No. 684,874. Patented Oct. 22, 1901.

A. L. SIMON.

ROTARY ENGINE.

(Application filed July 6, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

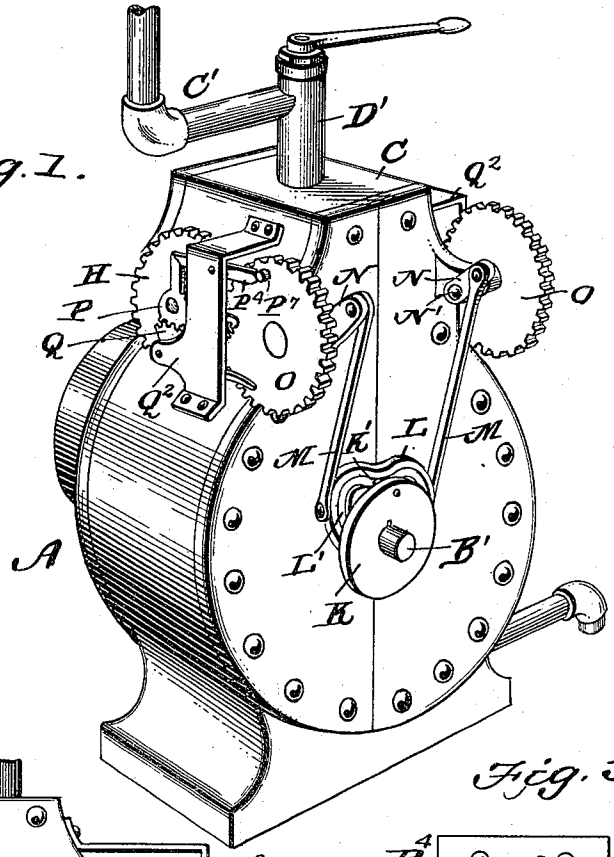


Fig. 2.

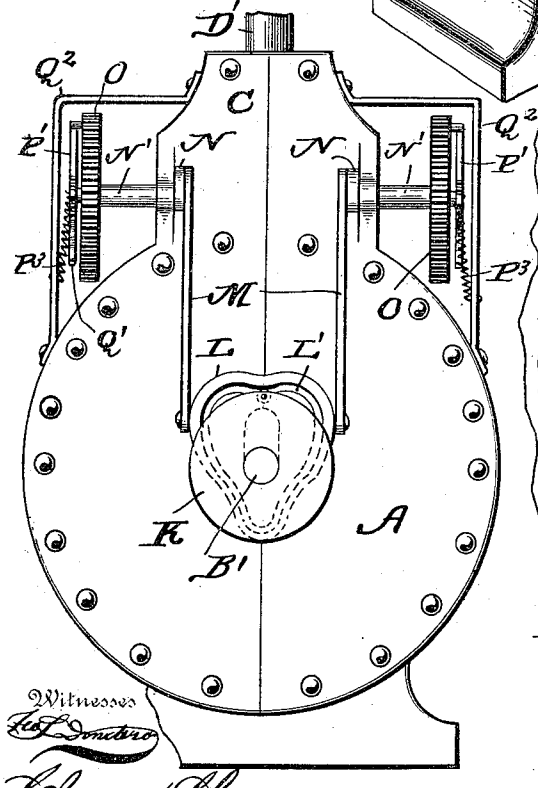
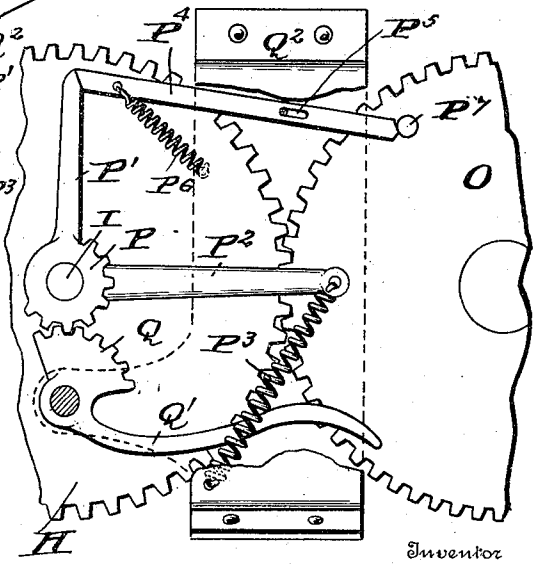


Fig. 3.



