

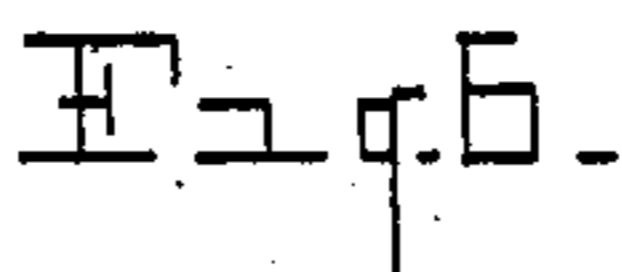
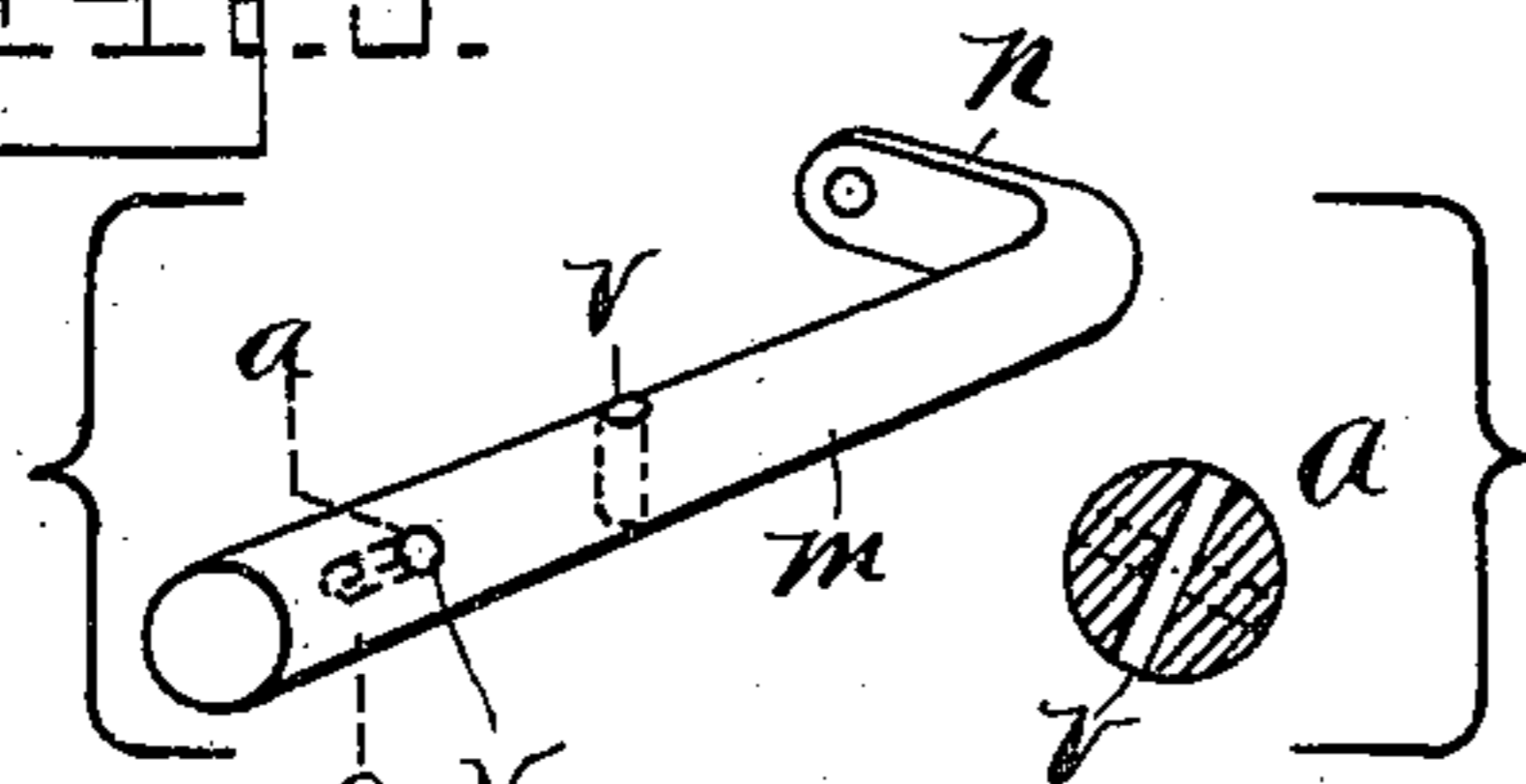
