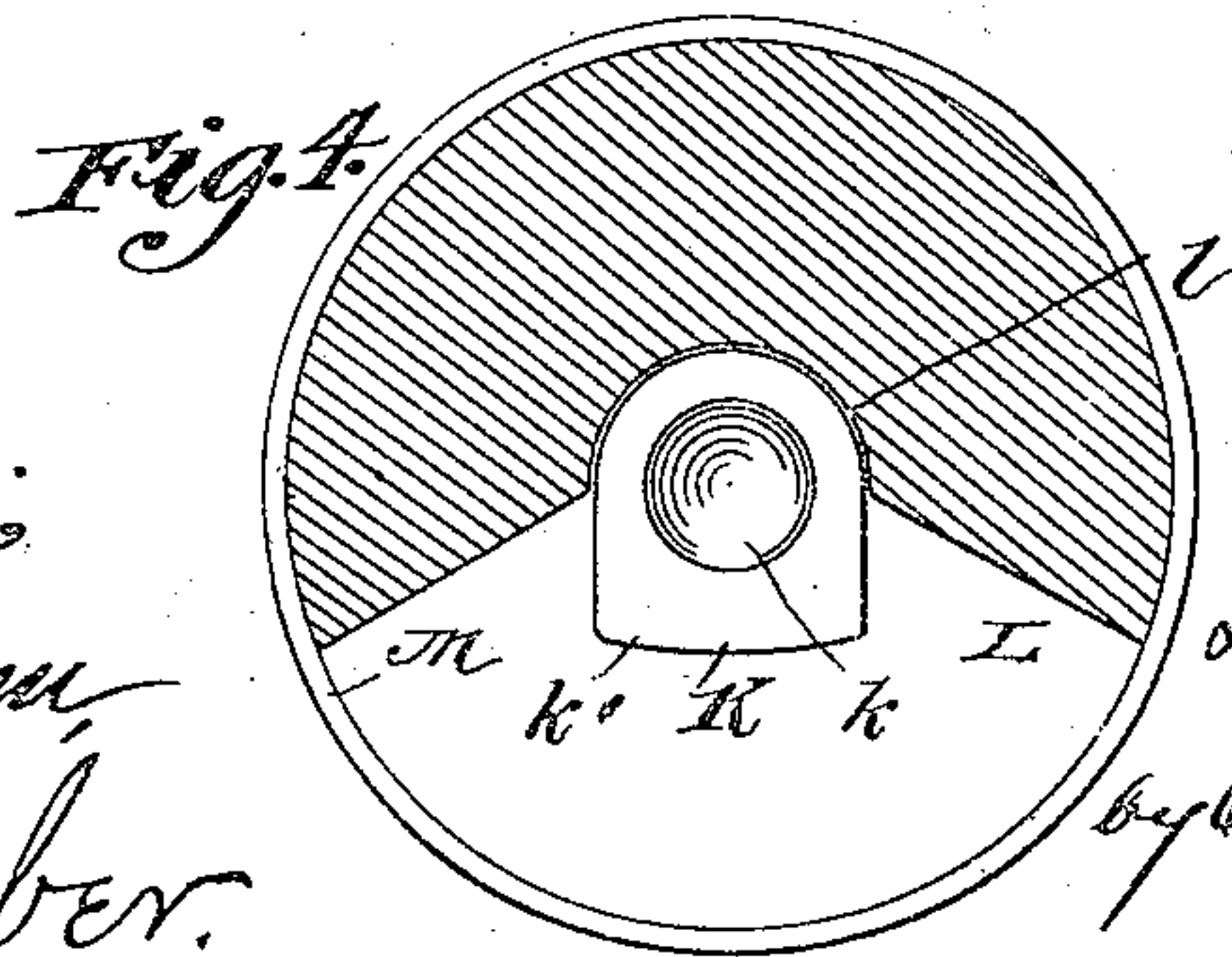
