Jan. 22, 1924. 1,481,677

A. E. BLASHILL.

SHELL FUSE

Original Filed July 3, 1917 2 Sheets-Sheet 1

Fig. 1.

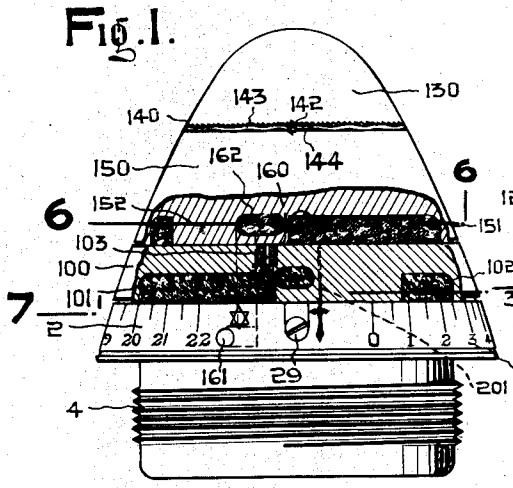


Fig. 2.

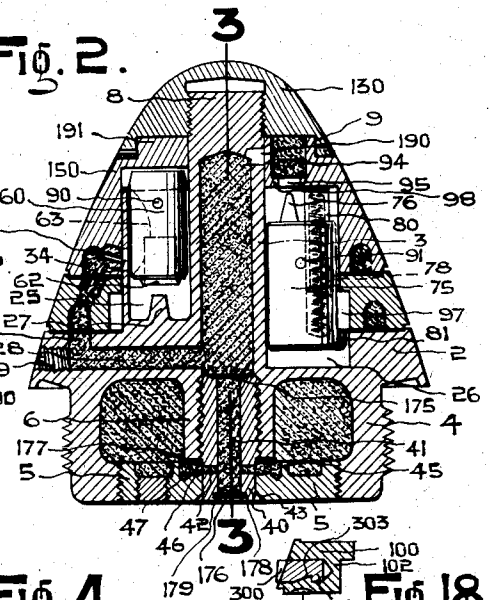


Fig. 3.

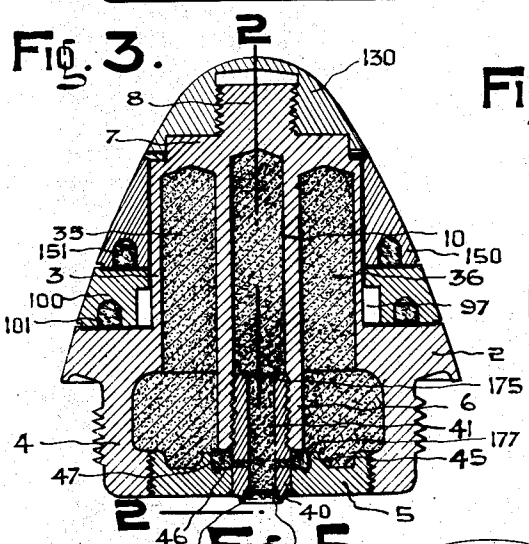


Fig. 4.

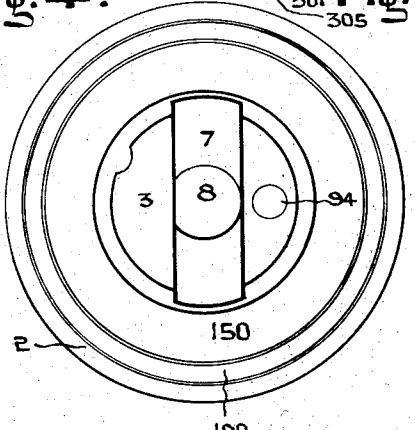


Fig. 18

Fig. 5.

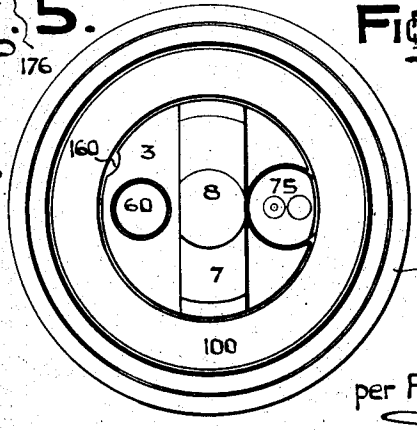


Fig. 15.

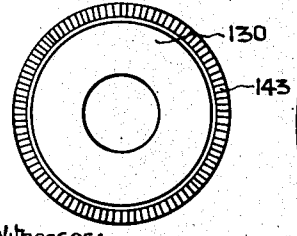


Fig. 16

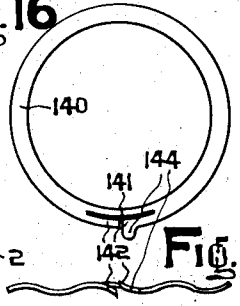


Fig. 17.

