D. N. CLARK.

ROTARY ENGINE.

APPLICATION FILED DEC. 23, 1919.

1,367,801.

Patented Feb. 8, 1921.

4 SHEETS—SHEET 1.

Fig. 1.

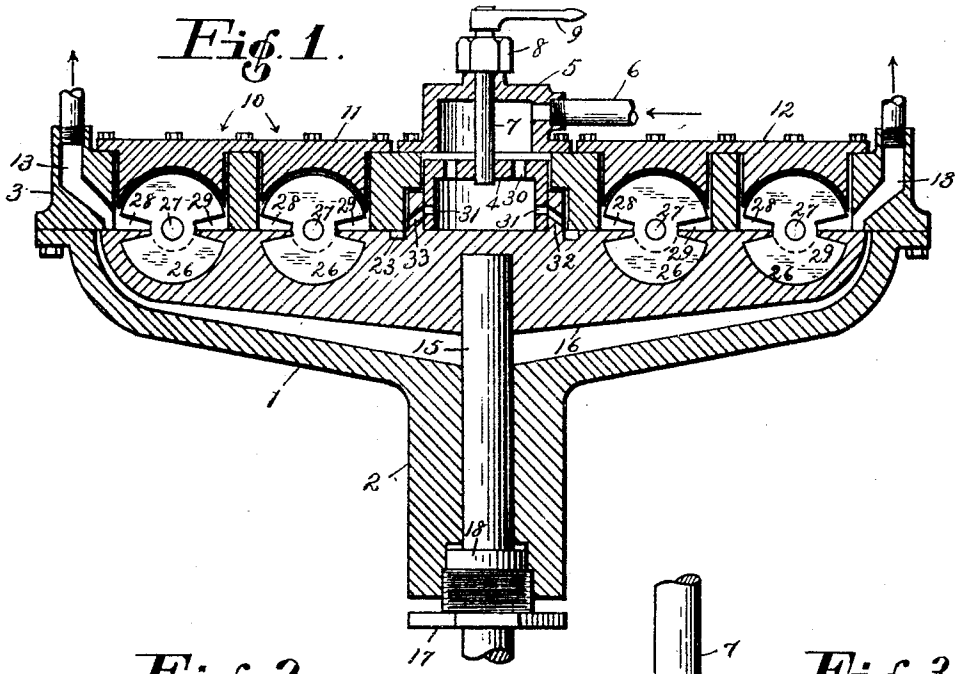


Fig. 2.

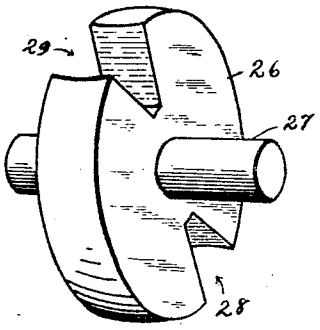
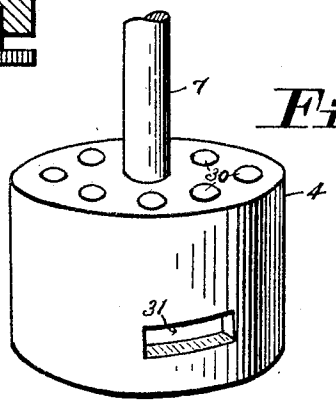


Fig. 3.



Inventor

Daniel N. Clark

By Hazard & Miller

Attorneys

D. N. CLARK.

ROTARY ENGINE.

APPLICATION FILED DEC. 23, 1919.

1,367,801. Patented Feb. 8, 1921.

4 SHEETS—SHEET 2.

Fig. 4.

