

No. 625,689.

J. S. KINGSLAND.
ROTARY ENGINE.

Patented May 23, 1899.

(Application filed Aug. 15, 1898.)

(No Model.)

4 Sheets—Sheet I.

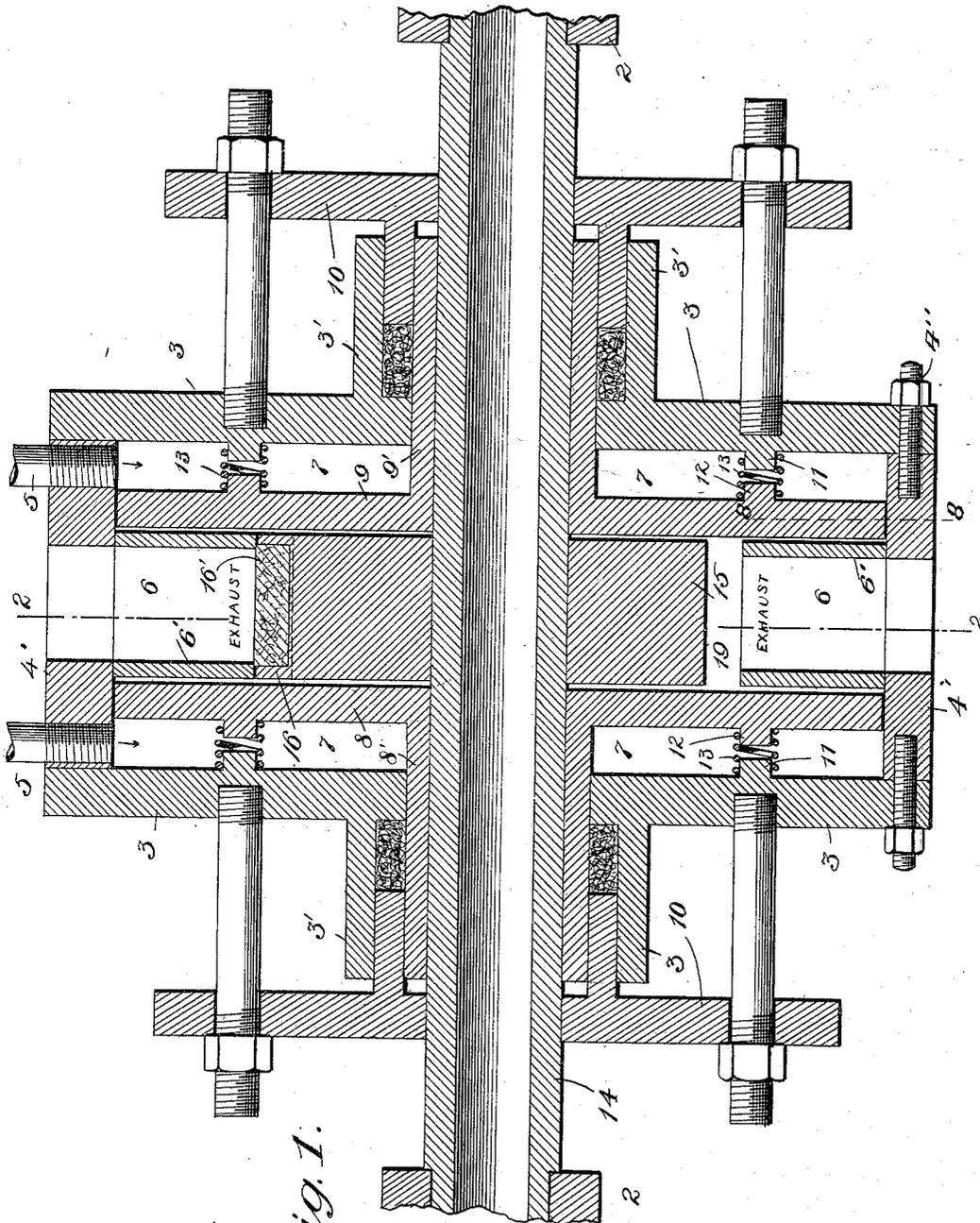


Fig. 1.

