No. 657,409. Patented Sept. 4, 1900.

A. H. GOULD.

ROTARY ENGINE.

(Application filed Feb. 21, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

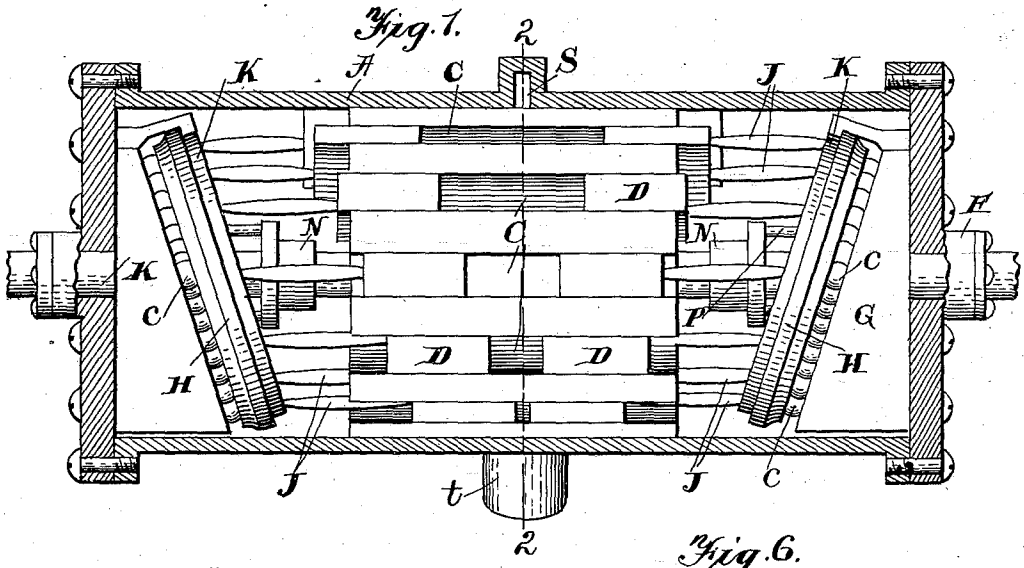
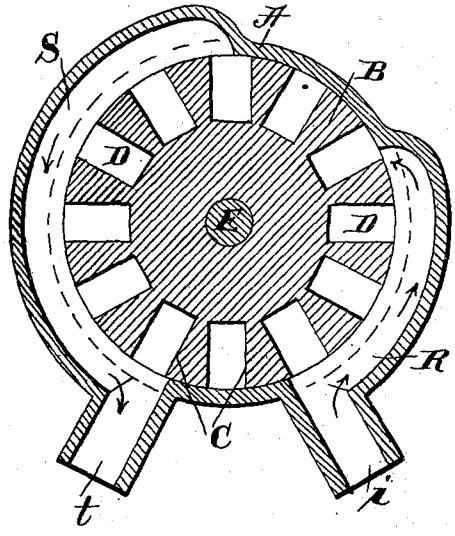


Fig. 6.

Fig. 2



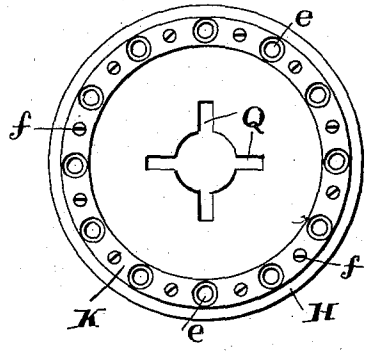


Fig. 7.

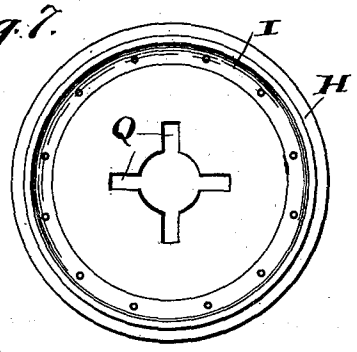


Fig. 8.

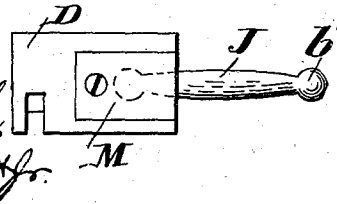


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Fig. 3.