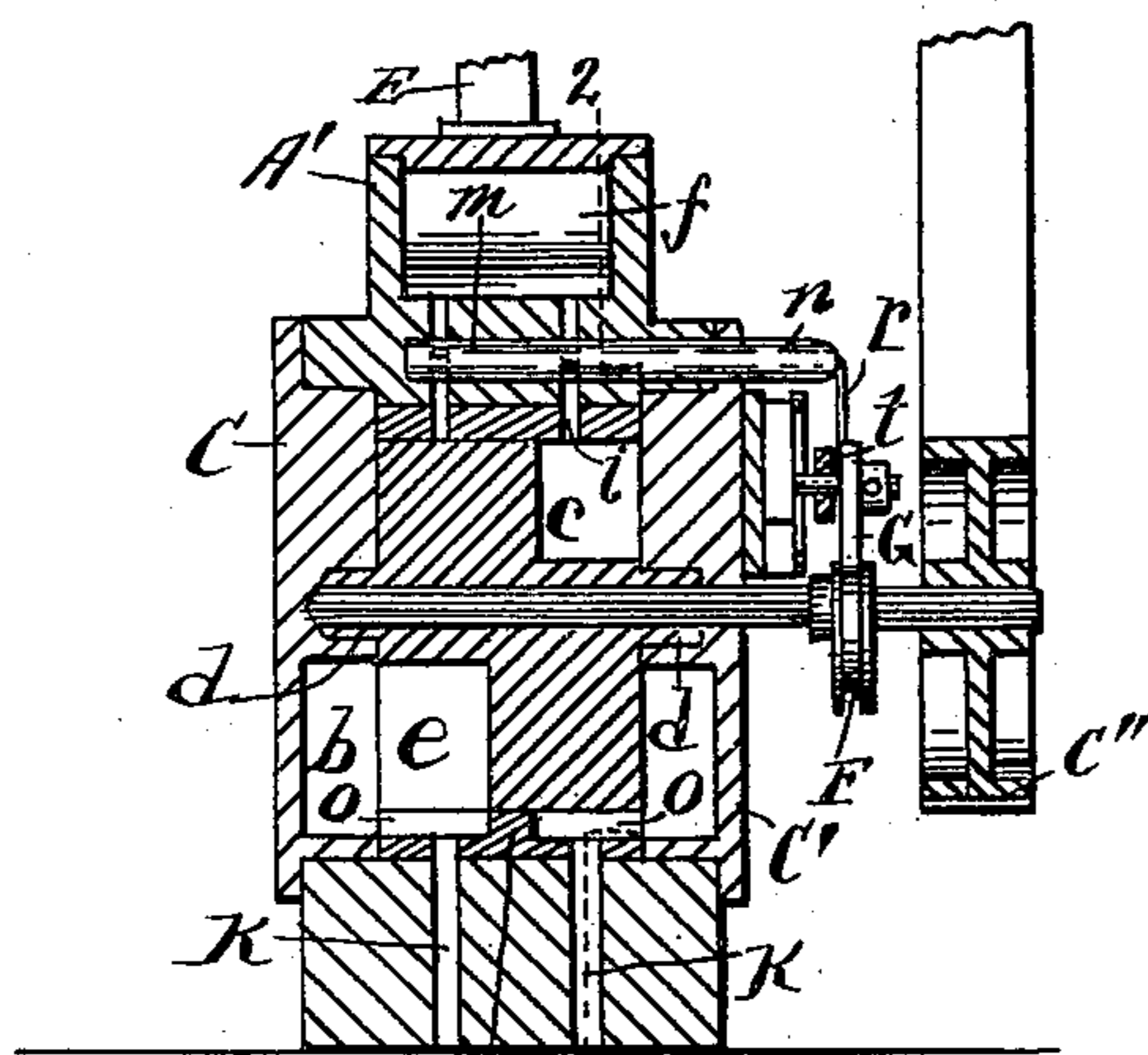
