No. 680,479. Patented Aug. 13, 1901.

# P. ENGLISH & L. COONEY, JR.

## ROTARY ENGINE.

(Application filed Oct. 9, 1899.)

(No Model.) 2 Sheets—Sheet 1.

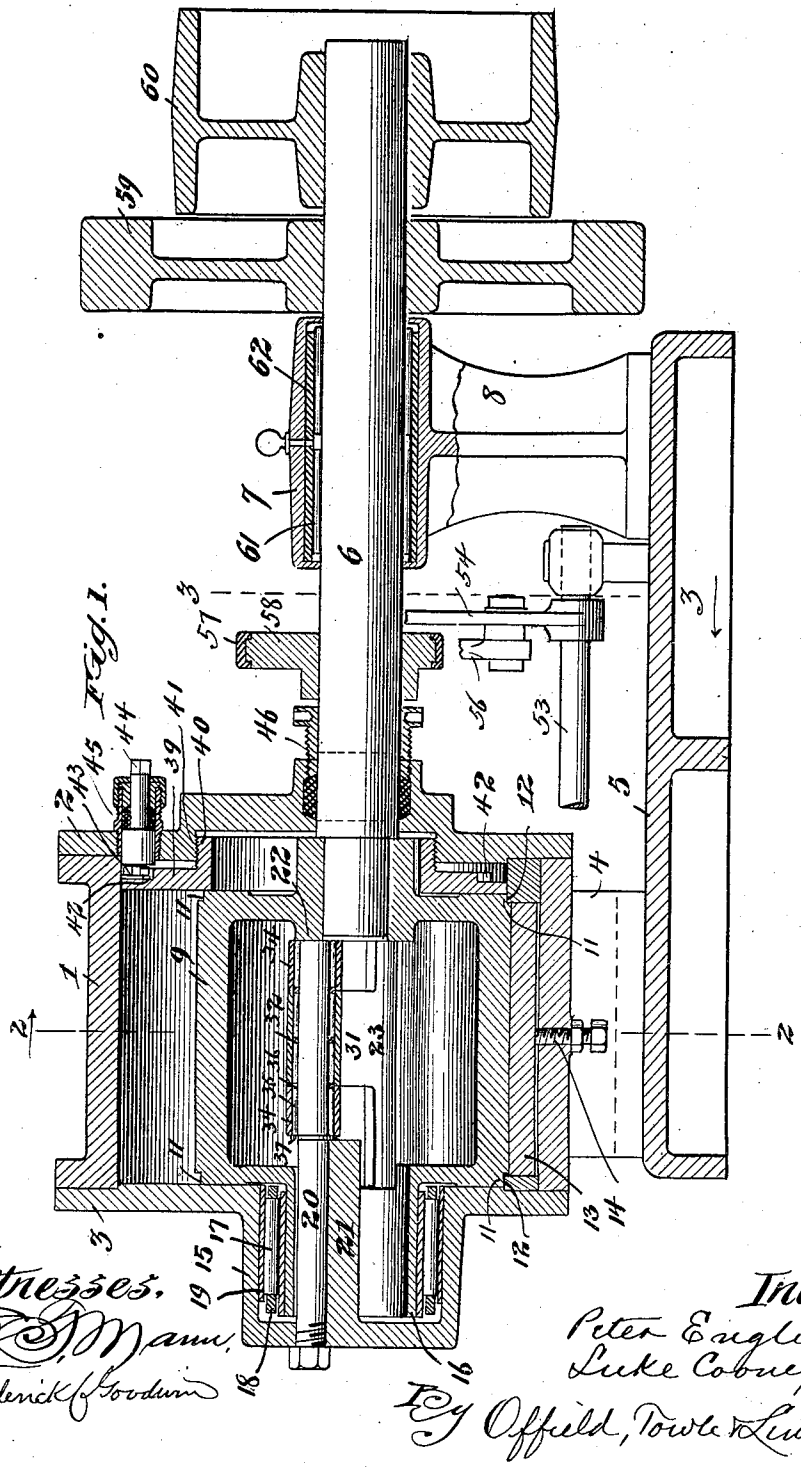


Fig. 1.

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Fig. 3.

