No. 792,216. PATENTED JUNE 13, 1905.

O. JACOBY.

ROTARY ENGINE.

APPLICATION FILED JAN. 10, 1905.

2 SHEETS—SHEET 1.

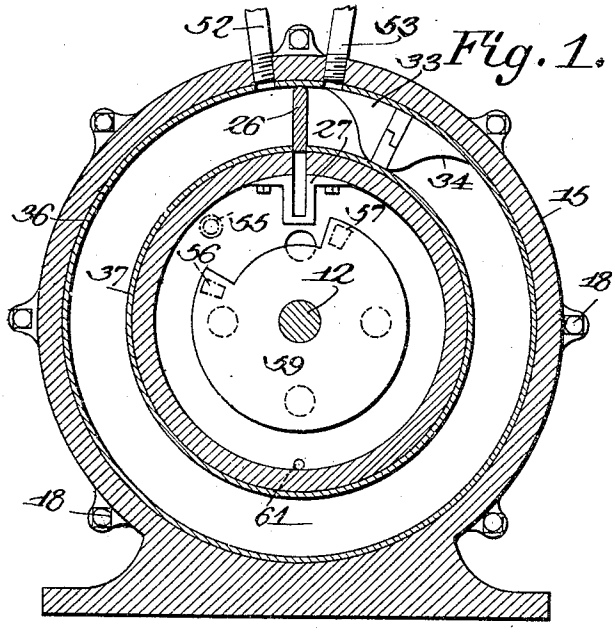

Fig. 1.

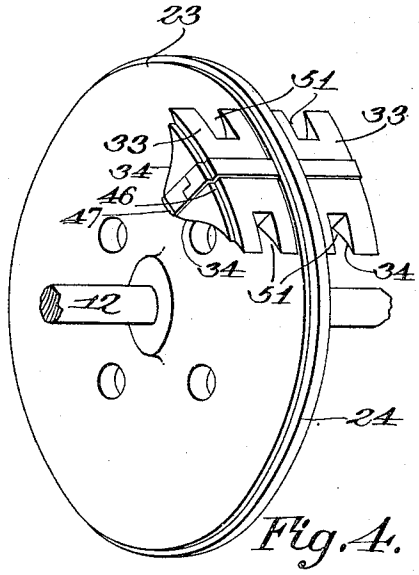

Fig. 4.

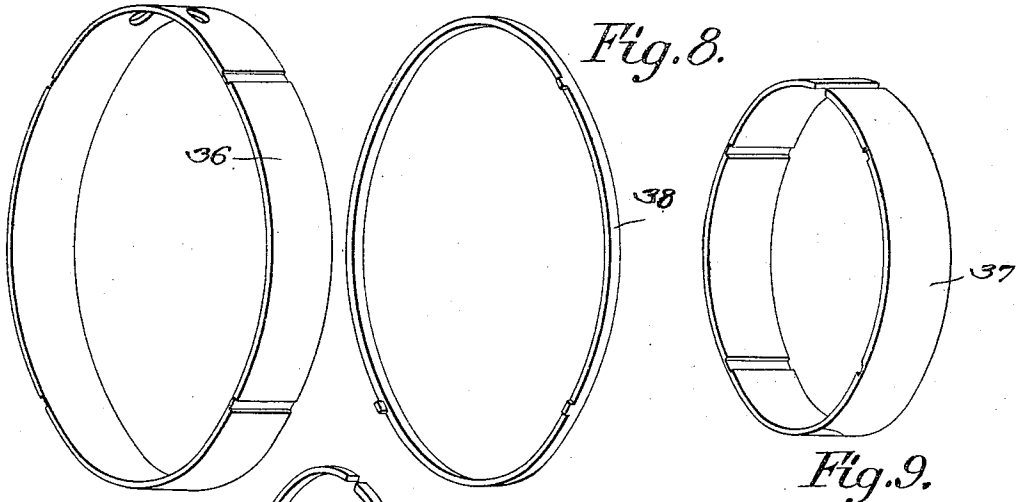

Fig. 8.

