

A. NOTEMAN.  
Rotary-Engine.

No. 216,342.

Patented June 10, 1879.

FIG.1.

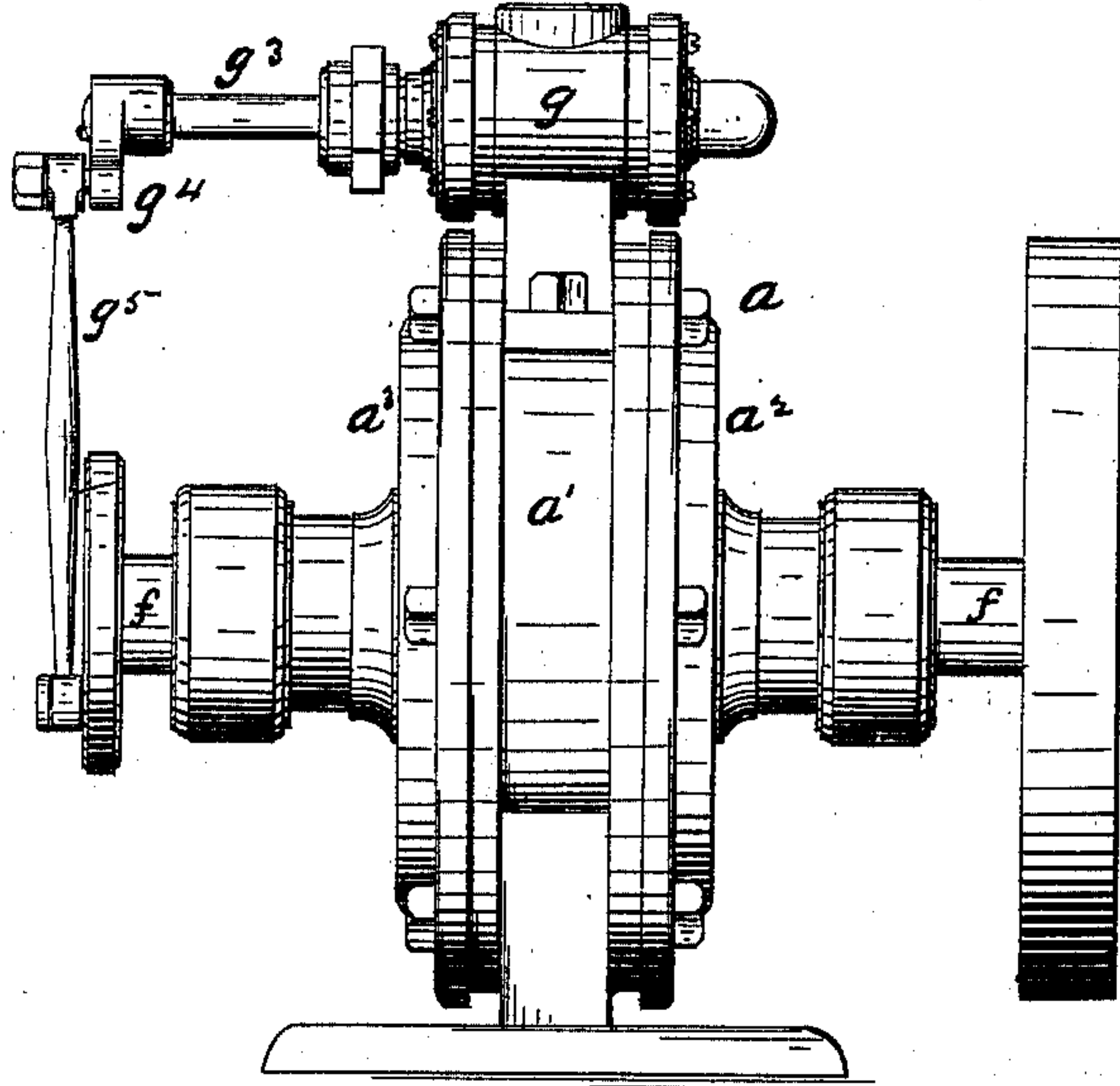


FIG.8.

