No. 770,890. PATENTED SEPT. 27, 1904.

W. M. BYRD.

ROTARY ENGINE.

APPLICATION FILED JULY 13, 1904.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

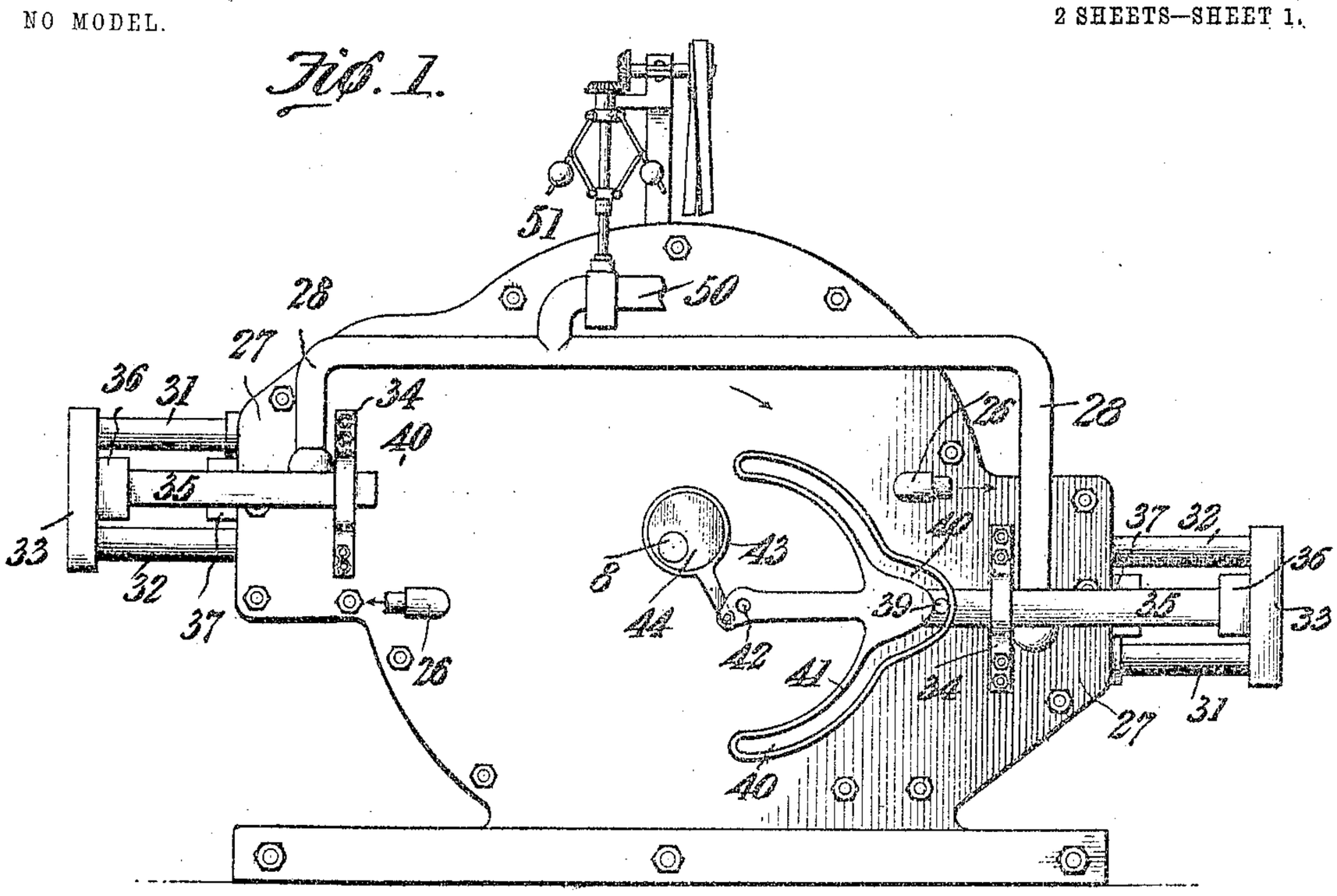


Fig. 8.

