R. A. HADFIELD, A. McK. JACK & A. B. H. CLERKE.

CAP FOR ARMOR PIERCING PROJECTILES.

APPLICATION FILED MAR. 17, 1913.

1,076,419. Patented Oct. 21, 1913.

2 SHEETS—SHEET 1.

Fig. 1.

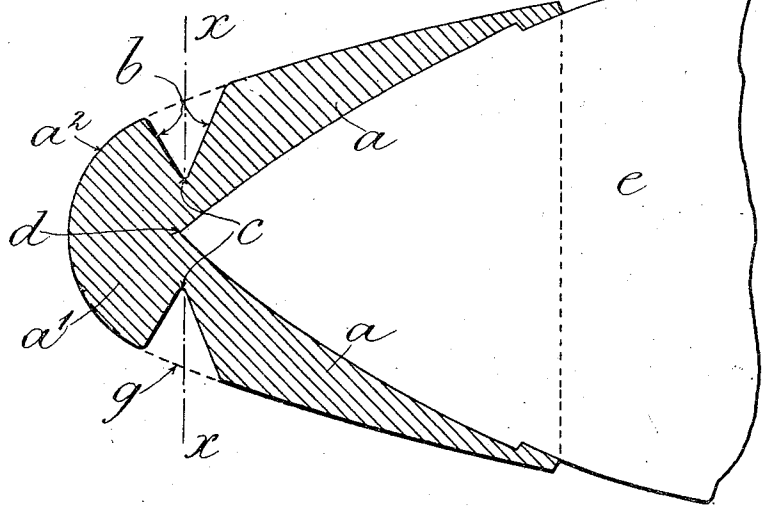
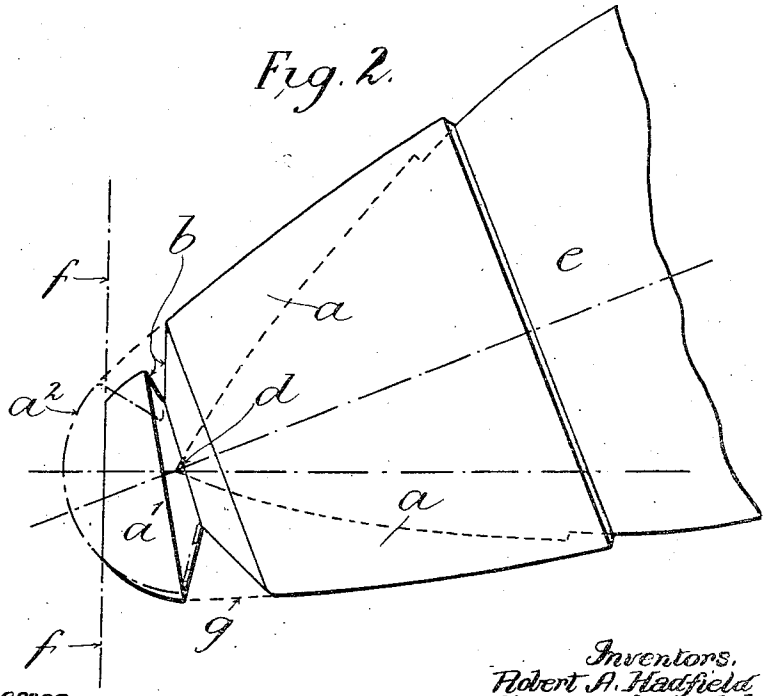


