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HANDBOOK OF CURRENT BRITISH

LAND SERVICE FUZES

This edition supersedes I. Arm. Publication HB.14, 1956

HB. 45 — PARTS 1 & 2

1962

INSPECTORATE OF ARMAMENTS · WOOLWICH

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Record of Amendments

Amendment Serial No.	Date	D.C.I.	By whom amended	Date of insertion
1	14/3/70		S	

Preface

The Handbook of Current British Land Service Fuzes has been compiled by the Inspectorate of Armaments.

Part 1 deals with the principles used in the design of fuzes, the general aspects of various types of fuzes and other miscellaneous information of a general nature. A chart giving technical data is attached as an annexure.

Part 2 has been divided into sections, each section dealing with one type of fuze e.g. Percussion D.A., Percussion D.A. and Graze; Mine A. Tk. Within each section the detailed descriptions of the individual fuzes are attached as annexures for ease of insertion of additional fuzes or deletion of fuzes which may become obsolete.

Descriptions of "Drill", "Inert" or "Imitation" fuzes have not been included in all cases.

The information detailed in this publication is based on a series of notes, compiled from various sources, by one of the technical officers of this Inspectorate, and any suggestions, errors of a technical nature or ommissions should be notified to the Director, Inspectorate of Armaments, Red Barracks, Woolwich, S.E.18.

Arndt/- 17/3/70 -

Part I

HANDBOOK OF CURRENT BRITISH

LAND SERVICE FUZES

Part 1

HANDBOOK OF CURRENT BRITISH

LAND SERVICE FUZES

Contents

PART I

Section 1

PRINCIPLES

INTRODUCTION

1. In general, a fuze acts in conjunction with an exploding system, to ensure the correct functioning of the bursting charge in a projectile, bomb, mine, grenade or rocket.

By far the greatest variety of fuzes are to be found in projectiles fired from artillery weapons. These may be classified in a number of ways, thus:-

(a) According to function

(i) "Time" - to function after a predetermined time; these are subdivided into "mechanical" and "combustion" according to the method of operation.

(ii) "Proximity" - to function on nearing the target.

(iii) "Percussion Graze" - to function on appreciable deceleration.

(iv) "Percussion Direct Action" - to function on impact.

(b) According to position in the projectile

(i) "Nose" - shaped to conform to the shell contour at the nose.

(ii) "Base" - cylindrical in shape, for entry into the base of the shell cavity.

Nose fuzes have a right-hand and base fuzes a left-hand screw thread, to avoid the possibility of their becoming unscrewed by rotational acceleration in the bore. An exception to this rule is provided by nose fuzes in some mortars and bomb throwers. Here, rotational effects are negligible, and the use of a left-hand thread prevents the fuze from being unscrewed with the protecting cap (which has a right-hand thread).

(c) According to filling

(i) "Igniferous" fuzes have a magazine filled with gunpower, to give a flash: these fuzes are not usually employed in H.E. shell unless the filling is provided with a picric powder exploder.

(ii) "Detonating" fuzes have a magazine filled with a pellet of C.E. A small channel, filled with lightly stemmed C.E., connects from the detonator to the magazine, so that when the detonator is fired, this continuous column of explosive builds up a detonating impulse.

Although particular types of fuzes are considered separately, one or more types may be combined into a single fuze, e.g. "Time and Percussion", "Direct Action and Graze", etc.

FUZE POWDERS

2. Fuze powders as a whole are very sensitive to moisture, which in quite small quantities alters their rate of burning very considerably.

(a) 22 sec. and 30 sec. Powders
These consist of 75 per cent potassium nitrate, 16 per cent charcoal and 9 per cent sulphur. They are made with specially selected charcoal and under very carefully controlled conditions so as to produce powders which burn regularly and at the desired speed.

(b) SR227 and 227A
These are very similar to gunpowder, their composition being 72 per cent potassium nitrate, 21 per cent charcoal and 7 per cent sulphur. SR227 is used in the rings and SR227A in the form of pellets in combustion time fuzes.

(c) RD 202
This is a slagless powder, so called to distinguish it from other fuze powders which, like gunpowder, yield on burning a large quantity of solid residue. It contains 74.2 per cent ammonium perchlorate, 23.0 per cent charcoal and 2.8 per cent starch. It gives very long times of burning, and is used in the time rings of certain combustion time fuzes.

FORCES

3. General. - All components of fuzes are either fixed relatively to the fuze or are free to move within certain limits. The movement of the free components, controlled or restrained as necessary by friction and/or springs, depends principally upon the forces arising from acceleration, deceleration and spin, although it is also affected by "side-slap" to an extent depending mainly upon the state of wear of the guns.

Some or all of these forces are utilised to ensure correct operation as well as in various safety devices.

4. Nose fuzes

(a) Nose fuzes of the direct action type are normally "armed" by:-

(i) Set-back force or

(ii) Centrifugal force or

(iii) A combination of both.

(b) Set back force acts on the free or movable parts of the fuze at the instant of firing. Centrifugal force is intended to be effective only when deceleration occurs on the projectile leaving the bore, when the free or moving parts are forced outwards by spin. While passing through the bore the moving parts are expected to remain in their original positions by friction as a result of set-back.

(c) The majority of fuzes incorporate shutters which move into the "armed" position by the influence of centrifugal force. Such shutters are usually designed to remain in the "unarmed" or safe position until the shell is spinning between a specific number of revolutions per minute (r.p.m.), the number of revolutions varying in different fuzes to meet the requirements of the equipments for which they are approved. Springs assembled either under compression or expansion may be used to assist or restrain the centrifugal force.

(d) Locking devices may also be incorporated to secure the movable components in the "armed" position after centrifugal force becomes effective.
In certain new fuzes a delayed arming shutter actuated by centrifugal force is incorporated in the design. See para. 4 (c) (iii).

(e) The "time" element of time (combustion and mechanical) fuzes, is initiated at the instant of firing by set-back (that is, the effect of inertia).

5. Base fuzes

(a) Base fuzes of the direct action type are normally "armed" in a manner similar to that described in (b) above.

(b) A "delay" action, which becomes effective after impact, may be incorporated.

(c) A rotary moving component or shutter which functions after set-back but prior to centrifugal force becoming effective may also be incorporated in the design. Later designs may incorporate a delayed arming mechanism.

6. Acceleration and Deceleration
The acceleration of the projectile and fixed components tends to leave the free moving components behind. If the acceleration is moderate, the loose parts "creep back" and if violent, "set-back". Conversely, deceleration causes "creep forward" and "set forward". Violent acceleration occurs at the instant of firing the gun, and comparatively moderate acceleration with the subsequent forcing of the projectile along the bore of the gun. Moderate deceleration continues from the moment the projectile leaves the muzzle until it becomes violent on impact. Violent and momentary deceleration also occurs with a worn gun with appreciable free run-up when the driving band first takes up the rifling.

7. Spin

Centrifugal force, resulting from the rotation of the shell, acts in a plane at right angles to the line of flight to force the free components outwards from the centre of the fuze.

Centrifugal force is not normally intended to be effective until the shell has left the bore of the gun as the free components are expected to be held in their original positions by frictional forces proportioned to the set-back forces in the gun.

8. Side-slap

Forces acting in a plane roughly at right angles to the axis of the bore are also set up owing to inadequate centring of the projectile. This causes the shoulder of the projectile to hit against the bore of the gun.

These forces, however, are only appreciable with a well worn gun, and in this case, the excessive hammering, is known as "side-slap". With the more modern high velocity guns this tendency is restricted, if not eliminated, by the fitting of double driving bands to the projectile.

MECHANICAL DEVICES

9. General

All fuzes embody devices to ensure:-

(a) Safety in handling, both before and during loading.

(b) Bore and muzzle safety immediately after firing.

(c) Arming after leaving the muzzle.

(d) Firing of fuze magazine and initiation of the bursting charge in the shell.

The above devices are housed in the fuze body. For time fuzes, the fuze body also contains the time element, for proximity fuzes, the proximity element, and may also incorporate a self-destruction element.

10. Arming of the fuze, this is a mechanical event which is designed to take place as the shell is fired (i.e. time fuzes) or after the shell leaves the muzzle of the gun (i.e. percussion fuzes). Before the fuze is "armed" it should not be capable of being put into operation by any conceivable rough usage, or by any drop in any position which is likely to occur in the Service. Generally speaking, the moving parts of a fuze are securely locked together by a number of devices, and the particular combination of forces which the fuze undergoes when being projected from a gun is used to unlock them. Any other combination of forces would not have the required effect. It is in fact a form of combination lock in which firing from a rifled weapon is the key.

The ultimate object of the mechanical devices is to ensure that the detonator is struck at the desired instant. Premature action is prevented by various forms of holding and locking devices, and, as a further safety measure, masking devices can be incorporated to block the detonating train to an H.E. bursting charge.

A component is said to be "armed" when it is in such a condition that there is nothing to prevent initiation of the bursting charge, either on a disturbance of the existing state of motion or rest (e.g. impact of a percussion fuze or movement of a blind) or on the functioning (normally or prematurely) of a time device.

Although freedom from premature action is essential for both safety and operational reasons and embraces handling, loading and projection until well clear of the muzzle, the projectile must be fully armed on approaching the target.

The various devices in use are described according to their principal functions of holding, masking and firing, bearing in mind the forces used to operate them as previously described.

11. Holding devices

(a) Shear wire (Fig. 1) This simple device consists of a short length of wire inserted in a radial hole in the striker the ends registering in two holes in the fuze head, alternatively the ends may be turned over around the stem of the striker, (see Fig. 3). If sufficient force is applied the wire will be sheared and the striker freed.

(b) Striker spring and Spring disc (Fig. 1) The striker spring consists of a spiral spring surrounding the striker to keep the striker separated from the detonator until overcome by a superior force (e.g. impact with the target).
The same function is performed by a corrugated spring disc in the centre of which is fixed a needle.

(c) Striker cup The striker cup consists of an inverted cup shaped metal component with a hole drilled centrally in the base through which the stem of the striker passes, the flanged head of the striker resting on the base of the cup. If sufficient force is applied on impact, the cup will collapse and the striker will be forced down on to the detonator.

(d) Centrifugal balls, Segments, etc. and Arming sleeves (Fig. 2) This combination depends for operation on two forces operating at right angles.
A number of balls, segments, etc., are retained under a flange of the striker by an arming sleeve. Movement of the detent on firing and of the arming sleeve due to creep forward, uncovers the balls, etc. which are then free to move outwards under centrifugal force to free the striker.

(e) Stirrup spring (Fig. 2) This consists of a thin metal cylinder with lugs turned over at each end and in opposite directions. The lugs can be used to lock two concentric sleeves together and rest at opposite ends of each sleeve. One of the sleeves is fixed and the other kept against a lug by a spring. The lugs are designed to be straightened out by one of the forces described (para. 3) and thus allow the moving sleeve to be freed under action of the spring.

(f) Ferrule (See Fig. 2) This is simply a sleeve or collar and is usually used to denote the outer or holding sleeve used in conjunction with a stirrup spring to hold the moving (e.g. arming) sleeve or ring.

(g) Detent (Fig. 2) This is a form of plunger, consisting of a small metal cylinder or block working in a hole or recess usually in the fuze body and resting on a spiral spring under part compression. The spring is used to keep the detent in a safe position in or behind a moving component and thus lock it. The detent spring may be designed to be overcome by any of the forces described in para. 3 to permit the detent being withdrawn and thus unlock or free the moving part.

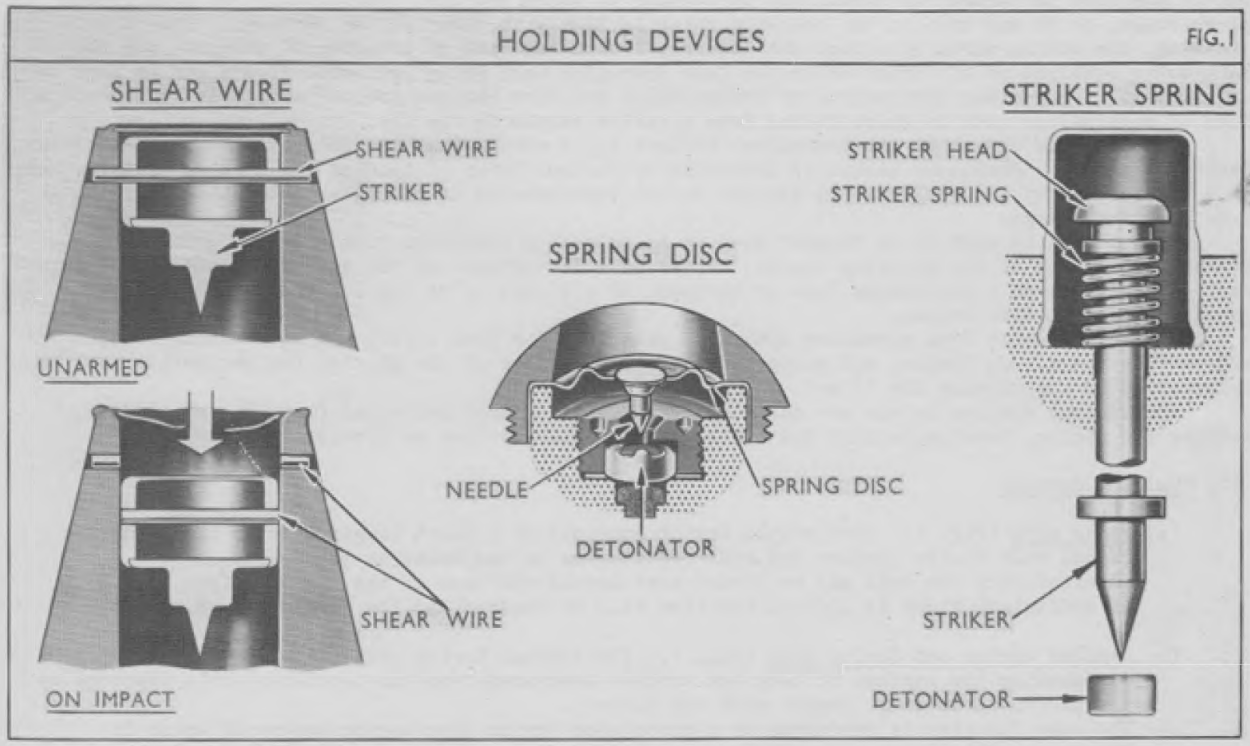
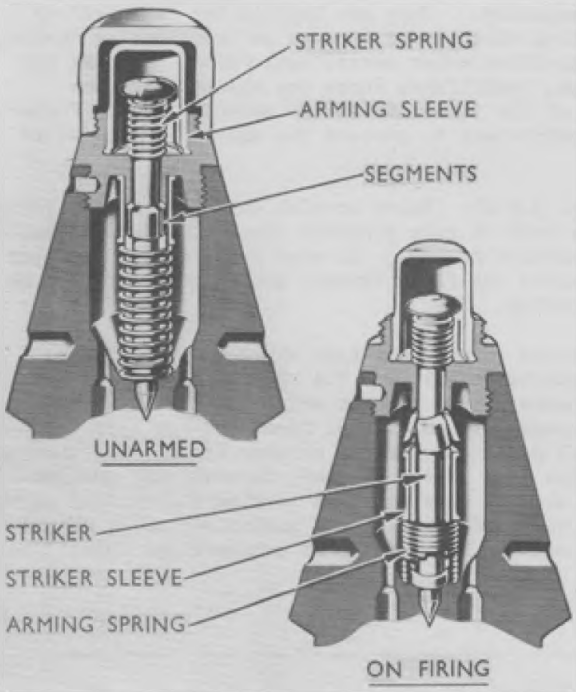


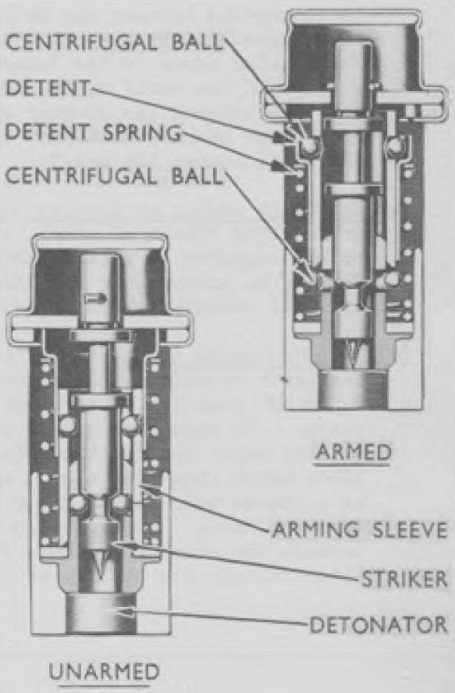
FIG.2

HOLDING DEVICES

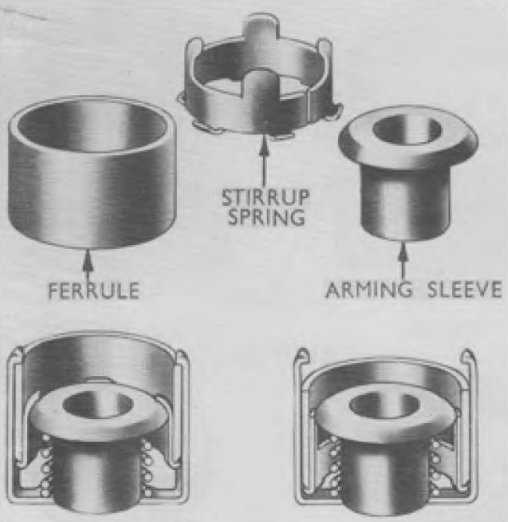
SEGMENTS



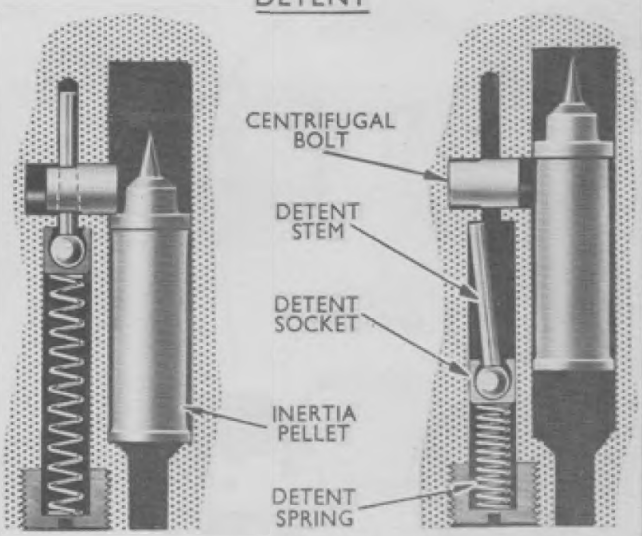
CENTRIFUGAL BALLS



STIRRUP SPRING AND FERRULE



DETENT



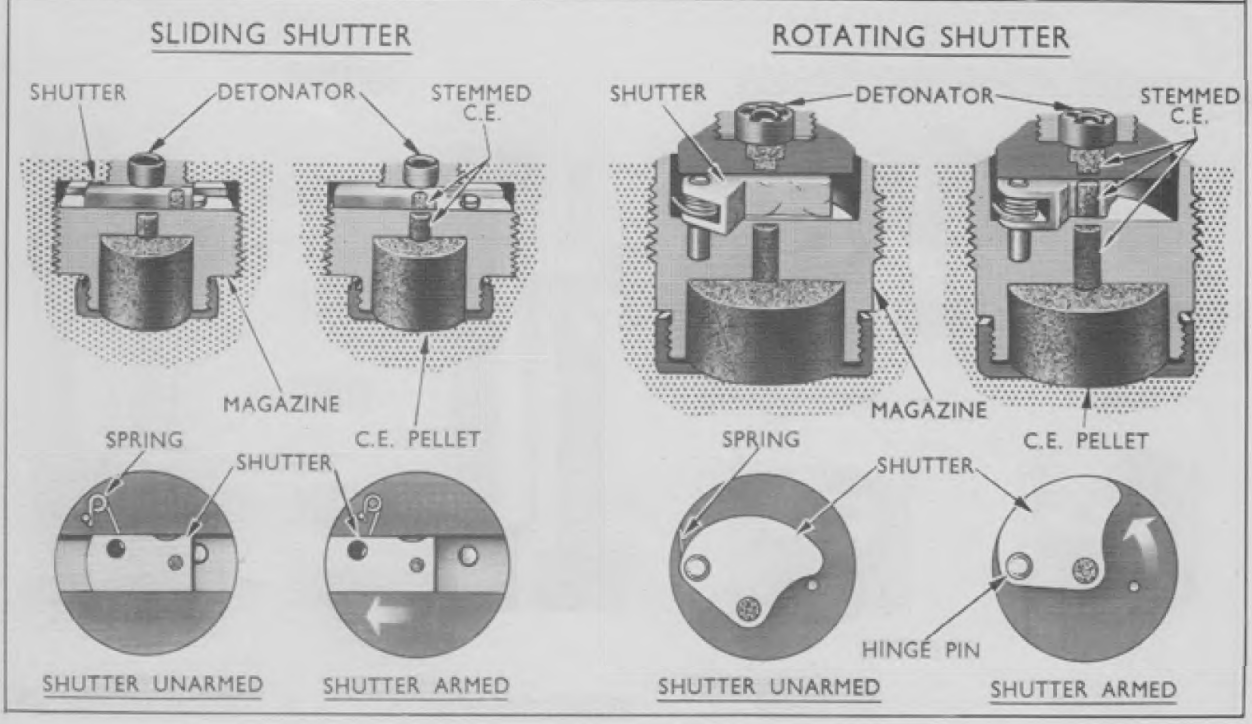
12. Masking Devices

(a) General - In the open or "armed" position, the detonator is connected to the magazine by channels in the shutter and top portion of the magazine body. In some cases, the striker and detonator are above the shutter and the shutter channels are filled with C.E. In other cases, the striker only is above the shutter, the detonator being housed in the shutter and therefore only positioned under the striker in the "armed" position. Shutters are so designed that a solid part of the shutter when in the "unarmed" position is interposed between the detonator, and magazine. They are kept in the "unarmed" or closed position by a spring, either operating directly or through an interlocking device. The shutter moves to the "armed" or open position under centrifugal force. During the passage of the shell up the bore of the gun, centrifugal force has also to overcome friction between the shutter and platform of the fuze body due to set-back of the former, and, under ideal conditions, this may be sufficient to prevent the shutter arming until the shell leaves the muzzle.

(b) Non-delay arming or masking shutters (Figs. 3 & 4) These consist essentially of sliding or rotating blocks of metal, which, in the shut or safe position block the channel leading to the magazine to provide safety from premature firing. In some cases it may take the form of an interrupter (or baffle) which masks the flash channel and is controlled by an optional selector which is set prior to loading.

(c) Delayed arming shutter (Fig. 4) This consists of a rotary type shutter containing a detonator assembled in a circular shaped shutter housing. The shutter is held in the "unarmed" position by means of a spring-loaded safety plunger which engages in a locking plate. On spin, the safety plunger disengages by centrifugal force and the shutter then rotates until the detonator is in a central position over the striker hole. The locking plate which fits into a slot made across the face of the shutter, moves out and engages in a recess made in the outer side of the shutter housing, thus locking the shutter in the open position. The delay is obtained by means of a pallet and pinion mechanism positioned beneath the shutter and this oscillates a segment by means of an escape wheel and pinion which retards the opening of the shutter.

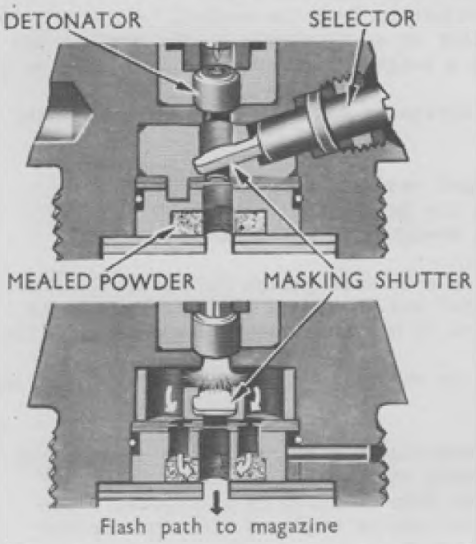
MASKING DEVICES FIG.3



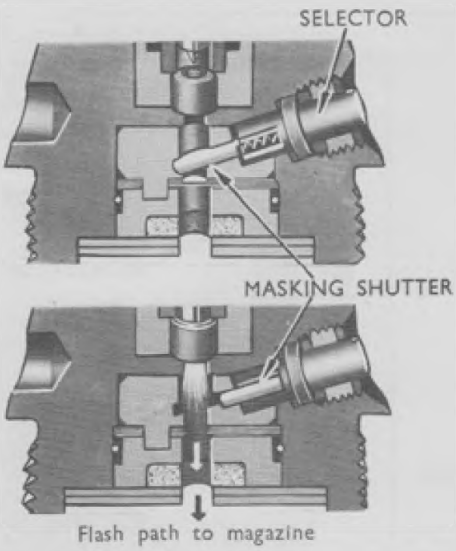
MASKING DEVICES

FIG.4

DELAY OR NON-DELAY MASKING SHUTTER

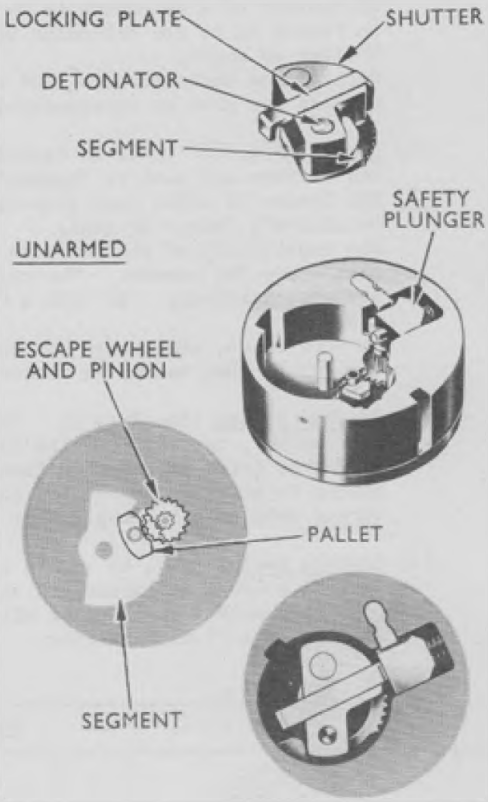


Top view shows selector at DELAY setting. Lower view (section turned 90°) shows flash path on impact.



Top view shows selector at SUPER QUICK setting. Lower view shows masking shutter moved outwards by centrifugal force during flight also the flash path on impact

DELAYED ARMING SHUTTER



13. Firing Devices

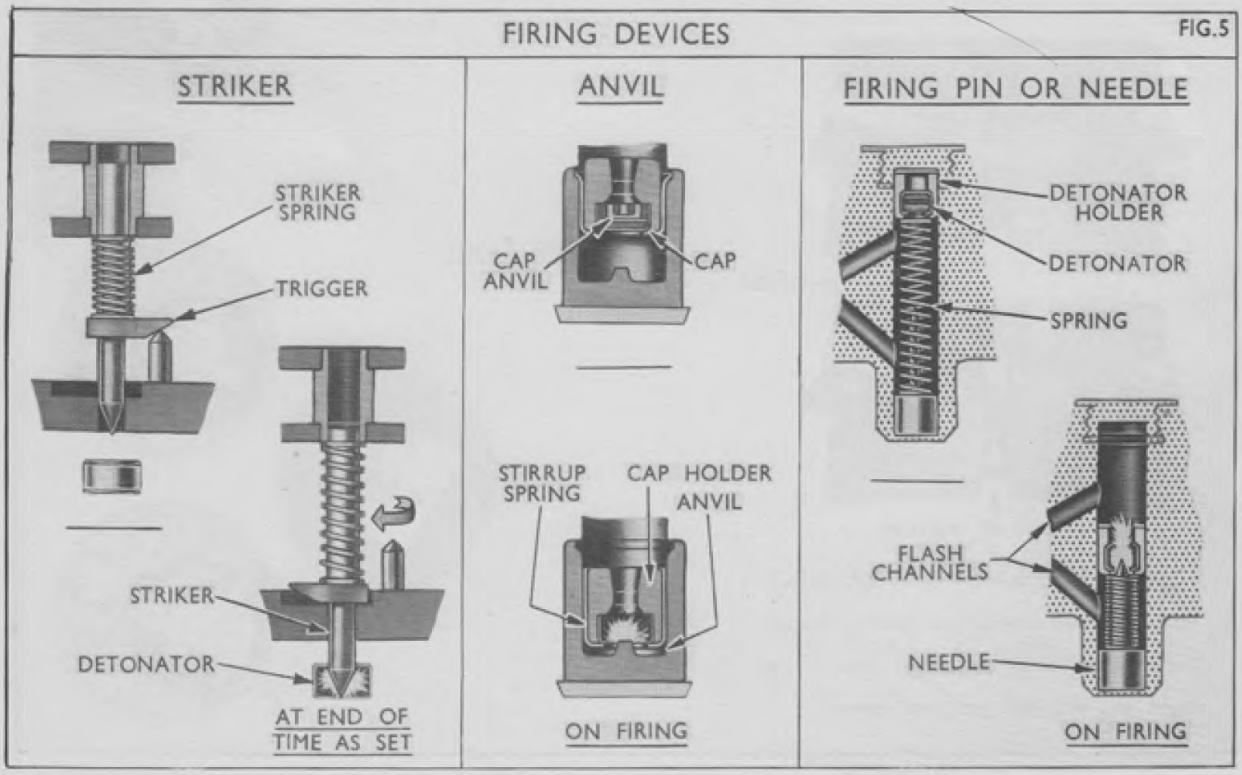
(a) Striker, Firing pin (or needle) and Anvil (Fig. 5) A striker, firing pin or needle is a rod of steel with a pointed end to impinge on the detonator.
The American term "firing pin" is synonymous with "striker" and the distinction between a striker and needle is that of size only, the needle being smaller.
An anvil is a steel block with a nipple or boss projecting from the centre.
Initiation of a detonator is by impact with a striker or anvil nipple. The striker may be forced on to the detonator or the detonator (in a weighted holder of "pellet") on to a striker or anvil.
Striker and detonator are kept apart by a holding device. Additional and inter-locking devices can also be incorporated.

(b) Hammer (Fig. 6) This is usually a rod with enlarged head and is mounted in front of the striker and used to "hammer" the striker on to the detonator.
The hammer is often used with very sensitive fuzes designed to function on striking on aircraft fabric or skin.
The sensitivity of the fuze can be reduced by having a thin diaphragm formed in the fuze head above the hammer. The shape of the hammer head and thickness of the diaphragm is somewhat critical. If such a fuze is too sensitive it may function on impact with raindrops.
In some cases, the hammer and striker are combined in one piece and the combined hammer and striker is then termed as "hammer".

(c) Striker spring (See Fig. 5) The striker spring consists of a spiral spring surrounding the striker, one end of which seats on a flange formed on the stem of the striker, and is used to drive the striker down on to the detonator when released by a trigger. The spring is kept in compression until released and must not be confused with the striker spring used as a holding device (see para. 11 (b)).

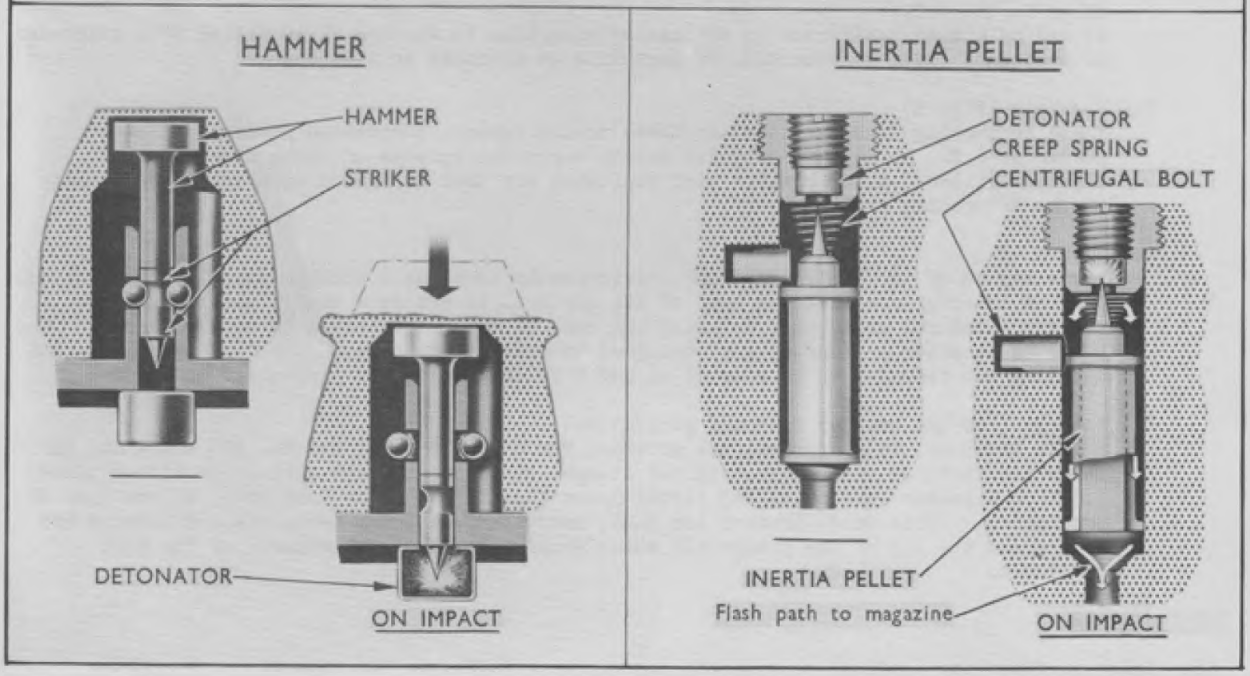
(d) Inertia pellet (Fig. 6) This is a metal weight, usually cylindrical in shape and can be used to house a detonator and carry it on to a striker or anvil. Alternatively, it can be fitted with a striker, in which case the pellet moves forward for the pointed shank to impinge on a fixed detonator.

FIRING DEVICES FIG.5



FIRING DEVICES

FIG.6



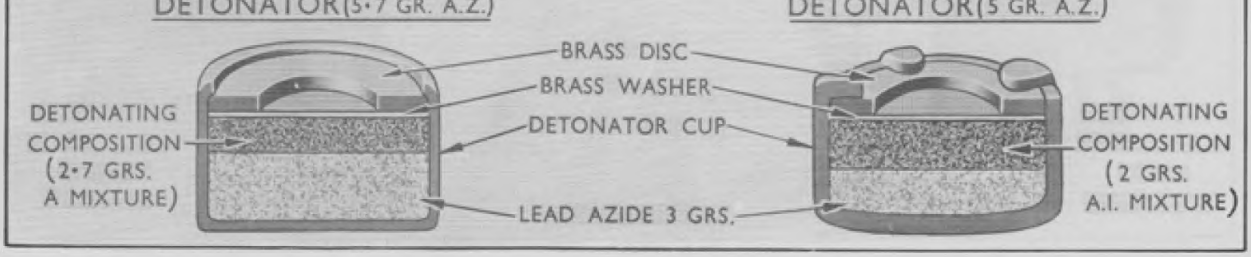
14. **Other Fuze Components**

(a) Pellets
These are formed of pre-pressed explosive, both C.E. and gunpowder pellets being used. Powder pellets are sometimes perforated, in which case they serve to reinforce flash, or they may be solid and in this form constitute a delay.

(b) Detonators (Fig. 7)
These are either igniferous or disruptive according to whether they are required to ignite powder or detonate C.E. respectively.
Detonators consist of small copper cups or shells containing the explosive, closed by a thin metal disc and a brass washer secured usually by turning over the lip or lugs formed on the mouth of the cup. In more recent designs of fuzes, lugless detonators may be assembled therein.
Certain detonator copper alloy cups are tinned whilst others may be made of aluminium.
Detonators are normally initiated by the needle point of the striker piercing the detonator i.e. by friction, but occasions occur where they may be initiated by a flash from another source, e.g. a powder pellet or another detonator. Caps (in the case of primers and tracer igniters) on the other hand are initiated by the rounded end of a striker being driven on to the base of the cap and causing the composition to be "nipped" between two metal surfaces, i.e. the base of the cap and rounded end or boss of an anvil.

DETONATORS

FIG.7



(c) Magazine (Fig. 8)
This can be formed either in the body of the fuze, or can be a separate container secured in or to the body.
It may be either igniferous or detonating according to whether it is filled with gunpowder to produce a flash or with C.E. or pentolite to detonate an H.E. charge.

(d) Channels (Fig. 8)
These connecting links may contain loose mealed powder, compressed powder, pellets of powder or C.E., or may be empty and merely serve the purpose of flash direction. Channels filled C.E. or similar high explosive are used to ensure substantial continuity of the detonating train.

(e) Caps
These may be of two kinds, an inner one (normally known as a striker cover) to protect and prevent interference with the head of the striker, to act as a windshield and also to prevent moisture, grit, etc. entering the nose of the fuze. This is not removable. The other is an outer or "safety cap" designed to protect the nose of the fuze in transit and handling but intended to be removed at the time of loading the projectile in the gun.

(f) Washers (for use between fuze and projectile)
On 8th November, 1955 approval was accorded for No. 221B Mk. 3 and No. 390 Mks.1 and 2A fuzes manufactured with bodies without stepped shoulders to have a brass or tinned plate 2.3 inch diameter washer (QX/88) fitted under the flange of the fuze body, at the time of production. This is to prevent the Band, securing fuze cover being pinched between the flange and the lip of the projectile which would otherwise make removal of the band difficult.

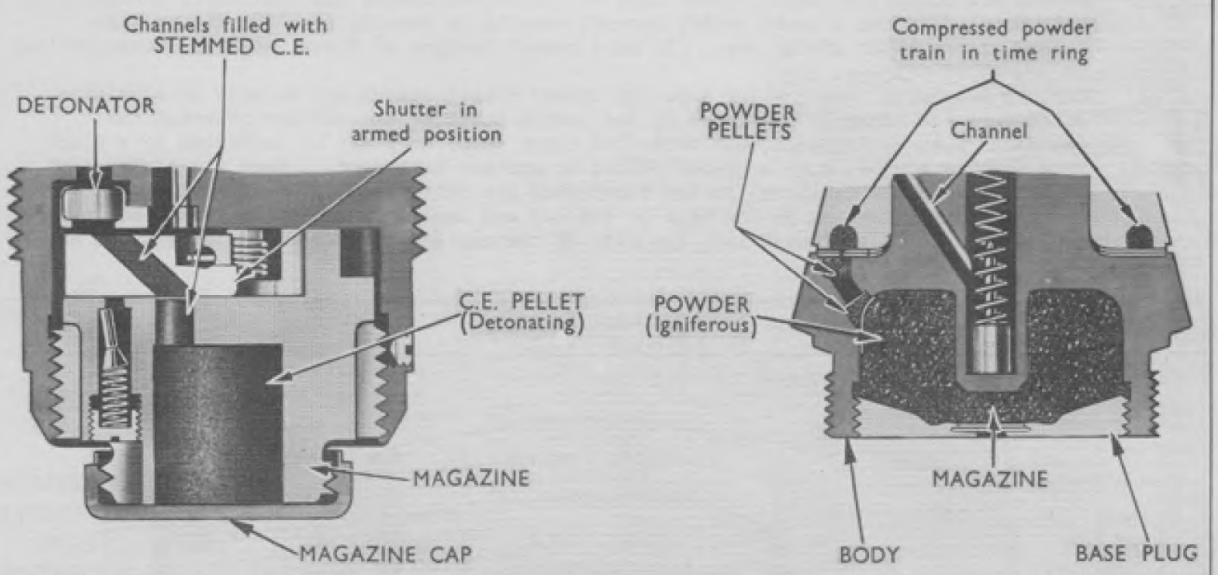
DELAY SYSTEMS

15. Delay in fuzes may be fixed or optional and may be attained in two ways:-

(a) The imposition of a baffle in a flash channel to force the flash to follow a tortuous path.

(b) A layer of solid pyrotechnic material which must be burnt through to allow the flash to proceed on its way.

MAGAZINE AND CHANNELS FIG.8



Having regard to the characteristics of detonation, it will be evident that delay can only be obtained in the igniferous train of a fuze and not in the disruptive train. Consequently a disruptive fuze can normally only have delay incorporated if the early part of the explosive train is igniferous.

Systems (a) and (b) above may be employed together.

CARE AND PRESERVATION

16. Fuzes deteriorate quickly when exposed to the atmosphere; it is important, therefore, that only such as are required for immediate use should be uncovered or removed from their hermetically sealed cylinders.

With effect from September, 1950, to improve the protection of fuzes from atmospheric conditions and water, approval was accorded for anodised surfaces exposed after assembly to be coated with Varnish RD 1177, care being taken to avoid applying any varnish to the plastic noses of V.T. and C.V.T. fuzes.

All openings in fuzes are treated with composition to prevent the entry of moisture and under normal conditions, fuzes should remain waterproof.

17. Time, and Time and Percussion fuzes of the combustion type are treated with waterproofing composition (i.e. Mark 9 luting) over the escape holes in the time rings, set screw recesses and also in the spaces between the cap, time rings and body. The threads of the base plug are treated with cement.

These fuzes are further protected by metal or tinned-plate covers which form an integral part of the fuze and are secured in position by a band secured by wire or similar means. The covers should never be twisted by hand to ascertain if they are tight, they should only be tested by pulling. When issued separately, fuzes are packed in containers or cylinders which are hermetically sealed. From the foregoing it will be seen that fuzes are adequately protected and should remain serviceable so long as the fuze seal remains unbroken and the container or cylinder in good condition.

18. The waterproofing of the time ring is broken when a fuze is set, or by loss of tension and unless it is restored at once the fuze may rapidly become unserviceable. The time ring may be moved accidentally by the turning of a loose fuze cover, or by vibration when travelling if the time rings have become loose due to loss of tension.

Whilst the fuze cover, is in position on the shell it must be assumed that the fuze is serviceable and usually the fuze will be found to be set at SAFE when the cover is removed.

19. "Tensioning" is the means by which relative movement between the time rings and the fuze body is prevented and the flame from the composition in the time rings of powder filled fuzes is confined. It also provides a seal against the entry of the flash of any propellant gases that may pass over the shell. Loss of tension may therefore lead to a "flash-over" or a premature in powder train fuzes. Further, if the time rings are loose in powder filled fuzes they may move relative to one another and so alter the setting; thus leading to a blind, a burst out of the calculated position or possibly a premature. Fuzes that have lost their tension, or have loose time rings, must not therefore be used.

20. Loss of tension with consequent movement of time rings is a defect seldom found, but every effort should be made to detect such defects when fuzes are uncovered. When a fuze is uncovered and found to be set at other than the SAFE position it is a clear indication of loss of tension and it should be replaced as soon as possible. If this cannot be done, it should be set aside for examination by an I.O.O. after it has been re-set at SAFE and had the waterproofing restored.

21. Except in great emergency, fuzes should not be pre-set unless some means of waterproofing is instantly available. When fuzes have to be pre-set it is imperative that the waterproofing seal, broken by the operation of setting, should be restored immediately the setting of each individual fuze is completed.

22. All uncovered fuzes, whether set at SAFE or not, should be treated with approved luting. The composition should be worked by hand into the grooves above and below the movable time ring. Surplus composition must be scraped off with a suitable chisel-shaped tool of wood or non-ferrous metal. None should be left in the setting slots, nether should there be a heavy deposit on the escape-hole discs of the time rings. The surface of the fuze must be left clean with the graduations clearly visible. This operation must be repeated every time the time ring is moved and will be facilitated if the composition is slightly warmed.

This waterproofing procedure will not repair a damp fuze, but it will ensure that a dry fuze remains serviceable.

PART I

Section 2

TYPES OF FUZES

TIME FUZES

1. General Time Fuzes are set for time before loading by rotation of a moving portion of the fuze against the fixed fuze body by means of a fuze key, fuze setter or fuze setting machine. Graduations are provided to enable the setting to be set by hand. In some latter designs, however, the graduations are omitted because the fuzes are always set by mechanical fuze setter.

The time element may be either of the combustion or mechanical type.

The bottom portion of the fuze body generally forms a platform upon which the moving part rotates for setting the time of functioning. With British fuzes, the fixed part is either graduated in arbitrary fuze lengths for reading against an indicator on the moving part, or else the moving portion is made to operate a fuze length indicator on the fixed part. In addition, both fixed and moving parts have slots for the engagement by the pawls of fuze keys or the older fuze setting machines. These slots are also used for setting the fuze at "SAFE". The latest fuze setting machines grip the fuze by means of knife rings.

The moving portion must be tight enough to prevent movement in handling, transport, loading and firing, and yet sufficiently loose to permit setting by the fuze key, fuze setter or fuze setting machine. The maintenance of the correct stiffness or tension is important.

"Time" refers to the length of time from the instant of firing the weapon to the instant of functioning of the fuze.

2. Mechanical This type of fuze normally has a fully wound-up clock-work mechanism retained by a trigger, which is released by the "set-back" on acceleration, after which the mechanism works until the movement of its parts releases a striker which is driven on to the detonator by a spring. The time between the starting of the mechanism and the release of the striker can be varied by the "setting" of the fuze. In modern designs a direct action percussion head may also be fitted. In certain fuzes, however, the time mechanism may be functioned by centrifugal force.

3. Combustion In the combustion type of fuze the detonator, in a suitable holder, is supported on a stirrup or coiled spring sufficiently weak to allow the holder to "set-back" on acceleration, bringing the detonator on to a needle. The resultant flash ignites a gunpowder pellet which, in turn, ignites the composition in the time ring(s).

These fuzes embody a train of compressed powder which burns through until the time as set has expired. The flash then fires a magazine. The powder is generally contained in circumferential grooves in adjacent time rings, the powder burning in one ring until it can ignite the powder in the other, depending upon the relative position of the two rings as determined by the setting. Two rings are usually employed, the upper ring being fixed by pinning to the stem of the fuze body, and the other movable, or "free" to rotate on the stem. The under surface of both rings is grooved for almost the entire circumference, the grooves being charged with fuze powder under compression. The upper ring has a radial channel from one end of the powder groove to pick up the flash from the detonator, the channel containing a perforated powder pellet to facilitate this function. A second channel to the outside of the ring forms a gas escape, being fitted with a small closing disc to provide a watertight cover, and a perforated powder pellet to blow the disc clear when ignited. The lower ring differs only in having a vertical channel (instead of a radial channel) to pick up the flame from the powder grooves in the upper ring.

Cloth washers are placed below the two rings to ensure a tight joint. Both rings are secured by a cap which is screwed on to the stem of the fuze and bears down on to the rings to secure the necessary tension.

The central stem or body contains the detonator, needle and magazine.

PERCUSSION FUZES

4. General Percussion fuzes are of various types according to the speed of action required. Generally speaking, the Direct Action fuze has the fastest action, followed closely by the Graze fuze and finally by the Delay Action Graze fuze.

The essential elements of percussion fuzes are the firing mechanisms accompanied by the holding and safety devices. These have already been described in detail in Section 1.

A self-destruction device is necessary for shell fitted with percussion fuzes when used in the A.A. role to prevent functioning of the fuze on impact with the ground should the fuze not function at the target. Such a device may be embodied in the fuze as a time element.

The term "delay" when used in conjunction with percussion fuzes refers to the action at the instant of impact.

5. Direct Action (D.A.) Fuzes These fuzes may be of the igniferous or detonating types, the mechanism consisting of a needle supported on a thin metal disc, or a hammer or striker supported on a shearing wire or coiled spring, exposed to a direct blow on impact with the target; its sensitivity depending on the strength of disc, shearing wire or coiled spring. It may be provided with a safety pin or tape, arming sleeve and segments retaining the striker in a safe position, and also usually a shutter.

D.A. fuzes filled C.E. are instantaneous in their action while D.A. fuzes filled gunpowder have a slight delayed action.

6. Direct action impact (D.A.I.) Fuzes These fuzes may be of the igniferous or detonating types, they differ mainly from the D.A. in being less sensitive. The mechanism usually consists of a steel hammer supported on a stout shearing pin; a shutter is also usually embodied.

7. Graze Fuzes The interior mechanism of graze fuzes is so arranged that when the shell is checked in flight or receives an appreciable deceleration, a movable part, usually called the graze, or inertia pellet can move forward to carry the detonator on to the needle (or vice versa). A creep spring keeps the two apart until this deceleration is experienced. As the movement of the inertia pellet or weighted needle gives rise to an "air gap" the fuze detonator is of the flash type.

Graze fuzes have a small inherent delay.

TIME AND PERCUSSION FUZES

8. These are time fuzes in which a percussion mechanism is embodied.

BASE FUZES

9. These fuzes usually depend on a detonator in an inertia pellet being driven on to a fixed needle (or vice versa) by the sudden retarding of the projectile at the moment of impact. A delay may be incorporated. Later designs normally incorporate a delayed arming mechanism.

PROXIMITY OR VARIABLE TIME (V.T.) FUZES

10. These are automatic time fuzes that require no time setting. They are designed to detonate the shell at the optimum lethal distance from the target, provided that, in the case of A.A. targets, the trajectory passes sufficiently close. The present day artillery V.T. fuze in service use is essentially a combined self-powered radio transmitting and receiving unit. In flight, the armed fuze transmits radio waves. Unlike radar devices, the waves are sent continuously and are non-directional. The radio waves fronts which are reflected back to the fuze, from any suitable reflecting surface, e.g. the ground or an aircraft, interact with the transmitted waves. When this inter-action of transmitted and reflected waves, resulting in ripples or beats, reaches a predetermined intensity, an electronic switch is tripped which permits an electric charge in the firing capacitor (condenser) to flow through an electric firing squib, detonating the filling in the projectile.

The major differences are in the matching of the radio to the shell, in optimising the sensitivity to the target (ground or air), in the arming delay and in the self destruction features of the fuze.

Safety devices are included as for other types of fuzes. These may be either electrical or mechanical. The fuzes are completely bore and muzzle safe.

ELECTRIC FUZES

11. These are usually functioned by means of a current passing through electric leads connected to a battery. The instant of actuation is therefore controlled and often from a distance. The ends of the connecting wires are usually bared and they may or may not be fitted with nipples. Where wires are of an unequal length, this is to minimise the risk of a short circuit when connecting up.

Electric fuzes either singly or in series are often used as a primary ignitory component in a sub-assembled store.

CONTACT FUZES

12. This term is usually associated with fuzes actuated by direct application of pressure such as fuzes for A. TK. mines.

PART I

Section 3

IDENTIFICATION OF FUZES

IDENTIFICATION OF FUZES

NOMENCLATURE OF FUZES (ALLOTMENT OF NUMBERS)

1. The system of group numbering of fuzes according to their design was introduced many years ago, but owing to the fact that the groups provided by the originators were not sufficiently extensive to cope with the great expansion of fuze design, various cases of apparently inconsistent numbering will be met with. In later practice, however, the system will be found to be applied more consistently, e.g.

Time mechanical fuzes of 2 inch gauge begin with No. 200

Small percussion fuzes, i.e., of gauge smaller than G.S. 1 inch begin with No. 130

Fuzes, T & P, of 2 inch gauge begin with No. 80

Fuzes, T & P, of G.S. 1 inch gauge begin with No. 50

Time fuzes of 2 inch gauge were introduced with No. 30, although congestions subsequently necessitated the use of numbers 28 and 29 for this type of fuze.

G.S. gauge time fuzes of more modern description are numbered upwards from No. 25, although earlier patterns of this class of fuze bore even earlier numbers.

G.S. Gauge percussion fuzes of the F.A. and D.A.I. types begin with No. 1 and continue after No. 19, owing to congestion, with No. 44

2. The remaining nose and base percussion groups bear various numbers out of the general order; this was the result of the lack of numbers available.

In certain cases (viz. Nos. 65A, 80, 80B, 83, 88) time and percussion fuzes had their number advanced by 100, i.e., becoming 165A, 180, etc., upon conversion to time fuzes only. This indicated that the percussion portion had been rendered inoperative by removal or other means.

Fuzes bearing fractional numbers, such as 80/44, also had their percussion portion rendered inoperative in a similar manner to Nos. 180, 188, etc., but different therefrom in having the first two graduations on the ring obliterated.

The fractional number given to these fuzes was originally used to denote the fact that they were time fuzes of the type designated by the number but adapted for use with a modified No. 44 fuze used as a gaine.

3. FUZES OF NEW DESIGN WILL, IRRESPECTIVE OF THEIR SIZE, TYPE OR CLASSIFICATION, BE INTRODUCED BY A MODEL number followed by the letter A and a number, e.g., L3A1 instead of a serial number and mark as formerly used for identification. New patterns of existing fuzes will, however, continue to be introduced and identified by an advance of the Mark.

In the case of proximity fuzes a final letter may be used to indicate frequency changes in models of the same fuze e.g., L7A1C.

4. Certain Naval and Air Service fuzes were allotted numbers under the old numerical system referred to above, but details of such fuzes are not included in this publication.

IDENTIFICATION LETTERS

5. The following general indications in nomenclature and stamping of fuzes were used in the past, and fuzes so marked may still be met with. This system of identification has, however, now been dispensed with.

"A" after Mk. of fuze ... ... Indicates fuzes similar to the previous converted Mark but of new manufacture.

"A" after No. of fuze ... ... Indicates a Picric Powder Pellet in lieu of a C.E. Pellet is assembled in the central magazine.

"B" after No. of fuze	Indicates the substitution of a weaker detent spring in place of the normal one for which the fuze was originally designed.
"B" after Mk. of fuze	Indicates a fuze fitted with a one piece striker instead of a striker with separate head.
"C" after No. of fuze	Indicates a converted fuze.
"D" after No. of fuze	Indicates fuze incorporates a delay.
"D" after Mk. of fuze	Indicates a fuze with a brass disc inserted above the detonator in the detonator plug.
"E" after the No. of fuze	Indicates the incorporation of a safety shutter, e.g., the No. 106E is fitted with a safety shutter whilst the No. 106 is without one.
"E" after the Mk. of fuze	Indicates the incorporation of a stronger creep spring, e.g., No. 119B Mk. 1E.
"M" after the Mk. of fuze	Indicates modification of the original design.
"N"	Indicates a Naval Service fuze (stocks of which may be found in the Land Service).
"P" after the No. of fuze	Indicates a powder filled magazine.
"Pb. SPL" after the Mk. of fuze ...	Indicates it is manufactured from Lead free material.
"S" after the Mk. of fuze	Indicates a fuze fitted with a steel instead of an aluminium hammer head.
"T" after the Mk. of fuze	Indicates a fuze which has had its percussion detonator removed and has been converted to function as "Time" only.
"Z" after the Mk. of fuze ... ... (except in the case of the No. 247)	Indicates a fuze fitted with a Lead Azide detonator. (This marking has now been dispensed with effect from October 1940 W.O.L.C. B3973 refers).
* after the Mk. of fuze	Indicates conversion.

NOTE:- Before 1945 marks of fuzes were stamped in Roman numerals. Since this date arabic numerals have been used.

PART I

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INDEX (Contd.)

FUZE TECHNICAL DATA CHART

SERVICE DESIGNATION ø Denotes OBSOLESCENT Fuze	MARK/ MODEL	TYPE	EQUIPMENT/STORE WITH WHICH USED	PROJECTILE OR ROUND	FUZE HOLE DETAILS	WEIGHT	
						FILLED	EMPTY
ANTI-PERSONNEL MINE FUZES							
Fuze, Mine, Anti-Personnel No. 2	2/1	Contact, pressure operated	Mine anti-personnel No. 6 Mark 1				
Fuze, Mine, Anti-Personnel No. 2 imitation	2		Mine, anti-personnel No. 6 imitation Mark 2				
Fuze, Mine, Anti-Personnel No.2 inert	2/1		Mine anti-personnel No.6 inert				
ANTI-TANK MINE FUZES							
Fuze, Mine, Anti-Tank No. 4	2 2/1	Contact, pressure operated	Mine anti-tank Mark 7 series				
Fuze, Mine, Anti-Tank No.4 imitation	1		Mine, anti-tank imitation Mark 7/1 and 7/2				
Fuze, Mine, Anti-Tank No.4 inert	1		Mine, anti-tank inert Mark 7/1				
ARTILLERY FUZES							
Fuze, Percussion D.A. No.117	10 ø 15 ø 17 ø 17/1 ø 17/2 ø 17/3 ø 17/4 ø 17/5 19 20	Direct action percussion detonating	Q.F. 25 pr. guns B.L. 5.5 inch guns B.L. 7.2 inch howrs B.L. 9.2 inch Marks 10, 10* and 10* guns (C.A.)	Shell H.E.	Nose 2 inch 14 T.P.I. (R.H.)		2lb 9¼ozs
Fuze, Percussion, D.A. and Graze No. 119B	17	Direct action percussion and graze detonating	Q.F. 25 pr. NOTE: May be used with all charges except charge 1 B.L. 9.2 inch Marks 10, 10* and 10* guns (C.A.)	Shell H.E.	Nose 2 inch 14 T.P.I. (R.H.)		
Fuze, Time and Percussion D.A. No. 213	4 ø 4/1 ø 4/2 5	Mechanical time and direct action percussion detonating	Q.F. 25 pr guns (a) B.L. 5.5 inch guns (b) B.L. 7.2 inch howrs (b) NOTE: (a) Not charges 1 and 2 (b) Not charges 1, 2 and 3	Shell H.E. and Chemical	Nose 2 inch 14 T.P.I. (R.H.)	2lb 3 ozs	2lb 3¾ ozs

FUZE TECHNICAL DATA CHART (Contd.)

SERVICE DESIGNATION ϕ Denotes OBSOLESCENT fuze	MARK/ MODEL	TYPE	EQUIPMENT/STORE WITH WHICH USED	PROJECTILE OR ROUND	FUZE HOLE DETAILS	WEIGHT	
						FILLED	EMPTY
Fuze, Time and Percussion Graze No. 221 B	4 ϕ 6	Combustion time and percussion graze igniferous	Q.F. 25 pr. guns B.L. 5.5 inch guns	Shell B.E. Smoke, Flare, Illuminating, Incendiary, and Chemical	Nose 2 inch 14 T.P.I. (R.H.)	2lb 1 oz	2 lb 0½ozs
Fuze, Percussion, D.A. No. 255	1 ϕ 1A ϕ 2 ϕ 3 ϕ 4 5	Direct action percussion detonating	Mks. 1, 1A, 2 and 4 fuses for Q.F. 40 mm. guns. Mks. 2 and 4 fuses for Q.F. 40/70 mm guns Mk. 5 fuse for Q.F. 2 pr. Mks. 9A and 10A guns	Shell H.E. and practice projectiles NOTE: Mark 1A to be used with H.E. shell only	Nose 1.196 inch 14 T.P.I. (R.H.)	3½ozs	3¼ozs
Fuze, Percussion, Base Medium, No. 303	1 ϕ	Percussion detonating graze action	6.5 inch A.V.R.E.	Shell H.E. L1 Mk.1	Base 1.6 inch 12 T.P.I. (L.H.)		
Fuze, Time No. 390	1 2 2A	Combustion time igniferous NOTE: For Mks. 2 and 2A see Mortar Fuzes	Q.F. 20 pr. guns	Shell B.E. Smoke	Nose 2 inch 14 T.P.I. (R.H.)	1lb 13½ozs	1lb 13¼ozs
Fuze, Percussion D.A. and Graze No. 410	1 ϕ 1/2 ϕ 1/3 ϕ 2 ϕ 2/1 2/2	Direct action percussion and graze detonating	Q.F. 76 mm guns Q.F. 20 pr. guns	Shell H.E. NOTE: Provided fuzes have been modified by the removal of the masking shutter	Nose 1.6 inch 14 T.P.I.(R.H.)	1lb 1½ozs	1lb 1oz
Fuze, Percussion, Base, Medium L10	1 ϕ	Percussion detonating graze action	Q.F. 25 pr	Shell HESH L3A1, L3A2	Base 1.8 inch 12 UNS T.P.I. 2 A (L.H.)		
Fuze, Percussion, Base, Medium L15	A1 ϕ A2 ϕ	Percussion detonating graze action	120 mm L1 Tk gun	Round HESH L2A2, L2A3	Base 1.8 inch 12 UNS T.P.I. 2A (L.H.)		
Fuze, Percussion, D.A. L17	A1 ϕ A2 ϕ A3	Direct action percussion detonating	76 mm Armd C guns	Shell H.E.	Nose 1.6 inch 14 T.P.I. (R.H.)	15½ozs	15¼ozs
Fuze, Percussion, Base, Medium, L19	A1 ϕ A2 ϕ A3 ϕ A4	Percussion detonating graze action, with delayed arming	(i) Q.F. 25 pr. (ii) 120 mm BAT gun (iii) 76 mm Armd C gun (iv) 105 mm L7 Tk gun (v) 120 mm L1 Tk gun (vi) 120 mm L11 Tk gun	(i) Shell HESH L3A6, L3A7, L3A8 and L3A9 (ii) Round HESH L19A3 (iii) Round HESH L29A1, L29A2 and L29A3 (iv) Round HESH, L35A1, L37A1 and Prac SH L38A1 (v) Shell HESH, L18A1, L18A2 and L18A3 (vi) Shell HESH L20A1 and Prac SH L30A1	Base 1.8 inch 12 UNS-2A(LH)	1lb 1oz	14¾ozs
Fuze Percussion, Base, Medium L24	A1 ϕ A2 ϕ	Percussion detonating graze action, with delayed arming	165 mm L9	Round HESH L33A1	Base 1.8 inch 12 UNS-2A (LH)	1lb 1½ozs	14¾ozs

FUZE TECHNICAL DATA CHART (Contd.)

SERVICE DESIGNATION ø Denotes OBSOLESCENT fuze	MARK/ MODEL	TYPE	EQUIPMENT/STORE WITH WHICH USED	PROJECTILE OR ROUND	FUZE HOLE DETAILS	WEIGHT	
						FILLED	EMPTY
Fuze, Percussion, Base Medium L29	A1 ø A2	Percussion detonating graze action, with delayed arming	(i) 105 mm L7 Tk gun	(i) Round HESH L35A2, L37A2 and Prac SH L38A2	Base 2.0 inch 12 UNS-2A (LH)	1lb 7 ozs	1lb 4¼ozs
			(ii) 120 mm L11 Tk gun	(ii) Shell HESH L31A1			
			(iii) 105 mm How L10	(iii) Round HESH L43A1			
ELECTRIC FUZES							
Fuze, Electric, No. 14	3 4 ø 5						
" " No. 14A	4 ø 5						
" " 12 inch No.F53	1						
" " 15 inch No.F53	1						
" " " "	1/1						
" " 21 inch No.F53	1						
" " 30 inch No.F53	1						
" " No. F85	2						
" " No. F92	1 ø						
" " No. F101	1						
" " No. F103	1 ø 2 3 ø						
" " No.F103 Drill	1						
" " No.F111	1						
GRENADE FUZES							
Fuze, Percussion, D.A. L9	A1 ø A2 ø A3	Graze action percussion detonating Direct and graze action percussion detonating	No. 4 .303 inch rifle fitted with a projector F.N. .762 mm rifle fitted with a projector L1A1 . 762 mm rifle fitted with a launcher	Models L9A1, L9A2 (formerly known as Mks 1 and 2) and L9A3 fuses are interchangeable with any mark of Grenade, A Tk, No. 94	Nose 13 mm/.7 mm (R.H.)	11.75 grams without safety clip	
Fuze, Percussion, D.A. Drill, L18	A1	Drill inert	As for fuze L9	Grenade No. 94 drill Mk.1			
MORTAR BOMB FUZES							
Fuze, Percussion, D.A. No. 161	1/1 ø 1/2 ø 3 ø 3/1 ø 3/2 ø 4	Direct action percussion detonating	2 inch Mortar	Bomb H.E.	Nose 1.77 inch 20 T.P.I.(L.H.)		14¼ozs

FUZE TECHNICAL DATA CHART (Contd.)

SERVICE DESIGNATION ϕ Denotes OBSOLESCENT fuze	MARK/ MODEL	TYPE	EQUIPMENT/STORE WITH WHICH USED	PROJECTILE OR ROUND	FUZE HOLE DETAILS	WEIGHT	
						FILLED	EMPTY
MORTAR BOMB FUZES (contd.)							
Fuze, Percussion, D.A. No. 162	1/2 ϕ 4 ϕ 8 ϕ 10	Direct action percussion detonating	3 inch and 81 mm Mortars	Bomb H.E. and Smoke W.P.	Nose 1.375 14 T.P.I. (R.H.)		
	3 3/1 ϕ 3/2 ϕ 3/3 ϕ 5 5/1 7 ϕ 9		4.2 inch Mortar				
Fuze, Time, No. 390	2 2A	Combustion time igniferous	3 inch Mortar	B.E. Screening, Coloured and Sky-trail smoke bombs	Nose 2 inch 14 T.P.I.(R.H.)	1lb 13$\frac{3}{4}$oza	1lb 13$\frac{1}{2}$oza
ROCKET FUZES							
Fuze, Rocket, Boxer, No. 20	5 ϕ 6 ϕ 7 ϕ	Pyrotechnic - ignited by flame	Rocket, life-saving Boxer	For use by Board of Trade			
Fuze, Percussion, L5, UK M404	1 ϕ	Percussion detonating	Launcher, Rocket, 3.5 inch U.K. M20 Mark 2	Head Rocket 3.5 inch H.E.A. Tk.	Base 1.5 inch 20 UNS-2A(R.H.)		
Fuze, Drill, L5	1	Drill inert					
Fuze, Practice, L5	2	Practice inert					
Fuze, Percussion, L16	A1	Percussion detonating NOTE Fuzes Drill L5 and Practice L5 represent both L5 and L16 fuzes for drill and practice purposes	Launcher, Rocket, 3.5 inch U.K. M20 Mark 2	Head Rocket 3.5 inch H.E.A. Tk.	Base 1.5 inch 20 UNS 2 A (R.H.)		

LIST OF OBSOLETE FUZES

NOTES:-

1. For particulars of the system adopted, for the numbering of fuzes see Part 1, Section 3.
2. Details of Naval and Air Services fuzes included in the old numerical grouping system are not included in this list.

NOMENCLATURE	FUZE NO.	MARKS	AUTHORITY
Percussion, D.A. with cap	1	1*,1**,2,2*,3	W.O.L.C. 23046
Mine, Contact, A.T.	1	1,2Z	W.O.L.C. C1315
Mine, Anti-Personnel	1	1,2	W.O.L.C. C6240
Mine, Anti-Personnel	2	1	W.O.L.C. C6107
		2	I.ARM. APPROVAL K541
Mine, Anti-Personnel Practice	2	1,2	W.O.L.C. C8462
Percussion, B.L., plain	2	1,2,3,4	W.O.L.C. 24069
Mine, Contact, A.T.	2	1	W.O.L.C. C2415
Mine, Contact, A.T.	3	1,1B,2,2B,3,3B,6	W.O.L.C. C8494
Percussion, D.A. with cap	3	1	(Naval)L.of C.5488,5572
		1*,1**,2,3,4	W.O.L.C. 23046
Graze	4	1	W.O.L.C. 10707
Mine, Anti-Tank	4	1	W.O.L.C. C8079
		1/1	W.O.L.C. C8737
Percussion, Pettman, G.S.	5	1	Altered to Mk.2
			W.O.L.C. 3200
		2	W.O.L.C. 24211
Percussion, Pettman, L.S.	6		W.O.L.C. 24069
Percussion, R.L.	7	1,2,2*,3,3*,4	W.O.L.C. 15759
Percussion, Small	8	1,1*,2,2*,3,3*,4	W.O.L.C. 15759
Percussion, Base, Armstrong	9	1,2,3	W.O.L.C. 23046
Percussion, D.A., delay	10	1,2,3	W.O.L.C. 23046
Percussion, Base, Large	11	1,2	W.O.L.C. 24618
		1*,2*,3,4,5,6	W.O.L.C. C6916
Percussion, Base, Medium	12	1,2,3,4,5,6,7,8,8A	W.O.L.C. B9512
		9,10,11	W.O.L.C. C6916
Percussion, Base, Medium	12 SPL	11	W.O.L.C. C6916
Percussion, Base, Medium	12F SPL	9*	W.O.L.C. B9512
		11	W.O.L.C. C6916
Percussion, D.A. Impact	13	1,1*,1**,1**A,2,2*,2*A,3,3*,3*A, 4,4A,4RA,5	W.O.L.C. B7987
Percussion	14	1	Design cancelled
Percussion, Base, Large, Bronze	15	1,2,3,4,5,6	W.O.L.C. C6916
Percussion, Base, Large, Bronze	15C	1,2,3	W.O.L.C. C6916
Percussion, Base, Large, Bronze	16	1,2,2*,2*R,3,4	W.O.L.C. C6916
Percussion, Base, Large, Bronze	16 with delay	1,2,3	W.O.L.C. C6916
Percussion, Base, Large, Bronze	16D	2,3,4	W.O.L.C. C6916
Percussion, D.A. with cap	17	1,2,3,3R,4	W.O.L.C. A451
Percussion, D.A. Impact	18	1	W.O.L.C. B9512
		2	W.O.L.C. C6916
Rocket, Boxer	20	1,2,3,4	W.O.L.C. 24072
Time, Armstrong, E	22		W.O.L.C. 12208
Time, sensitive, long	23	1	W.O.L.C. 8417
Time, sensitive, middle	24	1	W.O.L.C. 23544
Time, 15 seconds	25	1,2,3,4,5	W.O.L.C. A3624
Time	26	1	W.O.L.C. 17407
Time	27	1,2	W.O.L.C. 24542
Time	28	1	W.O.L.C. 24542
Time	29	1	W.O.L.C. 24542
Time	30	1,2,3	W.O.L.C. 22963
Electric	31	1	W.O.L.C. C8365
Time	31	1,1B,1C,1D,2,2*,3,4	W.O.L.C. 25545 & B1389

LIST OF OBSOLETE FUZES (Contd.)

NOMENCLATURE	FUZE NO.	MARKS	AUTHORITY
Time, Common	32		W.O.L.C. 24073
Time, Diaphragm, Shrapnel	33		W.O.L.C. 24073
Time, Hand, Grenade	34	1	W.O.L.C. 11016
Time, Mortar, Large	35		W.O.L.C. 24073
Time, Mortar, Small	36		W.O.L.C. 24073
Time, parachute, 10 inch	37		W.O.L.C. 24073
Time, parachute, 8 inch	38		W.O.L.C. 24073
Time, parachute, 5½ inch	39		W.O.L.C. 24073
Time, 30 seconds, M.L.	40		W.O.L.C. 14827
Time, 15 seconds, M.L.	41		W.O.L.C. 14827
Time, 15 seconds, M.L. special priming	42		W.O.L.C. 14827
Time, 15 seconds, with detonator	43	1,2,2*, 3	W.O.L.C. 14827
Percussion, D.A.	44	3	W.O.L.C. 24210
		1,1A,2,2A	W.O.L.C. 24573
		1A**,2**,2**M, 2***,3,2******, 3*,3*A,3*M,3**,3*****	W.O.L.C. B9512
		2****,3***,6,7, 4,4*,5,8,9,10,11	W.O.L.C. A3414 W.O.L.C. C9288
Percussion, D.A.	44B	1A,2,2**,2***,2****,3,3*,3*A,3**, 3***,3****,4,4*,5,6,7,8,9	W.O.L.C. 23943
		2*	W.O.L.C. B9512
Percussion, D.A.	44P	1	W.O.L.C. C6621
Percussion	44/80	2***,3**,5	W.O.L.C. A3414
		2,3	W.O.L.C.A2126 & A3351
		1,2A,2**,2**M,2****,3*,3*A,3*M, 3***,4,6	W.O.L.C. C2455
Percussion	44/83	1	W.O.L.C. 21845
Percussion, D.A. Impact	45	1,1A	W.O.L.C. A8911
		2	NAVAL L.of C. N.491
		1A****,2***,5,6	W.O.L.C. A3414
		1A******,3,4,7,8,1A**,2*,2*****, 2*****B, 2******	W.O.L.C. B9512
		9,9*,9/3, 9*/3,9/4,9*/4,9/7, 9*/7,10	W.O.L.C. C9288
Percussion, D.A. Impact	45P	2	W.O.L.C. B9512
		1ACZ,1A**,1AC,1*AC,2,2C,2CZ,2* 2*C,2*****B,3,3C,4,4C,7,7/1A, 7/2,8/2,9,9*,10,10/1AC,10/1*AC 10/2C,10/2*C,10/3,10/7	W.O.L.C. C9288
Percussion	46	1	W.O.L.C. 24073
Percussion, D.A.I.	47	1	Design cancelled
Percussion, D.A. with cap	50	1,2,3,4	W.O.L.C. 24546
Percussion, D.A. with cap, for practice	51	3	W.O.L.C. C7356
Percussion, Base, Medium	N52	1	W.O.L.C. C6235
Time and Concussion, Medium	52	1	W.O.L.C. 7111
Time and Concussion, Small	53	1,2	W.O.L.C. 7111
Time and Percussion, Middle	54	1,1*,2,3,3*	W.O.L.C. 23882
Time and Percussion, Short	55	1	W.O.L.C. 5573
		1*	W.O.L.C. 6550
		2,2*,3	W.O.L.C. 17358
Time and Percussion	56	4,4*	W.O.L.C. 24444
Time and Percussion, 22 secs	57	1	W.O.L.C. 24069
Time and Percussion, 20 secs	58	1, 2	W.O.L.C. 14827
Time and Percussion, 17 secs	59	1	W.O.L.C. 14827
Time and Percussion	60	1,1*,2,2*	W.O.L.C. 24544
Time and Percussion	60C	1,2	W.O.L.C. 24444
Time and Percussion	61	1	W.O.L.C. 24444
Time and Percussion	62	1,2	W.O.L.C. 24544
Time and Percussion	64	1,2,3	W.O.L.C. 26067
Time and Percussion	65	1,2	W.O.L.C. 24544
Time and Percussion	65A	1	W.O.L.C. A7399
Time and Percussion	66	1	Design cancelled
Time and Percussion	67	1	Design cancelled

LIST OF OBSOLETE FUZES (Contd.)

NOMENCLATURE	FUZE NO.	MARKS	AUTHORITY
Time and Percussion	68	1	Design cancelled
Electric (Roller Release)	F72	1,2	W.O.L.C. C8365
Time	79	1,2	W.O.L.C. B1389
Time and Percussion	80	1,1*,2,2*	W.O.L.C. 23599
		8,10,12	Designs cancelled
			W.O.L.C. 22636
		3,3A,4,4A,5,6, 7	W.O.L.C. B9707
		9,11	W.O.L.C. C2455
Time and Percussion	80B	1,2,3,4	W.O.L.C. B9707
		4A,5,6,7	W.O.L.C. C3408
Time	80/44	1,2,2A,3,4,5,6,9,12	W.O.L.C. B9707
		7,8	Designs cancelled
		10,11	(Naval) W.O.L.C.A3798
Time	80B/44	1,2,3,4,4A,5,6,7	W.O.L.C. B9707
Time	81/44	1	W.O.L.C. C7356
Time and Percussion	82	1,2,3,4	W.O.L.C. A1062
Time and Percussion	83	2,3*,3*Z,4,5	W.O.L.C. A1062
		3	W.O.L.C. 24144
		1,6	W.O.L.C. C2455
Time and Percussion	83M	1,2,3,3*,4,5	Designs cancelled -
			W.O.L.C. 21514
Time and Percussion	83R	1,1*,2	W.O.L.C. A1062
Time	83/44	1,2,3,3*,4,5	Designs cancelled
			W.O.L.C. 21510
Time	84	1	W.O.L.C. 23048
Time	85	1	W.O.L.C. 24544
Time	85/44	1	W.O.L.C. 25037
Time and Percussion	87	1,1A,2,3,4,5,6	W.O.L.C. 23884
		7,8,9	Designs cancelled
Time and Percussion	87C	1,1A,2,3,4,5,6	W.O.L.C. 23884
Time	87/44	1,1A,2,3,4,5,6,7	W.O.L.C. 22431
		10	W.O.L.C. 23884
		8,9,11	Designs cancelled
			W.O.L.C. 22626
Time and Percussion	88	1	W.O.L.C. 24144
		2	None issued W.O.L.C.
			19639
Time and Percussion	88	3	W.O.L.C. B9707
		3*,3*Z,4,5,6	W.O.L.C. C2455
Time and Percussion	88R	1,2	W.O.L.C. C3408
Time and Percussion	89	1,1*	W.O.L.C. A7994
Time and Percussion	91G	1	Design cancelled
Time and Percussion	91/44	1	Design cancelled
Electric	F92	1	W.O.L.C. C7556
Time and Percussion	94	1,2,3,3*,3*Z,4,5	W.O.L.C. 24544
Time	95/44	1,1A,2,2A,3,4,5,8,10	W.O.L.C. A4905
		6,7,9,11,12	Designs cancelled
			W.O.L.C. 22626
Time	95B/44	1,2,3,4,4A,5,6,7	W.O.L.C. A4905
Time	96/44	1	Design cancelled
Graze	100	1,1A,1B,1AW,2,2A,2B,2AW	W.O.L.C. 24544
Percussion	101	1,1*,1S,1S*	W.O.L.C. 24544
		2	(Naval) W.O.L.C.A5139
Percussion	101B	1,1S	W.O.L.C. 24140
		2,2J,2K,3,3C,4	W.O.L.C. C2455
Percussion	101D		Design cancelled
Percussion	101E	1,1S,1G,1SG	W.O.L.C. 24141
		1*,1*G,1S*,1S*G,2,2C,2G,2CM,2M,	
		3,3C	W.O.L.C. B9707
		4	W.O.L.C. C2455
Percussion	101EX	1,1*,1G,1*G,1S,1SG, 1S*,1S*G,2,	
		2*	W.O.L.C. 24070
Percussion	101XE	1,1G,1*,1*G,1S,1SG,1S*,1S*G,2,2G	W.O.L.C. 24070
Percussion	102	1,1*,1A,1A*,1S,1S*,1AS,1AS*,1B,	
		1*B,1SB,1S*B,2,2B,2*,2S,2*B,2SB,	W.O.L.C. 24544
		2S*,2S*B,3,3*,4	

LIST OF OBSOLETE FUZES (Contd.)

