No. 886,765. PATENTED MAY 5, 1908.

W. J. CHANCE.

ROTARY ENGINE.

APPLICATION FILED JULY 15, 1907.

3 SHEETS—SHEET 1.

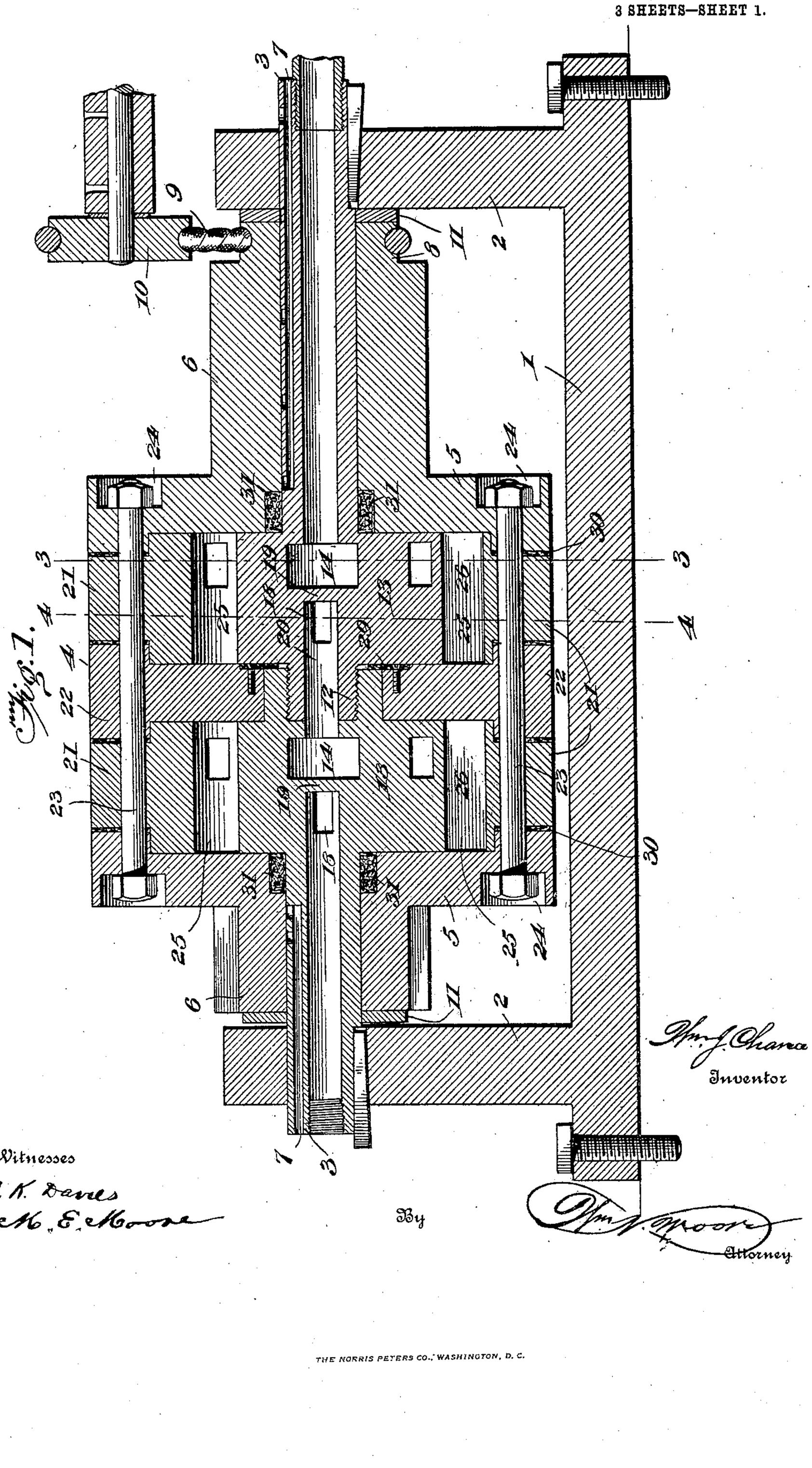

Fig. 1.

Witnesses

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3 SHEETS—SHEET 2.

Fig. 2.

