

No. 739,288.

PATENTED SEPT. 22, 1903.

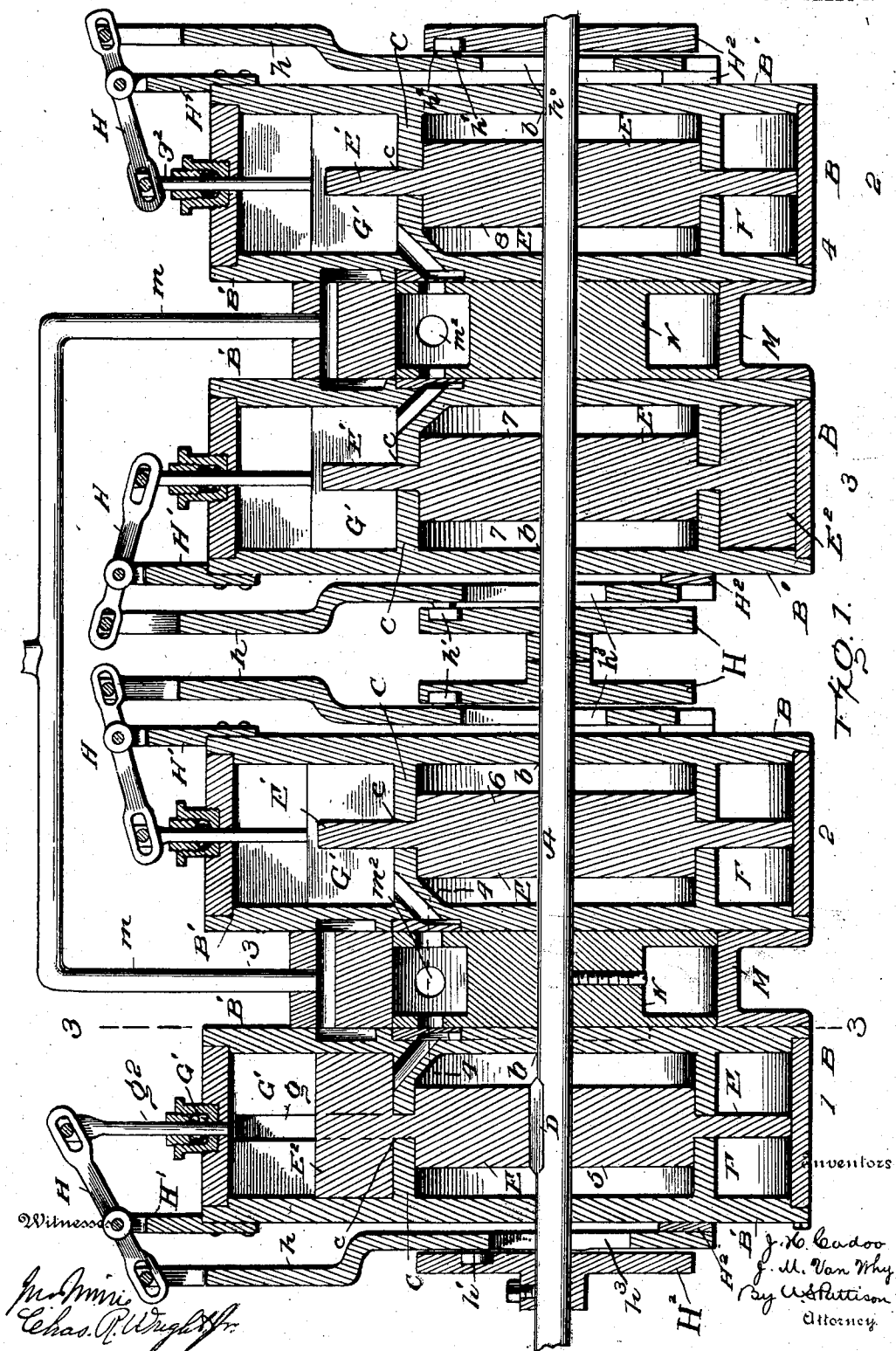
J. H. CADOO & J. M. VAN WHY.

