

No. 610,084.

Patented Aug. 30, 1898.

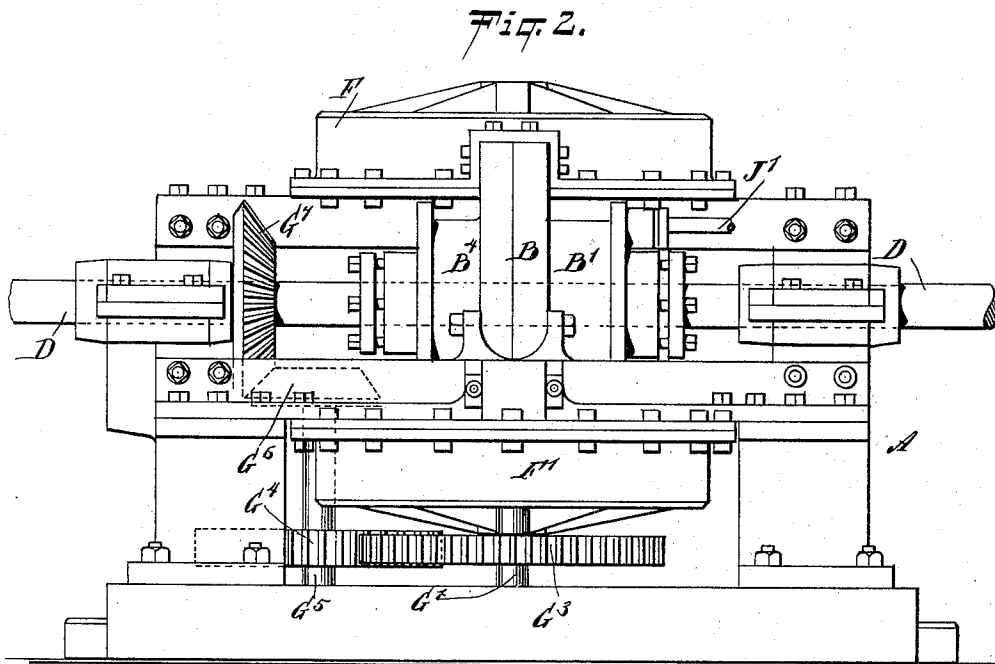
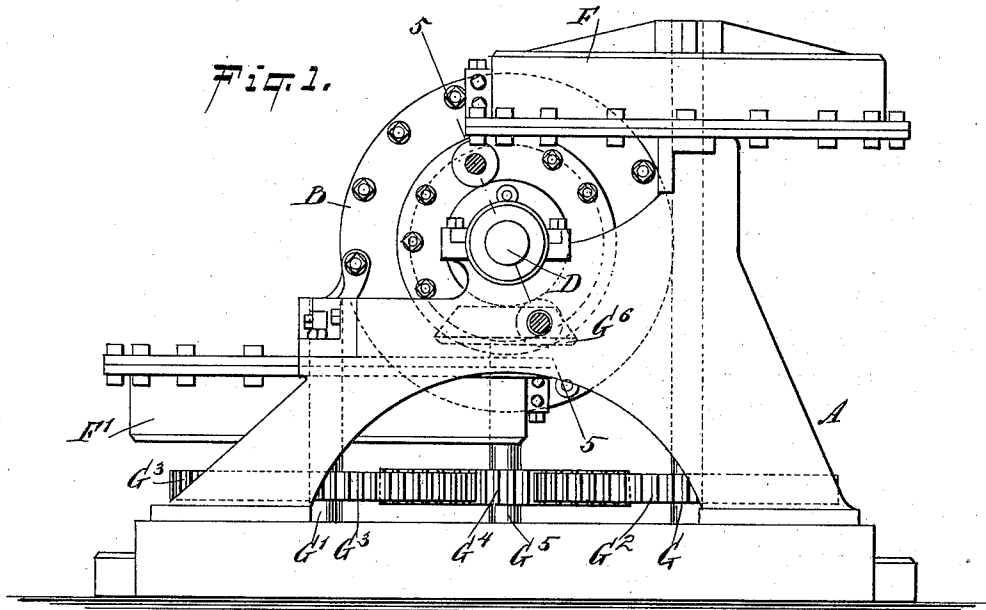
F. M. RICHARDS & H. M. FORBES.

ROTARY ENGINE.

