(No Model.) 2 Sheets—Sheet 1.

A. NOTEMAN.

Rotary Engine.

No. 238,802. Patented March 15, 1881.

Fig. 1.

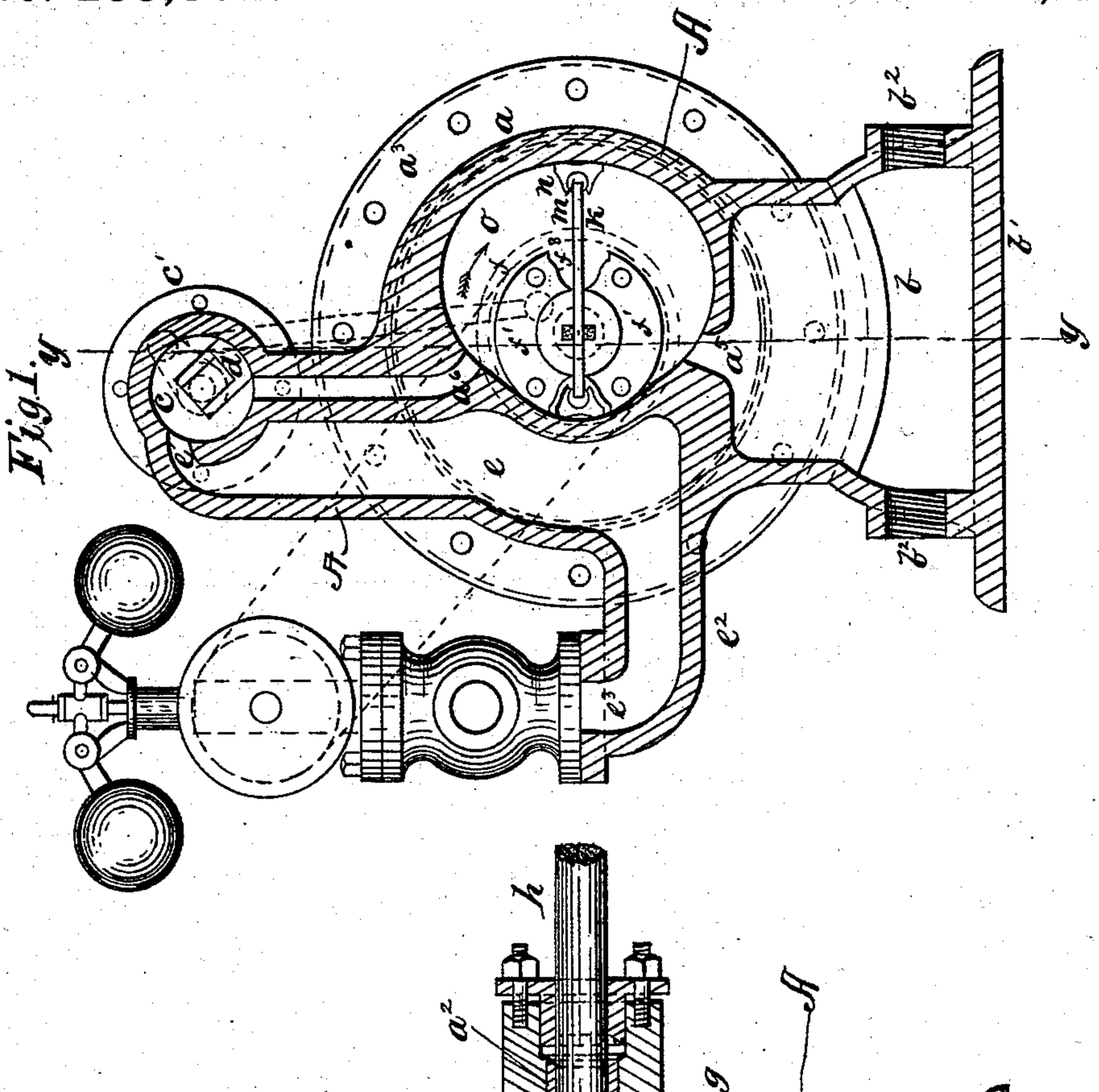
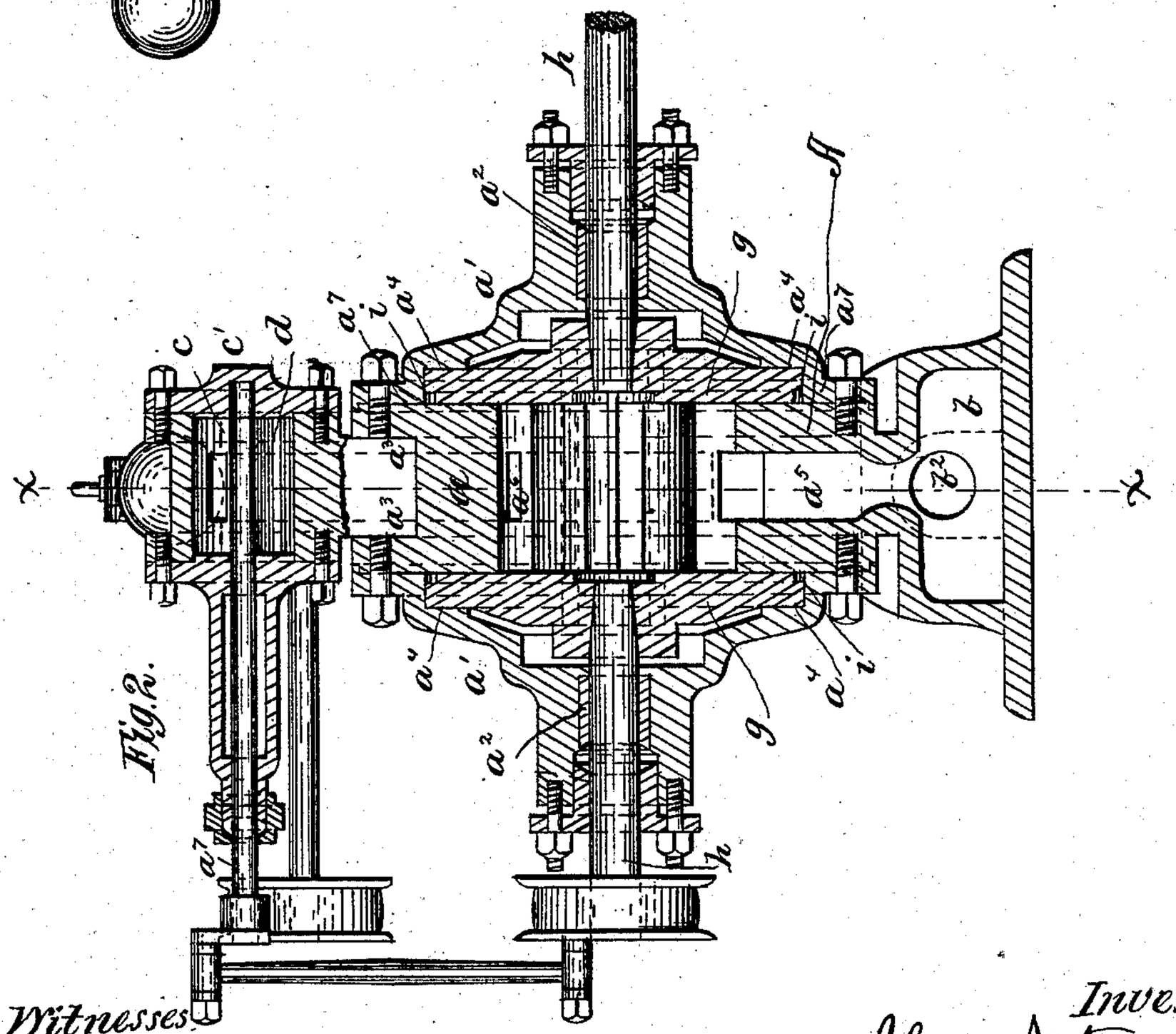


Fig. 2.



