DIRECTOR OF ARMAMENTS (INDIA) PUBLICATION.

JAPANESE AMMUNITION

C.I. AMM. TECHNICAL REPORT

No. 27 (SECOND ISSUE)

(This Supersedes the *First Issue* which should now be destroyed.)

BOMB, H.E., 320-MM., SPIGOT MORTAR (335 KG.)

COMPILED BY
THE CHIEF INSPECTOR OF AMMUNITION,
KIRKEE.

1945.

JAPANESE AMMUNITION.

C. I. AMM. TECHNICAL REPORTS.

REPORT NO. 27. APRIL 1945.

BOMB, H.E., 320-mm., SPIGOT MORTAR (335 Kg.)

Note:- The size 320-mm. refers to the maximum external diameter of the projectile and not, as might be thought, to the diameter of the spigot of the weapon. Military Intelligence Directorate (G.H.Q.I.) have ruled that the actual diameter of the bomb must be used in the nomenclature. The weight shown is that of the fuzed and filled bomb complete ready for firing.

...

G E N E R A L.

So far as is known the first use of this mortar in the Burma Theatre was during the Japanese advance into India in 1944. The first bombs were captured about June 1944 in the Bishenpur area. The following extract from the report of an officer of W.T.S.F.F., Fourteenth Army is of interest:-

"There is some report of a curious projectile having been used by the Japs at Kennedy Peak, so the equipment (Mortar) may have been fired once. With the second mortar captured, in addition to the one complete round of ammunition, there were also parts of another round, and two empty cartridge cases*, one of which was being used as a container for the mortar holding down bolts. The second mortar captured was not mounted. It would appear that even the Japs had had enough of it. The base plate was used as the roof of a small dugout, and the walls were supported by two charge boxes. On pulling these clear, I found that one of these boxes contained a complete charge and accessories. The Jap appears to be either thoroughly fed up with the equipment, which is quite reasonable or exceedingly bad in ammunition maintenance, which is not."

2. Since then further ammunition has been captured but little information has been received at Kirkee regarding its use and effectiveness. The weapon does not appear to have been used in other theatres and no reports of its use have been received from Australian or American sources.

3. As a brief general introduction to this weapon some useful remarks which have been extracted from General Headquarters, India, Military Directorate's Periodical Technical Summary No. 29 of July 1944 are reproduced below. These should be read in conjunction with the rough diagram of the mortar assembled ready for firing, in Plate C at the back of this Report.

"This unusual Japanese weapon, of a type which is not known to have been encountered before in any theatre of the Far Eastern war, was captured recently in the Imphal area. It is a Spigot type weapon, different in design from any used by other nations and showing little trace of foreign influence in other than the basic principle. In adapting the spigot principle to this weapon, however, the Japanese appear to have lost sight of many of the basic advantages of this type of weapon, and the final result is an unimpressive equipment which can have only a limited value in action. Spigot type weapons have been designed by most nations with the principle object of enabling a much larger projectile to be thrown than could be fired by a more conventional type of weapon of

* The term "cartridge cases" presumably refers to what is called "obturation chamber" in this Report.

equivalent size and weight, without detracting from ease of handling in any way. In this particular example, the size of the projectile is in fact considerable, being very much larger than could be obtained with any other Japanese weapon in normal use. But in order to project this formidable bomb the projector itself has been made immobile in action, little traverse and no elevation has been provided, thus rendering correction for line impossible when emplaced and adjustments for range dependent upon variations of the incremental charges and a large crew and slow rate of fire have been accepted. It is not yet possible to estimate the range and no reports have been received of ranges achieved in action. Although, according to PW, fantastic effectiveness is claimed for the weapon by the Japanese, no reports of undue annoyance being caused have been received from troops in contact. This accords with experience of much more professional equipments used elsewhere; the Germans, for example, have a 38-cm. equivalent of which no reports of great effectiveness in action have so far been received.

"The spigot is a steel cylinder with a cavity for the propellant machined at the top, intergral with a small seating plate square in plan but spheroid. This seats, and is retained on, the mounting plate, by a square steel plate with the centre portion domed; within the limits allowed by the retaining bolts is tolerance allowing very slight adjustments in setting up the spigot, being the only inherent means of adjusting line or elevation. Within and conforming with the dome is retained a wood reinforcing disc with an iron strengthening band. 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 equipment. Line of fire can be varied only slightly once the equipment has been emplaced, and, once the initial elevation has been determined by the angle at which the equipment is dug in, variation in range can only be obtained by varying the incremental charges."

4. The weight of the spigot mortar together with the mounting and emplacement is about 900 lb. The range has since been reported as being about 1,600 yards, presumably with full charge. Firing trials are being arranged.

It is clear from labels and markings that this is the Type '98 spigot mortar.

D E S C R I P T I O N.

B O M B.

5. The complete round ready for firing is made up of the following components:-

(i) Head, fitted with an exploder container and a fuze.
(ii) Body, similarly fitted with an exploder container and a fuze.
(iii) Tail unit, which houses the complete propellant and igniter assembly.

6. The following drawings and photographs have been included at the back of this report:-

Plate A:- Photograph of one complete assembled bomb, together with one bomb in components fitted with clamps for transport. Note that transit cover plates for protecting the threads have not been shown in this photograph.

Plate B:- Photograph of the assembly secuence of components of a complete plugged bomb.

Plate C:- Detailed drawing of the general assembly, and the assembly sequence of the bomb, including a rough sketch of the spigot mortar.

Plate D:- Photograph of the propellant charges and the general appearance of components comprising the obturation and igniter systems.

Plate E:- Detailed drawings of the igniter holder with extension, primer, percussion and electric igniters and exploder container. The latter component forms part of the head and body of the bomb to take the fuze.

Plate F:- Drawing of the propellant transport box holding
(a) Propellant charges with primer, container and obturation chamber.
(b) Two Fuzes, Percussion, Graze, H.E.
(c) One each, electric and friction igniter (Type'96).
(d) One igniter holder with extension.

Plate G:- Photograph of the general appearance and assembly sequence of components of the fuze, Percussion and Graze, H.E. used in the bomb.

Plate H:- Detailed drawing showing general assembly and component details of this fuze.

Head.

7. The head (4) - see Plates A, B and C - is a dome-shaped steel container finished internally with a dark purple lacquer. The cast block of picric acid (6) is securely packed inside with a wooden packing piece (5) in the nose and secured by a screwed plate (8) in the base. This has a convex surface in the centre to accommodate the protruding portion of the body fuze.

8. The exploder container (see Plate E item 3) is lacquered internally and externally and screws into the nose. It contains in the bottom two exploder pellets of R.D.X./Wax wrapped in a paper container. Above this the cavity of the container is lined internally with a copper cup, a further copper cup being used to line the top perforated exploder pellet. These two cups are soldered together. An adapter (2) is fitted to take the plug (1) or fuze.

9. For purposes of locating and positively securing the transit clamp a hole and a slot are provided diametrically opposite along the line of the centre of gravity of the head.

10. The head is painted black, with a red band at the nose and a yellow band just above the threads at the base.

Body.

11. The body (12) is a cylindrical forged steel structure having female threads at the top to receive the head(4) and male threads in the base to screw into the tail unit (17). Similar to the head it is internally lacquered and holds a picric acid block filling (11). The body is closed by a screwed plate (9) which takes an exploder container (10) in the centre; this is secured by welding. The details of the exploder container are the same as those described above.

12. The body is also provided, described in Para 7, with a hole and slot for fitting a transit clamp during transport.

13. It is painted black and two dashes presumably weight marking and date of filling, 17.12 (December 1942) followed by an inspection mark (OSAKA) are stencilled in white.

Tail Unit.

14. The tail unit (17) consists mainly of a hollow forged steel tube having an external taper with a reduced diameter at the base. Four sheet steel fins are attached by welding and eight strong 9 S.W.G. wires (18), which act as strengthening stays, are fastened to eye hooks (19) on the fins, see Plate A. The tail is

threaded internally at the top to receive the male threads on the body (12) and below these threads a shoulder is formed to seat the propellant assembly (flange of the obturation chamber (16)). Immediately below the thread is a screwed hole, normally plugged, to take the igniter holder with extension (13).

The tail unit is painted black internally and externally.

Note:- The significance of the Arabic figures stencilled in white on head, body and tail unit is not known. These numbers are all different and are unlikely to have been used as mating numbers.

PROPELLANT ASSEMBLY.

15. The details of the propellant assembly are shown in Plates D, E and F.

Obturation Chamber.

