



# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN ROTARY ENGINES.

Specification forming part of Letters Patent No. 187,215, dated February 13, 1877; application filed June 26, 1876.

*To all whom it may concern:*

Be it known that I, PETER D. M. CARMICHAEL, of Le Roy, in the county of Genesee and State of New York, have invented a new and Improved Rotary Engine, of which the following is a specification:

This invention relates to a compound rotary engine; and consists of a contrivance for cutting off steam, a governor for regulating steam, and the contrivance of the abutments, pistons, inlet and exhaust passages, all as hereinafter described.

Figure 1 is a section of the engine in the longitudinal axis of the shaft on the line *x x*, Fig. 4. Fig. 2 is a transverse section on the line *y y*, Fig. 1. Fig. 3 is a section on line *z z*, Fig. 1. Fig. 4 is a section on line *w w*, Fig. 1; and Fig. 5 is a section on the line *v v*, Fig. 1.

Similar letters of reference indicate corresponding parts.

A is the pipe through which the steam enters the hollow shaft B, when the channel C in the shaft is open to it, the steam being cut off while the abutment D is passing the mouth of the pipe. E is an adjusting-screw, pressing a bearing-piece against the shaft opposite to the steam-pipe, to make the shaft bear steam-tight at G, to prevent the steam from leaking into the chamber H and pressing it endwise. I is a centrifugal lever pivoted to the collar J, carried on the shaft in the chamber K, to regulate the throttle-valve L in the shaft for governing the engine. M is the steamway of the first engine, into which steam enters through passage N in the hub O, under the piston P, throwing it out against the case, and driving it around after passing the abutment Q, to turn the hub, which is attached to the shaft and turns with it. R is the exhaust-passage, through which the steam escapes from the chamber M back into passage S in the shaft, and goes through passage T in hub *u* into the second steamway V under piston W, entering at the moment the piston passes the abutment X, and exhausting therefrom at the outlet *y*.

The abutment Q, in the first steamway extends nearly half the way round the hub,

while the other, X, in the second steamway, is only of sufficient length to cut off the steam properly, and the second steamway is wider than the first, enabling the steam to work expansively in the second steamway.

The abutments and the ports are relatively arranged, so that the exhaust begins from steamway M at the moment the piston W passes abutment X; but, owing to the greater length of abutment Q, the exhaust from way M is completed before piston W comes to its exhaust. Thus abutment Q forms a cut-off for the second steamway, and enables a still greater expansion than is due to the difference of the two steamways in sizes.

The cut-off D for the first cylinder may be arranged in such relation to the abutment Q that it will cut off before piston P arrives at the point of closing, if desired.

The steamways and abutments are made tapering from the outer to the inner periphery, so that the abutments may be set up by screws *z* to take up the wear, and the abutment Q is, in consequence of its length, made in two parts, by which it adjusts better. The pistons are of rectangular form, as shown in the upper steamway of Fig. 1, and are fitted in suitable recesses in the hubs to bear at their ends against the shoulders of the recesses for transmitting the pressure of the steam. The recesses are also cut into the face of the hub sufficiently to allow the piston to shut in deep enough to pass the abutments, the pistons being closed by the abutments.

The pistons are packed in the face at *a*, each side of the steamway, to prevent the escape of the steam.

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

1. The secondary hub *u*, together with its piston and abutment, combined with the primary hub and its adjuncts in the arrangement, whereby the steam from the first engine exhausts through hub O, shaft B, and hub *u* into the second engine, substantially as specified.

2. The elongated abutment Q, in the pri-

mary steamway M, of a compound rotary engine, arranged in relation to the exhaust of the primary engine, and that of the inlet of the secondary one, whereby it forms the cut-off to the secondary engine, substantially as specified.

3. The combination, with the cock L in the

hollow shaft B, of the centrifugal lever I, pivoted to a support, J, mounted on the shaft, substantially as specified.

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Witnesses:

ANGUS L. TOMPKINS,  
KATE QUINLAN.