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JAPANESE AMMUNITION

C.I.AMN. TECHNICAL REPORT

No. 53

MORTAR BOMBS

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C.I.A.M.N. TECHNICAL REPORTS

REPORT NO. 53

FEBRUARY 1946

MORTAR BOMBS

G E N E R A L

As a result of examination of a large number of mortar bombs of different calibres, used by the Japanese, it is now possible to prepare a combined Technical Report describing these bombs.

2. Before dealing with the bombs in detail it will be useful to make a few brief remarks, as far as information is available, on the mortar equipment.
3. It will be seen from a study of Type numbers, which indicate the year of introduction that mortars have been introduced into the Japanese Army only comparatively recently. Possibly for this reason, mortars do not form part of the normal equipment of an infantry battalion but are handled by special mortar battalions, which are attached to the infantry divisions. It has also been reported that certain artillery units are equipped with large calibre mortars but there is no evidence of any ammunition for these weapons.
4. So far, from the information available here, the following mortars are known to exist :-
 - (a) 81-mm. Mortar :- Although three mortars exist in this calibre, only the Type '97 & Type '99 are used extensively in the Japanese Army; the Type 3 mortar reported to be used for A.A. fire, is primarily a naval weapon, adapted for land service.
 - (b) 90-mm. Mortar :- Two mortars are known, the Type '94 and Type '97. Both are commonly used in the Japanese Army.
 - (c) 12-cm. Mortar (Experimental) :- This mortar has been reported as being the chief C.W. weapon; but it fires both H.E. and C.W. projectiles. Only the H.E. round has been received here.
 - (d) 150-mm. Mortar :- Although seven mortars exist in this calibre, the only ones known to be commonly used are Type '93 and Type '97.
 - (e) 12.5-cm., 23-cm. & 28-cm., Artillery Mortars :- Though they have been reported, there is no definite evidence of their existence.
 - (f) 20-cm. Mortar :- This mortar is said to be copy of a Russian Model and is also reported to have been used by the Japanese.

In addition to these, a number of less orthodox weapons, such as the 70-mm. and 80-mm. Barrage Mortars and the 10.5-cm. and 32-cm. Spigot Mortars are also used.

The 50-mm. Type '98 Mortar, already described in Technical Report No. 33, as a Discharger, is now regarded as a Mortar and should be referred to as such.

A mortar of Chinese origin of 82-mm. calibre is also believed to be used by the Japanese, as ammunition for this equipment has been received and examined.

5. This Report deals with 81-mm., 90-mm., 120-mm. and 150-mm. H.E. mortar bombs - which have been examined at Kirkee; for quick reference and to give an idea of the appearance and comparative sizes, a photograph of some of these bombs is included at Plate A.

D E S C R I P T I O N

6. Before describing the bombs, it will be useful to describe the fuzes used, as most of the fuzes are used in two or more calibres.

FUZE, PERCUSSION, GRAZE (WITH OPTIONAL DELAY), TYPE '93.

7. This fuze is used in 90-mm. and 150-mm. H.E. bombs having a 24-mm. fuze hole and is suitably exploded in 81-mm. H.E. bomb. The details of construction of this fuze are given in Plate B while its general appearance is shown at Plate E. The fuze consists of :-

- (a) The brass body, upper half (8) which houses the detonator and striker assembly which is enclosed in a light alloy housing (7). The space below the detonator and striker assembly is closed by a hollow screwed brass plug which acts as a flash guide (9) when the delay plug is fitted.
- (b) The body, lower half (10) which is of brass houses the optional delay plug, when fitted. The body is screw-threaded externally (L.H.T.) to screw into the bomb. It is also screw-threaded internally (L.H.T.) at its lower end to take the gaine body (13). At its upper end it is internally threaded (R.H.T.) to take upper half of the body. The detonator is of the normal type consisting of a copper shell containing about 2 grains of a detonating composition of mercury fulminate, potassium chlorate and antimony sulphide.
- (c) The gaine body (13) which is made of brass, contains at its lower end a copper container having a pellet of C.E. on top of which is a pressing of fulminate of mercury. Above this is an inverted copper closing cup (11) acting as a distance piece. Felt pads are used to cushion the copper container in the gaine body.

8. Safety Devices :-

- (a) The small sliding piece in the detonator housing prevents the detonator from moving forward on to the striker, as its projecting legs fit under the diaphragm in the upper half of the fuze body.
- (b) The copper shear wire (2) prevents the complete housing from moving and so freeing the sliding piece.
- (c) The creep spring (4) keeps the detonator off the striker during flight.

9. Action :- The fuze may be used either with slight delay or without. If slight delay is required, the head portion of the fuze is unscrewed and the delay plug inserted on top of a lead washer and the head portion screwed back.

On firing the complete detonator and light alloy housing (7) sets back about 1/4-in., shearing the shear wire (2) on which they were suspended. This leaves the detonator (6) together with the small sliding piece (5) free to move forward on graze (any slight check). During flight the complete housing is kept back by air pressure on the nose of the bomb, while the detonator is kept off the striker by the light creep spring (4). This enables greater certainty of functioning on impact or graze. On impact or graze the detonator sets forward, overcoming the light creep spring, to initiate the bomb.

If the set-back force is insufficient to cause the shear wire to shear, such as might happen with a low charge or for other reasons, this wire will shear in any case on impact. The assembly housing will be forced inwards freeing the sliding piece and allowing the detonator to set forward on to the striker.

The fuze is therefore extremely quick acting for anti-personnel use but must be fitted with the delay plug for use against light earth works, etc. where a slight delay is required.

FUZE, PERCUSSION, GRAZE (WITH OPTIONAL DELAY) TYPE 100.

10. This fuze is used in 81-mm. and 120-mm. H.E. bombs. The details of this fuze can be seen in Plate C and its general assembly at Plate E. The fuze consists essentially of :-

- (a) The body, upper half (8) which contains the light alloy housing (7), striker (3) and detonator (6).
- (b) The body, lower half (12) which contains the delay mechanism (11).
- (c) The gaine (15).
- (d) The fuze cover.

It will be seen from the Plates that this fuze is generally very similar to the Type '93 fuze described above. The chief difference lies in the method adopted to achieve a delay. In this case the delay mechanism takes the form of a cylindrical selector (11). This has a hole drilled through it and a half through channel drilled at right angles to the first, thus forming a 'T' channel when viewed in cross section. The head of the 'T' is unfilled and forms a flash channel; the other channel is filled with .3 grains of gunpowder. For instantaneous action the unfilled channel is vertical and the flash passes directly downwards (as shown at Plate C); for slight delay the selector is turned through 90°, so that the flash channel is horizontal and the gunpowder channel vertical. The flash now enters the selector through the sides and has to pass through the gunpowder delay. The delay is set by turning the screw-driver slot in the head of the selector which is covered by tinfoil. A stop screw in the side of the body engages in a groove in the selector so that movement through only 90° is permitted.

The fuze cover takes the form of a thin envelope of aluminium alloy which fits over the fuze and with the aid of waterproofing composition forms a waterproof seal between the base of the cover and the body of the fuze. There are two keyholes in the cover which fit opposite the keyholes of the fuze. A thin

brass wire fits in a groove formed at the base of the fuze body, and the end is completed in the form of a ring. This facilitates the removal of the cover. The cover is intended to render the fuze waterproof and to ensure that the duralumin cup at the nose of the fuze is not damaged during transport. A steel stud fits in a small hole in the base of the cover and this prevents the cover from undue rotation due to rough handling.

11. Safety Devices :- This fuze employs the same safety devices as in the Type '93 fuze.

12. Action :- The action of this fuze is similar to that of the Type '93 fuze explained in para. 9. If delay is required, the selector is turned through 90° so that the flash passes through the delay channel in the selector.

FUZE, TIME & PERCUSSION, TYPE 3 (FOR MORTAR BOMB).

13. This fuze is used in 81-mm. H.E. bomb, Type 3 (Naval). According to information available here, the fuze is a combination air burst and a percussion fuze with a pyrotechnic arming device and is of entirely new design. Constructional details are shown at Plate D. Samples of this fuze have not been received and the information is given for the sake of completeness.

The time ring in this fuze fits between the upper and lower fuze bodies and is filled with 55 grains of a composition of lead chromate, barium peroxide, barium carbonate, etc.

14. Safety Devices :-

(a) Safety Clip - This prevents the percussion striker from moving on to the detonator during handling and transport. In later types of fuzes this clip is probably replaced by a safety strip secured to the body by a grub screw which may also pass through the time striker.

(b) Pyrotechnic Arming Collar - This keeps the striker off the detonator after the safety clip has been removed. It burns for 2 seconds, thus allowing the projectile to travel 200-450 yards before arming and therefore preventing early bursts on obstructions close to the mortar position.

15. Action :- After setting, the safety clip is removed; on firing, the time striker sets back on to the time detonator, overcoming its spring; this ignites the T shaped delay composition which in turn, after a short delay, ignites the combustible arming collar. This burns away igniting the time ring composition and arming the percussion striker.