16. The obturation chamber (16) is a heavy bell-shaped chamber made of brass. The mouth is slightly flanged outwards to form a seal on firing against the walls of the tail unit. A shoulder is formed just below the flange which rests on the lip of the cavity in the mortar spigot. There is a hole in the centre of the base through which passes the spigot of the propellant container (15). Two lifting straps are welded diametrically opposite on the inside of the chamber. The obturation chamber, as its name indicates, acts as a seal against the rush of propellant gases to the rear past the mortar spigot. It is very probable that the obturation chamber is left behind in the mouth of the spigot after the bomb has been fired. If so, its removal may be difficult. This point is being watched during firing trials which are to take place shortly and a supplement to this report will be issued if necessary.

Propellant Container.

17. The propellant container (15) is comprised of a cylinder of cardboard strengthened by a stout brass base. Fitted centrally in the base is the primer adapter (Plate F) secured by four rivets. The primer adapter has an externally screw-threaded spigot which mates with a corresponding recess at the base of the cavity for the obturation chamber, in the spigot of the mortar. A screw-threaded cup is formed in the adapter to hold an igniter charge of about 41 grs. of gunpowder. Four flash holes are bored in the walls to allow the flash to reach the gunpowder bag igniter in the main propellant increment (500 gms.). Into the mouth of the primer adapter screws the primer (14).

18. The propellant charge increments rest in the propellant container and are held in position by the cover (15A). The position of this cover is adjustable to suit the size of charge used. This adjustment is arranged by means of serrations on the primer body and a corresponding quick release spring catch on the propellant container cover (15A).

Propellant Charge.

19. This consists of a number of increments contained in silk bags of different sizes and shapes - see Plate D. The two bottom increments are in the form of rings, the lower (500 gms.)has an internal (igniter) filled with gunpowder to boost the flash from the primer. The weight of charge in grammes, date of filling (various dates in 1941-42) and Arsenal inspection mark (OSAKA) are stencilled on each bag.

The number of increments forming a full charge is not known. Those packed in propellant containers received at Kirkee were found to vary in different boxes.

It is open to doubt whether they actually represent original Japanese packing; boxes may have been opened and charges mixed at some time.

20. The result of an examination of five different sets of charges, in regard to the number of increments found, is tabulated below:-

Box.	Number and weight of charge increments found.						Total Charge Weight.	
	500 gm.	400 gm.	100 gm.	50 gm.	10 gm.	5 gm.	gm.	lb.
No.1	1	1	4	1	3	2	1390	3.06
No.2	1	1	2	1	3	3	1195	2.63
No.3	1	1	4	1	3	3	1395	3.07
No.4	1	1	4	1	2	4	1390	3.06
No.5	1	1	3	1	2	2	1280	2.81

To establish what is a full charge is therefore difficult. In the absence of any better data it is suggested that it is probably 1,400 gms. made up as follows:-

1 Increment of 500 gms.	..	500 gms.
1 Increment of 400 gms.	..	400 gms.
4 Increments of 100 gms.	..	400 gms.
1 Increment of 50 gms.	..	50 gms.
3 Increments of 10 gms.	..	30 gms.
4 Increments of 5 gms.	..	20 gms.
	Total	1400 gms.

The reason for the unusual shape of the 50 gm. increment is not clear. Its shape, however is probably the reason why only one increment of this size is used. There may be some particular arrangement of increments recommended in the Japanese firing instructions.

The above remarks are, of course, based on conjecture and should be taken only as a guide.

Primer.

21. The primer (14) is a long brass tube with flash holes at the top, filled throughout its length with mealed G.P. A perforated plug closes each end and the body has circular grooves or serrations forming a ratchet to provide adjustment of the cover (15A).

Igniter Holder.

22. The igniter holder (13) screws into the screwed hole in the side of the tail unit - see Para. 14. It consists of a brass housing to take either an electric or friction igniter. The igniter is held in position by a slotted retaining plug which allows the leads of the electric igniter or the friction wire loop of the friction igniter to protrude. The other end of the holder (13) is closed by a perforated diaphragm which in conjunction with a fluted sealing plug seals the back-flash of gases. Below this the holder (13) is screw-threaded internally to take an extension. This is filled with perforated G.P. pellets and conveys the flash to the 12 flash holes in the head of the primer (14). This assembly is shown in Plate C.

Note that the igniter holder (13) is normally plugged with a small elaborately made transit plug to prevent the ingress of dust etc. to the holder.

Electric Igniter.

23. There is nothing unusual in the design of this igniter (21) and its manufacture follows general Japanese practice. It differs somewhat from British types in that the ends of the electric leads are carried down to form pole pieces to which the fuzing bridge is joined.

24. Electric tests show that the bridge when cold has a resistence of 0.92 ohms and fuzes with a current of about 0.9 to 1.0 amps. A current of 0.8 amps. maintained for 4 seconds did not fuze the bridge.

Friction Igniter.

25. Again there is nothing unusual in the design of the friction igniter (20) although the method of securing the end of the friction wire, as a safety precaution against an accidental light pull, appears new. This principle of flattening the end of a brass wire forming jagged edges is also used in Japanese flares.

Note:- It is clear from markings on labels etc. that these two igniters are known to the Japanese as the "Type 96 electric igniter (primer)" and "Type 96 friction igniter (primer)" These components were manufactured on various dates in 1940-41.

FUZE, PERCUSSION, GRAZE, H.E.

26. The construction and general principle of this fuze can be seen from the drawing at Plate H while its general appearance and assembly sequence is given in Plate G. The fuze is of a somewhat ingenious design and the method of arming does not follow usual Japanese practice. So far as can be recollected the use of an arming pellet which burns during flight follows an old German practice for fuzes.

27. For purposes of description the fuze may be divided into three main parts:-

(i) Arming Mechanism.

This comprises a closing cap (1) screwed into the fuze body (12) which acts as a guide for the striker needle holder or inertia pellet (2). This pellet (2) and the arming detonator (5) in its holder (6) are kept apart by the striker spring (3). Below this is a cup shaped arming pellet holder (7), containing a pressed gunpowder pellet. This holder (7) rests on a copper sealing ring (10). This ring (10) prevents the escape of any flash or gas down to the graze mechanism of the fuze. Fitting inside the arming pellet holder (7) is the arming unit (8). This is a flanged disc having a short stud bearing against the pressed G.P. pellet and two long studs which, in the safe position, act as stops to prevent the graze pellet (16) moving on to the striker needle (11A) on any accidental jolt etc. when the safety fork (12A) is removed. The arming unit (8) owing to its short stud bearing against the pressed G.P. pellet keeps the arming spring (9) in compression while the fuze is in the safe condition.

(ii) Graze Mechanism.

This comprises a creep spring (13) held under slight compression between the striker needle holder (11) and the graze pellet (16). The general design of this graze pellet will be clear from the drawing at Plate H.

(iii) Gaine.

The gaine (21) follows general Japanese practice and is screwed into the base of the fuze body on to a lead washer (18) to hold the graze pellet (16) in position.

Safety Devices.

28. The following safety devices are incorporated :-

(i) A safety fork (1A) passing through the closing cap (1) and engaging in the annular groove round the striker needle holder (2), thus preventing any movement during handling and transport of the latter.

(ii) Another safety fork (12A) passing through the body above the graze pellet (16) thus preventing any movement in the direction of the striker (11A).

(iii) A steel striker spring (3) which, when the safety fork (1A) is removed, holds the striker (2) away from the arming detonator (5). This prevents accidential firing owing to any light jolt etc. during final assembly and to some extent also ensures positive functioning on shock of discharge.

(iv) Arming unit (8) which by reason of its two long studs prevents movement of the graze pellet (16) on to the striker owing to any accidental jolt etc. during final assembly. This arming unit (8) also forms a slow arming device which renders the fuze safe against any check etc. of the bomb during discharge until it is well clear of the mortar and mortar crew. It has not been possible yet to establish the actual time of delay provided by the pressed gunpowder pellet. It is considered to be roughly of the order of 0.05 second. A method of measuring this delay is being considered and a supplement to this Report will be issued if the delay can be determined definitely.

(v) A creep spring (13) which prevents forward creep of the graze pellet (16) during the flight of the bomb.

Action.

29. Before fuzing, the safety fork (12A) is removed from both fuzes. The safety fork (1A) of the fuze intended for the body is removed just before fitting the head on the body. The safety fork (1A) of the fuze in the head is removed just prior to firing.

