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AUSTRALIAN MILITARY FORCES

TECHNICAL INTELLIGENCE SUMMARY

No. 17
SEPT 1944.

Prepared by the General Staff Intelligence, and issued under the direction of the Commander in Chief, Headquarters, Australian Military Forces.

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AUSTRALIAN MILITARY FORCES
TECHNICAL INTELLIGENCE SUMMARY
NO. 17
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.. ..

70 MM BARRAGE MORTAR

1. GENERAL

This weapon is used to engage low flying aircraft by projecting parachute bombs up to a height of 1700 ft. The bomb, which has been previously described in AMF Tech Int Sum Nos. 6,11 & 15, is detonated when the parachute cord is struck by part of an aircraft.

2. DESCRIPTION (Figs 1-2)

The mortar consists of three main parts, namely:-

(a) barrel cap, (b) barrel and (c) wooden base.

(a) The barrel cap: The shallow cylindrical steel cap is open at one end and threaded internally to take the barrel. Externally attached to the closed base of the cap is a steel spike 20 ins long which is driven into the ground when the mortar is mounted. Centrally situated on the inside of cap base is a fixed hardened steel firing pin $\frac{1}{8}$ in. in diameter set in a mounting with outside diameter of .85 in. Two external diametrically opposed lugs on the base of the cap are evidently used when mortar is mounted on the wooden base.

(b) Barrel: This tubular steel component has total length of 35-1/32 ins with an internal diameter of 2.75 ins. The breech section is strengthened for 7.9 ins from the base. A screwed steel plug 7/32 in. thick with a central 7/8 in. diameter aperture for the firing pin, is designed to fit into the breech of the barrel to prevent a gas wash through the threads of the barrel cap.
The breech end of the barrel is threaded internally (12 threads per inch) to take the steel plug and externally (12 threads per inch) to allow the barrel to screw into the barrel cap.

(c) Wooden Base: A rectangular wooden base is understood to be the normal equipment for this mortar.

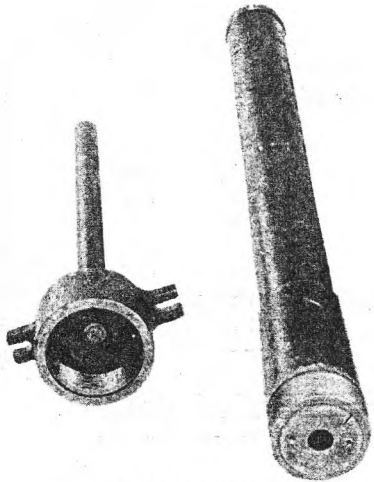
3. ANALYSIS OF STEEL COMPONENTS

	Barrel	Base Components
Carbon %	0.29	Not determined.
Manganese %	0.5	0.4
Silicon %	0.40	0.19
Chromium %	0.1	0.1
Molybdenum %	Nil	Nil
Nickel %	Trace	Trace
Tungsten %	Nil	Nil
Vanadium %	Nil	Nil

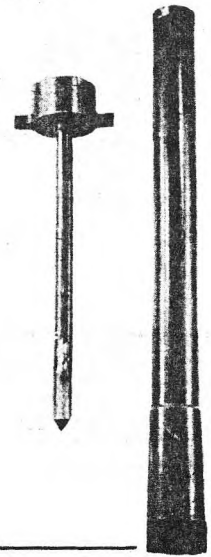
(SOURCE:- D of A, through M.G.O. Branch)

70 MM BARRAGE MORTAR

FIG I



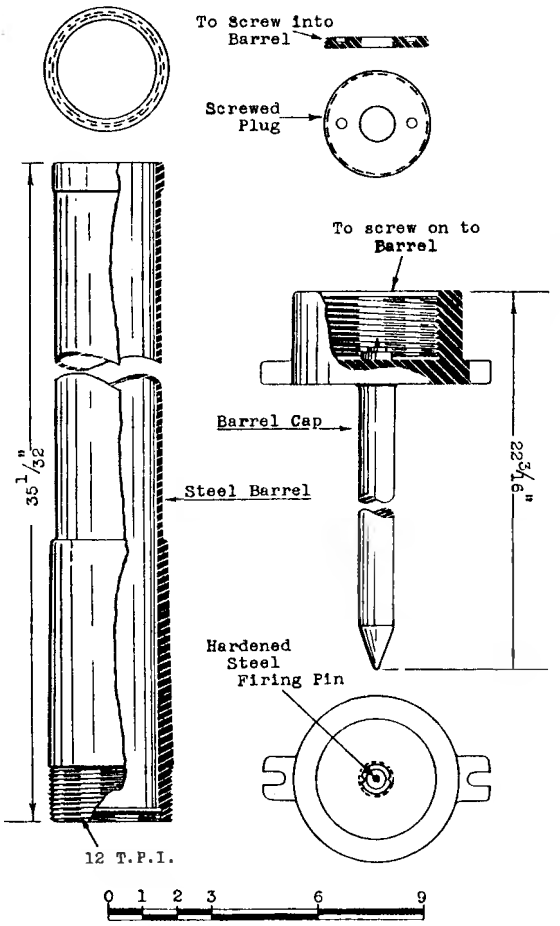
Barrel and Cap.



Firing Position.

70 MM BARRAGE MORTAR

FIG 2



32 CM SPIGOT MORTAR

1. GENERAL

This unusual weapon was captured in the Imphal area. It is an unorthodox development of the spigot principle and shows little trace of foreign influence or the appreciation of basic advantages of spigot weapons. The sizes of the projector and projectile are considerable with consequent loss of mobility. Little traverse and no elevation have been provided thus rendering correction for line impossible when emplaced. Adjustments for range depend on variations of the incremental charges. The weapon necessitates a large crew and has a slow rate of fire. No reports have been received as to its range or effectiveness. It should be noted that weapons of this type are readily adaptable for chemical warfare purposes.

2. DESCRIPTION (Figs 1-16)

The steel cylindrical spigot has a cavity for the propellant machined at the top and is integral with a small seating plate square in plan but spheroid. This seats and is retained on the mounting plate which is a square centrally domed steel plate. A tolerance, within the limits allowed by the retaining bolts, provides very slight adjustments in setting up the spigot, this being the only inherent means of adjusting line or elevation.
A wooden reinforcing disc with an iron strengthening band is retained within the dome and conforms with its shape. The mounting plate rests on the larger square steel base plate which in turn is supported by a solid wooden base in three sections. The whole equipment, when set up, is firmly bolted together to form a heavy massive weapon.

(a) Spigot: (Figs 2 and 15) - The propellant cavity is machined downward from the muzzle and in the base is a threaded recess normally protected by a metal protective plug. When the propellant assembly is in position in the cavity, this recess takes the threaded end of the flash train tube, centering it and locating the complete assembly. At the base of the spigot, about 13 mm above the spigot seating plate, are left and right diametrically opposed external threaded tapping to receive screw plugs. These engage in slots in the tail assembly of the round when it is loaded. The spigot is fabricated integrally with the spigot seating plate. For transport purposes a broad removable metal bracket with two double-handed carrying handles fits around the spigot at the centre of gravity. The spigot weighs 225 lbs and has the following dimensions:-

Length (spigot only)	..	795 mm
External diameter	..	256 mm
Depth of Cavity	..	190 mm
Diameter of cavity at 12.7 mm below muzzle	..	240 mm

Diameter of Cavity at 76.2 mm below muzzle .. .. 233.2 mm

(b) Mounting Plate: (Figs 4 and 14): This plate weighs 261 lbs, has a length and width of 800 mm and is 19 mm thick. It is a square steel plate with a central domed portion on which seats the spigot seating plate. There are four drillings at the front and rear of the domed portion for the spigot seating bolts which have heavy rims bearing against the front and rear edge respectively of the spigot seating plate. The only adjustment in setting up the weapon is made possible by the tolerance within these bolt heads. Left and right on the periphery of the domed portion are two drilled lugs for four main mounting bolts, while drillings at each of the corners accommodate the remaining four main mounting bolts. Two opposed machined grooves, at the front and rear of the plate respectively, indicate the axis of the spigot. Four single carrying handles are located at each corner. Markings on name plate give the place of manufacture as Osaka Arsenal and date August 1941.

(c) Wood Reinforcing Disc: (Figs 4 and 14): This component consists of a cylindrical wooden disc, the top of which is shaped to conform with the dome of the mounting plate. This disc internally reinforces the domed portion of the mounting plate and is itself strengthened by a circumferential metal hoop. The disc is retained to the mounting plate by four 3 in. wood screws.

(d) Base Plate: (Figs 4 and 15): The steel plate is 883 mm square, 12.7 mm thick and weighs 163 lbs. It is drilled for eight main mounting bolts and is fitted with four single carrying handles at the corners.

(e) Base: (Figs 3, 4, 16): This part is built up and consists of top, middle and bottom sections.

(i) Top Section: Four timber baulks are laid front to rear. The two inner baulks are retained to the middle section by two $\frac{3}{4}$ in. bolts each, while the two outer pieces have four drillings each, to take the eight main mounting bolts. Each baulk has a width and height of 216 mm, is 1320 mm long and weighs 12.5 lbs.

(ii) Middle Section: Six timber baulks are laid transversely. Each baulk is bolted to the bottom section by two $\frac{3}{4}$ in. bolts and the four internal pieces are drilled to retain the eight main mounting bolts. The baulks are held firmly by metal end stays fitting longitudinally in slots cut in the ends of the pieces. Each baulk in this section has the following characteristics:-

Weight	13.3 lbs
Length	1500 mm
Width	216 mm
Height	248 mm

(iii) Bottom Section: This construction is similar to the middle section except that there are no drillings for the main mounting bolts. The weight and dimensions of each baulk of this section are:-

Weight	18.5 lbs
Length	2000 mm
Width	216 mm
Height	248 mm

It will be seen that the eight main mounting bolts pass through the middle and top sections of the wooden base, the steel base plate and are finally retained by the steel mounting plate. Each bolt is 610 mm long and 31.8 mm in diameter.
Sixteen fixing bolts are used in building up the base, all of which are 558 mm long and 19 mm in diameter.
The four metal end stays are each 1370 mm long.

3. AMMUNITION (Figs 1 and 2)

Each round consists of four main components, namely:- (a) explosive head, (b) explosive body, (c) tail assembly and (d) propellant unit.

(a) Explosive Head: (Figs 5 and 12): The domed head has a nose fuse orifice normally protected by a metal screw plug. The rear portion is male threaded and the base itself is concave. A removable metal bracket with two double carrying handles can be fitted around the centre of gravity. The particulars of this component, filled less fuse, are as follows:-

Weight	172 lbs
External length (less internal threaded portion)	365 mm
External diameter	320 mm
Diameter of fuse orifice	35 mm

(b) Explosive Body: (Figs 6,7,8,12): This component is externally cylindrical with female threads at the top and a male threaded portion at the bottom. A metal diaphragm, with an orifice similar to that for the nose fuse, is located internally at the base of the top female threads. A large cavity is machined internally, leaving a thick base. No filling for this portion was recovered. A carrying bracket, similar to that used with the explosive head, is provided. The following are the general characteristics of this part:-

Weight	152 lbs
External length (less internal threaded portion)	276 mm
External diameter	320 mm
Weight of diaphragm	15 lbs
Diameter of "	286 mm
Thickness of "	12.7 mm

(c) Tail Unit: (Figs 9 and 13): This assembly consists basically of a hollow steel cylinder, female threaded at the top and slightly tapered externally from a point 300 mm below the top to the base. At a position 70 mm below the top is a threaded orifice, normally protected by a metal screw cap, into which screws the initiating igniter. Four small locating recesses are cut into the base for fixing the projectile in relation to the propellant assembly. There are four tail fins each supported by two wire struts. The usual type of carrying bracket is provided. Weights and dimensions of this assembly are as follows:-

Weight of assembly	350 lbs
" " carrying bracket (same for head and body)	9 lbs
External length	890 mm
" diameter at top	320 mm
" " " base	273 mm
Internal diameter	260 mm
Length of fins	542 mm
Height " "	178 mm
Thickness of fins	3.2 mm

The internal diameter of this assembly is given as reported, but there is probably less clearance, the diameter of the spigot being 256 mm.

