DIRECTOR OF ARMAMENTS (INDIA) PUBLICATION.

L Donaldson
for Major Bonney

RESTRICTED.

The information contained in this Report is not to be communicated, either directly or indirectly, to the press or to any person not authorised to receive it.

JAPANESE AMMUNITION

C.I. AMN. TECHNICAL REPORT

No. 24 (SECOND ISSUE)

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

AIRCRAFT CANNON CARTRIDGES, 12·7 M.M. SEMI-RIMLESS. FOR AIRCRAFT CANNONS BROWNING TYPE.

COMPILED BY
THE CHIEF INSPECTOR OF AMMUNITION,
KIRKEE.

1945

RESTRICTED

JAPANESE AMMUNITION

C. I. AMN. TECHNICAL REPORTS

REPORT NO.24 (SECOND ISSUE) AUGUST 1945

JAPANESE AIRCRAFT CANNON CARTRIDGES, 12.7-mm. SEMI-RIMLESS FOR AIRCRAFT CANNONS BROWNING TYPE

G E N E R A L

Quantities of 12.7-mm. Aircraft Cannon ammunition were frequently received during the years 1943 and 1944 from aircraft shot down in the India and Burma theatres, for critical examination at Kirkee and some Reports have already been issued on these. This Report is intended to collate and supplement all earlier information and repeat it in a form more suitable for reference purposes. None of this ammunition has been received in 1945 which may be due either to the decreasing use of Japanese fighter aircraft in these areas or due to the fact that the 12.7-mm. aircraft cannon is not now so commonly used. The former is thought to be the most probable reason.

2. So far as is known there are two 12.7-mm. weapons used in Japanese aircraft:-

(a) Type '01 Aircraft Cannon.
(b) Type '89 Aircraft Cannon.

Both these weapons are of the Browning Type and take the same ammunition with different natures of shell etc.

3. Japanese 12.7-mm. ammunition is practically identical with Italian 12.7-mm. ammunition and at one time considerable quantities appear to have been obtained from the Italian Government. This is clear from the fact that much of the ammunition captured had Italian markings; the stamping "B.P.D." on the base indicates that the cartridges were made by the Italian firm of Bombini Parodi Delfino. Dates of manufacture examined were 1937, 1938 and 1939. Much of the ammunition captured was, however, of Japanese manufacture and following their usual custom with Small Arm Ammunition no base markings were used.

4. It will be seen from Plate A that 12.7-mm. ammunition of Japanese manufacture can be distinguished from similar ammunition of Italian manufacture by the colour markings on the shell, and the presence ~~absence~~ of Japanese characters on the fuze. In addition it will be seen from Plate B that the Italian cartridge case has usually a copper cap which is a push fit in the case and has the usual base markings. The Japanese manufactured case, however, has usually a brass cap ringed in and no base markings.

5. The 12.7-mm. (.5-in.) Japanese or Italian round is somewhat similar in appearance to the British .5-in. Vickers round except

that:-

(a) The Vickers .5-in. cartridge case is rimless while the Japanese is semi-rimless.

(b) The Vickers round is fitted only with a ball and A.P. bullet while the Japanese or Italian round has fuzed shell as well as bullets.

6. The Japanese or Italian 12.7-mm. cartridge can readily be identified from the American .5-in. Browning cartridge as follows:-

(a) The American cartridge case is about 3/4-in. longer.

(b) In the .5-in. Browning no shell are used but bullets only, similar to the .5-in. Vickers.

Note:- For convenience a distinction has been made here between a bullet and a shell. The shell is fuzed and has a H.E. or incendiary filling while the bullet is without a fuze, i.e. closed at the tip.

D E S C R I P T I O N

7. A photograph of eight different rounds examined at Kirkee is given at Plate A and a detailed description of each round will be given later. As the cartridge case is common to all rounds it will be convenient to describe it here and leave the description of each type of shell or bullet until later in the report.

8. A drawing of a typical cartridge case is given in Plate B. It will be noticed that the cartridge case is semi-rimless, the anvil being formed integral with the case. The body of the case tapers uniformly towards the mouth for a distance of approximately 2½-ins. It is then sharply necked down to a suitable diameter to accept the shell or bullet. The neck of the case is crimped on to the body of the shell or bullet in three places and the mouth is usually turned over to fit into the serrated cannelure in the shell. The Italian method of fixing the bullet or shell is similar to that of the Japanese.

