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HANDBOOK
OF
ENEMY AMMUNITION

PAMPHLET No. 14

GERMAN ROCKET, GUN AND MORTAR AMMUNITION

By Command of the Army Council,

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HANDBOOK
OF
ENEMY AMMUNITION

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German Ammunition

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GERMAN FUZE A. Z. 1.

Fig. 1

This fuze is of the direct action and graze type with an optional delay of 0·15 seconds. It is used with low velocity equipments as a substitute for the AZ 23 (0·15). The design is similar in principle to the latter fuze, but the springs surrounding the centrifugal safety segments and operating the delay shutter are weaker. The fuze may be identified by the stamping " AZ 1 " on the flange as illustrated in Fig. 1.

The fuze consists of the following principle components, steel body, light alloy ballistic cap, wooden needle extension, steel needle, creep spring, six light alloy centrifugal segments, a copper covered expanding spring, detent and spring, steel inertia pellet with detonator, plastic holder, delay mechanism, and securing ring.

All steel components are rust proofed.

The body is screwthreaded below the flange for insertion in the shell and is provided with a domed top which is secured by pressing the top of the flange around the side of the dome. The top of the dome is bored centrally in two diameters and bushed to receive the sleeve and needle holder.

The ballistic cap is attached to the fuze body by canneluring it above the flange and turning its lower edge under the flange. The top of the cap is flat and closed by spinning it over a small disc of the same material.

The wooden rod, 2·3 inches long, forms an extension to the needle under the ballistic cap. Its head is housed in the top of the cap and its lower end is accommodated in a steel sleeve above the needle.

The sleeve protrudes from the top of the dome and its forward movement is limited by a flange which bears against a shoulder in the top of the dome.

The needle is secured in a steel holder which is recessed on its underside to form a seating for one end of the creep spring. The other end of the spring is seated on a shoulder in the inertia pellet. On the underside of the holder are six centrifugal segments each pivoted on a pivot pin.

The segments are kept towards the centre of the fuze by the expanding spring and are so arranged that one, which locks the remainder, is itself locked by a detent with spring which protrudes from the top of the mechanism holder.

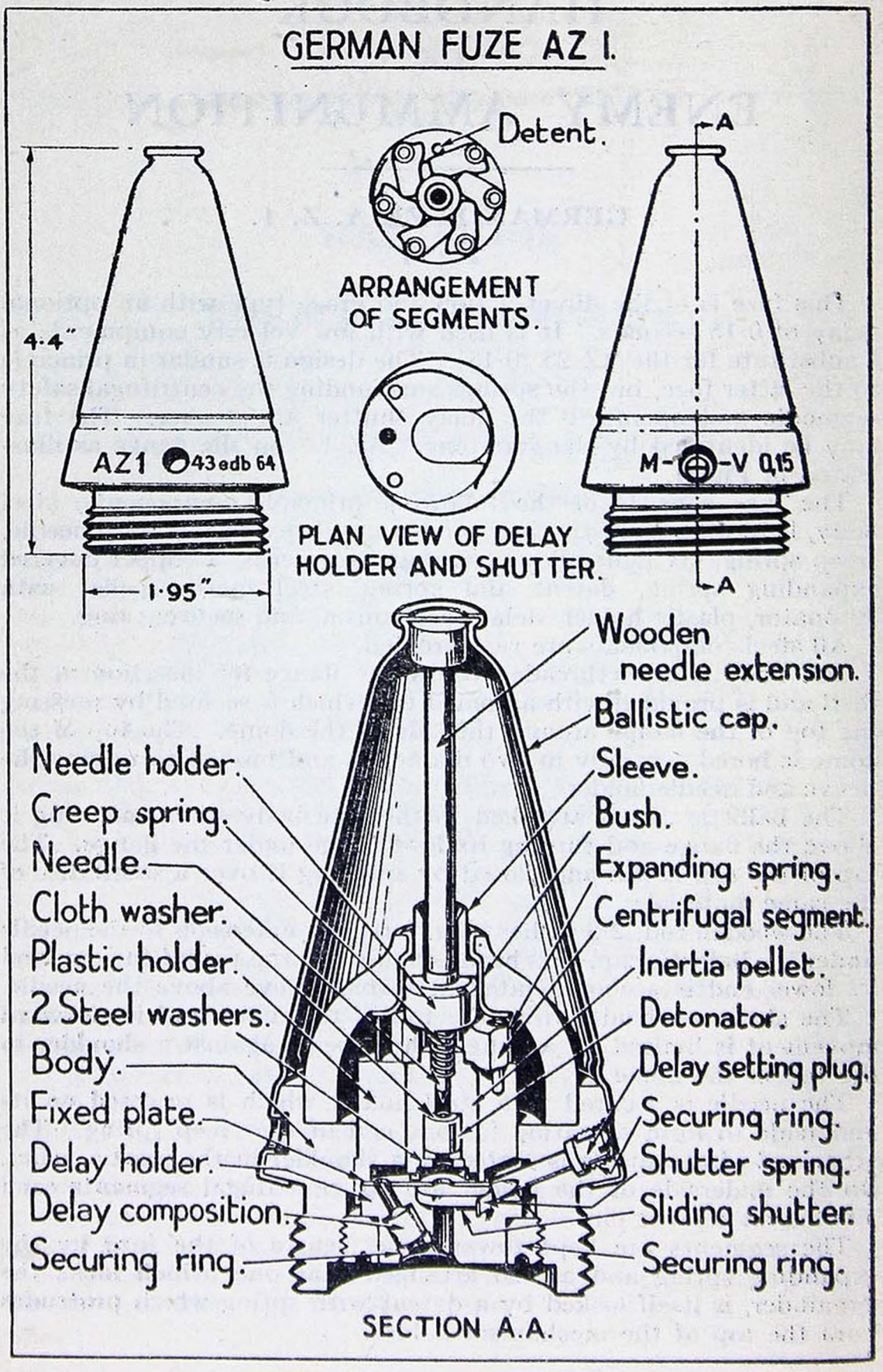

GERMAN FUZE AZ I.
Detent.
ARRANGEMENT OF SEGMENTS.
4·4"
AZ1 43 edb 64
1·95"
PLAN VIEW OF DELAY HOLDER AND SHUTTER.
A
M- -V 0,15
A
Wooden needle extension.
Ballistic cap.
Sleeve.
Bush.
Expanding spring.
Centrifugal segment.
Inertia pellet.
Detonator.
Delay setting plug.
Securing ring.
Shutter spring.
Sliding shutter.
Securing ring.
Needle holder.
Creep spring.
Needle.
Cloth washer.
Plastic holder.
2 Steel washers.
Body.
Fixed plate.
Delay holder.
Delay composition.
Securing ring.
SECTION A.A.

FIG. 1

The mechanism holder is cylindrical and in two diameters ; it is bored centrally to accommodate the inertia pellet. The top of the holder forms a platform for the centrifugal segments ; its underside is recessed to accommodate the delay shutter and to provide a flash channel to the delay filling.

The inertia pellet is bored in three diameters to accommodate at the top the needle and creep spring and, at the bottom the detonator which is secured between a paper disc and a cloth or millboard washer at the top, and two steel washers at the bottom.

The delay mechanism consists of a delay holder, sliding shutter, spring, delay setting plug, thin fixed plate and a screwed securing ring. All these pieces excepting the spring are made from light alloy.

The delay holder is provided with two channels, one bored centrally and empty, and the other bored at an angle so that the top is displaced from the centre and the bottom is in communication with the bottom of the central channel. The inclined channel is filled with a pellet of delay composition secured by a screwed ring. A recess in the top surface of the holder accommodates a centrifugal shutter which, at rest, masks the central channel ; it is retained in this position by a light spring. In flight, movement of the plate is regulated according to the position of the delay setting plug. The setting plug is accommodated in an inclined radial channel in the fuze body and is secured by a screwed ring. The outer end of the plug is slotted for setting purposes and also to serve as an index, and its inner end is chamfered to a screwdriver edge. When set for delay action, it retains the shutter in the closed position, when set to non-delay, the chamfered end of the setting plug permits the shutter to slide outwards, under centrifugal action, to unmask the central channel. A fixed thin plate, with two holes corresponding with the delay and central fire channels, is fitted on the holder and forms an upper bearing surface for the shutter. The holder closes the bottom of the fuze and is retained by a screwed alloy ring.

Action

Before firing.—The needle is separated from the detonator by the centrifugal segments which are retained in the closed position by their spring. The shutter of the delay mechanism closes the central fire channel by the pressure of its spring.

To set the fuze for non-delay action, the slot in the index plug is turned to a position parallel to the axis of the fuze thereby permitting the shutter to slide out under centrifugal action when in flight. For delay action the plug is turned until the slot is positioned at right angles to the fuze axis and in alignment with the stampings " M " and " V 0,5 " on the ballistic cap ; in this position the plug retains the shutter in the closed position.

On firing.—The detent locking the centrifugal segments sets back, the spring surrounding the segments expands, and the segments

swing outwards one after the other under centrifugal action thus allowing the needle and inertia pellet free movement towards each other. The creep spring, however, prevents creep action. If the fuze is set for delay action, the setting plug retains the shutter which masks the central flash channel. If the fuze is set for non-delay action, the position of the setting plug permits the shutter to slide outwards and unmask the central flash channel.

On impact.—The needle is forced on to the detonator by direct action. On graze the inertia pellet carries the detonator on to the needle. The flash from the detonator passes either through the central flash channel or the delay channel according to the setting of the fuze.

GERMAN FUZE Wgr Z. T.

(Fig. 2)

This is a direct action and graze fuze with a plastic body and is used in 5 cm., 8 cm., and 10 cm. H.E. Mortar bombs. The fuze may be identified by the stamping " Wgr Z T " above the flange. An exterior view of the fuze showing stampings is illustrated in Fig. 2.

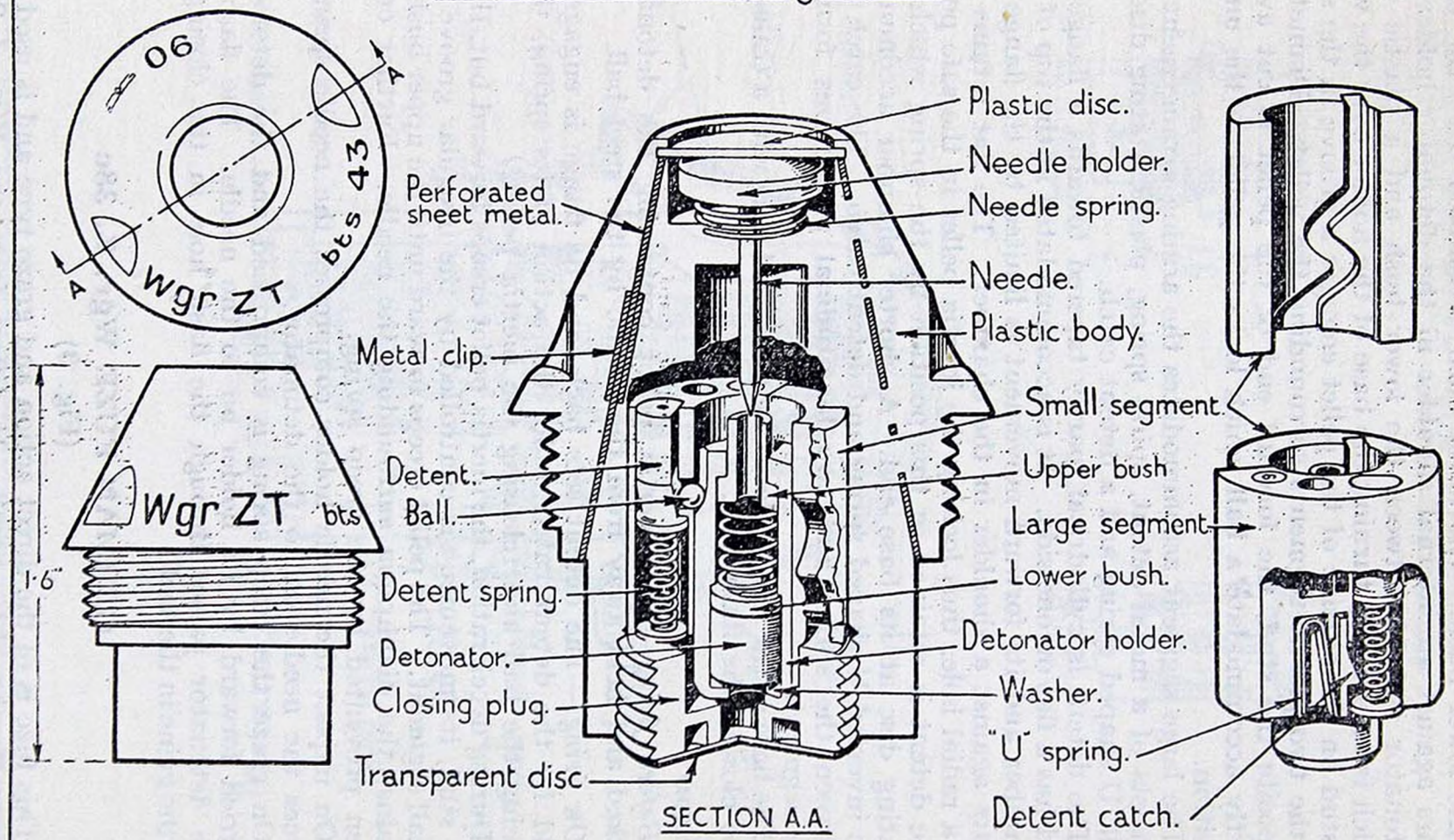
The principal parts are the body, needle, needle spring, inertia pellet with detonator, a large segment housing a detent arming arrangement, a small segment with an irregular groove, and a base closing plug.

The plastic body is reinforced at its forward end by embedding in it, a thin perforated sheet of metal shaped to a cone and joined by a metal clip. The body is bored centrally in three diameters. At the top two chambers, separated by a diaphragm accommodates the needle, needle holder and spiral spring and, below these chambers, another accommodates the fuze mechanism. The top of the fuze is closed by a laminated plastic disc.

The head of the needle is embedded in a plastic holder which has an annular recess on its underside to form a seating for one end of the needle spring. The stem of the needle passes through the diaphragm which also provides a seating for the other end of the spring.

The inertia pellet consists of a white metal detonator holder, upper and lower plastic bushes, creep spring, detonator and plastic washer. The detonator holder is cylindrical, has an internal flange at one end, and is bored centrally in two diameters to form chambers which accommodate the bushes, spring and detonator. The upper bush has an external flange and is inserted in the holder from the bottom so that its smaller diameter protrudes and forms a guide for the point of the needle. It is retained in this position by the spiral creep spring. One end of the spring is seated against the shoulder of the upper bush whilst the other is seated on the shoulder

GERMAN FUZE Wgr. Z.T.



SECTION A.A.

Fig. 2

of the lower bush. The lower bush, assembled from the bottom, bears against an internal shoulder in the detonator holder. The detonator is held between the lower bush and a plastic washer which is secured by turning the base of the holder over the washer. A stud on the outside of the pellet engages a groove in the smaller of the two plastic segments surrounding the pellet. Diametrically opposite the stud, the forward end of the pellet is cut away to partly accommodate a ball which locks the pellet in the unarmed position.

The large segment accommodates the arming arrangement which consists of a metal detent, spiral spring, plastic seating disc, steel ball, U shaped spring and a detent catch.

The detent is cylindrical, partly tapered towards a flanged base and has a flat on one side. It is accommodated in the top of a long chamber and its forward movement is limited by the flange which bears against a shoulder in the chamber. The flat retains a ball in a radial hole, thus locking the inertia pellet in the safe position. The detent is retained in this position by the spring which has a seating disc at its base end. A shorter chamber accommodates the inverted U shaped spring and detent catch. The catch is held between the spring and two longitudinal projections formed in the segment.

The base of the fuze is closed by a screwed plug with a transparent disc closing the flash hole.

Action

Before firing.—The inertia pellet containing the detonator is locked and held away from the needle by the steel ball.

On firing.—The detent sets back, and its flange is engaged and held by the detent catch under the action of its spring, thereby freeing the ball and releasing the inertia pellet.

During deceleration, the inertia pellet creeps forward but, through its stud, its movement is controlled by the irregular groove in the small segment. The pellet creeps forward until the upper bush bears against the diaphragm surrounding the needle. Further creep is then prevented by the creep spring.

On impact the needle holder compresses the needle spring and forces the needle on to the detonator.

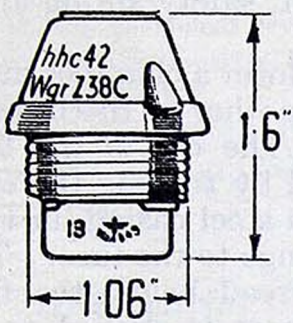
On graze the creep spring is compressed and the detonator is carried forward by its holder on to the needle. The flash from the detonator passes through the flash hole in the closing plug to the gaine in the shell.