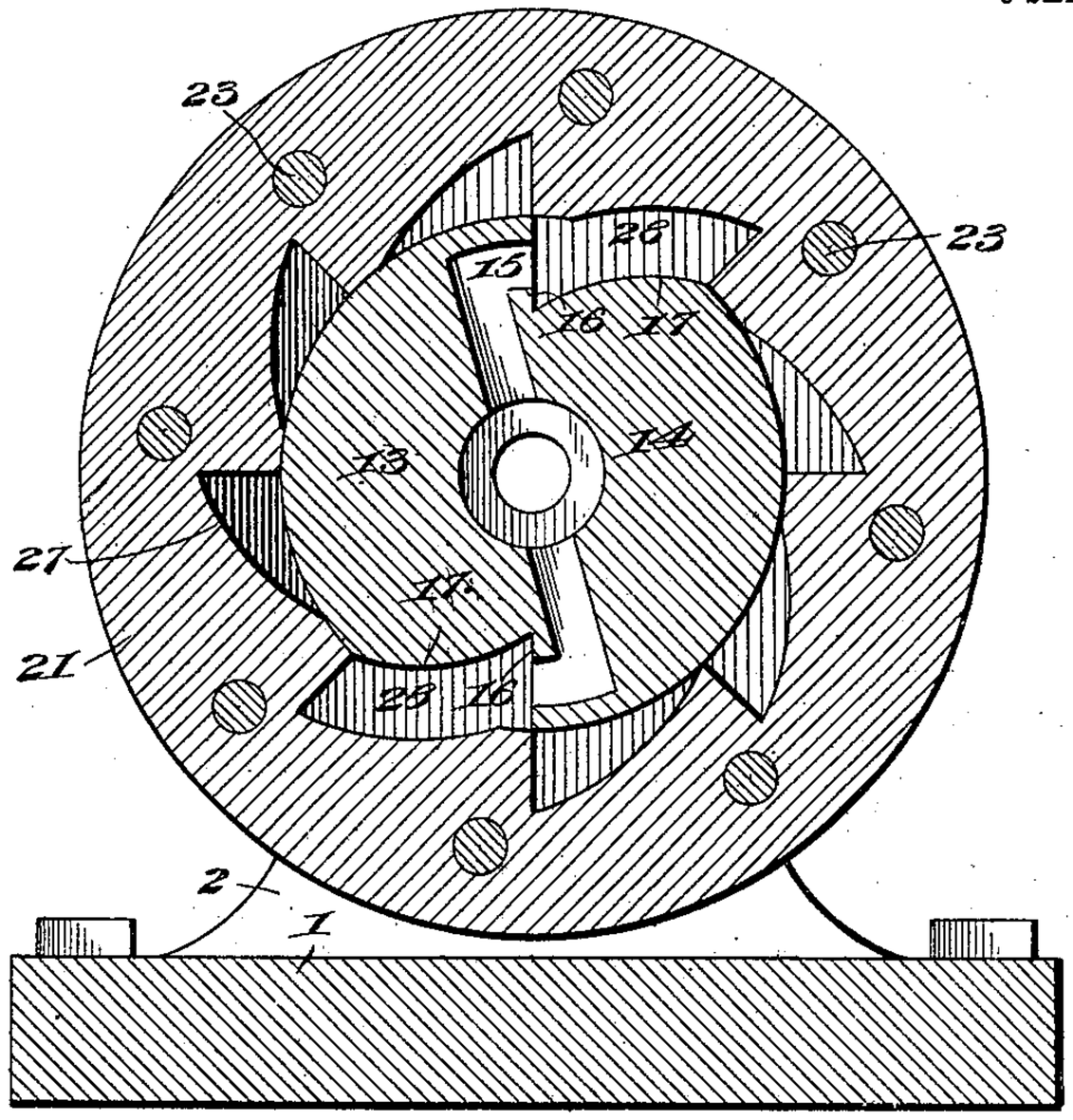
