July 2, 1940. **L. A. SKINNER** 2,206,057

ROCKET PROJECTILE

Filed Aug. 31, 1939

Fig-1-

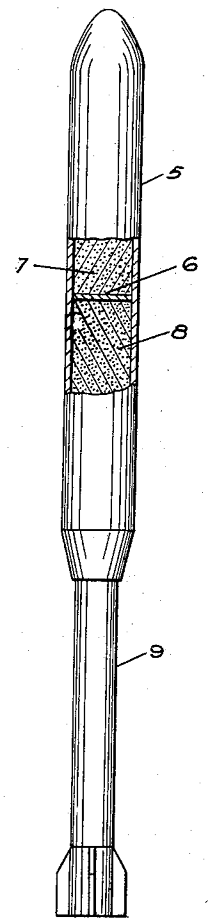
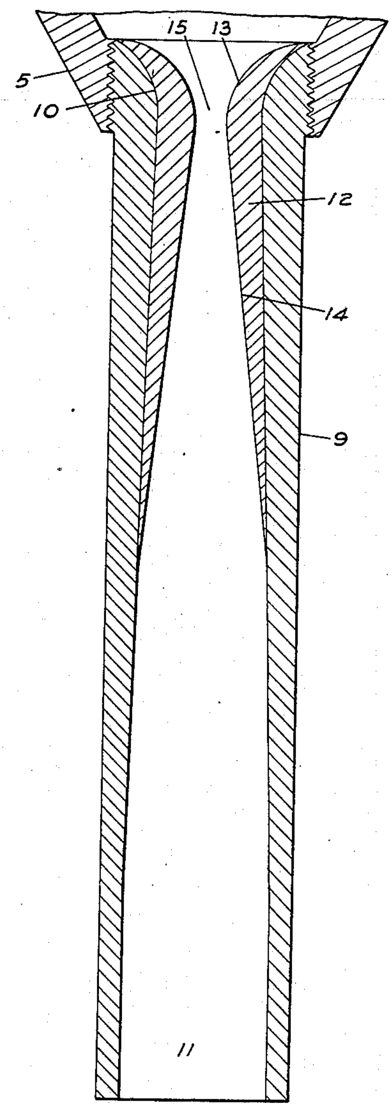


Fig-2-



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ROCKET PROJECTILE

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Application August 31, 1939, Serial No. 292,841

8 Claims. (Cl. 102—23)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to a rocket projectile.

In a projectile of the type shown in my Patent 1,994,490 of March 19, 1935, an external propelling charge initiates the flight of the projectile and an auxiliary propelling charge carried by the projectile functions during flight in the manner common to rockets to continue propulsion.

In pyrotechnic rockets employing black powder as a driving charge it has been customary to employ a discharge orifice of a fixed size which has a certain definite relation to the speed at which the gases are liberated in order that these gases should be forcibly expelled, thus lifting the rocket by their impact with the air.

Where the driving charge consists of a composition, such as nitrocellulose or a double base powder, having the characteristics of a requirement of pressure to initiate ignition and an increased burning rate under pressure, it becomes necessary to provide a means for regulating or controlling the pressure within the driving charge container.

The purpose of this invention is to regulate the pressure and the velocity of efflux of the gases by means of an exhaust orifice which increases in cross-sectional area as the driving charge is consumed.

The specific nature of the invention as well as other objects and advantages thereof will clearly appear from a description of a preferred embodiment as shown in the accompanying drawing in which:

Fig. 1 is a view in side elevation and partly in section of a rocket projectile.

Fig. 2 is a longitudinal sectional view of the discharge tube.

Referring to the drawing by characters of reference there is shown a projectile comprising a body 5 having a partition 6. The space in front of the partition is adapted to contain any desired element such as an explosive, signalling, or incendiary charge 7 or it may be used to house a parachute or carry a message. The space in rear of the partition contains a driving charge 8 which preferably consists of nitrocellulose or a double base powder which requires a certain amount of pressure to insure ignition and whose burning rate increases as the pressure increases.

A discharge tube 9 of a metal having a high melting point is attached to the rear of the body and is formed with a forwardly flared entrance 10 and a rearwardly flared exit passage 11 to provide a constricted throat. The throat of the passage is further constricted by a lining 12 of a low-melting point material such as Wood's metal, solder, Babbitt and the like. The lining which is similarly formed with a forwardly flared entrance 13 and a rearwardly flared passage 14, extends rearwardly an appreciable distance from the front edge of the entrance 10 of the tube. The thickest part of the lining which establishes the constricted throat 15 is positioned a relatively short distance from the front edge of the entrance 10, this distance being approximately equal to the radius of the tube and being substantially at the constricted throat of the tube.

The particular manner of igniting the driving charge forms no part of this invention but as an example it may be accomplished by conventional methods employed in rockets or as shown in the patent previously referred to. At the commencement of combustion of the driving charge the quantity of gas developed will be small but because the throat 15 is relatively small the pressure within the driving charge chamber will build up rapidly. When ignition is well established and the pressure increases, the outrushing hot gases will cause the lining to be melted and the molten metal will be forced rearwardly. In this manner the discharge orifice will be gradually enlarged until the predermined entrance 10 and exit passage 11 is reached.

I claim:

1. A rocket comprising a body, a driving charge in the body, a tube fixed to the rear of the body, said tube formed of a metal having a high melting point and having a forwardly flared entrance and a rearwardly flared exit passage to provide a constricted throat, a lining of a low melting point metal in the tube with its thickest portion spaced from the front edge of the tube and having a forwardly flared entrance and a rearwardly flared passage to provide a constricted throat.

2. A rocket comprising a body, a driving charge in the body, a tube of a high melting point metal fixed to the rear of the body, a lining of a low melting point metal in the tube, said lining having its thickest portion spaced from the front edge of the tube and having a forwardly flared entrance and a more gradual rearwardly flared passage to provide a constricted throat.

3. A rocket comprising a body, a driving charge in the body, a tube of a high melting point metal fixed to the rear of the body, a lining of a low

melting point metal in the tube, said lining having its thickest portion spaced from the front edge of the tube and having a forwardly flared entrance and a rearwardly flared passage to provide a constricted throat.

4. A rocket comprising a body, a driving charge in the body, a tube of a high melting point metal fixed to the body, and a lining of a low melting point metal in the tube and having a constricted throat spaced from the front edge of the tube.

5. A rocket comprising a body, a driving charge in the body, a tube of a high melting point metal fixed to the body, and a lining of a low melting point metal in the tube and having a constricted throat.

6. A rocket comprising a body, a driving charge in the body, a tube of a high melting point metal fixed to the body and having a constricted throat spaced from the entrance end, and a lining of a low melting point metal in the tube and having a constricted throat in the throat of the tube.

7. A rocket comprising a body, a driving charge in the body, a tube fixed to the body, and a lining in the tube removable by heat, said liner having a sharply flared entrance and a gradually flared exit passage providing a constricted throat.

8. A rocket comprising a body, a driving charge in the body, a tube fixed to the body, and a lining in the tube removable by heat, said liner having a flared entrance and a flared exit passage providing a constricted throat.

LESLIE A. SKINNER.