Dec. 2, 1941. A. A. FRIES 2,264,791

SHELL ASSEMBLY

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Fig. 1.

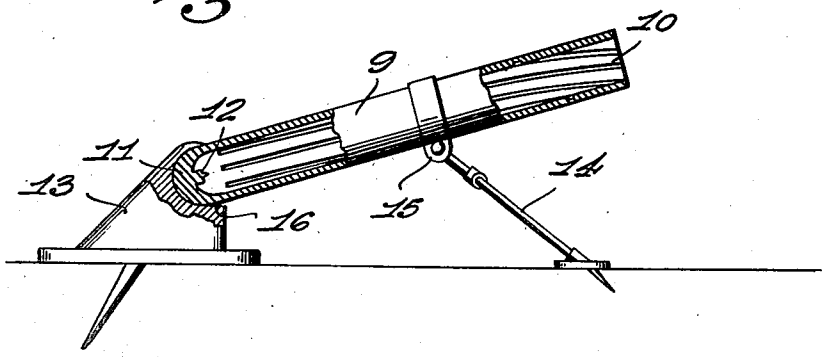


Fig. 2.

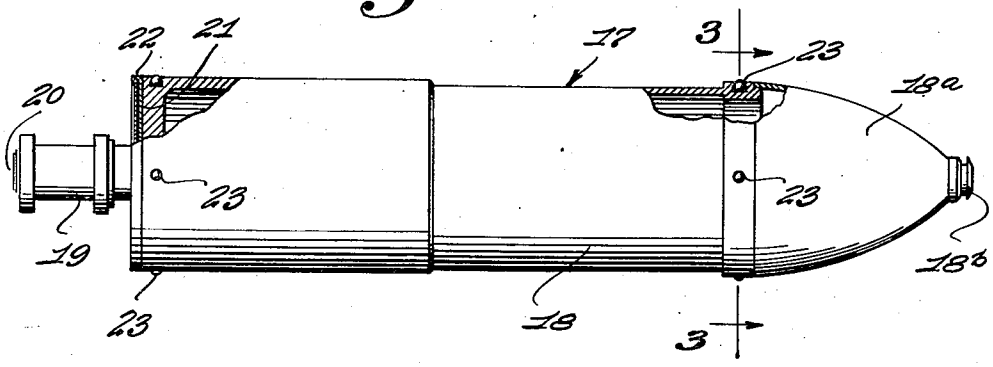


Fig. 3.

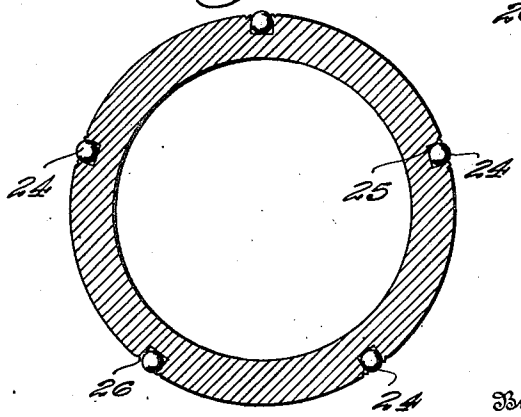
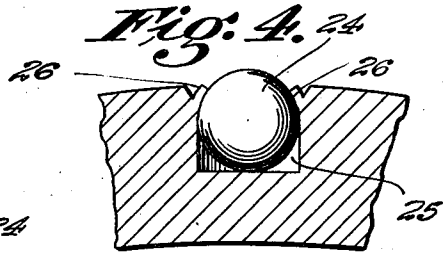


Fig. 4.



