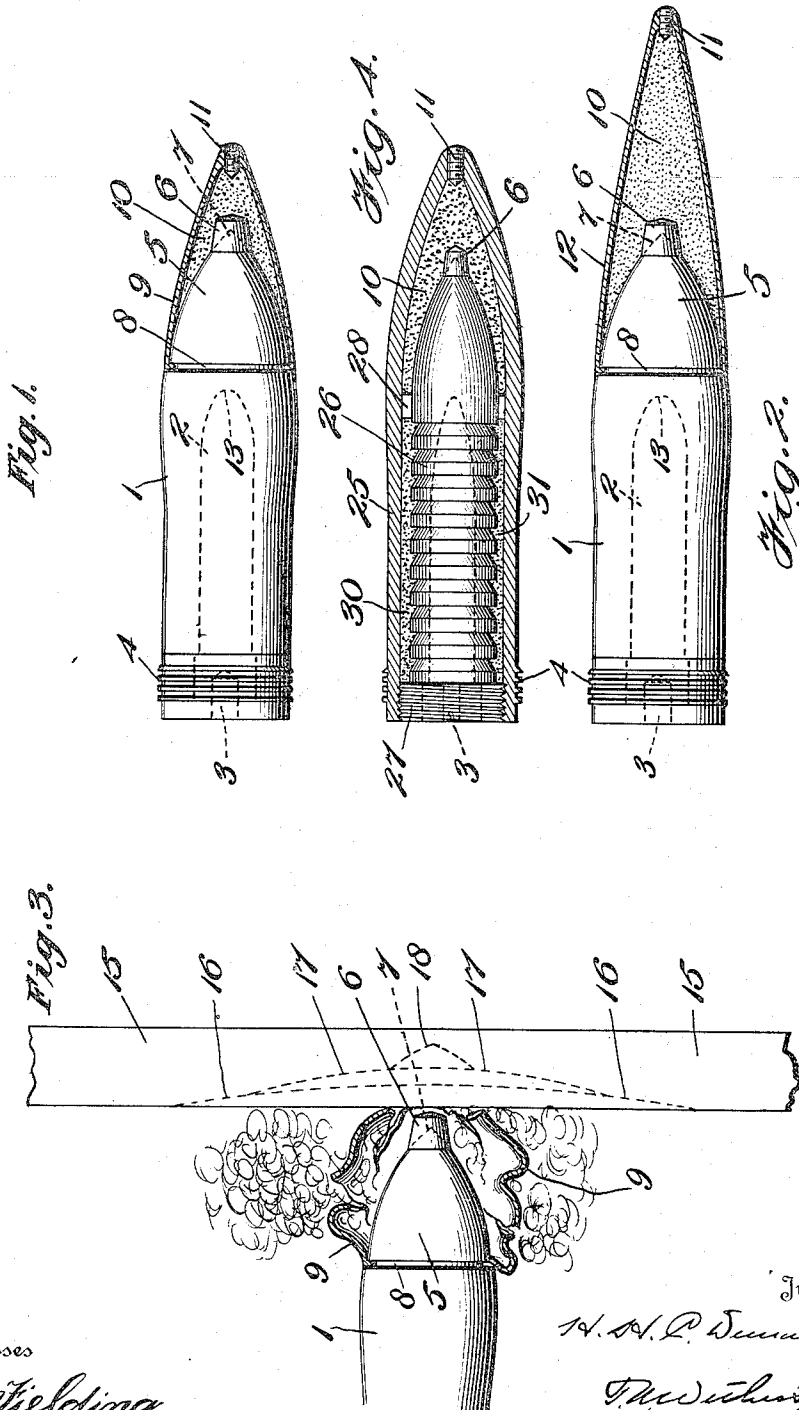


H. H. C. DUNWOODY.
SHELL OR PROJECTILE.
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Witnesses

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SHELL OR PROJECTILE.

