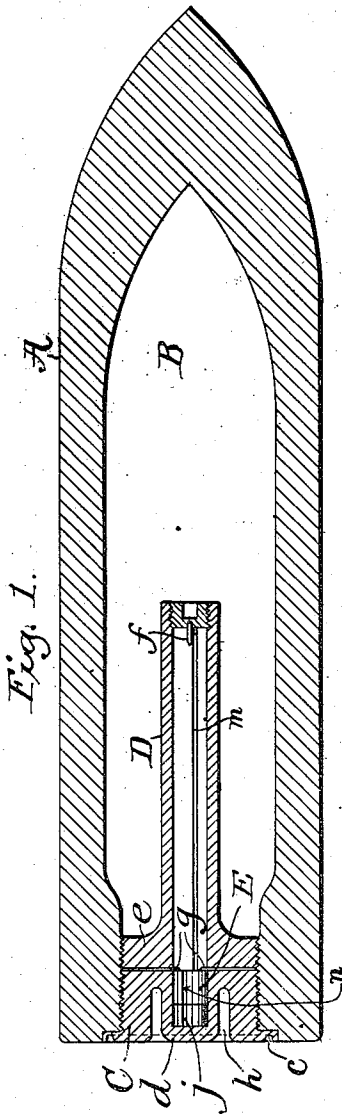


(No Model.)

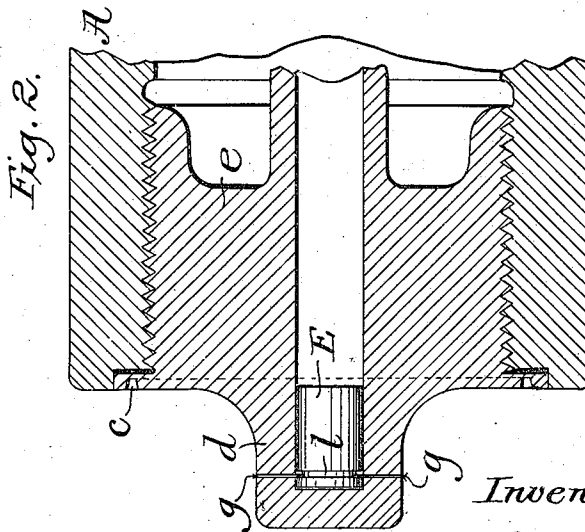
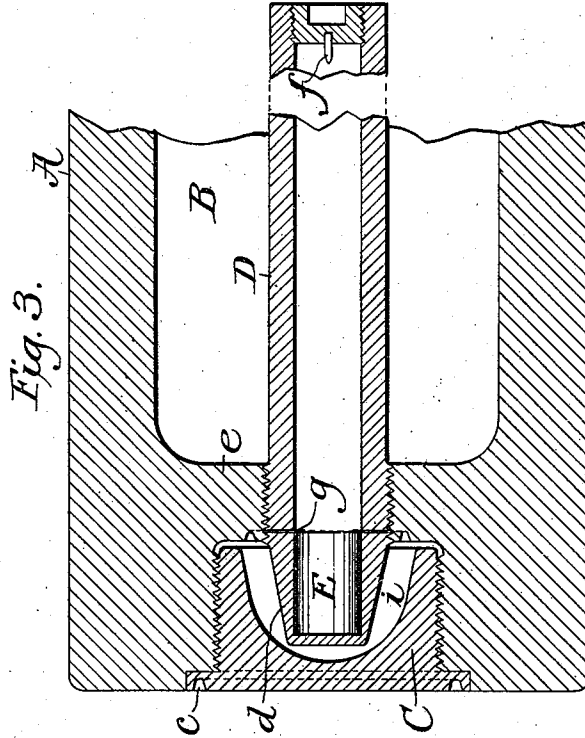
H. MAXIM & P. R. ALGER.
DETONATING FUSE.

No. 549,072.

Patented Oct. 29, 1895.



Witnesses:
H. Graham.
E. S. Todd.



Inventors,
Philip R. Alger and
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UNITED STATES PATENT OFFICE.

