Notified in A.C.Is. for the week ending 10th April, 1940

HANDBOOK

FOR THE

ORDNANCE, Q.F. 18-PR. MARKS IV, IVA AND IVB

ON

CARRIAGES, 18-PR., MARKS IIIT, IIITR, IV, IVP, IVR, V, VP, AND VR

LAND SERVICE

1940

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CHAPTER V

AMMUNITION

STATEMENT OF AMMUNITION, Q.F. 18-PR.

CARTRIDGES

Mark	Case	Primer	Charge	Shell	Fuze	Length	Remarks
			FULL CHARGES				
Shrapnel—			lb. oz. dr.			inches	
I	Any Mark	No. 1, Mk. II or IIM	1 6 15 M.D.8, I	XVI	No. 80 or 80B light	22·34	
VI	,,	,,	1 6 15 M.D.8, I	VI, VIII, X, XII or XVII	No. 80 or 80B heavy	22·54 (*c*)	
XIII	,,	,,	1 6 15 M.D.8, I	V, VII or IX	No. 80 or 80B light	,,	
XXII	,,	,,	1 6 15 R.D.B.8, I	XVI	,, ,,	22·34	
XXIII	,,	,,	1 6 15 R.D.B.8, I	V, VII or IX	,, ,,	22·54	
XXIV	,,	,,	1 6 15 R.D.B.8, I	VI, VIII, X, XII or XVII	No. 80 or 80B heavy	,, (*c*)	
LII	,,	,,	1 6 15 M.D.8, I	V, VII or IX	,, ,,	,,	
LX	,,	No. 11, Mk. I or IM	1 13 8 R.D.N./A.040, II	XII	No. 80 heavy	21·92	
LXIII		No. 1, Mk. II or IIM	1 6 15 W.057, W.054 or W.8, I	VI, VIII, X, XII or XVII	No. 80 or 80B heavy	22·54 (*c*)	
LXV		,,	1 6 15 W.057, I	V, VII or IX	No. 80 or 80B light	22·54	
LXVII		,,	1 6 15 M.D.8, I	VI, VIII, X, XII or XVII	,, ,,	,, (*c*)	
LXVIII		,,	1 6 15 R.D.B.8, I	,, ,,	,, ,,	,, (*c*)	
High explosive streamline—							
IXC	Any Mark	No. 1, Mk. II or IIM	1 6 4 M.D.8, II	IC	No. 106	21·915	
XC		,,	1 6 4 R.D.B.8, II	,,	,,	,,	
XIC		,,	1 6 4 M.D.8, II	,,	No. 117	22·8	
XIIC		,,	1 6 4 R.D.B.8, II	,,	,,	,,	
XIIIC		,,	1 6 4 W.057 or W.8, I	,,	,,	,,	
XIVC		,,	1 6 4 M.D.8, II	,, with smoke box	No. 106E	21·915	
XVC		,,	1 6 4 R.D.B.8, II	,, ,, ,, ,,	,,	,,	
XVIC		,,	1 6 4 W.057 or W.8, I	,, ,, ,, ,,	,,	,,	
XVIIC		,,	1 6 4 M.D.8, II	,, ,, ,, ,,	No. 117	22·8	
XVIIIC		,,	1 6 4 R.D.B.8, II	,, ,, ,, ,,	,,	,,	
XIXC		,,	1 6 4 W.057, I	,, ,, ,, ,,	,,	,,	
XXIC		,,	1 6 4 M.D.8, I	,, ,, ,, ,,	,,	,,	
XXIIC			1 6 4 R.D.B.8, I	,, ,, ,, ,,	,,	,,	

High explosive							
XXX	Any Mark	No. 1, Mk. II or IIM	1 6 15	M.D.8, I	II, III or VII	No. 106	22·79
XXXI		,,	1 6 15	R.D.B.8, I	,, ,,	,,	
XXXVIII		,,	1 6 15	M.D.8, I	,, ,,	No. 106E (*d*)	
XXXIX		,,	1 6 15	R.D.B.8, I	,, ,,	,, (*d*)	
XLI		No. 11, Mk. I, IM or IMR	1 13 8	R.D.N./A.040, II	III	,,	
XLII		No. 1, Mk. II or IIM	1 6 15	W.057, W.054 or W.8, I	II, III or VII	,, (*d*)	
XLIII		,,	1 6 15	W.057, W.054 or W.8 I	,, ,,	No. 106	
XLIV		,,	1 6 15	M.D.8, I	II, III or VII with smoke box	No. 106E	
XLV		,,	1 6 15	R.D.B.8, I	,, ,,		
XLVI		,,	1 6 15	W.057, W.054 or W.8, I			
XLVII		No. 11, Mk. I, IM or IMR	1 13 8	R.D.N./A.040, II			
Smoke bursting streamline—							
VC	Any Mark	No. 1, Mk. II or IIM	1 6 4	M.D.8, II	IC	No. 106	21·845
VIC		,,	1 6 4	R.D.B.8, II		,,	,,
VIIC		,,	1 6 4	M.D.8, II		No. 106E	,,
VIIIC		,,	1 6 4	R.D.B.8, II	,,	,,	,,
IXC		,,	1 6 4	M.D.8, II	IC or IIC	No. 117	22·8
XC		,,	1 6 4	R.D.B.8, II	,,	,,	,,
XIC		,,	1 6 4	W.057, I	,,	,,	,,
Smoke bursting							
IV	Any Mark	No. 1, Mk. II or IIM	1 6 15	M.D.8, I	III, IV, V, VI or convtd. I	No. 106	22·86
VI		,,	1 6 15	R.D.B.8, I		,,	
VII		,,	1 6 15	M.D.8, I		No. 106E	
VIII		,,	1 6 15	R.D.B.8, I		,,	
IX		,,	1 6 15	W.057, W.054 or W.8, I		,,	
X		,,	1 6 15	W.057, W.054 or W.8, I		No. 106	

CARTRIDGES—*continued*

Mark	Case	Primer	Charge	Shell	Fuze	Length	Remarks
			FULL CHARGES—*continued*				
			lb. oz. dr.			inches	
Armour-piercing							
I	Any Mark	No. 1, Mk. II or IIM	1 6 15 M.D.8, I	I	No. 12 special	21·17	
II	,,	,,	1 6 15 R.D.B.8, I	,,	,,	,,	
Paper shot	Any Mark	No. 1, Mk. II, IIM or III	1 4 0 R.D.B./S.F./2½/50	—	—	23·05	
			REDUCED CHARGES				
			oz. dr.				
High explosive							
I (*a*)	Any Mark	No. 1, Mk. II, or IIM	9 0 M.D.2½, I	II, III or VII	No. 106	22·79	
II (*a*)	,,	,,	9 0 R.D.B.2½, I	,,	,,	,,	
III (*a*)	,,	,,	9 0 M.D.2½, II	,,	,,	,,	
IV (*a*)	,,	,,	9 0 R.D.B.2½, II	,,	,,	,,	
VII (*a*)	,,	,,	9 0 M.D.2½, II	,,	No. 106E	,,	
VIII (*a*)	,,	,,	9 0 R.D.B.2½, II	,,	,,	,,	
IX (*b*)	,,	,,	5 4 M.D.T. 15–13, I	,,	,,	,,	
X (*b*)	,,	,,	5 4 R.D.B.T. 15–13, I	II, III or VII with smoke box.	,,	,,	
XI (*b*)	,,	,,	5 4 M.D.T. 15–13, I	,, ,,	,,	,,	
XII (*b*)	,,	,,	5 4 R.D.B.T. 15–13, I	,, ,,	,,	,,	
XIII (*b*)	,,	,,	5 4 W.T. 154–136, I	,, ,,	,,	,,	
XIV (*b*)	,,	,,	5 4 W.T. 154–136, I	,, ,,	,,	,,	

(*a*) This charge is now obsolescent.
(*b*) This charge will supersede the 9-oz. charge as stocks of the latter become exhausted.
(*c*) With shell Marks XII or XVII, the length is 21·92 inches.
(*d*) For shell filled TNT or Amatol, No. 106E Pb special for shell filled Lyddite, and No. 106E for shell filled Lyddite prior to 26/10/35.

Mark	Driving Band Design No.	Length	Diameter		Weight			Number of bullets	Total weight filled (nearest ¼ lb.)	Remarks
			Body	Band	Shell painted	Bursting charge	Fuze (approx.)			
Shrapnel—		inches	inches	inches	lb. oz. dr.	lb. oz. dr.	lb. oz. dr.		lb. oz. dr.	
V	R.L.13413A	9·868	3·29	3·39	17 6 6	0 2 8	0 15 2	349	18 8 0	
VI	R.L.13413A	9·868	3·29	3·39	16 13 14	0 2 8	1 7 10	328	18 8 0	
VII	R.L.22579	9·868	3·29	3·39	17 7 2	0 1 12	0 15 2	345	18 8 0	
VIII	R.L.22579	9·868	3·29	3·39	16 14 10	0 1 12	1 7 10	323	18 8 0	
IX	R.L.22579	9·868	3·29	3·39	17 7 2	0 1 12	0 15 2	345	18 8 0	
X	R.L.22579	9·868	3·29	3·39	16 14 10	0 1 12	1 7 10	323	18 8 0	
XII	R.L.22579	9·25	3·29	3·39	16 12 12	0 1 12	1 9 8	292	18 8 0	
XVI	R.L.22579	9·66	3·29	3·39	17 7 2	0 1 12	0 15 2	311	18 8 0	
XVII	R.L.24511	9·25	3·29	3·39	16 12 12	0 1 12	1 9 8	292	18 8 0	
High explosive streamline—										
IC	R.L.24511	10·0	3·29	3·39	14 13 8	1 1 4	2 1 0	—	18 0 0 (*a*)	
							2 8 0	—	18 8 0 (*b*)	
High explosive—										
II	R.L.13413A	9·59	3·29	3·39	14 13 8	0 13 0	2 1 0	—	17 12 0 (*a*)	
III	R.L.22579	9·59	3·29	3·39	14 13 8	0 13 0	2 1 0	—	17 12 0 (*a*)	
VII	R.L.24511	9·59	3·29	3·39	14 13 8	0 15 4	2 1 0	—	17 12 0 (*a*)	
								Smoke-mixture lb. oz. dr.		
Smoke bursting streamline—										
IC	R.L.24511	9·93	3·29	3·39	14 11 3 (*d*)	0 1 9	2 8 0	1 1 10	18 8 0 (*b*)	
IIC	R.L.24511	9·96	3·29	3·39	14 11 3 (*d*)	0 1 13	2 8 0	1 1 4	18 8 0 (*b*)	
Smoke bursting—										
Convtd. I	R.L.13413A	9·59	3·29	3·39	14 13 8 (*d*)	0 2 4	2 1 0	0 12 11	18 8 0 (*c*)	
III	R.L.22579	9·59	3·29	3·39	14 17 8 (*d*)	0 1 9	2 1 0	1 1 7	18 0 0 (*a*)	
IV	R.L.24511	9·59	3·29	3·39	14 17 8 (*d*)	0 1 9	2 1 0	1 1 7	18 0 0 (*a*)	
V	R.L.22579	9·60	3·29	3·39	14 12 9 (*d*)	0 1 13	2 1 0	1 1 2	18 0 0 (*a*)	
VI	R.L.24511	9·60	3·29	3·39	14 12 9 (*d*)	0 1 13	2 1 0	1 1 2	18 0 0 (*a*)	
Armour-piercing—										
I	R.L.24511	10·565	3·29	3·39	16 6 6	0 8 14	1 8 12	—	18 8 0	
Paper shot—										
II	—	23·05	3·4	—	—	—	—	—	18 8 0	

NOTE.—(1) The figures given in the penultimate column indicate the nominal weight and consequently are at a slight variance with the sum of weights given in columns 6, 7, 8 and 9.

(2) The weight in column 6, for smoke bursting streamline shell, and smoke bursting plain base shell, includes the weight of the container.

(*a*) With Nos. 106 or 106E fuze, without cap.

(*b*) With No. 117 fuze, without cap.

(*c*) With Nos. 106 or 106E fuze, with cap and exploder B.

(*d*) Includes weight of container.

GENERAL

Ammunition for the Q.F. 18-pr. gun is of the fixed Q.F. type, comprising a primer, propellant charge (in a brass case), projectile and fuze, all of which are issued, stored, and loaded together as one complete round. Under peace conditions some natures of shell are issued and stored without fuzes, plugs being used instead. These shell are fuzed before practice.

The name cartridge is given to the complete round (Fig. 92).

Cartridges are issued in boxes containing four rounds. The time and percussion fuzes used with shrapnel, when in the projectile, are provided with a brass cover, soldered on, to protect the fuze from deterioration due to damp. Fuzes when issued separately are supplied in hermetically sealed cylinders, which should not be opened until actually required for use.

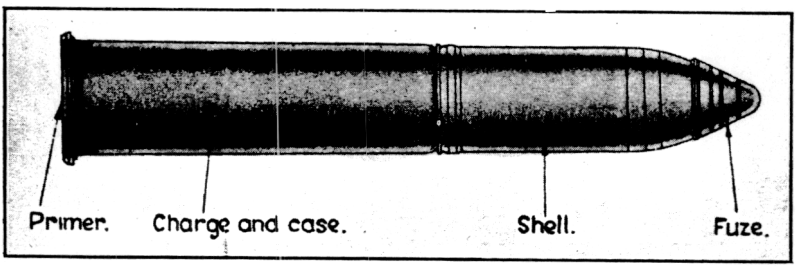

FIG. 92

The propellant charges are usually grouped according to their ballistic properties; the Group Letter and No. is stencilled on the rear of the cartridge case.

The propellant charges are normally of cordite. N.C.T. charges were used considerably in certain war areas and may still be met with.

The cartridge being of the fixed type, there is no facility for varying the charges; consequently, the normal cartridge is the full charge. For practice purposes, or for use on service in hilly country, or when considered desirable to reduce wear of the gun, certain reduced cartridges are made up and issued. These are specially marked to avoid confusion in their issue and use.

The table on pages 208 to 210 shows the cartridges now in use with this equipment.

PRIMERS

PRIMER, PERCUSSION, Q.F. CARTRIDGE, NO. 1

The *Mark II* primer (Fig. 93) consists of a body, percussion cap, anvil plug, copper ball, screwed plug and brass closing disc.

The body is of metal provided with a flange in front of which it is screw-threaded externally to screw into the base of the cartridge

case, and two slots are cut in the flange for the No. 27 key. The interior is bored, cupped and threaded, to take the percussion arrangement.

The cap is of copper, and contains detonating composition, covered by a tinfoil disc ; it is placed in a recess in the body, and over it an anvil plug is screwed, having a coned seating, into which is placed a soft copper ball. Three fire holes are bored through the anvil plug to allow the flash from the cap to pass into the cone seating.

The screwed plug screws in on the anvil plug and retains the copper ball in position ; it is perforated by three fire channels and is covered by a paper capsule, to prevent the powder working into the ball seating. A fillet of cement is placed between the cap and body to prevent the ingress of damp.

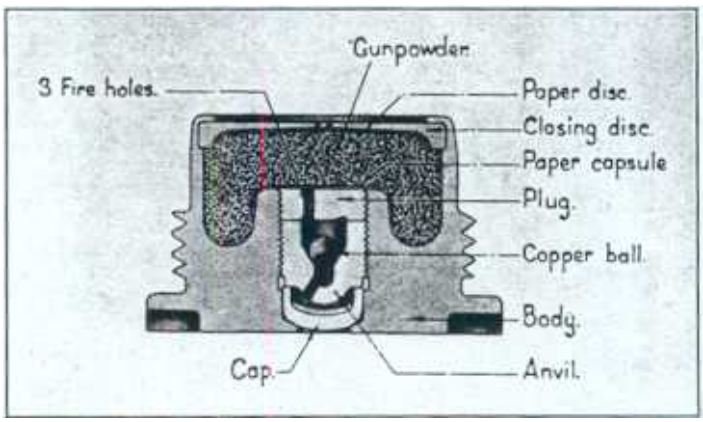

FIG. 93

The magazine of the primer contains R.F.G.2 or G.12 gunpowder, covered by a brass disc ; this disc has six radial slits and a hole in the centre to weaken it, and has a paper disc secured to its under side with cement. The brass closing disc is secured in position by the metal of the primer being burred over it, and it is coated with cement.

The primer is marked, as shown on page 245.