(d) Propellant Assembly:(Fig 10): The primary and incremental charges are contained in a brass case seating in the cavity in the spigot. A hollow metal tube, containing the flash train, screws through a threaded orifice in the base of the case, into the threaded recess at the base of the spigot cavity. When in position, four flash holes at the base of the flash tube are located below the primary charge. The initiating igniter screws into the threaded orifice in the side of the tail assembly of the projectile. When the propellant assembly has been set up and the projectile correctly positioned by the diametrically opposed plugs in the spigot mating with the grooves in the base of the tail assembly, the ignition head of the flash tube is brought into close proximity with the initiating igniter. For carriage, the charges are retained by wood and cardboard discs held by flanges on the flash tube.
Firing is believed to take place on removal of a safety washer from the head of the initiating igniter protruding through the wall of the tail assembly. A delay element is presumed to be included in the train.
The following components were carried in a strong, square wooden box reinforced with metal and sealed from moisture by a metal liner with felt seating pads:-

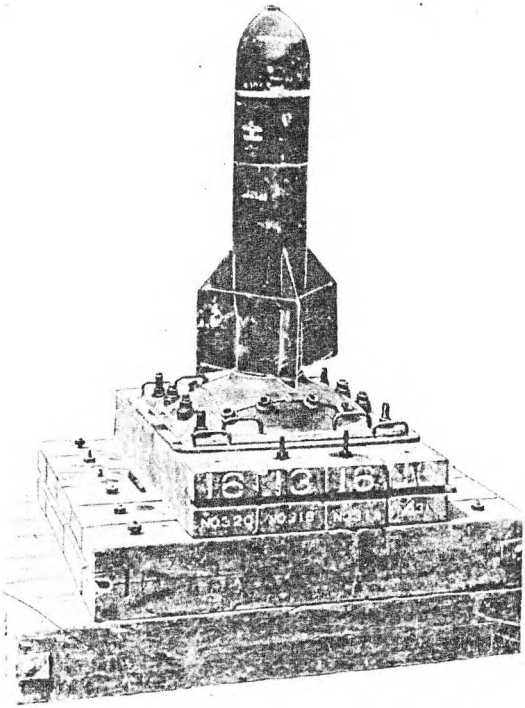
One brass case.
One 500 gms annular primary charge with central annular portion of black powder.
One 400 gms annular increment.
Four 100 gms circular increments.
One 50 gms increment in long bag.
Two 10 gms increments in small bags.
Four 5 gms " " "
Two Impact fuses.
One initiating igniter.
One friction pull igniter.
One electric igniter.

All the charges are contained in silk bags. It is probable that the pull and electric igniters are for use with special firing arrangements.
The weight of the filled case is 35 lbs. All charges are marked with the Osaka Arsenal mark and were manufactured in May, June and July 1941.

(SOURCE:- GHQ INDIA PTS No. 29)

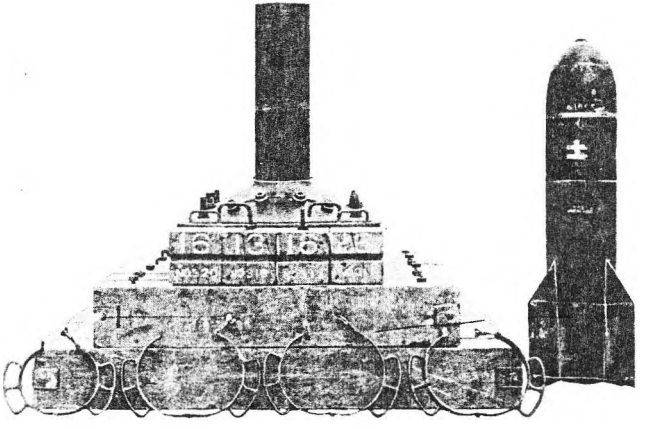
32 CM SPIGOT MORTAR

FIG I Complete Weapon.



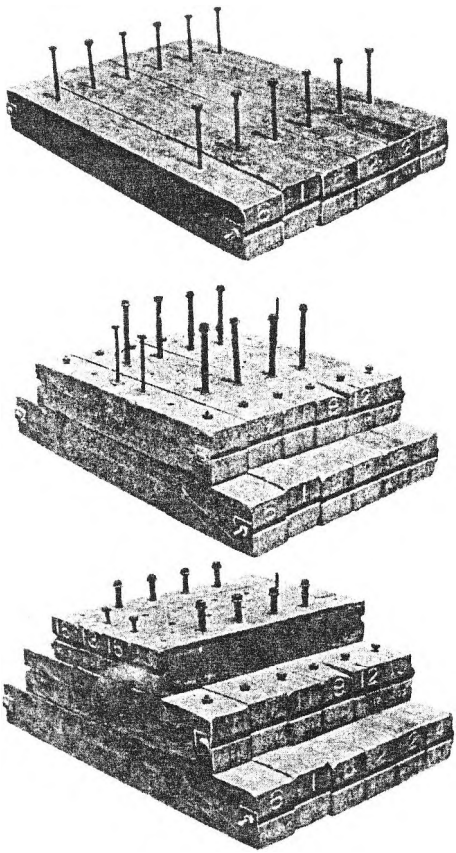
32 CM SPIGOT MORTAR

FIG 2 Separate View of Spigot and Bomb, and Detachable Carrying Handles.



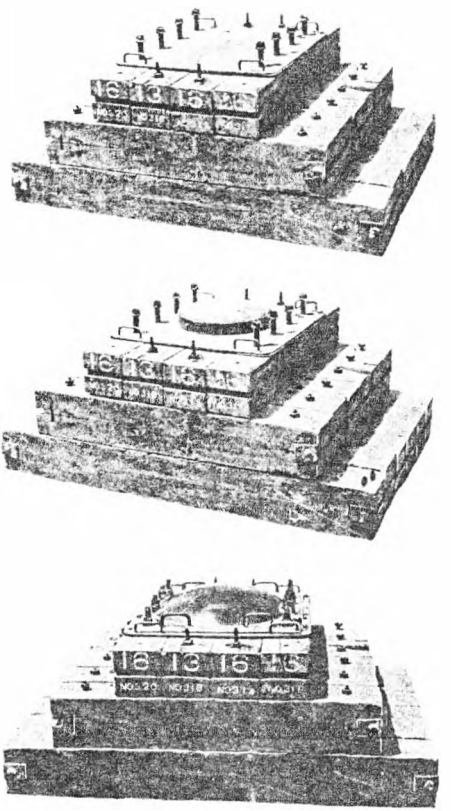
32 CM SPIGOT MORTAR

FIG 3 First Three Stages of Base Construction, showing Bottom, Middle, and Top Sections.



32 CM SPIGOT MORTAR

FIG 4 Three Final Stages of Base Construction, Showing Base Plate, Wooden Disc, and Domed Mounting Plate.



32 CM SPIGOT MORTAR

FIG 5 Explosive Head, and Carrying Handles.

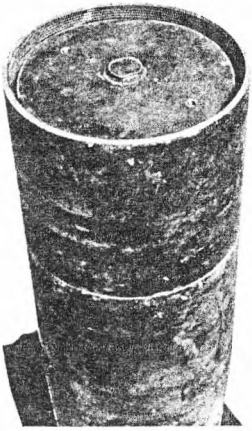


FIG 6 Bomb with Explosive Head removed from Body.

32 CM SPIGOT MORTAR

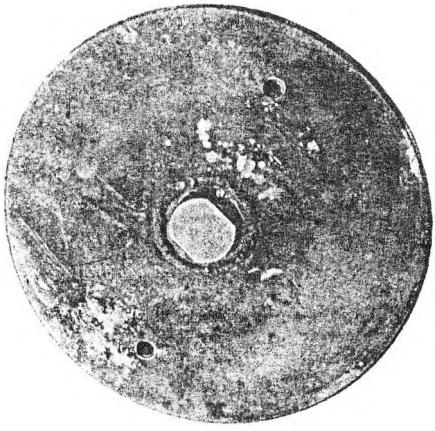


FIG 7 Metal Diaphragm.

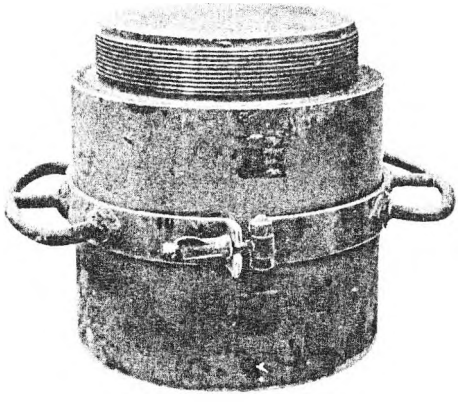


FIG 8 Explosive Body and Carrying Handles.

32 CM SPIGOT MORTAR

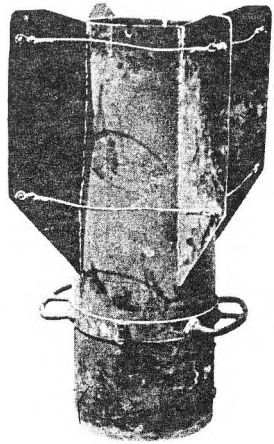


FIG 9 Tail Unit and Carrying Handles.

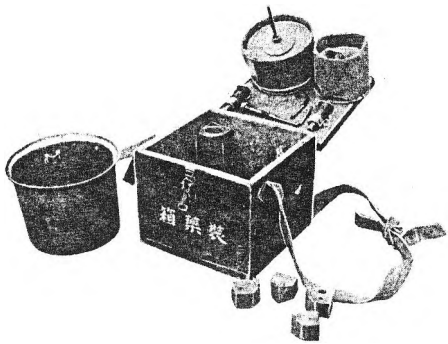
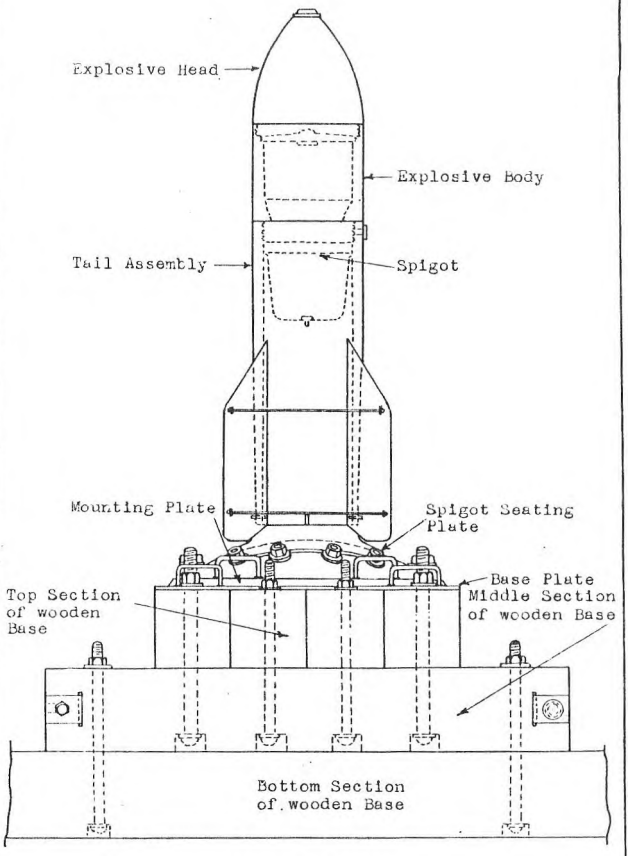


FIG 10 Propellant Assembly.

32 CM SPIGOT MORTAR

FIG II



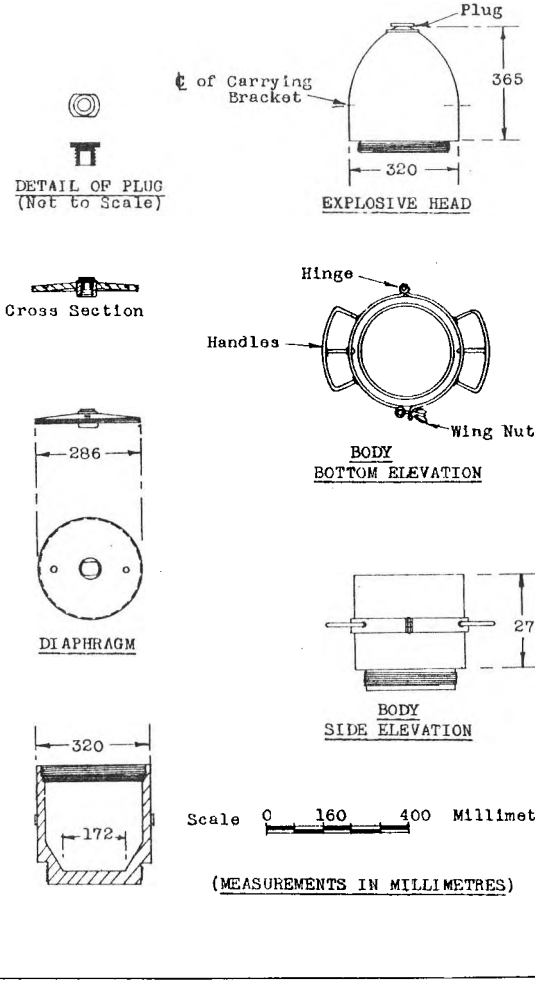
COMPLETE WEAPON

0 200 400 600 800 1000

SCALE IN M.M.

32 CM SPIGOT MORTAR

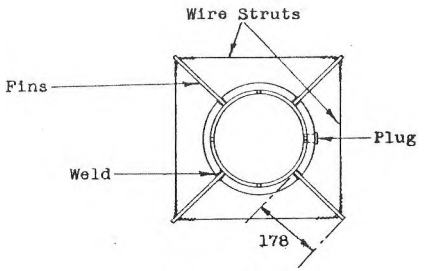
FIG 12 Details of Explosive Head, Body, and Diaphragm.



