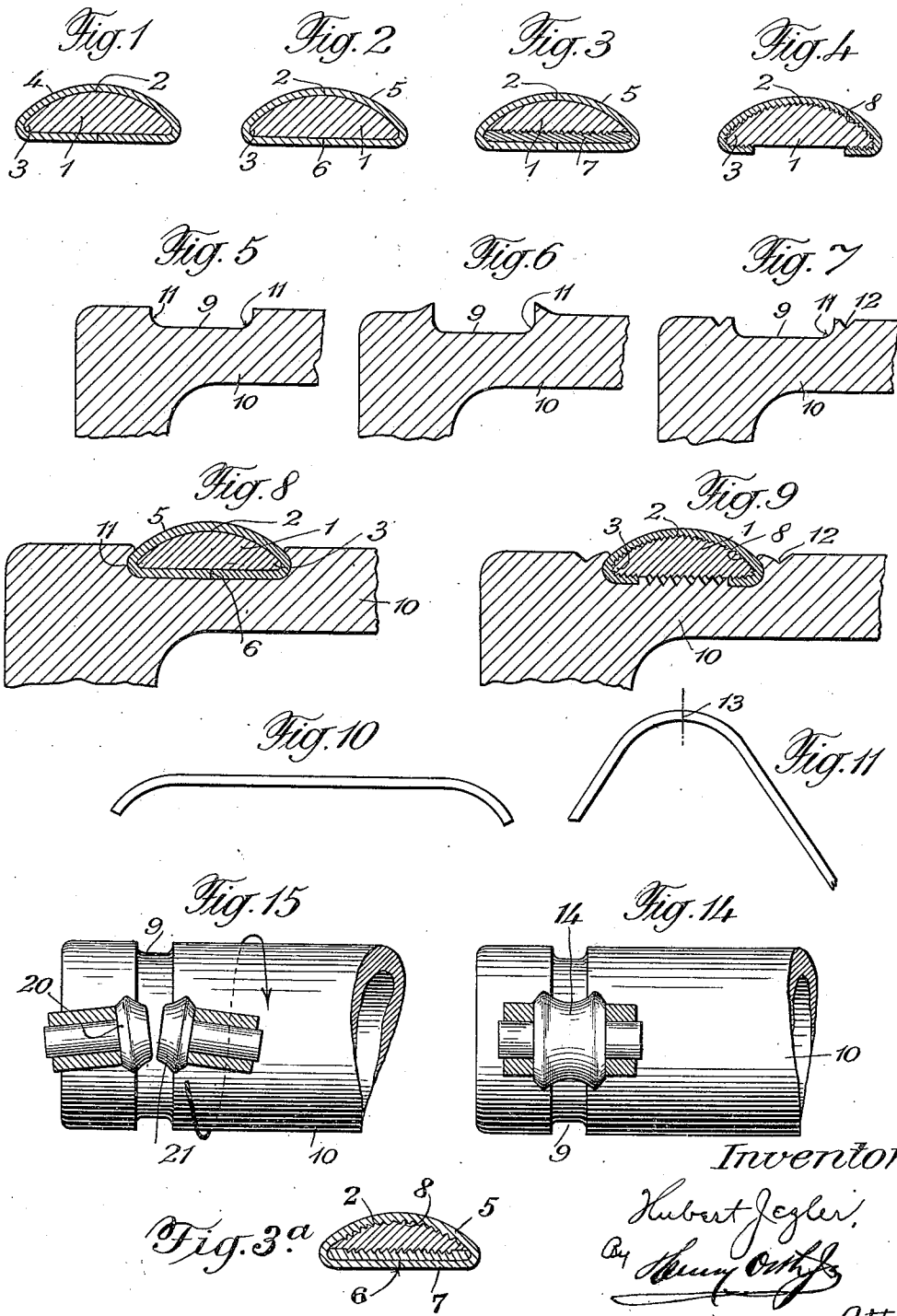


H. JEZLER.
GUIDE RING FOR PROJECTILES.
APPLICATION FILED MAR. 26, 1919.

1,361,158.

Patented Dec. 7, 1920.