The primer is issued assembled in the cartridge ; in addition, spare primers are issued in boxes containing four, to replace missfired primers.

The letter M after the Mark indicates that the primer has been repaired and refilled.

Action

When the striker of the firing mechanism is driven by its spring on to the cap, the composition is ignited on the anvil ; the flame

passes through the fire channels in anvil and plug, to ignite the gunpowder in the magazine. The magazine explodes, opens out the closing disc and ignites the propellant charge. The explosion of charge and magazine forces the copper ball into the coned seating of the anvil plug, closing the fire channels and preventing the escape of gas at that point. The wall of the primer is pressed outwards to grip the cartridge case tightly, and prevent gas escape between the primer and case.

PRIMER, PERCUSSION, Q.F. CARTRIDGE, NO. 11

The *Mark I* primer (Fig. 94) differs from the *Mark II* No. 1 Q.F. percussion primer principally in having a magazine screwed into the body. It is of brass, rounded at the front end and perforated with eight holes, a white metal dome being inserted at the front end.

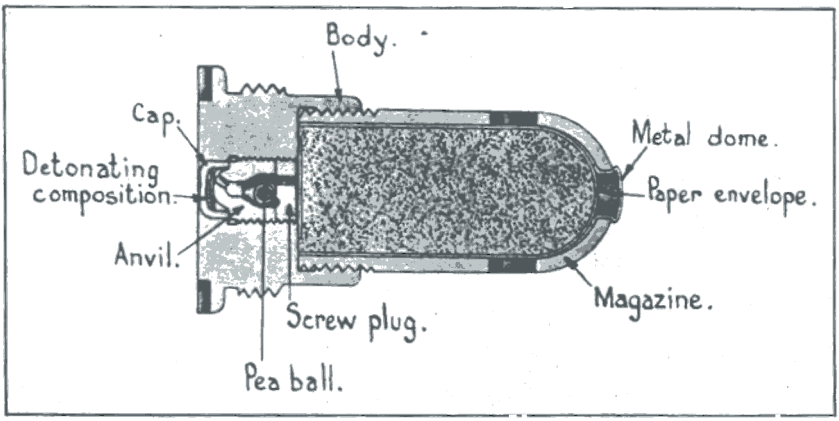

FIG. 94

A paper envelope is fitted internally and the magazine is filled with six drams of G.12 gunpowder.

The *Mark IM* is the *Mark I* repaired and refilled.

The *Mark IMR* is the *Mark IM* repaired, the anvil and plug being of increased diameter.

PROPELLANT CHARGES

The full charge (Fig. 95) consists of a bundle of M.D.8, R.D.B.8, W.052, W.054 or W.8 cordite, recessed at one end to fit over the primer and the boss of the case, the other end being in contact with the shell. The cordite sticks are secured in two places by shalloon braid. The weight of the charge is 1 lb. 6 oz. 15 dr. With R.D.N./A.040 cordite, the weight of the charge is 1 lb. 13 oz. 8 dr.

The charge for the streamline shell is generally similar to the above, except that Mark II cordite is used for the M.D.8 and R.D.B.8

charges, it also differs in weight slightly and in the tying of the sticks. The weight of the charge in this case is 1 lb. 6 oz. 4 dr.

The reduced charge consists of a bundle of M.D.2¼ or R.D.B.2¼ cordite having a cylindrical core of 10·4-inch cordite sticks, secured in two places with sewing silk surrounded at the base by a ring of 4·1-inch sticks, tied in two places with sewing silk; the whole is arranged to fit over the boss of the case and the protruding portion of the primer. The weight of the reduced charge is 9 oz.

With M.D.T. 15–13, R.D.B.T.15–13 and W.T.154–136 cordite, the weight of the charge is 5 oz. 4 dr.

Alternatively, the reduced charge may comprise a central bundle of cordite sticks, tied in seven places with double sewing silk, with two fins of cordite passed through the charge, at right angles to it, near each end, to keep the charge central in the case. A recess is formed in the base of the charge.

The charge for paper shot consists of R.D.B./S.F., 2½/50 cordite, which is filled loose into a silk cloth or cream serge bag choked at the mouth with sewing silk. The words PAPER SHOT are stencilled on the side of the case. The weight of the charge is 1 lb. 4 oz.

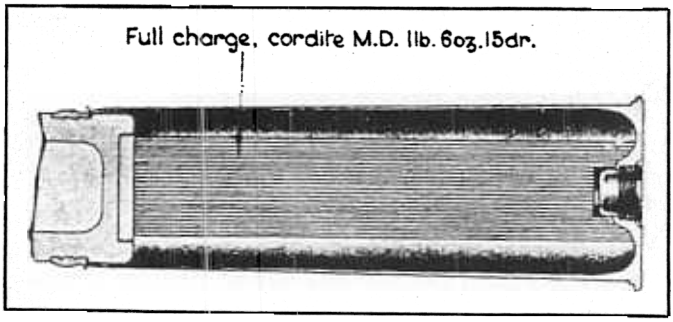

FIG. 95

THE CASE

The case (Fig. 95) is of solid-drawn brass, slightly tapered towards the mouth, with a hole in the base, threaded and recessed, to take the primer. A rim is provided, by means of which the extractor of the breech mechanism automatically ejects the case when the breech is opened. The case is secured to the base of the projectile by coning the front portion, or lip, into an undercut recess below the driving band of the shell.

The case is lacquered inside to prevent deterioration.

Certain appropriate abbreviations are stencilled on the case, as shown in Chapter VI, to indicate the nature of the projectile in use.

The older method of identification was by means of certain markings and colourings.

The safety clip is of brass, cross-shaped so as for form four arms, the ends of which are turned to form clips to engage with the rim of the cartridge case. The clips are painted for identification purposes as shown in Chapter VI. One arm is slightly longer than the others, the clip portion being differently shaped so as to spring over the rim of the cartridge. The clip has a canvas loop for withdrawing the cartridge from the ammunition box of the trailer.

The clip protects the cap of the percussion primer and prevents the primer from unscrewing in transit and store ; it must be removed before loading.

PROJECTILES

(Plate 16)

The projectiles used with this equipment are :—

Shrapnel.
High explosive.
Smoke bursting.
Armour-piercing.

The projectiles are secured to the case by a process of coning or indenting, usually the former. Shrapnel shell are as a rule issued,

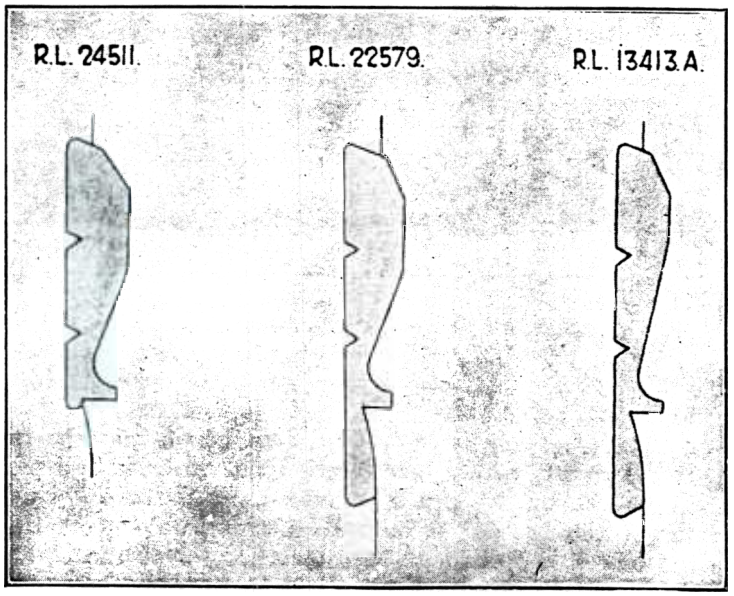

FIG. 96

stored and transported, fuzed ; for safety reasons smoke shell are stored plugged.

The various designs of driving bands to be met with are as shown on Fig. 96.

The ballistics of the shell may vary considerably according to the design of band ; cartridges should therefore be stacked, so that driving bands of the same design are together as far as possible.

Projectiles are painted, primarily, in order to preserve the bodies from rust. Advantage is taken of this necessity to indicate, by the colour employed, the nature of the filling, see Chapter VI and Plate 16.

Shrapnel shell

The *Mark XVII* shrapnel shell (Fig. 97) has a 2-calibre radius head and is of forged steel. Its length is about 2·8 calibres ; the walls near the base are thickened, forming a shoulder on which rests

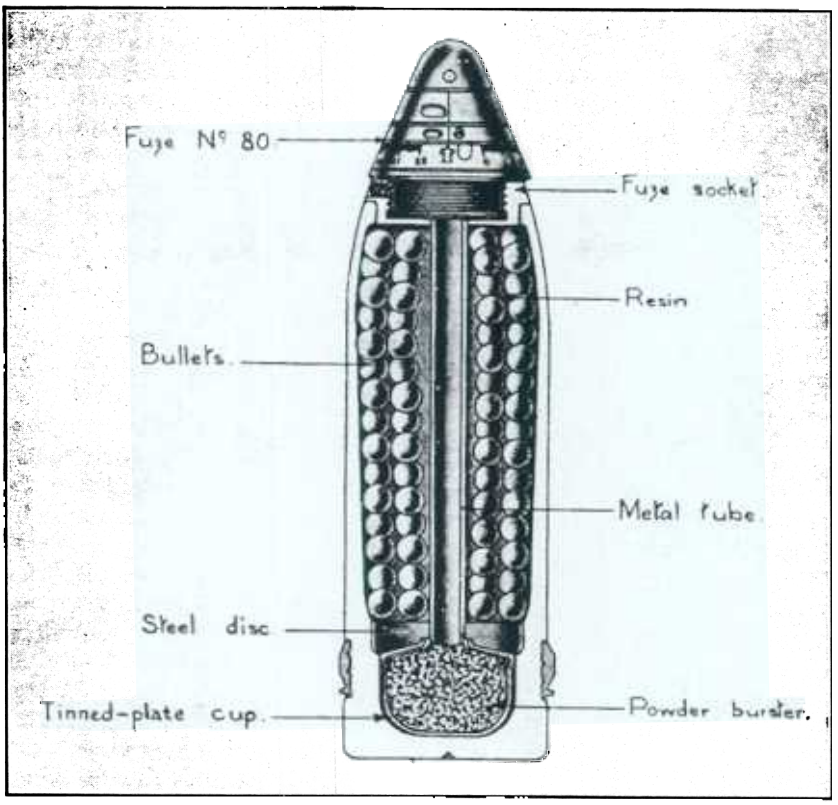

Fig. 97

a steel disc ; below the disc is placed a tinned-plate cup for the bursting charge. A hole is bored through the centre of the disc, into which is screwed the lower end of a central brass tube which projects slightly through the disc into the mouth of the cup.

The shell contains about 292 mixed metal bullets (seven parts

lead, one part antimony), 41 to the pound, the spaces between the bullets being filled up with resin. The front end of the shell is closed by a flanged gunmetal bush, or fuze socket, screwed in, the socket being screw-threaded internally to the 2-inch fuze-hole gauge, to take fuzes of the No. 80 type. A set screw is provided to prevent the fuze body being turned during the operation of setting the fuze. A hole is bored through the bottom of the socket for the central tube, which is expanded or soldered into the socket to prevent the resin working through.

The shell is provided with a driving band to design R.L. 24511, pressed into an undercut groove having waved ribs, near the base. The band has a projecting rim at its lower end to form a stop for the brass cartridge case, below which the shell is prepared for the attachment of the case by coning.

The bursting charge is $1\frac{3}{4}$ oz. of fine grain gunpowder, which completely fills the cup. A disc of shalloon is shellacked in the bottom of the fuze-hole socket, and prevents the powder working out of the central tube. This Mark of shell is designed for use with the No. 80 fuze (heavy).

Action

On discharge from the gun, the steel disc takes the set back effect from the bullets. When the fuze magazine explodes, according to the fuze setting, the flame passes through the central tube, to the bursting charge in the tinned-plate cup. The explosion of the bursting charge presses the steel disc and bullets forward, relative to the shell body, so clearing disc, bullets, tube, socket and fuze away from the shell. The mouth of the shell is caused to expand slightly to allow free exit to the bullets, but otherwise the shell is not affected by the explosion. The bursting charge is just sufficient to clear the bullets out of the shell, but adds practically nothing to their forward velocity.

When the bullets are clear of the shell they still retain their original forward motion and also their rotational motion, consequently, they spread out from the centre, forming a cone of dispersion, the angle of opening being the angle between the lines of flight of the outer bullets of the cone. The longer the range, the larger becomes the angle, for the remaining velocity of the shell falls off, but its rotational velocity does not decrease to the same extent.

The *Mark XVI* shell differs from the *Mark XVII* in being designed for the No. 80 fuze (light), which, being of aluminium, is lighter than the brass Mark XI fuze, consequently, the shell body is slightly longer (2·9 calibres) and heavier. It contains 311 bullets, 41 to the pound. The driving band is to design R.L. 22579, the lower portion being sloped for the attachment of the case by coning.

The *Mark XII* shell differs from the *Mark XVII* in being fitted with the driving band to design R.L. 22579. It is for use with the No. 80 fuze (heavy).

The *Mark X* shell is generally similar to the *Mark XII* from which it differs in length (three calibres) and weight of the body. It contains 323 bullets, 41 to the pound.

The *Mark IX* shell is similar to the *Mark X* except that it is designed for the No. 80 fuze (light). It contains 345 bullets, 41 to the pound.

The *Mark VIII* shell is generally similar to the *Mark X*, from which it differs in having a slightly larger cup and cup chamber.

The *Mark VII* shell differs from the *Mark IX* in the size of the cup and chamber, which are larger.

The *Mark VI* shell differs from the *Mark VIII* in having a driving band to design R.L. 13413A.

The *Mark V* shell differs from the *Mark VII* in having a driving band to design R.L. 13413A.

Intervening Marks of shell are either cancelled or obsolete.

The shrapnel shell, it will be observed, are designed and filled for certain specific types of fuze. Thus the Marks XVII, XII, X, VIII and VI are light shell and require heavy fuzes of the No. 80 Mark XI type to bring the projectile to the normal weight of 18½ lb. On the other hand, the Marks XVI, IX, VII and V are heavy shell and should be used with light fuzes only such as No. 80 Mark IVA.

A certain number of Mark IX, VII and V shell may still be met, with a combination of heavy shell and heavy fuzes.

High explosive shell

There are two types of high explosive shell approved for use, namely, the streamline and the plain base.

The *Mark IC* streamline shell (Fig. 98) is of forged steel with a 7·57 calibre radius head, and the base portion sloped at an angle of 7½ degrees to form the streamline. It is 2·98 calibres long and has a parallel cavity for the explosive, the upper part being screwed to the 2-inch fuze-hole gauge below which is a ledge to make the shell suitable for use with an exploder container.

Near the base is an undercut groove, with waved ribs, into which is pressed a copper driving band, shaped externally to design R.L. 24511. Below the driving band the shell body is sloped slightly for the lip of the cartridge case. A hardened steel plate is screwed into the base of the shell.

The weight of the empty shell is 14 lb. 13 oz., and of the bursting charge 1 lb. 1 oz., the total weight fuzed being 18½ lb. Notches are cut in the mouth of the shell for the purpose of securing the fuze by punch stabbing.

The *Mark VII* shell (Fig. 99) is of steel, with a 2-calibre radius head and plain base. It is 2·87 calibres long and has a cavity similar to the Mark IC streamline shell. The driving band is to design R.L. 24511, below which the shell body is sloped to suit the mouth of the cartridge case. A hardened steel plate is screwed or

riveted into the base. Notches are cut in the mouth of the shell for securing the fuze.

The *Mark III* shell differs from the *Mark VII* in being fitted with a driving band to design R.L. 22579.

