No. 608,125.

Patented July 26, 1898.

H. P. HURST.

HIGH EXPLOSIVE SHELL AND FUSE THEREFOR.

(No Model.)

(Application filed Apr. 28, 1897.)

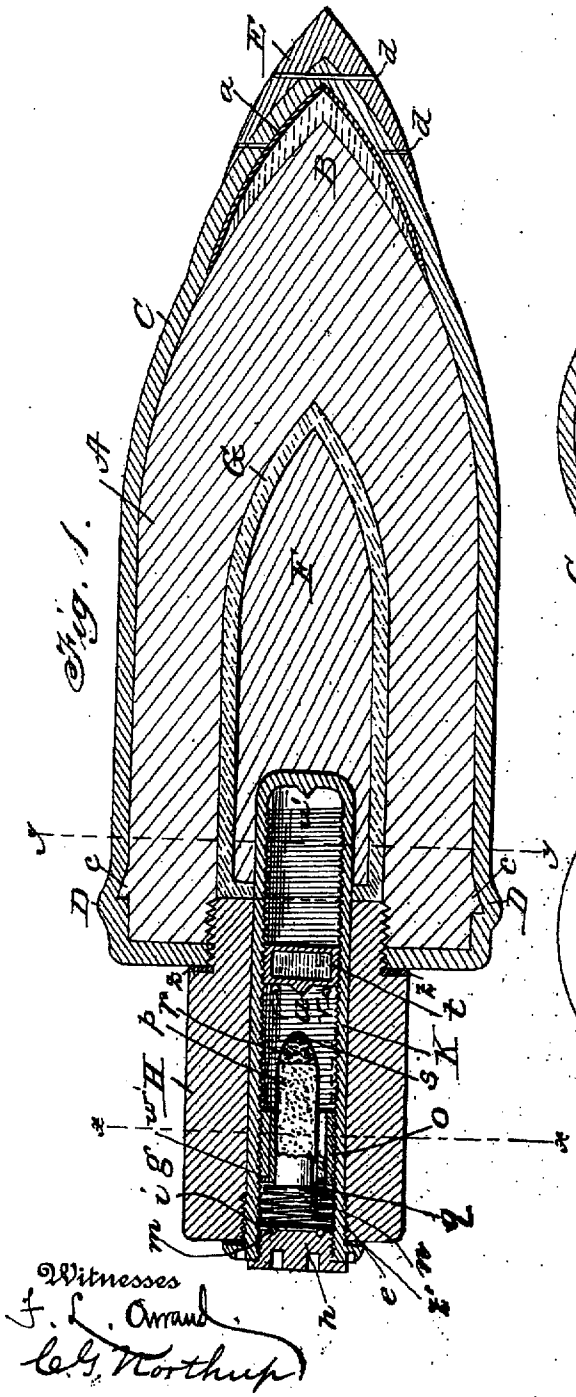

Fig. 1.

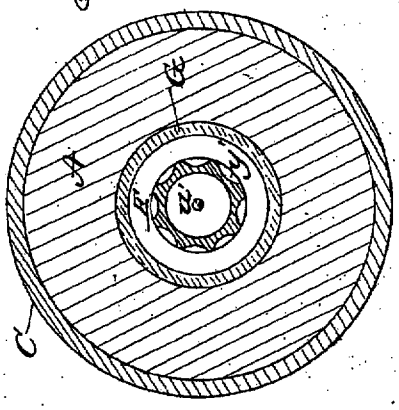

Fig. 3.

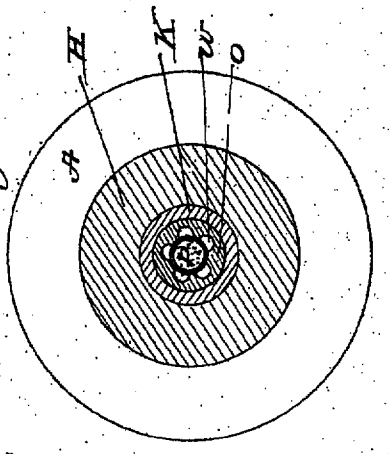

Fig. 2.

Witnesses

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HIGH-EXPLOSIVE SHELL AND FUSE THEREFOR.

SPECIFICATION forming part of Letters Patent No. 608,125, dated July 26, 1898.

Application filed April 28, 1897. Serial No. 634,236. (No model.)

