

(No Model.)

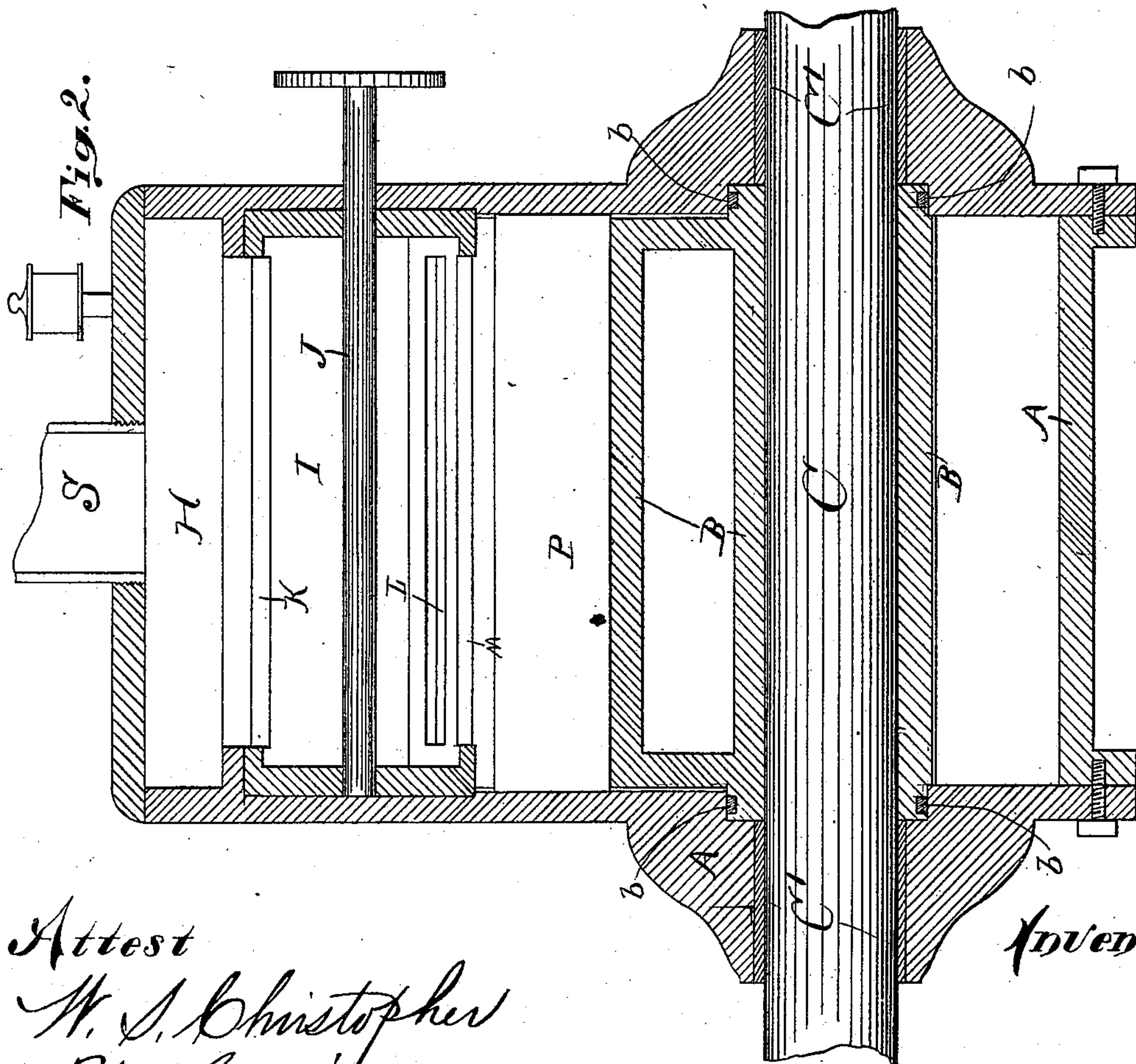
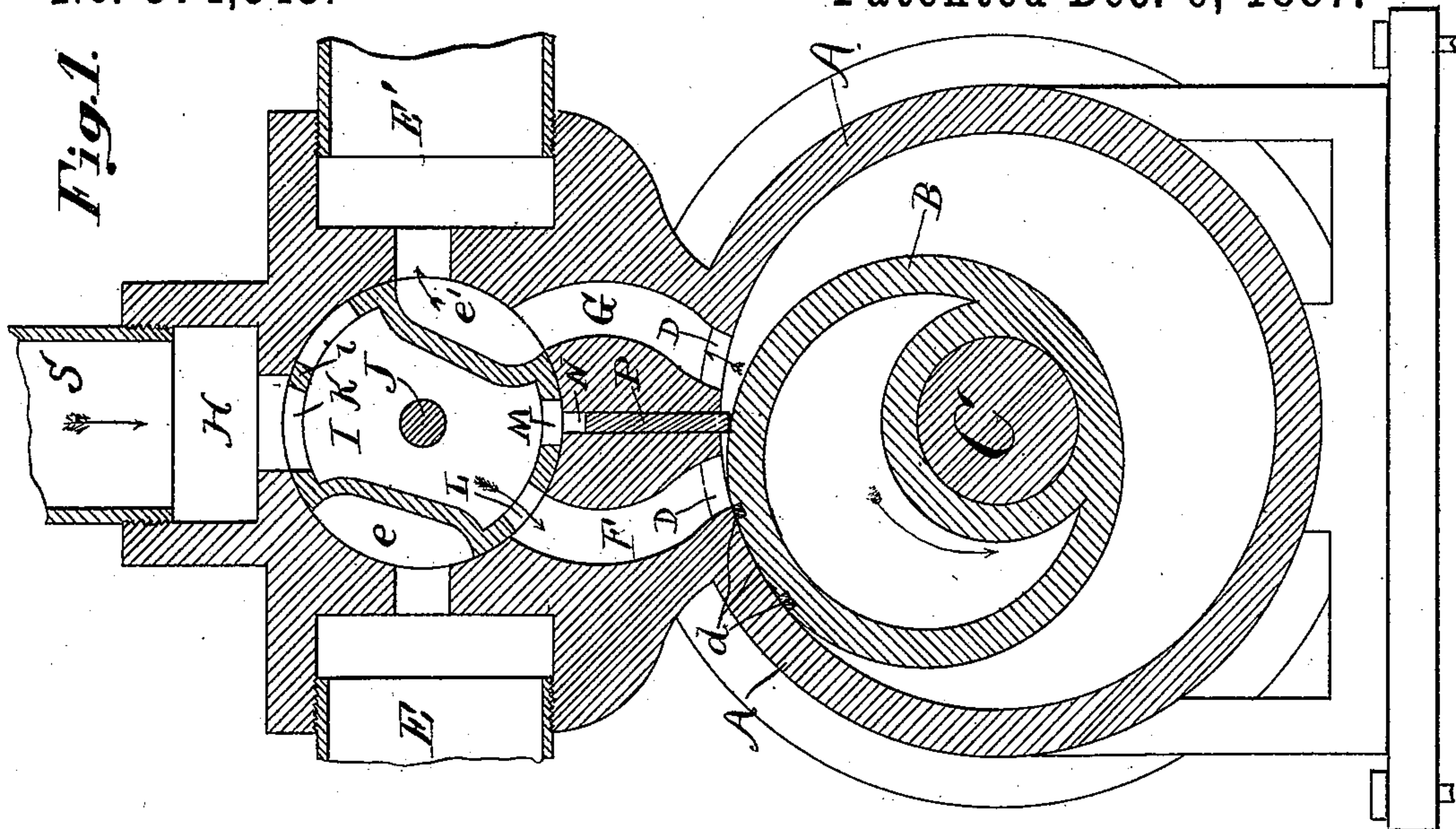
2 Sheets—Sheet 1.