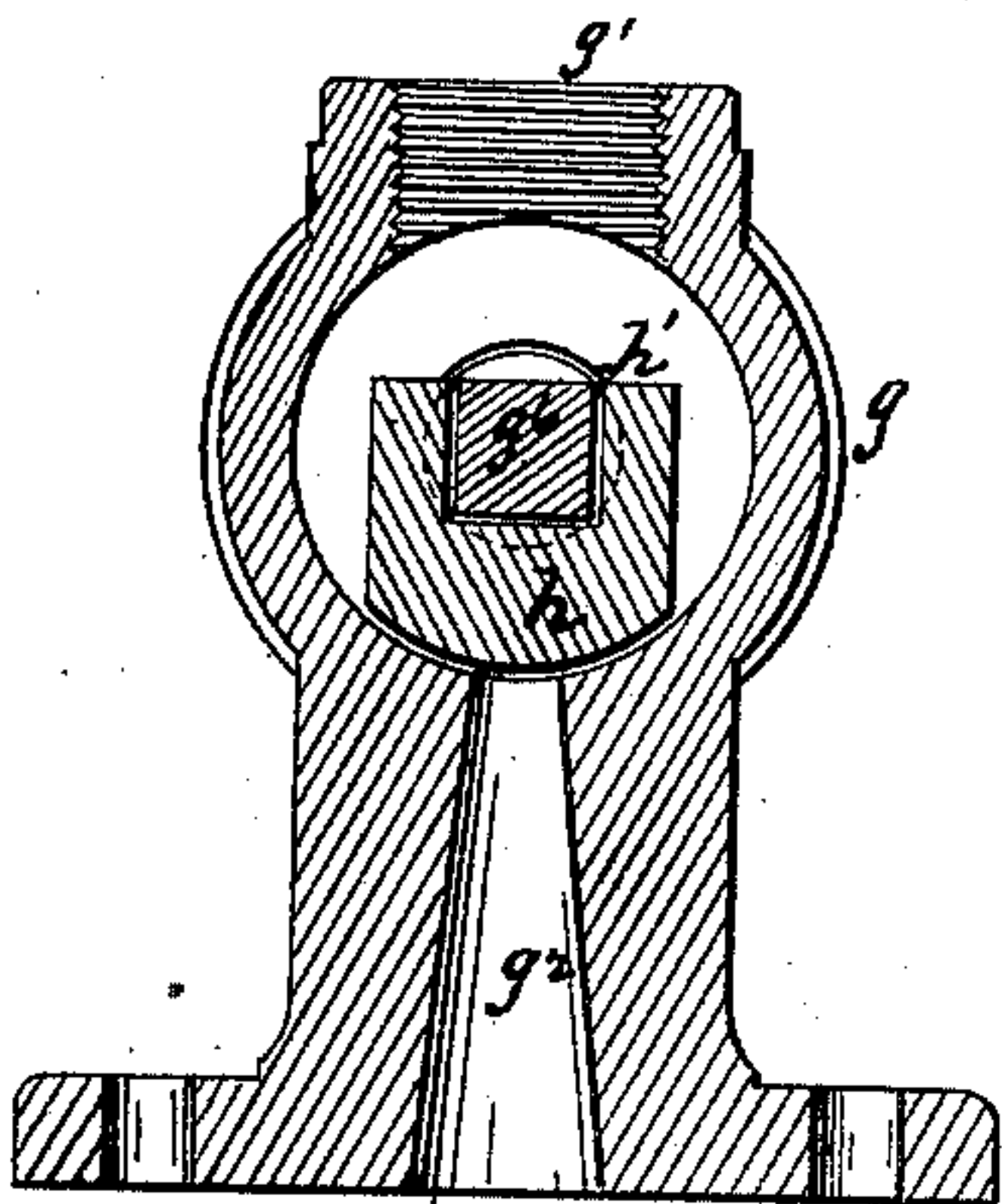


FIG.2.