NOMENCLATURE	FUZE NO.	MARKS	AUTHORITY
Percussion	103	1,1*,1P,1*P,1S,1SP,1S*,1S*P,2,3,4,5,6	W.O.L.C. 24544
Percussion	105B	1	W.O.L.C. 19932
Percussion	105C	1,2	W.O.L.C. 19932
Percussion	105C CONVD.	1	W.O.L.C. 19932
Percussion D.A.	106	1,1S,1D,1SD,2D,2AD,2SD,2ASD,2DC, 2DCS, 5	W.O.L.C. C2455
		2,2A,2S,2AS,2A*,2A*S	W.O.L.C. 24619
		2A*D,2A*SD	W.O.L.C. A2973
		3,3S,3D,3SD	W.O.L.C. 23880
		2*,2*D,2*SD	W.O.L.C. A4841
Percussion D.A.	106E	4Z	Design cancelled
			W.O.L.C. A5788
		1,1S,2,2S,3,3S,3Z,4,4Z,5,6,6/1,6/3, 6/4,7,8,9,9/1	W.O.L.C. C9563
Percussion D.A.	106E. P6SPL	6	Design cancelled
			W.O.L.C. A5788,B3973
		8,9,9/1	W.O.L.C. 9563
Percussion D.A.	106PD	1	W.O.L.C. C3882
Percussion D.A.	106P	1	Designs cancelled
	106PE	1	W.O.L.C. A1136,A4904 A9203
		2	W.O.L.C. C7742
Percussion	107	1	W.O.L.C. 21654
		2	W.O.L.C. 24373
		3	W.O.L.C. 21654
Graze	108	1,1A, 2	W.O.L.C. 24544
Percussion	109	1,1*,1A,1B,1A*,1B*,1S,1S*,1AS,1SB, 1AS*,1SB*,2,2B,2*,2*B,2S,2SB,2S*, 2S*B,3,3*,3S,3S*,6	W.O.L.C. 24142
		4,5	Designs cancelled
Percussion	109E	3,3*,3G,3*G,3S,3S*,3SG,3S*G,6,6G,6M	W.O.L.C. A7511
Percussion	110	1,2,3	W.O.L.C. 25113
Percussion D.A.	115	1*,1*S	W.O.L.C. A1061
		1,1S,2,2S	W.O.L.C. B56
Percussion D.A.	115E	1Z,2SZ,2Z	Designs cancelled
			W.O.L.C. A5788
		1,1S,2,2S,3,3Z,4,4Z,4/1,4/12,4/2, 4/2Z	W.O.L.C. B56
		5,6,7	W.O.L.C. C2455
Percussion	116	1,2	W.O.L.C. A7634
Percussion D.A.	117	1	Design cancelled
			W.O.L.C. A6155
		5	Design cancelled
			W.O.L.C. B5322
		6	W.O.L.C. C7031
		7	Design cancelled
			W.O.L.C. C2156
		9	Design cancelled - never introduced
		2,4,11,12,13,16	W.O.L.C. C8135
		3,3A,8,14	W.O.L.C. C8565
Percussion D.A.	117C	1,1A,2,3,3A,4	W.O.L.C. C6414
Percussion D.A. and Graze	119	1,1A,3,3A,4,5,6,7,9	W.O.L.C. C5615
		2	W.O.L.C. C2077
		8	N.Amer.production
		10	Mark not taken up
		11	W.O.L.C. C9008
Percussion D.A.and Graze	119B	2,2M	W.O.L.C. C2077
		1,3,4,4M, 9	W.O.L.C. C5615
		15	No design prepared
		10 and 11	W.O.L.C. C9913
		12,13,16	Indian designs
		14	W.O.L.C. C9914

LIST OF OBSOLETE FUZES (Contd.)

NOMENCLATURE	FUZE NO.	MARKS	AUTHORITY
Time	122	1	D.C.8188 d/18.11.1916
Time	123	1	D.C.8188 d/18.11.1916
Time	124	2	Cancelled W.O.L.C.B3227
Time	125	1	W.O.L.C. C3264
		2,2/1	W.O.L.C. C3882
Time	127	1	W.O.L.C. C3882
Percussion, Base, Small	130	1,2	W.O.L.C. 23200
Percussion, D.A.	132	5,6	W.O.L.C. C6805
Percussion	134	1	W.O.L.C. 24692
Percussion	135	1	W.O.L.C. 25179
Percussion	136	1	W.O.L.C. A1546
Percussion, D.A.	138	1	W.O.L.C. C4027
Percussion, D.A.	139	1,2,3	W.O.L.C. C3946
Percussion, D.A.	139P	2,3	W.O.L.C. C3946
Percussion, Spigot	145	1	W.O.L.C. 21654
Percussion, Spigot	146	5R,5R*	W.O.L.C. C3946
		1	W.O.L.C. 24753
		2,3,4,5	W.O.L.C. A7676
Percussion, Spigot	147	1	W.O.L.C. 25635
Percussion, Spigot	148	1	W.O.L.C. A6411
Percussion, D.A.	150	1,2,3	W.O.L.C. C6184
Percussion, D.A.	150P	1	W.O.L.C. C4027
Percussion, D.A.	151	1,2,3	W.O.L.C. C8080
Percussion, D.A.	151A	1,2,3	W.O.L.C. C8080
Percussion, D.A.	152	1	W.O.L.C. C8719
Percussion, D.A.	152A	1	W.O.L.C. C8719
Percussion, Base, Large	158A	1	W.O.L.C. C9288
Percussion, Base, Large	159	1	Naval cancelled for Land Service
		2	W.O.L.C. C9008
Percussion, D.A.	160	1	W.O.L.C. C4027
Percussion, D.A.	161	1	W.O.L.C. C9565
		2	Indian design
Percussion, D.A.	162	1	W.O.L.C. C8719
		1/1,2/1, 2/2	Design not proceeded with
		1/3, 4/1	W.O.L.C. C9850
		2	Indian design
		4/2,5/2	W.O.L.C. C9399
		6	W.O.L.C. C8622
Time	165A	1	W.O.L.C. 24544
Time	180	3,4,4A,5,6,7,8,10,12,15	W.O.L.C. C3408
		9,11,13,14	Designs cancelled W.O.L.C. 22626
Time	180B	1,2,3,4,4A,5,6,7,	W.O.L.C. C3408
Time	183	1,2,3,3*,3*Z,4,6	W.O.L.C. C2591
		5	Design cancelled
Time	183M	1,2,3*,3,4	Designs cancelled W.O.L.C. 21514
Time	185	1	W.O.L.C. A6110
Time	187	1,2,5,7	W.O.L.C. 23884
		3,4,6	Designs cancelled W.O.L.C. 22626
Time	188	1,2,3,3*,3*Z,4	W.O.L.C. C2539
		5,6	W.O.L.C. B9794
Time	188M	1,2,3,3*,3*Z,4,5,6	W.O.L.C. A7736
Time	189M	1	W.O.L.C. 24543
Time	194M	1,2,3,3*,3*Z,4,5	W.O.L.C. 24543
Time	195	1,1A,2,2A,3,4,8, 10	W.O.L.C. A4905
		6,7,9,11,12	Designs cancelled W.O.L.C. 22626
Time	195B	1,2,3,4,4A,5,6,7	W.O.L.C. A4905
Time	197	1,2	W.O.L.C. C3408
Time	199	1,2,2A,3,4,5,6,7,8,9	W.O.L.C. C4700
Time	200	1,2,3	W.O.L.C. B2685
Time	203	1,2,	W.O.L.C. C4549
Time	204	1	W.O.L.C. C4549

LIST OF OBSOLETE FUZES (Contd.)

NOMENCLATURE	FUZE NO.	MARKS	AUTHORITY
Time	205	1	W.O.L.C. C4549
Time	207	5	Design cancelled
			W.O.L.C. B8744
		1	W.O.L.C. C8456
		4	Design cancelled
		2	Naval Service
		3	Naval Service
Time	208	1,3,6/3,7/3,8/3, 9/3	W.O.L.C. C9583
		2,4,	W.O.L.C. C5724
		5,5/1,6/2	W.O.L.C. C9396
		7/1,7/2,8/2,9/1,9/2,10/1,10/2,10/3, 11/1,11/2,11/3,12/1,12/2,12/3	W.O.L.C. C9429
		7,8,9,10,11,12	Never introduced
Time	209	1,2,	W.O.L.C. C3091
Time	210	1	W.O.L.C. C9008
Time	212	1	W.O.L.C. C6741
Time and Percussion D.A.	213	1	W.O.L.C. C9690
Time and Percussion D.A.	213	2,3,3/1	W.O.L.C. C9709
Time	214	1	W.O.L.C. C7555
Time and Percussion	220	1,2,3	W.O.L.C. C2455
Time and Percussion Graze	220B	1	W.O.L.C. C7742
Time and Percussion Graze	221	1,2	W.O.L.C. C5763
		1*,2*	W.O.L.C. C8075
Time and Percussion Graze	221B	1,2	W.O.L.C. C9085
		3	W.O.L.C. C9889
Time	221T	1	W.O.L.C. C8075
Time and Percussion Graze	222	1	W.O.L.C. C4681
Time and Percussion Graze	222B	1,1M,2,4	W.O.L.C. C4681
		2,4	None issued
Time and Percussion Graze	223	1,2	W.O.L.C. C2246
Time and Percussion Graze	223A	1,2,3	W.O.L.C. C6045
Time and Percussion D.A.	228	1	W.O.L.C. C6045
Percussion D.A.	230	1,1Z	W.O.L.C. C9007
		2,3	Design cancelled
	230P	2,3	W.O.L.C. C9288
Percussion Graze	231	1,2,3,4,4A	W.O.L.C. C9288
Percussion Graze	231B	1,1**,1**M,3	W.O.L.C. C5540
Percussion Graze	231ND	1,3,4	W.O.L.C. C5540
Percussion	232	1,1M	W.O.L.C. C5540
Percussion D.A.	233	1	W.O.L.C. C3176
Percussion D.A.	242	1,2,3	W.O.L.C. C6590
		4	W.O.L.C. C9009
Percussion D.A.	242P	1,2,3	W.O.L.C. C9008
		4	W.O.L.C. C9009
Percussion D.A.	243	1,2,3	W.O.L.C. C9008
Percussion D.A.	244	1,2,3,4,5,5/1	W.O.L.C. C8457
Percussion D.A.	245	1,2,3	W.O.L.C. C9805
		1A	W.O.L.C. C2774
Percussion D.A.	246	1	W.O.L.C. C638
		2	W.O.L.C. C8457
Percussion	247	1,1A,1Z,2,3	W.O.L.C. C9084
Percussion D.A.	248	1	W.O.L.C. C6594
Percussion D.A.	250	1	W.O.L.C. C9288
		2	W.O.L.C. B9305
Percussion D.A.	251	1,1A,2,3	W.O.L.C. C2538
Percussion D.A.	254	2	Appl. K/1684
Percussion D.A.	255	3	W.O.L.C. C7741
Percussion D.A.	257	1	W.O.L.C. C9900
		2,2/1	W.O.L.C. C8566
Percussion D.A.	258	1	W.O.L.C. C9690
Percussion D.A.	258	N2	W.O.L.C. C7741
Percussion, Base, Large	270	1	W.O.L.C. C7741
Percussion, Base, Hotchkiss, Tracer	280	1	W.O.L.C. C6804 W.O.L.C. C6805
Percussion, Base, Tracer	281	1,2,3	W.O.L.C. C8360
Percussion, Base	283	1,2	W.O.L.C. C2541

LIST OF OBSOLETE FUZES (Contd.)

NOMENCLATURE	FUZE NO.	MARK	AUTHORITY
Percussion, Base	284	1	W.O.L.C. C2774
Percussion, Base	285	1	Design cancelled
Percussion, Base, Tracer	288	1	W.O.L.C. C6413
Percussion, Base	289	1	W.O.L.C. C6741
Percussion, Base	291	1	W.O.L.C. C7238
Percussion, Base, Medium	295	1,1/1,1/2	W.O.L.C. C6412
Percussion, Base	297	1	W.O.L.C. C2416
Percussion, Base, Medium	299	1/1, 1/2	W.O.L.C. C6412
Percussion, Base, Medium	303	2	Design cancelled
Percussion, Base, Large	346	1	Design cancelled
			W.O.L.C. A8040
		2	I.Arm. Approval K1258
Percussion D.A.	360C	1	W.O.L.C. C9288
Percussion D.A.	370	1,2	W.O.L.C. C5991
Percussion D.A. and Graze	410	1/1	Design not approved
		2/3	Design not approved
		3,4	W.O.L.C. C7297
Percussion	425	1,2	W.O.L.C. C848
D.A. and Percussion	426	1	W.O.L.C. C7502
Percussion	430	1,2	W.O.L.C. C3720
Percussion	431	1	W.O.L.C. C3584
Percussion, Base, Large	480	1	Design cancelled
			W.O.L.C. A8040
		2	C 9288
Percussion, Base, Medium	500	1	W.O.L.C. C6044
	501	1,2	W.O.L.C. C9396
Percussion, Base, Medium	502	1	W.O.L.C. C4308
Percussion, Base, Medium	551	1	W.O.L.C. 9288
		2,3	W.O.L.C. C9583
Time	600	1,2	W.O.L.C. C2249
Time	610	1	W.O.L.C. C2249
Time	620	1,2	W.O.L.C. C2249
Time	700	1,1M,1MS,1MQ,2,2S,2Q,3	W.O.L.C. C2454
Time	701	1,1S,1Q	W.O.L.C. C3018
Percussion, D.A.	721	1,2,2/1*,2/2*	W.O.L.C. C2977
Percussion, D.A.	724	1	W.O.L.C. C6741
Percussion, D.A.	725	1	W.O.L.C. C2720
		2,3	W.O.L.C. C8458
Percussion, D.A.	731	1	W.O.L.C. C3018
UNNUMBERED			
Percussion, Base, Hotchkiss		1	W.O.L.C. 5006
		2,2*,3,3***,4**,6,6*	W.O.L.C. 24535
		7, 10	W.O.L.C. C7356
Percussion,Detonating,24/31,R.Y.		1,1F/Y	W.O.L.C. C3882
Percussion, Petard		1	W.O.L.C. C8365
L. SERIES			
Time and D.A.	L1	1,3,5,5/1,6/2,7/2,8/2,9/2,10/2,10/3, 11/2,11/3,12/2,12/3,13/2,13/3,14/2, 14/3	W.O.L.C. C9525
		6/3,7/3,8/3,9/3,16/3,17/3	W.O.L.C. C9943
		2,4,6,6/1,7,7/1,8,8/1,9,9/1,10,10/1, 11,11/1,12,12/1,13,13/1,14,14/1,15, 15/1,15/2,15/3,16,16/1,16/2,17,17/1, 17/2	Never introduced
Percussion, D.A. and Graze	L2		Design not approved
Percussion, D.A. and SD	L3	A1,A2	W.O.L.C. C6847
Percussion, D.A. and SD	L4		Design not approved
Percussion, Base, Medium	L6	1	Not introduced
CVT	L7	1	W.O.L.C. C9943
Percussion,Base, Medium	L8	1,2	Designs cancelled
Percussion, D.A.	L9	A1	W.O.L.C. C9786
	L11		These model numbers were never used
	L12		
	L13		
Time and Percussion, DA	L20		Design cancelled
Percussion, D.A. and Graze	L22		Design cancelled

1. The following chart gives main details of the detonators used in the fuzes described in Part 2 of this publication.

2. The detonators are shewn under their revised short nomenclature, the legend being as follows:-

A. Initiating composition 'A' mixture

B. Initiating composition 'B' mixture

ASA. Lead azide, Lead styphnate, Aluminium mixture

E. Bofors Detonating composition

F. Fulminate

L. Initiating composition 'L' mixture

P. Gunpowder

Y. Composition, exploding (CE)

Z. Lead azide

3. Full details of any detonator and the method of filling used can be obtained by reference to the appropriate drawing the number of which is given in the chart.

DETONATOR CHART

FUZE	MARK/MODEL	DETONATOR	DRAWING NO.
Fuze, Mine, Anti-Personnel No.2	2/1	2.5 gr. 'A' copper alloy cup	QX 155 AF
Fuze, Mine, Anti-Tank No.4	2 and 2/1	5.7 gr. 'AZ' lugless tinned copper alloy cup	QX 124 AF
Fuze, Percussion D.A. No.117	10	5 gr 'AZ' copper alloy cup	QX 37 AF
	15, 17, 17/1, 17/2, 17/3, 17/4, 17/5 and 19	5.7 gr 'AZ' lugless tinned copper alloy cup	QX 124 AF
	20	5.5 gr 'LZ' lugless tinned copper alloy cup	QX 216 AF
Fuze, Percussion D.A. and Graze No. 119 B	17	Upper:- 5.7 gr. 'AZ' lugless tinned copper alloy cup Lower:- 5.7 gr. 'AZ' lugless tinned copper alloy cup	QX 124 AF QX 124 AF
Fuze, Percussion, D.A. No.161	1/1	5 gr. 'AZ' copper alloy cup	QX 37 AF
	1/2, 3, 3/1 and 3/2	2.8 gr. 'AZ' lugless tinned copper alloy cup	QX 122 AF
	4	2.6 gr. 'LZ' lugless tinned copper alloy cup	QX 214 AF

DETONATOR CHART (Contd.)

FUZE	MARK/MODEL	DETONATOR	DRAWING NO.
Fuze, Percussion, D.A. No.162	1/2 and 3	5 gr 'AZ' copper alloy cup	QX 37 AF
	3/1 and 3/2	5.7 gr. 'AZ' lugless tinned copper alloy cup	QX 124 AF
	3/3, 4, 5, 5/1, 7 and 8	2.8 gr. 'AZ' lugless tinned copper alloy cup	QX 122 AF
	9 and 10	2.6 gr. 'LZ' lugless tinned copper alloy cup	QX 214 AF
Fuze, Time and Percussion D.A. No. 213	4, 4/1 and 4/2	Upper (Perc.) 5.7 gr. 'AZ' lugless tinned copper alloy cup Lower (Time) 5.7 gr. 'AZ' lugless tinned copper alloy cup	QX 124 AF QX 171 AF
	5	Upper (Perc.) 5.5 gr. 'LZ' lugless tinned copper alloy cup Lower (Time) 5.5 gr. 'LZ' lugless tinned copper alloy cup	QX 216 AF QX 215 AF
Fuze, Time and Percussion Graze No. 221B	4 and 6	Time:- 2.51 gr. 'BP' copper alloy cup Perc:- 2.51 gr. 'BP' copper alloy cup	QX 32 AF QX 32 AF
Fuze, Percussion, D.A.No.255	1 and 2	1.7 gr. 'B' or 'B1' copper alloy cup	FD No. 3568
	1A	1.7 gr. 'B' or 'B1' copper alloy cup or 1.7 gr. 'A' copper alloy cup	FD No. 3568 QX 16 AF
	3,4 and 5	1.7 gr. 'B' lugless tinned copper alloy cup	S5/7817/GF
Fuze, Percussion, Base Medium No. 303	1	1.7 gr 'A' copper alloy cup	QX 28 AF
Fuze, Time, No. 390	1,2 and 2A	1.93 gr. 'BP' copper alloy cup	QX 30 AF
Fuze, Percussion,D.A. and Graze No. 410	1, 1/2 and 1/3	Inertia Pellet:- 1.7 gr. 'A' copper alloy cup Shutter:- 1.8 gr. 'ZY' copper alloy cup	QX 16 AF QX 115 AF
	2, 2/1 and 2/2	Inertia Pellet:- 1.7 gr. 'A' copper alloy cup Shutter:- 1.8 gr. 'ZY' lugless copper alloy cup	QX 16 AF QX 120 AF
Fuze, Percussion L5 UK M404	1	8.6 gr. 'AZY' copper alloy cup	QX 114 AF
Fuze, Percussion, Base, Medium L10	1	2.8 gr. 'AZ' lugless tinned copper alloy cup	QX 63 AF
Fuze, Percussion, Base, Medium L15	A1 and A2	2.8 gr. 'AZ' lugless tinned copper alloy cup	QX 122 AF
Fuze, Percussion, L16	A1	2.8 gr. 'AZ' lugless tinned copper alloy cup	QX 122 AF
Fuze, Percussion, D.A. L17	A1	5.7 gr. 'AZ' lugless tinned copper alloy cup	NOD 8805
	A2	5.7 gr. 'AZ' lugless tinned copper alloy cup	QX 124 AF
	A3	5.5 gr. 'LZ' lugless tinned copper alloy cup	QX 216 AF

DETONATOR CHART (Contd.)

FUZE	MARK/MODEL	DETONATOR	DRAWING NO.
Fuze, Percussion, Base, Medium, L19	A1,A2 and A3 A4	2.8 gr. 'AZ' lugless tinned copper alloy cup 2.6 gr. 'LZ' lugless tinned copper alloy cup	QX 122 AF QX 214 AF
Fuze, Percussion, Base, Medium L24	A1, A2	2.8 gr. 'AZ' lugless tinned copper alloy cup 2.6 gr. 'LZ' lugless tinned copper alloy cup	QX 122 AF QX 214 AF
Fuze, Percussion, Base, Medium L29	A1 A2	2.8 gr. 'AZ' lugless tinned copper alloy cup 2.6 gr. 'LZ' lugless tinned copper alloy cup	QX 122 AF QX 214 AF

Part 2

HANDBOOK OF CURRENT BRITISH

LAND SERVICE FUZES

Part 2

HANDBOOK OF CURRENT BRITISH

LAND SERVICE FUZES

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HANDBOOK OF CURRENT BRITISH LAND SERVICE FUZES

Section I

PERCUSSION FUZES

PART 2

HANDBOOK OF CURRENT BRITISH LAND SERVICE FUZES

Section I

PERCUSSION FUZES

CONTENTS

Introduction

PERCUSSION FUZES

1. The fuzes described in this Section are essentially unrotated rocket fuzes of the base percussion detonating type with non-delay action on impact. A detailed description of the "action" for each individual fuze included will be found in the particular Annexure and the illustrations incorporated therein.

FUZE, PERCUSSION, L5, U.K., M404

1. Particulars

(a) Type	Percussion, base
(b) Weapon	Launcher, Rocket, 3.5 in. U.K., M20 Mark 2
(c) Projectile	H.E.A.T.

DESCRIPTION - MARK 1 FUZE (Fig. 1)

GENERAL

2. The L5, U.K., M404 Mark 1 fuze is a base percussion detonating type functioning with non-delay action on impact. It consists principally of a body, plug, magazine, sealing disc, plunger, creep spring, actuating sleeve, set-back sleeve, striker, detonator, stop screw, locking pin and spring, ejection pin and safety band.

3. Body. - The body is made of aluminium alloy anodised all over. It is cylindrical in shape, formed plain, with an external diameter of 2 inches. Internally, a shoulder is formed towards the rear of the body on which seats an aluminium disc, and beyond the shoulder the body is screw-threaded to receive a body closing adapter on to which is screwed the rocket motor. The front portion of the body is threaded internally at the mouth to accept a plug into which is screwed the magazine. In the side of the body a slot is cut for the ejection pin and adjacent to it a hole is drilled and threaded for a stop screw. Opposite to the slot for the ejection pin, a recess is made to house the locking pin and spring which are retained in the recess by a small screwed plug.

4. Plug. - This plug is made of aluminium alloy anodised all over. It is cylindrical in shape and threaded externally to 1.5 inch diameter (20 UNS-2A) partially to screw into the front of the body and partially to engage in the screw-threads formed in the rocket head. Internally, it is recessed on two diameters, the larger being screw-threaded to accept the magazine, the smaller housing the detonator. A circumferential recess is formed around the face of the rear of the plug and two key holes are drilled in the front to facilitate assembly. A paper disc is inserted between the plug and the magazine, being secured to the face of the plug by shellac.

5. Magazine. - Made of aluminium alloy anodised all over, the magazine is cup-shaped and threaded externally to screw into the plug. Internally, it houses the pre-pressed C.E. pellet. Two flats are formed on the base to facilitate assembly into the plug.

6. Sealing disc. - This is a dished disc of aluminium alloy anodised all over. It is assembled into the rear of the body, the rim being flattened by pressing it on to the shoulder formed in the body.

7. Plunger. - Made of brass, zinc plated all over, the plunger is cone shaped with a flange formed at the rear. It is housed inside the body, the flange resting against the inner side of the shoulder formed towards the rear of the body.

8. Creep spring. - This is a cylindrical coiled tinned steel wire spring, formed with 2.1/2 effective coils of 0.02 inch diameter wire, one coil at each end being close coiled and ground square with the axis of the spring. It is assembled around the actuating sleeve.

9. Actuating sleeve. - The actuating sleeve is made of steel, zinc plated all over. It is cylindrical in shape and formed with a small external flange at the rear. About the centre, a longitudinal slot is formed and three slots are cut in the forward end. It is assembled around the plunger.

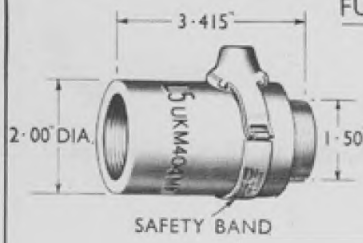
10. Set-back sleeve. - The set-back sleeve is made of steel, zinc plated all over. It is cylindrical in shape and a longitudinal and radial slot are cut in one side. It is assembled over and around the actuating sleeve.

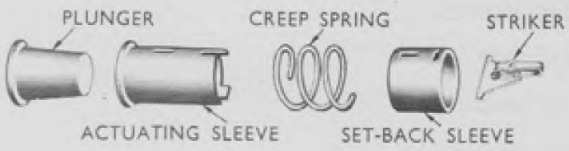
11. Striker. - The striker consists of a zinc-plated steel pin formed with a needle point, above which is a flange and a shank; a flat double phosphor-bronze spring and a steel triangular shaped plate lever formed with a lug each side. The pin is riveted to the centre of the apex of the lever and to one end of the spring.

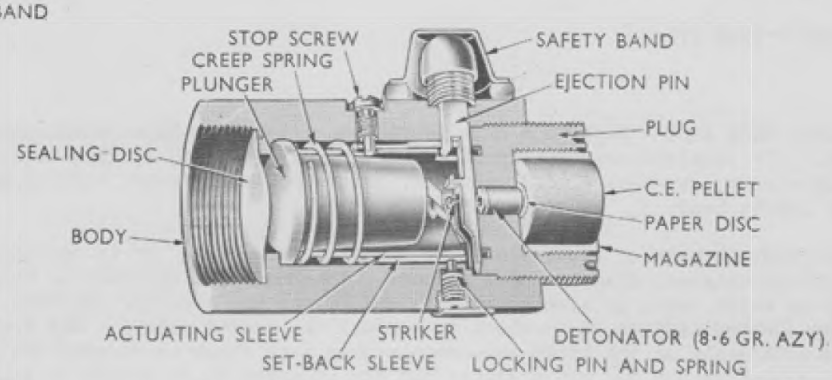
12. Detonator. - This is a 8.6 grain "AZY" (copper alloy cup) detonator, and it is assembled with the open end towards the striker, behind a glazed board washer in a hole formed in the centre of the plug.

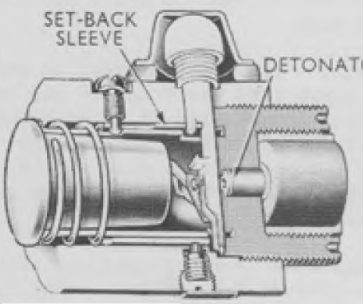
FUZE, PERCUSSION, L.5., U.K., M.404, MARK I

FIG.1



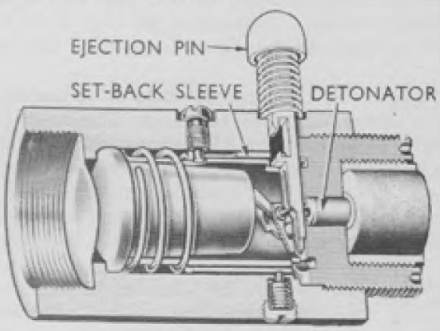




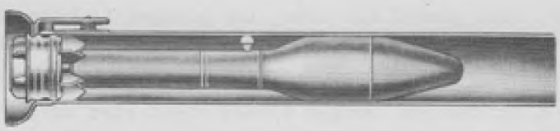


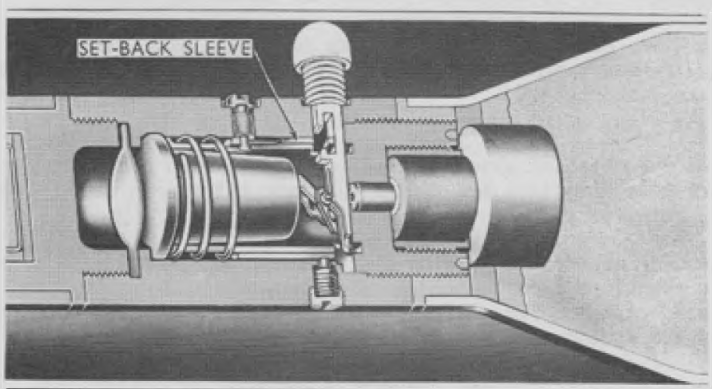
SAFE POSITION

SAFETY BAND



LOCKED POSITION

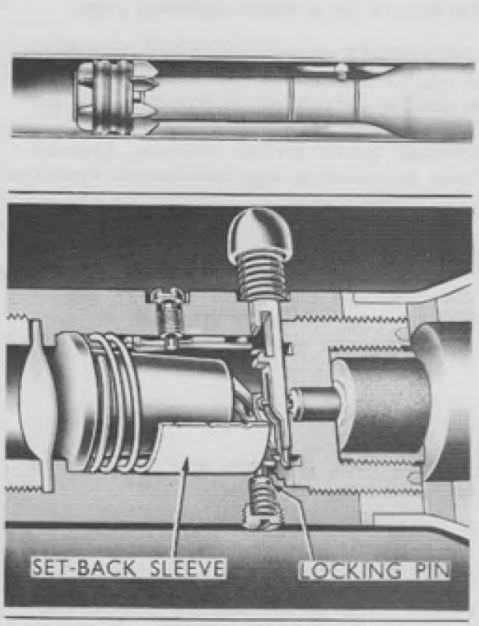




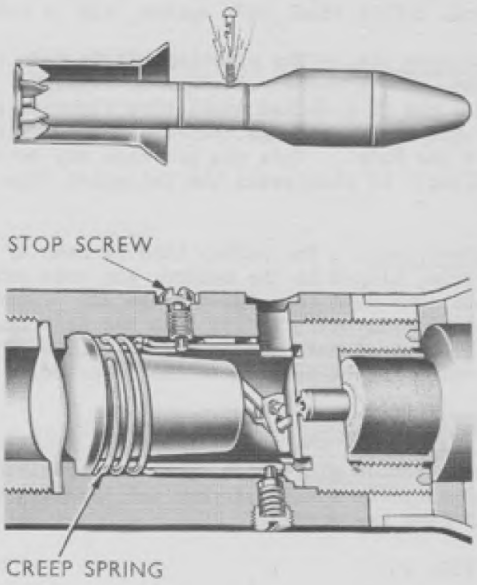
ROCKET LOADED

FIG.2

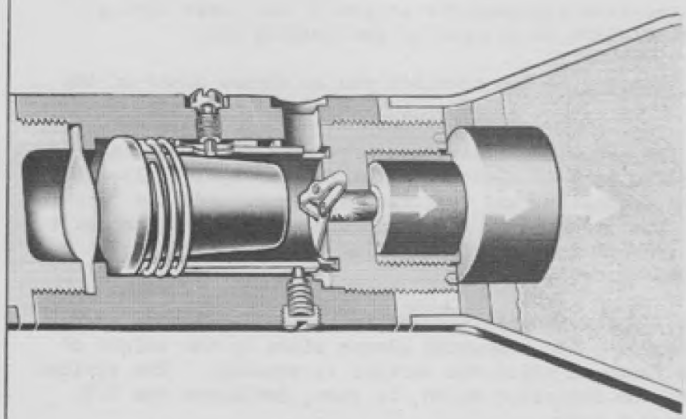
FUZE, PERCUSSION, L.5., U.K., M.404, MARK I



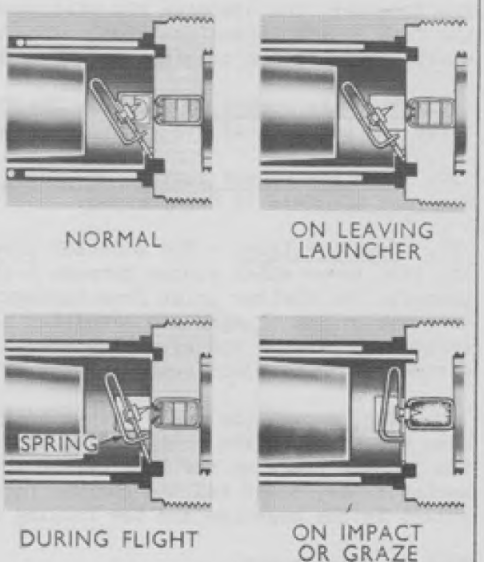
ON FIRING



DURING FLIGHT



ON IMPACT OR GRAZE



NORMAL

ON LEAVING LAUNCHER

DURING FLIGHT

ON IMPACT OR GRAZE

ACTION OF STRIKER

13. Stop screw. - The screw is made of steel, zinc plated all over, the head being formed with a screwdriver slot. It is assembled in the side of the body and acts as a guide for the set-back sleeve and a stop for the actuating sleeve.

14. Locking pin and spring. - The locking pin is made of brass, zinc plated all over and formed with a flange around the centre. It is assembled in the side of the fuze body, followed by a small cylindrical coiled steel wire spring, and is retained in the fuze body by a small screwed plug.

15. Ejection pin. - The ejection pin is made of steel, zinc plated all over. It is formed from square bar, with a number of steps or keyways. A dome shaped cup is welded to the outer end and houses one end of a coiled steel wire ejection spring when the pin is assembled in the fuze. The ejection pin passes through the fuze body and is held in position by the safety band which encircles the body. This pin prevents any movement of the internal parts during storage, transit and handling; it also masks the detonator from the striker, thus precluding any accidental functioning.

16. Safety band. - The safety band is made of steel zinc plated all over. It is formed from flat spring strip, hinged in the centre, the ends being fitted with a loop and engaging lever for securing purposes. The band is painted green and printed in red on one side are the words "SAFETY BAND - NOT TO BE REMOVED UNTIL ROCKET HEAD HAS BEEN LOADED INTO LAUNCHER". On the side opposite to the legend is a raised boss around the underside of which is fitted a neoprene washer, which is retained by lugs being turned over on to the outer edges.

SAFETY ARRANGEMENTS

17. The ejection pin, which is held in position by a hinged safety band prevents any movement of the internal parts during storage and handling and, in addition, masks the 8.6 grain "AZY" detonator from the striker.

ACTION (FIG. 2)

18. The safety band is not removed until just prior to the rocket head being finally pushed home into the launcher, and under the influence of its spring the ejection pin moves out from the "safe" position to lock in the set-back sleeve. The fuze cannot arm when the ejection pin is in either of the two positions. As the rocket enters the launcher, the ejection pin is depressed by the bore of the launcher into the intermediate position. The set-back sleeve is then free to move on firing. It will be noted that at this moment the fuze is still safe since the ejection pin prevents movement of the actuating sleeve and firing pin. If it becomes necessary to remove the rocket from the launcher, the ejection pin will move outwards and re-engage the set-back sleeve thus returning the fuze to its locked position. The safety band should then be replaced thereby returning the ejection pin to the original safe position.

19. When the rocket is fired. - The force of set-back opposing the action of the creep spring moves the set-back sleeve to its rearward position where it is held by the locking pin.

20. When the rocket leaves the muzzle of the launcher. - The ejection pin is thrown clear of the fuze and the fuze is fully armed.

21. During flight. - The set-back sleeve and the actuating sleeve are prevented from rotating by the stop screw which passes through a slot provided in both sleeves. The striker spring also prevents the striker point from impinging on the detonator, and the creep spring retards the forward movement of the plunger and actuating sleeve. The strength of the creep spring is strong enough to retard the plunger and actuating sleeve and to prevent the fuze from firing should the rocket strike a light object such as light brush or undergrowth.

22. Upon impact (or graze with a heavy object). - the inertia plunger and actuating sleeve overcome the force of the creep spring and move forward. The actuating sleeve aided by the weight of the plunger bears on the lugs of the triangular frame on which the striker is mounted. The striker spring is depressed and the striker forced on to the detonator which, in turn, detonates the C.E. pellet in the magazine and the filling in the rocket head.

MARK 1 (Obsolescent) WOLC - § C5462, C9145

23. As described in paras. 2 to 22 inclusive.

FUZE DRILL L5

1. Particulars

(a) Type	Drill, inert, base
(b) Weapon	Launcher, Rocket, 3.5 inch U.K. M20 Mark 2
(c) Projectile	Rocket, 3.5 inch Drill, L1A1
(d) Use	To represent Fuzes L5 U.K. M404 Mark 1 and L16.

DESCRIPTION - Mark 1

GENERAL

2. This is an inert fuze comprising an aluminium alloy body with a projecting pin to represent the ejection pin on operational fuzes. A safety band is fitted to enable the correct loading drill to be carried out.

3. A hole is drilled longitudinally through the centre of the body with another drilled at right angles to it.

4. The fuze is coloured black with markings in white.

SUMMARY OF DIFFERENCES

MARK 1 FUZE

WOLC-S C 5462

5. As described in paras. 2 to 4 inclusive.

NOTE This fuze was originally introduced as "Fuze Practice L5 Mark 1". The nomenclature was later amended to "Fuze Drill L5 Mark 1" and the use restricted to "Rocket 3.5 inch Drill L1A1" only.

FUZE PRACTICE L5

1. Particulars

(a) Type	Practice, inert, base
(b) Weapon	Launcher, Rocket, 3.5 inch U.K. M20 Mark 2
(c) Projectile	Rocket, Practice, 3.5 inch U.K. M29 Mark 2
(d) Use	To represent Fuzes L5 U.K. M404 Mark 1 and L16

DESCRIPTION - Mark 2 (Fig. 1)

GENERAL

2. The L5 Mark 2 practice fuze is an inert fuze comprising an aluminium body with steel ejection pin and is fitted with a safety band. It incorporates the mechanical details to make loading procedure and the action, up to the time the rocket leaves the launcher, similar to the operational fuze.

3. The exterior surface of the fuze is coloured light blue and markings are in white.

4. Body. - Made of aluminium alloy and cylindrical in shape, at the front it is threaded externally, on a reduced diameter, to take the practice head and, at the rear, threaded internally to take the body closing cap of the motor. From the rear a central longitudinal boring is made to accept the setback pin whilst another is made at right angles to this boring near the front end to take the ejection pin. A smaller diameter hole, to form the housing for a detent and spring, is made diametrically opposite the housing for the ejection pin and approximately in the centre of the body.

5. Ejection pin. - Of round section and with a domed top welded in place, a portion approximately one half inch long near the bottom of the pin is reduced in diameter. It is assembled into the body with the ejection pin spring between the domed top and a recess formed on the circumference of the body by counterboring.

6. Setback pin. - A pin of circular section which is slotted at the forward end to allow the passage of the reduced diameter portion of the ejection pin. This slot is counterbored from the top to the diameter of the main portion of the ejection pin. A small portion near the centre of the pin is reduced in diameter. It is held in place in the central boring in the body by a spring and screw.

7. Safety band. - As used on the L5 U.K. M404 Mk.1 and L16A1 fuzes.

ACTION (FIG. 2)

8. The safety band is removed just prior to the rocket being finally pushed home in the launcher. The ejection pin moves out under the influence of its spring but is retained in the fuze by the setback pin. When the rocket is pushed home the ejection pin is depressed by the bore of the launcher bearing on the domed head. In this position the smaller diameter portion of the ejection pin is in line with the slot in the setback pin.

9. When the rocket is fired the force of setback overcomes the setback spring and the setback pin moves to the rear releasing the ejection pin. The setback pin is held in this rearward position by the detent.

10. When the rocket leaves the launcher the ejection pin moves out under the influence of its spring and is thrown clear of the fuze.

SUMMARY OF DIFFERENCES

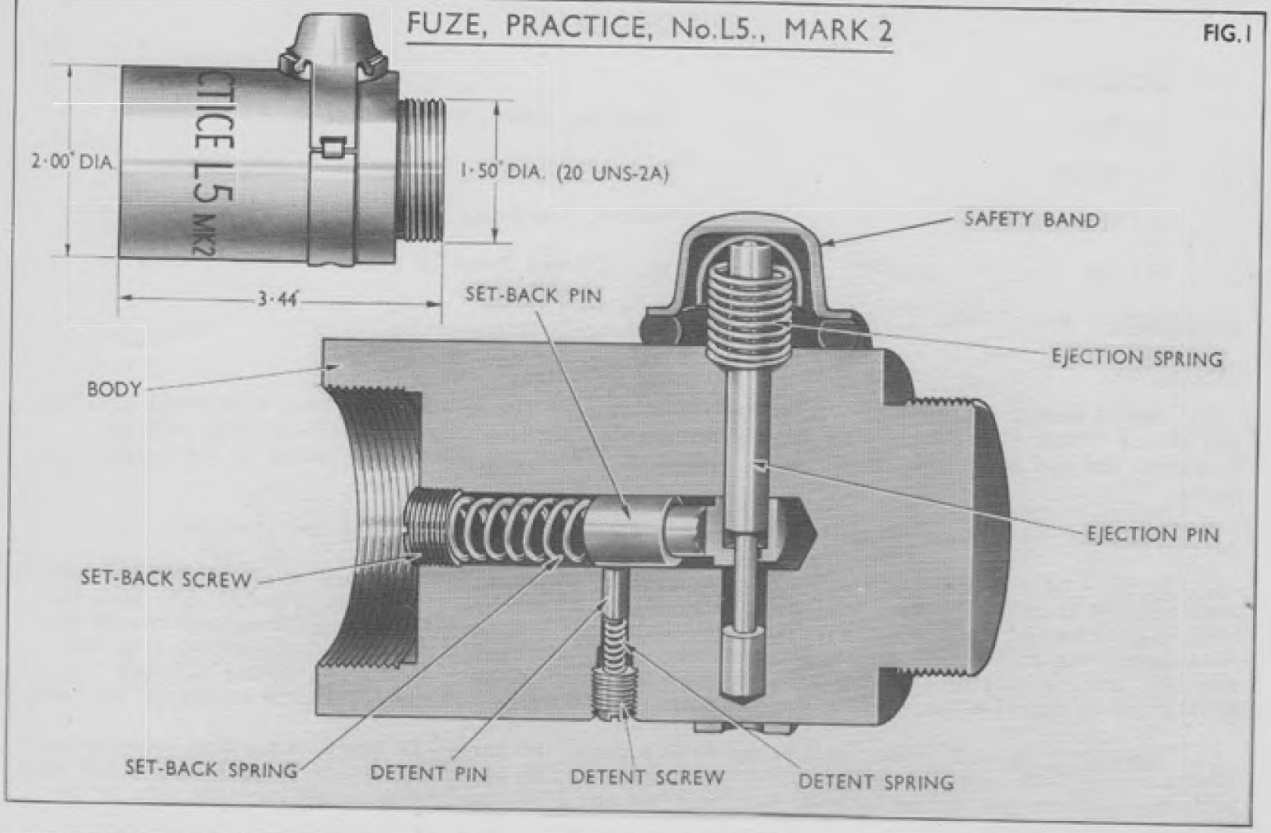
MARK 2 FUZE

WOLC-8 C 5424

11. As described in paras. 2 to 10 inclusive.

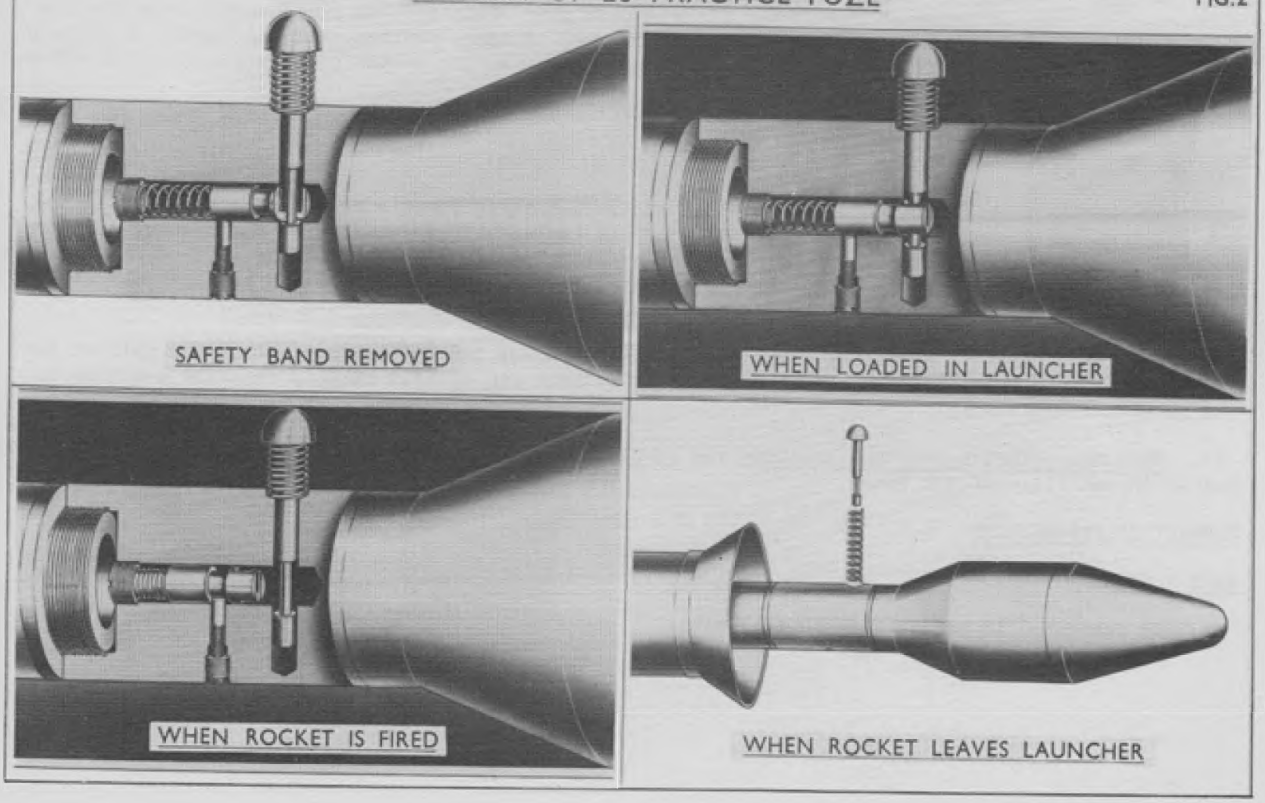
FUZE, PRACTICE, No.L5., MARK 2

FIG.1



ACTION OF L5 PRACTICE FUZE

FIG.2



FUZE, PERCUSSION, L16

1. Particulars

(a) Type	Percussion, base
(b) Weapon	Launcher, Rocket, 3.5 inch U.K., M20 Mark 2
(c) Projectile	H.E.A.T.

DESCRIPTION - MODEL A1 (Fig.1)

GENERAL

2. The L16A1 fuze is a base percussion detonating type functioning with non-delay action on impact. It consists principally of a body, plug, magazine, sealing disc, plunger, creep spring, actuating sleeve, set-back sleeve, striker, shutter assembly, detonator, stop screw, locking pin and spring, ejection pin and safety band.

3. Body. - The body is made of aluminium alloy, anodised all over. It is cylindrical in shape, formed plain, with an external diameter of 2 inches. Internally, a shoulder is formed towards the rear of the body on which seats an aluminium disc, and beyond the shoulder the body is screw-threaded to receive a body closing adapter on to which is screwed the rocket motor. The front portion of the body is threaded internally at the mouth to accept a plug into which is screwed the magazine. In the side of the body a slot is cut for the ejection pin and adjacent to it a hole is drilled and threaded for a stop screw. Opposite to the slot for the ejection pin, a recess is made to house the locking pin and spring which are retained in the recess by a small screwed plug. Adjacent to the locking pin, another pin is inserted through the side of the fuze body to locate the shutter assembly and prevent it rotating.

4. Plug. - The plug is made of aluminium alloy anodised all over. It is cylindrical in shape and threaded externally to 1.5 inch diameter (20 UNS-2A) partially to screw into the front of the body and partially to engage in the screw-threads formed in the rocket head. Internally, it is recessed on two diameters, the larger being screw-threaded to accept the magazine; the smaller, leaving a thin diaphragm of metal between the base of the recess and the outer surface at the base of the plug, is filled with loose C.E. stemmed in. Two key holes are drilled in front to facilitate assembly.

5. Magazine. - Made of aluminium alloy anodised all over, the magazine is cup shaped and threaded externally to screw into the plug. Internally, it houses the prepressed C.E. pellet. Two flats are formed on the base to facilitate assembly into the plug.

6. Sealing disc. - This is a dished disc of aluminium alloy anodised all over. It is assembled into the rear of the body, the rim being flattened by pressing it on to the shoulder formed in the body.

7. Plunger. - Made of brass, zinc plated all over, the plunger is cone shaped with a flange formed at the rear. It is housed inside the body, the flange resting against the inner side of the shoulder formed towards the rear of the body.

8. Creep spring. - This is a cylindrical coiled tinned steel wire spring, formed with 2.1/2 effective coils of 0.02 inch diameter wire, one coil at each end being close coiled and square with the axis of the spring. It is assembled around the actuating sleeve.

9. Actuating sleeve. - The actuating sleeve is made of steel, zinc plated all over. It is cylindrical in shape and formed with a small external flange at the rear. About the centre, a longitudinal slot is formed and three slots are cut in the forward end. It is assembled around the plunger.

10. Set-back sleeve. - The set-back sleeve is made of steel, zinc plated all over. It is cylindrical in shape and a longitudinal and radial slot are cut in one side. It is assembled over and around the actuating sleeve.

11. Striker. - The striker consists of a zinc-plated steel pin formed with a needle point, above which is a flange and a shank; a flat double phosphor-bronze spring and a steel triangular shaped plate lever formed with a lug at each side. The pin is riveted to the centre of the apex of the lever and to one end of the spring.

12. Shutter assembly. - This comprises a Shutter plate, shutter, shutter spring, shutter retaining spring, shutter spring pin, shutter hinge pin, and shutter retaining spring pin. The shutter plate, is a flat circular disc, with a slot formed on the outside to fit over a locating pin inserted through the side of the fuze body adjacent to the locking pin. The end of this pin positions the plate and prevents it rotating. The front surface of the plate is cut away and shaped to act as a guide for the shutter and around the periphery a slot is made to accommodate the retaining spring. The shutter hinge pin, shutter spring pin and shutter retaining spring pin are also assembled in the front surface of the plate. The rear surface of the plate is recessed leaving a small portion of metal to act as a stop to the shutter when in the "armed" position. The shutter which is a flat, irregular shaped component has a hole drilled through the centre, the rear portion of the hole being enlarged to house the detonator. On one side, near the detonator recess, are two small pins. These pins bear against the side of the ejection pin which, when ejected, allows the shutter, under the influence of the shutter spring, to swing into the "armed" position thereby bringing the detonator into alignment over the point of the striker. The shutter is assembled over the hinge pin on which it pivots and is moved into the armed position, when the ejection pin is ejected, by a double armed spring which is assembled under tension over a pin positioned to one side of the shutter plate, one arm of the spring bearing against the side of the shutter, the other bearing against the side of the shutter plate. When in the armed position a shoulder on the shutter locks behind a turned over projection on the free end of the shutter retaining spring.

13. Detonator. - This is a 2.8 grain "AZ" lugless (tinned copper alloy cup) detonator, and is assembled with the open end towards the striker. It is assembled in a recess formed in the shutter and is held in position by a retaining washer which is secured by burring over an upstand formed around the recess.

14. Stop screw. - The screw is made of steel, zinc plated all over, the head being formed with a screwdriver slot. It is assembled in the side of the body and acts as a guide for the set-back sleeve and a stop for the actuating sleeve.

15. Locking pin and spring. - The locking pin is made of brass, zinc plated all over and formed with a flange around the centre. It is assembled in the side of the fuze body, followed by a small cylindrical coiled steel wire spring, and is retained in the fuze body by a small screwed plug.

16. Ejection pin. - The ejection pin is made of steel, zinc plated all over. It is formed from square bar, with a number of steps or keyways. A dome shaped cup is welded to the outer end and houses one end of a coiled steel wire ejection spring when the pin is assembled in the fuze. The ejection pin passes through the fuze body and is held in position by the safety band which encircles the body. This pin prevents any movement of the internal parts during storage, transit and handling, it also retains the shutter in the "unarmed" position, thus precluding any accidental functioning.

17. Safety band. - The safety band is made of steel, zinc plated all over. It is formed from flat steel strip, hinged in the centre, the ends being fitted with an eyelet and an engaging lever for securing purposes. The band is varnished over the zinc plating and printed in red on one side are the words "SAFETY BAND - NOT TO BE REMOVED UNTIL ROCKET HEAD HAS BEEN LOADED INTO LAUNCHER." On the side opposite to this legend is a raised boss around the underside of which is fitted a hard rubber washer, which is retained by lugs being turned over onto its outer edges. Earlier patterns had a loop instead of an eyelet and were painted green.

SAFETY ARRANGEMENTS

18. These are:-

(a) The safety band which secures the ejection pin in position.

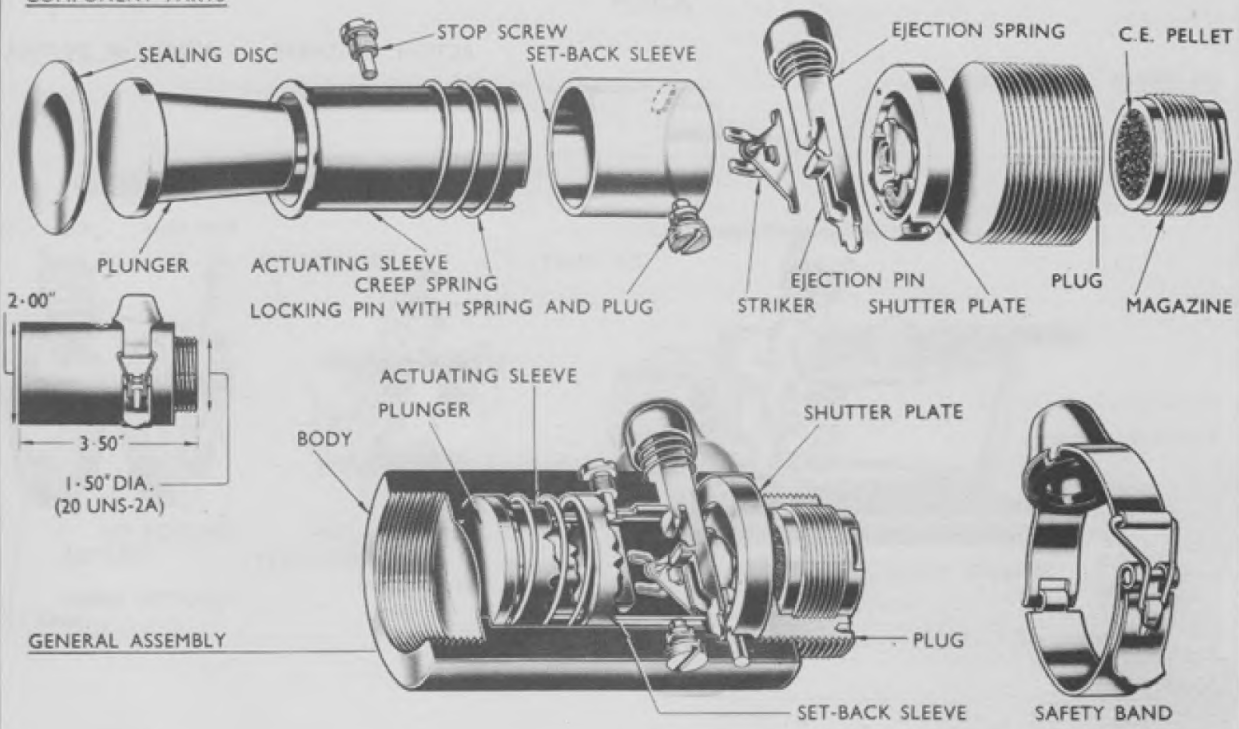
(b) The ejection pin, which is held in position during transit and storage by the safety band, passes between the striker and fuze shutter, preventing contact between them. The ejection pin also keeps the shutter in the unarmed position until after firing.

(c) The shutter is made with two metal stops which bear against the side of the ejection pin and keep the shutter in the unarmed position until the pin is ejected. In the unarmed position, the detonator is held away from the striker and is out of alignment with the C.E. channel in the plug of the fuze.

FUZE, PERCUSSION, L16A1.

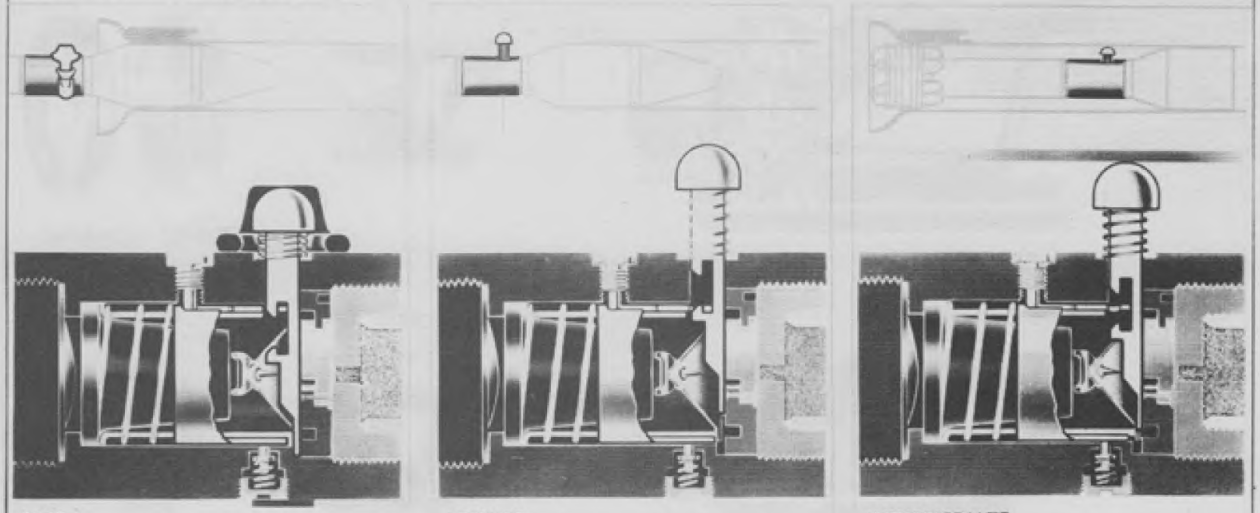
FIG. 1

COMPONENT PARTS



ACTION

LOAD INTO LAUNCHER AND REMOVE SAFETY BAND



SAFE

SAFETY BAND ON-
SET BACK SLEEVE HELD

LOCKED

SAFETY BAND OFF-
SET BACK SLEEVE HELD

INTERMEDIATE

ROCKET IN LAUNCHER-
SET BACK SLEEVE FREE

FIG.2

FUZE, PERCUSSION, L16A1.

ACTION

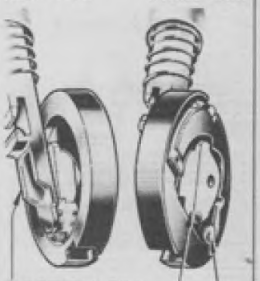
ON FIRING-
UNARMED

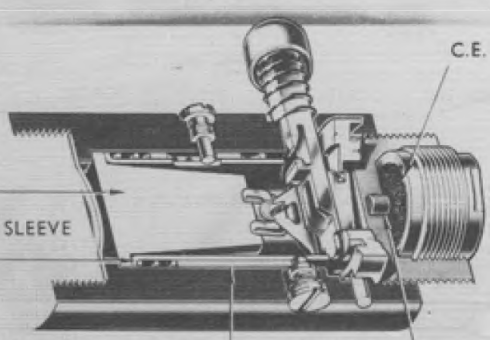
ACTION OF STRIKER

ACTION OF SHUTTER

UNARMED

Rear view Front view

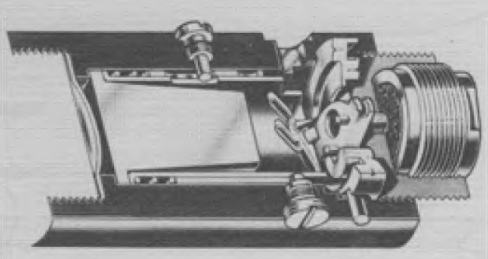


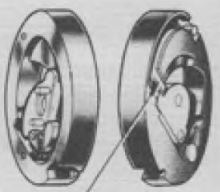


DURING FLIGHT-
ARMED

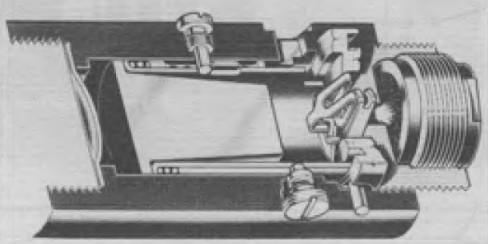
ARMED

Rear view Front view





ON IMPACT



STOP SCREW
ACTUATING SLEEVE

ON IMPACT

ACTION (FIG. 2)

19. The safety band is not removed until just prior to the rocket head being finally pushed home into the launcher, and under the influence of its spring the ejection pin moves out from the safe to the locked position. The fuze cannot arm when the ejection pin moves out from the safe to the locked position, nor can the fuze arm when the ejection pin is in either of these two positions. As the rocket enters the launcher, the ejection pin is depressed by the bore of the launcher into the intermediate position. The set-back sleeve is then free to move on firing. It will be noted that, at this moment, the fuze is still safe since the ejection pin prevents movement of the actuating sleeve, firing pin and the shutter. If it becomes necessary to remove the rocket from the launcher, the ejection pin will move outwards, under the influence of its spring, and re-engage the set-back sleeve thus returning the fuze to its locked position. The safety band should then be replaced thereby returning the ejection pin to its original safe position.

20. When the rocket is fired. - The force of set-back opposing the strength of the creep spring moves the set-back sleeve to its rearward position where it is retained by the locking pin.

21. When the rocket leaves the muzzle of the launcher. - the ejection pin is thrown clear of the fuze, the shutter revolves under the influence of its spring, and becomes locked in the armed position by a shoulder on the shutter becoming locked behind a projection on the end of the shutter retaining spring. The fuze is thus fully armed.

22. During flight. - the set-back sleeve and the actuating sleeve are prevented from rotating by the stop screw which passes through a slot provided in both sleeves. The striker spring also prevents the striker from impinging on the detonator, and the creep spring retards the forward movement of the plunger and actuating sleeve. The strength of the creep spring is strong enough to retard the plunger and actuating sleeve and to prevent the fuze from firing should the rocket strike a light object such as light brush or undergrowth.

23. Upon impact (or graze with a heavy object) . - the inertia plunger and actuating sleeve overcome the strength of the creep spring and move forward. The actuating sleeve aided by the weight of the plunger bears on the lugs of the triangular frame on which the striker is mounted. The striker spring is depressed and the striker point forced on to the detonator which, in turn, detonates the C.E. pellet in the magazine and the filling in the rocket head.

MODEL A1 WOLC - 8 I.Arm. Approval K 593

24. As described in paras. 2 to 23.

PART 2

HANDBOOK OF CURRENT BRITISH LAND SERVICE FUZES

Section 2

PERCUSSION, DA., FUZES

PART 2

HANDBOOK OF CURRENT BRITISH LAND SERVICE FUZES

Section 2

PERCUSSION, DA., FUZES

CONTENTS

Introduction

PERCUSSION, DA., FUZES

1. Percussion fuzes are of various types according to the speed of action required. Generally speaking, the Direct Action fuze has the fastest action, followed closely by the Graze Action fuze and finally by the Delay Action Graze fuze. Direct Action (D.A.) fuzes may be of the igniferous or detonating types, the mechanism consisting of a needle supported on a thin metal disc, or a hammer or striker supported on a shearing wire or coiled spring, exposed to a direct blow on impact with the target; its sensitivity depending on the strength of disc, shearing wire or coiled spring. It may be provided with a safety pin, arming sleeve and segments retaining the striker in the "unarmed" position and also usually a shutter which may or may not be retained in the "unarmed" position by a detent which sets-back on firing. D.A. fuzes filled C.E. are instantaneous in their action, while D.A. fuzes filled gunpowder have a slight delayed action.

2. Percussion fuzes are normally shaped to conform to the projectile contour and have a right hand screw-thread to avoid the possibility of their becoming unscrewed from the projectile by rotational acceleration in the bore. An exception to this rule occurs, however, in nose fuzes used in Mortars and Bomb Throwers which have a left hand thread to prevent unscrewing of the fuze from the projectile when the safety cap is removed. The threaded portion screwed into the projectile may be of different lengths, diameters and numbers of threads per inch, while the depth of intrusion of the fuze body into the projectile may also vary between different fuzes depending upon the calibre of the projectile for which approved.

3. Arming and safety devices. - Nose fuzes of the direct action type for artillery equipments are normally "armed" by:-

(a) Set-back force or

(b) Centrifugal force or

(c) a combination of both

Set-back force acts on the free or movable parts of the fuze at the instant of firing. Centrifugal force is intended to be effective only when deceleration occurs on the projectile leaving the bore, when the free or moving parts are forced outwards by spin. While passing through the bore the moving parts are expected to remain in their original positions by friction as a result of set-back. The majority of fuzes incorporate shutters which move into the "armed" position by the influence of centrifugal force. Such shutters are usually designed to remain in the "unarmed" position by a detent until fired and until the projectile is spinning between a specific number of revolutions per minute (r.p.m.), the number of revolutions varying in different fuzes to meet the requirements of the equipments for which they are approved. Springs assembled either under compression or tension may be used to assist or restrain the centrifugal force. Locking devices may also be incorporated to secure the movable components in the "armed" position after centrifugal force becomes effective. In certain new fuzes a gaine which may or may not incorporate delayed arming shutter actuated by centrifugal force is incorporated in the design. D.A. percussion fuzes for mortar, bombs; grenades and rockets are normally "armed" by set-back force only.

4. Functional differences. - Instances may arise where different marks of the same fuze are restricted to use in different equipments, for example, see Annexures in respect of Nos. 162 and 255 fuzes.

FUZE, PERCUSSION, DIRECT ACTION, NO.117

1. **Particulars** — Perc. Direct action

(a) Type

(b) Guns — Q.F. 25 Pr. gun
B.L. 5.5 in. gun
B.L. 7.2 in. howr.
B.L. 9.2 in. gun Mks 10, 10v, 10* (CA)

(c) Projectiles — HE shell, Smoke and Chemical bursting shell.

DESCRIPTION. - Mark 20 Fuze (Fig.1)

GENERAL

2. The 117 is a direct action percussion detonating type for use with streamline shell when an instantaneous effect is desired. It consists principally of a body, magazine with cap, shutter, detonator, locking weight, guide bush, percussion and arming arrangements, striker cover and safety cap.

3. Body (QX 1293) - Of brass, the upper part of the body is cone shaped, the larger diameter forming a flange. Below the flange the body is screw threaded to a 2 inch diameter (14 threads per inch, right hand) to suit the fuze hole of the shell. Two key holes are drilled just above the flange to facilitate the assembly and removal of the fuze from the shell, and a third hole is drilled and tapped near the top of the body to take a screw which secures the guide bush to the body. Below the flange two holes are drilled and tapped, one to take the magazine securing and the other to provide a shutter gauging hole. The latter hole is closed by a screw coated with a suitable cement, after the assembly of the fuze components. Internally, the body is bored from the top and bottom to form two main cavities separated by a platform.

(a) Upper cavity. - The top of the cavity is screw threaded to receive the guide bush. The base end is cone shaped to obviate the possibility of the bottom coils of the arming spring being trapped under the flange of the striker spindle. The cavity houses the percussion and arming arrangements and its base provides a seating for the arming spring.

(b) Platform. - The underside of the platform is provided with a hinge pin for the shutter, a hinge pin for the locking weight, a stop pin and, two distant pins which prevent the magazine from fouling the shutter through being screwed in too far. The top pin may be made of fibre or, of brass and fitted with a fibre sleeve. Three holes are drilled through the platform, the centre hole housing the point of the striker. The other holes act as vents to relieve pressure in the lower cavity should the detonator fire prematurely in handling or transit, or on shock of discharge. One of these holes is positioned directly over the detonator when the shutter is in the unarmed position.

(c) Lower cavity. - The cavity is bored in two diameters. The smaller boring, which is at the top, is plain and houses the shutter and locking weight. The larger boring is screw threaded to accomodate the magazine.

4. Magazine (QX 1539). - Made of brass the magazine is screw threaded at the top to fit into the base end of the body. The lower part, of smaller diameter, is also screw threaded for the attachment of the bottom cap. Internally, the magazine is bored from the base, the boring terminating in a small blind hole counter-bored in the centre leaving a diaphragm of metal. This hole is filled with loose C.E. stemmed in, which is sealed by a paper disc shellacked to the top of the main boring. The bore accomodates a C.E. pellet which is assembled and sealed with a box cloth disc. The pellet is retained in position by a brass cap which is screwed on to the base of the magazine. The cap is prevented from unscrewing by being crimped in two or more equi-spaced places on its rim. To facilitate the assembly of the magazine to the body, the magazine has two key holes drilled into the underside of the flange. The magazine is retained in position by a set screw which screws into the side of the body.

5. Shutter (QX 248). - Of irregular shape, the brass shutter is positioned between the upper face of the magazine and the underside of the body platform. It is drilled in the centre to receive a hinge pin and is prepared with a recess, which accomodates the detonator. The inner curve of the periphery forms a working surface for the toe of the locking weight.

6. Shutter spring (QX 1462). - This is a steel spring made up of 3.1/4 coils of tinned 0.024 inch diameter (23 SWG) steel wire. It holds the locking weight in such a position that it prevents the shutter from revolving and placing the detonator in the armed position until the fuze is spinning between 2200 and 3000 revolutions per minute. This may also be known as the locking weight spring.

7. Detonator. - The detonator conprises 5.5 grains "LZ" composition in a lugless tinned copper alloy cup.

8. Locking weight (QX 253). - Kidney shaped, the locking weight is made of brass. It is located between the upper face of the magazine and the underside of the body platform, and is adjacent to the shutter. One end is slotted to receive the shutter spring and drilled to receive a hinge pin; the other end is formed with a toe and a recess. The toe, under the influence of the shutter spring, bears against the inner curve of the periphery of the shutter and retaining it in the unarmed position, thus masking the diaphragm at the top of the magazine.

9. Guide bush (QX 1666). - Of brass, the guide bush is formed with a bevelled flange about its centre, the periphery of which is serrated. Above and below the flange the bush is screw threaded externally, the top threads receiving the safety cap and the bottom threads screwing into the top of the fuze body to which it is locked by a set screw. Internally, a hole is drilled longitudinally through the centre to provide a striker guide. The top end of the hole is enlarged to form a seating for the striker spring, the base of the enlargement being recessed to accommodate the rim of the striker cover. The lower end is formed with a chamfer to take the four segments and a recess under the flange is bored to form a seating for the arming sleeve. The joint between guide bush and fuze body is waterproofed by an approved composition.

10. Percussion and arming arrangement. - These arrangements comprise a striker, striker spring, striker sleeve, segments, arming sleeve and arming spring:-

(a) Striker (QX 1459). - The striker is of steel and is in two parts, striker and head, which are secured together by a split pin. The striker is a metal rod, circular in section, having a point at its lower end. Above the point a flange is formed against which bears the lower end of the striker sleeve. When assembled with its sleeve and segments there is a small clearance between the base of the flange and the arming springs seating at the base of the upper cavity.

(b) Striker spring (QX 1462). - Of spring steel and of circular section, the spring is assembled between the striker head and the top face of the guide bush where it is held under initial compression. When the segments fall away and release the striker the spring reasserts itself and withdraws the point of the striker from its recess in the locking weight.

(c) Striker sleeve (QX 1667). - Made of brass, the sleeve fits over the striker spindle. The lower end is seated on the flange of the striker and the other end is chamfered to bear against the segments.

(d) Segments (QX 1668). - Assembled in sets of four, the brass segments form a sleeve about the striker spindle and are positioned between the boss of the guide bush and the upper end of the striker sleeve. They maintain the striker spring under initial compression until caused to fall from position by the setting back of the arming sleeve and centrifugal force during the acceleration of the shell.

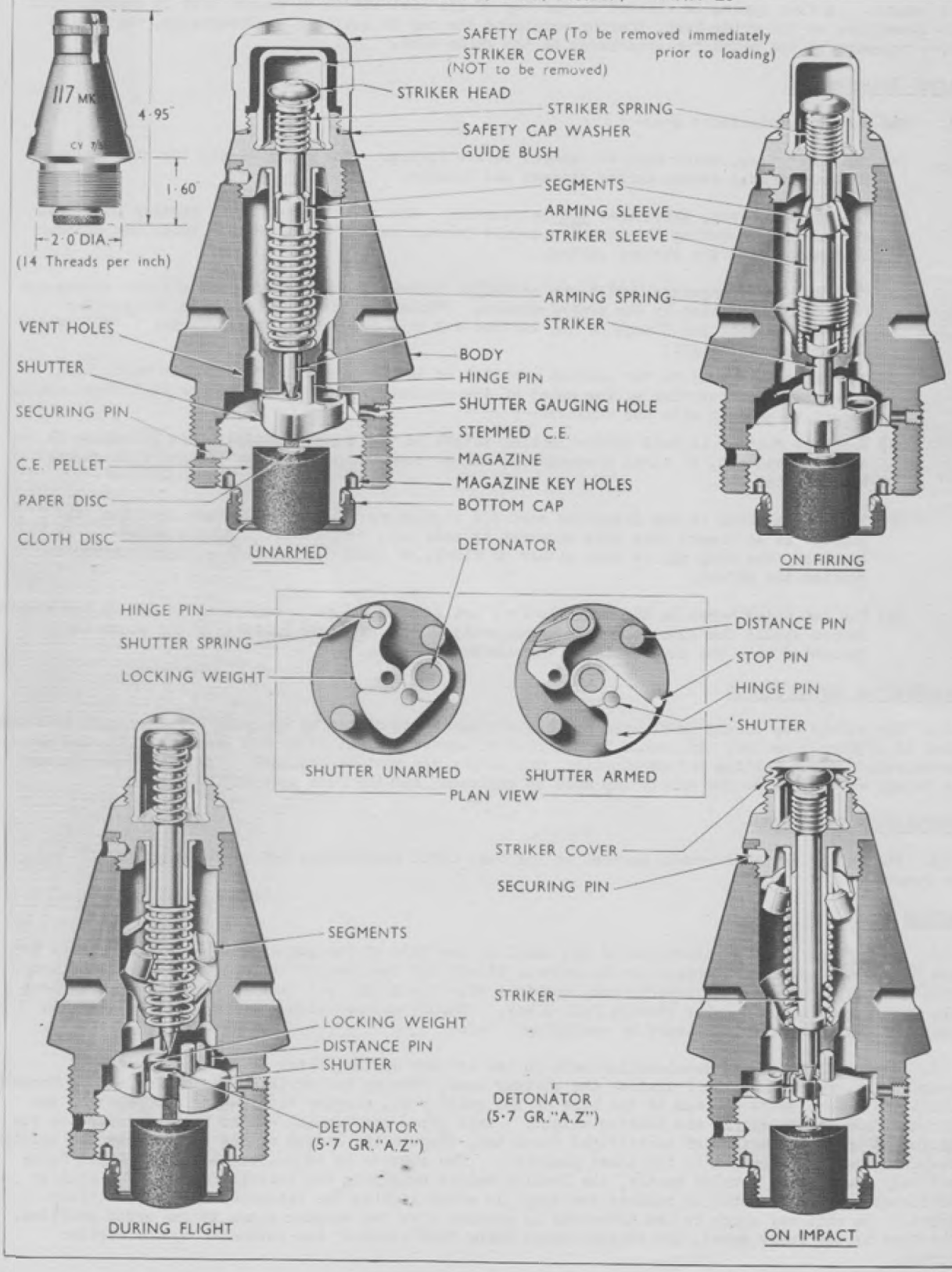
(e) Arming sleeve (QX 244). - Of brass, the sleeve is flanged at both ends and is located between the guide bush and the arming spring upon which it rests. Until being set back by the acceleration of the shell in the bore of the gun, the sleeve fits over the segments and retains them in position.

(f) Arming spring (QX 245). - Made of steel, the spring is assembled over the striker sleeve, its top end bearing against the arming sleeve and its lower end seated on the base of the upper cavity of the body. The spring retains the arming sleeve in position around the segments until the sleeve sets back and allows the segments to fall away from the striker spindle.

11. Striker cover (QX 235). - The brass cover is assembled over the striker head and is retained in position by its open end being forced into the recess at the base of the top enlargement of the guide bush. The cover prevents the pressure of air from acting on the striker head during flight, obviating the possibility of the striker acting prematurely. The cover must not be removed or interfered with in any way when preparing the fuze prior to loading the shell into the weapon.

FIG.1

FUZE, PERCUSSION, D.A., No.117, MARK 20



12. Safety cap. - Made in Zinc Base Alloy or Steel the cap is lacquered or coloured black externally. It is formed with a milled ring around its circumference and an oblique slot for nearly the whole of its length. A flat spring is riveted in the top of the slot and is so shaped that it engages with the serrations on the guide bush, thereby retaining the cap in position. Internally, the cap is screw threaded at the mouth for attachment to the guide bush.

