PUBLISHED
APRIL 27, 1943.
BY A. P. C.

W. BORN
GUN BARREL
Original Filed March 21, 1939

Serial No.
373,181
2 Sheets-Sheet 1

FIG. 8

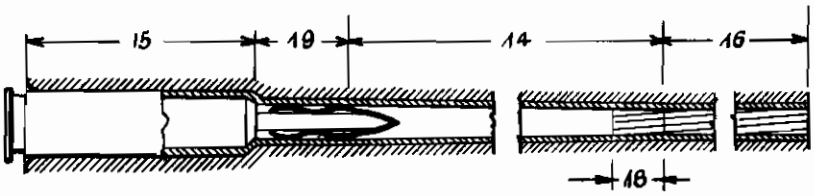

FIG. 9

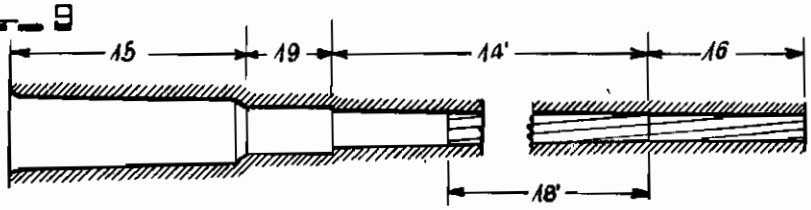

FIG. 10

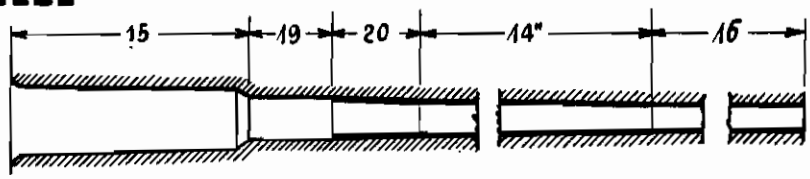

FIG. 11

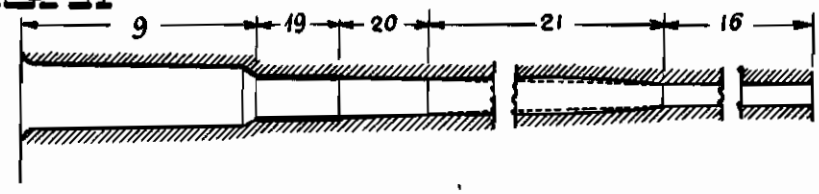

FIG. 12

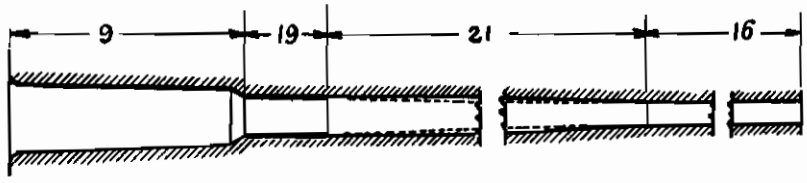

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FIG. 1

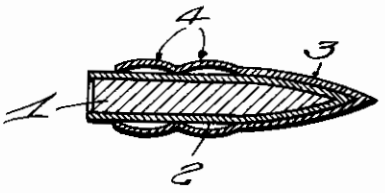

FIG. 4

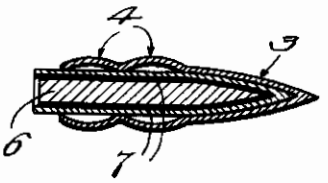

FIG. 2

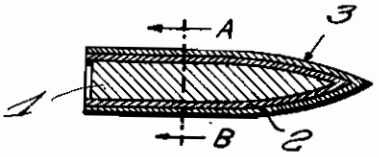

FIG. 5

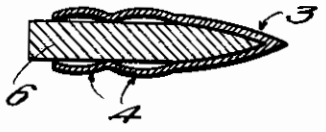

FIG. 3

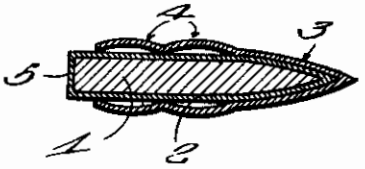

FIG. 6

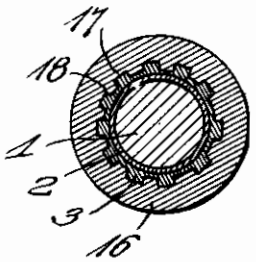

FIG. 2a

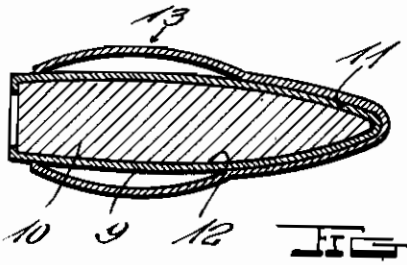

FIG. 7

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Published Apr. 27, 1943

Serial No. 373,181

ALIEN PROPERTY CUSTODIAN

GUN BARREL

Woldemar Born, Stuttgart, Germany; vested in the Alien Property Custodian

Application filed January 4, 1941

This invention relates to a fire arm and has particular reference to a barrel for a bullet and barrel system in which the bullet or projectile is deformed during its passage through the barrel from a larger initial calibre or maximum diameter down to a smaller muzzle calibre, in order to increase the propelling force imparted to the bullet.

This application is a division of my copending application Serial No. 263,256, filed March 21, 1939, for Barrel and Bullet System.

It is an object of the present invention to provide a barrel in which the bullet irrespective of the large deforming forces acting upon it is only deformed in a predetermined ballistically favorable manner, without assuming any undesirable shape or destruction.

Another object of the invention is to provide a barrel which prevents the production of excessive gas pressures and ensures an efficient guiding and centering action on the cylindrical part of the bullet and high firing precision.

Still another object of the invention is to prevent inflation, swelling or jamming of the bullet and especially of its core due to the upsetting pressure exerted upon it by the powder gases.

