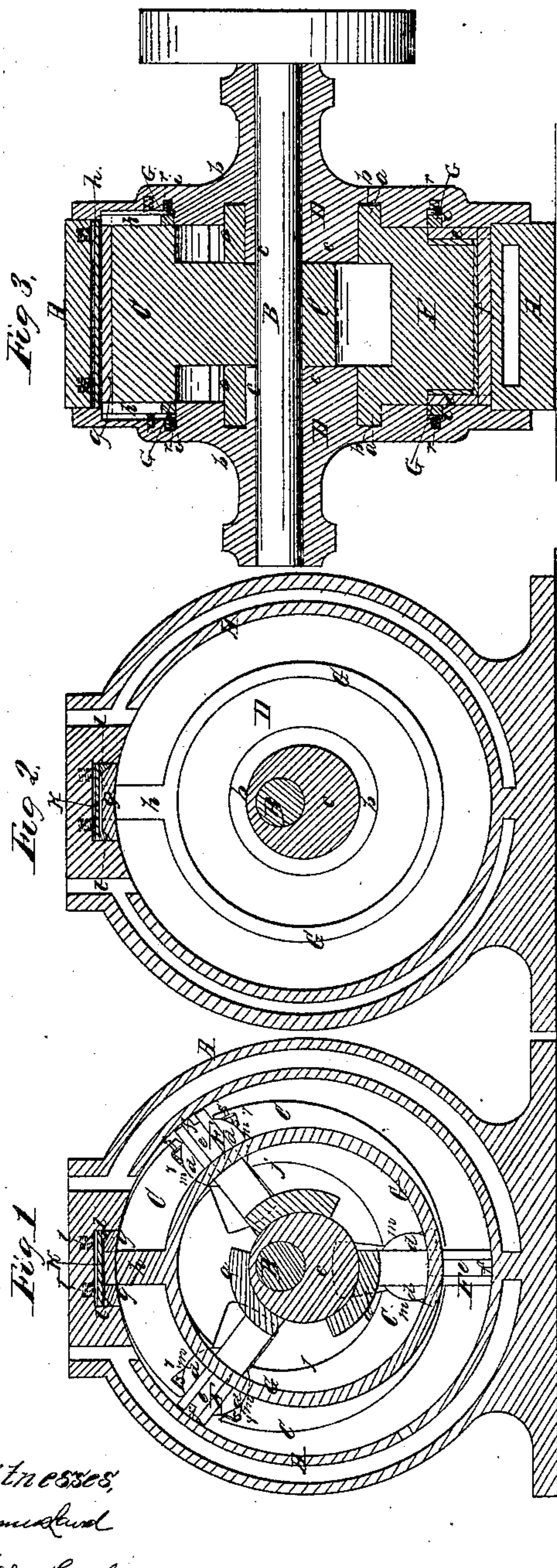


*J. B. Root,*

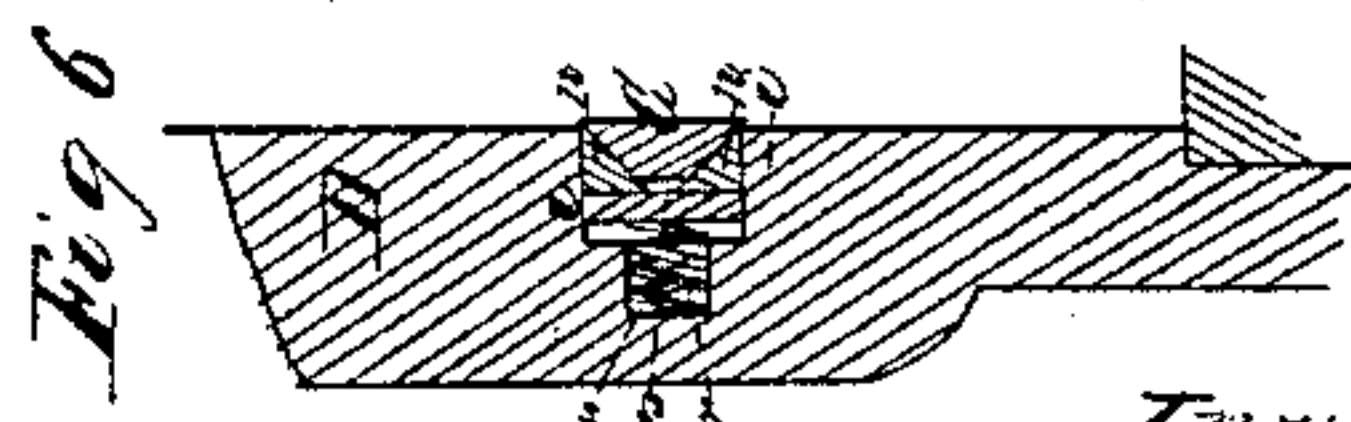
