Jan. 2, 1951 R. H. GODDARD 2,536,599

STEAM-OPERATED ROTATING COMBUSTION CHAMBER

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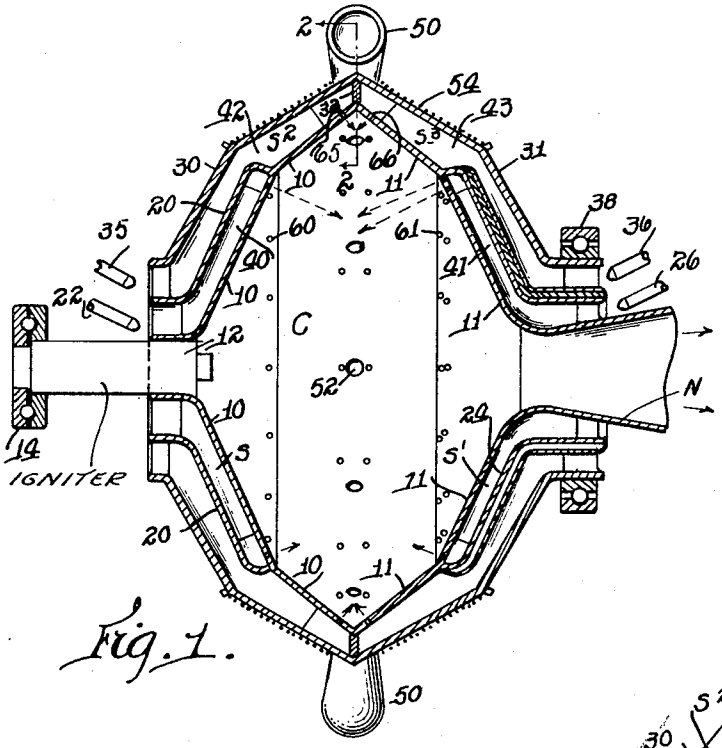

Fig. 1.

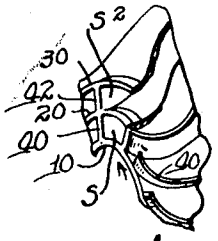

Fig. 3.

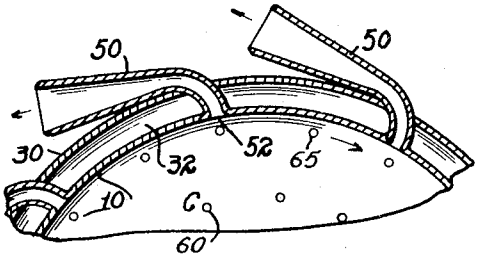

Fig. 2.

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STEAM-OPERATED ROTATING COMBUSTION CHAMBER

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2 Claims. (Cl. 60—35.6)

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This invention relates to rotating combustion chambers as used in rockets and rocket craft and in which a blast of combustion gases is discharged through a rearwardly projecting nozzle.

It is one object of the present invention to provide improved means for rotating the combustion chamber by steam evolved in a peripheral portion of the chamber itself. Another object is to provide improved feeding and jacketing means for such a rotating combustion chamber.

The invention further relates to arrangements and combinations of parts which will be hereinafter described and more particularly pointed out in the appended claims.

A preferred form of the invention is shown in the drawing, in which

Fig. 1 is a sectional side elevation of a rotating combustion chamber embodying this invention;

Fig. 2 is a partial transverse sectional elevation, taken along the line 2—2 in Fig. 1; and

Fig. 3 is a detail perspective view of certain parts to be described.

Referring to the drawing, a rotating combustion chamber C is shown which comprises oppositely facing chamber walls 10 and 11. The wall 10 may be supported on an ignition device 12, which in turn is rotatably mounted in a supporting thrust bearing 14. The chamber wall 11 is connected into a tapered discharge nozzle N.

