

Jan. 30, 1934.

H. E. G. T. GERLICH

1,944,884

BULLET

Filed March 6, 1931

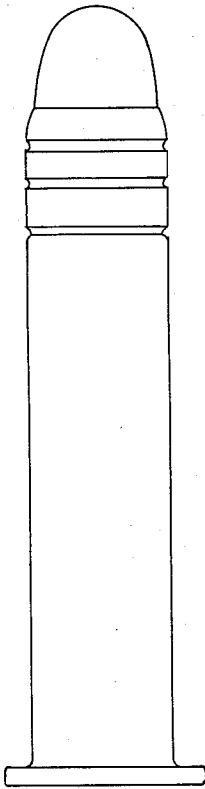


Fig. 1.

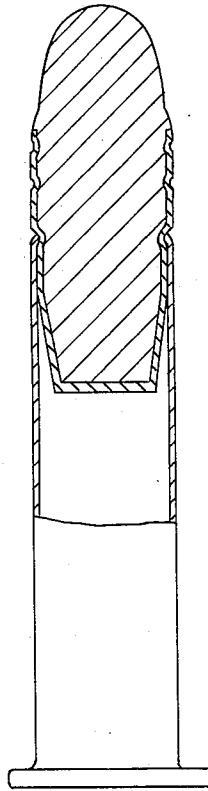


Fig. 2.

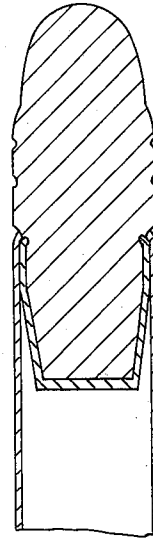


Fig. 3.

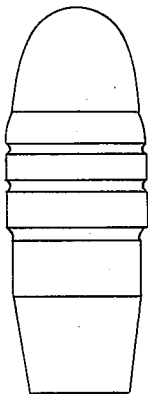


Fig. 4.

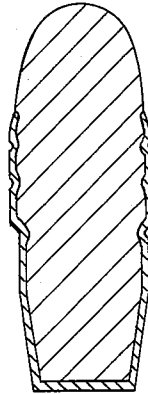


Fig. 5.

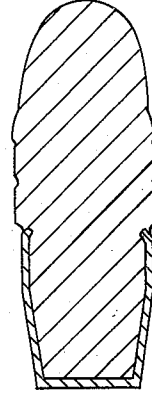


Fig. 6.

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UNITED STATES PATENT OFFICE

1,944,884

BULLET

Hermann Ernst Gustav and Thorismund Gerlich,
Kiel, GermanyApplication March 6, 1931, Serial No. 520,566,
and in Great Britain March 15, 1930

22 Claims. (Cl. 102—28)

This invention relates to bullets and refers more particularly to bullets which are constructed from a relatively soft metal such as lead or an alloy thereof and are for instance commonly employed with rim fire ammunition of the usual .22 calibre etc. These bullets are for instance also commonly used for target practice with so called miniature rifles, small calibre fire arms, aiming tubes and the like.

It has already been attempted to provide also such lead bullets with a cone-shaped or so-called boat-tailed rear portion in order to reap the well-known ballistic advantages of such a bullet-shape also in connection with bullets of relatively soft materials, such as lead or alloys thereof and not jacketed with a metallic casing or jacket, as is usually employed in connection with modern high velocity boat-tail bullets of the military type. These attempts however proved to be a failure in practice owing to the unprotected boat tail of these bullets freely entering the cartridge casings and being exposed also laterally to the direct action of the flame of the burning propulsive charge thus being mechanically damaged or partly melted by the immediate contact with the hot propelling gases and becoming irregularly deformed etc. with the corresponding loss of the required accuracy of such bullets.

Moreover bullets having a cylindrical rear portion, i. e. bullets of the heretofore usual, so-called flat base type, have been provided, as is well known, with paper wrappings or tubular protecting cases made of paper, vegetable parchment or pegamoid and such paper like materials.

