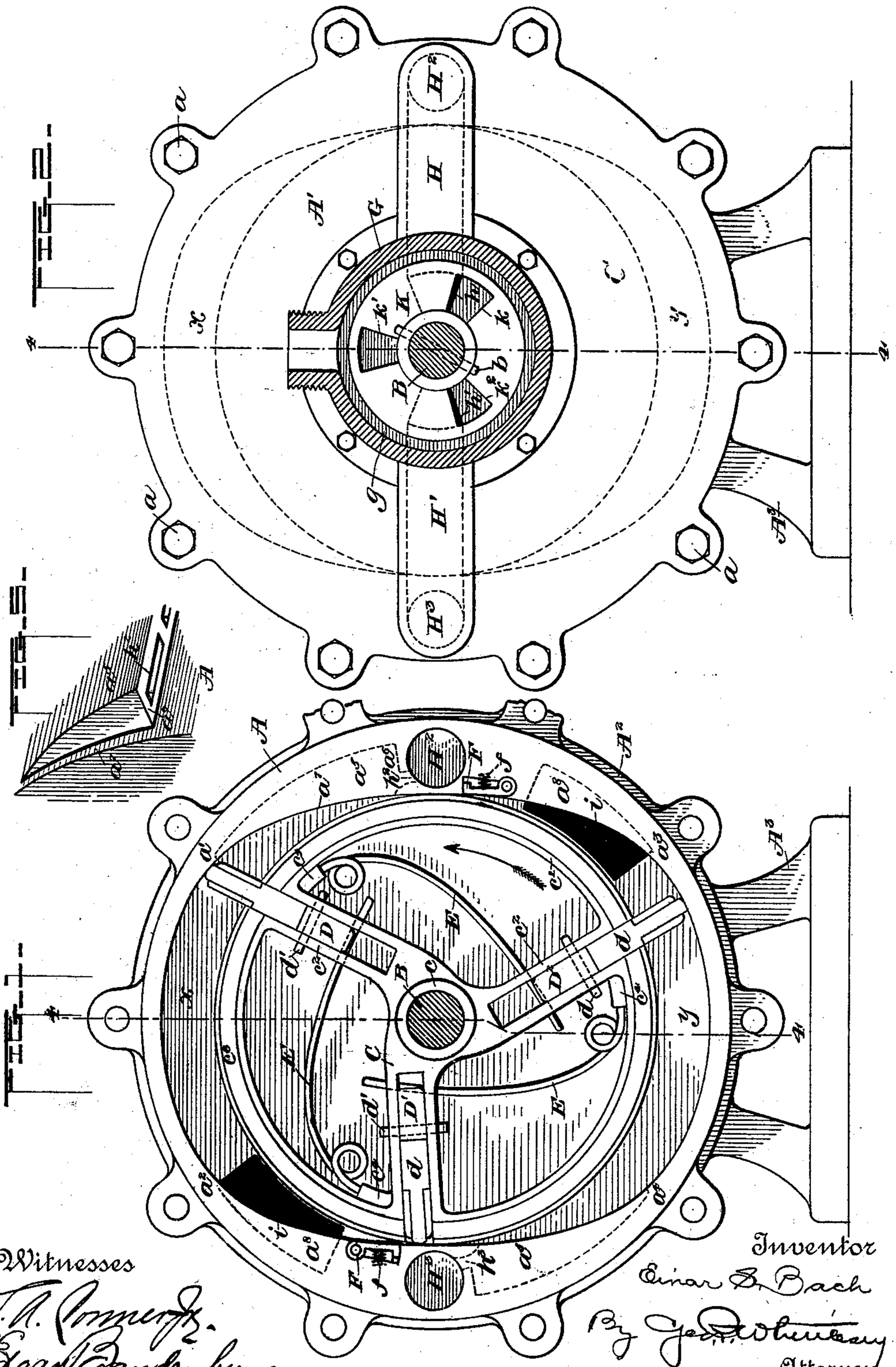
(No Model.)

2 Sheets—Sheet 1.

E. S. BACH.

ROTARY ENGINE.

No. 549,484. Patented Nov. 12, 1895.



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(No Model.) 2 Sheets—Sheet 2.

