(No Model.)

L. GATHMANN.

SAFETY FUSE FOR HIGH EXPLOSIVE SHELLS.

No. 583,042. Patented May 25, 1897.

Fig. 1.

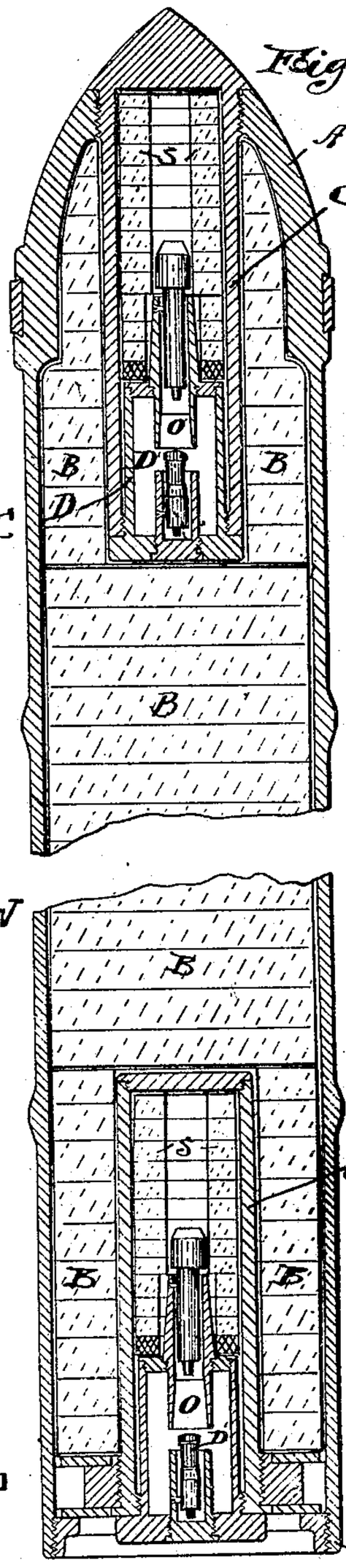


Fig. 2.

