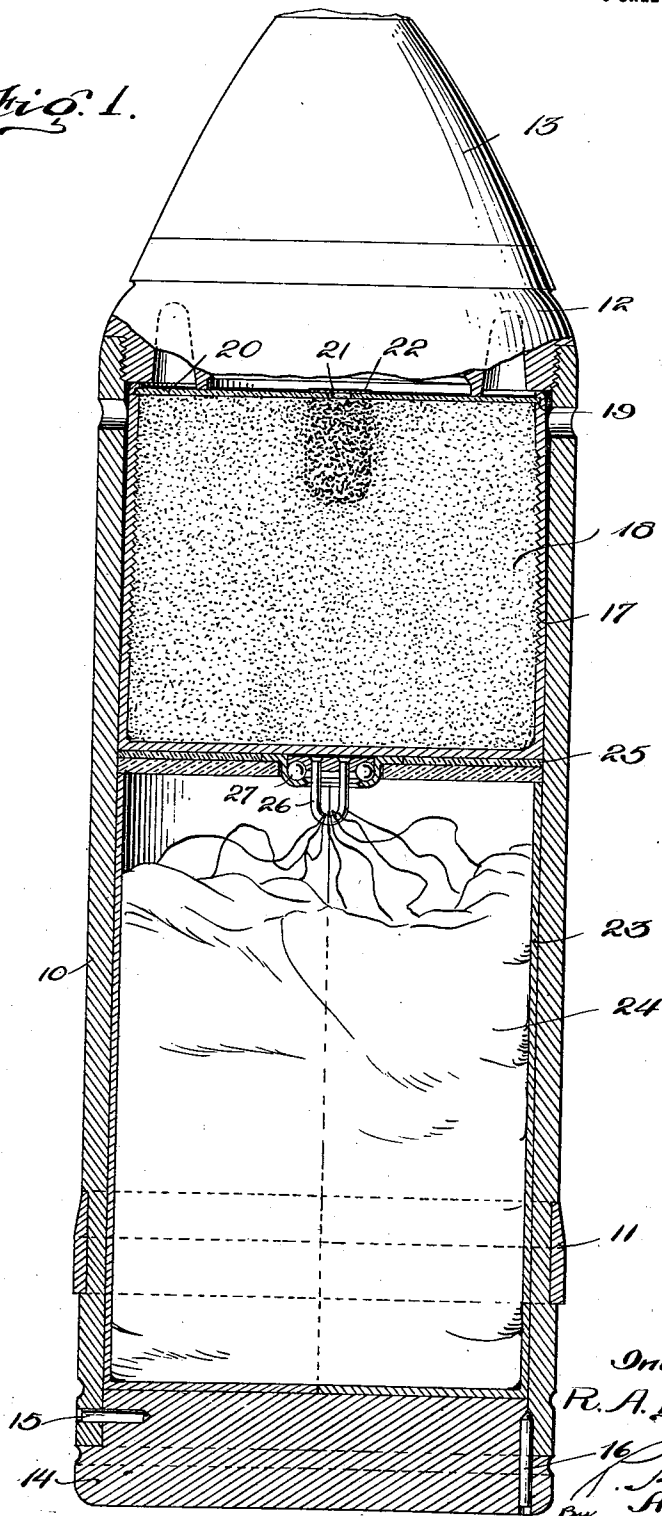


R. A. DARLING.
CARRIER SHELL.
APPLICATION FILED DEC. 9, 1918.

1,309,982.

Patented July 15, 1919.
3 SHEETS—SHEET 1.

Fig. 1.



