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JOHN D. RICHARDSON.

Improvement in Rotary Engines.

No. 123,362. Patented Feb. 6, 1872.

Fig. 1

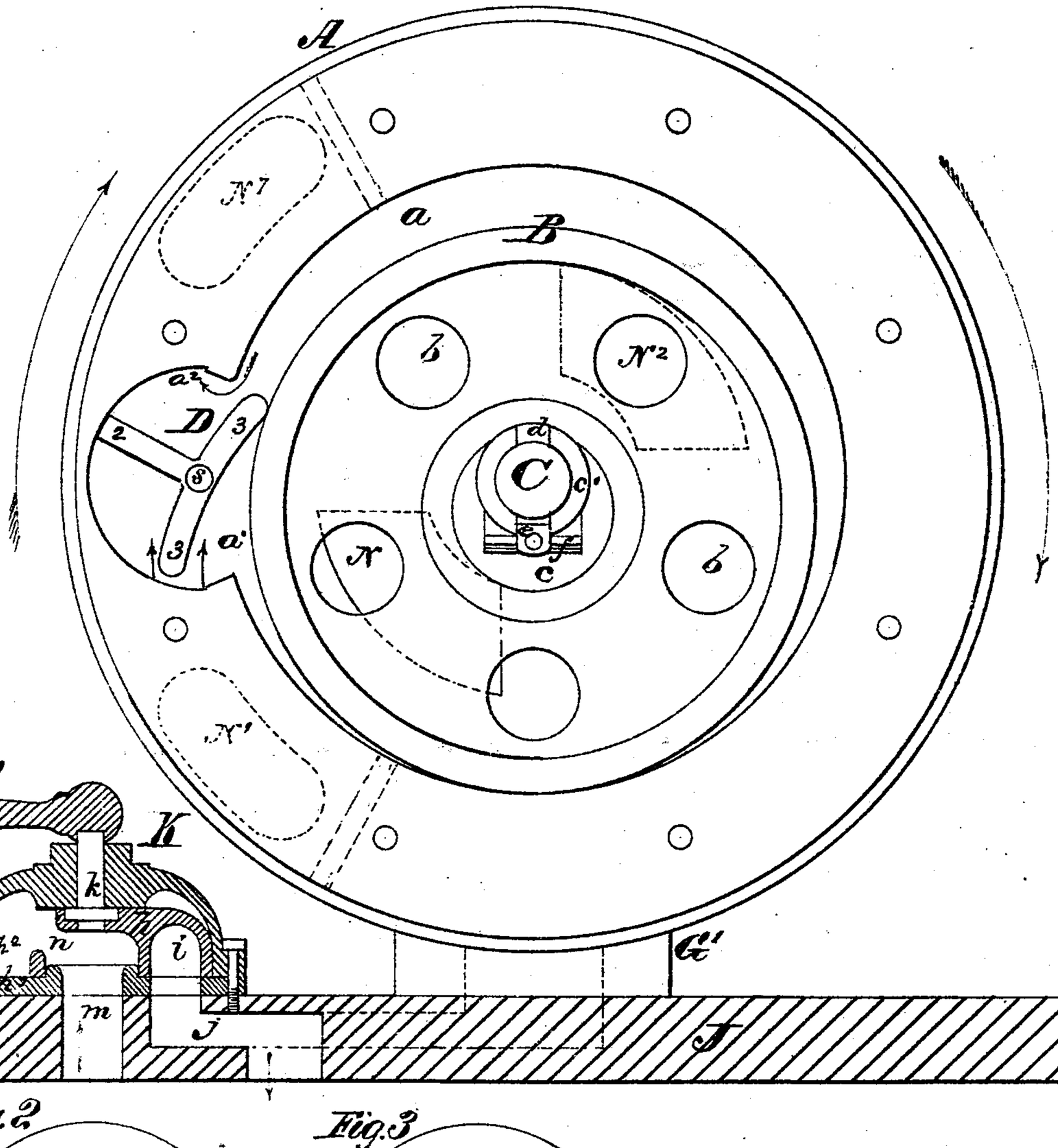


Fig. 2