Witnesses
Chas. Shaw

Inventor
Alvin L. Simon,

By Thurston & Co.
Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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Fig. 4.

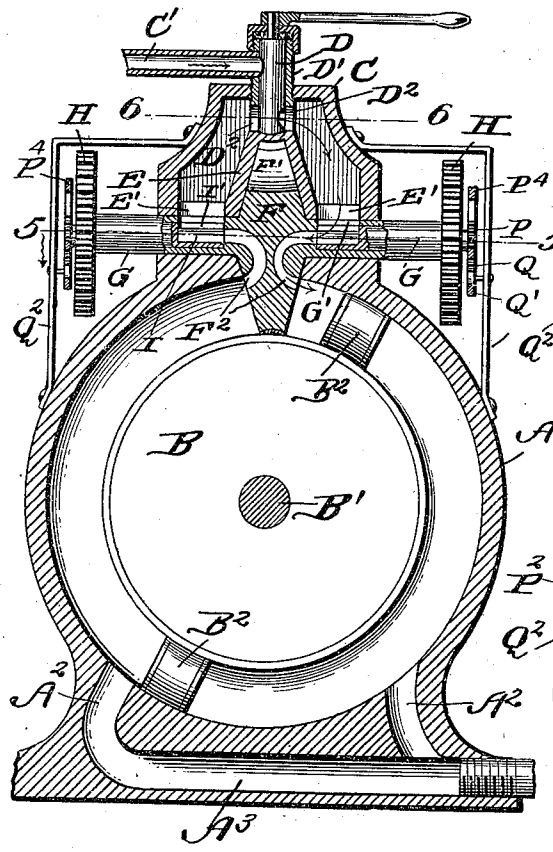


Fig. 5.

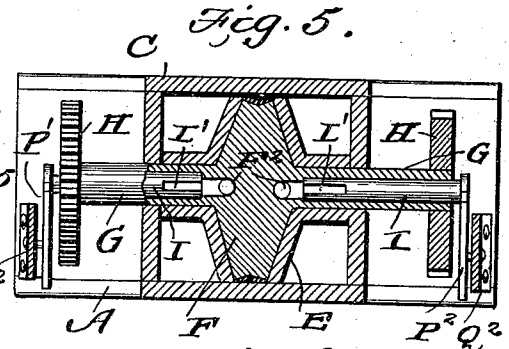


Fig. 6.

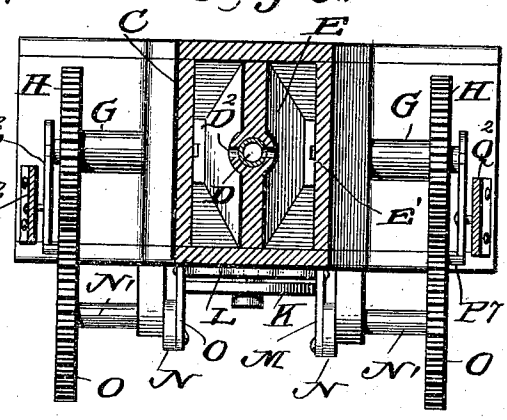


Fig. 7

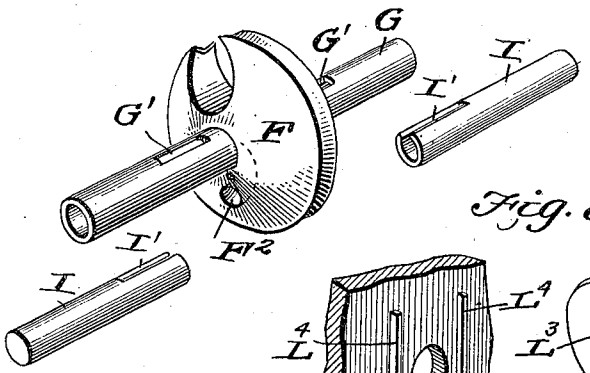


Fig. 9

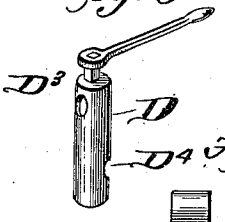


Fig. 10.