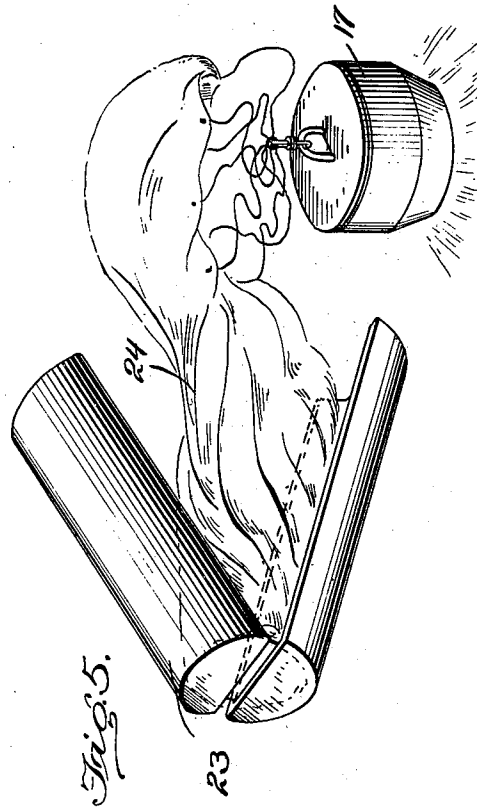
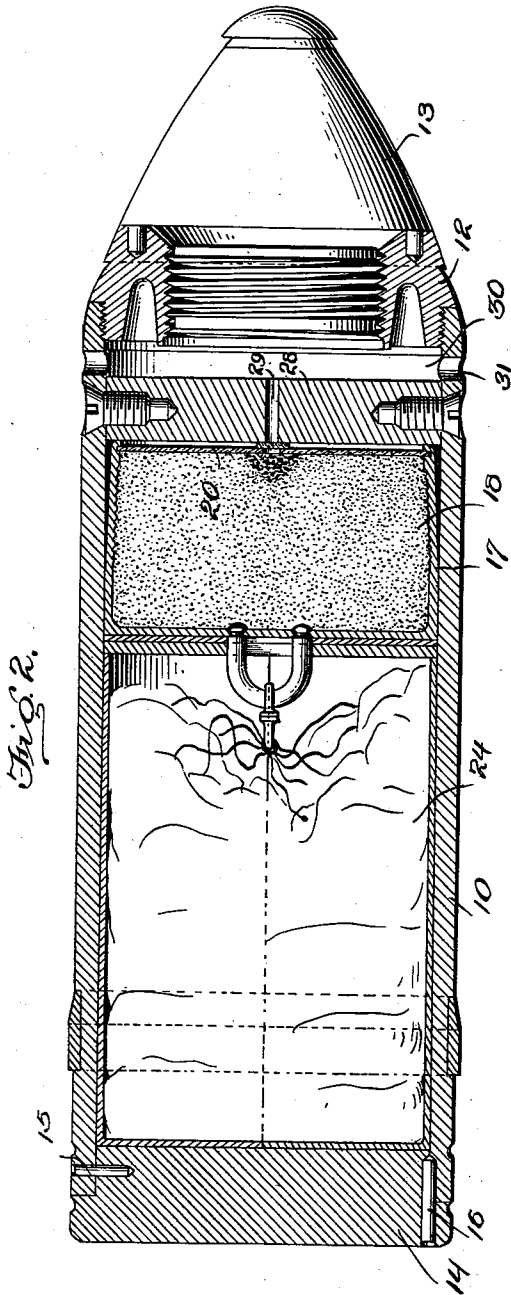
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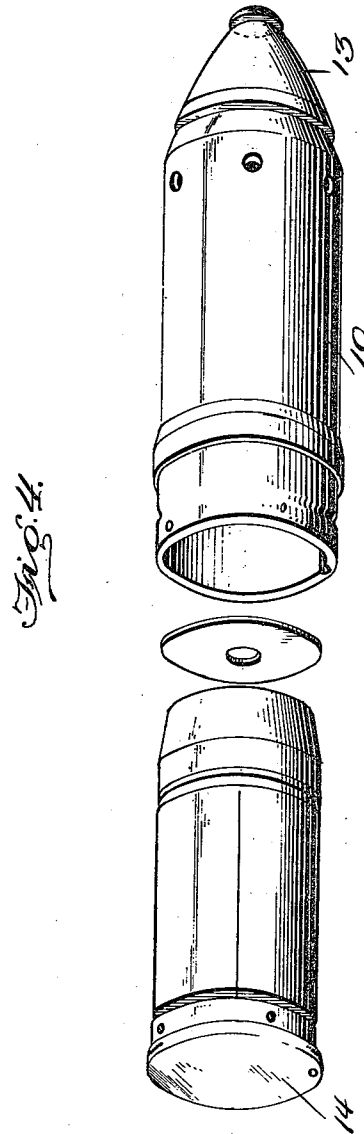
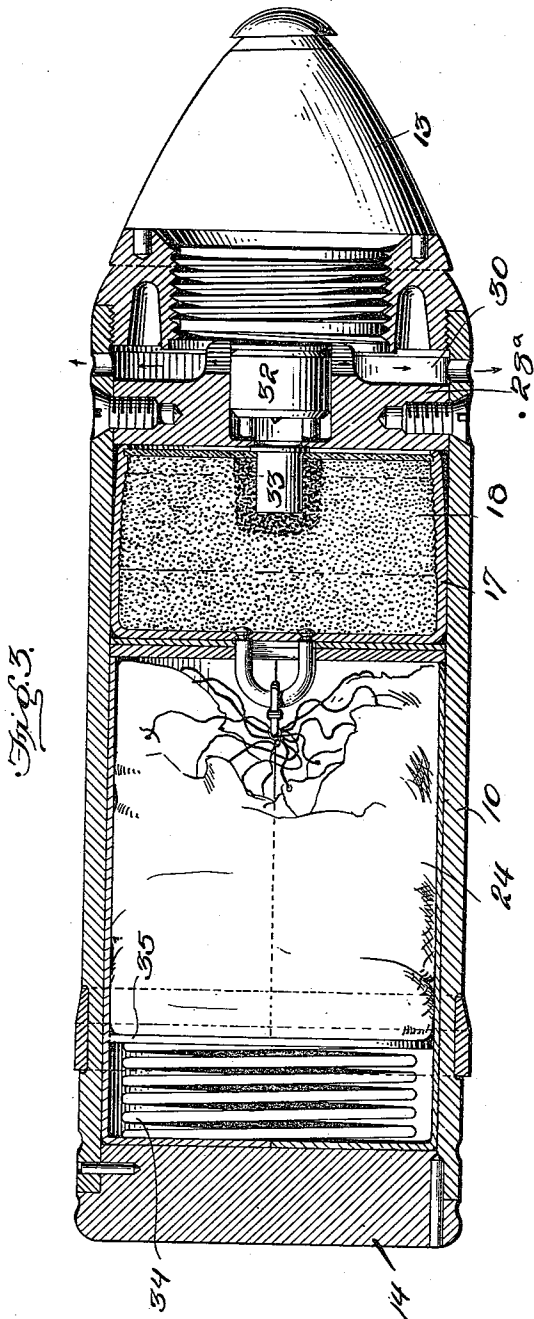
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UNITED STATES PATENT OFFICE.