GERMAN FUZE Wgr. Z. 38c

(Fig. 3)

This fuze is of the direct action and graze type and is used in the 8 cm. Mortar H.E. bomb. It differs from the Wgr. Z 38 fuze

GERMAN FUZE Wgr Z 38C.



SLEEVE.

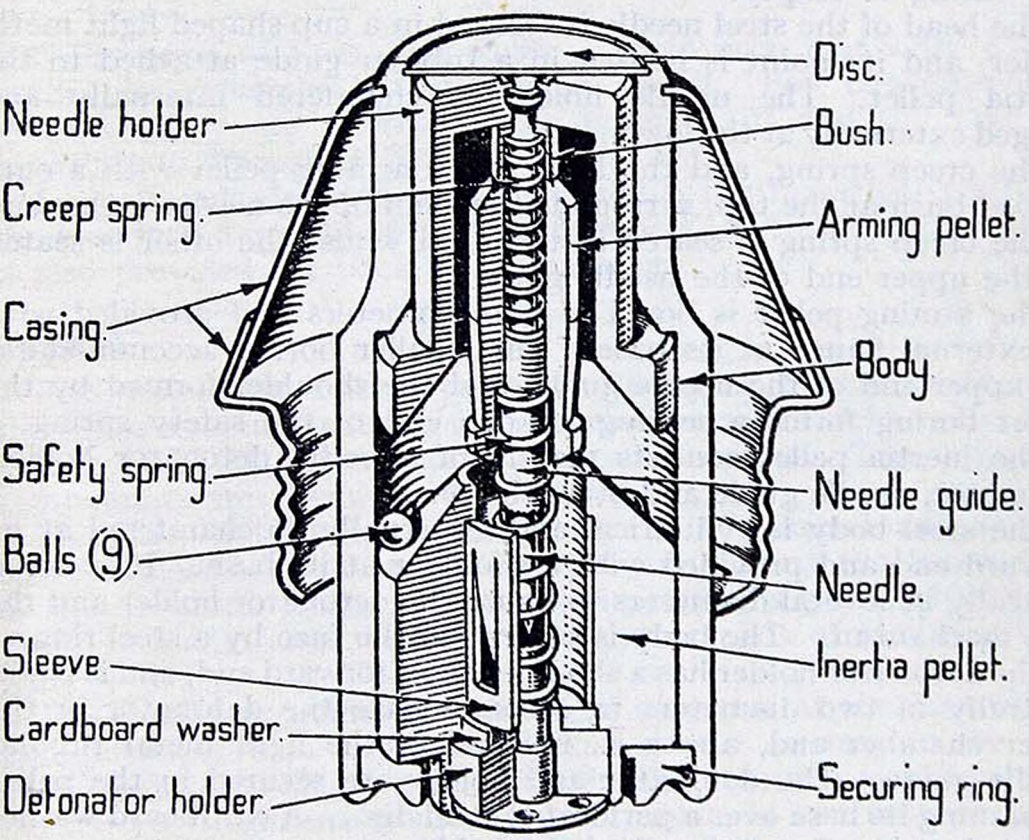


FIG. 3

described in Pamphlet No. 4, principally in that it is not fitted with a gaine and that the fuze body at the nose end is reduced in external diameter and enclosed in a steel casing.

The fuze consists mainly of a steel body, nine steel balls, needle, needle holder, creep spring, arming pellet, safety spring and inertia pellet.

The body is bored in two diameters to form a chamber at the head to accommodate the needle holder and another at the base to house the inertia pellet and nine steel balls. The top of the fuze body is closed by a brass disc which is secured by turning the end of the body over it. Attached to the body is a steel casing, in two parts, which surrounds the head and forms a flange to the fuze. The lower part of the case has a pressed screwthread below the flange for insertion in the bomb and the upper part is shaped to suit the external contour of the bomb. The space between the fuze body and casing is empty.

The head of the steel needle is secured in a cup shaped light metal holder, and its point is housed in a tubular guide attached to the inertia pellet. The needle holder is chamfered internally and flanged externally at the lower end.

The creep spring, and the light metal arming pellet with a cup-shaped bush at the top, surrounds the stem of the needle. One end of the creep spring is seated in the bush whilst the other is seated on the upper end of the needle guide.

The arming pellet is bored in two diameters and provided with an external flange at its base. The smaller boring accommodates the upper end of the needle guide, and the shoulder formed by the larger boring forms a seating for one end of the safety spring.

The inertia pellet consists mainly of a body, detonator holder, detonator, needle guide and brass sleeve.

The steel body is cylindrical and, externally, is chamfered at its forward end and provided with a shoulder at its base. It is bored centrally in several diameters to house the detonator holder and the fuze mechanism. The body is secured in the fuze by a steel ring.

The detonator holder has a shoulder at its forward end, and is bored centrally in two diameters to accommodate the detonator in the lower chamber and, above it, the end of the light metal tubular needle guide. The detonator and holder are secured in the pellet by turning its base over a perforated steel disc. A cardboard washer is fitted to the forward end of the holder.

The brass sleeve is split, and three tongues, cut in its side, are bent inwards to form springs.

The nine steel balls are located between the needle holder and the inertia pellet.

Action

Before firing.—The needle is prevented from coming in contact with the detonator by the nine steel balls.

After firing.—On acceleration the arming pellet, needle holder and needle set back compressing the safety spring. The arming pellet is then held by the springs in the sleeve engaging its flange. The needle is prevented from piercing the detonator by the steel balls. During flight, on deceleration, the needle and its holder are returned to their former position by the action of the creep spring, and the balls creep forward into the recess in the needle holder vacated by the arming pellet.

On impact, the creep spring is compressed and the needle fires the detonator. On graze, the inertia pellet carries the detonator on to the needle.

GERMAN FUZE Wgr. Z 50 + (Type A) for ROCKET PROJECTILES

(Fig. 4)

Three types of Fuze Wgr. Z 50 + have been met with, each is similar in principle but differs in detail. For convenience in reference they are referred to as types A, B and C. The fuze described in Pamphlet No. 13 is type B.

A plastic adapter is provided to enable the fuzes to be fitted in the standard 5 cm. (1·96 inches) fuze hole, and a plastic container is also provided for packing in transport.

Type A

This fuze differs from type B, externally in its contour at about the flange and, internally in the shape of the needle holder, detonator holder and the centrifugal bolts with spring. The remaining components are similar to type B.

The base end of the needle holder is lengthened and recessed on its underside to form a sleeve accommodating the forward end of the detonator holder. The sleeve portion is provided with two radial holes through which pass the inner ends of two centrifugal bolts.

The detonator holder is reduced in diameter at the forward end and provided with a circumferential groove to receive the inner ends of the centrifugal bolts when in the unarmed position.

The centrifugal safety mechanism consists of two bolts each with a spiral spring and securing plug. The bolts are accommodated in radial borings diametrically opposed in the fuze body so that in the unarmed position the bolts pass through the sleeve portion of the needle holder to engage the circumferential groove in the detonator holder. They are retained in this position by a brass spiral spring seated between the outer ends of the bolts and a screwed closing plug. The bolts and the plugs are recessed to form a seating for the spring.

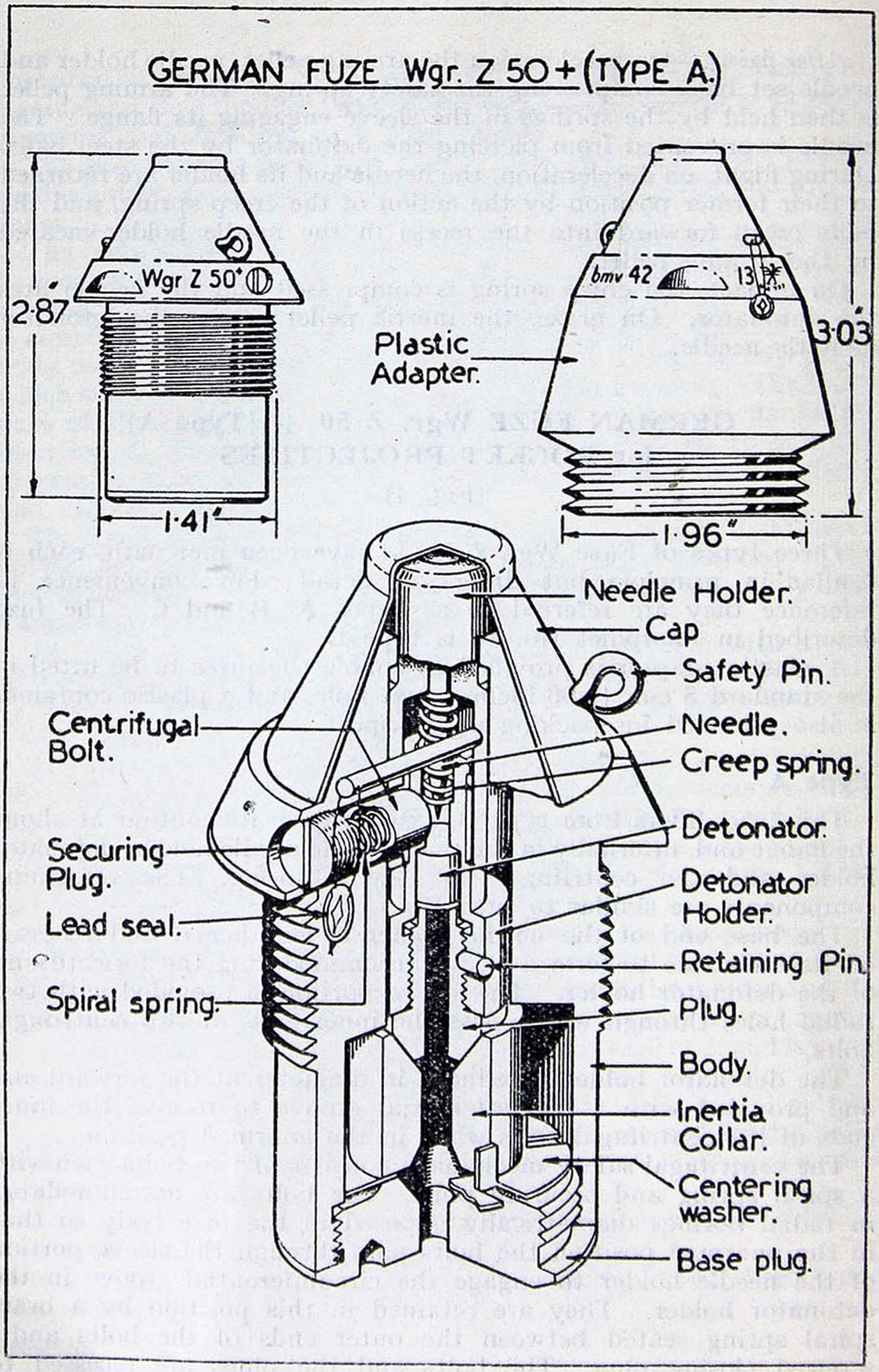

GERMAN FUZE Wgr. Z 50+ (TYPE A.)
Wgr Z 50*
2·87"
1·41"
bmv 42
13
3·03"
Plastic Adapter.
1·96"
Needle Holder.
Cap
Safety Pin.
Centrifugal Bolt.
Needle.
Creep spring.
Detonator.
Securing Plug.
Detonator Holder.
Lead seal.
Retaining Pin.
Spiral spring.
Plug.
Body.
Inertia Collar.
Centering washer.
Base plug.

FIG. 4

Action

Before firing.—The safety pin is withdrawn and the cap removed. The needle is separated from the detonator by the centrifugal bolts which lock the needle holder and detonator holder together.

After firing.—During acceleration the needle holder sets back and prevents the outward movement of the centrifugal bolts until the projectile is well clear of the projector. When the centrifugal force is sufficient to overcome the friction between the needle holder and the bolts and the resistance of the springs, the bolts move outwards thus allowing the needle holder and detonator holder free movement. The needle holder moves forward slightly under the action of the creep spring which also prevents creeping of the detonator holder.

On impact the needle is forced on to the detonator by direct action. On graze the detonator is carried forward on to the needle, or it may be forced on to the needle by a sideways movement of the inertia collar. The flash from the detonator passes through the central fire channel in the inertia collar and base plug to the gaine in the shell.

NOTE.—A red band around the needle holder is exposed when the fuze is in the armed position.

GERMAN NOSE FUZE Kz. C/27 (Lm)

(Fig. 5)

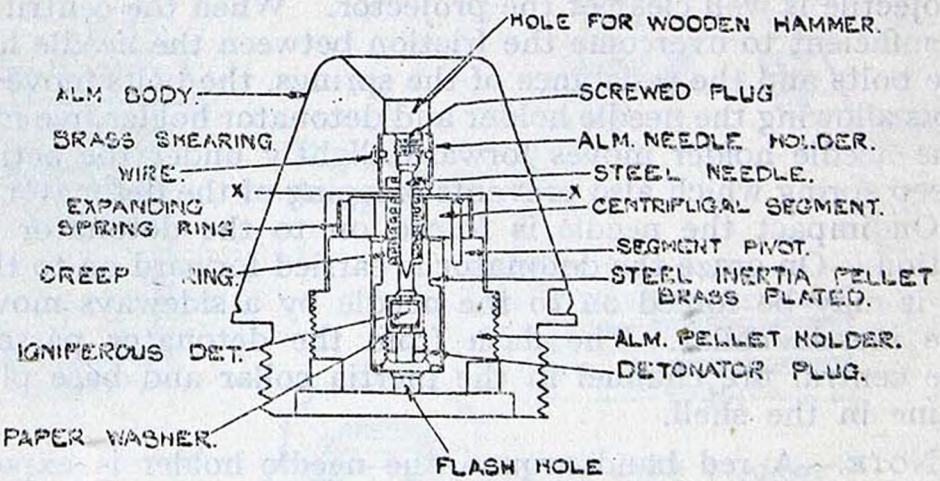
This is an igniferous nose fuze of the direct action and graze type. It is designed to function on impact through a wooden extension rod or on graze, and is used under the ballistic cap of shell of naval design, for heavy guns. The rod forms an extension to the needle. One end is accommodated in a recess in the nose of the fuze body whilst the other is located in the top of the ballistic cap.

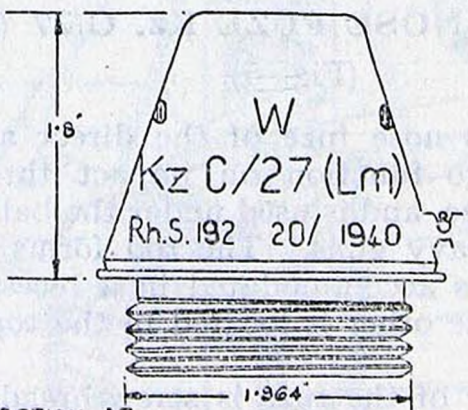
The aluminium body of the fuze is screwthreaded externally at the base for insertion into the shell and recessed internally to take an aluminium needle holder and the graze mechanism.

The needle is of steel and is secured by a steel plug which screws into the needle holder. The needle holder is supported in the body by a brass shearing wire. The stem of the needle is surrounded by a creep spring and the point is accommodated in the top of the inertia pellet.

An aluminium pellet holder with a central flash hole at the base and recessed internally to house the inertia pellet is screwed into the base of the fuze. On top of this holder are five fixed pivots on which are mounted five brass centrifugal segments surrounded by an expanding spring ring of phosphor bronze which maintains them in position overlapping the top of the inertia pellet and preventing it from forward movement.

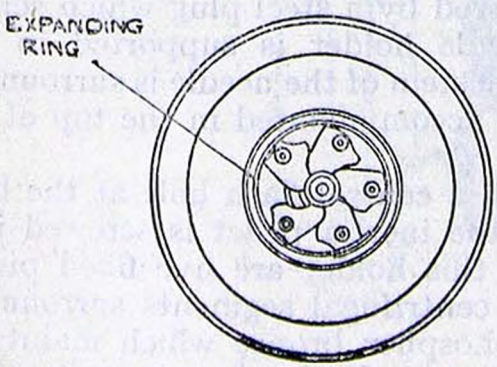
GERMAN FUZE K.Z. C/27 (Lm)





PLAN SECTION AT X-X SHOWING SEGMENTS.

SECTION THROUGH X-X SHOWING INSIDE STAMPINGS AND SCREWED PLUGS HOLDING SHEARING WIRE.



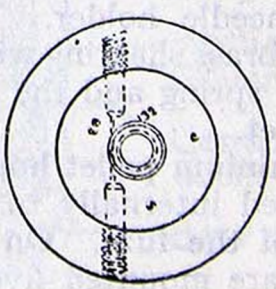


FIG. 5

The inertia pellet which is of steel, brass plated, has a central cavity housing the igniferous detonator and is closed at the base by a paper washer and a brass screwed plug with a central flash hole.

The detonator consists of a copper shell closed at each end by a copper disc ·003 inch thick and contains 2·3 grains of composition above ·86 grains of glazed gunpowder. The composition is made up of mercury fulminate 27·7 per cent., potassium chlorate 38·7 per cent., antimony sulphide 26·9 per cent., and ground glass 6·7 per cent.