9. All cartridge cases examined were made of brass.

10. The propellant found in all rounds was usually either graphited N.C. and N.G., with carbamite as a stabiliser, for Italian manufacture or graphited N.C. only with diphenylamine as a stabiliser for Japanese manufacture. In some rounds of Japanese manufacture examined late in 1944 the propellant was N.C. with D.N.T., and diphenylamine as a stabiliser. Full details of these propellants are given under Chemical Analysis below.

All rounds of Japanese manufacture had a piece of decoppering foil above the propellant charge, which consisted of either pure tin or lead-tin foil. The decoppering foil was not found in rounds of Italian manufacture.examined here.

The caps of cartridges examined were found to hold a charge varying from .8-gr. to 1.3-grs. of a composition similar to British "A" mixture, i.e. mercury fulminate, potassium chlorate and antimony sulphide.

11. Armour Piercing (Round No.1 Plate A). The only purely A.P. A.P. Cartridge examined was of Italian origin. This bullet can be distinguished by its black tip and brass or gilding metal envelope. Its make up is somewhat similar to the .5-in. Browning A.P. bullet, i.e. gilding metal envelope (or steel, coated with gilding metal) lead tip and hardened steel core. For details see Plate B. A fired round only, with separate bullet was examined. The length of the complete round appeared to be 4.5-ins. but this seems excessive in view of the length of other rounds being consistently about 4.2-ins.

12. Armour Piercing Tracer (Round No.2 in Plate A). This has the typical Japanese mouth marking of thin green and white bands, with the tip of the bullet painted pink. It gives a whitish trace turning to red when fired. Full details of the tracer composition are given under Chemical Analysis below.

13. Armour Piercing Tracer (Round No.3 in Plate A). This also has the typical Japanese mouth markings of thin green and white bands but has no coloured tip. The tracer composition used is believed to give a white trace as opposed to the red trace of Round No.2 above. Details of the tracer composition are given under Chemical Analysis below.

14. Armour Piercing Tracer (Round No.4 in Plate A). This round also has the typical Japanese mouth marking but one black band only is used. It is understood that this gives a longer burning bright red trace. Details of the tracer composition are given under Chemical Analysis below.

Note:- It will be seen that there are three natures of A.P. tracer rounds all of which are of Japanese manufacture, the only difference being in the nature of the tracing composition used.

15. High Explosive/Incendiary (Rounds Nos.5 and 6 in Plate A). These rounds are fitted with a fuzed shell having a filling of high explosive and incendiary composition. The rounds are of Italian manufacture and have distintive Italian markings i.e. body painted red or blue. The fuzes also are of Italian manufacture and can be easily identified by the letter 'J' stamped on the body and also by the slightly longer shape of fuze used. The cartridge case is stamped with the letters "B.P.D." (Bombini Parodi Delfino) followed by a date (year only) which in the samples examined was either 1937, 1938 or 1939. Full details of the method of filling of the shell are given in Plate B while the fuze used is the Type 'B' shown in Plate C and fully described below. Details of the shell fillings are given under Chemical Analysis below. The fillings in both shell are generally identical and the reason for the difference in the body colour is not known, see para. 25 below.

16. High Explosive/Incendiary (Round No.7 in Plate A). This round is of Japanese manufacture with the typical Japanese mouth marking of a white band. The fuze is stamped with Japanese markings and unlike the Italian fuze is not fitted with a gaine. This is described as Type 'A' fuze in Plate C. Full details of the shell are given in Plate B and details of the filling are shown under Chemical Analysis below.

17. High Explosive/Incendiary (Round No.8 in Plate A). See also Plate B. The method of manufacture of this shell is peculiar to the Japanese; a similar shell or bullet is found in 7.7-mm. calibre. It is thought that the round may be intended more for observation purposes than for its high explosive or incendiary effect. The round can readily be distinguished by the truncated tip of the bullet and the purple band at the junction of the bullet and case. Similar markings are used on the round in the 7.7-mm. calibre.

