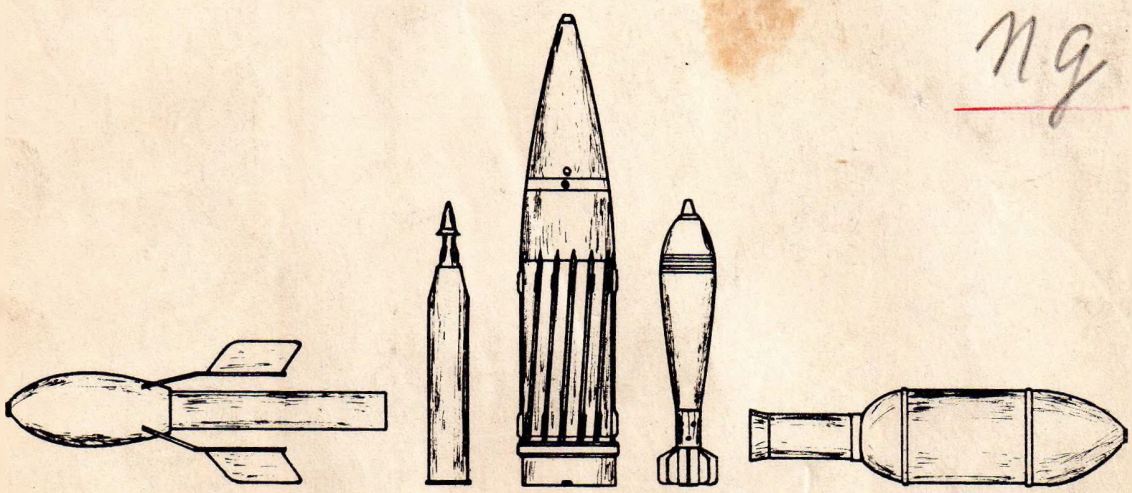
RESTRICTED

CAPTURED AMMUNITION

BULLETIN



No. 6

Date 10 April 1945

Office of A.C. of S., G-2
Supreme Headquarters Allied Expeditionary Force

SUPREME HEADQUARTERS
ALLIED EXPEDITIONARY FORCE
Office of Assistant Chief of Staff, G-2
Main Headquarters

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C O N T E N T S

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SUPREME HEADQUARTERS
ALLIED EXPEDITIONARY FORCE
Office of Assistant Chief of Staff, G-2
Main Headquarters

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Development of German Gun Cartridge Case Design

The information at present available on the development of German cartridge case design for 75 mm. equipments and above presents an interesting picture of the economic use of material and manufacturing equipment. The German authorities appear to have been influenced before the war by a real or anticipated shortage of copper. The following three types of cartridge case, which are those used for fixed as well as separate ammunition illustrate this.

Type 1 Solid drawn brass The normal design of cartridge case which was probably standard up to about 1937. Cartridge cases of this type are to be found even in present ammunition stocks, partly due to presence of pre-war ammunition, partly to reworked cases, and partly to the fact that in certain natures of ammunition, brass cases have been retained as standard. Cases of this type are marked with the normal case design number of the gun which they fit.

Type 2 Solid drawn steel, brass coated This type was probably adopted as standard for future production in about 1937. The case is usually made of a normal deep drawing, aluminium killed, steel, protected from rust by copper plating, overplated with brass. Cases of this type are marked with the case design number followed by St.

Type 3 Solid drawn steel, phospate coated This is really a variant of Type 2 which has appeared since the beginning of the war. This type forms the bulk of recently produced cases. Marking is the same as for type 2.

In addition to a shortage of copper, the Germans appear to have anticipated either a shortage of suitable deep drawing steel or of drawing equipment. The following two types probably represent experimental designs tried out around 1937 at the time when the solid drawn steel case was introduced:-

Type 4 Composite Case: Drawn brass body, steel base The body of this type of case is a drawn brass tube, the rear edge being turned in to form an interior lip. The base is a copper/brass plated solid machined steel plate with a groove round the edge inside the rim against which the rear of the body butts. The two parts are secured together by a large steel washer which fits over the primer boss and grips the interior lip of the body, and a ring which screws into the primer boss. Obturation is secured by coating the touching faces of the components with a black wax and by a glazeboard washer which fits under the steel washer. Cases of this type are marked with the case design number followed by a two figure number, the two separated by an oblique stroke. The second number is common to all built up cases for a particular gun, and the two numbers together can be taken to represent the composite case design number.

/Type 5

Type 5 Composite Case: Drawn steel body, steel base Identical in every respect to Type 4 except for the substitution of steel for brass as the material for the body. The whole case is protected by copper plating, over-plated with brass. Cases of this type are marked in exactly the same way as Type 4.

It would appear that these two types of case did not appeal to the Germans. In any case the design was dropped. The next stage in the development was the introduction on a limited scale during the early years of the war, probably for field trials, of two new types of case.

Type 6 Composite case: Sheet steel body, brass base This case, consists of a brass base and sheet steel body protected by oil or scale blackening. The body is assembled as a tube with a vertical lap, the two edges sometimes being bevelled to form a flat joint. There is one spot weld at the front end of the lap joint. The rear edge of the body is turned inwards to form an interior flange which butts into a shallow groove cut in the base plate.

The body is fixed to the base by a steel washer and a nut which screws into the primer boss. Obturation is provided by a cardboard disc gripped between the steel washer and the brass base. Cases of this type have only been reported for the 10.5 cm. le F.H. 18, marked with the normal design number followed by /65A. A great deal of trouble was given by this case due to jammed cases caused by an expanded body.

Type 7 Composite Case, sheet steel body, steel base Construction similar to Type 6 except that the base is of steel, protected in the same way as the body. The near edge of the body is in some cases reinforced by a short thin steel liner in the form of a tube. The liner is split by three saw cuts at the front edge in order to allow it to fit the inside of the body more closely. Cases of this type have been met for the 10.5 cm. le F.H. 18 marked with the case design number followed by /65 or /65B. Similar trouble to Type 6 due to jammed cases was encountered with this type.

These two types of cases were not satisfactory but from the experience gained with them the Germans produced two new types of composite case, which are really variants of each other. These were extremely satisfactory in service but somewhat susceptible to rust.

Type 8 Composite case, spiral sheet steel body, steel base This case consists of a steel base and steel body both protected by oil or scale blackening. The body is assembled from a thin steel sheet, coiled to form a tube to give about 3 to 4 turns at the bottom and about 1½ turns at the top. The turns are forced together by rolling the case into a steel former by means of an internal roller. Adjacent turns of the case are coated with a black wax. The base of the tube is turned in to form an internal flange. The body is fixed to the base in a similar way to Type 6. Cases of this type have been examined or reported for the 10.5 cm.le.F.H.18, marked with the case design number followed by /65C, for the s.10 cm.K.18 marked with the case design number followed by /70C, for the 10 cm.le.F.H.14/19(t) with no additional markings, for the 12.2 cm.s.F.H.39(r) marked with the case design number followed by C, for the 15 cm.s.F.H.18 marked with the case design number followed by /71C, and for the 17 cm.K. in Mrs Laf marked with the case design number followed by /78C.

/Type 9

Type 9 Composite case, spiral sheet steel body, steel base A composite case similar in construction to Type 8 but with an additional layer of steel sheet coming only a portion of the way up the side of the case. Cases of this type have only been met for the 12.2 cm.K. 390(r) with no special markings.

Though this type of case is satisfactory in the field for separate loading ammunition it requires a considerable amount of specialised plant for its production. Very recently two new types of case have been encountered which appear to overcome this disadvantage though it is not known whether they are satisfactory in service.

Type 10 Composite case, sheet steel body, built up steel base The base consists of a flat pressed steel disc with the primer boss formed in the centre. To this is spot-welded a second steel disc with a central hole which fits over the primer boss. This second disc is smaller in diameter than the first by the width of the cartridge rim. The body of sheet steel is bent in the form of a tube with a vertical joggled lap joint. There is one spot weld at the mouth. The body is reduced in diameter towards the base and the rear edge turned in to form an internal flange. Round the reduced part of the body is fitted a split sheet steel ring which is also turned in at the base. The ring is not welded at the joint. The body and the base are held together by means of a steel washer which is shaped to fit over the flange of the body. The washer and the base plate are held together by four screws which pass through the washer and the upper plate of the base and screw into the bottom plate of the baseplate. The case is protected by phosphating, and is marked with the case design number and composite case number followed by D. Cases of this type have only been seen for the 1e F.H.18.

Type 11 Composite case, sheet steel body, built up steel base The only difference in construction between this type of case and Type 10 is the use of bolts to assemble the body to the base. The heads of the bolts are countersunk into the base plate. The case is protected by oil blackening. Marking is the same as for Type 10. Cases of this type have only been seen for the 1e F.H.18.

/Flash Reducers

FLASH REDUCERS

German nomenclature: Kartusche vorlagen.

Such have been in use in the German Army for some time and are added to the propellant charge to reduce muzzle flash. These have also been in the service of the armies of other Continental countries.

Recent German practice has been to use potassium sulphate as the standard flash reducing agent. Potassium chloride (sometimes known as 'Duneberger Saltz'), which was earlier used as the standard flash reducing component has lately only been encountered in the s.10 cm. K.18 equipment. Flash reducing charges are usually made up in flat circular or annular silk bags which frequently have the weight and formula stamped on them.

The following equipments which use Q.F. separate ammunition have flash reducing charges:

Equipment	Weight of each bag (gm)
15 cm. s.F.H.18	50
15 cm. s.J.G.33	50
s.10 cm.K.18	50
10.5 cm. le F.H.18	40
7.5 cm le.J.G.18)	
7.5 cm le.Geb.J.G.18)	20
7.5 cm. Geb.G.36)	
7.5 cm le.F.K.18)	

Flash reducers are included in the propellant charges of certain Q.F. fixed ammunition. Flash reducers have recently been introduced for use in the 8 cm and 12 cm mortars - 8 cm.Gr.W.34, 10 cm Nb.W.35 and 12 cm Gr.W.42. The flash reducer for use in the latter is somewhat unusual. It is known as a 'Dampfsunrsbeutel'and consists of 40 gm of Nz.D.Bl.P. (6,6,0.5) - a nitrocellulose single base propellant in flake form.

/Driving Bands

DRIVING BANDS

At the beginning of this war, driving bands were mainly of the bimetallic type. These consisted of an inner layer of iron, upon which was superimposed a layer of copper, the thickness of the copper being sufficient to take the rifling. There has however been a steady increase in the use of soft iron driving bands in place of the bimetallic type. At first their use was confined to the smaller calibres but it would appear that now this type is manufactured for all calibres to the exclusion of the bimetallic type.

In a few cases minor modifications in the design of certain projectiles resulted e.g.

10 cm Pzgr.rot and 10 cm Pzgr.rot(Ei)	one bimetallic driving band or two soft iron driving bands
H.E. projectiles for the s.F.H.18	two bimetallic driving bands or one soft iron driving band

The nature of the driving band is sometimes included in the nomenclature and stamped and stencilled on the body of the projectile. The following abbreviations are used:

KPS	- kupferpressstahl	bimetallic (copper/iron) driving band
FES	- führungsintereisen	sintered iron driving band
FEW	- führungweicheisen	soft iron driving band

The H.E. projectile, 'K.Gr.rot', which is used in the 7.5 cm le.F.H.18 has a yellow band on the body to indicate the presence of a bimetallic driving band. This is the only known example of the use of this sign.

Keying

Both soft iron and bimetallic driving bands were attached in the groove by one or two rows of knurling, depending on the calibre of the projectile. This consisted of a series of vertical cuts in a slightly raised rib in the driving band groove. In this method the effective width of the driving band and the width of the groove were approximately equal. When the high velocity equipments, 7.5 cm KwK42 and 8.8 cm Pak and KwK 43, a new method was introduced. The driving band is attached to two rows of vertical indentations. In this method vertical cuts are made into the unraised groove. Recently in the case of the larger calibres another method has been introduced. The width of the groove is much wider than the effective width of the driving band and the band is keyed on by a single row of knurling which is not centrally placed. The knurling is located under that part of the band which is not effective as the driving band.

Examination appears to indicate that:

1. The whole width of the 'FES' band is effective as a driving band.
2. Only a part of the width of the 'FEW' band is effective as a driving band, keying being described above.

/H.E. Projectiles

H.E. PROJECTILES (Diagrams 1 and 2)

Small Calibres 3.7 to 5 cm.

These are invariably fitted with a nose percussion fuze which contains a magazine in which a disrupture detonator is set in penthrite wax. This is sufficient to detonate the bursting charge without an additional exploder.

