W. S. MINOR.

ROTARY ENGINE.

APPLICATION FILED APR. 9, 1908.

900,410. Patented Oct. 6, 1908.

3 SHEETS—SHEET 1.

Fig. 1.

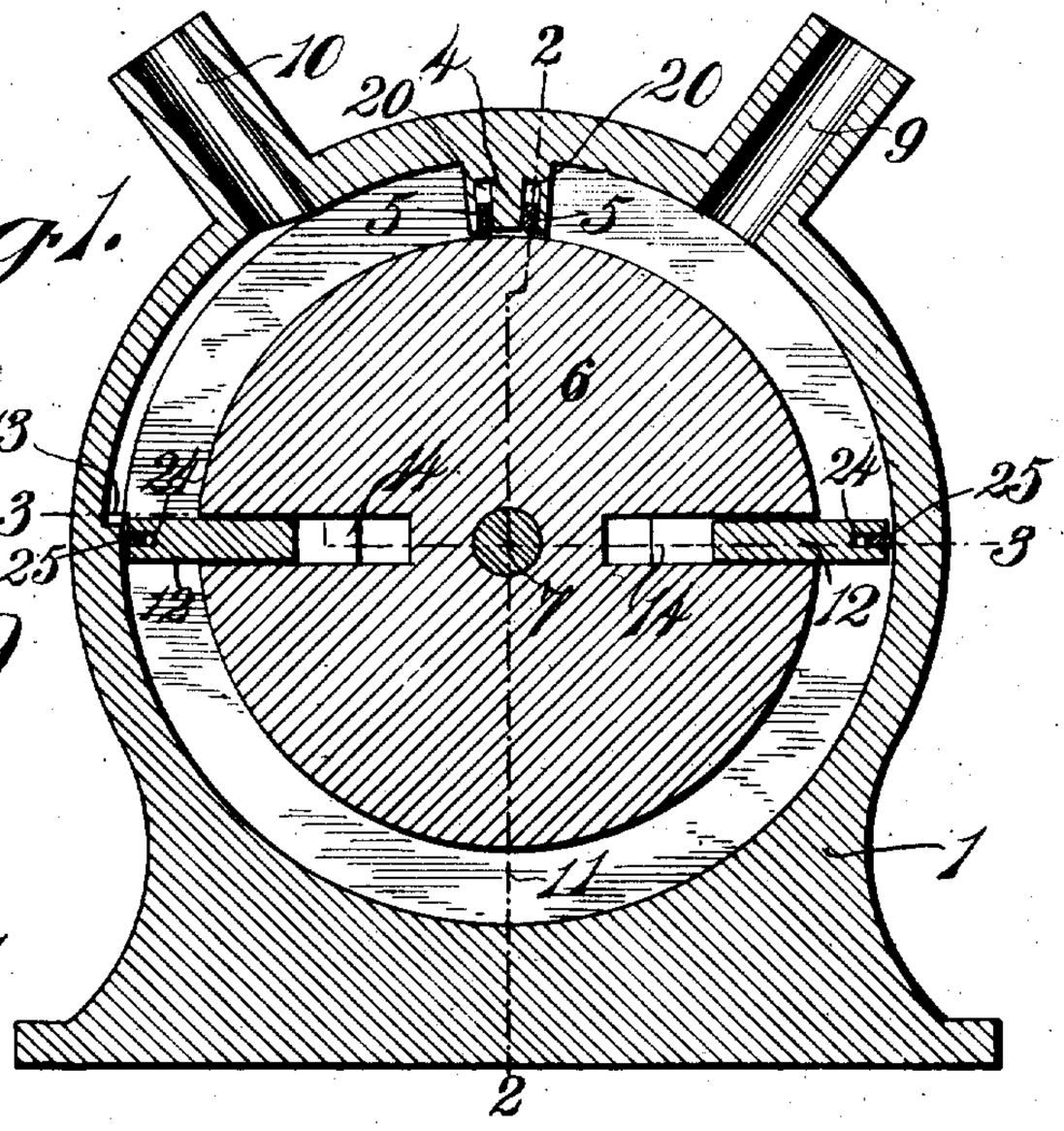


Fig. 9

