Sept. 30, 1952 B. F. SCHMIDT 2,612,108

PROJECTILE

Filed Aug. 11, 1948

FIG. 1.

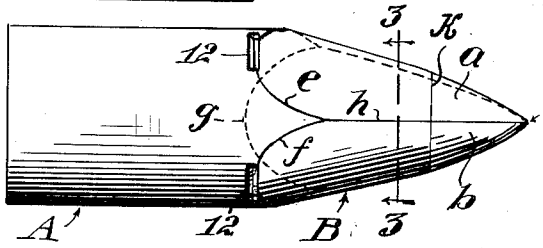


FIG. 2.

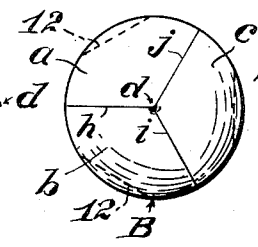


FIG. 3.

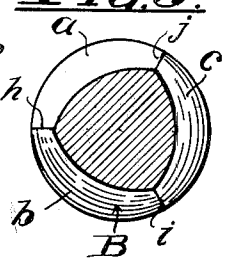


FIG. 4.

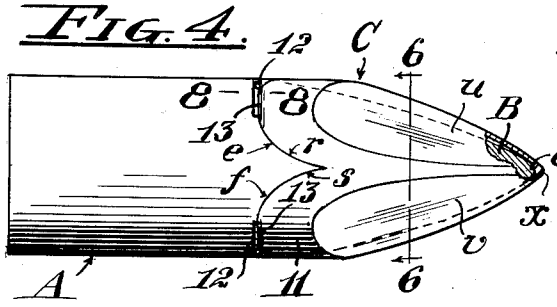


FIG. 5.

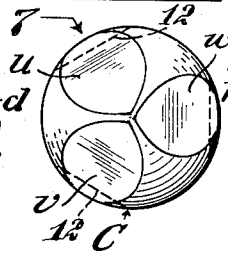


FIG. 6.

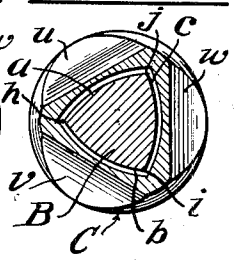


FIG. 7.

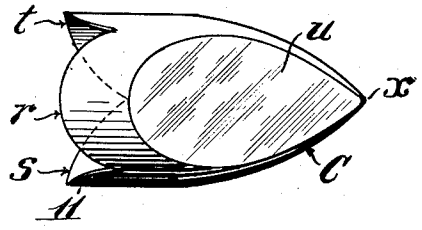


FIG. 8.

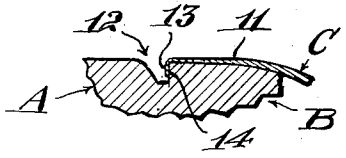


FIG. 9.

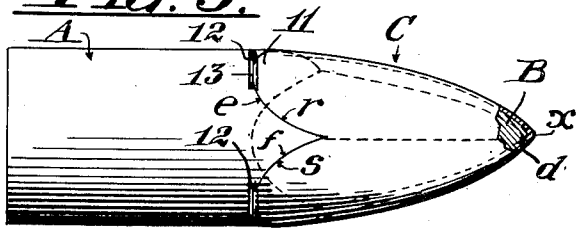


FIG. 10.

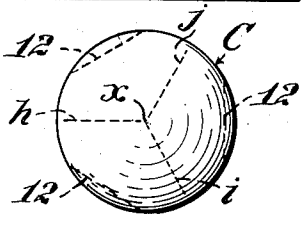


FIG. 11.

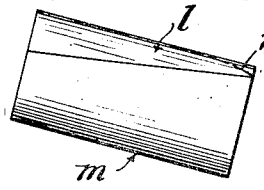
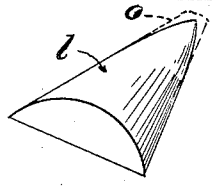


FIG. 12.