SAFETY ARRANGEMENTS

13. The safety arrangements are:-

(a) The safety cap, which must be removed before firing. The cap protects the striker cover from accidental damage during storage and transit.

(b) The striker cover, which must NOT be removed. The cover protects the striker head from air resistance during flight and prevents foreign matter being trapped under the striker head and around the striker spring.

(c) The four brass segments, which are assembled between the guide bush and striker sleeve are retained in position by the arming sleeve. Whilst in position they hold the striker sleeve down onto the flange of the striker and thus return the striker point in the recess in the locking weight.

(d) The shutter is held in the unarmed position by the locking weight which, in turn, is prevented from rotating by the point of the striker. The shutter spring holds the locking weight in contact with the shutter.

(e) When the shutter is held by the locking weight in the unarmed position the detonator is out of alignment and, if fired prematurely, cannot communicate with the stemmed C.E. channel in the magazine.

(f) To obviate shock to the detonator when the shutter revolves to the armed position, the shutter is so shaped that this movement is made in a comparatively gentle manner. In addition, the stop pin is made either of fibre, or brass fitted with a fibre sleeve, to cushion the effect.

(g) The two holes bored in the body platform act as vent holes to relieve pressure in the shutter recess should the detonator fire prematurely. One of these holes is sited above the detonator when the shutter is in the unarmed position.

EXAMINATION BEFORE FIRING

14. The safety cap should be removed and the striker cover tested by applying a direct pull to ensure that it is firmly secure; it should be examined to ascertain that it is not damaged, distorted or punctured. After testing and examination, the safety cap must be replaced. If the striker cover is in any way defective the safety cap must be replaced, and the fuze must NOT be loaded.

PREPARATION FOR FIRING

15. The safety cap must remain screwed to the fuze until immediately before loading, when it will be removed.

ACTION (FIG. 1)

16. On firing. - The acceleration of the shell in the bore of the gun causes the arming sleeve to set back and compress the arming spring between itself and the base of the upper cavity of the body. This movement uncovers the segments and, combined with the slight set back of the striker, releases the four segments and permits them to fall clear. Should acceleration not displace the segments they will be positively displaced by centrifugal force.

17. During flight. - As deceleration sets in the striker spring, which is assembled under compression, reasserts itself against the striker head, forcing the striker and striker sleeve forward until the sleeve meets the end of the boss of the guide bush, thereby withdrawing the point of the striker from its recess in the locking weight. This frees the locking weight which revolves on its hinge pin under the action of centrifugal force and, through the medium of its toe, starts the shutter revolving on its hinge pin to the armed position. The shutter is so shaped that centrifugal force can only cause it to revolve gently, the locking weight supplying the initial force. The shutter continues to revolve until it reaches the stop pin which locates the detonator under the striker point. In this way shock to the detonator is avoided when the shutter moves to the armed position. The fuze is now fully armed, the striker point being held clear of the detonator by the striker spring.

18. On impact. - The striker cover is forced on to the striker head, thereby forcing the striker inwards to compress the striker spring and permit the point of the striker to pierce the detonator. The resultant detonating wave passes through the magazine diaphragm to the stemmed C.E. which, in turn, detonates the C.E. pellet in the magazine and the bursting charge in the shell.

OTHER MARKS - SUMMARY OF DIFFERENCES

MARK 10 FUZE (Obsolescent) WOLC - § C3881, C9008

19. The detailed variations of the mark 10 fuze are:-

(a) Body. - The body of this fuze is not provided with a shutter gauging hole. (QX 258)

(b) Magazine. - The magazine (QX 239) is provided with two key slots in the base and is fitted with a brass or steel bottom cap.

(c) Shutter spring. - The spring comprises three coils of 0.02 inch diameter steel wire. (QX 249)

(d) Detonator. - The detonator comprises 5 grains of "AZ" composition in a copper alloy cup.

(e) Safety cap. - The cap may be made of brass, malleable cast iron, steel or zinc base alloy.

(f) Guide bush (QX 241) striker sleeve (QX 243) and striker segments (QX 246) and striker (QX 240) are fitted to this fuze.

MARK 15 FUZE (Obsolescent) WOLC - § C6622, C7414

20. The detailed variations of the mark 15 fuze are:-

(a) Body. - The body of this fuze is not provided with a shutter gauging hole. (QX 258)

(b) Magazine. - The magazine (QX 239) is provided with two key slots in the base and is fitted with a steel bottom cap.

(c) Shutter spring. - The spring comprises three coils of 0.02 inch diameter steel wire. (QX 249)

(d) Detonator. - The detonator comprises 5 grains of "AZ" composition in a copper alloy cup.

(e) Safety cap. - The cap may be made of malleable cast iron, steel or zinc base alloy.

(f) Guide bush (QX 241), striker sleeve (QX 243) striker segments (QX 246) and striker (QX 240) are fitted to this fuze.

MARK 17 FUZE (Obsolescent) WOLC - § C6622, C7414

21. The detailed variations of the mark 17 fuze are:-

(a) Body. - The body of this fuze is not provided with a shutter gauging hole. (QX 258)

(b) Magazine. - The magazine (QX 239) is provided with two key slots in the base and is fitted with a steel bottom cap.

(c) Shutter spring. - The spring comprises three coils of 0.02 inch diameter steel wire. (QX 249)

(d) Detonator. - The detonator comprises 5.7 grains of "AZ" composition in a lugless tinned copper alloy cup.

(e) Safety cap. - The cap may be made of malleable cast iron, steel or zinc base alloy.

(f) Guide bush (QX 241), striker sleeve (QX 243), striker segments (QX 246), and striker (QX 240) are fitted to this fuze.

MARK 17/1 FUZE (Obsolescent) WOLC - § C7414, C9083

22. The detailed variations of the mark 17/1 fuze are:-

(a) Magazine. - The magazine (QX 239) is provided with two key slots in the base and is fitted with a steel bottom cap

(b) Shutter spring. - The spring comprises three coils of 0.02 inch diameter steel wire (QX 249)

(c) Detonator. - The detonator comprises 5.7 grains of "AZ" composition in a lugless tinned copper alloy cup.

(d) Safety cap. - The cap may be made of malleable cast iron, steel or zinc base alloy.

(e) Guide bush (QX 241), striker sleeve (QX 243), striker segments (QX 246), and striker (QX 240) are fitted to this fuze.

MARK 17/2 FUZE (Obsolescent) WOLC - § C7414, C9083

23. A modified mark 15 fuze, the detailed variations of the mark 17/2 fuze are:-

(a) Magazine. - The magazine (QX 239) is provided with two key slots in the base and is fitted with a steel bottom cap

(b) Shutter spring. - The spring comprises three coils of 0.02 inch diameter steel wire. (QX 249)

(c) Detonator. - The detonator comprises 5.7 grains of "AZ" composition in a lugless tinned copper alloy cup.

(d) Safety cap. - The cap may be made of malleable cast iron, steel or zinc base alloy.

(e) Guide bush (QX 241), striker sleeve (QX 243), striker segments (QX 246), and striker (QX 240) are fitted to this fuze.

MARK 17/3 FUZE (Obsolescent) WOLC - § C7414, C9083

24. A modified mark 17 fuze, the detailed variations of the mark 17/3 fuze are:-

(a) Magazine. - The magazine (QX 239) is provided with two key slots in the base and is fitted with a steel bottom cap.

(b) Shutter spring. - The spring comprises three coils of 0.02 inch diameter steel wire (QX 249)

(c) Detonator. - The detonator comprises 5.7 grains of "AZ" composition in a lugless tinned copper alloy cup.

(d) Safety cap. - The cap may be made of malleable cast iron, steel or zinc base alloy.

(e) Guide bush (QX 241), striker sleeve (QX 243), striker segments (QX 246), and striker (QX 240) are fitted to this fuze.

MARK 17/4 FUZE (Obsolescent) WOLC - § C7414, C9083

25. A modified empty mark 16 fuze (now obsolete), the detailed variations of the mark 17/4 fuze are:-

(a) Magazine. - The magazine (QX 239) is provided with two key slots in the base and is fitted with a steel bottom cap.

(b) Shutter spring. - The spring comprises three coils of 0.02 inch diameter steel wire (QX 249).

(c) Detonator. - The detonator comprises 5.7 grains of "AZ" composition in a lugless tinned copper alloy cup.

(d) Safety cap. - The cap may be made of malleable cast iron, steel or zinc base alloy.

(e) Guide bush (QX 241),striker sleeve (QX 243), striker segments (QX 246), and striker (QX 240) are fitted to this fuze.

MARK 17/5 FUZE

WOLC - § C9931

26. The detailed variations of the mark 17/5 fuze are:-

(a) Magazine. - The mark 17/5 is fitted with the new pattern magazine (QX 1539) having two key holes in the flange in lieu of two key slots in the base, and the C.E. pellet contained in the magazine is shortened and sealed by a box cloth disc. Some earlier issues of this fuze were assembled with the older magazine (QX 239) which may or may not have been modified to approximate to magazine QX 1539.

(b) Shutter spring. - The spring comprises three coils of 0.02 inch diameter steel wire (QX 249)

(c) Detonator. - The detonator comprises 5.7 grains of "AZ" composition in a lugless tinned copper alloy cup.

(d) Safety Cap. - The cap may be of malleable cast iron, steel or zinc base alloy.

(e) The introduction of a new guide bush (QX 1666), striker sleeve (QX 1667) and striker segments (QX 1668) was approved on 24th July, 1959, for use with this fuze in lieu of guide bush (QX 241), striker sleeve (QX 243) and segments (QX 246), which are now obsolescent. Striker (QX 240) is fitted.

MARK 18 FUZE (Never introduced into Service)

27. The mark 18 fuze is similar to the Mark 17/1 fuze but has the shutter locking weight, and, the walls of the shutter recess, the centre hole of the body platform, the top face of the magazine, and the projecting surfaces of the distances, hinge and stop pins, tin plated.

MARK 19 FUZE (Obsolescent)

WOLC - §§ C 9629, C 9865

28. The detailed variations of the mark 19 fuze are:-

(a) Detonator. - The detonator comprises 5.7 grains of "AZ" composition in a lugless tinned copper alloy cup.

(b) Safety cap. - The cap is made of zinc base alloy, or steel.

(c) This fuze is fitted with a new pattern striker (QX 1459) and striker spring (QX 1462). The introduction of a new guide bush (QX 1666), striker sleeve (QX 1667) and striker segments (QX 1668) was approved on 24th July, 1959, for use with this fuze in lieu of guide bush (QX 241), striker sleeve (QX 243) and segments (QX 246), which are now obsolescent.

MARK 20 FUZE

WOLC §§ C 9865

29. This fuze is described in paras. 3 to 13 inclusive.

FUZE, PERCUSSION, DIRECT ACTION, NO. 161

1. Particulars:-

(a) Type	Direct action, percussion, nose.
(b) Mortar	2 inch mortar and Bomb Thrower.
(c) Projectile	H.E. bomb.

DESCRIPTION - Mark 4 Fuze (Fig. 1)

GENERAL

2. The No. 161 fuze is a direct action percussion type, the body of which has a left-hand fuze-hole thread to prevent the fuze from unscrewing from the bomb when the safety cap is removed. The fuze consists principally of a body, striker, striker spring, detent, detent spring, retaining ball, shutter, shutter spring, hinge pin, detonator, septum, steel disc, magazine, cap, safety cap and safety pin with securing band.

3. Body. - Of zinc base alloy, the body is formed externally with a flange above which it is screw-threaded to accept a safety cap. These threads are surmounted by a plain portion which is reduced in diameter and formed with a cannelure which retains a brass cap. Below the flange the body is threaded to a 1.77 inch diameter (20 threads per inch L.H.) to screw into the nose of the bomb. Beneath these threads the body is reduced in diameter and is plain. A hole is drilled in the flange for the use of a tommy bar which assembling the fuze to the bomb, and a shutter gauging hole, closed by a grub screw, is drilled through the lower threads. Internally, the body is formed with a number of recesses to house the components. The largest of these recesses, at the base of the body, is partially screw-threaded to accept the magazine.

4. Striker. - Of steel and zinc plated all over, the striker is formed with a stem which tapers to a point at one end and is surmounted at the other end by a head. The head is mushroom shaped, with a neck which is recessed to accommodate a steel ball.

5. Striker spring. - Made of steel, the striker spring is of the coiled type and is assembled, under compression, on the stem of the striker, holding it in the armed position when the detent sets back and the ball rolls out of the recess in the neck of the striker. The spring is treated with oil OX-10.

6. Detent. - Made of brass, the detent is formed with a short hollow stem and a cylindrical head which is chamfered at the top. It is retained in position by a detent spring fitted over the stem and a detent stop, screwed to the body and resting against the top surface of the head. The detent retains the striker in the unarmed position by locking the ball in the striker recess until set back causes the detent to move against its spring and unmask the oblique channel in the body.

7. Detent spring. - A cylindrical steel spring of 24 coils, the detent spring is assembled below the head of the detent under initial compression. The spring is treated with Oil OX-10.

8. Ball. - Of non-corrosive steel and 0.25 inches in diameter, the steel ball rests in the recess of the striker and against the head of the detent. In conjunction with the detent, the ball retains the striker in the unarmed position. The ball is not treated with a lubricant or preservative.

9. Shutter. - The shutter is a plate of zinc based alloy, its contour roughly conforming to that made by the driving chain on a bicycle. A hole for a hinge pin is drilled at the small end which is recessed in the side to receive one leg of a spring; the large end of the shutter is recessed to receive a detonator. The shutter is held in the unarmed position by the point of the striker, against which it is pressed by the spring.

10. Shutter spring. - Of steel, this is a coiled torsion spring formed with two legs, the coils pivoting about the shutter hinge pin. One leg is engaged in the side recess of the shutter whilst the other bears against the wall of the fuze body. When assembled, the spring is under compression and upon the striker being raised, it reasserts itself and forces the shutter to the armed position. The spring is treated with oil OX-10.

11. Hinge pin. - Made of steel and tinned to prevent the formation of copper azide; the hinge pin is knurled at the end which is forced into a hole prepared in the body of the fuze. The pin functions as a pivot about which the shutter rotates, and serves as an anchor for the shutter spring.

12. Detonator. - This is a 2.6 gr "LZ" lugless (tinned copper alloy cup) detonator.

13. Septum. - A tinned-plate disc, the septum separates the shutter and striker point from the disc.

14. Disc. - Fitted above the magazine, the zinc plated steel disc is provided with a channel which is filled with stemmed C.E. The filling, which is retained in position by paper discs shellacked to the top and bottom surfaces of the disc, is located beneath the striker point from which it is separated by the septum.

15. Magazine. - Of zinc-alloy, the magazine is screw-threaded externally for its reception in the base of the body. It is recessed from the top to accommodate a C.E. pellet and two key slots are formed in the base to take an assembly tool. The screw-threads are coated with an approved cement, and the magazine is retained in position by spinning over, or crimping the base in three equidistant places.

16. Cap. - Cup shaped and made of brass, the cap is fitted over the nose of the fuze, its mouth being pressed into the cannelure formed in the upper part of the body.

17. Safety cap. - The brass cap is protected by a zinc alloy, cup shaped safety cap which is threaded internally to screw on to the body. The periphery is knurled to facilitate assembly and removal, and on the top appears a directional arrow and the legend "REMOVE BEFORE FIRING."

18. Safety pin with securing band. - Of solid steel, zinc plated all over the pin is formed with an enlarged head above which it is reduced in diameter to form a rivet for a tin plated or zinc plated brass tag. The pin is inserted in a hole drilled below the cannelure in the fuze body, and is positioned between the detent and ball. It prevents the movement of the ball should the detent momentarily set back on impact when dropped from an aircraft. The head of the pin is sealed in the fuze body with an approved cement. A length of 1/2 inch wide white waterproof adhesive tape, attached to a slot in the tag, is wound over the junction of the safety cap and the body, leaving the tommy hole clear. On the tape the legend "REMOVE SAFETY PIN BEFORE FIRING" is printed in black.

SAFETY ARRANGEMENTS

19. The safety arrangements are:-

(a) The safety cap, which must be removed before firing, protects the brass cap and striker, preventing damage during transit and storage.

(b) The detent and ball retain the striker in the unarmed position.

(c) The shutter is held in the unarmed position by the striker.

(d) The safety pin, to which is attached an adhesive tape band marked "REMOVE SAFETY PIN BEFORE FIRING", retains the ball in position, thus preventing arming should the detent set back before the fuze is prepared for firing.

PREPARATION FOR LOADING

20. Unwind the adhesive tape, remove the safety cap and then remove the safety pin.

ACTION (FIG. 1)

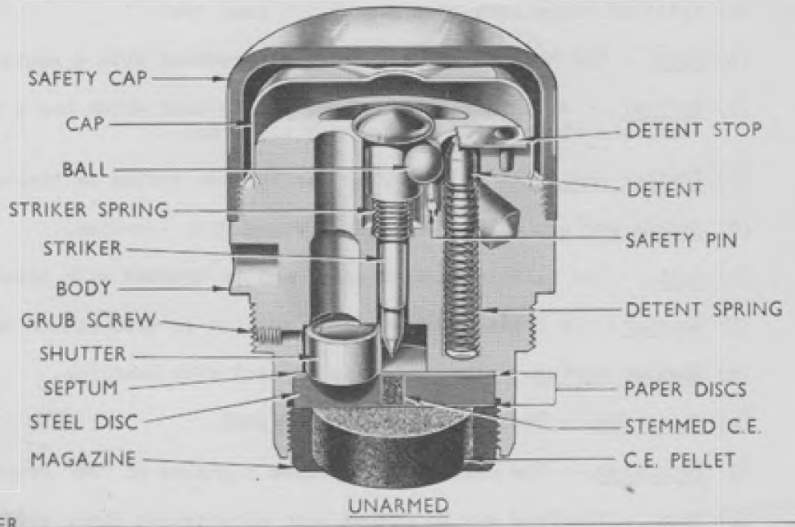
21. On firing. - The shock of discharge causes the detent to set back, compressing its spring and unmasking the oblique channel in the body. At the same time, the striker sets back on its spring releasing the ball which travels to the outer end of the oblique channel. The shutter is retained in the unarmed position by the point of the striker.

22. During flight. - The detent spring reasserts itself and returns the detent to its original position, thereby preventing the ball from moving back towards the striker. The striker spring reasserts itself, forcing the striker to, and retaining it in, the armed position. This action frees the shutter which, under the influence of its spring, moves to the armed position. In this position the detonator in the shutter is in line with the stemmed C.E. in the disc below the septum.

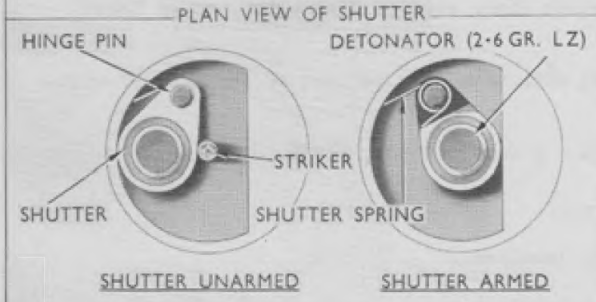
23. On impact. - The cap is crushed on to the head of the striker which is forced into the detonator. The resulting detonating wave passes through the septum to the stemmed C.E. in the disc, and from thence to the magazine and the bursting charge in the bomb.

FIG.1

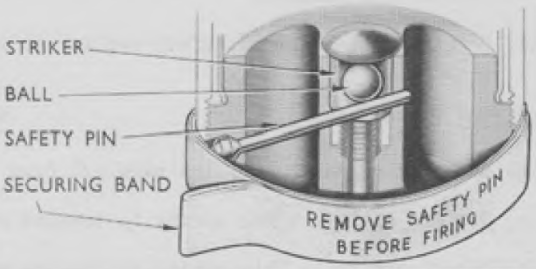
FUZE, PERCUSSION, D.A., No.161, MARK 4

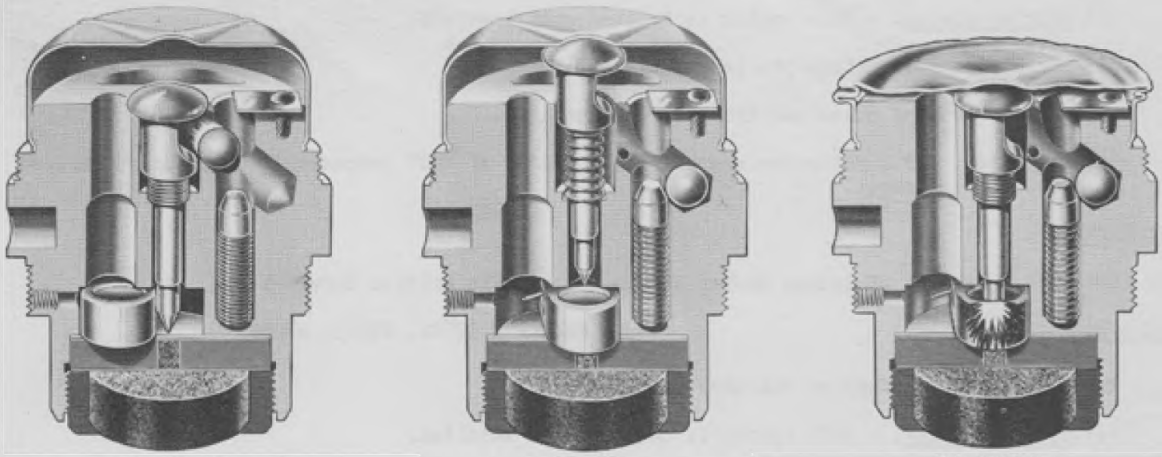


UNARMED



SHUTTER UNARMED SHUTTER ARMED





ON FIRING ARMED ON IMPACT

SUMMARY OF DIFFERENCES

MARK 1/1 FUZE (obsolescent) WOLC - § C4316, C5488, C9565, N2096

24. The detailed variations of the mark 1/1 fuze are:-

(a) Body. - The body of this fuze is not provided with a shutter gauging hole.

(b) Striker. - An alternative striker may be used which has a zinc alloy head and a steel stem, the whole being zinc plated all over.

(c) Striker spring. - In this fuze the striker spring is treated with lanoline.

(d) Detent spring. - The spring is treated with lanoline.

(e) Ball. - The ball is made of steel and is treated with lanoline

(f) Shutter. - A brass shutter may be used as an alternative to one made of zinc based alloy.

(g) Shutter spring. - The spring is treated with lanoline.

(h) Hinge pin. - The hinge pin is not tinned.

(j) Detonator. - The detonator comprises 5 grains of "AZ" composition in a copper alloy cup.

(k) Disc. - The fuze may be fitted with alternative discs made of zinc alloy or, of brass coated with lacquer.

(l) Safety cap. - A steel safety cap may be used with this fuze in lieu of one made of zinc alloy.

MARK 1/2 FUZE (obsolescent) WOLC - § C6417, C9565, N2096

25. The detailed variations of the mark 1/2 fuze are:-

(a) Striker spring. - The spring is treated with lanoline.

(b) Detent spring. - This spring is treated with lanoline.

(c) Shutter spring. - This spring is treated with lanoline.

(d) Hinge pin. - The hinge pin is not tinned.

(e) Ball. - Made of steel and treated with lanoline.

(f) Detonator. - The detonator comprises 2.8 grains of "AZ" composition in a lugless tinned copper alloy cup.

MARK 2 FUZE

26. The mark 2 fuze is of Indian design and is not used in British Service.

MARK 3 FUZE (obsolescent) WOLC - § C7624, C9565, N2096

27. The detailed variations of the mark 3 fuze are:-

(a) Striker spring. - This spring is treated with lanoline.

(b) Shutter spring. - This spring is treated with lanoline.

(c) Ball. - Made of steel and treated with lanoline.

(d) Detonator. - The detonator comprises 2.8 grains of "AZ" composition in a lugless tinned copper alloy cup.

MARK 3/1 FUZE (obsolescent) WOLC - § C8738, N1911, C9565, N2096

28. The detailed variations of the mark 3/1 fuze are:-

(a) Ball. - The ball is made of steel and treated with oil OX-10.

(b) Detonator. - The detonator comprises 2.8 grains of "AZ" composition in a lugless tinned copper alloy cup.

MARK 3/2 FUZE (obsolescent) WOLC - § C8739, N1911

29. The detailed variations of the mark 3/2 fuze are:-

(a) Detonator. - The detonator comprises 2.8 grains of "AZ" composition in a lugless tinned copper alloy cup.

MARK 4 FUZE

30. As described in paras. 2 to 23 inclusive.

FUZE, PERCUSSION, D.A. No. 162

1. Particulars

(a) Type	Direct Action, percussion, nose.
(b) Mortars	Mark 4 3 in and 81 mm Mortars (See note (a)) 4.2 in Mortar (See note (b))
(c) Projectiles	H.E. and smoke W.P.

DESCRIPTION - MARK 8 (Fig. 1)

GENERAL

2. This is a direct action detonating fuze and consists principally of a body, striker with spring, retaining ball and safety pin; shutter with spring, hinge pin, detonator, detent with spring, steel disc, septum, magazine, cap and safety cap.

NOTE: The main difference between marks of fuzes approved for use in M.L. 3 inch Mortars and those approved for use in M.L. 4.2 inch Mortars is that the detent of fuzes used in the latter are made of aluminium instead of brass.

3. Body (QX 1505) - This is zinc-base alloy and at its upper part has a cannelure formed to accommodate the cap and below this it is screw-threaded externally for engagement of the safety cap. A tommy hole is formed through the threads for fixing purposes. Below the threads for the safety cap a flange is formed below which the body is screw-threaded 14 threads per inch (R.H.) to 1.375 inch diameter to suit the fuze hole of the bomb, after which the remainder of the body is formed plain. Internally, it is formed with a number of recesses to house the integral parts of the fuze. An inspection hole is formed at the base of the recess for the detent and spring. Internally, in the upper part of the body, an oblique channel, tapered at the base, is formed to accommodate the ball. A tapped hole, for use in assembly and at inspection, is formed in the lower portion leading into the shutter recess. Before issue the outer end of this hole is sealed with an aluminium cup which is in turn sealed with an approved cement.

4. Striker - This is of all steel the lower end being formed pointed to pierce the detonator, and the upper end having a circular flat head slightly below which is formed a coned flanged portion to accommodate the retaining ball when the fuze is unarmed. It is zinc-plated all over.

5. Striker spring - This is of coiled steel wire, the last coil at each end being laid flat. It is assembled, under compression, beneath the flange on the striker and raises the striker in the armed position when the detent sets back and the ball drops into the oblique recess in the fuze body.

6. Detent (QX 1507) - This consists of a short brass rod, the top end of which is chamfered, whilst the lower end is machined to a spherical form of a slightly reduced diameter. The lower end fits into the top of the detent spring and is retained in the body of the fuze by the cap.

7. Detent spring - This is a cylindrical coiled steel wire spring and is assembled under initial compression below the detent.

8. Shutter (QX 1123) - Made of zinc base alloy the shutter is pear-shaped and pivots on a tin-plated brass hinge pin, the large end being recessed to accommodate the detonator which is retained in position by a washer and secured by turning over a burr formed on the shutter.

9. Shutter spring - This is a coiled steel wire torsion spring having two legs, one of which engages in the recess in the side of the shutter, the other bearing against the side of the fuze body. When the point of the striker is raised by the action of the striker spring, the shutter spring causes the shutter to rotate to the armed position so that the detonator is positioned directly under the point of the striker.

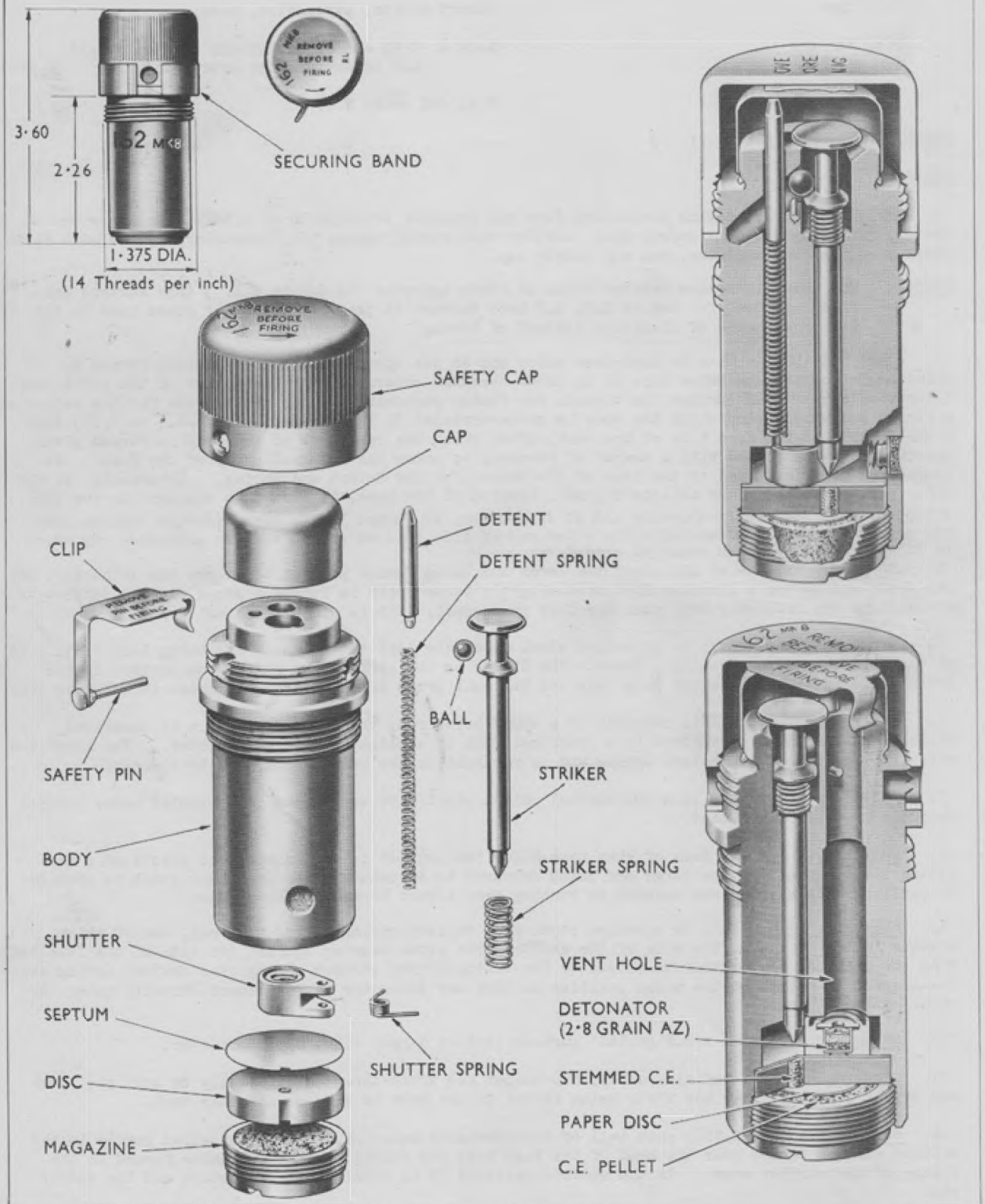
10. Detonator - This is a 2.8 gr "AZ" lugless (tinned copper alloy cup) detonator.

11. Magazine - This is of zinc-alloy, cup-shaped and screw-threaded externally to suit the lower end of the fuze body, two key slots being formed on the base to take an assembly tool.

12. Ball - This is a 0.1875 inch ball of non-corrosive material. It is assembled partly in the oblique channel formed near the head of the fuze body and partly above the chamfer formed on the flange of the striker stem. In the unarmed position it is retained by the detent and the safety pin.

FIG. 1

FUZE, PERCUSSION, DA., No. 162, MARK 8



13. Safety pin (QX 81A) - This is made in three pieces, a pin and a collar which is sweated to the clip. The pin portion is inserted in a hole drilled below the cannelure formed in the fuze body, the clip attached thereto fitting over the top of the cap. The pin is positioned between the detent and ball and prevents the ball moving should the detent momentarily set back on impact when dropped from aircraft. The clip which fits over the cap bears the legend "REMOVE PIN BEFORE FIRING". The head of the pin is sealed in the fuze body with Mk. 8 luting.

14. Septum - This is a tinned-plate disc with a small recess cut in the side to position it when assembled above the steel disc.

15. Disc - This is a circular disc of either steel (zinc-plated) or brass with a small recess cut in the side to position it when assembled above the magazine. A hole is drilled through the disc and filled with C.E. stemmed in, the composition being retained by paper discs shellacked to both top and bottom surfaces. The hole filled C.E. is positioned beneath the striker point and is separated from it by the thin tinned plate septum.

16. Cap - This is of brass, cup-shaped, and fits over the nose of the fuze. It is secured by pressing the metal at the mouth into the cannelure formed in the head of the fuze.

17. Safety cap - This is cup-shaped, the sides being knurled to facilitate assembly and removal. It fits over the top of the fuze. A directional arrow and the words "REMOVE BEFORE FIRING" appear on the top. After assembly, a band of adhesive tape is wound around the safety cap overlapping the joint between it and the fuze body, it being so affixed that the tommy hole is left clear.

SAFETY ARRANGEMENTS:-

18. These are;

(a) The safety cap, which is removed before firing, protects the striker cover (cap) and striker thus preventing damage during transit and storage.

(b) The detent and ball retain the striker in the unarmed position.

(c) The shutter is held in the unarmed position by the point of the striker.

(d) The Safety pin, to which is attached a clip marked "REMOVE PIN BEFORE FIRING" retains the ball in position thus preventing arming should the detent set back before the fuze is prepared for firing.

PREPARATION FOR FIRING

19. Before loading unwind the adhesive tape, remove the safety cap and then remove the safety pin.

NOTE: If the tag breaks off leaving the safety pin in the fuze the following action will be taken:-

(a) During training - the pin will be withdrawn, by the use of pliers, and the bomb will be fired. If it proves impossible to withdraw the pin the bomb will be set aside for destruction.

(b) During operations - the pin will be withdrawn, by the use of pliers, and the bomb will be fired. If it proves impossible to withdraw the pin the bomb will be fired with the pin in position. If neither of the above courses is possible the bomb will be set aside for destruction.

ON NO ACCOUNT WILL FUZES BE RE-PINNED OR THE BOMBS REPACKED.

ACTION

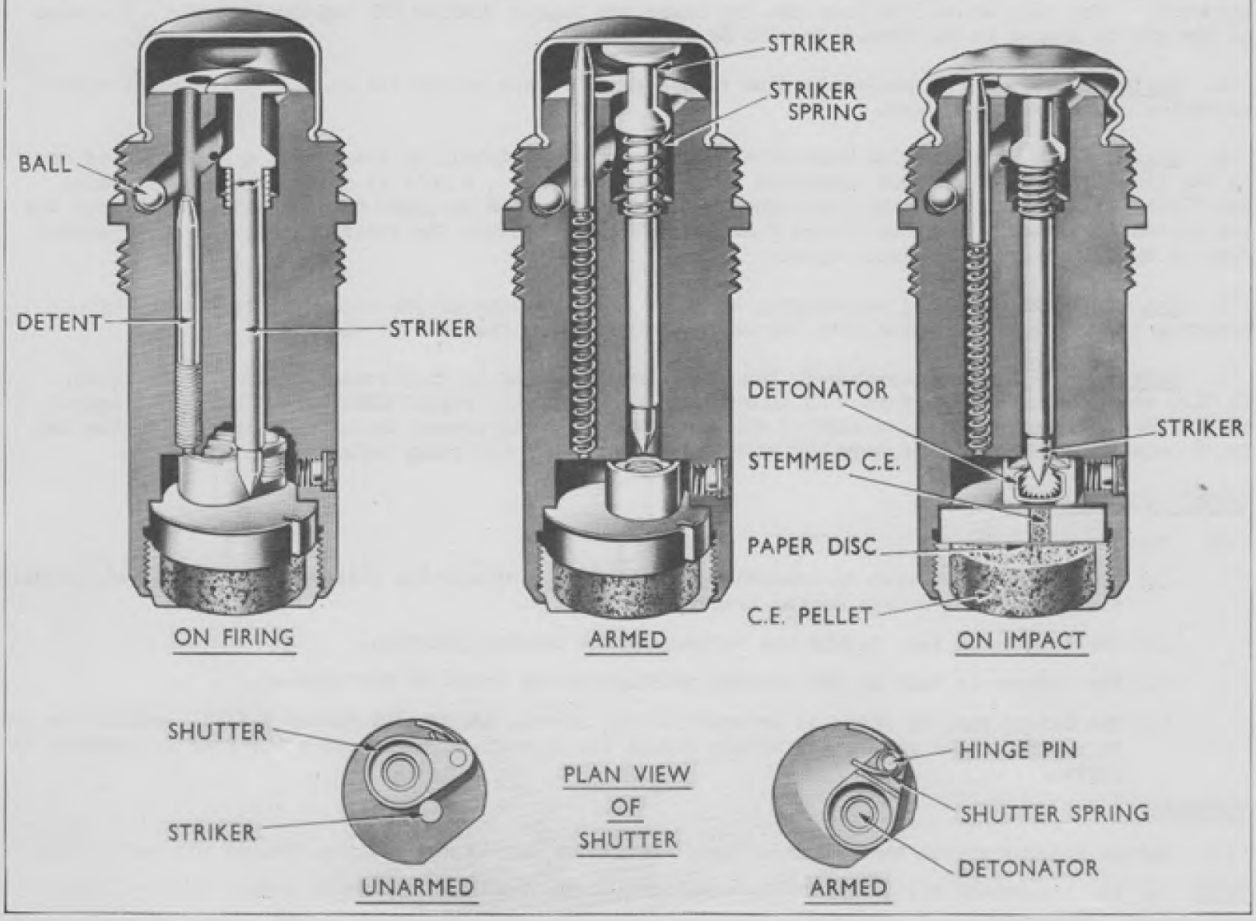
20. On firing - The shock of discharge causes the detent to set back, compressingits spring and unmasking the oblique channel. At the same time the striker also sets back, compressing its spring and releasing the ball which travels down the oblique channel and wedges in the tapered end.

21. During flight - On deceleration occuring the detent spring re-asserts itself and the detent is pushed upwards blocking the oblique channel and preventing the ball returning to the striker. The striker spring also re-asserts itself and the striker, now no longer retained in the unarmed position by the ball, is pushed upwards to allow the shutter to rotate under the pressure of the shutter spring until it bears against a flat portion formed in the shutter recess.

In this position the detonator is immediately below the point of the striker and above the stemmed CE in the disc below the septum. The fuze is armed.

22. On impact - The cap is crushed the striker being forced into the detonator. The detonator fires and the resulting detonation wave passes to the charge in the bomb through the septum to the stemmed CE and the CE pellet in the magazine.

ACTION OF FUZE, No.162, MARK 8 FIG.2



SUMMARY OF DIFFERENCES

23. MARK 1/2 FUZE (Obsolescent) WOLC - 8 C4232, C5488, C8080

The differences to be found in this mark of fuze are:-

(a) Body (QX 334) - The body used has no inspection holes for detent and shutter and the oblique channel is not tapered at the base.

(b) Detent (QX 349) - The detent is formed with a flat lower end which rests on the detent spring.

(c) Shutter (QX 345 or 346) - Of zinc alloy (QX 345) or brass (QX 346) the shutter differs from that used in the mark 8 fuze only in that the recess for the detonator is of a larger diameter. The shutter hinge pin is not tin-plated.

(d) Detonator - A 5 gr 'AZ' (copper alloy cup) detonator is fitted.

(e) Ball - Not made of non-corrosive material.

(f) Safety pin (QX 23A) - Made in only two pieces, the pin being riveted to the clip. Sealed in the fuze body with Mark 6 luting.

(g) Disc - A zinc alloy disc may be used.

24. MARK 3 FUZE (Obsolescent) WOLC - § C6419, C8080.

The main differences from the Mark 8 fuze are:-

(a) Body (QX 334) - The body has no inspection holes for detent and shutter and the oblique channel is not tapered at the base.

(b) Detent (QX 1114) - Of aluminium in lieu of brass and formed with a flat lower end.

(c) Shutter (QX 345 or 346) - Of zinc alloy (QX 345) or brass (QX 346) the shutter differs only in that the recess for the detonator is of a larger diameter. The shutter hinge pin is not tin-plated.

(d) Detonator - A 5 gr 'AZ' (copper alloy cup) detonator is fitted.

(e) Ball - Not made of non-corrosive material.

(f) Safety pin (QX 23A) - Made in only two pieces, the pin being riveted to the clip.

(g) Disc - A zinc alloy disc only is fitted to this mark.

25. MARK 3/1 FUZE (obsolescent) WOLC - § C6419, C8080.

The mark 3/1 fuze differs in the following ways:-

(a) Body (QX 334) - The body has no inspection holes for detent and shutter and the oblique channel is not tapered at the base.

(b) Detent (QX 1114) - Of aluminium in lieu of brass and formed with a flat lower end.

(c) Shutter (QX 345 or 346) - Of zinc alloy (QX 345) or brass (QX 346) the shutter differs from that used in the mark 8 fuze only in that the recess for the detonator is of a larger diameter. The shutter hinge pin is not tin-plated

(d) Detonator - A 5.7 gr 'AZ' lugless (tinned copper alloy cup) detonator is fitted.

(e) Ball - Not made of non-corrosive material.

(f) Safety pin (QX 23A) - Made in only two pieces, the pin being riveted to the clip.

(g) Disc - A zinc alloy disc only is fitted to this mark.

26. MARK 3/2 FUZE (Obsolescent) WOLC - § C6419, C8080.

The differences between this mark and the mark 8 fuze are:-

(a) Body (QX 1116) - In this type of body the oblique channel is not tapered at the base. No aluminium sealing cup is fitted.

(b) Detent (QX 1114) - Of aluminium in lieu of brass and formed with a flat lower end.

(c) Shutter (QX 345 or 346) - Of zinc alloy (QX 345) or brass (QX 346) the shutter differs only in that the recess for the detonator is of a larger diameter. The shutter hinge pin is not tin-plated.

(d) Detonator - A 5.7 gr 'AZ' lugless (tinned copper alloy cup) detonator is fitted.

(e) Ball - Not made of non-corrosive material.

(f) Safety pin (QX 23 A) - Made in only two pieces, the pin being riveted to the clip.

27. MARK 3/3 FUZE WOLC - § C6419, C8080.

The differences to be found in this mark of fuze are:-

(a) Body (QX 1116) - In this type of body the oblique channel is not tapered at the base. No aluminium sealing cup is fitted.

(b) Detent (QX 1114) - Of aluminium in lieu of brass and formed with a flat lower end.

(c) Shutter (QX 1123) - The shutter hinge pin is not tin-plated.

(d) Ball - Not made of non-corrosive material.

28. MARK 4 FUZE (Obsolescent) WOLC - § C7753, C8080, C9850

The differences in this fuze are:-

(a) Body (QX 1116) - The oblique channel is not tapered at the base. No aluminium sealing cup is fitted.

(b) Detent (QX 349) - The detent is formed flat at the lower end.

(c) Ball - Not made of non-corrosive material.

29. The ball, detent spring, shutter spring and striker spring are lanoline treated.

30. MARK 5 FUZE WOLC - § C7753, C8080

The differences in this fuze are:-

(a) Body (QX 1116) - The oblique channel is not tapered at the base. No aluminium sealing cup is fitted.

(b) Detent (QX 1114) - Of aluminium in lieu of brass and formed with a flat lower end.

(c) Ball - Not made of non-corrosive material.

31. The ball, detent spring, shutter spring and striker spring are lanoline treated.

32. MARK 5/1 FUZE WOLC - § C8738

The differences from the Mark 8 fuze are:-

(a) Body (QX 1116) - The oblique channel is not tapered at the base. No aluminium sealing cup is fitted.

(b) Detent (QX 1114) - Of aluminium in lieu of brass and formed with a flat lower end.

(c) Ball - Not made of non-corrosive material.

33. The ball, detent spring, shutter spring and striker spring are treated with oil QX-10. The change to oil from lanoline was made in order not to impair correct functioning at extremes of temperature.

34. MARK 7 FUZE (Obsolescent) WOLC - § 9488

There is only one difference between the mark 7 and mark 8 fuzes:-

(a) Detent (QX 1637) - Made of aluminium in lieu of brass

35. MARK 8 FUZE (Obsolescent) WOLC - § 8740

As described in paras 2 to 20 inclusive.

36. MARK 9 FUZE WOLC - § 9848

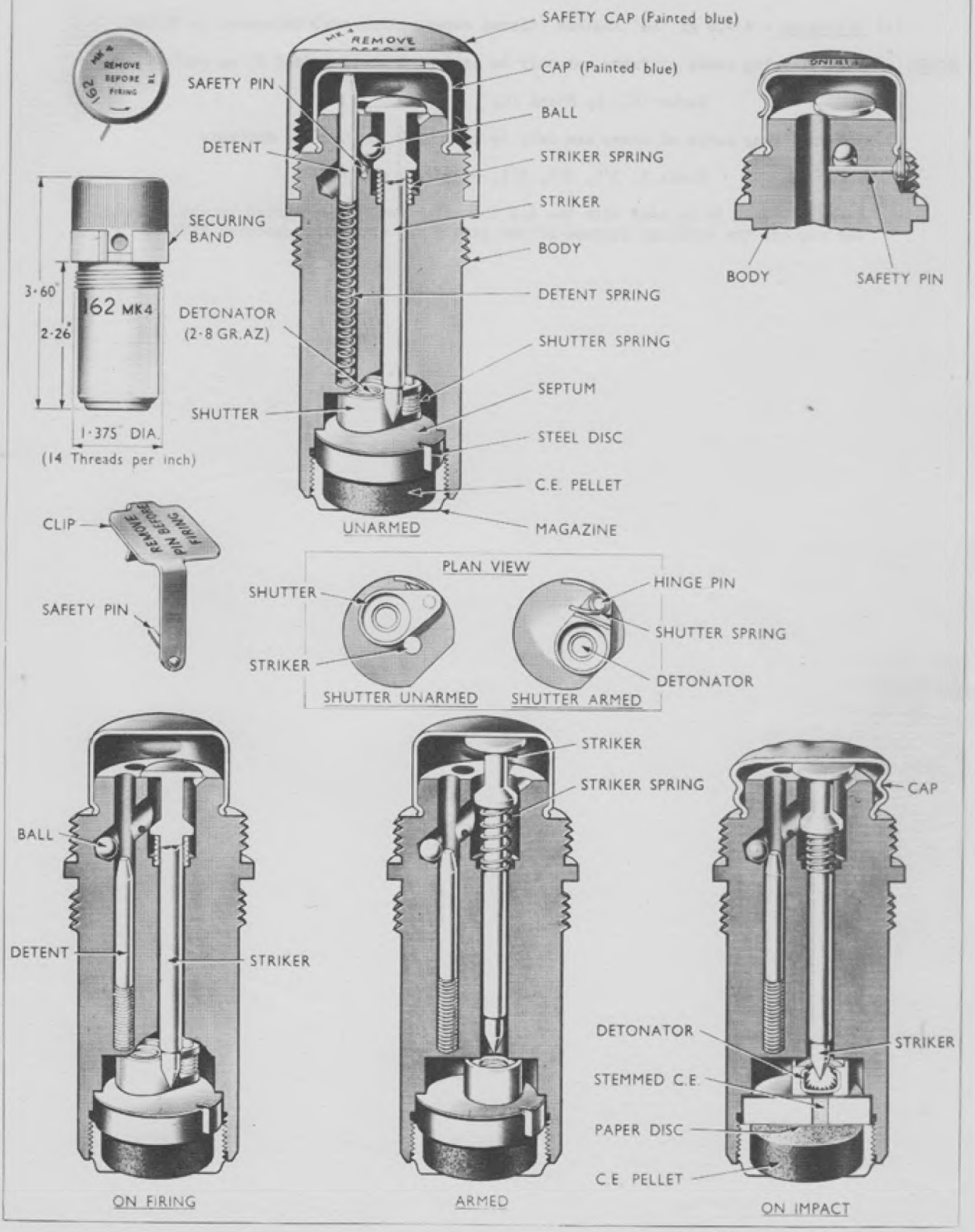
There are only two differences between the mark 9 and mark 8 fuzes:-

(a) Detent (QX 1637) - Made of aluminium in lieu of brass.

(b) Detonator - A 2.6 gr 'LZ' lugless (tinned copper alloy cup) detonator is fitted.

FIG.3

FUZE, PERCUSSION, D.A., No.162, 'MARK 4



35. MARK 10 FUZE

WOLC - 8 C 9848

There is only one difference between the mark 10 and mark 8 fuzes:-

(a) Detonator - A 2.6 gr 'LZ' lugless (tinned copper alloy cup) detonator is fitted.

NOTES: (a) The following marks of fuzes can only be used with the 3 in and 81 mm mortars:-

Marks 1/2, 4, 8 and 10.

(b) The following marks of fuzes can only be used with the 4.2 in. mortar:-

Marks 3, 3/1, 3/2, 3/3, 5, 5/1, 7 and 9.

Marks of fuzes to be used with the 4.2 in mortar can be identified by the walls of the cap and the external surface of the safety cap which are coloured BLUE.

FUZE, PERCUSSION, D.A., NO. 255

1. Particulars

(a) Type	Direct action, percussion, nose. Mks. 1 to 4 incorporate a slight delay. Mk. 5 has no delay.
(b) Guns	Mks. 1, 1A, 2 and 4 for Q.F. 40 mm. gun Mks. 2 and 4 for Q.F. 40/70 mm. gun Mk. 5 for Q.F. 2 pr. Mks. 9A and 10A gun
(c) Projectiles	H.E. Shell and Practice Projectiles Mk. 1A for H.E. shell only.

DESCRIPTION Mark 4 (Fig. 1)

GENERAL

2. This is a direct action detonating fuze and consists of a head containing a striker and detonator and a body containing a detonator pellet housing, shutter, stemmed plug and magazine. The head is screwed on to a stem on the top of the body and the magazine is screwed into the bottom of the body. The nose of the head is flat and the lower part of the body is threaded externally (R.H.) to 30 mm. (1.196 inch) dia. (14 threads per inch) to enter the fuze hole of the shell. The rest of both head and body is shaped externally to conform to the shell contour. The head is bored out to leave only a thin diaphragm at the nose. The upper part houses the firing device and the lower threaded part takes the striker guide, detonator plug and stem of the body. The body contains the detonator pellet housing inside the stem; below this is the shutter and the lower threaded part takes the stemmed plug and magazine. The detonator pellet contains lead azide in the middle and C.E. at the bottom; the stemmed plug contains C.E. and the magazine a C.E. pellet. The shutter prevents a prematurely fired detonator initiating the magazine and the striker holding devices prevent the detonator being struck until the shell is clear of the muzzle.

3. Head - The aluminium alloy head has a flat nose and is shaped externally to conform to the contour of the shell. It is bored from the lower end in four diameters leaving a solid diaphragm 0.040 of an inch thick at the nose. Under the diaphragm is a hammer; immediately below, in a larger bore, is most of the striker assembly, and in the large threaded bore at the bottom is the lower part of a striker guide. Beneath the striker guide is a detonator plug containing the detonator, and at the bottom the stem of the body.

4. Body - The aluminium alloy body is shaped externally to conform to the shell contour and has two key slots for inserting or removing the fuze. The top is formed into a platform to support the head and a threaded stem at the centre to enter the head. The bottom is threaded to a gauge of 1.196 of an inch to enter the shell. The interior is bored in four diameters. The upper and smallest bore inside the stem is coned at the top to facilitate the passage of the detonator flame and contains the detonator pellet, pellet spring and locking segments. At the bottom of this bore is an annulas recess to receive the locking segments in the armed position. The centre bore contains the shutter assembly and the largest bore at the bottom is threaded to take the stemmed plug, and below this, the top part of the magazine.

5. Striker assembly - This consists of the hammer and striker, striker guide, centrifugal balls and the arming unit comprising the arming sleeve and arming spring, stirrup spring and striker ferrule contained in an arming unit housing. The hammer rests on top of the striker in the top part of the striker guide. Two balls project from radial holes in the striker guide into a groove round the stem of the striker, being retained in this unarmed position by the arming sleeve surrounding the striker guide. Around the sleeve is the arming spring held in compression by the upper lugs of the stirrup spring bearing on top of the sleeve. The lower lugs of the stirrup spring engage under the bottom of the ferrule. Set back of the striker ferrule on firing straightens out the lugs of the striker stirrup spring to free the arming sleeve.

6. Hammer - This is of aluminium alloy shaped to form a stem and head. The hammer rests on top of the striker inside the striker guide with the head just under the diaphragm in the fuze head.

7. Striker - The steel striker has a circumferential groove near its upper end to receive the centrifugal balls that project from the striker guide in the unarmed position and prevent the striker from reaching the detonator. The lower end is pointed for piercing the detonator.

8. Centrifugal balls - Two steel balls lock the striker in the unarmed position by projecting from radial holes in the striker guide into a groove in the striker, being held in by the arming sleeve surrounding the striker.

9. Striker guide - Made of brass (tinned) is in two diameters, the larger diameter is threaded to screw into the top of the lower bore of the fuze head. The upper diameter forms a stem to support the arming unit housing. It is bored centrally to take the hammer and striker and has two radial holes for the centrifugal balls. The lower surface is recessed for the detonator and has a transverse slot for the use of an assembly tool.

10. Arming unit - This consists of the arming sleeve and spring, stirrup spring and ferrule held together by the arming unit housing. It is assembled as a complete unit.

11. Arming sleeve - This cylindrical steel sleeve fits over the stem of the striker guide. A flange at the top retains the arming spring and in the unarmed position receives the upper lugs of the stirrup spring which keep the sleeve down with the arming spring in compression and thus holds the balls in the radial holes in the striker guide. The arming sleeve is freed by the straightening of the lugs of the stirrup spring by set back of the ferrule in firing.

12. Arming spring - The coiled spiral steel arming spring fits over the arming sleeve and in the unarmed position is compressed between the flange of the arming sleeve and the bottom part of the arming unit housing. The arming spring forces the sleeve forward to free the balls as soon as set-back forces cease.

13. Striker stirrup spring - The cylindrical phosphor-bronze stirrup spring has lugs on its lower and upper edges. In the unarmed position, the lower lugs fit under the striker ferrule and the upper lugs over the arming sleeve to hold it down. Set-back of the striker ferrule straightens the lugs and frees the arming sleeve.

14. Striker ferrule - The top of the cylindrical brass ferrule engages a flange at the top of the arming unit housing and the bottom is chamfered to take the turned-up lower lugs of the striker stirrup spring. On firing, the ferrule sets back and straightens out the lugs of the stirrup spring.

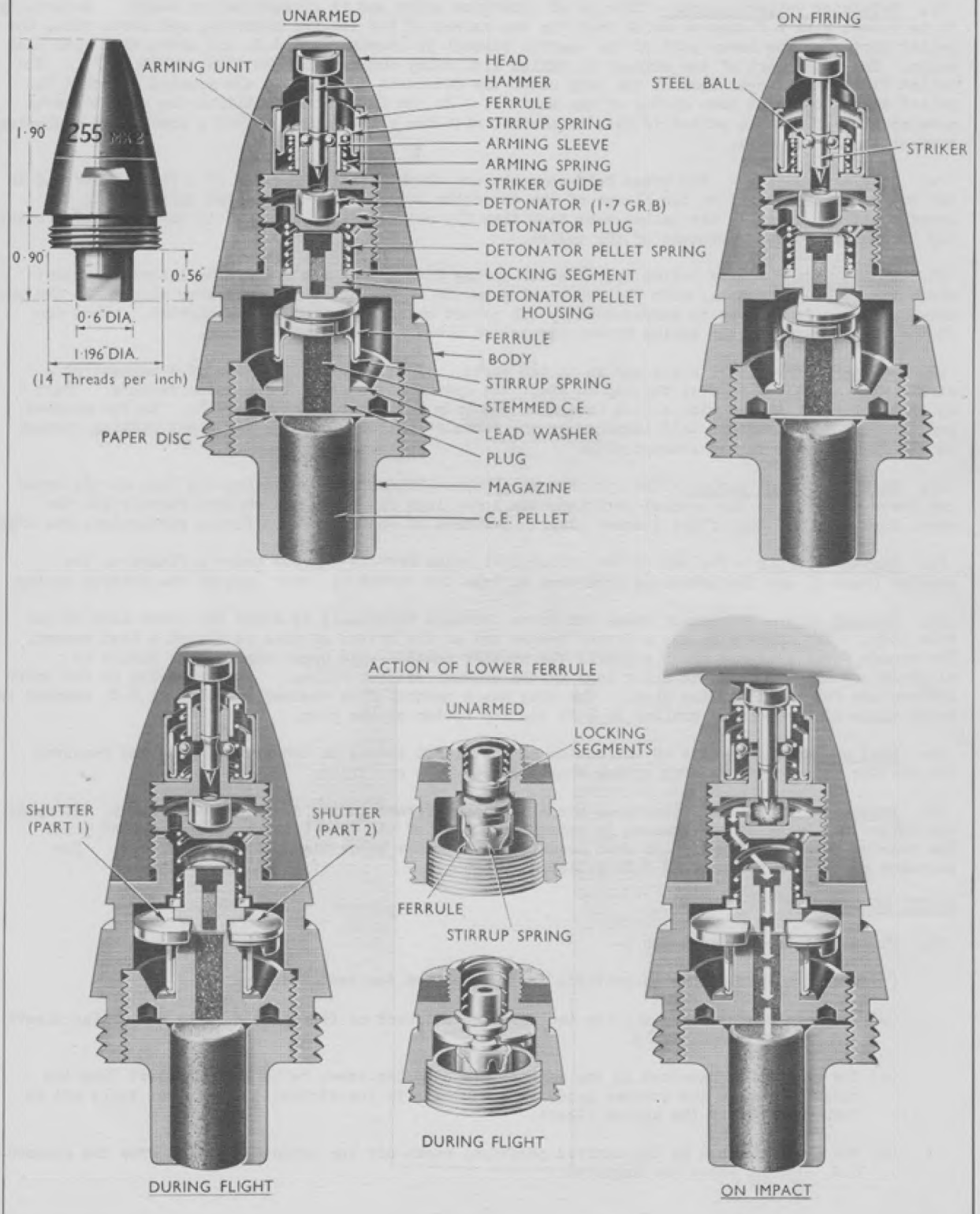
15. Arming unit housing - This consists of a brass sleeve formed with a flange at the top and bottom which form a seating for the ferrule arming sleeve and arming spring.

16. Detonator and Shutter assembly - This consists of the detonator and detonator plug, detonator pellet housing, locking segments, pellet spring and the two parts of the shutter. Immediately beneath the striker is the detonator in its plug, and beneath this is the detonator pellet which, in the unarmed position, rests on top of the shutter. Surrounding the top half of the pellet is the pellet spring which is kept in compression between the bottom of the detonator plug and the two locking segments on a shoulder of the pellet housing. The two parts of the shutter fit on top of the spigot of the stemmed plug in the unarmed position and are enclosed by the top of a shutter ferrule, the bottom of which rests on the lower lugs of a shutter stirrup spring. The top lugs of the stirrup spring rest on top of the spigot of the stemmed plug. Set-back of the shutter ferrule on firing straightens out the lugs of the shutter stirrup spring and frees the two parts of the shutter, and also, at this stage, assists the pellet spring in keeping the detonator pellet pressed down on to the shutter to prevent it opening. On acceleration ceasing, set-back also ceases, and centrifugal force causes the two shutter parts to fly outwards. This allows the pellet spring to force the detonator pellet down on to the stemmed plug. As soon as this happens, centrifugal force also causes the two locking segments to enter their recesses in the body to prevent any subsequent creep forward of the pellet during flight, lock the shutter in the armed position and ensures a continuous explosive channel to the magazine.

17. Detonator - A 1.7 grain 'B' lugless (tinned copper alloy cup) detonator is used. It is housed in the centre recess in the top of the detonator plug immediately underneath the striker.

18. Detonator plug - Made of brass (tinned) the plug screws into the lower part of the fuze head beneath the striker guide. The upper surface is slightly recessed and the centre is further recessed to take the detonator. Three vertical fire holes displaced from the centre act as a baffle to the

FUZE, PERCUSSION, D.A., No.255, MARK 4 FIG.1



flame from the detonator in passing to the detonator pellet. The recess in the face also provides for the flash from the detonator reaching all three channels.

19. Detonator pellet housing - This is of aluminium alloy and is cylindrical in shape. Externally it is formed with a flange on which rest the two halves of the locking segments, and above this, the pellet spring. The lower part of the central channel is stemmed with C.E. and above this with lead azide. The upper part of the channel is filled with delay composition (RD 1305 and RD 1337). The pellet fits in the upper bore of the body under the detonator plug and in the unarmed position the pellet spring keeps it down on top of the shutter. In the fully armed position the shutter parts have spun clear and the pellet is thus in contact with the stemmed plug toform a continuous explosive channel to the magazine.

20. Locking segments - The brass half-segments are shaped like two halves of a flat washer and in the unarmed position fit on the flange of the detonator pellet under the pellet spring. In the armed position, directly the pellet sets back they fly outwards into a recess in the body and prevent any subsequent forward movement of the pellet.

21. Pellet spring - This coiled spiral steel spring fits around the top of the detonator pellet above the locking segments, with the top bearing on the underside of the detonator plug. In the unarmed position it is kept in compression by the pellet being supported by the shutter. When the shutter flies outwards the spring forces the pellet down on to the stemmed plug.

22. Shutter - This is of brass and is in two parts. Part 2 is in the shape of a segment of a circle with a small flange at the top to limit the upward movement of the shutter ferrule. Part 1 is in the form of a disc with a flat formed on one side and nestles under Part 2. In the unarmed position the two parts are held together by the ferrule and this prevents any flash passing through to the fire channel in the stemmed plug.

23. Shutter stirrup spring - The cylindrical phosphor-bronze stirrup spring has lugs on the upper and lower edges. In the unarmed position, the lower lugs fit under the shutter ferrule and the upper lugs over the top of the stemmed plug. Set-back of the ferrule on firing straightens the lugs.

24. Shutter ferrule - The top of the cylindrical brass ferrule engages under a flange on the shutter (Part 2) and the bottom is chamfered to take the turned-up lower lugs of the stirrup spring.

25. Stemmed plug - This is of brass and screw threaded externally to enter the lower bore of the fuze body. The upper side has a dished recess and at the bottom of this is fitted a lead washer. The centre forms a pintle which supports the shutter parts. The upper edge of the pintle is slightly cut away to take the upper lugs of the shutter stirrup spring. Two key-holes in the under surface are for inserting the plug. The plug has a central fire channel filled with C.E. stemmed in. Paper discs are secured by shellac to both top and bottom of the plug.

26. Lead washer - This fits at the bottom of the dished recess in the stemmed plug and receives the shutter ferrule and stirrup spring when they set back on firing.

27. Magazine - This is a cylindrical brass container formed in two diameters externally, the upper and larger one being screw-threaded to enter the bottom of the fuze body under the stemmed plug. The smaller diameter is plain and when assembled, protrudes below the bottom of the fuze. The magazine contains a pre-pressed C.E. pellet.

SAFETY ARRANGEMENTS

28. The safety arrangements are :-

(a) The fuze head diaphragm protects the hammer from accidental damage.

(b) The fuze cannot arm until the two ferrules set-back of firing to release the arming sleeve and shutter respectively.

(c) The striker is retained in the safe position by two steel balls which project from two radial holes in the striker guide into a groove in the striker. The steel balls are in turn retained by the arming sleeve.

(d) The shutter, when in the unarmed position, masks off the detonator pellet from the stemmed C.E. channel above the magazine.

EXAMINATION BEFORE FIRING

29. Perforation of the diaphragm may cause a premature and all fuzes should be examined and any with perforated diaphragms should be segregated and NOT fired.

ACTION (Fig. 1)

30. On firing - The striker and shutter ferrules set back, overcoming their stirrup springs and releasing the arming sleeve and shutter respectively. The arming sleeve sets back retaining the balls and locking the striker, and the detonator pellet holder also sets back against the shutter, retaining it in the unarmed position.

31. During flight - The arming sleeve is forced forward by its spring, unmasking the two holes in the striker guide and thus releasing the two steel balls which fly outwards. The striker is then free to move downwards on impact. The two parts of the shutter move outwards allowing the detonator holder spring to force the pellet holder down on to the stemmed plug. The detonator pellet holder is locked in position by the two halves of the locking segment which fly outwards into the annular recess in the body.

32. On impact - The diaphragm is crushed, the hammer is forced in and the striker is driven into the detonator. The flash from the detonator is baffled by the detonator plug and its displaced fire holes so allowing a normal ignition of the delay filling, lead azide and C.E. filling of the detonator pellet. The resultant detonation fractures the thin diaphragm of the pellet holder to detonate the C.E. stemming in the plug and, in turn, the C.E. pellet in the magazine and thence the shell filling.

OTHER MARKS - SUMMARY OF DIFFERENCES

MARK 1 FUZE (Obsolescent) WOLC-§ B8478, C7608, C8265

33. The variations in this fuze are:-

(a) Diaphragm - This is 0.025 ins thick.

(b) Hammer - Made of plastic.

(c) Detonator - 1.7 grain 'B' or 'B1' copper alloy cup.

(d) Detonator plug - Has a single central fire channel only.

(e) Shutter - A different shutter is fitted to the fuze. Made of brass in two parts, Part 1 is in the shape of a segment of a circle with a small flange at the top to limit the upward movement of the shutter ferrule. Part 2 is an elongated "D" shape and nestles in Part 1. The upper side of Part 2 is cut away to form a slot which is opposite the central boring in the detonator pellet. In the unarmed position the two parts are held together by a ferrule to prevent any flash passing through to the stemmed plug below.

MARK 1A FUZE (Obsolescent) WOLC-§ B9204, C7608, C8265, C9900

34. This fuze varies from the Mk 4 fuze in the following:-

(a) Diaphragm - This is 0.025 ins thick.

(b) Hammer - Made of plastic.

(c) Detonator - A 1.7 grain 'A' detonator may be fitted as an alternative to the 1.7 grain 'B' detonator.

(d) Detonator pellet - NO delay filling. Some slight delay is given, however, by the shape of the detonator plug and the baffling effect of the three displaced fire channels.

(e) Shutter - The shutter is the same as that fitted to the Mark 1 fuze.

MARK 2 FUZE (Obsolescent) WOLC-§ C4170, C7608, C8175

35. (a) Detonator - A 1.7 grain 'B' (copper alloy cup) detonator is fitted.

(b) Detonator Pellet - Composition RD 1337 was authorised as an alternative to composition RD 1305 from 21st July, 1955.

MARK 4 FUZE WOLC-8 C7608, C8263

36. As described in paras 2 to 32.

MARK 5 FUZE WOLC-8 C8264

37. The mark 5 fuze is similar to the mark 4 except:-

(a) Detonator plug - Detonator plug (QX 1265) which has a .125 inch diameter hole drilled through its centre is fitted to this fuze.

(b) Detonator pellet - NO delay filling is used.

NOTE:- Consequent on (a) and (b) above there is NO delay incorporated in this mark of fuze.

FUZE, PERCUSSION, D.A. NO. L9

1. Particulars

(a) Type	Direct action, and graze percussion, nose
(b) Weapon	Launcher fitted to rifle.
(c) Projectile	No. 94 H.E. Energa Grenade

DESCRIPTION - Model A3 Fuze (Fig. 1)

GENERAL

2. The fuze is designed to give direct and graze action and consists principally of a body, cap, striker, and striker head and spring, arming sleeve and spring, detonator carrier, detonator assembly balls and washers. A safety clip, in the form of a circlip is fitted.

3. Body. - Of aluminium alloy thisis cup-shaped, a hole being formed in the base for the pellet holder. Externally the front portion is coned and then formed parallel and milled for use as a finger grip when assembling the fuze to the grenade. Below the milled portion it is reduced in diameter and threaded to enter the grenade, and below the threaded portion it is formed plain. Internally, it is threaded at the front to take a cap. Two slots diametrically opposed, are cut into the parallel portion of the body to take the ends of the safety clip.

4. Cap. - Externally this is cone-shaped and threaded at the base to screw into the body. Internally, it is formed on two diameters, the rear and larger diameter accommodating the front portion of the arming sleeve and the forward and smaller diameter, the flange on the striker. A hole is drilled in the head forming a guide for the upper part of the striker. It is made of aluminium alloy.

5. Striker. - This is in the form of an aluminium alloy rod. The head is conical in shape, below which it is formed with a flange to fit and seat inside the top of the cap. A hole is drilled in the conical portion of the striker to accept the striker head. The rear portion of the striker is reduced in diameter for a short distance to partially house the steel balls. The faces of this housing nearest to the balls are chamfered. A sharp needle point is formed at the lower end of the striker which is reduced in diameter to fit into the striker spring.

6. Striker Head. - This is in the form of a short rod of tungsten carbide the outer end being serrated. It is fitted into the hole drilled in the top of the coned portion of the striker which is stabbed on the outside in three places to secure it.

7. Detonator Carrier. - Made of nickel plated brass, the top of the carrier is a sliding fit within the arming sleeve. A flange at the bottom is a similar fit within the fuze body. An undercut groove is milled around the centre into which the lugs of the arming sleeve are forced when the sleeve sets back. Immediately behind this groove the diameter is slightly increased to take the arming spring.

Internally the carrier is bored from the top to form a holder for the striker spring and to act as a striker guide, the top edge being chamfered to form a partial housing for the six steel balls. A platform is positioned approximately half way down the carrier, below which the carrier is threaded internally to take the detonator assembly. The platform has a central hole to allow passage of the striker point.

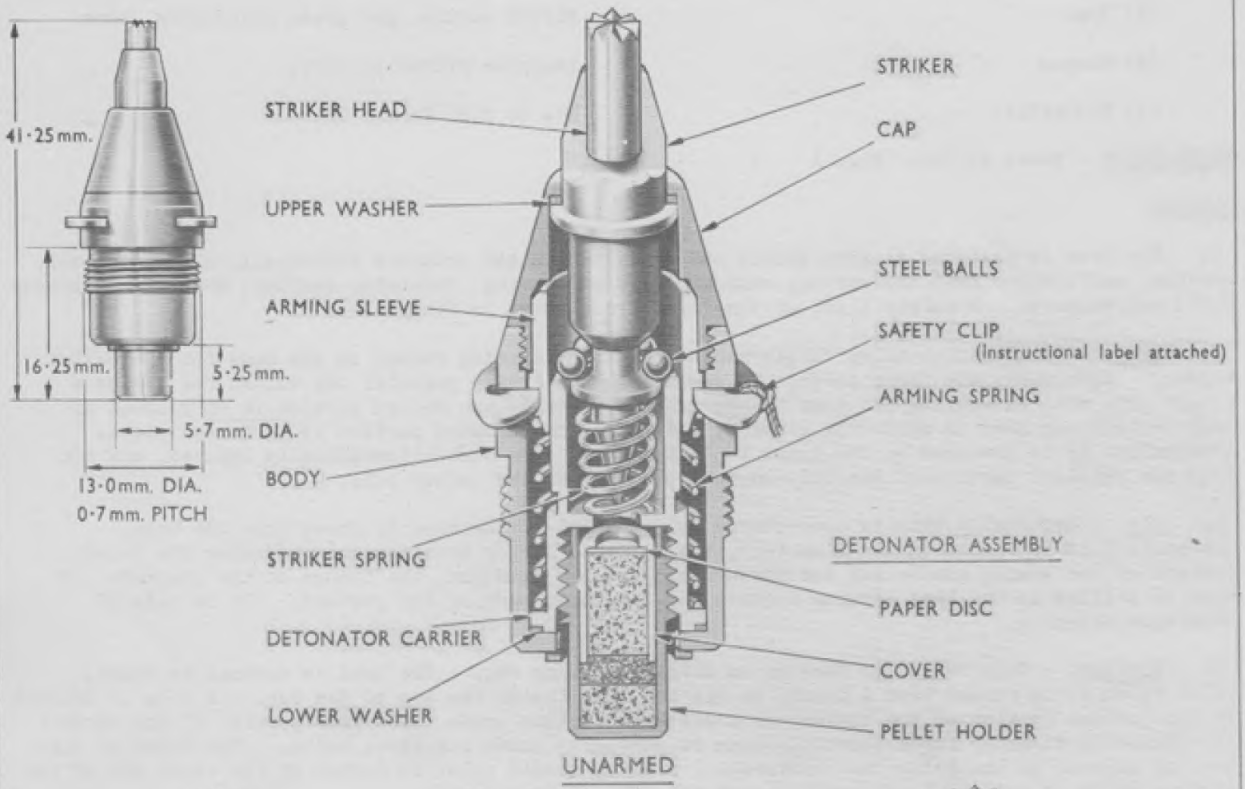
8. Striker Spring. - This is a cylindrical coiled cadmium plated steel wire spring. It is assembled around the needle portion of the striker, being positioned between the rear flange of the striker and the platform of the detonator carrier.

9. Arming Sleeve. - This is flanged towards the rear to fit the interior of the fuze body and has four lugs at the rear which are forced into a groove round the outside of the detonator carrier when the sleeve sets-back. An annular slot is cut into the flange to accept the ends of the safety clip. It is made of nickel plated brass.

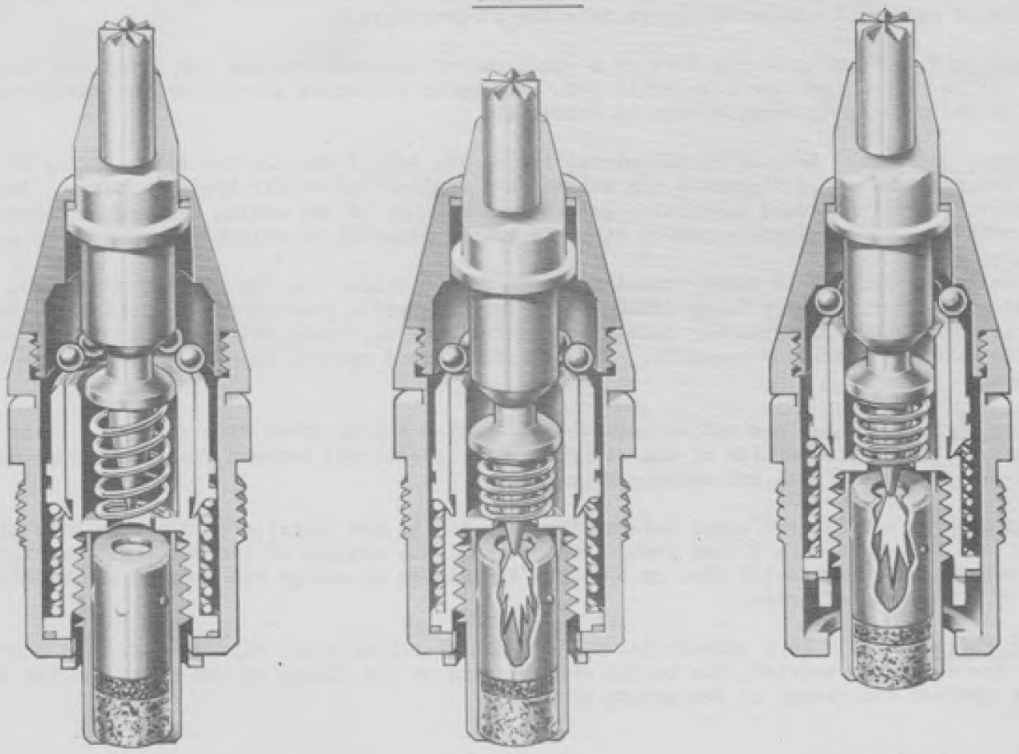
10. Arming Spring. - This is a cylindrical coiled cadmium plated steel wire spring. It surrounds the rear of the detonator carrier, the bottom coil bearing on its flange at the rear, and the top coil bearing against the flange of the arming sleeve.

FIG. 1

FUZE, PERCUSSION, DA., L9A3



UNARMED



ARMED | ON IMPACT | ON GRAZE

11. Detonator Assembly. - Screwed into the base of the detonator carrier, the assembly consists of:-

(a) Cover. - This is in the form of a hollow tube, threads being formed externally at the open end to fit the threads of the detonator holder.

(b) Holder. - An inverted cup-shaped metal holder with a central hole bored in the base it is inserted open end first into the cover to hold in place the detonator filling. To ensure a tight fit five external pips are made in the sides of the holder to grip the inside of the cover.

(c) Paper disc. - This is inserted between the filling and the base of the holder, being used to seal the hole in its base.

(d) Filling. - A fulminate of mercury based composition is used being partly stemmed and partly in pellet form.

12. Safety clip. - This is in the form of a circlip made of nickel plated spring steel. The enlarged ends fit through the slots in the fuze body and engage in the annular slot in the arming sleeve. An instructional label is attached.

13. Protecting Cap. - This is made of rubber with stiffening ribs on the outer surface. It is intended for placing over the fuze when assembled to the grenade as a means of protection. It must be removed before firing.

SAFETY ARRANGEMENTS

14. These are:-

(a) The safety clip keeps the arming sleeve in the safe position.

(b) The six steel balls, kept in position by the arming sleeve, prevent the striker moving down on the detonator or the striker guide carrying the detonator assembly onto the striker.

(c) The arming sleeve is kept in the safe position by the arming spring when the safety clip is removed.

PREPARATION FOR FIRING

15. (a) The protecting cap is removed.

(b) The safety clip is removed.

ACTION (Fig. 1)

16. On firing. - The sudden acceleration causes the striker to set back locking the steel balls between the striker and the chamfered end of the detonator carrier and the arming sleeve to set-back against its spring. This forces the lugs into the groove of the striker guide locking together sleeve, spring and carrier. When the striker spring overcomes the effect of set-back the balls are freed and only the light striker spring keeps the striker point from the detonator. The fuze is now armed.

17. On impact. - The hard serrated head of the striker digs into the target driving the point of the striker into the detonator.

