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M. E. FULLER.

ROTARY ENGINE.

APPLICATION FILED JAN. 31, 1905.

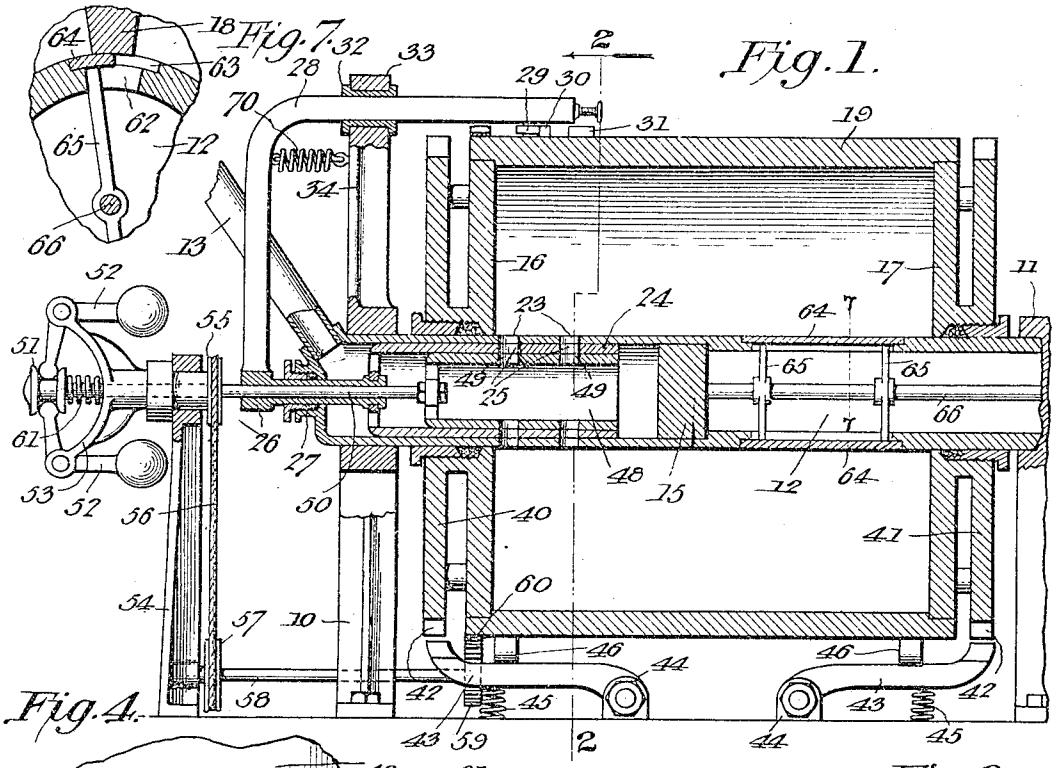


Fig. 1.

Fig. 7.

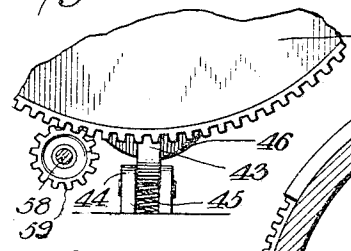


Fig. 4.

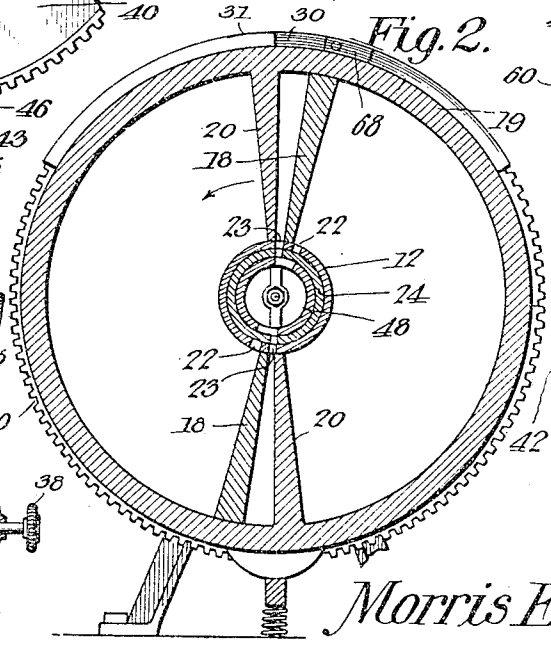


Fig. 2.

