J. JARDINE.
Rotary-Engine.

No. 207,968. Patented Sept. 10, 1878.

Fig 1.

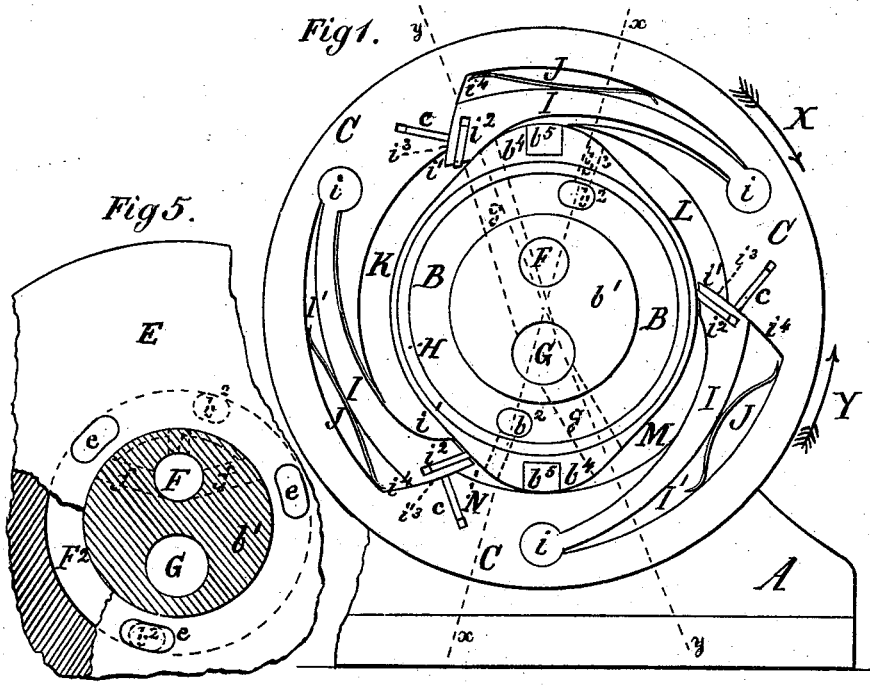


Fig 4.

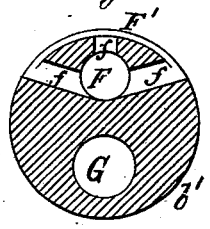


Fig 5.

Fig 2.

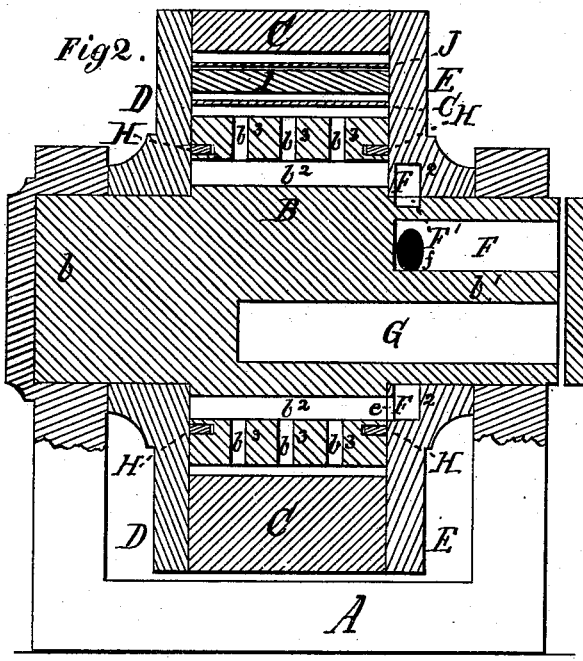
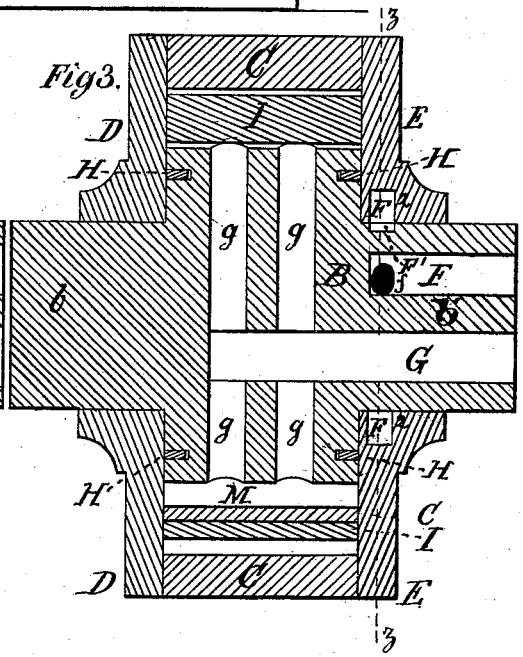


Fig 3.



Witnesses.
J. P. Th. Lang
James Martin Jr.

Inventor.
John Jardine
by
Mason, Fenwick & Lawrence
his Attorneys

UNITED STATES PATENT OFFICE.

JOHN JARDINE, OF GLASGOW, SCOTLAND, GREAT BRITAIN, ASSIGNOR OF ONE-HALF HIS RIGHT TO CURTIS O. LUCE, OF BRANDON, VERMONT.

IMPROVEMENT IN ROTARY ENGINES.

Specification forming part of Letters Patent No. **207,968**, dated September 10, 1878; application filed January 24, 1878.

