G. T. ELLIS.

Rotary-Engines.

No. 161,218. Patented March 23, 1875.

Fig. 1

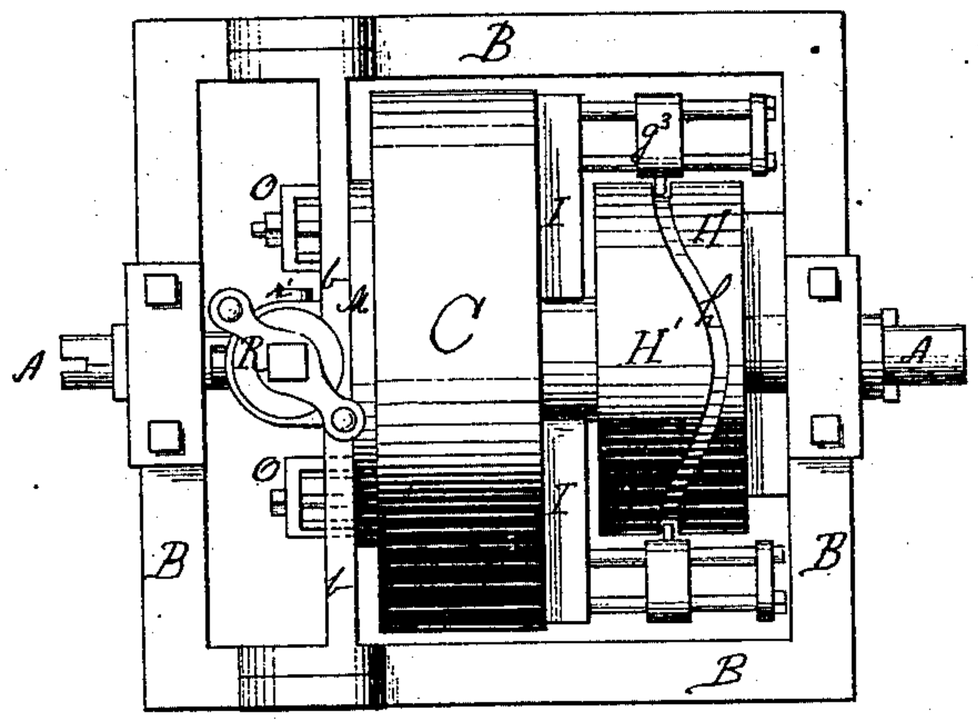


Fig. 4

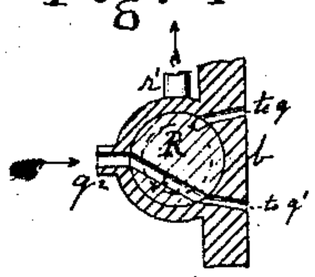


Fig. 5

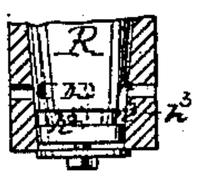


Fig. 2

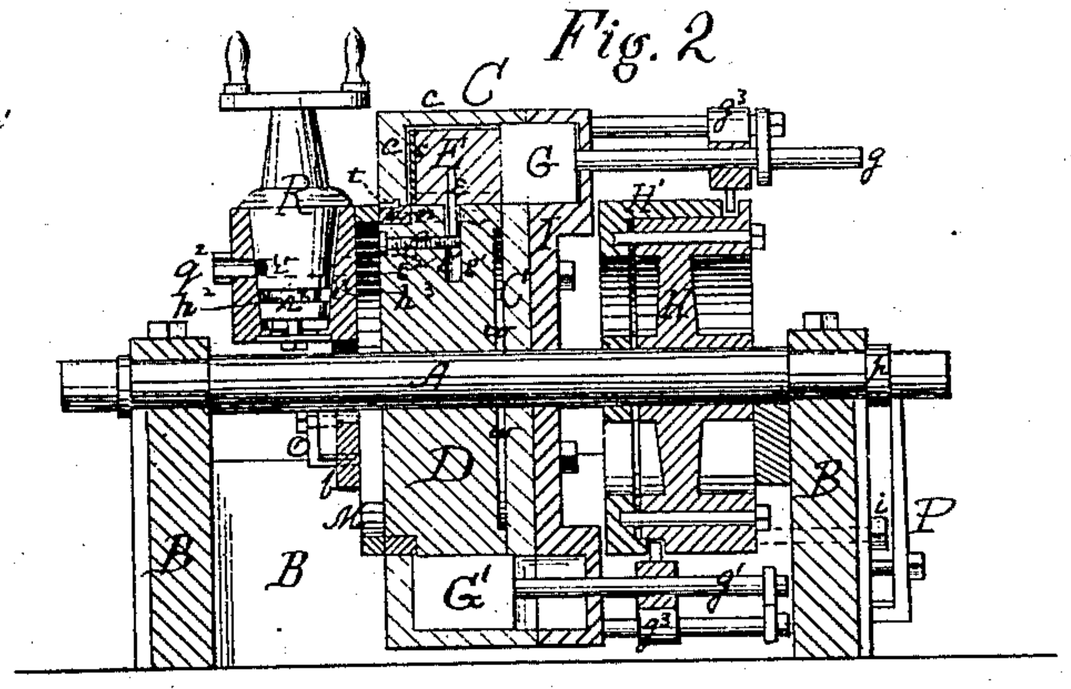


Fig. 3

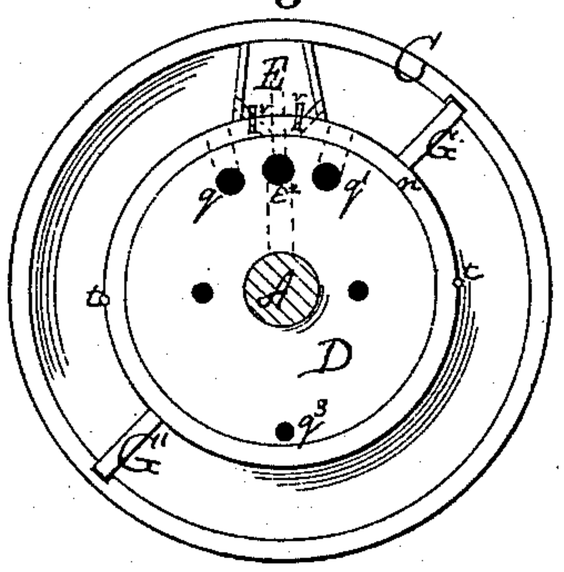


Fig. 6

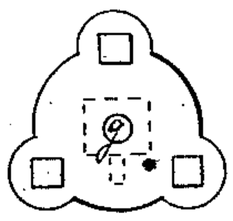
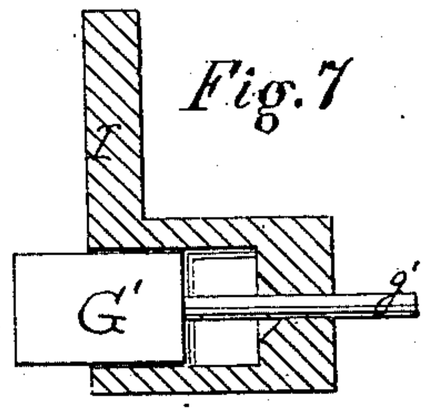


Fig. 7



WITNESSES

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UNITED STATES PATENT OFFICE.

GEORGE T. ELLIS, OF OSWAYO, PENNSYLVANIA, ASSIGNOR OF ONE-HALF HIS RIGHT TO H. LORD, OF SAME PLACE.

IMPROVEMENT IN ROTARY ENGINES.

Specification forming part of Letters Patent No. **161,218**, dated March 23, 1875; application filed January 26, 1875.