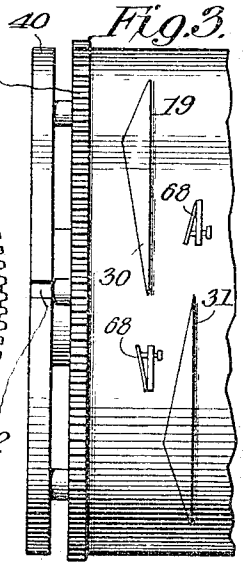


Fig. 3.

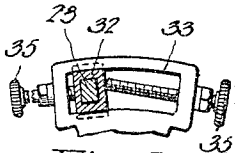


Fig. 5.

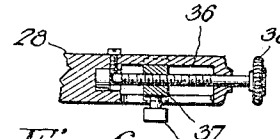


Fig. 6.

Witnesses

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UNITED STATES PATENT OFFICE.

MORRIS EUGENE FULLER, OF TAGUS, NORTH DAKOTA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 787,370, dated April 18, 1905.

Application filed January 31, 1905. Serial No. 243,529.

To all whom it may concern:

Be it known that I, MORRIS EUGENE FULLER, a citizen of the United States, residing at Tagus, in the county of Ward and State of North Dakota, have invented a new and useful Rotary Engine, of which the following is a specification.

This invention relates to rotary engines of that general type in which radially-arranged piston-wings are carried by a revoluble cylinder and are acted upon intermittently by volumes of fluid under pressure, the fluid expanding between the wings and abutments, which are unlocked at intervals and follow the course of the piston-wings, to be again locked in advance of the admission of another volume of fluid.

The principal object of the invention is to provide a rotary engine of simple construction in which provision is made for locking and releasing the movable abutments at predetermined intervals, for controlling the flow of steam or other fluid by means of a cut-off valve that may be readily adjusted when the engine is to be reversed, and, further, to provide a novel form of governor for controlling the speed of the engine.

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 longitudinal sectional elevation of a rotary engine constructed in accordance with the invention. Fig. 2 is a transverse sectional elevation of the same on the line 2 2 of Fig. 1. Fig. 3 is a detail plan view of a portion of the cylinder. Fig. 4 is an end elevation of a portion of the cylinder, showing more particularly the means for transmitting movement to the governor and for locking the movable abutments in position. Fig. 5 is a detail sectional view illustrating the means employed for adjusting the position of the cut-off valve. Fig. 6 is a detail sectional view illustrating the mechanism for adjusting the position of the contact-roller of the cut-off valve with relation to its actuating-cam. Fig. 7 is a detail sectional view on the line 7 7 of Fig. 1, illustrating the valve for controlling the exhaust.

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

The engine is provided with a suitable frame, which in the present instance includes a pair of standards 10 and 11, the upper portions of which serve as supports for a horizontally-disposed tubular shaft 12, which is firmly locked in place and held from both revoluble and longitudinal movement. One end of this hollow shaft communicates with a steam-supply pipe 13, while the opposite end serves as an exhaust, the hollow interior of the shaft being divided into two chambers by a transversely-disposed partition 15. Mounted on the shaft are two cylinder-heads 16 and 17, that preferably are provided with suitable stuffing-boxes surrounding the shaft. These cylinder-heads carry two radially-arranged abutments 18, and the perimeters of the heads serve as supports for a revoluble cylinder 19, which may, if necessary, serve as a belt-wheel for the transmission of the power. The cylinder 19 carries two radially-arranged wings 20, that are rigidly secured to the cylinder and extend inward into contact with the periphery of the hollow shaft 12. It will be observed that the abutments 18 are rigidly secured to the cylinder-heads, but are free from the cylinder and shaft, while the wings 20 are rigidly secured to the cylinder, but are free from the cylinder-heads and shaft. Leading from the steam end of the shaft to the interior of the cylinder are two sets of ports 22 and 23, that are under the control of a slidable cut-off valve 24, having two ports 25, which may be placed in alinement with either set of said ports, depending on the direction in which the engine is to rotate. The shaft 24 is cylindrical in form and is provided with a hollow stem 26, extending out through a