Fig. 9.

Fig. 7

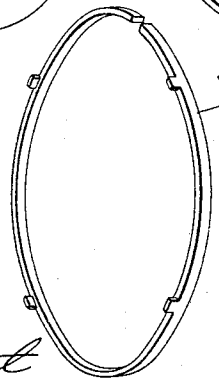

Fig. 10.

Witnesses

E. J. Stewart

Jno E. Parker

Otis Jacoby,

Inventor.

by Cachow & Co

Attorneys.

No. 792,216. PATENTED JUNE 13, 1905.

O. JACOBY.

ROTARY ENGINE.

APPLICATION FILED JAN. 10, 1905.

2 SHEETS—SHEET 2.

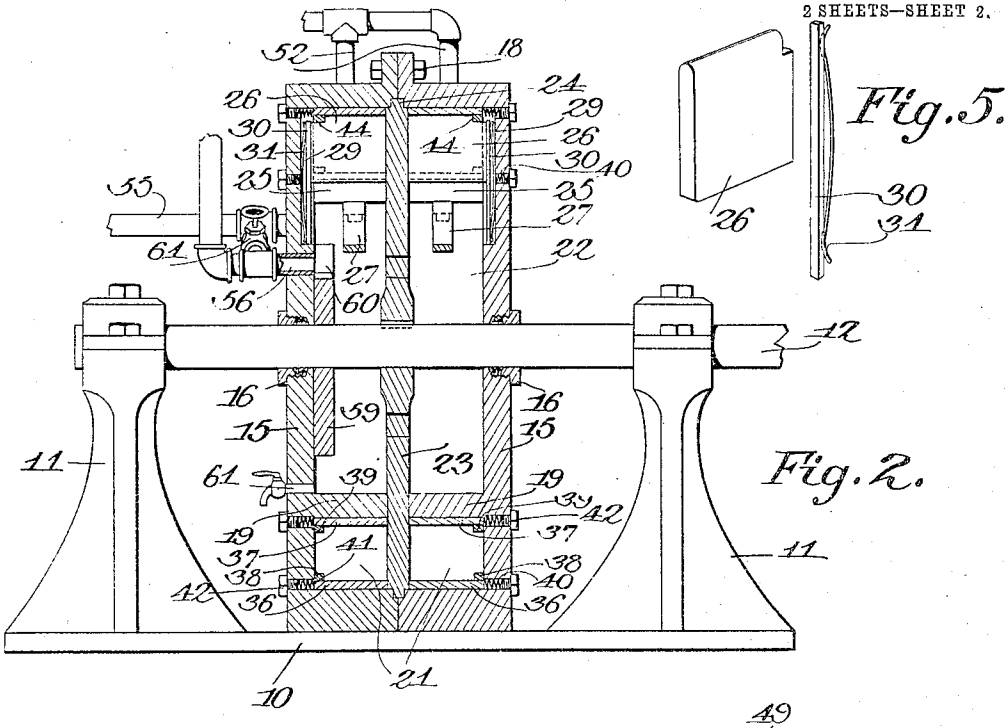

Fig. 2.

Fig. 5.

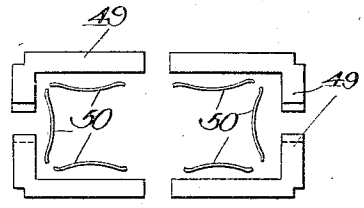

Fig. 6.