Witnesses:

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Arthur E. Blashill
Inventor.

per Attorney

William P. Stewart

Jan. 22, 1924. 1,481,677

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SHELL FUSE

Original Filed July 3, 1917 2 Sheets-Sheet 2

Fig. 6

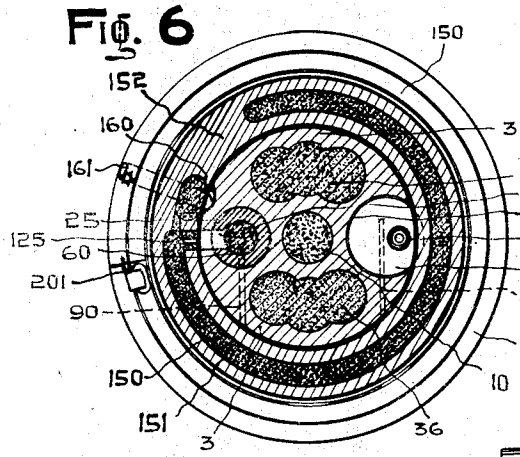


Fig. 7.

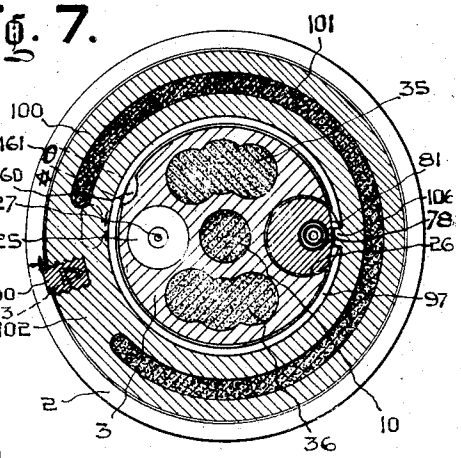


Fig. 8.

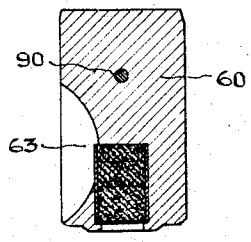


Fig. 9.

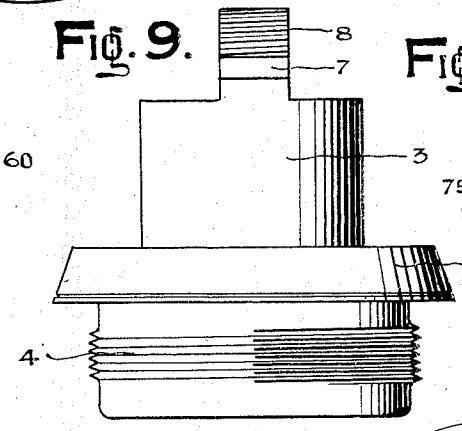


Fig. 10.

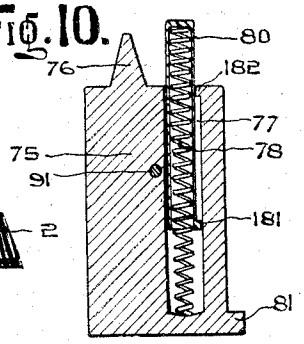


Fig. 11.

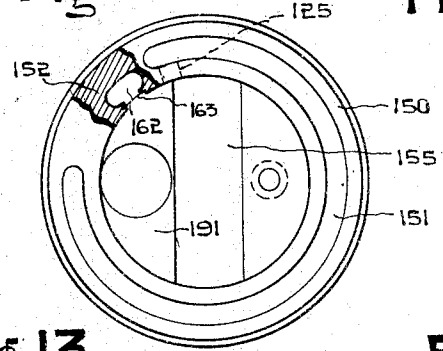


Fig. 12

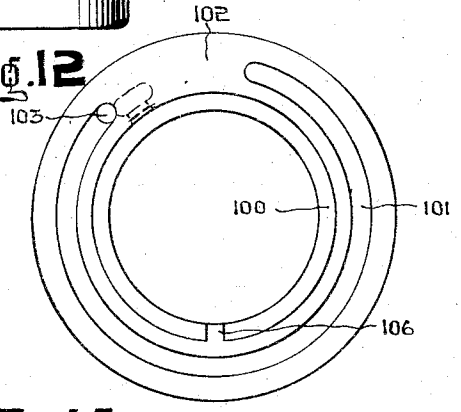


Fig. 13.