Witnesses

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Fig. 2.

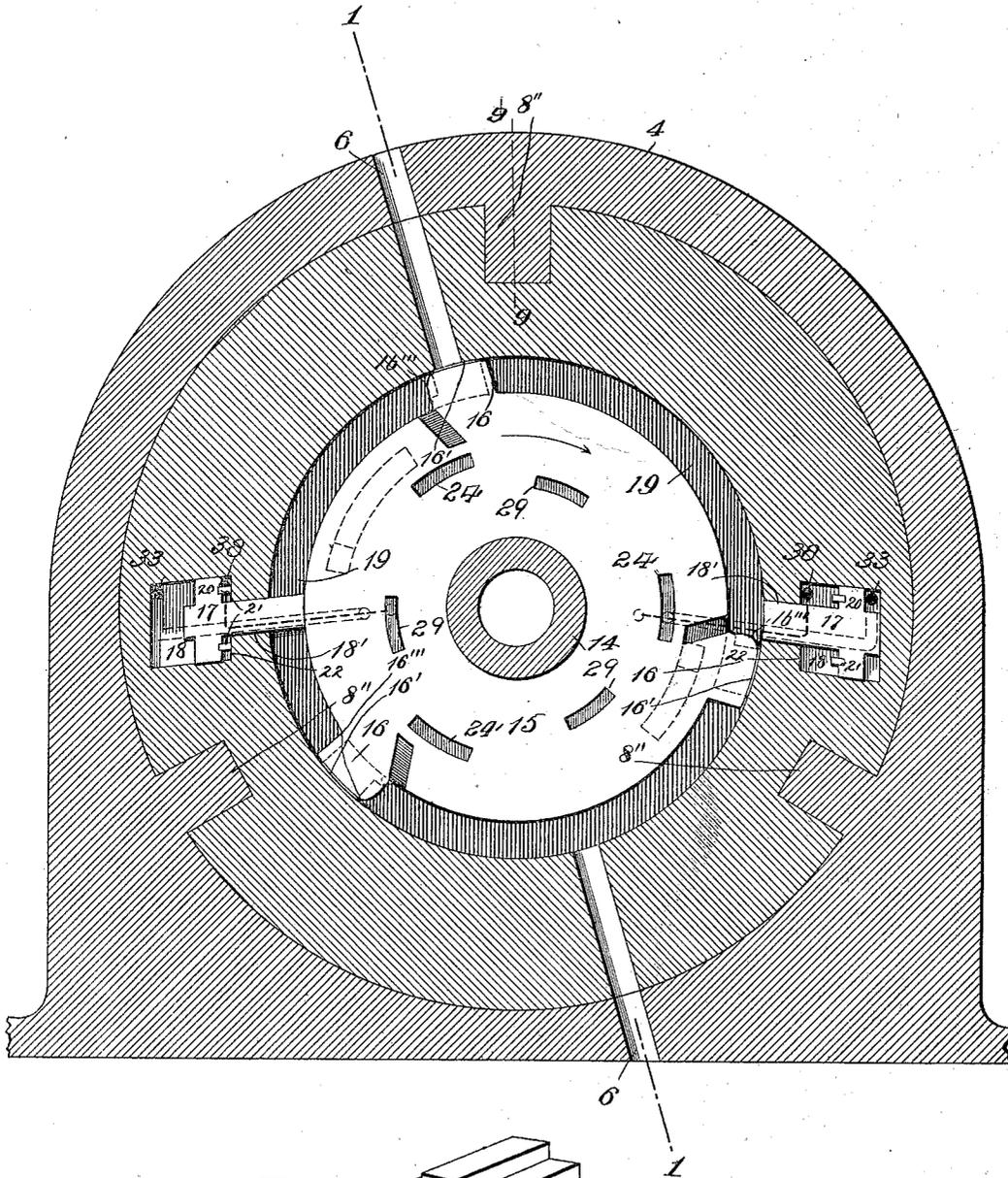
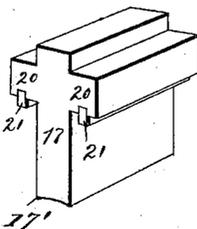


Fig. 3.