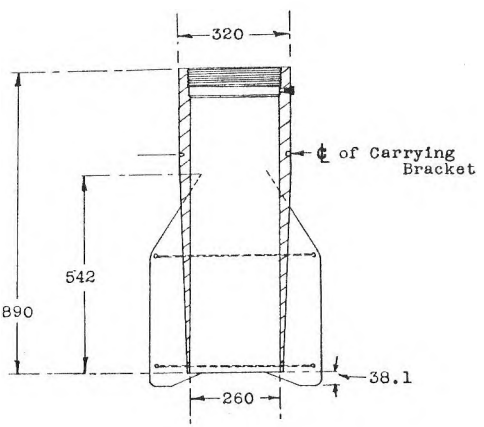
(MEASUREMENTS IN MILLIMETRES)

32 CM SPIGOT MORTAR

FIG 13 Tail Assembly.



BASE END VIEW



SECT. ELEVATION

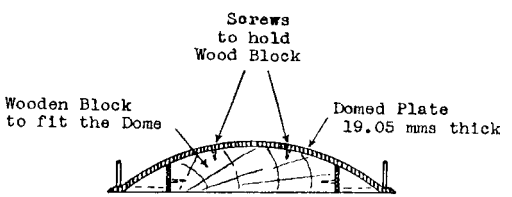
Scale 0 160 400 Millimetres

(MEASUREMENTS IN MILLIMETRES)

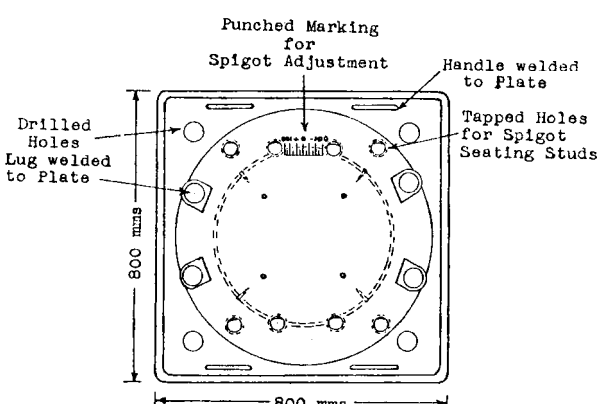
32 CM SPIGOT MORTAR

FIG 14 MOUNTING PLATE

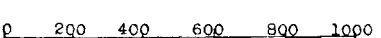
ELEVATION



SECTION



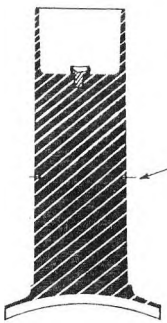
PLAN



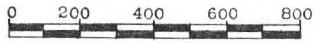
SCALE IN M.M.

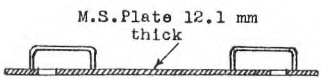
32 CM SPIGOT MORTAR

FIG 15

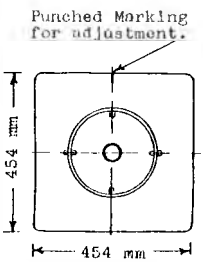


CROSS SECTION
OF
SPIGOT

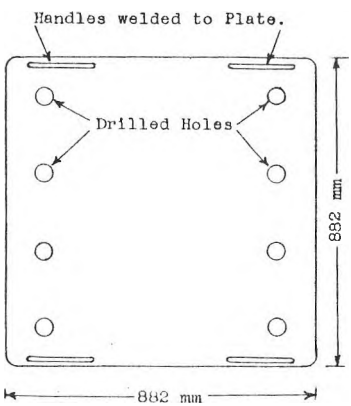




SECTIONAL ELEVATION
OF
BASE PLATE

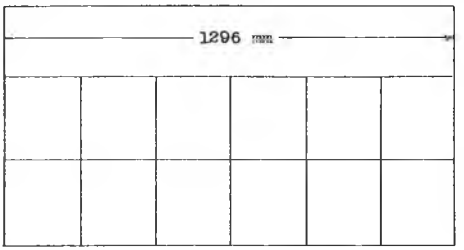


PLAN OF SPIGOT

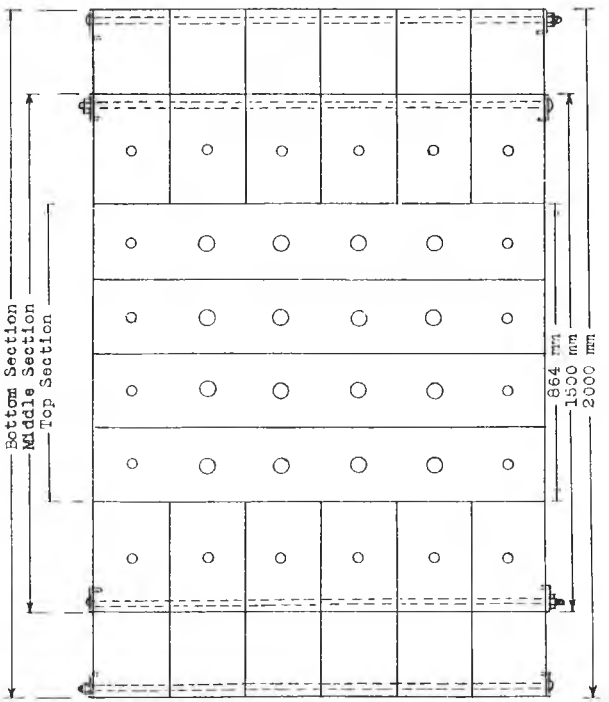


PLAN OF BASE PLATE

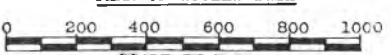
32 CM SPIGOT MORTAR FIG 16



ELEVATION



PLAN OF WOODEN BASE



SCALE IN M.M.

105 MM CARTRIDGE CASE

1. GENERAL

This separate loading type of cartridge is believed to be used in the 105 mm Howitzer Type 91.

2. DESCRIPTION (Figs 1-5)

(a) Case: The drawn brass case is flanged at the base and tapers slightly towards the front and is completely lacquered. A boss, raised centrally inside the base, is drilled and threaded to take a percussion primer. The mouth of the case is covered by a wax-impregnated cardboard lid with a 30 mm side. This lid is attached to the case by a length of paper-backed adhesive tape. The top of the lid was missing in the specimen examined. The adhesive consists essentially of rosin and had produced a green corrosion film on the brass case. The case and primer weigh 3615 gms. The chief dimensions of the case are:-

Length of Case	242 mm
Diameter of flange	122.4 mm
Thickness of flange	5.8 mm
Diameter of case above flange	111.4 mm
Diameter of case at mouth	108.4 mm
Internal diameter of case at mouth	106.8 mm
Taper	1 in 186 (18 minutes angle)

Markings on the side of the case indicate date of filling as April 1942. The letter "A" denotes "Lot A" and a character translated as "wo" is an abbreviation for the place of manufacture. These markings are printed in indigo coloured dye. Stamped markings on the base are the letter "F", the date of manufacture November 1942, the crossed cannon army arsenal sign, an "S" in a diamond which may be a manufacturers stamp and a character which can be translated as "little" or "small".

(b) Propellant Charge: This is contained in four bags made from thrown natural silk. They are stitched internally except for approximately 40 mm of external stitching closing the hole on the upper edge through which the bags were filled. A length of silk thread is stitched three times between the ends of each bag to limit the bag length. The propellant is in the form of graphite-coated flakes, approximately 12 mm square, 0.8 mm thick with the following composition:-

Nitrocellulose	97.9%
Diphenylamine	1.3%
Graphite	0.1%
	99.3%
Moisture & Volatile matter	1.5%

A small proportion of a blue-green dye is also present.

The weights of propellant and bags are:-

Bag No.	Bag	Propellant	Propellant and Bag
1 (front)	3.2 gms	439.8 gms	443 gms
2	2.4 gms	158.1 gms	160.5 gms
3	2.1 gms	104.5 gms	106.6 gms
4 (base)	3.4 gms	445.1 gms	448.5 gms
	11.1 gms	1147.5 gms	1158.6 gms

The bags are covered in the cartridge case by a lacquered cardboard lid weighing 37.6 gms. A braid withdrawal becket, made from medium length cotton fibres, is attached to the upper surface of the lid.
On the base of bag No. 4, adjacent to the percussion primer, is sewn an igniter containing 15.2 gms of gunpowder approximating to British G 20 in size and having the following approximate composition:-

Potassium Nitrate	75.1%
Sulphur	9.5%
Charcoal	15.4%
	100.0%

A strip of decoppering foil is folded in the Silk thread on the top of this bag and has the following dimensions and composition:-

Dimensions	
Length of strip	743 mm
Width of strip	25 mm
Thickness of strip	0.06 mm
Weight	7.9 gms
Composition of foil	
Lead	38.1%
Tin	61.4%
Antimony	0.5%
	100.0%

The bags are marked in Japanese characters 1, 2, 3, 4 respectively from the top and A, B, C, D, from the bottom. All four bags have the "crossed cannon" Army Arsenal stamp, a symbol meaning "n", and the characters for "Type 91 Ten Howitzer". The significance of the character for "ten" is not known. The dates on bags in order Nos. 1, 2, 3, 4 are December 1940, September 1941, November 1939 and August 1940 respectively.
Other marks are OK 443, OK 161, OK 105, OK 126 respectively and are printed in Roman letters and Arabic numerals. The abbreviation for "Osaka" is stamped in violet ink on the underside of the cardboard lid.

(c) Percussion Primer: Consists of a brass body which screws into the cartridge case with a right hand 1.4 mm thread, 13.4 mm major diameter. No sealing device is used at the junction. Three semi-cylindrical recesses are machined into the head of the primer to take a spanner. A copper striker, which has a cylindrical shaft and a "mushroom" head, is housed in a recess inside the primer with the base of the shaft nearly level with the exterior of the primer. A copper cup rests with its base on the "mushroom" head of the striker and is retained by a screwed plug on the lower surface of which is formed an anvil with

a central flash hole. The plug is secured in the primer body by a double stabbing of the thread. Into the copper cup is pressed 0.04 gm of a detonating composition containing mercury fulminate, potassium chlorate and antimony sulphide covered by a tinfoil disc. Around the top of the cup is a thin annulus of paraffin wax. A perforated pellet of granular gunpowder, weighing 0.5 gm, is inserted next and the primer is sealed by a lacquered silk disc. The weight of the primer is 13.8 gms. Stamped markings on the head of the primer are translated "Osaka Army Arsenal March 1942".

(SOURCE:- MUNITIONS SUPPLY LABORATORIES through MGO Branch)

105 MM CARTRIDGE CASE

FIG I

105 MM CARTRIDGE CASE

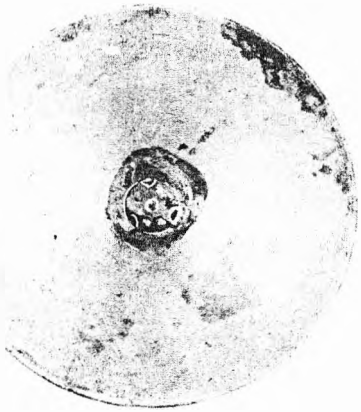


FIG 2 Base.

FIG 3 Propellant Bags and Lid.

105 MM CARTRIDGE CASE

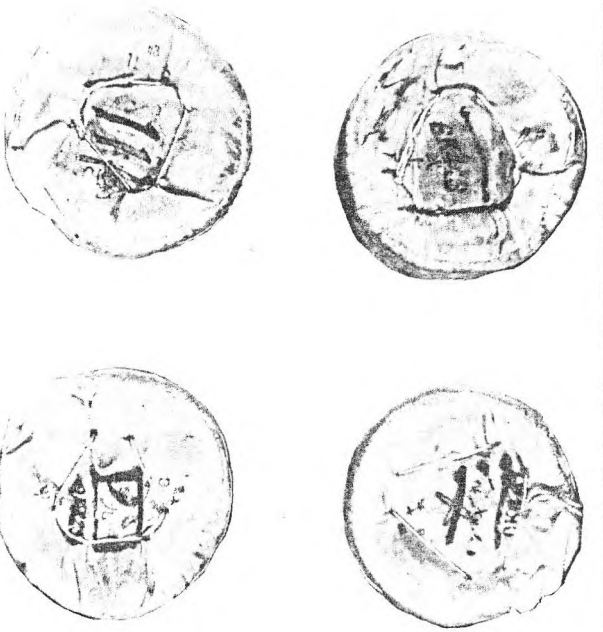
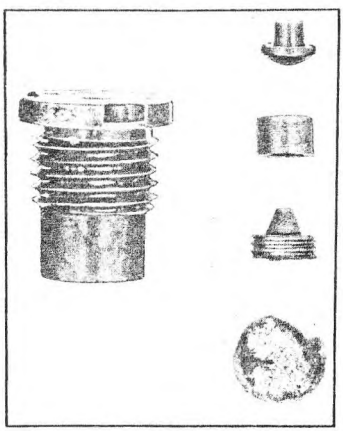
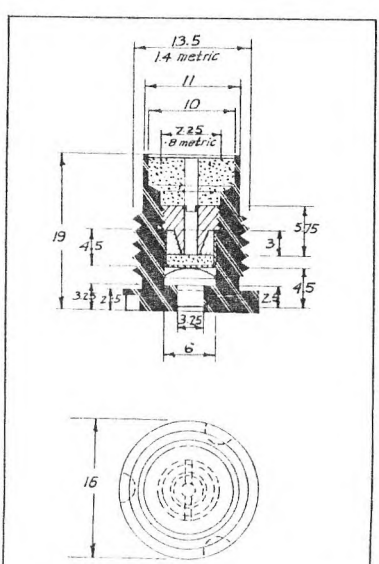


FIG 4 Propellant Bags, Upper Surfaces.

