Oct. 10, 1944. L. FRANCIS 2,360,217

MULTICHARGE GUN

Filed June 20, 1941 2 Sheets-Sheet 1

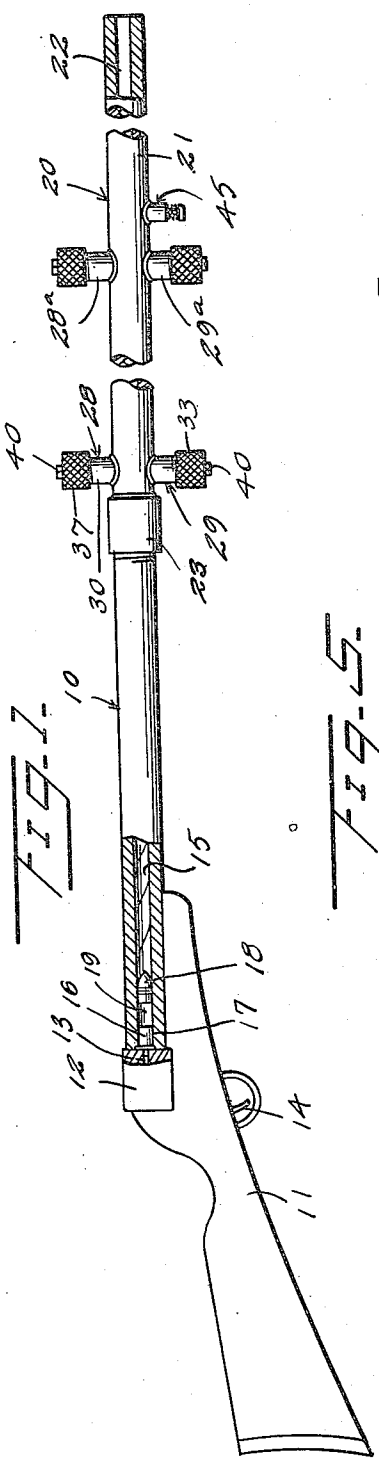


FIG. 1.

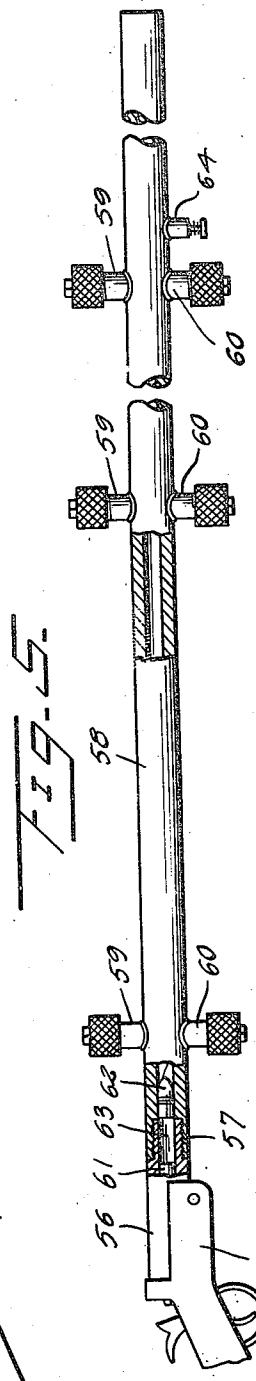


FIG. 5.