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CARRIER-SHELL.

1,309,982.

Specification of Letters Patent.

Patented July 15, 1919.

Application filed December 9, 1918. Serial No. 266,008.

To all whom it may concern:

Be it known that I, ROY ANDREW DARLING, a citizen of the United States, residing at Evanston, Illinois, have invented new and useful Improvements in Carrier-Shells, of which the following is a specification.

This invention relates to illuminating or signal projectiles or shells of that type adapted, when set off in the air, to ignite and discharge a light-producing body, hereinafter referred to as a "flare", secured to a parachute, this type of projectile or shell being of particular value in military and naval operations, as, for instance, in exposing objects to make a clear target of them; illuminating areas of land or sea to disclose movements of the enemy or facilitate the landing of aircraft; communicating orders, and conveying intelligence, generally. It is, of course, understood that my improved illuminating projectile may be used for pyrotechnic display generally.

It is the aim of the present invention to provide certain improvements in illuminating projectiles which will make the same entirely efficient and reliable in operation. Shells constructed in accordance with the present invention will operate without fail and when properly timed and fired will function at the desired time and position to illuminate the object or area sought to be lighted.

It is the further aim of the invention to provide an illuminating shell comprising a small number of parts, each of which is relatively simple in construction, so that the shell may be manufactured at a cost greatly in reduction to that of shells now used.

This invention accordingly consists in the features of construction, combination of parts and in the unique relations of the members and the relative position, proportioning the distribution thereof as more completely outlined herein.

To enable others more skilled in the art so fully to comprehend the underlying features thereof that they may embody the same by numerous modifications in the structure contemplated by this invention, drawings depicting a preferred form have been annexed as a part of this disclosure and in such drawings like characters of reference denote corresponding parts throughout all of the views, of which:—

Figure 1 is a longitudinal sectional view

through a shell in which one embodiment of my invention is incorporated.

Fig. 2 is a view similar to Fig. 1, but illustrates another form of my invention.

Fig. 3 is a longitudinal sectional view through a modified form of shell.

Fig. 4 is an exploded perspective view of the parts of my improved shell.

Fig. 5 is a perspective view of the "flare" and parachute in the positions they take when the flare begins to fall after being discharged from the shell body.