FUZES

18. There are two types of fuzes used; one type which is peculiar to cartridges of Japanese manufacture, is for convenience described as Type 'A' and the other found on cartridges of Italian manufacture is described as Type 'B'. Details of both fuzes are given in Plate C.

TYPE 'A' FUZE (Japanese Manufacture)

19. This is of Japanese manufacture and has Japanese characters indicating date of manufacture and maker stamped on the body of the fuze. All samples examined were manufactured in Tokyo Arsenal and the dates ranged from December 1941 to October 1943.

20. The general construction of the fuze can be seen from Plate C. It consists of a brass body in two parts, the lower portion (7) being securely coned over the upper portion (3). The steel striker (4) is operated by a small aluminium push rod (2), and the nose of the fuze is closed by a brass disc (1) which is secured by the turning over of the nose of the fuze. The head of the striker (4) has a circular ridge which seats in a circular groove formed in two brass centrifugal segments (5). These segments are retained in position round the striker by a steel spring (6). The lower portion of the fuze body (7) is screw-threaded externally to screw into the mouth of the shell and internally to take a brass detonator holder (8). This holder is fitted with a small detonator holding approximately .92-gr. of fulminate of mercury composition. The detonator shell is made of copper and the mouth is closed by a flanged copper disc. The detonator is held in position in the holder by the mouth of the latter being turned over.

21. Action. On firing the steel striker (4) sets back, the circular ridge bearing hard into the circular grooves in the segments (5), preventing any tendency for them to move outwards under centrifugal force. When acceleration ceases the centrifugal segments (5) tend to move outwards and owing to the inclined surfaces of the circular ridge in the striker (4) and the groove in the segments (5), the striker is caused to move slightly forward towards the nose and this is further assisted by creep action. The push rod has sufficient longitudinal movement to allow this. The segments are then free to move outwards against the weak pressure of the spring. The fuze is now armed and on impact the striker is forced into the detonator.

TYPE 'B' FUZE (Italian Manufacture)

22. This is of Italian manufacture and all samples examined

have had the letter 'J' stamped on the body of the fuze.

23. The general construction of this fuze can be seen from Plate C. It consists of a brass body (2), a brass striker (3), two aluminium centrifugal segments (4), copper alloy spring retaining segments (5) and a brass adapter (6) to take the brass gaine (9). The body of the fuze, unlike the Japanese fuze, is in one piece, the nose of the fuze being closed by a brass disc (1) which is held in position by the mouth being turned over. The fuze is threaded internally to take an adapter, the latter being screw-threaded externally to screw into the shell and internally to take the gaine. The main filling in the gaine is P.E.T.N. above which is pressed a layer of fulminate of mercury. On top of this is pressed a layer of fulminate of mercury composition to act as the initiator on being pricked by the sharp point of the striker. This composition is probably similar to British 'A' mixture, complete analysis has not been possible.

24. Action. The action is identical with that of Type 'A' fuze. It may be noticed, however, as a matter of interest that the slot to allow the segments to move outwards is, in the case of Type 'A' fuze, in the upper half of the fuze body while in the Type 'B' fuze it is actually in the adapter.

CHEMICAL ANALYSIS

(Chief Inspector of Military Explosives, Kirkee)

25.

Round No.1

No results of chemical analysis are available. A fired round only was examined.

Round No.2

Propellant .. Unitubular graphited rods 0.06-in. x 0.033-in. x 0.01-in. of composition,
N.C.+ volatile matter + graphite .. 96.7%
Diphenylamine .. 3.3%

Loose filling just below silk cloth disc .. Barium peroxide

Tracer composition (apparently pressed in ~~four~~ 2 increments)

1st layer (from base of bullet) .. Aluminium, magnesium, barium peroxide and wax

2nd layer .. Aluminium, magnesium, barium peroxide and wax

3rd layer .. Aluminium, magnesium, strontium, and barium peroxide and wax

4th layer .. Aluminium, magnesium, strontium nitrate, strontium peroxide and wax.

