H. C. MUSTIN & W. R. BROOKINS.

PROJECTILE.

APPLICATION FILED FEB. 29, 1916.

1,209,611.

Patented Dec. 19, 1916.

3 SHEETS—SHEET 1.

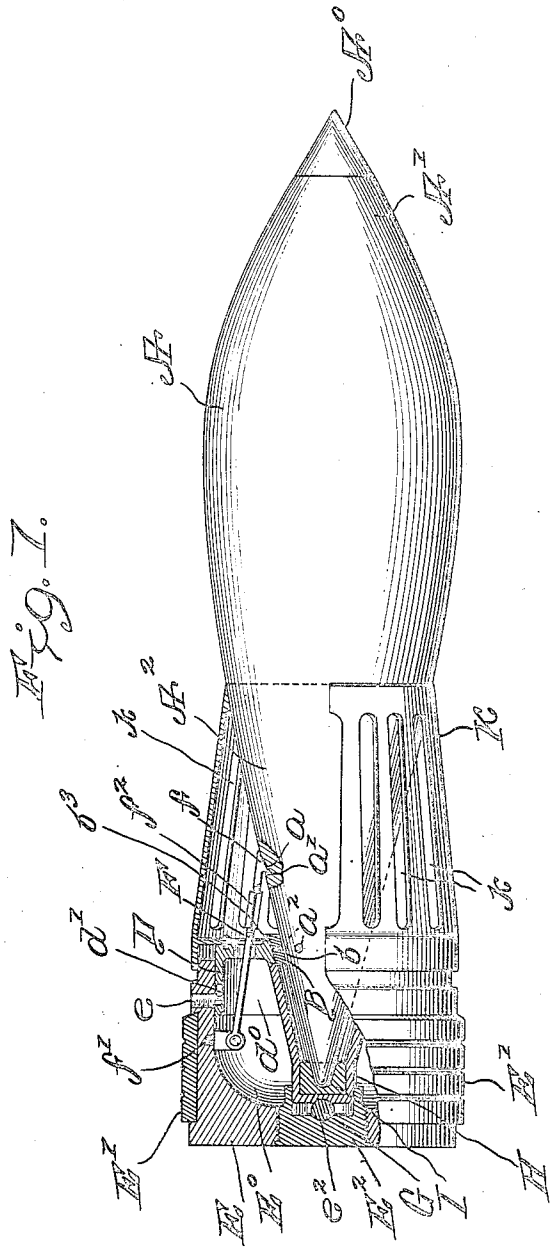


Fig. 1.

Witness
Edwin J. Beller.

Inventors.
H. C. Mustin and
W. R. Brookins.
by Williamson, Ginsta & Mackaye,
Attorneys

H. C. MUSTIN & W. R. BROOKINS.

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3 SHEETS—SHEET 2.

Fig. 2.

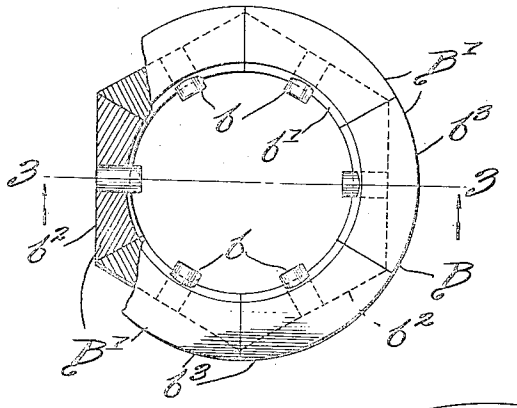


Fig. 3.

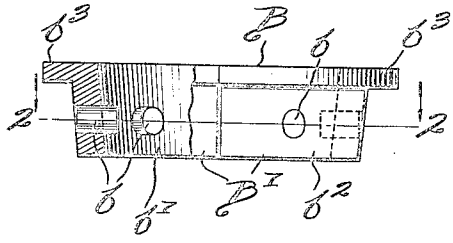


Fig. 4.