Action

On acceleration the needle is prevented from setting back on to the detonator by the segments and possibly by the shear wire. Centrifugal force set up by the projectile in flight causes the spring ring to expand and permit the segments to rotate clear of the inertia pellet thus leaving the needle and inertia pellet held apart by the shear wire and creep spring. On impact the shear wire is broken ; on graze or impact the spring is compressed by the striker being driven in and the graze pellet setting forward. The flash produced by the needle piercing the detonator passes through the flash channel to the gaine of the shell.

GERMAN BASE FUZE Bdz. C/38

(Fig. 6)

This is an igniferous base fuze of the graze type with delay action and is used in shell for heavy guns, the ammunition of which is often of naval design.

The body is of steel, brass plated, and closed at the forward end by a screwed-in brass head with a central cavity and flash hole sealed with a brass disc and varnish. The body is screwthreaded externally for insertion into the shell and recessed internally to take the graze mechanism. The head is screwthreaded internally to take a brass plug which holds a screwed brass delay unit at its forward end.

The needle is of steel and is secured by a steel plug which screws into the needle holder. The point of the needle protrudes into the top of the graze pellet. The recess in the fuze body houses a steel platform which carries five centrifugal segments overlapping the top of the brass graze pellet. The segments are encircled by an expanding ring of phosphor bronze which retains them in the overlapping position and thus prevents forward movement of the graze pellet.

The brass graze pellet, which is closed at the base by a screwed-in steel plug, houses a detonator holder resting on a fibre washer. The detonator consists of a copper shell closed at the top by a copper

GERMAN BASE FUZE Bdz. C/38.

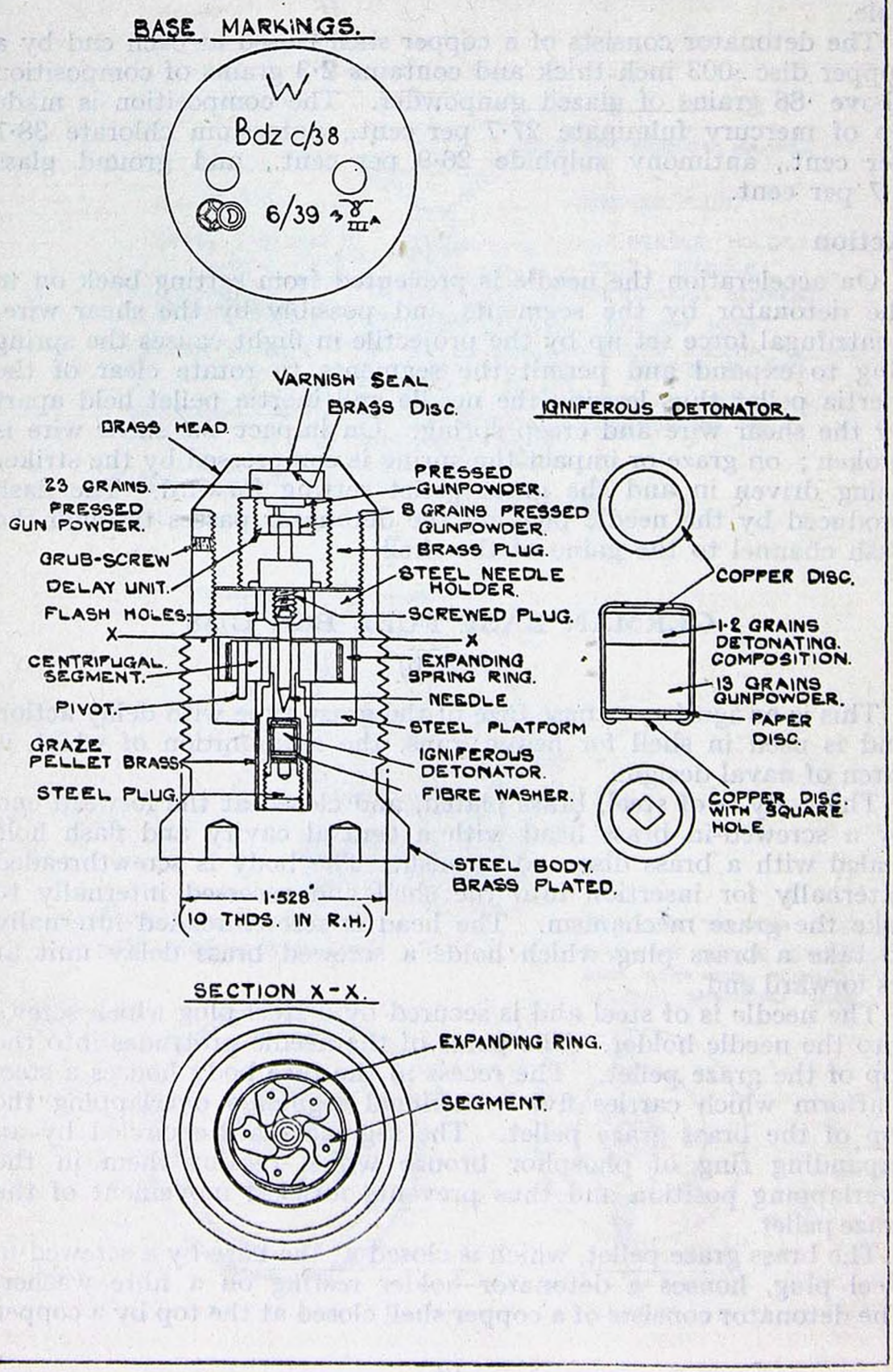


FIG. 6

disc and at the bottom by a copper disc with a square hole in the centre covered by a paper disc. The filling consists of 1·2 grains of detonating composition over 13 grains of gunpowder. The composition is made up of mercury fulminate 21·3 per cent., potassium chlorate 44·0 per cent., antimony sulphide 34·0 per cent., and grit 0·7 per cent.

The delay unit is in the form of a brass plug with a central flash hole in the base and a recess filled with 0·8 grains of pressed gunpowder. An eccentric flash hole leads to a larger recess in the forward end of the unit which contains 1·2 grains of pressed gunpowder. Above the delay unit is a filling of 23 grains of pressed gunpowder contained in a recess in the brass head of the fuze.

Action

Centrifugal force set up by the spin of the projectile in flight causes the spring ring to expand and permit the segments to rotate on their pivots thus freeing the graze pellet which, as there is no creep spring, tends to creep forwards towards the needle. The detonator is pierced immediately on graze or impact and the flash produced passes through the flash holes in the needle holder to the delay unit.

GERMAN BASE FUZE 27/34. Wz. 36. (Polish origin)

(Fig. 7)

This base fuze is of the graze type and used in German 3·7 cm. A.P. shell of Polish origin. A drawing showing its external contour and markings is included in Fig. 7.

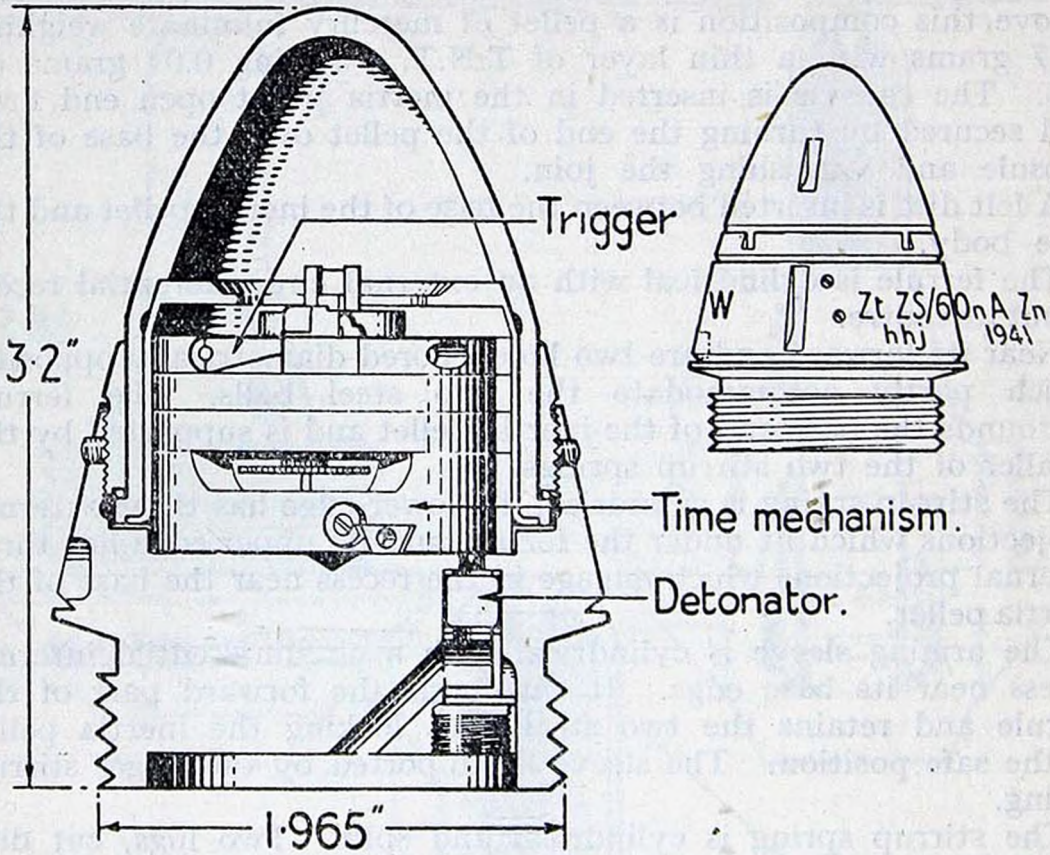
The fuze consists principally of a steel body, steel inertia pellet containing detonating composition, brass ferrule, two steel balls, brass arming sleeve, a small and a large stirrup spring, and a felt disc.

The body is in two parts. The rear part is flanged, and screwthreaded externally for insertion in the shell. Internally, it is screwthreaded to receive the front portion, and bored in two diameters to accommodate the fuze mechanism. The front part is screwthreaded externally at one end for attachment to the rear part, and is tapered to the front to a tubular closed end. The tapered portion is bored radially to form two rows of three holes each. An internal needle is formed in the closed end and is integral with the body.

The inertia pellet is cylindrical with a solid closed base end. Externally, near the base, it is recessed circumferentially, and above the recess are two indents, diametrically opposed, which partly accommodate the two balls.

The pellet contains 0·89 grams of C.E. and a capsule of detonating composition. The copper capsule is cup-shaped with a hole in its base which is closed on its inside by a copper disc 0·003 inches thick.

GERMAN MECHANICAL TIME FUZE (Zt.Z.S/60nAZn).



TRIGGER ARRANGEMENT.

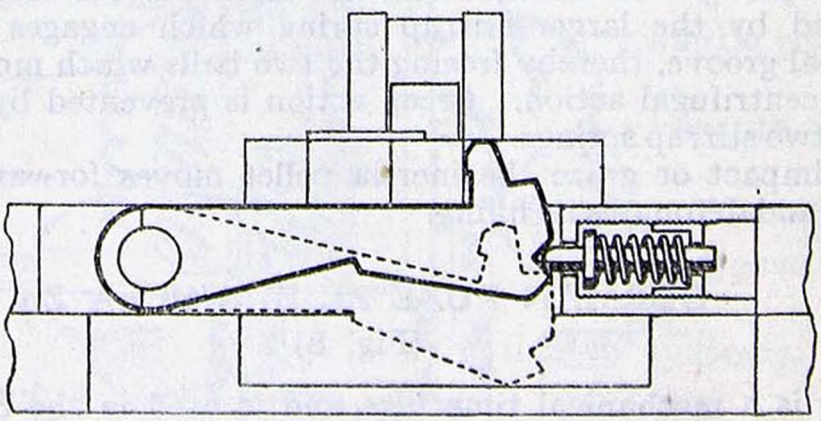


FIG. 8

from other German mechanical fuzes already described, by the low crh. of the fuze cap. Its maximum time of running is 60 seconds. The overall length of the fuze is 3·2 inches and it weighs 1 lb. 4 oz.

The body of the fuze is of zinc alloy, and the nose cap, hand race and screwed collar are of light alloy.

The time mechanism is similar to that of the Dopp.Z.S/60 S, described and illustrated in Pamphlet No. 10, but the hand is of light metal and the trigger plunger, supporting the trigger, is engaged in the end of the trigger instead of the outer side.

GERMAN 7·5 cm. PAK. 41 CARTRIDGE Q.F. A.P.B.C./T. SHOT (Pzgr. Patr. 41 H.K.)

This Q.F. fixed round is used in the 7·5 cm. anti-tank gun model 41. The overall length of the round is 28·8 inches and the weight 17 lb. 2 oz. The exterior of the shell, except the skirts is painted grey green on an undercoat of red. The edges and forward faces of the skirts appear to be treated with a graphitic coating, possibly to function as a lubricant.

The complete round consists of the following components.

A.P.B.C. shot with tungsten carbide core and tracer.
Case stamped with the model number 6344.
Propellant charge of double base composition with igniter.
Primer percussion C/12 nA. St.

Shot. Fig. 9

The total weight of the shot is 5 lb. 11¼ oz. It consists of a soft iron or steel body, a tungsten carbide core, and a ballistic cap with black plastic material between the cap and the core.

The body is in one piece with two collapsible skirts. The rear skirt is cannelured for the attachment of the case, and the forward skirt has 10 equidistant holes in it, each approximately 0·25 inch in diameter. Immediately in rear of the forward skirt the body is reduced in diameter. The body is bored centrally in two diameters to receive the core and tracer respectively and provided with a central hole for the escape of air when assembling the core. The hardness of the body is 90 to 110 V.D.H. with the exception of the tip at the forward end where, probably due to cold work, the hardness increased to 140/150 V.D.H. The density is 7·81 gm. per c.c.

The tungsten carbide core weighs 2 lb. and its density is 15·27 gm. per c.c. The core is coated with white paint before assembly, apparently to ensure a tight fit when pressed into the body. The nose of the core is embedded in a black plastic material which fills the space between the nose and the ballistic cap.

The steel ballistic cap is secured by turning the forward end of the body over its base to form a cannelure. Two holes are provided for the escape of the excess plastic during this operation.

GERMAN 7·5 c.m. Pak 41 A.P.B.C./T. SHOT.

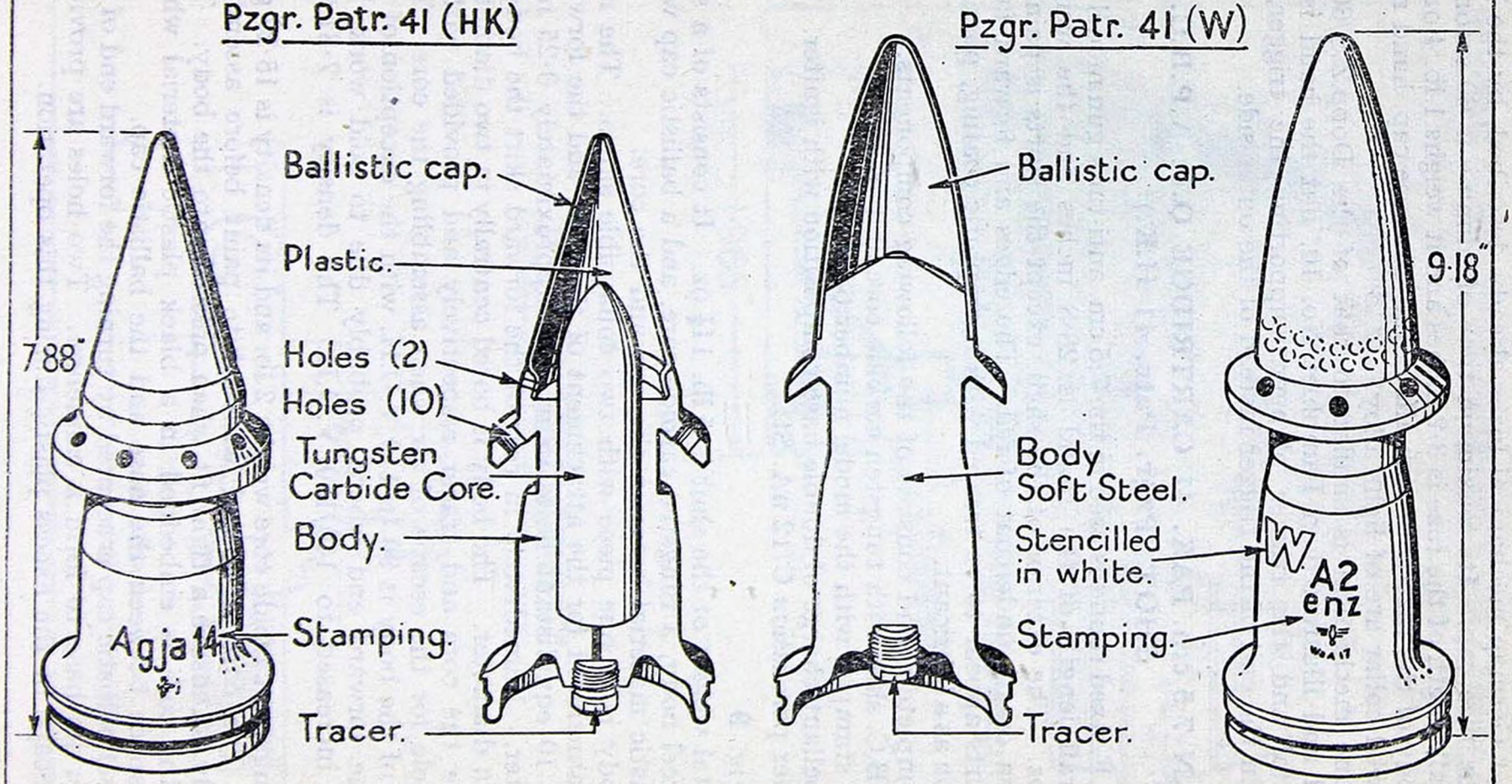


FIG. 9

FIG. 10

Tracer

The tracer weighs 9½ drams. The body is of steel and is screw-threaded for insertion in the shot. The tracer composition is contained in a brass plated steel cup secured by turning over the lip of the body.

