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PROJECTILE

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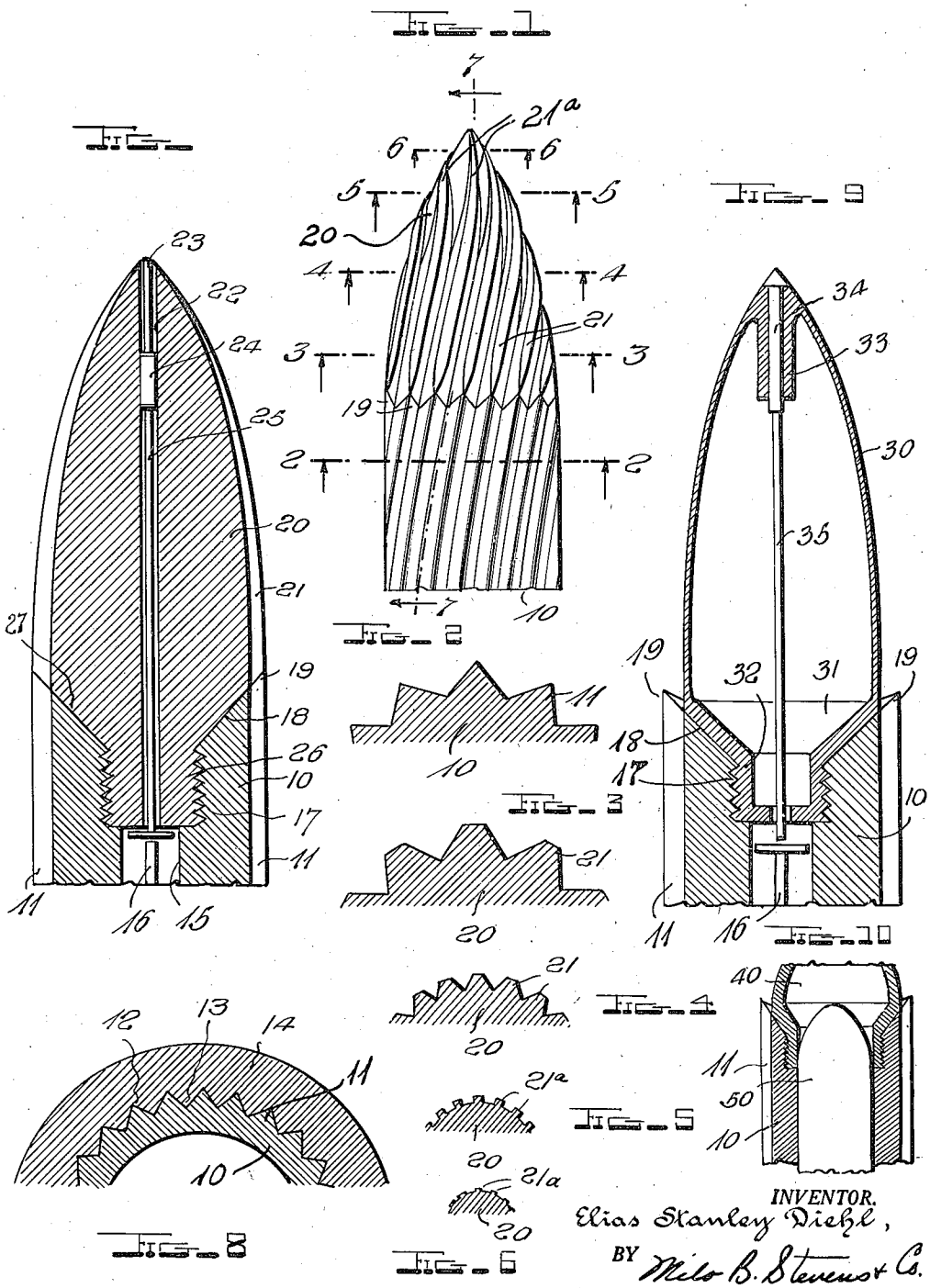


FIG. 1 FIG. 9 FIG. 2 FIG. 3 FIG. 10 FIG. 4 FIG. 5 FIG. 8 FIG. 6

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PROJECTILE

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2 Claims. (Cl. 102—92.5)

My invention relates to high explosive shells and is directed more particularly to obtaining relatively higher muzzle velocities and greater penetration for a projectile of a given calibre and with a given charge than is possible with shells of the usual type.

With the foregoing in view, an object of my invention is to provide novel rifling for a tool steel projectile which has its periphery formed to fit closely into the rifling of a gun.

A further object is to provide a tool steel projectile having its periphery formed with lands and grooves which are complementary of those of a gun whereby a close fit of the projectile in the gun is assured.