Medium Calibres

These, with the exception of those intended for tank and anti-tank guns, may be fitted with a nose percussion or a T. and P. fuze. The former has a gunpowder magazine and the latter no magazine at all. In order to detonate the bursting charge, a gaine is located in a steel holder beneath the fuze. Two types are in general use and these consist of a large detonator, which can be initiated by flash or explosion, embedded in penthrite wax. The following varieties are in general use:

Naval
- Zdlg. 'A'
- Zdlg. 'B'

Army
- gr.Zdlg. c/98 Np. - small type
- Zdlg. 36 Np. - large type

'Np' in the nomenclature indicates that the main filling consists of penthrite/wax. Gaines have been manufactured in which the main filling consisted of cyclonite - such gaines have 'H' in the nomenclature instead of 'Np'. Earlier versions had fillings of T.N.T., picric acid etc. but these are not encountered these days. In the larger calibres, the gauges of the percussion and the T. and P. fuzes are the same, hence the same projectile may be used. Since however the depth below the head is greater in the former than the latter, it is necessary to place a distance piece (zwischenstuck) between the fuze and the gaine, when a T. and P. fuze is fitted. This consists of a cylindrical piece of iron with a central hole and with cork washers at either end.

In the 7.5 cm range, fuzes of different gauge are used, hence two different types of projectile are manufactured. With the exception of certain projectiles for A.A. equipments, all the projectiles in this group have streamlined bases.

Bursting charges may be poured or cast into blocks and packed in the projectile in a cardboard liner which is cemented to the internal walls of the projectile. The latter is an older method. In the former case, the projectile is often in one piece, but in the latter, it either has a screwed in base plate (for certain A.A. equipments) or else a large ogive adapter is fitted - such is necessary in order that the charge may be inserted. A smoke box (rauchentwickler) is usually included. This is located either at the base of the projectile or beneath the gaine. Often the title of the smoke box, e.g. 'R.3.' is stencilled on the side of the projectile.

/Large Calibres

Large Calibres

These are essentially similar to the above. The following are the main differences:

1. A ballistic cap is often fitted, the nose fuze being located underneath.
2. A base fuze is often fitted in addition to a nose fuze.
3. Often only a base fuze is fitted - this is probably comparable to British Common Pointed.
4. The gaine located under the nose fuze is usually 'Zdlg.36' and that above the base fuze is 'gr.Zdlg.c/98'.
5. Frequently an additional exploder is fitted under the top gaine.
6. Tracer is often fitted for the measurement of muzzle velocity.

Bursting Charges

The bursting charge of 3,7 cm and 5 cm H.E. projectiles consists of penthrite wax or T.N.T. In other calibres it consists of T.N.T. or amatol although cyclonite and penthrite wax has appeared in limited quantity in certain 10.5 cm H.E. projectiles.

NOTE:

The following information was found in a German document:

a) Certain projectiles for the le.F.H.18 have been issued without gaine tubes. Such are marked with 'o.M.' in black.

b) '15 cm Gr.19' projectiles for the s.F.H.18 have been issued without gaine tubes. Such are marked with 'o.M.' or 'o.R.o.M.' in black.

These projectiles must not be fired with Charges 7 or 8, otherwise prematures may result.

GERMAN 7.5 cm. Igr. 18, (or Jgr. 18) H.E. SHELL

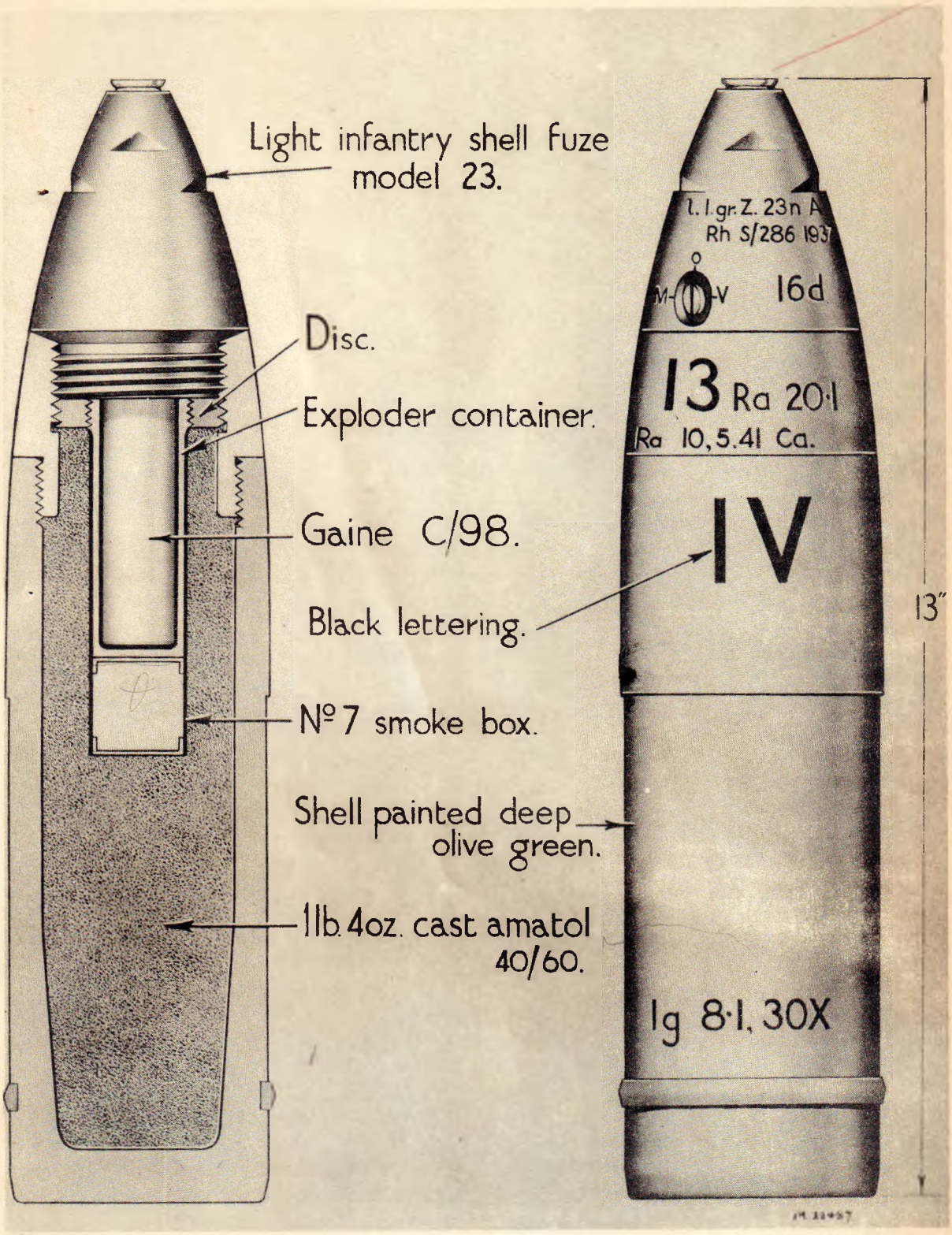

DIAGRAM 1

GERMAN GAINE 36 FILLED P.E.T.N./Wax
(Zdlg 36 Np)

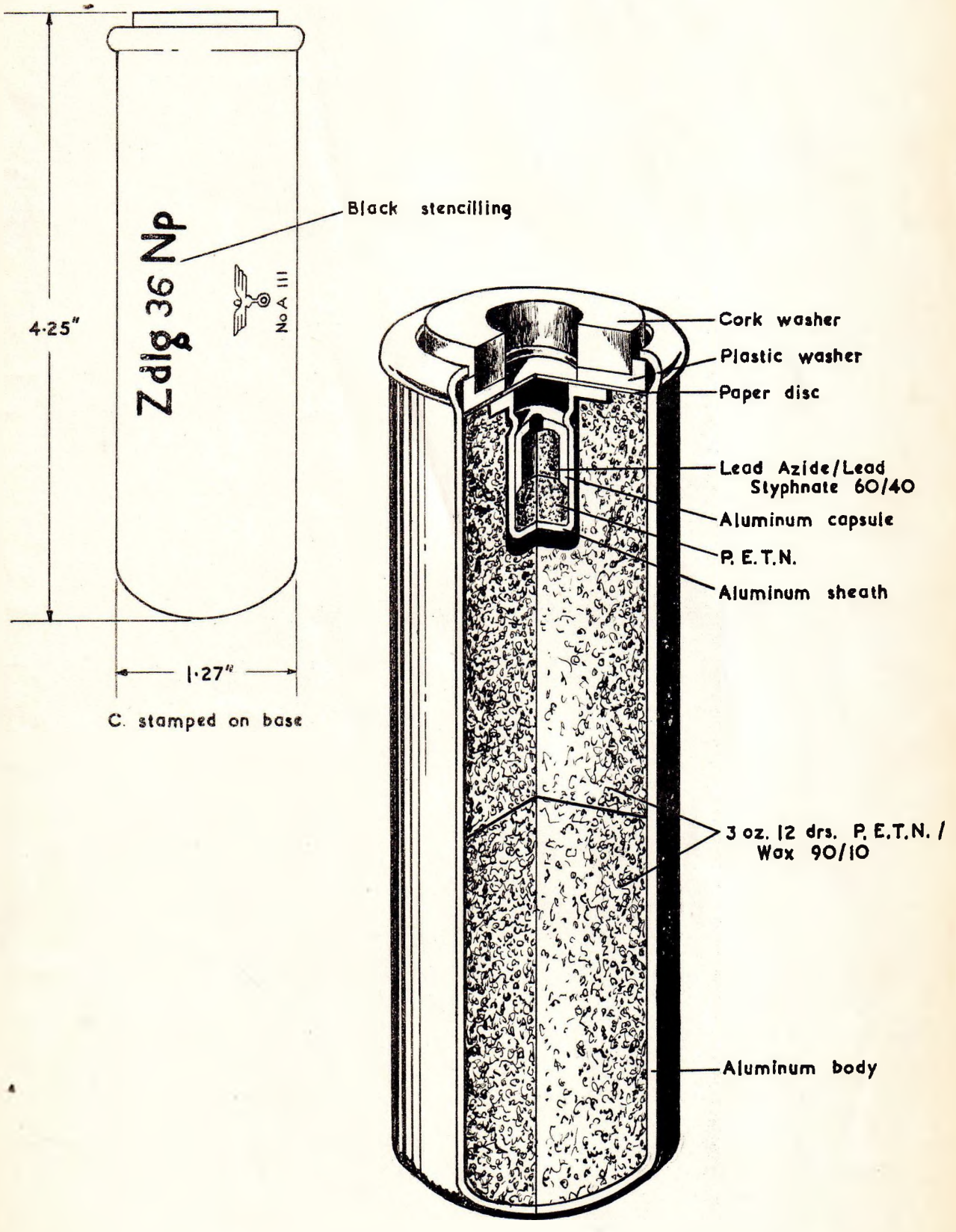

Diagram 2

HOLLOW CHARGE PROJECTILES (Diagrams 3 to 7)

Projectiles which involve the hollow charge principle have been introduced on a large scale during this war, for the attack of armour. Attack is achieved not by actual penetration but by the formation of 'concentrated blast' in a direction parallel to the axis of the projectile and forward through the nose.

German hollow charge projectiles incorporate the following in their design:

1. A thin walled projectile with a high bursting charge content.
2. A screwed on cap, attached just above the shoulder and constructed either of thin steel or zinc alloy. This is usually held in place by a set screw.
3. A large air space in the head of the projectile which is formed by the screwed on cap and an internal cup which is in contact with the bursting charge.
4. A nose percussion fuze, and a central tube which leads to a gaine at the base of the projectile. The gain consists of a large detonator set in p.E.T.N./wax. This detonator may be initiated by flash or 'explosion'. The gaines usually fitted are 'Zundladung 40' '40B' or '41'.

On impact, the nose percussion fuze initiates the gaine via the central tube which in turn initiates the bursting charge.

For hollow charge projectiles of calibre 7.5 cm, 8.8 cm and 10.5 cm, the nose percussion fuze is type A.Z.38 or A.Z.38St. (this is a version made almost entirely of steel). This fuze is fitted with a disruptive magazine containing penthrite wax. 15 cm projectiles are fitted with a nose percussion fuze, type Kl...Z.40 Nb, a fuze which is fitted normally to smoke projectiles. This fuze contains no magazine and as a result a small gaine is located in a steel holder beneath it.

Hollow charge projectiles include the following in their nomenclature:

Granatpatrone 38 (fixed ammunition)
Granat 39 (separate ammunition)

In the first place, the internal design was similar for all calibres, but as the war progressed, a steady series of modifications has appeared. These modifications have involved:

1. The shape of the screwed on cap
2. The shape of the internal cup
3. The diameter of the central tube
4. The nature of the bursting charge
5. The fitment of an additional internal cup in the HL/C series.
6. The fitment of tracer in all calibres except the projectiles for the 7.5 cm le.J.G.18.

/These

These modifications have proceeded on different lines in the various calibres. Modifications in design have been indicated by the inclusion of HL/A, HL/B, HL/C etc. in the nomenclature. Modification HL/C has been reached in many but not all calibres. Projectiles are painted grey-green in colour and apart from the normal German markings, modifications are indicated by a stencilling e.g. HL/A, B, or C, in black, on the projectile and beneath the nose fuze.

It has been usual for the bursting charge to be contained in a red waxed paper cover, the whole being cemented to the internal walls of the projectile with a black bituminous substance. An exception has been found in the 7.5 cm Gr. Patr. 38 HL/C. In this case, the bursting charge is contained in a steel liner.