30. The fuze is armed during flight as follows. On shock of discharge, the striker needle holder (2) sets back; the needle piercing the detonator (5) and the flash igniting the G.P. pellet in its holder (7) which commences to burn from the top. The gases from this burning pellet pass via slots in the base of the detonator holder (6) and out to the atmosphere through the pressure release holes in the closing cap (1). The tin foil discs covering these holes are blown out as soon as sufficient pressure is generated. The G.P. pellet continues to burn until such time as that portion of the pellet which is bearing against the short stud in the arming unit (8) is sufficiently weakened for the arming spring (9) to force the arming unit (8) upwards, thus withdrawing the two long studs through the striker needle holder (11) to uncover the striker needle (11A). The time which elapses between the shock of discharge and the moment when the long studs are withdrawn to arm the fuze is not yet known. It is, of course, dependent on the rate of burning of the gunpowder pellet, see para 28 (iv) above. Both the fuzes in the bomb are now armed and the graze pellet (16) is held off the striker needle (11) only by the creep spring (13). On impact, or on any appreciable check to the bomb, the graze pellet sets forward to fire the fuzes.

31. The presence of two fuzes in this bomb has decided advantages:-

(a) The chances against fuze failure are two to one.

(b) By having simultaneous head and body initiation a high standard of detonation is ensured. It is thought, however, owing to the main filling of picric acid and the powerful exploder system used that even with one fuze the rate of detonation should be good.

Marking.

32. The fuze is lacquered externally with a transparent varnish and a paper label is pasted on the body as shown in Plate G. The characters on this label have not been translated but appear to refer to instructions for fuzing. The stamped markings on the flange of the body indicate the date of manufacture and are followed by the Osaka Arsenal inspection mark - see Plate H.

ASSEMBLY AND LOADING.

33. In the absence of any lifting equipment on the mortar site, it is reasonable to assume that the sequence of assembly and loading of the bomb is probably as follows:-

(a) The tail unit (17) by means of its transit clamp is placed on the spigot after removing the transit cover protecting the threads. The tail unit is located on the spigot by diametrically opposite slots at the base of the tail, fitting in two corresponding studs on the mortar spigot. This method of fitting has probably two functions. Firstly, it helps to prevent rotation of the tail when screwing on the body (12) and head (4). Secondly, the screwed hole for the igniter holder (13) can be positioned towards the rear in a suitable firing position.

(b) The obturation chamber (16) is inserted in the tail unit so that its shoulder rests on the lip of the cavity in the mortar spigot. The propellant container is then placed in position and rotated to cause the screwed spigot of the primer adapter to mate with the corresponding threaded recess in the cavity of the mortar spigot, thus securing the propellant container and obturation chamber firmly to the mortar spigot. To facilitate screwing, the primer adapter has four machined flats to accommodate a box type spanner. It is assumed that the propellant charge is now loaded according to the range required and the cover (15A) fitted in position. Alternatively, the propellant container, complete with charge and cover, could be fitted and screwed up by hand, but the use of a spanner would not then be possible. It is also assumed that the igniter holder with extension (13) is now screwed in position into the tail unit (17). This can be done at any time but it would be more convenient at this stage.

(c) The body, after removal of the thread protecting transit covers, is screwed into position by means of the transit clamp. The body-fuze, after removal of safety fork (12A) is then screwed home. The safety form (1A) is then removed, just before head is assembled.

(d) The head, after removal of the thread protecting transit covers, is then screwed in position by means of its transit clamp. The head fuze, after removal of the lower safety fork (12A), is then screwed home. This fitting of the fuze may, of course, be done before the head is assembled.

(e) All transit clamps are now removed and the igniter (friction or electric) inserted in the igniter holder (13). The bomb is now ready for firing except for removal of safety fork (1A) from head fuze, and most probably firing is done at a safe distance from behind cover.

34. On firing, the flash from the igniter passes via the extension in the igniter holder (13) through the flash holes to the primer filling and down to the base and again through flash holes out, to the gunpowder igniter ring in the 500 gm. charge increment. The propellant gases generated bear on the base of the bomb propelling it forward (when sufficient pressure is generated) and at the same time expand the obturation chamber until the flange at the mouth fits tightly against the parallel walls of the tail unit, thus preventing any appreciable escape of the gas to the rear. The lip of the mouth of the obturation chamber as explained in para 16 is flanged to facilitate its expansion outwards to seal the gases.

PACKING AND METHOD OF TRANSPORT.

35. The bomb, for purposes of transport, is divided into three components. There is a painted character on each clamp indicating for what portion of the bomb it is intended. The clamps are not interchangeable. The ignition and propellant components are packed separately in a transport box. The method of packing is shown clearly in Plate A.

36. Considerable care has been taken in the design of the propellant transport box which is made of well seasoned white wood lined internally throughout with zinc sheet. A felt seating is formed in the mouth of the box into which a raised rib on the lid is seated to render the box waterproof. Details of this box and the items packed in it are shown clearly in Plate F.

A label on the underside of the lid gives full details of component types and dates of manufacture - see Plate F.

METALLURGICAL ANALYSIS.

37. There is nothing to add to the details given in the drawings.

CHEMICAL ANALYSIS.

(Chief Inspector of Military Explosives, Kirkee).

38. Explosive Charge - Head (4)

Main filling -		Picric acid ..	79.5%
		Dinitronaphthalene	20.5%
Exploder -			
Top perforated pellet	-	R.D.X. ..	97.8%
		Wax ..	2.2%
Bottom pellet	-	R.D.X. ..	97.1%
		Wax ..	2.9%

39. Explosive Charge - Body (12)

Main filling -		Picric acid ..	78.0%
		Dinitronaphthalene	22.0%
Exploder -			
Top perforated pellet	-	R.D.X. ..	97.7%
		Wax ..	2.3%
Bottom pellet	-	R.D.X. ..	98.1%
		Wax ..	1.9%

All exploder pellets are coated with graphite.

40. Propellant Charge.

Graphited N.C. tubular black cards 0.14-in. to 0.245-in. long, 0.1-in. diameter having a perforation diameter of 0.024-in. Composition N.C., volatile matter, and graphite 61.0%, N.G. 36.0%, Diphenylamine 3.0%.

Gunpowder bag igniter in the 500 gm. charge increment -

G.P.size G.20 consisting of:-	Sulphur ..	9.2%
	Potassium nitrate	74.8%
	Charcoal ..	16.0%

41. Filling in Primer (14)

Mealed G.P. consisting of:-

Sulphur	..	9.0%
Potassium nitrate		74.4%
Charcoal	..	16.6%

42. Filling in Primer Adapter (at base of primer).

G.P.size G.20 consisting of:-

Sulphur	..	14.3%
Potassium nitrate		69.3%
Charcoal	..	16.4%

43. Filling in Primer Extension (13)

Tubular G.P. pellets 0.39-in. long, 0.156-in. diameter having a perforation of dia.0.05-in.

Consists of :-

Sulphur	..	9.2%
Potassium nitrate		75.4%
Charcoal	..	15.4%

44. Friction Igniter (20)

Friction composition - sulphur, potassium chlorate and antimony sulphide. Main filling- gunpowder G.20. Quantity in both cases was not sufficient for quantitative estimation.

45. Electric Igniter (21)

(i) Filling round the bridge, inside the plastic plug.	..	Potassium chlorate and a lead salt of some organic composition.
(ii) Main filling	..	G.20 gunpowder.
(iii) Sealing composition, closing mouth of igniter, round the leads.	..	Resinous matter with a low m.p.

46. Fuze, Percussion, Graze, H.E.

(i) Arming detonator (5)	..	Consists of two layers:- A top layer of Mercury fulminate, Potassium chlorate, and Antimony sulphide, below which is mealed gunpowder.
(ii) Arming pellet	..	Pressed mealed G.P.
(iii) Main detonator (15)	..	0.8 grs. of:- Mercury fulminate, Potassium chlorate and Antimony sulphide.
(iv) Gaine.(21)	..	Lead azide pellet, pressed into the main filling of:- R.D.X. .. 95.5% Wax .. 0.5%

APPRECIATION.
(Economic, development and manufacture aspects)

47. This generally is a cumbersome weapon and the design is open to considerable criticism. It is most unlikely that it can be an efficient weapon. Nevertheless, great care has been taken in its manufacture and the standard of workmanship employed throughout is excellent. It would seem that no expense has been spared to produce the best possible materials and finish. It is thought that this is probably an original design evolved in Japan, no other comparable weapon is known.

48. Trials are being staged shortly to obtain information regarding its functioning and standard of fragmentation. The results of these trails will be included in a supplementary Report in due course.

SUMMARY OF DATA.

49. Complete Round.

Overall length	... 62.25-ins.fuzed. 62.0-ins.plugged.
Maximum diameter of body.	... 12.6 -ins.
Total weight filled (without transit clamps)	...738 - lbs.
Total explosive charge	...101 - lbs.

