

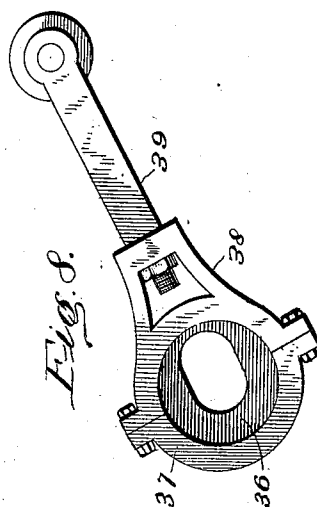
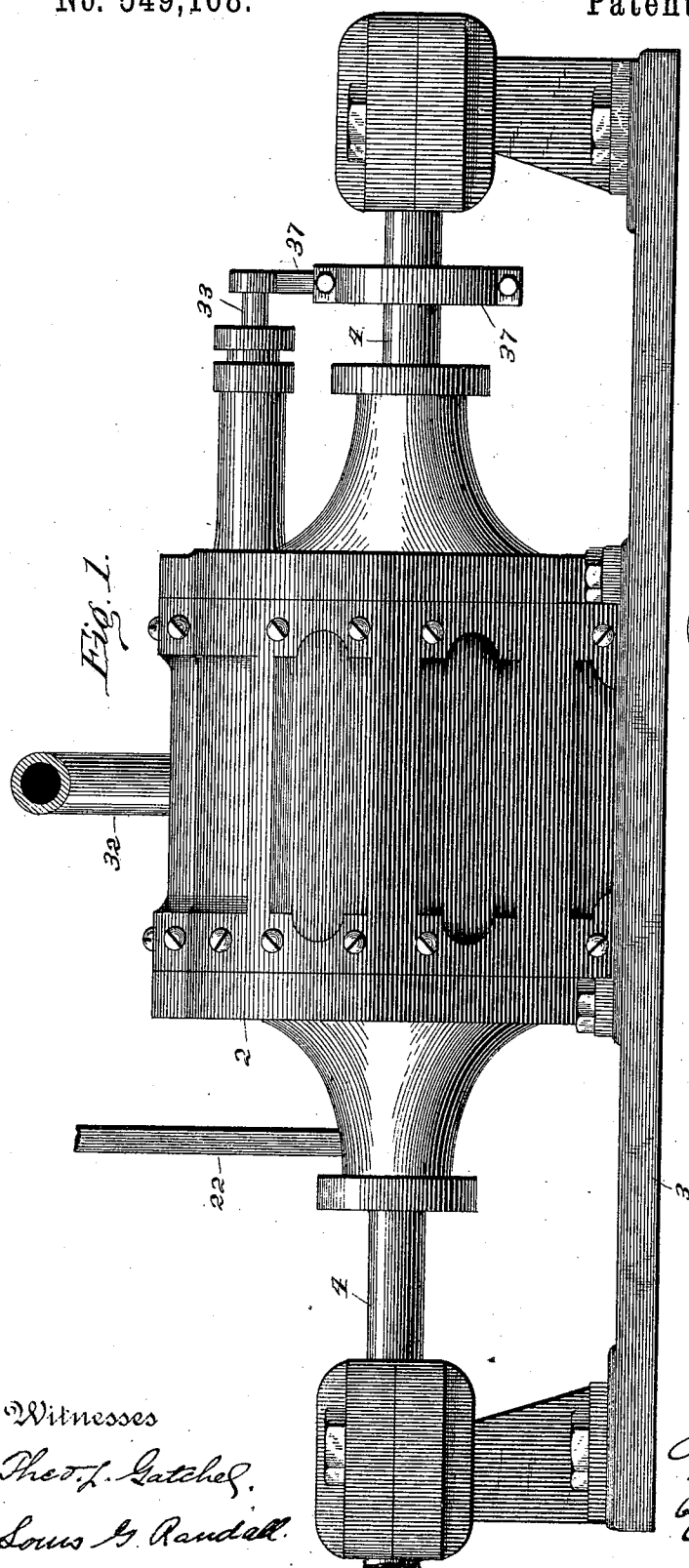
(No Model.)

3 Sheets—Sheet 1.

J. E. THOMAS & P. J. BRUMAGIN.
ROTARY ENGINE.

No. 549,168.

Patented Nov. 5, 1895.



Witnesses
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their Attorney.

