A. K. Rider,

Rotary Steam Engine.

No. 45,636. Patented Dec. 27, 1864

Fig. 3.

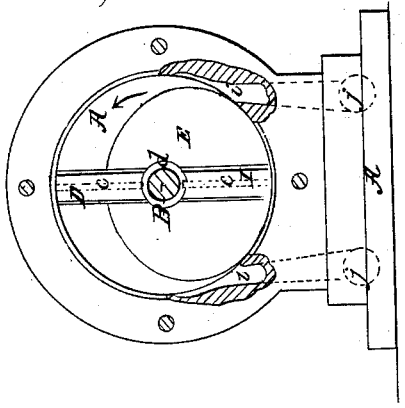


Fig. 1.

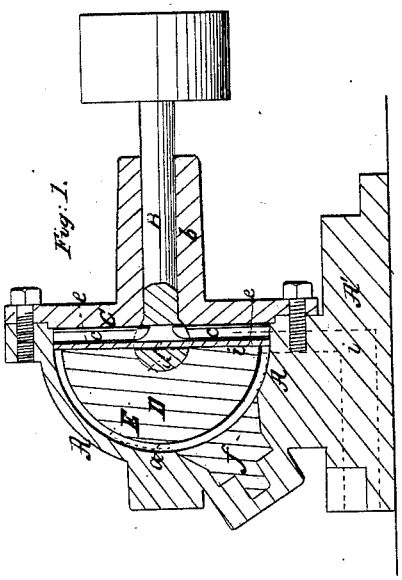
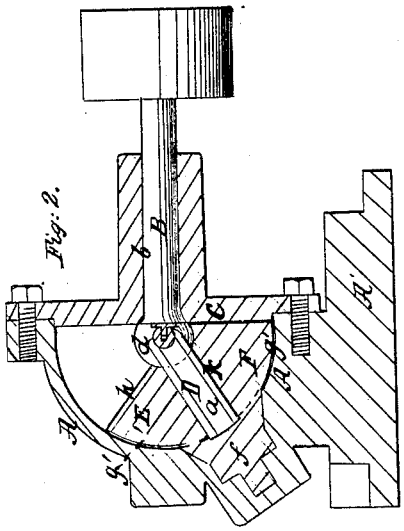


Fig. 2.



Witnesses:

Henry J. Brown

J. H. Combs

Inventor:

A. K. Rider,

per Brown Combs & Attorneys.

UNITED STATES PATENT OFFICE.

ALEXANDER K. RIDER, OF HYDEVILLE, VERMONT.

IMPROVEMENT IN ROTARY ENGINES.

Specification forming part of Letters Patent No. **45,636**, dated December 27, 1864.

To all whom it may concern:

Be it known that I, ALEXANDER K. RIDER, of Hydeville, in the county of Rutland and State of Vermont, have invented a new and Improved Rotary Engine; 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—

Figures 1 and 2 are central vertical sections of the engine parallel with the shaft, showing it in two different positions. Fig. 3 is a view taken at right angles to Figs. 1 and 2, looking directly into the cylinder, the head being removed.

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

This engine is composed of a hemispherical cylinder fitted with a rotating and oscillating piston and a rotating sphero-conical abutment, the said piston being attached by a hinge-joint, or its equivalent, to the rotating main shaft of the engine, and fitted to a slot in the abutment, the axis of whose rotation is oblique to that of the main shaft, the whole operating as hereinafter described. The engine may be used as a motor or as a pump.

A is the hemispherical cylinder, made with a movable head, C, the interior of which is faced flat, and in the center of which there is a bearing, *b*, for the main shaft B of the engine. This shaft passes through the head C, and at its axis coincides with the axis of the cylinder, and is perpendicular to the head C. The bearing B should be fitted with a stuffing-box. The cylinder is cast on or secured firmly to a suitable base, A′.

