

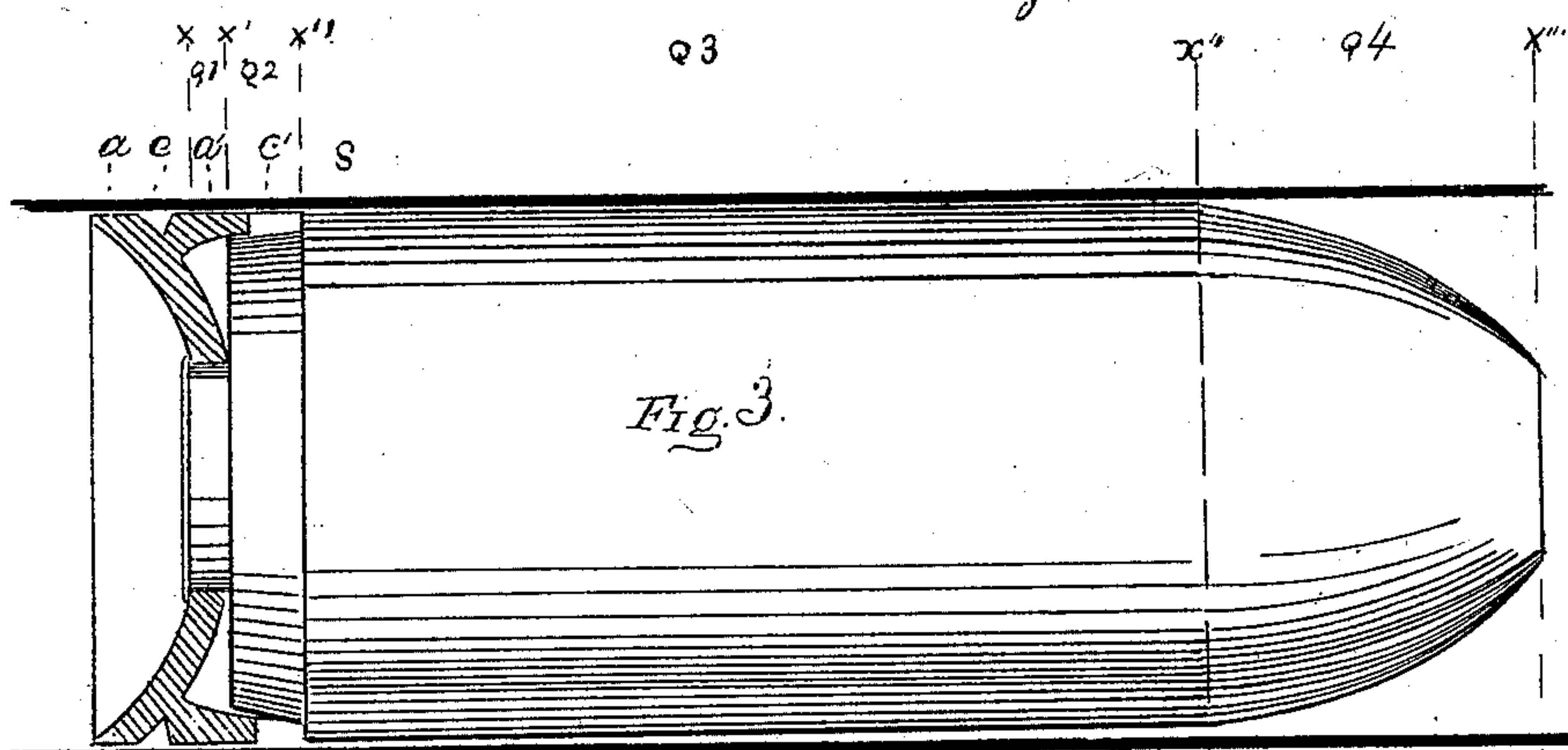
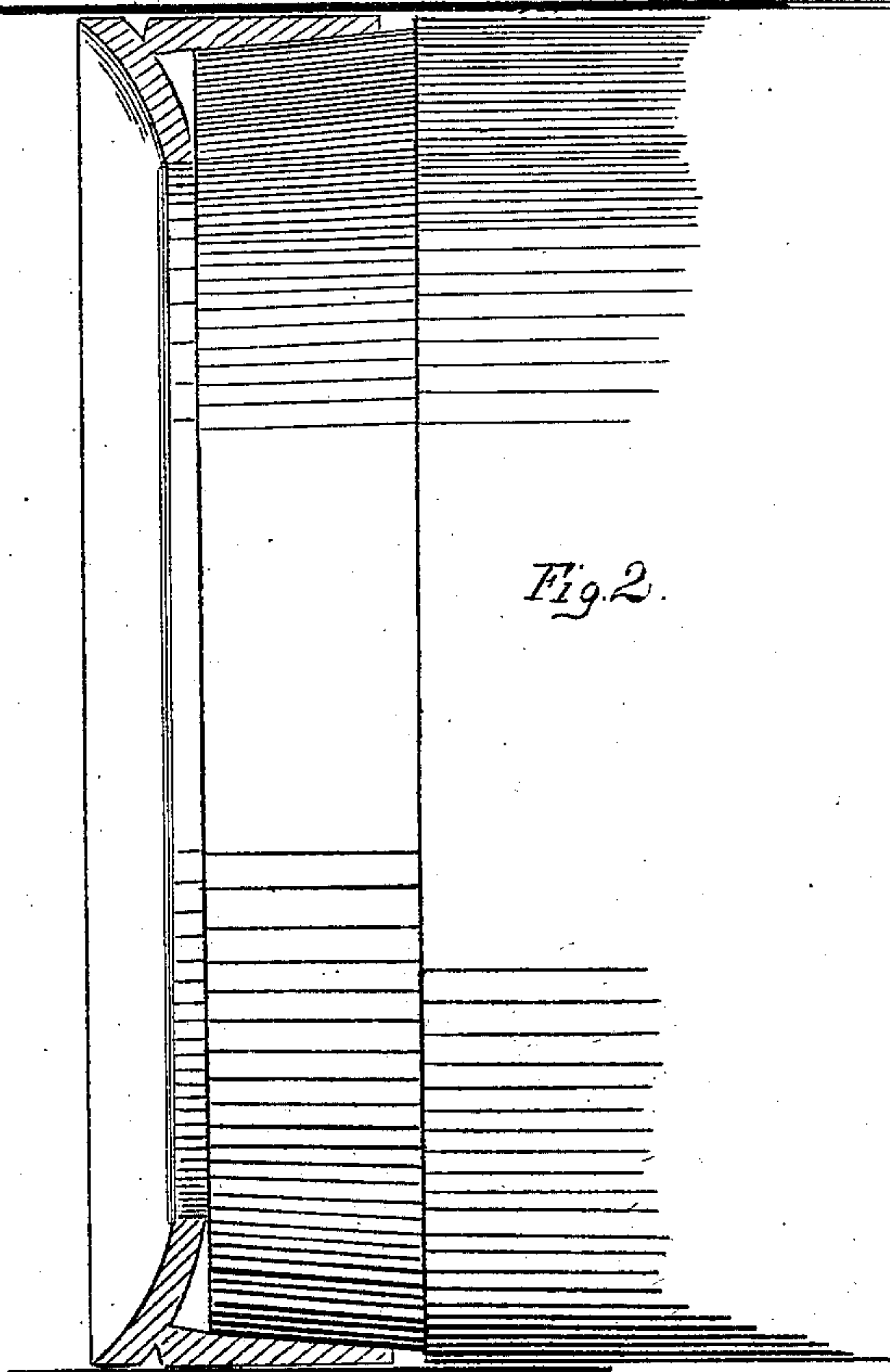