ROTARY ENGINE.

APPLICATION FILED DEC. 9, 1902.

NO MODEL.

3 SHEETS—SHEET 1.



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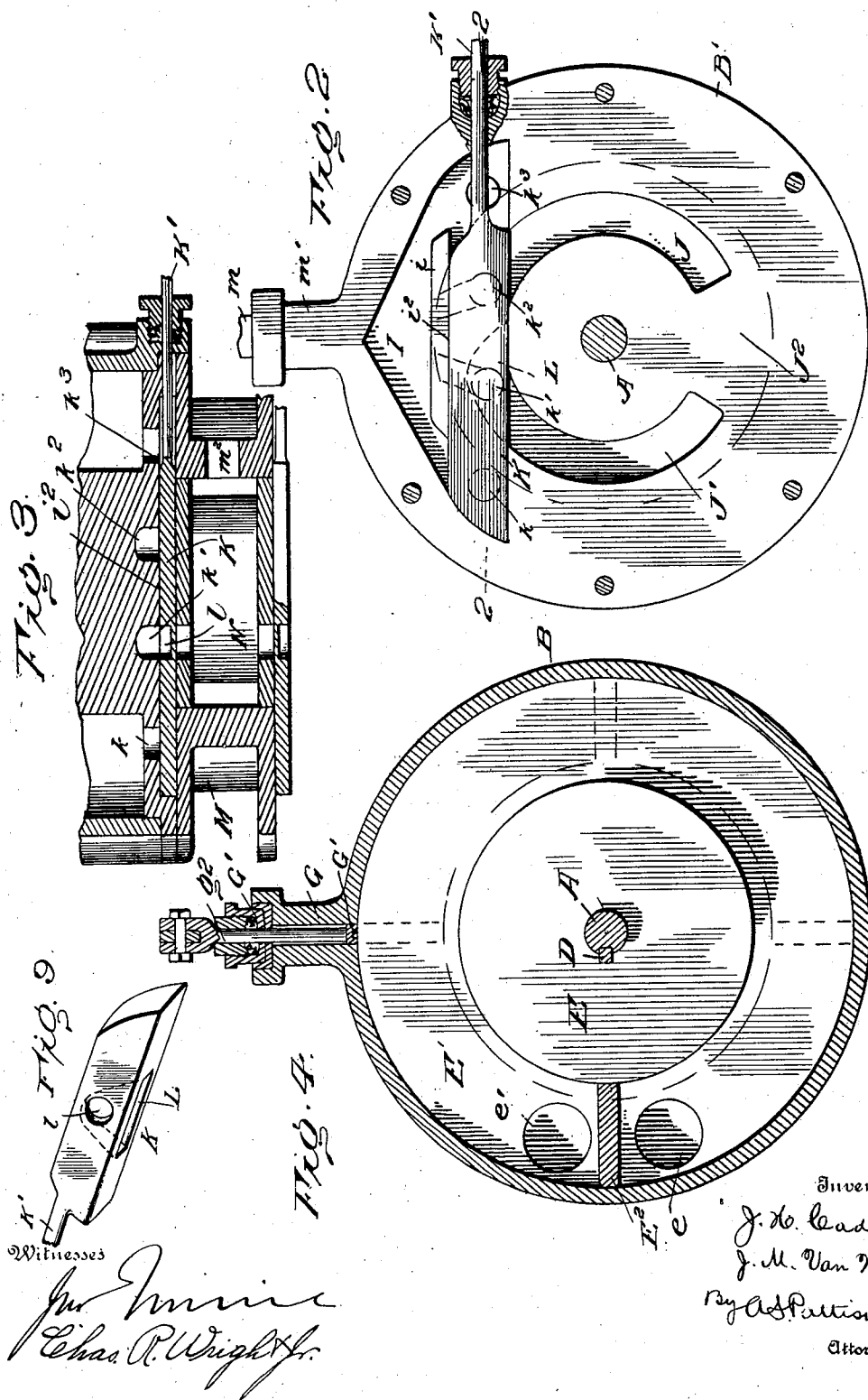
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3 SHEETS—SHEET 2.