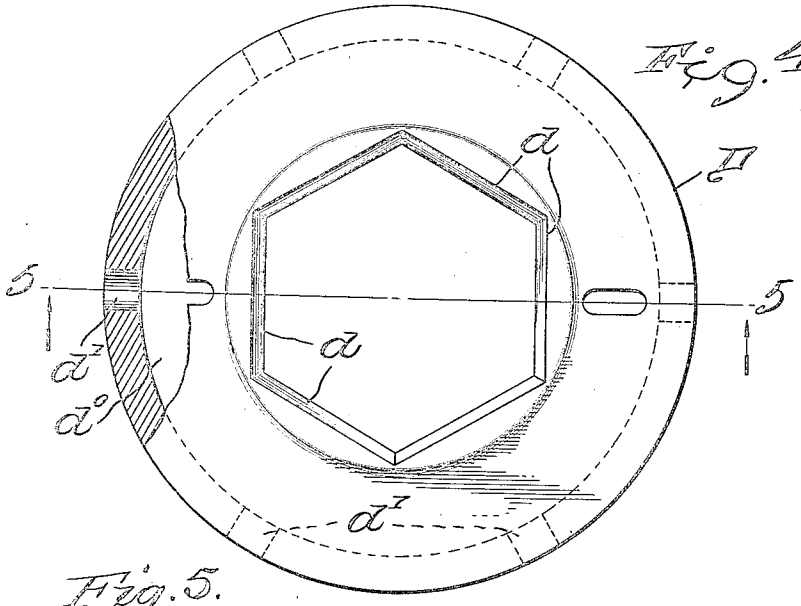
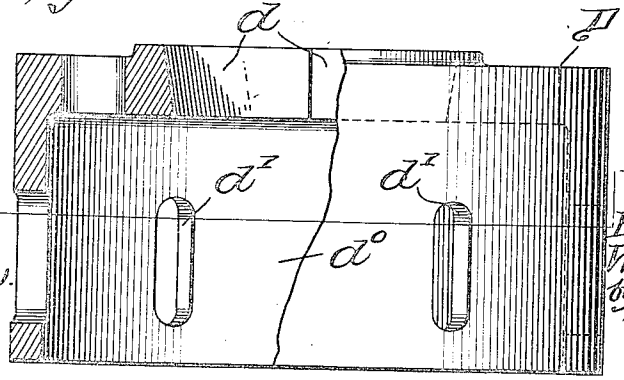


Fig. 5.



Witness
Edwin J. Beller.

Inventors
H. C. Mustin &
W. R. Brookins
by Wilkinson,
Gunster & MacKaye
Attorneys

H. C. MUSTIN & W. R. BROOKINS.

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3 SHEETS—SHEET 3.

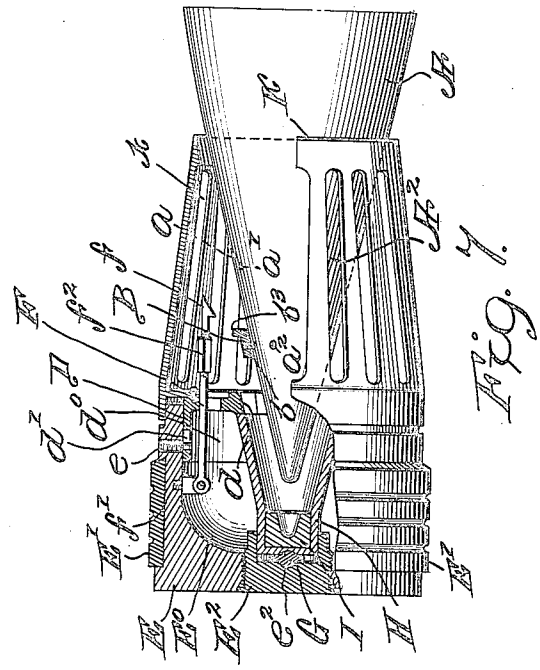


Fig. 1.

