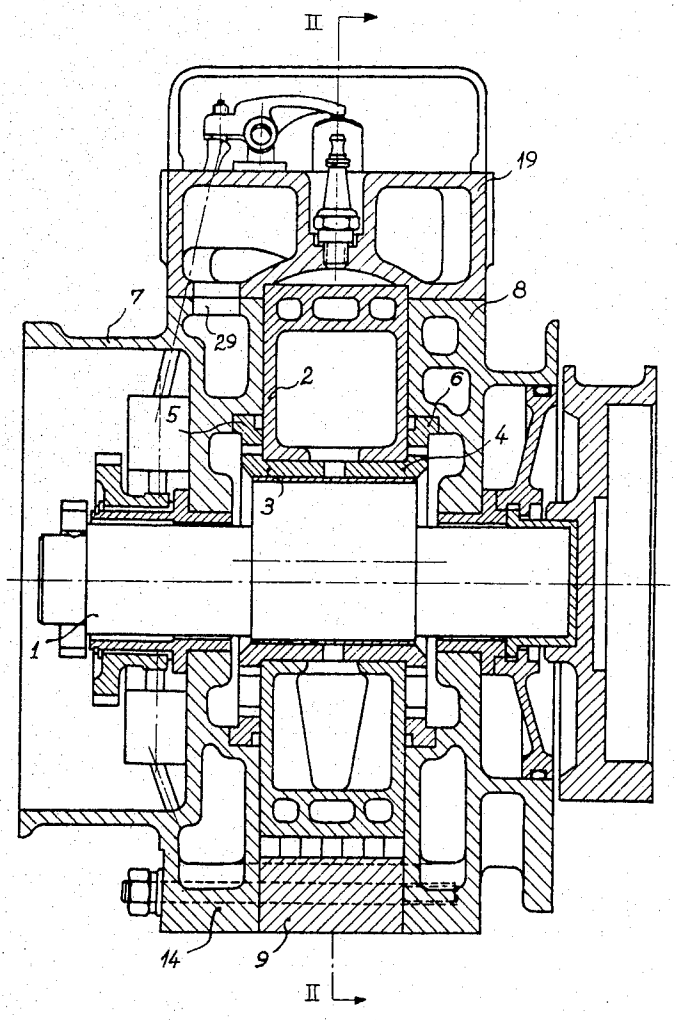
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Fig-1