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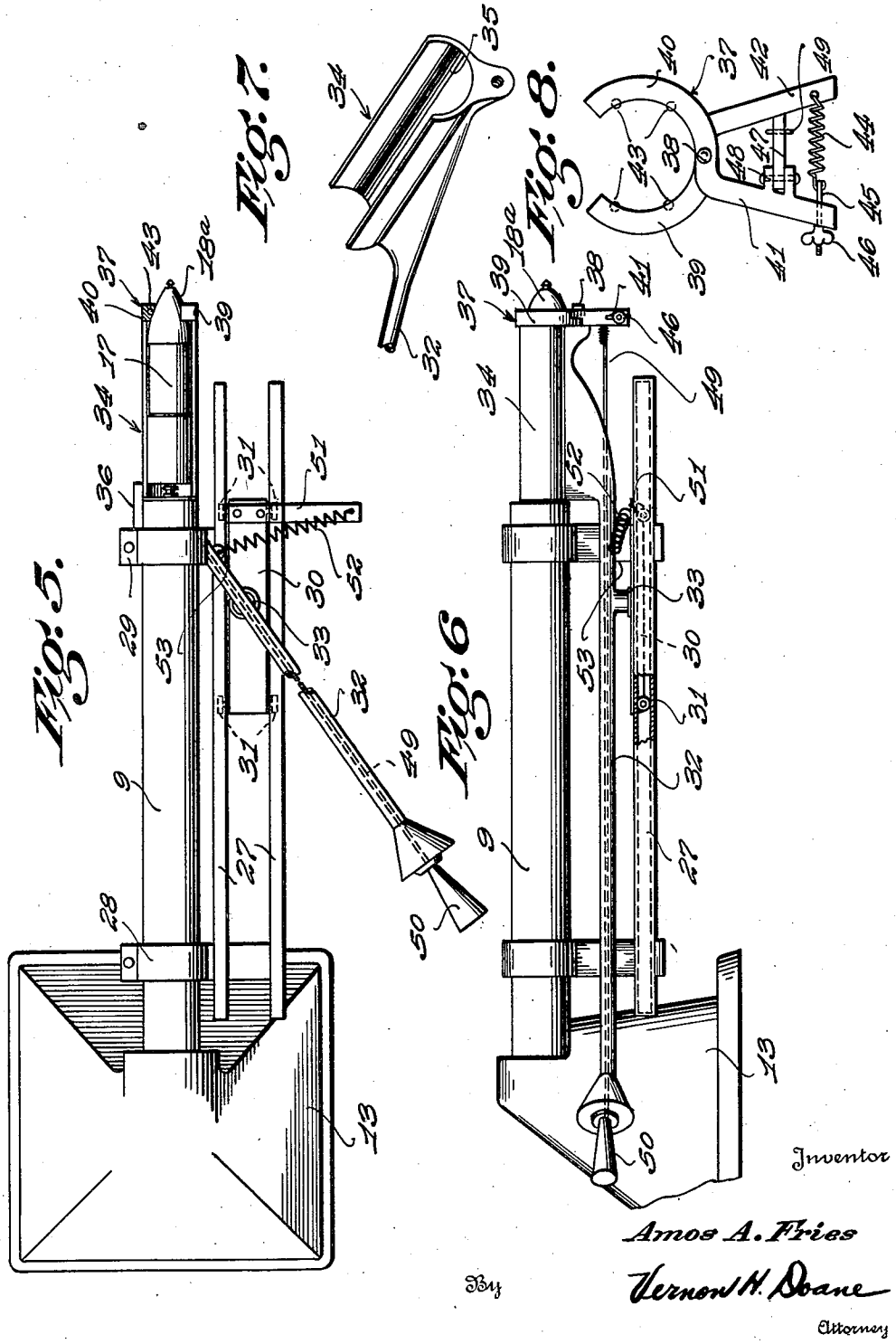
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2,264,791

SHELL ASSEMBLY

Amos Alfred Fries, Washington, D. C.

Application August 3, 1940, Serial No. 350,233

2 Claims. (Cl. 89—1)

This invention relates to improved means for firing Stokes mortars, howitzers or other muzzle loaded ordnance pieces.

In this general type of weapon, the breech or base end is usually closed and the shell assembly, which includes the projectile, the explosive propelling charge, and the primer, is loaded as a unit through the muzzle and allowed to descend through the bore as a result of gravitational forces. The weapon is provided with a stationary firing pin within the closed breech which is so positioned as to contact the primer and thus ignite the explosive charge at the instant that the shell assembly reaches its proper position in the breech.