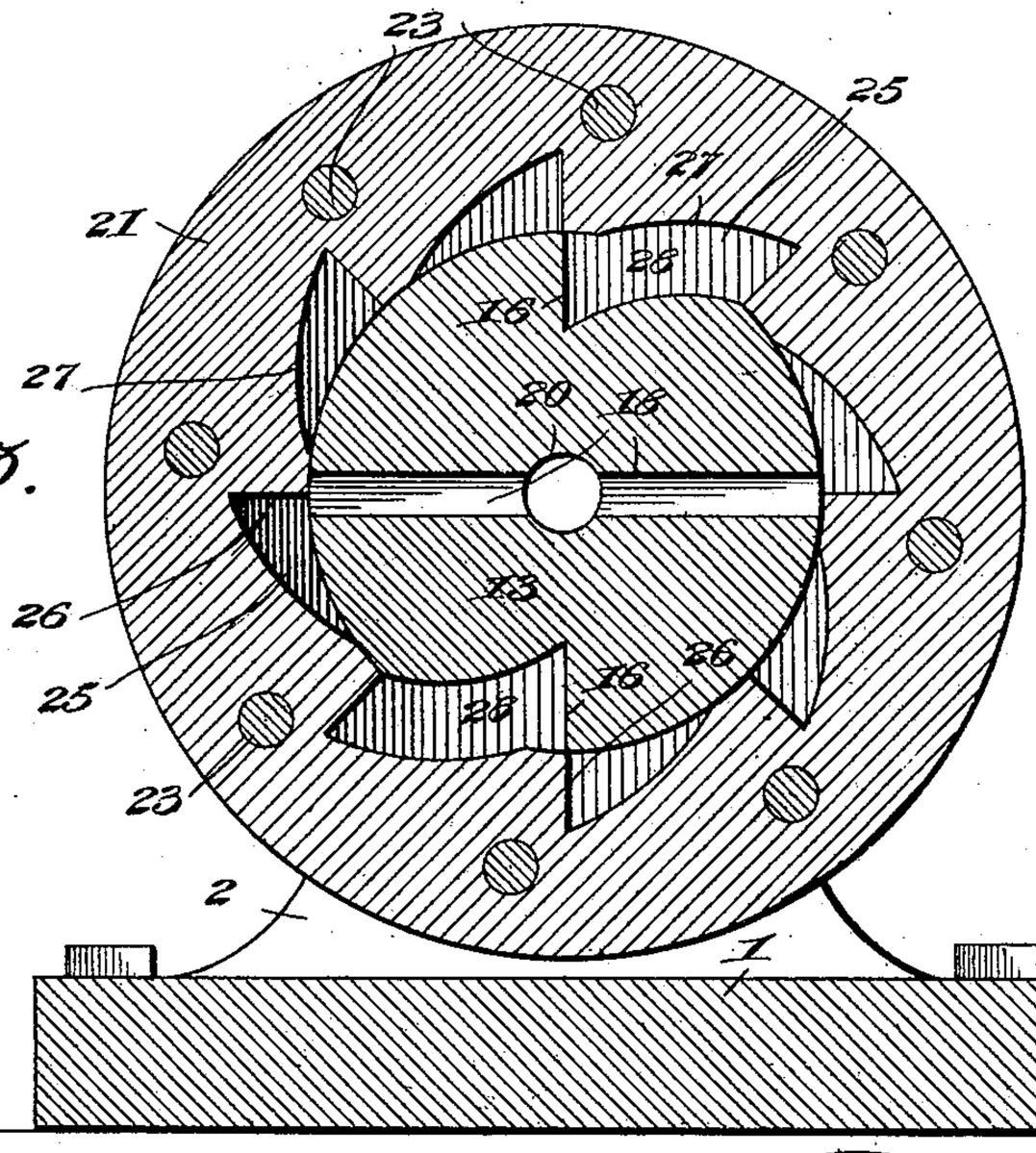