To all whom it may concern:

Be it known that I, HARRIS P. HURST, a citizen of the United States, residing at Summit, in the county of Pike and State of Mississippi, have invented certain new and useful Improvements in High-Explosive Shells and Fuses Therefor; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to projectiles and shells, particularly of the armor-piercing and high-explosive class, and the fuse and fuse-fitting for detonating the high explosive.

The object of the invention is to produce a shell that will be effective against hard-faced armor and at the same time be capable of carrying a high-explosive charge so arranged as to detonate only on retardation or at the impact or after the impact and at the same time to provide a fuse that will work effectively, but be harmless until the shell has left the bore of the gun.

In the shell in use the fuse or detonator, if exploded accidentally or prematurely, in all instances will fire the shell charge. I propose to isolate the fuse and the bursting charge by a barrier to be composed of any suitable material, of steel or other metal, of a saturating substance, or a fluid—as, for instance, water—and in some experiments, made before the filing of this application, I have succeeded in preventing the ignition of the charge when the igniter was ignited by placing between the igniter and the charge a substance which upon the explosion of the igniter strained the fire or saturated the bursting charge to that degree that it was incapable of being fired by the igniter.

I also propose to chill or freeze nitroglycerin or its compounds—dynamite. This substance has been fired when in a chilled or frozen condition; but heretofore no effort has been made to prevent the excessive heating of the layer of explosive lying next to the shell-walls, which when heated to a temperature of 356° or more explodes spontaneously. I propose to surround the frozen explosive by a substance that will absorb the heat and thaw out the explosive so that it may be in a condition to be detonated by the igniter or by the excessive heat imparted to the shell on impact.

I attain these objects in the following manner, reference being made to the accompanying drawings, on which letters of reference are used to illustrate the various parts.

Figure 1 is a longitudinal section of my invention. Figs. 2 and 3 are cross-sections on lines *x x* and *y y*.

A represents the body of a hard-metal projectile having an armor-piercing point B.

In Fig. 1 I show in the shell-cavity a frozen-dynamite charge F, surrounded by a coating of ice or chilled water G, presenting a barrier to the introduction of excessive heat to the dynamite charge. In the rear portion of the shell is a fuse-container H, having a fuse-tube K, held in position by screw-threads *e*. The forward portion of this fuse-tube K extends into the mass of frozen dynamite. At the rear of tube K is a removable plug *h*, closing the fuseway and having a plate *i*, seated on roller-bearings *m*. In front of this plate is a coiled spring *n*, held under compression by the thimble *o*. Through this thimble extends the detonator *p*. The detonator is contained in a case having at the rear thereof pins *q* to prevent forward motion. In the forward portion of the detonator-case may be a delayed-action fuse *r*, and in front of the case is the primer *s*, for firing the fuse charge. In front of the detonator is a fluid-tank *t*, having a nipple *u* and resting against studs *v*, preventing rearward motion. The fluid-tank *t* may be omitted, and in its place the forward portion of the tube may be filled with water or other fluid and the nipple *u* moved up to the forward portion of the tube, as shown by *u'*. The interior of the fuse-tube is screw-threaded in the reverse direction of the rifling of the gun and the thimble *o* correspondingly screw-threaded. The thimble *o* has passages *w*, closed at the rear by a frangible material *w'*. One of these channels *w* is shown in the unshaded portion on the bottom of thimble O in Fig. 1.

When the shell is fired, the rotary motion imparted to the shell by the rifling of the gun will cause the thimble *o*, assisted by the coiled spring, to move forward in the fuse-

tube, the shock of firing rupturing the frangible partitions w', causing the flow of the fluid in the tube to the empty space or cavity in the rear of the detonator, and when the thimble has reached the studs v, which may be placed at any desirable point, the forward progress of the detonator is arrested. On impact of the shell the pins q at the rear of the detonator are sheared off by the thimble o and the primer s brings up against the nipple u' in the forward portion of the fuse-tube. In the meantime the layer of ice G has become warm water, thus thawing out the frozen dynamite F, and when the detonator brings up against the nipple u' the dynamite is in the condition to be exploded. The thimble o may be fitted loosely in tube K and held from forward motion by studs v, placed against the forward portion of thimble o, and if the water-tank is used the shock of impact will send the water-tank to the far end of tube K, it also being fitted loosely, and become wedged in the forward portion of this tube. On impact of the shell the detonation will be exactly as heretofore described, the primer being exploded by the nipple u. The object of the water-tank is to prevent the detonation of the explosive F in the event the detonator is set off or exploded in the gun by the shock of firing or otherwise, and whether used as shown or the detonator surrounded by a fluid the object to be attained is the same. If the explosive F were wet guncotton and the detonator exploded in the position shown in Fig. 1, the water-tank t, if made with thin walls, would be ruptured and the water thrown to the front end of the closed tube, the thinned walls y' of the fuse-tube being also ruptured, the guncotton would receive an excess of water, thereby making it impossible for the detonator, when exploded accidentally or prematurely, to detonate the freshly-saturated wet guncotton. In either case described the tank t or the column of water forms a barrier and serves as a stop to prevent the burning gases from reaching the bursting charge in the shell. Pressure on the tank t causes the fluid to spread the tank, and thus grip and close the fuseway more effectually than if the tank were a solid block, and if the tank were ruptured the water would strain the burning gases and take the fire out before reaching the bursting charge. The fuse-tube is shown with strongly-closed walls, leaving a large space unoccupied in the fuse-tube in front and in rear and around the detonator, as shown in full lines, this unoccupied space forming a fuseway and a safety-chamber at the same time.