Witnesses

Chas. R. Wright

Inventors

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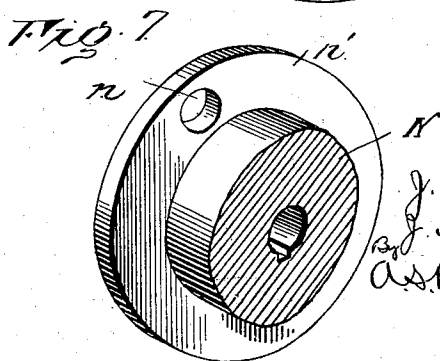
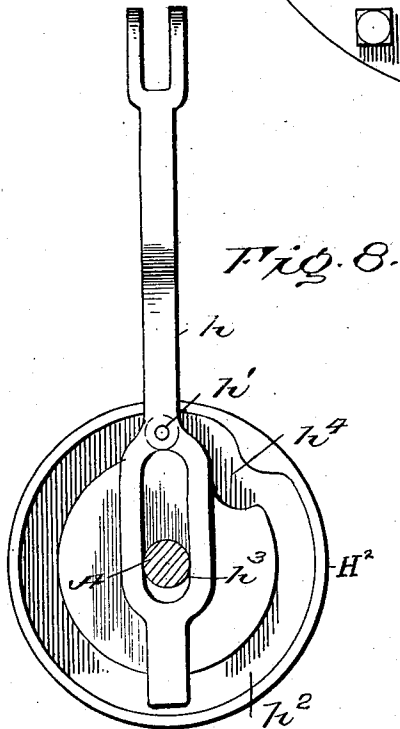
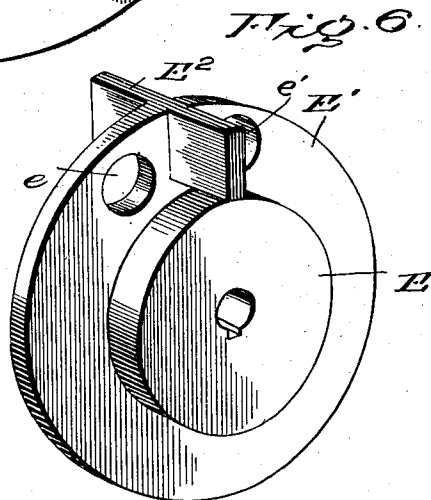
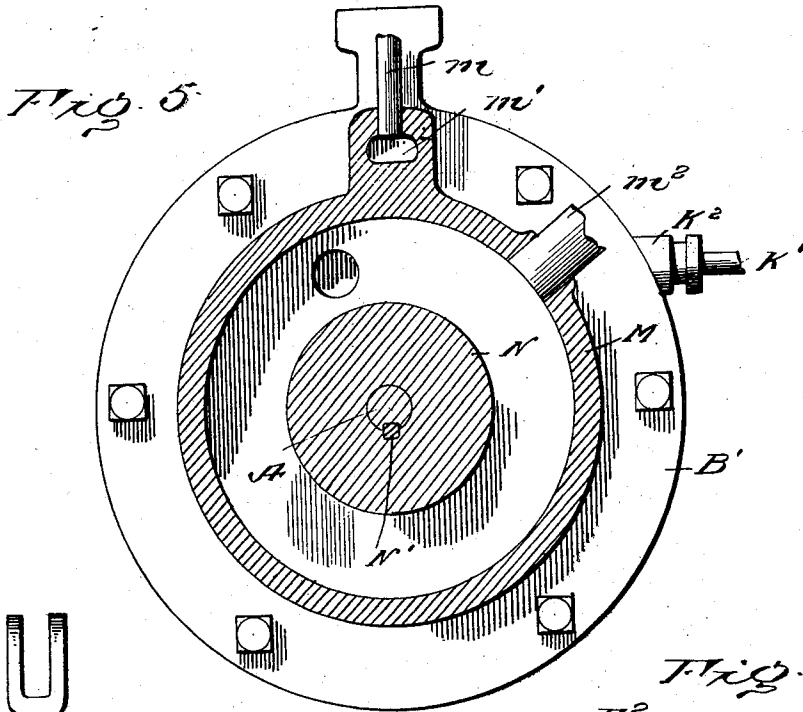
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3 SHEETS—SHEET 3.