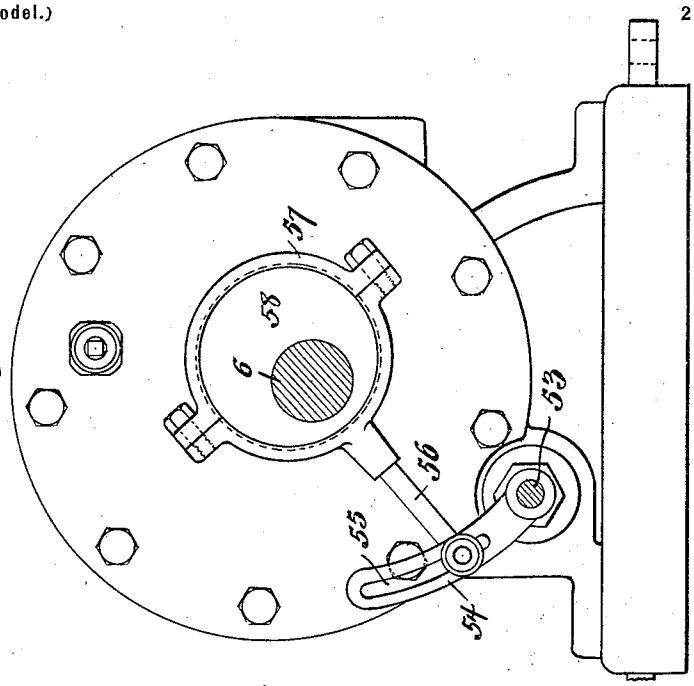
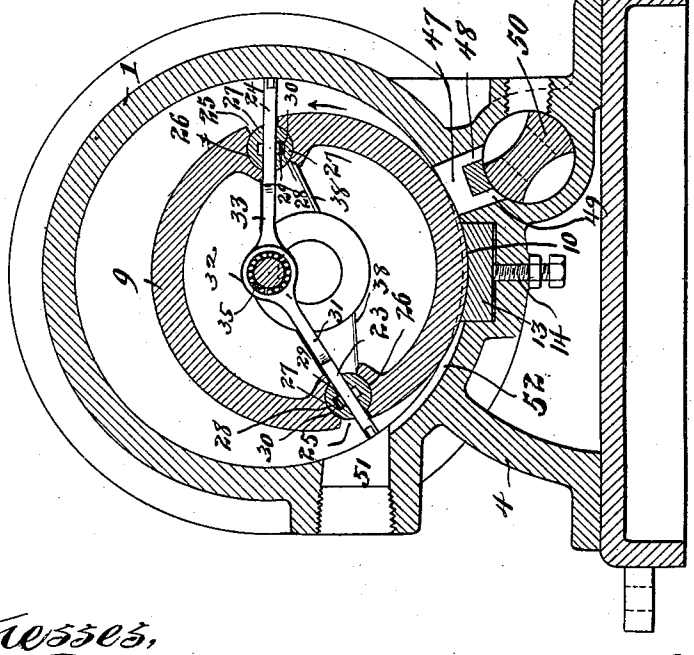



Fig. 2.




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# UNITED STATES PATENT OFFICE.

PETER ENGLISH, OF BENTON HARBOR, MICHIGAN, AND LUKE COONEY, JR., OF CHICAGO, ILLINOIS, ASSIGNORS OF THREE-FOURTHS TO PAUL E. BERGER, OF CHICAGO RIDGE, ILLINOIS, AND FRANCIS W. GRIDLEY, OF SYRACUSE, NEW YORK.

## ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 680,479, dated August 13, 1901.

Application filed October 9, 1899. Serial No. 733,040. (No model.)

*To all whom it may concern:*

Be it known that we, PETER ENGLISH, of Benton Harbor, in the county of Berrien and State of Michigan, and LUKE COONEY, Jr., of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification.

This invention relates to rotary engines, and is in the general nature of an improvement upon the construction set forth in a prior application filed by us January 23, 1899, Serial No. 703,049.

The present invention has for its object the simplification of the construction and the reduction of friction in the engine; and to these ends the invention consists in certain novel features, which we will now proceed to describe and will then particularly point out in the claims.