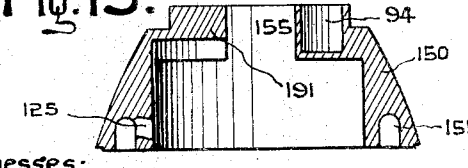
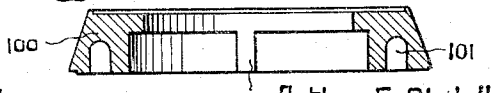


Fig. 14.



Witnesses:

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Patented Jan. 22, 1924. 1,481,677

UNITED STATES PATENT OFFICE.

ARTHUR E. BLASHILL, OF WESTMOUNT, QUEBEC, CANADA.

SHELL FUSE.

Application filed July 3, 1917, Serial No. 178,516. Renewed March 2, 1922. Serial No. 540,666.

To all whom it may concern:

Be it known that I, ARTHUR E. BLASHILL, of the city of Westmount, Province of Quebec, Dominion of Canada, a subject of the King of Great Britain, have invented certain new and useful Improvements in Shell Fuses; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention relates to time and percussion fuses for projectiles, and more particularly to fuses of this type for shrapnel shells.

Heretofore these fuses have been of a complex nature, and either dangerous to handle and transport when loaded and assembled with the shells, or liable to fail; another defect is that after the shell bursts the fuse preserves its identity as a single projectile only and if not destroyed by impact is a source of information for the enemy. The object of my invention is to overcome these defects.

To this end my invention consists of a fuse composed of a relatively small number of parts forming an axial magazine surrounded by time and percussion pellets and explosive charges, this arrangement permitting of a parallel arrangement of the pellets thereby maintaining concentricity of equilibrium and economizing space. This economizing of the space required for the operating parts (the pellets, detonators and time rings) is designed by me to either provide chambers or explosive charges or to accommodate a greater length of shell within given limits between the base of the shell and the nose of the fuse. Another feature of my invention is a positive lock for one of the pellets, obtained by the interlocking of it with the movable time ring, and subordinate positive locks for both pellets in the form of uniformly sensitive devices to be overcome only by the shock of discharge, for instance. Another feature is practically direct intimate relation of the detonators with the time rings and magazine respectively.

For full comprehension, however, of my invention reference must be had to the accompanying drawings in which similar reference characters indicate the same parts and wherein:

Figure 1 is a side elevation of a fuse constructed according to my invention and illustrated partly in section;

Figure 2 is a vertical sectional view thereof taken on line 2—2 Figure 3;

Figure 3 is a similar view to Figure 2 taken at right angles thereto on line 3—3 Figure 2;

Figure 4 is a plan view of the fuse with the cap removed;

Figure 5 is a similar view to Figure 4 with the upper time-ring also removed;

Figure 6 is a horizontal sectional view taken on line 6—6 Figure 1;

Figure 7 is a horizontal sectional view taken on line 7—7 Figure 1;

Figure 8 is a vertical sectional view of the time-pellet drawn to a larger scale;

Figure 9 is a side elevation of the body of the fuse;

Figure 10 is a vertical sectional view of the percussion pellet drawn to a larger scale;

Figure 11 is an under-side elevation of the upper time-ring;

Figure 12 is a similar view to Figure 11 of the lower time-ring;

Figure 13 is a diametrical sectional view of the upper time ring; and

Figure 14 is a similar view to Figure 13 of the lower time-ring.

Figure 15 is an underside view of the nose-cap;

Figure 16 is a plan view of the spring lock washer for preventing rotation of the nose-cap when in position;

Figure 17 is a side elevation thereof; and

Figure 18 is a detail elevation of the lock for setting the movable time-ring.

The present embodiment of my invention is, as before mentioned, a fuse for shrapnel shells and its design performs three functions, first exploding the shell at predetermined time, secondly exploding when striking or grazing an object, and thirdly the destruction of the fuse in a manner to produce fragmentation of it. This triplex nature of the fuse is one of its important features.

It is composed of a body, movable and fixed time-rings, and a cap.

The body comprises a base having a flange, 2, a central pedestal 3 and a depending central annular member 4 externally screw threaded and having an open bottom closed by a plug 5. A central tube 6 projects downwardly and its lower end is flush with the rim of the annulus. The top of the pedestal has a transverse tang 7 having a central stud 8 while the ends of the top of