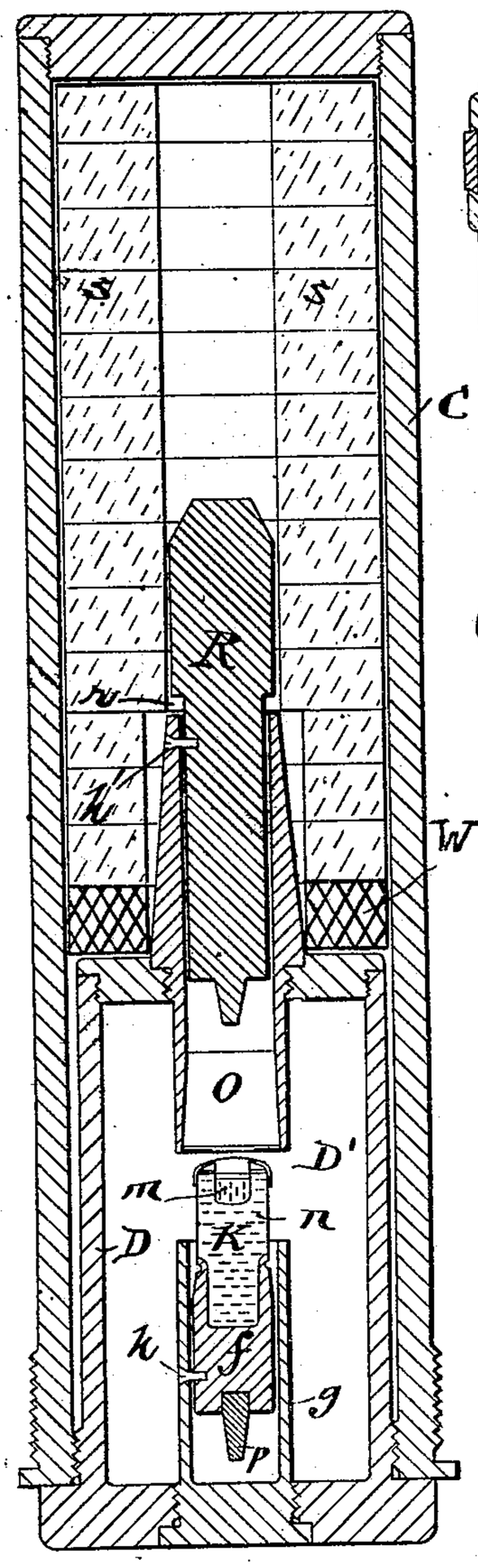
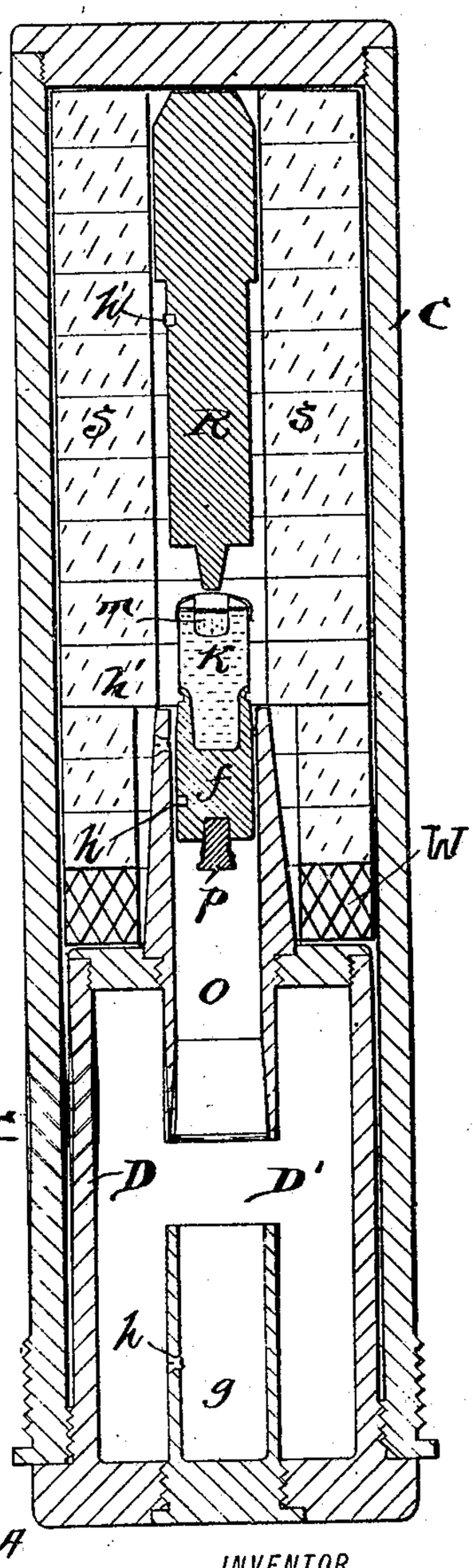


Fig. 3.



WITNESSES:

Frederick C. Goodwin

E. L. Huber.

INVENTOR

Louis Gathmann

BY

Offield, Towler & Linthicum

ATTORNEY.

UNITED STATES PATENT OFFICE.

LOUIS GATHMANN, OF CHICAGO, ILLINOIS, ASSIGNOR TO GEORGE WHITMAN McMULLEN, OF PICTON, CANADA.

SAFETY-FUSE FOR HIGH-EXPLOSIVE SHELLS.

SPECIFICATION forming part of Letters Patent No. 583,042, dated May 25, 1897.

Application filed December 15, 1896. Serial No. 615,768. (No model.)

To all whom it may concern:

Be it known that I, LOUIS GATHMANN, of Chicago, Illinois, have invented certain new and useful Improvements in Safety-Fuses for High-Explosive Shells, of which the following is a specification.

