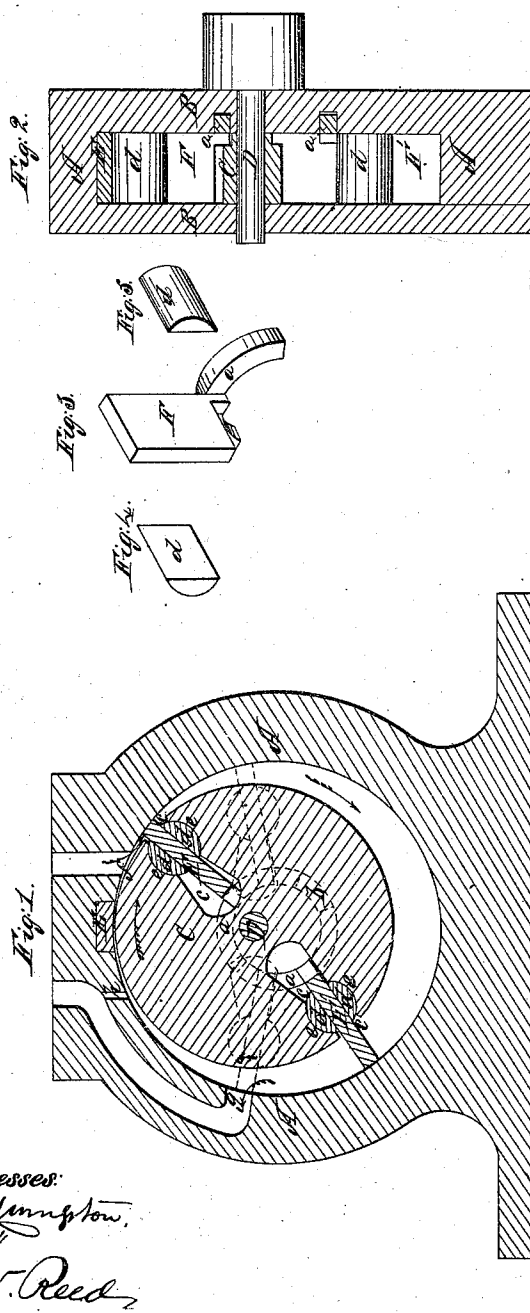


No. 32,208.

PATENTED APR. 30, 1861.

J. B. ROOT.
ROTARY ENGINE.



Witnesses:
M. J. Livingston,
G. W. Reed,

Inventor:
John B. Root

UNITED STATES PATENT OFFICE.

JOHN B. ROOT, OF BATTLE CREEK, MICHIGAN.

ROTARY ENGINE.

Specification of Letters Patent No. 32,208, dated April 30, 1861.

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 drawing, 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 is a perspective view of one of the pistons. Figs. 4 and 5 are perspective views of the oscillating packing pieces of the pistons.

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

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

It consists in certain means of directing and controlling the compound radial and oscillating movement of the pistons, and of packing the same within the rotating cylinder.

To enable others to make and use my invention I will proceed to describe its construction and operation.

A, is the stationary outer cylinder bored truly and fitted at each end with a tight head B, one or both of said heads being movable for the introduction of the inner rotating cylinder or piston drum C. This drum is turned truly and secured 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 stationary cylinder that the drum C, may work in contact with a packing piece or stationary abutment E, which is fitted into a cavity formed for its reception in the inner periphery of the main cylinder.

F, F', are the pistons consisting each of a flat plate of metal which may be fitted with suitable packing at its sides and ends, and each having rigidly attached to it an arc formed piece of metal *a*, which is fitted to a circular groove *b*, in one of the cylinder heads such groove being concentric with the inner periphery of the outer cylinder. An arc formed piece *a*, may be provided on each side of each piston and a groove *b*, in each