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PROJECTILE

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Application August 11, 1948, Serial No. 43,696

3 Claims. (Cl. 102—52)

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This invention relates to a bullet or projectile and particularly pertains to a projectile of the type designed for penetration of metallic walls set forth in my co-pending application for United States Letters Patent Serial Number 647,755, filed February 15, 1946, now abandoned.

The primary object of the invention is to provide a bullet or projectile which is especially applicable for use in effecting perforation of well casings by the gun perforating method having greater penetrating capacity than bullets or projectiles now generally used in well casing perforating operations.

Another object is to provide an improvement in soft nosed projectiles said improvement primarily residing in forming the nose of the body of the projectile of contoured pyramidal form, that is with a series of lateral faces of arcuate convex configuration diverging from the tip of the projectile and merging into the cylindrical body portion thereof instead of the conical formation of the nose of the projectile body commonly employed thereby increasing the penetrating power of the projectile.

A further object is to equip the contoured pyramidal nose of the projectile body with a cap having its interior contoured to conform or nearly conform to the projectile nose and which cap is formed of a solid material that is considerably softer than the hard metal of which the pyramidal end of the projectile is formed, whereby the cap will serve to prevent or at least minimize the formation of an objectionable burr around the entrance margin of the perforation formed in the well casing by passing of the projectile therethrough, and will also serve as a lubricant for the projectile during its penetration of the well casing, and will co-operate with the pyramidal nose of the projectile body in insuring proper penetration of the well casing.

With the foregoing objects in view, together with such other objects and advantages as may subsequently appear, the invention resides in the parts and in the combination, construction and arrangement of parts hereinafter described and claimed and illustrated by way of example in the accompanying drawing, in which:

Fig. 1 is a view in side elevation of the projectile showing the pyramidal formation of the nose or pointed end thereof and showing it as uncapped;

Fig. 2 is a view in front end elevation of the projectile shown in Fig. 1;

Fig. 3 is a detail in cross section taken on the line 3—3 of Fig. 1 as seen in the direction indicated by the arrows;

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Fig. 4 is a view in side elevation of the projectile shown in Fig. 1 as fitted with a cap;

Fig. 5 is a front end view of the capped projectile shown in Fig. 4;

Fig. 6 is a detail in cross section taken on the line 6—6 of Fig. 4 as seen in the direction indicated by the arrows;

Fig. 7 is a plan view of the cap shown in Figs. 4, 5 and 6 showing it as detached and as viewed in the direction of the arrow 7 in Fig. 5;

Fig. 8 is a detail in cross section taken on the line 8—8 of Fig. 4, showing the manner of affixing the cap to the projectile body;

Fig. 9 is a view in side elevation of a modified form of the projectile;

Fig. 10 is a view in front end elevation of the capped projectile shown in Fig. 9;

Fig. 11 is a diagram illustrating the manner of developing an arcuate transverse curvature on the lateral face of the pyramidal nose of the projectile; and

Fig. 12 is a diagram depicting the manner of imparting a parabolic contour to the tip portion of the lateral face of the pyramidal nose of the projectile.

Referring to the drawings more specifically A indicates generally the body of the projectile which body is cylindrical in form and B indicates a pointed nose on one end thereof. In carrying out the invention the nose of the projectile is contoured to give it a pyramidal form, it being provided with a series of lateral faces here shown as three in number and indicated at *a*, *b* and *c*. These faces diverge from the vertex *d* constituting the tip of the projectile nose B and intersect the peripherial surface of the cylindrical body A; the margins of the inner ends of the faces *a*, *b* and *c* being curved as indicated at *e*, *f* and *g* respectively. The longitudinal or lateral edges of the faces *a*, *b* and *c* are straight as viewed in plan; such an edge *h* being formed at the juncture and defining one side margin of each of the faces *a* and *b*, another such edge *i* extending along the juncture and defining one side margin of each of the faces *b* and *c*, and a third such edge *j* extending along the juncture and defining one side margin of each of the faces *c* and *a*. The edges *h*, *i* and *j* diverge outwardly from the vertex or tip *d* and intersect the cylindrical surface of the body A at the juncture of the curved inner end margins *e*, *f* and *g* of the faces.

