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JAPANESE AMMUNITION

C I AMM. TECHNICAL REPORT

No. 30

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CARTRIDGE Q.F. 75MM.

WITH

HOLLOW CHARGE A.T /H.E

SHELL (TYPE 2)

CARTRIDGED FOR

75MM. REGIMENTAL GUN. TYPE MEIJI '41

COMPILED BY
THE CHIEF INSPECTOR OF AMMUNITION,
KIRKEE.

1945.

RESTRICTED.

JAPANESE AMMUNITION.

C. I. AMM. TECHNICAL REPORTS.

REPORT NO. 30 FEBRUARY 1945.

HOLLOW CHARGE A/T., H.E. SHELL (TYPE 2) CARTRIDGED FOR 75-MM. REGIMENTAL GUN, TYPE MEIJI 41.

G E N E R A L.

During the Japanese retreat from Assam and Manipur in 1944, quantities of hollow charge shell cartridged for the 75-mm. Type Meiji 41, regimental gun, were captured. This was the first definite information of hollow charge ammunition being used by the Japanese in this area, although, it was known that they had used hollow charge ammunition in the Pacific Ocean Area. So far as is known this hollow charge shell has been used in this area only in the Type Meiji 41 regimental gun. It could, of course, if suitably cased be used in the Type '94 Mountain Gun and the Meiji 38 series of field guns. There is a report that this shell has actually been found in New Guinea cased for the Type '94 mountain gun.

It is interesting to note that this is also the first information we have had of steel cases being used in the Burma area for gun ammunition by the Japanese. All hollow charge rounds so far examined have been cased with steel cases, the greater part being rust-proofed by a brass plating process; but a small number are rust-proofed by a cadmium process.

2. Before describing the hollow charge round in detail it will be useful to make a few brief remarks in general on the ammunition for this gun. The gun is known as the Type Meiji 41 (1908) (infantry) regimental gun, - M.V. about 1250 f.s., and maximum range 7700 yds.; H.E. shell filled and fuzed about 13½ to 14 lbs., shrapnel shell about 15 lbs. It is sometimes described, on packages, etc., as the Type 41 mountain gun. There are a number of different types of ammunition and these are shown in the illustration at the end of this report, as Plate F. There is known to be an A.P./H.E. round also for this gun, but a sample has not yet been examined at Kirkee.

3. The description below of the hollow charge round is based on examinations here of a number of rounds.

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

CARTRIDGE.

Case:-

4. The appearance and general make up of the case can be seen .....

seen from Plates A and B. This conforms generally to normal practice for cartridge cases used in this gun. An outstanding point is that the case is made of steel. Both rust-proofing processes (brass plating and cadmium plating) have not lasted very well, and in most cases the cartridge cases have become rusty.

5. The approximate cubic capacity for ballistic purposes is 720 c.cs. It is interesting to note that similar to the brass cartridge case for the 75-mm. Type '88 A.A. field gun (see C.I.Amm. Technical Report No.29), the primer in this steel case is enclosed in a pocket in the base and vented forward through a small hole 0.33-in. in diameter. The normal brass case for the Meiji 41 regimental gun does not have this form of pocket.

6. Stencilled/stamped markings on the cartridge case of the round actually dealt with in this report indicate that the case was manufactured at Osaka in September 1943 and assembled in the round in the same month. It has not been possible to definitely identify the two stencilled Japanese characters, and it is not clear whether these are intended to indicate that the shell is of the hollow charge type. It is believed they are filler and inspection marks, and the 'A' refers to the propellant. The "II" in Roman figures on the side of the case is also not understood. It may have some connection with the hollow charge filling which is known to be Type 2.

Propellant:-

7. There is nothing unusual in the propellant or in the method of securing it in the cartridge case. It follows usual Japanese practice when the short primer (27-mm. primer hole) is used. The charge weight is 7-ozs. and the general make up of the charge can be seen clearly in Plate B. The silk bag used for the propellant with the markings thereon is shown in Plate A. The nature of propellant is given in detail under chemical analysis below. A lead tinfoil decoppering strip, following usual Japanese practice, is secured by adhesive to the glazedboard closing cup.

Primer:-

8. The primer is of the usual short type (27-mm. primer hole). The thread of this primer has approximately a 55 degs. angle with a pitch of 0.056, 18 threads per inch. Other details of the primer can be seen clearly in Plate B.

SHELL.

Body:-

9. The general appearance and make up of this shell which embodies the hollow charge principle will be seen from the drawings in Plates A and B. The appearance of the shell and the assembly sequence of the components are shown in the photograph at Plate C.

For convenience .....

10. For convenience of description the shell may be divided into three parts :-

(a) Zinc base alloy head (10) varnished internally with a black finish.

(b) Thin-wall steel body (4) also varnished internally with a black finish.

(c) Metal liner (8) consisting of a steel cone and an aluminium flash tube.

11. The construction and details of these can be seen clearly from the drawing in Plate B and the assembly sequence from Plate C. A detailed analysis of the metal of these components is given under metallurgical analysis below. Details of the plastic used for the transit plug are given under chemical analysis below.

12. The stampings on the shell body indicate that it was manufactured in May 1943.

Filling:-

13. This consists of a precast block of 1-lb. 2-ozs. of T.N.T./R.D.X. (50/50). The block is shaped internally to give a hollow charge effect and the metal liner fits snugly in the block. This arrangement can be seen from the drawing at Plate B. The block filling is contained in a rolled paper container with stencil markings as shown in Plate A. The container is impregnated in wax. Full details of the composition used are given in the chemical analysis below. The shell was filled in August 1943.

Exploder, or Primer.