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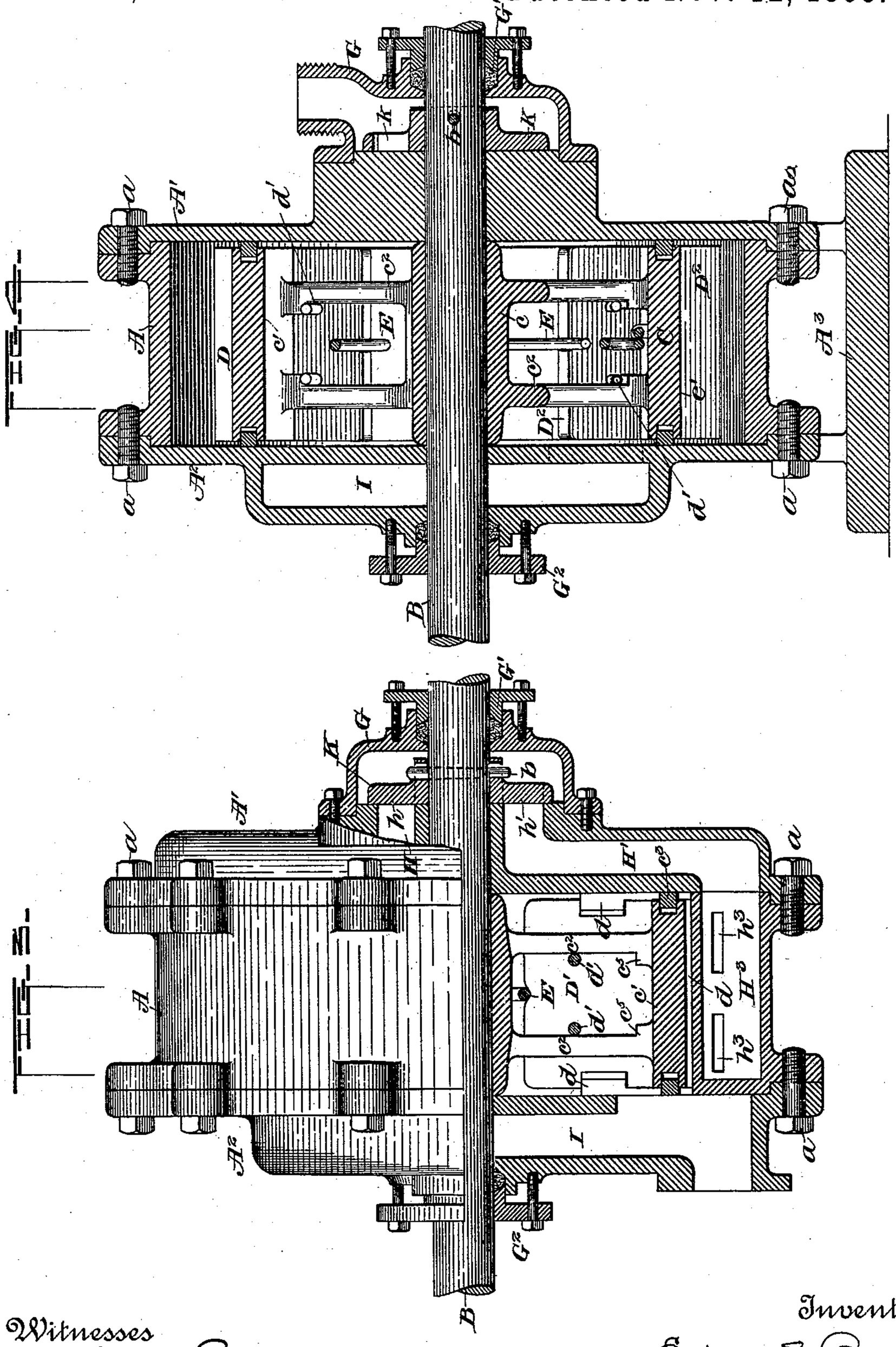

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UNITED STATES PATENT OFFICE.

EINAR SEBASTIAN BACH, OF COLORADO CITY, COLORADO.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 549,484, dated November 12, 1895.

