T. H. LINDLEY & H. SCHREIER.

ROTARY ENGINE.

APPLICATION FILED JULY 19, 1910.

986,636. Patented Mar. 14, 1911.

2 SHEETS—SHEET 1.

Fig. 3.

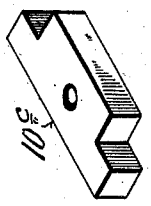
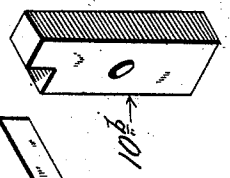


Fig. 4



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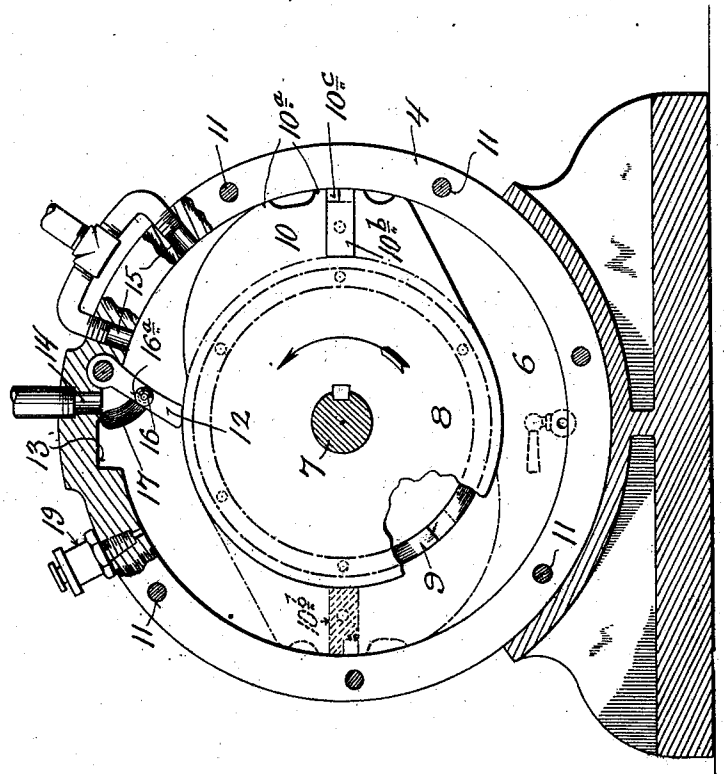

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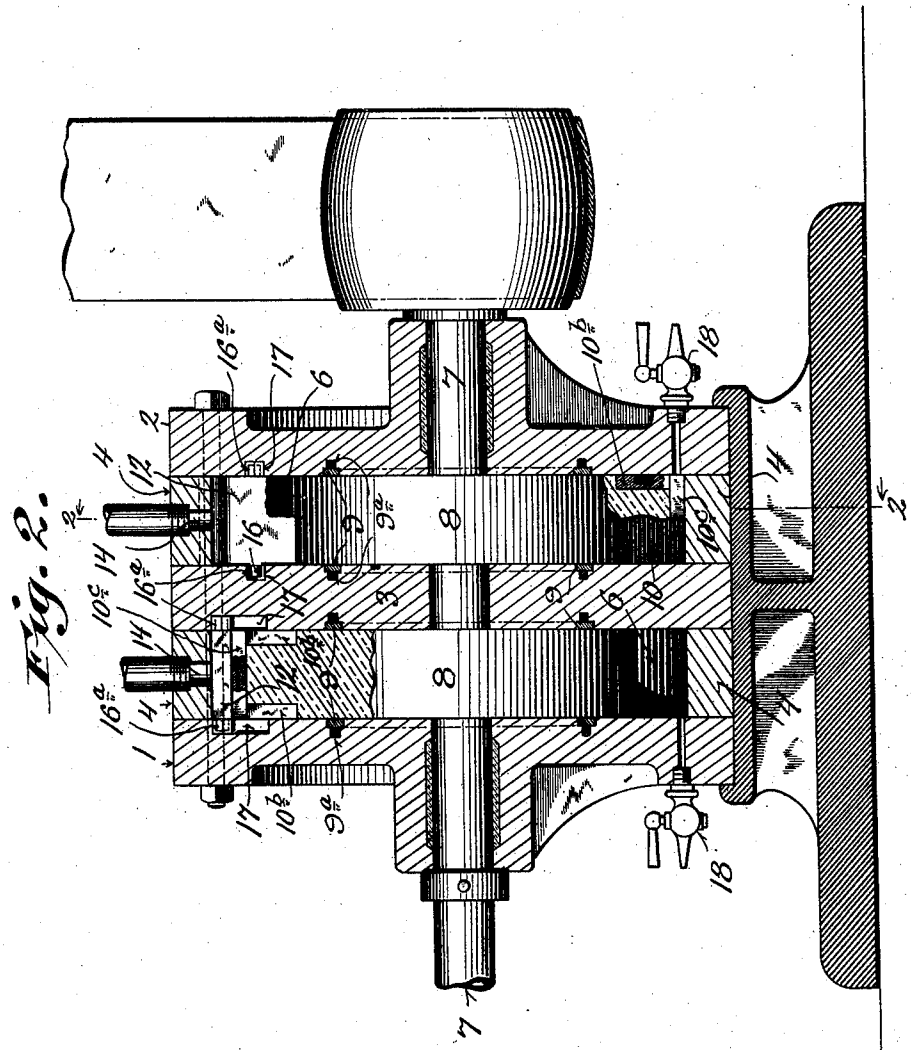
2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

THOMAS H. LINDLEY, OF CEDAR RAPIDS, IOWA, AND HERMAN SCHREIER, OF SHEBOYGAN, WISCONSIN.