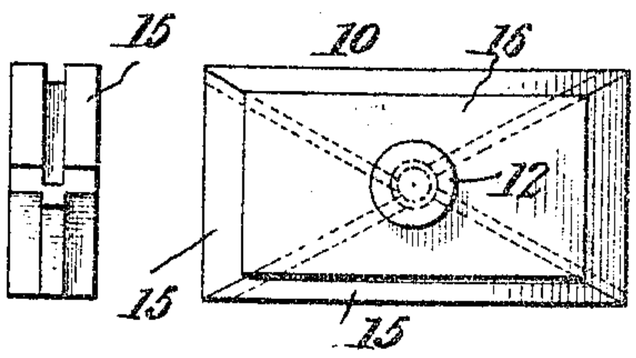


Fig. 5.

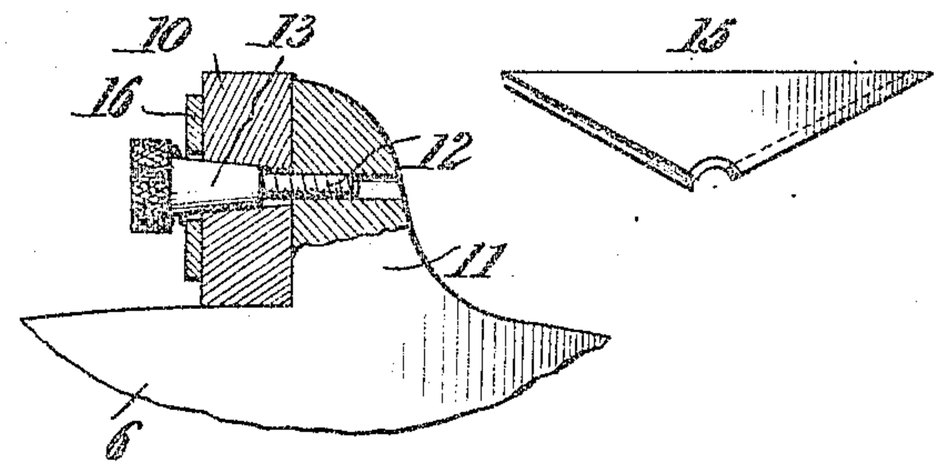
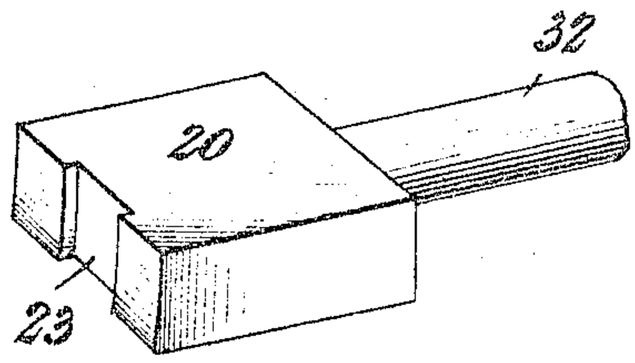


Fig. 6.

Fig. 7.

Fig. 9.



Witnesses

E. J. Stewart

Jno. E. Porter

Walter M. Byrd Inventor

by Church & Church

Attorneys

No. 770,890. PATENTED SEPT. 27, 1904.

W. M. BYRD.

ROTARY ENGINE.

APPLICATION FILED JULY 13, 1904.

NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.