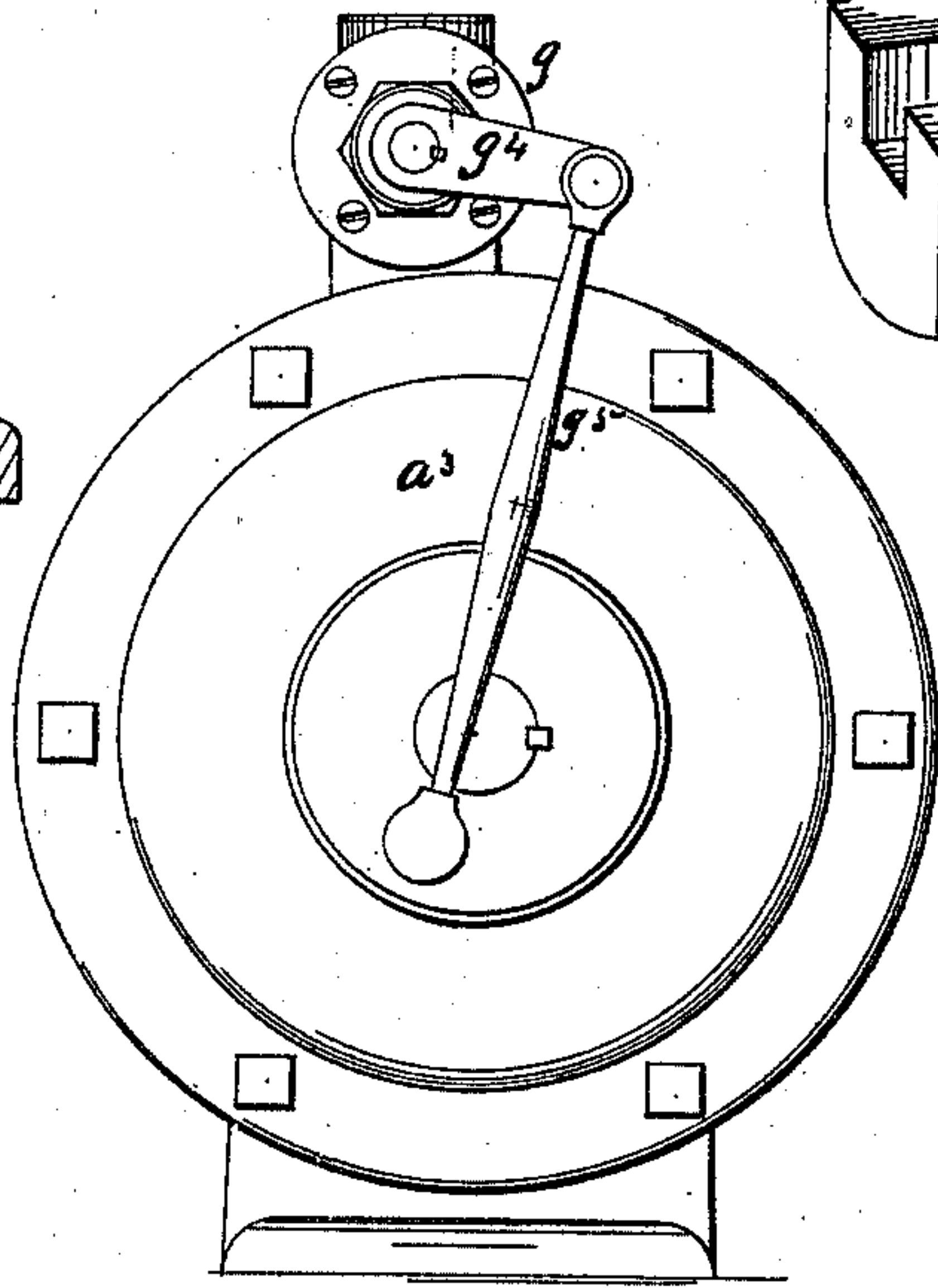
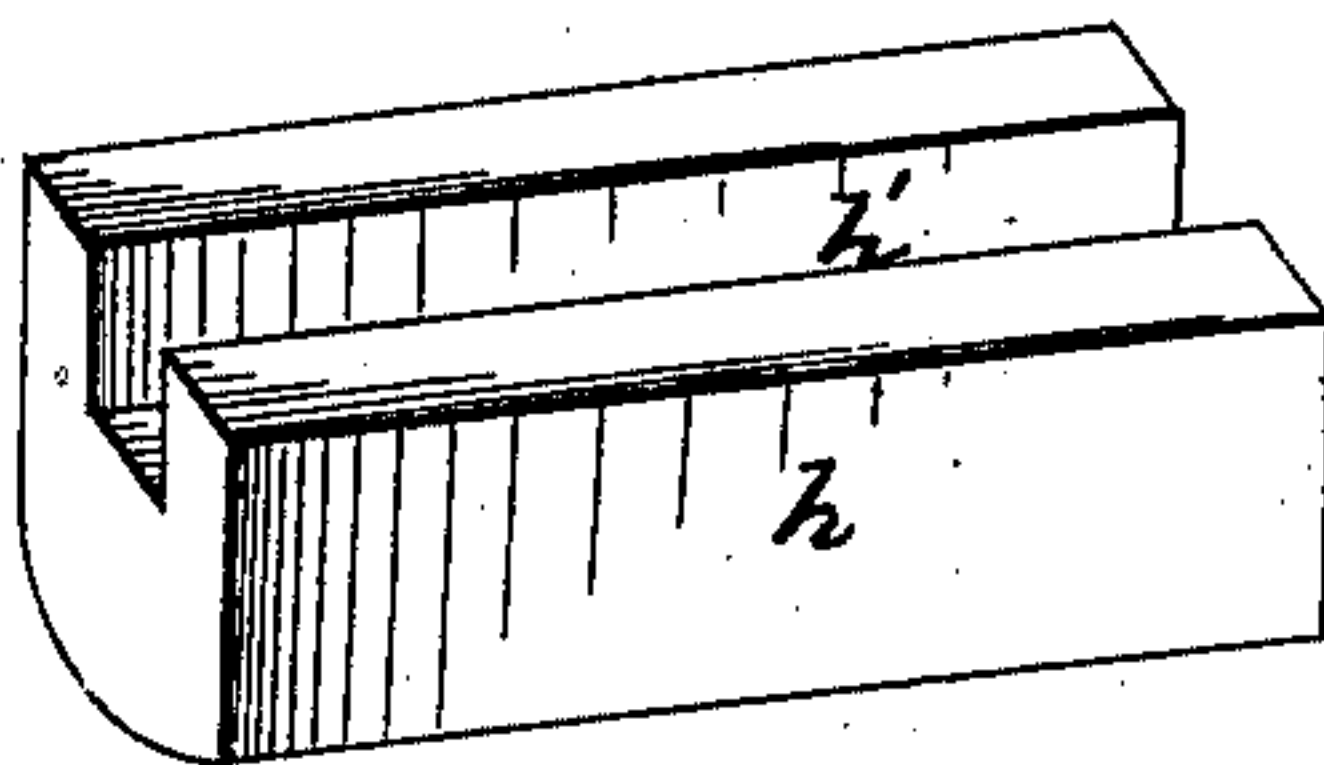


FIG.9.



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FIG.3.

