(No Model.)

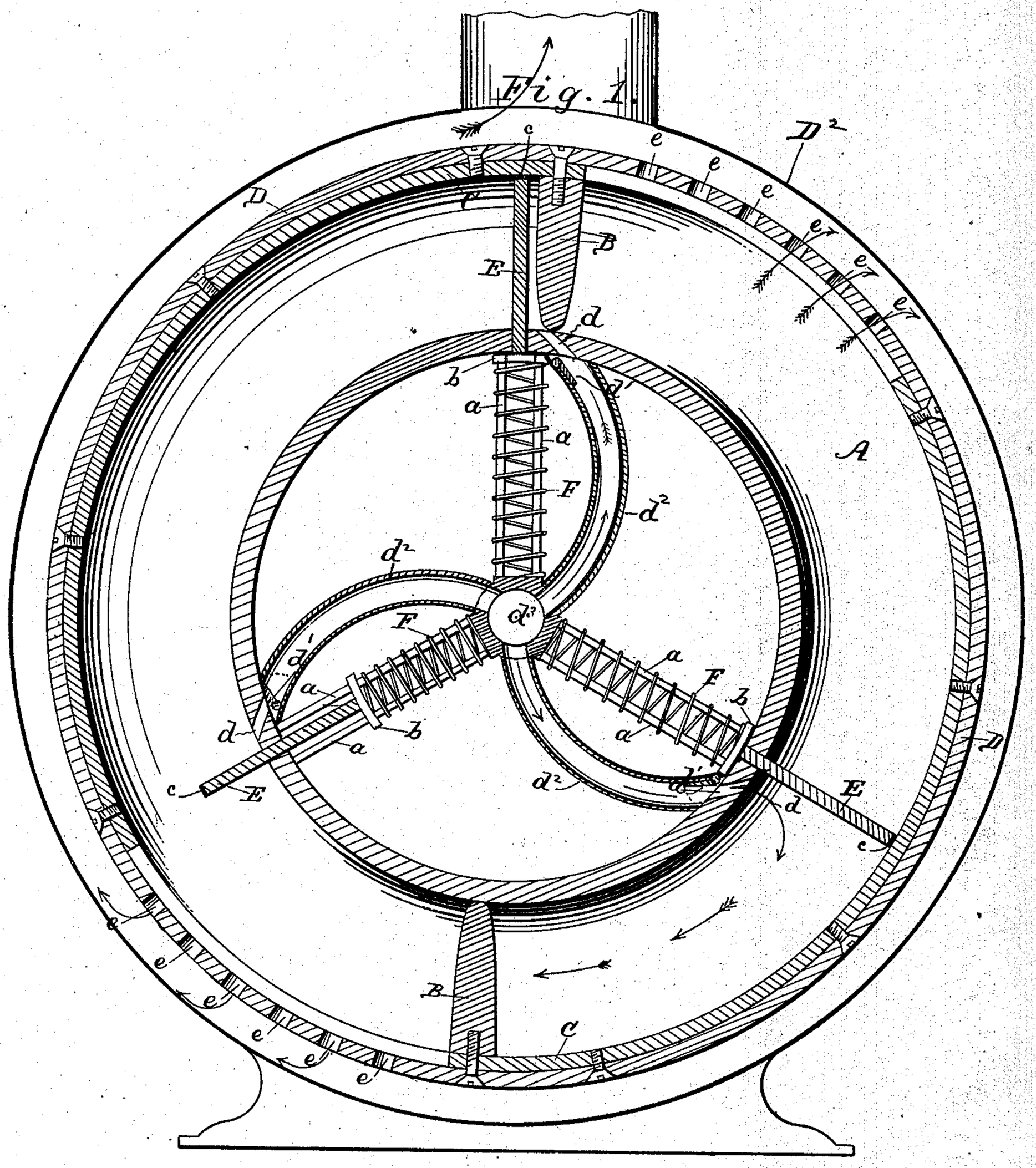
2 Sheets—Sheet 1.