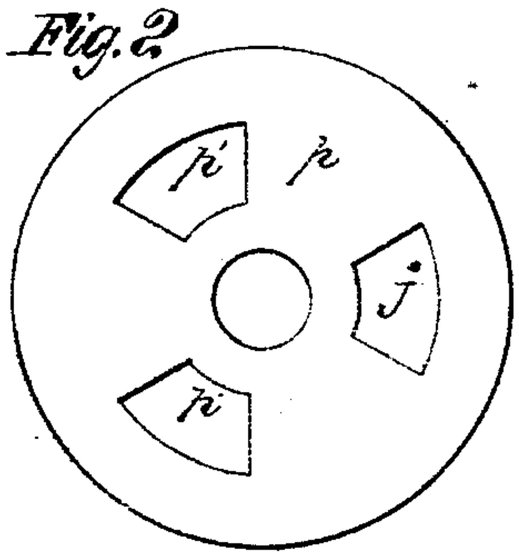
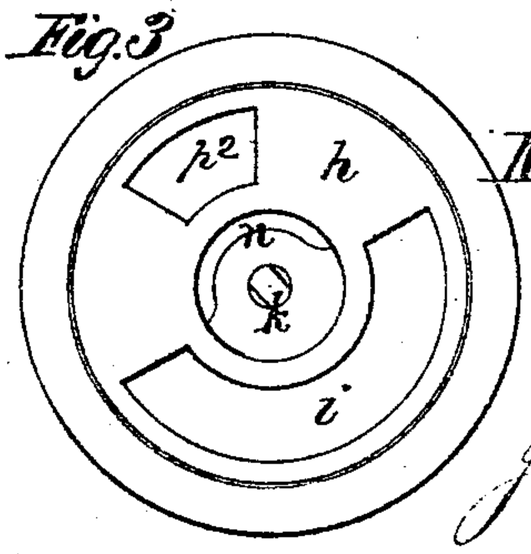


Fig. 3



Witnesses.
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4 Sheets--Sheet 2.

JOHN D. RICHARDSON.

Improvement in Rotary Engines.