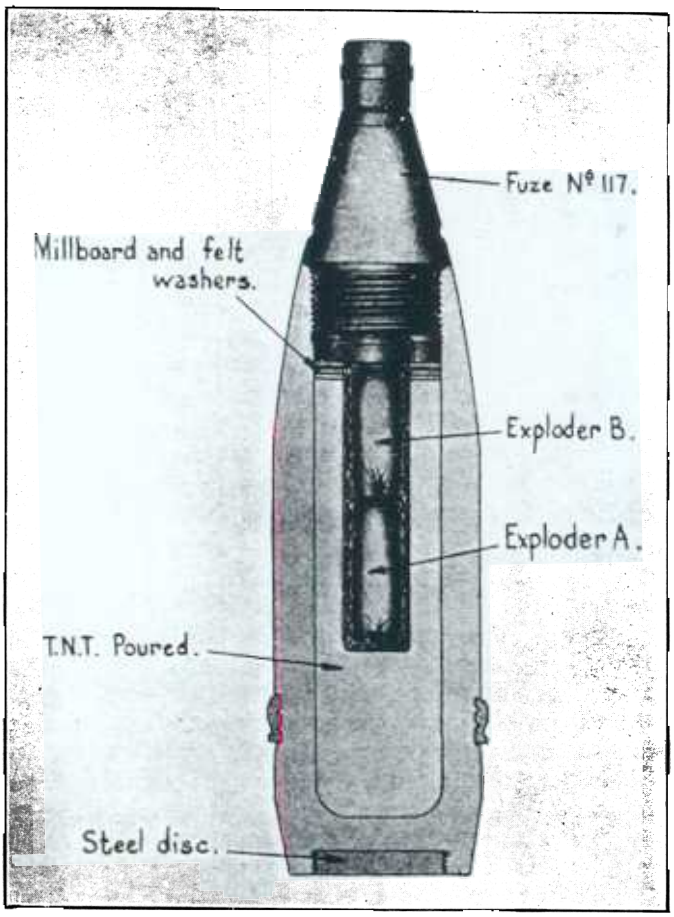

FIG. 98

The *Mark II* shell is of the same general type as the *Mark III*, but the fuze is secured by a set screw instead of notches. The nose is reduced in diameter slightly. It has a driving band to design R.L. 13413A.

Certain Marks of H.E. shell (streamline and plain base) are fitted with smoke boxes.

The *Mark III* smoke box takes the place of the A exploder shown in Figs. 98 and 99 and consists of a steel cylinder with a tinned-plate lid which is soldered to the body after filling. The cylinder is

filled with three pellets of red phosphorus wrapped in fine white paper together with two paper discs.

The *Marks I* and *II* smoke boxes differ from the *Mark III* in that the cylinder is of paper and the filling is 2¼ oz. of smoke producing powder. No more of these will be made.

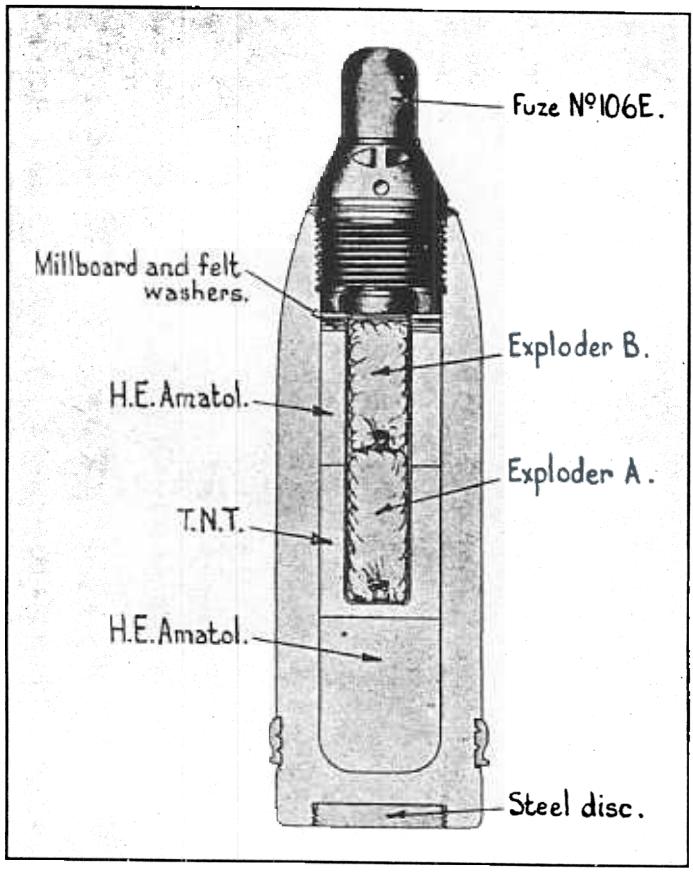

FIG. 99

Method of filling

High explosive shell are filled with either T.N.T., amatol or lyddite, and are fitted with a suitable exploder system.

Before filling, the interior of the shell is varnished to ensure a smooth surface for the explosive with a view to avoiding premature action.

The explosive, T.N.T., may either be melted and poured into the shell in the fluid state and allowed to solidify in its place, this is spoken of as " poured filling ", or it may be used for convenience in the form of blocks placed in a paper container and referred to as

" block filling ". The block filling also applies to lyddite with this equipment.

With the explosive amatol, the shell may consist of cold pressed 80/20 amatol with a centre third of cold pressed T.N.T., or alternatively, a top and bottom block filling of 80/20 amatol and a centre block filling of T.N.T.

With cold pressed filling the explosive is used in the dry powder form and pressed into the shell by hydraulic or other pressure. This process was used very extensively, during the period of the 1914–18 war, for amatol only, and is known as " cold pressed " filling.

Block filling was introduced for convenience with this equipment and consists of three blocks, the top and bottom of amatol and the centre of T.N.T.

Care must be taken when filling shell by the pouring process that no cavities are formed by the contraction of the explosive on solidification, and in the case of the block or pressed fillings, that the density of the explosive in the shell is most suitably arranged from the point of view of safety and efficiency.

When the explosive is cast or pressed into position in this manner it is somewhat inert and difficult to detonate. This factor forms a valuable safeguard in transport, loading and firing, but renders it necessary to introduce an intermediary between bursting charge and fuze, as the service fuze would have great difficulty in completely detonating the shell.

The intermediary is known technically as an exploder, and is arranged as follows :—

A cavity is formed in the bursting charge immediately below the fuze, during the operation of filling. The exploder is inserted in this cavity in the form of a crystalline explosive enclosed in small bags, ranging in weight from 10 to 20 drams. The explosives usually employed for this purpose are T.N.T. and C.E. The small bags are packed fairly tight, and when inserted in the shell a certain amount of pressure is necessary to get the fuze fully home, in order to prevent set back on firing. This is most important, as, if the act of firing produces a gap between fuze and exploder, the efficiency of the shell will be very much impaired, even to the extent of producing " blinds ". The fuze must be in immediate contact with the exploder at all times. For the same reason the exploder bags must be inserted in the shell with the choked end downwards, i.e. away from the fuze.

Amatol-filled shell may introduce a special difficulty, by reason of the grade of T.N.T. used in the bursting charge. If crude T.N.T. is used and the storage temperature exceeds 70 degrees Fahr., certain oils are found to exude from the filling, which, if allowed free access to the exploder, will have the effect of rendering the exploder filling solid and inert, leading most probably to blind shell. To overcome this difficulty, such shell have the bursting charge and exploder separated by a moisture-tight barrier, in the form of a steel

exploder container, which screws into the shell and has a stem projecting into the cavity of the bursting charge with which it is in close contact.

It should be noted that the exploder container is not used with lyddite-filled shell, as exudation does not occur with this nature.

The effects of exudation are very much less with C.E. exploders than with T.N.T. exploders, consequently, the former type, i.e. C.E., are used with amatol shell destined for use in hot climates, also in certain other cases. C.E. exploders, however, *must on no account be used with lyddite filled shell* owing to dangerous chemical interaction.

The exploder comprises two bags with the Nos. 117, 106E and 106 fuzes. As a rule H.E. shell are issued with one bag in position and with a plug, the second bag being issued in the cylinder with the fuze.

Amatol-filled shell are more difficult to detonate than lyddite or T.N.T., and are, for this reason, provided with a " surround " of T.N.T., which lies between exploder container and the bursting charge.

With H.E. streamline shell the fuze used is the No. 117 or 106E.

With plain base shell the fuze used is the No. 106E or 106, except in the case of the Mark IXC and XC cartridges having the Mark IC streamline shell with the No. 106 fuze.

The method of filling H.E. shell is shown in Figs. 98 and 99.

Smoke bursting shell

The *Mark IIC* streamline smoke bursting shell (Fig. 100) is of forged steel with a 7·57 calibre radius head, and the base portion sloped at an angle of 7½ degrees to form the streamline. It is 9·96 inches long and has a parallel cavity for the smoke composition, the upper part being screw-threaded to take a No. 3A shell burster container. A radial charging hole is bored through the body, closed by a plug covered with solder. The shell is fitted with a driving band to design R.L. 24511.

The shell is filled with a smoke producing mixture of white phosphorous. The mixture, in a molten state, is introduced into the shell through the radial hole and solidifies on cooling.

The bursting charge consists of T.N.T. blocks or, alternatively, pressed T.N.T., whilst the detonative impulse is provided by an F. type 5-dram C.E. exploder. Both are contained in the burster container immediately below the fuze.

The No. 3A shell burster container is of steel, flanged at the top and screw-threaded externally to suit the shell. Internally, the upper part is screwed to the 2-inch fuze-hole gauge.

The shell may be of new manufacture or it may be converted

from the Mark IC H.E. streamline shell or the Mark IC streamline smoke bursting shell.

The *Mark IC* streamline smoke bursting shell is generally similar to the *Mark IIC*, differing in being fitted with a No. 3 shell burster container, and is also fitted with a base plate.

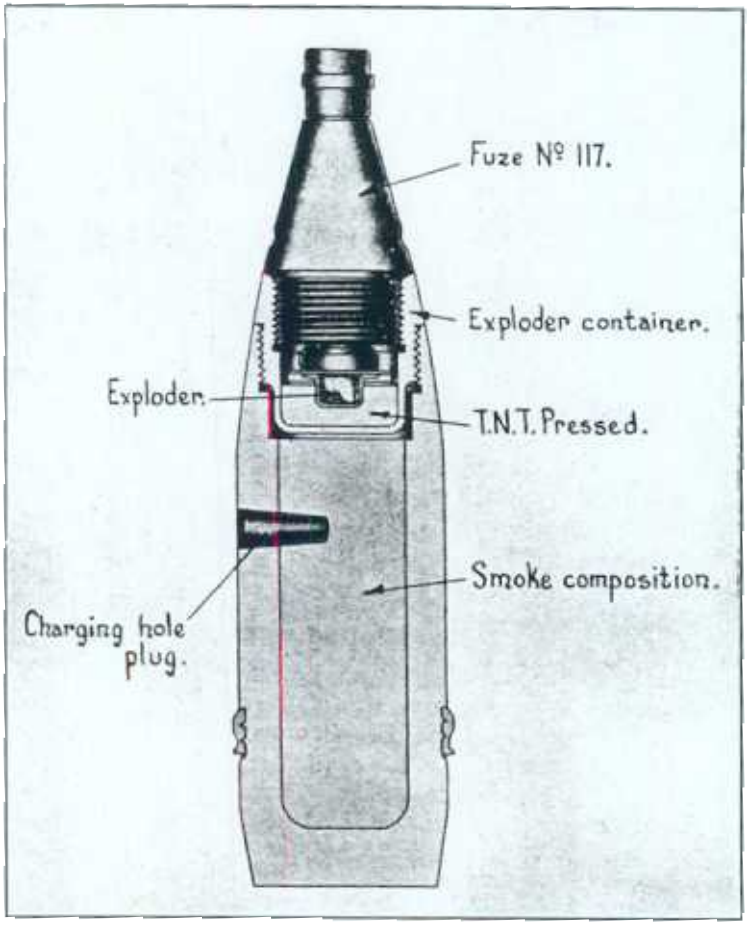

FIG. 100

The *Mark VI* smoke bursting shell (Fig. 101) is converted from the Mark VII H.E. shell or Mark II smoke bursting shell and is of forged steel with a 2-calibre radius head and plain base. It is 9·6 inches long and its weight is 18 lb. 1 oz. The head is prepared to take a No. 3A shell burster container, and a tapered charging hole is drilled in the body, which is closed after charging by driving in a steel charging-hole plug.

The *Mark V* smoke bursting shell differs from the *Mark VI* in being converted from the Mark III H.E. or Mark I smoke shell.

The *Mark IV* smoke bursting shell is generally similar to the *Mark VI*, the same Mark and type of shell being converted as for the Mark V above, except that it is prepared to take a No. 3 shell burster container. The driving band is to design R.L. 24511.

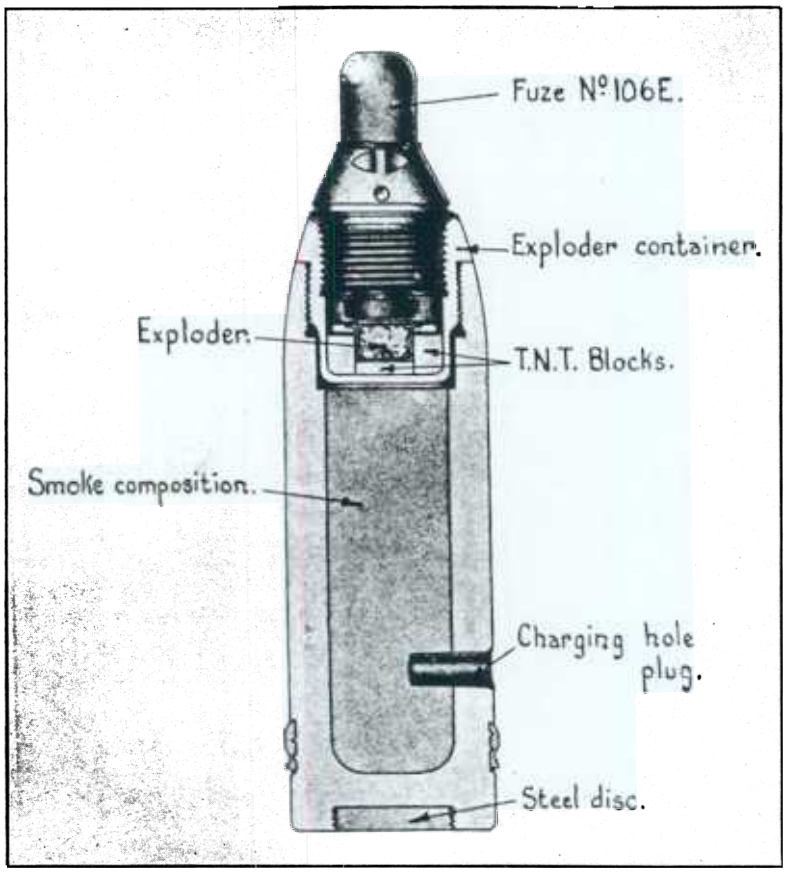

FIG. 101

The *Mark III* smoke bursting shell is generally similar to the *Mark V*, the same Mark and type of shell being converted as for the Mark V above. A No. 3 shell burster container is fitted and the driving band is to design R.L. 22579.

The converted *Mark I* smoke bursting shell is converted from the *Mark II* H.E. and has a driving band to design R.L. 13413A. It has a radial charging hole drilled just above the driving band closed by a plug, covered by solder.

ARMOUR-PIERCING SHELL

The *Mark I* armour-piercing shell (Fig. 102) is of steel with a 1·5-calibre radius head and plain base. It is 3·14 calibres long and has a parallel cavity for the explosive, which is loaded into an aluminium container. The base is bored and threaded to take a steel adapter, which receives the medium base fuze. Near the base an undercut groove, with waved ribs, receives a copper band, which is pressed into position and shaped externally to design R.L. 24511.

