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D. ABREY.

Rotary-Engine.

No. 214,604. Patented April 22, 1879.

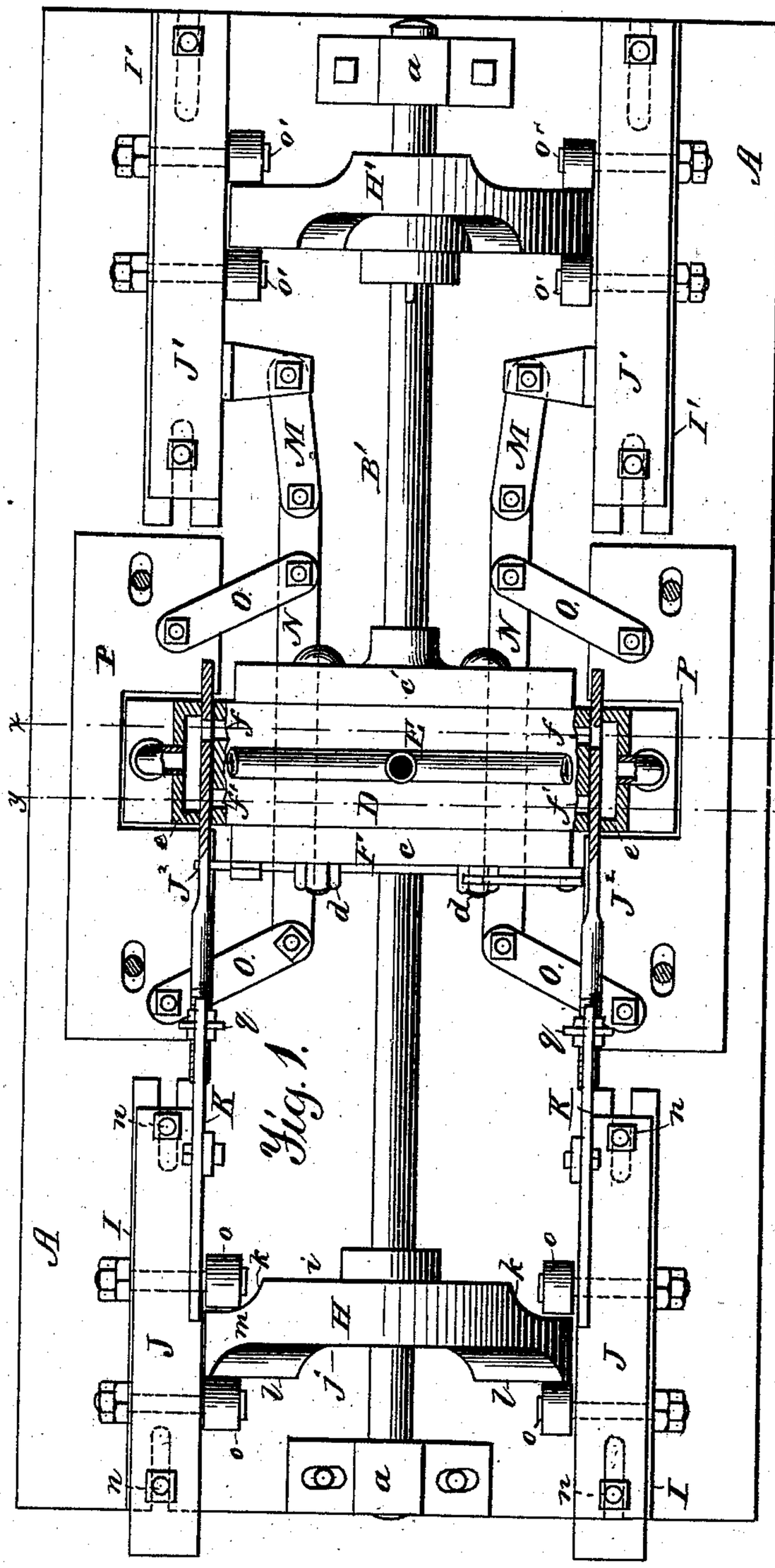

Fig. 1.