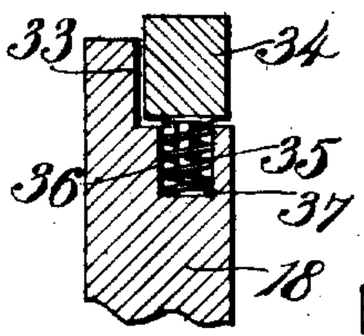
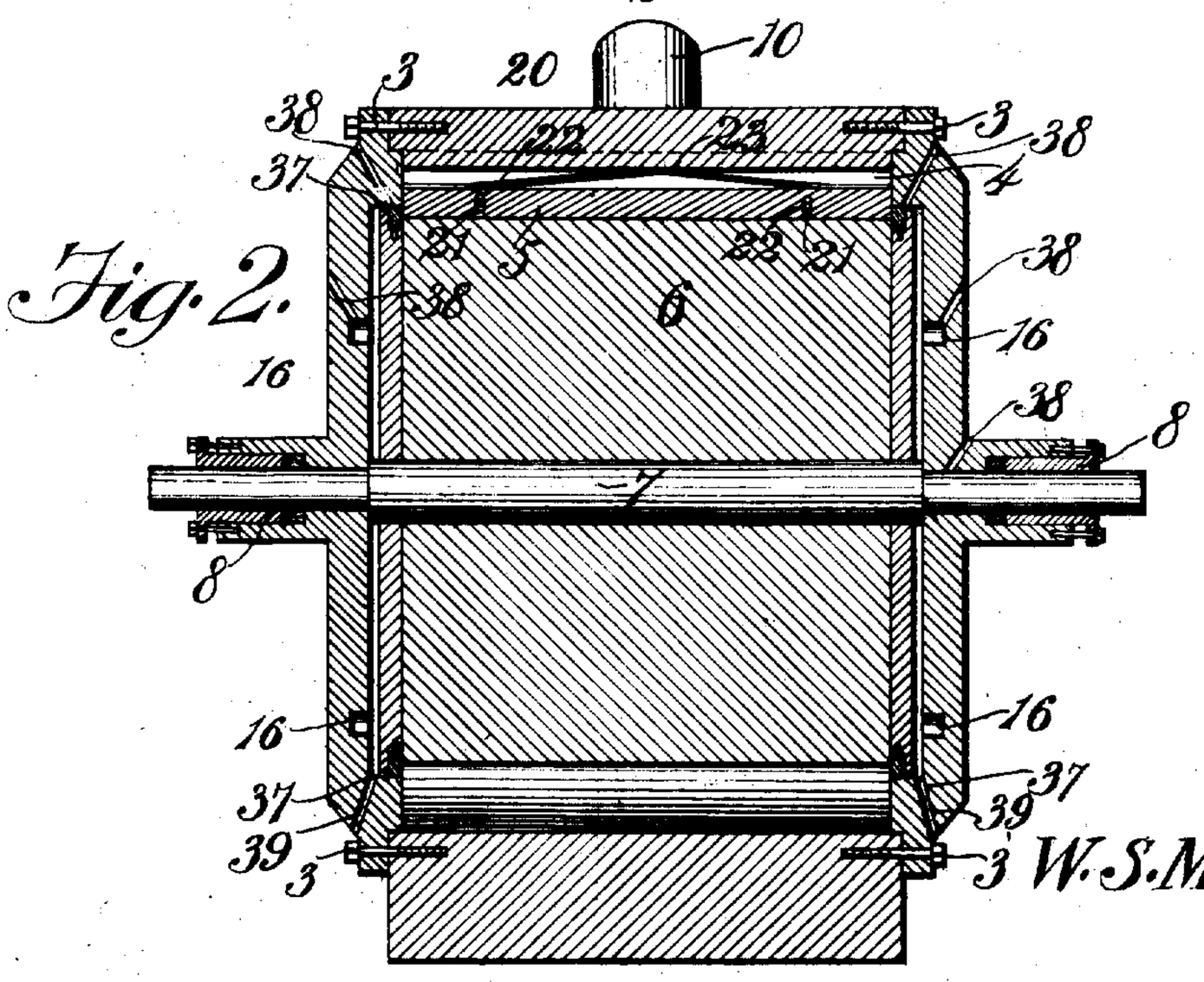


Fig. 2.



Witnesses

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3 SHEETS—SHEET 2.

Fig. 3.