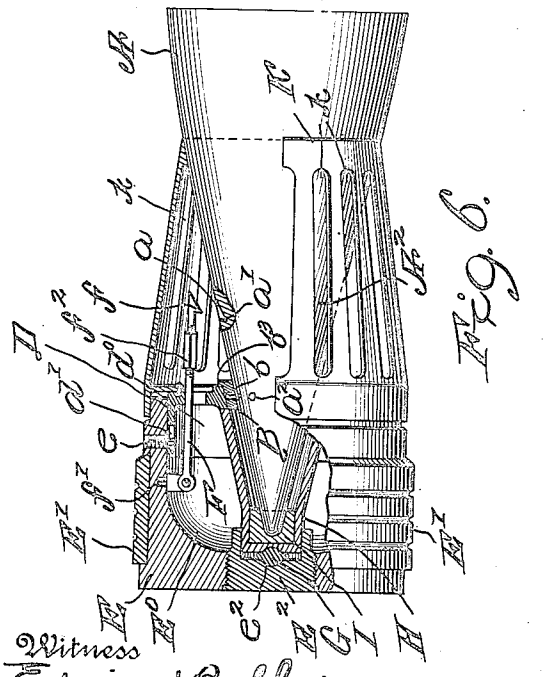


Fig. 2.

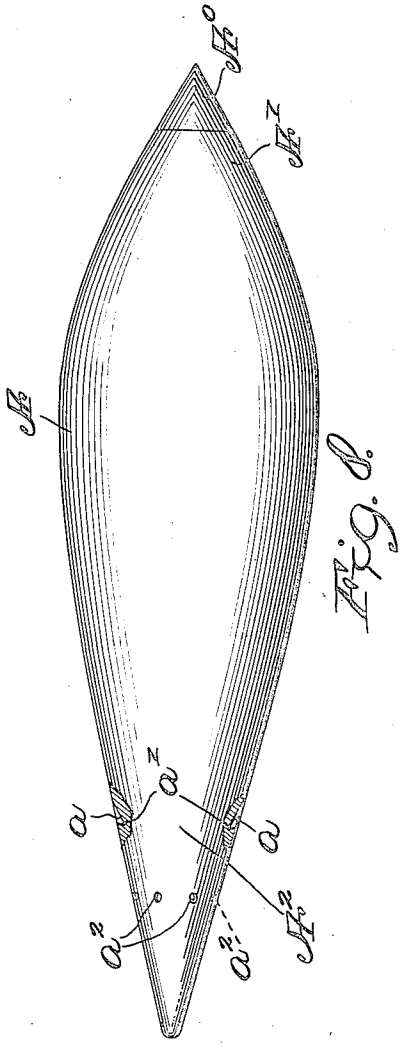


Fig. 3.

Witness
Edwin J. Bellew.

Inventor
H. C. Mustin and
W. R. Brookins.
by Wilkinson, Gioster & Mackaye,
Attorneys

UNITED STATES PATENT OFFICE.

HENRY C. MUSTIN, OF THE UNITED STATES NAVY, AND WALTER R. BROOKINS, OF DAYTON, OHIO.

PROJECTILE.

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Application filed February 29, 1916. Serial No. 81,217.

To all whom it may concern:

Be it known that we, HENRY C. MUSTIN, of the United States Navy, and WALTER R. BROOKINS, citizens of the United States, stationed at Pensacola and residing at Dayton, in the counties of Escambia and Montgomery and States of Florida and Ohio, respectively, have invented certain new and useful Improvements in Projectiles; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in projectiles particularly that type that are fired from rifled guns of large caliber; it has for its purpose increases of the range, accuracy of fire, and striking energy of any gun now in service without the alteration of any part of the gun or its equipment excepting the graduations of the sight scales.

It is well known to those skilled in aerodynamics that the resistance to motion through the air of any object of stream line shape is very much less than the resistance of an object that is not of stream line shape. The projectiles heretofore used in rifled guns have had a flat base which in flight causes a partial vacuum and a turbulent air stream in its rear, adding greatly to the resistance to its forward motion. Primarily, this invention provides a projectile which, after leaving the muzzle of the gun, has a pointed base, as well as a pointed nose, of an outline which is two fair curves from nose to base; preferably the largest diameter of the projectile is nearer to the nose than to the base. A projectile of this form without any other attachments would be unsuitable for use in guns now in service for the following reasons: 1st. As the rotating band must be at a point where the diameter is nearly maximum, either the shell would have to be rammed an excessive distance forward of the origin of the rifling, or else it would be necessary to sacrifice a portion of the powder chamber space and thereby reduce the charge. 2nd. The pointed base would offer an unsuitable form to the action of the propellent gases.

