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SECRET

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**THIS DOCUMENT MUST NOT
FALL INTO ENEMY HANDS.**

**AUSTRALIAN MILITARY FORCES****ENGINEER - IN - CHIEF
BOMB DISPOSAL
TECHNICAL INSTRUCTIONS****11 March, '44****Headquarters,
Australian Military Forces**

*Prepared by the Staff of the Engineer-in-Chief and issued under
the direction of the Commander-in-Chief.*

AUSTRALIAN MILITARY FORCES

EC 5520

E in C
L H QDISTRIBUTION:

All CEs and CsRE. (2 copies)
 All RAE Fd Sqns, Fd Coys, A Fd Coys,
 A Tps Coys, Div & Corps Fd Pk Coys,
 Bomb disposal Pls and HQ AA and Frt Coys. (each 1)
 LHQ SME (Fd) (8)
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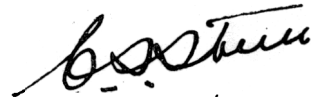
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E IN C BOMB DISPOSAL TECHNICAL INSTRUCTIONS

1. Issued herewith are revised Bomb Disposal Technical Instructions. The revision was necessary because of extensive new information received.
2. Acknowledgment is made for information received from RAE and Allied Forces thus enabling the Manual to be kept up-to-date, and it is pointed out that the future value of these instructions will depend upon further new data received from the field.
3. Details of techniques, special appliances, etc contained herein will NOT be communicated to anyone not directly entitled to such information.
4. All previous E in C Bomb Disposal Technical Instructions are cancelled by the issue of this Manual, and will be destroyed by fire.



(C.S. STEELE)
 Major General
 Engineer in Chief

11 Mar 44.

TABLE OF CONTENTS

A :- INTRODUCTION

Sec. 1 - General Instructions

B :- JAPANESE BOMBS AND COMPONENTS

Sec. 2 - H.E. Bombs
 3 - Anti-personnel Bombs
 4 - Incendiary Bombs
 5 - Miscellaneous Aerial Missiles
 6 - Fuzes, Serial A
 7 - " " B
 8 - " " C
 9 - " " D
 10 - Gains, Booster Systems and Magazines
 11 - Ammunitions

CHAP. C :- GERMAN BOMBS AND COMPONENTS

Sec. 12 - H.E. Bombs
 13 - Anti-personnel Bombs
 14 - Incendiary Bombs
 15 - Miscellaneous Aerial Missiles
 16 - Fuzes
 17 - Disposal Techniques
 18 - Miscellaneous Data

CHAP. D :- MISCELLANEOUS TECHNICAL INSTRUCTIONS

Sec. 19 - Destruction of Bombs, Ammunition, etc.
 20 - General

CHAP. E :- EQUIPMENT AND PLANT

Sec. 21 - General Use
 22 - Anti-Japanese
 23 - Anti-German

CHAP. F :- CONCERNING CIVIL DEFENCE ORGANISATION

Sec. 24 - Function in Bomb Disposal, Co-operation
 etc.

(See also Reverse side.

FILING AND REFERENCE SYSTEM

EXAMPLE - B/2/76

Prefix capital letter - (B)

Refers to CHAPTER

See
TABLE OF
CONTENTS

First numeral - (2)

Refers to SECTION

Suffix numeral - (76)

Number allotted a specific BDTI

(Except in several instances only,
the original BDTI number has been
retained)

IMPORTANT

1. When issued, insert new BDTIs in Manual under correct CHAPTER and SECTION, and in appropriate sequence. In filing, disregard the suffix numeral.
2. In despatching messages, telegrams, etc., ALWAYS USE THE COMPLETE REFERENCE (as Example above).

I N D E X.

IN NUMERICAL SEQUENCE OF BDTIs

Ref. No.	Issued	Subject
A/1/1	20 Dec 43	General Instructions
B/5/2	20 Dec 43	Japanese Smoke Signal (Aircraft)-1 Kg
B/3/3	20 Dec 43	Japanese Anti-personnel HE Bomb, Type - 15 Kg
B/2/4	20 Dec 43	Japanese GP, HE Bomb, Type 94 - 50 Kg
B/2/5	20 Dec 43	Japanese GP, HE Bomb, Type 97 - 60 Kg
B/2/6	20 Dec 43	Japanese GP, HE Bomb, Type 98 - 60 Kg
B/2/7	20 Dec 43	Japanese GP, HE Bomb, Type 94 -100 Kg
B/2/8	20 Dec 43	Japanese GP, HE Bomb (Early type) - 250 Kg
B/4/9	20 Dec 43	Japanese Incendiary Bomb Type 97 - 50 Kg (Phos/Rubber pellets)
B/4/10	20 Dec 43	Japanese Incendiary Bomb Type 97 - 60 Kg (Electron fire-pots)
B/4/11	20 Dec 43	Japanese Incendiary Bomb Type 98 - 60 Kg (Solid oil)
B/4/12	20 Dec 43	Japanese Incendiary Bomb Type 0 - 50 Kg (Phos/rubber pellets)
B/5/13	20 Dec 43	Japanese Bomb Container - 60 Kg
B/5/14	20 Dec 43	Japanese Gas Bomb, Type 92 - 50 Kg
B/6/15	20 Dec 43	Japanese Bomb Fuze - A.3(A)
B/8/16	20 Dec 43	Japanese Bomb Fuze - C.1(A)
B/7/17	20 Dec 43	Japanese Bomb Fuze - B.1(A)
B/6/18	20 Dec 43	Japanese Bomb Fuze - A.2(A)
B/7/19	20 Dec 43	Japanese Bomb Fuze - B.3(A)

Ref. No.	Issued	Subject
B/6/20	20 Dec 43	Japanese Bomb Fuze - A.4(A)
B/7/21	20 Dec 43	Japanese Bomb Fuze - B.4(A)
B/6/22	20 Dec 43	Japanese Bomb Fuze - A.1(A)
D/20/23	20 Dec 43	Disposal of Gas Bombs and Missiles
D/20/24	20 Dec 43	Treatment of Incendiary Agents
B/6/25	11 Mar 44	Japanese Bomb Fuze - A.1(G)
B/6/26	11 Mar 44	Japanese Bomb Fuze - B.3(B)
E/22/27	20 Dec 43	Special Bomb Disposal Tools and Essential Common Hand Tools, etc. (Anti-Japanese)
D/20/28	20 Dec 43	Safety Precautions Summarized
D/20/29	20 Dec 43	Types of Camouflages and Safety Precautions
B/2/30	20 Dec 43	Summary of Japanese HE Bombs
D/20/31	20 Dec 43	Precautions in the Use of Steaming-out Equipment
F/24/32	20 Dec 43	Reporting UXBs through Civil Defence Services
F/24/33	20 Dec 43	Bomb Categories and Priorities
F/24/34	20 Dec 43	Bomb Cemeteries
A/1/35	20 Dec 43	Abandoning of Bombs
E/21/36	20 Dec 43	Excavating and Timbering
E/22/37	20 Dec 43	Sterilization of Japanese Bombs - Use of Thermit Eqpt.
/ /38		
/ /39		

Ref. No.	Issued	Subject
/ /40		
/ /41		
/ /42		
/ /43		
/ /44		
/ /45		
D/20/46	20 Dec 43	Bomb Data - Tables
/ /47		
B/5/48	20 Dec 43	Japanese Practice Bomb - 31 Kg
D/20/49	20 Dec 43	Precautions when Handling Explosives
D/20/50	20 Dec 43	Elementary Safety Precautions in Bomb Disposal
F/24/51	20 Dec 43	Safety Precautions for Rail Traffic near UXBs
B/2/52	20 Dec 43	Japanese GP, HE Bomb, Type 98-250 Kg
/ /53		
/ /54		
/ /55		
/ /56		
D/20/57	20 Dec 43	Explosives Used in Bombs
/ /58		
/ /59		
B/2/60	20 Dec 43	Japanese SAP, HE Bomb Type 99 - 63 Kg

Ref. No.	Issued	Subject
/ /61		
D/20/62	20 Dec 43	Precautions when Trepanning and Steaming-out Picric Fillings
D/19/63	20 Dec 43	Destruction of a Bomb by Detonation
/ /64		
B/2/65	20 Dec 43	Japanese SAP, HE Bomb Type 99 - 250 Kg
A/1/66	20 Dec 43	Reports and Returns
B/7/67	20 Dec 43	Japanese Bomb Fuze - B.2(A)
B/8/68	20 Dec 43	Japanese Bomb Fuze - C.2(A)
/ /69		
/ /70		
B/5/71	20 Dec 43	Japanese Smoke Float (Yellow Smoke)
B/11/72	20 Dec 43	Japanese Aircraft Cannon Ammn - 20 mm
B/6/73	20 Dec 43	Japanese Bomb Fuze - A.2(B)
D/19/74	20 Dec 43	Destruction of Bofors Ammn 40 mm
B/5/75	20 Dec 43	Japanese Float Flare, Type 94, Modification 1 - 3 Kg
B/2/76	20 Dec 43	Japanese AP, HE Bomb - 800 Kg
B/7/77	20 Dec 43	Japanese Bomb Fuze - B.2(B)
B/5/78	20 Dec 43	Japanese Illuminating Float Flare
D/20/79	20 Dec 43	Making Camouflnets Safe
B/5/80	20 Dec 43	Japanese Navigation Marker ("card-board type")
F/24/81	20 Dec 43	Evacuation of Danger Areas and Safety Distances

Ref. No.	Issued	Subject
B/6/82	20 Dec 43	Summary of Japanese Bomb Fuzes
D/20/83	20 Dec 43	Protective Works
B/6/84	20 Dec 43	Japanese Bomb Fuze - A.3(B)
E/21/85	20 Dec 43	Apparatus Reviving - Operating Instructions
B/6/86	20 Dec 43	Japanese Bomb Fuze - A.5(A)
E/23/87	20 Dec 43	Stevens' Stopper Design II - Operating Instns
/ /88		
/ /89		
E/21/90	20 Dec 43	Probes, Bomb, 6 ft.
B/9/91	20 Dec 43	Japanese Bomb Fuze - D.1(A)
B/5/92	20 Dec 43	Japanese Pamphlet Container (Aircraft)
B/10/93	20 Dec 43	Gaines, Booster Systems - Japanese
B/10/94	20 Dec 43	Magazines, Fuze, Incendiary Bomb - Japanese
B/8/95	20 Dec 43	Japanese Bomb Fuze - C.3(A)
B/2/96	20 Dec 43	Japanese GP, HE Bomb, Type 94 - 50 Kg (Incorporating Fuze C.3(A))
B/6/97	20 Dec 43	Japanese Bomb Fuze - A.2(C)
B/9/98	20 Dec 43	Japanese Bomb Fuze - D.2(A)
B/4/99	20 Dec 43	Japanese Incendiary bomb, type 2 - 250 Kg (Electron/Steel Cylinders)
B/2/100	20 Dec 43	Japanese HE Cluster Bomb - 1/3 Kg
B/7/101	20 Dec 43	Japanese Bomb Fuze - B.5(A)

Ref. No.	Issued	Subject
B/2/102	20 Dec 43	Japanese GP HE Bomb, Type 99 - 30 Kg
B/9/103	20 Dec 43	Japanese Parachute Flare Fuze-D.3(A)
E/23/104	20 Dec 43	Stethoscope, Electrical, Design IVB Operating Instns
B/7/105	20 Dec 43	Japanese Bomb Fuze - B.1(B)
B/5/106	20 Dec 43	Japanese Parachute Illuminating Flare (Aircraft)
/ /107		
/ /108		
E/21/109	20 Dec 43	Trepanning and Steaming-out Plant Des. III (Operating Instns)
E/21/110	20 Dec 43	Detectors ITP (Operating Instns)
B/4/111	20 Dec 43	Japanese Incendiary Bomb, Type 99 - 32 Kg (Phosphorous/Steel Pellets)
B/6/112	20 Dec 43	Japanese Bomb Fuze - A.1(B)
B/9/113	20 Dec 43	Japanese Bomb Fuze - D.2(B)
B/2/114	20 Dec 43	Japanese HE Cluster Bomb - 1 Kg
B/7/115	20 Dec 43	Japanese Bomb Fuze - B.5(B)
B/5/116	20 Dec 43	Japanese 1/3 Kg HE Cluster Bomb Container
D/20/117	20 Dec 43	Methods of Removal of Bomb Fillings
E/22/118	20 Dec 43	Solidifying Mixtures (Interim In- structions)
D/20/119	20 Dec 43	Principles for Treatment of Incen- diary Materials
B/9/120	20 Dec 43	Japanese Bomb Fuze - D.2(C)
B/9/121	20 Dec 43	Japanese Bomb Canister Fuze - D.4(A)

Ref. No.	Issued	Subject
A/1/122	20 Dec 43	RAE Responsibilities in Bomb Disposal
B/7/123	13 Jan 44	Japanese Bomb Fuze - B.6(A)
E/22/124	20 Dec 43	Fuze Extractor Design III (AUST)
D/20/125	20 Dec 43	Artificial Respiration
B/5/126	20 Dec 43	Japanese Navigation Marker, Type O Model 1
D/19/127	20 Dec 43	Demolition of Bombs in Dumps
B/ 5/128	20 Dec 43	Japanese Float Flare, Type 94- 1 Kg
/ /129		
/ /130		
/ /131		
/ /132		
/ /133		
/ /134		
/ /135		
/ /136		
/ /137		
/ /138		
/ /139		
/ /140		
/ /141		
/ /142		

Ref. No.	Issued	Subject
/ /143		
/ /144		
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/ /158		
/ /159		
/ /160		
/ /161		
/ /162		
/ /163		
/ /164		

**GENERAL
INSTRUCTIONS**

GENERAL INSTRUCTIONS

1. SECURITY.

- (a) This Manual will be kept by the unit. It is NOT a personal issue. Officers holding it are responsible for its safe custody and will ensure that the contents are disclosed only to those who are affected.
- (b) It is essential that the methods and apparatus used (including British) in the disposal of unexploded bombs are denied to the enemy. All ranks must at all times ensure that knowledge gained or information imparted to them is not divulged to unauthorised persons.
- (c) Publication through the press, or over the air, of any of the following particulars is STRICTLY forbidden
 - (i) Precise location of bombs
 - (ii) Size of bombs
 - (iii) Difficulty or lack of difficulty in recovering unexploded bombs
 - (iv) Time allowed to elapse before recovery is attempted
 - (v) Nature of fuze assemblies
 - (vi) Time and method of removal of fuzes
 - (vii) Use or existence of booby traps in fuzes or other parts of unexploded bombs
 - (viii) Time elapsing before delay action bombs explode
 - (ix) Methods, other than digging, used to recover bombs
 - (x) Demolition of unexploded bombs in situ
 - (xi) Degree of efficiency of bomb disposal techniques in use
 - (xii) Any indication of the nature of special apparatus in use or about to be used
 - (xiii) Photographs of any of the above items.

2. DISPOSAL PROCEDURE.

- (a) Wherever possible, unexploded bombs should be destroyed in situ without handling or disturbance. This will be possible more often than is generally realized. In such cases the fuze assembly should be destroyed with the bomb.
- (b) When destruction in situ is NOT permissible, UXBs should be defuzed at the site by methods laid down for the particular fuze/s found fitted however long ago the bomb may have fallen
- (c) Safety Precautions and Safety Distances must always be observed when destroying fuzed or unfuzed bombs in situ, or at a bomb cemetery or other suitable open area to which they have been transported for destruction.

3. SAFETY PERIODS.

No unexploded bomb should be disturbed, or excavation down to it commenced, until a period of -

125 hours for Japanese bombs, or
96 hours for German bombs

has elapsed from the time the bomb actually fell UNLESS immediate disposal of the bomb is essential when

- (i) Operations are affected
- (ii) The war effort is affected, or
- (iii) Invasion is either imminent or in progress locally, in which case no time limits will be observed and all unexploded bombs, mines, etc., will be dealt with immediately as they fall (any Category given merely indicates the priority of task)

4. RELAXATION OF THE SAFETY PERIOD RULE IN CERTAIN CASES.

At the discretion of the CRE, the rule under which work may not be started on CATEGORY B and C bombs within the Safety Periods abovementioned may be waived in the following cases -

- (a) bombs round lying on the surface, and
- (b) bombs partially covered with debris, or which have penetrated underground but some portion of the bomb case is visible

PROVIDED that -

- (i) the responsible RAE officer who carries out the reconnaissance can definitely ascertain that the bomb is NOT fitted with a clockwork fuze which is ticking, or with a chemical long delay type fuze, and
- (ii) the disposal of other UXBs of higher priority is not thereby delayed, and
- (iii) early disposal is desirable.

5. NON-RETENTION OF SPECIMENS.

The retention of bombs and/or components as personal souvenirs is forbidden. CEs and CsRE may, however, retain specimens for instructional or other special purposes.

6. SALVAGE.

Before bombs are handed over as salvage, they must be COMPLETELY EMPTIED of explosive and the fuze/s removed. A visual inspection should be made of the interior of the case, with a torch if necessary, to make sure that every trace of the explosive has been removed. No explosive must be left on the outside of the case as may occur after steaming-out. These precautions are important as accidents have occurred when the bomb case is finally broken down with an oxy-acetylene torch.

7. SAFETY PRECAUTIONS - TRAINING.

Instruction in bomb disposal Safety Precautions should be regularly undertaken. Unit Commanders will ensure that all ranks are thoroughly aware of and always made to observe these Precautions.

RAE RESPONSIBILITIES IN BOMB DISPOSAL

The text of ENGINEER IN CHIEF'S TECHNICAL INSTRUCTION NO 43 issued under EC 2275 of 16 Nov 43 is repeated below for information of those probably not reached by its original distribution.

"BOMB DISPOSAL

1. FOREWORD.

This Tech Instn defines the responsibilities of RAE Units for bomb and ammunition disposal, and conforms with GRO's : G257 31 Jul 42, G341 30 Apr 43 and G407 28 May 43.

2. BOMB DISPOSAL PLS.

(a) Bomb disposal Pls are LHQ Tps, but when allotted to a Formation or L of C Area they come under command of the HQ Formation or L of C Area, and being RAE would come under the CE or CRE. When Bomb Disposal Pls are not required for their primary role of bomb disposal, the CE or CRE should employ them on engineer work, but arrange that they can quickly resume disposal duties if necessary.

(b) Bomb Disposal Pls are responsible for :-

- (i) full technique of bomb disposal
- (ii) disposal or breaking-down of enemy ammunition
- (iii) destruction of blind rounds
- (iv) breaking-down of service ammunition when requested by an I O O.

3. OTHER RAE UNITS.

(a) The following RAE Units will have responsibilities as detailed in para 3 (b) :-

Fd Sqns, Fd Coys, A Fd Coys and A Tps Coys,
Div and Corps Fd Pk Coys,
HQ AA and Frt Coys.

(b) The above units are responsible for :-

- (i) full technique of bomb disposal
- (ii) disposal of enemy ammunition
- (iii) destruction of blind rounds.

Army Tps Coys have certain additional responsibilities as defined in GRO G257 of 31 Jul 42.

4. EQUIPMENT.

The RAE Units of para 3 (a) do not hold as much special equipment as the Bomb Disposal Pls, but use should be made of Bomb Disposal Pl equipment when required.

RAE Units other than Bomb Disposal Pls do not hold Trepanning nor Steaming-out apparatus. Some special appliances for electrically fuzed bombs, although on the W.E.T., will NOT be issued from AOD's (where now held) until the necessity arises; but all this equipment is issued to, and held by Bomb Disposal Pls.

5. TRAINING.

- (a) CEs and CsRE are responsible for unit training. This should be supervised by officers who have attended a Bomb Disposal Course.
- (b) CEs and CsRE should ensure that each unit detailed in para 3 (a) possesses at least 2 officers and 3 senior NCOs, who have qualified at a Bomb Disposal Course, as only personnel so qualified should defuze a bomb.
- (c) In Bomb Disposal Pls, only officers and sergeants normally attend a Bomb Disposal Course, and are therefore the only personnel fully qualified to defuze a bomb.
- (d) E in C will issue periodically Bomb Disposal Tech Instns direct to units. OsC are responsible for passing these Instns between officers and NCOs who have qualified at a Bomb Disposal Course.
- (e) A Bomb Disposal SORE from E in C will periodically visit units to assess their technical efficiency, or will be made available when requested by a CE or CRE.

6. ENEMY BOMB INTELLIGENCE.

New or varied types of enemy bombs and components will be despatched to E in C for examination. Before disposal an enemy bomb should, if possible, be examined by a qualified officer to determine if it is a new type. CEs and CsRE are responsible for sending bomb intelligence to E in C by fastest mail or by signal if important.

7. OTHER SERVICES.

The responsibilities of Allied Naval and Air Forces are understood to be as follows :-

(a) Navy

The disposal of shells and enemy bombs in Naval establishments or ships, and the disposal of mines, are Naval responsibilities.

(b) Air Force

- (i) The disposal of bombs and shells in Air Force establishments, is an Air Force responsibility
- (ii) The disposal of Allied bombs in crashed aircraft, or jettisoned Allied Bombs, is an Air Force responsibility."

(Sgd)

C. S. STEELE
Major General
Engineer in Chief

NOTES ON SERVICE RESPONSIBILITIES

The division of Service responsibility generalized in para 7 above may be subject to variation in the following circumstances :-

1. "Mines" mentioned in para 7(a) means parachute mine, German 'G' type mine or similar mine, and all marine weapons whether laid by ship or aircraft.

RAE may be called upon to dispose of these in an emergency.

2. Normal Navy method of disposal is to first render the "mine" safe and subsequently burn out the explosive charge.

Assistance of RAE may be required to -

- (a) perform the latter work in situ, or
 - (b) remove the "mine" elsewhere with the same object,
or
 - (c) remove the carcass.
3. The consent of the local Commander must be obtained before a "mine" is destroyed by explosion in situ. When this course is decided upon any beach and anti-tank mines in the proximity (up to 100 yds radius for a parachute or sea mine) should first be disarmed.
 4. When there is any difficulty in ascertaining whether it is an unexploded bomb or mine which has fallen in a harbour basin, wet dock etc., it should always be assumed to be a mine for disposal, whenever possible, by Navy.
 5. It has been agreed between the three Services that the closest co-operation will always be maintained and that assistance demanded of one Service by another will be readily given whenever possible.

REPORTS AND RETURNS

1. GENERAL.

(a) The number of Reports and Returns required of Units RAE by E in C has been kept down to the necessary minimum for the central collation of operational and technical statistics. All Officers should realize that these statistics, when examined as a whole and against those received from Allied Forces in other theatres -

(1) may have a definite bearing on disposal techniques which may be laid down, and

(ii) enables a better understanding of enemy methods and munitions for the benefit of RAE and Allied Forces generally.

(b) While it is not to be expected that Units RAE only occasionally engaged in bomb disposal should render UXB WORK REPORTS as regularly as Bomb Disposal Pls in operational areas, it is most desirable that they do so over a suitable period and in the form prescribed.

2. SPECIAL REPORTS. (E in C Tech Instn No 43, para 6 also refers)

(a) An officer who has qualified at a Bomb Disposal Course should assist in drafting signals of a special technical nature

(b) A complete report, accompanied by detail drawings and photos (if possible) of new or varied types of bombs, etc. must always be forwarded by fastest mail even though the specimen itself is to be consigned. Specimens often get lost in transit.

3. REGULAR RETURNS.

Units RAE continually engaged in bomb disposal duties (e.g. Bomb Disposal Pls) will render through usual RAE Channels to E in C fortnightly UXB WORK REPORTS in the prescribed manner. (Form BDI). Form AAF A.87 should be used for NIL returns.

4. UXB WORK REPORTS.

These are required for statistical purposes and should be as complete and accurate as possible. Form BDI will be completed in triplicate by Units: the original copy forwarded by fastest mail to E in C, one copy for GRE and one copy retained by unit.

Average figures from penetration data should be passed to relief Units.

5. UNIT UXB RECORD.

Form BD.2 will be completed in duplicate whenever UXBs are reported for disposal. The original copy should be retained by the Unit for own record purposes and the other forwarded to GRE for his information.

6. DAILY REPORTS.

Daily reports of bombs disposed of, or outstanding will be made under arrangements of CEs. They would probably be necessary only during periods of continuous air attack (e.g. against Civil areas). Form BD.3 may be found suitable.

UXB WORK REPORT NO. _____

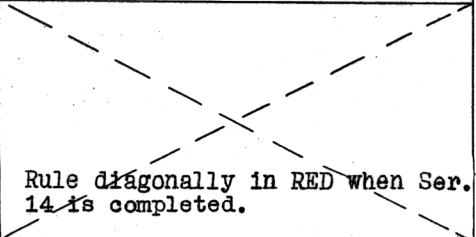
Unit _____

FOR FORTNIGHT ENDING / /

SER.	TYPE AND SIZE OF BOMB	Category of UXB	Dealt with	Exploded in situ	Recovered	Outstanding	TYPE OF FUZE/S				BEHAVIOUR UNDERGROUND		TYPE OF GROUND	REMARKS
							Long Delay		Other Types					
							Nose	Tail	Nose	Tail	Pen.	O/set		
1														
2														
3														
4														
5														
6														
7														
	TOTAL													

SPECIAL REMARKS e.g. (Types of Aircraft (if known),
 (Height from which dropped,
 (Target aimed at,
 (Any special features, markings, etc.

Name & Rank_____
Date

SER	UNIT U.X.B. RECORD		FORM BD.2
1	Disposal Instns received from :-		Bomb Serial No.
2	Date of Message	(Date) / / (Time)	hrs.
3	Date of Bomb falling	(Date) / / (a)	hrs (True) (b) hrs(Approx)
4	Location		
5	Bomb Category Allotted		
6	Report Verified	(Date) / / (Time)	hrs.
7	Operations Commenced	(Date) / / (Time)	hrs.
8	Operations Carried out by	(Name & Rank)	
9	Type of Bomb	Size	Fuze/s
10	Bomb Data	Pen. _____ ft. O/set _____ ft.	
11	How Fuzes dealt with		
12	How Bomb disposed of		
13	Operations Completed	(Date) / / (Time)	
14	Clearance Given	(Date) / / (Time)	
15	Special Remarks (Sketches overleaf if necessary)		
Record entered by _____ (Name & Rank) _____ Designation		 Rule diagonally in RED when Ser. 14 is completed.	

4.

FORM BD. 3

UXB DAILY REPORT

As at 1800 hrs.

Date _____ (Unit)

UXBs	NO.	REMARKS
Daily Fall		
Dealt with		
Discredited		
Delay Action		
Outstanding	Category A1	
	" A2	
	" B	
	" C	
	" D	
	TOTAL	

SPECIAL REMARKS

(Name & Rank)

ABANDONING OF BOMBS

1. INTRODUCTION.

Cases may arise in which a bomb, known to have fallen, cannot be reached after excavating. This may happen when the bomb has penetrated into running sand, alluvial soil or waterlogged ground. The question will then arise whether the bomb may properly be abandoned, or it is necessary to take special steps (e.g. employment of special equipment) to discover the bomb. Factors to be taken into consideration will include the size of the bomb, when it fell, nature of the ground, importance of nearby property and installations, and the possibility of vibration affecting the bomb if it is abandoned and traffic resumed.

2. AREAS NOT AFFECTED BY OPERATIONS.

For areas on the Australian mainland not affected by operations, the final decision as to whether the bomb should be abandoned is normally given by the Civil Defence authorities after a technical report has been submitted by the responsible RAE Officer, and all relevant factors have been considered.

When an unexploded bomb is thus abandoned, mention of the fact should be made in the usual Bomb Disposal Report and care taken to keep a proper unit record of the site and circumstances for future reference.

3. AREAS AFFECTED BY OPERATIONS.

In areas of active operations it will be unusual to take any action in respect of unexploded bombs which do not interfere in any way with the conduct of operations.

As a Base Area is developed later with L of C installations and communications, unexploded bombs may come to light. These should be dealt with as newly fallen bombs. In no case must it be assumed that a bomb becomes progressively safer to handle as time elapses, and the usual precautions laid down will always be observed.

When work on the recovery of a bomb is abandoned in Base Areas, precautionary measures should first be taken which will ensure a reasonable presumption that the bomb will not be exploded at a later date by any normal traffic or building operations. These measures are (i) the explosion of a charge as near as practicable to the estimated position of the bomb and (ii) the establishment of a permanent record of the estimated position and size of the bomb.

A suitable charge is 20-50 lbs of explosive according to the type of soil. The usual Safety Period and precautions should be observed against the possibility of a fuze being rendered active. After this period the work of making good the excavation can be undertaken.

The permanent record should preferably be a concrete pillar inscribed "UXB". If the bomb lies in an area likely to be developed for Military use, a record should also be made by the local CRE on his plans or maps.

B

**JAPANESE
BOMBS, AMMUNITION, ETC.**

Sec. 2 : H.E. Bombs.

3 : Anti-personnel Bombs

4 : Incendiary Bombs

5 : Miscellaneous Aerial Missiles

6 : Fuzes, Serial A

7 : " " B

8 : " " C

9 : " " D

10 : Gaines, Booster Systems & Magazines

11 : Ammunition

1. CHARACTERISTICS.

- (a) The bomb utilizes the body of Fuze B.5(A) as part of its own construction
- (b) The principle of a hollow-cone charge is employed

2. DETAILS.

Dimensions: Lengths - overall 10 1/2"
body incl. nose 4 1/2"
tail tube 3"
tail unit 4"
Diameter of barrel 1 1/2"
Barrel wall thickness 3/100"

Weights : Burster charges - TNT/RDX .. 104 grams
 RDX 4.6 "
Booster charge RDX 5.7 "
Total charges 114.3 "

Colour : BLACK body and nose
ALUMINIUM - like tail tube and fins

Markings : YELLOW $\frac{3}{8}$ " band around barrel.

3. USE.

ARMY Airforce bomb which is carried in a cluster of 76 bombs in a container (see BDTI B/5/116).

Bomb is mainly for AA usage, both airborne and grounded. Other suitable targets include AFVs and constructions.

4. DESCRIPTION. (See diagram)

The bomb comprises 3 main structural portions :

- (a) Nose piece. Attached for ballistic purposes is a hollow domed-cone constructed of 1/50" thickness sheet steel. (In UXBs, the nose will tend to collapse on impact with hard surfaces.)
- (b) Body. The barrel wall is of pressed steel 3/100" thickness, and bent over to retain the nose piece. Located in the body is a hollow-cone of thin pressed steel. The main burster charge of TNT/RDX is cast in the space between the cone and the body walling. Cast in the neck of the body is a smaller burster charge of RDX which serves as a subsidiary booster.
- (c) Tail assembly is constructed wholly of anodised duralumin (aluminium-like in appearance) and comprises -
 - (i) Tail tube (or tail extension piece) which screws over the neck of the body and is threaded at the rear end to receive the body of fuze B.5(A). The septum is perforated centrally to take an initiator. A cup containing a burster charge of RDX (5.7 grams) fits inside a cardboard cylinder, both sliding into the tube below the septum.

(ii) Fuze body. This also serves as a tail cone
For detail description see BDTI B/7/101.

(iii) Tail fin unit. 3 fins are screwed to the
conical fuze body and are braced mid-length
with hexagonal-strutting of shape and length
as shown. A hexagonal-shaped plate closes
their extreme end to ensure vertical descent.

5. FUZZING.

Tail fuze B.5(A) is a structural part of the
bomb. For description see BDTI B/7/101.

6. DISPOSAL.

Wherever possible, destroy in situ the com-
plete bomb (see NOTES 1 and 2).

7. PRECAUTIONS WHEN HANDLING.

In UXBs, the arming screw will generally be
found missing. In some cases it may be only partly
withdrawn. In both conditions the bomb is dangerous
and the following precautions should be observed when
necessary to handle -

(a) Pick up bomb by the middle and carry HORIZONT-
ALLY.

(b) Avoid jolting and do NOT drop it.

NOTE 1 :- In rare cases the arming screw may be found
in its original position and undamaged.
When this is so the bomb cannot function of
its own accord and is safe to handle.

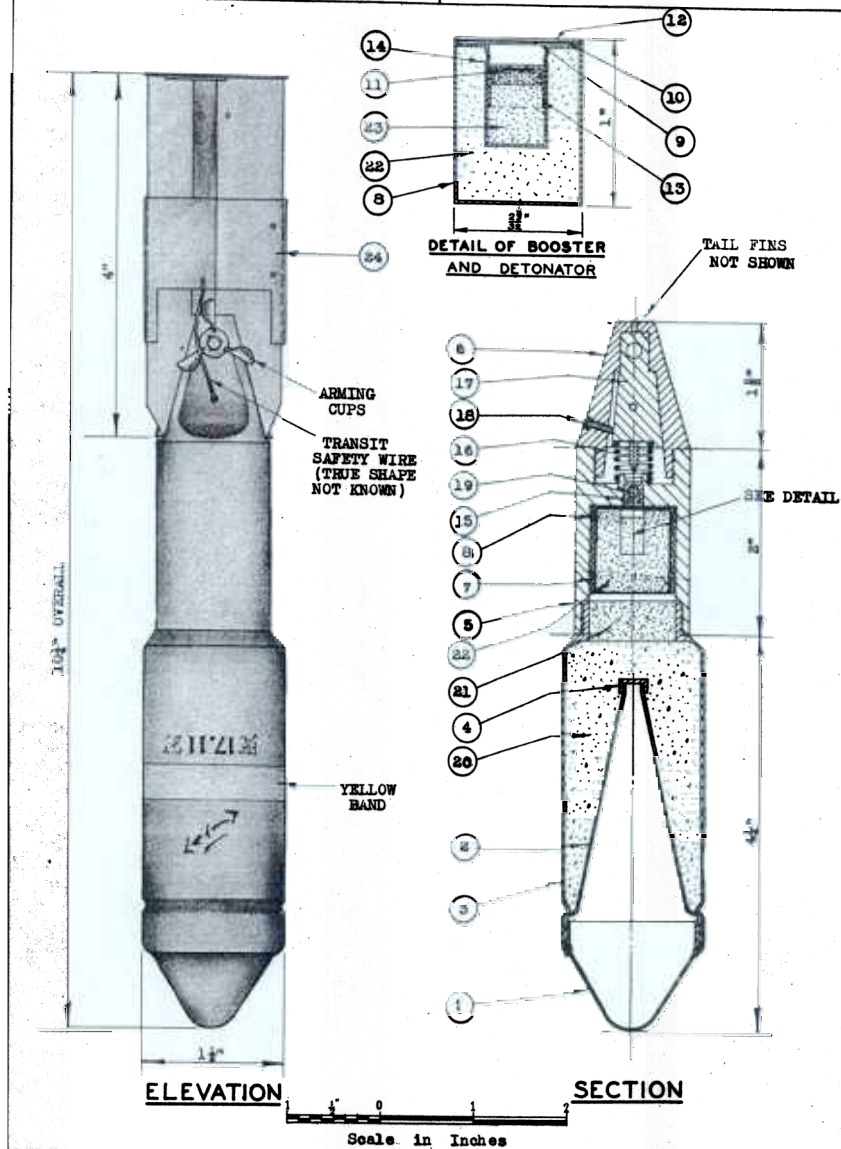
NOTE 2 :- If for any special reason dismantling is
necessary, do NOT attempt to unscrew the
tail cone first. Instead, commence dis-
mantling from the nose end. Keep the bomb
HORIZONTAL until the booster container is
finally extracted.

NOTES

JAPANESE
H.E. (CLUSTER) BOMB. $\frac{1}{3}$ Kg.
INCORPORATES FUZE B. 5 (A).

USE - ARMY AIRFORCE

REFER E IN C. BDTI B/2/100



LEGEND

ITEM	MATERIAL	ITEM	MATERIAL
1. NOSE PIECE	STEEL	13. LEAD AZIDE CONTAINER	ALUMINIUM
2. CENTRAL CONE	STEEL	14. CUP HOLDER	ALUMINIUM
3. BODY CASING	STEEL	15. DETONATOR HOLDER	BRASS
4. CONE CAP	STEEL	16. CREEP SPRING	STEEL
5. TAIL TUBE	DURALUMIN	17. INERTIA PELLET	STEEL
6. BODY OF FUZE	DURALUMIN	18. GUIDE SCREW	STEEL
7. CYLINDER	CARDBOARD	19. INITIATOR	
8. BOOSTER CONTAINER	ALUMINIUM	20. BURSTER	R.D.X./T.N.T. (50/50)
9. WASHER	ALUMINIUM	21. BURSTER	R.D.X.
10. BLUE SILK GAUZE		22. BOOSTER	R.D.X.
11. BLUE SILK GAUZE		23. DETONATOR	LEAD AZIDE AND P.E.T.M.
12. WASHER	ALUMINIUM	24. TAIL FINS	DURALUMIN

JAPANESE H.E. CLUSTER BOMB - 1 Kg
Incorporates Fuze B.5(B)

1. REFERENCES.

BDTI B/7/115 should be read in conjunction with this Tech Instn.

2. DETAILS.

Dimensions: Overall length (incl. fins). 16 $\frac{3}{4}$ ins
Length of body (incl. nose). 8 $\frac{3}{8}$ ins
Diameter of body 1-13/16 ins
Wall thickness of body 0.07 ins
Width of tail 1-25/32 ins

Weights: Total weight (excl. nose) . . 1.01 Kg
Filling (HEXANITE and ANISOL) 313.5 grams
Charge/weight ratio 31%

Colour: Body - BLACK (assumed)
Tail unit - unpainted TIN

Markings: "Anchor" ideograph stencilled in purple on tail denoting NAVY Airforce type.

3. USE.

- (a) This bomb is one of a cluster (probably 40 in all) carried in a container which separates after release from the aircraft and scatters the cluster.
- (b) Due to the application of the shaped charge (as in 1/3 Kg H.E. type) probable targets include airborne and grounded aircraft, AFVs, oil installations and structures.

4. DESCRIPTION. (See diagram)

The bomb consists of 3 main structural portions:-

- (a) Body. A side-welded cylinder of sheet steel is crimped near the nose to retain internally a cone made of thin pressed steel. A hemispherical ballistic cap of thin pressed steel is fitted at the nose end. This would tend to collapse on impact with a hard surface. The rear end of the cylinder is crimped to a ring which screws into the base of the fuze body.
- (b) Fuze body. For description see BDTI B/7/115.
- (c) Tail unit. This consists of a light sheet tin cone secured to the fuze body by 4 small screws, and 4 fins of similar material soldered to the cone. A tin cylinder 1 $\frac{1}{8}$ " wide braces the fins, protects the vanes from damage and assists their rotation. Extending the full length of the tail unit and passing through the cone is a reach rod terminating at the arming vanes.

5. FUZING.

The fuzing system, known as fuze B.5(B), is incorporated in the rear end of the bomb body. Refer to BDTI B/7/115 for details.

6. FILLING.

The main filling is HEXANITE and ANISOL (37/63 approx) cast in the space between the cone and the body casing. The rear end is formed to take a small gaine.