In the accompanying drawings, Figure 1 is a central vertical longitudinal sectional view of an engine embodying our invention. Fig. 2 is a transverse sectional view taken on the line 2 2 of Fig. 1, and Fig. 3 is a similar view on the line 3 3 of Fig. 1.

In the said drawings, 1 indicates a suitable cylindrical casing having at its ends heads 2 and 3 and supported upon a suitable base 4, which latter rests upon a bed-plate 5. A shaft 6 is supported in a suitable bearing 7 on a standard 8, arising from the bed-plate 5, and extends through the cylinder-head 2 into the interior of the cylinder, where it is provided with a drum 9. This drum and the shaft 6 are arranged eccentrically relatively to the cylinder and concentrically relatively to each other. The drum 9 is of such diameter that its main or body portion cuts or intersects the inner surface of the cylinder 1, and this latter is therefore not truly cylindrical upon its inner face, but is provided at the point where said drum intersects its inner surface with a cylindrical portion 10 of smaller radius, said radius being identical with that of the body of the drum 9. The depression 10 thus formed is of less length than the cylinder 1, and the drum 9 is reduced in diameter at each end, as indicated at 11, so that said reduced portions bear upon the truly cylindrical portions 12 of the interior of the cylinder 1, at each end of the depression 10 therein, as shown in Fig. 1. Located within the depression 10 is a bearing block or abutment 13, whose exposed face corresponds in curvature with the depression 10 and with the face of the drum. This block is preferably constructed of steel and adjusted by means of a screw 14 or in any other suitable manner in order to take up wear.

The drum 9 is supported at one end by means of the shaft 6, to which it is secured, its other end being supported within a cylindrical bearing-box 15, formed in the head 3. To this end the drum 9 is provided with a trunnion 16, and in the particular construction shown a plurality of rollers 17 are interposed between the bearing-box and trunnion, being held in place by an annular spacing-frame 18, in slots in which the rollers are held. We have also shown the bearing-surfaces of the trunnion and box as provided with annular bearing-sleeves 19, between which the rollers 17 travel.

The drum 9 is hollow, as well as its trunnion 16, and there is provided a fixed shaft 20, which is concentric with the cylinder 1 and which extends through the hollow trunnion into the interior of the drum. This shaft is mounted in the head 3, and in order to give it additional support said head is provided with an arm 21, which extends inward through the hollow trunnion 16 and has a suitable seat in which the fixed shaft 20 rests. The inward or free end of the shaft 20 preferably abuts against the inner end of the hub 22 of the drum 9. Mounted upon this fixed shaft are two wings or vanes 23 and 24, which are of a length equal to the length of the body of the drum and which extend through suitable slots in the body and ends of the drum 9. The slots in the body of the drum are indicated at 25 and are flaring both inwardly and outwardly in order to accommodate the varying angular positions which the wings or vanes assume relatively to the drum. In order to provide suitable bearings in the body of the drum for these wings or vanes, each wall of

the slots 25 is provided with a cylindrical groove or seat 26, and in each of these seats is located a semicylindrical bearing-block 27, having one face rounded to fit the seat 26 and the other face plane to fit against the corresponding plane surface of the wing or vane. The wing or vane thus slides between plane surfaces, and the bearing-blocks are free to rock with a minimum of friction in the seats provided for them. That one of each pair of blocks 27 which lies on that side of the wing or vane against which the pressure comes is provided with a longitudinal groove 28, in which is inserted a packing-strip 29, backed by a spring 30, so as to take up any wear and prevent looseness and rattling between these parts. The wings or vanes 23 and 24 are supported from the fixed shaft 20, so as to rotate around the same, and we prefer for this purpose the construction shown, in which the wing or vane 23 is provided with a central radial arm 31, having a hub 32, while the wing or vane 24 is provided with two radial arms 33, having hubs 34, which surround the shaft 20 on each side of the hub 32. In order to reduce the friction to a minimum, antifriction-rollers 35 may be introduced between said hubs and the shaft 20, being held in place by rings 36 and being prevented from displacement longitudinally by a collar 37 on the shaft 20 at one end and by the hub 22 of the drum 9 at the other end.

It will be understood, of course, that the slots 38 in the ends of the drum 9, through which the wings pass, will be flared or enlarged in width toward the center of the drum in order to accommodate the varying angular positions of the wings or vanes.

