April 29, 1930. R. J. ANDERSON 1,756,079

MORTAR SHELL

Filed Feb. 6, 1929

Fig. 1.

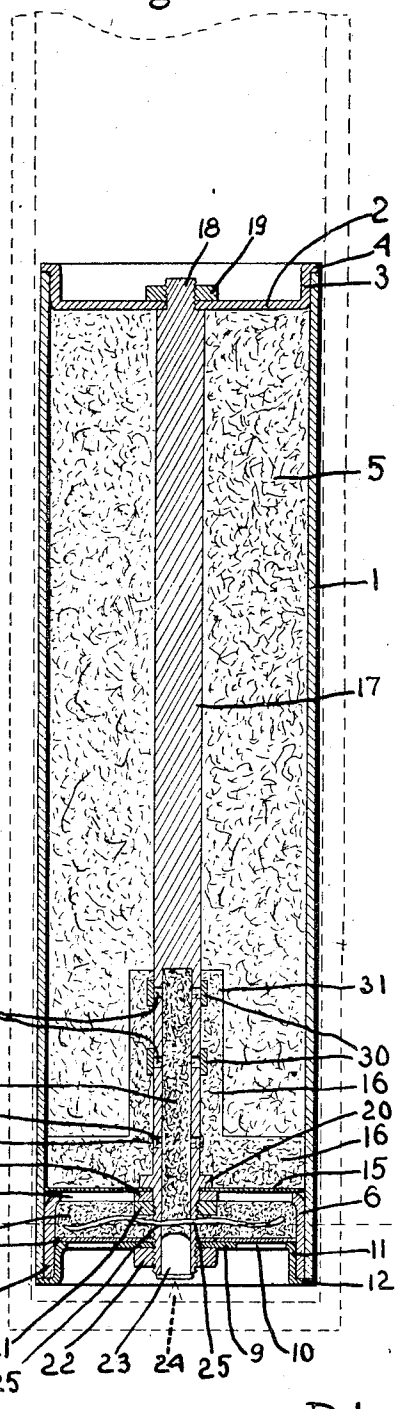


Fig. 2.

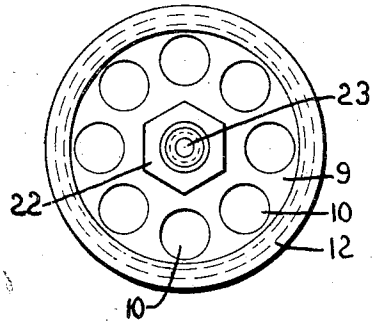
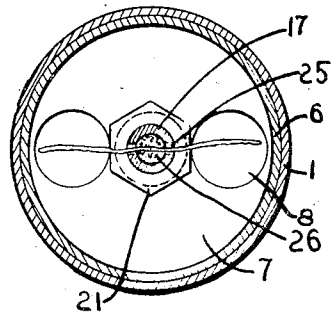


Fig. 3.



Inventor
Robert J. Anderson
by Heard Smith & Tennant
Attys.

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UNITED STATES PATENT OFFICE

ROBERT J. ANDERSON, OF WHITMAN, MASSACHUSETTS, ASSIGNOR TO NATIONAL FIREWORKS, INC., OF WEST HANOVER, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS

MORTAR SHELL

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This invention relates to improvements in shells for mortars in which the shell is provided with a main flammable or bursting charge and also with a propelling charge adapted upon ignition to project the shell from the mortar.

The charge for shells of this type may be a bursting charge such as shrapnel or may be a flammable charge such as HC (hexachlorathane mixture) CM (tear gas mixture) or smoke produced mixture.

The invention is illustrated herein as embodied in a shell adapted for use in a so-called "Stokes" mortar which comprises a cylindrical barrel having a closed lower end or breech with a central firing pin. In the use of this form of mortar the shell, which is dropped into the muzzle of the barrel, is provided at its base with a casing containing the propelling material and hvaing a central percussion cap adapted to engage the firing pin when the shell drops by gravity to the lower end of the barrel thereby firing the cap, igniting the propelling material and projecting the shell from the barrel.

The shells for mortars of this type have heretofore been so constructed that the lower wall or base of the shell is often detached by the propelling charge and remains in the barrel so that its removal is required before the mortar can again be fired. Frequently the expansion of the flange of the base of said casing causes it to stick within the mortar and renders it temporarily or permanently useless.

One of the objects of the invention is to provide a shell for a mortar of this type in which expulsion of the entire shell including the base will be insured.

In usual shells for mortars of this type the upper wall of the casing containing the propelling material is provided with a plurality of ports which communicate with the main charge and a thin partition of zinc is interposed between the upper wall of the casing and the lower end of the flammable or bursting charge. When the propelling charge is fired it burns through the thin partition of zinc and ignites the flammable or bursting charge. Sometimes the flammable or bursting charge is ignited within or as soon as the shell leaves the barrel and injures the gunner.