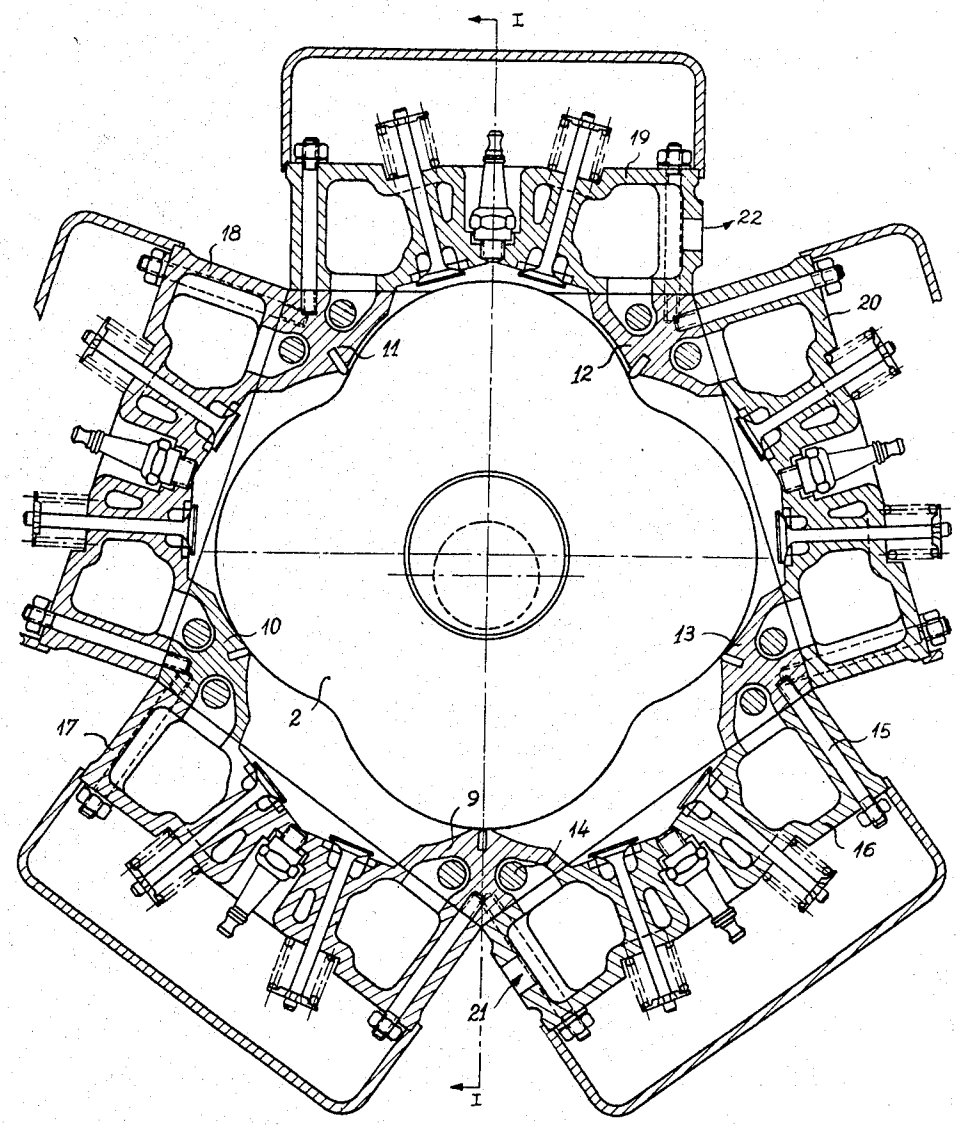
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Fig. 2



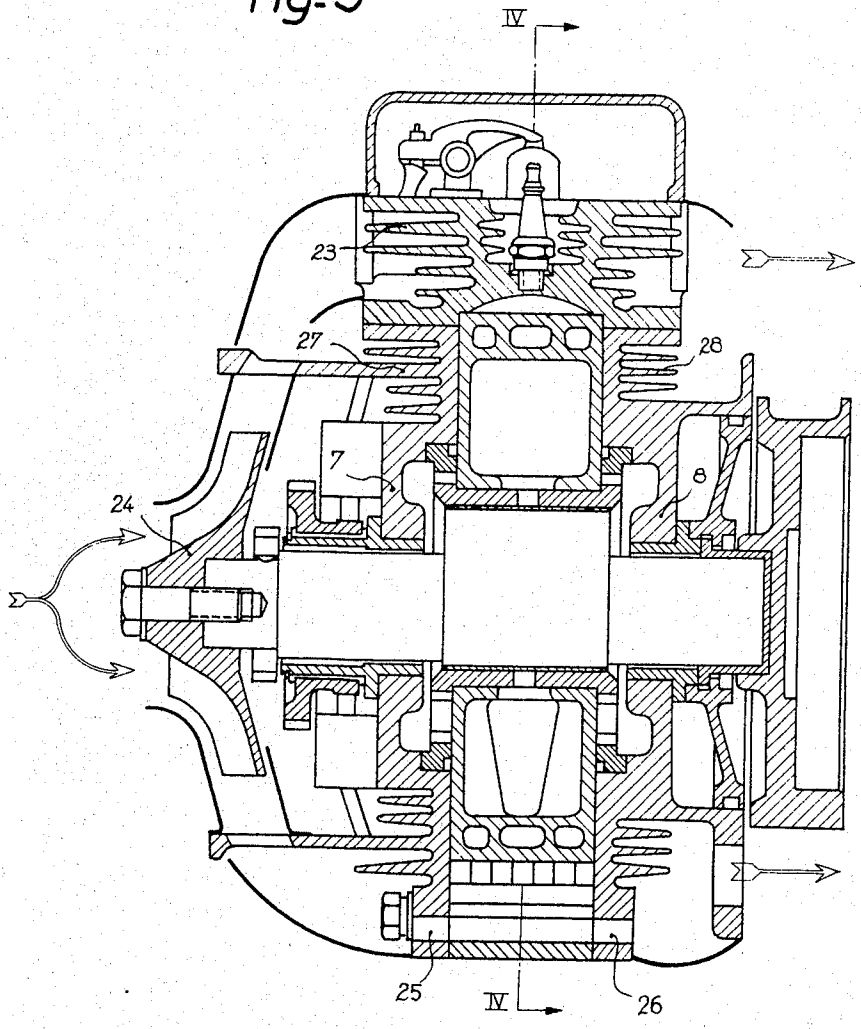
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Fig-3