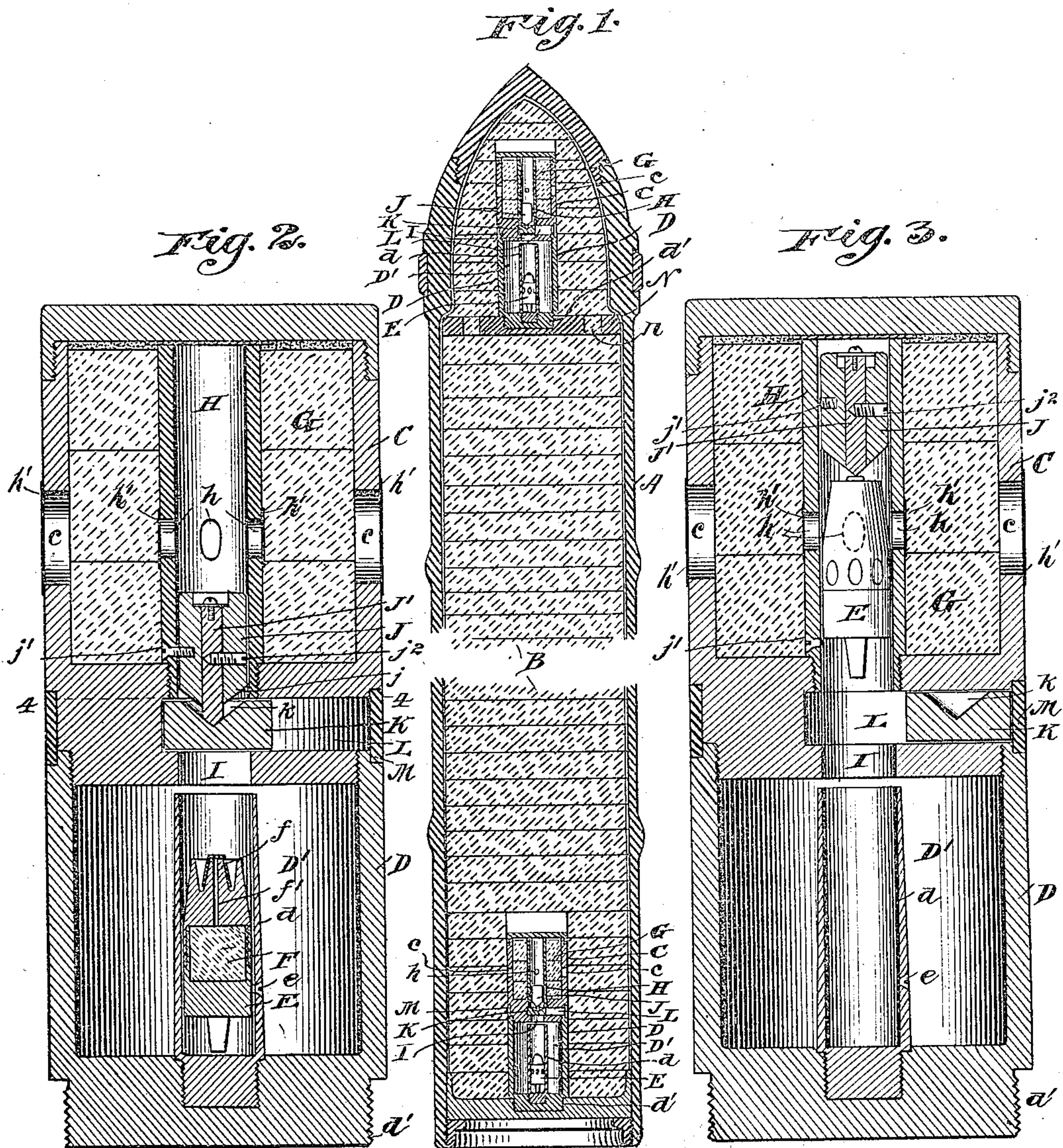