Witnesses

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UNITED STATES PATENT OFFICE.

JAMES H. CADOO AND JOSEPH M. VAN WHY, OF ELMIRA, NEW YORK.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 739,288, dated September 22, 1903.

Application filed December 9, 1902. Serial No. 134,597. (No model.)

To all whom it may concern:

Be it known that we, JAMES H. CADOO and JOSEPH M. VAN WHY, citizens of the United States, residing at Elmira, in the county of Chemung and State of New York, have invented new and useful Improvements in Rotary Engines, of which the following is a specification.

Our invention relates to improvements in rotary engines, and more particularly pertains to that class in which a series of cylinders arranged side by side and the pistons carried thereby are mounted on a common shaft.

The object of our invention is to provide a rotary engine in which the expansion of the steam is more effectively utilized than has heretofore been accomplished.

Another object of our invention is to arrange several cylinders having pistons mounted upon a common shaft and to so arrange them that a separate piston is being acted upon by the direct force of the steam during each quarter revolution of the shaft, and thus giving a continuous pressure indirectly to the shaft.

A further object of our invention is to provide a rotary engine in which all steam-pressure within the cylinder is taken off of the shaft upon which the pistons are mounted, and thus reducing the resistance of the steam on the shaft and increasing the power of the engine in comparison with the steam area.

A still further object of our invention is to provide a piston composed of a vertical disk and having blades carried thereby and a slide carried by the cylinder adapted to be drawn upward and down at the proper instant to allow said blades to pass and having a valve operated by the shaft whereby the steam-pressure is cut off during said raising and lowering of the slide.

In the accompanying drawings, Figure 1 is a vertical sectional view of a series of our engines arranged upon a shaft having the different arrangements of the automatic cut-offs and the piston-blades. Fig. 2 is an end view of one of the cylinders, showing the hand-operated valve for reversing the direction of the engine. Fig. 3 is a transverse horizontal sectional view taken on line 2 2, Fig. 2. Fig. 4 is an end view of one of the cylinders with one of the cylinder-heads removed. Fig. 5

is a vertical sectional view of the steam-chest taken on line 3 3, Fig. 1. Fig. 6 is a perspective view of one of the pistons removed. Fig. 7 is a perspective view of the automatic cut-off which is located within the steam-chest. Fig. 8 is an end view of the cam carried by the shaft and showing the operating-arm for raising and lowering the slide. Fig. 9 is a perspective view of the slide looking from the opposite side from that shown in Fig. 2.

Referring now to the drawings, A represents an elongated drive-shaft, which is adapted to be connected to the device to be driven in any desired manner, and loosely surrounding said shaft are four cylinders 1, 2, 3, and 4, although any desired number of cylinders may be used, as this forms no part of our invention. The said cylinders are preferably made of main or cylindrical portions B, which are supported by the cylinder-heads B', which have centrally-located openings b, through which the shaft A is adapted to pass and freely rotate therein. The said heads are provided with inwardly-extending lugs or annular rings C, which are of a length to leave a central circumferential groove or recess c therebetween, the purpose of which we will now proceed to explain. The shaft A carries the pistons 5, 6, 7, and 8, which are securely locked thereon by keys D, and said pistons are arranged respectively within the cylinders 1, 2, 3, and 4 and are adapted to freely rotate therein with the shaft A. The said pistons are composed of an enlarged central portion E, which is adapted to bear against the rings C, and are provided with the outwardly-extending vertically-disposed circumferential member E', which passes within the opening c between the inner ends of the rings C, and thus it will be seen that the inward steam-pressure is directly on the rings C of the cylinder and not on the flange of the piston or shaft proper, and it will be seen that said rings C form annular steam-chests F near the periphery of the cylinder. Carried by the member E' are the outwardly-extending wings or blades E², which are of a size to snugly fit within the chest F and close the same, and for the purpose of admitting the steam on both sides of the member E', as it is seen that the steam is admitted to one side of

the cylinder, we provide openings e and e' , and thus it will be readily seen that the pressure on the said member is equalized and will not hinder or decrease the power of the engine.

