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JAPANESE AMMUNITION

C.I. AMM. TECHNICAL REPORT

No. 42

BASE FUZES FOR A. P./H. E. SHELL 37-MM., 47-MM. AND 75-MM. CALIBRES.

COMPILED BY
THE CHIEF INSPECTOR OF AMMUNITION,
KIRKEE.

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JAPANESE AMMUNITION

C. I. AMN. TECHNICAL REPORTS

REPORT NO.42

JUNE 1945

BASE FUZES FOR A.P./H.E. SHELL IN 37-mm., 47-mm. AND 75-mm. CALIBRES

G E N E R A L

A number of different base fuzes used in Japanese 37-mm., 47-mm. and 75-mm. A.P./H.E. shell have now been examined and it is, therefore, possible to prepare a combined detailed Technical Report on these fuzes.

2. Although base fuzes used in 40-mm., 57-mm., 105-mm. and 150-mm. A.P./H.E. shell have not yet been examined at Kirkee there is a certain amount of information available. It will be useful to give a brief description of each.

3. 40-mm. The fuze employed appears, from reports, to be very similar in design and action to the fuze used in the 37-mm. A.P./H.E. shell fully described below. It differs, however, in certain details, e.g. it has a gaine which screws into the body of the fuze unlike the 37-mm. fuze which has a magazine integral with the body. It is possible that the size of the fuze hole may be different but information is insufficient to give any definite indication.

4. 57-mm. The fuze employed in the 57-mm. A.P./H.E. shell would seem, from reports, to be generally similar in action to the fuze used in the 75-mm. A.P./H.E. shell fully described below. The following major differences, however, appear to exist:-

(a) The fuze is not fitted with a tracer element.

(b) The inertia pellet carries the striker and the detonator is in a fixed plug.

(c) The gaine forms part of the fuze, the two being joined by screw threads.

From recent information it would seem that this fuze is known to the Japanese as the "Type '92 Small Delay Base Fuze".

5. 105-mm. and 150-mm. The information available is limited but it would seem that the base fuze used in A.P./H.E. shell of these calibres is very similar to, if not identical with, the fuze used in the 75-mm. A.P./H.E. shell fully described below.

6. The descriptions given below are based on actual critical examinations carried out at Kirkee.

D E S C R I P T I O N

FUZE, BASE PERCUSSION FOR 37-mm. A.P./H.E. SHELL (28-mm. FUZE HOLE)

(Believed to be Type '94)

7. According to recent information this fuze is known to the Japanese

as the"Type '94 Small Delay Base Fuze". Plate A shows the general construction and details of this fuze. For purposes of description it can be divided into three main parts:-

(i) The body (2).
(ii) The striker assembly, comprising items 6, 7, 8 and 9.
(iii) The detonator holder (5).

8. Body. The body (2) is made of steel rust-proofed by oil blackening externally and internally. The diameter of the body is stepped down in three dimensions from the flange to the magazine. The flange has two diametrically opposed key slots. The body of the fuze is screw-threaded externally to screw into the base of the shell and internally at one end to take a steel base plug (11). This plug screws hard onto a copper washer to prevent the propellant gases at time of firing from reaching the interior of the fuze. At the magazine end the body of the fuze is screw-threaded internally to take a steel closing plug (1). The magazine contains a pellet of R.D.X./wax, wrapped in paper and weighing about 16-grs. A 0.5-gr. pellet of lead azide is pressed into this pellet as shown in Plate A. It should be noted that the closing plug (1) is centrally drilled leaving a thin diaphragm which facilitates the propagation of the detonation wave to the main filling.

9. Striker Assembly. This consists of the inertia pellet (7), the striker (9) and the creep spring (6). The inertia pellet, in the unarmed condition, is secured to the striker by a copper shear pin (8). A taper is formed at the base of the inertia pellet (7) to avoid any possibility of it binding on the walls of the base plug (11) owing to set up on shock of discharge. The copper shear pin (8) is covered at both ends by solder, preventing any lateral movement. The shank of the striker is specially shaped so that when the brass inertia pellet sets back it will ride over the tapered portion of the shank and a certain amount of brass, owing to impact on base plug, will be forced into the reduced diameter at the head of the striker thus locking the inertia pellet rigidly onto the striker, see para. 12 below.

