

No. 676,211.

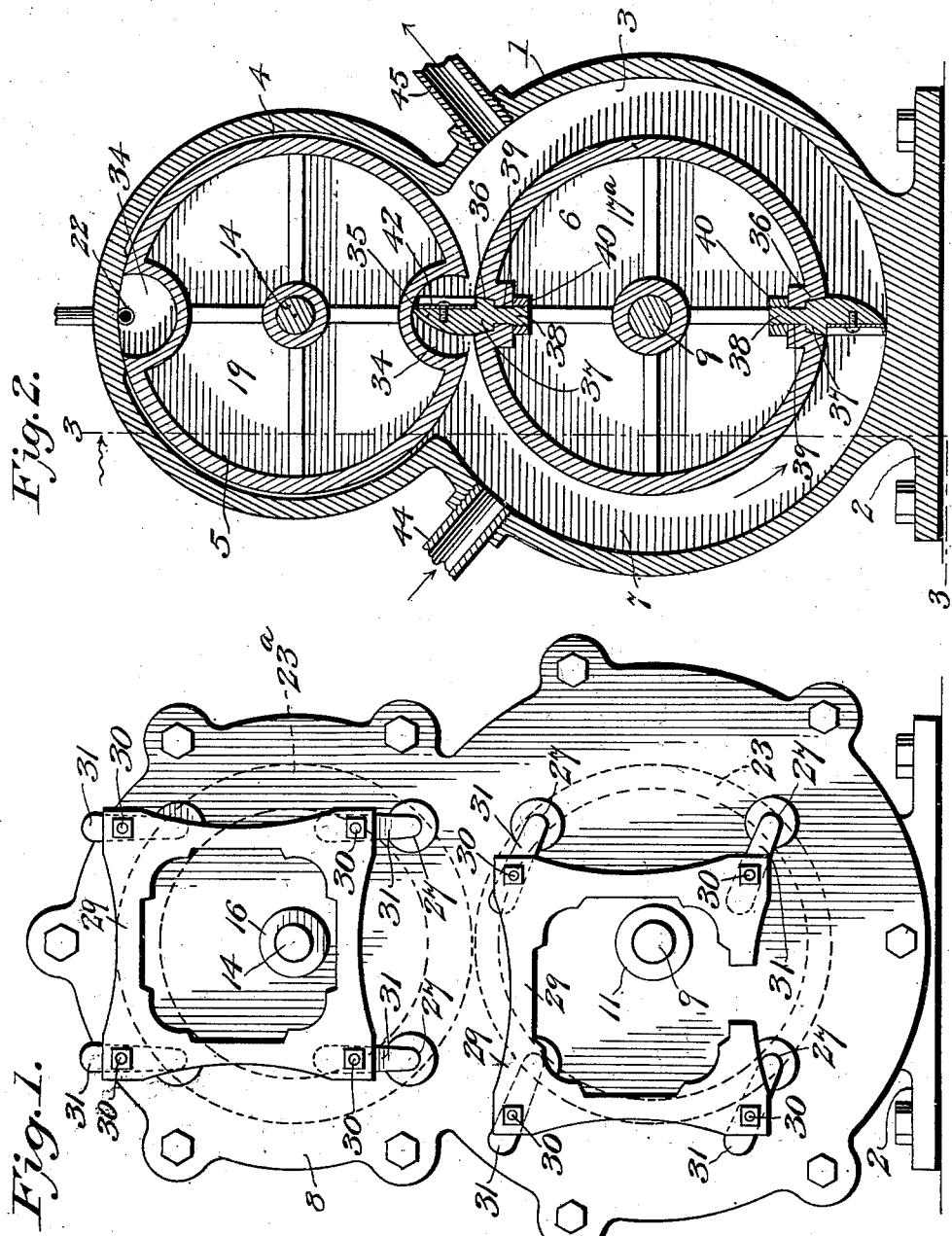
Patented June 11, 1901.

J. B. THOMAS.

## ROTARY ENGINE.

(No Model.)