With these and other objects in view, as may become apparent from the within disclosures, the invention consists not only in the structures herein pointed out and illustrated by the drawings, but includes further structures coming within the scope of what hereinafter may be claimed.

The character of the invention, however, may be best understood by reference to certain of its structural forms, as illustrated by the accompanying drawings in which:

Figures 1 to 7 show axial sections of projectiles or bullets cooperable with the gun barrel of my invention.

Figure 1 shows a jacket type projectile having an open bottom and an outer jacket with bulbed portions, in its original form; Fig. 2 shows the same projectile after its deformation in the barrel; Fig. 2a is a cross-sectional view of the same projectile taken at line A—B, Fig. 2, showing the projectile in the rifled portion of a barrel; Fig. 3 shows a modified bullet having a closed jacket; Fig. 4 shows a bullet including a steel jacket and an additional jacket having hollow inflations; Fig. 5 shows a bullet in which the outer jacket is drawn directly over the steel core; Fig. 6 shows a bullet in which a layer of a plastic material is interposed between the outer jacket and the steel core; Fig. 7 shows a bullet in which the outer cover is provided with one bulbed portion only for obtaining a streamline final shape of the bullet; Figs. 8 to 12 are exaggerated fragmentary axial sections of embodiments of my novel barrel construction; Fig. 8 shows a barrel in which the tapered portions of the lands extend into the conical part of the barrel; Fig. 9 shows a barrel in which the lands extend further into the conical part of the barrel; Fig. 10 shows a barrel in which the conical portion has two different tapers, the maximum taper being immediately in front of the cartridge magazine or breech chamber; Fig. 11 shows a barrel in which the taper follows a curve, having its maximum taper near the breech chamber; and Fig. 12 shows a barrel similar to Fig. 11, but with the maximum taper at the end of the conical part.