10. Detonator Holder (5). The detonator holder (5) screws into the body of the fuze and onto a small baffle plate (3). The function of this plate is to prevent the flash from the detonator passing direct to the pressed G.P. pellet; the combination thus giving a slight delay to allow the shell to travel a short distance after impact before the filling detonates. The detonator holder has a tapered channel which acts as a striker guide leading to a small detonator (4) which is held in position by the mouth of the holder being turned over.

Safety Devices

11. The safety of the fuze is ensured by the point of the striker (9) being well below the mouth of the inertia pellet (7) and secured in that position by the shear pin (8). The tapered shape of the striker also acts, to a lesser extent, as a safety device because even if the shear pin fails it would require a heavy shock or drop to cause the inertia pellet (7) to set back sufficiently to expose the point of the striker (9).

Action

12. On shock of discharge the inertia pellet (7) sets back, shearing the shear pin (8). The metal of the inertia pellet binds onto the tapered shank of the striker (9) and owing to impact with the base plug (11) some metal is probably forced over the flange at the head of the striker (9). The striker (9) and the inertia pellet (7) are now one complete unit with the point of the striker (9) protruding well above the mouth of the inertia pellet (7). The inertia pellet is, however, kept in the rearward position and the point of the striker away from the detonator, by the creep spring during flight. On impact the pellet

sets forward overcoming compression of the spring and the striker functions the detonator. The baffle plate in combination with the pressed G.P. pellet causes a slight delay before the fuze functions as explained above.

FUZE, BASE, PERCUSSION WITH TRACER FOR 47-mm. A.P./H.E. SHELL (24-mm. FUZE HOLE)

13. According to recent information this fuze is known to the Japanese as the "Small Mk. 2 Base Fuze."

The general construction and details of this fuze are shown in Plate B. For purposes of description it can be divided into three main parts:-

(i) The fuze body (8).
(ii) The tracer element with closing plug (9).
(iii) The gaine (1).

14. Body. The fuze body (8) tapers towards its lower end and is fitted with two slots diametrically opposite to take a fuze key. It is recessed internally at the tapered end to hold the tracing composition. The mouth is closed by a perforated, screwed plug; the perforation in the plug being closed by a tracing cloth disc (lacquered blue) placed on top of composition. The weight of tracing composition is about 56-grs. At the other end the body is screw-threaded externally to screw into the shell and internally to take the gaine. A copper washer fits under the flange of the fuze when it is screwed home into the shell to act as a seal and prevent the entry of propellant gases to the shell filling. The fuze is internally recessed to hold an aluminium detonator holder (6) and a strong steel spring. A small detonator (5) is held in position in the holder (6) by the mouth being turned over. The recess in the body of the fuze is closed by the striker (3) the flange of which rests on a flange in the fuze body; the striker unit being kept in position by the gaine. Note that one small (.05-in.) flash hole is formed through the flange of the striker. The detonator holder is prevented from coming into contact with the point of the striker only by the creep spring (4).

15. Gaine. The gaine (1) is made of aluminium and is screwed into the body onto the flange of the striker (3). The gaine filling consists of about 6.6-grs. of R.D.X. into which is pressed a small pellet of lead azide weighing about 1.7-grs. The mouth of the gaine is then closed by a screwed plug which is drilled internally to take a pressed pellet of gunpowder weighing about 0.5-gr. which acts as a booster and delay pellet. To facilitate assembly two tommy holes are drilled in the plug as shown in Plate B.

Safety Devices

16. The only safety device is the strong steel spring (4) holding the light detonator holder (6) clear of the point of the striker (3). This is a comparatively high velocity gun and the A.P./H.E. shell is intended for relatively short ranges when the impact forces are high. It is therefore possible to use a strong spring which is adequate to hold the light detonator holder (6) off the striker during even severe jolting and shocks in transport.

Action

17. On firing, the flash from the propellant ignites the tracing composition which burns during flight; time of burning is not known. On impact with the target the detonator holder sets forward against compression of spring and impinges on the striker; the flash passes through the flash hole to the pressed G.P. pellet thus causing a slight delay before the fuze functions.