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Fig. 4.

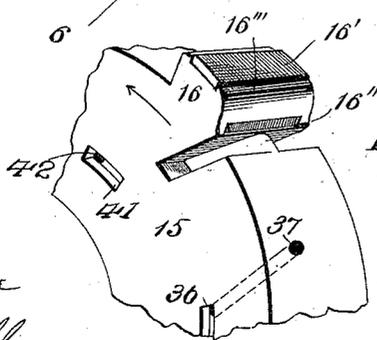
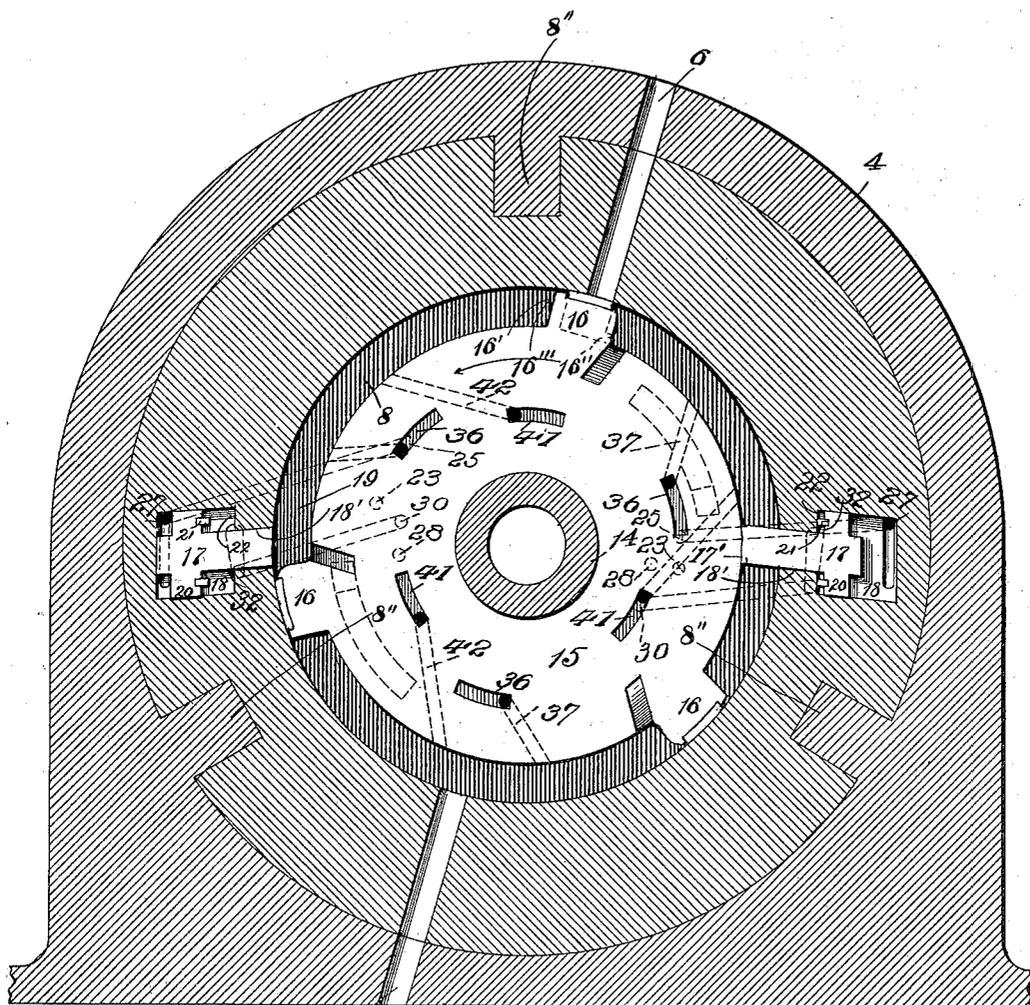


Fig. 5.

