J. ABSTERDAM.

Projectile.

No. 88,689. Patented April 6, 1869.

Fig. 5

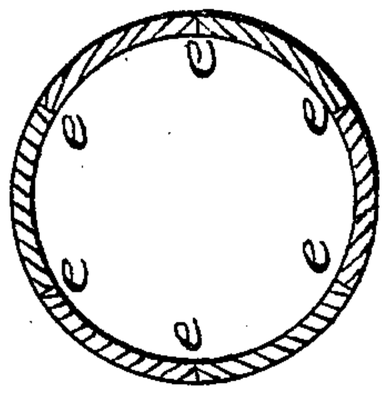


Fig. 4

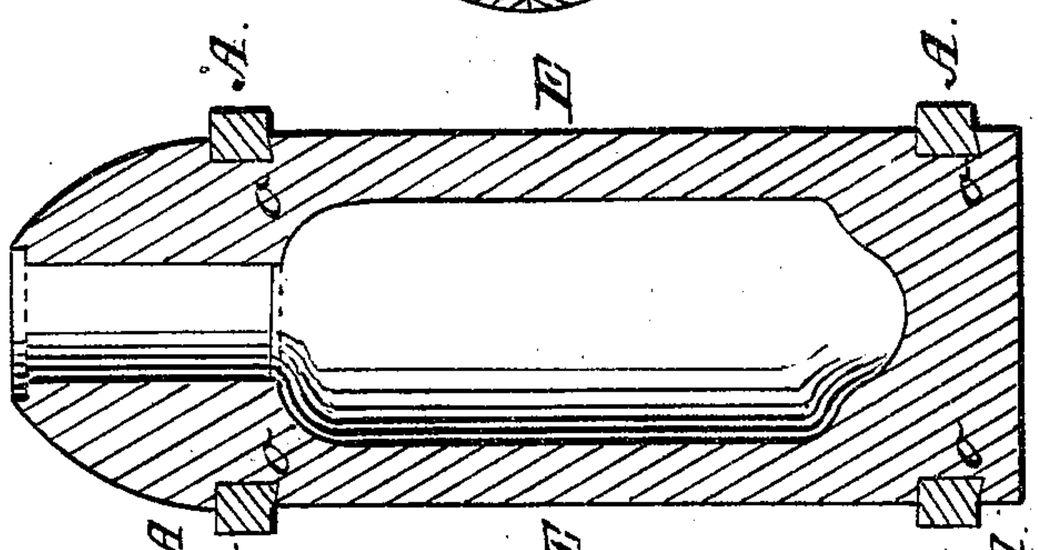


Fig. 3

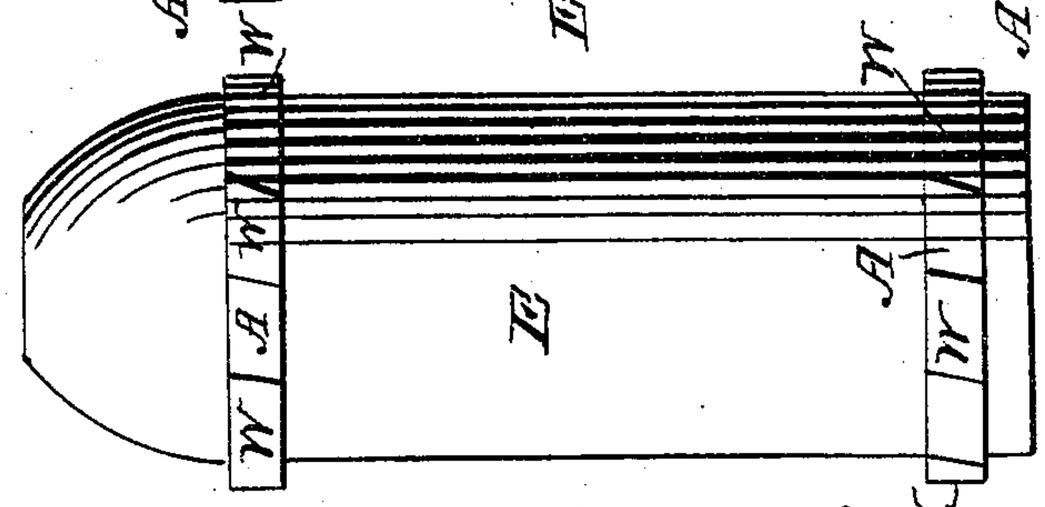


Fig. 2.