5 It will also be seen that the openings e and e' are arranged one on each side of the blades or wings E^2 for the purpose of allowing the steam to pass on either side thereof for the purpose of reversing the engine, as will be hereinafter more fully described. The upper
10 end of each of said cylinders is provided with an upwardly-extending chamber G in communication therewith, and within said chamber is a slide G' , which is provided with a
15 vertical slot g , which is adapted to straddle the member E' of the piston and allow it to freely travel therein. The upper end of said slide is provided with an upwardly-projecting rod g^2 , which passes through a packing G' at
20 the upper end of the chamber G and by means of which the slide is raised and lowered at the desired time to allow the blades or wings E^2 to pass, and said slide G' acts as a resisting point for the steam. Connected to
25 the upper end of said rod g^2 is a lever H , which is intermediately pivoted to the arm H' , carried by the upper end of the cylinder, and connected to the opposite end of the lever H is a rod h , which has its lower end passing
30 through a guide H^2 , carried by the cylinder, and above said guide it is provided with a slot h^3 , which is adapted to receive the shaft A , and above said slot is a laterally-extending stud carrying a roller h' , which is adapted
35 to travel in the cam-groove h^2 , carried by the cam h^3 , which is keyed on the shaft A . The said cam-groove h^2 is provided with a curved portion h^4 , which is adapted to raise and drop the slide G' instantaneously. The said cams
40 h^3 are rigidly connected to the shaft A and are arranged so that but one slide is being raised at a time and that is just before the wings or blades E^2 reach their respective slide. It is understood that there are four
45 pistons, and the wings or blades are arranged on the quarter—that is, during each quarter-revolution of the shaft one of said slides is raised and lowered, and steam is adjusted between it and the slide. By this arrangement
50 it is readily seen that there is always steam-pressure on the blades of one of the said pistons, and, in other words, there is a continuous direct steam-pressure on one of the pistons, so there is a continuous power given to
55 the shaft A .

As clearly shown in the drawings, the cylinders are arranged in pairs, and the cylinders of each pair are spaced apart, and the adjacent faces of each pair of cylinders are
60 provided at their upper ends with cut-away portions I , and extending downwardly around the shaft A are the two segmental grooves J and J' , which have their upper ends in communication with the cut-away portion I . The
65 said cut-away portion I is provided with a transverse strip i , which forms a slideway i^2 , and extending from said slideway inwardly

through the slides of the cylinder are the openings k , k' , k^2 , and k^3 , and extending across
70 said openings is a slide K , which is adapted in either position to cover the two steam-inlet openings k' and k^2 , leaving either of the outer openings k and k^3 in communication with the cut-away portion I , as clearly shown in Fig. 2. Connected with the slide L and extending
75 through a packing K^2 in the cylinder is the operating-arm K' , which is adapted to be operated by hand. The said slide K is provided with a recess L , extending from the under side upwardly therein, and the side thereof
80 adjacent the cylinder has an opening l , communicating with the said recess L , by means of which the steam passes from the segmental slots or recess J and J' to the cylinder, and between said slots is the segmental solid portion J^2 , the purpose of which will be hereinafter more fully described.