Fig. 3.



Witnesses

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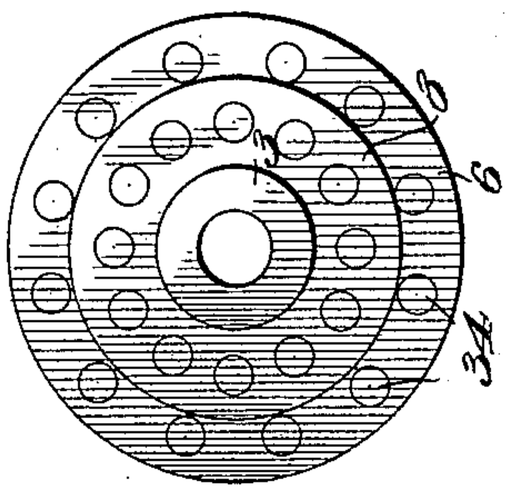
3 SHEETS—SHEET 3.

Fig. 7.



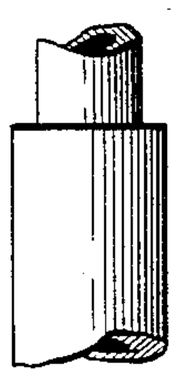


Fig. 6.

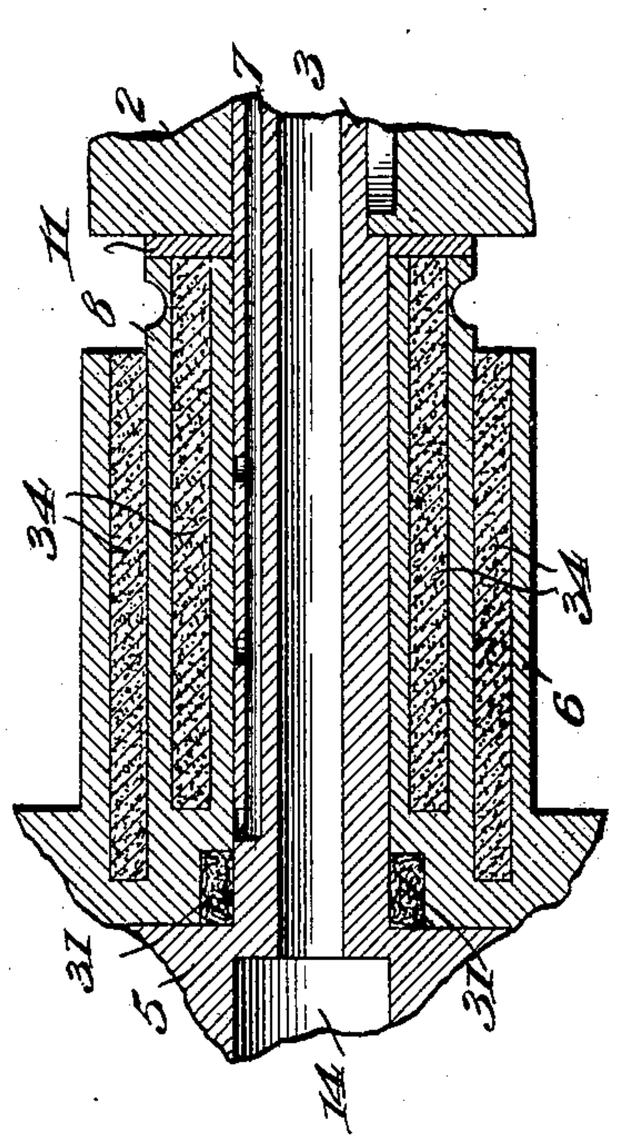


Fig. 4.