This invention relates to a novel method of constructing a safety-fuse for shells carrying large masses of high explosives, whereby the danger of accidental and premature explosion of said shell is prevented and an instantaneous explosion is insured immediately upon the shell striking any resisting object, such as armor-plates or earthworks. To attain this security from accidental and premature explosion, I provide a fuse wherein the detonating charge is normally located at such distance from the priming charge that it will not detonate said charge even though the fuse should itself explode. That is to say, the detonating charge or fuse, consisting of dry guncotton and a fulminating-cap, is preferably mounted in a thin shell or stock normally supported so as to occupy a central position in a strongly-constructed detonating-chamber, which thus locates the fuse at a considerable distance from the priming and main body of explosives, which, as they require a sharp detonation in immediate contact with them to cause their explosion, will not be effected by any premature or accidental detonation of fuse. This distance of detonating charge or fuse from priming charge is gradually decreased after the shell has been fired from the gun, and its velocity continues to decrease until finally when the shell has made a flight of several hundred yards the detonating charge or fuse has decreased the distance between it and the priming charge to *nil* and rests in close contact with the same. The percussion-cap of the detonating charge or fuse will then explode the same in the usual manner upon impact or retardation of the shell and thereby cause the almost instantaneous explosion of the priming and main charge of the explosives.

I obtain the before-stated results as follows: First, I provide a shell loaded with large masses of high explosives, said shell preferably having an open or partially open base through which the gases of the expelling charge may pass to the interior of the shell to equalize the internal and external pressures, thereby allowing the shell to be constructed of minimum weight and with a maximum of space for the explosive material; second, I provide a strongly-constructed chamber or chambers in which a priming of high-explosive material, such as guncotton containing only a small percentage of water, is located, and, third, I also provide a strongly-constructed chamber or chambers having an area much larger than that of the fuse, wherein a detonating cartridge or fuse is located, said chamber protecting the priming and main charges of high explosives from premature explosion even though the detonating-cartridge of the fuse should be accidentally or prematurely exploded.

It is a well-known fact that some high explosives, notably wet guncotton, will not explode by any ordinary concussion or blow, and that it is necessary to explode a strongly-charged detonating cap or cartridge in close proximity to such explosives to insure their explosion. This I accomplish by my mode of construction, while the detonating cap or fuse is kept apart from the priming charge and main body of explosive at least until the projectile has been discharged from the gun.

In the accompanying drawings, Figure 1 is a longitudinal section of a shell or projectile having a detonator with its priming-chamber and fuse at each end. Fig. 2 is an enlarged longitudinal section of priming and detonating cases, showing a plunger and fuse in the position they occupy in the shell before the latter has been fired from the gun. Fig. 3 is an enlarged longitudinal section showing the position of said plunger and fuse in the shell after it has been fired from the gun, the fuse having passed into the priming-chamber and being in close contact with the plunger.

In the drawings the projectile or shell is marked A and the main explosive charge B. The priming-chamber case C is preferably secured either to the head or base of the shell A, depending upon the location desired, or two detonating-cases may be used in each shell, one at each end, to insure against misfire. The detonator-chamber case D is preferably secured to the primer-chamber case

C. In the detonating-chamber D is located a percussion-fuse, which consists of a plunger *f*, held in place in a stock *g* by a brittle screw *h* or other suitable holding device, a detonating charge of dry guncotton K, held in one end of the plunger *f*, and a fulminate cap *m*, all contained and supported within a thin tube or container *n*. On the base of the plunger *f* is secured a soft metallic stud *p*, which will absorb some of the severe shock on the release of the holding device due to the firing of the gun.

In the forward part of the detonator-case D is secured a guide-tube O, the forward end of which is closed by a plunger R, normally held in place by the brittle screw *h'*, as shown in Fig. 2. The plunger *f* and also the plunger R are normally held in place by the brittle screws to guard against the fuse or detonating-cartridge coming into contact with the priming charge close enough to endanger same should an explosion of said fuse or detonating-cartridge occur prematurely.

S indicates the priming charge, preferably of guncotton, containing a smaller percentage of water than the main charge B.

W indicates an asbestos pad or washer.