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Fig. 6.

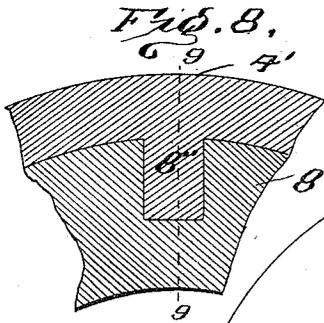
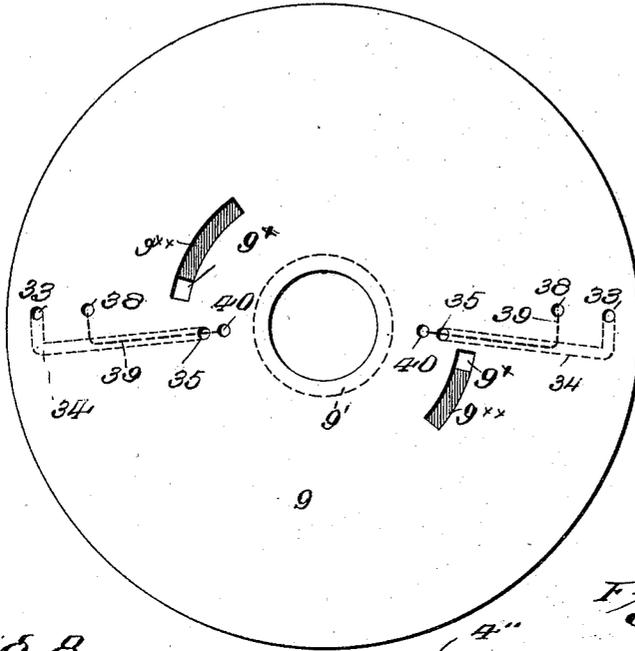
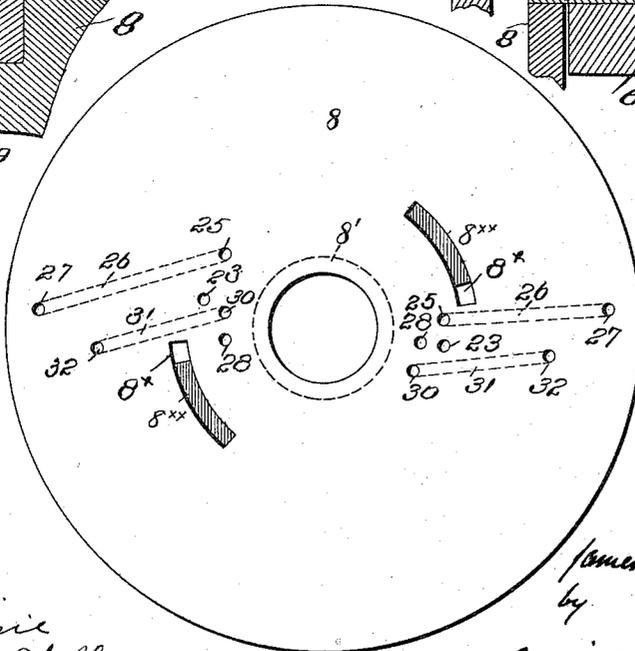
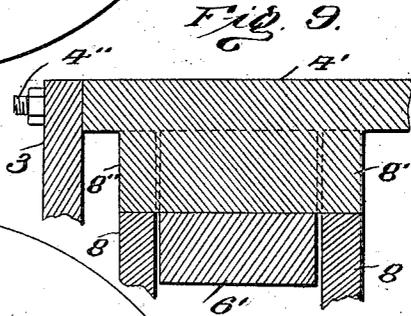


Fig. 7.



Witnesses

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UNITED STATES PATENT OFFICE.

JAMES S. KINGSLAND, OF BUFFALO, NEW YORK.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 625,689, dated May 23, 1899.

Application filed August 15, 1898. Serial No. 688,658. (No model.)

To all whom it may concern:

Be it known that I, JAMES S. KINGSLAND, a resident of Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Rotary Engines; and I do hereby 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 pertains to make and use the same.

