NOT TO BE TAKEN INTO THE FRONT TRENCHES.

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NOTE.

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40
W.O.
2918

NOTES

ON THE AMMUNITION FOR

Q.F. 13-PR.
Q.F. 18-PR.
Q.F. 4·5-INCH HOWITZER.

ORDNANCE COLLEGE.

1915.

LONDON:
PRINTED UNDER THE AUTHORITY OF HIS MAJESTY'S STATIONERY OFFICE
BY HARRISON AND SONS, 45-47, ST. MARTIN'S LANE, W.C.
PRINTERS IN ORDINARY TO HIS MAJESTY.

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2913

NOTES

ON THE AMMUNITION FOR

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These notes are intended for the information of officers as to the details of the ammunition issued for use with their equipments, and they supplement the regular Treatise and Handbooks.

It must be clearly understood that they are no authority in themselves, and that the official authority is contained in Lists of Changes published every month with Army Orders.

Descriptions are complete to December, 1915.

(B 11673) Wt. w. 16929—5683 25M 2/16 H & S P. 15/842

CONTENTS.

KEY TO SHADING OF FIGURES.

Yellow.

Red.

Green.

Blue.

Ammunition used with the Q.F. 13- and 18-pr. Equipments.

These equipments are provided with *fixed* ammunition. The brass case, fitted with the means of ignition and containing the propellant charge, has the projectile, usually fuzed, secured in its mouth; so that the complete round is, like a round of small-arm ammunition, ready to load. The ammunition for the two equipments is identical, except as regards weights and dimensions.

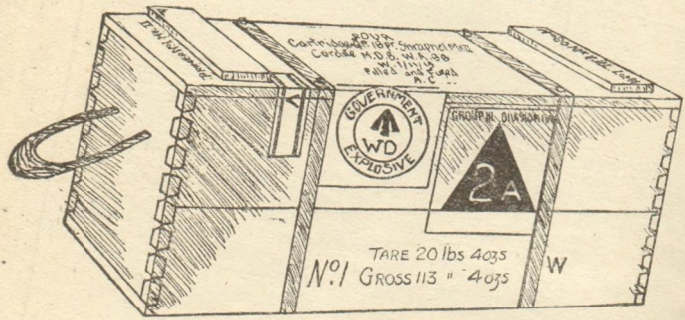
Cartridge.	Brass case (p. 9) fitted with the means of ignition, Primer, Percussion, No. 1 (p. 13), and containing the propellant charge of Cordite or Nitro-cellulose.		
Projectile ...	Shrapnel (p. 9).	Star (p. 11).	High Explosive (pp. 13, 15). Filled—Trotyl, Amatol, or Lyddite. Exploder—Gaine No. 1, or No. 2 with 14 dram Trotyl Exploder (p. 41).
Fuze	T. and P. No. 80 (p. 37), or T. and P. No. 85 (p. 39).	Time No. 25 (p. 27).	Graze No. 100 (p. 33).

Ammunition used with the Q.F. 4·5-inch Howitzer Equipment.

The Equipment is provided with *separate* Q.F. ammunition. The projectile is not secured in the mouth of the cartridge case, and the latter is loaded separately. The projectiles are carried fuzed or plugged as may be desired.

Cartridge.	Brass case (p. 19) fitted with the means of ignition. Primer, Percussion, No. 1 (p. 13), and containing a propellant charge of Cordite, Ballistite, or C.S.P. 60.				
Projectile	Shrapnel (p. 21).	Star (p. 21).	High Explosive (pp. 23, 25). Filled. Lyddite. Picric Powder.	Trotyl or Amatol. Exploder. $1\frac{1}{2}$ oz. Trotyl crystals.	Gaine, with 14 dram Trotyl Exploder.
Fuze ...	T. and P. No. 82 (p. 35).	T. and P. No. 82 (without adapter) (p. 35).	D.A. No. 17 (p. 29).	D.A. No. 44 (p. 31).	Graze No. 100 (p. 33).

BOX, AMMUNITION, Q.F. 18-PR.



Q.F. 13-Pr. AND 18-Pr.

Packing.

When carried in wagons and limbers each round is packed in a cane carrier which fits into a pigeon-hole in the wagon or limber box. A full wagon with limber carries 76 rounds, and a gun-limber carries 24 rounds.

For transport and storage, four complete rounds are packed in a wood box, labelled as shown opposite and stencilled thus :—

LID.

Numeral of Primer.

"Fuzed" date of fuzing.
Number of Cartridges in box.
Designation and numeral of filled Cartridge and Shell.
Size and Lot number of the Cordite.
* Monogram of Station and date of filling.
* "Filled and Fuzed."
† "A.C."
‡ "No Fuze Covers. Use at once."

Numeral of Fuze.

* Omitted if the shells are empty and plugged.
† Only if the charges are *adjusted*.
‡ Omitted if fuze covers are fitted.

FRONT.

Tare and gross weight.
Monogram of Station.
Number of box.

Special Markings.

13-pr. Shrapnel.—The box has black cleats or painted black rectangles on the ends, and "13-pr." stencilled in black UNDERNEATH the cleats or rectangles.

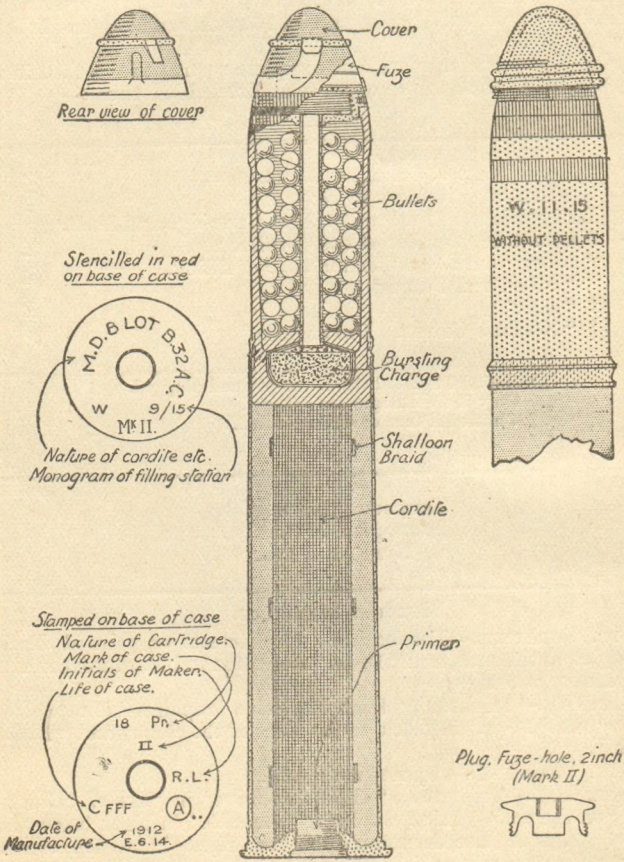
13-pr. H.E.—On the lid, "High Explosive" replaces "Shrapnel"; on the ends "13-pr." in black on the LEFT of the cleats, and "H.E." below them.

18-pr. Shrapnel.—As shown opposite.

18-pr. H.E.—On the lid, "High Explosive" in place of "Shrapnel"; on the ends, "High Explosive" stencilled in black below the cleats. A blue disc is painted on the right hand top corner when the ammunition is fitted with gaine containing DELAY-COMPOSITION.

13-pr. or 18-pr. Star Shell.—In addition to the other markings, the ends are painted with a black star.

CARTRIDGES, Q.F. 18-PR., WITH SHRAPNEL SHELL.



CARTRIDGES, Q.F. 18- AND 13-PR. WITH SHRAPNEL SHELL.

The complete round includes the brass case, fitted with a percussion primer (page 13) and containing the propellant charge, shrapnel shell with fuze and fuze cover. A four-armed safety clip, attached to the base of the brass case, protects the cap of the primer from accidental blows. It also forms a means of withdrawing the round from the box or basket.

The propellant charge is M.D. Cordite, size 8; 1 lb. $4\frac{11}{16}$ oz. for 13-pr. and 1 lb. $6\frac{5}{16}$ oz. for 18-pr. The sticks are tied in a bundle, those in the centre being slightly shorter than the outer layer. This forms a recess for the projecting end of the primer to fit into when the charge is in place.