When the shell is fired from the gun, the plungers *f* and R, being held to the shell only by the brittle screws, will break their fastenings and will set back the stud *p* on the plunger *f*, absorbing a portion of the shock, while the shoulders *r* on the plunger R strike upon the end of guide-tube O and prevent it from moving back too far

Fig. 3 shows the normal position of the fuse mechanism after the shell has been fired from the gun and reached a point, say, several hundred yards from the muzzle of same and has decreased its speed from the highest imparted by the gun.

The plungers R and *f*, being heavier than the mean density of the shell and combined contents and not being subjected to the exterior aerial resistance of said shell A, will in consequence attain forward movement relative to the shell, and after the shell has made a flight of, say, several hundred yards will reach the positions indicated in Fig. 3.

By constructing a shell loaded with high explosives of three distinct parts, as herein shown and described, the shell is protected from any accidental or premature explosion. These three parts are, first, the shell A, containing the large mass of high explosive, preferably wet guncotton; second, a priming-chamber case C, containing the more sensitive charge of guncotton or other explosive, and, third, a detonating-chamber case D, in which the most sensitive or initial explosive is located, said chamber being large and strong enough to withstand the full pressure exerted by an accidental or premature explosion of the detonating charge or fuse which is held therein without communicating any severe shock to the priming or main charge of explosives.

The detonating-chamber, as shown, is about thirty times as large as the fuse located therein. The initial explosive force of dry guncotton is estimated as above four hundred thousand pounds to the square inch when closely confined, and such force decreases in proportion to the increased area wherein it is exerted. My device is intended to so reduce it by providing increased area about it that the walls of the strongly-constructed chamber will be ample to withstand the shock. The required area may be easily computed, and thus by properly applying my invention any premature explosion of the fuse will result in no damage to the shell itself other than a misfire. The fuse should preferably be located in the axis of the chamber, so that the force of an accidental explosion will be distributed equally upon its walls.

It is obvious that modifications of my invention may be made. For example, the detonating charge or fuse might be located in various positions within the body of the shell. The shell may also be of various constructions, although I have shown the preferred form.

I claim—

1. In a high-explosive shell, a safety-fuse consisting of a chamber with walls of predetermined strength, with a fuse in said chamber, the cubical capacity of said chamber bearing a certain constant relationship to the cubical capacity of the fuse, whereby, when the said fuse is exploded in the said chamber, the force of the explosion is reduced to less than a rupturing strain of the chamber and the said explosion is isolated.

2. The herein-described improvements in fuses for high-explosive shells consisting of a chamber containing a priming charge of explosive material, a second chamber, a fuse normally held within said second chamber and a normally-closed passage between said chambers through which the fuse may pass during the flight of the shell, substantially as described.

3. The combination with an explosive shell of a detonator consisting of a chamber containing a priming charge of explosive material, a second or fuse chamber located in line therewith, a guide-tube connecting said chambers and a fuse normally held in the second chamber in line with said tube, said fuse-chamber being of a cubical capacity greatly in excess of that of the fuse contained therein, substantially as described.

4. The combination with an explosive shell of a detonator consisting of a priming-chamber having a priming charge of explosive material secured therein with a central passage or opening through the body of said charge, a detonating or fuse chamber, a fuse supported therein, a guide-tube connecting said chambers and a plunger normally supported within and closing said tube, substantially as described.

5. The herein-described improvement in fuses for high-explosive shells consisting of a

casing providing in one end thereof a priming-chamber, a second casing providing a detonating-chamber, a guide-tube connecting said chambers, a fuse normally held within said detonating-chamber in line with said tube and a plunger normally sustained within and closing said tube, said plunger and said fuse being adapted to be dislodged by momentum during the flight of the shell, substantially as described.

6. In a safety-fuse for high-explosive shells the combination with a detonator-casing having a priming-chamber and a fuse-chamber, a guide-tube connecting said chambers and a fuse-support located within the fuse-chamber and adapted to support the fuse in line with the guide-tube and said support being open to the fuse-chamber space whereby the shock of a premature explosion may be dissipated within said chamber, substantially as described.

LOUIS GATHMANN.

Witnesses:
M. C. MASSIE,
G. W. MCMULLEN.