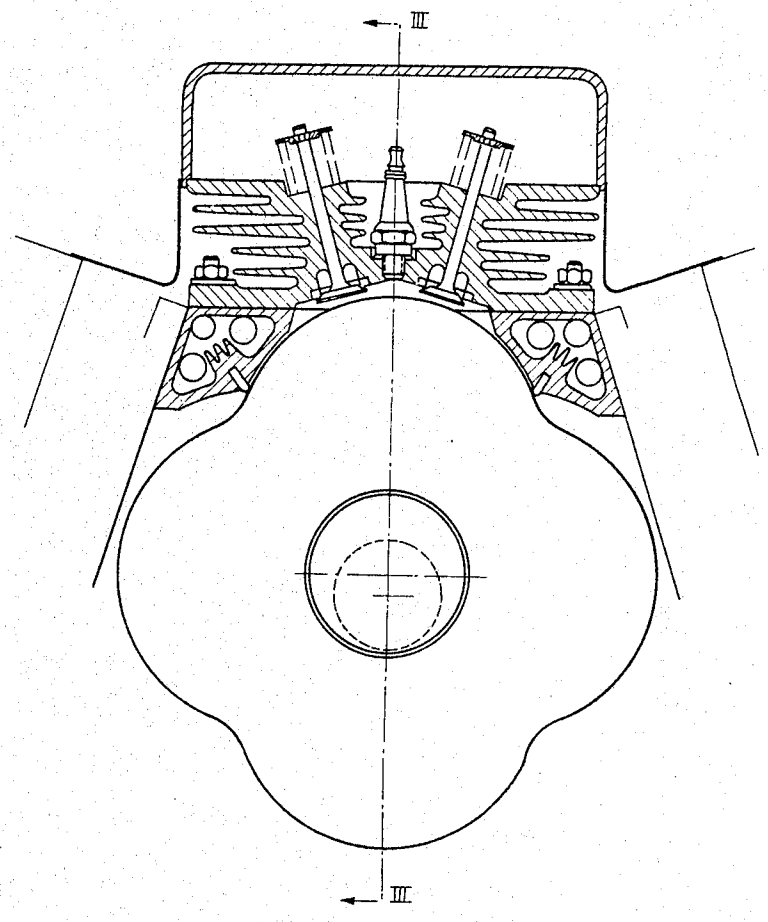
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Fig. 4



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3,286,698

ROTARY ENGINES

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Filed Jan. 2, 1964, Ser. No. 335,129
Claims priority, application France, Jan. 11, 1963, 921,219, Patent No. 1,353,048
6 Claims. (Cl. 123—8)

This invention relates to rotary engines of the type comprising a stator having $(N+1)$ lobes, and a rotor having N lobes, the latter being trunnioned on an eccentric solid with the crankshaft.

