the respective grooves through the outer face of the valves. The grooves 22ª and 23 constitute passages for the motive medium and communicate with the openings or passages 17 and 18 formed in the heads or end pieces of the piston. A movable valve 26 is located in each chest and communicates with the exhaust port 7 and is adapted to make connection with either one of the ports 24 or 25 of the adjacent valve 20 according to the direction of rotation of the piston. When the valves 26 are moved in one position the motive medium is admitted for instance through the ports 25 and exhausted through the ports 24, thereby driving the engine in one direction, and upon moving the valves 26 to admit the motive medium through the ports 24 and to admit of the exhaust passing out through the ports 25 the engine is driven in the reverse direction. Any means may be provided for moving the valves 26.

The disk or partition 9 has its outer peripheral portion 27 thicker than the central portion and said disk is preferably composed of similar parts which have their end portions halved and overlapped and secured by suitable fastening means, as indicated most clearly in Fig. 2. By having the disk or partition formed of sections it may be readily placed in position about the central ball-shaped portion 14 of the piston. The disk has a central opening with the portion bordering upon the opening made concave to conform to the spherical surface of the part 14. Radial openings 28 are formed in the partition at diametrically opposite points and the parts bordering upon said openings are beveled, as indicated at 29. The wings 16 extend through the openings 28 and the bevel portions 29 admit of ample oscillatory play between the wings and partition as the same change relationship in the rotation of the piston. Fillers 30 are located in the openings 28 and snugly fit the same. The openings 28 consist of bores and the fillers 30 consist of round pins of a diameter corresponding to the diameter of the bores to admit of said fillers obtaining a close fit in the openings 28. The inner ends of the fillers or pins 30 are made concave to fit closely against the outer surface of the ball-shaped member 14 of the piston. The outer ends of the parts 30 are made convex to snugly fit the outer wall of the groove 13. Slots 31 are formed in the fillers or pins 30 and extend longitudinally thereof from the inner ends to within a short distance of the outer ends of said parts 30, said slots being of a width corresponding to the thickness of the piston wings 16, so as to insure a close fit between the walls of the slots 31 and opposite sides of said piston wings. The outer end portions of the fillers or pins 30 obtain a snug fit within the outer ends of the openings 28 formed in the thickened portion 27 of the partition and said outer end portions are formed with grooves in which packing rings are fitted. The openings 28 extend through opposite sides of the central portion of the partition, as indicated most clearly in Figs. 2 and 3, to admit of the piston wings projecting upon opposite sides of the partition. By having the outer portion of the partition thickened, as indicated at 27, the parts thereof upon opposite sides of the openings 28 are held together by the material upon opposite sides of the outer ends of the openings 28, as will be readily comprehended. By reason of the oblique arrangement of the partition or disk 9 there is a relative angular change between said partition and the piston wings during the rotation of the piston, which results in imparting an oscillatory movement to the fill-

ers or pins 30. The provision of the parts 30 and the mounting of the same in the manner disclosed insures a close joint or steam tight fit between the piston wings and the disk or partition 9 at all stages of movement of the piston.

Grooves 32 are formed in the edge portions of the central part of the disk or partition bordering upon the diametrical opening which receives the ball-shaped part 14 of the piston and the piston wings 16 and filler pieces 30. Packing strips 33 are fitted in the grooves 32 and their inner edges are made concave to fit the outer surfaces of the parts 30 and 14. The packing strips 33 are pressed against the parts 30 and 14 by means of springs 34, which are inserted in recesses formed in the disk. The packing strips 33 are preferably of metal and their end portions are straight, whereas their middle portions are curved to fit about the ball-shaped portion 14 of the piston. The packing strips 33 are placed in position prior to inserting the filler pieces 30 in the openings 28 and when in position said packing strips are retained in place by the parts 30, as will be readily understood.

In operation the steam or motive medium is admitted into the steam chests or spaces at the ends of the cylinder through the ports 6 and passes through one or the other of the ports 24 or 25 into the spaces formed upon opposite sides of the piston wings 16 so as to exert a pressure upon said piston wings to operate the engine in one direction. The exhaust steam or spent motive medium passes outward through either of the ports 24 or 25 into the valves 26, thence outward through the exhaust ports 7. Upon moving the valves 26 the engine may be reversed. As the piston rotates and the angle between the piston wings 16 and the disk or partition 9 changes the parts 30 oscillate to allow for this change of inclination and at the same time maintaining a steam tight fit between said piston wings and disk or partition 9.

From the foregoing description, taken in connection with the accompanying drawings, the advantages of the construction and of the method of operation will be readily apparent to those skilled in the art to which the invention appertains, and while I have described the principle of operation of the invention, together with the device which I now consider to be the embodiment thereof, I desire to have it understood that the device shown is merely illustrative, and that such changes may be made when desired as are within the scope of the claims appended hereto.

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

1. In a rotary engine, the combination of a cylinder, a rotary piston arranged within the cylinder and having chests formed between the ends of said piston and the respective ends of the cylinder, said piston comprising an intermediate ball-shaped portion and terminal conical shaped end pieces, the end pieces adjacent the chests havinng openings therethrough, piston wings mounted between the ball-shaped portion and the conical faces of the end pieces, a diagonal partition arranged within the cylinder and having the piston wings passing therethrough, stationary valves located in the chests and having grooves upon the sides adjacent the ends of the piston having the openings formed therein, said grooves opening outward through the valve to provide ports, and a movable valve adapted to cover one or the other of the ports in the stationary valve according to the direction of rotation of the piston.