the tang are stepped down as at 9 to afford clearance for the rim of the cap which is screwed upon the stud as will be presently shown. This tang is diametric and has greater width on one side of the centre of the fuse than on the other. The central magazine is formed by the bore of the tube 6 and a boring 10 along the axis of the body to a point within close proximity of the base of the stud. This magazine 6, 10, is, as seen in Figures 2 and 3, in the central line of the shell and consequently aligned with ventral tube of the shell (not shown). At diametrically opposite sides of the magazine are a pair of borings to serve as chambers for the time and percussion pellets. These pellet chambers are indicated at 25 and 26 respectively. The boring 25 has an upright central firing pin 27 in its bottom and beneath lies a horizontal boring 28 extending from the periphery of the flange to the magazine 10, the other end of this boring being closed by plug 29, while the vertical boring 30 leads from boring 28 upwardly through the top of the flange and effects communication between the magazine and the bottom time ring which will presently be described. The side of the pedestal in line with the chamber 25 has a flash 34 communicating with the pellet-chamber and in the same radial plane as hole 30. The body of the pedestal at diametrically opposite sides thereof and between the borings 25 and 26, is bored out to present chambers 35 and 36 respectively, the width, depth and height of each of which is almost equal in extent to the cubical contents of the pedestal in diametric line through the magazine while the metal of the pedestal between the ends of these chambers 35 and 36 and the pellet chambers is relatively thick to adapt these portions to sustain the heavy end thrust occasioned by the shock of discharge. These chambers are designed to contain an explosive by which the fuse is destroyed and they are fired from the magazine; communication is effected between the magazine and these explosive chambers by an axially bored screw 40, the boring being indicated at 41 and constituting a portion of the magazine and having lateral borings 42 while the head 43 is bevelled by countersinking the plug 5, which it reinforces. The plug has its inner side formed with an annular recess forming a central hub 45 in bearing relation with the lower end of the central magazine 6 and contains an annular chamber 46 with which the holes 42 in the screw 40 register; and in the top of this hub is a series of holes 47 adapted to communicate with the bottom of the explosive chambers. The upper end of the screw 40 is closed by a celluloid disc 175 and the lower end by a brass disc 176 for preventing displacement of the powder in the magazine and screw. The brass disc is held in a socket 178 by a bead 179 formed on the screw and which is pressed in when the disc has been inserted. The flash from the screw to the explosive chamber is regulated by a felt disc 177 interposed between the tube 6 and the hub 45 of the plug and is of a diameter sufficient to partially close the upper ends of the holes 47 thereby reducing the openings to the desired degree and consequently delaying the flash. The flash may be further regulated by lowering or raising the point of communication between the annular chamber and the holes 47.

The time and percussion pellets are indicated at 60 and 75 respectively, and they are axially movably contained in the pellet chambers 25 and 26. The pellet 60 has an axial recess in its lower end for the time detonator and the mouth of the recess has a surrounding flange or bead 62 to be spun in to hold the detonator in place while a saw cut 63 parallel to the axis of the pellet and in a radial plane intersects the recess effecting communication between the latter and the upper time-ring to be presently described.

Pellet 75 has at one end an eccentrically arranged firing pin 76 and a hole 77 also eccentrically disposed is bored from the top of the pellet to within close proximity of the bottom. A helical compression spring 78 is seated in this hole with its upper end normally extended above the top of the pellet, and a cap 80 in the form of a sleeve with one end closed encloses the top of the spring and extends slidably into the hole, one side being flattened for a portion of its length and extended at a shoulder 181, which is prevented from complete displacement from the pellet by the turned-in edge 182 of the latter. One side of the pellet is cut away on the circumferential line of the pedestal and has a lateral lug 81 at one end forming one member of the safety lock which co-acts with the movable time-ring. When a shell equipped with this fuse grazes or strikes an object this pellet 75 starts forward and its firing pin strikes a percussion detonator which fires the magazine; the detonator being carried by the upper time-ring. These pellets are safely held while being handled or shipped from place to place by uniformly sensitive and positive locks in the form of safety pins 90 and 91 respectively which are sheared off when relative motion in an axial direction is set up between the pellet and the body of the fuse.

This percussion detonator consists of the usual explosive material located in a chamber 94, the bottom of which has an opening 95 effecting communication with and in axial alignment with the firing pin 76, while a lateral opening 190 effects communication with the magazine. The mouth of this chamber has a flange or head 98 adapted to

be turned in after the detonating material is in place.

The movable ring is indicated at 100 and its perimeter conforms to the general contour of the fuse. The underside has a time train channel 101 extending from one side of the bridge 102 around the ring to the other side thereof, and a flash hole 103 leads down through the top of the ring to the channel at the side of the bridge opposite to the side of bridge beside which the flash hole 125 in the fixed ring is located. The inner wall of the ring is increased in diameter in the form of a counter-bore 97 sufficient to provide a clearance space to accommodate the travel of the lug 81 of the pellet, this counter-bore being continued throughout the circumference with the exception of a small segment 106 forming a stop block coacting with the member 81 and forming therewith the lock to temporarily positively hold the pellet. The usual lug adapted to be straddled by the fuse key in the setting of the fuse is indicated at 300 and is constituted by the outer end of a pin 301 mounted in the solid portion 102 of the movable time-ring. In order to prevent rotation of this pin it is notched as at 303 and the adjacent wall of the ring is pressed in as at 305 to engage the notch.