Application filed January 2, 1895. Serial No. 533,547. (No model.)

To all whom it may concern:

Be it known that I, EINAR SEBASTIAN BACH, a citizen of the United States, residing at Colorado City, in the county of El Paso and State of Colorado, 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.

My invention relates to rotary engines, and its object is to provide an improved engine or motor of this class adapted to be operated by steam, compressed air, water, or any other fluid under pressure and of greater efficiency than those with which I am acquainted.

The invention consists in certain constructions and arrangements of parts, hereinafter described, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation with one end of the casing removed. Fig. 2 is also an end elevation, the valve-chest being in section. Fig. 3 is a top plan partly in section. Fig. 4 is a vertical section on line 4 4, Figs. 1 and 2. Fig. 5 is a detail.

The casing is composed of a preferably-cylindrical body A and heads A' A^2, secured to said body by screws a, the joints being made fluid-tight in any desired way. Legs A^3 may be cast with or attached to the heads. The interior of the body A is elliptical in shape, though not a true ellipse. The ends from a' to a^2 and a^3 to a^4 are arcs (preferably of about eighty degrees) of a circle struck from the axis of the transverse shaft B. The sides are formed by continuing the curve of the ends in a parabolic curve, the two parabolas on each side meeting in a common tangent at the minor axis of the ellipse.

Secured to the shaft B within the casing is a cylindrical wheel C, having a hub c, a rim c', and arms or spokes c^2, the latter being preferably double, as shown. The rim and arms are slotted to receive the flat sliding pistons or abutments D D' D^2. Those portions of the rim between the slots have a groove in their edges to receive the packing-strip c^3, which is kept pressed out by any suitable means against the smooth plane inner faces of the heads A' A^2 of the casing. The pistons, which are preferably three in number, are each provided with grooved edges and outer ends to receive the packing-strips d. A spring E is provided for each piston, one end being held in a socket c^4 on the wheel C and the other end bearing against the inner end of the piston and tending to force it outwardly.

The end of the piston may be notched to keep the spring in place. In each piston are one or more pins or studs d', which when the piston reaches the limit of its outward movement bring up against the shoulders c^5 on the arms c^2 and thus positively stop the piston from further outward movement. These stop-pins are so placed that the ends of the piston do not touch the casing between the points a' a^2, the joint being kept tight by the packing d.

The rim c' of the wheel comes close to the sides of the casing on the minor axis of the ellipse—that is to say, about midway between the points a' a^3 and a^2 a^4, the slight space between them being kept fluid-tight by means of the hinged packing-plates F, let into recesses in the body A and held against the rim c^2 by the springs f.

Steam or other fluid under pressure is supplied to a valve-chest G, secured to the head A' and surrounding the shaft B, which passes through stuffing-boxes G' and G^2 on the valve-chest and the head A^2, respectively. In the A' are cored out two passages H H', which open at one end into the valve-chest by the ports h h', located diametrically opposite on either side of the shaft in a preferably flat valve-seat g. The other ends of the passages H H', communicate with transverse passages H^2 H^3, cored out in the body A at points on or near the minor axis of the elliptical casing. Each of these transverse passages has one or more narrow ports h^2 h^3 opening into the spaces x y between the rim of the cylindrical wheel C and the ends of the elliptical chamber in the body A, the ports h^2 leading to the upper space x and the ports h^3 to the lower space y, as shown in Fig. 1, and in each case in advance of the adjacent packing-plate F. The body A has a recess a^5 at the points where the ports h^2 h^3 enter it, as shown by

the dotted lines in Fig. 1 and in perspective in Fig. 5, thereby enlarging the spaces $x\ y$ and affording a chamber to be filled with the fluid as soon as it is admitted and having a shoulder a^6 radial to the shaft and serving as a stationary abutment for the fluid to act against. The pistons do not enter this recess, being compelled to slide on the edges a^7 thereof. The backs of the recesses a^5 merge into the elliptical curve of the chamber in the body A at the points $a'\ a^4$.

At the opposite end of each space $x\ y$ there is a similar recess a^8, with which communicate the two exhaust-ports i, which lead, preferably, to a common exhaust-passage I, cored out in the head A^2.