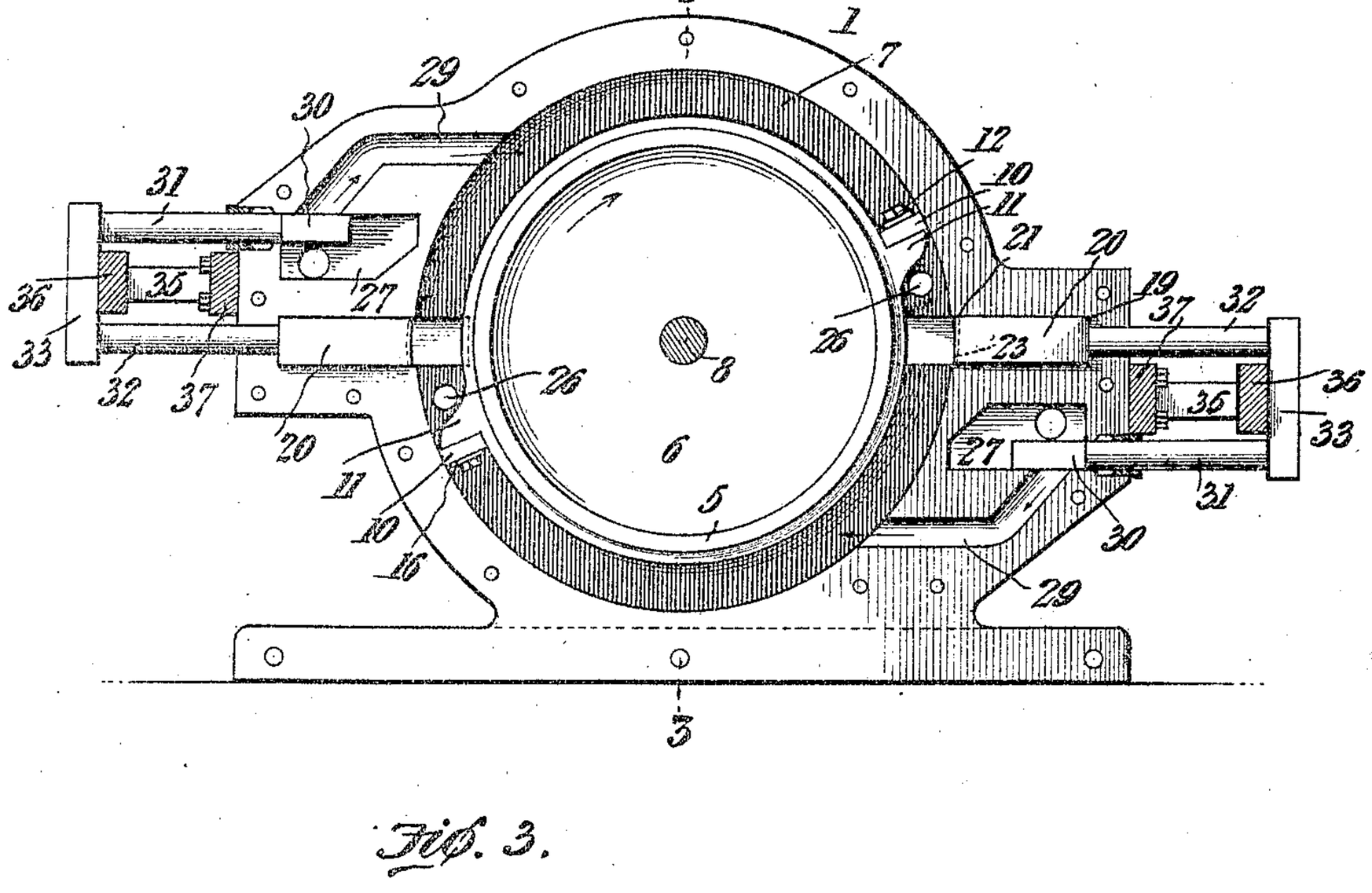


Fig. 3.