B O M B S

16. Of all the calibres, only 81-mm., 90-mm., 120-mm. and 150-mm. H.E. bombs have been examined at Kirkee. A detailed description of each is given below which may be taken as typical.

81-mm. H.E. BOMB.

17. According to information so far available there are two types of H.E. bombs, which differ in dimensions and weight. For ease of reference they may be called the short type and the long type. Only the short type, which has an overall length of 13 1/4 ins. and weighs 7 lbs. 6 1/2 ozs., has been examined. The long type referred to in reports is much heavier in weight (about 14 lbs. 5 ozs.).

18. At Plate A is shown the general appearance and the details of construction in Plate F. It will be seen from the Plates that this bomb follows conventional practice. In design and construction this bomb is generally similar to our 3-in. H.E. mortar bomb and differs in having :-

- (a) The bourrelet machined to form five gascheck rings.
- (b) Much smaller tail unit with peculiar shaped vanes and having the augmenting cartridges retaining arrangement integral with the vanes, as in the Italian 81-mm. bomb. The method of assembly is also different i.e. the cartridge container has a screw-threaded spigot which screws in the base of the bomb body and further held by a steel securing pin.
- (c) A different type of primary cartridge and augmenting cartridge.
- (d) A different type of nose adapter and exploder system. This consists of the usual pellets, three in number, in a paper container but housed in a screwed steel exploder container which fits into the nose adapter. In addition it holds a wooden distance piece and brass cup holder.
- (e) An entirely different type of fuze.

19. Filling :- The main filling in the bombs examined was 1 lb. 2 ozs. of cast Trinitrophenetol. The exploder consisted of three pressed pellets of R.D.X./Wax, the top pellet being recessed to house the aluminium cup.

20. Primary Cartridge :- This consists of a cardboard case, the base of which is stiffened internally by a steel cup and brass head, a cap chamber, which holds a brass cap and a brass anvil, and fits in a cardboard wad housed in the steel cup. The charge consists of brownish flakes of a double based propellant, about 127 grains in weight. Above the charge is placed in the following order, a cardboard disc, a lead disc and a felt disc; these three are held in place by the mouth of the case being turned over.

21. Augmenting Cartridge :- Six augmenting cartridges can be accommodated on each bomb forming a full charge. Each charge consists of 88 grains of a double based propellant contained in a silk bag (details are shown in Plate F) stitched at the edges, the seams being heavily coated with lacquer.

22. Fuze :- The bombs examined, were fuzed with the fuze percussion, graze, Type 100 with optional delay (described above in para. 10). Reports from other sources state that the per-

percussion graze fuze, Type '93 is also used; this, however, is possible only with bombs having a different type of exploder to accept the enlarged gaine portion of the type '93 fuze.

90-mm. H.E. BOMB.

23. Again two types exist in this calibre, the short type and the long type. Only the long type which has an overall length of 17 1/2 inches and weighs 11 lbs. 6 1/2 ozs. has been examined. The short type referred to in reports is believed to be about 15 1/2 inches long and 11 lbs. 14 ozs. in weight.

24. Constructional details can be seen in Plate G. This bomb is very similar to the 81-mm. H.E. bomb. The major differences are:-

- (a) Larger calibre.
- (b) The 90-mm. bomb has a screwed cap, fitting in the cartridge container, to hold the primary cartridge in position.
- (c) It has no securing pin to keep the tail unit in position.
- (d) There is no wooden distance piece and brass cup holder in the exploder.
- (e) The type of filling is different.

25. Filling:- This consisted of 2 lbs. 5 ozs. of T.N.T. The filling in the exploder was in one instance 1 1/4 ozs. of picric acid; in another it was about the same weight and consisted of three pellets, the bottom two being of picric acid and the top perforated pellet graphited C.E.

26. Primary Cartridge:- It is very similar to the one used in 81-mm. H.E. bomb but is somewhat larger in size; the length is 3.4 ins. as against 2.65 ins. of the 81-mm. bomb cartridge. The charge weighs grains and is a double based propellant. Note the different type of anvil used.

27. Augmenting Cartridge:- The cartridge is very similar to the 81-mm. bomb augmenting cartridge but is larger in size. The charge weighs 223 grains and is a double based propellant in the form of thin rectangular flakes.

Details of the propellant charges are given under "Chemical Analysis" below.

28. Fuze:- The fuze used is the percussion graze fuze Type '93 with optional delay (described earlier in para. 7).

120-mm. H.E. BOMB.

29. This bomb closely resembles in design, the German 12-cm. bomb 42 (12-cm. Wgr: 42) which is in turn based on a Russian Model. The shape of tail unit, method of ignition and form of primary and augmenting cartridges are very similar. It is

probable that the Japanese and German bombs are interchangeable, but there is no definite information. No smoke and chemical bombs have been reported and only H.E. bombs described below have been examined at Kirkee.

30. Constructional details are shown at Plate H. The bomb is of the conventional, streamlined, fin stabilized type but differs from other Japanese mortar bombs in the method of ignition, arrangement of primary and augmenting cartridges, the construction of the tail unit and the exploder system.

The tail unit is welded to the bomb and has 42 flash holes just above the vanes and accommodates five augmenting cartridges around it. It should be noted that the augmenting cartridges are not held in between the vanes, but around the cartridge container, just above them. In the bombs examined, no steel exploder container was used but the exploder filling, in the form of three pellets, was housed in a paper tube, which fitted snugly in the main filling.

31. Filling :- The bombs examined had a filling of 6 lbs. of cast T.N.T. The exploder filling consisted of three prepressed pellets of picric acid; the top pellet being recessed to accommodate the aluminium cup. The use of R.D.X./Wax is also reported by American Reports.

32. Primary Cartridge :- This cartridge is entirely different from that used in Japanese bombs of other calibres. It comprises two separate parts, a cartridge and a primer.

The cartridge is a cardboard tube containing 306 grains of a double based propellant; it is closed at the lower end by a thin black plastic cap and at the mouth by a cardboard disc. The cartridge fits snugly in the cartridge container and is held in position by the screwed primer. This is the Type 'C', described in T.R. No.31, except that the body is made of steel and oil-blackened.

33. Augmenting Cartridge :- It is a flat ring-shaped silk bag having a radial slit for assembly on the tail unit just above the tail vanes. Each bomb accommodates five bags, forming a full charge; of these four are lacquered blue and one yellow. This distinction in the colour is not clear as all the bags hold the same amount and the same type of propellant i.e. 1.7 ozs. of a double based propellant.

Details of the charges are given under "Chemical Analysis" below.

34. Fuze :- This bomb takes the percussion, graze, fuze, Type 100 with optional delay.

150-mm. H.E. BOMB.

35. As in the case of Jap. 81-mm. and 90-mm. H.E. bombs, here also there are two versions, the short type and the long type. Only the long type which has an overall length of 30 3/4 ins. and weighs 56 lbs. has been examined and is described in this Report. The small type referred to in reports is 26 ins. long, weighs 43 1/2 lbs., and is filled with T.N.T.

Smoke bombs filled W.P. and chemical bombs filled H.C.N. have been reported but none have been received here.

36. The H.E. bomb has the usual streamlined shape, almost identical to that of the 90-mm. H.E. bomb but differs from it in the following respects :-

- (a) The use of tail adapter (similar to in our 3 in. H.E. mortar bomb) to secure the assembly of the bomb body and the tail unit. The assembly is further held by a grub screw.
- (b) Tail vanes individually welded to the cartridge container.
- (c) The use of gunpowder in the primary cartridge.
- (d) The primary cartridge retaining cap fits on the cartridge container.
- (e) The brass head of the primary cartridge is formed with two rolled threads.

Constructional details can be seen in Plate J; the general appearance in the comparative photograph at Plate A.

37. Filling :- This was T.N.T. - 13 1/2 lbs. in weight. The exploder filling consisted of three pellets, the bottom two being of picric acid while the top perforated pellet was graphited C.E.

38. Primary Cartridge :- Though it resembles closely the 90-mm. bomb primary cartridge, it is much larger in size; the length being 5.5 ins. and max. dia. 1.49 ins. Its construction is also similar except for the fact that it holds two brass cups in the base and gunpowder, contained in a silk bag, which is placed in between the propellant charge and the cardboard wad. The charge weighs 993 grs. and is a double based propellant; for details see Chemical Analysis below.

39. Augmenting Cartridge :- Though no sample has been received, it is known from other reports that the cartridges are similar to the 90-mm. bomb augmenting cartridges but are of larger size. Six cartridges are accommodated on each bomb and each charge holds about 1400 grains of double based propellant.

40. Fuze :- The bomb examined was fuzeed with percussion, graze, fuze; Type '93 with optional delay.

P A C K I N G

FUZES.

41. Details are shown at Plate E, which may be taken as typical.

42. Type '93 Fuze :- This fuze is packed in a soldered tinned-plate cylinder with a screwed lid. The fuze is held firmly by two wooden blocks, shaped to fit into the cylinder and internally recessed to take the base and the nose of the fuze respectively. The top wooden block has a second hole in the upper surface to house the delay plug. The cylinder is 5.3 ins. long and 1.6 ins. in diameter.