On account of the above, we provide in this invention an automatically detachable base having a flat rear end for the stream line shaped projectile; this base is designed to carry the rotating band for imparting to the projectile the rotation due to the rifling; and means are provided for detaching this base from the projectile immediately after it leaves the muzzle of the gun.

In order that the muzzle velocity of this projectile may be the same as the muzzle velocity of the projectile heretofore used of corresponding caliber, with the same powder charge, the weight of this projectile, together with its detachable base, must equal the weight of the old type projectile. Consequently after releasing the base at the muzzle there is a loss of weight which, for the same muzzle velocity, would apparently tend to cause a reduction in the velocity and striking energy at any given range; but as the reduction in resistance to flight is much greater than the reduction in weight, the velocity at any given range will be higher than that of the old type projectile; it follows, since the value of the striking energy is one half the mass times the square of the velocity, that the loss in mass will be much outweighed by the gain in velocity.

Various means may be employed for utilizing this invention, but the means we prefer are as follows.

Reference is had to the accompanying drawings, in which the same parts are indicated by similar reference symbols throughout the several views.

Figure 1 shows a side elevation of the projectile and base in the assembled position ready for loading into the gun, parts being shown in section; Fig. 2 is a plan view of the split collar forming part of the arrangement for attaching the base to the projectile, parts being shown in section along the line 2—2 of Fig. 3, and looking down; Fig. 3 is a side elevation of the split collar shown in Fig. 2, partly in section along the line 3—3 of said figure, and looking in the direction of the arrows; Fig. 4 is a detail showing the solid collar used in connecting the base to the projectile, parts being shown in section along the line 4—4 of Fig. 5, and looking in the direction of the arrows; Figs. 2 to 5, inclusive, are on a larger scale than the remaining figures. Fig. 5 is a side elevation, partly in section along the line 5—5 of Fig. 4 and looking in the direction of the arrows; Fig. 6 shows the base of the projectile and the connected parts in the position they assume after the projectile has passed down

the bore of the gun; Fig. 7 is a similar view of Fig. 6, showing the position of the various parts shortly after the projectile has left the bore of the gun; and Fig. 8 shows the projectile in flight after it has rid itself of the base cap and attachments.

A represents the projectile of a stream line form, preferably having the nose A′ of ogival shape and blunter than the tapered rear end of the shell A^2, which is also preferably of ogival shape; and the maximum diameter of the shell being preferably forward of its center of gravity. This shell is provided with oppositely-disposed notches a, which are preferably undercut, as at a', to securely hold the attaching hooks to be hereinafter described, and it is also provided with steps a^2 to receive the pins projecting inwardly from the segments of the split collar B.

The nose of the projectile may be provided with a suitable fuse A°, such, for instance, as the well known Frankford Arsenal fuse; but to secure the best results, the outer face of this fuse should follow the stream lines of the projectile as shown in Figs. 1 and 8.

The split collar B is made up of a number of segments B′, as shown most clearly in Figs. 2 and 3. Each of these segments is provided with a lug or pin b adapted to project into one of the sockets a^2 in the body of the projectile. The inner surface b' of each of the segments B′ is tapered and curved to fit the contour of the projectile, and the segments, when assembled on the projectile, form preferably a continuous collar, as shown in Fig. 2. The outer surface b^2 of each segment is flat, but in the form of a keystone terminating at its upper end in the arc shaped flange b^3, which flange engages the upper face of the integral collar D, as will be hereinafter described. The exterior of the split collar B, therefore, resembles a tapered nut, having a flanged ring on top of this tapered portion. We have shown this split collar composed of six segments, but any desired number of segments may be used.