7. DISPOSAL.

(a) Destruction:

Wherever possible, destroy the complete bomb in situ

(b) Handling Bomb:

When the Safety Detent Pin and Reach Rod are missing in UXBs, the striker needle is either held off the detonator cap only by a light creep spring or more probably has pierced the cap. In both conditions the bomb is dangerous to handle. If necessary to do so, pick up bomb by the middle, carry horizontally, avoid jolting and do NOT drop it.

(c) Rendering safe (provisional)

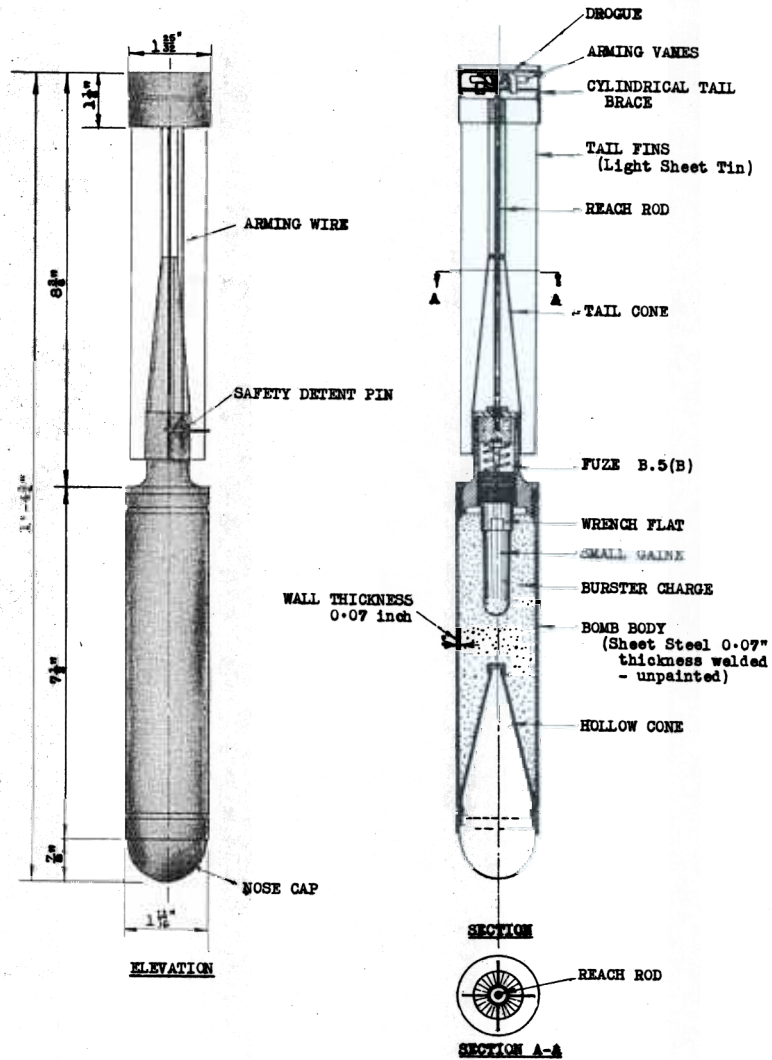
Before handling, dismantling or transporting a UXB the fuze should be treated wherever practicable with an approved explosive neutralizer (see BDTI B/10/93, para 14) on the fairly certain assumption that the detonator is pierced.

NOTES

JAPANESE
H.E. (CLUSTER) BOMB - 1 Kg.
INCORPORATES FUZE B.5(B)

USE :- NAVY AIRFORCE

REFER E IN C B.D.T.I. B/2/114



1 0 1 2 3 4
Scale in Inches

JAPANESE G.P., H.E. BOMB, TYPE 99 - 30 Kg

1. DETAILS.

Dimensions: Overall length 2'9 $\frac{1}{4}$ "
Diameter of body 5 $\frac{7}{8}$ ins
Wall thickness of body 9/32 ins
Length of body 2'4 $\frac{1}{8}$ "
Length of tail 1'1 $\frac{1}{4}$ "
Diameter over tail fins 8 $\frac{1}{4}$ ins

Weights: Main filling TNT/RDX (50:50). 11 $\frac{3}{4}$ Kg
Charge/weight ratio 39%

Colour: Painted BLACK overall

Markings: YELLOW and a WHITE band, each $\frac{7}{8}$ " wide,
around body forward of suspension lug.

2. USE. General Purpose (GP) bomb for use by ARMY Air-
force.

3. DESCRIPTION. (See diagram). The general construc-
tion is similar to that of the 50 Kg H.E. bomb described in
BDTI B/2/4. The bomb consists of the following portions :-

- (a) Barrel (1), which is a cylinder of 9/32" thickness
steel, is threaded at the fore end to screw on to the
nose piece (2), and is secured thereto with a single
grub screw (10). A swinging suspension lug is
fitted at the point of balance.
- (b) Nose-piece (2) of cast steel machined down to form
a thread for screwing into the barrel. Two grub
screws (9), diametrically opposite, engage in the
thread of the nose fuze and secure it.
- (c) Tail unit, the cone (3) of which is 3/16" steel, is
welded to the rear end of the barrel. A steel adap-
tor (7) is welded to the apex of the cone for fitment
of a tail fuze also secured by two grub screws.
Four fins (4) of sheet steel are spot welded to the
cone and, at their extreme end, are rivetted to box-
type struts (6).

5. MAIN FILLING. The nose piece, barrel and tail cone
are separately filled with a combination of TNT and RDX
(50:50), which is of a hard nature and white in colour. The
explosive is made up in block form wrapped in a cardboard
covering. A cardboard separating disc is placed at each
end of the barrel filling.

6. FUZING. Normal fuzing will probably be both NOSE
FUZE A.2(A) and TAIL FUZE B.1(A), together with exploder
systems normal for each of these types.

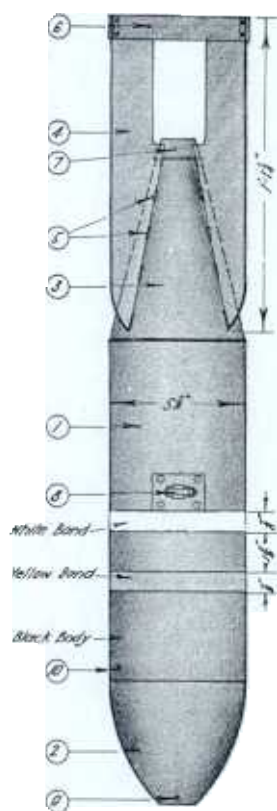
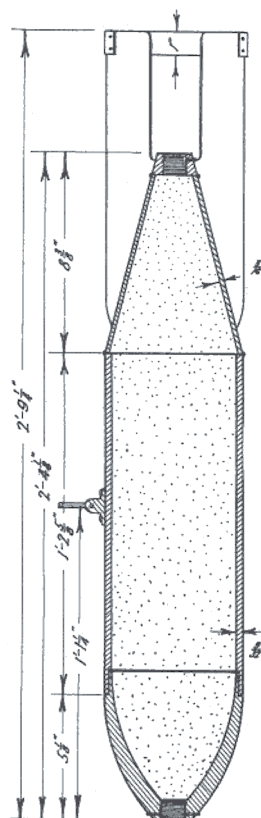
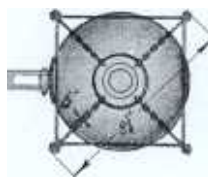
7. DISPOSAL. (Bomb filled and fuzed as above)

- (a) Fuze removal : See appropriate BDTIs.
- (b) Demolition (fuzed or unfuzed) : Normal methods.
- (c) Trepanning (if nose piece not removable) : Permis-
sible, but see BDTI D/20/62 for
Special Precautions.
- (d) Steaming-out (or boiling-out) : Permissible, but by
improvised methods - see BDTI D/20/31
- (e) Burning-out : Not permissible.

JAPANESE G. P. BOMB TYPE 99 - 30 Kg.

USE:- ARMY AIRFORCE

REFER B.D.T.I. B/2/102

**ELEVATION****SECTION****NOSE
VIEW****TAIL
VIEW**

1 0 1 2 3 4 5 6
Scale in Inches

LEGEND

1. BARREL	7. ADAPTOR
2. NOSE PIECE	8. SUSPENSION
3. TAIL CONE	9. GRUB SCREWS
4. TAIL FINS	10. GRUB SCREW
5. WELDS	
6. STRUTS	

JAPANESE G.P., H.E. BOMB, TYPE 94 - 50 Kg

1. DETAILS.

Dimensions: Overall length. 3'4½" (aver.)
Length of body. 2'10½"
Diameter of barrel 7½ ins
Thickness of barrel wall 7 mm (9/32" approx)
Thickness of tail fins.. 2 mm

Weights: Filling - nose block. . . 7 lbs PICRIC
" barrel block.. 30 lbs "
" tail block. . . 5 lbs "
Total weight of filling. 42 lbs "
Charge/weight ratio.. . . 39% approx.

Colour: BLACK overall

Markings: (a) RED band, ¾" wide, on tip of nose piece
(b) One YELLOW and one WHITE band, each about 1" wide, around barrel forward of suspension
(c) "50 K" stencilled in white paint on barrel near nose piece.

2. USE.

A General Purpose (GP) bomb in common use by the ARMY Airforce.

3. DESCRIPTION. (See diagram)

The bomb comprises 3 separate portions :-

- (a) Barrel. A cylinder 7½" external diameter of 7 mm (9/32 ins) thickness steel. The fore end is threaded internally to screw on to the nose piece. A swinging type suspension lug is fitted at the point of balance.
- (b) Nose piece of steel, which is machined down and threaded (8 t.p.i.) for screwing into the barrel.
- (c) Tail unit. The cone is butt welded to the barrel and at the apex an adaptor, threaded internally, is welded on to take a tail fuze. Four fins, either "T" or spot welded to the cone, are braced at their extreme end with box-type struts.

4. FILLING.

The filling consists of 3 separate preformed blocks of PICRIC ACID. The nose block is pressed crystalline powder, the barrel block is cast whilst the tail block is pressed crystalline powder with a cast central core about twice the width of the exploder tube and extending from the closed end of the exploder tube to the fore end of the block.

Each block is wrapped in cardboard approx. 1/16" thickness. A barrier consisting of a felt disc 1/4" thick and a waxed cardboard disc 3/16" thick is placed between each block. The nose block fits against a shaped wood block placed inside the fuze opening. A space 3 mm wide between the blocks and the casing is filled with paraffin wax.

A pocket 2 $\frac{3}{8}$ " deep is formed in the nose block to take 2 Picric pellets (one a ring pellet). A pocket 5" deep is formed in the tail block to take an exploder tube.

5. FUZZING.

Fuzes generally used are :-

Nose Fuze	A.2(A)	and modifications
Tail Fuze	B.1(A)	" "

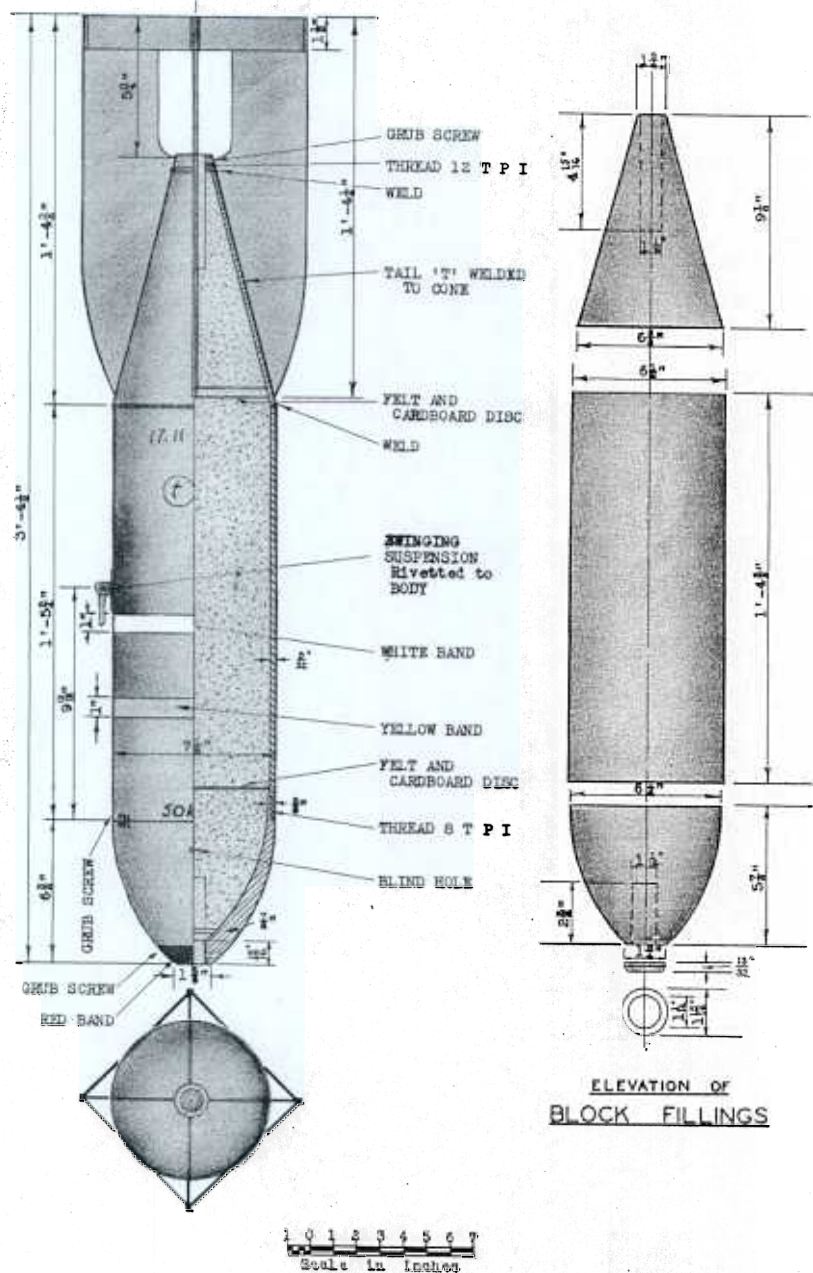
6. DISPOSAL. (Bomb filled and fuzed as above)

- (a) Fuze removal : See appropriate BDTIs.
- (b) Demolition (fuzed or unfuzed) : Normal methods.
- (c) Trepanning (if nose piece not removable) : Permissible, but see BDTI D/20/62 for Special Precautions.
- (d) Steaming-out (or boiling-out) : Permissible, but by improvised methods (see BDTI D/20/31).
- (e) Burning-out : Not permissible.

NOTES

USE - ARMY AIRFORCE

REFER E IN C B.D.T.I. B/2/4



JAPANESE G.P., H.E. BOMB, TYPE 94 - 50 Kg
Incorporates Fuze C.3(A)

1. REFERENCES.

- (a) BDTI B/2/4 - description of 50 Kg, Type 94, bomb, which resembles subject bomb
- (b) BDTI B/8/95 - description of Fuze C.3(A)

2. DETAILS.

Dimensions: Overall length.. . . . 3'3 $\frac{1}{2}$ "
Length of body.. . . . 2'9 $\frac{3}{4}$ "
Diameter of barrel.. . . . 7 $\frac{1}{8}$ "
Wall thickness.. . . . 9/32"
Diam nose fuze opening 2 $\frac{1}{8}$ "

Weights : Total weight (fuzed).. . . . 110 lbs
Bomb empty (incl. fuze).. . . . 67 lbs
Fuze C.3(A).. . . . 9 lbs
Bursting charge (PICRIC ACID) 43 lbs
Charge/weight ratio 39%

Colour : BLACK (painted)

Markings : A YELLOW and a WHITE band, each 1" wide around barrel forward of suspension.

3. USE. ARMY Airforce type General Purpose (GP) bomb, fuzed only for long delay.

4. DESCRIPTION. (See diagram)

Construction is identical with the 50 Kg Type 94 H.E. bomb described in BDTI B/2/4, EXCEPT for the following differences :-

- (a) The nose is machined down 1" to provide a fuze opening 2 $\frac{1}{8}$ " diam. to take a C.3(A) fuze. This has reduced the maximum width of nose wall from $\frac{7}{8}$ " to $\frac{5}{8}$ "
- (b) The fins, at their extreme end, are fitted with a closing plate.

5. FILLING.

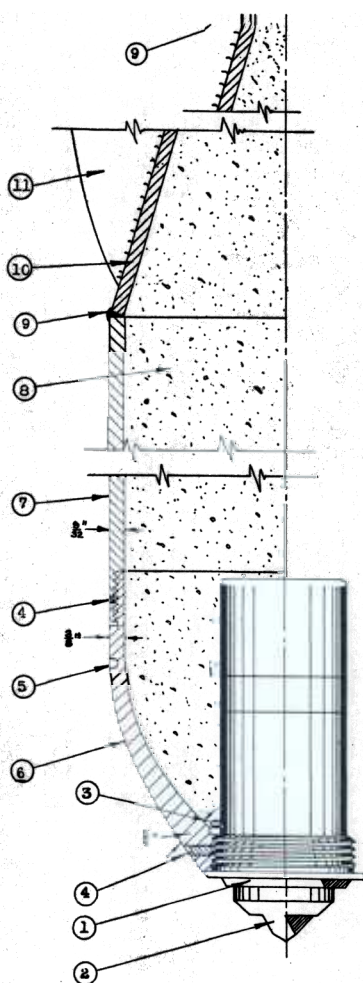
Bursting charge same as described in BDTI B/2/4 except that pocket formed in nose block will take a C.3(A) fuze and booster.

6. FUZING.

Only chemical long delay fuze type C.3(A) can be fitted at the nose.

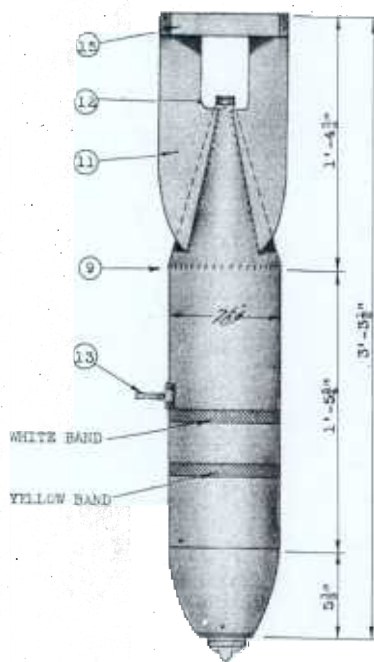
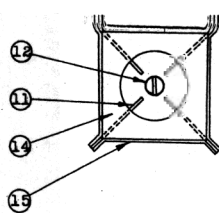
7. DISPOSAL. (Bomb filled and fuzed as above)

- (a) Demolition : Normal methods
- (b) Fuze removal: For fuze C.3(A) see BDTI B/8/95
- (c) Trepanning : May be trepanned AFTER fuze has been immunized, but normal method is to unscrew nose piece
- (d) Steaming-out: May be steamed-out AFTER fuze has been immunized, NEVER BEFORE
- (e) Burning-out : NEVER permissible.



PART SECTION

1 0 1 2 3
Scale in Inches



ELEVATION

1 0 2 4 6 8 10
Scale in Inches

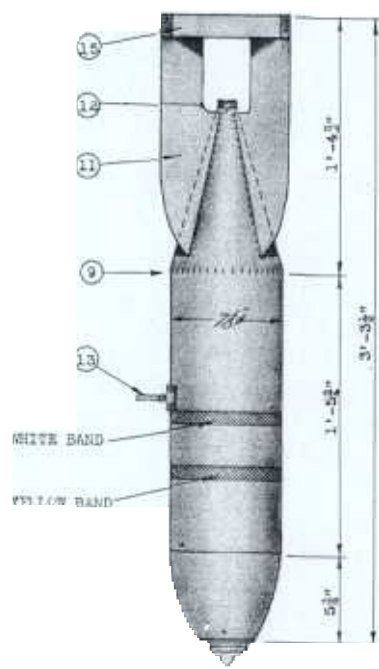
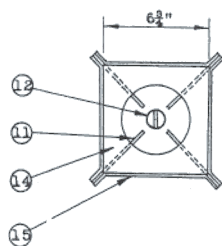
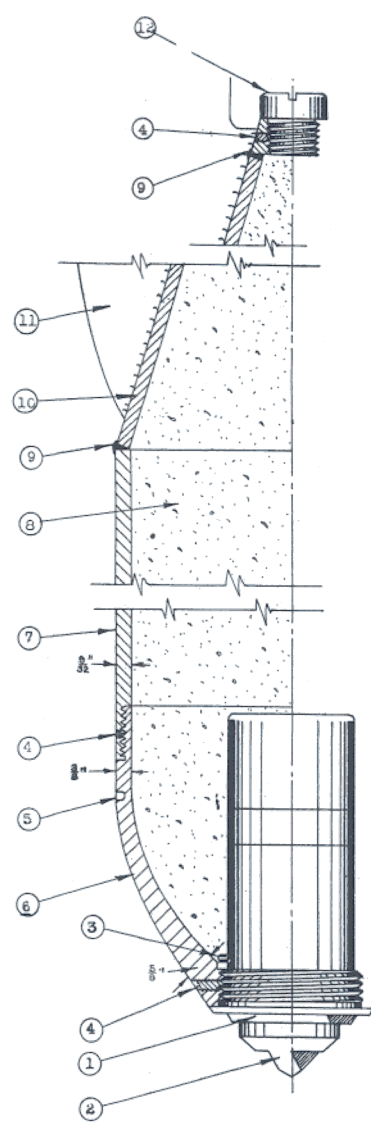
LEGEND

- | | |
|--------------------|-------------------|
| 1. FUZE C.3(A) | 9. WELD |
| 2. FUZE NOSE-CAP | 10. TAIL CONE |
| 3. LOCKING PLUNGER | 11. TAIL FINS |
| 4. GRUBSCREW | 12. BAKELITE PLUG |
| 5. BLIND HOLES (2) | 13. SUSPENSION |
| 6. NOSE PIECE | 14. CLOSING PLATE |
| 7. BARREL CASING | 15. TAIL STRUTS |
| 8. BURSTER CHARGE | |

JAPANESE G. P. H.E. BOMB TYPE 94 - 50 Kg INCORPORATES FUZE C.3(A)

USE - ARMY AIRFORCE

REFER B.D.T.I. B/2/96



PART SECTION

ELEVATION



LEGEND

- | | |
|--------------------|-------------------|
| 1. FUZE C.3(A) | 9. WELD |
| 2. FUZE NOSE-CAP | 10. TAIL CONE |
| 3. LOCKING PLUNGER | 11. TAIL FINS |
| 4. GRUBSCREW | 12. BAKELITE PLUG |
| 5. BLIND HOLES (2) | 13. SUSPENSION |
| 6. NOSE PIECE | 14. CLOSING PLATE |
| 7. BARRIL CASING | 15. TAIL STRUTS |
| 8. BURSTER CHARGE | |

JAPANESE G.P. H.E. BOMB, TYPE 97 - 60 Kg

1. DETAILS.

Dimensions: Overall length.. . . . 3'4 $\frac{1}{2}$ "
Length of body.. . . . 2'8 $\frac{3}{8}$ "
Diameter of barrel 7 $\frac{7}{8}$ ins
Wall thickness.. . . . 9/32 ins

Weights: Total weight (excl. fuze) 130 lbs (aver.)
Empty bomb 80 lbs "
Filling (see para 4).. . . 50 lbs "
Charge/weight ratio 38 $\frac{1}{2}$ % approx.

Colour: GREY overall

Markings: Though structural details are uniform, as above, colour markings have varied as follows:-

Example A : (land use)

HEXANITE and ANISOL filling
1" BLUE band around barrel aft of suspension
Two thin RED lines diametrically opposite and full length of body.
GREEN tail fin struts.

Example B : Cast PICRIC filling

Same as A but blue band is absent.

Example C : HEXANITE and ANISOL filling

Same as A, plus 1" BLACK band two-thirds around barrel and above blue band.

Example D : HEXANITE and ANISOL filling

1" BLUE band around barrel aft of suspension
GREEN tail fin struts
3" GREEN band on tip of nose

Example E : HEXANITE and ANISOL filling

Same as D plus standard 2 thin RED lines

Example F : (land use) cast PICRIC filling

No colour markings.

2. USE.

General Purpose (GP) type bomb for use by NAVY Airforce.

3. DESCRIPTION. (see diagram)

This bomb consists of 3 main structural portions

- (a) Barrel. A cylinder of 9/32" thickness steel. Suspension is Navy type eye-bolt welded on.
- (b) Nose piece of cast steel. The barrel slides over the machined down portion and is secured by 20 rivets in 2 rows of 10 each. The joint is sealed by a continuous weld. A grub screw through the nose engages in the thread of the fuze.

- (c) Tail unit, comprising a coupling ring, tail cone and 4 fins. The shaped steel coupling ring is screwed to the barrel by 28 screws in 2 rows of 14 each. The tail cone, of 3/16" thickness steel, is secured to the coupling ring by a single row of 24 rivets and the joint sealed by a continuous weld. A steel disc is welded into the apex of the cone for sealing. 4 sheet steel fins are either spot welded or T-welded to the cone and braced at their extreme end with box-type struts lightly rivetted to the fins.

4. FILLING.

Filling may be either cast PICRIC ACID or HEXANITE and ANISOL (see Examples, para 1). In each case, the barrel and the nose are filled in the one operation and the tail cone separately. The usual felt and paper discs fill the gap between the 2 fillings.

5. FUZING.

A nose fuze only is fitted. Fuze most commonly used is A.3(A).

6. DISPOSAL. (Bomb filled and fuzed as above)

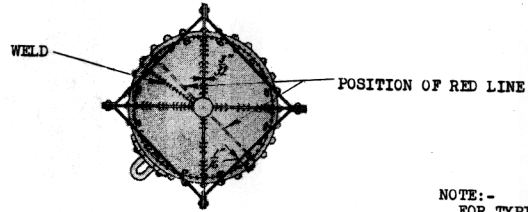
- (a) Fuze removal : See appropriate BDTI.
- (b) Demolition : Normal methods.
- (c) Trepanning : Permissible, but see BDTI D/20/62 for Special Precautions if filling is PICRIC ACID.
- (d) Steaming-out : Permissible.
- (e) Burning-out : Permissible if HEXANITE and ANISOL filled. NOT permissible if PICRIC filled.

NOTES

JAPANESE
G. P. BOMB, TYPE 97 - 60 Kg.

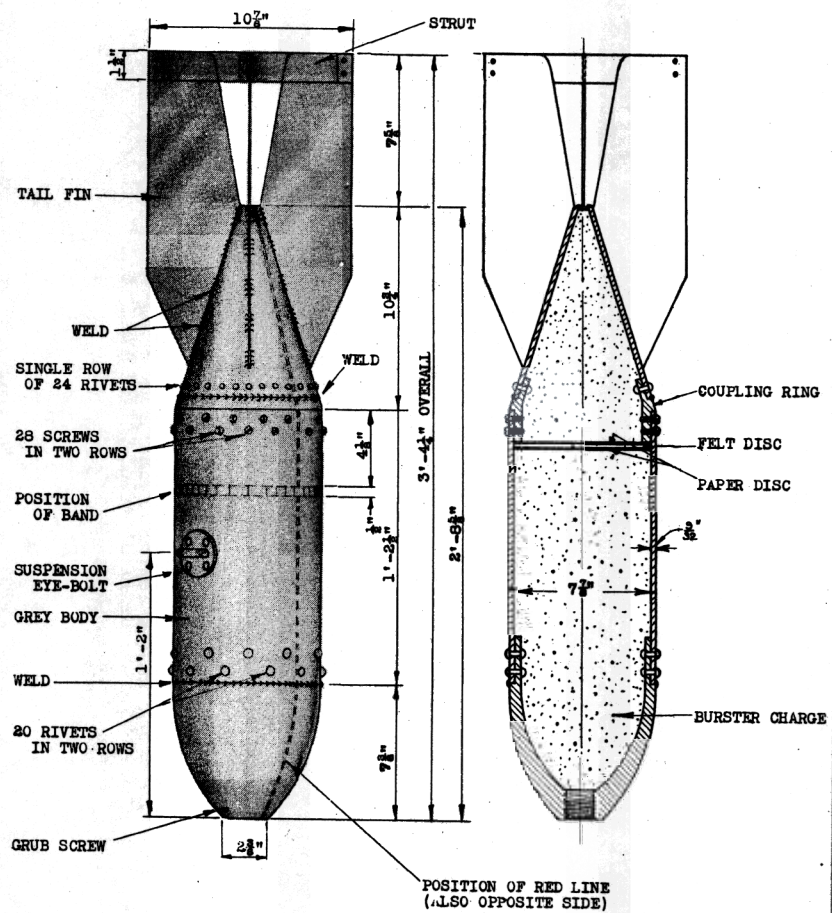
USE - NAVY AIRFORCE

REFER E IN C B.D.T.I. B/2/5



NOTE:-
FOR TYPICAL COLOR MARKINGS -
SEE PARA 1

TAIL VIEW



ELEVATION

SECTION

1 0 2 4 6 8 10 12
Scale in Inches

JAPANESE G.P., H.E. BOMB, TYPE 98 - 60 Kg

1. DETAILS.

Dimensions: Overall length 3'6"
Length of body 2'10"
Diameter of barrel 9 $\frac{3}{8}$ "
Thickness of barrel wall . 5/16"
Width of tail fins 9 $\frac{3}{8}$ "
Diam over tail fins .. . 13 $\frac{1}{4}$ "
Thickness of tail fin . . . 1/16"

Weights : Burster (PICRIC ACID) . . . 82 lbs
Total weight 135 lbs
Charge/weight ratio .. . 60.6%

Colour : GREY

Markings : (a) BLUE band around barrel above sus-
pension
(b) GREEN tail struts

2. USE.

NAVY Airforce type G.P. bomb.

3. DESCRIPTION. (See diagram)

The external dimensions of this bomb closely correspond with the 60 Kg Type 98 Incendiary (solid oil) bomb.

The bomb comprises 3 separate structural portions :-

- (a) Barrel. A cylinder of 9 $\frac{3}{8}$ " external diameter formed of 5/16" thickness steel. The nose end is threaded internally for screwing on to the nose piece. Dual suspension provided is normal Navy Airforce eyebolt type.
- (b) Nose piece, of steel, is machined down and threaded for screwing into the barrel. The joint is sealed with a continuous weld. The fuze seats on a boss formed at the nose end.
- (c) Tail unit. A shaped coupling ring is secured to the barrel with rivets (or screws) in 2 rows of 16 each. A tail cone fits over the ring and is continuous-welded to the barrel. Four fins of sheet steel are spot welded to the cone and are braced at their extreme end with box-type struts (for variations see NOTE 1 below).

4. FILLING.

The PICRIC ACID (Lyddite) burster charge is assumed to be in cast form. The nose piece and the remainder of the bomb case are filled in separate operations. The usual felt and paper discs are placed in the gap between the two fillings. The nose portion is formed to take a Navy type standard gaine (for variation in filling see NOTE 2 below).

5. FUZING.

Provision is made for a nose fuze only. It is probable that either A.1(A), A.3(A) or A.3(B) may be used.

6. DISPOSAL. (Bomb filled and fuzed as above)

- (a) Fuze removal. See relevant BDTI for fuze found fitted.
- (b) Demolition. Normal methods.
- (c) Trepanning. } Permissible, but see
- (d) Steaming-out. } BDTI D/20/62 for
- (e) Burning-out. NOT permissible.

NOTE 1 :-

Variation in fin bracing. Some recent types of above bomb have 4 sets of fin bracing by way of an inner and an outer set at their extreme end as well as mid-length. These struts are of 1/32" thickness sheet steel and 1½" wide, bent for welding to the fins. In each case the outer struts are box-type and the inner struts are arranged cylinder-type.

NOTE 2 :-

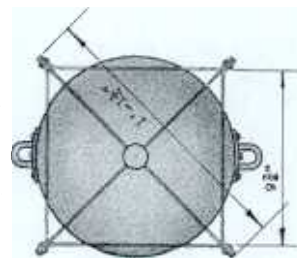
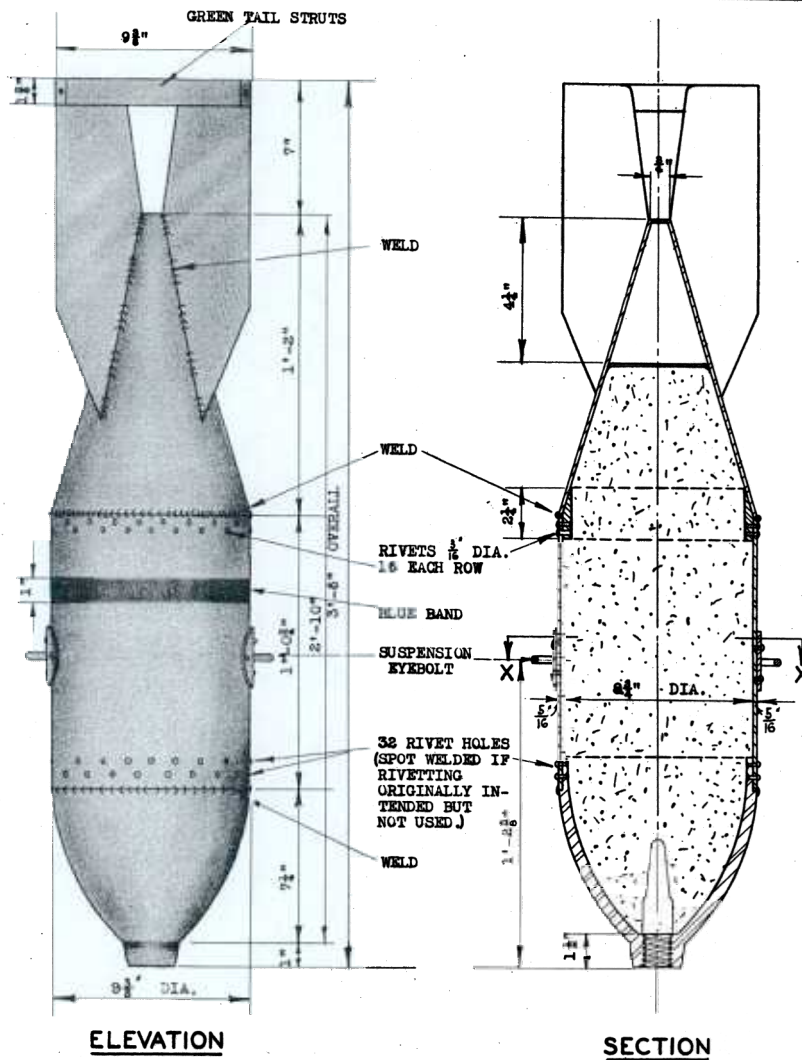
Variation in filling. A bomb with struts as in NOTE 1 above was filled HEXANITE and ANISOL. Disposal for bombs so filled is as follows :-

- (a) Demolition. Normal methods
- (b) Trepanning. Permissible.
- (c) Steaming-out. Permissible, provided a chemical long delay nose fuze, e.g. C.2(A) is NOT fitted.
- (d) Burning-out. Permissible.

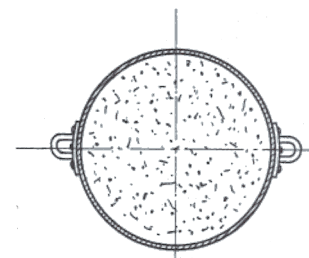
JAPANESE H.E. G.P. BOMB. TYPE 98 - 60 KG.

USE - NAVY AIRFORCE

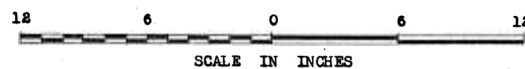
REFER E.I.N.C BDTI B/2/6



REAR END ELEVATION



SECTION X-X



JAPANESE S.A.P., H.E. BOMB, TYPE 99 - 63 Kg

1. DETAILS.

Dimensions: Overall length 3'6 $\frac{1}{2}$ "
Length of body 2'1 $\frac{3}{4}$ "
Diameter of barrel 9"
Min wall thickness $\frac{1}{4}$ "
Width of tail fins 8 $\frac{3}{8}$ "
Diameter of tail fins . 12 $\frac{3}{8}$ "

Weights : Total weight (unfuzed). 138 lbs (62.6 Kg)
Filling (PICRIC ACID) . 70 lbs
Charge/weight ratio ..50.7 %

Colour : GREY (painted)

Markings : GREEN 3" band on nose
GREEN tail fin struts
RED LINES (2) diametrically opposite and
full length of body.

2. USE.

NAVY Airforce S.A.P. ordinary bomb mainly for
lightly armoured targets (e.g. ships).

3. DESCRIPTION.

Bomb comprises 2 main structural portions :-

- (a) Body. The body and nose are of cast steel and
machine turned. Provision is made in the nose
for fitment of a fuze and a grub screw to secure it

A base plate screws into the rear end of the body
and is secured thereto by a 3/16" diam grub screw
engaging in the flange thread

Suspension is normal Navy type eyebolt.

- (b) Tail unit. A hollow tail cone of sheet steel
fits over the upper portion of the base plate
flange and is secured thereto with 20 - 3/16" diam
set screws

Four fins are rivetted to the cone and are braced
at their extreme end with box-type struts secured
by single rivets. The fins are distinguishable by
their broadness.

4. FILLING.

The bursting charge is PICRIC ACID (LYDDITE)
cast in the bomb in the one operation. The tail cone is
empty of explosive.

5. FUZING.

Provision is made for a nose fuze only. Fuze
probably used is A.1(C). Fuze A.3(A) has also been found
fitted.

6. DISPOSAL. (Bomb filled and fuzeed as above)
- (a) Fuze removal. See relevant BDTI for fuze fitted.
 - (b) Demolition. Normal methods
 - (c) Trepanning. } Permissible, but see
 - (d) Steaming-out. } BDTI D/20/62 for
 - (e) Burning-out. NOT permissible.

NOTE 1 :- Colour variations

The following variations in colour and colour markings have been recorded. Construction corresponds exactly with bomb above described but type of burster charge is unconfirmed.

