No. 696,245. Patented Mar. 25, 1902.

F. G. KENNEDY.

ROTARY STEAM ENGINE.

(Application filed Aug. 7, 1901.)

(No Model.)

Fig. 1.

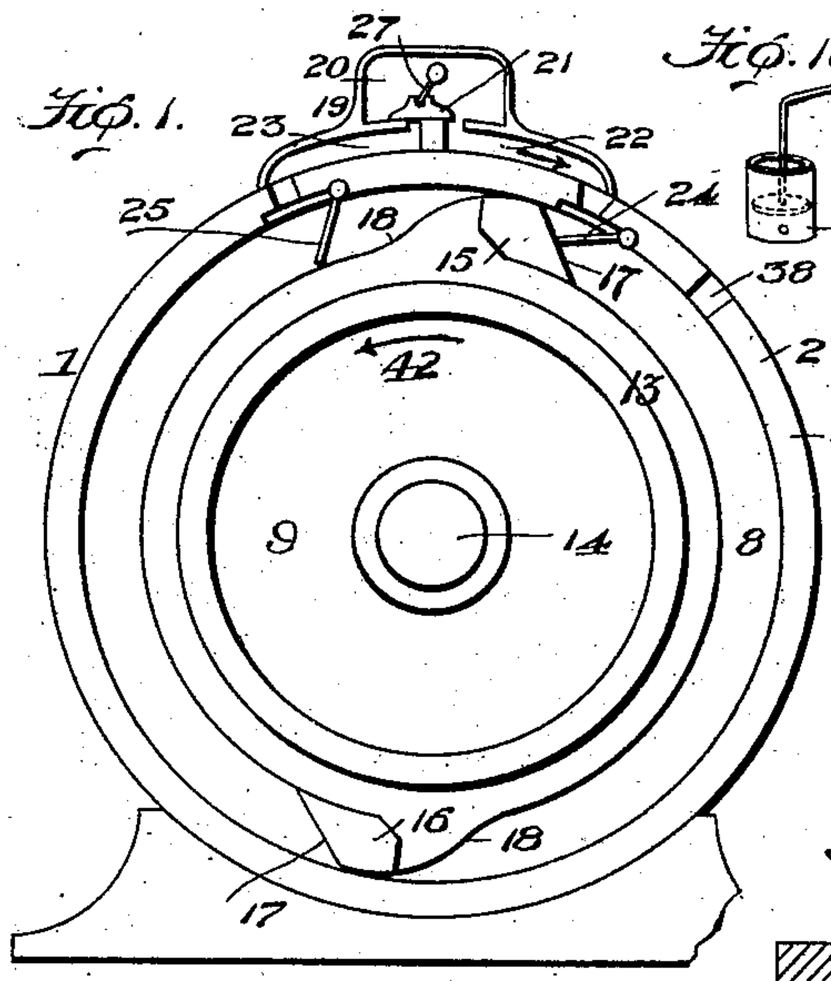


Fig. 10.

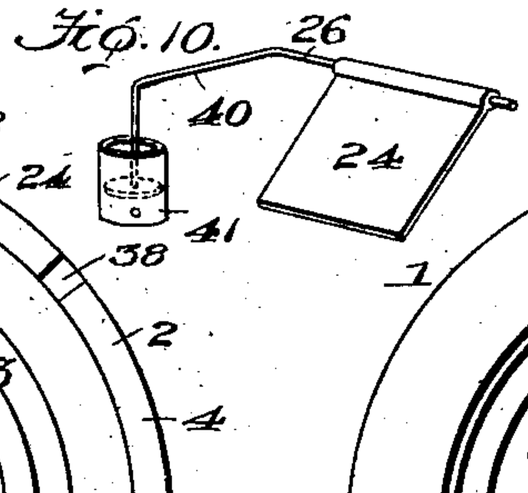


Fig. 2.