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

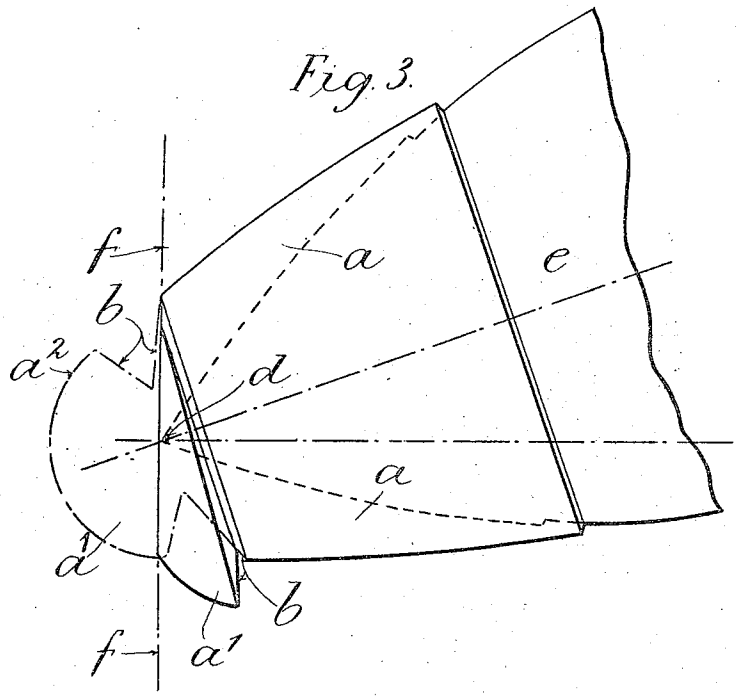
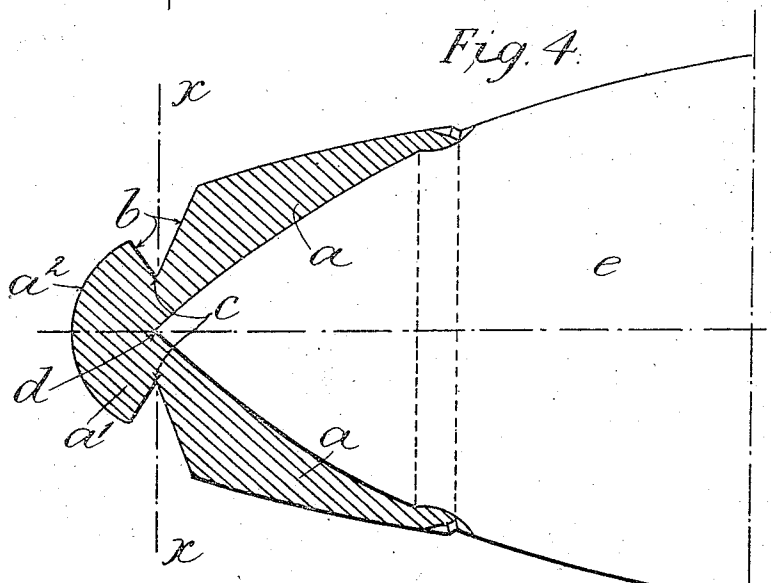


Fig. 4.



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UNITED STATES PATENT OFFICE.

ROBERT ABBOTT HADFIELD, OF WESTMINSTER, AND ALEXANDER McKENZIE JACK AND AUGUSTUS BASIL HOLT CLERKE, OF SHEFFIELD, ENGLAND,

CAP FOR ARMOR-PIERCING PROJECTILES.

1,076,419. Specification of Letters Patent. Patented Oct. 21, 1913.

Application filed March 17, 1913. Serial No. 754,822.

To all whom it may concern:

Be it known that we, ROBERT ABBOTT HADFIELD, knight, F. R. S., ALEXANDER McKENZIE JACK, and AUGUSTUS BASIL HOLT CLERKE, subjects of the King of Great Britain and Ireland, residing, respectively, at Carlton House Terrace, in the city of Westminster, England; Brincliffe, Sheffield, in the county of York, England, and Hecla Works, Sheffield, in the county of York, England, have invented Improvements in or Relating to Caps for Armor-Piercing Projectiles, of which the following is a specification.

When an armor piercing projectile fitted with a cap of any of the kinds now commonly used, strikes obliquely against a hard faced armor plate, the metal of the cap which lies on that side of the point of the projectile which forms an acute angle with the plate has to be displaced in a radial direction more rapidly than the metal of the cap which lies on the side which forms an obtuse angle with the plate with the result that the lateral or radial pressure exerted by the cap upon the pointed end portion of the projectile, due to the inertia of the mass of cap metal, is considerably increased on the side nearest to the plate, that is to say on the side forming an acute angle with the plate, as compared with that on the other side of the projectile, that is to say the side forming an obtuse angle with the plate, thus causing an unbalanced lateral or transverse stress on the pointed end portion of the projectile in addition to the stress exerted thereon when the point of the projectile reaches the plate with the result that the projectile seldom or never completely perforates the plate without being itself broken up, except at comparatively high velocities.

The present invention has for its object to provide caps adapted to afford a more uniform and effective support to the pointed end portion of a projectile than heretofore when striking a hard faced armor plate obliquely, so that the projectile may completely perforate the plate without becoming broken up, even when traveling at a comparatively low velocity. For this purpose the forward end portion of a cap for an armor piercing projectile is so constructed and arranged in relation to the rear portion of the cap, that on its striking an armor plate obliquely, it, or some of it, will, without unduly disturbing the rear portion of the cap, be in the first place, thrown over or displaced to that side of the pointed end portion of the projectile that forms an obtuse angle with the armor plate in such manner that the mass of cap metal on that side is increased so that during the subsequent progression of the pointed end of the projectile through the mass of cap metal, the lateral or radial pressure exerted by the cap on that side of the projectile, due to inertia of the cap metal, shall be rendered equal or more nearly equal, than heretofore, to the lateral pressure exerted by the cap on the opposite or acute side of the pointed end portion of the projectile and due to the inertia of the cap metal on that side.