Round No.3

Propellant .. Unitubular graphited rods 0.052-in. x 0.032-in. x 0.01-in. of composition,
N.C. + volatile matter + graphite .. 95.5%
Diphenylamine .. 4.5%

Loose filling just below cloth disc .. Traces of potassium and barium salts

Tracer composition (apparently pressed in three increments)

1st layer (from base of bullet) .. Barium peroxide and magnesium

2nd layer .. Barium peroxide

3rd layer .. Barium peroxide, barium nitrate, potassium nitrate, aluminium and magnesium

Round No.4

Propellant .. Consists of graphited tubular N.C. powder with diphenylamine as the stabiliser, size 0.1-in. x 0.03-in.

Tracer composition .. Consists of strontium nitrate, strontium peroxide, magnesium, aluminium and waxy matter

Round No.5

Propellant .. Black shining tubular grains 0.1-in. x 0.55-in. x 0.02-in. consisting of:-
Carbamite .. 2.0%
Petroleum wax .. 1.5%
N.G. .. 35.5%
Graphite, volatile matter and N.C. .. 61.0%

Shell
Top filling .. P.E.T.N./Wax

Bottom filling .. T.N.T. .. 21.2%
Wax .. 0.9%
Aluminium .. 41.0%
Potassium chlorate .. 1.4%
Potassium perchlorate .. 35.5%

Round No.6

Propellant .. Black shining tubular grains 0.1-in. x 0.55-in. x 0.02-in. Composition:-
Carbamite .. 2.0%
Petroleum wax .. 1.5%
N.G. .. 35.5%
Graphite, volatile matter and N.C. .. 61.0%

Shell

Top filling .. P.E.T.N./Wax

Bottom filling .. T.N.T. .. 18.7%
Wax .. 1.9%
Aluminium .. 41.1%
Potassium perchlorate .. 35.1%
Potassium chlorate .. 2.8%
Iron in traces

Round No.7

Propellant .. Graphited unitubular rods 0.05-in. x 0.025-in. x 0.01-in.
Composition:-
Diphenylamine .. 1.6%
D.N.T. .. 6.9%
Graphite, volatile matter and N.C. .. 91.5%

Shell

Top filling .. R.D.X. .. 98.5%
Wax .. 1.5%

Bottom filling (incendiary) .. Wax .. 2.8%
Aluminium .. 14.8%
Magnesium .. 32.2%
Barium nitrate .. 46.7%
Total .. 96.5%

Round No.8

Propellant .. Graphited unitubular rods 0.05-in. x 0.025-in. x 0.01-in.
Composition:-
Diphenylamine .. 1.6%
D.N.T. .. 6.9%
Graphite, volatile matter and N.C. .. 91.5%

Shell

Top filling

Inner liner .. R.D.X. .. 49.3%
P.E.T.N. .. 50.0%
Wax .. 0.7%

Outer liner .. R.D.X. .. 48.6%
P.E.T.N. .. 51.3%
Wax .. 0.1%

Incendiary composition .. Wax .. 2.8%
Aluminium .. 14.8%
Magnesium .. 32.2%
Barium nitrate .. 46.7%
Total .. 96.5%

APPRECIATION
(Economic, manufacture and development aspects)

26. This is an old equipment and out of date compared with modern aircraft cannon equipments. Its velocity is comparatively low and it is probable that the equipment may not now be widely used by the Japanese.

Although certain rounds are stated earlier to be of Italian manufacture they do not according to information available really conform to 12.7-mm. cartridges used by the Italians. It is thought that the rounds or components may have been manufactured in Italy specially for the Japanese or they are of old Italian designs.

SUMMARY OF DATA

27. Round No.1

Overall length of complete round	..	Believed about 4.5-ins.
Length of case	..	3.18-ins.
Length of bullet	..	2.27-ins.
Weight of bullet	..	590-grs.
Weight of propellant	..	Not known.

Rounds Nos.2, 3 and 4

Overall length of complete round	..	4.21-ins.
Length of case	..	3.18-ins.
Length of bullet	..	1.75-ins.
Weight of bullet	..	548-grs.
Weight of propellant	..	127-grs.

