No. 713,007. Patented Nov. 4, 1902.

D. B. & O. D. KINGSBURY.

ROTARY ENGINE.

(Application filed Jan. 16, 1901.)

(No Model.)

Fig I

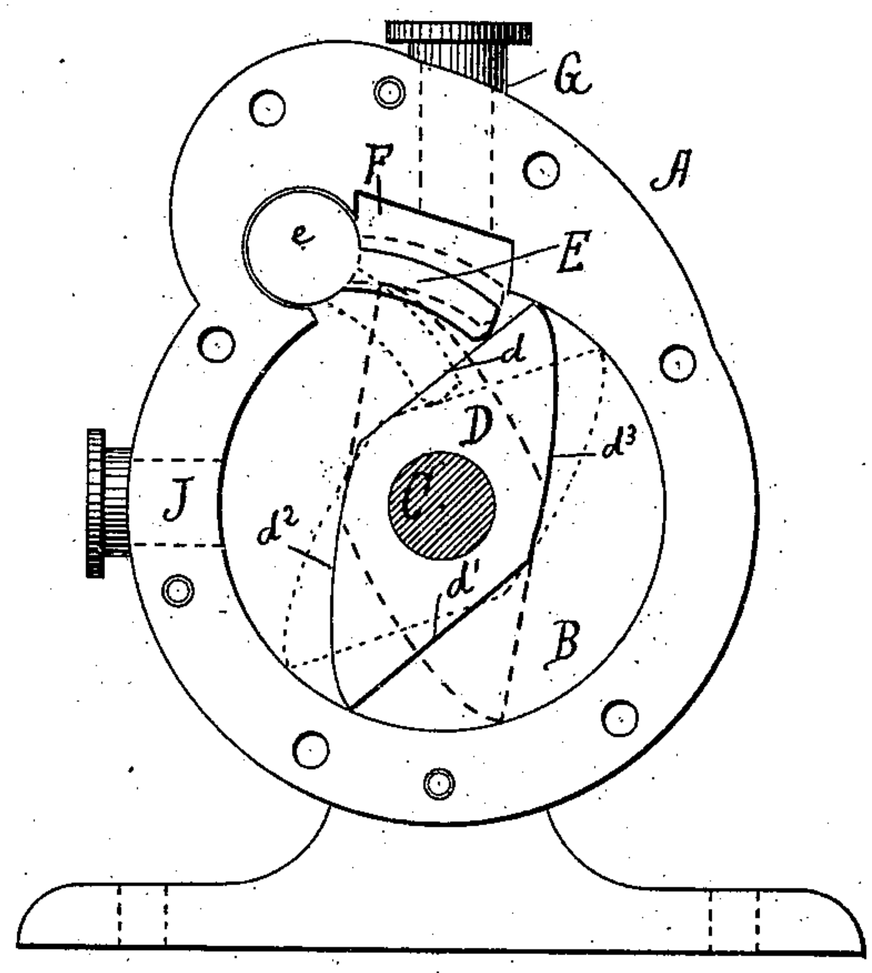
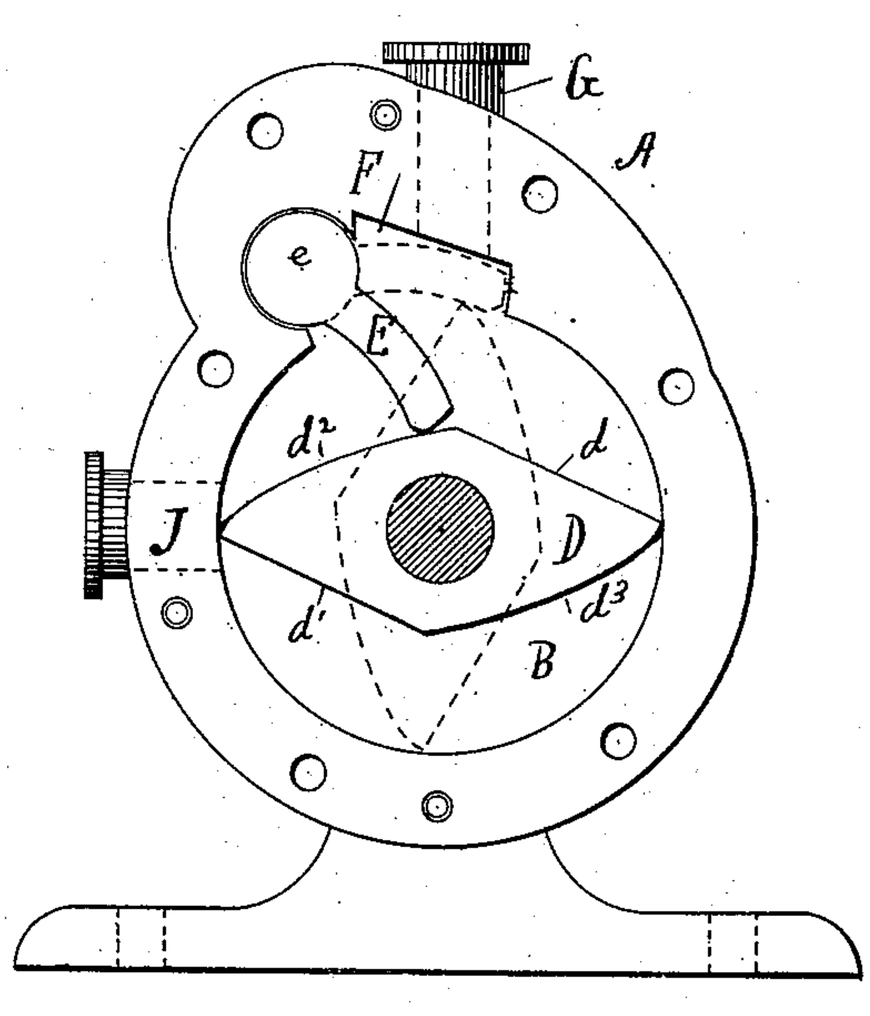


