Oct. 17, 1950 R. H. GODDARD 2,526,219

STEAM PRODUCTION FROM COOLING LIQUID IN COMBUSTION CHAMBERS

Filed May 7, 1947

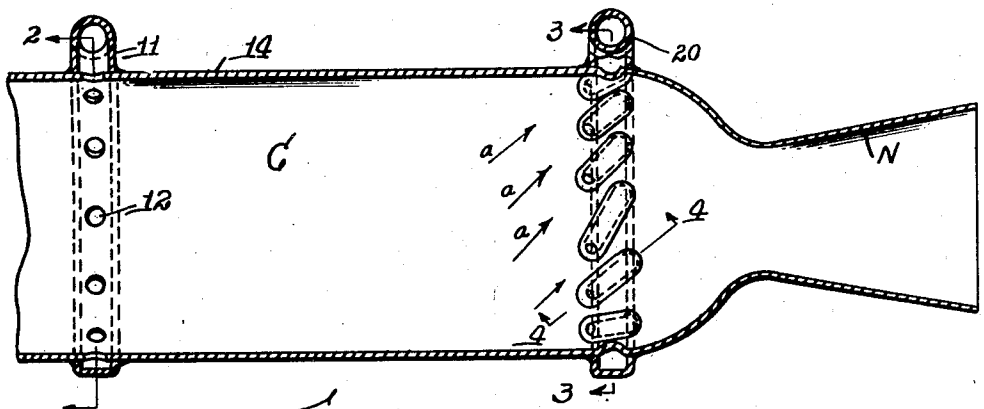


Fig. 1.

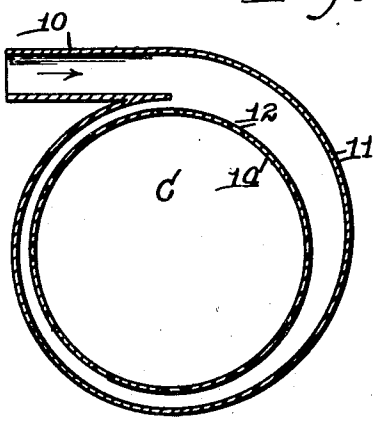


Fig. 2.

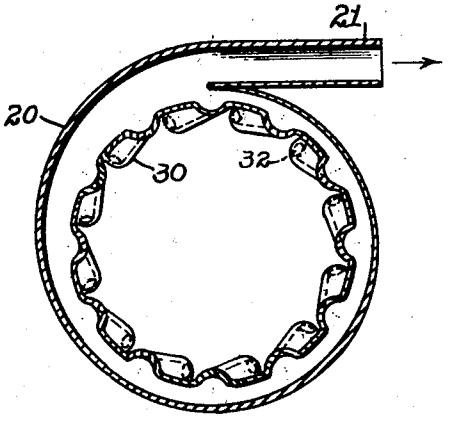


Fig. 3.

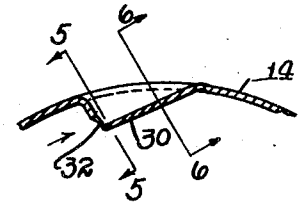


Fig. 4.

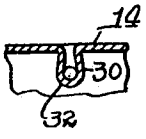


Fig. 5.

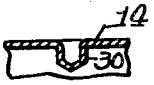


Fig. 6.

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2,526,219

STEAM PRODUCTION FROM COOLING LIQUID IN COMBUSTION CHAMBERS

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Application May 7, 1947, Serial No. 746,616

3 Claims. (Cl. 60—46)

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This invention relates to combustion chambers of the type used in propulsion apparatus, and relates more particularly to the production of steam from the cooling liquid used in such combustion chambers.

It is the general object of this invention to provide an improved construction by which dry steam may be obtained, while the unvaporized part of the liquid film remains in the combustion chamber to provide further cooling action.

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 partial longitudinal sectional elevation of a combustion chamber embodying this invention;

Figs. 2 and 3 are transverse sectional elevations, taken along the lines 2—2 and 3—3 in Fig. 1, respectively;

Fig. 4 is an enlarged detail sectional view of a certain part, taken on the line 4—4 in Fig. 1; and

Figs. 5 and 6 are detail transverse sections, taken along the lines 5—5 and 6—6 in Fig. 4 respectively.

Referring to the drawing, a combustion chamber C is shown, which is provided with the usual discharge nozzle N. The chamber C receives a cooling liquid, as water, through a supply pipe 10 and volute 11, and this liquid is tangentially delivered into the chamber C through inclined ports or openings 12 in the wall 14 of the chamber C.

The liquid thus introduced travels circumferentially along the inner surface of the chamber wall 14 and forms a protecting or cooling film thereon, which film is gradually vaporized as it travels spirally toward the nozzle N with the combustion gases. At a point adjacent the discharge end of the chamber C, a second volute 20 is provided, in which steam is to be collected for discharge through a delivery pipe 21.

If the port openings into the volute 20 are made directly in the wall 14, similar to the liquid inlet ports 12, unevaporated portions of the liquid film will enter these latter port openings, and the steam delivered through the pipe 21 may be quite wet.

In order to obtain dry steam, a series of depressed portions 30 are displaced inwardly in the chamber wall 14 adjacent the volute 20. These depressed portions 30 may have the general cross section shown in Figs. 5 and 6, and are each provided with an inlet opening or port 32 in the end wall of the depressed portion 30. These ports 32 are directed toward the liquid film as said film travels spirally rearward in the combustion chamber and as indicated by the arrows *a* in Fig. 1.

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With this construction, the ports 32 will be inside of the path of the unevaporated liquid, which liquid closely contacts the wall 14, but said ports will be positioned to collect and deliver part of the steam which is produced by vaporization at the inner face of the liquid film. Consequently, the liquid remaining in the cooling film passes by the depressed portions 30 and radially outside of the ports 32, while the inwardly associated and relatively dry steam is in part collected through these ports and is thereafter delivered through the pipe 21. This dry steam will commonly contain a minor proportion of combustion gases.

The degree of dryness of the steam may be controlled by varying the distance by which the ports 32 are inwardly offset from the inner face of the chamber wall 14.

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 propulsion apparatus, a combustion chamber, means to introduce a cooling liquid to said chamber and to form a helically-moving peripheral film thereof on the inner surface of the side wall of said combustion chamber, and means to withdraw a fluid which largely comprises vaporized cooling liquid under pressure from said chamber, said latter means projecting towards the axis of said chamber and through said liquid film and said latter means having intake openings positioned inwardly with respect to said film of liquid.

2. The combination in propulsion apparatus as set forth in claim 1, in which the intake openings for the fluid are formed in inwardly depressed portions of the combustion chamber wall.

3. The combination in propulsion apparatus as set forth in claim 2, in which said depressed portions extend longitudinally in the direction of helical flow of said liquid film, and in which the intake openings are in the ends of said depressed portions which are approached by said film.

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

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The following references are of record in the file of this patent:

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