Weapons of this type have been found quite satisfactory in certain types of military operations. Due to their simplicity they may be manufactured in quantity at low cost and the smaller caliber weapons have been portable to the extent that they could be carried by two or more men. Various arrangements for obtaining the benefits of rifled bores have been devised with a resultant increase in range and accuracy. However, there have been certain deficiencies which have been regarded as inherent in weapons of this type. One of the most important of such deficiencies has been the fact that it has never been feasible to fire projectiles from such weapons at an angle smaller than approximately 45 degrees above the horizontal plane. This lower limit of the angle of fire has made it necessary to provide a variety of powder charges known as "zone charges" in order to adapt these weapons to varying ranges. This necessity of varying the "zone charges" for different ranges has been a serious handicap to the use of weapons of this type in field operations and with or against rapidly approaching or receding targets. Due also to the lower limit of the angle of fire, these weapons have not been suitable for direct or horizontal fire and they have consequently been of little or no value as a defense against tanks and other motorized or mobile units.

It is one of the primary objects of the present invention to overcome the foregoing deficiencies in Stokes mortars, howitzers and other muzzle loaded ordnance pieces and to adapt such weapons to direct or substantially horizontal fire.

Another important object of this invention is to permit ordnance pieces of the type described to have a greatly increased firing power available for use at short ranges in order to increase their effectiveness in the destruction of armored tanks, "pill boxes," armored trains and strong fortifications.

Still another important object of this invention is to provide mechanism for loading ordnance pieces of the type described and assuring their discharge without limitation as to the angle of fire.

In order to accomplish the foregoing and other objects referred to hereinafter, I provide means for permitting muzzle loaded ordnance pieces of the type described to be loaded and fired with the barrel at any desired angle from the horizontal. For a detailed explanation of the invention, reference is made to accompanying drawings wherein:

Figure 1 is a side elevation view of an ordnance piece of the type with which the invention is applicable, portions of the barrel and supporting base of the piece being shown broken away;

Figure 2 is a plan view of a shell assembly embodying certain features of my invention, portions of the shell assembly being shown broken away;

Figure 3 is an enlarged sectional view taken along the line 3—3 of Figure 2;

Figure 4 is an enlarged view of one of the antifriction devices with which the shell assembly is provided;

Figure 5 is a plan view of an ordnance piece provided with mechanism for loading and assuring the discharge of the weapon;

Figure 6 is a side elevation view of the ordnance piece shown in Figure 5;

Figure 7 is a perspective view of the bed-like member for supporting the shell assembly during loading; and

Figure 8 is an end elevation view of the mechanism for imparting an impetus to the shell assembly to project it to the breech of the weapon.

For the purpose of illustration I have shown and will describe my invention as used with a Stokes mortar although, as above stated, the invention is applicable to other types of muzzle loaded ordnance pieces.

The reference numeral 9 designates generally the barrel of a Stokes mortar which is shown with a rifled bore 10, a closed breech 11 and a relatively stationary firing pin 12. As shown, the barrel 9 is supported by a base 13 and one or more legs 14 pivotally secured to the barrel 9 by means of a clamping ring 15. The base 13 is shown as provided with a socket 16 which receives the closed breech 11 of the barrel 9 in a manner to permit pivoted adjustment of the barrel. However, the precise means for supporting

he barrel are of no particular consequence and do not limit myself to the arrangement just described as I contemplate that the barrel may be supported by any other suitable means.

The mortar just described is capable of receiving and firing the shell assembly shown in Figure 2, and which is designated generally by the reference numeral 17. This shell assembly comprises a projectile 18 having a tapered nose 18a, a container 19 for a propelling powder charge, a primer 20 for igniting the powder charge, and a fuse 18b in the nose for exploding the projectile at a given time or upon impact. In the event that the shell assembly is to be used in a weapon having a rifled bore, it should be provided with a circular disc 21 at its base or rear end, said disc 21 having a rearwardly disposed peripheral flange 22 which is adapted to be expanded into contact with the rifling of the bore upon explosion of the powder charge in the manner described in United States Patent No. 1,589,194, issued on June 15, 1926, to George S. Maxwell. Any other suitable method of adapting the projectile to be rotated by the rifling in the bore may be substituted for the arrangement just described.