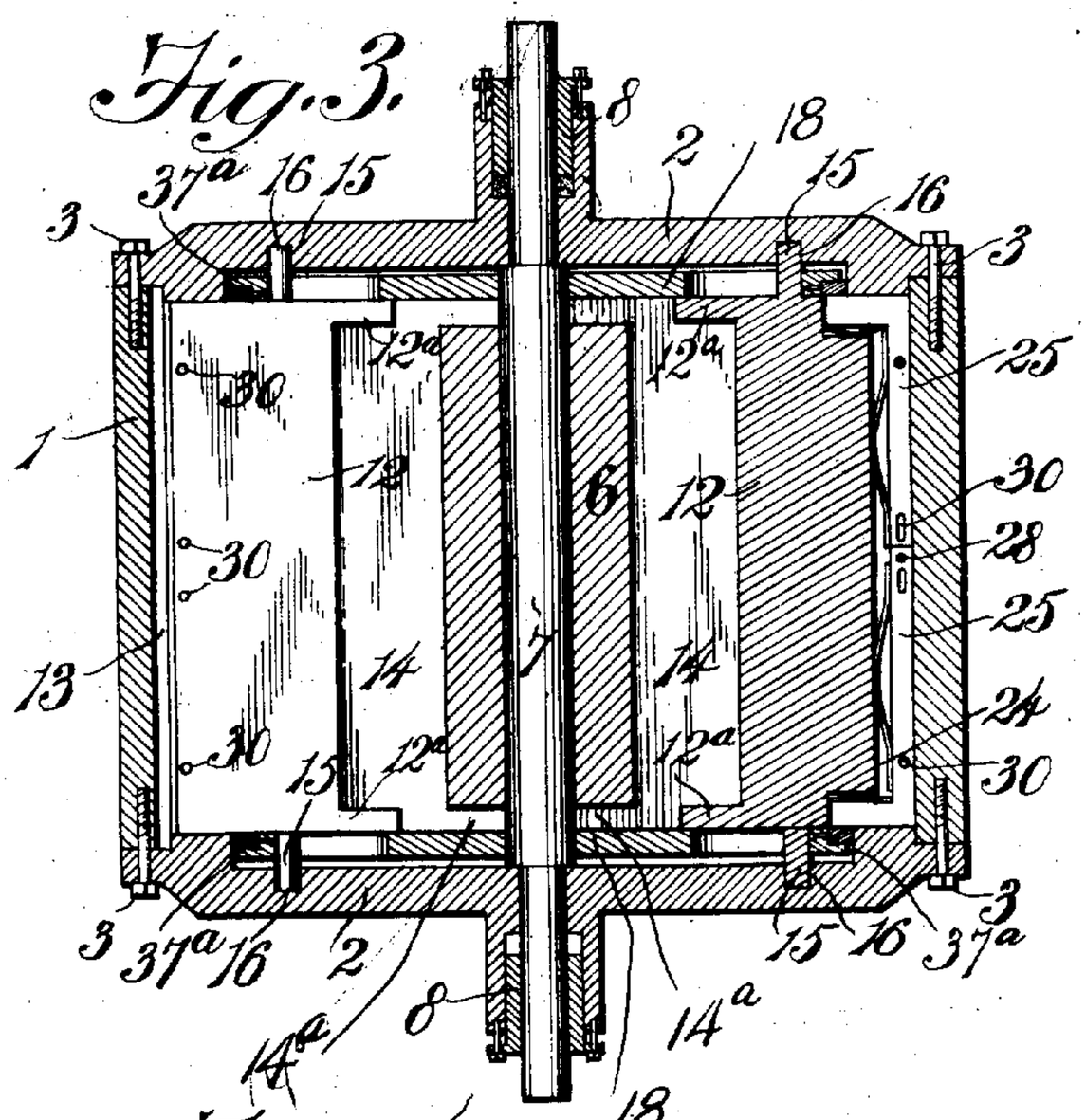
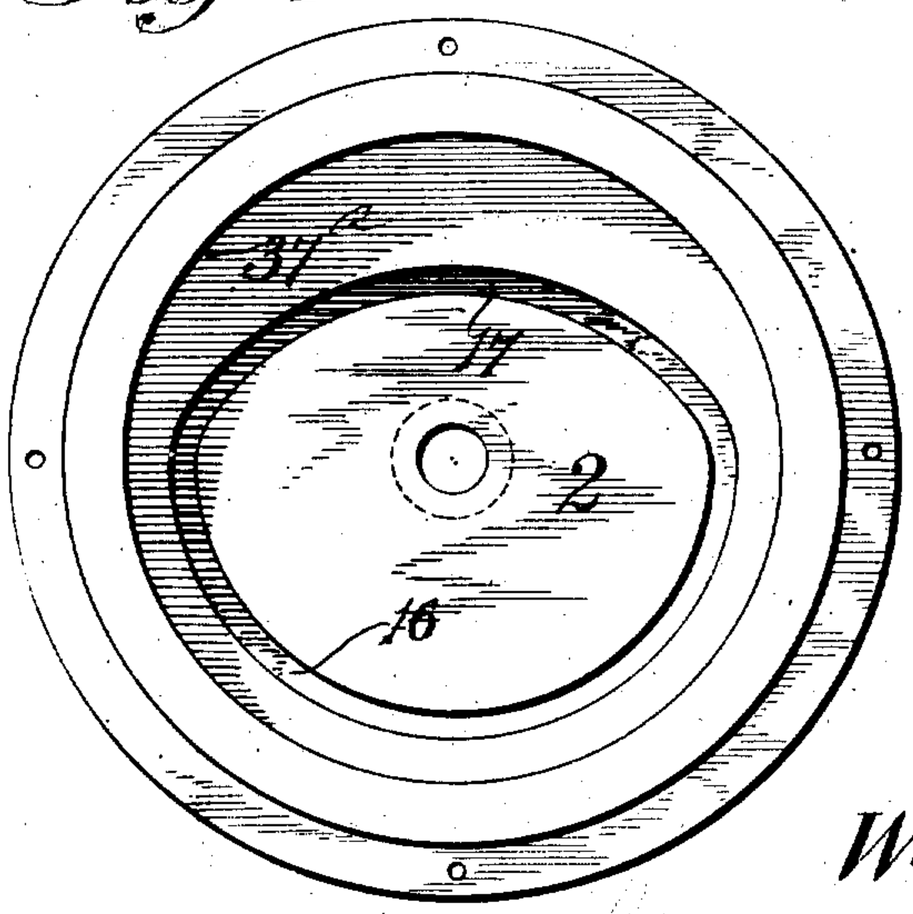