The Germans have introduced hollow charge projectiles for use in certain captured equipments. These are standard German projectiles which have been modified. These bear the usual German colourings and markings. To distinguish them from the usual German projectiles, the country for whose equipment they are intended is stencilled on their bodies.

An exception has been the 7.5 cm Gr.Patr. 38/15(f). This consists of a French H.E. projectile Model 1915 which has been converted into a hollow charge type. This projectile has German colourings and markings. The first hollow charge projectiles appear to have had a bursting charge of 20/80 cyclonite/T.N.T. but this mixture has never been encountered.

A Table is attached in which are given particulars of known German hollow charge projectiles.

NOTES:

1. The 8.8 cm Gr. 39 HL is obsolescent for the 8.8 cm KwK and Pak 43 series of equipments and in any case should not be used in equipments which have fired more than 500 rounds.
2. The 7.5 cm Jgr. 38 HL/A and HL/B is fired with a special charge. 'Sonderhülsenkartusche'd. le. J. G 18' when used in the 7.5 cm le J. G. 18.
3. Hollow charge projectiles have been introduced on a large scale for use in both the gun and the howitzer type of equipment. Recent information however suggests that the use of such in guns is to be discontinued.
4. The following information was obtained from a captured document. Difficulties have been encountered in barrel prematures with defective 7.5 cm Gr. 38 HL/A and HL/B. The newer 7.5 cm Gr. 38 HL/C is not liable to this failure. According to the Germans, defective shell may be detected by shaking them. If they are heard to rattle, they should be discarded.

HOLLOW CHARGE PROJECTILES

German Nomenclature	Weight of Projectile (Kg)	Weight of Bursting Charge (Kg)	Nature of Bursting Charge	Remarks	Equipments
Fitted with Nose Percussion Fuze - A.Z.38 or A.Z.38St.					
7.5 cm Gr. 38	4.44	0.57	cyclonite/T.N.T. 60/40		7.5 cm. KwK 38 KwK 40 Pak 40 I.F.K. 18 F.K.16 n.A. F.K. 38 Geb.G.36 I.G.40
7.5 cm Gr. 38 HL/A	4.40	0.55			
7.5 cm Gr. 38 HL/B	4.37	0.51	cyclonite/wax 95/5		
7.5 cm Gr. 38 HL/C	4.50	0.52	cyclonite/T.N.T. 60/40	Tracer not fitted	
7.5 cm Igr. 38	2.85	0.53	cyclonite/T.N.T. 60/40		7.5 cm. le.I.G. 18 le.Geb.I.G. 18
7.5 cm Igr. 38 HL/A	2.85	0.53	cyclonite/wax 95/5		'B/A' type also used in the 7.5 cm Geb.K.15
7.5 cm Igr. 38 HL/B					
7.5 cm Gr. 39	4.5		cyclonite/T.N.T. 60/40		7.5 cm. Geb.K.15

German Nomenclature	Weight of Projectile (Kg)	Weight of Bursting Charge (Kg)	Nature of Bursting Charge	Remarks	Equipments
7.62 cm Gr. 38 HL/B	4.80	0.51	cyclonite/wax 95/5		7.62 cm Pak 36 7.62 cm F K 39
7.62 cm. Gr. 38 HL/C	4.80	0.51		Tracer is now fitted	
8.8 cm Gr. 39 HL	7.65	0.65	cyclonite/wax	Tracer fitted	8.8 cm equipments
8.8 cm Gr. 39/43 HL	ditto	ditto	ditto	ditto	8.8 cm PaK 43 Pak 43
10.5 cm Gr. 39 rot	11.76	1.75	cyclonite/T.N.T. 60/40		10.5 cm. l.F.H.16 l.F.H.18 l.F.H.18M l.F.H.18/39 l.G.42 Stu.H.42 Geb.H.40
10.5 cm Gr.39 rot HL/..	12.30	1.75	cyclonite/T.N.T. 60/40		
10.5 cm Gr.39 rot HL/B	12.10	1.50	cyclonite/wax 95/5		
10.5 cm Gr.39 rot HL/C	12.35	1.51	cyclonite/wax 95/5	Tracer is now fitted	

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German Nomenclature	Weight of Projectile (Kg)	Weight of Bursting Charge (Kg)	Nature of Bursting Charge	Remarks	Equipments
10.5 cm Gr.39	11.76	1.75	cyclonite/T.N.T. 60/40		10.5 cm.I.G.40
10.5 cm Gr.39 HL/..	12.30	1.75	cyclonite/T.N.T. 60/40		
10.5 cm Gr.39 HL/B	12.10	1.50	cyclonite/wax 95/5		
10.5 cm Gr.39 HL/C	12.35	1.51	cyclonite/wax 95/5	Tracer is now fitted	
Fitted with Nose Percussion Fuze: Kl..Z.40 Nb					15 cm.s.F.H.13 s.F.H.18 s.F.H.36 s.F.H.42
15 cm. Gr.39 HL	24.58	3.89	cyclonite/wax	Tracer fitted	
15 cm. Gr.39HL/..	24.58	4.14	cyclonite/wax	Tracer fitted	
15 cm. Igr.39 HL	24.58	3.89	cyclonite/eax	Tracer fitted	15 cm.s.J.G.33 Stu.H.43
15 cm. Igr.39 HL/..	24.58	4.14	cyclonite/wax	Tracer fitted	

HOLLOW CHARGE PROJECTILE
(7.5 cm. GR. 38)

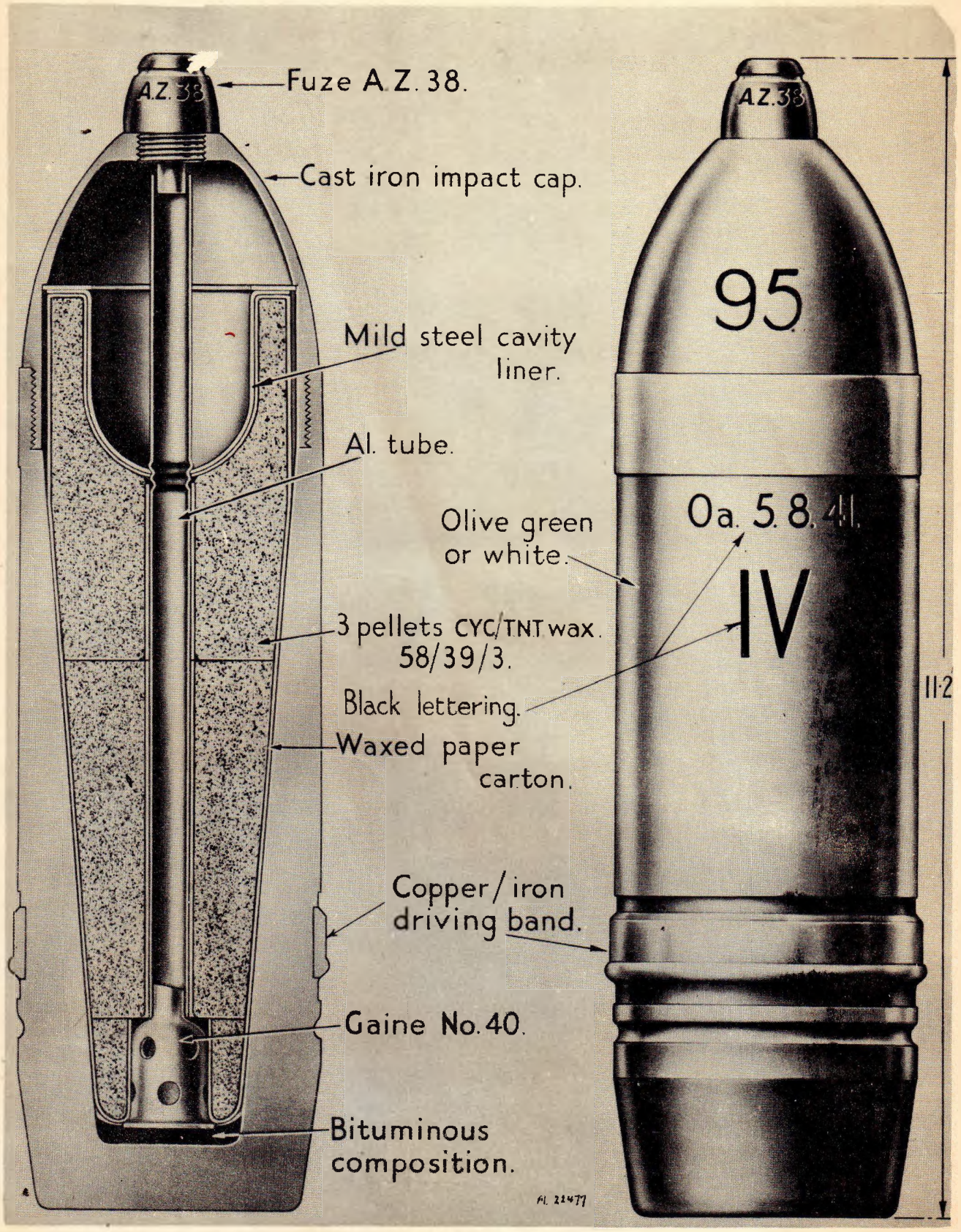
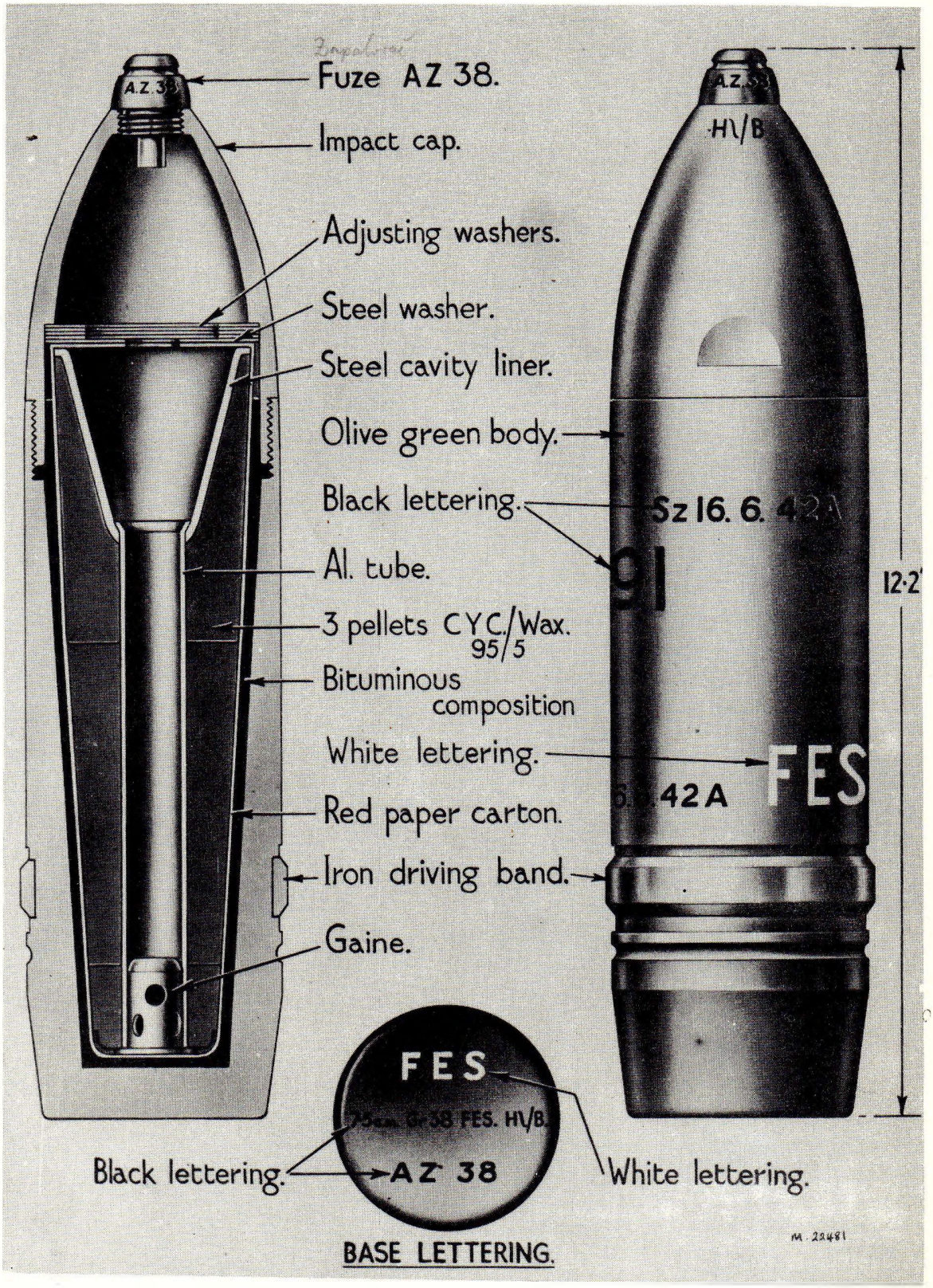


DIAGRAM 3

HOLLOW CHARGE PROJECTILE
(7.5 cm. GR. 38 HL/B)



BASE LETTERING.

