No. 828,260. PATENTED AUG. 7, 1906.

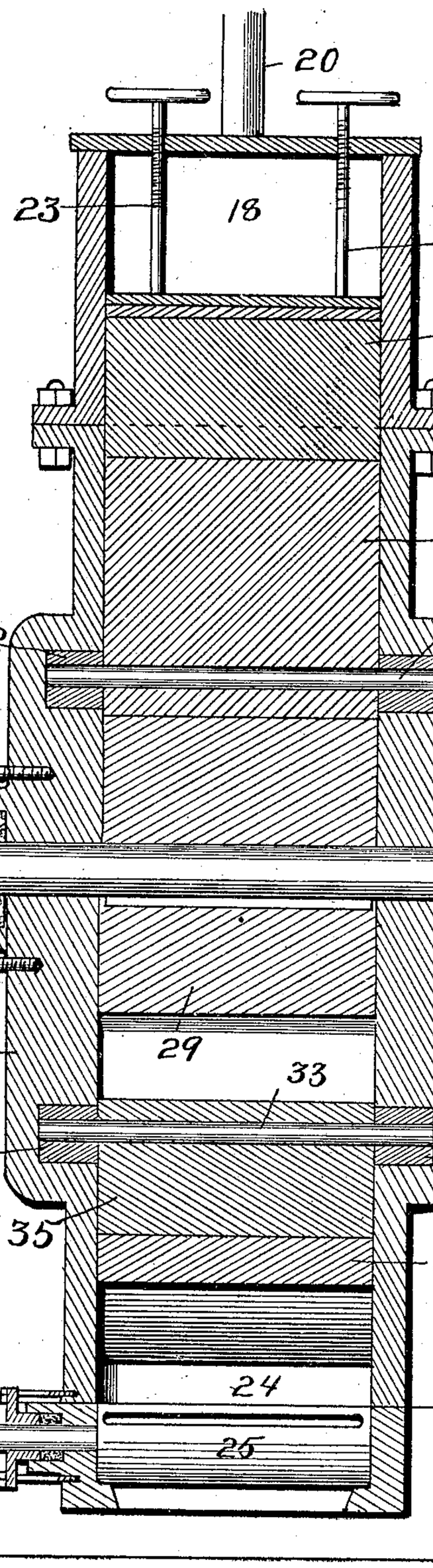
O. WILLIAMS.

ROTARY ENGINE.

APPLICATION FILED JAN. 20, 1905.

2 SHEETS—SHEET 1.

Fig. 1.



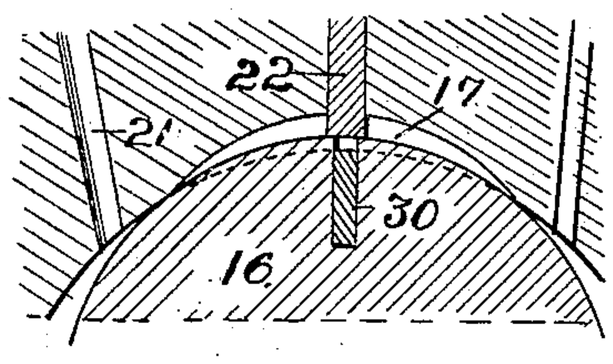


Fig. 4.

Witnesses.

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2 SHEETS—SHEET 2.

Fig. 3.

