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F. JANEČEK ET AL

2,315,207

FIREARM

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FIG. 1.

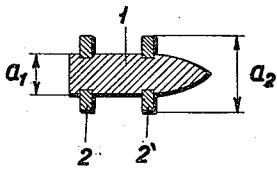


FIG. 2.

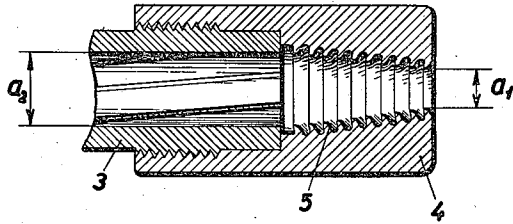


FIG. 3.

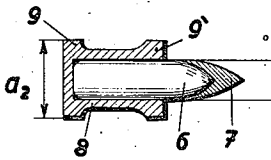


FIG. 4.

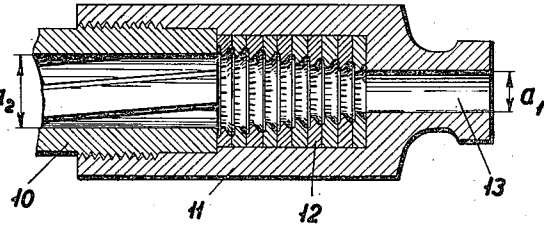


FIG. 6.

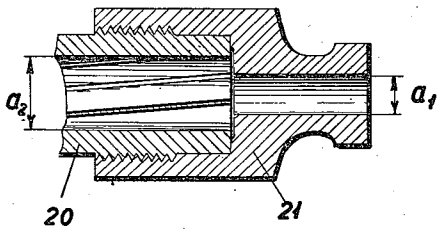


FIG. 5.

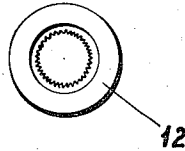


FIG. 8.

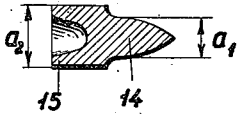


FIG. 7.

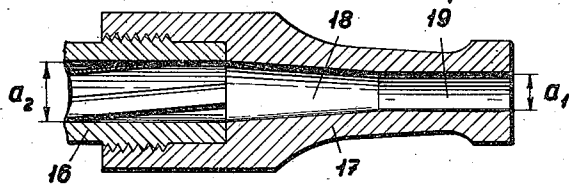


FIG. 9.

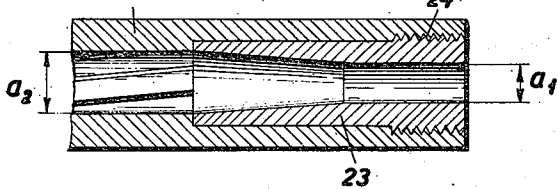
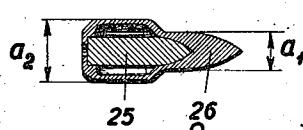


FIG. 10.



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## UNITED STATES PATENT OFFICE

2,315,207

## FIREARM

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Prague-Nusle, Czechoslovakia; vested in the  
Alien Property Custodian

Application January 10, 1939, Serial No. 250,208  
In Czechoslovakia July 16, 1938

3 Claims. (CL 42—76)

The invention relates to the construction of the barrel and the corresponding projectile of a firearm which are so constructed as to secure an increased ballistic performance of the firearm and a complete utilisation of the propelling charge, while employing a comparatively small barrel.

The principle of this invention comprises employing a barrel of normal construction with a normal cylindrical bore in which the projectile is loaded, said projectile being so constructed that its calibre after passing through the barrel is substantially altered in a readily removable attachment designed for the purpose and mounted on the end of the barrel, the projectile being thereby rendered ballistically more suitable for flight through the air.

The essential parts of this arrangement are therefore three, namely:

1. The normally manufactured barrel with a cylindrical bore and suitable rifling of relatively large calibre.

2. An attachment which is fixed to the end of the barrel, is readily detachable and is so constructed that in it the projectile of large calibre is altered to a ballistically more advantageous projectile of smaller calibre.