Some 18-pr. cartridges contain propellant charges of 1 lb. 10 oz. of nitro-cellulose powder. They are lettered N.C.T. in place of M.D.

The full *life* of a case, or number of times it is considered safe to allow it to be refilled, is six full charges. The letter C (Cordite) is stamped on the base as shown, and a letter F (Full) is stamped every time the case is refilled. This enables the remaining life of the case to be ascertained.

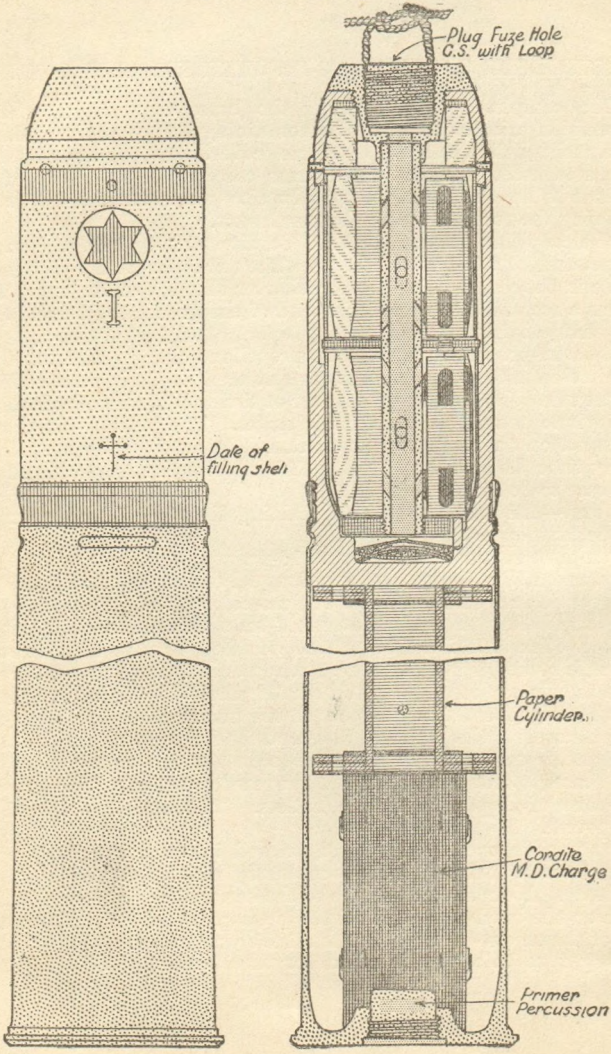
NOTE.—All fired cases with remaining lives should be returned at the first opportunity.

Complete rounds for 13-pr. and 18-pr. weigh respectively 16 lbs. 7 ozs. and 22 lbs. 14 ozs., and the shrapnel shells, 13 lbs. and $18\frac{1}{2}$ lbs. These shells are painted black or lead colour, the tip is red, and a red band below the tip indicates that the shell contains its bursting charge. The shell is formed of the steel body into which is screwed the fuze socket of 2-inch gauge. A recess is formed in the base to take the tin cup containing the small gunpowder bursting charge. On the ledge formed at the top of the recess rests the steel disc which supports the bullets. The central pipe screws into the steel disc, and is soldered into the fuze socket at the upper end. In some cases it contains perforated gunpowder pellets, which increase the cone of dispersion of the bullets. The bullets weigh 41 to the pound.

A narrow copper driving band pressed into an undercut groove near the base of the shell is the means by which the shell is caused to rotate. Near the lower edge of the band a lip is formed which rests on the brass case. Below the lip, a groove is formed for the top of the case to be pressed into all the way round.

Plug, fuze hole, No. 1, is used for these shell.

CARTRIDGES, Q.F., 13- AND 18-PR., STAR SHELL.



CARTRIDGES Q.F., 13- AND 18-PR.—STAR SHELL.

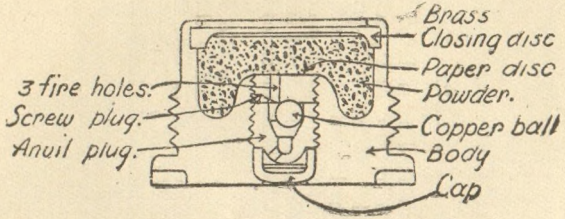
The case and primer are as described for the shrapnel. The propellant charge is of cordite M.D., size $4\frac{1}{4}$; 6 ozs. 10 drms. for the 13-pr., and 8 ozs. for the 18-pr. The space between the charge and the base of the shell is filled by a paper cylinder, which retains the charge in position.

The Star shell is painted black, with a red star on a white disc, near the shoulder. A red band indicates that the shell contains its bursting charge.

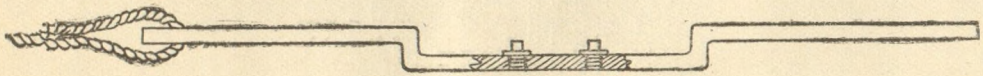
The shell is generally similar to to the shrapnel, but contains stars in place of bullets, and is therefore much lighter. For the 13-pr. it weighs $7\frac{1}{2}$ lbs., for the 18-pr. $10\frac{1}{2}$ lbs. The fuze socket is of G.S. or 1-inch gauge.

The weight of a 13-pr. round is 11 lbs. 6 ozs. and of an 18-pr. 14 lbs. $2\frac{1}{2}$ ozs.

PRIMER, PERCUSSION, Q.F. CARTRIDGES, NO. 1, MARK II.



Key No. 27 (Primer)



PRIMER, PERCUSSION, No. 1, MARK II.

The primer is screwed into the base of the cartridge case, and is provided with a percussion cap and a small magazine of gunpowder. When the cap is struck by the striker of the breech mechanism it fires the gunpowder, which in turn ignites the propellant charge. The small copper ball is blown back into a coned seating in the anvil plug, and seals the hole against the back rush of the propellant gas.

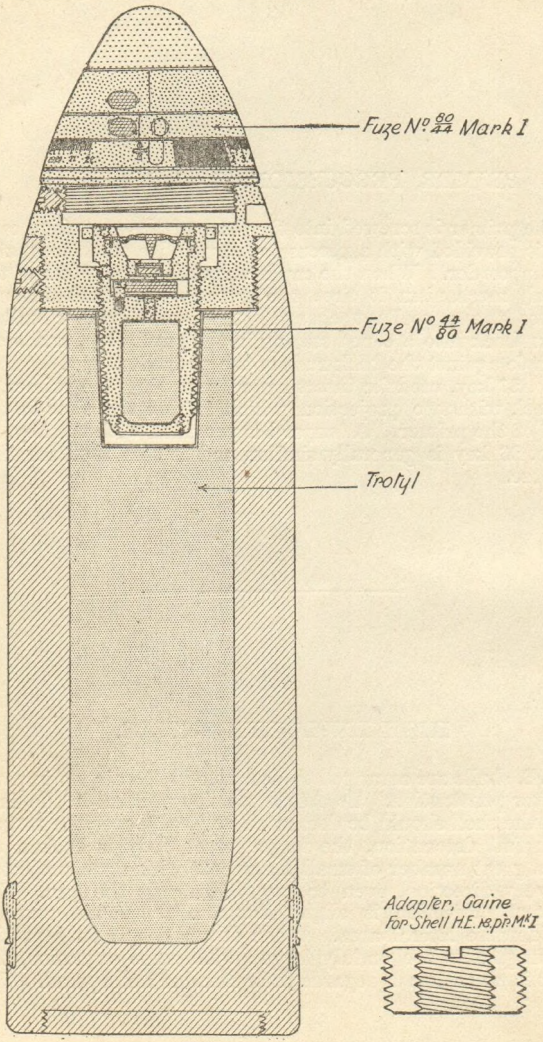
No. 27 key, used for inserting or removing the primer, is of steel, with two projections which engage the slots in the head of the primer. A lanyard is provided with the key.

No. 26 key is generally similar, and is also used for this purpose.

HIGH EXPLOSIVE SHELLS.