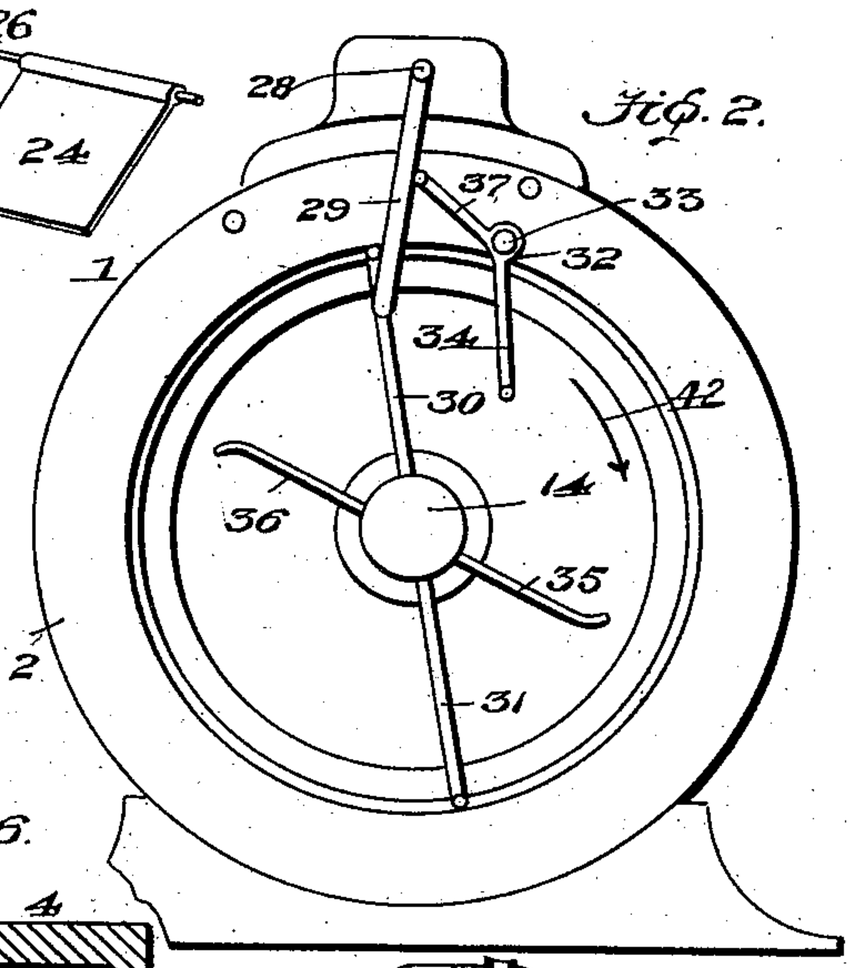


Fig. 6.

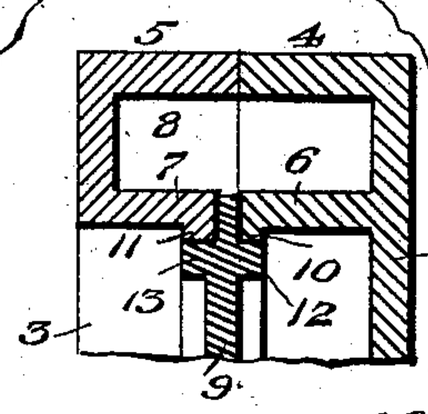


Fig. 8.

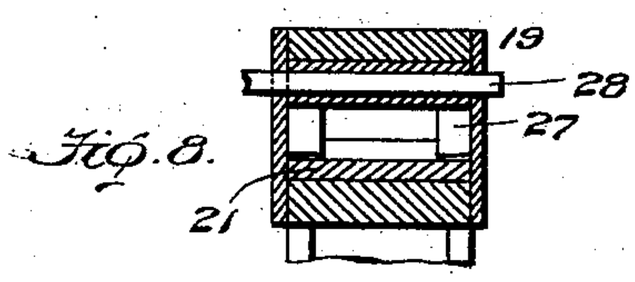


Fig. 9.