FUZE, BASE, PERCUSSION WITH TRACER FOR 75-mm. A.P./H.E. SHELL (40-mm. FUZE HOLE)

18. This fuze is believed to be known to the Japanese as the "Type '95 Base Percussion Fuze". Its general construction and details are shown in Plate C.

This fuze is somewhat different from the fuzes previously described in that the gaine is completely separate and in a sense is part of the shell filling see C.I.Amn. Technical Report No.39. The fuze itself is made of steel rust-proofed by oil blackening internally and externally. It is threaded externally to screw into the shell and has a flange which seats onto a copper washer (10) when screwed home into the shell. It is tapered below the flange and recessed to hold about 85-grs. of tracing composition. The tracing composition is covered by a tracing cloth disc lacquered blue and the recess finally closed by a perforated steel closing plug (15) screwed into position. There are two tommy holes diametrically opposite in the base of the plug (15) to facilitate assembly. Internally the fuze body is drilled longitudinally to take the inertia pellet (8), the creep spring (6) and the screwed striker plug (5) which is screwed into position. Laterally the fuze is drilled to house two centrifugal bolts (12), two springs (13) and two screwed closing plugs (14). The inertia pellet (8) houses a small detonator (7) holding about 1.7-grs. of fulminate of mercury, which is held in position by the mouth of the pellet being turned over. A groove is formed round the inertia pellet into which two centrifugal bolts (12) protrude to lock it in the rearward position. The base of the inertia pellet (8) is domed and seats on a lead disc (9). This arrangement appears to be intended to prevent any possible binding of the base of the inertia pellet (8) with the walls of the recess in the fuze on shock of discharge. The lead washer cushions the set back of the inertia pellet (8) and probably also acts as an insulator to prevent forward throw of pellet (8) which might be caused by shock action of propellant gases on base of shell. It should be noticed that a somewhat increased distance exists between the top flange of the inertia pellet (8) and the nose of the centrifugal bolt (12). This probably is to allow some slight set back of the inertia pellet (8) without any possibility of binding on the centrifugal bolts (12). Two inclined flash holes (.05-in.) are formed in the striker plug one at each side of the striker to allow the flash from the detonator to pass to the delay or booster G.P.pellet in the gaine.

19. Gaine. The gaine (1) is made of steel rust-proofed and holds about 17-grs. of R.D.X. into which is pressed about 5-grs. of lead azide. Above this is a copper cup (3) holding a G.P. pellet about 2.31-grs. The mouth of the gaine is finally closed by a screwed plug (4) which has a central perforation holding a G.P. pellet weighing about 1.7-grs. Similar to previous fuzes this arrangement is intended to give a slight delay after impact of the shell with the target and thus ensure penetration before the shell functions. The pellet of G.P. in the closing plug (4) provides the main delay in the gaine; the term 'booster' in Plate C is not strictly correct. The G.P. pellet in the mouth of the gaine is more correctly a booster.

Safety Devices

20. During handling and transport the inertia pellet is positively locked by the centrifugal bolts (12) and centrifugal action is necessary to release the inertia pellet.

Action

21. On firing, the flash from the propellant ignites the tracer composition in the usual way. On shock of discharge the centrifugal bolts remain in position owing to set back and continue to lock the inertia pellet (8) while the projectile is travelling up the bore. On deceleration (when the shell is clear

of the bore) centrifugal force causes the centrifugal bolts to move outwards freeing the inertia pellet, which is then held off the striker only by the light creep spring. On impact the fuze functions as described earlier in para. 17 of this Report.