Referring now to the drawings in greater detail, and first to Figs. 1 to 3, it will be seen that a core 1 of lead or the like is surrounded by a normal cover or jacket 2 in known manner. In addition, an outer jacket 3 is drawn over the jacket 2 from the top end and surrounds the cylindrical part of the same in the form of two annular bulged or bulbed portions 4. In the bulbed state of the outer cover there is an axial spacing left between the rear edge of the same and the end edge of the bullet while in a radial direction the end edge of the outer cover engages tightly the body of the bullet. During the passage of such a bullet through the conical portion of a barrel of the type shown in Figs. 8 to 12, the bulbed portions 4 of the outer jacket are compressed or depressed to assume the cylindrical form shown in Fig. 2 and due to the drawing and stretching action involved therein the jacket 3 becomes longer. The dimensions are preferably so chosen that the end edges of the outer jacket and of the core of the bullet coincide with each other in the final cylindrical or smooth state of the jacket as shown in Fig. 2. The hollow spaces between the bulbed portions 4 and the inner jacket 2 have now disappeared, the outer jacket surrounds the inner jacket smoothly and the shape of the projectile is now exactly similar to that of an ordinary jacket type bullet. The provision of the bulbed portions in an outer jacket of the bullet and the additional provision of a normal, tightly fitting inner jacket 2 facilitate projection of the bullet from the barrel of my invention.

By way of alternative, the normal jacket 2 of the bullet may be closed at the rear end of the same, so as to protect the softer core of the bullet against the direct action of the powder gas, as shown in Fig. 3.

In the prefered form of bullet only the outer jacket 3 and its bulbed portions are subjected to the deformation required to effect the requisite guiding of the bullet in the lands and grooves of the rifled portion of the barrel. To this end, the maximum cross section or calibre of the portion of the bullet inside the outer jacket is made smaller than the smallest calibre or cross section within the lands in the cylindrical portion of the barrel. This offers the advantage that the outer jacket if desired may be applied directly on the steel or like core of ordnance projectiles or the like, in the manner shown in Fig. 5.

On the other hand, it is also possible in bullets having a steel core and an outer jacket 3, to provide a thin layer of easily deformable or plastic material, 8, Fig. 6, such as soft lead or hard lead and the like between the outer jacket 3 and the core 8, or even to completely fill up the hollow spaces within the bulbed portions by such a material. The intermediate layer 8 is then drawn out in the passage of the bullet through the barrel and assumes the full length of the bullet, thus acting as a lubricant or antifriction means for the bullet. A further advantage is attained by the easily deformable intermediate layer in that in case of large tolerances of the bullet diameter and an excessive diameter of some bullets, the steel core is not jammed in the barrel but the difference is compensated by deformation or displacement of the soft intermediate layer 8.

A bullet of a ballistically favorable tear or torpedo shape may be obtained by a construction as shown in Fig. 7. In this case, the bullet 10 with its jacket 9 which may be slightly torpedo- or tear-shaped, is provided with an outer cover 11 that is drawn over the jacket 9 from the top end thereof and bulged or arched from the point 12 where the forwardly tapered front end of the projectile passes over into the middle and rear part thereof, towards the end of the projectile, in the form of a single bulb 13 the rear end of which tightly engages the body of the bullet as in the above described types. In its passage through the barrel the bulbed portion is compressed only to such an extent that the end edge of the outer jacket 11 coincides with the end edge of the normal jacket 9, while a certain clearance is left at the bulbed portion so that the bullet leaves the barrel in a tear-shaped form underlying favorable aerodynamic conditions.

In order to obtain the required increase of the ballistic effect with projectiles such as described, the barrels from which the projectiles are fired are constructed in the following manner.

The tapered part of the barrel between the breech chamber and the cylindrical part is made longer than with normal barrels (the length of the tapered part of which is about 3 to 5 calibre lengths), by an amount corresponding to the required deformation work so as to keep the gas pressure within the known limits, while the pitch or taper may be kept at the known figure, i. e., one depth of the rifling or groves at 3 to 5 calibre lengths or 1:80 to 1:100. The tapered part is followed by a cylindrical guidance for the bullet. Instead of making the normal tapered part of the barrel longer it is also possible to provide a separate conical portion between the normal tapered portion and the cylindrical portion of the barrel. I prefer to make said conical part with a smooth unrifled bore in order to avoid any undue resistance offered against acceleration of the projectile in addition to the resistance due to the deformation work.