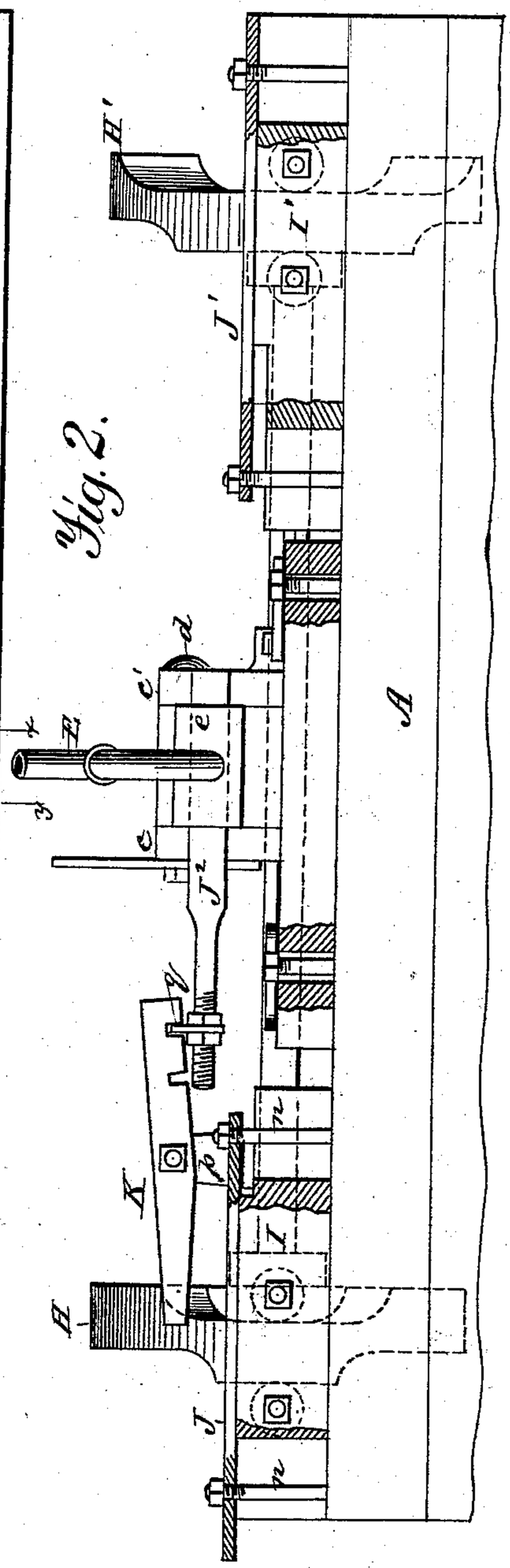

Fig. 2.

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Fig. 3.