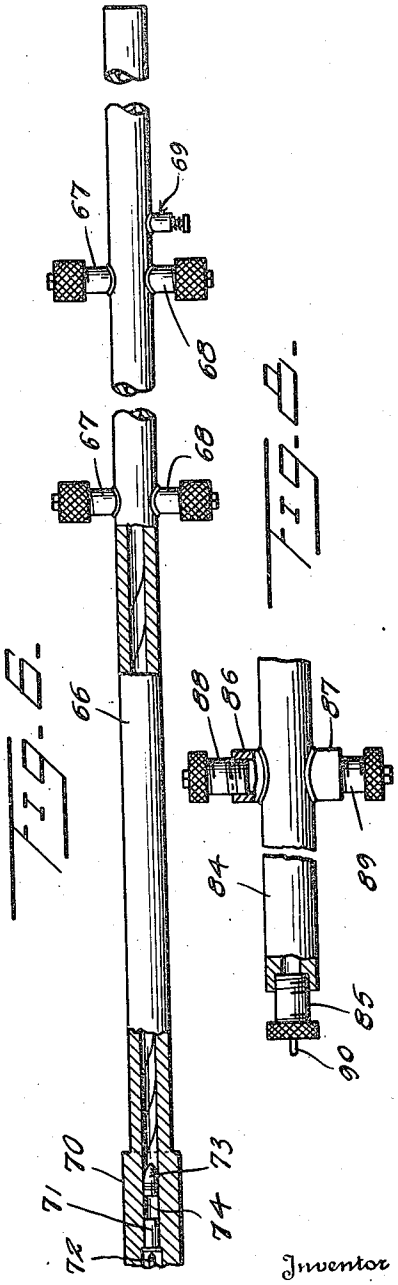


FIG. 6.

FIG. 2.

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Fig. 2.

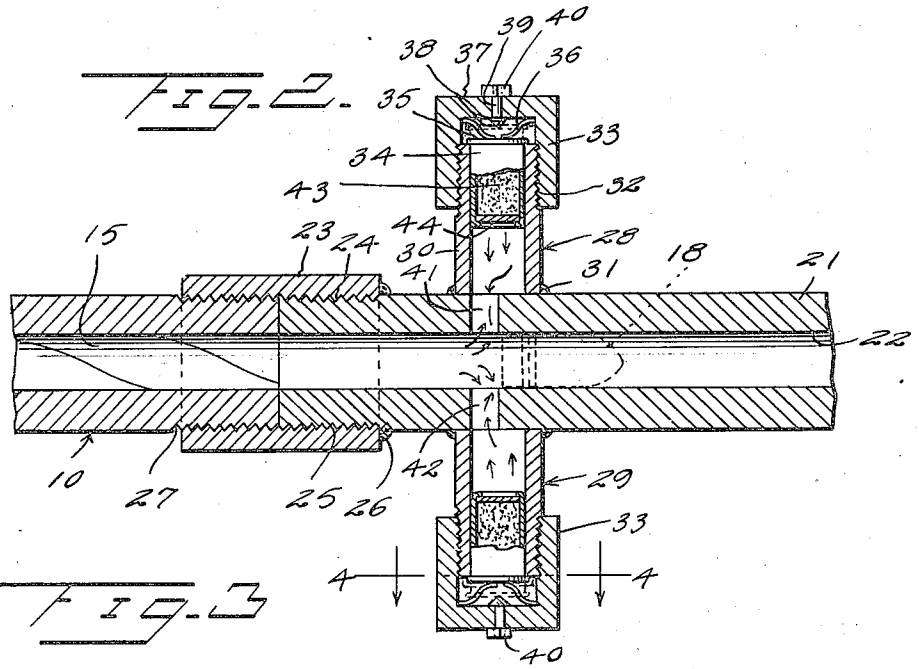


Fig. 3

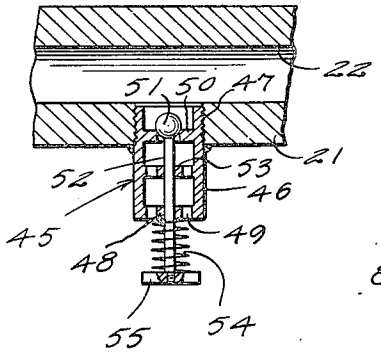


Fig. 7.

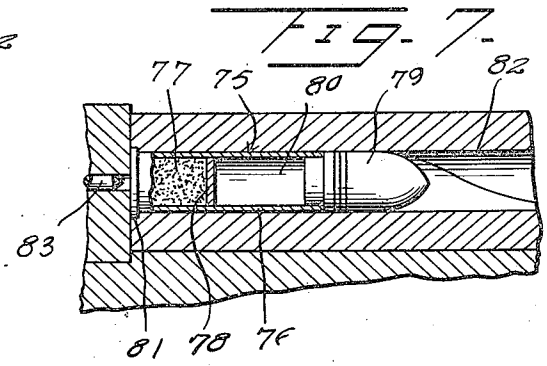
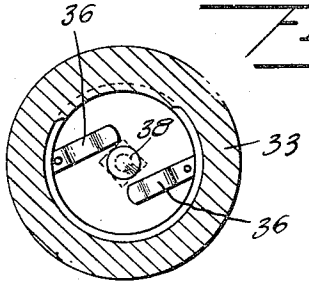


Fig. 4.



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MULTICHARGE GUN

Louis Francis, Miami, Fla.

Application June 20, 1941, Serial No. 399,005

3 Claims. (Cl. 42—76)

This invention relates to a multi-charge gun or attachment.