Propellant charge

The propellant charge weighs approximately 5 lb. 11 oz. and consists of tubular sticks of Digl. type in two lengths, 16·55 inches and 18·5 inches long respectively. The longer sticks weighing approximately 4 lb. 6½ oz. are contained in a white stocking bag tied at the top, the shorter sticks surround the bag and are not tied. The stocking is in two parts, stitched in the middle, and an igniter is sewn at one end. The stocking is centred by one or two cardboard washers, approximately 2 inches in internal diameter, at the top of the case.

The stocking examined was marked in black

7·5 cm. Pak 41
2·580 Kg.

$$\text{Digl. RP} - \text{G } 1{,}5 \left(\frac{420}{490} - 2{,}5/1\right)$$

dgb 1944/2
Bg. 8. 5. 43 E.

Case

The case is of steel, coated with brass, and is 21·4 inches in length. The base is stamped "7·5 cm. Patrh. (6344) Pak 41," and stencilled in White "Pzgr. 41. H.K." The case examined was not stamped "St" as is usual with German steel cases. The details of the charge as marked on the bag are stencilled on the case.

Primer

The percussion primer C/12 nA. is described in Pamphlet No. 4, page 10. The letters "St" added to the designation indicate that the primer is of steel.

German 7·5 cm. Pak. 41 Cartridge Q.F. APBC/T Shot
(Pzgr. Patr. 41 W.)

This Q.F. fixed round is used in the 7·5 cm. anti-tank gun Model 41, as far as is known for practice only. The overall length of the round is 30 inches, and it weighs approximately 17 lb. The exterior of the shell including the ballistic cap is painted black, except the edges and forward faces of the skirts which appeared to be coated with a graphitic lubricant. The letter W is stencilled in white on the shot body.

The complete round consists of the following components :—

A.P.B.C. shot with tracer.
Case stamped with the model number 6344.
Propellant charge of double base composition with igniter.
Primer percussion C/12 nA St.

Shot. Fig. 10.

The total weight of the shot is 5 lb. 7½ oz. It consists of a solid soft steel shot with two skirts, tracer and ballistic cap. The skirts are integral with the shot. The rear skirt is cannelured circumferentially for the attachment of the case, and the base is bored centrally and screwthreaded internally to receive the tracer. Six equidistant holes approximately 0·24 inch in diameter are bored through the forward skirt. The hardness of the body is almost uniform between 90 and 110 V.D.H. The steel ballistic cap is attached to the shot by two rows of spot welds. The space between the nose of the shot and the ballistic cap is void.

The tracer is similar to that described in the Pzgr. Patr. 41 H.K. round.

Propellant charge case and primer

The propellant charge is similar to that described in the Pzgr. Patr. 41 H.K. round, excepting the diameter of the sticks and the weight of the short ones. The long sticks weighed 2,000 grams and the short ones 666 grams.

The stocking bag is marked in black.

7·5 cm. Pak. 41.
2670 g.

$$\text{Digl. RP—G } 1{,}5 \left(\frac{420}{490} - 2{,}7/1\right).$$

Ktz. 1942/8.
Bg. 8. 3. 43E.

The case and primer is the same as that described in the Pzgr. Patr. 41 H.K. round. The base of the case is stencilled in White " Pzgr. 41 W."

German Cartridge Q.F. 7·5 cm. Pak. 40 Hollow Charge Shell

(7·5 cm. Gr. Patr. 38 H1/B)

This round is of the fixed Q.F. type and is fired from the 7·5 cm. anti-tank gun Model 40. The overall length of the complete round is 38 inches and it weighs approximately 17 lb. 6 oz. The shell body and cap is painted deep olive and stencilled in black, except the stencilling FES which is in white.

The complete round consists of the following components :—

Shell hollow charge filled cyclonite/wax (95/5).
Fuze AZ 38.
Gaine Zdlg 40B.
Propellant charge of double base composition with igniter and flash reducer.
Case of steel coated with brass model 6340 St.
Primer percussion C/12 nA St.

Shell fuze and gaine

The filled shell and AZ 38 fuze are similar to that of the 7·5 cm. L.G. 40 hollow charge shell (Granate 38 H1/B), described in Pamphlet No. 8, pages 24 and 36, and illustrated in Figs. 10 and 15. The gaine is described is Pamphlet No. 13. The stencilling " FES " denotes that the driving band is of the sintered iron type containing (after the removal of the waxy material with which it was impregnated) carbon 0·06 per cent., silicon 0·02 per cent. manganese 0·21 per cent.

Propellant charge

The propellant charge is of the Gudol type in the form of square flakes, weighing approximately 14 oz. 13 dr. with a central tube of Digl. weighing approximately 2 oz. 2 dr. The mean size of the flakes is 0·156 inch × 0·156 inch × 0·22 inch, and the external and internal diameter of the tube 0·55 inch and 0·47 inch respectively. The charge is contained in a knitted viscose rayon bag with an igniter sewn to the base. The bag is marked in red " Auch fur Tropen " and in black 7·5 cm. Pak. 40, 490g. Gu. Bl.P.—AO—(4 . 4 . 0,6).

The igniter consists of 40 grams Nz Man NP (1,5—1,5) in the form of chopped cord.

The compositions, as found by analysis, are as follows :—

Composition	Propellant per cent.	Central Stick per cent.	Igniter per cent.
Nitrocellulose	34·50	63·62	92·29
Nitroguanidine ...	30·27	—	—
Diethylene-glycol-dinitrate	34·17	32·33	5·73
Diphenylamine ...	—	0·23	0·45
Ethyl centralite ...	—	—	—
Sodium sulphate ...	0·62	—	—
Potassium sulphate ...	—	3·52	0·33
Graphite	0·44	0·30	1·20
Total ...	100·00	100·00	100·00

The flash reducer consists of 20 grams of potassium sulphate and is contained in a separate bag of knitted cellulosic material. The bag is stencilled 20g. K_2SO_4.

Case

The case is of steel, coated with brass, and is 28·1 inches in length. The base is stamped with the model number " 6340 St. 7·5 cm. Pak. 40 " and stencilled in white " FES ". Details of the charge as marked on the cartridge bag are stencilled on the case.

Primer

The percussion primer C/12 nA is described in Pamphlet No. 4, page 10. The letters " St " added to the designation indicate that the primer is of steel.

GERMAN CARTRIDGE Q.F. 7·62 cm. Pak 36 APBC/T. SHOT WITH T.C. CORE

(7·62 cm. Panzergranat-Patrone 40)

This cartridge is used with the 7·62 cm. Pak 36 anti-tank gun. The overall length of the complete round is approximately 36·7 inches and it weighs 19 lb. 9½ oz. The shot is painted black and stencilled in red except the white letters " KPS " denoting that the driving band is iron covered with copper. The cartridge case is stamped in the base " 6340 St. 7·5 Pak 40 " and apparently is a converted case. The complete round for the 7·62 Pak 36 may, however, be readily identified by the white tip 1·58 inches long on the ballistic cap.

The fixed Q.F. Cartridge consists of the following components :—

APBC Shot with T.C. Core
Tracer
Brass Case or steel case coated with brass
Propellant charge
Percussion primer C/12 nA. St.

Shot (Panzergranate 40) Fig. 11

The Shot with its ballistic cap is 9.45 inches in length and, without tracer, weighs 8 lb. 10 oz. The steel body is a machined forging, and that portion of the cavity surface forming a housing for the plastic is coarsely machined probably to make a good bond with the plastic. It is screwthreaded in the base to receive a core holder and externally at the shoulder to receive a ring adapter securing the ballistic cap. The base is recessed to form a cannelure when the core holder is assembled.

GERMAN 7·62 cm. Pak 36 A.P.B.C./T. SHOT WITH T.C. CORE.
(7·62 cm. Panzergranate-Patrone 40)

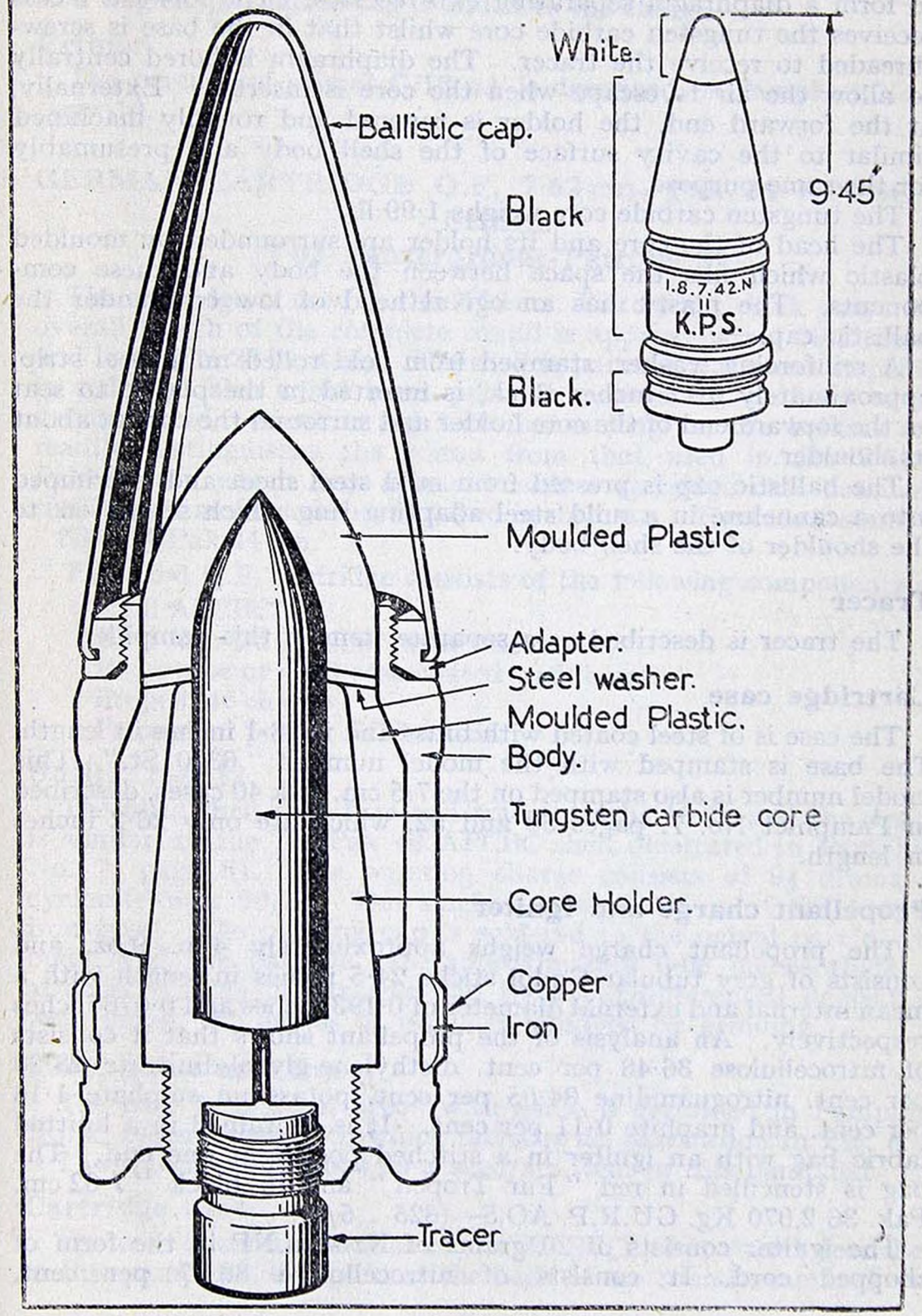


FIG. 11

The single driving band is of soft iron with a coating of copper. A cannelure for the attachment of the case is formed in rear of the driving band.

The core holder is of steel, and is bored centrally in two diameters to form a diaphragm separating two recesses. The forward recess receives the tungsten carbide core whilst that in the base is screw-threaded to receive the tracer. The diaphragm is bored centrally to allow the air to escape when the core is inserted. Externally, at the forward end, the holder is tapered and roughly machined similar to the cavity surface of the shell body and presumably for the same purpose.

The tungsten carbide core weighs 1·99 lb.

The head of the core and its holder are surrounded by moulded plastic which fills the space between the body and these components. The plastic has an ogival head of low crh. under the ballistic cap.

A reinforcing washer, stamped from cold rolled mild steel strip, approximately 0·12 inches thick, is inserted in the plastic to seat on the forward end of the core holder and surround the core at about its shoulder.

The ballistic cap is pressed from mild steel sheet and is crimped into a cannelure in a mild steel adapting ring which screws on to the shoulder of the shell body.

Tracer

The tracer is described as a separate item in this pamphlet.

Cartridge case

The case is of steel coated with brass and is 28·1 inches in length. The base is stamped with the model number " 6340 St." This model number is also stamped on the 7·5 cm. Pak 40 cases, described in Pamphlet No. 7, pages 50 and 52, which are only 26·2 inches in length.

Propellant charge and igniter

The propellant charge weighs approximately 4 lb. 9 oz. and consists of grey tubular Gudol sticks 24·5 inches in length with a mean internal and external diameter of 0·193 inches and 0·076 inches respectively. An analysis of the propellant shows that it consists of nitrocellulose 36·48 per cent. diethylene-glycol-dinitrate 28·20 per cent. nitroguanidine 34·05 per cent. potassium sulphate 1·16 per cent. and graphite 0·11 per cent. It is contained in a knitted fabric bag with an igniter in a stitched pocket at one end. The bag is stencilled in red " Fur Tropen " and in black " 7·62 cm. Pak. 36 2,070 Kg. GU.R.P. AO,5—(625 . 5/2).

The igniter consists of 20 grams of Nz.Man.NP in the form of chopped cord. It consists of nitrocellulose 86·67 per cent.

diethylene-glycol-dinitrate 9·53 per cent. diphenylamine 0·42 per cent. ethyl centralite 0·83 per cent. graphite 0·70 per cent. potassium sulphate 0·25 per cent. and camphor 1·60 per cent.

A flash reducer consisting of 1 oz. 2 dr. of potassium sulphate in a ring shaped fabric bag is added to the charge.

Primer

The percussion primer C/12 nA is described in Pamphlet No. 4, page 10.

GERMAN CARTRIDGE Q.F. 7·62 cm. Pak 36 APCBC/T. SHELL

(7·62 Panzergranat-Patrone 39)

The cartridge is used in the 7·62 cm. Pak 36 anti-tank gun. The overall length of the complete round is approximately 39·2 inches, and it weighs 28 lb. 4 oz. The shell is painted black and stencilled in red, and also a red band painted immediately in front of the driving band. A white tip 1·58 inches long on the ballistic cap readily distinguishes the round from that used in the 7·5 cm. Pak 40 gun which fires a round with a cartridge case bearing a similar case model number stamped in the base. The case is stamped " 6340 St Pak 44 Rh."

The fixed Q.F. cartridge consists of the following components :—

Shell APCBC.
Base fuze Bd Z 5103* with tracer.
Brass case or steel case coated with brass.
Propellant charge
Percussion primer C/12 nA St.

Shell. Fig. 12

The filled shell with fuze and tracer weighs 16 lb. and the design is similar to the 7·5 Pak 40 APCBC shell illustrated in Pamphlet No. 7, page 51. The bursting charge consists of 9½ drams of cyclonite wax 90/10. The single driving band is of the copper-iron type. The piercing cap is soldered to the ogival part of the body, and the ballistic cap, approximately 0·06 inches thick, is attached to the penetrative cap by a circumferential deposit of weld metal, the excess of which is removed by grinding.

Fuze, gaine and tracer

The base fuze Bd Z 5103* with gaine is described in Pamphlet No. 4, pages 14 and 15, which includes an illustration in Fig. 8.

The tracer is described as a separate item in this pamphlet.