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 5.

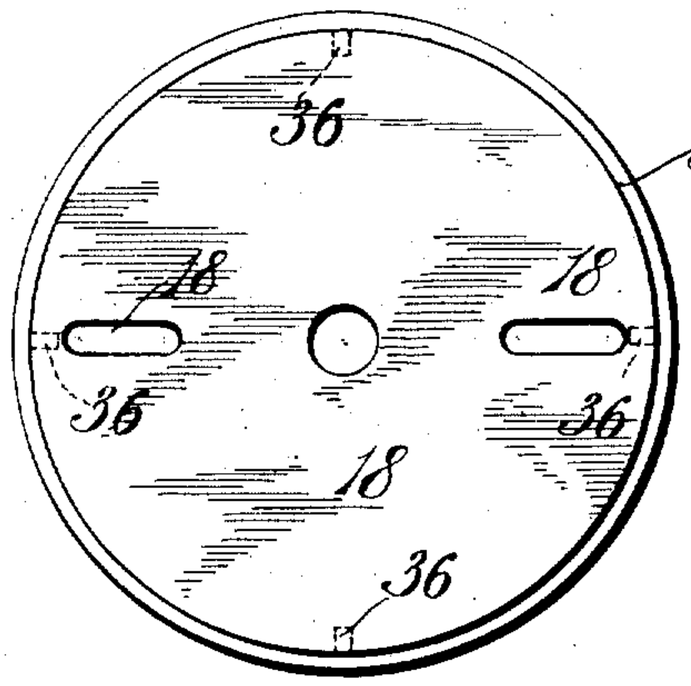

Fig. 6.