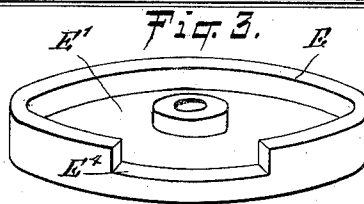
(Application filed July 16, 1897.)

(No Model.)

2 Sheets—Sheet 1.



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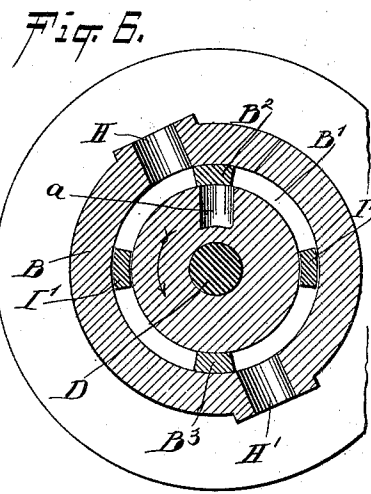
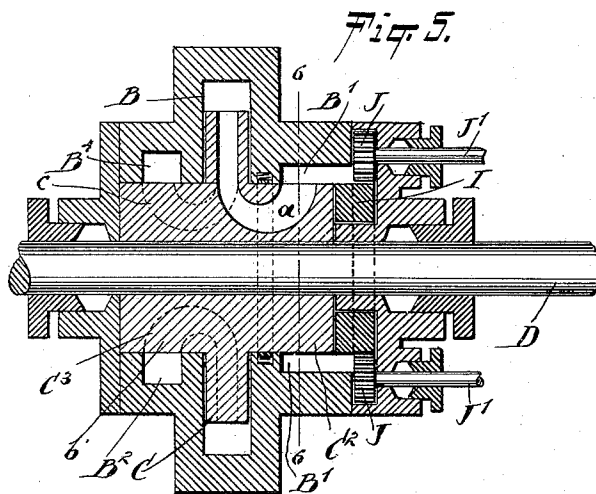
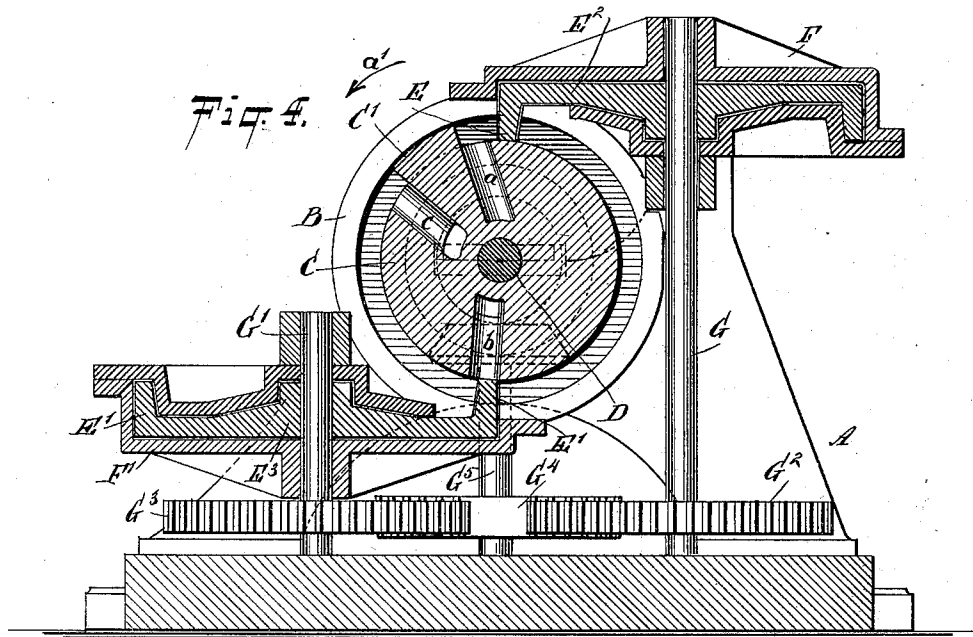
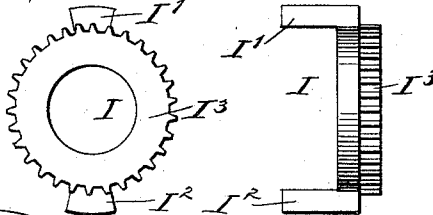


Fig. 7.

Fig. 8.



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UNITED STATES PATENT OFFICE.