50. Head and Body (Plugged) (4)

	Head.	Body.
Overall length	... 15.0-ins.	13.2-ins.
Maximum diameter	... 12.6-ins.	12.6-ins.
Weight filled (without transit clamp).	...17[illegible].5 lbs.	208.5 lbs.
Weight of transit clamp	... 9 lbs.	9 lbs.
Explosive charge, Nature and Weight	... 56 lbs	45 lbs.
	Picric acid and dinitronaphthalene.	

Exploder container (with adapter) (3)
(identical for head and body).

Length	... 4.52-ins.
Diameter	..(2.36-ins. (over flange) (1.51-ins. (over body)
Filling, Nature and weight	.. 1.4 -ozs.; R.D.X. and Wax in paper container.
Fuze hole	35 -mm.

51. Tail Unit (17).

Overall length	.. 36.5 -ins.
Maximum diameter	.. 12.6 -ins.(over cylindrical portion).
Dimensions over tail fins	.. 18-ins. square.
Weight without transit clamp.	..345 lbs.
Weight of transit clamp.	.. 9 lbs.

52. Propellant Assembly.

Complete weight, (Obturation chamber, propellant container with charge and primer)	.. 13 lbs.

Propellant Assembly (Contd.)

Obturation Chamber (16)

Length	8-ins.
Maximum external diameter. ...	10.15-ins.
Weight	7-lbs. 5½-ozs.

Propellant Container (15)

Height	5.4-ins. (max.).
Diameter	7.25-ins.
Weight	5-lbs. 10-ozs.
Details of propellant charge. ...	Graphited N.C./N.G. tubular cords. (See para. 20 of text for number of increments, charge weight etc.).

Gunpowder bag igniter.

Weight and size.	198.2 grs. G.20.

Primer (14)

Length	7.72-ins.
Diameter at to	0.4 -ins.
Diameter at base over threads. ...	0.68-ins.
Weight filled	3.8 -ozs.
Magazine filling and weight. ...	Mealed G.P. 43.7-grs.
At the base of primer (in primer adapter).... ...	G.P., G.20 41.25-grs.

53. Igniter holder with extension (13)

Length	6.48-ins.
Diameter of body.	0.469-ins.
Diameter over flange	1.15-ins.
Weight	4.62-ozs.
Length of extension	2.98-ins.
Diameter of extension	0.314-ins.
Weight of extension	355.57-grs.
Filling in extension	Perforated G.P. pellet, 18.21-grs. 0.39" X 0.156" dia.; Perforation dia. 0.05".

54. Friction Igniter (20)

Length	2.17-ins. body, and 5.62-ins. with friction wire loop.
Diameter	0.25-ins.
Friction composition	2.93-grs.
Filling	G.P. G.20, 8.02-grs.

55. Electric Igniter (21)

Length	2.17-ins.
Diameter	0.25-ins.
Electric bridge..	0.92-ohms. resistance; fuzing current of 0.9 amp.
Filling	G.P., G.20, 8.18-grs.

56. Fuze.

Type	...	... Percussion Graze H.E.
Length	...	... 3.9-ins.
Weight (filled).	...	... 13.9-ozs.
Gaine filling.	...	... R.D.X./ Wax 31-grs.: Lead azide pellet 18.4-grs.

Details for Transport.

57.

Components.	Stowage Dimensions.	Weight.
Head with clamp and thread cover.	18.5" X 15.0" X 15.0"	186 lbs.
Body with clamp and thread covers.	18.5" X 14.0" X 14.0"	220 lbs.
Tail Unit with clamp and thread cover.	18.5" X 18.0" X 37.0"	355 lbs.
Propellant container box.	12" X 12" X 10.5"	30 lbs.
Total.	-	785 lbs.

CHIEF INSPECTORATE OF AMMUNITION,
INDIA, KIRKEE.

SECOND ISSUE,
APRIL 1945 .

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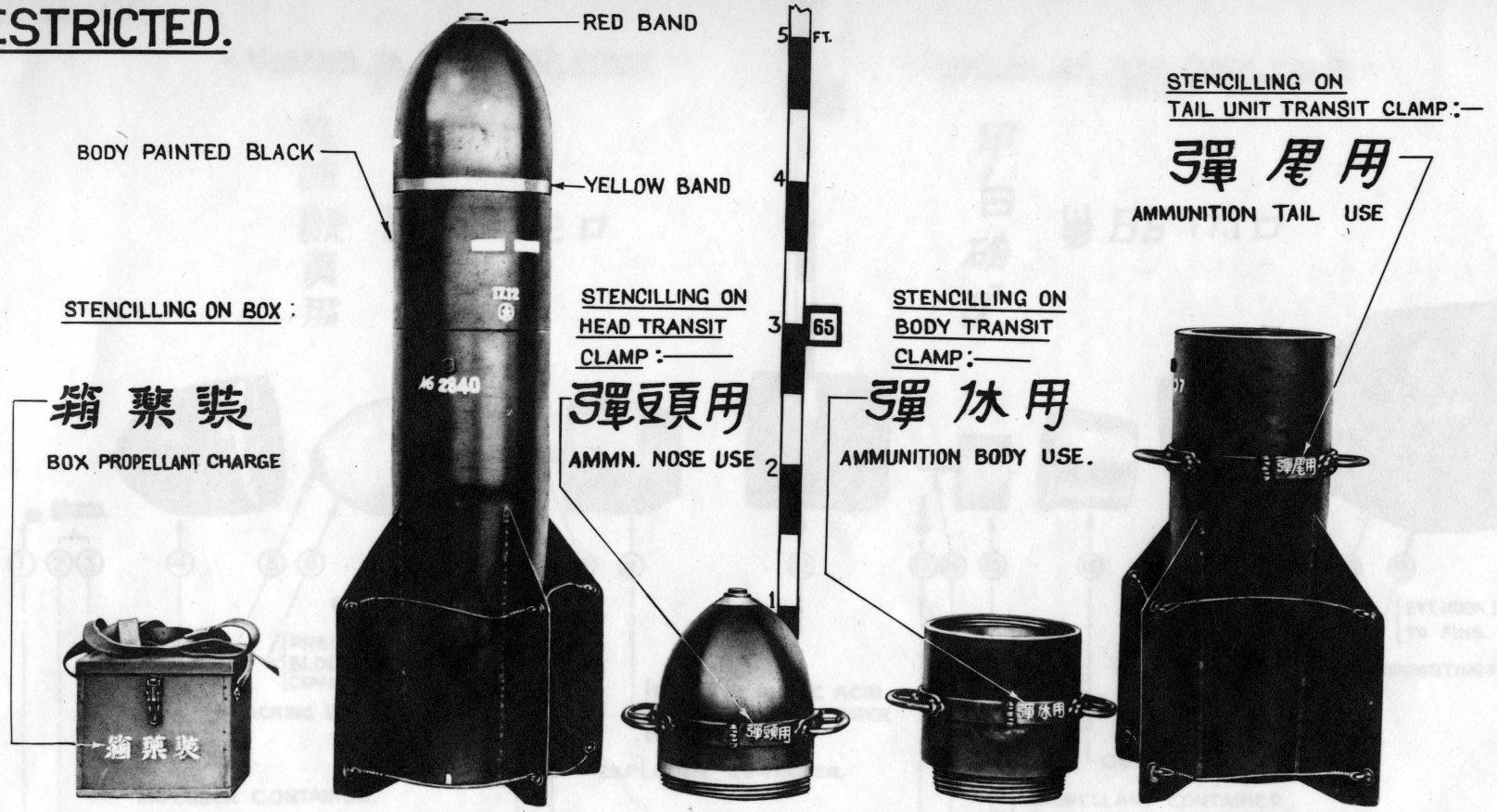

PROPELLANT TRANSPORT BOX.
FOR PACKING & TRANSPORT OF (I) PROPELLANT (II) FUZES (III) PRIMERS & PRIMER EXTENSION & (IV) ELECTRIC & FRICTION IGNITERS.

BOMB COMPLETE
PLUGGED, WITHOUT TRANSIT CLAMPS.

(4) HEAD
WITH TRANSIT CLAMPS.
(ALUMINIUM TRANSIT COVERS FOR PROTECTING THREADS NOT SHOWN.)

(12) BODY
WITH TRANSIT CLAMPS.

(17) TAIL UNIT
WITH TRANSIT CLAMPS.

JAPANESE 320 MM. H.E. SPIGOT MORTAR BOMB (335 kg.)

BOMB ASSEMBLED AND SEPARATE COMPONENTS DURING TRANSPORT.