A casing 20 encloses a portion of the chamber wall 10 and provides a jacket space S to which gasoline may be supplied through a nozzle 22. A casing 24 encloses a portion of the chamber wall 11 and provides a jacket space S' to which liquid oxygen may be supplied through a nozzle 26. Outer casing members 30 and 31 are separated by an annular partition 32 and provide jacket spaces S2 and S3 which may be supplied with cooling water through nozzles 35 and 36. The outer casing members 30 and 31 may be reenforced by a criss-cross winding of piano wire as indicated at 54, and a bearing 38 supports the outer casing 31.

Radiating partitions 40, 41, 42 and 43 are provided in the jacket spaces S, S', S2 and S3 and are effective in holding the chamber walls 10 and 11, the jacket casings 20 and 24, and the outer casing members 30 and 31 all in definite spaced relation.

The inner ends of the partitions or vanes 40, 41, 42 and 43 are preferably curved forward in the direction of rotation as indicated in Fig. 3, so that injected liquids will be more quickly and easily picked up and directed outward by centrifugal force in the jacket space portions between adjacent partitions.

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A plurality of reaction nozzles 50 (Figs. 1 and 2) are mounted in a circumferential series about the outer casing members 30 and 31 of the rotating combustion chamber C and communicate with the chamber through ports or openings 52.

Gasoline from the space S is sprayed into the combustion chamber C through spray openings 60, and liquid oxygen from the space S' is similarly sprayed into the chamber C through spray openings 61. As the mass of oxygen required for complete combustion is much larger than the mass of gasoline, the spray openings 61 are preferably more numerous than the spray openings 60, and the oxygen sprays are directed away from the nozzle N.

The mixed combustion liquids and vapors will thus be directed toward and ignited by the igniter 12, and the combustion gases will be discharged through the nozzle N as is usual in rocket propulsion.

The cooling water in the spaces S2 and S3 is forced outward by centrifugal force and becomes highly heated from the hot combustion gases in the chamber C. Mixed water and steam is then discharged into the outer peripheral portion of the chamber C through port openings 65 and 66, where it is immediately turned to highly heated steam which escapes through the ports 52 to the nozzles 50. A mixture of steam and combustion gases then escapes to the atmosphere through the nozzles 50 and produces a reaction which rapidly rotates the combustion chamber C.

All parts of the combustion chamber C are thus effectively jacketed and cooled, and the cooling water injected through the nozzles 35 and 36 not only cools the outer portion of the combustion chamber but also provides steam for rotating the chamber without the application of external power. A rotating combustion chamber unit of high efficiency and unusual simplicity is thus achieved.

Having thus described the invention and the advantages thereof, it will be understood that the invention is not to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what is claimed is:

1. In combustion apparatus comprising a rotating combustion chamber of generally bulbous form and a rearwardly-directed discharge nozzle and means to feed fuel and oxidizer to said combustion chamber, in combination, jacket means to cool the wall of said combustion chamber, means to discharge a cooling liquid from the peripheral portion of said jacket means to the peripheral portion of said combustion chamber, a

plurality of chamber-rotating nozzles mounted on said combustion chamber, and means to discharge a mixture of steam and combustion gases from the peripheral portion of said combustion chamber to said latter nozzles, said nozzles traversing the jacket means, and the outer end portions of said nozzles constituting substantially elongated cones which discharge tangentially to the periphery of said combustion chamber at its point of largest diameter.

2. In combustion apparatus comprising a rotating combustion chamber of generally bulbous form and having a rearwardly-directed discharge nozzle and means to feed fuel and oxidizer to said combustion chamber, in combination, a jacket for said combustion chamber, means to supply a cooling liquid to said jacket adjacent the axis of said combustion chamber, partition means providing radial jacket spaces in which said liquid is forced outward by centrifugal force, means to spray said liquid into the peripheral portion of said combustion chamber, a plurality of chamber-rotating nozzles mounted on said rotating chamber, and communicating connections

from the peripheral portion of said chamber to said latter nozzles.

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Executrix of the Last Will and Testament of Robert H. Goddard, Deceased.

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