2 Sheets—Sheet 1.

J. DARLING.
Rotary-Engines.

No. 208,298. Patented Sept. 24, 1878.

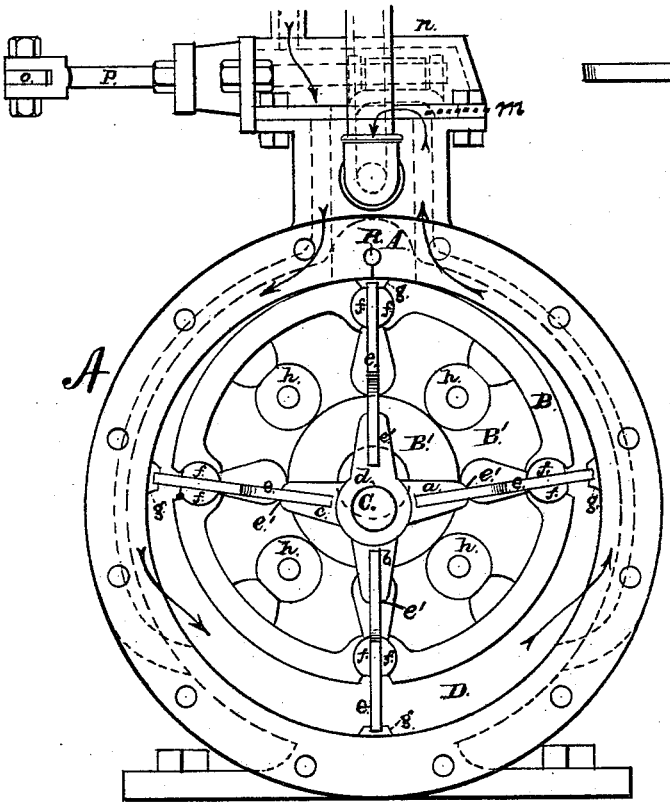


FIG. 1.

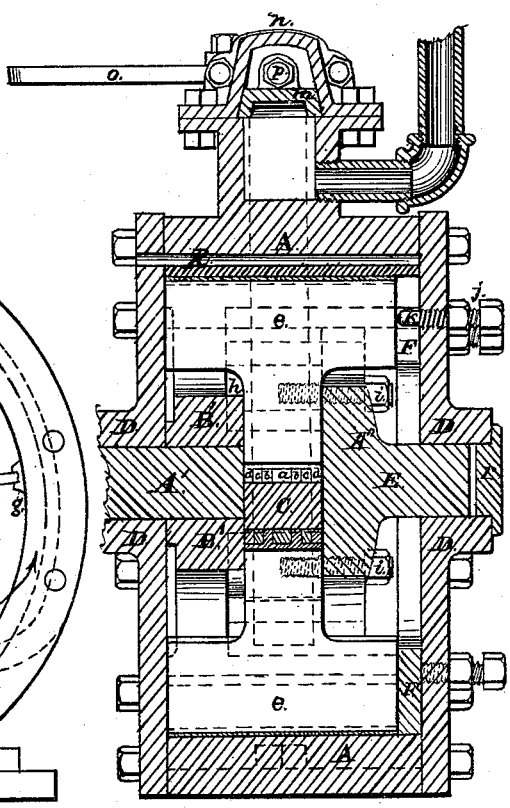
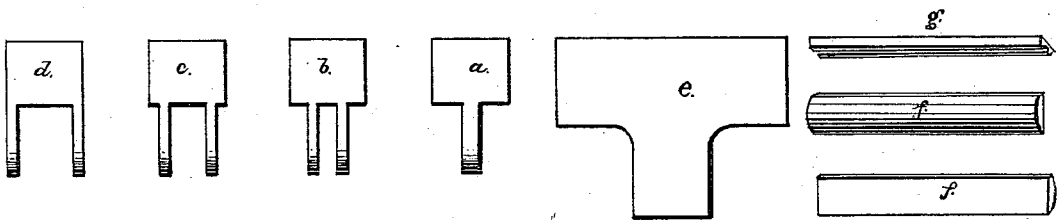


FIG. 2.



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Inventor:
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2 Sheets—Sheet 2.

J. DARLING.
Rotary-Engines.

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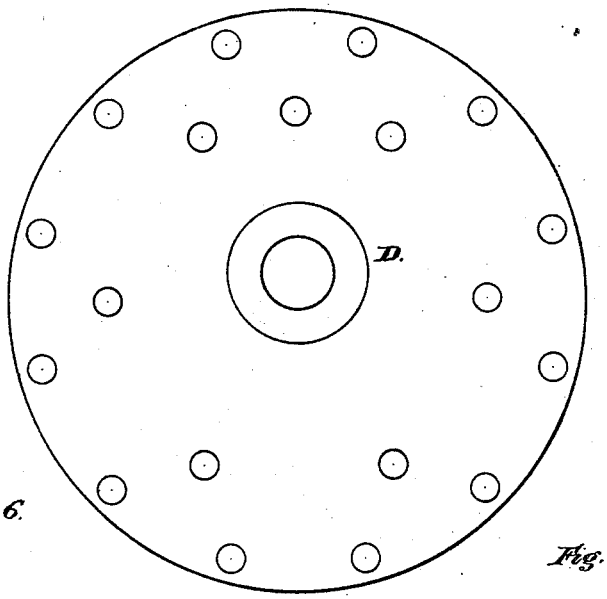

FIG. 3.