As before stated, the cylinders of each pair are spaced apart, and between said cylinders is a casing or steam-chest M , which is secured
90 therebetween to the sides B' of the cylinder. The upper end of said chest is provided with a transverse independent passage m' , which has its sides in communication with the cut-away portions I of the two cylinders forming
95 the pair, and connected to the upper end thereof is an exhaust-pipe m , which is adapted to convey the exhaust to any desired point, and in communication with the side of said chest M is a steam-supply pipe m^2 . Within
100 said steam-chest is a rotatable spool N , which is secured to the shaft A by means of the key N' and which is provided at its sides with the laterally-extending flanges n' , which extend outwardly and fit snugly against the inner
105 side of the steam-chest M and against the side of the cylinder and holding the slide-valve K in position. Each of said flanges n' is provided with an opening n , which are arranged in different parts thereof in respect to the opening carried by the opposite flange, and in the other rotary spool or cut-off openings are arranged at different parts in respect to the shaft, so that at each quarter-revolution
110 of the shaft one cylinder is taking steam, one expanding, one exhausting, and the fourth also exhausting, but more nearly in the position to take steam as the first commences to use the expansion of the steam. It will be seen that this is done by the rotary spool N ,
120 as just after the slide for the respective piston has moved upwardly and downwardly the opening n in the spool comes opposite to the segmental slot J' and the steam passes up through the recess L in the slide K , and as
125 the spool continues to rotate the opening M comes opposite the solid portion J^2 and the steam is cut off. The expansion of the steam now commences and continues until the blades E pass around beyond the opening k^3 ,
130 and the steam is then exhausted. The openings in the spools are so arranged that one opening in one of said spools comes opposite the segmental slot J on each quarter-revolu-

tion. To reverse the direction of the engine from that shown in Fig. 2, the slide K is drawn over, thus leaving the opening k to be used as the exhaust and closing the opening k^3 and bringing the recess L in the slide opposite the segmental slot J, thus allowing the steam to pass into the cylinder through the opening k^2 on the opposite side of the slide, and thus reversing the engine. When it is desired to stop the engine, the slide K is drawn over to the center, and in this position the recess L in the slide is between the two steam-supply pipes k' and k^2 , and the steam is entirely cut off from the cylinder.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. A rotary engine comprising a stationary cylinder, a rotary piston therein, the side of said cylinder having segmental steam-channels communicating with the cylinder, a rotary automatic valve adapted to close said channels, and a slide-valve controlling the communication between said cylinder and channels.

2. A rotary engine comprising a stationary cylinder, a rotatable piston therein, a shaft carrying said piston, the side of said cylinder having segmental channels communicating with the cylinder, a steam-chest surrounding said channels, a rotary valve within said steam-chest and having an opening in a line with said channels, and a slide-valve controlling the communication between the segmental channels and the cylinder.

3. A rotary engine comprising a rotatable shaft, a cylinder surrounding the same, a piston carried by the shaft within the cylinder and composed of a vertically-disposed disk having openings extending transverse thereof, steam engaging wings carried by said disk, a vertically-disposed chamber carried by the upper end of said cylinder, and a vertically-moving slide adapted to be raised and lowered to allow said wings to pass, substantially as described.

4. A rotary engine comprising a shaft, a cylinder, a piston carried by the shaft within the cylinder, a vertically-disposed circumferential narrow member carried by the piston and having openings extending transverse thereof, laterally-extending steam engaging wings carried by said circumferential narrow member, a vertically-disposed chamber carried by the upper end of said cylinder, a vertically-moving slide within said chamber and having a slot adapted to receive said vertically-disposed circumferential narrow member, and means for raising and lowering said slide at the proper time.

5. A rotary engine comprising a rotatable shaft, a cylinder surrounding the same, a vertically-disposed piston having openings extending transverse thereof and steam engaging wings carried by the sides of said piston between said openings.

6. A rotary engine comprising a rotatable

shaft, a cylinder surrounding the same, a piston carried by the shaft and rotating within the cylinder, the side of said cylinder having a segmental expansion-chamber provided with inlet-openings, a steam-chest surrounding said openings, a rotary valve within said steam-chest, and having an opening in a line with the said segmental recess, a sliding valve closing the upper end of said segmental chamber, substantially as described.

7. A rotary engine comprising a rotatable shaft, a cylinder surrounding the same, a piston carried by the shaft and rotating within the cylinder, the side of said cylinder having exhaust and inlet openings, a steam-chest surrounding the shaft and said openings, a slide-valve between said cylinder and chest and covering said openings, and a rotary valve carried by the shaft within said chest, substantially as described.