18. On graze. - Sudden deceleration causes the detonator carrier, now locked to the arming sleeve and spring to act as an inertia pellet and move forward against the striker spring and fire the detonator on the point of the striker.

SUMMARY OF DIFFERENCES

A2 FUZE (Obsolescent) WOLC - 8 C7754, C9891.

19. The A2 fuze differs in the following particulars.

(a) Body. - No slots are cut for the safety slip.

(b) Arming sleeve. - No annular slot is formed for the safety clip.

(c) Safety clip. - No safety clip is fitted to this model of fuze.

NOTE This fuze was originally known as the Mark 2 fuze.

A3 FUZE WOLC - § C9891

20. As described in paras. 2 to 18 inclusive.

FUZE PERCUSSION DA., DRILL L18

MODEL A1 WOLC- C 7754

1. This drill fuze is in fact an empty L9A2 fuze used for drill purposes. When fitted to the grenade no identifying marks to show that it is not a live fuze are visible.

2. This fuze can only be identified as drill by the fact that two holes diametrically opposite are bored through the pellet holder.

FUZE, PERCUSSION, D.A., L17

1. Particulars:-

(a) Type	Direct action, percussion, nose.
(b) Guns	76 mm. Armd C. gun
(c) Projectile	H.E. shell.

DESCRIPTION - Model A2 (Fig. 1)

GENERAL

2. The L17 fuze is a direct action percussion detonating type for use with shell having a 1.6 inch diameter fuze-hole (14 threads per inch, right hand). It consists principally of a body, fairing, shutter, shutter spring, detonator holder, detonator plug, detonator, needle assembly, detent, detent spring and bottom cap.

3. Body. - Of brass, the body is formed with an external cone shaped flange at the top. A key hole is drilled in the side of the flange to suit the key provided for inserting and removing the fuze from the shell. Externally, under the flange, there is an undercut beneath which are screw threads for a distance of 0.35 inch to a 1.6 inch diameter, (14 threads per inch, right hand). Under these threads the diameter of the body is reduced to 1.26 inches and further reduced and screw threaded to a 1.0 inch diameter at the base for the acceptance of the bottom cap. Internally, the body is bored from top and bottom to form two main cavities separated by a platform. Adjacent to the lower cavity, which is offset, is a hole which connects with the upper cavity and accommodates the detent, detent spring and detent plug. The hole is screw threaded at the base to accommodate the plug. Prior to assembling the bottom cap to the body a boxcloth disc is inserted in the base of the cap.

(a) Upper cavity. - The top of the cavity is screw threaded for the attachment of the fairing. Beneath the threads a shoulder is formed upon which seats the detonator holder, complete with detonator plug and detonator. It also houses the needle assembly and the shutter with its spring, which pivots on the top surface of the platform.

(b) Platform. - Projecting from the top surface of the platform is the shutter hinge pin. In the centre a blind hole is drilled from the underside to form a flash channel, leaving a thin diaphragm of metal at the top of the hole. The flash channel is filled with C.E. which is stemmed in.

(c) Lower cavity. - Forming a magazine, the lower cavity is filled with a 0.555 inch diameter pre-pressed C.E. pellet, 1.05 inches long, on top of which is a paper disc.

4. Fairing. - The fairing is a brass collar forming the domed exterior of the upper part of the fuze. The lower part of the fairing is screw threaded externally to screw into the top of the fuze body to which it is secured by a set screw. A tommy hole is bored in the side to facilitate assembly to the fuze the centre hole being recessed to fit over the needle disc.

5. Shutter. - Of bronze or rolled brass, the shutter is a flat, smooth piece of metal of irregular shape provided with three vertical holes of different diameters. Connected to the largest hole is a slot which accommodates one arm of the shutter spring. The shutter is secured through the second hole by a hinge pin on which it pivots, and the third and smallest hole is filled with loose C.E. which is stemmed in. A paper tablet is secured by shellac to each of the top and bottom surfaces of the shutter, covering the hole filled with C.E. Retained in the unarmed position by the spring,

the shutter rests against a stop pin and is further secured in this position by the detent, the stem of which bears against a recess formed in the side of the shutter.

6. Shutter spring. - Formed with two arms, the spring is made of tinned steel piano wire and its coils fit over a stud on the metal platform of the body. One arm fits into the slot formed in the side of the shutter and the other arm bears against the wall of the fuze body. The spring ensures that the shutter masks the hole in the lower part of the fuze body until the detent sets back and the shutter is swung open by centrifugal force when spin is between 1400 rpm and 2000 prm.

7. Detonator holder. - Made of brass, tinned, the holder is formed with an external flange to seat on the shoulder in the upper cavity of the body. Internally the holder is bored to two main diameters, the upper being the greater and forming a continuation of the central hole in the fairing, thus providing the required clearance for the needle disc to function on impact. The lower boring is screw-threaded to take the detonator plug, and the base of the holder is drilled from the top to form a fire channel, a thin diaphragm of metal being left to act as a closing disc. Two holes are drilled into the lower face of the base, one to accommodate the upper end of the detent and the other to locate the holder on the shutter hinge pin.

8. Detonator plug. - Screw threaded externally, the brass, tinned detonator plug screws into the detonator holder and is bored and recessed internally from the base. The recess houses the detonator and the central hole above it allows the needle to pass through to pierce the detonator on impact.

9. Detonator. - A 5.7 grain AZ detonator, it consists of a lugless tinned copper alloy cup filled with 3.0 grains of lead azide, pressed in, followed by 2.7 grains of 'A' mixture pressed in on top. Over the filling are positioned a paper disc and a tinned brass washer, in that order, the whole being secured by spinning over the lip of the cup. It is then waterproofed by a drop of varnish R.D.1177 placed centrally on the brass washer and the complete detonator dipped in shellac varnish and allowed to dry.

10. Needle assembly. - The assembly comprises a disc and needle:-

(a) Disc. - Of copper, the disc is a cup shaped diaphragm and has a hole in the centre for the insertion of a needle. The outer rim is formed with a flange to fit over the top of the detonator holder and upon which the fairing seats, holding the disc in position.

(b) Needle. - Of stainless steel, the needle has a flat circular head. It is secured to the disc, point downwards, by being pressed in.

11. Detent. - Assembled in the fuze from the base of the body, the detent is a brass pin with a cone shaped head at the lower end which seats on the detent spring.

12. Detent spring. - The detent spring (1 lb. 12 oz.) is a cylindrical spring of 22 working coils. It is 1.27 inches long and is made of 0.164 inch diameter tinned steel wire.

13. Detent plug. - Screwed in the base of the hole housing the detent and its spring, this brass plug retains the spring. It has a screwdriver slot in the head to facilitate its insertion or removal from the fuze body.

14. Bottom cap. - Cup shaped, the brass cap is threaded internally to screw on to and seal the magazine chamber of the fuze body and the hole accommodating the detent and detent spring. The cap is retained in position by stabbing the joint between the body and the cap in three places. A box-cloth disc is inserted between the body and the cap.

SAFETY ARRANGEMENTS

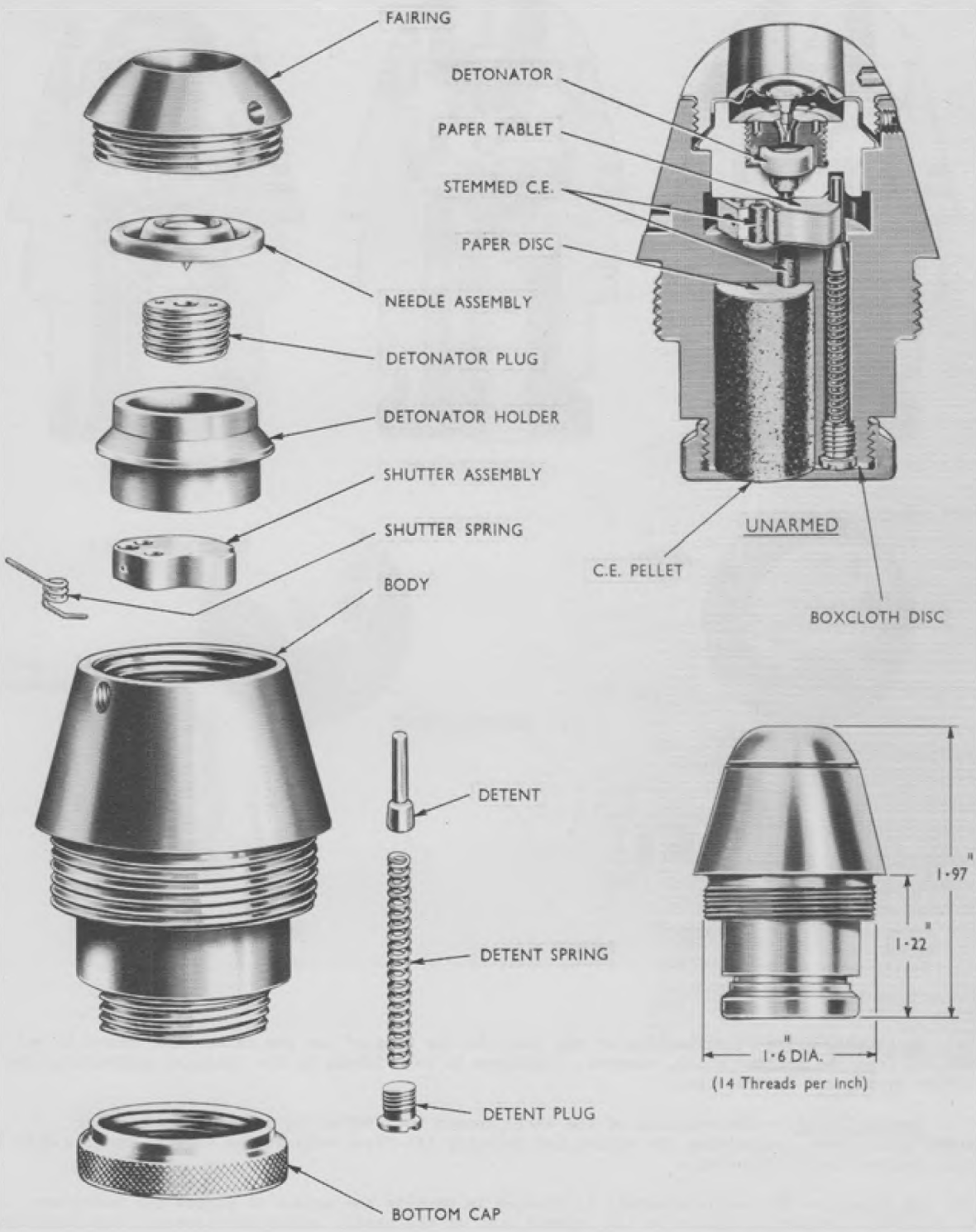
15. The safety arrangements incorporated in the L17 fuze are as follows:-

(a) The shutter is retained in the unarmed position by the shutter spring and by the spring loaded detent until the gun has been fired.

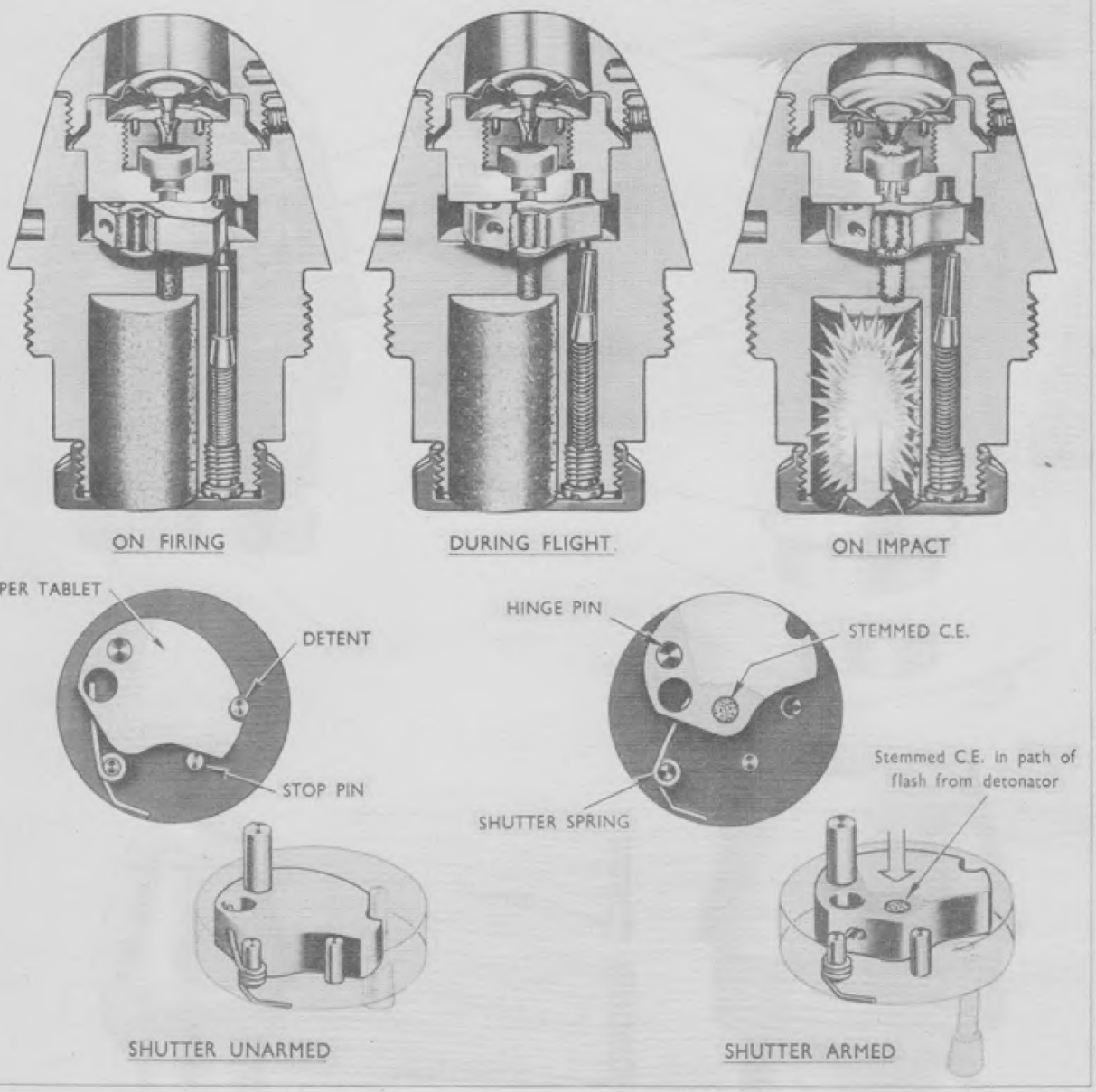
(b) In the unarmed position the shutter masks off the C.E. stemming below the detonator from that above the magazine.

FIG.1

FUZE, PERCUSSION, DA., L17A2



ACTION OF FUZE, PERCUSSION, D.A., L17A2 FIG.2



ACTION (FIG. 2)

16. On firing. - The acceleration of the shell in the bore of the gun causes the detent to set back and free the shutter which, however, continues to be retained in its original position by the shutter spring and by friction.

17. During flight. - The rotation of the shell causes the shutter to swing outwards under centrifugal force, compressing the spring and bringing the flash hole in the shutter in line with the flash channel in the fuze body.

18. On impact. - The needle assembly is crushed in causing the needle to pierce the detonator. The resultant detonation passes to the stemmed C.E. in the needle holder and shutter, and the stemmed C.E. in the platform of the body, detonating the C.E. pellet in the lower cavity of the body, thereby causing the detonation of the bursting charge in the shell.

SUMMARY OF DIFFERENCES

MODEL A1 FUZE (Obsolescent) (Fig . 3) WOLC - § C7908. DP39753

19. This model is a Naval Service N2 Mk. 2 fuze fitted with an adapter to fit a 1.6 inch fuze hole.

20. The differences from the Model A2 fuze are:-

(a) Body. - Of brass, the body is formed with an external cone shaped flange at the top. In the side of the flange a hole is drilled to facilitate the assembly of the body to the adapter by means of a key. Externally, below the flange, it is screw threaded to a 1.2 inch diameter, followed by a plain portion of smaller diameter and finally, is screw threaded at the bottom for the acceptance of the bottom cap. Internally, the body is bored from the top and bottom to form two main cavities separated by a platform. Adjacent to the lower cavity, which is offset, is a hole which connects with the upper cavity and accommodates the detent and spring.

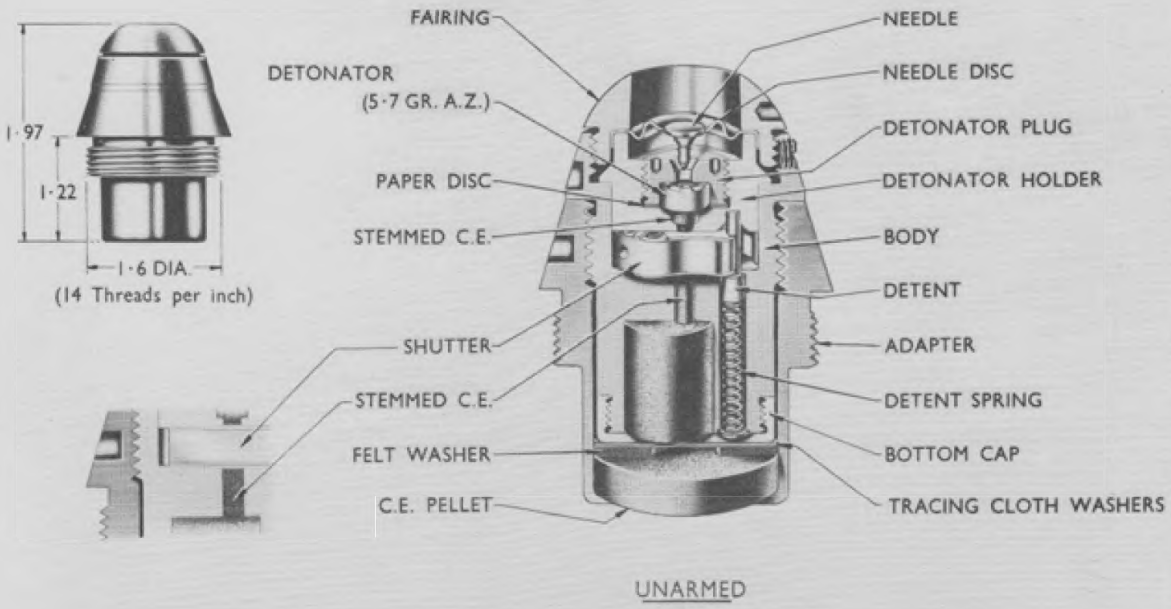
(i) Upper cavity. - The top of this cavity is screw threaded for the attachment of the fairing. Beneath the threads a shoulder is formed upon which rests the detonator holder, complete with detonator plug and detonator. It also houses the needle assembly and the shutter with its spring, which pivots on the top surface of the platform.

(ii) Platform. - Projecting from the top surface of the platform is the shutter hinge pin. In the centre a blind hole is drilled from the underside to form a flash channel, leaving a thin diaphragm of metal at the top of the hole. The flash channel is filled with C.E. which is stemmed in.

(iii) Lower cavity. - Forming a magazine, the lower cavity is filled with a 0.595 inch diameter pre-pressed C.E. pellet, 0.715 inch long.

FIG.3

FUZE PERCUSSION, D.A., L 17A1



UNARMED

(b) Detent spring. - The detent spring (1 lb. 5 oz.) is a cylindrical spring of 22 working coils. It is 1.25 inches long and is made of 0.014 inch diameter steel wire.

(c) Adapter. - Cylindrical in shape and made of brass, the adapter is formed with an external cone shaped flange. A key hole is drilled in the side of the flange to suit the key provided for inserting and removing the adapter from the shell. Externally, under the flange, there is an undercut beneath which are screw threads for a distance of 0.35 inch to a 1.6 inch diameter, 14 Threads per inch, right hand. The lower part of the adapter is screw threaded at the top for the acceptance of the fuze. Prior to being screwed on to the fuze body a 5.9 grain C.E. pre-pressed pellet, covered with a felt washer and two tracer cloth washers, is assembled in the base of the adapter, the internal threads of which are coated with an approved cement.

(d) Action on impact. - The needle assembly is crushed in causing the needle to pierce the detonator. The resultant detonation passes to the stemmed C.E. in the needle holder and shutter, the stemmed C.E. and C.E. pellet in the fuze body, detonating the C.E. pellet in the base of the adapter which, in turn, detonates the bursting charge in the shell.

MODEL A2 FUZE — WOLC - § DP 39753

21. As described in paras. 2 to 18 inclusive.

22. Approval was given on 19th January, 1961 for the L17A2 fuze to be modified by the removal of the stemmed C.E. from the fire channel in the detonator holder. This was to increase safety and obviate the possibility of failures.

MODEL A3 FUZE — WOLC - § IA Approval K 1781

23. Similar to the model A2 but fitted with a 5.5 gr. "LZ" detonator in lieu of a 5.7 gr. "AZ" detonator.

24. This fuze may have paper discs on the upper and lower faces of the shutter to cover the stemming in place of the larger paper tablets.

25. The paper disc at the bottom of the detonator plug cavity in the detonator holder is not fitted.

PART 2

HANDBOOK OF CURRENT BRITISH LAND SERVICE FUZES

Section 3

PERCUSSION, DA., & GRAZE FUZES

PART 2

HANDBOOK OF CURRENT BRITISH LAND SERVICE FUZES

Section 3

PERCUSSION, DA., & GRAZE FUZES

CONTENTS

Introduction

PERCUSSION, DA., & GRAZE FUZES

1. Percussion fuzes are of various types according to the speed of action required. Generally speaking, the Direct Action fuze has the fastest action, followed closely by the Graze Action fuze and finally by the Delay Action Graze fuze. Direct Action (D.A.) fuzes may be of the igniferous or detonating types, the mechanism consisting of a needle supported on a thin metal disc, or a hammer or striker supported on a shearing wire or coiled spring, exposed to a direct blow on impact with the target; its sensitivity depending on the strength of disc, shearing wire or coiled spring. It may be provided with a safety pin, arming sleeve and segments or balls retaining the striker in the "unarmed" position and also usually a shutter which may or may not be retained in the "unarmed" position by a detent which sets-back on firing. D.A. fuzes filled C.E. are instantaneous in their action, while D.A. fuzes filled gunpowder have a slight delayed action.

2. Graze action fuzes. - The interior mechanism of Graze Action fuzes is so arranged that when the shell is checked in flight or receives an appreciable deceleration, a movable part, usually called the graze or inertia pellet, can move forward to carry the detonator on to the needle (or vice versa). A creep spring keeps the two apart until this deceleration is experienced. As the movement of the inertia pellet or weighted needle gives rise to an "air gap" the fuze detonator is of the flash type. Graze action fuzes have a small inherent delay in functioning.

3. Percussion D.A. and Graze fuzes. - These are Direct Action percussion fuzes in which a Graze mechanism is additionally embodied. A selector which may be set "Super-quick" or "Delay" prior to loading may also be incorporated in the design. The term "delay" in this context refers to the action at the instant of impact.

4. Percussion D.A. and Graze nose fuzes are normally shaped to conform to the shell contour and have a right hand screw-thread to avoid the possibility of their becoming unscrewed from the shell by rotational acceleration in the bore. The threaded portion screwed into the shell may be of different lengths, diameters and numbers of threads per inch and the depth of intrusion of the body of the fuze into the shell may vary between different fuzes depending upon the calibre of the shell for which approved.

5. Arming and safety devices. - Nose fuzes of the direct action percussion and graze type are normally "armed" by:-

(a) Set-back force or

(b) Centrifugal force or

(c) a combination of both

Set-back force acts on the free or movable parts of the fuze at the instant of firing. Centrifugal force is intended to be effective only when deceleration occurs on the projectile leaving the bore, when the free or movable parts are forced outwards by spin. While passing through the bore the moving parts are expected to remain in their original positions by friction as a result of set-back. The majority of fuzes incorporate shutters which move into the "armed" position by the influence of centrifugal force. Such shutters are usually designed to remain in the "unarmed" position by a detent until fired and until the shell is spinning between a specific number of revolutions per minute (r.p.m.), the number of revolutions varying in different fuzes to meet the requirements of the equipments for which they are approved. Springs assembled either under compression or tension may be used to assist or restrain the influence of the centrifugal force. Locking devices may also be incorporated to secure the movable components in the "armed" position after centrifugal force becomes effective. In certain new fuzes a delayed arming shutter mechanism actuated by centrifugal force is incorporated in the design.

FUZE, PERCUSSION, DIRECT ACTION AND GRAZE, No. 119B

1. Particulars.

(a) Type. - Direct action percussion and graze, nose

(b) Guns. - Q.F. 25 pdr. (May be used with all charges except Charge 1)
B.L. 9.2 inch Marks 10, 10V and 10* (C.A.)
Not to be used in:-
B.L. 5.5 inch gun
B.L. 7.2 inch howr.

(c) Projectile. - H.E. shell

DESCRIPTION. - Mark 17 fuze (Fig. 1)

GENERAL

2. The No. 119B fuze is a direct action percussion and graze detonating fuze. It consists principally of a body, inertia pellet assembly, detonator holder, detent and detent spring, centrifugal bolt and bolt hole plug, striker assembly, striker cover, safety cap, detonators, shutter assembly and magazine with cap. The No. 119B fuze is distinguishable from the No. 117 which is similar in external contour, by having two bands around the body, one knurled and the other coloured black.

3. Body. - Of brass, the upper part of the body is cone shaped, the larger diameter forming a flange below which it is reduced in diameter and screw-threaded to a 2 inch diameter (14 threads per inch right hand) to suit the fuze-hole of the shell. The upper conical portion has a flat top and is screw-threaded to accept the safety cap. Two key holes are drilled just above the flange to facilitate the assembly and removal of the fuze from the shell, and higher up a lateral threaded hole is formed in the side to accept the centrifugal bolt behind which is inserted a screwed plug to seal the orifice. In the threaded portion below the flange a hole is drilled and tapped to accept a pin for securing the magazine after assembly. Internally, the body is bored from the top and bottom to form two main cavities separated by a thick partition of metal.

(a) Upper cavity - A hole is drilled through the centre of the body to act as a guide for the stem of the striker. A recess at the top makes a seating for the striker spring which is assembled under the head of the striker. A small undercut or groove is also formed in this recess to accept the flange formed on the striker cover.

(b) Partition - A central bore drilled up from the bottom of the partition houses the inertia pellet sleeve, detonator (top), detonator plug and the creep spring which is assembled over the needle shank of the striker and rests on top of the detonator plug. The rear of this central bore is slightly enlarged and tapped. This recess accommodates a spacing washer which is retained in position by the detonator holder which also houses the bottom detonator. On three sides, set at 90° to each other, three off-centre holes are drilled in the body to act as vents to relieve pressure in the middle portion of the body should the detonator(s) fire prematurely. On the fourth side another smaller diameter hole is drilled to house the detent and detent spring.

(c) Lower cavity - The lower bore, of larger diameter, is screw-threaded for about two thirds of its depth from the base to accept the magazine and the striker shutter assembly which is housed in a recess formed in the top surface of the magazine.

4. Inertia pellet assembly. - This comprises an inertia pellet sleeve, detonator plug, detonator and creep spring.

(a) Inertia pellet sleeve - Made of brass, the sleeve is cylindrical and is bored internally to accommodate at the rear a 5.7 grain AZ detonator and above this on a slightly larger diameter it is screw-threaded to accept the detonator plug. The top portion is recessed and the rim is chamfered to fit over the wider end of the spiral creep spring on assembly.

(b) Detonator plug - Made of brass, the plug is cylindrical, the top portion being of slightly larger diameter and threaded to screw into the inertia pellet sleeve.

(c) Detonator - This is a 5.7 grain AZ lugless (tinned copper alloy cup) detonator and is assembled in the base of the inertia pellet sleeve.

(d) Creep spring - This is a coil shaped cone of 27 SWG (0-0164) diameter steel wire assembled under light compression between the top of the detonator plug and under the flange formed above the needle shank of the striker.

5. Detonator-holder. - Made of brass, the holder is circular and formed with a flange at the base above which is threaded externally to screw into the fuze body. Internally it is recessed to house the lower 5.7 grain AZ lugless (tinned copper alloy cup) detonator.

6. Detent. - This is a metal rod with a rounded knob formed at one end, the knob being loosely enclosed by a cylindrical weight. The stem of the detent is assembled behind the centrifugal bolt and prevents the bolt moving outwards until after the fuze is fired.

7. Detent spring. - This is a spiral of approx. 16 coils of 0.02 inch diameter spring steel wire and is assembled below the detent. Set-back of the detent on acceleration compresses the spring and the stem of the detent becomes locked under the shoulder formed in the detent hole in the fuze body.

8. Centrifugal bolt. - This is of steel, formed cylindrical with an undercut formed on the rim of its inner face. It is inserted in the hole in the side of the fuze body, the undercut portion fitting under a flange formed on the stem of the striker. This locks the striker in the "safe" position and the bolt is retained in this position by the stem of the detent until the detent sets back on firing.

9. Bolt hole plug. - This is of brass with the head portion being screw-threaded. A screwdriver slot is made in the rear face to facilitate insertion. After the centrifugal bolt and detent are assembled the plug is screwed home thus sealing the centrifugal bolt hole.

10. Striker assembly. - This consists of the striker, striker head, retaining pin and striker spring:-

(a) Striker - The steel striker has a separate mushroom shaped steel head secured by a split pin. The striker spindle is circular in section, having a sharp point formed at its lower end above which a shaped flange is formed to make a seating against the top of the partition in the body of the fuze. Above the flange the stem of the striker is of increased diameter, the upper end being reduced in diameter to fit the head and bored to take a split pin. The striker head is bored centrally to fit onto the top of the striker and radially for the split pin.

(b) Striker spring - This is a spiral of approx. 6 coils of .048 inch diameter steel wire which is assembled under initial compression between the striker head and the upper surface of the fuze body.

11. Method of assembly of Striker and Inertia pellet assemblies, etc. - The striker is assembled from the lower part of the body. The striker spring is then assembled and compressed and retained in this position by fitting on the striker head which is secured to the top of the striker by a retaining (i.e. split) pin. The centrifugal bolt is then assembled, the undercut portion around the face fitting under the flange formed on the stem of the striker. The detent and detent spring are then assembled and the centrifugal bolt hole plug inserted in the side of the body. The creep spring is then assembled over the needle shank of the striker from the rear end of the body, followed by the inertia sleeve in the base of which is assembled the top detonator and above which is screwed in the detonator plug. The base of the creep spring seats on top of the detonator plug. The creep spring, inertia pellet assembly and spacing washer are then secured in position by the screwing home of the detonator holder in the centre of which is housed the bottom detonator.

12. Striker cover. - The striker cover is of brass, cup shaped, flat on top, with a ridged edge at its mouth, and has 6 equally spaced radial saw-cuts .3 inch in depth made around the rim. It fits over the striker head and is secured by the bottom ridged edge being sprung into an annular undercut or groove at the bottom of the recess formed in the top of the fuze body. The cover prevents air resistance during flight from acting on the striker head to cause premature action of the striker. This cover must not be removed when preparing and inspecting fuzes for loading.

13. Safety cap. - The safety cap is made of steel, and externally it is lacquered or coloured black. It is formed with a milled ring around its circumference and an oblique slot on one side for nearly the whole of its length. A flat spring is riveted in the top of the slot and the end is so shaped that it engages with serrations formed around the top of the fuze body, thereby retaining the cap in position. Internally, the cap is threaded at the mouth to fit over the threads formed on top of the fuze body. On assembly the cap seats on a natural rubber washer which is placed at the bottom of the threads formed on top of the fuze body. The cap may be removed before firing, but NOT the striker cover underneath.

14. Detonators. -

(a) Upper - This is a 5.7 grain AZ lugless (tinned copper alloy cup) detonator (QX 124 AF) and is assembled in the base of the inertia pellet sleeve.

(b) Lower. - This also is a 5.7 grain AZ lugless (tinned copper alloy cup) detonator. Previous to July 1959 the detonator was manufactured to (QX 124 AF) but after this date detonators manufactured to (QX 171 AF) were assembled.

15. Shutter assembly. - This comprises a brass sliding block, a steel locking pin, a steel wire shutter spring, a steel wire catch spring and a shutter locking catch. When the shell leaves the muzzle the shutter locking catch spins outwards under centrifugal force permitting the shutter block to compress the shutter spring and to slide outwards in the "armed" position where it is retained by the locking pin.

16. Magazine. - Made of brass, the main upper portion is screw-threaded externally to suit the body, whilst the bottom part is reduced in diameter and screw-threaded to accept the cap. After assembly, it is secured in the body by a pin inserted through the side of the fuze. The magazine is bored from the base in two diameters, the larger bore containing a C.E. pellet which is assembled with the hard end nearest to the bottom cap. The smaller centre bore terminates in a diaphragm from 0.003 to 0.008 of an inch thick and is filled with loose C.E. stemmed in. A recess is formed in the upper face to house the shutter assembly.

17. Magazine cap. - The cap may be made of brass, steel or zinc base alloy. It is screw-threaded internally to suit the base of the magazine and retains the C.E. pellet in position. After filling, the cap is screwed home and is crimped in two or more equi-distant spaced places to prevent it unscrewing.

SAFETY ARRANGEMENTS

18. These are:-

(a) A safety cap which protects the striker cover and striker head from accidental damage.

(b) A striker cover which protects the striker head from air resistance during flight and which must not be removed.

(c) Centrifugal bolt, which is retained by a detent, and holds the striker by a flange and thus prevents the whole striker moving backwards.

(d) The creep spring which keeps the striker and inertia pellet apart.

(e) The shutter which is retained in the unarmed position by the shutter locking catch.

(f) The shutter, when in the unarmed position, which prevents the main (i.e. lower) detonator firing the magazine, if accidentally detonated, by the interpolation of the solid part of the shutter between the two.

EXAMINATION BEFORE FIRING

19. The safety cap should be removed and the striker cover tested by applying a direct pull to ensure that it is firmly secure; it should be examined to ascertain that it is not damaged, distorted or punctured. After testing and examination, the safety cap must be replaced. If the striker cover is in any way defective the safety cap must be replaced, and the fuze must NOT be loaded.

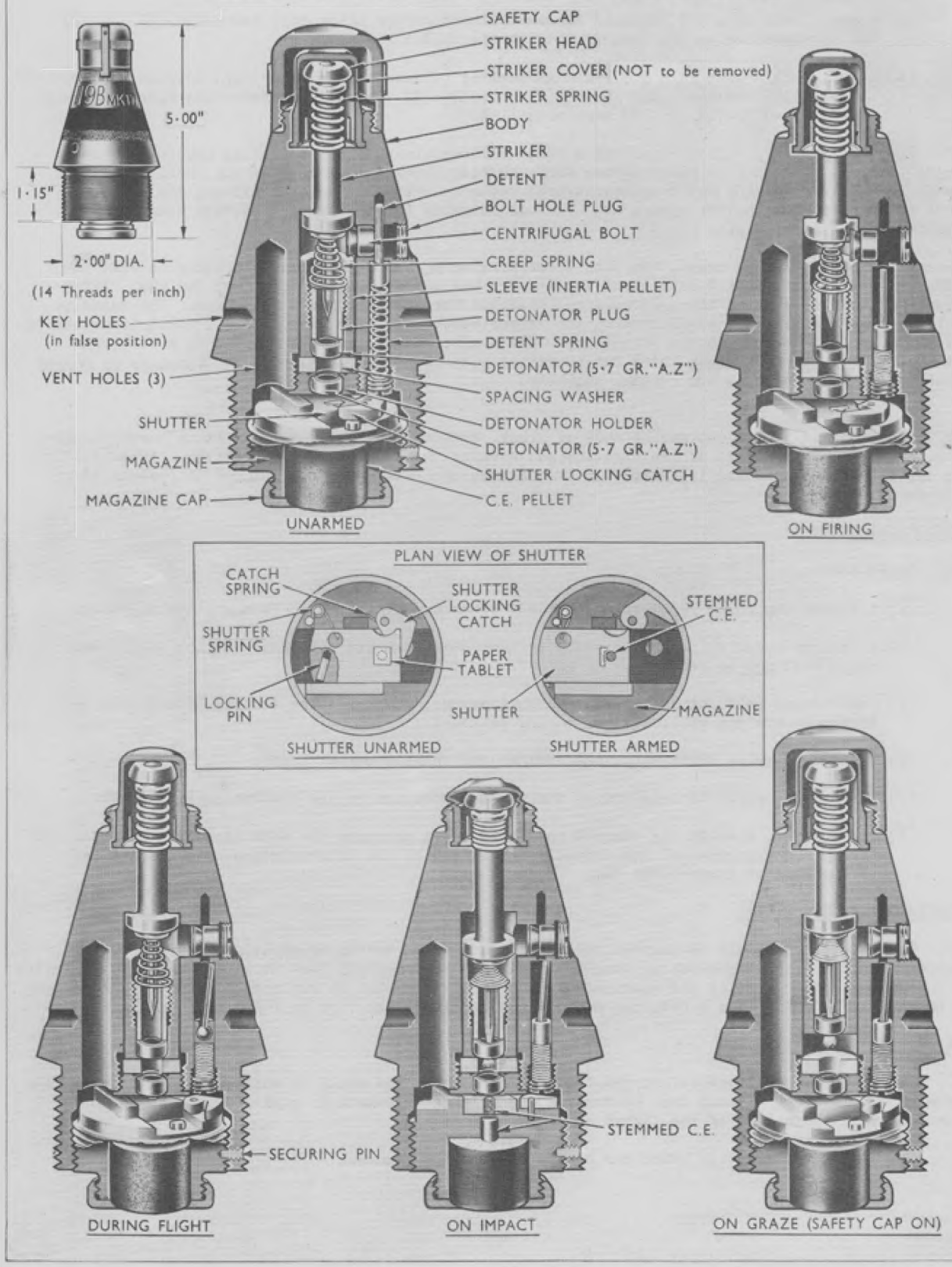
PREPARATION FOR FIRING

20. The steel cap must not be removed from the fuze until the shell to which it is fitted, is prepared for loading. It may then be removed, or allowed to remain in position, the decision depending upon the nature of the target about to be engaged.

The brass striker cover under the cap is never to be removed.

FUZE PERCUSSION, D.A., AND GRAZE, No. 119B, MARK 17

FIG 1



ACTION FIG. 1

21. On firing. - Due to acceleration of the projectile, the striker and detent set back compressing the creep and detent springs respectively, until the shaped portion under the surface of the flange formed around the striker engages a similarly shaped portion of the centrifugal bolt, thus preventing its movement and the stem of the detent sets back and is retained under the shoulder in the detent bore. The shutter remains in the unarmed position, due to friction caused by set back, thus ensuring safety in the bore should either of the detonators function prematurely.

22. During flight. - When acceleration ceases the striker moves forward under the action of the striker spring helped by the creep spring, and centrifugal force now causes the locking catch to swing outwards to release the shutter. Further rotation of the projectile causes the shutter and the released centrifugal bolt to move outwards, the former bringing a channel, filled with stemmed C.E. into alignment with the detonators in the fuze. When the shutter arrives in this position centrifugal force causes the locking pin in the side of the shutter to come out of its recess and catch behind a lug in the magazine, so retaining the shutter in the armed position. The sleeve now has a tendency to creep forward due to acceleration, but this tendency is resisted and checked by the creep spring.

23. On impact (cap off). - The fuze usually functions by direct action, the striker being driven inwards and its point piercing the detonator in the sleeve. The resulting flash causes the lower detonator to function and a detonating wave passes via the stemmed C.E. in the channels of the shutter and magazine to the C.E. pellet in the latter and thence to the bursting charge in the shell.

If, due to the small angle of arrival or other causes, the striker is not driven in, the fuze will function by graze action, as described below.

24. On impact (cap on). - Against light cover the striker is rendered inoperative by the presence of the cap, and the fuze will function by graze action. When this happens the sleeve with its detonator moves forward on to the point of the striker, immediately the projectile is retarded, and the detonator is fired.

Except for a slight delay that is inherent in fuzes functioned by graze action, all subsequent events are as previously described.

OTHER MARKS - SUMMARY OF DIFFERENCES

MARK 17 FUZE WOLC - 8C.6622

25. This fuze is described in paras. 2 to 18 inclusive.

FUZE, PERCUSSION, D.A. AND GRAZE NO.410

1. Particulars

(a) Type	Direct action percussion and graze, with optional delay., nose.
(b) Guns	Q.F. 76 mm. gun) Q.F. 20 pr. gun) Provided the fuzes have been modified by removal of the masking shutter (See paras. 31 and 32).
(c) Projectile	H.E. shell

DESCRIPTION

GENERAL - Mark 2/1 Fuze (Fig. 1)

2. This is a direct action and graze detonating fuze with optional delay and consists principally of a body, magazine, flash regulator (consisting of the masking shutter housing and delay holder), percussion mechanism, inertia pellet, shutter, optional delay selector, striker cover and nose cap.

3. Body.(QX 78 A). - This is manufactured from brass and is screw-threaded externally at both ends; one end to 1.6 inch diameter (14 threads per inch, right hand) to suit the shell fuze-hole, the other end to receive a nose cap.

It is bored, recessed and screw-threaded internally leaving a platform. The lower portion accommodates the magazine, delay holder and masking shutter housing, whilst the upper portion accommodates the percussion mechanism and inertia pellet. A hole is bored from the outside of the body into this lower portion to take the masking shutter selector.

4. Nose cap. - Externally this is formed conical in shape with a parallel portion towards the head which is flat.

Internally it is formed on two diameters, the lower portion being threaded to screw on to the top of the fuze body, the upper recess fitting over the striker cover.

5. Magazine (QX 1093). - Made of zinc base alloy (passivated) the magazine is recessed at the top to accommodate the shutter, and screw-threaded externally to suit the fuze body and also to receive a closing cap. A recess is bored in the base to house a 60 grain C.E. pellet, a smaller hole being bored in the recess leaving a thin diaphragm of metal between the shutter recess and bottom portion of the magazine. This smaller recess is filled with loose C.E. stemmed in.

A hole is bored in the top surface of the diaphragm to accommodate the pin on which the shutter revolves. A hole is also drilled through the side of the top portion of the magazine to take a pin over which the safety plunger spring seats.

A grub screw inserted through the side of the fuze body engages with the threads of the magazine and prevents it unscrewing once the magazine has been screwed home.

6. Percussion mechanism. - This consists of a Striker, Striker sleeve, Detent, Detent Spring, Arming Sleeve, Striker Cover, Shear Wire, Washers and Balls.

7. Striker. - Made of steel, zinc plated, the striker consists of a cylindrical rod formed with a needle point at the lower end above which it is formed parallel for a short distance and is then undercut and chamfered to make a seating for the two steel balls assembled to retain the striker sleeve. Above this undercut the stem is again formed parallel and then the diameter is increased to form a flange. Above this flange the stem is reduced in diameter for a short distance, a second but smaller flange is then formed and above this the head of the striker, the top being rounded.

A hole is drilled through the striker head through which passes the shear wire, the ends being turned anti-clockwise to secure it in position.

8. Striker sleeve. - Made of steel, zinc plated, the sleeve is in the form of a cylindrical tube, the exterior being of two diameters. Two holes diametrically opposite are drilled through the smaller diameter in which are fitted the two balls which secure the striker in the safe or unarmed position.

9. Arming sleeve. - This is a cylindrical sleeve with two holes diametrically opposite drilled through the upper end in which are fitted two balls set under the lower flange of the striker. It fits over the striker sleeve and retains the two balls securing the striker in position

10. Detent. - This is cylindrical and of two diameters, the top portion being enlarged and cup shaped. It slides over the arming sleeve and keeps in position the two balls situated under the lower flange formed on the striker. A washer, assembled under the top portion of the detent, acts as a seating or bearing surface for the top coil of the detent spring.

11. Detent spring. - This is a cylindrical spring of steel wire. It is assembled over the detent and arming sleeve, the bottom coil resting on a washer assembled on the flange of the striker sleeve whilst the top coil bears against the washer placed under the top portion of the detent.

12. Striker cover. - This is assembled over the head of the striker. The open end is formed in a flange the edges of which are turned down, the shoulders of which rest on the washer cover. A washer is assembled under the washer cover, and the edge of the flange of the striker cover is turned over thus securing the three components together.

The striker cover seats in the top of the fuze body and is secured by turning over a lip formed on the fuze body on to the flange of the striker cover. A fillet of cement is applied to the joint, prior to the lip being turned over.

13. Washer cover. - This is a flat disc with a hole formed in the centre through which passes the head of the striker. It is secured in the striker cover.

14. Inertia pellet. - Made of zinc base alloy, externally this is cylindrical in shape while internally it is bored to three diameters. The lower and small recess accommodates a 1.7 grain "A" detonator, while the two larger recesses accommodate the lower portion of the striker mechanism.

On graze the inertia pellet is carried forward for the detonator to impinge on the point of the striker.

15. Masking shutter housing. - This is assembled below the platform in the fuze body and houses the masking shutter (QX 1128) into which the selector engages. Flash channels are formed in the housing to allow the flash to reach the delay holder.

16. Selector. - This consists of a cylindrical body formed with a flange, the interior being bored out to take a spring, the outer end being closed by a screwed plug. The inner end is slotted, to allow the masking shutter to move outwards from its recess in the housing. The selector is inserted from the side of the fuze body and retained in position by a screwed nut. A screwdriver slot is formed in the head of the selector to permit it being set to delay if required.

17. Delay holder. - This is assembled beneath the masking shutter housing. The centre is bored through to form a flash channel between the upper and lower detonators. The channel is closed by the masking shutter when the fuze is set DELAY. Two holes drilled through on either side of the central flash channel communicate with the recess in the base of the holder which is filled with about one grain of mealed gunpowder.

18. Shutter (QX 1094). - Made of aluminium alloy (anodised) the shutter is of the rotary type and holds a timed lugless 1.8 gr. "ZY" detonator (QX 120 AF). It is assembled in the recess formed in the top of the magazine. The shutter is held in the "unarmed" position by means of a spring-loaded safety plunger which engages in a locking plate. On spin, the safety plunger disengages by centrifugal force and the shutter, assisted by a weight set in the opposite end to the detonator, rotates until the detonator is in a central position under the flash channel in the delay holder. The locking plate, which fits into a slot made across the face of the shutter, moves out and engages in a recess made in the side of the magazine, thus locking the shutter in the armed position.

SAFETY ARRANGEMENTS

19. These are:-

(a) The nose cap which protects the striker cover and striker, thus preventing accidental damage during storage and transit.

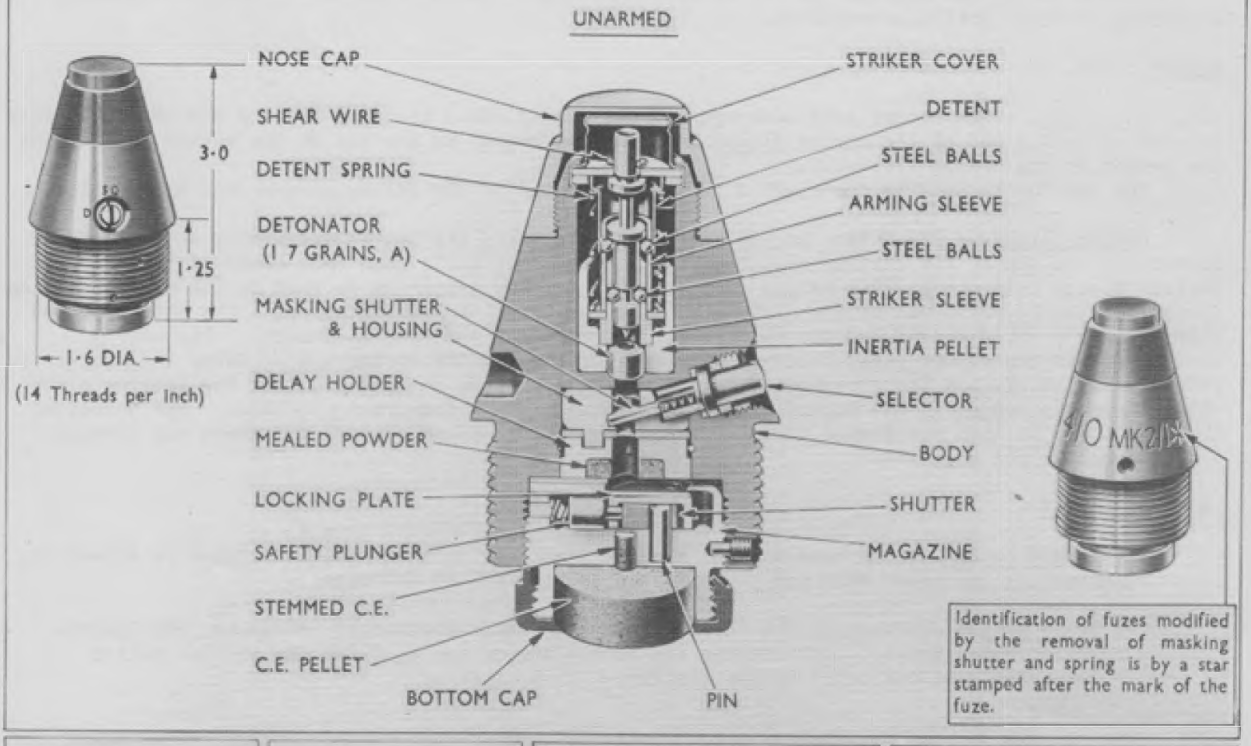
(b) The striker and inertia pellet are retained in the safe position by the upper and lower steel balls in conjunction with the striker sleeve, arming sleeve and detent. The striker is also retained by a brass shear wire which passes through a hole drilled in the striker head.

(c) The shutter is held in the unarmed position by the safety plunger.

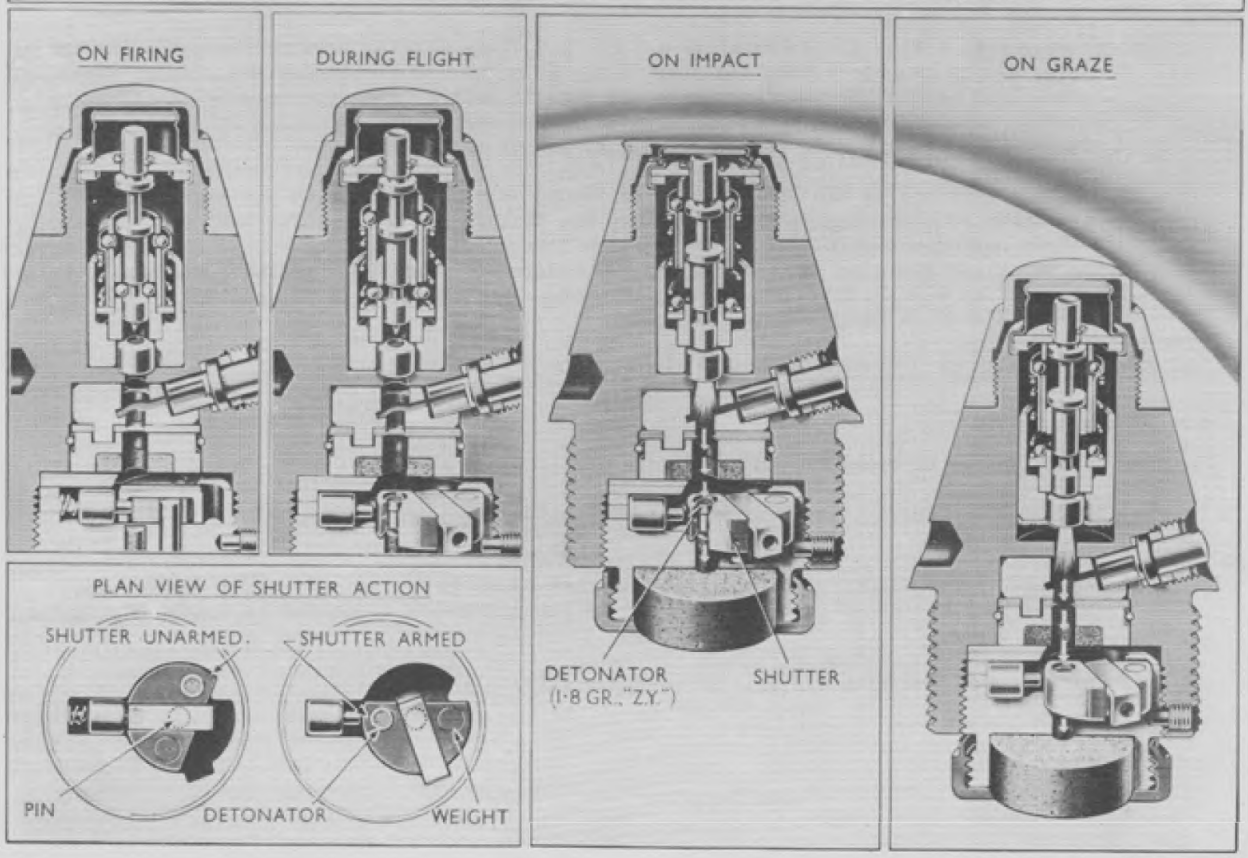
(d) When in the unarmed position, the shutter screens off the detonator and delay pellet from the stemmed C.E. channel in the magazine.

FUZE, PERCUSSION, DA & GRAZE, No.410, MARK 2/1

FIG.1



Identification of fuzes modified by the removal of masking shutter and spring is by a star stamped after the mark of the fuze.



PREPARATION FOR FIRING

20. Before firing the selector is set at either SQ (super quick or direct action) or D (delay) according to which action is required.

ACTION (FIG. 1)

21. On firing. - The detent sets back against its spring, thus allowing the top set of steel balls to move partially out of the arming sleeve into the cup recess at the top of the detent, so locking the detent to the arming sleeve.
The shutter is held in the unarmed position by means of the safety plunger and by friction.

22. During flight. - The detent spring reasserts itself and the detent and arming sleeve move forward to the top of the striker assembly bore. The lower balls then fall clear of the striker sleeve into the inertia pellet recess. The striker mechanism is then in the armed position, the striker being supported by the shear wire which rests on the washer cover. The detent spring then acts as a creep spring and prevents forward movement of the inertia pellet. The safety plunger in the top of the magazine moves outwards, overcoming its spring and allowing the shutter to rotate until it reaches the stop formed in the magazine. When in this position the locking plate slides into the recess in the magazine, locking the shutter in the armed position. The detonator in the shutter is then positioned directly below the central flash channel and above the stemmed C.E. channel in the magazine.

23. On Impact

(a) Direct action. - The nose cap and striker cover are crushed and the striker is driven in, breaking the shear wire and piercing the inertia pellet detonator.

(b) Graze action. - The nose cap, cover plate and shear wire remain intact and the inertia pellet moves forward, compressing the detent spring and carrying the inertia pellet detonator onto the point of the striker.

24. Selector System :-

(a) Super quick. - When the selector is set at "S.Q." the masking shutter overcomes its spring during flight and moves into the slot in the selector, thus clearing the central flash channel and permitting the flash from the inertia pellet detonator to communicate directly with the detonator in the shutter. The resultant detonation initiates the stemmed C.E. channel and, in turn, the C.E. pellet in the magazine.

(b) Delay. - When set at "D" the selector is turned through 90° so that its two lugs are positioned at right-angles to and against the face of the masking shutter, thus preventing it from moving outwards. This diverts the flash from the inertia pellet detonator through the two flash holes in the masking shutter housing to ignite the mealed powder delay pellet which, after a delay of 0.07 seconds, initiates the detonator in the shutter. Subsequent action is then as described in (a) above.

OTHER MARKS - SUMMARY OF DIFFERENCES

MARK 1 FUZE (obsolescent) WOLC. §§ C4680, C6740

25. The variations to be found in the Mk. 1 fuze are:-

(a) Body. - The older type of body which incorporates a shorter masking shutter (QX. 1128) is used.

(b) Magazine. - The diaphragm is thinner than that found in the Mk. 2/1 fuze; radius on shutter and tolerances on diameter of hinge pin different. Secured by copper pin instead of grub screw.

(c) Shutter. - Fitted with 1.8 gr. "ZY" (copper alloy cup) detonator.

MARK 1/2 FUZE (obsolescent) WOLC. § C5363, C6740.

26. This fuze has the following differences:-

(a) Body. - The older type of body which incorporates a shorter masking shutter (QX 1128) is used.

(b) Magazine (QX 1077). - Has a slightly different design to that used in Mk. 2/1 fuze. Secured by a copper pin instead of a grub screw.

(c) Shutter. - Slightly different design to that fitted to Mark 2/1 fuze; radius on shutter recess and tolerance on diameter of hinge pin. Fitted with 1.8 gr. "ZY" (copper alloy cup) detonator.

MARK 1/3 FUZE (obsolescent) WOLC. § C5809, C6740.

27. The Mark 1/3 fuze differs in:-

(a) Body. - The older type of body which incorporates a shorter masking shutter (QX 1128) is used.

(b) Shutter. - Fitted with a 1.8 gr. "ZY" (copper alloy cup) detonator.

MARK 2 FUZE (obsolescent) WOLC. § C6739, C6740.

28. There is only one variation from the Mark 2/1 fuze:-

(a) Shutter. - Fitted with 1.8 gr. "ZY" (copper alloy cup) detonator.

MARK 2/1 FUZE WOLC. § C7297.

29. Described in paras. 2 to 24 inclusive.

NOTE. Prior to 13th September 1956 the total length of the slot in the masking shutter housing was 0.293 inch and the depth, from the centre line of the component, was 0.113 inch. After this date the dimensions were amended to 0.313 inch and 0.133 inch respectively.

MARK 2/2 FUZE WOLC. § C7825.

30. This is a Mark 2/1 fuze modified to improve functioning. Variations are:-

(a) Body. - A new design body (QX 100 A) is used.

(b) Masking shutter. - A new design (QX 1371) is used in which the length is increased from 0.032 inch to 0.330 inch.

(c) Selector. - A new design (QX 1373) is used in which the length from under the flange to the end of the slot is reduced from 0.110 inch to 0.090 inch.

REMOVAL OF MASKING SHUTTER

31. In December 1959 approval was given for the modification, as required, of Marks, 1, 1/2, 1/3, 2, 2/1 and 2/2 fuzes as follows:-
Marks 1, 1/2 and 1/3 removal of spring (QX 536) and masking shutter (QX 534)
Marks 2 and 2/1 removal of spring (QX 536) and masking shutter (QX 1128)
Marks 2/2 removal of spring (QX 536) and masking shutter (QX 1371)

32. After modification these fuzes will be marked with a STAR 1/4 inch in diameter stamped immediately after the mark of fuze.

PART 2

HANDBOOK OF CURRENT BRITISH LAND SERVICE FUZES

Section 4

PERCUSSION, BASE FUZES

PART 2

HANDBOOK OF CURRENT BRITISH LAND SERVICE FUZES

Section 4

PERCUSSION, BASE FUZES

CONTENTS

Introduction

PERCUSSION, BASE FUZES

1. Base detonating percussion fuzes usually depend on a detonator in an inertia pellet being driven on to a fixed needle (or vice versa) by the sudden retarding of the projectile at the moment of impact. A "delay" action, which becomes effective after impact, may be incorporated. The mechanism usually incorporates a shutter which may, or may not, be retained in the "unarmed" position by a detent which sets-back on firing or by a plunger which moves outwards under the influence of centrifugal force.

2. Base fuzes are cylindrical in shape for entry into the base of the shell cavity and have a left hand screw-thread to avoid the possibility of their becoming unscrewed from the shell by rotational acceleration in the bore. The threaded portion screwed into the base of the shell may be of different lengths and numbers of threads per inch, which the depth of intrusion into the shell may vary between different fuzes depending upon the calibre of the shell for which approved.

3. Arming and safety devices. - Base fuzes of the percussion type are normally armed by:-

(a) Set-back force or

(b) Centrifugal force or

(c) a combination of both

Set-back force acts on the free or movable parts of the fuze at the instant of firing. Centrifugal force is intended to be effective only when deceleration occurs on the projectile leaving the bore, when the free or moving parts are forced outwards by spin. While passing through the bore the moving parts are expected to remain in their original positions by friction as a result of set-back. The majority of fuzes incorporate a shutter which moves into the "armed" position by the influence of centrifugal force. Such shutters are usually designed to remain in the "unarmed" position until the shell is spinning at a specific number of revolutions, being retained by a spring plunger which moves outwards under the influence of centrifugal force, or by a detent. The number of revolutions required varies in different fuzes to meet the requirements of the equipments for which they are designed or approved. Springs assembled either under compression or tension may be used to assist or restrain the centrifugal force. Locking devices may also be incorporated to secure the movable components in the "armed" position after centrifugal force becomes effective. In certain new fuzes a delayed arming mechanism actuated by centrifugal force is incorporated in the design, and provides bore and muzzle safety to cover a specified minimum distance from the gun at which arming of the fuze can take place.

FUZE, PERCUSSION, BASE, MEDIUM, NO. 303

1. Particulars

(a) Type	Percn., Base, Medium
(b) Guns	6.5 A.V.R.E.
(c) Projectile	H.E., L1 Mk. 1

DESCRIPTION - Mark 1 (Fig. 1)

GENERAL

2. This is a base detonating fuze and consists principally of a body, magazine, stemmed plug, rotor plug, rotor assembly, arrester pin, detent and detent spring, striker and striker spring, centrifugal plunger, collar, shear wire and base plug.

3. Body. - This is of aluminium. Externally it is formed with an enlarged portion at the base above which it is screw-threaded to 1.6 diam. (12 threads per inch, left hand) to suit the fuze-hole in the base of the shell. Above the threaded portion it is of slightly reduced diameter and formed plain, and at the top it is further reduced in diameter, an undercut being made above which it is screw-threaded to accept a cap which forms the magazine.

Two flats are formed on the sides of the enlarged portion to facilitate assembly or removal from the shell.

From the base a hole is bored in the centre of the body to house the striker and striker spring, whilst off centre three holes are bored; one to house the detent and detent spring, the other two being to lighten the body and also to act as vents to relieve the pressure should the detonator be fired prematurely. A hole is also drilled in the centre of the top and screw-threaded to take the arrester pin. Below the stemmed plug a larger hole is drilled through the side of the body to house the rotor assembly which after insertion is retained in position and sealed by screwing home the rotor plug. This horizontal hole also connects with one of the vent holes bored from the base of the body. Another hole is bored through the side of the enlarged portion of the body at the base to accept the two centrifugal plungers which are retained in position by screwed plugs.

Two blue bands are painted around the base portion of the fuze.

4. Magazine. - This consists of a cup shaped flat-bottom cap, threaded internally at the mouth to screw on to the top of the fuze body. A hole is also formed in the top, being closed by a brass septum, beneath which is inserted a box cloth washer. A C.E. pellet weighing approximately 1 oz. is assembled in the magazine.

5. Stemmed Plug. - This is of metal, screw-threaded externally and with a hole drilled through the centre leaving a thin diaphragm of metal at the base. This recess is filled with C.E. stemmed in and retained in position by a paper disc shellacked to the top surface of the plug. The plug is screwed into the hole formed in the centre of the top of the body.

6. Rotor Plug. - This is of metal, screw-threaded externally, with a screwdriver slot cut across the base. Internally it is recessed to fit over the end of the rotor assembly. It is assembled in the side of the body behind the rotor assembly.

7. Arrester Pin. - This is of metal, formed with a cylindrical shank and an enlarged screw-threaded head. It screws into the hole formed off centre in the top of the body, the shank or stem emerging through the bottom of the hole acts as a stop or arrester when the detent sets back and the rotor assembly revolves under the influence of the rotor spring.

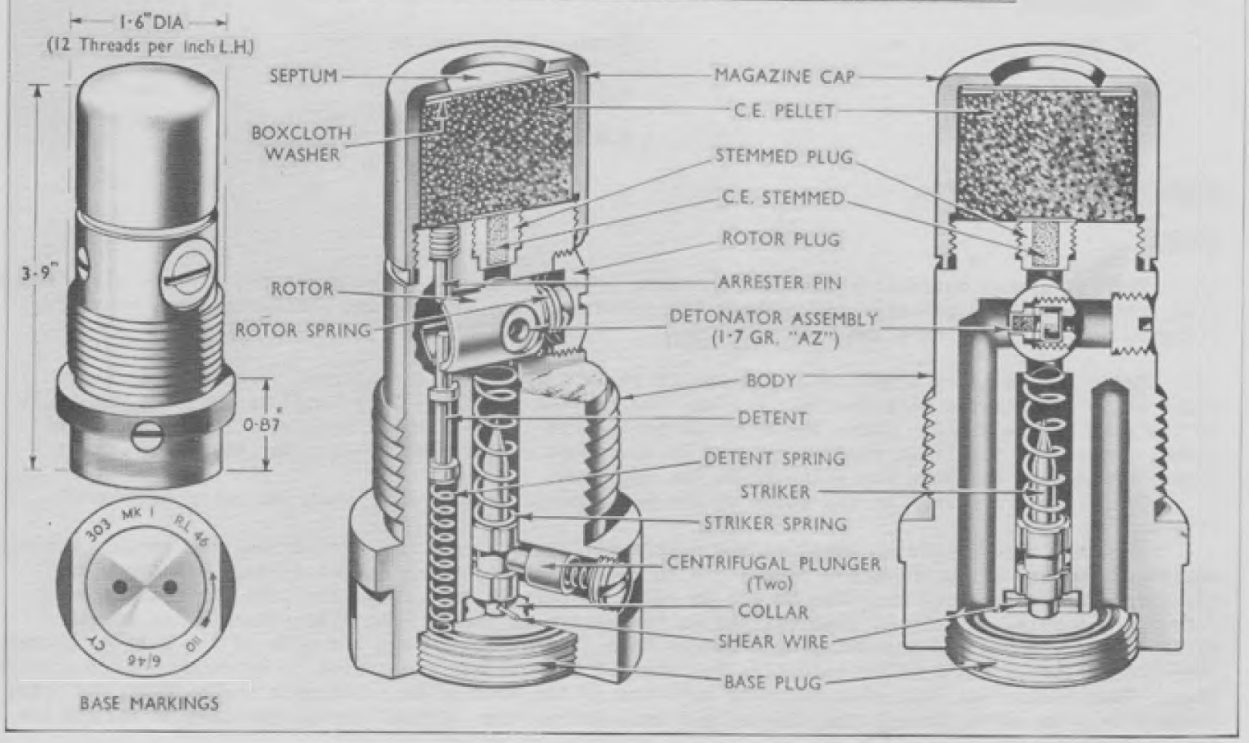
8. Rotor Assembly. - This consists of a cylindrical housing, consisting of a rotor, rotor spring, detonator plug and 1.7 grain "A" (copper alloy shell) detonator, distance piece, and a lead azide/C.E. sleeve. A hole is bored in the side of the rotor to accommodate the lead azide sleeve above which is inserted the distance piece and detonator housed in the detonator plug. One end of the rotor is closed and formed with a spigot or boss over which is assembled a cylindrical coiled rotor spring. Slots are cut in the sides of the open end of the rotor, the end of the detent engaging in the smaller slot, the other which is wider acting as a stop when it comes into contact with the stem of the arrester pin when the rotor revolves.

9. Detent. - This is of steel and consists of a rod with a cylindrical flanged head, a collar being formed about the centre of the rod to act as a guide.

It is inserted from the base of the body and seats on the detent spring. The stem of the detent engages in a slot in the rotor assembly and retains it in the unarmed position until the shell is fired.

FUZE, PERCUSSION, BASE, MEDIUM, No.303 MARK I

FIG.I



10. Detent Spring. - This is a cylindrical coiled steel wire spring which is positioned behind the detent.

11. Striker. - This is of steel, in the form of a rod with a needle point at the front. At the lower portion of the rod two collars are formed which act as centring bands, the portion between the collars forming a recess into which the centrifugal plungers engage. A small spigot is formed at the rear of the striker and a small hole to accept a copper shear wire is drilled through it.

12. Striker Spring. - This is a cylindrical coiled steel wire spring which is assembled over the stem of the striker, the top coil resting below an undercut formed in the top of the channel of the body.

13. Centrifugal Plungers. - These consist of a short stem with an enlarged cylindrical head. A recess formed in the top of the head makes a seating for the coiled spring. The plungers are inserted through the side of the body, the holes being closed by screwed plugs. The stems of the plungers engage in the recess between the two collars formed on the striker and prevent the striker moving forward until the plungers are withdrawn by centrifugal force.

14. Collar. - This is inserted over the spigot formed at the rear of the striker being secured by the shear wire which is inserted in holes drilled through the collar and spigot. In flight the shear wire in the collar prevents the striker moving forward after the plunger is disengaged by centrifugal force.

15. Base Plug. - This is in the form of a solid screw-threaded disc. Two grooves are formed on its inner face, thus connecting the two vents drilled in the body.
Two holes diametrically opposite are formed on the outer surface of the base for the assembly tool.

SAFETY ARRANGEMENTS

16. These are:-

(a) The stem of the detent engages in a slot in the rotor assembly and retains it in the unarmed position until fired.

(b) The rotor assembly, when in the unarmed position, masks off the detonator and ZY filled sleeve from the striker and stemmed C.E. plug respectively.

(c) The stems of the two centrifugal plungers engage in a recess formed in the striker and prevent the striker from moving forward until fired.

(d) The collar, in conjunction with the shear wire, prevents the striker moving forward during flight after the centrifugal plungers have been disengaged.

ACTION

17. On firing. - The detent sets back, overcoming its spring, and disengages from the recess in the rotor assembly. The rotor assembly and the two centrifugal plungers set back and are retained by friction.

18. During flight. - The rotor assembly rotates under the influence of its spring until the side of the detent slot engages with the arrester pin. In this position the detonator is located immediately above the striker channel and the ZY sleeve is brought into alignment with the stemmed C.E. channel leading to the magazine. The centrifugal plungers retaining the striker overcome their springs and fly outwards, but the striker is prevented from moving forward by the shear wire inserted through the collar and rear end of the striker. The striker spring also assists in holding the striker clear of the detonator.

19. On impact. - The shear wire is broken, the striker moves forward compressing the striker spring and the point of the striker pierces the detonator. The resultant flash initiates the ZY sleeve which, in turn, detonates the C.E. channel in the plug and the C.E. pellet in the magazine, and thence the filling in the shell.

SUMMARY OF DIFFERENCES

MARK 1 FUZE (Obsolescent) WOLC-8 I.Arm. Approvals L/18856, L/19155, L/19495, K.1365

20. As described in paras. 2 to 19 inclusive.

21. Only a small number of this fuze have been produced.

FUZE, PERCUSSION, BASE, MEDIUM, L10

1. Particulars

(a) Type	Percussion, base, medium
(b) Guns	Q.F. 25 pr. gun
(c) Projectile	H.E.S.H. See note (a)

DESCRIPTION - Mark 1 Fuze (Fig. 1)

GENERAL

2. The L10 base medium percussion fuze is a graze action detonating type which incorporates a delayed arming shutter. It consists principally of a body, magazine and cap, striker assembly and cover, creep spring and delayed arming shutter No. 1 containing a 2.8 grain "AZ" detonator.

3. Body. - Made of aluminium-alloy-anodised, the body is cylindrical in shape with a wide flange formed at the base above which it is screw-threaded externally to 1.8 inch diameter 12 UNS threads per inch 2A left hand to suit the fuze-hole of the shell for approximately a quarter of its length, the remainder of the body being left plain. A hole is drilled in the centre of the base and screw-threaded to accept a tracer adapter (120 mm shell only). Two key holes, diametrically opposite, are also formed in the base to enable the fuze to be inserted or removed from the shell. The base of the body and flange is coated with varnish R.D. No. 1177 after empty and filled details are stamped on the base. Internally, the body is bored to three diameters, the smaller at the base to accommodate the striker assembly, the second shorter but slightly larger in diameter and screw-threaded to take the striker cover, whilst the third and largest is screw-threaded at the mouth. This recess accommodates the delayed arming shutter above which the magazine is screwed home.

4. Magazine. - Made of aluminium alloy-anodised, the magazine is cup-shaped and screw-threaded externally for about two thirds of its length, the remaining portion being left plain. Two key slots are formed on its outer rim to facilitate assembly. Internally, a small recess is drilled in the bottom, leaving a thin diaphragm of metal between the recess and the outer surface of the base of the magazine. This small recess in the bottom of the magazine is filled with C.E. stemmed in, whilst a prepressed pellet of C.E. is inserted in the larger recess. The threads of the magazine are coated with composition RD 1285 or 1285 A and it is then screwed into the open end of the fuze body, the base of the magazine resting above the delayed arming shutter. The outer end of the magazine protrudes outside the body of the fuze and is closed by a magazine cap.

5. Magazine cap. - Made of aluminium-alloy-anodised all over, the cap is cup-shaped, the inner rim being screw-threaded to engage over the mouth of the magazine.

6. Striker assembly. - This consists of a holder, needle striker and plug.

(a) Striker holder. - The weighted cylindrical holder is made of steel-electro-plated with zinc. It is formed in two diameters with a small recess formed in the base and a hole bored through the centre to house the needle striker.

(b) Needle striker. - Made of steel-electro plated with zinc, the needle striker is formed with a stem with a sharp point and a flanged head.

(c) Plug. - This is a flat disc of brass formed with a hole through the centre.

The stem of the needle striker protrudes through the hole bored in the striker holder. The needle striker is retained in the holder by the brass plug which is assembled behind its flanged head and which is secured by spinning over a lip formed on the base of the holder. After turning over the lip the needle striker must be free to move sideways in the hole in the striker holder. The striker assembly is inserted into the fuze body together with the creep spring and is retained in position by screwing home the striker cover.

7. Striker cover. - The striker cover is made of aluminium alloy-anodised all over and is in the form of a disc, the outer rim of which is screw-threaded. The underside is recessed to make a seating for the top of the creep spring. A small hole is also drilled in the centre through which the point of the striker emerges, when the striker holder sets forward on impact or graze.

8. Creep spring. - Made of steel, tinned and electro-plated with zinc wire, the cylindrical coiled spring has 4 effective coils of .040 inch diameter, with one coil at each end being close coiled and ground square with the axis of the spring. It is assembled around the top portion of the striker holder and prevents the holder creeping forward whilst the shell is in flight. It is retained in position by the striker cover.

9. Delayed arming shutter No. 1. - The assembly comprises four main components, an aluminium alloy circular shaped shutter body, the escapement, a steel electro-plated with zinc safety plunger with spring and an aluminium alloy anodised rotary type shutter containing a 2.8 grain "AZ" lugless (tinned copper alloy cup) detonator. The shutter is held in the "unarmed" position by means of a spring loaded safety plunger which engages in a locking plate. The safety plunger is retained in a recess formed in one side of the shutter body by a plunger retaining strip. On spin, the safety plunger overcoming its spring, disengages from the recess in the end of the locking plate, by the influence of centrifugal force, and the lead weighted biased shutter rotates until the detonator in it is in a central position over the striker hose. The plunger retaining strip, which engages in a slot cut in the side of the plunger, retains the plunger in its recess in the shutter body and prevents it from moving into the shutter housing when the plunger spring reasserts itself, thus obviating the possibility of the shutter and delayed arming mechanism being fouled by the plunger. The locking plate, which fits into a slot made across the face of the shutter, moves out and when the shutter reaches the fully "armed" position engages in a recess made in the outer side of the shutter body, thus locking the shutter in the "armed" position. The delay is obtained by means of a pallet and escape wheel mechanism positioned beneath the shutter. The escape wheel is fitted with a pinion which is in mesh with a segment on the side of the shutter. The pallet acts as a pendulum and engages successive teeth in the escape wheel to retard the rotary movement of the shutter. The approximate time of arming is .06 second from the time the shutter commences to open which occurs when the shell is spinning at 5,900 revolutions per minute. A cover-plate which is made of aluminium alloy, is assembled on to the base of the shutter body and is retained in position by securing screws. It is prepared to accept the pivot pins of the shutter and escape wheel. The shutter body is fitted in the fuze body below the magazine which, when assembled, holds it in position. It is also secured by a screw inserted through the side of the fuze body. The threads and slotted head of the screw are coated with composition RD 1285 or RD 1285 A at the time of assembly.

SAFETY ARRANGEMENTS

10. These are:-

(a) The shutter is retained in the unarmed position by the spring loaded safety plunger which engages in a shutter locking plate.

(b) When the shutter is in the unarmed position, its detonator is screened off from the striker and from the stemmed C.E. channel leading to the C.E. pellet in the magazine.

(c) The shutter is designed so as to provide a slight delay before it reaches the armed position. The appropriate time of operation is 0.06 seconds at 5,900 revolutions per minute.

(d) The creep spring prevents the striker holder and striker from moving forward during flight.