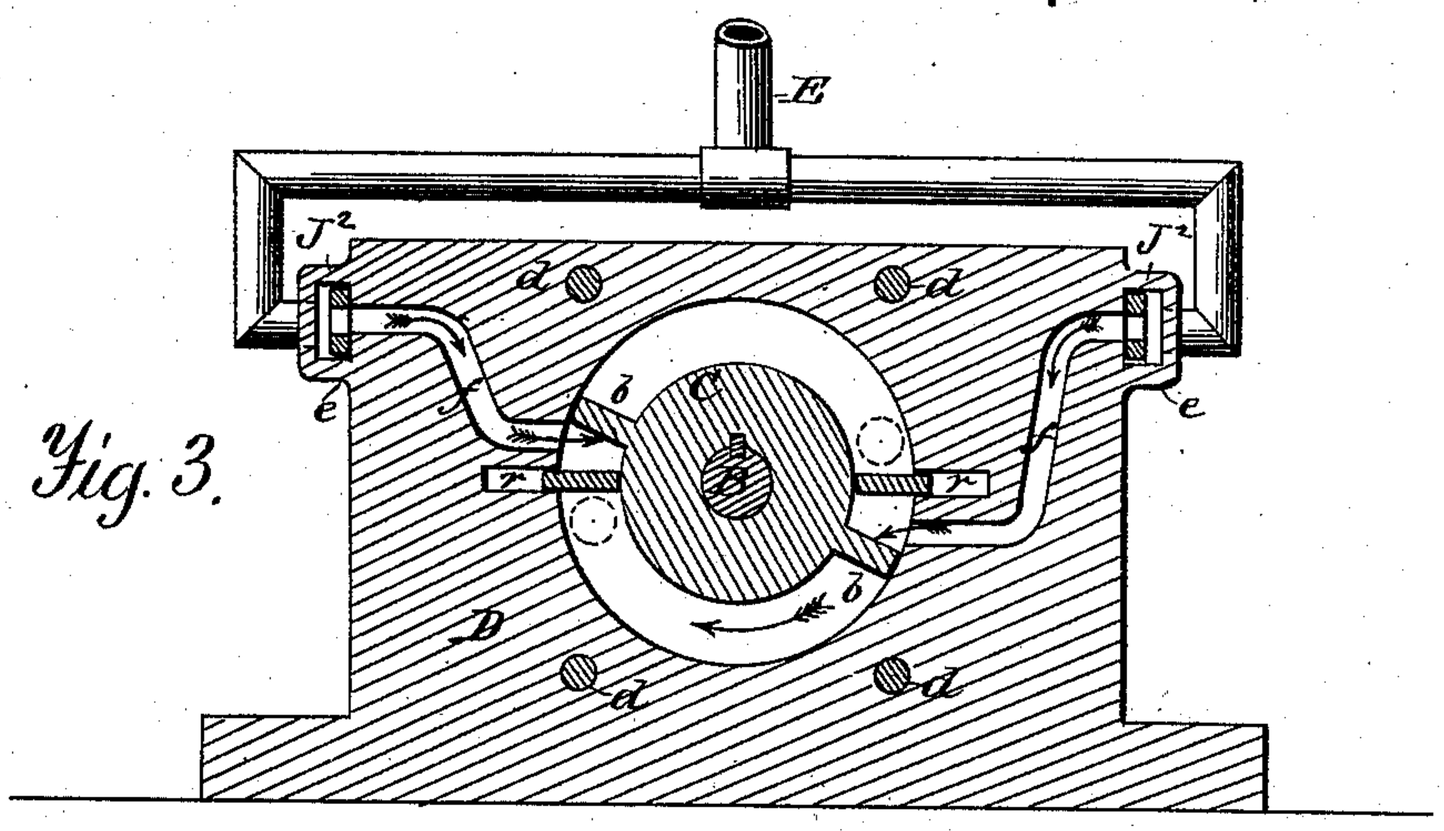

Fig. 4.