It is however essential, that especially the so-called boat-tail or stream-line bullets made of lead and softer metals, but also such cylindrical flat base bullets, should be covered by a protective coating by a method, which renders manufacture rational and which is technically far more efficient, in order to obtain satisfactory results in actual practice. Therefore the primary object of the present invention is to provide a bullet having either a cylindrical rear portion (flat base bullet) or a substantially cone-shaped or boat-tailed rear portion with a reliable protective coating, which readily answers the requirements of manufacture and which will not only withstand the effects of the hot flame of the explosive charge, but upon which partly burned particles or burned residues of the explosive charge will not be likely to adhere and which moreover will tend to reduce friction and general deformation of the bullet and will do away with lead-fouling for all practical purposes and even in connection with higher

speeds of such lead bullets. This will result in an improved construction especially of boat-tailed lead bullets, i. e. such bullets, made of relatively soft metals, which will render them more accurate in connection with their superior ranging capabilities, thus decisively improving not only their absolute accuracy under these conditions, but also their practical accuracy, i. e. increasing the probabilities of a hit combined with better effects owing to their reduced times of flight, flattened trajectories and increased striking velocities especially at longer ranges. This being particularly so in connection with such lead bullets, which are fired with a velocity in the neighbourhood of the velocity of sound or not exceeding this velocity relatively to a very appreciable extent over those portions of their trajectories, which are of capital importance.

In order to maintain a maximum of precision with lead bullets of this kind, that is to say especially also lead bullets having a cone-shaped rear portion, it is necessary to avoid any damage, such as deformations and so on, being done to the cone-shaped rear portion which protrudes naked into the powder—and combustion—chamber. This rear portion, being not only exposed to the flame set up by the explosion on its base surface, but also laterally, is far more liable to be melted or damaged, owing to the fact that these surfaces of such bullets are exposed to the hot gases of the combustion to a considerably higher degree than is the case with a standard lead bullet or bullets of other soft materials with relatively low melting points and having a cylindrical rear portion. At least the base and cone-shaped rear portion of the bullets should therefore be efficiently protected.

Any deformations of the conical rear portion, the effect of substances being fused on, such as the residues of combustion caking on to the rear portion and the effect of metal melting away, this being particularly noticeable when bullets are made of soft material with low melting points, must be absolutely avoided in order to ensure a perfectly even and steady departure of the bullet from the muzzle and consequently a true flight.

It is a fact established by experiments and confirmed by practical experience that irregularities and deformations at the rear end of the bullet constitute the greatest percentage of the causes leading to variations in the flight of the bullet, this being more particularly the case with all .22 calibre rim-fire ammunition. These irregularities or burr being caused by the shock set up by the pressure of the gases and also as a result of the

stretching of the bullet by the bore diameter being somewhat smaller than the bullet diameter.

In such cases at the moment when the bullet is leaving the muzzle of the rifle and since this unevenly displaced metal gives a final uncontrollable directing effect to the bullet, particularly also owing to the metal displacing influence exerted by the lands, it is obvious that the gases set up by the explosion of the charge must necessarily begin to issue at different times and unevenly at different points around the circumference of the hindmost part or section of the bullet sealing the bore. This tends to produce a more or less pronounced tilting effect on the bullet at the moment of its delivery from the muzzle. Hence the correct and steady delivery of the bullet from the muzzle and its steadiness and accuracy during its flight is thereby impaired from the very start.

In accordance with the present invention I provide a bullet having either a substantially cone-shaped or boat-tailed rear portion or a cylindrical rear end and being constructed from a relatively soft metal, such as lead or an alloy thereof, the rear portion having a protective coating applied thereto in a more or less liquid, warm or cold state and consisting of a solution of a non-metallic material, which has the capacity of resisting heat, shocks, friction etc. and which may be very thin, but of a thickness to meet the specific requirements of each individual case, the thickness depending on the nature of the specific material as well as on the calibre of the bullet and the respective bore, the depth of the grooving and the character of the rifling etc.

The rear portion of the bullet and also, if required, its whole bearing surface or even the whole bullet including its nose may thus be coated with a fire-proof lacquer, elastic enamel and especially also such artificial materials as registered under the names of "Cellon", "Cellophane" etc. or paper like and other artificial materials. Such materials may be impregnated, if desired, and should have the requisite capacity for resisting heat, friction, shocks etc. and may have a certain degree of glaze or capacity for being polished. This artificial coating may be applied by treating the cone-shaped rear portion and also, if desired, the bearing surface or the whole outer surface of the bullet with a fluid solution, warm or cold, which on cooling and drying imparts to the surfaces of the bullet the desired properties of durability and which renders it more resistant to heat etc.