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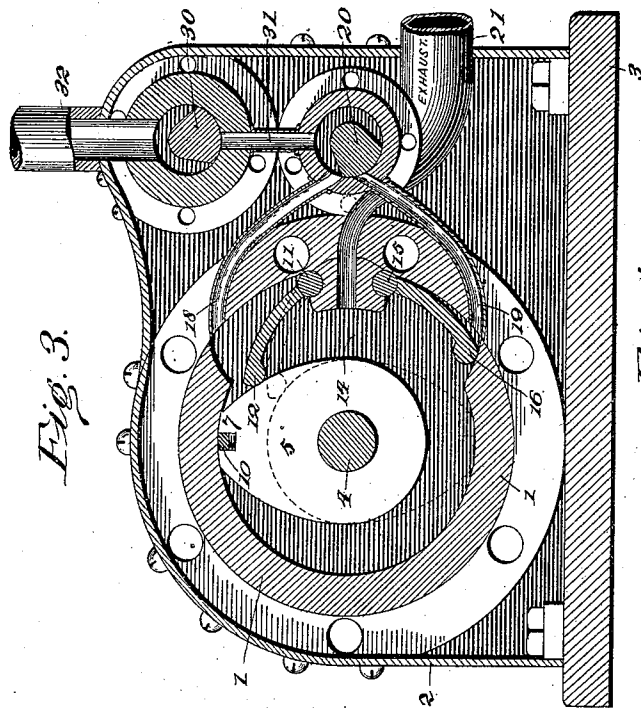


Fig. 3.

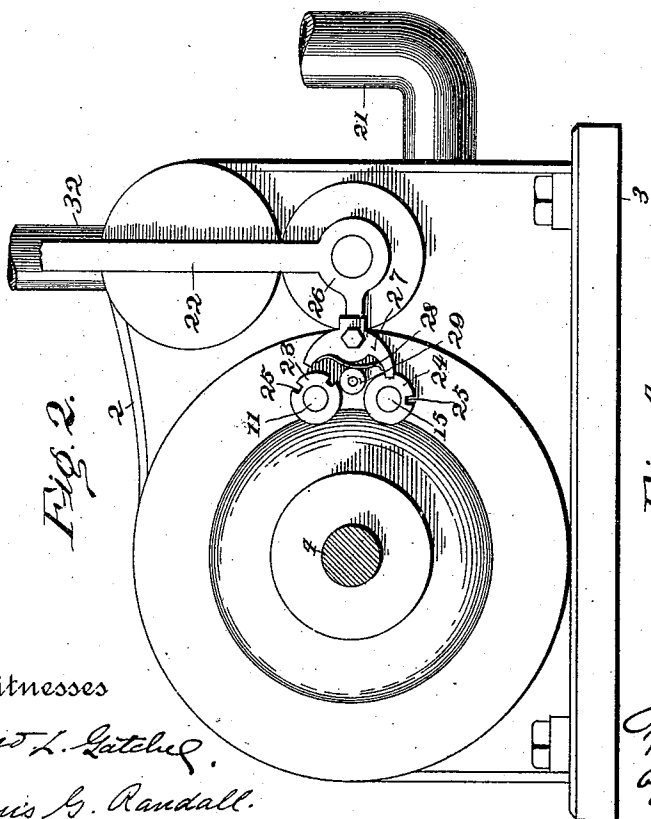


Fig. 2.

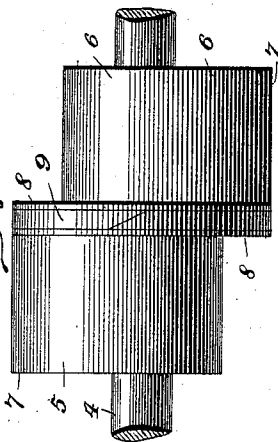


Fig. 7.

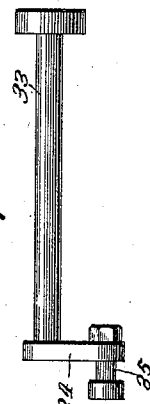


Fig. 6.



Fig. 4.



Fig. 5.