14. At the base of the block filling, in continuation of the flash tube, is a special exploder forming a self contained exploder unit separate from the filling. The make up of this exploder is clearly shown in Plate B. Its function is to boost up and transmit the detonating wave/flash from the fuze in the nose of the shell to the base of the main filling, detonating the latter to give the intended hollow charge effect. The flash distance from bottom of fuze gaine to top of exploder is 6½-inches.

15. It is interesting to note that this exploder is identical in every detail to that used in the H.E. A.T. hollow charge rifle grenade (30-mm.) which will be described later in a Technical Report, now nearing completion.

Fuze:-

16. The shell fuze hole is threaded to take the Type '88 (24-mm. fuze hole), and in view of the nature of the round it is assumed that the instantaneous, Type '88 will always be used. This is supported by the fact that this type of fuze has been found packed with the hollow charge rounds.

PACKING. .....

P A C K I N G.

17. The method of packing used for the rounds and fuzes, is shown clearly in Plates D and E. In most cases the paper wrapping in the wooden box was not completely waterproof, and the cartridge cases were found rusted, particularly where they come in contact with the wooden packing frame. The fuzes were very well packed as shown in Plate D and it is thought that they were specially packed for these hollow charge rounds. This type of fuze packing, a soldered tin band and high enamel finish on container, has not previously been encountered for other Type '88 fuzes. Similarly very lengthy instructions are printed by an enamel process on the side of the container which is also uncommon with the packing used for this type of fuze. The fuzes were all in a very good condition when the containers were opened.

METALLURGICAL ANALYSIS.

(By the Inspector of Metal & Steel, Ishapore).

Head - Zinc base alloy casting.

18.

(1)	Density.- - - - -	6.05 gms.
(2)	Weight. - - - - -	409.7 gms.
(3)	Tensile.-- - - - -	4.0 tons/sq. in.
	Ultimate Tensile Strength, Elongation. - - - - (Specimen taken along dome).	Nil.
(4)	V.P.H. - - - - -	73.
(5)	Analysis. - - - -	Al. 3.00 % Cu. 0.052 % Pb. 0.06 % Cd. 0.0075% Sn. 0.012 % Fe. Trace. Mg. Nil.
(6)	Stability. - - - -	Crumbled to powder after test for 4 days.
(7)	Macro etch & Fracture. - -	Specimen full of blow holes. Shows large grains.

Body - Steel (Thin-walled shell).

19.

(1)	Markings. - - - -	March 1943 in Japanese characters.*
(2)	Thread. - - - - -	Right Handed Screw.
(3)	Identification Painting. -	Yellow band at mid length of body. Red band at top of (Mazak) head.
(4)	External diameter. - -	2.91 in.
(5)	Length of body. - - -	7.2 in.
(6)	Wall thickness. - - -	0.25 in.
(7)	Finish forged cavity.	
(8)	Hardness. - - - -	321 V.P.H.
(9)	Tensile. - - - -	Yield strength.- 43.5 tons/sq. in. Ultimate tensile strength.- 68.0 tons/sq. in. Elongation.- 17.0 % R. of A.- 40.0 %
	Ratio. - - - - -	$\frac{Y}{B}$ .. 64.0 %

*The shell metallurgically examined is not the same as that shown in Plate A, etc.

Contd.- .....

Body - Steel (Thin-walled shell).- (Contd.-)

(10) Analysis.	- - - -	C.% Si.% Mn.% 0.67; 0.2; 0.61; S.% P.% .054; .054; W.% 1.0 (approx.).
(11) Method of Manufacture.	- -	Forged with finished avity. Heat-treated & externally machined.

Note:- No base plate present.

Driving Band - Copper.

20. (1) V.P.H.	- - - - -	105.
(2) Analysis.	- - - -	99.85 % Cu.
(3) Method of manufacture.	- -	From solid drawn tube.

Cone and Flash Tube.

(i) Cone - Steel.

(a) V.P.H.	(i) On dome.	- 243)	i.e. approx.
	(ii) On flange at mouth.	- 274)	45/50 tons tensile.
	(iii) At mid length	- 224)	
(b) Analysis.	- - - -		C. 0.36%; Mn. 0.74%.
(c) Method of manufacture.-	-		Apparently hot pressed to cone shape with a wall thickness of .09-in. and then finish machined inside and outside to the taper section of cone.

Note:- Finish very good and well lacquered.

(ii) Flash Tube - Solid drawn aluminium tube.

(a) V.P.H.	- - - - -	30 - 34.6.
(b) Wall thickness.	- - -	0.02 in.
(c) Internal diameter.-	- -	0.065 in.
(d) Tensile.	- - - -	6.4 tons/sq. in. (U.T.S.).
(e) Analysis.-	- - - -	Cu. (Under .1%) Mg. (About 2.0%) Si. 0.35% Al. Rest.

Cone fixed on to the tube by spinning & bending.

Cartridge Case.- Details will follow as a supplement to this report.

CHEMICAL ANALYSIS. ....

CHEMICAL ANALYSIS.

(by the Chief Inspector of Military Explosives, Kirkee).

PROPELLANT.

21. 7-ozs. of flakes of graphited N.C. with diphenylamine, size 0.4" x 0.3" and 0.025" thick.

N.C. + graphite.	97.7 %
Diphenylamine.	2.3 %

PRIMER.

22. Magazine -

62 grs. of pressed gunpowder, size approx. G.20.

Cap Composition -

0.6 grs. of a composition of :-

Mercury fulminate)	Quantitative analysis not
Potassium chlorate)	possible, the quantity
Antimony sulphide)	being too small.

SHELL.

23. Main (block) filling.

1 lb. 2 ozs. of cast T.N.T./R.D.X. (50/50).

EXPLODER.

24. Filling in the aluminium container -

95.6 grs. of R.D.X./Wax (90/10).

Filling in flanged cup -

7.1 grs. of P.E.T.N./Wax.