Witnesses
P. B. Turpin
J. B. Holcomb

Inventor
Alonzo Noteman,
By R. S. & A. L. Lacey, Attys.

(No Model.)

2 Sheets—Sheet 2.

A. NOTEMAN.

Rotary Engine.

No. 238,802. Patented March 15, 1881.

Fig. 3.

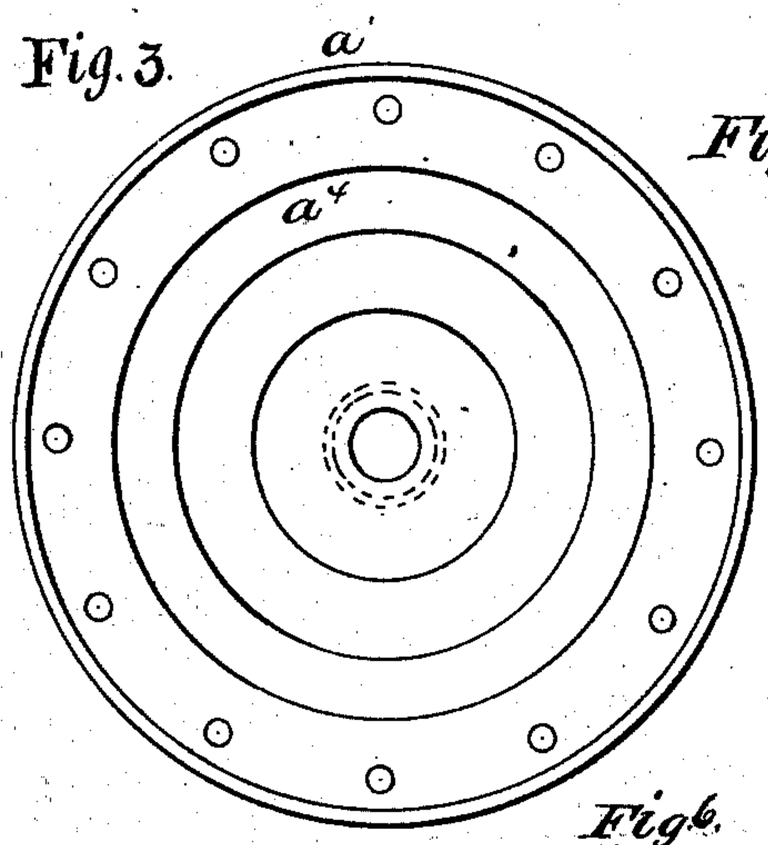


Fig. 4.

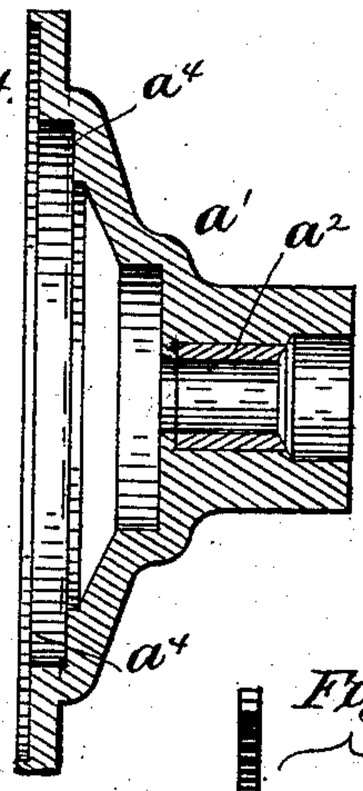


Fig. 5.