An object of this invention is to provide in a gun structure for an increase in the velocity of the projectile as the projectile advances through the barrel.

Another object of this invention is to provide a gun structure wherein an initial charge is provided for the purpose of initially moving the projectile through the gun barrel, and at spaced points along the length of the barrel there are provided booster charges which are set off progressively from the gas pressure behind the projectile so as to progressively increase the movement of the projectile in its advance through the barrel.

A further object of this invention is to provide for an acceleration in the movement of the projectile through the gun barrel by the application of successive additions of force which are set off by the pressure behind the projectile and which increase in intensity from the starting point to the end of the barrel.

A further object of this invention is to provide in a gun structure of this kind means for relieving the projectile from atmospheric resistance during the passage of the projectile along the gun bore.

A further object of this invention is to provide a gun structure of this type which may be formed with a relatively thin barrel, thereby materially reducing the weight of the gun without reducing the ability of the barrel to resist exploding or splitting.

A further object of this invention is to provide an improved method of firing a projectile which includes interposing an air cushion between the firing charge and the projectile so as to cushion the shock of the initial charge and also provide an expansive medium for cushioning the recoil from the successive charges.

A further object of this invention is to provide a booster attachment for a gun which may be mounted on the forward end of the gun barrel or muzzle for increasing the effective range of the gun by means of successive or progressive impulses which are given to the projectile, the successive impulses being obtained from blank cartridges extending laterally or radially from the barrel and which are set off from the pressure behind the projectile formed by preceding explosive charges.

A further object of this invention is to provide an improved method of increasing the muzzle velocity of a projectile which includes interposing an air space between the initial firing charge and the projectile and progressively exploding opposed charges behind the moving projectile.

A further object of this invention is to provide an improved method of increasing the muzzle velocity of a projectile which includes interposing an air space between the initial firing charge and the projectile progressively emploding opposed charges behind the moving projectile, and automatically relieving the vacuum generated behind the projectile.

A further object of this invention is to provide an improved cartridge for use with this gun, which includes a shell, a powder charge in the shell and a projectile at the forward end of the shell, the projectile being spaced forwardly of the charge to thereby provide an air space or air cushion between the charge and projectile for cushioning the recoil.

It will be so understood that the term "gun" as herein used in a generic term applying to shotguns, rifles, mobile or stationary artillery, cannons, machine guns, rapid fire guns, mortars, bomb throwers, and other ordnance using a barrel for shooting or ejecting a projectile or other article.

To the foregoing objects and to others which may hereinafter appear, the invention consists of the novel construction, combination and arrangement of parts as will be more specifically referred to and illustrated in the accompanying drawings, wherein are shown embodiments of the invention, but it is to be understood that changes, variations and modifications may be resorted to which fall within the scope of the invention as claimed.

In the drawings:

Figure 1 is a detail side elevation partly broken away and in section of a gun barrel constructed according to an embodiment of this invention,

Figure 2 is a fragmentary longitudinal section of the projectile booster means,

Figure 3 is a fragmentary longitudinal section showing the vacuum relieving means,

Figure 4 is a sectional view taken on the line 4—4 of Figure 2,

Figure 5 is a detail side elevation partly broken away and in section of another form of gun barrel embodying this invention,

Figure 6 is a detail side elevation partly broken away and in section of another form of gun barrel embodying this invention,

Figure 7 is a fragmentary longitudinal section partly in detail of the breech end of a gun show-

ing an improved form of cartridge for use with this invention, and

Figure 8 is a fragmentary side elevation of another form of gun barrel embodying this invention.

Referring to the drawings and first to Figures 1 to 3 inclusive, the numeral 10 designates generally a gun barrel having a stock 11 at one end and a breech mechanism 12 including a firing pin 13, which is operated by means of a trigger 14. The gun barrel 10 is provided with a rifled bore 15 and a cartridge or shell 16 is adapted to engage in the cartridge chamber 17 at the rear end portion of the barrel 10. A projectile 18 is adapted to engage within the rear portion of the bore 15 at a point spaced forwardly from the forward end of the cartridge 16 so as to thereby provide an air space 19 between the rear end of the projectile 18 and the forward end of the cartridge or charge member 16.

