

(No Model.)

2 Sheets—Sheet 1.

N. J. VERRET & T. H. MOONEY.
ROTARY ENGINE.

No. 579,851.

Patented Mar. 30, 1897

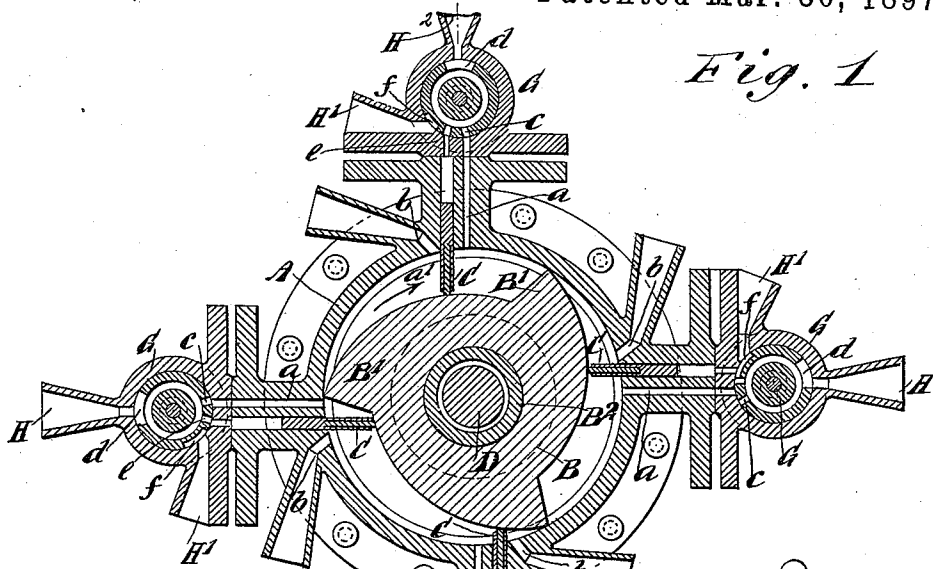


Fig. 1

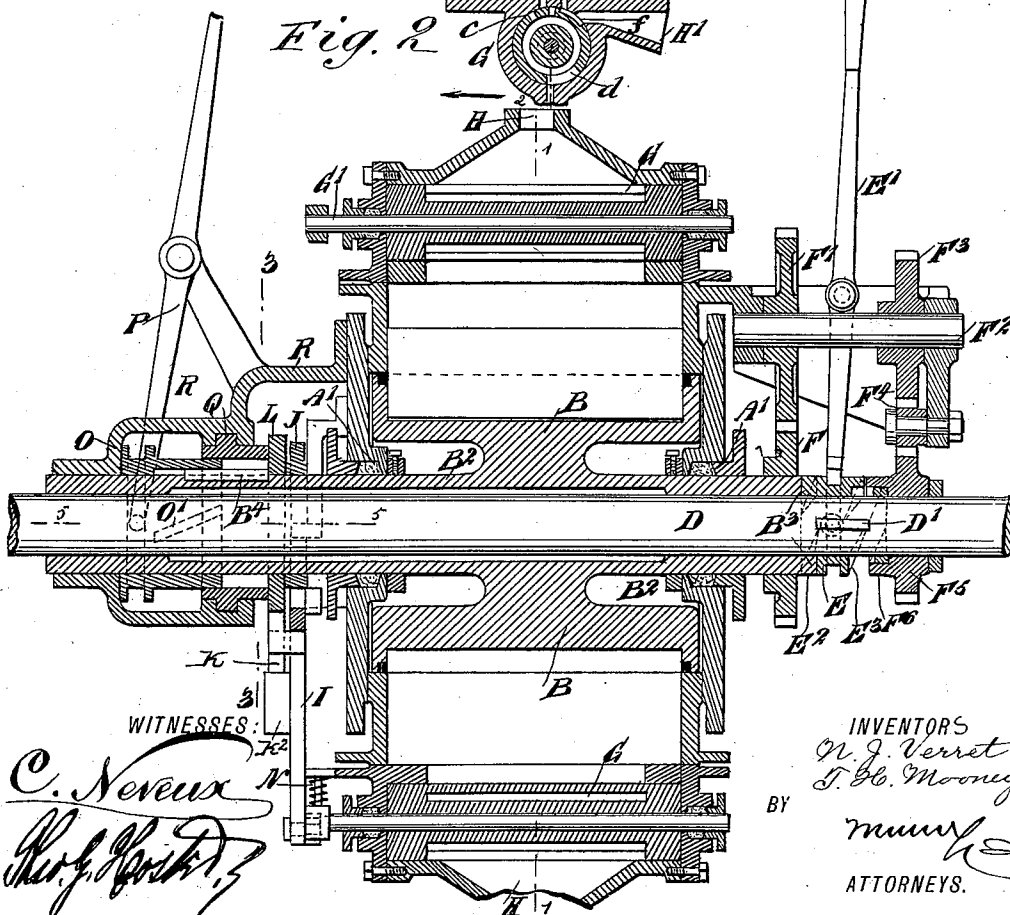


Fig. 2

WITNESSES:

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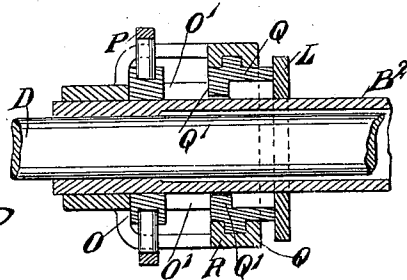
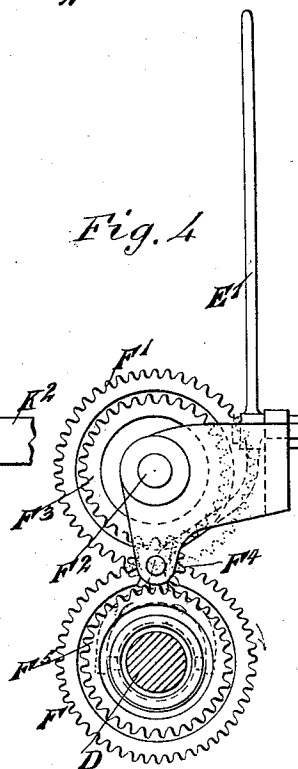
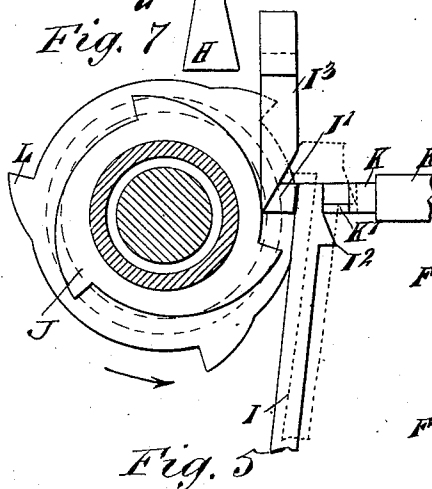
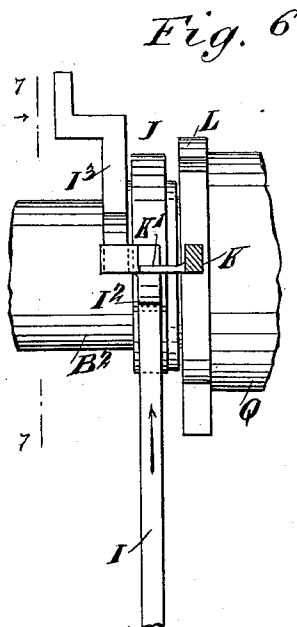
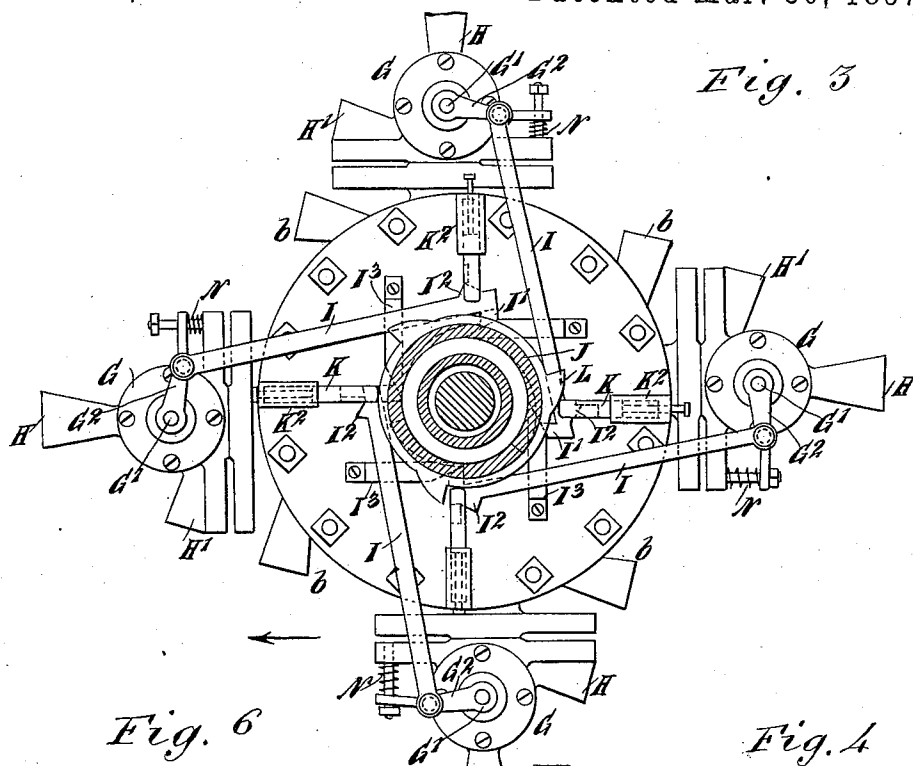
(No Model.)