The admission of the actuating fluid is controlled by a rotating-valve K, preferably in the form of a disk keyed upon the shaft B within the valve-chest G, and held against the valve-seat g by the pressure of the fluid. The holes in the hub of the valve through which the key b passes are elongated, so that the disk is capable of a slight axial motion on the shaft and, being thus loose, is kept pressed tight against the valve-seat.

In the disk valve are three ports $k\ k'\ k^2$, spaced at equal distances apart, like the three pistons. The ports and pistons have a certain relative position, which will clearly appear upon an inspection of Figs. 1 and 2. The arrangement is such that just as the piston D passes the point a', as shown in Fig. 1, the pot h is uncovered by the port k, admitting the fluid pressure to the passages H H^2, ports h^2, and chamber a^5, where it exerts its force against the pistons. At the same instant the piston B′ is about midway between the points $a^2\ a^4$ and the piston D^2 has traversed most of the space y and is nearly at the point a^3, the beginning of its exhaust. As soon as it reaches that point the port h' will be entirely closed, the forward movement of the disk K having carried the port k^2 away from the port h'. As soon as the piston D′ reaches the point a^4 the port k' will begin to open the port h' and the port k to close the port h. The fluid is thus admitted to the passages H H′ alternately and the pistons are acted upon alternately in the spaces x and y.

Since the arcs from a' to a^2 and a^3 to a^4 are concentric with the shaft, the pistons have no radial movement while subjected to the fluid-pressure; but as soon as they reach the point a^2 or a^4 and begin to be forced inwardly by the flattened parabolic curves of the casing then the exhaust-port opens and relieves the pressure. The pistons, therefore, are not subjected to any unbalanced pressure while sliding in or out in the slotted arms c^2, and the only resistance to be overcome by the cam action of the casing between the points $a^2\ a^4$ and $a^3\ a'$ is that of the spring E, which need be only strong enough to overcome the weight of the piston, so as to assist in its outward movement. This construction greatly reduces the wear and enhances the easy and rapid running of the motor. Another important feature in this connection is the position of the pistons, which are not radial, but tangent to the shaft B or to a small circle concentric with the shaft. This inclines them forward, which not only brings them more nearly normal to the flattened curves $a^3\ a'$ and $a^2\ a^4$, and so renders it easier for them to be forced inwardly by said curves, but also counteracts to a certain extent the effect of centrifugal force, which tends to throw the pistons out against the inner surface of the casing. Any loss which might be due to their not standing at right angles to the column of actuating fluid is made up by the increased surface presented to the pressure. The particular position of the pistons must be governed by the speed at which the motor is to run, since the greater the speed the larger must be the circle to which they are tangent, or, in other words, the greater must be their departure from a radial position.

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

1. In a rotary engine, a casing having its ends composed of arcs $a'\ a^2$, $a^3\ a^4$, concentric with the shaft, and sides composed of parabolic arcs meeting in a common tangent midway between the ends, said sides having recesses a^5 with radial ends a^6 and terminating at the points $a'\ a^4$, and recesses a^8 beginning at the points $a^2\ a^3$, with inlet ports $h^2\ h^3$ in the ends a^6 of the recesses a^5, and exhaust ports i opening into and covering one end of the recesses a^8, substantially as described.

2. In a rotary engine, the combination with the casing A having an elliptical interior with ends concentric with the shaft B, of a cylindrical wheel C mounted on the shaft, having arms c^2 each inclined forward at an angle with the radial line, said arms and the rim being slotted from one side to the other, sliding pistons D mounted in said slots, and spring rods E each having one end fastened to the wheel C and the other end bearing against the inner end of a piston D, substantially as described.

3. In a rotary engine, the combination with a casing A, having an elliptical interior with concentric ends, of a wheel C having slotted double arms c^2 provided with shoulders c^5, pistons D sliding in the slots and carrying pins d' sliding along the inner edges of the arms c^2 and adapted to abut against said shoulders, and spring rods E, each having one end inserted in a socket c^4 on the wheel, and the other end resting against the inner end of a piston between the double arms c^2, substantially as described.

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

EINAR SEBASTIAN BACH.

Witnesses:
LUTE M. FIELD,
JOHN F. MORGAN.