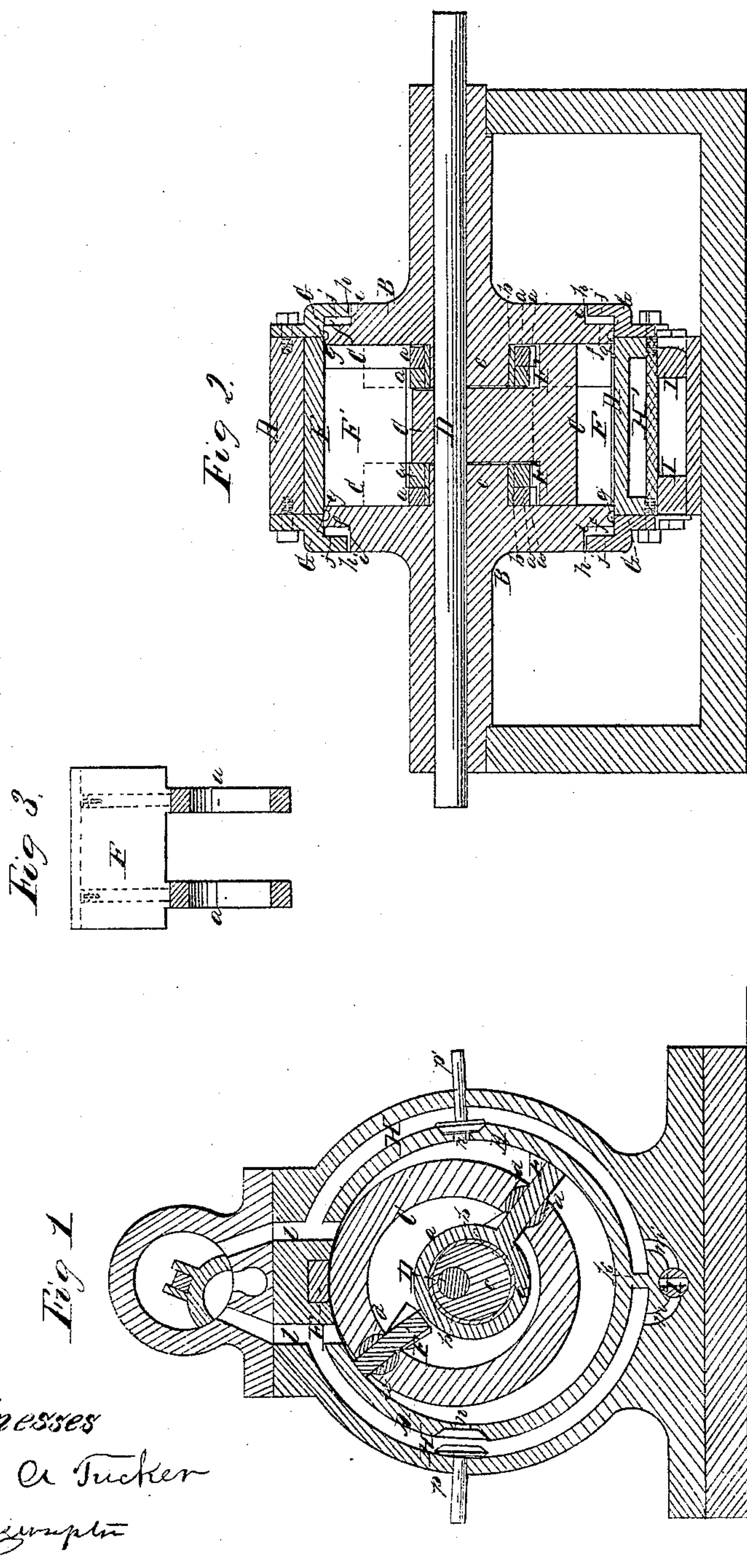


*J. B. Root.*

*Rotary Steam Engine.*

*N<sup>o</sup> 34,376.*

*Patented Feb 11, 1862.*



*Witnesses*  
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# UNITED STATES PATENT OFFICE.