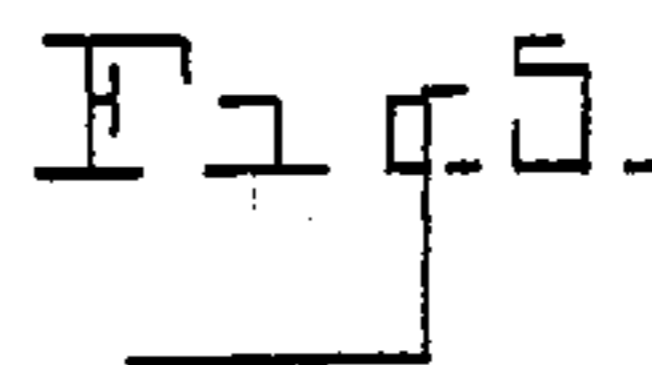
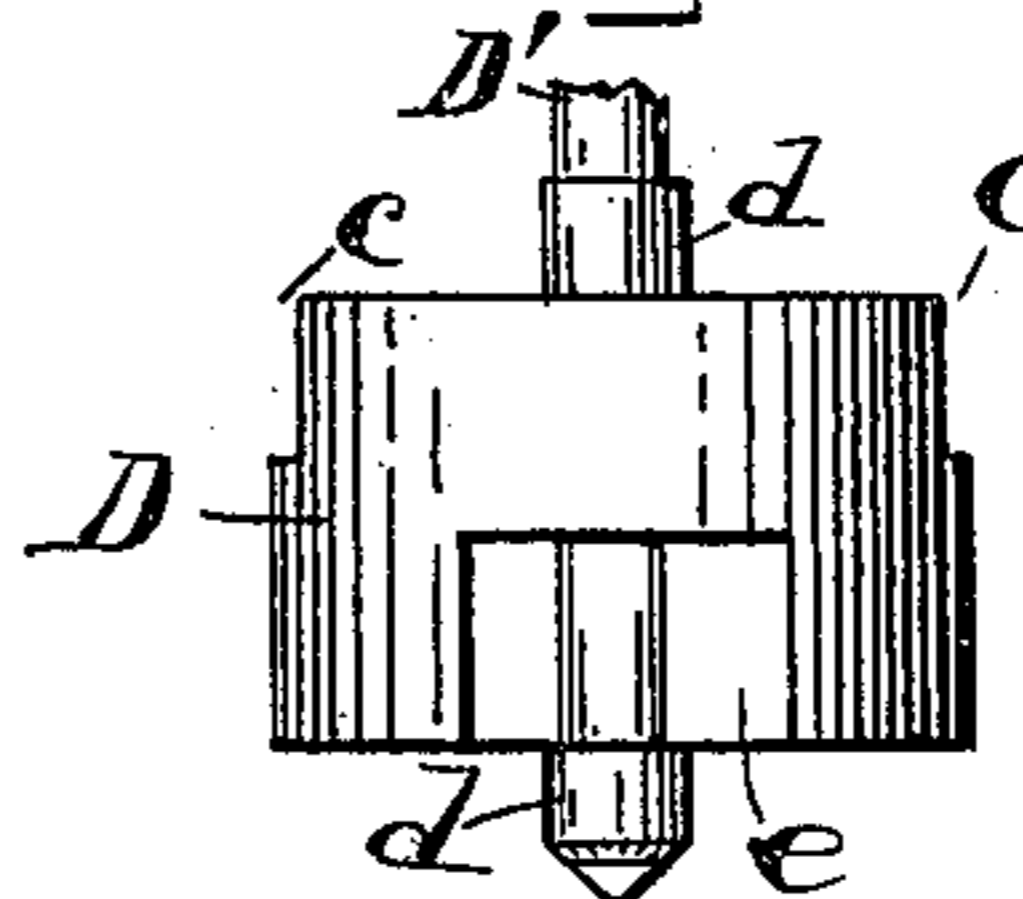