F. H. CRASS.

ROTARY ENGINE.

No. 322,353. Patented July 14, 1885.

Fig. 1.



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(No Model.)

2 Sheets—Sheet 2.

F. H. CRASS.

ROTARY ENGINE.

No. 322,353. Patented July 14, 1885.

Fig. 2.

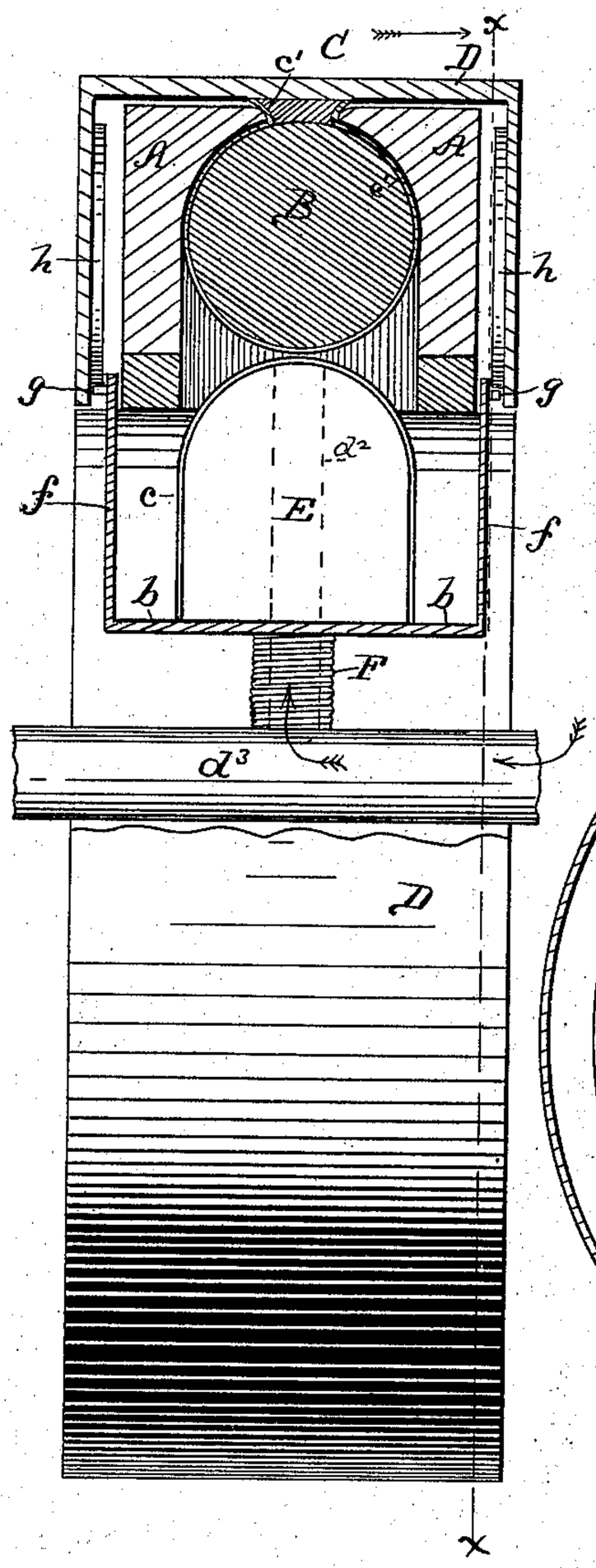


Fig. 4.