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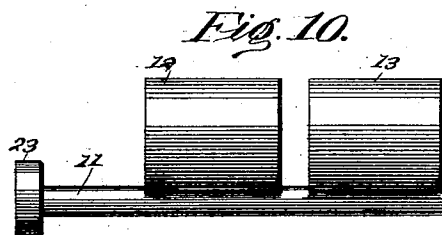
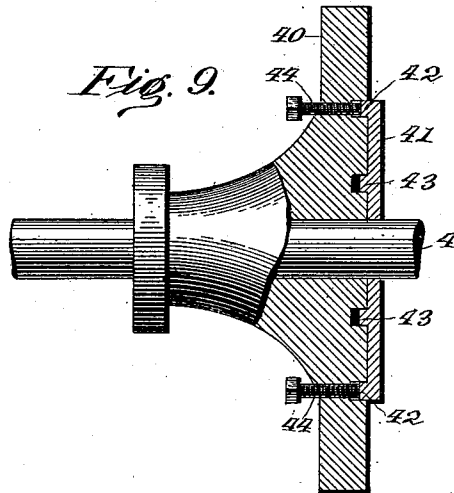
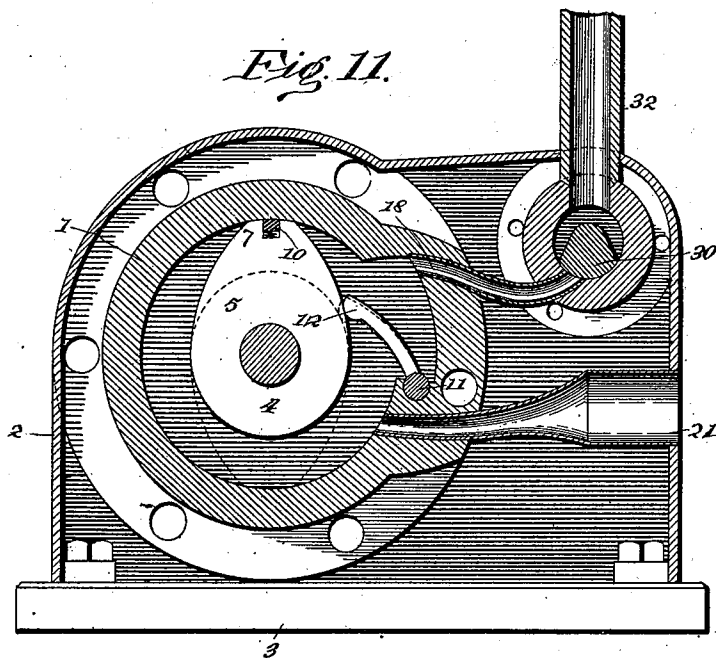
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3 Sheets—Sheet 3.

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UNITED STATES PATENT OFFICE.

JOHN E. THOMAS AND PERRY J. BRUMAGIN, OF PORTLAND, OREGON.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 549,168, dated November 5, 1895.

Application filed February 14, 1895. Serial No. 538,406. (No model.)

To all whom it may concern:

Be it known that we, JOHN E. THOMAS and PERRY J. BRUMAGIN, citizens of the United States, residing at Portland, in the county of Multnomah and State of Oregon, have invented certain new and useful Improvements in Rotary Engines; and we 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 appertains to make and use the same.

Our invention relates to improvements in rotary engines, the object of the same being to provide an engine of this character which will be noiseless in its operation, simple in construction, and which will provide simple means of reversing and automatic means for actuating the cut-off valves and means for locking one set of valves upon reversing the engine and releasing the other set.

The invention consists, essentially, of a cylinder mounted in a suitable casing packed with mineral wool and suitably secured to a base, the cylinder being provided with a central partition and having rotating therein two pistons mounted upon a common shaft, having a central partition between them provided with an expanding-ring, the said pistons having their operating parts diametrically opposite one another and moving in the space in the cylinder divided by the said partition therein. Engaging the periphery of the rotating pistons are expansion-valves pivoted in the frame, one for each piston, which are spaced apart for the passage of the partition of the pistons therethrough and which are adapted to admit steam from the steam-chest to one or the other of said pistons alternately, thereby preventing dead-centers. Beneath the expansion-valves just mentioned we further provide similar expansion-valves, which are adapted to be brought into use when the engine is reversed. An exhaust-port leads from the cylinder between the pivots of the said expansion-valves. The cut-off valve in the steam-chest has its stem extending outside the casing, with a crank-arm thereon, which is connected to an eccentrically-mounted rod on the main drive-shaft, so that at every revolution of the said shaft the valve is opened to admit steam to the cylinder behind the expansion-valves. The reversing-valve is situ-

ated beneath the cut-off valve and is adapted to admit steam to the upper or lower port, as may be desired. The stem of this reversing-valve is extended outward and has connected to it a hand-lever, by means of which the said valve may be reversed at the will of the operator. The shafts upon which the expansion-valves are mounted are extended outside the casing and carry upon their ends notched disks, which are engaged by a forked extension on the end of the reversing-valve, so that when the said valve is reversed one or the other of the expansion-valves is locked and the other is released, thereby admitting steam to the cylinder through but one inlet. We provide a head for the cylinder, with an adjustable wear-plate consisting of a disk having annular flanges therein fitting corresponding recesses in said cylinder-head and engaged by set-screws passing through said cylinder-head, by means of which it may be adjusted to take up the wear of the pistons against said cylinder-head.