Another tinned plate cylinder shorter in length has been examined at Kirkee. This is the short type and is only 3 3/4 ins. in length. It holds only one wooden block and has no accommodation

for the delay plug. In some cases the upper wooden block in the cylinder has two recesses side by side to hold two optional delay plugs, but in the cylinder received here, only one delay plug was found.

Red or green blobs were marked on the containers. It is not clear what they actually indicate but it is possible that they may have some connection with the number of delay plugs in the cylinder, if any; for instance, a green blob was found in the case of those cylinders, which held two delay plugs.

43. Type 100 Fuze :- This fuze is packed similarly in a tinned plate cylinder - 3.4 ins. long and 1.3 ins. in diameter. The fuze is positioned by one wooden block at the bottom, suitably recessed to take the base of the fuze. There is no wooden block to take the nose of the fuze but there are two waxed cloth discs between the nose of the fuze and the container lid.

BOMBS.

44. The photograph at Plate K shows the method of packing of 81-mm. H.E. bombs; this method may be taken as typical. Stowage dimensions etc. of the packages are given in the Summary of Data - para. 51.

45. 81-mm. H.E. Bomb :- The pack received here consisted of a roughly made wooden packing case holding three plugged bombs. Two compartments are formed in one end of the packing case; one to accommodate three tinned plate cylinders with fuzes and the other, a tarred paper bag containing primary and augmenting cartridges.

Another method of packing consists of four bombs in a roughly made wooden box, the fuzes, primary cartridges and augmenting cartridges being packed as above. Reports state that, in some cases, the packing has been modified by the addition of an alphalt impregnated paper lining to improve waterproofing.

46. 90-mm. H.E. Bomb :- These bombs were received packed two in a roughly made, wooden box complete with two fuzes in tinned plate cylinders.

The primary cartridge may be already in place in the tail of the bomb; in other cases they are each wrapped in waxed paper, and packed two in a tinned plate cylinder. A steel key, to remove the cartridge retaining cap, may be found tied to the tail unit of one of the bombs.

47. 120-mm. H.E. Bomb :- Two bombs, with the primary cartridges in position, are packed in a wooden box. The tail units are protected by a waterproof cover of pitch impregnated paper. Two compartments as in the 81-mm., 90-mm. bomb packing cases are formed in one end of the box, one to house fuze cylinders and the other to accommodate two paper packages containing primary and augmenting cartridges.

48. 150-mm. H.E. Bomb :- One round is packed in a wooden box, the round held firmly in the packing case by means of a wooden frame, suitably shaped. The fuze, in a tinned plate cylinder, and primary and augmenting cartridges in a waxed paper bag are also included.

(Chl.

CHEMICAL ANALYSIS

(Chief Inspector of Military Explosives, Kirkee)

49.

BOMBS

	<u>81-mm.</u>	<u>90-mm.</u>	<u>120-mm.</u>	<u>150-mm.</u>
Main filling.	Trinitrophenetol (M.P. 77.5°C)	T.N.T. Grade II (Set Point 79.95°C)	T.N.T. Grade I (Set Point 80.35°C)	T.N.T. Grade I (Set Point 80.13°C)
Exploder filling.				
Top Pellet	RDX/Wax 98/2 %	C.E. (M.P. 129°C)	Graphited picric acid	Graphited C.E.
Middle Pellet	" " 98.3/1.7 %	Picric acid (M.P.)	(M.P. 122°C)	Picric acid (M.P.)
Bottom Pellet	" " 98.7/1.3 %	Picric acid (122°C)		Picric acid (121°C)
Augmenting cartridge charge.	Brownish black flakes 0.04" x 0.04" x 0.006"	Rhombic black flakes 0.05" x 0.05" x 0.01"	Chocolate coloured flakes 0.05" x 0.05" x 0.013"	Cartridge not received.
	N.C. + Volatile matter 65.0 %	N.C. + Volatile matter + Dye 55.0 %	N.C. 56.5 %	
	N.G. 34.5 %	N.G. 41.5 %	N.G. 39.3 %	
	Centralite 0.5 %	D.P.A. 3.5 %	D.P.A. * paraffin traces 3.0 %	
Primary cartridge charge.	Same as augmenting charge.	Same as augmenting charge.	Flakes - 0.05" x 0.05" x 0.012"	Flakes - 0.13" x 0.125" x 0.02"
			N.C. 56.5 %	N.C. + Volatile)
			N.G. 41.0 %	matter + Graphite) 57.0%
			D.P.A. 2.5 %	N.G. 39.0%
				D.P.A. 4.0%
Powder in silk bag.	-	-	-	Gunpowder
Cap Composition.	A mixture of antimony sulphide, potassium chlorate and mercury fulminate.			

FUZES

Gaine filling

Mercury fulminate
& C.E.Lead azide
& C.E.

Delay composition

Gunpoder

Gunpowder

A P P R E C I A T I O N
(Economic, Manufacture & Development Aspects)

50. All bombs examined at Kirkee were made of steel, were relatively thin-walled and were filled with a brisant explosive (Trinitrophenetol or T.N.T.). They all showed a high standard of workmanship and were well finished both inside and out.

As is usual in Japanese ammunition, every effort has been made to ensure maximum detonation by the use of a good exploder system. Picric acid pellets are the most commonly used, especially over T.N.T. fillings but R.D.X./Wax is generally used in bombs and shell filled trinitrophenetol (e.g. Shell, H.E./A.A., Type '100 for 82-mm. A.A. gun, Type '99 - T.R. No. 50), although it may also be used over T.N.T. This suggests that R.D.X./Wax is not restricted to use with one type of filling but is possibly replacing picric acid as an exploder. Another interesting feature of these exploder systems is the use of a C.E. pellet immediately above picric acid pellets - a practice condemned in the British Service.

Smoke and chemical bombs for these equipments have been reported but none have been examined here.

51. Interchangeability :- The Japanese counter part of our 3-in. mortar is their 81-mm. mortar and ammunition not only for the Japanese mortar but also for the German and Italian is all interchangeable with ammunition for the British 3-in. M.L. with certain restrictions.

- (a) The striker stud in the 3-in. mortar has a flat blunt nose; its function only being to force the striker clip on to the primary cartridge. The foreign mortars, however, have a comparatively sharp pointed striker and the primary cartridge is not fitted with a striker clip, the striker fires the primary cartridge cap direct. While British 3-in. mortar ammunition could be fired from the foreign 81-mm. mortars, foreign ammunition cannot be fired from the 3-in. mortar unless the striker stud is modified by giving it a sharp point.
- (b) The windage using foreign 81-mm. mortar bombs in the 3-in. mortar is small and it is necessary to ensure that the barrel is thoroughly clean before using 81-mm. bombs. Barrels will also have to be cleaned frequently to avoid the tendency of bombs to stick in the barrel or, owing to the increased friction, to give a high incidence of misfires, particularly at angles below 60°.

I D E N T I F I C A T I O N

52. There should be no difficulty in identifying these bombs, from the details given in the photograph at Plate A. The 120-mm. mortar bomb can be easily identified by the peculiar shape of the tail unit.

The usual Japanese characters indicating the type of bomb, filling, date etc. are stencilled in white on the bomb body. Stamped characters on the bomb body and cartridge container, are also found which indicate the month and year and place of manufacture.

All these markings are shown in the Plates.

53.

BOMBS

	<u>81-mm.</u>	<u>90-mm.</u>	<u>120-mm.</u>	<u>150-mm.</u>
<u>Complete bomb.</u>				
Length.	11.8-in.	16-in.	24-in.	29.4-in.
Weight.	7 lbs. 6½ ozs.	11 lbs. 6½ ozs.	26 lbs.	56 lbs.
Nature & weight of main filling.	Trinitrophenetol 1 lb. 2 ozs.	T.N.T. 2 lbs. 5 ozs.	T.N.T. 6 lbs.	T.N.T. 13 lbs. 8 ozs.
Nature & weight of exploder filling.	R.D.X./Wax 1.32 ozs.	C.E. & Picric acid, 1.32 ozs.	Picric acid 1.38 ozs.	C.E. & Picric acid, 1.39 ozs.
<u>Bomb body.</u>				
Length	7.71-in.	11.25-in.	14.4-in.	20.85-in.
Dia. (max)	3.189-in.	3.51-in.	4.7-in.	5.9-in.
<u>Primary cartridge.</u>				
Length	2.65-in.	3.4-in.	5.7-in.	5.5-in.
Dia. (max)	0.80-in.	0.91-in.	0.82-in.	1.49-in.
Dia. (min)	0.78-in.	0.87-in.	0.76-in.	1.44-in.
Weight filled	1.1 ozs.	1.57 ozs.	1.12 ozs.	5.5 ozs.
Weight of charge	127 grains		305 grains	993 grains
Primer.	-	-	Type 'C'	-
<u>Augmenting cartridge.</u>				
Max.No. of charges used	6	6	5	6
Length	2.2-in.	2.5-in.	Ext.dia. 4.5-in.)	) Not examined.
Width	1.9-in.	2.3-in.	-	
Weight filled	102.8 grains	248 grains	1.86 ozs.	
Weight of charge	88 grains	223 grains	1.7 ozs.	

