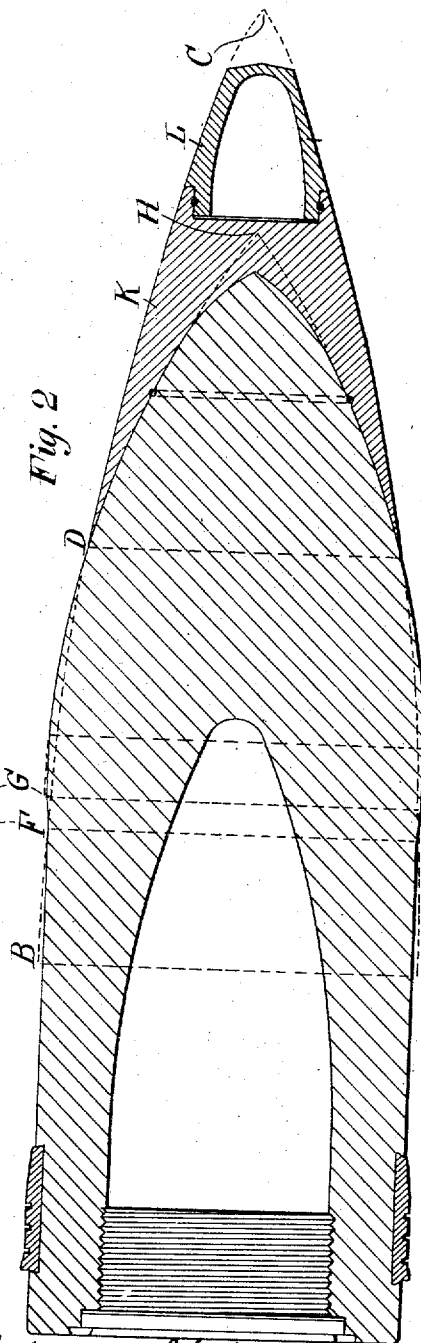
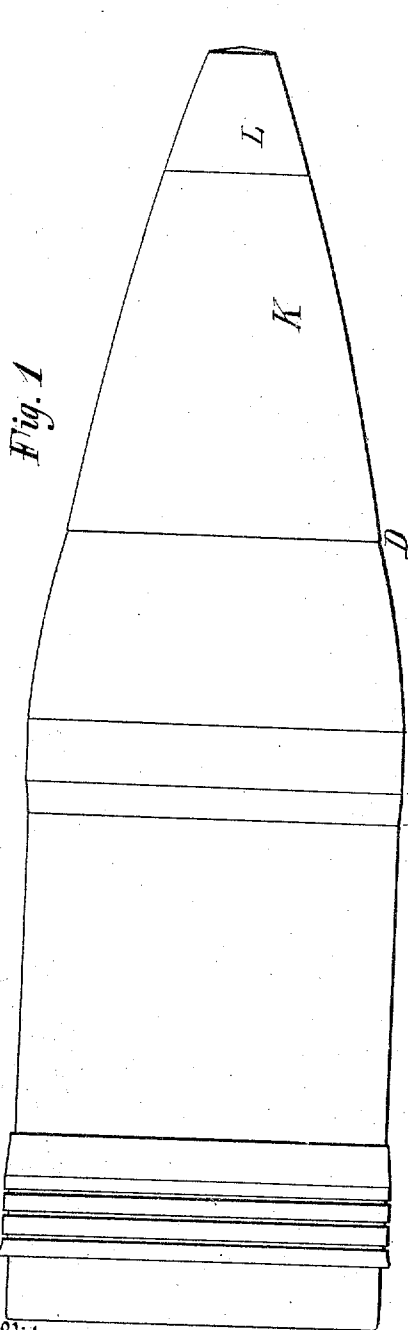


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PROJECTILE.

APPLICATION FILED MAR. 1, 1909.

963,489.

Patented July 5, 1910.



Witnesses
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UNITED STATES PATENT OFFICE.

CHARLES VAN CISE WHEELER AND ALEXANDER GEORGE McKENNA, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNORS TO FIRTH STERLING STEEL COMPANY, A CORPORATION OF PENNSYLVANIA.

PROJECTILE.

963,489.

Specification of Letters Patent.

Patented July 5, 1910.

Application filed March 1, 1909. Serial No. 480,773.

To all whom it may concern:

Be it known that we, CHARLES VAN CISE WHEELER and ALEXANDER GEORGE McKENNA, both citizens of the United States, and residents of Washington, in the District of Columbia, United States of America, have invented certain new and useful Improvements in Projectiles, of which the following is a specification, accompanied by drawings.

The object of this invention is to improve the armor piercing quality of projectiles at long range by combining so far as we have discovered them to be compatible a minimum loss of energy in flight with a minimum of resistance in plate penetration for a given impact velocity thus attaining an actual increase of effectiveness at long range.

We have been unable to discover, from experiments of our own and of others conducted on many different lines and investigating a number of widely differing hypotheses, any exact law for calculating or foretelling the initial energy required to penetrate at long range a given plate under given conditions of caliber and of shell construction. The factors are so numerous and so mutually dependent and the cost and labor of experiments to isolate and analyze each factor are so great that at present it is doubtful if any one of the principal conditions can be regarded as an independent variable. Certain experiments and experiences show ways by which flight may be improved with sacrifice of penetration quality and we ourselves have shown in our previous United States Patents No. 721,487 February 24, 1903 and No. 875,023 December 31, 1907, ways of improving penetration for a given impact velocity. We have now, in pursuing certain hypotheses which we are so far unable to establish as laws, discovered and produced in the present invention an outside contour of projectile as a whole inclusive of cap and nose, of approved form that affords a means of getting improved armor-piercing effects at long range for a given initial velocity.