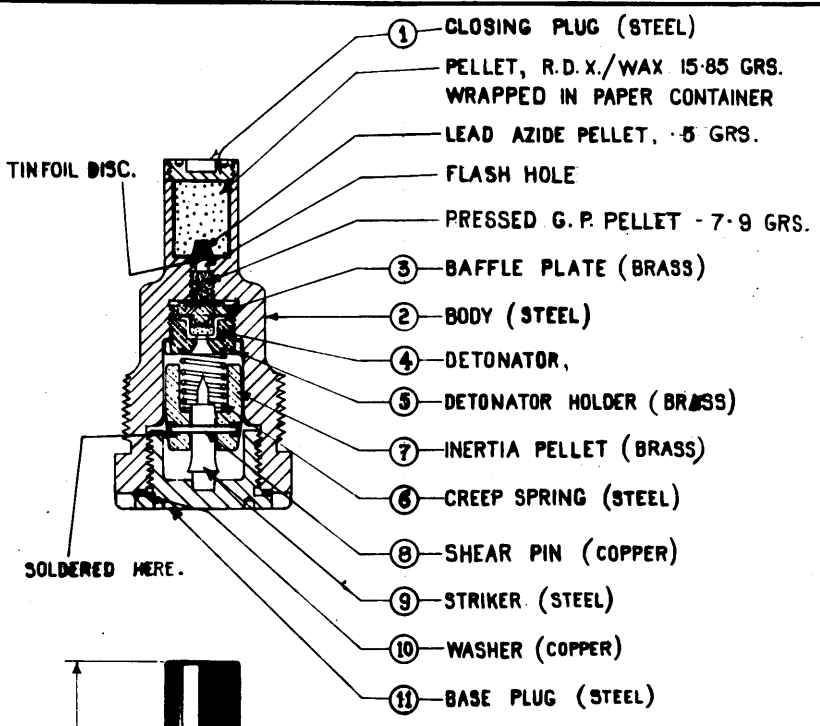
CHEMICAL ANALYSIS
(Chief Inspector of Military Explosives, Kirkee)

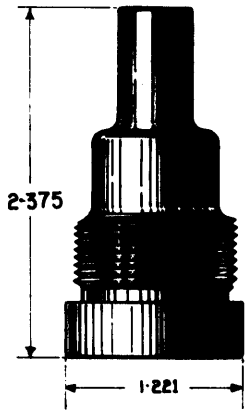
22. There is nothing to add to the details given in the Plates. The quantities of explosives examined were generally too small for any quantitative or detailed chemical analysis to be made.

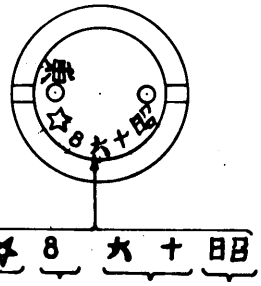
A P P R E C I A T I O N
(Economic, manufacture and development aspects)

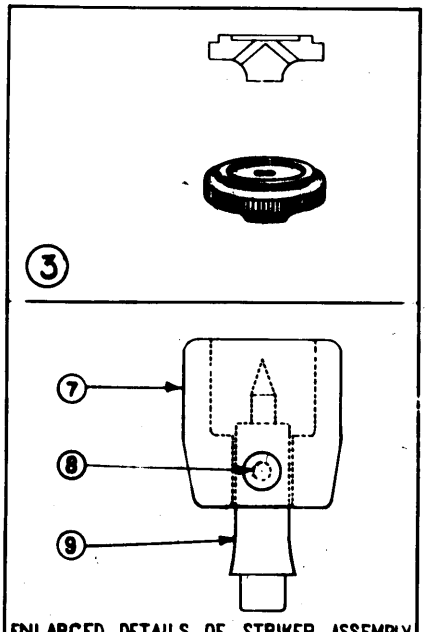
23. All 37-mm., 47-mm. and 75-mm. A.P./H.E. shell which have been examined at Kirkee have been found fitted with the types of fuzes described above and it would appear that these are the standard fuzes used in Japanese A.P./H.E. ammunition. No variations have so far been encountered.