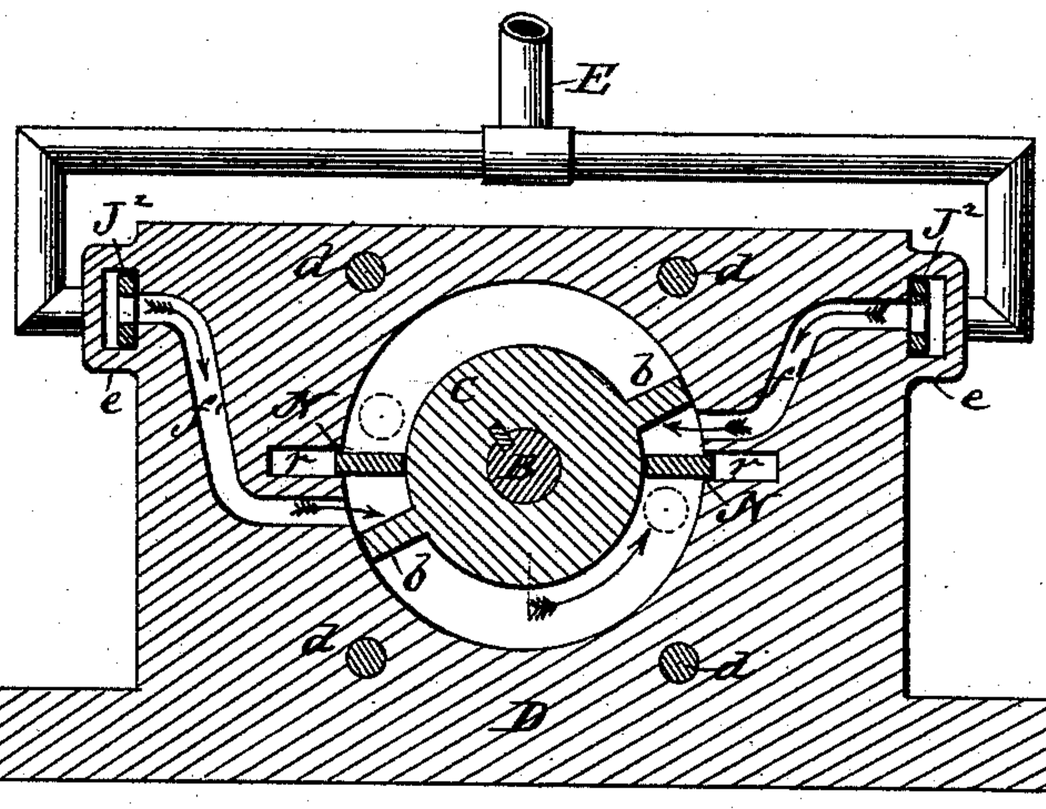

Fig. 5.

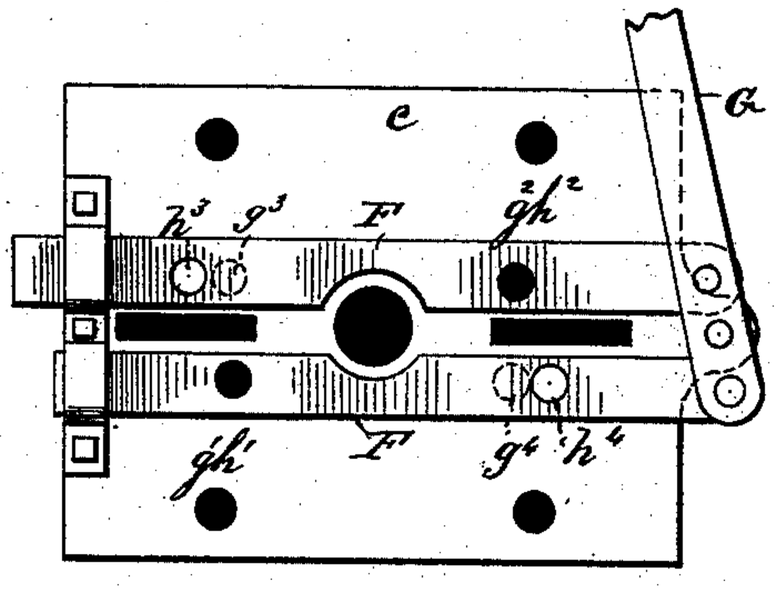

Fig. 6.

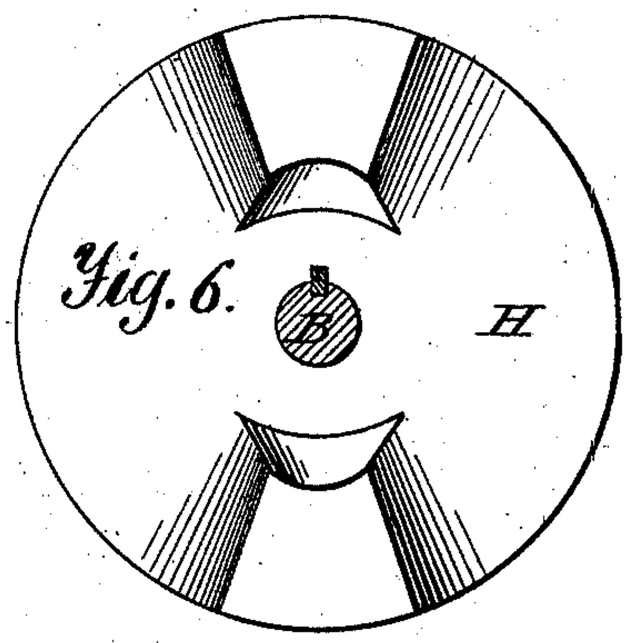

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Fig. 7.