Filling in the inverted cup -

Lead azide.

PLASTIC PLUG.

25. A phenol formaldehyde moulding containing about 60% cotton filler. The accetone-soluble matter, water-soluble matter and PH of the aqueous extract were much in excess of the limits set down for Grade 'A' plastics; ammonia in aqueous extract was in slight excess. In other respects, the sample conformed to Grade 'A' plastics. The sample gave 3.61 % ash composed of siliceous matter, iron oxide, aluminium oxide, zinc oxide, calcium oxide and magnesium oxide.

A P P R E C I A T I O N.

(Economic, manufacture and development aspects).

26. The use of a hollow charge shell in comparatively large numbers for this gun may have been influenced by the fact

that .....

that the gun is a relatively low velocity weapon. Although there have been reports that an A.P./H.E. shell exists, none have been encountered in the Burma area.

27. The general construction and finish of this hollow charge round is good. The exploder unit is particularly well made and the workmanship is of a high standard. It will be seen that the most modern explosives have been used throughout for the main filling and in the exploder. The shell body, head and metal liner, etc. very closely resemble the German, 75 mm. hollow charge shell, referred to in O.B. Proc. No. 23326. The steel and composition washers closing the mouth of the steel cone are however absent in the Japanese shell. The total weight of the Japanese shell filled and fuzed is, however, 8 lbs. 4 ozs. against 10 lbs. ½ oz. for the German shell. H.E. filling in the Japanese shell weighs practically the same i.e. 1 lb. 2 ozs.

28. It is considered a reasonable assumption that the design of the Japanese hollow charge shell is based on the German hollow charge shell, above. That the cone angle and shape of the cone is practically identical with that used in the German shell, supports this assumption. The standardization of the exploder unit for use in this hollow charge shell and in the Japanese H.E., A.T., rifle grenade (30 mm. rifled cup discharger) is significant. The H.E., A.T., rifle grenade and discharger are very close copies of the German Gewehr Panzergranate and discharger.

29. The performance of the German shell, assuming correct functioning, is estimated in O.B. Proc. No. 23326 to be 70 mm. at normal and 60 mm. (30 degs.) of homogeneous armour plate I.T. 80. Subsequently the German shell perforated a 50 mm. armour plate at 30 degs. (O.B. Proc. 25569). It is considered that the Japanese hollow charge shell will have a performance not less than that of the German shell.

30. The Inspector of Metal & Steel, Ishapore, in his report remarked that the outstanding features of this Japanese hollow charge shell were :-

(i) The very inferior type zinc base alloy used for the head which may be prone to complete disintegration in hot humid climates and at intermediate stages of deterioration to break up on firing.

(ii) The finished cavity forged thin walled heat-treated steel body of low tungsten carbon steel showing 43 tons yield.

(iii) The somewhat unnecessary presence of tungsten in the body confirms other investigations that generous supplies of this metal are apparently available in Japan.

(iv) The 2% Magnesium content of the aluminium alloy flash tube. Although this may have been used merely as a matter of convenience as there appears no special merits in its use in the annealed condition of the tube.

SUMMARY OF DATA. ....

SUMMARY OF DATA.

COMPLETE ROUND.

Length (fuzed). - -	18 ins.
Weight (fuzed). - -	10 lbs. 14 ozs.
Weight (plugged).- -	10 lbs. 9 ozs.

CARTRIDGE CASE.

Length.- - - -	7.25 ins.
Diameter over rim. -	3.56 ins.
Diameter under rim. -	3.31 ins.
Diameter at neck. -	2.98 ins.

PROPELLANT.

Weight and nature. -	7 ozs. of graphited N.C. flakes. Contained in an undyed silk bag.

PRIMER.

Type. - - - -	Short, (27 mm. primer hole).
Length. - - -	0.78 ins.
Diameter over rim. -	1.3 ins.
Magazine filling. -	62 grs. of pressed gunpowder.
Cap composition. - -	0.61 grs. of a composition of :- Mercury fulminate, Antimony sulphide, Potassium chlorate.

SHELL.

Type. - - - -	Hollow charge H.E., A.T. (Type 2).
Length. - - -	9.47 ins.
Diameter over body. -	2.9 ins.
Diameter over driving band. - - -	3.01 ins.
Weight and nature of filling. - - -	1 lb. 2 ozs. of cast T.N.T./R.D.X. (50/50).
Weight filled & plugged.	7 lb. 15 ozs.
Weight filled & fuzed.-	8 lb. 4 ozs.
Coloured band markings.	Shell painted black with 0.35 in. Yellow band round middle of body; red band at the nose.

FUZE.

Type. - - - -	Percussion, Type '88 Instantaneous, A (24 mm. F.H.).
Length. - - -	3.56 ins.
Weight. - - -	6 ozs.

PACKING.

Two plugged rounds with two fuzes, in S.T.B. containers, in a wooden box.