54.

FUZES.

	<u>TYPE '93</u>	<u>TYPE 100</u>
Length	3.75-in.	3.125-in.
Weight filled	6.5 ozs.	6.5 ozs.
Special features	Optional delay plug.	Delay selector.

55.

PACKING

	<u>81-mm.</u>	<u>90-mm.</u>	<u>120-mm.</u>	<u>150-mm.</u>
<u>Contents.</u>				
	3 bombs plugged 3 fuzes in cylinders, 3 primary & 18 augmenting cartgs. in brown paper envelope.	2 bombs plugged 2 fuzes in cylinders, 2 primary cartgs. in a cylinder, 12 augmenting cartgs. in waxed paper.	2 bombs plugged, 2 fuzes in cylinders, 10 augmenting cartgs. - 5 in paper envelope.	1 bomb, 1 fuze in cylinder, 1 primary cartg. in waxed paper.
<u>Dimensions.</u>				
Length	22-in.	26.4-in.	30.5-in.	38.25-in.
Breadth	13.75-in.	10.25-in.	15-in.	11.25-in.
Height	5.5-in.	8.3-in.	8.5-in.	11.25-in.
Weight filled	63 lbs.		81 lbs.	83 lbs.

NOTE :- The Chinese bomb shewn in Plate A and its fuze in Plate E have not been described in this Report but are included only because these Plates had been prepared some time before writing.

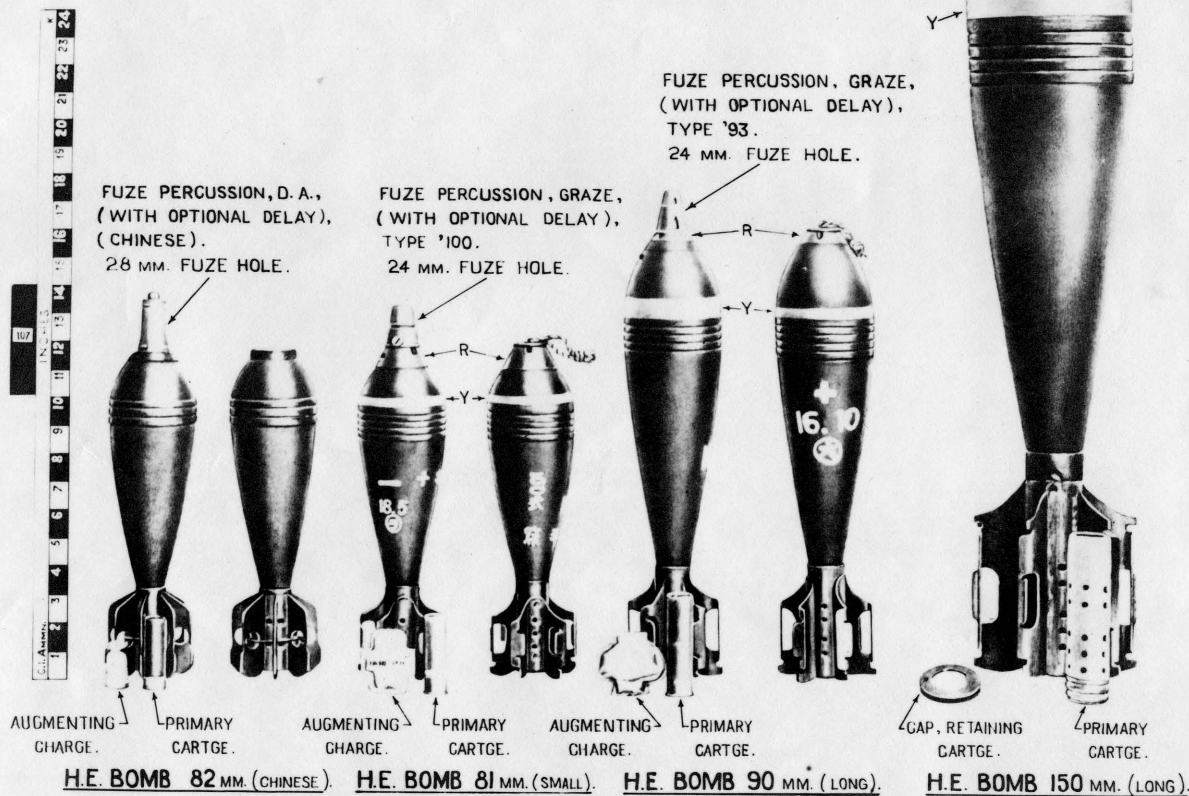
RESTRICTED.

KEY TO COLOUR BANDS :-

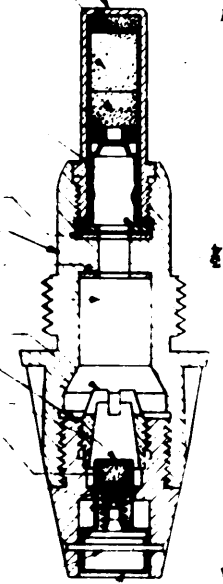
R - RED.

Y - YELLOW.

BODY PAINTED BLACK EXCEPT FOR 82 MM.
WHICH IS VARNISHED OVER METAL GIVING
A DIRTY-GREY FINISH.
ALL STENCILLING IN WHITE.

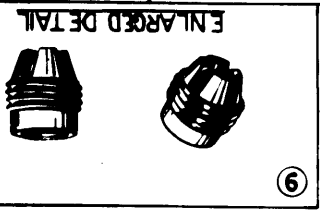


- ① DURALUMIN, CLOSING CUP
- ② SHEAR WIRE (TINNED COPPER), SOLDERED
- ③ DURALUMIN, STRIKER
- ④ CREEP SPRING, STEEL
- ⑤ DURALUMIN, SLIDING PIECE
- ⑥ DETONATOR
- ⑦ LIGHT ALLOY HOUSING
- ⑧ BODY, UPPER HALF
- ⑨ FLASH GUIDE
- ⑩ RECESS FOR OPTIONAL DELAY PLUG
- ⑪ LEAD WASHER
- ⑫ BODY LOWER HALF
- ⑬ BRASS WASHER
- ⑭ COPPER, SEPTUM
- ⑮ CARD BOARD WASHER
- ⑯ CLOSING CUP, (COPPER)
- ⑰ SILK DISC
- ⑱ FELT WASHER
- ⑲ MERCURY FILM MATE, 12.35 GRS.
- ⑳ C.E. 15.43 GRS.
- ㉑ COPPER LINING
- ㉒ FELT DISC
- ㉓ GAME BODY



- ⑬ GAME BODY
- ⑭ FELT DISC
- ⑮ COPPER LINING
- ⑯ C.E. 15.43 GRS.
- ⑰ MERCURY FILM MATE, 12.35 GRS.
- ⑱ FELT WASHER
- ⑲ SILK DISC
- ⑳ CLOSING CUP, (COPPER)
- ㉑ CARD BOARD WASHER
- ㉒ COPPER, SEPTUM
- ㉓ BRASS WASHER
- ㉔ BODY LOWER HALF
- ㉕ LEAD WASHER
- ㉖ RECESS FOR OPTIONAL DELAY PLUG
- ㉗ FLASH GUIDE
- ㉘ BODY, UPPER HALF
- ㉙ LIGHT ALLOY HOUSING
- ㉚ DETONATOR
- ㉛ DURALUMIN, SLIDING PIECE
- ㉜ CREEP SPRING, STEEL
- ㉝ DURALUMIN, STRIKER
- ㉞ SHEAR WIRE (TINNED COPPER), SOLDERED

STAMPED
STAMPED
MORTAR
MARKINGS (SECRET)
4 B + BB
INSPECTION MK.
APRIL 15, 1940
ARSENAL, OSAWA ARSENAL



OPTIONAL DELAY PLUG



PRESSED C. P. 100 GR.
LOOSE C. P. 20.0-33.0 GRS.
TIN-FOL
CLOSING CUP
FLASH HOLE

JAPANESE FUZE, PERCUSSION, GRAZE (WITH OPTIONAL DELAY)