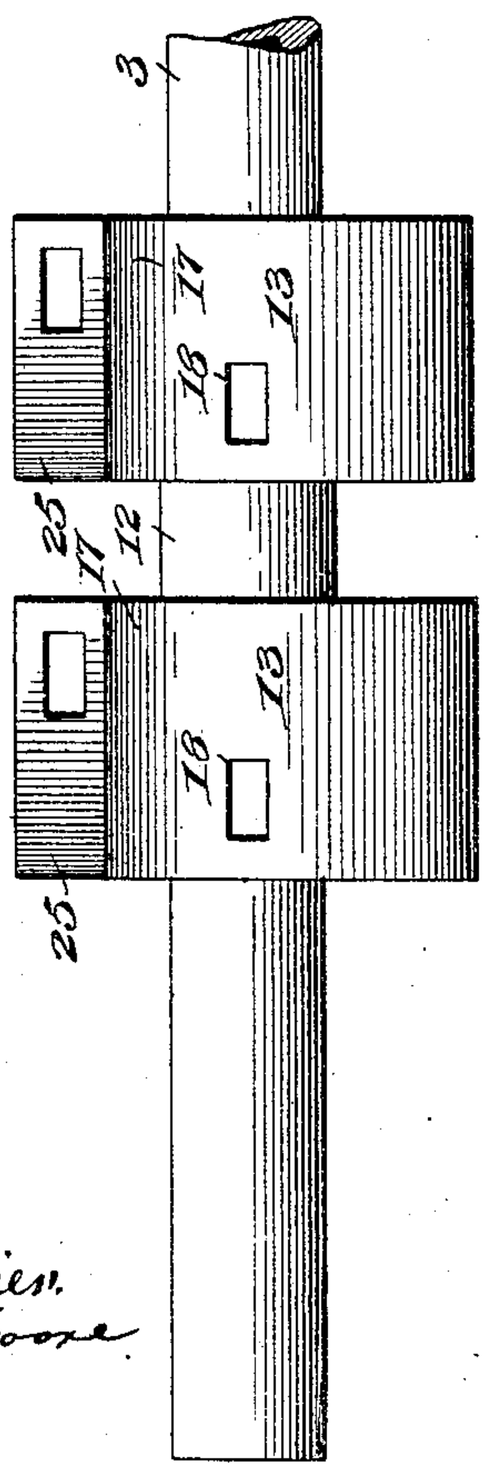
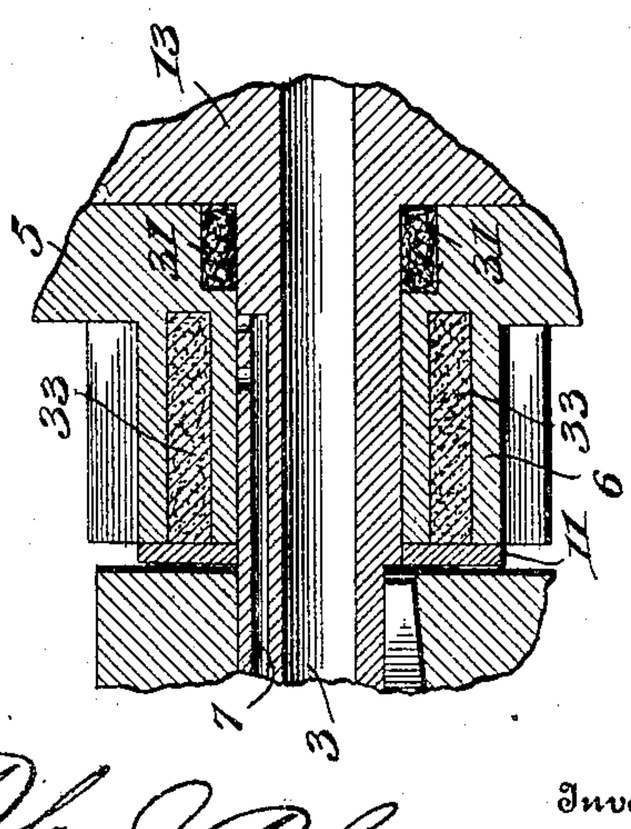


Fig. 5.



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UNITED STATES PATENT OFFICE.

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ROTARY ENGINE.

No. 886,765. Specification of Letters Patent. Patented May 5, 1908.

Application filed July 15, 1907. Serial No. 383,790.

To all whom it may concern:

Be it known that I, WILLIAM JEFFERSON CHANCE, a citizen of the Dominion of Canada, residing at Dawson, in the Yukon Territory and Dominion of Canada, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification.

My invention relates to improvements in rotary engines, and refers in particular to the class of motors in which a revoluble cylinder is adapted to rotate about a stationary piston, and the primary objects of my invention are the provision of a machine of this character which shall be economical of fuel consumption and shall utilize the full power of the motive fluid, which may be readily controlled at will, and which shall occupy but a small amount of space so as to be readily adaptable for a great variety of uses.

Another object of my invention is to reduce the number of moving parts to the machine, in this case there being only one movable element so that the friction and wear is reduced to the lowest minimum, the full force of the impelling fluid being thereby converted into useful power, rendering the machine very efficient in operation.

Other objects are to dispense with the valve mechanisms usually called for in such machines, to combine and balance the parts so that the rotary element at all times is being impelled by the steam or other motive fluid and thus avoid dead-centers, and also to produce a machine in which there shall be no vibration or trembling.

A further object of the invention is the provision of a rotary engine which may be made either simple or compound in its operation, and which by but slight alterations or additions in its structure may be compounded any number of times.

