No. 637,986. Patented Nov. 28, 1899.

J. H. DARRAGH.

ROTARY ENGINE.

(Application filed Mar. 14, 1899.)

(No Model.)

Fig. 1.

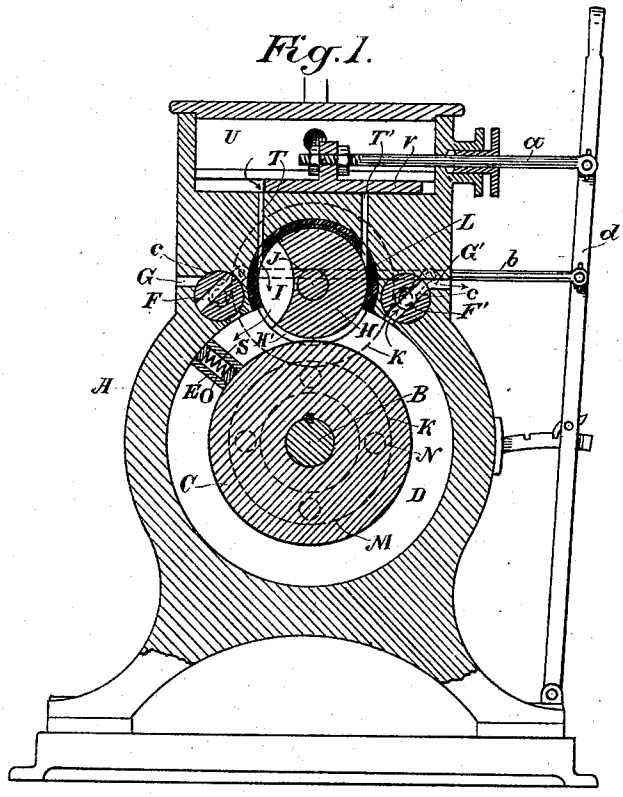


Fig. 2.

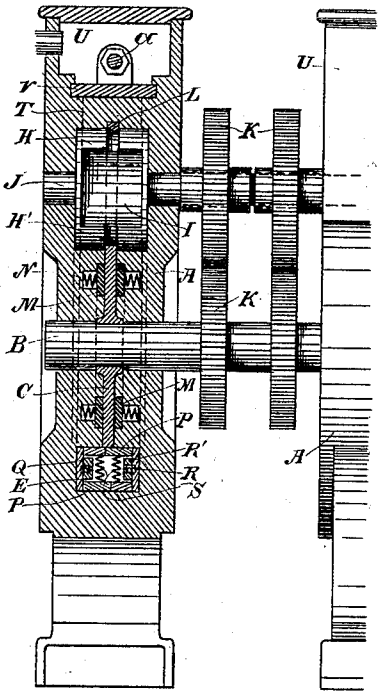


Fig. 3.

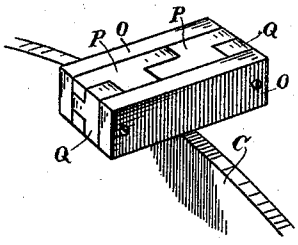
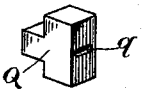


Fig. 4.



Witnesses,
J. F. Ashcroft

Inventor,
John H. Darragh
By Dewey Strong & Co.
Attys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN H. DARRAGH, OF OAKLAND, CALIFORNIA, ASSIGNOR OF THREE-FOURTHS TO JOSEPH H. THOMPSON, OF SAME PLACE.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 637,986, dated November 28, 1899.

Application filed March 14, 1899. Serial No. 709,027. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. DARRAGH, a citizen of the United States, residing at Oakland, county of Alameda, State of California, have invented an Improvement in Rotary Engines; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to improvements in that class known as "rotary engines."

It consists, essentially, in details of construction, which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is a vertical section transverse to the shaft, showing the interior mechanism. Fig. 2 is a vertical section through the longitudinal axis of the shaft. Fig. 3 is a detail view of the piston. Fig. 4 is a detail of one of the end pieces in the piston.

The object of my invention is to provide certain improvements in that class of rotary engines in which a piston is fixed to the periphery of a disk mounted upon a shaft, said piston traveling in an annular channel in a casing, with means for applying the pressure of steam to continuously propel the piston and rotate the disk.