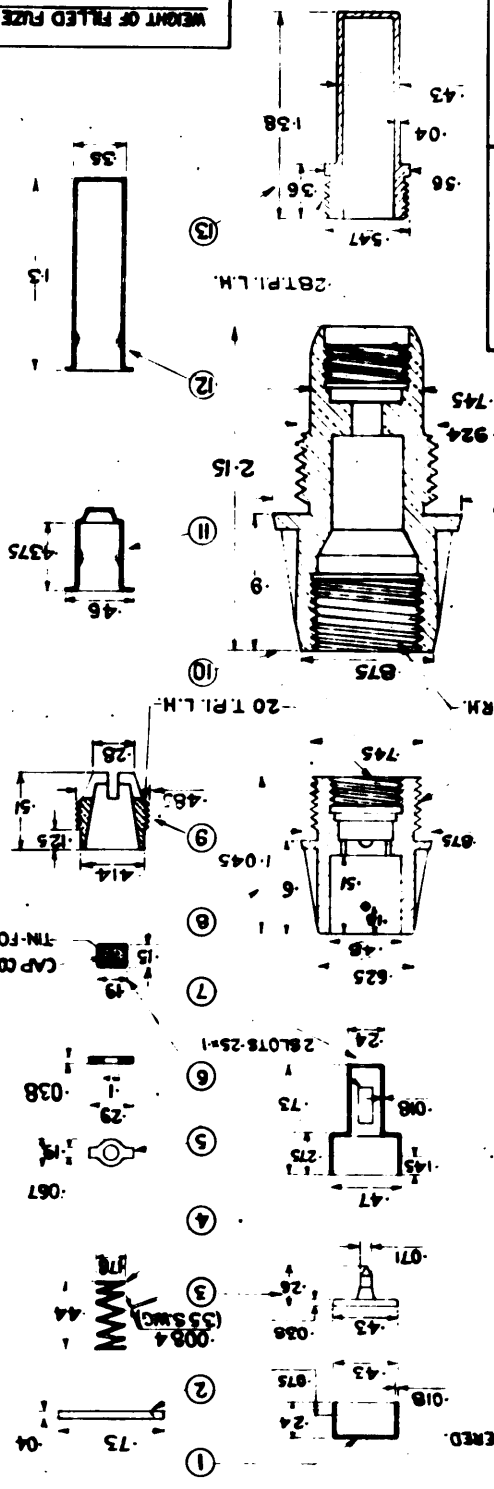
TYPE 93

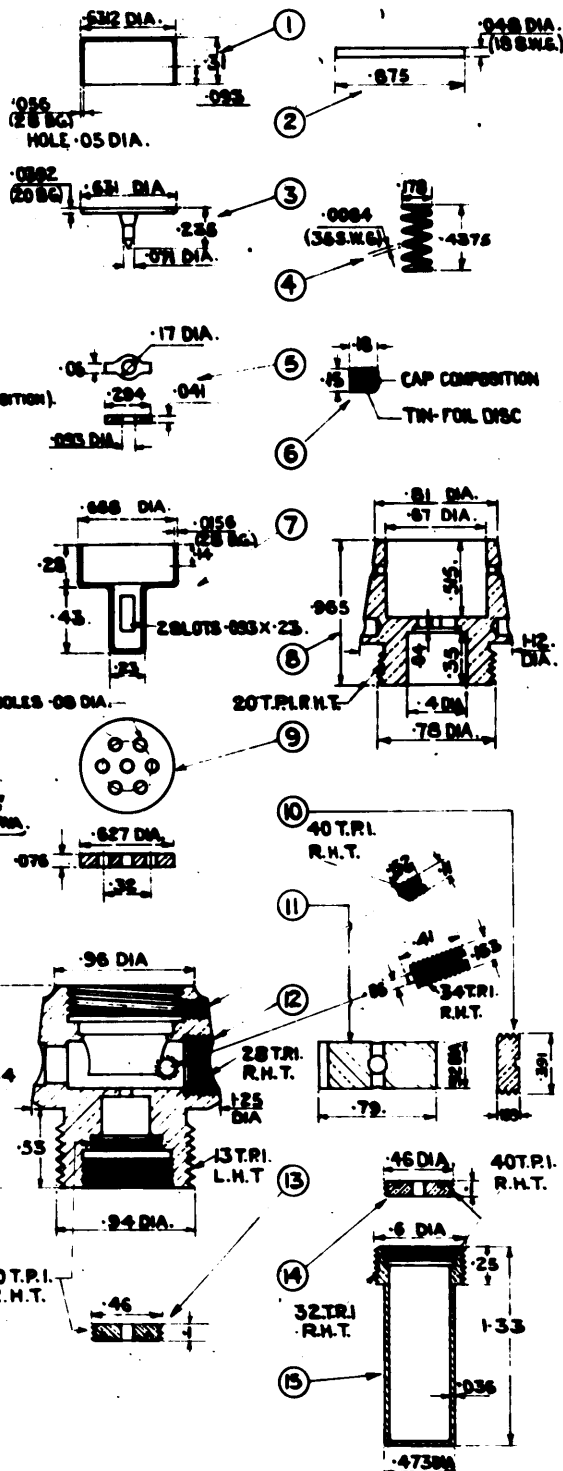
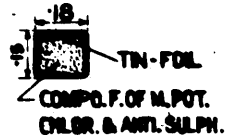
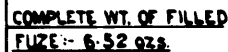
90 MM. & 150 MM. MORTAR BOMBS, & 60 MM. BOMBS SUITABLY EXPLORED WITH 24 MM. FUZE HOLE

GENERAL ARRANGEMENT & ASSEMBLY SEQUENCE

C.I. ANN. 8/226
KINSEI 887, 45

WEIGHT OF FILLED FUZE 0.5026
FUZE MADE OF BRASS UNLESS
OTHERWISE STATED.

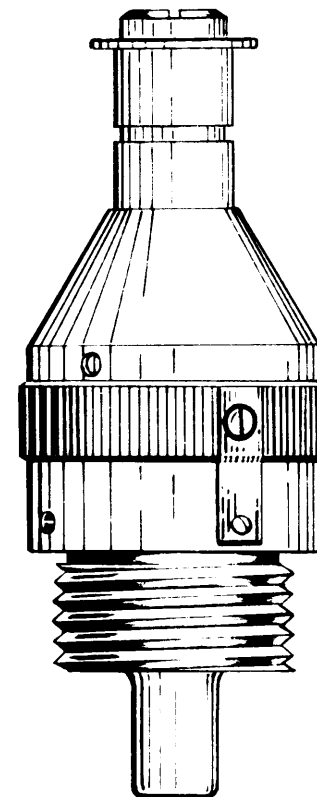
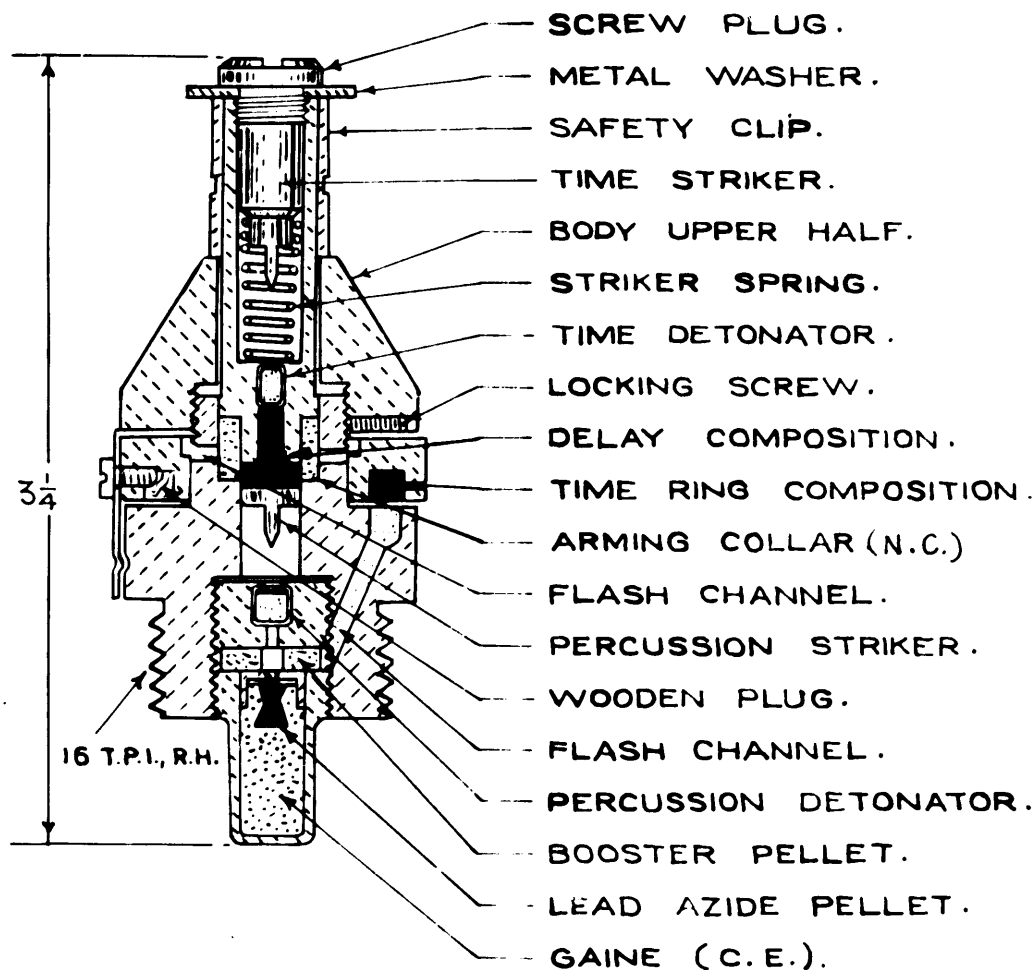




81mm. & 120mm. MORTAR BOMBS WITH 24mm FUZE HOLE.

