July 20, 1937. M. E. EVANS 2,087,594

PROJECTILE

Filed Nov. 6, 1934

FIG. 1

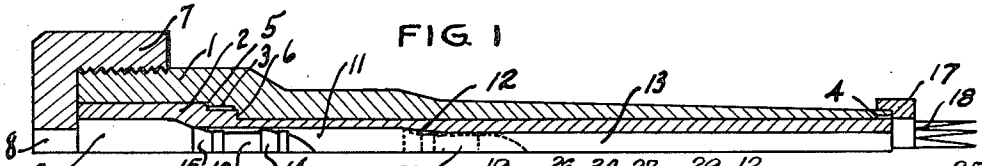


FIG. 2

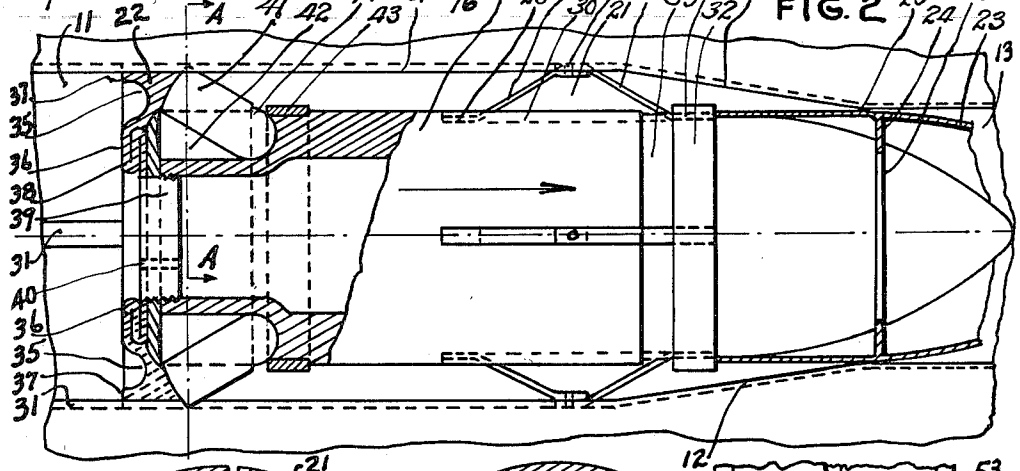


FIG. 3

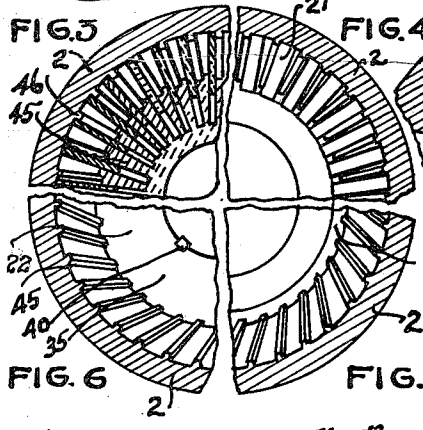


FIG. 4

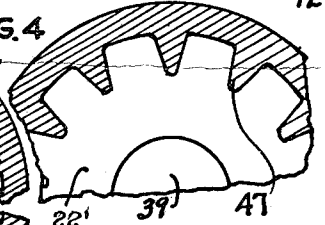


FIG. 5

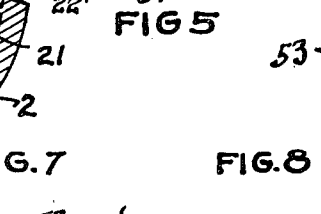


FIG. 6

FIG. 7

FIG. 8

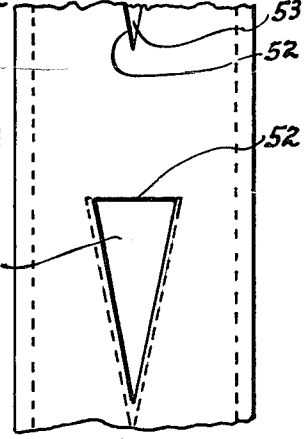


FIG. 9

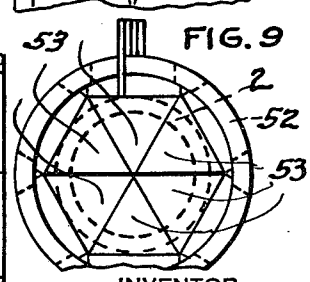
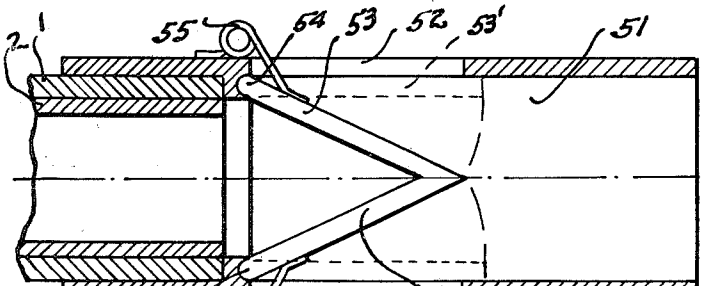


FIG. 10



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PROJECTILE

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Application November 6, 1934, Serial No. 751,740

7 Claims. (Cl. 102—26)

This invention relates to ordnance and particularly to heavy ordnance including guns and projectiles and silencing devices therewith. It relates specifically to the interior formation of firing tubes, special projectiles to operate therewith and silencing devices for these tubes.