In order to provide a means whereby the muzzle velocity of the projectile 18 may be increased so as to thereby increase the effective range of the gun structure, I have provided as shown in Figures 1 to 3, inclusive, a booster attachment generally designated as 20. The attachment 20 includes a cylindrical barrel member 21 provided with a smooth bore 22, which is coaxial with the bore 15 and of substantially the same diameter as the bore 22. The rear end portion of the barrel 21 has mounted thereon a cylindrical coupling sleeve 23, which is formed with interior threads 24 engaging threads 25, which are formed on the rear end portion of the barrel 21. The sleeve 23 is preferably firmly held against rotation or movement relative to the barrel 21 by welding 26 which engages the forward end portion of the sleeve 23 and also engages the barrel 21. The gun barrel structure 10 at the forward end thereof is formed with exterior threads 27 upon which the coupling sleeve 23 is adapted to be threaded so that the barrel member 21 will form a continuation of the barrel 10.

In order to provide a means whereby the muzzle velocity of the projectile 18 may be increased, as it travels through the barrel extension or attachment 21, I have provided opposed pairs of booster charge chambers 28 and 29. The booster charge chambers 28 and 29 are of like construction and each includes a cylindrical booster charge chamber barrel 30 which is welded as at 31 to the exterior of the barrel 21. The booster charge chamber member 30 is provided with exterior threads 32 adjacent the outer end portion thereof and a breech cap 33 is adapted to be threaded onto the threads 32.

A blank cartridge 34 is adapted to movably engage within the booster charge chamber barrel 30, the cartridge or shell 34 being formed with a flange 35 which seats on the outer end portion of the booster charge chamber barrel 30. The breech cap 33 is provided with an opposed pair of springs 36, which are fixed to the outer wall 37 thereof and which engage against the outer end portion of the cartridge 34. A conical firing pin 38 having a stem 39 is secured in the outer end wall 37 of the breech cap 33 by means of a fastening member 40 which may be in the form of a nut which is adapted to be threaded onto the stem 39. Normally the percussion cap of the cartridge or shell 34 is disposed in inwardly spaced relation with respect to the firing pin 39 being held in such spaced relation by means of the two springs 36, so that the gun barrel structure may be readily shifted or moved without effecting movement of the shell or cartridge 34. The gun barrel member 21 is formed with diametrically opposed openings or ports 41 and 42, which communicate the booster charge chambers 28 and 29 respectively with the bore 22 of the barrel 21.

The openings 41 and 42 are substantially smaller in diameter than the interior diameters of the booster charge chamber members 28 and 29 and are also smaller in diameter than the diameter of the bore 22. The cartridges or shells 34 have a charge 43 of powder therein and a relatively thin cap or wad 44 is crimped or otherwise firmly held in the outer end portion of the shell so that the charge 43 will not be ignited prematurely by any flame or hot gases which may precede the projectile 18 as it moves lengthwise of the bore 22. The cartridge 34 is adapted to be fired by outward movement thereof under the pressure of the exploded and expanding gases which engage behind the shell 18, that is gases passing outwardly through the ports 41 and 42 and thereby forcing the two opposed cartridges 34 outwardly into engagement with their respective stationary firing pins so that the powder charge 43 will be ignited and the resultant expansion of the gases will increase the pressure of the gases behind the projectile 18 so as to thereby increase the muzzle velocity of the projectile 18.

As shown in Figure 1 the booster charge chambers 28 and 29 are positioned adjacent the rear end portion of the barrel 21 so as to provide the additional pressure necessary behind the projectile or bullet 18 for forcing the bullet or projectile 18 through the additional length of barrel 20. As shown in Figure 1 the barrel extension or attachment 20 is also provided with a second pair of opposed booster charge chamber members 28^a and 29^a which are positioned forwardly from the rear booster charge chamber members 28 and 29. While the several booster charge chamber members are shown in Figure 1 as extending from the upper and lower sides of the barrel member 21 it will be understood that these booster charge chamber members may preferably be disposed in horizontal position to extend laterally from the opposite sides of the barrel extension member 20 in order that the booster members will not interfere with the sighting of the gun.

In order to provide a means whereby any vacuum which may be created in either the bore 15 or in the bore 22, I have provided an inwardly opening relief check valve generally designated as 45. The check valve structure 45 includes a cylindrical housing 46 which is threaded as at 47 into the barrel 21. The cylindrical body 46 is formed with an outer end wall 48 which is provided with a plurality of openings 49. A valve seat 50 is fixed within the body 48 adjacent the inner end portion thereof and a spherical check valve member 51 is adapted to normally engage on the seat 50. An outwardly extending valve stem 52 is fixed to the valve member 51 and slidably engages through a valve stem guide 53 carried by the body 46 outwardly from the valve seat 50.