GENERAL ARRANGEMENT & ASSEMBLY SEQUENCE

CLANN. 8/1238
MURKEL SEPT '45



FUZE, TIME & PERCUSSION, TYPE '3,

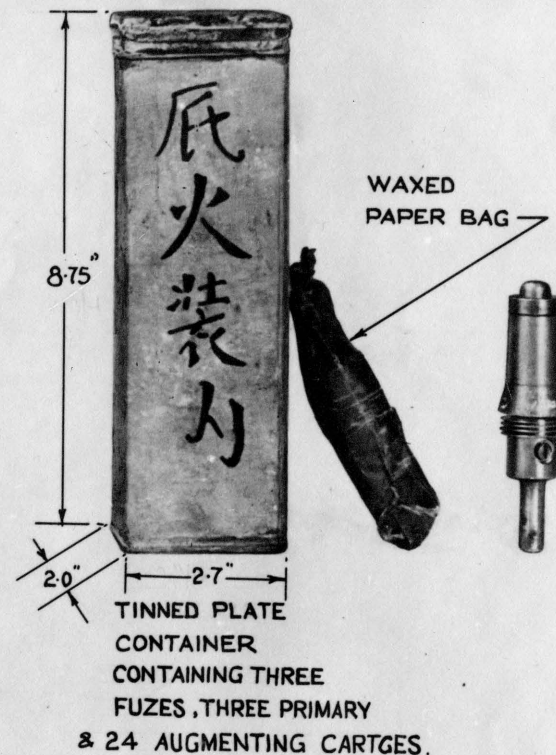
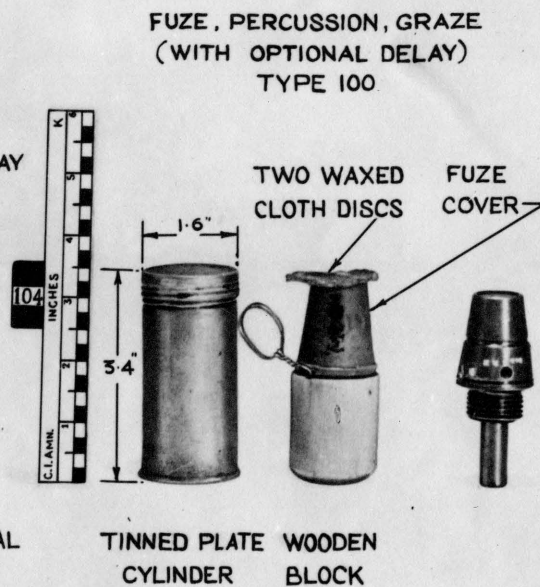
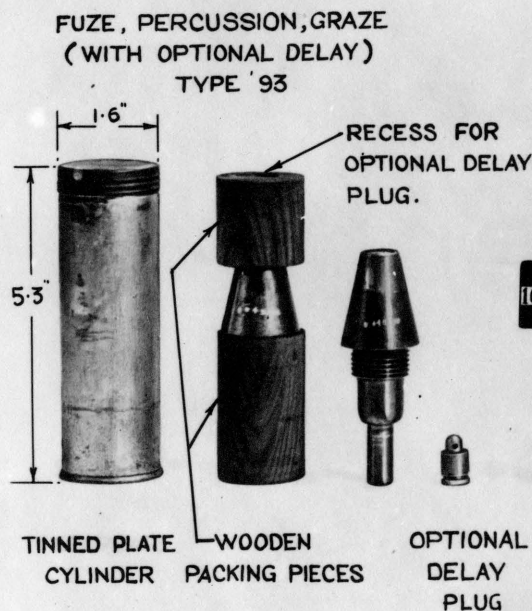
FOR

81 MM. MORTAR AMMUNITION, NAVAL, TYPE '3.

C.I. Amns/1234A
KIRKEE JAN 46

RESTRICTED.

FUZE, PERCUSSION, D.A.
(WITH OPTIONAL DELAY)
CHINESE



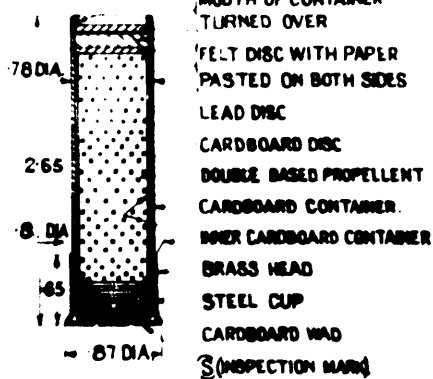
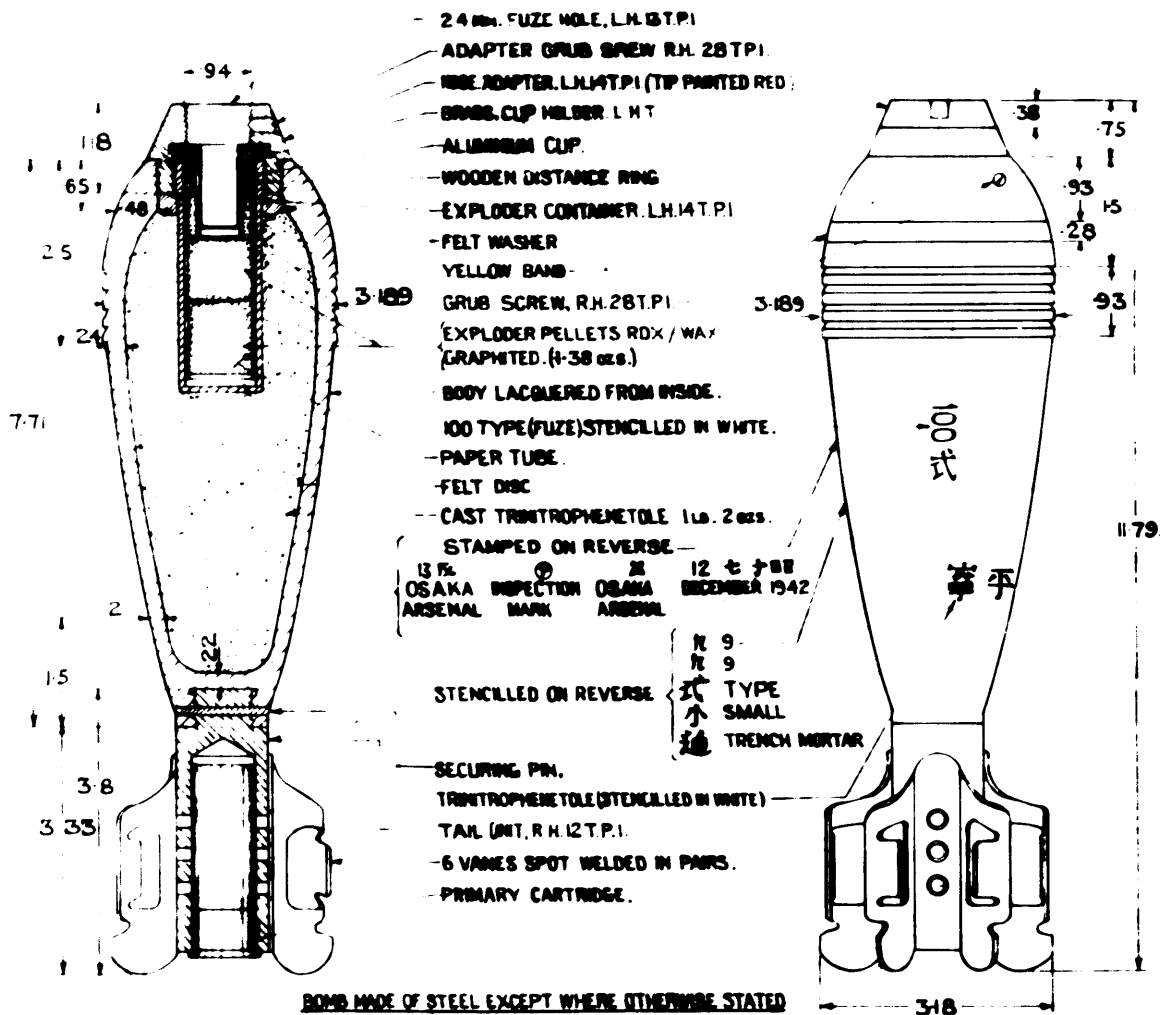
FUZES
FOR

JAPANESE 81 MM, 90 MM, 120 MM. & 150 MM. MORTAR BOMBS
AND
CHINESE 82 MM. MORTAR BOMBS

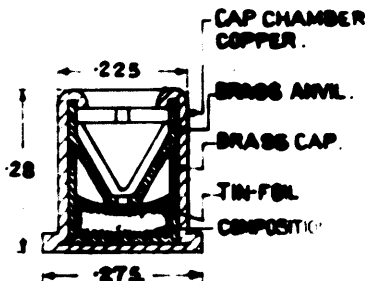
CI.AMN. S/1244
KIRKEE. SEPT. '45

PLATE E

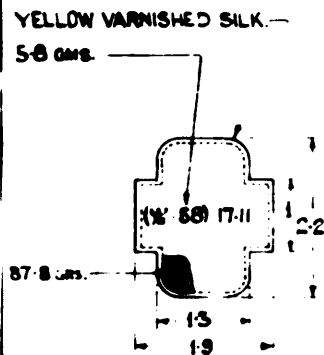
RESTRICTED



PRIMARY CARTRIDGE
WT. 11.028



CAP ASSEMBLY
WT. 3.000



AUGMENTING CHARGE
WT. 102.8 ozs.