With the above and other objects in view, my invention consists of a stationary piston having induction and exhaust ports therein, and a revoluble cylinder adapted to rotate about said piston, said cylinder having consecutive recesses adapted to act as piston heads to receive the force of the impelling fluid.

My invention further comprises a rotary engine embodying certain other novel features of construction, combination and arrangement of parts substantially as disclosed herein, specifically set forth in the claims and as illustrated in the accompanying drawings, in which:

Figure 1, is a vertical longitudinal sectional view of the same. Fig. 2, is a transverse sectional view of the engine taken on line 3—3 of Fig. 2, through the inlet ports of the stationary element or piston. Fig. 3, is a like view taken on the line 4—4 of Fig. 1, through the exhaust ports of the piston. Fig. 4, is a detail view of the stationary piston showing the arrangement of inlet and exhaust ports therein. Figs. 5 and 6, are broken sectional views of a modified form of end hub for the cylinder. Fig. 7, is an end view of one of such hubs.

In the drawings: The numeral 1, designates the bed of the engine provided with the posts or standards 2, in which is keyed or otherwise fixedly secured, the hollow supporting shaft 3, which forms the steam or other motive fluid inlet and exhaust conduit.

Mounted for rotation upon the stationary shaft is the cylinder 4, having the cylinder heads or ends 5, these heads being provided with hub extensions 6, which form the journal bearings for the support of the cylinder. One of the hubs of the cylinder is preferably formed with gear teeth as shown at the left in Fig. 1, and the other as shown at the right is left plain, so that by connection with the hubs of the cylinder, power may be communicated either by gear, belt or friction drive, or if so desired, the driving connection may be applied direct to the outer rim or surface of the cylinder.

As shown in the sectional view Fig. 1, the ends of the supporting shaft are preferably formed with a channel or openings 7, extending inward therefrom to admit lubricant to the hub bearings of the piston, these two, being the only bearings of the machine. A pulley 8, is also preferably carried by the cylinder at one end, which by means of a suitable connection 9, serves to drive the governor pulley 10, the governor and valve being mounted on the inlet end of the shaft to control admission of the motive fluid to the machine. Thrust rings 11, are also usually mounted on the shaft at the ends of the cylinder, and when the machine is used for marine work, these thrust rings are preferably ball bearing.

Where the engine is designed for compound expansion, as is the case of the one shown in the annexed drawings, in which the

expansion is double, the hollow shaft is preferably made in a number of sections, the adjoining sections being secured by screw threads 12, as shown, or fastened together in other like manner. Upon each of the adjoining ends of the shaft sections, are mounted or preferably formed integral therewith, the circular enlargements or pistons 13. The steam is led into the forward ends of the pistons by way of the hollow shaft and into the radial steam ports 14, which are preferably two in number and extend in opposite directions from the center of the piston. At a point slightly inward from the periphery of the piston, these live steam ports are directed angularly as at 15, and the ports open to an angular shoulder or recess 16, formed in the periphery of the piston. From the base of this shoulder at the mouth of the live steam port, the surface or face of the piston is flared off in a tangential curve 17, to its coincidence with the periphery. Disposed substantially at right angles to the live steam ports in the piston and in rear of said live steam ports as shown in Fig. 2, are the straight-way exhaust ports 18, which also extend in opposite directions from the center of the piston, there being an abutment wall 19, placed between the central portions of the inlet and exhaust ports to prevent the steam from passing direct from the inlet to the exhaust ports. A short central passage 20, extends from the exhaust ports of the first piston to the intake ports of the second piston, and so on, in order, according to the number of pistons used, and the expansion of the steam is thus compounded.