FRED M. RICHARDS AND HENRY M. FORBES, OF PORTAGE, WISCONSIN,
ASSIGNORS OF ONE-THIRD TO GEORGE E. YORK, OF SAME PLACE.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 610,084, dated August 30, 1898.

Application filed July 16, 1897. Serial No. 644,748. (No model.)

To all whom it may concern:

Be it known that we, FRED M. RICHARDS and HENRY M. FORBES, both of Portage, in the county of Columbia and State of Wisconsin, 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 arranged to utilize the motive agent to the fullest advantage and to reduce the working parts of the engine to a minimum.

The invention 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 an end elevation of the improvement. Fig. 2 is a side elevation of the same. Fig. 3 is a perspective view of one of the abutments. Fig. 4 is a cross-section of the improvement. Fig. 5 is a sectional side elevation of the cylinder on the line 5 5 of Fig. 1. Fig. 6 is a cross-section of the same on the line 6 6 of Fig. 5. Fig. 7 is a face view of the valve, and Fig. 8 is a side elevation of the same.

The improved rotary engine is mounted on a suitably-constructed frame A, supporting a cylinder B, in which revolves a piston C, having a piston-head C' and secured on the main driving-shaft D, journaled in suitable bearings arranged on the main frame A.

Into the working chamber of the cylinder B extend one or more abutments E E', preferably arranged diametrically opposite each other, as is plainly indicated in Fig. 4, each abutment being mounted to revolve through a suitable cut-out portion or slot formed in the cylinder B, suitable packings being provided to render the joint between the abutments and the cylinder steam-tight. The abutments E E' are in the form of annular flanges on disks E² E³, respectively, mounted to revolve within suitable casings F F', respectively, carried by the main frame A.

The disks E² E³ are secured on vertically-disposed shafts G G', respectively, journaled in suitable bearings in the main frame A and

the said casings F F', and on the said shafts are secured gear-wheels G² G³, in mesh with a gear-wheel G⁴, fastened on a vertically-disposed shaft G⁵, journaled in suitable bearings in the frame A and connected at its upper end by a beveled gear-wheel G⁶ with a beveled gear-wheel G⁷, attached to the main driving-shaft D. Thus when the main shaft D is rotated a rotary motion is transmitted by the gear-wheels G⁷ G⁶ to the shaft G⁵, which by the gear-wheel G⁴ and gear-wheels G³ G² imparts a simultaneous rotary motion to the shafts G G', so that the disks E² E³ and the abutments E E', carried by the said disks, are rotated.

In order to let the piston-head C' pass the abutment at the proper time, we form each of the said abutments with a recess E⁴, as is plainly indicated in Fig. 3, it being understood that the said recesses of the two abutments are located approximately diametrically opposite each other. When the piston-head C' approaches one of the abutments, the corresponding recess E⁴ is at that time in the working part of the cylinder to allow the said piston to pass through the abutment at the recess.

On one side of the cylinder B is formed an annular steam-chest B', connected at diametrically opposite points with steam-inlets H H', deriving their supply of motive agent from a boiler or other source. In the steam-chest B' is mounted to oscillate a valve I, formed with arms I' I², located diametrically opposite each other and extending into the said steam-chest B', as is plainly indicated in Fig. 6. Fixed abutments B² B³ likewise extend into the said steam-chest B' at points at right angles to the arms I' I², the said abutments being located adjacent to the inlets H H', as plainly indicated in Fig. 6.

The interior of the steam-chest B' is connected by an inlet-port a in the piston C with the interior or working chamber of the cylinder B, (see Fig. 5,) so that live steam from the said steam-chest can pass into the cylinder whenever the said port is uncovered by the abutments B² B³ and arms I' I². Exhaust-ports b c are likewise formed in the piston C and serve to connect the interior or working chamber of the piston B with an exhaust-

chest B⁴, formed on the side of the cylinder B directly opposite to that on which the inlet-chest B' is located. The exhaust B⁴ connects with an exhaust-pipe leading to the

5 outer air.

Now in order to shift the valve I said valve is provided with a gear-wheel I³, in mesh with pinions J, secured on stems J', passing through suitable stuffing-boxes held on the cylinder
10 B at the outside thereof, so as to be under the control of the operator. By the arrangement described a rotary motion can be given to the valve I, so as to move the arms I' I² into different positions relatively to the abutments
15 B³ B³ to cut off the steam sooner or later, as the case may be.