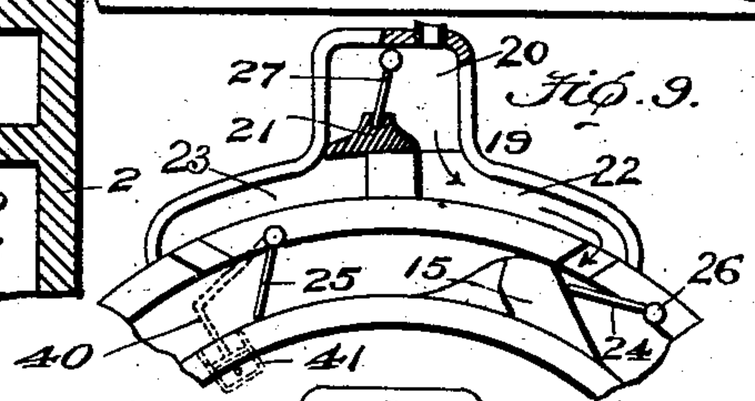


Fig. 3.

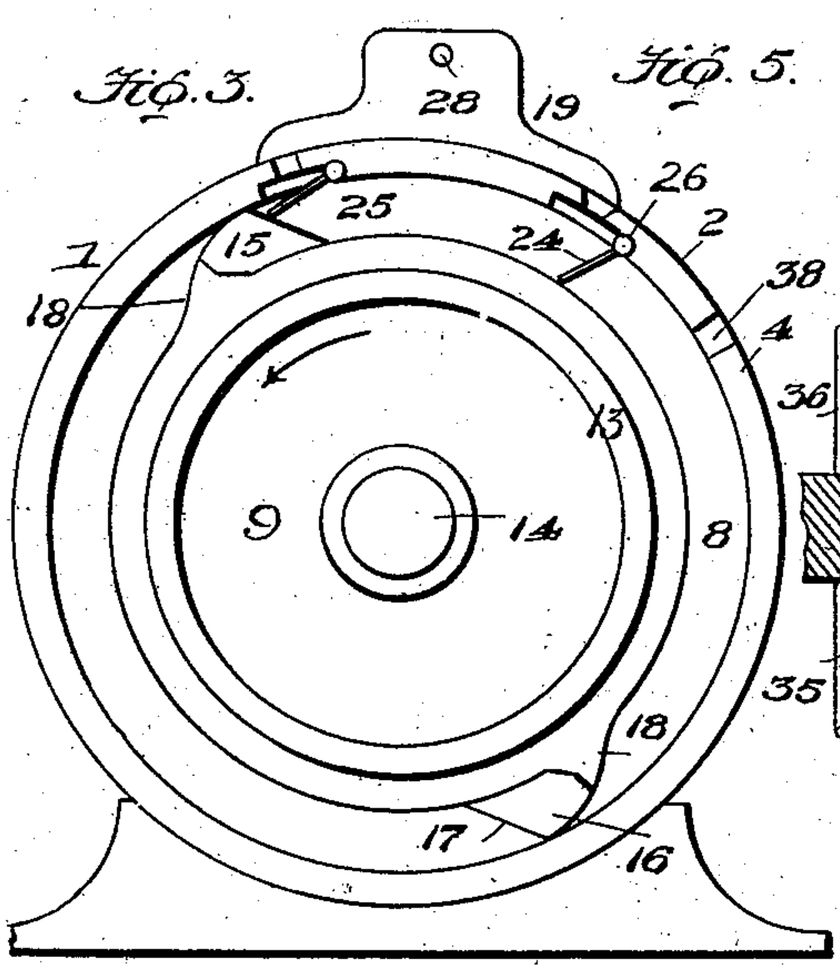


Fig. 5.