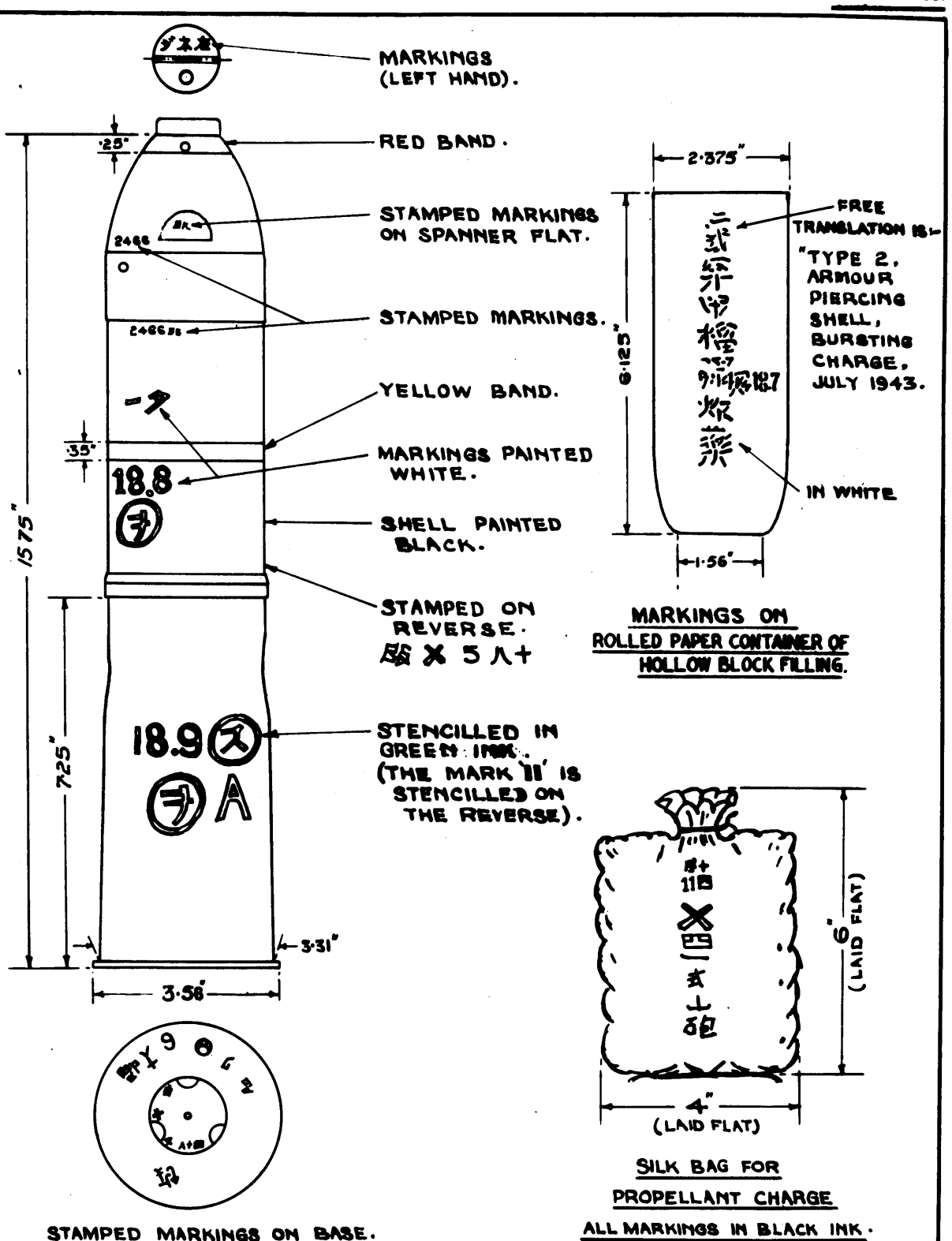
Stowage dimensions of wooden box.-

Length. - - -	24⅜ ins.
Breadth. - - -	12 ins.
Height. - - -	6⅞ ins.
Weight (filled). - -	41 lbs.

- oOo -

CHIEF INSPECTORATE OF AMMUNITION.
INDIA, KIRKEE.

FIRST ISSUE,
FEBRUARY, 1945.



STAMPED MARKINGS ON BASE.

MARKINGS ON ROLLED PAPER CONTAINER OF HOLLOW BLOCK FILLING.