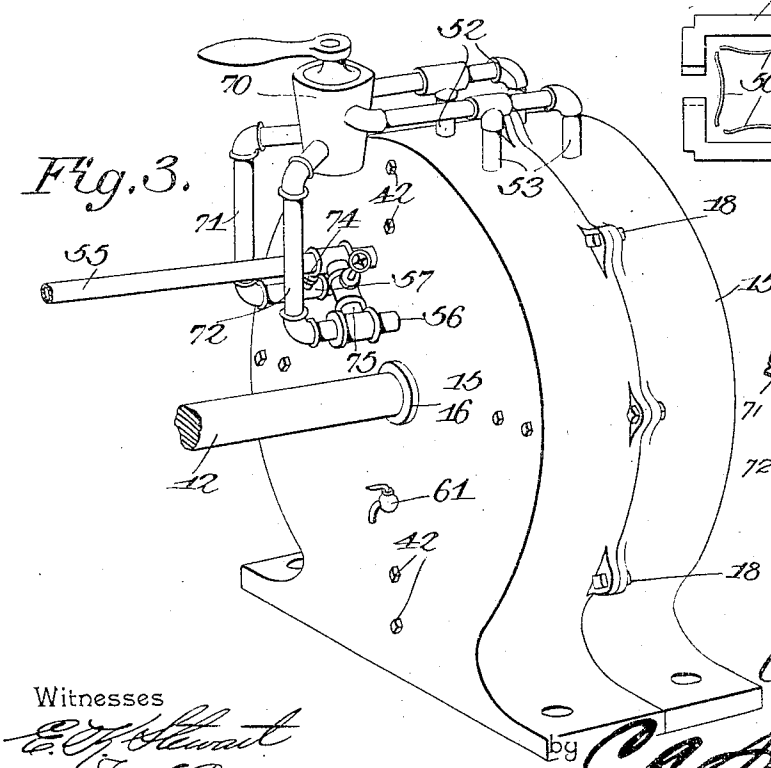

Fig. 3.

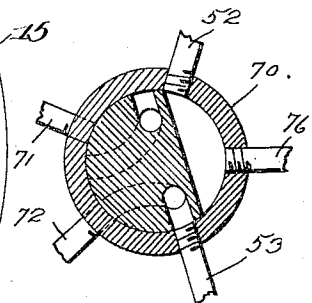

Fig. 11.

Witnesses

E. F. Stewart

Jno. E. Parker

Otis Jacoby,
Inventor.

by Cachow & Co
Attorneys

No. 792,216. Patented June 13, 1905.

UNITED STATES PATENT OFFICE.

OTIS JACOBY, OF WILSONBURG, WEST VIRGINIA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 792,216, dated June 13, 1905.

Application filed January 10, 1905. Serial No. 240,473.

To all whom it may concern:

Be it known that I, OTIS JACOBY, a citizen of the United States, residing at Wilsonburg, in the county of Harrison and State of West Virginia, have invented a new and useful Rotary Engine, of which the following is a specification.

This invention relates to rotary engines, and has for one of its objects to provide a machine of simple and compact construction in which the steam chest and valve are disposed at a point within the body of the cylinder, thereby utilizing to advantage what would otherwise be waste space.

A further object of the invention is to provide an engine with an inwardly-movable abutment, the latter being moved from the steam-space of the cylinder into the steam-chest each time the piston-wing passes and being returned automatically to operative position by the pressure of steam or other fluid in the chest.

A still further object of the invention is to provide a novel form of engine in which a piston-wing carried by a revoluble piston disk or drum is provided with a plurality of cam-faces for engaging and moving the abutment inward from the steam-space.

A still further object of the invention is to provide a novel form of valve mechanism by means of which the steam may be cut off at a predetermined point in advance of a complete stroke or rotative movement of the piston.

A further object of the invention is to improve the arrangement of the packing and to provide a perfect-balanced light-running engine in which a simple form of piston-disk is provided with a pair of opposed piston-wings, both of which are acted upon with equal force at the same time.