2 Sheets—Sheet 2

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NICHOLAS J. VERRET AND THOMAS H. MOONEY, OF PINE BLUFF, ARKANSAS.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 579,851, dated March 30, 1897.

Application filed May 4, 1896. Serial No. 590,178. (No model.)

To all whom it may concern:

Be it known that we, NICHOLAS J. VERRET and THOMAS H. MOONEY, of Pine Bluff, in the county of Jefferson and State of Arkansas, have invented a new and Improved Rotary Engine, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved rotary engine which is simple and durable in construction, very effective in operation, and arranged to utilize the motive agent to the fullest advantage.

The invention consists principally of an annular cylinder provided with slidable steam-cushioned abutments, an inlet and an exhaust port on opposite sides of the abutments, and a revoluble piston having cam-heads extending into the cylinder and adapted to move the abutments outward.

The invention also consists of certain parts and details and combinations of the same, as will be fully described hereinafter and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a cross-section of the improvement on the line 1 1 of Fig. 2. Fig. 2 is a longitudinal section of the same on the line 2 2 of Fig. 1. Fig. 3 is a cross-section of the improvement on the line 3 3 of Fig. 2. Fig. 4 is an end elevation of the reversing-gear. Fig. 5 is a sectional plan view of the cut-off mechanism, the section being taken on the line 5 5 of Fig. 2. Fig. 6 is an enlarged side elevation of part of the valve-shifting mechanism, and Fig. 7 is a sectional end view of the same on the line 7 7 of Fig. 6.

The improved rotary engine is provided with a cylinder A, in which operates a piston B, having cam-shaped heads B' extending into the annular sides of the cylinder to form the latter into a number of compartments adapted to take steam alternately, as hereinafter more fully described. The heads B' operate in conjunction with abutments C, fitted to slide in suitable guideways in the cylinder, as is plainly indicated in Fig. 1, said abutments being pressed inward in contact with the cam-shaped backs of the heads B' by pressure of steam, and the outward-sliding motion

of the abutments is controlled by the said cam-shaped backs. The piston B is mounted loosely with its hub B² on the driving-shaft D, said hub being journaled in suitable bearings A', formed in the heads of the cylinder A. The shaft D is connected with the hub B² either directly by a key D' or a clutch E, slidable on said shaft and engaging with one clutch-face E² a clutch-face B³ on one end of the hub B². When the piston rotates in the direction of the arrow a', a similar rotary motion is given to the shaft D.

When it is desired to give a reverse motion to driving-shaft D from the revolving piston B, then the following arrangement is provided; the clutch E is shifted by a lever E', under the control of the operator, for moving the clutch-face E² out of engagement with the clutch-face B³. The rotary motion of the hub B² is transmitted by a gear-wheel F, secured on said hub, to a gear-wheel F', in mesh with the gear-wheel F and secured on a shaft F², journaled in a suitable bracket attached to the cylinder A. On the shaft F² is fastened a gear-wheel F³, connected by an intermediate gear-wheel F⁴ with a gear-wheel F⁵, mounted to rotate loosely on the shaft D and formed on its hub with clutch-teeth F⁶, adapted to be engaged by the clutch-face E³ on the clutch E, opposite to that on which the face E² is located. Now it will be seen that when the lever E' is manipulated and the clutch E is shifted to the right to disconnect the faces E² and B³, then the face E³ moves in mesh with the face F⁶, and consequently a rotary motion in the inverse direction of the arrow a' is given to the shaft D by the several gear-wheels above described.

