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ROTARY ENGINE AND PUMP

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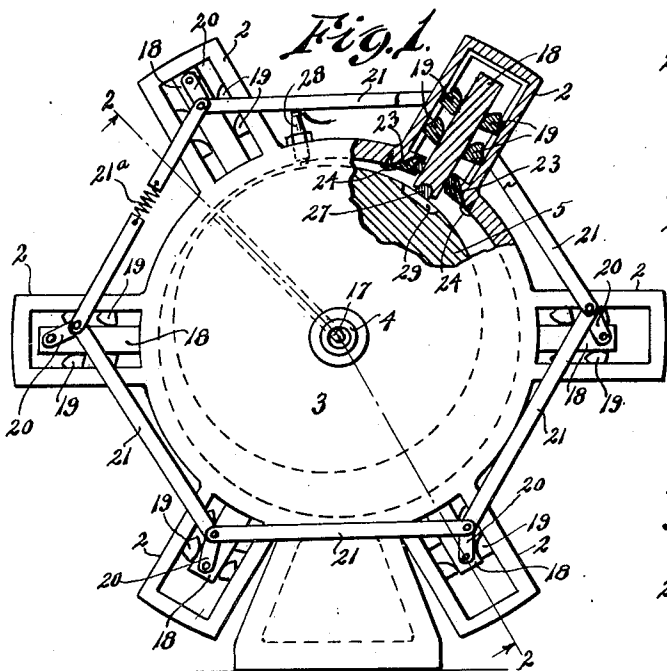
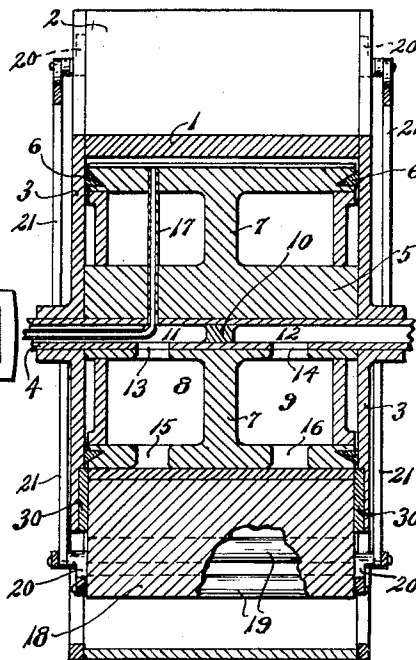


Fig. 2.

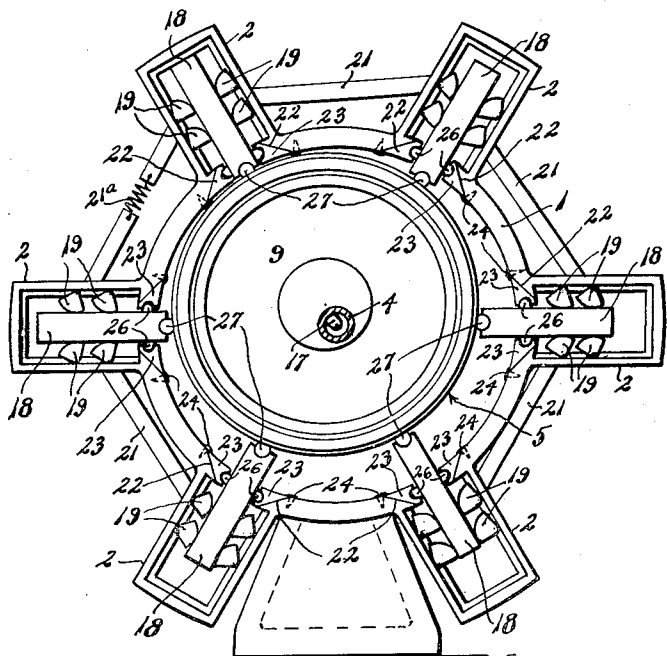


Fig. 3.

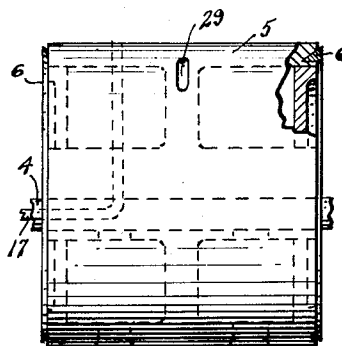


Fig. 4.

