W. HARTMANN.

ROTARY ENGINE.

APPLICATION FILED JUNE 27, 1910.

1,011,619. Patented Dec. 12, 1911.

Fig. 2.

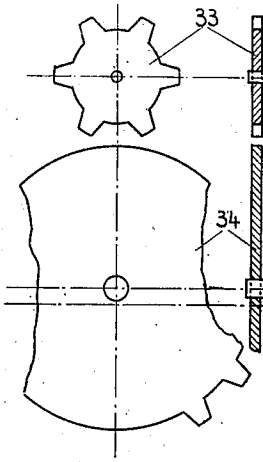


Fig. 1.

Fig. 3.

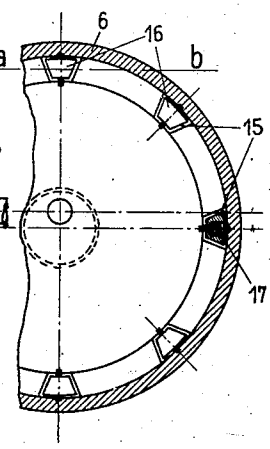


Fig. 5.

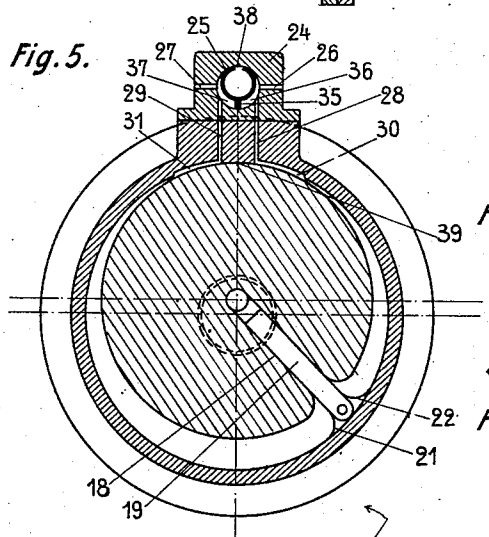


Fig. 4.

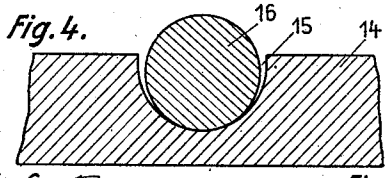


Fig. 6.

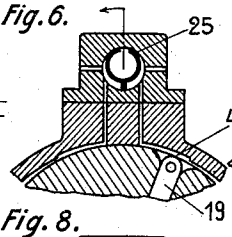


Fig. 7.

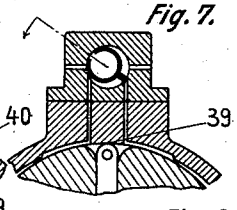


Fig. 8.

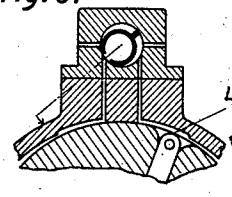


Fig. 9.

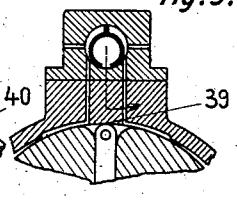


Fig. 10.

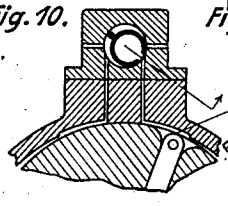
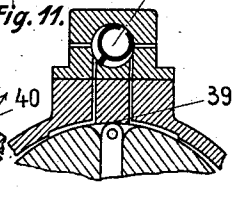


Fig. 11.



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UNITED STATES PATENT OFFICE.

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ROTARY ENGINE.

1,011,619. Specification of Letters Patent. Patented Dec. 12, 1911.

Application filed June 27, 1910. Serial No. 569,066.

To all whom it may concern:

Be it known that I, WILLY HARTMANN, a subject of the King of Saxony, resident of Dresden, Germany, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification.