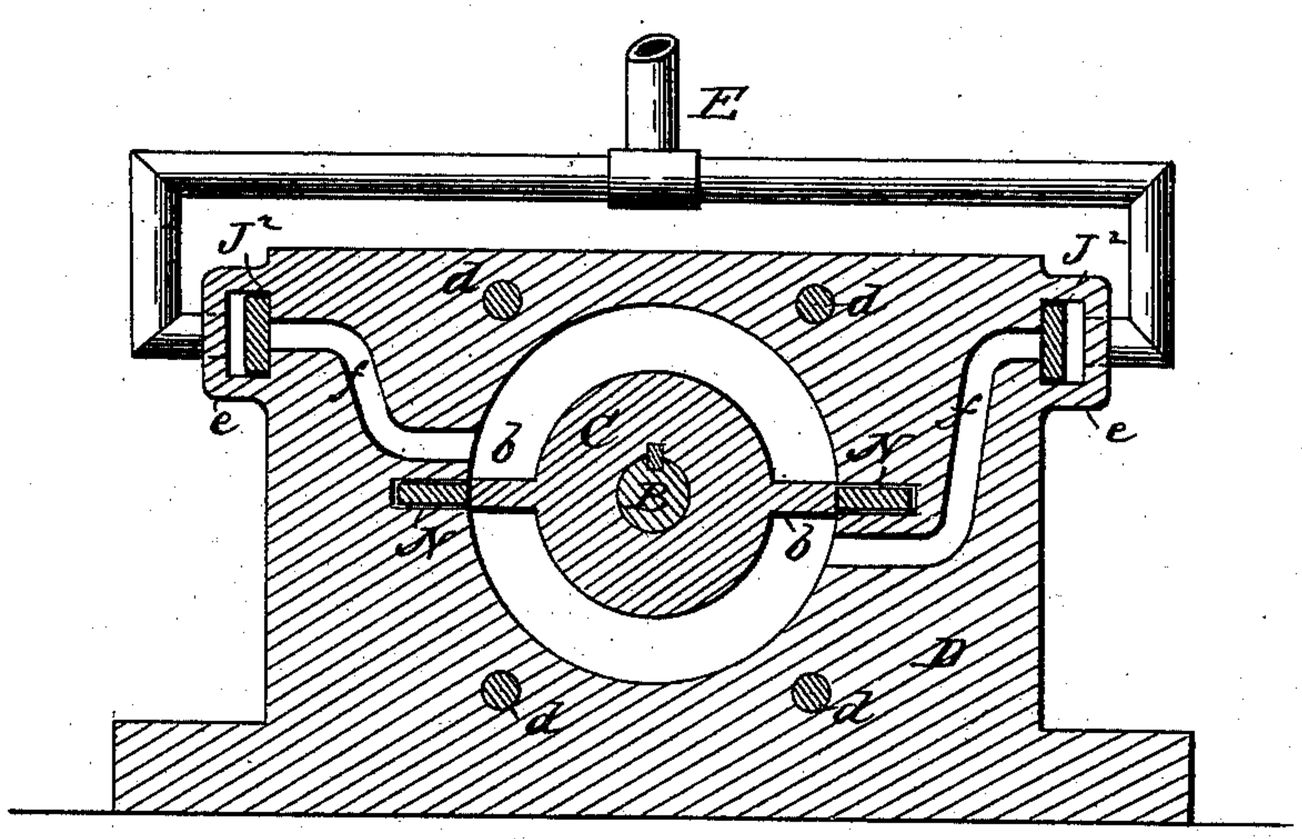


Fig. 8.

