No. 713,663. Patented Nov. 18, 1902.

H. MILLS.

ROTARY ENGINE.

(Application filed Mar. 10, 1902.)

(No Model.)

Fig. 1.

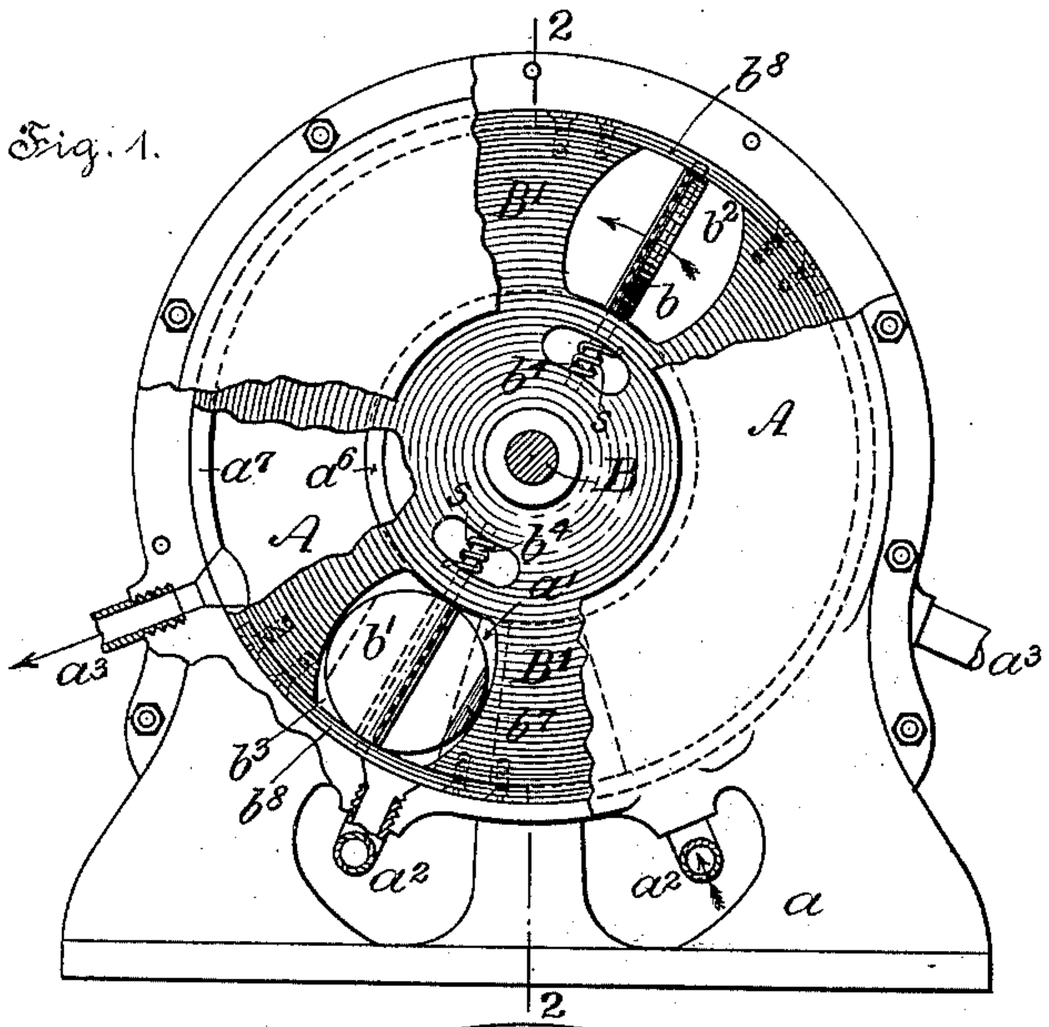


Fig. 2.