Referring to the drawings in detail, and particularly to that embodiment of my invention illustrated in Fig. 1, the numeral 10 designates a shell body of cylindrical or tubular form having the usual rifling band 11. The forward end of the shell body 10 is internally threaded for the reception of a head cap 12, having, as is usual, a threaded opening into which the nipple of a time fuse 13 is screwed. The internal structure of the time fuse 13 is not shown in the present illustrative disclosure of my invention, for the reason that such fuses are well known in the art, and any suitable type of fuse which will function at a set time after the shell is fired from a gun may be employed. Slidably fitting in the base end of the shell body 10 is a base plate 14 held in place by means of a shearing pin 15 positioned in a radial opening in the shell body and extending into a recess in the base plate 14. To prevent the pin 15 from being sheared prematurely due to the rotation of the projectile, a twisting pin 16 is fitted in a recess formed by registering grooves in the shell body and base plate.

In each embodiment of my invention, the flare comprises a substantially cylindrical metallic container 17 closed at one end and open at the other. The container 17 is of such diameter as to fit snugly, but without binding, in the shell body 10 and preferably it tapers inwardly slightly toward its open end. The interior surface of the container 17 is threaded for a greater portion of its length so as to prevent the body of composition 18 which, when ignited, gives off a bright light, from falling out of the container after the flare is discharged from the shell body and the flare is hanging downwardly from the parachute. Adjacent the open end of the container 17 is a circumferential internal groove 19 which receives the edge of a disk 20 closing the open end of the

container 17 so as to prevent the composition 18, during handling of the projectile, from sifting out of the container 17. The disk or cover 20 has a centrally disposed flash opening 21 which may be closed by a small sheet 22 of silk, pyralin or other material, which, while preventing the powder from sifting from the casing 17 through the opening 21, will permit the flash of the time fuse 13 to pass through the flash opening 21 for the purpose of igniting the composition 18. The flare composition 18 may be composed of any suitable ingredients and if desired, a small charge of black powder may be positioned immediately adjacent the flash opening 21 so as to insure proper ignition of the composition 18, but preferably the portion of composition or powder about the opening 21 is the same as the main body of the composition 18 but it is packed to a lesser degree so that it is more readily ignitable. While the flare composition may be varied as desired, for purposes of illustration it is stated that the following ingredients mixed in the proportions stated may be used:—

	Barium nitrate ---	16 lbs.—14 oz.
	Magnesium -----	6 lbs.—11 oz.
30	Ammonium perchlo-	
	rate -----	— 2 oz.
	Linseed glue -----	1 lb.— 5 oz.
	Sodium carbonate_	— 2 oz.

Between the flare 17 and base plate 14 is a parachute casing 23 which is cylindrical in cross section and of such dimensions as to fit loosely in the shell body 10. The casing 23 is split longitudinally into two parts so that after the flare is discharged from the shell body 10, the parts of this casing will fall apart, permitting the parachute 24 to open properly. The rear end of the casing 23 is closed. Between the casing 17 and the forward edge of the casing 23 are gas check disks 25.

In Fig. 1 of the drawings, the forward edge of the flare container 17 and the outer face of the disk 20 are in close proximity to, or abut, the inner face of the head cap 12. The parachute 24 is secured to the closed end of the flare container 17 by means of a swiveled shackle 26 and to relieve friction between the shackle and the casing 17, ball bearings 27 may be provided. It is understood, of course, that the swivel connection between the flare and parachute is provided for the reason that as the shell is propelled through the air, it rotates at high speed, and after the flare is discharged from the shell body 10, the flare rotates at a greater speed than does the parachute because the flare is of greater weight.

The operation of the illuminating shell shown in Fig. 1 is briefly as follows:—The gunner having determined the range at

which it is desired that the illuminating shell shall function to illuminate the desired object or area, the time fuse 13 is set, the shell is inserted in the breech of the gun, and the gun is fired. During the flight of the shell, the fuse 13, at the time set, will flash, and this flash will penetrate through the closure 22, pass through the flash opening 21, and ignite the flare composition 18. When the flare composition 18 is ignited, gases are immediately generated, and these gases will force the disk or cover 20 out of the groove 19 and against the inner face of the head cap 12. The pressure of the gases instantly upon ignition of the flare composition is so great that it will shear off the pin 15 and force the base plate 14, the casing 23, with the parachute carried therein, and the flare, from the shell body 10 with considerable velocity. After the flare is discharged from the shell, it will, due to gravity, fall toward the ground and the parts of the container 23 will fall apart, permitting the parachute 24 to open.