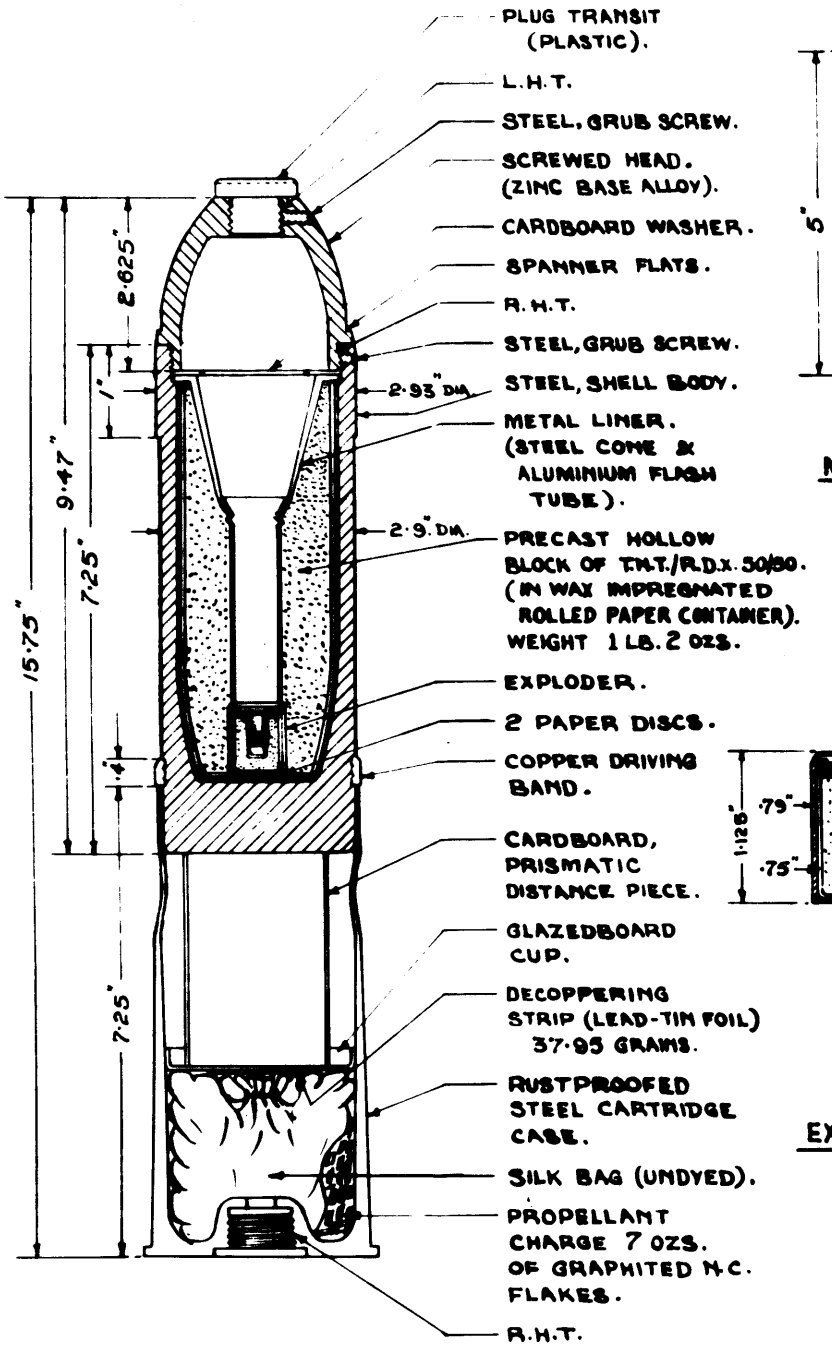
SILK BAG FOR PROPELLANT CHARGE

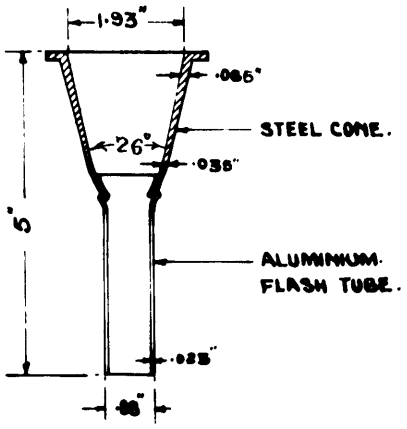
ALL MARKINGS IN BLACK INK.

HOLLOW CHARGE A/T H.E. SHELL (TYPE 2) CARTRIDGED FOR 75 MM. REGIMENTAL GUN TYPE MEIJI 41

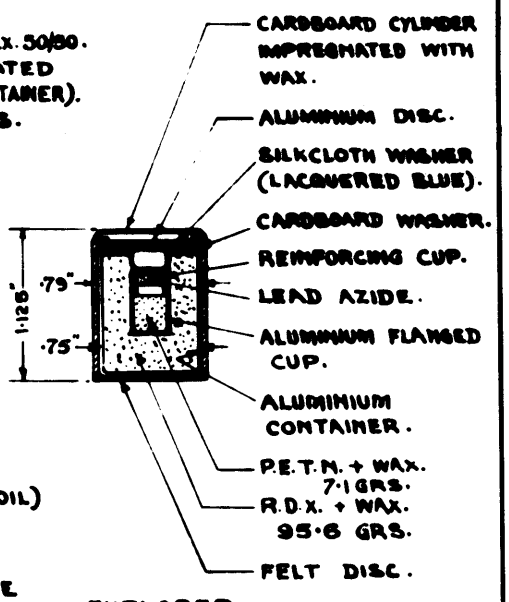
(MARKINGS AND EXTERNAL DIMENSIONS)

C.I.A.M.M. S/922.
KIRKEE. NOV. '44.