Fig II



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ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 713,007, dated November 4, 1902.

Application filed January 16, 1901. Serial No. 43,489. (No model.)

To all whom it may concern:

Be it known that we, DAVID B. KINGSBURY and OTIS D. KINGSBURY, citizens of the United States, residing at Ravenna, county of Portage, and State of Ohio, have invented certain new and useful Improvements in Rotary Engines, of which the following is a clear, full, and exact description, such as will enable others skilled in the art to which it pertains to make and use the same.

Our invention relates to rotary engines or motors; and it consists in the peculiar construction of said engine or motor whereby greater working efficiency is attained from the motive fluid than has heretofore been the case, said construction embodying an elongated revolving piston and a swinging abutment which is automatically operated by said piston to close and open the steam port or inlet, said swinging abutment acting to regulate or control the steam or fluid supply and also acting as an auxiliary to impel the piston during the running of the engine or motor.

In the drawings, Figure I illustrates an engine or motor in side elevation with one of the cylinder-heads removed, showing the internal construction of the said engine or motor. This view illustrates in dotted lines the position of the abutment and piston as the steam or fluid is beginning to be fed to the interior of the cylinder and in heavy dotted lines the position of the abutment and piston just as the said abutment is closing. In light dotted lines the abutment and piston are shown in the position they occupy in relation to each other when the said abutment is open to its fullest extent and before said abutment starts to close. Fig. II is also a view in side elevation of an engine or motor constructed according to our invention and illustrating the same with one of the cylinder-heads removed. This shows in solid lines the position of the abutment and piston just as the piston end reaches the exhaust-port and the engine or motor is exhausting and also showing the abutment as it starts to rise or close. In dotted lines the position of the piston and abutment is shown just as the said abutment is fully closed and before the steam begins to act on the piston.

We will now proceed to set forth our preferred construction as embodied by our invention and also the operation of the same.

In the drawings, A represents the casing, which embodies the engine or motor-cylinder B. The casing and cylinder are provided with heads which inclose the piston and valve of the engine or motor and afford bearings for the rotary piston-shaft C. The bearings for said shaft may be provided with the usual stuffing-boxes or other suitable packing to prevent the escape of the motive fluid.

D represents a revolving piston which is mounted upon and drives shaft C. The piston D is oblong in cross-section and at its longest diameter extends diametrically across the internal walls of the cylinder B and also extends from end to end of the same. The piston D of a substantially diamond shape is formed flat on diagonally opposite faces d and d', respectively, and is formed curved on the faces d^2 and d^3, respectively. The flat faces d and d' are the working faces of the piston and the faces d^2 and d^3 act as cams to lift and close the swinging abutment E, which is pivotally secured at one end in the inner wall of the cylinder B, as at e, and is preferably located at the upper part of said cylinder, although this is not essential. The under side or face of the swinging abutment E is preferably curved, so as to coact with the curved faces d and d' of the piston D. The free end of the abutment E extends far enough from its pivoted end to fit into and close a port F, where the motive fluid enters the cylinder, and the said abutment is also preferably long enough to follow the flat faces d and d' of the piston as said piston revolves, (see light dotted lines, Fig. I,) thus forming a tight joint, a steam wall or head, and a jack all in one for the purpose of forcing the piston around within the cylinder. The action of the abutment E and the piston in this connection will be clearly seen in the solid and light dotted lines in Fig. I, which illustrates the free end of the abutment E pressing against the flat face d of the piston, and inasmuch as said flat face d acts as an incline plane and the free end of the abutment starts against it at the upper or outer end of said piston it will be seen that the piston receives its greatest aid or force from the abutment just as the steam or operating fluid

is starting to effect said piston and that this aid or force lessens as the said abutment opens more and as it nears the axis of the piston. Thus the working-surface area includes the upper surface of the abutment and the gradually-increasing surface of the flat face of the piston as it revolves.