A tensionable spring 54 is disposed about the valve stem 52 and at one end engages against the outer side of the end wall 48 and at its other end engages against a knob or head 55, which is threaded onto the outer end portion of the stem 52. Adjustment of the head or knob 55 relative to the stem 52 will vary the tension of the spring 54 and the pressure of the valve member 51 against the seat 50, so that the valve mem-

ber 51 may be moved inwardly to an open position for admitting air into the bore 22 through the openings 49 at the desired moment in order to break the vacuum behind the bullet or projectile.

While in Figure 1 I have shown the vacuum breaking or relieving check valve structure 45 as being disposed between the forward pair of booster charge chamber members 28a and 29a and the forward end of the barrel 21, there may be an additional check valve member 45 disposed between the two pairs of booster charge chamber members and these check valve members 45 may be positioned at any desired point along the length of the barrel member 21 so as to break the vacuum which may be created within the bore 22 at the desired point.

Referring now to Figure 5 there is disclosed a gun barrel structure including an inner cartridge chamber member 56 on the forward end of which is threaded, as at 57, an elongated barrel member 58. The barrel member 58 is formed as a single unit and has fixedly secured thereto a series of spaced apart opposed pairs of booster charge chamber members 59 and 60, which are similar in every detail to the booster charge chamber members 28 and 29 shown in Figure 2. The cartridge or charge member 61 is disposed within the rear cartridge chamber 56 and the projectile 62 is positioned in forwardly spaced relation to the charge member 61, so as to thereby form an air cushioning space 63. There may also be secured to the barrel member 58 one or more vacuum relieving check valve structure 64 which are similar in every detail to the check valve structure 45 shown in greater detail in Figure 3. It will be understood that the barrel 59 may be of any desired length and that the adjacent pairs of booster members 59 and 60 may be disposed in any selected spaced apart relation, the distance between adjacent pairs of these booster charge chambers being such as to permit the booster charges from the booster charge chambers to increase the muzzle velocity of the bullet or projectile to the desired extent before the succeeding booster charges come into operation. For convenience of illustration the gun barrel structure 58 is shown as being mounted on a gun stock 65, but it will be understood that the barrel structure 58 may, if desired, be mounted on a stationary or mobile carriage dependign on the use to which the gun is being put.

In Figure 6 there is disclosed another embodiment of this invention wherein a gun barrel 66 has a plurality of longitudinally spaced apart opposed pairs of booster charge chambers 67 and 68. A vacuum relieving check valve member 69 similar in every detail to the relief valve structure 45 is mounted at the desired point on the barrel 66 and it will be understood that one or more of these relief valves 69 may be mounted on the barrel 66. The barrel 66 is formed with a cartridge chamber or cartridge holding member 70 at the rear end portion thereof within which a cartridge or shell 71 is adapted to engage. The cartridge or shell 71 may be fired by means of a firing pin 72 operated from a suitable firing mechanism (not shown). A projectile or bullet 73 is positioned forwardly from the charge or cartridge 71 thereby providing an air cushioning space 74 between the rear end of the projectile or bullet 73 and the forward end of the charge member 71.

Referring now to Figure 7 there is disclosed a cartridge member generally designated as 75, which is formed of an outer shell 76 within the rear portion of which is positioned a powder charge 77, which is held in position by means of a disc-shaped wadding or plate 78. A bullet or projectile 79 is mounted in the forward end of the shell 76 in forwardly spaced relation to the wadding or disc 78 thereby providing an air chamber 80 between the powder charge 77 and the rear end of the bullet or projectile 79. The shell 76 may be formed with a flange 81 at its rear end to limit the insertion of the shell 76 in the bore 82 of the gun barrel. The rear wall of the shell 76 may also be provided with the desired percussion cap or charge firing means so that the charge 77 may be ignited by means of a firing pin 83 or other suitable charge igniting means.

