

(No Model.)

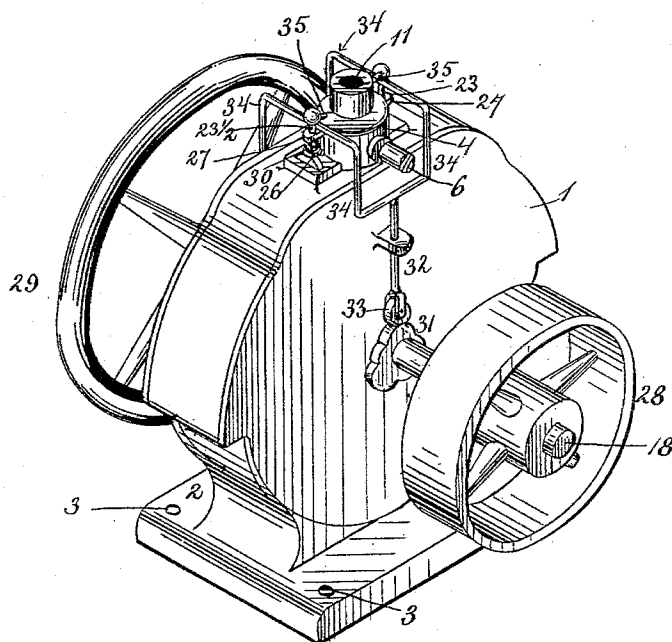
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W. S. BATE.
ROTARY ENGINE.

No. 602,930.

Patented Apr. 26, 1898.

Fig. 1.



Witnesses:

Wm. Gardner.
Thomas J. Lee.

Inventor:

Wm. S. Bates

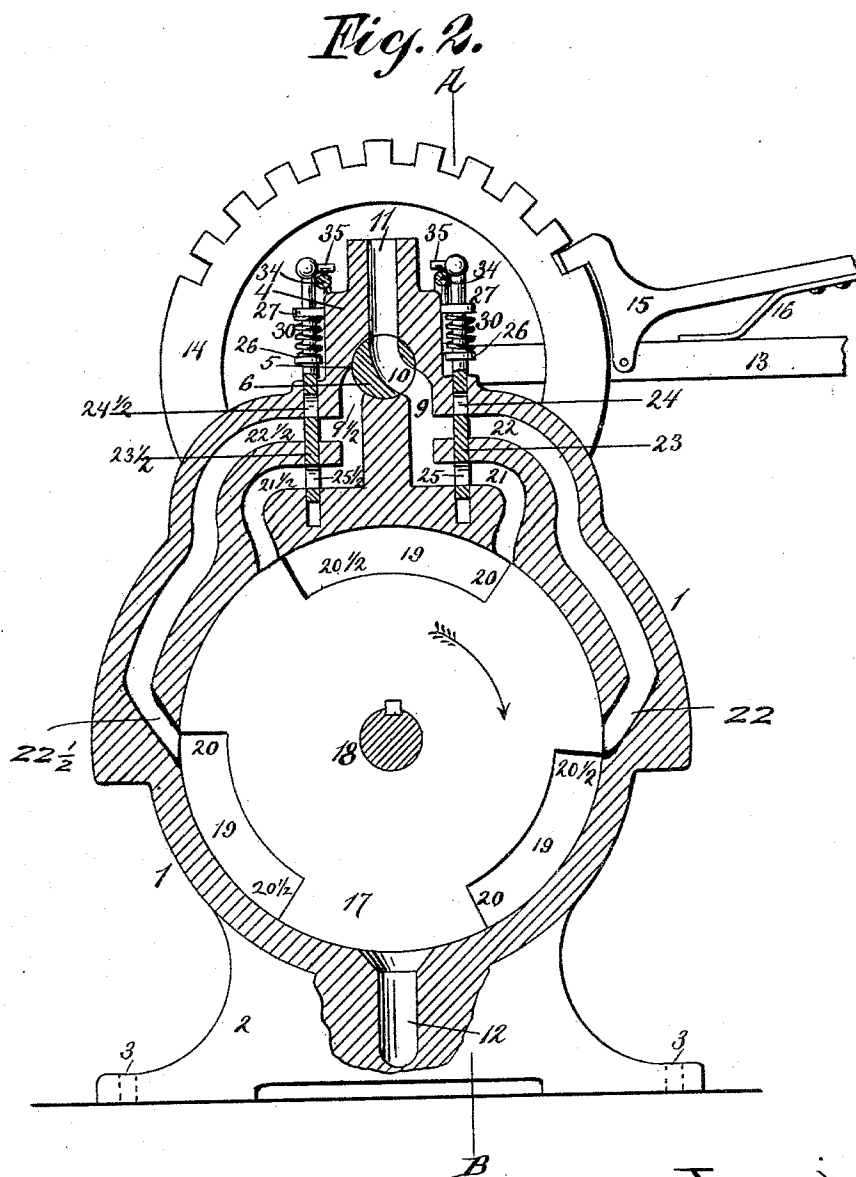
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W. S. BATE.
ROTARY ENGINE.