PLATE A

C.I.AMM-S/1046
KIRKEE. APRIL '45

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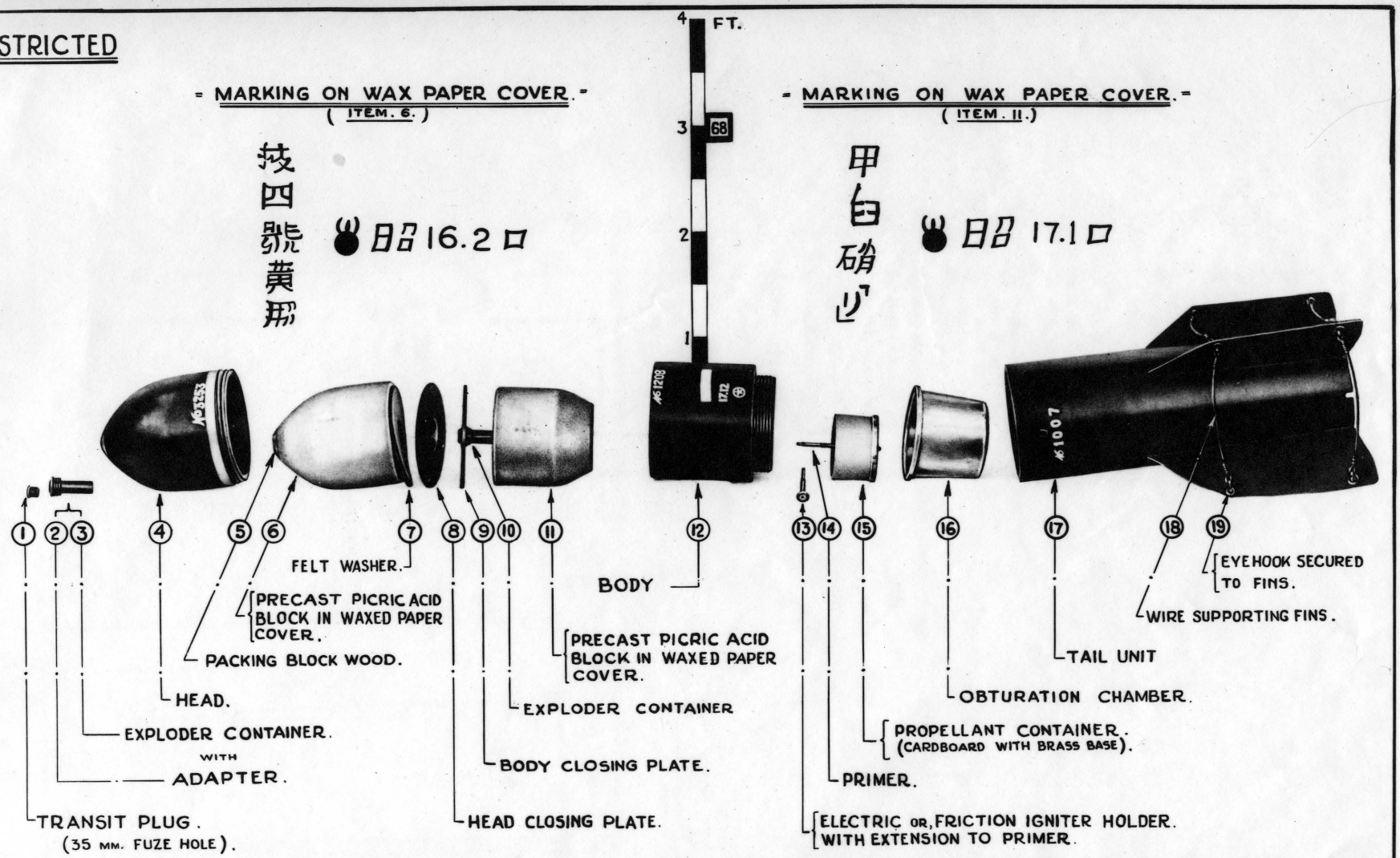

JAPANESE 320 MM., H.E., SPIGOT MORTAR BOMB (335 Kg.)

ASSEMBLY SEQUENCE OF COMPONENTS

C.I.AMM. S/1045.
KIRKEE, APRIL, 1945.

PLATE B

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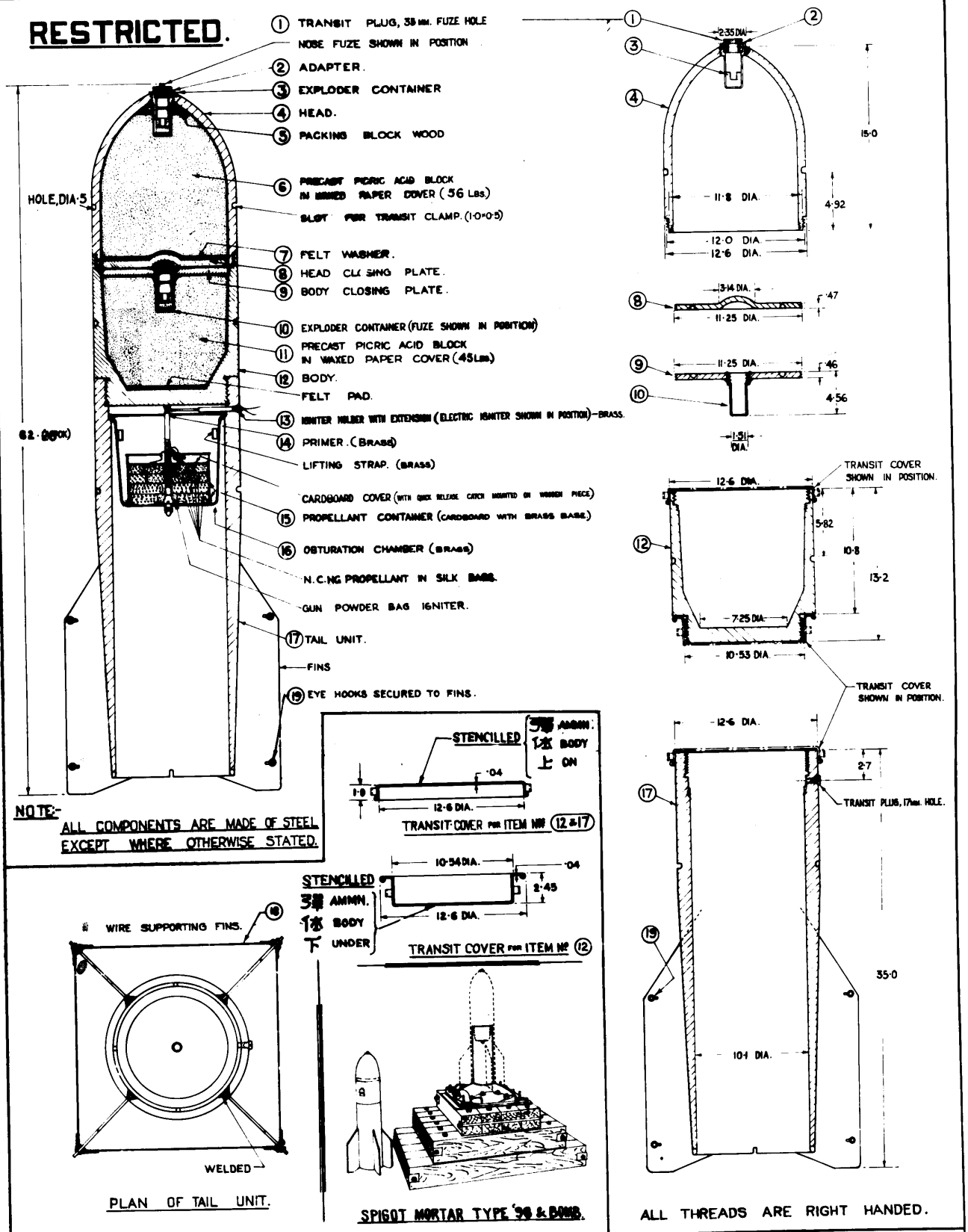


NOTE:- ALL COMPONENTS ARE MADE OF STEEL EXCEPT WHERE OTHERWISE STATED.

JAPANESE 320 MM, H.E, SPIGOT MORTAR BOMB. (335 Kg.)

GENERAL ASSEMBLY & ASSEMBLY SEQUENCE

DIMENSIONS IN INCHES.