H.E. shells are arranged to detonate in the air, on impact, or after penetration. To obtain maximum effect in the first case, the shell should be detonated vertically over the target. With full detonation, the forged steel body is broken up into a great number of small fragments which are projected in every direction, even backwards towards the gun. The forward projection is slight, but the fragments cover a considerable lateral area. When detonation is only partial the fragments are unduly large; with mere explosion, the effect is much less as regards their number and spread.

SHELL, H.E., 18-PR., MARK I.



HIGH EXPLOSIVE SHELLS—*continued.*

H.E. shells are all painted yellow, but those filled Trotyl or Amatol are sometimes issued unpainted. After filling, a red band is painted round the shoulder. Those filled Lyddite have no other distinguishing mark. When filled Trotyl or Amatol, a light green band is painted round the centre. With Amatol, the actual proportions of its constituents are stencilled below the green band as a fraction, thus 40/60. When a 1½-oz. exploder of Trotyl crystals is fitted (necessitating a No 44 fuze), another light green band is painted round the nose, above the red filling band.

An H.E. shell has little incendiary effect, and when detonated, the effect of the fumes is small. Detonation is indicated, with Lyddite and Trotyl, by black smoke and absence of yellow colouration in the shell crater. With Lyddite, the smoke may be grey or even nearly white. With Amatol, the colour of the smoke varies with the proportions of the constituents. In every case, yellow smoke denotes explosion. Where a *smoke-producer* is included in the filling of the shell, it is hardly possible to distinguish visually between detonation and explosion.

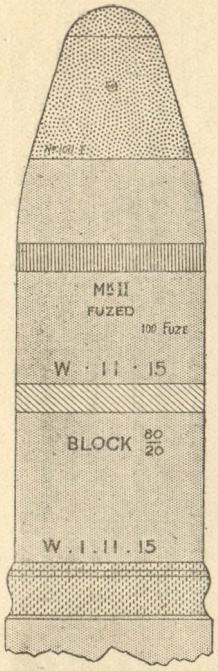
Precautions are taken to guard against detonation of H.E. shell in any other manner than by the action of the fuze. A steel base-plate is screwed or riveted into a turned out recess in the base, to guard against the flash of the propellant passing through possible flaws in the metal of the shell. With Lyddite, the interior of the shell is coated with copal varnish and lead is excluded from the paint used on the shell, and from the metals used for the fuze hole bush and plug. Metallic particles, rusty filings, and also chalk, lime or plaster, in contact with picric acid (Lyddite) form dangerously sensitive compounds. The fuze or fuze hole plug should only be removed where there is no danger of such contamination.

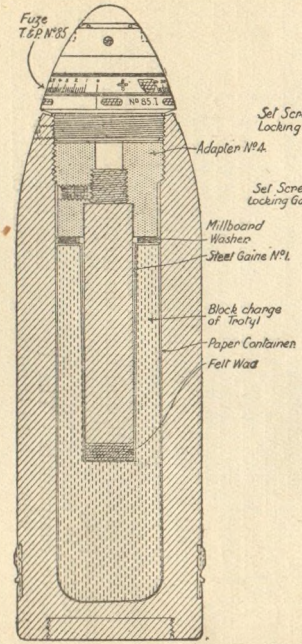
CARTRIDGE, Q.F. 13- AND 18-PR., WITH H.E. SHELL.

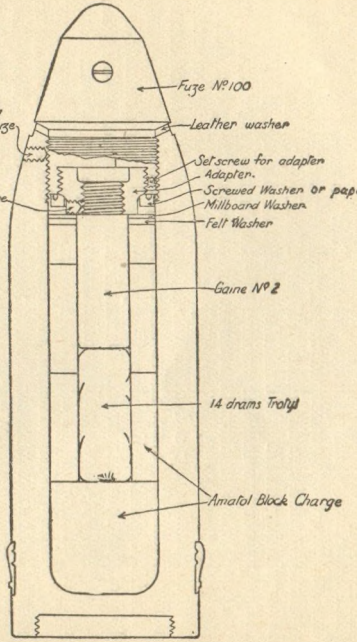
The cartridge is as described for shrapnel, but the base of the case is painted yellow to enable it to be identified when only the end can be seen.

Mark I shell is being superseded. It is a common shell, filled Trotyl. Into the nose is screwed a double socket of which the upper portion is to 2-inch gauge, and the lower to G.S. gauge. An adapter may be screwed into the lower portion to take a gaine.

Shells, H.E., 13- and 18-pr., Marks II and III.







SHELLS, H.E., 13- AND 18-PR., MARKS II AND III.

These shells are painted yellow. When filled otherwise than with Lyddite, they have a light green band round the centre. After filling, a red band is painted round the shoulder. Those filled with Amatol are stencilled with a fraction showing the proportion of the constituents, *e.g.*, 80/20. The Amatol is generally in the form of blocks, the upper blocks being pierced centrally to form a recess for the gaine.

The gaine is screwed into the adapter, which is then screwed into the fuze. The fuze is then screwed into the nose of the shell. This fuze, No. 100, is most sensitive and is designed to act even on boggy ground. The purpose of the gaine is to ensure the detonation of the explosive charge ; without it, there would be only an explosion.

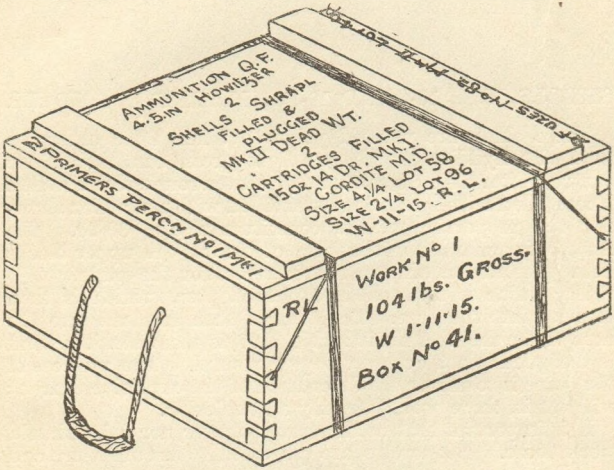
It is important that neither fuze, adapter, nor gaine should work loose. Set-screws are provided to ensure this, and punch dabs are made at the junction of screw threads for adapter and gaine, and for adapter and fuze.

When inserting No. 100 fuze be CAREFUL to use luting, and to see that a red patch on the fuze is NOT opposite the set-screw in the nose of the shell. If this precaution is not taken, the shell might be detonated on inserting the set-screw.

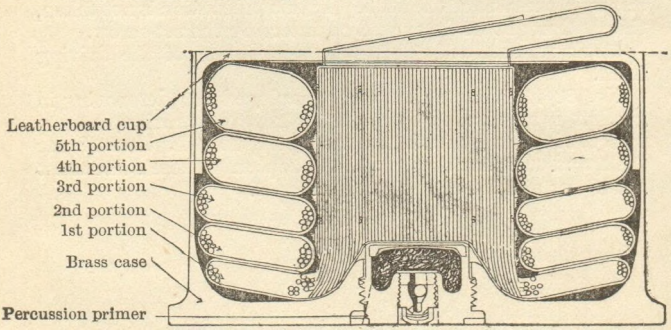
Mark III shell only differs in the pattern of the driving band.

No. 80/44 fuze was formerly employed for detonating in air, but is superseded by No. 85. The preparation consists in screwing the gaine into an adapter, the adapter into the shell, and the fuze on top of the adapter. These fuzes must not be set at a lower graduation than 2.

Box, Ammunition, Q.F. 4·5-inch Howitzer.



Cartridge, Q.F. 4·5-inch Howitzer.



Q.F. 4·5-INCH HOWITZER.

Packing.

When carried in wagons and limbers, two complete rounds fit into each basket carrier, which is inserted in a compartment of the wagon or limber box. A full wagon with limber contains 48 rounds (32 and 16), and a carriage limber 12 rounds.

For transport and storage, two complete rounds are packed in a wood box. 4·5-inch ammunition is boxed plugged, except a percentage of H.E. Mark V shell, filled Amatol, which are boxed ready fitted with graze fuze, No. 100, with Gaine.