No. 602,930.

Patented Apr. 26, 1898.



Witnesses:
O. W. Gardner.
Thomas Lee

Inventor:
W. S. Bate

(No Model.)

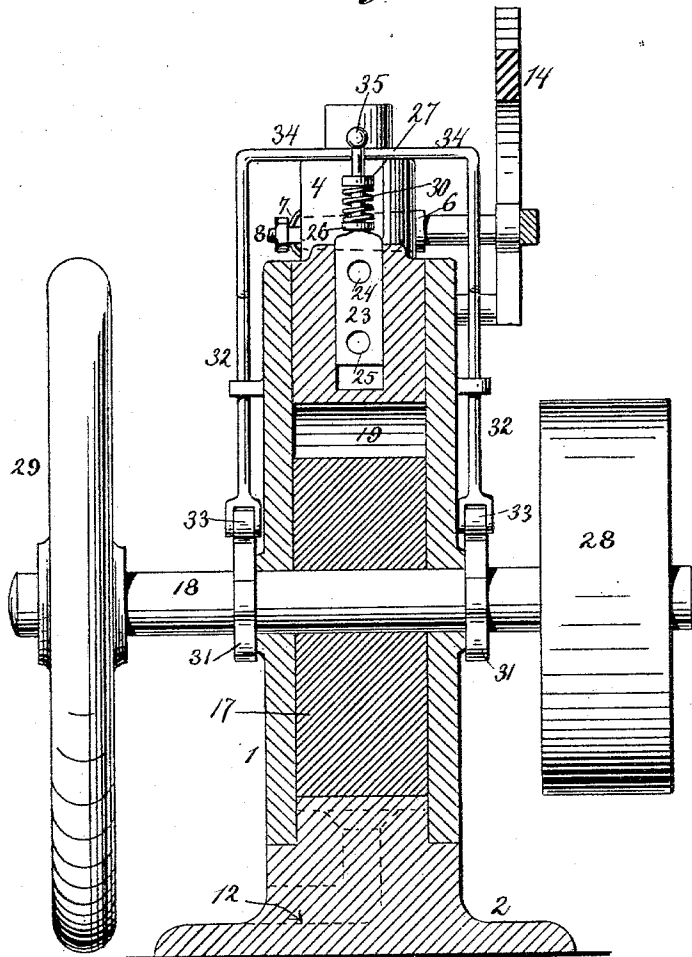
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Patented Apr. 26, 1898.

Fig. 3.



Witnesses:
Oluf J. J. J.
Thomas Lee

Inventor:
W. S. Bate

(No Model.)