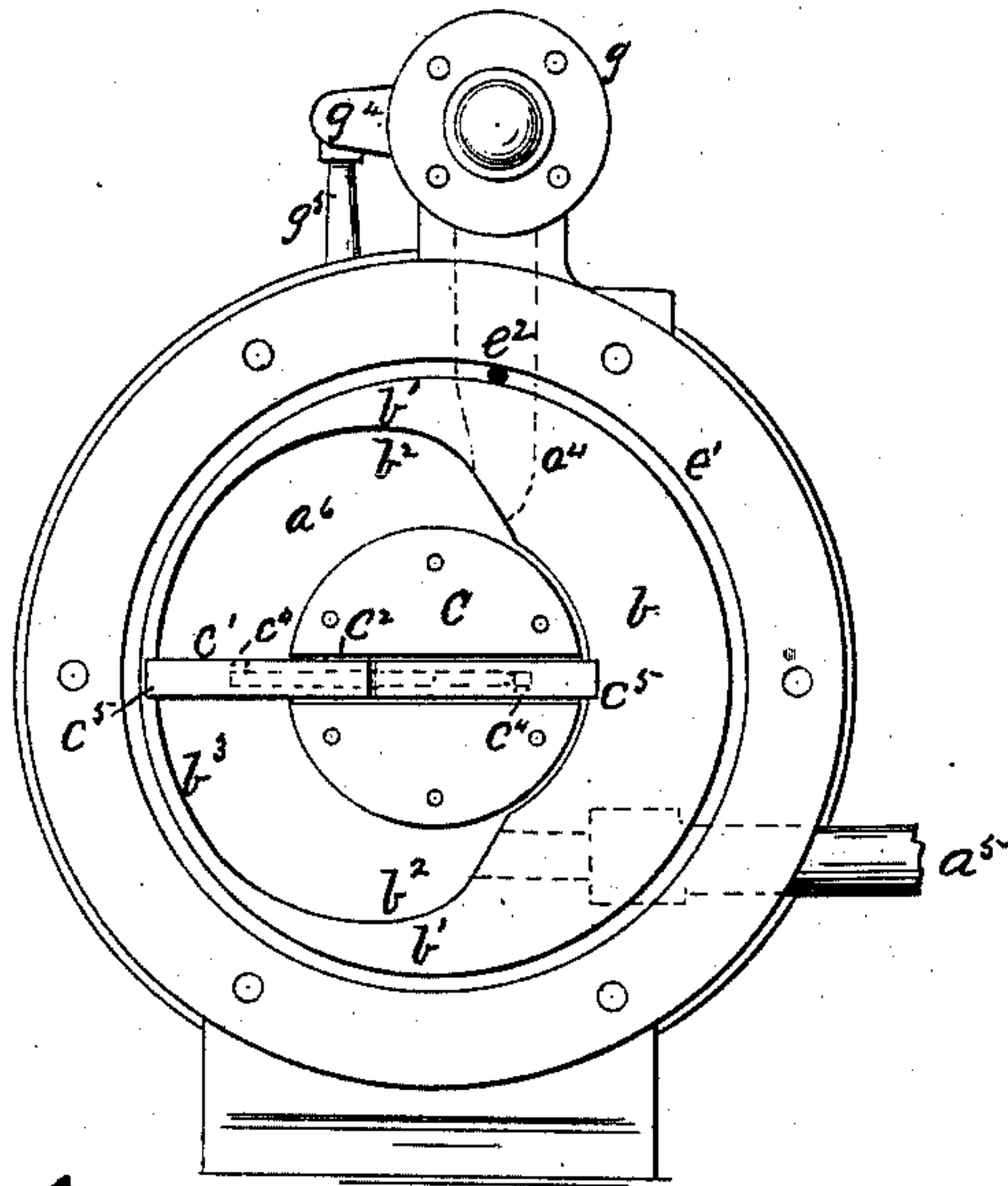


FIG.4.