2 SHEETS—SHEET 1.



Inventor:

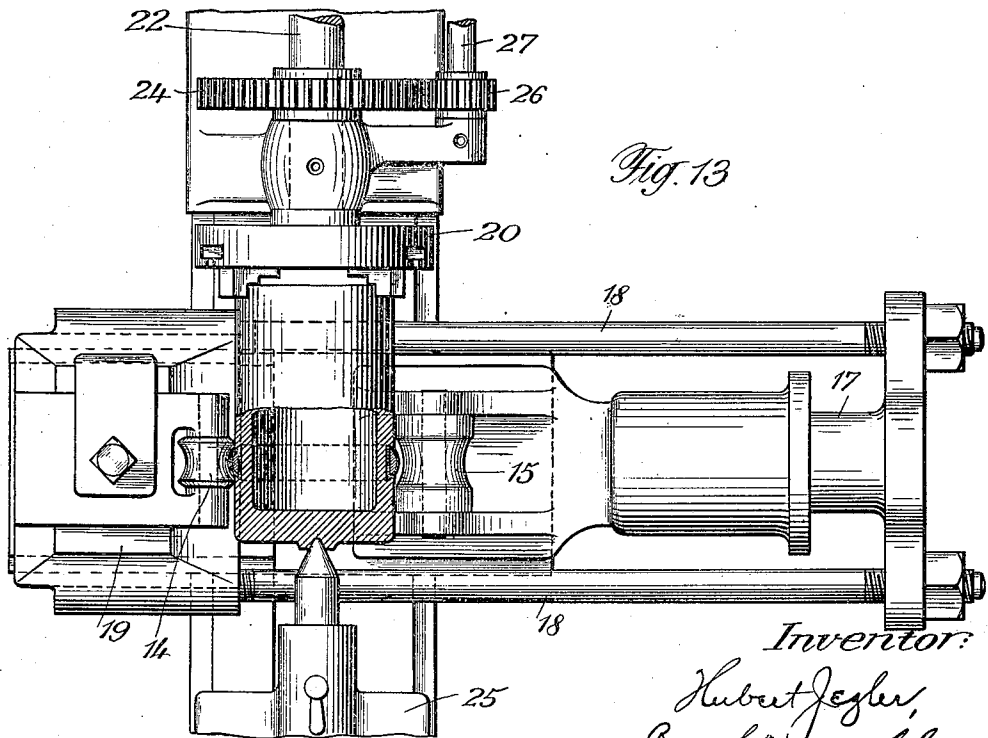
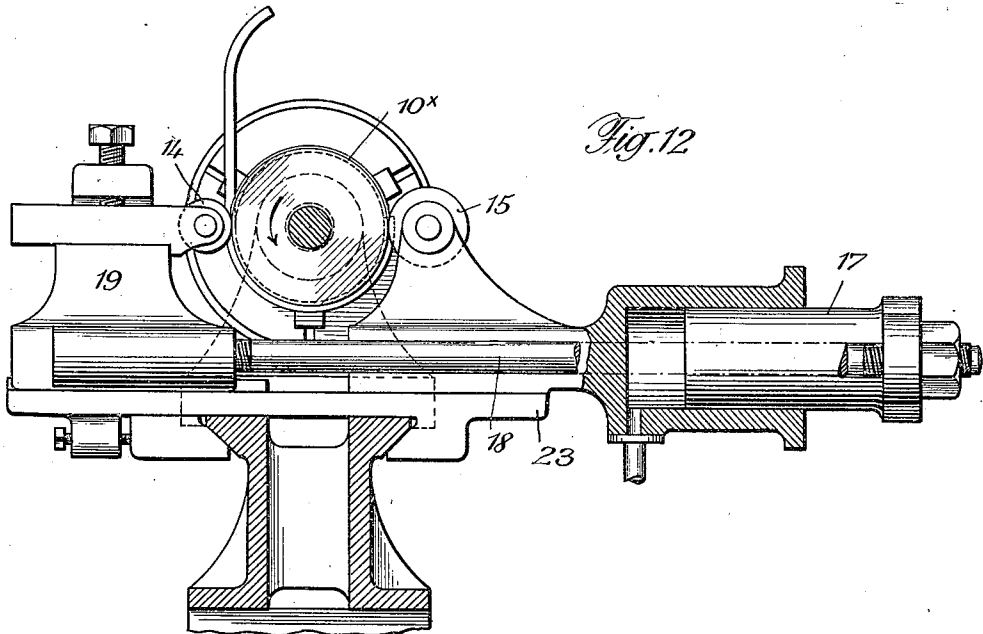
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UNITED STATES PATENT OFFICE.

HUBERT JEZLER, OF ZURICH, SWITZERLAND.

GUIDE-RING FOR PROJECTILES.

1,361,158.