Colour : GREEN body
GREY tail unit

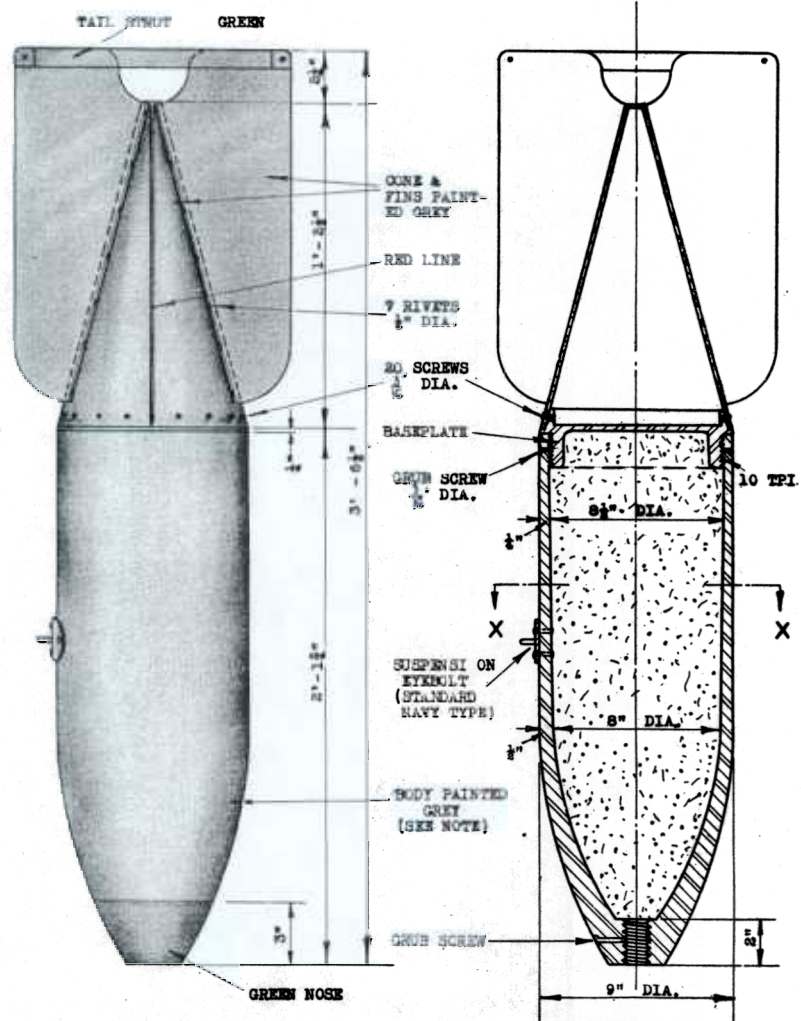
Markings: GREEN tail fin struts
RED LINES (2) diametrically opposite on tail cone only.

NOTES

JAPANESE S.A.P. H.E. BOMB, TYPE 99 - 63 KG.

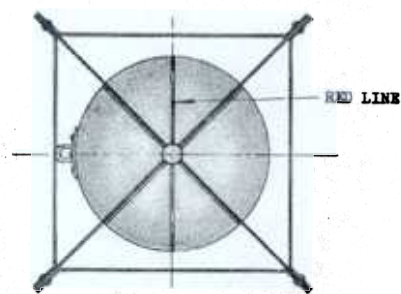
USE - NAVY AIRFORCE

REFER E. INC. BDTL. B/2/60

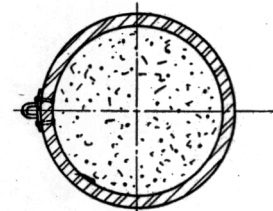


ELEVATION

SECTION



REAR END ELEVATION



SECTION X-X

1 0 2 4 6 8 10 12
SCALE IN INCHES

JAPANESE G.P. H.E. BOMB, TYPE 94 - 100 Kg

1. DETAILS.

Dimensions: Overall length 4'5"
Length of body 3'10"
Diameter of barrel 9 $\frac{1}{2}$ "
Barrel wall thickness 13/32"
Length of tail 1'9 $\frac{1}{4}$ "
Width of tail fins 9 $\frac{1}{2}$ "
Diameter over tail fins 1'1 $\frac{3}{8}$ "

Weights : Total weight 100 Kg (approx)
Filling (PICRIC ACID) 51 Kg (est.)
Charge/weight ratio 51 % (approx)

Colour : BLACK (painted)

Markings : (a) YELLOW and WHITE $\frac{3}{4}$ " bands around
barrel forward of suspension
(b) "100K" stencilled in white paint on
barrel above nose joint

2. USE.

ARMY Airforce G.P. type bomb.

3. DESCRIPTION. (See diagram)

This bomb comprises 3 main structural portions

- (a) Barrel. A hollow cylinder of 13/32" thickness steel and 9 $\frac{1}{2}$ " external diameter, threaded internally for screwing on to the nose piece. A swinging suspension, normal for Army types, is fitted
- (b) Nose piece. The cast steel nose piece is machined down and threaded for screwing into the barrel. A threaded fuze opening is provided, and 2 grub screws for securing the fuze
- (c) Tail unit. A tail cone of 5/16" thickness sheet steel is butt-jointed and welded to the barrel. A tail fuze adaptor is welded to the apex of the cone. Four tail fins are welded to the tail cone and are braced both centrally and at their extreme end with box-type struts rivetted to the fins. The twin bracing is a distinguishable feature.

4. FILLING.

The bursting charge is preformed blocks of PICRIC ACID possibly varying as in the 50 Kg Type 94 H.E. G.P. bomb (see BDTI B/2/4, para 4).

The nose, barrel and tail cone sections contain separate blocks, each block being wrapped in waxed paper and embedded in paraffin wax. A thick felt and a cardboard disc are placed to fill the gap between the blocks.

The nose block fits against a wood washer which is perforated for the booster tube.

Pockets are formed in the nose and tail blocks to take respectively a short and a long booster tube.

5. FUZING.

Fuzes generally used are -

Nose fuze A.2(A)
Tail fuze B.1(A)

6. DISPOSAL. (Bomb filled and fuze as above)

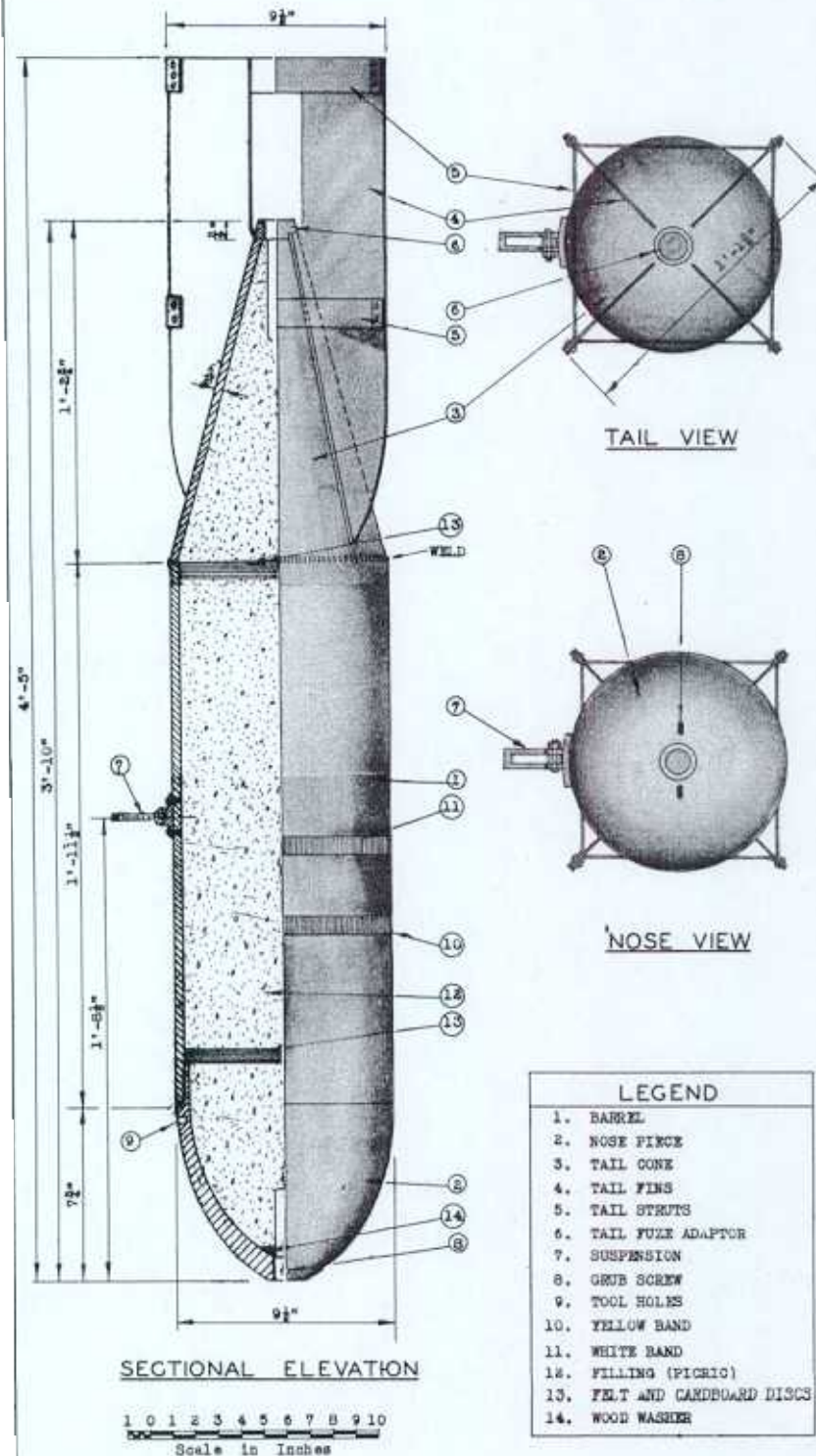
- (a) Fuze removal. See relevant BDTI for fuze/s fitted
- (b) Demolition. Normal methods
- (c) Trepanning. } Permissible, but see
- (d) Steaming-out. } BDTI D/20/62 for
- (e) Burning-out. NOT permissible.

NOTES

JAPANESE G.P. H.E. BOMB TYPE 94-100 Kg

USE - ARMY AIRFORCE

REFER E INC B.D.T.I. B/2/7



JAPANESE G.P. H.E. BOMB, TYPE - 250 Kg

NOTE :- Temporarily referred to as "Early Type".

1. DETAILS.

Dimensions: Overall length 6'0"
Length of body 4'9 $\frac{3}{4}$ "
Diam of barrel 13 $\frac{3}{4}$ "
Thickness of barrel wall 5/16"
Width of tail fins 13 $\frac{3}{4}$ "

Weights : Weight of filling (HEXANITE and
ANISOL) .. . lbs
Total weight .. . lbs
Charge/weight ratio .. . %

Colour : GREY (painted)

Markings : GREEN band, about 6" wide, on nose tip
BLUE 1" band around barrel.
GREEN tail fin struts.

2. USE.

NAVY Airforce G.P. type bomb for use against
land targets. Suitable for demolition purposes.

3. DESCRIPTION. (See diagram)

The bomb comprises 3 main structural portions:

- (a) Barrel. A hollow cylinder formed of 5/16"
thickness steel and of 13 $\frac{3}{4}$ " external diameter.
The nose end is either -
- (i) threaded internally for screwing on to the
nose piece, or
 - (ii) a slip fit on the machined down portion of
the nose piece, the two portions being secured
with 1 row of 16 rivets and the joint continuous
welded.

NOTE 1 :- In some bombs the 2 portions have
been found screwed together as in
(i) and with rivet holes sealed by
spot welding.

At the rear end a plain coupling ring is fitted
internally and secured with 1 row of 16 rivets.
Suspension is normal Navy type eyebolt.

- (b) Nose piece, of cast steel, is machined down for
fitment to the barrel by method (a) (i) or (ii)
above. The nose opening receives a fuze and grub
screw for securing it.

- (c) Tail unit. A cone constructed of sheet steel
fits over the coupling ring and is secured thereto
with 32 screws in 1 row. An adaptor is welded to
the apex of the cone to take a tail fuze.

Each of the 4 tail fins is shaped on the internal edge to allow for the fuze arming vanes. The fins are braced at their extreme end with box-type struts.

4. FILLING.

The burster charge is HEXANITE and ANISOL, the nose portion being poured separately. The two fuze pockets are formed with thin cardboard liners.

5. FUZING.

Fuzes fitted may be selected from -

Nose - A.1(A), A.3(A), A.3(B) mechanical impact
C.2(A) chemical long delay

Tail - B.3(A) mechanical impact
C.1(A) chemical long delay

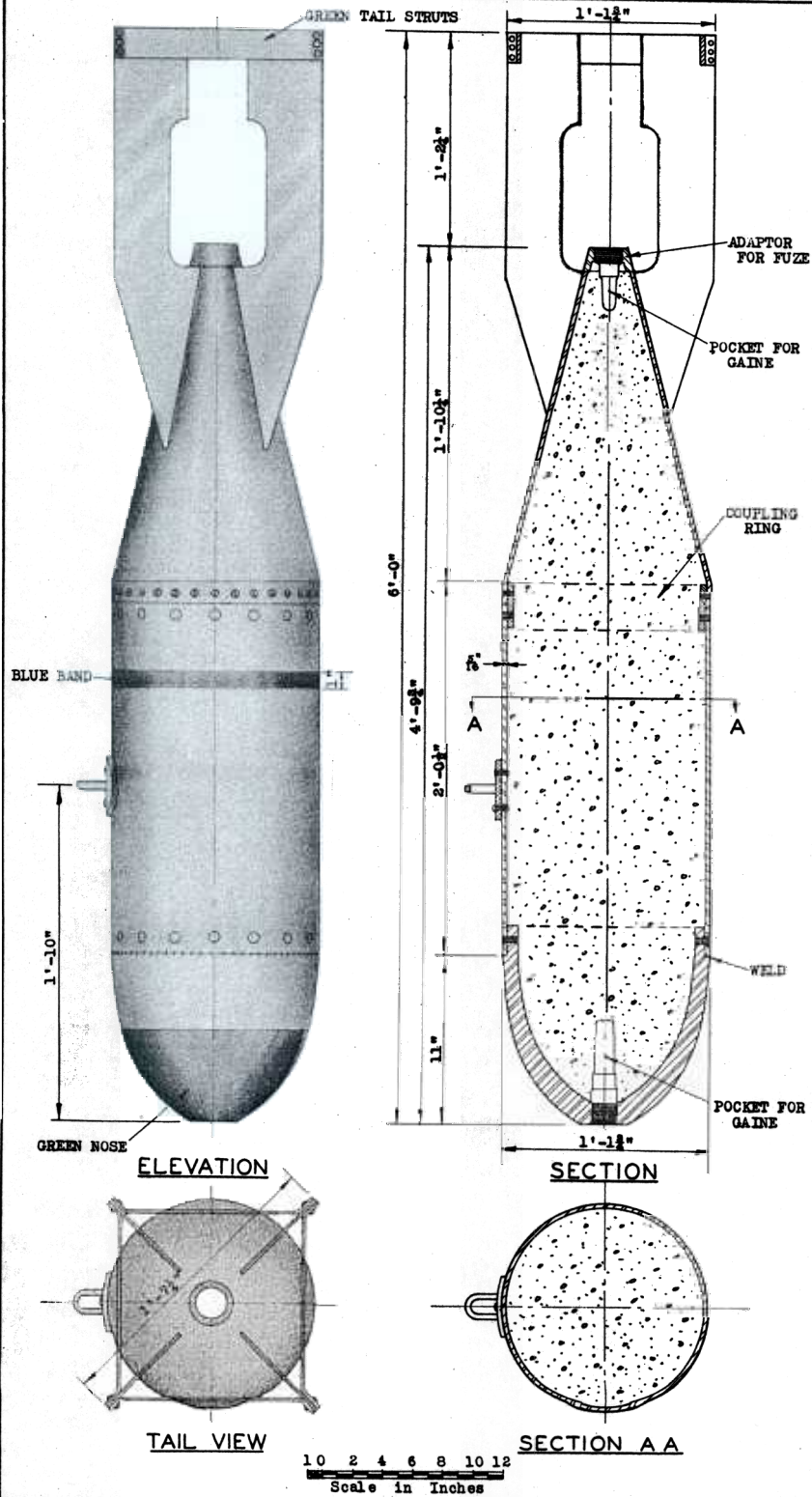
6. DISPOSAL. (Bomb filled with HEXANITE and ANISOL)

- (a) Fuze removal. See relevant BDTI for fuze/s found fitted.
- (b) Demolition. Normal methods
- (c) Trepanning. Permissible
- (d) Steaming-out. Permissible, provided a chemical long delay type fuze is NOT fitted
- (e) Burning-out. Permissible.

JAPANESE
G.P. H.E. BOMB TYPE - 250 Kg.
(“EARLY TYPE”)

USE - NAVY AIRFORCE

REFER E.M.C. B.D.T.I. B/2/8



JAPANESE G.P. H.E. BOMB, TYPE 98 - 250 Kg

1.

Originally referred to as "Later Type".

2. DETAILS.

Dimensions: Overall length.. .. 6'0"
Length of body.. .. 4'10½"
Diam of barrel.. .. 12"
Thickness of barrel wall.. .. ½"
Width of tail fins. 12"

Weights : Burster charge.. .. 183½ lbs
Total weight. lbs
Charge/weight ratio 36% approx

Colour : GREY (painted)

Markings : Vary as following examples -

EXAMPLE A. (Burster charge - HEXANITE and ANISOL).
GREEN band 4"-6" wide on nose tip
RED lines (2) diametrically opposite and full
length of body
GREEN tail fin struts.

EXAMPLE B. (Burster charge -)
GREEN band 6" wide on nose tip
RED lines (2) as above

EXAMPLE C. (Burster charge -)
RED lines (2) as above. No other colour markings

3.

NAVY Airforce GP type bomb for land targets.
Also suitable for use against shipping (unarmoured).

4. DESCRIPTION. (See diagram)

The bomb consists of 3 main structural portions :-

(a) Barrel. A drawn steel tube of ½" thickness and of 12" external diameter. A shaped coupling ring is fitted internally at the rear end and is secured with set screws in 2 rows of 20 each. Suspension is normal Navy type eyebolt.

(b) Nose piece, of cast steel, is machined down to receive the barrel. The joint between the 2 portions is continuous welded. The nose opening receives a fuze and a grubscrew to secure it.

NOTE 1 :- In some bombs the barrel and nose piece may be secured with rivets. When riveting is omitted, the holes are sealed with spot welds.

(c) Tail unit. A cone constructed of steel fits over the coupling ring and is welded thereto (see NOTE 2). An adaptor is welded to the apex of the cone to receive a tail fuze.

Each of the 4 tail fins is shaped on the internal edge to allow for the fuze arming vanes. Box-type struts are fitted at their extreme end.

NOTE 2 :- In some bombs the cone may be secured to the coupling ring with 18 rivets in one row. When rivetting is omitted the holes are sealed with spot welds.

5. FILLING.

The burster charge is HEXANITE and ANISOL, the nose portion being poured separately. The two fuze cavities are formed with thin cardboard liners.

A booster of Hexanite and Anisol in compressed powder form and contained in a waxed paper cylinder 1'6½" long by 1⅞" diameter is sometimes inserted in the tail cone. A pocket is formed at one end to receive a Navy type standard gain.

6. FUZING.

Fuzes fitted may be selected from -

Nose - A.1(A)	A.3(A), A.3(B) mechanical impact
C.2(A)	chemical long delay
Tail - B.3(A)	mechanical impact
C.1(A)	chemical long delay

7. DISPCAL. (Bomb filled with HEXANITE and ANISOL)

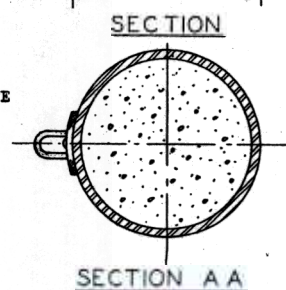
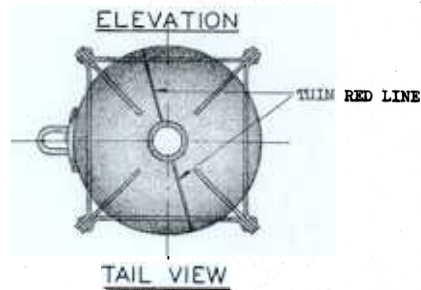
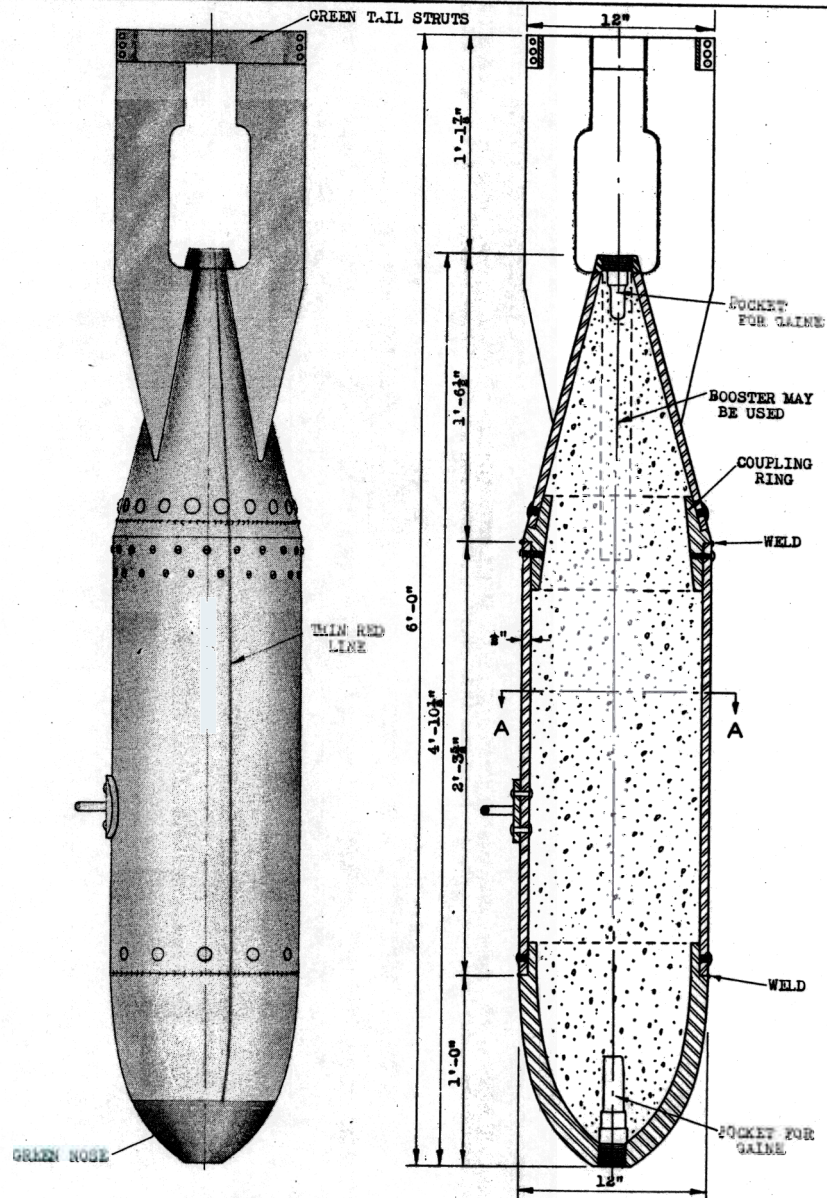
- (a) Fuze removal. See relevant BDTI for fuze/s found fitted
- (b) Demolition. Normal methods
- (c) Trepanning.
- (d) Steaming-out. Permissible, BUT a chemical long delay fuze must first be immunized if fitted.
- (e) Burning-out.

NOTES

JAPANESE
G.P. H.E. BOMB TYPE 98 - 250 Kg.

USE - NAVY AIRFORCE

REFER E IN C B.D.T.I. 3/2/52



1 2 4 6 8 10 12
Scale in Inches

JAPANESE S.A.P., H.E. BOMB, TYPE 99 - 250 Kg

1. DETAILS.

Dimensions: Overall length 5'8 $\frac{1}{4}$ "
Length of body 3'3 $\frac{3}{4}$ "
Diameter of body 12"
Min. thickness of body wall . $\frac{7}{8}$ "
Width of tail fins 13 $\frac{1}{2}$ "

Weights : Total weight 546 lbs
Weight of filling (ANISOL) .. 133 lbs
Charge/weight ratio 24% approx.

Colour : GREY (painted)

Markings : (Bomb filled with ANISOL)-
GREEN band 6" wide on nose
RED LINES (2) diametrically opposite and
full length of bomb casing.

2. USE.

NAVY Airforce S.A.P. type bomb. Suitable targets - lightly armoured ships and shore installations (medium constructions).

3. DESCRIPTION. (See diagram)

The bomb comprises 3 main structural portions:-

- (a) Body. The barrel and nose are a single steel casting, and machined externally and internally. Provision is made in the nose for a fuze and a grub screw to secure it. Suspension is normal Navy type eyebolt.
- (b) Base plate. A steel base plate screws into the rear end of the body and is locked thereto with a grub screw. The top flange of the plate is machine slotted for an assembly tool. Positioned centrally is a threaded hole to take a fuze. A conical-shaped booster container of steel screws on to a flange formed below this hole
- (c) Tail unit. The tail cone, made of sheet steel, is secured to the top flange of the base plate with 6 screws. Hinged doors are fitted to the 3 access openings. A steel adaptor is welded to the apex of the cone to receive the tail arming assembly of the tail fuze.

Welded to the cone are 4 tail fins which are shaped on the internal edge to allow for the fuze arming vanes. Cylinder-type bracing is fitted at the extreme end of the fins.

NOTE 1 :- In UXBs, the tail cone will often separate from the body on penetration.

4. FILLING.

- (a) The burster charge of ANISOL is in the form of about 7 preformed blocks of the pressed powdered explosive, each block covered with a layer of paper, a thin layer of paraffin wax and a layer of cloth. The blocks are embedded in paraffin wax in the bomb case. The rear block is perforated to take the booster container and its diameter is reduced by $1\frac{3}{4}$ " so as to fit into a cylinder made of a composition material acting as a packing between it and the flange on the base plate. The recesses on the underside of the base plate are filled with a similar material. Between this and the filling are 2 wide cardboard discs.
- (b) The booster explosive is 330 grams of pressed powdered PICRIC ACID wrapped in waxed paper. A pocket is formed to take a Navy type standard gaine. A perforated cardboard washer fits over the top of the filling.

5. FUZING.

Tail fuze B.2(A) is normal fuzing. Nose fuze A.1(G) would be added if dual fuzing is desired.

6. DISPOSAL. (Bomb filled and fuzed as above).(a) Fuze removal

- (i) Fuze A.1(G) - see BDTI B/6/25
 (ii) Fuze B.2(A) - see BDTI B/7/67

(b) Demolition: Normal methods(c) Trepanning: Permissible, but not necessary if base plate is removable.(d) Steaming-out: Permissible, but not necessary if base plate is removable and blocks can be eased out (see BDTI D/20/117, para 3)

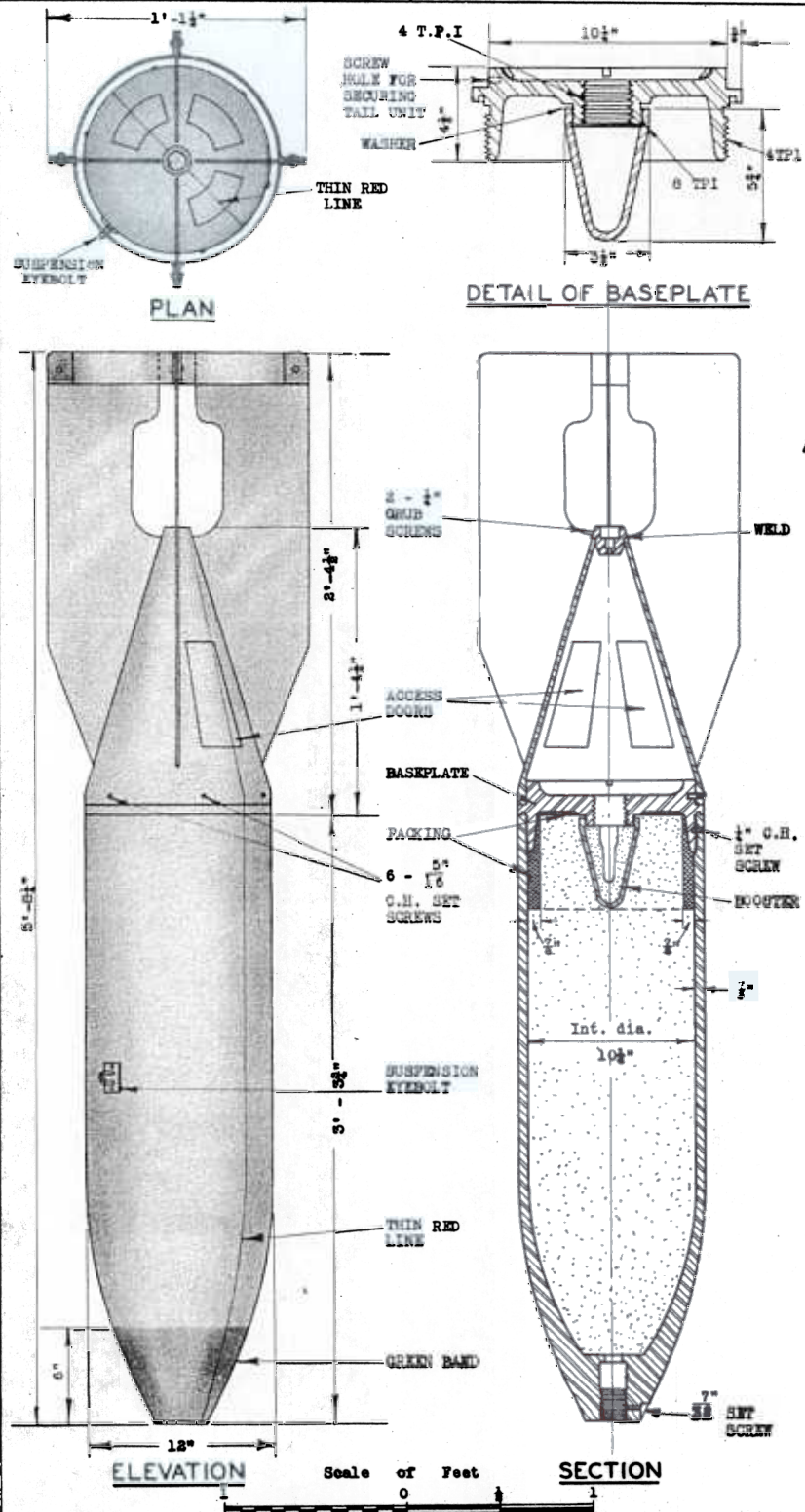
If steaming-out is resorted to, an improvised hand attachment should be used (see BDTI D/20/31, PART C)

(e) Burning-out: NOT permissible.NOTES

JAPANESE S.A.P. H.E. BOMB, TYPE 99 - 250 KG.

USE - NAVY AIRFORCE

REFER E. IN C. BDTI B/2/65



JAPANESE A.P., H.E. BOMB - 800 Kg

1. JAPANESE DESIGNATION.

2. DETAILS.

Dimensions: Length (less tail unit) 48.3"
Diameter (maximum) 16.1"
Wall thickness (Tapers from 4" near the
(solid nose end to 2" at
(the tail end)

Weights : Filled (less tail unit) 746 Kg
Burster charge 30 Kg
Charge/weight ratio 4%

Colour :

Markings :

3. USE.

NAVY Airforce special type A.P. bomb (believed to be a converted projectile) for use where a high degree of penetration is required, e.g. heavy fortifications and heavy armoured ships.

4. DESCRIPTION. (See diagram)

The tail unit was missing from the specimen bomb.

The remainder of the bomb, i.e. body and nose, is of ONE PIECE construction of forged machined steel, heavily constructed at the nose, and threaded internally at the base to take a base plate. A suspension lug is belted to the body at the point of balance.

8 indentations are cut in the nose, presumably for the fitment of a ballistic cap when used as a projectile.

The base plate is holed and threaded to receive twin fuzes.

5. FILLING.

Burster charge is cast ANISOL with an aluminium plug as a cushion in the forward end.

6. FUZING.

Twin fuzes of type B.2(B) are fitted in the baseplate.

7. DISPOSAL.

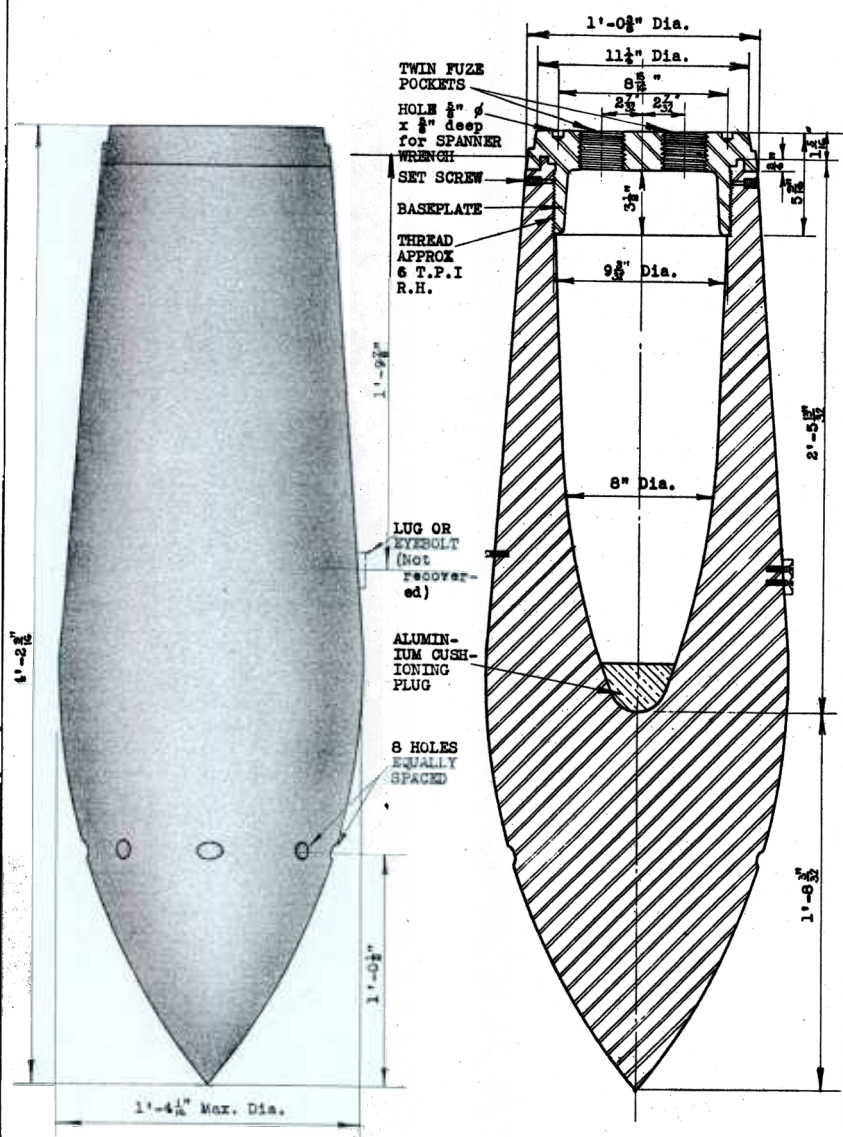
(a) Fuze removal. See BDTI B/7/77

(b) Steaming-out. Permissible (after removal of baseplate)

JAPANESE A.P. H.E. BOMB — 800 Kg.

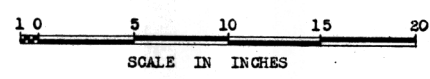
USE — NAVY AIRFORCE

REFER E IN C BDTI B/2/76



ELEVATION

SECTION



JAPANESE, ANTI-PERSONNEL H.E. BOMB, TYPE - 15 Kg

1. DETAILS.

Dimensions: Overall length 2'1 $\frac{3}{8}$ "
Length of body 1'8 $\frac{1}{4}$ "
Diameter of barrel 3 $\frac{1}{8}$ "
Thickness of barrel wall . 17/32"
Width of tail fins
Diameter over tail fins .. 5 $\frac{1}{2}$ "

Weights : Weight empty 26 lbs
Burster charge (PICRIC
ACID) . . . 7 lbs approx
Total weight 33 lbs "
Charge/weight ratio .. . 21.2% "

Colour : BLACK (painted)

Markings : RED band, $\frac{1}{2}$ " wide, on nose
YELLOW and WHITE bands, each $\frac{3}{4}$ " wide,
around barrel forward of suspension
"15K" stencilled with white paint on
barrel.

2. USE.

ARMY Airforce Anti-personnel (Fragmentation)
type bomb.

3. DESCRIPTION. (See diagram)

The bomb comprises 3 main structural portions:

(a) Barrel. This consists of an inner and an outer case. The inner case is a tube of 5/32" thickness steel, threaded externally for a length of $\frac{3}{4}$ " at one end to screw into the nose piece, and at the other end for a length of 9/16" to take a threaded shrapnel ring. The threaded parts are retained by grub screws as shown.

The outer case consists of 26 shrapnel rings, 25 of which are $\frac{3}{8}$ " thick and approx $\frac{3}{8}$ " wide, whilst the remaining ring is 1-3/16" wide for fitment of normal Army type horizontal swinging suspension. The shrapnel rings are not easily noticeable until the painted surface is scraped.

(b) Nose piece, of uniform thickness steel, is threaded for screwing on to the barrel inner casing. The nose opening receives a fuze and a grub screw to secure it.

(c) Tail unit. The tail cone, constructed of sheet steel, is welded to the end shrapnel ring. Four fins are rivetted to the cone, and to each other on the internal edges, and are braced at their extremity with narrow box-type struts.

Alternative vertical suspension is provided by a rigid fitment at the end of the tail fins.

4. FILLING.

The burster charge is cast PICRIC ACID (Lyddite). The nose piece filling is cast separately and 4 cardboard washers are inserted in the gap between the 2 fillings.

5. FUZING.

Nose fuze A.2(B) only is employed.

6. DISPOSAL. (Bomb filled and fuzed as above)

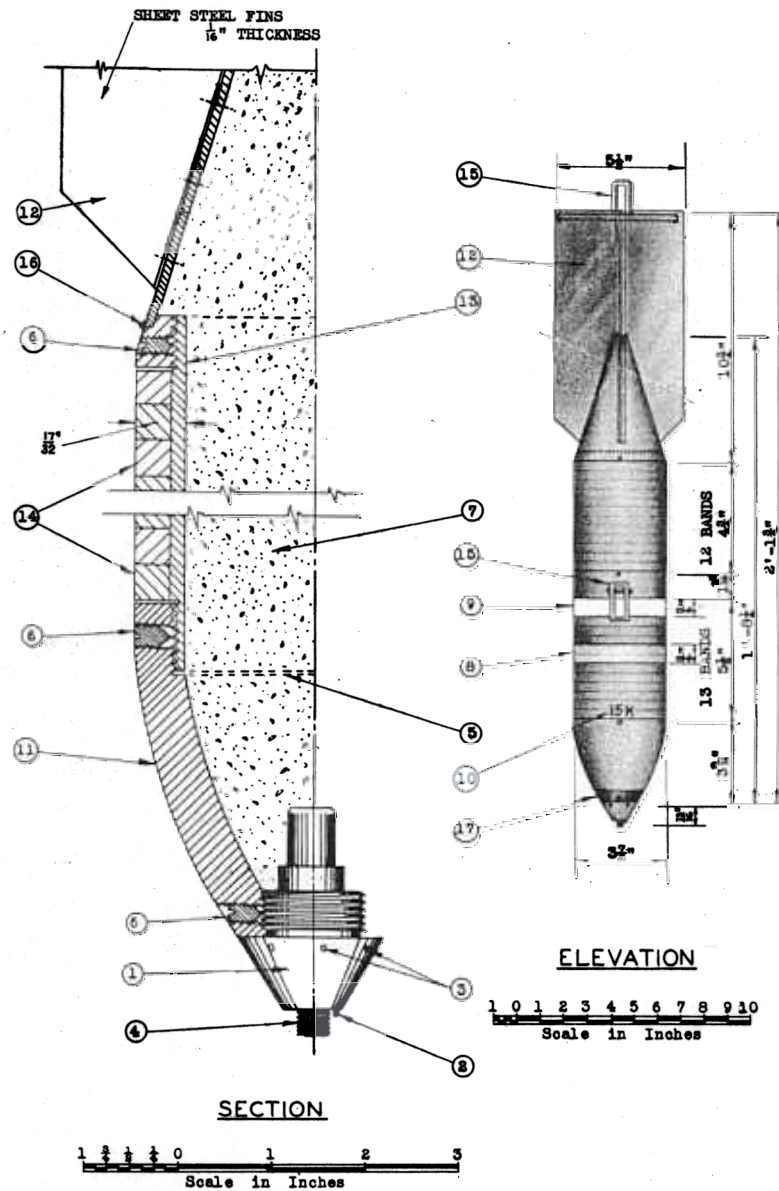
- (a) Fuze removal. For fuze A.2(B) see BDTI B/6/73
- (b) Demolition. Normal methods
- (c) Trepanning. Not applicable to this size bomb
- (d) Steaming-out. Simplest method is to apply a steam jet through nose fuze opening
- (e) Burning-out. NOT permissible.