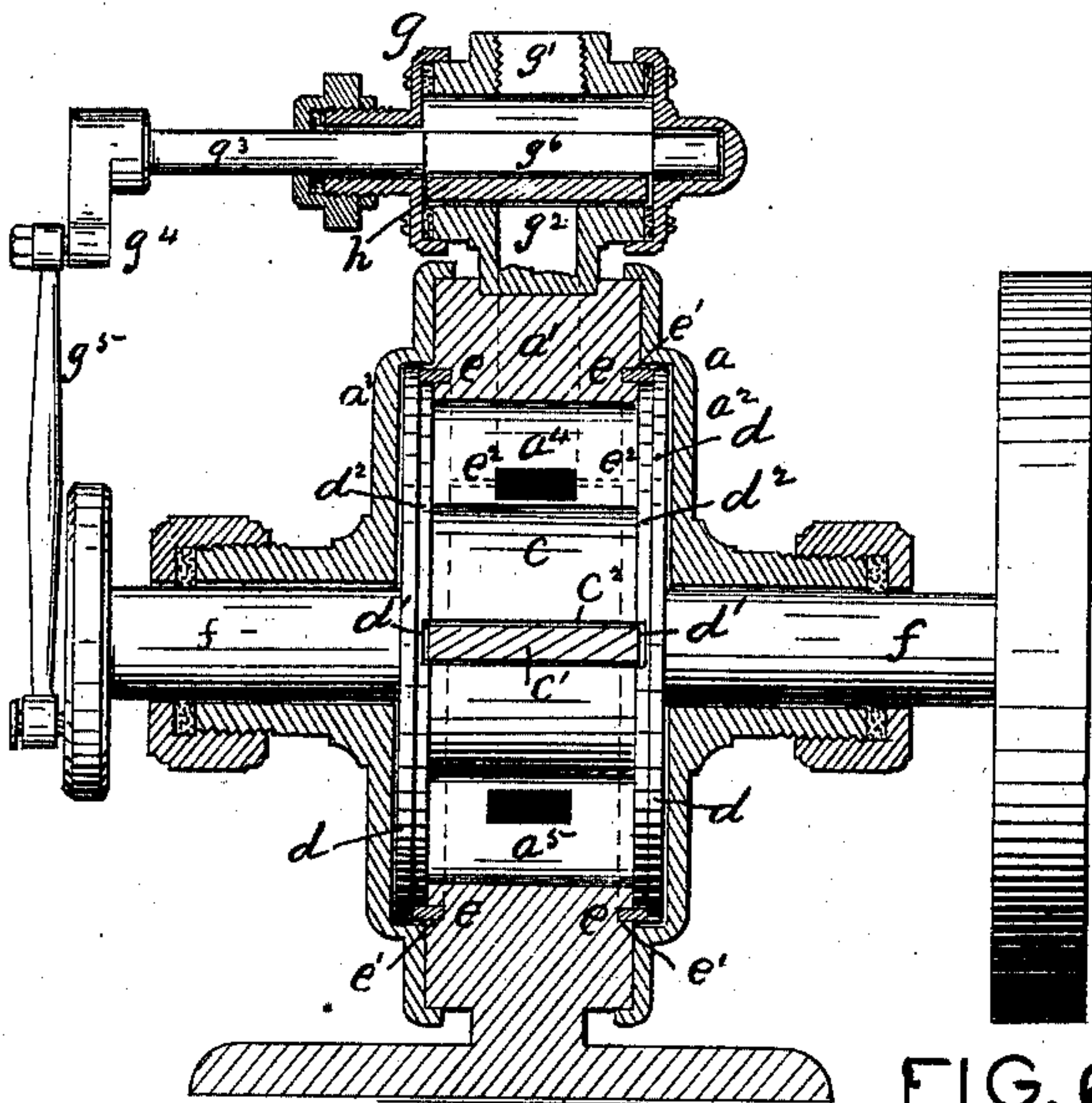


FIG.5.