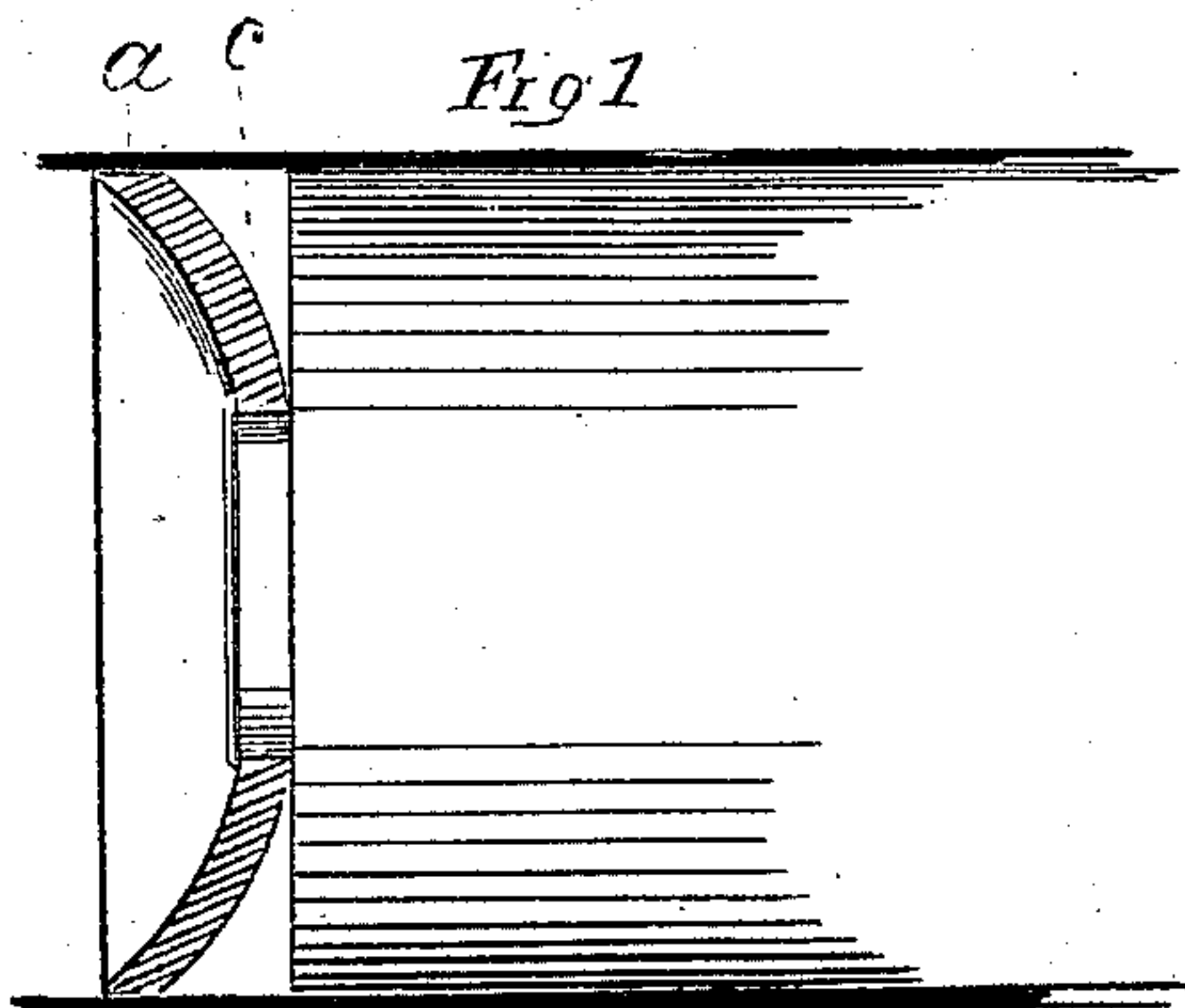
C. ARICK.