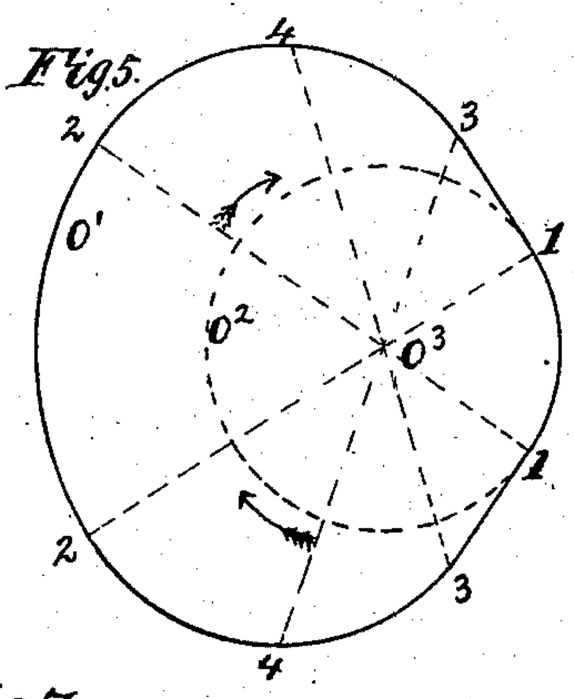


Fig. 6.

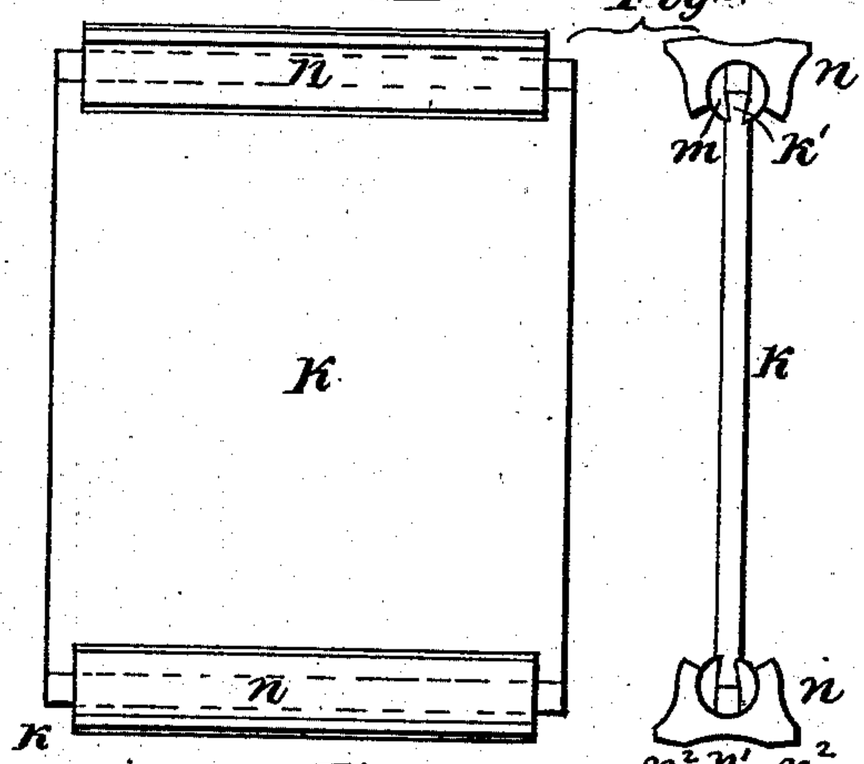


Fig. 7.