The invention also consists of other details of construction and combinations of parts, which will be hereinafter more fully described and claimed.

In the drawings forming a part of this specification, Figure 1 represents a side elevation of our engine complete. Fig. 2 is an end view of the same. Fig. 3 is a cross-section through the cylinder, showing the pistons therein, the expansion-valves, the steam inlet and outlet ports, and the cut-off and reversing valve. Fig. 4 is a detail view of the cut-off valve. Fig. 5 is a similar view of the reversing-valve. Fig. 6 is a similar view of the stem of the cut-off valve, showing its crank-arm and the means of connection with the other operating parts. Fig. 7 is a detail view of the pistons, showing the partition between the same and the expanding-ring thereon. Fig. 8 is a detail view showing the connection between the main shaft and the stem of the cut-off valve. Fig. 9 is a side view, partly in section, showing the cylinder-head and the adjustable wear-plate thereon. Fig. 10 is a detail rear view of the expansion-valves. Fig. 11 is a cross-sectional view of a modified form of engine as adapted for stationary use.

Like reference-numerals indicate like parts in the various views.

1 represents a cylinder inclosed by a suitable casing 2, made up of a series of panels and supported upon a base 3. Between the casing 2 and cylinder 1 is a packing of mineral wool for an obvious purpose. Passing centrally through the cylinder 1 is the main shaft 4, which is journaled in suitable bearings in the outside of the casing. Upon this shaft are mounted two pistons 5 6, the operating ends 7 thereof being diametrically opposite one another and the same being disposed on the shaft substantially as shown in Fig. 7. Between the pistons 5 and 6 is a circular partition 8, which registers with a similar partition on the inner face of the cylinder 1 and forms a tight connection therewith, dividing the cylinder into two compartments. The said partition 8 is further provided with an expandible ring 9 for the purpose of making a perfectly tight connection between the said partition 8 and the cylinder 1.

The elongated ends of the pistons 5 and 6 engage with the inner surface of the cylinder 1 during the rotation of said cylinder and have formed therein gaskets 10 10 for forming a tight connection between said pistons and said cylinder. Mounted upon a shaft 11, journaled in suitable bearings in the cylinder-head, are two expansion-valves 12 13, the said valves being adapted to bear against the periphery of the rotating pistons 5 and 6, respectively, and being formed with a space 14 between them for the passage of the partition 8 of the pistons. Beneath the shaft 11 is similarly mounted a similar shaft 15, carrying similar expansion-valves 16, one of which is not shown, which are likewise adapted to engage the periphery of the pistons 5 and 6, respectively. As shown in Fig. 3, these valves are not in use, the same being brought into use when the engine is reversed.

Leading into the cylinder 1 at points just back of the free ends of the expansion-valves 12 13 and 16 17 are steam-inlet ports 18 19, leading from the steam-chest in which the reversing-valve 20 is located. Leading from the cylinder 1, between the shafts upon which the said expansion-valves are mounted, is a suitable exhaust-port 21. The reversing-valve 20 is formed as shown in detail in Fig. 5, and has a stem extending outside of the steam-chest, to which is connected a suitable operating-lever 22, by means of which said valve may be reversed at will. The shafts 11 and 15 are likewise extended outside the cylinder-head and have formed upon their outer ends disks 23 24, the same being provided with notches 25 in their periphery. The operating-lever 22 is formed with a right-angular extension 26, carrying a forked stop-piece 27, which is pivotally mounted thereon. Between the forks of said stop-piece is a short flat spring 28, which engages a projection 29 on the outer end of the cylinder-head. One arm of the stop-piece 27 is adapted to engage one of the notches 25 in the disk 23 or 24. When the operating-lever 22 of the revers-