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Fig. 4

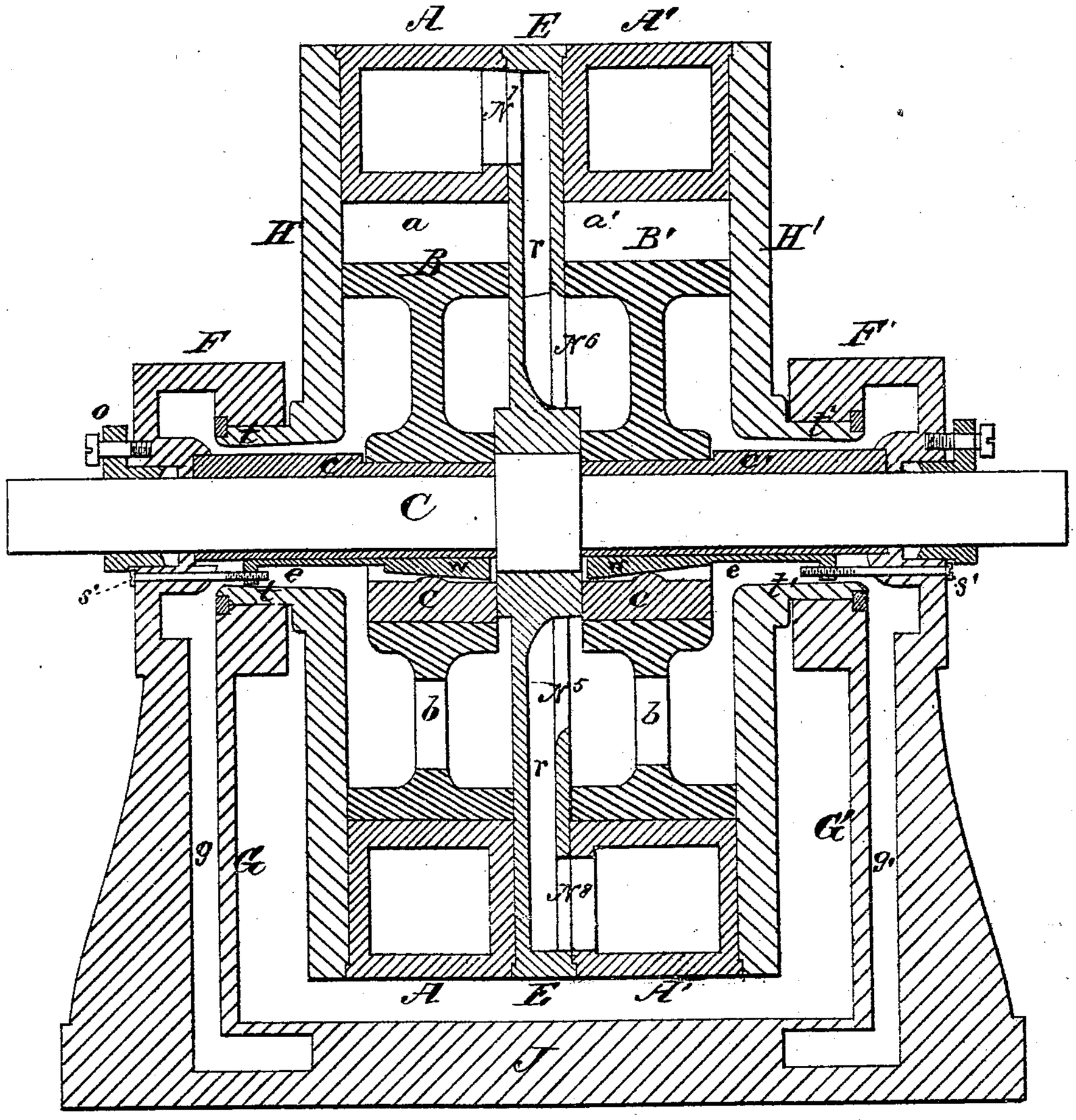


Fig. 5

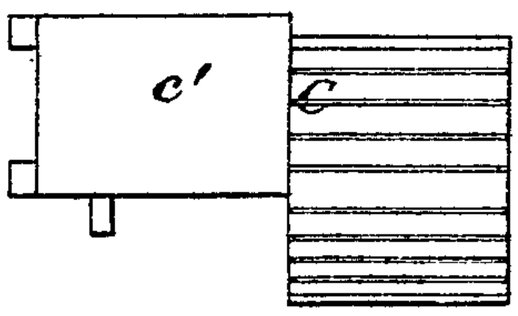
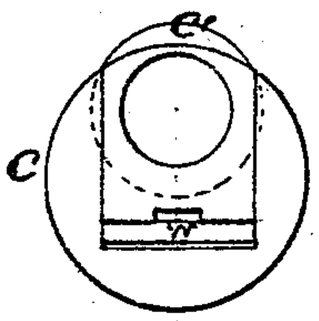