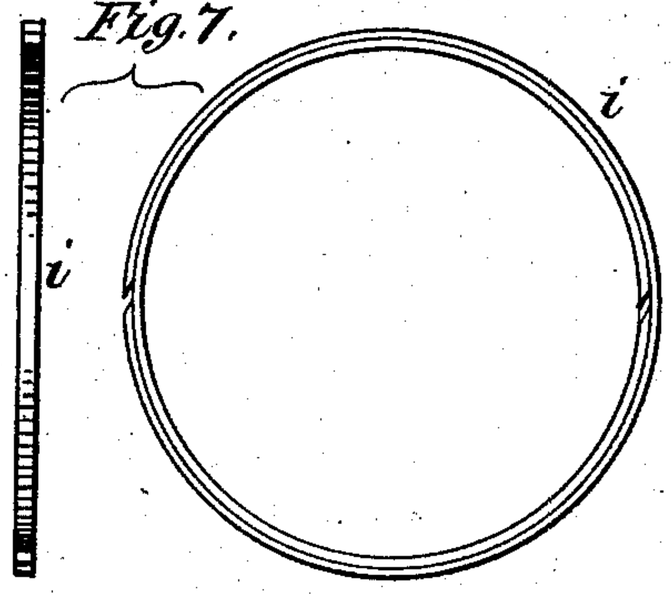


Fig. 8.

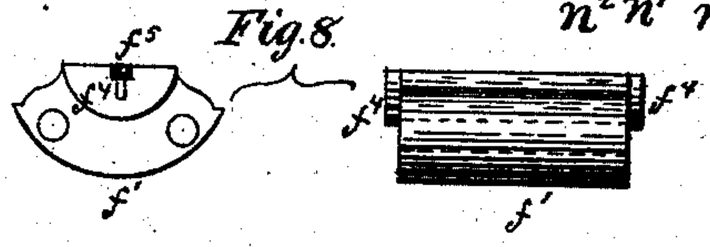


Fig. 9.

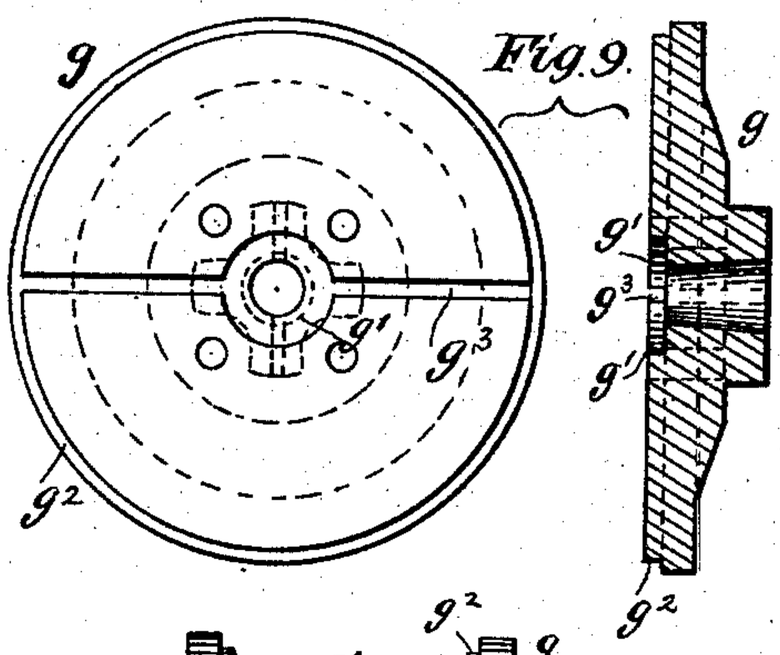


Fig. 10.