The lateral faces *a*, *b* and *c* are curved transversely, being formed with uniform arcuate transverse curvatures of convex configuration extending along the length thereof from their

curved inner margins to a point near the outer convergent ends thereof; this inner portion of the lateral faces *a*, *b* and *c* conforming to the arcuate surface of an oblique section of a cylinder having a diameter slightly exceeding that of the cylindrical body A. It has been found in practice that a convex arcuate surface forty per cent larger than that of the body A is satisfactory but such curvature while preferred is not critical. Thus, while the width of the arcuate lateral faces varies throughout the length of the portion of the nose B formed therewith, the radii of the arcuate faces at any point in the length thereof will be greater than the radius of the cylindrical body A.

The outer end portions of the lateral faces *a*, *b* and *c* are curved both transversely and longitudinally, being formed, from a transverse line *k* spaced inwardly a suitable distance from the tip *d* and defining the outer end of the uniformly arcuate portion of the surfaces *a*, *b* and *c*, with arcuate contours of decreasing widths and shortening radii, thus imparting a longitudinal convex parabolic contour leading from the line *k* to the tip *d* with the later slightly rounded.

The mode of developing the convex contours of the lateral faces *a*, *b* and *c* is illustrated diagrammatically in Figs. 11 and 12 in which Fig. 11 shows the manner of forming the face with a transverse arcuate curvature by initially machining it in the form of an oblique segment *l* of a cylinder *m* so that the face will have a cylindrical contour from end to end and tapering from its inner end to nearly a point at its outer end. After the lateral faces *a*, *b* and *c* have thus been formed the outer end portion of the nose B indicated by the dotted line *n* in Fig. 12 is ground away as indicated by the dotted line *o* in Fig. 11 to give the tip end portion of the nose B the desired longitudinal and transverse curvatures.

The foregoing described contouring of the nose B of the projectile constitutes an important feature of the present invention, and while being subject to modification and to some departure from the exact formation defined without departing from the spirit of the invention, it has been determined by tests that the described contouring shown in the drawing imparts greater penetrating power to the projectile than that possessed by the conventional conoidal nosed type of projectile and also to a flat faced pyramidal nosed bullet.

The pyramidal nose B is formed of a hard metal capable of penetrating the metal of which a well casing is made as is common in projectiles of this character.

A cap C of solid relatively soft material such as lead, zinc, copper, aluminum, plastic or the like is fitted to and sheaths the pyramidal nose B of the projectile; the cap being contoured on the interior thereof to conform or nearly conform to the contours of the nose B and having an externally cylindrical inner end portion 11 the periphery of which will extend flush with the periphery of the cylindrical body A of the projectile when the cap is applied thereto. The margin of the end portion 11 of the cap C is contoured to conform to the curved ends *e*, *f* and *g* of the faces *a*, *b* and *c* as indicated at *r*, *s* and *t* and is tapered along its inner face to wafer thinness at its extreme edge to merge into the surface of the body A.

As a means for attaching the cap C to the projectile the latter is formed with spaced apart recesses at the juncture of the base of the pyramidal nose B with the cylindrical body A, which recesses extend in line circumferentially of the projectile at the juncture of the mediate portion only of the arcuate ends *e*, *f* and *g* of the faces *a*, *b* and *c*; the outermost portions of the marginal contours *r*, *s* and *t*, of the cap being inturned into said recesses forming tongues 13 which effect interlocking engagement with the forward side walls 14 of the recesses 12 as shown in Fig. 8 whereby the cap is held in place on the projectile.

The external forward end portion of the cap C may be variously contoured but is preferably although not necessarily tapered with its end terminating in a thin walled tip *x*.

