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JAPANESE AMMUNITION

C.I. AMM. TECHNICAL REPORT

No. 36

BANGALORE TORPEDO, TYPE '99

(STEEL, 30-MM. STANDARD ISSUE)

JAPANESE AMMUNITIONC.I.AMM. TECHNICAL REPORTSREPORT No.36APRIL 1945.BANGALORE TORPEDO, TYPE '99
(STEEL, 30-MM., STANDARD ISSUE)G E N E R A L

The Japanese Bangalore Torpedo fulfils generally the same role as the 1½ and 2-in. British Service Bangalore Torpedoes. Japanese torpedoes so far encountered have an internal diameter of just less than 1 13/64-in. (30-mm.).

2. According to information available at present, there are three types of the Japanese Bangalore Torpedo in use:-

- (a) Bangalore Torpedo, Type '99 (Steel, 30-mm.) which appears to be a standard issue.
- (b) A modification of the standard type '99 Bangalore Torpedo by the fitting of fins and an A.C. bomb type nose fuze, for projection from the 50-mm. Type '98 discharger.
- (c) A Bangalore Torpedo consisting of strips of bamboo filled with suitable explosive and connected by lengths of primacord.

3. It is believed that the Japanese use also mild steel tubes something similar to the standard issue of the Bangalore Torpedo but of a smaller diameter. These tubes appear to be issued and transported empty and filled for use when required with the standard cylindrical explosive blocks 1 1/8" in diameter.

4. The tube has an external diameter of 1 13/32-in. and internal diameter of 1 3/16-in. making the 1 1/8" cylindrical explosive blocks a good sliding fit. The tube is closed at one end by a screwed plug, which screws direct into the body of the tube. At the other end is an adapter screwed and pinned to the tube. This adapter is screw-threaded externally to take a nose cap. Two or more lengths of the tube can be screwed together similar to the Type '99 standard issue torpedo. Nothing is known of the igniter and possibly the ordinary friction or electric detonator is used, or a detonator with a length of fuze. The tube is painted olive drab.

5. This Report deals only with the Type '99 Bangalore Torpedo, which has been received in Kirkee for technical examination; the other types have not yet been received. Incidentally, all lengths of Bangalore Torpedoes received here were found to be filled with picric acid, although reports from American sources state that a filling of R.D.X. and T.N.T. is also used.

D E S C R I P T I O N

6. The construction of the Type '99 Bangalore Torpedo can be

seen clearly from the drawing in Plate B while its general appearance and the assembly sequence of the igniter set assembly will be seen from the photograph at Plate A. The torpedo consists of filled lengths of steel tubing suitable for transport and storage, fitted with a nose transit cap at one end and a tail transit plug at the other. The overall length of each section is approximately 47-ins. The internal diameter of the tube is just under 1 13/64-ins. (30-mm.).

Over one end of the tube is fitted an adapter secured to the tube by welding. This adapter is screw-threaded internally with a right-handed thread (38-mm. thread hole) and takes the tail transit plug (6) or igniter set assembly (5). The other end has a circular flange welded on to act as a stop for the pointed nose cover (1). This flange also secures in position a thin screw-threaded collar which fits over the nose of the tube and on to which the pointed nose cover (1) is secured (right-handed thread 38-mm. hole).

It will be seen that a number of tubes can be connected together to form a Bangalore Torpedo of any length required. To ensure continuity of the explosive filling between lengths the explosive at the externally threaded end of the tube is filled flush with the mouth. At the other end (internally threaded) it will be seen from the drawing that a cylindrical cavity lined with a rolled paper container has been formed in the filling to take the twin detonators of the igniter set assembly (5). Although air gaps exist round these detonators the space is small and it is thought that a small quantity of plastic explosive may be used and the ends of the twin detonators pressed into this. In some lengths examined quantities of explosive (similar to gelignite) were found which supports this belief.

Stencilled markings on the length examined, indicate that it was filled in November 1941. It has not been possible to identify the other two marks. The last character literally meaning 'yellow' indicates that the filling is picric acid.

Filling.