Projectile.

No. 47,078.

$a\ e\ c\ a'$

Patented Mar. 28, 1865.



Witnesses.  
*Robt R. Smith*  
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$q_3$

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$x'''$

$x''''$



# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN PACKING PROJECTILES FOR RIFLED ORDNANCE.

Specification forming part of Letters Patent No. 47,078, dated March 28, 1865.

*To all whom it may concern:*

Be it known that I, CLIFFORD ARICK, of St. Clairsville, in the county of Belmont, in the State of Ohio, have Invented an Improved Mode of Operating Projectiles for Rifled Ordnance; 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.

The primary object of my invention is the introduction at the base of a rifle-projectile of an "automatic chuck," to be actuated by the force of the discharge before the inertia of the projectile is overcome, whereby the windage will be closed, and the axis of the projectile be made to coincide with the axis of the piece from which it is fired. The arrangement is effected by combining with a concave and convex disk a cylindrical key, so adapted and applied to the base of the projectile as to insure under the pressure of discharge the primary effect sought, and at the same time guarantee that, as the projectile is driven out of the piece, it shall have imparted to it by such disk the motion of rotation essential to its accuracy of flight.

The disk combined with my improvement differs in no material respect from others long in use, and it is through its immediate influence that the motion of rotation is imparted.

The additional advantages secured by the proposed chucking effect consist chiefly in the presentation of the projectile, before its inertia is overcome, in the best possible position to receive the force of the discharge, and at the same time to cause it to be delivered from the gun without receiving the impressions of vibration incident to imperfectly-closed windage and irregular and imperfect packing, and also by avoiding the possible detriment of having the projectile itself graze the walls of the bore at any time after it is moved from its bed.