In the embodiment shown in Fig. 2, the structure is very similar to that shown in Fig. 1, with the exception that a partition 28 is secured by means of screws in the forward end of the shell body 10, between the flare and the head cap 12. The numeral 29 designates a small flash opening in the partition 28, which opening registers with the flash opening 21 of the flare. This partition 28 is spaced slightly from the inner face of the head cap so as to provide a chamber 30 which has communication with the atmosphere through the openings 31 in the shell body 10 for the purpose of relieving excessive pressures of the gases generated by the fuse 13, and thus insuring against bursting of the forward end of the shell. It is, of course, obvious that, if desired, the openings 31 may be omitted.

The projectile illustrated in Fig. 2 operates similarly to that shown in Fig. 1, but in this embodiment the flash from the time fuse 13 passes through the flash opening 29 in the partition 28 to ignite the composition 18. Upon ignition of the composition, gases are generated, which immediately force the disk 20 against the inner face of the partition 28 and propel the flare from the shell body with considerable velocity.

In the embodiment of Fig. 3, I have shown a centrifugal plunger 32 mounted within an opening in the partition 28^a. The internal structure of this plunger 32 is not shown, as it may be of any suitable type, it being only necessary that it be of such construction that, upon functioning of the time fuse 13, the pressures generated thereby will force the plunger 32 toward the flare to ignite a primer 33 carried in a recess in the flare composition 18. To insure that the parachute will open properly after it and the

flare are discharged from the shell, a coiled spring 34 is provided in the rear portion of the split casing 23, and this spring, which is under compression, engages a disk 35 abutting the parachute 24.

When the projectile illustrated in Fig. 3 is shot into the air, and the time fuse 13 functions, the pressure of the generated gases forces the plunger of the device 32 inwardly, resulting in the ignition of the primer 33, which in turn ignites the composition 18. The gases evolved by the burning of the compound 18 blow the flare from the shell body as in the embodiments shown in Figs. 1 and 2. After the flare, together with the casing 23 and its contained parts are discharged from the shell, the parts of the casing fall apart, and at the same time the spring 34 forces the parachute out through the open end of the casing.

It will be noted that in each embodiment of my invention the gases generated upon ignition of the flare composition 18, cause the flare and its parachute to be discharged from the shell body 10. In illuminating shells heretofore employed in military operations, an explosive charge of powder, distinct from the flare composition, is employed for igniting the flare and discharging the flare and its parachute from the shell body. A time fuse or similar mechanism ignites the explosive charge, and the bursting or explosive charge, in turn, ignites the flare composition, and it is the gases generated by the explosion of the bursting charge which force the flare and parachute from the shell body. This old type of shell is open to the objections that the cost of the shell is increased by making provision for the bursting charge, and the shells, although great care is employed in manufacturing and assembling them, do not operate uniformly.

It will be seen that when a shell of this old type functions, a distinct step or operation, namely the explosion of the bursting charge, takes place between the time fuse and the flare composition and this additional step has considerable influence on the time element, that is, the space of time between the functioning of the time fuse and the time the flare is properly functioning in space. Extensive tests with this old type of shell disclose that a slight change in the density of the bursting charge will vary the time element, a more loosely packed charge requiring more time to force the flare and parachute from the shell body than would a more densely packed charge. It is impracticable to form the bursting charges into compressed cakes and retain the same in that condition and thus obtain uniformity of action for the reason that the cakes cannot be housed in a closed container because in addition to providing means whereby a charge is ignited by the fuse means must be

provided whereby the charge upon explosion can ignite the flare composition. Not infrequently shells of this old type fail to operate entirely because the bursting charge fails to ignite the flare composition, or, in some instances, when ignited, it bursts the walls of the shell body.