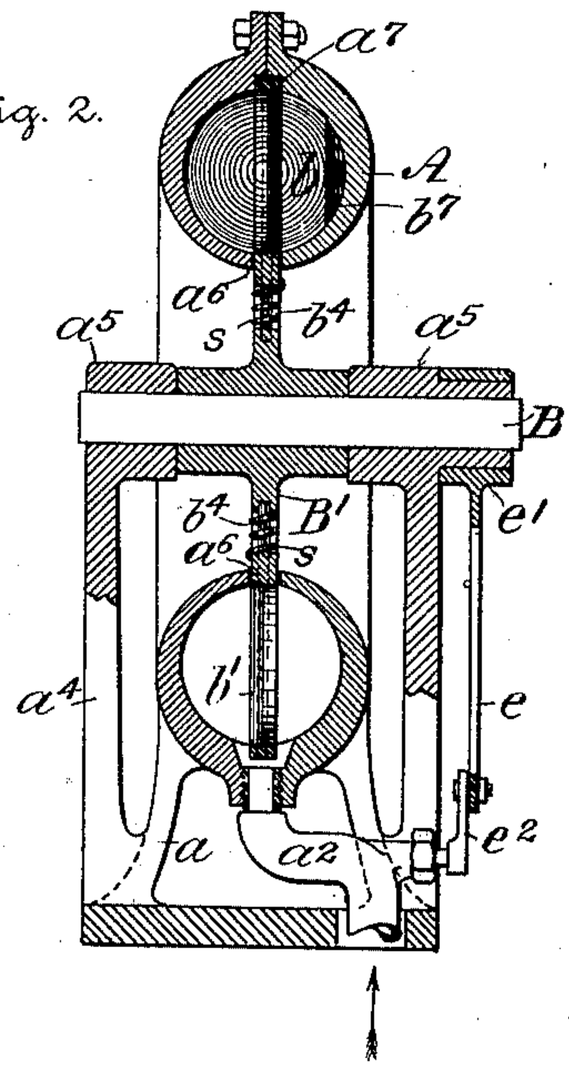


Fig. 3.