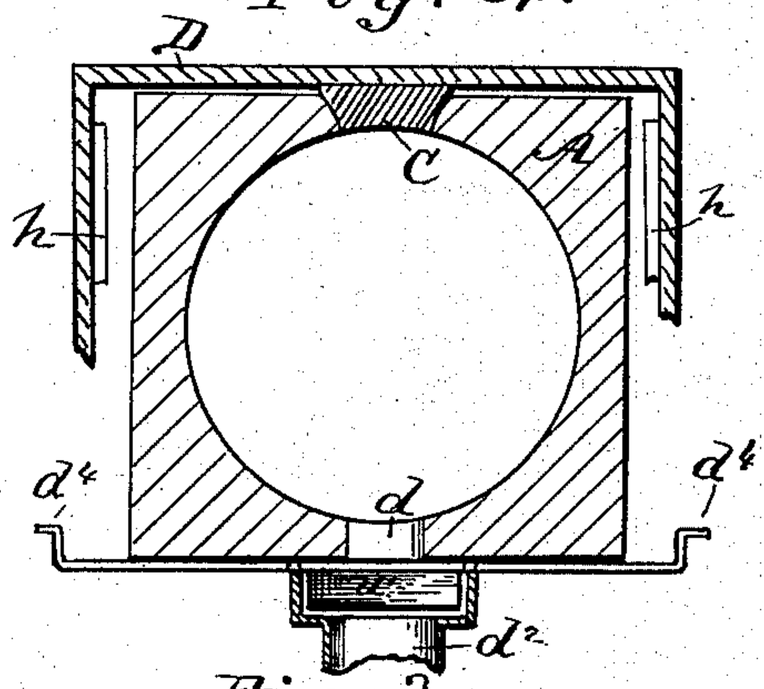
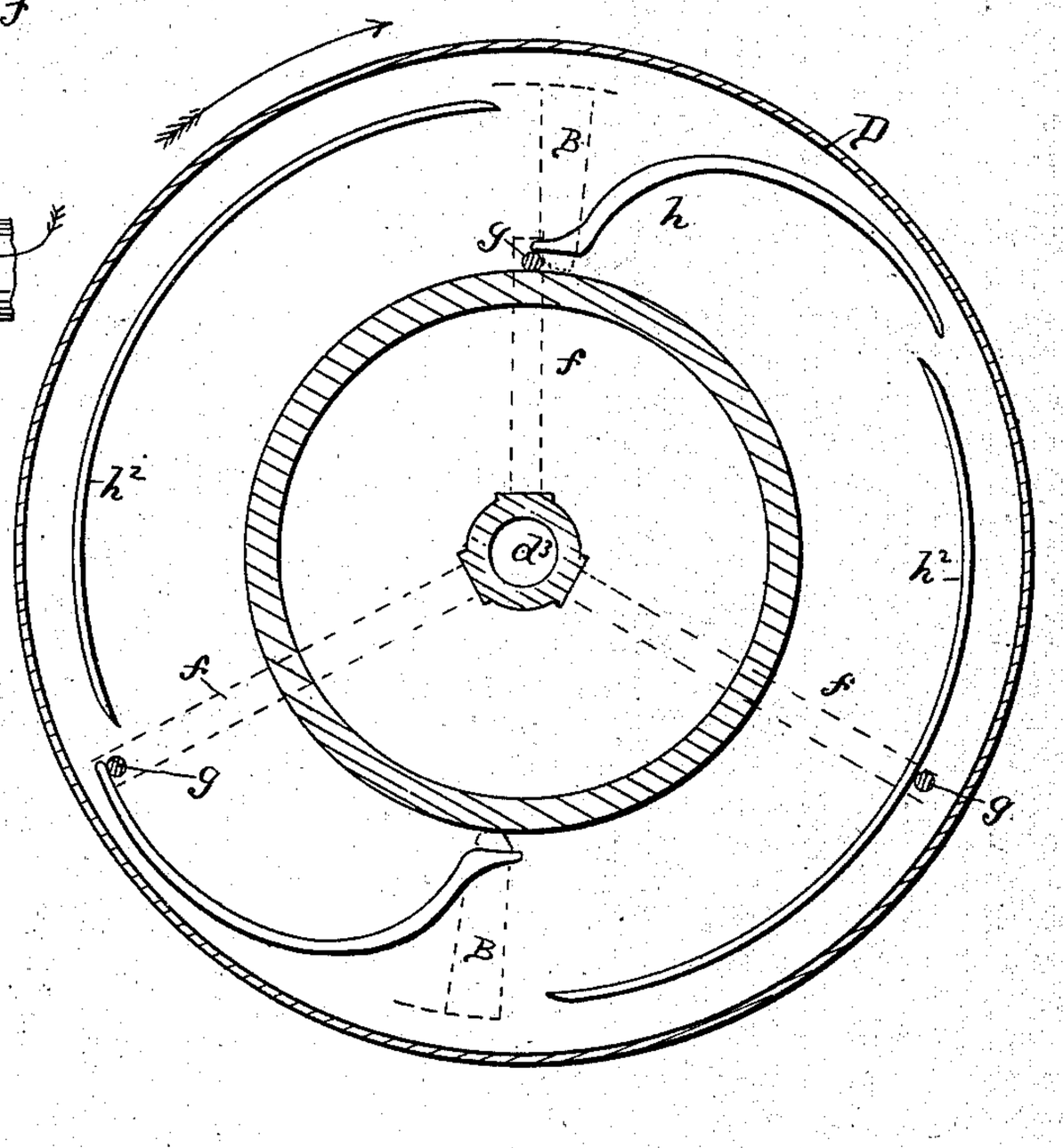