The integral collar D is provided with an angular tapered opening in its center, the sides d of which are adapted to fit over the tapered sides of the split collar B and grip the same after the manner of a wrench gripping a nut. This collar is preferably made chambered, as at d°, as shown in Fig. 4, and is provided with elongated slots d' adapted to receive the points of the pins e secured in the detachable base E. This detachable base E is preferably made hollow, as shown at E°, for the sake of lightness, and is provided with the impression band E′ of copper, or other suitable material, to engage the rifling of the gun and impart a spinning motion to the base. The base piece E is held against dropping off the projectile by means of the hooks F, having barbs f adapted to engage in the oppositely-disposed notches a' in the body of the projectile. These hooks are hinged to the pins f', carried by the base piece E, and they are adjusted in the locking position by means of the turnbuckles f^2. There are two or more of these hooks, but two on opposite sides of the projectile will be sufficient.

The center of the base piece is preferably provided at its rear with a plug E^2, having a cup-shaped recess e^2 therein to receive the compression ball G, which is made of copper, or other compressible material, adapted to be compressed by the inertia of the projectile when the propellent gases act upon the rear of the base piece. Projecting into this cup-shaped recess e^2 is the base of the tapered plunger H, the interior surface of which is substantially parallel to but spaced away from the corresponding surface of the projectile. The lower face of this plunger bears against the compression ball G, and the upper face bears against the integral collar D and the split collar B and holds the same in the assembled relation. In the bottom of this plunger H a suitable support or adapter I is mounted, which is interiorly shaped to fit the tip of the base of the projectile. This adapter is preferably made of cast iron, or other frangible material, that will split or crack and not stick on the base of the projectile.

K represents a disk made of suitable light metal, and attached to the integral collar D. This disk is preferably provided with slots k, for the sake of lightness, and is tapered as shown. The function of this disk is merely to facilitate the handling of the projectile, especially when loading the same into the gun, and also to protect the hooks F when they are in the engaged position shown in Fig. 1.

The parts being in the assembled position shown in Fig. 1, the projectile is inserted in the bore of the gun and rammed home until the rifling band E′ engages the compression slope, and in the act of loading the cage K facilitates entrance of the projectile into the powder chamber and prevents the parts of the base from catching against the obstructions, and also protects the hooks F. The propellent charge is then inserted and the gun fired in the usual way. The powder gases will throw the base piece E forward, and the inertia of the projectile will cause the compression ball G to be flattened out, and the base piece E will move slightly forward, relative to the projectile, shoving the hooks F out of engagement with the notches in the projectile, while at the same time the plunger H will hold the collars B and D in the assembled relation, and as the projectile, with its base still attached, moves for-

ward in the bore, a rotary motion will be imparted to the same through the rifling band E′, the collar D and the divided collar B; a slight forward movement of the base piece E relative to the collar D being permitted by the slots b^6 engaging the pins *e*.

As the projectile moves forward in the bore the centrifugal force will cause the hooks F to swing outward, and the parts will assume the position shown in Fig. 6; the base piece and cage being still connected to the projectile. After the projectile leaves the bore, the pressure of the air on the forward portion of the base piece, supplemented by the suction in rear thereof, will cause the base piece with the parts carried thereby, including the cage, to slip away rearward from the projectile, as shown in Fig. 7; and about the same time the segments B′ of the split collar B will be thrown outward by the centrifugal force due to the spinning of the projectile, until all of these parts originally attached to the rear of the projectile will be permanently detached therefrom, and the projectile will be free to continue its flight, untrammeled by such parts, the shape of the projectile in its trajectory being then indicated as in Fig. 8. When in this shape the projectile is of stream line form throughout its exterior surface, and the resistance of the air will be enormously reduced over such resistance as found with projectiles of the ordinary shape.

The base piece and parts carried thereby should preferably be made as light as practicable, to secure the sufficient strength, so that as much weight may be put into the projectile as practicable, and as little in the parts shed therefrom after the projectile gets well started on its course.

It will be seen that the herein described device is applicable to any type of rifled gun now in use, and that no changes will be required either in the rifling of the bore, the shape of the powder chamber, the powder charge, or the mode of firing the gun.