DIAGRAM 4

7.5 cm. HOLLOW CHARGE PROJECTILE-Type HL/C

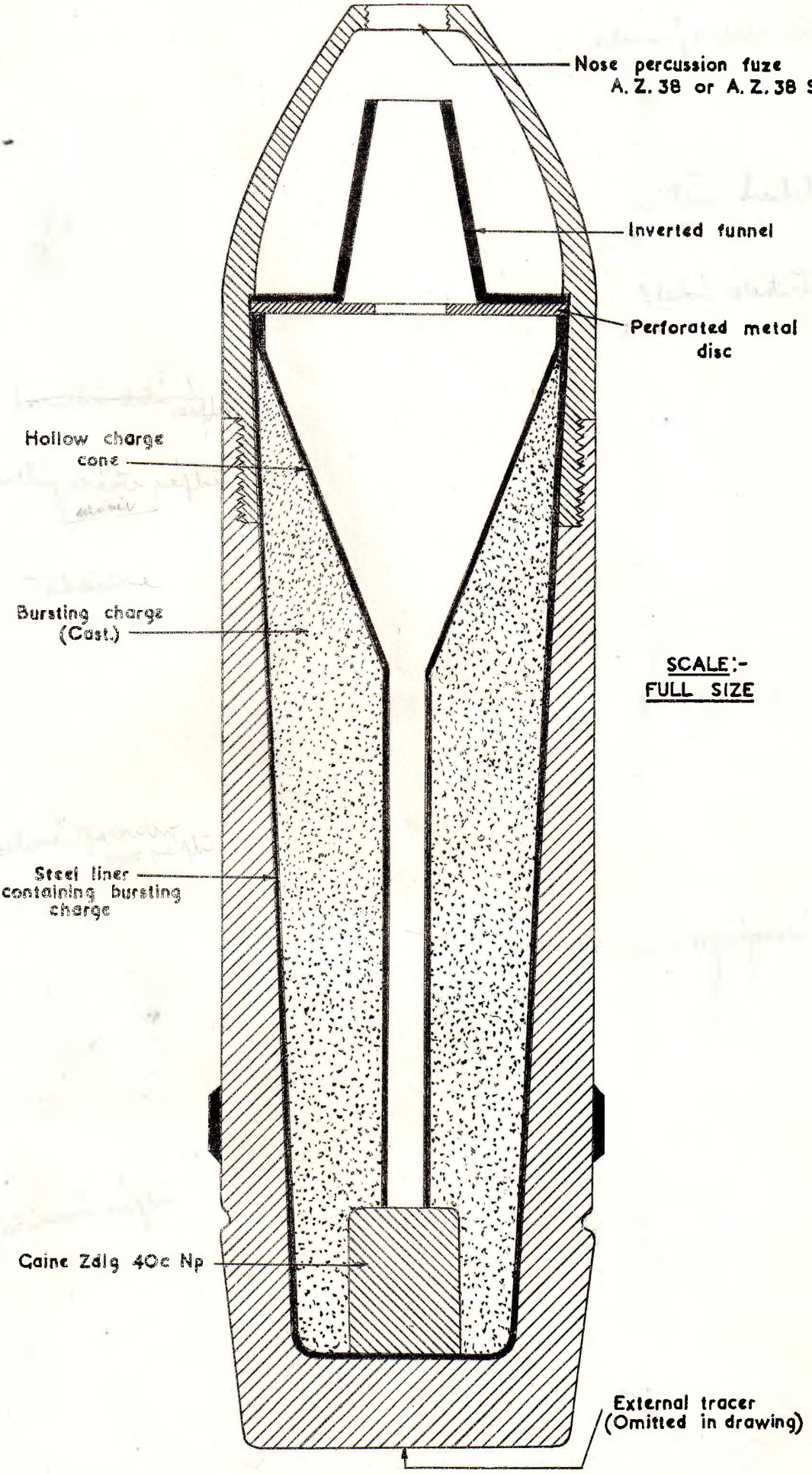


Diagram 5

10 cm G R 39
HOLLOW CHARGE PROJECTILES

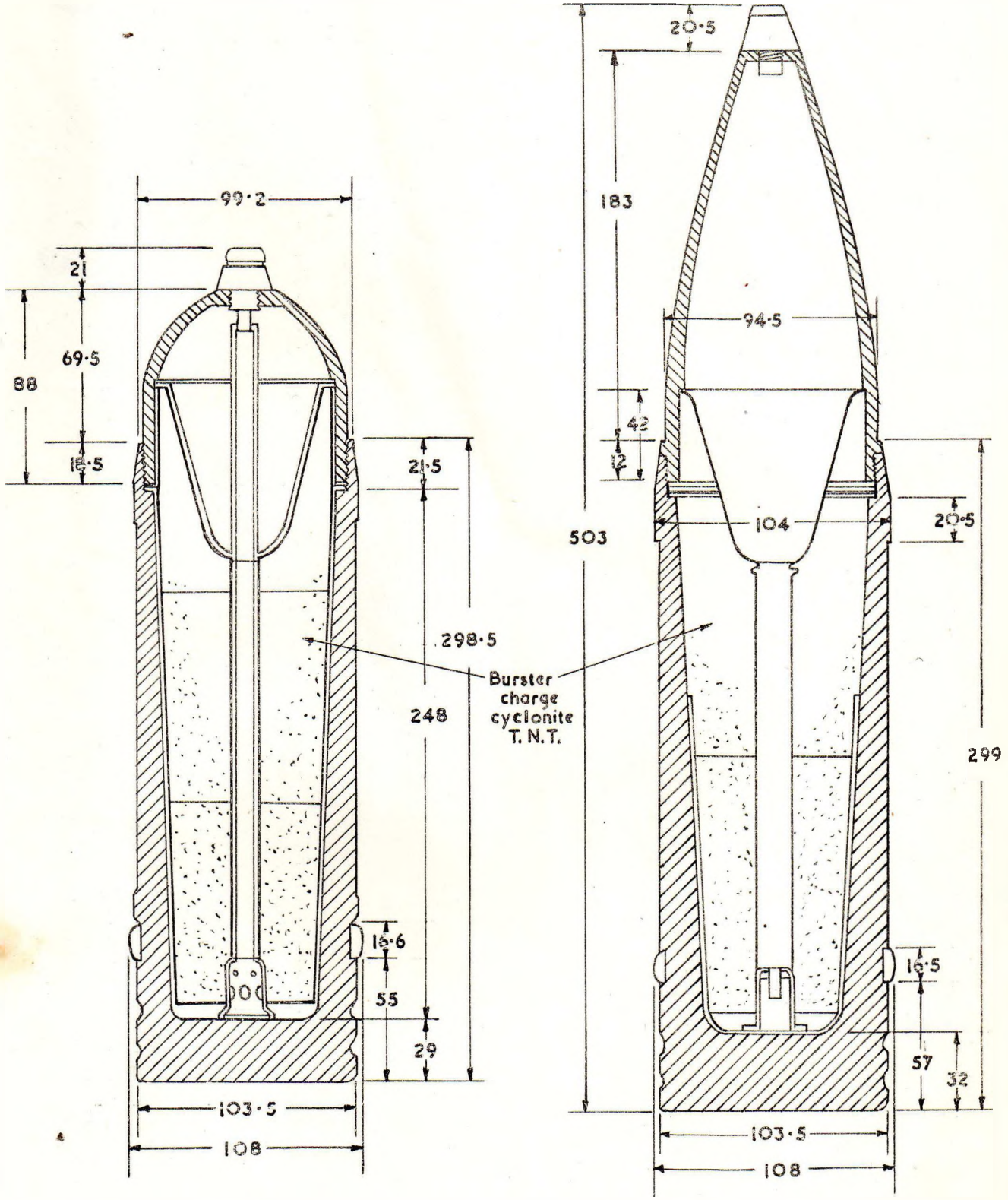


Diagram 6

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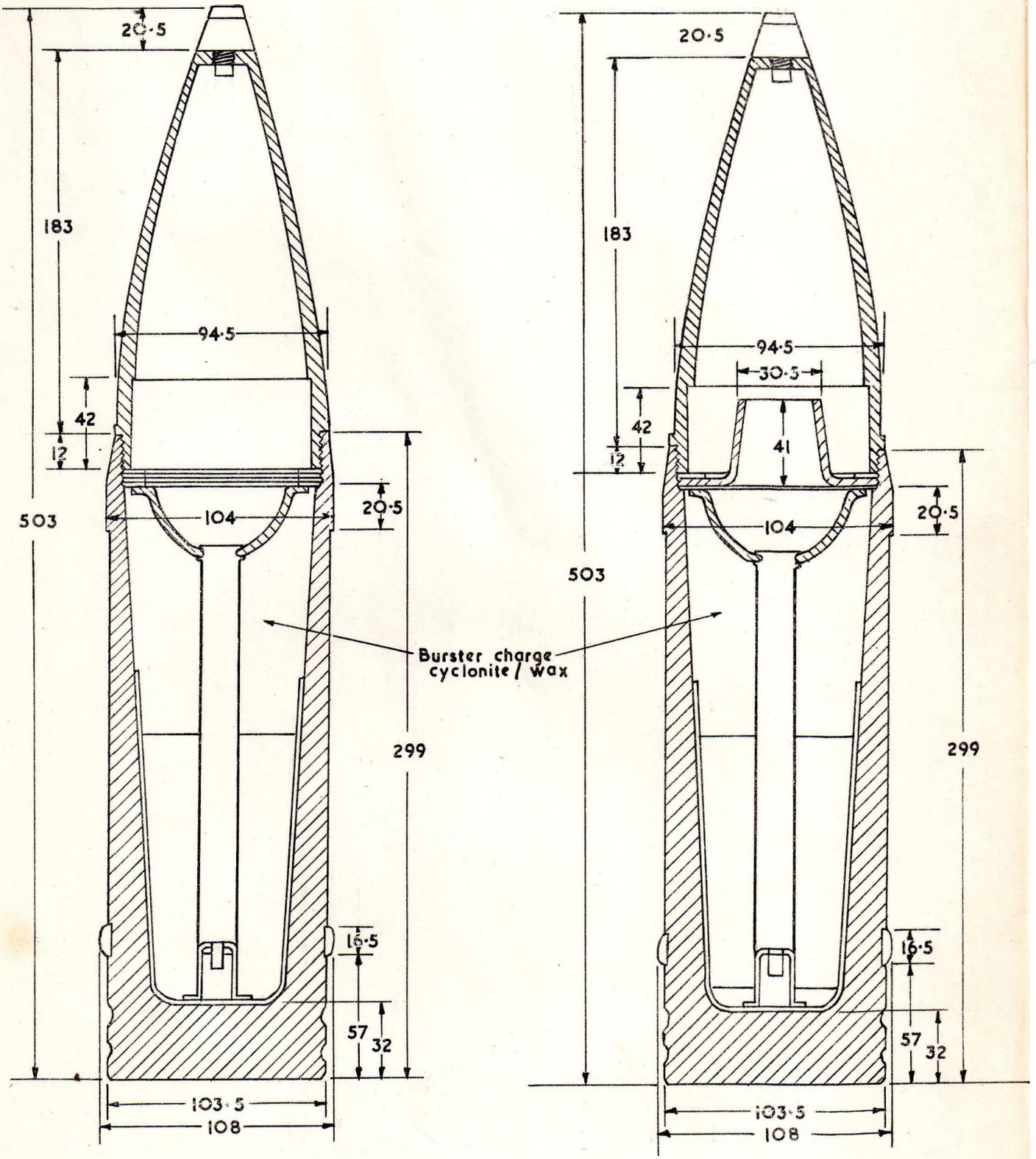
10 cm G R 39
HOLLOW CHARGE PROJECTILES



Rot H 1/B

Rot H 1/C

Diagram 7

SUB-CALIBRE PROJECTILES (Diagram 8)

A number of sub-calibre projectiles are known to be in the service of the German Army.

The object of the design is to obtain a projectile which can be fired from an existing gun at a higher muzzle velocity than the standard shell, thereby obtaining a greater maximum range without exceeding design pressure. A certain loss in the lethal capacity of the shell has been accepted in order to get the actual range.

The following types are known to exist:

Equipment	Projectile
10.5 cm le.F.H.18	a) 10.5 cm Sprgr.42 TS H.E. projectile actual calibre - 8.8 cm
	b) 10.5 cm Pzgr.39 TS AP/HE projectile actual calibre - 7.5 cm
15 cm s.F.H.18	a) 15 cm Sprgr. 42 TS H.E. projectile actual calibre - 12.8 cm
	b) 15 cm Pzgr. 39 TS AP/HE projectile actual calibre - 10.5 cm

TS = Triebspiegel

Specimens of both the 10.5 cm and 15 cm H.E. projectiles have been recovered. Both are equipped with rings at shoulder and base which fly off when the projectile leaves the muzzle. The following is a description of the construction of the 10.5 cm H.E. projectile and except for measurements can be applied to the 15 cm projectile also.