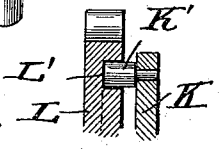
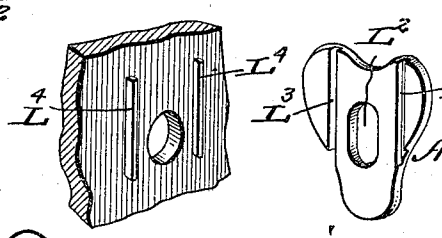


Fig. 8.



Witnesses

Geo. L. Dondero

Florence Shaw

Inventor

Alvin L. Simon.

By O'Brien & Co

Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ALVIN LEVI SIMON, OF HUNTINGTON, INDIANA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 684,874, dated October 22, 1901.

Application filed July 6, 1901. Serial No. 67,298. (No model.)

To all whom it may concern:

Be it known that I, ALVIN LEVI SIMON, a citizen of the United States, residing at Huntington, in the county of Huntington and State of Indiana, have invented a new and useful Rotary Engine, of which the following is a specification.

This invention relates generally to rotary engines, and more particularly to a reversible rotary engine having a vibratory valve for regulating the inflow of steam to the cylinder.

The object of the invention is to provide an exceedingly simple and efficient engine of this class; and with this object in view the invention consists in the peculiar construction of the several elements and in the novel manner of combining or arranging the said elements, all of which features, both of construction and combination, will be fully described hereinafter, and pointed out in the claims.

In the drawings forming part of this specification, Figure 1 is a perspective view of a rotary engine constructed in accordance with my invention. Fig. 2 is an end view of the same. Fig. 3 is an enlarged detail view of the valve-gear. Fig. 4 is a vertical sectional view. Fig. 5 is a horizontal sectional view on the line 5 5 of Fig. 4, and Fig. 6 is a horizontal section on the line 6 6 of Fig. 4. Fig. 7 is a detail perspective view of the vibrating disk, shaft, and valves contained within the shaft. Fig. 8 is a detail perspective view illustrating the inner face of the cam and the guides for guiding the movement of said cam. Fig. 9 is a detail perspective view of the reversible inlet-valve, and Fig. 10 is a detail sectional view illustrating the connection between the rotary disk and cam.

In constructing an engine in accordance with my invention I employ a cylinder A, having a rotary piston B, mounted upon the shaft B′ and provided with blades or wings B^2, said blades or wings B^2 being essentially circular in cross-section and adapted to travel in an essentially-circular channel formed within the sides of the cylinder, the piston B occupying the main portion of the cylinder. A steam-chest C is arranged upon the cylinder A and has a steam-supply pipe C′ leading thereto, a reversible valve D being located in the top of the cylinder, whereby the steam can be directed to either side of the steam-chest for the purpose of driving the piston in one direction or the other. This valve D is arranged within a casing D′, which has openings D^2 at each end, and the valve D is of a tubular form and has an inlet-opening D^3 and a discharge-opening D^4, the inlet-opening D^3 being adapted to register with one or the other of the openings D^2.

A hollow partition E divides the steam-chest into two chambers, and the casing D′ rests upon the upper end of this partition. This partition E is in the nature of a casing, and working therein is the vibratory valve F, having tubular journals G, which extend through the sides of the steam-chest and carry the gear-wheels H at their outer ends. The disk F is cut out at one side essentially in the form of a circle, as shown at F′, to permit the passage of the blade or wing B^2 of the piston, it being understood that the valve E is so located that a portion of the said valve will always project into the cylinder through an opening in the top, and thereby form a dividing-block, dividing the cylinder into two sections. The valve F is also formed with ports F^2 for the purpose of conducting steam from the chest to the cylinder, the base of the partition E having port-openings E′, which register with the port-openings G′, produced in the tubular journals G, and located in the journals G are the valves I, having port-openings I′, which are adapted to be brought into register with the openings G′ and E′, thereby permitting steam to pass from the chest through the ports F^2 into the cylinder.