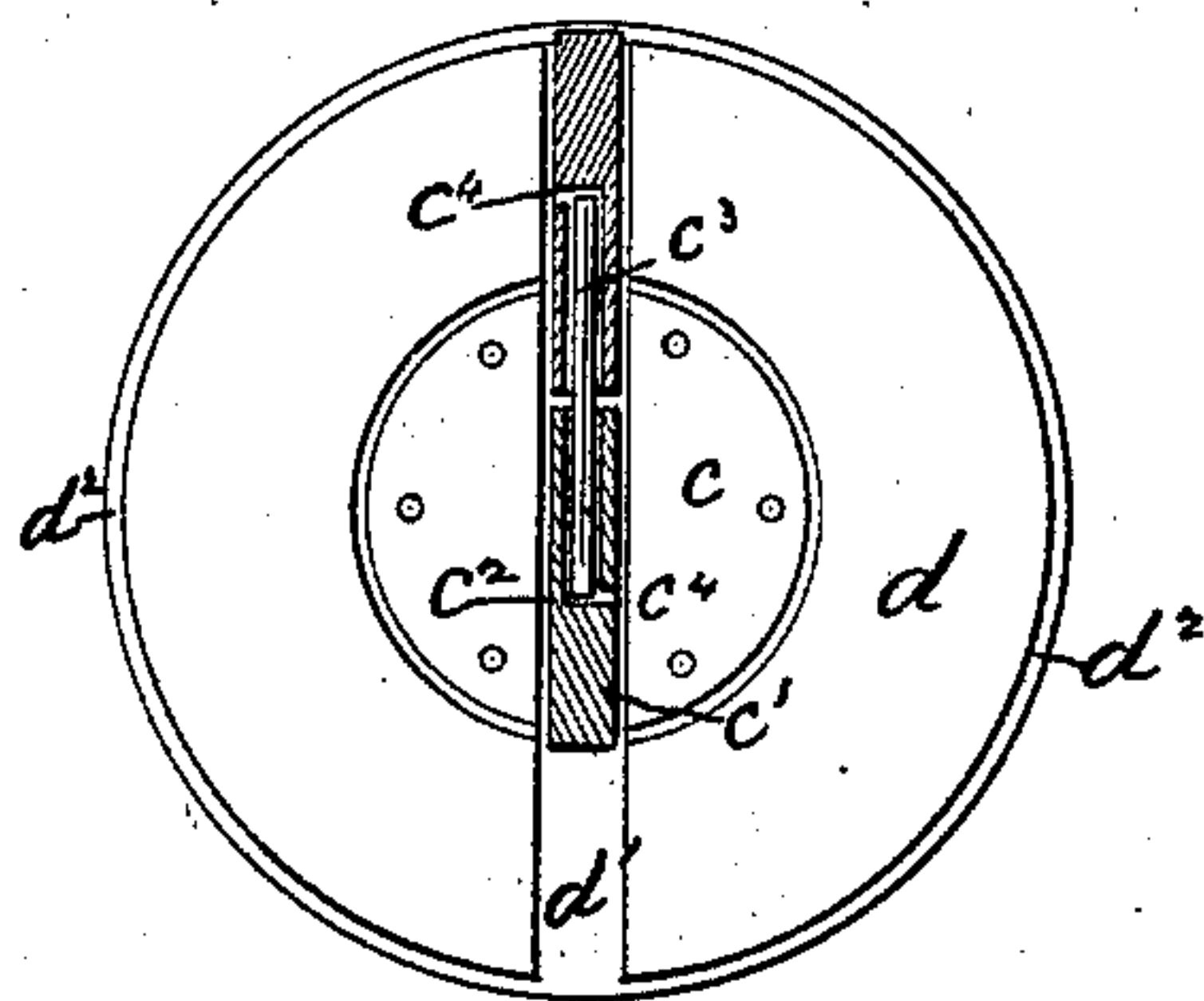
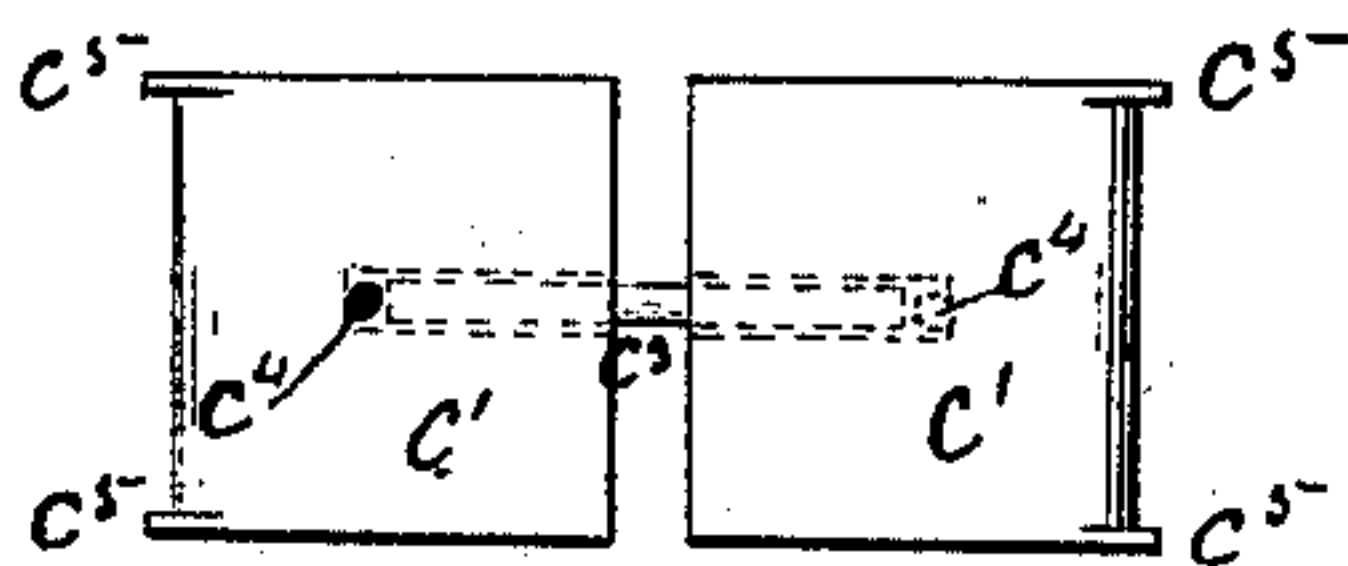


FIG.6.