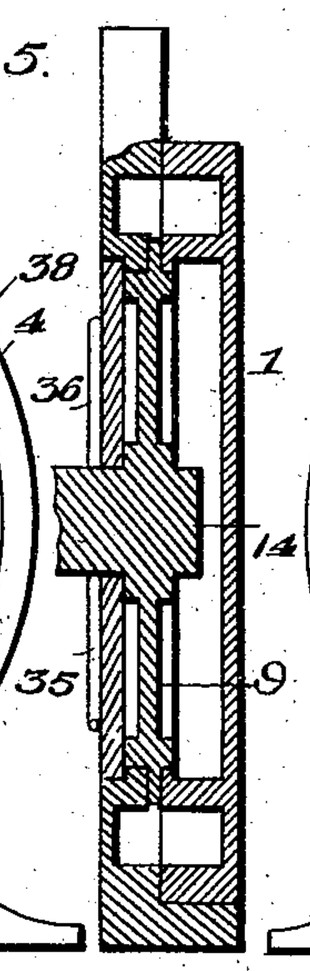


Fig. 4.

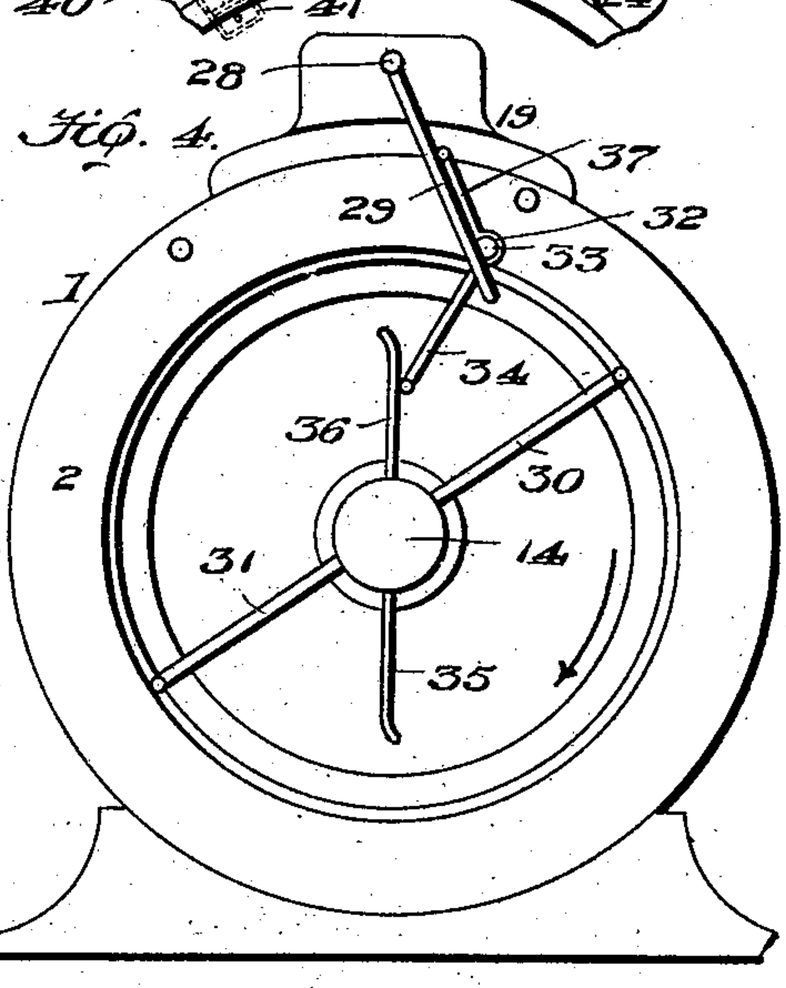
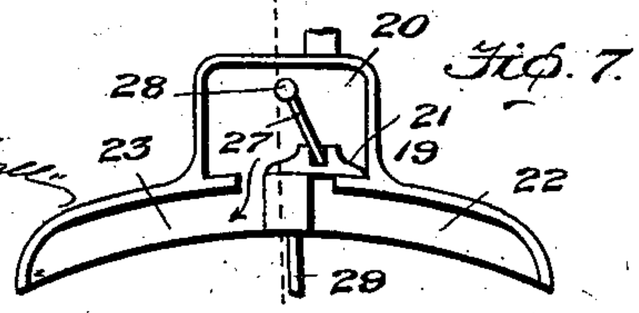


Fig. 7.