NOTES

JAPANESE ANTI-PERSONNEL H.E. BOMB TYPE - 15 Kg.

USE - ARMY AIRFORCE

REFER E IN C B.D.T.I. B/3/3



LEGEND

- | | |
|----------------------|--------------------|
| 1. FUZE - A. 2(B) | 10. MARKING |
| 2. ANTI-BINDING PIN | 11. NOSE PIECE |
| 3. TOOL HOLES | 12. TAIL FINS |
| 4. STRIKER SPINDLE | 13. INNER CASING |
| 5. CARDBOARD WASHERS | 14. SHRAPNEL RINGS |
| 6. GRUB SCREWS | 15. SUSPENSION |
| 7. PICRIC ACID | 16. WELDED JOINT |
| 8. YELLOW BAND | 17. RED BAND |
| 9. WHITE BAND | |

JAPANESE INCENDIARY BOMB, TYPE 99 - 32 Kg
(Phosphorous/steel pellets)

1. JAPANESE DESIGNATION.

Type 99, Model 3, No. 3 Incendiary Bomb.

2. DETAILS.

Dimensions: Overall length 2'0 $\frac{1}{2}$ "
Length of body (incl nose) .. 1'1 $\frac{1}{2}$ "
Thickness of barrel wall .. 3/16"
Diameter of barrel 5 $\frac{3}{4}$ "
Diameter over tail fins 5 $\frac{3}{4}$ "

Weights : Total weight, unfuzed 70.4 lbs
Burster charges (tail cone .. 3.5 lbs
(central tube 3/16 lbs

Colour : GREY (painted)

Markings : SILVER-WHITE 2" band on nose
SILVER-WHITE 1" band on tip of tail fins
RED LINES (2) diametrically opposite and
full length of body and tail cone.

NOTE 1 :- SILVER-WHITE is standard colour for phosphorous incendiary agent.

3. USE.

NAVY Airforce type incendiary bomb mainly for AA use, both grounded and airborne. Also suitable for ground targets of inflammable materials.

NOTE 2 :- This bomb was used on one occasion in SPA as a beach mine for disabling amphibious landing craft, possibly as a substitute expediency.

4. DESCRIPTION. (See diagram)

The bomb consists of 3 main structural portions :-

- (a) Barrel. The barrel casing is welded on to the machined down portion of the nose piece and the joint machine finished. At the rear end it screws on to a shaped coupling ring. Twin suspension is provided by 2 Navy type eyebolts diametrically opposite.

A cylindrical canister constructed of 3/16" thickness steel fits full length in the barrel. The annular space between its outer and inner walls houses the incendiary pellets and is sealed both ends with steel discs.

The central burster charge is contained in a steel tube which screws into the nose piece and runs full length of barrel

- (b) Nose piece, of solid steel, is machined down to receive the barrel and hollowed out centrally for a nose fuze.

- (c) Tail unit. The truncated tail cone is in 2 sections. The lower section is constructed of sheet steel butt-welded to both the coupling ring and the upper section. The upper section is a shaped steel ring perforated and threaded to receive a tail fuze.

4 tail fins, each spot welded to the cone in 4 places, are braced down from their extremities where shown with 3/16" diameter steel rods flattened at each end for single rivetting to the fins. Each fin is bent to an angle of 30 deg at 4" down from their ends so as to impart rotation to the bomb on release.

FILLINGS.

- (a) Burster charges. The tail cone burster charge is 3½ lbs of pressed powdered PICRIC ACID with a pocket formed for a Navy type gaine. The central burster charge is a cylindrical plug of pressed powdered PICRIC ACID weighing 3 ozs with one end formed to receive a special type detonator
- (b) Incendiary material (see detail drawings). 198 steel pellets in sticks of 9 lightly soldered together (i.e. 22 sticks) are packed vertically in the annular space in the canister. Liquid white phosphorous is poured in so as to fill the cavities in the pellets and interstices between the sticks. The phosphorous solidifies and binds the mass.

6. ACTION.

- (a) Functioning of bomb. The bomb will revolve upon release due to the angled tail fins. Revolution speed will gradually increase. On reaching 1000 r.p.m. the safety mechanism of the tail fuze assembly is freed.

When reaching the time-setting period during descent the tail fuze assembly will initiate explosion of the burster charges. The explosion will shatter the bomb casing, break up the sticks, and spray the individual steel pellets conically downward.

Impact in the air or with ground surfaces before the time-setting is reached will cause the instantaneous nose fuze to initiate explosion and throw the pellets laterally within a less diameter

- (b) Incendiary material. The phosphorous in the pellet will emit a flame through the flame ports on exposure to the air and ignite combustible material on which the pellet lodges.

Particles of loose phosphorous in the bomb may also have some incendiary effect on combustible ground surfaces.

7. FUZZING.

Dual fuzing is normally employed, consisting of Navy Airforce type fuzes as under :-

Nose fuze - A.1(B) mechanical impact
Tail fuze - D.2(A) or D.2(B) or D.2(C)
clockwork airburst.

8. TREATMENT. (Bomb which has functioned)

See BDTI D/20/119 for treatment of ignited pellets, resultant fires and precautions to be observed.

9. DISPOSAL. (Bomb which has failed to function)

- (a) Fuze removal. If fitted, deal with the tail fuze first and BEFORE the bomb is moved.

For fuze D.2(A)	see BDTI B/9/98
" " D.2(B)	" " B/9/113
" " D.2(C)	" " B/9/120
" " A.1(B)	" " B/6/112

- (b) Destruction. Remove bomb, if necessary, to a suitable site where there is no risk of fire or damage, place in an excavation and explode the tail burster charge. Do NOT attempt to dismantle bomb.

NOTE 3 :-Modification - (probably a factory variation).

A bomb recently examined conforms exactly with the one above described but differs in the following respects :-

- (a) The cylindrical canister narrows down sufficiently so as to extend to the end of the coupling ring, and its rear opening is sealed with a lid soldered on
- (b) Incendiary material. 21 lengths of 1" external diam. m.s. piping (an inner row of 7-10 $\frac{3}{8}$ " lengths and an outer row of 14-9 $\frac{3}{8}$ " lengths) are packed vertically in the canister. Each inner and outer length of piping is divided into 8 equal portions, the piping being cut completely through except for $\frac{1}{4}$ " of circumference left along one side. Width of cut is 5/64". That is to say, each length of piping breaks up into 8 individual pellets of equal length, those in the outer row being shorter than the inner ones, there being a total of 168 pellets in all.

8 shaped inserts (see diagram) slide into each length of piping and abut midway under each cut. The inserts in the outer row of piping are therefore correspondingly shorter than those in the inner row.

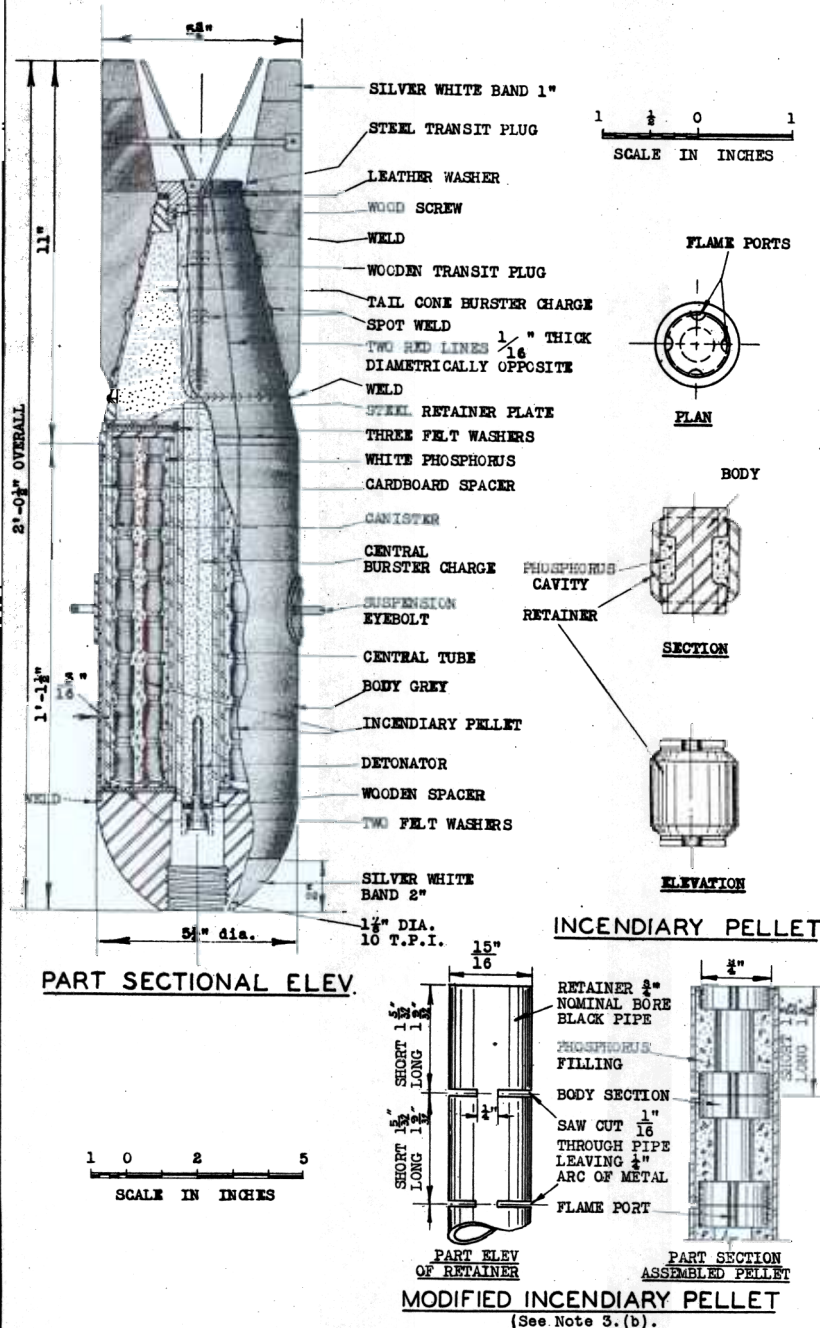
Phosphorous filling is same as described in para 5 (b) above

- (c) Burster charges are all PICRIC ACID. The tail cone charge is in cast block form with waxed paper covering. The central burster charge is in 2 lengths. The short length is pressed powder and holed for the detonator, and the long length is cast. Each length is wrapped in waxed paper with cotton cloth outer covering.

JAPANESE
INCENDIARY BOMB TYPE 99 - 32 KG.
(PHOSPHORUS/STEEL PELLETS)

USE - NAVY AIRFORCE

REFER E. IN C. BDTI B/4/III



JAPANESE INCENDIARY BOMB, TYPE 97 - 50 Kg
(Phosphorous/Rubber Pellets)

1. JAPANESE DESIGNATION.

No 2 Incendiary bomb.

2. DETAILS.

Dimensions: Overall length 3'9"
Length of body 2'7"
Diameters { barrel 7 $\frac{3}{4}$ "
 (nose piece 7 $\frac{3}{4}$ "
 (tail fins 9 $\frac{1}{2}$ "
Width of tail fins 6 $\frac{3}{4}$ "
Thickness of barrel wall . . . 1"

Weights : Total weight 46 Kg
Burster charges (2) 2.5 Kg (5 $\frac{1}{2}$ lbs)

Colour : GREY (painted)

Markings : YELLOW and WHITE 1" bands around barrel
below suspension
WHITE DOUBLE CROSS ideograph on barrel
above suspension
"50K" stencilled with white paint above
nose weld.

3. USE.

ARMY Airforce type Incendiary bomb. Suitable
for inflammable targets.

4. DESCRIPTION. (See diagram)

(NOTE 1 :- Casing construction, and especially external
appearance, closely resembles the 50 Kg type
92 Gas bomb, see BDTI B/5/14)

The bomb consists of 3 main structural por-
tions :-

(a) Barrel. Same as described in BDTI B/4/12, para
4 (a).

(b) Nose piece. See BDTI B/4/12, para 4 (b).

(NOTE 2 :- Compare differences in cross section as
shown in the respective diagrams)

(c) Tail unit. A truncated tail cone fits over the
rear end of the barrel and the joint is sealed with
a continuous fillet weld. Four fins are spot
welded to the cone and braced with 2 sets of box-
type struts made of 5/16" tubular steel welded to
the fins.

5. FILLINGS.

(a) Burster charges. Same as described in BDTI
B/4/12, para 5 (a) except for omission of PICRIC
ACID solid booster pellets

(NOTE 3 :- Compare differences in shape of nose charge
as shown in the respective diagrams)

- (b) Incendiary material. Same as described in BDTI B/4/12, para 5 (b).

6. ACTION.

Same as described in BDTI B/4/12, paras 6 (a) and (b).

7. FUZING.

Army Airforce type fuze A.2(B) is normally employed. Fuze A.2(A) may be used if penetration of light to medium constructions is desired.

8. TREATMENT. (Bomb which has functioned)

See BDTI D/20/119 for treatment of ignited pellets, resultant fires and precautions to be observed.

9. DISPOSAL. (Bomb which has failed to function)

- (a) Fuze removal. For fuze A.2(B) see BDTI B/6/73
" " A.2(A) " " B/6/18

- (b) Destruction. Remove bomb, if necessary, to suitable site where there is no fire risk, place in an excavation and explode the nose charge; or alternatively, detach nose piece and explode the central charge. Do NOT attempt to dismantle remainder of bomb.

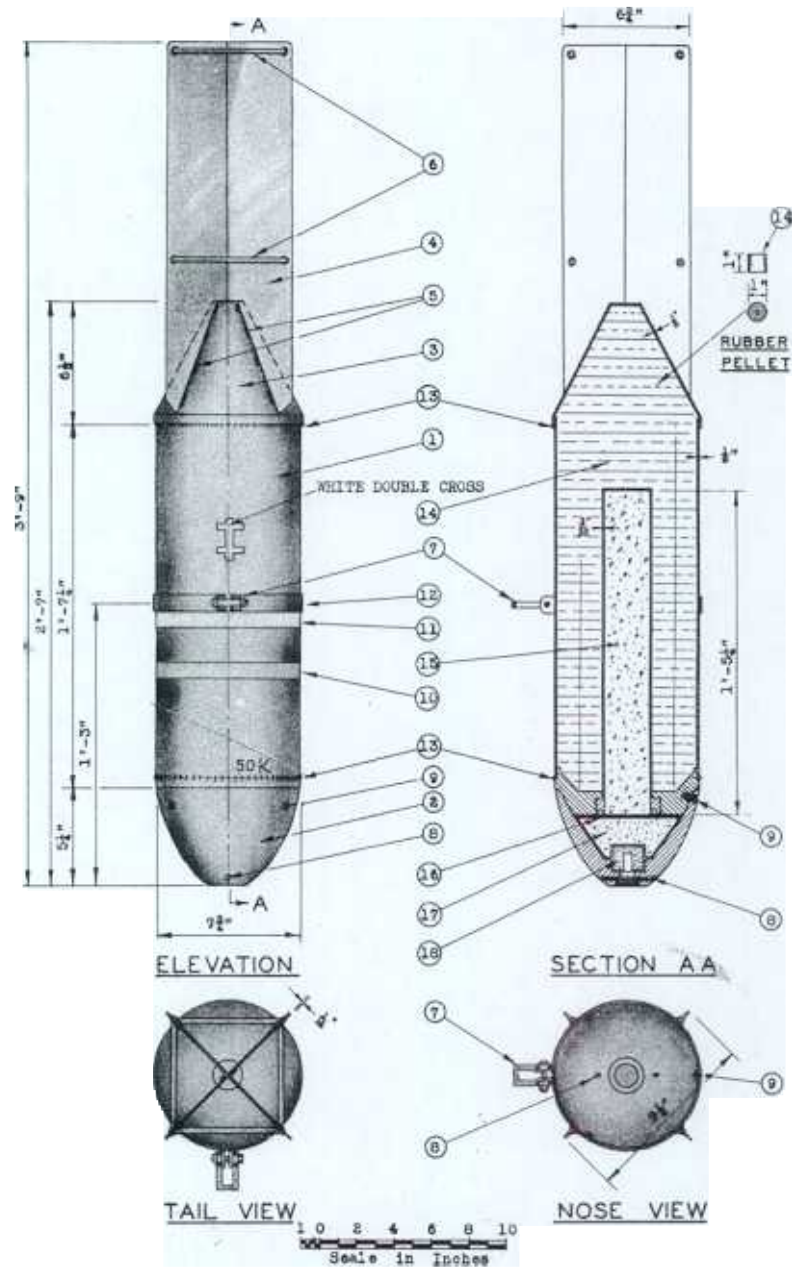
Finally deal with unconsumed scattered pellets in the prescribed manner.

NOTES

JAPANESE INCENDIARY BOMB TYPE 97 - 50 Kg (PHOSPHOROUS / RUBBER PELLETS)

USE - ARMY AIRFORCE

REFER E IN C B.D.T.I. B/4/9



LEGEND

- | | |
|-----------------------------|----------------------------|
| 1. BARREL | 10. YELLOW BAND |
| 2. NOSE PIECE | 11. WHITE BAND |
| 3. TAIL CONE | 12. CARRYING BAND |
| 4. TAIL FINS | 13. FILLET WELD |
| 5. SPOT WELDS | 14. RUBBER PELLETS |
| 6. TAIL FIN STRUTS | 15. CENTRAL BURSTER CHARGE |
| 7. SUSPENSION | 16. CARDBOARD DISC |
| 8. GRUB SCREWS | 17. NOSE BURSTER CHARGE |
| 9. NOSE RETAINING DOWEL PIN | 18. BOOSTER |

JAPANESE INCENDIARY BOMB, TYPE O - 50 Kg
(Phosphorous/Rubber Pellets)

1. JAPANESE DESIGNATION.

"No 2 Incendiary bomb".

2. DETAILS.

Dimensions: Overall length 3'4"
Length of body 2'8½"
Diameters (barrel 7"
 (nose piece 7½"
 (tail fins 9½"
Thickness of barrel wall ⅛"
Width of tail fins ⅞"
Weights : Bomb empty 59 lbs
 Burster charges (nose 4 lbs
 (central tube 5 lbs

Colour : GREY (painted)

Markings :

NAVY

ARMY

(a) 1" bands around barrel below suspension	WHITE	YELLOW and WHITE
(b) Ideograph (for chemical) on barrel above suspension	WHITE CROSS	WHITE DOUBLE CROSS
(c) Size of bomb stencilled in white above nose weld	"50K"	"50K"

3. USE.

- (a) Bomb can be carried by bombers of a type common to both NAVY and ARMY Airforces (e.g. Type 96 M/B "NELL").
- (b) Bomb is of Incendiary classification and is suitable for inflammable targets.

4. DESCRIPTION. (See diagram)

The bomb consists of 3 main structural portions :-

- (a) Barrel. A side-welded tube constructed of ⅛" thickness sheet steel. A steel carrying band encircles the barrel for fitment of normal ARMY type swinging suspension (see para 3 (a) above). The nose end is welded to a shaped heavy bulkhead which
 - (i) is perforated and threaded to receive the central burster container;
 - (ii) forms a base for attachment of the nose piece; and
 - (iii) serves as a "push" plate (see para 6(a) below)
- (b) Nose piece, of steel, is retained on the bulkhead by 3 dowel pins which screw partly into the nose piece only. The nose opening receives a fuze and 2 grub screws to secure it
- (c) Tail unit. A domed tail cone fits over the rear end of the barrel and the joint is sealed with a continuous fillet weld. Four fins are welded to the cone and braced at their extreme end with box-type struts.

5. FILLINGS.

- (a) Burster charges, and booster pellets, are all of PICRIC ACID. The nose burster charge is in the form of a preformed block, with a pocket formed to receive booster pellets as shown in diagram. The central burster charge is contained in a thin steel tube which measures 1'5¼" length by 2-5/16" diameter.
- (b) Incendiary material. Packed in the barrel and cone are 400-475 cylindrical pellets of black rubber which measure 1" length by 1" diameter. A liquid solution (about 6 litres) of white phosphorous (64.5%) in carbon disulphide is poured into the bomb and the rubber pellets become impregnated with the mixture.

6. ACTION.

- (a) Functioning of bomb. On impact, the fuze assembly initiates detonation of the burster charges. Explosion of the nose charge tends to give an upward lift to the bulkhead, shearing the nose weld and separating the casing sections. Penetration before explosion is thereby somewhat counteracted. Explosion of the central charge shatters the casing and tends to scatter the pellets laterally.
- (b) Incendiary. The pellets ignite on exposure to the air either immediately or within a minute or two. Each burns with a flame 4-6 ins high for about 5-7 mins at comparatively low temperature, giving off a grey smoke and smelling slightly of burning rubber.

7. FUZING.

Army Airforce type fuze A.2(B) is normally employed by both Services.

8. TREATMENT. (Bomb which has functioned)

See BDTI D/20/119 for treatment of ignited pellets, resultant fires and precautions to be observed.

9. DISPOSAL. (Bomb which has failed to function)

- (a) Fuze removal. For fuze A.2(B) see BDTI B/6/73.
- (b) Destruction. Remove bomb, if necessary, to suitable site where there is no fire risk, place in an excavation and explode the nose charge; or alternatively, detach nose piece and explode the central charge. Do NOT attempt to dismantle remainder of bomb.

Finally deal with unconsumed scattered pellets in the prescribed manner.

NOTES

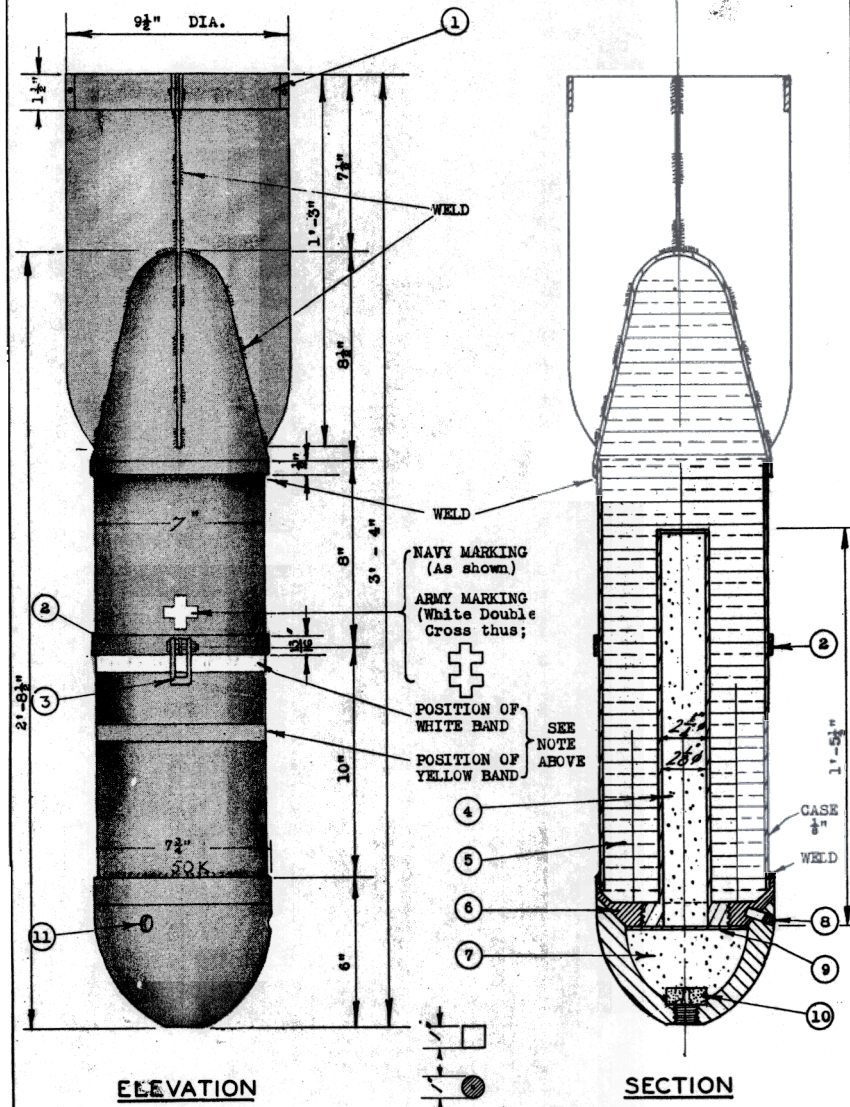
JAPANESE INCENDIARY BOMB TYPE O - 50 Kg. (PHOSPHOROUS / RUBBER PELLETS)

USE - NAVY & ARMY AIRFORCES

REFER E IN C. BDTI B/4/12

NOTE: NAVY - WHITE BAND ONLY

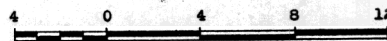
ARMY - WHITE & YELLOW BAND



ELEVATION

SECTION

RUBBER PELLET



SCALE IN INCHES

LEGEND

- | | |
|---------------------------|------------------------|
| 1. BRACING STRUT | 7. NOSE BURSTER CHARGE |
| 2. CARRYING BAND | 8. DOWEL PIN |
| 3. SUSPENSION | 9. PACKING DISC |
| 4. CENTRAL BURSTER CHARGE | 10. BOOSTER PELLET |
| 5. RUBBER PELLET | 11. TOOL HOLE |
| 6. BULKHEAD | |

JAPANESE INCENDIARY BOMB, TYPE 97 - 60 Kg
(Electron fire-pots)

1. JAPANESE DESIGNATION.

2. DETAILS.

Dimensions: Overall length 3'4 $\frac{1}{2}$ "
Length of body 2'8 $\frac{3}{8}$ "
Diameter of barrel 7 $\frac{7}{8}$ "
Thickness of barrel wall . 3/16"
Diam over tail fins 10 $\frac{1}{2}$ "

Weights : Total weight lbs
Electron fire-pots (4) .. lbs
Burster charge lbs

Colour : GREY (painted)

Markings : RED Tail fin struts.

3. USE.

NAVY Airforce electron type incendiary bomb.
Best results obtained when bomb penetrates constructions,
oil tanks, etc.

4. DESCRIPTION. (See diagram)

The bomb consists of 3 main structural portions :-

- (a) Barrel. This is a hollow tube of 3/16" thickness steel screwed at the rear end to a shaped steel coupling ring with 28 screws in 2 rows of 14 each. Suspension is normal Navy type eyebolt.

The barrel is partitioned by 2 loose fit "push" plates of steel, one immediately below the coupling ring and the other between the nose and barrel electron fire-pots. Butting hard against both these plates is an inner casing formed of 4 curved pieces of polished steel. Running longitudinally between the inner and barrel casing are 4 wood packing pieces.

- (b) Nose piece, of cast steel, is machined down to receive the barrel and is secured thereto with 20 rivets in 2 rows of 10 each. The nose opening receives a fuze and either 1 or 2 grub screws to secure it.

The nose houses a solid steel block which is perforated centrally for the fuze assembly and has a circular channel recessed in the uppermost side filled with a burster charge of black powder.

The nose electron fire-pot is contained in a steel drum open at the rear end.

- (c) Tail unit. The tail cone fits over and is rivetted to the coupling ring with 1 row of 24 rivets. 4 tail fins of sheet steel are welded to the cone and braced at their extreme end with box-type struts.

5. FILLINGS.

(a) Burster charge. See para 4 (b) above.

(b) Incendiary material. Each of the 4 electron fire-pots consist of an electron body filled with pressed thermit and end-layers of a priming composition to assist ignition. The fire-pots are made so as to form a continuous tubular cavity passing along the central axis of the bomb.

The nose fire-pot is cylindrical in shape and fits snugly into a steel drum. It measures length by diam and weight full is lbs ozs.

The 2 barrel fire-pots are hemi-cylindrical in shape and fit in the bomb as a complete cylinder. Each "half" measures 9-3/16" length by 6 3/8" max width, and weight full is 10 lbs 6 ozs.

The conical-shaped tail fire-pot measures 7 7/8" length by 5 3/8" major diam and 3 1/4" diam at tail end. Weight full is 12 lbs 2 ozs.

6. ACTION.

On impact, the nose fuze assembly ignites the quick match in the tubular cavity and side branches from it ignite the fire-pots. Simultaneously, the burster charge is ignited and explodes. The force of explosion is transmitted throughout the length of the body per medium of the steel drum, steel partitions and inner casing thus shearing rivets and screws and separating all sections of the bomb. If the fire-pots are not ejected, their own action will quickly free them of the casing.

7. FUZING.

Normal fuzing is Navy type nose fuze A.3(A) incorporating a magazine.

8. TREATMENT. (Bomb which has functioned)

See BDTI D/20/119 for treatment of ignited fire-pots and resultant fires.

9. DISPOSAL. (Bomb which has failed to function)

(a) Fuze removal. For fuze A.3(A) see BDTI B/6/15

(b) Destruction. After removing fuze the bomb may be dismantled and the fire-pots and explosive destroyed separately by ignition. Alternatively, place in an excavation where there is no fire risk and cause the bomb to function by inserting an igniting agent into the fuze cavity and firing.

NOTES

- (d) Tail unit. The tail cone fits over the coupling ring and is butt-welded to the barrel. The apex of the cone is closed with a wood plug. 4 fins are rivetted to the cone and are braced at their extreme end with box-type struts.

5. FILLINGS.

- (a) Burster charge. The nose burster charge is BLACK POWDER pressed into a conical-shaped metal container which is screwed to the bulkhead with 6 small screws.
- (b) Ignition charge. A cardboard cylinder filled with 7 lbs 6 ozs of pressed powdered THERMIT fits into the central tube. A quantity of priming composition is added at the tail end of the cylinder.
- (c) Incendiary material. The main filling, weighing 29 lbs, consists of an inflammable mixture of petrol and kerosene held in the form of a gel by an alcoholic-soap mixture containing free Stearic Acid. Sodium silicate is also added to prevent excessive spreading of the burning mixture.

6. ACTION.

On impact, the nose fuze assembly initiates explosion of the burster charge. The following separate actions happen simultaneously -

- (a) The quickmatch contained in the central copper tube is ignited and sequence of further ignition is firstly priming composition, then thermit and finally the oil filling via ports in the wall of the central tube
- (b) Explosion of the burster charge forces the inner container upwards, splitting open the bomb body and allowing the burning mixture to escape.

NOTE 2 :- The wood plug at the apex of the cone is soon blown out by internal pressure and so air is admitted. The burning oil can escape through this opening if the body fails to separate.

7. FUZING.

Normal fuzing is Navy type nose fuze A.3(A) incorporating a magazine. Fuze A.3(B) may also be used.

8. TREATMENT. (Bomb which has functioned)

See BDTI D/20/119 for treatment of ignited oil, resultant fires and precautions to be observed.

9. DISPOSAL. (Bomb which has failed to function)

(a) Fuze removal

For fuze A.3(A) see BDTI B/6/15

" " A.3(B) " " B/6/84

(b) Destruction

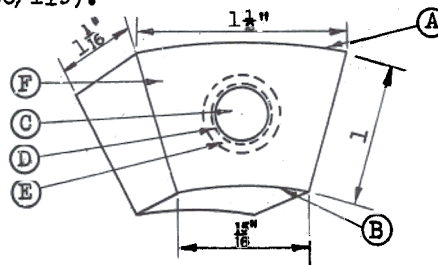
Remove bomb, if necessary, to a suitable site where there is no fire risk, place in an excavation, insert an igniting agent into the fuze cavity and explode the burster charge.

Alternatively, the bomb may be dismantled by removing the screws securing the rear end of the barrel and the bomb contents destroyed separately by ignition.

NOTE 3 :- Possible substitute filling.

It is possible for the compartments in the bomb to be close packed with wedge-shaped pellets instead of oil. Each wedge weighs 62.9 grams and the material may be described as a modified thermit type incendiary agent with a rubber-like substance as a binder. Method of ignition is not known but is assumed to be as for oil filling.

Treatment of ignited wedges should be same as for an electron incendiary agent (see BDTI D/20/119).



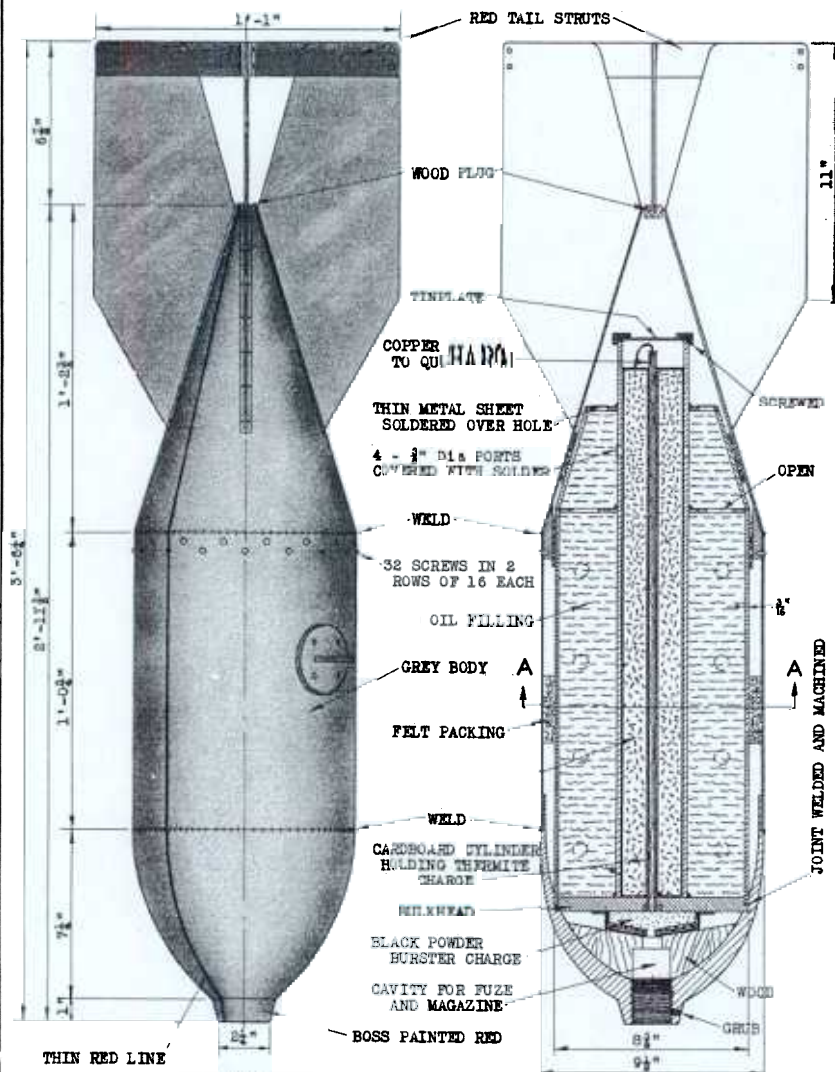
- A - Major radius of curvature - $3\frac{3}{4}$ "
- B - Minor " " " - $2\frac{3}{8}$ "
- C - Hole $\frac{3}{8}$ " diameter
- D - $\frac{1}{16}$ " layer
- E - $\frac{1}{8}$ " " } Incendiary material of
- F - Remainder } varying mixtures.

NOTES

JAPANESE
INCENDIARY BOMB TYPE 98 - 60 Kg
(SOLID OIL)

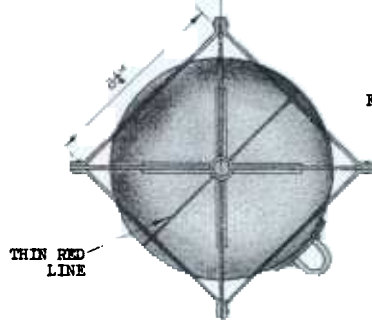
USE - NAVY AIRFORCE

REFER E IN C B.D.T.I. B/4/11

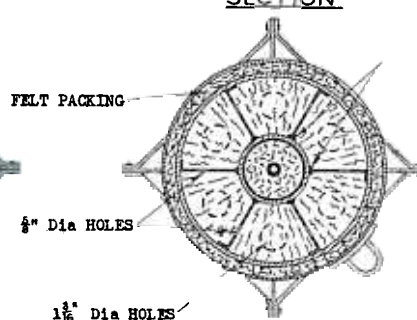


THIN RED LINE
ELEVATION

SECTION



TAIL VIEW



SECTION A-A



JAPANESE INCENDIARY BOMB, TYPE 2 - 250 Kg
(Electron/steel cylinders)

1. JAPANESE DESIGNATION.

Type 2, No 25, Mk III bomb, Model 1.

2. DETAILS.

Dimensions: Overall length 5'11"
Length of body 4'6½"
Diameter of barrel 12"
Barrel wall thickness .. 7/32"
Diam of tail cylinder.. ..

Weights : Cylindrical incendiaries . 136 Kg (300 lbs)
Burster charge 33 Kg (72½ lbs)
Total weight 254 Kg (560 lbs)

Colour : GREY (painted).

Markings : SILVER-WHITE band about 6" wide on nose
RED circular fin struts

3. USE. NAVY Airforce type incendiary bomb mainly for AA use, particularly grounded aircraft. Other suitable targets include dumps, installations and built-up areas.

4. DESCRIPTION. (See diagram)

The bomb consists of 3 main structural portions :-

(a) Barrel. A 12" diam steel cylinder of 7/32" wall thickness is secured at the rear end to a shaped coupling ring with 40 studs in 2 rows of 20 each. Suspension is normal Navy type eyebolt.

Fitting loosely against the coupling ring is a perforated retaining plate of 3/16" MS plate. A similar retaining plate fits into the nose piece supporting the bottom tray of incendiary cylinders.