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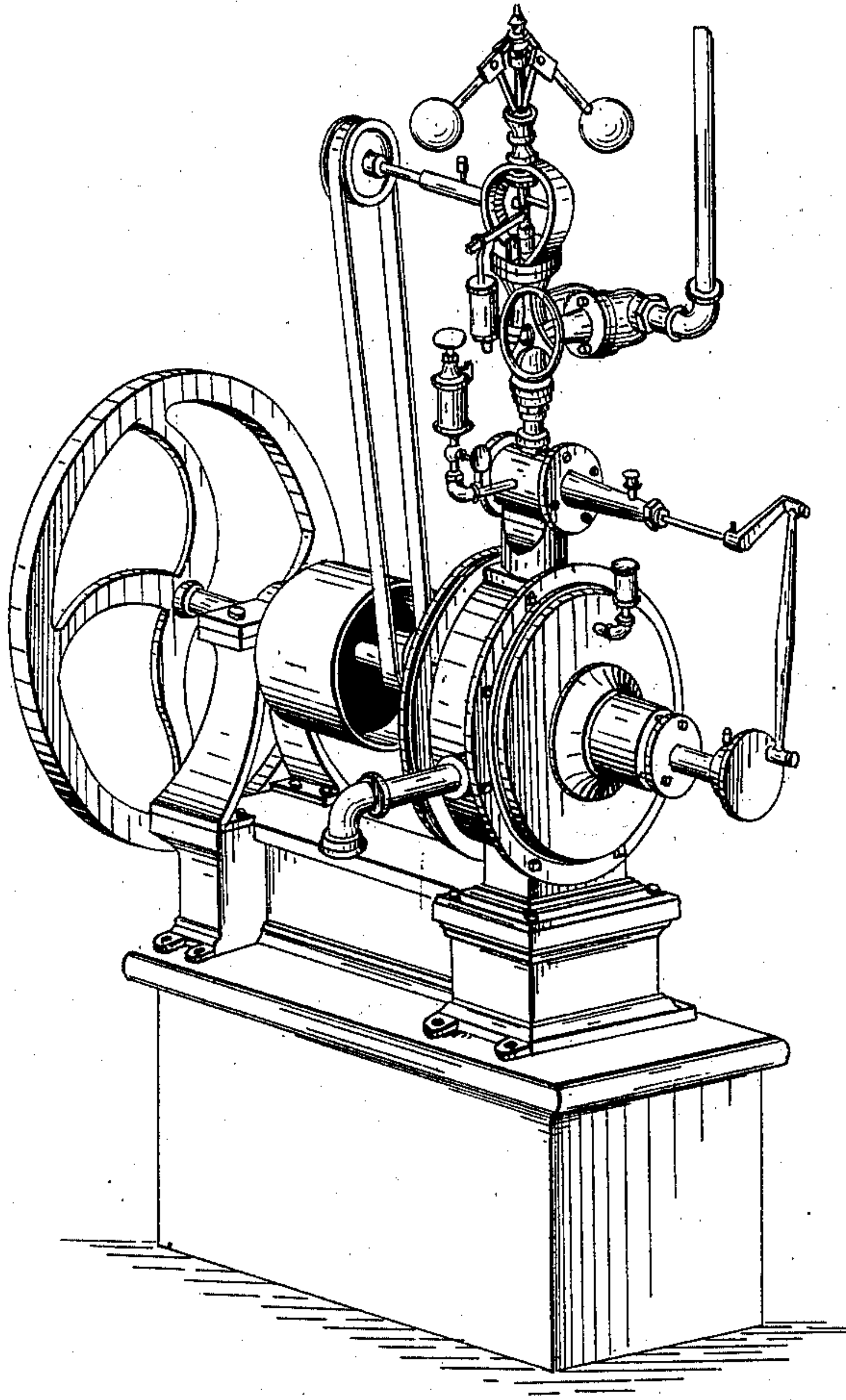
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FIG. 7.



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# UNITED STATES PATENT OFFICE.

ALONZO NOTEMAN, OF TOLEDO, OHIO.

## IMPROVEMENT IN ROTARY ENGINES.

Specification forming part of Letters Patent No. **216,342**, dated June 10, 1879; application filed March 10, 1879.

*To all whom it may concern:*

Be it known that I, ALONZO NOTEMAN, of 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 that the following is a full, clear, and exact description of the invention, which 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 of reference marked thereon, which form a part of this specification.

This invention has for its object to so construct the blades of the piston, the packing-rings, and other parts of the engine that a perfect action shall be secured by the action of the steam.

It consists in admitting steam to the end of the pin inside of and connecting the blades, in admitting steam to the rear side of the packing-rings, in the construction and relative arrangement of the abutment and of the blades of the piston, and in other improvements, all of which will be hereinafter fully explained.

On January 29, 1878, Letters Patent No. 199,737 were granted to me for rotary pumps, and many of the principles shown and described in said patent are embodied in and made applicable to the invention of a steam rotary engine, as hereinafter described.

In the drawings, Figure 1 is a front elevation; Fig. 2, a side elevation. Fig. 3 is a side elevation with the end plate removed. Fig. 4 is a vertical section. Fig. 5 is an inside face view of one of the head or guide plates. Fig. 6 shows the blades of the piston. Fig. 7 is a perspective of a complete engine. Fig. 8 is a vertical section of the steam-box, and Fig. 9 is a perspective of the cut-off.

$a$  is the casing, composed of the cylinder  $a^1$  and end plates  $a^2 a^3$ , within which the piston  $c$  revolves. The cylinder  $a^1$  is provided with the inlet-port  $a^4$  and exhaust-port  $a^5$ , and the end plates  $a^2 a^3$  have suitable bearings for the axis of the piston  $c$ .

The abutment  $b$  is made semicircular in form, and so that it fills about one-third of the inner space or chamber of the casing. Its ends or points  $b^1 b^1$  are made to extend past the vertical diameter, so that it occupies more

than half the inner circumference of the casing. The ports  $a^4 a^5$  pass through the points  $b^1 b^1$ , communicating with the vacuum-chamber  $a^6$  at points close to the piston-head  $c$ . The points  $b^1 b^1$  are made slightly concave, so as to provide cam-surfaces for actuating the blades  $c^1$  of the piston  $c$  in the revolutions of the latter.

The inner openings of the ports  $a^4 a^5$  are arranged so that they are separated a distance less than the diameter of the vacuum-chamber  $a^6$ , the object of which is to secure the continued action of the live steam on the blade  $c^1$  for nearly an entire revolution of the latter, thereby securing a more even, regular, and forcible movement of the piston than is secured in engines of this class of ordinary construction.