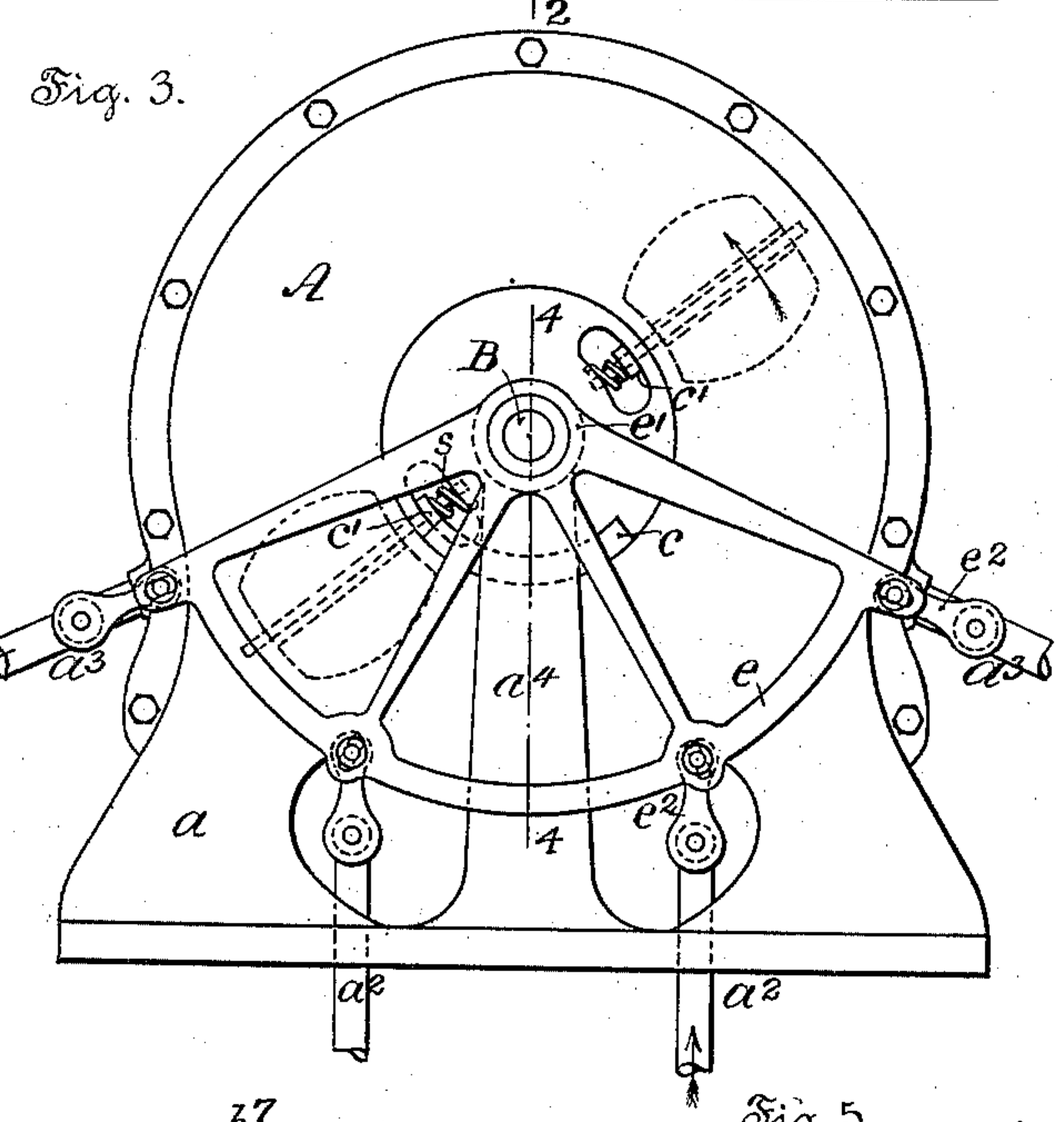


Fig. 4.

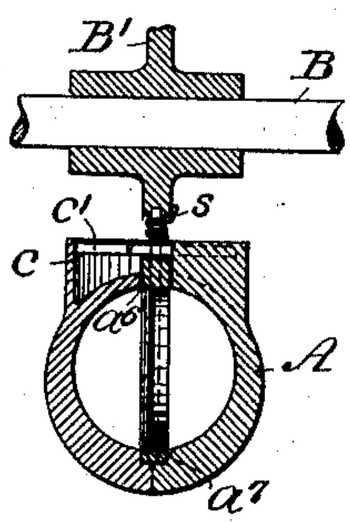
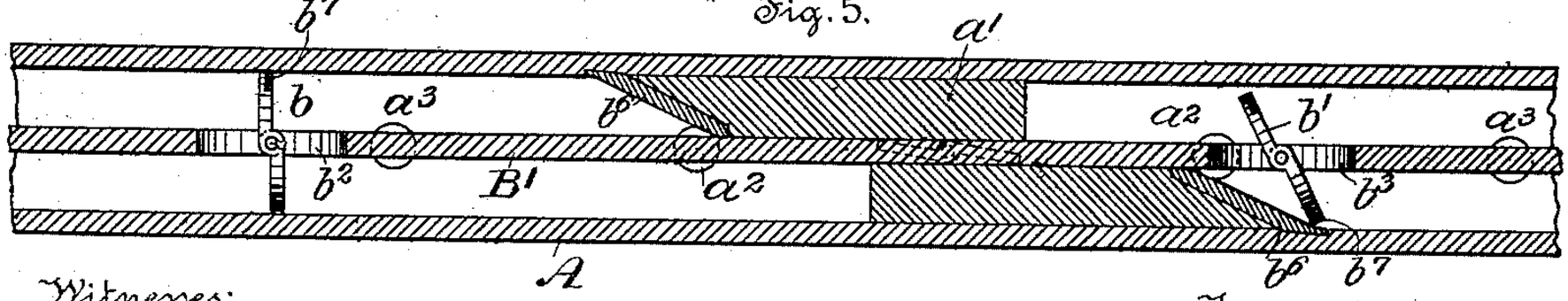


Fig. 5.