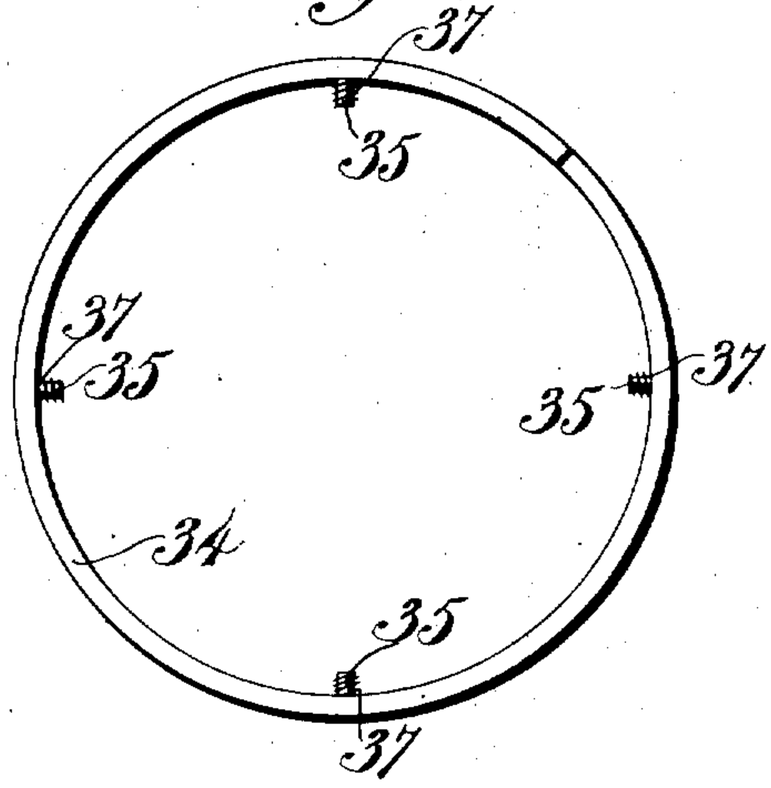

Fig. 7.