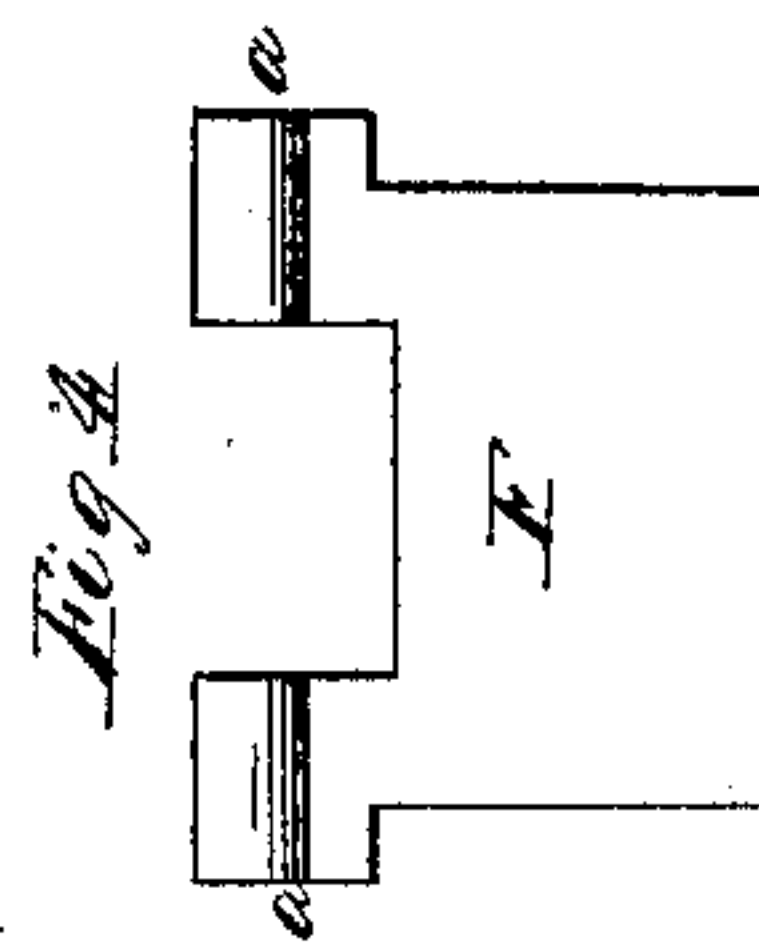
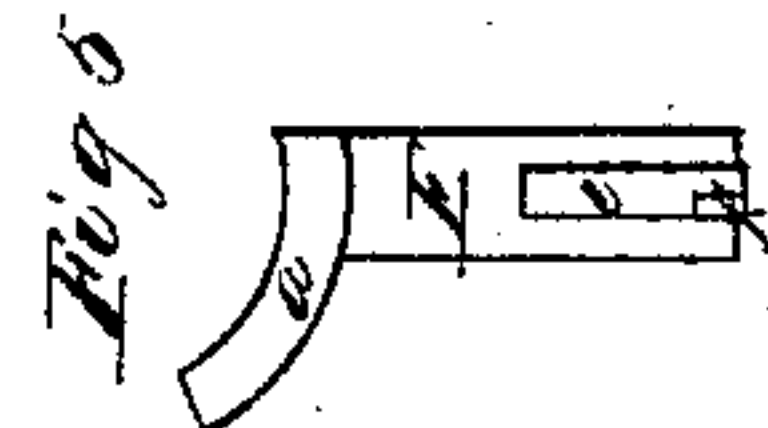
*Rotary Steam Engine.*