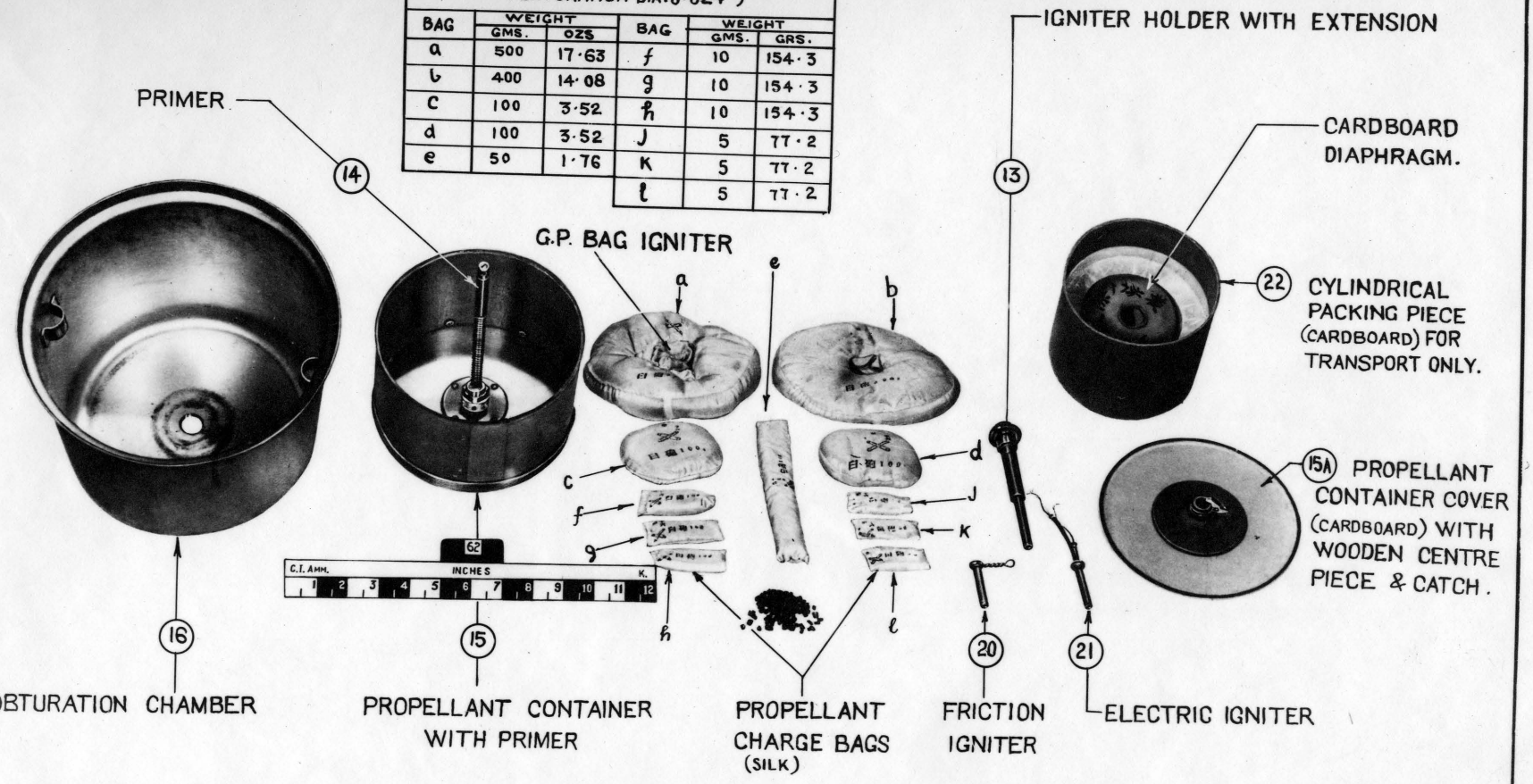
C.I. AMM. S/1056
KIRKEE, APRIL. 45.

RESTRICTED.

PROPELLANT INCREMENTS

GRAPHITED N.C. TUBULAR CORDS
(LENGTH = 0·14" TO 0·245" EXT. DIA. = 0·1"
PER FORATION DIA. 0·024")

BAG	WEIGHT GMS.	WEIGHT OZS	BAG	WEIGHT GMS.	WEIGHT GRS.
a	500	17·63	f	10	154·3
b	400	14·08	g	10	154·3
c	100	3·52	h	10	154·3
d	100	3·52	J	5	77·2
e	50	1·76	K	5	77·2
			l	5	77·2



JAPANESE 320 MM. H.E. SPIGOT MORTAR BOMB (335 KG)

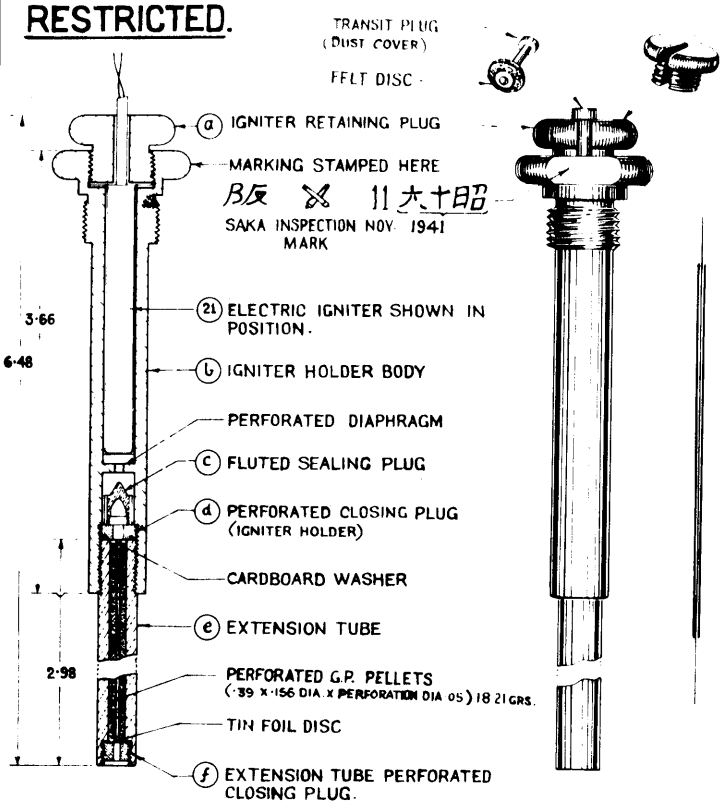
PROPELLANT CHARGES, OBTURATION & IGNITER SYSTEM.

GENERAL APPEARANCE OF COMPONENTS.

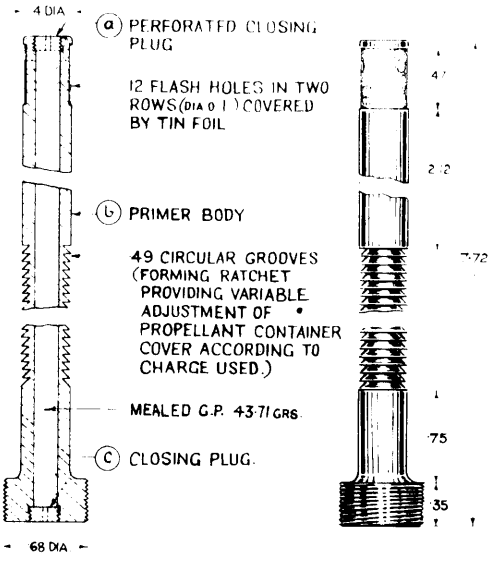
PLATE I

C.I.AMM.S/1061
KIRKEE. APRIL '45

RESTRICTED.



(13) IGNITER HOLDER WITH EXTENSION

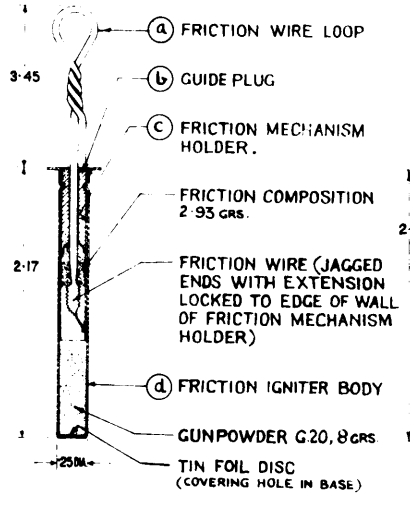


(14) PRIMER

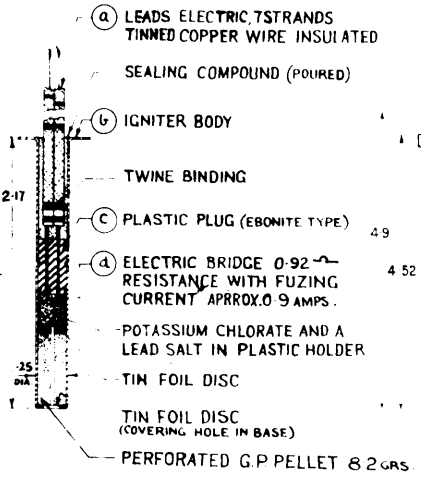
GENERAL NOTES

(I) ALL COMPONENTS ARE MADE OF BRASS EXCEPT WHERE OTHERWISE STATED.

