April 24, 1956 L. R. SWEETMAN 2,742,821

VENT FOR TAPERED BORE GUN

Filed April 17, 1945

Fig. 2.

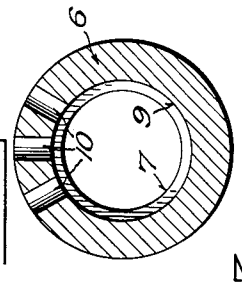


Fig. 3.

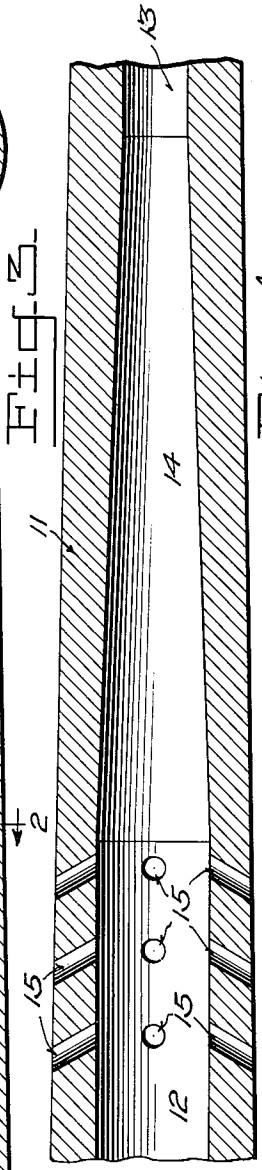


Fig. 4.

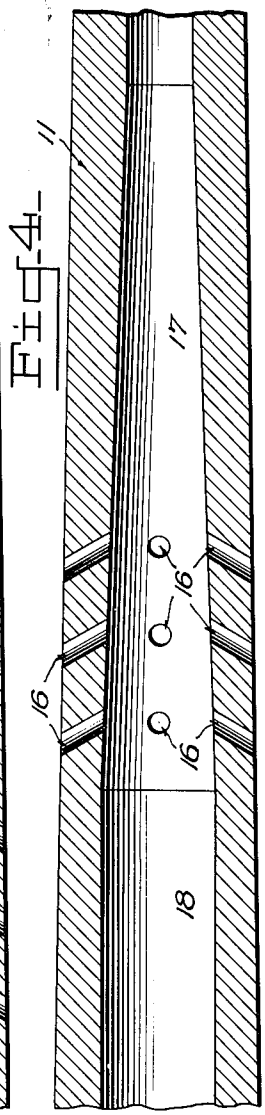


Fig. 5.

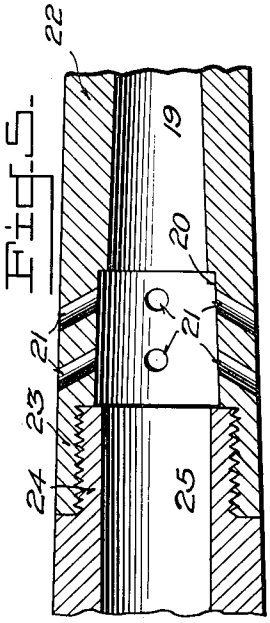
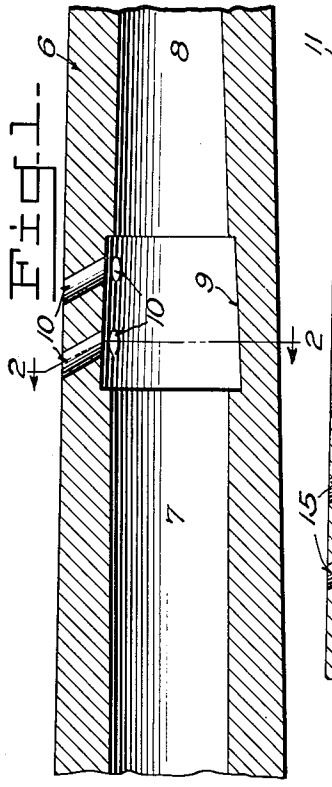


Fig. 1.