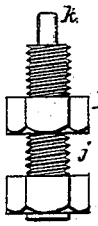

Fig. 6.

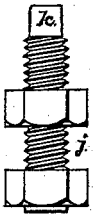

Fig. 7.

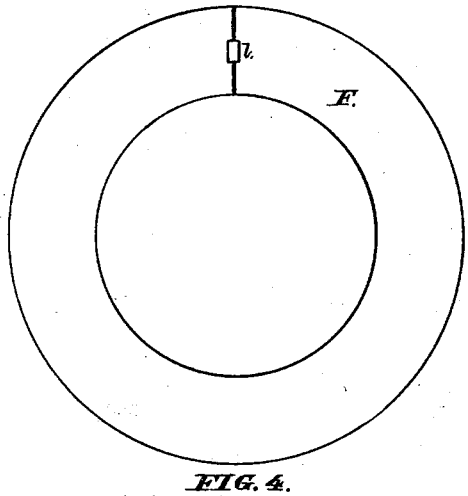

FIG. 4.

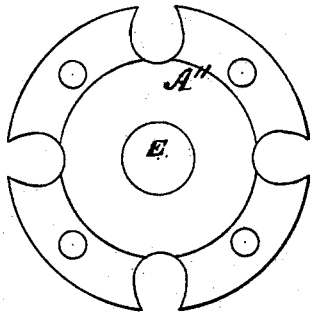

FIG. 5.

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UNITED STATES PATENT OFFICE.

JEREMIAH DARLING, OF CINCINNATI, OHIO.

IMPROVEMENT IN ROTARY ENGINES.

Specification forming part of Letters Patent No. **208,298**, dated September 24, 1878; application filed August 24, 1874.

To all whom it may concern:

Be it known that I, JEREMIAH DARLING, of Cincinnati, in the county of Hamilton and State of Ohio, have invented a new and useful Improvement in Rotary Engines, of which the following is a specification:

My invention relates to that class of rotary engines in which the power is applied within a stationary cylinder to radial arms or wings rotating a shaft extending through said cylinder in a line parallel but not coincident with its axis, and having centered upon and revolving with said shaft an inner cylinder, through whose periphery said wings extend; and consists, first, in an oiling device or reservoir located in the shell of the permanent cylinder, and opening, by means of a narrow slit through and across the inner face of said cylinder, into the interior at the line of contact between the inner and outer cylinders, whereby the oil is supplied in contact with the periphery of the inner cylinder at a point from which steam is excluded, the surface of the inner cylinder forming a sliding bottom, by which the delivery of oil is regulated by the action of the parts; second, in providing for the radial wings or pistons an independent central hinge, free to move within a chamber provided for its occupancy within the inner revolving cylinder, but held in position in relation to the main or stationary cylinder solely by the wings or pistons which rest within the radial jaws of said hinge and extend thence through the periphery of the inner cylinder; third, in an expansible ring to take up the side wear of the revolving wings and the inner cylinder and maintain a steam-tight joint, adjustable in said position, and also by its expansion to form a steam-tight joint at its contact with the shell of the permanent cylinder.

Figure 1 of the drawings herewith is a side elevation of the engine with one of the heads of the main cylinder removed to expose the interior to view. Fig. 2 is a vertical cross-section of the same. Fig. 3 is an elevation of one of the main cylinder-heads. Fig. 4 is an elevation of the expansible ring for packing the sides of the wings and inner cylinder. Fig. 5 is a view of the head or flange upon one portion of the divided shaft, which serves as one head of the inner cylinder to inclose the chamber occupied by the hinge hereinafter described. Figs. 6 and 7 represent, at different points of observation, the cam-ended screw which I use to expand the ring shown in Fig. 4.

a b c d are the parts of the hinge-joint hereinafter described; *e*, one of the propelling-wings, and *f f* the plano-convex gibs hereinafter described. A is the main cylinder of the engine, which is secured to a suitable bed-plate, and having induction and eduction ports, (indicated by dotted lines and arrows in Fig. 1,) and a slide-valve, *m*, operated in a chest, *n*, by a rod, P. By the movement of this valve the induction and eduction ports are reversed and the motion of the engine correspondingly changed.