105 MM CARTRIDGE CASE

FIG 5 Primer Components.





105 MM HE HOWITZER SHELL

1. GENERAL

Two shells examined were without fuses or transit plugs and were slightly rusty. The shells had not been fired.

2. DESCRIPTION (Figs 1 & 2)

(a) Body: The nose of the shell is threaded internally to a depth of 20 mm to receive the nose adapter and exploder container (35 mm major diameter, 1.8 mm pitch, left hand). A grub screw is provided to secure the adapter. The ogival head has a radius of approximately 2½ c.r.h. and tapers to the body of the shell.
The cylindrical body is 104 mm in diameter and is approximately 15 mm thick.
The plain 22 mm wide copper driving band attached 35 mm from the base of the shell has two cannelures 2 mm wide and 1.5 mm deep. The front segment of the band tapers slightly towards the nose.
Further characteristics of the body are as follows:-

Overall length including nose adapter	427 mm
Diameter over driving band	107.5 mm
Diameter of front band at shoulder	104.5 mm
Distance of front band from base of shell	285 mm
Weight of complete shell	35 lbs
" " bursting charge	4 lbs 13 ozs

(b) Exploder System: This consists of an exploder container, nose adapter and aluminium container. The steel exploder container is 72 mm long, 30 mm diameter over the cylindrical portion and is externally threaded at the top to screw into the nose of the shell. The internal diameter is 26 mm. This container screws down to a shoulder in the shell nose and above it screws the nose adapter which is internally threaded to take the fuse (23.75 mm major diameter 2.0 mm pitch, lefthand). Between the nose adapter and exploder container is a pressed aluminium cup which fits into a recess in the top of the exploder and houses the magazine of the fuse. The overall length of the cup is 18 mm. The internal and external diameters of the cylindrical portion are 13 mm and 14 mm respectively.

(c) Explosive filling: The paper wrapped exploder charge is made up of three cylindrical pellets of pressed picric acid. A felt disc is attached to the bottom and a millboard washer at the top. The top pellet weighs approximately 5.6 gms, is 15.5 mm long and is centrally perforated to accomodate the aluminium cup which is separated from the picric acid by a paper liner inserted in the hole. The centre and bottom pellets weight 20.5 gms and 13.0 gms respectively thus making a total weight 39.1 gms. The melting point of samples taken from the three pellets ranged from 119.5°C to 120°C (U.K. specification for picric acid - Melting point 120° to 121.6° C).

The main bursting charge is cast T N T of grade 2 quality (setting point 79.45°C). In the top of the charge is a cavity 60 mm deep and 30 mm in diameter, into which fits the exploder tube. The total weight of T N T in the shell is 4 lbs 13 ozs.

(d) Markings: The shell is painted black and has a 15 mm red band at the nose and a 20 mm yellow band on the body, the lower edge being 100 mm from the front of the driving band. These colour markings indicate an HE filling. A white plus - minus sign 25 mm wide indicates that the weight of the shell is within 0.5% of the specified weight.
On one shell the number 3989 is stamped in adajcent positions on the nose and nose adapter. The abbreviation for "Osaka" is stamped on the nose, body and base. In front of the driving band are stamped markings indicating "Osaka Army Arsenal June 1941". The marks on the other shell are "G 264" on nose and nose adapter, an inspection stamp repeated seven times and the date of manufacture, December 1941. The markings on the exploders from the two shells are similar and mean "March 1941 Picric acid".

(SOURCE:- MUNITION SUPPLY LABORATORIES. through MGO Branch)

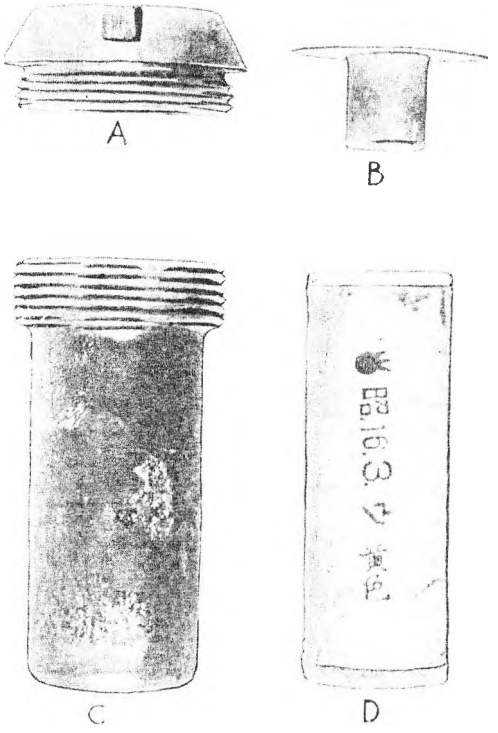
105 MM HE HOWITZER SHELL

FIG I

105 MM HE HOWITZER SHELL

FIG 2 Components of Exploder System.

(A) Nose Adapter. (B) Aluminium Cup. (C) Exploder Container. (D) Exploder.



105 MM HE SHELL

1. GENERAL

Four HE shells for 105 mm gun were examined. They had not been fired and were in fair condition although most of the paint markings had been obliterated. No fuses or transit plugs were present.

2. DESCRIPTION (Figs 1 - 2)

(a) Body: The pointed head of the shell is ogival in shape with a high c.r.h. of approximately 12. The shell is 505 mm long including the nose adapter. At the nose the shell is threaded internally with a right hand thread to a depth of 10 mm to take the nose adapter into which is screwed the exploder container. The front band is of copper and has a plain profile. The copper driving band of the double cannelure type tapers to front and rear. It has an overall width of 22 mm and is situated 79 mm from base of shell to rear of the band. The cannelures are 2 mm wide and 1.5 mm deep. The width of the three lands so formed is 6 mm. The mean wall thickness of the shell along its length is as follows:-

Distance from nose of Shell	Thickness of Wall
76 mm	9 mm
127 mm	11 mm
203 mm	13 mm
254 mm	14 mm
305 mm	15 mm
356 mm	16 mm

The shell is streamlined, tapering from the diameter of 104 mm at a distance of 54 mm from the base to 89 mm diameter at the base.

Further general characteristics are:-

Length excluding nose adapter	467 mm
Diameter of body	104 mm
" " driving band	107.2 mm
" " front band	102.5 mm
Distance from base of shell to rear of front band	251 mm
Width of front band	20 mm
Weight of shell complete	35 lbs 7 oz.

(b) Exploder System: This consists of a nose adapter, exploder container and copper cup.

(1) Nose Adapter: The lower portion of the nose adapter has a right hand external thread 46 mm major diameter and 2 mm pitch and is screwed into the nose of the shell, the base coming flush with a supporting shoulder inside the nose. Internally the adapter is threaded in two diameters. The upper thread (23 mm major diameter, 2.0 mm pitch, left hand) extends to a depth of 17 mm to take the fuse. The lower thread (33 mm major diameter 1.8 mm pitch, left hand) extends 30 mm and takes the exploder container which is held in position by a grub screw.

(ii) Exploder Container: This component is housed in the exploder cavity in the top of the bursting charge. The container is 72 mm long, 30 mm external diameter and is threaded for a distance of 25 mm commencing 5 mm from the top.

(iii) Copper Cup: The small pressed copper cup houses the magazine of the fuse and fits into a recess in the top of the exploder.

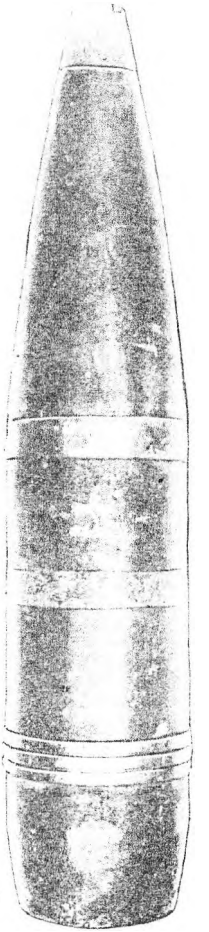
(c) Explosive Filling: The exploder is identical with that used in 105 mm HE Howitzer shell. It is a wrapped charge, 25 mm external diameter, 68 mm long and fits inside the exploder container. It consists of three pellets of pressed picric acid enclosed by a paper wrapping and has a millboard washer attached to the top and a felt disc on the bottom. The top pellet is perforated and has a paper liner inserted in the hole to prevent contact of the picric acid with the copper cup. This pellet is 15.5 mm long and weighs 5.6 gms. The centre and bottom pellets are solid.and weigh 20.5 gms and 13.0 gms respectively, making the total weight of the exploder charge 39.1 gms. The picric acid is of good quality, samples melting at between 120°C and 121°C.
The main bursting charge weighs 5 lbs 4 oz and as in the howitzer shell, is cast T N T of fairly low grade, the setting points of samples averaging 79.4°C (UK specification for Grade 2 T N T 79.5°C - 80.0°C). The exploder cavity at the top of the charge, 30 mm in diameter and 47 mm deep, takes the lower part of the exploder container.

(d) Markings: The body is painted black, with a 20 mm wide red band around the tip of the nose adapter and a 20 mm wide yellow band around the body 70 mm above the driving band. These are the normal markings for an HE shell.
The usual weight variation plus and/or minus signs were present on shells examined. Three of the four shells examined were manufactured at Osaka Army Arsenal. The fourth shell had characters which may have represented some unidentified arsenal. Two shells bore dates December 1941 and the others April 1942 and December 1943.
The markings on the exploder indicate picric acid and date of manufacture as October 1941.

(SOURCE:- MUNITIONS SUPPLY LABORATORIES through MGO Branch)

105 MM HE SHELL

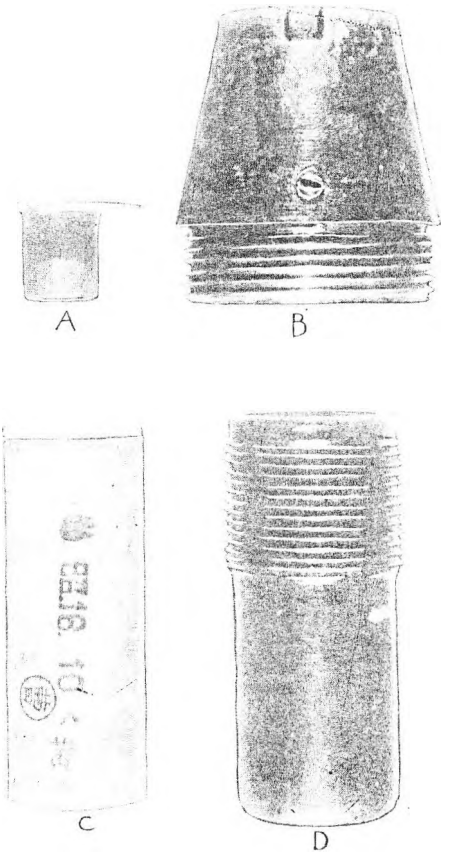
FIG 1



105 MM HE SHELL

FIG 2

(A) Copper Cup. (B) Nose Adapter. (C) Exploder. (D) Exploder Container.



82 MM CHINESE MORTAR BOMB

1. GENERAL

A small number of mortar bombs, which are believed to be of Chinese origin, have been recovered in New Guinea. Each bomb and fuse were stamped with Chinese characters and either stamped or painted with left handed Swastikas. This type of Swastika is not used by the Germans. The fins strongly resemble the British design. The primary cartridges examined were made in Great Britain.