The rear or base ring is in three segments and is held together by the driving band which fits in a groove in the segments. The space between the segments is made gas tight by steel cylinders which make a close fit in channels formed in the edges of the segments. The ring has welded to it a thin steel fairing which acts as a shield during loading.

Lateral movement of the ring is restricted by grooves machined round the shell base which engage with corresponding annular projections on the inside of the ring. In addition the ring is keyed to the shell by cylinders held in radially drilled holes. These cylinders engage with depressions in the shell base and also make contact with the under surface of the driving band.

The forward or centering ring consists of a hollow ring of thin steel, almost cut through at three points and keyed to the body of the shell by three steel balls which engage in depressions formed in the shell body. The balls are housed in shaped bosses welded to the inside of the ring and are pressed into the depressions by grub screws. The ring is fitted into position by slipping over the nose of the shell.

/The

The following are data relating to the general structure of both H.E. projectiles:

10.5 cm. Sprgr. 42 TS

Weight of projectile	11 kg.
Nose percussion fuze	...Z.23
Gaine	gr.Zdlg. C/98Np
Bursting charge	1.1 kg. T.N.T.
Smoke box	Rauchentwickler Nr. 8
Colour	yellow

15 cm. Sprgr. 42 TS

Weight of projectile	30 kg.
Nose percussion fuze	...Z.23
Gaine	Zdlg.36Np
Bursting charge	4.1 kg. T.N.T.
Smoke box	Rauchentwickler Nr. 9
Colour	yellow

Propellant Charges

Special propellant charges are issued with this class of projectile. Details are as follows:

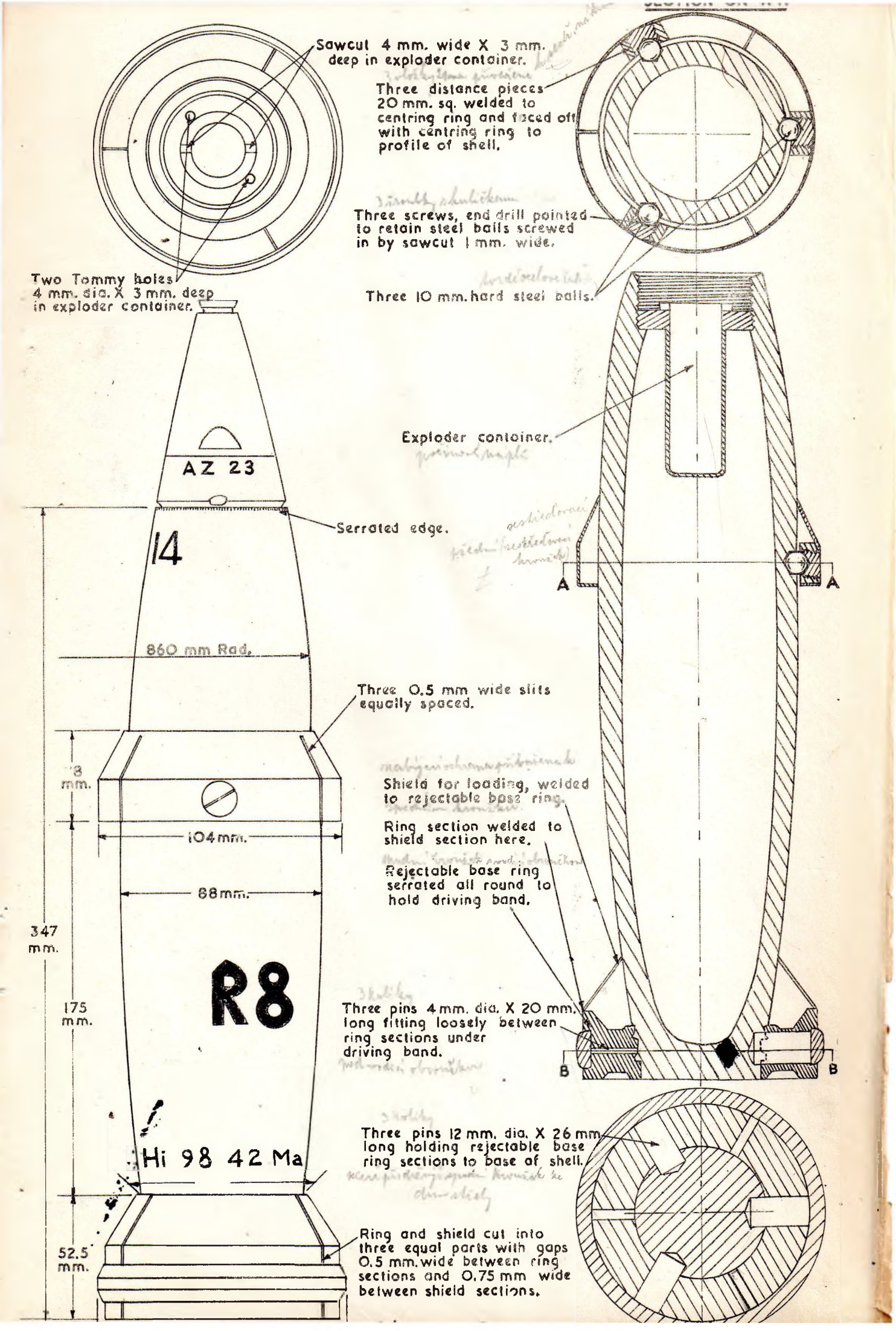
a) For use with the 10.5 cm Sprgr.42 TS
German nomenclature — Sonderhülsenkartusche 42 TS d.le.F.H.18
Weight - 1.915 kg.

b) For use with the 10.5 cm Pzgr. 39 TS
German nomenclature — Sonderhülsenkartusche 39 TS d.le.F.H.18
Weight - 2.12 kg.

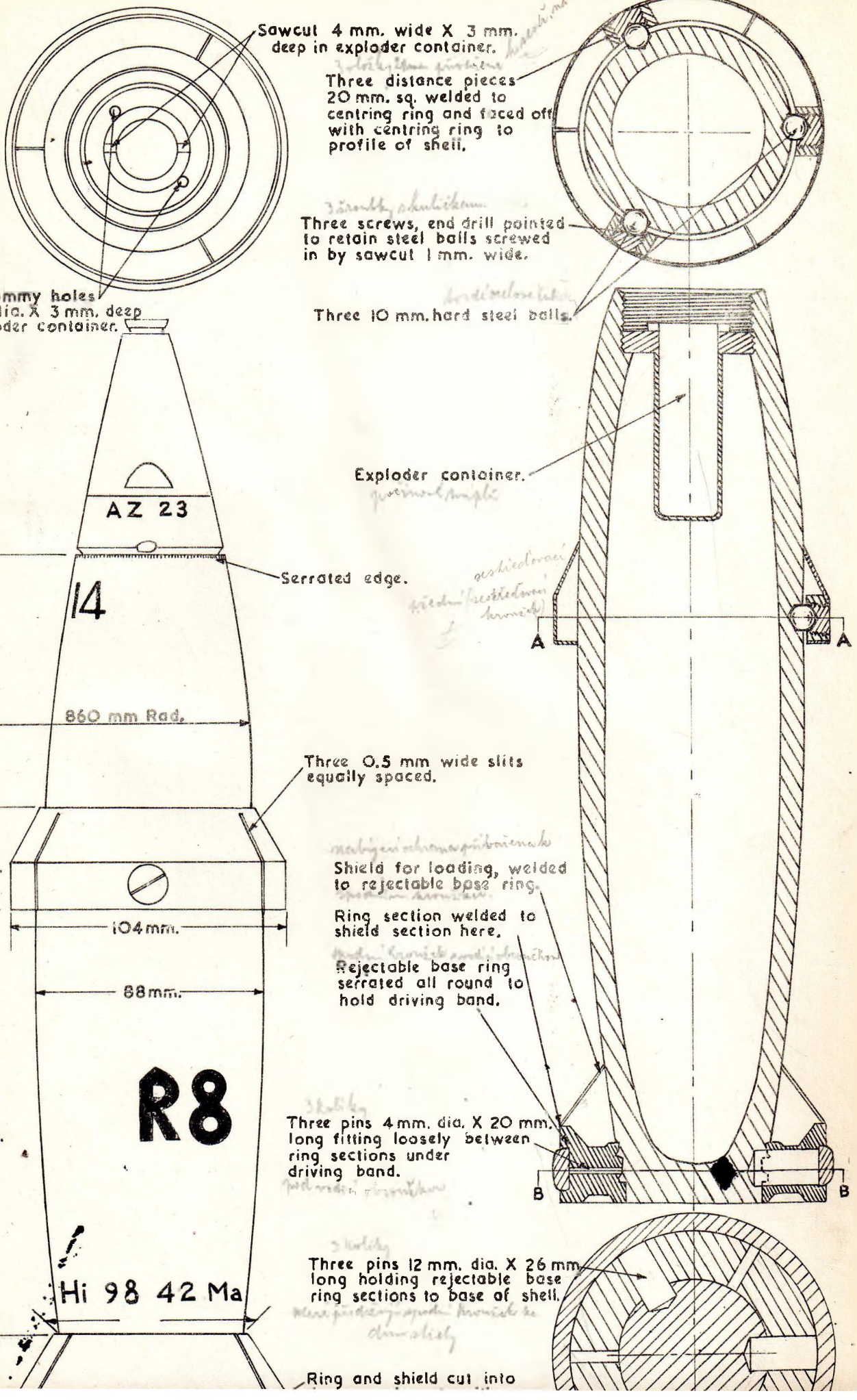
c) For use with the 15 cm. Pzgr. 39 TS
German nomenclature — Sonderhülsenkartusche 39 TS d. S.F.H.18
Weight - 4.6 kg.

NOTE:

The A.P. projectiles have not as yet been recovered.


Sawcut 4 mm. wide X 3 mm. deep in exploder container.
Three distance pieces 20 mm. sq. welded to centring ring and faced off with centring ring to profile of shell.
Three screws, end drill pointed to retain steel balls screwed in by sawcut 1 mm. wide.
Two Tommy holes 4 mm. dia. X 3 mm. deep in exploder container.
Three 10 mm. hard steel balls.
Exploder container.
AZ 23
14
Serrated edge.
860 mm Rad.
Three 0.5 mm wide slits equally spaced.
8 mm.
104 mm.
88 mm.
347 mm.
175 mm.
R8
Hi 98 42 Ma
52.5 mm.
Shield for loading, welded to rejectable base ring.
Ring section welded to shield section here.
Rejectable base ring serrated all round to hold driving band.
Three pins 4 mm. dia. X 20 mm. long fitting loosely between ring sections under driving band.
Three pins 12 mm. dia. X 26 mm. long holding rejectable base ring sections to base of shell.
Ring and shield cut into three equal parts with gaps 0.5 mm. wide between ring sections and 0.75 mm wide between shield sections.
A
A
B
B