The valves I extend through the hubs of the gear-wheels H and are closed at their outer ends and provided with an operating device, hereinafter described. A rotary disk K is mounted upon one end of the shaft B′ upon the exterior of the cylinder, said disk having a roller K′, which travels in a cam-groove L′ of a sliding block L, arranged upon the shaft B′ between the disk K and the head of the cylinder, the block being slotted vertically, as shown at L^2, to permit the vertical movement produced by the roller K′ working in the cam-groove L′. The inner face of the block L is also slotted vertically, as shown at L^3, guide-ribs L^4, arranged upon the head of the cylinder, working in the said groove for the purpose of guiding the movement of the

said block. It will thus be seen that as the shaft B′ rotates the disk is rotated with it, moving the block L vertically up and down, and connected to the block L are the pitmen-rods M, the upper ends of said rods being connected to crank-arms N, which are mounted upon the ends of the shafts N′, carrying the gears O, said gears O meshing with the gears H, arranged upon the end of the disk-shaft. Each tubular valve I has a mutilated gear P upon its outer end, and extending from the said mutilated gear are the arms P′ and P^2. A toothed segment Q has an arm Q′ extending therefrom, said segment being journaled in a bracket Q^2, arranged upon the side of the engine, as most clearly shown in Figs. 1 and 2.

A coil-spring P^3 is attached to the end of the arm P^2, the opposite end being attached to the bracket Q^2. A lever P^4 is also pivoted to the bracket Q^2, said lever having a slot P^5, through which the pivot-pin passes, so that the said lever can have a limited longitudinal movement. The long arm of this lever P^4 is adapted to engage the upper end of the arm P′, being held in such position by means of a coil-spring P^6. The opposite or short arm of the lever P^4 is adapted to be engaged by a pin or stud P^7, carried by the gear-wheel O. The normal position of the parts is shown in Figs. 1 and 3 just prior to operation.

In operation the steam enters through pipe C′ and passes through the valve D into the steam-chest C and is directed to one side or the other, according to the position of the valve D. The steam will then pass through the port-openings to the cylinder and, acting upon the head, will force the piston around in the direction indicated by the arrow. After the piston passes the exhaust-opening A′ its momentum will serve to carry it the balance of the way, and during the rotation of this piston blade or wing the opposing blade or wing will be brought up to the upper end of the cylinder. At the same time the sliding block L is being moved through the medium of the disk K, pin K′, and cam-groove L′, and through the medium of the pitmen M and crank-arms N the gears O are being partially rotated. The gears O and H meshing with each other disk F is caused to move, and during the movement of the gear O the pin P^7 contacts with the lever P^4, tripping the same and releasing it from contact with the arm P′. The spring P^3 immediately acts upon the arm P^2 and causes the mutilated gear P to partially rotate, and inasmuch as the said gear contacts with the segment Q the arm Q′ will be moved upwardly. The moment the arm P^2 is thrown down the valve I is operated, cutting off the supply of steam, and it is at this time that the cut-out portion F′ is brought into alinement with the channel of the cylinder, so as to permit the passage of the wing or blade B^2, which is at that moment approaching the disk F. As before stated, the arm Q′ moves upwardly at the same time that the arm P′ moves downwardly, and the pin P^7, contacting with the said arm Q′, forces it down to its normal and lowermost position, resetting the arms P′ and P^2, and consequently reopening the valve I, and by this time the reverse movement of the sliding block has taken place and reversing the motion of the gear O and the pin P^7, contacting again with the lever P^4, will slip past the same, inasmuch as the said lever is slotted, as shown at P^5, thereby permitting slight longitudinal movement. It will thus be seen that as each piston blade or wing approaches the disk the cut-out portion of said disk is brought around into such position as to permit the blade or wing to pass through the same, and the valve-gear is so constructed, arranged, and operated that steam is cut off at the moment the piston blade or wing passes through the disk, but is let in again the very moment the piston blade or wing passes the said disk, and at the same time the said disk is moved around into such position as to effectively divide the cylinder into two divisions. It will thus be seen that I provide an exceedingly simple and efficient construction of a rotary engine, and it will of course be understood that by reversing the position of the valve D steam can be admitted to the opposite side of the steam-chest, and thereby operate the piston in a reverse direction, and in that instance the port A^2 will be the exhaust-port, the ports A^2 and A′ communicating through a passage A^3.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a rotary engine, the combination with the cylinder, of the piston having blades or wings, of a vibrating cut-off disk having a cut-out portion adapted to permit the passage of the piston blades or wings, said cut-off disk having ports, valves provided with ports and adapted to coact with the cut-off disk, and means for operating the cut-off disk and valves, substantially as shown and described.