This invention relates to a rotary engine which is characterized by the conical shape of the piston and its casing whereby it becomes possible to maintain a perfect joint between these two parts by means of controlled re-adjustment.

The invention further concerns the means for the automatic re-adjustment of all parts according to their wear.

The sliding vane mounted in the eccentrically arranged piston is connected with a disk mounted upon the casing in such a manner that the sliding vane is pulled during the revolutions of the piston so that the curvature of its edges is tightly pressed against the inner wall of the cylinder, said sliding vane having further two lateral elastic projections which also bear against the inner wall of the cylinder and serve to increase the tight joint between the sliding vane and the cylinder.

The invention further consists in the regulation of the admission of the explosive mixture, and of the air for combustion, of the exhaust of the burned gases and of the air which has been drawn in for cooling which are all effected by a gear of particular construction. This gear consists of a casing mounted upon the cylinder of the engine and having channels for connecting the engine cylinder and the inlet- and outlet-ports. A hollow drum like plug is mounted in said casing which has an annular shoulder bearing against the wall of the casing and further a slot in its outer surface and which is controlled periodically by cams in such a manner that the connecting channels are alternatingly opened and closed.

In the accompanying drawings the improved rotary engine is shown.

Figure 1 is a longitudinal section through the engine. Fig. 2 shows in elevation part of the cams for actuating the valve-gear. Fig. 3 represents in plan view part of the device for the automatic re-adjustment. Fig. 4 is a cross section on line *a—b* of Fig. 3; Fig. 5 is a cross section of the engine; Figs. 6 to 11 represent in cross section the different positions of the regulating plug.

The improved engine consists of the conical cylinder 1 and of the conical piston 2 keyed upon the shaft 3 which is concentric with the drum but eccentric with the casing. The shaft 3 is fixed in the well known manner in the cylinder covers 4 and 5. The large end of the cylinder 1 is enlarged at 6 so that a shoulder is formed which serves as abutment for the disks 7 and 8. A ball bearing 9 is arranged between the disks 7 and 8. The disk 7 is mounted upon a hub 10 of disk 8, on which it can revolve. Upon threaded parts of the shaft 3 nuts 11 and 12 are screwed which serve for re-adjusting the position of the piston 2 in the cylinder 1. Said nuts have washers 12 running on ball bearings 13.

The following device serves for the automatic re-adjustment of different parts of the engine. A crown 14 is formed on the outer surface of the disk 8. Conical rollers 16 mounted on shafts fixed in the inner wall of the casing are continually pressed by springs 17 against the inclined bottom of groove 15 of said crown 14. The pressure exerted by the rollers 16 upon the crown 14 is transmitted in vertical direction to the disk 7 and to the piston 2. Said rollers 16 serve for uniformly pressing the disk 8 against the joint rings whereby all the revolving parts are well tightened. This device is covered by the vaulted lid 5.

In a radial slot 18 extending over the entire length of the piston 2 a sliding vane 19 is located which is connected with the disk 7 by means of a bolt 20. Said sliding vane has a curved outer edge which slides along the inner wall of the cylinder 1 and is kept in contact with the same owing to the disk 7 to which it is fixed. To insure an absolutely tight joint between said slide valve and the cylinder wall blades 21, 22 of elastic material are provided which are fixed to said sliding vane and slide along said cylinder wall.

The valve gear is mounted upon the boss 23 of the cylinder 1. It consists of the casing 24 and of the hollow plug 25 mounted in the same. The casing 24 has inlet channels 26, 27 and channels 28, 29 leading to the cylinder. Said cylinder 1 has cavities 30, 31 which communicate with the orifices of the channels

28, 29. A toothed wheel 33 (Fig. 2) with six teeth is fixed upon the shaft 32 of the plug 25 said disk being driven by the disk 34 fixed upon the driving shaft and having two teeth. The plug 25 is eccentrically mounted in the boring of the casing 24 and it bears against the wall of said boring on the one hand with its rib 35, extending over the entire length of the plug, and on the other hand with its surface at the point which is situated opposite said rib. At this point of the surface the plug has a passage 38. Two hollow spaces 36, 37 are thus formed between the plug and the wall of the boring of the casing.