The body or shell of the cylinder may be made of one continuous piece, or as shown in the longitudinal sectional view, it may consist of the outer ring members 21, forming the shell proper, and the intermediate members or division walls 22, the whole being clamped together by the fastening bolts 23, the heads of the bolts being received in countersunk recesses 24, in the faces of the cylinder heads. The annular shell members 21, or rings of the cylinder, surround the pistons and are provided on their inner periphery with the spaced buckets 25, the buckets having an angular abutment face 26. The buckets taper from the foot of the abutment wall or face in a gradual curve 27, and coincide with the inner peripheral line of the cylinder. The buckets all incline in the same forward direction and are of such length that when one bucket is about to pass the shoulder at the mouth of the live steam port on the stationary piston, the next forward bucket is in full communication with the recess at the mouth of said port, the bucket and recess in the piston thereby forming an expansion chamber 28, this relation of the parts being clearly illustrated in Fig. 3. The steam when it enters these so-called expansion chambers, impinges against the angular abutment wall of the bucket causing the cylinder to rotate, and as the bucket passes the exhaust port in the piston, the steam escapes from the bucket through said port, thence in the manner before described to the inlet ports of the next piston in order. The arrangement of the ports in the piston and cylinder thus forms a coöperative valve action to alternately admit and exhaust the impelling fluid to and from the respective buckets in the cylinder, and by this arrangement there are no idle points in the movement of the cylinder. The annular division wall 22, of the cylinder extends inward between the pistons, and an inner washer 29, is preferably carried by said wall to form a steam tight joint between the different pistons. Gaskets or packing rings 30, of lead or other suitable material are preferably clamped between the different members of the cylinder to insure a perfectly tight joint. The piston heads are also preferably formed with an annular recess 31, on their inner faces to receive the piston packing 32. In this case, I prefer to use a packing composed of woolen tape, asbestos and graphite.

It will be evident that by increasing or diminishing the number of pistons and the other parts accordingly, the machine may be compounded and the power multiplied as much as desired, or if desired, the machine may be built to operate by simple or single expansion. The motor hereinbefore described thus partakes of the nature both of a turbine and rotary engine, possessing the desirable qualifications of each.

From the foregoing description taken in connection with the drawings, the operation of my invention will be readily understood, its advantages be appreciated, and it will further be apparent that I have produced a practical and efficient rotary engine which accomplishes all the results herein disclosed as the objects of the invention.

In order to make the cylinder as light as possible and to render it less conductive of heat, I find it advisable to honeycomb the supporting hubs on the ends of the cylinder with a series of openings which may be left open or which are afterwards plugged up with some non conductive material. This construction is illustrated in Figs. 5, 6 and 7, Fig. 5, indicating the gear end of the hub which is provided with a series of longitudinal circularly arranged perforations or openings 33, therein. The other or plain friction hub of the cylinder is formed with an inner and outer series of concentric openings 34, therein, the openings of the opposite concentric series preferably being arranged to alternate as shown in the end view so as not to weaken the hub. These openings in the hubs may be left open, or if so desired, they may be plugged up with a composition of

asbestos and plaster of paris, which forms a good heat insulator and prevents loss of power due to heat radiation. I prefer to use the above composition to plug up the openings in the hubs, but of course any other agent which will serve the purpose as well, may be employed.

I claim:

1. A rotary engine comprising a hollow intake shaft, stationary pistons mounted thereon, separate inlet and exhaust ports in each piston, the exhaust ports of one piston being connected to the inlet ports of the next consecutive piston, and a revoluble cylinder having abutment faces adapted to be acted upon by the fluid issuing from the inlet ports of the pistons, and to automatically discharge the exhaust fluid to the exhaust ports of the pistons.

2. A rotary engine comprising a hollow stationary intake shaft, stationary pistons mounted thereon, oppositely extending radial intake ports being formed in the forward ends of each piston, and similarly arranged exhaust ports arranged in the rearward portion of each piston, a revoluble cylinder surrounding the pistons, and abutment pockets formed in the interior walls of the cylinder adapted to allow passage of the inpelling fluid from the exhaust to the inlet ports of the respective pistons.

3. A rotary engine comprising a hollow intake shaft made in sections, stationary pistons mounted on each section, oppositely extending radial intake ports being formed in the forward ends of each piston, radial exhaust ports located in rear of the inlet ports and arranged at right angles thereto, a revoluble cylinder surrounding the pistons, and abutment pockets being formed in the interior walls of the cylinder to establish communication between succeeding ports in order.

4. A rotary engine comprising a hollow intake shaft made in sections connected by screw threaded joints, stationary pistons on each section, a revoluble cylinder surrounding the pistons and having inwardly extending partition walls separating the pistons on the shaft, there being oppositely extending radial intake ports in the forward portions of each piston and radial exhaust ports in the rear of each piston disposed at right angles to the intake ports, the cylinder having abutment pockets formed on its interior walls establishing communication between the ports of the pistons in succession.