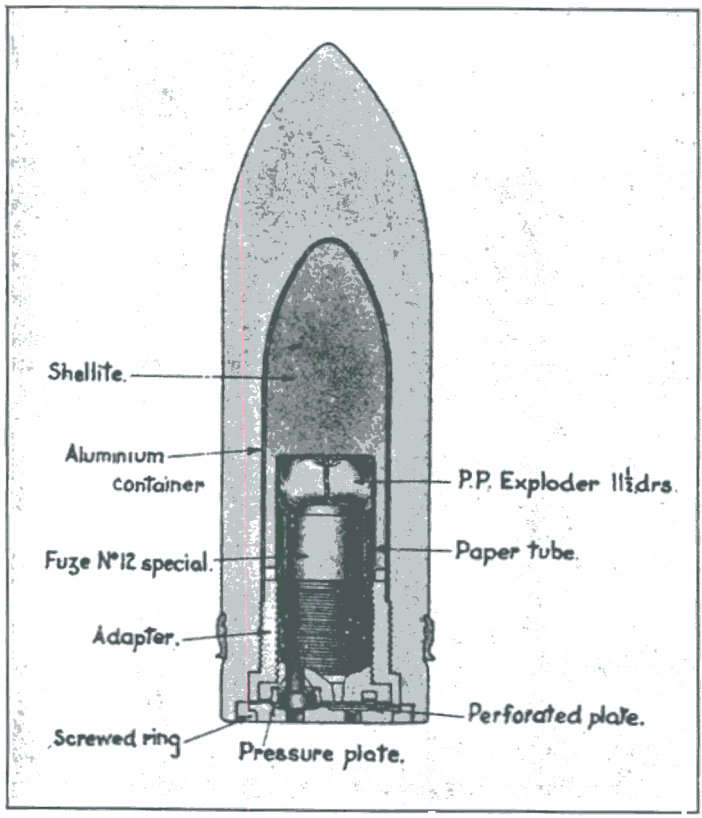

FIG. 102

Below the band the shell is sloped slightly to suit the lip of the cartridge case which is attached by coning. The base is reduced in diameter externally to receive the screwed securing ring of the base cover plate, the other portion of which, namely, the perforated plate, being thus retained in position against the pressure plate of the fuze. The screwed ring may be shaped to screw into instead of over the base of the shell, which would be prepared to correspond.

The fuze being used in the base of a shell filled with high explosive, special precautions have to be taken to prevent the shell being detonated in the bore by the gases from the cartridge reaching the shell filling by way of the threads of the fuze or adapter. For this purpose a special gas sealing arrangement comprising a gascheck plate and cover plate is provided.

The gascheck plate is a flat disc of pure copper shaped at one point to fit in the pressure plate recess of the fuze, the key slots of which are plugged; it covers the junction of adapter and shell. The cover plate is in two parts, i.e. a perforated steel plate and a steel locking ring; the latter screws either over the base of the shell or into the base, according to the pattern used. The cover plate is painted red.

Paper shot

The *Mark II* paper shot consists of a brown paper cylinder closed at each end by a number of strawboard discs glued together, one end of the cylinder being flanged to form a driving band. A tapered aperture is formed in the flanged end for filling with shot and sand to bring it to the required weight, the aperture being closed with a cork bung. The weight of the filled shot is 18½ lb. This shot is issued for training purposes where authorized.

FUZES

Fuze, T. and P., No. 80

(Plate 17)

This fuze is used with shrapnel shell.

The *Mark XI* fuze consists of the following parts which are of metal, unless otherwise stated:—

Body, percussion pellet, detonator, stirrup spring, ferrule, creep spring, magazine, base plug, bottom and top time rings, time pellet, detonator, stirrup spring, needle, cap and fuze cover.

The *body* has the lower portion threaded externally to the 2-inch fuze-hole gauge, above which it is enlarged to form a platform or flange for the time rings. The circumference of the platform is sloped and engraved almost completely with equally spaced setting graduations, reading from 0 to 22, subdivided into tenths. The graduations are read by an index line engraved on the bottom time ring. The fire channel leading from the bottom ring to the magazine is in the centre of the unengraved portion of the platform, to one side of which is a safety mark, thus ⫩, in red and to the other side a stud for the fuze key used for screwing the fuze in the shell. A leather washer is fitted under the flange to make a tight joint when the fuze is screwed into the shell. A stem formed above the platform centres the time rings; the upper end is reduced in diameter and threaded to receive the cap. The interior of the body is bored

throughout to accommodate the mechanism ; the lower portion of the bore is threaded for the base plug above which is the percussion chamber, the latter being separated from the time lighting chamber by means of a diaphragm into which is screwed a double ended steel needle. The needle is flanged and rests on a lead washer to make a flash-tight joint. A groove round the exterior of the percussion chamber forms the magazine, from which a short diagonal channel leads, by a vertical channel, to the top of the platform, so connecting the composition in the bottom time ring with the magazine. In the stem an oblique channel connects the lighting chamber with the top time ring. Two small vertical grooves on the exterior of the stem take the locking pins of the top time ring. Shellacked to the top face of the platform is a cloth washer having a small hole, which leaves the powder pellet in the platform exposed.

Percussion arrangement

The *percussion pellet* is cylindrical in shape, reduced in diameter at the inner end and bored to take a detonator, which is held in position by a screwed plug. The plug has a central fire channel.

The *detonator* consists of a perforated copper shell closed by a brass or copper disc. It contains 1·39 grains of detonating composition, reinforced by a small pellet of about 1·6 grains of gunpowder, the whole being pressed into position and covered by a lid. A glazed-board washer lies between the detonator and plug.

The *stirrup spring* is a small fitment consisting of a perforated disc with two curved arms ; it fits on the percussion pellet, the arms supporting the ferrule.

The *ferrule* is a short tube, which fits over and projects above the pellet, the outer end resting on the arms of the stirrup spring ; in this position it prevents any forward movement of the pellet.

The *creep spring* is of steel wire and lies within the ferrule between pellet and needle ; it prevents rebound action of the pellet on firing, and creeping or boring forward of the pellet on deceleration of the projectile during flight.

The *magazine* contains about 60 grains of fine grain gunpowder and the connecting channel has two perforated powder pellets.

The *base plug* is threaded to enter the fuze body, the threads being coated with approved cement. A central flash hole is provided, covered by a brass washer and linen disc which are shellacked together and secured in position by burring over the metal.

Time arrangement

The bottom ring fits on the stem, round which it is free to turn. On the under side of the ring a concentric channel is provided in the form of an incomplete circle, into which is pressed a fuze composition of fine grain powder, the bottom of the ring being covered by a paper washer. At one end of the composition there is a small vertical hole, containing a perforated powder pellet, which comes into

communication with the top time ring ; at the same place a radial channel connects to the exterior of the ring forming a gas escape channel. Gunpowder is pressed into this channel, using a chequered punch, or alternatively a loose powder pellet may be used, the channel being closed by paper and brass discs, secured by stabbing and coated with shellac. Adjacent to the gas escape channel is the setting mark or index ; there is also a stud fitted to take the fuze setting key. The top face of the bottom ring has shellacked to it a cloth washer, having a small hole which exposes the powder pellet in the vertical channel.

The *top ring* rests on the bottom ring and has the upper surface plain to form the support for the cap. The circumference is sloped and plain. The ring is fixed to the stem over which it fits, by pins which engage partly in the stem and partly in the ring. It has a channel cut round its lower face, similar in shape, filling, and gas escape provision to the bottom ring. At the beginning of the composition a small hole is bored through obliquely to the inner surface, where it communicates by the hole in the stem with the lighting chamber. The oblique channel in the ring contains a powder pellet and is closed by a paper disc.

The *time pellet* is cylindrical in shape, is supported on a stirrup spring and has the under side recessed to receive the detonator.

The *detonator* consists of a perforated copper shell charged with 0·75 grains of a detonating composition, on top of which is a 0·87 grain powder pellet. One end of the explosive column has a brass disc, the other a copper disc on which is shellacked a paper disc.

The *stirrup spring* is a small fitment consisting of a perforated disc with two arms. It supports the time detonator pellet by the arms, which fit over the top of the stem of the fuze body.

The screwed steel *needle* has a flange which rests on a lead washer in the fuze body to make a flash-tight joint between the time and percussion chambers. The needle is double-ended, one point projecting into the time chamber, the other into the percussion chamber.

Waterproof composition is inserted in the space between the rings, cap and body.

The *cap* is dome-shaped and screws on the stem to retain the time rings. After being screwed home it is secured in position by a steel set screw, therefore it is only necessary to move the bottom time ring to set the fuze without having to clamp or unclamp the cap.

The *fuze cover* consists of a cap and tear-off band ; it is provided with a becket of tarred whipcord, to assist the operation of tearing off. The lower edge of the band is soldered to the fuze platform below the graduations. A projection on the cover fits over the setting stud on the bottom time ring. The fuze with cover can thus be screwed into the shell using the No. 17 key.

When issued, the fuze is set at safety before the cover is secured.

To set the fuze

First see that the set screw in the nose of the shell is fully home in the fuze ; then place a No. 18 key over the fuze until it grips the setting stud on the bottom time ring, and revolve the key clockwise until the index on the ring is opposite the required graduation on the body.

Action

Time arrangement

On firing, the time pellet sets back, straightening out the arms of the stirrup spring and carrying the detonator on to the upper point of the needle. The flame from the detonator passes through the hole in the stem to the top time ring, where it ignites the fuze composition, blowing out the closing disc in the gas escape hole.

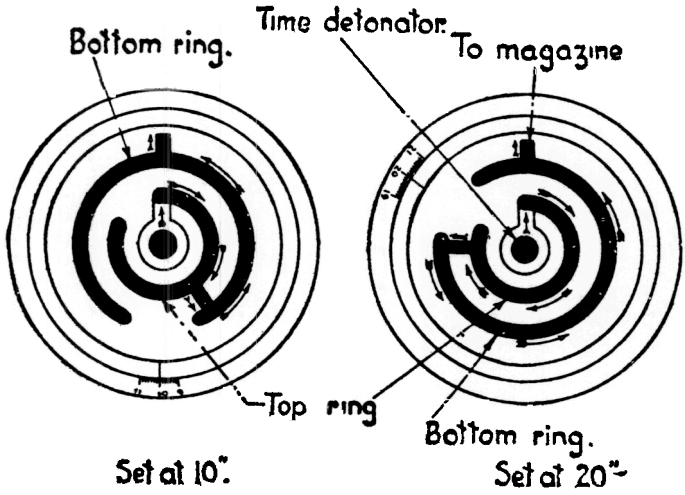

FIG. 103

During flight the composition in the top time ring burns round in the same direction as the spin of the shell, until the burning surface is opposite the hole in the bottom time ring. The bottom time ring is then ignited, the explosion blowing out the closing disc of the gas escape hole, and the composition burns round in an opposite direction to that of the top ring until the powder pellet in the magazine is reached. The explosion of the magazine then occurs, followed by that of the shell.

The direction of the burning is shown by the arrows on Fig. 103.

Percussion arrangement

On firing, the acceleration of the shell causes the ferrule to set back, straightening the arms of the stirrup spring and unmasking the front end of the percussion pellet. The creep spring prevents rebound of the percussion pellet.

During flight the creep spring prevents creeping or boring action of the pellet.

On impact or graze, the retardation of the shell leads to the forward movement of the percussion pellet, stirrup spring and ferrule, the resistance of the creep spring being overcome, thus carrying the detonator on to the needle. The flame from the detonator passes through the detonator plug to the magazine, which is exploded, should the time arrangements not have functioned during flight.

Time of burning :—When set to the extreme graduation, 22, the fuze should burn for 22 seconds at rest under normal conditions.

The *Mark VII* fuze differs from the *Mark XI* in several minor manufacturing details ; principally in the shape of the base plug and ferrule. A slot is also provided on the flange instead of a stud for fixing purposes.

No more of the Mark VII fuzes will be manufactured.

Fuze, T and P., No. 80B

This fuze differs from the No. 80 fuze in having the projecting lip round the platform removed.

Fuze, percussion, D.A., No. 117

(Plate 18)

This fuze is a detonating fuze of the 2-inch gauge, used with H.E. streamline and smoke bursting streamline shell when instantaneous effect is desired.

The *Mark IIIZ* fuze consists of the following parts :—

Body, magazine with bottom cap, shutter with detonator, locking weight, guide bush, percussion and arming arrangements striker cap and safety cap.

The *body* is of metal, the lower portion threaded externally to the 2-inch fuze-hole gauge and the upper portion, conical in shape, bored and threaded internally to receive the guide bush and percussion and arming arrangements. Two keyholes are formed in the side for fixing purposes.

The base is bored and recessed to house the shutter and locking weight, and screw-threaded to receive the magazine, the upper and lower cavities being connected through the diaphragm to receive the striker. An annular recess formed in the body houses the lower end of the arming spring to obviate the possibility of the spring being trapped under the collar of the striker spindle.

The *magazine* is of metal, screw-threaded externally to suit the body, and reduced in diameter at the bottom end and screw-threaded to receive a metal cap. It is bored from the base in two diameters ; the larger bore contains a compressed pellet of C.E. and the smaller bore is filled with loose stemmed C.E.

Two key recesses are formed in the base to facilitate assembly.

The *shutter* is located between the top of the magazine and the underside of the body diaphragm and is permitted to swing on a pivot when disengaged by the locking weight. It is fitted with a 5-grain detonator containing lead azide.

The *locking weight* is an arc-shaped fitment located above the magazine and pivoted at one end whilst the other end is kept in positive engagement with the shutter by means of a spring until influenced by centrifugal force. The end of the weight adjacent to the shutter is recessed on the upper side to accommodate the point of the striker.

The *guide bush* is of metal, screw-threaded above a flange to receive the safety cap, and below the flange to fit into the top of the fuze body. The flange is coned to suit the contour of the body and is milled round the edge. It is bored through the centre to form a guide for the striker and is recessed at the top and bottom to form seatings for the striker spring and arming sleeve respectively.

The *percussion and arming arrangements* consist of a steel striker, with separate head secured by a split pin, striker spring, arming sleeve, four brass segments, striker sleeve and arming spring.

The striker is assembled with its spring under compression between the under side of the striker head and the top recess of the guide bush and with its point projecting through the hole in the diaphragm of the body into the recess in the locking weight, preventing movement of the latter and the shutter.

The striker sleeve and four segments are assembled round the striker, the segments being held between the top of the striker sleeve and bevelled portion of the guide bush by the arming sleeve, the latter being positioned by the arming spring.

The *striker cap* is of metal and positioned over the head of the striker, being seated in the upper recess of the guide bush. The object of this cap is to prevent the resistance of the air during flight acting on the striker head and so interfering with the functioning of the striker spring. This cap must not be removed when preparing the fuze prior to loading.

The *safety cap* is of steel and has a flat steel spring riveted into an oblique slot on one side, the free end of the spring engaging the milling on the guide bush, and retaining the cap in position when screwed on. The safety cap is removed before loading.

A warning label, reproduced hereunder, is attached to the cap by shellac and finally coated with shellac on filling.

The label bears the warning :—

IMPORTANT

When preparing this fuze for firing, the black steel safety cap only is to be unscrewed and removed.

Action of fuze

Before loading, the safety cap is removed.

On firing, the acceleration of the shell in the bore causes the arming sleeve to set back, compressing the arming spring and freeing the four segments which become displaced under the influence of centrifugal force.

The striker spring then expands from its state of compression and carries the striker forward until the striker sleeve impinges upon the guide bush. The point of the striker is thus drawn forward clear of the recess in the locking weight. The shutter remains in the closed position due to friction set up by acceleration.

During flight, friction on the shutter becomes less with deceleration and the rotary motion of the shell causes the shutter to swing into position and the detonator is thus located under the point of the striker and over the fire channel in the magazine.

On impact, the striker cap is crushed, the striker being forced inwards compressing the spring and causing the point to pierce the detonator. The resulting detonation passes through the small column of stemmed C.E. to the C.E. pellet in the magazine and thence to the bursting charge in the shell.

NOTE.—The filled shutter is designed to open fully when the fuze is spun between 1,800 and 2,200 revolutions per minute.

The *Mark IIZ* fuze originally differed from the *Mark IIIZ* in not having the annular recess in the body to seat the lower end of the arming spring. These fuzes have now been altered to conform with the Mark IIIZ, but no advance in the Mark has been made.

FUZE, PERCUSSION, D.A. NO. 106E

(Plate 19)

This fuze is a detonating fuze of the 2-inch gauge, used with H.E. and smoke bursting shell when instantaneous effect is desired. A No. 53 or No. 121 fuze key is used for fixing the fuze in the nose of the shell.

The *Mark VIII* fuze consists of the following parts :—

Body, magazine, bottom cap, safety cap, detonator plug, detonator, shutter, tape with weight, hammer, collar, washer, shearing wire, guide pin and sealing wire.

The *body* is of metal, having the lower portion threaded to the 2-inch fuze-hole gauge. Its upper end continues the general line of the shell, terminating in a cylindrical stem, the lower part of which is screw-threaded to receive the safety cap. A transverse hole is bored across the stem and has an external groove formed on it just above the threaded portion to take the shearing wire. A second transverse hole is bored just below and parallel to that of the shearing wire to take the steel guide pin. Slots are provided on the exterior to take the fuze key. A third and smaller hole is undercut, to

accommodate the ends of the sealing wire and lead plug, by which the fuze is sealed after final inspection. There is also an eye formed in the metal through which the sealing wire passes. The body is bored axially to different diameters, the lower portion being threaded to receive the magazine and the upper portion plain to take the hammer stem, the detonator plug being screwed in the middle position.