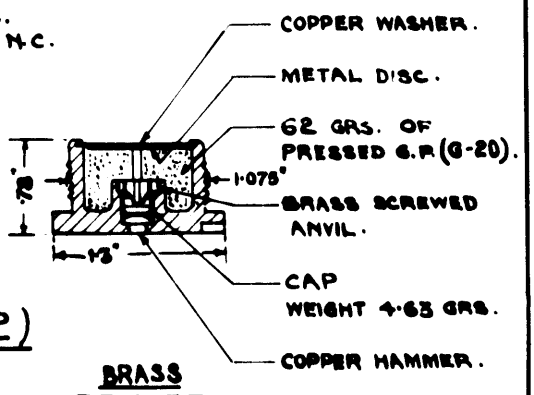




METAL LINER



EXPLODER



BRASS PRIMER

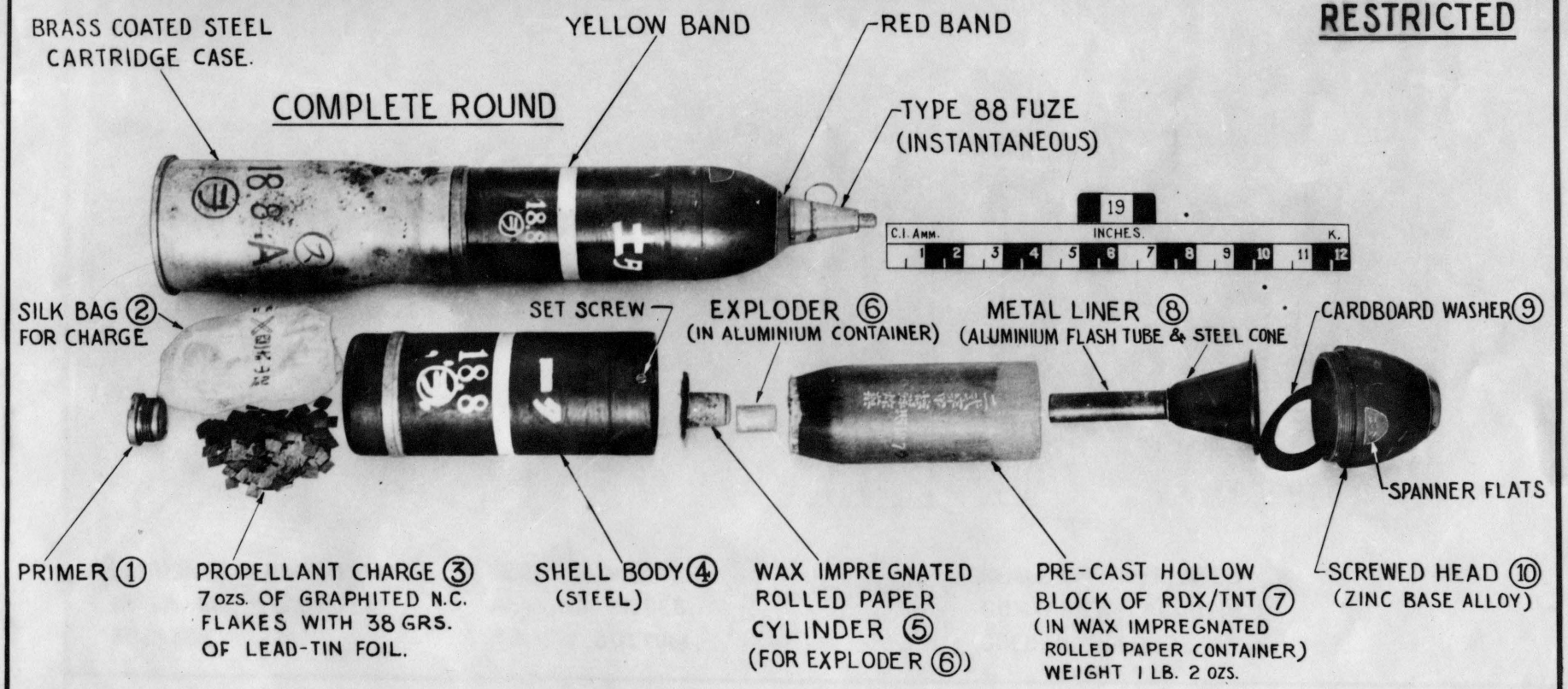
WEIGHT OF COMPLETE ROUND WITHOUT PLUG – 10 LB. 9 OZS.

HOLLOW CHARGE A/T H.E. SHELL (TYPE 2) CARTRIDGED FOR 75 MM. REGIMENTAL GUN TYPE MEIJI 41

(INTERNAL DETAILS AND DIMENSIONS)

C.I.A.M.M. 8/521.
KIRKEE. NOV. '44.

RESTRICTED



HOLLOW CHARGE A/T H.E. SHELL (TYPE 2)

CARTRIDGED FOR

75 MM. REGIMENTAL GUN TYPE MEIJI '41.

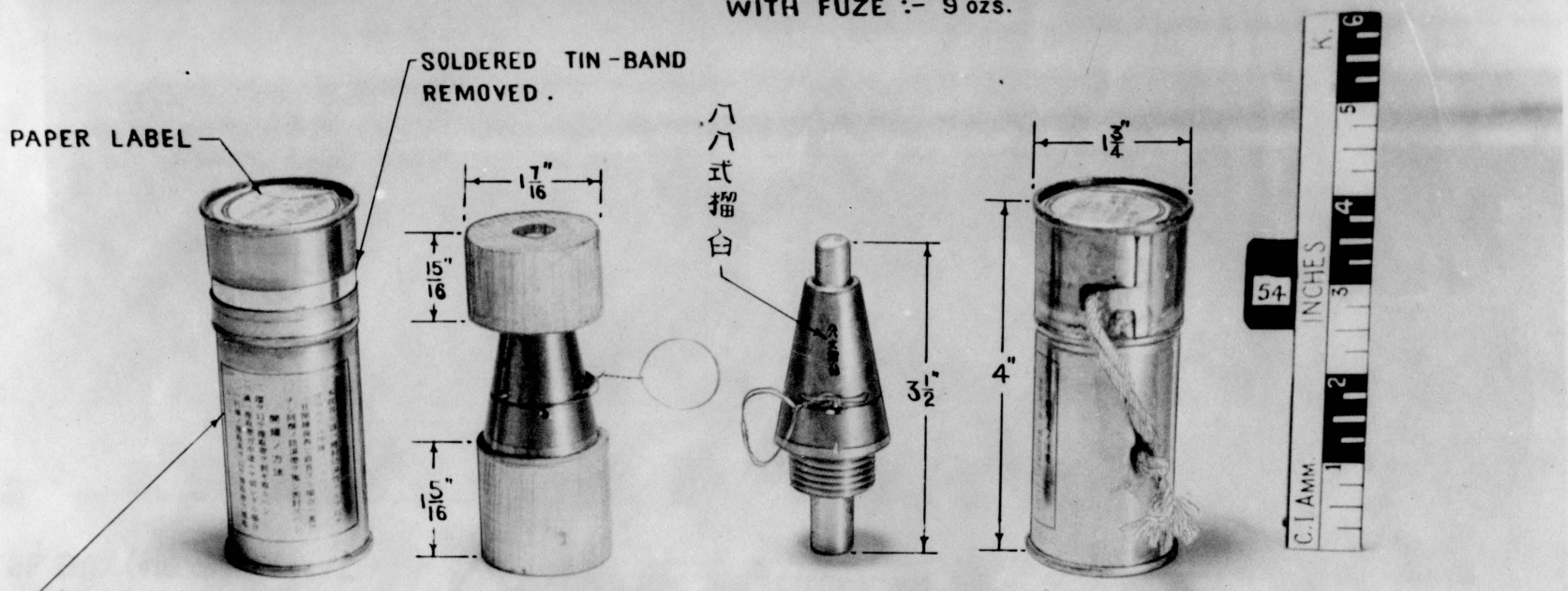
(COMPLETE ROUND AND ASSEMBLY SEQUENCE)

C.I. AMM. S/920
KIRKEE. OCT. 1944.

