

No. 4,776.

PATENTED SEPT. 26, 1846.

J. MILLER.  
ROTARY ENGINE.

Fig. 1.

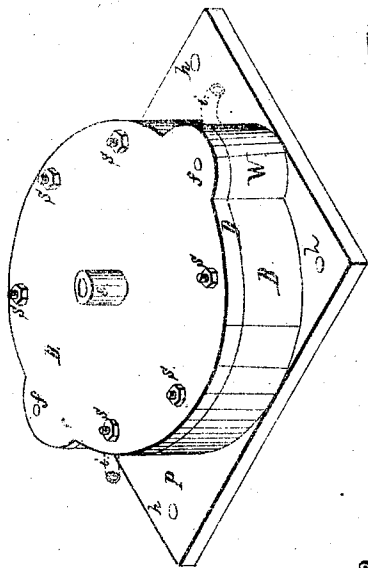


Fig. 3.

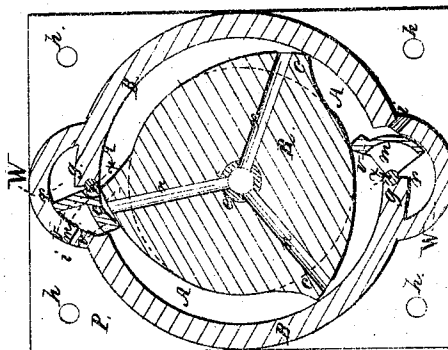
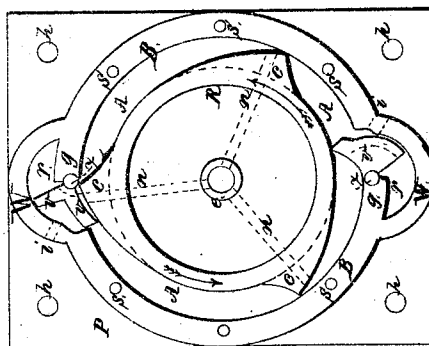


Fig. 2.



# UNITED STATES PATENT OFFICE.

JAMES MILLER, OF PHILADELPHIA, PENNSYLVANIA.

## ROTARY ENGINE.

Specification of Letters Patent No. 4,776, dated September 26, 1846.

*To all whom it may concern:*

Be it known that I, JAMES MILLER, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in the Construction of Rotary Steam-Engines; and I do hereby declare that the following is a full and exact description of the same, reference being had to the annexed drawings, making a part of this specification, in which—

Figure I is a perspective view; Fig. II a vertical view of the interior and part of the exterior, having one side or the top plate removed; and Fig. III a vertical view of a section through the middle across the shaft.

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

The exteriors, represented in Fig. I, incloses the moving parts of the engine. The rectangular plate P, forms one side, and has apertures, *h, h, h, h*, for securing it by bolts or screws. On this is firmly attached the hollow cylinder, B, having at two opposite sides the recess wings, W, for valves. The inclosing cylinder and plate, in casting, may form one piece; but the recess wings should be cast separately and fitted. The dotted lines, *i, i*, at the wings show where steam is inducted.

The upper plate, D D, is fitted and secured steam tight to the inclosing cylinder, by screws, (*s, s, &c.*) and has a central opening for the hollow shaft, *e*, also openings, *f, f*, over the recess chambers, which may be used for the escape of steam, in cases desired.

The interior, represented in Fig. II, I construct as follows: The inclosing cylinder B B, having the inside turned out cylindrically, two openings at opposite sides are made, for valves, (*v, v, v*). These openings have their sides extending to, and vertical to the plates, and sufficiently apart to suit the width and radius of the valve which I use. In the inclosing cylinder, at one side of each opening, is made also vertically to the plates a semicircular groove, *g*, for the axle of the valve, which axle being a little longer each way is fitted and further secured in the plates. Connected with these openings are recesses, *r, r*, formed by the recess wings W, W. These recesses are of semicircular form, and in depth (as well as radius) made to suit the action of the valves.