The engine operates as follows:—The piston 2 revolves in the cylinder 1 and its periphery bears against the part 39 of the inner wall of the cylinder, said part being situated between the channels 28 and 29. The space formed between the cylinder wall and the piston, owing to the eccentric position of the piston in the cylinder, is separated into two compartments by the sliding vane 19. The engine has a three-revolution cycle and its work begins by drawing in the explosive mixture, the plug 25 being in the position shown in Fig. 6, and the suction channel 26 communicating with channel 28 (see Figs. 6 to 11). The sliding vane 19 which at this moment has already passed the channel 28, will now during almost one complete revolution produce a suction until the sliding vane 19 has reached the point 39 of the wall of the cylinder turning in the direction of the arrow (Fig. 7). At this moment the plug is turned for one sixth of its perimeter as the first tooth of the disk 34 engages with the corresponding tooth of the disk 33, the plug being thus brought to the position shown in Fig. 7 that is to say the cylinder is completely shut off from suction 26. The sliding vane 19 continues its way and passes over point 40; it now compresses the gas. At the moment when the sliding vane 19 passes the point 40 the second cam of the disk 34 turns the plug 25 for one sixth of a revolution and brings the same to the position Fig. 8; the cylinder communicates with the boring of the plug 25 and at the same time with the suction tube 26 through the channel 28. The sliding vane compresses the gas driving the same toward the channel 29; simultaneously cooling air is drawn in behind said sliding vane through the suction 26 which is alternatingly connected with the source of gas or air by a convenient device not shown in the drawing. When the sliding vane 19 has again reached the position 40 the compressed charge has been completely introduced into the inner space of the plug 25 and said plug has been turned for another sixth of a revolution so that it has reached the position Fig. 9 in which the communication between the inner space of the plug and the cylinder is completely shut off. After the sliding vane 19 has again passed the point 40, the plug has been again turned for one sixth of a revolution and the inner space of said plug communicates with the cylinder through the suction 26, and the exhaust channel 27 communicates with the cylinder by means of the channel 29, as shown in Fig. 10. At this moment the charge is ignited in any convenient manner by an igniting mechanism which is not shown in the drawings as it does not form part of the invention, and explodes. The expanding gas acts upon the sliding vane 19 and drives the same so that the cooling air previously drawn in is exhausted through the channel 29. This action is completed when the sliding vane 19 has again reached the position 39. Simultaneously the plug has been turned for one sixth of a revolution (Fig. 11) and the communication between the exhaust and the cylinder is maintained, the communication between the suction channel and the cylinder is shut off until the sliding vane 19 has again left the part 40 and the plug 25 turned for another sixth of a revolution, that is to say has returned to the position shown in Fig. 6. The suction channel 26 and the exhaust channel 27 communicate both with the cylinder. The sliding vane begins again to draw in the gas and to exhaust the burned gases. The cycle begins again. The sliding vane or piston therefore draws in the explosive mixture at the first revolution, compresses the same at the second revolution in simultaneously drawing in the cooling air and at the third revolution, after the explosion has taken place, it drives out the cooling air previously drawn in. This improved engine requires comparatively little fuel and is nevertheless of great efficiency for the reason that the sliding vane acts like a lever whereby the expansion of the gases is much better utilized than is otherwise the case.

I claim:—

1. An improved rotary-engine, comprising in combination a conical cylinder having an inlet channel and an exhaust channel at its upper end, a fixed cover and a removable cover of said cylinder, a shaft mounted in said covers so that it is concentric with the drum but eccentric in the casing, and a conical piston fixed upon said shaft so that its circumference is in contact with the inner wall of said cylinder between said channels of the cylinder, said piston having a radial slot extending over the entire length of the same, a sliding vane movably located in said slot of the piston so that its rounded off edge is in contact with the cylinder wall, means for securing the air tight joint between said sliding vane and said cylinder wall, a disk centrally mounted upon said shaft and rigidly con-

nected with said sliding vane, means for the automatic re-adjustment of the said revoluble parts and means for regulating the admission of the explosive mixture and the exhaust of the burned gases substantially as described and shown and for the purpose set forth.