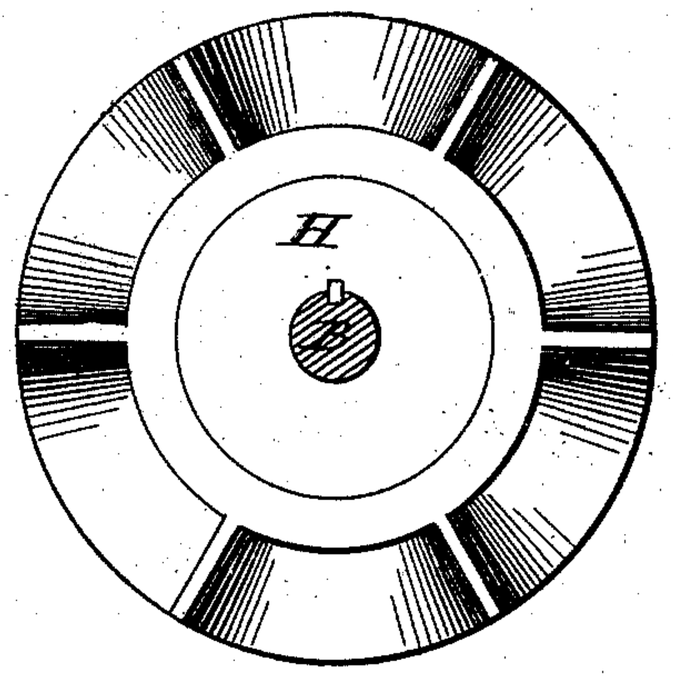
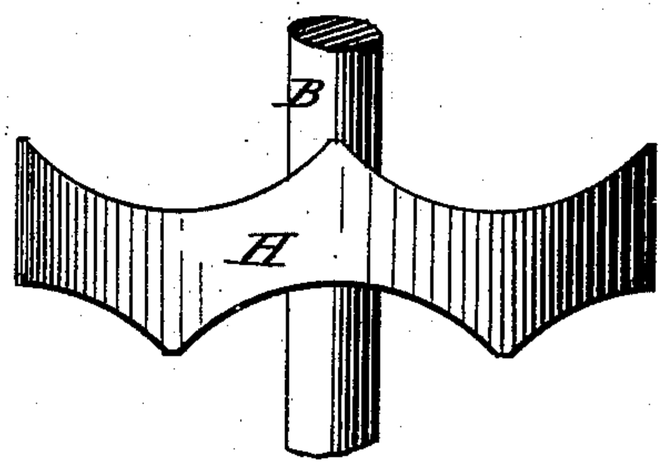


Fig. 9.



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UNITED STATES PATENT OFFICE.

DANIEL ABREY, OF GREENVILLE, MICHIGAN.

IMPROVEMENT IN ROTARY ENGINES.

Specification forming part of Letters Patent No. **214,604,** dated April 22, 1879; application filed February 18, 1879.

To all whom it may concern:

Be it known that I, DANIEL ABREY, of Greenville, in the county of Montcalm and State of Michigan, have invented a new and Improved Rotary Engine; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a plan view, Fig. 2 is a side elevation, Fig. 3 is a section through line *x x* of of Fig. 1, Fig. 4 is a section through line *y y* of Fig. 1, Fig. 5 is a detail, of the device for changing the position of the exhaust-ports when reversing the engine; Fig. 6, a detail side view of the cam or waved wheel. Fig. 7 is a vertical cross-section through the piston, showing the movable abutments withdrawn from the piston. Figs. 8 and 9 show modified forms of the cam or waved wheel.

My invention relates to certain improvements in rotary engines, and more particularly to rotary engines of that class in which a revolving piston having wings is arranged within a cylindrical chamber, to operate in connection with movable abutments.