2. DESCRIPTION (Figs 1 - 3)

The bomb consists of the normal three main components namely, nose fuse, body and tail unit.
General data:-

Overal length (without fuse)	11-5/8 ins
Width at fins	82 mm
Maximum diameter	82 mm
Overall weight (less fuse & cartridge)	7 lbs 13½ ozs
Weight of filling	9 ozs

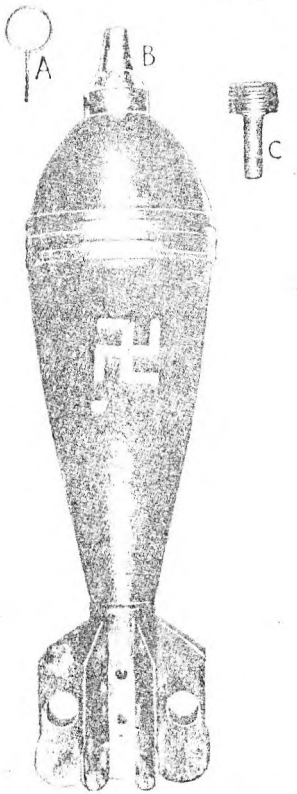
The bombs are painted in two ways, some being light olive drab and others black. The quality of the material and workmanship is only fair.
The HE filling is a coarse granular mixture of TNT (60%) and potassium perchlorate (40%).
The primary cartridge was of British manufacture and had the following inscription on the body:-
"Eley-Gastight - water resisting - case - metal lined - made in Great Britain". On the cartridge head is - "12 Eley - Kynoch - 12 (ICI)".
The secondary propellant consists of small graphited flakes contained in small silk bags; the average weight of each increment is 1/6 oz. The increments are held in place by a wire passing through the holes in the tail fins.
The two types of fuses recovered were instantaneous and combination instantaneous and delay action.
The instantaneous fuse is extremely simple. An inertia weight, holding the firing pin, moves forward against a creep spring on impact. The only safety feature is the safety pin which is withdrawn prior to loading.
The combination fuse has no safety pin. Setback causes the sliding collar to move down against its spring thus allowing the retaining ball to fall out, freeing the primer carrier. On impact the primer carrier moves forward in the inner body. At the mouth of the inner body the two firing pin locking balls are free to move out, allowing the primer to impinge on the firing pin which has moved forward against its spring. The resultant flash travels back down the inner body to the selector switch. When the screwdriver slot is fore and aft with the fuse body, the flash travels straight through to the gaine. When turned 90°, a short delay train is ignited.
The two types of fuses have the following physical properties:-

	Instantaneous fuse	Combination fuse
Overall weight	6 oz.	8 oz.
" length	3¾ ins	4-9/16 ins
Maximum diameter	30.5 mm	30 mm
Diameter at threads	28 mm	28 mm
Threads per in.	12	12

(SOURCE:- M.E.I.U.)

82 MM CHINESE MORTAR BOMB

FIG 1



(A) Safety Pin.

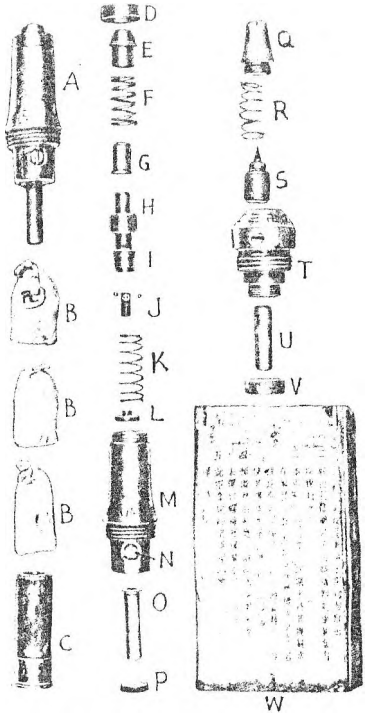
(B) Instantaneous Fuse.

(C) Fuse Seat Liner.

82 MM CHINESE MORTAR BOMB

FIG 2

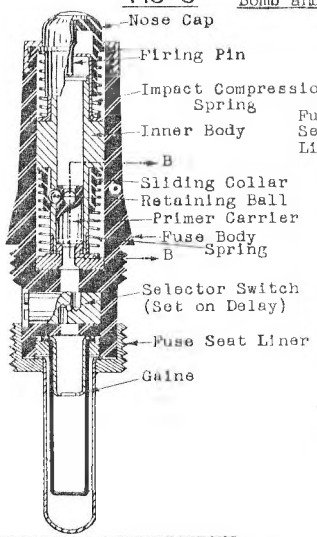
Fuse Components, Primary and Secondary Charges.



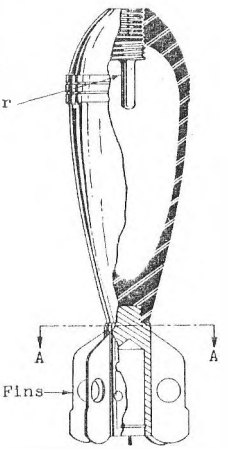
(A) Combination Fuse. (B) Increments. (C) Cartridge.
(D) Collar. (E) Nose Cap. (F) Impact Spring. (G) Cap.
(H) Inner Body. (I) Setback Collar. (J) Primer Carrier.
(K) Setback Spring. (L) Closing Disc. (M) Fuse Body.
(N) Selector Switch. (O) Gaine. (P) Retaining Ring.
(Q) Nose. (R) Creep Spring. (S) Inertia Weight.
(T) Fuse Body. (U) Gaine. (V) Retaining Ring.
(W) Fuse Shipping Container.

82 MM CHINESE MORTAR BOMB

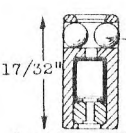
FIG 3 Bomb and Fuse Details.



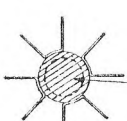
COMBINATION INSTANTANEOUS AND DELAY FUSE
Overall Length : 4 9/16"



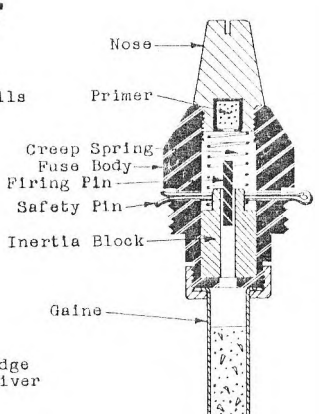
Overall Length : $11\frac{5}{8}$"



Section B-B
(Twice Scale)



Section A-A



INSTANTATEOUS FUSE
Overall Length $3\frac{1}{4}$"

100 KG TYPE I TIME BOMB

1. GENERAL

This type of 100 Kg bomb differs from Type 94 100 Kg bomb in the steel nose section, tail fuse pocket, tail brake and HE pre-formed blocks.

2. DESCRIPTION (Figs 1-2)

(a) Nose Section: The steel nose piece has a 3 ins orifice to receive the C-3(a) time fuse. It is 1 in. shorter due to the wide opening, reducing the overall length of this bomb to 52 ins.

(b) Tail Section: Two types of tail fuse pockets have been recovered. The older type (February 1942) has the same tail fuse pocket as the type 94 bomb. Markings on the shipping box indicate "Type 94 100 Kg bomb fitted with tail brake". This fuse pocket will take either the B-1(a) or B-1(b) tail fuse.
Bombs dated August 1942 and later have had a larger tail fuse orifice and a correspondingly shorter tail cone. Markings on packing boxes for these latter bombs mean "Type 1 100 Kg bomb". The B-7(a) fuse fits the pocket, but it is unlikely that an impact fuse of this type would be used in combination with a time fuse. The fuse pocket has three threads and and annular groove. It is presumed that a spring loaded plunger on the fuse body (similar to that on the C-3(a) fuse) snaps into the groove as it is screwed, thus preventing subsequent withdrawal. Due to this construction, it is believed that an unreported anti-disturbance fuse or an additional time fuse exists.

(c) Filling: All fillings examined have been preformed picric acid blocks. The nose block is moulded to receive the C-3(a) fuse and the cavity is paper lined. This block is marked "Type 1 one hundred kilogram bomb No. 1 bursting charge, picric acid." The tail block is marked either type 94 for small tail fuse pocket or type 1 for bombs with the larger sized fuse pocket. Central blocks had been marked either type 94 or type 1 and are interchangeable.

(d) Weights:

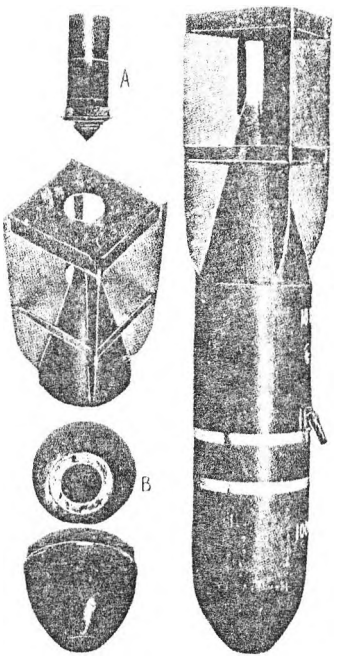
Steel nose section ..	15.0 Kg
HE Nose block	6.3 Kg
Type 94 HE tail block ..	7.2 Kg
Type 1 HE tail block ..	7.2 Kg

(SOURCE:- M.E.I.U.)

100 KG TYPE I TIME BOMB

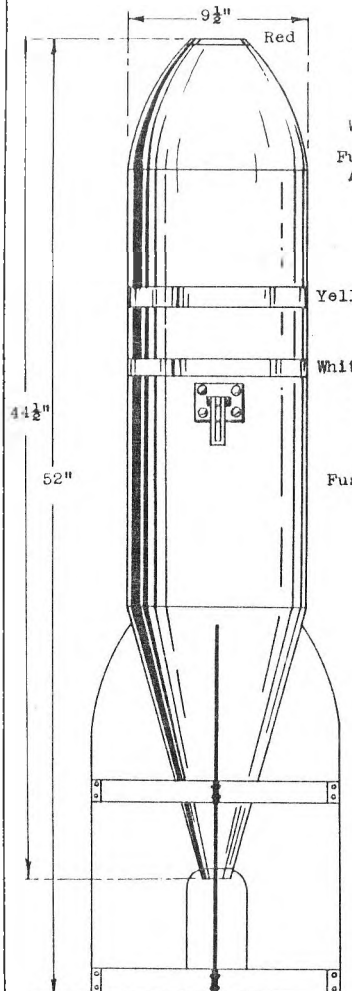
FIG I

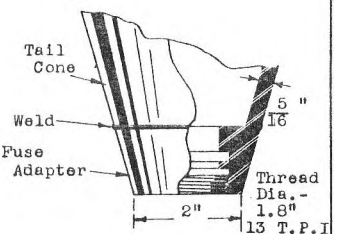
(A) C-(3)a Time Fuse. (B) HE Nose Section.



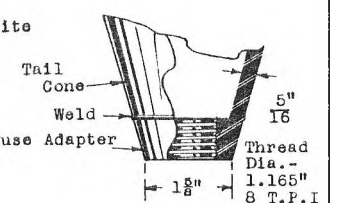
100 KG TYPE I TIME BOMB

FIG 2

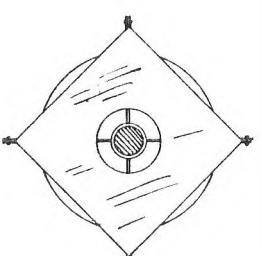




TYPE 1 TAIL CONE



TYPE 94 TAIL CONE



TAIL BRAKE

100 KG GP HE TYPE 94 ARMY BOMB

1. DESCRIPTION (Figs 1-2)

This bomb consists of a threaded nose piece, barrel, tail cone and four tail fins.
The nose piece is threaded and screws into the main body of the bomb. A threaded fuse opening is provided with two grub screws placed diametrically opposite to secure the nose fuse in position.
The barrel is a hollow steel cylinder threaded at the forward end to receive the nose piece. The steel tail cone is welded to the rear end of the barrel. A threaded adapter, welded to the apex of the cone, receives the tail fuse. The four tail fins, which are welded to the tail cone, are braced centrally and at the extreme ends with box-type struts riveted to the fins.
The suspension lug riveted to the barrel is the usual army folding type.

2. BOMB DATA

Weight of Steel nose	16.0 Kg
" " Steel body and tail.. ..	44.7 Kg
Length overall	53 ins
of bomb body	46 ins
Diameter of " "	9⅝ ins
Thickness of wall	5/16 in.
Length of tail fins	21¾ ins
Width of tail (diagonally)	13¼ ins
Fuses .. .. ..Nose -	A-2(a),A-2(b),A-2(c),D-5(a)
" .. .. ..Tail -	B-1(a),B-1(b)

3. FILLING

Three types of filling have been noticed in this bomb.
(a) The common filling consists of four pre-formed, paper wrapped, picric acid blocks, comprising a nose block, two identical central blocks and a tail cone block, sealed in with paraffin. The blocks bear the following marking - "Type 94 100 Kg Bomb number (1, 2 or 3) bursting charge,picric acid". The nose charge is designated "No.1", the central blocks "No.2", and the tail cone block "No.3". The weights are as follows:-

Nose block	7.5 Kg
Central blocks (each 16 Kg)	32.0 Kg
Tail Cone block	7.5 Kg
	47.0 Kg
Loading factor ($\frac{47}{107.7}$)	43.6%

When the bomb is filled with straight picric acid, no Japanese characters appear directly above the weight mark (100 Kg).