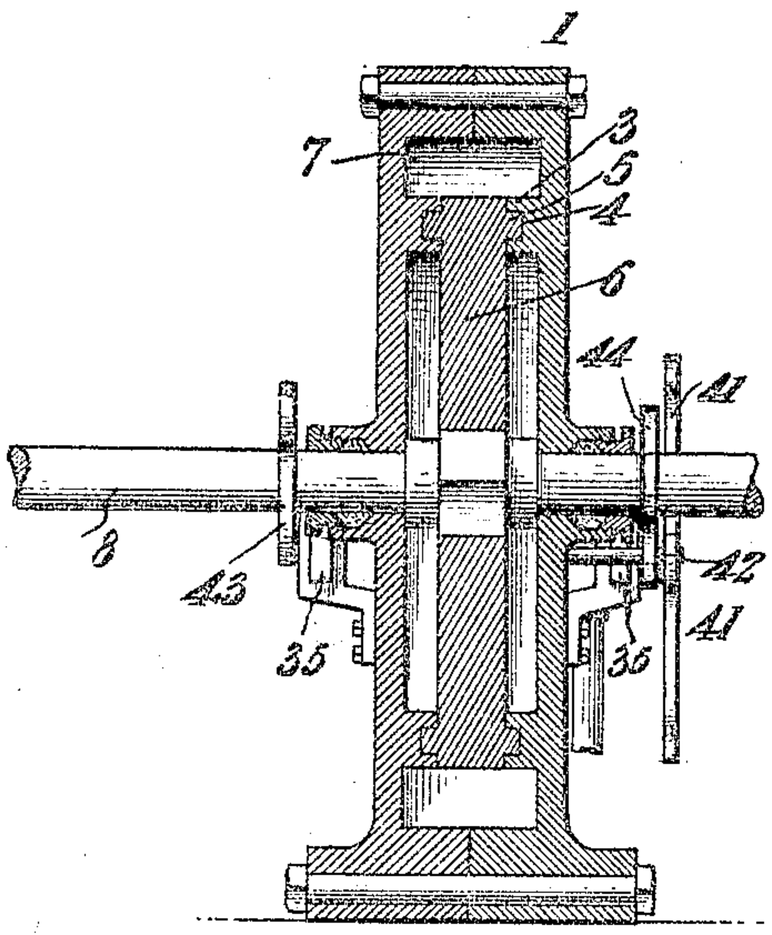
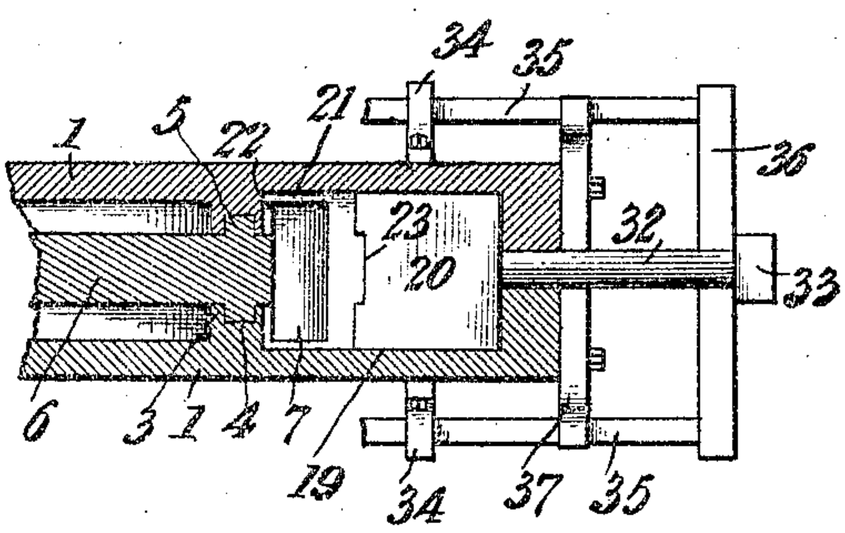


Fig. 4.



Witnesses
E. F. Hewett
Jno. E. Barnes

Walter M. Byrd Inventor
by Church & Co
Attorneys

No. 770,890. Patented September 27, 1904.

UNITED STATES PATENT OFFICE.

WALTER MOSELY BYRD, OF MOUNT GILEAD, NORTH CAROLINA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 770,890, dated September 27, 1904.

Application filed July 13, 1904. Serial No. 216,401. (No model.)

To all whom it may concern:

Be it known that I, WALTER MOSELY BYRD, a citizen of the United States, residing at Mount Gilead, in the county of Montgomery and State of North Carolina, have invented a new and useful Rotary Engine, of which the following is a specification.

This invention relates to rotary engines, and has for its principal object to provide an engine of simple and economical construction in which steam will be simultaneously introduced into the steam-space of the cylinder at diametrically opposite points and by thus equalizing the pressure on opposite sides of the center of rotation preserve the engine in perfect balance.

A further object of the invention is to provide novel means for controlling the admission of steam to the engine and the exhaust from said engine.

A still further object of the invention is to provide a novel form of piston-ring that may be readily adjusted in order to compensate for wear.

With these and other objects in view, as will more fully hereinafter appear, the invention consists in the novel 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 an elevation of a rotary engine constructed in accordance with the invention. Fig. 2 is a longitudinal sectional elevation of the same. Fig. 3 is a transverse sectional elevation of the engine on the line 3 3 of Fig. 2. Fig. 4 is a sectional plan view of a portion of the engine on the line 4 4 of Fig. 2. Fig. 5 is an elevation of one of the piston-wings. Fig. 6 is a transverse sectional elevation of the same, showing the piston-wing as carried by a piston-drum. Fig. 7 is an elevation of one of the parts of the piston-wing detached. Fig. 8 is a view showing one of the edges of a piston-wing member. Fig. 9 is a detail perspective view of one of the movable abutments detached.