suitable stuffing-box 27 in the end of the shaft, and to this stem is connected an angularly-bent operating member 28, one arm of which is extended over a portion of the periphery of the cylinder and carries a pin or antifriction-roller 29, to be engaged by one or other of a pair of operating-cams 30 and 31 in accordance with the direction in which the engine is to rotate. The operating member 28 extends through a guiding-block 32, that is arranged in an arcuate guide 33, formed at the upper end of an arm 84, carried by the standard 10, and with this block engages a pair of adjusting-screws 35, which may be turned in order to adjust the position of the valve-operating member in a direction circumferentially of the cylinder in order that the ports 25 of the valve may be moved into alinement with either the ports 22 or the ports 23. The horizontal arm of the operating member is further provided with a guiding-slot 36, in which is arranged a block 37, that may be adjusted in a direction parallel with the axis of the shaft 12 by means of a screw 38. This block serves as a support for the pin or roller 29, and by turning the screw 38 said pin or roller may be adjusted into operable relation with either the cam 30 or the cam 31, and the adjustment, furthermore, may be utilized for the purpose of controlling the time of cut-off of the valve and the quantity of steam admitted to the cylinder under normal conditions.

To the cylinder-head 16 is secured a disk 40, and to the head 17 is secured a disk 41, these disks being of the same diameter and each being provided with a pair of diametrically-opposed flanges 42, with which may engage locking-levers 43. The levers 43 are pivoted in small brackets 44 and are normally pressed upward to engage with the disk-notches by means of helical compression-springs 45, so that the cylinder-heads and the abutments 18, carried thereby, may be locked in place. On the periphery of the cylinder are cams 46, which at the proper time engage with the arms 43 and move the free ends of the same out of the notches 45, so that the cylinder-heads and abutments are free for movement, as hereinafter described.

Arranged within the cut-off valve 24 is a governor-valve 48 in the form of a hollow cylinder having suitable ports 49. The outer end of this valve is secured to a governor-stem 50, that passes through the hollow stem 26 of the cut-off valve, and at its opposite end is provided with a flanged head or collar 51, engaged by the inner ends of weighted levers 52, that are carried by a revoluble bracket 53, that is mounted in bearings in a suitable standard 54, the stem being movable in the direction of its length through said bracket. To the inner end of the bracket is secured a sheave or pulley 55, that is connected by a belt 56 to a pulley 57 on one end of a horizontally-disposed shaft 58. The shaft 58 carries a pinion 59, which intermeshes with a gear 60, carried by the cylinder 19. If the speed of the engine increases above the normal, the counter-weighted ends of the lever 52 will move outward and the movement will be transmitted to the governor valve-stem 50, causing the same to move inward and reducing the effective area of the ports 47. If the speed is below the normal, the governor-arms will be moved inward by a spring 61 and the ports will be opened to allow more steam to pass to the cylinder.

In the exhaust end of the hollow shaft 12 are arranged two diametrically-opposed exhaust-ports 62 of a width greater than the width of the inner end of each abutment 18, and when the abutments are locked in position they will stand immediately over said ports, so that a portion of the port will be exposed at each side of the abutment. The surface of the shaft is recessed, forming two seats 63 for the reception of valves 64 in the form of curved metallic strips, that are secured to arms 65, the latter being secured to a shaft 66, that may extend out to the end of the hollow shaft 12. The valves 64 may be operated either automatically or by hand, and on the passage of the abutments in either direction the valves will be moved in the same direction and will close that portion of the exhaust-port between the abutment and the piston-wing that is receding from the abutment, while the exhaust-port is open on the side facing the approaching piston-wing to permit the escape of steam in advance of said wing.