L. GATHMANN.
SAFETY FUSE FOR HIGH EXPLOSIVE SHELLS.

APPLICATION FILED DEC. 18, 1897.

NO MODEL.

2 SHEETS—SHEET 1.



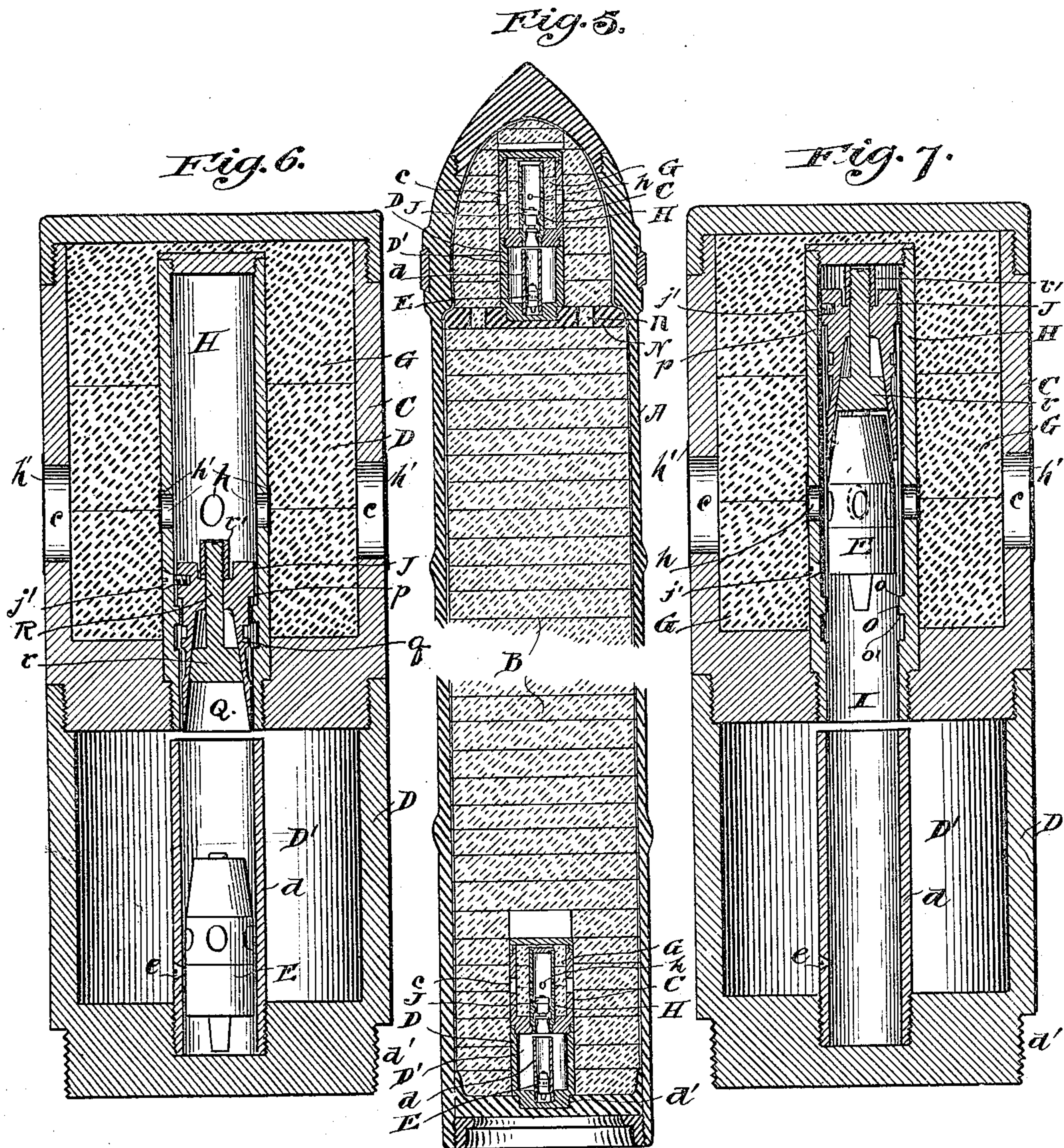
Witnesses,
J. J. Mann,
E. L. Huber.

Inventor,
Louis Gathmann
by Offield, Powell & Lullieum
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UNITED STATES PATENT OFFICE.

LOUIS GATHMANN, OF CHICAGO, ILLINOIS.

SAFETY-FUSE FOR HIGH-EXPLOSIVE SHELLS..

SPECIFICATION forming part of Letters Patent No. 734,697, dated July 28, 1903.

Application filed December 18, 1897. Serial No. 662,420. (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 safety-fuses for high-explosive shells, and is in the nature of an improvement upon the structure set forth in my Letters Patent No. 583,042, granted May 25, 1897.

The present improvement has for its object to insure the safety of the priming charge by positively preventing it from being affected by the gases produced by a premature explosion of the detonating charge. In my prior Letters Patent aforesaid I have described and claimed a construction wherein a fuse for high-explosive shells is provided with a chamber containing a priming charge of explosive material and a second chamber in which the detonating charge is normally contained and which has a cubical capacity of sufficient size and walls of sufficient strength to withstand the force of a premature explosion of the detonating charge, and a passage between said two chambers through which the fuse may pass during the flight of the shell.