Witnesses

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FORREST G. KENNEDY, OF PHILADELPHIA, PENNSYLVANIA.

ROTARY STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 696,245, dated March 25, 1902.

Application filed August 7, 1901. Serial No. 71,213. (No model.)

To all whom it may concern:

Be it known that I, FORREST G. KENNEDY, a citizen of the United States of America, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Rotary Steam-Engines, Concentric Pistons, of which the following is a specification.

My invention, which relates to rotary engines, is directed more particularly to improvements in the type of engine employing a concentrically-disposed piston; and the improvements have for their object the production of a simply and durably constructed rotary engine, in the operation of which a constant unvarying steam-pressure is at all times exerted against the abutments to obtain an uninterrupted and uniform speed.

The nature of my invention will be readily comprehended, reference being had to the following detailed description and to the accompanying drawings, in which—

Figure 1 is a view in elevation of the interior of a rotary engine embodying my invention, showing the parts in one position. Fig. 2 is an elevation of the opposite side of the engine and showing the correlative parts in corresponding position. Figs. 3 and 4 are views similar to Figs. 1 and 2, but showing the parts in their other position. Fig. 5 is a vertical transverse sectional view of the engine. Fig. 6 is an enlarged sectional view of portion of the casing and piston. Fig. 7 is an enlarged sectional view of the slide-valve casing and valve. Fig. 8 is a sectional view on line 8 of Fig. 7. Fig. 9 is an enlarged view of the slide and abutments in the positions they occupy in Fig. 1. Fig. 10 shows the cushion connection for the flap-valves.

Referring to the drawings by numerals, 1 denotes the engine-casing, consisting of two disks 2 3, having inner peripheral flanges 6 7, whereby there is provided an annular chamber 8. The disks are bolted or otherwise secured together with the outer flanges 4 5 abutting; but between the inner flanges 6 7 a space is provided for the reception of the outer portion of the piston-disk 9, the periphery of which is preferably slightly below the inner surfaces of the flanges 6 7 for a purpose to be presently explained. The flanges 6 7 terminate at their inner ends in depending flanges 10 11, and on the piston-disk are annular flanges 12 13, which contact with the depending flanges 10 11 and coöperate therewith to prevent leakage. The piston-disk is fixed to a central shaft 14.

15 16 are piston-heads carried by the piston-disk and which completely fill the chamber 8 transversely. The piston-face or steam side 17 of each head is inclined, and at the opposite side of each head is a cam-surface 18, extending from the periphery of the piston-disk to the top of the head.

Above the casing and seamed thereto is a valve-casing 19, having a chamber 20, connected with the steam-supply and in which is arranged a valve 21, adapted to alternately open and close two ports 22 23, communicating with the chamber 8.

24 25 are swinging abutments which are arranged to be successively engaged by the piston-heads to control the admission of steam. The abutments 24 25 are preferably of the flap type and are each pivoted or hinged on a pintle-rod 26, to be engaged at its lower edge by the cam-surface 18 on the piston-heads and elevated to close its respective port, the abutment when in closing position occupying a depressed seat, whereby it forms no obstruction to the piston-heads.

The valve 21 is preferably of the slide type and, as above stated, in its movements both ports are controlled. The valve is slidably supported in the chamber 20 and is moved by a forked arm 27, fixed to an oscillating shaft or stem 28, one squared end of which extends outwardly beyond the valve-casing. Fixed to and depending from the shaft end is an arm 29, arranged in the path of two arms 30 31, carried by the shaft 14. The arms 30 31 alternately engage the arm 29 to rock the shaft 28 and move the valve in one direction, and to move the valve in the opposite direction there is employed a rock-lever 32, pivoted by a screw or bolt 33 on the outer side of the engine-casing and having an arm 34 in the path of and engaged alternately by two arms 35 36, also on the shaft 14, to move its other arm 37, whereby the rock-arm 29 is engaged and the valve moved in the opposite direction.