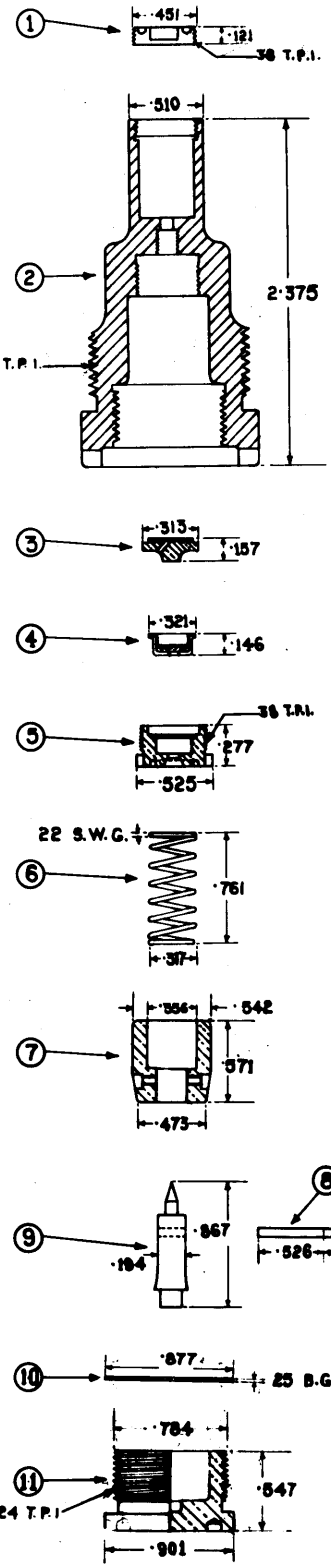
24. The ammunition follows generally A.P./H.E. shell design as is used in the German and Italian service; fuzes and explodering arrangement being to some extent similar in design and action. There is not, however, any marked similarity and it would appear that Japan has developed her own designs independently.











NOTE

(i) BODY OIL BLACKENED

(ii) ALL THREADS ARE RIGHT HANDED.

(iii) WEIGHT OF FUZE (FILLED) 5 1/2 OZS.

JAPANESE FUZE, BASE, PERCUSSION, (HOTCHKISS TYPE)