In order to obtain the object of my present invention, I provide means for positively closing the passage between the two chambers, said means being controlled and operated by the pressure generated by reason of the explosion of the detonating charge in the fuse-chamber and serving, because of said premature explosion, to prevent the passage of the gases generated by said explosion from the fuse-chamber to the priming-chamber.

In the accompanying drawings, Figure 1 is a longitudinal section of a shell or projectile embodying my invention in one form. Fig. 2 is an enlarged longitudinal sectional view of the priming and detonating cases, showing the parts in the position they occupy in the shell before the latter has been fired from the gun. Fig. 3 is a view similar to Fig. 2, showing the position of the parts after the shell has been fired from the gun. Fig. 4 is a transverse sectional view taken on the line 4-4 of Fig. 2. Fig. 5 is a view similar to Fig. 1, illustrating a modified construction of the priming and detonating devices.

Fig. 6 is an enlarged sectional view of the priming and detonating devices shown in Fig. 5, the same being shown in the position they occupy in the shell before the latter has been fired from the gun. Fig. 7 is a view similar to Fig. 6, showing the parts in the position assumed by them after the shell has been discharged from the gun.

In its general features the present structure is similar to that set forth in my prior Letters Patent, hereinbefore referred to, A representing the shell, and B the main explosive charge of guncotton or other high explosive.

C indicates the priming-chamber case, and D the detonating-chamber case, the two being shown in the present instance as connected by providing the base of the former with an externally-screw-threaded portion, over which the correspondingly internally threaded upper end of the latter is screwed. The detonator-case D has walls of a sufficient strength, and the detonator-chamber D' is of sufficient capacity to withstand the pressure generated by the accidental explosion of the detonator normally contained therein, as set forth in my prior Letters Patent, and there is located in said chamber a tube or stock *d*, in which is located a plunger E, carrying a detonating charge F of fulminate or other suitable material, and provided at its outward end with a seat *f* to receive a percussion-cap of any improved type and a passage *f'*, extending from said seat to the charge of fulminate F. The priming-chamber case C has its chamber provided with a priming charge G of guncotton or other suitable explosive, and the walls of said case are provided with lateral apertures *c* to establish communication between the priming-chamber and the interior of the shell A.

H indicates a stock or tube mounted in the priming-chamber, the rear stock *d* and front stock H being arranged in line with each other, and preferably with their axes coincident with the axes of the cases and of the shell, and there is provided a passage I in line with the two stocks and formed in the present instance in the base of the priming-chamber case C and adapted to permit the passage of the plunger E from the rear stock to the front stock after the shell has been fired from the gun.

J indicates a plunger movable within the front stock H, its rear end being preferably conical, as shown at *j*, and there is mounted in said plunger a pin *J'*, extending longitudinally of the same and normally projecting rearward from the said plunger a short distance, as shown in detail in Fig. 2. The plunger J is secured to the stock by means of a brittle screw or break-pin *j'*, and the pin *J'* is secured in the plunger by means of a similar brittle screw or break-pin *j''*, while the plunger E is secured in the stock *d* by means of a brittle screw or break-pin *e*, the said plunger being normally held at the rear ends of their respective stocks by said screw or pin, as shown in Fig. 2.

The passage I between the detonating-chamber and the priming-chamber is controlled and normally closed by a block or plug K, preferably constructed of copper or some other relatively soft metal, there being provided a lateral recess L, extending from the passage I to the side of the casing C, said recess increasing in width outwardly, as shown in Fig. 4, while its inner portion I is semi-circular in form and of greater diameter than the passage I, so as to form seats for the block or plug K. This latter is of sufficient width to close the passage I when in the position shown in Figs. 2 and 4 and is normally held in that position by the engagement of the pin *J'* of the plunger J with a recess *k* in the upper surface of the block or plug. The block or plug is not symmetrical with respect to the axis of the passage I and of the cases and shell, being provided with a laterally-projecting portion *k'*, which extends outward into the recess L. The recess L is closed by a band or ring M, which is held in position between the cases C and D when the two are screwed together and by the removal of which access may be had to the recess L in an obvious manner.