In operation steam is admitted to the valve-casing chamber, and assuming that the parts

are in the positions shown in Figs. 1 and 2 the steam enters the chamber 8 past the abutment 24 and exerting pressure against the piston-head 15 drives the piston disk and shaft to the left. The inclined piston-face of the piston-head is engaged by the abutment, and this arrangement prevents a too-sudden movement of the latter. In its full open position the lower edge of the abutment rests at an inclination on the flanges 6 and 7, but slightly out of contact with the reduced periphery of the piston-disk, whereby friction between these parts is avoided, as in Fig. 6. In the movement of the piston-disk the piston-head 15 passes the abutment 25, closing the latter by the engagement of the cam-surface 18, and the instant said abutment is passed the slide-valve 21 is shifted through the described connection to close the port 22 and open the port 23, whereby the abutment 25 is opened by gravity and steam-pressure, and the steam-pressure is exerted against the piston-head 15 through the port 23 before any material diminution of the pressure obtained through the port 22 is permitted. The steam-pressure is therefore constant as contradistinguished from intermittent, and as a result the speed of the engine is uninterrupted and uniform. In the further rotation of the piston-disk the slide-valve is reciprocated and the abutments 24 and 25 are alternately moved by the piston-head 16 in the manner already described, it being understood that the parts are so timed as to secure a uniform movement, regardless of whether one or the other abutment is in action. The steam exhausts through the opening 38.

I do not limit myself to the particular types of abutment employed, nor is the illustration and description of a specific slide-valve-controlling means to be regarded as a limitation, as many modifications may be made in the various parts without departing from the spirit of my invention.

The rapidity of the motion of the piston in the direction of the arrows 42 will cause the abutment in sliding down the incline of the piston-head under the pressure of the steam to strike the concentric walls at the base of the piston-head with a hammer blow, and to prevent this I provide for cushioning this blow. This provision consists of an air-cushion, which may be in the form of a dash-pot 41, Figs. 9 and 10, which may be fastened in any suitable way to the casing, the piston of the cushion being connected to the hinge of the valve outside of the casing by an arm 40, as in Fig. 10, so that the descent of the abutment will at the same instant cause the dash-pot piston to descend upon the air-cushion, and thereby ease the contact of the abutment upon the casing-walls.

I claim as my invention—

1. In a rotary engine, a casing having an annular chamber, a valve-casing communicating with the chamber by passages, a slide-valve in the valve-casing, a swinging abutment in the casing at each passage, a rotary piston and piston-heads on the piston each having an inclined steam-face to ease the opening of the swinging abutments and with a cam-surface to close the said swinging abutments.

2. In a rotary engine, the annular steam-chamber having a bottom wall 6 7 divided by a continuous opening, in combination with a rotary disk piston its circumferential wall part closing and forming a steam-tight joint between said bottom wall parts and its periphery being within the bottom surface of said steam-chamber, and swinging abutments in said chamber, resting upon the bottom wall parts, free of frictional contact with the circumference of the rotary piston.

3. In a rotary engine, the combination of a casing, a rotary piston therein, a valve controlling the steam-ports, an arm on the valve-stem, arms on the piston-shaft engaging the stem-arm in one direction, a rock-lever and other arms on the shaft arranged to move the rock-lever to engage the stem-arm in the opposite direction.

4. In a rotary engine, a casing having annular circumferential flanges 4 and 5 and inner flanges 6 and 7 of less projection than the outer flanges forming an annular chamber, in combination with a piston-disk having annular flanges 12 and 13 on its opposite sides and a peripheral rim between the ends of the inner flanges joining and closing the opening between the latter and terminating slightly below their inner surfaces, the separated ends of the inner flanges terminating in depending flanges 10 and 11 in joint forming contact with the piston side flanges, piston-heads fixed on the rim of the disk and swinging abutments in the casing coacting with said piston-heads.

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

FORREST G. KENNEDY.

Witnesses:
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JOSIE SALLER.