3. The suitably constructed projectile which permits such alteration of its calibre.

The actual barrel employed is a normal barrel provided with rifling grooves for producing the rotation of the projectile and differs from an entirely normal barrel merely by a suitable device at its muzzle end (screwthread, bayonet joint or the like), permitting easy detachment and fixing of the attachment.

The attachment may be made in many modifications according to the construction of the projectile. Said projectile is merely deformed from the diameter of the barrel bore to the final calibre by means of guiding and sealing flanges, collars or the like. In this case, the bore of the attachment merges from the barrel bore into the final diameter of the projectile by a conical or other suitable transition. The attachment is not rifled, so that the projectile leaving it has a smooth surface without traces of rifling, or the projectile guide is braked and the projectile is reduced either in the conical bore of the attachment or by an annular recess which may be single or stepped. By employing a single knife edge or an entire system of knife edges of circular or other profile in the attachment, the guide bands of the projectile or its shell are cut up into a quantity of splinters which, due to inertia, leave the attachment after the projectile.

Due to this braking or cutting up of the projectile casing or guide bands, there is produced a considerable force which counteracts the recoil and thereby considerably reduces it.

The projectiles are advantageously so constructed that their form, length, weight and mean load correspond to the final calibre, which may be substantially smaller than the bore of the barrel.

Due to the herein described arrangement, during the passage of the projectile through the barrel, an expansion of the gases occurs in the bore, said bore being substantially larger than corresponds to the size of the projectile in the normal arrangement. Therefore, for the same maximum pressures of the gases, the force acting on the base of the projectile is increased in the proportion in which the cross-section is increased, and in the same proportion the acceleration of the projectile is also increased. An adequate expansion ratio is attained even with a relatively short barrel, so that abnormal lengthening of the barrel is not necessary for satisfactory utilisation of the propelling charge and for attaining very high initial velocities.

The advantage of this construction is that by means of the firearm constructed on this principle, in comparison with the normal constructions, greater ballistic performances are secured, for the same length of barrel or the same weight of firearm, or the same ballistic performances are secured by employing shorter barrels or a lighter firearm. In addition, the manufacture of the barrel is just as simple as in the normal construction, because the bore of the barrel is cylindrical throughout the entire length.

A further advantage is that the projectile leaving the barrel attachment is quite smooth, that is to say, it has no grooves and rifling traces, so that the air-resistance of the projectile is thereby diminished. By exchanging the attachment, the same firearm can be used for projectiles of different final calibres, and after removing the attachment, the same firearm may be used for firing normal heavy projectiles of a form and weight corresponding to the bore of the barrel. The same firearm may therefore be employed, for example, with the attachment for firing light armour-piercing projectiles of small calibre and high initial velocity or without attachment for firing heavy expanding projectiles of low initial velocity.

Some constructional examples are shown in the accompanying drawing.

Figure 1 is a section through the projectile,

Figure 2 is a section through the muzzle part of the barrel and the barrel attachment,

Figure 3 is a section of a modification of the projectile in section,

Figure 4 is a section of another modification of the attachment,

Figure 5 is a view of one of the insertion rings of Figure 4,

Figures 6, 7 and 9 are sections of modifications of the attachment, and

Figures 8 and 10 are sections of further modifications of the projectile.

In Figure 1, 1 is the body of the projectile. Its length, form and weight correspond to the final calibre  $a_1$  of the projectile, as possessed by the latter after leaving the barrel attachment. The guide bands or collars 2 and 2' correspond to the bore of the barrel  $a_2$ . These bands are advantageously made of light plastic metal (for example dural or the like), in order that the energy required for their acceleration may be as small as possible.

Figure 2 shows a section through the barrel muzzle and the muzzle attachment. The barrel 3, over its entire length from the cartridge chamber to the muzzle, has a cylindrical bore of calibre  $a_2$  and a suitable number of rifling grooves of constant pitch or a pitch varying as desired. The number of the rifling grooves and their depth are selected as usual with regard to the material and the size of the sealing bands. The terminal angle of the rifling is such that the rotation necessary for stabilising the projectile is imparted to the final form of the projectile with calibre  $a_1$ . The attachment 4 is screwed or fixed in any other manner (for example by bayonet joint or the like) to the barrel 3 and in its interior a number of knife edges 5 are formed in continuation of the barrel 3. The inner diameter of these knife edges gradually diminishes from the original barrel calibre  $a_2$ , to the calibre  $a_1$ , so that the projectile entering the attachment 4 after leaving the barrel muzzle impacts against these knife edges, whereby the flange material is progressively cut away. After passing through the attachment, the projectile is entirely free from guide flanges and continues its further trajectory in a ballistically favourable form.