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VENT FOR TAPERED BORE GUN

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Application April 17, 1945, Serial No. 588,878

2 Claims. (Cl. 89—14)

(Granted under Title 35, U. S. Code (1952), sec. 266)

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 improvements in tapered bore guns and more particularly to venting means for eliminating the mutilation of the case which invaribly occurs in firing a conventional tapered bore gun.

Tapered bore guns of large caliber have proven very effective in anti-tank and armor piercing uses, especially in 57 mm.–40 mm. size. The advantages of employing a tapered bore together with a deformable projectile are that a projectile of the smaller cross section is obtained, thus having a reduced wind resistance resulting in better stability in range, enabling more favorable types and amounts of powder, relative to the projectile weight to be used, producing greater muzzle velocity; and the life of the barrel is prolonged over that of a barrel of the smaller diameter employing powder in the proportion used in a barrel of the larger diameter. However, the advantage of the tapered bore has been partially lost by the disadvantage of the shell being mutilated, due to the fact that the mutilated shell scores the breech and prevents re-sizing and re-use of the case as is customary in the Army.

This mutilation of the case is caused by the formation of a pressure wave in the bore created when the deformable projectile enters the tapered section, producing momentary decrease in velocity thereof. Since the gas pressure is extremely high, approximately 50,000 pounds per square inch, the action of the gas is analogous to the action of liquids under pressure. Since the pressure front is moving toward the muzzle, this momentary deceleration creates a back pressure wave toward the breech which mutilates the case end.

It is, therefore, a primary aim of this invention to provide means for venting the bore of the barrel to neutralize this back pressure wave and to permit it to escape into the atmosphere.

More particularly, it is an object of this invention to provide vents disposed in the forward end of the enlarged portion of the barrel or adjacent the rear end of the tapered section to eliminate the back pressure wave.

Still a further aim of the invention is to provide vents so arranged that they will not only function to eliminate the back pressure wave, but will also function as a muzzle brake to reduce the recoil and, in addition, to compensate for the recoil vertical jump of the gun.

Still another object of the invention is to form the bore with a recessed section into which the vents open so that the projectile skirts will not close the vent openings at the instant that the back pressure wave is created and so that the skirts will not extrude into the vent openings and thereby cause erosion of the bore around the vents.

Other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the drawing, which illustrates preferred embodiments thereof, and wherein:

Figure 1 is a longitudinal, substantially central sectional view of a portion of a tapered gun barrel constructed in accordance with the preferred form of the invention;

Figure 2 is a cross sectional view of the barrel taken substantially along a plane as indicated by the line 2—2 of Fig. 1;

Figure 3 is a fragmentary, longitudinal substantially central sectional view of a slightly modified form of the invention;

Figure 4 is a view similar to Fig. 3 of another modification thereof; and

Figure 5 is a view similar to Fig. 1 and showing another embodiment of the invention.

Referring more particularly to the drawing, wherein like reference characters designate like or corresponding parts throughout the different views, in Figs. 1 and 2 **6** designates generally a portion of a gun barrel having a bore including the bore sections **7** and **8**. Bore section **7** is of the same diameter throughout its length, whereas bore section **8** is tapered and diminishes from a diameter equal to that of bore section **7** to a diameter of a smaller caliber bore section, not shown in Figs. 1 and 2, but illustrated in Figs. 3 and 4. In this preferred embodiment of Figs. 1 and 2, the bore section **8**, at the end thereof which joins with bore section **7**, is recessed at **9** to provide a portion of greater diameter than either of the sections **7** or **8**. The upper part of the barrel **6** is provided with a plurality of openings or passages **10** which open into the recessed portion **9** at their inner ends and which open outwardly of the barrel **6** at their outer ends. As seen in Fig. 1, the vent openings or passages **10** are inclined to the rear from their inner to their outer ends, for a purpose which will hereinafter become apparent. The number and size of the vents **10** will vary depending upon calibers of the barrel, arrived at as a result of test.