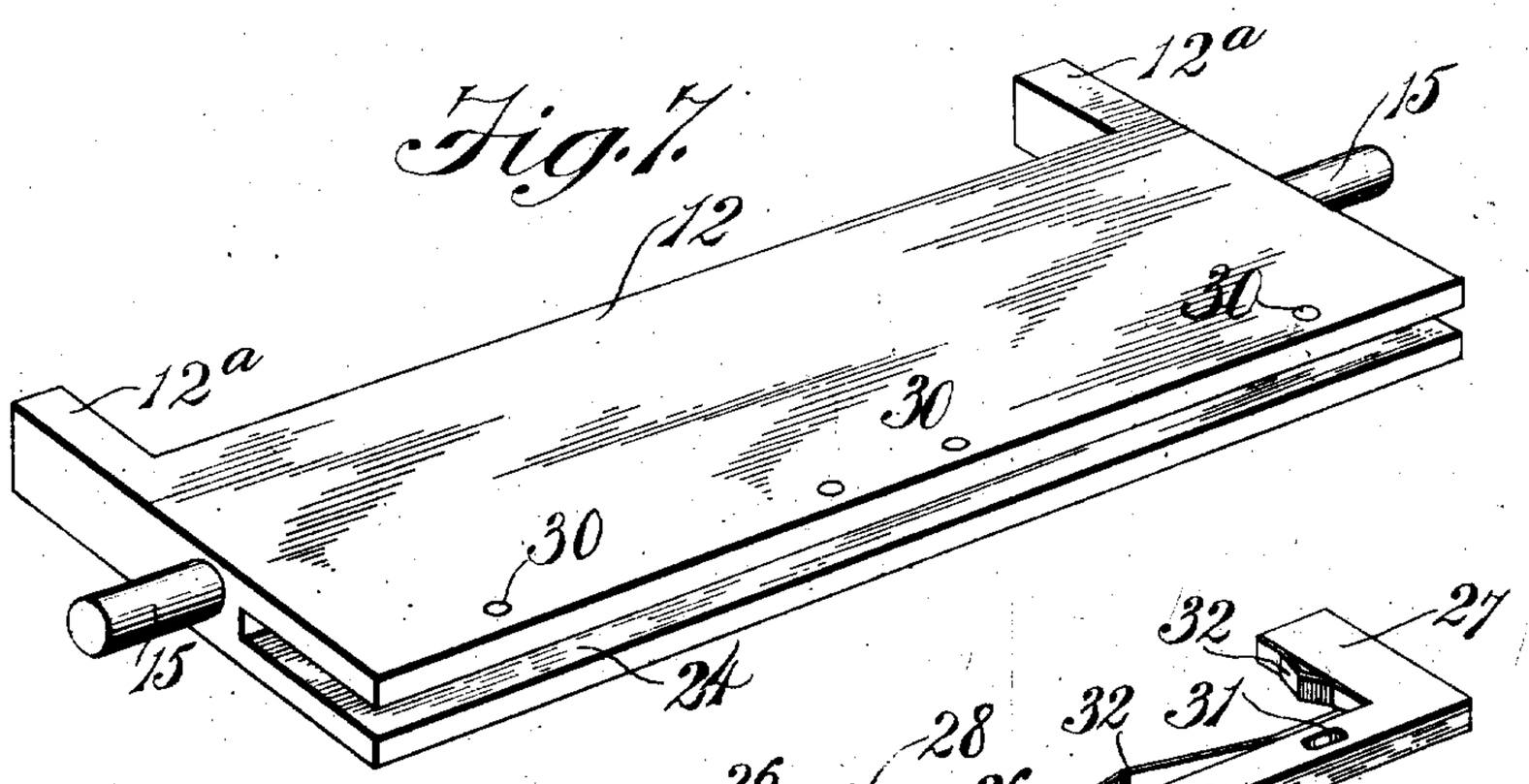

Fig. 8.

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UNITED STATES PATENT OFFICE.

WALTER S. MINOR, OF CUNNINGHAM, TENNESSEE.

ROTARY ENGINE.

No. 900,410. Specification of Letters Patent. Patented Oct. 6, 1908.

Application filed April 9, 1908. Serial No. 426,118.

To all whom it may concern:

Be it known that I, WALTER S. MINOR, a citizen of the United States, residing at Cunningham, in the county of Montgomery and State of Tennessee, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to improvements in rotary engines for steam or other fluid under pressure, and it consists of the novel features of construction and the combination and arrangement of parts hereinafter fully described and claimed.

The object of the invention is to provide an engine of this character which will be simple and practical in construction, strong and durable in use, and highly efficient in operation.

A further object of the invention is to provide improved packing devices for the piston blades and other parts of an engine of this character.

The above and other objects of the invention, as will hereinafter more fully appear, are attained in its preferred embodiment illustrated in the accompanying drawings, in which

Figure 1 is a vertical transverse or cross section through my improved rotary engine; Fig. 2 is a longitudinal section taken on the plane indicated by the line 2—2 in Fig. 1; Fig. 3 is a horizontal section taken on the plane indicated by the line 3—3 in Fig. 1; Fig. 4 is a side elevation of the inner face of one of the end plates or heads of the cylinder; Fig. 5 is an elevation of the inner side or face of one of the end plates of the piston; Fig. 6 is a detail view of one of the packing rings for the end of the piston; Fig. 7 is a detail view of one of the blades of the piston; Fig. 8 is a detail perspective view of the jointed angular packing strips for one of the piston blades; and Fig. 9 is a detail section through the packing ring.

My improved rotary steam engine comprises a casing or cylinder 1 formed with a suitable base and open ends adapted to be closed by similar end plates or heads 2 which may be suitably secured. I preferably, however, groove the inner face of each of the heads adjacent to their outer edges so as to receive the ends of the cylinder and secure them to the latter by bolts or similar removable fastenings 3, as shown more clearly in Fig. 2. Formed within the bore of the cylinder and extending longitudinally thereof at any suitable point, but preferably at its top, as shown in Fig. 1, is a rib or projection 4 which serves as an abutment and which is provided with one or more packing strips 5 to engage the periphery of a cylindrical rotary piston 6 which is mounted concentrically on a longitudinal shaft 7, the ends of which project through and are mounted for rotation in bearings formed at the centers of the heads 2 and provided with suitable stuffing boxes or glands 8.

Steam inlet and exhaust passages 9, 10, respectively, are provided in the cylinder on opposite sides of the abutment 4 and communicate with the annular steam passage or space 11 formed between the piston and cylinder and adapted to be separated at intervals to break the communication between the inlet and exhaust passages, by piston blades or valves 12. The portion of the bore of the cylinder 1 adjacent to the exhaust port or passage 10 is slightly enlarged by cutting away a portion of the inner wall of the cylinder, as shown at 13, thereby facilitating the outlet of steam, as presently explained.

