

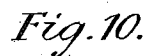
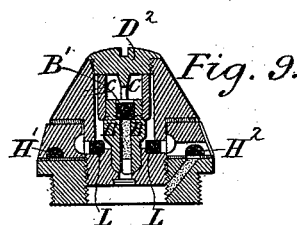
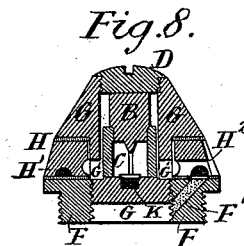
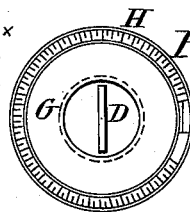
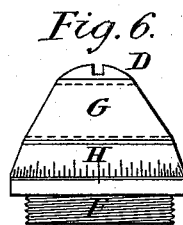
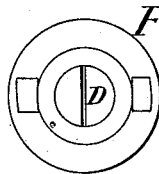
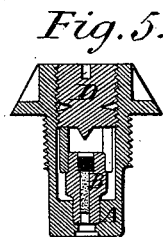
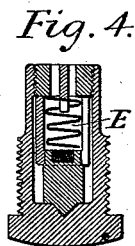
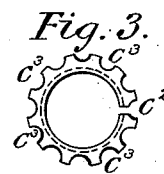
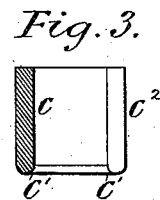
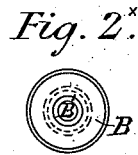
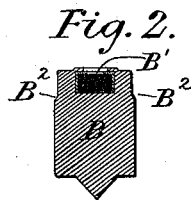
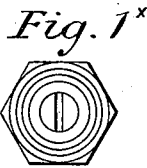
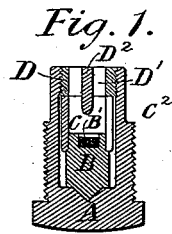
(No Model.)

T. NORDENFELT.

SHELL FUSE.

No. 381,717.

Patented Apr. 24, 1888.



Witnesses
Baltus D. Long
Lloyd B. Wright

Inventor
T. Nordenfelt,
By [Signature]
[Signature]

UNITED STATES PATENT OFFICE.

THORSTEN NORDENFELT, OF WESTMINSTER, ENGLAND.

SHELL-FUSE.

SPECIFICATION forming part of Letters Patent No. 381,717, dated April 24, 1888.

Application filed July 12, 1887. Serial No. 244,084. (No model.) Patented in England February 13, 1884, No. 3,235; in France February 15, 1884, No. 160,354; in Italy December 31, 1884, No. 17,765, and in Spain September 2, 1885, No. 5,043.

To all whom it may concern:

Beit known that I, THORSTEN NORDENFELT, a subject of the King of Sweden, residing at 53 Parliament Street, in the city of Westminster, England, civil engineer, have invented certain new and useful Improvements in Fuses for Projectiles, (for which I have received Letters Patent in Great Britain, No. 3,235, dated February 13, 1884; in France, No. 160,354, dated February 15, 1884; in Italy, No. 17,765, dated December 31, 1884, and in Spain, No. 5,043, dated September 2, 1885,) of which the following is a specification.

The object of my invention is to produce fuses for use in all kinds of shell projectiles which shall be more simple in construction, more reliable in action, and safer in transport than the fuses of many kinds now employed.

In most percussion-fuses hitherto adopted the parts which control the ignition, and at the proper time cause the fulminate to be struck, consist of a hammer and a mantelet. The latter is held in position to prevent the hammer from moving forward prematurely by various means.

In my improved fuse I support the mantelet by forming the hammer with a larger diameter or shoulder at one end, against which shoulder the mantelet rests, and thus holds the hammer in position. I make the mantelet of drawn brass, or of other metal having suitable elasticity, and split or divide it on one side from end to end, so that pressure will cause the mantelet to open out sufficiently for its edge to pass the shoulder on the hammer and glide over the entire length of the hammer, and thus leaving the hammer free to run forward on impact. The elasticity of the mantelet also insures its adhesion to the hammer, so that the stroke against the cap or fulminate is given by the aggregate weight of the hammer and mantelet.

This fuse can be used in the point of the projectile as well as in its base. In the former case the flash passes through a hole in the hammer; in the latter case I have one or more openings through the screwed cover of the fuse. I can place the cap or detonating cap composition either in the hammer, in which case a needle hard point is fixed in the cover, or I can place the cap or fulminate in the cover and then the pointed hammer, or a nee-

dle inserted into it, strikes the cap or composition. By this method I also produce a very simple and effective time-fuse, which I can easily combine with a percussion-fuse.