In the modified form disclosed in Fig. 3, the barrel **11** includes a large caliber bore section **12**, a smaller caliber bore section **13** and a tapered bore section **14** therebetween, the rear end of which is of the same caliber as the bore section **12** and the forward end of which is of the same caliber as the bore section **13**. Barrel **11** is provided with vent openings or passages **15** formed in the forward end of its bore section **12** and which open into said section. Vent openings **15** extend entirely around the barrel **11** and are likewise inclined rearwardly from their inner to their outer ends, and may be of any desired number and size as required.

The embodiment of the invention shown in Fig. 4 varies only from that shown in Fig. 3 in that vent openings or passages **16** are formed in the rear portion of the tapered, intermediate bore section **17** instead of in the rear bore section **18**.

Another embodiment of the invention is disclosed in Fig. 5, and is similar to the preferred form as shown in Figs. 1 and 2, in that the tapered bore section **19** is provided with a recessed portion **20**, adjacent its rear end, similar to and for the same purpose as the recessed portion **9**. In this form of the invention, the vent openings or passages **21** may be formed entirely around the barrel and open into the recessed portion **20** and are inclined outwardly and rearwardly. Also, in this embodiment of the invention, the barrel **22** is formed of sections and the tapered section **19** thereof, at its enlarged end, is provided with an enlarged internally threaded socket **23** for engaging an externally threaded restricted extension **24** of the enlarged straight barrel section **25**, for detachably connecting the barrel sections.

From the foregoing, it will be apparent that when a projectile, not shown, of a caliber corresponding to the caliber of the larger bore section of the barrel is fired

through any one of the barrels as shown in Figs. 1, 3, 4, and 5, will, when it passes from the larger bore section, adjacent the breech end of the barrel, and into the tapered section where it is deformed, create a back pressure wave which will be released through the vents located either at the rear end of the tapered section or at the forward end of the rear, straight section. This will prevent the back pressure wave from moving back to the breech of the barrel, not shown, and mutilating the open end of the empty shell case, not shown. While the vent means will function acceptably when located in any of the positions as shown in the drawing, the preferred position is as shown in Figs. 1 and 2 wherein the vent passages are located near the rear end of the tapered bore section. By providing the recessed portion **9** or **20**, the skirts of the projectile, not shown, will not extrude into the vent openings to cause erosion of the bore therearound and will not impede the release of the excess pressure. By grouping the vent passages in the upper portion of the barrel, as shown in Figs. 1 and 2, the vented pressure is additionally utilized to function as a muzzle brake and also to reduce the recoil vertical jump. The grouping of the vents in the upper part of the barrel also prevents an excess amount of flash toward the ground that would reflect against and expose the gun crew.

It is important to note that the provision of vents to atmosphere in the locations illustrated do not affect the exterior ballistics of the projectile, firstly because gas pressure in the barrel has already reached a maximum before the vents are reached, and has started to diminish at the time the projectile passes the vents, and secondly because of the fact that muzzle velocity of a projectile is dependent to a very large degree upon the ratio of the weight of the projectile to the type and amount of propellent powder. Firing tests on vented gun barrels, in which the muzzle velocity was measured, indicated that the values obtained were the values to be expected for the weight of projectiles and type and amount of propellent powder used.

Various additional modifications and changes are contemplated and may obviously be resorted to, provided that

they do not depart from the spirit and scope of the invention as hereinafter defined by the appended claims, as only preferred embodiments have been disclosed.

I claim:

1. In a gun barrel having a breech end bore portion of one caliber, a muzzle end bore portion of a lesser caliber, and an intermediate tapered bore portion connecting and merging with the bores of said end portions to provide a smooth bore surface, there being a cylindrical recess formed in said intermediate portion of the wall of said barrel and adjacent the connection with said breech end bore portion, said recess being of greater diameter than the bore of said breech end portion, there also being a plurality of vents opening outwardly and rearwardly through the top portion of the wall of said cylindrical recess.

2. In a gun barrel having a breech end portion of one caliber, a muzzle end portion of a lesser caliber, and an intermediate portion connecting the bores of said end portions and having a bore tapered from its breech end to its muzzle end, there being a cylindrical recess in the wall of said barrel between said breech part and said intermediate part of greater diameter than the bore of said breech portion, said cylindrical recess having a plurality of vents extending through its wall thereof.

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