Another object of the invention is to provide means for insuring a desired predetermined time interval to elapse after the firing of the propelling charge before the ignition of the flammable or bursting charge so that the mortar may be aimed to provide the proper trajectory to cause the main charge to be ignited at approximately the desired distance from the mortar.

A further object of the invention is to provide a device of the character specified of simple and economical construction which will increase the efficiency and utility of the mortar.

These and other objects and features of the invention will more fully appear from the following description and the accompanying drawings and will be particularly pointed out in the claims.

In the drawings:

Fig. 1 is a vertical longitudinal central sectional view of a shell embodying the invention, also illustrating in dotted lines a mortar of the "Stokes" type with a shell engaging the firing pin thereof.

Fig. 2 is an underneath plan view of the bottom of the shell.

Fig. 3 is a sectional view on lines 3—3 Fig. 1 view beneath.

The shell containing an illustrated embodiment of the invention shown in the drawing comprises a cylindrical metal body 1 having at its upper end a closed head and at its lower end a casing containing a propelling material, the head of the casing being secured to the cylindrical body in such a manner as to insure the ejection of the entire shell from the mortar when the shell is fired.

The head desirably comprises a circular sheet metal plate 2 having a peripheral flange 3 the upper edge 4 which is offset to overlie and engage the upper end of the cylindrical body 1 thereby forming in the upper part of the body a closed chamber to contain a main charge 5 of flammable or bursting material such as hexachlorathane mixture, tear gas mixture, smoke producing mixture or a bursting charge.

The lower end of the cylindrical body 1 is closed by a casing containing a propelling charge. In the preferred construction illustrated herein the casing comprises a cup-shaped member the cylindrical wall 6 of which telescopically fits within the cylindrical body 1 and the upper wall 7 of which is provided with a plurality of ports 8 which are adapted to communicate with the chamber containing the main charge. The base of the casing desirably comprises a metallic disc 9 having a plurality of ports 10 and a downwardly extending flange 11 which fits telescopically within the wall 6 of the casing.

The lower end of the flange 11 is bent outwardly to provide a rim 12 which engages the end of the wall 6 and also the end of the cylindrical body 1 of the casing. An imperforate disc 13 is placed upon the disc 9 of the base of the casing and serves to retain the propelling charge 14 within the casing. A thin disc 15 preferably of fusible metal such as lead is placed on the upper wall of the casing.

Desirably the layer 16 of starting material such as thermite is interposed between the disc 15 and the lower end of the main charge 5.

Any means may be provided within the scope of the invention for connecting both the head of the shell and casing containing the starting material to the body of the shell to insure complete ejection of all portions of the shell from the mortar. In the preferred construction this is accomplished by providing a tubular member such as a bolt 17, preferably arranged axially of the body, connecting the head 2 of the shell and the base 9 of the casing containing the fusible material. In the construction shown the bolt is provided at its upper end with a reduced portion 18 which extends through the head 2, the reduced portion being screw threaded and provided with a nut 19 which clamps the head upon the shoulder of the bolt.

The bolt is desirably provided near its lower end with a flange 20 which is engaged by the disc 15. The lower end portion of the bolt is screw threaded and is provided with a nut 21 which clamps the wall 7 of the casing containing the propelling charge against the flange 20 of the bolt. Another nut 22 upon the lower end of the casing engages the base 9. By virtue of this construction the bolt 17 connects the upper and lower walls of the casing containing the propelling mixture rigidly to the head so that when propelling charge is fired portions of the shell will be ejected from the mortar.

Any suitable means may be provided for firing the propelling charge and igniting the main flammable or bursting charge. In the present construction the bolt 17 is bored axially for a considerable distance of a diameter adapted to receive a percussion cap or cartridge 23 which will engage the firing pin 24 of the mortar when the shell is dropped into and slides down the barrel of the mortar. The bore of the bolt is provided with lower lateral ports 25 communicating with the propelling charge 14 and desirably a quick match is threaded through the ports to insure ignition of the propelling charge.

Of course a shell of this type may be fired in other types of mortars having reciprocable firing pin to engage the percussion cap or cartridge of the shell.

A further object of the invention as above stated is to provide means for insuring the ignition or explosion of the main charge a predetermined time interval after the firing of the propelling charge. This is accomplished by filling the bore of the bolt 17 or other tubular member with a slow burning material 26, such as black powder, forming a fuse, and providing ports 27 located at such distance from the ports 25, which communicate with the propelling charge, as to provide the desired time interval required for the burning of the black powder before the ports 27 are reached. These ports desirably are covered with small pieces 28 of black match located within the zone of the starter to insure ignition of the starter and consequent ignition of the flammable or bursting charge.

Desirably in the manufacture of shells tubular members or bolts having ports 27 located at required distances to provide for the predetermined time interval are constructed and supplied so that by selecting a proper tubular member or bolt in the assembling of the shell a proper time interval before igniting the main charge is given. However standard tubes may be provided having the ports 27 located at a predetermined distance from the ports 25 and one or more pairs of ports 29 located at greater distances from the ports 25 corresponding to different time intervals for the combustion of the slow burning material 26. In such case the tubular member or bolt may be provided with a ring or rings 30 adapted to close the ports which are not to be used to ignite the starting material.