Fig. 3.



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UNITED STATES PATENT OFFICE.

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ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 322,353, dated July 14, 1885.

Application filed September 8, 1884. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK H. CRASS, a citizen of the United States, residing at Murfreesborough, in the county of Rutherford and State of Tennessee, have invented certain new and useful Improvements in Rotary Engines, of which the following is a description.

Figure 1 is a central section taken through the rotary engine at right angles to its axis of revolution. Fig. 2 is an edge view of the rotary engine with a part of its annular chamber shown in section. Fig. 3 is a sectional view through line *x x*, Fig. 2, on a reduced scale, showing the cams for operating the slide-valves; and Fig. 4 is a cross-section of the annular steam-chamber, taken through one of the inlet-valves.

The object of my invention is to provide a new form of rotary engine which shall more efficiently perform its work of operating continuously in the same direction without the loss of power involved in reciprocating engines; and to this end my improvement consists in the peculiar construction and arrangement of a revolving outer casing bearing piston and exhaust ports, in combination with a stationary steam-chamber and cut-off gates or slides, all as hereinafter fully described, and pointed out in the claims.

In the drawings, A A represent an annular or ring-shaped steam-casing having its chamber either round in cross-section, as shown in Fig. 2, or oblong or square. This casing is composed of two sections or halves, made exactly alike, and separated from each other a short distance, so as to leave a middle peripheral slot extending all around the casing and communicating with its steam-space within.

In the steam-space are two (more or less) pistons, B, which are of a shape to correspond to the cross-section of the steam-space, and are provided with packing around their edges to make them fit steam-tight in the casing. These pistons, at their outer edges, are firmly attached to the peripheral ribs or slides C, which are bolted or riveted to the middle peripheral line of the inner portion of the outer casing, D. These ribs or slides correspond in number to the pistons, and extend about two-thirds the distance between the pistons. Said ribs or slides also rest in and snugly fill the slotted space between the two halves A of the steam-casing, and form a connection between the pistons and the outer casing.

E are sliding cut-off plates, which are arranged to move radially across the steam-space to form a bearing or end gate for the steam-cushion, or be withdrawn inwardly to permit the pistons to pass by. As all of these sliding cut-off plates have a similar construction and arrangement, it will be sufficient to describe one.

Radially within the inner space of the steam-casing are arranged for each sliding plate two bars, *a a*, having a spiral spring, F, wound about the outer surface and bearing against a cross-head, *b*, of the sliding gate, which sliding gate is adapted to slide between the bars *a a* inwardly to the center to compress the spring F and allow the piston to pass by. The sliding gates are provided with a steam-packing, *c*, and the piston and rib or slide C are also provided with a steam-packing, *c'*.