The upper or fixed time ring is indicated at 150, and like the movable ring, its perimeter conforms to the general contour of the fuse, and its underside has a time train channel 151 extending from one side of the bridge 152 around the ring to the opposite side and a flash-hole 125 leads from the pellet chamber 25 to one end of this channel. The inner wall of this ring is of a diameter to snugly fit the pedestal.

The vertical dimension of this fixed ring is slightly greater than the dimension from the top of the movable ring to the shoulder of the pedestal, just below the tang. The top of this fixed ring is partially closed and has a slot 155 to accommodate the tang on the pedestal while the detonator chamber 94 before-mentioned is located at one side of the centre of and above pellet chamber 26.

These time rings are held against displacement from the pedestal by a nose-cap 130 having an internal central tapped boring through which the cap is adapted to be screwed on the central stud 8. In order to maintain a resilient pressure upon the time rings in the event of the felt washers between the rings shrinking and to lock the nose cap without the use of a set screw, a metal lock washer 140 is located between the nose-cap and upper time ring outside of the tang 7. This washer is crimped to give it the required resiliency and has a circumferential slit 141 to present a pair of pawls 142, the pawls being adapted to respectively engage the adjacent edge of the nose-cap which is serrated as at 143 and to bite into the upper time-ring thereby securing a positive lock between the latter and the nose-cap. To enable the removal of the cap the pawl which engages the same is provided with a lip 144 which may be pressed down with the thumb thus moving the pawl out of engagement with the teeth on the cap.

The escape holes have heat insulating linings and sheets of the same material and are sunk flush with the surfaces beneath the holes for obvious reasons.

The perimeter of the flange of the base is engraved to indicate the usual graduations 200, the indicator or gauge line being indicated at 201, the percussion point by a star and the safety point at a cross, star or other preferred symbol.

My improved fuse is provided with an internal ventilation system for the time rings. The system comprises a vertical passage 160 in the perimeter of the body 3, the lower end of which passage communicates with the outer atmosphere through a horizontal passage 161 in the flange 2 of the body. The passage 160 is constructed and arranged to communicate with the upper time train through an extension of the latter, 162; communication between this extension and the passage being normally cut off by a thin disc 163 which can be made rather light and glued in position as the centrifugal force exerted upon it during rotation of the shell will hold it in position. Communication between the passage 160 and the lower time train is effected in a similar manner to the upper time train with the exception that the counter-bore 97 performs the dual function of affording a space for the lug 81 on the percussion pellet and a universal connection between the extension of the time train and the vertical passage 160. It is obvious that no matter what position the time ring may be in the gas will always be able to escape to the atmosphere.

The fuse above described has the following characteristics and advantages to wit:

It is in effect per se a self-destroying bomb having considerable destructive power, thus in addition to being adapted to effect relatively great damage to the enemy it absolutely prevents him from obtaining information from any part of the fuse. It is more simple in construction and more easily assembled and inspected than other fuses heretofore known. All chances of incorrect assembling are obviated; the percussion pellet which is the dangerous element in the fuses of this nature, is positively locked against movement towards its detonator by the movable time ring. The eccentric balanced arrangement of the pellet permits an axial magazine to be employed and lateral explosive chambers and an explosive base to