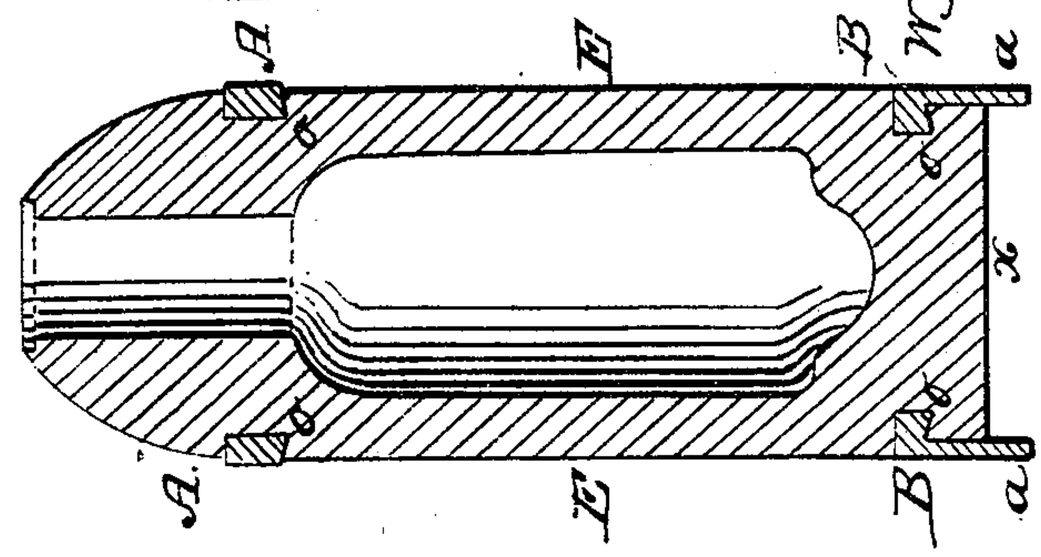
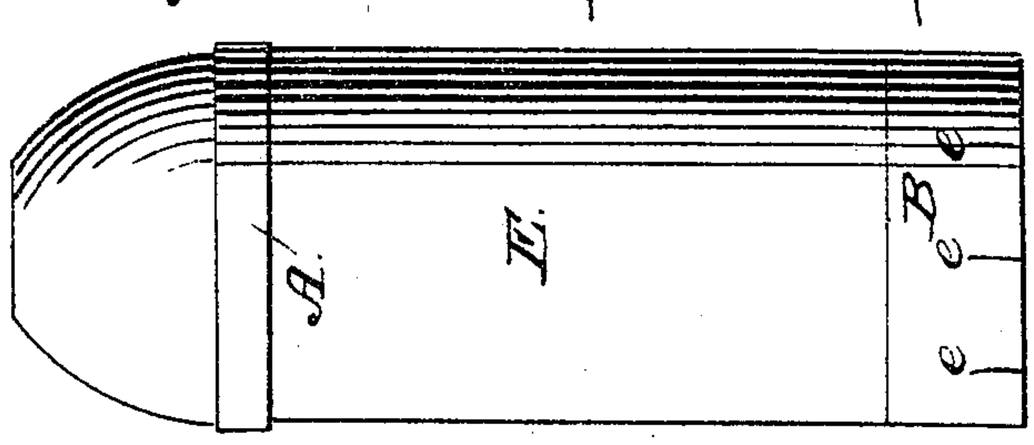


Fig. 1.



Witnesses

J. N. Webb

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JOHN ABSTERDAM, OF NEW YORK, N. Y.

Letters Patent No. 88,689, *dated April* 6, 1869.

IMPROVEMENT IN PROJECTILES.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, JOHN ABSTERDAM, scientific and mechanical engineer, of the city, county, and State of New York, have invented a new and useful Projectile for rifle-cannon; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, in which—

Figure 1 represents a perspective view of my projectile, with an expanding ring.

Figure 2 represents a longitudinal section of the same.

Figure 3 represents a perspective view of my projectile, without an expanding ring.

Figure 4 represents a longitudinal section of the same.

Figure 5 represents the end of the expanding ring B.

E is the body of the projectile.

A B are the rings, or bands, of malleable brass, cast around the cylindrical part of the body of the projectile.

The nature of my invention consists in grinding the surface of the body of an elongated projectile for rifle-cannon on an emery-wheel, to prevent the wearing off of surface of the bore of the gun.

It also consists in constructing an elongated projectile for rifle-cannon with an expanding sabot-ring, or band, of brass, or other suitable metal, cast around the base of the body of the shot, with sides projecting rearward, having its inner surface cast parallel to the longitudinal section of the projectile, to prevent the sides of the expanding metal from wedging in the bore of the gun, in case the same or part of the same should strip from the body of the shot.