5. In a rotary engine, the combination with a stationary and a rotary member, the rotary member having supporting hubs, and said hubs having longitudinally arranged heat-insulating openings therein.

6. In a rotary engine, the combination with a stationary and rotary member, one of said members having supporting hubs provided with openings therein, and heat insulating material in said openings.

7. An engine comprising stationary and rotary members, one of said members having supporting hubs provided with openings therein, and a composition of asbestos and plaster of paris filled in said openings.

8. A compound rotary engine comprising a hollow intake shaft arranged in separable sections, a piston on each section, radial intake ports being formed in each piston and exhaust ports arranged in rear of such intake ports, a revoluble cylinder surrounding the pistons, and abutments formed in the interior walls of the cylinder to admit passage of the impelling fluid from the exhaust to the inlet ports of the successive pistons.

9. A compound rotary engine comprising a hollow shaft arranged in separable sections, a piston on each section having intake ports formed therein and exhaust ports arranged in rear of such intake ports, a revoluble cylinder surrounding the pistons, and pockets in the walls of the cylinder to allow passage of the impelling fluid from the exhaust to the inlet ports of the successive pistons, the cylinder having end hubs adapted to transmit power.

10. A rotary engine comprising an intake shaft, stationary pistons mounted thereon, there being radial intake ports formed in the forward ends of each piston and exhaust ports arranged in rear of said intake ports, a revoluble cylinder surrounding the pistons, abutment pockets formed in the walls of the cylinder to establish communication between the succeeding ports, hubs on the ends of the cylinder for transmitting power, and means for controlling admission of motive fluid to the pistons.

11. A rotary engine comprising a hollow intake shaft, stationary pistons mounted thereon and each provided with radial intake ports and exhaust ports arranged in rear of the intake ports, a revoluble cylinder surrounding the pistons having end hubs adapted to transmit power, means for lubricating the hubs and cylinder, abutments on the inner wall of the cylinder to receive the impact of the impelling fluid and to lead said fluid to the successive ports in order, and a governor for controlling admission of the impelling fluid.

12. An engine comprising a hollow intake shaft, stationary pistons mounted thereon, separate inlet and exhaust ports in each piston adapted to discharge from one to the other in succession, a revoluble cylinder surrounding the pistons having abutment faces to be acted upon by the impelling fluid, and partitions carried by the cylinder separating the pistons on the shaft.

13. An engine comprising a hollow intake shaft, pistons mounted thereon, the pistons having separate inlet and exhaust ports there-

in arranged in succession, a revoluble cylinder surrounding the pistons having abutment faces to be acted upon by the impelling fluid, the cylinder having end hubs supporting the same, one end hub forming a frictional driving element and the opposite hub a positive driving element for transmitting power.

14. An engine comprising a hollow intake shaft and stationary pistons mounted thereon, each piston having separate inlet and exhaust ports adapted to discharge from one to the other in succession, a revoluble cylinder surrounding the pistons having pockets to be acted upon by the impelling fluid, the cylinder having supporting hubs provided with driving means for transmitting power, and partitions separating the different pistons on the shaft.

15. The combination with a stationary piston having a supply inlet and ports radiating therefrom terminating in angularly directed outlets opening into recessed portions in the surface of the piston, a cylinder mounted to rotate about said piston provided with angular pockets which in combination with the recessed portions of the piston form expansion chambers, the piston being further provided with radial exhaust ports in rear of the inlet ports to free the expansion chambers of the impelling fluid.

16. The combination with one or more stationary pistons having inlets and ports radiating therefrom and terminating in angularly directed outlets opening into recessed portions in the surface of the pistons, a cylinder mounted to rotate about said pistons provided with angular pockets which in combination with the recessed portions of the pistons form expansion chambers, the pistons being further provided with radial exhaust ports located in rear of the inlet ports and disposed angularly with respect thereto, division walls between the different pistons, means for controlling admission of impelling fluid to the inlet ports, and means for transmitting power from the cylinder.

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

WILLIAM JEFFERSON CHANCE.

Witnesses:
ETTA. DE PENCIER,
FRED. G. CRISP.