10·5 cm. SUB-CALIBRE H.E. SHELL



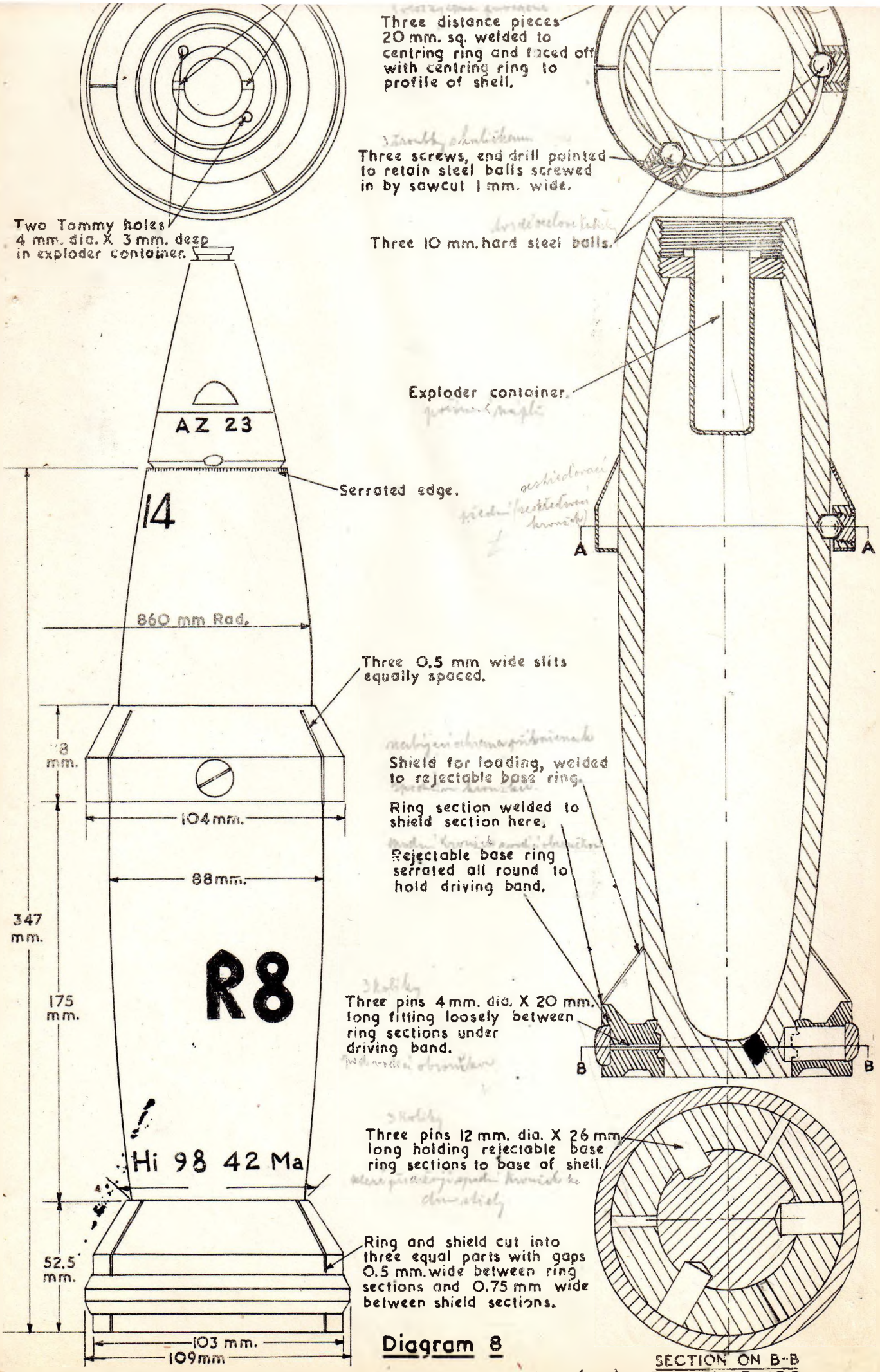


Diagram 8

SECTION ON B-B

Office of A. C. of S., G-2, SHAEF C.E.N. G-2 (Tech) Plate No. D. 150

SHAEF NO. 6

INCENDIARY-SHRAPNEL PROJECTILES FOR A.A. GUNS

It is now known that the Germans are using a new type of incendiary-shrapnel shell. The shrapnel takes the form of a number of incendiary pellets thought to be contained in a relatively thin walled shell and fired by 8.8 cm equipments.

The incendiary pellet consists of a small metal capsule approximately 1 1/8 inch long and 9/16 inch diameter. It contains an incendiary filling which has been analyzed as follows:

Approximately 3.0 gm of composition pressed with serrated drift:

Acid insoluble matter) yellow, brown, resinous)	3.4%
Barium nitrate	48.0%
Magnesium/aluminum alloy	24.0%

Approximately 0.25 gm of loose composition:

Acid insoluble matter) including organic matter)	5.7%
Barium nitrate	42.0%
Magnesium/aluminium alloy	26.8%

A steel plug, containing a type Z6 igniferous detonator is fitted into the open end of the capsule. The opening containing the detonator cup is covered by a steel plate 0.3" thick, on the inside of which is a spike which acts as a striker. The weight of the pellet complete is 28 gm. Further shell fragments have been recovered and are thought to be part of a container for these pellets. Their dimensions suggest that the complete projectile may be fired by 8.8 cm A.A. equipments.

The pellets appear to be ignited either by the initial detonation of the shell, or failing this by impact.

SHEAB NO. 6

GROOVED H.E. PROJECTILES FOR A.A. EQUIPMENTS

H.E. projectiles for certain A.A. equipments are now issued with fragmentation cuts on their bodies. These consist of a number of vertical cuts and one or more circular cuts. Such ammunition is issued for the following equipments:

8.8 cm Flak. 18, 36, and 37
8.8 cm Flak. 41
10.5 cm Flak. 38 and 39

Such ammunition has 'gerillt' printed on the label.

H.E. STICK BOMBS (Diagrams 9 & 10)

A number of stick bombs have been designed for firing from artillery equipments. Two classes have so far been encountered, a) H.E., and b) hollow charge. Only the former will be described here. The following types are known to exist:

... German nomenclature - 15 cm Stielgranat 42.

This bomb is fired from the 15 cm. s.J.G.33 (heavy infantry gun) and is designed for use against personnel in the open and for clearing minefields and wire obstacles. It consists of the bomb with nose percussion fuze, stick unit, fins and propellant charge. The stick unit leaves the bomb at a distance of approximately 150 metres from the muzzle of the gun.

The following is a description of the main parts:

The bomb is of welded steel construction. The casing is 3 mm thick and made up of three main parts - the nose, a parallel sided centre piece, and a tapered rear piece. The front of the nose is reinforced with a steel ring, welded to the casing, and tapped to receive the fuze adaptor. The base is also reinforced by a steel ring, welded to the casing, which accommodates a steel cup. This cup has a machined surface on the base and sides; it is 10 mm. thick at the base and 5 mm thick at the sides.

The tail is of unusual construction. Three steel tubular sockets, equally spaced round the bomb, project from the rear portion of the casing at an angle of 20 degrees to the main axis; they are welded to the casing and are provided with supporting bars welded to the base ring. The three sockets receive tubular bars to which sheet steel fins are attached. These bars are bent in order to bring the fins parallel to the main axis whilst providing clearance to the muzzle of the gun. Both the sockets and the fin bars are drilled to take spring fastening clips. In addition to the three detachable tail fins there are six steel plate fins, 5 mm thick, welded to the casing and spaced in pairs between the tubular sockets.

The main filling is poured Amatol 50/50. A booster charge in the form of a cylinder of compressed T.N.T. pellets runs down the centre for approximately 375 mm from the gaine. Two normal annular picric pellets are around the gaine.

Fuze (see attached drawing)

The bomb is fitted with nose percussion fuze War. Z.36.

/Description

Description

A steel fuze adaptor (1), which carries the gaine, screws into the nose of the bomb. The body of the fuze (2), which is of aluminium, screws into this adaptor. A circular aluminium block (3) slides into the base of the fuze and is held in position by an aluminium plug (4) which carries a block of match composition. The body is recessed from the front to carry a steel striker guide (5), at the base of which is the detonator, and a steel head (6), which carries the aluminium striker pellet (7).

A steel detent (8), pivoted at one end and spring loaded, is retained beneath the striker pellet by a spring loaded pin (9) which in turn is held forward by a powder plug (10).

A steel inertia pellet (11) carrying a cap is held by a creep spring from a secondary striker pin (12). A safety pin (13) passes through the face of the fuze body and a cannelure in the forward end of this inertia pellet.

The fuze has alternative settings, instantaneous and short delay. The setting is effected by a selector screw (14) recessed into the face of the fuze body. Alternative flash tubes lead from the detonator to the match composition, (a) a central tube and (b) a tube leading to a pyrotechnic delay (15) offset in the aluminium block (3). When set for delay the central flash tube is masked by a spring loaded slide (16) which is held by a detent (17). When set for instantaneous, this detent is moved forward, by the selector screw, to release the slide. The letters C and N are stamped on either side of the selector screw to indicate "without delay" and "with delay" respectively.

A round inspection window (18) is provided in the face of the fuze body. A hole (19) pierces the fuze body to form a ventilating shaft to the pyrotechnic train (20).

Markings

Typical markings stamped on the face of the fuze body are

Mgr Z 36 bmv 42

Operation

Before firing the safety pin is withdrawn. On firing the inertia pellet (11) sets back on the secondary striker pin (12). The pyrotechnic train (20) is ignited and melting the wax plug (10) it releases the pin (9) which sets back to release the detent (8). The fuze is then armed.

On impact the striker pellet sets back against the creep spring (21) and the detonator is fired.

/Stick unit

Stick unit

This consists of a hollow steel tube which is open at the front end and closed except for a small hole at the rear. At the forward end is a lip. The surface of the stick is machined at each end and also at 3 places in between. The machined portion at the rear has 3 cannelures.

Length of stick	- 905 mm
Diameter	- 149 mm
Thickness	- 5 mm

Propellant charge

The standard cartridge case for the 15 cm s.J.G.33 is used but on its base is stamped 'Stielgr'.

A percussion primer, type C/13nA, is screwed into an adapter which is screwed into the base of the cartridge case.

The propellant charge consists of 180 gm. of Digl.Bl.P. - 10.5 - (3.3.0.8). This is a 'diglykol' type of propellant in flake form, size 3x3x0.8mm. The charge is made up in a long silk bag which is laid in the cartridge case in circular form. A cardboard closing cup is fitted in with shellac. A large steel primer magazine adapter is arranged in the centre of the charge. This contains a cardboard holder of gunpowder. The top of the adapter projects through the hole in the centre of the closing cup and is held in place by a large nut.

This charge, which is known as the 'Hülsenkartusche f. 15 cm Stielgr.42', is used only with the stick bomb.

Weight of bomb	- 75 kg.
Weight of bursting charge	- 57 kg.
Colour	- field grey

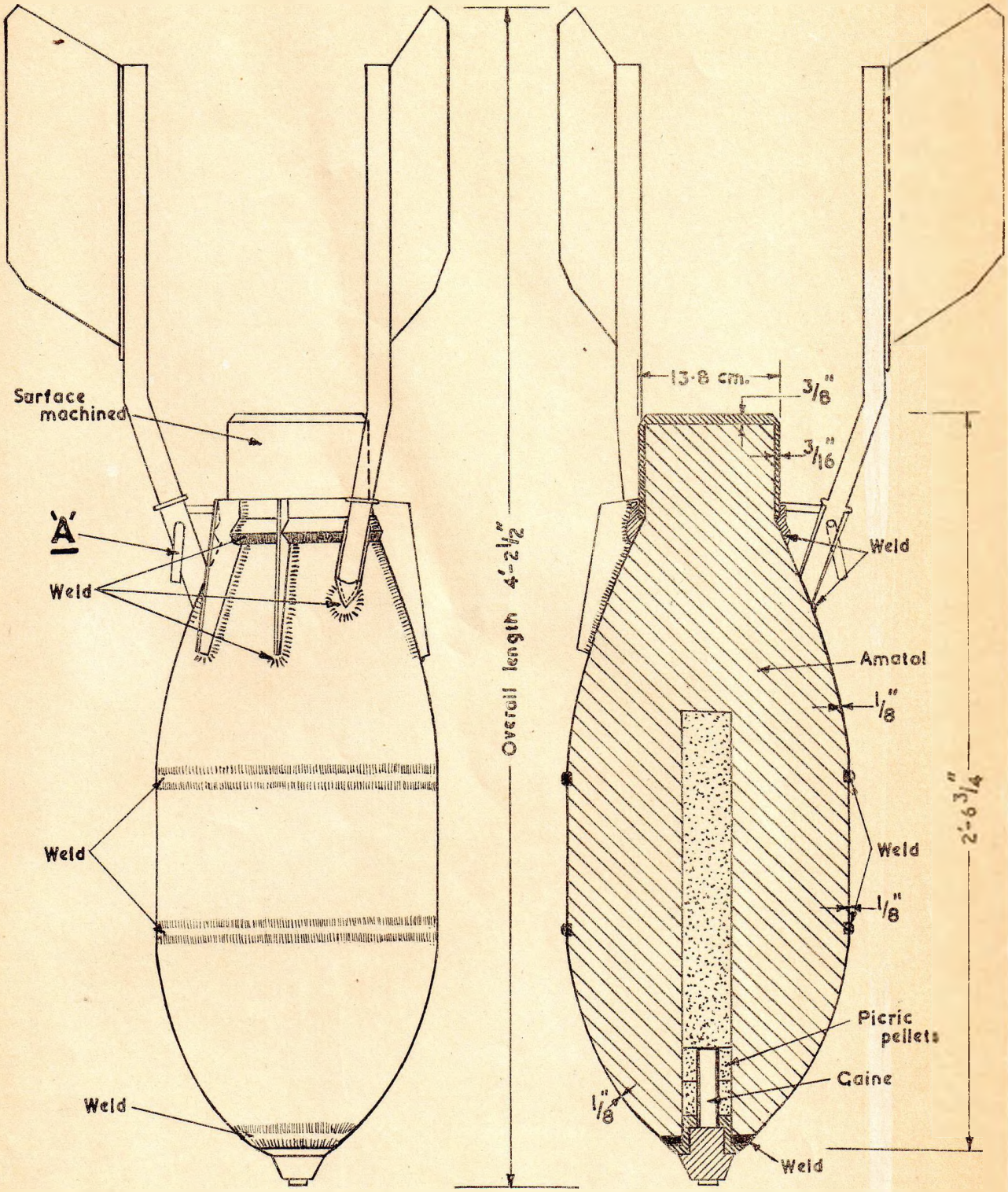
Packing

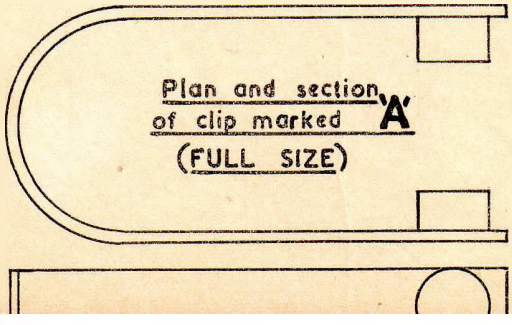
1 fuzed or unfuzed bomb in wooden crate	- 80 kg
6 tail units in a wooden box	- 13.2 kg.
1 stick unit in a wooden crate	- 22.2 kg.
2 propellant charges in a wooden box	- 10.9 kg.