Fig. 6



Witnesses.
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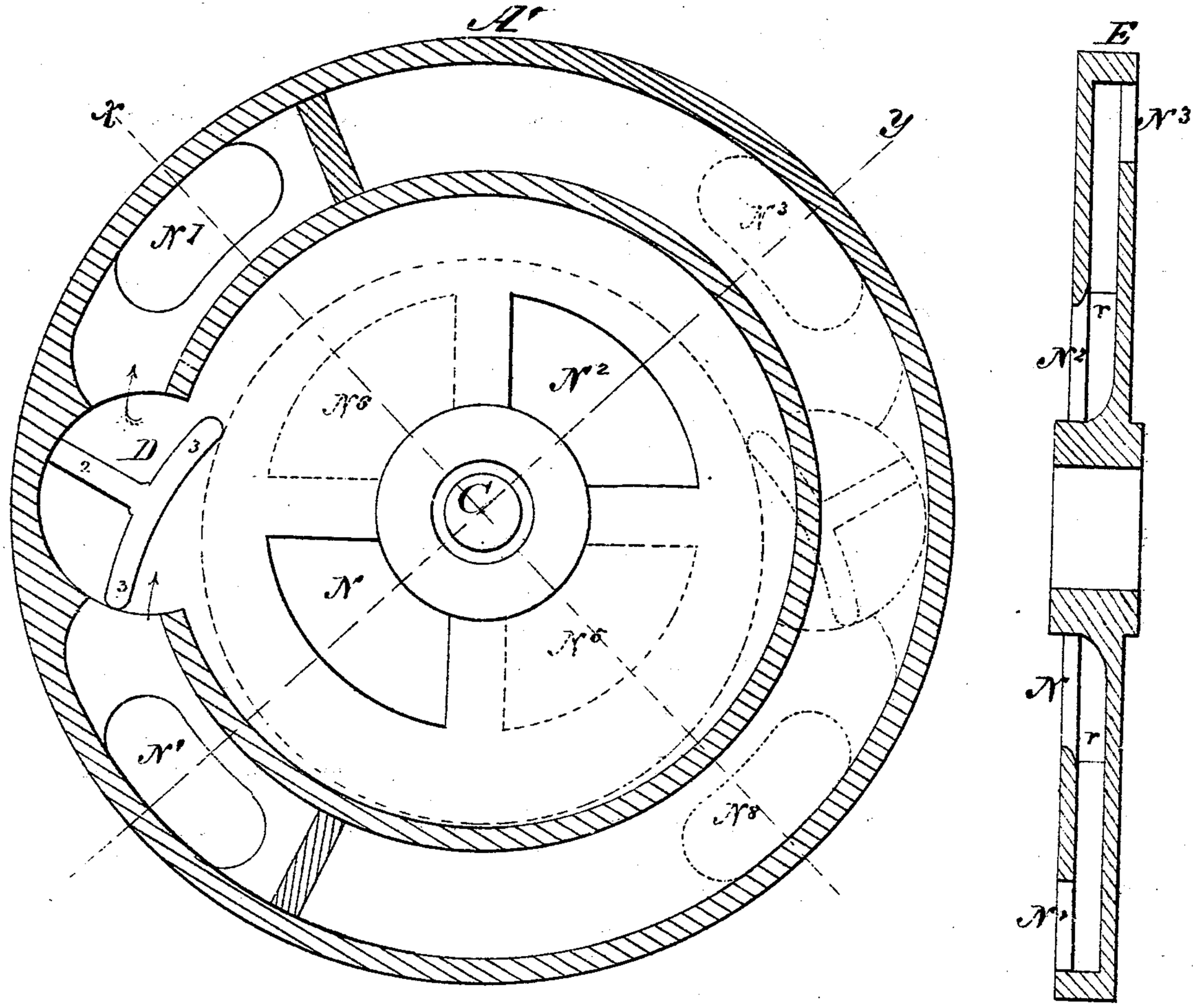
4 Sheets--Sheet 3.

JOHN D. RICHARDSON.

Improvement in Rotary Engines.

No. 123,362. Patented Feb. 6, 1872.

Fig. 7.



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4 Sheets--Sheet 4.

JOHN D. RICHARDSON.

Improvement in Rotary Engines.