To all whom it may concern:

Be it known that I, JOHN JARDINE, of Glasgow, Scotland, Empire of Great Britain, have invented a new and useful Improvement in Rotary Engines, which improvement is fully set forth in the following specification and accompanying drawings, in which latter—

Figure 1 is an elevation of my improved rotary engine, from which the revolving end plate containing the induction-ports has been removed to fully exhibit the inner mechanism of the engine. Fig. 2 is a longitudinal central section of the whole engine in the line *x x* of Fig. 1. Fig. 3 is a similar section in the line *y y* of Fig. 1, the standard-frame being omitted. Fig. 4 is a transverse section of a trunnion containing the steamways of the stationary piston. Fig. 5 is a detail view of the end plate containing the induction-ports and a transverse section along its face and through the supporting-trunnion.

The nature of my invention consists in certain constructions, combinations, and arrangements of parts, hereinafter fully described and specifically claimed, whereby a rotary engine is produced which has a stationary piston, which forms abutments for the steam, and a revolving cylinder with swinging abutments, and which engine combines many advantages not found in other rotary engines, as will be hereinafter seen.

In the drawings, A represents a supporting-frame; B, an oval-shaped piston, having two trunnions, *b* b^1, which are firmly secured in the said frame. C is a revolving cylinder, having removable end plates D E, which revolve around the trunnions *b* b^1 and keep the cylinder concentric with them. The trunnion b^1 has an induction-passage, F, and an eduction or exhaust passage, G. The passage F communicates by means of openings *f* with a chamber, F^1, on the periphery of the trunnion b^1, which chamber communicates with a circular chamber, F^2, in the end plate E. The end plate E has three equidistant ports, *e*, which by turns communicate with two stationary steam-passages, b^2, of the piston B, whence the steam is conducted into the working steam-chamber by means of ports b^3. Below the induction-passage F an exhaust-passage, G, extends longitudinally through the trunnion b^1 and a suitable distance into the piston B, and there branches off laterally into a number of exhaust-ports, *g*. The exhaust-ports *g* are arranged on the off side of the steam-abutments b^4 of the piston B, while the receiving steam-ports b^3 are on the abutting side. The vertex of each abutment is provided with a packing-strip, b^5, of suitable material. The ends of the piston B are provided with concentric packing-rings H, which are caused to pack the joints either by steam or other means.

At three equidistant points the cylinder C is provided with swinging abutments I, which have cylindrically-formed end bearings *i* fitted to similar seats in the metal of the cylinder, and which swinging abutments thereby are enabled to articulate and swing back and forth in recesses I′, which are provided in the cylinder. The free ends of the swinging abutments I are provided with downward-projecting heads i^1 and packing-strips i^2, and their abutting surfaces i^3 are concentric with their fulcrums *i*. The corresponding end surfaces i^4 of the recesses I′ are of the same shape as the abutting surfaces i^3, and the two surfaces are very accurately fitted to each other. Three packing-strips, *c*, of suitable construction, are inserted into the cylinder C, and at a right angle or thereabout to the abutting surfaces i^3, to prevent leakage of steam there and at the fulcrums *i*, which latter are firmly kept in their bearings by the lateral pressure of the said packing-strips. To prevent the lifting of the swinging abutments I by the steam they are provided with pressure-springs J of sufficient strength to resist such action.

Operation: Steam is admitted into the passage F, which, by means of the ports *f*, enters the concentric chamber F^2 and keeps it filled. In Fig. 1 the portion N of the steam-chamber is ready to receive steam, and its supplying-passage b^2 is just opposite one of the revolving supply-ports *e*. The steam thereby enters the portion N of the steam-chamber, and impinges upon the abutment I, which it forces off toward the next exhaust-port *g*. Before it arrives there the preceding valve I has passed over the abutment b^4 and the steam-port b^3, and one of the ports *e* begins to move over the upper passage, b^2, and supplies steam between the said upper abutment and the said valve,

When the first-described abutment I arrives at the upper exhaust, *g*, the second or preceding abutment is at the middle of its stroke, and the third valve becomes now active in the same manner the first one has been, and the described action of the abutments now is repeated over and over, turning the cylinder B in the direction of the arrow X. By making the ports *e* shorter or longer the engine will work with more or less expansion.

It will be noticed that the supply and exhaust ports open in the swells or slopes of the abutments, and not in the cylindrical surface of the piston, the consequence of which is that before the steam begins to exhaust, as from portion K of the steam-chamber in Fig. 1, the swinging abutment operated thereby has partly receded into its recess I′, and the pressure upon it has been considerably reduced, so that the exhaust begins without the shock generally experienced when steam is suddenly discharged while operating a fully-exposed abutment.

The cylinder may be provided in a proper manner with a cog-wheel or pulley to drive the line-shafting of a shop or other working machinery. If power is applied to the cylinder B, and the same is revolved in the direction of arrow Y in Fig. 1, the engine serves as a rotary pump for lifting water. In this case the action of the ports *g* b^3 and connecting-passages will be reversed. The water then enters through the passage G and is discharged from the passage F.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a rotary engine, a stationary piston having two abutments, and supply and exhaust ports b^2 b^3 *g* on opposite sides of each abutment, and exhaust and supply passages F G *f* in one of its trunnions, in combination with a revolving cylinder having three swinging abutments and a rotary steam cut-off with three steam-ports, *e*, in range with the supply-passages b^2 and ports b^3, substantially as hereinbefore set forth.

2. In a rotary engine, the combination of the piston B, having ports b^3 b^2 and passages F F^1 *f*, and the revolving steam-chamber, having ports *e*, substantially as set forth.

Witness my hand, in the matter of my application for a patent for a rotary engine, this 9th day of January, A. D. 1878.

JOHN JARDINE.

Witnesses:

THOS. ROSS,

HENRY F. FIELD.