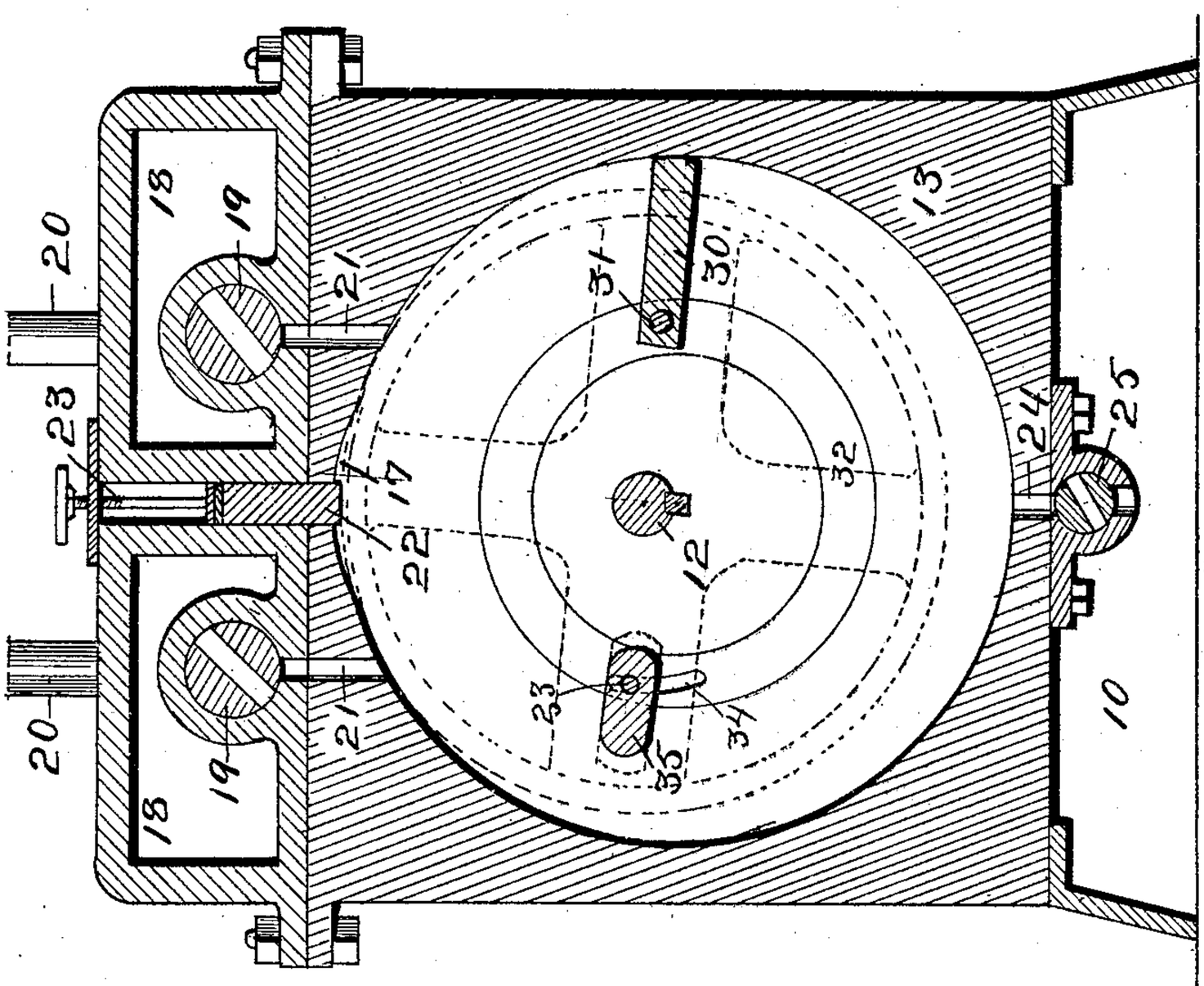
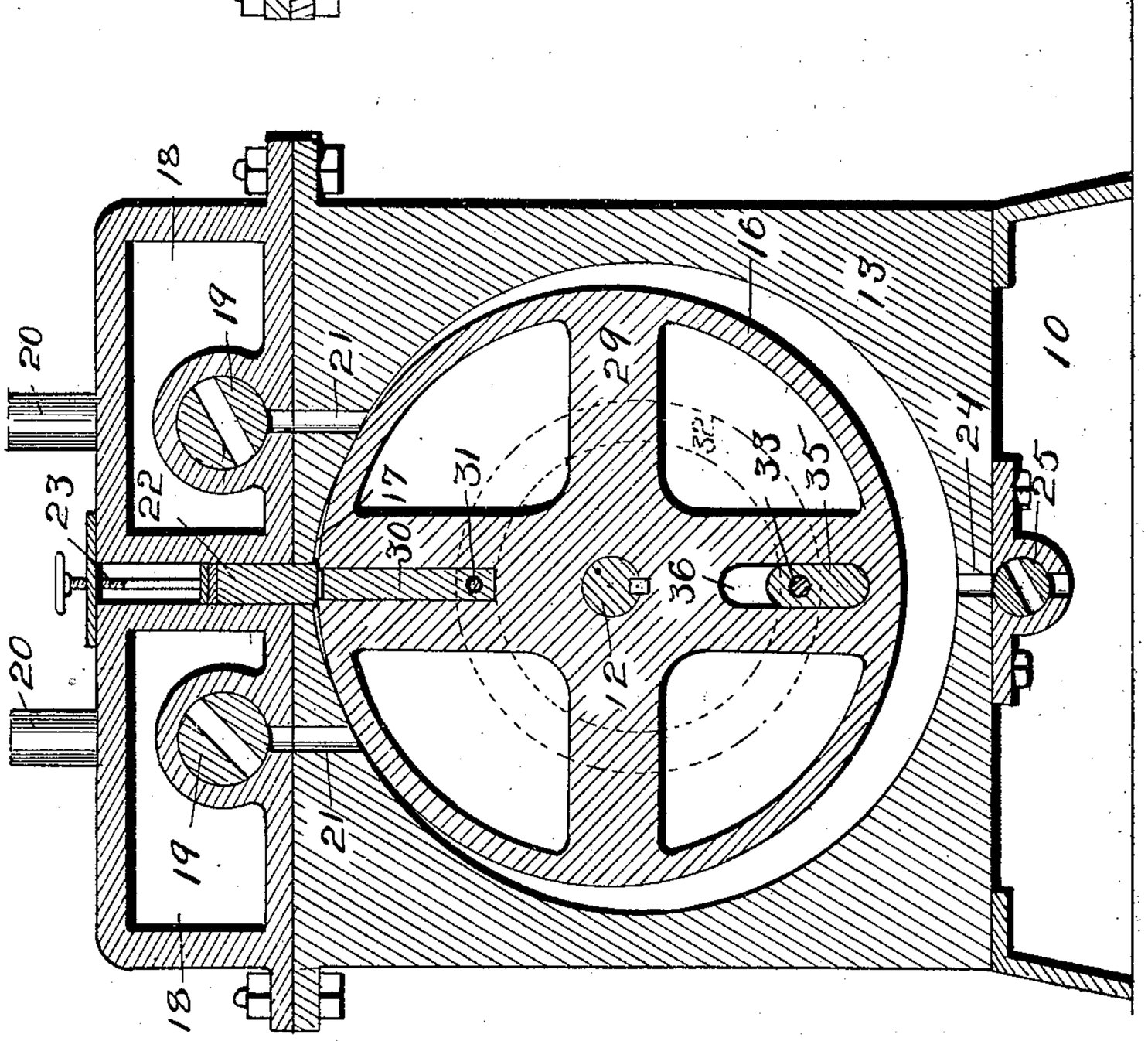