HUDSON MAXIM, OF NEW YORK, N. Y., AND PHILIP R. ALGER, OF THE
UNITED STATES NAVY.

DETONATING FUSE.

SPECIFICATION forming part of Letters Patent No. 549,072, dated October 29, 1895.

Application filed May 27, 1895. Serial No. 659,886. (No model.)

To all whom it may concern:

Be it known that we, HUDSON MAXIM, of the city, county, and State of New York, and PHILIP R. ALGER, of the United States Navy, citizens of the United States, have invented certain new and useful Improvements in Detonating Fuses, of which the following is a specification.

The present invention relates particularly to that class of fuses employed for the detonation of shells containing a charge of high or other explosives.

The principal object of the invention is to provide means by which the charge of the shell is protected from any accidental or premature explosion of the detonating material.

A further object of the invention is to provide means by which the fuse is prevented from detonating immediately upon the occurrence of the shock of retardation arising from the striking of the shell upon the armor, embankment, or other target, and by which such detonation and the explosion of the shell is delayed until the armor or target has been penetrated, and by which, at the same time, the charge of the shell is protected from any premature explosion of the fuse.

A further object of the invention is to relieve the movable portion of the fuse or the fuse charge as far as possible from any resistance when it has been set in forward motion relative to the shell to effect the explosion of the same.

A further object of the invention is to locate the fuse charge normally outside the shell or powder charge and permit it to travel forward into the powder charge upon the retardation of the shell preliminarily to its detonation.

With such objects in view the invention consists in a shell the base or other suitable portion of which, carrying or containing the fuse, is so constructed as to be weaker and to be burst more readily (provided the fuse charge be in its normal position) than is that part of the shell or fuse carrier which separates the fuse from the explosive charge of the shell; but when the fuse charge has, by the retardation of the shell, been shifted to that position

in which it is intended to be detonated the inclosing portion of its carrier, which at such time and in such position separates it from the charge of the shell, will be weaker and more readily burst than that part of the said carrier which separates the fuse charge from the atmosphere.

The invention further consists in a hermetically-sealed fuse carrier or container in which the forward end of the fuse charge is relieved from resistance by grooving the container or the casing of the fuse charge to allow the backward passage of air past the fuse charge or by producing and maintaining a vacuum or partial vacuum in the container, or by both of such means.

The invention further consists in the parts and combinations thereof hereinafter set forth and claimed.

Such being the general nature of the invention, in order to make the same more clearly understood there are shown in the accompanying drawings means for carrying it into practical effect without limiting the improvements in their useful applications to the particular constructions which, for the sake of illustration, have been delineated.

Referring to the drawings, Figure 1 is a longitudinal sectional view of a shell and fuse embodying the invention. Fig. 2 is a similar view on a larger scale, the forward portion of the shell being omitted, showing another embodiment of the invention. Fig. 3 is a similar view showing another embodiment of the invention.

Referring to the drawings, A indicates the body of the shell or projectile, which may be of any usual or preferred form. It contains an interior space or chamber B for the powder or explosive charge, herein termed the "shell charge."

C is the base of the shell, screwed into the end thereof or otherwise secured thereto.

The fuse container, carrier, or tube is shown at D, preferably formed with or carried by the base C and extending forward into the shell-chamber B. The predetermined length of this tube within the limits of the shell will govern the interval of time between the strik-

ing of the shell and the detonation of the fuse and shell charge. A packing-groove *c* around the head of the base serves to more effectually occlude its joint with the shell-body against penetration by the propelling-gases of the gun.

E is the fuse charge, comprising a detonating material in a suitable casing, which is adapted to slide in the tube *D*. It is held in its normal rearmost position, as seen in Fig. 1, by one or more pins or stops *g* of such softness or weakness as to be readily sheared by the fuse charge acting under its inertia upon the retardation of the shell. When the fuse charge thus frees itself and strikes the forward end of the tube *D*, it is detonated by a pin *f*, fixed in the latter.

The stop *g* may be situated in front of the fuse charge or may engage a groove *l* in its casing, as in Fig. 2.

