B. B. HOTCHKISS.

PROJECTILES.

No. 183,674. Patented Oct. 24, 1876.

Fig. 3.

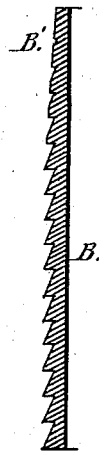


Fig. 2.

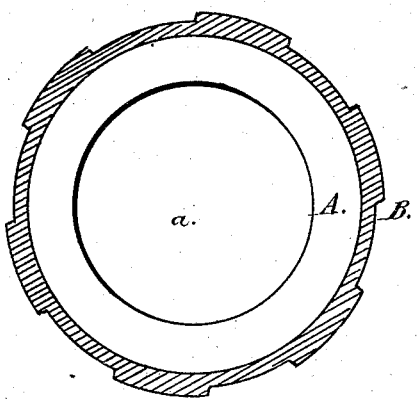
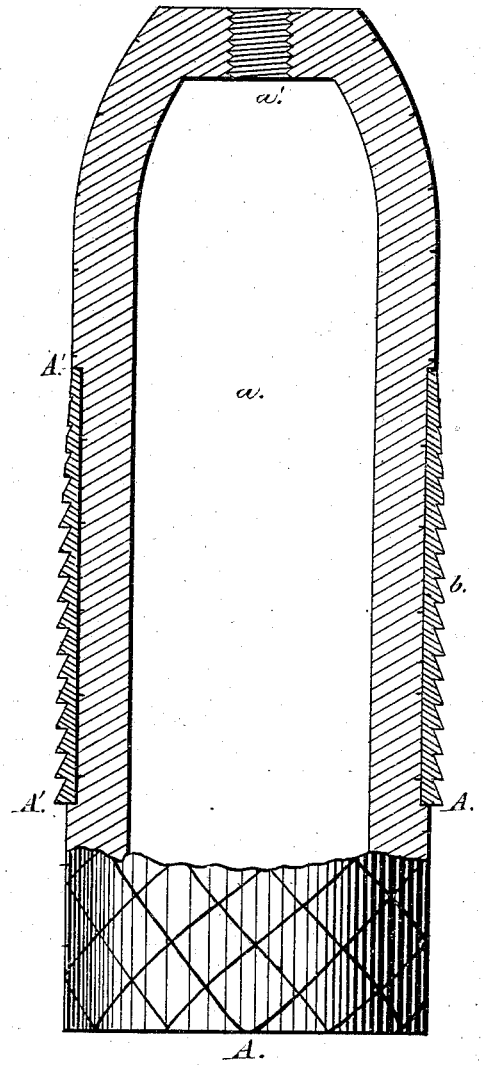


Fig. 1.



B. B. Hotchkiss

INVENTOR.

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BENJAMIN B. HOTCHKISS, OF NEW YORK, N. Y.

IMPROVEMENT IN PROJECTILES.

Specification forming part of Letters Patent No. **183,674**, dated October 24, 1876; application filed April 8, 1876.

To all whom it may concern:

Be it known that I, BENJAMIN B. HOTCHKISS, of New York city, in the State of New York, (temporarily residing at 27 Rue de Choiseul, Paris, France,) have invented certain Improvements in Projectiles, of which the following is a specification:

The improvement is more particularly intended for rifled ordnance, but it may serve with some advantage in either rifled or smooth-bored pieces of any caliber. It is especially intended for breech-loading pieces.

I apply around an iron shell a packing of softer metal, as brass, in the form of a broad band partially sunk into the body of the shell, and peculiarly ridged and chamfered. The front of the packing-belt is of only the same diameter as the body of the projectile. It enlarges gradually from thence to about the middle of the width of the belt, where it attains the full diameter required for filling the rifled grooves of the piece from which it is to be fired. From thence to the rear edge, and also partially on the front half, it is grooved, with grooves extending around like screw-threads. They may be formed like a screw in a continuous helical line, or they may be separate independent beads extending around like rings. The front face of each is inclined. The back face is a little overhanging or under cut. These ridges, and the spaces between should be so proportioned that the lands of the gun, on crushing down the summits of the ridges, will nearly, but not quite, fill the spaces between. The chamfering at the front of this packing enable the projectile to move easily through the air. Experiment indicates that, in shooting at a range of about three miles, the same elevation and same powder give a quarter of a mile farther flight with the chamfered front than when the packing-belt maintains its full diameter to its front edge. The ridging fills the grooves in the gun quite as effectively as solid metal. I believe the ridged surfaces are more effective in preventing the escape of a too large quantity of gas, while the lands of the gun are able to easily depress the ridges and make the proper impression in the packing. The entire exterior of the body of the projectile is scored with narrow and shallow grooves or scratches, crossing each other at or near right angles. When the shell explodes these scores determine the lines of fracture, and greatly promote the breaking up of the entire shell into pieces of just the right magnitude to be effective.