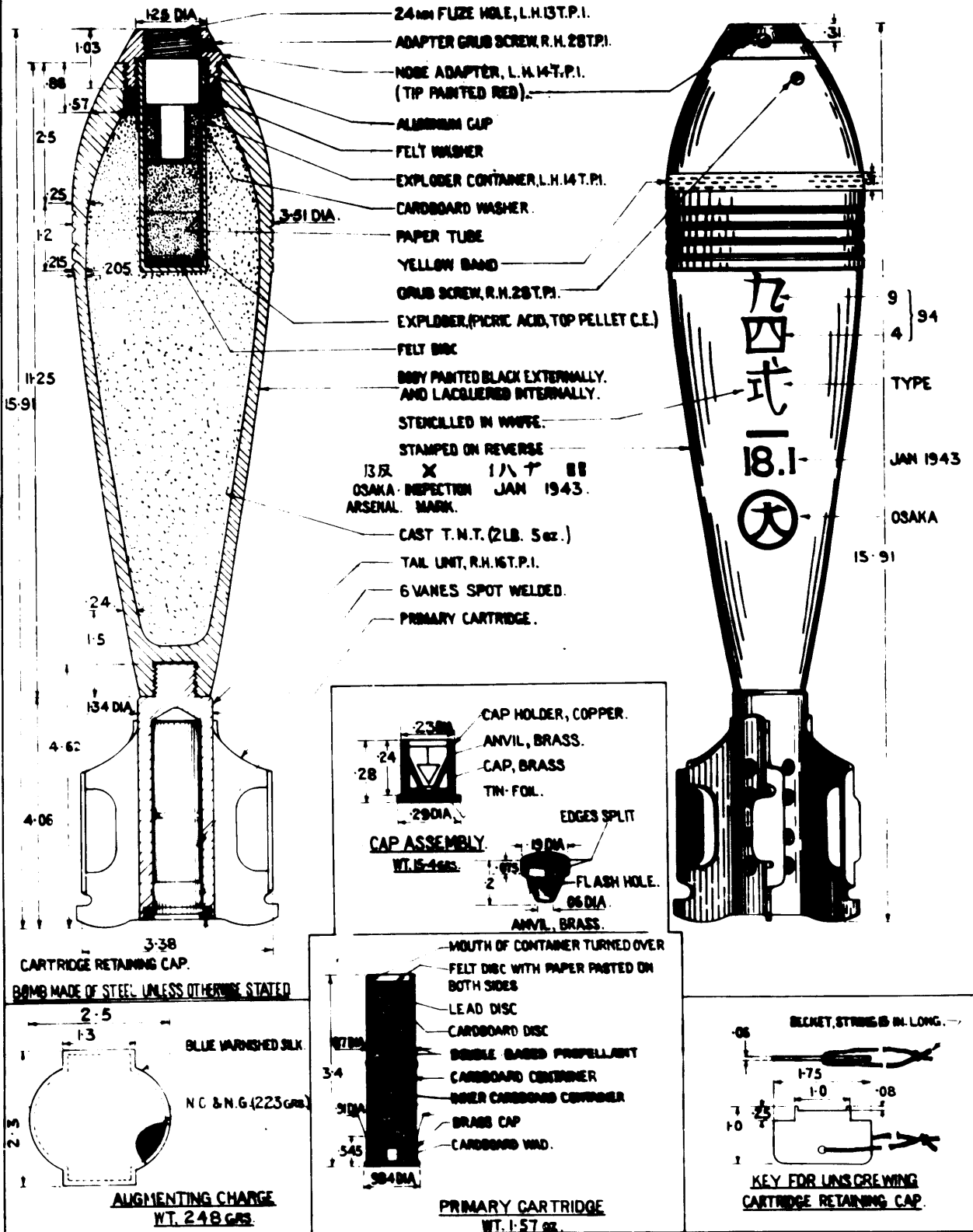
JAPANESE BOMB HE ML 81mm MORTAR.

DIMENSIONS IN INCHES.

WITH 24mm. FUZE HOLE.

C.I. ANN. 8/439

RESTRICTED



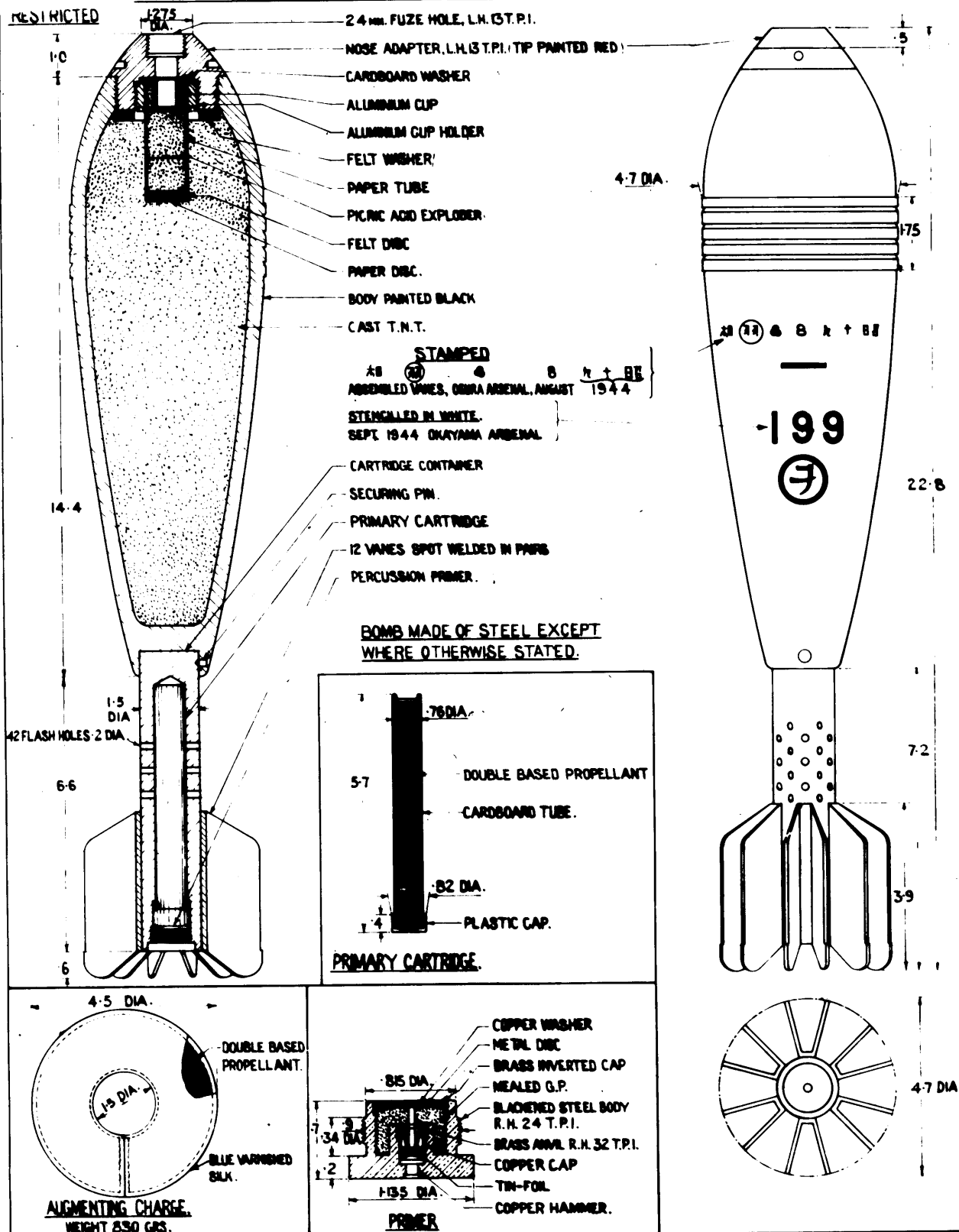
JAPANESE BOMB HE M.L. 90mm MORTAR.

WITH 24mm FUZE HOLE.

DIMENSIONS IN INCHES.

C.I. AMN. S/1307.
KIRKEE, OCT. '45.