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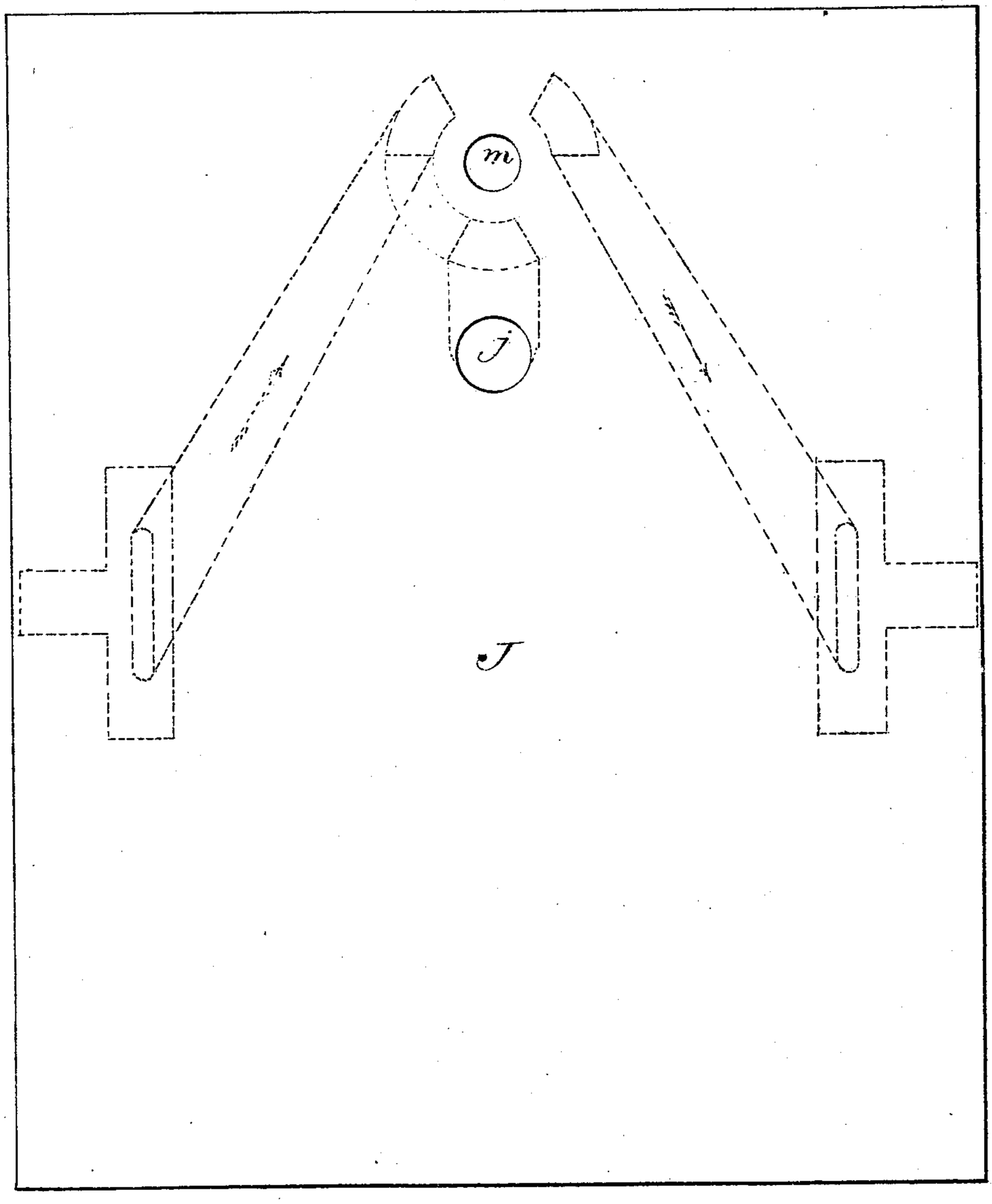
Fig. 9



Witnesses.
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J. F. Campbell.

Inventor
John D. Richardson
by his Attys
Mason Fenwick & Lawrence

UNITED STATES PATENT OFFICE.

JOHN D. RICHARDSON, OF HOUSTON, TEXAS.

IMPROVEMENT IN ROTARY ENGINES.

Specification forming part of Letters Patent No. 123,362, dated February 6, 1872.