With these and other objects in view, as will more fully hereinafter appear, the invention consists in certain novel features of construction and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size, and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings, Figure 1 is a transverse sectional elevation of a rotary engine constructed in accordance with the invention. Fig. 2 is a longitudinal sectional view of the same on the line 2 2 of Fig. 1. Fig. 3 is a perspective view of the engine. Fig. 4 is a detail perspective view of the piston and piston-wings detached. Fig. 5 is a similar view of one of the movable abutments and its packing and wear strip. Fig. 6 is a detail view of the packing members employed for the piston-wings. Fig. 7 is a detail perspective view of the outer lining-ring of the cylinder. Fig. 8 is a similar view of one of the lining securing-rings. Fig. 9 is a detail perspective view of one of the inner lining-rings of the cylinder. Fig. 10 is a similar view of the securing-ring therefor. Fig. 11 is a detail sectional view of the reversing-valve.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

The general frame of the engine comprises a base or bed plate 10, having standards 11, that are provided at their upper ends with bearings for the reception of a shaft 12, and the latter has collars fitted within suitable grooves in the bearings in order to prevent independent longitudinal movement.

The cylinder is of the duplex type and is provided with two rigid heads 15, that are provided with stuffing-boxes 16 for the passage of the shaft. This cylinder is made of two half-sections, each of practically the same construction and provided with flanges or lugs through which extend securing-bolts 18, and projecting inward from each of the side walls or heads of the cylinders are annular ribs 19, that form two complete annular steam-spaces 21, while that portion of the cylinder within the flanges 19 constitutes a steam-chest 22.

The two cylinders are divided from each other by a piston-disk 23, keyed or otherwise secured to the shaft and having a marginal flange 24 of reduced width that fits within a suitable annular groove formed in the inner

wall of the cylinder, and while it is not necessary that the joint between these members should be steam-tight it is made so close that the walls of the groove will serve as guides to prevent sidewise movement or wabbling of the piston.

In each of the flanges 19 there is formed a radial shaft 25 for the reception of a radially-movable abutment 26, and the inner edges of said abutment is exposed to the pressure of the steam or other actuating fluid within the chest and is normally held outward in the annular steam-space 21. In order to prevent excessive inward movement of the abutment, the inner face of each flange 19 carries a small bracket or strap 26, on which the abutment may rest when the engine is not operating; but this bracket is of a width considerably less than the width of the slot, so that the fluid under pressure may freely operate on the inner edge of said abutment.

In order to reduce wear on the abutment and to prevent too great freedom of movement, one edge of each abutment is extended within a radial slot 29, formed in the adjacent wall of the cylinder-head, and in said slot is also placed a bearing-strip 30, that is held outward against the side edge of the abutment by means of a small leaf-spring 31, this bearing-strip being readily removed when worn.

Projecting from opposite sides of the piston-disk 24 are piston-wings 33, the inner faces of which are arranged on curved lines to form cams 34, and the outer edges of these piston-wings will engage the outer edges of the abutments 26, the latter being preferably inclined for the purpose, and the cam-faces in rotating over the outer edges of these wings will force the latter inward until they are wholly removed from the annular steam-spaces and the piston-wing is free to continue its travel. Inasmuch as the cams are double, the abutments will move out gradually and without any danger of breakage, no matter in which direction the engine may be rotating.

In order to reduce wear and at the same time to provide for the ready renewal of parts, the two curved walls of each annular space are lined, there being an outer lining-ring 36 and an inner lining-ring 37, and these are held in place by securing-rings 38 and 39, respectively, the latter rings fitting closely in the angles formed between the inner walls of the piston-wings and the main lining-rings. These main lining-rings are further employed as packings to prevent the escape of steam from the annular steam-spaces, and for this purpose each cylinder-head is provided with a number of openings 40, in which are placed small compression-springs 41, that bear against the edges of the main piston wing or disk 23. These springs are held in place and their stress may be adjusted by suitable screw-plugs 42.

One corner of each of the abutments 26 is notched or recessed, as at 44, to permit the passage of the larger of the packing-rings, and the edge portions of the piston-wings are likewise recessed at 46 and 47 to permit the free passage of both of said fastening-rings. Each piston-wing is further provided with transverse recesses for the reception of packing-strips 49, having overlapping end portions to prevent the passage of steam and normally held out against the inner wall of the steam-space by springs 50.