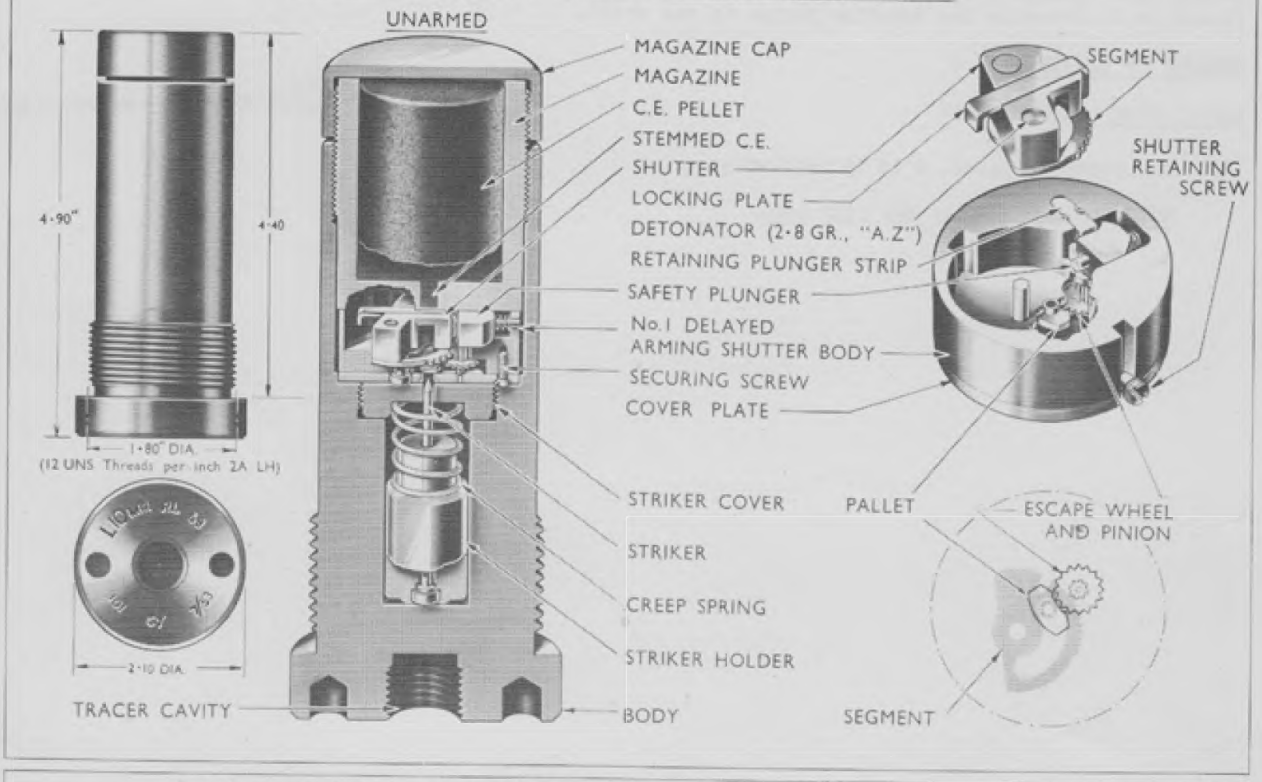
ACTION (FIG. 1)

11. On firing. - The shutter and striker needle holder set back and are retained in the unarmed position by friction.

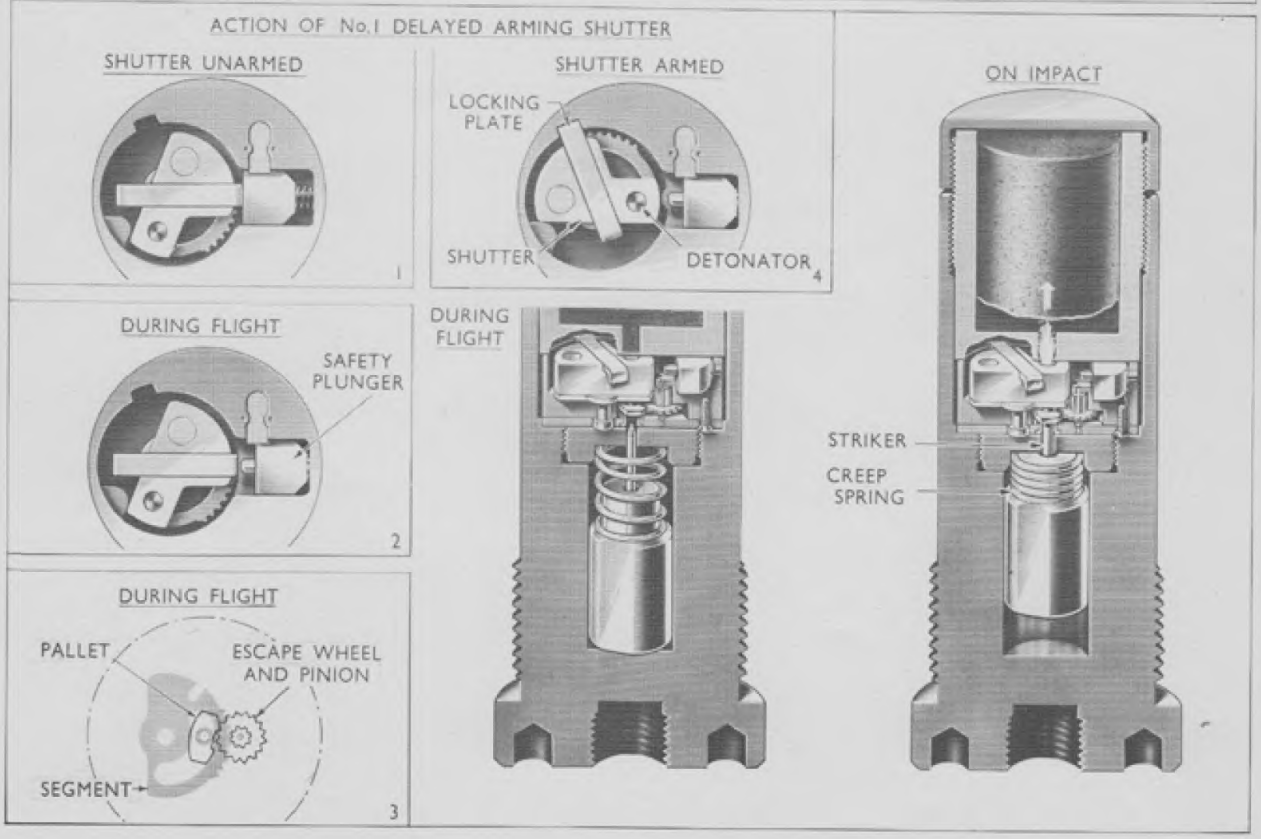
12. During flight. - The safety plunger overcomes its spring and moves outward to release the shutter. The plunger retaining strip, which engages in a slot cut in the side of the plunger, retains the latter and prevents it from leaving its recess in the shutter housing when the plunger spring re-asserts itself, thus obviating the possibility of the shutter and delayed arming mechanism being fouled by the plunger. The shutter begins to rotate until its detonator reaches a central position directly in alignment with the striker needle and the stemmed C.E. leading to the C.E. pellet in the magazine. The delay is obtained by means of a pallet and escape wheel mechanism positioned beneath the shutter. The escape wheel is fitted with a pinion which is in mesh with a segment on the side of the shutter. The pallet acts as a pendulum and engages successive teeth in the escape wheel to retard the rotary movement of the shutter. When the shutter reaches the fully armed position, it is locked by the locking plate which moves outwards along its slot in the top face of the shutter to engage in a recess in the shutter housing.

FIG.1

FUZE, PERCUSSION, BASE, MEDIUM, No. L10, MARK 1



ACTION OF No.1 DELAYED ARMING SHUTTER



13. On impact or graze. - The momentum of the striker holder overcomes the creep spring and carries the striker forward for the point to pierce the detonator. The resultant detonating wave is transmitted through the stemmed C.E. in the magazine channel, to the C.E. pellet in the magazine and thence on to detonate the bursting charge in the shell.

SUMMARY OF DIFFERENCES

MARK 1 FUZE (obsolescent) WOLC - § D21 ~~I.Arm. Approvals K/228~~, K/457

14. Described in paras. 2 to 13 inclusive.

NOTE (a) HESH L3A1 and L3A2 only.

FUZE, PERCUSSION, BASE, MEDIUM, L15

1. Particulars

(a) Type	Percussion, base, medium
(b) Guns	120 mm. L1 TK gun
(c) Projectile	H.E.S.H. L2A2 and L2A3

DESCRIPTION Model A2 (Fig. 1)

GENERAL

2. The L15 base medium percussion fuze is a graze action detonating type which incorporates a delayed arming shutter and a striker locking assembly. It consists principally of a body, striker assembly, creep spring, striker locking segment assembly, delayed arming shutter No.3 containing a 2.8 grain "AZ" detonator, magazine and cap.

3. Body. - The body is made of aluminium alloy, anodised all over. It is cylindrical in shape with a wide flange formed at the base above which it is threaded externally to 1.80 inch diameter (12 UNS threads per inch 2A left hand) for approximately a quarter of its length to screw into the base of the shell. Above the threaded portion the remainder of the body is left plain. A hole is drilled in the centre of the base and screw-threaded to accept a tracer-adapter (120 mm. L1 TK shell only). Two key holes, diametrically opposite, are also formed in the base to enable the fuze to be inserted or removed from the shell. Internally, the body is bored from the top in four diameters, the smaller at the base to accommodate the striker assembly and creep spring, the second and third which are slightly larger in diameter accommodates the striker locking segment assembly, whilst the fourth and largest is screw-threaded at the mouth. This larger recess accommodates the delayed arming shutter assembly above which the magazine is assembled. The base and the flange of the body is coated with varnish after the markings have been stamped on.

4. Striker assembly. - This consists of a brass electro-tinned cylindrical body, with a flange at the base above which it is formed on three decreasing diameters, a recess being formed in the top of the smallest diameter to accept the base portion of the electro-plated tin or zinc coated steel needle, the stem of which on assembly in the fuze protrudes through the centre of the two striker locking segments. The needle, the base of which is flanged, is retained in the recess in the top of the striker body by a tin coated brass washer which is secured by spinning over the lip of the recess. The needle is free to move sideways in the recess. The striker assembly is inserted into the cavity in the base of the fuze body together with the creep spring which is assembled around the larger diameter of the striker body, the bottom coil resting on the flange. The creep spring is retained under initial compression by the top coil seating in a recess and bearing against the base of the striker locking segment holder.

5. Creep spring. - This is a cylindrical coiled tinned steel wire spring, with four effective coils of .056 inch diameter wire, one coil at each end being close coiled and ground square with the axis of the spring. It is assembled round the larger diameter of the striker body and prevents the assembled striker creeping forward when the locking segments open under the influence of centrifugal force and the shell is in flight.

6. Striker locking segment assembly. - This is assembled in the fuze body, the lower portion fitting over the top of the striker. It is retained in position by a screw inserted through the side of the fuze body, the shank of which bears on the striker locking segment cover. The striker locking segment assembly comprises a holder, two electro-tin plated steel pins, two springs, two segments, a washer and a cover.

(a) Holder. - The holder is made of aluminium alloy and is cylindrical in shape. Externally, it is formed on two diameters, the larger being at the top. The bottom portion of the larger diameter is chamfered to blend with the smaller. The bottom of the smaller diameter is also chamfered. Internally, from the base it is bored out in two diameters, whilst a recess is formed in the top face to house the two locking segments, leaving a platform of metal between the top and bottom. A hole, the lower edge of which is chamfered, is drilled through the centre of the platform to permit the stem of the striker to pass through. In the base of the recess in the top of the holder, near the periphery, two holes diametrically opposite are drilled to accept the steel pins over which are assembled the coiled springs and the segments. When assembled, the tops of the two pins protrude above the top surface of the holder.

(b) Segments. - The segments are made of aluminium alloy and are perfectly flat irregular arc-shaped fitments. One end is in the form of a toe which is machined to act as a working surface when the two segments are assembled in the unarmed or locked position, the other end is wider and acts as a weight which, under the influence of centrifugal force, overcomes the springs and allows the two segments to open outwards. Two holes are drilled near the toe, the larger to fit over the pin on which the segment pivots, the smaller accommodating the turned up end of the segment spring. In the closed or unarmed position the top portion of the striker bears against the underside of the closed segments, and thus the striker is prevented from moving forward until the segments are opened by centrifugal force.

(c) Segment springs. - These springs are made of 0.022 inch diameter tinned steel wire, with 6.2 close wound coils, the ends of the wire being bent up at right angles to the coils. These are assembled over the pivot pins and beneath the segments, the lower end of the spring fitting into a small hole drilled in the holder adjacent to the pin, whilst the upper end of the spring is located in a small hole drilled in the segment.

(d) Washer. - The washer is made of aluminium alloy and is in the form of a flat disc with a hole formed in the centre, and two slots, diametrically opposite, near the periphery. It is assembled on top of the holder, the protruding ends of the pivot pins being located in the slots, and the pivot of the striker needle protruding through the centre hole.

(e) Cover. - The cover is made of aluminium alloy, formed with a large hole in the centre. It fits over the top of the holder and retains the washer in position above the segments. It is secured in position by spinning the bottom edge around the external chamfered portion of the holder.

7. Delayed arming shutter No. 3. - This consists of four main components the body, the escapement, a safety plunger with spring and a rotary type shutter containing a 2.8 grain "AZ" lugless (tinned copper alloy cup) detonator assembled in a circular-shaped shutter body. The shutter is held in the "unarmed" position by means of a spring-loaded safety plunger which engages in a locking plate. The safety plunger is retained in a recess in the side of the shutter body by a plunger retaining strip. On spin, the safety plunger overcomes its spring and disengages from the recess in the end of the locking plate under the influence of centrifugal force and the lead weighted biased shutter rotates until the detonator is in a central position over the striker hole. The plunger retaining strip, which engages in a slot cut in the side of the plunger, retains the plunger in its recess in the shutter body.

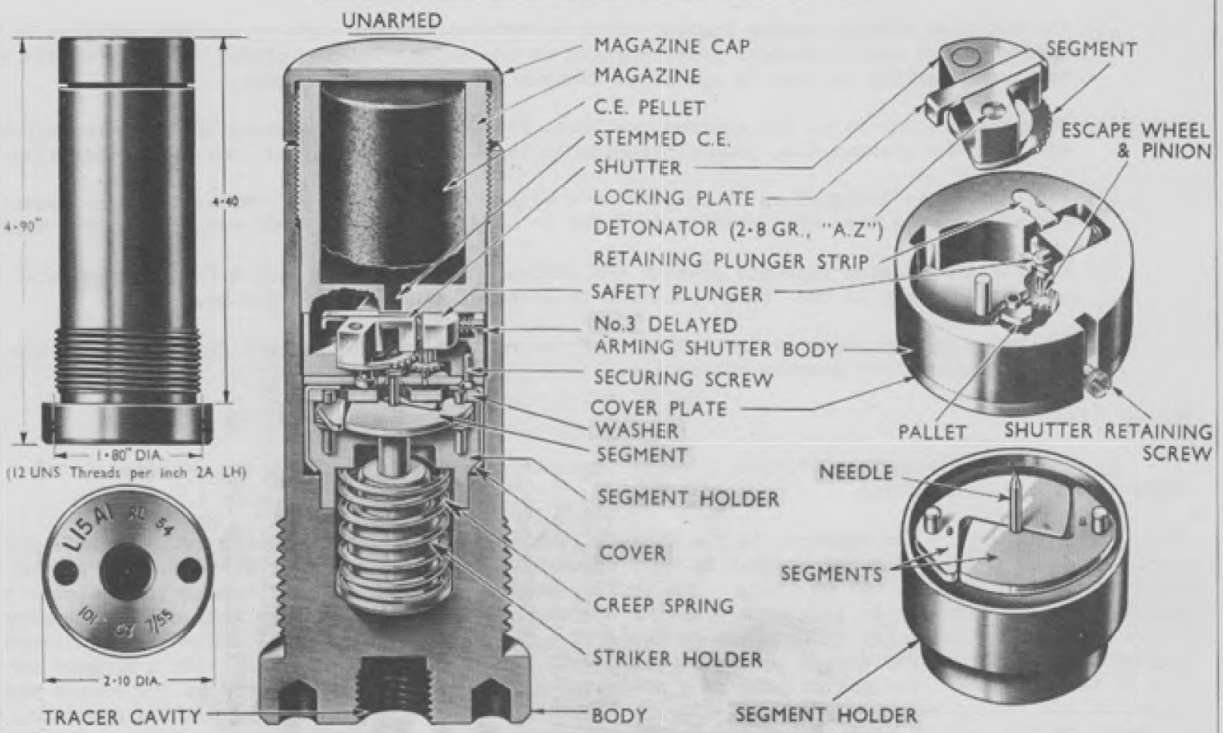
The locking plate, which fits into a slot made across the face of the shutter, moves out and engages in a recess made in the outer side of the shutter body, thus locking the shutter in the "armed" position. The delay is obtained by means of a pallet and pinion mechanism positioned beneath the shutter and this oscillates a segment by means of a 'scape wheel and pinion which retards the opening of the shutter. The shutter commences to open when the shell is spinning between 7,000 and 8,500 revolutions per minute. The time of opening is between 0.020 and 0.055 seconds when the shell is spinning at 9,000 revolutions per minute. The D.A. shutter assembly is assembled in the fuze body below the magazine. It is located and prevented from revolving by a screw inserted through the side of the fuze body which enters a slot formed in the side of the shutter body. It is further secured by a screw inserted through the side of the fuze body, the stem of which enters a hole drilled in the shutter body. The threads of both screws are coated with cement, the junction of the thread is stabbed after screwing home. The slotted end of the screws is then coated with cement.

8. Magazine. - The magazine is made of aluminium alloy anodised all over. It is cup-shaped and screw-threaded externally commencing at the mouth for about two thirds of its length, the remaining portion being slightly reduced in diameter and left plain. Two key slots are formed in the outer rim to facilitate assembly. Internally, the magazine is bored out to take a prepressed pellet of C.E. and a small recess which is filled with loose C.E. stemmed in is drilled in the centre of the bottom leaving a thin diaphragm of metal between the recess and the outer surface at the base of the magazine. The magazine is screwed into the open end of the fuze body, the base of the magazine resting above the delayed arming shutter assembly. The outer end of the magazine protrudes above the body of the fuze, and is closed by a magazine cap.

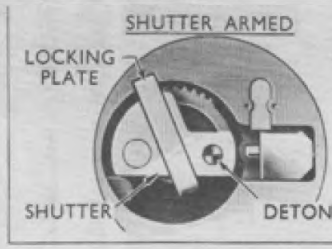
9. Magazine cap. - The cap is made of aluminium alloy, anodised all over. It is cup-shaped with an internal thread to screw over the mouth of the magazine, the threads being coated with RD 1285 or RD 1285A prior to assembly.

FIG.1

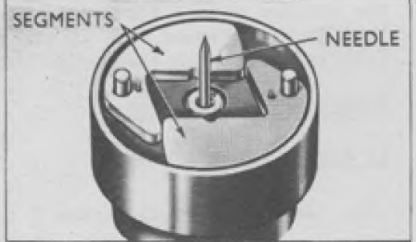
FUZE, PERCUSSION, BASE, MEDIUM, L15. A 2

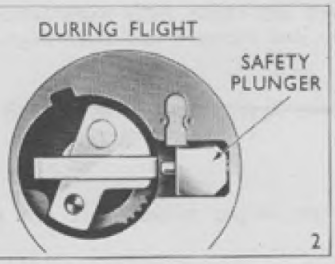


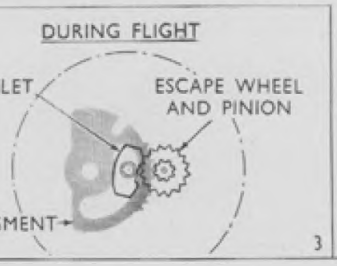
ACTION OF No.3 DELAYED ARMING SHUTTER

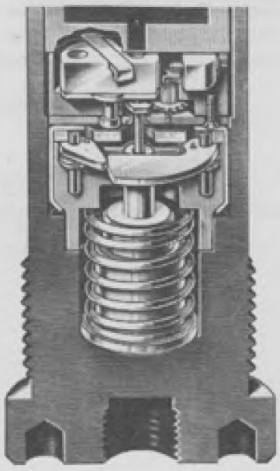


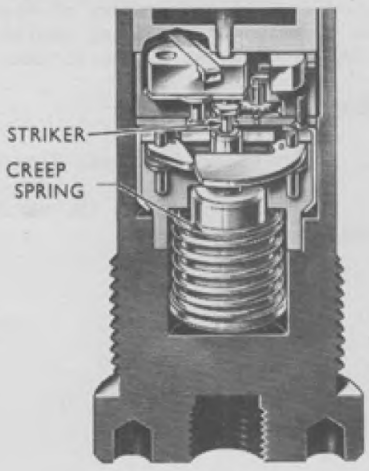
SEGMENTS ARMED








DURING FLIGHT



ON IMPACT

SAFETY ARRANGEMENTS

10. These are:-

(a) The rotating delayed arming shutter which is retained in the safe or unarmed position by the spring loaded safety plunger which engages in the safety locking plate. This provides bore and muzzle safety to cover a specified minimum distance from the gun.

(b) When the shutter is in the unarmed position, its detonator is screened off from the striker and from the stemmed C.E. channel leading to the C.E. pellet in the body of the magazine.

(c) The shutter is designed so as to provide a slight delay before it reaches the armed position. The approximate time of operation is 0.020 to 0.055 seconds at 9,000 revolutions per minute.

(d) The striker locking segments prevent the striker from moving forward before firing, and hold the striker in the "SAFE" position in transit, handling and loading.

(e) The creep spring prevents the tendency of the striker to move forward during flight, due to deceleration after leaving the muzzle.

ACTION (FIG. 1)

11. On firing. - The shutter, striker locking segments and striker set back are retained in the unarmed position by friction.

12. During flight. - The segments in the striker locking assembly move outwards against their springs leaving a clear passage for the striker to move forward. The safety plunger overcomes its spring and moves outwards to release the shutter. The shutter begins to rotate until its detonator reaches a central position directly in alignment with the striker needle and the stemmed C.E. channel leading to the magazine. The delay is obtained by means of a pallet and escape wheel mechanism positioned beneath the shutter. The escape wheel is fitted with a pinion which is in mesh with a segment on the side of the shutter. The pallet acts as a pendulum and engages successive teeth in the escape wheel to retard the rotary movement of the shutter. When the shutter reaches the fully armed position, it is locked by the locking plate which moves outwards along its slot in the top face of the shutter to engage in a recess in the shutter housing.

13. On impact or graze. - The momentum of the striker holder overcomes the creep spring and carries the striker needle forward to pierce the detonator. The resultant detonating wave is transmitted through the stemmed C.E. in the magazine channel to the C.E. pellet in the magazine and thence to the bursting charge in the shell.

SUMMARY OF DIFFERENCES

A1 Fuze (obsolescent) WOLC § I.Arm. Approvals K/586, K/640, K/870

14. As described in paras. 2 to 13.

15. A limited number only of these fuzes stamped L15A1 were produced and these were manufactured prior to the drawings being sealed. The under-flange of the striker and forward and rear edges of the larger diameter of the striker assembly were NOT chamfered.

A2 Fuze (obsolescent) WOLC § D22 ~~I.Arm. Approvals K/768, K/1368~~

16. As described in paras. 2 to 13.

17. The under-flange of the striker and forward and rear edges of the larger diameter of the striker assembly are chamfered.

FUZE, PERCUSSION, BASE, MEDIUM L19

1. Particulars:-

(a) Type	Percn., Base, Medium, with delayed arming shutter
(b) Guns	Q.F. 25 pr. gun 120 mm. B.A.T. gun 76 mm. Armd C gun 105 mm. TK. gun 120 mm. TK. gun
(c) Projectiles	H.E.S.H. shell (and Prac. S.H.) See Notes (a) and (b)

DESCRIPTION - Model A1 (Fig. 1)

GENERAL

2. The L 19 base, medium, percussion fuze is a graze action detonating type which incorporates a delayed arming shutter and a striker locking assembly. It consists principally of a body, magazine and cap, striker assembly, creep spring, striker locking segment, locking ring, and delayed arming shutter No. 3 series containing a 2.8 grain "AZ" detonator.

3. Body. - Made of Aluminium alloy - anodised all over, the body is cylindrical in shape with a wide flange formed at the base above which it is screw-threaded externally to 1.80 dia. 12 UNS. -2A (L.H.) gauge for approximately a quarter of its length, the remainder of the body being left plain. A hole is drilled in the centre of the base and screw-threaded to accept a tracer-adapter. Two key holes diagonally opposite are also formed in the base to enable the fuze to be inserted or removed from the shell. Internally, the body is bored from the top in four diameters, the smaller at the base to accommodate the striker and creep spring, the second and third, which are slightly larger in diameter, accommodates the striker locking segment, whilst the fourth and largest is screw-threaded at the mouth. This larger recess accommodates the delayed arming shutter above which the base portion of magazine is screwed home. The base and flange of the body is coated with varnish after the marking has been stamped on. Two screw threaded holes are formed in the body, the lower is for the alignment screw for the delayed arming shutter and the upper is for shutter gauging.

4. Striker. - The striker consists of a brass electro-tinned cylindrical body, with a flange at the base above which it is formed on three decreasing diameters, a recess being formed in the top of the smallest diameter for the electro-plated tin or zinc coated steel needle, the stem of which protrudes through the centre of the striker locking segment. The needle, the base of which is flanged, is retained in the recess in the top of the body by a tin coated brass washer which is secured by spinning over a lip at the top of the recess. The needle is free to move sideways in its recess.

The striker is inserted into the cavity in the base of the fuze body together with the creep spring which is assembled around the larger diameter of the striker body, the bottom coil resting on the flange. The creep spring is retained under initial compression by the top coil seating in a recess and bearing against the base of the striker locking segment assembly.

5. Creep spring. - The creep spring is a cylindrical coiled tinned steel wire spring, with five effective coils of .048 dia. (18 SWG) wire, one coil at each end being close coiled and ground square with the axis of the spring. It is assembled round the larger diameter of the striker body and prevents the assembled striker creeping forward when the shell is in flight.

6. Striker, locking segment assembly. - This is assembled in the fuze body, the lower portion fitting over the top of the striker. It is retained in position by the delayed arming shutter and the magazine.

The striker locking segment assembly comprises a holder, two electro tin plated steel pins, two springs, two segments, a washer and a cover.

(a) Segment holder. - The segment holder is of aluminium alloy, cylindrical in shape. Externally it is formed in two diameters, the larger being at the top. The bottom portion of the larger diameter is chamfered to blend with the smaller. The bottom of the smaller diameter is also chamfered. Internally, from the base it is bored out in two diameters, whilst a recess is formed in the top face to house the two locking segments, leaving a platform of metal between the top and bottom. A hole is drilled through the centre of the platform to permit the striker to pass through. In the base of this recess, near the periphery, two holes diametrically opposite are drilled to accept the steel pivot pins over which are assembled the coiled torsion springs and the segments, this assembly being contained by the Washer and Cover. When assembled, the tops of the two pins protrude above the top surface of the holder.

(b) Segments. - The segments are made of aluminium alloy, and are perfectly flat irregular arc-shaped fitments. One end is in the form of a toe which is machined to act as a working surface when the two segments are assembled in the unarmed or locked position, the other end is wider and acts as a weight which, under the influence of centrifugal force, overcomes the springs and allows the two segments to open out. Two holes are drilled near the toe, the larger to fit over the pin on which the segment pivots, the smaller accomodating the turned up end of the segment spring. In the closed or unarmed position the top portion of the striker bears against the underside of the closed segments, and thus the striker is prevented from moving forward until the segments are opened by centrifugal force, whilst the needle of the striker assembly protrudes through the hole formed by the two semi-circular slots one in each segment, through the washer and cover and into the pivot tube of the Shutter delayed arming.

(c) Segment spring. - The segment springs are made of .024 (23 S.W.G.) tinned steel wire, with 5.2 close wound coils, the ends of the wire being bent up at right angles to the coils. These are assembled over the pivot pins and underneath the segments, the lower end of the spring fitting into a small hole drilled in the holder adjacent to the pin, whilst the upper end of the spring is located in a small hole drilled in the segment.

(d) Washer. - Made of aluminium alloy-anodised, the washer is in the form of a flat disc with a hole formed in the centre, and two slots diametrically opposite near the periphery. It is assembled on top of the holder, the protruding ends of the pivot pins being located in the slots, and the point of the striker needle protruding through the central hole.

(e) Cover. - The cover is made of aluminium alloy, formed with a large hole in the centre. It fits over the top of the holder and retains the washer in position above the segments. It is secured in position by spinning or pressing the bottom edge over around the external chamfer of the larger diameter portion of the segment holder.

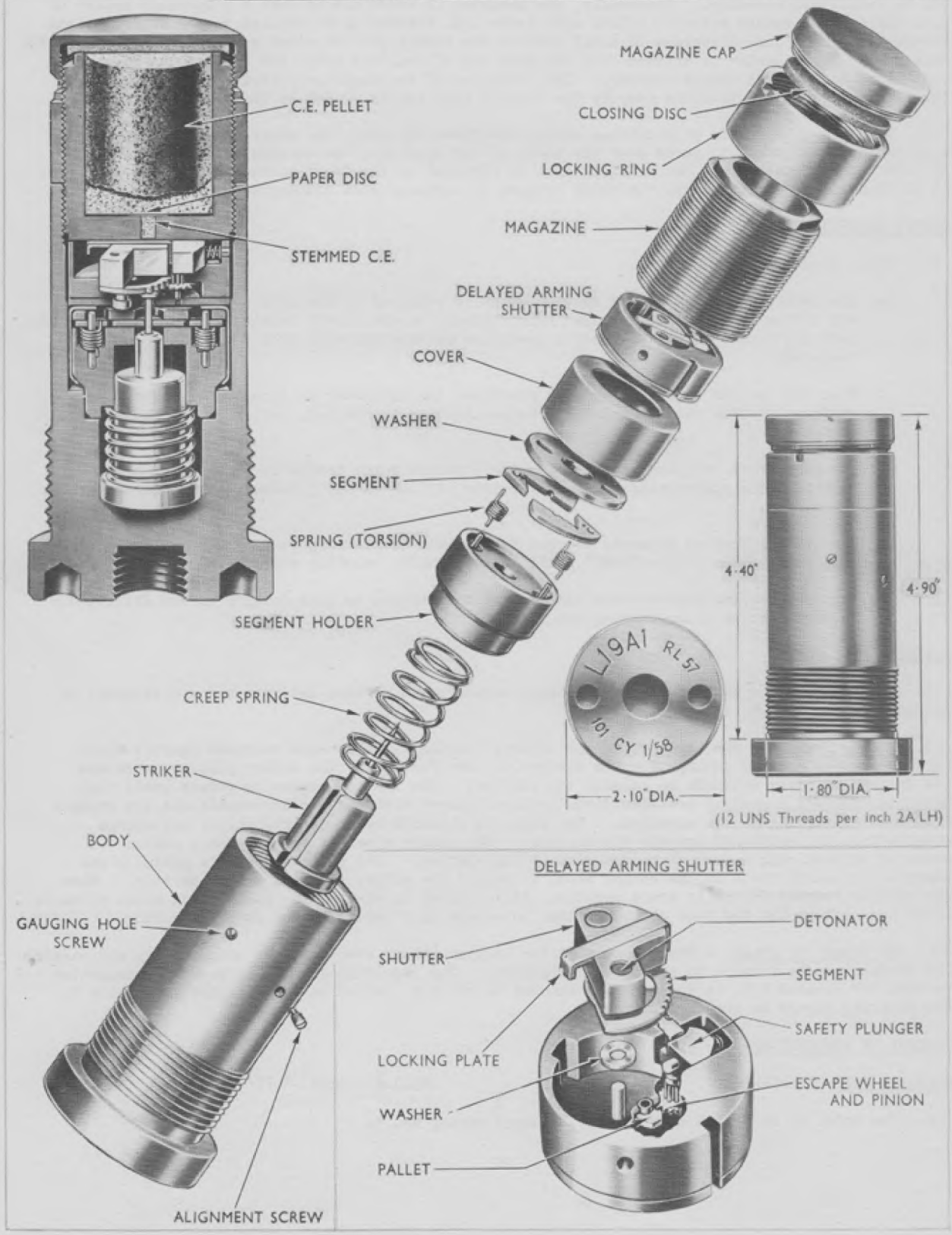
7. Locking ring. - Made of aluminium alloy - anodised all over, the ring is cylindrical in shape, formed plain on the outside and screw-threaded internally. Two slots, diametrically opposed, are cut across the mouth to facilitate assembly. It is screwed onto the upper part of the magazine, locking against the top of the body.

8. Delayed arming shutter No.3 series. - This consists of four main components, the body, the escapement, a safety plunger with spring and a shutter containing a 2.8 grain "AZ" lugless (tinned copper alloy cup) detonator assembled in a circular shaped shutter body over which fits a cover plate. The shutter is held in the "unarmed" position by means of the spring-loaded aluminium alloy safety plunger which engages in one end of a locking plate. The safety plunger is retained in a recess in the side of the shutter body by a plunger retaining strip. On spin, the safety plunger overcomes its spring and disengages from the recess in the end of the locking plate by centrifugal force and the lead weighted biased shutter rotates until the detonator is in a central position over the striker hole. The plunger retaining strip, which engages in a slot cut in the side of the plunger, retains the plunger in its recess in the shutter body. The locking plate, which fits into a slot made across the face of the shutter, moves out and engages in a recess made in the outer side of the shutter body, thus locking the shutter in the "armed" position. The delay is obtained by means of a pallet and pinion mechanism positioned beneath the shutter and this oscillates a segment by means of a "scape wheel and pinion which retards the opening of the shutter. The shutter commences to open when the shell is spinning between 7,000 and 8,500 revolutions per minute. The time of opening is between 0.020 and 0.055 seconds when the shell is spinning at 9,000 revolutions per minute.

The closed (lower) face of the Shutter, Delayed Arming rests on the Holder, Segment. When the magazine is screwed home, it clamps both the Shutter, Delayed Arming and Holder segment, in position with the creep spring located between the striker flange and the face of the larger recess in the holder. The correct position of the Shutter, Delayed Arming is controlled by the engagement of a screw with the vertical slot in the body. The fuze body and the Shutter, Delayed Arming body are provided with safety gauging holes which are in alignment in the assembled fuze and through which the "SAFE" position of the shutter is gauged at the filling stage. After gauging the hole is closed by a screw. The threads of this screw are coated with cement and the thread is stabbed after screwing home, and the slotted end of the screw is then coated with cement.

FUZE, PERCUSSION, BASE, MEDIUM, L19A1

FIG.1



9. Magazine. - The magazine is made of aluminium alloy - anodised all over. It is cup shaped and screw-threaded externally except for an undercut at each end. Two key slots are formed in the outer rim to facilitate assembly. Internally, the magazine is bored out to take a prepressed pellet of C.E. and a small recess which is filled with loose C.E. stemmed in is drilled in the centre at the bottom, leaving a thin diaphragm of metal between the recess and the outer surface at the base of the magazine. The magazine is screwed into the open end of the fuze body, the base of the magazine resting on the delayed arming shutter. The outer end of the magazine protrudes above the body of the fuze, it is locked into the body by the locking ring and is closed by the magazine cap.

10. Magazine cap. - Made of aluminium alloy - anodised all over, the magazine cap is cup-shaped with an internal thread to screw over the mouth of the magazine, the threads being coated with RD 1286 prior to assembly. A box-cloth disc is attached to the inner surface by shellac adhesive. It is then secured by the outer rim being crimped in three or more equi-spaced positions.

SAFETY ARRANGEMENTS

11. These are:-

(a) The rotating delayed arming shutter which is retained in the safe or unarmed position by the spring loaded safety plunger which engages in the safety locking plate. This provides bore and muzzle safety to cover a specified minimum distance from the gun when arming commences.

(b) When the shutter is in the unarmed position, its detonator is screened off from the striker and from the stemmed C.E. channel leading to the C.E. pellet in the body of the magazine.

(c) The shutter is designed so as to provide a slight delay before it reaches the armed position, the approximate time of operation is 0.02 to 0.055 seconds at 9,000 revolutions per minute.

(d) The striker locking segments prevent the striker from moving forward before firing, and hold the striker in the "SAFE" position in transit, handling and loading.

(e) The creep spring prevents the tendency of the striker to move forward during flight, due to deceleration after leaving the muzzle.

ACTION (FIG. 2)

12. On firing. - The shutter, striker locking segments and striker set back and are retained in the unarmed position by friction.

13. During flight. - The segments in the striker locking assembly move outwards against their springs leaving a clear passage for the striker to move forward. The safety plunger overcomes its spring and moves outwards to release the shutter. The shutter begins to rotate until its detonator reaches a central position directly in alignment with the striker needle and the stemmed C.E. channel leading to the magazine. The delay is obtained by means of a pallet and escape wheel mechanism positioned beneath the shutter. The escape wheel is fitted with a pinion which is in mesh with a segment on the side of the shutter. The pallet acts as a pendulum and engages successive teeth in the escape wheel to retard the rotary movement of the shutter. When the shutter reaches the fully armed position, it is locked by the locking plate which moves outwards along its slot in the top face of the shutter to engage in a recess in the shutter housing.

14. On impact or graze. - The mementum of the striker holder overcomes the creep spring and carries the striker needle forward to pierce the detonator. The resultant detonating wave is transmitted through the stemmed C.E. in the magazine channel to the C.E. pellet in the magazine and thence to the bursting charge in the shell.

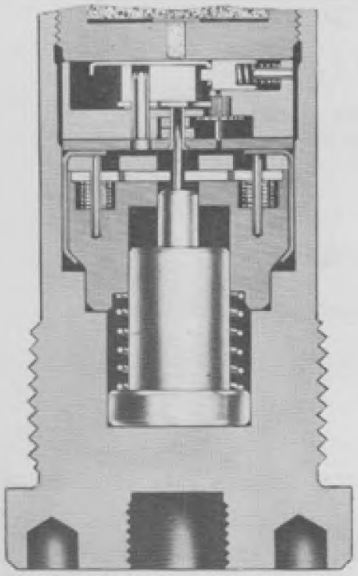
SUMMARY OF DIFFERENCES

MODEL A1 FUZE (Obsolescent) WOLC-S C 9808 D 277

15. The model A1 is fitted with Shutter, delayed arming No. 3.

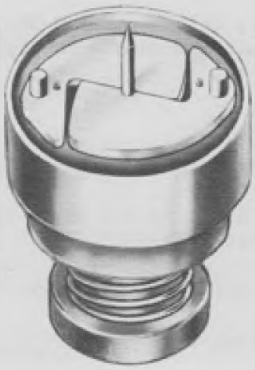
ACTION OF L19A1 FUZE

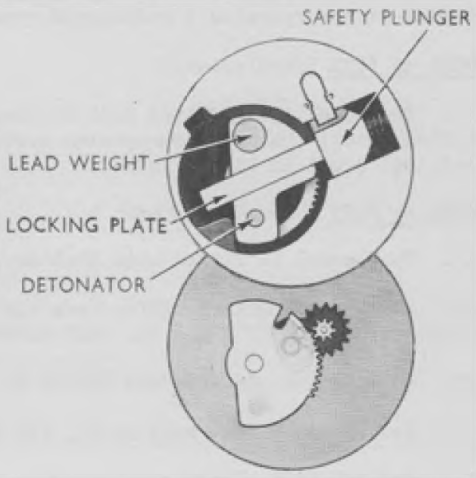
FIG.2



FUZE UNARMED WITH DELAYED ARMING SHUTTER SEGMENTS AND STRIKER HELD IN SAFE POSITION

BEFORE FIRING

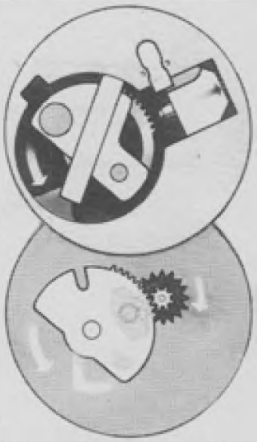




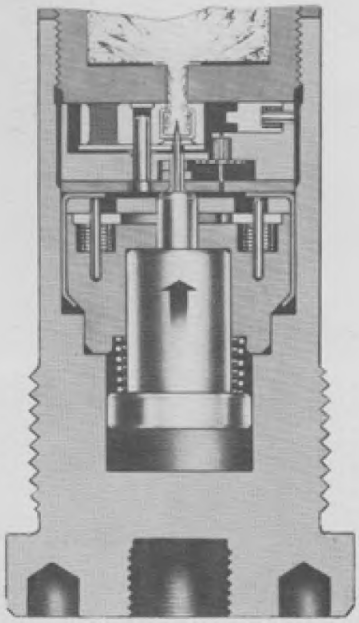
SHUTTER LOCKED IN THE UNARMED POSITION

DURING FLIGHT

COVER AND WASHER REMOVED FOR ILLUSTRATIVE PURPOSES

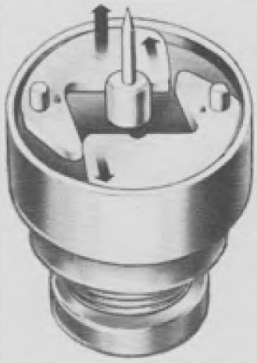


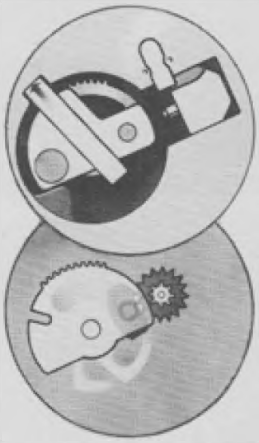
SHUTTER RELEASED AND ROTATING TOWARDS THE ARMED POSITION



SEGMENTS HELD OPEN AND STRIKER IN FIRED POSITION

ON IMPACT





SHUTTER LOCKED IN THE FULLY ARMED POSITION

MODEL A2 FUZE (Obsolescent) WOLC-§ C 9808

16. The model A2 is fitted with Shutter, delayed arming No. 3A. This differs from the No.3 in that it incorporates a redesigned cover plate (QX 75 SA) in lieu of (QX 573).

MODEL A3 FUZE (Obsolescent) WOLC- § C 9808 C.9991

17. The model A3 is fitted with Shutter, delayed arming No. 3B which is similar to the No. 3A shutter except that it incorporates certain components manufactured from corrosive resisting stainless steel in lieu of steel.

MODEL A4 FUZE (Obsolescent) WOLC-§ C.9991 . D271

18. This model is fitted with Shutter, delayed arming No. 3C, 3C/1 or 3C/2.

19. All these shutters differ from the No.3, 3A and 3B in that they incorporate a 2.6 gr. LZ detonator in lieu of a 2.8 gr. "AZ" detonator.

20. In addition the shutters differ in the following way:-

(a) No. 3C - same body as No. 3B, i.e. die-cast.

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MODEL A5 FUZE WOLC D271

21. This model is fitted with Shutter, delayed, arming, No 6 or 6/1.

22. The body of the No 6 shutter is die-cast whereas that of the No 6/1 shutter is manufactured from bar.

23. The Nos 6 and 6/1 shutters differ from the Nos 3C, 3C/1 and 3C/2 shutters mainly in certain manufacturing details.

NOTE 1.

a. 105 mm Tk - Round, HESH, L35A1 only.

b. 120 mm Tk, L1 - Shell, HESH, L18A3, L20A1 and Prac SH, L30A1 only.

NOTE 2.

With effect from September, 1969 the nomenclature of the Shutters, Delayed Arming, Nos 6 and 6/1 referred to in this Annexure will be amended to read as shown below:

Delayed Arming Unit, No 6
Delayed Arming Unit, No 6/1

FUZE, PERCUSSION, BASE, MEDIUM L24

Particulars:-

(a) Type	Percn., Base, Medium, with delayed arming shutter
(b) Guns	165 mm. L33A1
(c) Projectile	H.E.S.H. shell

DESCRIPTION - MODEL A1 (Fig. 1)

GENERAL

2. The L24 base, medium, percussion fuze is a graze action detonating type which incorporates a delayed arming shutter and a striker locking assembly. It consists principally of a body, magazine and cap, striker assembly, creep spring, striker locking segment, locking ring, and delayed arming shutter No.4 series containing a 2.8 grain "AZ" detonator.

NOTE The L24 fuze differs from the L19 fuze in only two features:-

(a) Striker locking segment assembly is fitted with weaker torsion springs than those used in the L19 fuze.

(b) Delayed arming shutter No. 4 is designed to arm at a lower rate of spin; a stainless steel safety plunger and a weaker plunger spring than that used in the delayed arming shutter No. 3 being used.

3. Body. - Made of Aluminium alloy - anodised all over, the body is cylindrical in shape with a wide flange formed at the base above which it is screw-threaded externally to 1.80 dia. 12 UNS.-2A (L.H.) gauge for approximately a quarter of its length, the remainder of the body being left plain. A hole is drilled in the centre of the base and screw-threaded to accept a tracer-adapter. Two key holes diagonally opposite are also formed in the base to enable the fuze to be inserted or removed from the shell. Internally, the body is bored from the top in four diameters, the smaller at the base to accommodate the striker and creep spring, the second and third, which are slightly larger in diameter, accommodates the striker locking segment, whilst the fourth and largest is screw-threaded at the mouth. This larger recess accommodates the delayed arming shutter above which the base portion of magazine is screwed home. The base and flange of the body is coated with varnish after the marking has been stamped on. Two screw threaded holes are formed in the body, the lower is for the delayed arming shutter alignment screw and the upper for shutter gauging.

4. Striker. - The striker consists of a brass electro-tinned cylindrical body, with a flange at the base above which it is formed on three decreasing diameters, a recess being formed in the top of the smallest diameter for the electro-plated tin or zinc coated steel needle, the stem of which protrudes through the centre of the striker locking segment. The needle, the base of which is flanged, is retained in the recess in the top of the body by a tin coated brass washer which is secured by spinning over a lip at the top of the recess. The needle is free to move sideways in its recess.

The striker is inserted into the cavity in the base of the fuze body together with the creep spring which is assembled around the larger diameter of the striker body, the bottom coil resting on the flange. The creep spring is retained under initial compression by the top coil seating in a recess and bearing against the base of the striker locking segment assembly.

5. Creep spring. - The creep spring is a cylindrical coiled tinned steel wire spring, with five effective coils of .048 dia. (18 SWG) wire, one coil at each end being close coiled and ground square with the axis of the spring. It is assembled round the larger diameter of the striker body and prevents the assembled striker creeping forward when the shell is in flight.

6. Striker locking segment assembly. - This is assembled in the fuze body, the lower portion fitting over the top of the striker. It is retained in position by the delayed arming shutter and the magazine.

The striker locking segment assembly comprises a holder, two electro tin plated steel pins, two springs, two segments, a washer and a cover.

(a) Segment holder. - The segment holder is of aluminium alloy, cylindrical in shape. Externally it is formed in two diameters, the larger being at the top. The bottom portion of the larger diameter is chamfered to blend with the smaller. The bottom of the smaller diameter is also chamfered. Internally, from the base it is bored out in two diameters, whilst a recess is formed in the top face to house the two locking segments, leaving a platform of metal between the top and bottom. A hole is drilled through the centre of the platform to permit the striker to pass through. In the base of this recess, near the periphery, two holes diametrically opposite are drilled to accept the steel pivot pins over which are assembled the coiled torsion springs and the segments, this assembly being contained by the Washer and Cover. When assembled, the tops of the two pins protrude above the top surface of the holder.

(b) Segments. - The segments are made of aluminium alloy, and are perfectly flat irregular aro-shaped fitments. One end is in the form of a toe which is machined to act as a working surface when the two segments are assembled in the unarmed or locked position, the other end is wider and acts as a weight which, under the influence of centrifugal force, over-comes the springs and allows the two segments to open out. Two holes are drilled near the toe, the larger to fit over the pin on which the segment pivots, the smaller accomodating the turned up end of the segment spring. In the closed or unarmed position the top portion of the striker bears against the underside of the closed segments, and thus the striker is prevented from moving forward until the segments are opened by centrifugal force, whilst the needle of the striker assembly protrudes through the hole formed by the two semi-circular slots one in each segment, through the washer and cover and into the pivot tube of the shutter delayed arming.

(c) Segment spring. - The segment springs are made of .018 (26 S.W.G.) tinned steel wire, with 6.1 close wound coils, the ends of the wire being bent up at right angles to the coils. These are assembled over the pivot pins and underneath the segments, the lower end of the spring fitting into a small hole drilled in the holder adjacent to the pin, whilst the upper end of the spring is located in a small hole drilled in the segment.

(d) Washer. - Made of aluminium alloy-anodised, the washer is in the form of a flat disc with a hole formed in the centre, and two slots diametrically opposite near the periphery. It is assembled on top of the holder, the protruding ends of the pivot pins being located in the slots, and the point of the striker needle protruding through the central hole.

(e) Cover. - The cover is made of aluminium alloy, formed with a large hole in the centre. It fits over the top of the holder, and retains the washer in position above the segments. It is secured in position by spinning or pressing the bottom edge over around the external chamfer of the larger diameter portion of the segment holder.

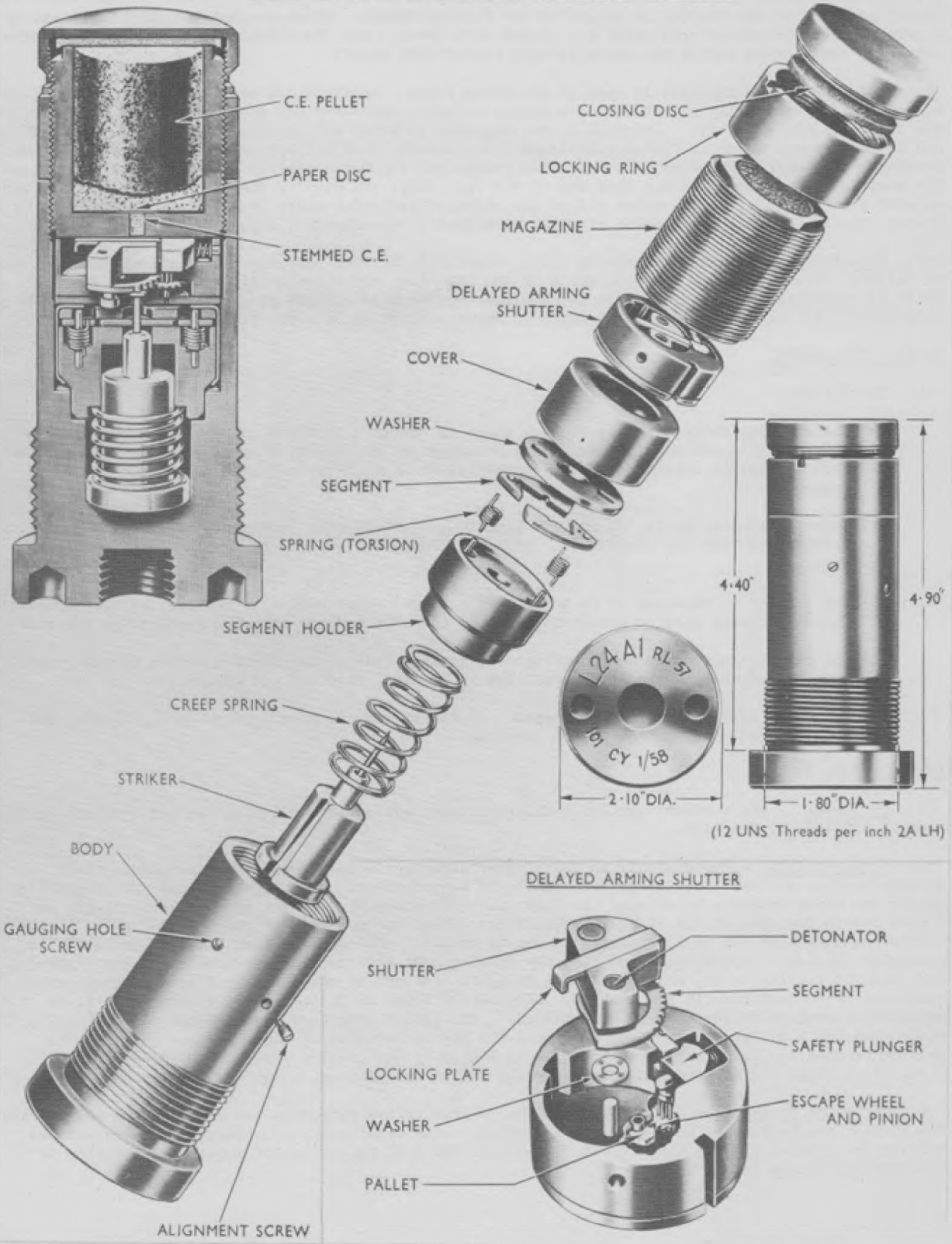
7. Locking ring. - Made of aluminium alloy - anodised all over, the ring is cylindrical in shape, formed plain on the outside and screw-threaded internally. Two slots, diametrically opposed, are cut across the mouth to facilitate assembly. It is screwed onto the upper part of the magazine locking against the top of the body.

8. Delayed arming shutter No. 4 series. - This consists of four main components, the body, the escapement, a safety plunger with spring and a shutter containing a 2.8 grain "AZ" lugless (tinned copper alloy cup) detonator assembled in a circular shaped shutter body over which fits a cover plate. The shutter is held in the "unarmed" position by means of the spring-loaded stainless steel safety plunger which engages in one end of a locking plate. The safety plunger is retained in a recess in the side of the shutter body by a plunger retaining strip. On spin, the safety plunger over-comes its spring and disengages from the recess in the end of the locking plate by centrifugal force and the lead weighted biased shutter rotates until the detonator is in a central position over the striker hole. The plunger retaining strip, which engages in a slot cut in the side of the plunger, retains the plunger in its recess in the shutter body. The locking plate, which fits into a slot made across the face of the shutter, moves out and engages in a recess made in the outer side of the shutter body, thus locking the shutter in the "armed" position. The delay is obtained by means of a pallet and pinion mechanism positioned beneath the shutter and this oscillates a segment by means of a 'scape wheel and pinion which retards the opening of the shutter. The Shutter commences to open when the shell is spinning between 3,700 and 4,500 revolutions per minute. The time of opening is between 0.045 and 0.075 seconds when the shell is spinning at 5,900 revolutions per minute.

The closed (lower) face of the Shutter, Delayed Arming rests on the Holder, Segment. When the magazine is screwed home, it clamps both the Shutter, Delayed Arming and Holder segment, in position with the creep spring located between the striker flange and the face of the larger recess in the holder. The correct position of the Shutter, Delayed Arming is controlled by the engagement of a

FUZE, PERCUSSION, BASE, MEDIUM, L24A1

FIG.1



screw with the vertical slot in the body. The fuze body and the Shutter, Delayed Arming body are provided with safety gauging holes which are in alignment in the assembled fuze and through which the "SAFE" position of the shutter is gauged at the filling stage. After gauging the hole is closed by a screw. The threads of this screw are coated with cement, and the thread is stabbed after screwing home, and the slotted end of the screw is then coated with cement.

9. Magazine. - The magazine is made of aluminium alloy - anodised all over. It is cup-shaped and screw-threaded externally except for an undercut at each end. Two key slots are formed in the outer rim to facilitate assembly. Internally, the magazine is bored out to take a prepressed pellet of C.E. and a small recess which is filled with loose C.E. stemmed in is drilled in the centre at the bottom, leaving a thin diaphragm of metal between the recess and the outer surface at the base of the magazine. The magazine is screwed into the open end of the fuze body, the base of the magazine resting on the delayed arming shutter. The outer end of the magazine protrudes above the body of the fuze, it is locked into the body by the locking ring and is closed by the magazine cap.

10. Magazine cap. - Made of aluminium alloy - anodised all over, the magazine cap is cup-shaped with an internal thread to screw over the mouth of the magazine, the threads being coated with RD 1286 prior to assembly. A box-cloth disc is attached to the inner surface by shellac adhesive. It is then secured by the outer rim being crimped in three or more equi-spaced positions.

SAFETY ARRANGEMENTS

11. These are:-

(a) The rotating delayed arming shutter which is retained in the safe or unarmed position by the spring loaded safety plunger which engages in the safety locking plate. This provides bore and muzzle safety to cover a specified minimum distance from the gun when arming commences.

(b) When the shutter is in the unarmed position, its detonator is screened off from the striker and from the stemmed C.E. channel leading to the C.E. pellet in the body of the magazine.

(c) The shutter is designed so as to provide a slight delay before it reaches the armed position. The approximate time of operation is 0.045 to 0.075 seconds at 5,900 revolutions per minute.

(d) The striker locking segments prevent the striker from moving forward before firing, and hold the striker in the "SAFE" position in transit, handling and loading.

(e) The creep spring prevents the tendency of the striker to move forward during flight, due to deceleration after leaving the muzzle.

ACTION (FIG. 2)

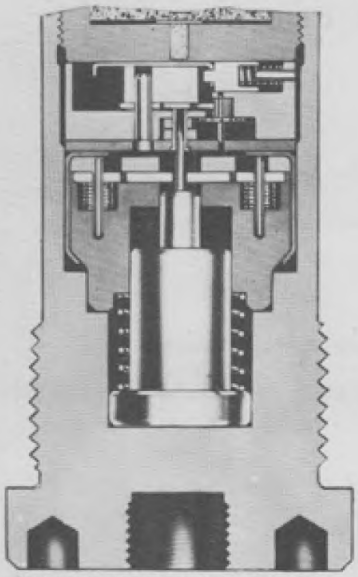
12. On firing. - The shutter, striker locking segments and striker set back and are retained in the unarmed position by friction.

13. During flight. - The segments in the striker locking assembly move outwards against their springs leaving a clear passage for the striker to move forward. The safety plunger overcomes its spring and moves outwards to release the shutter. The plunger retaining strip, which engages in a slot cut in the side of the plunger, retains the latter and prevents it leaving its recess in the shutter housing when the plunger spring reasserts itself. The shutter begins to rotate until its detonator reaches a central position directly in alignment with the striker needle and the stemmed C.E. channel leading to the magazine. The delay is obtained by means of a pellet and escape wheel mechanism positioned beneath the shutter. The escape wheel is fitted with a pinion which is in mesh with a segment on the side of the shutter. The pallet acts as a pendulum and engages successive teeth in the escape wheel to retard the rotary movement of the shutter. When the shutter reaches the fully armed position, it is locked by the locking plate which moves outwards along its slot in the top face of the shutter to engage in a recess in the shutter housing.

14. On impact or graze. - The momentum of the striker holder overcomes the creep spring and carries the striker needle forward to pierce the detonator. The resultant detonating wave is transmitted through the stemmed C.E. in the magazine channel to the C.E. pellet in the magazine and thence to the bursting charge in the shell.

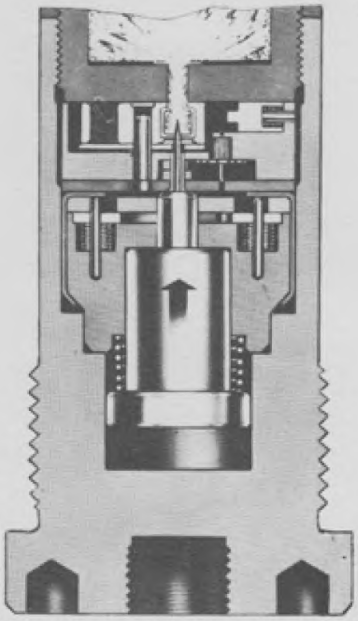
ACTION OF L24AI FUZE

FIG.2



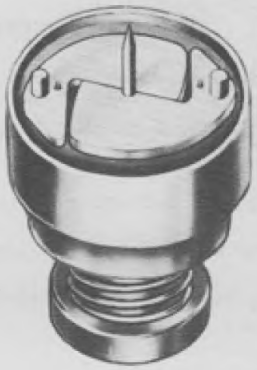
FUZE UNARMED WITH DELAYED ARMING SHUTTER SEGMENTS AND STRIKER HELD IN SAFE POSITION

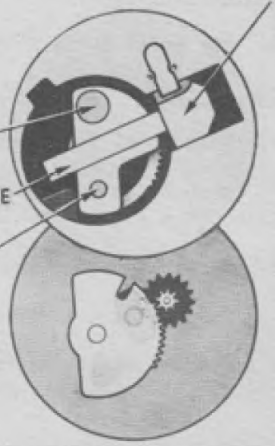
COVER AND WASHER REMOVED FOR ILLUSTRATIVE PURPOSES



SEGMENTS HELD OPEN AND STRIKER IN FIRED POSITION

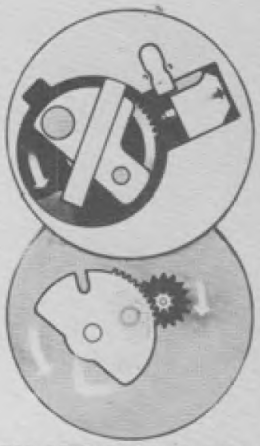
BEFORE FIRING





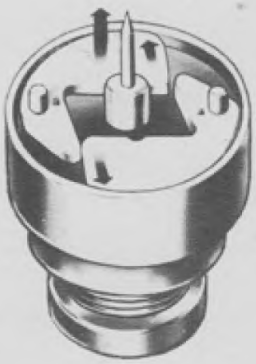
SHUTTER LOCKED IN THE UNARMED POSITION

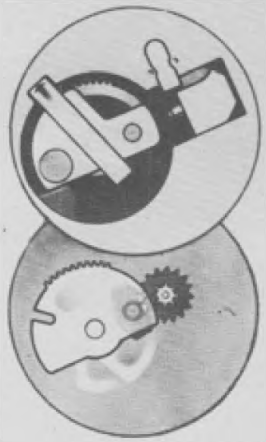
DURING FLIGHT



SHUTTER RELEASED AND ROTATING TOWARDS THE ARMED POSITION

ON IMPACT





SHUTTER LOCKED IN THE FULLY ARMED POSITION

SUMMARY OF DIFFERENCES

MODEL A1 FUZE (Obsolescent) WOLC S S ~~C.9992~~ C9946. C9992

15. The model A1 is fitted with Shutter, delayed arming No. 4.

MODEL A2 FUZE WOLC S S C.9992

16. This model is fitted with shutter, delayed arming No. 4A or 4A/1.

17. Both these shutters differ from the No. 4 in that they incorporate a 2.6 gr 'LZ' detonator in lieu of a 2.8 gr 'AZ' detonator.

18. In addition the shutters differ in the following way:-

(a) No. 4A - die cast, body as for No. 4 but with larger diameter shutter gauging hole.

(b) No. 4A/1 - machined from bar, it also incorporates a larger diameter shutter gauging hol

UNDER para 18(b) add:

"NOTE:
With effect from September, 1969 the nomenclature of the Shutters, Delayed Arming, Nos 4A and 4A/1 referred to in this Annexure will be amended as shown below:

Delayed Arming Unit, No 4A
Delayed Arming Unit, No 4A/1"

FUZE, PERCUSSION, BASE, MEDIUM L29

1. Particulars:-

(a) Type	Percn., Base, Medium, with delayed arming shutter
(b) Guns	105 mm. TK. gun 120 mm. TK. gun 105 mm. HOW. L10
(c) Projectiles	H.E.S.H. shell (and Prac. S.H.). See Notes (a) (b) and (c)

DESCRIPTION - Model A1 (Fig. 1)

GENERAL

2. The L29 base, medium, percussion fuze is a graze action detonating type which incorporates a delayed arming shutter and a striker locking assembly. It consists principally of a body, magazine and cap, striker assembly, creep spring, striker locking segment, locking ring, and delayed arming shutter No. 3 series containing a 2.8 grain "AZ" detonator.

3. Body. - Made of Aluminium alloy - anodised all over, the body is cylindrical in shape with a wide flange formed at the base. It is screw-threaded externally to 2.0 dia. 12 UNS. - 2A (L.H.) gauge for approximately a quarter of its length from the top, the remainder of the body being left plain. A hole is drilled in the centre of the base and screw-threaded to accept a tracer-adapter. Two key holes diagonally opposite are also formed in the base to enable the fuze to be inserted or removed from the shell. Internally, the body is bored from the top in four diameters, the smaller at the base to accommodate the striker and creep spring, the second and third, which are slightly larger in diameter, accommodates the striker locking segment, whilst the fourth and largest is screw-threaded at the mouth. This larger recess accommodates the delayed arming shutter above which the base portion of magazine is screwed home. The base and flange of the body is coated with varnish after the marking has been stamped on. Two screw threaded holes are formed in the body, the lower is for the alignment screw for the delayed arming shutter and the upper for shutter gauging.

4. Striker. - The striker consists of a brass electro-tinned cylindrical body, with a flange at the base above which it is formed on three decreasing diameters, a recess being formed in the top of the smallest diameter for the electro-plated tin or zinc coated steel needle, the stem of which protrudes through the centre of the striker locking segment. The needle, the base of which is flanged, is retained in the recess in the top of the body by a tin coated brass washer which is secured by spinning over a lip at the top of the recess. The needle is free to move sideways in its recess.

The striker is inserted into the cavity in the base of the fuze body together with the creep spring which is assembled around the larger diameter of the striker body, the bottom coil resting on the flange. The creep spring is retained under initial compression by the top coil seating in a recess and bearing against the base of the striker locking segment assembly.

5. Creep spring. - The creep spring is a cylindrical coiled tinned steel wire spring, with five effective coils of .048 dia. (18 SWG) wire, one coil at each end being close coiled and ground square with the axis of the spring. It is assembled round the larger diameter of the striker body and prevents the assembled striker creeping forward when the shell is in flight. It also retains the striker in the unarmed position before firing

6. Striker locking segment assembly. - This is assembled in the fuze body, the lower portion fitting over the top of the striker. It is retained in position by the delayed arming shutter and the magazine.

The striker locking segment assembly comprises a holder, two electro tin plated steel pins, two springs, two segments, a washer and a cover.

(a) Segment holder. - The segment holder is of aluminium alloy, cylindrical in shape. Externally it is formed in two diameters, the larger being at the top. The bottom portion of the larger diameter is chamfered to blend with the smaller. The bottom of the smaller diameter is also chamfered. Internally, from the base it is bored out in two diameters, whilst a recess is formed in the top face to house the two locking segments, leaving a platform of metal between the top and bottom. A hole is drilled through the centre of the platform to permit the striker to pass through. In the base of this recess, near the periphery, two holes diametrically opposite are drilled to accept the steel pivot pins over which are assembled the coiled torsion springs and the segments, this assembly being contained by the Washer and Cover. When assembled, the tops of the two pins protrude above the top surface of the holder.

Annexure "F" -
Sub-para 6b. - DELETE existing sub-para and INSERT new sub-para 6b. -

Amdt 1/Feb/1970

b. Segments

The segments are made of aluminium alloy and are housed in the recess at the top of the segment holder. The segments are pivoted on the pins fitted in the platform of the holder and are designed to allow the needle of the striker to pass through a hole formed when they are assembled in the locked or unarmed position.

(c) Segment spring - The segment springs are made of .024 (23 S.W.G.) tinned steel wire, with 5.2 close wound coils, the ends of the wire being bent up at right angles to the coils. These are assembled over the pivot pins and underneath the segments, the lower end of the spring fitting into a small hole drilled in the holder adjacent to the pin, whilst the upper end of the spring is located in a small hole drilled in the segment.

(d) Washer. - Made of aluminium alloy-anodised, the washer is in the form of a flat disc with a hole formed in the centre, and two slots diametrically opposite near the periphery. It is assembled on top of the holder, the protruding ends of the pivot pins being located in the slots, and the point of the striker needle protruding through the central hole.

(e) Cover. - The cover is made of aluminium alloy, formed with a large hole in the centre. It fits over the top of the holder and retains the washer in position above the segments. It is secured in position by spinning or pressing the bottom edge over the external chamfer of the larger diameter portion of the segment holder.

7. Locking ring. - Made of aluminium alloy - anodised all over, the ring is cylindrical in shape, formed plain on the outside and is screw-thread internally. Two slots, diametrically opposed, are cut across the mouth to facilitate assembly. It is screwed onto the upper part of the magazine, locking against the top of the body.

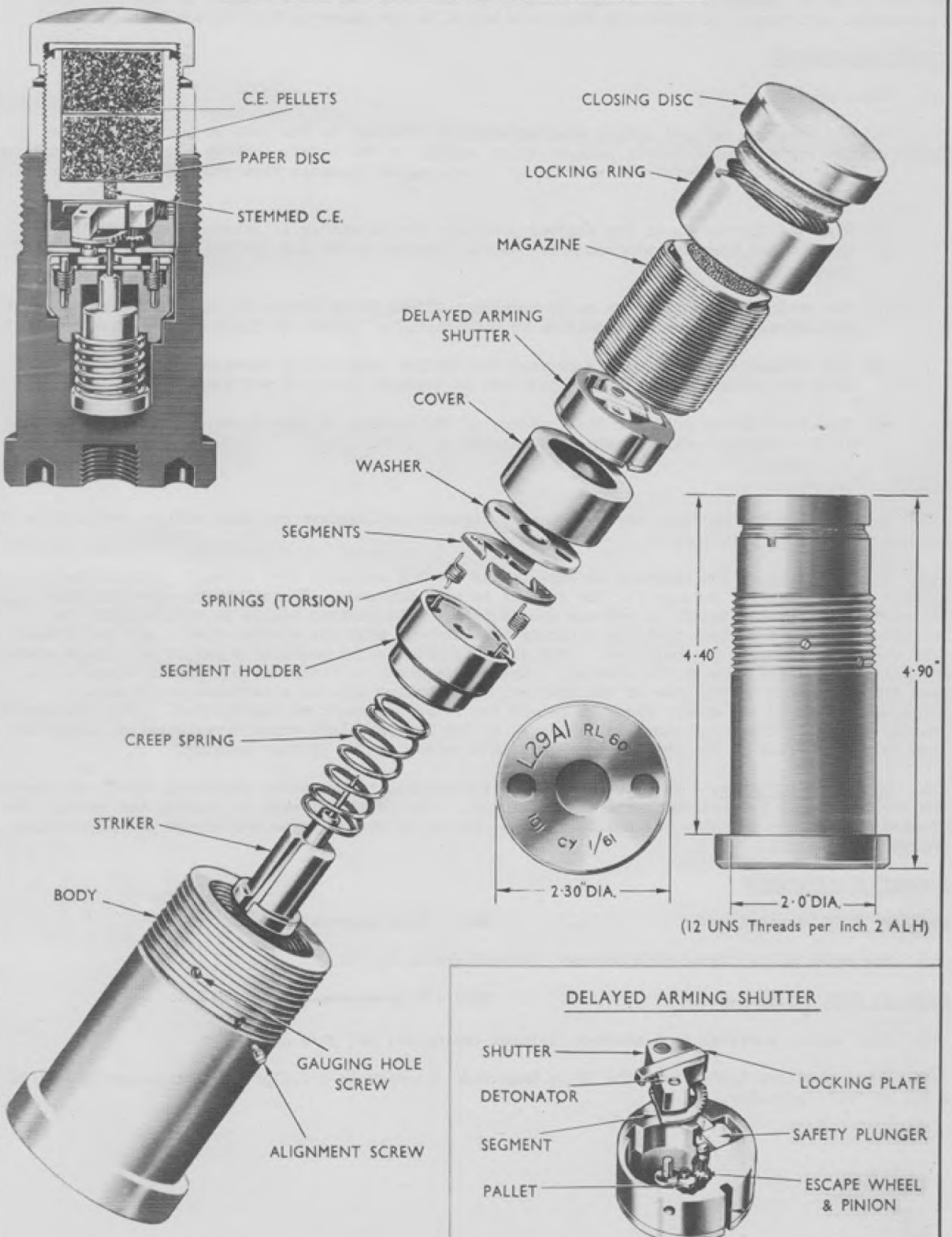
8. Delayed arming shutter No. 3B. - This consists of four main components, the body, the escapement, a safety plunger with spring and a shutter containing a 2.8 grain "AZ" lugless (tinned copper alloy cup) detonator assembled in a circular shaped shutter body over which fits a cover plate. The shutter is held in the "unarmed" position by means of the spring-loaded aluminium alloy safety plunger which engages in one end of a locking plate. The safety plunger is retained in a recess in the side of the shutter body by a plunger retaining strip. On spin, the safety plunger overcomes its spring and disengages from the recess in the end of the locking plate by centrifugal force and the lead weighted biased shutter rotates until the detonator is in a central position over the striker hole. The plunger retaining strip, which engages in a slot cut in the side of the plunger, retains the plunger in its recess in the shutter body. The locking plate, which fits into a slot made across the face of the shutter, moves out and engages in a recess made in the outer side of the shutter body, thus locking the shutter in the "armed" position. The delay is obtained by means of a pallet and pinion mechanism positioned beneath the shutter and this oscillates a segment by means of a 'scape wheel and pinion which retards the opening of the shutter. The Shutter commences to open when the shell is spinning between 7,000 and 8,500 revolutions per minute. The time of opening is between 0.02 and 0.055 seconds when the shell is spinning at 9,000 revolutions per minute.

The closed (lower) face of the Shutter, Delayed Arming rests on the Holder, Segment. When the magazine is screwed home, it clamps both the Shutter, Delayed Arming and Holder segment, in position with the creep spring located between the striker flange and the face of the larger recess in the holder. The correct position of the Shutter, Delayed Arming is controlled by the engagement of a screw with the vertical slot in the body. The fuze body and the Shutter, Delayed Arming body are provided with safety gauging holes which are in alignment in the assembled fuze and through which the "SAFE" position of the shutter is gauged at the filling stage. After gauging the hole is closed by a screw. The threads of this screw are coated with cement, and the thread is stabbed after screwing home, and the slotted end of the screw is then coated with cement.

9. Magazine. - The magazine is made of aluminium alloy - anodised all over. It is cup-shaped and screw-threaded externally except for an undercut at each end. Two key slots are formed in the outer rim to facilitate assembly. Internally, the magazine is bored out to take a prepressed pellet of C.E. and a small recess which is filled with loose C.E. stemmed in is drilled in the centre at the bottom, leaving a thin diaphragm of metal between the recess and the outer surface at the base of the magazine. The magazine is screwed into the open end of the fuze body, the base of the magazine resting on the delayed arming shutter. The outer end of the magazine protrudes above the body of the fuze, it is locked into the body by the locking ring and is closed by the magazine cap.

FIG.1

FUZE, PERCUSSION, BASE, MEDIUM, L29A1



DELAYED ARMING SHUTTER

10. Magazine cap. - Made of aluminium alloy - anodised all over, the magazine cap is cup-shaped with an internal thread to screw over the mouth of the magazine, the threads being coated with RD 1286 prior to assembly. It is then secured by the outer rim being crimped in three or more equi-spaced positions. A box-cloth disc is attached to the inner-surface by shellac adhesive.

SAFETY ARRANGEMENTS

11. These are:-

(a) The rotating delayed arming shutter which is retained in the safe or unarmed position by the spring loaded safety plunger which engages in the safety locking plate. This provides bore and muzzle safety to cover a specified minium distance from the gun when arming commences.

(b) When the shutter is in the unarmed position, its detonator is screened off from the striker and from the stemmed C.E. channel leading to the C.E. pellet in the body of the magazine.

(c) The shutter is designed so as to provide a slight delay before it reaches the armed position. The approximate time of operation is 0.02 to 0.055 seconds at 9,000 revolutions per minute.

(d) The striker locking segments prevent the striker from moving forward before firing, and hold the striker in the "SAFE" position in transit, handling and loading.

(e) The creep spring prevents the tendency of the striker to move forward during flight, due to deceleration after leaving the muzzle.

ACTION (FIG. 2)

12. On firing. - The shutter, striker locking segments and striker set back and are retained in the unarmed position by friction.

13. During flight. - The segments in the striker locking assembly move outwards against their springs leaving a clear passage for the striker to move forward. The safety plunger overcomes its spring and moves outwards to release the shutter. The shutter begins to rotate until its detonator reaches a central position directly in alignment with the striker needle and the stemmed C.E. channel leading to the magazine. The delay is obtained by means of a pallet and escape wheel mechanism positioned beneath the shutter. The escape wheel is fitted with a pinion which is in mesh with a segment on the side of the shutter. The pallet acts as a pendulum and engages successive teeth in the escape wheel to retard the rotary movement of the shutter. When the shutter reaches the fully armed position, it is locked by the locking plate which moves outwards along its slot in the top face of the shutter to engage in a recess in the shutter housing.

14. On impact or graze. - The momentum of the striker holder overcomes the creep spring and carries the striker needle forward to pierce the detonator. The resultant wave is transmitted through the stemmed C.E. in the magazine channel to the C.E. pellet in the magazine and thence to the bursting charge in the shell.

SUMMARY OF DIFFERENCES

MODEL A1 FUZE (Obsolescent) WOLC - S/S IA Approval K 1918

15. The model A1 is fitted with Shutter, delayed arming No. 3B.

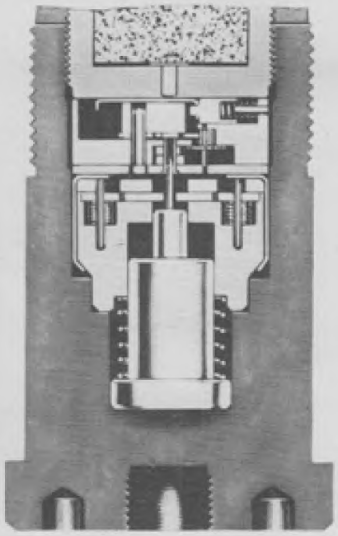
MODEL A2 FUZE (Obsolescent) WOLC - S/S ~~IA Approval K 1918~~ 323. D271

16. This model is fitted with shutter, delayed arming No. 3C, 3C/1 or 3C/2.

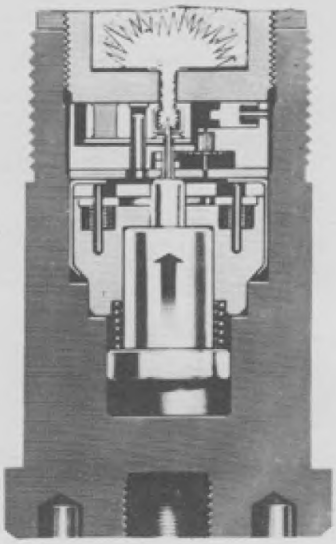
17. These shutters differ from the 3B in that they incorporate a 2.6 gr "LZ" detonator in lieu of a 2.8 gr "AZ" detonator.