Cartridge case

The case is similar to that of the APBC/T Shot round described in this pamphlet, except that the base of the round examined was

Shell

The weight of the shell filled and fuzed is approximately 20 lb. 8 oz. The shell is painted yellow and stencilled in black. The numeral " 13 " stencilled on the shell shoulder indicates the bursting charge is amatol 40/60 which weighs approximately 1·9 lb. The shell is streamlined, has a solid base, and is fitted with two soft iron driving bands and an exploder container carrying the gaine " Gr Zdlg C/98."

Fuzes and gaine

Details of fuze Zt Z S/30 Fg[1] are given in Pamphlet No. 8, page 16, and the gaine Gr Zdlg C/98 in Pamphlet No. 6, page 14.

Cartridge case and primer

The cartridge case and primer are identical to that used with the APCBC/T round described in Pamphlet No. 13.

Propellant charge and igniter

The propellant is flashless, and basically of the same composition as that used in the APCBC/T cartridge. It is tubular in form but of slightly different size as indicated by the markings stencilled on the case. The bag containing the charge has an igniter containing 20 grams of nitrocellulose powder sewn to its base. The weight of the charge as indicated by the stencilling on the case is 5,355 kg. (13 lb. 13 oz.) and the stencilling " TROPEN " on the case indicates that the charge is suitable for hot climates. The designation indicating the nature and size of the propellant, as stencilled on the case, is " Gu. R.P. — KN — (740 — 4,2/1,5) ".

GERMAN 8·8 cm. FLAK STAR SHELL

(Fig. 13)

The shell is of the base ejection type and is of conventional design. The filled shell with fuze weighs approximately 20 lb. 6 oz. and its overall length is 15·57 inches. It is fitted with two driving bands and is painted a light green with a black tip immediately below the fuze. The shell is not cannelured for the attachment of the case. The shell examined was stencilled in white " rdf V1. 41 ". The fuze Zt.Z.S/60 nA Zn is described as a separate item in this pamphlet.

The shell body is formed with a diaphragm at the head end which is bored centrally and screwthreaded to receive a primer. The recess above the diaphragm is screwthreaded to receive the fuze which is secured by a grub screw.

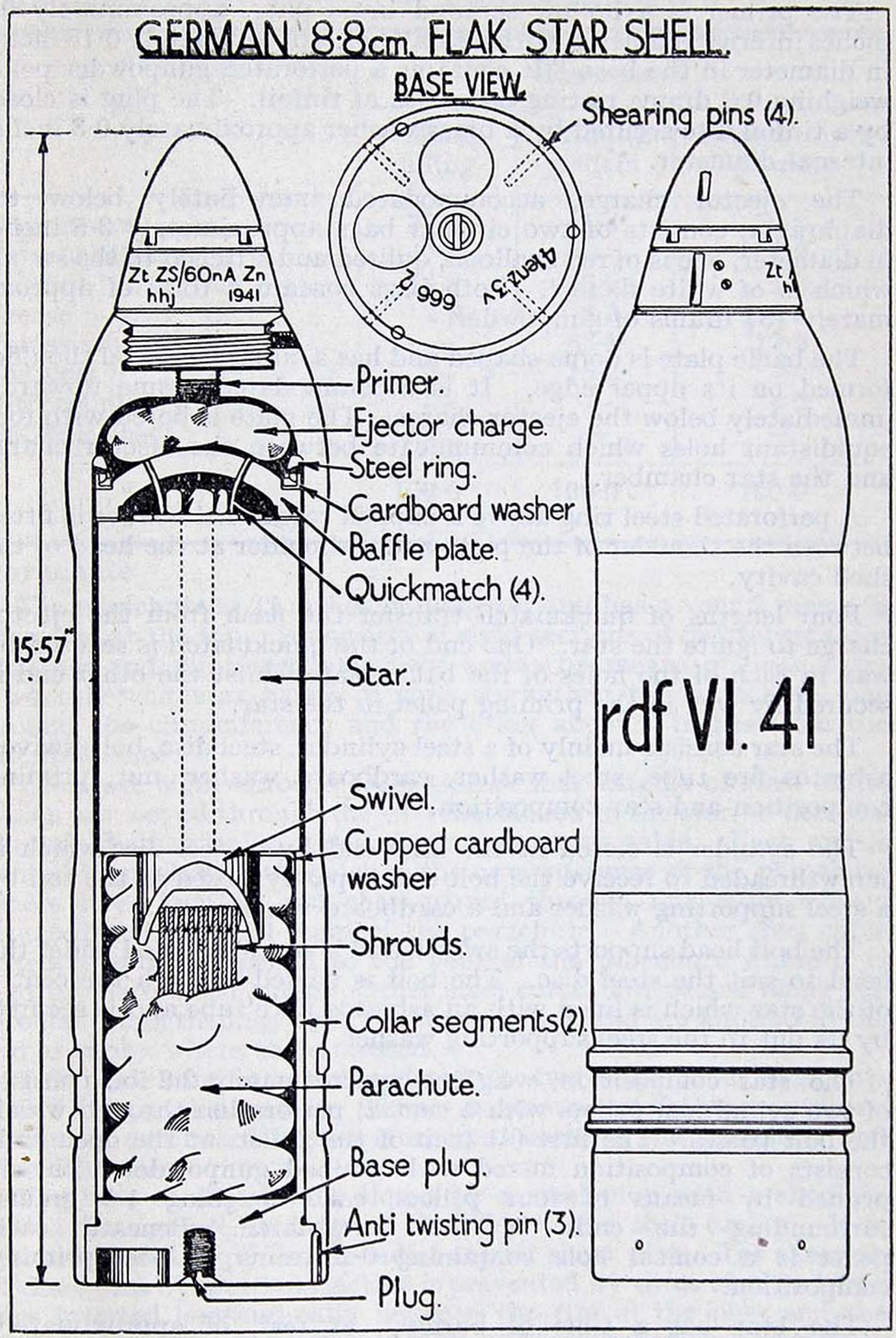

GERMAN 8·8cm. FLAK STAR SHELL.
BASE VIEW.
Shearing pins (4).
Zt ZS/60nA Zn
hhj 1941
15·57"
Primer.
Ejector charge.
Steel ring.
Cardboard washer
Baffle plate.
Quickmatch (4).
Star.
Swivel.
Cupped cardboard washer
Shrouds.
Collar segments (2).
Parachute.
Base plug.
Anti twisting pin (3).
Plug.
rdf VI. 41

FIG. 13

The primer is a hollow screwed brass plug, approximately 0·4 inches internal diameter, with a small hole approximately 0·15 inches in diameter in the base. It contains a perforated gunpowder pellet weighing 0·6 drams resting on a disc of tinfoil. The plug is closed by a tinfoil disc secured by a brass washer approximately 0·3 inches internal diameter.

The ejector charge, accommodated immediately below the diaphragm, consists of two circular bags approximately 3·5 inches in diameter, one is of red shalloon, quilted and stitched to the second which is of white flannel. Both bags contain a total of approximately 13½ drams of gunpowder.

The baffle plate is dome-shaped and has a circumferential shoulder formed on its upper edge. It is accommodated, dome upwards, immediately below the ejector charge. The plate is bored with four equidistant holes which communicate between the ejector charge and the star chamber.

A perforated steel ring above a cupped cardboard washer is fitted between the shoulder of the plate and a shoulder at the head of the shell cavity.

Four lengths of quickmatch transfer the flash from the ejector charge to ignite the star. One end of the quickmatch is secured by wax in each of the holes of the baffle plate whilst the other end is secured by wax in the priming pellet in the star.

The star consists mainly of a steel cylinder, steel disc, bolt, swivel, asbestos fire tube, steel washer, cardboard washer, nut, priming composition and star composition.

The cylinder is closed at the base end by a steel disc which is screwthreaded to receive the bolt and is partly closed at the top by a steel supporting washer and a cardboard washer.

The bolt head supports the swivel, and is screwthreaded under the head to suit the steel disc. The bolt is passed through the centre of the star which is lined with an asbestos fibre tube and is secured by its nut to the steel supporting washer.

The star composition, weighing approximately 2·2 lb., consists of two cylindrical pellets with a central perforation through which the bolt passes. The first 0·1 inch of the pellet, at the open end, consists of composition mixed with grained gunpowder. This is primed by means of four pellets, each weighing 1·5 grams, surrounding the ends of the quickmatch. Beneath each pellet is a conical hole containing 0·2 grams of loose priming composition.

The star has a time of burning, at rest, of approximately 23 seconds, and a light intensity of approximately 375,000 candles.

The compositions, as found by analysis, consist of :—

	Per cent.		
	Main filling	Priming pellets	Intermediate priming
Magnesium	33·7	1·4	70·8
Barium nitrate	47·3	—	1·2
Sulphur	14·9	6·6	1·9
Grease	2·9	8·3	4·2
Potassium nitrate ...	—	68·5	17·9
Charcoal	—	15·2	—
Nitrocellulose	—	—	4·0
Residue (insol.)	1·2	—	—
	100·0	100·0	100·0

Parachute

The parachute is 22 inches in diameter and has a vent 2 inches in diameter at the top. It consists of eight sections of flax fabric sewn together and reinforced along the seams by means of linen tape. Two other circular bands of tape strengthen the parachute, one around the circumference and the other about 3 inches from the circumference.

There are eight shrouds consisting of four lengths of steel cable, which are looped through the swivel attached to the star, so that the shrouds diametrically opposite are continuous cable. Each end is passed through a steel eyelet in the circumference of the parachute where it is knotted and then passed through five more eyelets situated in the radial seam of the parachute. Another steel cable extends from the swivel to the vent of the parachute where it is tied to the crossed cable. Other steel cables are passed along the circular strengthening tapes in the parachute and are knotted to the radial cables where these crossed.

The parachute is accommodated in two steel collar segments which line the shell cavity. The segments support the star container. A cupped cardboard washer is inserted between the parachute and star container.

The base of the shell is closed by a steel plug with a shoulder which fits against an internal shoulder in the shell cavity. It is secured by four equidistant radial copper shear pins. The shearing of these pins by rotational action is prevented by three steel twisting pins inserted longitudinally between the rim of the plug and the shell body. The base of the plug is bored centrally and screw-threaded to enable a tracer to be fitted.

Action

The ignition of the ejection charge is initiated by the fuze through the primer. Pressure set up on the baffle plate is transmitted through the star cylinder and parachute protecting segments to the base plug thereby causing the shearing pins to break and the whole to be ejected. At the same time, the quickmatch is ignited and after a short interval which allows time for the parachute to open, ignition of the star composition takes place.

GERMAN 10 cm. leF.H.18 HOLLOW CHARGE SHELL (10 cm. Gr. 39 rot. Hl/A, Hl/B and Hl/C)

(Fig. 14)

A 10 cm. leF.H.18 hollow charge shell, designated " 10 cm. Gr. 39 rot Hl " is described in Pamphlet No. 8 and illustrated in Fig. 20. Shell of later design with a letter " A ", " B " or " C " added to the abbreviation " Hl ", are illustrated in Fig. 14. These shell differ from the former design mainly in the shape of the shell cap, filling, shape of the hollow cavity in the bursting charge and the model of the gaine. The shell bodies of the latter three types are similar, but differ in the method of securing the cap as shown in Fig. 14. The overall length of the shell, with fuze, is 19·75 inches. The present standard issue is design Hl/C.

The fuze used in each is the AZ 38 described in Pamphlet No. 8 and illustrated in Fig. 10. The gaine " Zundladung 41 " is described in Pamphlet No. 13.

Shell design " Hl/A "

The weight of the shell filled and fuzed is 26 lb. 14½ oz. The wall of the shell is comparatively thin, and the cavity for the bursting charge tapers towards the base. An internal screwthread is formed at the front end to receive the base of the cap which is secured by a rivet. The cap is of greater crh than that of the shell of original design. The single driving band is 0·59 inches wide and of the ferrous type.

The bursting charge, indicated by the numeral " 95 " stencilled on the shell body, is cyclonite, T.N.T. and wax, the percentage of each being approximately 57, 40 and 3 respectively. It weighs 3 lb. 4 oz. 9 dr. and is in three blocks. The blocks are contained in a waxed paper carton and are secured to the shell by a bituminous composition lining the walls. A blue label, printed in black, and affixed to the carton, reads as follows :—

Sprengladung
der 10 cm Gr 39
H.5 (SH) krl 1941
Fp 02 (umkr) elg 1941
rdf 95 93/1941

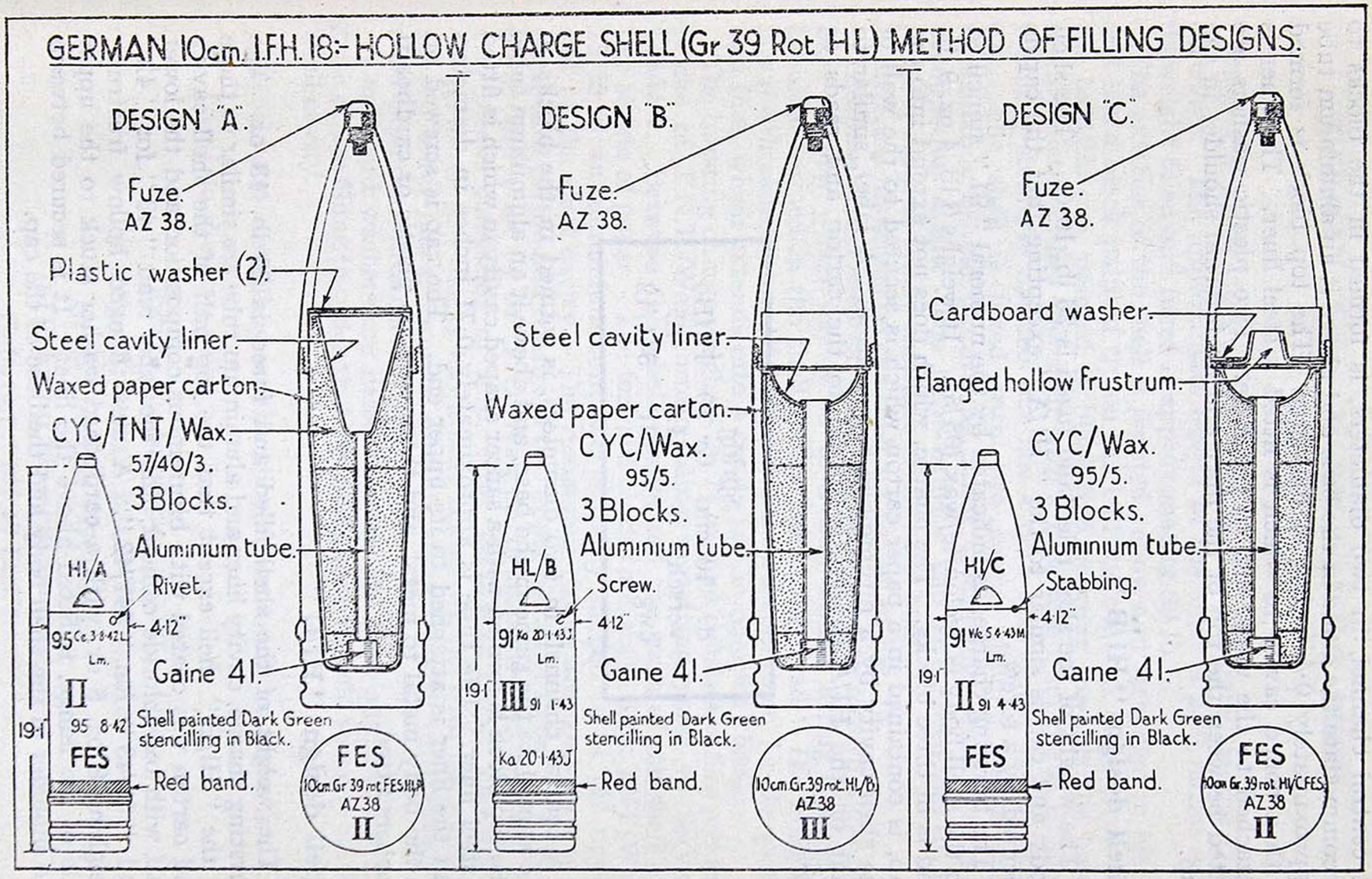

GERMAN 10cm. I.F.H. 18:- HOLLOW CHARGE SHELL (Gr 39 Rot HL) METHOD OF FILLING DESIGNS.
DESIGN "A".
Fuze. AZ 38.
Plastic washer (2).
Steel cavity liner.
Waxed paper carton.
CYC/TNT/Wax. 57/40/3.
3 Blocks.
Aluminium tube.
Rivet.
4·12"
Gaine 41.
19·1"
HL/A
95 Ce 3 8 42 L Lm.
II
95 8 42
FES
Shell painted Dark Green stencilling in Black.
Red band.
FES 10cm Gr 39 rot FES HL/A AZ 38 II
DESIGN "B".
Fuze. AZ 38.
Steel cavity liner.
Waxed paper carton.
CYC/Wax. 95/5.
3 Blocks.
Aluminium tube.
Screw.
4·12"
Gaine 41.
19·1"
HL/B
91 Ka 20 1 43 J Lm.
III 91 1 43
Ka 20 1 43 J
Shell painted Dark Green stencilling in Black.
Red band.
10cm Gr 39 rot. HL/B. AZ 38 III
DESIGN "C".
Fuze. AZ 38.
Cardboard washer.
Flanged hollow frustrum.
CYC/Wax. 95/5.
3 Blocks.
Aluminium tube.
Stabbing.
4·12"
Gaine 41.
19·1"
HL/C
91 Vic 5 4 43 M Lm.
II 91 4 43
FES
Shell painted Dark Green stencilling in Black.
Red band.
FES 10cm Gr. 39 rot. HL/C FES. AZ 38 II

FIG. 14

A central channel, in two diameters, is formed in the blocks to accommodate the gaine in the base and above it an aluminium tube approximately 0·4 inches in diameter. The top block is formed with a coned cavity in which is fitted a steel liner. The liner is attached to the upper end of the tube. Two plastic washers are fitted between the top of the liner and an internal shoulder in the cap.