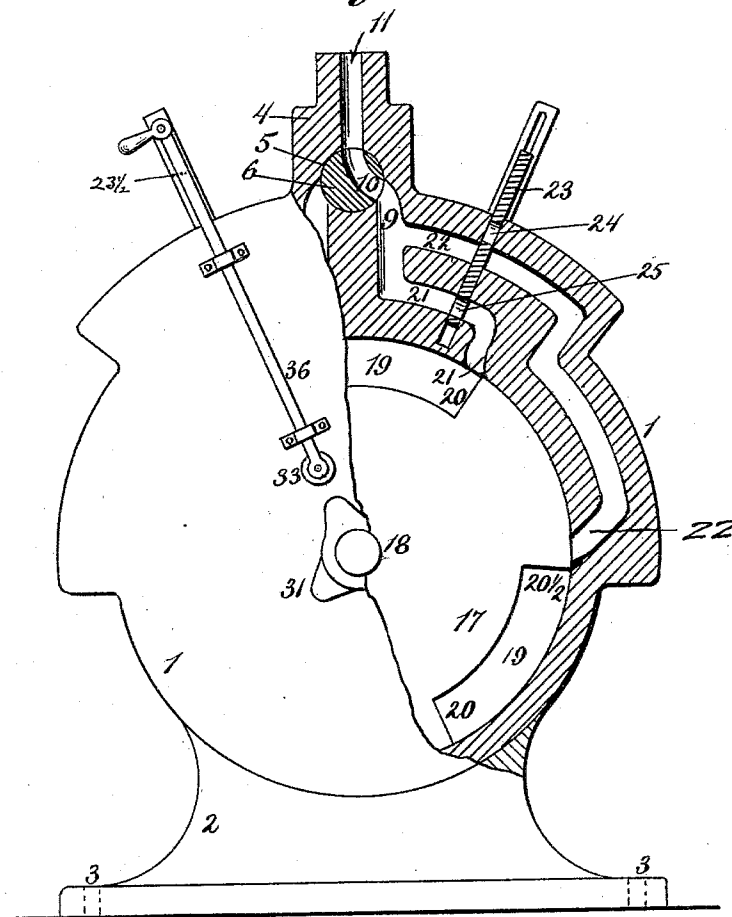
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Fig. 4.



Witnesses:

W. S. Bate
Thomas Lee

Inventor:

W. S. Bate

UNITED STATES PATENT OFFICE.

WILLIAM S. BATE, OF BROOKLYN, NEW YORK.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 602,930, dated April 26, 1898.

Application filed April 3, 1897. Serial No. 630,550. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM S. BATE, of the city of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification.

My invention relates to motors, and particularly to improvements in rotary engines having reversible concentric pistons; and the objects in view are to furnish a machine of simple construction, with means for providing a constant and uniform supply of steam or other motive agent and for the most efficient and economical use of the same. These valuable and original features will be set forth in the following description, and their elements of novelty will be particularly pointed out in the appended claims.

In the drawings, Figure 1 is a perspective view of a motor embodying my improvements. Fig. 2 is a vertical section of the same, perpendicular to the axis of rotation of the piston; and Fig. 3 is a vertical section parallel with the axis of rotation upon plane of line A B, Fig. 2. Fig. 4 represents a modified method of arranging the sliding valves and lifting-rods shown in the other drawings.

Similar numerals of reference indicate corresponding parts in all the figures of the drawings.

1 designates the casing, which is of cylindrical shape and provided with a base 2, having means for attachment to a fixed object, such means consisting in vertical bolt-holes 3, adapted for the reception of fastening-bolts.

Fixed to or integral with the casing, preferably at its upper side, is a valve-casing 4, having a tapered transverse bore 5, in which is revolvably mounted the tapering plug 6. This throttle or reversing plug is held in steam-tight contact with the walls of the casing 4 by means of a tension-spring 7, which is held in place by the nut 8, which is threaded upon a reduced extension of the said plug. This plug is provided with a passage 10, which may be brought into communication with either of the twin inlet-ports 9 and 9½ with which the cylinder 1 is provided and convey steam or other motive agent to them from the inlet-opening 11 of the valve-casing (and through them to the interior of the cylinder)

by the movement to and fro of the reversing-lever 13. Said lever is fixed to the projecting portion of the plug of the throttle-valve 6 and operates adjacent to a segmental rack 14, being provided with a locking-pawl 15 to engage the notches of the said rack, said pawl being held in operative relation with the rack by means of a spring 16.

The exhaust-port 12 is located diametrically opposite the inlet-ports and in the construction illustrated in the drawings is formed in the base of the cylinder.