The packages are marked as shown opposite.

Cartridges.

Howitzer cartridges are of small sized (quick burning) cordite, as the bore is short; the charge is small, and is made up in such a form that its weight can be readily altered. The cartridge consists of a brass case, fitted with a No. 1 percussion primer (page 13), and contains the propellant charge. The top is closed by a leatherboard cup which forms a lid.

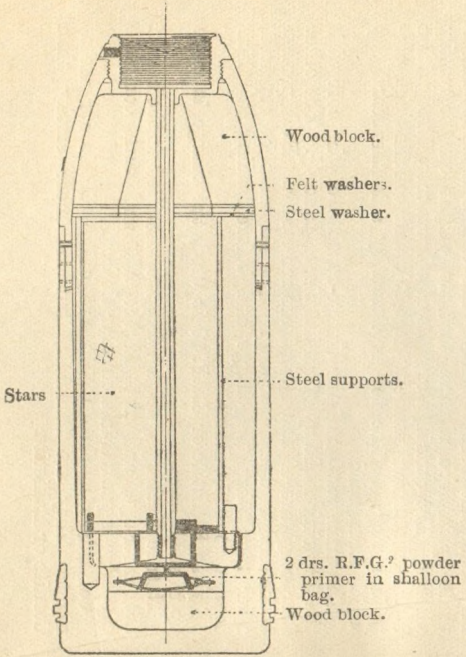
The main portion of the charge consists of the core with the first ring made up of cordite sizes $2\frac{1}{4}$ and $4\frac{1}{4}$. The other four rings are of size $4\frac{1}{4}$, and are removable. Each portion is enclosed in a cambric bag. The lid must be replaced, after regulating the charge and before loading it. Full charge, 15 oz. 14 drams.

When Ballistite or C.S.P. 60 is used, the charge is made up in small bags.

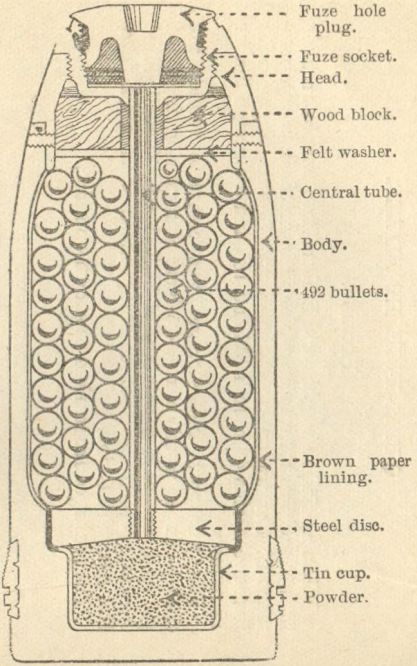
Nature of charge, weight, &c., are stencilled on the base of the cartridge, and also on the lid, and each complete cartridge is packed in a circular tin box.

Cartridges marked C.S.P. are only suitable for use at night. They are flameless, but are more smoky than Cordite or Ballistite.

SHELL, Q.F. STAR, 4·5-INCH HOWITZER.



SHELL, Q.F. SHRAPNEL, 4·5-INCH HOWITZER.



SHELL, Q.F. SHRAPNEL, 4·5-INCH HOWITZER.

The shell when filled and fuzed weighs 35 lbs. It is made in two portions, body and head. The body is of forged steel; there is a recess in the base to take a tin cup containing 3 oz. of gunpowder, and above this the body is reduced in thickness, forming a shoulder on which rests a steel disc, which supports about 500 bullets (35 to the lb.). The steel head is lightly attached to the body by rivets and twisting pins. The head is fitted with a metal socket of 2-inch gauge to take the fuze, the flash from which is conveyed to the gunpowder in the tin cup by a central brass pipe. The bullets are held together by melted resin run in from the top. Over them is a felt washer, and a wood block fills up space between felt washer and fuze-hole socket. The T. and P. fuze is No. 82, shown on page 33. Fuze hole plug No. 1, Mk. II, is used in the absence of a fuze.

SHELL, Q.F. STAR, 4·5-INCH HOWITZER.

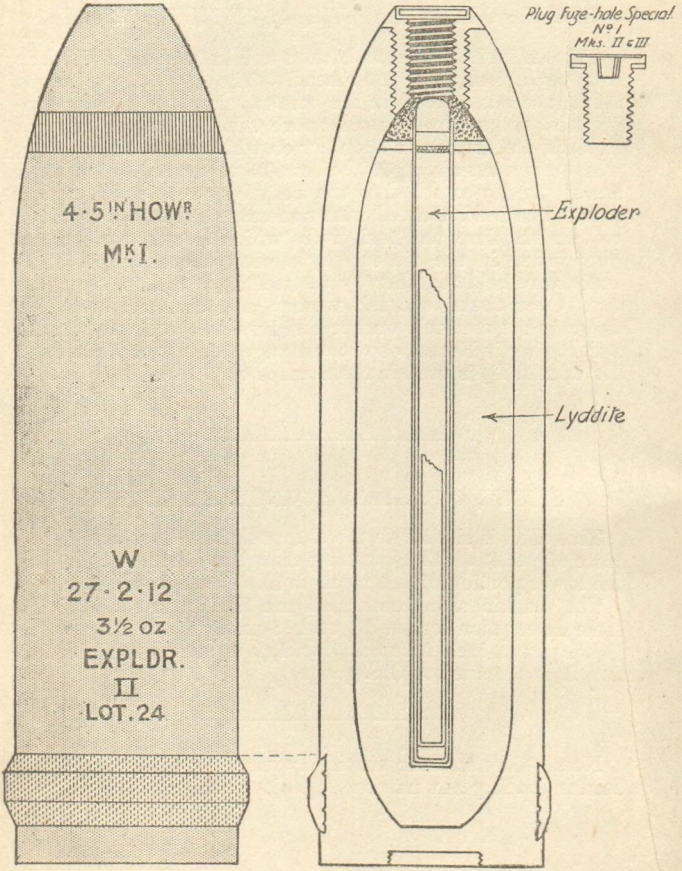
This shell is similar to the shrapnel, but contains stars in place of bullets. The bursting charge is much smaller and the lower portion of the recess is filled by a wood block.

The markings on these shell are similar to those of the same description for the 13- and 18-pr. equipments.

Adapter, 2-inch fuze hole, No. 1, is used if it is desired to fit a fuze threaded to G.S. gauge.

NOTE.—The rammer provided with the equipment is to be used in loading ALL natures of projectiles.

Shell, Q.F., Lyddite, 4·5-inch Howitzer.



SHELL, Q.F., H.E., 4·5-INCH HOWITZER, FILLED LYDDITE.

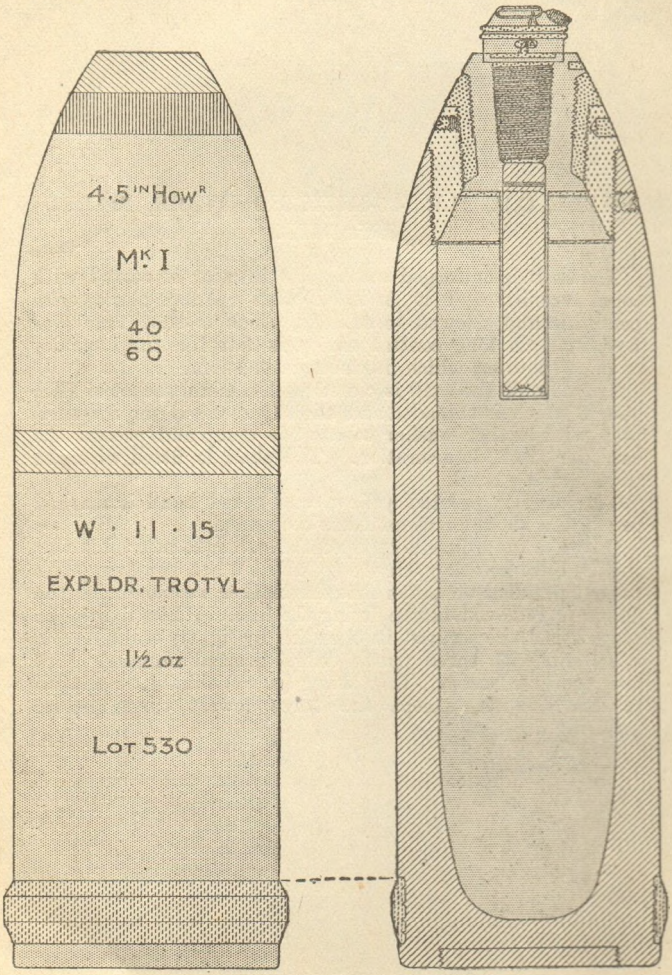
The shell is of forged steel. Its interior is coated with copal varnish and it is filled with melted picric acid, poured in and allowed to solidify, which is then known as Lyddite. A long central cavity is left for the exploder of Picric powder, which produces detonation.