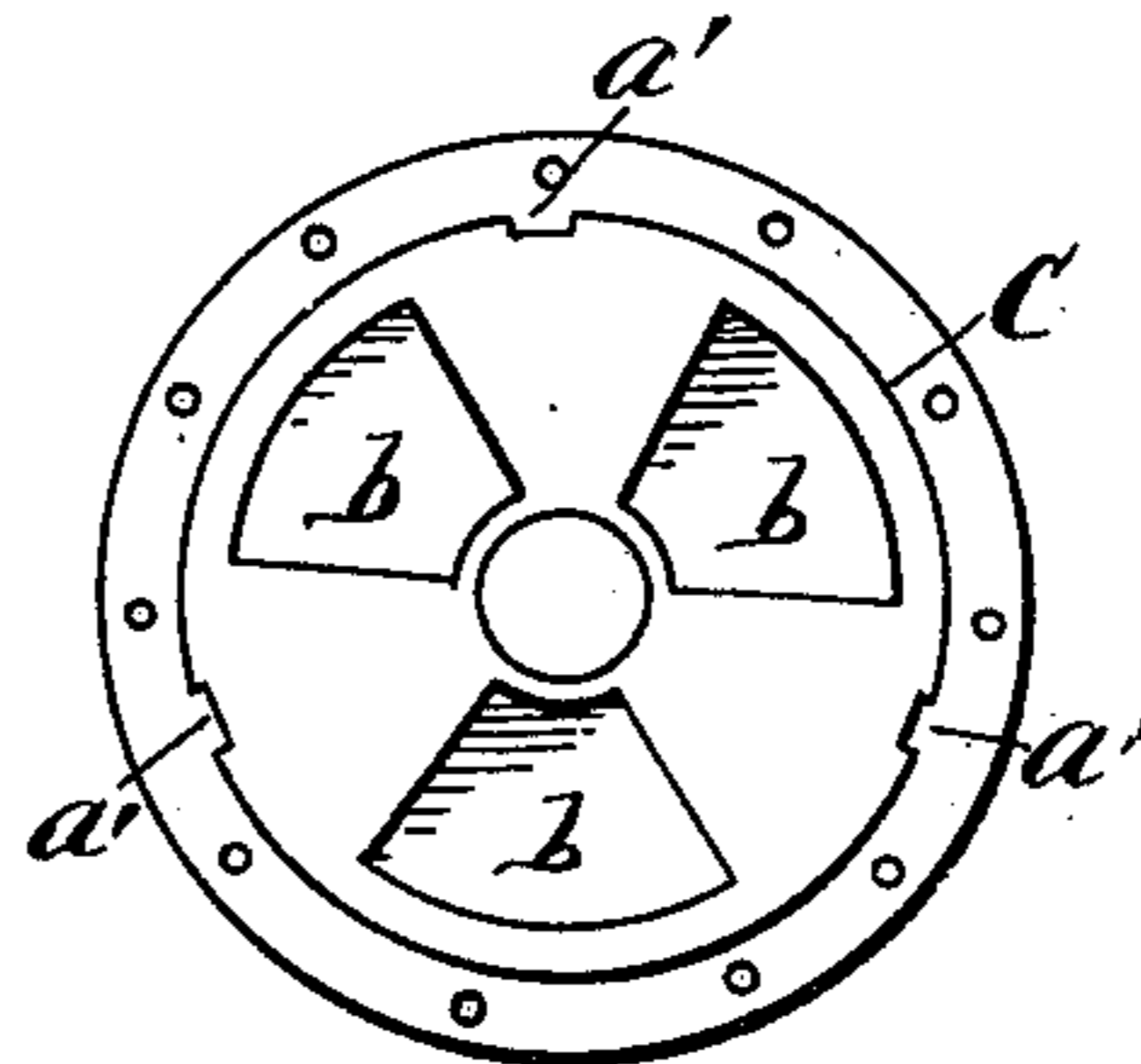