In the inner periphery of the stationary steam-chamber are formed the induction-ports *d d d*, and in the rotating steam-casing D are formed the exhaust-ports *e e*, each of which may be a series of holes, as shown, or a single large opening.

The induction-ports receive steam through valves *d'*, Fig. 1, from pipes d^2, communicating with the hollow axial shaft d^3, the said valves being operated through axial crank-rods d^4, (see Fig. 4,) communicating with a suitable valve-gear, (not here shown;) and the exhaust-ports *e*, which are constantly traveling, communicate with the annular chamber of an outer casing, D^2, from which the steam escapes through an opening at the top.

For operating the sliding gates E, their cross-heads *b* are connected to side bars, *f f*, on opposite sides of the steam-chamber, which bars are provided with pins bearing anti-friction rollers *g*. These rollers are acted upon by cams *h h* on the inner sides of the parallel flanges of the revolving casing, which cams, as the casing revolves, serve at the proper time to draw the sliding plates E inwardly out

of the way of the pistons. When these cams pass said pins, and the piston has passed by the radial line of the sliding gate, the springs tend to force the sliding plates outwardly across the steam-space again and hold them tightly and firmly against the inner portion of the outer periphery of the steam-casing, and the cams h^2 h^2, fixed also on the flanges of casing A, strike against the rollers *g* on the opposite side and hold them positively to place until they are to be moved again.

The operation of my improved rotary engine is as follows: Steam enters through one of the ports *d* and presses on one side against the sliding gate E in the stationary steam-chamber, and on the other side against the piston B of the revolving casing. This pressure on the piston causes the casing to move until the piston reaches the next sliding gate. The sliding gate is then quickly drawn in by the cam mechanism before described, and at the same time the rib or slide C passes the preceding sliding gate and the exhaust-ports are then thrown into open communication with the chamber filled with steam, which passes out through said exhaust-ports into outer casing, D^2. With the arrangement shown this action is repeated three times for every revolution; but it is obvious that it might be effected a greater or less number of times.

In making use of my invention I do not confine it to using steam, as any other motive fluid, such as water or compressed air, might be employed. I may also readily adapt my invention to run in the opposite direction by arranging the cams *h* that govern the slides upon pivots and providing adjusting devices for changing the inclination of the cams. I may also, in large cylinders, use a greater number of slide-valves, E, than shown.

Having thus described my invention, what I claim as new is—

1. The combination of the revolving casing A, having rib or slide C, piston B and exhaust-ports *e*, in combination with the annular steam-chamber made in two parts, A A, and the sliding gates, as and for the purpose described.

2. The combination of the revolving casing having piston attached thereto and projecting inwardly, an annular steam-chamber made in two parts, having a space between them at the middle peripheral line, the inwardly-sliding spring, seated radial gates having cross-heads, *b*, and arms *f*, with pins *g*, and cams arranged upon the flanges of the outer casing, as and for the purpose described.

3. The combination, with the steam-chamber A, of the sliding gates E, having cross-heads *b* and arms *f*, the parallel bars *a a*, and the spring F, surrounding said bars and bearing against the cross-head of the sliding gate, as and for the purpose described.

4. The combination, in a rotary engine, of the steam-chamber, its rotary piston, the sliding gate, and a concentric flange, h^2, for holding the sliding gate tightly to its place across the steam-space.

5. The combination, with an annular steam-chamber having a slot or space communicating with the steam-space throughout its entire middle peripheral line, of the revolving casing having a piston projecting inwardly into the steam-space, and a rib or slide, C, extending a part of the distance between the pistons and filling the middle slot of the steam-space, and outlet openings or exhaust-ports in the said casing between the end of the rib or slide and the next adjacent piston, as described.

The above specification of my invention signed by me in the presence of two subscribing witnesses.

F. H. CRASS.

Witnesses:
EDW. W. BYRN,
CHAS. A. PETTIT.