In my invention, A is a suitably-constructed casing having a shaft B extending through the ends, and upon this shaft is mounted a disk C, which is turnable in a circular groove or channel made between the sides of the central portion of the casing A, as shown. Exterior to the periphery of the disk C the casing is widened out and has formed within it an annular channel D of sufficient width and depth to receive a piston E, which is fixed to the periphery of the disk and through which power is applied to revolve the disk and the shaft B, to which it is keyed.

The power applied to the piston is steam or other medium under pressure in the usual manner, and this is admitted through one of the passages T or T′, opening into the sides of the abutment-chamber, and is exhausted through the opposite one of the valves F or F′, which are here shown as cylindrical in shape, fitting in correspondingly-shaped chambers contiguous to the abutment-chamber upon each side thereof, and the axes of which are parallel with the shaft B, as shown. These valves F have passages made through them, which may communicate with passages G, made in the casing A and communicating with the annular piston-chamber D.

The valves F are turnable within their chambers, so as to bring their passages in or out of line with their passages G at pleasure, so that one of said valves may be turned to cut off the communication through its passage, while the other may be opened to allow a direct connection with the piston-chamber. This latter passage serves as an exhaust-passage while the engine is in motion, while the one upon the opposite side, through which steam is admitted, is closed. Intermediate between these two valves is the abutment H, which consists of a revoluble drum having a length greater than that of the piston E and having formed in one side of it a concave segmental chamber I. The curvature of this segmental chamber is of the same radius with the periphery of the annular piston-chamber D, and the abutment is mounted upon a shaft J, which passes through the casing A parallel with the shaft B and at such a distance therefrom that the periphery of the abutment fills the annular piston-chamber; but at the instant when the piston E is brought to a point contiguous with this abutment H the latter will then have been revolved, so that the segmental chamber I is coincident with the exterior of the piston-chamber D, and having the same curvature it for the instant forms a complete annular piston-chamber, so that the piston may pass through this segmental chamber to the opposite side of this rotary abutment. By the time the piston has reached this point the abutment will have been rotated, so that its periphery fills that portion of the annular piston-chamber and prevents any escape of steam to the opposite side when the steam is admitted to act upon the piston E after it has passed the abutment.

In order to revolve the shafts B and J in unison and to accurately bring the segmental chamber I of the abutment H into line with the remainder of the piston-chamber at each approach of the piston, gears K are mounted upon the shafts B and J, intermeshing so that the revolutions of the two shafts are in unison

and the parts are always brought into the required position at the proper time.

The outer periphery of the disk C fits into a groove or channel H′, made around the periphery of the abutment H, and fits closely enough to form a guide to steady the two and to prevent independent end motion during their revolutions. The periphery of the chamber in which the abutment H revolves is fitted with a packing L, which projects into the channel H′, fitting it snugly from one side to the other of the chamber to its junction with the edges of the piston-chamber D, where the two chambers intersect. This packing prevents any leakage through this channel. The ends of the abutment H extend beyond the ends of the segmental chamber I, and the chamber in which the abutment revolves being also longer than the piston-chamber allows these ends of the chamber H to fit and rotate therein with any suitable or desired packing to prevent any escape of steam beyond the ends of the segmental chamber I or around the abutment.

In order to make a tight joint about the disk C, I have shown packing-rings M with pressure-springs N acting against them and forcing them into contact with the sides of the disk, so that any leakage from the piston-chamber toward the shaft is prevented.

The piston consists of two sides O, which are fixed upon the periphery of the disk C and transverse thereto. Between these sides are fitted transversely and outwardly slidable packing-plates P, overlapping each other where they meet in the center, as shown, so that they may move slightly upon each other to maintain a constant fit within the piston-chamber. At the ends of the piston are other packing-strips Q, which are slotted, as shown at *q*, so as to allow them to move slightly with relation to the other parts, and these are forced outwardly by springs R, the inner ends of which abut against fixed parts R′, extending across between the plates O and the outer ends pressing against the packing-plates Q. Between the plates P are springs S, which act to constantly force these plates out and keep them in contact with the inner periphery of the chamber, thus forming tight joints at all times.

Within the casing and opening into the upper part of the chamber in which the abutment H revolves are the passages T, heretofore mentioned, the upper ends of which open into a main steam-chamber U. Within this chamber is a slidable valve V, which may be moved to close either of the steam-passages T or T′.