The opposite end portions of each piston-wing are further recessed, as indicated at 51, in order to permit the free entrance of steam through pipes 52 53, that are disposed, respectively, on opposite sides of the abutment, thus permitting the pressure of the steam to operate on the piston as soon as the latter has passed the abutment. In practice one of these pipes will act as a steam-inlet and the other as an exhaust, and by the employment of a suitable reversing-valve the engine may be turned in either direction.

The inner circular space within the ribs 19 constitutes the steam-chest and is connected by a pipe 55 to a steam-boiler or other source of fluid-pressure supply. In one of the heads of the cylinder is formed a pair of ports 56 57, and the inner wall of this cylinder-head is faced to form a seat for a revoluble disk valve 59, a portion of which is cut away, as shown in Fig. 1, in order to uncover said ports during a portion only of the stroke of the plunger. This steam-space 60 in the disk is of any length, being proportioned to the size of the engine and the character of the work which it is to perform. Leading from the lower portion of the steam-chest is a petcock 61, by which water of condensation may be discharged.

At a convenient point adjacent to the engine is arranged a reversing-valve 70, and to the valve-casing are connected two pipes 71 and 72, that lead from the ports 56 57, and from said valve-casings extend two pipes 52 and 53, each of these being branched, as shown in Fig. 2, in order to communicate with both of the annular steam-spaces. By turning the reversing-valve in one direction, as shown in Fig. 11, steam is conveyed from the steam-chest through pipe 72 and the valve to pipe 53 and thence to the cylinder at a point on one side of the abutment 26, while the exhaust-steam passes from the opposite side of the abutments through pipe 52 to the valve and escapes through exhaust-pipe 76. By turning the valve the pipes 71 and 52 may be made to supply steam to the cylinder, while the exhaust passes from pipe 53 to pipe 76.

The two pipes 71 and 72 are connected to the main steam-supply pipe by valved branches 74 75, either of which may be opened in order to start the engine in case the

valve-disk is blanking both ports or in case it is desired to utilize steam under pressure throughout the whole of the stroke of the engine.

Having thus described the invention, what is claimed is—

1. In a rotary engine, a cylinder having an annular steam-space and a centrally-disposed steam-chest, a piston, a shaft carrying the same, a piston-wing arranged within the steam-space, and an abutment exposed to the pressure in the steam-chest and movable thereby to a position within the steam-space.

2. The combination in a rotary engine, of a cylinder having an annular steam-space, and a centrally-disposed steam-chest, a slotted rib or partition dividing the two, an abutment guided within the slot and having its inner edge exposed to the pressure of steam in the chest, a shaft, a piston carried thereby, and a piston-wing arranged within the steam-space and serving by contact with the abutment to force the latter from the steam-space into the steam-chest.

3. The combination in a rotary engine, of a cylinder having an annular rib dividing it into an outer steam-space and an inner steam-chest, said rib having a radially-arranged slot, an abutment guided in the slot and having its inner edge exposed to the pressure of steam in the chest, a shaft, a piston carried thereby, and a cam-shaped piston-wing adapted to engage and force the abutment from the steam-space into the steam-chest.

4. The combination in a rotary engine, of a cylinder having an annular rib dividing said cylinder into an outer steam-space, and an inner steam-chest, said rib having a radially-disposed slot, an abutment guided in the slot and having its inner edge exposed to the pressure of steam in the chest, means for preventing excessive inward movement of the abutment, a piston, and a piston-wing having two cam-faces arranged to act on the abutment in either direction of movement of said piston.

5. The combination in a rotary engine, of a cylinder, an annular rib dividing the cylinder into an outer steam-space and an inner steam-chest, a duct leading from the steam-chest to the steam-space, a shaft extending through the steam-chest, a revoluble valve mounted on the shaft and controlling the flow of steam through the duct, a movable abutment guided within the steam-space and having its inner edge exposed to the pressure of steam in the chest, a revoluble piston member carried by the shaft, and a piston-wing having its inner face arranged on curved lines to form a double abutment-engaging cam.