2 Sheets—Sheet 1.



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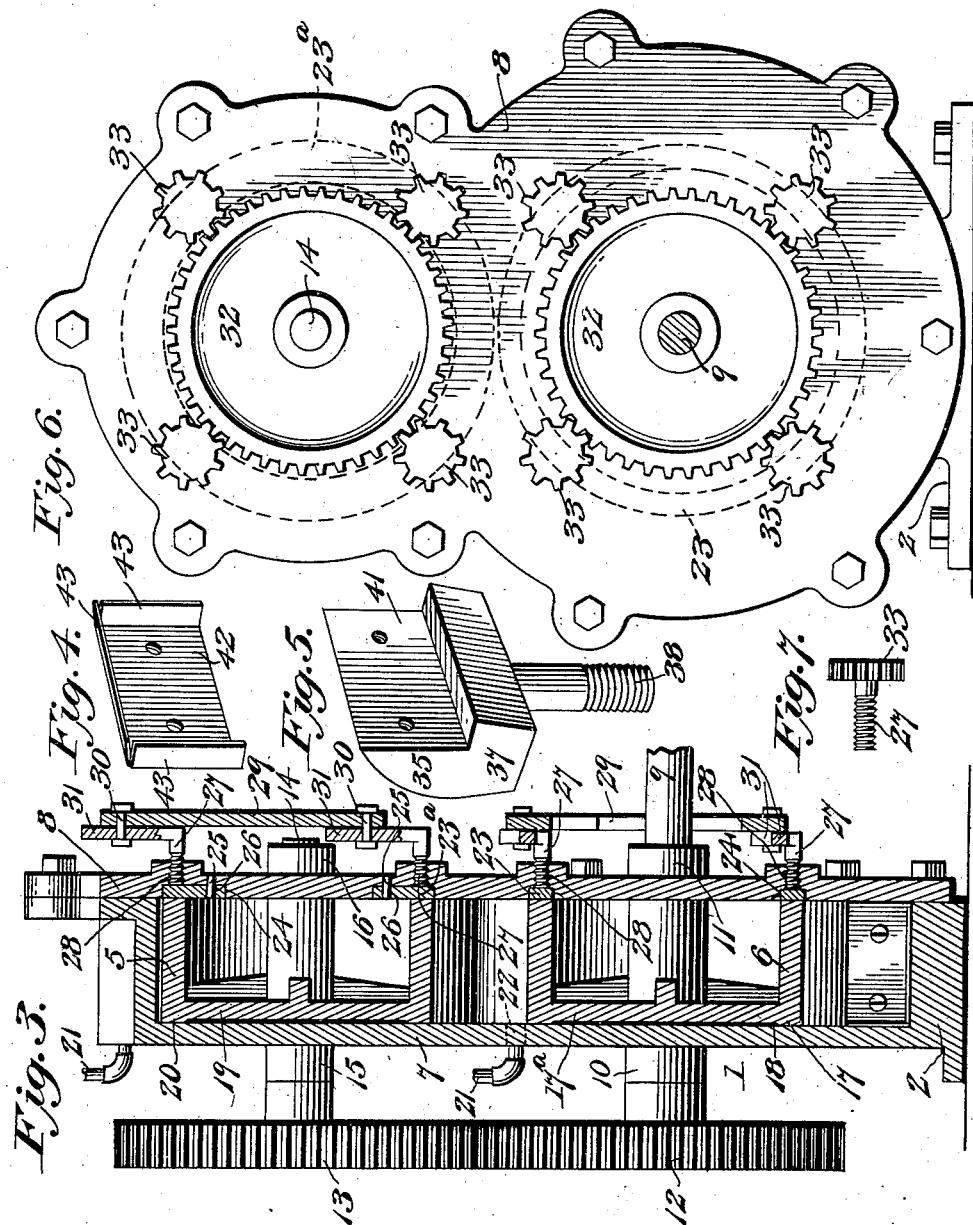
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## ROTARY ENGINE.

(Application filed May 24, 1900.)

(No Model.)

2 Sheets—Sheet 2.



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# UNITED STATES PATENT OFFICE.

JAMES BRYANT THOMAS, OF ST. LOUIS, MISSOURI.

## ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 676,211, dated June 11, 1901.

Application filed May 24, 1900. Serial No. 17,874. (No model.)

To all whom it may concern:

Be it known that I, JAMES BRYANT THOMAS, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented 5 a new and useful Rotary Engine, of which the following is a specification.

This invention relates to motive-fluid engines of that type commonly known as "rotary" engines, and has special reference to certain 10 improvements in that class of rotary engines involving a concentric rotating piston and a rotary abutment-valve coöperating therewith.

To this end the invention has in view the 15 provision of a simple and efficient form of engine having means for holding the piston and rotary abutment in effective steam-tight relation to each other and the cylinder or casting, whereby the pressure of the steam may 20 be utilized to the fullest extent.