7. The filling found in the sample examined is poured picric acid and the weight of explosive in each length is 3-lb. 2-oz.

Igniter Set Assembly.

8. The general make-up of the igniter set and the assembly sequence of components is shown in the photograph at Plate A. Full details of construction etc. are given in Plate B. For convenience of description it can be divided into:-

- (a) Firing lanyard attached by means of an eye-bolt to double friction cords. A safety pin (4) passes through this eye-bolt and protruding flange of igniter set body (8) to prevent accidental functioning.
- (b) Screwed locking collar, light alloy (7).
- (c) Body, light alloy (8).
- (d) Twin delay tubes (9B), attached at one end by crimping to friction igniter tubes (9A) and at the other end to the detonators (10). The mechanism of the friction igniter follows normal Japanese practice which will be clear from the details in Plate B.

(e) Twin detonators (10).

Note that the small brass cap is a spring push fit in the top of the igniter set body (8) and, by the application of a suitable waterproof varnish, hermetically seals the igniter set.

9. The igniter set assembly, complete (5), is carried in the pointed nose cover (1) during storage and transport. The pointed nose cover (1) together with the igniter set assembly (5) is packed in a metal container (11) painted olive drab. Details of this container can be seen in Plate A. It follows normal practice in having a mild steel sheet body with a "push on" lid, the joint being waterproofed by a piece of adhesive tape or varnished paper strip. A paper label is attached to the cylinder giving details in Japanese characters of the type of igniter and the date of manufacture. In the sample examined this was November 1941 (Showa 16). The place of manufacture could not be deciphered.

ACTION

10. The igniter set assembly (5) is removed from the pointed nose cover (1) and the latter is screwed on to one end of the tube after removing the nose transit cap. One or more lengths are then assembled together and the igniter set assembly (5) screwed into the tail end of the last length, after removing the tail transit plug (6). The safety pin (4) is then withdrawn and the firing lanyard pulled from a safe distance to fire the igniter. The delay in the igniter set is of the order of 7 seconds.

11. Note that in pulling the firing lanyard (3) the pull is probably in two parts. Firstly a slow pull to withdraw the push fit brass cap, and secondly a quick jerk to fire the friction igniter. The length of the slack cord after the brass cap is withdrawn is about $5\frac{1}{2}$ inches. A long quick jerk on the lanyard will of course also fire the igniter but perhaps not so positively. Failures occurred in small trials at Kirkee when the lanyard was not pulled with a quick jerk. The igniters were old however and may have been somewhat insensitive owing to damp.

METALLURGICAL ANALYSIS

12. Mild steel is used for the lengths of the Bangalore Torpedo while a light aluminium alloy is used generally for the igniter set assembly except in the case of the push cap, friction and detonator tubes which are of brass.

CHEMICAL ANALYSIS

(Chief Inspector of Military Explosives, Kirkee)

13. Torpedo.

Filling in tube .. Picric acid (122°C) M.P.)

14. Igniter set assembly.

Friction igniter tube.

Friction composition

.. A composition of:-
Sulphur
Potassium chlorate
Antimony sulphide and
Binding material.

(Quantitative analysis not possible, the quantity being too small)

Delay tube.

Perforated G.P. pellet, Igniter end	..	Sulphur	..	8.8%
		Potassium nitrate	..	73.6%
		Charcoal	..	17.6%
Perforated G.P. pellet, Detonator end	..	Sulphur	..	8.7%
		Potassium nitrate	..	73.9%
		Charcoal	..	17.4%
Delay composition	..	T.N.T.	..	55.8%
		Sulphur	..	4.4%
		Potassium nitrate	..	32.9%
		Charcoal	..	6.8%

Detonator tube.

Top filling	..	Mercury fulminate (fulminate value 92.0%) highly contaminated with shellac.
Bottom filling	..	P.E.T.N. and wax contaminated with copper carbonate.

APPRECIATION

(Economic, manufacture and development aspects)

15. The general construction and finish of the Bangalore Torpedoes examined was good. It will be seen that no boosting primer is used at the end of the filling in the tube, the lack of which is presumably compensated by the comparatively sensitive filling of picric acid used.