The nose of the shell is closed with a metal socket of G.S. gauge, which is threaded and slightly recessed for a special plug with leather washer to exclude damp and protect the exploder from deterioration. The shell is fitted with the usual driving band.

The shell is painted yellow, and a red band is marked round the shoulder when it has been filled.

Only the Plug, fuze hole, Special, No. 1, is to be used in this shell. Fuze hole key No. 10 (p. 42). When removing this plug, care must be taken that the leather washer under the flange is removed before fixing the fuze. When fixing the plug, it is to be secured in the shell by lightly stabbing the raised lip with three punch dabs, directed obliquely into the fuze hole recess. Thin luting (p. 43) should be applied to the threads, except the three lowest turns, before screwing in.

SHELL, Q.F., H.E., 4·5-INCH HOWITZER, WITH TROTYL EXPLODER.

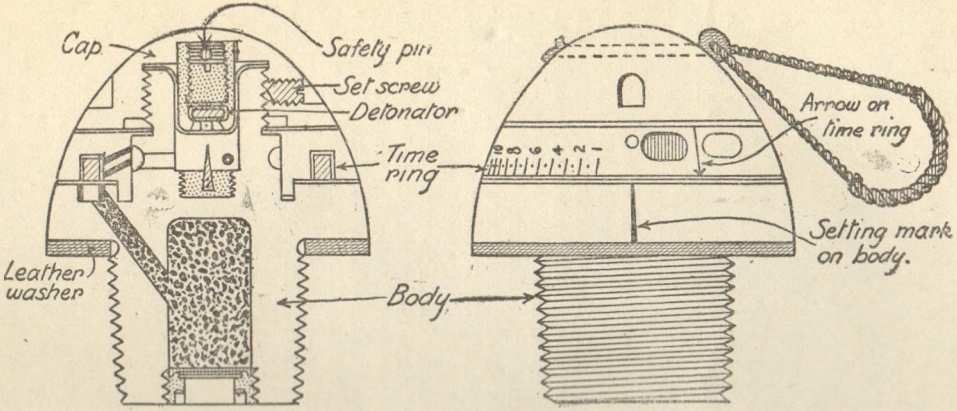


SHELL, Q.F., H.E., 4·5-INCH HOWITZER, FILLED TROTYL OR AMATOL.

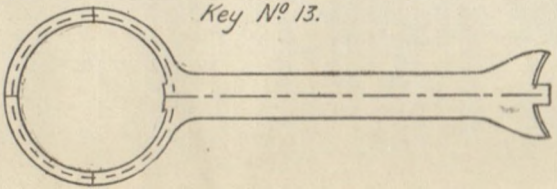
The precautions as regards lead-free paint, bushes, adapters and plugs are not necessary with these shell, but the provision of a base-plate is important. They are generally similar to those just described, but in some cases the head is arranged to permit of *block* filling, and is closed by a screwed-in plug, threaded to take alternatively a fuze hole socket of 2-inch gauge for use with No. 100 fuze and gaine (pages 33, 43), or an adapter for No. 44 fuze (page 31) in conjunction with a Trotyl exploder.

They are painted yellow, with a light green band round the centre. A red ring is marked round the shoulder after filling. The actual proportions of the constituents of Amatol are stencilled as a fraction, thus 40/60. If a Trotyl exploder is fitted, a light green band is painted round the nose of the shell, above the red band.

The operations of fixing and removing the fuzes used are described on pp. 29 and 31.


Cap
Safety pin
Set screw
Detonator
Time ring
Arrow on time ring
Setting mark on body.
Leather washer
Body
28 26 24 22 20

Key No 13.



FUZES.

The bursting charge of a shell is ignited by means of a fuze designed to act at any particular instant during its flight, or upon or after impact or graze.

A Time Fuze is constructed to act at the expiration of an interval of time, which is regulated by the setting of the fuze previous to loading. According to the setting, a longer or shorter portion of a length of composition, ignited on discharge, is allowed to burn before exploding a small magazine of gunpowder, which communicates a flash to the bursting charge of the shell.

Fuze, Time (15 Seconds), No. 25.

Used with Star shell, 13- and 18-pr.

The fuze consists of body, time ring and cap.

The lower portion of the body is screw threaded to G.S. gauge.

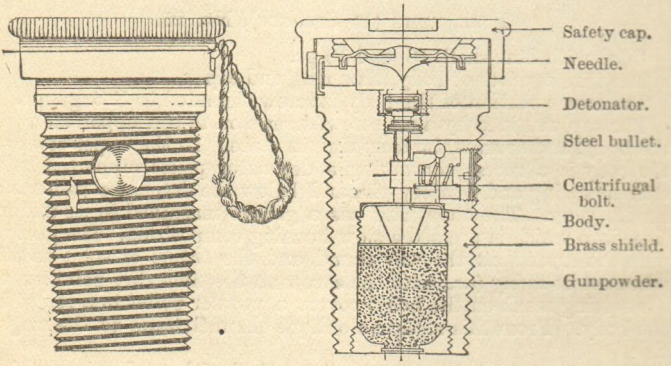
The cap, retained by a set-screw, screws on to the upper stem of the body, and secures the time ring in place. In the upper stem of the body is a recess containing a detonator pellet supported by a stirrup spring and a safety pin, and below the detonator pellet is a needle plug. The time ring has a groove machined in its underside, into which is pressed a slow burning composition. The groove does not extend all the way round, and the *bridge* of solid metal, when set at *safety* (*i.e.*, with the arrow on the time ring pointing to the setting mark on the body) covers a powder pellet in a recess in the body. From this recess an oblique channel leads to the magazine.

The outer face of the time ring is marked with graduations which can be *set* to the mark on the body with key No. 13. The circular end of this key is used for *fixing* the fuze in the shell. The safety pin is pulled out before loading.

The shock of discharge sets back the detonator pellet, straightening out the arms of the stirrup spring, and so starts the action of the fuze.

The preservation of the composition from damp is most important. Damp might lengthen the time of burning or even prevent ignition. Deterioration of the composition might result in the flash from the detonator pellet passing right round to the powder pellet and causing a premature.

Fuze, Percussion, D.A. No. 17.



SHELLS, H.E., 13- AND 18-PR., MARKS II AND III.

These shells are painted yellow. When filled otherwise than with Lyddite, they have a light green band round the centre. After filling, a red band is painted round the shoulder. Those filled with Amatol are stencilled with a fraction showing the proportion of the constituents, *e.g.*, 80/20. The Amatol is generally in the form of blocks, the upper blocks being pierced centrally to form a recess for the gaine.

The gaine is screwed into the adapter, which is then screwed into the fuze. The fuze is then screwed into the nose of the shell. This fuze, No. 100, is most sensitive and is designed to act even on boggy ground. The purpose of the gaine is to ensure the detonation of the explosive charge ; without it, there would be only an explosion.

It is important that neither fuze, adapter, nor gaine should work loose. Set-screws are provided to ensure this, and punch dabs are made at the junction of screw threads for adapter and gaine, and for adapter and fuze.

When inserting No. 100 fuze be CAREFUL to use luting, and to see that a red patch on the fuze is NOT opposite the set-screw in the nose of the shell. If this precaution is not taken, the shell might be detonated on inserting the set-screw.