(b) Nose piece, of steel, is machined down to receive the barrel and the joint is sealed with a continuous weld. The nose opening receives a fuze and a grub screw to secure it.

(c) Tail unit. A tail cone of 3/16" sheet steel fits over the coupling ring and the joint is sealed with a continuous weld. A tail fuze adaptor is welded to the apex of the cone.

Welded to the cone are 4 angled-fins arranged to impart an anti-clockwise rotation to the bomb in flight. The fins are braced at their extreme end with an outer set of cylinder-type strutting and 2 inner sets of box-type strutting arranged as shown.

5. FILLINGS.

(a) Burster charges. All voids within the bomb body (nose, barrel and cone) are filled with a burster charge of BLACK POWDER, the flash from which initiates ignition of the incendiary cylinders.

(b) Incendiary material. Packed endwise on perforated celluloid trays in 10 tiers are a total of 756 steel-pipe cylinders each wrapped separately in paper. Pressed into each cylinder are particles of electron metal with a rubber-like substance as a binder. A thin layer of a priming composition is added at each end. The charge weight of each tube is approx 65 grams and total weight approx 180 grams. The celluloid trays are highly inflammable.

6. FUZZING. Navy type fuzes normally employed are -

Nose fuze A.3(A) or A.3(B) - mechanical impact
Tail fuze D.2(A) or D.2(B) or D.2(C) clockwork
airburst.

7. ACTION.

(a) Functioning of bomb. The bomb will begin revolving upon release due to the angled tail fins. Revolution speed will gradually increase. On reaching 1000 r.p.m. the safety mechanism of the tail fuze assembly is freed. When reaching the time-setting period during descent the tail fuze assembly will initiate explosion of the burster charge. The bomb body is shattered and the ignited incendiary cylinders are sprayed conically downward. Impact on aircraft in flight or on ground before time-setting is reached will cause the instantaneous nose fuze to initiate explosion. Explosion in mid-air will spray incendiary cylinders within a diameter of 325 yds. Ground impact bursts will throw cylinders about 110 yds.

(b) Incendiary material. The incendiary mixture burns with a fierce spluttering re-action, the steel attaining a red heat. Each cylinder has incendiary action normally lasting 20 secs but sometimes reaches as much as 60 secs. A flame 6"-9" length is emitted out of each open end of the cylinder.

8. TREATMENT. (Bomb which has functioned)

See BDTI D/20/119 for treatment of ignited cylinders and resultant fires.

9. DISPOSAL. (Bomb which has failed to function)

(a) Fuze removal. Deal with tail fuze first

For tail fuze	D.2(A)	see	BDTI	B/9/98
" "	D.2(B)	"	"	B/9/113
" "	D.2(C)	"	"	B/9/120
" nose	A.3(A)	"	"	B/6/15
" "	A.3(B)	"	"	B/6/84

(b) Destruction. Remove, if necessary, defuzed bomb very carefully to a bomb cemetery or other suitable open area, bury in an excavation (as deep as possible) and explode the burster charge with an igniting agent inserted into a fuze cavity.

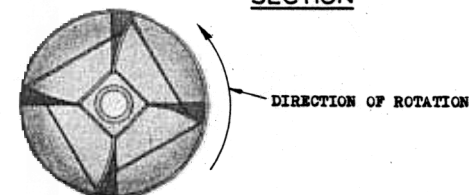
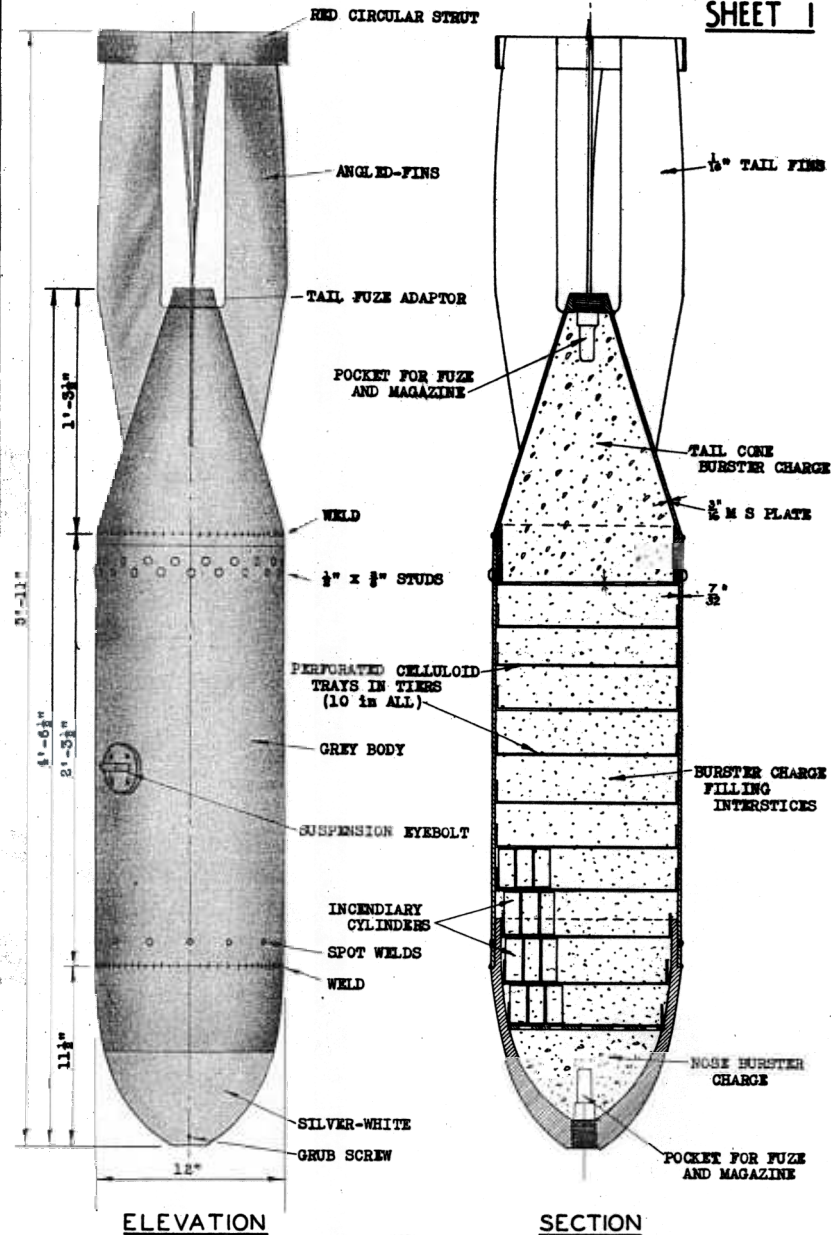
NOTE 1 :- Handle UXBs with care as the ignition charge is filled in among the steel-pipe cylinders and friction may cause explosion if the paper wrappings are damaged. MG fire will explode the bomb.

JAPANESE
INCENDIARY BOMB TYPE 2 - 250 Kg
(ELECTRON / STEEL CYLINDERS)

USE - NAVY AIRFORCE

REFER E IN C B.D.T.I. B/4/99

SHEET 1

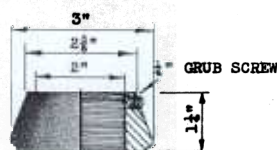
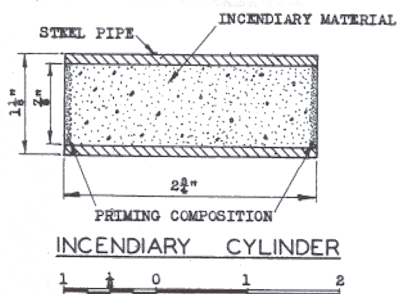
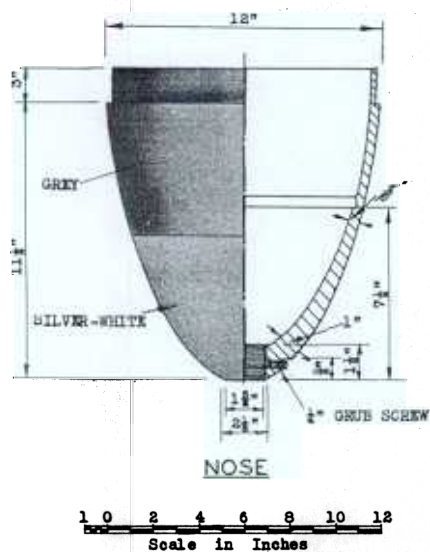


TAIL VIEW

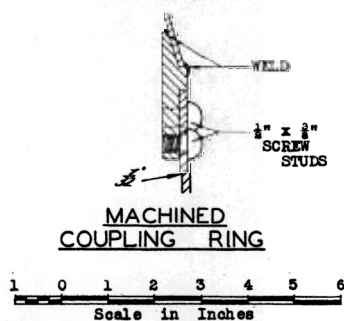
1 0.1 2 4 6 8 10 12
Scale in Inches

REFER E IN C B.D.T.I. B/4/99

SHEET 2.



TAIL FUZE
ADAPTOR



JAPANESE 1/3 Kg H.E. CLUSTER BOMB CONTAINER

1. REFERENCE.

See BDTI B/2/100 - description of 1/3 Kg H.E. bomb.

2. DETAILS.

Dimensions : Overall length. 3'5½"
Diameter. 8"
Wall thickness. 0.050" (16 gauge)
Thickness of end plates. 0.075" (13 gauge)

Weights : Container empty 20¼ lbs
Filled (bombs & packing) 35 Kg (78 lbs)

Colour : Painted BLACK.

3. USE.

Contains 76 ARMY Airforce type 1/3 Kg H.E. bombs packed in 4 sections each of 19 bombs.

4. DESCRIPTION. (See diagram)

The container is formed by 3 interlocking lengths of corrugated sheet steel closed at each end by hexagonal sheet steel plates. The 3 lengths are held in position by 4 encircling sheet steel bands and clips. The clips are prevented from opening by 2 arming wires.

Attached externally to each end plate are 3 Bungee cords 7½" long with a steel hook at the end of each.

One of the 3 interlocking lengths serves as the upper portion of the horizontally suspended container. To this portion is spot welded a smooth semi-circular sheet steel piece 2'10" long, in the centre of which is located a swinging type suspension lug.

On each side of the lug, between it and the inner steel bands is welded a small eye-bolt through which the arming wires pass.

The 4 internal sections, each containing a group of 19 packed bombs, are formed by a transverse cardboard disc between each group.

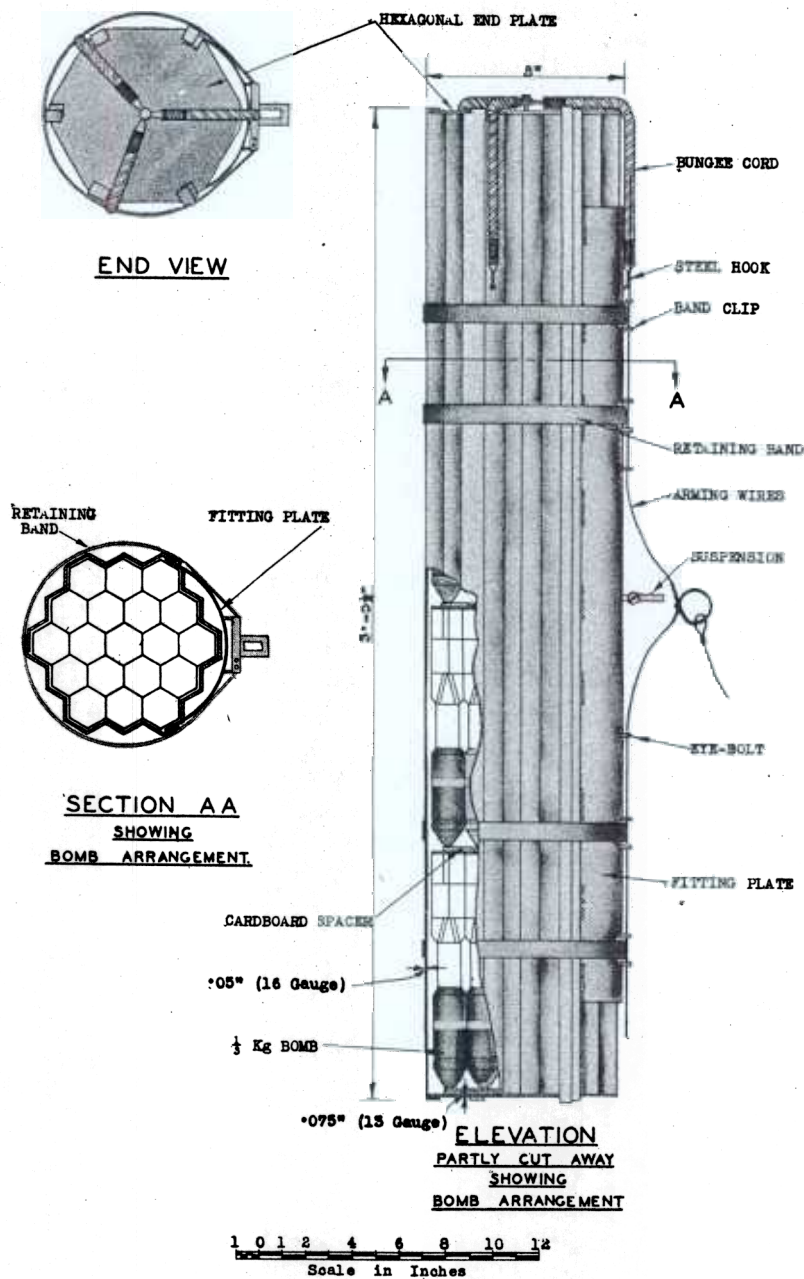
5. OPERATION (assumed).

The arming wires are made fast at their centre to the bomb rack. On release of the container the arming wires slip the eye-bolts and clips, the encircling bands and end plates fall away and the interlocking sections separate, thus releasing the cluster.

JAPANESE $\frac{1}{3}$ Kg H.E. (CLUSTER) BOMB CONTAINER

USE - ARMY AIRFORCE

REFER E IN C B.D.T.I. B/5/116



JAPANESE PAMPHLET CONTAINER - 50 Kg
(AIRCRAFT)

1. JAPANESE DESIGNATION.

2. DETAILS.

Dimensions: Overall length (excl. fuze) .. 3'1"
Diam. of body.. .. 7 1/8"
Diam. over tail fins. .. 9 1/2"
Width of fins.. .. 6 3/4"

Weights : Total weight filled.. .. 110 lbs
Weight empty approx
lbs "

Colour : LIGHT BROWN

3. USE.

ARMY Airforce type container fitted with D.1(A) aerial burst fuze which is designed to burst open and release the load of pamphlets at a predetermined height above ground.

4. DESCRIPTION. (See diagram)

The complete casing is constructed of cardboard throughout and consists of a body and a tail unit.

The BODY has 2 diametrically opposite slots running horizontally down the sides and terminating about 1-in. from either end. The flattened end of its rounded nose is centrally perforated to receive a flanged ring, the cylindrical portion of which fits into a solid wooden block suitably recessed to receive it. The ring is secured by 3 wire nails passing through its flange. The wooden block is in 2 pieces split to line up with the slots in the barrel.

A small BURSTER CHARGE in a cardboard container has a pocket to receive the detonator of the fuze when latter is screwed into the flanged ring. The charge is composed of potassium nitrate, aluminium, sulphur and siliceous matter.

Normal ARMY type swinging suspension is fitted.

The TAIL UNIT consists of a conical portion secured to body by small bolts which fit into bayonet slots in the body. 4 tail fins braced with 2 sets of box-type struts complete the assembly.

5. FUZING.

ARMY type fuze D.1(A) is fitted (see BDTI B/9/91)

6. ACTION.

When the fuze functions the detonator explodes the burster charge, splitting the bomb into 2 halves and releasing the pamphlets in mid-air.

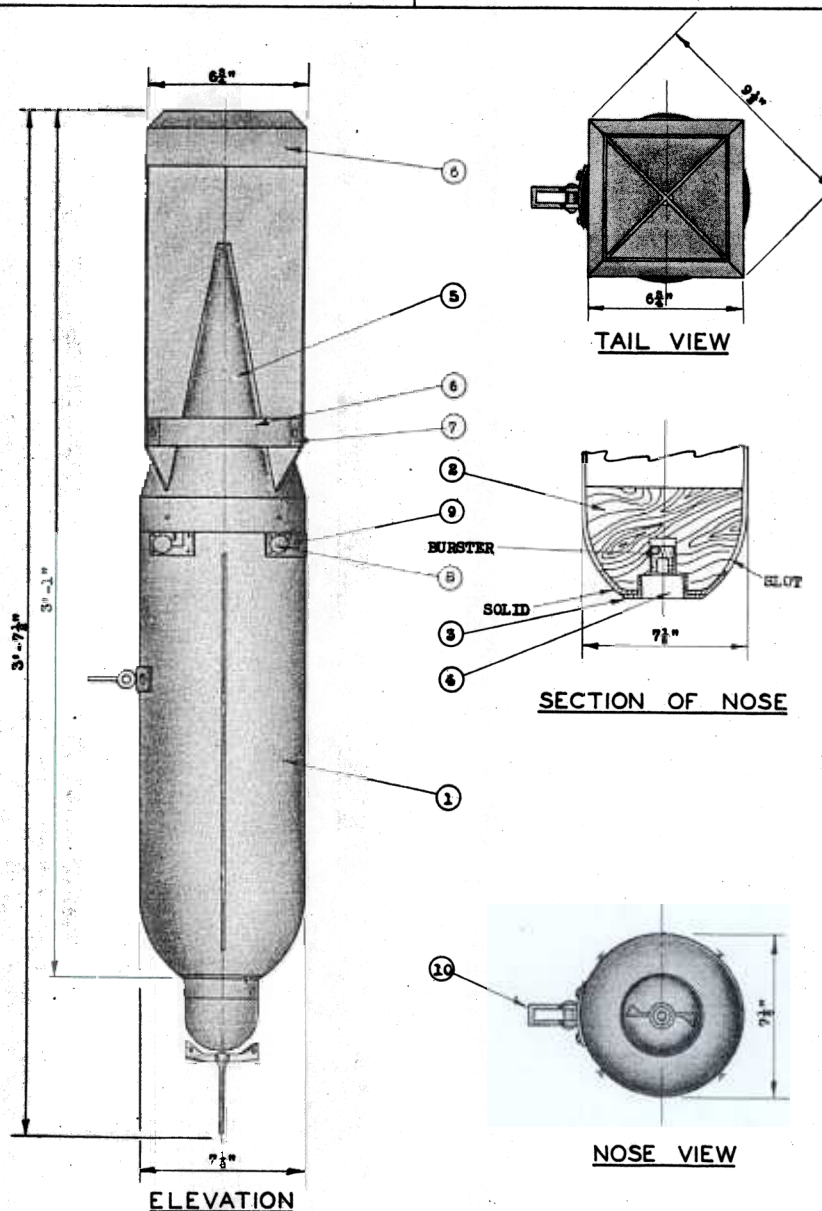
7. DISPOSAL.

Deal with fuze as laid down in BDTI B/9/91. The casing will generally collapse on impact with any surface except very soft ground, and the carcass is harmless after removal of the fuze and burster charge.

JAPANESE PAMPHLET CONTAINER — 50 Kg.

USE - ARMY AIRFORCE

REFER E INC B.D.T.I. B/5/92



1 0 2 4 6 8 10 12
Scale in inches

LEGEND

1. BODY	CARDBOARD	6. BOX-TYPE STRUTS	CARDBOARD
2. SHAPED BLOCK	WOOD	7. WASHERS	THIN METAL
3. RING (See FUZE D.1(A))	ALUMINIUM	8. SMALL BOLTS	METAL
4. SPACE FOR BASE OF FUZE.		9. BAYONET SLOTS	
5. TAIL UNIT	CARDBOARD	10. SWINGING SUSPENSION	METAL

JAPANESE PARACHUTE BOMB CONTAINER - 60 Kg
(Provisional)

1. DETAILS.

Dimensions: Overall length.. . . . 2'11½"
Length of body cylinder.. . . 1'10¼"
Max. diameter 9¾"
Thickness of body casing. . . 0.08"

Weights : Total weight, incl. bombs .. 60 Kg
Container, excl. bombs .. . 10 Kg

Colour : GREY body cylinder

Markings : GREEN band on nose tip
BLACK band on remainder of nose.

2. USE.

NAVY Airforce type container housing 5 parachute HE bombs (each approx 10 Kg) and released at low level flying against personnel and grounded aircraft.

3. DESCRIPTION. (See diagram)

(a) Body casing consists of 2 hemi-cylindrical pieces of sheet steel joined internally with 4 lugs and rivets. Suspension is normal NAVY type eye-bolt.

(b) Nose piece. The nose tip is machined solid steel and has a threaded opening for a fuze. The hollow portion below is made of sheet steel and the 2 parts are weld jointed. A sheet steel rim, welded around the base of the hollow portion, fits inside the body casing and is positioned by 4 lead strips soldered to the rim.

(c) Base cover. IT IS ASSUMED that a conical shaped base cover of sheet metal fits into the rear end of the body cylinder in same manner as nose piece, and that nose piece and base cover are prevented from falling outwards by 4 joining wires attached to fixed eyebolts on rim each end.

4. FUZING. Airburst type nose fuze D.4(A) is fitted.

5. ACTION. (Assumed)

The nose piece and base cover are probably separated from the container on fuze D.4(A) initiating a burster charge in mid-air, breaking the 4 joining wires and allowing the bombs, aided by the parachutes, to escape out of the rear end of the cylinder.

NOTE 1. A container which has failed to release its bombs in the air will probably either -

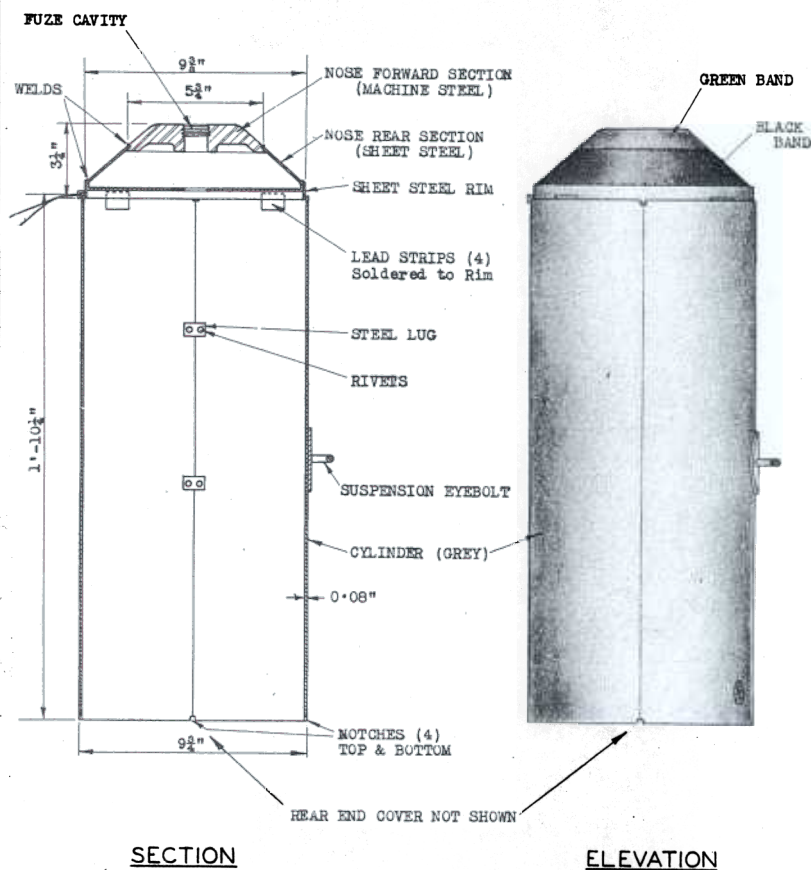
(a) collapse on impact and the bombs may be scattered,
or

(b) the body casing may remain intact, the heavy nose driven inwards and the condition of the bombs inside will not be known. In such cases, endeavour to remove fuze D.4(A) by normal method before attempting to dismantle container with the object of removing bombs.

JAPANESE PARACHUTE BOMB CONTAINER - 60 Kg.

USE - NAVY AIRFORCE

REFER E IN C B.D.T.I. B/5/13.



1 0 2 4 6 8 10
Scale in Inches

JAPANESE PRACTICE BOMB (AIRCRAFT) - 31 Kg

1. DETAILS.

Dimensions: Overall length 2'10 $\frac{1}{2}$ "
Length of body 1'5 $\frac{1}{4}$ "
Length of tail unit 1'5 $\frac{1}{4}$ "
Barrel wall thickness $\frac{1}{4}$ "
Diam. of barrel.. .. 7"
Diam. over tail fins 9 $\frac{1}{2}$ "
Width of tail fins 7 $\frac{1}{4}$ "

Weight : Total weight (excl.
smoke producing material) 68 lbs approx.

Colour : WHITE (painted)

Markings : RED LINES (2) diametrically opposite and
full length of bomb body.

2. USE. NAVY Airforce steel walled CONCRETE FILLED
bomb used for sighting and for bombing exercises.

3. DESCRIPTION. (See diagram)

The bomb consists of 2 main structural parts -

(a) Nose and Barrel are in one piece, machined steel,
with no provision for a base plate or coupling ring.
A shaped wooden disc closes the base and projects
4" into tail cone for securing same. Twin suspen-
sion Navy type eyebolts are fitted.

(b) Tail unit. A tail cone of sheet metal is secured
to the barrel with 8 screws. 4 tail fins of sheet
steel are spot welded to the cone and braced with
box-type struts. The cone is slotted between the
fins as shown for exit of smoke.

A metal container fits neatly inside tail cone
and is secured to base closing disc with 4 screws.
This holds a smoke producing liquid. A central
booster tube filled with PICRIC ACID is inserted in
the apex of the container and extends into the
liquid.

4. FILLINGS.

(a) Nose and body are filled with CONCRETE for ballis-
tic purposes and stability

(b) Composition of smoke producing liquid is unknown.

5. ACTION. On impact, the fuze assembly initiates de-
tonation of the booster charge and the metal container is
fractured. Heat from explosion causes the smoke material
to produce smoke which escapes through the slots in the
tail cone.

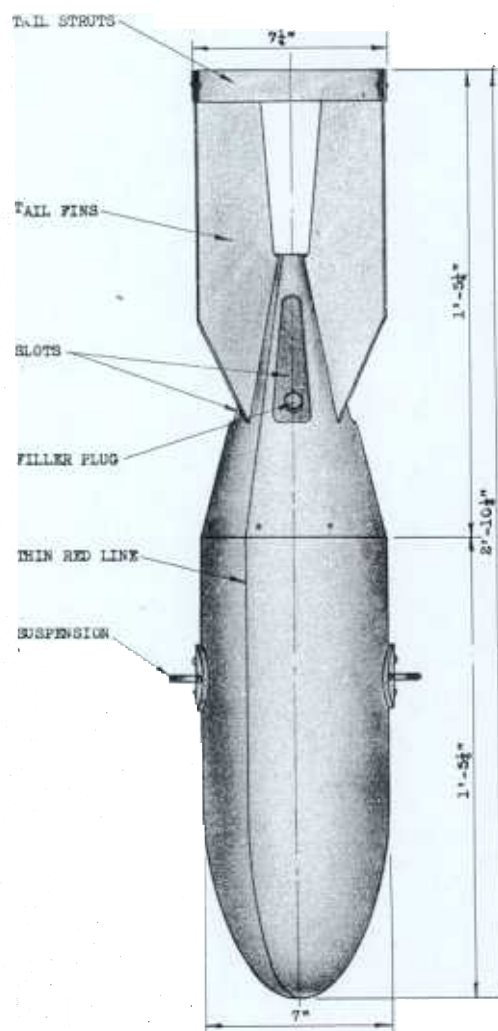
6. FUZING. Only tail fuze B.6(A) can be fitted.
For description and method of removal see BDTI B/7/123.

NOTE 1. The bomb is harmless after withdrawal of
fuze with attached booster tube.

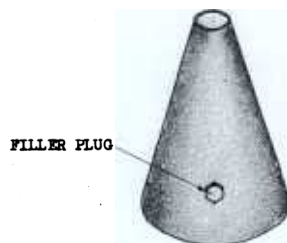
JAPANESE PRACTICE BOMB - 31 Kg.

USE - NAVY AIRFORCE

REFER ENC B.D.T.I. B/5/48



ELEVATION



SHEET STEEL
CONTAINER
IN
TAIL CONE



JAPANESE GAS BOMB, TYPE 92 - 50 Kg

1. DETAILS.

Dimensions: Overall length 3'9"
Length of body 2'7"
Diameters (barrel 7 $\frac{3}{4}$ "
 (nose piece 7 $\frac{3}{4}$ "
 (tail fins 9 $\frac{1}{2}$ "
Width of tail fins 6 $\frac{3}{8}$ "
Thickness of barrel wall 1 $\frac{1}{8}$ "

Weights : Empty bomb. 60 lbs (approx)
Liquid gas filling 44 lbs
Burster charges (2) 5 $\frac{1}{2}$ lbs "

Colour : GREYISH GREEN (painted)

Markings : RED and BLUE narrow bands on nose
YELLOW and WHITE 1" bands around barrel
below suspension
YELLOW 1" band around barrel above suspen-
sion (standard colour for vesicant
chemical in this position)
DOUBLE CROSS ideograph (colour probably
YELLOW) on barrel below tail cone weld.

2. USE.

ARMY Airforce type gas bomb.

3. DESCRIPTION. (See diagram)

(NOTE 1 :- Casing construction, and especially external appearance, closely resembles the 50 Kg Type 97 Incendiary bomb - see BDTI B/4/9.)

The bomb consists of 3 main structural por-
tions :-

- (a) Barrel. A side-welded tube constructed of $\frac{1}{8}$ " thickness sheet steel. A steel carrying band encircles the barrel for fitment of normal ARMY type swinging suspension. The nose end is welded to a shaped heavy bulkhead which -
- (i) is perforated and threaded to receive a container for the secondary detonating, booster and burster system;
 - (ii) forms a base for attachment of the nose piece; and
 - (iii) serves as a "push" plate (see para 5 below)
- (b) Nose piece, of steel, is retained on the bulkhead by 3 screw studs. The nose opening receives a fuze and either 1 or 2 grub screws to secure it
- (c) Tail unit. A truncated tail cone fits over the rear end of the barrel and the joint is sealed with a continuous fillet weld. Four fins are spot welded to the cone and braced with 2 sets of box-type struts made of approx 5/16" tubular steel welded to the fins

4. FILLINGS.

- (a) Burster charges and boosters are all of PICRIC ACID. The nose burster charge is in the form of a preformed block of explosive which fits against a perforated wood block at the nose and has a pocket formed to receive a booster pellet. The cylindrical shaped central burster charge is pressed powdered explosive wrapped in waxed paper which fits into a thin steel cylindrical container and also receives a secondary booster tube
- (b) Chemical contents. The body and cone cavities are filled with approx 13 litres of liquid MUSTARD and LEWISITE gases (50/50 mixture by weight).

5. ACTION.

On impact, the fuze assembly initiates detonation of the nose burster charge. The shock overcomes the creep spring of the secondary striker which pierces an initiator cap and so initiates the secondary booster and burster systems.

Explosion of the nose charge tends to give an upward lift to the bulkhead, shearing the nose weld and separating the casing sections. Penetration before explosion is thereby somewhat counteracted. Explosion of the central charge shatters the casing and spreads the liquid gas.

6. FUZING.

Normal fuzing is nose fuze A.2(B).

7. DISPOSAL. (Bomb which is intact)

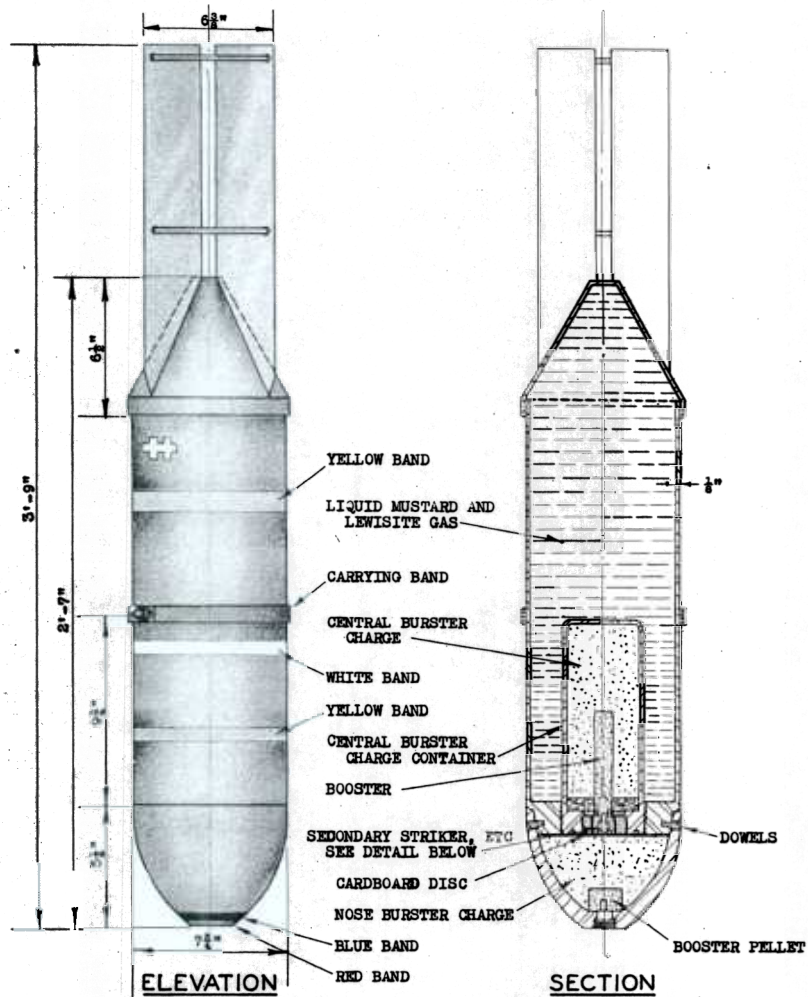
- (a) Fuze removal. For fuze A.2(B) see BDTI B/6/73
- (b) Destruction. Refer to BDTI D/20/23 - "Disposal of Gas Bombs and Missiles".

NOTES

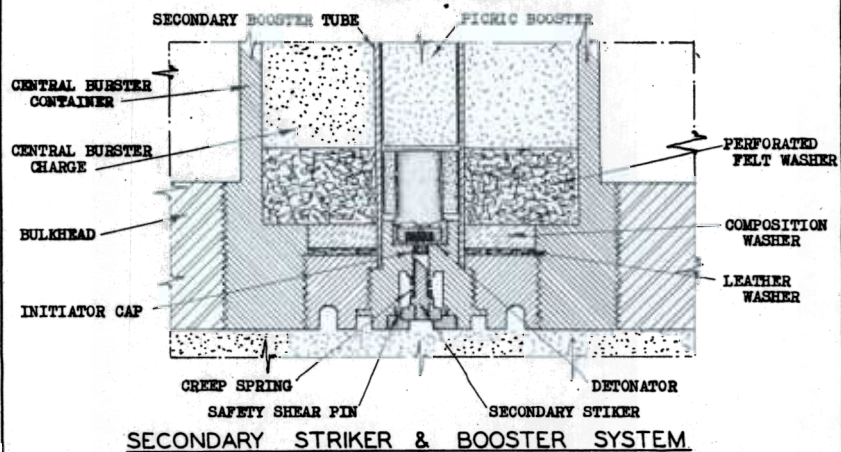
JAPANESE GAS BOMB, TYPE 92 - 50 KG.

USE - ARMY AIRFORCE

REFER E INC BDTI B/5/14



1 0 2 4 6 8 10 12
Scale in Inches



- (b) Tail piece. The TAIL CONE is made of thin sheet metal and slotted for attachment to 3 screws on metal nose. The nose end is closed by a thin sheet metal BULKHEAD, and the rear end by a metal cap. 4 TAIL FINS (unbraced) are soldered to the cone. Army type swinging suspension is fixed where shown.

Screwed to the bulkhead is a CENTRAL TUBE housing an INNER TUBE, with linen packing between the two. The DETONATOR extends into the inner tube, sliding through the cylindrical burster charge. BROWN WADDING (probably steeped in an inflammable mixture) fills the end of the inner tube.

5. FILLINGS.

- (a) Burster charge. A cylindrical plug of pressed powdered ~~PICRIC~~ PICRIC ACID wrapped in waxed paper and holed centrally for the detonator.
- (b) Smoke material. RED PHOSPHOROUS powder completely fills the tail cone outside the central tube.

6. ACTION.

On impact, the fuze assembly initiates the detonator which detonates the burster charge. This bursts the bomb and at the same time the heat from explosion causes the red phosphorous to ignite and give off a dense cloud of white smoke.

7. FUZING.

Fuze A.5(A) is an integral part of the bomb construction. For description, see BDTI B/6/86.