This type of engine comprises $(N+1)$ variable-volume working chambers bounded by the inner contour of the stator on the one hand and by the outer contour of the rotor on the other hand. Associated with each working chamber is a combustion chamber receiving the inlet and exhaust valves as well as the ignition spark plugs.

In the present inventor's prior Patent 3,200,794 filed on November 16, 1961, there is described a specific form of embodiment wherein the stator consists of a peripherial ring surrounding the rotor and a pair of lateral bearing plates, the combustion chambers being formed in said ring.

This disposal is objectionable in that it prevents any free access to the valves for any adjustment or maintenance work thereon without removing at least the lateral bearing plate opposite to the engine shaft driving end and the parts mounted on said plate or so disposed as to interfere with its removal.

On the other hand, although the machining of the combustion chambers is already considerably facilitated by the arrangements set forth in the aforesaid patent of the same applicant, it is nevertheless necessary to perform these machining operations within a cylindrical annulus and in succession, so that special means incumbent on this type of work must be implemented. It may also be pointed out that the stator is a casting attended by considerable moulding difficulties.

It is the chief object of this invention to provide an improved arrangement whereby these difficulties are overcome. It consists in designing each combustion chamber complete with its valves and spark plug in the form of a self-contained unit to be termed hereinafter "combustion head," the function of this unit corresponding to that of a cylinder-head of a conventional piston engine.

The two lateral bearing plates of the rotary engine of this invention are braced independently of said combustion head by means of bracing members or distance-pieces.

It will be readily appreciated by anybody conversant with the art that this arrangement permits of removing one or several valves without removing any parts other than the corresponding combustion head.

Under these conditions, these combustion heads can be machined on any conventional machine tools, and given equal conditions the rapidity and precision of the machining operations are greatly improved.

Besides, the production of raw castings or foundry blanks is not attended by any difficulty whatsover.

It is a complementary advantage of this arrangement that it facilitates greatly the cooling of the engine since the combustion heads are free from the bearing plates instead of forming an integral part thereof or being clamped therebetween.

This advantage is still more appreciable in the case of air-cooled engines. Of course, this greater air-cooling facility does not preclude liquid cooling.

With the foregoing and other objects in view, the invention resides in the novel arrangement and combination of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed may be made within the scope of what is claimed without departing from the spirit of the invention.

Other objects and advantages will become apparent from the following description taken in conjunction with the accompanying drawings in which:

FIGURE 1 is a longitudinal section taken upon the line I—I of FIGURE 2, showing a water-cooled rotary engine constructed according to the teachings of this invention;

FIGURE 2 is a cross section taken upon the line II—II of FIG. 1;

FIGURE 3 is a longitudinal section taken upon the line III—III of FIGURE 4, showing an air-cooled rotary engine constructed according to the teachings of this invention; and

FIGURE 4 is a fragmentary cross-section taken upon the line IV—IV of FIGURE 3.

Referring first to FIGURE 1, there is shown therein a rotary engine comprising five working chambers in the stator and four lobes in the rotor.

The reference numeral **1** designates the crankshaft, and **2** is the rotor revolving about the eccentric portion of said crankshaft.

This rotor is rotatably driven through a pair of toothed wheels **3**, **4** solid with the rotor and a corresponding pair of internally-toothed annuli **5**, **6** mounted on the stator.

This stator consists of a pair of lateral bearing plates **7**, **8** adequately braced by means of distance-pieces or bracing members **9**, **10**, **11**, **12** and **13**, all these component elements being assembled by means of bolts or studs **14**.

As shown in FIGURE 2, the aforesaid distance-pieces or bracing members **9** to **13** are located at the corners or similar regions where the stator lobes are connected to each other.

This assembly consisting of the two bearing plates **7**, **8** and of the bracing members **9** to **13** has roughly the shape of a pentagon having its sides finished by a complentary machining operating subsequent to the assembly.

On the flat faces thus obtained the combustion heads **16**, **17**, **18**, **19** and **20** are secured by means of bolts **15**.