16. There is no special exploder arrangement at the nose end of the tube to take the twin detonators of the igniter set assembly. The filling had only a cylindrical recess lined with a rolled paper container, in which the two detonators extend. In some lengths examined there was a small quantity of plastic explosive (analysed chemically as similar to gelnite) and it is thought that this may be used as a field expedient to boost up the impulse from the detonators.

17. A number of torpedo lengths and igniter sets were examined in addition to the sample critically examined and all were found to conform in detail to the sample.

FUNCTIONING AND PERFORMANCE

18. See Plate C. To form some estimate of the functioning of the torpedo two lengths were screwed together, a pointed nose cover fitted at the nose end and the standard Japanese igniter at the other. The detonators of the igniter set were placed direct into the cavity of the torpedo without any boosting explosive. The two lengths of torpedo were then fired in the same way as they would be fired on service.

It will be seen that the standard of detonation is high and fragmentation good. It might have been better if the twin detonators were surrounded by some plastic explosives. As it stands, however, there is little more to be desired in the results obtained.

Total weight (including nose cover) of the two lengths was 19 lb. and fragments weighing 10 lb. 10 oz. were recovered, 82.5%.

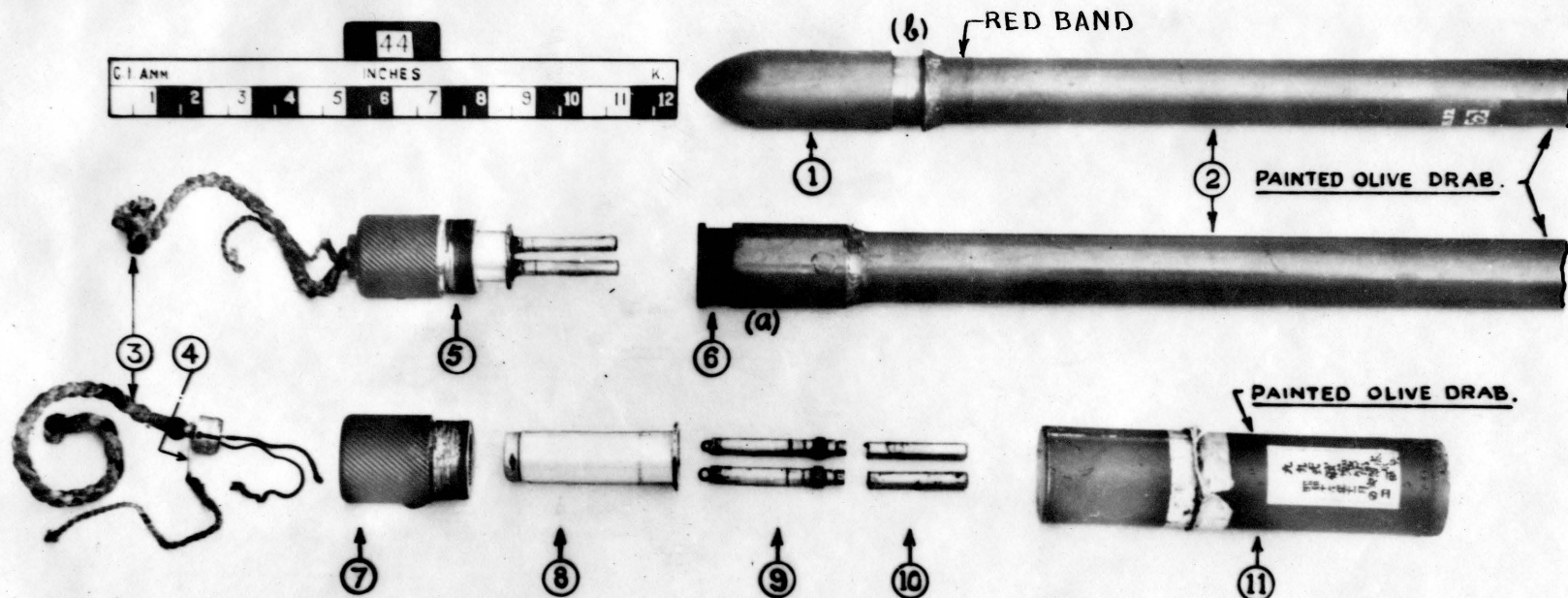
The balance is considered to be metal dust dissipated in the air and not recoverable.

