(No Model.)

J. G. BUTLER.

PROJECTILE.

No. 373,387. Patented Nov. 15, 1887.

Fig. 1

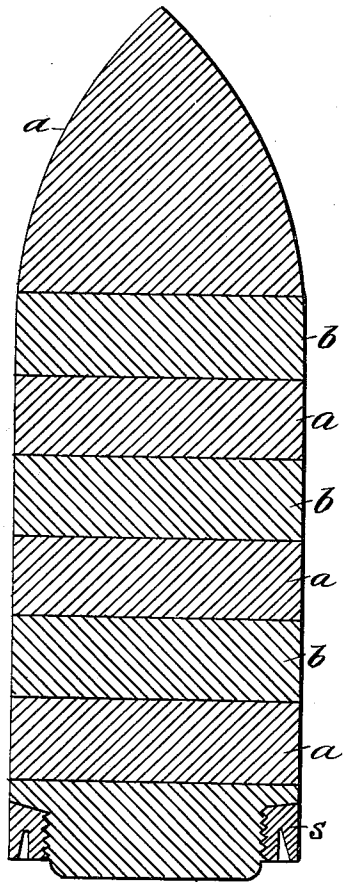


Fig. 3

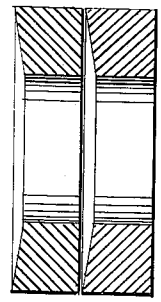


Fig. 4

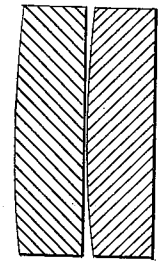
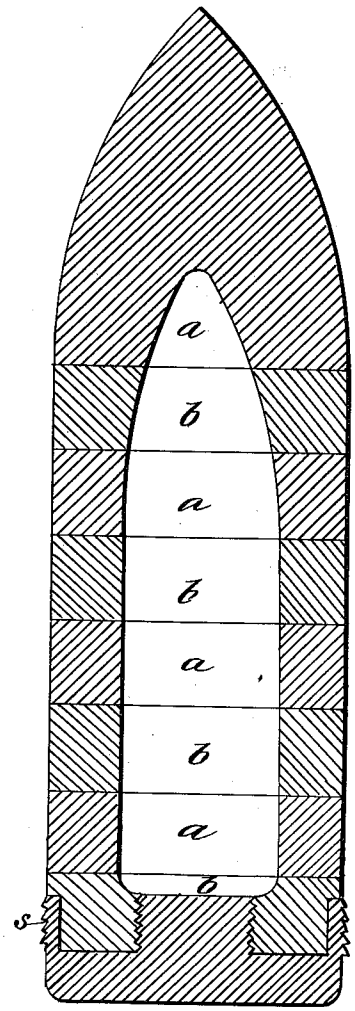


Fig. 2



WITNESSES:

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PROJECTILE.

SPECIFICATION forming part of Letters Patent No. 373,387, dated November 15, 1887.

Application filed April 7, 1887. Serial No. 234,017. (No model.)

To all whom it may concern:

Be it known that I, JOHN G. BUTLER, of the city of Springfield and county of Hampden, in the State of Massachusetts, have invented a new and useful Improvement in Projectiles for Rifled Guns, of which the following is a true and correct description, reference being had to the accompanying drawings, making part of this specification.

The object of my invention is to construct a projectile in such a manner as to give it an unusual degree of strength to enable it to preserve its integrity of form upon impact against hard resisting objects, such as iron and steel armor-plates.

Projectiles of this class have heretofore been made either of forged and tempered or otherwise hardened steel or of chilled cast-iron. In the case of the steel projectiles it has been found, as a rule, that if they possess sufficient toughness to resist breaking upon impact they will become disfigured, thereby losing penetrative power, while if hardened sufficiently to resist this disfigurement or tendency to "upset" they are liable to break upon impact.

My invention is intended to obviate these difficulties; and it consists of a projectile of compound structure—*i. e.*, made up of metal of two or more qualities or characteristics, as hard and soft or decarbonized steel, or of hard steel and wrought-iron, these metals being in alternate disks or rings having a common axis and welded one to the other by blows or pressure applied in the direction of the axis or normal to the disks.

In the construction of my projectile I first forge the properly-shaped head of the projectile of a steel capable of taking under proper treatment the necessary degree of temper or hardness. This head is forged in a pot or die, and afterward to its flat surface a disk of softer steel or wrought-iron is welded. To this is again welded a disk of carbonized steel, which may be of somewhat lower grade than the head of the projectile. Another disk of the softer material is welded to the projectile, which now begins to assume shape, and so on, alternating the disks of carbonized and decarbonized material until a projectile of the required length is obtained. If a fibrous iron be used for the softer disks, care is taken to arrange the fiber of one disk perpendicular to the fiber of the preceding disk of the same material. The disks are also so arranged that the position of the "sabot" or rotating ring shall come opposite the softer disks, which resist temper or hardening sufficiently to allow cutting the necessary groove or shoulder for said rotating ring in case it be necessary to do so after tempering or hardening the projectile. When the projectile has been forged, it is finished in a lathe to the exact dimensions, and then tempered to the requisite degree of hardness. Its symmetrical shape will probably allow it to temper "true," if not it must be ground after hardening.

A projectile thus constructed will be less liable to break upon impact than if homogeneous, the toughness of the softer disks preventing rupture, while the hardened head and disks prevent upsetting. Injurious molecular disturbance in the hard portions will also be reduced to a minimum by the juxtaposition of softer parts, and the forgings being small can be of the finest quality.

Referring to the accompanying drawings, Figure 1 represents a solid shot, and Fig. 2 a shell of the compound construction described. In each figure, *a* represents the hard steel parts, and *b* the softer disks, and *s* the rotating rings. Fig. 3 shows the form of disks for forging when the scoria or slag is to be squeezed inward, and Fig. 4 when it is to be expelled outward.

Having thus described the nature and object of my invention and the manner of carrying it into effect, what I claim as my invention, and desire to secure by Letters Patent, is—

1. The projectile built up of solid alternating layers of carbonized and decarbonized metal—*i. e.*, hard and soft metal welded one upon the other—substantially as and for the purpose set forth.

2. As an improved article of manufacture, the projectile consisting of solid alternating layers or disks of carbonized and decarbonized or hard and soft metal welded one upon or to the other, which layers include the ring or sabot arranged next to a soft-metal layer or disk, substantially as set forth.

JOHN G. BUTLER.

Witnesses:
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C. B. ZINCK.