2. A rotary engine comprising a cylinder of approximately spherical form, a diagonally arranged partition located within the cylinder, a piston comprising a centrally disposed ball-shaped portion, conical end pieces and piston wings, the latter extending through the obliquely disposed partition, and both of the end pieces of the piston having openings extending therethrough upon opposite sides of the piston wings, stationary valves located in end portions of the cylinder and fitting close against the ends of the piston and having inner and outer grooves in their inner sides and outwardly opening ports in their outer sides, means for admitting motive medium into the spaces at the ends of the cylinder, and valves located in the spaces at the ends of the cylinder and adapted to cover one or the other of the ports formed in the said valves according to the direction of rotation of the engine, said valve being in communication with exhaust ports.

3. A rotary engine comprising a cylinder of approximately spherical form having steam chests at opposite ends, and having inlet and exhaust ports in communication with said chests, said cylinder having a peripheral groove in its inner wall arranged in a plane obliquely to the axis of the engine, a partition having its outer portion fitted in said peripheral groove and having a space between the outer portion of said partition and the outer portion of the groove, said space being in communication with the steam chests at opposite ends of the cylinder, a piston located within the cylinder and comprising a centrally disposed ball-shaped portion and conical shaped end pieces, piston wings passing through openings in the oblique partition and making connection at their edges with the ball and conical portions of the piston, stationary valves in the end spaces of the cylinder, said valves having inner and outer grooves in their inner faces and the ports

leading from said grooves through their outer faces, the piston ends having openings upon opposite sides of the piston wings communicating with the grooves in the stationary valves, and movable valves located in said chests and adapted to cover one or the other of the ports of the stationary valves and having communication with the exhaust ports.

4. A rotary engine comprising a spherical shaped cylinder having oppositely disposed chests and inlet and exhaust ports, an obliquely disposed partition arranged within the cylinder, a piston comprising a middle portion of ball shape and end portions of conical form, said end portions having radial grooves in their conical faces and the ball-shaped portion having peripheral grooves in the plane of the radial grooves of the conical end pieces, sector-shaped wings loosely fitted in the grooves of the ball and conical shaped parts of the piston and passing through openings in the oblique partition, the end pieces of the piston having openings extending therethrough upon opposite sides of the piston wings, valves located in the chests and held close against the ends of the piston and having openings to communicate with the openings of the piston ends, self-expansible packing rings fitted in the spaces formed between the ends of the piston and the inner walls of the cylinder, and movable valves for admitting the motive medium to one or the other of the openings of the stationary valves according to the direction of rotation of the engine, said valves communicating with the exhaust ports.

5. In a rotary engine the combination of a cylinder, a piston arranged to operate therein and comprising conical shaped end pieces, an intermediate ball-shaped part and radially disposed wings, means for supplying and exhausting the motive medium, an obliquely disposed partition having radial bores through which the piston wings pass, and filler pieces mounted in the openings of the partition and having slots in which the piston wings are fitted.

6. A rotary engine comprising a cylinder, a piston arranged to operate therein and comprising a middle ball-shaped portion and conical-shaped end pieces, piston wings located between the ball and conical shaped parts of the piston, means for admitting and exhausting the motive medium from the cylinder, an obliquely disposed partition having radial openings, filler pieces fitted in the openings and adapted to turn therein and having slots for the passage of the piston wings, and packing strips upon opposite sides of the filler pieces.

7. A rotary engine comprising a cylinder, a piston arranged to operate therein and comprising a middle ball-shaped portion and conical-shaped end pieces, piston wings located between the ball and conical shaped parts of the piston, means for admitting and exhausting the motive medium from the cylinder, an obliquely disposed partition comprising an outer thickened peripheral portion and a reduced central portion, and having radial openings, the latter having opposite side portions extending through opposite sides of the central reduced portion, filler pieces consisting of rounded pins fitted in the radial openings of the partition and having slots in their inner end portions to receive the piston wings and having their outer ends fitted in the openings extending through the thickened peripheral portion of the partition.

8. A rotary engine comprising a cylinder, a piston arranged to operate therein and comprising a middle ball-shaped portion and conical-shaped end pieces, piston wings located between the ball and conical shaped parts of the piston, means for admitting and exhausting the motive medium from the cylinder, an obliquely disposed partition comprising an outer thickened peripheral portion and a reduced central portion, and having radial openings, the latter having opposite side portions extending through opposite sides of the central reduced portion, filler pieces consisting of rounded pins fitted in the radial openings of the partition and having slots in their inner end portion to receive the piston wings and having their outer ends fitted in the openings extending through the thickened peripheral portion of the partition, and spring pressed packing strips located upon opposite sides of the slotted end portions of the filler pieces and extending around the ball-shaped portion of the piston.

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

ROBERT S. WHITE, Jr.

Witnesses:
N. G. Bailey,
D. P. Hogan.