A further object of the invention is to so construct the piston and its rotary abutment as to provide simple and efficient means for easily assembling the parts, while at the same 25 time permitting of securing a uniform adjustment thereof with reference to the sides of the cylinder, whereby perfectly steam-tight joints may be maintained at all times between the sides of the cylinder and the adjacent 30 faces or edges of the rotating piston and the rotary abutment.

A further object of the invention is to provide novel and efficient means for adjusting the packing associated with the piston and 35 the rotary abutment, whereby the said packing may be equally and uniformly adjusted at all points through the medium of a common actuating element for the adjusting devices, combined with the packing, respectively, for the piston and its abutment.

Another object of the invention is to provide the piston with an effective form of piston-head or piston-wing having a strong connection with the piston body or drum, but de- 45 tachably related thereto, whereby the same may be readily removed and replaced for purposes of repair and adjustment, and the invention also contemplates in connection with the detachable piston-heads for the piston an 50 improved type of expanding packing, which constantly contacts with the side walls and

periphery of the piston-chamber, thus reducing the leakage of steam to a minimum.

With these and many other objects in view, which will readily appear to those familiar 55 with the art as the nature of the invention is better understood, the same consists in the novel construction, combination, and arrangement of parts hereinafter more fully described, illustrated, and claimed. 60

The essential features of the several improvements are necessarily susceptible to some modification without departing from the spirit or scope of the invention; but the preferred embodiment thereof is shown in the 65 accompanying drawings, in which—

Figure 1 is a side elevation of a rotary engine constructed in accordance with the present invention. Fig. 2 is a vertical longitudinal sectional view thereof. Fig. 3 is a vertical transverse sectional view on the line 3 3 of Fig. 2. Fig. 4 is a detail in perspective of the expanding packing-plate for the piston heads or wings. Fig. 5 is a detail in perspective of one of the detachable heads or 70 wings removed from the piston body or drum. Fig. 6 is a side elevation showing a modification in which a different type of actuating element is employed for coupling together the adjusting-screws for each packing-ring. Fig. 7 is a detail of one of the adjusting set-screws utilized in the construction shown in Fig. 6. 75

Like numerals of reference designate corresponding parts in the several figures of the drawings. 85

In carrying out the invention there is employed a cylinder or casing 1, of an ordinary type, surmounting the base 2 and provided with an interior circular piston-chamber 3 and with a circular abutment-chamber 4, offset from the upper side of the piston-chamber 3 and communicating therewith to permit of the projection of the rotary abutment 5 into the top portion of the chamber 3, within which the revolving piston 6 works. The 90 cylinder or casing 1 is preferably constructed with a closed side 7 and is provided at the opposite side thereof with a removable side or cover plate 8, bolted or otherwise suitably fastened to the contiguous portion of the casing or cylinder to form an effective steam-tight closure for its open side, while at the 95 100

same time being detachable to permit of the ready removal of the parts of the engine.

The lower piston-chamber 3, within which the piston 6 is concentrically arranged, is of a greater diameter than the said piston to leave an annular steam chest or space about the periphery of the piston, and the latter is keyed or otherwise suitably fastened upon a transverse driving-shaft 9, extending through bearings 10 and 11, respectively, in the closed side 7 and detachable cover-plate 8 of the casing and carrying upon one extremity, exterior to the casing, a gear-wheel 12, which intermeshes with a corresponding or companion gear-wheel 13, mounted on one extremity of the abutment-shaft 14, carrying the rotary abutment 5 and journaled in bearings 15 and 16, formed, respectively, on the closed side 7 and detachable cover-plate 8 of the casing. This construction provides for a direct gear connection between the piston and the rotary abutment, so that the same will rotate in perfect unison and synchronism to insure the maintenance of the proper working relation between these parts of the engine.

