Aug. 7, 1951 R. H. GODDARD 2,563,028

COMBUSTION APPARATUS COMPRISING A COMBUSTION CHAMBER WITH TARGET TYPE PREMIXING EXTENSION

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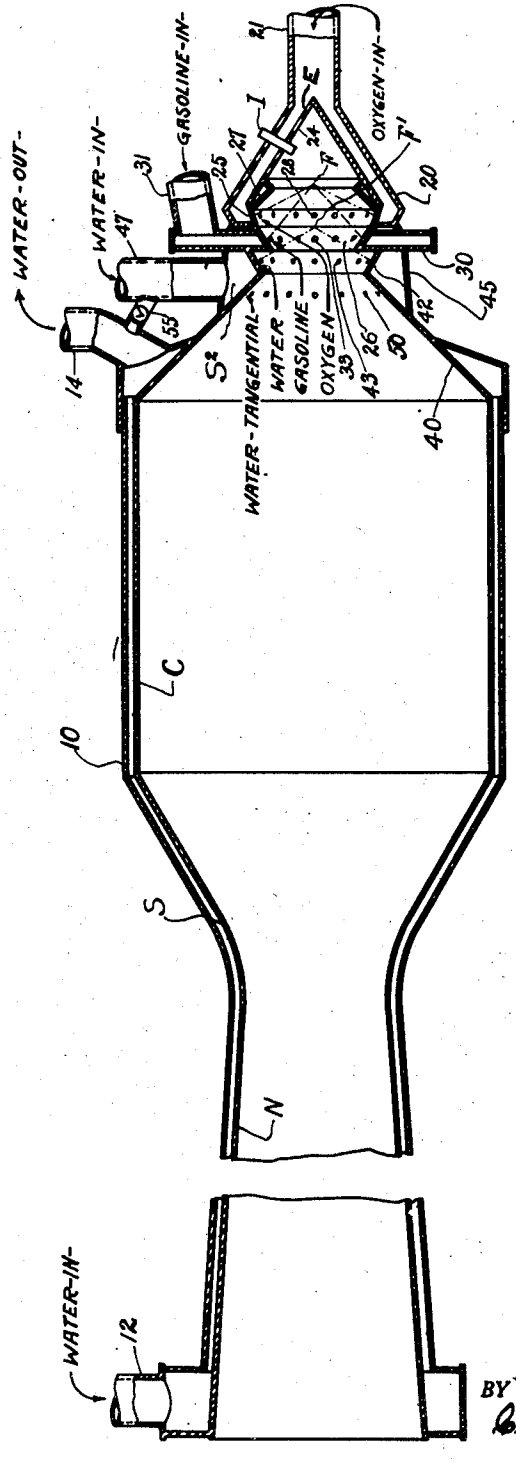

Fig. 1

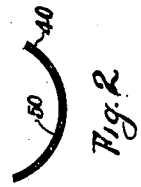

Fig. 2

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COMBUSTION APPARATUS COMPRISING A COMBUSTION CHAMBER WITH TARGET TYPE PREMIXING EXTENSION

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2 Claims. (Cl. 60—45)

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This invention relates to combustion apparatus as used in rockets and in other aerial propulsion mechanisms. Such combustion apparatus commonly comprises a combustion chamber and an associated discharge nozzle. If the combustion chamber is of the target type, the chamber also includes a premixing extension at the end thereof which is opposite to the discharge nozzle.

It is the general object of the present invention to provide a target-type combustion chamber having improved devices for feeding a liquid fuel, as gasoline, a liquid oxidized, as liquid oxygen, and a third liquid, as water, to said combustion chamber.

In the preferred form, the gasoline and oxygen are directed to a common focus in the premixing extension of the combustion chamber, and the water is directed to a separate focus which is positioned somewhat nearer the main combustion chamber than the previously-mentioned common focus.

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 the improved combustion apparatus, and

Fig. 2 is a detail sectional view to be described.

Referring to the drawing, the apparatus includes a combustion chamber C, an associated discharge nozzle N, a target-type extension E, and an outer casing 10 enclosing a jacket space S. Cooling water may be admitted to the space S through a pipe 12 at the outer end of the nozzle N, and the water may be discharged through a pipe 14 at the inner end of the combustion chamber.

The extension E has an outer casing 20 to which liquid oxygen may be supplied through a pipe 21. The extension E comprises a conical end portion 24, a reversed conical flange 25, and a second reversed conical flange 26 which is somewhat more sharply inclined. A baffle 27 covers a portion of the inner surface of the extension E.

The flange 25 is provided with a series of holes 28 through which oxygen is fed under pressure in a series of jets converging at the focal point F. The baffle 27 assists in directing the jets to said focal point.

The flange 26 is surrounded by a flat, hollow casing 30, to which gasoline may be delivered through a pipe 31. The flange 26 also has a plurality of openings 33 through which the gasoline is delivered under pressure to the extension E in a series of jets, also converging at the point F.

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At its inner end, the combustion chamber C has a conical end wall 40 which is joined to the side wall of the flat casing 30 by a short reversed conical flange 42 having a series of spray openings 43. An annular casing 45 provides a jacket space S2 around the flange 42, and this space may be supplied with water under pressure through a pipe 47. This water is delivered through the holes 43 in a series of jets converging at a focal point F' which is spaced axially from the focal point F and which is in the path of the combustion gases as they approach the entrance to the combustion chamber C.

An additional series of spray openings 50 may be provided at the smaller part of the conical end wall 40 of the combustion chamber. These openings 50 are tangentially arranged, as shown in Fig. 2, and provide a thin film of water which cools that portion of the conical wall 40 which is not cooled by the water in the jacket spaces S and S2.

A portion of the water discharged from the jacket space S through the pipe 14 may be delivered to the supply pipe 47 through a cross pipe 55 if so desired. In this case, separate supply connections for the pipe 47 may be omitted.

The operation and advantages of the combustion chamber above described will be readily apparent. The gasoline and liquid oxygen are delivered to a common focal point F in the premixing extension E, and combustion may be started by an igniter I of any usual or desired type.

As the combustion gases then travel toward the chamber C, they pass the focal point F', to which point the jets of water are being directed. The water spray is there picked up by the hot combustion gases and is quickly and effectively converted into steam, which increases the volume of the gaseous discharge through the nozzle N, and correspondingly increases the thrust and effectiveness of the combustion apparatus. The water supplied through the spray openings 50 to the conical end wall 40 of the combustion chamber is also converted into steam and provides additional gaseous volume.

Combustion apparatus constructed as above described has been tested and has been found to provide a strong thrust and very high discharge velocities at the open end of the nozzle N.

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, a combustion chamber having a nozzle and having a closed inner end comprising a target-type premixing chamber extension, means to direct converging jets of two different combustion liquids toward said chamber extension and inward to a common axial focus in said extension, and means to direct jets of a third and inert liquid toward said extension and inward to a second focus which is spaced from said common focus and which is nearer the nozzle end of said combustion chamber, said inert liquid being vaporized by the heat in said chamber extension and thereby substantially increasing the volume of gaseous discharge from said chamber extension.

2. In combustion apparatus, a combustion chamber having a conical inner end wall, a conical target-type premixing extension, rearwardly-facing conical means to direct converging jets of two different combustion liquids rearward and inward to a common axial focus in said extension, conical means to direct jets of a third liquid rearward and inward to a second focus which is spaced from said common focus and which is nearer said combustion chamber, and means to direct an additional portion of said third liquid in tangential jets against the conical inner end wall of said combustion chamber.

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

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