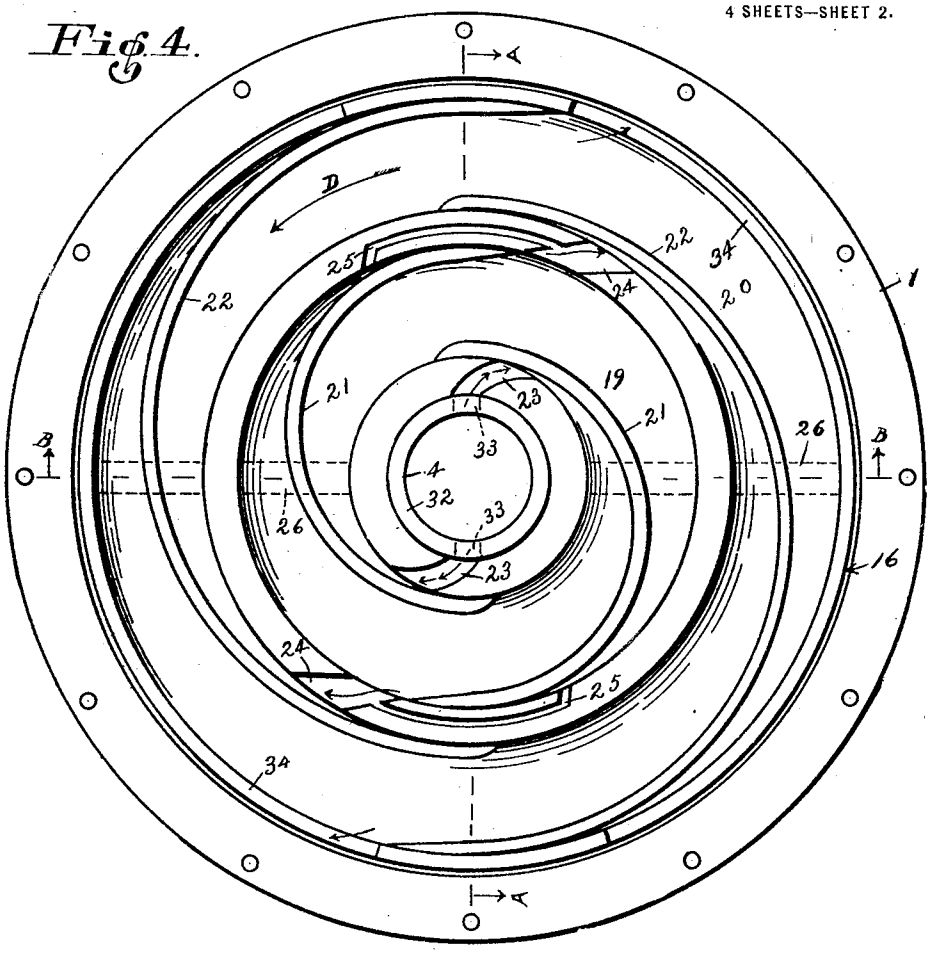
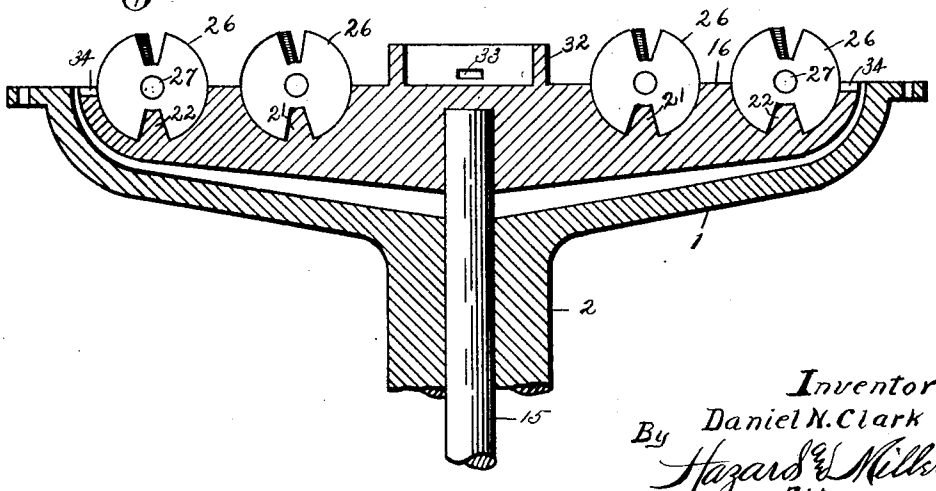


Fig. 5.



Inventor
Daniel N. Clark
By Hazard & Miller
Attorneys

D. N. CLARK.

ROTARY ENGINE.