With the object of further increasing the precision of such bullets I provide as a further feature of this invention a cannellure which is evenly pressed or cut in the body of the bullet, i. e. near the flat base of the bullet or near the point, where the part conical or boat tail joins the cylindrical part of the bullet. The plane in which this cannellure lies cuts the axis of the bullet at a right angle, the cannellure itself being shaped and dimensioned so as to suit the particular design of the bullet and the rifling.

The protective coating and if only the boat tail is protected preferably extends down into this cannellure whilst further the cannellure is adapted to receive the inwardly turned edge of the cartridge case.

The peripheral recess or cannellure is preferably relatively shallow and not necessarily of circular cross section, the recess merging into the rearward portion of the bullet with the avoidance of any sharp angles which would tend to

be distorted or otherwise impair the accuracy of the bullet during its flight.

In order to diminish and to avoid the causes which disturb precision as above mentioned, special care has to be taken with the design of that special part of the bullet, where the cone-shaped rear portion merges into the main body of the bullet, that is to say, of that portion of the bullet where for instance the protecting coating ends within the cannellure. This small cannellure in question would have, occasion arising, to be gradually levelled out in the direction of the body of the bullet and would have to be of a suitably regulated but more or less small width, so that it could be just filled out smoothly and evenly by the metal which is displaced by the lands, being bridged over, so-to-say, by this displaced metal evenly and without producing an uneven burr in front or beyond the rear edge of the cannellure. At the same time, particular care must be taken to see that the rear edge of the cannellure is of a diameter which is at least practically nearly equal to the lands' diameter of the bore.

In this way and at the moment at which the bullet leaves the muzzle, the gases will escape as evenly and synchronously as possible all around the circumference of the cone-shaped rear portion of the bullet, that is to say, at that moment at which the hindmost bearing cross section of the bullet, which is identical with the edges of the cannellure, passes out of the muzzle section of the barrel. An absolutely precise position of this edge at right angles to the axis of the bullet, that is to say, to the axis of the bore, is therefore of particular importance. In the same way the rear edge of the cannellure and its transition into the cone-shaped rear portion, which begins at this portion of the bullet, will have to be fashioned with a special preciseness and evenness all around the circumference of the bullet.

By these means an absolutely symmetrically balanced and in every way correct departure of the bullet out of the muzzle is guaranteed, provided that a correctly bored and rifled barrel be used, and therefore owing to this perfect delivery of the bullet from the muzzle its precision is increased in every normally rifled barrel quite apart from the fact that it would furthermore be possible to even increase this precision by using a rifling which is adapted in a greater degree to the design of the bullet and its speed etc.

In order that my invention may be clearly understood and more readily carried into practice, I have appended hereunto one sheet of drawing illustrating the same, wherein:

Fig. 1 is a view of a bullet constructed in accordance with my invention.

Fig. 2 is a section of same.

Fig. 3 is a view illustrating a cartridge incorporating a bullet in accordance with this invention.

Fig. 4 is a section of same.

Figs. 5 and 6 illustrate another construction. In the construction illustrated by Figs. 1 to 6 of the accompanying drawing the bullet *k*, which is constructed from lead or a suitable alloy, is provided with a rearwardly projecting portion 2 of substantially cone- or boat-tail shape, this portion being adapted to lie within the cartridge case.

The substantially cone- or boat-tail shaped rear portion of the bullet is covered with a protecting coating of some artificial non-fusible and

heat- and shock-resisting material other than metal as for instance such artificial materials as registered under the names of "Cellon", "Cellophane" and the like.