The *magazine* is of metal threaded externally to engage the interior of the body, where it is retained by a set screw. It is reduced in diameter at the lower end, and threaded externally to take the bottom cap. The top of the magazine is recessed to receive the shutter. The magazine is bored from the under side in two diameters; the larger bore contains a compressed pellet of C.E., the smaller bore being filled with loose stemmed C.E. The lower end of the small channel is closed by a paper disc shellacked in position, the upper end being closed by a thin metallic diaphragm, formed in the metal of the magazine.

The *bottom cap* is threaded internally to screw on to the magazine, a shalloon disc being shellacked to the inside. The flange is crimped to the magazine in two or three places.

The *safety cap* is of steel, dome-shaped, threaded internally at the lower end to screw on to the upper portion of the fuze, a leather washer being used to make a watertight joint. An eye is formed on one side to take the sealing wire.

The *detonator plug* is of metal, screw-threaded externally to screw into the fuze body. It is bored in two diameters, the larger at the top to receive the detonator. A brass washer is inserted over the detonator and is retained by spinning over the metal of the holder. The boring below the detonator forms a fire channel, which contains loose stemmed C.E. the lower end being closed by a paper disc shellacked on.

The *detonator* consists of a copper shell containing five grains of fulminate of mercury, on the top of which is placed a brass disc and cupro-nickel washer, secured in position by turning over lugs left on the lip of the copper shell.

The *shutter* is of metal, and lies between the detonator and magazine to prevent the latter being functioned by the premature action of the detonator. It is somewhat irregularly shaped and is pivoted at one end to admit of centrifugal movement, being retained in the closed position by a coiled spring which is sufficiently strong to prevent the shutter moving until the shell is spinning above 1,300 revolutions per minute. A hole bored through the shutter comes into the central position when the shutter is opened by the rotational motion of the shell. This hole is filled with loose stemmed C.E. and is closed at the top and bottom by paper tablets secured by shellac.

The *tape* is of copper strip, the inner end having a hole through which the collar pin passes; the outer end is fitted with a weight. The tape is wound round the collar and prevents it dropping off;

the weight ensures the unwinding of the tape by the rotation of the shell during flight.

The *hammer* is of steel, with mushroom head, the latter being recessed on its upper surface to take an aluminium pad. The stem terminates at the lower end in a point. One side of the stem is cut away for some distance to accommodate the shearing wire and guide pin, whilst near the head is a small hole to take the securing pin of the tape and collar.

The *collar* is of steel and is in halves of exactly similar dimensions. A radial hole is drilled through the centre of one half to take the pin, which secures the collar and inner end of the tape to the stem of the hammer. The collar prevents the hammer being driven on to the detonator accidentally during the process of loading.

The *washer* is of steel, and is placed on top of the fuze body to form a rigid support for the collar. The washer is provided to prevent the steel collar being driven into the metal of the fuze body by a heavy blow on the hammer, thus, possibly, allowing the hammer to reach the detonator.

The *shearing wire* is of copper, and passes through the top of the body, across the slot in the stem of the hammer, supporting the hammer clear of the detonator when the tape and collar have been thrown off. The ends of the shearing wire are folded round the body, in opposite directions within the circumferential groove provided. *These ends are exposed when the safety cap is removed. If not visible the fuze must not, under any circumstances, be loaded in the gun. It is dangerous.*

The *guide pin* is of steel, and is screwed into the body from one side ; the inner end is plain, and passes across the slot in the hammer stem. The guide pin ensures that the hammer rotates with the fuze, and that the rotation of the shell unwinds the tape ; the pin also prevents the hammer from moving out during the act of loading.

The *sealing wire* is provided to secure the safety cap in position and to prevent its being tampered with. The wire is arranged as shown on Plate 19, the ends being secured in a recess in the fuze body by a lead plug.

To prepare the fuze for loading

To prepare the fuze, the sealing wire is cut, or broken. The cap is unscrewed and removed, at *the moment of loading*. The nose of the fuze should then be examined to ascertain if the shearing wire and tape are in position.

If either of these fittings is deficient, the fuze must not be loaded.

If the sealing wire appears to have been tampered with, the fuze must not be used.

Action of fuze

Before loading, the safety cap is removed.

On firing, the acceleration of the shell in the bore causes the hammer and safety shutter to set back, resulting, most probably, in

the tape and shutter remaining in their original positions, whilst the shell is in the bore.

During flight.—When acceleration ceases, that is, on leaving the bore, the rotation of the shell causes the weighted end of the tape to fly outwards, and to unwind the tape from the collar, which then drops off, leaving the hammer supported by the shearing wire only. The guide pin prevents any independent rotary movement of the hammer which might break the shearing wire prematurely. During this period the safety shutter also will swing outwards, bringing its C.E. channel into line with the C.E. channels in the detonator plug and magazine, respectively, which position is maintained during flight.

On impact, the hammer is driven in (the aluminium pad absorbs a slanting blow which might otherwise bend or break the hammer), breaking the shearing wire and piercing the detonator. The resulting detonation passes through the channels of C.E. in the detonator plug, shutter and magazine, which in turn detonates the bursting charge in the shell.

The *Mark VIII Pb* special fuze is similar to the *Mark VIII,* but is made of lead-free metal and is distinguished by a half-inch yellow band painted round the body. Normally it will be used with shell filled with lyddite or shellite.

The *Mark VII* is a conversion from fuze No. 106 and is generally similar to the *Mark VIII,* differing only in minor dimensions.

The *Mark VI* fuze is also a conversion from fuze No. 106 and approximates to the *Mark V.*

The *Mark V* fuze differs principally from the *Mark VIII* in the following particulars :—The body is provided with a groove round the lower end of the plain part of the body for the purpose of securing the fuze to the shell by punch stabbing. The detonator holder is of different shape and is not screwed into the body but supported by the magazine. The shutter is of different shape and the fire channels are smaller.

The *Mark IV* fuze differs principally from the *Mark V* in having a thinner diaphragm between the shutter recess and the magazine chamber.

The *Mark III* fuze is a conversion from fuze No. 106 *Mark II* type by the addition of a magazine shutter and detonator holder similar to those used with the *Mark V.* There is a brass disc over the detonator in lieu of a washer.

The *Mark II* fuze differs from the *Mark III* in the design of the detonator, detonator plug, shutter and magazine. The detonator contains four grains of fulminate of mercury. The detonator holder is in the form of a plug which screws into the fuze body from the under side. The shutter is of somewhat similar design to that used in Marks III to V fuzes, but is fitted with a plunger and spiral spring. The magazine or bush does not support the detonator holder as in the Marks III to V. A distance collar is fitted into the upper end of

the bush to prevent its being screwed in far enough to jam the shutter against the fuze body.

The *Mark I* fuze differs from the *Mark II* in minor details only.

The *Marks IS, IIS* and *IIIS* fuzes differ from the *Marks I, II* and *III* in having an all-steel needle.

Certain fuzes are fitted with a brass disc over the detonator to minimize the risk of premature action.

Fuzes of the 106E type with the letter " Z " added to the Mark indicates that lead azide detonators are fitted.

No more Marks I, IS, II, IIS, III, IIIS, IV and V will be manufactured.

Fuze, percussion, d.a. No. 106

This fuze differs from the No. 106E type in not being fitted with a shutter or separate magazine.

Fuzes of the 106E and 106 types are issued in tinned-plate cylinders, which contain, in addition to the fuze, the second exploder bag required with them.

Fuze, percussion, base, medium, No. 12, special

(Plate 20)

This fuze is used with A.P. shell.

The *Mark XI* fuze consists of the following parts :—

Body, pea ball and retaining bolt, cap, steel needle, detonator pellet, detonator creep spring, centrifugal bolt, retaining bolt, pressure plate and locking pellet.

The *body* is of metal, provided externally with a left-hand thread, a flange being formed at the rear, and two keyholes being drilled in the rear for the fuze key. For safety reasons these keyholes are drilled clear of any other channels in the body and they are plugged when the fuze is inserted in the shell. The fuze is bored centrally from the top for the detonator pellet, the upper end being threaded for the cap, the lower end being reduced in diameter and connected by a radial channel with a side channel, the upper end of which terminates in an annular groove forming the magazine of the fuze. The side channel is filled with five perforated powder pellets and the annular groove contains a magazine ring of powder. The radial channel is closed by a plug. A channel is bored from the rear to take the pressure plate and spindle, the lower end being threaded for the protecting ring. A transverse channel is bored across the middle of the fuze for the centrifugal bolt and retaining bolt, the ends being threaded for closing plugs, whilst in the same plane a radial hole is tapped to receive a guide pin which engages a slot in the detonator pellet, to ensure the pellet rotating with the fuze. The lower portion of the pellet chamber has an annular groove to receive the projecting ring of the pellet and provide a gas seal until deceleration takes place, whilst the bottom of the chamber forms a seating

for a pea ball which seals the radial connecting channel to the magazine until the pellet moves clear. A *retaining bolt* for the *pea ball* is housed in a second radial channel drilled in the opposite direction to the connecting channel, a spiral spring being supported on a closing plug.

The *cap* is of metal, mushroom-shaped, the stem being threaded externally to screw into the body, and coned internally to receive and lock the detonator pellet when the latter moves forward. The cap is bored and threaded centrally for a screwed *steel needle*, which is secured by stabbing. Six fire holes are bored through the cap in line with the magazine, and two keyholes outside these. A paper disc is interposed between magazine and cap, which is secured by a set screw or key.

The *detonator pellet* is of metal, the upper end being tapered to enter the stem of the cap and become wedged on impact, whilst the lower end is reduced in diameter and has a projecting ring formed to enter the annular groove in the fuze body. A guide groove is cut along the side for some distance to engage the guide pin of the body. The upper end is tapped centrally for the detonator plug from which a fire channel passes vertically and diagonally to the outside of the pellet above the projecting rim. A transverse channel, in two diameters, accommodates the centrifugal bolt, whilst a small channel to one side takes the guide pin of the bolt. A recess is bored in the side below this channel for the locking pellet and spring.

The *detonator* contains about three grains of detonating composition and is retained by the detonator plug which screws into the detonator pellet. The plug is bored centrally to allow the needle access to the detonator.

The *creep spring* is of phosphor bronze and lies between the fuze-cap and detonator, to keep them apart during flight.

The *centrifugal bolt* is of metal, mushroom-shaped, fitting in the transverse channel of the pellet. A fire hole is drilled across the stem, and to keep this in line with the fire channel in the pellet a guide pin is driven into the head which enters the small transverse channel in the pellet. Before firing, the stem of the bolt projects beyond the pellet to enter a recess in the side of the fuze body, with its fire channel masked and the head of the bolt masking the fire channel of the pellet. It is retained in this position by a *retaining bolt*, which is cylindrical to slide in the transverse channel of pellet and body, and forked in two diameters to engage the stem of the pressure plate.

The *pressure plate* is of copper, comprising disc and stem in one piece. The stem, near the inner end, is reduced in diameter to suit the smaller diameter of the retaining bolt which comes into line on firing. The disc portion is seated on the base of the fuze to form a gascheck and is shaped to permit of its extension into the coned portion of the recess on firing and so carry the stem portion forward

into the side channel. The plate is secured in position by the steel protecting ring.

The *locking pellet* is of metal and is inserted in the small recess in the detonator pellet below the centrifugal bolt, so that when the detonator pellet moves forward the locking pellet enters the recess in the body vacated by the stem of the centrifugal bolt to prevent rebound of the detonator pellet.

Action

Before firing, the cover plate prevents the pressure spindle from being driven in; consequently, the retaining bolt is in contact with the thick portion of the pressure plate spindle and retains the centrifugal bolt so that its stem engages the recess in the fuze body. This prevents the detonator pellet moving towards the needle. Should the detonator fire accidentally, the fire channels in detonator pellet and centrifugal bolt are out of alignment, the projecting rim of the pellet is in the recess of the body and the pea ball is in its seating so that no communication exists between detonator and magazine.

On firing, the pressure plate is pressed forward into its seating, carrying forward the stem, bringing the reduced diameter of the stem opposite the retaining bolt.

During deceleration of the shell in the air, the set-back effect is released and the interior parts are freed to act centrifugally. The guide pin in the groove of the detonator pellet constrains the pellet to rotate with the fuze and not independently. The retaining bolt moves outwards, so that its arms fit on the smaller part of the pressure plate stem, and is followed by the centrifugal bolt. The retaining bolt is now clear of the detonator pellet and the centrifugal bolt is clear of the recess in the body, whilst the fire channels in the pellet and bolt are brought into line. The projecting pin on the bolt still engages its recess in the pellet and so prevents the bolt turning on its longer axis, which, if it occurred, would break the continuity of the fire channel. The detonator pellet is now balanced by the creep spring which prevents any substantial forward motion of the pellet during flight, but a small movement of the pellet takes place which is sufficient to allow the pea ball to come into line with its retaining bolt, so that both bolt and ball are acted upon centrifugally and withdrawn clear of the fire channel.

On impact, the detonator pellet carries the detonator on to the needle, and the consequent flame passes through the fire channels in detonator pellet, centrifugal bolt and pea ball recess, to the perforated pellets in the side channel, which are ignited, to ignite in turn the magazine. The flame from the magazine passes through the fire holes in the cap to the bursting charge of the shell. Any tendency of the detonator pellet to rebound from the needle after impact is prevented by the action of the locking pellet, which enters the recess in the fuze body, also by the wedging action of the pellet in recess of the cap.

BLANK CARTRIDGES

CARTRIDGE, Q.F., BLANK, 18-PR., FILLED, 3-LB. BLANK L.G., F.G. OR R.F.G.2

The cartridge (Fig. 104) consists of a case, percussion primer, charge and leatherboard cup.

The case consists of a service case but may be one sentenced for use with blank charges.

The No. 1 percussion primer is the Mark II or IIM, described on page 212, or, alternatively, the Mark III.

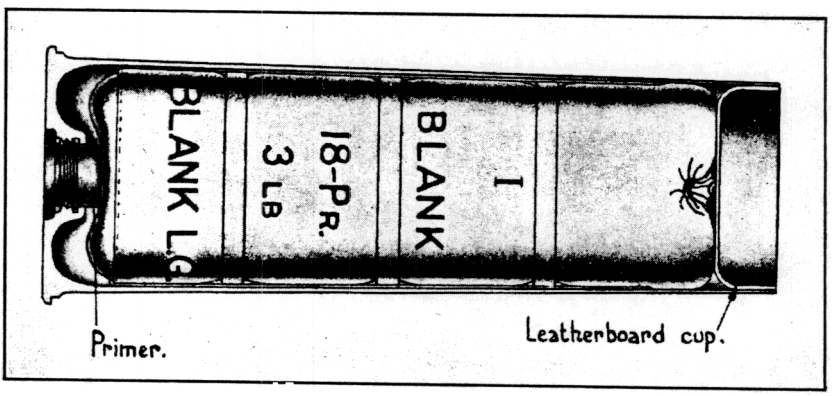

FIG. 104

The Mark II leatherboard cup is used with this particular charge.

The charge consists of 3 lb. of blank L.G., F.G. or R.F.G.2 gunpowder in a silk or cream serge bag and is held in the case by a leatherboard cup secured in three places to the inside of the case by shellac.

CARTRIDGE, Q.F., BLANK, 18-PR., FILLED, 2-LB. 12-OZ. G.12

The *Mark I* cartridge is similar in construction to that of the 3 lb. blank cartridge, but contains 2 lb. 12 oz. of blank G.12, the silk or cream serge bag being choked at the mouth with sewing silk.

CARTRIDGE, Q.F., BLANK, 18-PR., FILLED, 1-LB. BLANK L.G., G.12 OR R.F.G.2

The *Mark II* cartridge (Fig. 105) consists of a service case but may be one sentenced for blank, a Mark II, IIM or III No. 1 percussion primer, charge, felt jacket, a Mark I leatherboard cup and a split paper ring.

The charge consists of 1 lb. blank L.G., G.12 or R.F.G.2 gunpowder in a silk cloth bag, having a shalloon base. It is hooped with silk braid and choked with sewing silk.

The felt jacket is placed over the top of the charge and is secured near the base with a draw-string of sewing silk. A silk braid loop is attached to the top of the jacket.

The leatherboard cup is inserted in the case, base downwards, being wedged in position by the split paper ring.