Within the cylinder the piston 17 is fixed to the shaft 18, with its periphery contiguous to the inner surface of the cylinder. The piston is cored or recessed to form pockets 19, terminating at both ends in abrupt concave abutments 20 and 20½ to provide for the reversal of the motion of the piston. To one end of the piston-shaft 18 is attached a pulley or driven wheel 28, and to the other end a fly-wheel 29.

So far I have described features of my motor which are already known to the art and which I do not claim as original with myself; but I will now proceed to specify such parts as I believe to be new and of my own invention and which I desire to secure by Letters Patent.

By reference to Fig. 2 of the drawings it will be seen that instead of putting the inlet-ports 9 and 9½ into single and direct communication with the interior of the cylinder I make each of them with two branches 21 and 22 and 21½ and 22½, at the entrances of which I place slide-valves 23 and 23½ to control and regulate the flow of steam to the cylinder. The passages 21 and 21½, it will be observed, are arranged so as to admit the steam or other agent to the upper part of the cylinder and the passages 22 and 22½ to the sides of the same, for reasons that will be fully set forth hereinafter. The slide-valves 23 and 23½ are provided with double ports 24 and 25 and 24½ and 25½, so arranged in relation to the steam-passages 21 and 22 and 21½ and 22½ that when steam is admitted to the passage 21 it will be cut off from 22 and when admitted to 21½ it will be cut off from 22½, and vice versa.

Around the rods of the slide-valves 23 and 23½ and confined between the flanges 26 and the guides 27 are placed spiral springs 30, so

arranged that when the valves are lifted from their seats, by means that will hereinafter be described, and the springs thereby compressed they will upon being released carry the valves back into their seats by their expansion.

Fixed to the piston-shaft 18 and at either or both of the vertical sides of the cylinder-casing, as may be preferable, are cams 31, of a generally triangular shape, so situated in relation to the lifting-rods 32 that their revolution with the piston-shaft and contact with the traveling wheels 33 on the free extremities of the lifting-rods will impart to the latter and to their arms 34 a reciprocating motion and cause them when brought into contact with the lugs 35, attached to the inner sides of the valve-rods 23, to open and close the valve-ports 24 and 25 and 24½ and 25½, as will be hereinafter fully described.

The cams need not be irremovably attached to the cylinder-shaft at the point indicated in the drawings, but so clamped to it that their position in relation to the cylinder-chambers can be shifted and the amount of cut-off be increased or diminished, as desired.

A different method of arranging the valves and lifting-rods in relation to the cams is shown in Fig. 4, where two independent rods 36 are used on each vertical side of the cylinder-casing, but each in connection with a similar and correspondingly-situated rod on the other side of the cylinder-casing.

When it is desired that the motor shall be single-acting, all the valves on one side of the cylinder-casing and valve-casing may be dispensed with. Again, the passages 22 and 22½ and the valve-ports 24 and 24½ could be omitted and the engine still be operated to much greater advantage than it could without using the remaining single-port slide-valves. Also, when economy of the motive agent is not an object the slide-valves can be altogether dispensed with, but both passage-ways at either side of the valve-casing retained, the use of two being of much greater advantage than the use of one, as heretofore, as it will be obvious that the steam or other motive supply would be much more constant and regular. Again, if it is considered desirable to increase the number of steam-chambers in the piston to five or more the number of passage-ways in the cylinder-casing and valve-ports in the sliding valve can be correspondingly added to.

Having described the construction of my improved motor, I will now state its method of operation, which is as follows: Having turned the lever 13 to the right, as shown in the drawings, the steam or other motive agent is allowed to pass through the valve-plug 6, the inlet-port 9, the valve-port 25, and the passage 21 into the piston recess or chamber 19. The initial pressure of the steam or other motive agent thus admitted drives the piston in the direction of the arrow in Fig. 2 until the right-hand abutment 20 of the piston-chamber in communication with the motive