In the cylinder A and on the opposite sides of each abutment C are arranged an inlet-port a and an exhaust-port b, of which the inlet-port a is adapted to register with a small port c of a rotary valve G, mounted to turn in suitable bearings attached to the cylinder A. The rotary valve G is provided with a larger port d, connected at all times with a steam-inlet pipe H, connected with a boiler or other suitable source of supply. The valve G is also provided with a port e, adapted to connect with the passage leading to the guideway for the abutment C, so that the latter is held in contact with the back of the head B'

by steam-pressure. The guideway for each abutment is also adapted to connect by a groove *f* in the valve *G* with an outlet *H'*, so that the abutment *C* can readily move outward at the time the steam escapes through the outlet *H'* to the air. By this arrangement each abutment *C* is steam-cushioned.

Now in order to impart the desired rocking motion to each valve *G*, so as to move the port *c* in and out of register with the port *a* and cut off the steam sooner or later, we provide the following device: The valve-stem *G'* of each valve *G* is provided at one outer end with a crank-arm *G*², connected with a bar *I*, formed on its free end with an inwardly-projecting hook *I*¹ and with an outwardly-projecting hook *I*². The inwardly-projecting hook *I*¹ is adapted to be engaged by a toothed wheel *J*, secured on the hub *B*² of the piston *B*, so that the wheel *J*, engaging the hook *I*¹, pulls on the bar *I* to impart a swinging motion to the crank-arm *G*², so as to rock the valve *G* and move its port *c* in register with the port *a*. Before being released by the hook *I*¹ sliding off the tooth of the wheel *J* the sliding bar *K* comes down, so as to engage by the tooth *K'* the tooth *I*² on the bar *I* and hold the valve open. Steam can now pass from the inlet-pipe *H*, through the valve *G* and the ports *c* and *a*, into the interior of the cylinder between the abutment *C* and the adjacent head *B'*. When this takes place, the other port *e* is in register with the guideway for the abutment *C*, so as to hold the latter in contact with the back of the next following head *B'*. The other hook *I*² is adapted to engage a tooth *K'* on the sliding or reciprocating bar *K*, fitted to slide in a suitable casing *K*², attached to one cylinder-head, as plainly indicated in Fig. 3. This sliding bar *K* engages the rear surface of the hook *I*² and holds the valve *G* in an open position, as indicated at the top of Fig. 1, until said sliding bar *K* is pushed outward by a toothed wheel *L*, so as to release the bar *I* and to permit a spring *N*, pressing on the crank-arm *G*², to close the valve *G* relative to the ports *c* and *a* and at the same time connect the groove *f* with the guideway for the abutment *C*. The toothed wheel *L* thus forms, with the bar *K*, a tripping device for the valve *G*, so as to cut off sooner or later, according to the position of the teeth on the wheel *L*. The wheel *L*, besides turning with the hub *B*², can be turned so as to shift its teeth into different positions relative to the bars *K*, so as to cut off sooner or later.

The cut-off-controlling device is arranged as follows: On the hub *B*² is arranged a key *B*⁴, on which is fitted to slide longitudinally a collar *O*, engaged by a lever *P*, under the control of the operator, for shifting said collar longitudinally. On the collar *O* are arranged inclined slots *O'*, (see dotted lines in Fig. 2,) engaged by pins *Q'*, held on a wheel *Q*, mounted to turn in a bracket *R*, secured on one of the cylinder-heads, said wheel *Q*

carrying the toothed wheel *L*. It will be seen that the rotary motion of the hub *B*² is transmitted by the collar *O* to the wheels *Q* and *L*, and by shifting the said collar *O* longitudinally the slots *O'* engage the pins *Q'* to cause an additional turning of the wheel *Q*, so that the position of the teeth on the wheel *L* relative to the bars *K* is shifted.