(b) Above the weight mark on some 100 Kg bombs appear characters indicating T N T - picric acid

mixture. This filling has the same appearance as the straight picric acid pre-formed blocks. The translation of the characters on the blocks is "Type 94 one hundred kilogram bomb No. (1, 2, 3) bursting charge T N T - Picric Acid". Weights are as follows:-

Nose block		7.3 Kg
Central blocks	15.8 Kg	
	16.1 Kg	31.9 Kg
Tail Cone block		5.5 Kg
		44.7 Kg
Loading factor	$\frac{44.7}{105.4}$	42.4%

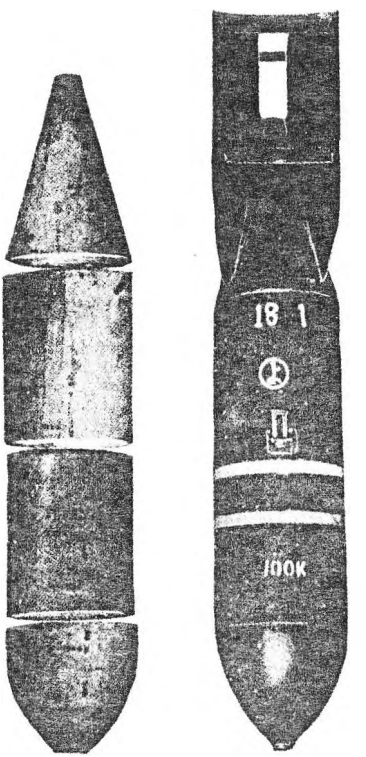
(c) A third type of filling has been found in a 100 Kg bomb marked with characters meaning "special", above the weight mark. The filling is cast directly into the bomb case in one piece, evidently using a mould for the nose. The steel nose piece is difficult to unscrew. The filling is a white starchy looking substance consisting of 77.6% ammonium nitrate and 22.4% cyclonite. It is very hygroscopic and gets "mushy" if exposed to moisture. On being steamed out it turns darker, looking somewhat like T N T and does not burn readily. A very small amount of T N T had been poured in at the nose, apparently as a sealing compound.

(SOURCE:- M.E.I.U.)

100 KG GP HE TYPE 94 ARMY BOMB

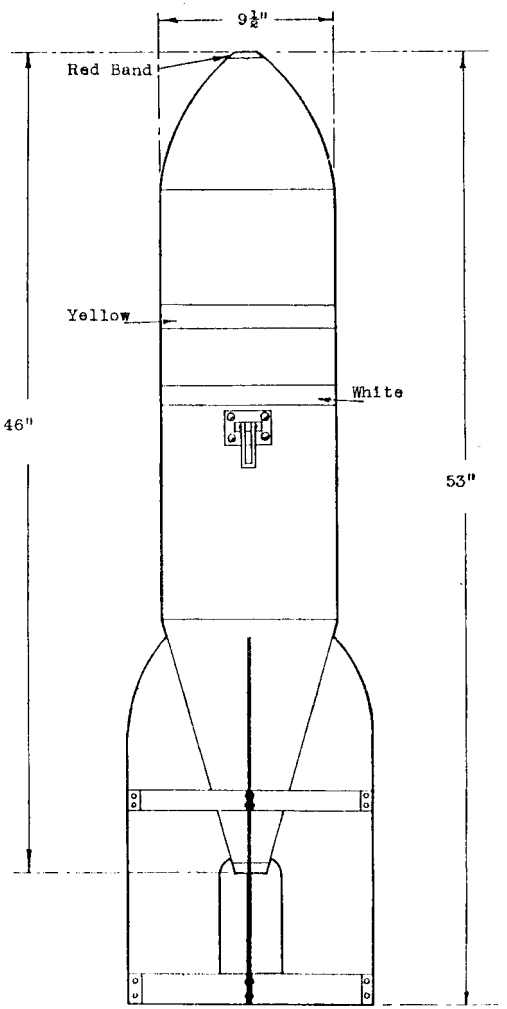
FIG I

Complete Bomb, and Cast Blocks of Explosive Filling.



100 KG G P HE TYPE 94 ARMY BOMB

FIG 2



100 KG GP HE TYPE 3 ARMY BOMB

1. GENERAL

This bomb was recovered in New Guinea and had similar construction to 100 Kg Type 94 HE Bomb except that the weld was at the nose section instead of at the tail. In this case the tail cone was externally threaded to screw into the bomb body.

2. DESCRIPTION (Fig 1)

The filling consisted of preformed picric acid blocks sealed in with a T N T binder instead of the customary paraffin. No characters appeared above the weight mark. Weights and loading factor are as follows:-

Weight of nose and body ..	42.3 Kg
" " tail	14.9 Kg
Total weight of filling ..	51.0 Kg
	108.2 Kg

Loading factor 47%

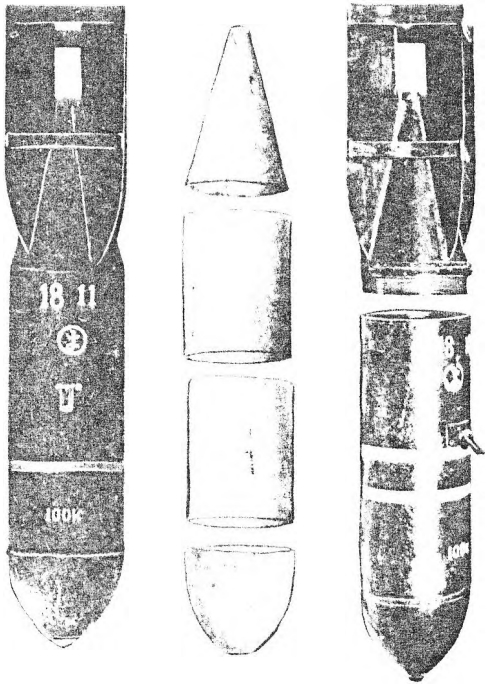
3. MARKINGS

Markings on packing boxes indicated that this bomb is designated - "Type 3 100 Kg bomb". Some specimens, with only one yellow band as well as the usual two bands, yellow and white, were recovered. No significance can be ascribed to the difference in marking. The markings on the packing boxes were identical for both single and double band bombs. The position of the yellow band, whether accompanied by a white band or not, varies from 6 to 8 ins forward of the carrying lug. The white band is just forward of the carrying lug plate.

(SOURCE:- M.E.I.U.)

100 KG GP HE TYPE 3 ARMY BOMB

FIG 1



Yellow Band. HE Blocks. Yellow & White Bands.

250 KG GP HE TYPE 92 ARMY BOMB

1. GENERAL

This bomb is an enlarged version of the 100 Kg Type 94 HE bomb.

2. DESCRIPTION (Figs 1-2)

The construction of the body and tail, the type of suspension and the colouring are the same as the smaller bombs. The main differences exist in the measurements, weight, fusing and by presence of a weight discrepancy mark.

Dimensions are as follows:-

Overall length	76¼ ins
Length of body	59⅛ ins
" " body barrel	34½ ins
Diameter of body	11⅞ ins
Thickness of wall	¼ in.
Length of tail fins	29 ins
Width of tail (diagonally)	16½ ins

The weight of the bomb case varies with the weight discrepancy marking.

Bomb marked " ± "	
Main body and tail	94.3 Kg
Nose piece	43.2 Kg
	137.5 Kg
Loading factor	43.1%

Bomb marked " + "	
Main body and tail	95.9 Kg
Nose piece	42.5 Kg
	138.4 Kg
Loading factor	42.9%

The bomb is threaded at the nose and tail to receive A-4(a) and B-4(a) fuses. Specimens examined would not take the B-7(a) fuse.

3. EXPLOSIVE FILLING

Consists of four pre-formed, paper wrapped, picric acid blocks sealed in place by paraffin.

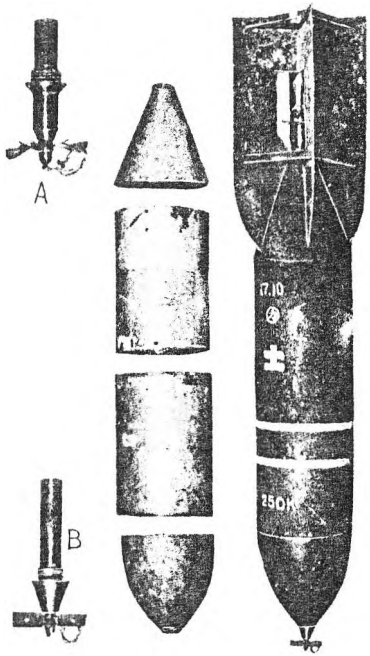
Weight of nose block	17.2 Kg
" " central blocks (each 38.0 Kg)	76.0 Kg
" " tail block	11.1 Kg
	104.3 Kg

(SOURCE:- M.E.I.U.)

250 KG GP HE TYPE 92 ARMY BOMB

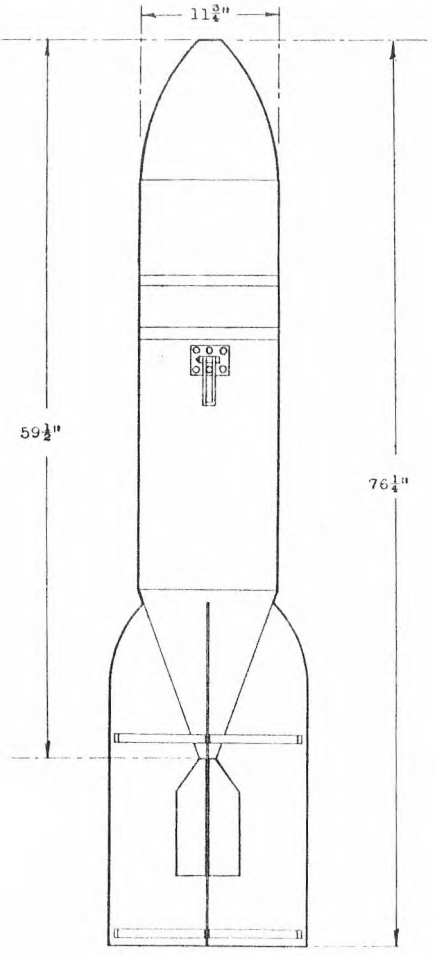
FIG I

(A) B-4(a) Tail Fuse. (B) A-4(a) Nose Fuse.



250 KG GP HE TYPE 92 ARMY BOMB

FIG 2



TYPE O MODEL I NAVIGATION MARKER BOMB

1. GENERAL

This bomb is filled with 350 gms of aluminium powder and is used from aircraft in daylight to determine tides, drift and currents.

2. DESCRIPTION (Fig 1)

The streamlined aluminium coloured bomb is 12½ ins long, 3 ins in diameter and weighs 3.7 lbs (average 11 bombs). It consists of nose, body and tail sections.

(a) Nose: A cast iron nose 2⅝ ins long is ogival shaped with a central hole 1½ ins in diameter and a ½ in. wide recess, the thickness of the bomb body, at the large end of the nose.

(b) Body: A 29 gauge (US) tinplate body is 3 ins in diameter 5¼ ins long with a seam lap-soldered. The body forcibly fits over the ½ in. recess in the nose.

(c) Tail: The tail cone is made of 29 gauge (US) tinplate with lap-soldered seam. It is 4⅜ ins long and is fitted with four fins of the same gauge tinplate which are strengthened by ⅛ in. ribs on outside surfaces and by four 5/16 in. wide struts of 24 gauge (US) tinplate riveted on the ends. The fins are soldered to the tail cone and measure 4-3/16 ins across opposite fins.

(d) Wooden Components: (i) A wooden disc 2-15/16 ins. in diameter and ⅜ in. thick has half its thickness bevelled to fit the tail cone which is attached to it by means of four small nails. The disc is fitted into the end of the body and also held in place by four nails.

(ii) The plunger, 7½ ins long is made from three pieces. A wood turning 3 ins long and 1½ ins diameter has a rounded end to conform to the shape of the nose. A plywood disc, 2¾ ins in diameter and ⅛ in. thick is screwed to the above turning by two small wood screws. A rod 15/32 ins in diameter is glued in a hole in the disc and the turning and extends 3⅜ ins above the disc.

(e) Filling: The powdered filling was identified as high purity aluminium of about the fineness used in paint. The aluminium had a 0.34% acetone soluble portion which is assumed to be oil.

(f) Markings: A yellow paper label 2⅜ ins by 2¾ ins printed in black and pasted to the body is translated:-

"(1) This bomb is used in daylight for measurement of drift.
(2) Just before launching the bomb, remove it from its container and then throw it, as is, overboard. Be careful not to hit the

rudder of the airplane.

(3) This bomb can be dropped from between 200 and 2000 metres."