It has for its object the utilization of standard gun pressures, calibers and acceleration distances to impart a higher velocity to a projectile of a given category than has been possible heretofore thereby increasing the potentialities of such projectiles. A further object is to transform standard naval ordnance already installed to a lesser category in conformity to naval treaties but with such transformation to increase their range. Thus a 12 inch gun with a charge of 334 pounds throws a 1070 pound shell, with muzzle velocity of 2250 ft. per second, a distance of 17342 yards. The maximum pressure is 30,000 pounds per sq. inch. It is the object of the instant invention to utilize this charge of 334 pounds in the converted 12 inch gun on a 10 inch shell weighing 617 pounds which normally receives a charge of 182 pounds to give it a muzzle velocity of 2250 ft. and a range of 16290 yards. The maximum pressure is 30000 pounds against 32000 pounds for the standard 10 inch charge. With the charge doubled but the pressure slightly lower the muzzle velocity will not be quite doubled, but it will be so much improved as to be outstanding in effect.

Thus, with categories prescribed by naval treaties the armament in accord therewith and practicing the instant invention would keep the adversary beyond return striking distance.

A further purpose of the present invention is to direct the explosive pressure over a greater pressure resisting area effective on a projectile.

Another object of the present invention is to control the exhausting gases within a tube thereby dissipating much of their sound producing capacity.

The ultimate object is to increase the accuracy of firing of a projectile and its distance of travel in naval engagements whereby the armament of a given category is completely outclassed by the instant invention.

The invention consists of the various methods and mechanical expedients now to be portrayed and described. While primarily directed to major ordnance it is applicable to minor firearms wherein the bore and projectile permit the incorporation of the following features.

Referring to the drawing:

Fig. 1 shows a partial sectional view of a heavy gun with a projectile in the liner thereof.

Fig. 2 shows a partial sectional view of a projectile adapted to concentric travel from a large to a small section of a liner.

Fig. 3 shows a partial sectional view along the line A—A of Fig. 2.

Fig. 4 shows the mid-shell supports in expanded position as a partial sectional view.

Fig. 5 shows deep rifling of a liner with a projectile therewith in sectional view.

Fig. 6 shows the rifling of a tapered section of a liner with the rifling positioned to rotate a shell.

Fig. 7 shows the mid-shell supports in a contracted position.

Fig. 8 shows a silencer tube with openings extending in series longitudinally thereof.

Fig. 9 shows an end view of a silencer tube with wings closing the liner muzzle.

Fig. 10 shows a longitudinal sectional view of the silencer tube.

Referring to Fig. 1, a tube 1 carries therein a rifled liner 2 positioned against rotation by breech key 3 and muzzle key 4 in said tube and against longitudinal movement by shoulders 5 and 6 and by a breech collar 7 which carries an adjustable breech block 8 giving access to a charge chamber 9 and to a projectile 10 positioned for firing. Proceeding from the breech end, the liner 2 changes inner diameter from the charge chamber 9 to a smaller diameter 11 adapted to receiving the projectile through the charge chamber 9, and then changes to a tapered section 12 connecting to a smaller diameter section 13 extending to the muzzle end of the tube and liner. The various diameters 9, 11, 12 and 13 of the liner are concentric, and a shell in the firing position concentric with them, travels in accord with the principles of the instant invention concentrically through the liner 2. For a shell 10 to travel to the categorical diametered section 13 of the liner, special supports to maintain the said concentricity and to constrain the explosive gases behind the shell in the firing position and course of travel are provided. A middle support 14 and a rear support 15 on the shell 10 maintain the required concentricity, and the rear support 15 also acts as a seal to restrain the gases. The shell 10 shown in a traveling position 16 in the tapered section 12 of the liner 2 is acted upon circumferentially by the tapered section 12 as a cam which functions to reduce the diameters of the supports 14 and 15 consecutively as the nose of

the shell pursues its concentric course into the smaller liner section 13.

The effective pressure of the gases upon the shell 10 is greater than in the previous art by the extent of the increase of the area upon which it acts. The muzzle velocity of the projectile is something new in the art, giving either increased accuracy or increased range dependent upon the control and increased penetrative power.