cylinder head. The pistons are received within slots *c, c*, in the drum C, and each of said pistons is fitted with two cylindrical segment pieces *d, d*, of a length equal to the width of the pistons, the said pieces being arranged one on each side of their respective piston with their flat chord faces next the piston the thickness of which is sufficient to keep the said segments at the proper distance apart to make them concentric that they may fit to a cylindrical bearing *e, e*, formed partly in one side and partly in the other side of the slot *c*. The slots *c, c*, are tapered toward and from the center of the cylinder to leave room for the oscillating movement of the pistons relatively to the drum C, consequent upon the pistons being kept always radial to the inner periphery of the cylinder A, by means of their arc formed pieces *a, a*, fitting to the grooves *b*. The two segment pieces *d, d*, combine to form a journal for their respective piston in its oscillating movement while their flat chord faces form guides to the pistons in their radial movement relatively to the drum C. It may be observed that the oscillating and radial movements of the pistons are only apparent or relative to the rotating drum C. Their actual movement is simply a rotary one and concentric with the outer cylinder A. The segment pieces *d, d*, besides serving to control or direct the oscillating and radial movements of the pistons, serve as packing pieces. The piston being always forced by the pressure of steam close against the segment on the exhaust side and forcing the said segment close against its bearing in the drum C, and the pressure of steam on the segment on the steam side keeping it in close contact with the piston. The segments, it will be therefore seen, constitute a very simple means of performing very important duties, and with the simple concentric groove or grooves *b*, and arc pieces *a, a*, constitute the whole of the means necessary to control the operation of the pistons, making an engine of very cheap construction.

f, is the induction port and *g*, the principal eduction port, the port *f*, being arranged very near the packing piece E, and the port *g*, being arranged farther off the said packing piece and on the other side thereof. The steam commences to act upon each piston as it passes the port *f*, and continues to act with its full pressure till another piston has passed the said port. The steam left in front

of each piston after it has passed the port *f*, is confined between that piston and the other one until the latter passes the exhaust port. Now in the revolution of the pistons the cubic capacity of the chamber *G*, formed between them is always enlarging or diminishing commencing to enlarge as the one passes the abutment *E*, and continuing to enlarge until both are at equal distances from the widest part of the said chamber opposite to the abutment, and diminishing after passing that position in which they are represented in Fig. 1 in red outline. Now the steam confined between the pistons expands while the said chamber continues enlarging, and the force of its expansion acts upon the forward piston with a tendency to aid in producing its revolution, but if confined between the pistons after they have passed that position it is compressed by their continued revolution, and so made to constitute an obstruction to their revolution. I therefore so arrange the eduction port *g*, that the forward piston will pass it and commence to permit the exhaust from between the two just as they arrive in the position above specified and represented in red outline in Fig. 1, by which means I make use of the effect of the expansive force as long as such force continues to be developed, and avoid subsequent compression. I provide a smaller eduction port *h*, nearer the abutment *E*, to provide for the exhaust of any steam that may not have escaped by the port *g*.

The above system of using the steam expansively and preventing its compression, may be made use of in a reversible engine by providing a port similarly arranged to, and like *g*, on each side of the abutment, and providing each of such ports with a valve by which it may be closed when the induc-

tion is to be on its side of the abutment. In an engine which will seldom require to be reversed, and in which it is only desirable to prevent compression without regard to getting the benefit of expansion, a smaller port may be arranged in a position corresponding with *g*, on the opposite side, such port communicating with *f*, by a small passage and being fitted with a valve by which it may be closed when the engine is running in the forward or usual direction. When the engine has more than two pistons the port *g*, will be arranged so that the exhaust will commence when any two of them arrive at uniform distances from the widest part of the chamber *G*.

I have described my improvements with particular reference to a steam engine but they are also applicable to gas or water pressure engines and rotary pumps.

I do not claim the use of arc formed guide pieces for the pistons when not attached to the bodies of the pistons, but to hinged packing pieces. Neither do I claim broadly the fitting of the pistons to the rotating drum with oscillating or roller like guides. But

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

The employment in connection with the outer cylinder *A*, eccentric piston drum *C*, and rigidly constructed pistons *F*, *F*, of arc formed pieces *a*, *a*, attached rigidly to the pistons and fitted to concentric grooves in the heads of the cylinder, and segment pieces *d*, *d*, fitted to the pistons and to bearings in the rotating drum, the whole combined substantially as herein described.

JOHN B. ROOT.

Witnesses:

M. M. LIVINGSTON,
C. W. COWTAN.