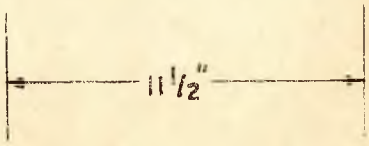
B.

A stick bomb is believed to be in existence for firing from the 8 cm. mortar - s.Gr.W.34.

GERMAN STICK BOMB for 15 cm. (5·9 in.) HEAVY INFANTRY GUN s. I. G. 33







SCALE:- 2 Inches to 1 Foot

GERMAN NOSE FUSE Wgr. Z. 36 (percussion)

Scale – Twice Full Size

NOTE – Length of gaine from back of adaptor (Y) = 2¾ ins.

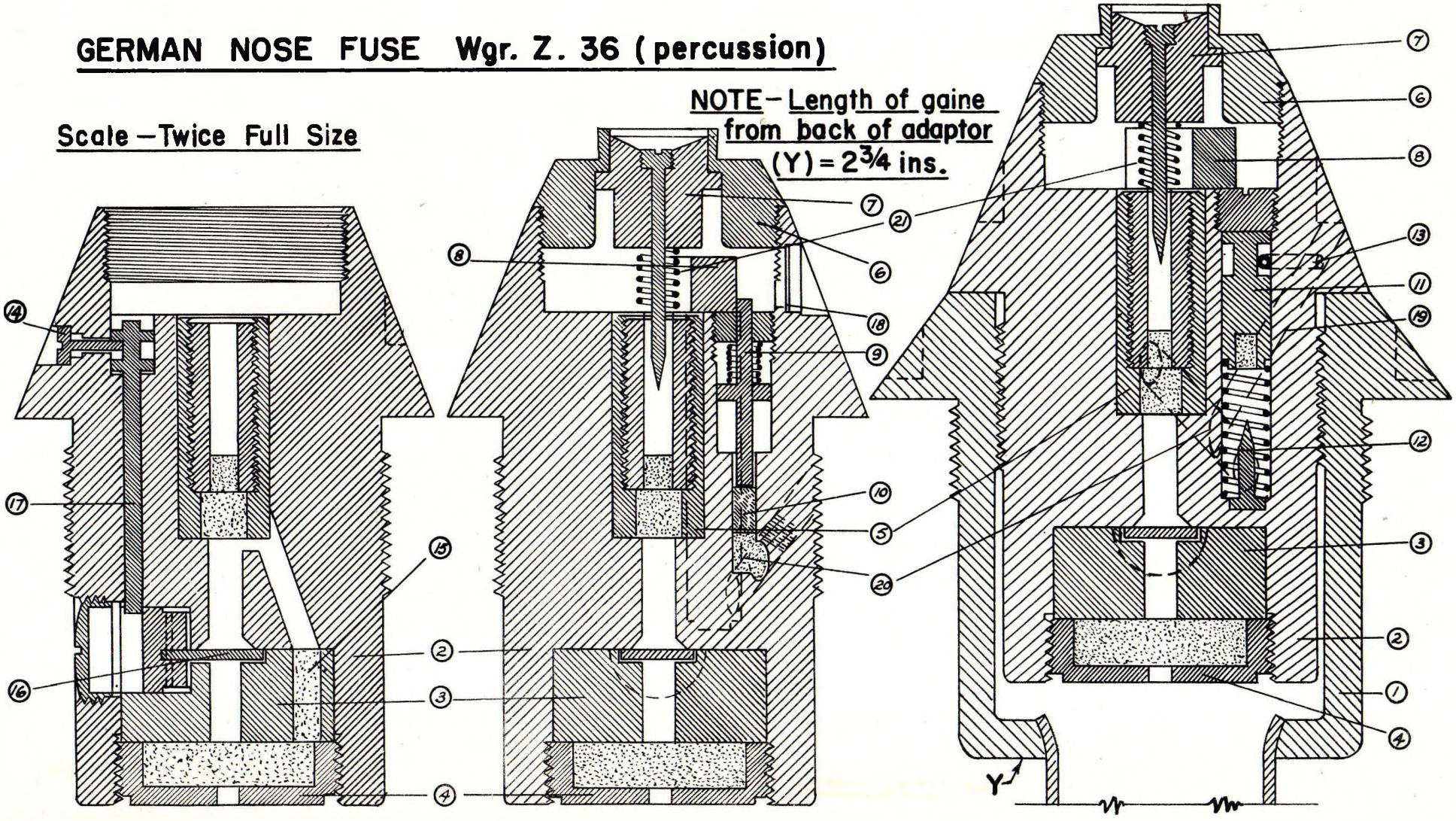


DIAGRAM 10

ROCKET ASSISTED H.E. PROJECTILES (Diagrams 11 & 12)

Rocket assisted H.E. projectiles are known to be in use in the German Army but as yet no specimens have been recovered. The following are known:

1. German nomenclature: 15 cm. R.Gr.19

This projectile is fired from the 15 cm s.F.H.18 and associated equipments. In this projectile the rocket element appears to operate fairly soon after the projectile leaves the muzzle. There are two patterns. The older pattern has a base plate which is held in place by magnesia luting and is thrown off to expose the Venturi. The newer pattern has individual plugs fitting into the Venturi which are subsequently thrown clear. The following are the general particulars:

Nose fuze:	percussion:	El.A.Z. or El.A.Z.m.R.
	T. and P. :	Dopp.Z. s/90
Weight of projectile		45.1 kg.
"	" bursting charge	1.6 kg.
"	" rocket propellant	5.8 kg.

The nose percussion fuze is unusual since it is an electric type - a type not normally employed in artillery projectiles.

Fuze - El.A.Z.

This electric fuze operates D.A. or graze and does not become armed until the projectile is 30 metres from the gun.

The fuze is not ready for use but must be electrically charged. by means of the electrical charging gear - A-gerät 182 -, and the charging key - A - schlüssel 40. The fuze remains charged for 2 hours and may be discharged and charged as often as desired. In the tropics, the fuze must be used immediately after charging, or at least no longer than 5 minutes. Otherwise it must be discharged and then re-charged.

Fuze - El.A.Z.m.R.

This is similar to the above except that it is fitted with a charging ring instead of a charging point. It is not ready for use and must be charged by means of the charging gear - A-gerät 181 and the charging key - A-schlüssel 221. If more than 5 minutes elapses, the fuze must be discharged and re-charged.

Propellant charge

A special propellant charge, known as the 'R-hülsenkartusche d.s.F.H.18' is used with this projectile

It consists of 6.2 kg. Digl.R.P.-GI-(360, 3,8/1,3). This is a double base propellant containing ethylene diglykol dinitrate and nitrocellulose and in tubular form, size:

length	- 360 mm
external diameter	- 3.8 mm
internal "	- 1.3 mm

An igniter containing 40 gm of nitrocellulose powder - Nz.Man. N.P.-(1,5:1.5) is attached. The propellant bag is stamped with 'R' in red.

/NOTE

NOTE:

The base plate in the old pattern appears to fall within an area 3500 - 5800 metres in front of the gun and 1000 metres right and left of the line of fire.

2. German nomenclature - 28 cm. R.Gr.4331

This is used in the 28 cm.K.5(E) and is pre-rifled as is general for projectiles for this equipment. Externally it resembles the standard H.E. projectile. The foremost part contains the rocket element and the rear part contains the bursting charge. A time fuze, Zt.Z. s/30, is fitted at the nose. The rocket element is initiated 19 seconds after commencement of flight through the time fuze. When the rocket element is initiated, the base plate (weight - 10 kg) is blown off and the Venturi exposed.

The bursting charge is initiated by two internal fuzes - A.Z.4331 - which are armed by the heat from the propellant gases.

The projectile is painted grey green and in addition to the normal stencillings has 'R' and the weight of the rocket propellant in kg., i.e. '19.5 kg' stencilled in red on the fore part of the body.

The following are the general particulars:
Weight of projectile (range table) - 248 kg.
Rocket propellant - Treibsatz T 28/4.7 - 19.5 kg.

The projectile is fired with the normal charge.

3. German nomenclature: 28 cm R.Gr.4341

This is similar to the above except that it is not pre-rifled. It is fitted with 2 centering bands and a driving band.

The equipment is as yet unknown - it is believed to be the 28 cm Br.N.K.(E).

ANTI-CONCRETE PROJECTILES (Diagram 13)

This type of projectile would appear to have been designed primarily for the attack of concrete and is also sometimes described as S.A.P.

The general construction is as follows:

1. A hollow shell containing a bursting charge and a base fuze which may be set 'instantaneous' or 'with delay'.
2. The bursting charge is of graded sensitivity, the sensitivity decreasing from base to nose.
3. A small ballistic cap is often fitted.

These projectiles have 'Be' in the nomenclature although sometimes they are alternatively described as S.A.P (Halbpzgr.).

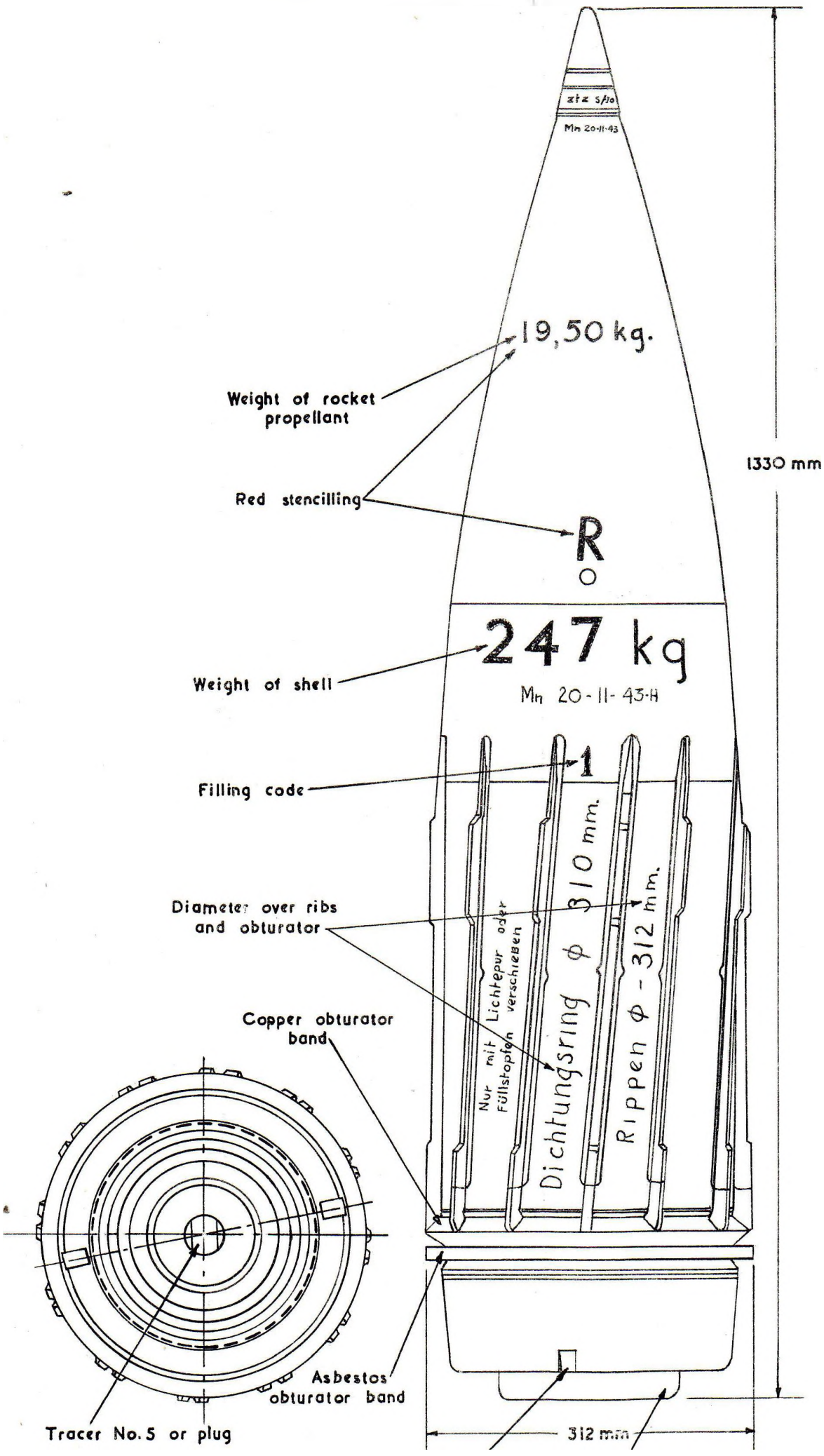
Recently a new type of anti-concrete projectile has been introduced but specimens so far have not been recovered. These are known as 'Ro.Gr.'.

Ro = rochling = rattling

There are two models, 'Ro.Gr.42' and Ro.Gr.44'. Very little is known concerning these but they are believed to be unrotated and fin-stabilised.

Particulars of known types are given in the attached Table.