APPLICATION FILED DEC. 23, 1919.

1,367,801.

Patented Feb. 8, 1921.

4 SHEETS—SHEET 3.

Fig. 6.

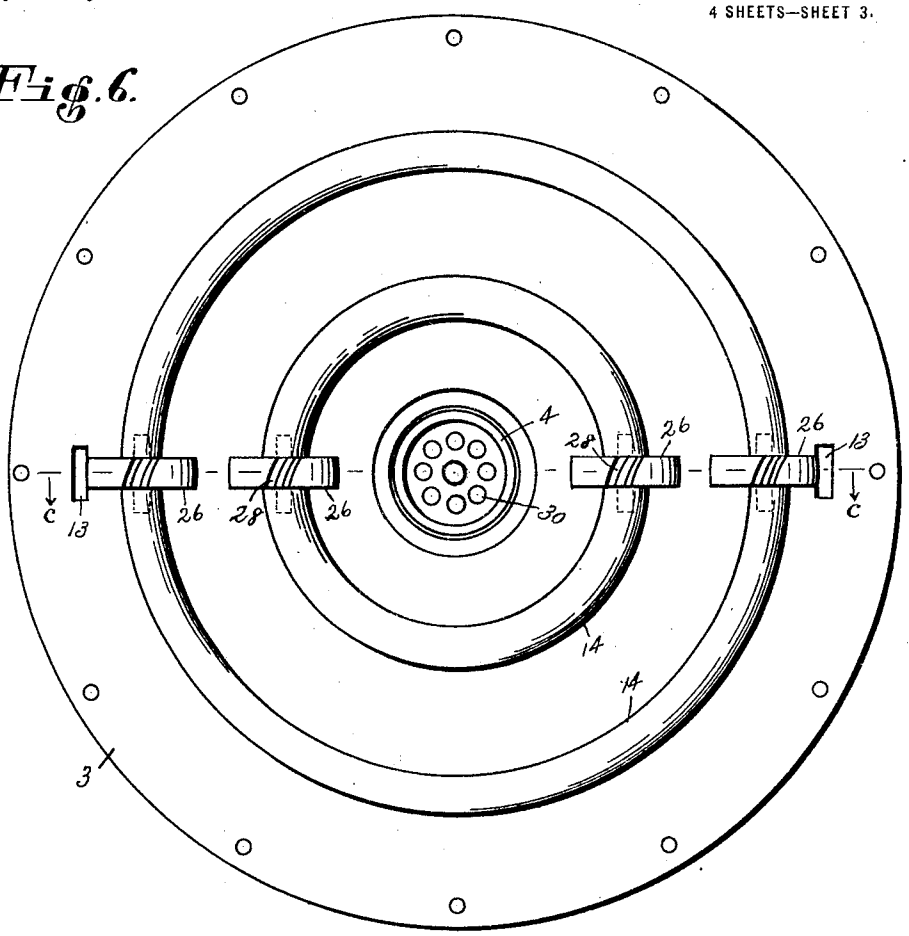
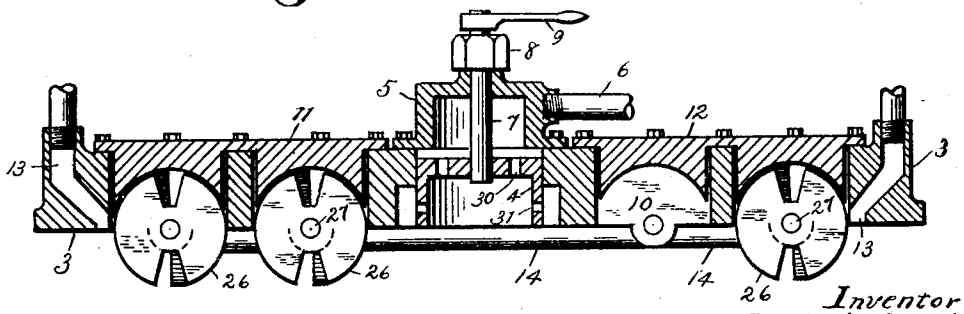


Fig. 7.



Inventor
Daniel N. Clark
By Hazard & Miller
Attorneys

D. N. CLARK.

ROTARY ENGINE.