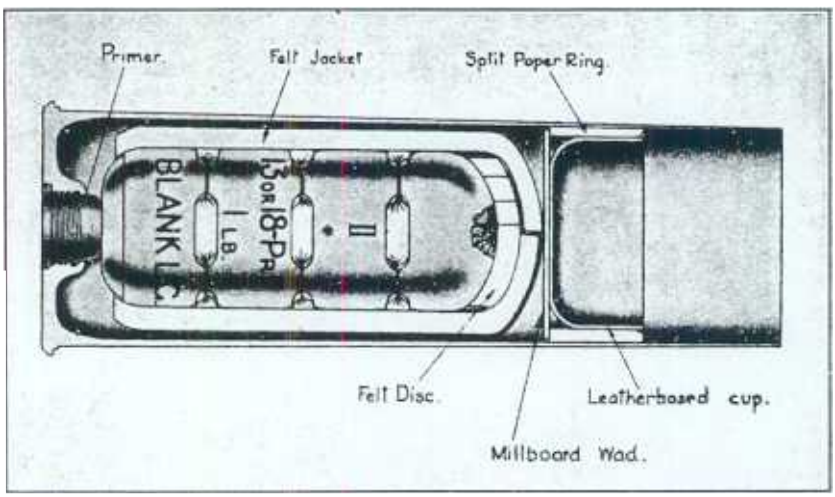

FIG. 105

CARTRIDGE, Q.F., BLANK, 18-PR., FILLED, ½-LB. BLANK L.G., G.12 OR R.F.G.2

The *Mark I* cartridge is similar in construction to that of the 1 lb. blank cartridge, but contains ½ lb. of blank L.G., G.12 or R.F.G.2 gunpowder in a silk cloth or cream serge bag.

The cartridge is provided for use in the Colonies.

CARTRIDGE, Q.F., BLANK, 18-PR., FILLED, 8-OZ. 12-DR. CORDITE W.T. 154–136, MARK I; M.D.T. 15–13, MARK III OR R.D.B.T. 15–13, MARK III

The cartridge (Fig. 106) consists of a case, percussion primer, charge, igniter, millboard wad, one Mark I and two Mark II leatherboard cups, and a split paper ring.

The case, primer, cups and ring are as described for the gunpowder cartridges.

The charge consists of a circular bundle of cordite W.T., M.D.T. or R.D.B.T. and weighs 8 oz. 12 dr. The core is composed of cordite sticks cut in two lengths and a recess is left in the lower end to fit over the primer. The core and charge are tied with sewing silk.

The igniter consists of two shalloon discs and one silk cloth disc stitched together to form a circular compartment in the centre, and

an outer ring ; it is filled with 6 drams of R.F.G.2 gunpowder. The igniter is placed over the ends of the charge and tied to the first tie of the bundle in four places.

The charge is held in position by the millboard wad and a Mark I leatherboard cup ; for the M.D.T. and R.D.B.T. charges two extra cups of the Mark II pattern are placed over the Mark I cup, and secured by shellac. The mouth of the case has six lugs for securing the split paper ring in position.

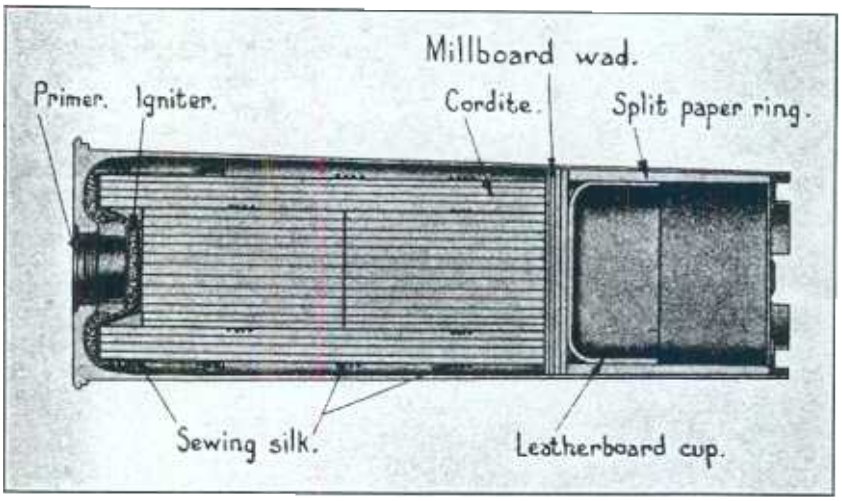

FIG. 106

The *Mark II* M.D.T. and R.D.B.T. cartridges differ from the *Mark III* in having no recess in the lower end to take the primer, and the igniter is stitched to form parallel compartments instead of a circular one.

The *Mark I* M.D.T. and R.D.B.T. cartridges differ from the *Mark III* in having the core composed of cordite sticks cut in one length.

DRILL AMMUNITION

The greatest care is necessary in the storage, handling and use of ammunition held on charge as drill, and every possibility of its being mixed with service or blank ammunition is to be avoided, as errors of this kind may lead to serious accidents.

CARTRIDGE, DRILL, Q.F. 18-PR.

The *Mark VIII* cartridge is of rubber, shaped to represent the service cartridge, and is fitted with a metal nose and base. The nose is screw-threaded to the 2-inch fuze-hole gauge and provided with a fixing screw to secure the fuze. The base has a rubber plug to take the blow of the striker.

The *Mark VII* differs principally from the *Mark VIII* in being of wood, the brass base and metal nose are connected by a threaded mild steel bolt and the nose is provided with a transit plug.

The *Mark VI** differs from the *Mark VII* in having a fuze-hole socket of a slightly different shape.

Earlier Marks converted to approximate to the Mark VII have the letter W added to their numeral.

Drill fuzes

Fuzes for drill purposes are of the same external dimensions as the service fuzes but are without internal parts.

Drill fuzes have the word DRILL stamped on them and are painted black.

With the latest pattern of drill fuze the No. 106 type does not contain a detonator plug or holder. A circular hole is bored in the bottom cap and, in the case of the No. 106E drill fuze, through the magazine. The tape is soldered.

The No. 101 type is not fitted with a needle.

The No. 80 type is not fitted with a base plug, percussion mechanism, time detonator pellet and stirrup. A hole is bored through the centre of the top cap and the needle plug removed.

Base fuzes will not contain any internal mechanism and a circular hole will be bored through the cap.

CHAPTER VI

MARKINGS ON AMMUNITION AND PACKAGES

General remarks

Ammunition issued to the service is suitably marked to facilitate identification and to ensure correct segregation in store and transport. Markings also ensure that the correct types are used in the gun and assist greatly in tracing defects, in design or manufacture, to their source.

Markings are of two kinds, permanent and temporary. The former are in the nature of stamping in the metal of the articles concerned and relate, as a general rule, to the process of manufacture, whilst the latter are usually painted or stencilled and refer more particularly to the explosive elements employed in the ammunition.

Very great care should be exercised in the handling of ammunition, either loose or in packages, to avoid causing damage to the markings, as partial obliteration may render it difficult and, in some cases, impossible to identify the article.

In drawing up a scheme of marking, the general principle observed is that it should always be possible to identify, from the information on the exterior, the contents of a package or a separate article and the conditions of manufacture.

In the latest method Q.F. fixed ammunition will be batched for the purpose of recording the various components employed in the make-up of the cartridge. Each batch contains a propellant charge of one lot only but may contain more than one lot of other components, i.e. the cordite employed in the make-up of a particular batch will be of one Lot No. but the fuzes may be of more than one Lot No.

Batches are distinguished by consecutive numbers preceded by the appropriate letter, e.g. Batch A.1 denotes the first batch of shrapnel ammunition. When it is found necessary to use more than one lot of fuzes in a batch, the batch is divided into sub-batches as follows:—

Batch A.1	...	Contains rounds with first lot of fuzes.
Batch A.1–A	...	Contains rounds with second lot of fuzes.
Batch A.1–B	...	Contains rounds with third lot of fuzes.

Batches will be stored separately and will be so arranged as to avoid dividing a batch or sub-batch.

A label is fixed to the inside of each box giving particulars of the components contained in the ammunition therein. The par-

ticulars on these labels must be altered as necessary when any change is made in components.

When it is necessary to replace original components by those of other Lot Nos., the letter X will be appended to the batch or sub-batch numbers on the box. It will also be stencilled on the side of the cartridge case when the fuze, or other component, is changed. The letter X denotes that the box contains components other than those originally packed.

In the event of batched ammunition being removed from its boxes and requiring to be repacked, e.g. unexpended ammunition after firing has taken place, care must be taken to ensure that only ammunition of the same batch or sub-batch is placed in each box The stencilling on the cartridge cases will enable this to be done.

If possible, the ammunition will be repacked in the boxes from which it was removed. Failing this, the batch or sub-batch number on the box in which the ammunition is repacked must be amended to agree with the contents.

The following pages show the markings to be found on Q.F. 18-pr. ammunition and packages, with their significance.

Primers

Stamping

(*a*) Number and Mark of primer.
(*b*) Manufacturer's initials or recognized trade mark.
(*c*) Date of manufacture (month and year).
(*d*) Lot number.
(*e*) Initials or monogram of filling factory or station.
(*f*) Date of filling (month and year).

Primers that have been modified and refilled will have M added after the Mark.

Stamping on the base

(*a*) Calibre of gun.
(*b*) Mark of empty case.
(*c*) Manufacturer's initials or recognized trade mark.
(*d*) Year of manufacture.
(*e*) Lot number of case.
(*f*) The letter C followed by an F or R for every time the case has been filled with a full or reduced charge.
(*g*) The letter F or R barred out thus Ⱡ or Ⱡ if the propellant is removed from the case but not fired.

Stencilling on the side

The following markings will be found stencilled on the side in silver nitrate, with ammunition other than batched.

(*a*) Mark of filled cartridge.
(*b*) Nature and size of propellant as applicable.

(*c*) Lot number of propellant.
(*d*) Monogram of firm, or initials of filling factory.
(*e*) Date of filling (month and year).
(*f*) Numeral of filled cartridge (for fuzed rounds only).
(*g*) The abbreviation RED indicating a reduced charge, when applicable.
(*h*) Propellant code letter in a rectangle, e.g. [E] indicates W cordite.

With batched ammunition only the batch letter and number, followed by the sub-batch letter where applicable, will be shown on the side of the case, e.g. Batch C.216.B.

Stencilling on the base

To denote the nature of ammunition the appropriate abbreviation is stencilled in $\frac{3}{4}$-inch type on the base of the cartridge case as follows:—

(*a*) Armour-piercing ... ... A.P.
(*b*) High explosive ... ... H.E.
(*c*) Practice ... ... PRAC.
(*d*) Reduced charge ... ... R.
(*e*) Shrapnel ... ... SHP.
(*f*) Streamline ... ... SL.
(*g*) Smoke ... ... SMK.
(*h*) Smoke box ... ... SMK. BX.
(*j*) When a grouped propellant is used the group letter and number will be stencilled on the base in a rectangle, e.g. [C.14].

The following identification markings on the base may still be met with as an alternative to the above stencilling; this method of marking was dispensed with in 1929.

Streamline shell

(*a*) $\frac{1}{2}$-inch white ring on outside of base, remainder yellow, indicates H.E. with full charge.
(*b*) One quadrant green and the remaining three quadrants white, indicates streamline smoke bursting shell, with full charge.

Plain base shell

(*a*) Yellow, denotes H.E. shell and full charge.
(*b*) Green, smoke bursting shell and full charge.
(*c*) Blue, armour-piercing shell and full charge.
(*d*) Unpainted, shrapnel shell and full charge.

(*e*) Yellow, with 1½-inch white band across base, H.E. shell having a reduced charge.
(*f*) Yellow, with H.E. PRACTICE stencilled on in red, H.E. practice shell and full charge.

Painting of safety clips

To identify the various types of cartridges employed with the equipment when carried in the trailer ammunition boxes, the safety clips are painted as follows :—

Full charge rounds

H.E.	Clip uncoloured.
Shrapnel ...	,, painted red.
Smoke	,, ,, green.
A.P.	,, ,, blue.

Reduced charges

H.E.	Long arm painted white.

Streamline shell

H.E. ...	Long arm painted yellow.
Smoke ...	Green with long arm painted yellow.
Blank ...	Long arm painted black.

PROJECTILES

(Plate 16)

No markings are placed where the projectile surfaces touch the fittings of the ammunition boxes.

The base of the shell is varnished.

Stampings on the body

(*a*) Calibre and Mark.
(*b*) Manufacturer's initials or recognized trade mark.
(*c*) Date of completion of shell (month and year).
(*d*) The letters C.S. or B.S. denoting that the projectile is of cast-steel or bar-steel.
(*e*) The letters C.I. denoting that the projectile is of cast-iron.
(*f*) The letters S.S. denoting that the projectile is of semi-steel.
(*g*) Abbreviation SMK on smoke bursting shell.
(*h*) The letters A.P. on armour piercing projectiles.
(*j*) Numeral in ring denoting size of charging hole in smoke bursting shell, e.g. ②.
(*k*) Lot number of empty projectile.

Stamping on converted shell

(*a*) Date of conversion.
(*b*) Initials or recognized trade name of contractor converting.
(*c*) Lot number of converted shell.

Painting

(*a*) High explosive shell are painted yellow.
(*b*) Shrapnel shell are painted black.
(*c*) Smoke bursting shell are painted green.
(*d*) Armour-piercing shell filled H.E. are painted yellow to the shoulder, with the head green.
(*e*) High explosive shell for use with reduced charges have the body from driving band to green band painted white, remainder yellow.

Stencilling

1. Tips of shell

(*a*) Red tip denotes shrapnel.
(*b*) Black tip denotes absence of smoke box in amatol-filled shell.

2. Rings round the head

(*a*) Red ring indicates that shell is filled.
(*b*) A ring of red crosses in place of the red ring denotes amatol- or T.N.T.-filled shell suitable for hot climates.
(*c*) A black ring above the red ring indicates that the shell is fitted with exploders, only suitable for a powder-filled fuze.
(*d*) Two white rings, one above and one below the red ring, denote armour-piercing.
(*e*) A light brown ring above the red ring on smoke bursting shell denotes shell is of cast-iron or semi-steel.

3. Bands round the body

(*a*) Green band round centre denotes shell filled with amatol or T.N.T.
(*b*) Two black bands denotes H.E. practice projectile.
(*c*) One black band round body denotes empty H.E. shell to be used for drill purposes.

4. Additional markings

(*a*) Calibre and Mark of shell.
(*b*) Design number and method of filling.
(*c*) Monogram of filling factory or station.*
(*d*) Date of filling (day, month and year).*
(*e*) T.N.T. filled shell have T.N.T. stencilled on the green band.
(*f*) The fraction to indicate the proportion of poured amatol filling, e.g. 40/60 is stencilled below the green band. The fraction is omitted when the proportion is 80/20.

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* Smoke bursting shell bears this information both for charging and head filling.

(*g*) Amatol-filled shell with rusty fixed containers authorized for firing at practice will be stencilled $\frac{\text{R.F.C.}}{\text{B.M.1937}}$, the figures representing year of examination.

(*h*) Amatol-filled shell other than in (*g*) which are not fully serviceable but are sentenced for practice will be stencilled FIRE 1947, or year as applicable, above the green band.

(*j*) High explosive shell fitted with C.E. or T.N.T. exploders will be stencilled EXPR. C.E. or EXPR. T.N.T. respectively.

(*k*) Series number in a ring denoting filling lot.

(*l*) The abbreviation PHOS on smoke shell denotes the use of phosphorus as a smoke-producing mixture.

(*m*) Two green discs diametrically opposite each other on the head of H.E. shell denote the presence of a red phosphorus smoke box.

(*n*) Smoke shell have the actual weight to the nearest $\frac{1}{8}$ lb. stencilled on the shoulder.

(*o*) Series number in a ring to denote charging lot will be found on smoke shell in addition to (*k*).

(*p*) The lot number of picric powder exploders will be stencilled on A.P. shell.

(*q*) The Mark of the fuze, the word FUZE and the lot number, e.g. XI FUZE LOT 4, will be found on A.P. shell.

(*r*) The fraction 70/30 on the tip of the shell denotes the proportion of shellite ingredients.

Fuzes

Stamping

(*a*) Number and Mark of fuze.

(*b*) Contractor's initials or recognized trade mark.

(*c*) Date of manufacture (month and year).

(*d*) Date of conversion (month and year) if fuze has been converted.