One of the most convenient means for causing any premature detonation of the fuse charge while it is in its normal or outermost position in its carrier to burst outward into the atmosphere and leave intact the shell charge is to greatly strengthen the fuse-container *D* at a point in advance of the normal position of the fuse charge, leaving the outer or rear end of such container relatively weaker. This may be done, as shown in Figs. 1, 2, and 3 of the drawings, by surrounding the tube *D* in advance of its rear end with a thick and solid annulus or body of metal *e*, leaving the outer end *d* of the tube comparatively thin and not reinforced. If when the fuse charge is in its normal position, as shown in Figs. 1, 2, and 3 of the drawings, it should be detonated, it would burst through the part *d* of its container, leaving the forward portion of the tube and the shell charge intact. The reinforcement *e* may be integral with the tube *D* and base *C*, as seen in Figs. 1 and 2, or with the shell, as in Fig. 3. In Fig. 1 the rear end of the tube is within the shell-base, and is weakened by forming around it in the base a deep groove *h*. In Fig. 2 the tube end *d* is without the base, and is thereby left unreinforced. The end *d* may extend through and behind the reinforcement *e*, Fig. 3, and still be within the rear end of the shell. In such case the shell base or cap may be separate from the tube and be formed with a chamber *i*, inclosing the end of the latter. Where the end *d* is thus protected against accidental outside blows, it may be made much thinner than when left exposed, as in Figs. 1 and 2.

For the detonating material of the fuse it is preferred to employ one which is local in its effect, acting with great force within and throughout a limited area.

It is desirable that the fuse charge when once started into motion relative to the shell shall meet with as little resistance as possible in its tube *D*. If air be left in the tube, the

interior of the latter is formed with a longitudinal groove *m*, through which the air may pass from in front of the charge *E* when the latter moves forward. In place of or in connection with the use of the groove *m* the casing of the charge *E* may be exteriorly grooved, as shown at *n*.

With or without the use of the grooves *m* or either of them the tube *D* is exhausted wholly or partially of air from in front of the charge *E* and its front end hermetically sealed in any well-known manner.

In order to better confine, tamp, and direct forward and outward the force of the fuse charge when and as it is exploded, a follower *j* of steel or other metal or substance may be attached to the rear end of the fuse charge, Fig. 1.

What is claimed is—

1. The combination with a fuse charge, of a tube or container therefor, which is strengthened or reinforced, and left relatively weaker at its rear end, substantially as set forth.
2. A fuse container or tube adapted to carry a fuse charge in its rear end and reinforced in advance of the normal position of said fuse charge, substantially as set forth.
3. The combination with a shell, of a fuse tube or container within the same, and a reinforcement in advance of the rear end of said container and between the same and the body of the shell, substantially as set forth.
4. A fuse tube or container for shells provided in advance of its rear end with a closing base for the shell adapted to reinforce said container, substantially as set forth.
5. The combination with a shell, and a fuse tube or container within the same, of a fuse charge in said container and adapted to move longitudinally within the same, and a follower or tamping device at the rear of said charge and adapted to move forward with the same, substantially as set forth.
6. A fuse tube or container, a detonating charge within the same, and longitudinally movable therein, and means for temporarily holding said charge at or near the rear end of the container, said container having a vacuum or partial vacuum in its forward end, substantially as set forth.
7. A fuse tube or container having a detonating charge longitudinally movable therein, said container being adapted to be attached to a shell and having a vacuum or partial vacuum in front of said charge, substantially as set forth.
8. A fuse tube or container adapted to carry a longitudinally movable detonating charge, having a reinforcement adapted to close the base of a shell, and formed with a groove *h* by which the rear end of the container is weakened, substantially as set forth.
9. The combination with a shell having a space or chamber for an explosive charge, of

a fuse tube or container the tube portion of which extends from without the charge chamber and shell and thence forward into the charge chamber, and a fuse charge in said
5 tube normally situated in that portion of the tube exterior of said charge chamber and movable from said position to the inner or forward portion of the tube, as set forth.

In witness whereof we have hereunto signed our names in the presence of two witnesses.

HUDSON MAXIM.
PHILIP R. ALGER.

Witnesses:

JOS. STRAUS,
A. A. ACKERMAN.