In order to take up wear at the ends of the drum, we employ, as in our prior application, a disk 39, having a threaded hub 40, which screws into a threaded recess 41 in the head 2, said disk being provided with marginal teeth 42, engaged by a pinion 43 on a shaft 44, adapted to be operated from the exterior of the cylinder.

A stuffing-box 45 is provided where the shaft 44 passes through the head 2, and a similar box 46 is provided where the shaft 6 passes through the head 2.

Steam is admitted to the cylinder 1 through an inlet-port 47, having branches 48 and 49 and controlled by an oscillating valve 50, as in our prior application hereinbefore referred to, while the exhaust-steam escapes through an outlet-port 51. A groove or passage 52 extends from the abutment 14 to this exhaust-port to insure the complete exhausting of the steam.

The oscillating valve 50 is mounted on a rock-shaft 53, provided with an arm 54, having a slot 55. This slot serves to adjustably connect to the arm 54 one end of a pitman 56, the other end of which is provided with a strap 57, encircling an eccentric 58 on the shaft 6. This eccentric imparts an oscillatory motion to the valve 50, and the extent of movement of said valve may be regulated by adjusting the connection of pitman 56 and the arm 54.

We have shown the shaft 6 as provided with a fly-wheel 59 and driving-wheel 60, and we have also shown a bearing 7 as being a roller-bearing comprising a plurality of rollers 61, located between the shaft 6 and a suitable bearing-sleeve 62, inserted within the bearing 7.

We do not wish to be understood as limiting our invention to the precise details hereinbefore set forth, and shown in the drawings, as it is obvious that these features may be varied without departing from the principle of our invention.

We claim—

1. In a rotary engine, the combination, with a cylinder having an eccentric bearing-box in one of its heads and a supporting-arm extending from said box inward toward the center of the cylinder, of a main shaft in line with said bearing-box and extending through the other head of the cylinder into the interior thereof, a drum secured on and concentric with said main shaft and bearing, and having a hollow interior and a hollow trunnion adapted to run within the bearing-box, a fixed shaft supported by the arm of the bearing-box and extending through the hollow trunnion into the interior of the drum, and wings or vanes pivotally mounted on said fixed shaft extending through the slots in the drum and bearing against the inner face of the cylinder substantially as described.

2. In a rotary engine, the combination, with a cylinder having in one of its heads an externally-closed eccentric bearing-box communicating with the interior of the cylinder, and a fixed shaft concentric with the cylinder and extending into the interior thereof, said shaft being provided with wings or vanes pivotally mounted thereon and bearing against the inner face of the cylinder, of a main shaft extending through the other head of the cylinder a short distance into the interior thereof, said shaft being eccentric relatively to the cylinder and concentric with the bearing-box, and a drum closed at one end to form a hub whereby it is secured to the end of the main shaft, having a hollow interior to receive the fixed shaft and provided with a hollow open trunnion at its opposite end supported within the bearing-box, said drum being concentric with the main shaft and bearing-box and eccentric relatively to the cylinder, and provided with slots through which the wings or vanes extend substantially as described.

3. In a rotary engine, of the character described, the combination, with a cylinder having a fixed concentric shaft, wings or vanes having hubs encircling said shaft and rollers interposed between said hubs and shaft, said cylinder having also an eccentric externally-closed bearing-box in one of its heads, of a correspondingly eccentric main shaft extend-

ing through the other head, a hollow drum secured at one end to said shaft and concentric therewith and having at its other end a hollow trunnion through which the fixed shaft passes, and rollers interposed between said trunnion and the bearing-box, said drum having slots through which the wings or vanes pass, substantially as described.

4. In a rotary engine, the combination, with a cylinder having in its inner face a depression or recess of smaller radius and less length than the cylinder proper, of an eccentric hollow drum inclosed in said cylinder and having a body portion of a radius conforming to the depression or recess, and reduced ends to bear upon the true cylindrical face of the cylinder, an abutment-block located in said depression or recess, a fixed shaft concentric with the cylinder and extending into the interior of the hollow drum, and wings or vanes pivotally mounted on said fixed shaft, extending through slots in the drum and having at their outer ends a width greater than the length of the depression or recess in the cylinder substantially, as described.

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