The piston 6 is preferably in the form of a solid cylindrical body bored concentrically to receive the shaft 7 which is keyed or otherwise secured therein and formed in its periphery at diametrically opposite points are longitudinal grooves or channels 14 to receive the piston blades 12. The latter are in the form of flat, rectangular plates of such size as to slide freely in the grooves or recesses 14 and to drop entirely within the same to permit them to pass under the cylinder abutment 4. Said recesses 14 are shaped as clearly shown in Fig. 3 and in their bottoms are smaller recesses 14^a to receive extensions 12^a formed at the ends of the rear edge of the valve blades or plates 12. While said blades may be projected and retracted by any suitable means I preferably employ the one illustrated which consists in providing at the ends of said blades outwardly projecting pins or extensions 15 adapted to travel through grooves or channels 16 formed in the inner faces of the cylinder heads 2. As illustrated in Fig. 4, each of the grooves 16 has a little more than half of it disposed concentrically with respect to the piston so that when the pins pass through

this portion of the grooves the blades will be held projected and against the inner wall or bore of the cylinder 1; and the remaining portion 17 of each of said grooves is eccentrically disposed to provide a cam portion which serves to move the pins 15 inwardly and outwardly with respect to the center of the piston and thereby retract the blades 12 as they approach the abutment 4 and pass under it and then project said plates as they leave it. The blades 12 are retained in the grooves in the piston by two end plates 18 which are suitably secured and formed with oppositely disposed radially extending slots 18 to receive the pins 15, which latter are preferably formed integral with the blades 12 at points adjacent to their inner corners. It will be noted that the extensions 12ª on the blades 12 will cover the slots 18 and prevent the passage of steam through said slots.

The packing strips 5 for the abutment 4 are in the form of metal plates arranged for radial sliding movement in channels or grooves 20 formed in the bottom of said abutments, said plates being retained in the grooves by transverse pins 21 passed through said abutment and through elongated slots or openings 22 formed in said packing strips. The latter are projected and held firmly against the periphery of the piston by leaf springs 23 which are V-shaped and arranged as clearly shown in Fig. 2.

For the purpose of preventing the leakage of steam around the blades 12 I provide the outer portions of each of them with grooves or channels 24 to receive angular packing strips 25. Said groove 24 is formed longitudinally in the outer edge and also in the outer portions of the ends of the blade 12 and each of the right angular packing strips 25 is adapted to fit in one end of the groove 24 and to slide both radially and laterally with respect to the piston so that the long portion or arm 26 of each of the strips will engage the inner wall of the cylinder 1 and the short portion or arm 27 of the same will engage one of the end plates 2 of the cylinder. The long arms 26 of the two packing strips on each valve have their inner ends recessed to overlap and are loosely united by a transverse pin 28 passed through and fixed in one of said ends and adapted to project into and slide in a slot 29 in the other of said ends, as shown more clearly in Fig. 8. The strips 25 are retained in the groove 24 by transverse pins 30 passed through the blade and into enlarged or elongated openings 31 in said strips. The latter are actuated outwardly by V-shaped leaf springs 32 arranged in the grooves 24 beneath the arms 26, 27 of said strips, as clearly illustrated in Fig. 3.

For the purpose of preventing the escape of steam around the ends of the piston I preferably form in the inner faces of the end plates 18 annular grooves 33 to receive split packing rings 34. Two of said rings are preferably provided at each end of the piston and they are split diagonally at one point so that their ends overlap; and the two rings at each end of the piston are arranged so that their split portions are disposed at diametrically opposite points. Said rings are retained in position but at the same time permitted to have radial movement, by means of inwardly projecting pins 35 formed upon them and extending into recesses 36 formed in the end plates 18 and adapted to receive coil springs 37 which latter surround said pins and serve to project the rings and press them against the outer wall of circular depressions 37ª formed in the inner faces of the cylinder heads 2, as clearly shown in the drawings.

38 denotes oil passages formed in the cylinder heads and 39 denotes a waste passage for the outlet of oil and water of condensation from each of the recesses or depressions 37. If desired, suitable oil cups may be provided at the outer ends of the passages 38.

The operation is as follows. Assuming the parts to be in the position shown in Fig. 1 and steam to be admitted into the inlet 9, it will be seen that both the pressure and expansion of the steam thus admitted will be against the blade 12 on the right hand side of the engine and the piston 6 will be rotated. As the pins 15 on the other blade 12 enter the cam portions 17 in the grooves in the cylinder heads said blade will be drawn into the piston until it is entirely within the same when it passes under the abutment 4, and will be again projected into the steam space 11 as soon as it passes said abutment. It will thus be seen that one of the blades is always projected and serves to divide the annular steam space 11 and receive the impact of the steam. As the blades are retracted the steam escapes around them and through the enlarged portion 13 of the steam space and from thence through the exhaust 10.