The chief object of my invention is to provide means for cutting off the supply of steam, so as to permit it to be used expansively, and also in providing a positive and direct action for the movable abutments without the use of springs. To this end I locate on the same shaft carrying the piston, and upon each side of the latter, a waved or cam wheel having alternate projections and indentations upon each side of its periphery, the edge of which wheel is arranged between two friction-rollers located upon slide-bars on each side of the piston-shaft, to which slide-bars a reciprocating movement is given by the rotary action of the waved wheel. One of these waved wheels serves to operate the valves controlling the induction-ports of the engine with a cut-off action, and the other operates the movable abutments. For transmitting motion to the movable abutments, a parallel action is provided by forming said abutments in the nature of bars arranged parallel with the axis of the piston, and connected by pivoted links to a suitable support, so that a movement imparted to said abutments in the direction of their length causes them to advance laterally upon their radially-arranged and swinging links to close tightly against the piston or recede from and get out of the way of its wings, as the case may be.

In the drawings, A represents the bed-frame of the engine, upon which are arranged bearings *a a*, which carry the main shaft B. C, Figs. 3, 4, and 7, is the rotary piston, which is rigidly keyed to the shaft and is formed with diametrical wings *b b*, which are tightly packed within the cylindrical chamber of the piston-casing D, the said piston being securely held in place by heads *c c′*, clamped upon opposite sides of the piston-casing by bolts *d d*.

E is the inlet-pipe for the steam. This is provided with two branches, which enter steam-chests *e e*, upon opposite sides of the piston-casing. From each of these steam-chests there are two sets of induction-ports, (see Fig. 1,) one set of which, *f f*, are used for driving the piston in one direction, and the other set, *f′ f′*, of which are employed when the engine is to be reversed and the piston driven in the opposite direction. Of these two sets of ports, *f f* enter the cylinder as shown in Fig. 3, to drive the piston in the direction of the arrow—*i. e.*, the left-hand port *f* enters the cylinder above the abutment on that side, and the right-hand port *f* enters the cylinder below the abutment on that side. The other set of ports, *f′ f′*, enter the cylinder upon the opposite sides of the abutment from *f f*, as shown in Fig. 4—*i. e.*, the left-hand port *f′* enters below the abutment on that side, and the right-hand port *f′* enters above the abutment on said side.

Now, for discharging the steam from the cylinder, one of the heads, *c*, is perforated with four holes, g^1 g^2 g^3 g^4, and a couple of parallel slide-bars, F F, having corresponding openings h^1 h^2 h^3 h^4, (see Fig. 5,) are connected to a lever, G, and guided by suitable keepers, so as to control the escape of exhaust-steam from the orifices g^1 g^2, &c.

When the openings g^1 g^2 and h^1 h^2 are in registration, as in Fig. 5, the discharge-orifices are adapted for co-operation with the induction-ports *f f* when the piston is revolving in

the direction of the arrow in Fig. 3, the relative position of the said exhaust-ports being indicated in said figure in dotted lines. When the openings g^3 g^4 and h^3 h^4 are in registration, (which are shown out of registration in Fig. 5,) then the exhaust-openings are adapted to the ports f' f' in Fig. 3, for driving the piston in the opposite direction, the relative position of the discharge-ports being also indicated in this figure in dotted lines.

The means for operating the valves and the abutments will now be described: First, for operating the valves I locate upon the shaft B, upon one side of the piston, a waved or cam wheel, H, having upon its sides alternate projections and indentations, the projection *i* on one side being opposite an indentation, *j*, on the other side, and the indentation *k* of the first side being opposite the projection *l* of the opposite side. The outer surfaces of these projections and indentations are straight lines, and the change from the plane of one of these straight sections to another is made by an inclined portion of the periphery *m*, (which is of less actual thickness than the straight section, but of the same thickness when measured on a line parallel with the axis.) The object of their construction is to permit this inclined section of the cam-wheel to pass between two rollers fixed an invariable distance apart, which distance shall be just equal to the thickness of the straight sections, it being obvious that the portion of the cam-wheels which goes through the roller at an angle must be made thinner than that portion which goes through at right angles. As this cam-wheel is designed to operate the valves with a quick or cut-off stroke, the outer angles or turns from the straight to the inclined sections of the cam-wheels are made sharp and abrupt. Upon each side of this cam-wheel are disposed slides I, arranged in positions parallel with the shaft B. These slides are contained between top plates, J, and the bed-frame, which plates are connected to the bed-frame by bolts or ports *n*. The slides I are slotted at their ends, and the forks formed by said slots are made to embrace the ports *n*, so as to guide the slides in rectilinear reciprocation. Upon each of these slides are arranged rollers *o o*, disposed upon opposite sides of the edges of the cam-wheel H, and in a plane of revolution at right angles thereto.

