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SUBCALIBER MORTAR TRAINER SHELL

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2 Sheets-Sheet 1

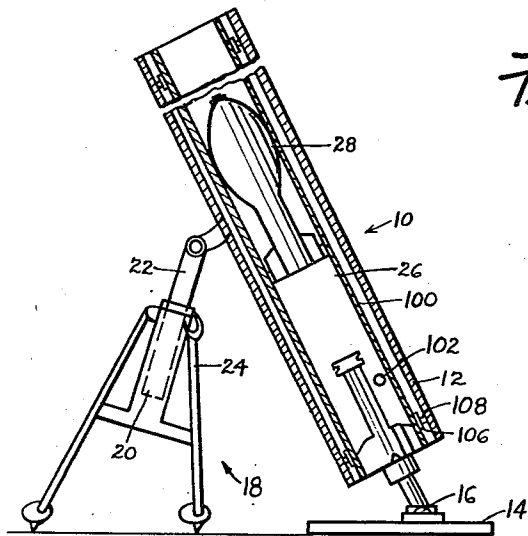


Fig. 1

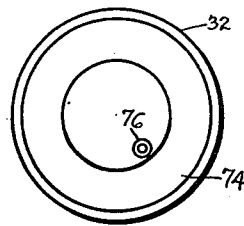
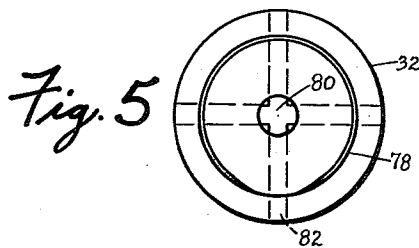


Fig. 6

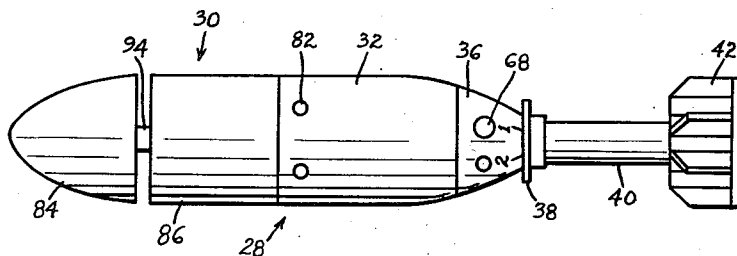


Fig. 2

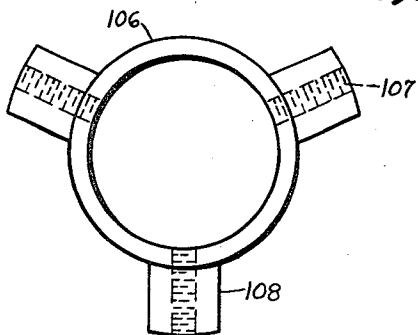


Fig. 8

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Fig. 3

Fig. 4

Fig. 7

Fig. 9

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SUBCALIBER MORTAR TRAINER SHELL

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(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates to mortars and in particular pertains to a subcaliber mortar used to train military personnel and to an associated subcaliber adapter which is insertable into a standard mortar gun to permit the subcaliber mortar to be used with regulation equipment in close simulation of actual firing conditions.

A primary object of the invention is to provide a subcaliber mortar that will simulate accurately and realistically regulation sized mortars in training of combat men.

Another primary object of the invention is to modify the regulation mortar gun so that it is capable of using the subcaliber mortar in a manner duplicative of regulation mortars.

Another object of the invention is to provide a practice mortar whereby the range is controlled, as desired.

Still another object of the invention is to provide a subcaliber mortar that is adapted to be quickly loaded for firing a round.

Yet another object of the invention is to provide a device that is capable of using inexpensive, lowpowered propellant with the training mortar.

And yet another object of the invention is to provide a training mortar that will simulate the explosion of actual mortars when the projectile from the muzzle has reached the target.