This invention relates to rotary engines, and has for its object to increase their efficiency.

It consists in the construction hereinafter described and pointed out.

In the accompanying drawings, Figure 1 is a section of the engine on line 1 1 of Fig. 2. Fig. 2 is a section on line 2 2 of Fig. 1, showing a piston in full lines. Fig. 3 is a perspective of a gate. Fig. 4 is a section on line 2 2 of Fig. 1, looking oppositely to the rim in Fig. 2. Fig. 5 is a perspective of a piston-head and contiguous parts of a piston. Fig. 6 is an elevation of a port-plate, showing admission-ports to actuate the gates and admission-ports to drive the engine. Fig. 7 is an elevation of a second port-plate, showing ports to exhaust from the gate-recesses and also engine admission-ports. Fig. 8 is a partial section on line 8 8 of Fig. 1. Fig. 9 is a similar section on lines 9 9 of Figs. 2 and 8, respectively.

Numeral 2 denotes fixed bearings for the main shaft 14, which is preferably tubular.

3 3 indicate cylinder-heads, and 4 the body of the cylinder, having admission-ports 5 and exhaust-ports 6. Annular steam-chambers (denoted by 7) are included between non-rotatable annular valve-port plates 8 and 9 and the cylinder-heads.

8' indicates plate-holding lugs fixed to the cylinder and engaging suitable recesses in the plates. The plates are provided with flanges 8' and 9' and the heads with flanges 3', between which respective flanges is inclosed suitable packing. These plates are movable endwise the shaft and bear on the cylinder and are held in contact therewith by steam-pressure and by springs. The plates are removable and renewable in case other plates having ports of different capacities are desired or in case the plates become worn by the piston or shaft. In practice the piston will be normally in contact with the plates, but will

be defended against excessive pressure by their bearing on the cylinder. In case, however, the pistons, on account of end thrust or on account of mechanical defects, strike the plates the latter can yield and the friction which would otherwise result is largely avoided and a plate, if worn, can be renewed.

As shown, the cylinder comprises a ring 4', held in fixed relation to the main part of the cylinder by any suitable means, such as bolts 4''. As represented, there is fixed to ring 4' an exhaust-port ring 6'. The rotation of this ring 6' is prevented by lugs 8'' engaging recesses in the ring. The port-plates are held in similar manner by the same lugs, which extend lengthwise the cylinder sufficiently to enter similar recesses in the port-plates with the effect stated. This ring contains the gate-chambers and the main part of the exhaust-ports. It is not essential, however, that a separable cylinder-ring 4' be employed; but it is important that the port-plates be kept from sharing the rotary movement of the piston and shaft. By this construction the plates bear against the cylinder, being movable lengthwise the shaft and pressed toward each other by steam and by the springs. The plates will be held close to the piston-faces. They bear on the cylinder, suitably hollowed and shaped for the purpose, and make a steam-tight joint therewith, the cylinder-wall preventing the plates from being crowded against the piston to produce excessive friction. As the plates are separable, the ports therein can be more conveniently and economically formed than otherwise. It also provides for alteration or substitution of plates to permit variation of the length of the conduits 8^{xx} and 9^{xx}, (hereinafter described,) whereby the steam cut-off may be varied.

10 denotes followers having suitable bolts for setting them up in the stuffing-box, comprising the above-mentioned flanges.

11 and 12 are studs fixed to the port-plates and cylinder-heads, respectively, to hold springs 13. Said springs act to press the port-plates against the cylinder and piston. Their office is necessary at times when there is no steam-pressure in chamber 7.

15 denotes a piston integral with or fixed to the shaft 14, and 16 denotes piston-heads. These preferably have packings 16', pressed

out by steam entering ports 16". Their rear faces 16" are curved or inclined to the piston radius, as shown, to cooperate with movable gates, to be next described, to modify the impact of said curved rear faces of the heads, permitting the gates to slide down behind them without jar.