The invention is entirely automatic in its operation and will be steady and powerful and free from vibration. Furthermore, it is exceedingly simple in construction and composed of few parts which are strong and durable.

While I have shown and described in detail the preferred embodiment of my invention I wish it understood that I do not wish to be limited to the precise construction set forth and that various changes in the form, proportion and minor details may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention. I also wish it distinctly understood that I may substitute other forms of packing devices for the ones herein set forth, and provide the valve guide pins with ball or roller bearings.

Having thus described my invention what I claim is:

1. A rotary engine comprising a cylinder having open ends, a longitudinal abutment and inlet and exhaust ports on opposite sides of said abutment, the bore of the cylinder adjacent to the exhaust port having a cut away portion, said abutment being formed with a longitudinal slot, a spring pressed packing strip arranged in said slot, cylinder heads covering the open ends of the cylinder and formed in their inner faces with circular depressions, the latter being formed in their bottoms with grooves having concentric and cam or eccentric portions, a shaft arranged concentrically in the cylinder and having its ends journaled in said heads, a cylindrical piston fixed concentrically on said shaft and formed at opposite points in its periphery with radial grooves, end plates removably secured to the ends of the piston and arranged to project into the circular depressions in the cylinder heads, said end plates being formed with radial slots to aline with the ends of the grooves in the piston and having their inner edges formed with annular grooves, annular spring pressed packing strips arranged in the last mentioned annular grooves at the ends of the piston and adapted to engage the side walls of the circular depressions in the cylinder heads, piston blades arranged for radial sliding movement in the grooves in the piston and formed at their ends with pins to project through the slots in said end plates and into the grooves in the bottoms of the circular depressions in the cylinder heads, the outer ends of said blades being formed with grooves, and angular spring pressed packing strips arranged in the grooves in the piston blades to bear against the inner wall of the cylinder and the adjacent portions of the inner faces of the cylinder heads, substantially as shown and described.

2. In a rotary engine, the combination of a cylinder having open ends, a longitudinal abutment and inlet and exhaust ports on opposite sides of the abutment, cylinder heads closing the open ends of the cylinder and being formed with concentrically arranged circular depressions, the latter having in their bottoms grooves provided with concentric and eccentric or cam portions, a concentric shaft journaled in the cylinder heads, a concentric piston fixed on said shaft and formed in its periphery with the radial grooves 14 and with the recesses 14^a at the ends of the bottom portions of the recesses 14, end plates secured upon the ends of the piston and formed with the radial slots 18 to register with the grooves 14 in the piston, slidably mounted piston blades arranged in the grooves of the piston and formed with extensions 12^a to cover the slots in said end plates and to project into said recesses 14^a when the blades are in retracted position, and pins carried by the ends of the blades and projecting through the slots in the end plates of the piston and into the grooves in the bottoms of the circular depressions in the cylinder heads.

3. In a rotary engine, the combination of a cylinder having open ends, cylinder heads upon the same and formed with concentric circular depressions, a concentric rotary piston, concentric end plates upon the latter and formed in their inner edges with the annular grooves 33 having the sockets 36 arranged at intervals in their bottoms, and the split packing rings 34 arranged in the grooves 33 between the end plates of the piston and the ends of the latter and formed with the inwardly projecting radial pins to enter the sockets 36, and the coil springs 37 arranged upon the pins 35 for expanding the rings and holding them in contact with the side walls of the circular depressions in the cylinder heads.

4. In a rotary engine, the combination of a cylinder, a piston therein formed with radial recesses, piston blades in said recesses and formed in their outer edges and the adjacent portions of their ends with the grooves 24, said blades being also formed with the transverse openings 30 intersecting said grooves, the right angular packing strips 25 arranged in the grooves 24 and having short arms to project beyond the ends of the blades and long arms to project beyond the outer longitudinal edges of the blades, said long arms being formed with the elongated openings or slots 31 to register with the openings 30 in the blades, said long arms of the packing strips having their ends recessed and overlapping, the recessed end of one being formed with the slot 29 and the recessed end of the other carrying the pin 28 to enter the slot 29, transverse pins passed through the openings 30 and 31 in the blades and packing strips and springs arranged in the bottoms of the grooves 24 and adapted to bear against the inner edges of both arms of the packing strips to force the latter outwardly, substantially as shown and described.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

WALTER S. MINOR.

Witnesses:
J. A. HARNEY,
EDGAR ORGAIM.