$b^3$  is a semicircular recess or chamber formed centrally in the face of the abutment  $b$ . It extends around and covers nearly half the piston  $c$ , which revolves within it. This removes the piston largely from the pressure of the steam, which thus acts more directly on the blades  $c^1$ .

The piston  $c$  has the channel or passage  $c^2$ , in which are placed the blades  $c^1$ , which move back and forth therein. It is secured rigidly to the head-plates  $d d$ , on the inner faces of which are guide-chambers  $d^1$  to receive the edges and give steadiness to the back-and-forth movement of the blades  $c^1$ .

The head-plates  $d$  have cut around their rims rabbets  $d^2$ , made to fit snugly over packing-rings  $e$ , which latter are seated steam-tight in circular grooves  $e^1 e^1$  cut in the cylinder  $a^1$  around the vacuum-chamber  $a^6$  and abutment  $b$ , as shown in Fig. 3. The faces of the head-plates  $d$  fit snugly against the sides of the abutment  $b$  and on the narrow bearing  $b^3$  inside the packing-ring  $e$ .

The axles  $f$ , to which the head-plates and piston are affixed, are journaled in the end plates  $a^2 a^3$  of the casing  $a$ , and have on their outer ends the necessary crank, fly-wheel, and pulleys for driving the attached machinery.

The blades  $c^1$  are connected by the pins  $c^3$  in suitable corresponding mortises. In the side of each blade is formed a small orifice or opening,  $c^4$ , which admits steam to the end of the connecting-pin  $c^3$ , and thus the blades are made



to extend to adapt themselves to the varying diameters of the chamber  $a^6$  by the pressure of the steam on said pin. The blades have formed on their outer corners the projections or lips  $e^5$ , which extend upon the sides of the abutment  $b$  and the bearing  $b^3$  and insure a steadier motion.

$e^2$  are small steam-passages which connect the channels or grooves  $e^1$  with the steam-passage from the steam-box. Steam is admitted through the passages  $e^2$  to the rear or inner edge of the packing-rings  $e$ , and the latter are thereby kept pressed outward and firmly packed in the rabbets  $d^2$  in the faces of the head-plates  $d$ , as shown in Fig. 4.

$g$  is the steam chest or box, placed on the upper side of the casing, and having the inlet-port  $g^1$  and exit-port  $g^2$ , which latter communicates with the inlet-port  $a^4$  in the casing  $a$ .

The steam-chest has journaled in it the axle or shaft  $g^3$ , which passes through the steam-chamber, and has on one of its outer ends a suitable crank,  $g^4$ , which is connected by a pitman,  $g^5$ , with the crank on the axle  $f$ .

The portion  $g^6$  of the shaft  $g^3$  within the steam-chest is made rectangular, or of any other suitable form adapted to hold and control the movements of the cut-off valve  $h$ .

The cut-off valve  $h$  is placed over port  $g^2$ , and it is operated by a swinging or oscillating movement. It is constructed with a channel or mortise,  $h'$ , in its upper side, which corresponds with the shape of and fits upward upon the part  $g^6$  of the shaft  $g^3$ . It is put on the shaft so that it is held rigidly in place, except that it can move vertically downward, thus providing against wear, and preserving at all times a steam-tight fit. The valve swings or oscillates over the port  $g^2$ , which it opens and closes twice in each revolution of the piston through the medium of the connecting-pitman  $g^5$ . The steam exhausts twice from the chamber  $a^6$  in each full revolution of the cylinder.

In the revolutions of the piston, the port  $a^4$  is opened, and the live steam let in upon the upper blade before the exhaust-port  $a^5$  is opened.

The live steam flows in until the upper blade has made about one-quarter of a revolution, when the valve  $h$  cuts off the onward flow, and the blade is driven to the exhaust-port by the expansive power alone of the steam. Thus, it will be seen, the engine is operated half the time by the direct action and the other half by the expansive property alone of the steam. By this arrangement great economy is secured over ordinary engines, in which a continuous stream of live steam is necessary to their efficient operation.

In Fig. 7 I have shown a complete engine constructed according to my invention. It is unique and compact in form; is substantial and durable, and can be made cheaply.

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

1. In a rotary engine, the blades  $c^1$ , coupled by a pin,  $c^3$ , and having holes  $c^4$ , communicating with the mortises or holes containing the ends of the coupling-pin, substantially as and for the purpose set forth.

2. In a rotary engine, the blades  $c^1$ , constructed with the lips or projections  $e^5$  to extend upon the sides of the abutment  $b$  and the bearing  $b^3$ , substantially as and for the purpose set forth.

3. In a rotary engine, the combination of the cylinder  $a^1$ , having ports  $a^4$   $e^2$  and grooves or channels  $e^1$ , surrounding the vacuum-chamber  $a^6$  and abutment  $b$ , the head-plates  $d$ , supporting the piston and axles, and provided with rabbets or channels  $d^2$  around their rims, and the circular adjustable packing-rings  $e$  placed within the channels  $e^1$ , and pressed outward against the head-plates, substantially as and for the purpose set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

ALONZO NOTEMAN.

Witnesses:

J. M. HUESTON,  
A. B. RICHARDS.