2. In a rotary engine, the combination with the cylinder, of the piston having blades or wings, the vibrating cut-off disk having an opening to permit the passage of the piston blades or wings, said cut-off disk having ports adapted to direct steam into the cylinder, tubular shafts carried by the cut-off disk communicating with the ports, valves arranged within the tubular shafts or journals, means attached to the tubular shafts or journals for the purpose of operating the cut-off disk, and means connected to the valves for the purpose of operating the same, substantially as set forth.

3. In a rotary engine, the combination with the cylinder, of a piston having blades or wings, a cut-off disk having tubular shafts or journals, said cut-off disk having a cut-out portion adapted to permit the passage of the piston blades or wings, said vibrating disk

having ports communicating with the tubular shafts or journals, vibrating valves arranged in the said tubular shafts or journals, said shafts or journals and valves having ports adapted to register, the roller-disk arranged upon the piston-shaft and the cam-groove sliding block adapted to be operated by means of the roller-disk, means arranged upon the ends of the tubular shafts or journals and also upon the ends of the valves for the purpose of operating the same, and the connections between the said means and the sliding block, substantially as and for the purpose described.

4. The combination with a cylinder and steam-chest, of a piston rotating in the said cylinder and having blades or wings, a hollow partition arranged in the steam-chest, a vibrating cut-off disk arranged in the said hollow partition and projecting also into the cylinder, said disk having a cut-out portion adapted to permit the passage of the piston blade or wing, the oppositely-disposed ports produced in the vibrating disk, the tubular journals or shafts having ports, the tubular valves having ports, said valves being arranged in the tubular journals or shafts, gears arranged upon the ends of the tubular journals or shafts, a roller-disk mounted upon the piston-shaft, a sliding block having a cam-groove and operated by means of the roller-disk, gears O having cranks, and the pitmen connecting said crank to a sliding block, and gear-operating devices attached to the valves and operated by means of the intermeshing gears, substantially as and for the purpose described.

5. In a rotary engine, the combination with the cylinder, steam-chest and piston, said piston having blades or wings, of the hollow partition arranged in the steam-chest and adapted to divide the same, a vibrating cut-off disk arranged in the said partition and adapted to project into the cylinder, said cut-off disk having oppositely-disposed ports and tubular shafts or journals having ports, said tubular shafts or journals having gears arranged at their outer ends, valves arranged in each tubular shaft and having port-openings, a mutilated gear arranged upon the outer end of each valve, said gear having arms arranged as shown, one of said arms having a spring attached thereto, a tripping-lever adapted for engagement with the other arm, a toothed segment having an arm projecting therefrom, said toothed segment being adapted to mesh with the mutilated gear, the gear O having an operating pin or stud, the cranks attached to the shafts of the said gears O, the pitmen connected to said cranks, the sliding block, and means for operating the same, substantially as set forth.

6. In a rotary engine, a valve-gear comprising the gears H and O, the gear O having a tripping pin or stud, the mutilated gear P, having the arms P′ and P^2, the toothed segment Q having the arm Q′, the tripping-lever P^4, the springs P^3 and P^6, and means for partially rotating the gear O, substantially as and for the purpose described.

ALVIN LEVI SIMON.

Witnesses:
JULIUS M. SIMON,
ERVIN M. ZENT.