SUMMARY OF DATA

19.

Weight of each length filled and plugged for transport	..	..	10-lb.
Nature of filling and weight in each length	..	Picric Acid	.. 3-lb. 2-oz.
Length of each length, plugged for transport	..	..	47-in.
Length of each length with pointed nose cover, ready for firing	..	..	51.25-in.
Diameter of tube (external)	..	..	1.4-in.
Diameter of tube (internal)	..	..	1.2-in. (30-mm.)

RESTRICTED.



- ① POINTED NOSE COVER, THREADED INTERNALLY.
- ② BODY, THREADED INTERNALLY AT ONE END (a) AND EXTERNALLY AT THE OTHER END (b).
- ③ FIRING LANYARD, WITH DOUBLE FRICTION CORD.
- ④ SAFETY PIN.
- ⑤ IGNITER SET ASSEMBLY WITH LOCKING COLLAR, THREADED EXTERNALLY.

- ⑥ TAIL TRANSIT PLUG, THREADED EXTERNALLY.
- ⑦ IGNITER SET ASSEMBLY, LOCKING COLLAR.
- ⑧ IGNITER SET, BODY.
- ⑨ IGNITER SET, TWIN DELAY TUBES.
- ⑩ IGNITER SET, TWIN DETONATORS.
- ⑪ METAL CONTAINER FOR IGNITER SET ASSEMBLY, COMPLETE WITH POINTED NOSE COVER.

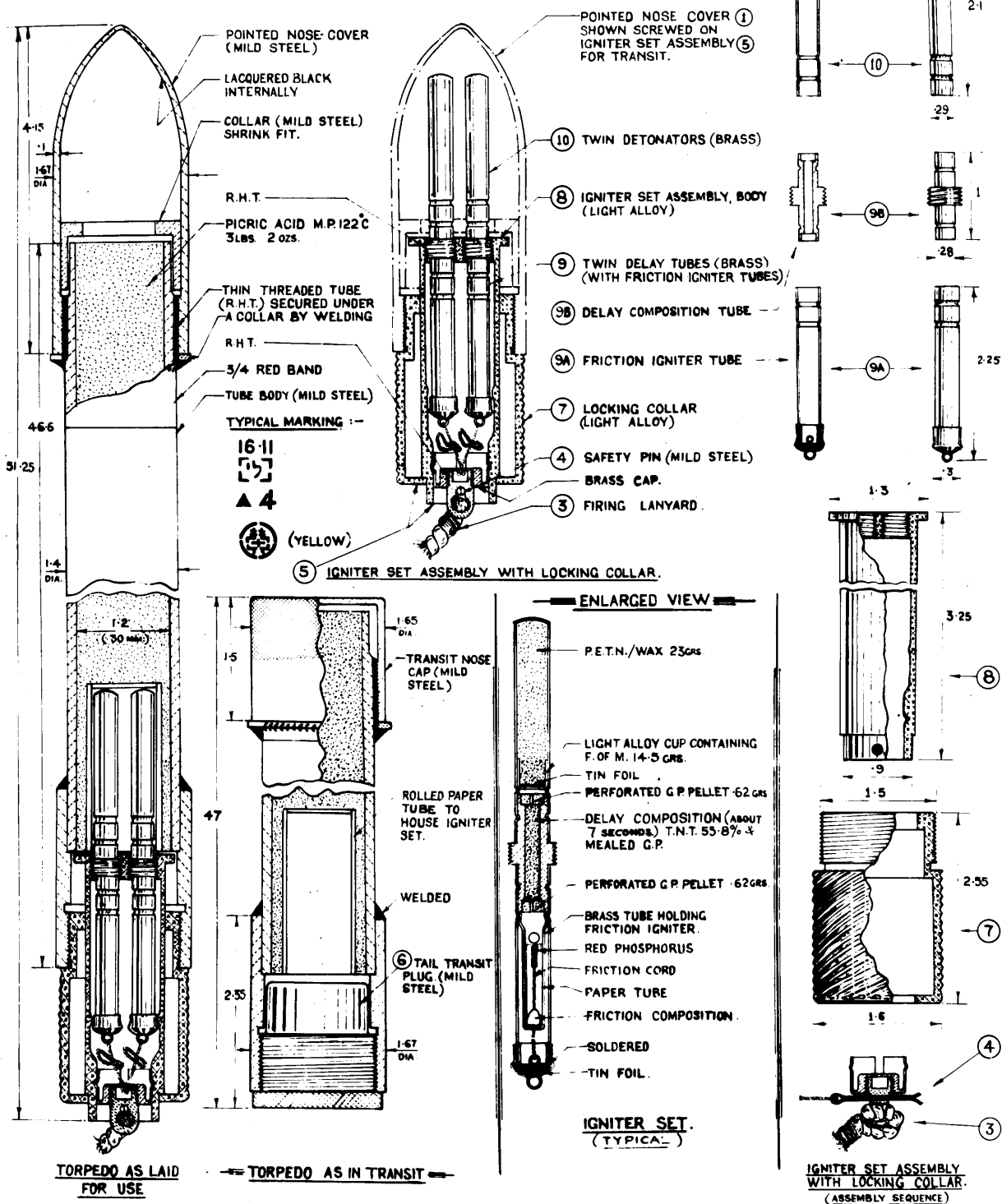
— JAPANESE BANGALORE TORPEDO TYPE 99 —
(STEEL, 30 M.M., STANDARD ISSUE.)