Fig. 2.



Witnesses
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ROTARY ENGINE.

No. 828,260. Specification of Letters Patent. Patented Aug. 7, 1906.

Application filed January 20, 1905. Serial No. 241,976.

To all whom it may concern:

Be it known that I, ORIN WILLIAMS, a citizen of the United States, residing at Des Moines, in the county of Polk and State of Iowa, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification.

The objects of my invention are to provide a rotary engine of simple, durable, and inexpensive construction susceptible of being rotated at a relatively high speed and also susceptible of maintaining steam-tight joints between the piston and cylinder and between the blade and the rotary hub, and, further, to provide means for moving the piston in and out of the rotary hub without shocks or jars to it that might tend to produce excessive wear, and, further, to counterbalance the centrifugal action incident to the rotation of the sliding piston in the rotary hub at high speed.

My invention consists in certain details in the construction, arrangement, and combination of the various parts of the device whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which—

Figure 1 shows a vertical longitudinal central sectional view of an engine embodying my improvements. Fig. 2 shows a vertical transverse sectional view of same. Fig. 3 shows a similar view with the piston in a different position and with the rotary hub omitted, its outline being indicated by dotted lines, the piston and its counterbalancing-weight being shown in section. Fig. 4 shows an enlarged detail view illustrating the relative positions of the pressure-blade, rotary hub, piston, and cylinder when the piston is adjacent to the pressure-blade.

Referring to the accompanying drawings, I have used the reference-numeral 10 to indicate the engine-bed, on which are the standards 11, supporting the rotatable shaft 12 of the engine.

The cylinder-heads of the engine are similar, and each comprises a body portion 13, formed with an opening above its center to receive the shaft 12, which opening is surrounded by a packing-box 14, provided with a follower 15. On the interior of the cylinder-head is an annular groove forming a perfect circle centered below the shaft 12, said circle being concentric with the cylinder-head.

The cylinder proper is indicated by the numeral 16 and is formed on a true circle concentric with the cylinder-heads, except at its top, and at this point the cylinder is provided with a segmental recess extending above a true circle concentric with the cylinder. This segmental recess at the top of the cylinder is indicated by the numeral 17. On top of the cylinder are the steam-chests 18, provided with valves 19 and steam-inlet pipes 20. Communicating with each valve-chamber is a steam-inlet 21, which also communicates with the interior of a cylinder at the point spaced apart from the segmental recess 17. Between the steam-chests 18 is a pressure-blade 22, normally projected downwardly a slight distance into the segmental recess 17 and adjustably supported in position by means of the screw-rods 23. Communicating with the bottom of the cylinder is an exhaust-port 24, controlled by a valve 25. This valve 25 is operated in unison with the shaft 12 by means of a crank-arm 26 on the valve-stem connected by an eccentric-strap 27 with the eccentric 28 on the shaft 12.

