

D. D. HARDY.  
 ROTARY-ENGINE.

No. 184,284.

Patented Nov. 14, 1876.

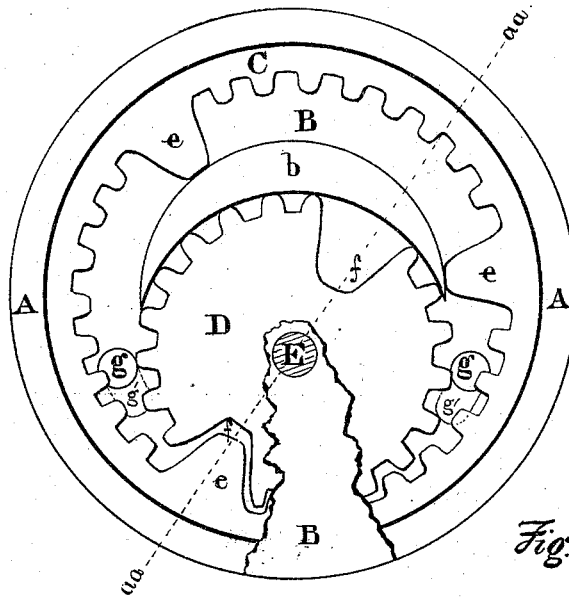


Fig. 1.

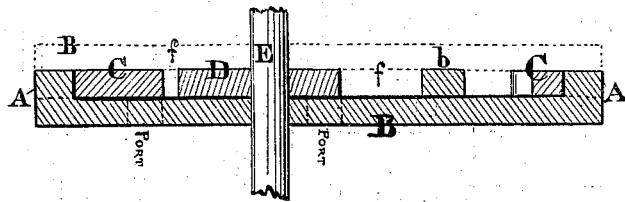


Fig. 2.

Witnesses  
 H. W. Mills,  
 J. A. Remond.

Dexter D. Hardy  
 by E. H. Hurler, Atty in Fact

# UNITED STATES PATENT OFFICE.

DEXTER D. HARDY, OF DELAVAN, ILL., ASSIGNOR OF ONE-HALF HIS RIGHT TO GEORGE C. WHITMORE AND WILLIAM A. JACOBUS, OF SAME PLACE.

## IMPROVEMENT IN ROTARY ENGINES.

Specification forming part of Letters Patent No. 184,284, dated November 14, 1876; application filed September 18, 1876.

To all whom it may concern:

Be it known that I, DEXTER D. HARDY, of Delavan, in the county of Tazewell, and in the State of Illinois, have invented an Improvement in Rotary Steam-Engines; and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the annexed drawings, making a part of this specification, in which like letters of reference refer to like parts, and in which—

Figure 1 represents a plan view of the interior of the engine with the nearest cylinder-head B removed; and Fig. 2, a cross-section along dotted line *a a a a*, Fig. 1.

This engine is designed for a rotary steam-motor, but may also be adapted for use as a pump or blowing-machine, &c.

It consists, first, of a stationary cylinder, with the usual heads and ports, in which the steam is admitted or discharged.

Second, inclosed between the heads of said cylinder is an annular internal-toothed wheel, *i. e.*, without spokes, of the same diameter as, and revolving against, the interior surface of said cylinder, and also on its sides against the cylinder-heads. This wheel is provided with two or more lugs or steam-abutments, in the shape of one of the teeth much enlarged, projecting toward the center of the wheel, and which necessarily supplant some of the teeth, placed equidistantly on its interior. By these lugs the wheel is impelled, by means of steam, as hereafter described.

Third, with the teeth of latter wheel is engaged a wheel or pinion of equal thickness with that of said annular wheel, but of much less diameter, and, like the same, extending from head to head, and provided on its periphery with recesses to receive and let pass each lug of the larger wheel as it comes round. This pinion or wheel is set on an axle or shaft, which passes through one or both of the cylinder-heads, from whence the power is applied to the operation of machinery.

Fourth, filling the space not swept over by the lugs of the larger wheel nor the teeth of the pinion, and extending from head to head of the cylinder, is a crescent-shaped block, which confines the steam to its pressure on the lugs of said annular wheel after they pass

the port. The outer or larger curve of the block is concentric with the larger wheel; the inner curve is in contact with the teeth of the pinion; and the block may be fastened to or form part of the head or heads of the cylinder.

The steam-ports are placed one near each point of the block, and are convertible as supply or exhaust ports, and pass through the head or heads.

In the drawings, which represent one of the forms in which I construct this engine, A is the cylinder; B B, the cylinder-heads, one being nearly entirely removed; C, the annular internal-toothed wheel; *e e e*, steam-lugs; D, the pinion; *f*, spaces cut out to admit the steam-lugs *e* of the other wheel; *b*, the crescent-shaped block, between the cylinder-heads and the wheels C D; *g g*, the steam-ports, each having a depression, *g' g'*, opening into it, excavated from the inner surface of the cylinder-head, and extending toward the engaged part of the wheels, used merely to extend the operation of the steam; E, the shaft.

The operation of this engine is as follows: The cylinder is stationary or fixed. Steam, entering one of the ports *g*, near where the wheels become disengaged, acts against one of the lugs *e* of wheel C, each of which lugs has a bearing or contact on the outer curve of the block *b*, for about half a revolution of the wheel C. The two wheels being engaged by teeth, the pinion D is caused to rotate, the exhaust steam passing off by the other port when the lug ceases contact with said block *b*. The lug, continuing its course, passes the pinion D by being admitted within the recess or recesses *f* of the latter. Steam is prevented from passing to the other port by reason of the contact of the teeth of pinion D with the inner curve of the block *b*.

The engine is reversible by making either port the supply-passage for steam, the steam-lugs *e* always acting as cut-offs or openers of the ports in either case.

What I claim as my invention is—

In combination with the cylinder A and heads B, provided with steam-ports *g g*, an

annular internal-toothed wheel, with two or more lugs, *e e*, on the inner side of same, pinion D, with recesses to admit the said lugs *e e*, and with shaft E, and the crescent-shaped block *b*, substantially as and for the purposes described.

In testimony that I claim the foregoing ro-

tary steam-engine I have hereunto set my hand this 8th day of September, A. D. 1876.

DEXTER D. HARDY.

Witnesses:

WM. A. RENNEN,  
I. H. J. WALSINGHAM.