To all whom it may concern:

Be it known that I, GEORGE T. ELLIS, of Oswayo, in the county of Potter and State of Pennsylvania, have invented certain new and useful Improvements in 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 top-plan view; Fig. 2, a longitudinal vertical section; Fig. 3, a vertical cross-section, showing the rear side of the stationary center D; Fig. 4, a horizontal section of the plug-valve; Fig. 5, a vertical section of the same; Fig. 6, an end view of the parts that support the engine-valve rods, and Fig. 7, a detached section, showing the construction of the valves and valve-seats.

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

This invention has for its object to improve the construction of rotary engines, and relates particularly to that class of rotary engines in which an annular steam-chamber or cylinder is made to rotate around the periphery of a fixed circular disk.

The invention consists, first, in constructing said rotating cylinder in one piece to render it thoroughly steam-tight, and increase its strength; it consists, second, in an improved mode of packing the joints between the rotating and the fixed parts; thirdly, in a new construction of the abutment; fourthly, in a new mode of packing the abutment; fifthly, in a new construction of the valve-seats to prevent the jarring and wearing of the valves when in operation; and, sixthly, in a new arrangement of the steam ports, passages, and valve, all substantially as I will now proceed to set forth.

In the drawings, A represents the engine-shaft supported in suitable bearings in the bed-plate or frame B of the engine. D represents a stationary center or circular solid disk, bolted to a cross-beam, *b*, of said frame, with the shaft passing through its center. C represents the revolving cylinder attached to and rotating the shaft, and provided with a heavy flange, *c c*, which embraces the periphery of the stationary center, and in the concave face of which is formed an annular groove or cavity that constitutes the steam-chamber of the engine. E represents the abutment which is constructed independently of the center D and cylinder C, and is held in place by means of a pin, *e*, supported in a hole, e^1, in the center D, by a screw e^2. G G′ are the sliding engine-valves; *g* g^1, the valve-stems; g^2 g^2, guide-rods; H H′, a circular cam secured to the frame in any suitable manner, as by a bolt, *i*, and provided with a circumferential groove, *h*, for operating the engine valves; g^3, a block attached to the valve-stem, carrying a pin which projects into the cam-groove *h*; H′, a portion of the cam, made adjustable in order to vary the width of the cam-groove to compensate for the wear of the pins which work therein; I, a stout bar secured to the outer end of the cylinder C, and provided with enlarged extremities in which are recesses to receive the engine-valves when they are retracted by the cam; *n*, a packing-ring inserted in a rabbet around the outer edge of the stationary center, between the center and the surrounding cylinder, so as to bear against the shoulder of the rabbet and at the same time to rotate with the cylinder, to which it is secured by an embedded key or spline, *t*, having its end hooked into the cylinder or packing-ring so as not to work out; M, another ring, pressing against the inner ring *n*, as shown in Fig. 2; O O, stout springs, adjustably secured to the cross-beam *b*, and pressing with great force against the outer ring M, whereby it presses the inner ring to a tight joint with the shoulder of the fixed center, and causes the joint to wear tighter the longer the engine runs; P, another stout spring, supported by the bed-plate or frame, and bearing against a collar, *p*, on the shaft A, by which it presses the face or circular end of the cylinder C firmly against the face of the stationary center, and causes the two faces to wear to a tight joint; and R, a plug-valve, through which, by means of a cross-passage, *r*, the live steam is admitted from the pipe q^2 to the ports *q* or q^1, accordingly as the valve is turned in one direction or another, and through which, also, the

exhaust steam is allowed to escape by means of an exhaust-opening, r^1, through the valve communicating with an annular groove, r^2, around one side of the valve, and a vertical recess, r^3, in the side next to the ports q q^1, which, by turning the valve to let the live steam into one port, is always brought into such a position as to open the exhaust-passage from the other port.