Many modifications may be made of this invention without departing from the letter and scope and intent of the same—as, for instance, the tank t is shown as a screw-threaded block, with a fluid center, and is fitted into the screw-threaded fuseway of tube K in such a manner that in case of accidental or premature explosion of the detonator the block t will positively block up and close the fuseway and present an effectual barrier to the passage of the burning gases of the detonator to the bursting charge in the shell-cavity, thereby making the shell charge practically non-detonating until the shell has been fired from the gun and the barrier moved in the fuseway during the flight of the shell.

The armor-piercing and other shells in use can easily have the bursting charge and fuse-fitting, illustrated and described herein, applied thereto without altering the general design, and some of the existing detonators can also be made use of in my system.

I am not aware that any one has heretofore made, shown, or described a shell having a positively-engaging block or effectual closure for the fuseway, and I desire to protect my invention broadly without regard to the means I employ to accomplish the desired result.

It is the intention to have the fuse-tube K easily removable, and it may be arranged to be inserted just before the shell is put into the gun. Gas-checks Z and Z' may be provided. The diameter of detonator p may be equal to interior of fuse-tube K, and this may be done by enlarging the forward portion of detonator p, as is shown in dotted lines of Fig. 1.

What I claim is—

1. 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.

2. 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 detonator, and means to move said barrier when the shell is propelled from the gun.

3. A shell carrying therein a chilled or frozen explosive and a chilled or frozen fluid in operative relation therewith.

4. A projectile having a chilled or frozen explosive therein surrounded by a chilled or frozen fluid, as set forth.

5. A projectile having a chilled or frozen explosive therein, a chilled or frozen fluid interposed between said explosive and the walls of the shell-cavity, and means to detonate said explosive, as set forth.

6. A high-explosive shell carrying a detonator and a fluid in operative relation thereto, and means to move said fluid out of the way of said detonator, as set forth.

7. A high-explosive shell carrying a detonator, means for isolating said detonator consisting of a fluid barrier, and means to move the location of said barrier, as set forth.

8. A shell having an explosive charge there-

in, a detonator carried by said shell and an interposed fluid between said charge and said detonator, as set forth.

9. In a shell the bursting charge therein, a detonator therefor, and means to saturate said charge on the accidental or premature bursting of said detonator, as set forth.

10. In a high-explosive shell, the bursting charge therefor, a detonator carried by said shell, and an isolating fluid for said detonator, as set forth.

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.

12. A projectile having an explosive therein, a detonator carried by said projectile, and an interposed fluid between said detonator and said explosive, and a delayed-action fuse, all combined, as set forth.

13. A high-explosive shell having a detonator, a fluid interposed between the detonator and the explosive charge, and an empty space or cavity adapted to receive the fluid after firing the shell and before detonation of the high explosive, as set forth.

14. A shell having a fuse-container, a fuse-tube carried thereby having a removable plug securing in said tube a detonator and a fluid, as set forth.

15. 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.

16. A shell, a fuseway connected thereto, a detonator carried by a thimble having venting grooves or channels therein, said thimble adapted to move in the fuseway, as set forth.

17. In a shell, an internally-grooved fuseway, a detonator adapted to move in said fuseway, said fuseway being grooved in reverse direction of the rifling of the gun, as set forth.

18. A shell having an explosive charge, a detonator carried thereby and a fluid-tank therein, said tank provided with means to explode said detonator, as set forth.

19. A shell having a detonator carried by a thimble fitted in a fuse-tube, a spring bearing upon said detonator and seated upon a roller-bearing plate or disk, as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

HARRIS P. HURST.

Witnesses:

F. L. OURAND,

A. K. WILLIAMS, Jr.