In Figures 4, 5, 6 and 7 the cap C is shown as having its forward end portion tapered and provided with flat facets *u*, *v* and *w* diverging from the tip *x* of the cap, the facets being arranged to overlie the curved lateral faces *a*, *b* and *c* of the pyramidal end of the projectile. In Figures 9 and 10 the cap C is shown as being of general conoidal form and as fitted and fastened on the pyramidal nose B of the projectile body A in the manner previously described.

In the operation of the invention when the projectile is forcibly impelled nose foremost against a metallic wall to be penetrated thereby, the tip *x* of the soft cap C on striking the surface of the wall being ruptured by the impact and rendered fluid by generated heat while the tip *d* of the projectile noses passes therethrough and enters the surface of the wall. Continued advance of the projectile causes the lateral sharp edges *h*, *i* and *j* of the nose B to split the cap C and at the same time effect a severing action on the metal surrounding the nose B as it advances through the wall while the contoured faces *a*, *b* and *c* effect displacement of the cap material and that of the wall as the projectile moves into the latter. It is assumed that part of the material of the cap, then in a fluid state under the action of the heat generated by frictional engagement of the nose B with the metal of the wall, will cling to the surface of the nose B as it advances and will thereby serve as a lubricant for the projectile in passing through the wall, while another portion of the then displaced material of the cap will have accumulated on the surface of the metal being penetrated by the projectile so as to prevent or minimize the splash of the surface metal occasioned by impact of the projectile therewith, and which splash, when it occurs, occasions the formation of objectionable burrs on the inner margins of the perforations formed in the wall by penetration of the projectile.

If sufficient impetus is given the projectile it will pass completely through the wall which of course is intended, leaving a circular perforation in the wall free or at least nearly free of burrs on the entrant end thereof.

Tests have proven that all conditions being equal the capped pyramidal nosed projectile herein set forth will penetrate a considerably greater wall thickness than can be effected with the conventional conical nosed projectile and those formed with flat faces.

While I have shown and described specific embodiments of my invention I do not limit myself to the exact details of construction set forth, and the invention embraces such changes, modifications and equivalents of the parts and their formation and arrangement as come within the purview of the appended claims.

For example, while the preferred transverse arcuate curvature of the contoured faces of the pyramidal nose has been specified as being 40 per cent greater than the arcuate curvature of the cylindrical body A, a considerable range of this differential may be employed, since this curvature may be of anywhere from that of the body member to at least 50 per cent greater and still afford superior penetrating power over the conventional conically nosed or flat faced bullet.

I claim:

1. A projectile having a cylindrical body, and a pyramidal nose on the forward end of said body having transversely curved lateral faces of convex configuration, said faces being formed with longitudinal parabolic curvatures on their outer end portions terminating in a rounded tip, there being circumferentially extending notches formed at the juncture of the cylindrical body and the pyramidal nose, a cap on said nose having its inner end margin conforming to the inner ends of the lateral faces on said nose, and lips on said margin extending into said notches.

2. A projectile comprising a cylindrical body formed with a pyramidial nose having convex lateral faces with inner end portions contoured to conform to the curved surface of an oblique section of a cylinder, said inner end portions having curved margins intersecting the surface of said cylindrical body, said lateral faces having converging transversely curved outer end portions formed with longitudinal parabolic contours terminating in a tip, circumferentially spaced notches formed in said cylindrical body at the juncture of the surface thereof with said curved margins, and a cap sheathing said pyramidal nose having an inner margin contoured to conform to the curved margins of the inner end portions of the lateral faces, and lips on said contoured inner margin of said cap extending into said notches.

3. The structure called for in claim 2 in which the convex lateral faces of the pyramidal nose are formed with longitudinal convex edges defining adjacent of said lateral faces and leading from the tip of said nose into intersection with the curved inner margins of said faces.

BENJAMIN F. SCHMIDT.

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The following references are of record in the file of this patent:

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