ACTION OF L29A1 FUZE

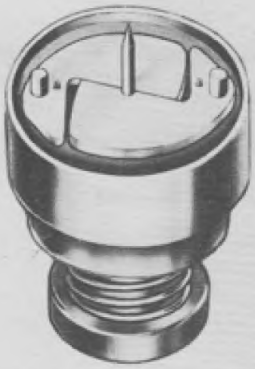
FIG.2

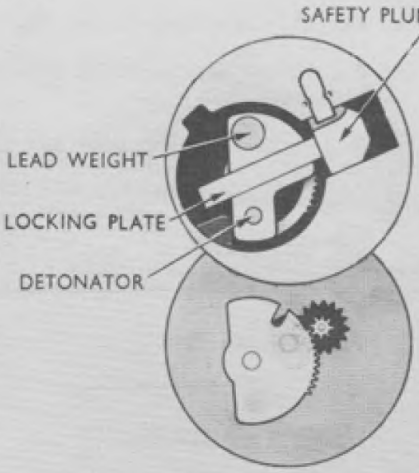


COVER AND WASHER REMOVED FOR ILLUSTRATIVE PURPOSES



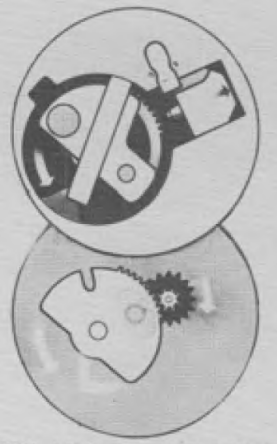
BEFORE FIRING





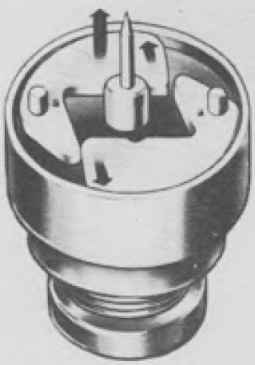
SHUTTER LOCKED IN THE UNARMED POSITION

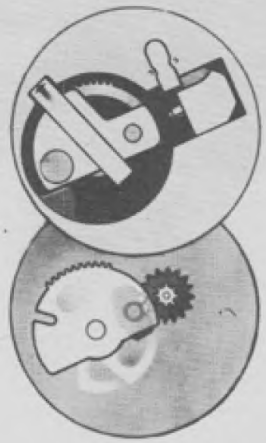
DURING FLIGHT



SHUTTER RELEASED AND ROTATING TOWARDS THE ARMED POSITION

ON IMPACT





SHUTTER LOCKED IN THE FULLY ARMED POSITION

18. In addition these shutters differ in the following way:-

(a) No. 3C - same body as No. 3B, i.e. die-cast.

(b) No. 3C/1 - body machined from bar, it also incorporates a shutter gauging hole of increased diameter.

(c) No. 3C/2 - body die cast but incorporating a shutter gauging hole of increased diameter.

NOTES

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MODEL A3 FUZE

19. This model is fitted with Shutter, delayed, arming, No 6 or No 6/1. The top CE pellet is not covered by a cloth disc.

20. The body of the No 6 shutter is die-cast whereas that of the No 6/1 shutter is manufactured from bar.

21. The Nos 6 and 6/1 shutters differ from the Nos 3C/1 and 3C/2 shutters mainly in certain manufacturing details.

NOTE 1.

a. 105 mm Tk - Round, HESH, L35A2, L37A2 and Prac SH, L38A2.

b. 120 mm Tk, L11 - Shell, HESH, L31A4, L31A5.

c. 105 mm How L10 - Round, HESH, L43A1.

NOTE 2.

With effect from September, 1969 the nomenclature of the Shutters, Delayed Arming, Nos 6 and 6/1 referred to in this Annexure will be amended to read as shown below:

Delayed Arming Unit, No 6
Delayed Arming Unit, No 6/1

FUZE, BASE, PERCUSSION, L56

1. Particulars.

a.	Type	Percussion, Base with delayed arming shutter.
b.	Guns	Ordnance, 120 mm Tk, L11.
c.	Projectiles	Shell, HESH, L31A7. Shell, Smoke, WP, L34A1.

Description - Model A1 (Fig 1)

2. The L56A1 fuze is a graze action detonating type incorporating a delayed arming shutter and a striker assembly. It consists, principally, of a body, striker assembly, No 7 Delayed Arming Shutter, a magazine filled with a CE pellet and stemmed CE, and a cap.

3. Body.

Made of aluminium alloy, the cylindrically shaped body is formed with a flanged base and is screw-threaded externally to a 2.0 in diameter 12 UNS (LH) gauge. The base is formed with two key-holes, diametrically opposite, and a hole in the centre which is screw-threaded to accept a tracer adaptor should this be required; the key-holes facilitate the use of an assembly tool. Internally, the body is suitably shaped to accommodate the components and is screw-threaded at the mouth for the acceptance of a magazine.

4. Striker Assembly.

The striker assembly is located at the bottom of the fuze body and consists, principally, of a housing, with top and bottom covers, in which are assembled two cages with eight anti-friction balls, an inertia pellet, creep spring, striker and washer.

a. Housing.

The steel housing takes the form of an open-ended cylinder with an aluminium cover at each end. The covers are swaged into cannelures formed at the ends of the cylinder.

b. Cage.

This is a cylindrical moulded polythene component the side of which is shaped to form four wedge-shaped prongs, each with the top edge radiused to form a seating for a steel ball. A recess is formed in the base of the cage. Two of these cages are assembled together so that their prongs interlock and form eight holes (four at each end) for the reception of the anti-friction balls. The cages with the steel balls function as an anti-friction device which ensures the free sliding movement of the inertia pellet on impact or graze.

c. Inertia Pellet.

This is a solid steel cylinder located within the assembled cages below the striker. On impact or graze the pellet moves forward, overcoming the creep spring and causing the striker to impinge on the detonator located in the delayed arming shutter.

d. Creep Spring.

This is a helical spring positioned between the top cover of the striker assembly and the washer. Its function is to prevent the striker from creeping on to the detonator in the delayed arming shutter whilst the shell is decelerating in flight.

e. Striker and Washer.

The striker is a steel needle pointed at one end and flanged at the base. The aluminium alloy washer is saucer-shaped and fits over the striker through a hole drilled in its centre. The washer, with the striker assembled, is positioned in a recess formed in the top cage and is retained in position by the creep spring which is under compression due to the pressure exerted on it by the top cover.

5. Shutter, Delayed Arming, No 7.

The No 7 shutter is a mechanical safety unit which, when assembled to the fuze, ensures that the projectile is not armed until it has travelled a pre-determined distance from the gun. The shutter consists, principally, of a body, shutter assembly, detent, detent spring, shutter lock and an escapement mechanism.

a. Body.

Of aluminium alloy, the body is circular in shape and is recessed from the top and from the bottom to form a platform. The top recess is closed by a plate screwed to the upper face of the body and is shaped to accommodate the shutter assembly and the shutter lock. A pin protruding from the platform is the pivot about which the shutter and segment rotate, and a cylindrical recess in the platform houses a detent. The bottom recess of the body houses the pallet and escape pinion, and is closed by a cover plate.

b. Shutter Assembly.

The shutter assembly comprises a shutter with a 2,3 gr LZY lugless aluminium alloy detonator, locking plate and safety plunger.

(1) Shutter.

Of aluminium alloy, the shutter takes the form of a semi-circle with a segment removed to form an arm. A channel is cut across the top surface for the reception of the locking plate and a pivot hole is flanked by two holes, one containing the detonator and the other a lead weight. Two pins projecting from the underside of the shutter engage in a hole and a slot formed in the escapement segment.

(2) Locking Plate.

This is a steel strip with each end bent at right angles; a hole is drilled in one end to accept the spigot of the safety plunger. The locking plate and the safety plunger together retain the shutter in the unarmed position before firing. During flight and on impact the locking plate locks the shutter in the armed position, that is, when the detonator is directly over the striker.

(3) Safety Plunger.

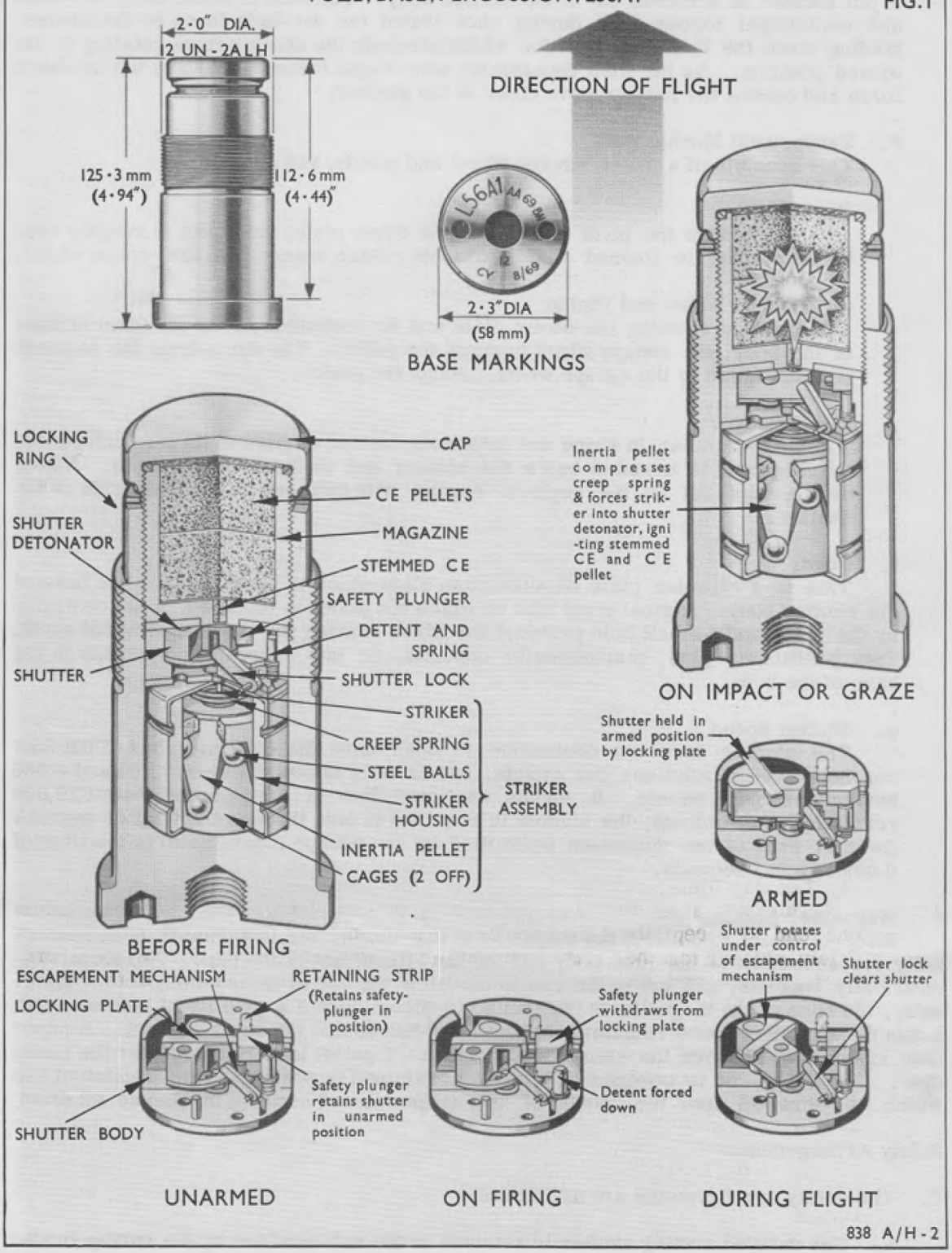
Of steel, the safety plunger is formed with a spigot on its front face which engages with the locking plate. The plunger is held against the locking plate by a spring and is retained in its recess in the body of the shutter by a retaining strip. The safety plunger, in conjunction with the locking plate, retains the shutter in the unarmed position.

c. Detent.

This is a cup-shaped component, spring-loaded and located in a recess in the shutter body. Its function is to prevent any movement of the safety plunger until after shot start.

FUZE, BASE, PERCUSSION, L56A1

FIG. 1



838 A/H-2

d. Shutter Lock.

This is a rectangular steel strip which provides bore safety. It is pivoted on a pin located in a recess cut in the shutter body. The lock is acted on by set-back and centrifugal forces, and during shot travel the set-back force predominates, holding down the lock in a position which prevents the shutter from rotating to the armed position. As the shell decelerates centrifugal force overcomes the set-back force and causes the lock to move clear of the shutter.

e. Escapement Mechanism.

This consists of a pallet, escape wheel and pinion, and segment.

(1) Pallet.

Mounted on the pivot tube set in the cover plate, the pallet is roughly oval in shape and is formed with two teeth which engage with the escape wheel.

(2) Escape Wheel and Pinion.

Mounted between the cover plate and the underside of the platform formed in the body, the escape wheel engages the pallet. The drive from the segment is transmitted to the escape wheel through the pinion.

(3) Segment.

Semi-circular in shape and with teeth formed on part of its circumference, the segment is mounted below the shutter and on the same pivot pin. A hole and a slot cut in the segment engage with two pins on the underside of the shutter.

f. Cover.

This is a circular plate of aluminium alloy which is screwed on to the base of the shutter body. A steel pivot tube on which the pallet is mounted, is set centrally in the plate and a small hole provides the lower bearing for the escape wheel pivot. Two positioning pins, diametrically opposite, fit into corresponding holes in the base of the body.

g. Shutter Speed.

The shutter does not commence to open until the rotating speed of the fuze reaches 3,700 revolutions per minute, and is fully opened between 3,700 and 4,500 revolutions per minute. It should be noted that in a high speed test at 15,000 revolutions per minute, the shutter is required to turn through the first 60 degrees (ie that part of the movement controlled by the escape mechanism) in the time of 0.009 to 0.019 seconds.

6. Magazine.

Made of aluminium alloy, the magazine is cup-shaped and is screw-threaded externally for assembly to the fuze body and for the attachment of the cap. Two slots, diametrically opposite, are cut in the rim to facilitate the use of an assembly tool. Internally, the base of the magazine is channelled to accommodate a quantity of stemmed CE, a thin diaphragm of metal remaining between the recess and the outer surface. A paper disc is positioned above the stemmed CE and a CE pellet is assembled over the paper disc. The CE pellet is covered by a felt disc retained in position by an aluminium cap which is screwed onto the mouth of the magazine and secured by shellac adhesive.

Safety Arrangements

7. The safety arrangements are as follows:

a. The delayed arming shutter is retained in the safe position by the spring-loaded safety plunger which engages with the locking plate. The detent prevents the safety plunger from withdrawing from the locking plate until after shot start.

b. Bore safety is ensured by the shutter lock which prevents the shutter from moving to the armed position until the shell commences to decelerate.

c. When the shutter is in the unarmed position its detonator is screened off from the striker and the stemmed CE channel leading to the CE pellet in the magazine.

d. The escapement mechanism provides a slight delay before the shutter reaches the armed position.

e. The creep spring prevents the striker from moving forward during flight. The tendency of the striker to do this is due to the deceleration of the shell after it leaves the gun.

Action

8. On Firing.

Set-back force acts on the detent which is forced downwards against its spring and centrifugal force causes the safety plunger to withdraw from the locking plate to a position over the detent, now prevented from rising to its former position when set-back ceases.

9. During Flight.

Deceleration commences as the shell leaves the muzzle, set-back ceases and the shutter lock moves clear of the shutter under the action of centrifugal force. The shutter, now free to move, rotates under the control of the escapement mechanism for the first 60 degrees of its travel, after which the segment disengages from the escape pinion and the shutter swings to the fully armed position. It is locked in this position by the shutter locking plate which, under centrifugal action, has moved out to engage with a slot in the shutter body. The shutter detonator is now in alignment with the striker and with the diaphragm beneath the stemmed CE.

10. On Impact or Graze.

The momentum of the inertia pellet compresses the creep spring and forces the striker on to the shutter detonator. The resultant detonating wave penetrates the diaphragm under the CE channel, ignites the stemmed CE and the CE pellet in the magazine which, in turn, ignites the bursting charge in the shell.

Summary of Differences

Model A1 Fuze	I Arm Approval E/297

11. As described in paras 2 to 10.

NOTE: With effect from September, 1969 the nomenclature of the Shutter, Delayed Arming, No 7 referred to in this Annexure will be amended to "Delayed Arming Unit, No 7".

FUZE ASSEMBLY, BASE, PERCUSSION, L58

1. Particulars.

a.	Type	Percussion, Base, with delayed arming shutter and shell base.
b.	Guns	105 mm Field, L13 gun (Abbot) Ordnance, 105 mm Light Gun, L19A1.
c.	Projectiles	Shell, HESH, L42.

Description - Model A1 (Fig 1)

2. The L58A1 fuze is a graze action detonating type incorporating a delayed arming shutter and a striker assembly. It consists, principally, of a shell base, can, striker assembly, No 7 Delayed Arming Shutter and, a magazine filled with a CE pellet and stemmed CE.

3. Shell Base.

Made of aluminium alloy, the base not only closes the end of the shell but houses the fuze and four tracers. Externally, the base is reduced to a three inch diameter at the forward end which is partly screw-threaded to a 12 UNS (LH) gauge for assembly to the shell body. A nylon sealing ring is assembled over the plain portion adjacent to the screw threads. Internally, the base is bored and screw-threaded to accommodate the fuze. Four equi-spaced holes are drilled in the rear face of the base, each being screw-threaded at the mouth. Each hole accommodates a tracer and a screwed plug. Two plain holes, diametrically opposite, are bored in the rear face to facilitate the use of an assembly tool.

4. Can.

This is an aluminium casing, cylindrical in shape and closed at one end. It provides a housing for the striker assembly and the delayed arming shutter. To secure the can to the magazine the open end is swaged into a cannelure formed on the periphery of the magazine.

5. Striker Assembly.

The striker assembly is located at the bottom of the fuze can (or casing) and consists, principally, of a housing, with top and bottom covers, in which are assembled two cages with eight anti-friction balls, an inertia pellet, creep spring, striker and washer.

a. Housing.

The steel housing takes the form of an open-ended cylinder with an aluminium cover at each end. The covers are swaged into cannelures formed at the ends of the cylinder.

b. Cage.

This is a cylindrical moulded polythene component the side of which is shaped to form four wedge-shaped prongs, each with the top edge radiused to form a seating

for a steel ball. A recess is formed in the base of the cage. Two of these cages are assembled together so that their prongs interlock and form eight holes (four at each end) for the reception of the anti-friction balls. The cages with the steel balls function as an anti-friction device which ensures the free sliding movement of the inertia pellet on impact or graze.

c. Inertia Pellet.

This is a solid steel cylinder located within the assembled cages below the striker. On impact or graze the pellet moves forward, overcoming the creep spring and causing the striker to impinge on the detonator located in the delayed arming shutter.

d. Creep Spring.

This is a helical spring positioned between the top cover of the striker assembly and the washer. Its function is to prevent the striker from creeping on to the detonator in the delayed arming shutter whilst the shell is decelerating in flight.

e. Striker and Washer.

The striker is a steel needle pointed at one end and flanged at the base. The aluminium alloy washer is saucer-shaped and fits over the striker through a hole drilled in its centre. The washer, with the striker assembled, is positioned in a recess formed in the top cage and is retained in position by the creep spring which is under initial compression due to the pressure exerted on it by the top cover.

6. Shutter, Delayed Arming, No 7.

The No 7 shutter is a mechanical safety unit which, when assembled to the fuze, ensures that the projectile is not armed until it has travelled a pre-determined distance from the gun. The shutter consists, principally, of a body, shutter assembly, detent, detent spring, shutter lock and an escapement mechanism.

a. Body.

Of aluminium alloy, the body is circular in shape and is recessed from the top and from the bottom to form a platform. The top recess is closed by a plate screwed to the upper face of the body and, is shaped to accommodate the shutter assembly and the shutter lock. A pin protruding from the platform is the pivot about which the shutter and segment rotate, and a cylindrical recess in the platform houses a detent. The bottom recess of the body houses the pallet and escape pinion, and is closed by a cover plate.

b. Shutter Assembly.

The shutter assembly comprises a shutter with a 2.3 gr LZY lugless aluminium alloy detonator, locking plate and safety plunger.

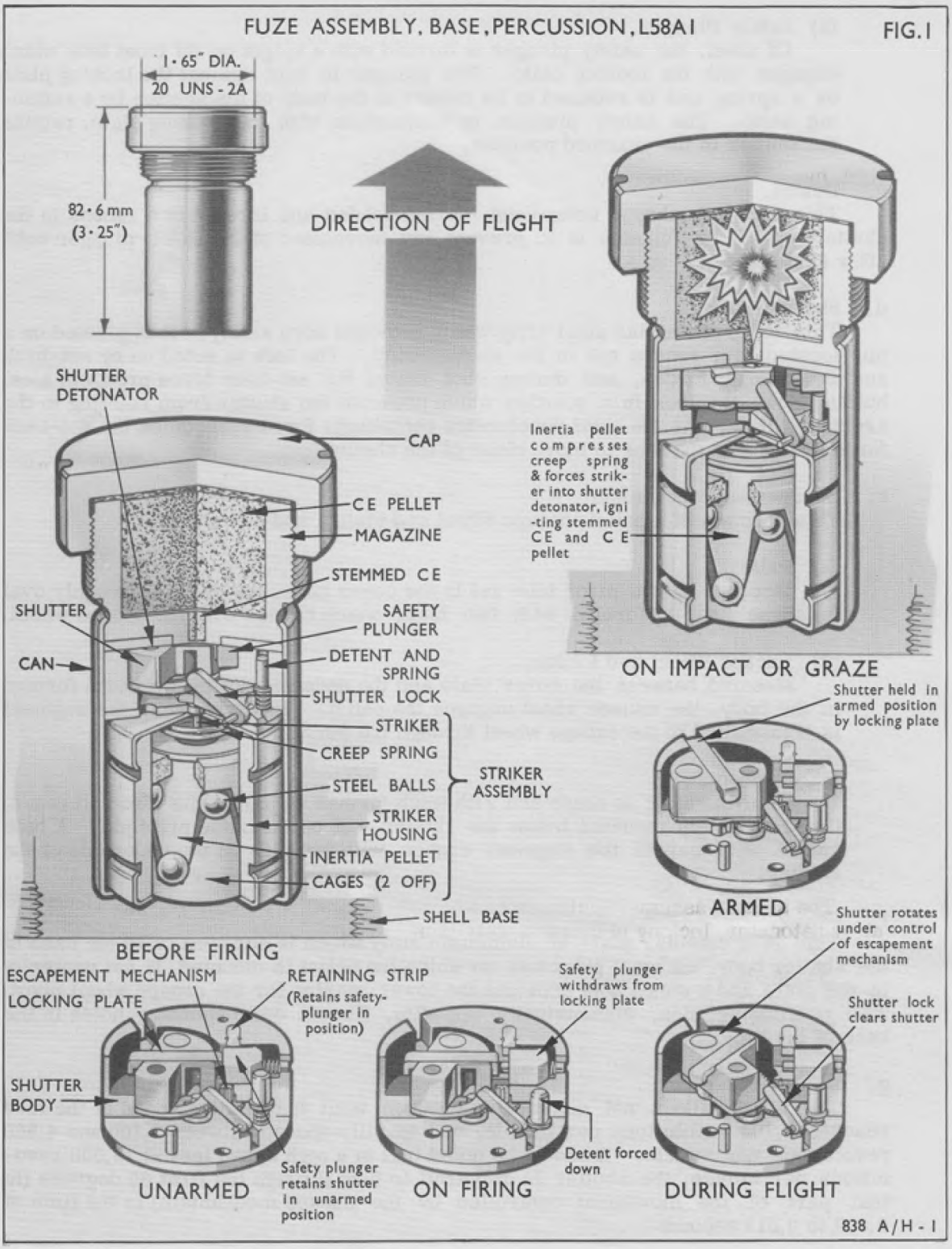
(1) Shutter.

Of aluminium alloy, the shutter takes the form of a semi-circle with a segment removed to form an arm. A channel is cut across the top surface for the reception of the locking plate and a pivot hole is flanked by two holes, one containing the detonator and the other a lead weight. Two pins projecting from the underside of the shutter engage in a hole and a slot formed in the escapement segment.

(2) Locking Plate.

This is a steel strip with each end bent at right angles a hole is drilled in one end to accept the spigot of the safety plunger. The locking plate and the safety plunger together retain the shutter in the unarmed position before firing.

FUZE ASSEMBLY, BASE, PERCUSSION, L58A1 FIG. 1



During flight and on impact the locking plate locks the shutter in the armed position, that is, when the detonator is directly over the striker.

(3) Safety Plunger.

Of steel, the safety plunger is formed with a spigot on its front face which engages with the locking plate. The plunger is held against the locking plate by a spring and is retained in its recess in the body of the shutter by a retaining strip. The safety plunger, in conjunction with the locking plate, retains the shutter in the unarmed position.

c. Detent.

This is a cup-shaped component, spring-loaded and located in a recess in the shutter body. Its function is to prevent any movement of the safety plunger until after shot start.

d. Shutter Lock.

This is a rectangular steel strip which provides bore safety. It is pivoted on a pin located in a recess cut in the shutter body. The lock is acted on by set-back and centrifugal forces, and during shot travel the set-back force predominates, holding down the lock in a position which prevents the shutter from rotating to the armed position. As the shell decelerates centrifugal force overcomes the set-back force and causes the lock to move clear of the shutter.

e. Escapement Mechanism.

This consists of a pallet, escape wheel and pinion, and a segment.

(1) Pallet.

Mounted on the pivot tube set in the cover plate, the pallet is roughly oval in shape and is formed with two teeth which engage with the escape wheel.

(2) Escape Wheel and Pinion.

Mounted between the cover plate and the underside of the platform formed in the body, the escape wheel engages the pallet. The drive from the segment is transmitted to the escape wheel through the pinion.

(3) Segment.

Semi-circular in shape and with teeth formed on part of its circumference, the segment is mounted below the shutter and on the same pivot pin. A hole and a slot cut in the segment engage with two pins on the underside of the shutter.

f. Cover.

This is a circular plate of aluminium alloy which is screwed on to the base of the shutter body. A steel pivot tube on which the pallet is mounted, is set centrally in the plate and a small hole provides the lower bearing for the escape wheel pivot. Two positioning pins, diametrically opposite, fit into corresponding holes in the base of the body.

g. Shutter Speed.

The shutter does not commence to open until the rotating speed of the fuze reaches 3,700 revolutions per minute, and is fully opened between 3,700 and 4,500 revolutions per minute. It should be noted that in a high speed test at 15,000 revolutions per minute, the shutter is required to turn through the first 60 degrees (ie that part of the movement controlled by the escape mechanism) in the time of 0.009 to 0.019 seconds.

7. Magazine.

Made of aluminium alloy, the magazine is cup-shaped and is screw-threaded externally for assembly to the shell base and for the attachment of the cap. Two slots, diametrically opposite, are cut in the rim to facilitate the use of an assembly tool. Internally, the base of the magazine is channelled to accommodate a quantity of stemmed CE, a thin diaphragm of metal remaining between the recess and the outer surface. A paper disc is positioned above the stemmed CE and the CE pellet is assembled over the paper disc. The CE pellet is covered by a felt disc retained in position by an aluminium cap which is screwed on to the mouth of the magazine and secured by shellac adhesive.

Safety Arrangements

8. The safety arrangements are as follows:

a. The delayed arming shutter is retained in the safe position by the spring-loaded safety plunger which engages with the locking plate. The detent prevents the safety plunger from withdrawing from the locking plate until after shot start.

b. Bore safety is ensured by the shutter lock which prevents the shutter from moving to the armed position until the shell commences to decelerate.

c. When the shutter is in the unarmed position its detonator is screened off from the striker and the stemmed CE channel leading to the CE pellet in the magazine.

d. The escapement mechanism provides a slight delay before the shutter reaches the armed position.

e. The creep spring prevents the striker from moving forward during flight. The tendency of the striker to do this is due to the deceleration of the shell after it leaves the gun.

Action

9. On Firing.

Set-back force acts on the detent which is forced downwards against its spring and centrifugal forces causes the safety plunger to withdraw from the locking plate to a position over the detent, now prevented from rising to its former position when set-back ceases.

10. During Flight.

Deceleration commences as the shell leaves the muzzle, set-back ceases and the shutter lock moves clear of the shutter under the action of centrifugal force. The shutter, now free to move, rotates under the control of the escapement mechanism for the first 60 degrees of its travel, after which the segment disengages from the escape pinion and the shutter swings to the fully armed position. It is locked in this position by the shutter locking plate which, under centrifugal action, has moved out to engage with a slot in the shutter body. The shutter detonator is now in alignment with the striker and with the diaphragm beneath the stemmed CE.

11. On Impact or Graze.

The momentum of the inertia pellet compresses the creep spring and forces the striker into the shutter detonator. The resultant detonating wave penetrates the diaphragm under the CE channel, ignites the stemmed CE and the CE pellet in the magazine which, in turn, ignites the bursting charge in the shell.

PART 2 SECTION 4
ANNEXURE H

Amdt 1/Feb/1970

Summary of Differences

Model A1 Fuze	I Arm Approvals K/2764, K/2824, K/3047

12. As described in paras 2 to 11.

NOTE: With effect from September, 1969 the nomenclature of the Shutter, Delayed Arming, referred to in this Annexure has been amended to "Delayed Arming Unit, No 7".

PART 2

HANDBOOK OF CURRENT BRITISH LAND SERVICE FUZES

Section 5
TIME FUZES

PART 2

HANDBOOK OF CURRENT BRITISH LAND SERVICE FUZES

Section 5

TIME FUZES

CONTENTS

Introduction

TIME FUZES

1. Time fuzes are designed to function after a predetermined time. "Time" refers to the length of time from the instant of firing the weapon to the instant of functioning of the fuze. Combustion time fuzes are "igniferous" fuzes i.e., they have a magazine filled with gunpowder, to give a flash. These fuzes are used with carrier shell or bombs to give an "air" burst and are not usually employed in H.E. filled projectiles unless the H.E. filling is provided with a picric powder exploder. In the combustion type of fuze the detonator, in a suitable holder, is supported on a stirrup or coiled spring sufficiently weak to allow the holder to "set-back" on acceleration, bringing the detonator on to a needle. The resultant flash and heat ignites a gunpowder pellet or a layer of pressed in mealed gunpowder which, in turn, ignites the composition in the time ring(s). These fuzes embody a train of compressed fuze powder which burns through until the time as "set" has expired. The flash from the train then fires the gunpowder in the magazine. The fuze powder is generally contained in circumferential grooves in adjacent time rings, the powder burning round in one ring until it can ignite the powder in the other, depending upon the relative position of the two rings as determined by the setting. Two rings are usually employed, the upper ring being fixed by pinning to the stem of the fuze body, and the other movable or "free" to rotate on the stem. The under surface of both rings is grooved for almost the entire circumference, the grooves being charged with fuze powder under compression. The upper ring has a radial or oblique channel from one end of the powder groove to pick up the flash from the detonator, the channel containing a perforated gunpowder pellet or a layer of mealed powder to facilitate this function. A second channel to the outside of the ring forms a gas escape, being fitted with a small metal closing disc to provide a watertight seal, behind which is assembled a perforated gunpowder pellet to blow the disc clear when the train is ignited. The lower ring differs only in having a vertical instead of a radial channel to pick up the flame from the powder grooves in the upper ring. The central stem or body contains the detonator, needle and magazine. Cloth washers are placed on the underside of the two rings to ensure a tight joint and to prevent "flash-over". Both rings are secured by a cap which is screwed on to the stem of the fuze and bears down on the rings to secure the necessary tension.

2. Setting. - Time fuzes are set for time before loading by rotation of a moving portion of the fuze against the fixed fuze body by means of a fuze key, fuze setter or fuze setting machine. Graduations are provided to enable the setting to be set by hand. The bottom portion of the fuze body generally forms a platform upon which the moving part rotates for setting the time of functioning. With British fuzes, the fixed part is either graduated in arbitrary fuze lengths for reading against an indicator on the moving part, or else the moving portions is made to operate a fuze length indicator on the fixed part. In addition, both fixed and moving parts have slots for the engagement by the pawls of fuze keys or the older fuze setting machines. These slots are also used for setting the fuze at "SAFE". The latest fuze setting machines grip the fuze by means of knife rings. The moving portion must be tight enough to prevent movement in handling, transit, loading and firing, and yet sufficiently loose to permit setting by the fuze key, fuze setter or fuze setting machine. The maintenance of the correct stiffness or tension is most important.

3. Shape and dimensions. - Time fuzes are conical in shape to conform to the contour of the projectile for which approved, and have a right hand screw-thread to avoid the possibility of their becoming unscrewed from the projectile by rotational acceleration in the bore. Note:- Rotational acceleration in the bore does not occur in respect of Mortar bombs. The threaded portion for screwing into and the depth of intrusion of the lower part of the fuze body into the projectile is usually much less than that of standard fuzes approved for use in H.E. filled projectiles.

4. Functional differences. - Instances may arise where different marks of the same fuze, all incorporating identical setting graduations, have different times of burning. This is due to the use of different natures of fuze powders in the time ring(s) which have varied rates of burning. The arbitary fuze length graduations on such fuzes will, therefore, have different values.

FUZE, TIME, No. 390

1. Particulars

(a) Type	Time, combustion, nose
(b) Guns	Mark 1 for Q.F. 20 pr. gun. Mks. 2, 2A for 3 in. ML Mortar.
(c) Projectiles	B.E. Smoke shell or mortar bomb.

DESCRIPTION Mark 1 (Fig. 1)

GENERAL

2. The Mark 1 No. 390 fuze is a tensioned double banked combustion (powder train type) time fuze with a burning time variable between 0 to 23 seconds. It consists principally of a body, base-plug, needle, spring, detonator-holder, mechanism sleeve and plug, magazine ring, detonator, bottom ring, top ring, cap and cover.

3. Body.- Made of brass, the main feature of the body is the platform below which it is reduced in diameter and threaded 14 threads per inch right hand to fit a 2 inch diameter hole. A stepped shoulder may or may not be formed on the lower edge of the platform. Above the platform the body is formed with a stem which is reduced in diameter at the upper end and threaded externally to receive a cap. The side of the platform is bevelled and graduated in quarter divisions for almost its entire circumference, the divisions reading from 0 to 30. At the centre of the ungraduated portion, between the figures 30 and 0, a setting mark (a red arrow head) below which appears the word "SAFE" is engraved. The graduations are read in conjunction with a line engraved on the bottom ring and when the fuze is set at "safe", the setting mark engraved on the bottom ring coincides with the arrow head. A hole is bored in the side of the platform for use with a fixing key. The stem is bored centrally from the top to receive the needle, spring and mechanism sleeve and the detonator-holder and its detonator. Two oblique flash channels lead from the centre bore (i.e., the detonator channel) to the top time ring to allow the flame and gas from the detonator to circulate in the body of the fuze, thus ensuring less violent ignition of the time ring. The lower end of the body is bored and recessed to form a magazine and prepared with threads to receive a base plug, a short oblique and vertical channel, containing perforated powder pellets, connecting the magazine with the top surface of the flange. The magazine is filled with not less than 80 grains of G.20 gunpowder. A wooden, plastic or compressed paper ring fitted over a boss formed on the body inside the magazine recess serves to reduce the weight and also the capacity.

4. Base plug. - Made of brass or zinc-alloy, the plug is dished on the inner surface and has a flash hole drilled in the centre which is closed by a thin brass disc to which a paper disc is affixed with shellac. The plug is screwed intc the base of the body and retains the gunpowder charge in the magazine recess, the base of the fuze being sealed with shellac varnish coloured RED.

5. Needle. - Made of steel, the needle is formed with an enlarged head, which acts as a needle pellet, and a long shank. The upper end of the shank is pointed to pierce the detonator. When assembled, it is housed in the centre of the body.

6. Spring. - This is a spiral of 15 coils of 0.02 inch circular section steel wire. It is assembled between the base of the detonator-holder and the head of the needle and surrounds the needle shank.

7. Detonator holder. - Made of brass, the holder is bored vertically and prepared to house the detonator.

8. Mechanism sleeve. - Made of brass, the sleeve is in the shape of a cylindrical tube. It is threaded externally at its lower end to screw into the top of the stem formed on the fuze body and threaded internally at the other end to accept the mechanism sleeve plug.

9. Mechanism sleeve plug. - Made of brass, the plug is formed with a flange below which it is screw-threaded to engage in the top of the mechanism sleeve. A cloth disc is shellacked to its inner face. A screwdriver slot is formed in the head to facilitate insertion. It is screwed into the upper end of the sleeve and retains the detonator-holder with its detonator, spring and needle, in position. The spring, being in initial compression, prevents the detonator-holder setting back and the needle from moving forward until the gun is fired.

10. Magazine ring. - This is a shaped ring of either wood, plastic or compressed paper. It is inserted and positioned over a boss formed in the magazine portion of the body.

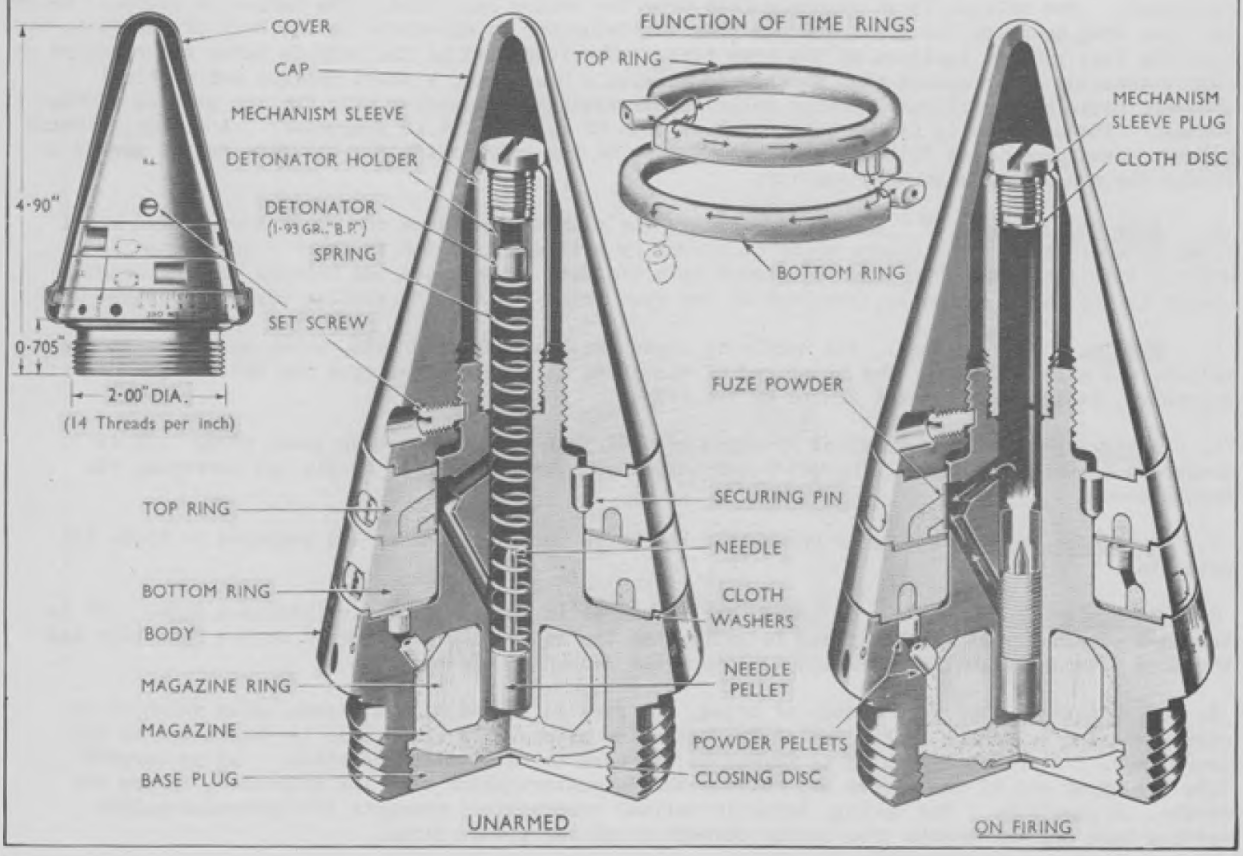
11. Detonator. - This is a 1.93 grain "BP" detonator and is assembled in the base of the detonator-holder.

12. Bottom ring. - Made of brass, the bottom ring is bevelled externally to conform to the shape of the flange of the fuze body and has a concentric groove, filled with composition SR.227 pressed in and covered by a paper disc washer extending nearly all round its under surface. A small recess is bored in the top surface and houses a perforated powder pellet. This recess is coincident with the beginning of the groove and is connected to the latter by an oblique channel. A gas escape hole, with an oval aluminium alloy sealing disc, is formed in the side of the ring. The ring has setting slots for engagement by a fuze setting key and a "setting" line is engraved for reading against the graduations on the flange of the fuze body. It is assembled over the stem ofthe body on which it is free to rotate, for setting purposes.

13. Top ring. - Made of brass, the top ring is similar to the bottom ring but the external circumference is slightly smaller. The oblique channel is filled with mealed powder pressed in and connects the concentric groove with the port in the stem of the fuze body when the ring is assembled in position. A gas escape hole, in which is assembled a gunpowder pellet retained by an oval brass sealing disc, is formed in the side of the ring and also connects with the commencement of the concentric groove and the oblique channel filled with the mealed powder. The concentric groove is filled with fuze powder SR 227 which is afterwards covered by a paper washer shellacked over the base. Setting slots, for use in conjunction with those in the bottom ring, are cut in the periphery. The ring is assembled over the stem of the fuze body and on top of the bottom ring and is prevented from rotating by a brass pin which fits coincident recesses prepared in the ring and stem.

FUZE, TIME, No.390, MARK I

FIG.I



14. Cap. - Made of aluminium alloy, the cap is cone shaped. Internally, at the base, it is screw-threaded for assembly over the stem formed on the fuze body. Two holes are drilled radially in the sides to facilitate assembly. After the cap is screwed on to the fuze body and the fuze is tensioned at 450 ± 50 inch ounces a hole is drilled through into the stem, the inner portion of the hole in the cap being threaded. A set screw is then inserted and screwed home, the recess behind the screw being sealed with waterproofing composition.

15. Cover. - At the time of issue, a Cover, 2 inch, Time or Time and Percussion fuze No. 5, is assembled to the fuze. It is made of brass and is conical in shape. It is fitted with a rounded rubber ring at its lower end, the cover and ring being clamped to the fuze body by a securing band. The band fits under the platform of the body and is pressed tightly round and the ends secured by copper wire, the ends of the wire being twisted and tucked under the band. Alternatively, the cover may be held in position by a securing band secured by a tongue engaging in a slot, the tongue being turned over. A hole in the band coincides with one of the tommy holes in the body of the fuze. When issued the cover is hermetically sealed.

16. Waterproofing. - The joints between the time rings, body and between ring and top cap, escape hole discs and the set screw in the cap are sealed with Mark 8 Luting.

17. Washers - time rings. - Cloth, all wool, melton finish washers are affixed to the upper surface of the platform and of the bottom time ring to ensure a tight joint when assembled and also to prevent any flash-over.

18. Washer for joint between shell and fuze. - In the case of fuzes manufactured without a stepped shoulder formed on the fuze body a brass or tin plate washer 2.3 inch diameter is placed under the flange of the fuze body before the fuze is assembled in the shell. This is to prevent the Band, securing, fuze cover being pinched between the flange of the fuze and lip of the shell, thus making removal difficult.

SAFETY ARRANGEMENTS

19. These are:-

(a) Initial compression of needle spring keeps the detonator clear of needle.

(b) When the fuze is set at safe, the flash holes in the lower time ring and to the magazine are masked by the bridges of the upper and lower time rings respectively. This provides a double safety device against ignition of the magazine, should the initiating mechanism function prematurely.

PREPARATION FOR FIRING

20. The cover must remain on the fuze until immediately before firing when it is removed by using pliers on the securing wire or tongue of the cover band. The cover should then be eased off the fuze with a screwdriver. The fuze is then set to the required graduation on the body by rotating the setting mark on the bottom ring.

ACTION (FIG. 1)

21. On firing. - The detonator sets back on the needle, compressing the spring. The detonator is detonated and the flash passes through the flash channels in the stem of the body and ignites the mealed powder in the oblique channel in the top ring, which in turn ignites the fuze composition, blowing out the closing disc in the gas-escape hole, thus a vent is provided for the gases generated as the burning of the time train progresses.

22. During flight. - The composition in the top ring burns round until, after an interval of time, determined by the setting, the flame reaches the powder pellet in the bottom ring, which is fired, and ignites the composition in the bottom ring, blowing out the closing disc in the gas escape hole. The composition in the bottom ring burns round in the reverse direction until after an interval of time determined by the setting, the flame reaches the powder pellet in the vertical portion of the channel in the body of the fuze which is fired and ignites the pellet in the oblique channel and, in turn, the powder in the magazine. The powder in the magazine explodes, blows out the brass disc in the base plug and the resultant flame passes through to ignite the bursting charge in the head of the shell.

SUMMARY OF DIFFERENCES

MARK 1 FUZE (For use with Q.F. 20 pr. gun) WOLC.& B.8620

23. This fuze is described in paras 2 to 22 inclusive.

MARK 2 FUZE (For use with 3 in. ML. Mortar) WOLC.- C214

24. The differences to be found in this fuze are:-

(a) Body. - A stepped shoulder will always be formed on the underside of the platform of this fuze. A washer 2.3 inch diameter is therefore not required when fitting this fuze to a mortar bomb.

(b) Bottom time ring. -

(i) Filled RD 202 instead of SR 227 making this fuze a 46 second fuze.

(ii) Circular gas escape hole sealed with aluminium disc.

(c) Top time ring. -

(i) Circular gas escape hole sealed with aluminium disc.

(ii) There is no mealed powder in the lighting hole.

(d) Cap. - The cap is tensioned at 750 ± 50 inch ounces before being secured.

MARK 2A FUZE (For use with 3 in ML Mortar) WOLC - & C214

25. This fuze differs from the Mark 1 fuze in the following:-

(a) Bottom ring -

(i) Filled RD 202 instead of SR 227 making the fuze a 46 second fuze.

(ii) After 19.2.47 brass closing discs have been used instead of aluminium in the gas escape holes and connecting pellets of G20 gunpowder have been used in place of SR 227A.

(b) Cap. - Tensioned at 750 ± 50 inch ounces before being secured.

NOTES 1. Prior to 9/6/49 to distinguish them from Mark 1 No. 390 fuzes, the bottom ring of Marks 2 and 2A fuzes was painted or lacquered Red, to denote that they were filled with slow burning composition but after this date this means of identification was dispensed with.

2. On 8.11.1954 approval was given for all marks of fuze, other than those manufactured with a stepped shoulder, to have a brass or tinned plate 2.3 inch diameter washer (QX /88) assembled, at the time of production, under the flange of the fuze to prevent the Band, Securing, Fuze Cover being pinched between the flange of the fuze and the lip of the projectile thus making removal difficult.
This washer was never introduced in paras. W.O.L.C. as a separately demandable item of supply.

PART 2

HANDBOOK OF CURRENT BRITISH LAND SERVICE FUZES

Section 6

TIME & PERCUSSION FUZES

PART 2

HANDBOOK OF CURRENT BRITISH LAND SERVICE FUZES

Section 6

TIME & PERCUSSION FUZES

CONTENTS

Introduction

TIME & PERCUSSION FUZES

1. The time mechanism of time and percussion fuzes is designed to function after a predetermined time. "Time" refers to the length of time from the instant of firing the weapon to the instant of functioning of the fuze.

2. Time and percussion graze fuzes are usually of the igniferous type, that is they are, in effect, combustion time fuzes in which a percussion mechanism is embodied. The percussion mechanism being so arranged that should functioning to a predetermined time not be required or fails to be achieved, the fuze will be functioned by graze action when the shell is checked in flight or receives an appreciable deceleration. These fuzes are used with B.E. Smoke, Flare, Illuminating and Chemical shell primarily to function on "air burst" if required and secondly, to function on graze.

(a) Time Mechanism. - In the time mechanism the detonator, in a suitable holder, is supported on a coiled spring sufficiently weak to allow the holder to "set-back" on acceleration, bringing the detonator on to a needle. The resultant flash and heat ignites a gunpowder pellet or a layer of pressed in mealed gunpowder which, in turn, ignites the fuze composition in the time ring(s). These fuzes embody a train of compressed fuze powder which burns through until the time as "set" has expired. The flash from the train then fires the explosive in the magazine. The fuze powder is generally contained in circumferential grooves in adjacent time rings, the powder burning in one ring until it can ignite the powder in the other, depending upon the relative position of the two rings as determined by the setting. Two rings are usually employed, the upper ring being fixed by pinning to the stem of the fuze body, and the other movable, or "free", to rotate around the stem. The under surface of both rings is grooved for almost the entire circumference, the grooves being charged with fuze powder under compression, the powder being retained by a thin paper washer shellacked to the under surface of the rings. The upper ring has a radial or oblique channel from one end of the powder groove to pick up the flash from the detonator, this channel containing a perforated gunpowder pellet or a layer of pressed in mealed powder to facilitate this function. A second channel leading to the outside of the ring forms a gas escape, being sealed with a paper and a small metal closing disc to provide a watertight cover. Behind the discs is placed a perforated gunpowder pellet to blow the metal disc clear when the train is ignited. The lower ring differs only in having a vertical, instead of a radial, channel to pick up the flame from the powder grooves in the upper ring. The central stem or body contains the time detonator, needle and the magazine. Cloth washers are placed on the underside of the two rings to ensure a tight joint and to prevent "flash-over". Both rings are secured by a cap which is screwed on to the stem of the fuze and bears down on the rings to secure the necessary tension.

(b) Percussion Mechanism. - In the case of graze action, a movable part, usually called the graze or inertia pellet, moves forward to carry the detonator on to a needle (or vice versa). A creep spring keeps the two apart until deceleration is experienced. As the movement of the inertia pellet or weighted needle gives rise to an "Air gap" the percussion detonator is of the flash type. Graze fuzes have, therefore, a small inherent delay in functioning.

3. Time and percussion D.A. fuzes are fitted with a mechanical timing mechanism in the body which is operated by a main spring and controlled by an escapement, the time from the instant of firing to the time of bursting or functioning the shell being adjustable between a specific number of seconds prior to loading. The upper part of the fuze is arranged for direct percussion action on impact. These fuzes are of the detonating type, that is, a C.E. pellet is assembled in the magazine portion of the body and the fuzes are, therefore, instantaneous in their action.

(a) Timing mechanism. - These fuzes normally have a fully wound-up clockwork mechanism retained by a trigger, which is released by the "set-back" on acceleration, after which the timing mechanism works until the movement of its parts releases a striker which is driven on to a detonator by a spring. The time between the starting of the mechanism and the release of the striker can be varied by the "setting" of the fuze. In certain fuzes, however, the time mechanism may be functioned by centrifugal force.

(b) Percussion mechanism. - The direct action percussion mechanism is embodied in the upper part of the fuze body. It normally consists of a needle supported on a metal cup or disc, or a hammer or striker supported on a shearing wire or coiled spring, exposed to a direct blow on impact with the target; its sensitivity depending on the strength of the cup, disc, shearing wire or coiled spring. In some new designs of fuzes a direct action percussion head may be incorporated.

4. Setting for "time". - The fuzes are set for time before loading by the rotation of a moving portion of the fuze against the fixed fuze body by means of a fuze key, fuze setter or fuze setting machine. Graduations may be provided to enable the setting to be set by hand but in certain new designs of fuzes, where the "setting" is carried out by fuze setting machines, the graduations are dispensed with. With British fuzes, if the body is graduated, the fixed part is either graduated in arbitrary fuze lengths for reading against an indicator on the moving part, or else the moving portion is made to operate a fuze length indicator on the fixed part. In addition, both fixed and moving parts have slots or recesses for engagement by the pawls of fuze keys or fuze setting machines. These slots are also used for setting or re-setting the fuze at "SAFE". The latest fuze setting machines grip the fuze by means of knife rings. The moving portion of the fuze must be tight enough to prevent movement in handling, transit, loading and firing, and yet sufficiently loose to permit setting by the fuze key, fuze setter or fuze setting machine. The maintenance of the correct stiffness or tension is most important.

5. Shape and dimensions. - These nose fuzes are shaped to conform to the contour of the shell for which approved and have a right hand screw-thread to avoid the possibility of their becoming unscrewed by the shell by rotational acceleration in the bore. The threaded portion for securing into and number of threads per inch and also the depth of intrusion of the lower part of the fuze body into the shell may vary between different fuzes depending upon the calibre of the shell for which approved. In time fuzes of the igniferous type the threaded portion for screwing into the projectile and the depth of intrusion of the lower part of the fuze body is usually much less than that of standard fuzes approved for use in H.E. filled shell.

6. Arming and Safety devices. - Fuzes of the time and percussion type are normally "armed" by:-

(a) Set-back force or

(b) Centrifugal force or

(c) a combination of both

Set-back force acts on the free or movable parts of the fuze at the instant of firing. Centrifugal force is intended to be effective only when deceleration occurs on the projectile leaving the bore, when the free or moving parts are forced outwards by spin. While passing through the bore the moving parts are expected to remain in their original positions by friction as a result of set-back. The majority of fuzes incorporate one or more shutters which move into the "armed" position by the influence of centrifugal force. Such shutters are usually designed to remain in the "unarmed" position by a detent or by a ferrule, arming sleeve and a number of balls which retain the point of the striker in the shutter, until fired and until the shell is spinning between a specific number of revolutions per minute (r.p.m.), the number of revolutions varying in different fuzes to meet the requirements of the equipments for which they are approved. Springs assembled either under compression or expansion may be used to assist or restrain the centrifugal force. Locking devices may also be incorporated to secure the movable parts in the "armed" position after centrifugal force becomes effective. In certain new fuzes a delayed arming shutter mechanism actuated by centrifugal force is incorporated in the design.

7. Functional differences. - Instances will arise where different marks of the same fuze may vary, in that, some may have "graduations" on the body thus permitting of their being "set" for time by hand, while with others the "graduations" are omitted, thus restricting their being "set" only by fuze setting machines. Also certain marks of fuzes which are manufactured without a stepped shoulder under the flange of the body, require a thin metal washer to be placed between the underside of the flange and the lip of the shell at the time the fuze is assembled.

FUZE, TIME AND PERCUSSION, D.A., NO. 213

1. (a) Type — Time, Mechanical and Percussion Direct Action.

(b) Guns — Q.F. 25 pr. gun
B.L. 5.5 in. gun
B.L. 7.2 in. howr.

(c) Projectile — H.E. and Colour bursting shell

DESCRIPTION Mark 5 fuze (Fig. 1)

GENERAL

2. This is a detonating fuze, fitted with a mechanical timing mechanism which is operated by a main spring and controlled by an escapement. The time of bursting the shell can be varied to actuate between 0 and 80 seconds after the gun is fired. The upper part of the fuze is arranged for direct percussion action on impact. The fuze consists principally of a body, dome, head, locking weight, striker head with needle, detonator holders (upper and lower), pellet holder, shutter, magazine and cap, tensioning ring, Mechanism, time, 80 seconds, No. 1A and a safety cap. The exterior of the body is threaded at the bottom to 2 inch diameter (14 threads per inch, right hand) to screw into the nose of the shell. The top of the body is enlarged and shaped to conform to the contour of the shell, this contour being maintained by the dome and lower portion of the head of the fuze, the upper portion of the head being shaped to the same contour as the No. 117 and 119 (b) (cap off) fuzes.

The interior of the body is divided by a platform. The upper part contains the movement, a recess in the underside of the platform takes the lower detonator holder, and the bottom part contains the shutter and magazine.

The dome which is of brass covers the top of the clock and can be rotated in the fuze body. The dome is retained by a spring tensioning ring which fits in an internal groove near the foot of the dome. Inside the head of the fuze is a locking weight. On firing the set back of this weight breaks the shear wires and drives the locking pins downwards. The locking pin cut through and cannelure the upper edge of the body surrounding the time mechanism thus locking the dome in the position in which it has been set. Beneath the locking weight is a platform or hand race, across which a shaped slot is cut. Rotation of the dome positions the slot and thereby sets the fuze.

The clockwork mechanism rotates a spring-loaded hand beneath the hand race, and is driven by a mainspring and controlled by an escapement through a train of gear wheels.

The clockwork mechanism is started by firing the gun, the hand being released for rotation by the set back of a trigger.

NOTE The time mechanism will NOT arm when used with charges 1 or 2,25 pr. gun and charges 1, 2 or 3, 5.5 inch gun and 7.2 inch howitzer.

3. Clockwork Mechanism - The clock is assembled as a complete unit and fixed to the top of the platform in the fuze body.

The Mechanism, Time, 80 seconds, No. 1A described in Part 2, Section II Annexure B.

4. Head. - The head of aluminium alloy, is shaped to suit the contour of the fuze dome, into which it screws. The top is screw-threaded externally to suit the safety cap.

Internally it is bored from the bottom to accommodate the locking weight, a pellet holder and on a smaller diameter to accommodate the detonator holder (upper). While from the top it is bored to accommodate the striker cup and striker head with needle. After assembly of the striker the recess in the top of the head is closed by a closing disc and washer which are secured by turning over a lip formed in the top of the head.

5. Body. - This is of brass or steel and is formed with a shoulder below which it is screw-threaded to 2 inch diameter (14 threads per inch, right hand) to suit the fuze-hole of the shell. Above the shoulder is an inclined surface graduated "0" to "80" and engraved in BLACK with an arrow head and the word "SAFE" engraved and filled in with red in the ungraduated space between the figures "80" and "0".

Internally the body contains the clockwork mechanism in the upper part and below this is the lower detonator holder. A slot in the top of the magazine houses a movable shutter retained in the unarmed or safe position by a steel spring.

6. Striker. - This consists of a steel striker head and needle. The needle being formed with a flange which seats in a recess formed in the striker head in which it is secured by turning over a lip.

The striker is held off the upper percussion detonator by a striker cup through the centre of which the needle protrudes.

7. Detonator holder. - (upper). - This cylindrical aluminium alloy holder has a flange formed at the base. Internally the top is recessed to take a varnished 5.5 gr "LZ" detonator (QX 216 AF) and below this it is bored to form a fire channel.

It is inserted in the fuze head from underneath, with the detonator immediately beneath the striker needle.

8. Detonator holder (lower). - This is assembled off centre on the underside of the platform and above the sliding shutter. The holder is of brass and is recessed to accommodate a 5.5 gr. "LZ" detonator which is secured in position by burring over a lip formed on the holder. A hole is bored through the bottom of the detonator recess to permit the flash from the detonator passing on to the oblique channel in the shutter when in the armed position.

9. Pellet holder. - This is of aluminium alloy, cylindrical in shape. Externally it is screw-threaded at the top, and a hole is formed in the base. It contains a perforated gun-powder pellet.

It is assembled in the head below the flange on the detonator holder (upper).

10. Shutter. - The brass shutter slides in a slot on top of the magazine.

At one end is an oblique channel filled with C.E. stemmed in. A small hole in the side takes the end of a steel shutter spring which pivots on a dowel pin and keeps the shutter at the centre in the unarmed or safe position. In this position the oblique channel is clear of both the detonator and magazine channel.

When the shell is in flight, centrifugal force overcomes the spring and pulls the shutter outwards to the open or armed position.

In this position the lower detonator, shutter channel, and magazine channel are all in alignment.

11. Detonators

(a) Upper. - This is the percussion detonator and is a 5.5 gr. "LZ" detonator in a lugless tinned copper alloy cup. The disc is varnished and coloured Blue for identification purposes.

(b) Lower. - This is the time detonator and is also a 5.5 gr. "LZ" detonator in a lugless tinned copper alloy cup. It is different from the upper detonator in that the disc is NOT varnished and it is coloured Red.

12. Magazine securing ring. - This is a brass collar screw-threaded on the outside to enter the fuze body from underneath. It surrounds the magazine and secures it by bearing on the under surface of the flange formed on the upper part of the magazine. The ring is secured by a No. 2 BA steel set screw inserted from the side of the threaded portion near the bottom of the fuze body.

Four slots at the bottom are for an assembly tool.

13. Magazine. - This is of brass and is screw-threaded externally at the bottom to take a bottom cap. It is bored from the underside to form a recess to take a C.E. pellet sealed by a box-cloth disc, these being retained in position by the bottom cap.

A flange is formed towards the top of the magazine, the under surface of which forms a bearing for the magazine securing ring. The top forms a platform for the shutter assembly.

A slot across the top accommodates the sliding shutter. A dowel pin in the recess forms a pivot for the shutter spring and another positions the magazine to the fuze body platform.

A small channel off centre, with a diaphragm of metal left at the top, leads from the shutter slot to the recess in the magazine. It is filled with C.E. stemmed in.

The magazine is held in position by the magazine securing ring.

14. Magazine Cap (QX 1599). - This is of lead free brass designed to withstand the required closing torque, and is threaded internally. It screws over the bottom of the magazine and retains the C.E. pellet and box-cloth disc in position. After filling the magazine, the cap is screwed on and then crimped in two or more equi-distant spaced places to prevent it unscrewing.

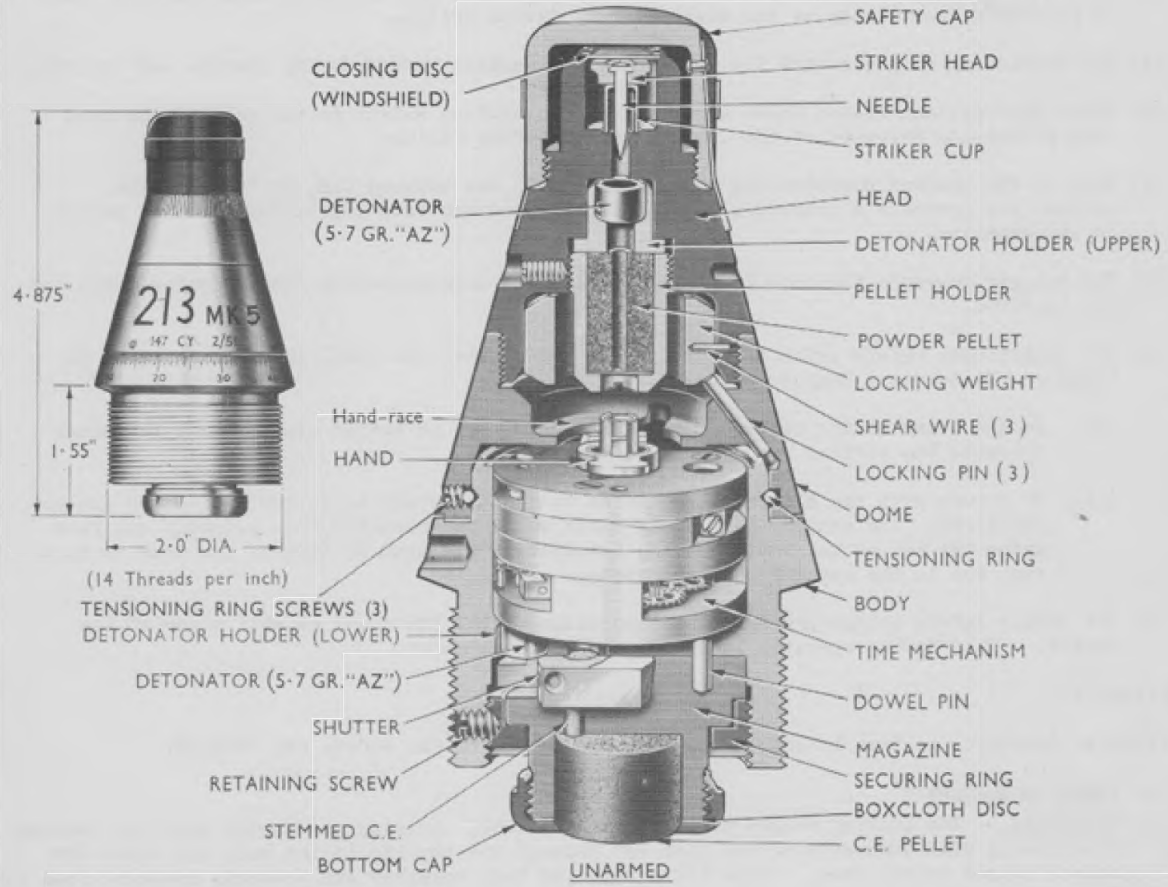
15. Safety cap. - This is of steel or malleable cast iron, dome shaped with a flattened top and has a flat steel spring riveted into an oblique slot on one side. The free end of the spring engages in the milling on the head of the fuze and retains the cap in position. The cap is formed with milled ring around its circumference and is screw-threaded internally at its lower end for engagement with the threads formed on top of the fuze head.

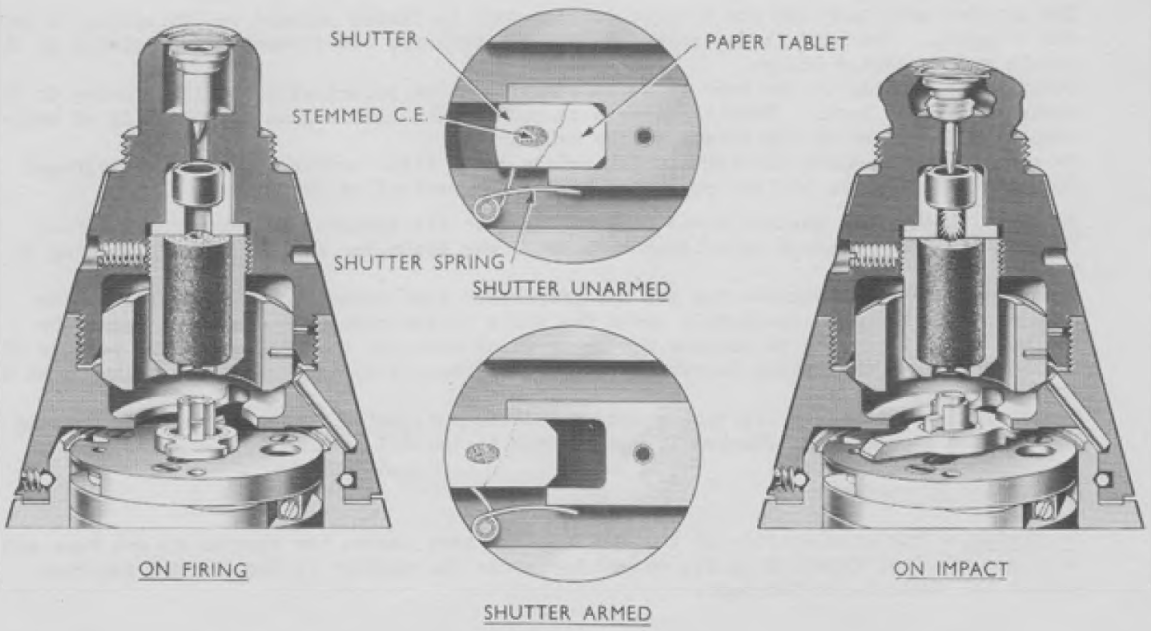
The cap is painted or lacquered black externally.

16. Tin-plating. - Some components are tin-plated to overcome possible deterioration of the fuze during storage and thus improve its safety. The components so treated are magazine, body (internal), detonator holders, shutter and striker cup.

FIG.1

FUZE, TIME AND PERCUSSION, D.A., No.213, MARK 5





SAFETY ARRANGEMENTS

17. (a) The safety cap protects the windshield and striker head during storage and transit.

(b) When the fuze is set at SAFE, the hand race in the dome is coincident with the hand which is prevented from rising by the muzzle safety device bridge.

(c) The tensioning ring prevents the dome being accidentally moved during storage and transit.

(d) Three equi-distant spaced shear wires secure the locking weight to the wall of the head thus preventing movement of the locking weight before firing.

(e) When in the unarmed position the shutter masks off the stemmed C.E. in the magazine channel and prevents a prematurely fired lower detonator from initiating the C.E. pellet in the magazine.

(f) The trigger prevents the hand from rotating and the time mechanism from starting until the gun is fired.

(g) The centrifugal safety catch is housed under the striker cam until the shell rotates in flight. It serves a dual purpose:-

(i) In the event of the clockwork mechanism being set in action accidentally the catch prevents the striker reaching the detonator.

(ii) If a fuze with the clockwork mechanism accidentally set in action was loaded and the gun fired; the centrifugal safety catch would be prevented from swinging out from under the cam as the latter would, immediately the hand is lifted, jam down on to a step cut in the catch for this purpose.

(h) The muzzle safety bridge prevents the hand rising until the shell is well clear of the muzzle. This device operates if the fuze is set too short.

ACTION (Fig. 1)

18. Prior to loading, the fuze is set to the time required, and the safety cap removed.

(a) Timing mechanism:-

On firing. - The locking weight in the head sets back, shearing the copper pins and forcing the locking pins downwards. The pins cut through the top lip in the body and enter the recess formed in the dome. This locks dome and body together and prevents movement from the time set position.
The trigger sets back and the trigger locking bolt is forced outward by its spring to retain the trigger. The hand is now released from the trigger, but prevented from rising by the muzzle safety device bridge.
During acceleration in the bore it is unlikely that the pellet will oscillate owing to the force of the set back. When the muzzle is reached the hand begins to rotate in an anti-clockwise direction by the action of the main spring.
On acceleration ceasing the centrifugal safety catch flies outwards, due to centrifugal force, and leaves the striker supported by its cam resting on the pillar.

During flight. - The shutter moves outwards against its springs, by centrifugal force, bringing the fire channel coincident with the lower detonator and the channel leading to the magazine.
When the clockwork mechanism has run the prescribed time according to the setting, the hand has been brought immediately under the slots in the hand race and rises under the influence of its spring to release the lever which controls the striker. The release of the lever allows the spring to rotate the cam off the pillar and force the striker down on the detonator.
The striker is forced by its spring into the detonator, which fires. The flash passing through the stemmed C.E. channel in the shutter to the C.E. pellet in the magazine.

(b) Percussion arrangement

On firing. - the acceleration of the shell in the bore causes the shutter to set back and set up sufficient friction in its recess to retain the shutter in the unarmed position whilst the shell is in the bore.

During flight. - when acceleration ceases, the shutter moves forward by momentum and outward by centrifugal force, to bring its fire channel in alignment with the lower detonator and the channel to the magazine.

On impact. - the cap having been removed before loading, the striker head is crushed in and the needle pierces and fires the upper detonator. The resultant wave ignites the gunpowder pellet, the flash from which passes through the dome and fuze body to detonate the lower (time) detonator. The action is then described under Timing Mechanism.

OTHER MARKS - SUMMARY OF DIFFERENCES

MARK 4 FUZE (Obsolescent) WOLC - § C7359, C9461

19. The detailed variations of this fuze are:-

(a) Detonators. - 5.7 gr. "AZ" detonators are filled. The upper is coloured Blue and the lower White

(b) Magazine Cap. - may be of brass, aluminium alloy or steel.

MARK 4/1 FUZE (Obsolescent) WOLC - § C9051, C9461

20. Variations for this fuze are:-

(a) Detonators. - 5.7 gr. "AZ" detonators are fitted. The upper is coloured Blue and the lower White.

(b) Magazine cap (QX 261) is not made of lead free brass.

(c) Magazine securing ring - this is secured by a copper pin.

MARK 4/2 FUZE (Obsolescent) WOLC - § C9461, C9866

21. Similar to the Mark 5 but with the following difference:-

(a) Detonators. - 5.7 gr. "AZ" detonators are filled. The upper is coloured Blue and the lower White.

MARK 5 FUZE WOLC - § C9866

22. This fuze is described in paras. 2 to 18 inclusive.

Magazine securing ring - this is secured by a copper pin.

FUZE, TIME AND PERCUSSION GRAZE NO. 221B

1. Particulars

(a) Type	Time combustion and percussion graze, nose.
(b) Guns	Q.F. 25 pr. gun B.L. 5.5 inch gun
(c) Projectiles	B.E., Smoke, Flare, Illuminating and Chemical shell

DESCRIPTION

GENERAL Mark 6 Fuze (Fig. 1)

2. The No. 221B fuze is a double banked tensioned combustion time percussion graze action type. The standard time of burning under normal atmospheric conditions is 0 to 49.1/2 seconds. It consists principally of a body, base plug, bottom and top rings, cap, time detonator holder, with associated needle and spring, percussion detonator holder, inertia pellet with associated needle and creep spring, centrifugal bolt with detent and detent spring. A metal cover is fitted to this fuze.

3. Body. - Made of brass, the body is formed with a flange or platform below which it is reduced in diameter and threaded to 2.0 inch diameter 14 threads per inch right hand to screw into the nose of the shell. A stepped shoulder is formed below the flange to prevent the securing band of the cover being nipped between the lip of the shell and the fuze. Above the flanged portion the body is formed with a short stem the top of which is reduced in diameter and screw-threaded externally to receive the cap. The periphery above the flange is bevelled and graduated in divisions for almost its entire circumference, the divisions reading from 0 to 22. At the centre of the ungraduated portion, between the figures 22 and 0, a setting mark (a red arrowhead) is engraved below which appears the word "SAFE". The graduations are read in conjunction with a line engraved on the bottom ring and when the fuze is set at "safe", the setting mark engraved on the bottom ring coincides with the arrow head. A hole is bored in the side of the flanged portion for use with a fixing key. The stem is bored centrally to receive the percussion arrangement, the bore being enlarged at the top and screwthreaded to receive the detonator holder and plug. An additional boring to one side of the central channel contains the time arrangement and time detonator and is connected to the port on the outside of the stem by a radial and an oblique flash channel which meet at the port. These two flash channels allow the flame and gas from the time detonator to circulate in the body of the fuze, thus ensuring less violent ignition of the time ring. A recess in the stem bored through the base receives the detent and detent spring and is closed by a screwed plug. A horizontal recess made through the side of the stem and connecting with the detent recess, contains the brass centrifugal bolt, the latter locking the percussion arrangement in the safe position. The recess is closed by a screwed plug which is inserted in the outer end of the recess prior to the cap ring being assembled. The centrifugal bolt is prevented from moving outwards by the detent, until the detent "sets back" on firing. The lower part of the body is bored and recessed to form a magazine, and has an oblique and vertical channel connecting the magazine with the top of the platform and the bottom ring. The channels contain perforated powder pellets. The magazine cavity is filled with 60 grains of G20 gunpowder and is closed by a base plug, the base of the fuze is then sealed with a shellac varnish.coloured RED.

4. Base plug. - Made of brass or zinc alloy, the base plug is in the form of a disc with a dished inner surface, the exterior being threaded to screw into the base of the magazine portion of the fuze body. A hole is drilled through the centre of the plug and is sealed by a thin brass disc, having six slits radiating from its centre, and over which is shellacked a paper disc assembled in a recess formed around the hole.

5. Bottom ring. - Made of brass, the bottom ring is bevelled externally to conform to the shape of the flange of the fuze body and has a concentric groove, filled with fuze powder RD202 pressed in and covered by a paper washer, extending nearly all round its under surface. A small recess is bored in the top surface coincident with the commencement of the groove and into which is assembled a perforated powder pellet. An oblique channel connects the powder pellet and the fuze powder. A gas escape hole, containing a perforated powder pellet, is provided in the side of the ring, the outer orifice being sealed with a paper and then an aluminium disc. The ring is assembled over the stem of the fuze body, around which it is free to rotate for setting purposes. When set at "safe" a setting marked engraved on the periphery coincides with the arrow head engraved on the body.

6. Top ring. - Made of brass, the top ring is similar to the bottom ring but is of slightly smaller diameter. An oblique channel leading from the concentric groove passes to the inner surface of the ring, and, when the ring is assembled over the stem of the fuze body, the end of the channel (the lighting hole) is positioned to register with the port in the side of the stem. The concentric groove is filled with 30 second fuze powder which is covered by a paper washer shellacked to the under surface of the ring, while the oblique channel (the lighting hole) is filled with mealed powder pressed in. A gas escape hole, in which is assembled a perforated powder pellet, is provided in the side of the ring, the outer orifice being sealed with a paper and then a brass disc. The ring is assembled over the stem of the fuze body and on top of the bottom ring and is prevented from turning by a brass pin fitting into corresponding semi-circular recesses drilled in the ring and stem. Setting slots, for use in conjunction with those in the bottom ring, are cut in the periphery.

7. Cap (QX 1567). - Made of aluminium alloy, the cap is cone shaped. It is bored and screw-threaded at the mouth to fit the stem of the body. Two key recesses are formed in the sides for tightening the cap until sufficient tension is applied to the bottom ring. Two tapped holes are bored in the sides in positions set at 90° to the key recesses. A pointed set screw is inserted in the hole nearest to the 22 graduation on the time ring after tensioning to secure the cap. The other hole is then plugged, both plug and set screw holes are then filled in with RD 1286 cement. Internally a groove is formed above the screw threaded portion to weaken the cap.

8. Time arrangement. - This consists of a holder, detonator, spring and needle:-

(a) Detonator holder - Made of brass, the time detonator holder is cylindrical in shape. The underside is recessed to accommodate the detonator and a small hole is drilled in the top. After the detonator is assembled the bottom lip of the holder is turned over to secure it in position.

(b) Detonator - The detonator, consists of a copper alloy cup filled with 2.51 grains "BP" mixture. It is inserted in the holder with the paper side uppermost.

(c) Time detonator spring - The time detonator spring is cylindrical in shape and is made of a spiral of .029 inch diameter tinned steel wire having approximately 13 coils. It is required to compress to 0.48 inches with a load of 5 lb. 2 oz.

(d) Time detonator needle - The needle is of steel, having an enlarged cylindrical head with a stem terminating in a sharp point.

The coiled spiral spring supports the detonator holder whilst the base of the spring seats on the enlarged head of the time needle, thus keeping the detonator in the holder clear of the point of the needle until "set-back" takes place on firing.

9. Percussion arrangement. - This consists of an inertia pellet with needle, creep spring, and detonator assembly contained in the central channel of the stem of the fuze body. The needle is prevented from moving forward by the inner end of the centrifugal bolt engaging in a recess in the side of the inertia pellet.