8. A rotary engine comprising a rotatable shaft, a cylinder surrounding the same, a piston carried by the shaft and rotating within the cylinder, the side of said cylinder having inlet and exhaust openings, a slide-valve adapted to slide across said openings, the side of said cylinder also having segmental expansion-chambers in communication with the inlet-openings, a steam-chest surrounding the shaft and said segmental chambers, and a rotary valve mounted upon the shaft within the steam-chest, substantially as described.

9. A rotary engine, comprising a rotary shaft, a cylinder surrounding the same, a piston carried by the shaft and rotating within the cylinder, the side of said cylinder having inlet and exhaust openings, a slide-valve covering said openings, the side of said cylinder also having segmental expansion-chambers in communication with the inlet-openings, a steam-chest surrounding the shaft and said segmental chambers, a rotary member within the steam-chest and an outwardly-extending flange carried by said rotary member and covering said segmental chambers and having an opening in a line therewith, substantially as described.

10. A rotary engine comprising a cylinder, inwardly-extending flanges carried by the side thereof, a rotary piston composed of an enlarged hub portion, a vertically-disposed narrow disk-shaped portion extending between the inwardly-extending flanges of the cylinder and having two transverse openings, wings carried by said vertical portion between said openings and entirely filling the portion of the cylinder above the flanges, and means for admitting steam to said cylinder on either side of said wings, substantially as described.

11. A rotary engine comprising a cylinder, a rotary piston therein and composed of a vertically-disposed narrow disk, wings carried by said disk, a slide adapted to straddle said disk, and means for instantaneously raising and lowering said slide, to allow the wings to pass, substantially as described.

12. A rotary engine comprising a cylinder,

a rotary shaft passing therethrough, an enlarged rotary piston mounted thereon, a circumferential narrow member carried by the outer circumference of said piston and engaging the inner circumference of the cylinder, inwardly-extending circular flanges carried by the sides of said cylinder and resting upon the outer circumferences of the piston, and laterally-extending wings carried by said circumferential narrow member.

13. A rotary engine comprising a cylinder, a rotary shaft therein, a piston within the cylinder and carried by the shaft, the side of said cylinder having an enlarged recess therein and inlet and exhaust openings extending therefrom to the interior of the cylinder, segmental expansion-recesses communicating with the lower end of said enlarged recess, a slide within said enlarged recess and having a vertical recess in its lower face and a transverse opening communicating with the inlet-opening in the side of the cylinder, a steam-chest surrounding said valve and segmental chambers, and a rotary spool having an opening in the path of said segmental chambers, substantially as described.

14. A rotary engine, comprising a cylinder, a rotary shaft passing therethrough, a piston carried by the shaft, the side of said cylinder having an enlarged recess in one side and exhaust-openings in communication therewith and the interior of the cylinder and arranged in a horizontal line, and segmental slots in communication with the lower end of said recess, a slide within said recess and adapted to cover the two central inlet-openings and one of the outer exhaust-openings, the under side of said slide having an upwardly-extending recess, and transverse openings communicating therewith and with one of said inlet-openings, a steam-chest surrounding said segmental slots, a rotary spool within said chest and carried by said shaft, an outwardly-extending flange carried by the spool adjacent the side of the cylinder and having an opening therein in a line with said segmental slot, substantially as described.

15. A rotary engine comprising a cylinder, a piston therein, the side of said cylinder having segmental expansion-recesses therein, and having inlet-openings communicating with said cylinder, the side of said cylinder having a transverse recess in communication with the segmental recesses, and a slide within said transverse recess, substantially as described.

16. A rotary engine comprising a cylinder, a piston therein, the side of said cylinder having segmental expansion-recesses therein and having inlet-openings communicating with said cylinder, an enlarged recess above the segmental recesses and in communication therewith and having exhaust-openings in communication therewith and a slide-valve adapted to cover said inlet and exhaust openings, substantially as described.