(*e*) Initials of filling firm or monogram of filling station.

(*f*) Date of filling (month and year).

(*g*) Filled lot number.

(*h*) The letter Z added to Mark indicates that a lead azide detonator is fitted.

Painting

(*a*) The No. 106E Mark VIII Pb special fuze is identified by a half-inch yellow band round the body.

(*b*) The No. 106PE fuze is identified by a half-inch red band round the body.

Other 106 fuzes with this equipment have no distinguishing marks.

FUZE COVERS

Stamping

(*a*) Number and Mark of cover.
(*b*) Initials or trade mark of manufacturer.
(*c*) Number and Mark of fuze.
(*d*) Initials of filling firm or monogram of filling station.
(*e*) Date of filling (month and year).
(*f*) Filled lot number.

AMMUNITION PACKAGES

Q.F. 18-pr. ammunition is issued to the service in 4-round boxes, the earlier patterns being of wood and the later patterns of steel. The particulars of these boxes are shown in the following table :—

No. of Box	Contents	Dimensions (all in inches)	Material	Remarks
C.1, Mk. I ...	12 cartridges.		Wood	Cordite blank cartridges complete.
C.1, Mk. IA	,,	26·26 × 17·5 × 17·9	,,	
C.28, Mk. I	20 cases	24·85 × 20·125 × 13·95	Wood	For 20 empty blank cases.
C.51, Mk. III	4 cartridges.	26·75 × 10·375 × 10·375		
C.52, Mk. IC	,,	26·75 × 10·312 × 10·312	,,	
C.52, Mk. II	4 cartridges.	25 × 9·25 × 9·25	Steel	
C.151, Mk. II	,,	29·3 × 10·875 × 10·875	Wood	—
C.151, Mk.II*	,,	29·3 × 10·875 × 10·875	,,	With adjusting blocks.
C.151, Mk.III		29·375 × 11·0 × 10·9		,,
C.151B, Mk. I		32·25 × 11·375 × 11·875		,,
C.159, Mk. I		27·125 × 10·562 × 10·812		For streamline H.E. fuzed.
C.180, Mk. I		28·35 × 9·25 × 9·25		With adjusting blocks.

Powder blank charges are issued to the service in metal-lined cases.

Markings, usually in the form of stencilling, are placed in the most convenient positions on the boxes, where they are least likely to receive damage and where they can be seen when piled or stacked.

Painting

(*a*) Boxes containing ammunition other than smoke or blank ; steel boxes are painted service colour and wood boxes are stained Vandyke brown.
(*b*) Boxes containing smoke shell are painted green.
(*c*) Boxes containing blank are painted red.
(*d*) A yellow band round the box denotes practice ammunition.

Stencilling on both ends and both sides

(*a*) Batch letter and number as applicable, e.g. :—

Full charge shrapnel	BATCH	A. 000
,, ,, H.E.	,,	B. 000
,, ,, smoke bursting	,,	C. 000
,, ,, A.P.	,,	E. 000
,, ,, H.E. streamline ...	,,	H. 000
,, ,, smoke bursting streamline	,,	J. 000
Reduced charge H.E.	,,	M. 000
Practice full charge, H.E.	,,	N. 000

Followed by the sub-batch letter and number as applicable, e.g. :—

Batch containing rounds with first lot of fuzes ...	A.1.
,, ,, ,, ,, second ,, ,, ...	A.1–A.
,, ,, ,, ,, third ,, ,, ...	A.1–B.

When components are taken for proof and replaced by components of other lots the letter X will be appended to the batch or sub-batch number on cartridge case and ammunition box.

(*b*) The words RED CHARGE or PRACTICE when reduced or practice full charges are packed.

(*c*) SHRAP when shrapnel shell are packed.

(*d*) Green disc denoting H.E. shell with smoke composition in box.

(*e*) The symbol  in red, if 106 fuzes are fitted.

(*f*) The symbol  in red, if 106E fuzes are fitted.

(*g*) The symbol  in red, if 117 fuzes are fitted.

Stencilling on both ends

(*a*) PLUGGED when box contains plugged shell.

(*b*) LYD when shell are filled lyddite.

(*c*) T.N.T. when shell are filled T.N.T.

(*d*) The fraction 40/60 or other fraction denoting composition when shell are filled amatol.

(*e*) Red crosses to indicate shell are suitable for hot climates.

(*f*) SMK. PHOS. denoting box contains smoke bursting shell.

Stencilling on both sides

(*a*) Calibre of gun, e.g. 18-PR.

(*b*) H.E. or H.E.S.L. denoting box contains high explosive or high explosive streamline shells as applicable.

(*c*) SMOKE or SMOKE S.L. denoting box contains smoke bursting or smoke bursting streamline shells as applicable.

(*d*) Propellant code letter in a yellow rectangle, e.g. :—

D	for cordite, M.D.
C	,, ,, R.D.B.
E	,, ,, W.

(*e*) The letter R when packed shrapnel which have central tube affected by rust.

(*f*) R PRACTICE and year of practice when packed shrapnel which have central tube caked with powder and affected by rust.

(*g*) The word BATCH above the batch letter and number.

Stencilling on the top

(*a*) The letters O.D. on wooden box denote the box has been oil dressed.

(*b*) The words PHOS and DECK CARGO when smoke bursting shell are packed.

NOTE.—With steel and end-opening wood boxes the marking is on a side not otherwise marked.

LABELS

Labels as under will be found attached to ammunition packages :—

(i) Interior

(*a*) A packer's label affixed to under side of lid.

(*b*) A batch label giving particulars of all components of rounds in the case of batched ammunition.

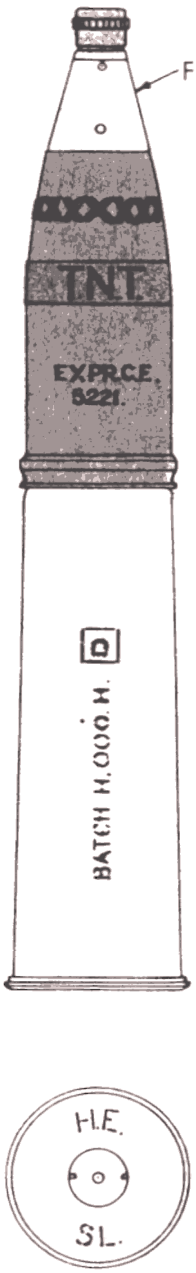
(ii) Exterior

(*a*) A Government explosive and classification label affixed to side of box.

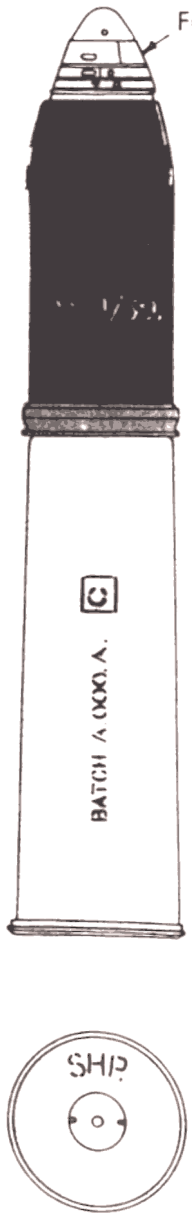
(*b*) Two station labels are affixed either over junction of lid and body or one label over a wing nut and the other over the junction of lid and body.

CARTRIDGES, Q.F., 18-PR

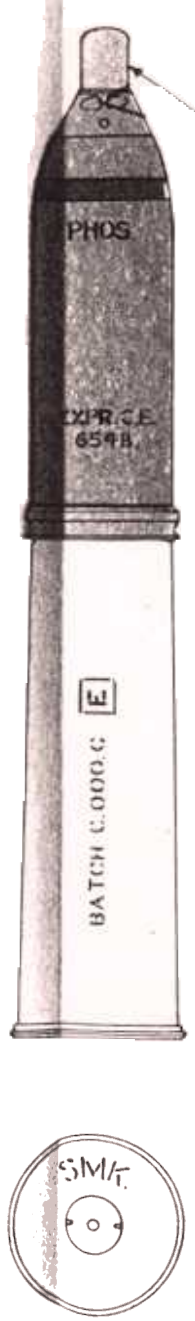
H.E. STREAMLINE.



SHRAPNEL.

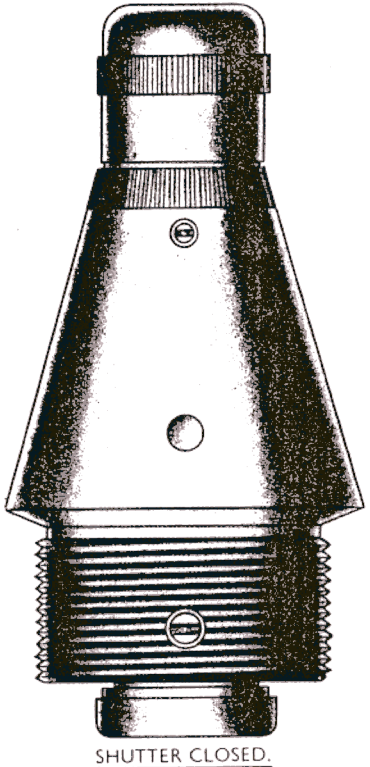


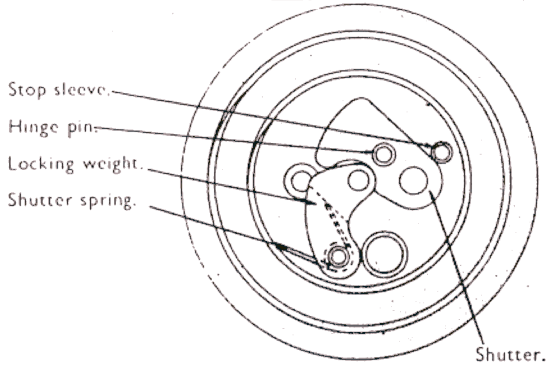
SMOKE BURSTING.

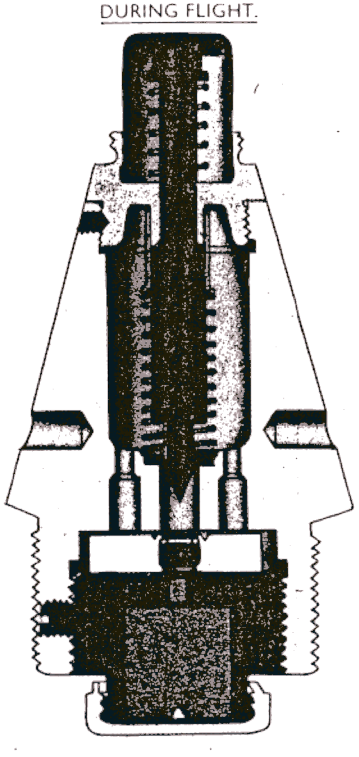


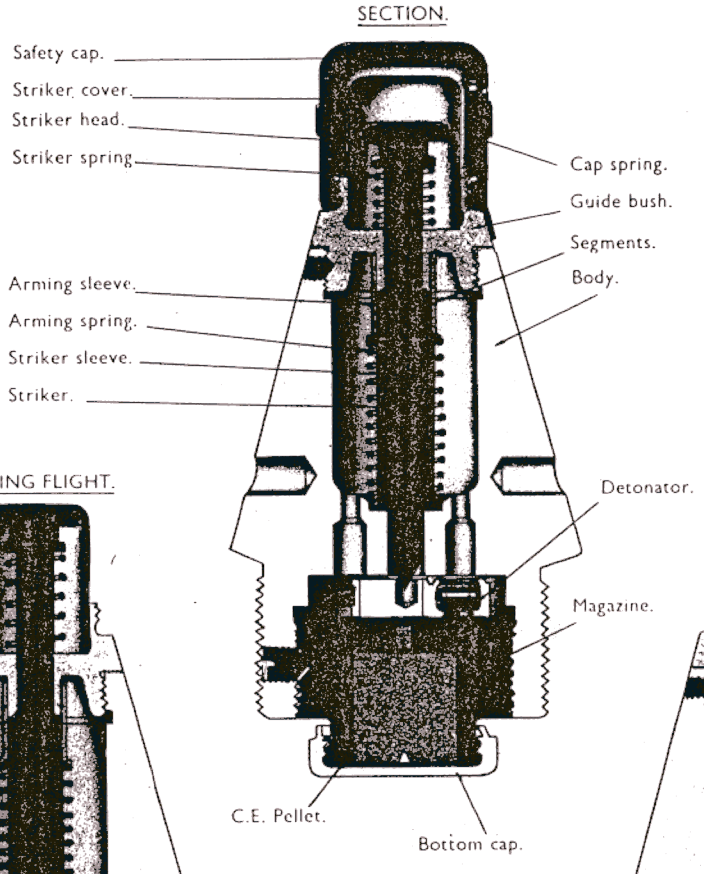
ARMOUR-PIERCING.

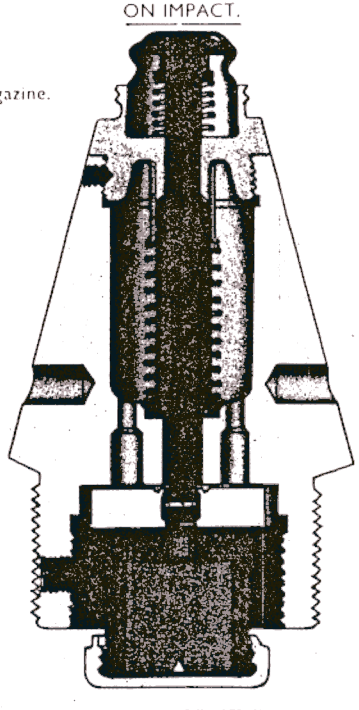
FUZE, PERCUSSION, DIRECT ACTION, No. 117, MARK IIIZ

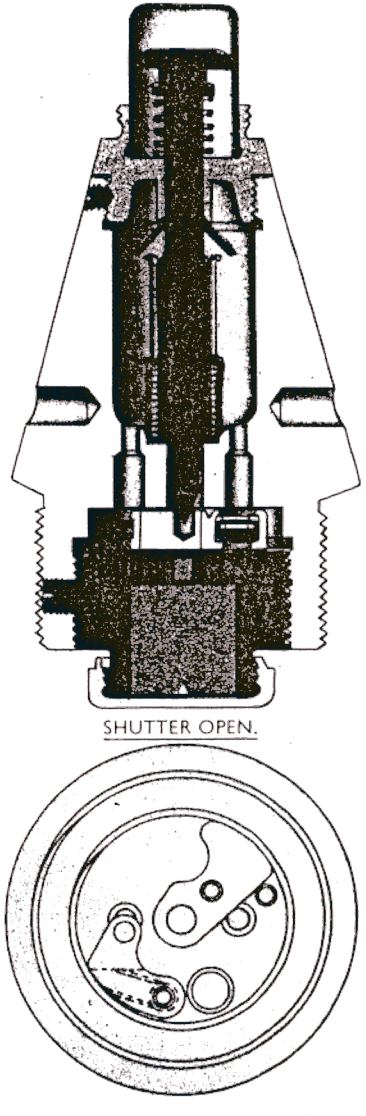






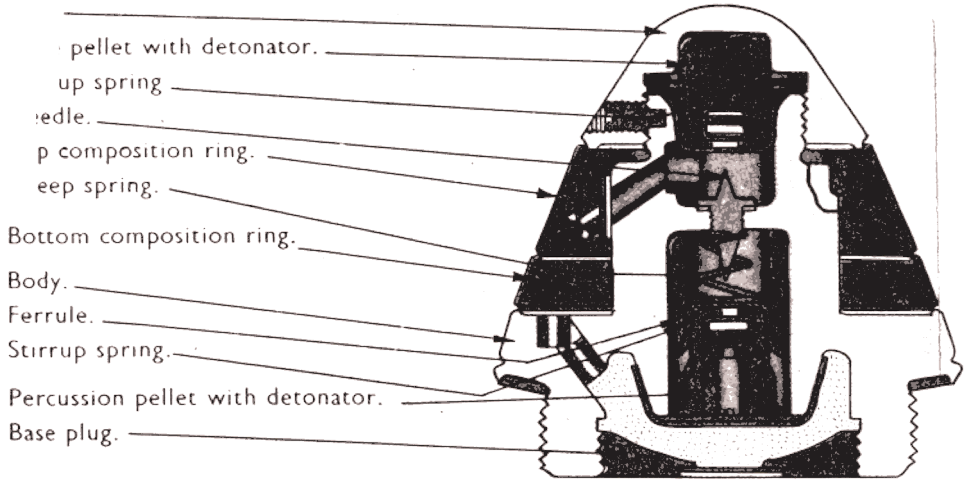




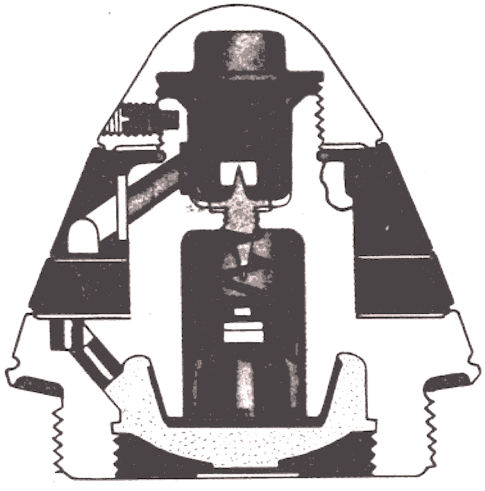


FUZE, TIME AND PERCUSSION, No. 80, MARK XI

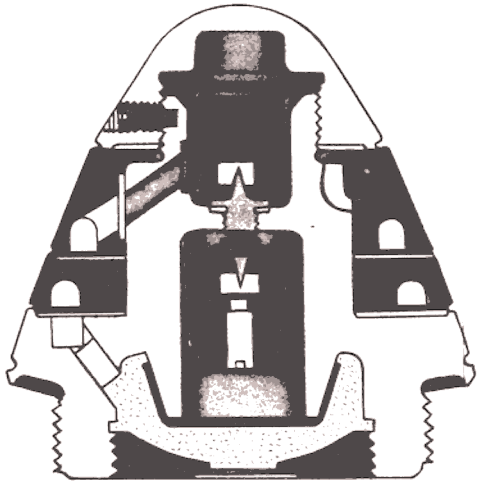
SECTION.