A piece of thin sheet or plate metal of suitable character is placed behind the abutment, as shown at *s*, and its ends are bent around the sides of the abutment, to hold it in position, for the purpose of packing the joint at that point, and preventing the escape of steam around the abutment. One or more thin narrow strips of sheet or plate metal, *v v*, are inserted into grooves cut in the under side of the abutment, and in the convex surface of the fixed center, for the purpose of further packing the abutment. The abutment rocks loosely on the pin *e*, so as to adjust itself easily to the walls of the steam-chamber, and avoid undue friction, wearing, or binding therein.

To prevent the rattling and jar of the valves G G′ as they play back and forth while the engine is at work, I cause them to slide in grooves made a little wider and higher than the valves themselves, and a little longer than the path traveled by the valves, so that they can slide easily without undue friction, and so that the cam H H′ will arrest their movement before their ends strike against the walls of the chamber in which they operate. The pressure of the steam against their sides will set them against the sides of the grooves, so as to insure a perfectly tight joint, which will wear tighter the longer the engine is used.

The springs O are constructed in the form of the letter U, and placed over the cross-beam *b*, on each side of the shaft, with their ends abutting firmly against the ring M. A screw-bolt passing through their center into the cross-beam affords means for tightening them up, as may be desired. By causing them to bear against the packing-ring at different points, they hold it more rigidly and evenly in place. The front face of the fixed center D is made concave around the shaft A, as shown at *w*, so that the cylinder C will press more closely against its lateral edges, and wear to a better joint.

The construction of the parts above referred to is as follows: The cylinder C is cast or constructed in a single piece, for purposes of greater strength, and to prevent leaking, and is placed on a lathe, and a recess or groove is cut in the concave face of its flange *c*, to serve the purposes of a steam-chamber. The abutment is then placed in the lower side of said steam-chamber, the pin *e* is dropped into the deep pin-hole in the fixed center, the fixed center is placed in position and turned bottom up to allow the pin *e* to drop into the hole provided for it in the abutment, the screw e^2 is inserted to keep the pin in position, and the fixed center is turned back to its proper position; the pin or key *t* is inserted in the ring *n*, and both are placed in the rabbeted recess between the edge of the flange *c* and the solid face of the fixed center; the outer ring M is placed upon the projecting end of the fixed center, the fixed center is bolted to the cross-beam *b*, and the springs O O are secured and adjusted so that each bears upon the outer ring, pressing it and the inner ring firmly into place, and making the joint on that side of the fixed center steam-tight. The valves G G are then inserted in their respective recesses, and the plate I is bolted to the cylinder, the cam and connected parts being properly attached. The spring P is then secured to the frame, so as to hold the cylinder tightly against the fixed center, and make the joint steam-tight on that side. The plug-valve is inserted and secured by the screw at its lower end, as shown in Fig. 2, and the engine is ready for operation.

I claim as my invention—

1. A rotary engine having a revolving cylinder, C, constructed in one piece, combined with the fixed center D and independent abutment E, substantially as and for the purposes set forth.

2. In combination with the fixed center D and rotary cylinder C, the inner packing-ring *n*, working in a rabbet of the fixed center, and the outer ring M, held against the inner one by adjustable springs O, substantially as described.

3. The combination of the independent abutment E, with the center D, secured by means of the pin *e* in the elongated recess *e′*, substantially as and for the purpose described.

4. The independent abutment E, combined with the sheet or plate metal packing *s*, applied around the rear wall and sides of the abutment in the cylinder C, substantially as described.

5. The independent abutment E, combined with the packing-strips *v v*, held in grooves or recesses in the proximate faces of the abutment and cylinder, substantially as described, to prevent steam from passing under the abutment.

6. The springs P, combined with the shaft A, the cylinder C, and the fixed center D, substantially as described, for the purpose specified.

7. The plug-valve R, having the cross-way *r*, the circumferential recess r^2, and vertical recess r^3, combined with the steam-pipe q^2, exhaust r^1, and ports or passages q q^1, substantially as and for the purposes set forth.

8. The combination of the fixed part H and the adjustable plate H′, composing the cam, substantially as and for the purposes set forth.

GEORGE T. ELLIS.

Witnesses:
M. CHURCH,
L. HILL.