Another object of the invention is to provide an adapter and a subcaliber barrel that are capable of being accurately secured to each other with the adapter further provided with an outer surface to facilitate assembly of the subcaliber barrel into the mortar barrel.

Still another object of the invention is to provide a seal at the upper end of the mortar anvil to baffle gases that escape when a round is fired.

A feature of the invention resides in providing an anvil of reduced diameter whereby binding thereof is avoided.

Another feature of the invention is to provide a recess in the anvil base to prevent damage to the firing pin of the mortar.

Yet another feature of the invention is in the provision of a movable breech to carry the cartridge, said breech being moved by the anvil to cause the cartridge to strike a firing pin.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

Fig. 1 is a vertical elevation of the mortar with the front section cut away to afford a view of the adapter and subcaliber mortar therein,

Fig. 2 is an end elevation of the subcaliber mortar shell assembled,

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Fig. 3 is a vertical section of the subcaliber mortar shell illustrated in Fig. 2.

Fig. 4 is an exploded perspective view of the mortar shell of the invention,

Fig. 5 is an end view taken on line 5—5 of Fig. 4 of the body of the mortar shell,

Fig. 6 is a view of the other end of the body of the mortar shell and is taken on line 6—6 of Fig. 4,

Fig. 7 is a perspective view of the adapter barrel used with a mortar,

Fig. 8 is a top plan view of an adapter to be used with the barrel of Fig. 7, and

Fig. 9 is a vertical elevation of the anvil to be inserted into the adapter barrel of Fig. 7.

It is desirable in training military personnel in the operation of mortars to simulate actual mortar fire while reducing the cost of such training and equipment. It is also desirable to reduce to a minimum any danger of injury during the training period. These objects are achieved by the mortar shell and adapter of the invention to provide an effective training device.

Referring to Fig. 1, a trench mortar 10 is in firing position, the mortar being of conventional construction and includes a barrel 12 angularly adjustable on a base 14 at 16. The usual elevating and support means 18, comprising a telescoping tube 20, movable on rod 22 and carrying adjusting legs 24, completes the basic structure.

Subcaliber adapter structure 26 and subcaliber mortar shell 28, presently to be described in greater detail are illustrated within mortar 10 in simulation of shell 28 dropping into the adapter in position to be fired.

Figs. 2-6 disclose the novel subcaliber mortar shell 28 which consists of a head 30, body 32, breech 34, ranging ring 36, locking ring or washer 38, tail section 40 and fin section 42. Mortar shell 28 is designed to be fired from a mortar by detonation of a 22 cal. blank and after having traveled the desired trajectory lands and explodes a second 22 cal. blank.

Body member 32 and tail section 40 are threaded at 44 and 46 respectively for interengagement in assembled position. Tail section 40 is axially bored throughout its length at 50 to provide a passageway used in the firing step. The forward end of tail member 40 includes an integral annular extension 52 with a flat surface providing a seat to receive the inner end of enlarged head portion 54 of breech 34. Stem 56 of the breech member is of lesser diameter than head 54 and is adapted to be slidably received within the forward end of passageway 50, sliding movement being arrested when head 54 engages the flat surface of annular extension 52.

Aperture or hole 58 is provided in one wall of tail section 40 (see Fig. 4), and is adapted to align with an aperture 60 of similar diameter in the wall of stem 56. These apertures, together with range member 36, control the range of the shell, depending upon the volume of gases permitted to escape, as will presently appear. To insure alignment of apertures 58 and 60, extension pin 62 is provided on surface 52 of the tail section and is adapted to receive detent or slot 64 on breech 34. Thus, when the device is assembled, engagement of slot 64 by pin 62 serves to automatically align the gas escape apertures 58 and 60 described above when the subcaliber shell is fired. Breech member 34 is bored at 66 to coaxially align with passageway 50. The forward end of head 54 of breech 34 is flat and seats thereon the cartridge blank used to fire the shell.