2. An improved rotary-engine, comprising in combination a conical cylinder having an inlet and an exhaust channel, a fixed cover and a removable vaulted cover of said cylinder, a shaft mounted in said covers so that it projects with both ends from said cylinder, so that it is concentric with the drum but eccentric in the casing, a threaded part of said shaft outside the fixed cover and a threaded part of said shaft inside the removable cover, a conical piston fixed upon said shaft so that its circumference is in contact with the inner wall of the cylinder between said channels of the cylinder, said piston having a radial slot extending over its entire length, a sliding vane movably located in said slot of the piston so that its rounded off edge is in contact with the inner wall of the cylinder, two blades of elastic material fixed with one end each on one side of said sliding vane and sliding with the other free end along said inner wall of the cylinder for securing the air tight joint between the edge of the sliding vane and the cylinder wall, a disk mounted upon said shaft so that it can freely revolve around the same, a bolt which fixes said disk upon said sliding vane a second disk revolubly mounted upon said shaft, a hub of said second disk upon which the first disk is mounted, a nut screwed upon the outer threaded part of the shaft and a nut screwed upon the inner threaded part of the shaft for re-adjusting the parts mounted upon said shaft, means for the automatic re-adjustment of said revoluble parts and means for regulating the admission of the explosive mixture and the exhaust of the burned gases, substantially as described and shown and for the purpose set forth.

3. An improved rotary-engine, comprising in combination a conical cylinder having an inlet and an exhaust channel, a fixed cover and a removable vaulted cover of said cylinder, a shaft mounted in said covers so that it projects with both ends from said cylinder, so that it is concentric with the drum but eccentric in the casing, an outer and an inner threaded part of said shaft, a conical piston fixed on said shaft so that its circumference is in contact with the inner wall of the cylinder between said channels, said piston having a radial slot extending over its entire length, a sliding vane in said slot, means for securing a tight joint between the sliding vane and the cylinder wall, a revoluble disk fixed to said sliding vane and mounted in the outer end of the cylinder so as to close its conical part, a disk mounted upon said shaft so that it can be displaced in axial direction, an outwardly extending flange of said disk having radial grooves with inwardly inclined bottom parts, conical rollers in said grooves and springs for continually pressing said rollers against the inclined bottom of the grooves to automatically re-adjust the revoluble parts mounted on the shaft, and means for regulating the admission of the explosive mixture to the cylinder and the exhaust of the burned gases from the cylinder, substantially as described and shown and for the purpose set forth.

4. An improved rotary-engine, comprising in combination a conical cylinder having a fixed and a removable cover, a shaft mounted in said covers, so that it is concentric with the drum but eccentric in the casing, a boss upon the upper end of said cylinder having an explosion chamber and two channels for connecting said chamber with the cylinder, and respectively with the admission of the explosive mixture and with the exhaust tube for the burned gases, a valve in said chamber, a toothed disk mounted on the outer end of said valve and a toothed disk mounted on the shaft of the piston for regulating the position of said valve, a conical piston fixed on said shaft so that its circumference is in contact with the inner wall of the cylinder between said channels, said piston having a radial slot, a sliding vane in said slot, means for securing a tight joint between the edge of said sliding vane and the inner wall of the cylinder, a disk fixed on said shaft and on said sliding vane, means for the automatic re-adjustment of the revoluble parts mounted on said shaft and means for the re-adjustment of the said parts by hand, substantially as described and shown and for the purpose set forth.

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

WILLY HARTMANN.

Witnesses:
F. WEIDL,
PAUL ARRAS.