supply reaches a point midway between the outlets of the passage-ways 21 and 22, by which time the movement of the cam 31, traveling with the piston-shaft 18, allows the lifting-rod 32 to fall and close the valve 25 and the piston-abutment 20 to be carried to the outlet of the supply-passage 22 by the impact of the steam or other agent. In the meantime the descent of the lifting-rod, caused by the expansion of the springs 30 and the force of gravity, has not only closed the valve-port 25, but also has brought the valve-port 24 into communication with the passage-way 22, so that by the time the piston-abutment has reached the outlet of said passage-way the full force of the steam or other motive agent is again exerted upon it until it reaches a point midway between said outlet and the exhaust-chamber 12; by which time the ascending movement of the lifting-rod and its branches, actuated by the cam, has once more cut off the motive supply; but by the time the before-mentioned abutting surface of the piston has reached the exhaust-chamber the corresponding abutment of the succeeding piston-chamber has passed the outlet of the supply-passage 21, which, being now again in communication with the power-supply through the valve-port 25, admits the full pressure of said supply to the newly-presented piston-chamber, as it had to the previous one. Thus one chamber after another is presented to the supply-passages, and the above-described operation is continued as long as the throttle-valve remains open and the steam or other motive agent supplied.

The reversal of the motor is accomplished by moving the lever 13, so as to cause the admission of steam or other motive agent through the inlet-port 9½ to the passage-ways and valves on the other side of the cylinder.

Only one slide-valve being necessarily in use at a time, the one not in service may be raised out of contact with the arms of the lifting-rods either by the movement of the throttle-valve and lever back and forth in connection with some suitable device (not shown in the drawings) or by means of some other simple and well-known form of mechanism adapted to the purpose.

What I claim as my invention is—

1. A rotary engine having a casing provided with two ports leading to different parts thereof, a piston, and the plate-valve provided with two ports adapted to admit fluid alternatively to one or the other of two ports in the casing, substantially as described.

2. A rotary engine having a casing provided with two ports leading to different parts thereof, a piston, and the plate-valve provided with two ports for admitting fluid alternatively to one or the other of the ports in the casing and an inlet-port intersecting the casing-ports provided with a throttle-valve, substantially as described.

3. A rotary engine having a casing with two ports leading to different parts thereof

on both sides of the casing, a piston, plate-valves each having two ports adapted to admit fluid alternatively to one or the other of said sets of ports according to the direction in which the engine is running, substantially as described.

4. A rotary engine having a casing provided with two ports leading to different parts thereof on both sides of the casing, a piston, two plate-valves each having two ports admitting fluid alternatively to either set of the ports according to the direction in which the engine is running, and an inlet-port leading to the casing-ports and a combined throttle and reversing-plug, substantially as described.

5. In the valve-casing 4, of a rotary engine, the combination of cylinder inlet-ports 21 and 22, with a slide-valve 23, having steam-ports 24 and 25 and so arranged in relation to said cylinder inlet-ports that the supply of steam or other motive agent through a valve-casing inlet-port 11, and throttle-valve plug 6, may be cut off from either one of said cylinder inlet-ports, while being admitted to the other, allowing the steam or other motive agent in the cylinder port and chamber so cut off to drive a piston 17.

6. In the valve-casing 4, of a rotary engine the combination of cylinder inlet-ports 21 and 22, and 21½ and 22½, with slide-valves 23 and 23½ having ports 24 and 25, and 24½ and 25½,

and so arranged in relation to said cylinder inlet-ports that the supply of steam or other motive agent through a valve-casing inlet-port 11, and throttle-valve plug 6 may be cut off from either port of such pair of said cylinder-ports as may be in communication with the motive supply, (while being admitted to the other), allowing the steam or other motive agent in the cylinder port and chamber so cut off to drive a piston.

7. A rotary engine having a casing provided with two ports leading to different parts thereof, a plate-valve provided with two ports, a piston, a piston-shaft, a cam on said shaft and connecting mechanism to operate the valve to periodically admit to and cut off the supply of fluid to the piston, substantially as described.

8. The improved rotary engine herein described comprising the cylinder-casing with an inlet and an exhaust port, a piston, a throttle-valve, ports leading to different parts of the casing and plate-valves with two ports for controlling the flow of the steam or fluid to the piston and means for periodically opening and closing said valves, substantially as described.

WILLIAM S. BATE.

Witnesses:

THOMAS J. LEE,
FRED W. SNYDER.