In carrying out the present invention it has been found desirable to make the piston, as well as the rotary abutment therefor, of as light formation as possible, and a preferable construction of these parts is shown in the drawings. Referring first to the revolving piston 6, the same is shown in the drawings as consisting of a circular hollow body or drum having a closed side portion 17<sup>a</sup> lying next to the closed side 7 of the casing and provided with a superficial bearing-rib 17, which has a close-fitting steam-tight contact with the inner ground face 18 of the said closed side 7 of the casing. The rotary abutment 5 for the revolving piston 6 is likewise of a similar formation, consisting of a circular hollow body or drum provided with a closed side portion 19, having an outer superficial bearing-rib 20, having a bearing steam-tight contact with the inner ground face 18 of the closed side 7 of the casing or cylinder, and, if found necessary, this steam-tight joint between the closed sides of the rotating piston and its rotary abutment may be lubricated through the medium of lubricating-pipe connections 21 in communication with openings 22, piercing the said closed side of the casing or cylinder in the circular plane of the bearing-ribs 17 and 20, respectively, of the piston 6 and the abutment 5. In order to maintain a proper steam-tight bearing of the closed sides of the piston and the rotary abutment upon the closed side of the casing, as well as to secure a steam-tight packing-joint for the opposite sides of the piston and the rotary abutment 5, the said piston and rotary abutment have each associated therewith an adjustable packing-ring, said packing-rings being designated, respectively, by the reference characters 23 and 23<sup>a</sup>. The said rings 23 and 23<sup>a</sup> are loosely mounted in annular grooves 24, formed in the inner face of the detachable side or cover plate

8 of the casing, and in order to prevent axial movement of the rings in their respective grooves or seats 24 the side or cover plate 8 of the casing is provided with short stationary guide pins or studs 25, projecting into the grooves 24 and loosely engaging in the pin-openings 26, formed in the rings 23 and 23<sup>a</sup>. The adjustable packing-ring for the revolving piston 6 is arranged to contact with the side of the piston opposite the closed side 7 of the casing, or, more properly speaking, against one edge of the rim of the piston body or drum, and the packing-ring 23<sup>a</sup> for the rotary abutment 5 bears a similar relation thereto. By reason of this relation of the adjustable packing-rings, respectively, to the piston and the rotary abutment the adjustment of said rings not only secures a steam-tight packing connection between one side of the casing and the piston and abutment, but also maintains a steam-tight bearing joint or fit between the opposite side of the casing and the said piston and rotary abutment. Heretofore in packing of this character set-screws and other devices have been employed for adjusting the same against the working parts of the engine; but in the present invention it is the purpose to provide adjusting devices for the adjustable packing-rings which will insure the equal and uniform adjustment of said rings at all points, whereby an even pressure thereon may be maintained upon the piston and rotary valve and a steam-tight joint preserved at all points. The adjusting devices for each packing-ring 23 and 23<sup>a</sup> are precisely the same, so that a description of one will suffice for the other; but it may be stated that there is associated with each of said packing-rings a series of adjusting set-screws 27, which are arranged in a circular series and work through threaded openings 28, formed in the side or cover plate 8 of the casing and communicating with the base of the groove 24, in which the packing-ring is loosely seated, so that the inner ends of the screws will bear upon the outer side of the packing-ring to provide for holding it in operative relation to the adjacent engine element.

To secure an equal and uniform adjustment of the packing-ring with which each set of adjusting-screws 27 is associated, it is necessary to move these screws in perfect unison or synchronism. This may be accomplished by various expedients; but in all cases it is necessary to employ a single or common actuating coupling element for all of the screws of each set. In one form of the engine the common actuating coupling element 125 for each set of screws is designated by the reference character 29 and consists of an open rectangular frame-yoke loosely encircling and having a free clearance about the adjacent shaft of the engine and connected 130 at its corners to the several screws of the set with which it is associated through the medium of the connecting-bolts 30, which engage with the corners of the frame-yoke 29

and also with the short crank-arms 31, provided upon the outer ends of the screws 27. It will thus be seen that by grasping the frame-yoke 29 of either set of screws, or, in fact, any one of the screws, and moving the same in the desired direction all of the screws of this set will move in perfect unison or synchronism, and thereby insure an equal and uniform adjustment of the packing-ring combined therewith. In the construction described after the desired adjustment of the packing-ring has been effected a tightening of the connecting-bolts 30 will maintain the parts in their adjusted positions. Another expedient for carrying out the same operation is shown in Figs. 6 and 7 of the drawings, and this consists in having the single or common actuating element in the form of a gear-wheel 32. The gear-wheels 32 are loosely arranged, respectively, on exterior portions of the piston and abutment shafts 9 and 14 and mesh with the pinion-heads 33, provided at the outer ends of the adjusting-screws 27 associated therewith. The turning of a gear-wheel 32 will necessarily secure a synchronous or simultaneous adjustment of all of the screws combined therewith.