6. The combination in a rotary engine, of a cylinder having an annular groove formed in its inner curved face, a shaft extending through the cylinder, a disk piston having its edge fitting within the groove, a pair of annular ribs arranged on the inner walls of the cylinder, and spaced for the passage of the disk piston, a pair of piston-wings carried by the piston and arranged in the spaces outside the ribs, means for admitting fluid under pressure to the central steam-chest formed between the ribs and the shaft, a duct leading from the steam-chest to the steam-spaces, and a valve carried by the shaft and controlling the flow of fluid through said duct.

7. In a rotary engine, a cylinder having a radially-slotted wall, an abutment having one of its edges guided within the slot, and a spring-pressed wear-strip also arranged within said slot and engaging the edge of the abutment.

8. In a rotary engine, a cylinder, a shaft extending therethrough, a disk piston disposed within the cylinder, a pair of annular ribs extended inward from the cylinder-heads into contact with the piston, a pair of radially-guided abutments movable into and out of the steam-space formed between the ribs and the curved wall of the cylinder, and means for forcing said abutments into contact with the opposite sides of the piston.

9. The combination in a rotary engine, of a cylinder having an annular slot formed in its curved wall, a shaft extending through the cylinder, a disk piston mounted on the shaft and having a peripheral rib arranged within the slot, radially-slotted heads forming parts of the cylinder and provided with annular ribs extended inward in the direction of the piston, said ribs being provided with radial slots, radially-movable abutments disposed within the slots of the ribs and heads, strips for limiting inward movement of the abutments, wear-strips arranged in the radial slots of the cylinder-heads, springs acting to force the strips outward into contact with the edges of the abutments, cam-shaped piston-wings carried by said piston, a steam-duct leading from the space within the annular ribs to the annular expansion-space of the cylinder, and a revoluble valve carried by the shaft and controlling the flow of steam through said duct.

10. The combination in a rotary engine, of a cylinder having a steam-entrance port and provided with an annular steam-space, an abutment arranged adjacent to the port and movable to and from the steam-space, and a cam-shaped piston-wing for engaging the abutment, said piston-wing being slotted to permit the entrance of steam through the port immediately after the wing passes the abutment.

11. In a rotary engine, a cylinder having an annular steam-space, and wear-rings forming linings for the inner and outer curved walls of said steam-space.

12. In a rotary engine, a cylinder including a pair of heads having inwardly-extending annular ribs forming annular steam-spaces,

a piston extending between the ribs into the steam-space, piston-wings carried by the piston, abutments movable into and out of the steam-spaces, annular wear-rings forming linings for the inner and outer curved walls of the steam-spaces, and springs carried by the cylinder-heads and forcing the inner edges of said rings into contact with the piston.

13. The combination in a rotary engine, of a cylinder including a pair of heads having inwardly-extending annular ribs forming annular steam-spaces, a disk piston extending between the ribs into the steam-spaces, a pair of piston-wings carried by the disk, piston wear-rings forming linings for the inner and outer curved walls of the steam-spaces, springs tending to force said wear-rings into contact with the disk piston, and plugs for adjusting the stress of the springs.

14. The combination in a rotary engine, of a cylinder having an annular steam-space, wear-rings forming linings for the inner and outer curved walls of said steam-space, and securing-rings for holding said wear-rings in place.

15. The combination in a rotary engine, of a cylinder having an inner steam-chest, and an outer steam-space, a movable abutment arranged within the steam-space, a shaft, a piston carried by the shaft, a piston-wing secured to the piston, a reversing-valve, steam-pipes leading from the valve-casing to the steam-space on opposite sides of said abutment, steam-pipes extending between the steam-chest and the valve-casing, an exhaust-port leading from the valve-casing, a main supply-pipe leading to the steam-chest, valved branch pipes leading from the main steam-pipe to the connecting-pipes between the steam-chest and the valve-casing, and a valve carried by the shaft and controlling the flow of steam from the chest to the valve-casing.

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

OTIS JACOBY.

Witnesses:
MARGARET FLYNN,
MARY FLYNN.