ing-valve 20 is turned to one side or the other for the purpose of reversing said valve, the arm of the stop 27, which is in engagement with one of the notches 25, is released therefrom and is thrown into engagement with the notch 25 on the other disk. By this construction one set of expansion-valves 12 and 13 or 16 is at all times locked against movement, while the other is free to move. Upon the reversal of the valve 20 the other set of expansion-valves is locked and the set which was formerly locked is released. Above the reversing-valve 20 in a suitable valve-chest is located the cut-off valve 30, the said valves 20 and 30 being connected by a suitable steam-port 31. Leading to the cut-off valve 30 is a steam-pipe 32, leading from the boiler. The said valve 30 is shown in detail in Fig. 4, and its stem 33, as shown in Figs. 6 and 8, is provided upon its outer end with a crank-arm 34, through the lower end of which passes a bolt 35. Eccentrically mounted upon the shaft 4 is a disk 36, which rotates with said shaft, and around said disk is bolted a collar 37, having an outward extension 38, at one side of which is connected a rod 39, which is in turn connected to the crank-arm of the valve-stem 33 by means of the bolt 35 thereon. It will thus be seen that the rotation of the shaft 4 through the connections just described will cause a rocking motion to be given to the stem 33 of the cut-off valve 30, so that upon each rotation of said shaft 4 the steam is admitted and cut off from the cylinder 1 back of the expansion-valves 12 and 13.

The cylinder-head 40 is provided upon its inner face with a wear-plate 41, the same being clearly shown in detail in Fig. 9. The said wear-plate 41 is provided with annular flanges 42 43, which engage with similar notches or grooves in the cylinder-head 40. Adjusting-screws 44 pass through said cylinder-head and engage the outer surface of the wear-plate 41 for the purpose of adjusting the same to take up the wear on said cylinder-head caused by the rotation of the pistons 5 and 6.

In Fig. 11 we have shown a modified form of our engine, which is adapted to be used as a stationary engine, the same being substantially similar to the reversible engine which has been described, except that the reversing-valve is dispensed with and one set of expansion-valves in the cylinder.

In the use of our engine each piston takes steam once in each revolution, the same being admitted by the cut-off valve described. In this way no dead-center can be formed, as one piston is at its best effort when the other is at its poorest. The steam is cut off by the cut-off valve at any desired point of the revolution, thus using the same expansively. The steam is admitted to the cylinder by the cut-off valve just before the expansion-valve begins to drop, thus keeping it in engagement with the piston continually, causing the engine to run without noise or vibration,

the steam being confined between the expansion-valves and the pistons.

Our invention has been described in its preferred form; but it is obvious that many minor changes in the details of construction may be made without departing from the nature or spirit of the invention or sacrificing any of its advantages.

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

1. In a rotary engine, the combination with a cylinder having two sets of steam inlet ports and exhaust port, of a reversing valve therefor acting in connection with said steam inlet ports and having its stem extended outwardly two sets of expansion valves pivotally mounted in said cylinder adjacent to said steam inlet ports and adapted to bear against the periphery of the rotating piston, the shafts upon which said valves are mounted being extended outside the casing, notched disks keyed to said shafts, an operating lever connected to said reversing valve having a pivotally mounted double forked stop thereon adapted to engage alternately with the notches in said disks, whereby upon the operation of said lever to reverse the engine one set of valves is locked and the other is released, substantially as and for the purpose described.

2. In a rotary engine, the combination with a cylinder, having two steam inlet ports leading therein, and an exhaust port leading therefrom, a reversing valve operating in connection with said steam inlet ports, a central shaft passing through said cylinder and mounted in suitable bearings on the outside

thereof, a pair of rotary pistons secured to said shaft having their operating ends at diametrically opposite points and a partition between said pistons dividing said cylinder into two compartments, two sets of expansion valves adapted to engage respectively said pistons and located adjacent to the steam inlet ports, the shafts upon which the said expansion valves are mounted being extended outside of the casing and provided with notched disks on their outer ends, a cut-off valve operated through an eccentric connection between its stem and the main shaft an operating lever connected with the stem of said reversing valve, having a pivoted bifurcated stop thereon, a spring between the two arms of said stop engaging a lug or projection on the outside of the casing, the said arms adapted to engage alternately with the notches in said disks, substantially as and for the purpose described.

3. In a rotary engine, the combination with a cylinder and a cylinder head, of an adjustable wear plate, the same consisting of a disk having annular flanges thereon, adapted to engage corresponding grooves in said cylinder head, and screws passing through said cylinder head and engaging the outer ends of said wear plate, substantially as and for the purpose described.

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

JOHN E. THOMAS.

PERRY J. BRUMAGIN.

Witnesses:

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D. H. JONES.