As the wheel H revolves, it will be seen that its alternate projections and indentations are traversed by the rollers *o*, and a reciprocating motion is imparted to the slides. To these slides the valves J^2 J^2 are attached, and are arranged to be simultaneously in registration with the ports *f*, as in Fig. 1, or be projected to a position out of registration. Thus, when the engine is running from the admission of steam through the ports *f*, as indicated by arrows in Fig. 3, the valves J^2 reciprocate from the position shown in Fig. 1 (in registration with said ports) to a position farther to the right and out of registration. To cause the valve to reciprocate over the ports *f'*, for running the engine in the opposite direction, the said valves must be adjusted to a new position, and for this purpose I provide between each valve J^2 and its actuating-slide I a take-up connection, which consists (see Fig. 2) of a notched latch, K, pivoted to a standard, *p*, projecting from slide I, and a tongue, *q*, fastened upon the valve-rod. By raising the latch, and fitting the tongue *q* in the notch closer to the fulcrum of the latch, the valves are bodily adjusted to the position in which they reciprocate over the other ports, *f' f'*.

By the proper timing of the projection on the wheel H, it will be seen that the steam may be cut off at any desired position of the piston.

For operating the sliding abutments a similar wheel, H', slides I', and rollers *o' o'* are arranged upon the opposite side of the piston. The reciprocating motion of these slides I' is imparted through links M to the parallel bars N, which form the movable abutments, and which parallel bars are pivoted to swinging or radial links O, so that a longitudinal movement given to the bars N causes them to advance to or recede laterally from the piston. These bars play in recesses *r r* in the piston-casing, on opposite sides of the piston, and their actuating-wheel H' has its projection so constructed and timed that the abutments are projected lightly against the hub of the piston for nearly a half-revolution, and then as the wings of the piston approach the abutments recede into these recesses, as in Fig. 7, just long enough to allow the wings to pass, when they are again projected to steam-tight contact with the hub of the piston.

In constructing the cam-wheels H and H', they may be made with a greater number of alternate projections and indentations, as shown in Figs. 8 and 9, or they may be made with a less number than herein shown.

With respect to the principle of a cam-wheel, H, operating, in connection with rollers *o o*, on a slide arranged parallel to the axis of said wheel, I would state that I do not claim these devices, broadly, in this application; but I reserve the right to cover them in a separate application as a new mechanical movement for converting a rotary into a reciprocating motion.

P are adjustable plates, to which the links O are pivoted. By changing the position of these plates the abutments N may be made to press more tightly against the piston to take up wear.

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

1. In a rotary engine, the combination, with the slide-valve J^2, of the cam-wheel H, rollers *o o*, and slide I, connected to said valve, substantially as shown and described.

2. In a rotary engine, the combination, with the valve J^2 and the piston-casing having two sets of induction-ports, of the tongue *q* and the latch K, connected to the operating-slide, and having two or more notches, substantially as shown and described.

3. In a rotary engine, the movable abutment consisting of a bar attached to the ends of swinging links and having a parallel action, as described.

4. In a rotary engine, the combination, with the piston and casing, of the cam-wheel H′, rollers o' o', slide I′, link M, abutment-bar N, and swinging links, substantially as and for the purpose described.

5. The combination, with a rotary engine having two sets of induction-ports for running in opposite directions, of the head *c*, having holes g^1 g^2 g^3 g^4, and the parallel bars F F, connected and operated by a lever, and having openings h^1 h^2 h^3 h^4, substantially as and for the purpose described.

6. In a rotary engine, the adjustable plates P, in combination with the bars N and O, substantially as and for the purpose described.

The above specification of my invention signed by me this 11th day of February, 1879.

DANIEL ABREY.

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

2,550
words.