G represents the steam or fluid supply pipe which leads into port F. This pipe G may connect or communicate with a cut-off valve if desired or found convenient, and said cut-off valve may be operated by the engine during any cycle or number of cycles in any usual manner which is well known to one skilled in the art, and thus the steam-supply may be cut off at any suitable point and used expansively, if desired.

J represents the exhaust-port, which is located at one side of the cylinder B and communicates with the interior of said cylinder, preferably at a right angle to the inlet-port F. Thus locating the exhaust-port J allows of the steam or fluid at the idle side of the piston supporting or balancing the said piston and diminishing the friction of the shaft-bearing, inasmuch as it acts as a cushion against the steam or fluid pressure, acting against the piston for a great part of the revolution of said piston. (See solid lines in Figs. I and II and dotted lines in Fig. II.)

While in smaller engines or motors we have found that two working faces are sufficient, still in larger engines or motors it is apparent that more than two working faces, such as d and d', may be employed with good results and two or more abutments E may be employed and operated in conjunction with the working faces of the rotary piston D.

The operation of our engine or motor is as follows: The motive fluid may be steam, gas, hot air, or water, and the same is introduced to the interior of the cylinder B through the pipe G and thence to port F. Now presuming the piston and abutment are in the position illustrated by solid lines in Fig. I the fluid passes through the port F into the cylinder and against the face d of the piston D and at the same time presses against the abutment E and tends to force said abutment downward or open. The free end of the abutment E being forced inward toward the center of the cylinder acts against the face d of the piston and forces the said piston in the same direction as the fluid, and thus acts auxiliary to said fluid. The above action continues until the piston and abutment have reached the position illustrated by light dotted lines in Fig. I. The fluid-pressure, however, continues to act until the piston and abutment have assumed the position illustrated by heavy dotted lines, Fig. I, which shows the abutment just closing. In the engine illustrated the momentum carries the piston from the point illustrated by heavy dotted lines in Fig. I to the position illustrated in solid lines, same figure, when the steam again acts. The above action takes place in the engine or motor illustrated every half-cycle, and hence it will be seen that the steam or other fluid is confined in the idle side of the piston until the said piston reaches the position illustrated by solid lines in Fig. II, when the said confined fluid will exhaust or escape. While the fluid is confined as heretofore stated, it acts as a cushion or balance for the piston, as against the fluid-pressure on the working face, and reduces the friction of the moving parts.

Our engine or motor is simple, efficient, and strong, and greater efficiency may be obtained from a given amount of force supplied than in the motors of like type.

What we claim is—

1. A rotary engine comprising a cylinder having an inlet and an exhaust port at direct right angles to one another with a swinging abutment controlling the inlet-port, a piston located within the cylinder and extending thereacross, said piston on its idle side being supported and balanced by the motive fluid previous to the exhaust of the motive fluid, substantially as described.

2. A rotary engine comprising a cylinder having an inlet-port on the upper end thereof and an exhaust-port at right angles thereto, a piston having a pair of flat working faces and a pair of cam-faces mounted within said cylinder, a swinging abutment controlling the inlet-port and supported by said faces of the piston, the idle side of the piston being supported and balanced by the motive fluid previous to the exhaust of the motive fluid.

3. A rotary engine which comprises a cylinder having an inlet with a swinging abutment controlling the inlet, said abutment located in line with the motive fluid and controlling the supply of the same, a rotary piston of a substantially diamond shape, operating within the cylinder and extending entirely thereacross, and an exhaust located at direct right angles to said inlet, whereby the idle side of the piston is supported and balanced by the motive fluid until the exhaust of the latter, at which time the abutment exerts a slight downward tendency on said piston compensating for the loss of the motive-fluid pressure, substantially as described.

Signed by us at Cleveland, in the county of Cuyahoga and State of Ohio, this 18th day of December, 1900.

DAVID B. KINGSBURY.
OTIS D. KINGSBURY.

Witnesses:
E. B. DONNELLY,
W. E. DONNELLY.