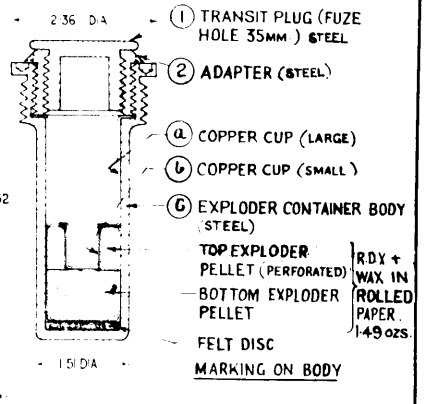
(II) ALL THREADS ARE RIGHT HANDED.



(20) FRICTION IGNITER (TYPE '96)



(21) ELECTRIC IGNITER (TYPE '96)



(3) EXPLODER CONTAINER (TYPICAL FOR HEAD AND BODY OF BOMB)

JAPANESE 320 MM. H.E. SPIGOT MORTAR BOMB (335 KG).

DETAILS OF :—

(I) IGNITER HOLDER (WITH EXTENSION),
(II) PRIMER, (III) FRICTION IGNITER,
(IV) ELECTRIC IGNITER, (V) EXPLODER CONTAINER.

DIMENSIONS IN INCHES

C.I.A.M.M. S/1057
KIRKEE APRIL 45

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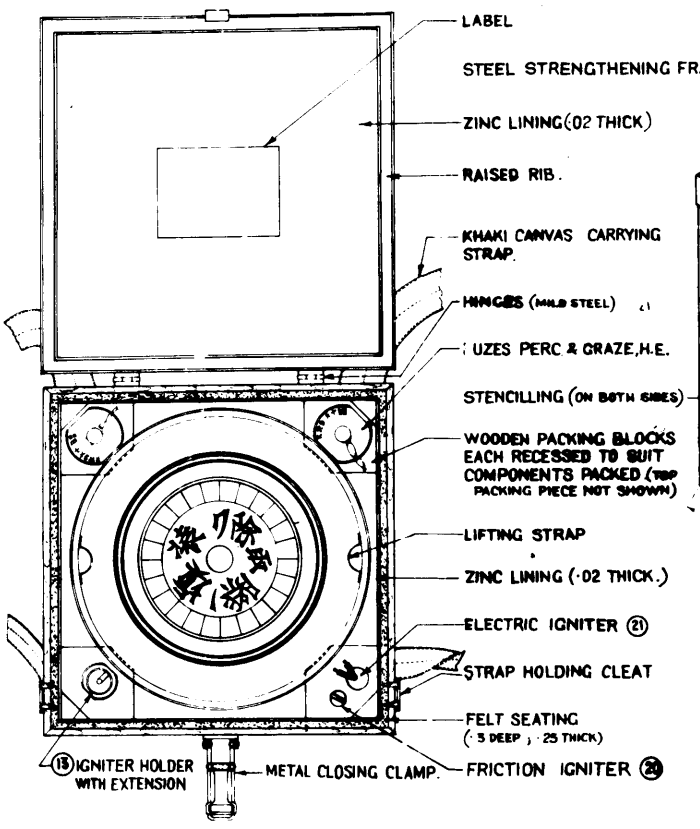
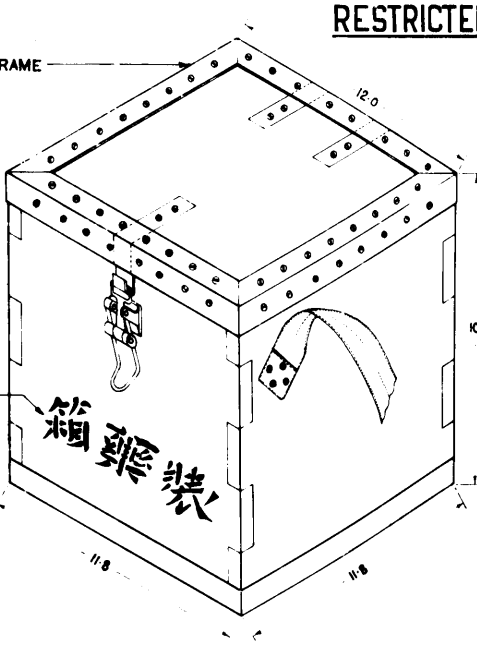
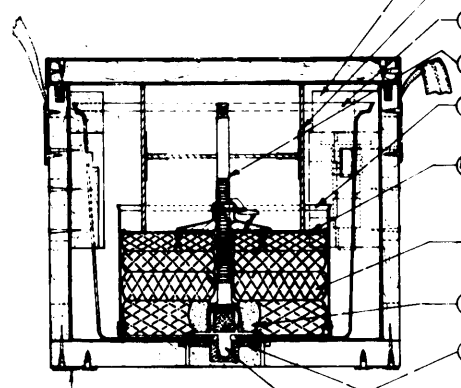


— PLAN —

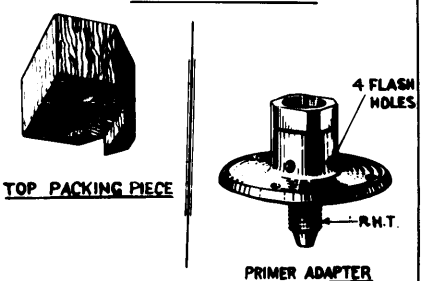


BOX MADE OF WHITE WOOD PAINTED DRAB-KHAKI EXTERNALLY
(SIDES · 5/8, TOP & BOTTOM - 3/4)



— SECTIONAL ELEVATION —

ENLARGED DETAILS



JAPANESE CHARACTERS ON PAPER LABEL ON UNDERSIDE OF LID :—

名称九八式曰砲装薬包
收容數 個
装薬九番管状薬(昭17 10号96号)
点火薬小粒薬(昭17 5号275号)
九六式摩擦門管(昭15 9表)
九六式電氣門管(昭15 9表)
昭和18年3月調製
大阪陸軍兵器本廠粕廠.

JAPANESE 320 MM. H.E., SPIGOT MORTAR BOMB (335K9)

PROPELLANT-TRANSPORT BOX.