An important feature of the shell assembly 17, insofar as the present invention is concerned, is the provision of a plurality of anti-friction devices 23, spaced longitudinally and circumferentially on the outer surface of the projectile 18. I have shown the anti-friction devices 23 as steel balls 24 rotatably mounted in sockets 25 formed in the surface of the projectile 18. The balls 24 should be of sufficient diameter so that they will bridge the grooves of the rifling within the bore 10 of the mortar and the sockets 25 should be of such depth that the balls 24 project very slightly beyond the outer surface of the projectile 19. The best information presently available to me indicates that for a mortar having a 4.2 inch bore the balls 24 should have a diameter of approximately ¼ inch and should project approximately 3/32 inch beyond the outer surface of the projectile. An economical and highly satisfactory manner of securing the balls 24 in position in the sockets 25 is clearly shown in Figure 4. Portions of the projectile 18 adjacent the edges of the sockets 25 are upset as indicated by the reference numeral 26 in such manner as to overlie the curved surfaces of the balls 24 without preventing rotation of these balls.

The operation and advantages of the arrangement as thus far described will now be explained. The shell assembly 17 shown in Figure 2 can be inserted in the muzzle of a Stokes mortar sluch as that shown in Figure 1. The anti-friction devices 23 will engage the wall of the bore and will substantially reduce the friction as the shell assembly moves to the breech 11. This reduction in friction enables the shell assembly to move through the bore and arrive at the breech with sufficient velocity to actuate the primer 20 in spite of the fact that the barrel 9 is so positioned as to fire the projectile 18 at a much smaller angle above the horizontal plane than has heretofore been considered possible with weapons of this type. When it is desired to fire the projectile in a horizontal or substantially horizontal plane, the shell assembly 17 may be given an impetus toward the breech by the individual loading the weapon, which impetus, due to the reduced friction, will be sufficient to move the shell assembly to the breech and to actuate the primer 20. In this manner, it would be possible to fire the weapon at an angle slightly below the horizontal plane, although in actual practice, such an angle of fire is seldom necessary or desirable.

I am aware that it has heretofore been proposed to supply projectiles with anti-friction balls or rollers in order to reduce the friction between the projectile and the bore as the projectile is fired from a gun, and I do not claim that general concept as my invention. However, it has never heretofore been proposed, insofar as I am aware, to provide anti-friction devices on a shell assembly consisting of a projectile carrying a propelling powder charge and primer at the base thereof for the purpose of substantially reducing the angle of fire of a muzzle loaded ordnance piece into which the shell assembly is intended to be loaded and from which it is adapted to be fired.

In Figures 5 to 8 inclusive I have shown by way of illustration, a mechanism for positioning the shell assembly at the muzzle of the mortar and mechanically giving the shell assembly the necessary impetus to project it into firing position at the breech.

A pair of channel irons 27 are spaced apart in parallel relationship with their open sides facing each other and are secured to the barrel 9 of the mortar by means of clamps 28 and 29. A carriage 30 is provided with four rollers 31 and is adapted to be reciprocated beside the barrel 9, using the spaced channel irons 27 as a runway. An elongated lever 32 is adapted to swing about a pivot 33 which extends upwardly from the carriage 30. One end of the elongated lever 32 is provided with a bed-like member 34 having a semi-cylindrical recess 35 therein for supporting a shell assembly. The bed-like member 34 is secured at an angle to the lever 32 to permit the lever to swing the bed-like member in front of the muzzle of the mortar in such position that the semi-cylindrical recess 35 is in alignment with the bore 10 of the barrel 9. A stop member 36 (see Fig. 5) is provided to facilitate proper positioning of the bed-like member 34.

A forcep-like mechanism which is designated generally by the reference numeral 37 is carried by the forward end of the bed-like member 34, being secured thereto by means of a pivot bolt 38. The forcep-like mechanism 37 comprises a pair of opposed arcuate jaws 39 and 40 provided with levers 41 and 42 respectively. The inner surface of the jaws 39 and 40 may be provided with anti-friction devices 43 which are shown as balls similar to the balls 24 described above.

A tension spring 44 tends to draw the levers 41 and 42 toward each other and means such as the bolt 45 and wing nut 46 are provided for adjusting the tension on the spring 44. A lever 47 is pivoted to the lever 41 as indicated at 48 and is adapted to hold the levers 41 and 42 spaced apart against the tension of the spring 44. The lever 47 may be swung about its pivot 48 by means of a linkage 49 which extends through the lever 32 to a handle member 50. It will be understood that by pulling on the handle 50, the linkage 49 will retract the lever 47 from contact with the lever 42 and thus permit the spring 44 to force the jaws 39 and 40 toward each other.