Upon the muzzle of the tube 1 is mounted a tube 17 provided with vanes 18 on the periphery thereof normally held free from the aperture of the muzzle but operated by the gases and air close to the muzzle upon the instant of projectile discharge to deflect the air from quick entrance to the muzzle and so somewhat reduce the sound vibration attendent upon firing.

Proceeding to a detailed consideration of these features, and referring to Fig. 2, a projectile body 19 is provided at its forward, mid- and rear-sections with supports 20, 21 and 22 respectively, adapted to maintain the concentricity of the projectile and designed to maintain the balance of rotation of the shell in its flight.

The forward support 20 is part of the forward ogive shell 23 and is mounted by a collar 24 in a groove 25 of the projectile ogive and by a cylindrical portion on the projectile 19.

The mid-support 21 comprises a plurality of angularly shaped bars 26 and 27 with remote ends 28 and 29 fastened to the bottoms of grooves 30 in the projectile 19 and with adjacent ends overlapping and riveted lightly together to form an arch. The mid-supports are of a width to fit in the narrowest grooves of the liner 2, but appear in Fig. 2 in the wide groove 31. A plurality of the mid-supports 21 around the mid-section of the projectile 19 assure stability thereto. Forward of the mid-supports 21 a soft metal ring 32 is positioned rotatably in a groove 33 permitting longitudinal movement along the projectile 19 a distance permitting pressure thereby upon the mid-support bars 27 which overlap the cooperating support bars 26. Between the forward support 20 and the mid-support 21, on the liner wall 2 is a tapered section 12 leading to the category bore 13. This tapered section 12 contacting with the forward moving mid-supports 21 (after forward support 20 has entered the category bore 13 and contacts therewith) causes a shearing action on the rivets 34 sufficient to sever them and allow the top members to depress the lower members 26 into the groove 30 with continued forward motion of the projectile 19 until the ring 32 contacting with the rifling 31 is forced longitudinally along the groove 33 to lock down the mid-supports 21. The supports 21 are thus depressed from the grooves 31 into which the metal of the ring 32 is pressed to form a mid-support and gas seal in the reduced section. The contact between the ring 32 and the angular members 27 is of a pressure to permit or not the rotation of ring 32 as may be chosen.

The rear support 22 of the projectile body 19 has an annular ring 35 of soft metal slidably bearing on the bow 11 of the liner 2 and fitting into the grooves 31 of the bore. Within this annular ring 35 and adjacent thereto a folded ring of metal 36 provides metal for squeezing the edge of an ammunition shell, not shown, against the shoulder 37 of the same metal 32. The middle of the folded ring 36 bears concentrically with a plate 38 on a plug 39 screwed into projectile 19. A key 40 in the plug 39 secures the support 22 and the plate 38 against rotation relative to the projectile 19 and assures movement with the projectile in the liner 11 as determined by the grooves 31 therein.

The annular ring 35 bears against a series of struts 41 positioned around the circumference of the bore 11 and pivotally seated in longitudinal slots 42 of the projectile 19. Adjacent the pivoted ends of the struts 41 is a circumferential ring 43 slidably positioned in slot 44 of projectile 19. Pressure on the annular ring 22 is transmitted through the struts 41 to the projectile 19 and thus effectively increases the pressure area effective upon the projectile. The struts 41 bear outwardly on the grooves 31 of the liner and from the side bearing thereon acquire a pressure causing rotation of the projectile in the liner 11 which is transmitted through the slotted section 45 of the projectile 19 shown in section in Fig. 3.

After the mid-section 21 of the projectile 19 has passed into the categorical bore 13 the rear support section 22 contacts with the constructing section 12 of the liner 11. This section acts as a cam upon the struts 41 and the annular ring 35 to compress them to a progressively smaller diameter, the laminated arrangement of the struts 41 and the soft character of the metal annular ring 35 facilitating such action. The face of the ring 35 bearing on the struts 41 is hardened sufficiently by overlapping metal plates therein to prevent detrimental penetration between the struts 41 which are supported in their angular position by the walls of the slots 42 wherein they rest. As the rear ring enters the categorical section 13 of the liner, it is forced into the rifle groove and slides longitudinally in the slot 44 of the projectile 19 with the depressed struts 41 thereby being locked down sufficiently to clear entrance to section 13. The sharp peripheral edge of the plate 38 between the struts 41 and the ring 35 serves to force the ring rearward, the folding 36 providing metal to prevent separation from the plug 39. The rear ring 43 in the small bore 39 now serves to prevent leakage of pressure gases and to give the necessary rotary motion to the projectile 19 through direction from grooves 31 in the categorical liner diameter 13. The transition of the projectile under pressure from the larger bore 11 through the taper bore 12 and into the small bore 13 is thus effected without shock by reason of the concentricity maintained by the supports.