The following is a description of what I consider the best means of carrying out the invention.

The accompanying drawings form a part of this specification.

Figure 1 is mainly a central longitudinal section, but with the extreme rear end in elevation. Fig. 2 is a cross-section on the line *s s* in Fig. 1. Fig. 3 is a cross-section through the packing-belt on a larger scale.

Similar letters of reference indicate corresponding parts in all the figures.

A is the body of the projectile; *a*, the cavity therein, and *a'* the ordinary threaded neck, adapted to receive a fuse-plug of any ordinary or suitable description. B B' *b* is a packing-belt of brass. It is applied in the form of a short tube. I have devised a peculiar method of applying this, which is made the subject of another application for patent. It may be briefly defined here as a means for compressing a brass tube of larger diameter so as to cause it to tightly apply around the sunk seat A' provided for it on the exterior of the body A. The exterior B' of the front portion of the belt is chamfered or conical; the exterior of the central and rear portion is ridged, as indicated by *b*.

In operation, my projectile, being properly prepared, is thrust into the rifled portion of the gun, and the full threaded force of the packing-belt is received in the slightly-larger chamber in the rear. On receiving the impulse of the powder the projectile is driven into the rifled portion, and the lands of the gun easily crush down the top of the ridges *b*, while the ridges remain uncrushed, or only slightly bent back, opposite the grooves.

Attempts have been before made to insure the breaking of a projectile in pieces of uniform size by giving an angular contour to the interior cavity. I find the effect may be much more easily produced by grooving the exterior. I groove the entire exterior surface with grooves *m*, which cross each other and divide the body of the shell into thirty or other de-

sired number of parts, of nearly equal size. When the rupture occurs it commences at these grooves, and experiment has determined that the shell in practice breaks in accordance therewith, even if the grooves are of a very moderate depth. I propose to groove the shells by machinery, giving each shell a few rotations in a tool analogous to a lathe, and traversing along its surface with a diamond-pointed or other hard cutter.

The grooving *m* is in two series of spirals, one right-handed, and the other left. This precise arrangement is not essential. The grooving one way may be in rings; the other way directly longitudinal. I belive some portion of the useful effect may be realized by grooving only in one direction, but I prefer the cross-grooves. Various other modifications in the forms and proportions may be made by any good mechanic. I esteem it a preferable form of the projectile to extend the packing a little into the rounding of the front, or, in other words, to taper the point backward a little onto the packing-belt. In such case, what I have termed the chamfer at the front of the band is really a continuation of the taper of the point.

The forms of the ridges *b* may be varied. I can produce a good effect by threads corresponding to ordinary screw-threads; but I prefer to make the front side more inclined than the back, as shown. The ridging *b* enables me to use packing varying in hardness from the softest copper to a quite hard brass, and yet always allow the conformity of the same to the form of the gun with little strain. The object is to give the least possible strain on the gun and yet pack the projectile tightly and rotate it with certainty. The extreme periphery is more yielding than the inner portions of the packing-belt, and its resistance increases gradually inward. This insures a more correct centering of the projectile than any other construction of packing known to me.

I claim as my invention—

1. A projectile, having a packing-band let into a sunk recess, A′, around the body A, with its exterior ridged, as indicated by *b*, and so proportioned that the metal of the ridges will, when crushed down to the lands of the gun, just fill the intervening hollows between the ridges, as and for the purposes herein specified.

2. In combination with a body, A, having a sunk packing-space, A′, and a ridged packing-belt, B *b*, the chamfered or conical front B′ on the said packing, as and for the purposes herein specified.

3. A double series of evenly-distributed scratches or shallow cuts on the solid exterior of the body of the shell, as and for the purposes specified.

In testimony whereof I have hereunto set my hand this 7th day of October, 1876, in the presence of two subscribing witnesses.

B. B. HOTCHKISS.

Witnesses:
WM. D. DEY,
E. VOLKMANN.