JOHN B. ROOT, OF BATTLE CREEK, MICHIGAN.

## IMPROVED ROTARY ENGINE.

Specification forming part of Letters Patent No. 34,376, 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 in a plane parallel with the plane of revolution, of an engine with my improvements. Fig. 2 is an axial section of the same. Fig. 3 exhibits a face view of one of the pistons and section of its eccentric bands.

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

This invention relates to that description of rotary engine whose inner rotating drum, to which the pistons are attached, is arranged eccentrically within the stationary cylinder.

It consists in certain improved means of keeping the pistons out in contact with the inner periphery of the cylinder and radial to the center thereof in their revolution with the eccentric drum.

It also consists in an improved construction of and mode of applying and securing the cylinder-heads to the cylinder, whereby the pistons are prevented from binding in case of unequal expansion of the cylinder.

It also consists in a certain arrangement of a valve and stop, in combination with a steam-jacket round the cylinder to provide for the warming up and expansion of the cylinder before starting the engine, as well as for keeping the cylinder warm during the operation of the cylinder; and it further consists in a certain arrangement of exhaust-valves used in connection with such jacket to provide for the reversal of the engine.

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 bored truly and fitted at each end with a movable head B.

C is the rotating drum to which the pistons are attached, said drum being of cylindrical form and being secured firmly to the main shaft D, which is arranged to work in bearings in the cylinder-heads, the position of such bearings being so much eccentric to the

cylinder A that the drum C may work in contact with a packing-piece or stationary abutment E, which is fitted to a cavity formed for its reception in the inner periphery of the main cylinder.

F F' are the pistons fitted to the drum C with cylindrical segment-pieces *d d*, as described in my last Letters Patent, and having each firmly secured to it two rings *a a*, fitted with cylindrical linings *b b*, which are fitted to two cylindrical hubs *c c*, projecting inward from the cylinder-heads, one lining *b* serving for both or all the rings fitted to one hub. The hubs *c c* are eccentric to the shaft D and drum C, but concentric with the inner periphery of the cylinder, and consequently keep the pistons radial to the center of the cylinder and in contact with its inner periphery. The cylindrical linings *b b* can be taken out and replaced by new ones whenever it becomes necessary by their wear or the wear of the hubs *c c* or rings *a a*. The said linings are of great importance apart from their taking the wear, as by placing them in the rings before inserting the piston-drum in the cylinder the rings belonging to either hub are all kept opposite each other and enabled to be all put on or to receive their respective hubs without difficulty, whereas without them it would be very difficult to get the rings all on the hubs. The pistons F F' and their rings *a a* may be of cast-iron and the linings *b b* of brass or composition metal. The hubs *c c* may be cast on the cylinder-heads, which will be of cast-iron. The piston-drum C is hollowed out on each side, as shown at *e e* in Figs. 1 and 2, for the reception of the hubs *c c* and rings *a a*. The hubs *c c* and rings *a a* constitute a most effective means of keeping the pistons radial to and in contact with the inner periphery of the cylinder A, as besides having the greatest degree of stability and durability they provide for a very easy movement. The number of pistons that may be employed is not limited to two, but three, four, or more may be used.

The two cylinder-heads B B, instead of being rigidly secured to the cylinder in the manner common to rotary engines, have their peripheries turned to fit the interior of the cylinder A and are grooved and fitted with packing to keep them steam-tight therein, and they



