

# UNITED STATES PATENT OFFICE.

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## METALLIC COMPOUND FOR PROJECTILES.

SPECIFICATION forming part of Letters Patent No. 645,976, dated March 27, 1900.

Application filed June 17, 1898. Serial No. 683,729. (Specimens.)

*To all whom it may concern:*

Be it known that we, GEORGES ROTH and CHARLES KRKA, subjects of the Emperor of Austria-Hungary, residing at Vienna, Empire of Austria-Hungary, have invented a new and useful Improved Metallic Compound for Projectiles, of which the following is a full, clear, and exact description.

The object of the present invention is to render the steel, copper, or nickel mantles hitherto applied to lead or hard-lead bullets and projectiles unnecessary. The core of this class of projectiles, as is known, is made of comparatively-soft metallic alloys (lead and antimony) and incased or partially incased in a harder shell.

According to the present invention a simpler form of projectile is produced, which consists of a harder metallic compound.

The metallic alloys hitherto known, such as brass and all the copper alloys, will not serve the purpose in view, owing to the fact that these metals rub off in the barrel of the weapon, being much too soft, so that not only is the precision of aim rendered less, but also the bullet flattens in the object struck. Particularly is this latter the case if the form of the projectile is complicated or peculiar, so that in such cases the power of penetration is reduced. Even Delta metal, as also all other copper alloys containing iron or manganese, are unsuited for the purpose. Then, again, all the metal alloys hitherto known have the disadvantage that their specific weight is insufficient and not sufficiently approximate to that of the hard-lead projectile with steel casing.

The new alloy forming the object of the present invention consists of a copper-tungsten or nickel-tungsten compound or a copper alloy containing tungsten. The amount of tungsten contained in the compound may in all cases be in excess of fifty per cent. if the excessive hardness and brittleness of such projectiles need not be taken into account. For all requirements hitherto made twenty-five per cent. of tungsten with pure copper, nickel, or a copper alloy will be found per-

fectly sufficient. If the copper-tungsten or nickel-tungsten compound contains twenty per cent. of tungsten, the specific weight of the projectile will be equal to that of the hard-lead projectile with a steel casing.

The manner in which the present invention is carried out is briefly as follows: The copper or copper alloy—advantageously an alloy of copper and nickel—is placed, together with the desired percentage—fifteen to twenty-five per cent.—of tungsten, in a crucible and subjected to the heat of a hydrooxygen-gas flame or to that of an electric furnace, being heated to the utmost extent. The castings obtained from the melted products are then rolled and drawn or forged to the required shape for the projectile. These projectiles are then finished by mechanical means, the material of the same having been rendered denser by the forging or drawing process. The electric furnace gives sufficient heat to properly and efficaciously carry out the process of forming the alloy. If the alloy has not been properly formed, the tungsten will dust out or separate out in the form of powder during the drawing or rolling process.

The amount of tungsten in the compound is varied according to the specific weight required or according to the degree of hardness of the projectile which it is desirable to attain.

One of the main advantages of the present new projectile material is that the specific weight of the projectile may be determined at will, so that specifically light or heavy projectiles may be manufactured, according to requirement.

We claim as our invention—

A mantleless projectile consisting of a malleable alloy of copper, nickel and at least ten per cent. of tungsten.

In witness whereof we have hereunto set our hands in presence of two witnesses.

GEORGES ROTH.  
CHARLES KRKA.

Witnesses:

HENRY C. CARPENTER,  
CHAS. E. CARPENTER.