A further object is to provide a projectile having a conical point, lands and groove on the cylindrical part of the shell adapted to have a fit with lands and grooves of the rifling of a gun for firing the projectile, continuations of said lands and grooves on said points of the projectile having the same pitch as those on the cylindrical portion of the projectile and being formed to provide a drill on the conical point of the projectile.

A further object is to provide in a shell such as that last described, means for detachably connecting the conical point to the cylindrical body of the projectile.

A further object is to provide a projectile such as that last described wherein the lands on the body portion of the projectile are continued a short distance beyond the front end of the body and sharpened to provide cutting teeth for penetrating or digging into a sloping or convex surface.

A further object is to provide a projectile such as that last described wherein a collapsible conical point is detachably secured to the body of the projectile when the drill providing point is removed and the device is used against a sloping or convex surface.

A further object is to provide a projectile such as theat last described wherein the body of the projectile includes a pointed supplemental shell of smaller calibre inwardly of the toothed front edge to aid the penetration of the sloping or convex surface after the toothed front edge has weakened the same by gouging or chipping such surface.

A further object is to provide an explosive projectile wherein fuse means are provided which is actuated by contact with a target but which delays the explosion of the projectile until the same has penetrated the target a predetermined distance.

A further object is to provide an explosive projectile effective against aircraft or the like.

Other objects and advantages reside in the particular form of my projectile and gun, combination and arrangement of the several parts thereof and in the particular mode of operation—all of which will be readily apparent to those skilled in the art, upon reference to the drawing in connection with the following detailed description and appended claims.

In the drawing:

Fig. 1 is a fragmentary elevation of the improved projectile;

Figs. 2–6 inclusive are fragmentary horizontal sections taken on the lines 2—2 to 6—6 inclusive respectively of Fig. 1;

Fig. 7 is a longitudinal vertical section taken along the bottom of one groove of the projectile of Fig. 1;

Fig. 8 is a fragmentary transverse section through a gun barrel of the invention and showing a projectile therein;

Fig. 9 is a view like Fig. 7 but showing a modified form of point for the projectile; and

Fig. 10 is a fragmentary vertical section showing a further modification.

Referring specifically to the drawing and more particularly to Figs. 1–8 inclusive, 10 designates the cylindrical body portion of the shell, the periphery of which is formed with a plurality of adjoining and inverted V-shaped ridges 11 which are arranged in slight spiral which corresponds in pitch to the rifling 12, 13 of the gun 14. As shown in Fig. 8, the rifling of the gun 14 comprises substantially inverted V-shaped lands 13 with V-shaped grooves 12 therebetween. In this connection it should be stated here that the pitch of the rifling for my gun is substantially less than that which is used usually for a gun of like calibre. Thus, if the usual rifling for a gun of a given calibre would make a complete turn around the inside of the barrel in a twenty-inch section of the barrel, my rifling would require a forty-inch section to make a complete turn. Moreover, it is to be understood that in each instance my projectile is formed of hardened or tool steel to withstand the greater pressure which is necessarily generated by the close fit in the barrel of the gun 14. Any suitable means, not shown, may be used to line up the rifling on the shell and gun automatically when the shell is inserted in the barrel. As a result of the close fit in the gun barrel and because of the rifling on the shell or

projectile, my projectile has an extremely high muzzle velocity and a much higher speed of spin in flight whereby it not only has an increased penetrating power but it also is more accurate. Obviously, on account of the increased penetrating power lighter guns can be used in place of heavier guns with the same effect.

As is shown in Figs. 1–7, particularly Figs. 1–6, the rifling **11** of the body **10** of the shell merges into rifling **21** on the conical point **20** of the shell. The rifling **21** of the point is progressively flattened and reduced in cross section as the tip is approached but retains the same pitch as the rifling **11** of the shell body whereby the smooth flight is assured. Moreover, the rifling **21** of the point **20** is formed to provide cutting ribs **21***a* in the nature of drill ribs at the frontal portion of the point **20** (see Figs. 5 and 6). These cutting ribs assist the shell to penetrate armor and thereby increase the penetrating power of the shell.

As is clearly shown in Fig. 7, the front end of the body **10** and the rear end of the point **20** are provided with complementary frustro-conical portions **18** and **27** respectively. The extreme rear end of the point **20** is provided with an externally threaded stud **26** which threadedly engages the internal threads **17** of the shell body **10**. The point **20** is axially bored as at **22**. The bore **22** mounts a contact detonator **23** at the tip. The detonator **23** actuates a slow fuse **24** of any suitable form which includes a small charge of explosive which is designed to drive rearwardly a rod **25** also carried in the bore **22**. The rod **25** actuates any suitable detonator **16** which is carried within the hollow interior **15** of the shell body **10**. It is understood that the detonator **16** explodes the main explosive charge (not shown) of the shell. The slow fuse **24** is so designed that the main detonator **16** will not be actuated until the shell has penetrated a predetermined distance into the target. Obviously, the fuse **24** can be removed and a fuse of a different speed inserted for different targets—depending upon the amount of penetration desired before explosion and upon the character of the target.

