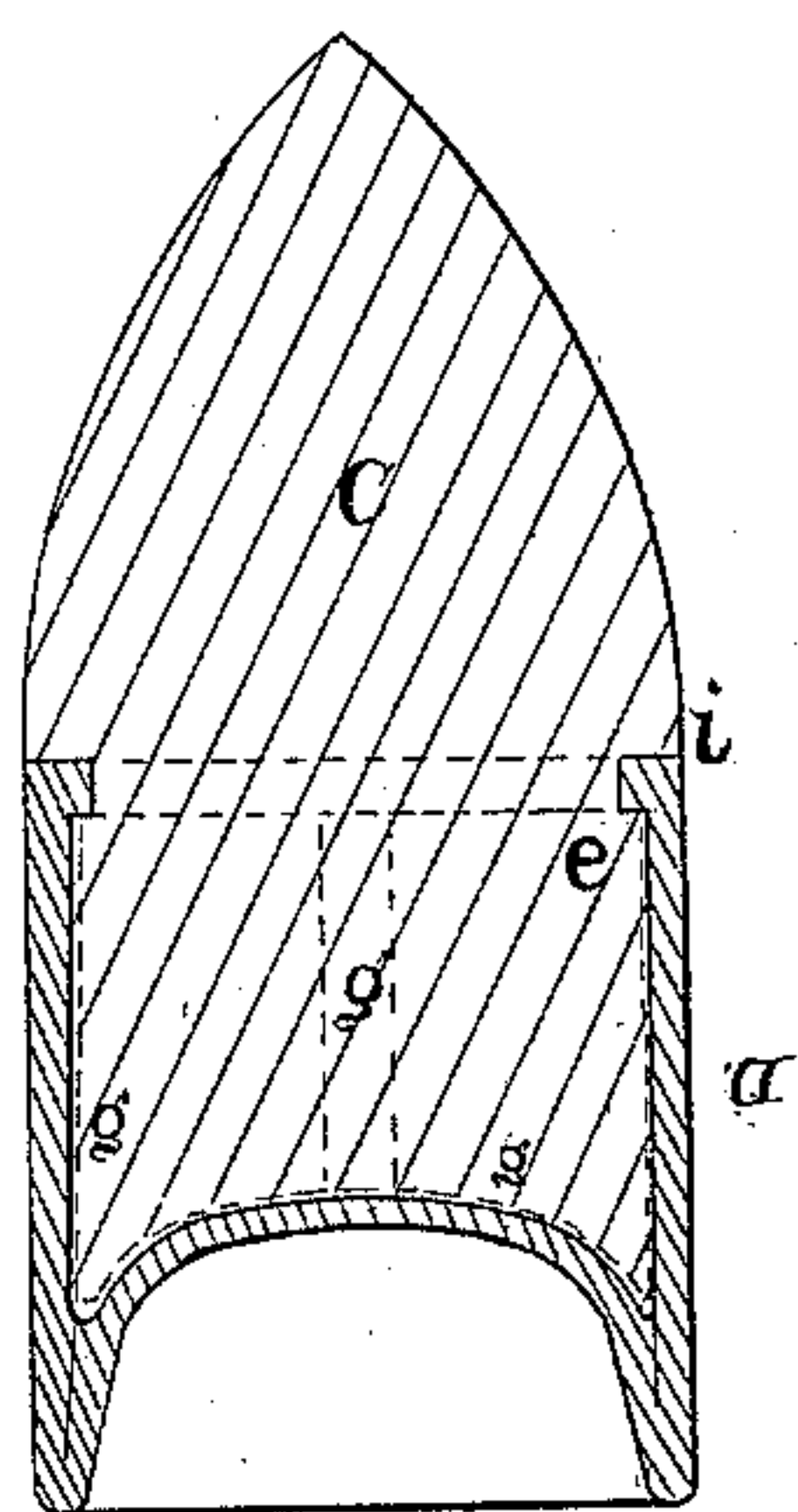


W. BOEKEL.  
Projectile.

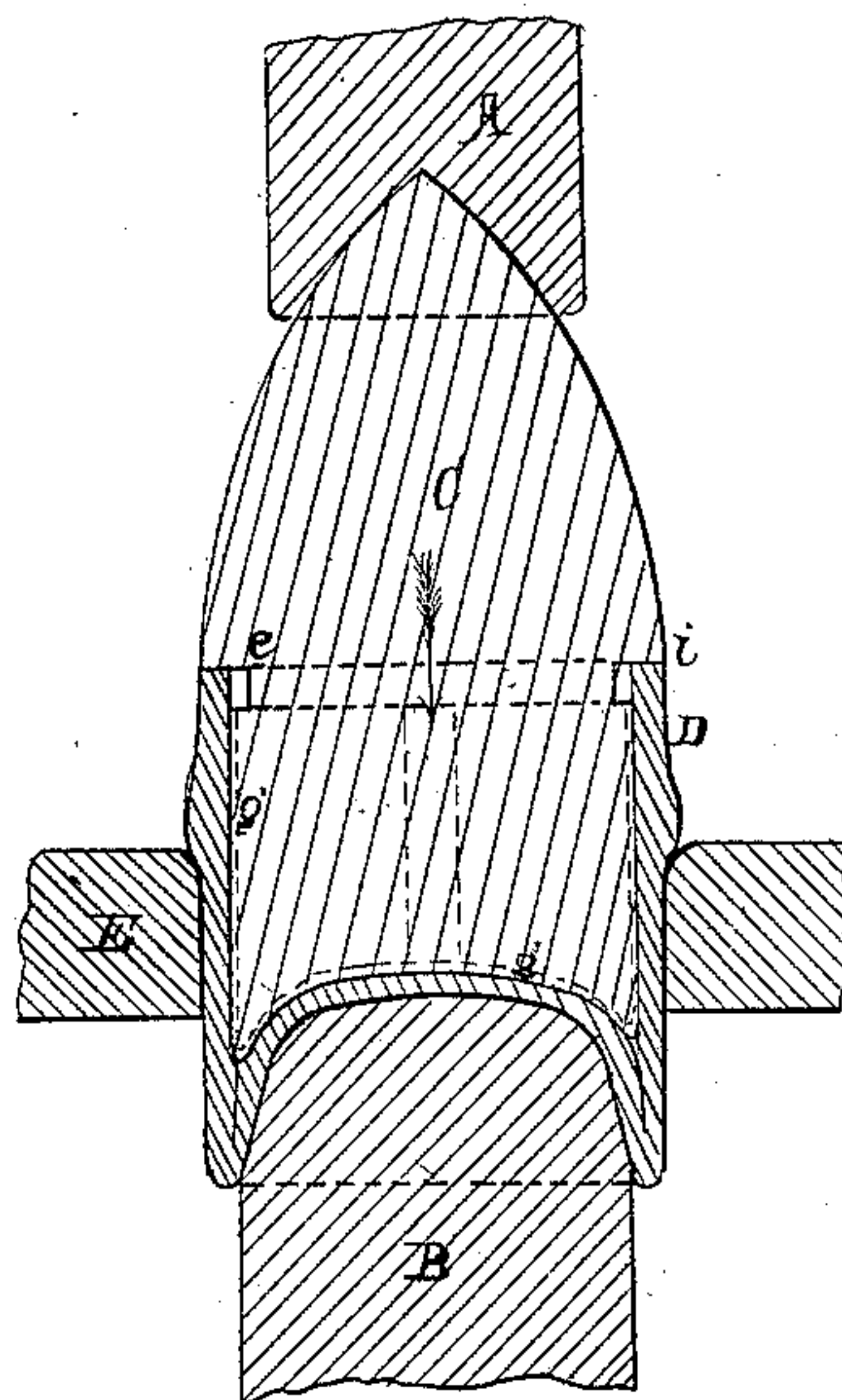
No. 36,449.

Patented Sept. 16, 1862.

— FIG 2 —



— FIG 1 —



Louis Lenneg  
Theodor Bergstr } Witnesses

Signed  
William Boekel.



# UNITED STATES PATENT OFFICE.

WILLIAM BOEKEL, OF PHILADELPHIA, PENNSYLVANIA.

## IMPROVEMENT IN THE APPLICATION OF SOFT-METAL PACKING TO PROJECTILES.

Specification forming part of Letters Patent No. 36,449, dated September 16, 1832.

*To all whom it may concern.*

Be it known that I, WILLIAM BOEKEL, of the city of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in Projectiles; and I do hereby declare the following to be a full and exact description of the same, reference being had to the accompanying drawings, and to the figures and letters of reference marked thereon.

My invention relates to the expansive class of projectiles used with rifled fire-arms, and is applicable to the elongated projectiles for rifle-muskets, as well as to those used with rifled ordnance of any caliber, its object being to secure perfect accuracy of flight and to provide in a reliable manner against any undue separation of the expanding metal from the main body of the projectile.