PLATE C.

RESTRICTED.

WT. OF CONTAINER PACKED WITH FUZE :- 9 ozs.



MARKINGS PRINTED BY ENAMEL-TRANSFER PROCESS.

FUZE IN WOODEN PACKING PIECES TOP & BOTTOM.

SEALED TIN-PLATED CONTAINER, LACQUERED GOLDEN COLOUR.

FUZES TYPE '88 INSTANTANEOUS

PACKED WITH

HOLLOW CHARGE A.T. H.E. SHELL (TYPE 2)

CARTRIDGED FOR

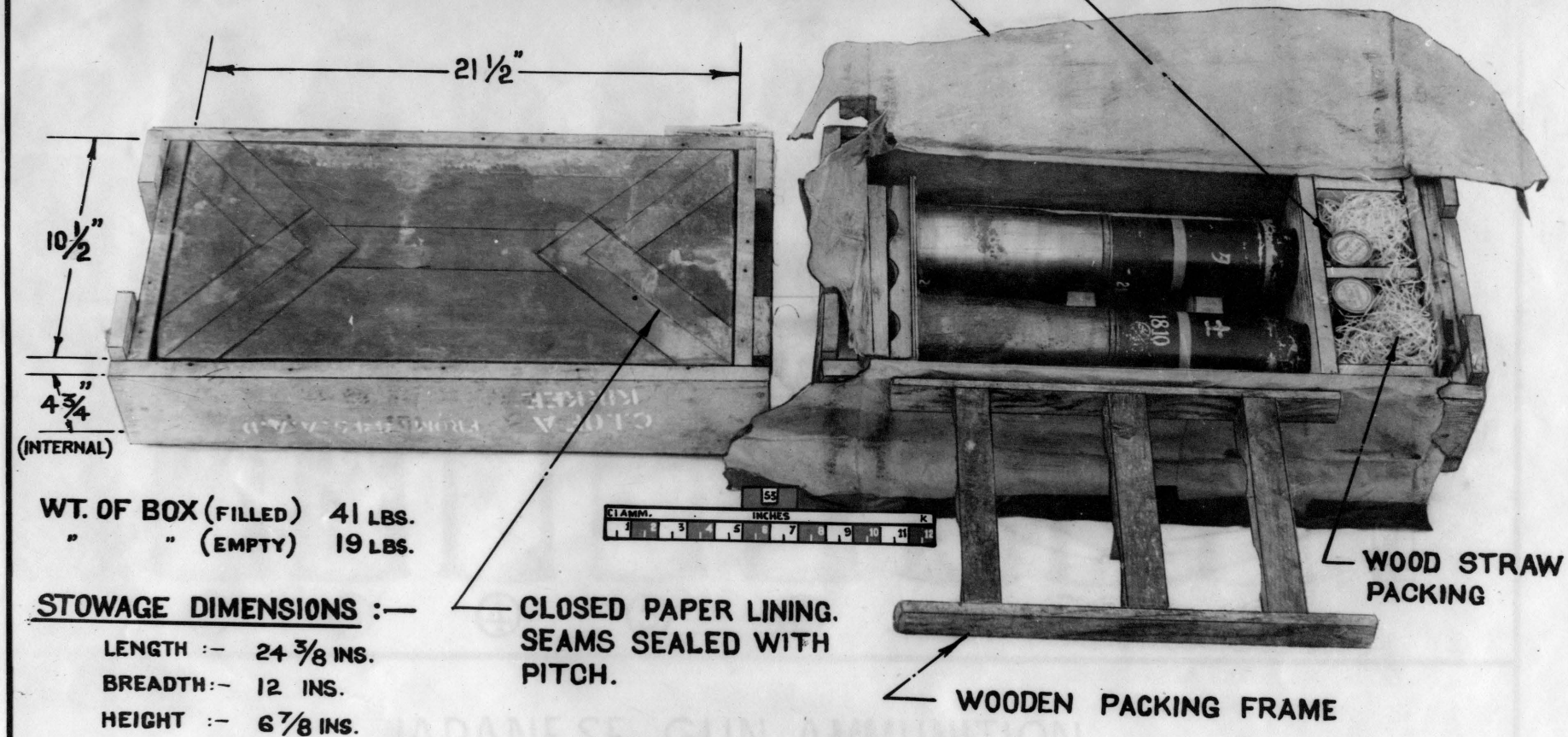
JAPANESE 75 MM. REGIMENTAL GUN TYPE MEIJI 41.

PACKING DETAILS.

PLATE D.

C.I.AMM.S/982
KIRKEE JAN 45

RESTRICTED



HOLLOW CHARGE A.T. H.E. SHELL (TYPE 2)