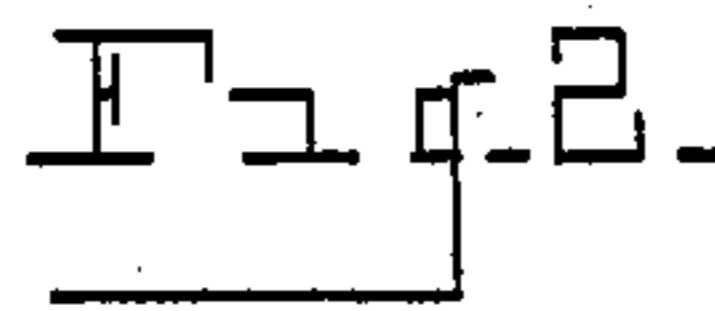
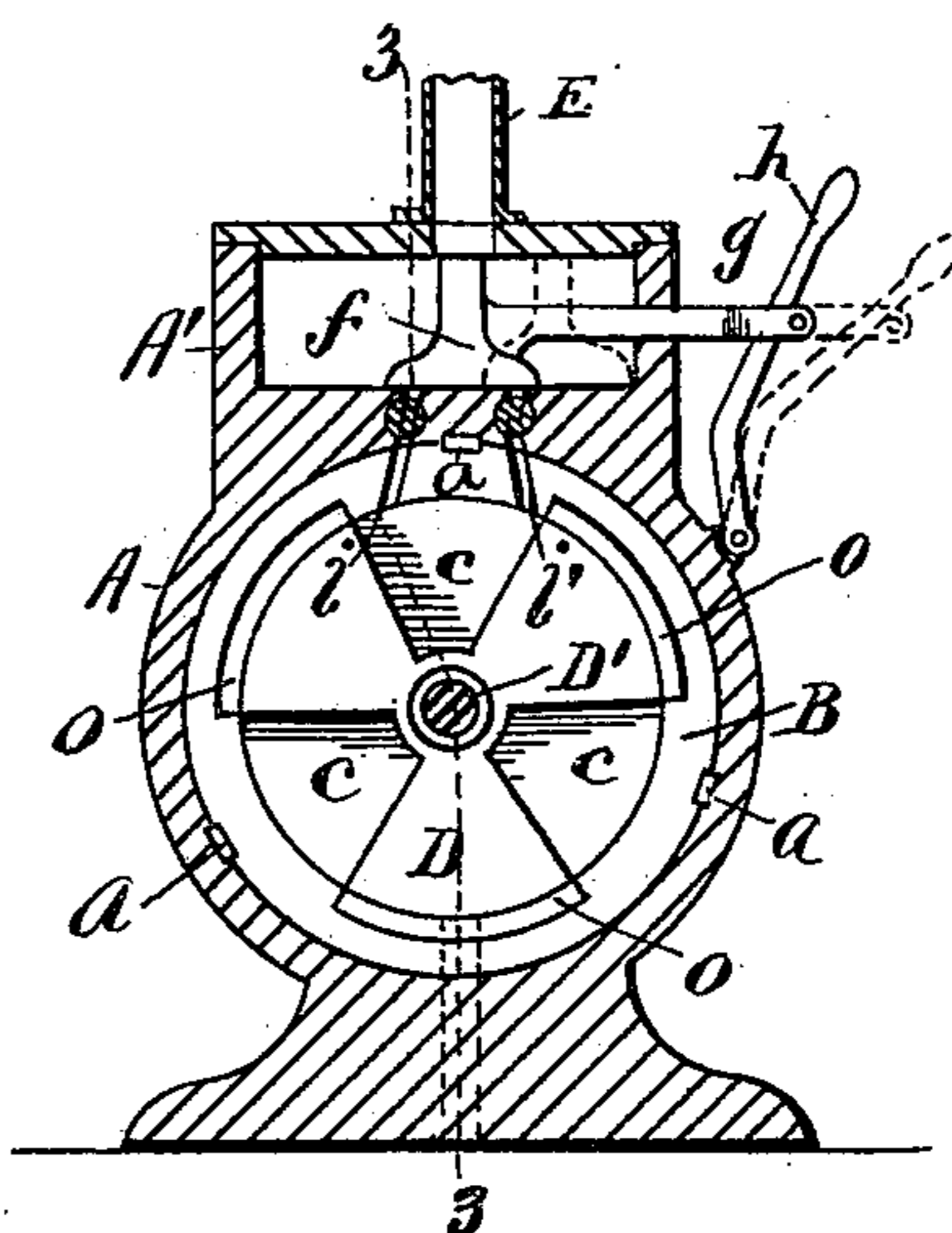