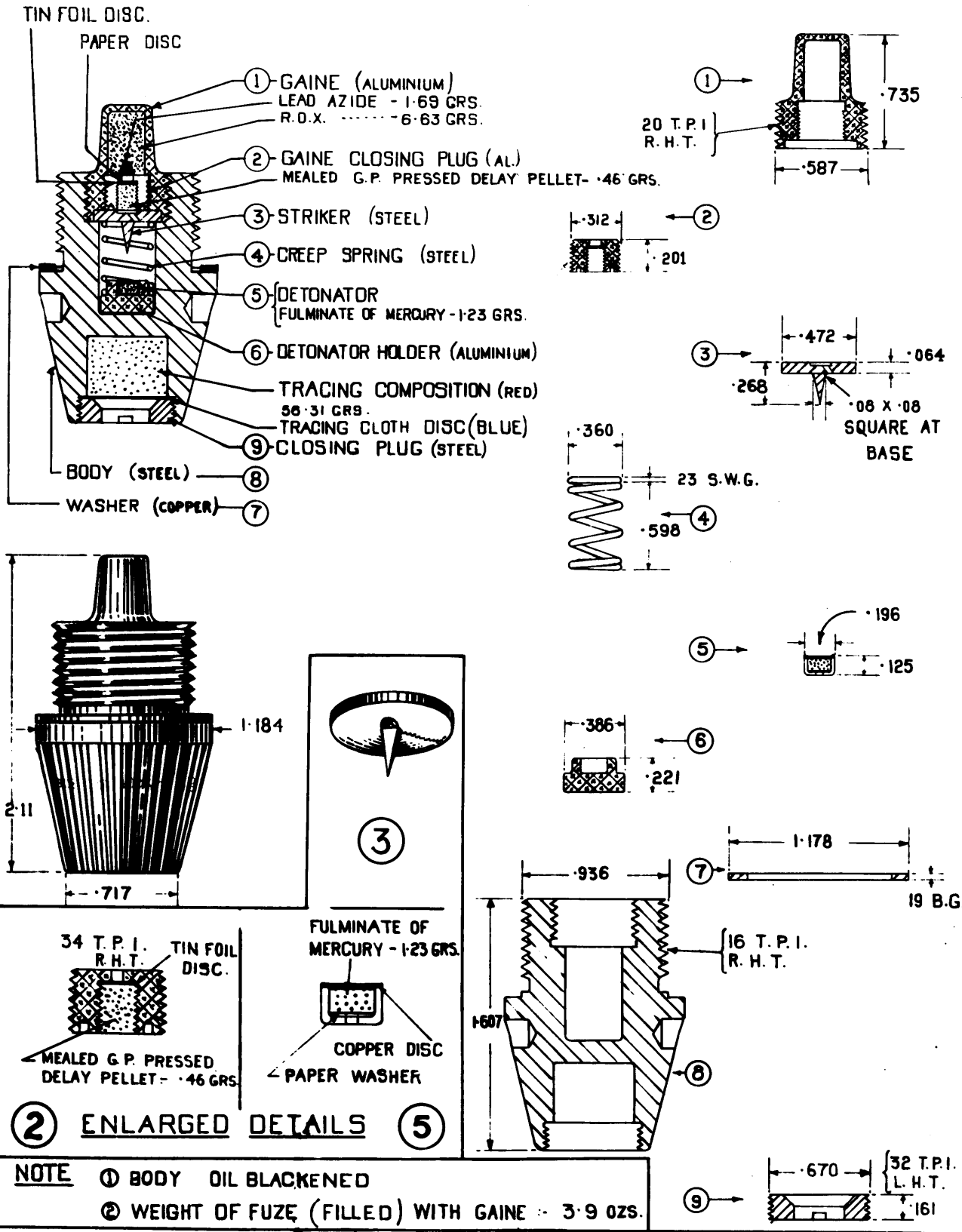
FOR

37 MM. A.P.H.E., SHELL, 28 MM. F.H.

(TYPE '94 TANK MOUNTED AND ANTI-TANK GUN)

DIMENSIONS IN INCHES.