Figure 3 shows an armour-piercing projectile. It consists of the hardened steel core 6, welded or soldered to the tip of which is the cap 7 of soft material (soft wrought iron, copper, brass or the like). On the rearward part of the core 6, which gently tapers conically to the rear, is mounted a sleeve 8 terminating in two or more guiding and sealing flanges 9 and 9'. The sleeve 8 is advantageously made of material of low specific gravity and sufficient strength, for example of dural or the like. After the projectile has passed through the barrel attachment, the entire sleeve 8 is cut to splinters by the knife edges of the attachment, so that the projectile leaves the firearm as a smooth projectile of calibre  $a_1$ . The armour piercing core in this projectile has the same calibre  $a_1$  so that weight of the projectile is used to the best advantage.

Figure 4 shows another alternative of the barrel attachment. The attachment 11 secured to the barrel 10 has a series of inserted rings 12 provided with knife edges. These knife edges may be interrupted in various ways, or as shown in Figure 5, a series of teeth may be provided. The attachment 11 may terminate in the cylindrical guide 13 for the projectile, whereby the latter is centered after the removal of the guide collars.

The projectile shown in Figure 8 is made of soft deformable material, for example soft iron, copper, brass or the like. Its body 14 in the rear part passes from the calibre  $a_1$  to the flange 15

of the calibre  $a_2$ . After passing through the barrel, the guide flange 15 of this projectile is compressed to the smooth final form of calibre  $a_1$  in the attachment 17 according to Figure 7 and in the cylindrical bore 19. Advantageously, the guide flange is constructed so that the work of deformation necessary for compressing the flange 15 from the diameter  $a_2$  to the diameter  $a_1$  is as small as possible, and so that after deformation, the cavity of the projectile is filled as completely as possible.

Figure 6 shows an attachment 21 having a circular recess. The projectile constructed for example as shown in Figure 3, after passing through the barrel 20 impacts with this flange 9' against the said circular recess and the sleeve 8 is braked by its guide flanges, while the projectile continues its path without sleeve. The bore  $a_1$  of this attachment is advantageously somewhat larger than the diameter of the projectile, so that the projectile passes through it with clearance and is not braked.

Figure 9 shows an attachment 23 inserted in the muzzle of the barrel 22 and secured, for example, by means of the screwthread 24.

Figure 10 shows another modification of an armour-piercing projectile, the hardened core 25 of which is pressed into the shell 26 of soft iron or other deformable material. During the passage of the projectile through the attachment, the guide of the projectile is deformed from the diameter  $a_2$  to the final diameter  $a_1$ .

We claim:

1. A firearm having a rifled barrel, and a bored out detachable attachment connected to the muzzle of the barrel, with the axis of the barrel and the axis of the bore of the attachment lying in alignment, a series of cutting rings within the attachment and a smooth-bored portion located between said cutting rings and the outlet end of the attachment, said cutting rings each having a smaller internal diameter than that of the barrel, whereby when the projectile is fired the forcing bands on the projectile are removed.

2. In combination with a firearm having a barrel with a rifled bore extending to its muzzle end, an attachment comprising a body detachably secured to said muzzle end, said body having a smooth outlet bore of lesser calibre than that of said rifle bore, and having a counterbore, and a plurality of disc-like rings located in said counterbore, said rings having bores with knife edges, the bores of the several rings progressively decreasing in diameter adjacent the muzzle of the barrel to the smooth outlet bore, the bores of the end rings corresponding respectively to said barrel bore and to said smooth outlet bore.

3. In firearms, a barrel of the ordinary construction having a bore rifled to its outlet end combined with a detachable body having a bore one portion of which is formed to fit over the muzzle end of the firearm barrel, and another portion of which is of tapered form with the end of larger diameter adjacent the muzzle end of the barrel and its end of lesser diameter constituting the discharge end of the firearm, said tapered portion of the bore having its surface provided with a plurality of annular knife edges arranged in proximity with one another.

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