Shell design " Hl/B "

The weight of the shell filled and fuzed is 26 lb. 10 oz. The shell body and cap is similar to the " Hl/A " excepting that the cap is secured by a screw.

The bursting charge, as indicated by the numeral " 91 " stencilled on the shell body is cyclonite/wax (95/5). It weighs 3 lb. 4 oz. 9 dr. and is in three blocks. The charge, which does not extend into the cap, is contained in a paper carton which is secured to the wall of the shell cavity by a bituminous composition. A label, similar to that on the Hl/A charge, is affixed to the carton and reads as follows :—

		Sprldg	
d.	10 cm.	Gr 39	Hl/B
versch	.	H.5	42
cwg.		91	541/42

A central channel, in two diameters, is formed in the blocks to accommodate the gaine in the base, and above it an aluminium tube. The top block is formed with a saucer shaped cavity in which is fitted a steel liner. The tube is approximately 0·71 inches in diameter, and the liner is attached to its upper end. The cap is screwed on to the body metal to metal, and there were no plastic or cardboard washers fitted.

Shell design " Hl/C "

The weight of the shell filled and fuzed is 26 lb. 13 oz. The bursting charge, cavity liner and aluminium tube are similar to those in the " Hl/B " shell except that the top half of the shell cavity and carton was coated with bituminous composition and the lower half with oxychloride cement, and the label read " 43 " for " 42 " and " 55/43 " for " 541/42 ". A steel flanged hollow frustrum, weighing 8 oz. 5 dr. with a cardboard washer stuck to the upper side of the flange, is fitted above the liner. It is secured between the shoulder in the shell body and the base of the cap.

GERMAN 15 cm. (NAVAL) A.P.B.C. SHELL

(Fig. 15)

This is a naval shell and is fired with a separate loading Q.F. cartridge. The approximate length of the shell is 24·8 inches and its weight filled and fuzed is approximately 99 lb.

The exterior of the shell is painted yellow and stencilled in black and has a black painted tip on the ballistic cap. A large arrow on the ballistic cap, painted in black and pointing towards the base, readily distinguishes this shell with a base fuze from the H.E. shell which is similarly marked but has a nose fuze under the ballistic cap. The shell is fitted with two copper driving bands and, immediately behind the driving bands, a lead ring which acts as a decoppering agent. The light ballistic cap is screwed on to an adapter secured to the shoulder of the shell body.

External markings on the shell are shown in Fig. 15.

The base of the shell cavity is screwthreaded to receive a flanged base adapter which screws on to a lead washer fitting against a shoulder formed in the shell cavity below the tread. The adapter is screwthreaded internally to receive a steel container, for the gaine and fuze, which extends into a cavity in the bursting charge.

The bursting charge weighs 4 lb. 7½ oz. and consists of five pressed blocks of T.N.T./Wax corresponding in setting point to Service Grade 1. Between the whole charge and the walls of the shell are two sheets of paper. The forward block consists of 6 oz. TNT/Wax 75/25 in an aluminium container suitably shaped to fit the upper end of the shell cavity. The remaining blocks are contained in a cardboard carton and consist of two upper blocks of 13 oz. TNT/Wax 80/20 and 1 lb. 0½ oz. TNT/Wax 85/15 respectively, followed by two blocks consisting of 2 lb. 4 oz. TNT/Wax 95/5. The upper of the lower two blocks has a base cavity which, with the annular shaped lower block, forms a suitably shaped cavity to receive the steel exploder container.

Cardboard washers are fitted between the base adapter and the base of the filling in order that the filling may be held securely in the shell cavity.

Labels and stencilling on the filling were found as under :—

Label on the nose pellet :—

Zweiteilige Sprengladung fur
15 cm Spgr L/4, 2u. L/4, 3 Bdz (m.Hb)
Nr 313 St 5114 (37/40a) ul
0,170 kg Fp 25 — elg umkr 40
Gefertigt : rdf 40 Lief 1.

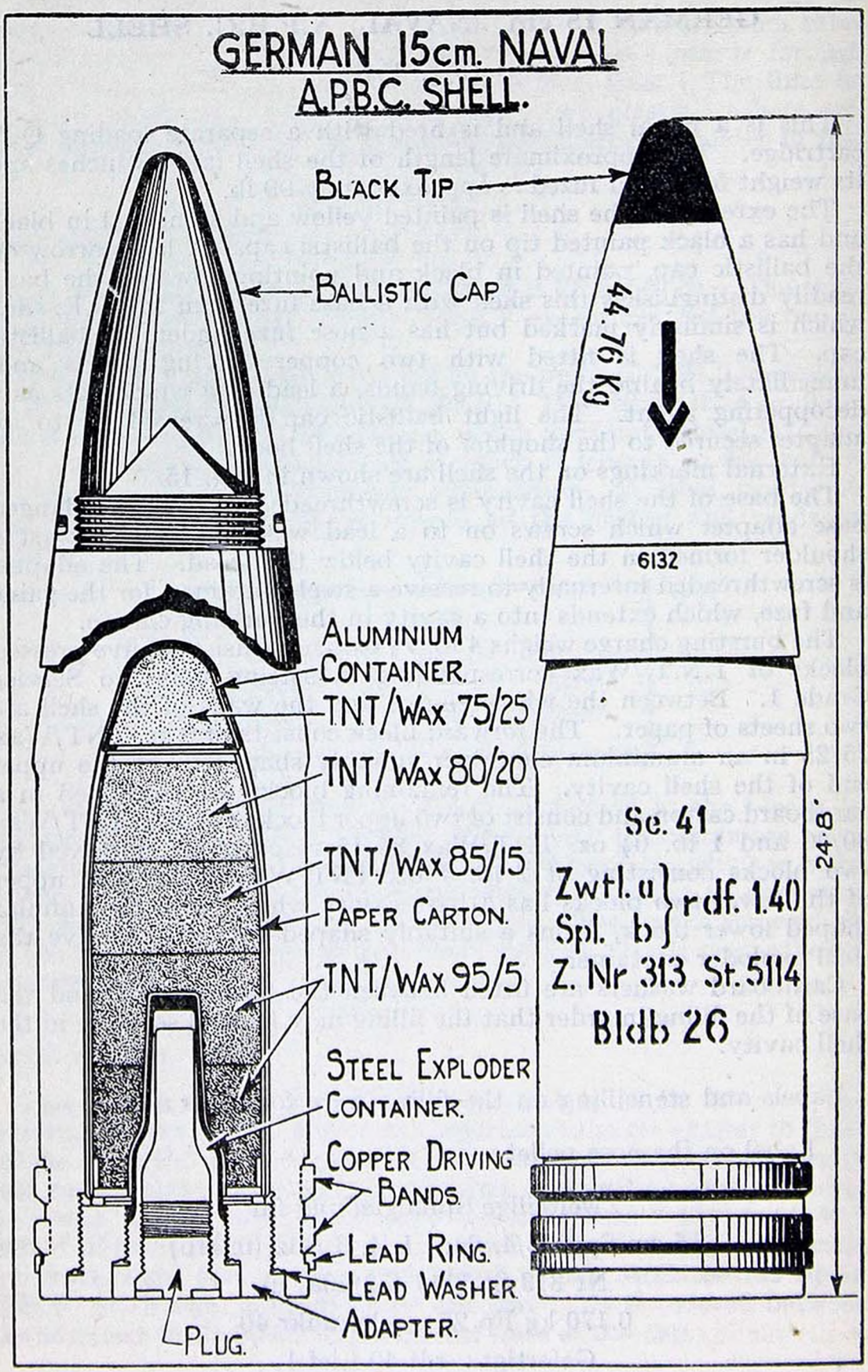

GERMAN 15cm. NAVAL
A.P.B.C. SHELL.
BLACK TIP
BALLISTIC CAP
ALUMINIUM CONTAINER.
T.N.T./WAX 75/25
TNT/WAX 80/20
T.N.T./WAX 85/15
PAPER CARTON.
T.N.T./WAX 95/5
STEEL EXPLODER CONTAINER.
COPPER DRIVING BANDS.
LEAD RING.
LEAD WASHER
ADAPTER.
PLUG.
44.76 Kg
6132
Se. 41
Zwtl. a } rdf. 1.40
Spl. b }
Z. Nr 313 St. 5114
Bldb 26
24·8"

FIG. 15

Label on side of cardboard container :—

Zweiteilige Sprengladung fur
15 cm Spgr L/4,2u. L/4, 3 Bdz (m.Hb)
Nr 313 St 5114 (37/40A)u2
0,370 kg Fp 20
0,470 kg Fp 15 } —elg umkr. 40
1,020 kg Fp 5
Gefertigt : rdf 40 Lief 1.

Stencilled on cardboard container :—

Marine Abnahmestelle
(Eagle)
11/9

Label on base of cardboard container :—

Zweit. Sprengladung f 15 cm Spgr L/4,2u L/4, 3 Bdz.
m (Hb) Nr 313 St 5114 (37/40 a)
0,170 kg Fp 25, 0,370 kg Fp 20, 0,470 kg Fp 15
1,020 kg Fp 5
elg umkr 40, Gefertigt ; rdf 40 Lief 1.

Gaine

The gaine in the exploder container is the large size C/98 described in Pamphlet No. 6, page 14.

Fuze

The fuze which is the Bdz C/38, is described as a separate item in this pamphlet.

GERMAN 15 cm. H.E.B.C. SHELL
(15 cm Sprgr L/4·6 m. Haube)

(Fig. 16)

This is a naval type of shell. It is fired with a separate loading Q.F. cartridge and fuzed with either the Kz.C/27 or M. Dopp.Z.S/90 type of fuze.

The exterior of the shell is painted yellow and stencilled in black and has a black tip painted on the ballistic cap. A large arrow on the ballistic cap, painted in black and pointing towards the nose, readily distinguishes this shell from the A.P.C.B.C. shell described in

GERMAN 15cm NAVAL H.E.B.C. SHELL

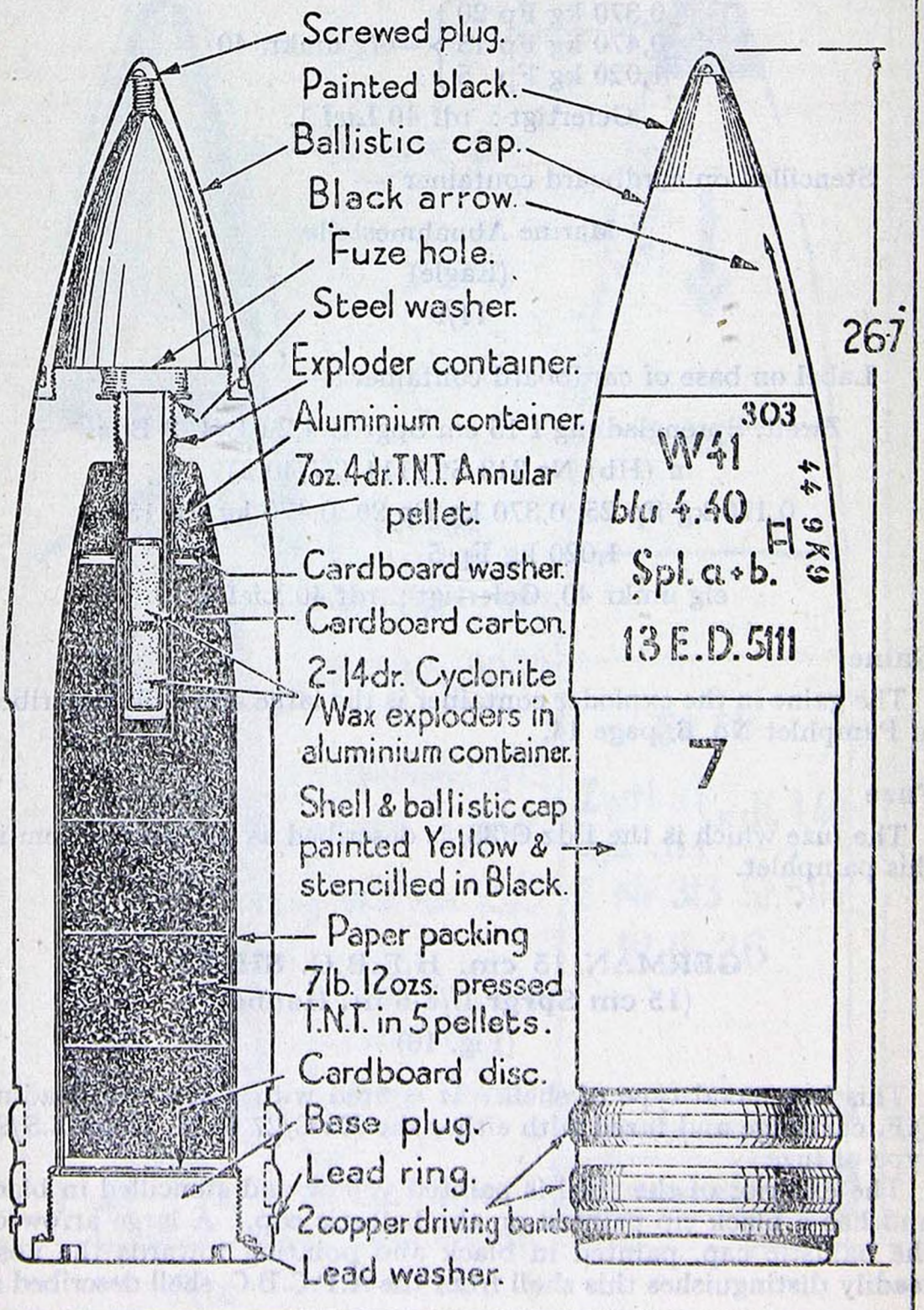


FIG. 16

this pamphlet. The shell is fitted with two copper driving bands and immediately behind them towards the base is a lead ring which acts as a decoppering agent. The overall length of the shell is 26·7 inches and its weight filled is approximately 100 lb. The shell is not issued fuzed. External markings on the shell are shown in Fig. 16.

The forward end of the shell body is screwthreaded externally to receive a light ballistic cap, and internally in two diameters to receive a long steel exploder container below the fuze.

The ballistic cap screws on to a shoulder and continues the external contour of the shell to the front. The cap has an aperture in the nose which is screwthreaded and closed by a screwed plug. A wooden distance piece, not shown in the drawing, extends from below the plug into the exploder container to retain the exploders in position during transportation.

The lower half of the steel container holds two small exploders each consisting of 14 dr. pellets of pressed cyclonite/wax 90/10 in aluminium cylinders.

The bursting charge consists of 8 lb. 3 oz. 4 dr. of TNT/Wax in six pellets with several sheets of thin paper between the filling and the walls of the shell. The top pellet weighing 7 oz. 4 dr. is annular in shape and contained in an aluminium container suitably shaped to fit the forward end of the shell cavity, and fitted with a cardboard closing washer at the base. The remaining five pellets consist of 7 lb. 12 oz. pressed T.N.T. contained in a cardboard carton with a cardboard washer at the forward end and a cardboard disc at the base. The top pellet is annular in shape and surrounds the exploder container and the pellet next below it has a cavity to receive the base end of the exploder container.

The base of the shell is closed by a flanged screwed plug which screws into the shell body. A lead sealing washer fits between a shoulder formed in the shell body below the thread and the flange on the plug.

Labels and stencilling on the bursting charge are as under :—

Label on side of cardboard container—

Zweiteilige Sprengladung fur
15 cm Spgr. L/4,5u. L/4, 6 Kz (m.Hb)
Nr 313D. 5111 u2
3,460 kg Fp 02 — hlu 40
Gefertigt : hlu 40 Lief 2.

Stencilled in circle on side of cardboard container—

Marine Abnahmestelle
(Eagle)
11/9

Label on base of cardboard container—

Zweiteilige Sprengladung fur
15 cm Spgr L/4,5 u. L/4, 6 Kz (m.Hb)
Nr. 313D — 5111
3,46 kg Fp 02 brutto
Gefertigt. hlu 40 Lief 2.