In addition to the cams 30 and 31 the periphery of the cylinder is also provided with cams 68 for momentary engagement with the roller 29 in order to effect a quick opening of the valve and allow a small quantity of steam to enter the cylinder for the purpose of moving the abutments. After each valve-opening operation a spring or springs 70 serve to return the valve to closed position.

In the operation of the engine, the parts being in the position shown in Fig. 2, the abutments 18 are locked and the ports 23 are active steam-ports, while the ports 22 are blanked. Steam admitted through the ports 23 will cause the wings 20, together with the cylinder, to travel in the direction of the arrow until the cams 46 on the periphery of the cylinder engage the locking-levers 43 and move the same out of engagement with the notches 42. The abutments are then free to move, and they will be traveled in the same direction as the piston-wings by the small quantity of steam between the wings and abutments and partly by the frictional engagement of the inner wall of the cylinder with the outer ends of said abutments until the parts arrive in such position that the abutment 18 is to the left of a port 23 and the

wing 20 is to the right of said port, both the abutment and wing moving in the same direction. The cam 68 then makes momentary engagement with the roller 29, and the valve is quickly opened to allow a small quantity of steam to enter the cylinder, and this volume of steam in expanding between the comparatively light abutment and the heavier piston-wing will move the abutment quickly through the remaining portion of its stroke or until it is again engaged and locked by the lever 43.

Having thus described the invention, what is claimed is—

1. In a rotary engine, a cylinder, revoluble wings carried thereby, cylinder-heads, intermittently-revoluble abutments carried by the heads, and means for locking the heads in position.

2. In a rotary engine, a cylinder, a stationary shaft, intermittently-revoluble cylinder-heads mounted on the shaft and serving as supports for the cylinder, means for locking the piston-heads in place, intermittently-revoluble abutments carried by the cylinder-heads, and revoluble wings carried by the cylinder.

3. In a rotary engine, the combination with a stationary shaft, of intermittently-revoluble cylinder-heads mounted thereon, means for locking the cylinder-heads in position, intermittently-revoluble abutments secured to the cylinder-heads, a cylinder supported by the heads, wings carried by said cylinder and extending inward to the periphery of the shaft, and means carried by the cylinder for unlocking said heads.

4. The combination in a rotary engine, of a stationary shaft, channeled for the admittance of exhaust of fluid under pressure, a pair of cylinder-heads mounted on said shaft, means for locking said cylinder-heads from rotative movement, intermittently revoluble abutments carried by the cylinder-heads, a cylinder carried by the heads, wings secured to the cylinder and extending inward to the periphery of the shaft, and means carried by the cylinder for unlocking the heads.

5. The combination in a rotary engine, of a stationary hollow shaft divided by a partition into steam inlet and exhaust spaces, ports leading through the hollow shaft, a hollow cylindrical cut-off valve revolubly adjustable to present its ports in alinement with the shaft-ports, cylinder-heads mounted loosely on the shaft, means for locking said cylinder-heads in place, intermittently-revoluble abutments carried by the cylinder-heads, a cylinder mounted on the heads, wings carried by the cylinder and extending inward to the periphery of the shaft, and cams carried by said cylinder for actuating the cut-off valve.

6. The combination in a rotary engine, of a hollow stationary shaft divided into steam inlet and exhaust spaces, cylinder-heads mounted on said shaft, means for locking said cylinder-heads from rotative movement, intermittently-revoluble abutments carried by the cylinder-heads, a cylinder mounted on said heads, wings carried by the cylinder and extending inward to the periphery of the shaft, ports leading from the interior of the shaft to the cylinder, a hollow cylindrical cut-off valve arranged within the steam-inlet space, means for adjusting said valve circumferentially in accordance with the direction in which the engine is to be rotated, an arm secured to the valve, and cams arranged on the cylinder and adapted to engage said arm.