be incorporated without altering the standardized dimensions of the fuse. The particular arrangement of parts also permits the base of the fuse to be a heavy design, while the pedestal and particularly that portion of it surrounded by the time rings has a relatively thin or weak wall. The ignition of the explosive charges in the fuse body is rendered more positive by the fact that it is substantially completely surrounded by the explosive mixture. The pellet chamber 26 being as shown extended in depth sufficiently to permit the pellet 75 to be suspended therein by its shear pin 91 with its firing pin 76 a short distance from the detonator and its base a short distance from the bottom of the chamber, accommodates the pellet in its movement under the shock of discharge to effect the shearing of the pin thus establishing a condition under which this pellet is yieldingly retained away from the detonator by its spring 78, while the relatively large diameter of the pellet with a portion of its face flattened, and its lower end intersecting the inner circumferential line of the movable ring with its stop-block 106, makes the fuse absolutely safe while set at "safety" owing to the fact that not only are the flash holes covered, but the percussion pellet is positively locked away from the detonator. The shear pins continue the safe condition of the fuse after the positive lock is released, and until the fuse is subjected to the shock of discharge the particular arrangement of parts secure the exposure of all operating parts to inspection by the removal of the nose cap and upper or fixed ring. The bottom plug when screwed to place is seated upon a shoulder near the lower end of the magazine, thus avoiding the cutting of the threads in the base, and furthermore the expanding of the edge of the magazine to overlap and lock the plug on its seat reinforces the threads in performing their function of holding the plug against the explosive power in the base of the fuse. The fact that the tang has greater width on one side of the centre than on the other effectively prevents the incorrect assembling; while the fact that the spring cap 80 is prevented from being completely displaced from the pellet 75 enables these particular parts to be assembled and gauged before the fuse is assembled. A similar advantage is obtained from the fact that the percussion detonator is carried by a fixed time ring. The particular relative contiguous arrangement of the central magazine and percussion detonator insures the firing of the magazine charge under all circumstances and avoids the danger of misfire owing to the collapse of the nose cap by a sudden violent impact, as happens with fuses, where the relative arrangement is more widely separated. The ignition of the time train is rendered more positive by the fact that the detonator 60 fires in a direction away from the firing pin 27, and directly and laterally into the time train, the fire being concentrated in the communicating flash hole. The eccentric position of the firing pin 76, and pellet 75 enables the percussion detonator to be located close to the magazine with the advantage just mentioned; and the additional advantage that the shoulders 191 on the fixed time ring serve to support the end thrust due to the pressure required in the charging of this time ring. My novel and particular arrangement and combination of parts provides the position or station * in addition to the usual safety mark, which eliminates the element of uncertainty in fuses heretofore used by making it absolutely essential to shift the time ring from safety before the detonating pellet can move towards its detonator or flash holes be uncovered. The percussion detonator being located in the top of the fixed or upper ring, the shortest possible communication between it and the magazine may be provided and this detonator is firmly locked in place by spinning in the edge or rim produced by grooving the portion of the time ring top surrounding the same. All the flash holes and time rings are charged in the ordinary way.

Operation.

Upon a battery coming into action and several rounds of ammunition being "uncovered" that is to say the cover being removed from each fuse, and assuming that the latter is now with the indicator or gauge line at safety, then both bridges cover the fire holes cutting off the time trains, and the stop-block 106 positively locks the percussion pellet 75 against movement towards the detonator.

The fuse is then set as ordered and if explosion on percussion is required the indicator line must be moved to *, otherwise the fuse will remain safe, when set at *, the safety pins 90 and 91 still prevent movement of the pellet and the bridges cover the flash holes. The shell is then placed in the gun, and when the latter is fired the shock of discharge causes the pins to be sheared with the immediate result that pellet 75 is seated on the bottom of its chamber and the detonator in pellet 60 is detonated by the firing pin 27. The effect is that the flash is driven through the slot 63 and flash holes 34 and 125 to the upper time ring which burns idly, the bridges being in juxtaposition with the other flash holes, and preventing advance of the fire. This condition in the time ring or a fraction of it obtains until the shell grazes or strikes and the pellet 75 is shot forward relatively speaking and the firing pin 76 detonates the det-

onator 94 with the instantaneous firing of the magazine 10, and with the explosion of the shell the fuse head is thrown off and the fire from the magazine ignites the channel 46 with the effect that a very slight interval of inaction within the fuse apart from the burning of these supplemental fuses occurs which terminates in the explosion of the charges in the chambers 35 and 36. This explosion is delayed in order that the proper scattering of the shrapnel may not be interfered with. When the explosion occurs the effect is of course, that the weakest part yields first and owing to the peculiar construction of my fuse the base is reinforced up to the flange by its walls beneath the flange being made thicker than the walls above it. With this construction the explosion is directed more heavily upon the upper or forward structure, including the pedestal time rings and nose cap which are fragmentized while the pellets are projected and the base shattered, the whole being shattered with an initial velocity having its source within the fuse itself.

When the fuse is set for time instead of the bridges being in juxtaposition with the flash holes, the latter will be placed in a position relatively to the time trains required by the particular range. The fire will therefore pass the lower ring and traverse same until it reaches flash holes 30 and 28 through which it is projected to the magazine, and thence to the shell and the explosion chambers of the fuse as just described.

Having fully set forth and ascertained the nature of my invention, I beg to state that what I claim and desire to protect by Letters Patent is:

1. In a shell fuse, the combination with the body thereof having a pair of explosive chambers arranged in parallelism and in the same diametric line; of time and percussion pellets arranged in parallelism and in a diametric line at right angles to the line of the chambers.

2. A shell fuse adapted to be mounted upon one end of a shell and having a chamber containing a high explosive substance, of time rings encircling the said chamber whereby the setting on the rings is destroyed when the high explosive substance is detonated.

3. In a shell fuse adapted to be mounted on one end of a shell, the combination with the body thereof, said body being chambered substantially throughout its length and containing a high explosive substance; of fixed and movable time rings mounted upon the body and encircling the explosive chamber, and means constructed and ararnged to detonate the said high explosive.