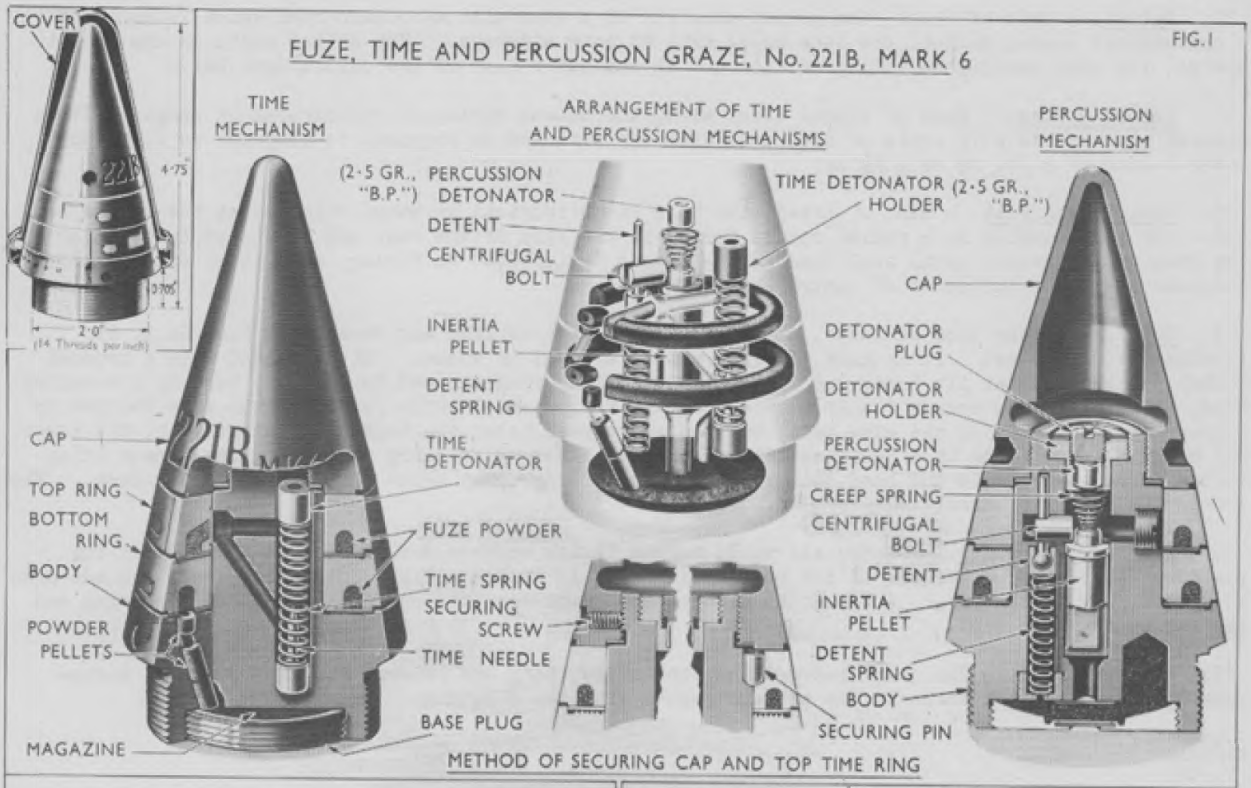
(a) Inertia Pellet with needle - Made of brass, the pellet is cylindrical with a guide band formed at the bottom and another at the top above which the diameter is reduced and bored centrally from the top to accept the steel needle. Two semi-circular or square slots are formed in the sides and guide bands of the pellet to act as flash channels from the percussion detonator to the magazine.

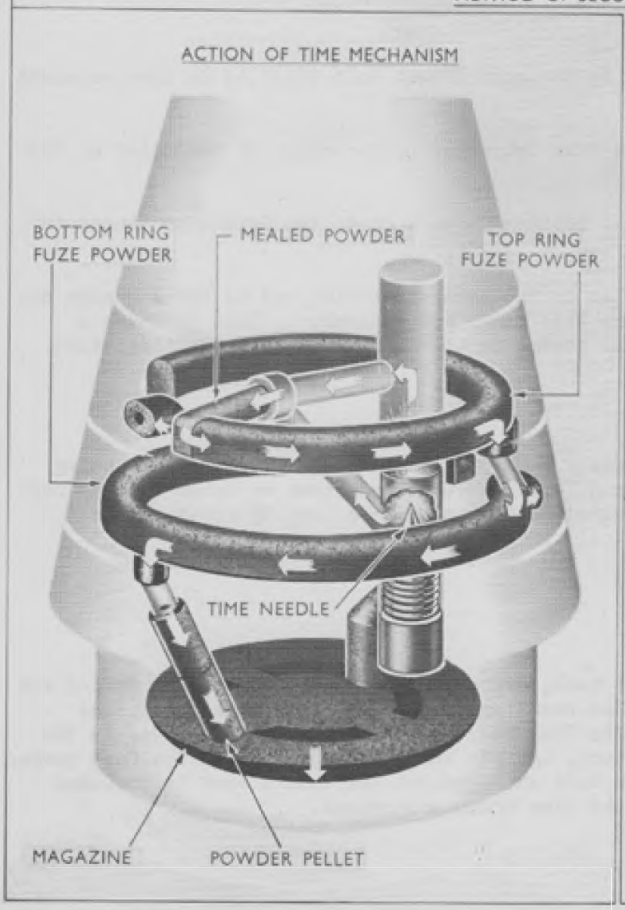
(b) Creep spring - Made of tinned steel wire, the creep spring is a conical spiral. The larger end is assembled under the detonator holder, whilst the smaller end fits over the needle point and rests on top of the inertia pellet. When the centrifugal bolt is disengaged, it prevents the inertia pellet creeping forward on to the detonator.

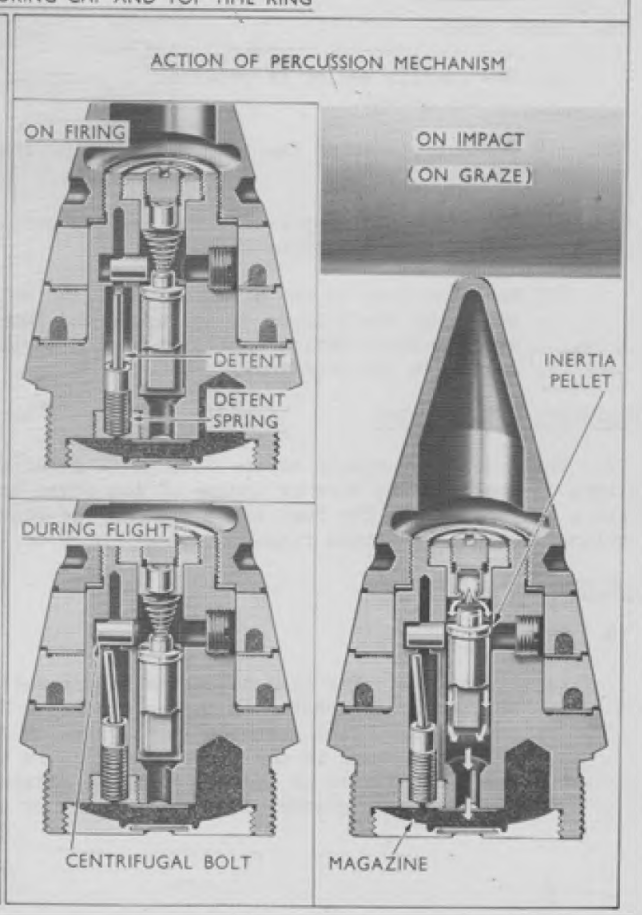
(c) Percussion detonator assembly - This consists of a detonator holder, plug, and detonator. The detonator holder is of brass formed with a threaded flange at the top to screw in to the centre bore in the stem of the fuze body. A hole is bored in the base so that the point of the needle assembled in the inertia pellet can pierce the base of the detonator. Above this hole the holder is recessed to house the 2.51 gr. BP detonator, (paper side uppermost). A box cloth disc is inserted above the detonator between it and the closing plug which is held in place by ring punching the formed top of the detonator holder.

FIG. 1

FUZE, TIME AND PERCUSSION GRAZE, No. 221B, MARK 6







10. Detent. - Made of brass, the detent consists of a stem with a rounded head which is enclosed in a cylindrical shaped pellet, the stem being free to move sideways. The detent rests on the detent spring, the stem passing up through a slot cut in the outer face of the centrifugal bolt.

11. Detent spring. - Made of tinned steel wire, the detent spring is cylindrical in shape. It is made of approximately 16 coils of 0.02 inch diameter wire and is required to compress to 0.45 inch under a load of 2 lb. $1\frac{1}{2}$ oz $\pm$ $1\frac{1}{2}$ oz.

12. Centrifugal bolt. - Made of brass, the bolt is cylindrical in shape with a slot cut across one end. It is assembled in a radial recess formed in the stem of the body and is locked in position by the stem of the detent until such time as the detent "sets-back" on firing, when it is free to move outwards under the influence of centrifugal force.

13. Cover. - At the time of issue, a Cover, 2 inch, Time or Time and Percussion fuze No.5, is assembled to the fuze. It is made of brass and is conical in shape. It is fitted with a rounded rubber sealing ring at its lower end, the cover and ring being clamped to the fuze body by a securing band. The band fits over a flange on the body and is pressed tightly round and the ends secured by copper wire, the ends of the wire being twisted and tucked under the band. Alternatively, the cover may be held in position by a securing band secured by a tongue engaging in a slot, the tongue being turned over. A hole in the band coincides with one of the tommy holes in the body of the fuze. When issued the cover is hermetically sealed.

14. Washers-time rings. - Cloth, all wool, melton finish washers are affixed to the body of the platform and the upper surface of the bottom time ring to ensure a tight joint when assembled and also to prevent any flash over. A washer is also assembled between the surface of the top time ring and the cap to act as a seal.

15. Waterproofing. - The joint between the time rings, body and between ring and top cap, escape hole discs and the set screw in the cap are sealed with Mk. 8 luting.

SAFETY ARRANGEMENTS

16. These are:-

(a) The inertia pellet is retained in position by the centrifugal bolt which is in turn retained by the detent.

(b) The resistance of the time spring holds the time detonator holder clear of the point of the needle.

(c) The creep spring prevents the inertia pellet setting forward on to the detonator housed in the percussion detonator holder.

(d) When the fuze is set at safe, the flash holes to the lower time ring and to the magazine are masked by the bridges of the upper and lower time rings respectively. This provides a double safety device against ignition of the powder in the magazine should the initiating mechanism act prematurely.

PREPARATION FOR FIRING

17. The cover must remain on the fuze until immediately before firing when it is removed by using pliers on the securing wire or tongue of the cover band. The cover should then be eased off the fuze with a screwdriver. The fuze is then set to the required graduation on the body by rotating the setting mark on the bottom ring.

ACTION (FIG. 1)

18. Time mechanism

(a) On firing. - The time detonator holder sets back, overcomes the resistance of the spring and carries the detonator on to the needle. The resultant flash from the detonator passes through the flash channels in the stem of the fuze body to ignite the mealed powder in the oblique channel in the top ring which, in turn, ignites the powder pellet and the fuze powder. The closing disc in the top ring gas escape hole is blown out and thus a vent is provided for the gases generated as the burning of the time train progresses.

(b) During flight. - The powder in the top ring burns round until after an interval of time determined by the setting, the flame ignites the powder pellet and the fuze powder in the bottom ring. The closing disc in the gas escape hole is blown out, the powder in the bottom ring burns round in the reverse direction and after an interval determined by the setting, the flame ignites the powder pellets in the channel leading to the magazine and, in turn, the powder in the magazine.

19. Percussion mechanism

(a) On firing. - The detent sets back against its spring thus freeing the centrifugal bolt.

(b) During flight. - The centrifugal bolt moves outward from its recess in the fuze body leaving the inertia pellet retained only by the creep spring.

(c) On impact or graze. - The inertia pellet overcomes the creep spring and moves forward to carry its needle on to the percussion detonator. The resultant flash passes down through the two slots formed in the sides of the inertia pellet to ignite the gunpowder in the magazine.

OTHER MARKS - SUMMARY OF DIFFERENCES

MARK 4 FUZE (Obsolescent) WOLC - § B7291, B7879, C3979 C9513

20. The differences to be found in this fuze are:-

(a) Base plug. - Prior to November 1944 base plugs had an additional filling hole drilled off centre. Some Mark 4 fuzes may still be fitted with this type of plug.

(b) Bottom ring

(i) Prior to June 1949 bottom rings were lacquered red to indicate slow burning powder.

(ii) The tension required to turn the bottom ring was increased from 250 ± 20 inch/ozs. to 450 ± 50 inch/ozs from January 1943.

(c) Cap. - Before August 1943 a plastic cap may have been fitted as an alternative to the alloy cap. No internal groove formed in cap fitted to this mark.

(d) Time detonator needle. - Prior to June 1942 a two piece needle may have been fitted.

(e) Percussion detonator assembly. - The detonator holder is screw-threaded internally at the top into which the closing plug securing the detonator is screwed. No box cloth disc is fitted between the detonator and the closing plug.

MARK 5 FUZE

21. This mark was allotted to a Pakistan design of fuze.

MARK 6 FUZE WOLC - § C9085

22. This fuze is described in paras. 2 to 19 inclusive.

PART 2

HANDBOOK OF CURRENT BRITISH LAND SERVICE FUZES

Section 7
PROXIMITY FUZES

PART 2

HANDBOOK OF CURRENT BRITISH LAND SERVICE FUZES

Section 7
PROXIMITY FUZES

CONTENTS

Introduction

PROXIMITY FUZES

1. Proximity or variable time (V.T.) fuzes are automatic time fuzes that require no time "setting". They are designed to function and detonate the shell at the optimum lethal distance from the target, provided that, in the case of A.A. targets, the trajectory passes sufficiently close. The present day artillery V.T. fuze in service use is essentially a combined self-powered radio transmitting and receiving unit. In flight, the fuze transmits radio waves. Unlike radar devices, the waves are sent continuously and are non-directional. The radio waves fronts which are reflected back to the fuze, from any suitable reflecting surface (e.g., the ground), interact with the transmitted waves. When this interaction of transmitted and reflected waves, resulting in ripples or beats, reaches a predetermined intensity, an electronic switch is tripped which then permits an electric charge in the firing capacitor (condenser) to flow through an electric firing squib, detonating the filling in the projectile. The major differences are in the matching of the radio to the shell, in optimising the sensitivity to the target, in the arming delay and in the case of fuzes approved for use in A.A. equipments in the self-destruction features of the fuze. The latest designs are controlled variable time fuzes (C.V.T.) incorporating mechanical time features, which prevent the V.T. element from functioning except during that portion of the trajectory which is close to the predicted target position. Amongst other advantages this helps to minimise the effects of rain and clouds, and, to some extent, any enemy radio-counter measures all of which might otherwise tend to produce very early bursts. But primarily, in the case of fuzes approved for use in A.A. equipments, it allows variable self-destruction at the end of the bracket enabling the fuze to be fired at low Q.E's which might not be possible with a fixed self-destruction time element. D.A. (direct action) elements are also included in some of the more recent designs of C.V.T. fuzes approved for use in Field Branch artillery equipments.

2. Arming and safety devices. - Safety devices are included as for other types of fuzes. They may be either electrical or mechanical. The fuzes are completely bore and muzzle safe. Fuzes of the proximity type are normally "armed" by:-

(a) Set-back force or

(b) Centrifugal force or

(c) a combination of both

Set-back force acts on the free or movable parts of the fuze at the instant of firing. Centrifugal force is intended to be effective only when deceleration occurs on the projectile leaving the bore, when the free or moving parts are forced outwards by spin. While passing through the bore the moving parts are expected to remain in their original positions by friction as a result of set-back. The majority of fuzes incorporate one or more shutters which move into the "armed" position by the influence of centrifugal force. Such shutters are usually designed to be retained in the "unarmed" position either by a detent which sets-back on firing, or by a spring plunger which moves outwards under the influence of centrifugal force, when the projectile is spinning between a specific number of revolutions per minute, the number of revolutions varying in different fuzes to meet the requirements of the equipment for which they are designed or approved. Springs assembled under either compression or tension may be used to assist or restrain the effect of centrifugal force. Locking devices may also be incorporated to secure the movable components in the "armed" position after centrifugal force becomes effective. In certain new fuzes a delayed arming shutter mechanism actuated by centrifugal force is incorporated in the design, and provides bore and muzzle safety to cover a specified minimum distance from the gun at which arming of the fuze can take place.

3. Setting for "time". - The fuzes are set for time before loading by rotation of a moving portion of the fuze against the fixed fuze body by means of a fuze key, fuze setter or fuze setting machine. Graduations are provided to enable the setting to be set by hand, the fixed part being either graduated in arbitrary fuze lengths for reading against an indicator on the moving part or else the moving portion is made to operate a fuze length indicator on the fixed part. In addition, both fixed and moving parts have slots for engagement by the pawls of fuze keys, fuze setters or fuze setting machines. The latest fuze setting machines grip the fuze by means of knife rings. The moving portion must be tight enough to prevent movement in handling, transit, loading and firing, and yet sufficiently loose to permit setting by the fuze key, fuze setter or fuze setting machine. The maintenance of the correct stiffness or tension is most important.
Note:- If once set to a predetermined time, but are not subsequently fired, C.V.T. fuzes cannot be re-set at "SAFE". Incidentally, the word "SAFE" is not engraved on the graduated portion of the fuze.

4. Shape and dimensions. - C.V.T. nose fuzes are conical and shaped to conform to the contour of the shell for which designed or approved and have a right hand screw-thread to avoid the possibility of their becoming unscrewed from the shell by rotational acceleration in the bore. The threaded portion for screwing into and the depth of intrusion of the lower part of the fuze body into the shell may vary between different fuzes depending upon the calibre of the shell for which approved. The depth of intrusion into the shell of the lower part of the body of C.V.T. fuzes is usually much greater than that of standard percussion type nose fuzes approved for use in H.E. filled shell.

PART 2

HANDBOOK OF CURRENT BRITISH LAND SERVICE FUZES

Section 8

ELECTRIC FUZES

PART 2

HANDBOOK OF CURRENT BRITISH LAND SERVICE FUZES

Section 8

ELECTRIC FUZES

CONTENTS

Introduction

ELECTRIC FUZES

1. These fuzes are usually functioned by means of a current passing through electric leads connected to a battery. The instant of actuation is therefore controlled, often from a distance. The ends of the connecting wires are usually bared and they may or may not be fitted with nipples. Where wires are of unequal length, this is to minimise the risk of a short circuit when connecting up. Electric fuzes either singly or in series are often used as a primary ignitory component in a sub-assembled store e.g., as an initiator in a fuze gaine.

FUZE, ELECTRIC, NOS. 14 AND 14A

1. **Particulars** — For exploding charges of gunpowder and also for instructional purposes; originally used as a means of ejection for Grenade No. 80 W.P. when fired from the Smoke Discharger, (now replaced by Fuze, Elec. No. F. 103).

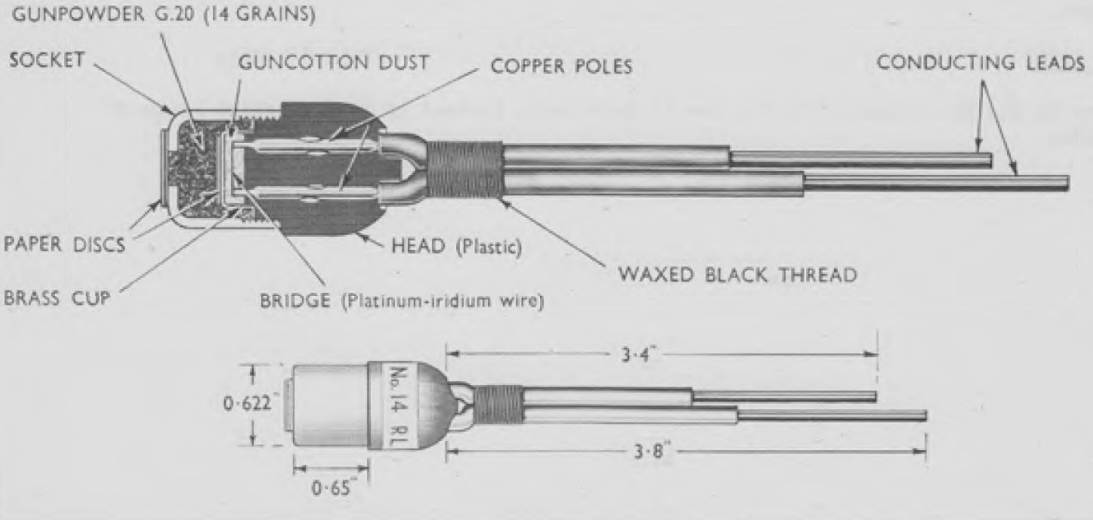
DESCRIPTION - No. 14 Mark 5 Fuze (Fig.1)

GENERAL

2. The fuze consists of a moulded plastic head, the top being dome-shaped below which it is slightly reduced in diameter and screw-threaded, a metal socket, and two conducting leads. The two copper poles are inserted in holes drilled through the head, the lower ends projecting below the base. The ends of the poles are flattened and connected together by a wire to form a bridge. Around the bridge is placed a small amount of guncotton dust which is retained by a brass cup secured by approved cement to a step formed below the screw-threads at the base of the head. The upper ends of the poles are connected to the wire leads by pure tin. The magazine portion of the fuze consists of a metal cup-shaped socket, screw-threaded internally at the mouth and with a hole drilled in the base, the hole being sealed by two paper discs secured to the external surface of the base by shellac. The socket is filled with 14 grains of G.20 gunpowder and then screwed onto the head, the threads being first coated by approved cement. The conducting leads consist of two wires each made up of three strands of copper wire coated with tin and covered with vulcanised india rubber one being 3.4 inches and the other 3.8 inches in length. The exposed ends of each wire are bared of their insulation for a distance of 1.5 inches. The wires are also secured together about a 1/4 inch from where they emerge from the head by a whipping of waxed thread. The recess in the head where the leads emerge is made watertight by rubber solution. The exterior of the head and socket is painted White.

FIG.1

FUZE, ELECTRIC, No.14, MARK 5



SUMMARY OF DIFFERENCES

No. 14

MARK 3 FUZE — WOLC-§§ 11977, 12501

3. The differences in this fuze are:-

(a) An ebonite head is used, the sides being longer than those of the plastic head, being taken to the bottom of the brass cup by an ebonite ring.

(b) The magazine is in the form of a cup made of brass which is a push fit on to the head.

(c) Guncotton yarn is used round the bridge in lieu of guncotton dust, no internal brass cup being used.

(d) Filling of 23 grains of R.P. or G.20 gunpowder used.

MARK 4 FUZE (Obsolescent) — WOLC-§§ 19776, A.4241, A.9294, B.6639

4. This fuze differs from the Mark 5 as follows:-

(a) An ebonite head is used, the sides being longer than those of the plastic head but not the full length of the brass cup as in the mark 3.

(b) A paper collar is used as an extension of the head in place of an ebonite ring as used in the mark 3.

(c) Guncotton yarn is used round the bridge in lieu of guncotton dust, no internal brass cup is used.

(d) Filling of 23 grains of R.P. or G.20 used.

MARK 5 FUZE — WOLC-§§ B 6639, B 6990

5. As described in para. 2.

NO.14A

MARK 4 FUZE (Obsolescent) — WOLC-§§ B 6639

6. Similar to the No.14 Mark 4 but has two 12 inch leads instead of the two short leads of unequal length.

MARK 5 FUZE — WOLC-§§ B 6639

7. Similar to the No.14 Mark 5 but has two 12 inch leads instead of the two short leads of unequal length.

FUZE ELECTRIC, NO. F.53

1. Particulars

Identical with Fuze electric, low tension, L.M.N.R./Chlorate; Seekay Wax filling.

Fuze, Electric, 12 inch, No. F.53, Mark 1
For Simulator 25 pr. H.E. shell burst L1A1

Fuze, Electric, 15 inch No. F.53, Mark 1
General use except for rocket motors.

Fuze, Electric, 21 inch No. F.53, Mark 1
For Charge Line Mine Clearing No. 1 Mark 2

Fuze, Electric, 15 inch No. F.53, Mark 1/1
For Igniter, electric, 3.5 inch H.E. Anti-tank Rocket, Mark 1/2.

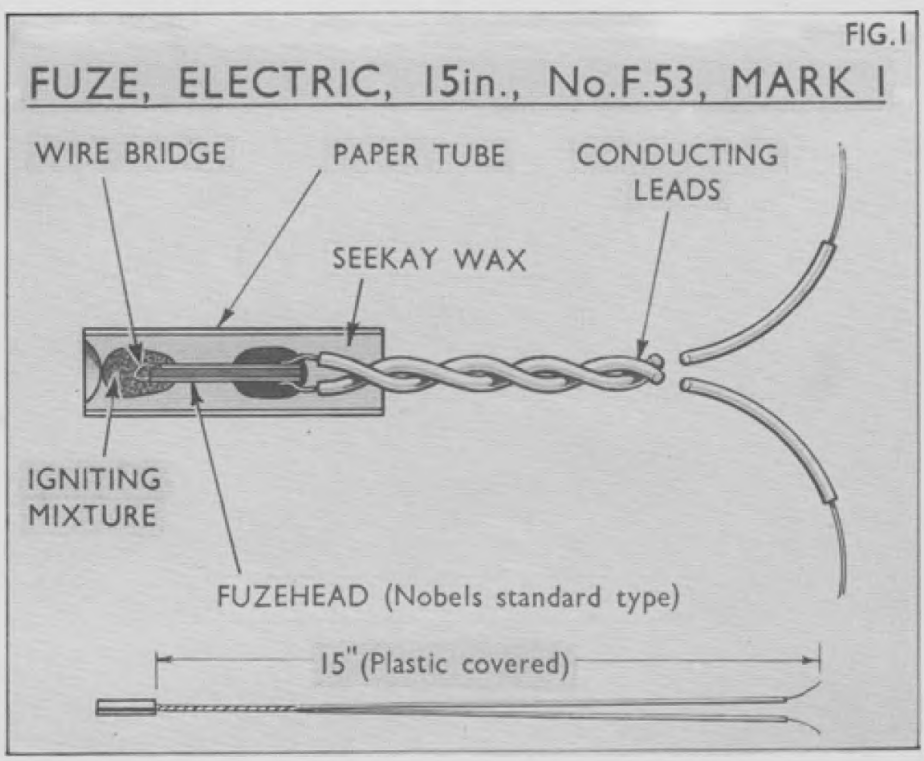
Fuze, Electric, 30 inch No. F.53, Mark 1
General use.

DESCRIPTION. - 15 inch No. F.53, Mark 1 (Fig. 1)

GENERAL

2. The fuze consists of two insulated conducting leads connected to a fuze head which carries a fusing bridge of wire surrounded by an igniting mixture consisting of lead non-nitro-rescreinate and chlorate. The fuze-head is sealed in a paper tube by means of seekay wax or other approved sealing material with the wire bridge towards the open end of the tube. The conducting leads which are of 25 S.W.G. (0.02) are of tinned copper covered by plastic insulating material. The bared end of each wire is flattened and soldered to the upper ends of brass foil contacts affixed to a press-board tube positioned in the centre of the fuze-head, the lower ends of the contacts being connected together by a wire bridge. The 15 inch long conducting leads are twisted together for a distance of 3 inches from the point where they emerge from the paper tube and at the extremity of each wire is bared of its insulation for a distance of 1.1/2 inches. The paper tube into which the fuze-head is sealed is 0.83 inches in length and 0.22 inches in diameter.

FIG.1



SUMMARY OF DIFFERENCES

15 INCH MARK 1 FUZE — WOLC - § B6567, C6552

3. Described in para. 2.

21 INCH MARK 1 FUZE — WOLC - § C6552

4. Differs in having two 21 inch cotton covered leads.

15 INCH MARK 1/1 FUZE — WOLC - § C6648, C6960

5. Differs from the 15 inch Mark 1 in having two 15 inch 22 S.W.G. (0.028) tinned copper polythene covered instead of two plastic covered 25 S.W.G. leads. This fuze was introduced as the 21 inch Mk. 1/1 but was changed to 15 inch in November, 1955.

30 INCH MARK 1 FUZE — WOLC - § IA Approval K 984

6. Differs from the 15 inch Mark 1 fuze only in having two 30 inch cotton covered leads.

12 INCH MARK 1 FUZE — WOLC - § IA Approval K 6705

7. Differs from the 15 inch Mark 1 only in having 12 inch leads in lieu of 15 inch.

FUZE, ELECTRIC, NO. F.85

1. Particulars — Used in Gaine, No. 17, Mark 1.

DESCRIPTION. - Mark 2 Fuze (Fig.1)

GENERAL

2. The fuze consists of a body through which pass two conducting leads the ends terminating in close proximity with the explosive filling which is contained in a sleeve assembled over the end of the body.

3. Body. - This is of polystyrene plastic in the form of a cylinder with a round spigot protruding from one end. The ends of each lead are twisted together and encased within the body at the moulding stage so that the cut ends of the wires are flush with the face of the spigot. An application of aquadag solution is applied over the cut ends of the wires in the centre of the spigot to form a conducting path.

4. Sleeve. - This is in the form of a brass tube, formed with an internal annular groove and a small slot across one end for securing purposes. This end fits over the spigot formed on the body, an application of distrene varnish being used as an adhesive. The remaining free space within the tube is filled with 0.9 grains of RD 1303 Composition the exposed surface and outer rim of the sleeve being covered with a protective and sealing coating of bitumen varnish. The leads of 2 inch free length are bared of insulation for the last 1.1/2 inches. The fuze head is approximately 1/2 inch in length and a 1/4 inch in diameter. The fuze is identified by two red spots placed diametrically opposite on the sleeve.

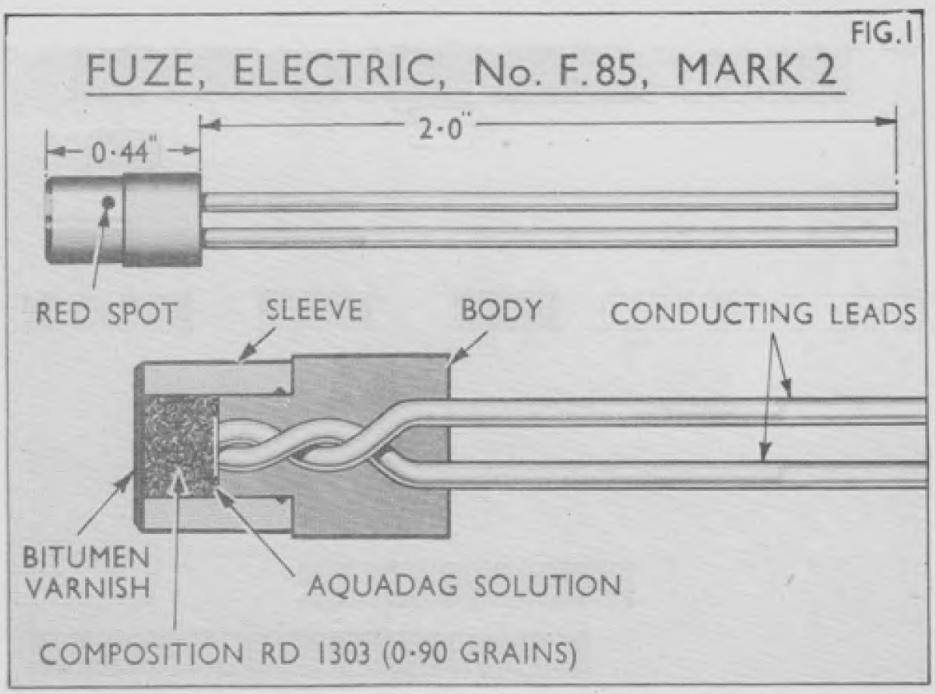
SUMMARY OF DIFFERENCES

MARK 2 FUZE	WOLC

5. Described in paras. 2 to 4 inclusive.

NOTE. There is a Mark 1 fuze used in Naval Service. This mark differs from the Mark 2 only in that it is filled with RD 1307 in lieu of RD 1303.

FIG.1



FUZE, ELECTRIC, NO. F.92

1. Particulars — Mark 1 for Mark 2 igniter in Generator, Smoke, No. 8, Mark 6

DESCRIPTION - Mark 1 Fuze (Fig. 1)

GENERAL

2. The fuze consists of a tube made of paper, wrapping, hard blue containing a fuze-head (standard Nobel type), with two conducting leads. The fuze-head is sealed in the paper tube by means of Seekay wax or other approved sealing material, with the wire bridge positioned towards the open end of the tube. A cavity formed in the opened end of the tube contains a small charge of PN 196 Composition, which is inserted into the cavity by smearing until it is flush with the top of the tube. The end of the tube from which the conducting leads emerge is sulphur sealed. The two conducting leads are plastic covered, each approximately 0.87 inch in length, the exposed ends being bared for approximately 0.25 inches. A strip of Blue paper, with the number and mark of the fuze printed thereon, is secured around the body of the tube.

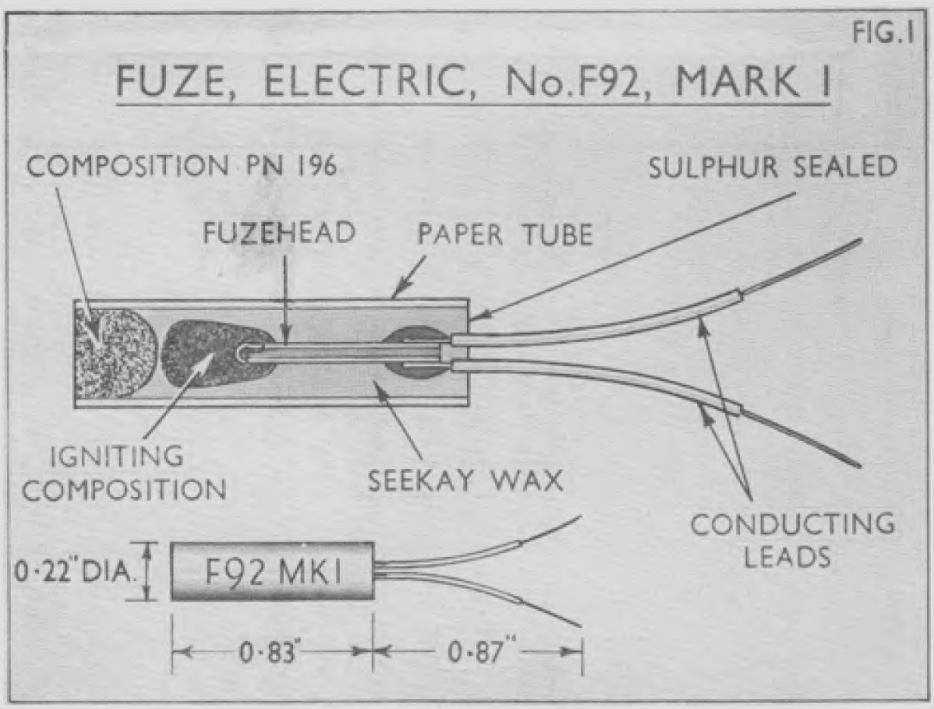
SUMMARY OF DIFFERENCES

MARK 1 FUZE (Obsolescent) — WOLC C 3127, C5764, C5765, C7556

3. Described in para. 2.

NOTE - There is a Mark 1/1 fuze which is used in the Naval Service, it differs from the Mark 1 only in that the leads are approximately 15 inches in length and are untwisted.

FIG.1



FUZE, ELECTRIC, NO. F.101

1. Particulars

Used in Igniter, Electric, No. 84, Mark 1/1 (for Generator, Smoke, No. 24, Mark 5)

DESCRIPTION. - Mark 1 Fuze (Fig. 1)

GENERAL

2. The fuze consists principally of a paper tube, a fuze-head, with two conducting leads for electrical ignition. The fuze-head which is the standard Nobel type is inserted and positioned in the tube so that the wire bridge which is surrounded by igniting composition is towards the open end of the tube. The fuze head is sealed into the tube by means of sulphur. The ends of the leads of conducting wires are bared and soldered to the upper part of the fuze-head. The conducting leads consist of two tinned copper plastic covered wires 15 inches in length. The exposed ends are bared for approximately 1.5 inches and where they emerge from the fuze body they are twisted together for a distance of 3 inches after which they are left untwisted.

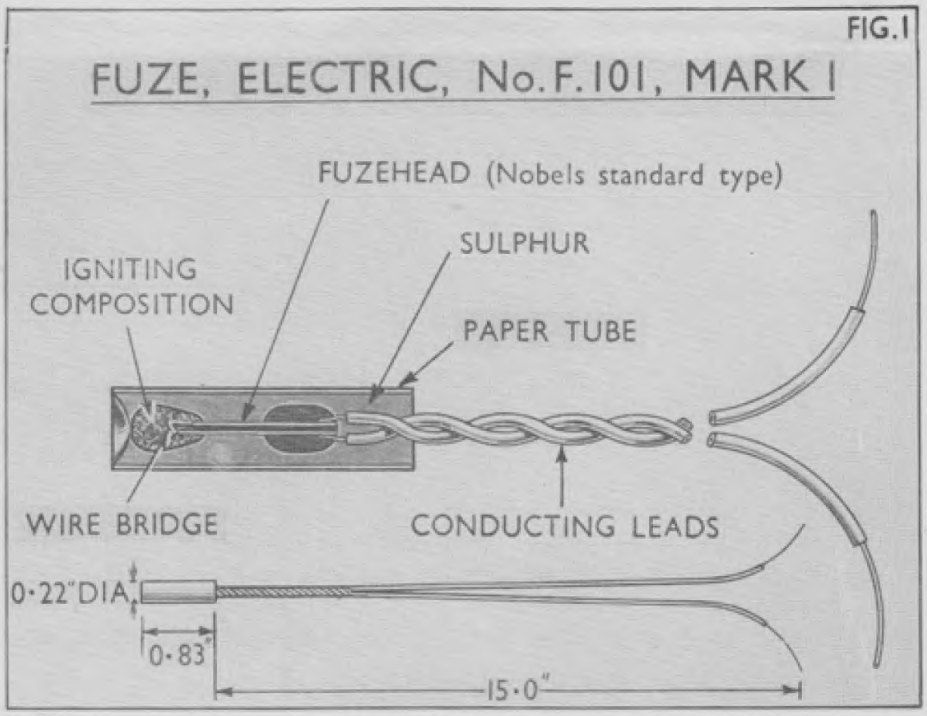
SUMMARY OF DIFFERENCES

MARK 1 FUZE

WOLC - § C3031

3. As described in para. 2.

FIG.1



FUZE, ELECTRIC, NO. F.103

1. **Particulars** — Used as a means of ejection for Grenade, No. 80 W.P. when fired from the Smoke Discharger.

DESCRIPTION. - Mark 3 Fuze (Fig. 1)

GENERAL

2. The fuze consists of a brass cup-shaped magazine, brass cover, neoprene plug, and a Fuze, Electric No. F. 53, Mark 1. The two conducting leads pass through the centre of the neoprene plug which is positioned in the tube shaped portion of the cover. The ends of the leads are bared and soldered to the upper ends of the copper poles in the fuze head. The leads are secured together by twisting the wires and two standard nipples are soldered to the exposed ends. The cover is filled for a depth of approximately .7 inches with RD 1153 A Composition stemmed in, the Fuze, Electric, No. 53, Mark 1 being positioned in the centre with the open end towards the magazine. The cover passes over the outer diameter of the magazine which is filled with 26 grains of G.20 gunpowder, and is secured with RD 1198 B Vitro-cellulose varnish applied to the internal walls of the cover and outer walls of the magazine.

SUMMARY OF DIFFERENCES

MARK 1 FUZE (Obsolescent) — WOLC - § C3880

3. The leads are secured together adjacent to the top of the cover with a whipping of black waxed thread. The composition in the magazine cover is retained by means of three equi-spaced indentations around the periphery of the cover.

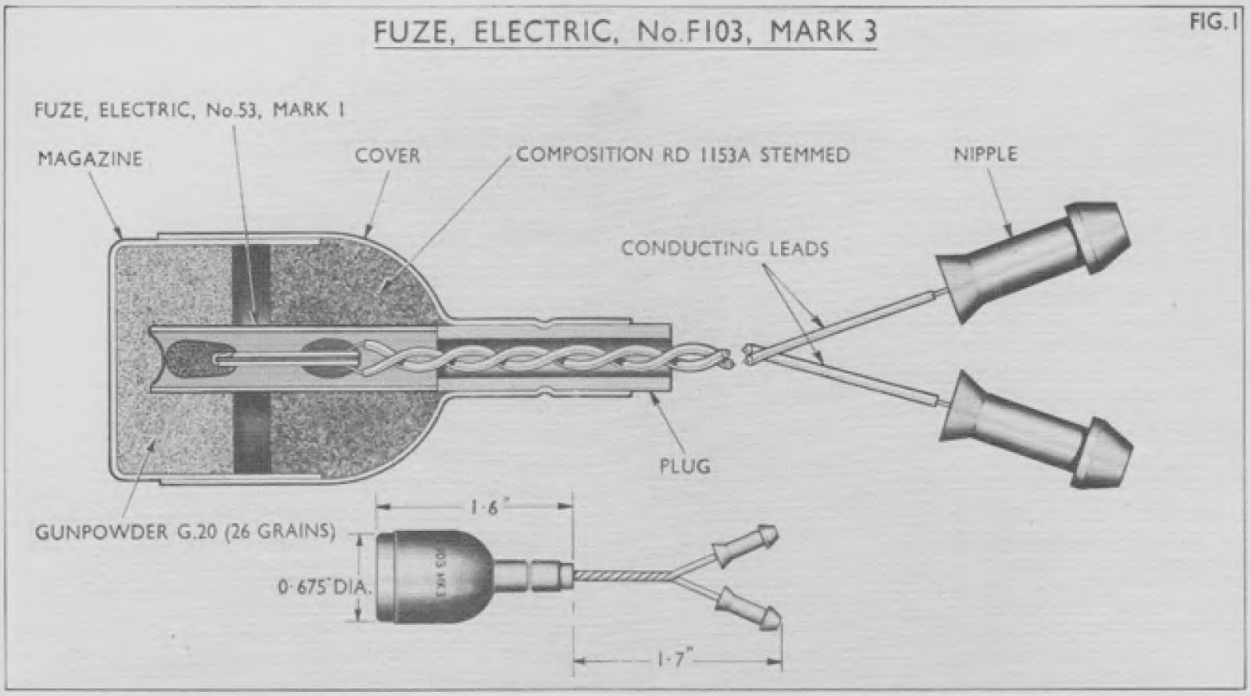
MARK 2 FUZE — WOLC - § C9720

4. Differs principally from the Mark 3 in the cover which is made in two pieces, a cover and a sleeve. The sleeve is secured to the cover is cannelured on to the plug. The composition is retained in the cover by three equi-spaced indentations around the periphery.

MARK 3 FUZE (Obsolescent) — WOLC - § C9720

5. Described in para. 2.

FUZE, ELECTRIC, No.F103, MARK 3 — FIG.1



FUZE, ELECTRIC, NO. F.111

1. Particulars — For Rocket, motor, 5 inch No. 3, Mark 3

DESCRIPTION. - Mark 1 Fuze (Fig. 1)

GENERAL

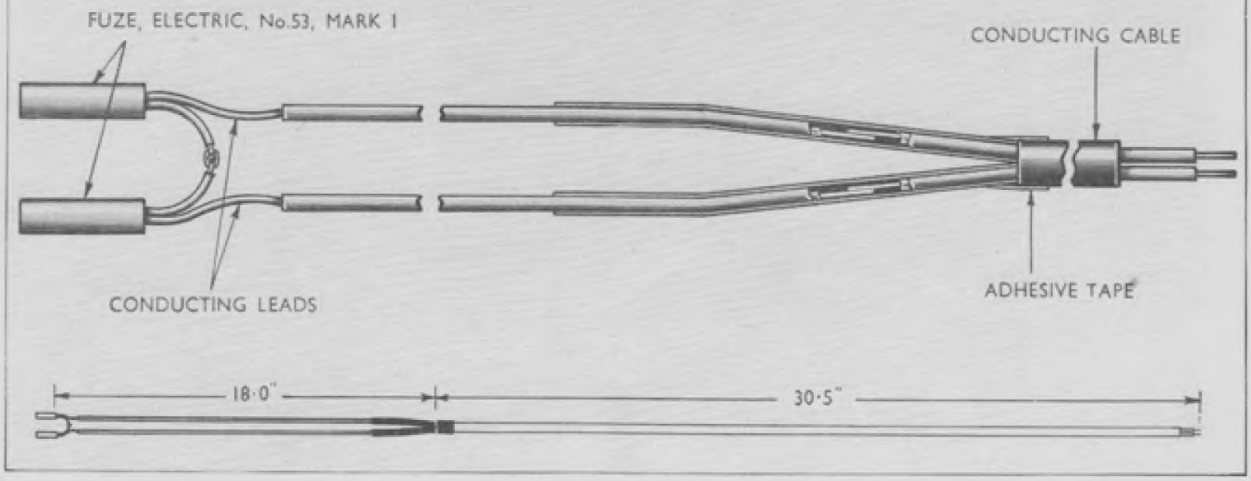
2. The fuze consists principally of two Fuzes, Electric, F. 53, Mark 1 connected in series and then joined to a conducting cable. One conducting lead of each fuze is cut about 2.1/2 inches from where it emerges from the fuze, part of the insulating material is removed, and the two short wires joined together by soldering, the junction being afterwards insulated. The two remaining cotton covered leads each 16 inch in length remaining uncut are coated with shellac varnish up to point where they are soldered to the rubber covered conducting cable. Before being soldered, an insulating sleeve 14.5 inches in length is slipped over each lead. A larger insulating sleeve 3 inches in length is affixed over the junction where the ends of the leads are soldered to the cable. These larger sleeves are retained in position by a piece of adhesive tape wrapped around the junction of the sleeve and cable. The end of the cable has the outer insulating cover removed for a distance of 3/4 of an inch, and the inner wires are then bared of their insulating covering for 1/4 of an inch and the bared ends tinned.

SUMMARY OF DIFFERENCES

MARK 1 FUZE — WOLC - § K430

3. As described in para. 2.

FUZE, ELECTRIC, No.F.111, MARK 1 — FIG.1



PART 2

HANDBOOK OF CURRENT BRITISH LAND SERVICE FUZES

Section 9
MINE FUZES

PART 2

HANDBOOK OF CURRENT BRITISH LAND SERVICE FUZES

Section 9

MINE FUZES

CONTENTS

Introduction

MINE FUZES

1. These fuzes are sometimes referred to as "Contact fuzes". This term being associated with fuzes actuated by direct application of pressure or a series of pressures applied by and above a specificed minimum load.

2. Safety and handling and transit. - Safety is usually achieved by the use of a safety clip which, when assembled, retains the movable parts in the unarmed position, the safety clip being removed from the fuze only on assembly of the fuze in the mine at the time of laying it.

FUZE, MINE, ANTI-PERSONNEL, NO. 2

1. Particulars

(a) Type	Contact i.e. pressure operated
(b) Mine with which used	Mine, anti-personnel No. 6 Mark 1.

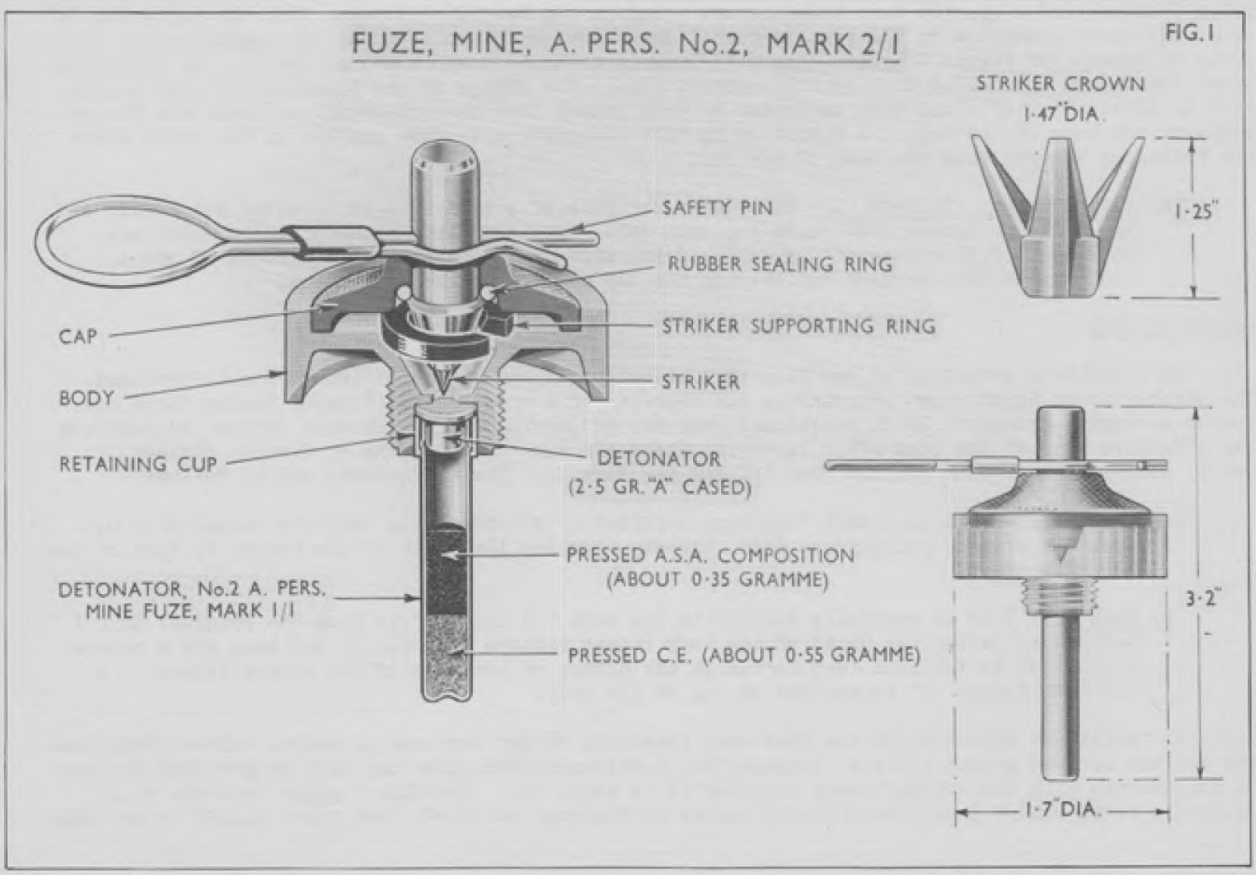
DESCRIPTION - Mark 2/1 Fuze (Fig. 1)

GENERAL

2. The No. 2 anti-personnel mine fuze is a component of the No. 6 Mark 1 anti-personnel pressure-operated mine which is designed primarily to inflict injury on personnel and to damage vehicle tyres. The complete mine assembly, with the exception of the detonator, the tip of the striker and the detector ring is made of non-metallic materials, and when partly buried in the ground, the exposed portions are of an inconspicuous colour. The fuze is designed to resist actuation by the blast of an anti-tank mine detonated not less than six feet away. The fuze consists principally of a body, cap, striker, striker supporting ring, safety pin, sealing ring, retaining cup, 2.5 grain 'A' cased detonator and a Detonator, No. 2, anti-personnel mine fuze, Mark 1/1.

3. Body. - The body is made of clear unpigmented polystyrene. Externally it is cylindrical in shape with ribs formed around the circumference. A large boss is formed in the centre of the base and a recess is formed in this boss to house the assembled detonator. The external portion of the boss is threaded to screw into the adapter of the mine, and around the boss, the body is hollowed out. A recess is also formed in the top surface of the body, and in the centre of this recess a cone-shaped hole is formed, the base of the hole connecting with the detonator recess.

4. Cap. - Made of polystyrene, coloured camouflage brown, the cap is roughly dome-shaped, the surface above where it fits into the body being left hatched. A hole is formed in the centre to take the striker. Before the cap is assembled in the top of the body the rim is coated with RD 1279 cement, and the two components retained under compression until the cement has set hard.



5. Striker. - Made of polystyrene coloured camouflage brown, the striker consists of a stem with the lower portion formed into a truncated cone, the tip of which is fitted with a brass striker pin. A 3/32 inch diameter hole is drilled through the stem at right angles to the axis to accommodate the safety pin. To obviate the possibility of the safety pin hole being fouled by the ingress of adhesive composition, a hole is drilled concentrically through the stem and is closed at the upper end with a parallel polystyrene plug which is secured in position with Composition RD 1279.

6. Striker supporting ring. - A split supporting ring of ebonite, moulded in the form of a horse-shoe, tapered internally to suit the cone of the striker, is positioned just below the highest diameter of the cone and rests on the fuze body. The striker is so designed that when assembled in the fuze the truncated cone is clear of the supporting ring.

7. Safety pin. - The safety pin consists of a length of No. 14 S.W.G. (0.08 inch) phosphor - bronze wire bent to form two separate arms, one straight for insertion through the hole in the stem of the striker, the other with a semi-circular bend in it to clip around the external circumference of the striker. A finger loop is also formed to facilitate extraction.

8. Sealing ring. - A small rubber sealing ring fitted round the striker stem, just above the truncated cone, is under radial compression between the stem of the striker and fuze cap provides a watertight seal.

9. Retaining cup. - This is of white polystyrene, in the form of a cup with a hole formed in the base. It fits over the head of the No. 106 detonator and also accommodates the 2.5 grain "A" detonator, which is assembled in the top of the open end of the former. The cup with detonators assembled is coated with RD 1221 A cement, covered with a tin foil disc, and then pushed home in the hole in the centre of the body and the cement allowed to set hard.

10. Detonator 2.5 grain "A" cased. - This is a tinned brass cased cup formed with an external flange and filled with 2.5 grains of "A" mixture. It is distinguished by being marked with a green spot. It is assembled in the open end of the No. 106 detonator, the flange resting on the rim or mouth of the No. 106 detonator.

11. Detonator, No. 2 anti-personnel mine fuze Mark 1/1. - This consists of the retaining cup (see para. 9 above) and a No. 106 Mark 1 detonator. Before the No. 106 detonator with the 2.5 grain "A" cased detonator assembled in the top, is pushed down through the hole in the cup approximately two turns of waterproof fabric adhesive tape 0.17 inch in width is wrapped around the No. 106 detonator above the flange and coated with RD 1219 composition. The flange of the detonator is also coated with RD 1219 composition and then detonator is then pushed into the retaining cap until the flange rests on the base of the cup. A fillet of RD 1219 composition is then applied to the joint where the detonator emerges from the base of the cup.

(a) Detonator No. 106 Mark 1. - This is in the form of a tube with an inverted domed base and has a flange formed just below the open end. It is filled, commencing from the base, with about 0.55 gramme of C.E. pressed in, above which is about 0.35 gramme of A.S.A. composition also pressed in, leaving the top portion of the tube empty.

LAYING OF MINE

12. To facilitate actuation of the fuze when assembled to the mine a Striker Crown is provided. The striker crown is of brown polystyrene and consists of a crown-shaped fitment having three equi-spaced diverging prongs. It is positioned over the projecting end of the fuze striker to increase the effective area of the head after laying. There are two current marks of Crowns, Striker, No. 6, anti-personnel mine viz the Mark 1/1 and the Mark 2. The differences are as follows.

(a) Mark 1/1. - This is a Mark 1 pattern modified by the insertion into the recess of a 0.1 inch thick white polystyrene disc, thereby reducing the depth of the recess to that of the Mark 2 pattern.

(b) Mark 2. - This is generally similar to the Mark 1/1 and differs from the original Mark 1 pattern by having the depth of the body recess reduced from 0.4 to 0.3 inch and a recess 0.156 inch by 0.1 inch deep formed in the centre of the base of the larger recess. A 1/4 inch figure '2' is moulded on top of the body.

13. To facilitate actuation of the fuze when assembled to the mine and to ensure correct functioning on snow covered ground a Plate, Bearing, No. 6 anti-personnel mine may also be provided for use in conjunction with the striker crown referred to in para. 12. The Mark 1 plate consists of a synthetic resin-bonded paper-board disc 6 inches in diameter and 0.125 inch thick coated on one side

only with white paint. The opposite side is left untreated. A cut away portion at the centre, consisting of a 1.48 inch diameter hole with four equi-spaced radial slots approximately 0.85 inch long and 0.35 inch wide, permits insertion of the fuzed mine.

SAFETY ARRANGEMENTS

14. These are:-

(a) The fuze striker is held in the safe position and is prevented from exerting pressure on the supporting ring during storage and transit by the safety pin, one arm of which passes through the hole in the striker stem, the other arm clipping around the stem to prevent accidental withdrawal.

(b) To afford additional safety in storage and transit, mine bodies and fuzes are packed unassembled, though in the same package, so that accidental firing of the fuze will not be communicated to the mine body.

(c) Cap, Safety No. 6 anti-personnel mine Mark 1 of transparent polystyrene is provided for use in mine lifting operations. Safety caps are packed and issued separately together with spare safety pins.

ACTION

15. On withdrawal of the fuze safety pin the striker is held away from the initiating detonator by the ebonite supporting ring only. Any pressure on the head of the striker, in excess of the safe load, fractures the supporting ring and forces the striker down onto the detonator.

SUMMARY OF DIFFERENCES

MARK 2/1 FUZE WOLC - § C9720

16. As described in paras. 2 to 15 above.

FUZE MINE ANTI-PERSONNEL NO. 2 IMITATION

1. Particulars

(a) Type — Bituminous plastic

(b) Mine with which used. — Mine, anti-personnel No.6 Imitation.

DESCRIPTION Mark 2 Fuze

GENERAL

2. Made of bituminous plastic and filled with asbestos the imitation fuze is shaped to represent the operational fuze. A hole is formed in the top portion representing the striker to take a safety pin.

SUMMARY OF DIFFERENCES

MARK 2 FUZE — WOLC - $\frac{S}{S}$ C 9720

FUZE MINE ANTI-PERSONNEL NO. 2 INERT

1. Particulars

(a) Type — Contact i.e. pressure operated (inert).

(b) Mine with which used. — Mine anti-personnel No. 6 inert.

DESCRIPTION Mark 2/1 Fuze

GENERAL

2. This fuze is in effect an inert Fuze mine anti-personnel No. 2 Mark 2/1, an empty detonator shell being fitted in lieu of the filled detonator of the operational fuze.

3. It is distinguished from the operational fuze by having a black body and cap. It also has the word "INERT" in quarter inch white letters on the cap.

SUMMARY OF DIFFERENCES

MARK 2/1 FUZE — WOLC - $\frac{S}{S}$ C 9720

4. As described in paras. 2 and 3.

FUZE, MINE, ANTI-TANK No. 4

1. Particulars

(a) Type	Contact i.e. pressure operated
(b) Mine with which used	Mine, Anti-tank, Mk. 7 series

DESCRIPTION - Mark 2 fuze (Fig 1)

GENERAL

2. The No. 4 anti-tank mine fuze is a pressure operated type and consists principally of a body, main spring, cap, screw, plunger, striker assembly, positioning ring, striker housing, detonator housing, a 5.7 grain "AZ" detonator and a safety clip.

3. Body.- Made of aluminium alloy-anodised, the body is cylindrical in shape and is reduced in diameter at the top to form a guide below which is a flange to support the spring. A hole is formed centrally to accommodate the plunger, positioning ring and striker diaphragm below which the body is screw-threaded to accept the striker housing. The words "MINE UNARMED" are stamped around the bottom face of the body and filled in with red.

4. Cap. - The cap is made of steel electro zinc plated. Externally, it is dome shaped with a flat top and is formed with a flange at the base. The words "MINE ARMED" are stamped on the top and filled in with red. Internally, it is hollowed out to accommodate the spring, has a boss formed in the centre to fit into the recess made in the top of the plunger and a central clearance hole drilled through the top to allow the screw to pass through and engage in the top of the plunger. When the cap is assembled and the screw is screwed home in the top of the plunger, a pin of hard brass is driven obliquely through the cap, plunger and screw, thereby locking these three components together, after which the end of the pin is stabbed to retain it in position.

5. Plunger. - The plunger is made of steel electro zinc plated. Externally, it is cylindrical in shape and is formed with a flange near the base below which it is reduced in diameter to form a small boss. A small recess is formed in the top face to fit over the boss formed inside the cap and a hole is drilled in the centre and threaded to accept the shank of the hexagon-head screw which secures the cap in position. A rubber sealing ring seats in a groove around the plunger and seals the mating surfaces between the body and the plunger.

6. Spring. - This is a cylindrical coiled spring of rectangular section spring steel. It is composed of two working coils, the ends being close coiled and ground flat. It is rustproofed by a phosphate process and coated with lanolin. It is assembled under the cap, seats around the top portion with the bottom coil resting on the flange of the body.

7. Striker assembly. - This comprises a diaphragm, point (i.e., needle) and a collar.

(a) Diaphragm - The diaphragms are made of beryllium copper. They are dome shaped discs with a hole drilled in the centre.

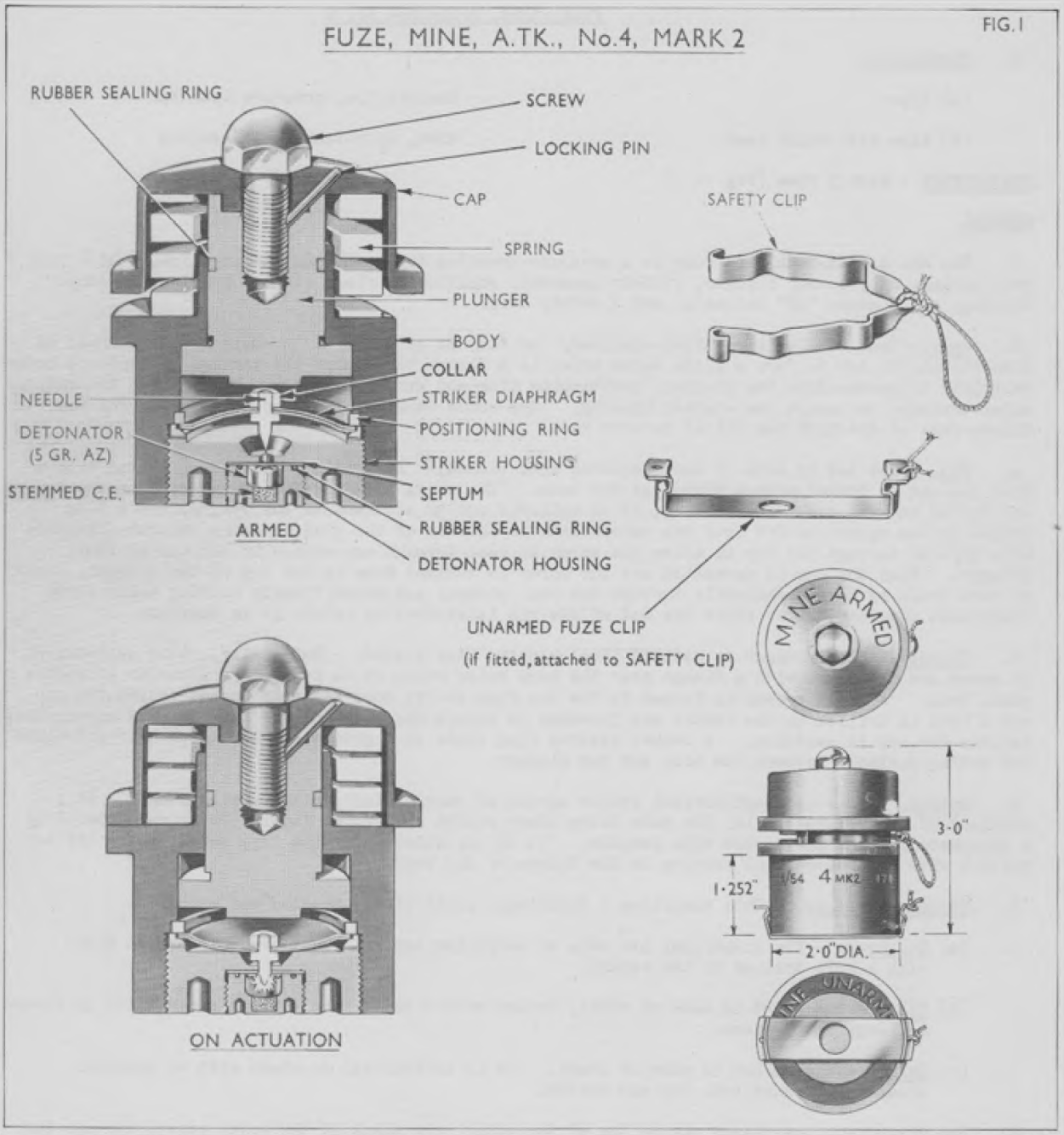
(b) Point - The point is made of steel, formed with a sharp needle point above which is formed a flange and a shank.

(c) Collar - The collar is made of steel. It is cylindrical in shape with an internal chamfer formed at both top and bottom.

8. Two diaphragms are placed one on top of the other, the shank of the point passes through the centre of the diaphragms from underneath, after which the collar is placed over the shank, which is then opened up with a centre punch to secure it in the collar. The whole assembly is then chamfered.

9. Striker housing. - The housing is made of brass electro tin plated. Externally, it is cylindrical in shape, formed plain at the top below which it is screw-threaded. A hole is drilled and screw-threaded in the centre of the base to accept the detonator housing. Two key holes, diametrically opposed, are also drilled in the base to facilitate assembly. From the top it is bored out on several diameters and in the centre a small hole is drilled through to connect with the recess formed in the base. Eight slots equi-distant spaced are cut in the rim of the upper face.

FIG.1



10. Detonator housing. - The detonator housing is also made of brass electro tin plated. Externally, it is cylindrical in shape and threaded to screw into the base of the striker housing. Two key holes, diametrically opposed, are also drilled in the base to facilitate assembly. Internally, it is bored out on two diameters leaving a thin diaphragm of metal at the base. The smaller cavity at the base is filled with loose C.E. stemmed in, the detonator being assembled in the larger cavity above. A circular recess is formed in the upper face to accept a rubber sealing ring.

11. Detonator. - This is a 5.7 grain "AZ" lugless (tinned copper alloy cup) detonator and is assembled in the detonator housing base downwards. After assembly a lead/tin foil septum is placed over the top of the housing.

12. Safety clip. - The safety clip, which is made of spring steel, is positioned between the body and the cap. To arm the fuze the safety clip is removed and the fuze is assembled in the mine with the words "MINE ARMED" uppermost. Three patterns of clip may be met with:-

(a) The earlier pattern, which is obsolescent, consists of a steel strip, rustproofed, in the form of a circlip. Midway around its circumference the clip is flattened and a length of whipcord is secured thereto. The clip is assembled between the cap and the body of the fuze.

(b) The second pattern is similar to the former except that the spring steel strip, is crimped in two places on either side of the flattened position. This is to enable the clip to be held more firmly in position.

(c) The third pattern consists of the second clip to which is secured by a length of whipcord an unarmed fuze clip which consists of a length of flat spring steel, the ends of which are bent up to fit over the base of the fuze body. With effect from approximately July, 1956, the Unarmed Fuze Clip was dispensed with and it will no longer be issued assembled over the base of the fuze. The reason being, that as the fuze will NOT, in future, be carried in the mine, this portion of the clip is no longer required.

SAFETY ARRANGEMENTS

13. These are

(a) Safety clip positioned between body and cap.

(b) Main Spring assembled under the cap and on the flange of the body, which prevents the plunger being forced down on to the Striker in the centre of the diaphragm until it is compressed by a specified pressure applied to the cap.

PREPARATION FOR USE

14. To arm the fuze. - the safety clip is removed and the fuze is assembled in the socket in the centre of the mine with the words "MINE ARMED" uppermost. The cover of the mine is then replaced.

ACTION (FIG. 1)

15. On the safe load on the mine cover being exceeded the plunger is forced down and, overcoming the main spring, it bears down on to the top of the needle in the centre of the diaphragm. The pressure forces the striker diaphragm to reverse sharply driving the sharp point of the needle into the detonator. The flash from the detonator then passes through and is augmented by the C.E. in the fire channel to detonate the filling in the mine.

SUMMARY OF DIFFERENCES

MARK 2 FUZE — WOLC - S C8536

16. As described in paras 2 to 15 inclusive.

MARK 2/1 FUZE — WOLC - S C8537

The mark 2/1 fuze differs in the following ways:-

(a) Striker assembly. - The diaphragms are zinc plated to improve resistance to corrosion.

(b) Septum, detonator assembly. - This is replaced by an aluminium cap.

FUZE MINE ANTI-TANK NO. 4 IMITATION

1. Particulars

(a) Type — Hardwood

(b) Mine with which used — Mine Anti-tank No. 7 Imitation

DESCRIPTION Mark 1 Fuze

GENERAL

2. This is a block of hardwood shaped to the outline of the operational fuze. It is painted service brown and has the words "MINE ARMED" on the cap and "MINE UNARMED" on the base in quarter inch red letters.

SUMMARY OF DIFFERENCES

MARK 1 FUZE — WOLC - § C9720

3. As described in para. 3.

FUZE MINE ANTI-TANK NO. 4 INERT

1. Particulars

(a) Type — Contact, i.e. pressure operated (inert)

(b) Mine with which used — Mine, Anti-tank, Inert No. 7

DESCRIPTION Mark 1 Fuze (Fig. 1)

GENERAL

2. This fuze is an operational fuze without striker assembly or detonator. It is distinguished from the operational fuze by being painted black, "INERT", in quarter inch high white letters, being stencilled on both cap and base.

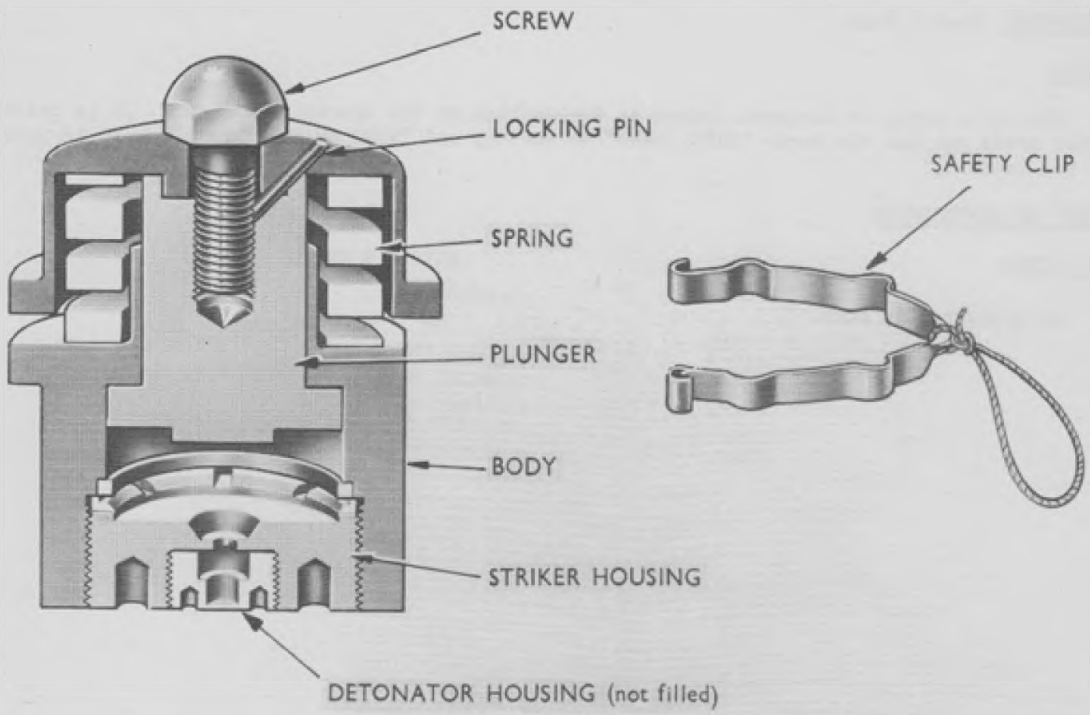
SUMMARY OF DIFFERENCES

MARK 1 FUZE — WOLC - § C9720

3. As described in para. 2.

FIG.1

FUZE, MINE, A.TK., No.4, INERT, MK.1



BASE MARKINGS

TOP MARKINGS

PART 2

HANDBOOK OF CURRENT BRITISH LAND SERVICE FUZES

Section 10

MISCELLANEOUS FUZES

PART 2

HANDBOOK OF CURRENT BRITISH LAND SERVICE FUZES

Section 10

MISCELLANEOUS FUZES

CONTENTS

Introduction

MISCELLANEOUS FUZES

1. This section deals with those fuzes which do not fall into any of the types in Sections 1 to 9.

FUZE, ROCKET, BOXER, No.20

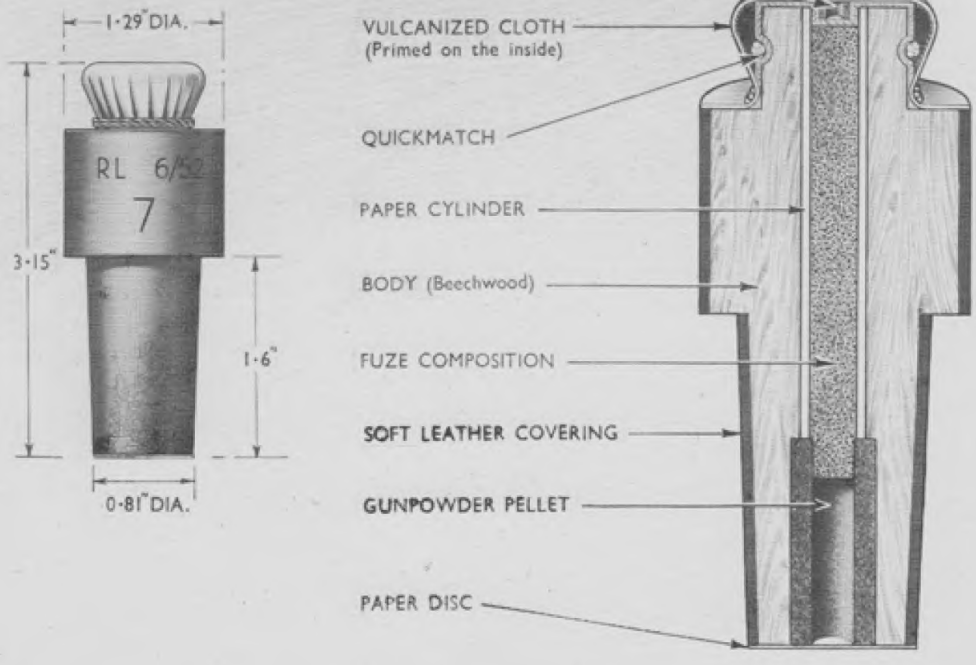
1. Particulars

(a) Type	Pyrotechnic, ignition by flame.
(b) Purpose for which used	For use by the Board of Trade for use in Rocket, Life-saving, Boxer.

DESCRIPTION. - Mark 7 (Fig.1)

2. The No.20 fuze, rocket, boxer is filled with fuze composition. It is ignited by flame from a portfire and is used to ignite the propelling charge of Boxer life-saving rocket which is a Board of Trade supply. The body of the fuze is of beechwood, the head of which is cylindrical below which it is of an increased diameter and is then tapered towards the base in two steps. It is approximately 3.15 inches in length. The head is covered with vulcanised, thin, all wool cloth which is primed on the inner surface, the skirt of the material being choked and secured to the bottom of the head by several turns of 3 cord thread. The larger tapered portion of the body is covered with soft leather about 0.05 inch thick, secured by shellac. A groove is machined around the circumference of the head and two strands of Quickmatch, one cut 4 inches and one 3 inches in length are affixed in the groove. A cylindrical hole is formed down the centre of the body and partially lined with a cylinder of hard grey paper, which is filled with fuze composition inserted in pellet form and then compressed to give a burning time of 5 seconds. A small recess is formed in the composition at the top of the cylinder at the head of the fuze and filled with a pellet of mealed gunpowder, a small hole 0.1 inch in diameter being made in the pellet after it is pressed home. A perforated gunpowder pellet is inserted in the body from the base and is retained in position by a white paper disc secured to the base by shellac.

FUZE, ROCKET, BOXER, No.20, MARK 7 — FIG.1



PREPARATION FOR FIRING

3. After the "Rocket, Life-saving, Boxer" is assembled on the tripod stand, remove the closing plug from the base of the rocket by means of the key provided and break the paper disc covering the cavity in the composition.

4. Insert the fuze in this conical cavity, and then light the top of the fuze by the flame of a portfire and stand clear.

SUMMARY OF DIFFERENCES

MARK 5 FUZE (Obsolescent) WOLC-S 16839, 24754, A30

5. This differs from the Mark 7 in having an outer covering of kemptulicon instead of leather.

MARK 6 FUZE (Obsolescent) WOLC-S 24754, A30, A3800

6. In this fuze the fuze composition is pressed to give a burning time of 10 seconds and is in a brown paper cylinder. The gunpowder pellet in the base is also slightly shorter than that fitted to the Mark 7 fuze.

MARK 7 FUZE (Obsolescent) WOLC-S

7. As described in paras. 2 to 4 inclusive.

PART 2

HANDBOOK OF CURRENT BRITISH LAND SERVICE FUZES

Section 11

TIME MECHANISMS, GAINES & DELAYED ARMING SHUTTERS

PART 2

HANDBOOK OF CURRENT BRITISH LAND SERVICE FUZES

Section 11

TIME MECHANISMS, GAINES & DELAYED ARMING SHUTTERS

CONTENTS

Introduction

TIME MECHANISMS, GAINES & DELAYED ARMING SHUTTERS

1. Time mechanisms, gaines and delayed arming shutter of one model number or type may well be used in a number of different fuzes.

2. The object of this section is to provide a detailed description of these components which can be read in conjunction with the description of the individual fuzes.

MECHANISM, TIME, 80 SECONDS Nos. 1 AND 1A

1. Particulars

(a) Type — Thiel

DESCRIPTION - No. 1 Mechanism (Fig. 1)

GENERAL

2. (a) Inside the fuze is a platform or hand race, across which a shaped slot is cut. Rotation of the appropriate portion of the fuze positions the slot and thereby sets the fuze.

(b) The clockwork mechanism which rotates a spring-loaded hand beneath the hand race is driven by a mainspring and controlled by an escapement through a train of gear wheels.