To all whom it may concern:

Be it known that I, JOHN D. RICHARDSON, of Houston, in the county of Harris and State of Texas, have invented a new and Improved Rotary Engine; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing making part of this specification, in which—

Figure 1, plate 1, is an elevation of the engine with one head removed, and showing, by a section through its base, the reversible inlet and exhaust valve. Figs. 2 and 3 indicate the arrangement of the valve-ports. Fig. 4, plate 2, is a diametrical section through the engine, taken in the plane indicated by dotted line *x* in Fig. 7. Figs. 5 and 6 are views of the eccentric hub and its collar. Fig. 7, plate 3, is a sectional view through one of the hollow rings, showing behind it the parted diaphragm and indicating an eccentric drum in dotted lines. Fig. 8, plate 3, is a section through the parted diaphragm taken in the plane indicated by dotted line *y* in Fig. 7. Fig. 9 is a bottom view of the base of the engine, indicating, by dotted lines, the inlet and exhaust ways.

Similar letters of reference indicate corresponding parts in the several figures.

This invention relates to engines of the rotary kind, which may be driven by steam or other elastic agent, or which may be used for pumping water. My object is to so construct an engine of the kind named that the piston, as well as an interior eccentric drum, shall rotate with the body or shell of the engine, thereby obviating a large amount of friction, which is incident to all rotary engines with which I am acquainted, and at the same time obtaining a more direct application of the force applied to drive the engine, as will be hereinafter explained.

The following description of my invention will enable others skilled in the art to understand it.

In the accompanying drawing I have represented the elements of two engines combined in one in such manner that steam operates on two pistons simultaneously, but it will be obvious from the following description that the elements of one engine may be omitted. A A′ represent two hollow rings, which are arranged on opposite sides of a hollow diaphragm, E, and confined together between two circular heads, H H′. These rings, together with their heads and the interposed diaphragm, constitute the body of the engine, and are supported upon standards G G′, by means of collars *t t′*, through which passes a shaft, C, that is keyed to the hub of the said diaphragm, as shown in Fig. 4, plate 2. The standards G G′ are hollow, and communicate below with steam-ways in the engine-base J, which lead to a reversible throttle-valve, K. Above, the hollow standards G G′ communicate with chambers *a a′*, within the rings A A′, through hollow journal-boxes F F′, and the collars *t t′*. The latter are formed on the heads H H′, and are received into the said journal-boxes and properly packed, as shown in Fig. 4. The throttle-valve communicates with a steam inlet-passage, *m*, and also with an exhaust-passage, *j*, both of which are made through the engine-base J, as shown in Fig. 1. The shell of the throttle-valve is dome-shaped, and the valve *h*, which is arranged therein and supported upon a fixed three-ported plate, *p*, is constructed with ports p^2, *n*, and *i*, and keyed on a stem, *k*, carrying a handle, *k′*. By turning the valve *h* in one direction a communication between one of the hollow standards and the steam-inlet *m* will be established, and a communication between the opposite hollow standard and the exhaust-passage *j* will be established. By reversing the valve *h* the direction of the inflowing and outflowing steam will be reversed. I will here state that when the engine is rotating the steam enters through one standard and exhausts through the other, passing through the hollow diaphragm E. Within the circular chambers *a* a^1, surrounded by the hollow rings A A′, cylindrical drums B B′ are eccentrically arranged so as to rotate around stationary eccentrics *c c′*, through which the shaft C passes, as shown in Fig. 4. Each one of the eccentric drums is smaller in diameter than the chamber in which it is arranged, and each drum touches the hollow ring surrounding it at one point only forming a butment, as shown in Fig. 1. Each one of said drums is perforated at *b b*, so that steam can pass freely through it on its way to or from the diaphragm E. Laterally each eccentric drum is ground steam-tight between the walls inclosing it. The axes