The operation is as follows: The steam entering the steam-chest B' passes through the port a into the cylinder between the piston-
20 head C' and the corresponding abutment E or E' to press on the said piston, so as to rotate the same in the direction of the arrow a'. (Shown in Fig. 4.) The steam in front of the piston-head C' passes through the exhaust-
25 port c or b into the exhaust-chest B⁴ and from the said exhaust-chest to the open air. As the piston C revolves in the cylinder a rotary motion is given to the main driving-shaft D, which transmits the motion to other ma-
30 chinery and at the same time rotates the abutments EE' by the means above described, so that the said abutments bring their cut-out portions or recesses E⁴ into the working chamber of the cylinder at the time the piston C' has to pass the corresponding abut-
35 ment.

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

40 1. In a rotary engine, the combination with a cylinder, and a piston mounted to turn in the cylinder and provided with a piston-head, of a revoluble disk mounted with its axis at right angles to the axis of the piston and hav-
45 ing an annular flange projecting at an angle from the disk and extending into the working chamber of the cylinder to form an abutment, said flange being cut away to permit the passage of the piston, substantially as de-
50 scribed.

2. In a rotary engine, the combination with a cylinder, and a piston mounted on a hori-
55 zontal axis to turn in the cylinder and provided with a piston-head, of a revoluble disk mounted on a vertical axis and having an annular flange projecting at an angle from the disk and extending into the working chamber of the cylinder to form an abutment, said flange being cut away for the passage of the
60 piston, substantially as described.

3. In a rotary engine, the combination with a cylinder, and a piston mounted on horizon-
65 tal pivots to turn in the cylinder, of two disks mounted at opposite sides of the cylinder on vertical pivots and having annular flanges projecting at angles from the disks and extending into the working chamber of the cyl-

inder to form abutments, said flanges being cut away for the passage of the piston, and means for operating the said disks from the
70 piston, substantially as described.

4. In a rotary engine, the combination with a cylinder provided with a steam-chest, and a piston mounted on horizontal pivots and pro-
75 vided with a piston-head, of disks mounted at opposite sides of the cylinder on vertical pivots and having annular flanges projecting at angles from the disks and extending into the working chamber of the cylinder to form
80 abutments, said flanges being cut away for the passage of the piston, means for operating the disks from the piston, and an oscillating valve in the steam-chest of the cylinder, sub-
stantially as described.

5. In a rotary engine, the combination with
85 a cylinder provided with a steam-chest on one side and an exhaust-chest on the other side, and a piston mounted on horizontal pivots in the cylinder, and provided with a piston-head and with ports leading from said chests to the
90 working cylinder, of disks mounted on vertical shafts at opposite sides of the cylinder, and having annular flanges projecting at angles from the disks, the flanges extending into the working chamber of the cylinder, and cut
95 away for the passage of the piston, gearing between the shafts of the disks and the piston, and an oscillating valve in the steam-chest of the cylinder, substantially as de-
scribed.

6. In a rotary engine, the combination of a
100 cylinder provided with an annular steam-chest having steam-inlets at diametrically opposite sides and provided with fixed and oppositely-arranged abutments, a piston in
105 the cylinder and having a port connecting the steam-chest with the cylinder and an oscillating valve in the steam-chest and provided with diametrically opposite arms ex-
tending between the fixed abutments, sub-
110 stantially as described.

7. In a rotary engine, the combination of a
cylinder provided with an annular steam-
chest having steam-inlets at diametrically
115 opposite sides and provided with fixed and oppositely-arranged abutments, a piston in the cylinder and provided with a port connecting the steam-chest with the cylinder, a valve arranged in the steam-chest and pro-
120 vided with diametrical arms extending between the fixed abutments and with a gear-wheel, and a pinion meshing with the gear-wheel of the valve and a stem secured to the pinion under the control of the operator, sub-
stantially as described.

8. A rotary engine, comprising a cylinder
having a central working chamber, a steam-
chest on one side and an exhaust-chest on the
130 other, the steam-chest being provided with fixed abutments, a piston mounted in the cylinder on a horizontal axis and provided with a piston-head and with ports leading from the chests into the working chamber, two disks
mounted on vertical shafts and arranged at

opposite sides of the cylinder and having annular flanges projecting at angles from the disks, the flanges extending into the working chamber of the cylinder to form abutments, and cut away for the passage of the piston, gearing for operating the disks from the piston, and an oscillating valve provided

with arms projecting into the steam-chest, substantially as herein shown and described.

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