The rotary hub (indicated by the numeral 29) is keyed to the shaft 12, and its periphery is in the form of a true circle which projects upwardly a slight distance into the segmental recess 17 of the cylinder. The said rotary piston stands close to the cylinder at points on opposite sides of the segmental recess 17. The said rotary piston is formed with a radial piston-recess, in which the piston 30 is slidingly mounted. This piston 30 has a rod 31 projected through it, and said rod also projects through two annular rings 32, rotatably mounted in the annular recesses of the cylinder-heads. These rings 32 are concentric with the center of the cylinder and eccentric relative to the center of the shaft 12. Hence as the hub 29 rotates within the cylinder the piston 30 will be moved radially, and said parts are so arranged and proportioned that the outer end of the piston will engage the interior of the cylinder throughout the entire path of travel of the piston, except at the segmental recess 17. I have provided for counterbalancing the piston 30 against centrifugal action when rotated at high speed as follows: The numeral 33 indicates a rod hav-

ing its ends projected into slots 34 in the rings 32. Mounted upon the rod 33 is a counterbalancing-weight 35, slidingly supported in a radial slot 36 in the hub 29. In this way the rings 32 are made to serve the double function of guiding the piston in its radial movement and also of forming connecting-links between the piston and the counterbalancing-weight, and since the counterbalancing-weight is on the opposite side of the cylinder from the piston the action of centrifugal force upon one will be counterbalanced by the other. Hence it is possible to adjust the piston so that it will engage the interior of the cylinder with just sufficient pressure to form a steam-tight joint and yet not bear upon the cylinder with such force as to cause undue friction and wear.

In practical use and assuming the hub 29 is in the position shown in Fig. 3 the piston 30 obviously forms a steam-tight connection with the interior of the cylinder, so that steam contained between the piston and the pressure-blade may expand and move the piston. The hub is rotated in a true circle, and the rings 32 are also rotated in a true circle; but the centers of these circles are not in line. Hence the hub and rings may rotate at a high rate of speed without shock or jar, and at the same time the piston will be moved in and out of the hub, as required to maintain a steam-tight connection with the interior of the cylinder. By providing the segmental recess at the top of the cylinder I accomplish a number of desirable results. In the first place the periphery of the hub projects a slight distance above a line drawn on a true circle around the interior of the cylinder. Hence the hub may be said to project upwardly a slight distance into the segmental recess 17. The advantage of this is that the piston travels with its outer end in line with the true circle of the interior of the cylinder at all points throughout its movement. Hence when the piston is in the position shown in Fig. 2 it is slightly below the periphery of the hub, and there is no danger of its striking upon the pressure-blade. However, before the piston reaches the induction-port it will be moved outwardly to engage the interior of the cylinder. On account of the segmental recess 17 the pressure-blade may project downwardly into the cylinder, or rather the segmental recess 17 of the cylinder, and it will engage the periphery of the hub at all times. If through excessive wear on the bearings of the shaft 12 the hub should move downwardly in the cylinder a slight distance, as would be the case when in use, the value of the engine is not impaired, and perfect steam-tight joints may be maintained between the piston and cylinder and between the pressure-blade and the hub by simply moving the pressure-blade down-wardly, so that it will keep in contact with the periphery of the hub. There is no danger of the pressure-blade striking upon the piston, because at the point where the piston passes the pressure-blade it is withdrawn into the hub. Hence it is not at all essential that the hub engage the cylinder near its upper end, because by the construction shown the piston and the pressure-blade themselves form the means for producing steam-tight contacts with the cylinder and hub, and as long as these are prevented from engaging and striking upon each other they may be adjusted to take up any wear upon the working parts which would tend to separate the upper portion of the hub from the cylinder.

Any of the valve-operating devices may be applied to operate the valves 19; but this forms no part of my present invention and for that reason is not illustrated or described. It is common in engines of this class to have two ports which may be alternately used as inlet and exhaust ports when the engine is reversed. In the present engine it is my object to use one of the ports 21 as an inlet, while the other serves as an exhaust, and when the engine is reversed the function of these ports is changed. In this way the exhaust-steam ahead of the blade 31 after passing the port 24 escapes through the port 21 toward which the blade is traveling.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States therefor, is—

1. In a rotary engine, the combination of a cylinder, a recess in the cylinder-wall, a rotatable hub within the cylinder arranged eccentrically and having a portion of its periphery projected beyond the inner wall of the cylinder and into said recess, a piston slidingly mounted in the hub, and means for guiding the piston in a true circle concentric with the interior of the cylinder.

