

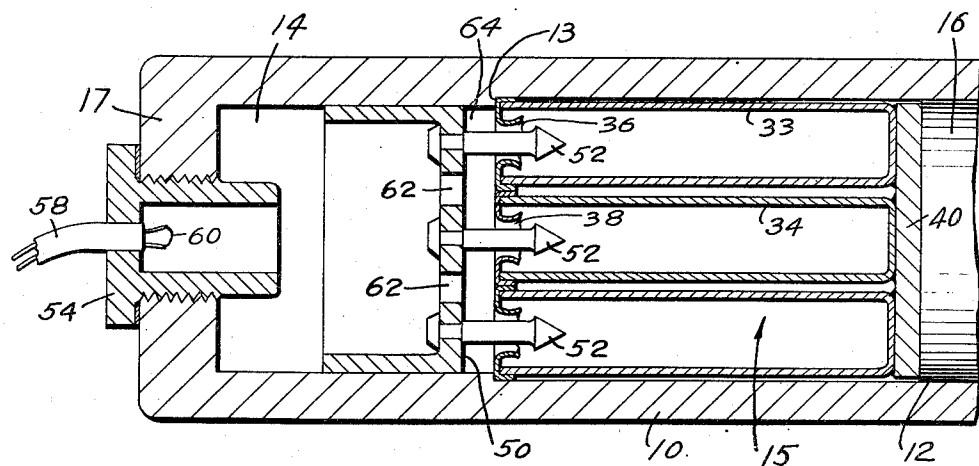
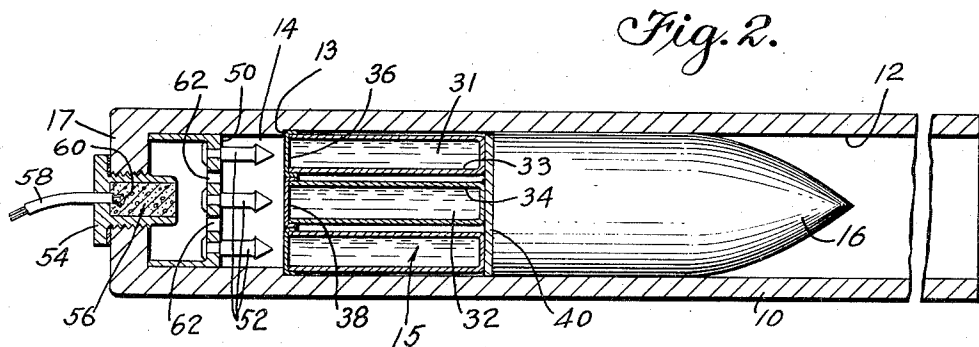
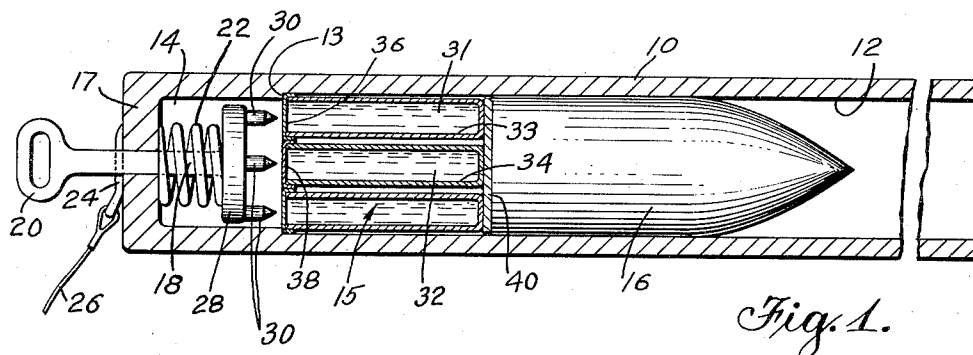
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APPARATUS FOR IMPELLING A PROJECTILE

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APPARATUS FOR IMPELLING A PROJECTILE

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2 Claims. (Cl. 89—1)

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The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates to ordnance, and more particularly to a method of and apparatus for impelling a projectile from a gun.

In a specific embodiment of the invention a gun barrel is charged with a propellant made up of two liquids which are contained in separate canisters. To fire the gun, the rear ends of the canisters are ruptured, permitting the propellant liquids to mix. The mixture is then burned, and the resulting gases propel the canisters forwardly while continuing to supply fuel to the combustion. By this means the pressure in the gun bore is maintained more nearly constant at the base of the projectile than is the case where a conventional powder charge is used.

An object of the invention is to provide an improved method of and means for propelling a projectile.

Another object of the invention is to provide improved apparatus utilizing inexpensive, easily produced liquid propellants.

A further object of the invention is to provide a method and apparatus of the type above outlined, whereby a projectile will be more effectively propelled.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following description.