Mark III shell only differs in the pattern of the driving band.

No. 80/44 fuze was formerly employed for detonating in air, but is superseded by No. 85. The preparation consists in screwing the gaine into an adapter, the adapter into the shell, and the fuze on top of the adapter. These fuzes must not be set at a lower graduation than 2.

FUZES—*continued.*

A Direct Action Percussion Fuze is intended to explode the shell when it strikes, and a heavy blow is required to make it act. The fuze is fitted with a copper disc supporting a steel needle over a detonator, with a magazine below it, and the needle must be crushed in on to the detonator to explode the fuze.

D.A. fuzes used in conjunction with a picric powder exploder to detonate the bursting charge of the shell, have their magazines filled with gunpowder ; but those which are intended to directly detonate the filling charge or a Trotyl exploder have detonating composition in their magazines.

Safety in store and in transport is ensured by a cap or a screw plug, which is only removed from the top of the fuze at the time of loading.

FUZE, PERCUSSION, D.A. No. 17, WITH CAP.

Used with H.E. shell, 4·5-inch Howitzer, when filled Lyddite and fitted with Picric Powder Exploder.

The body is screw threaded to G.S. gauge, and the top is plain to take the cap. The latter has a square recess on top for use with key No. 10 for fixing the fuze. Immediately below the cap is the needle supported by the copper disc over the detonator. Below the later is a steel bullet supported by a copper shearing wire. Under the bullet the fire channel is closed by a centrifugal bolt, kept in place by a side spring, and below the bolt is a thin brass shield covering the top of the magazine. The safety pin secures the cap, and also prevents any movement of the centrifugal bolt. Pin and cap are removed at the last moment of loading.

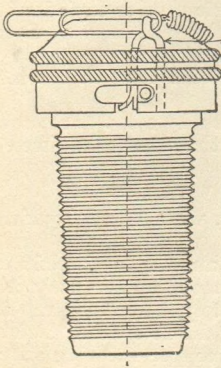
The rotation of the shell causes the centrifugal bolt to fly outwards, compressing its side spring and opening the fire channel. On impact the needle is crushed on to the detonator, which explodes and drives the bullet down, piercing the shield, and the magazine is ignited.

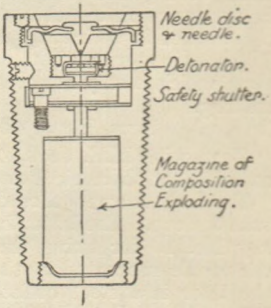
Fuzes are packed singly in sealed tin cylinders, which should be opened only when the fuze is actually required for use.

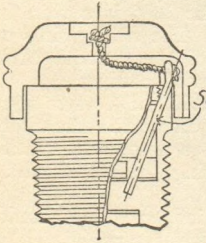
For removing this fuze from a shell key No. 19 (p. 32) is to be used, NOT in the square recess on top, but in the T-shaped slot of the cap. In this way there is less risk of disturbing or injuring the safety pin. If the fuze is *set* so tightly that it cannot be removed in the prescribed manner, or if it appears that the pin engaging the cap is being distorted, the shell must be set aside.

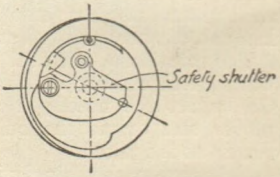
When fixing this fuze, thin luting should be applied to the threads, excepting the three lowest.

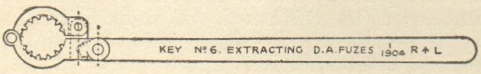
Fuze, Percussion, D.A. No. 44.











FUZES—*continued.*

FUZE, PERCUSSION, D.A. No. 44, WITH CAP.

Used with H.E. shell for 4·5-inch howitzer, when fitted with Trotyl exploder (green band painted round shell, above red "filling" band).

The body is screw-threaded to G.S. gauge, and the cap is provided with two securing pins. A square recess in the top of the cap is used in conjunction with No. 10 key for fixing the fuze in the shell. When loading, the securing pins are withdrawn; the cap is then taken off, and a safety pin, attached to it, is removed at the same time.

Immediately below the cap is the needle supported by a copper disc over the detonator. Below this, a pivoted shutter, kept in position by a spring, closes a channel leading down to the magazine filled with a detonating composition known as C.E. The safety pin engages the shutter, but after removal, the rotation of the shell causes the shutter to swing out on its pivot, overcoming its spring and uncovering the fire channel.

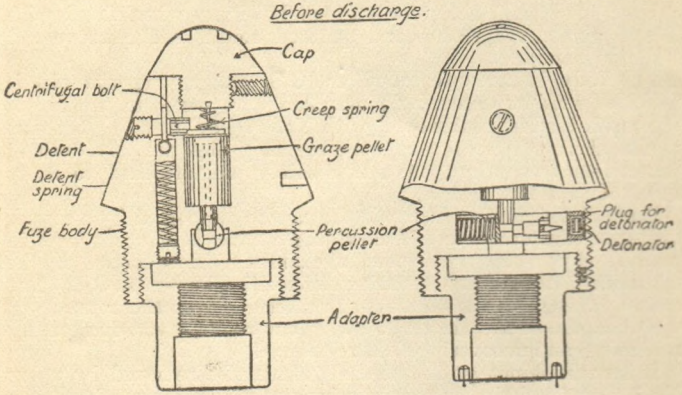
If the fuze is not *set* in the shell, it may be removed by using No. 10 key (p. 42) in the square recess on top of the cap. If *set*, the securing pins must be removed and No. 19 key used in the T-shaped slots. The pins must be replaced after the fuze has been extracted.

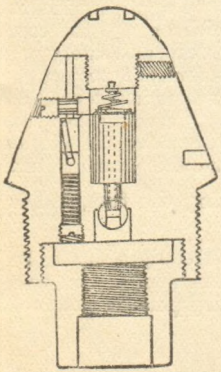
Should it appear that sufficient force cannot be applied without distorting the pins in the head of the fuze which engage the cap, No. 6 key may be used. Remove securing pins, cap, and safety pin from the fuze. Apply the key so as not to foul the projecting pins, with the rim of the jaws fitting into the recess in the head of the shell. Unscrew firmly and without jerking, watching the head of the fuze. Should any distortion be noticed, the attempt should be abandoned. In any case, replace safety pin, cap, and securing pins.

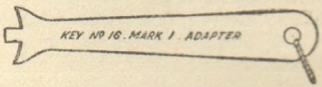
NOTE.—No. 6 key is not to be used for fixing the fuze, and is not for use with No. 17 fuze.

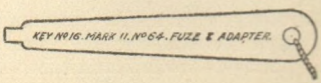
The fuze is fixed in the same manner as No. 17. Care should be taken that the fuze is screwed down with bottom of cap in line with the bush of the shell, and that the securing pins do not foul the bush.

FUZE, GRAZE, NO. 100, MARK I.









FUZE, GRAZE, No. 100.

Used with H.E. shell of all three equipments.

The fuze comprises a body and a cap. An adapter to take a gaine (p. 41) is screwed into a threaded recess in the underside of the body, and is secured by a set-screw and *punch dabs.* The lower part of the fuze body is screw-threaded to 2-inch gauge, and the contour of its upper part continues the general lines of the shell. The mushroom-shaped cap is secured in the upper part of the central recess.

The percussion pellet, fitted with a needle, is held clear of the detonator with the pellet spring compressed, by the graze pellet. This, in turn, is prevented from moving forward out of place by the centrifugal bolt, which is locked by a detent pressed upwards by a spring.