To enable others skilled in the art to make and use my invention, I will describe its construction and operation.

I make my projectile cylindro-conical in shape, or I make it in any other desired form, or shape. I cast it with one or more circular cavities running around its cylindrical part, perpendicular to the axis of the projectiles, as seen at A B. These cavities, I afterward fill with malleable brass; that is to say, with a brass that is malleable while hot.

Before filling the circular cavities with the malleable brass, I grind the surface of the body of the projectile on an emery-wheel, to admit of its passing through the cylinder-gauge.

And in order to cast the rings, bands, or bearings, I place the projectile upright in a mould, having its inner diameter a little larger than the diameter of the bore of the cylinder-gauge. I then fill the cavities A B with the melted malleable brass, which forms its surface against the sides of the bore of the mould; but, immediately after pouring the melted brass in the circular cavities, I extract the projectile from the mould, and plunge it immediately in water, while the brass is yet red hot or thereabout.

I afterward grind and polish the malleable-brass rings on an emery-wheel, to admit of their passing through the cylinder-gauge.

The cylinder-gauge which I use for trying the rings A is a little larger than the cylinder-gauge which I use for trying the body of the projectile, in order that the brass may be allowed to project a little beyond the surface of the body of the projectile, thereby forming the bearing-surface for the projectile while in the bore of the gun; but I grind the ring B, to admit of its passing through the same cylinder-gauge which I use for trying the body of the projectile.

It is not necessary that the ring B should project beyond the surface of the body of the projectile, on account of its being expanded, by the explosion of the charge into the rifles of the bore of the gun, in firing.

It is not necessary to turn or plane my projectile, as the bearing-surfaces of malleable brass remove the necessity of its being turned or planed, whereas other projectiles are either turned on a lathe or planed in being forced through circular dies, a process which deteriorates the strength of the iron, in removing the skin from the surface of the same.

When my projectile is intended to be fired with cannon rifled with shallow grooves, I let the ring B project beyond the base of the body of the projectile, as seen at *a*, thereby forming a cup with the base of the body, as seen at X.

But when my projectile is intended to be fired with cannon rifled with deep grooves, I dispense with the ring B, and use only the rings A, which in their being cast with a number of projections, or buttons *m*, corresponding with the number of the rifles of the bore, the projectile is made to take the grooves in inserting the projections in the rifles of the bore, in loading the gun.

I cast the rings A B in circular cavities, having their rear side tapering inward toward the base of the body of the projectile, as seen at *o*, and I regulate the dimensions of the rings, bands, or bearings according to the calibre of my projectiles.

I saw the end of the ring B in several cuts, diagonally to the axis of the projectile, as seen at *e*, so as to facilitate the expanding of the metal in the grooves of the gun, and to allow the flame from the charge to escape through the cuts, so as to ignite the time-fuse at the end of the projectile.

The malleable brass which I employ for the rings A B is composed of 60.16 copper and 39.71 zinc; or of 61.44 copper and 38.15 zinc; or of thirty-three parts, by weight, of copper and twenty-five parts, by weight, of zinc; or of three parts, by weight, of copper and two parts, by weight, of zinc.

This metal possesses greater density, or solidity than brass. Its specific gravity at 10° centigrade is 8.44, which, by calculation, ought to be only 8.08, thus showing, that in the formation of the alloy, a condensation must take place.

Calculation shows that this alloy may be considered as a determinate chemical combination, for the results

of its analysis very nearly accord with the assumption that it may be considered as composed of three atoms, by weight, of copper and two atoms, by weight, of zinc, (3 cu. × 2 zn.)

The hardness of this alloy, if not cooled immediately while hot, is the same as that of fluor-spar. It can be scratched by apatite, (glass.) Consequently its hardness is = 4; but, when suddenly immersed in water while red hot, its hardness is considerably diminished, and becomes very pliable—so much so, that a cast rod may be coiled spirally, without danger of cracking the metal.

This alloy is naturally harder than copper, very tough, and is, in a properly-managed fire, malleable—so much so, that a key may be forged out of a cast rod.

It is a well-known fact that common brass containing from 27.4 to 31.8 per cent. of zinc, and from 71.9 to 65.8 per cent. of copper, is not malleable while hot, and that the only way to work it is while cold.