Fig. 1 is a view in longitudinal cross-section of a gun and its charge which embody one form of the invention;

Fig. 2 is a similar view but showing a modified form of the invention; and

Fig. 3 is a fragmentary view of the apparatus shown in Fig. 2, but showing the elements as they appear after detonation.

The apparatus shown in Fig. 1 comprises a gun barrel 10 of the muzzle loading type, having a bore 12 which is formed with a shoulder 13 which separates the bore proper from a firing chamber 14. The charge of the gun comprises a propellant assembly indicated generally at 15, and a projectile 16.

The rear wall 17 of chamber 14 is bored to receive in sliding relation a plunger 18 having at its rear end a handle 20, and urged forwardly by a compression spring 22. In order to restrain the plunger against forward movement, a pin 24 is passed through a slot in the plunger, to be held therein frictionally, and may be withdrawn by means of a lanyard 26. At the head of the plunger is mounted a disk 28 formed with a plurality of forwardly directed pins 30.

The propellant member 15 of the gun comprises two hypergolic liquids 31, 32 contained respectively in concentric canisters 33, 34. The rear end of canister 33 is sealed by an annular frangible metallic diaphragm 36, and the rear end of canister 34 is sealed by a circular frangible metallic diaphragm 38. The two canisters are secured together by any suitable means, herein indicated

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as a disk 40 secured as by welding to their forward ends. The rear edge of canister 33 seats against shoulder 13, to maintain diaphragms 36, 38 in spaced relation to pins 30.

It will be seen that, with the parts in the positions shown in Fig. 1, withdrawal of pin 24 will permit spring 22 to move the plunger 18 forwardly, causing pins 30 to rupture the diaphragms 36, 38. The liquid contained in canisters 33 and 34 will ignite by contact and burn, producing high pressure gases. The action is further described in connection with Figs. 2 and 3.

The apparatus shown in Figs. 2 and 3 is similar to that of Fig. 1 except as hereinafter noted. In this embodiment, the firing mechanism comprises a piston 50 slidable in chamber 14 and carrying a plurality of headed perforating pins 52 designed to rupture diaphragms 36, 38 upon forward movement of the piston. Within the rear wall 17 of chamber 14 is mounted a tubular nut 54, within the bore of which is a primer 56 designed to be initiated by electrical current supplied through leads 58 to bridge wire 60 and containing sufficient explosive to move piston 50 forcibly forward and thus cause the pins 52 to rupture the diaphragms. The piston is formed with spaced apertures 62 to permit flame from the explosive to pass therethrough, and thereby ignite the liquids 31, 32, which in this case need not be of the hypergolic type.

The situation existing immediately after explosion of the primer 56 is shown in Fig. 3. The explosion has moved piston 50 forwardly, causing pins 52 to rupture the diaphragms and permitting the liquids 31, 32 to flow into the space 64 between the piston and the canisters. Ignition of the liquids by flame entering through apertures 62 produces pressure in the space 64 which propels the propellant assembly 15 forward and in so doing impels the projectile 16 from the gun. As the projectile and propellant assembly move forward, gas is allowed to move into the space forwardly of the liquids in the canisters thus permitting acceleration forces on the liquids to cause them to continuously flow rearwardly. By this means, further quantities of liquids 31, 32 are discharged through the ruptured diaphragms to be consumed and thereby maintain the pressure in space 64 at an approximately constant value until the projectile is expelled. Because combustion takes place at the rear of the bodies of liquid 31, 32, only liquids, and no gases, have to be accelerated forwardly in the gun bore. As a result, a greater portion of the energy developed by the explosion is applied to the acceleration of the projectile. In applications of the invention wherein it is not practicable to use acceleration forces to expel the liquids from the canisters, known types of pyrotechnic or mechanical devices may be used.

It will be clear that although the gun disclosed herein is of the muzzle loading type, the invention is also applicable to breech-loading guns, automatic or manual.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. Apparatus for propelling a projectile, comprising a gun, a shoulder in the bore of the gun defining a combustion chamber to the rear thereof, a container for propellant shaped to rest against said shoulder and thereby limit rearward movement of the projectile in said bore, a piston reciprocable in said combustion chamber and provided with apertures to permit passage of flame therethrough, means carried by said piston for rupturing said container, and means including an explosive charge positioned in communication with said combustion chamber for moving the piston forwardly to cause said rupturing means to rupture the rear end of said container.

2. Apparatus for propelling a projectile, comprising a

gun barrel having a bore formed with an annular stop defining a combustion chamber to the rear thereof, a container for liquid propellant shaped to rest against said stop and thereby limit rearward movement of the projectile in said bore, a plunger reciprocable in said combustion chamber and provided with apertures to permit passage of flame therethrough, means carried by said plunger for rupturing said container, and means positioned in communication with said combustion chamber for producing flame and moving the piston into rupturing contact with said container.

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