*N<sup>o</sup> 34,375.*

*Patented Feb 11, 1862.*



*Witnesses:*  
*James A. Root*  
*Robert A. Root*



*Inventor:*  
*John B. Root*



# UNITED STATES PATENT OFFICE.

JOHN B. ROOT, OF BATTLE CREEK, MICHIGAN.

## IMPROVED ROTARY ENGINE.

Specification forming part of Letters Patent No. 34,375, dated February 11, 1862.

*To all whom it may concern:*

Be it known that I, JOHN B. ROOT, of Battle Creek, in the county of Calhoun and State of Michigan, have invented certain new and useful Improvements in Rotary Engines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical section of the engine perpendicular to its axis of rotation and in such planes as to show most of the working parts. Fig. 2 is a similar section of the cylinder without any of the rotating parts of the engine but the main shaft. Fig. 3 is a vertical axial section of the engine. Fig. 4 is a face view of one of the pistons. Fig. 5 is an end view of the same. Fig. 6 is a transverse section of a portion of one of the cylinder-heads, showing the packing.

Similar letters of reference indicate corresponding parts in the several figures.

The first part of this invention relates to that description of a rotary engine whose inner rotating drum, to which the pistons are attached, is arranged eccentrically within the stationary cylinder; and it consists in a certain construction of packing-rings and mode of applying the same within the cylinder-heads, and in combination with the piston-drum, piston-packing, and cylinder abutment, whereby the steam is prevented passing the piston-drum and pistons.

The second part of the invention consists in a novel construction of and means for pressing out to proper contact with their opposed wearing-surfaces the aforesaid packing-rings or other packing-pieces employed in rotary engines, whereby the steam or other fluid is prevented from getting behind the said packing-rings or pieces after they have been allowed to be pressed out by the wear of their faces.

The third part of the invention consists in a mode of packing the oscillating segment-pieces described as fitting to the sliding pistons in my Letters Patent of April 30, 1861.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

A is the cylinder, B the main shaft, and C the piston-drum.

F F are the pistons, fitted to the drum with oscillating segment-pieces *d d* and furnished at their ends with arc-formed pieces *a a* to work on hubs *c c*, projecting from the interior of the cylinder-heads D D, and in circular grooves *b b* in the said heads D D, substantially as described in my Letters Patent of April 30, 1861. Said pieces *a a*, however, instead of being of equal length on each side of the piston, as shown in the drawings of these Letters Patent, are extended, as shown in Fig. 1, only in the direction in which the pistons rotate, that being the arrangement which I prefer for engines which are always required to work one way, while I prefer to have them extend equally on both sides, as shown in the drawings of the above-mentioned Letters Patent, in engines which are required to work both ways. The hubs *c c* may be fitted with loose sleeves, which may also be formed with flanges to line the grooves *b b*, such sleeves rotating with the pistons and relieving the pieces *a a* of wear, and being capable of easy removal and removal when worn.

The pistons are fitted at their sides with packing-strips *e e* and at their outer ends with packing-strips *f f* in the usual or any suitable manner, and the cylinder is fitted at the point where the piston-drum works in contact with it with a packing-piece *g*, constituting the abutment, the face of said piece *g* being of the form of an arc corresponding with the circle of the exterior of the drum.