In the accompanying drawing Figure 1 is a side view, and Fig. 2 a section of the best embodiment of the invention now known to us as designed, for example, for a six inch armor piercing shell.

As is customary, the diameter of the shell between rifling band and bourrelet should be a few hundredths less than the full caliber, and the rear or butt end of the shell may be of the usual approximately flat type.

To lay out the point and cap contour on a longitudinal axial plane proceed as follows:—From a point B located say one caliber from the rear end of the shell and at the end of a diameter or "swell" of a few hundredths of an inch in excess of the caliber (say six inches and three one hundredths) let an arc B C be drawn starting parallel with the axis, at B and running forward to intersect the axis at C, using a radius of considerably greater length than the entire shell length so produced. Too great a radius will give an unduly long shell, inconvenient to handle and necessitating a large empty space within the cap or a very material truncating of the tip of the cap within the contour given by this smooth curve. We prefer at present to use a radius of seven times the swell diameter of 6.03 inches stated above. The contour of our solid projective point crosses and intersects this curve twice, once in the rear of the bourrelet at F and once at D, at or about the rear end of the cap and lies well outside such curve between these points producing a bulge in the contour of the whole projectile and conforming to a more massive form of the solid shell point at this part of the contour than if the long gentle curve B C was followed. The bourrelet and this part of the shell point is more exactly constructed as follows: From a diameter of say six and three one hundredths inches for the swell and at very considerable distance in front of the point B, say two and sixty-seven hundredths, at G strike an arc G H starting parallel with the axis and extending forward to intersect the axis at H, with a radius of two and one half times the diameter of the swell (6.03). The bourrelet is eventually ground or turned down accurately to a hundredth inch less than the caliber and tapered off behind G as shown.

The nose of the shell point is preferably blunted as set forth in our Patent No. 721,487 of February 24 1903 and the present invention primarily concerns the relationship and contours of the exposed walls

of the projectile and cap rather than the inclosed point nose, understanding of course, that such nose be of suitable armor piercing form.

5 The cap K L occupies all the space between the shell point proper and the out-lying curve D C excepting that toward D it may terminate without coming to a knife-edge and at its tip it is preferably truncated as shown to shorten it without very
10 substantially affecting its distribution. Its forward portion L is hollow to reduce its weight to that determined on and to bring its mass more directly about the tip of the
15 shell nose and we prefer to determine its weight as explained in our Patent No. 875,023 December 31, 1907, with the precise construction described it will be now evident that the bourrelet is much farther forward
20 than the swell of the long arc B C and the shell consequently is less liable to wobbling in its initial flight from the gun mouth yet nevertheless the contour as a whole follows generally and very closely for all purposes
25 of air penetration and flight, the long gentle curve from B to C of radius more than twice the entire length of shell and some seven times the caliber. The bulge G D nevertheless brings both the bourrelet and the
30 center of mass much farther forward than if arc B D were actually followed. Furthermore, the shell point has a base portion which is shorter and requires less energy to penetrate than if a very long gently
35 tapered base such as would exist if the seven diameter radius of curve were here employed.

The invention allows some latitude from the proportions given. The chamber of the
40 shell is determined by the standard of shell weight and cap weight or their combined weight required. If the base or exposed portion of the shell point conforms to a more abrupt curve of two calibers radius, the
45 point will be shortened with a tendency to less efficient penetrating qualities, but the bourrelet and swell may be advanced somewhat and the mass of the cap as defined by

the bounding curves kept as before. So again if a somewhat lesser radius for the
50 general contour arc B C be chosen, say five calibers the projectile point being as described and shown, such arc B C may be bodily moved forward to start enough nearer
55 the bourrelet to allow the same volume for the cap about the point of the shell. The dimensions given therefor although exactly those which we prefer are intended merely to exemplify the shell improvement described
60 and claimed.

We of course contemplate the construction and use of dummy or practice shell having a contour and disposition of weight in simulation of and in accordance with the foregoing description whether cast in one piece
65 with the cap or otherwise, if intended to follow for practice purposes our invention and we desire to cover and to include all such as customary equivalents for practice purposes, of the new shell herein claimed.
70

Larger and smaller sizes of shell may be proportioned similarly to the six inch shell described.

What we claim is:

A chambered and capped armor piercing
75 projectile, the solid point of which approximates at its exposed portions a curvature of a radius not exceeding four calibers and the side contour of the cap of which approximates an arc of a radius of seven diameters,
80 which are projected rearward intersects and runs inside of the exposed contour of the shell point in the rear of the cap and becomes parallel with the axis of the shell in the rear of the bourrelet, the exposed
85 contour of the point thereby forming a slight bulge relatively to the said arc, for substantially the purposes set forth.

In testimony whereof we have signed this specification in the presence of two sub-
90 scribing witnesses, February 26th 1909.

CHARLES VAN CISE WHEELER.
ALEXANDER GEORGE McKENNA.

Witnesses:

WALTER ANDERSON,
H. F. CLARK.