An arm 51 extends laterally from the carriage 30 and a tension spring 52 extends from the arm

51 to a connection 53 on the lever 32 in advance of the pivot 33.

By manipulation of the lever 32 the carriage 30 may be drawn along the channel irons 27 toward the breech and the bed-like member 34 will then be accessible to receive a shell assembly such as that indicated by the reference numeral 17 in Figure 2. Before placing the shell assembly 17 in the recess 35 of the bed-like member 34, the levers 41 and 42 of the forcep-like mechanism 37 should be spread apart against the tension of the spring 44 and the lever 47 should be positioned to hold the levers 41 and 42 in such spread position. The tapered nose 18a of the projectile 18 should then be inserted between the jaws 39 and 40 of the forcep-like mechanism 37 and the main body portion of the shell assembly 17 should lie in the recess 35.

Again by manipulating the lever 32, the carriage 30 may be moved toward the muzzle and the lever 32 may be swung about the pivot 33 until the bed-like member 34 strikes the stop 36 when the shell assembly 17 will be in proper position to enter the bore. When it is desired to fire the weapon the handle 50 should be pulled which will act, through the medium of the linkage 49, to retract the lever 47 and permit the jaws 39 and 40 to squeeze against the tapered nose 18a of the projectile. As the jaws 39 and 40 bear forcefully against the tapered nose 18a, the shell assembly will be given an impetus toward the breech. The anti-friction devices 43 increase and render more certain this impetus and the magnitude of the impetus may be adjusted by adjusting the tension on the spring 44.

Immediately after pulling the handle 50 the shell assembly will have entered the bore and the operator of the gun should release the lever 32 in order that the tension spring 52 may withdraw the bed-like member and forcep mechanism from the muzzle of the gun before the projectile is fired.

The operation just described permits the operator of the weapon to remain at the breech and thus enables the weapon to be used in tanks, turrets, pill-boxes, etc.

It will be obvious to those skilled in this art that many modifications may be made in the mechanism for positioning the shell assembly, for controlling the jaws of the forcep-like mechanism and for retracting this mechanism from the muzzle of the weapon prior to firing. It should be understood that the particular mechanisms which I have shown and described are for purposes of illustration only and that the scope of my invention is not limited in this respect except by the provisions of the following claims.

It will be apparent that my invention will adapt weapons of the type to which is it applicable to a wider range of use than has heretofore been considered possible. By adapting the weapons for direct or horizontal fire their use as a defense against tanks and other mobile or motorized units becomes feasible and their value for the purpose of destroying fortifications is greatly increased. Since my invention eliminates the heretofore objectionable limit as to angle of fire, it becomes unnecessary to provide a variety of "zone charges" to accommodate the weapons for varying ranges. The firing power of these weapons can be greatly increased by using heavy powder charges to fire projectiles in a horizontal plane or at low angles of elevation.

Having thus described my invention, I claim:

1. A shell assembly for use in adapting for direct or substantially horizontal fire an ordnance piece which is provided with a closed breech, said assembly comprising a projectile, an explosive propelling charge at the base of said projectile, a primer ignitible by impact with the breech for igniting said propelling charge, and anti-friction devices on the surface of said assembly whereby said assembly may pass from the muzzle of the ordnance piece to the breech thereof with sufficient momentum to actuate said primer when the ordnance piece is disposed for direct or substantially horizontal fire.

2. A shell assembly for obviating the limitation on angle of fire and eliminating the necessity for the provision of a variety of propelling charges in ordnance pieces of the Stokes mortar type, said shell assembly comprising a projectile, a propelling charge at the base of said projectile, a primer ignitible by impact with the breech of the ordnance piece for igniting said propelling charge, and anti-friction devices on the surface of said assembly for contact with the bore of the ordnance piece whereby a small momentum imparted to said assembly projects it from the muzzle of the ordnance piece to the breech thereof with sufficient velocity to cause actuation of said primer by impact with the breech when the ordnance piece is disposed at a low angle of elevation.

AMOS A. FRIES.