(No Model.)

A. D. MINIER.

ROTARY STEAM ENGINE.

No. 392,356. Patented Nov. 6, 1888.

Fig. 1.

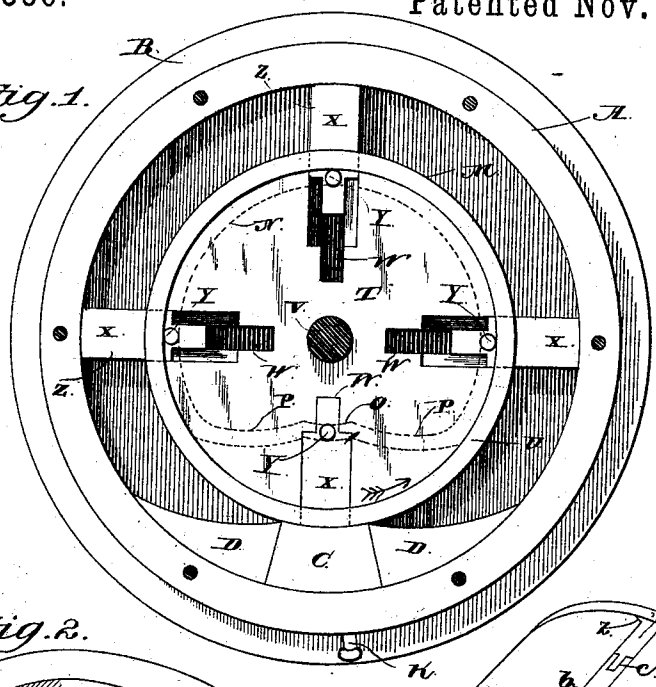


Fig. 2.

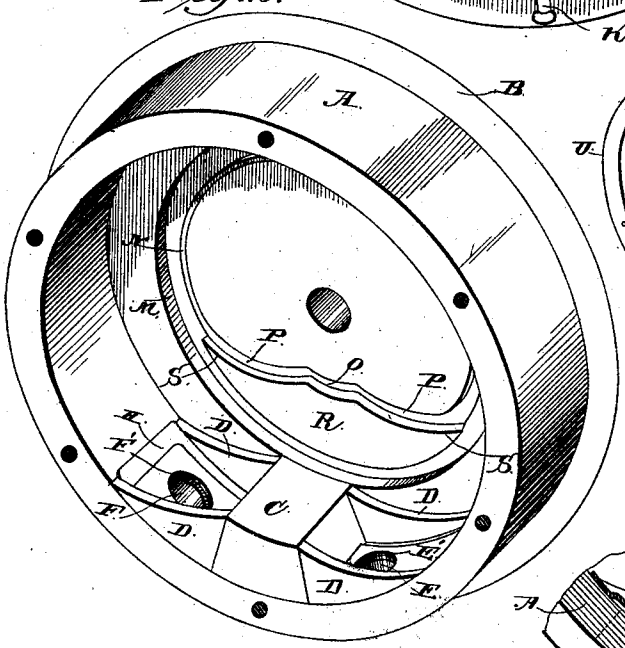


Fig. 3.

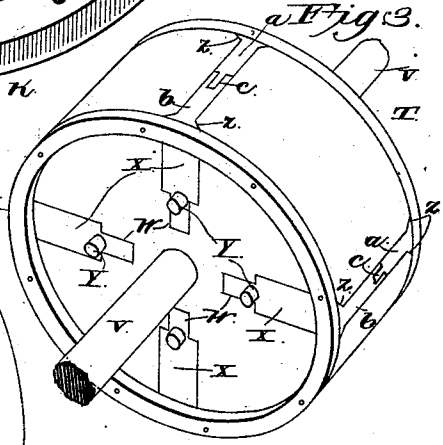


Fig. 4.

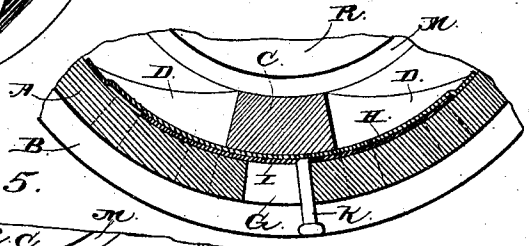
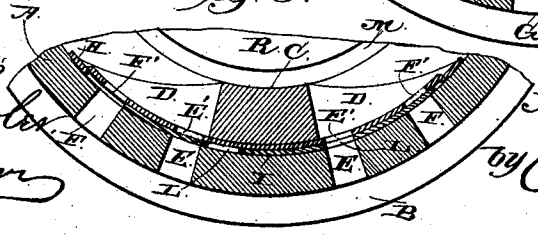


Fig. 5.



WITNESSES.

M. E. Fowler

J. W. Garner

INVENTOR.

Abram D. Minier.

by C. A. Crowles

his Attorney.

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

ABRAM DANIEL MINIER, OF MILAN, PENNSYLVANIA.

ROTARY STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 392,356, dated November 6, 1888.

Application filed March 24, 1888. Serial No. 268,385. (No model.)

To all whom it may concern:

Be it known that I, ABRAM DANIEL MINIER, a citizen of the United States, residing at Milan, in the county of Bradford and State of Pennsylvania, have invented a new and useful Improvement in Rotary Steam-Engines, of which the following is a specification.

My invention relates to an improvement in rotary steam-engines; and it consists in the peculiar construction and combination of devices that will be more fully set forth hereinafter, and particularly pointed out in the claim.

In the accompanying drawings, Figure 1 is an elevation of a rotary steam-engine embodying my improvements with one of the cylinder-heads removed. Fig. 2 is a perspective view of the interior of the case or cylinder of the engine, the drum or piston and one of the heads being removed therefrom. Fig. 3 is a detailed view of the piston and its radial wings. Figs. 4 and 5 are detail sectional views.