APPLICATION FILED DEC. 23, 1919.

1,367,801.

Patented Feb. 8, 1921.

4 SHEETS—SHEET 4.

Fig. 8.

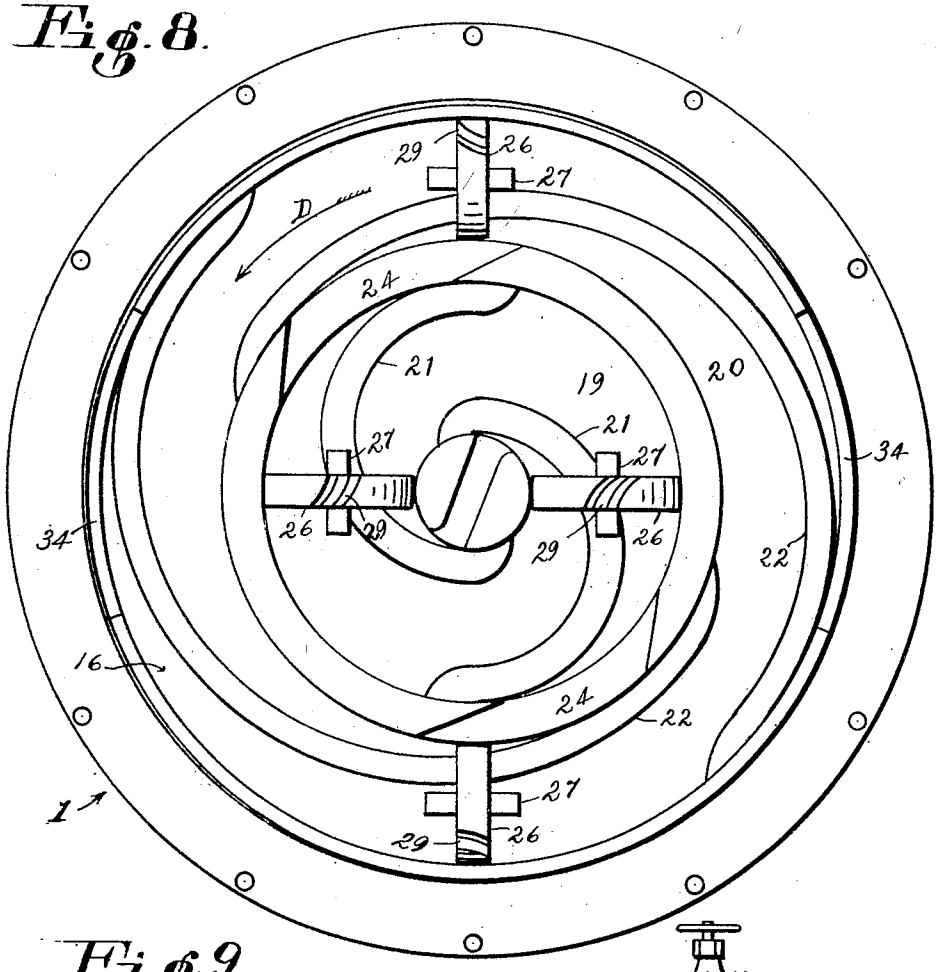
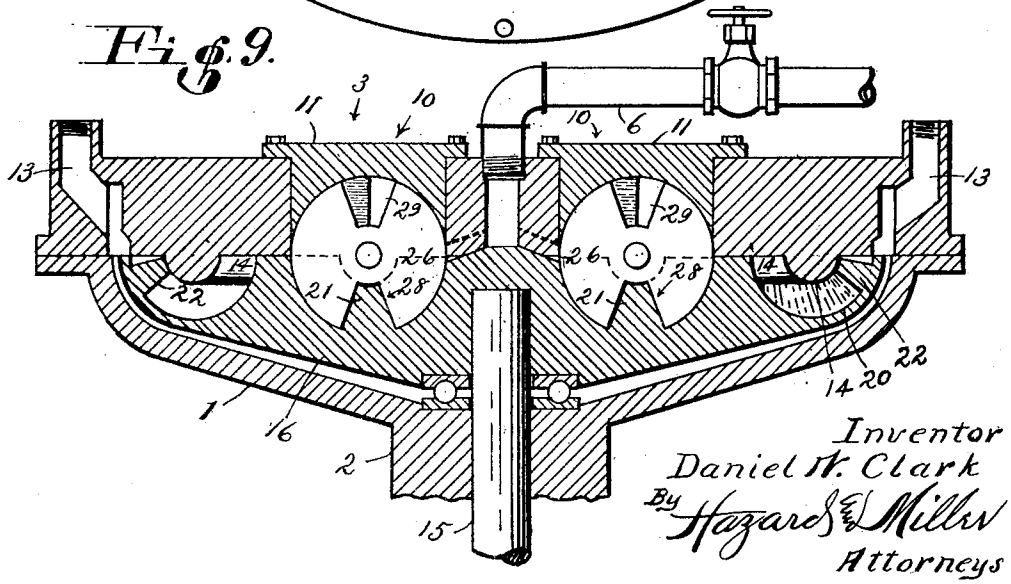