C.I. Amm. 5/1008
KIRKEE. APRIL 1945



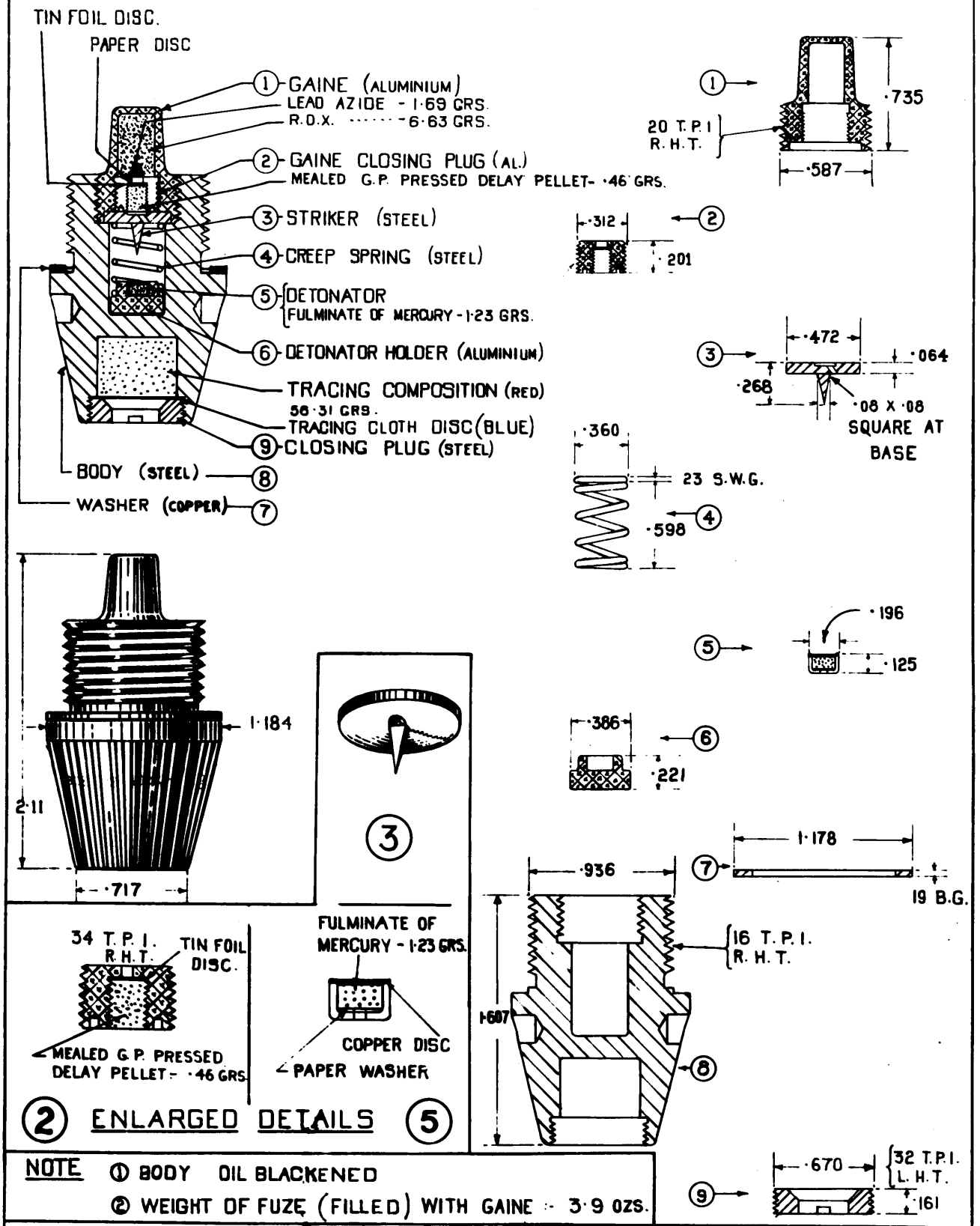
NOTE ① BODY OIL BLACKENED

② WEIGHT OF FUZE (FILLED) WITH GAINE - 3·9 OZS.

JAPANESE FUSE, BASE, PERCUSSION WITH TRACER FOR 47 MM. A.P./H.E. SHELL, 24 MM. F.H. (TANK MOUNTED AND ANTI-TANK GUN.)

DIMENSIONS IN INCHES.

C.I. Amm. S/1107
KIRKEE-APRIL 1945



2 ENLARGED DETAILS 5

3

NOTE ① BODY OIL BLACKENED

② WEIGHT OF FUZE (FILLED) WITH GAINE :- 3·9 OZS.

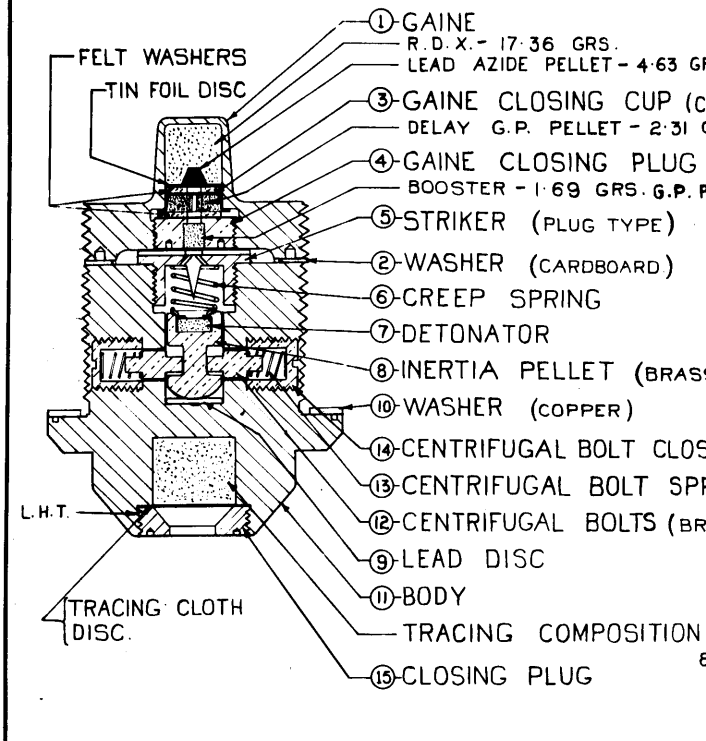
JAPANESE FUSE, BASE, PERCUSSION WITH TRACER

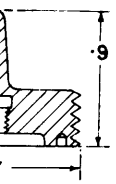
FOR 47 MM. A.P./H.E. SHELL, 24 MM. F.H.