Rounds Nos.5 and 6

Overall length of complete round	..	4.21-ins.
Length of case	..	3.18-ins.
Length of shell fuzed	..	2-ins.
Weight of shell fuzed	..	570-grs.
Weight of propellant	..	127-grs.

Round No.7

Overall length of complete round	..	4.15-ins.
Length of case	..	3.18-ins.
Length of shell fuzed	..	1.88-ins.
Weight of shell fuzed	..	533-grs.
Weight of propellant	..	127-grs.

Round No.8

Overall length of complete case	..	4.15-ins.
Length of case	..	3.18-ins.
Length of shell	..	2-ins.
Weight of shell	..	508-grs.
Weight of propellant	..	132-grs.

Fuze Type 'A' (Japanese)

Overall length	..	.675-in.
Fuze threads diameter	..	.4-in. L.H.T., 32 T.P.I.
Weight of filled fuze	..	133-grs.

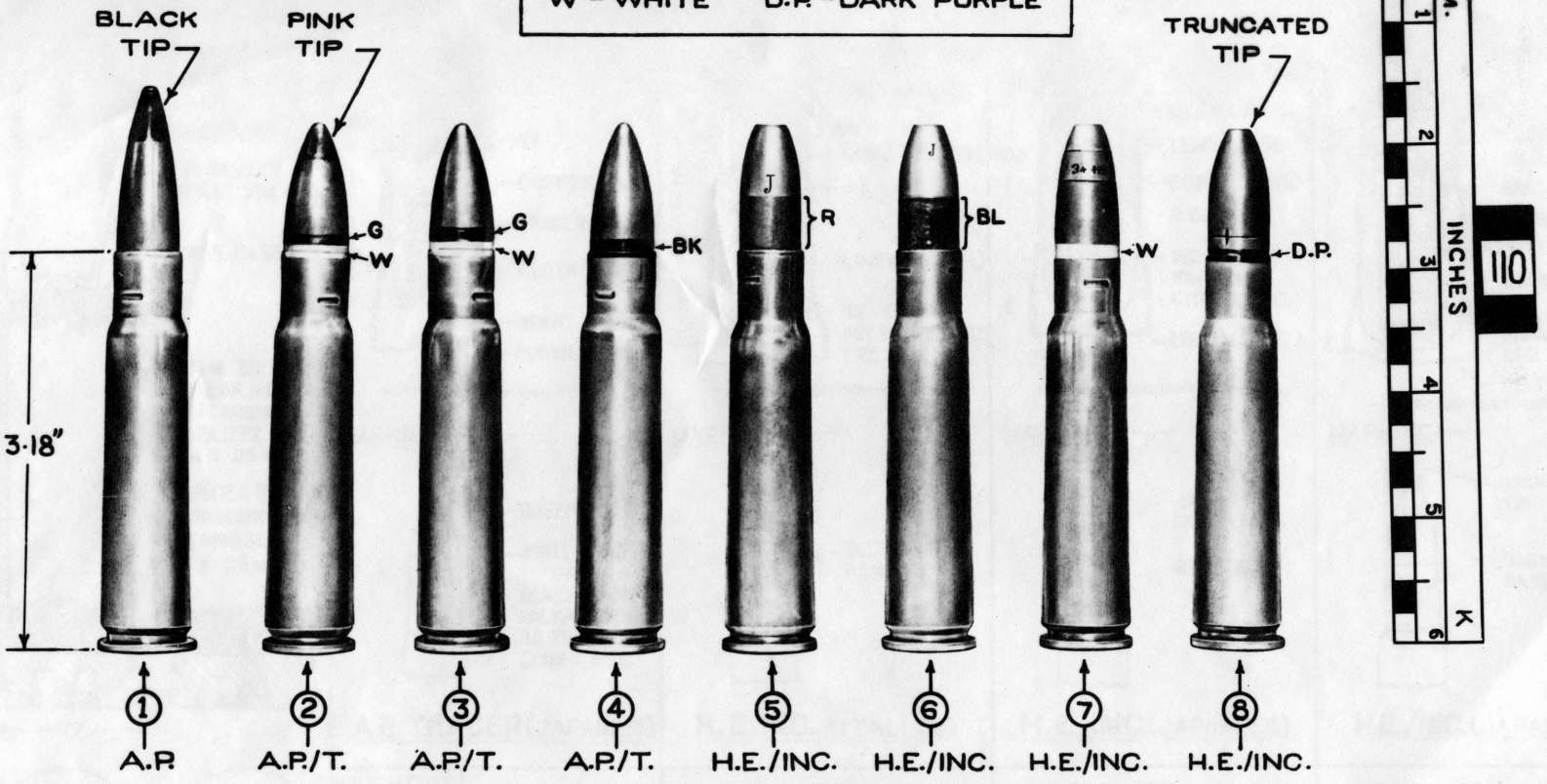
Fuze Type 'B' (Italian)