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

The engine bed and cylinder are formed of two cast sections 1 for convenience in finishing the parts, and these sections are then united together by suitable bolts, a packing-strip being introduced between the sections, if necessary. The cylinder is provided with an internally-projecting rib 3, extended inward from each of the cylinder-walls, said rib being annular in form and provided at its inner face with an annular groove 4, that is adapted to receive an annular rib 5, carried by the piston-drum 6. The interengaging parts will prevent the escape of the steam or other actuating fluid from the annular steam-space 7 to the stuffing-box, through which the main shaft 8 passes. The steam-space is rectangular in cross-section, although it may be of any other desired shape without departing from the invention, and in said steam-space are received the piston-wings 10. In the construction of the piston-wings the piston-drum is provided with radially-projecting lugs 11, two of such lugs being employed in the present instance and each provided with a threaded opening for the reception of a screw 12. The screw is provided with a shank portion 13 and its head being constructed for engagement by a screw-driver or wrench. On the face of each of the projecting lugs is arranged a piston-wing 10. The wing is made of a number of angular sections 15, having overlapping edges in order to present an approximately steam-tight joint, and these sections when assembled form a rectangular piston-wing. The central meeting-points of the several sections are each recessed for the passage of the frusto-conical portion 13 of the screw, and after the sections have been placed in position a rectangular washer 16 is placed over them and then the screw is turned into a threaded opening in the lug. In turning the screw home the frusto-conical portion 13 comes into engagement with the inner recessed portions of the sections 15 and acts as

a cam to simultaneously effect separation of all of the sections, said sections being forced outward into engagement with the several walls of the annular steam-space and fitting snugly thereagainst in order to prevent the passage of steam. The construction is such that in the event of wear, either of the edges of the wing or on the walls of the steam-space, the turning of the screw will readily compensate for such wear and make the piston-wing steam-tight. At diametrically opposite points in the cylinder are arranged guideways 19 for slidable abutments 20, that are movable inward for engagement with the periphery of the piston-drum, and the width of such abutments is slightly greater than the width of the steam-space, the walls of the latter being recessed, as indicated at 21, in order to form guides and supports for the sides of such abutments. The annular ribs 3 are of a diameter about equal to the greatest diameter of the piston-drum, and the outer walls of such ribs are provided with recesses 22 to receive the forward edges of the abutment, while the central portion of the inner edge of each abutment is provided with a recess 23 of a width approximately equal to the width of the piston-drum. In this manner all portions of the abutments are firmly supported and will offer but little resistance to the pressure. Immediately in advance of each abutment, it being considered that the piston-drum is rotating in the direction indicated by the arrow, is arranged an exhaust-port 26, through which any steam in the steam-space may escape.

Adjacent to each abutment-guiding recess 19 is a steam-chest 27, to which leads a steam-supply pipe 28, and from the steam-chest leads a port 29 to the steam-space of the cylinder. One wall of the steam-chest is faced to form a seat for a slide-valve 30. Each of the steam-valves 30 is provided with a stem 31, that is coupled to the stem 32 of the adjacent abutment 20 by means of a bar 33.

On the opposite sides of the cylinder are secured brackets 34, having guiding-openings for the passage of reciprocatory bars 35, that are coupled at their outer ends by a cross-bar 36, and this bar in turn carries a bar 33, to which the stems 31 and 32 are secured. The bars 35 are further guided by the opposite ends of a cross-bar 37, secured to the end of the cylinder. To each of the bars 35 is secured a pin 38, carrying an antifriction-roller 39, and each antifriction-roller is received in an arcuate slot 40, formed in one arm of a pivotally-mounted cam-lever 41, carried by a pin 42, projecting from the outer wall of the cylinder. The slot has a central portion, which when engaging with the antifriction-roller 39 will cause first outward and then inward movement of the bar 35, and during the remaining portion of the stroke of the lever the bar 35 will remain stationary. The cam-lever is connected to the strap 43 of an eccentric 44, mounted on the main shaft 8, and at each revolution of the shaft the pin or antifriction-roller 39 will traverse the whole of the cam-slot twice, and the abutment and valve to which the bar 35 is connected will be reciprocated twice to permit the passage of the piston-wings.