(c) The mechanism is started by the firing of the gun, the hand being released for rotation by the set-back of a trigger. A muzzle safety bridge prevents the hand from rising until 0.72 seconds after firing. The minimum arming distance is approximately 400 yds, but is dependant on the ordnance being used, and the maximum time of running is 43 seconds. Thereafter the hand bears on the under-surface of the hand race until, at the end of the time as set, it has rotated until it is coincident with the slot in the race into which it rises.

(d) The hand is secured to a hollow hand centre, the rim of which engages a tip on the end of the lever fixed to the top of the striker. A cam on the striker rests on a pillar and the rising of the hand releases the lever which allows the striker spring to rotate the cam off the pillar and force the striker down on to the detonator. The striker is prevented from reaching the detonator before the shell leaves the muzzle by a centrifugal safety catch.

CLOCKWORK MECHANISM

3. This comprises the mainspring, gear train and escapement, the hand and trigger assembly and the firing mechanism. It is assembled as a complete unit on a frame consisting of bottom, train, barrel and top plates and is fixed on to a platform in the fuze body.

4. Drive. - The drive is by the mainspring coiled inside a barrel mounted on a centre arbor. One end of the spring is fixed to the barrel and the other to the arbor. The arbor is held by the hand until the gun is fired and the spring is wound up by rotation of the barrel and retained in that state by a click.

5. Mainspring. - The flat steel mainspring, 14.875 inches long and .140 inches wide, is coiled inside the barrel, the inner end having a slot for engagement on a hook formed on the centre arbor, and the outer end itself forming a hook to engage a catch on the barrel. The spring is wound before the mechanism is assembled in the fuze by a key inserted through a hole in the top plate.

6. Barrel. - The brass barrel is mounted around the centre arbor and has teeth formed on the periphery for engagement with the winding key and the click. The portion of the inner circumference is undercut to form a catch for the outer end of the mainspring. A slot is cut in the bottom to give access to the mainspring and the top is covered by a circular disc plate.

7. Click and click spring. - The steel click pivots on a pin in the barrel plate. It has a single tooth to engage the teeth on the periphery of the barrel to prevent the mainspring from unwinding.

The flat steel click spring is secured to the periphery of the barrel plate by a screw. The spring keeps the click forced inwards.

8. Gear train. - This consists of a sequence of gear wheels to give the required step-up ratio from the drive to the escapement.

Rotation of the centre arbor by the mainspring turns the hand at the top and the centre wheel at the bottom. The centre wheel causes the third, fourth and 'scape pinions and wheels to rotate, the steel pinions being mounted above the brass wheels on the same arbors.

9. Centre arbor. - The cylindrical steel arbor is reduced in diameter at the bottom to form a pivot which rotates in a bearing hole in the train plate. The arbor passes through a hole in the barrel plate and the top rotates in a bearing hole in the top plate.

It is formed with a flange at its lower end to which the centre wheel is secured by three screws. Above this is another flange, part of which is undercut to form a hook for engaging the slot on the inner end of the mainspring.

Above this again, the centre arbor is reduced in diameter to suit the central pivot hole in the top plate and again at the top it is reduced and slotted to suit the hand centre.

10. Centre wheel. - The centre wheel is assembled on the lower end of the centre arbor with three securing screws. It is housed in a recess in the upper surface of the train plate and drives the third pinion.

11. 3rd. Arbor, pinion and wheel. - The arbor pivots rotate in bearing holes in the bottom and train plates.

The steel pinion enters a recess in the train plate and is driven by the centre wheel.

The brass wheel drives the fourth pinion.

12. 4th Arbor, pinion, and wheel. - The arbor pivots rotate in bearings in the bottom and train plates.

The steel pinion is driven by the third wheel and the brass wheel drives the 'scape pinion.

ESCAPEMENT

13. This comprises the escape wheel, pallet and hairspring and is the controlling device by means of which the power of the drive is allowed to "escape" only at a steady rate.

Vibration of the hairspring and pallet disengages one of the pads from the 'scape wheel. In doing so, the pad receives an impulse from the 'scape tooth as it jumps forward before being eventually locked by the entry of the other pallet pad into an adjacent tooth. This action is repeated by the disengagement of the second pad. The resulting series of impulses is transmitted to the pallet arm and results in an oscillation which is maintained at a rate determined by the weight and length of the pallet arm and the effective length and bending properties of the hairspring.

14. Escape,arbor, pinion and wheel. - The arbor pivots rotate in bearings in the bottom and train plates.

The pinion is driven by the fourth wheel.

The brass 'scape wheel has specially shaped teeth for engagement by the pallet pads.

15. Pallet. - The pallet consists of a straight steel bar, termed the pallet arm, with a hole in the centre for riveting to a steel arbor. On each end of the arm is a circular brass weight and at the centre, and at right angles to it, are two short arms with the ends turned upwards. The ends of the short arms are termed pallet pads and alternatively engage successive teeth of the 'scape wheel.

The arbor has a radial hole to take the hairspring. The pivots of the arbor rotate in bearing holes in the centre of the bottom plate and in a cover plate below the bottom plate.

16. Hairspring. - The centre of the straight phosphor-bronze hairspring is fitted between two D-shaped copper strips secured in the radial hole in the pallet arbor. The ends of the spring are held loosely in saw-cuts in the bottom plate and the regulator.

17. Regulator. - The regulator is a metal block which slides in an undercut groove in the bottom plate where it is held by a regulator screw. The regulator screw has a flange which engages a slot in the regulator. Movement of the screw in the tapped hole in the bottom plate slides the regulator in or out and thus alters the effective length of the hairspring.

HAND AND TRIGGER ASSEMBLY

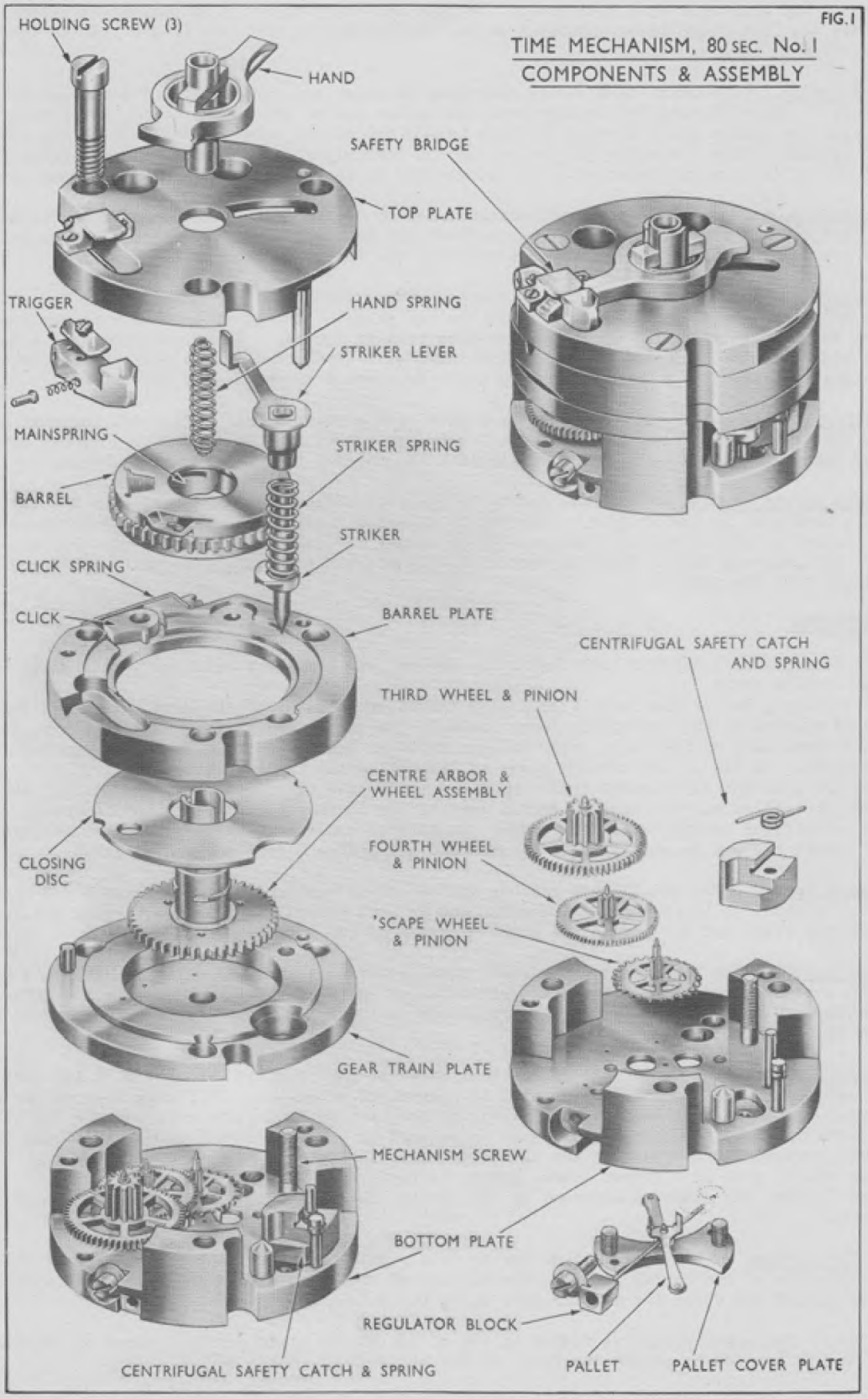
18. This consists of the hand, hand centre and handspring, trigger, trigger locking bolt and a muzzle safety bridge.

The hand is secured to the hand centre and the latter fits loosely in slots formed in the top of the centre arbor. The hand centre compresses the spiral handspring inside the arbor and also retains the end of the striker level. The hand and hand centre are thus tending to be rotated by the centre arbor and pushed up by the handspring.

The trigger prevents the hand rotating until the gun is fired, when it sets back to release the hand. The trigger locking bolt locks the trigger in the set-back position. The hand is now free to rotate but is still prevented from rising by the muzzle safety bridge until the shell is well clear of the muzzle. After clearing the bridge, the hand then bears on the under surface of the hand race. At the end of the time as set and as determined by the positioning of the hand race slot, the hand and hand centre are forced up through the slot and release the lever to operate the striker.

FIG.1

TIME MECHANISM, 80 SEC. No. 1
COMPONENTS & ASSEMBLY



19. Hand. - The aluminium hand fits around the hand centre to which it is secured by screws. It has two arms the longer one being chamfered at the end and with a slot cut in one side to take the end of the trigger locking strip.

20. Hand centre. - The brass hand centre comprises an inner and outer cylinder connected by a bridge piece. The cylinders fit loosely over the hollow end of the centre arbor, one inside and one outside, with the bridge piece resting in slots in the top of the arbor. A flange on the inside of the inner cylinder forms a bearing for the top of the handspring. The outer cylinder retains the turned-up end of the striker lever until it is released by the rising of the hand and hand centre.

21. Handspring. - The spiral steel handspring is housed in the centre arbor and inner cylinder of the hand centre. It is held in compression between the bottom of the centre arbor recess and the flange of the inner cylinder of the hand centre until the latter is free to rise.

22. Trigger. - The brass trigger 1.477 inches long, works in a slot in the top plate and pivots about one end on a trigger fulcrum pin also in the top plate. The other end has a projection on top to prevent the hand rotating until the trigger sets back on firing. This projection has a bevelled flange to ride over the hand on set-back. The inner side of the trigger is slightly chamfered to avoid fouling the barrel. A trigger locking strip is screwed to the top of the trigger.

23. Trigger locking bolt. - A brass bolt is fitted over a steel spiral spring and inserted in a recess in the side of the trigger. When the trigger sets back, the bolt is forced partly out of the recess into a notch in the barrel plate to lock the trigger in the set-back position.

24. Muzzle safety bridge. - The brass safety bridge fits across the trigger slot in the top plate and forms a back stop to the trigger. The top is extended forward over the trigger to cover the hand and prevent it rising until it has rotated an amount equivalent to 0.72 seconds time of running. This ensures that a fuze set too short will not burst the shell until it has travelled a safe distance from the gun.

FIRING MECHANISM

25. This consists of a striker lever and lever arbor; striker and striker spring; pillar and centrifugal safety catch.

The turned-up end of the lever fits inside the outer cylinder of the hand centre and the other end is riveted to the top of the lever arbor. The top of the striker slides in a vertical slot in the lower half of the lever arbor and are keyed in such a way that lever and striker rotate together. A cam on the striker rests on the pillar set in the bottom plate.

The rising of the hand centre frees the lever which then flies outwards, the striker cam is rotated off the pillar and the striker driven down by the striker spring on to the detonator.

The centrifugal safety catch will arrest the striker cam and prevent the striker reaching the detonator should the cam be accidentally rotated off the pillar before the gun is fired.

26. Striker lever. - The steel lever has one end square in section to suit the upper end of the lever arbor to which it is riveted. The other end is bent upwards to protrude through the curved slot in the top plate and fit inside the outer cylinder of the hand centre.

27. Lever arbor. - The top of the cylindrical steel arbor is squared to suit the lever and is fitted with a brass pivot. The lower part of the arbor has a vertical slot to take the upper end of the striker. The arbor rotates in a bearing hole in the top plate and a recess formed in the upper side of the barrel plate.

28. Striker. - The upper end of the cylindrical steel striker has two flats to suit the slot in the lever arbor, and the lower end is pointed to pierce the detonator. A flange towards the lower end is shaped to form a cam, the bottom of which is bevelled to facilitate rotation off the pillar when the lever is freed. The cam would also be engaged by the centrifugal safety catch and the striker thus prevented from reaching the detonator should the cam be rotated off the pillar through any cause, such as a broken lever, before firing.

After firing, the downward movement of the striker is limited by a recess in the top of the bottom plate.

29. Striker spring. - This spiral steel spring fits round the striker between the top of the cam and the under-side of the barrel plate. The release of the lever allows the spring to rotate the cam off the pillar and force the striker down on to the detonator.

30. Pillar. - The steel pillar is fitted on top of the bottom plate and is secured by punching. The upper end is rounded to engage the bevel of the striker cam.

31. Centrifugal safety catch. - This consists of a brass block with a flange on the inner side. An off-set hole takes a pivot pin on which the catch rotates. The pivot pin is screwed into the underside of the bottom plate and the upper end enters a hole in the train plate. A spiral steel spring is assembled on the pivot pin, one end fitting in an undercut to a step on the top of the catch and the other bearing against a stop pin fitted on top of the bottom plate.

Before firing, the spring keeps the safety catch in the safe position with the flange under the striker cam. After firing, centrifugal force overcomes the spring and swings the catch clear. Should the movement be accidentally set in motion, or the lever break before firing, the striker cam would be rotated off the pillar down on to the flange of the safety catch and thus prevent the striker reaching the detonator. In this case, the downward pressure of the striker spring is sufficient to prevent the catch swinging out in flight.

FRAME

32. This is made up of four brass plates, assembled one above the other and known as the bottom, train, barrel and top plates respectively.

The plates are positioned by dowel pins and secured by screws. There are two dowel pins between the fuze body and the bottom plate. One of the dowel pin holes in the bottom plate also takes one end of a long dowel pin that goes through all four plates. A short dowel pin goes through bottom, train and barrel plates.

Three equidistant screws inserted from the underside of the fuze body platform secure the bottom plate. The same screwed holes in the bottom plate are used to take the ends of three holding screws inserted from the top plate, to hold all four plates together.

Three studs screwed in from the outside of the fuze body fit into equidistant holes on the periphery of the bottom plate.

Holes are also provided in bottom and train plates for a movement screw to hold these plates together and retain the movement during assembly.

33. Bottom plate. - Three small holes form bearings for the lower pivots of the third, fourth and 'scape wheels. A hole in the centre forms a bearing for the upper pivot of the pallet arbor. The lower pivot of this arbor operates in a bearing hole in a small cover plate positioned on the under-side of the bottom plate by two dowels and secured by two screws.

A screwed hole takes the head of the centrifugal safety catch pivot pin and, nearby, two plain holes for the stop pin and pillar and a larger one for the striker to pass through.

A recess in the upper-side of the plate accommodates the striker cam when in the fired position and thus limits the movement of the striker.

34. Train plate. - Three small holes form bearings for the upper pivots of the third, fourth and 'scape wheels, and a large recess below the bearings for the third wheel enables the third pinion to engage the centre wheel situated in a recess in the top of the plate.

A central hole forms a bearing for the centre arbor pivot.

A small hole is for the centrifugal safety catch pivot pin and, nearby, a larger one for the striker to pass through.

35. Barrel plate. - The centre of the plate, on the upper-side, is recessed to house the barrel and a central hole permits the centre arbor to pass through. There is a hole in which the lower end of the winding key can pivot, the hole being enlarged on the upper-side to give clearance for the teeth of the key. A hole for the upper end of the striker to pass through is enlarged on the underside to form a seating for the striker spring, the upper-side housing the lower end of the lever arbor.

A groove in the upper-side takes the trigger when it sets back, and a V-notch connects with the groove and receives the spring-loaded trigger locking bolt to retain it in the set-back position.

A recess in the upper-side houses the pawl which pivots on a pin set in the barrel plate. The side of the plate has a flat surface to suit the pawl spring which is bent at one end to fit into a notch formed in the periphery of the plate where it is secured by a screw.

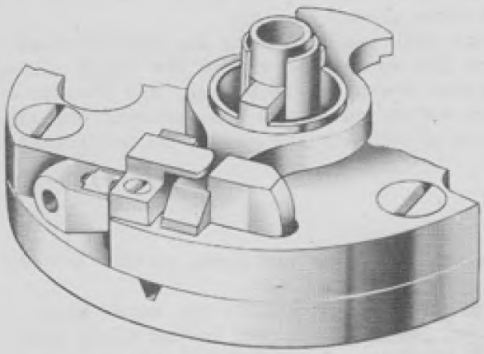
36. Top plate. - In addition to three equidistant holes at the edge of the plate to take the holding screws there are three main holes in this plate. The centre one forms the top bearing of the centre arbor, the second allows access to the click which can be released if necessary, whilst the third is the entry hole for the mainspring winding key.

A curved slot, formed radially from the centre, is cut to take the lever and a straight slot is cut at one side of the plate to house the trigger which is pivoted on a pin set into the inner side of the slot. The muzzle safety bridge is positioned over this slot.

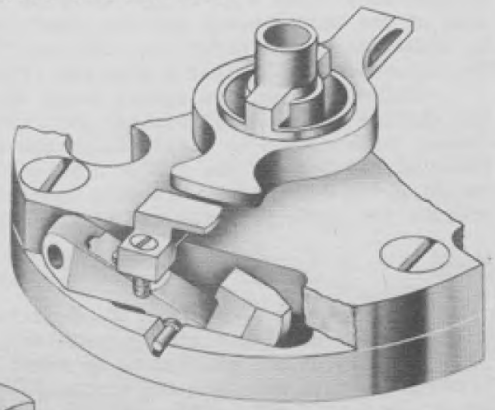
The long dowel which passes down through the other three plates is fixed in position on this plate. One portion of the plate is reduced in thickness on the underside with a projecting pintle left as the upper bearing for the lever arbor.

FIG.2

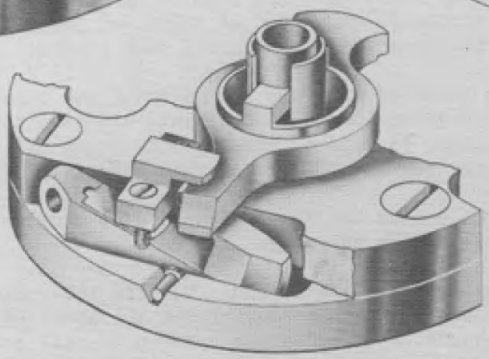
ACTION OF TIME MECHANISM 80 SEC. No.1



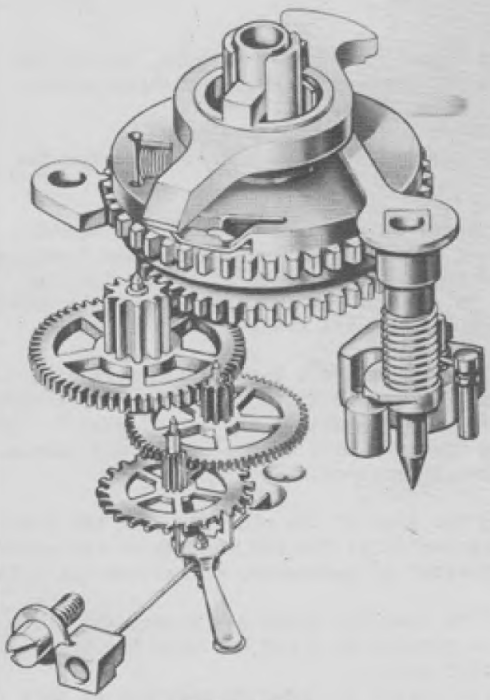
Hand held by trigger and safety bridge



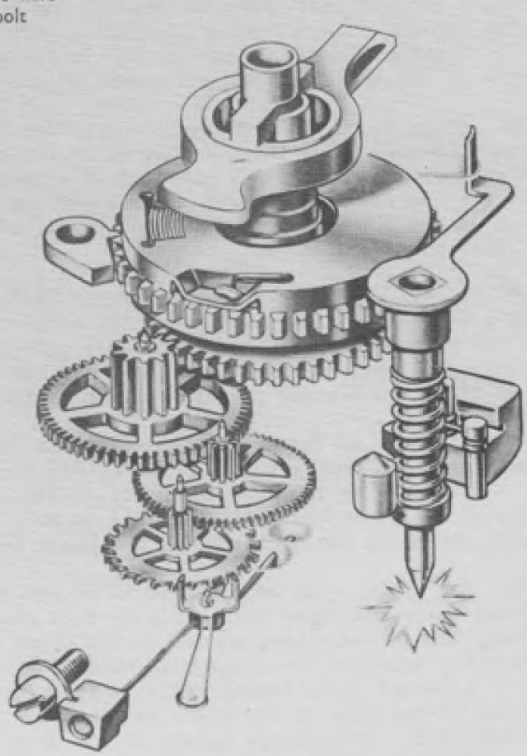
Hand clear of safety bridge



Trigger set back and held by trigger locking bolt



BEFORE FIRING



AT END OF TIME AS SET

SAFETY ARRANGEMENTS

37. (a) Trigger. - This prevents the hand rotating until the gun is fired.

(b) Centrifugal safety catch. - Should the movement be accidentally set in motion, or the lever break before firing, the striker cam would be rotated off the pillar down on to the flange of the safety catch and thus prevent the striker reaching the detonator. The downward pressure of the striker spring is sufficient to prevent the catch swinging out in flight.

(c) Muzzle Safety Bridge. - This prevents the hand rising until it has rotated an amount equivalent to 0.72 seconds time of running. This ensures that a fuze set too short will not burst the shell until it has travelled a safe distance from the gun.

ACTION (FIG. 2)

38. (a) Before firing. - The setting of the fuze positions the hand race slot.

(b) On firing. - The trigger sets back until the top projection clears the hand allowing it to rotate. The trigger locking bolt is forced outwards by its spring into the V-groove in the top plate thus retaining the trigger in the set-back position.

(c) On leaving the bore. - The centrifugal safety catch flies outwards and leaves the striker supported only by its cam resting on the pillar.
The hand is prevented from rising by the muzzle safety bridge until 0.72 seconds after firing when the shell is well clear of the muzzle.

(d) At the end of the Time as set. - The hand has rotated until it reaches the hand race slot into which it rises under action of its spring. This releases the striker lever which flies outwards as the striker spring forces the cam off the pillar and the striker down on to the detonator.

SUMMARY OF DIFFERENCES

No. 1 MECHANISM - QX 1A

39. As described in paras 2 to 38 inclusive.

40. Used in Fuze, Time and Percussion, DA No. 213.

No. 1A MECHANISM - QX 103A

41. The differences to be found in this mechanism are:-

(a) Mainspring. - In this mechanism a stronger spring .165 inches wide is fitted.

(b) Barrel plate - (QX 1418) - In this mechanism the barrel plate is recessed on the bottom face to take a closing disc between the bottom of the plate and the top of the train plate.

(c) Closing disc (QX 1231) - .025 inches thick the disc is fitted as described in (b) above.

42. Used in Fuze, Time and Percussion, D.A. No. 213.

MECHANISM, TIME, 43 SECONDS

1. Particulars

(a) Type — Thiel

DESCRIPTION - No. 4 Mechanism (Fig. 1)

GENERAL

2. (a) Inside the fuze is a platform or hand race, across which a shaped slot is cut. Rotation of the appropriate portion of the fuze positions the slot and thereby sets the fuze.

(b) The clockwork mechanism which rotates a spring-loaded hand beneath the hand race is driven by a mainspring and controlled by an escapement through a train of gear wheels.

(c) The mechanism is started by the firing of the gun, the hand being released for rotation by the set-back of a trigger. A muzzle safety bridge prevents the hand from rising until 0.72 seconds after firing. The minimum arming distance is approximately 400 yds, but is dependant on the ordnance being used, and the maximum time of running is 43 seconds. Thereafter the hand bears on the under-surface of the hand race until, at the end of the time as set, it has rotated until it is coincident with the slot in the race into which it rises.

(d) The hand is secured to a hollow hand centre, the rim of which engages a tip on the end of the lever fixed to the top of the striker. A cam on the striker rests on a pillar and the rising of the hand releases the lever which allows the striker spring to rotate the cam off the pillar and force the striker down on to the detonator. The striker is prevented from reaching the detonator before the shell leaves the muzzle by a centrifugal safety catch.

CLOCKWORK MECHANISM

3. This comprises the mainspring, gear train and escapement, the hand and trigger assembly and the firing mechanism. It is assembled as a complete unit on a frame consisting of bottom, train, barrel and top plates and is fixed on to a platform in the fuze body.

4. Drive. - The drive is by the mainspring coiled inside a barrel mounted on a centre arbor. One end of the spring is fixed to the barrel and the other to the arbor. The arbor is held by the hand until the gun is fired and the spring is wound up by rotation of the barrel and retained in that state by a click.

5. Mainspring. - The flat steel mainspring, 14.875 inches long and .165 inches wide, is coiled inside the barrel, the inner end having a slot for engagement on a hook formed on the centre arbor, and the outer end itself forming a hook to engage a catch on the barrel. The spring is wound before the mechanism is assembled in the fuze by a key inserted through a hole in the top plate.

6. Barrel. - The brass barrel is mounted around the centre arbor and has teeth formed on the periphery for engagement with the winding key and the click. The portion of the inner circumference is undercut to form a catch for the outer end of the mainspring. A slot is cut in the bottom to give access to the mainspring and the top is covered by a circular disc plate.

7. Click and click spring. - The steel click pivots on a pin in the barrel plate.
It has a single tooth to engage the teeth on the periphery of the barrel to prevent the mainspring from unwinding.
The flat steel click spring is secured to the periphery of the barrel plate by a screw. The spring keeps the click forced inwards.

8. Gear train. - This consists of a sequence of gear wheels to give the required step-up ratio from the drive to the escapement.
Rotation of the centre arbor by the mainspring turns the hand at the top and the centre wheel at the bottom. The centre wheel causes the third, fourth and 'scape pinions and wheels to rotate, the steel pinions being mounted above the brass wheels on the same arbors.

9. Centre arbor. - The cylindrical steel arbor is reduced in diameter at the bottom to form a pivot which rotates in a bearing hole in the train plate. The arbor passes through a hole in the barrel plate and the top rotates in a bearing hole in the top plate.

It is formed with a flange at its lower end to which the centre wheel is secured by three screws. Above this is another flange, part of which is undercut to form a hook for engaging the slot on the inner end of the mainspring.

Above this again, the centre arbor is reduced in diameter to suit the central pivot hole in the top plate and again at the top it is reduced and slotted to suit the hand centre.

10. Centre wheel. - The centre wheel is assembled on the lower end of the centre arbor with three securing screws. It is housed in a recess in the upper surface of the train plate and drives the third pinion.

11. 3rd. Arbor, pinion and wheel. - The arbor pivots rotate in bearing holes in the bottom and train plates.

The steel pinion enters a recess in the train plate and is driven by the centre wheel.

The brass wheel drives the fourth pinion.

12. 4th Arbor, pinion, and wheel. - The arbor pivots rotate in bearings in the bottom and train plates.

The steel pinion is driven by the third wheel and the brass wheel drives the 'scape pinion.

ESCAPEMENT

13. This comprises the escape wheel, pallet and hairspring and is the controlling device by means of which the power of the drive is allowed to "escape" only at a steady rate.

Vibration of the hairspring and pallet disengages one of the pads from the 'scape wheel. In doing so, the pad receives an impulse from the 'scape tooth as it jumps forward before being eventually locked by the entry of the other pallet pad into an adjacent tooth. This action is repeated by the disengagement of the second pad. The resulting series of impulses is transmitted to the pallet arm and results in an oscillation which is maintained at a rate determined by the weight and length of the pallet arm and the effective length and bending properties of the hairspring.

14. Escape arbor, pinion and wheel. - The arbor pivots rotate in bearings in the bottom and train plates.

The pinion is driven by the fourth wheel.

The brass 'scape wheel has specially shaped teeth for engagement by the pallet pads.

15. Pallet. - The pallet consists of a straight steel bar, termed the pallet arm, with a hole in the centre for riveting to a steel arbor. On each end of the arm is a circular brass weight and at the centre, and at right angles to it, are two short arms with the ends turned upwards. The ends of the short arms are termed pallet pads and alternatively engage successive teeth of the 'scape wheel.

The arbor has a radial hole to take the hairspring. The pivots of the arbor rotate in bearing holes in the centre of the bottom plate and in a cover plate below the bottom plate.

16. Hairspring. - The centre of the straight phosphor-bronze hairspring is fitted between two D-shaped copper strips secured in the radial hole in the pallet arbor. The ends of the spring are held loosely in saw-cuts in the bottom plate and the regulator.

17. Regulator. - The regulator is a metal block which slides in an undercut groove in the bottom plate where it is held by a regulator screw. The regulator screw has a flange which engages a slot in the regulator. Movement of the screw in the tapped hole in the bottom plate slides the regulator in or out and thus alters the effective length of the hairspring.

HAND AND TRIGGER ASSEMBLY

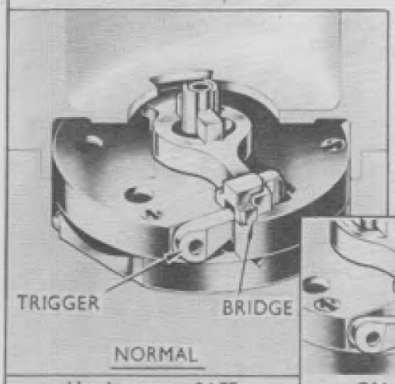
18. This consists of the hand, hand centre and handspring, trigger, trigger locking bolt and a muzzle safety bridge.

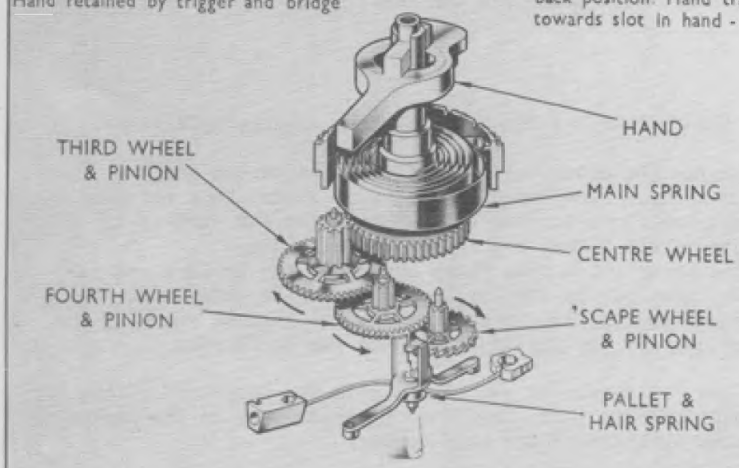
The hand is secured to the hand centre and the latter fits loosely in slots formed in the top of the centre arbor. The hand centre compresses the spiral handspring inside the arbor and also retains the end of the striker level. The hand and hand centre are thus tending to be rotated by the centre arbor and pushed up by the handspring.

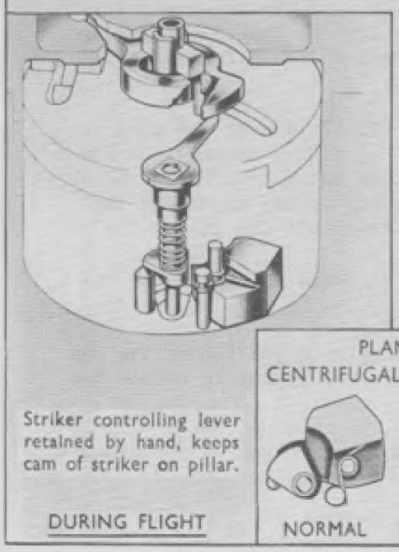
The trigger prevents the hand rotating until the gun is fired, when it sets back to release the hand. The trigger locking bolt locks the trigger in the set-back position. The hand is now free to rotate but is still prevented from rising by the muzzle safety bridge until the shell is well clear of the muzzle. After clearing the bridge, the hand then bears on the under surface of the hand race. At the end of the time as set and as determined by the positioning of the hand race slot, the hand and hand centre are forced up through the slot and release the lever to operate the striker.

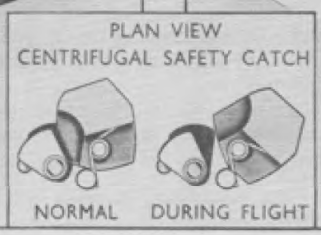
FIG. 1

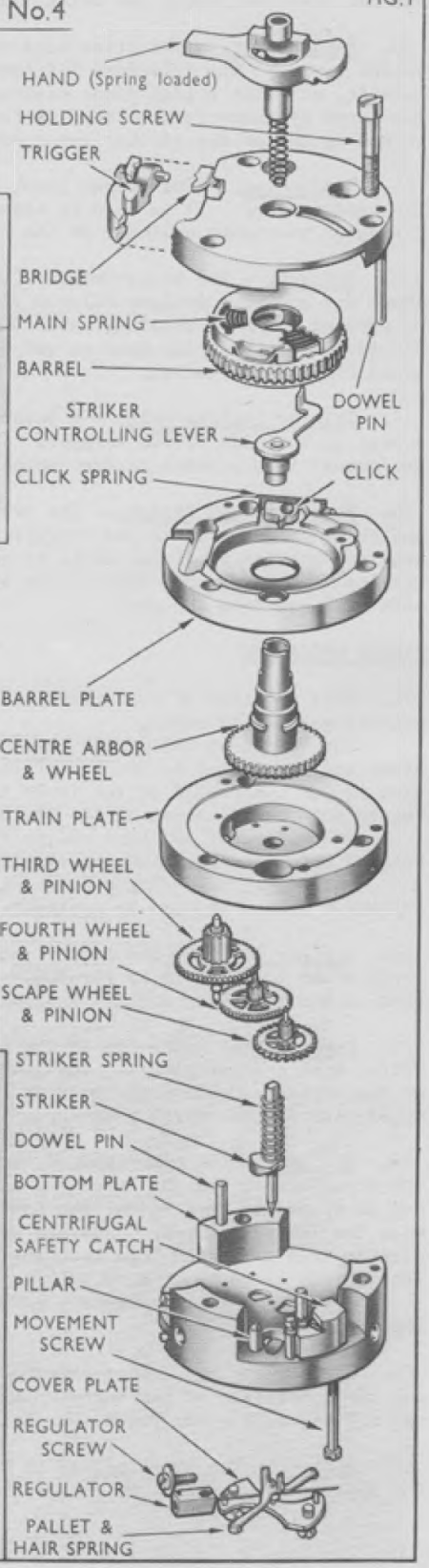
MECHANISM, TIME, 43 SEC., No.4











19. Hand. - The aluminium hand fits around the hand centre to which it is secured by screws. It has two arms the longer one being chamfered at the end.

20. Hand centre. - The brass hand centre comprises an inner and outer cylinder connected by a bridge piece. The cylinders fit loosely over the hollow end of the centre arbor, one inside and one outside, with the bridge piece resting in slots in the top of the arbor. A flange on the inside of the inner cylinder forms a bearing for the top of the handspring. The outer cylinder retains the turned-up end of the striker lever until it is released by the rising of the hand and hand centre.

21. Handspring. - The spiral steel handspring is housed in the centre arbor and inner cylinder of the hand centre. It is held in compression between the bottom of the centre arbor recess and the flange of the inner cylinder of the hand centre until the latter is free to rise.

22. Trigger. - The brass trigger 1.477 inches long, works in a slot in the top plate and pivots about one end on a trigger fulcrum pin also in the top plate. The other end has a projection on top to prevent the hand rotating until the trigger sets back on firing. This projection has a bevelled flange to ride over the hand on set-back. The inner side of the trigger is slightly chamfered to avoid fouling the barrel.

23. Trigger locking bolt. - A brass bolt is fitted over a steel spiral spring and inserted in a recess in the side of the trigger. When the trigger sets back, the bolt is forced partly out of the recess into a notch in the barrel plate to lock the trigger in the set-back position.

24. Muzzle safety bridge. - The brass safety bridge fits across the trigger slot in the top plate and forms a back stop to the trigger. The top is extended forward over the trigger to cover the hand and prevent it rising until it has rotated an amount equivalent to 0.72 seconds time of running. This ensures that a fuze set too short will not burst the shell until it has travelled a safe distance from the gun.

FIRING MECHANISM

25. This consists of a striker lever and lever arbor; striker and striker spring; pillar and centrifugal safety catch.

The turned-up end of the lever fits inside the outer cylinder of the hand centre and the other end is riveted to the top of the lever arbor. The top of the striker slides in a vertical slot in the lower half of the lever arbor and are keyed in such a way that lever and striker rotate together. A cam on the striker rests on the pillar set in the bottom plate.

The rising of the hand centre frees the lever which then flies outwards, the striker cam is rotated off the pillar and the striker driven down by the striker spring on to the detonator.

The centrifugal safety catch will arrest the striker cam and prevent the striker reaching the detonator should the cam be accidentally rotated off the pillar before the gun is fired.

26. Striker lever. - The steel lever has one end square in section to suit the upper end of the lever arbor to which it is riveted. The other end is bent upwards to protrude through the curved slot in the top plate and fit inside the outer cylinder of the hand centre.

27. Lever arbor. - The top of the cylindrical steel arbor is squared to suit the lever and is fitted with a brass pivot. The lower part of the arbor has a vertical slot to take the upper end of the striker. The arbor rotates in a bearing hole in the top plate and a recess formed in the upper side of the barrel plate.

28. Striker. - The upper end of the cylindrical steel striker has two flats to suit the slot in the lever arbor, and the lower end is pointed to pierce the detonator. A flange towards the lower end is shaped to form a cam, the bottom of which is bevelled to facilitate rotation off the pillar when the lever is freed. The cam would also be engaged by the centrifugal safety catch and the striker thus prevented from reaching the detonator should the cam be rotated off the pillar through any cause, such as a broken lever, before firing.

After firing, the downward movement of the striker is limited by a recess in the top of the bottom plate.

29. Striker spring. - This spiral steel spring fits round the striker between the top of the cam and the under-side of the barrel plate. The release of the lever allows the spring to rotate the cam off the pillar and force the striker down on to the detonator.

30. Pillar. - The steel pillar is fitted on top of the bottom plate and is secured by punching. The upper end is rounded to engage the bevel of the striker cam.

31. Centrifugal safety catch. - This consists of a brass block with a flange on the inner side. An off-set hole takes a pivot pin on which the catch rotates. The pivot pin is screwed into the under-side of the bottom plate and the upper end enters a hole in the train plate. A spiral steel spring is assembled on the pivot pin, one end fitting in an undercut to a step on the top of the catch and the other bearing against a stop pin fitted on top of the bottom plate.

Before firing, the spring keeps the safety catch in the safe position with the flange under the striker cam. After firing, centrifugal force overcomes the spring and swings the catch clear. Should the movement be accidentally set in motion, or the lever break before firing, the striker cam would be rotated off the pillar down on to the flange of the safety catch and thus prevent the striker reaching the detonator. In this case, the downward pressure of the striker spring is sufficient to prevent the catch swinging out in flight.

FRAME

32. This is made up of four brass plates, assembled one above the other and known as the bottom, train, barrel and top plates respectively.

The plates are positioned by dowel pins and secured by screws. There are two dowel pins between the fuze body and the bottom plate. One of the dowel pin holes in the bottom plate also takes one end of a long dowel pin that goes through all four plates. A short dowel pin goes through bottom, train and barrel plates.

Three equidistant screws inserted from the underside of the fuze body platform secure the bottom plate. The same screwed holes in the bottom plate are used to take the ends of three holding screws inserted from the top plate, to hold all four plates together.

Three studs screwed in from the outside of the fuze body fit into equidistant holes on the periphery of the bottom plate.

Holes are also provided in bottom and train plates for a movement screw to hold these plates together and retain the movement during assembly.

33. Bottom plate. - Three small holes form bearings for the lower pivots of the third, fourth and 'scape wheels. A hole in the centre forms a bearing for the upper pivot of the pallet arbor. The lower pivot of this arbor operates in a bearing hole in a small cover plate positioned on the under-side of the bottom plate by two dowels and secured by two screws.

A screwed hole takes the head of the centrifugal safety catch pivot pin and, nearby, two plain holes for the stop pin and pillar and a larger one for the striker to pass through.

A recess in the upper-side of the plate accommodates the striker cam when in the fired position and thus limits the movement of the striker.

34. Train plate. - Three small holes form bearings for the upper pivots of the third, fourth and 'scape wheels, and a large recess below the bearings for the third wheel enables the third pinion to engage the centre wheel situated in a recess in the top of the plate.

A central hole forms a bearing for the centre arbor pivot.

A small hole is for the centrifugal safety catch pivot pin and, nearby, a larger one for the striker to pass through.

35. Barrel plate. - The centre of the plate, on the upper-side, is recessed to house the barrel and a central hole permits the centre arbor to pass through. There is a hole in which the lower end of the winding key can pivot, the hole being enlarged on the upper-side to give clearance for the teeth of the key. A hole for the upper end of the striker to pass through is enlarged on the under-side to form a seating for the striker spring, the upper-side housing the lower end of the lever arbor.

A groove in the upper-side takes the trigger when it sets back, and a V-notch connects with the groove and receives the spring-loaded trigger locking bolt to retain it in the set-back position.

A recess in the upper-side houses the pawl which pivots on a pin set in the barrel plate. The side of the plate has a flat surface to suit the pawl spring which is bent at one end to fit into a notch formed in the periphery of the plate where it is secured by a screw.

36. Top plate. - In addition to three equidistant holes at the edge of the plate to take the holding screws there are three main holes in this plate. The centre one forms the top bearing of the centre arbor, the second allows access to the click which can be released if necessary, whilst the third is the entry hole for the mainspring winding key.

A curved slot, formed radially from the centre, is cut to take the lever and a straight slot is cut at one side of the plate to house the trigger which is pivoted on a pin set into the inner side of the slot. The muzzle safety bridge is positioned over this slot.

The long dowel which passes down through the other three plates is fixed in position on this plate. One portion of the plate is reduced in thickness on the underside with a projecting pintle left as the upper bearing for the lever arbor.

SAFETY ARRANGEMENTS

37. (a) Trigger. - This prevents the hand rotating until the gun is fired.

(b) Centrifugal safety catch. - Should the movement be accidentally set in motion, or the lever break before firing, the striker cam would be rotated off the pillar down on to the flange of the safety catch and thus prevent the striker reaching the detonator. The downward pressure of the striker spring is sufficient to prevent the catch swinging out in flight.

(c) Muzzle Safety Bridge. - This prevents the hand rising until it has rotated an amount equivalent to 0.72 seconds time of running. This ensures that a fuze set too short will not burst the shell until it has travelled a safe distance from the gun.

ACTION

38. (a) Before firing. - The setting of the fuze positions the hand race slot.

(b) On firing. - The trigger sets back until the top projection clears the hand allowing it to rotate. The trigger locking bolt is forced outwards by its spring into the V-groove in the top plate thus retaining the trigger in the set-back position.

(c) On leaving the bore. - The centrifugal safety catch flies outwards and leaves the striker supported only by its cam resting on the pillar.
The hand is prevented from rising by the muzzle safety bridge until 0.72 seconds after firing when the shell is well clear of the muzzle.

(d) At the end of the Time as set. - The hand has rotated until it reaches the hand race slot into which it rises under action of its spring. This releases the striker lever which flies outwards as the striker spring forces the cam off the pillar and the striker down on to the detonator.

SUMMARY OF DIFFERENCES

No. 3 MECHANISM - QX 6A (Obsolescent).

39. This mechanism differs from the No. 4 in the following:-

(a) Mainspring. - A weaker spring is used being .140 inches wide as opposed to .165 inches.

(b) Gear train. - The third, fourth and 'scape wheels are made of duralumin instead of brass.

(c) Hand. - A slot is cut in the side of the longer arm to take the end of the trigger locking strip.

(d) Trigger. - A trigger locking strip is screwed to the top of the trigger.

40. This mechanism was specifically regulated for the 5.25 inch Mark 2, 5 and 5/1 guns.

41. Previously used in the No. 208 Mark 5 and L1 Mark 5 fuzes.

No. 3A MECHANISM - QX 19A (Obsolescent)

42. The differences to be found in this mechanism are:-

(a) Mainspring. - A weaker spring .140 inches wide as opposed to the .165 inches wide spring of the No. 4 mechanism is used.

(b) Hand. - A slot is cut in the side of the longer arm to take the end of the trigger locking strip.

(c) Trigger.- Shortened to .470 inches. A trigger locking strip is screwed to the top of the trigger.

43. This mechanism was regulated for the 5.25 inch Mark 2, 5 and 5/1 guns to give a mean time of 23.90 seconds at a setting of $16\frac{2}{3}$.

44. Previously used in the No. 208 Mark 5/1 and L1 Mark 5/1 fuzes.

No. 4 MECHANISM - QX 7A (Obsolescent)

45. As described in paras 2 to 40 inclusive.

46. This mechanism was regulated for the 3.7 inch Mark 6 gun.

47. Previously used in the No. 208 Mark 6 fuze.

No. 4A MECHANISM - QX 24A (Obsolescent)

48. This mechanism differs from the No. 4 in the following:-

(a) Trigger. - Lengthened to .490 inches.

49. This mechanism was regulated for the 3.7 inch Mark 6 gun to give a mean time of 24.00 seconds at a setting of $16\frac{2}{3}$.

50. Previously used in the No. 208 Mark 6/1, 8/1, 9/1 and 10/1 fuzes.

No. 4B MECHANISM - QX 25A (Obsolescent)

51. The difference in this mechanism is:-

(a) Trigger. - Shortened to .470 inches.

52. Regulated for the 5.25 inch Mark 2, 5 and 5/1 guns to give a mean time of 23.90 seconds at a setting of $16\frac{2}{3}$.

53. Previously used in the No. 208 Mark 6/2 and L1 Mark 6/2, 7/2, 8/2, 9/2, and 10/2 fuzes.

No. 4C MECHANISM - QX 26A (Obsolescent)

54. The difference in this mechanism is:-

(a) Trigger. - Lengthened to .485 inch.

55. This mechanism is regulated for the 3.7 inch Mark 1 to 3 guns giving a mean time of 23.90 seconds at a setting of $16\frac{2}{3}$.

56. Previously used in the No. 208 Mark 6/3 and L1 Mark 6/3, 7/3, 8/3, 9/3 and 10/3 fuzes.

SHUTTER, DELAYED ARMING NO. 3 SERIES

1. Particulars

(a) Type — Escapement

DESCRIPTION - No. 3B (Figs. 1 & 2)
GENERAL

2. This delayed arming shutter is a mechanical safety unit which, when assembled to a fuze, ensures that a projectile is not armed until it has travelled a pre-determined distance from the gun. The shutter consists primarly of a body, a shutter assembly and an escapement mechanism.

3. Body (QX.1795 or QX 1823) - of anodised aluminium alloy and circular in shape the body is recessed from the top and the bottom to form a platform. From the top the recess is generally circular in shape with a pivot pin set in its centre to take the shutter and escapement segment. Two rectangular recesses are formed, the larger, which is not as deep as the main recess, being for the safety plunger and the smaller for the shutter locking plate. A stop to position the shutter in the armed position is formed in the bottom of this recess.

FIG.1

SHUTTER, DELAYED ARMING, No.3

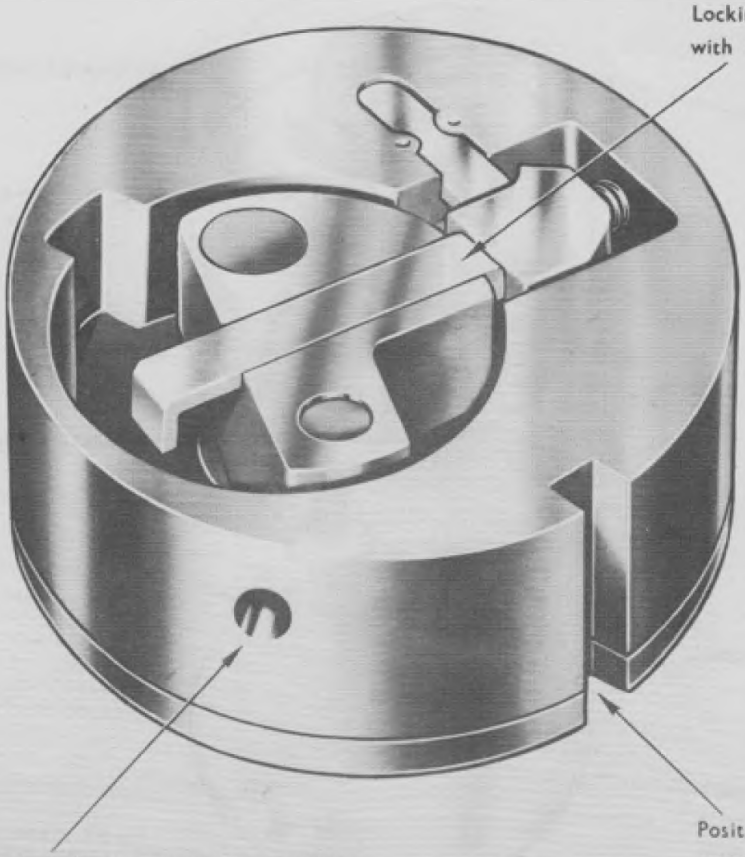
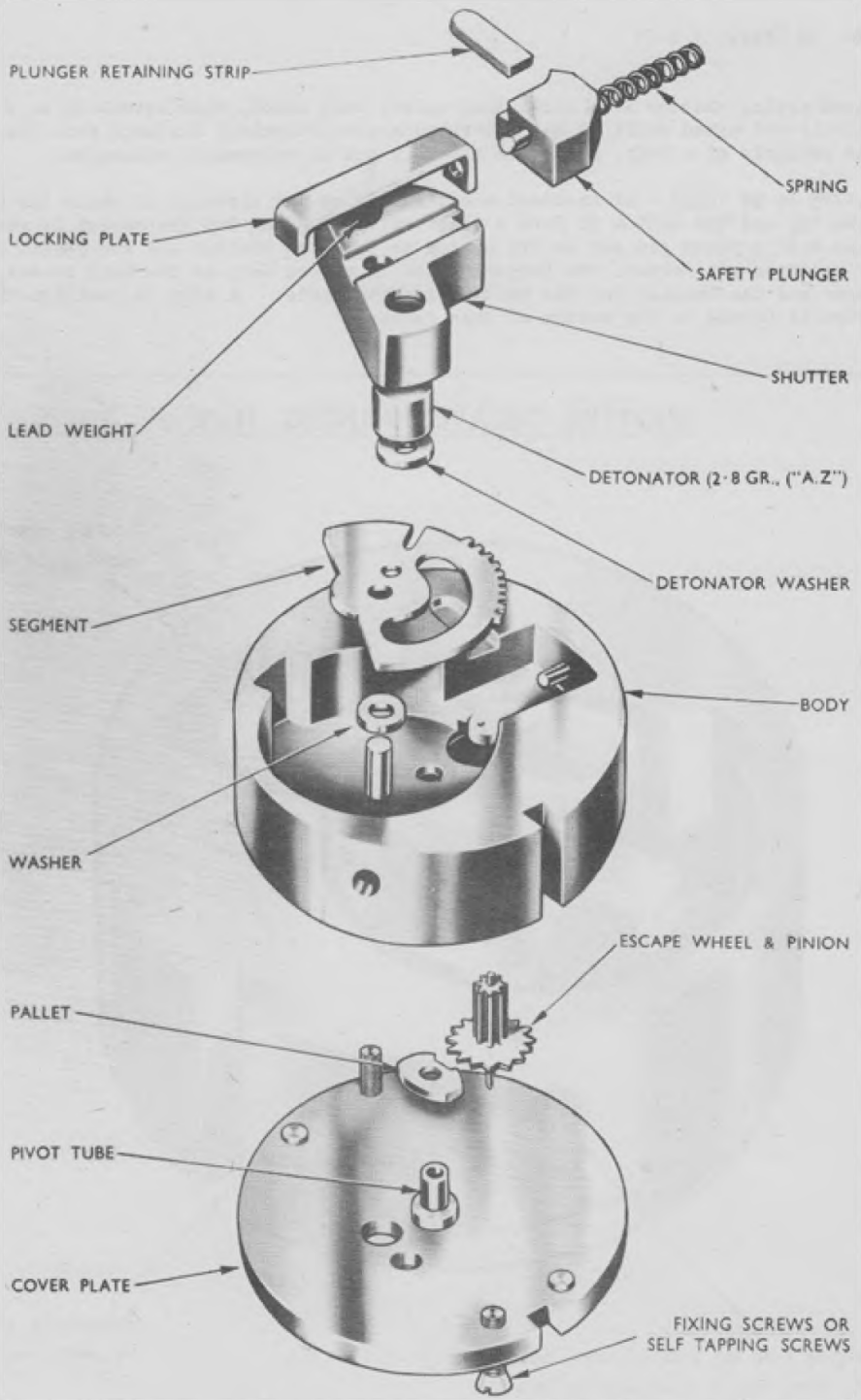


FIG.2

DELAYED ARMING SHUTTER COMPONENTS



On the underside the body is recessed to take the pallet and escape pinion. A positioning slot is cut on the outside of the body and a shutter gauging hole is bored from the outside into the shutter recess.

With body QX 1795 a washer is required for the shutter pivot pin but with body QX 1823 no washer is required as a raised bearing round the pivot pin is formed in the base of the recess.

4. Shutter assembly. - This consists of the following components:-

(a) Shutter (QX.1615). - Made of aluminium alloy and anodised, the shutter is semi-circular in shape with a segment removed to form a projecting arm. Three holes are formed in the shutter, one to take the detonator is in the projecting arm, another at the opposite end is for a lead weight, whilst the third, situated near the centre, is for the pivot. Slots are cut in the upper surface and down the curved side to take the locking plate and the pin of the safety plunger. There are two projecting pins on the underside which engage in a hole and a slot formed in the escapement segment.

(b) Locking plate (QX.1614). - This is a metal strip bent down through 90° at each end. The turned down portion at one end is drilled to take the pin of the safety plunger.

(c) Safety plunger (QX.1168). - of anodised aluminium alloy and irregular in shape the safety plunger is fitted with a pin on its front edge. It is retained in its recess in the body by the plunger retaining strip and is held against the shutter locking plate by a spring consisting of 18 coils of steel wire of 30 SWG (QX.1706).

(d) Detonator (QX.122 AF). - A 2.8 gr. "AZ", lugless tinned copper alloy cup, detonator which is inserted into the appropriate hole in the shutter from the underside and is retained by a zinc-plated washer and either ring or stab punching.

5. Escapement mechanism. - This consists of the pallet, escape wheel and pinion, and segment.

(a) Pallet (QX.1617). - Mounted on a pivot tube set in the cover plate, the pallet is roughly oval in shape and has two teeth formed on one long side.

(b) Escape wheel and pinion (QX.1619). - Mounted with the lower pivot in a bearing in the cover plate, and the upper pivot in a bearing formed in the platform below the safety plunger recess, the wheel engages the pallet. The drive from the wheel is transmitted to the segment through the pinion which engages it through a space formed between the base of the shutter recess and the platform of the safety plunger recess.

(c) Segment (QX.1618). - Semi-circular in shape, and with teeth formed on part of its circumference, the segment is mounted below and on the same pivot as the shutter. Two holes are formed in the segment, one to take the pivot, the other to engage with one of the pins set in the underside of the shutter. A slot formed radially from the circumference is formed to take the other pin on the shutter.

6. Cover (QX.120 SA). - This is a circular plate of anodised aluminium alloy with a pivot tube set centrally. Four holes are drilled in the plate the main two being the lower bearing for the escape wheel pivot and a tapped hole to take the cover plate fixing screw. Two positioning pins are formed on the top surface of the plate to engage corresponding holes in the base of the body. A slot is also cut to align with the positioning slot in the body.

ACTION (FIG. 3)

7. On firing. - The shutter sets back and is retained in the unarmed position by friction.

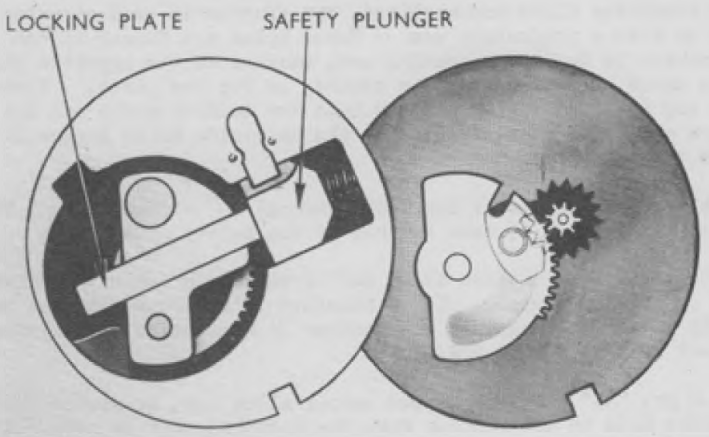
8. During flight. - Once set-back forces have been overcome, rotation of the shell, at the designed number of revolutions per minute, causes sufficient centrifugal force to withdraw the safety plunger from the locking plate, which itself tends to move towards the shutter. The shutter, controlled by the escapement mechanism, commences to move in the direction of spin. After movement has taken place through sixty degrees the teeth of the segment disengage the escape pinion and the shutter swings over until the locking plate, now being pulled across the shutter in the opposite direction, engages in the slot formed in the body.

The shutter is now against the stop in the shutter recess and the detonator is in the armed position.

FIG.3

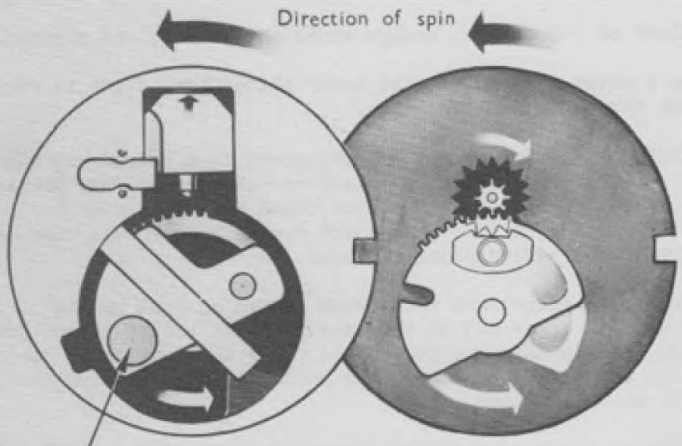
ACTION OF DELAYED ARMING SHUTTER

SHUTTER ACTION ESCAPE MECHANISM ACTION



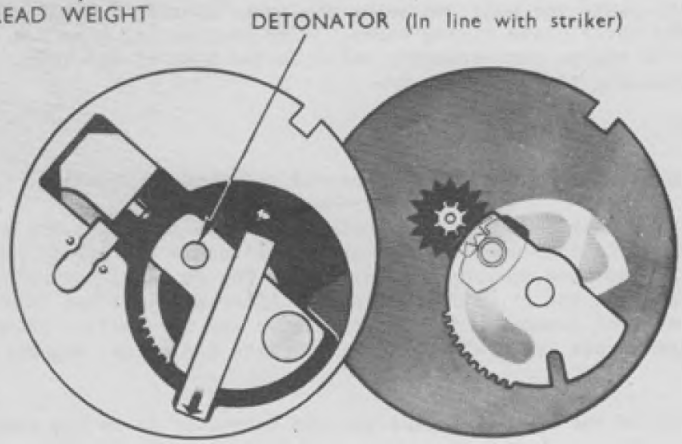
BEFORE FIRING

Shutter held by locking plate and safety plunger in the unarmed position



ARMING OF SHUTTER

Safety plunger withdraws (approximately at the muzzle) and releases the shutter which rotates towards the armed position under the control of the escape mechanism.



DURING FLIGHT AND AT IMPACT

The locking plate centrifruges into the slot. The shutter is now locked in the armed position

9. Shutter speed. - Shutters in this series commence to open at between 7000 and 8500 revolutions per minute and the time of opening is between 0.02 and 0.055 seconds at 9000 revolutions per minute.

It should be noted that in a high speed test at 15,000 revolutions per minute all shutters are required to turn through the first 60°, i.e. that part of the movement controlled by the escape mechanism, in a time of 0.01 to 0.03 seconds.

SUMMARY OF DIFFERENCES

No. 3 (Obsolescent) — WOLC - $\frac{S}{S}$ C 9808

10. Although the part drawing numbers of all the components of this shutter do not agree with those of the No. 3B the only significant differences are:-

(a) Body (QX.572). - A slightly different design with a smaller shutter gauging hole.

(b) Cover plate (QX.573). - In this design of plate the pivot tube has no integral bearing for the pallet. Washer (QX.581) has therefore to be assembled on the pivot tube below the pallet.

No. 3A (Obsolescent) — WOLC - $\frac{S}{S}$ C 9808

11. The differences in this shutter are:-

(a) Body (QX. 1620). - Similar to the 3B but with a smaller shutter gauging hole.

(b) Cover plate (QX.75A)- of aluminium alloy to a different specification to that used for cover plate QX.120 SA.

No. 3B (Obsolescent) — WOLC - I.ARM. Approvals K.1395, K.1918.

12. As described in paras. 2 to 9 inclusive.

No. 3B/1 (Obsolescent) — WOLC - I.ARM. Approvals K.1788, K.1918.

13. The shutter differs only in that the body (QX.1794) is manufactured from bar metal as opposed to being die cast.

No. 3C (Obsolescent) — WOLC - I.ARM. Approvals K.1918, K.1996.

14. This shutter incorporates the following instead of those used in the 3B.

(a) Body (QX.1620). - Similar to QX.1795 but having a smaller shutter gauging hole.

(b) Cover plate (QX.75 SA). - Made of aluminium to a different specification than that used for QX.120 SA.

(c) Detonator (QX.214 AF). - This is a 2.6 gr. "LZ" detonator.

No. 3C/1 — WOLC - I.ARM. Approval K.1918

15. This shutter differs from the 3B only in that the body (QX.1794) is manufactured from bar metal and is not die cast and a 2.6 gr. "LZ" detonator (QX.214 AF) is fitted.

No. 3C/2 — WOLC - I.ARM. Approval K.1918

16. This is a 3B shutter fitted with a 2.6 gr. "LZ" detonator in lieu of the 2.8 gr. "AZ" detonator.

SHUTTER, DELAYED ARMING NO. 4 SERIES

1. Particulars

(a) Type — Escapement

DESCRIPTION - No. 4A (Figs. 1 & 2)

GENERAL

2. This delayed arming shutter is a mechanical safety unit which, when assembled to a fuze, ensures that a projectile is not armed until it has travelled a pre-determined distance from the gun. The shutter consists primarly of a body, a shutter assembly and an escapement mechanism.

3. Body (QX.1795 or QX.1823). - of anodised aluminium alloy and circular in shape the body is recessed from the top and the bottom to form a platform. From the top the recess is generally circular in shape with a pivot pin set in its centre to take the shutter and escapement segment. Two rectangular recesses are formed, the larger, which is not as deep as the main recess, being for the safety plunger and the smaller for the shutter locking plate. A stop to position the shutter in the armed position is formed in the bottom of this recess.

FIG.1

SHUTTER, DELAYED ARMING, No.4

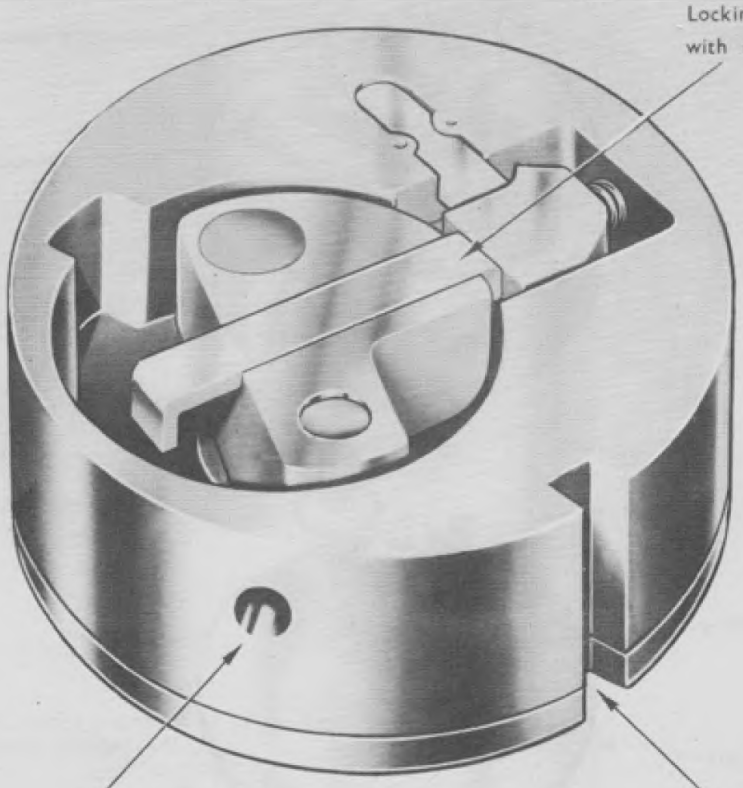
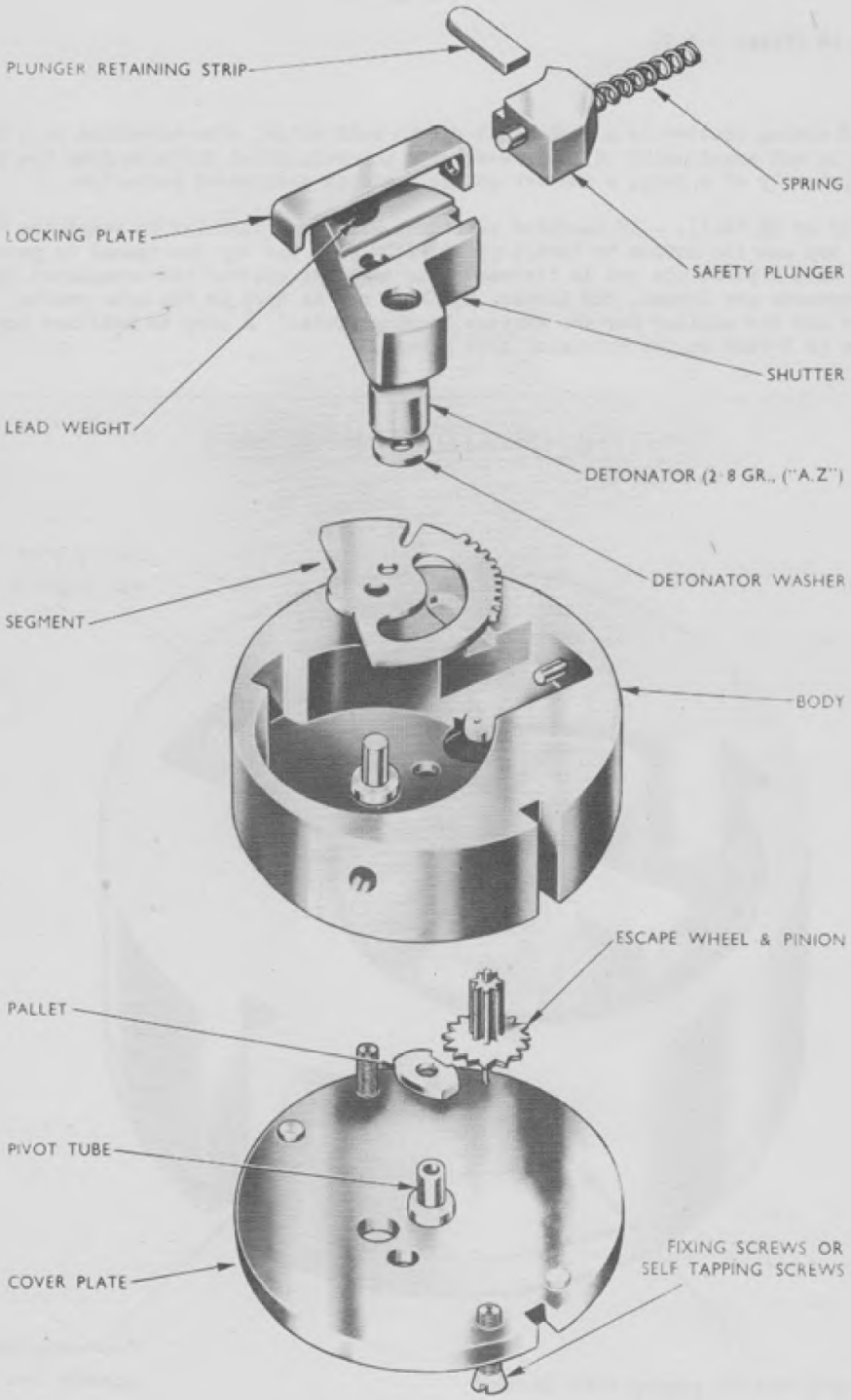


FIG.2

DELAYED ARMING SHUTTER COMPONENTS



On the underside the body is recessed to take the pallet escape pinion. A positioning slot is cut on the outside of the body and a shutter gauging hole is bored from the outside into the shutter recess.

With body QX 1795 a washer is required for the shutter pivot pin but with body QX.1823 no washer is required as a raised bearing round the pivot pin is formed in the base of the recess.

4. Shutter assembly. - This consists of the following components:-

(a) Shutter (QX.1615). - Made of aluminium alloy and anodised, the shutter is semi-circular in shape with a segment removed to form a projecting arm. Three holes are formed in the shutter, one to take the detonator is in the projecting arm, another at the opposite end is for a lead weight, whilst the third, situated near the centre, is for the pivot. Slots are cut in the upper surface and down the curved side to take the locking plate and the pin of the safety plunger. There are two projecting pins on the underside which engage in a hole and a slot formed in the escapement segment.

(b) Locking plate (QX.1614). - This is a metal strip bent down through 90° at each end. The turned down portion at one end is drilled to take the pin of the safety plunger.

(c) Safety plunger. (QX.1638). - of steel and irregular in shape the safety plunger is fitted with a pin on its front edge. It is retained in its recess in the body by the plunger retaining strip and is held against the shutter locking plate by a spring consisting of 14 coils of steel wire of 32 SWG (QX.1707).

(d) Detonator (QX.214 AF). - A 2.6 gr. "LZ", lugless tinned copper alloy cup, detonator which is inserted into the appropriate hole in the shutter from the underside and is retained by a zinc-plated washer and either ring or stab punching.

5. Escapement mechanism. - This consists of the pallet, escape wheel and pinion, and segment.

(a) Pallet (QX.1617). - Mounted on a pivot tube set in the cover plate, the pallet is roughly oval in shape and has two teeth formed on one long side.

(b) Escape wheel and pinion (QX.1619). - Mounted with the lower pivot in a bearing in the cover plate, and the upper pivot in a bearing formed in the platform below the safety plunger recess, the wheel engages the pallet. The drive from the wheel is transmitted to the segment through the pinion which engages it through a space formed between the base of the shutter recess and the platform of the safety plunger recess.

(c) Segment (QX.1618). - Semi-circular in shape, and with teeth formed on part of its circumference, the segment is mounted below and on the same pivot as the shutter. Two holes are formed in the segment, one to take the pivot, the other to engage with one of the pins set in the underside of the shutter. A slot formed radially from the circumference is formed to take the other pin on the shutter.

6. Cover (QX.120 SA). - This is a circular plate of anodised aluminium alloy with a pivot tube set centrally. Four holes are drilled in the plate the main two being the lower bearing for the escape wheel pivot and a tapped hole to take the cover plate fixing screw. Two positioning pins are formed on the top surface of the plate to engage corresponding holes in the base of the body. A slot is also cut to align with the positioning slot in the body.

ACTION (FIG. 3)

7. On firing. - The shutter sets back and is retained in the unarmed position by friction.

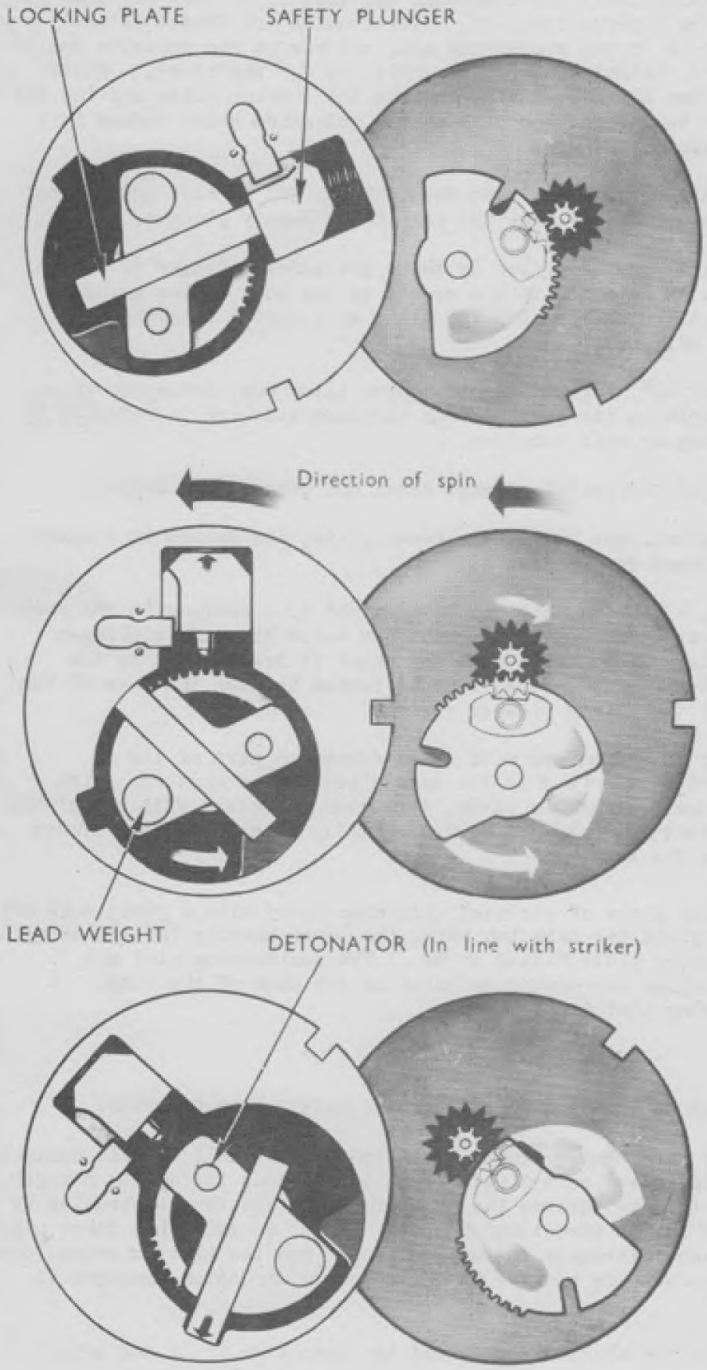
8. During flight. - Once set-back forces have been overcome, rotation of the shell, at the designed number of revolutions per minute, causes sufficient centrifugal force to withdraw the safety plunger from the locking plate, which itself tends to move towards the shutter. . The shutter, controlled by the escapement mechanism, commences to move in the direction of spin. After movement has taken place through sixty degrees the teeth of the segment disengage the escape pinion and the shutter swings over until the locking plate, now being pulled across the shutter in the opposite direction, engages in the slot formed in the body.

The shutter is now against the stop in the shutter recess and the detonator is in the armed position.

FIG.3

ACTION OF DELAYED ARMING SHUTTER

SHUTTER ACTION ESCAPE MECHANISM ACTION



BEFORE FIRING

Shutter held by locking plate and safety plunger in the unarmed position

ARMING OF SHUTTER

Safety plunger withdraws (approximately at the muzzle) and releases the shutter which rotates towards the armed position under the control of the escape mechanism.

DURING FLIGHT AND AT IMPACT

The locking plate centrifruges into the slot. The shutter is now locked in the armed position

9. Shutter speed. - Shutters in this series commence to open at between 3700 and 4500 revolutions per minute and the time of opening is between 0.045 and 0.075 seconds at 5900 revolutions per minute.

It should be noted that in a test at 5900 revolutions per minute all shutters are required to turn through the first 60°, i.e. that part of the movement controlled by the escape mechanism, in a time of 0.045 to 0.075 seconds.

SUMMARY OF DIFFERENCES

No. 4 (Obsolescent) WOLC - I.Arm. Approvals K.1466, K.1918

10. This shutter differs from the 4A in three ways:-

(a) Body (QX.1620). - This is similar to the body of the 4A but has a smaller shutter gauging hole.

(b) Cover plate (QX.75SA). - of aluminium alloy to a different specification to that used for cover plate QX.120 SA.

(c) Detonator (QX.122AF). - This is a 2.8 gr. "AZ" detonator in lieu of the 2.6 gr. "LZ" detonator used in the 4A.

No. 4A. WOLC - I.Arm. Approval K.1918.

11. As described in paras. 2 to 9 inclusive.

No. 4A/1 WOLC - I.Arm. Approval K.1918.

12. This shutter differs only in that the body (QX.1794) is manufactured from bar metal as opposed to being die cast.