E. H. KRUGER.

ROTARY ENGINE.

No. 374,543.

Patented Dec. 6, 1887.



Attest

W. S. Christopher
H. P. Gulick

Inventor

Edward H. Kriger.

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2 Sheets—Sheet 2.

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Fig. 3.

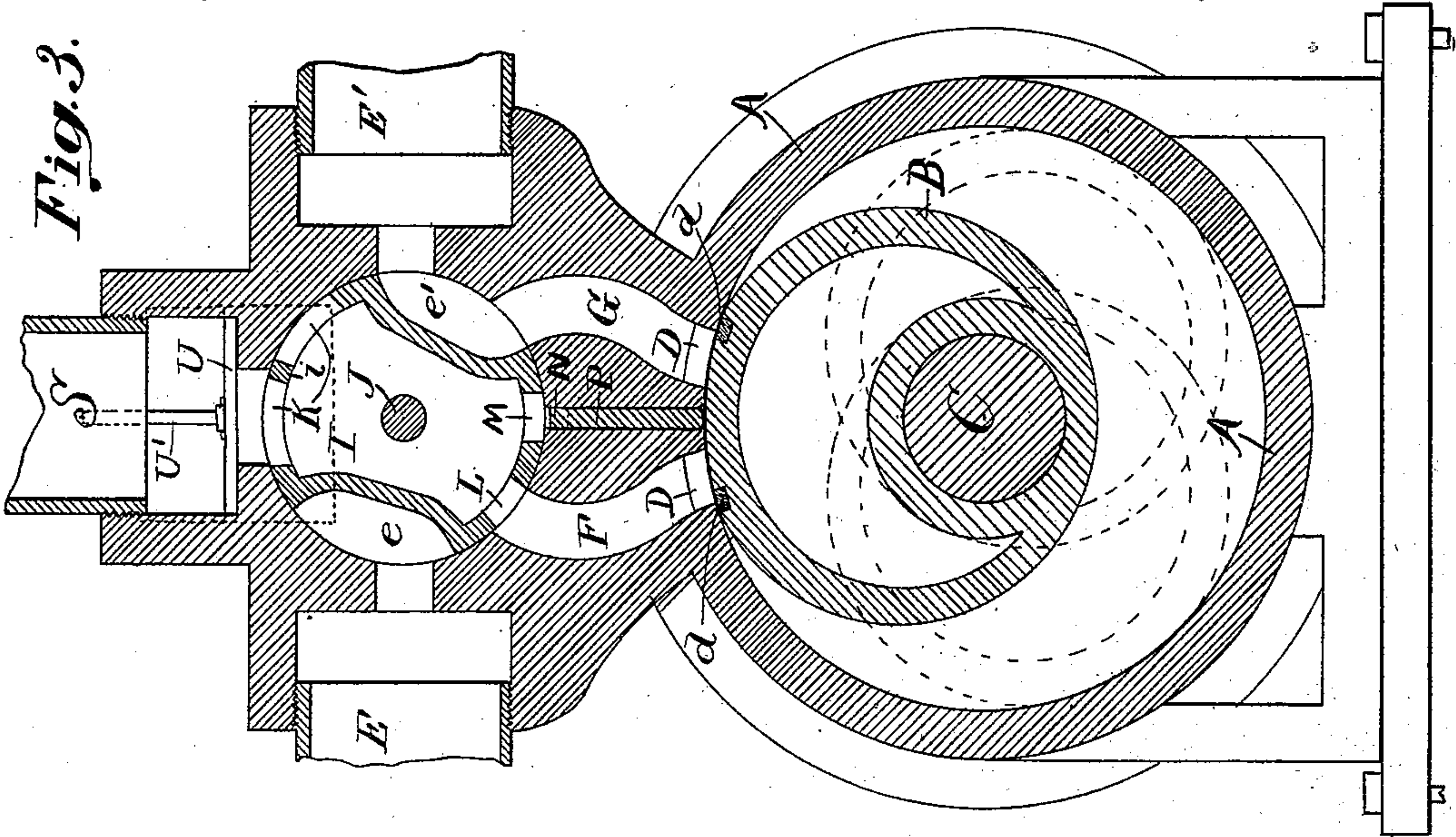
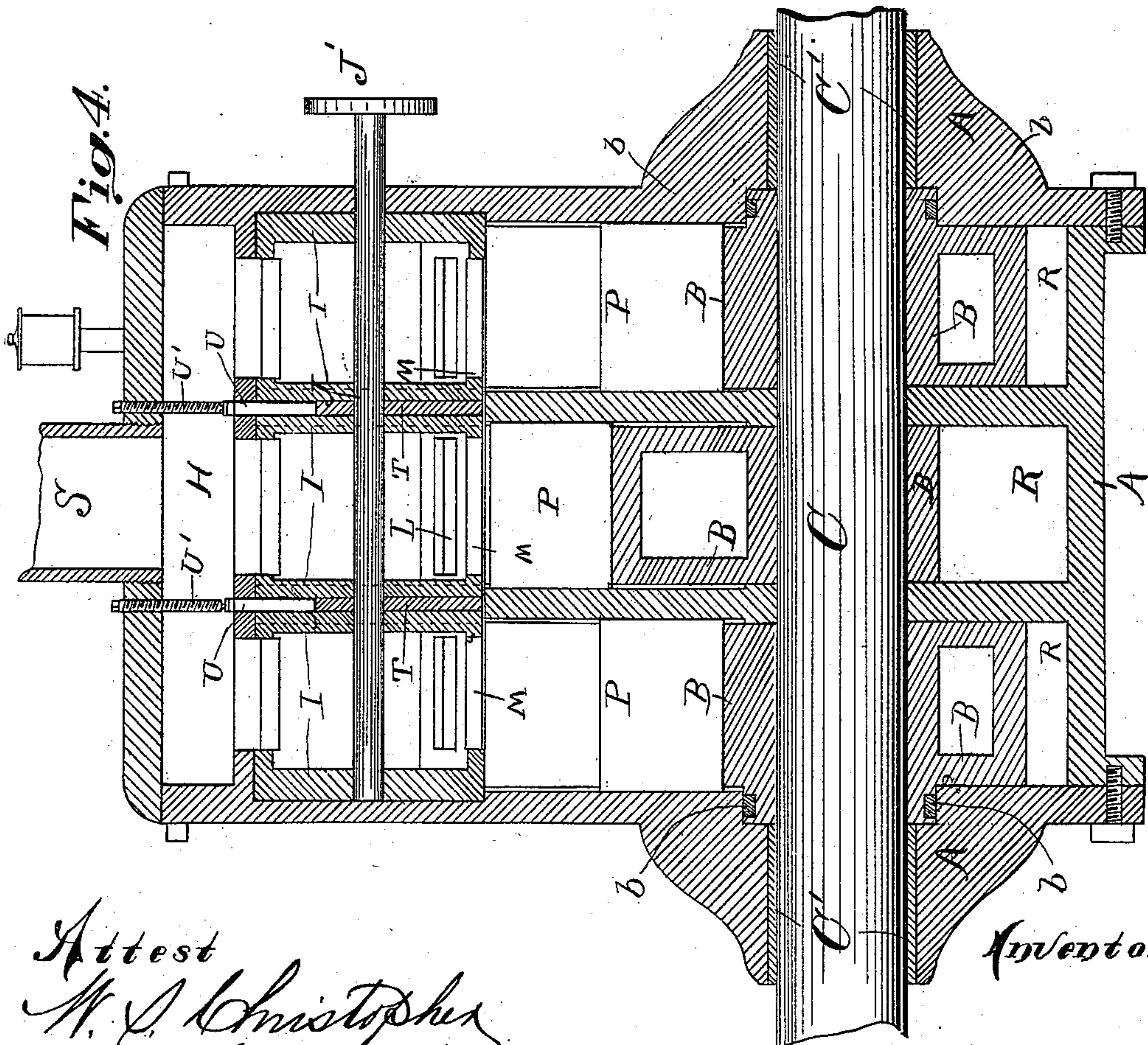