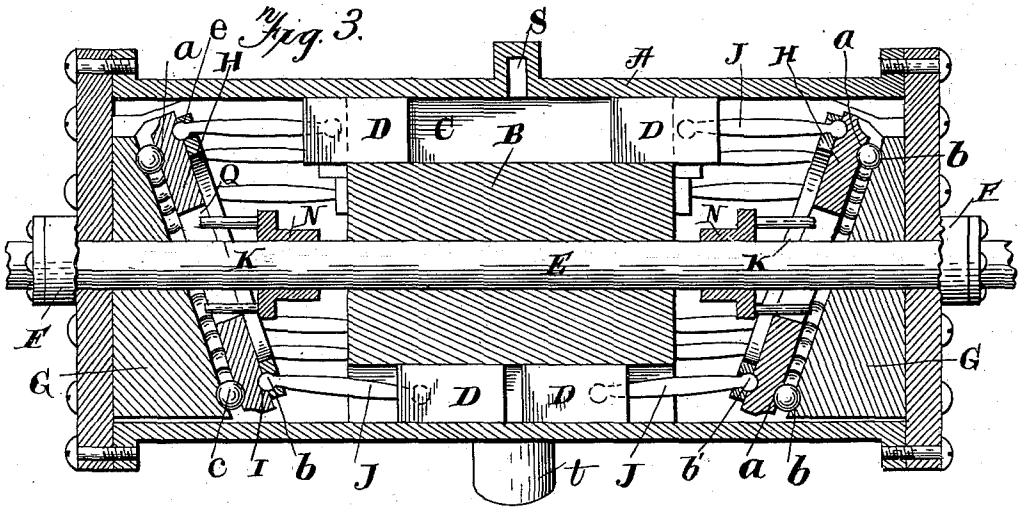


Fig. 4.

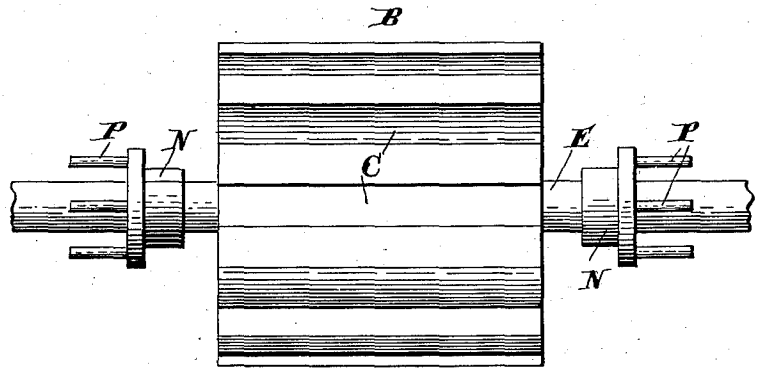
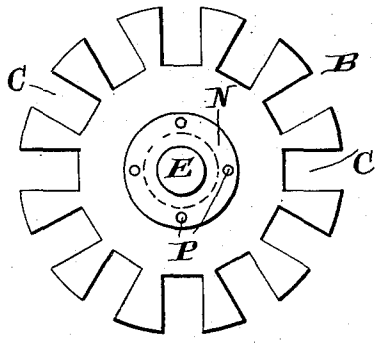


Fig. 5.



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UNITED STATES PATENT OFFICE.

ALEXANDER H. GOULD, OF TOLEDO, OHIO.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 657,409, dated September 4, 1900.

Application filed February 21, 1900. Serial No. 6,073. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER H. GOULD, a citizen of the United States, residing at Toledo, in the county of Lucas and State of Ohio, 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 pertains to that type of engines which includes a revolving mandrel or armature carrying a plurality of pistons which through the medium of piston-rods act upon an inclined surface for revolving the mandrel or armature, all of which will be fully described hereinafter, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is an interior side elevation of the mechanism constituting my invention, the casing being shown in section. Fig. 2 is a transverse sectional view on the line 2 2 of Fig. 1. Fig. 3 is a longitudinal vertical central sectional view of Fig. 1. Fig. 4 is a detached side elevation of the mandrel or armature and its shaft. Fig. 5 is an end elevation of Fig. 4. Fig. 6 is an interior end elevation of one of the revolving rings, the piston-securing band being shown in position thereon. Fig. 7 is a similar view to Fig. 6 with the piston-holding band removed. Fig. 8 is a detached view of one of the pistons, showing the manner of connecting the pitman thereto.