In Fig. 3 which is a partial sectional view of the projectile along line A—A of Fig. 2, the slotted character of the strut support is clearly evident. The tongues 46 of the liner groove are shown straight through the tapered section of the liner 2. These are normally curved as shown in Fig. 6 where the annular ring support 22 is compressed to the categorical bore 13 and into the groove thereof.

In Fig. 4 the mid-supports 21 are shown in the large bore 31. In Fig. 7 the supports 21 are shown in compressed position.

In Fig. 5 the tongues 47 of the grooves in the bore 11 of large diameter are sufficiently elongated to normally support thereon a projectile of the categorical size shown therein with a rear plate 22' shaped to the grooves and supported by struts in the manner before described. With such tongues the mid-supports 21 are dispensed with as the bore defined by the tips of the tongues 47 supports the projectile concentrically throughout the length and the rear plate func-

tions as a gasket and pressure transmission medium to the struts.

Referring to Figs. 8, 9, and 10, the collar **50** of the short cylinder **51** fits closely over the muzzle ends of the tube **1** and the liner **2** to form an attachment for a sound muffler that is based upon the principle of retarding the inflow of air through the muzzle after exit of the projectile and burned gases. In the cylinder **51** a series of longitudinal triangular apertures **52** arranged in circumferential relationship are closed on the inner side by triangular doors **53** having the base of the triangles hinged on the side **54** adjacent the gun muzzle and held in a balanced closed position by external springs **55** attached thereto through the openings **52**. The springs **55** are attached to the collar **50**. The doors when closed and then simultaneously pressed inwardly of the tube **51** support each other and form a barrier to the muzzle of the liner **2**. When the doors **53** are in the closed position shown in dotted outline **53'** the exit from the bore **13** is clear and as the gases exit the doors are held shut by the gas pressure. As the pressure in the tube **51** drops, the air is drawn into the tube **51** through the door openings **52** pushing the doors **53** slightly inwardly. With the backward surge of the air toward the muzzle the doors **53** are pushed further inwardly and the air deflected through the openings **52**. In Fig. 8 a longitudinal series of openings **52** and doors **53** are shown for application in the manner just outlined.

The embodiments of the invention presented are subject to variations to suit the limitations imposed by the size of the firearms to which the advantages of the invention are to be attached. Such variations as come within the following claims are part of this invention. Uniform distance between riflings continuous through different diameters of a firing tube is featured.

I claim:

1. As an article of manufacture, a firearm projectile of metal cylindrical in shape, a plurality of normally radially extending collapsible supports at its mid-section, and a rifling band mounted on the projectile and cooperating with the collapsible supports to hold the same in collapsed position.

2. As an article of manufacture, a firearm projectile of metal cylindrical in shape, a plurality of normally radially extending collapsible supports at its mid-section, and a rifling band mounted on the projectile and cooperating with the collapsible supports, said rifling band being slidable longitudinally of the projectile upon collapsing of the supports.

3. As an article of manufacture, a firearm projectile of metal cylindrical in shape, a plurality of normally radially extending collapsible supports at its mid-section, and a rifling band slidable longitudinally of the projectile upon collapsing of the supports into engagement with the supports to maintain said supports in collapsed condition.

4. As an article of manufacture, a firearm projectile of metal cylindrical in shape, a ring-like metallic gasket of greater diameter than the projectile secured to the rear section of the projectile, and a plurality of normally radially extending supporting struts engaging with and supporting the peripheral front face of the gasket.

5. As an article of manufacture, a firearm projectile of metal cylindrical in shape, a ring-like relatively soft metal gasket of greater diameter than the projectile adapted to be reduced in diameter as the projectile passes into a bore the diameter of the projectile, and a plurality of normally radially extending struts pivotally mounted on the projectile supporting the peripheral front face of the gasket and foldable about their pivot to within the body of the projectile.

6. As an article of manufacture, a firearm projectile of metal cylindrical in shape with ogive point, a ring-like relatively soft metal gasket of greater diameter than the projectile adapted to be reduced in diameter as the projectile passes into a bore the diameter of the projectile, a plurality of normally radially extending struts pivotally mounted on the projectile supporting the peripheral front face of the gasket and foldable about their pivot to within the body of the projectile, and a rifling band cooperating with the struts to hold the same in folded position.

7. As an article of manufacture, a firearm projectile of metal cylindrical in shape with ogive point, a ring-like relatively soft metal gasket of greater diameter than the projectile adapted to be reduced in diameter as the projectile passes into a bore the diameter of the projectile, a plurality of normally radially extending struts pivotally mounted on the projectile supporting the peripheral front face of the gasket and foldable about their pivot to within the body of the projectile, and a rifling band cooperating with the struts, and slidable along the projectile to hold the struts in folded position.

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