7. The combination in a rotary engine, of a hollow stationary shaft divided by a partition into steam inlet and exhaust spaces, intermittently-revoluble cylinder-heads carried by the shaft, means for locking said cylinder-heads in position, intermittently-revoluble abutments carried by the heads, a cylinder mounted on said heads, wings carried by the cylinder and extending inward to the periphery of the shaft, a pair of sets of steam-inlet ports leading through the hollow shaft, a hollow cylindrical cut-off valve having a single set of ports, a stem carrying the valve, an angularly-bent stem-carrying member, a guide through which one arm of said member extends, means for adjusting said guide to effect circumferential adjustment of the valve, and valve-operating cams carried by the cylinder.

8. The combination in a rotary engine, of a hollow stationary shaft divided into steam inlet and exhaust spaces, intermittently-revoluble cylinder-heads mounted on the shaft, means for locking said heads from movement, intermittently-revoluble abutments carried by the heads, a cylinder mounted on said heads, wings secured to the heads and extending to the periphery of the shaft, steam-inlet ports leading through the shaft, a hollow cylindrical cut-off valve in the steam-inlet space, a stem connected to said valve, an operating-arm secured to the stem and extending over a portion of the periphery of the cylinder, a pin or antifriction-roller adjustable longitudinally of said arm, and a pair of cams carried by the periphery of the cylinder, and with either of which the pin or antifriction-roller may be adjusted for engagement.

9. The combination in a rotary engine, of a hollow shaft, a fluid-pressure-supply pipe connected thereto, cylinder-heads mounted on the shaft, means for locking said cylinder-heads from rotative movement, intermittently-revoluble abutments carried by the cylinder-heads, a cylinder mounted on the heads, wings secured to the cylinder and extended inward to the periphery of the shaft, a cut-off valve arranged within the shaft, means for operating the cut-off valve, a governor-valve arranged within the cut-off valve, telescopically-disposed stems carrying the two valves, and a centrifugal governor connected to the stem of the governor-valve.

10. The combination in a rotary engine, of a

hollow shaft, a steam-inlet pipe connected thereto, cylinder-heads mounted on the shaft, means for locking the cylinder-heads from rotative movement, intermittently-revoluble abutments carried by the cylinder-heads, a cylinder mounted on the heads, wings carried by the cylinder and extending inward to the periphery of the shaft, a cut-off valve arranged within the hollow shaft, means for operating the cut-off valve, a hollow cylindrical governor-valve arranged within the cut-off valve, telescopic stems carrying said valves, a centrifugal governor connected to the stem of the governor-valve, an annular rack carried by one of the cylinder-heads, a pinion intermeshing with said rack, a shaft carrying the pinion, a pulley mounted on the shaft, a governor-pulley, and a belting connecting between the two pulleys.

11. The combination in a rotary engine, of a hollow shaft, a central partition arranged therein and dividing the shaft into steam inlet and exhaust spaces, cylinder-heads mounted on said shaft, notched disks secured to the heads, pivotally-mounted spring-actuated levers engaging in said notches, and locking the heads from movement, intermittently-revoluble abutments carried by the heads, a cylinder mounted on said heads, means secured to the cylinder and extended inward to the periphery of the shaft, cams arranged on the periphery of the cylinder and adapted to engage the locking-levers, a cut-off valve in the steam-inlet space of the shaft, and cams carried by the cylinder and adapted to actuate said cut-off valve.

12. The combination in a rotary engine, of a cylinder, piston-wings carried thereby, a hollow shaft provided with steam-exhaust ports, the outer face of the shaft being recessed, exhaust-valves arranged in the recesses and connected for mutual movement, abutments adapted to engage and move said valves, and cylinder-heads carrying said abutments.

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

MORRIS EUGENE FULLER.

Witnesses:
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A. P. NELSON.