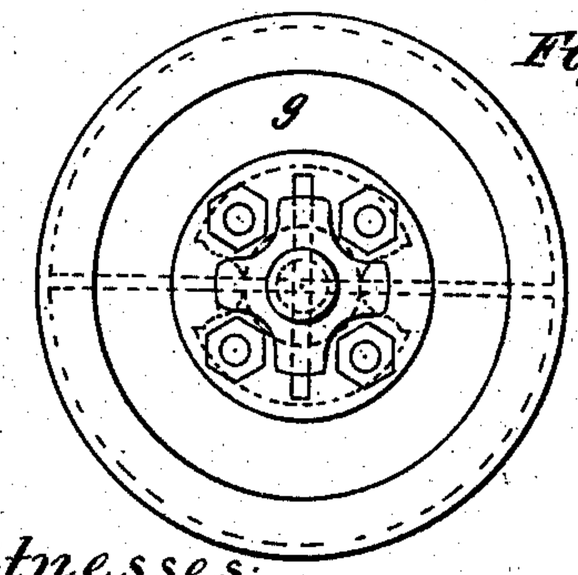
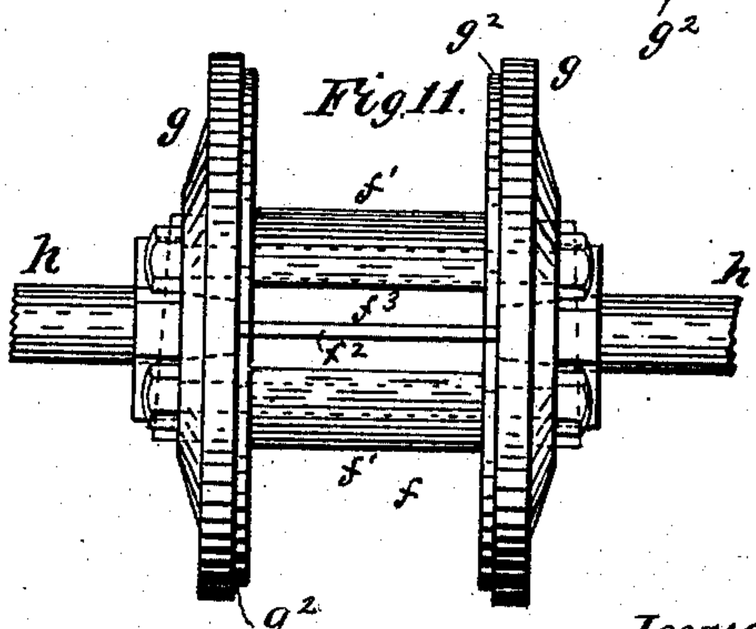


Fig. 11.



Witnesses:
P. B. Turpin
J B Holderby

Inventor
Alonzo Noteman,
By R.S. & A.P. Lacey,
Att'ys.

UNITED STATES PATENT OFFICE.

ALONZO NOTEMAN, OF TOLEDO, OHIO.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 238,802, dated March 15, 1881.

Application filed September 11, 1880. (No model.)

To all whom it may concern:

Be it known that I, ALONZO NOTEMAN, a citizen of the United States, residing at Toledo, in the county of Lucas and State of Ohio, have invented certain new and useful Improvements in Rotary Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

The object of this invention is to so construct the several parts of a rotary engine that there shall be not only no loss of power, but that there shall be an increased power by the utilization of the entire force of the steam.

It consists in the construction and arrangement of the several parts, as hereinafter described, and pointed out in the claims.

In the drawings, Figure 1 is a vertical section on the line *x x*, Fig. 2, and Fig. 2 is a vertical section on the line *y y*, Fig. 1. Figs. 3 and 4 show one of the end plates of the case, having the bearings recessed to receive a bronze or other suitable metal sleeve, which may be taken out when worn and replaced by a new one. Fig. 5 is a diagram illustrating the manner of forming the steam-cylinder. Fig. 6 shows side and edge views of the blade. Fig. 7 shows the split packing-rings which are put in the grooves in the disks or rotating heads of the piston. Fig. 8 shows a side and an end view of one-half of the piston. Fig. 9 shows an inside face and a cross-section of one of the rotating piston-heads. Fig. 10 shows the outside face of one of the rotating piston-heads, and Fig. 11 shows the piston complete.

A is a casing, within which is contained the cylinder *a*. The ends of the cylinder are closed by the plates *a' a'*, which are provided with enlarged bearings, in which are put the removable bronze or other suitable metal bearing rings or sleeves, a^2 a^2. The head-plates *a' a'* are so formed and attached to the flanges a^3 a^3 that annular chambers a^4 a^4 are formed between their rims and the body of the cylinder.