RESTRICTED

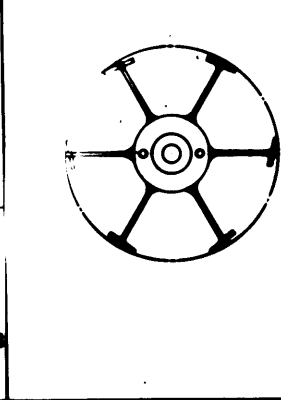
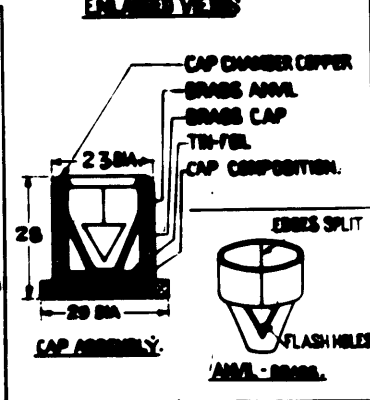
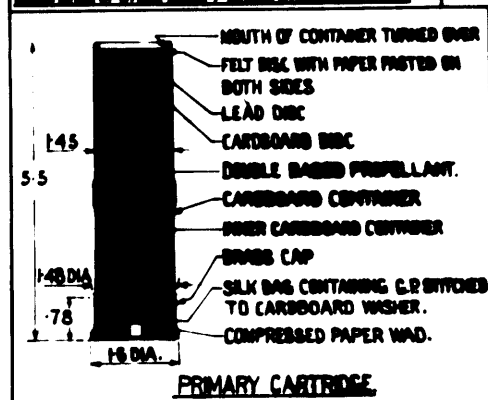
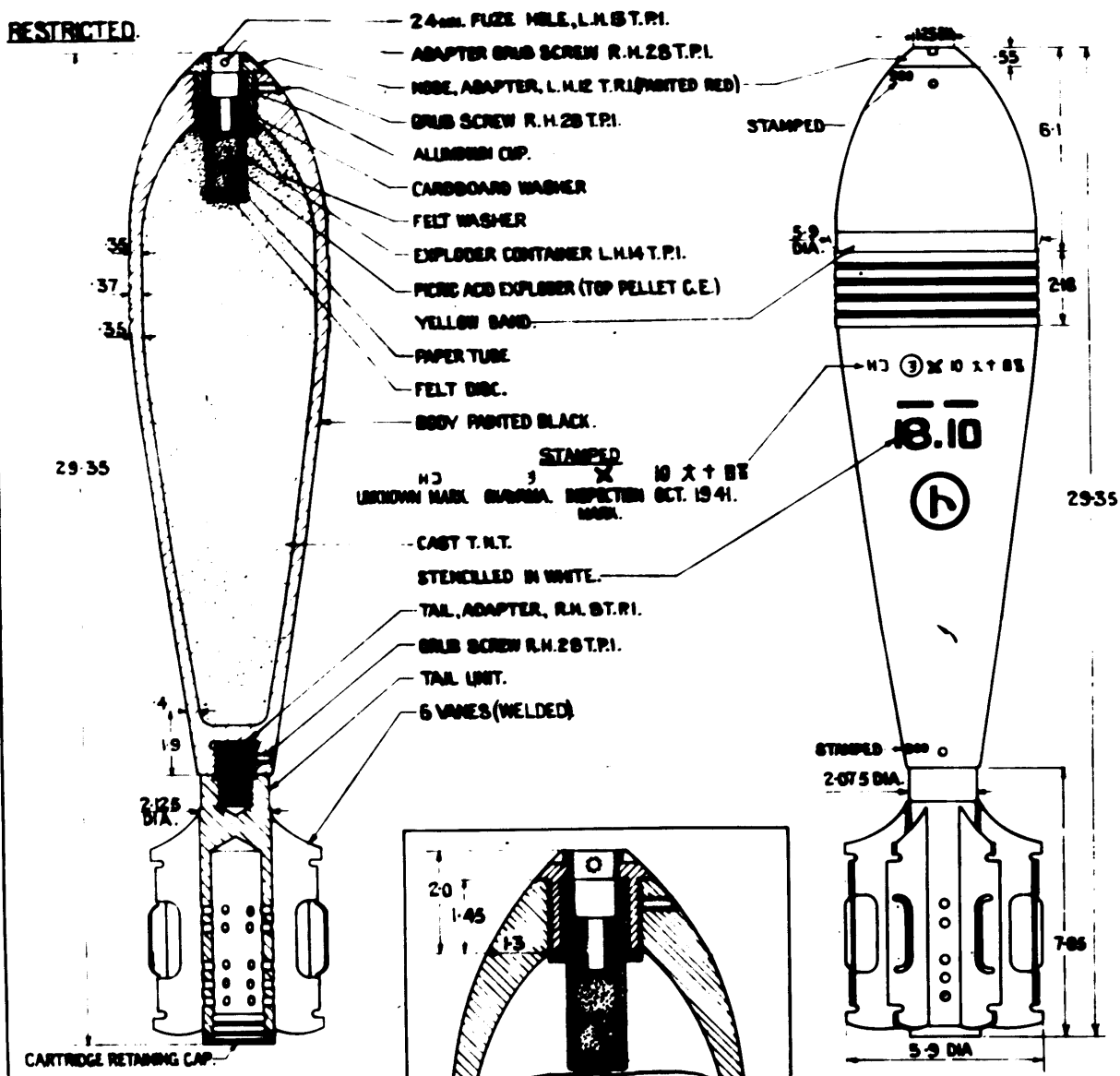


JAPANESE, BOMB, H.E., M.L. 120mm. MORTAR
WITH 24 MM. FUZE HOLE.

DIMENSIONS IN INCHES.

C.I. AMN. 5/359
HMKF, DEC. '45.

RESTRICTED.



JAPANESE BOMB H.E.M.I. 150mm MORTAR.

WITH 24mm. FUZE HOLE.

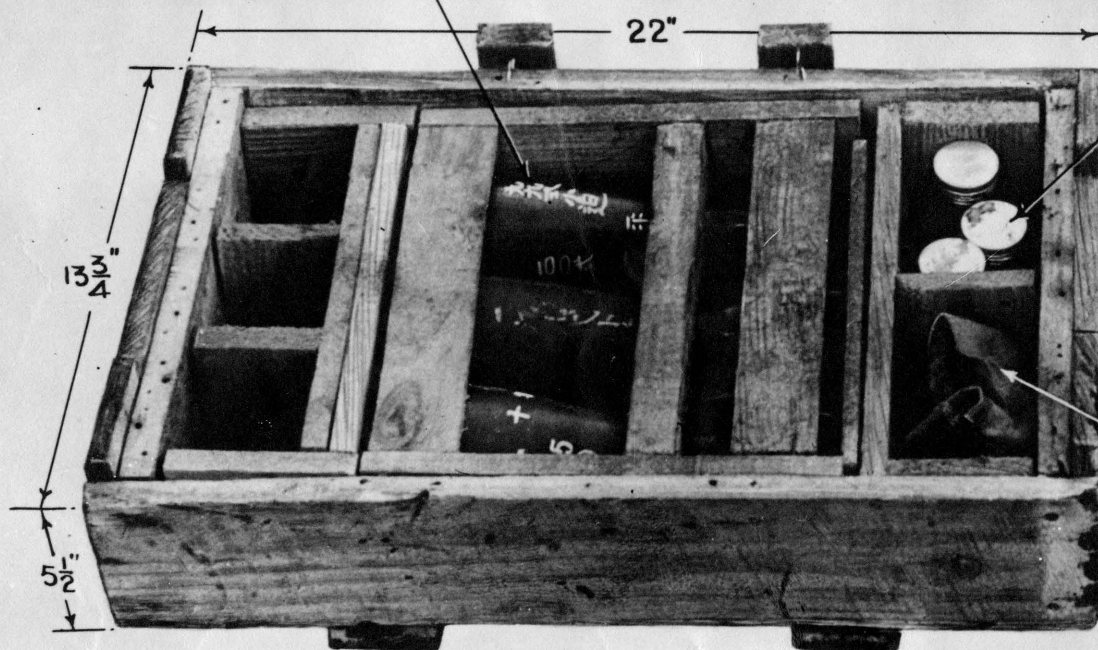
DIMENSIONS IN INCHES.

CL. AMN. 8/1330
 SOURCE, INC. '49.

RESTRICTED.

THREE BOMBS M.L. 81 MM.
MORTAR (PLUGGED).

THREE TINNED PLATE CONTAINERS
CONTAINING THREE FUZES PERCUSSION
WITH OPTIONAL DELAY TYPE 100.



BROWN WATER-PROOF
ENVELOPE CONTAINING
THREE PRIMARY AND
AUGMENTING CARTRIDGES

WT. OF FILLED BOX :- 63 LBS.

JAPANESE BOMBS M.L. 81MM. MORTAR
METHOD OF PACKING

C.I.A.M.N.S/1336
KIRKEE DEC. '45

PLATE K.