Within the cylindrical space, formed by the inclosing cylinder and the two plates, is the cylindric revolver R, having at its axis a hollow shaft, *e*, and at its circumference at equal distances, three cams attached, *c, c, c*, serving as pistons for the steam to act against. The revolving cylinder, in diameter should be about four-fifths that of the cylindric space, and in length such as to work moderately steam tight between the inclosing plates. The cams attached are made to work in like manner in the space between it and the inclosing cylinder. Between the cams are the spaces, A, A, A, which receive the steam acting on the cams. The surfaces of the cams, a little way should fit the inclosing cylinder, and then slope each way to the revolving cylinder in such a manner as to meet it tangentially. The forward slope which operating lifts the valve, should be cylindric convex; the other cylindric concave, or else a plane surface. In the convex slope, near the vertex of each cam, is an aperture or passage, *n*, connecting with the hollow of the shaft, designed for the escape of air, in the space A, backward of the valve, and for the escape of steam as soon as the aperture in its movement passes the valve.

The steam being introduced at the apertures, *i, i*, the use of a valve or gate in the cylindric space between the cams is necessary to receive the backward force of the steam. To secure this object fully, and avoid at the same time an excessive pressure of the valve against the revolver, from the action of the steam, I construct the valve on such a principle, as to direct all the backward force of the steam upon the fulcrum of the valve, or upon its axle in the groove *g*, excepting so much, if need be, as may serve to keep the valve at all times close against the revolver. This exception is made to obviate the necessity of a spring which I may and would otherwise use for the purpose. I give herein two forms involving the principle; V representing one, and V V a modification thereof. I make it in the first, (V,) to consist of a portion of a cylinder, having a quadrant form, and at its radial center a strong axle, *x*, fitting in the semicircular groove, *g*, in such a manner as to allow to the valve its reciprocal circular motion, of about thirty-five degrees. The axle, to be more secure, has its ends inserted in the inclosing plates. The cylindric length and

radius of the valve, is such as to fit the recess,  $r$ , in which it acts. Around the axle, in the body of the valve, is a passage or opening,  $m$ , from side to side connecting the recess ( $r$ ), with the steam chambers in the cylindric space, serving both the purpose of lightness in the valve and of vent for air or steam. As a substitute for a spring, the valve has one of its radial sides, namely that toward the revolver, extended sufficiently for the action of the steam to keep it closed against the revolver. It has the same side also sufficiently curved (inward) to cause it to bear always at its extremity against the revolver or its cams in this movement. This projection has its extremity—(except the bearing surface, which is rounded,)—made cylindrical to the axis, and for it a corresponding enlargement in the inclosing cylinder. I also make its arc or thickness at this extremity such, that, lifted by the cam, it shall cut off the steam, before any escape thereof can take place at the aperture,  $n$ , leading to the hollow shaft. I also make a portion of this recess of such a form, that when the valve is entirely shut by the cam, the steam shall still have access laterally to the projection.

In this form of the valve it is evident that the pressure of steam on all the surface that is cylindrical is directed against the axle,  $x$ , and its groove,  $g$ , and that it is only the small projecting radial surface that can occasion any pressure of the valve on the revolver.

The valve  $v v$  is a modification of the one already described, having the axle, the vent, and the difference of radial sides similar,—also the recess and valve inclosure similar,—the difference in the valve being only the cutting out a portion of the cylindrical side between the radial ones. Also the chief effects sought are similar, namely, directing only so much of the steam's force upon the valve against the revolver as may be desirable, and all the remainder upon the axle and groove,  $g$ . To either of these valves I

may affix metallic packing—if necessary, but the form first described is better adapted to different modes of packing, of which one that is stationary in the inclosing parts might be preferable. (This may be constructed in two parts, as follows. Each part may consist of a thin bar bent and forming a right angle, one side or arm thereof packing the end of the valve from the axle out, the other arm packing half the length of the cylindric sides, so with the other. They may be fixed permanent in grooves inside the parts inclosing the valve, and suitably adjusted by springs or screws.)

In using two valves and three cams to the revolver, as herein described, the steam exerts a propelling force all the time either upon one or upon two of the cams. The arrangement of a vent and escape for air or steam through the valve and recess out at  $f$ , may be substituted for the arrangement allowing its escape by the shaft. These arrangements both at a time, or either one alone may be used, as occasion requires.

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

1. The combination with the revolving disk in rotary steam engines of a valve having the form herein described, or any modification thereof analogous in design and effect, by which the pressure of steam upon the valve, is directed wholly or mainly toward its center or axis of motion and upon its axle, and (for the purpose of avoiding friction) only so much on the sliding part as may be desirable or necessary to keep the valve closed on the sliding surface, against the revolver.

2. I also claim the combination and arrangement of three cams with two valves constructed as herein set forth, and escapes for the steam at recesses behind the valves as herein described.

JAMES MILLER.

Witnesses:

Z. C. ROBBINS,  
CHARLES PASCOE.