8. DISPOSAL.

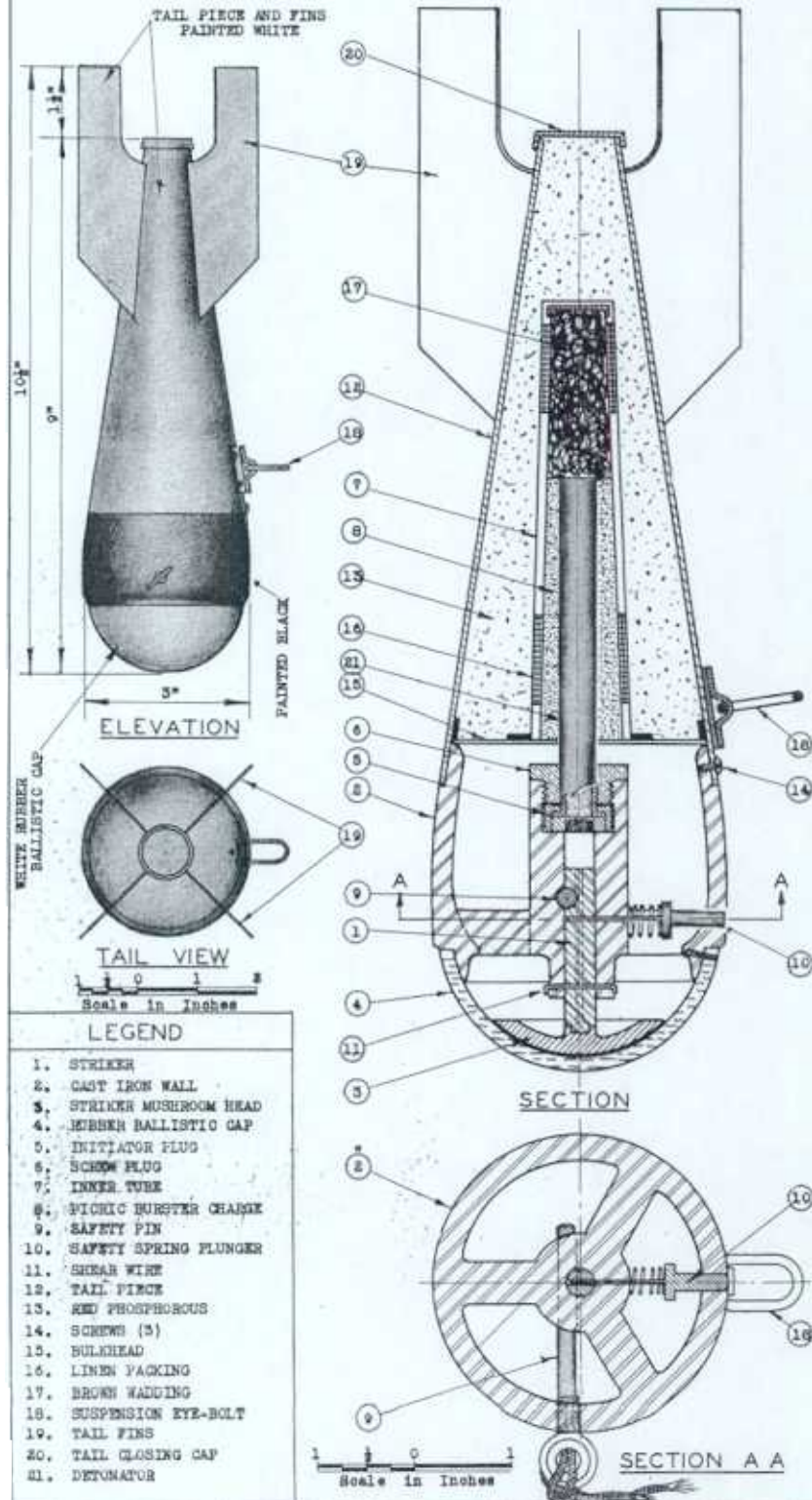
- (a) Destruction. Wherever possible, destroy in situ. To destroy, place charge against mushroom head if the latter has not been driven in hard against fuze head; if it is, place charge on tail cone near joint with metal nose
- (b) Precautions when handling. In UXBs the thin shear wire will almost certainly be sheared and the striker has pierced the initiator, or is free to do so. In either condition the bomb is dangerous. If necessary to handle, pick up by the middle, carry HORIZONTALLY, avoid jolting and do NOT drop bomb.
- (c) Rendering fuze safe. See BDTI B/6/86.

NOTE 1 :- If dismantling bomb is necessary, first detach tail cone and withdraw together with burster plug. NEVER remove detonator WHILST it is pierced by the striker.

JAPANESE SMOKE SIGNAL (AIRCRAFT) — 1 Kg.

USE — ARMY AIRFORCE

REFER E.M.C. B.D.T.I. B/5/2



JAPANESE SMOKE FLOAT - 2 Kg
(Yellow Smoke)

1. JAPANESE DESIGNATION.

2. DETAILS.

Dimensions: Overall length 1'6 $\frac{1}{8}$ "
Max. diameter of body .. 4 $\frac{3}{4}$ "

Weights : Total weight 4 $\frac{3}{4}$ lbs

Colour : WHITE (painted)

Markings : YELLOW nosepiece (painted)

3. USE.

NAVY Airforce type smoke float for navigation purposes by day.

4. DESCRIPTION. (See diagram)

(a) Nose piece is cast brass weighted with lead and soldered to the BUOYANCY CHAMBER. The SMOKE CANDLE UNIT screws into the nose as shown.

(b) Buoyancy Chamber (body) is conical in shape and constructed of 22 gauge sheet metal. 3 fins are soldered to the tail end. An EMISSION TUBE passes centrally full length of body and is supported by 3 metal discs. A cork plug fits into the tail end of the tube.

(c) Smoke Candle Unit consists of a casing of light alloy containing a smoke producing composition. A QUICKMATCH WICK and a length of SAFETY FUZE connects the candle with the IGNITER.

(d) The Igniter cartridge casing houses a release pin, a spring loaded striker and an initiator cap pressed into a plug which screws into the end of the cartridge.

5. ACTION.

After removing the safety pin, the release pin is withdrawn per medium of the pull cord and the striker is put under pressure of its spring. The striker is released when the end of the release pin is free of the cartridge case and impinges the initiator cap. The smoke composition is finally ignited by the safety fuze and quickmatch wick. The bomb is dropped by hand immediately after the release pin is pulled right out.

6. DISPOSAL. (Bomb which has failed to function)

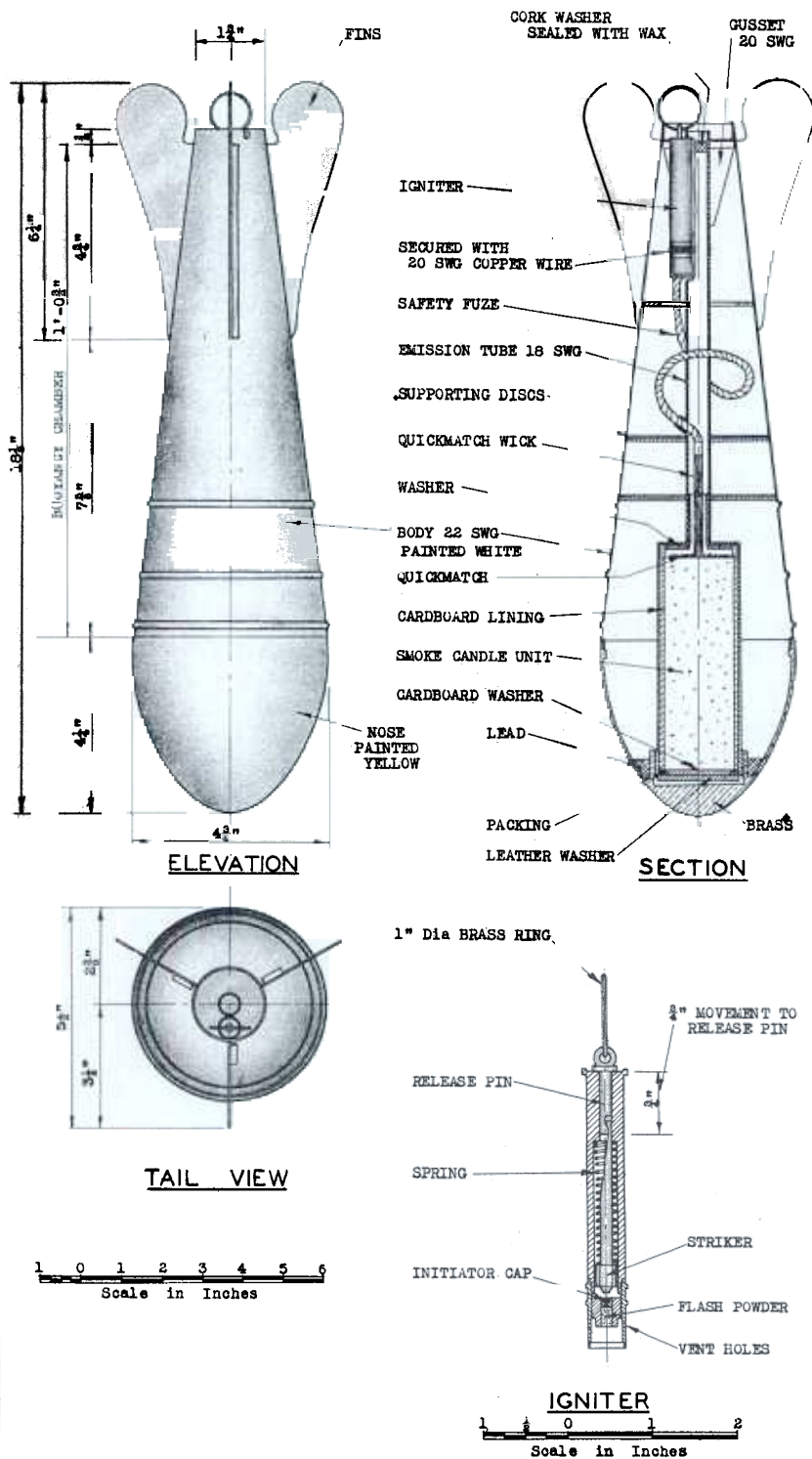
(a) Precautions in handling. When release pin is missing the bomb should be handled with care. If necessary to carry, keep bomb TAIL DOWN.

(b) Destruction. Puncture the buoyancy chamber and dump in deep water; or alternatively, fill emission tube with water, wait $\frac{1}{2}$ hour, then dismantle and destroy parts separately.

JAPANESE SMOKE FLOAT - 2 Kg. (YELLOW SMOKE)

USE - NAVY AIRFORCE

REFER E IN C B.D.T.I. B/5/71



JAPANESE PARACHUTE ILLUMINATING FLARE
(AIRCRAFT)

1. JAPANESE DESIGNATION.

2. DETAILS (incomplete).

Dimensions: Overall length 2'10"
Length of container 2'7 $\frac{1}{2}$ "
Length of barrel of container . . 2'5 $\frac{1}{2}$ "
Diameter of barrel 6 $\frac{1}{2}$ "

Colour : GREY (painted)

Markings : NIL

3. USE.

NAVY Airforce type flare to illuminate target areas for night bombing or reconnaissance purposes.

4. DESCRIPTION. (incomplete) see diagram.

The outer container consists of a cylindrical barrel of 18 gauge M.S. plate.

A weighted nose piece of 16 gauge M.S. plate is lap-jointed to the barrel and houses a wooden block which apparently secures the nose weight and also serves as a distance piece.

Four stabilizing fins are soldered to the rear end of the barrel.

A single NAVY type suspension eyebolt is provided, and is presumed to be located over a band around the barrel at approx 12" from the nose.

The exact nature of the end cap is not known, but it is held in position by spot soldering in four places, and sealed against moisture with shellac or similar material.

The inner casing (of which no particulars are available) slides into the container, and houses the flare candle with attached parachute.

5. FUZING.

The flare is fuzeed at the nose only with fuze D.3(A) - see BDTI B/9/103.

6. ACTION.

On release of the flare from the aircraft, fuze D.3(A) functions after a brief interval of falling and ignites a small powder charge which propels the candle with attached parachute from the container. (It is assumed that the inner casing is also expelled and frees itself from the candle and parachute.)

Flares observed have burned for approx. 4 $\frac{1}{2}$ mins, and the rate of descent appeared to decrease as the candle was consumed.

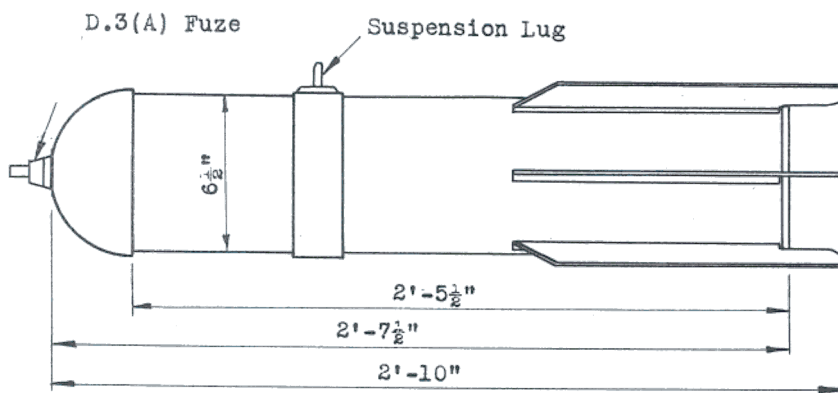
At an estimated height of approx 1200 ft above ground, descent appeared to cease, and the flare hovered at this height until the candle was wholly consumed.

7. DISPOSAL. (provisional)

Procedure for disposal of an un-ignited flare should be as follows -

- (a) Place flare in a nearby excavation if fire risk is present.
- (b) Deal with fuze D.3(A) as laid down in BDTI B/9/103, para 7.
- (c) Insert an igniting agent into fuze cavity and destroy flare. (A method of ignition through the rear end of container is not suggested owing to lack of details of construction.)

NOTES



JAPANESE ILLUMINATING FLOAT FLARE, TYPE

1. JAPANESE DESIGNATION. "Illuminating Flare Bomb".
2. DETAILS.

Dimensions: Overall length.. .. 1'10 $\frac{1}{2}$ "
Length of body.. .. 1'2"
Max. diam. of body.. .. 6 $\frac{1}{4}$ "

Weights : Illuminating charge 5 $\frac{1}{8}$ lbs
Total weight. lbs

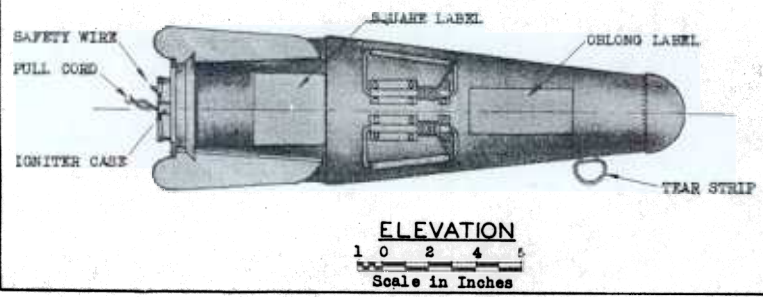
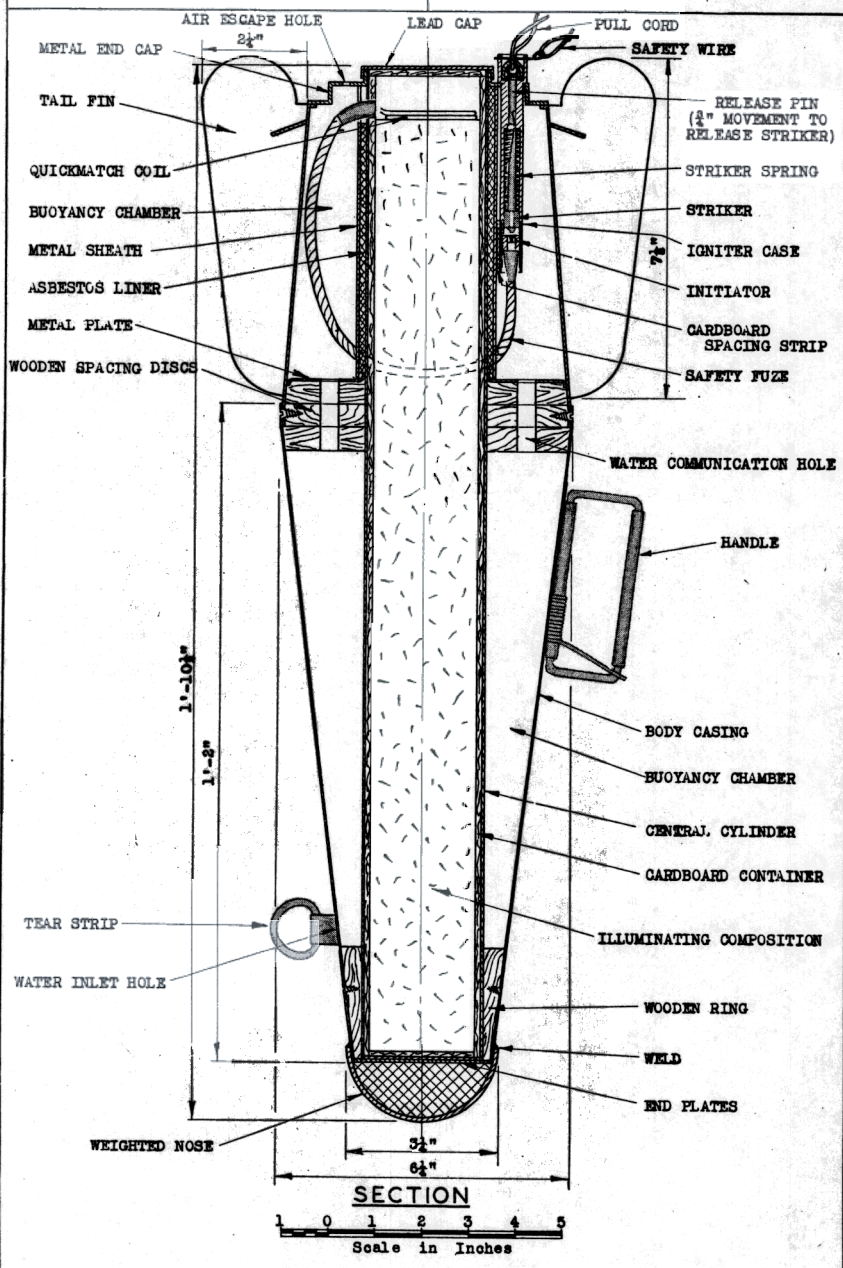
Colour : GREY (painted)
3. USE. NAVY Airforce type float flare for navigation purposes by night.
4. DESCRIPTION. (See diagram)
 - (a) Nose. The hemispherical metal nose is welded to the body and weighted for ballistic purposes.
 - (b) Body. The BODY CASING, made of sheet steel, is conical in shape. 2 hinged SPRING HANDLES for carrying are fitted midlength. Body and tail casing are joined by 8 screws which screw into WOODEN SPACING DISCS through both these parts. A CENTRAL TUBE, containing the illuminating composition, slides into a WOOD RING at the nose end. A WATER INLET HOLE in the nose end of the BODY BUOYANCY CHAMBER is covered by a TEAR-STRIP.
 - (c) Tail unit. TAIL CASING is made of sheet steel with 4 PINS soldered on. A shaped METAL END CAP is soldered on to seal the REAR BUOYANCY CHAMBER. The central tube projects through the metal end cap and is itself sealed with a thin LEAD CAP soldered on.

An IGNITER cartridge is inserted through the metal cap and the hole sealed with solder. A 10" length of SAFETY FUZE connects the igniter with a coil of QUICKMATCH which rests on top of the illuminating composition.
5. ACTION. Preparation for hand launching is same as for SMOKE FLOAT BOMB described in BDTI B/5/71 para 5. The safety fuze burns for 35 secs and the quickmatch ignites the illuminating composition which burns for 1 $\frac{1}{2}$ mins with a brilliant greenish-yellow flame. Heat of initial combustion melts the lead cap and the flame issues through the opening.
6. DISPOSAL. (Flare which has failed to function)
 - (a) Precautions in handling. When Igniter release pin is missing, the flare should be handled with care as it burns with intense heat. If necessary to carry, keep flare TAIL DOWN.
 - (b) Destruction. Puncture body case (or remove tear-strip) and dump in deep water; or alternatively, flare may be expended by puncturing lead cap with a knife and inserting an igniting agent.

JAPANESE ILLUMINATING FLOAT FLARE TYPE

USE - NAVY AIRFORCE

REFER E IN C B.D.T.I. B/5/78



JAPANESE FLOAT FLARE, TYPE 94 - 1 Kg

1. JAPANESE DESIGNATION.

Type 94, Aerial Indicator Flare.

2. DETAILS.

Dimensions : Overall length 1'0"
Diam. of casing 2 $\frac{3}{4}$ "
Diam. over tail fins 4"

Weights : Complete flare lbs
Empty of charges. 1 lb.

Colour : GREY (painted)

3. USE.

NAVY Airforce type float flare for night navigational purposes.

4. DESCRIPTION. (See diagram)

Apart from size and minor details, the design of this flare is similar to the 3 Kg flare described in BDTI B/5/75. Construction is also soldered tinplate throughout.

The flare herein described has 4 tail fins but NO box-type struts as in the 3 Kg flare.

5. ACTION.

The preparation for dropping flare and the principle for generating acetylene gas and igniting it with phosphine gas are same as in the 3 Kg flare though the former gas emerges at the tail somewhat differently.

6. DISPOSAL. (Flare which has failed to function)

Expend in water.

NOTE 1.

Modification of Type. (Possibly ARMY Airforce use)

A factory variation of the flare above described is similar as regards construction and action but differs in the following respects :-

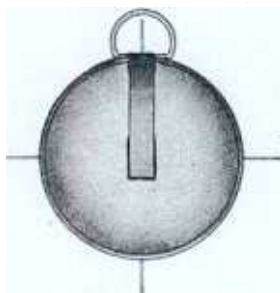
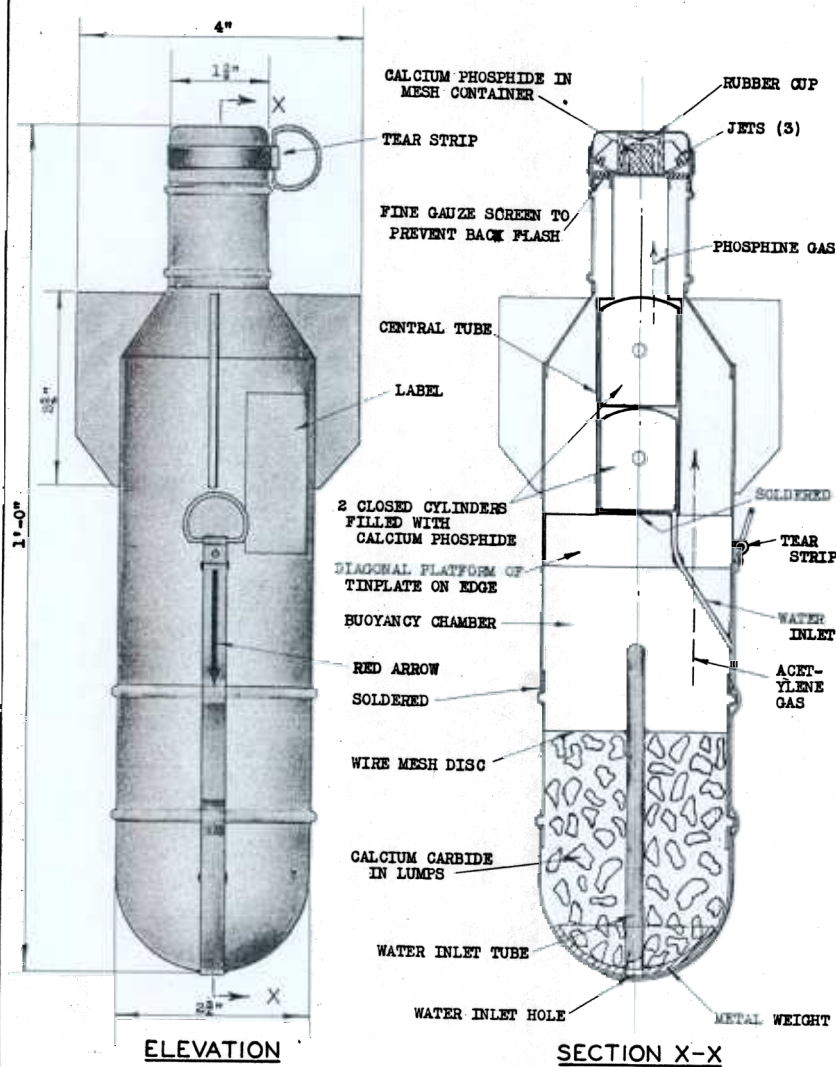
Overall length. 14" approx
Diam. of casing 3" "
Colour BLACK

Construction :- 2 tinplate diaphragms, each perforated with 2 holes, are fitted internally, one immediately above and the other around top of nose water inlet tube. Calcium phosphide is contained in a single cylinder. An additional lead weight is soldered to the exterior of the nose about 1" from the end in such a manner as to cause flare to float at an angle.

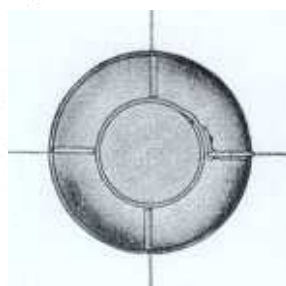
JAPANESE FLOAT FLARE. TYPE 94 - 1 Kg

USE - NAVY AIRFORCE

REFER E IN C B.D.T.I. B/5/128



PLAN AT NOSE



PLAN AT TAIL

1 0 1 2 3 4
Scale in Inches

JAPANESE FLOAT FLARE, TYPE 94 - 3 Kg

1. JAPANESE DESIGNATION.

Type 94, Modification 1, Float Light.

2. DETAILS.

Dimensions: Overall length.. . . . 1'8 $\frac{1}{4}$ "
Max. diameter 4 $\frac{3}{8}$ "

Weights : Complete flare.. . . . 7 lbs
Calcium carbide charge .. . 2 lbs

Colour : BRIGHT YELLOW

3. USE.

NAVY Airforce type float flare for night navigational purposes.

4. DESCRIPTION. (See diagram)

The flare is of soldered tinsplate construction throughout. A lead weight in the nose and a buoyancy chamber in the rear section keep the flare upright in water. Internal construction divides the flare into 2 parts.

(a) Acetylene gas generating chamber. A WATER INLET hole in the nose connects with a central WATER INLET TUBE which is perforated along its length and sealed at the rear end. Tinsplate diaphragms divide the chamber into 2 compartments. Lumps of CALCIUM CARBIDE (2 lbs in all) are contained in a wire mesh cylinder in each compartment.

(b) Buoyancy chamber and igniting system. Located centrally in the BUOYANCY CHAMBER is a CENTRAL TUBE supported on a piece of tinsplate on edge. Inside this tube is an INNER TUBE which houses 3 TINPLATE CYLINDERS each with gas emission holes and filled with lumps of CALCIUM PHOSPHIDE (1 $\frac{1}{2}$ ozs in all) contained in cylinders made of wire mesh. At bottom of central tube a further quantity of calcium phosphide is placed in a ball made of wire mesh. A second WATER INLET TUBE leads from interior of inner tube to a hole in side of outer casing and sealed by tear-off strip.

5. ACTION.

Before dropping, the 2 tear-off strips and end cap are removed. After impact with the sea, water enters through the nose inlet hole, wets the calcium carbide and acetylene gas is generated. Simultaneously, water enters through the side inlet hole, wets the calcium phosphide and generates phosphine. The acetylene gas passes along the annular space between the central and inner tubes, emerges through 3 jets at tail end and is there ignited by the phosphine gas which is spontaneously inflammable in the air. Excess of production of acetylene increases internal pressure which lowers the water level in nose inlet tube. As internal pressure drops, more water will enter and increase production of acetylene. By this means a fairly constant pressure is maintained.

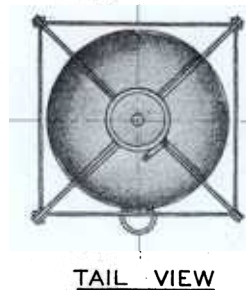
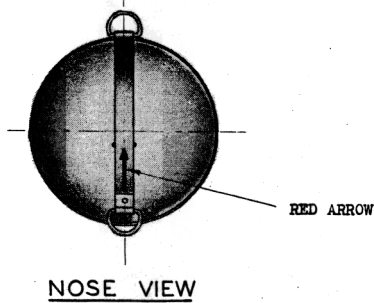
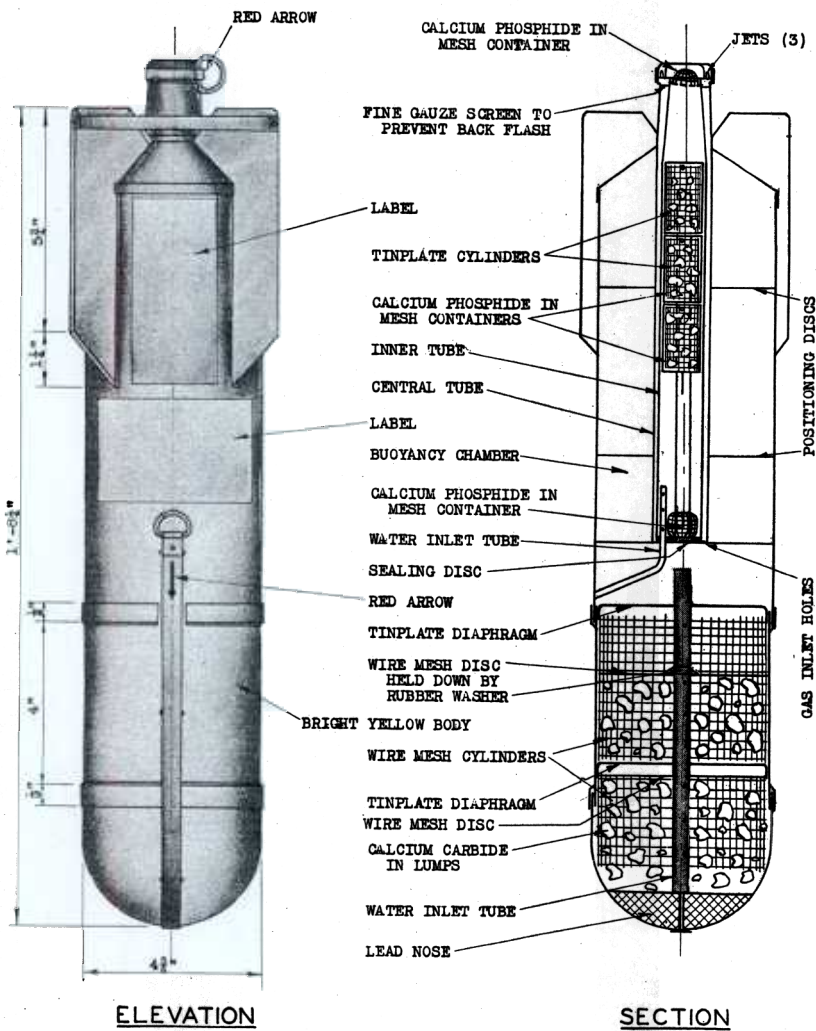
6. DISPOSAL. (Flare which has failed to function)

Expend in water.

JAPANESE FLOAT FLARE. TYPE 94. MODIF. 1 - 3 Kg.

USE - NAVY AIRFORCE

REFER E N C B.D.T.I. B/5/75



1 0 1 2 3 4 5 6
Scale in Inches

JAPANESE NAVIGATION MARKER, TYPE O, MODEL 1

1. JAPANESE DESIGNATION.

Type O Navigation Marker, Model 1 of which two variations by different factories are described herein.

For convenience, they are referred to as VARIATION A and B.

2.

Aluminium powder filled seamarker, employing NEITHER fuizing system NOR explosive constituents.

3.

NAVY Airforce seamarker for navigational purposes by day.

VARIATION A - See FIG 1

4. DETAILS.

Overall length 13"
Diameter of body 3"
Colour - ALUMINIUM sprayed

5. DESCRIPTION.

A lead-weighted brass NOSE PIECE is perforated centrally to receive a turned wooden PLUNGER, the nose end of which is rounded in continuation of the nose curve, and sealed with paper glued on.

A cylindrical BODY of thin tinplate is soldered to the nose piece and lightly tacked to a wooden CLOSING DISC at the rear end. The plunger passes centrally through the body to just short of the closing disc.

A TAIL UNIT, all of thin tinplate, consists of a cone lightly tacked to the closing disc, and 4 fins soldered-on. Light box-type struts are singly rivetted to the fins.

The body is filled with finely powdered ALUMINIUM.

6. ACTION.

(a) The marker is dropped from the aircraft by hand.

(b) Impact with the sea thrusts the plunger hard against the wood closing disc thus dislodging the tail unit and allowing the aluminium powder to escape and form a film on the water surface.

VARIATION B - see FIG 2

7. DETAILS.

Overall length 12½"
Diameter of body 3"
Total weight filled 3 lbs 11 ozs
Weight of filling 11 ozs
Colour - ALUMINIUM sprayed

8. DESCRIPTION.

A weighted NOSE PIECE of cast steel is perforated centrally to receive a turned wooden PLUNGER, the nose end of which is rounded in continuation of the nose curve. A wooden RAM is glued into a hole in its rear end.

A thin 3-ply disc is screwed to the plunger and overlaps the central hole thus retaining the plunger and serving as a seal.

A cylindrical BODY of thin tinplate fits over the machined down portion of the metal nose and is secured thereto by crimping into 4 holes. A wooden CLOSING DISC closes the rear end. The central ram 4-11/16" length by 7/16" diam extends centrally through the body to just short of the closing disc.

A TAIL UNIT, all of thin tinplate, consists of a cone lightly tacked to the closing disc, and 4 fins soldered-on. Light box-type struts are singly rivetted to the fins.

The body is filled with finely powdered aluminium.

9. ACTION.

- (a) The marker is dropped from the aircraft by hand
- (b) Impact with the sea thrusts the plunger hard inwards, the ram dislodges the tail unit and the aluminium powder escapes and spreads as a film over the water surface.

NOTES

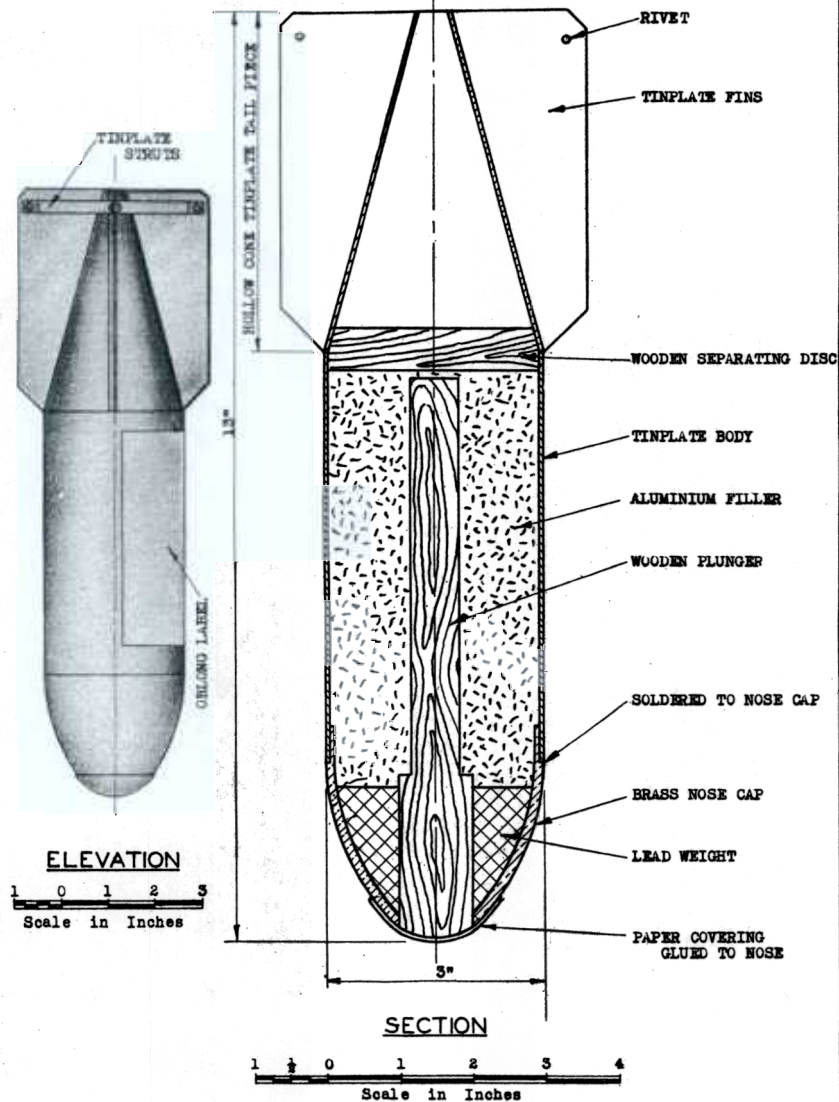
JAPANESE NAVIGATION MARKER, TYPE O, MODEL 1.

USE - NAVY AIRFORCE

REFER ENC B.D.T.I. B/5/126

VARIATION A

FIG 1



TRANSLATION OF ATTACHED LABELS

1. OBLONG LABEL

MANUFACTURED DECEMBER 1941
TYPE O NAVIGATION MARKER, MODEL 1.
NAVAL AIR TECHNICAL BRANCH DEPOT

2. SQUARE LABEL

1. THIS BULLET SERVES FOR MEASURING DRIFT BY DAY.
2. IMMEDIATELY BEFORE DROPPING IT, REMOVE IT FROM ITS PROTECTIVE COVERING IN THE PLANE THEN DROP IT JUST AS IT IS; BUT BE CAREFUL WHEN DROPPING IT NOT TO DAMAGE THE TAIL.
3. HEIGHT AT WHICH THIS BULLET SHOULD BE DROPPED IS FROM 200 M to ?? M.

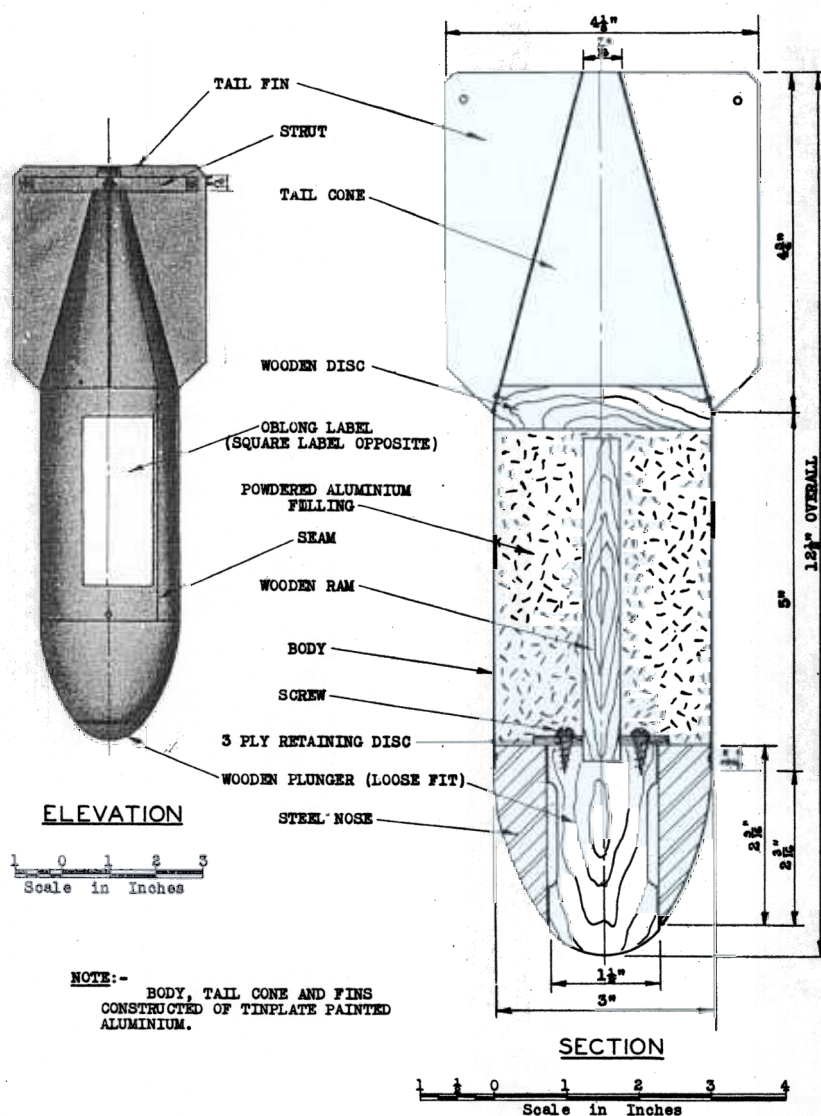
JAPANESE NAVIGATION MARKER. TYPE O. MODEL 1,

USE - NAVY AIRFORCE

REFER ENC B.D.T.I. B/5/126

VARIATION B

FIG II



TRANSLATION OF ATTACHED LABELS

1. OBLONG LABEL

MANUFACTURED DECEMBER 1941
O TYPE SEAMARKER BOMB MODEL 1.
ASANO KARITTO Co Ltd.