Now it will be seen that we employ three heads *B'* on the pistons *B* and four abutments *C*, so that two of the abutments are always in engagement with one of the heads *B'*. By this arrangement we give four successive impulses to the piston *B* in each compartment for each revolution, so as to insure a continuous rotary movement with full pressure, whereby the motive agent is utilized to the fullest advantage. It is further understood that while one valve delivers steam to the cylinder to act on the corresponding head *B'* the steam acting on the next following head is acting under expansion, as this valve was cut off at the desired time.

Having thus fully described our invention, we claim as new and desire to secure by Letters Patent—

1. A valve-operating mechanism for rotary engines consisting of a rocking or oscillating valve, a link connected thereto to oscillate the same and provided with teeth upon opposite sides of the outer or free end, with a revolving toothed wheel adapted to engage one of these teeth and reciprocate said link, a catch adapted to engage the other tooth and hold the link, and means for releasing said catch, substantially as described.

2. A valve-operating mechanism for rotary engines consisting of a rocking or oscillating valve, a link connected thereto to oscillate the same and provided with teeth upon opposite sides of the outer or free end, with a revolving toothed wheel adapted to engage one of these teeth and reciprocate said link, and a cam-wheel revolving with the toothed wheel and adapted to release said catch, substantially as described.

3. A valve-operating mechanism for rotary engines consisting of a rocking or oscillating valve, a link connected thereto to oscillate the same and provided with teeth upon opposite sides of the outer or free end, with a revolving toothed wheel adapted to engage one of these teeth and reciprocate said link, and a cam-wheel revolving with the toothed wheel and adapted to release said catch, and means for adjusting the angular position of said wheels whereby the release is made earlier or later, substantially as described.

4. A valve-operating mechanism for rotary engines consisting of a rocking or oscillating valve, a link connected thereto to oscillate the same and provided with teeth upon opposite sides of the outer or free end, with a revolving toothed wheel adapted to engage one of these teeth and reciprocate said link, and a cam-wheel revolving with the toothed wheel and adapted to release said catch, and means

for adjusting the angular position of said wheels consisting of a sliding collar upon the piston-hub and within the releasing wheel-hub, one of these having a spiral cam-slot and a pin upon the other engaging the slot, substantially as described.

5. In a rotary engine, the combination of a revolving piston having a plurality of cam or piston heads, and a set of steam-ports one in excess of the number of piston-heads, a sliding steam-operated abutment and a rocking valve for each set of ports, and means for operating said valves comprising a link pivotally connected to the valve and having a tooth upon each side of the outer end thereof, a revolving toothed wheel adapted to engage one of the teeth on the bar or link to reciprocate the same, a spring attached thereto for securing its return, a slide engaging the opposite tooth on the bar or link to retain the valve in its open position and a revolving cam-wheel engaging said slide to release the valve-link, substantially as described.

6. In a rotary engine, the combination of a revolving piston having a plurality of cam or piston heads, and a set of steam-ports one in excess of the number of piston-heads, a sliding steam-operated abutment and a rocking valve for each set of ports, and means for operating said valves comprising a link pivotally connected to the valve and having a tooth upon each side of the outer end thereof, a revolving toothed wheel adapted to engage one of the teeth on the bar or link to reciprocate the same, a spring attached thereto for securing its return, a slide engaging the opposite tooth on the bar or link to retain the valve in its open position and a revolving cam-wheel engaging said slide to release the

valve-link, and means whereby the said releasing cam-wheel may be shifted on its shaft so as to release said link earlier or later, substantially as described.

7. A rotary engine, provided with a cut-off mechanism for rocking valves, said cut-off mechanism comprising a rocking valve provided with a spring-pressed crank-arm on its stem, a bar pivotally connected with said crank-arm and having inwardly and outwardly projecting hooks, a continuously-revolving toothed wheel adapted to engage the inwardly-projecting hook, and a toothed wheel having a continuous rotary motion and adapted to trip said bar and release the outwardly-extending hook, substantially as shown and described.

8. A rotary engine, provided with a cut-off mechanism for rocking valves, said cut-off mechanism comprising a rocking valve provided with a spring-pressed crank-arm on its stem, a bar pivotally connected with said crank-arm and having inwardly and outwardly projecting hooks, a continuously-revolving toothed wheel adapted to engage the inwardly-projecting hook, a toothed wheel having a continuous rotary motion and adapted to trip said bar and release the outwardly-extending hooks, and means, substantially as described, for turning the last-named toothed wheel in addition to its regular turning movement, to change the position of its teeth relatively to the bars, as set forth.

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Witnesses:

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D. S. MILLS.