4. In a shell fuse, adapted to be mounted on one end of a shell, the combination with the body thereof, said body being chambered substantially throughout its length and containing a high explosive; of fixed and movable time rings mounted upon the body and encircling the explosive chamber, and means controlled by the said time rings for detonating the high explosive.

5. A shell fuse consisting of a body having therein time and percussion pellets arranged parallel to each other and in the same diametric line and such body being formed with parallel chambers in diametric line at right angles to the line of the pellets, an annular chamber in the base of the body and connecting with the said pair of chambers; and the said body having therein a magazine; and igniting means connecting the magazine to the parallel chambers; detonators in effective detonating relation with the pellets: means whereby one of the said detonators ignites the magazine; fixed and movable time rings effecting and controlling communication between the other of said detonators and said magazine.

6. A shell fuse adapted to be mounted upon one end of a shell and having an axial chamber extending substantially throughout the length thereof and containing a high explosive substance whereby the fuse is completely destroyed when the substance is detonated.

7. In a shell fuse the combination with the body thereof having an axial magazine extending substantially throughout the axial length thereof, a pair of pellet chambers arranged in parallelism with the axis and in the same diametric line, a flash hole leading from the magazine through the body to within close proximity of one of the pellet chambers, and a flash hole in the outer wall of the body, a pair of explosive chambers disposed parallel to the axis and extending substantially throughout the body from the annular chamber to the top, and in a diametric plane at right angles to the diametric plane of the pellet chambers, passages effecting communication between the magazine and the explosive chambers; fixed and movable time rings each having a time groove in the underside thereof, the lower being movable and the upper fixed, the said upper time ring partially enclosing the top of the said body having a detonator chamber in alignment with and eccentric to one of the pellet chambers and having a lateral flash hole adapted to register with the first-mentioned flash hole communicating with the magazine, time and percussion pellets in the pellet chambers, the percussion pellet having an eccentric firing pin at one end, and in juxtaposition with the detonator chamber, a yielding resistance retaining the percussion pellet away from the detonator, a detonator carried by the lower end of the time pellet, a firing pin on the bottom of the

chamber of the time pellet, and such time pellet having a flash slot in its side connecting with the detonator and registering with the flash hole in the wall of the body, and the said body having a flash hole leading from a point in communication with the lower fuse ring to the magazine.

8. In a shell fuse the combination with the body thereof having an axial magazine extending substantially throughout the axial length thereof, a pair of chambers arranged in parallelism with the axis and in the same diametric line, a flash hole leading from the magazine through the body, in the same annular plane as one of the pellet chambers, an annular explosive chamber within the base of the body, a pair of explosive chambers disposed parallel to the axis and extending substantially throughout the body from the annular chamber to the top and in a diametric plane at right angles to the diametric plane of the pellet chambers, passages effecting communication between the magazine and the explosive chambers, fixed and movable time rings, each having a time groove in the underside thereof the lower being movable and the upper fixed, the said upper time ring partially enclosing the top of the said body and having a detonator chamber in alignment with and eccentric to one of the pellet chambers, and having a lateral flash hole communicating with the magazine, time and percussion pellets in the pellet chambers, the percussion pellet having an eccentric firing pin at one end and in juxtaposition with the detonator chamber; shear pins rigidly temporarily retaining the pellets in fixed position spaced from the bottom of the chambers; a yielding resistance retaining the percussion pellet away from the detonator; a detonator carried by the lower end of the time pellet, a firing pin on the bottom of the chamber of the time pellet and such time pellet having a flash slot in its side communicating with the detonator, and registering with the flash hole in the wall of the body, and the said body having a flash hole leading from a point in communication with the lower fuse ring to the magazine.

9. In a shell fuse the combination with a movable time ring and a pellet, of a lug on the pellet and engaging beneath the time ring, such time ring having a clearance space to accommodate the lug in the movement of the pellet and a stop block within the said clearance space for engagement with the lug for the purpose of temporarily positively limiting the axial movement of the pellet.

10. In a shell fuse of the type described and containing a magazine, automatic detonating means in communication with the magazine, and an explosive chamber; of a passage extending from the magazine to the explosive chamber and means for controlling the passage.

11. In a shell fuse of the type described and containing a magazine, automatic means for detonating the magazine and an explosive chamber; of means connecting the magazine to the explosive chamber and consisting of an annular groove encircling the magazine, a series of holes effecting communication between the groove and the said magazine and a second series of holes effecting communication between the groove and the said explosive chamber, and means for reducing the extent of communication between the second series of holes and the chamber.

12. In a shell fuse the combination with the body thereof having a transverse tang at its top, movable and fixed time rings fitted on the perimeter of the body, the fixed ring having its top partially closed and formed with a slot adapted to register with the tang; a nose cap, and means for fastening the nose cap in place.