2. SQUARE LABEL

1. THIS BULLET SERVES FOR MEASURING DRIFT BY DAY.
2. IMMEDIATELY BEFORE DROPPING IT, REMOVE IT FROM ITS PROTECTING COVERING IN THE PLANE AND DROP IT JUST AS IT IS; BUT BE CAREFUL WHEN DROPPING IT NOT TO DAMAGE THE TAIL PIECE.
3. HEIGHT AT WHICH THIS BULLET SHOULD BE DROPPED IS FROM 200 M to 3000 M.

JAPANESE NAVIGATION MARKER
(Temporarily called "Cardboard type")

1. JAPANESE DESIGNATION.

Navigation Marker Bullet (?) Improvement 1.

2. TYPE.

Aluminium powder filled seamarker, employing
NEITHER fuizing system NOR explosive constituents.

3. DETAILS.

Dimensions: Overall length.. .. 12 $\frac{3}{8}$ ins
Diameter of body 2 $\frac{1}{8}$ ins

Weights : Aluminium filling.. .. 14.2 ozs
Steel Nose 2 lbs 6.7 ozs
Body and Tail 2.86 ozs
Total.. .. 3 lbs 7.7 ozs

Colour : ALUMINIUM SPRAYED

4. USE.

NAVY Airforce seamarker for navigational purposes by day.

5. DESCRIPTION. (See diagram)

Component parts are -

A hollow weighted NOSE PIECE of cast steel, the nose end sealed by a paper cone secured with adhesive paper.

A hollow cylindrical paper BODY, reinforced by 9 - $\frac{1}{2}$ in. wide cardboard strips, the whole being glued together and the rear end closed by a cardboard disc. The body is joined to the nose and tail pieces with strips of adhesive paper.

A TAIL UNIT comprising a cardboard cone with four fins glued to it, but no struts.

ALUMINIUM POWDER filling in body and nose piece, having a coverage on water of approx 4.2 sq ft/gram

6. ACTION.

(a) The marker is dropped from the aircraft by hand

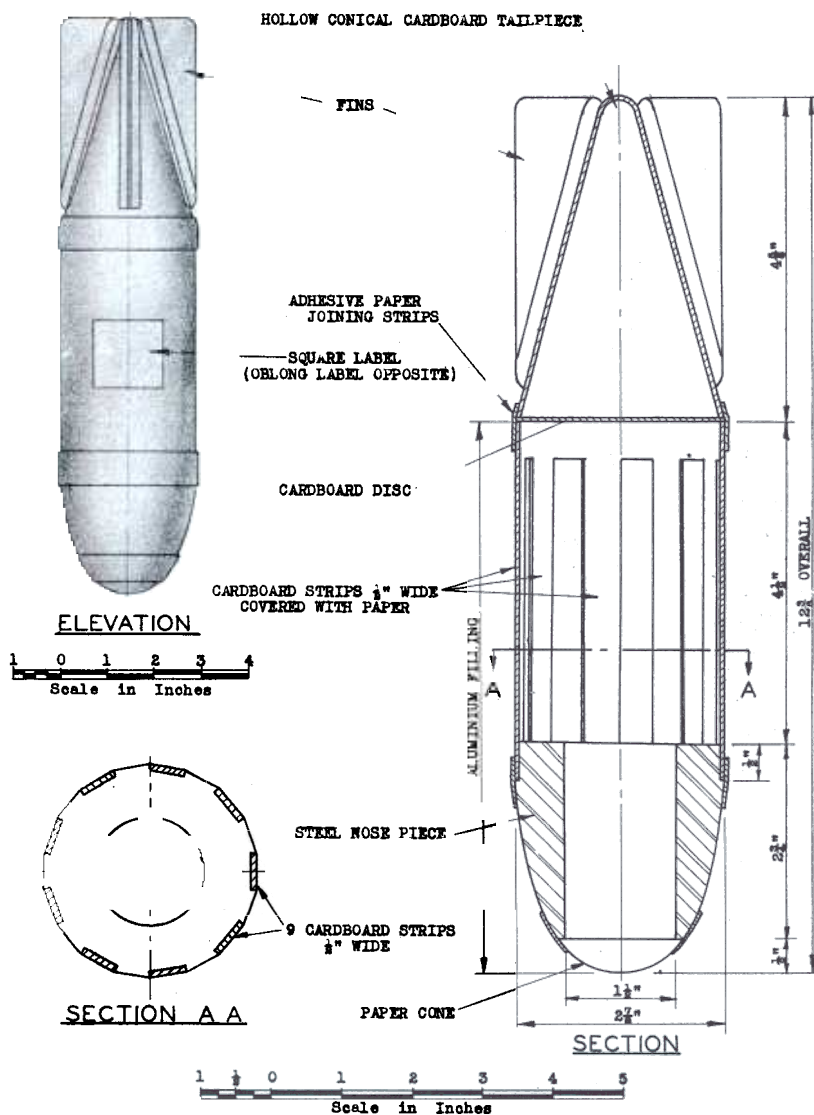
(b) Shock of impact with the water bursts the paper nose tip and the paper body is broken open allowing the powder to escape and spread over the surface of the sea.

JAPANESE NAVIGATION MARKER

(TEMPORARILY CALLED "CARDBOARD TYPE")

USE - NAVY AIRFORCE

REFER E IN C B.D.T. B/5/80



COLOUR:- ALUMINIUM SPRAYED

TRANSLATION OF ATTACHED LABELS

1. OBLONG LABEL

MANUFACTURED DECEMBER 1940.
NAVIGATION MARKER BULLET (?) IMPROVEMENT 1.
ASONA KARITTO Co Ltd.

2. SQUARE LABEL

1. THIS BULLET SERVES FOR MEASURING DRIFT BY DAY.
2. IMMEDIATELY BEFORE DROPPING IT, REMOVE IT FROM ITS PAPER TUBE IN THE PLANE THEN DROP IT JUST AS IT IS; BUT BE CAREFUL WHEN DROPPING IT NOT TO DAMAGE THE TAIL PIECE.
3. HEIGHT AT WHICH THIS BULLET SHOULD BE DROPPED IS FROM 200 M to 3000 M.

SUMMARY OF JAPANESE BOMB FUZES

<u>MECHANICAL IMPACT NOSE FUZES</u>				
FUZE	USE	ACTION	DETONATING EQPT	REF.
A.1(A)	Navy	Merely Pistol	Standard gaine or mag. inducing instan. or delay.	B/6/22
A.1(B)	Navy	Merely Pistol	Special elonga- ted Detonator	B/6/112
A.1(C)	Navy	Merely Pistol	Standard gaine or mag. inducing instan. or delay	B/6/25
A.2(A)	Army	Fuze gives choice of instan. or delay	Standard Detona- tor	B/6/18
A.2(B)	Army	Merely Pistol	Standard Detona- tor	B/6/73
A.2(C)	Army	Fuze gives choice of instan. or de- lay	Special Detona- tor	B/6/97
A.3(A)	Navy	Merely Pistol	Standard gaine or mag. inducing instan. or delay	B/6/15
A.3(B)	Navy	Merely Pistol	do do	B/6/84
A.4(A)	Army	Fuze gives choice of instan. or de- lay	Standard Detona- tor and a boos- ter tube	B/6/20
A.5(A)	Army	Merely Pistol	Special elonga- ted Detonator	B/6/86

MECHANICAL IMPACT TAIL FUZES.

FUZE	USE	ACTION	DETONATING EQPT	REF.
B.1(A)	Army	Instan. Fuze	Standard Detona- tor and a boost- er tube	B/7/17
B.1(B)	Army	Short delay fuze	Special Detonator and a booster tube	B/7/105
B.2(A)	Navy	Pistol with tail arming extension	Standard gaine inducing delay	B/7/67
B.2(B)	Navy	do do	Special gaine in- ducing delay	B/7/77
B.3(A)	Navy	Merely Pistol	Standard gaine or mag. inducing in- stan. or delay	B/7/19
B.3(B)	Navy	do do	do do	B/7/26
B.4(A)	Army	Instan. fuze	Standard detona- tor and a booster tube	B/7/21
B.5(A)	Army	Merely Pistol	Special initiator, detonator and booster	B/7/101
B.5(B)	Navy	do	Special gaine	B/7/115
B.6(A)	Navy	Pistol	Special holder for initiator plug	B/7/123

LONG DELAY FUZES

FUZE	USE	ACTION	DETONATING EQPT	REF
C.1(A)	Navy	Tail pistol for long delay obtained chemically	Standard gaine inducing in-stan.	B/8/16
C.2(A)	Navy	Nose pistol for long delay obtained chemically	Standard gaine inducing in-stan.	B/8/68
C.3(A)	Army	Nose fuze for long delay obtained chemically	Standard Detona-tor and a booster cup	B/8/95

AIRBURST FUZES

FUZE	USE	ACTION	DETONATING EQPT	REF.
D.1(A)	Army	Nose fuze, barometric operation and firing electrically	Special detonator	B/9/91
D.2(A)	Navy	Tail fuze with time setting clock	Standard gaine or mag. inducing instan.	B/9/98
D.2(B)	Navy	do do	do do	B/9/113
D.2(C)	Navy	do do	do do	B/9/120
D.3(A)	Navy	Nose pistol operated mechanically	Initiator and delay holder appended	B/9/103
D.4(A)	Navy	Nose pistol operated mechanically	Initiator and delay holder appended	B/9/121

JAPANESE BOMB FUZE - A.1(A)

1. JAPANESE DESIGNATION.

2. TYPE.

NAVY Airforce mechanical impact nose fuze to which a NAVY type standard gaine or magazine can be fitted.

3. BOMBS IN WHICH USED.

Details of fuze A.1(A) are INCOMPLETE but it can probably be substituted for fuze A.3(A) in any of the bombs listed in BDTI B/6/15, para 3.

4. COLOUR.

Natural BRASS.

5. DESCRIPTION. (See diagram)

A sleeve (5) screws into the fuze body (7) and is secured thereto by a set screw (12). A vane boss (3) fits into the upper end of the sleeve and is restricted to rotary movement by two opposite pins (4) which engage in a groove cut around each part. Four-bladed arming vanes are attached to the boss.

A spindle (6) passes through the centre of the fuze body, sleeve and boss, and is held against outward movement by a shoulder (8). Its rotary movement is prevented by a locating pin (10) engaging in a keyway cut in the fuze body. The upper end of the spindle is left-hand threaded to take a mushroom-headed cup (1) which is restricted to vertical movement by two opposite screw pins (2) engaging in keyways cut partly along opposite sides, so limiting outward movement.

The spindle is restrained from inward movement whilst in the armed condition by a shear wire (11). Method by which fuze is made safe for transit is not known.

6. ACTION.

On release, the vanes cause the boss to rotate clockwise so raising the mushroom-headed cup on the threaded spindle to its limit of travel.

On impact, the cup is forced inwards driving the striker spindle, the safety wire is sheared and the striker needle pierces the initiator cap (or detonator) in the gaine or magazine.

7. DISPOSAL.

(a) Destruction. When the bomb is to be destroyed in situ, the fuze should be destroyed with the bomb.

(b) Rendering safe for handling.

(i) If there is a space between the mushroom-headed cup and the top of the boss, secure the cup against movement in ANY direction with adhesive tape and thin pliable wire, and at the same time bind the boss against rotary movement.

- (ii) In many cases, however, the cup may be found jammed hard against the boss and probably bent over it at the edges. In such cases adhesive tape should be used to prevent movement of any movable part, including the boss.

(c) Fuze removal.

- (i) Perform (b) (i) or (ii) above
- (ii) Remove grub screw securing fuze to the bomb
- (iii) Unscrew fuze by means of the remote controlled Fuze Extractor Design iii (Aust), if available

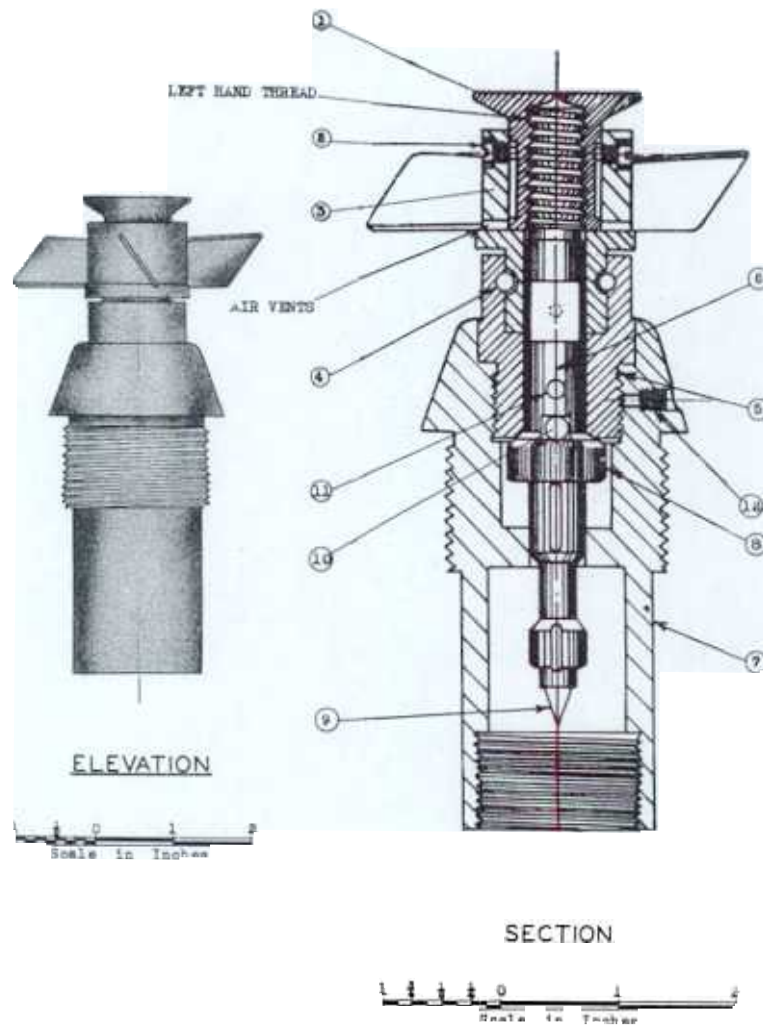
Alternatively, unscrew fuze a partial turn only with C-spanner or Stillson Wrench and complete removal by remote control
- (iv) Destroy the complete fuze assembly without separating the gaine or magazine.

NOTES

JAPANESE BOMB U A (A)

TYPE - MECHANICAL IMPACT
USE - NAVY AIRFORCE

REFER E N C B.D.T.I. 8/6/22



LEGEND

- | | |
|------------------------|-------------------|
| 1. MUSHROOM HEADED CUP | 8. SHOULDER |
| 2. SCREW PINS | 9. STRIKER NEEDLE |
| 3. VANE BOSS | 10. LOCATING PIN |
| 4. RETAINING PINS | 11. SHEAR WIRE |
| 5. SLEEVE | 12. SET SCREW |
| 6. STRIKER SPINDLE | |
| 7. FUZE BODY | |

JAPANESE BOMB FUZE - A.1(B)

1. JAPANESE DESIGNATION.

2. TYPE.

NAVY Airforce mechanical impact nose fuze with instantaneous action.

3. BOMBS IN WHICH USED

32 Kg Incendiary bomb.

4. COLOUR.

Natural BRASS.

5. DESCRIPTION. (See diagram)

A sleeve (7) screws into and protrudes beyond the upper end of the fuze body (9). A vane boss (5) fits into the sleeve and is restricted to rotary movement therein by two opposite pins (6) engaging in a groove cut around each part. Four-bladed arming vanes are attached to the boss.

A striker spindle (8) passes through the centre of the fuze body, sleeve and boss. It is held against outward movement by a shoulder (12) and against rotary movement by a pin (13) engaging in a keyway cut in the fuze body. Only a portion of the upper end of the spindle is threaded (left-hand). A striker needle (16) is fitted to the lower end.

A cup (1), with a mushroom-shaped head, screws on to the spindle and is restricted to vertical movement by two opposite screw pins (3). These engage in keyways cut partly along each side of the cup and limit its outward movement.

A groove cut around the lower end of the fuze body enables a detonator holder (18) to be secured by means of two set screws (17). The cup end of the detonator (19) rests in the holder and its shank projects through fitting in a pocket formed in the burster charge.

The spindle is restrained from inward movement whilst in an armed condition by a shear wire (10). Means by which fuze is made safe for transit is not known.

6. ACTION.

On release, the vanes and boss rotate clockwise causing the cup to unscrew outwards. After $5\frac{1}{2}$ revolutions the cup is free from the threads on the spindle, i.e. the fuze is fully armed.

On impact, the cup is forced inwards thus driving in the striker spindle, shearing the safety wire and the detonator is pierced. The travel of the striker is $\frac{7}{16}$ ".

7. DISPOSAL.

(a) Destruction. When the bomb is to be destroyed in situ, the fuze should be blown up with the bomb

(b) Rendering safe for handling. If there is a space between the mushroom-headed cup and the top of the boss, secure the cup against movement in ANY direction with thin pliable wire and adhesive tape and at the same time bind the boss against rotary movement.

In many cases, however, the cup may be found jammed hard against the boss and probably bent over it at the edges. In such cases adhesive tape should be used to prevent movement of any movable part, including the boss.

(c) Fuze removal.

(i) Perform (b) above

(ii) Remove grub screw securing fuze to the bomb

(iii) Unscrew fuze by means of the remote controlled Fuze Extractor Design III (Aust), if available

Alternatively, unscrew fuze a partial turn only with C-spanner or Stillson Wrench and complete removal by remote control

(iv) Do NOT attempt to detach the detonator holder but destroy the complete fuze assembly

JAPANESE BOMB FUZE A.1(B)

TYPE - MECHANICAL IMPACT
USE - NAVY AIRFORCE

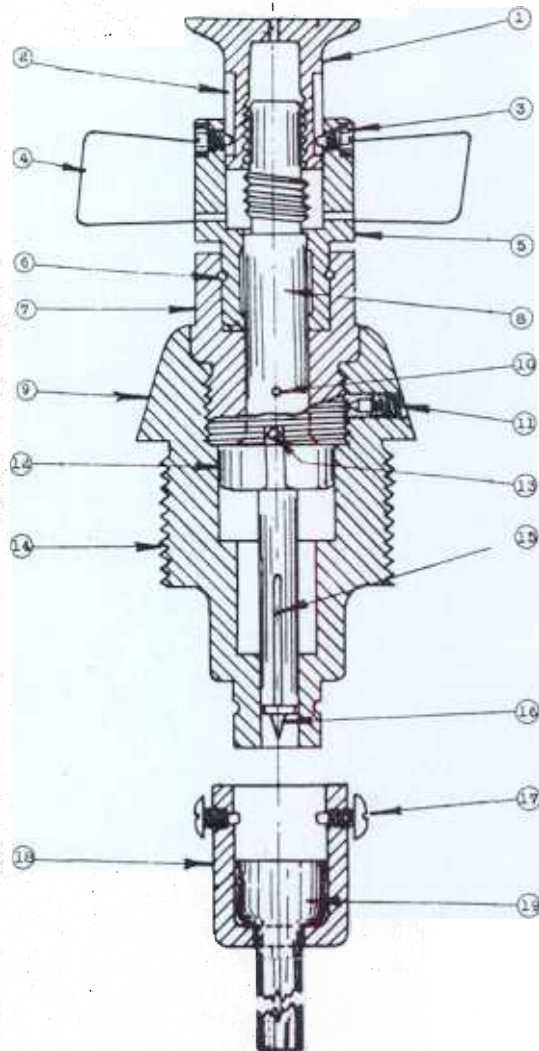
REFER B.D.T.I. B/6/112

ARMED POSITION



ELEVATION

1 0 1 2
Scale in Inches



SECTION

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
Scale in Inches

LEGEND

- | | |
|--------------------------|--------------------------------------|
| 1. CUP | 11. GRUB SCREW |
| 2. GUIDE AND KEEP SLOTS | 12. SPINDLE SHOULDER |
| 3. GUIDE AND KEEP SCREWS | 13. LOCATING PIN |
| 4. VANES | 14. $1\frac{1}{2}$ " O/D - 10 T.P.I. |
| 5. VANE BOSS | 15. AIR CHANNEL |
| 6. RETAINING PINS | 16. STRIKER NEEDLE |
| 7. SLEEVE | 17. SET SCREWS |
| 8. STRIKER SPINDLE | 18. DETONATOR HOLDER |
| 9. FUZE BODY | 19. DETONATOR |
| 10. SHEAR WIRE | |

MATERIAL:- ALL BRASS EXCEPTING STEEL SCREWS AND STRIKER NEEDLE

JAPANESE BOMB FUZE - A.2(A)

1. JAPANESE DESIGNATION.

Type 93, Impact Fuze, Mk. II.

2. TYPE.

ARMY Airforce mechanical impact nose fuze with selective instantaneous or delay action set before fitting of fuze to the bomb.

3. BOMBS IN WHICH USED

30, 50 and 100 kg H.E. bombs Army types
50 kg INCENDIARY bomb (Phosphorous rubber pellets)
50 kg GAS bomb, Type 92

4. COLOUR.

BRASS (natural colour).

5. DESCRIPTION. (see diagram)

The fuze body consists of 2 portions (7) and (10) which screw together. All parts are brass except striker needle, creep spring and shear wire which are steel.

(a) Upper portion (7) houses the striker mechanism comprising a spindle (5) which is retained by a shoulder, a striker needle (9) and a creep spring (8). Two-bladed arming vanes (3) are soldered to the boss (2) which is prevented from binding against the fuze body by a stud on each part. Two assembly tool holes are drilled diametrically opposite. The spindle is held against movement by a steel safety wire (6). A transit safety fork (1) fits over the vanes and into two holes in the fuze body. This is withdrawn on loading into the bomb rack.

(b) Lower portion (10) houses a slip-fit initiator cap plug (12) and a delay plug (13). A detonator (18) containing a gunpowder flash plug (16) screws into its base. The delay plug (13) has two channels, one filled with a pyrotechnic mixture and the other open. A selector screw (14), slotted for a screwdriver, engages in the wall of the plug. The parts are assembled so that when the slot is in the horizontal position the open channel is blocked and the pyrotechnic train can burn through giving a delay. By turning the screw to the vertical position the flash will pass directly through the open channel and initiate the detonator before the pyrotechnic train could burn through.

6. ACTION.

On release, the vanes (3) rotate ten times and fall off though the fuze is armed after six revolutions. On impact, the striker spindle (5) is forced inward shearing the shear wire (6), overcomes the creep spring (8) and the striker needle (9) pierces the initiator cap (12). The detonator (18) is initiated via the open flash channel or pyrotechnic train as desired.

7. DISPOSAL.

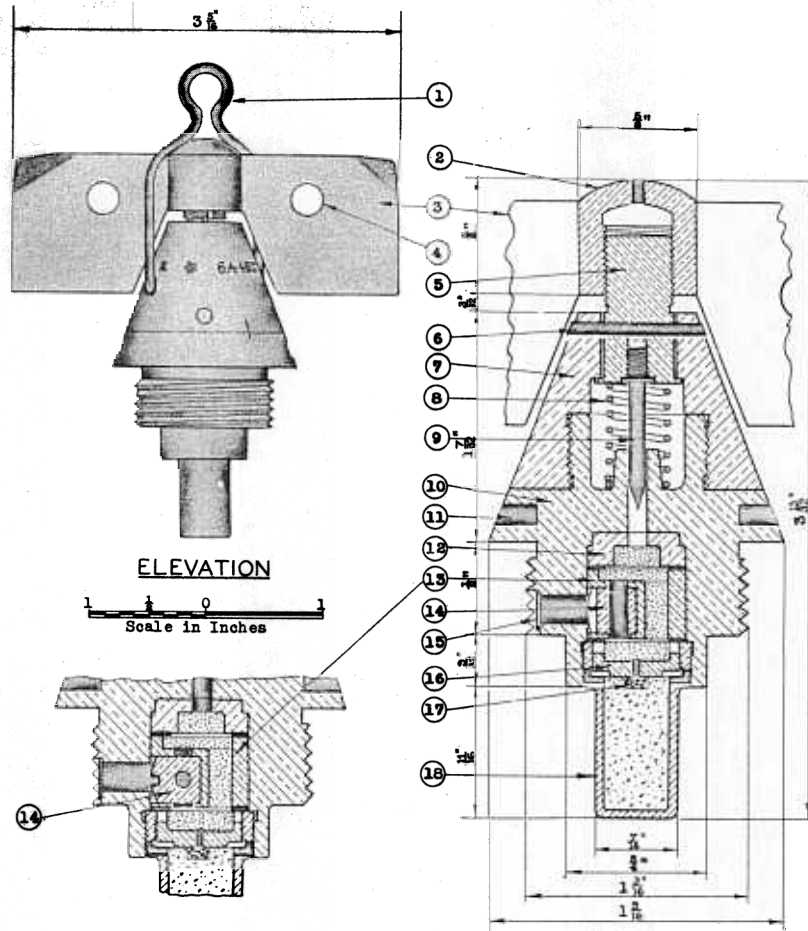
- (a) Destruction. When the bomb is to be destroyed in situ, the fuze should be destroyed in the bomb.
- (b) Rendering safe for handling. Secure the spindle against rotary and vertical movement with thin pliable wire and adhesive tape. Special BD Tool No. 2 may be applied to prevent inward movement of the spindle if it projects $\frac{1}{4}$ " or more beyond the fuze head.
- (c) Fuze removal.
 - (i) Perform (b) above
 - (ii) Remove grub screw securing fuze to the bomb
 - (iii) Unscrew fuze by means of the remote controlled Fuze Extractor Design III (Aust) if available.
Alternatively, unscrew fuze a partial turn only with Special BD Tool No. 3 (C-spanner) or Stillson Wrench, and complete removal by remote control.

NOTES

JAPANESE BOMB FUZE-A.2(A)

TYPE - MECHANICAL IMPACT
USE - ARMY AIRFORCE

REFER B.D.T.I. B/6/18.

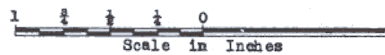


PART SECTION

SHOWING SELECTOR SCREW
IN SHORT DELAY POSITION

SECTION

SHOWING SELECTOR SCREW
IN INSTANTANEOUS POSITION



LEGEND

1. TRANSIT SAFETY FORK	11. TOOL HOLES
2. VANE BOSS	12. INITIATOR GAP
3. ARMING VANES	13. DELAY PLUG
4. AIR HOLES	14. SELECTOR SCREW
5. ARMING SPINDLE	15. TIN FOIL COVERING HOLE
6. SAFETY WIRE - STEEL	16. FLASH PLUG
7. UPPER FUZE BODY	17. DETONANT
8. CREEP SPRING	18. DETONATOR
9. STRIKER NEEDLE	
10. LOWER FUZE BODY	

JAPANESE BOMB FUZE - A.2(B)

1. JAPANESE DESIGNATION.

2. TYPE.

ARMY Airforce mechanical impact nose fuze with instantaneous action.

3. BOMBS IN WHICH USED

15 Kg Anti-personnel- Army type
50 Kg Incendiary (phosphorous rubber pellets)
50 Kg Type 92 Gas bomb

4. COLOUR. Natural BRASS.

5. DESCRIPTION. (See diagram)

The fuze body (6) is machined out of the one piece. The striker spindle (5) is retained in the body by a shoulder and is restricted to vertical movement only by a stud sliding in a groove in the fuze body. Screwed into its base is a striker needle (7) splayed to a point. The vane boss (1), to which two-bladed vanes (2) are attached, screws on to the end of the spindle and is prevented from binding with the fuze body by two studs (3), one on each part. The U-shaped transit safety fork (4) is withdrawn on loading into the bomb rack.

A steel creep spring (8) keeps the striker needle off the detonator after the boss has fallen off. A striker guide plug (9) and a detonator (11) screw into the base of the fuze body.

6. ACTION.

On release, the vanes rotate 10 times and the boss falls off. The distance between the striker point and detonator is approx 3 mm which means that the fuze is armed after 5 revolutions of the vanes.

On impact, the striker spindle is forced inward overcomes the creep spring and the needle pierces the initiator.

7. DISPOSAL.

(a) Destruction. When the bomb is to be destroyed in situ, the fuze should be blown up with the bomb

(b) Rendering safe for handling. Secure the spindle against INWARD, OUTWARD and ROTARY movement with thin pliable wire and adhesive tape. Special BD Tool No 2 may be applied to prevent inward movement of the spindle if it projects $\frac{1}{4}$ " or more beyond the fuze head

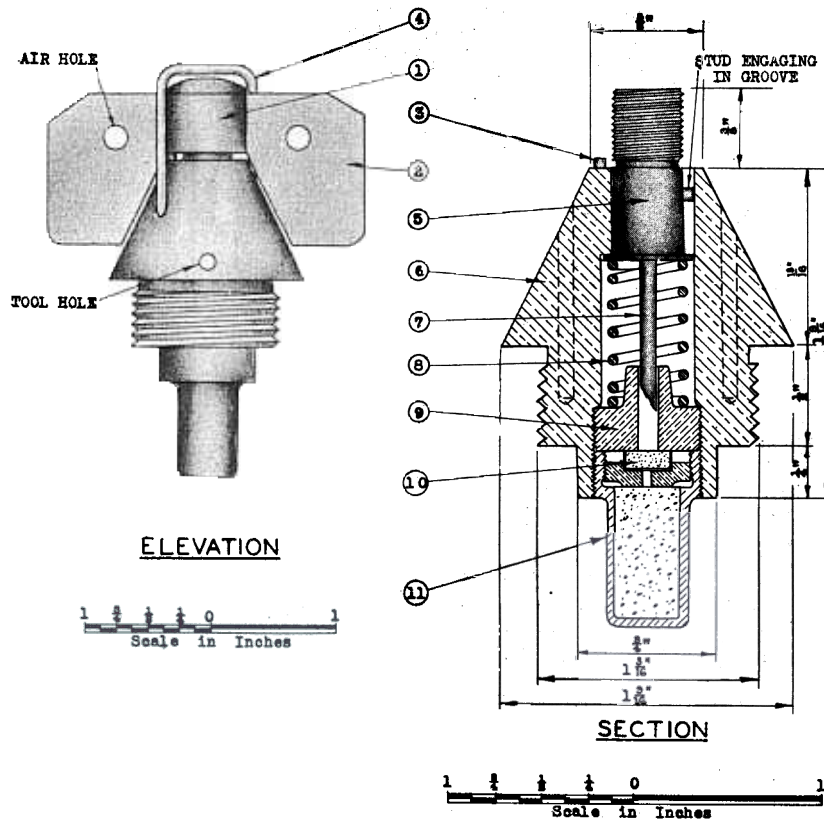
(c) Fuze removal.

- (i) Perform (b) above
- (ii) Remove grub screw securing fuze to the bomb
- (iii) Unscrew fuze by means of the remote controlled Fuze Extractor Design III (Aust), if available. Alternatively, unscrew fuze only a partial turn with Special BD Tool No 3 (C-spanner) or Stillson Wrench and complete removal by remote control.

JAPANESE BOMB FUZE - A. 2(B)

TYPE - MECHANICAL IMPACT
USE - ARMY AIRFORCE

REFER E IN C B.D.T.I. B/6/73



LEGEND

- | | |
|------------------------|-------------------|
| 1. VANE BOSS | 7. STRIKER NEEDLE |
| 2. ARMING VANES | 8. CREEP SPRING |
| 3. STOP STUD | 9. STRIKER GUIDE |
| 4. TRANSIT SAFETY FORK | 10. INITIATOR CAP |
| 5. STRIKER SPINDLE | 11. DETONATOR |
| 6. FUZE BODY | |

JAPANESE BOMB FUZE - A.2(C)

JAPANESE DESIGNATION.

2. TYPE.

ARMY Airforce mechanical impact nose fuze with either instantaneous or delay action chosen and mechanically adjusted in the bomb rack during flight.

3. BOMBS IN WHICH USED

30, 50 and 100 Kg H.E. Bombs (Army Airforce types).

4. COLOUR.

Natural BRASS.

5. DESCRIPTION. (See diagram)

The fuze body consists of two portions (2) and (7) which screw together.

- (a) Upper portion (2) houses the striker mechanism. The end of the striker spindle (3) is r.h. threaded to take the vane boss (9A) to which two-bladed vanes (18) are attached. A U-shaped transit safety fork (1) fits over the vanes; this is withdrawn on loading bomb into the bomb rack. The boss and fuze head are prevented from binding by two stop studs, one on each part

The base of the spindle is tapped to take a steel striker needle (4) which is held off the initiating cap by a steel creep spring (13) and a corner shear wire (12).

- (b) Lower portion (7) houses an Initiator cap plug, the selective instantaneous or delay assembly, and the detonator

The initiating cap plug (5) screws into the fuze body above a slip-fit plug (6) which has two channels, one filled with a pyrotechnic mixture and the other open. A selector switch (16) is let into one side of the fuze body and is retained by a grub screw engaging in a groove (15). A hole drilled through the flash port regulator (14) matches the open channel in the plug (6).

A detonator (10) screws into the base of the fuze body. A knurled locking ring (8) tightens the fuze in the bomb after the slot in the head of the selector switch has been adjusted to suit the selector gear.

6. ACTION.

On release, the vanes (18) rotate ten times and fall off though the fuze is armed after six revolutions

On impact, the striker spindle is forced inward shearing the safety wire, overcomes the creep spring and the striker needle pierces the initiator cap.

When the slot in the head of the selector switch is turned horizontally to obtain delay, the open channel is blocked and the flash ignites the pyrotechnic train which burns through and in turn ignites the black powder in the top of the detonator, finally initiating the detonator.

When the selector switch slot is turned vertically to obtain instantaneous action, the flash passes unobstructed through the open channel and the detonator is initiated before the pyrotechnic train has burnt through.

7. DISPOSAL.

(a) Destruction. When the bomb is to be destroyed in situ, the fuze should be blown up in the bomb

(b) Rendering safe for handling.

(i) If the spindle is projecting beyond the head of the fuze body, secure it against INWARD, OUTWARD and ROTARY movement with thin pliable wire and adhesive tape. Special BD Tool No 2 may be applied to prevent INWARD movement of the spindle if it projects more than $\frac{1}{4}$ " beyond the fuze head

(ii) If the end of the spindle is flush with the head of the fuze body, secure it against OUTWARD movement with adhesive tape, taking care NOT to apply pressure to the spindle

(iii) If the end of the spindle is driven in beyond the head of the fuze body, OUTWARD movement may be prevented by gently pouring in a thin solidifying liquid (e.g. plaster of paris) to fill the space. Then bind over the fuze head with adhesive tape taking care NOT to transmit pressure to the spindle

(c) Fuze removal.

(i) Perform (b) (i), (ii) or (iii) above as necessary

(ii) Remove the grub screw securing the fuze to the bomb

(iii) Loosen locking ring with Special BD Tool No 3 or Stillson Wrench

(iv) Unscrew fuze by means of the remote controlled Fuze Extractor Design III (Aust), if available

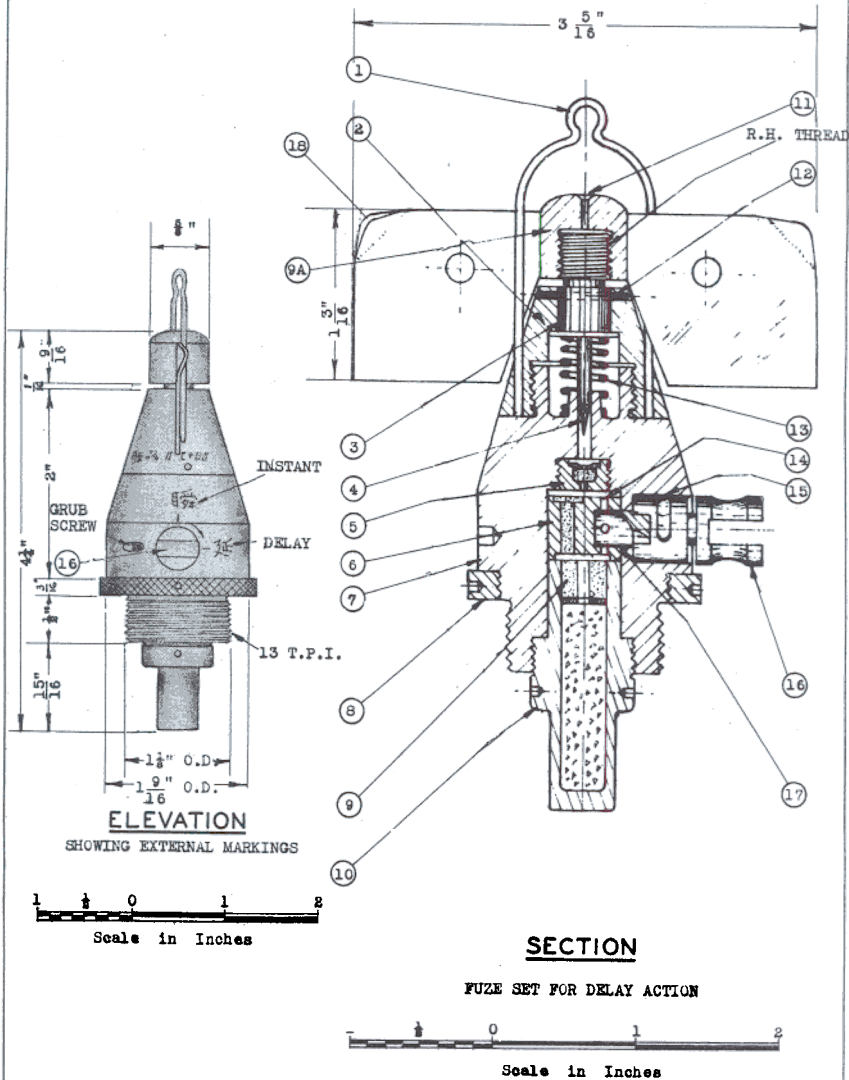
Alternatively, unscrew fuze a partial turn only with Special BD Tool No 3 (C-spanner) or Stillson Wrench and complete removal by remote control.

NOTE.1. The detonator (10), pyrotechnic plug (6) and the selector switch (16) may safely be detached but NOT the initiator cap (5) whilst pierced by the striker needle. In such cases first treat with an explosive neutralizer (see BDTI B/10/93, para 14)

JAPANESE BOMB FUZE - A. 2(C)

TYPE - MECHANICAL IMPACT
USE - ARMY AIRFORCE

REFER E IN C BDTI B/6/97



LEGEND

- | | |
|----------------------|--------------------------|
| 1. SAFETY FORK | 10. DETONATOR |
| 2. UPPER FUZE BODY | 11. AIR VENT |
| 3. STRIKER SPINDLE | 12. SHEAR WIRE |
| 4. STRIKER NEEDLE | 13. CREEP SPRING |
| 5. INITIATOR CAP | 14. OPEN CHANNEL |
| 6. DELAY PLUG | 15. GRUB SCREW GROOVE |
| 7. LOWER FUZE BODY | 16. SELECTOR SWITCH |
| 8. LOCKING RING | 17. FLASH PORT REGULATOR |
| 9. BLACK POWDER | 18. ARMING VANE |
| 9A. ARMING VANE BOSS | |

JAPANESE BOMB FUZE - A.3(A)

1. JAPANESE DESIGNATION.

Type 97, Mk II, Impact Fuze, Model 2.