ROTARY ENGINE.

986,636. Specification of Letters Patent. Patented Mar. 14, 1911.

Application filed July 19, 1910. Serial No. 572,719.

To all whom it may concern:

Be it known that we, THOMAS H. LINDLEY and HERMAN SCHREIER, both citizens of the United States, and residents of Cedar Rapids, in the county of Linn and State of Iowa, and of Sheboygan, in the county of Sheboygan and State of Wisconsin, respectively, have invented certain new and useful Improvements in Rotary Engines; and we do hereby declare that the following is a full, clear, and exact description thereof.

The object of our invention is to provide a simple, economical and efficient rotary engine, wherein steam or other fluid under pressure is admitted to a rotatory piston or series of pistons, each located in circular cylinders provided with oscillatory cylinder-heads in the form of pivoted gates, the cylinder-heads or gates being raised at each revolution of the pistons by means of cam-extensions carried thereby, upon which extensions the steam-pressure is applied, steam being admitted alternately upon one side of each gate through a port and exhausted from the cylinder upon the opposite side of the gate through a similar port.

The invention consists in various peculiarities of construction and combination of mechanical elements to be hereinafter set forth.

In the accompanying drawings: Figure 1 illustrates a rotary engine embodying the features of our invention, the view being an elevation, with the face-plate of the casing removed; Fig. 2, a longitudinal sectional view of the same, as indicated by line 2—2 of Fig. 1, and Figs. 3 and 4, detail perspective views of piston packing blocks.

Referring by characters to the drawings, 1 and 2 indicate the outer face-plates of an engine-casing, and 3 a similar intermediate plate, between which plates are interposed rings 4, 4. These rings constitute spacers and annular closures for circular steam-chambers 6, which steam-chambers correspond to the cylinders of reciprocative steam-engines. A shaft 7 is journaled in centrally disposed bearings of the face-plates 1 and 2, to which shaft are secured disks 8, the disks being arranged to revolve within the steam-chamber 6 and are provided with split packing-rings 9 which impinge thereagainst and are countersunk in opposite walls of the adjacent face-plates that form the side-walls of the steam-chamber. The packing-rings 9 are held in engagement with the disk faces by coiled springs 9^a, which coiled springs are socketed in the face-plates and form a steam-tight joint between the stationary and movable members at this point. Thus friction of the revolving face of each disk relative to the side-walls of the chambers is reduced to the area of said rings. Each disk 8 is formed with a cam extension 10 having a convex face, the outer surface 10^a of which is ground to conform to the inner circular walls of the rings 4, said outer surfaces being recessed to eliminate friction between the gates and ring walls. The outer surface 10^a in conjunction with the convexed faces of the cams engage and oscillate the gates when the engine is in motion, whereby said gates are held closed for an interval. A steam-tight joint is formed between the working surface 10^a of the cam and circular wall of the ring and also between the faces of the cam and adjacent plate faces by means of a series of spring pressed packing-blocks. To provide a seat for these blocks the cam 10 is countersunk upon its opposite faces and edge 10^a, there being seated within the countersunk portion a pair of side-blocks 10^b, which side-blocks are provided with sockets, into which coiled springs are fitted, as best shown in Fig. 2, the said coiled springs being adapted to press the blocks outwardly against the adjacent side-walls of the cylinder 6. The upper edges of these side-blocks are cut away to form a broken joint connection with a block 10^c, which is fitted thereto and adapted to pack the joint between the circular ring 4 and edge 10^a of the cam. The face of the cam opposite the convexed face is tangentially disposed with relation to the circular disk and this face is designed to permit the gate to follow down gradually and close upon said circular face of the disk after the cam has passed under the aforesaid gate. The entire working face of the cam, as shown, extends over a surface of approximately one-quarter of the circumference of the disk. A series of tie-bolts 11 pass through apertures of the several face-plates and rings and serve to hold the same in their assembled relation, said rings and face-plates thus forming a rigid casing or shell having two

or more steam-chambers therein, as shown, in which chambers disks constituting pistons are arranged to revolve.