Overall length	..	1.1-ins.
Fuze threads diameter	..	.390-in. L.H.T., 32 T.P.I.
Weight of filled fuze	..	183-grs.
Diameter of gaine body	..	~~.2755in.~~ 0.275"
Threads of gaine body	..	R.H.T.

RESTRICTED.

KEY TO COLOUR BANDS

R – RED	BL – BLUE
G – GREEN	BK – BLACK
W – WHITE	D.P. – DARK PURPLE



JAPANESE A.C. CANNON CARTRIDGES 12·7 M.M.

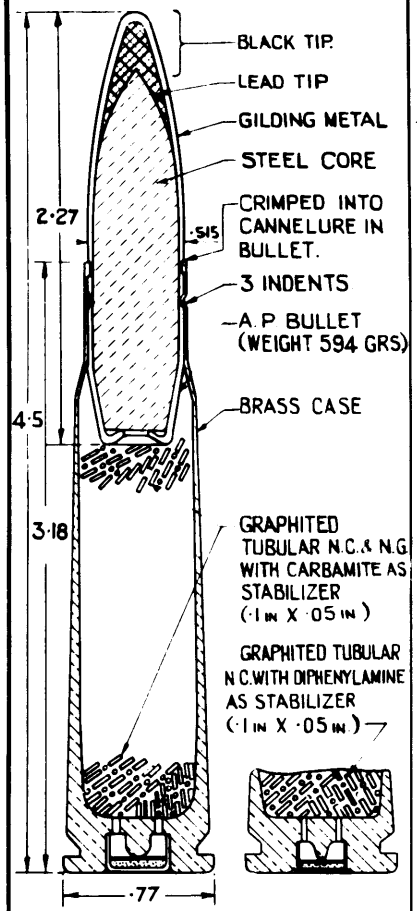
SEMI – RIMLESS

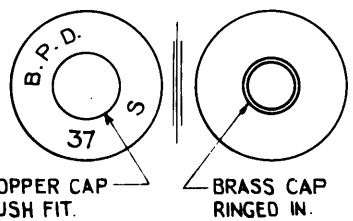
FOR A.C. CANNON (BROWNING TYPE)

COMPARATIVE PHOTOGRAPH.

C.I.AMM.S/1115
KIRKEE MAY '45

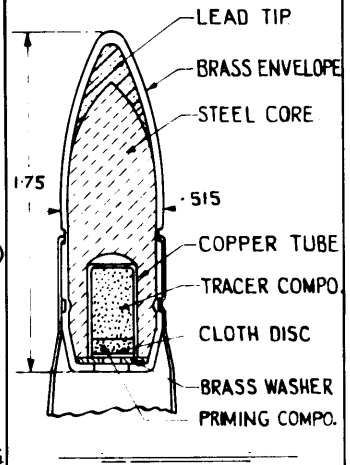
PLATE A.



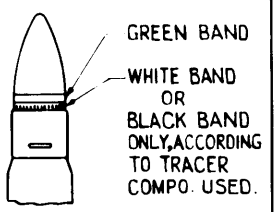


ITALIAN JAPANESE

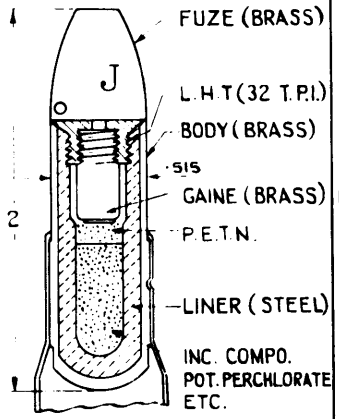
TYPICAL CARTRIDGES.