Witnesses:

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Att'y.

UNITED STATES PATENT OFFICE.

HARRY MILLS, OF NEW YORK, N. Y.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 713,663, dated November 18, 1902.

Application filed March 10, 1902. Serial No. 97,391. (No model.)

To all whom it may concern:

Be it known that I, HARRY MILLS, a citizen of the United States, residing at New York city, State of New York, have invented new and useful Improvements in Rotary Engines, of which the following is a specification.

My invention relates to rotary engines in which flap-valves mounted on a rotating disk operate as pistons inside an annular tube of any cross-section and forming the steam-cylinder; and the objects of my improvements are to provide a rotary engine which is composed of comparatively few parts, simple in construction, and very efficient in operation, which can be easily adjusted and repaired, having positively no dead-centers to overcome, and being reversible by one motion of a throttle-lever.

My invention consists in the arrangement and construction of the flap-valves operating as pistons and means for manipulating the same.

It further consists in the construction of cylinder-heads inside the cylinder and which serve as a means to control the movements of the said flap-valves or pistons; and my invention further consists of the improvements hereinafter set forth, and pointed out in the claims.

My invention will be more fully understood taken in connection with the accompanying drawings, forming part hereof, in which—

Figure 1 is an elevational view, partly in section, showing my improved rotary engine composed of a tubular ring-shaped pressure-cylinder having inlets and outlets for the driving fluid and a race for a disk provided with one or more pistons and means for operating the latter from the inside of the cylinder. Fig. 2 is a vertical section on line 2 2 of Fig. 1. Fig. 3 is an elevation of my improved rotary engine, showing the means for reversing the direction of running the same and also a modified form of means for operating the pistons. Fig. 4 is a section on line 4 4 of Fig. 3, showing the modified means for operating the pistons; and Fig. 5 is a view showing part of the tubular ring-shaped pressure or fluid cylinder developed and illustrating the means for operating the pistons mounted in a disk having its race or guide in the said cylinder.

Referring now to the drawings for a further description of my invention, A is a tubular ring-shaped fluid or pressure cylinder mounted on a base a and provided with one cylinder-head a', steam-inlets a^2, and steam-exhausts a^3. On the base are secured or formed integral therewith standards a^4, which are provided with journal-boxes a^5 at their tops to carry a shaft B, concentric with the tubular ring-shaped cylinder A. On this shaft B is secured a disk B′, extending therefrom through a slot a^6 of the inner and into a groove a^7 of the outer circumferential wall of the pressure-cylinder A, and it is necessary that this disk B′ fit neatly in the said slot a^6 to avoid loss of steam. Any suitable means may be employed to insure a comparatively tight fit, provided they do not produce friction. To rotate the shaft B, pistons b and b' are arranged diametrically opposite in the openings b^2 and b^3 of the disk B′, and these pistons are mounted on spindles b^4, journaled in the said disk B′ in such a way that they can be turned to receive the driving fluid from its inlet, and thereby rotate the shaft B, or to be turned after they pass the exhaust-pipe a^3 to be in line with the disk B′, and thus to pass through between the section of the cylinder-head a', after which they are again put in position to receive another blast of the driving fluid to rotate the said shaft B and impart power to machinery connected therewith. The pistons $b\,b'$, as before stated, are attached to spindles b^4 and have a contour to fit exactly the cross-section of the ring-shaped pressure-cylinder A, and to allow for the turning of the pistons about the axis of their spindle the flaps on either side are offset, as shown in Fig. 5, so that a diametrical line through the center of the spindle is in line with the opposite faces of the flaps composing the piston in order to produce a tight and right-angular joint between the edge of the piston and the walls of the cylinder A. These pistons are held at right angles to the plane of the disk B′ by spiral springs s, interposed between the spindles b^4 and the disk B′, and are successively opened against their action by wedge-shaped cams b^6, located near the cylinder-head a', so that as soon as one of the pistons b or b' passes the cams b^6 and the proper power-inlet a^2 it automatically swings into position and is ready to be driven

around by the fluid entering between the cylinder-head a' and the piston just described.