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To all whom it may concern:

Be it known that I, HENRY H. C. DUNWOODY, brigadier general, U. S. Army, retired, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Shells or Projectiles; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to shells or projectiles and has for its object to increase the destructive powers of such shells as will appear below.

With these and other objects in view the invention consists in the novel details of construction and combinations of parts more fully hereinafter described, and particularly pointed out in the claims.

Referring to the accompanying drawings forming a part of this specification, in which like numerals designate like parts in all the views Figure 1 is a plan view partly in section of a shell made in accordance with my invention; Fig. 2 is a view similar to Fig. 1, showing a slightly modified form of my invention; Fig. 3 is a diagrammatic view similar to Figs. 1 and 2 illustrating a possible mode of operation of my invention; and Fig. 4 is a view similar to Fig. 1 showing another modification of my invention.

1 indicates any suitable shell or projectile, but preferably provided with the cavity 2 for containing the bursting charge, the usual base fuse 3, the ring 4, the tapered forward end 5, the soft steel cap 6 covering the hardened point 7 and the groove 8 in which fits the hollow tapered cap 9, all as are now employed in the standard Navy shell. Inside the hollow tapered cap 9 I place any suitable high explosive 10 which is safe to fire out of the gun, and yet which is capable of being detonated by the fuse 11, placed in the extreme point of the cap 9, as shown.

In the modified form of my invention shown in Fig. 2, the parts are the same as in Fig. 1, except the hollow cap 12 is made of larger dimensions or is more tapered than is the cap 9, so as to accommodate a larger

quantity of the high explosive 10. In both cases, in order not to disturb the center of gravity of the shell and thereby destroy the ballistics thereof, I may shift the extreme end 13 of the cavity 2 sufficiently far to the rear in each case, in order to balance the added weight due to the high explosive 10 contained in the hollow caps 9 and 12, respectively.

The high explosive 10 is conveniently loaded into the hollow cap by pouring it in through the extreme end of the hollow cap and then inserting the fuse 11 as will be readily understood.

The operation of my shell will be more clear from a consideration of the diagrammatic view shown in Fig. 3. Upon striking a resistance, such as an armor plate 15, the fuse 11 will cause a detonation of the high explosive 10, which will rupture the cap 9 and at the same time exert a greater or less inward pressure on the armor plate 15 thereby causing a strain in said armor plate which may be conveniently represented by the dotted line 16.

As the distance between the fuse 11 and the soft cap 6 will be traversed by the shell in a very brief interval of time, the strains in the plate 15 will not have time to readjust themselves before the said cap 6 strikes the plate and sets up an additional strain which may be represented by the dotted line 17. The area included in the limits of the dotted line 17 will probably be smaller than that included in the limits of the dotted line 16, because the contact area between the plate 15 and the soft cap 6 is much less than is the contact area between the plate 15 and the detonating explosive 10. Therefore the strains set up by the cap 6 will be more concentrated or more confined than will be the strains set up by the detonating explosive 10. But at the same time, it is important to remember that the strains set up by the soft cap 6 are added to the strains set up by the detonation of the explosive 10 and therefore the line 17 will be located farther inside the plate 15 than would be the case if no detonation had occurred on the outside of the said plate.

After the soft cap 6 has been destroyed

by the impact and the extreme hardened point 7 has reached the plate, it will in turn set up far more localized strains than either the detonating explosive 10 or the soft cap 6.

5 The strains set up by said hardened point 7 may be conveniently represented by the dotted lines 18 which again are located farther inside the plate 15 than are either the strains set up by the explosive 10 or the soft

10 cap 6. It is also evident that the said strains produced by the hardened point 7 will be located farther inside the plate 15 when an explosive such as 10 is detonated than would be the case if no such explosive had been

15 employed. It therefore follows that a shell such as one provided with an explosive such as 10 that is detonated on the outside of a plate at the instant of impact, will penetrate more armor or will overcome a greater

20 resistance on impact than would be the case if no explosive such as 10 is employed in its hollow cap 9.