Since the trajectory of the projectile will be flatter and the range longer, it will be necessary to change the graduations on the sights to correspond to these altered conditions; but this is a very simple matter and does not involve any changes in the construction of the gun proper, or of its mount, or of the size or quality of the propellent charge.

It will be obvious that projectiles of this character may be used for carrying high explosives, or shrapnel, or for any of the other purposes for which ordinary shell are now employed, and we do not mean to limit the invention to any particular kind or character of projectile, except as set forth in the claims.

It will be obvious that various modifications might be made in the herein described apparatus, and in the construction, combination and arrangement of parts which could be used without departing from the spirit of our invention.

Having thus described our invention what we claim and desire to secure by Letters Patent of the United States is:—

1. The combination with a rifled gun projectile, of a base detachably secured thereto, and means operated by the inertia of the projectile and the centrifugal force imparted by the rifling, for automatically detaching said base immediately after the projectile has left the bore of the gun.

2. The combination with a rifled gun projectile, of a flat base serving as a gas check for the powder gases, detachably secured thereto, and means operated by the inertia of the projectile and the centrifugal force imparted by the rifling, for automatically detaching said base immediately after the projectile has left the bore of the gun.

3. The combination with a rifled gun projectile, of substantially stream line shape, of a base detachably secured thereto, and means operated by the inertia of the projectile and the centrifugal force imparted by the rifling, for automatically detaching said base immediately after the projectile has left the bore of the gun.

4. A rifled gun projectile of substantially stream line shape with a detachable base, and automatic means for releasing said base by utilizing the inertia of the projectile and the centrifugal force due to the rotation imparted by the rifling.

5. The combination with a projectile of substantially stream line shape for use in rifled guns, of a detachable base carrying the rifling band, means for normally holding said base attached to said projectile, and automatic means for releasing said base from the projectiles after the projectile leaves the muzzle of the gun, said releasing means being actuated by the inertia of the projectile and the centrifugal force due to the rotation imparted by the rifling.

6. The combination with a projectile of substantially stream line shape for use in rifled guns, of a detachable base carrying the rifling band, means for normally holding said base against rotation on said projectile, and for permitting a slight longitudinal movement of said base relative to said projectile, and automatically operated means for releasing said holding means after the projectile leaves the muzzle of the gun, said releasing means being actuated by the inertia of the projectile and the centrifugal force due to the rotation imparted by the rifling of the gun.

7. The combination with a projectile of substantially stream line shape, of a detachable flat base, hinged hooks carried by said base and engaging said projectile for nor-

mally holding said base attached to said projectile, and means actuated by the inertia of the projectile for releasing said hooks when the gun is fired, substantially as described.

8. The combination with a projectile for use in rifled guns, of a detachable base carrying the rifling band, means for normally holding said base against turning on said projectile, comprising an integral collar connected to said base, a segmented collar held against turning in said integral collar and connected to the projectile, and means for normally holding said base against longitudinal movement relative to said projectile but automatically releasing same when the gun is fired, substantially as described.

9. The combination with a projectile for use in rifled guns, of a detachable base carrying the rifling band, means for normally holding said base against turning on said projectile, comprising an integral collar connected to said base, a segmented collar held against turning in said integral collar and connected to the projectile, and hooks hinged to said base and engaging said projectile and normally holding said base against longitudinal movement relative to said projectile but automatically releasing same when the gun is fired, substantially as described.

10. The combination with a projectile for use in rifled guns, of a detachable base carrying the rifling band, means for normally holding said base against turning on said projectile, comprising an integral collar connected to said base, a segmental collar held against turning in said integral collar and connected to the projectile, and a cup-shaped plunger carried by said base and surrounding the rear end of said projectile and normally locking said collars in engagement, but releasing same after the projectile leaves the bore of the gun, substantially as described.

11. The combination with a projectile for use in rifled guns, of a detachable base carrying the rifling band, means for normally holding said base against turning on said projectile, comprising an integral collar connected to said base, a segmental collar held against turning in said integral collar and connected to the projectile, and a cup-shaped plunger carried by said base and surrounding the rear end of said projectile and normally locking said collars in engagement, but releasing same after the projectile leaves the bore of the gun, with hooks hinged to said base and engaging said projectile and normally holding said base against longitudinal movement relative to said projectile but automatically releasing same when the gun is fired, substantially as described.