When making a separate time-fuse, I place the hammer in front of the mantelet, so that on the discharge of the cartridge the inertia of the hammer overcomes the resistance of the split mantelet, and a blow is struck upon the fulminate with sufficient energy to ignite it, and the ignition passes to the usual fuse-ring, and thence to the bursting charge. The time for the burst is regulated in the usual manner by turning a movable collar.

When making a combined percussion and time fuse, I place the mantelet in front of the hammer, so that the fuse for percussion is "armed" on discharge by the split mantelet gliding back over the thicker portion of the hammer; also, at the moment of discharge, the receding mantelet, at or near the last part of its rearward movement, strikes and ignites a detonating composition, which communicates the flash, through a circular channel and an orifice, to the usual ring-fuse, which is placed in a movable collar. When the ring-fuse has burned until the flame reaches the hole leading into the shell, the bursting charge is exploded. The movable collar will of course be adjusted as usual for the ring-fuse to burn the required time for the range fired at.

The space between the hammer and the cover before the fuse is armed enables me to put in a light spiral spring, as sometimes used in other fuses, for holding the hammer in position before impact, to secure the full length of stroke.

The construction of the single fuse is simpler than that of any other fuse which is armed on discharge, and the combined percussion and time fuse is much simpler than those generally used.

The safety of the fuse is gained by the fact that no shaking to which the fuse may be exposed in transport, however long continued, can overcome the elasticity of the mantelet or cause it to move back the full length of the hammer, without which the fuse is not armed. It will also be found easier in manufacture on a large scale to secure the same elasticity to split tubes than to insure suspending wires of

very small dimensions always offering the same support to the mantelet.

In order that my said invention may be most fully understood and readily carried into effect; I will proceed to describe the drawings hereunto annexed.

In the drawings, Figure 1 is a longitudinal section, and Fig. 1^x an end view, of a percussion-fuse constructed in accordance with my invention and adapted to be screwed into the base of a shell. Fig. 2 is a longitudinal section, and Fig. 2^x an end view, of the hammer to a larger scale. Fig. 3 is a longitudinal section, and Fig. 3^x an end view, of the mantelet to the same enlarged scale. Fig. 4 is a longitudinal section, and Fig. 4^x an end view, of a percussion-fuse similar to that shown at Figs. 1 and 1^x, excepting that a light spring is inserted to insure that the hammer shall remain in place until the instant when the shell strikes. Fig. 5 is a longitudinal section, and Fig. 5^x an end view, of a percussion-fuse of like construction, but adapted to be screwed into the nose or fore part of a shell. Fig. 6 is a side elevation, Fig. 7 an end elevation, and Fig. 8 a vertical section, of a time-fuse. Fig. 9 is a vertical section, and Fig. 10 a horizontal section, of a combined time and percussion fuse.

In Figs. 1 1^x, 2 2^x, and 3 3^x, A is the body of the fuse, with the usual central chamber, and which enters and is screwed into the fuse-passage in the base of the shell. B is a hammer, normally at rest at one end of the fuse-chamber. C is the mantelet, normally at rest at the opposite end of the fuse-chamber, and D is the cover. The cover, when screwed into the body of the fuse, keeps the hammer and mantelet in place. D' D' are passages through the cover to permit the fire from the fuse to pass to the charge. B' is the patch of fulminate upon the hammer, and D² is the pin upon the cover, with which the fulminate is brought in contact at the time of impact. The hammer, as will be seen, has a conical surface upon it at B², and the mantelet has a corresponding surface at C'. The mantelet is split from end to end at C², and it may be grooved longitudinally at C² C² to adjust its elasticity. Its internal diameter is such as to fit upon the upper end of the hammer; but when the gun is fired the inertia or tendency to remain at rest of the mantelet causes the hammer, which instantly moves with the shell, to be thrust into its interior, the slit C² in the mantelet opening to admit of this taking place. When the forward movement of the shell is checked on its striking an object, then the momentum of the hammer and mantelet causes the patch of fulminate B' to strike against the pin D², it explodes, and the flash passes to the charge in the shell.

The percussion-fuse shown at Figs. 4 and 4^x is similar to that above described, except that a light spring, E, is inserted to insure that the hammer shall remain in place until the instant when the shell strikes.

In the percussion-fuse shown at Figs. 5 and

5^x the cover D is without perforations, but a passage is bored through the hammer B, and also through the inner end of the body A. The hole in the hammer may be charged with priming-powder. The fulminate is exploded in the same way as before, it communicates the fire to the priming-powder, and so to the charge within the shell.