The trajectory distances are controlled by means of a ranging ring 36, rotatively mounted on the forward end of tail member 40, and is retained for free, though not loose, rotation thereon by means of a split ring 38 seated in a groove on tail member 40 adjacent the tapered edge of the ranging ring. Gas escape outlets 68 of varying

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diameters to control range, are provided in annular series on the surface of the ranging member 36. Indicia 70 are aligned with holes 68 to indicate the different ranging distances. Thus, if a hole 68 of small diameter is aligned with gas outlets 58 and 60, gas pressure caused by firing of the cartridge is increased and mortar shell 28 will increase the trajectory distance. If an outlet 68 of large diameter is aligned as indicated above, a greater volume of gas will escape on firing to reduce pressure within the mortar and consequently reduce the range of said shell.

Fins 42 are interchangeable and are assembled upon the rear portion of tail 40 in any desired manner as by tapping the fins into position with a hammer.

Body member 32 is designed to receive breech means 34 and head assembly 30. The rear end of assembly 32 is bored and internally threaded at 44 for assembly with tail section 40. An axial bore 72 of smaller diameter than the threaded bore extends partly into the interior of body member 32, the annular surface 74 thereof engaging surface 52 when members 32 and 36 are assembled. Firing pin 76 extends into bore 72 to engage the percussion cap of a cartridge 71 (shown in dashed lines) retained on breech 34. It will be noted that bore 72 is of greater length than head member 54 to provide space for the cartridge member and for axial movement of breech member 34 when the shell is fired, to cause the cartridge to strike firing pin 76.

The forward end of body member 32 includes a threaded extension 78 and an axial passage 80 of the same diameter as passageway 66 to receive a second cartridge 91 (shown in dashed lines) therein. Passageway 80 does not extend entirely through the length of body member 32, but terminates at the point where gas outlets or apertures 82 extend through the walls of member 32 normal to the axis of said passageway. Thus, when the second cartridge is exploded, gases will escape through the fairly large apertures 82. This avoids any further movement of the subcaliber shell, as well as prevents any possible damage thereto.

Removably secured to body member 32 is a shell head 30, composed of nose piece 84 and firing cylinder 86. The rear end of cylinder 86 is bored and threaded at 88 to receive threaded projection 78 of body member 32 in closely fitting relation. A smaller diameter bore 90 receives the disk 92 containing firing pins 93, the stem or rod portion 94 thereof being slidably received in passageway 96 of cylinder 86. The end of stem 94 is fixed in nose piece 84 in seat 98. In this manner, when the shell strikes the target which, in training, normally is the ground, firing pins 93 on disk 92 strike the cartridge retained within cylinder 86 and explodes the round. Gases produced escape through apertures 82.

Referring to the adapter structure illustrated in Figs. 7-9, an adapter barrel 100, is of sufficient diameter to receive the subcaliber round 28. A gas escape opening 102 in barrel 100 allows gases to escape into the standard mortar gun and into the atmosphere, thereby preventing air compression as the projectile drops into the barrel. Otherwise, the shell may lock in the barrel due to the formation of an air-lock. Detents 104 are provided at the lower end as well as at the upper end of barrel 100 to receive in locking engagement adapter rings 106. Rings 106 have an internal diameter slightly greater than the external diameter of barrel 100. Rings 106 are fitted on adapter 100 and are held in position in detents 104 by means of set screws 107 extending through spacing fins 108. Fins 108 engage the inner surface of the standard mortar gun to immovably hold subcaliber barrel 100 in position in spaced relation to the trench mortar.

Anvil 110 comprises a slightly tapered base 112, stem 114 and a baffle flange 116 containing annular grooves 118 to prevent escaped gases from passing down into the base of the anvil. A slot 120 is provided in base 112 to clear and to avoid injury to the firing pin or striker found

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in the standard trench mortar. The anvil is positioned in the bottom of subcaliber barrel 100 prior to insertion of the structure into the mortar gun.