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ROTARY ENGINE AND PUMP

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2 Claims. (Cl. 123—14)

This invention relates to improvements in rotary engines and pumps. More especially it relates to rotary engines and pumps of the type having a cylindrical rotor mounted eccentrically in the cylindrical bore of a stator, with a plurality of sliding, radial abutments dividing the work-chamber into fluid compression and expansion sub-chambers.

It is among the objects of the invention to improve upon constructions as heretofore known by providing more uniformly fluid-tight expansion and compression areas. Features contributing to the attainment of this result consist in a novel structure and arrangement of packing means around the vanes; a novel mounting of each abutment for movement on anti-friction rocker or rolling bearings; and automatic actuating means whereby the movements of the abutments are made inter-related. A further object is to utilize the exploded charge in one sub-chamber or cylinder for ignition of the charge in the next adjacent sub-chamber or cylinder during normal operation.

It is intended that the patent shall cover, by suitable expression in the appended claims, whatever features of patentable novelty exist in the invention disclosed.

In the accompanying drawing:

Figure 1 is an end elevation, partly in medial section, of a device embodying features of the invention,

Figure 2 is a section taken on line 2—2 of Figure 1,

Figure 3 is an elevation, similar to Figure 1, with an end plate and one set of links removed, Figure 4 is a detail view of the rotor.

Referring to the drawing, in which like numerals designate like parts throughout, the stator or casing comprises a cylinder 1 having a plurality of hollow, radial projecting arms 2, and end plates 3, 3, each of the latter being provided with a suitable bearing in which shaft 4 is centrally journaled. A rotor or piston 5 is eccentrically and fixedly mounted on shaft 4, said rotor being cylindrical in form and of diameter somewhat less than the diameter of the stator bore. The said rotor extends from end plate to end plate of the stator, and has packing rings 6, triangular in cross-section, one at each end near the rotor's periphery, ensuring a fluid-tight bearing between rotor and end-plates. The interior of the rotor 5 is divided, by vertical partition 7 to provide the two passages 8, 9, the former for inflow of fluid and the latter for outflow.

Shaft 4 is of hollow tube construction and has

a plug 10 dividing its interior into inlet and outlet passageways 11, 12. It and the hub of rotor 5 have ports 13, 14 providing communication between the respective shaft passageways 11, 12 and the rotor passages 8, 9; and the peripheral wall of rotor 5, at points on the line of the rotor's shortest radius, has the ports 15, 16 connecting the interior of the rotor with the work chamber between stator and rotor, the port 15 opening into the inlet passage of the rotor and port 16 opening into the outlet passage thereof.

A small, flexible tube or pipe 17 extends into the inlet passageway 11 of shaft 4, and radially through the rotor to a point on its periphery on the line of the rotor's longest radius. This tube or pipe may conduct fuel, or other fluid, to the high-compression sub-chamber. In certain cases, high pressure air may be introduced through tube 17 into the high compression sub-chamber to start operation. The projecting arms 2 of stator cylinder 1 support the dividing partitions between the expansion and compression sub-chambers. Each partition comprises an abutment 18, extending from end to end of the stator, mounted on anti-friction rocker bearings 19 for movement in radial direction. They are loosely mounted and thus can roll while rocking. These rocker bearings afford greater improvement in lessened frictional wear over bearings revolving about fixed axes and concentration of space required over that required by roller bearings and will afford such improvement in combination with vanes as well as abutments.

The abutments 18 extend inward from their housings 2 with the inner end of each engaging against the peripheral surface of rotor 5. The outer end of each abutment is provided on each side with a pivoted arm 20, and the several arms 20 on each side are inter-connected by links 21 in order that movement of one abutment 18 will transmit motion to all of the other abutments. If found desirable, or necessary, one or more of the links 21 may be of two part construction with spring intervening, as seen at 21^a in Figure 1, to ensure a proper relative movement of each abutment in operation.