A barrel of this kind is shown in Fig. 8. The conical part 14 in this case begins right in front of the breech chamber 15 and bullet space 19 and has a maximum calibre corresponding to the maximum diameter of the outer jacket of the bullet 1, from which it is tapered uniformly down to the diameter of the cylindrical end portion 16 of the barrel that corresponds to the diameter of the bullet after the outer jacket of same has been drawn out and depressed. The cylindrical portion 16 is rifled at 17 and the lands taper off in the conical part 14, over a distance 18, in a similar manner as with the conventional barrels.

Where the manufacturing tolerances to be admitted for the barrel and bullet calibre are large, it may be required that the rifling extends further into the conical part 14' by a distance 18', Fig. 9, and in some instances to a point near the cartridge magazine 15, in order to ensure the required degree of firing precision. In this case, the lands are so formed, if possible, that the grooving or channelling work exerted with respect to the outer jacket is kept at a low rate. To this end, the lands may be formed to rise quite gradually from the inner walls of the barrel, as to their height and width, with a very small twist or without any initial twist, so as to assume only quite gradually their normal width and height and their final twist.

In order to ensure high resulting precision it is required that the front bulb of the outer jacket is guided and centered in the conical part of the barrel already after a very short travelling distance and while the rear bulb is still being guided in the breech chamber. In order to produce such early guiding action with larger working tolerances I may provide the conical portion of the bore in the barrel with a high initial taper in front of the breech chamber 15, for example, in the manner shown in Fig. 10 in which a short conical connecting portion 20 of an increased taper or pitch is provided between the long conical part 14'' of the barrel and the chamber 19.

Furthermore, it is contemplated that the conical portion of the barrel bore may have a taper following a non-linear, curved characteristic having its maximum taper or pitch near the breech chamber or near the muzzle end, as shown by way of example at 21 in Figs. 11 and 12, respectively, whereby the special features, more particularly the explosion speed, of the respective gun-powder may be met or a rapid initial acceleration of the bullet may be effected.

It will thus be understood from the foregoing that in a barrel and bullet system employing the novel barrel of my invention, the deformation of the projectile is effected by drawing out and depressing an additional outer jacket on the projectile body and the lands are so shaped and dimensioned with respect to the wall thickness of the outer jacket as to form grooves in said outer jacket only, without entering too deeply into the same or even cutting through the same. Accordingly, the real bullet bodies or any portions or projections or rings of the same are not subjected to deformation in the barrel and bullet system embodying my invention, as distinct from known systems of this kind.

This will be seen best from Fig. 2*a*, showing a cross sectional view through the projectile on the line A—B in Fig. 2, as it leaves the barrel which is shown in an end view. As shown in this figure, the core 1 and the inner or normal jacket 2 are not deformed at all, while the outer jacket 3 has been deformed and depressed into

tight engagement with the inner jacket. Also, the lands 18 between the grooves 17 of the rifling have formed corresponding channels or grooves in the outer jacket while intermediate the lands the engagement between the jackets 2 and 3 is less tight. The portion of the barrel in which the first acceleration and deformation is imparted to the projectile is made without any twist of the rifling, if any, in order to ensure that the outer jacket will be drawn out smoothly and exactly in the direction of the axis of the projectile, whereby the resulting precision is enhanced.

The smooth shape of the bullet core prevents the outer jacket from getting stuck at any intermediate point of the core and ensures a smooth sliding of the outer jacket along the core. Moreover, due to the provision of a separate normal jacket around the bullet core in the case of a soft and deformable nature of the core, the same is prevented from getting upset in the barrel and causing cold welding or jamming therein.

The outer jacket may be made of any suitable deformable or resilient material, as for instance, soft sheet iron, plated sheet iron, gun metal or the like and its thickness may be of the order of the thickness of normal projectile jackets.

WOLDEMAR BORN.