(No Model.) 2 Sheets—Sheet 1.

F. J. HAESELER.

ROTARY ENGINE.

No. 538,514. Patented Apr. 30, 1895.

FIG. 1.

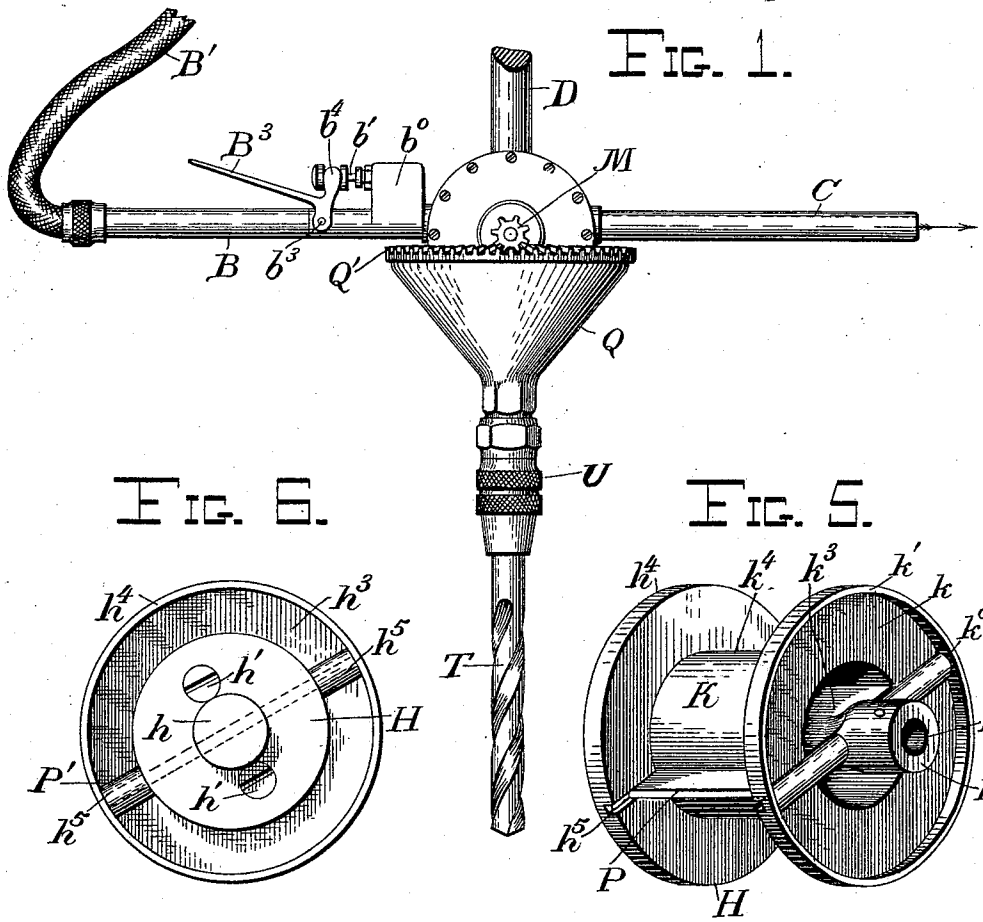

FIG. 6.

FIG. 5.

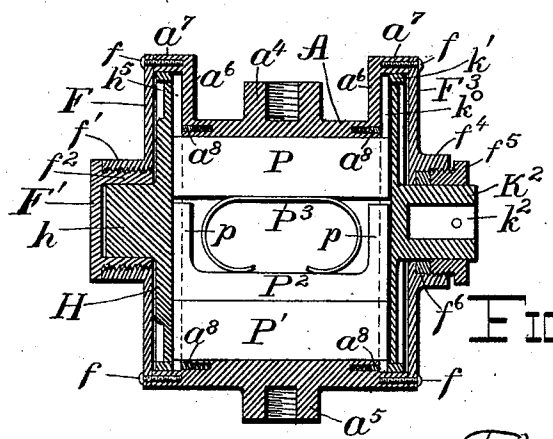

FIG. 4.

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(No Model.) 2 Sheets—Sheet 2.

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ROTARY ENGINE.

No. 538,514. Patented Apr. 30, 1895.

FIG. 2.