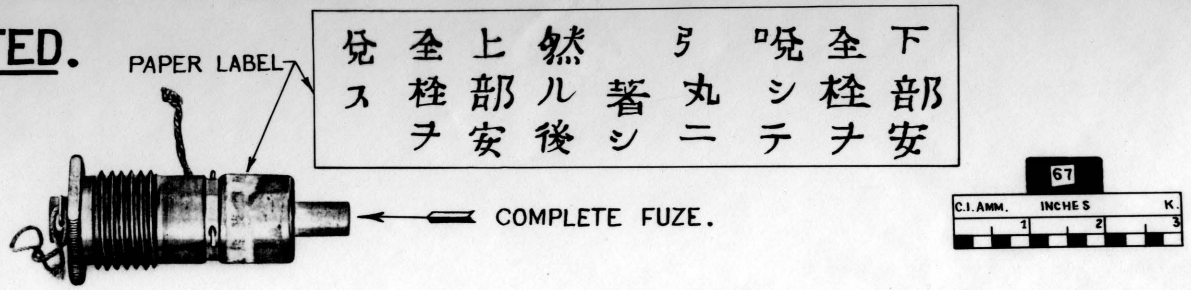
HOLDING :—

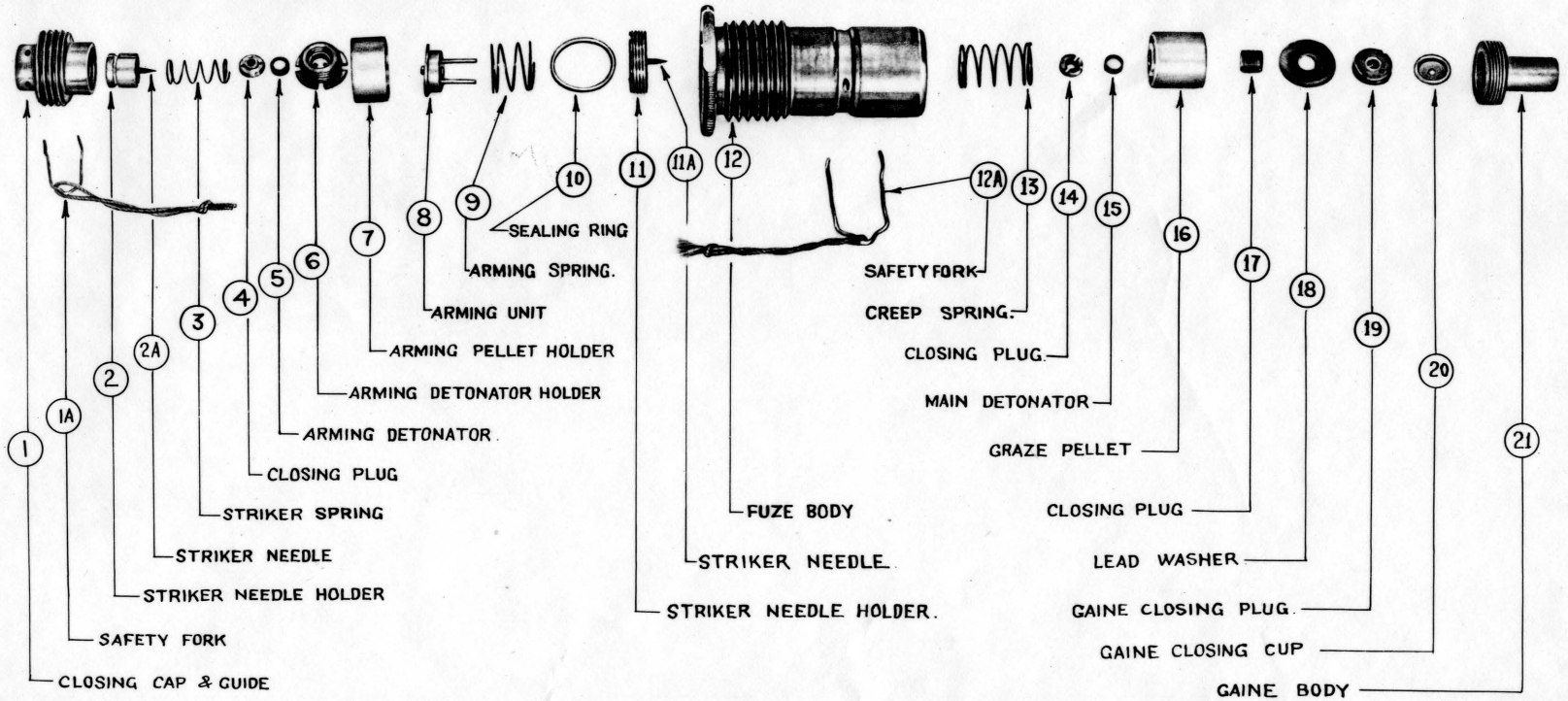
(a) PROPELLANT CHARGES WITH PRIMER, CONTAINER & OBTURATION CHAMBER
(b) TWO FUZES PERC.& GRAZE, H.E.
(c) ONE EACH ELECTRIC & FRICTION IGNITER.
(d) ONE IGNITER HOLDER WITH EXTENSION

DIMENSIONS IN INCHES

C.I.A.M.M. 6/1058
KIRKEE. APRIL '46

RESTRICTED.





FUZE, PERC. & GRAZE, H.E.

FOR

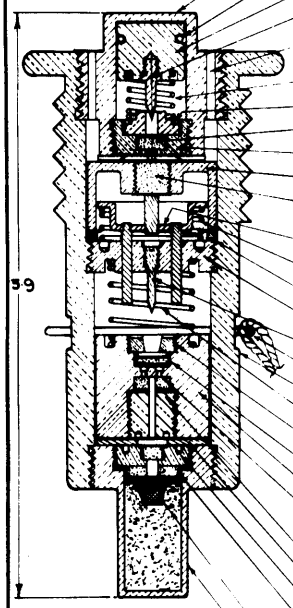
JAPANESE 320 MM. H.E. SPIGOT MORTAR BOMB (335 KG.)

ASSEMBLY SEQUENCE OF COMPONENTS.

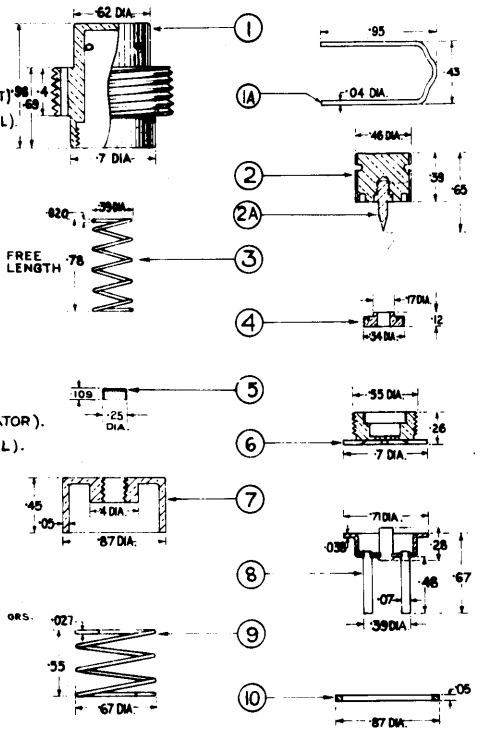
C.I.AMM.S/1043
KIRKEE APRIL '45

PLATE G

RESTRICTED.

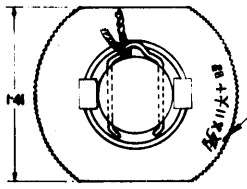


1. CLOSING CAP & GUIDE (FOR INERTIA PELLET).
1A. SAFETY FORK (INERTIA PELLET)
2. STRIKER NEEDLE HOLDER. (INERTIA PELLET)
2A. STRIKER NEEDLE (ARMING DETONATOR)(STEEL).
— PRESSURE RELEASE HOLES COVERED BY TIN FOIL DISCS.
3. STRIKER SPRING (STEEL).
4. CLOSING PLUG (ARMING DETONATOR)
5. ARMING DETONATOR.
6. ARMING DETONATOR HOLDER
7. ARMING PELLET HOLDER
— ARMING PELLET G.P. 2·38 GRS. COVERED BY TIN FOIL DISCS, TOP & BOTTOM
8. ARMING UNIT (LIGHT ALLOY)
9. ARMING SPRING (STEEL)
10. SEALING RING (COPPER).
11. STRIKER NEEDLE HOLDER (MAIN DETONATOR).
11A. STRIKER NEEDLE (MAIN DETONATOR) (STEEL).
12A. SAFETY FORK (GRAZE PELLET).
12. FUZE BODY.
13. CREEP SPRING (STEEL).
14. CLOSING PLUG (MAIN DETONATOR).
15. MAIN DETONATOR.
16. GRAZE PELLET (NICKEL PLATED BRASS).
— PERFORATED BOOSTER PELLET (G.P. 2 GRS. WITH FELT WASHER UNDERNEATH).
17. CLOSING PLUG
18. LEAD WASHER.
19. GAINE CLOSING PLUG. (FILLED 1·23 GRS.).
20. GAINE CLOSING CUP (COPPER) FILLED G.P. 2·9 GRS.
— LEAD AZIDE PELLET 3·4 GRS.
21. GAINE BODY. (FILLED R.D.X. + WAX 31 GRS.).

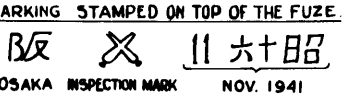


NOTE :— FUZE MADE OF BRASS EXCEPT WHERE OTHERWISE STATED.

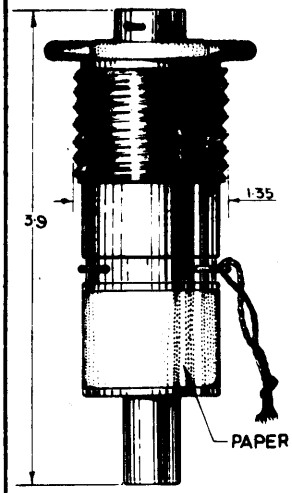
ALL THREADS ARE RIGHT HANDED THREADS.

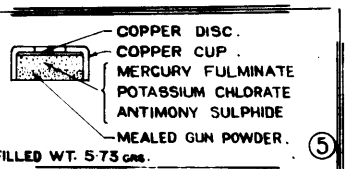


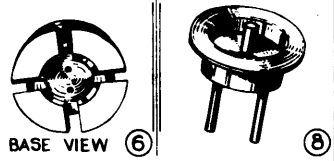
MARKING STAMPED ON TOP OF THE FUZE.



OSAKA INSPECTION MARK NOV. 1941







ENLARGED DETAILS

FUZE, PERC. & GRAZE, H.E.

FOR

JAPANESE 320 MM. H.E., SPIGOT MORTAR BOMB (335 KG)

GENERAL ASSEMBLY & COMPONENT DETAILS.

DIMENSIONS IN INCHES.

C.I. AMM. S/1059
KIRKEE. APRIL '45