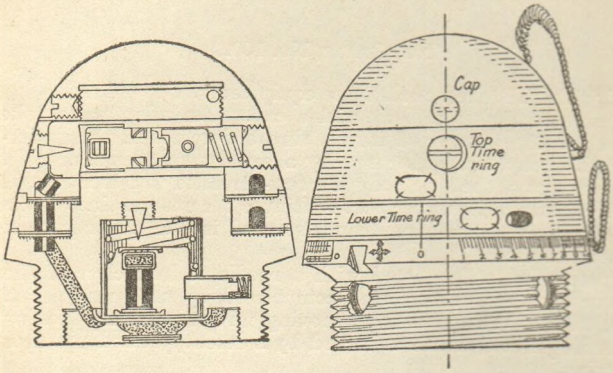
The shock of discharge causes the detent to set back, compressing its spring ; and the detent pin, catching under the shoulder of its recess (as in the lower figure), prevents return to its original position. The rotation of the shell then causes the centrifugal bolt to move outward, clearing the graze pellet. The latter is restrained from working forward during flight by a *creep-spring.* On graze or impact, the graze pellet flies forward, compressing the creep-spring, and clearing the percussion pellet, which, by the action of its spring, carries its needle on to the detonator. The flash passes down into the gaine, which detonates the shell.

SPECIAL MARKS.—A red patch is painted on the body of the fuze. When the fuze is fixed, this mark must not lie directly above the set-screw hole in the shell, or there will be a chance of piercing the detonator and exploding the shell when the set-screw is put in.

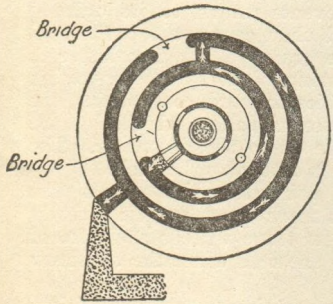
When the gaine used with the fuze contains DELAY composition, the fuze cap is painted blue.

No. 16 fuze key is used for fixing and removing the fuze.

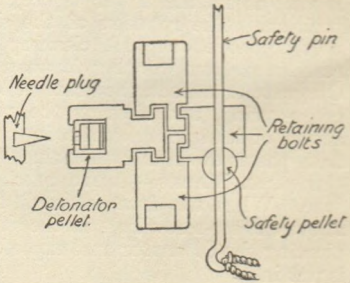
Fuze, Time and Percussion, No. 82.



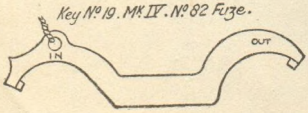
Arrangement of Time rings



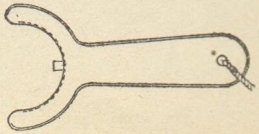
Ignition of Time composition



Key No. 19. Mk. IV. No. 82 Fuze.



Key No. 36. Setting Fuze T.F.P. No. 82.



FUZES—*continued.*

FUZE, TIME AND PERCUSSION (40 SECONDS), No. 82.

Used with shrapnel and star shell for B.L. 4·5-inch howitzer.

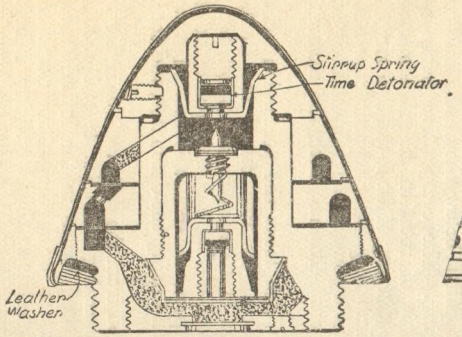
The lower portion of the body is screw-threaded to 2-inch gauge up to the shoulder which fits the nose of the shell. A platform is formed above, on which rests the lower time ring. Above is the upper time ring clamped by a screwed cap, secured by a set-screw to the stalk of the body.

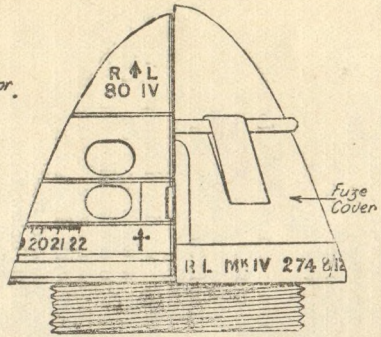
Each time ring has a groove in its underside, forming a circle broken by a short *bridge* of solid metal. The grooves are filled with composition pressed in, and both are furnished with gas escape holes, suitably closed. The upper ring is fitted with the mechanism for the ignition of the time composition by the rotation of the shell on discharge. When the time safety pin is withdrawn, the safety pellet is then only supported by a shearing wire. This wire is sheared by the shock of discharge, and the pellet sets back into a recess, allowing three retaining bolts to fly out by centrifugal action and so release the lighting pellet with detonator, which also flies outwards, carrying the detonator on to a needle. The consequent flash fires a perforated powder pellet below the needle and ignites the composition in the upper ring. The composition burns round in the same direction as the spin of rotation, till it comes to an exposed powder pellet at the beginning of the lower time ring. This is fired, igniting the lower time ring, which burns round in the reverse direction until it reaches a powder pellet in the body which is in communication, by a diagonal channel, with the magazine of the fuze.

The percussion safety pin, which locks the percussion pellet, is removed at the time of loading. On rotation of the shell, the centrifugal bolts are spun out of recesses in the pellet, but any tendency for it to *creep* forward during flight is prevented by a spiral spring. On graze or impact, the pellet is carried forward, compressing the creep spring and firing the detonator, and the flash ignites the magazine.

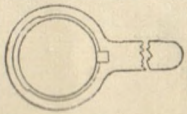
The fuze is fixed and removed from the shell by No. 19 Key, and is set to the required time of burning with No. 19 or No. 36 Key. The projecting arm engages a small recess in the lower time ring, which can thus be turned so as to bring the setting mark on the ring opposite any desired graduation on the body. It will be seen that the arrangement of the composition in the rings allows for the setting of any time of burning from 0 to 40 seconds by moving the lower ring only. When the setting mark on the ring is opposite the red cross on the body, the bridges of the rings cover the powder pellets, and the fuze is set at SAFETY.

Fuze, Time and Percussion, No. 80.

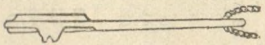


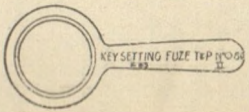


Key No 17.



Key No 18.





FUZES—*continued.*

FUZE, TIME AND PERCUSSION (22 SECONDS), No. 80.

Used with shrapnel shell of the Q.F. 13- and 18-pr. equipments.

This fuze is not suitable for use with the howitzer equipment, as with reduced charges and consequent low initial velocities, the *set-back* arrangement for igniting the time rings could not be depended upon to act with certainty.

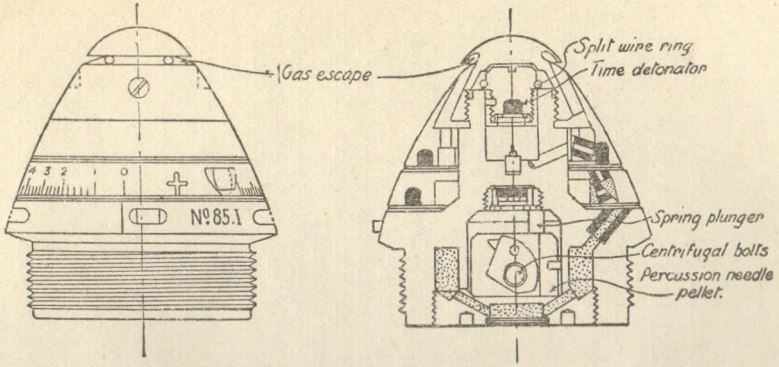
The fuze does not contain any centrifugal bolts or pellets, and is not fitted with safety pins. The lower part of the body is screwthreaded to 2-inch gauge, and the arrangement of the composition in the time rings is similar to that of No. 82. The lighting pellet, fitted with a detonator, is supported on a stirrup-spring. On discharge, this pellet sets back, straightening out the arms of the stirrup-spring and carrying the detonator on to the upper point of a double ended needle. The flash passes through a hole in the stem and lights the time composition.

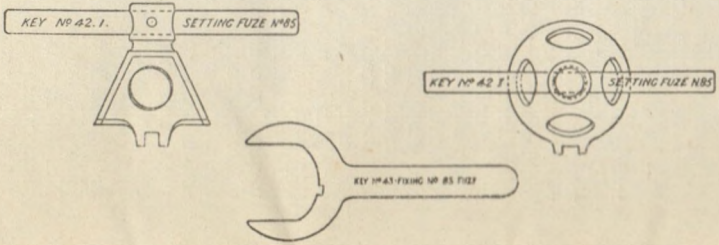
The percussion pellet is kept clear of the lower point of the needle by a ferrule supported on a stirrup-spring. On discharge, the ferrule sets back, straightening the arms of the stirrup-spring, and a creep-spring prevents any further action during flight. On graze or impact the percussion pellet and detonator fly forward on to the lower needle. The flash passes through the pellet and into the magazine.