When this shell is to be used against forts or works not employing chilled armor of very great thickness, it is convenient to employ a larger cap such as 12 and thereby detonate a greater quantity of explosive 10 as is indicated in Fig. 2.

25 In using this invention against earth works, or against masonry, the main body portion 1 of the shell may be greatly decreased and the hollow cap portion 12 may be proportionately enlarged so that only enough energy is stored up in the body portion 1

30 to penetrate the outer works, while the high explosive 10 is detonated against any substantial resistance that may be met with. In all cases the explosive charge 2 carried by the shell may be exploded after

35 the shell has penetrated the walls against which it is fired, and the well known destructive effects of the shell thus secured, or when desired the fuse 3 may be set or timed so as to act about the same time or slightly

40 after or before the fuse 11, according to the results it is desired to attain.

45 When using the shell against modern chilled armor, it is well known that the energy stored up in the shell is greater than the capacity of the chilled point 7 to withstand the shock of impact. That is to say, the point 7 could be driven through a greater thickness of modern armor, if it could be

50 made to resist greater shocks than at present. Put in other words, considerable of the energy stored up in the shell from a modern 12 inch gun using nitro-cellulose powder could be taken out of the shell and still have the point 7 penetrate all of the

55 armor it can now penetrate without breaking it. It therefore follows that although a portion of the energy furnished by the detonation of the charge 10 will be exerted in blowing back the shell 1 and therefore in

60 lessening to some extent the force of im-

65 pact of the shell on the armor 15, yet at the same time by no means is all of the energy of detonation thus expended; and since action and reaction of necessity are equal, even that portion of the energy of detonation that is thus expended, is of necessity utilized in straining the armor plate, so that as a net result of the detonation any energy which is taken out of the shell is stored up in straining the armor plate; and all the additional energy of detonation which is not taken out of the shell is further stored up or used in destroying the armor plate.

An important feature of my invention resides in the fact that the effect of detonating a charge against armor plate as distinguished from exploding a charge against such a plate is largely used up in racking strains or unsettling the particles or molecules, so to speak of the plate, thereby creating a tendency to shatter the plate at the very moment when two additional blows are imparted to it. That is to say the plate is subjected to a shattering action while one blow caused by the impact of the soft nose 6 is imparted to the plate, and immediately after this blow and while the plate is still subjected to this shattering action another blow caused by the impact of the hard point 7 is imparted to the plate, so that the effective destructive action of the shell is had on the plate when in its weakest condition.

In the further modified form of the invention shown in Fig. 4, the outer casing 25 extends to the base of the shell, and surrounds the inner body 26, to which it may be screw threaded as at 27. A spider or other support 28 is located near the forward end of said body 26 to hold the same firmly inside the casing 25, and yet leave said body comparatively free to move forward upon impact.

A considerable space 30, is afforded between the casing 25 and body 26 for the accommodation of a high explosive 31, or an ordinary propellant capable of being exploded as distinguished from being detonated on impact according to the use to which the shell is to be put.

What I claim is:—

1. In a shell having a chilled pointed end and a softer metal cap inclosing said end, the combination of a hollow tapered cap attached to said shell near the base of said chilled end inclosing said softer metal cap; a high explosive in said tapered cap; and a fuse adapted to detonate said high explosive substantially as described.

2. In a shell having a cavity, a bursting charge in said cavity, a chilled pointed end, and a softer metal cap inclosing said end, the combination of a tapered hollow cap inclosing said softer metal cap and attached to the base of said chilled end; a high explosive capable of being detonated on im-

5 pact carried in said hollow cap; a fuse in the extreme end of said hollow cap for detonating said high explosive; and a fuse in the base of said shell for exploding said bursting charge, and adapted to be timed with reference to said first named fuse, substantially as described.

In testimony whereof I affix my signature, in presence of two witnesses.

HENRY H. C. DUNWOODY.

Witnesses:

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