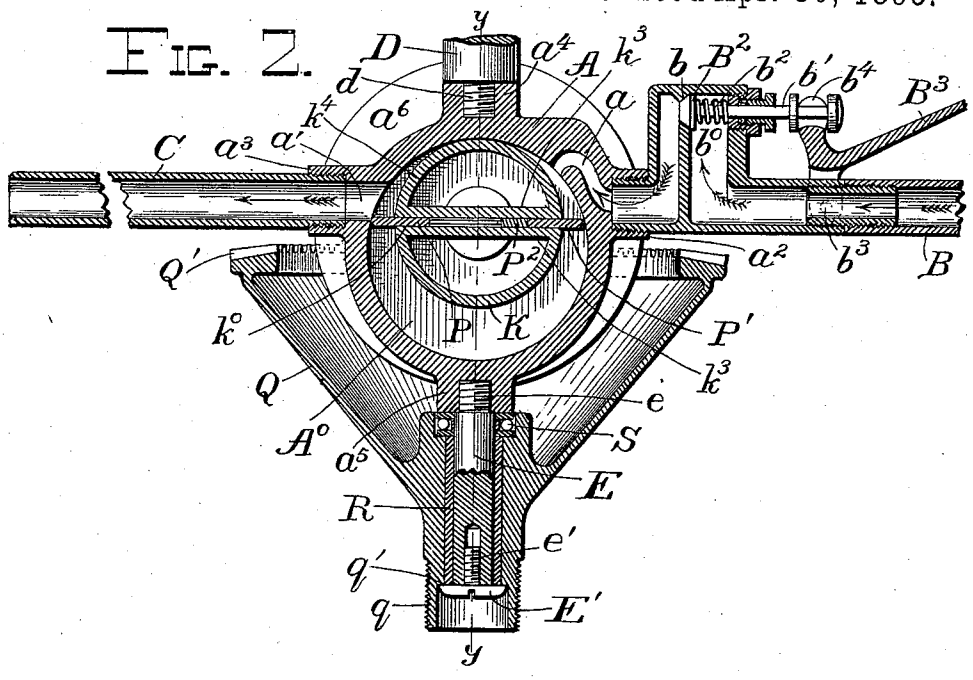
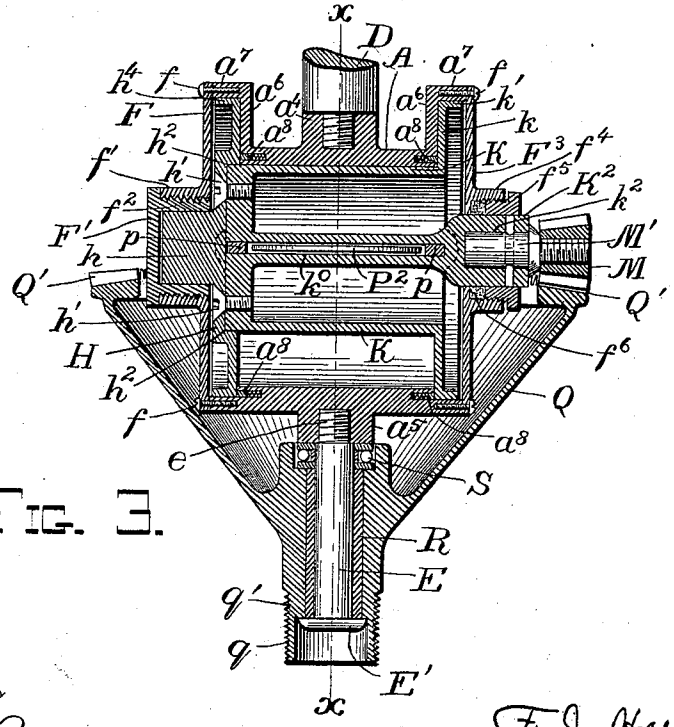


FIG. 3.



Witnesses
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UNITED STATES PATENT OFFICE.

FRANCIS J. HAESELER, OF THE UNITED STATES NAVY.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 538,514, dated April 30, 1895.

Application filed January 11, 1895. Serial No. 534,565. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS J. HAESELER, a lieutenant in the United States Navy, and a citizen of the United States, stationed at Annapolis, in the county of Anne Arundel and State of Maryland, have invented certain new and useful Improvements in Rotary Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in rotary engines and especially in those rotary engines intended for use in drilling and boring, and the said invention consists in certain novel features hereinafter described and claimed.

Reference is had to the accompanying drawings, in which the same parts are indicated by the same letters throughout the several views.