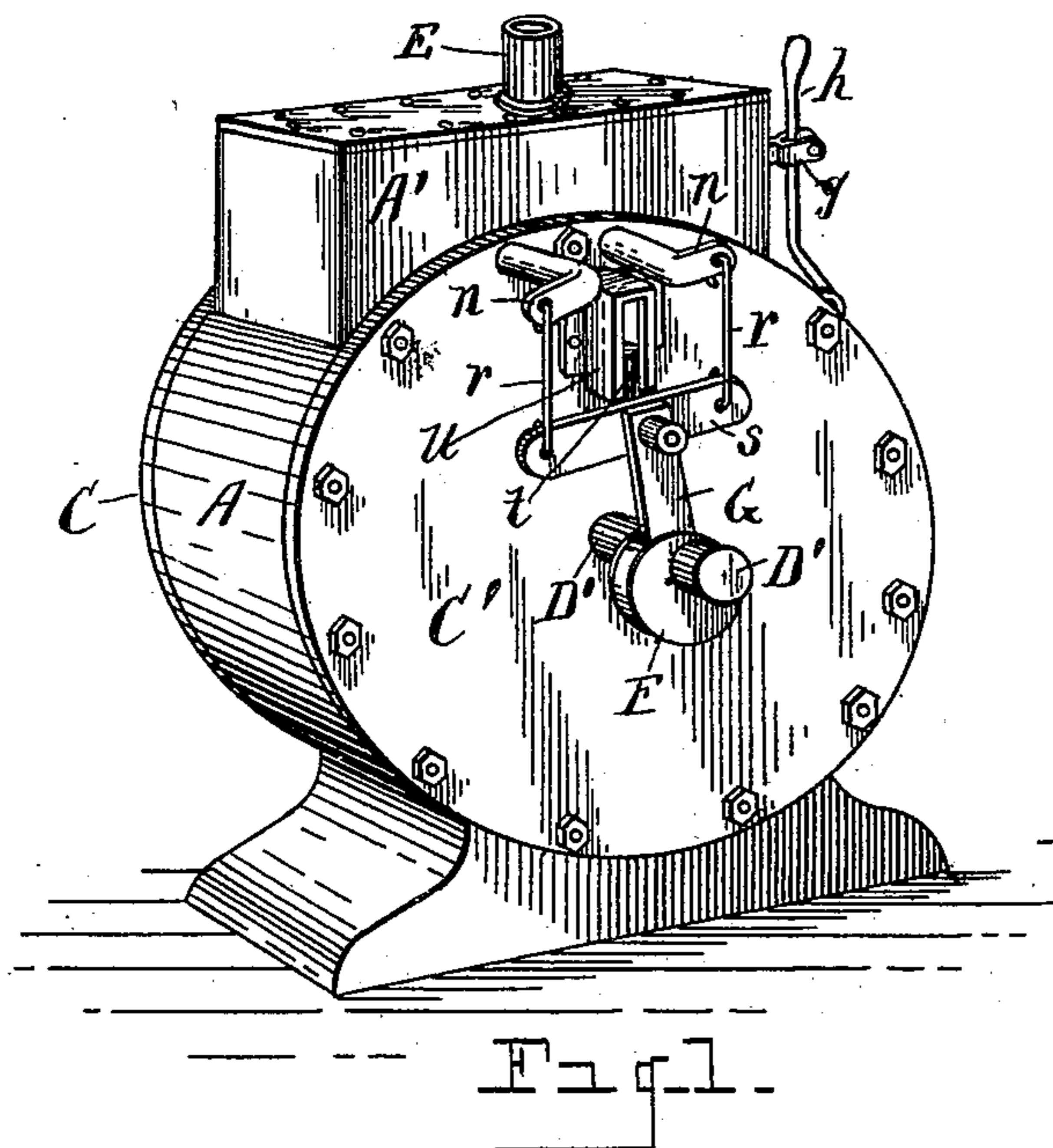
No. 622,013.