Specification of Letters Patent.

Patented Dec. 7, 1920.

Application filed March 26, 1919. Serial No. 285,198.

To all whom it may concern:

Be it known, that I, HUBERT JEZLER, a citizen of the Republic of Switzerland, residing at Zurich, Bleicherweg 39, Switzerland, have invented certain new and useful Improvements in Guide-Rings for Projectiles; and I do hereby declare the following to be a clear, full, 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, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to improvements in methods of mounting the guide rings on artillery-projectiles and to improvements in guide rings for such projectiles.

The guide rings used hitherto are of copper and as this metal is relatively scarce, it will be necessary to use for the manufacturing of these rings metals that are more current and the loss of which is not so disadvantageous from the economical point of view as that of the copper. This end is attained according to the method forming the object of the present invention by providing the artillery-projectiles with guide rings which do not contain any copper. The firing results attained with projectiles provided with such rings are thereby much better than those obtained with projectiles having copper rings, the wear of the gun being not increased in any way owing to the use of such rings.

The method according to the present invention consists in rolling around the projectile a composite bar or band comprising a flattened metallic core which is relatively soft, homogeneous, tough and which has a relatively great tensile and shearing strength and is surrounded at least partially by a protective metallic envelop, and in fixing said band in an annular recess or throat of suitable shape provided in the casing of the projectile by means of rolls. The flattened metallic core having advantageously an arc-shaped upper surface consists preferably of aluminium or an alloy of aluminium, or it can be made of zinc or an alloy of lead of sufficient strength, for instance of lead and calcium or lead and sodium, or also of another appropriate material. As a metallic protective envelop, a tube of soft iron or another metal of sufficient strength may be used, or said envelop may consist of soft

sheet iron surrounding the core, or of another metal of sufficient strength. The lower edges of the envelop may be welded or folded together, or they can be connected in any other suitable manner, or said edges need not be connected at all.

The invention will now be more particularly described with reference to the accompanying drawings illustrating by way of example several embodiments of the invention. In these drawings:

Figures 1-4 are cross-sections through composite bars or rods used for manufacturing the guide ring.

Figs. 5-7 illustrate three different shapes of the recesses or throats provided in the casing of the projectiles for the guide ring that has to be mounted thereon;

Figs. 8 and 9 illustrate two different forms of guide rings that have been mounted on the casing of the projectiles and fixed thereby by means of rolls.

Fig. 10 shows a composite bar cut to a length corresponding to the circumference of the bottom of the recess or throat that is provided in the casing of the projectile for the ring, the two ends of the latter being bent in conformity with the curvature of the bottom of said throat;

Fig. 11 shows a composite bar previously to its cutting into a length that corresponds to the circumference of the bottom of the recess provided in the casing of the projectile.

Fig. 12 is a front view of a lathe on which the composite bar can be rolled into the recess of the casing of the projectile.

Fig. 13 is a plan view corresponding to Fig. 12.

Fig. 14 shows a detail of the lathe illustrated in Figs. 12 and 13 on an enlarged scale, and

Fig. 15 shows the use of two rolls arranged obliquely relatively to the axis of the projectile.

Referring to the Figs. 1-4 and 7, 8, the core 1 of the bar having a flattened cross-section consists of aluminium or an alloy of aluminium, or of zinc or an alloy of lead of sufficient strength, for instance of lead and calcium or of lead and sodium, or of another appropriate homogeneous and tough material. The upper surface 2 of this core 1 is preferably arc-shaped in the transversal direction of the bar; the edges 3 are rounded off. The bar 1 shown in Fig. 1 is wholly

surrounded by a tube 4 fitting snugly thereto; the walls of the tube 4 are thin and consists of soft iron or another metal having sufficient strength. This thin metallic envelop has to protect the core 1 from the mechanical influences exerted by the pressure of the rifling of the bore of the gun onto its relatively soft mass when the shot is fired, as well as from the chemical effects produced by the deflagration of the powder. As shown in Figs. 2 and 8, a soft sheet iron surrounding wholly the core 1 and fitting snugly thereto can be used as a protective envelop instead of the closed tube 4; the two ends of the sheet iron folded or bent around the lower portion of the core are touching each other at 6 and they can be welded or folded together, or they may be connected in any other suitable manner. Any other soft metal having sufficient strength can be used instead of soft sheet iron.