of both drums B B′ coincide with each other, and are located below the axis of the engine-shaft C, and the peripheries of both drums are turned true and smooth. I have represented the eccentrics *c c′*, around which the said drums revolve, as being made expansible, so that compensation can be made for wear, but I do not deem expansible eccentrics necessary, and may use those which are not expansible and substitute new ones when one pair wears out. The main portion of each eccentric *c* is segmental, and cut out so as to receive one end of a tube, *c′*, which completes the cylinder, as shown in Fig. 6. Between the flattened lower side of the tube *c′* and the adjacent surface of the segmental portion *c* a wedge, *w*, is applied, which is secured to a stem, *e*, that has tapped through its angular outer end a screw, *s′*. This screw passes through the journal-box below shaft C, and is used for adjusting the wedge *w*, when it is desired to expand the eccentric *c* to the hub of the drum that revolves around it. The outer end of each one of the tubes *c′* is rigidly held in its respective journal-box, so that these tubes will not turn with the engine-shaft.

As above stated, the adjustability of the eccentrics is not important, and they may be made solid on their respective holding-tubes.

It will be seen that the drums B B′ will both turn with the hollow rings, the diaphragm, and the heads H H′. Each one of the hollow rings has a semicircular recess, a^1, made into it by cutting away its lateral and interior walls, and into each recess a three-winged piston, D, is applied, which oscillates freely by its pivots *s*. The wing 2 of each piston is perpendicular to the wings 3 3, and these latter are of equal length and curved so as to present an arc which is concentric to a circle touching the inner surface of the inner wall of the hollow ring A or B, and the axis of motion of each piston is so arranged that the inner continuous surface of the two wings 3 3 will be concentric to the axis of the shaft C, when the wing 2 is in a line radiating from this axis. When steam acts against the piston D, in the direction of the arrows indicated in Fig. 1, the uppermost wing of the piston will be pressed closely against the periphery of the eccentric drum, and steam will be prevented from entering the exhaust-passage a^2 by the wings 2 and 3 and the eccentric drum B; but as the engine revolves the chamber on the live-steam side of the piston will gradually increase its capacity until it finally communicates with the said exhaust-passage a^2. In this way steam enters the chamber *a* outside of the drum B, on one side of the piston D, passes around the said drum and exhausts through a^2 on the opposite side of the piston, thus giving one revolution to the engine. This action of the steam takes place on both sides of the diaphragm simultaneously; and I will now explain in what manner the steam is admitted and allowed to escape. I have previously shown how the steam enters the body of the engine on one side and escapes from the engine on the other side. The diaphragm E is a hollow disk, which is subdivided by radial partitions, into four steam-passages, as follows: The steam-passage N admits steam through N^1 into the hollow ring A, from which it escapes into chamber *a* at a^1, and acts against the piston D, pressing the end of the upper wing 3 against the periphery of drum B, as shown in Fig. 1. The passage N^2 at the same time admits steam through N^3 into the ring A′, from which it escapes and acts on the opposite piston D in chamber a^1. The steam from chamber *a* exhausts through a^2, N^7, and N^6; thence through the web of drum B′, through collar *t*, journal-box F′, hollow standard G′, and passage *j*. The steam from a^1 exhausts through N^8 N^5, through the drum B′, through journal-box F′, hollow standard G′, and passage *m*. When the valve *k* is turned so as to admit steam into the engine through the standard G′, the rotation of the engine will be reversed and the steam, after passing through the chambers *a a′* and rings A A′, will exhaust through the journal-box F, standard G, and exhaust-passage *j*.

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

1. The perforated revolving drum B, arranged eccentrically within a chamber, *a*, which is surrounded by a hollow ring, A, in combination with the oscillating piston D and hollow diaphragm E, substantially as described.

2. The arrangement of rings A A′, pistons D D, and eccentric drums B B′, on opposite sides of the hollow-ported diaphragm E, in combination with steam-inlet and outlet passages communicating with the hollow standards G G′, on which the engine-shaft C is supported, substantially as described.

3. The combination of the reversible throttle-valve K, hollow standards G G′, hollow journal-boxes F F′, and an engine which rotates bodily, substantially as described.

JOHN DUN RICHARDSON.

Witnesses:
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S. D. HEWES.