Fig. 4.



Attest
H. J. Christopher
W. P. Gulick

Inventor

Edward H. Kruger

UNITED STATES PATENT OFFICE.

EDWARD H. KRUGER, OF GRAYSON, KENTUCKY.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 374,543, dated December 6, 1887.

Application filed September 11, 1886. Serial No. 213,272. (No model.)

To all whom it may concern:

Be it known that I, EDWARD H. KRUGER, a resident of Grayson, Carter county, Kentucky, have invented certain new and useful
5 Improvements in Rotary Engines, of which the following is a specification.

The various features of my invention and the advantages arising from their use, conjointly or otherwise, will be apparent from the follow-
10 ing description.

In the accompanying drawings, forming part of this specification, Figure 1 is a vertical central cross-section of my engine. Fig. 2 is a vertical central longitudinal section of the
15 same. Fig. 3 is a vertical central cross-section of the form of engine shown in Fig. 4. Fig. 4 is a central longitudinal section of the engine when provided with triple cylinder.

The cylinder A is preferably placed with its
20 axis horizontal, but may be placed so that the axis will be vertical. The piston B extends from one cylinder-head to the other and is mounted on the shaft C, which has bearings in the cylinder-heads C'. The piston is cylin-
25 drical and eccentrically situated on the shaft. It is flattened somewhat at one side, where it fits against the cylinder. This flattened surface is equal to or somewhat greater than the distance between the outer edges of the steam
30 and exhaust ports. Two packing-strips, d, are set in this flattened part of the piston, and may be set out by springs or any other suitable means. The ends of the piston form steam-tight joints with the cylinder-heads.
35 The piston preferably rests in these cylinder-heads, and tight joints are then formed by packing-rings b. The interior of the steam-chest H communicates with the cylinder by two passages, F and G, across the openings
40 of which in the cylinder are the bars D, which guide the packing-strips d across the ports. The steam-chest itself preferably extends over the whole length of the cylinder. It has a cylindrical cavity communicating
45 with three pipes—viz., the steam-pipe S and the two exhaust-pipes E E'. A long valve, I, rigidly attached to the stem J, on which it is centrally mounted, is fitted into the steam-chest H, making steam-tight joints there.