Patented Mar. 28, 1899.

A. OLIVER.
ROTARY ENGINE.

(Application filed Aug. 29, 1898.)

(No Model.)



WITNESSES.

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ALFRED OLIVER, OF ALPENA, MICHIGAN.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 622,013, dated March 28, 1899.

Application filed August 29, 1898. Serial No. 689,777. (No model.)

To all whom it may concern:

Be it known that I, ALFRED OLIVER, a citizen of the United States, residing at Alpena, in the county of Alpena, State of Michigan, have invented certain new and useful Improvements in Rotary Engines; and I do 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 the letters of reference marked thereon, which form a part of this specification.

This invention relates to rotary engines of the concentric-cylinder class; and it consists in the construction and arrangement of parts hereinafter fully set forth, and pointed out particularly in the claims.

The object of the invention is to produce a reversible rotary engine of simple, compact, and inexpensive construction in which the arrangement is such as to obviate the possibility of a dead-center and minimize frictional resistance. This object is attained by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a perspective view of my improved engine. Fig. 2 is a vertical section of the engine on line 2 2 of Fig. 3. Fig. 3 is a like section on line 3 3 of Fig. 2. Fig. 4 is a view in elevation of one of the chambered heads of the case. Fig. 5 is a plan view of the rotary piston, showing the recesses in the opposite sides thereof. Fig. 6 is an enlarged detail view of one of the cut-off valves adapted to control the steam-ports leading from the steam-chest to the piston.

Referring to the letters of reference, A designates the inclosing case, which is preferably circular in form and provided with an inner annular chamber in which is centrally located a ring B, which is secured in said case against rotation by suitable keys *a*, which lie in notches in the outer edge of said ring and engage corresponding notches *a'* in the heads of said case. The heads C C' of the case correspond with the cylinder-heads of a reciprocating engine and are provided on their inner face with a series of chambers *b*. The piston D is annular and provided with a concentric shaft D', the opposite ends of said piston being provided with the projecting

hubs *d*, through which said shaft passes and which are journaled in the opposed heads of the case, said shaft passing through the head C' and carrying the driving-pulley C''. Formed in the opposite ends of said piston are alternating recesses *c* and *e*, respectively, which are triangular in form and extend through the periphery of the piston. These recesses do not communicate from side to side of the piston, but, instead, there is a central portion of the face of the piston which is unbroken and which is embraced by the central portion of the ring B, so as to confine the steam within the recesses of the piston and prevent its passage from side to side thereof.

Mounted upon the top of the case A is a steam-chest A', in which is located an ordinary slide-valve *f*, having a stem *g* passing through said chest and adapted to be actuated by a pivotal lever *h*. Communicating with the steam-chest is a steam-induction pipe E. Passing from the steam-chest obliquely downward through the ring B are two sets of double steam passages or ports *i i'*, respectively, the opposite ports of each set communicating with the opposite recesses in said piston. The arrangement is such that when the valve *f* is on its center both sets of ports will be closed and there will be no steam admitted to the piston. When said valve is drawn to the right, however, as shown by dotted lines in Fig. 2, steam is admitted in both the left-hand ports *i*; but owing to the alternation of the recesses in the opposite ends of the piston steam passes into said recesses from one port only at a time. With the parts in the position shown in Fig. 2 the opening of the ports *i* will cause the steam to pass through one of said ports into the corresponding recess *c* in one side of said piston. The force of the steam striking the wall of said recess will cause the piston to turn to the left, which movement brings the recess *c* in the piston in which the steam is entering into communication with one of the chambers *b* in the adjacent head of the case, the rush of steam in filling said chamber further accelerating the movement of the piston. When the recess *c* has been carried past the port *i*, so that steam is no longer admitted to said recess, one of the recesses *e* in the opposite end of said piston will then be caused to register with the

opposite port *i*, and the operation just described will take place at the opposite end of the piston, and so the operation continues as the steam is admitted into the recesses in the opposite sides of the piston, making, in effect, a duplex engine and obviating the possibility of the engine's becoming stalled upon a dead-center. The steam entering the chambers *b* of the heads of the case is permitted to expand therein, thereby reducing lateral pressure upon the piston and decreasing the friction between the piston and the opposed head. Said chambers also serve to form a water-packing, as some water of condensation forms therein, preventing the steam from blowing through the engine.