17. A rotary engine comprising a cylinder, a piston therein, the side of said cylinder having a segmental expansion-recess therein, an enlarged recess above the segmental recess and communicating therewith, and having two inner inlet-openings and an exhaust on each side of said inlet-openings, and a slide within the enlarged upper recess and having an opening adapted to communicate with one of said inlet-openings and the segmental recess, substantially as described.

18. A rotary engine comprising a cylinder, a piston therein, the side of said cylinder having two segmental expansion-recesses therein, an enlarged recess above the segmental recesses and in communication with the upper end and having two inlet-openings and an exhaust-opening on each side of said inlet-openings, and a slide within the enlarged upper recess and of a length to cover the two inlet-openings and one exhaust-opening, and said slide having a recess communicating with one of said segmental recesses and one of said inlet-openings, substantially as described.

19. A rotary engine comprising a cylinder, a piston therein, the side of said cylinder having two segmental recesses therein, and an enlarged upper recess in communication with the upper end of said segmental recesses, and having inlet and exhaust openings therein, a slide-valve in said upper enlarged recess, a steam-chest surrounding said recesses, and a rotary valve within said chest and having an opening in communication with said segmental recesses, substantially as described.

20. A rotary engine comprising a rotatable shaft, a cylinder, a piston within the cylinder and composed of a vertically-disposed disk having openings extending transverse thereof, steam engaging wings carried by the side of said disk, and a vertically-moving slide within said chamber having a slot adapted to receive said vertically-disposed disk.

21. A rotary engine comprising a cylinder, a piston therein, the side of said cylinder having segmental expansion-chambers in communication with the cylinder, a rotary valve communicating with the sides of said expansion-chambers, and a slide-valve controlling the upper ends of said expansion-chamber.

22. A rotary engine, comprising a cylinder, a shaft passing therethrough, a piston within the cylinder on said shaft, an outward-extending disk-shaped member carried by the piston, laterally-extending wings carried by said disk-shaped member, a slide carried by the cylinder and having a vertical slot adapted to receive said disk-shaped member, an upwardly-extending arm carried by the slide and passing through the cylinder, a cam on said shaft, an intermediately-pivoted lever having one end connected to the upwardly-extending arm and a connection between said intermediately-pivoted lever and said cam.

23. A rotary engine comprising a rotatable shaft, a cylinder surrounding the same, a ver-

5 tically-disposed piston having openings extending transverse thereof, steam engaging wings carried by the sides of said piston between said openings and a slide having a vertical slot adapted to receive the vertically-disposed piston.

10 24. A rotary engine comprising a rotatable shaft, a cylinder surrounding the same, a vertically-disposed piston having openings extending transverse thereof, steam engaging wings carried by the sides of said piston between said openings and supply and exhaust openings carried by one side of said cylinder.

15 25. A rotary engine comprising a cylinder, a rotary shaft passing therethrough, an enlarged rotary piston mounted thereon, a circumferential narrow member carried by the outer circumference of said piston and engaging the inner circumference of the cylinder and having openings extending transversely therethrough, inwardly-extending circular flanges carried by the sides of the cylinder and resting upon the outer circumference of the piston, laterally-extending wings carried by the vertical circumferential narrow member, and a slide having an opening adapted to receive the said vertical circumferential narrow member.

26. A rotary engine comprising a rotatable shaft, cylinders surrounding said shaft, pistons carried by said shaft within the cylinders, vertically-disposed circumferential narrow members carried by the pistons and having openings extending therethrough at different parts thereof in respect to each other, wings carried by said narrow members adjacent the openings, the adjacent sides of said cylinders having segmental expansion-chambers therein and openings connecting the upper ends thereof with the said cylinders, steam-chests connecting the adjacent sides of said cylinders and rotary spools carried by the shaft within said steam-chests and having openings therein registering with the segmental chambers and arranged at different points in respect to the wings carried by the respective cylinders.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

JAMES H. CADOO.
JOSEPH M. VAN WHY.

Witnesses:

H. K. FUHRMAN,
LEWIS E. WRIGHT.