An important feature of my invention resides in the novel packing means for the abutments 18. Adjacent to each side of a vane I provide an inclined surface 22 on the stator with the incline toward the abutment, and strips 23, triangular in cross-section, seat on this incline and are held against dropping away by the heads of screws 24. They can however have slight movement up and down the inclines under the influence of pres-

sures within the engine or pump. Each strip 23 extends from end to end of the stator and stands with a plane face closely parallel to the side of its adjacent abutment 18. The said plane face of each strip 23 is provided with a longitudinal groove 25, half round in cross-section, and a packing strip 26, also half round in cross-section, is set in this groove with its plane face in contact with the side of the abutment. The triangular strips 23 can have slight movements on their inclined seats to ensure a tight contact of packing with abutment, and the half-round strips 26 can adjust themselves on their seats to ensure a square fluid-tight engagement against the abutments. Thus the packings can adjust themselves to both the lateral and the oscillating movements of the vanes 18.

The inner end of each abutment 18 is provided with the half round packing strip 27, similar to that above described. In this case however the groove is in the end of the abutment and the slightly concave face of the strip 27 engages with exact fluid-tight contact against the peripheral surface of the rotor. Packing pieces 30 inserted in the end-plates 3, 3 of the stator seal the joints between the ends of abutments 18 and the end-plates.

The features of the invention are for the most part applicable to either engines or pumps, and to compressors. When used as an engine, however, I propose an improved form of ignition. A spark plug 28 may be employed for the initial firing, as is usual, but, according to the invention each subsequent explosion will be occasioned by the explosion which precedes it. A groove 29 (Figures 1 and 4) permits escape of some of the burning products of combustion from one sub-chamber into the sub-chamber which next is to be fired. The groove 29, being formed in the rotor 5, provides centrifugal scavenging effect which prevents deposit settling in the groove which otherwise might clog it.

Used as a gas engine, an explosive charge may be introduced from a suitable compressor or fan (not shown) through passage-way 11 of shaft 4, through port 13, passage 8 of the rotor, and port 15, into the sub-chamber when affording maximum expansion. Exhaust gases are forced out through port 16, rotor passage 9, port 14 and passage-way 12 of shaft 4. Each sub-chamber between each pair of abutments 18 serves both for expansion and compression of fuel in operation of the engine. The charge in each sub-chamber is gradually compressed to the point of maximum compression when the rotor turns through one half a revolution after introduction of each charge. It is then ignited, either by the spark

plug 28, in case of initial firing, or by the explosion in the adjacent sub-chamber, in case the engine is in operation.

The inter-connected abutments 18 are actuated automatically under the urge of the rotor. As the rotor forces some of the abutments 18 outward the links 21, and pivoted arms 20, cause the other abutments to move inward to keep their inner ends always pressed tight against the rotor.

Used as a pump or compressor, the inlet and exhaust passages 15, 16 both serve as inlet channels, and the tube 17, always exposed to the fluid at high compression, serves as the outlet. No valve is needed for controlling the flow, and operation may be in either direction. As an engine also the direction of operation may be reversed by simply plugging the ignition groove 29 and opening a similar groove in the rotor's periphery at a corresponding point beyond the largest radius of the rotor.

In a simplified form the end plates 3, 3 may be keyed eccentrically to the shaft 4, and the rotor wall 7 and hub 5 may be omitted.

The invention presents improvements which are considered to be highly important advances in the art.

I claim as my invention:

1. In a rotary engine having a cylindrical rotor mounted eccentrically in the cylindrical bore of a stator, and a plurality of radial abutments mounted slidably in the stator, the combination thereof of packing means for the abutments, comprising inclined surfaces on the body carrying the abutments adjacent to each side of an abutment; triangular strips seated for small movement on said inclines; each of said strips having a plane surface closely adjacent to the side of an abutment, and each said plane surface having a longitudinal half round groove therein; and a half round packing strip seated loosely in each said groove, for slight oscillation, with its plane face projecting into square contact with the side of a vane.

2. A rotary engine comprising, in combination, a stator with cylindrical bore; a cylindrical rotor mounted eccentrically in said bore; a plurality of radial abutments mounted slidably in the stator with the inner end of each abutting against the peripheral surface of the rotor; and links inter-connecting the outer portions of said abutments, and so arranged in cooperation with the rotor that radial movement of one of said abutments will cause movement of the other said abutments, one of said links being in sections with resilient means connecting the sections.

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