C.I. AMM. S/991
 KIRKEE, FEB. 45.

PLATE A.

RESTRICTED

TORPEDO PAINTED OLIVE DRAB EXTERNALLY
WEIGHT WITH IGNITER SET (5) AND NOSE COVER (1) 10 LBS.



JAPANESE BANGALORE TORPEDO TYPE '99

STEEL, 30 MM STANDARD ISSUE

GENERAL ARRANGEMENT & ASSEMBLY SEQUENCE.

DIMENSIONS IN INCHES

CIAMM 5/1029
 KIRKEE, MARCH 45

TOTAL WEIGHT
OF FRAGMENTS
A + B (ozs.)

14 1/2

11 1/2

20

15

37

24

18

23 LESS THAN 1/100 Oz.
7 METAL DUST.

TOTAL WEIGHT:-
10 Lbs. 10 Ozs.

TWO LENGTHS OF TORPEDO, FRAGMENTS RECOVERY

TOTAL WEIGHT OF TWO EMPTY LENGTHS:- 12 Lbs. 12 Ozs.

WEIGHT OF METAL RECOVERED :- 10 Lbs. 10 Ozs.

RECOVERY PERCENTAGE :- 82.5.

(A)

(B)

POINTED
NOSE-COVER

MORE THAN

IGNITER SET

FRAGMENTS FROM FRONT (POINTED COVER END) LENGTH
(VERY ROUGHLY)

FRAGMENTS FROM REAR (IGNITER END) LENGTH
(VERY ROUGHLY)



WEIGHT CATEGORY A & B Ozs.	NUMBER OF FRAGMENTS A + B
MORE THAN 1 Oz.	9
1 - 1/2	16
1/2 - 1/4	43
1/4 - 1/8	75
1/8 - 1/25	464
1/25 - 1/50	834
1/50 - 1/100	1323
LESS THAN 1/100	5830 METAL DUST.

RESTRICTED.

TYPICAL FRAGMENTATION

- OF -

JAPANESE BANGALORE TORPEDO TYPE '99

TWO LENGTHS SCREWED TOGETHER & INITIATED WITH STANDARD JAPANESE IGNITER AS FOR SERVICE

C.I. AMM. S/ 1064
KIRKEE, APRIL 45.

PLATE C