have deep rabbets *f i f i* in the outer sides to enable them to be secured in their places by means of two rings *G G*, (see Fig. 2), which are bolted one to each end of the cylinder, the said rings having rabbets *g j g j* turned in their outer sides to correspond with the rebates *f i f i* and form continuations of the bore of the cylinder for the reception of portions of the packed peripheries of the cylinder-heads, and the openings *h h* of the said rings being large enough for the reception of the cylindrical portions *i i* of the rebates in the heads. One of the rings *G G* may be secured to the cylinder and the corresponding head put in from the inside of the cylinder before the piston-drum is put in; but the other one cannot be put in until after the piston-drum, and its ring *G* cannot be put on the cylinder till after it has been placed therein. As a substitute for one of the rings, an inner flange may be provided around the interior of one end of the cylinder, such flange corresponding with the part *j h* of the ring. The pressure of the steam within the cylinder tends to force the heads outward, and this pressure is to be met and the wear compensated for by set-screws screwed through the portion *j h*, or by steam admitted between the rabbets *f i* and *g j*. This mode of fitting the cylinder-heads allows them to adapt or accommodate themselves to any unequal expansion of the cylinder and keep the shaft in the center thereof.

*H H'* is the steam-jacket, which nearly surrounds the cylinder, terminating near opposite sides of the abutment *E* and being divided by a transverse partition *k* opposite the abutment. The cylinder-ports *l l'*, arranged on opposite sides of the abutment, communicate directly with the cylinder and also with the jacket, as shown in Fig. 1, and the said ports are to be covered by a steam-chest fitted with a valve similar to what has been used in many rotary engines for the purpose of causing the induction into either one and eduction from the other port, according to the desired direction of the rotation of the shaft. The two portions *H* and *H'* on opposite sides of the partition *k* are connected by two small passages *m m'* with the seat of a cock or valve *I*, by which communication between them may be opened and closed, and from the said portions of the jacket there are two ports *n n'* leading directly into the cylinder, such passages being at such equal distances from the partition *k* that when one piston is passing one port another piston is passing the other port; and these ports are fitted with valves *p p'*, which can be opened or closed from outside the cylinder and jacket by screws or other convenient means. In the operation of the engine the valve *p* or *p'* on the opposite side of the cylinder to that on which steam

enters is always open, the object of such valves being to permit the steam to be exhausted in such manner as to permit its being used to a certain extent expansively and to prevent any back-pressure on the pistons. Fig. 1 shows the induction taking place through the port *l'* and the eduction through the port *n* of the valve *p*. The valve *p'* is closed to permit the expansive force of the steam left within the cylinder between a piston that has passed the port *l'* and another which has not yet arrived at *n* to act upon the latter piston. When it is not desired to use the steam expansively, both valves *p* and *p'* may be open.

The valve *I* is always closed while the engine is in operation, and the portion of the jacket on the induction side of the partition *k* is always filled with live steam and the portion on the opposite side with the exhausting steam, and hence the cylinder is kept warm. To provide for the warming of the cylinder before starting the engine, and thereby causing it to expand before the working parts and so preventing the binding of the latter, the valve *I* is brought to a position to admit steam through the passages *m m'*, and so make communication between the two compartments *H H'* of the steam-jacket, and on either port *l* or *l'* being opened to the steam-chest the whole jacket is filled with live steam. When the cylinder has been warmed in this way, the engine is started by merely closing the valve *I*.

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

1. The combination of the rings *a a*, attached to the pistons, and the hubs *C C*, projecting inward from the cylinder-heads in positions eccentric to the shaft and piston-drum, but concentric with the cylinder, substantially as herein specified.

2. The cylinder-heads *B B*, constructed with rabbets and fitted to the cylinder and to rabbets in rings *G G*, or flanges secured to or formed on or in the cylinder, substantially as and for the purpose herein described.

3. The steam-jacket *H H'* with its two compartments communicating with the cylinder-ports *l l'*, its partition *k*, passages *m m'*, and valve *I*, all constructed and arranged and operating substantially as herein set forth.

4. The two ports *n n'* and valves *p p'*, combined with the cylinder and steam-jacket *H H'*, substantially as and for the purpose herein described.

5. The linings *b b*, applied in combination with the rings *a a* of the pistons and the hubs *c c* of the cylinder-heads, substantially as and for the purpose herein specified.

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Witnesses:

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