The exhaust-ports *k* pass through the bottom side of the ring B and through the base of the case. These ports register with the opposed recesses *c* and *e* in the opposite sides of the piston and permit of the escape of exhaust-steam therefrom as said recesses pass the lower arc of ring B.

Formed in the inner arc of ring B is a series of pockets *o*, which lessens the contact-surface between said ring and the piston, thereby reducing the friction between said parts.

To reverse the engine, the slide-valve is moved in the opposite direction to that indicated by dotted lines in Fig. 2, thereby closing the ports *i* and opening the ports *i'*, whereby the steam admitted to the piston through said ports would tend to drive said piston in the opposite direction.

To provide for removing the steam-pressure from the face of the piston after it has reached the point of cut-off, I employ two cut-off valves *m*, which cross the ports *i i'* and are adapted to close them. The outer ends of the stems of said valves are provided with short cranks *n*, which stand outwardly in opposite directions and are connected by means of links *r* with a cross-head *s*, which is mounted upon a vertically-reciprocatory slide *t*, confined in a suitable way *u*, attached to the head C' of the case. Upon the shaft D' of the engine is an eccentric F, the eccentric-rod G of which is pivoted to said cross-head *s*. By this arrangement it will be seen that a rotation of the shaft D' will cause said cross-head to reciprocate vertically and impart a rocking motion to the valves *m*. Passing through each of said valves *m* are the ports *v*, adapted to register, respectively, with each of the double ports *i i'*, establishing communication between the steam-chest and piston, the arrangement being such that said valves are operated to admit steam in reciprocal succession to the opposite recesses *c* and *e* of the piston and to cut off the steam from said recesses in the pis-

ton when by the operation of the engine said recesses shall have passed the point where steam can be no longer admitted thereto. This arrangement relieves the piston from the pressure of the steam at the time when the steam is not being admitted to the recesses therein, thereby relieving said piston from the friction which would result from said pressure.

Having thus fully set forth my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a rotary engine, the combination of the case, the ring therein held from rotation, said ring having pockets in the periphery thereof, a rotary piston adapted to turn within said ring having alternate radial recesses in the opposed ends thereof adapted to successively register with the pockets in said ring, the heads of said case having chambers which correspond with the recesses in said piston, the steam-chest upon said case, ports leading from said steam-chest to the recesses in the opposite ends of said piston, rocking valves located in said ports having apertures passing at right angles therethrough adapted to register with said ports respectively, and admit steam to the opposite recesses of the piston in alternate succession, means for actuating said valves and exhaust-ports communicating with said recesses.

2. In a rotary engine, the combination of the case having a steam-chest therein, a fixed ring within said case and fixed chambered heads closing the ends of said case, a piston adapted to rotate within said ring between the opposed heads of the case and having in its opposed ends a series of radial recesses adapted to successively register with the chambers in said opposed heads, steam-ports establishing communication between the steam-chest and the recesses of the piston, rocking valves located in said ports having apertures passing at right angles therethrough which are adapted to register with said ports, respectively, and admit steam to the opposed recesses of the piston in alternate succession, the shaft of the piston passing through one of said heads, an eccentric on said shaft, an eccentric-rod connecting said eccentric with the stem of said rocking valves whereby said valves are actuated by the rotation of the shaft of the piston, substantially as and for the purpose set forth.

In testimony whereof I sign this specification in the presence of two witnesses.

ALFRED OLIVER.

Witnesses:

JNO. S. McVICAR,
PAUL DANE.