A shell constructed in accordance with the present invention is devoid of the bursting charge for discharging the flare from the shell body and therefore the structure is greatly simplified and variations in the time element, due to introduction of the bursting charge, are entirely eliminated. The flare composition is formed in a cake and compressed to the predetermined density in a container and thus any number of shells may be constructed which have uniformity in operation as the gases formed upon ignition of the flare composition eject the flare from the shell and there is every assurance that the flare will be burning correctly to give the desired illumination at the time its parachute opens. Upon ignition of the flare composition, the pressure of the gases generated, from a practical standpoint, instantaneously becomes so great that the flare is discharged from the shell body, and since no appreciable time elapses between the flash of the time fuse and the discharge of the flare body and since ignition of the flare is assured, the projectiles function with great punctuality. A shell of this type travels at a speed of between twenty-five and twenty-seven thousand feet per second, so that it is evident that should the flare be discharged from the shell a fraction of a second prior, or subsequent, to the time intended, or should the flare composition be tardy in igniting and thus fail to give proper illumination where required, the object, (such as an airship which it is desired to throw in silhouette), would not be properly brought to view and the purpose in firing the shell would be defeated.

It is old in the art to provide illuminating shells having a two-part support for the parachute, but in prior structures, so far as I am aware, the support or casing for the parachute is open at both of its ends, whereas in a shell constructed in accordance with my invention, the casing 23 is closed at its rear end. The closure at the rear end of the casing 23 is of advantage for the flare is discharged from the shell body 10 with such force that the pressure or inrush of air, if the casing were not closed, might tear or otherwise damage the parachute and cause it to operate improperly.

What I claim is:

1. A projectile having a shell body, and a flare lamp discharged from the shell body by the gases generated upon ignition of the flare.
2. A projectile having a shell body, a

fuse, and a flare lamp adapted to be discharged from the body by the gases generated upon ignition of the flare, the pressure of said gases constituting, substantially, the sole force for discharging the flare from the shell body.

3. A projectile having a shell body provided with a partition, a fuse, and a flare having a casing open at one end, the open end of said casing being in close proximity to said partition, and the gases generated upon ignition of said flare being adapted to discharge the flare from the shell body.

4. A projectile having a shell body provided with a partition, a time fuse, and a flare ignited by the time fuse and having a casing provided with a removable cover, said cover being in close proximity to said partition and the flare being discharged from the shell body by the gases generated upon ignition of the flare.

5. A projectile having a shell body, a fuse, a flare, and a parachute connected to said flare, said flare and parachute being discharged from the shell body by the gases generated upon ignition of the flare.

6. A projectile having a shell body, a fuse, and a flare ignitable directly by said fuse, said flare being discharged from the shell body by the gases generated upon ignition of the flare.

7. A projectile having a shell body, a fuse, and a flare having a flash opening through which the flash of the time fuse passes to directly ignite said flare.

8. A projectile having a shell body provided with passages communicating with the atmosphere and located adjacent a time fuse to eliminate excessive pressure, a fuse, a flare, and a parachute.

9. A projectile having a shell body provided with a time fuse, a fixed partition spaced from the fuse, and a flare having a casing open at one end, the open end of said casing being in immediate proximity to said partition.

10. A projectile having a shell body provided with a fuse, a partition spaced from said fuse to provide a chamber, passages leading from the chamber to the atmosphere, and a flare in said shell body having

an open end in close proximity to said partition.

11. A projectile having a shell body, a fuse at the forward end of said shell body, a base plate closing the base end of the shell body, a shearing pin for maintaining the base plate in position, and a flare and parachute between the time fuse and base plate, said parachute and flare being discharged from the body by the gases generated upon ignition of the flare.

12. A projectile having a shell body, a fuse at the forward end of said shell body, a base plate closing the base end of the shell body, a shearing pin for maintaining the base plate in position, and a flare and parachute between the time fuse and base plate, said flare being ignitable directly by said time fuse.

13. A projectile having a shell body, a flare therein, a parachute connected to the flare, and a divided casing housing said parachute and closed at its rear end.

14. A projectile having a shell body, a fuse at the forward end of the shell body, a base plate slidably fitted in the base of said shell body, a flare and parachute between the fuse and the base plate, and a two-part cylindrical casing housing said parachute and closed at its rear end.

15. A projectile having a shell body provided with a fixed face, a fuse, a base plate slidably fitted in the base end of said shell body, a shearing pin for holding the base plate in position, a flare in the body and having a removable cover in close proximity to said fixed face, a parachute connected to the flare, a two-part casing housing the parachute and closed at its rear end, said flare and parachute being discharged from the shell body by the gases generated upon ignition of the flare.

16. A projectile having a shell body, a flare lamp and a fuse adapted to directly ignite said flare lamp whereby the gases generated from said flare will force the flare from the shell body.

Signed at Indian Head, Md., this 30th day of November, 1918.

ROY ANDREW DARLING.