Operation of the device is readily apparent from the above and will be only briefly described.

The subcaliber barrel 100 is assembled by sliding adapter rings 106 on the barrel, securing said rings in position by engagement of set screws 107 in detents 104. Anvil 110 is then tapped into position in the bottom of barrel 100, the bottom thereof being identified by the two vent holes 102. The adapter assembly is inserted into mortar barrel 12 and is retained in spaced position by means of fins 108. Thus, when a shell is fired, sufficient gas expansion space is provided to lessen the pressure of gases formed by the discharge and passed outwardly through aperture 102.

Subcaliber mortar shell 28 is prepared for firing by inserting a cartridge in breech 34 with the primer seated on the annular surface thereof. Stem 56 of breech 34 is retained in passageway 50 of tail section 40 with aperture 60 therein aligned with aperture 58 in the flared portion of tail member 40. Body member 32 is secured to tail section 36 with recess, or bore 72 receiving the cartridge and primer described above. Bore 72 is sufficiently large to provide spading between the cartridge and firing pin 76. A second cartridge is placed in the front end of body member 32 in axial passageway 80 with the primer thereof adapted to seat on the annular outer surface of the front end. Head cylinder 86 is provided with a recess 90 which slidably receives a movable firing pin 92. Pin 92 is fixed to nose piece 84.

With the subcaliber shell 28 thus loaded, the desired range is determined and ranging ring 36 is rotated until an aperture 68, to give the required range, is aligned with aperture 58. Indicia 70 indicate the precalculated range and are in alignment with the equivalent apertures.

Subcaliber shell 28 is dropped into barrel 100 with the tail end downward. Anvil stem 114 enters passageway 50 of shell 28, contacting breech 34. This causes the breech member 34 to move away from seat 52 into recess 72. The primer of the cartridge retained on the breech then engages firing pin 76, causing the cartridge to fire. At this time, movement of breech 34 to the firing position has caused aperture 60 to be positioned in concentric relation to aperture 58. Gases produced by the firing of the subcaliber mortar shell are expelled through apertures 60, 58 and the selected ranging outlet 68. A smaller aperture 68 will cause a greater volume of gases to be retained in the shell, thereby increasing the range of the missile when the shell trajectory is complete. Nose 84 will strike the ground, or other surface, causing firing pin 92 to be moved towards the cartridge in body member 32 and firing said cartridge in a manner simulating an actual shell explosion. Gases produced escape to the atmosphere through outlets 82, which are of sufficient size to cause no further movement of the shell. Annular rings or grooves 118 provide an effective baffle seal against any produced gases entering the barrel chamber around the anvil.

The invention is adapted to be used in various training media and is adaptable to the 60, 81 and 125 mm. mortars to provide training in the calibration and use thereof. The conventional mortar and action thereof is thus faithfully reproduced, with the cost of training and possibility for injury reduced to a minimum.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A subcaliber mortar shell comprising a head, a body member secured to said head, a tail section, a breech member having an aperture, said breech member being mounted in said tail section and being adapted to receive

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a cartridge, an aperture in said tail section, means for aligning said apertures, means securing said tail section to said body member, a firing pin in said body member adapted to engage such cartridge in said breech member, and ring means including a plurality of apertures rotatively secured on said tail section, said ring apertures being aligned with said breech member and tail section apertures to control the range of the shell.

2. The combination of claim 1 wherein said ring means includes a plurality of apertures of different diameters, said ring means being adjustable with said tail and breech aligned apertures to selectively align at least one of its apertures with the breech aperture, and indicia on said ring means to designate the selected range.

3. The combination of claim 1 wherein said breech member comprises a head section seated on said tail member and a stem section received in said tail member, said aperture aligning means comprising inner engaging means on said breech member and tail member.