An oscillatory gate 12 is pivotally mounted within a pocket 13 of each ring 4, these gates comprising oscillatory cylinder heads which are arranged to close against the annular faces of the disks 8 by means of steam pressure. Steam or other motive fluid is admitted to one side of the gate and adjacent to its fulcrum, through a port 14 from a suitable source of supply, the steam in its passage around the circular chamber causing the disk to rotate by exerting force upon the cam extension 10, the steam being thereafter exhausted through ports 15 upon the opposite sides of said gate. In Fig. 1 of the drawings two exhaust ports 15 are shown connected exteriorly by a pipe common to both, this construction being preferable in order that the full exhaust area may be had without weakening the ring 4 by cutting therein a single large exhaust port. It is understood, however, that, in some instances, where large sizes of engines are made, a single port may be substituted for the two ports shown.

In order to prevent the steam pressure from forcing the gate against the working face of the disk to such an extent that said gate would act as a brake, we have provided means for limiting the downward movement of said gate. This means consists of studs 16 that extend from the edges of the gate, the studs being arranged to travel in circular countersunk recesses 17 with which the adjacent walls of the face-plates are provided. These recesses are struck from the oscillatory center of the gates and their lower ends are so proportioned that they serve as shoulders against which the studs 16 abut when the gate is seated firmly upon the working face of the disk 8. By this construction it will be seen that the great force of the steam pressure tending to cause a breaking friction upon the rotary disk is obviated, it being understood that these parts are finely fitted to accomplish the desired result.

Pet-cocks 18 are connected to the lower portion of each chamber, as shown in Fig. 2, whereby condensation may be drawn off from the cylinders 6 when the engine is first started, there being a certain amount of condensation at this time due to the temperature of the metals. Attention is also called to the fact that, as shown, the inner face of the gate is described upon the arc of a circle which conforms to the face of the ring 4 and thus when said gate has been closed by the cam, its lower face forms a continuation or flush joint with the circular ring face. It will also be observed that, owing to the curvature of the working face of cam 10^a, that there will be only one point of contact between said gate and cam during the movement of lifting the gate, except at the instant that the gate is fully closed. Thus the friction is materially eliminated between these working surfaces.

As indicated by dotted lines in Fig. 1, the cam extensions of the disks 8 are set upon the shaft 7 in such relation that they will be directly opposite each other, and hence a dead center is avoided, with the result that when one of the disks is operating to close its gate, the opposite disk is in its most effective working position. Thus a constant pressure or working force is maintained. Furthermore, by setting the cam-faces of the disks opposite, it will also be understood that a perfect balance is maintained with relation to the shaft, so that no uneven thrust upon said shaft is exerted, as were the parts set otherwise an unequal pressure of steam upon the shaft would result.

While we have shown a direct connection between the engine and load, it is desirable that said engine should be back geared with relation to the load, whereby the same will revolve quite slowly and thus the full effect of each charge of steam is obtained, while at the same time the ill effects upon the moving parts, due to high speed, is eliminated.

By referring to the cross-section view, Fig. 2 of the drawings, it will be seen that the studs 16 are preferably provided with split thimbles 16^a formed from spring metal, the thimbles being arranged to expand within the recesses 17 and thus form steam-tight closures for said recesses, whereby leakage of steam is prevented at this joint. It will also be observed that, owing to the close proximity of the steam inlet with relation to the axes of the gate the power required to close said gate in opposition to the steam pressure admitted through the inlet is reduced to the minimum, it being understood that the pocket into which the gate closes is provided with a seat around the steam inlet, against which seat the gate closes to form a cut-off. Thus said gate also acts as a valve to cut off the source of steam supply when the cam extension of the disk is passing thereunder. It should also be understood that, as shown in Fig. 1, each oil cylinder is provided with standard oil cups 19, adapted to supply oil within the chambers.

While we have shown and described the engine as being provided with two steam chambers, it is understood that the number may be increased indefinitely.

We claim:

A rotary engine comprising outer plates, an intermediate face-plate, spacing rings interposed between the plates having pockets therein provided with seats, steam inlet ports communicating with the seats, gates pivoted within the pockets having outer faces adapted to close against the pocket

seats, whereby steam is cut off, circular recesses in the outer and intermediate plates, the recesses being struck about the fulcrum points of the gates, laterally disposed studs extending from said gates fitted within the recesses, whereby the opening movement of the gates is limited, steam exhaust ports extending through the rings upon that side of the gates opposite their fulcrums, a shaft journaled in the outer plates, disks secured to the shafts between said plates, cams extending from the disks in opposite directions adapted to engage the outer walls of the rings, each cam having a convexed face that merges into a circular face that is ground to conform to the inner walls of the ring about which it travels, each convex face being adapted to engage and close the gate in conjunction with which it operates, recesses in the outer surface of each cam whereby friction is eliminated, packing-members carried by the cam between the recesses, the face of each cam opposite its convex face being tangentially disposed with relation to the disks.

In testimony that we claim the foregoing we have hereunto set our hands at Milwaukee in the county of Milwaukee and State of Wisconsin in the presence of two witnesses.

THOMAS H. LINDLEY.
HERMAN SCHREIER.

Witnesses:
GEO. W. YOUNG,
MAY DOWNEY.