In many instances, such as when the gun and shell are used with a flat trajectory against a sloping or convex target or where used at a higher angle against a vertical surface, a pointed shell has a tendency to glance or ricochet off of the same. In such instances, it is desirable to use the projectile in the manner of Figs. 9 and 10. In Fig. 9 the body **10** is identical to that first described except that it may be longer or heavier to compensate for the omission of the point **20**. Instead of the point **20**, a collapsible point **30** is utilized which has a diameter smaller than that of the body **10** and substantially equal to the diameter of the body taken from the floor of the grooves of the rifling **11**. The sole purpose of the point **30** is to provide a wind break and insure accuracy of fire. The point **30** is made only strong enough to withstand the wind pressure in flight and may be of any suitable material. The frustro-conical rear end **31** of the point **30** fits into the frustro-conical recess **18** of the body **10** and the short threaded stud **32** engages the threads **17** of the body. An inwardly directly and axially arranged stud **33** is formed at the tip of the point **30** fixedly mounting in the bore thereof by any suitable means the front end **34** of a detonator actuating rod **35** which terminates adjacent the detonator **16** of the shell body **10**. As the point **30** collapses upon impact, the rod **35** moves rearwardly and actuates the detonator. By varying the distance between the rear end of the rod **35** and the detonator **16**, the explosion can be delayed as desired or made instantaneous.

As is shown in Figs. 1, 7 and 9, the forward ends of the rifling **11** of the body **10** extend forwardly of the edge thereof and are sharpened to points **19**. Thus, when the rim of the body **10** engages the target at an angle the saw-toothed effect formed thereon digs into the same instead of glancing off as would be the case with a pointed shell. Not only that but the explosion following closely on the heels of the impact is rendered more effective by the preliminary gouging and weakening of the armor or other surface of the target.

Fig. 10 shows a further modification wherein the body **10** has mounted thereon a collapsible point **40** which is substantially the same as the point **30** except that the detonating rod **35** and associated parts may be eliminated. In this form of the invention a supplementary shell **50** of smaller calibre and having a pointed front end is carried by the body **10** axially thereof. The tip of the supplementary shell **50** is just inwardly of the plane defining saw-toothed rim of the body so that it does not engage the target until the said rim has actually dug into the same to some degree. With the rim already engaged, the point of the supplemental shell **50** will be enabled to have a penetrating effect to assist the rim. Any suitable means for exploding the supplemental shell **50** may be provided. The supplemental shell may be more or less loosely mounted within the body **10** so that the inertia thereof will drive it forward upon impact of the body **10** with the target.

The shells comprising the invention can be used to supplement each other—as where the concave "point" of the Fig. 9 form weakens the target to permit actual penetration thereof by shells of the Fig. 1 form. At the same time, the Fig. 10 form, to some extent at least, combines the forms of Figs. 1 and 9.

While I have shown and described what are thought now to be the preferred embodiments of my invention, it is to be understood that the same is susceptible of other forms and expressions and that I do not limit myself to the precise structure shown except as hereinafter claimed.

I claim:

1. A projectile for a gun, comprising a hardened steel body, rifling on the periphery of said body adapted to fit the rifling of a gun barrel, said rifling comprising V-shaped lands and grooves, said body having a substantially concave front end, said lands of said rifling being continued beyond the front edge of said body and formed to provide points a hardened steel point detachably connected to said body for selective use therewith, said point having rifling on the periphery thereof of the same pitch as that of said body, said rifling of the point being V-shaped at the rear end and merging with the rifling of said body, said rifling of said point being progressively reduced in size and progressively changed in form towards the front end of the point to provide drill ribs.

2. A projectile for a gun, comprising a hardened steel body, rifling on the periphery of said body adapted to fit the rifling of a gun barrel, said rifling comprising lands and grooves, said body having a substantially concave front end,

said lands extending forwardly of the front edge of said front end and formed to provide digging teeth a hardened steel point detachably connected to said body for selective use therewith, said point having rifling on the periphery thereof of the same pitch as that of said body, said rifling of said point at the rear end thereof, being identical to that of said body and merging therewith, said rifling of said point being progressively reduced in size and progressively changed in form towards the front end of said point to provide drill ribs.

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