Label on aluminium container holding nose pellet—

Zweiteilige Sprengladung fur
15 cm Spgr L/4, 5 u. L/4, 6 Uz (m.Hb)
Nr 313E — 5111 il
0,211 kg Fp 02 hlu 40
Gefertigt : hlu 40 Lief 2.

GERMAN 15 cm. K. Mrs. Laf. Ctge. Q.F. (Separate)

(Fig. 17)

This is a separate loading Q.F. cartridge and weighs approximately 49 lb. 4 oz. and is fitted with a percussion primer C/12 nA St.

Propellant charge

The propellant charge weighs approximately 29 lb. 3½ oz. and is of the double base type consisting basically of nitrocellulose and diethylene-glycol-dinitrate in tubular form. The sticks are 32·5 inches in length with an external and internal diameter of ·3 inch and ·12 inch respectively.

The propellant bag is stencilled 13,25 kg R.P/38 Bu (825 . 7,5/3). An analysis of this type of propellant averages : nitrocellulose 66·98 per cent., diethylene-glycol-dinitrate 28·87 per cent., akardite 2·84 per cent., graphite 0·21 per cent., sodium sulphate 0·14 per cent. and volatile matter 0·96 per cent.

Details of the igniter composition are not yet available.

Case

The brass case is the normal flanged type 32 inches in length and fitted at the mouth with a brass lid which extends an additional 2 inches to the front. The base of the case is stencilled in black with the weight of the propellant charge and bears the stamping " L/45 ".

Primer

The percussion primer C/12 nA is described in Pamphlet No. 4, page 10. The letters " St " added to the designation indicate that the primer is of steel.

GERMAN 15cm SEPARATE Q.F. CARTRIDGE.

(15.cm.K.Mrs.Laf.)

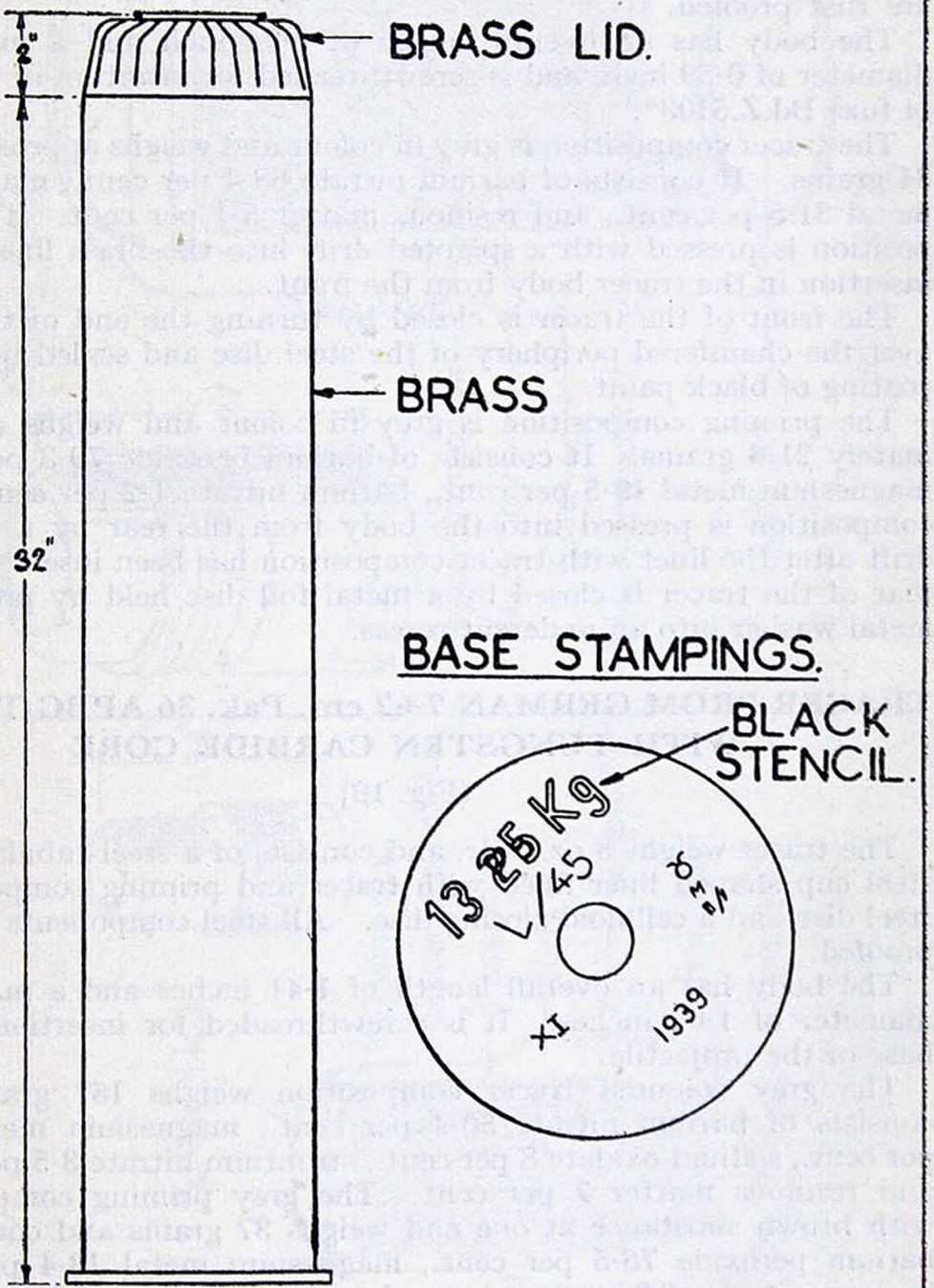


FIG. 17

TRACER FROM GERMAN 7·62 PAK. 36 APCBC/T SHELL

(Fig. 18)

The tracer weighs 10½ drams and consists of a steel tubular body, brass tubular liner, tracer and priming compositions, steel closing disc, metal foil disc, and a metal washer. The steel components are rust proofed.

The body has an overall length of 0·94 inch and a maximum diameter of 0·59 inch, and is screwthreaded for insertion in the base of fuze Bd.Z.5103*.

The tracer composition is grey in colour and weighs approximately 34 grains. It consists of barium nitrate 63·4 per cent., magnesium metal 31·5 per cent., and resinous matter 5·1 per cent. The composition is pressed with a spigoted drift into the brass liner before insertion in the tracer body from the front.

The front of the tracer is closed by turning the end of the body over the chamfered periphery of the steel disc and sealed by a thin coating of black paint.

The priming composition is grey in colour and weighs approximately 21·6 grains. It consists of barium peroxide 79·3 per cent., magnesium metal 19·5 per cent., barium nitrate 1·2 per cent. The composition is pressed into the body from the rear by a serrated drift after the liner with tracer composition has been inserted. The rear of the tracer is closed by a metal foil disc held by pressing a metal washer into an undercut recess.

TRACER FROM GERMAN 7·62 cm. Pak. 36 APBC/T SHOT WITH TUNGSTEN CARBIDE CORE

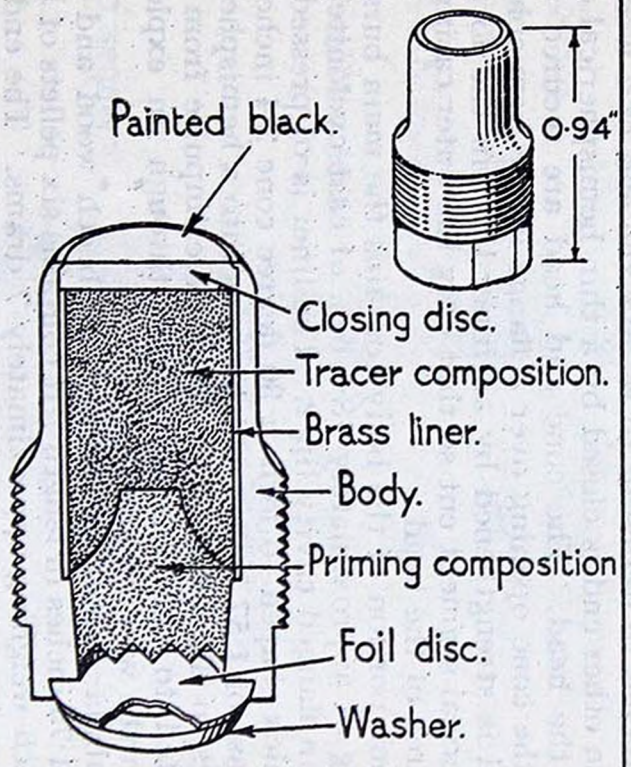
(Fig. 19)

The tracer weighs 3 oz. 5 dr. and consists of a steel tubular body, steel cup shaped liner filled with tracer and priming compositions, steel disc and a celluloid closing disc. All steel components are rust proofed.

The body has an overall length of 1·41 inches and a maximum diameter of 1·02 inches. It is screwthreaded for insertion in the base of the projectile.

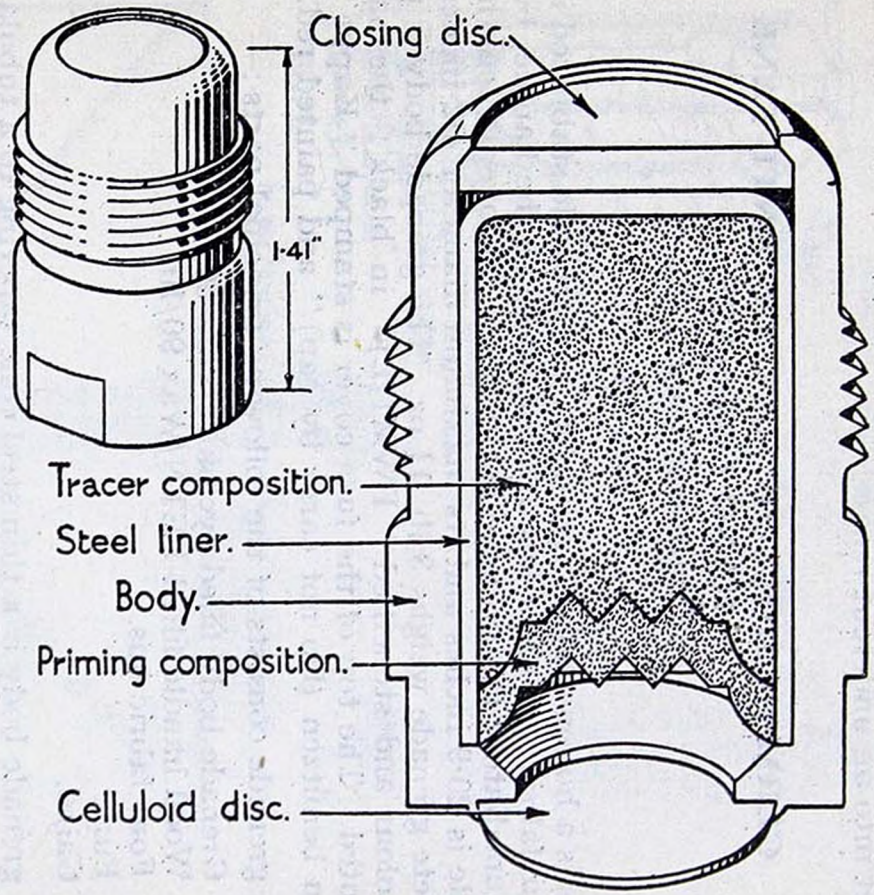
The grey coloured tracer composition weighs 157 grains and consists of barium nitrate 50·4 per cent., magnesium metal 31·1 per cent., sodium oxalate 8 per cent., strontium nitrate 3·5 per cent., and resinous matter 7 per cent. The grey priming composition, with brown substance at one end weighs 37 grains and consists of barium peroxide 76·5 per cent., magnesium metal 13·4 per cent. barium nitrate 4·6 per cent., and resinous matter 5·5 per cent. The tracer and priming compositions are pressed into the liner in separate increments by a convex serrated drift before being inserted in the body from the front.

GERMAN TRACERS.



A.P.C.B.C. SHELL.

FIG. 18



A.P.B.C. SHOT.

FIG. 19

The front of the body is closed by turning its mouth over the chamfered periphery of the steel disc.

The rear of the body is closed by a thin yellow opaque celluloid disc let into an undercut recess.

GERMAN HOLLOW CHARGE ANTI-TANK HAND GRENADE

Panzerwurfmine 1 (L)

Fig. 20

This is a hollow charge anti-tank hand grenade stabilized in flight by four fabric fins. The fins are held close to the handle, but open out immediately the grenade is thrown. The overall length of the grenade is 20·9 inches and its maximum diameter 4·2 inches. The complete grenade weighs 3 lb. 1¼ oz. The grenade body is painted buff colour and stencilled " PWM1(L) " in black; the handle is unpainted. The top of the fuze cover is stamped " Kappe nicht z Tragen benützen (Do not carry by cap) " and painted red.

The grenade consists of the following principal parts :—

Grenade body filled cyclonite/Wax 50/50.
Wood handle filled PETN/Wax 90/10.
Four fabric fins.
Fuze.
Gaine.

The grenade body is a thin steel cone tapering to a tubular opening 1·18 inches in diameter to receive the end of a wooden handle, whilst the other end is closed by a thin hemispherical outer casing forming the head. The cone and head are secured together by turning the cone opening over a flange in the hemispherical head. The head is strengthened by an inner liner in the form of a thin hemispherical segment cut so that only the outer casing covers the impact area of the head.

The cone portion of the body contains the main bursting charge consisting of approximately 18·5 ozs. of cast cyclonite wax 50/50, and a thin flanged cavity liner. The liner is of pressed steel 0·069 inches thick shaped to form a 30 degree cone 2·4 inches in length, with a base of 1·57 inches which opens into a hemispherical recess 2·8 inches in diameter. The detonative impulse from the fuze is transmitted to the bursting charge through an explosive filling carried in the wooden handle.

The tubular handle is made from beech wood and is approximately 11·75 inches in length ; it contains six pellets of PETN/Wax 90/10, each weighing approximately 7 drams. The end pellets are secured by nitrocellulose varnish and are in contact with the bursting charge and gaine respectively. The forward end of the handle is

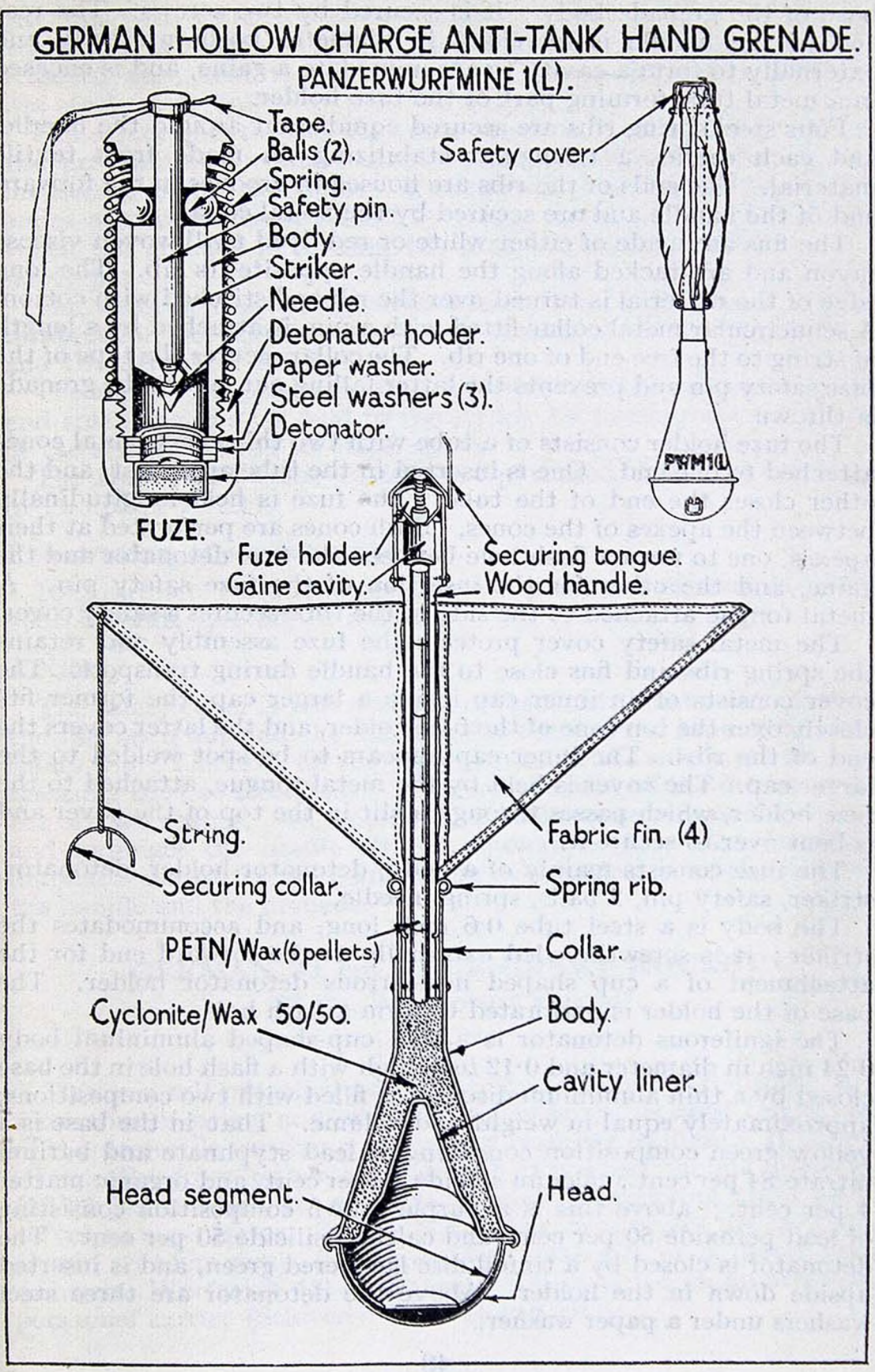

GERMAN HOLLOW CHARGE ANTI-TANK HAND GRENADE.
PANZERWURFMINE 1(L).
Tape.
Balls (2).
Spring.
Safety pin.
Body.
Striker.
Needle.
Detonator holder.
Paper washer.
Steel washers (3).
Detonator.
FUZE.
Safety cover.
PWM1(L)
Fuze holder.
Gaine cavity.
Securing tongue.
Wood handle.
String.
Securing collar.
PETN/Wax (6 pellets)
Cyclonite/Wax 50/50.
Head segment.
Fabric fin. (4)
Spring rib.
Collar.
Body.
Cavity liner.
Head.