Openings *h* are provided in the walls of the stock H to establish communication between the interior of said stock and the priming-chamber of the case C, these openings being preferably located opposite and in line with the openings *c* of the said case and both sets of openings being provided with thin metallic coverings *h'*, which will readily yield to internal pressure.

The device thus constructed operates in the following manner: In case of a premature explosion of the detonating charge carried by the plunger E the chamber D' will, as set forth in my prior Letters Patent, resist the force of this explosion and not be ruptured thereby. The pressure of the gas, however, will be exercised against the under face of the block or plug K and will force the said block or plug upward against its upper seat and will thereby positively close the lower end of the stock or tube H and prevent the heated gases produced by the explosion from having access to the priming charge G. In the normal use of the shell, however, after

the same has been fired from the gun, the screws or pins which hold the plungers E and J will be broken in the manner set forth in my prior Letters Patent, and after the shell has passed some distance from the gun these plungers will move forward into and assume the position shown in Fig. 3. The forward movement of the rear plunger E into the front stock H is permitted by the lateral movement of the block or plug K, which latter, owing to the rapid rotary motion imparted to the shell after it leaves the gun, will be carried laterally outward by centrifugal force into the recess L, as shown in Fig. 3, thereby opening the passage I and permitting the plunger E to move forward into the position shown in Fig. 3. This lateral movement of the block K is assured by reason of its center of gravity being located at one side of the axis of the shell, such location being due to the non-symmetrical form given to it in the manner heretofore pointed out by reason of its laterally-projecting portion *k'*. When the parts are in the position shown in Fig. 3, the striking by the shell of a suitable resistance will cause the explosion of the detonating charge in the plunger E by reason of the contact of the percussion-cap carried by said plunger with the pin *J'* or the end of the plunger J, and, as shown in Fig. 3, this will occur when said detonating charge is opposite the apertures *h* in the stock H, so that the explosion of said charge will be communicated to the priming charge G, and thence through the opening *c* to the main charge B of the shell.

In Fig. 1 I have shown a shell provided with a detonating and priming charge located at each end; but either one of these detonating and priming charges may be omitted. In said construction I have shown the device in the front of the shell as supported therein by providing the base of the detonating-chamber D with a screw-threaded portion *d'*, which screws into a diaphragm N, having apertures *n* establishing communication between those portions of the shell lying on opposite sides of said diaphragm. The device in the lower portion or base of the shell is shown as screwing directly into the said base.

In Figs. 5, 6, and 7 I have shown a modified form of construction, in which the front stock H is extended through and forms a lining for the passage I between the front and the rear stocks, said front stock H being provided with an internal ring or annular projection O, the forward shoulder *o* of which forms a seat, against which a corresponding shoulder *p* on the plunger J abuts when the shell is fired from the gun and the break screw or pin *j'* is broken, these shoulders by their abutments serving to stop and limit the rearward yielding of the plunger J at the initial movement of the shell. In the construction shown in said Figs. 5, 6, and 7 the laterally-yielding block or plug K is dispensed with and the plunger J has a longi-

itudinal aperture Q of gradually-increasing width rearwardly, so that the rear portions of the walls of said plunger are comparatively thin and capable of expanding and yielding outward. There is provided externally on this portion of the plunger J a ring or projecting annulus q, which is adapted to engage with the rearmost shoulder o' of the annular projection O of the front stock when the plunger is expanded.

R indicates a pin extending longitudinally through the opening Q in the plunger J and having at its rear end a conical plug r, which conforms to the taper of the rear portion of the opening Q. A suitable nut or cap r' is provided on the forward end of the pin R.

The device thus constructed operates in the following manner: In the case of a premature or accidental explosion of the detonator in the chamber D' the pressure of the gas in said chamber will be exerted on the plunger J by acting upon the rear exposed face of the conical plug r of the pin R and will force this plug forward, thereby expanding the rear portion of the plunger and causing the annular projection or shoulder q of the plunger to engage the shoulder o' of the projection O, and thus arrest the forward motion of the plunger J. Further pressure will expand the said plunger so as to firmly close the passage I by reason of said expansion and by reason of the contact of the ring q with the ring O, and thereby positively prevent the passage of the gas generated by the explosion into the priming-chamber. Under normal conditions, however, when the shell is fired from the gun the screws or pins j' and e will break and the plunger J and E will move forward in the manner already described into the position shown in Fig. 7 and will operate to explode the priming and main charges in the manner already set forth.