The disk B′ divides the pressure-cylinder into two chambers, closed only by two sections of the cylinder-head a', and as the disk is provided with openings b^2 b^3 it is necessary to have the width of the cylinder-head sections a' a trifle longer than the openings b^2 or b^3, so that no driving fluid can pass from one end of one chamber to the other end of the same chamber, as will be more fully understood from Fig. 5. The edges of the pistons b b' may be provided with wearing-plates b^7, which may be renewed whenever required. In order to be able to quickly remove or replace any of the pistons, it is preferred to make the pressure-cylinder in two parts bolted together and to removably mount the spindles b^4 into the disk B′ by providing a cap-piece b^8 for each of the said spindles.

To turn the pistons b b' at the right time, cam-plates c, as shown in Figs. 3 and 4, may be used and attached to the outside of the cylinder A. In this case, however, arms c' must be secured to the spindles b^4 so that they will contact with the cams c much in the same way as shown in Fig. 5, where the cams are placed on the inside of the cylinder A.

In the drawings the engine represented is a reversible one and is provided with two fluid-inlets a^2 and two fluid-exhausts a^3, one of each of which only is open when the engine is running. In order to open one set and close the other set of throttle-valves or close all of the valves, a segmental bar e, with hub e', is mounted on the journal-bearing a^5 and swings concentric therewith. Each of the valves on the inlets and exhausts a^2 and a^3 is provided with an arm e^2, and all of these are connected to said bar e, so that when the latter is in the position as shown all the valves are closed, when moved in one direction one set of valves is open and the other still closed, and when moved in the other direction the other set of valves is open and the one previously open is closed, by which the action of the engine is reversed. The same throttle-valve process could be extended to all the feed and exhaust pipes of a compound, triple, or quadruple expansion plant of these engines. It may also be remarked that modifications in the construction and detail arrangement of parts composing the engine may be made without departing from the spirit of my invention.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a rotary engine an annular steam-cylinder and a rotating disk, having its race in the said steam-cylinder in combination with rotatable flap-valves or pistons mounted in said disk, said valves or pistons having one-half of their respective opposite faces on one diametrical line, substantially as and for the purposes set forth.

2. In a rotary engine an annular steam-cylinder and a rotating disk having its race in the said steam-cylinder, in combination with rotatable flap-valves or pistons mounted in openings of said disk, and having one-half of their respective opposite faces on one diametrical line, and a wedge-shaped cylinder-head inside the steam-cylinder adapted to close the steam-cylinder at one portion in its circumference, said portion being of greater length than the openings in said disk for the said valves or pistons, substantially as and for the purposes set forth.

3. In a rotary engine, an annular steam-cylinder and a rotating disk having its race in the said steam-cylinder, in combination with rotatable flap-valves or pistons mounted in said disk and having one-half of their respective opposite faces on one diametrical line, a wedge-shaped cylinder-head inside the steam-cylinder, adapted to close the steam-cylinder at one portion in its circumference, wearing-plates on said flap-valves and the cylinder-head and means for manipulating the said flap-valves, substantially as and for the purposes set forth.

4. A rotary engine comprising a ring-shaped pressure-cylinder a race in said cylinder, a shaft journaled in bearings concentric with the said cylinder, a head in said cylinder, a disk attached to said shaft and fitting the said race two pistons attached to spindles journaled in openings of said disk, means for turning said pistons into the plane of said disk and at right angles thereto, fluid inlets and outlets in said pressure-cylinder, valves for said inlets and outlets and a segmental bar fulcrumed to the shaft-bearing and connecting with said valves, substantially as and for the purposes set forth.

In witness whereof I have hereunto set my hand, in the presence of two subscribing witnesses, this 6th day of March, 1902.

HARRY MILLS.

Witnesses:
THOS. R. SWAIN,
HERMANN BORMANN.