When the steam-passage T is opened and T′ is closed, the valve F will be turned in unison, so as to cut off communication through itself with the passage G, and the valve F′ will be similarly turned, so as to open communication through itself with the interior of the piston-chamber and communicating with the escape or exhaust passage G′ on that side. This movement of the valves is made in unison by means of a rod *a*, connecting with the valve V, and another rod *b*, connecting with rocker-arms *c*, which are fixed upon the ends of the shafts of the valves F F′, as shown. The outer ends of these levers connect with a main operating-lever *d*, suitably fulcrumed and movable about its fulcrum, so that when the lever is moved in one direction the valves will be set, as shown in Fig. 1. When moved in the opposite direction, the valve V will close the passage T and open the passage T′ and will close the exhaust-passage G′ and open the exhaust-passage G upon the opposite side, when the movement of the engine will be reversed.

The operation of the engine will be as follows: The parts being in position, as shown in Fig. 1, steam is admitted into the chamber U, and passing through the passage T will, when the abutment H has turned to the position shown in the figure, admit steam through the segmental concavity I, and the piston having just passed the segment the pressure of the steam will force it around until it arrives at the opposite side, when the abutment will again have been turned so that the concavity will coincide with the periphery of the piston-chamber and again allow the piston to pass. The rotation of the abutment soon carries the segmental chamber far enough to cut off further admission of steam from the passage to the piston-chamber, and the steam will then act expansively during the remainder of the stroke. Just before the piston reaches it will have passed the exhaust-passage G′, and the steam which has served to drive the piston to this point will be allowed to freely escape therethrough. The steam can also be used expansively in this engine by connecting the valve V with a movable portion of the engine, so that it will be withdrawn sufficiently to uncover the port or passage T at the instant when the piston has passed the abutment and to cut off the steam after the piston has reached any desired point in its revolution, the length of the valve V being such that the passage T′ will remain covered after the steam has been cut off from the passage T, and in the same manner when the valve has been moved to the opposite side to reverse the engine the cut-off of the steam from this direction can also be effected in a similar manner.

As shown in Fig. 2, a series of these engines may have their pistons fixed to a common shaft, each abutment having its own independent actuating-gear and valve setting and adjusting mechanism, so that all the engines may be in operation to drive the shaft, or one or more may be cut out by closing its admission-valve.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination in a rotary engine of a casing having an annular piston-chamber, a shaft passing axially through the center hav-

ing a disk fixed to it projecting into the annular chamber and having a piston fixed to its periphery, a rotary abutment having a concave segment cut out corresponding in curvature with the periphery of the piston-chamber and reversible valves upon each side of said abutment with passages made through them coincident with other passages made through the casing whereby either of said valves may serve as an exhaust while the other remains closed.

2. In a rotary engine, a casing having a central shaft, a disk fixed thereto, an annular piston-chamber, into the inner side of which the edge of the disk projects, a piston fixed upon the edge of the disk and revoluble within the piston-chamber, a cylindrical abutment parallel with the central shaft projecting into the piston-chamber so as to entirely cut it off at their point of junction, said abutment having a concave segmental chamber, the concavity of which is of the same radius as the exterior periphery of the chamber, the ends of the abutment extending beyond the ends of the piston-chamber and packed to form tight circumferential joints at their outer ends, and valve-controlled passages communicating with the abutment-chamber whereby steam is admitted into the passage with which the abutment-chamber coincides after the piston has passed the abutment.

3. In a rotary engine, a casing, a shaft extending through the center, a disk fixed upon the shaft having a piston fixed upon its periphery, an annular chamber formed in the casing within which the piston revolves, a cylindrical rotary abutment having a length greater than the length of the piston-chamber and a cylindrical chamber within which it revolves and in which its ends form a close joint, a concave segmental chamber formed in one side of the abutment corresponding in curvature with the outer periphery of the piston-chamber, valve-controlled steam-passages adapted to register with the abutment-chamber whereby steam is admitted into the passage with which the abutment-chamber coincides after the piston has passed the abutment, and intermeshing gears mounted upon the main shaft and that of the abutment whereby the two are rotated in unison, and the segmental chamber made to coincide with the piston-chamber while the piston passes the abutment.

4. In a rotary engine, a casing, a shaft passing centrally through the same, a disk mounted upon the shaft and turnable in a channel formed within the casing, a piston fixed to said disk, an abutment revoluble in a chamber above the piston-chamber, and having a centrally-located annular groove in which the periphery of the disk fits and is guided, channels made in the casing upon each side of the disk interior to the piston-chamber, annular packing-plates fitted in said channels, and springs for maintaining the plates in contact with the disk.

