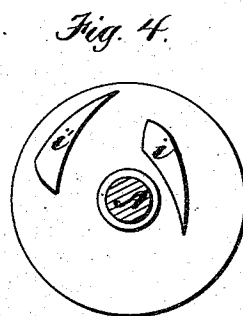
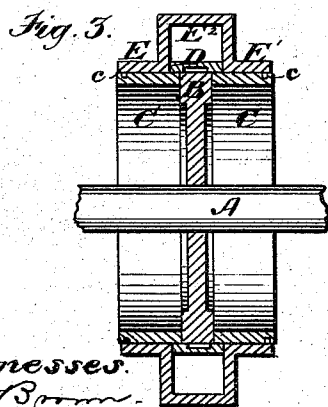
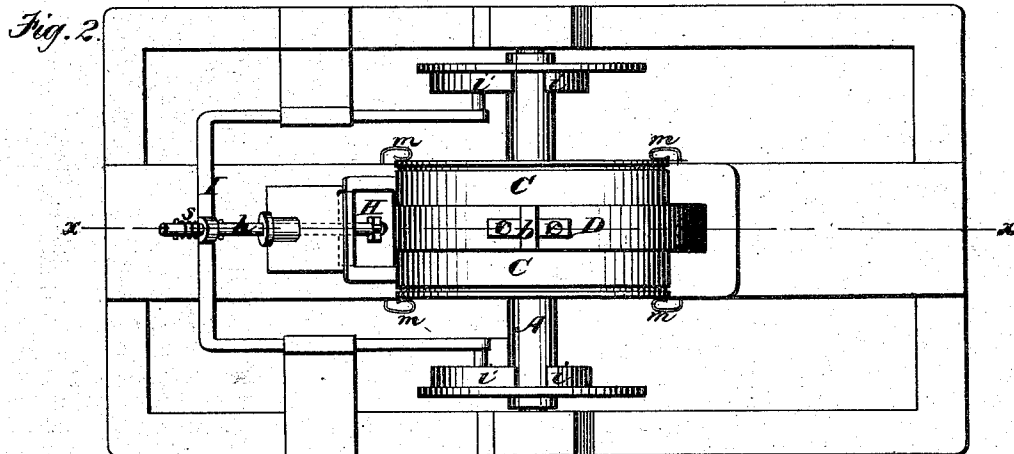
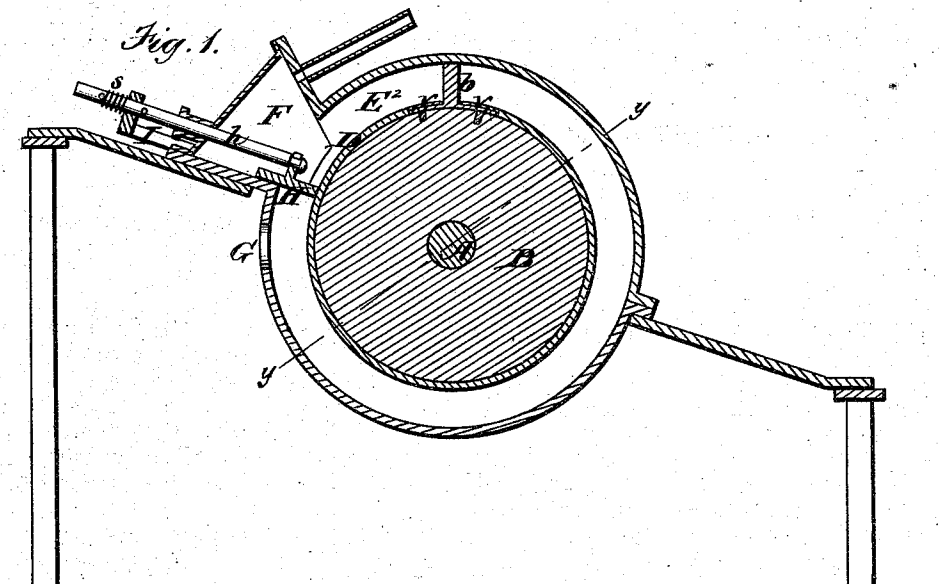


D. L. I. FLANDERS.
Rotary-Engines.

No.156,557.

Patented Nov. 3, 1874.



Witnesses.
 C. F. Brown.
M. Church

Inventor.
 D. L. I. Flanders.
 by his Attys.
Hart & Ellsworth

UNITED STATES PATENT OFFICE.

DAVID L. I. FLANDERS, OF STURGIS, MICHIGAN, ASSIGNOR OF ONE-HALF
HIS RIGHT TO JONATHAN W. FLANDERS, OF SAME PLACE.

IMPROVEMENT IN ROTARY ENGINES.

Specification forming part of Letters Patent No. **156,557**, dated November 3, 1874; application filed
August 11, 1874.

To all whom it may concern :

Be it known that I, DAVID L. I. FLANDERS, of Sturgis, in the county of St. Joseph and State of Michigan, have invented a new and Improved Rotary Engine; and I do hereby declare the following to be a full and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a section through line *x x*, Fig. 2. Fig. 2 is a top-plan view, with a portion of the casing removed. Fig. 3 is a section through line *y y*, Fig. 1. Fig. 4 is a view showing the arrangement of the cams, and Fig. 5 a section, showing a modification of the packing-ring.

Similar letters of reference in the accompanying drawings denote the same parts.