Fig. 9.



Inventor
Daniel N. Clark
By Hazard & Miller
Attorneys

UNITED STATES PATENT OFFICE.

DANIEL N. CLARK, OF ALBIA, IOWA.

ROTARY ENGINE.

1,367,801. Specification of Letters Patent. Patented Feb. 8, 1921.

Application filed December 23, 1919. Serial No. 346,968.

To all whom it may concern:

Be it known that I, DANIEL N. CLARK, a citizen of the United States, residing at Albia, in the county of Monroe and State of Iowa, have invented new and useful Improvements in Rotary Engines, of which the following is a specification.

My invention relates to improvements in rotary engines and the objects of my invention are to provide a rotary engine adapted to be operated by the expansion of gases; a further object being to provide in a rotary engine a means for expanding a gas such as steam to its greatest volume and gain from it a high percentage of its energy; a further object being to provide a rotary steam engine having few parts, that is simple in its design and operation and economical in its steam consumption; the invention consisting of the novel features herein illustrated, described and claimed.

Figure 1, of the drawings, is a vertical cross section of the device taken on the line A, A Fig. 4.

Fig. 2 is a perspective view of one of a set of transversely rotating disks.

Fig. 3 is a perspective view of a cylindrical valve for the device.

Fig. 4 is a top view of a runner as shown in position in the lower half of a casing.

Fig. 5 is a sectional elevation of the runner and lower half of the casing as shown in Fig. 4 taken on the line B, B Fig. 4.

Fig. 6 is a bottom view of the top half of a casing showing a set of transversely disposed disks in place.

Fig. 7 is a sectional view in elevation of the top half of a casing as shown in Fig. 6 right side up and taken on the line C, C Fig. 6.

Fig. 8 is a plan view; and Fig. 9 is a diametrical sectional view both of a modified form of the runner.

In carrying out my invention a casing is provided comprising a lower member 1 having a central bearing 2 and an upper member 3 having a central bore in which is fitted a rotatable valve 4. A bonnet 5 is fitted over the top of the bore and carries a steam inlet conduit 6. A stem 7 fixed to the valve 4 extends upwardly through the top of the bonnet 5 and is provided on top of the bonnet with a packing gland and nut 8. The stem 7 carries an operating handle 9.

Through the top member 3 of the casing is formed rectangular chambers 10 adapted to be closed with a steam tight joint by plates 11 and 12, the plates carrying downwardly extending portions fitting the rectangular chambers and are formed circular at the bottom as shown. The top member 3 of the casing is provided with exhaust ports 13, 13 and on its under surface with annular rings 14, 14, they being semicircular in cross section.

A shaft 15 is rotatably mounted in the bearing 2 and carries, within the casing, a runner 16. The runner is spaced from the lower member of the casing all around and has a flat top adapted to rotate against the flat under surface of the top member 3 of the casing. The vertical adjustment of the runner relative to the under surface of the top member of the casing is provided for by a nut 17 operating against a ring 18 fixed to the shaft 15 thus forming a step bearing.

The runner 16 is provided with a concentric annular channel 19 and a second concentric annular channel 20 outside of the first, the annular channels being semi-circular in cross section.