4. A subcaliber mortar shell comprising a head including a nose piece, a bore in said head, a stem secured in said nose piece and slidable in said bore, said stem including a disk end, a body member including a bore to seat a blank cartridge in proximity to the disk end, a second bore in said body member, a tail piece having an aperture therein secured to said body member, a breech in said last named bore extending into said tail piece and adapted to retain a blank cartridge, said breech having an aperture aligned with said tail piece aperture and ring means including apertures rotatively secured on said tail piece, said ring, breech and tail apertures being aligned to control the range of the shell when the tail piece cartridge is discharged.

5. A subcaliber mortar shell comprising a body member having an extension at one end formed with a bore therein, said body member formed with a second bore at its other end, said first-mentioned bore adapted to receive a blank cartridge, a head piece comprising a nose piece and a cylinder securable to said extension so that said first-mentioned bore communicates with the interior of said cylinder, said cylinder being movably engaged with said nosepiece, firing means secured in said nose piece and extended into said cylinder, second firing means secured to said body member and extending into said second bore, a tail piece securable to said body member and containing an axial bore, and a breech member movably seated in said axial bore of said tail piece, said breech means adapted to receive a second blank cartridge and to be moved to bring said second cartridge into contact with said second firing means.

6. A subcaliber mortar shell comprising a body member having an extension at one end formed with a bore therein, said body member formed with a second bore at its other end, said first-mentioned bore adapted to receive a blank cartridge, a head piece comprising a nose piece and a cylinder securable to said extension so that said first-mentioned bore communicates with the interior of said cylinder, said cylinder being movably engaged with said nose piece, firing means secured in said nose piece and extended into said cylinder, second firing means secured to said body member and extending into said second bore, a tail piece securable to said body member and formed with an axial bore and at least one aperture, a breech member movably seated in said axial bore of said tail piece and formed with at least one aperture therein, said breech member adapted to receive a second blank cartridge and to be moved to bring said second cartridge into contact with said second firing means, and

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means to align said apertures in said tail piece and said breech member for the escape of gas when a cartridge is fired.

7. A subcaliber mortar shell comprising a body member having an extension at one end formed with a bore therein, said body member formed with a second bore at its other end, said first-mentioned bore adapted to receive a blank cartridge, a head piece comprising a nose piece and a cylinder securable to said extension so that said first-mentioned bore communicates with said nose piece, firing means secured in said nose piece and extended into said cylinder, second firing means secured to said body member and extending into said second bore, a tail piece securable to said body member and formed with an axial bore and at least one aperture, a breech member movably seated in said axial bore of said tail piece and formed with at least one aperture therein, said breech member adapted to receive a second blank cartridge and to be moved to bring said second cartridge into contact with said second firing means, means to align said apertures in said tail piece and said breech member for the escape of gas when a cartridge is fired, and a ranging ring formed with apertures of different dimension, said apertures being adapted to align with said aligned tail and breech apertures to control the range of the shell.

8. A subcaliber mortar shell comprising a head member formed with a bore, said head member comprising a nose member including a stem extending slidably into said head bore and first firing means secured to said stem, a body member removably secured to said head member and including cartridge holding means, said firing means adapted to discharge a cartridge retained in said cartridge holding means when the nose member strikes an object, a tail section removably secured to said body member, second firing means secured within said body member, and second cartridge holding means movable within said tail section to bring a cartridge into contact with said second firing means.

9. A subcaliber mortar shell comprising a head formed with a bore, said head member comprising a nose member including a stem extending slidably into said head bore and first firing means secured to said stem, a body member removably secured to said head member and including cartridge holding means said firing means adapted to discharge a cartridge retained in said cartridge holding means when the nose member strikes an object, a tail section removably secured to said body member, second firing means secured to said body member, and second cartridge holding means movable within said tail section to bring a cartridge into contact with said second firing means, said body member including a plurality of passages extending from the second cartridge holding means to release gases formed by explosion of the second cartridge.

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