- 5 It will readily be apparent from the foregoing that by employing a bullet of any type and especially bullets having a cone-shaped rear portion protected by a thin sheath or coating of a relatively hard substance other than metal or a
10 coating of non-fusible and heat-resisting material of suitable hardness and elasticity and easily and cheaply applicable in manufacture, any deformation or irregularities in the shape of the bullet caused by the explosive charge are avoided,
15 whilst further the gases issuing synchronously and evenly distributed around the part conical or the flat base of the bullet at the muzzle a symmetrically balanced and correct delivery of the undeformed bullet from the muzzle is obtained, as well as its steadiness and consistency during its flight. These bullets will leave the muzzle accurately and steadily, whilst further by the aid of the boat tail, which in an unprotected state would ruin the accuracy of such lead
20 and similarly soft bullets, the end-velocity of the bullet and the flatness of the trajectory is also further increased in reducing times of flight correspondingly. Moreover any lead fouling of the barrels will be avoided to a great extent or even
30 completely in connection with bullets as described and the bearing surfaces of which are coated and protected by a film of "Cellophane" or a similar artificial material thus eliminating another main cause, which frequently and severely disturbs accuracy.

I claim:—

1. A soft metal bullet having a protecting coating of benzyl cellulose applied in solution to the bullet and allowed to solidify on the bullet to
40 form an elastic or resilient skin thereon.
2. A soft metal bullet having a protective coating of cellulose acetate material applied in a liquid state to, and allowed to dry on, the bullet.
3. A soft lead bullet coated with a solution of
45 nitro-cellulose in amyl acetate allowed to dry on the bullet.
4. A lead bullet carrying a protective coating of an acetyl cellulose material.
5. A soft lead boat tailed bullet having a protective coating of an acetyl cellulose material.
6. A boat tailed soft metal bullet having a protective coating over the boat tailed portion, such coating being of an acetyl cellulose material applied in liquid form and allowed to solidify on
55 the bullet.
7. A boat tailed lead bullet having a slightly

elastic or resilient protective coating over the boat tailed portion, such coating being of an acetyl cellulose material applied in a liquid condition to the bullet and allowed to solidify thereon.

8. A soft lead bullet having a substantially non-combustible protective coating of slightly elastic or resilient acetyl cellulose material.

9. A lead bullet having a protective coating of cellulose ester material.

10. A lead bullet having a coating of cellulose ether material.

11. A boat tailed lead bullet having a protective coating of a cellulose ester material applied to the bullet in a liquid condition and allowed to solidify on the bullet and covering the boat tail and guiding parts of the bullet.

12. A lead bullet having a protective coating of a cellulose acetate material containing a plasticizer and being self-adhesive.

13. A boat tailed bullet having on its boat tail part a protective coating of a material which includes a cellulose ester.

14. A boat tailed bullet having on its boat tail part a protective coating of a material which includes a cellulose ether.

15. A boat tailed lead bullet having a protective coating of a cellulose ester material applied to the bullet in a liquid condition and allowed to solidify on the bullet and covering the boat tail and guiding parts of the bullet.

16. A bullet comprising in combination a soft metal body, and a protective coating therefor, said coating consisting of substantially pure cellulose in a homogeneous and isotropic form.

17. A bullet having a self-adherent protective coating comprising substantially pure cellulose in a homogeneous and isotropic form.

18. A bullet comprising in combination a soft metal body, and a protective coating therefor, said coating comprising a self-adherent elastic cellulosic material in a homogeneous and isotropic state.

19. A bullet comprising in combination a soft metal body, having a boat shaped tail, and a protective coating for said tail, said coating consisting of substantially pure cellulose in a homogeneous and isotropic form.

20. A soft metal bullet having a protective coating of a material which includes a cellulose ester.

21. A soft metal bullet having a protective coating of a material which includes a cellulose ether.

22. A soft metal bullet having a protective coating comprising an outer skin of a residual solute of a cellulose.

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THORISMUND GERLICH.

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CERTIFICATE OF CORRECTION.

Patent No. 1,944,884.

January 30, 1934.

HERMANN ERNST GUSTAV THORISMUND GERLICH.

It is hereby certified that error appears in the above numbered patent requiring correction as follows: In the heading to the printed specification, line 3, for "Hermann Ernst Gustav and Thorismund Gerlich" read Herman Ernst Gustav Thorismund Gerlich; page 3, lines 130 and 131, for "HERMANN ERNST GUSTAV.

THORISMUND GERLICH."

read HERMANN ERNST GUSTAV THORISMUND GERLICH; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 31st day of October, A. D. 1939.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.

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