The annular channel 19 is provided with two vanes 21, 21 wound from the inner edge of the channel downwardly, across the channel and upwardly terminating at the outer edge of the channel, the two vanes being positioned diametrically opposite each other. The channel 20 is provided with two vanes 22, 22 disposed from the inner edge of the channel downwardly, across the channel and upwardly terminating at the outer edge thereof. The two vanes 22 are positioned diametrically opposite to each other the inner ends or beginnings of the vanes being disposed, radially, adjacent to the outer ends of the two vanes 21. In the surface of the runner 16 are formed ports 23, 23 connecting with the channel 19 and ports 24, 24 connecting the channel 19 with the channel 20 and bypass ports 25, 25 connecting the channel 19, outwardly of the vanes, with the ports 24, 24.

Through the chambers 10 in the top member 3 of the casing are inserted disks 26, 26, 26, 26, carried on spindles 27, the spindles having bearings in the annular rings 14, 14 of the top member 3. The disks are of such diameter and so curved on their peripheries as to fit into the semi-circular channels 19 and 20 of the runner 16. The disks also

carry notches 28 and 29, the notches being adapted to fit and ride on the vanes 21, 21 and 22, 22, so that if the runner 16 were rotated in the direction of the arrow D, Fig. 4, the vanes 21, 21 and 22, 22 would rotate all the disks, those on the left, as shown in Fig. 1, being rotated clockwise and those on the right being rotated contra-clockwise.

The rotary valve 4 carries perforations 30 and two ports 31, 31.

The runner 16 carries an upwardly extending ring 32 having ports 33, 33, connecting the ports 31 of the valve 4 with the ports 23, 23 in the runner 16. The ring 32 has a close fit about the valve 4. The outer rim of the runner is cut away forming an exhaust means 34 nearly all the way around which is in communication with the exhaust ports 13, 13.

In Fig. 4 the transverse disks 26 are shown in position in dotted lines, and in Fig. 5 the disks are shown in full, positioned within the annular channels.

It is to be understood that the disks 26 fit closely in the annular channels 19 and 20 and also fit closely to the downwardly extending portions of the covers 11 and 12 so that an excessive by-pass of steam is prevented; the same being true of the fit of the disks upon the spiral vanes of the runner.

In Figs. 8 and 9 is shown a modification of the invention as disclosed in Figs. 1 to 7 inclusive.

In this modification the disks 26, 26 operating in the channel 20 are positioned on the quarter relative to the disks operating in the channel 19 and the vanes 22, 22 are disposed in the channel 20 to meet the new position of the disks.

The main feature of this modification is that the mean effective pressure and the zones and periods of expansion of the fluid used in operating the turbine are altered and differ from that set up in Figs. 1 to 7, and it is obvious that the disks in one channel might be disposed variously relative to the disks in the other channel and that the vanes in both channels might be formed in several ways differently from those shown, the exact position of the sets of disks relative to each other and the formation of the vanes in the channels forming no part of my present invention.

In the operation of the engine, steam is admitted from a source of supply to the conduit 6 from which it passes into the bonnet 5, through the perforations 30 of the valve 4, leaving the valve by the ports 31. The valve may be rotated so that the ports 31 match with the ports 33 of the annular ring 32 on the runner. The steam then passes through the ports 23 into the annular channel 19 expanding in one direction against the vanes 21 and in the other direction against the two disks 26 positioned in the annular channel 19. The disks are rotatable on an axis transversely of a radius of the runner, therefore the steam under pressure backs against the disk and pushes with the same pressure against the spirally disposed vanes 21 causing a rotation of the runner in the direction of the arrow D, Fig. 4. When the rotation has proceeded to a point equal to about one-half of a revolution, the vanes 21 leave the disks and the steam which caused the movement of the runner then passes out of the channel 19 through the ports 24, 24 and into the channel 20 filling the space between the vanes 22 and the two disks 26 positioned within the channel 20 and exerting a pressure against the disk and against the vanes 22 thereby rotating the runner again in the direction of the arrow D. At this same period of the cycle a new charge of steam is taken into the channel 19 in the same manner as the previous charge. The runner then proceeds in its rotation to about a half revolution at which point the vanes 22 leave the disks which they have been rotating and the steam charge which has been expanding within the channel 20 passes out through the exhaust ports 13, 13 at which time a third charge is taken into the channel 19, while the second charge passes from the channel 19 into the channel 20.