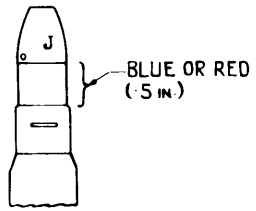
MARKING :—



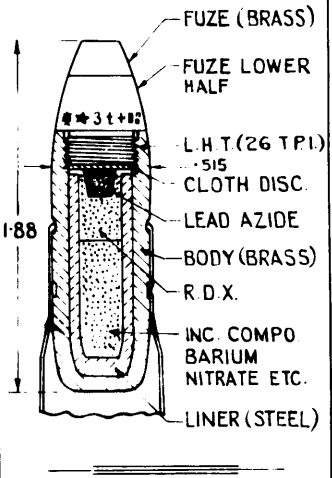
A.P. TRACER (JAPANESE)



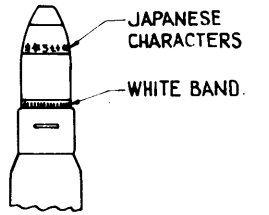
MARKING :—



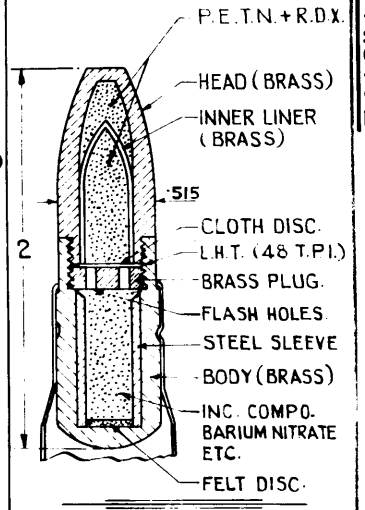
H.E. INC. (ITALIAN)



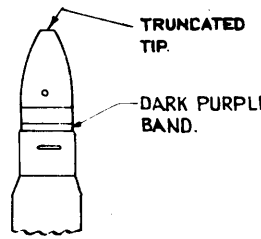
MARKING :—



H.E. INC. (JAPANESE)



MARKING :—



H.E./INC. (JAPANESE).

WEIGHT OF SHELL	548 GRS.	570 GRS.	533 GRS.	508 GRS.
PROPELLANT	127 GRS N.C.	127 GRS. N.C. & N.G.	127 GRS. N.C.	132 GRS. N.C.

JAPANESE A.C. CANNON CARTRIDGES 12·7 MM. (SEMI-RIMLESS).

FOR

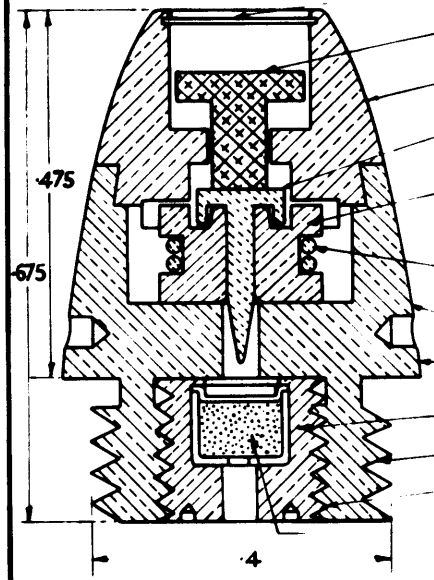
AIRCRAFT CANNON (BROWNING TYPE).

TYPICAL CARTRIDGE & DETAILS OF SHELL.

DIMENSIONS IN INCHES.

C.I.AMN.5/1205
KIRKEE. AUG. 1945

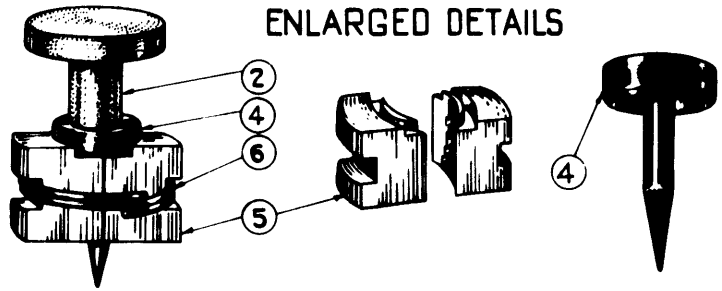
PLATE B.