FIG. 20

enclosed in a metal collar which fits into the tubular opening at the base of the grenade body ; it is secured by two screws. The rear end of the handle is increased in diameter both internally and externally to form a cavity to accommodate a gaine, and is encased in a metal tube forming part of the fuze holder.

Four steel spring ribs are secured equidistant around the handle, and each carries a triangular stabilizing fin made from textile material. The ends of the ribs are housed in grooves in the forward end of the handle and are secured by the metal collar.

The fins are made of either white or red dyed twill woven viscose rayon and are tacked along the handle opposite its rib. The long edge of the material is turned over the rib and stitched with cotton. A semicircular metal collar fitted with a pin, is attached by a length of string to the free end of one rib. The collar secures the tape of the fuze safety pin and prevents the latter falling out before the grenade is thrown.

The fuze holder consists of a tube with two thin sheet metal cones attached to one end. One is inserted in the tube apex first, and the other closes the end of the tube. The fuze is held longitudinally between the apexes of the cones. Both cones are perforated at their apexes, one to form a flash hole between the fuze detonator and the gaine, and the other for the insertion of the fuze safety pin. A metal tongue attached to the side of the tube secures a safety cover.

The metal safety cover protects the fuze assembly and retains the spring ribs and fins close to the handle during transport. The cover consists of an inner cap inside a larger cap, the former fits closely over the top cone of the fuze holder, and the latter covers the end of the ribs. The inner cap appears to be spot welded to the larger cap. The cover is held by the metal tongue, attached to the fuze holder, which passes through a slit in the top of the cover and is bent over to secure it.

The fuze consists mainly of a body, detonator holder, detonator, striker, safety pin, 2 balls, spring, needle.

The body is a steel tube 0·6 inch long, and accommodates the striker ; it is screwthreaded externally at the forward end for the attachment of a cup shaped non-ferrous detonator holder. The base of the holder is perforated to form a flash hole.

The igniferous detonator is a thin cup-shaped aluminium body 0·24 inch in diameter and 0·12 inch high with a flash hole in the base closed by a thin aluminium disc. It is filled with two compositions, approximately equal in weight and volume. That in the base is a yellow green composition consisting of lead styphnate and barium nitrate 84 per cent., calcium silicide 12 per cent. and organic matter 4 per cent. ; above this is a purple brown composition consisting of lead peroxide 50 per cent. and calcium silicide 50 per cent. The detonator is closed by a tinfoil disc lacquered green, and is inserted upside down in the holder. Above the detonator are three steel washers under a paper washer.

The cylindrical striker is a sliding fit in the fuze body and is provided with a mushroom head and coned end to hold the needle ; it is bored, centrally to receive the safety pin with a length of tape attached and, near the head, radially to accommodate partially two steel safety balls.

The safety pin thrusts the balls outward to foul the fuze body and prevent the forward movement of the striker thereby holding the needle off the detonator. During transport the tape is secured under a metal collar attached by string to one of the spring ribs. When the grenade is thrown, the drag of the tape withdraws the safety pin.

The weak helical spring surrounds the fuze body and is held in compression between a step on the underside of the striker head and the detonator holder.

The short steel needle is provided with a sharp pyramidal point and small shank, it is held in the striker by burring the coned end of the striker around its small shank.

The small PETN gaine (kl Zdlg 34 Np) is used. This was described in Pamphlet No. 11.

Penetration of armour plate

It is estimated that the grenade will penetrate 80 mm. of homogeneous plate (I.T.80) at normal.

Action

The safety cover is removed and immediately the bomb is thrown the fins open out and the metal collar releases the tape of the fuze safety pin. The drag on the tape withdraws the safety pin thereby releasing the two steel balls. The needle is held off the detonator by the striker spring. On impact, the striker compresses the spring and impinges the needle on the detonator. The flash from the detonator detonates the gaine which in turn detonates the filling in the handle and the grenade.

GERMAN 32 cm. INCENDIARY ROCKET

(32 cm. Wurfkörper Flamm)

Fig. 21

This is a self-propelled base venting rocket projectile filled with a mixture of petrol and oil. The venturis are inclined to the axis of the projectile causing rotation and stability in flight. It is fired electrically from either a six-barrel two-wheel mobile projector (28/32 Nebelwerfer 41) or from its own transporting crate which serves as a projector. In the latter case, four crates are laid on a simple wooden ramp (schweres Wurfgerät 40) or a metal ramp (schweres Wurfgerät 41) or six crates are mounted on an armoured personnel carrier (Schwerer Wurfrahmen HO).

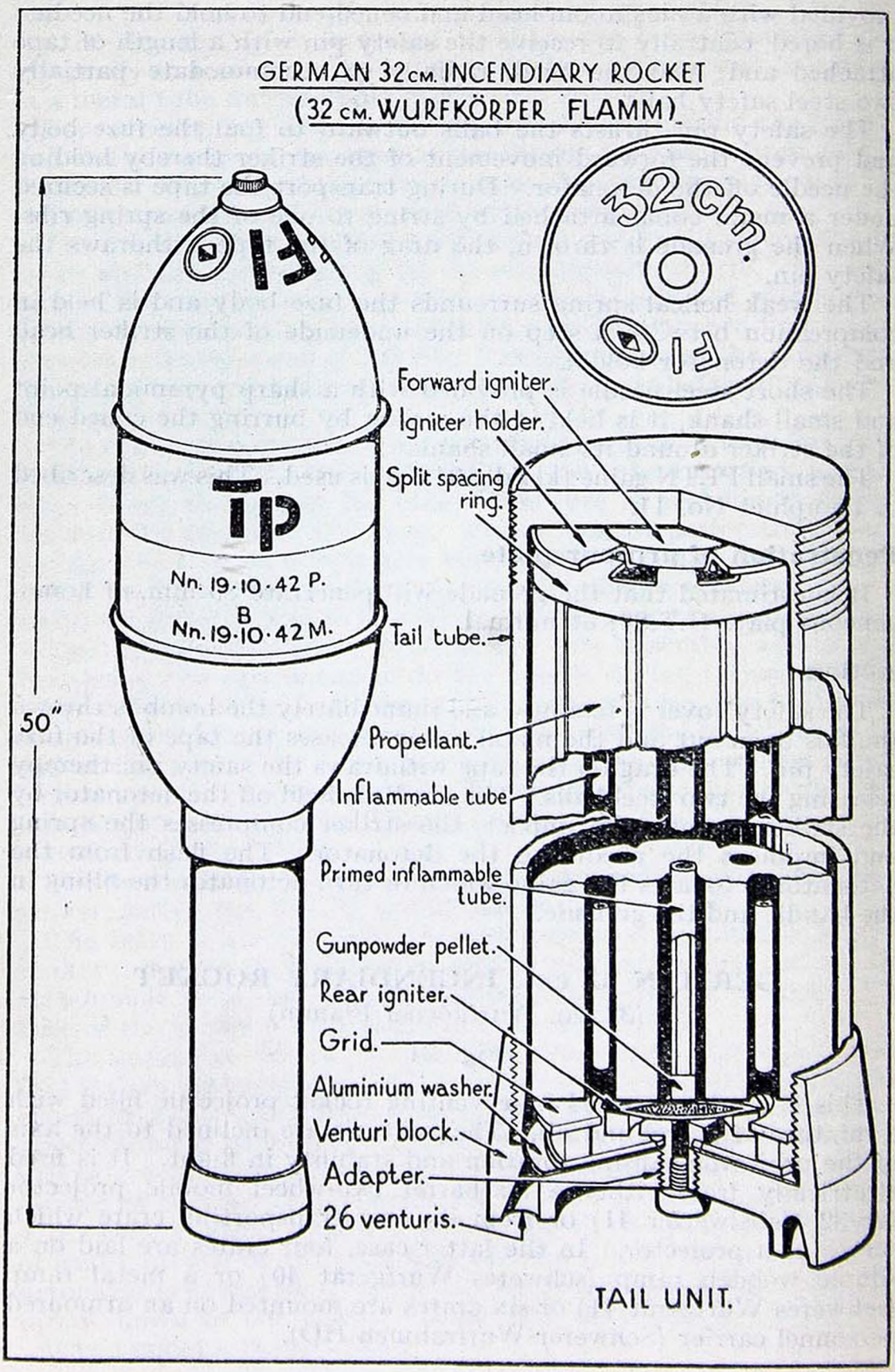

GERMAN 32cm. INCENDIARY ROCKET
(32 cm. WURFKÖRPER FLAMM)
32 cm.
TP
Nn. 19·10·42 P.
B
Nn. 19·10·42 M.
50"
Forward igniter.
Igniter holder.
Split spacing ring.
Tail tube.
Propellant.
Inflammable tube
Primed inflammable tube.
Gunpowder pellet.
Rear igniter.
Grid.
Aluminium washer.
Venturi block.
Adapter.
26 venturis.
TAIL UNIT.

FIG. 21

The overall length of the complete round is 4 feet 2 inches and its total weight 174 lb. External markings on the round are shown in Fig. 21. Rounds suitable for hot climates are also stencilled "Tp".

The complete round consists principally of :—

Shell filled petrol/oil mixture.
Bursting charge of penthrite wax.
Incendiary igniter.
Fuze Wgr Z 50 +.
Gaine Gr Zdlg C/98 Np.
Tail unit with propellant charge and ignition system.
Electric ignition fuze.

Boxes containing the following components are issued separately :—

12 fuzes Wgr Z 50 + each in a separate plastic container.
15 gaines packed 5 in a plastic container.
16 single electric ignition fuzes and 4 quadruple fuzes, in a cardboard box.

Shell

The overall length of the shell is 31·6 inches and its diameter 12·8 inches. The empty body weighs 13 lb. 12½ oz. and is of thin sheet steel 0·07 inches thick; it is welded circumferentially at about its centre. Two circumferential ribs are also formed in the body, one below the head and the other above the streamlined base. The head is shaped to a low crh and prepared to receive a plastic adapter which incorporates a gaine container. Near the nose is a charging hole closed by a plug. The base is streamlined and terminates in a short cylindrical tube which is screwthreaded internally to receive the tail tube.

The incendiary filling is a brown liquid consisting of 11¼ gallons of petrol/oil mixture.

The bursting charge consists of a cylinder of penthrite wax surrounding the gaine container.

The incendiary igniter is contained in a soldered tin sheet cylinder, 24·1 inches long, placed axially in the shell with one end butting against the base of the gaine container.

Fuze and gaine

The fuze used is one of the Wgr Z 50 + type referred to elsewhere in this pamphlet.

The gaine is the large size C/98 Np described in Pamphlet No. 6, page 14.

Tail unit (Fig. 21)

The tail unit has an overall length of 19·9 inches and weighs approximately 49 lb. 8 oz. filled. It consists of the following principal components : tail tube, venturi block, propellant charge,

a grid, spacing ring and an ignition system. Typical stencilling on the tail tube and venturi block is shown in Fig. 21. The internal metal parts are not rust proofed.

The steel cylindrical tail tube weighs 23 lb. 14 oz. and appears to be a solid forging machined inside and out to a diameter of 5·5 inches and 5·05 inches respectively, and internally to a depth of 18 inches ; it is closed at the forward end and screwthreaded externally for insertion in the base of the bomb body. The venturi end has a coned opening screwthreaded externally to receive the venturi block.

The solid venturi block weighing 9 lb. 6¾ oz. is cup-shaped to an overall depth of 3 inches and an internal depth of 1·75 inches; it is screwthreaded internally for attachment to the tube. Externally, it is chamfered towards the top. Twenty-six venturis, equally spaced, are formed in the base near the periphery ; each has a throat diameter of approximately 0·22 inch and the cones are inclined at 14 degrees to rotate and stabilize the rocket in flight. The venturis of rockets suitable for hot climates are sealed on the outside by a " soldered on " flat tinned iron ring which blows off on ignition. The area of the base surrounded by the ring of venturis is recessed to a depth of 0·1 inch, also bored centrally and screwthreaded to receive an adapter screwed in from the inside. The base is stamped " DOVT 15 WU 26 × 5.5 ⌀ 14°, all 8c, 41." The stamping includes characteristics of the venturi, *i.e.*, the number, throat diameter and inclination.

The propellant charge, weighing 14 lb. 6¾ oz. is a single multi-perforated stick of double base propellant of the Digl type, having eight longitudinal " V " section channels formed in its exterior when extruded from press. The propellant of the round examined consisted of nitrocellulose 62·5 per cent., diethylene-glycol-dinitrate 33·6 per cent., volatile matter 0·6 per cent., stabilizer (probably akardite) 0·6 per cent., graphite 0·12 per cent., ash (carbonated) 0·75 per cent. and error and undetermined matter 2·43 per cent. The stick is 16·27 inches long and 4·79 inches in diameter, with a central perforation, star shaped in section, surrounded by eight circular perforations equally spaced on a circle 2·6 inches in diameter. The tropical propellant is marked " Dgp. DOP. 15 Wu (Digl. Ngl.) Tp. dbg 142/2 " and the non-tropical " DO. Wu. P.15 (Digl) dbg 1942. 12 ". The base of the propellant is supported by a grid.

The grid consists of an annular ring $\frac{3}{16}$ inch thick, 4⅝ inches external and 3⅛ inches internal diameter, supported by six small cylindrical distance pieces ½ inch in diameter and ⅜ inch high from a flat plate $\frac{1}{16}$ inch thick and 4⅝ inches in diameter. The grid is bolted to the front face of the venturi block by the adapter.

The adapter is a cylindrical tube with a hexagon flange formed at one end. The stem portion is screwthreaded externally for insertion in the block and internally to receive the electric ignition fuze. The adapter is inserted from the front ; for transportation it is closed by a screwed plug.

Between the grid and the block is a thin aluminium washer which closes the venturis.

The free space at the forward end of the propellant is taken up by a split spacing ring with ten pairs of lugs bent inwards to form a "U" shape in section.

The ignition system consists of a forward and rear igniter, eight inflammable tubes in the channels round the exterior of the propellant stick and one primed inflammable tube in the centre perforation, and an electric ignition fuze.

The forward igniter consists of a pressed pellet of gunpowder with a perforated strip of nitrocellulose across its face, in a flat circular aluminium container. The igniter is held in a holder in the form of a washer fitting in the head of the tube with its inner edge turned over to hold the igniter centrally within the spacing ring. The open side of the igniter faces the propellant stick.

The rear igniter consists of a flat rough circular bag containing 10 grains of igniter composition in the form of six pointed star-shaped flakes ; it is housed centrally between the base of the propellant and the adapter. The bag is marked Nz.Man.St. P (2 . 55/23) dt 1938/5. WO. 7.8.42 W.

The inflammable tubes found in the "V" channels in the side of the stick are slightly shorter than those in the central hole and are not primed. The tube in the central hole contains what appears to be quickmatch and each end is closed by a gunpowder pellet. The forward end is housed centrally within the forward grid opposite the forward igniter. The rear end is in contact with the rear igniter.

The electric ignition fuze, enclosed in an aluminium tube and bakelite container, is screwed into the central hole of the adapter. It may be fired from a 4-volt battery. Rounds may be fired singly. For firing from the Wurfgerät, four ignition fuzes, externally similar in appearance, are wired in series. One only, tagged "O", is instantaneous, the remainder, tagged "2", "4" and "6" respectively include powder pellets so as to fire at intervals of 2 seconds.

(21780) 44955/2476 10,000 3/45 K.H.K Gp. 8/8