The vanes in the annular channels are so disposed as to their length and the position of their beginnings and endings that the notches of the disks 26 always carry one or both of the vanes so that the rotation of the disk will always be positive.

The ports 33 in the ring 32 of the runner are adapted to receive steam from the ports 31 of the valve 4 for a short instance only in the cycle. This small volume of steam in entering the channel 19 immediately begins to expand as the spiral vanes proceed outwardly developing a larger volume of space and the expansion continues until the steam passes over to the channel 20 in which channel the same condition of expansion continues and at a higher rate of speed so that it is possible by a proper construction of the ports to admit a volume of steam that may, in the cycle of rotation, be expanded down into a vacuum.

It is to be understood that the vanes in the runner may be increased in number to three or more sets in each of the annular channels and also that the vanes may be spirally disposed at a different rate of outward advance from that shown or the rate of spiral advance outwardly may be altered throughout the length of the advance and the transverse disks, in order to make them steam tight, may be constructed with spring rings on their peripheries and spring surfaces in the faces of the notches to engage the sides of the vanes that there may be

spring surfaces embodied in the surface of the runner to engage the under surface of the top member of the casing.

The power derived from the shaft 17 may be connected by any suitable means with the device to be operated and it is to be understood that the bearing carrying the shaft may be elongated and otherwise altered in form and means forming a step bearing may be changed if deemed necessary; the exact form of the casing, bearing, vanes and transverse disks as shown forming no part of my present invention.

It will of course be understood that in place of steam, any other expansible fluid such as ether, or hydrocarbon vapors may be used.

It is obvious that various other changes might be made in the means herein shown and described for carrying out my invention without departing from the spirit thereof as claimed.

I claim:

1. In a rotary engine, in combination, a casing, a runner rotatably mounted in the casing, vanes disposed spirally on the runner, means in coöperative relation with the vanes and the runner for directing the steam outwardly in a plane at right angles to the axis of the runner by way of the spiral vanes.

2. In a rotary engine, in combination, a casing, a runner rotatably mounted in the casing, a concentric annular channel in the surface of the runner, the channel being semi-circular in cross section, vanes wound from the inner edge of the annular channel spirally through the channel terminating at the outer edge of the channel, means operating with the vanes in the channels for causing steam to flow by way of the spiral vanes.

3. In a rotary engine, in combination, a casing, a runner rotatably mounted in the casing, an annular concentric channel semi-circular in cross section formed in the surface of the runner, vanes disposed spirally through the annular channel and disks having notches slidably adapted to the vanes mounted to rotate on an axis transversely of a radius of the runner.

4. In a rotary engine, in combination, a casing, a runner rotatably mounted in the casing having a surface adapted to rotate against an inner surface of the casing, a concentric annular channel formed in the surface of the runner, vanes disposed spirally through the annular channel, the channel being semi-circular in cross section, disks having notches adapted to slidably fit upon the vanes the disks being mounted to rotate transversely of the channel and means for admitting steam to the runner between the vanes and the disks.

5. In a rotary engine, in combination, a casing, a runner rotatably mounted in the casing having a surface adapted to rotate against an inner surface of the casing, a plurality of concentric annular channels formed in the surface of the runner, the channels being semi-circular in cross section, a plurality of vanes disposed spirally through the channels, disks rotatably mounted in the casing and transversely of the channels of the runner and adapted to rotate closely in the channels, the disks being provided with recesses adapted to fit over and slide upon the spiral vanes, a steam inlet means for the engine communicating with the innermost of the channels, steam ports connecting each concentric channel with the channel next outwardly therefrom whereby the steam may be expanded in zones of larger volume and exhaust ports for the engine.

6. In a rotary engine, a runner comprising a body member having a flat surface, a concentric annular channel formed in the flat surface of the runner and vanes disposed spirally through the annular channel.

In testimony whereof I have signed my name to this specification.

DANIEL N. CLARK.