Referring now to the drawings, A is a cylindrical casing in which is situated a revoluble armature or mandrel B. This mandrel or armature B is provided with a plurality of longitudinally-extending recesses or grooves C in its periphery, which recesses or grooves constitute piston-receiving cylinders, as will be more fully explained hereinafter. The periphery of this mandrel or armature B fits snugly the inner surface of the sides of the cylinder A, the said cylinder sides constituting the outer wall of the said grooves, thus providing a plurality of inclosed longitudinally-extending grooves C, which, as before stated, constitute piston-receiving cylinders. Situated in each of these piston-receiving grooves C are two pistons D, the said pistons being independent of each other for the purpose of being forced in opposite directions by the introduction of steam between them. The mandrel or armature B is provided with a concentric longitudinally-extending shaft E, which has its end journaled in suitable bearings F at the ends of the cylinder A.

Situated within the cylinder A at its ends are the inclined surfaces G, and these surfaces are rigidly supported or connected in any desired manner with the said cylinder. Situated just inside of these inclined surfaces G are the revoluble and oscillating or wabbling disks H, the outer surfaces or sides of the said disks being provided with concaved annular ball-receiving grooves *a*, which register with correspondingly-arranged ball-receiving grooves *b*, formed in the inclined surfaces G. Placed within these ball-receiving grooves are a plurality of balls *c* and which constitute the ball-bearing between the revoluble and oscillating disks H and the inclined surfaces G, as will be readily understood. The inner surfaces of these revolving disks H are provided with a circular groove I, which is adapted to receive the inner ball-shaped ends *b'* of the pitman J, and the inner ball-shaped ends of the pitmen are secured in position by means of a ring K, which is provided with a plurality of openings *e*, which register with the recess formed in the inner face of the revolving disk H and larger in diameter than the adjacent stem portion of the pitman, whereby the disks are permitted to wabble or oscillate in respect to the pitman in the operation of the engine. These pitman-securing rings are held in place by a suitable number of screws *f*, passing therethrough between the pitman-receiving perforations *e*. The opposite and inner ends of the pitman J are connected with the pistons D by means of suitably-constructed plates M, which fit in recesses formed in the pistons, the said plate M and the pistons being provided with recesses corresponding to the shape of the end of the pitman sufficiently larger to permit a relative oscillation or free movement of the parts.

The shaft E is provided with a collar N of any suitable construction, and this collar N is provided with a plurality of outwardly-projecting pins P, which are adapted to enter the radially-arranged slots Q, formed in the inner faces of the revolving disks H in their

center. These pins and collars serve to lock or hold the armature or mandrel B (through the intervention of the collar N and the shaft) against independent revolution, whereby when one is rotated the other is correspondingly rotated or revolved.

By reference to Fig. 2 it will be seen that the center of the cylinder or casing A is provided with a steam-inlet port R, which extends part way around (approximately one-fourth) the said cylinder, and consequently a corresponding distance around the mandrel or armature. This steam-inlet port R has an inlet-opening *i* communicating with its inlet end, and this port R is in communication with the grooves C at a point between the inner ends of the pistons D, the inlet end of this port being in communication with the piston-receiving grooves at a point slightly above the lower side of the armature or mandrel B, and consequently admits steam between the piston-heads just as the pistons are traveling up the inclined surface of the end pieces G through the medium of the revolving disk H, to which the outer ends of the pitman are attached. The opposite side of the cylinder A is provided with an exhaust-port S, which extends nearly half-way around the cylinder, and consequently nearly half-way around the armature or mandrel B, and this exhaust-port S is in communication with the piston-receiving grooves at a point between their inner ends, the said exhaust-port S having an outlet *t* for the outward passage of the steam.

In operation steam is admitted through the inlet-port *i* and being continuously fed between the piston-heads within the piston-grooves as the armature revolves in the direction indicated by arrow in Fig. 2 tending to force the said pistons apart, and their pitmen are forced against the revolving oscillating disks H, causing them to revolve, owing to their inclination, and in turn the disks cause the revolution of the armature or mandrel B through the medium of its shaft and the pins P. When the pistons have reached the inner end of the steam-port R, then from that point on the expansion of the steam is used in the said piston-receiving grooves until the piston reaches a point directly above the center of the axes of the armature, at which point the said groove is placed in communication with the exhaust-port S and permits the escape of the steam. The pistons are brought continuously and consecutively in communication with the steam-inlet port R and consecutively carried in communication with the exhaust-port S before they begin to travel down the incline.