28 cm R. Gr. 4331



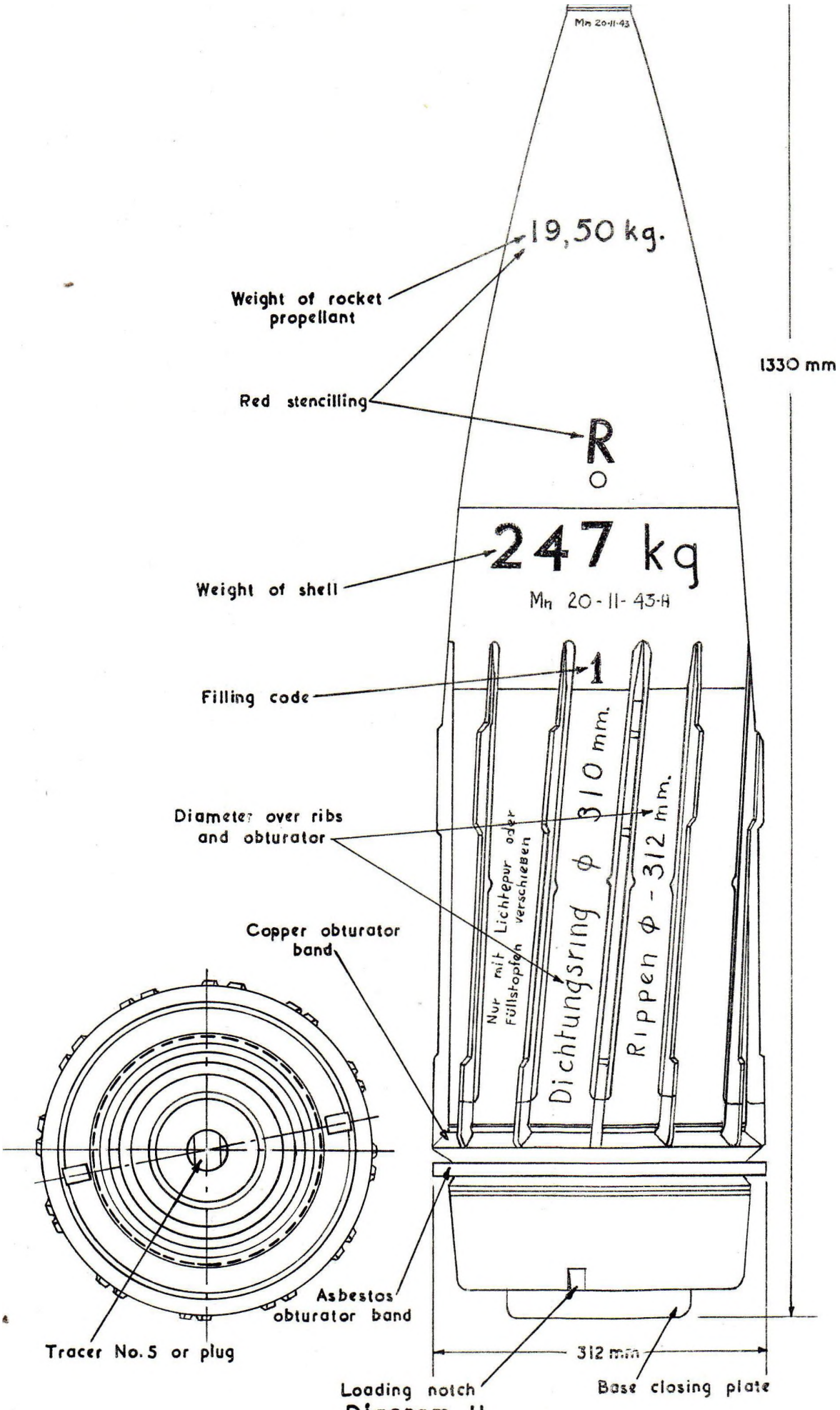


Diagram II

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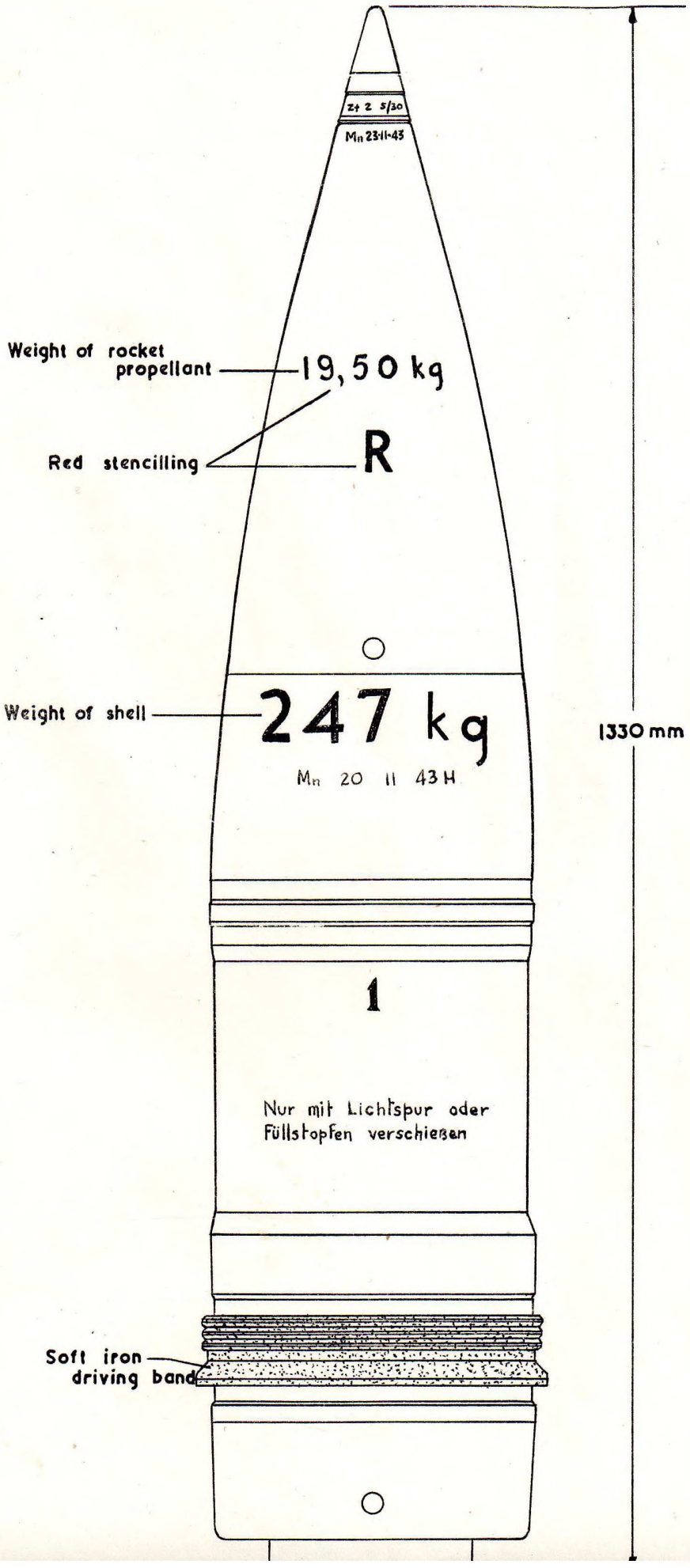
28 cm R. Gr. 4341



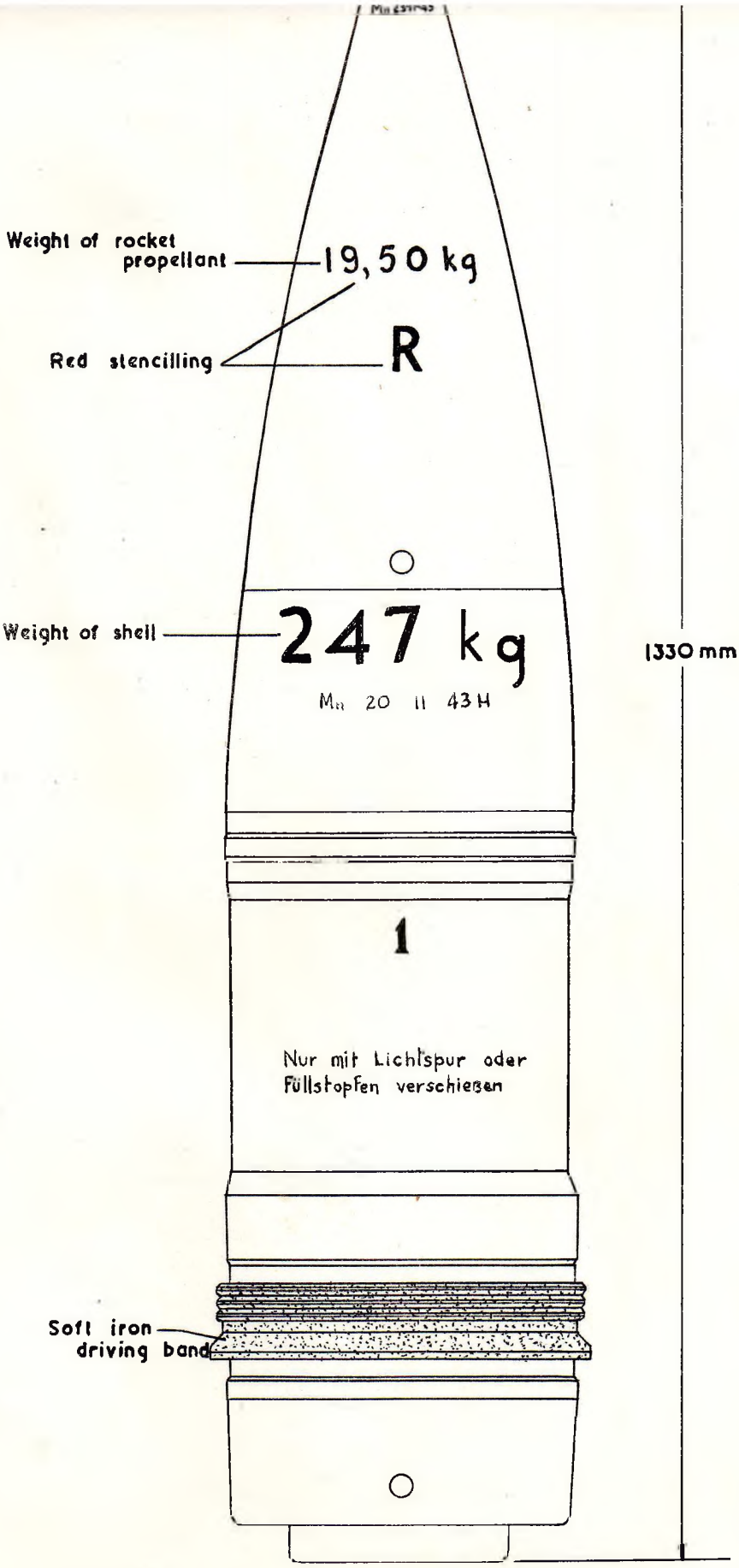


Diagram 12

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ANTI-CONCRETE PROJECTILES

GERMAN NOMENCLATURE	Weight of Projectile (Kg)	Weight of Bursting Charge (Kg)	Fuze	Caine	Equipment
15 cm.Gr.19 Be.	43.5	3.18	Bd.Z.f. 15 cm.Gr.19 Be.	gr.Zdlg. c/98	15 cm. s.F.H.13 s.F.H.18 s.F.H.36 s.F.H.42 s.H.T.
15 cm.Gr.19 rot Be.	43.5	3.11	ditto	ditto	15 cm. K.18 K.39 K.(E) K.ins Mrs.Laf.
15 cm. Halbpzgr.	45.	1.80	Bd.Z. AK.Zr.1163		15 cm. K.39
21 cm.Gr.18 Be.	121.4	11.50	Bd.Z.f. 21 cm.Gr.18 Be.	gr.Zdlg. c/98 .	21 cm.Mörser.18 lg.21 cm. Mörser.18
21 cm.Rö.Gr.42 Be.		2.70			21 cm.Mörser.18
21 cm.Rö.Gr.44 Be.		7.05			ditto
21 cm.Gr.39 Be.(Halbpzgr)	135	8.15	Bd.Z.DVZR(t)		21 cm.K.39 39/40 39/41

SUPREME HEADQUARTERS
ALLIED EXPEDITIONARY FORCE
Office of Assistant Chief of Staff, G-2
Main Headquarters

CAPTURED AMMUNITION BULLETIN NO. 6

GERMAN NOMENCLATURE	Weight of Projectile (Kg)	Weight of Bursting Charge (Kg)	Fuze	Gaine	Equipment
24 cm.Gr.39 Be.(Halbpzgr)	166	10.38	Bd.Z.DWZR(t)		24 cm. K.39 39/40
35.5 cm.Gr. Be.	575	36.00	Bd.Z.f. 21 cm.Gr.19 Be.		N.I.
35.5 cm.RÄ.Gr.42 Be.		29.40			ditto
35.5 cm.RÄ.Gr.44 Be.					ditto
s.Gr.Be.		90.			Gamma Mörser 42 cm.M.(t)