The gates are denoted by 17. These are preferably made of aluminium for lightness and alloyed with other metal to impart wearing qualities. They are held movable in chambers 18, cored out of the cylinder. Said chambers have each their upper and lower walls inclined with respect to a horizontal diametric line downwardly toward their outer ends, as represented, to insure that the gates when not contracted by steam-pressure shall not fall into the path of the piston-heads. These gates are moved back and forth across the annular chamber 19, which constitutes the path of the piston-heads, in such manner that the heads freely pass the gates, the latter being suitably retracted, and thereupon after such passage are again pushed across the passage to inclose each between itself and the proximate advancing piston-head a steam-expansion chamber. In its latter movement it slides down the curved or inclined face 16", and its momentum is thereby gradually checked. The inner face 17' of each gate has a curvature similar to that of the piston.

Each gate recess or chamber 18 has a neck 18', which is filled by the gate and constitutes a way therefor. Behind the neck the recess is enlarged, as shown.

20 denotes partitions carried by the gate and separating the main part of the recess 18 into two steam-chambers.

21 indicates projections adapted to strike the shoulders 22 of the recess-wall and stop the gate. These projecting strips or stops 21 may be made of elastic material, if desired, to avoid concussion.

The gates are moved by steam through the medium of suitable ports receiving steam from the chamber 7 and exhausting into the chamber 19, the latter being suitably divided by gates and piston-heads and the divisions made to communicate with appropriate ports or conduits, as will be explained. Ports in plate 8 take steam from a chamber 7 to move the gates to and fro, and ports in plate 9 exhaust the steam into exhaust-divisions of piston-head way 19. To move the gates outwardly, steam enters port 28 in plate 8, conduit 29 in the piston, and through port 30, conduit 31, and port 32 in said plate 8 to the inner part of recesses 18. These ports, including port 23, are so situated and connected that steam is admitted to close the gate at the instant the piston-head passes it. To move the gate inwardly, steam is admitted from chamber 7 through port 23 in plate 8, conduit 24 in the piston, port 25, conduit 26, and port 27 in plate 8 into the outer part of recess 18. To exhaust the outer part of recess 18, steam passes out of port 33 through conduit 34 and

port 35 in plate 9, through conduit 36 and port 37 in the piston, into the piston-head way 19. To exhaust the inner part of recesses 18, steam passes through port 38, conduit 39, and port 40 in plate 9 into conduit 41 and port 42 in the piston into the piston-head way 19.

The opening and closing of the admission and exhaust ports for operating gates are so situated and connected as to be seasonably opened and closed by the rotation of the piston-head, so that steam is taken from the chambers 7 and discharged with the main exhaust as the operation demands.

Preferably the exhaust-port on one side of a gate-partitions will not be opened by the piston as soon as the admission-port on the opposite side of said partitions, so that some compression is produced and pounding of the gate thus prevented. These gateway admission-ports may be made comparatively small to limit the amount of steam admission.

The main admission-plate ports for driving the engine are denoted by 8^x and 9^x, respectively. There are two in each port-plate, and each communicates with a port immediately behind a piston-head as soon as said head passes it and is closed as the piston covers the ports 8^x and 9^x. In the instance illustrated there are six admissions to each rotation. Each admission is brief, and its extent is determined by the size of the ports, and particularly by the length of their circumferential parts 8^{xx} or 9^{xx}, which may be varied to provide for more or less expansion. In the form represented and to insure the six admissions in one rotation there are provided three piston-heads and two gates and two main exhaust-ports.

The main oppositely-situated exhaust-ports (denoted by 6) are two in number and cored out of the cylinder-body.

It may be noted that the piston-heads describe circles and meet no obstructions. There is no dead-center in the engine. The gates when moving are free of steam-pressure from the piston-head way, the gate-recesses being at such times adjacent a division or part of said way which is exhausting. The gates are cushioned by steam. They cannot fall into the path of the piston-heads and are thoroughly protected against pounding. The main steam-admission is at both sides of the piston. There is no wear on the packing. There is no friction between the port-plate and shaft, and steam-tight joints are provided between the piston and port-plates.