The object of this invention is to improve the construction and operation of rotary steam-engines, so as to enable them to economize the power of the steam to a greater degree than heretofore. To this end the invention consists, first, in the improved mode of constructing the steam-cylinder; secondly, in the improved mode of packing the steam-cylinder.

In the drawings, A represents the main shaft, running in any suitable bearings, and provided with a circular disk, B, firmly secured to it, the piston-head *b* being attached to the periphery of the circular disk in any suitable manner—as, for example, by means of flanges and screw-bolts *v v*. The edges of the disk B are carefully ground to a smooth surface, and to a perfectly-uniform thickness. C C are two rings of uniform diameter with the disk B, and fitting closely against it on either side, as shown in the drawings. The proximate edges of the rings are ground to form a steam-tight joint with the lateral surfaces of the disk B. D is a strap or band, sufficiently wide to cover the convex surface of the disk B, and lap over upon the surface of rings C C on either side of said disk. The ends of this band abut against the piston-head *b*, so that it rotates therewith, and forms a steam-tight packing over the joints, between the rings and disk B. This packing-band is, preferably, somewhat thinner at the middle than at the edges, as shown in Fig. 3, for the purpose of reducing its friction to a

minimum. The rings C C, which I have described, form the inner wall of the steam-cylinder, the outer wall being shown at E E', and being constructed in any suitable manner, so as to fit closely around the peripheries of the rings, and contain a suitable annular steam space or chamber, E², for the piston-head to revolve in.

The live steam enters the space or chamber directly from the steam-chest F, and exhausts at G. H is an abutment, which is held against the outer surface of the band D, except when the piston-head is passing, at which time it is thrown back by a sliding yoke, I, operated by a cam or cams, *i*, upon the main shaft. As soon as the piston-head passes the point where the abutment is located, other cams *i'* operate to return the abutment to its former position.

The abutment may be made to bear upon the band with yielding pressure, if preferred; and for that purpose the stem or rod *h* which controls the abutment is represented in the drawing as provided with a small spring, *s*.

The operation of this engine is as follows: After the piston-head passes the abutment, and the latter returns to its position in contact with the band D, the steam, which had previously been cut off at any suitable point, is admitted from the steam-chest directly into the space between the abutment and the piston-head, and acts directly upon the latter, causing it to turn the disk B and the shaft A, the exhaust being always open, so that there is no dead steam to impede the movement of the piston. At any suitable point in the revolution of the piston the steam may be cut off, so that during the remainder of the revolution the piston will work by expansion alone. The steam in the space E² operates to hold the band D slightly down upon the rings C C, and prevent any escape of steam through the joints at the edge of the disk B.

The joints between the rings C and the outer walls E E' may be packed, in the ordinary manner, by any suitable packing, arranged in grooves *c c*, or otherwise.

The rings C C are not intended to revolve, and in engines of great power, if the friction

of the band D tends to make them revolve, such movement may be prevented by forming either a projection upon or a slot in their outer edges, and causing the same to engage with a corresponding slot or projection at the outer edge of the fixed wall E E', or by means of flanges and bolts, or other suitable fastening. They are, however, intended to be capable of a slight movement longitudinally of the shaft, and they are both pressed toward the disk B by a series of springs, *m m*, attached to the fixed walls E E', and bearing against their outer edges. They are thus held with a yielding pressure against the smooth surface of the disk B. It is, therefore, obvious that, if the joints between the rings and the disk B, or between the rings and the band D, should not happen to be ground to a perfectly steam-tight connection, the operation of the engine would soon grind the parts to a tight joint.

I do not intend to confine myself exclusively to the employment of the apparatus which I have described for operating the movable abutment, as the latter may be operated by many different mechanical contrivances which would readily suggest themselves to any practical engineer, and I have not shown the means for cutting off and letting on the steam, and for varying the cut-off, as many devices for that purpose are in common use, and can readily be adapted to this form of engine.

I have shown in the drawings no mode of reversing the engine, but this can be easily accomplished by arranging another live-steam port and movable abutment at a suitable point in the cylinder, to let in steam in front of the piston, and applying the ordinary valve-gear for that purpose.

In small engines the band D may be omitted if the other parts are carefully ground so as to prevent the escape of the steam, but in large engines the band will be found essential. Instead of this band being constructed to bear

at its edges upon the rings, and to arch over the edge of the disk, it may, if preferred, be constructed with an intermediate rib or flange, bearing upon the periphery of the disk B, or in small engines it may be constructed of uniform thickness, although the arched form shown in Fig. 3 is preferable.

In small engines it is possible to construct the disk B to bear directly against one side of the fixed wall E E', and to apply the movable ring only on the other side of the disk. This construction, however, is inferior to that shown in the drawing, and, if employed, I regard it as the mere equivalent thereof.

This engine has been carefully tested, by practical use, for business purposes, and by comparing its results with the results obtained from a reciprocating engine fed by the same steam at the same power, it is found to effect a saving in the power of the steam to a very remarkable degree.

I claim as my invention—

1. In rotary steam-engines, a steam-cylinder having an outer fixed wall, E E', and an inner wall composed of adjustable rings C C, substantially as described.
2. The combination of the outer wall E E', the disk B, supporting the piston-head, and the independent rings C C, adapted to bear against the sides of the disk B, with a yielding pressure, substantially as and for the purposes described.
3. The springs *m m*, combined with the rings C C, wall E E', and disk B *b*, substantially as and for the purposes described.
4. The band D, combined with the rings C C, and disk B *b*, substantially as and for the purposes described.

DAVID L. I. FLANDERS.

Witnesses:

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