Figure 1 represents a side elevation of my improved engine. Fig. 2 represents a vertical section through the same, the said section being along the line $x\,x$ of Fig. 3. Fig. 3 represents a vertical section through the engine along the line $y\,y$ of Fig. 2. Fig. 4 represents a similar section of the piston and cylinder to that shown in Fig. 3, except that the blades are in a different position. Fig. 5 represents a perspective view of the rotary piston detached from the cylinder and shown on an enlarged scale, and Fig. 6 represents an end view of the rotary piston as seen from the left of Fig. 5.

A represents a solid casting which is bored as at A^0, see Fig. 2, in a trochoidal or substantially elliptical form, the whole constituting what might be termed, the cylinder. Steam, air, or other fluid under pressure is admitted to the said cylinder through the port a, and after accomplishing its work escapes through the port a'. The said cylinder A is provided with perforated lugs a^2 and a^3 interiorly screw-threaded as shown in Fig. 2, and also with similar lugs a^4 and a^5, which are vertically disposed and adapted to receive the screw-threaded ends d and e of the parts D and E hereinafter to be described.

The casting A is provided with eccentric flanges a^6 which are bent over as at a^7 to receive the cylinder heads, while the said casting is recessed to receive the packing ring a^8.

B and C represent the two handles by which the machine is manipulated, and of which C is used as an escape pipe and B as a feed pipe for the operating fluid. When compressed air is used these two pipes may be left uncovered as shown, but when steam is used, they should be covered with non-conducting material.

B′ represents a flexible pipe connected to the feed pipe B, and a similar hose or pipe may be connected to the escape pipe C, if desired. This combined feed pipe and handle B is provided with a valve chamber b^0 and a valve seat b upon which the supply valve B^2 is normally pressed by means of the spring b^2 which closes the valve stem b'. The said valve stem is connected to the fork b^4 of the bell crank lever B^3 which is pivoted at b^3 to the pipe B. It will be seen that whenever the said bell crank lever B^3 is pressed down the fluid will be admitted to the cylinder, and that when the said bell crank lever is released, the spring b^2 and fluid pressure will force the valve B^2 back on its seat thus operating the engine only while the operator presses down the said bell crank lever, and so preventing the said engine from continuing its rotation after the operator has released the said lever.

D represents a standard or other equivalent device by means of which the requisite downward feed may be applied, should other than hand pressure be necessary.

E represents a cylindrical stem screwed as at e into the lug a^5, and having a cap E′ connected to the lower end thereof.

F and F^3 represent the two cylinder heads, which are secured to the rims a^7 by means of the tap rivets f.

The cylinder head F is provided with a cylindrical hub f' with a female screw-thread therein, in which engages the male screw-thread on the part f^2 of the journal bearing F′, the two parts F and F′ together composing an air tight or "blind" cylinder head, in which one of the journals h of the rotary piston M revolves. The opposite cylinder head F^3 is provided with a stuffing box f^4 in which the glands f^5, and packing f^6 are placed,

whereby this end of the cylinder is made tight.

The rotary piston is composed essentially of three parts, the detachable head H, the cup-shaped piston body K, and the blades, which blades are preferably made in three parts as will be hereinafter more fully described. The piston head H is provided with a cylindrical lug h which serves as one of the journals for the piston and the said head is secured to the piston body K, by means of the screws h'. This head is shouldered as at h^2 to fit snugly over the end of the piston body K, is recessed as at h^3, and is provided with an annular rib h^4, all as shown most clearly in Fig. 6. The said piston head is also provided with guide slots h^5 for the piston blade. The piston body K, is set eccentrically in the cylinder and is provided with a flange k terminating in an annular rib k'. The said piston body has a transverse web k^3 on either side of the axis thereof and connecting the shell of the cylindrical portion k^4, inside which web a guide slot k^0 is provided for the piston blades. This web terminates in a cylindrical journal K^2 which is perforated as at k^2 to receive the shaft M′ of the pinion M which shaft is keyed fast in the journal K^2, and revolves with the rotary piston. The blades are preferably made in two rectangular sections P and P′ separated from each other by a double L-shaped plate P^2 provided with arms p between which is placed a spring P^3 under such a tension as to normally press the parts P and P′ outward, but with slight force. When the cylinder is revolving the parts P and P′ will be thrown outward with sufficient force due to centrifugal force and thus they will be held firmly against the interior of the cylinder, and thus prevent any great loss of motive power due to leakage of the fluid around the blades.