5. In a rotary engine, a casing having a central shaft, a disk fixed upon said shaft turnable in a channel formed in the casing with packing-rings, a piston fixed upon the periphery of the disk, an annular chamber in which the piston is revoluble, an abutment turnable in unison with the rotations of the disk and piston having a length greater than that of the piston-chamber and forming steam-tight joints at the outer end of its chamber, a segmental concavity formed in said abutment which coincides with the piston-chamber to allow the piston to pass the abutment at each revolution, valve-controlled steam passages adapted to coincide with the abutment-concavity whereby steam is admitted into the passage with which the abutment-concavity coincides after the piston has passed the abutment, a groove made around the central portion of the abutment into which the edge of the piston-disk projects and a segmental packing-ring surrounding the abutment-chamber and fitting the said groove.

6. In a rotary engine, a casing having a central shaft, a disk mounted thereon turnable in a channel in the casing with a piston fixed upon its periphery, an annular chamber in which the piston is revoluble, a cylindrical abutment revoluble on an axis parallel with the main shaft and intersecting the piston-chamber, said abutment having a segmental concavity formed on one side adapted to coincide with the piston-chamber to allow the piston to pass and to be closed behind the piston, a slide-valve movable in a chamber, passages connecting said chamber with the abutment-chamber through either of which steam may pass when the valve exposes the passage and steam from said passage passes through the segmental chamber of the abutment when the latter arrives in line therewith.

7. In a rotary engine, a casing having a central shaft, a disk mounted thereon turnable in a channel in the casing with a piston fixed upon its periphery, an annular chamber in which the piston is revoluble, a cylindrical abutment revoluble on an axis parallel with the main shaft and intersecting the piston-chamber, said abutment having a segmental concavity formed in one side adapted to coincide with the piston-chamber to allow the piston to pass and to be closed behind the piston, cylindrical valves fitting in chambers upon each side of the abutment having passages therethrough coincident with other passages which extend through the casing, means for rotating said valves so that one of the passages is closed and the other opened, a slide-valve movable in a chamber, passages connecting said chamber with the abutment-chamber through either of which steam may pass when the valve exposes the passage and steam from said passage passes through the segmental chamber of the abutment when the latter arrives in line therewith.

8. In an engine of the character described, the casing having the annular piston-cham-

ber, the centrally-journaled shaft and disk fixed thereto turnable in a slot or channel in the casing, a piston carried upon the periphery of the disk revoluble in the annular channel, a cylindrical abutment turnable in a chamber, the axis of which is parallel with the main shaft, a segmental concavity formed in one side of the abutment, gears mounted upon the main shaft and the abutment-shaft whereby the two are turned in unison and the segmental concavity is brought to coincide with the exterior periphery of the annular piston-chamber while the piston is passing therethrough, said abutment being immediately thereafter turned to intersect and cut off the piston-chamber and to bring the segmental chamber of the abutment into a line opening into the piston-chamber behind the latter, passages communicating with the abutment-chamber and a valve by means of which steam is admitted into the passage with which the segmental abutment-chamber coincides after the piston has passed the abutment, and a valve upon the opposite side of the abutment with an exhaust-passage therethrough.

9. In an engine of the character described, the casing having a shaft, a disk, a revolving piston fixed thereto, an annular chamber in which the piston fits, a revoluble abutment having a segmental concavity, gears by which the abutment is revolved in unison with the revolution of the main shaft and disk whereby the segmental concavity is brought to coincide with the piston-chamber at the instant when the piston is passing, passages communicating with opposite sides of the abutment-chamber, a valve movable to cut off steam from one of said passages and admit it to the other whereby steam is admitted therethrough to a point behind the piston after it has passed the abutment, rotary valves turnable in chambers upon each side of the abutment having passages therethrough, and means for turning said valves in unison so that one valve is closed and the other is opened to serve as an exhaust, and mechanism by which said valve and the steam-admission valve may be reversed in unison.

10. In a rotary engine of the character described, a disk mounted upon a central shaft turnable in a channel in the main casing, an enlarged annular piston-chamber into which the edge of the disk projects and joint packing upon each side of the disk, packing whereby the piston is maintained tight within the enlarged chamber comprising spring-pressed overlapping plates between the fixed piston sides and projecting beyond the plane of the sides of the disk, end plates intersecting the ends of the side plates and springs whereby said end plates are also movable outward to form end joints.

In witness whereof I have hereunto set my hand.

JOHN H. DARRAGH.

Witnesses:
S. H. NOURSE,
JESSIE C. BRODIE.