Another yellow paper label 2 ins by 4 ins and printed in black is pasted longitudinally on the opposite side of the body and is translated:-

"April 1942 Type 0 Model 1
Navigation Marker Bomb
Asano Co."

Other bombs examined had the same markings with exception of dates of manufacture which were given as November 1942 and July 1942.

(g) Assembly: The nose is placed in the body, and the plunger is inserted. The aluminium powder is then added and the wooden disc is nailed to the body and the tail. The junctions of the nose with the plunger, the nose with the bomb body and the body with the tail are all sealed with 9/16 in. wide paper tape. The entire assembly is coated with aluminium paint.

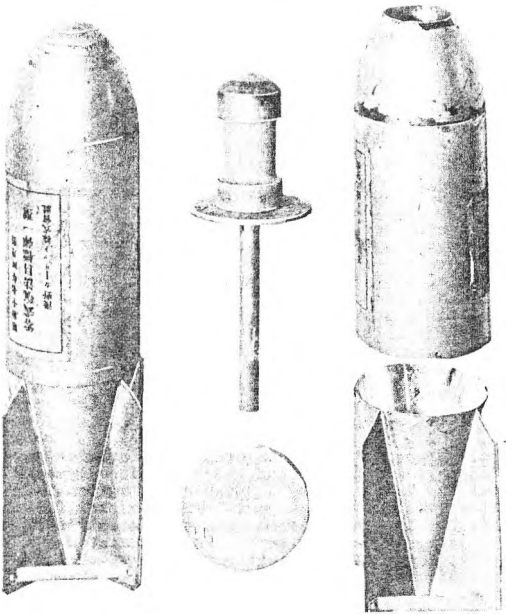
3. FUNCTIONAL CHARACTERISTICS

On impact with water, the wooden plunger pushes off the wooden disc and tail and ejects the aluminium powder which forms a visible patch on the water. The marker was tested by dropping from 1000 ft. Each bomb formed a bright white spot when it hit the water, the spot increasing to about 25 ft diameter in 3 seconds, after which the size did not increase appreciably in 10 minutes in calm water. The test was carried out at 0930 hrs with the sun and one of the spots on the line of flight. The spots could not be seen 2 miles away at an altitude of 600 ft. but were visible at least 5 miles away in the same direction at an altitude of over 1000 ft. It was concluded that at altitudes in excess of 1000 ft. the spot could be observed for at least 10 miles regardless of the angle of the sun.

(SOURCE:- C.W. SERVICE - EDGEWOOD ARSENAL, MARYLANDS)

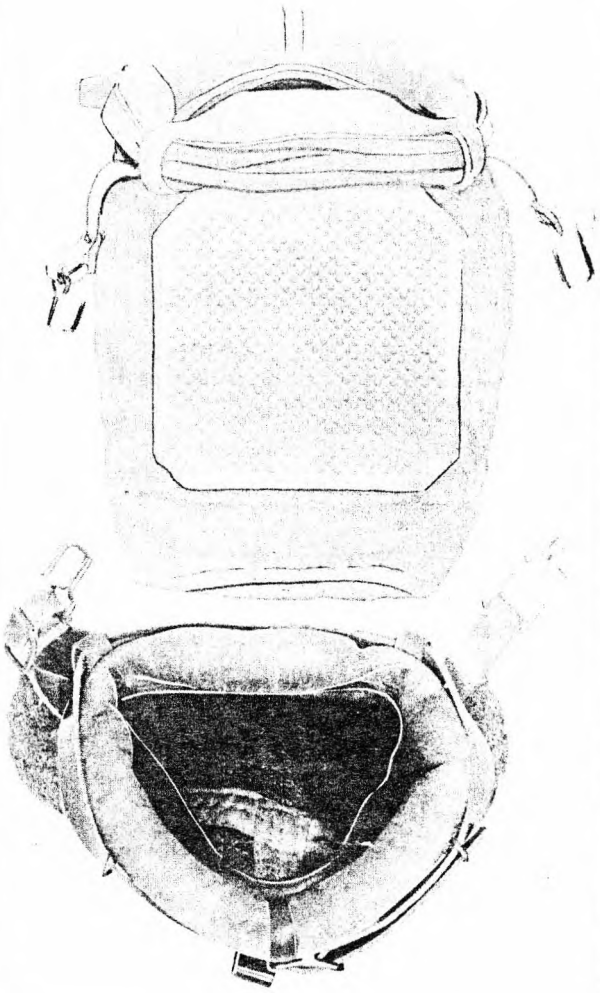
TYPE 0 MODEL 1 NAVIGATION MARKER BOMB

FIG 1



HORSE RESPIRATOR

FIG 3



50 MM SMOKE GRENADE

1. GENERAL

This grenade has a nose fuse and propellant unit similar to Japanese Type 91 HE grenade and can be projected from a discharger of 50 mm calibre. Such a grenade is also suitable for throwing by hand as the fuse can be initiated by a blow on the fuse head as well as by shock of discharge from a projector.

2. DESCRIPTION (Figs 1 - 2)

The grenade is headed with a fuse having a safety cap held by a double pronged safety pin (all of brass) with an attached finger loop of string. The fuse projects from a necked head of a smooth and unpainted brass body. The propellant unit, projecting from the base appears as a cylindrical extension of a reduced diameter of the body. It is of blackened steel having six equally spaced ports and a visible percussion cap in the base. One group of Japanese stampings on the base of the grenade body were translated to read "December 1937 Nagoya Arsenal" followed by two ideographs which are not understood. A second group on the fuse body above the gas escape port gave "March 1939 Osaka Army Arsenal". The five main components of the grenade are described in the following order:-

W.P. Container
Grenade Body
Propellant Unit
Fuse
Burster Unit

(a) W.P. Container: This container occupies the body of the grenade and is filled with 174 gms of white phosphorus. It consists of a pressed cylindrical 34 SWG brass container with a domed head and a sweated rimmed cap behind the swaging near the other end. An axial brass tube 1.1 cms outer diameter, extends through the container to which it is sweated at flanged openings at either end. A filling hole formed in the rear end with a countersunk rim is sealed by a sweated disc.

(b) Grenade Body: The brass cylindrical cup of press construction has walls 0.7 mm thick and a heavy base which is externally necked to form an internal screw-thread beneath a smaller central hole. The rim of the cup engages and is sweated to the rimmed perimeter of a domed brass grenade head which is externally necked to allow the formation of an internal screw-thread that receives the fuse body. A cardboard packing disc is positioned between the head and the W.P. container.

(c) Propellant Unit: This component incorporates an adaptor, percussion primer and cap, propellant holder and propellant.
The propellant unit adapter is a steel cylindrical body 2.6 cms in diameter and 3.0 cms long, blackened

over its complete surface. The front end, which is reduced in diameter and screw-threaded to engage the base of the grenade body, has a central shallow cavity containing a felt disc and a countersunk lead washer behind the thread. A screwed primer plug with two diametrically opposite keyway holes and a tapered and central firing pin aperture screws flush with the base of the adapter. This plug is recessed in the inner surface to contain the brass primer, the percussion cap end being sealed from the firing pin aperture by a tin-foil disc.
Within the primer, two flash holes are positioned to either side of an anvil which separates the percussion cap composition from the primer charge of black powder. A tissue paper disc seals the primer on the forward surface. In front of the primer is a steel disc with a central flash hole which butts against the rim of a copper cup (35 SWG) lining the propellant unit adapter. This cup is the holder for the propellant which is a grey-brown nitrocellulose powder in the form of flakes approximately 1 mm square. The cup is visible through the six ports in the side of the adapter.

(d) Fuse: This is a brass component and screws into the head of the grenade body. Assembled from the tip and within the rounded head of the fuse body is a brass striker into which is screwed a steel striker pin. The latter has a flanged and slotted head below which it is screw-threaded so that the point may be withdrawn from the face of the striker. A conical striker spring keeps the striker away from a percussion cap which is positioned within a larger cap containing black powder. Two flash holes opposite to the base of the percussion cap are exposed to the black powder.
This assembly is retained in the head of the fuse body by a brass safety cap (32 SWG) which in turn is secured by a double pronged brass safety pin (12 SWG). The pin which passes through four holes in the safety cap crosses the cavity of the head where each prong engages opposite recesses in the striker and prevents its rear movement. The lugs of the safety cap are swaged to conform with a groove in the outer surface of the fuse body.
Above the external screw-thread which is at the base of the fuse body are two tommy holes and one gas escape port filled with wax. The cavity of the fuse body extends below the percussion cap to the base which is internally screw-threaded to engage the screwed head of the delay pellet.
The delay pellet consists of a brass tube 3.5 cms long and 0.9 cm outer diameter. The front portion (3.1 cms) of the bore (0.5 cm diameter) is headed with a layer of black powder and filled with a dark grey solid delay pellet. This mixture weighs 0.70 gm and has the following:-

Potassium Nitrate	53%
Sulphur	25.7%
Charcoal (by difference)	21.3%

The remaining portion of the bore is enlarged to contain more black powder. The possible remains of a tissue paper sealing disc and a thin steel washer were observed at the base of this pellet.

(e) Burster Unit: Positioned beneath the delay pellet of the fuse and also within the coaxial tube of the W.P. container is firstly a copper cased intermediary pellet then a cardboard cased burster pellet. The base of the latter projects into the hole in the grenade body and is retained by a felt disc occupying the shallow cavity in the head of the propellant unit adapter.
At the forward end the copper case of the intermediary pellet is open and exposes a smaller and flanged copper sleeve containing green initiating powder headed with black powder which is penetrated by a central flash cavity. Below the initiating powder the remaining portion of the copper case is filled with a buff coloured intermediary powder charge. The green substance was decomposed mercury fulminate and the buff coloured substance was CE (Tetryl).
The burster pellet consists of 1.32 gms of a pale yellow crystalline solid identified as pure T N T, held in a cardboard container.

(f) Weights and Dimensions:

Weight	Complete	543	gms	(19.00 ozs)
"	propellant unit ..	85	gms	(2.97 ozs)
"	W.P. container (filled)	255	gms	(8.93 ozs)
"	W.P. filling	174	gms	(6.09 ozs)
"	delay pellet	12.95	gms	(0.453 ozs)
"	intermediary pellet..	2.67	gms	(0.094 ozs)
"	burster pellet	1.77	gms	(27.1 grs)
"	propellant	1.1	gms	(16.8 grs)
Overall length		14.5	cm	(5.71 ins)
Diameter of grenade body ..		49.7	mm	(1.958 ins)

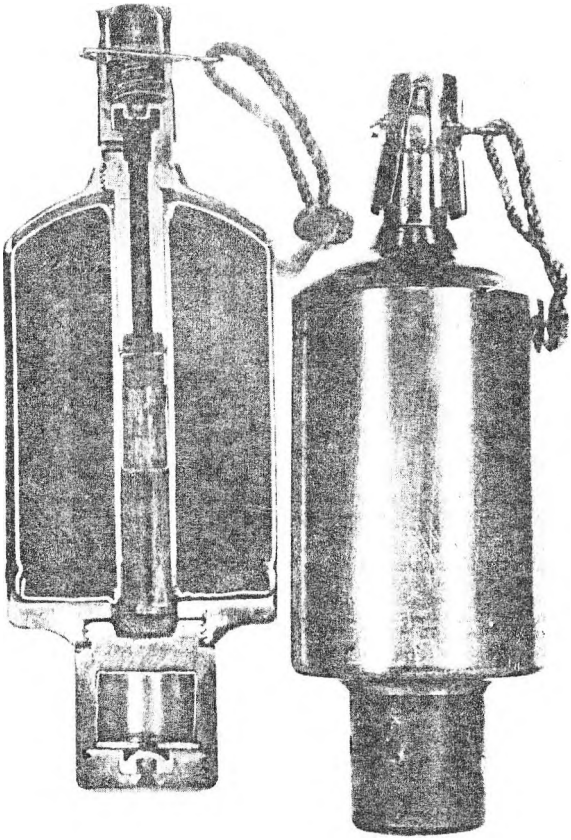
3. FUNCTION

Before the grenade is inserted in the barrel of the discharger the fuse must be armed by screwing home the striker pin until its point projects from the rear face of the striker. The double pronged safety pin is then removed leaving the safety cap loosely held at the groove in the fuse body. On discharge, the striker sets back on the percussion cap the flash from which ignites the head of the delay pellet. After the delay period the burning train reaches the black powder composition in the base of this pellet and initiates the intermediary pellet which functions the burster pellet. The W.P. container would be shattered and probably forced out with the grenade head thus scattering the contents.
Even if thrown by hand it is necessary to leave the propellant unit adapter in place to retain the two pellets of the burster unit. After arming of the grenade and before throwing the fuse must be initiated by a sharp blow on the head of the safety cap.