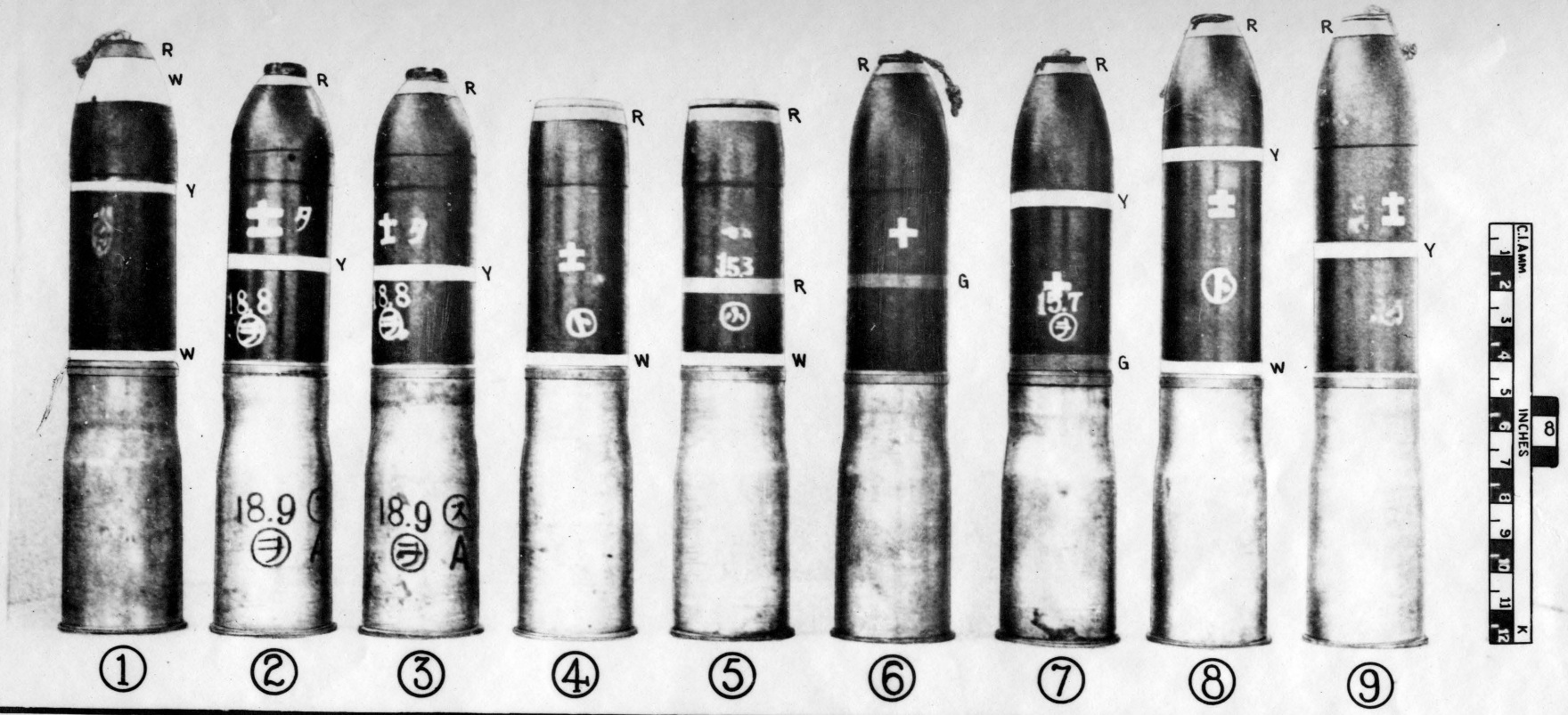
CARTRIDGED FOR

JAPANESE 75MM. REGIMENTAL GUN TYPE MEIJI 41.

PACKING DETAILS.

C.I. AMM./S 981
KIRKEE. JAN. 45.

PLATE E.



R = RED BAND, W = WHITE BAND
Y = YELLOW BAND, G = GREEN BAND

JAPANESE GUN AMMUNITION

TYPICAL FOR

75 MM. REGIMENTAL GUN TYPE 'MEIJI 41'

C.I. AMM. S/913
KIRKEE. OCT. 1944

KEY TO PHOTOGRAPH OPPOSITE

No.	TYPE OF SHELL	Complete Round			Length of Case	Propellant		H. E. Filling or Burster. (including Exploder)		
		Weight		O/A Length		Weight	Nature	Weight		Nature.
		Lbs.	oz.	Ins.	Ins.	ozs.		Lbs.	oz.	
1	H. E. (Enlarged Nose-adapter.) ..	12	7	16 3/4	7 1/4	9·34	Square Flakes of N. C. + Graphite 97·7% and Diphenylamine 2·3 %	2	13 1/4	T. N. T., Grade I
2	H. E. HOLLOW CHARGE, .. (Steel Cartridge Case, rust proofed by apparent cadmium process.)	10	9	15 3/4	,,	7	,,	1	2	T. N. T./R. D. X. (50 : 50 approx).
3	H. E. HOLLOW CHARGE. .. (Steel Cartridge Case, rust proofed by brass plating.)	10	9	15 3/4	,,	7	,,	1	2	- Do - - Do -
4	SHRAPNEL ..	16	3	15	,,	9·25	,,	0	3 1/2	G. P.
5	SHRAPNEL ..	16	1	15	,,	9·38	,,	0	4	G. P.
6	H. E. ..	15	8	16 1/2	,,	9·34	,,	1	1/4	T. N. T., Grade I.
7	H. E. ..	15	9	16 1/2	,,	9·35	,,	1	1/4	- Do - - Do -
8	H. E. ..	15	3	17 3/4	,,	9·35	,,	1	13 1/4	T. N. T., Grade II
9	H. E. ..	15	10	17 3/4	,,	9·36	,,	1	14 1/4	T. N. T., Grade I

PLATE F.

Notes.

Round 1: This is a shrapnel shell body adapted by using an enlarged nose adapter for a H. E. Filling. Note the increased weight of filling and prominent white nose. Possibly, an indication to the user that it is particularly suitable against earth works using a slight delay fuze.

Rounds 4 and 5: Only slight differences in construction and filling. The reason for the red band in middle of shell is not yet clear.

Rounds 6 and 7: These have tapered cavities with extremely thick walls and small weight of filling, probably intended to give high fragmentation effect for anti-personnel use. Note green band. The shell has no bourrelet.

Rounds 8 and 9: These have parallel wall cavities and comparatively thin walls. These shells are identical with those cased for the Type '94 Mountain Gun. The reason for the white band is not yet clear.