Below and connecting with the cylinder by the port a^5 is the exhaust-chamber *b*, which is provided with the exhaust-ports b^2 b^2. The exhaust-chamber *b* is closed below by the plate *b'*, which forms the base on which the engine rests, and which provides the necessary facilities for securing the casing to the wood or other supporting frame-work.

a^6 is a steam-inlet port connecting the piston-chamber with the chamber *c*, formed in the small valve-casing *c'*, mounted on the main casing A. Within the chamber *c* is placed the cut-off valve *d*, which is seated over the end of the port a^6 and operated by shaft a^7.

e is the steam-chest formed within the main casing A. It is formed and arranged to open, by the port *e'*, into the chamber *c* in the valve-casing *c'*, and it extends through the side stem, e^2, which is connected with the steam-supply mechanism which connects the engine with the boiler. The steam-chest *e* is arranged to extend downward from the upper port, *e'*, parallel with the port a^6, there being but a single wall or partition between it and said port a^6. This arrangement brings the chest within the compass of the casing A, and gives a compactness in structure not attained in ordinary engines. The stem e^2 projects from a point low down on the casing, and thus provides an arrangement whereby the governor and other regulating mechanism can be placed in close juxtaposition to the cylinder. This arrangement of steam-chest prevents wire-drawing the steam through the steam-pipes by always having a supply of steam at hand to fill the cylinder. The parts, lying in such compact form, are not liable to be affected by cold-air currents, as when they are separated.

f is the revolving piston, composed of the equal and corresponding halves or sections *f' f'*, which are secured to the rotary heads *g g*, which are fixed to the revolving shafts *h h*. The shafts *h h* are journaled in the head-plate *a'* of the cylinder *a*, as shown in Fig. 2. The sections *f' f'* are slightly separated, so as to provide the channel f^2 between them, through which the blade hereinafter described plays back and forth. The outer edges of sections are beveled, so as to form cup-shaped recesses or seats f^3, in which the saddles or packing-segments of the blade are received, as hereinafter explained. On the ends of the segments *f'* there are formed tenons f^4, which fit into mortises *g'* in the rotary heads *g* and make a firm close joint. The segments are also pro-

vided with short central mortises, f^5, in which are put packing-pads f^6, which snugly pack the blade as it moves to and fro in the channel f^2. The rotary heads g have the circular rabbets g^2 cut around the rims, into which are put the split packing-rings i. When the piston, with its rotary heads, is put in place in the cylinder, the packing-rings fill in the angle formed by the side of the cylinder, the inner surface of the flange a^7 of the head-plate a', and the rim of the rotary heads g, as shown in Fig. 2. The packing-ring thus has a double bearing, and prevents the escape of steam outward between the cylinder and end plate, and also around the end of the rotary head. The ring i, being held thus unconfined or loosely on the rim of the rotary head, has a greater degree of adaptability or adjustment, and will make a better packing and be more durable than were it held rigidly in a channel in the rotary head, or in the cylinder, and packed outward in one direction only. The rotary heads g have the cross-grooves g^3, which coincide with the channels f^2 and receive the edges of the sliding blade.

k is the blade which slides to and fro in the channel f^2 in the revolving piston f. Its edges fit snugly into the channels g^3. On its opposite ends are formed the dovetail tenons k', onto which is slipped a knuckle, m, having a corresponding dovetail mortise. The knuckle m is made round, as shown. n is a packing saddle or segment, which has a round channel or mortise cut in its under or inner side, which is adapted to slip over the knuckle m. When slipped onto the knuckle, as shown in Fig. 6, it will have a rotating movement thereon, which permits it to adapt itself automatically to the different positions which the blade assumes in the rotation of the piston. The blade, the knuckle, and the saddle being made in separate pieces enables me to replace any part, when worn or broken, without replacing all.

The saddle n is bifurcated, so as to provide two arms or bearing-heads, n^2 n^2, separated by an intermediate chamber or depression, n'. In this construction of the saddle I secure, substantially and in effect, an extended bearing-surface with very slight frictional contact. These blades move easier, have a more perfect adjustment, and make a more perfect adjustment than is attained by blades of ordinary construction.