13. In a shell fuse the combination with the body thereof having a transverse tang at its top, the said tang being of greater width on one side of the axis of the fuse than on the other, movable and fixed time rings fitting on the perimeter of the body the fixed ring having its top partially closed and formed with a slot adapted to register with the tang, a nose cap and means for fastening the nose in place.

14. In a shell fuse a percussion pellet having at one end an eccentric firing pin and a hole or seat containing an expansile helical spring, a cap fitting over the spring and registering within the hole, one side of the cap having a lug and the mouth of the hole being constricted to prevent exit of the lug from the hole.

15. In a time fuse the combination with the time ring of a time pellet containing a detonator and having a radial long standard slot in its perimeter extending substantially throughout the length of the pellet and being independent of the detonating opening for concentrating the detonating flash on the time ring.

16. In a fuse of the type described, the body having an open end, a central magazine and explosive chamber, a plug screwed in the said open end for the purpose of closing the same and having a central opening and a screw located in the said opening for the purpose of reinforcing the plug and constructed and arranged to form part of the magazine and assist in effecting communication between the magazine and the explosive chamber.

17. In a fuse, a movable time ring, a lug mounted therein for setting the same, means for preventing relative rotation between the lug and the ring, said means consisting of

a notch in the lug and a projection on the ring adapted to engage the said notch.

18. A shell fuse including a body; upper and lower time rings; a nose-cap, the underside immediately above the upper time-ring being serrated, and means for preventing rotation of the nose-cap when in position, said means consisting of a metal crimped spring washer located between the nose-cap and upper time-ring and being split to prevent upwardly and downwardly extending pawls, the downwardly extending pawl being constructed and arranged to bite into the upper time ring and the other pawl being constructed and arranged to engage the serrated portion of the nose-cap, such last mentioned pawl having a lip for the purpose of moving it out of engagement with the serrations.

19. In a shell fuse of the type described the combination with a body having a central pedestal and an upper and lower time ring encircling the pedestal and having time trains; of a ventilating system for the escape of gases from the time rings, said system comprising a vertical passage in the perimeter of the pedestal and in communication with the outer atmosphere, a port effecting communication between the train of the upper time ring and the said passage, a counter bore in the lower time ring in constant communication with the said passage irrespective of the position of such lower time ring, and a port effecting communication between the counter bore and train for said ring.

20. In a shell fuse of the type described the combination with a body having a central pedestal and an upper and lower time ring encircling the pedestal and having time trains; of a ventilating system for the escape of gases from the time rings, said system comprising a vertical passage in the perimeter of the pedestal and in communication with the outer atmosphere, a port effecting communication between the train of the upper time ring and the said passage, a counter bore in the lower time ring in constant communication with the said passage irrespective of the position of such lower time ring, a port effecting communication between the counter bore and train for said ring; and means normally closing the ports in both rings and constructed and arranged to be held in position by centrifugal force.

21. A shell fuse including a body, an upper and lower time ring, a nose cap the underside of the said cap being serrated and a crimped spring lock washer adapted to respectively bite into the upper time ring and engage the serrations on the cap for the purpose of preventing rotation of the cap when the latter is tightened and to maintain a resilient pressure upon the rings.

22. In the manufacture of shell fuses having time and percussion elements the method of providing means for causing the destruction of the fuse consisting in forming a vertical central passage in the body forming an annular chamber in the body in position encircling the central passage, extending the annular chamber upwardly at opposite sides of said central passage, filling said annular chamber and its extensions with an explosive substance, and filling said central passage with a combustible substance, closing the lower end of the chamber effecting communication between the annular chamber and said central passage and forming passages effecting communication between the time percussion means and the central passage.

23. In a shell fuse, a detonator, a percussion pellet having a firing pin on one end eccentric to the pellet and in the axial plane of the detonator, a hole in the said end of the pellet and containing an expansile helical spring, and a cap fitting over the spring and registering with the hole, said spring being adapted to offer yielding resistance to the movement of the pellet toward the detonator.

24. A shell fuse adapted to be mounted upon one end of a shell and having a chamber extending substantially throughout the length thereof and containing a high explosive substance whereby the fuse is completely destroyed when the substance is detonated.

25. A shell fuse adapted to be mounted upon one end of a shell and having an axial chamber adapted to contain a combustible powder, and a second chamber located in juxtaposition with the axial chamber and adapted to contain a high explosive substance, and a port effecting communication between the chambers.

In testimony whereof I have signed my name to this specification in the presence of two witnesses.

ARTHUR E. BLASHILL.

Witnesses:
GORDON G. COOKE,
WILLIAM J. C. HEWETSON.