A represents the cylinder or case of the engine, which is provided with the removable heads B. In the lower side of the cylinder is an abutment, C, the inner side of which is concentric with the cylinder, and extending from opposite sides of the abutment are two pairs of curved guides or shoulders, D. On opposite sides of the abutment are openings E, which are made through the bottom of the cylinder, and arranged at suitable distances beyond said openings E are similar openings, F.

G represents a vertical longitudinal slot which is made in the bottom of the cylinder on one side of and between the openings E, and on the inner side of the cylinder and arranged under the abutment is a guide-plate, H, having openings E′ and F′, which register with the openings E F.

I represents a cut-off plate, which is arranged between the guide-plate H and the opposing side of the cylinder, and said guide-plate is provided with a projecting stud, K, that works in the slot G and has openings L at a suitable distance apart, which openings are adapted to alternately register with the openings E′ and F′, so as to close one of the openings E and open its companion opening F and open the other opening E and close its companion opening F.

The heads of the cylinder are provided on their inner sides with concentric grooves M, and said cylinder-heads are further provided with segmental curved grooves N, which form offsets or extensions of the concentric grooves M and communicate with short segmental grooves O, which are concentric with the central openings in the cylinder-heads and with curved grooves P, which extend from the ends of the grooves O and are concentric with the guide-shoulders D. Cams R are thus formed between the lower sides of the grooves M and the grooves P and O, the ends of said cams projecting across the grooves M, and thereby lengthening the lower sides of the cam-grooves P, as at S.

T represents a circular piston, which is arranged in the central portion of the cylinder and concentrically therewith, and is provided on opposite sides at its perimeter, with annular tongues or flanges U, which work in the circular grooves M. The said flanges or tongues are made of zinc or other comparatively soft material, and are adapted to form tight joints with the grooves M and reduce friction between the sides of the piston and the heads of the cylinder. One side of the face or periphery of the piston bears against the concave inner face of the abutment C. The said piston has trunnions or spindles V, which project from opposite sides thereof at its center and are journaled in the central opening of the cylinder-heads, and, if necessary, will be provided with packing-boxes to prevent steam from leaking around the spindles or trunnions.

In practice the spindles or trunnions will be formed by the shaft passing through the center of the piston and keyed thereto. The piston is divided at suitable distances apart with a series of radial transverse open slots, W, the ends of which are beveled outward in opposite directions through nearly their entire depth, as shown. In these slots are fitted radially-movable wings X, each of which is formed of two sections, *a b*, the said sections being connected together by a tongue-and-groove joint, *c*. On opposite edges of the said radial wings and projecting in opposite directions from the same are beveled flanges Z, which engage the beveled ends of the slots W.

Y represents pins, which extend transversely

through openings in the radial wings, and have their ends projecting beyond the sides of the piston and engaging the grooves N, O, and P, as shown.

The operation of my invention is as follows: By reason of the pins which extend through the radial wings being in engagement with the cam-slots of the cylinder-heads said radial wings are at all times moved outward and caused to bear against the inner side of the cylinder. Steam is admitted through one of the ports F and exhausted through one of the ports E on the opposite side of the abutment. As the steam presses against each of the radial wings in succession, it forces the piston in a circular direction in the cylindrical case, and as the pin or bolt of each wing travels in the segmental grooves N, which are concentric with the cylinder, the said radial wings are kept in contact with the sides of the cylinder, as before stated, and prevent the steam from leaking. At the instant that the outer end of each radial wing in succession comes in contact with the curved guides D its operating pin or bolt engages one of the curved grooves P, and the said radial wing moves inward toward the center of the piston as it slides over the said guides, thereby permitting the steam behind it to exhaust through the exhaust-opening E. The radial wing as it passes over the abutment C is momentarily relieved of steam-pressure; but as soon as it clears the curved side and the opposite side of the abutment it is again subjected to the action of the live steam, thereby continuing the rotary motion of the piston. By sliding the cut-off slide in the opposite direction from that indicated in the drawings the arrangement of the steam-ports will be reversed, so that steam will be admitted from the opposite side of the abutment and exhausted from the other side thereof, thereby causing the piston to rotate in a reverse direction from that indicated by the arrow. By reason of the radial wings being made in separable sections connected by the tongue-and-groove joint provided with the flanges Z the steam is adapted to spread the said radial wings laterally so as to cause them to bear snugly against the opposing sides of the cylinder-heads, and thereby effect steam-tight joints therewith and prevent leakage and back-pressure of the steam.

By providing the guides D the strain on the pins Y is relieved as the wings are drawn inward, so that the liability of the said pins being bent or broken is reduced to a minimum, and by providing curved guide and cut-off plates under the abutment C, I not only produce a very simple and compact arrangement of parts, but also leave the interior of the cylinder unobstructed for the play of the steam.

Having thus described my invention, I claim—

In a rotary engine, the combination, with the cylinder having cam-grooves in its heads, the abutment C, the curved guides D, extending in pairs from opposite sides of the abutment and arranged concentrically with the cam-grooves, an inlet-opening, F, and an outlet-opening, E, on each side of the abutment and between the guides, and a circumferential slot, G, under the abutment, of the guide-plate H, secured to the inner side of the cylinder, passing under the abutment, and provided with openings E′ F′, registering with the openings E F, the cut-off plate I, arranged under the guide-plate and provided with openings L, a stud, K, projecting from the cut-off plate through the slot G, and the piston moving over the abutment, as specified.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in presence of two witnesses.

ABRAM DANIEL MINIER.

Witnesses:
REUBEN THOMSON,
S. A. HINES.