(SOURCE:- 2/1 AUST CW LABORATORY RAE)

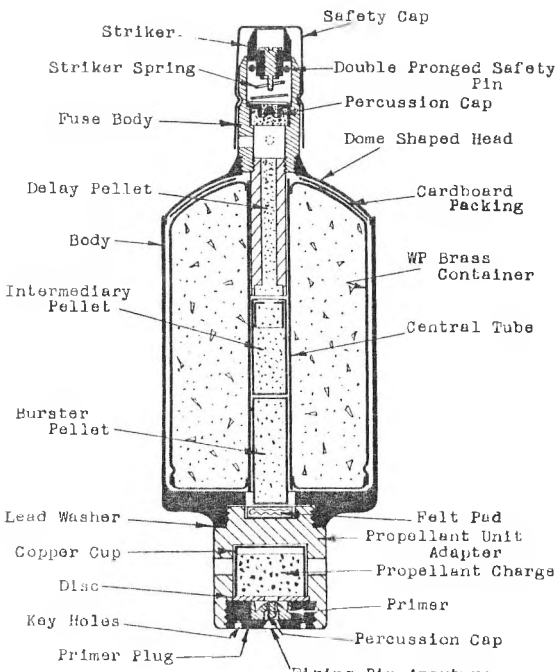
50 MM SMOKE GRENADE

FIG 1



50 MM SMOKE GRENADE

FIG 2



TYPE 94 NAVIGATION FLARE

1. GENERAL

This flare was recovered in New Guinea and was evidently intended as a navigation marker for use by aircraft flying over the sea at night.

2. DESCRIPTION (Figs 1 - 2)

The grey cylindrical tin plate body is hemispherical at the nose and tapers away at the tail end to a short cylinder of smaller diameter.

(a) Nose Section: This section is made from 23 SWG tin plate pressed into a hemispherical shape and is soldered to the lower body with a 5 mm overlap. A cup shaped piece of heavy galvanised iron is soldered into the nose and acts as a weight to ensure that the flare floats vertically. A cylindrical tube penetrates the weight centrally and is soldered to the nose. This tube has a number of small perforations throughout its length and covers a small jet at the nose end through which water can pass when the tear-off strip is removed. The above tube contains a smaller cylindrical tube which is open at the nose and closed at the other end. There is a small triangular notch in the circumference of the tube at the open end. The tube is free to move vertically through approximately 4 mm, the vertical movement being controlled by a wire stop pin. About 3 cm from the top of the perforated tube is soldered a 29 SWG wire mesh disc. It is thought that this disc acts as a rough diaphragm to retain the bulk of the calcium carbide in the nose section. Damage to the flare probably caused the diaphragm to be bent back as illustrated as examination of a second specimen revealed the diaphragm to be flat.

(b) Body Section: This component is made in lower and upper sections. The lower section is constructed of 23 SWG tin plate with a longitudinal pressed and soldered seam and an external swaging at each end. It is soldered to the upper section with a 7.5 mm overlap. The upper body section is of 26 SWG tin plate also with a longitudinal pressed and soldered seam and is soldered to the lower tail section with 4 mm overlap. A 27 SWG strip is soldered diametrically across the body and serves as a support for an internal cylinder and also to strengthen the flare. A thin tube with approximate diameter of 3 mm runs from an opening covered by the tear-off strip, through an opening in the internal cylinder and is soldered to this and to the strip. This tube is closed at the upper end but two small holes in the wall of the tube permit entry of water to the cylinder. This internal cylinder is constructed of 31 SWG tin plate with a pressed and soldered seam and is soldered at one end to the internal support and at the other end with a 3 mm overlap to another cylinder of smaller diameter which runs to the tail of the flare. The larger internal cylinder contains two small cylindrical containers, soldered together and

constructed of 31 SWG tin plate with a pressed and soldered seam. Each of these smaller containers holds a charge of calcium phosphide and is connected to the large internal cylinder by a small hole in the wall which permits entry of water to the phosphide charge. A label pasted to the body of one flare examined is translated "Type 94 Navigation Flare Central Industrial Co Ltd. Omori Factory Manufactured 1940".

(c) Tail Section: The conical lower tail section of 25 SWG tin plate is soldered to the cylindrical upper tail section which has an external swaging at each end. Four fins are soldered near the tail. The tail is closed by a 28 SWG top cap and annular brass liner which are soldered to the upper tail section. The top cap is attached to a 11 SWG lower cap by the tail tear-off strip.
The internal cylinder of the tail section of 31 SWG tin plate with a pressed and soldered seam is soldered at the top to the annular brass liner with a 4 mm overlap.
The lining is soldered to the upper tail section and serves to support the lower cap which has a pressed indentation in the centre to hold a wire mesh cylinder filled with 1.5 gms of calcium phosphide.
Three small tapered jets are equally spaced around the perimeter of the lower cap to allow the escape of gas from the interior of the flare. The central portion of the lower cap is penetrated by a jet, which leads into the cylinder in the tail section.
Two brass gauze washers are fitted in the annular space directly beneath the brass lining and are designed to function on the Davy Safety Lamp principle to prevent the burning gases from striking back into the interior of the flare. The wire mesh cylinder is protected by a circular metal strip and a perforated guard. The top cap of the flare has a rubber cover riveted to its inner surface and is designed to fit over the wire mesh cylinder and the jet.

(d) General Data:

Total weight of flare as received ..	709 gms
Correction for three missing tail fins	18 gms
Overall length	30 cms
Diameter of body	7 cms
" " tail section	3.5 cms
Length of tail fins	7 cms
Depth of immersion in water when floating	20 cms

(e) Analysis of Contents: (i) Calcium Carbide: As some decomposition of the carbide had occurred presumably due to partial removal of the tear-off strips, it was not possible to estimate the original yield of acetylene. A theoretical figure was obtained by expressing the total calcium in the charge as calcium carbide.

Weight of Charge	263 gms
Theoretical weight of carbide	240 gms
" yield of acetylene	84 litres at N T P.

(ii) Calcium Phosphide: The impure calcium phosphide in the cylindrical containers and the wire mesh cylinder had undergone some decomposition.

Total weight of calcium phosphide:-

In cylindrical containers	27 gms
In wire mesh cylinder	1.5 gms (approx)

3. OPERATION

The flare operates in water, the calcium carbide decomposing to form acetylene which is ignited by the spontaneously inflammable impure phosphine, liberated by the action of water on the calcium phosphide. The two tear-off strips must be removed before the flare is dropped in water. Initial submersion in water causes the evolution of impure phosphine from the small charge of phosphide in the wire mesh cylinder and this gas on ignition lights the acetylene liberated from the carbide after water has forced its way through the jet in the nose and passed through the perforations in the tube attached to the nose section. The acetylene escapes through the 3 small tapered jets in the tail section. Water also enters the cylindrical containers in the upper body through the tube also in the upper body section. A small quantity also will probably enter through the jet in the lower cap on initial submersion of the flare. The impure phosphine liberated passes out in a steady stream through this jet and is available for the immediate re-ignition of the acetylene if it is extinguished e.g. by rough seas. It is suggested that this charge of phosphide is in two containers to increase the time during which phosphine is liberated. Pressure of gas from reaction with the phosphide in the lower container would prevent water from rising for some time to the level of the hole in the upper container and little decomposition of the charge in the latter would occur till the charge in the former was nearly expended. A fairly constant pressure of acetylene is probably maintained by control of the amount of water entering the carbide through the nose jet. This control appears to be governed by the gap between the base of the small tube and its seating round the nose jet in the following manner:-

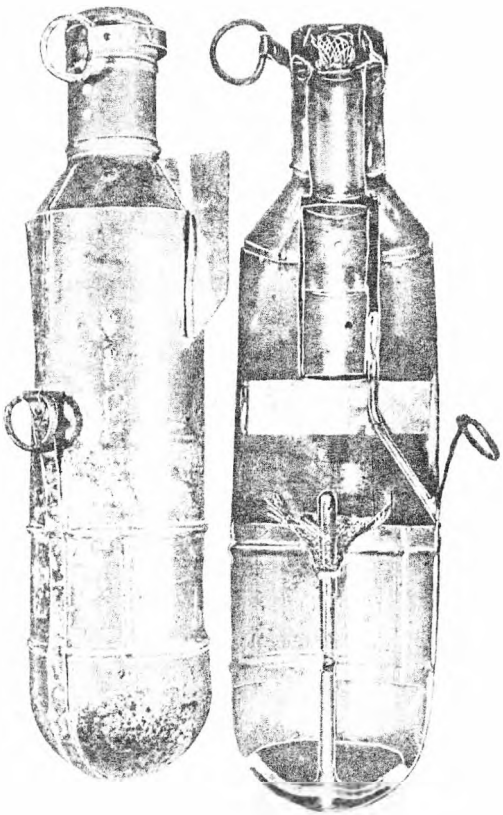
When the flare is first immersed in water the external water pressure lifts the smaller cylindrical tube and the water flows in through the gap formed. When the pressure inside the flare becomes greater than the external pressure this tube is forced down and the gap consequently almost closed. A triangular notch at the base of this tube allows some water to be forced out of the flare. When the pressure drops the water pressure outside lifts the tube and water again enters.

(SOURCE:- 2/1 AUST C.W. LABORATORY, R.A.E.)

TYPE 94 NAVIGATION FLARE

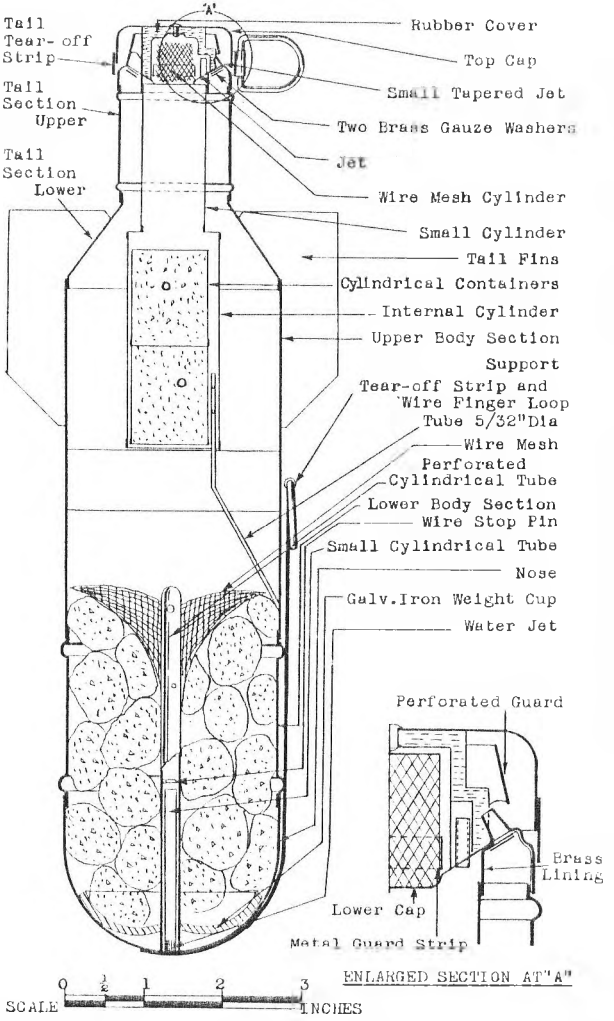
FIG 1

External and Sectional Views.



TYPE 94 NAVIGATION FLARE

FIG 2



TYPE 95 PASSENGER CAR

1. GENERAL

The vehicle was recovered in the Admiralty Islands and has been identified as Type 95 four-wheel drive passenger car.

2. DESCRIPTION (Figs 1-3)

The vehicle has the appearance of a small commercial passenger car although high clearance and provision of four wheel drive indicates that it is intended for similar use as the US 1/4 ton truck or the German Volkswagen.
The power unit is a two cylinder four cycle air-cooled V-type petrol engine with magneto ignition. It is suspended from an inverted U frame mounted at the front of the main frame and is supported in the rear by two trunnions mounted in saddle at the transmission. An electric starter is provided in addition to normal hand cranking.
The car is equipped with selective two or four wheel drive and two wheel rod operated brakes with emergency brake operating on the rear drive shaft.
Leaf springs and shock absorbers are used with the rear wheels and coil springs and shock absorbers with the front wheels. A spare wheel and tyre is carried on the rear. Front and rear towing hooks are provided. Other features include steering wheel on the right hand side, hoods provided for shading the headlights, seats for two passengers in front and one in the rear. The battery compartment is to the left of the rear seat and the tool box on the right. A main and an auxiliary petrol tank are provided.

3. PHYSICAL DATA

Actual measurements:

Height (w/o top)	4 ft 4 ins
Wheel base	6 ft 8 ins
Length - overall	11 ft 8 ins
Tread	4 ft 2 ins
Body width-overall	5 ft
Tyre size	6:00 x 18
Speeds forward	3
" reverse	1

Documentary data:

Bore	90 mm
Stroke	110 mm
Piston displacement	1400 cc
Oil capacity	3.30 litres
Main petrol tank capacity ..	35 litres
Auxiliary" " "	14 litres
Fuel consumption	0.08 litres per km
Reduction ratios - first	4.96
second.. ..	1.96
third	1.00
reverse ..	6.76