By means of an engine constructed as herein shown and described I am able to utilize the full power of the steam in a plurality of cylinders and to also use the expansion power of the steam, which will be regulated, as will be readily understood, by the length of the steam-receiving port.

I do not here show any throttle or valve in communication with the steam-receiving opening *i*, communicating with the steam-port R; but it will be readily understood that any desired form of throttle or valve will be situated in the communication between this opening *i* and the source of steam for the purpose of regulating the speed of the engine.

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

1. An engine of the type described comprising a rotatable armature having a plurality of longitudinally-arranged piston-receiving grooves formed in its periphery, a casing inclosing the said armature and forming the outer wall of the said piston-receiving grooves, pistons situated in said grooves, an inlet-port and an exhaust-port in communication with said grooves, and pitmen carried by the pistons and working on inclined surfaces carried by the cylinder, substantially as described.

2. An engine of the type described comprising a rotatable armature having a plurality of longitudinally-arranged piston-receiving grooves formed in its periphery with open outer sides, a casing inclosing the said armature and forming the outer wall of the said piston-receiving grooves, a piston situated in both ends of each groove, an inlet-port and exhaust-port in communication with said grooves between the pistons, and pitmen carried by the pistons and working on inclined surfaces carried by the ends of the cylinder, substantially as described.

3. An engine of the type described comprising a rotatable mandrel or armature having a plurality of longitudinally-arranged piston-receiving grooves, two independent pistons situated in each passage, steam and exhaust ports alternately in communication with the said passages between the inner ends of the pistons, inclined rotatable and oscillating disks situated at each end of the said mandrel or armature, and a plurality of oppositely-extending pitmen having their inner ends connected with the said pistons and their outer ends connected to the said rotatable and oscillating disks, substantially as described.

4. An engine of the type described comprising a rotatable mandrel or armature having a plurality of longitudinally-extending piston-receiving grooves, two independent pistons situated in each groove, independent rotatable and oscillating disks supported at an incline and situated at opposite ends of the said armature, the armature and the said disks connected to prevent independent rotation but permitting independent oscillation of said disks, and oppositely-extending pitmen having their inner ends connected with the pistons and their outer ends connected with the said disks, substantially as described.

5. An engine of the type described comprising a rotatable armature having a plural-

ity of longitudinally-arranged piston-receiving grooves formed in its periphery with open outer sides, a casing inclosing the said armature and forming the outer wall of the said piston-receiving passage, pistons situated in the said grooves, an inlet-port in communication with the grooves at their inner ends, an exhaust-port also in communication with the said grooves, an inclined oscillating disk at the end of the armature, a connection between the armature and the disk adapted to hold the same against independent revolution but permitting independent oscillation of the disk, and a plurality of pitmen having one of their ends connected with the pistons and their opposite ends connected with the disk, substantially as described.

6. An engine of the type described comprising a rotatable armature, the said armature having a plurality of longitudinally-arranged piston-receiving grooves in its periphery with open outer sides, a casing inclosing the said armature and constituting the outer wall of the said piston-receiving grooves, inclined oscillating and rotating disks supported at the ends of the armature and within the casing, two pistons situated in each of said grooves, a plurality of oppositely-extending pitmen having their inner ends connected with the pistons and their outer ends connected with the rotatable and oscillating disks, and inlet and outlet ports in communication with the grooves between the said pistons, substantially as described.

7. An engine of the type described comprising a rotatable armature provided with a plurality of piston-receiving passages in its periphery, an inclined surface at the end of the armature, an independent rotatable and oscillating disk journaled against the said inclined surface, the disk having radially-extending slots, longitudinally-extending pins connected with the mandrel and loosely projecting into the said radially-extending slots of the disk, a plurality of pistons in the piston-passages, and a plurality of pitmen having one of their ends connected with the pistons and their opposite ends connected with the said disk, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ALEXANDER H. GOULD.

Witnesses:
WM. L. KEEPERS,
E. H. LOSEE.