A cover, to be removed at the time of setting, is fitted to protect the fuze from damp.

No. 17 key is used for fixing and removing the fuze. No. 18 key is used for setting. It is provided with a prong which engages a stud on the lower time ring. When the setting mark on the ring is opposite the red cross on the body, the fuze is set at SAFETY.

Fuze, Time and Percussion, No. 85.





FUZES—*continued.*

FUZE, TIME AND PERCUSSION (21 SECONDS), No. 85.

Used with shrapnel shell for Q.F. 13- and 18-pr. equipments.

The fuze body is screw-threaded to 2-inch gauge. The arrangement of the time rings is similar to Nos. 80 and 82 fuzes, but the setting mark is on the body, below the ring, and the scale and red safety cross are marked round the lower time ring. The gas escape from the time rings is through openings leading into a groove round the cap. The lighting pellet, carrying the detonator, is supported over the needle by a split wire ring. On discharge, the pellet escapes from the ring, which is left on the shoulder of the pellet recess, and sets back on to the needle ; the detonator is fired, igniting the composition.

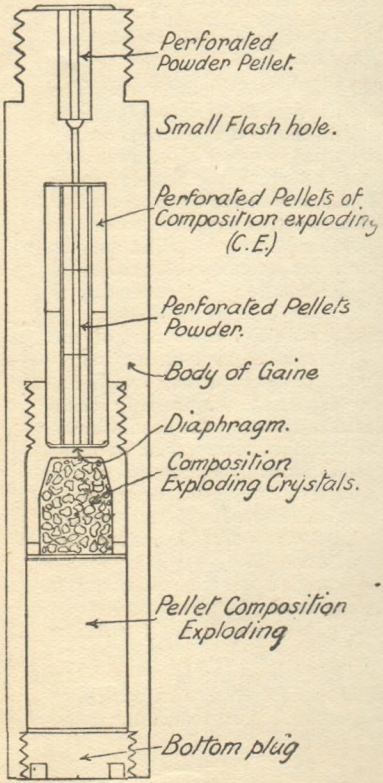
The percussion detonator is fitted in the upper part of the needle pellet recess. The needle is carried on a pivoted block, which is kept housed in the pellet by centrifugal bolts. On discharge, the bolts spin outwards, compressing their springs, disengaging the pellet, and allowing the needle block to revolve about its pivot by centrifugal action, so as to bring the needle underneath the detonator. Spring plungers prevent the pellet creeping forward during flight. On graze or impact the pellet flies forward, depressing the spring plungers, and carries the needle on to the detonator, the flash from which fires the magazine.

The fuze is made in America, and its time of burning differs by about 0·7 in the setting from No. 80 fuze.

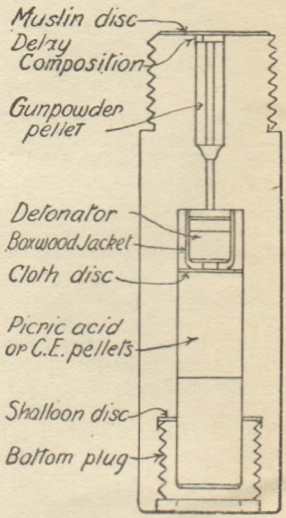
No. 42 key is used for setting, and No. 43 key for fixing and removing the fuze.

NOTE.—These fuzes are sometimes issued with a rubber band round the gas-escape groove. The band must be removed before loading.

Gaine Nº 1.



Gaine Nº 2.



GAINES.

High Explosives used as bursting charges of shell must be comparatively stable and safe substances, as they have to sustain the violent shock of discharge from the gun or howitzer. Such substances require a violent detonation actually in contact with them to ensure that they shall detonate, and not merely explode. The necessary violence can be produced by *successive explosions*, and the gaine is the means to this end.

No. 1 Gaine.

(Used with H.E. shell, filled Trotyl or Amatol.)

The gaine is a steel sleeve or tube. The upper end is threaded to screw into an adapter, which is then screwed into the shell, and the gaine lies in a recess formed in the material of the bursting charge. The flash from the magazine of the fuze explodes the perforated powder pellets. The flame from them passes through a small flash hole and ignites the powder pellets in contact with the exploding composition (C.E.), which detonates and causes the crystals below to detonate. This detonation is passed on with increased violence to the pellet at the bottom, and the filling of the shell is detonated.

No. 2 Gaine.

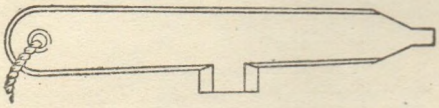
Is intended to supersede No. 1 gaine, and is about half the length. The upper portions of the two patterns are identical. The flame from the perforated powder pellets passes through the flash hole and explodes a detonator enclosed in a boxwood jacket. This detonates two pressed pellets of exploding composition (C.E.), or of picric acid, which in turn detonates some Trotyl crystals contained in a batiste bag which is placed below the gaine, choke down, in the lower part of the recess in the material of the bursting charge. This detonates the filling of the shell.

Note.—A red band round the body of a gaine denotes that it contains C.E., and a yellow band denotes picric acid. There is no difference in use.

Delay Gaines.

A certain number of gaines of both patterns are fitted with a small pellet of DELAY composition, immediately above the perforated powder pellets. This lessens the chance of a premature in the bore of the gun, and also allows time for the shell to penetrate or to rise before detonating, at the point of impact. Gaines prepared in this way are used only with No. 100 fuze ; the cap of the fuze is painted BLUE, and a blue band is painted round the body of the gaine, above the red or yellow band.

No. 10 KEY.



DELAY GAINES—*continued.*

Now that H.E. shells are not to be used with T. and P. fuzes, they can only be burst in the air by means of a ricochet. The ballistics of the 13- and 18-pr. guns only admit of this action at ranges up to about 3,500 yards. Ammunition fitted with Delay Gaines should therefore not be used when firing at longer ranges, nor over ground on which ricochets are not to be expected.

With the 4·5-inch Howitzer, Delay Gaines are only used as a precaution against prematures at the howitzer, and their use will not be necessary with Fuze, No. 100, Mark III. The burst of the 4·5-inch H.E. shell is liable to be smothered and ineffective if it occurs after penetration.

PLUGGING AND FUZING FILLED SHELL.

Particular instructions are noted where necessary under the heads of the several shells and fuzes.

No. 23 key is used for removing or fixing fuze hole plugs. It may be used for fixing D.A. fuzes (with caps), but must NOT be used for removing them.

No. 10 key may be used for the same purposes as 23.

Luting, Mark III, consists of 80 parts of whiting, 20 parts of mineral jelly, and 1 of castor oil. It is best applied with the fingers.

Thin luting consists of Mark III luting and mineral jelly in equal parts. It should be applied with a small brush.

Waterproofing composition consists of 2 parts, by weight, of beeswax, 2½ of French chalk, and 1 part of mineral jelly. This will probably supersede luting.

When inserting set-screws for adapters, plugs, &c., the hole should be filled with Mark III luting, and the surplus wiped off after the screw is in place.

When fixing fuzes, a seating for the set-screw should be made in the thread of the fuze with a bit and brace, after the fuze has been screwed in. The set-screw should be coated with Pettman cement before insertion.

PLUGGING AND FUZING FILLED SHELL—*continued.*

Fuzes not provided with washers should be smeared with Mark III luting under the platform, before insertion, and the screw threads—omitting the lowest three—treated with thin luting.

NOTE.—When circumstances permit, lists should be kept up for each gun of the particulars of the ammunition provided for it, in the order in which it is to be expended. Particulars should include Designation and Mark, Initial of Manufacturer, Monogram of Station, and Date of Filling and Lot Number. The information enables faulty rounds to be identified, and is of assistance in tracing causes of failure.