My cylindrical key not only serves to secure this chucking effect, but at the same time contributes in a high degree to the efficiency of the expanding disk.

The advantages secured in this latter respect consist, first, in the absolute preservation of the disk from the effect of any vibratory motion of the projectile while in the bore of the piece; secondly, in relieving the

disk in a high degree from compression and transverse strain, whether occasioned by the vibrations of the projectile or other cause; and, thirdly, in so affixing the disk in its place as not only to guarantee its maximum efficiency, but at the same time insure with absolute certainty its retention on the projectile throughout its trajectory, without reference to its original fastenings.

It also secures, by its prompt and effective suppression of the windage, the maximum effect of the discharge.

The disk, as heretofore, is made of an alloy of copper, and the cylindrical key to be combined with it of the same material, and together they constitute in a single casting my improvement.

The mode of affixing this disk to the projectile heretofore has been by means of a central projecting core from its base, adapted to a corresponding aperture at the center of the disk. This core, when the disk was placed upon it, was clinched down, and there were rivets or pins at different points around it to assist in imparting to the projectile any rotary motion communicated to the disk.

The mode of affixing the present improvement to the projectile primarily is the same. I, however, aver that the pins may be dispensed with without detriment.

Heretofore this disk was sometimes placed with its convexity toward the projectile, and sometimes with its concavity. In either case a yielding space would be produced between the disk and the base of the projectile, being an inclosed or open space according to this circumstance in placing it. Its convexity is necessarily toward the base of the projectile in my improvement.

To enable others skilled in the art to make and use my invention, I will proceed to describe it.

Figure 1 of the drawings presents a vertical section of a concave and convex disk as heretofore applied to a three-inch projectile, its concavity toward its base. Fig. 2 presents a vertical section of my improvement as applied to an eight-inch projectile. Fig. 3 presents a vertical section of my improvement as applied to a three-inch projectile.

In the drawings the outer tinted lines represent the grooves of the gun, and the adjoining space the windage, and while these draw-



ings may not exhibit in mathematical nicety all the conditions necessary to a complete construction of my improvement, nevertheless they do present a substantial view of the device as intended for use on such projectiles, the windage being only .03 of an inch, and this is on the hypothesis that rifle-projectiles may be successfully operated without reference to their caliber with this maximum windage. If, however, it should be necessary to increase the windage in higher calibers, the arrangement shown in Fig. 2 will necessarily undergo material modifications, proceeding, nevertheless, on the same plan shown in Fig. 3, as hereinafter more fully explained.

In constructing my improvement the external surfaces of the disk  $a$  and the cylindrical key  $a'$  are given the same diameter, and this is the diameter also of the projectile on which it is to be used.

The annular or cylindrical key  $a'$  of my improvement, as shown in Figs. 2 and 3, is cylindrical in its exterior surface and conical or funnel-shaped in its interior. The inclination of its interior surface is regulated by certain arbitrary conditions, as will hereinafter more fully appear.

The form of projectile with which my improvement is designed to be used is in the main cylindro-conoidal, and may for easy description be referred to in sections, as indicated by the transverse lines  $xx$ ,  $x'x'$ ,  $x''x''$ ,  $x'''x'''$ , and  $x''''x''''$ , Fig. 3, wherein—

Section 1 is the central projecting core for the reception of the disk or part  $a$  of my improvement.

Section 2 is an annular rabbet, in form a frustum of a cone, with the base toward the top of the projectile, and is designed for the reception of the part  $a'$  of my improvement. The inclination given the bottom of this annular rabbet  $s$  must be the same inversely as the interior surface of the part  $a'$ , and is hence controlled by the same arbitrary conditions.

Section 3 is the cylindrical portion of the projectile, and its general diameter may be diminished by the use of bands or raised sections thereon at its extremities. These bands will control the matter of windage, and may cheapen the projectile, but the advantage in their use is regarded as chimerical.

Section 4 is the conoidal or forward portion of the projectile, and is given the best supposable form for cleaving the medium through which in its flight it may be expected to pass.

The convexity given the disk or part  $a$  of my improvement has, as heretofore, reference to its radial expansion when suppressed. This is, of course, sufficient if it close the windage and fill the grooves of the gun—more would be excess. It is hence evident that as the external surface of the disk or part  $a$  is of the same diameter as the projectile on which it is placed, an increase of windage will necessitate an increase of its convexity, and that this increase of convexity will necessarily increase the width of the space  $e$  at all points;

and hence, the precise windage the projectile is to have is an important matter of observation in the construction of my improvement.