I have constructed my cylinder on some geometrical principles, which I will now explain. These principles have been shown in engines heretofore patented, but have not been so accurately adapted as I have them.

In Fig. 5 I have drawn a geometrical figure which illustrates my invention. By comparison it will be seen that this figure corresponds to the contour of the chamber o in the cylinder a, Fig, 1. In Fig. 5 I have drawn the outline o', which corresponds to the contour of the cylinder, and within the outline o', I have drawn, in dotted lines, the circle o^2, which represents the position of the piston f and its relative position to the cylinder. The piston is seated in one side of the cylinder, its seat having the same curvature as its periphery. At 1 1, I have marked the point where the line or contour o' diverges from the circumference of the circle o^2. From the points 1 1 lines are drawn through the center o^3 of the circle o^2, and are extended and intersect the contour o' at 2 2. The segment between 1 and 1 and between 2 and 2 are segments of concentric circles. From the points 1 and 1 the contour o' is drawn tangent to the circle o^2, which tangents are extended to points 3 3, from which, if lines be drawn through the center o^3 and extended to intersect the contour at 4 4, the said lines 3 4 and 3 4 will be of same length with lines 1 2 and 1 2. The curved lines 3 2 and 3 2, which connect the ends of the straight lines or tangents 1 3 with the ends of the segment 2 2, are gradually increasing or avoid curves from the points 3 to 2.

It will be seen that the chamber o in the cylinder a, Fig. 1, has the same form or contour as the geometric figure o' in Fig. 5. The lines 1 2 and 3 4 represent the blade k. The ports a^6 and a^5 are located at the termini of the tangent bearings 1 3, 1 3. The ovoid bearing-surfaces from 3 to 2 are the cams which give lateral motion to the blade. They gradually increase in curvature from the ends of the tangent bearings till they unite in the concentric curve 2 2, or, reversely, they diminish gradually in curvature till they join with the tangents.

The piston revolves in the direction indicated by the arrows, Figs. 1 and 5. The object of this peculiar form for the chamber o is to give a nicety and perfection of movement to the piston and its blade as they revolve, so that there shall be no back-pressure nor loss of force or motion, and whereby the amount of friction shall be reduced to the least possible minimum, and wherein the entire action of the parts and the escape of the steam shall be noiseless. The saddle or blade-head n on one end of the blade, when it clears the circle 1 1 in contact with the piston, is forced out on the straight line or tangent by the action of the opposite ovoid cam, 2 3, acting on the saddle on the other end of said blade. The tangent bearing permits the saddle to slide noiselessly past the inlet-port a^6. The diminishing of the opposite ovoid cam-surface, 2 3, causes the saddle to move with steadiness and regularity, and without noise. The saddle on the opposite end of the blade slides as noiselessly past the exit-port a^5, for reasons similar to those indicated above.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a rotary engine, a removable knuckle or interposed retaining-bar placed on the end of the blade, and adapted to carry the oscillating saddle, so that the latter will readily adjust itself in the revolutions of the piston, substantially as set forth.

2. In a rotary engine, a blade having its ends provided with dovetail tenons, a removable knuckle having a dovetail mortise, which slides over the tenon on the blade, and the removable saddle, which slides onto and has an oscillating movement thereon, substantially as set forth.

3. In a rotary engine, the combination, with the cylinder *a* and the head-plates *a'*, constructed and secured to the cylinder *a* so as to provide circular chambers a^4, of the piston-head plates *g*, provided with the rabbets g^2 on the inner edges of their rims, and the packing-rings *i*, placed in the rabbets g^2, and bearing against the body of the cylinder and against the inner surface of flange in the outer rim of the end plates, *a'*, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

ALONZO NOTEMAN.

Witnesses:
DUDLEY E. SALTONSTALL,
JOEL M. GLOYD.