The operation of my invention is as follows, viz:

It being known that common brass or bronze is extremely brittle while hot, therefore it can readily be seen that all projectiles having their sabots, or packing made of either of those metals are extremely dangerous in firing, for the heat generated by the explosion of the charge is sufficiently intense to heat the brass to a degree that will cause the projectile to strip in firing. The projectile, in being stripped of its brass, loses its range and accuracy of flight, and the fragments of brass are not the less dangerous to life when fired over the heads of troops, but the brass packing, or sabot, in breaking in the bore of the gun, is also liable to slug, or wedge the projectile in the bore, thereby causing the bursting of the piece in firing. So it will be seen, that in casting the ring, or band B, of figs. 1 and 2, with projecting sides, of one thickness, the danger of bursting the gun by slugging, or wedging is entirely obviated, even if the expanding metal of my projectile from the body of the same should be stripped in firing.

Lead, and a variety of other soft metals, have been used for taking the grooves of the gun, and have been found to be liable to strip, in not possessing sufficient tenacity to resist the torsion of the projectile while passing through the bore of the gun. Therefore, brass has been substituted, on account of possessing greater tenacity. But those who have witnessed the firing of projectiles with brass sabots have also seen the stripping of projectiles, and the bursting of guns, especially guns of large calibre, where large charges of powder are used, in which large charges produce intense heat, in firing, showing that brass is totally unfit for the packing, or sabots of projectiles unless malleable while hot, on account of otherwise becoming brittle from the heat generated by the explosion of the charge. Now, my brass does not become brittle in being heated, but becomes more pliable in firing my projectile. My malleable brass takes the grooves of the gun, without stripping, and, if red-hot shot should be required to be fired, my projectile may be heated red hot, and fired, without danger of stripping. All that is required, in heating my projectile red hot, is simply to sprinkle the brass with water, so as to prevent it from melting.

The brass, in being cast in circular cavities, having their rear side tapering inward toward the base of the body of the projectile, forms an interlocking-joint with the iron of the body, which becomes tighter by the action of the charge in firing; and, as the projectile is pressed forward, by the charge, through the bore of the gun, the rings are pressing rearward in the taper of the grooves by their inertia, and in being pressed in the rifles of the bore of the gun.

My brass, by being plunged in water while hot, becomes soft and pliable, which otherwise would be too hard, and is also shrinked around the iron, by sudden cooling, tighter than could be obtained by cooling gradually.

The sawing of the end of the ring B in several cuts, at oblique angles to the axis of the projectile, facilitates the expanding of the metal into the rifles of the bore, and permits a sufficient amount of flame to escape through the cuts, in order to ignite the paper fuse in the end of the projectile.

The advantages of my invention are as follows, viz:

By grinding the cylindrical surface of the body of my projectile on an emery-wheel, I polish the same with a smooth surface, that prevents the wearing or deteriorating of the surface of the bore of the gun, at the same time preserving the strength of the casting, as the grinding takes off only the rough surface, without destroying the strength of the iron, in contradistinction to other projectiles now made, where the skin of the iron is taken off in planing, or forcing the projectile through dies.

Also, in casting the band, or ring B with projecting sides, of even thickness, parallel to the longitudinal section of the projectile, I obviate the danger of bursting the gun from stripping, even if said ring should be loose, cracked, or detached from the body of the shot; and the other advantages of my projectile may be described in the manner following, viz:

First, the brass of my projectile has not its strength deteriorated by the heat generated in firing the gun, and does not crack in being cast around the body of the projectile.

Second, it may be cast around the body of the projectile, with as much facility as lead, by following the process herein described; whereas,

Third, common brass or bronze cannot be cast around a body of iron without danger of parting asunder or cracking.

Fourth, my projectile may be heated red hot, and fired, without stripping, a result which cannot be obtained with projectiles provided with common brass or bronze.

Fifth, in casting the brass in circular cavities, having their rear side tapering inward toward the base of the body of the projectile, the packing has a tendency to become tighter in firing; whereas,

Sixth, in other projectiles now in use, the packing has always a tendency of becoming loose in firing.

Seventh, in plunging the projectile suddenly in water while the brass is hot, I soften the brass, to such an extent as to render it very soft and pliable, whereas otherwise it would be too hard, and also shrink the brass firmly around the body of the projectile by the sudden shrinkage of the brass.

Eighth, in sawing the end of the expanding ring B at oblique angles to the axis of the projectile, I facilitate the expanding of the brass into the rifles of the bore, at the same time allowing a sufficient amount of flame to escape through the cuts, so as to ignite the paper fuse with great facility.

Having thus described my invention,

What I claim as new, and desire to secure by Letters Patent, is—

The cup *x*, having sides parallel to the major axis of the projectile, and immovably secured and retained thereon by the interlocking-dovetail B, substantially as herein described and shown.

I hereby set my signature, in the city of Philadelphia, Pennsylvania, this 2d day of June, 1865.

JOHN ABSTERDAM.

Witnesses:

J. H. WEBB,

A. R. REDSECKER.