D is the semicircular piston fitted to the spherical interior surface of the cylinder A, and to the flat interior surface of its movable head C, with suitable packing, *a c*. The shaft B is provided at its inner end with a spherical enlargement or knob, *d*, which is concentric with the spherical interior of the cylinder, and this knob is fitted into a recess provided for it in the straight side of the piston, which is hinged to the said knob by a long cylindrical pin, *e*, which is inserted into a groove extending the whole length of the straight edge of the piston, and through a hole in the knob *d*, the said groove having the transverse sectional form of a portion of a circle greater than a semicircle, so that it will hold the pin *e* securely. The said pin is grooved longitudinally to receive the packing-strips *c*, which prevent the escape of steam between the said piston and the cylinder-head. These strips are of T shape in their transverse sections, as shown in Fig. 2, and fit flat against the cylinder-head, toward which they may be pressed out by suitable springs, and they prevent the pin *e* from turning in the knob of the shaft.

E is the rotating abutment, which I term of "sphero-conical" form, because one face, *g*′, is spherical, to fit the spherical interior of the cylinder, and the opposite face, *h*, conical. This abutment is made with a stout pivot or journal, *f*, to fit to a suitable bearing in the lower part of the cylinder, the said journal being concentric with the axis of the cylindrical and conical faces of the abutment, and its bearing being so arranged as to keep the said axis at an angle of, say, from forty degrees to fifty degrees with the axis of the shaft B. The angle of the conical face *h* with the axis of the abutment is such that one portion of its straight profile will fit against the flat inner surface of the head C, as shown in Fig. 2. The abutment has a parallel slot, *k*, cut or formed diametrically through it for the reception of the piston, which is fitted to slide freely within the said slot.

The induction-passage *i* communicates with the interior of the cylinder on one side of the line, where the abutment is in contact with the cylinder-head, and the eduction-passage *j* communicates therewith on the opposite side of the said line. This line in the example of my invention represented has a vertical direction below the shaft. The inside of the cylinder-head may be grooved in this line and the groove be fitted with metallic packing.

The operation of the engine as a motor is as follows: The steam or other fluid which is used as the motive agent, entering the cylinder from the opening *i*, is prevented from passing the abutment below the shaft B, where it is in contact with the cylinder-head, and its pressure exerted against the portion of the piston which projects from the abutment above the said opening *i*, and so produces the rotation of the piston, the main shaft, and the abutment in the direction of the arrow shown in Fig. 3. As the piston rotates, it is projected

from the slot *k* of the rotary abutment, first on one and then on the other side of the center thereof, and is always withdrawn into one side as it is projected from the other side. Each of its radial straight edges is flush with the face of the abutment as the said edge arrives vertically below the shaft B, and its projection from the abutment commences as it passes that position and continues until it arrives in a position vertically above the shaft, when its retraction within the abutment commences. In this operation the whole length of the straight edge of the piston is always in contact with the face of the cylinder-head, though the piston oscillates upon the pin *e* between a position in which its faces are parallel with the axis of the main shaft and cylinder, and with that of the abutment, as shown in Figs. 1 and 2, and one in which they are parallel only with the axis of the abutment and oblique to the axis of the main shaft. The piston operating in this way is equivalent to two pistons applied as they are in many rotary engines, and one is always subject to the direct pressure of the fluid entering at *a*. The eduction of the steam from behind the piston commences as it passes the eduction-passage *j*.

The engine may be made to work in the opposite direction to that described by making *j* the induction-passage and *i* the eduction-passage.

By applying rotary motion to the shaft B to produce the rotary motion of the piston and abutment, the engine may be made to serve as an effective pump.

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

1. A rotary engine composed of a cylinder of hemispherical form, a rotating sphero-conical abutment, a rotating and oscillating piston, and a rotating shaft, the whole combined to operate substantially as and for the purposes herein specified.

2. The attachment of the rotating and oscillating piston D to the main shaft by means of the pin *e*, inserted into a groove in the straight edge of the piston and passing through the shaft, substantially as herein specified.

3. The T-shaped piston-packing *c*, applied in combination with the pin *e*, which attaches the piston to the main shaft, and with the inside of the cylinder-head, substantially as and for the purpose herein specified.

ALEXR. K. RIDER.

Witnesses:

FRANK A. BROCKWAY,

ROWLAND WATTER.