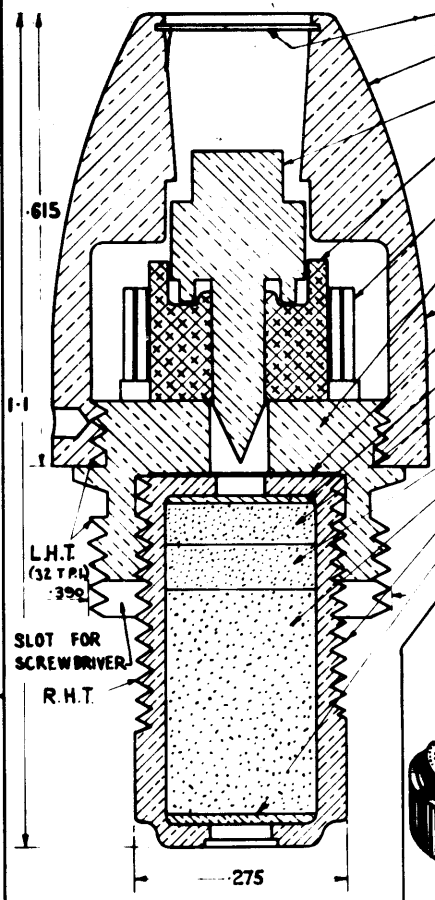


1. BRASS DISC.
2. ALUMINIUM PUSH ROD.
3. BODY, UPPER HALF (BRASS).
4. STRIKER (STEEL).
5. TWO CENTRIFUGAL SEGMENTS (BRASS).
6. SPRING, RETAINING SEGMENTS (STEEL).
   STAMPED 東 ★ 3 七十日日.
7. BODY LOWER HALF (BRASS).
8. DETONATOR HOLDER (BRASS).
   L.H.T. 26 T.P.I.
   R.H.T. 32 T.P.I.
9. DETONATOR (FULMINATE OF MERCURY).

TYPE 'A' FUZE (JAPANESE).

ENLARGED DETAILS

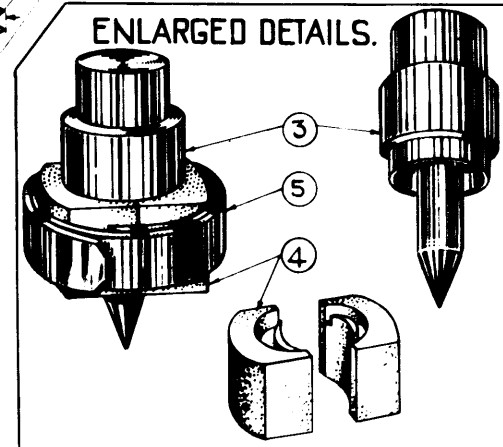




1. BRASS DISC.
2. BODY (BRASS)
3. STRIKER (BRASS)
4. TWO CENTRIFUGAL SEGMENTS. (ALUMINIUM)
5. SPRING RETAINING SEGMENTS. (COPPER ALLOY)
6. ADAPTER (BRASS)
   STAMPED:— J
7. TINFOIL
8. METAL FOIL DISC.
   FULMINATE OF MERCURY. (BLACK COMPO).
   LAYER OF FULMINATE OF MERCURY.
   P.E.T.N.
9. GAINE BODY (BRASS).
10. BRASS FOIL.

TYPE 'B' FUZE (ITALIAN)

ENLARGED DETAILS.



FUZES, PERCUSSION, D.A.

FOR

JAPANESE A.C. CANNON CARTRIDGES 12·7 MM. (SEMI-RIMLESS).

FOR A.C. CANNON BROWNING TYPE

(DETAILS OF TYPICAL JAPANESE & ITALIAN FUZES)

DIMENSIONS IN INCHES.

C.I. AMN. S/1206
KIRKEE. AUG. 1945