Where a plurality of such ports are provided in the tubular member or tubular portion of the bolt the lower portion of the main charge 5 is provided with a chamber 31 and the starting material extends into such chamber to surround the ports. By reason of this construction a shell may be provided in which any desired time interval may be caused to elapse between the firing of the propelling charge and the ignition of the main charge.

In the operation of the device when used in the "Stokes" mortar the shell is dropped into the upper end of the barrel and falls by gravity upon the lower end or breech of the mortar. When the percussion cap or car-

tridge 23 engages the firing pin 24 it will be fired thereby firing the propelling charge.

The expansion of the propellinig charge will blow out the portions of the fibrous disc 13 which overlie the ports 10 and create such pressure against the base or breech of the mortar as to discharge the shell from the mortar. At the same time the firing of the percussion cap 23 or the cartridge will ignite the slow burning mixtures 26 such as black powder and it will burn during the progress of the shell until it reaches the port 28 or such other port 29 as may have been selected to provide the proper time interval for ignition of the main charge after the firing of the propelling charge.

By virtue of this construction therefore premature ignition of the main charge is prevented; means are provided in so timing the ignition or explosion of the main charge that the firing thereof at a predetermined distance from the mortar will be insured thereby making the shell more effective in its destructive effect than those heretofore constructed and complete expulsion of all parts of the shell from the mortar is insured.

It will be understood that the particular embodiment of the invention disclosed herein is of an illustrative character and is not restrictive, and that various changes in form, construction and arrangement of parts may be made within the spirit and scope of the following claims.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is:

1. A mortar shell comprising a cylindrical body having a closed head providing a chamber containing a main flammable or bursting charge, a casing having a chamber containing a propelling charge forming a closure for the lower end of said cylindrical body and provided with means operable by impact for firing said propelling charge and means connecting said casing to said body operable to insure complete expulsion of the shell from the mortar when fired.

2. A mortar shell comprising a cylindrical body having a closed head providing a chamber containing a flammable or bursting charge, a casing having a chamber containing a propelling charge telescopically fitting within the lower end of said body and having a rigid wall forming the base of said body, means rigidly connecting said head and said base operable to insure complete expulsion of the shell from the mortar when fired and means operable by impact for firing the propelling charge.

3. A mortar shell comprising a cylindrical body having a head providing a closed chamber containing a main flammable or bursting charge, a casing containing a propelling charge fitting the lower end of said body and having a rigid base, a tubular member containing a slow burning material, forming a fuse, extending from said base through said casing into said main charge and having ports communicating respectively with said propelling charge and said main charge and a percussion cap at the lower end of said tubular member operable by impact to ignite said propelling charge and said fuse, whereby said main charge will be ignited a predetermined interval of time after the expulsion of the shell from the mortar.

4. A mortar shell comprising a cylindrical body having a closed head providing a chamber containing a main flammable or bursting charge, a casing containing a propelling charge fitting the lower end of said cylindrical body and having a rigid base, a tubular member containing a slow burning material forming a fuse, extending from said base through said casing into said main charge and having a lower port provided with a quick match communicating with said propelling charge and a port communicating with said main charge located at such distance from said lower port as to provide a predetermined time interval for combustion of said fuse before igniting said main charge and a percussion cap at the lower end of said tubular member operable by impact to ignite said quick match and said fuse.

5. A mortar shell comprising a cylindrical body having a closed head providing a chamber containing a main flammable or bursting charge, a casing containing a propelling charge fitting the lower end of said cylindrical body and having a rigid base engaging the end of said body, a bolt extending axially of said shell rigidly connecting said head and said base, having a bore extending upwardly from the lower end thereof containing a slow burning material forming a fuse, the tubular portion of said bolt having a lower port communicating with said propelling charge and an upper port located at such distance from said lower port as to provide a predetermined time interval for combustion of said fuse before igniting said main charge and a percussion cap seated in the bore of said bolt operable by impact to ignite said propelling charge and said fuse.

6. A mortar shell comprising a cylindrical body having a closed head providing a chamber containing a main flammable or bursting charge, a casing containing a propelling charge fitting the lower end of said cylindrical body and having an apertured upper wall, an imperforate sheet of fusible metal intermediate of said perforate wall and said main charge, a rigid base for said casing engaging the lower end of said body, a bolt rigidly connecting said head and said base having an axial bore extending upwardly from the lower end thereof containing a slow burning material forming a fuse, the tubular portion of said bolt having a lower port com-

municating with said propelling charge and a plurality of other ports located respectively at distances from said lower port as selectively to provide a desired predetermined time interval for combustion of said tubes before igniting said main charge, means for closing the unselected ports and a percussion cap seated in the bore of said bolt operable by impact to ignite said propelling charge of said fuse.

In testimony whereof, I have signed my name to this specification.

ROBERT J. ANDERSON.