It is obvious that various modifications in the details of construction may be made without departing from the principle of my invention. For example, the shell and the cases may be constructed in various manners, and different means for connecting the same may be employed. It is, moreover, obvious that the fuse may be considered as a small shell or, in other words, that the principle of the invention embodied in the fuse may be embodied in a shell.

I therefore do not wish to be understood as limiting myself strictly to the precise construction shown and described.

I claim—

1. The herein-described improvement in fuses for high-explosive shells, consisting of a chamber containing a priming charge of explosive material, a second chamber, a detonator normally held within said second chamber, a passage between said chambers through which the detonator may pass during the flight of the shell and means controlled by excess of pressure in the second chamber for

positively closing the passage between said chambers, substantially as described.

2. The combination with an explosive shell, of a fuse, comprising a chamber containing a priming charge of explosive material, a second or detonator chamber in the rear thereof, a passage connecting the two chambers, a detonator normally held in the second chamber in line with said passage and adapted to pass through the same during the flight of the shell and means controlled by an excess of pressure in the detonator-chamber for positively closing said passage, substantially as described.

3. In a device of the character described, the combination with a casing having a priming-chamber at its forward end, a detonator-chamber in the rear thereof, a detonator normally held within said latter chamber, and a passage connecting the two chambers, of a block or a plug located in said passage and adapted to positively close the same upon an excess of pressure in the detonator-chamber and to be moved laterally by the rotation of the shell to open said passage after the shell is fired from the gun, substantially as set forth.

4. In a device of the character described, the combination with a fuse-casing having a priming-chamber and a detonator-chamber and a connecting-passage, of guide-tubes one in each chamber in line with said passage, a plunger normally held in each guide-tube adapted to be freed by the shock of firing, and a laterally-movable block or plug normally held in said passage by engagement with the forward plunger and adapted to positively close said passage upon any excess of pressure in the detonator-chamber and to be moved laterally outward by the rotation of the shell when the said plunger is freed, substantially as set forth.

5. In a safety-fuse of the character described, a detonator-casing comprising a detonator-chamber opened and internally threaded at its forward end, a priming-chamber externally threaded at its base to screw into the detonator-chamber, a connecting-passage extending longitudinally through said base, a lateral recess adapted to receive a safety block or plug extending through said base from the passage to the side of the casing and a ring or band clamped between the two cases and closing the mouth of said recess, whereby, when the two parts of said casing are unscrewed, said ring or band may be removed to give access to said recess, substantially as described.

6. In a safety-fuse for high-explosive shells, a priming-case adapted to contain a priming charge of gun cotton or the like and provided with openings in its lateral wall having yielding coverings of thin metal, a guide tube or stock extending longitudinally of said chamber and provided with lateral openings located opposite those of the casing and having external yielding coverings of thin metal, and

a detonator adapted to move longitudinally of said tube or stock and to be opposite said openings when in position for explosion, substantially as described.

- 5 7. A shell for high explosives provided with a fuse way or channel and a lateral recess or chamber, in combination with a barrier or partition normally closing said fuse way or channel and movable into said lateral recess or chamber during the flight of the shell, substantially as described.

8. In a shell, a bursting charge, a fuseway, a detonator adapted to move therein, and a barrier effectually closing the fuseway, whereby, upon the accidental or premature explosion of the detonator the fuseway is blocked thereby preventing the passage of the gases from the detonator to the bursting charge.

9. In a shell, a bursting charge therein, a fuseway, a detonator adapted to move in the fuseway, and a barrier positively engaging and closing said fuseway, so as to confine the gases from the detonator in case of the accidental or premature explosion of the detona-

tor, and means to move said barrier when the shell is propelled from the gun. 25

10. For use in an explosive shell, a closed fuse-tube having its walls reduced or weakened at or near its front end to enable the detonator-gases to rupture the same and fire the shell charge, with a detonator in its rear end and a block or barrier secured in said fuse-tube between the detonator and the weakened portion of the same to prevent the gases from the detonator reaching the weakened portion of the fuse-tube and firing the shell charge in case of an accidental or premature explosion of the detonator. 30 35

11. In a shell, a bursting charge, a fuseway, a detonator adapted to move therein, and a barrier or block arranged to close the fuseway and constructed to be moved by the rotary motion of the shell when propelled by the gun, as set forth. 40

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