Fig. 3 illustrates a composite bar comprising a flattened reinforcing bar 7 inserted between the core 1 and the inwardly bent edges of the metallic envelop 5. Said bar 7 secures the proper fixing of the envelop 5 to the core 1. In Figs 4 and 9 the core 1 is intimately surrounded, but only over a portion of its circumference, by a protective envelop 8 of soft sheet iron or another soft metal of sufficient strength; the edges of this envelop 8 bent around the lower portion of the core are not touching one another, so that the core 1 is in direct contact with the casing 10 of the projectile (Fig. 9) between the ends of said edges. In order to obtain a sufficient adhesion when the shot is fired, it is advisable to metallically connect the metallic protective envelop 5, or 8, to the metallic core 1. It is also advantageous to roughen the inner surface of the protective envelop (as shown in Figs. 4 and 9) in any suitable manner in order to prevent any sliding of this envelop on the core; for the same purpose it is also advisable to roughen the inner surface of the reinforcing bar 7 (Fig. 3), or eventually both its surfaces.

Throats or recesses 9 having a flat bottom (Figs. 5-7) provided in the casing 10 of the projectile are for taking up and fixing the guide rings to said casing: these recesses 9 have inner edges 11 rounded off in conformity with the curvature of the outer surface of that portion of the protective envelop 5, or 8, that is bent around the rounded off edges 3 of the core, so that the edges of the composite bar lie snugly against the rounded off edges 11 when said bar is inserted into a recess 9. The upper edges of the recesses 9 can have different shapes; for instance they can be simply rectangular (Fig. 5), raised (Fig. 6) or grooves 12 (Figs. 7 and 9) may be provided laterally of these edges. It is advisable to slightly roughen the bottom of the recesses, as shown by way of

example in Fig. 9, in order to prevent any sliding of the ring when its turning moment is transmitted to the projectile while the latter moves within the bore of the gun toward the mouth of this bore.

The composite bar cut exactly to the requisite length is fixed within the recesses 9, the upper edges of the latter being pressed to this end against the bar in any suitable manner, preferably by means of rolls; the composite bar is then in the position illustrated in Fig. 8 or 9. In order that the joint of the composite bar may be worked in an exact manner, the ends of the segment of the bar must be so bent that their curvatures correspond exactly to that of the bottom of the recess 9 (Fig. 10). To this end, a composite bar is so bent that its curvature corresponds to that of the bottom of the recess (see Fig. 11) and this bar is then cut at a point 13, the bent portions on both sides of the cut being identical; the same is carried out at a distance from the point 13 corresponding to the circumference of the flat bottom of the recess, a segment of a composite bar being then obtained having the shape shown in Fig. 10. Owing to said previous bending of the ends of the segment of the bar, the metal has not the tendency to jet-out at the joint, and this portion of the guide ring has consequently exactly the same properties as all other portions of the ring, so that any rupture at this point of the protective envelop is eliminated when the projectile is fired.

Figs. 12 to 14 illustrate a lathe on which a segment of a bar of the kind shown in Fig. 10 can be rolled around the casing of the projectile and fixed thereto by means of rolls 14, 15. In this lathe a hydraulic pressure is exerted upon the roll 14, so that the latter is pressed against the projectile 10* which rotates about its axis in the direction of the arrow shown and is supported at the same time by the opposite roll 15. The projectile 10* is fixed between a face plate 20 mounted on a shaft 22 and the center of a tail-stock 25. The shaft carries a toothed wheel 24 meshing with a toothed wheel 26 fixed on a driving shaft 27.

For the purpose of obtaining the pressure required for pressing the roll 14 against the projectile, a liquid subjected to a suitable pressure is forced into a chamber 16 carried by the slide 23 of the lathe. The liquid acts in said chamber on a piston 17 reciprocating in said chamber 16 and connected by means of rods 18 having screw-threaded ends to a slide 19 carrying the roll 14 and adapted to be moved in the axial direction of the rods 18 on the slide 23. The pressure exerted by the roll 14 presses the material of the edges of the recess onto the edge of the composite bar while the latter is rolled simultaneously around the projectile, the bar be-

ing thus fixed in the recess. Experiments have shown, that it is sometimes more advantageous to use two rolls 20, 21 (Fig. 15) arranged obliquely relatively to the axis of the projectile instead of a single roll 14; the two rolls 20, 21 have the effect to draw out the material of the upper edges of the recess 9 toward the interior of said recess, as is the case in Mannesmann's process, without that it is necessary to take recourse to a too high pressure (even when the strength of the casing is great).