Having described my invention, I claim—

1. In a rotary engine, a shaft, a cylinder, a port-plate movable lengthwise the shaft and bearing on the cylinder and together with the cylinder-head inclosing a live-steam chamber, a piston having a head and admission-port adjacent the head, said latter port being adapted to communicate with said chamber through a port in the plate, and the latter port adapted to be opened and closed by the piston, substantially as described.

2. In a rotary engine, a shaft, a cylinder, a port-plate movable lengthwise the shaft and bearing on the cylinder and together with the cylinder-head inclosing a live-steam chamber, a piston having a head, an admission-port adjacent the head, said latter port being adapted to communicate with a port in the plate and the latter port adapted to be opened and closed by the piston, a gate for closing the path of said head, and ports in the port-plate opened and closed by the piston to admit steam to move the gate, said plate being situated contiguous the piston and adjacent the gate-chambers, substantially as described.

3. In a rotary engine, the cylinder, the piston having a piston-head, two port-plates having ports for admitting and exhausting steam in the piston-head way, and means for holding the port-plates against the cylinder contiguous the piston, and adjacent the gate-chambers, substantially as described.

4. In a rotary steam-engine, a cylinder, a piston, a separable port-plate bearing on the cylinder and comprising between it and the cylinder-head a steam-chamber, said plate having a live-steam port leading to the piston-head way and adapted to be opened and closed by the piston.

5. In a rotary steam-engine, a cylinder, a piston, two port-plates bearing oppositely on the cylinder and each comprising between it and a cylinder-head a steam-chamber, and each having a live-steam port leading to the piston-head way behind a piston-head on opposite sides thereof and adapted to be opened and closed by the piston.

6. In a rotary steam-engine, a cylinder, a piston having a head, a gate, steam-ports whereby the gate is reciprocated, and two port-plates bearing oppositely on the cylinder and each comprising between it and a cylinder-head a steam-chamber, one of said plates having a port whereby steam may be admitted from the piston-head way to actuate the gate and the other plate having a port whereby said steam may be exhausted into the piston-head way.

7. In a rotary engine, the cylinder, the piston having heads, admission and exhaust ports to drive the piston, the gates, the gate-receiving recesses, said gates carrying wings to divide the recesses into admission and exhaust chambers, and admission and exhaust ports for said chambers, substantially as described.

8. In a rotary engine, the cylinder, the piston having heads, the gates, admission and exhaust ports for the piston-head way, like ports for the gate-holding recesses, and means to admit steam to move the gates, said means being operative only when the gates are adjacent the exhaust portions of said way, both the admission and exhaust ports of the gate-recesses communicating with the piston-head way, substantially as described.

9. In a rotary engine, the shaft, the shaft-bearings, the piston, the cylinder having heads provided each with an exterior flange adjacent the shaft, the port-plates contiguous the piston having each an exterior flange contiguous the shaft, and packing between the cylinder-head and port-plate flanges, substantially as described.

10. In a rotary steam-engine, the shaft, the cylinder, the piston, a removable steam-port plate contiguous an end of the piston and bearing on an interior face of the cylinder, and a live-steam chamber between the cylinder-head and piston, all substantially as set forth, whereby the plate is pressed inwardly in a yielding manner against the cylinder and injurious pressure on the piston is prevented.

11. In a rotary steam-engine, the shaft, the cylinder, the piston, a removable steam-port plate contiguous an end of the piston and bearing on an interior face of the cylinder, lugs fixed to the cylinder and engaging the port-plate to prevent its rotation, and a live-steam chamber between the cylinder-head and piston, all substantially as set forth, whereby the plate is pressed inwardly in a yielding manner against the cylinder and injurious pressure on the piston is prevented, and rotation of the plate obviated.

12. In a rotary engine, a cylinder, a piston port-plates having admission-ports, the main exhaust-ports, gates to successively open and close the piston-head path and means for actuating the gates comprising admission and exhaust ports situated in the port-plates said latter ports exhausting into the piston-head way.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JAMES S. KINGSLAND.

Witnesses:

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J. C. DAVIS.