The nature of my invention consists, first, in providing such projectiles with metallic expanding cups made in a peculiar manner, with a view to combine superior tenacity with the requisite pliability for filling the rifle-grooves; and, secondly, in the application of a simple mechanical means of thoroughly uniting the expanding metal with the iron body of the projectile.

In the place of the usual metallic bands or cups cast upon the projectile and secured to the same by grooves and projections of various kinds, I employ cups prepared from any practicable composition of soft metals in the following manner: The metal or composition is first cast in the form of slabs of any convenient size, to be afterward subjected to the action and pressure of rolls until reduced to the required uniform thickness. From the metal thus prepared in the form of sheets I then cut circular blanks or lozenges, which, by successive action of properly-shaped punches and dies, are next formed into cups of the shape and size required to fit accurately upon any certain description of projectiles. The next operation is to draw these cups upon the iron projectile by any means, applying the requisite motion and pressure. The projectiles thus preliminarily provided with the expanding cups are now subjected to the action of a drawing plate or die, which not only reduces the previously larger diameter of the cup to the exact dimension required, but also thoroughly embodies the inner surface of the cup with the iron, filling every pore and inequality in

the latter and impressing itself into any grooves and recesses that may be provided in the iron, for the purpose of thoroughly uniting the two metals and resisting the torsional strain exerted upon the cups by the centrifugal motion imparted by the rifle-grooves in firing.

The principle and application of my invention will be fully understood upon reference to the drawings, in which—

Figure 1 represents a projectile as undergoing the action of the drawing-plate, and Fig. 2 is a projectile in its finished state, both views being sections, and provided with similar letters of reference.

In Fig. 1 the projectile is confined between centering pieces A and B, of which the former embraces the conical point of the iron part C, while B accurately fits the cavity in the expanding cup D at the blunt end of the projectile.

E is the drawing plate or die, through which the projectile is represented as being forced in the direction of the arrow. The plate E, by reducing the diameter of the cup D, carries before it a gradually-increasing annular swell of metal, the main body of which is finally forced inward to fill the annular recess *e* in C, while any portion remaining in excess is sheared off against the sharp edge *i*, to the diameter of which the cup is being reduced.

*g g* are shallow grooves running longitudinally from the recess *e* to the back end of the projectile and crossing the same, as represented in dotted lines. While the expanding metal is forced into the grooves *g g* on the sides of the iron by the action of the draw-plate E, the pressure to which the whole is subjected endwise between the centering-blocks A and B is made to cause the required impression of the cup into the end grooves.

The use of lead exclusively, without the addition of other metals to produce a harder composition, has been (particularly for large projectiles) found impracticable, as its consistency is not sufficient to properly withstand and transmit the centrifugal motion imparted with a shock by the rifle-grooves. The usual composition employed appears to be a mixture of fifteen parts of lead to one of antimony. This composition, when simply cast upon the projectile, possesses the requisite hardness for the above purpose, but is at the same time so brittle that it is frequently found to break



asunder and separate from the projectile, to the peril of near friendly troops in immediate advance of the artillery by which they are used, and exerting an injurious effect upon the accuracy of flight of the projectile.

I have found by a series of experiments that with my improved process of treating the composition of which the expanding cups are made a mixture of twenty or more parts of lead to one of antimony acquires sufficient density and hardness to produce on the one hand as good an effect as the mixture of fifteen to one, while it also possesses the required tenacity and fibrous character to effectually guard against the breaking and flying off of the cup. Owing to the unequal contraction of the two metals, the expanding cups or bands, when cast upon the iron, do not form a very perfect union, and have to be interlocked with deep grooves and projections upon the iron to impart the centrifugal motion to the latter.

Having satisfied myself that my improved process of subjecting the expanding cup to

the action of a drawing-plate, as described, has also a very beneficial effect in uniting the cast bands or cups more thoroughly with the iron, I do therefore not desire to confine the application of this process to the expanding cups of my improved make only; but

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

1. The described method of producing and attaching the soft-metal expanding cup or packing-band to the projectile.

2. The described process of reducing the diameter of metallic expanding cups or bands to the exact dimensions required, and embodying the same with the iron by the application of a draw-plate or its equivalent, substantially in the manner and for the purpose specified.

WILLIAM BOEKEL.

Witnesses:

LOUIS ZENNEGG,  
THEODORE BERGNER.