The annular rabbet  $s$  cast or cut on section 2 of the projectile is square down on the line  $x''x''$ , and is of such depth thereat as may be determined on for the thickness of the forward edge of the part  $a'$ , less one-half the windage. The inclination given the bottom of this annular rabbet  $s$  is controlled by the length of the space  $e'$ . The space  $e'$  is made the same in every case as the space  $e$  at its greatest width, and this space  $e$ , as before stated, is regulated by the windage, being of greater or less width as the convexity of the disk  $a$  is increased or diminished, the width of this space  $e'$  being established in any given case. The line marking the course or inclination of the bottom of this annular rabbet  $s$  is diagonal to a rectangle whose length is the space  $e'$  and whose width is one-half the windage-ring. The key  $a'$  of my improvement being adapted to this annular rabbet, as shown, the thickness of its forward edge is hence greater than the depth of the shoulder of the rabbet on the line  $x''x''$  by one-half the windage-ring, and this superior thickness, section by section, is the same at all points; and now, if the annular key  $a'$  could be forced home on the rabbet  $s$ , and no stretching of the metal occur, that portion of it forward of the line  $yy$ , Fig. 2, would be sufficient to close the windage and completely chuck the projectile in the bore of the piece, and this chucking effect would not be maintained by the strength of the key  $a'$  only, (no annihilation of the metal being possible,) but by all the strength of the piece itself. There would, however, be a stretching of this annular key  $a'$ , diminishing its thickness and width, and to some extent compressing or solidifying it, so that its section forward of the line  $yy$ , Fig. 2, would not contain a sufficient quantity of metal to occupy and fill the annular rabbet  $s$  and the windage surrounding it, and hence it becomes necessary to consider this deficiency and its compensations, and for all practical purposes the expansion by the heat of the discharge will justify in leaving out of the account the matter of compression.

It is only necessary to consider what the dimensions of the annular rabbets and the windage surrounding it are and to provide in the key  $a'$  a sufficiency of metal to occupy it, and if, upon calculation, so much of it as lies forward of the line  $yy$ , Fig. 2, should prove insufficient, a quantity of greater or less amount, ample for the purpose, may be lodged in proper position in rear, as shown.

The transverse section of the key  $a'$  in rear of the line  $x'x'$  may, by a gentle curvature, be somewhat increased. It is of the highest importance that no surplus of metal shall be used in this key  $a$ , and that when it is operated it shall only close the windage at a close metal fit without swaging or in any manner taking effect on the grooves of the



gun. It is not necessary, for the purposes of rotation, that it should do so, and it would hence be detrimental, as causing unnecessary friction as well as increased strain upon the piece, and it is only secondary in importance to this that the disk *a* shall be given only such convexity as when it is suppressed its periphery shall occupy the grooves of the piece without excess.

It will be observed that incidental to the reduction of the amount of metal in rear of the line *y y*, connecting the disk *a* with the key *a'*, groove *c* occurs, allowing, as heretofore, the angular contact of the disk *a* to collect and deposit therein the fouling of the previous discharge, and thus have it conveyed out of the piece.

My improvement being constructed and affixed to a projectile, as described, it may then be placed in the gun from which it is to be fired, and its operation will be as follows:

Under the pressure of the discharge the disk *a* is flattened against the base of the shot, so that what were its concave and convex surfaces are now plane surfaces at right angles to the axis of the projectile and the bore of the gun, and its rim has received the impression of its lands and grooves. The metal composing the annular key *a'* has, at the same time, been pressed or driven forward into the space *c'*, and has been caused to assume the

form of and to occupy and fill, at a close metal fit, with the lands only, the annular rabbet *s* and the windage surrounding it, the key *a'* in its new form chucking, and its disk *a* being prepared to rotate, the projectile; and this condition exists before the inertia of the projectile is overcome, so that as it is started from its bed the only frictional resistance to be overcome is the metal fit of the rim of the disk *a* with the entire surface of the lands and grooves and the outer surface of the key *a'* with the surface of the lands only.

The friction of the key *a'* on the projectile, assisted by that of the disk pressing upon its base, will prevent any axial motion of the disk, not only guaranteeing the rotation of the projectile, but also with absolute certainty the retention in its place of the disk throughout its trajectory.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

The annular key *a'*, in combination with an expanding disk, *a*, constructed, applied, and operated substantially as and for the purpose set forth.

CLIFFORD ARICK.

Witnesses:

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JAMES H. GRIDLEY.