These combustion heads consist of machined castings formed with cavities and passages for the ignition spark plug and the inlet and exhaust valves, and also for circulating a cooling medium, other passages being provided therein for the assembly members, in this example screw bolts or studs. These castings are formed with a suitably shaped concavity at their lower central portion which constitutes the combustion chamber proper, the inlet and exhaust valves and the spark plug projecting therein as in conventional cylinder-heads. The lateral inner or lower surface of each combustion head is flat and fits on the relevant flat face of said bracing members or distance-pieces.

Under these conditions, each combustion head is independent of the other combustion heads of the engine, this feature being advantageous not only for production purposes but also for assembling and disassembling the engine.

The combustion heads of the rotary engine of this invention may be cooled by circulating either a suitable liquid coolant, for example water, or atmospheric air blown by a fan.

A typical form of embodiment of a water-cooled engine according to this invention is illustrated in FIGURE 2 by way of example.

In this example the water penetrates into and flows through the combustion head **16**, the rear bearing plate **8**, and subsequently feeds in parallel the combustion heads

17, 18 and 20, before flowing into the front bearing plate 7 and through the combustion head 19 (through passages such as 29), the liquid escaping through the orifice 22.

On the other hand, in each combustion head a pair of small passages or ducts deliver cooling water to the adjacent bracing members, the flow occuring through the front plate 7 as set forth hereinabove.

FIGURES 3 and 4 illustrate diagrammatically by way of example a typical air-cooled rotary engine constructed according to the teachings of this invention. In this case the combustion heads are cast with integral fins 23 through which air is blown by a fan 24, as shown by the arrows in FIGURE 3.

This cooling air also flows through the bracing members 9–13 by virtue of orifices 25 formed in the front bearing plate 7, and escapes through orifices 26 formed in the rear bearing plate 8. Fins 27, 28 are also cast integrally with the bearing plates 7, 8 to improve the cooling effect.

Although the present invention has been described in conjunction with preferred embodiments, it is to be understood that modifications and variations may be resorted to without departing from the spirit and scope of the invention, as those skilled in the art will readily understand. Such modifications and variations are considered to be within the purview and scope of the invention and appended claims.

I claim:

1. Rotary engine comprises a rotor having N lobes revolving within a stator having $(N+1)$ lobes to constitute $(N+1)$ working chambers having each a combustion chamber associated therewith, said stator consisting of two lateral bearing plates and of a member surrounding the rotor periphery, said engine being characterized in that said peripheral member consists of a plurality of separate elements half of which are bracing members and distance-pieces, and the remainder are combustion heads each formed with a combustion chamber and adapted to receive the valves and spark plug relevant to this chamber, as well as means for assembling these component elements.

2. Rotary engine according to claim 1, characterized in that said two lateral bearing plates of said stator are held at the proper relative spacing by bracing members and distance-pieces located at their corner regions where the stator lobes are joined to each other, means being provided for assembling these component elements.

3. Rotary engine according to claim 1, characterized in that said bracing members and distance-pieces are formed with flat faces providing a polygonal contour and that the sides of the resulting polygonal assembly are adapted to be machined.

4. Rotary engine according to claim 1, characterized in that said combustion heads are mounted on said flat faces by means of bolts and studs.

5. Rotary engine according to claim 1, characterized in that said bracing members and distance-pieces and said combustion heads as well as said lateral bearing plates, are provided with passages and cavities for the selective circulation of cooling water and blown air.

6. A rotary engine comprising a rotor having N lobes, a stator having $(N+1)$ lobes to constitute $(N+1)$ working chambers each having a combustion chamber associated therewith, said rotor being mounted to revolve within said stator, said stator comprising two lateral bearing plates and a peripheral member, said peripheral member comprising a plurality of alternately arranged spacing, bracing members and like number of combustion heads each of the latter being formed with a combustion chamber and being adapted to receive valves and a spark plug relevant to said chamber and means for assembling said stator.

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F. T. SADLER, *Assistant Examiner.*