DURING FLIGHT.

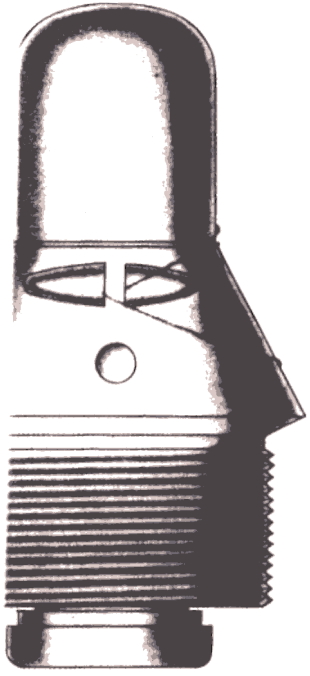


ON IMPACT.

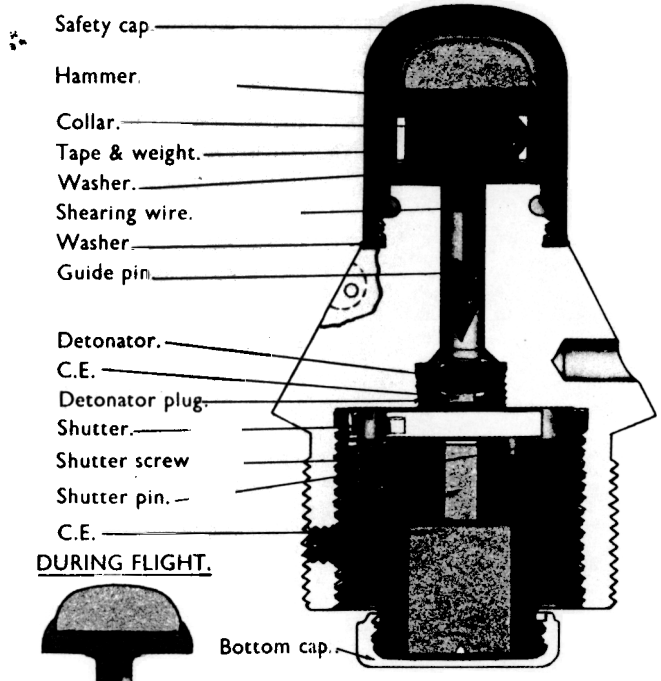


FUZE, PERCUSSION, DIRECT ACTION, No. 106 E, MARK VIII

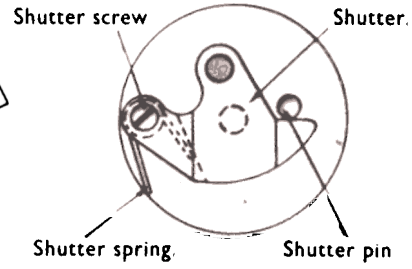
ELEVATION.



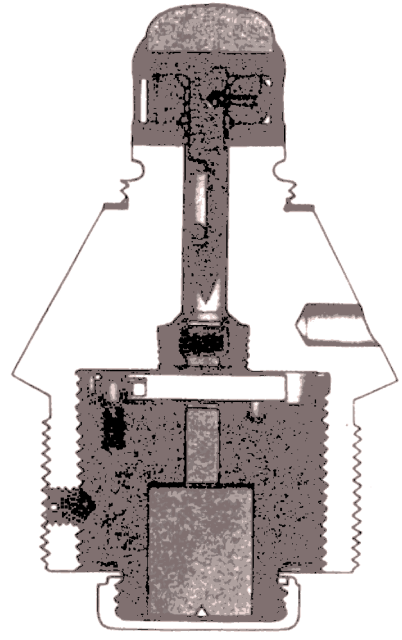
SECTION.



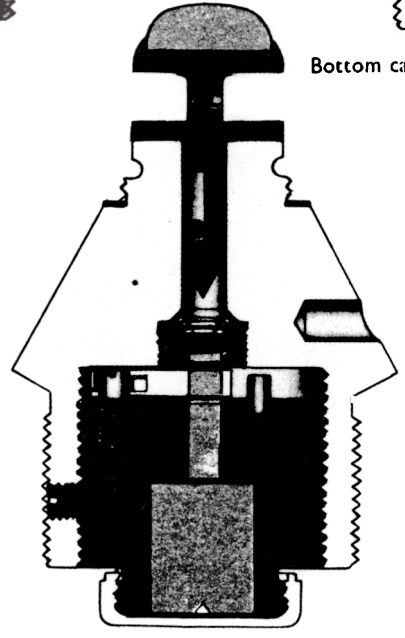
SHUTTER CLOSED.



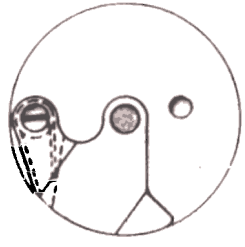
BEFORE FIRING.



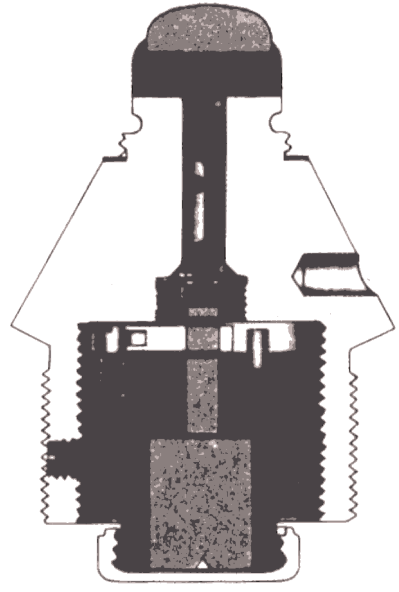
DURING FLIGHT.



SHUTTER OPEN.

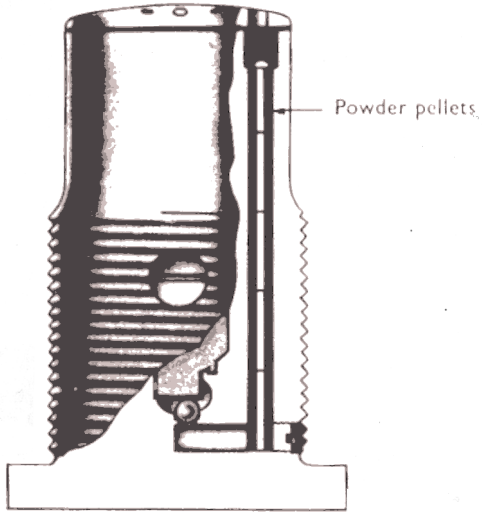


ON IMPACT.

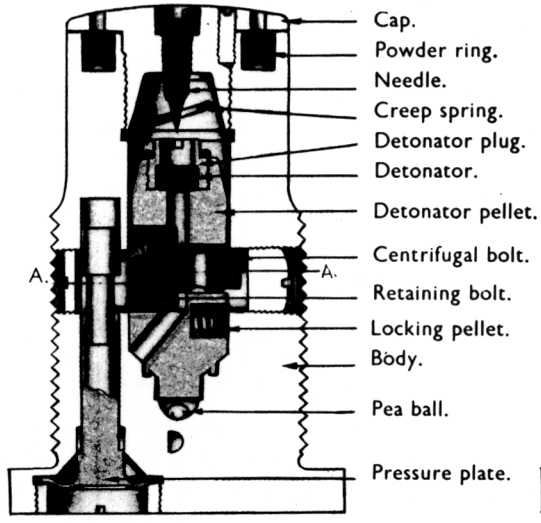


FUZE, PERCUSSION, BASE, MEDIUM, No. 12, SPECIAL, MARK XI

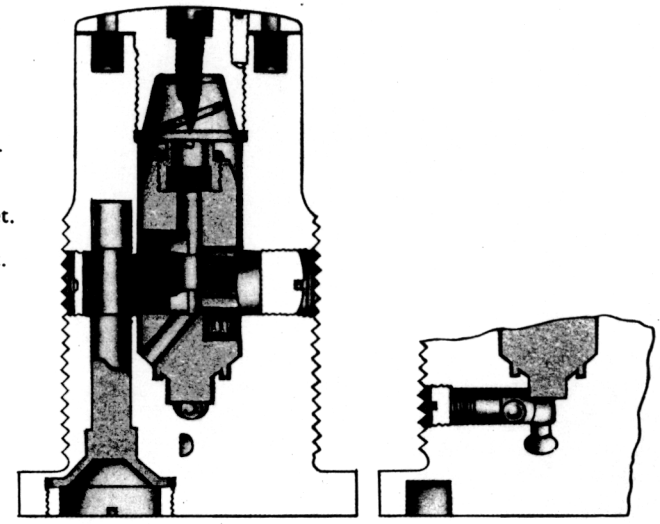
PART SECTION AT C.C.



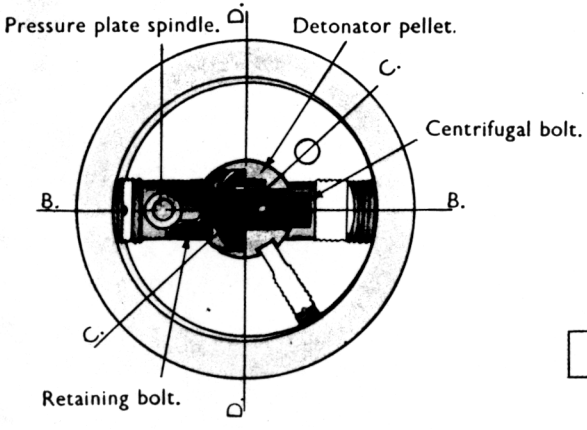
SECTION AT B.B.



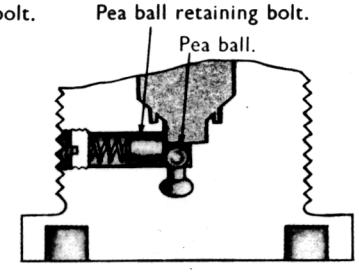
DURING FLIGHT.



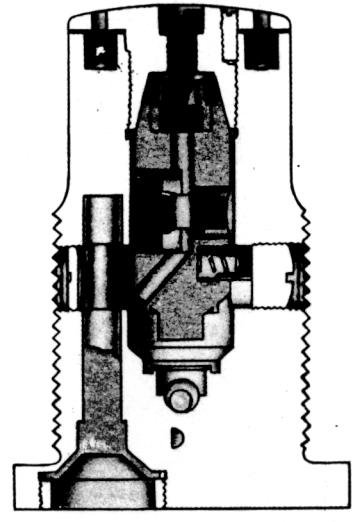
SECTION AT A.A.



PART SECTION AT D.D.

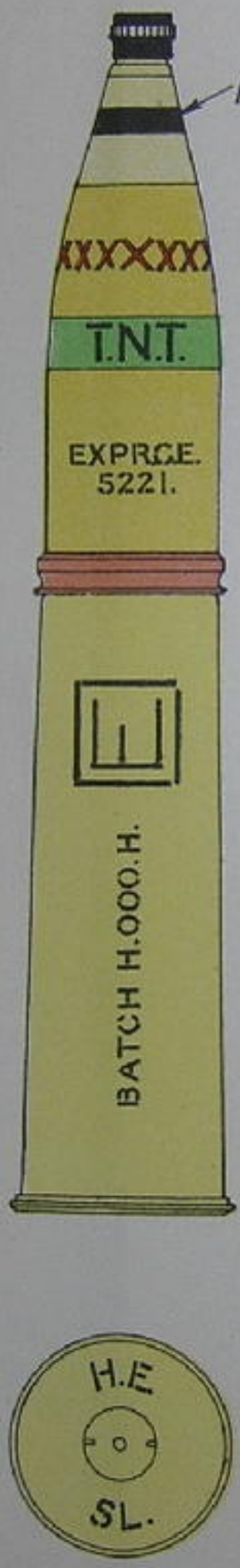


ON IMPACT.

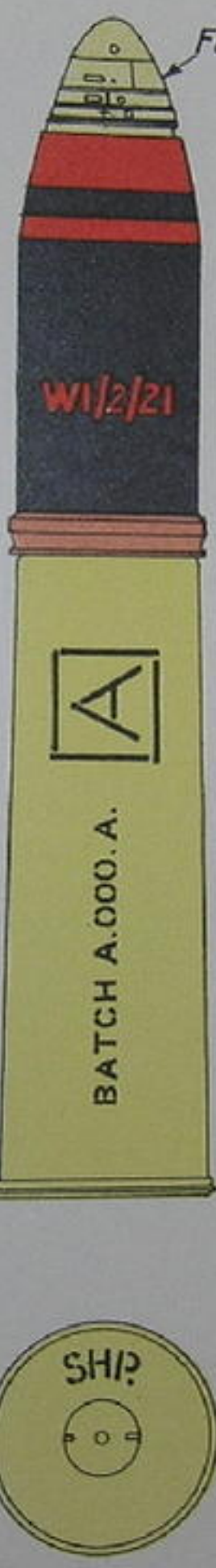


CARTRIDGES, Q.F., 18-PR

H.E. STREAMLINE.

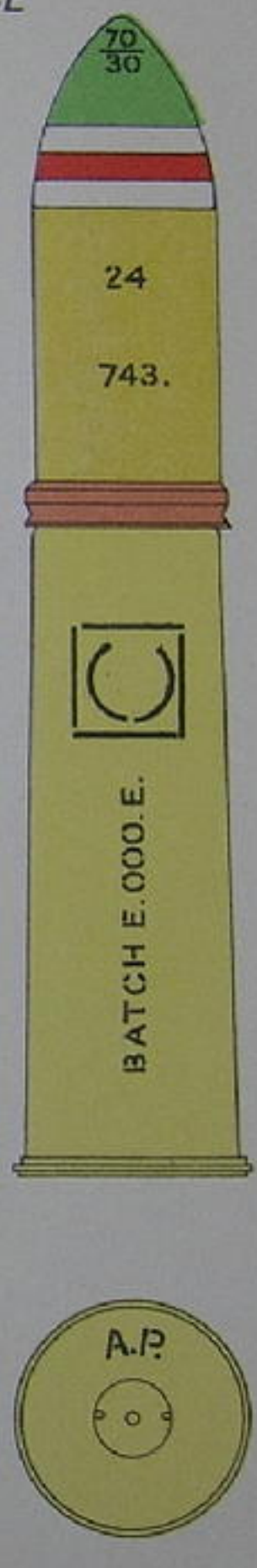


SHRAPNEL.



SMOKE BURSTING.

ARMOUR PIERCING.



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