The steam-supply pipe 50 has a valve under the control of a suitable governor 51, which may be driven from the main shaft 8.

In the operation of the engine with the parts in the position shown in Fig. 1 the valves 30 and the abutments 20 are in the full-in position, the abutments being firmly in engagement with the vertical walls of the drum and the valves 30 being open to admit steam through the ports 29 to the steam-space. Steam continues to enter the steam-space to drive the piston-wings, and the constantly-open exhaust-port serves to permit the passage of any exhaust-steam in advance of the piston-wings. When the piston-wings arrive at the exhaust-ports or immediately in advance of said arrival, the valves 30 are moved outward to cut off the flow of steam, and the abutments 20 are also moved outward to permit the passage of the piston-wings, and these parts remain out until the piston-wings have again assumed the position shown in Fig. 1, after which the valves are opened and the abutments are moved inward to again engage the piston-drum. It will thus be seen that the steam or other actuated fluid is simultaneously admitted at both sides of the cylinder and acting with equal pressure on both sides results in the perfect balance of the piston-drum, so that there will be considerably less friction than where steam is admitted through a single port to the steam-space.

Having thus described the invention, what is claimed is—

1. The combination in a rotary engine, of a cylinder, a steam-port leading thereinto, a steam-chest with which the port communicates, a revoluble piston disposed within the cylinder, a slidable abutment, stems extending from the abutment and the valve, a cross-bar rigidly connecting the stems, and means for operating said cross-bar to effect simultaneous movement of the valve and abutment.

2. The combination in a rotary engine, of a cylinder having an annular steam-space, a piston arranged within the cylinder, a steam-chest, a port leading from the steam-chest to the steam-space, an abutment-recess formed in the cylinder-wall, an abutment slidable in said recess, stems extending from the abutment and valve, a cross-bar connecting the two stems, a slotted rocker-arm connected to the cross-bar, and an eccentric operable from the main shaft of the engine and serving to actuate said rocker-arm.

3. The combination in a rotary engine, of a cylinder having an annular steam-space, a piston arranged within the cylinder, a steam-

chest, a port leading from the steam-chest to the steam-space, an abutment-recess extended within the cylinder-wall, an abutment in said recess, a valve in the steam-chest, a pair of stems leading from the abutment and the valve, a cross-bar connecting said stems, a slotted bell-crank lever mounted on the outer wall of the cylinder, an eccentric connected thereto, a slidably-mounted rod connected to the cross-bar and provided with pins or anti-friction-rollers adapted to enter the slot in said bell-crank lever.

4. In a rotary engine, the combination with a cylinder, of a piston-drum having a radially-projecting lug, and a piston-wing formed of a plurality of sections each provided at its inner edge with a recess, a washer or locking-plate, and a screw extending through said plate and through the recesses of the abutment-sections to the lug, said screw having a tapered portion for engagement with the recesses and serving as a cam for spreading the wing-sections.

5. The combination in a rotary engine, of a piston, a cylinder, a lug projecting from the piston, a piston-wing formed of a plurality of overlapping sections each provided with a recess, and such recesses forming a screw-receiving opening, a washer or locking-plate arranged over the several sections, and a screw extending through said washer and the recesses into the lug, said screw having a tapering portion forming a cam for spreading said wing-sections.

6. The combination in a rotary engine, of a cylinder having an annular steam-space, a piston arranged within the cylinder, a steam-chest, a port leading from the steam-chest to the steam-space, an abutment-recess extended within the cylinder-bore, an abutment in said recess, a valve within the steam-chest, stems connected to the abutment and valve, a cross-bar connecting the stems, a pivotally-mounted lever arranged at one side of the cylinder and having a cam-slot, a slidable rod secured to the cross-bar, an antifriction-roller carried by said end rod and entering the slot, and an eccentric connected to said lever.

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

WALTER MOSELY BYRD.

Witnesses:
J. WAITES SMITH,
W. D. ALLEN.