2. In a rotary engine, the combination of a cylinder, a segmental recess formed in the cylinder-wall outside of the circle of the interior of the cylinder, a rotary hub mounted eccentrically within the cylinder and having a portion of its periphery projected beyond the cylinder-line into the segmental recess, a piston slidingly mounted in the hub, and means for guiding the piston to follow the true circle of the interior of the cylinder throughout the rotation of the hub.

3. In a rotary engine, the combination of a cylinder, a segmental recess formed in the cylinder-wall outside of the circle of the interior of the cylinder, a rotary hub mounted eccentrically within the cylinder and having a portion of its periphery projected beyond the cylinder-line into the segmental recess, a piston slidingly mounted in the hub, means for guiding the piston to follow the true circle of the interior of the cylinder throughout the

rotation of the hub, and a pressure-blade projecting into the segmental recess to engage the periphery of the hub.

4. In a rotary engine, the combination of a cylinder, a segmental recess formed in the cylinder-wall outside of the circle of the interior of the cylinder, a rotary hub mounted eccentrically within the cylinder and having a portion of its periphery projected beyond the cylinder-line into the segmental recess, a piston slidingly mounted in the hub, and means for guiding the piston to follow the true circle of the interior of the cylinder throughout the rotation of the hub, said cylinder formed with an induction-port therein adjacent to the segmental recess.

5. The combination of a cylinder formed with a recess extending outside of the inner wall of the cylinder, the cylinder-head formed with a concentric annular groove, a rotary hub mounted within the cylinder with a portion of its periphery projected into the recess, a piston slidingly mounted in the hub, and a guiding means connected with the piston and inserted in the annular groove for guiding the piston in a true circle around the interior of the cylinder.

6. The combination of a cylinder formed with annular concentric grooves in the cylinder-heads, rings rotatably mounted in said grooves, an eccentrically-mounted rotatable hub within the cylinder, a piston slidingly mounted in the hub, means for connecting the piston and the rings, a counterbalancing-weight slidingly mounted in the hub diametrically opposite from the piston, and means for connecting the counterbalancing-weight with the rings.

7. The combination of a cylinder formed with annular concentric grooves in the cylinder-heads, rings rotatably mounted in said grooves, an eccentrically-mounted rotatable hub within the cylinder, a piston slidingly mounted in the hub, means for connecting the piston and the rings, a counterbalancing-weight slidingly mounted in the hub diametrically opposite from the piston, means for connecting the counterbalancing-weight with the rings, and a pressure-blade mounted in the cylinder to engage the periphery of the hub.

8. The combination of a cylinder formed with concentric annular grooves in the cylinder-heads and also formed with a segmental recess in the cylinder-wall, said recess extending outside of the cylinder-line, rings rotatably mounted in the annular grooves, a rotary hub mounted eccentrically within the cylinder with a portion of its periphery projecting outside of the cylinder-line and into the said recess, a piston slidingly mounted in the hub, a shaft connected with the piston and rotatably mounted in the rings, a counterbalancing-weight slidingly mounted in the hub, and a shaft connecting the counterbalancing-weight with the rings.

9. The combination of a cylinder formed with eccentric annular grooves in the cylinder-heads and also formed with a segmental recess in the cylinder-wall, said recess extending outside of the cylinder-line, rings rotatably mounted in the annular grooves, a rotary hub mounted eccentrically within the cylinder with a portion of its periphery projecting outside of the cylinder-line and into the said recess, a piston slidingly mounted in the hub, a shaft connected with the piston and rotatably mounted in the rings, a counterbalancing-weight slidingly mounted in the hub, and a shaft connected with the counterbalancing-weight and slidingly connected with the rings.

10. An improved rotary engine, comprising a cylinder, its inner wall forming a true circle, a segmental recess in the inner wall outside of the true circle, a pressure-blade projecting into the segmental recess with its end substantially in line with the periphery of the hub, said cylinder also formed with an induction-port adjacent to the segmental recess and with an exhaust-port and the cylinder-heads formed with annular concentric grooves, a shaft eccentrically mounted in the cylinder-heads, a rotary hub on the shaft with a part of its periphery projecting into the segmental recess beyond the true circle of a cylinder, a piston slidingly mounted in the hub, a weight slidingly mounted in the hub diametrically opposite from the piston, annular rings rotatably mounted in the grooves in the cylinder-heads, said rings formed with slots, a shaft connected with the piston and rotatably inserted in the rings, and a shaft connected with the weight and inserted in the said slots in the rings.

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Witnesses:
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