In the time-fuse shown at Figs. 6, 7, and 8, F F is the base of the body of the fuse, adapted to be screwed into the nose or fore part of the projectile. The body has also a chamber, in this instance, formed through it centrally from end to end in its base and in its fore part, which consists of the piece G, screwed into the base. The parts F and G, constituting the fuse-body, confine between them the ring H, the under side view of which is similar to that shown at Fig. 10. This ring has a groove, H', formed in it on its under side, passing nearly but not quite around the ring. The groove is filled with time-fuse composition, such that if the composition be ignited at one end it will take many seconds to burn out to the other end. The part F of the body also has a passage, F', bored in it, which is charged with priming-powder. The outer end of this passage F' coincides with the groove H', in which the fuse composition is contained. The part G receives within it the hammer B and mantelet C, as before, and these parts are kept in place by the cover D. In the manner already described, when the shell is fired from the gun, the hammer enters the mantelet. At the same time the hammer strikes the patch of fulminate at K, at the inner end or base of the central chamber, and explodes it. The fire passes out by the apertures G' G' in the piece G, and by the passage H² in the ring H, and so it reaches the commencement of the fuse composition. The fuse composition commences to burn, and it continues to do so until the passage F' is reached, when the priming-powder therein is fired and the bursting of the shell ensues. The ring H is capable of being turned in the usual way to adjust the time between the firing of the shell from the gun and the bursting, which is done by placing a greater or less length of the fuse composition in the groove H', between the point where the composition is ignited in the passage H² and the vent F' in the piece F, by which the flame passes to the charge. The ring H is graduated externally to seconds and fractions of seconds, or in other ways, to facilitate adjustment for use.

The fuse shown at Figs. 9 and 10 is similar in many of its features to the fuse last described. In this case, however, it is the mantelet which by its inertia fires the fulminate by which the fuse composition in the groove H' is ignited. L L are caps containing fulminate inserted into radial holes in the part G. These are struck by the mantelet C, when it slides onto the hammer at the time when the shell is fired from the gun. The fire passes out by the passage H² and ignites the composition in the groove H'. The fuse then operates as a time-

fuse in the manner already described; but if before the end of the time to which the fuse has been set the shell should strike an object, then immediately the momentum of the hammer and mantelet Band C carries them forward, the patch of fulminate B' on the hammer comes into contact with the pin D² on the cover, the flash from the explosion passes through the hole in the hammer to the charge, and the shell bursts independently of the time arranged.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. The combination, substantially as set forth, of the body of the fuse having the central chamber, the mantelet consisting of a ring cylindrical on its interior and split from end to end, occupying one end of the chamber and movable endwise thereof, the hammer at the opposite end of the chamber and adapted to move endwise thereof, with its end toward the mantelet of reduced diameter and yieldingly embraced thereby, said hammer being cylindrical on so much of its surface as is at any time to be embraced by the mantelet and the fulminate, whereby the hammer and mantelet are normally held in position of safety, while on firing the gun the hammer becomes surrounded throughout its length, or nearly so, by the mantelet, and is set free to move with the mantelet, thereby exploding the fulminate upon impact of the shell.

2. The combination, substantially as set forth, of the body of the fuse having the central chamber, a hammer at one end of the chamber, a split-ring mantelet at the opposite end thereof and embracing one end of the

hammer, and with difficulty movable along it toward its opposite end, the fulminate at the inner end or base of the central chamber fired upon movement of the hammer, the time-fuse ring capable of being turned around the body and about the inner end of its central chamber, and the slowly-burning time-fuse composition contained in the ring, to which the fire from the fulminate passes, the whole so arranged that on firing the gun the hammer travels relatively to the mantelet, and the time-fuse composition becomes instantly ignited.

3. The combination, substantially as set forth, of the fuse-body having the central chamber, a hammer and a split-ring mantelet at opposite ends of the chamber, with the mantelet embracing one end of the hammer, and with difficulty movable along it toward the other end, the rear fulminate at the inner or base end of the central chamber fired upon movement of the mantelet, the time-fuse ring capable of being turned around the body and about the inner end of its central chamber, the slowly-burning time-fuse composition contained in the ring, and to which passes the fire from the fulminate at the inner end of the central chamber, and the front fulminate fired upon movement of the hammer, whereby on firing the gun the mantelet travels relatively to the hammer and at once ignites the rear or time-fuse fulminate, at the same time setting the hammer free to be thrown forward to ignite the front or percussion fuse fulminate upon impact of the shell.

THN. NORDENFELT.

Witnesses:

GUSTAF ROOS,
F. A. NOEL.