In Figure 8 there is disclosed a further form of gun structure including a gun barrel 84 which has mounted in the rear end portion thereof a removable cartridge chamber 85. The cartridge chamber 85 is similar in every detail to the booster charge chamber 28 with the exception that the forward end of the magazine 85 is threaded into the rear end portion of the barrel 84. The barrel 84 forwardly from the rear end thereof has fixedly mounted thereon a pair of diametrically opposed sleeves 86 and 87 and a pair of removable booster charge chamber members 88 and 89 are threaded into the sleeves 86 and 87. The booster charge chamber members 88 and 89 are also similar in every detail to the booster charge chamber member 28. With a construction as shown in Figure 8 the charge in the rear cartridge chamber 85 may be fired by means of a firing pin 90 which may be operated by any suitable mechanism or operating structure and the charges carried by the booster charge chambers 88 and 89 will be fired in a manner similar to the firing of the charges in the booster charge chambers 28 and 29. The cartridge chamber 85 is of a diameter equal to the diameters of the booster charge chambers 88 and 89 so that these booster charge chambers may be interchanged one relative to the other and a similar type of booster charge chamber may be used throughout the length of the barrel 84 and also at the rear end of the barrel.

In the use and operation of this gun structure the several gun structures will operate in the same manner, the rear firing charge as shown in Figure 1 being fired by the conventional charge firing mechanism including the firing pin 13. The explosion of the charge in the shell 16 will force the projectile or bullet 18 lengthwise of the rear barrel 10. After the projectile 18 moves to a point within the outer barrel section 21 and beyond the opposed radial openings 41 and 42 the pressure force of the gases at the rear of the projectile 18 will expand laterally through the ports or openings 41 into the booster charge chambers 28 and 29. This pressure or expansion of gases will move the cartridges 34 outwardly against the firing pins 36 so as to explode the charges 43 in the cartridges 34. The explosion of the charge or powder 43 in each of the opposed booster shells will provide an additional pressure force behind the projectile 18, so as to speed up the movement of the projectile 18 and also eliminate any vacuum which might have been formed in the barrel 21 after the projectile 18 left the rear barrel member 10 and entered the forward barrel section 21. These booster charges may be of equal size, one relative to the other and may be more

or less or equal to the original charge which initially set the projectile in motion through the barrel structure. There may be as many of these booster charge chambers or cylinders **28** and **29** along the length of the barrel structure as may be desired, so as to provide a progressively increasing muzzled velocity to the projectile **18**.

While heretofore attempts have been made to accomplish this same result by increasing the amount of initial charge and also lengthening the gun barrel in actual practice it has been found that the result accomplished by this invention cannot be accomplished by increasing the first charge or unduly lengthening the barrel. By providing an additional length of barrel the projectile is capable of being more accurately guided on its course and the effective range of the gun is very materially increased. It has also been found that not only is the effective range of the gun increased, but the effectiveness of the projectile within such range is materially increased.

By providing the opposed booster charge chambers as hereindisclosed in the event the pressure in the barrel operates to only explode one of the lateral cartridges the additional pressure from the second exploded cartridge will be sufficient to effect the explosion of the second lateral cartridge, this being true even though the percussion cap of the second lateral cartridge is faulty because of the fact that wadding in the inner ends of the lateral cartridges is sufficiently thin that the flame or fire from the other lateral cartridge is sufficient to immediately burn through the wadding and explode the charge from the inner end of the cartridge.

What I claim is:

1. A gun barrel structure comprising a barrel member formed with a bore, a pair of diametrically opposed booster charge chambers fixed to said member intermediate the ends thereof, a stationary firing pin carried by each booster charge chamber, and means in each booster charge chamber for normally holding a cartridge out of engagement with said firing pin, said member being formed with opposed openings communicating said bore with said booster charge chambers.

2. A gun barrel structure comprising a barrel member formed with a bore, a pair of diametrically opposed booster charge chambers fixed to said member intermediate the ends thereof, a stationary firing pin carried by each booster charge chamber, and means in each booster charge chamber for normally holding a cartridge out of engagement with said firing pin, said member being formed with opposed openings communicating said bore with said booster charge chambers and said openings being smaller in diameter than the diameter of said bore.

3. A gun barrel structure comprising a barrel member, a pair of cylindrical diametrically opposed booster charge chambers fixed to said member intermediate the ends thereof, said member having openings communicating with said booster charge chambers, a breech cap carried by each booster charge chamber, a firing pin carried by each cap, and yieldable means carried by each cap normally holding a cartridge out of engagement with said pin, the fluid pressure from said barrel entering said booster charge chambers through said openings and acting to force the cartridges in said booster charge chambers outwardly into engagement with said pins to thereby explode said cartridges, the pressure of said exploded cartridges increasing the muzzle pressure to thereby provide for increased muzzle velocity in said barrel.

LOUIS FRANCIS.