A cap according to the invention is produced by forming it with an annular groove or recess, it may for example be of V shape in cross section, arranged between its forward end portion, which may be variously shaped, and its rear portion.

In the accompanying drawings, Figure 1 shows, in longitudinal section, a solid cap constructed according to the present invention applied to the pointed ogival end portion of an armor piercing shell which is shown in elevation. Figs. 2 and 3 are similar views to Fig. 1 showing two stages of how the forward end portion of the cap illustrated in Fig. 1 is thrown over or displaced as described, on striking an armor plate obliquely. Fig. 4 is a similar view to Fig. 1 showing a slightly modified construction of the cap.

In the example shown in Fig. 1, the cap a, which externally is mainly of ogival shape with a solid forward end portion a^1 having a rounded or convex front surface a^2, has formed therein an annular groove b of V shape the inner end or bottom of which surrounds a solid portion c of the cap metal of reduced cross sectional area located in a plane $x\ x$ transverse to the axis of the cap which plane passes through or closely adjacent to the point d of the projectile e.

Figs. 2 and 3 show approximately how the head portion a^1 of the cap on striking an armor plate, indicated at f, obliquely, is displaced to that side of the pointed end portion of the projectile e that forms an obtuse angle with the plate.

The cap shown in Fig. 4 is similar to that shown in Fig. 1 except that the head portion

a^1 thereof is of smaller radius and diameter and of less axial thickness than that of the cap shown in Fig. 1.

It is to be understood that the invention is not limited to the exact disposition mentioned of the groove b, as the same may be arranged a little more forward, or to the radius of curvature shown of the head portion a^1 of either of the caps illustrated, but good results have been obtained with caps constructed as shown in Figs. 1 and 4.

As will be seen, the diameter of the forward end portion a^1 of the cap, at its widest part, is, in each of the examples shown, less than that of the adjacent part of the rear or body portion of the cap.

The groove b may be covered by sheet material, as indicated by dotted lines at g (Fig. 1) to present a continuous surface to the air during flight. Or the cap may, if desired, be surmounted by a hollow air deflector of known or suitable construction and such for example as is described in the specification of former British Letters Patent No. 16901 of 1898 granted to one of us, or in the specification of former British Letters Patent No. 2817 of 1908, granted to two of us. Such a cap will inclose the solid forward end portion a^1 of the cap and be secured to the body or rear portion b of the cap. Usually however, caps constructed as described and made of the shape shown will not need an air deflector. The use of sheet covering material for the groove b, or of an air deflector, is not however in any way essential for attaining the object of this invention and such use forms no part of this invention and no claim is made thereto.

What we claim is:—

1. A cap, for an armor piercing projectile, having an annular groove or recess formed therein between its solid front end or head portion and its rear or body portion.

2. A cap, for an armor piercing projectile, having an annular groove or recess of V shape in cross section formed therein between its solid front end or head portion and its rear or body portion.

3. A cap, for a pointed armor piercing projectile, made externally mainly of ogival shape with a solid front end portion and having therein an annular groove between its front and rear portions.

4. A cap, for a pointed armor piercing projectile, made externally mainly of ogival shape with a solid front end or head portion having a rounded or convex front surface and having an annular groove or recess therein between its front end or head portion and its rear or body portion.

5. A cap, for a pointed armor piercing projectile, having an annular groove or recess formed therein between its solid front end or head portion and its rear or body portion and surrounding a solid connecting portion of the cap metal of reduced cross section located in a plane that is transverse to the axis of the cap and is adjacent to the point of the cavity in the cap designed to fit the pointed end of a projectile.

6. A cap comprising a rear or body portion adapted to fit a pointed armor piercing projectile and a forward end or head portion connected to the rear or body portion by intervening cap metal of reduced cross sectional area arranged to leave a space between the adjacent outer parts of the said two portions of the cap that will allow of the front end or head portion moving laterally relatively to the rear or body portion on its striking an object obliquely, substantially as described for the purpose set forth.

Signed at Sheffield, England this twentieth day of February 1913.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."