12. The combination with a projectile for use in rifled guns, of a detachable base carrying the rifling band, means for normally holding said base against turning on said projectile, comprising an integral collar connected to said base, a segmental collar held against turning in said integral collar and connected to the projectile, and a cup-shaped plunger mounted in said base and surrounding the rear end of said projectile and normally locking said collars in engagement, but releasing same after the projectile leaves the bore of the gun, a mass of compressible material interposed between the heel of said plunger and said base and adapted to be compressed when the gun is fired, with hooks hinged to said base and engaging said projectile and normally holding said base against longitudinal movement relative to said projectile but automatically releasing same when the gun is fired, substantially as described.

13. The combination with a projectile for use in rifled guns, of a detachable base carrying the rifling band, means for normally holding said base against turning on said projectile, comprising an integral collar connected to said base, a segmental collar held against turning in said integral collar and connected to the projectile, a cage mounted on the top of said base and forming a smooth junction between the top of said base and the body of the projectile, and a cup-shaped plunger carried by said base and surrounding the rear end of said projectile and normally locking said collars in engagement, but releasing same after the projectile leaves the bore of the gun, substantially as described.

14. The combination with a projectile for use in rifled guns, of a detachable base carrying the rifling band, means for normally holding said base against turning on said projectile, comprising an integral collar connected to said base, a segmental collar held against turning in said integral collar and connected to the projectile, a cage mounted on the top of said base and forming a smooth junction between the top of said base and the body of the projectile, and a cup-shaped plunger carried by said base and surrounding the rear end of said projectile and normally locking said collars in engagement, but releasing same after the projectile leaves the bore of the gun, with hooks hinged to said base and engaging said projectile and normally holding said base against longitudinal movement relative to said projectile but automatically releasing same when the gun is fired, substantially as described.

15. The combination with a projectile for use in rifled guns, of a detachable base carrying the rifling band, means for normally holding said base against turning on said projectile, comprising an integral collar con-

nected to said base, a segmental collar held against turning in said integral collar and connected to the projectile, a cage mounted on the top of said base and forming a smooth junction between the top of said base and the body of the projectile, and a cup-shaped plunger mounted in said base and surrounding the rear end of said projectile and normally locking said collars in engagement, but releasing same after the projectile leaves the bore of the gun, a mass of compressible material interposed between the heel of said plunger and said base and adapted to be compressed when the gun is fired, with hooks hinged to said base and engaging said projectile and normally holding said base against longitudinal movement relative to said projectile but automatically releasing same when the gun is fired, substantially as described.

16. The combination with a projectile of substantially stream line shape, of a detachable flat base, hinged hooks carried by said base and engaging said projectile for normally holding said base attached to said projectile, turnbuckles for adjusting said hooks, and means actuated by the inertia of the projectile for releasing said hooks when the gun is fired, substantially as described.

17. The combination with a projectile of substantially stream line shape, of a detachable flat base, hinged hooks carried by said base and engaging said projectile for normally holding said base attached to said projectile, and means actuated by the inertia of the projectile for releasing said hooks when the gun is fired, comprising a cup-shaped plunger mounted in said base and inclosing the rear end of the projectile, a mass of compressible material interposed between the heel of said plunger and said base and adapted to be compressed when the gun is fired, thus permitting the hooks to become disengaged from said projectile, substantially as described.

18. The combination with a projectile of substantially stream line shape, of a detachable flat base, hinged hooks carried by said base and engaging said projectile, for normally holding said base attached to said projectile, turnbuckles for adjusting said hooks, and means actuated by the inertia of the projectile for releasing said hooks when the gun is fired, comprising a cup-shaped plunger mounted in said base and inclosing the rear end of the projectile, a mass of compressible material interposed between the heel of said plunger and said base and adapted to be compressed when the gun is fired, thus permitting the hooks to become disengaged from said projectile, substantially as described.

In testimony whereof we affix our signatures.

HENRY C. MUSTIN.
WALTER R. BROOKINS.