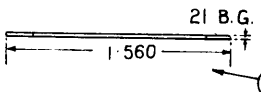
(TANK MOUNTED AND ANTI-TANK GUN.)

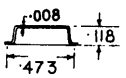
DIMENSIONS IN INCHES.

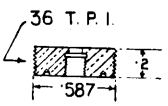
C.I. Armn. S/1107
KIRKEE-APRIL 1945

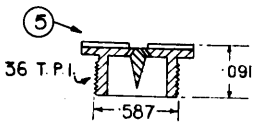


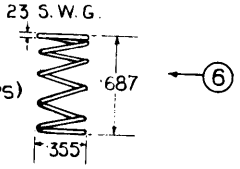


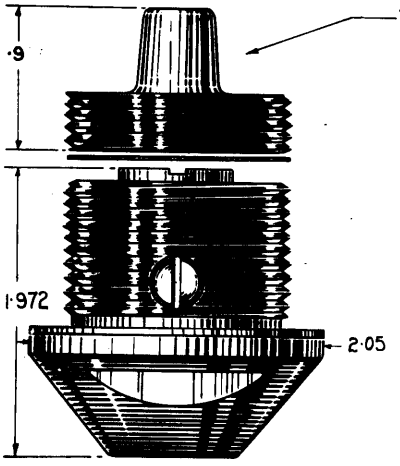


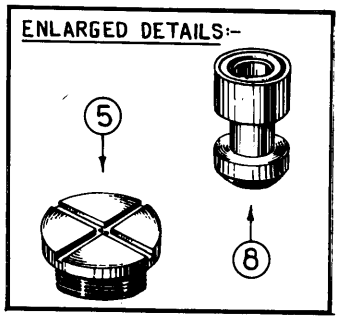


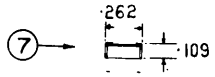


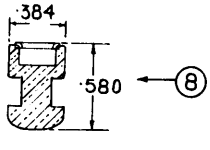


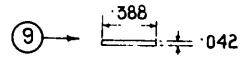


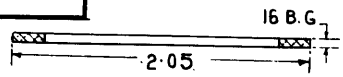












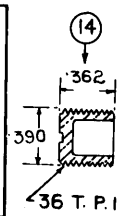
③ COPPER CUP

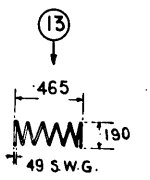
DELAY G.P. PELLET 2·31 GRS.

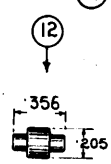
⑦ COPPER DISC

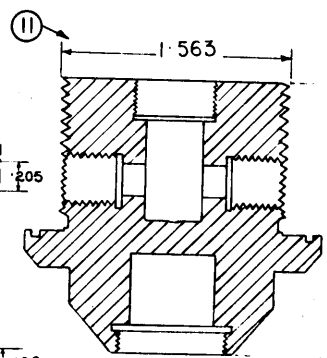
FULMINATE OF MERCURY 1·67 GRS.

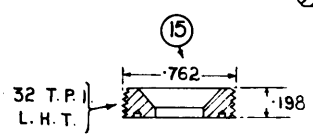
ENLARGED DETAILS











NOTE:- ① ALL COMPONENTS MADE OF STEEL AND ALL THREADS ARE RIGHT HANDED, UNLESS STATED OTHERWISE.
⑪ BODY OIL BLACKENED.
⑪ WEIGHT OF FUZE WITH GAINE (FILLED) 1 LB. 1 1/2 OZS.

JAPANESE FUZE, BASE PERCUSSION WITH TRACER FOR 75 MM. A.P.H.E., SHELL, 40 MM. F.H.

(SO FAR FOUND IN SHELL CASED FOR
① TYPE MEIJI '41 REGIMENTAL GUN.
⑪ TYPE '94 MOUNTAIN GUN.
⑪ TYPE MEIJI '38 SERIES OF FIELD GUNS.)

DIMENSIONS IS INCHES.

C.I. AMM. S/1106
KIRKEE. APRIL 1945.