50 The valve I is novel in construction and its shape is peculiar. Its surface is mostly cylin-

drical, fitting the interior of the steam-chest; but at its sides it is cut away, forming the spaces e e', which form ways from the cylinder to the respective exhaust-pipes E E'. 55

The valve I is hollow, and three ports, K, L, and M, pierce its shell. The port K, being large, is preferably crossed by a bar, i, to strengthen the valve. A flat passage, N, extends from the steam-chest to the cylinder
60 throughout the whole length of the latter. This passage is occupied by a loose plate, P, which makes a steam-tight joint with the sides of the passage. With the valve in the position shown in Fig. 1, the port K communi-
65 cates with the steam-pipe, the port L with the passage F to the cylinder, the port M with the passage N, containing the plate P, and the space e' completes the way from the passage G to the exhaust-pipe E'. The space e and ex-
70 haust-pipe E are not at this time in use. If, now, steam be turned on, it will pass through the ports K and L and passage F into the cylinder, where it exerts its pressure against the piston B and the plate P. The latter not mov-
75 ing, the piston is rotated in the direction of the arrow. As the piston rotates, the plate P is kept against its surface by the pressure of the steam in the steam-chest acting through the port M. As soon as the piston has passed
80 the opening of the passage G, steam commences to exhaust and the piston is carried by its momentum past the opening F, to again be acted upon by the force of the steam. Thus the piston continuously rotates in the direction
85 of the arrow.

To reverse the engine, the valve I is rotated slightly by the handle J' until the port M is over the opening of the passage G and the port L over the passage N. The space e then
90 completes a passage from the passage F to the exhaust-pipe E, and the port K is still presented to the opening of the steam-pipe S. In this position of the valve the steam acts on the other side of the piston from which it had
95 before acted, and the motion of the engine is reversed.

It will be observed that in whichever position the valve I is placed one or the other of the ports L or M establishes a communication
100 between the steam-space within the valve and the passage N. By this arrangement there is

always steam-pressure on the plate P, which in consequence is always kept snug against the piston, securing at all times a tight joint.

5 The fact of the plate P being kept in position by steam-pressure permits the cylinder to be placed in any position. This is a very important advantage over rotary engines, in which the gravity alone is depended upon to keep the plate in position.

10 Although the engine, as illustrated in Figs. 1 and 2, is operative, yet it is possible for it to stop on a dead-center. In order to avoid all possibility of the engine stopping on the center, I divide the cylinder into three compartments, R, as shown in Fig. 4, each one of which separately connects with the steam-chest. Each of the three compartments R is provided with a piston similar to the piston already described. The three pistons are
20 placed on journal C, which passes entirely through the three cylinders in the relative position shown by the full drawings and dotted lines in Fig. 3. This arrangement provides that two of the three pistons shall always be
25 under steam-pressure when the third is on the center, and, moreover, secures a more uniform motion.

When the triple cylinder is employed, the valve I may be made in one long piece, or it
30 may be, and preferably is, divided into three parts, as shown in Fig. 4. In this form the valve-chamber is divided into three parts by the partitions T, which extend from the partitions which divide the steam-cylinder as far
35 upward as the steam-chest H. Each of the valves I fits into its respective chamber, as does the single valve I, and all are rigidly mounted on the rod J. Two valves, U, are provided, which are guided by grooves in the

sides of the steam-chest and fit down into 40 spaces in the partitions T. These valves have the stems U' swiveled into them, and these latter are screwed through the top of the steam-chest H. By means of the stems U' one or the other of the valves U may be raised, 45 cutting off the steam from the far engine on that side. When both valves are raised, the steam is cut off from both of the end engines and admitted only to the middle engine. In this way the power of the engine may be di- 50 minished one or two thirds, economizing a proportionate amount of steam when the work required to be done is diminished. In practice, however, it is preferable not to shut off both end engines entirely, but to throttle the 55 steam down to small amount, admitting merely enough to the end engines to carry the middle engine over the center.

What I claim as new and of my invention, and desire to secure by Letters Patent, is-- 60

1. In a rotary engine, the combination of the cylinder A, piston B, situated eccentrically on journal-shaft C, steam-chest H, provided with passages F, G, and N, connecting with the cylinder, and appropriate inlet and outlet 65 orifices, plate P, fitting in passage N, and the hollow valve provided with the ports K, L, and M, and the spaces *e e'*, substantially as and for the purposes specified.

2. In a rotary engine provided with three 70 independent cylinders, each having an independent valve, the combination of the steam-chest H and cut-off valves U, substantially as and for the purposes set forth.

EDWARD H. KRUGER.

Attest:

O. M. HILL,
W. P. GULICK.