In the type of engine described the rotary abutment 5 is provided at diametrically opposite sides within the periphery of its drum or body with the clearance recesses or cavities 34, which are adapted to receive the piston heads or wings 35, arranged at diametrically opposite points upon the periphery of the piston body or drum 6. In many types of rotary engines the piston heads or wings 35 constitute integral parts of the piston-body; but in the present invention it is the purpose to make the piston heads or wings 35 separate and apart from the piston-body and to detachably secure the same thereto, whereby the said heads or wings may be readily removed or replaced as the adjustment or repair of the parts may require. To provide for a strong detachable connection between the piston heads or wings and the periphery of the piston, the latter is provided at diametrically opposite points within its periphery with flaring or beveled seats 36, extending transversely across the same in the form of grooves and adapted to snugly receive therein the correspondingly beveled or tapered bases 37 of the heads or wings 35, as plainly shown in Fig. 2 of the drawings. It will thus be seen that the piston heads or wings have their bases seated directly within the grooves or channels within the periphery of the piston body or drum, thereby providing a firm interlocking yet detachable joint connection between the heads or wings and the piston-body, and to effect a firm locking or fastening of the piston heads or wings to the body or drum of the piston the said heads or wings are preferably provided with one or more integral bolt-stems 38, extending through bolt-openings 39, communicating with the seats or grooves 36 and having their threaded

portions receiving the fastening-nuts 40, arranged inside of the hollow body or drum of the piston.

The separate piston heads or wings 35, which are arranged at diametrically opposite sides of the piston-body to project radially therefrom, are provided at one side with rabbed impact-faces 41, within which are detachably seated the expanding packing-plates 42. These expanding packing-plates 42 are of a general rectangular shape and not only fit upon the impact-faces of the piston heads or wings, but have struck up integrally therfrom a plurality of offstanding spring-flanges 43, located at the outer and end edges of the plates and contacting, respectively, with the side walls and periphery of the piston-chamber 3 to provide a steam-tight-joint connection between the same and the piston wings or heads. It will be observed that by reason of the peculiar formation of the expanding packing-plates 42 the same are practically of a cup form, with the sides thereof separately and independently yieldable. This construction is plainly shown in Fig. 4 of the drawings.

The steam is admitted in the usual way through the induction-pipe 44, opening into the piston-chamber at one side of the cylinder, and is exhausted through the eduction-pipe 45, arranged in a correspondingly opposite position.

From the foregoing it is thought that the construction, operation, and many advantages of the herein-described rotary engine will be readily apparent to those skilled in the art without further description, and it will be understood that various changes in the form, proportion, and minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is—

1. In a rotary engine, the casing having communicating piston and abutment chambers, the coöperating piston and rotary abutment arranged in their respective chambers, and each consisting of a hollow body or drum open at one side and provided with a closed side portion having a bearing contact with one side of the casing, a cover-plate for the casing arranged to cover the open sides of both the piston and the abutment, and packing-rings supported by the cover-plate and arranged to bear against the edges of the piston and abutment at the open sides thereof, substantially as set forth.

2. In a rotary engine, the casing provided with communicating piston and abutment chambers, the coöperating piston and rotary abutment arranged in their respective chambers and each consisting of a hollow body or drum, open at one side and provided with a closed side portion having on the exterior thereof a superficial bearing-rib contacting

with one side of the casing, a cover-plate for the casing arranged to close the open sides of the piston and abutment, and adjustable packing-rings supported by the cover-plate and arranged to bear against the edges of the piston and abutment at the open sides thereof, substantially as set forth.

3. In an engine of the class described, the combination with the casing, and a rotating-engine element, of an adjustable packing-ring seated in the side of the casing and engaging with the rotating-engine element, a plurality of adjusting-screws supported by the casing and engaging with the packing-ring at different points, a frame-yoke having similar connections with all of the screws to effect a synchronous movement thereof, and fastening means for locking the parts in an adjusted position, substantially as set forth.

4. In an engine of the class described, the combination with the casing, and the rotating-piston element, of an adjustable packing-

ring seated in the casing, a plurality of adjusting-screws mounted in the casing and engaging the said ring at different points, said screws being provided at their outer ends with crank-arms, and an open frame-yoke having similar bolt connections with the crank-arms of all of the adjusting-screws, substantially as set forth.

5. In a rotary engine, the rotating piston provided with a peripheral head or wing, and an expanding cup-packing seated upon the head or wing and consisting of a single metal plate provided with offstanding integral spring-flanges bent from the outer and end edges thereof, substantially as set forth.

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

JAMES BRYANT THOMAS.

Witnesses:

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EDWIN S. PULLER.