When the recess 9 has exactly the required diameter, it is not difficult to obtain guide rings having up to a tenth of a millimeter the exact required diameter; moreover, the exact diameter of the ring can also be obtained by a subsequent rolling of its outer surface by means of appropriate rolls, without that this ring has to be turned, filed or ground or subjected to any after-treatment as it is the case with regard to the guide rings made of copper.

For projectiles having a large caliber, it is preferred to use instead of a composite bar rolled around the projectile a ring-shaped bar consisting only of metal and provided with a metallic protective envelop of the kind above referred to; said ring is pressed onto the casing of the projectile from the side of its bottom piece and it is then secured against a stripping off by means of a suitable locking device.

In order to prevent rusting of the protective metallic envelop, the latter can be coated with another suitable metal.

The curvature given to the upper surface of the ring in the transversal direction of the latter allows of attaining a very important result; this curvature which has preferably the shape of an arc causes the gases produced in consequence of the deflagration of the powder and having a considerable expansive power to press the protective envelop against the core over a surface which is as large as possible.

In consequence of this, the static friction between the protective envelop and the core is considerably greater than the dynamic friction between the envelop and the bore of the cannon or gun, a fact that is of the utmost importance, particularly at the beginning of the movement of the projectile when the grooves are produced in the ring, as any stripping off of the latter is then prevented.

Under all circumstances the material used for the manufacturing of the core has to possess such mechanical properties that a static pressure is produced in said core when the grooves are pressed into it and that it retains thereby still such a degree of toughness that the greatest part of the shearing stresses and of the turning moment produced while the projectile is moving and which

have to be transmitted by the very thin protective envelop, are chiefly taken up by the mass of the core and not by the edges of the ring. The materials used for manufacturing the core (pure aluminium, alloy of aluminium and the like), while having a great compressive and tensile strength, are yet so soft that they can be pressed into the spaces provided between the grooves of the ring when said grooves are formed, without opposing too great resistance. In consequence of this, a static pressure is always present between the protective envelop and the bore of the gun, so that upon the firing of the gun the envelop adapts itself continually to the shape of the bore of the gun which varies with the position taken up by the projectile. When one of the above mentioned alloys is used for the manufacturing of the core, the strength and the hardness of the latter can be varied within large limits by varying the relative ratio between the different materials contained in the alloy, the resistance to be overcome by the projectile within the bore of the gun being then accordingly increased or diminished.

I claim:

1. A guide ring or sabot for artillery projectiles comprising a metal ring substantially entirely surrounded with and united to a sheet metal covering.

2. A guide ring for artillery projectiles comprising a core of one kind of metal and a protective metallic envelop entirely surrounding the core and of sufficient strength to retain said core under operating conditions.

3. A guide ring for artillery projectiles, comprising a core of aluminium and a protective metallic envelop of sufficient strength to retain said core under operating conditions.

4. A guide ring for artillery projectiles, comprising a core, and a protective metallic envelop of sufficient strength to retain said core under operating conditions and wholly surrounding said core and connected at its meeting edges.

5. A guide ring for artillery-projectiles, comprising a core and a tube of soft iron surrounding said core, thereby acting as a metallic protection for the latter.

6. A guide ring for artillery projectiles, comprising a core, a protective metallic envelop of sufficient strength to retain said core under operating conditions, and a flattened reinforcing bar provided between the inner surface of the core and the end portions of the protective envelop bent around the core.

7. A guide ring for artillery projectiles, comprising a metallic core, a protective metallic envelop for said core, and a flattened reinforcing bar having a roughened surface provided between the inner surface of the

core and the end portions of the protective envelop bent around the core.

8. A guide ring for artillery projectiles, comprising a core, and a metallic protective envelop entirely surrounding said core, and
5 said envelop having a roughened inner surface.

9. A guide ring for artillery-projectiles, comprising a core of aluminium having an
10 arc-shaped upper surface and rounded off edges, and a tube of soft-iron surrounding wholly said core and fitting tightly thereto.

10. A guide ring for artillery-projectiles,

comprising a core of aluminium having an arc shaped upper surface and rounded off
edges, a tube of soft-iron surrounding wholly said core and fitting tightly thereto, the ends of said tube being rigidly connected, and a reinforcing bar having an inner rough-
20 ened surface arranged between the inner or lower surface of the core and the portions of the tube bent around the lower portion of the core.

In testimony that I claim the foregoing as my invention, I have signed by name.

HUBERT JEZLER.