The blade P should fit snugly against the arms p but when the wear has been great the said arms will take the weight of the blades, should the same remain long in a fixed position. The spring P^3 is provided for keeping the blades pressed outward after they are worn, and thus enabling an old machine to start from any point.

It will be seen that the spring P^3 may break, or it may be omitted from the machine, and the blades will still work through the operation of the centrifugal force.

The cylinder is bored so that the diameter through the plane of the blades is constant, irrespective of the position of the blades. The blades, therefore can be, and are so adjusted, that the one pushes positively on the other, as the piston revolves, and unless there is a great deal of wear, no adjustments are needed since the centrifugal force will throw the blades close against the interior of the cylinder while the piston is revolving, and the trifling amount of leakage which takes place at starting, is automatically corrected.

Q represents a cone carrying the rack Q′ in which the pinion M meshes. This cone is journaled on the stem E having a sleeve R interposed between it and the said stem, and having the vertical thrust taken up by the ball-bearing S. This cone Q is provided with a shoulder q which fits over the head of the cap E′ on the stem E, and thus enables the cone to be lifted together with the cylinder and its attachments. The lower end q of the cone Q is provided with a chuck U in which the drill T is held.

It will be seen that when the fluid under pressure is admitted to the cylinder, the rotary piston will revolve causing the pinion M to revolve the cone Q and the bit T. It will also be seen that the machine will operate only so long as the lever B^3 is pressed down, thus preventing the accident so common when the operator lets go of the machine while it is still in operation.

By having one end of the cylinder provided with a blind-head, the necessity for packing that end of the cylinder is obviated; and by the herein described construction the cylinder can be conveniently cast in one piece and the parts can be readily assembled. The improved structure of the rotary piston also insures great lightness and rigidity and renders the same capable of being readily put together without the usual precaution in regard to leakage.

By having packing rings a^8 set in the body of the casting A and bearing on the back of the flanged piston heads, a suitable packing is secured without undue wear upon the more delicate parts of the rotating piston, the wear being over the entire vertical surface of the piston-flanges and not in rings on these surfaces.

By having the flanges of the piston at right-angles to the axis of the piston body, the wear on the edges and on the faces of the blades will be uniform, and the centrifugal force will cause the same to adjust themselves to the interior of the cylinder without special adjustments for wear.

As a result of the herein described combination and arrangement of parts an exceedingly light, and durable machine is made which is capable of automatic adjustment and is liable to keep in good running order, without the necessity for the frequent repairs and adjustments so common with rotary engines of a similar type hitherto in use.

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

1. In a rotary engine of the character described, the combination with a cylinder provided with inlet and exhaust ports, of a rotary piston mounted in said cylinder a pinion connected to said rotary piston, a cone provided with a circular rack meshing in said pinion, a ball bearing interposed between said cone and said cylinder, means for connecting the tool to said cone, a hollow handle connected to the exhaust port and also serv-

ing as an escape pipe, a hollow handle connected to the inlet port and also serving as a supply pipe, a spring operated valve normally preventing the passage of the operating fluid, and a hand lever pivoted on said handle and adapted to open said valve when desired, substantially as described.

2. In a rotary engine of the character described, the combination with a cylinder provided with inlet and exhaust ports, of a rotary piston mounted in said cylinder a pinion connected to said rotary piston, a cone provided with a circular rack meshing in said pinion, a ball bearing interposed between said cone and said cylinder, means for connecting the tool to said cone; a hollow handle connected to the exhaust port and also serving as an escape pipe, a hollow handle connected to the inlet port and also serving as a supply pipe; a spring operated valve normally preventing the passage of the operating fluid, and a bell crank lever pivoted to said handle and having one arm connected to said valve and to the other arm extending along said handle and adapted to be readily grasped by the operator, substantially as described.

3. In a rotary engine, the combination with a cylinder, of a piston body slotted through the center of the shaft, and inclosed therein, the rectangular blades P and P′ inclosed in said slot, and the double L-shaped blade P^2 inclosed between said blades P and P′, substantially as and for the purposes described.

4. In a rotary engine, the combination with a cylinder, of a piston body slotted through the center of the shaft, and inclosed therein, the rectangular blades P and P′ inclosed in said slot, and the double L-shaped blade P^2 and a spring inclosed between said blades P and P′, substantially as and for the purposes described.

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

FRANCIS J. HAESELER.

Witnesses:
D. V. BRIGHT,
GEORGE FORBES.