G *h* G *h* are the packing-rings fitted to grooves *i i*, provided for their reception in the cylinder-heads, and having applied behind them within the said grooves springs *r r*, which tend to press them toward the sides of the piston-drum and pistons. The said rings have each a radial offset *h* from the side next to the abutment. The grooves *i i*, and consequently the packing-rings, are concentric with the cylinder, as shown in Figs. 1 and 2, and of such diameter as to cross the side packing-pieces *e e* of the pistons within the circle of the outer periphery of the piston-drum C, as shown in Fig. 1, and outside of the inner circles *j j* of the annular side faces of the piston-drum, as shown in the same figure, the diameter of the inner and outer circles of the said faces being properly proportioned to the diameter of the said rings to



permit the ring so to cross the packing-pieces *e e*. The offsets *h h* of the packing-rings enter mortises in the ends of the abutment-packing *g*. If the packing-rings themselves thus combined with the piston-packing *e e* and abutment *g* are made steam-tight to the grooves, no steam can pass the sides of the piston-drum, either opposite to the abutment or at any other point in the circumference of the drum.

In the sectional view of the packing-rings (shown in Fig. 3) the rings *G h G h* are shown of the simplest possible construction—that is to say, of quadrangular transverse section—and are merely fitted snugly into the grooves *i i*, which are of similar form, and the springs *r r* are shown applied directly to the rings themselves; but the construction of and means for pressing out the packing-rings shown on a larger scale in the transverse sectional view, Fig. 6, and which constitutes the second part of this invention, is much preferable, inasmuch as it prevents leakage of steam round the rings. In this view the ring *G*, made of cast-iron, has its interior and exterior circumferences so beveled as to give it a *V* shape, or nearly so, in its transverse section; but the groove *i* is of square form, but somewhat deeper than is necessary with the application of the ring shown in Fig. 3, and the angular spaces left between the ring *G* and the sides of the groove *i* are filled by rings *n n* of Babbitt metal or other soft metal or alloy, of a wedge form in their transverse section. Behind the three rings *G n n* there is placed a follower *p*, consisting of a thin ring of steel, wrought-iron, or other metal, and behind the follower are the springs *r*, which press it against the backs of the rings *n n*, but not against the ring *G*, which is, however, pressed outward from the groove by the pressure of *n n*, while at the same time the latter, owing to their wedge-like form, are made to wedge into the spaces between the ring *G* and sides of the grooves so tightly as to prevent leakage from between that ring and the groove. This construction of and means for pressing out the rings is applicable to the packing-strips of the pistons and to the various packings used in rotary engines—as, for instance, to the abutment-piece *g*—whose edges are shown beveled in Figs. 1 and 2 to form cavities for the triangular strips *t t*, corresponding with *n n*, and pressed against

the piece *g* by means of a follower *k*, and springs *l l*, like *i* and *r*.

The mode of packing the segment-pieces *d d*, constituting the third part of my invention, is illustrated in Fig. 1. This consists in cutting along the cylindrical seats *m m*, in which *d d* work, grooves of *V* shape or concave form in their transverse section for the reception of packing-pieces *s s* of soft metal of corresponding form and either drilling one or more holes *s' s'* from the outside of the said drum to the said grooves, or making the seats *m m* wide enough toward the outer periphery of the cylinder for the entrance of steam into said grooves in such manner as to force down the said segments into the angles *y*, formed between the back of the segment and the inner side of the groove. These packing-pieces are only necessary to the segments on that side of the pistons on which the steam acts, as the pressure of the steam upon the piston causes the piston to press the other segment tightly into its seat, but in engines for running both ways it is desirable to apply a packing-piece *s* to each segment.

I have described my improvements with particular reference to a steam-engine, but they are also applicable to rotary pumps of similar character.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The packing-rings *G h G h*, constructed with offsets and applied and arranged within the cylinder-heads and in combination with the drum *C*, piston-packing *e e*, and cylinder abutment *g*, substantially as and for the purpose herein specified.

2. The combination, with a packing-ring *G*, abutment-piece *g* or other packing-piece of *V* form or having beveled edges, as described, of triangular or wedge-shaped packing-pieces *n n* or *t t*, a follower *p* or *k*, and springs *r* or *l*, the whole arranged and operating substantially as herein specified.

3. The packing-pieces *s s*, applied in combination with the segment-pieces *d d* and with proper provision for the admission of steam behind them, substantially as and for the purpose herein specified.

JOHN B. ROOT.

Witnesses:

JAMES LAIRD,  
RICHARDSON GAWLEY.