B is the inner cylinder, forming part of the shaft and revolving with it. This inner cylinder consists of two parts, B B′, attached to the part A′ of the shaft, and E, attached to the part A″. The two parts B B′ and E, when bolted together by bolts *i* in the bosses *h*, connect the two portions of the shaft in a substantially continuous whole, giving bearings in both heads of the main cylinder, and also leave a chamber between said parts and within said inner cylinder for the occupancy and operation of the central hinge-joint of the revolving wings *e*.

An aperture, R, is located horizontally across and through the shell of the main cylinder A vertically above the point where the inner cylinder, B, revolves in contact with the inner surface of the main cylinder A, and is slit at the bottom longitudinally into the interior of the cylinder A, to permit the oil to run entirely across the periphery of the inner revolving cylinder, B, and the ends of the wings *e* in passing. The aperture or reservoir R is connected externally with an oil-cup provided with a faucet.

As will be seen by this construction and arrangement of the parts, the periphery of the inner cylinder serves as the bottom to the oil-reservoir, and by its sliding motion takes oil by contact only in such quantity as is necessary to well lubricate the parts. It will also be observed that by this construction and arrangement of parts the steam is entirely excluded from the reservoir, so that the waste and disadvantage heretofore experienced in

all constructions where the oil is fed through steam-ports or otherwise and mingled with the steam is avoided, as this mode of oiling is self-regulating, and there is no waste.

The wings *e* of the engine pass radially through the periphery of the inner cylinder, B. The joint between the wings *e* and said periphery are journal-bearings, composed each of two plano-convex gibs, *f f*, fitting a circular bearing in the said periphery or shell, between which the wing *e* passes, permitting a vibratory motion of the wings with reference to the cylinder B, while preserving a steam-tight joint. The inner ends of the wings *e* rest without fastening within the radial jaws of a central hinge composed of the parts *a b c d*, and held together by the pivot C, which coincides with the true axis of the main cylinder A. The wings *e* being thus always in exact radial lines with relation to the main cylinder A, I construct them with T-shaped outer ends, *g*, which may be either separate pieces or permanently attached, so as to present a somewhat broader bearing-surface against the inner surface of the cylinder A and a ledge against which the steam or other motive power may act to hold them outward. This contact-surface of the wings is formed to the same arc as the interior surface of the cylinder A.

The central hinge and pivot C are not attached to the inner cylinder, B, by any fastening within the chamber they occupy. Being thus free, and the periphery or shell of the cylinder B serving as a fulcrum, the wings *e* are actuated as levers by the pressure against their outer ends, and force the immediately-following wings steam-tight against the cylinder A, the wings *e*, while under pressure of the steam, being held steam-tight against the cylinder A by pressure acting outwardly against the T-shaped ends, and are thus held in that position when the leverage ceases to act by reason of the exhaust having taken place.

By this arrangement and construction of parts the wings *e*, while traversing that arc of the cylinder at which the motive power is applied, are automatically held outward steam-tight against the surface of the cylinder A, while during the remaining portion of their travel, or after the exhaust-port is passed, the pressure and consequent friction are relieved.

In reversing the motion of the engine the exhaust-port is made the induction-port, and vice versa; but the action of the wings in the respect above indicated is precisely the same.

The shaft may project through both heads of the main cylinder A with suitable stuffing-boxes to prevent the escape of steam, or one portion only may project, the other extending only far enough to secure a bearing in the cylinder-head.

The ring F packs the edges of the wings and the end of the inner cylinder, B, by means of adjusting screws. (See Fig. 2.) It is constructed to fit the bore of the cylinder A closely, and then severed radially, as shown in Fig. 4. A recess, *l*, is provided, into which, when the ring is in position in the cylinder A, I insert the cam K on the end of the screw *j* passing through the cylinder-head, in order to expand the ring steam-tight against the cylinder A. The slit in the ring also serves to permit the oil from reservoir R to pass around the edge of the wings and the inner revolving cylinder B to lubricate the interior parts. The wings *e* may, when necessary, be "packed" against the inner surface of the cylinder A by thin strips of metal placed at the bottom of the sockets *e'* of the radial jaws *a b c d* under the ends of the wings, or springs may be used for the same purpose.

Having described my invention, I claim—

1. In a rotary engine of the kind described, in which the line of contact between the inner revolving and outer stationary cylinder is above the horizontal diameter of the latter, the longitudinal oil-reservoir R, located in the shell of the stationary cylinder above such line of contact, and communicating with the interior at such line of contact by a slot extending the full width of the inner cylinder, substantially as and for the purpose specified.

2. In a rotary engine such as described, the independent central hinge composed of the parts *a b c d* and pivot C, in combination with the inner revolving cylinder, B, having a central chamber inclosing said hinge, and the radial wings *e*, as and for the purpose specified.

3. The combination of the slotted packing-ring F and cam-shaped point K of the screw *j* with a rotary steam-engine, substantially as and for the purpose described.

JEREMIAH DARLING.

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