2. TYPE.

NAVY Airforce mechanical impact nose fuze to which a Navy type standard gaine or magazine can be fitted.

3. BOMBS IN WHICH USED

(a) Incorporating a gaine -

60 Kg, Type 97, GP - Navy type	
60 Kg, Type 98, GP -	" "
63 Kg, Type 99, SAP-	" "
250 Kg, Type , GP -	" "
250 Kg, Type , SAP-	" "

(b) Incorporating a magazine -

60 Kg, Type 97, Incendiary	(electron fire-pots)
60 Kg, Type 98,	" (solid oil)
250 Kg, Type ,	" (electron/steel cylinders)

4. COLOUR.

Natural BRASS.

5. DESCRIPTION. (See diagram)

The fuze body (11) houses the striker mechanism only. A striker spindle (10) passing through the centre of the body is left-hand threaded at the upper end to take a pressure sleeve (6). The spindle is prevented from rotating by a set screw (13) and a safety shear wire (8). A large-headed screw (3) threaded right-hand screws into the top of the spindle to prevent the pressure sleeve unscrewing completely from the spindle.

Four screws (2) pass through the centre flat of the 4-bladed arming vanes (1) and the top of the brass cap (4) and screw into the pressure sleeve (6), thus the whole assembly (1), (4) and (6) is free to rotate.

A steel striker needle (12) screws into the lower end of the spindle. The lower end of the fuze body is threaded (15) to take a Navy type standard gaine or magazine.

A 3-pronged transit safety fork (9) prevents rotation of the vanes. This is withdrawn on loading into the bomb rack.

An arming wire (5) is soldered at one end to the side of the brass cap (4), taken $1\frac{3}{4}$ turns around the brass cap, then passed through the brass loop (14) ending in a loop

6. ACTION.

On release, the arming wire (5) gives the vanes their initial start overcoming any binding between the brass cap and fuze body. The vanes rotate clockwise and the assembly (1), (4) and (6) is raised outward until the pressure sleeve is stopped by the large screw (3).

On impact, the brass cap and pressure sleeve assembly forces the spindle inwards shearing the safety wire, and the initiator is pierced by the striker needle.

7. DISPOSAL.

- (a) Destruction. When the bomb is to be destroyed in situ, the fuze should be blown up with the bomb
- (b) Rendering safe for handling. Secure the brass cap (and therefore the spindle) against movement in any direction with adhesive tape and pliable wire. If Special BD Tool No 1 is used, apply so as to grip both the Cap and fuze body or, if possible, the fuze body immediately below the cap.

(c) Fuze removal.

- (i) Perform (b) above
- (ii) Remove grub screw securing fuze to the bomb
- (iii) Unscrew fuze by means of the remote controlled Fuze Extractor Design III (Aust) if available.

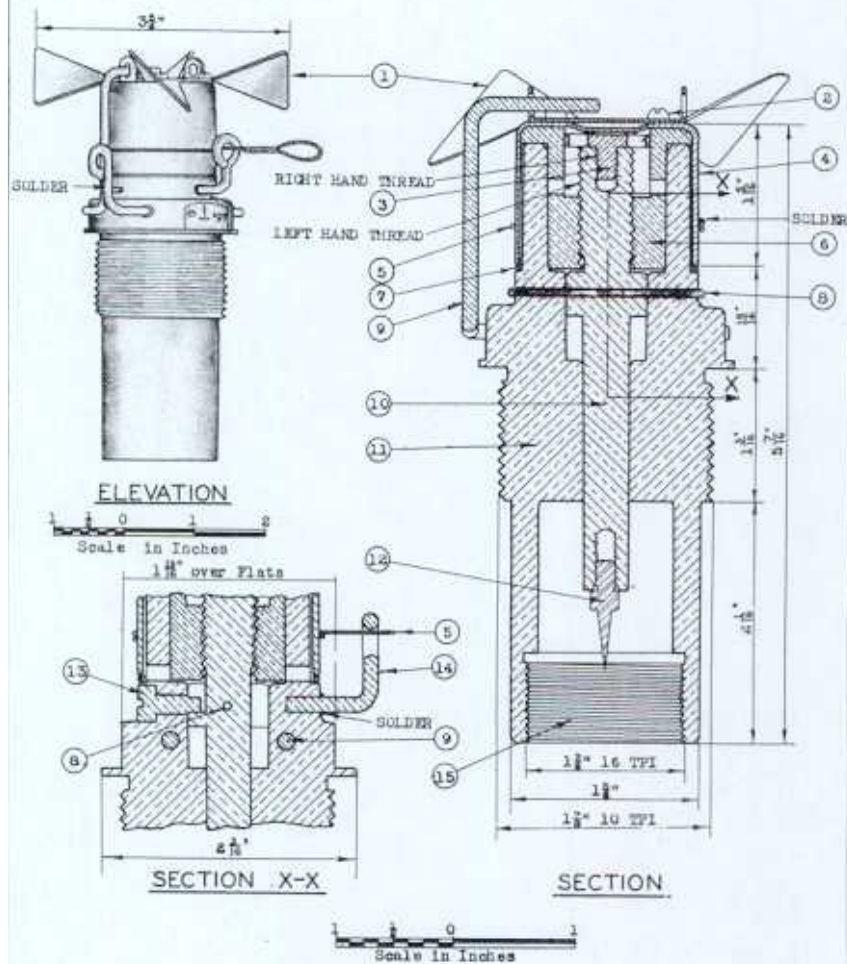
Alternatively, unscrew fuze only a partial turn with Special BD Tool No 5 (spanner) or Stillson Wrench and complete removal by remote control.

NOTES

JAPANESE BOMB FUZE -A.3(A)

TYPE - MECHANICAL IMPACT
USE - NAVY AIRFORCE

REFER. B.D.T.I. B/6/15



- | | |
|-----------------------|------------------------|
| 1. ARMING VANES | 9. TRANSIT SAFETY FORK |
| 2. SCREW | 10. STRIKER SPINDLE |
| 3. LARGE-HEADED SCREW | 11. FUZE BODY |
| 4. BRASS CAP | 12. STRIKER NEEDLE |
| 5. ARMING WIRE | 13. SET SCREW |
| 6. PRESSURE SLEEVE | 14. BRASS LOOP |
| 7. WASHER | 15. INTERNAL THREAD |
| 8. SHEAR WIRE | |

JAPANESE BOMB FUZE - A.3(B)

1. JAPANESE DESIGNATION.

2. TYPE.

NAVY Airforce mechanical impact nose fuze to which may be fitted a Navy Type standard gaine or magazine.

3. BOMBS IN WHICH USED

Fuze A.3(B) may be substituted for A.3(A) in any of the bombs mentioned in BDTI B/6/15, para 3.

4. COLOUR.

Natural BRASS.

5. DESCRIPTION. (See diagram)

(a) Comparison with fuze A.3(A) - see BDTI B/6/15

- (i) Upper portion of fuze body is $\frac{7}{8}$ " longer
- (ii) Arming assembly is correspondingly longer
- (iii) Striker spindle thread measures 28 t.p.i. (as against 8 t.p.i.)
- (iv) Lower portion of fuze body is more heavily constructed

(b) Operation.

Parts and operation similar to fuze A.3(A) - see BDTI B/6/15, para 5.

(c) Special feature.

The extra length of upper fuze body (i.e. projection beyond nose of bomb) tends to more certain action from low level bombing especially in the case of large bombs by reason of the curve of the nose piece.

6. ACTION.

Similar to fuze A.3(A)- see BDTI B/6/15, para 6

7. DISPOSAL.

(a) Destruction

(b) Rendering safe for handling

(c) Fuze removal

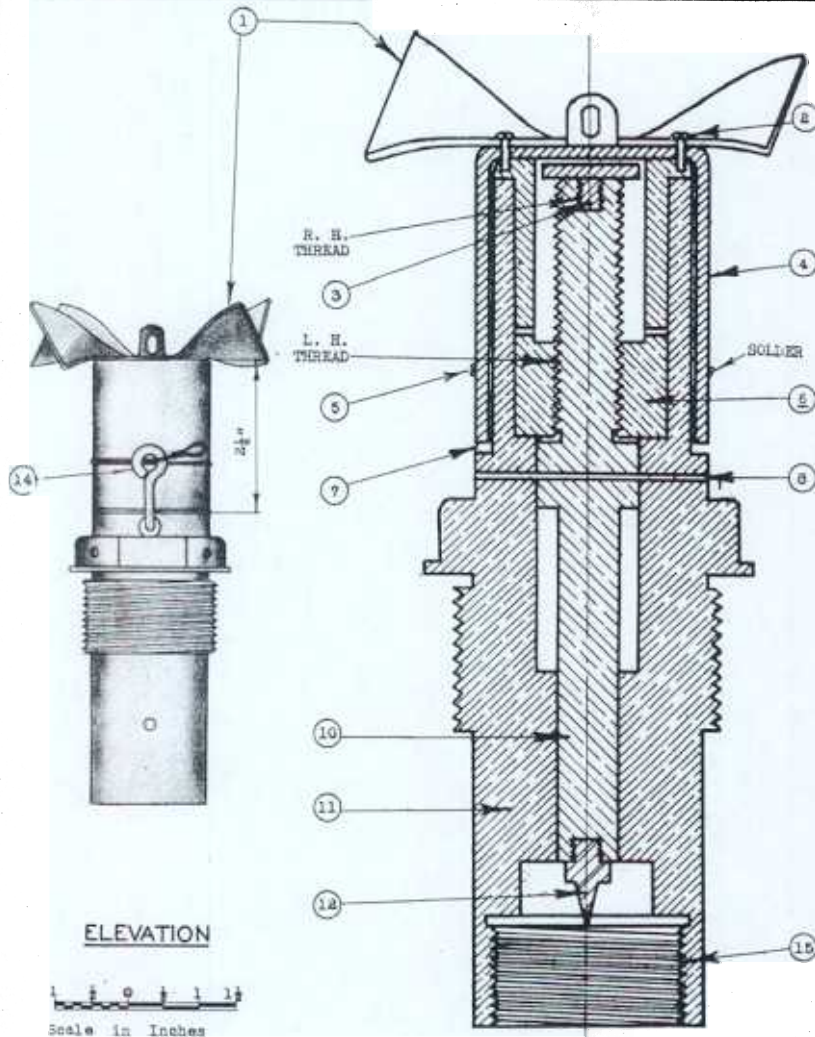
As for fuze A.3(A)
see BDTI B/6/15,
para 7.

NOTES

JAPANESE BOMB FUZE - A.3(B).

TYPE - MECHANICAL IMPACT
USE - NAVY AIRFORCE

REFER E. IN C. BDTI B/6/84



SECTION

1 1/2 0 1 1/2
Scale in Inches

LEGEND

- | | |
|-----------------------|---------------------|
| 1. ARMING VANES | 9. SAFETY FORK x |
| 2. SCREW | 10. STRIKER SPINDLE |
| 3. LARGE HEADED SCREW | 11. FUZE BODY |
| 4. BRASS CAP | 12. STRIKER NEEDLE |
| 5. ARMING WIRE | 13. SET SCREW x |
| 6. PRESSURE SLEEVE | 14. BRASS LOOP |
| 7. WASHER | 15. THREAD |
| 8. SHEAR WIRE | |

x Not shown, see A. 3 (A)

JAPANESE BOMB FUZE - A.4(A)

1. JAPANESE DESIGNATION
2. TYPE. ARMY Airforce mechanical impact nose fuze with selective instantaneous or delay action chosen before fitting fuze in the bomb.
3. BOMBS IN WHICH USED.
4. COLOUR. Natural BRASS.
5. DESCRIPTION. (See diagram)

The fuze comprises (a) fuze body housing the arming mechanism, (b) an extension piece housing the initiating and delay plugs and (c) the booster system.

(a) Fuze body.

2-bladed arming vanes (1) are attached to the vane boss (2) which is retained in the fuze body (3) by two screw pins (4) engaging in a groove around the boss. Threaded to the vane boss and passing through the centre of the fuze body is an arming spindle (5) to which two safety plungers (6) are pivoted and move freely through two guide holes in a plug (7) screwed into the base of the fuze body. A red setting mark near the end of the spindle indicates when the plungers are withdrawn clear (i.e. the fuze is fully armed). A striker needle is fixed to the underside of the plug (7).

(b) Fuze extension piece.

This is a brass cylinder (9) of same external diameter as the booster tube and screws into the base of the fuze body. A floating initiator cap (10) is held off the striker needle in the unarmed condition by the plungers (6) and in the armed condition by the creep spring (11).

Below the initiator cap is a delay plug (12) with two channels (one filled with a pyrotechnic mixture and the other open) situated between two layers of flash powder. A selector screw (13) engages in and regulates a plug which has a port matching the open channel. The parts are assembled so that when the slot in the head of the selector screw is turned horizontally the open channel is blocked and the pyrotechnic mixture will burn through giving delay. By turning the screw to the vertical position the flash passes unobstructed through the open channel and port and ignites the bottom layer of flash powder before the pyrotechnic train has burnt through.

A detonator (14) screws into the end of the extension piece below the delay plug.

- (c) Booster. A brass tube containing a booster (15) screws on to the end of the extension piece

NOTE 1. Safety Fork. A transit safety fork (probably fitting over the head of the vane boss and into the fuze body) is withdrawn on loading into the bomb rack.

6. ACTION. On release, the vane boss is rotated clockwise by the vanes so raising the spindle and withdrawing the two safety plungers clear of the guide holes. The fuze is armed after 10 revolutions.

On impact, the initiator plug moves forward due to inertia, overcomes the creep spring and is pierced by the striker needle. The following sequence then occurs :-

- (a) The flash ignites top layer of flash powder in delay plug
- (b) Bottom layer of flash powder is ignited via the open channel or pyrotechnic train as desired
- (c) Detonator initiated
- (d) Booster detonated.

7. DISPOSAL.

(a) Destruction. When the bomb is to be destroyed in situ, the fuze should be blown up with the bomb

(b) Rendering safe for handling

- (i) UNDAMAGED fuzes. Secure the vane boss against ROTARY movement by the best means using adhesive tape. If protruding, the spindle should be gripped with Special BD Tool No 2. Observe precautions as in NOTE 2 below
- (ii) DAMAGED fuzes. In UXBs, however, the vane boss will probably be distorted or perhaps broken off altogether, and conditions obtained as in NOTE 2 below. In such cases adopt best means, if possible, of preventing movement of any movable part and observe precautions as in NOTE 2 below.

(c) Fuze removal.

- (i) Perform (b) (i) or (ii) above
- (ii) Work with bomb in HORIZONTAL position
- (iii) Remove grub screw securing fuze to the bomb
- (iv) Unscrew fuze by means of the remote controlled Fuze Extractor Design III (Aust), if available.

Alternatively, unscrew fuze a partial turn only with Special BD Tool No 3 (C-spanner) or Stillson Wrench and complete removal by remote control.

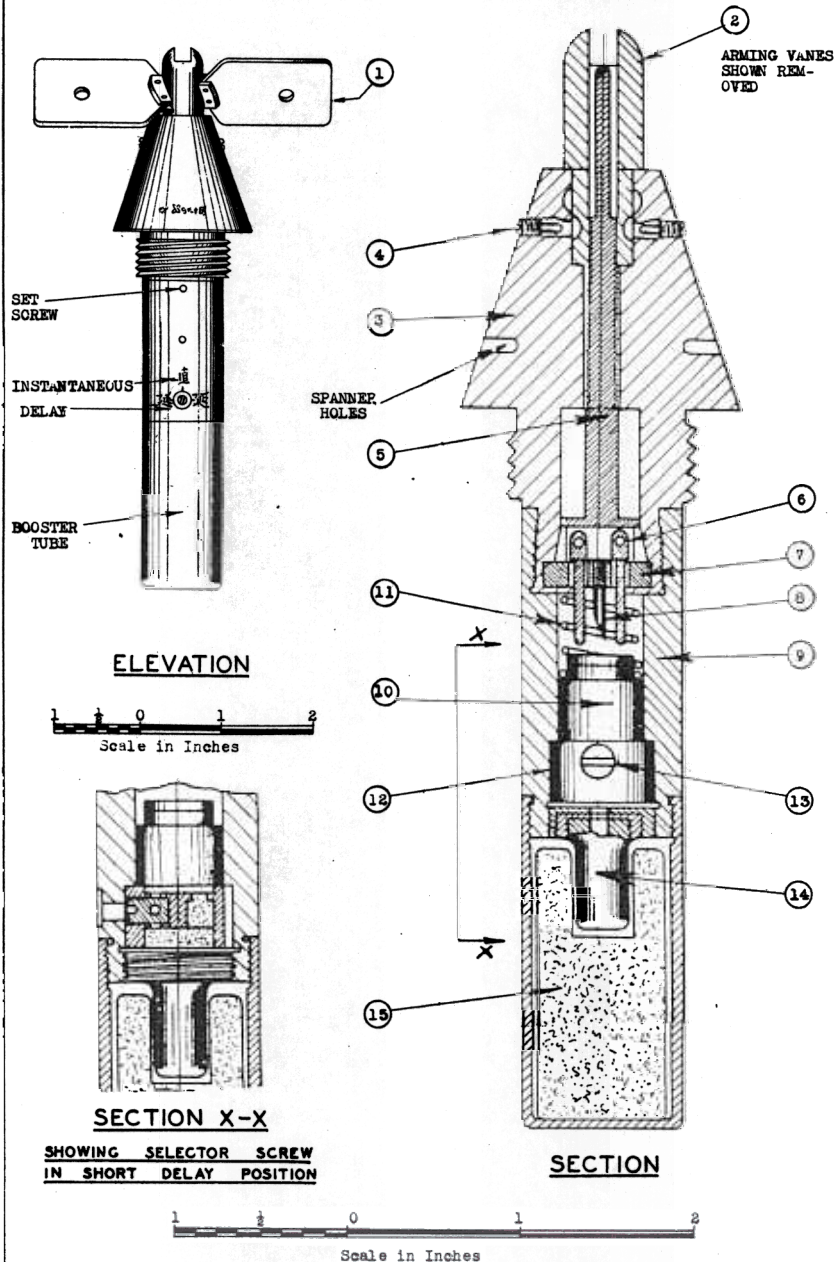
NOTE 2 :- When the safety plungers are withdrawn, the striker needle has either pierced the initiator cap or is held off it only by a creep spring. In either condition the bomb is dangerous as movement of the initiator cap in ANY direction may cause detonation. For this reason :-

- (a) Handle bomb VERY CAREFULLY. Avoid jolting.
- (b) Avoid transporting a fuzed bomb
- (c) After extraction, keep fuze in horizontal position until it is destroyed.

JAPANESE BOMB FUZE - A.4(A)

TYPE - MECHANICAL IMPACT
USE - ARMY AIRFORCE

REFER BDTI B/6/20



SHOWING SELECTOR SCREW
IN SHORT DELAY POSITION

SECTION

LEGEND

- | | |
|--------------------|-------------------------|
| 1. ARMING VANES | 9. FUZE EXTENSION PIECE |
| 2. VANE BOSS | 10. INITIATING PLUG |
| 3. FUZE BODY | 11. CREEP SPRING |
| 4. SCREW PINS | 12. DELAY PLUG |
| 5. ARMING SPINDLE | 13. SELECTOR SCREW |
| 6. SAFETY PLUNGERS | 14. DETONATOR |
| 7. PLUG | 15. BOOSTER |
| 8. STRIKER NEEDLE | |

JAPANESE BOMB FUZE A.5(A)

1. JAPANESE DESIGNATION.

2. TYPE. ARMY Airforce mechanical impact nose fuze incorporated within the nose portion of the 1 Kg smoke signal (see BDTI B/5/2).

3. DESCRIPTION. (See diagram)

Three transverse bars inside the nose portion of the smoke signal support a central column which serves as the FUZE BODY. The nose end is closed by a hemispherical ballistic cap of white sheet rubber.

A steel STRIKER passes through the centre of the fuze body, and has at one end a mushroom head fitting against the rubber ballistic cap and at the other end a striker needle screwed in.

A brass INITIATOR PLUG screws into the base of the fuze body and is retained by a SCREWED PLUG.

The end of a brass DETONATOR TUBE projects into the screwed plug and abuts the initiator plug.

Safety devices fitted are -

- (a) A SAFETY PIN, which is inserted through the external wall of the nose portion of the smoke signal and passes through a hole in the fuze body and partly engages in a groove cut on the side of the striker. It is withdrawn on loading into the aircraft.
 - (b) A SPRING-LOADED PLUNGER, the pin end of which passes through a hole in both fuze body and striker. The plunger is kept depressed (i.e. the pin end retains the striker) until the bomb is released.
 - (c) A thin SHEAR WIRE which passes through the fuze head and striker. After release, this is the only means by which the striker is held.
4. ACTION. On release from the aircraft the spring-loaded plunger is no longer held depressed and the pin end is ejected clear of the striker.

On impact, the mushroom-head forces the striker inwards, shearing the shear wire and piercing the initiator.

5. DISPOSAL.

- (a) Destruction
 - (b) Precautions when handling
- } See BDTI B/5/2
para 8
- (c) Rendering fuze safe. Using best judgment and discretion according to condition in which bomb is found, aim to secure striker against vertical and rotary movement by means of adhesive tape.

JAPANESE BOMB FUZE - A.5(A)

TYPE - MECHANICAL IMPACT
USE - ARMY AIRFORCE

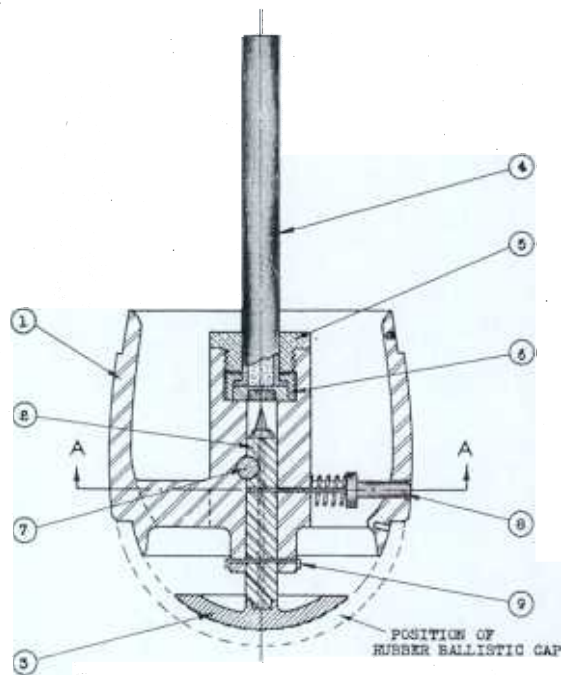
REFER E IN C B.D.T.I. B/6/86



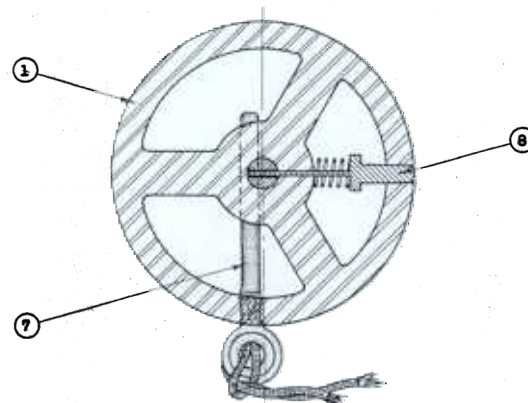
ELEVATION

RUBBER CAP REMOVED

1 0 1 2
Scale in Inches



SECTION



SECTION A-A

1 0 1 2
Scale in Inches

LEGEND

1. CAST IRON WALL	7. SAFETY PIN
2. STRIKER	8. SAFETY SPRING PLUNGER
3. STRIKER MUSHROOM HEAD	9. SHEAR WIRE
4. DETONATOR	
5. SCREW PLUG	
6. INITIATOR PLUG	

JAPANESE BOMB FUZE - B.1(A)

1. JAPANESE DESIGNATION.

Type 98 Tail Bomb Fuze.

2. TYPE.

ARMY Airforce mechanical impact tail fuze which includes booster components.

3. BOMBS IN WHICH USED.

30 Kg Type 99 G.P. }	Army Airforce bombs
50 Kg Type 94 G.P. }	
100 Kg Type 94 G.P. }	

4. COLOUR.

Natural BRASS.

5. DESCRIPTION. (See diagram)

The fuze body (6) is turned in the one piece. A shaped adaptor (10) screws into its base.

The upper end of the striker spindle (4) is threaded to take the vane boss (1) to which are attached four-bladed arming vanes (2). The boss is prevented from binding on the fuze head by studs, one on each part.

The striker spindle (4) is restrained from rotary movement by a guide pin (3) engaging in a keyway cut in the fuze body. A splayed-pointed striker pin (9) screws into the base of the spindle.

A steel creep spring (8) and a shear wire (5) restrains the striker spindle from inward movement whilst the fuze is in an armed condition.

A striker guide plug, screwed into an initiator plug (11), fits respectively through and against the perforated septum in the adaptor (10); both are held in position by a detonator screwed into the base of the adaptor.

A booster tube (17) screws on to the adaptor forming an extension of the lower fuze body. The tube contains a ring and a solid booster pellet of powdered picric acid wrapped in waxed paper.

A transit safety fork fits over the vane boss and into the fuze body. This is withdrawn on loading into the bomb rack.

6. ACTION.

On release, the boss falls off the spindle after $12\frac{1}{2}$ revolutions of the vanes, though the fuze is armed after 6 revolutions as the travel between the striker pin and the initiator cap is only 4 m.m.

On impact, the spindle moves inwards due to inertia, shearing the safety wire, overcomes the creep spring and the striker pin pierces the initiator cap. The booster is finally detonated by the detonator.

7. DISPOSAL.

- (a) Destruction. When the bomb is to be destroyed in situ, the fuze should be blown up with the bomb
- (b) Rendering safe for handling. Secure the spindle against movement in ANY direction with adhesive tape and thin pliable wire. Special BD Tool No 2 may be applied to prevent inward movement of the spindle if it projects $\frac{1}{4}$ " or more beyond the fuze head.
- (c) Fuze removal.
 - (i) Perform (b) above
 - (ii) Remove grub screw securing fuze to the bomb
 - (iii) Unscrew fuze by means of the remote controlled Fuze Extractor Design III (Aust), if available

Alternatively unscrew fuze a partial turn only with C-spanner or Stillson Wrench and complete removal by remote control
 - (iv) Destroy without separating the fuze components

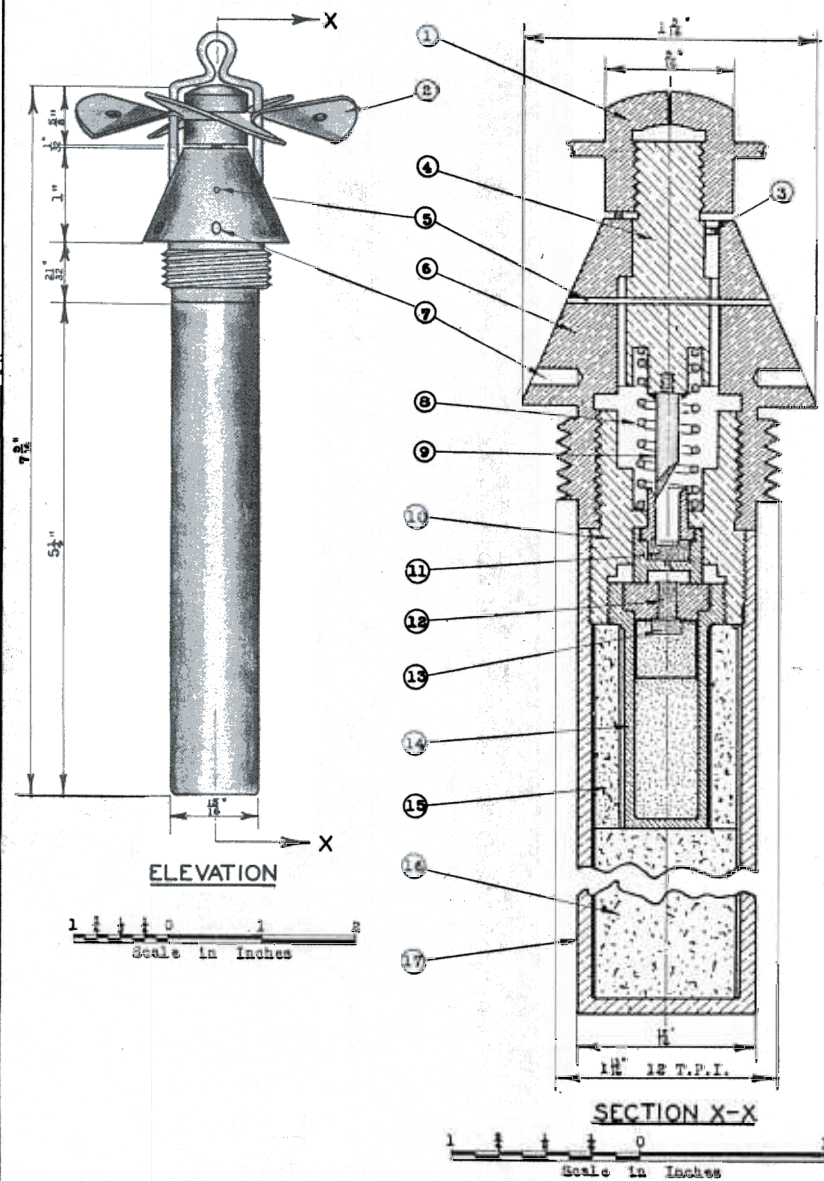
NOTE :- If for any reason dismantling is necessary (or as an added precaution before handling) the fuze should first be treated with an approved explosive neutralizer (see BDTI B/10/93, para 14) injected down the keyway, should it appear that the striker pin has pierced and is held in the initiator cap.

NOTES

JAPANESE BOMB FUZE B.1(A)

TYPE - MECHANICAL IMPACT
USE - ARMY AIRFORCE

REFER E N C B.D.T.I B/7/17



LEGEND

- | | |
|-----------------------|-------------------------|
| 1. VANE BOSS | 10. ADAPTOR |
| 2. ARMING VANES | 11. INITIATOR |
| 3. GUIDE PIN | 12. FLASH PLUG |
| 4. STRIKER SPINDLE | 13. DETONANT |
| 5. SHEAR WIRE | 14. DETONATOR |
| 6. FUZE BODY | 15. PICRIC RING PELLET |
| 7. TOOL HOLES | 16. PICRIC SOLID PELLET |
| 8. STEEL CREEP SPRING | 17. BOOSTER TUBE |
| 9. STRIKER PIN | |

JAPANESE BOMB FUZE - B.1(B)

1. JAPANESE DESIGNATION.

2. TYPE.

ARMY Airforce mechanical impact tail fuze which includes special components for short delay action.

3. BOMB IN WHICH USED.

50 Kg Type 94 G.P. bomb. - Army type.

4. COLOUR.

Natural BRASS.

5. DESCRIPTION. (See diagram)

In the bomb, Fuze B.1(B) closely resembles fuze B.1(A) but is larger by a vertical face below the conical fuze head.

Fuze B.1(B) consists of 3 main structural parts -

(a) Upper fuze body (4). This houses a striker block (3) which has a threaded end projecting through the top of the fuze body to take a vane boss (1). Two anti-binding studs (2) are fitted to the boss and fuze head, one on each part. Four-bladed arming vanes are attached to the boss. A guide pin (12) engages in a keyway (13) cut down one side of the striker block so limiting the block to vertical movement only. A striker needle is screwed to the base of the block

A steel creep spring (8) holds the striker needle off the initiator cap when the fuze is in the armed condition

A transit safety fork fits over the boss and into the fuze body. This is withdrawn on loading into the bomb rack.

(b) Lower fuze body (5). This screws into the upper fuze body and is secured thereto by a grub screw (14). A delay train ring (6) seats on the collar (7) and a spring steel washer (15) is inserted between the ring and the upper fuze body. The delay ring (6) is positioned by a locating pin (22) thus bringing into alignment the flash channel (10) drilled both through the ring and the fuze body, and the other end of the delay train over the sloping flash channel (11) leading to the relay plug (16)

An initiator cap plug (9) screws into the septum between the two internal cavities. The side walls of this plug are perforated near its top with four flash ports.

A detonator (18), with a plug (16) containing black powder screwed above it, screws into the base of the fuze.

- (c) Booster assembly. A hollow tube (17) screws on to the lower fuze body as a container for the booster explosive. The latter consists of a ring and a solid pellet of powdered picric acid each wrapped in waxed paper.

6. ACTION.

On release, the vane boss is rotated by the vanes until it falls off the threaded projection of the striker block. The fuze is armed, however, after 8 revolutions.

On impact, the striker block moves inward due to inertia overcoming the creep spring, and the striker needle pierces the initiator cap. The flash produced escapes sideways through the ports in the initiator cap, travels through the horizontal flash channel and ignites one end of the pyrotechnic delay train. When this burns to its extreme end, the flash travels down the relay channel, ignites the black powder relay and the detonator is initiated.

7. DISPOSAL.

- (a) Destruction. When the bomb is to be destroyed in situ, the fuze should be destroyed with the bomb
- (b) Rendering safe for handling. If the threaded end of the striker block is projecting beyond the top of the fuze, secure it against movement in ANY direction with adhesive tape and thin pliable wire. Special BD Tool No 2 may be applied to prevent inward movement of the threaded end if it projects $\frac{1}{4}$ " or more beyond the fuze head.
- (c) Fuze removal.
- (i) Perform (b) above
- (ii) Remove the grub screw securing fuze in the bomb
- (iii) Unscrew fuze by means of the remote controlled Fuze Extractor Design III (Aust), if available

Alternatively, unscrew fuze a partial turn only with C-spanner or Stillson Wrench and complete removal by remote control.

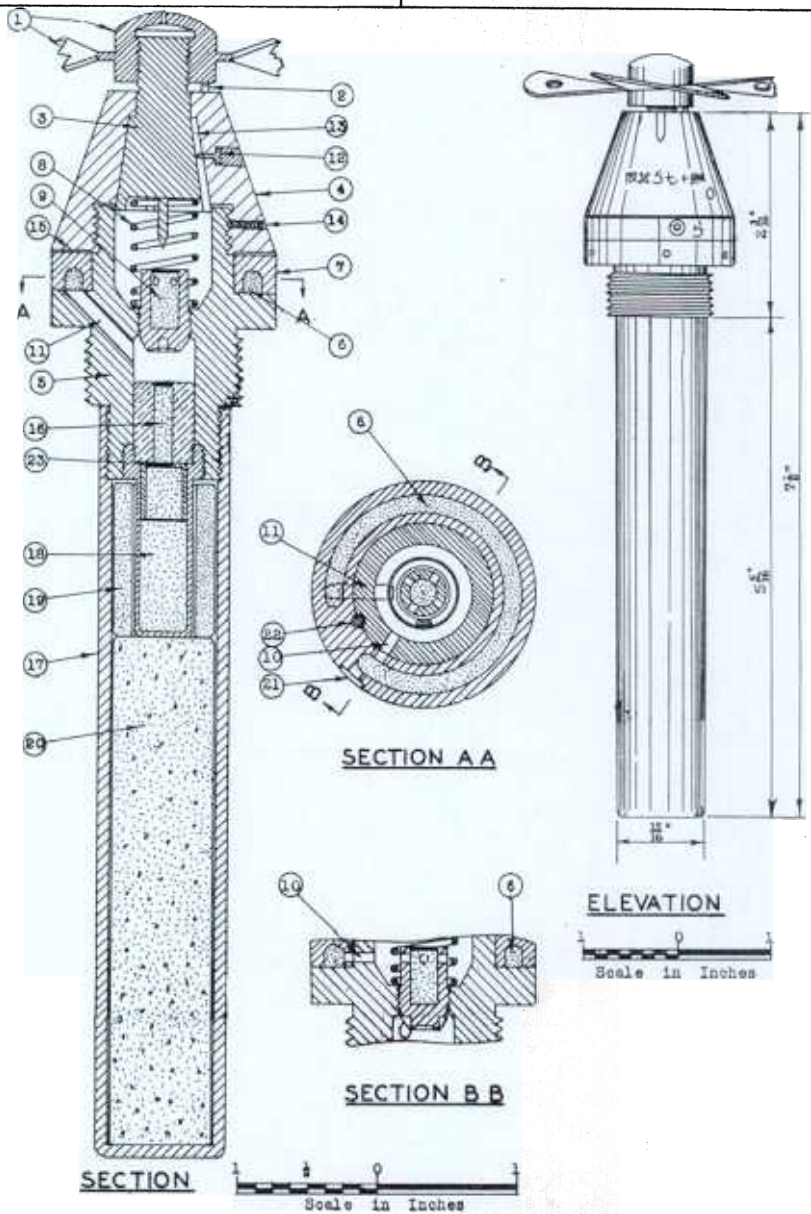
NOTE 1. If dismantling of fuze is necessary, the booster tube, picric pellets and detonator can be safely removed, but the initiator cap should NOT be unscrewed until it has been treated with an approved explosive neutralizer (see BDTI B/10/93, para 14) should it appear that the striker needle has pierced and is held in the initiator cap.

NOTES

JAPANESE BOMB FUZE - B.I(B)

TYPE - MECHANICAL IMPACT
USE - ARMY AIRFORCE

REFER B.D.T.I B/7/105



LEGEND

- | | |
|--------------------------|-------------------------|
| 1. ARMING VANES AND BOSS | 13. KEYWAY |
| 2. STOP STUDS | 14. GRUB SCREW |
| 3. STRIKER BLOCK (STEEL) | 15. SPRING STEEL WASHER |
| 4. UPPER FUZE BODY | 16. BLACK POWDER RELAY |
| 5. LOWER FUZE BODY | 17. BOOSTER TUBE |
| 6. DELAY TRAIN RING | 18. DETONATOR |
| 7. COLLAR | 19. PICRIC RING |
| 8. CREEP SPRING (STEEL) | 20. LONG PICRIC PELLET |
| 9. INITIATOR CAP | 21. GAS ESCAPE HOLE |
| 10. FLASH CHANNEL | 22. LOCATING PIN |
| 11. FLASH CHANNEL | 23. LEAD AZIDE PELLET |
| 12. GUIDE PIN | |

JAPANESE BOMB FUZE - B.2(A)

1. JAPANESE DESIGNATION.

2. TYPE.

NAVY Airforce mechanical impact tail fuze to which a standard gaine can be fitted, and specially designed for fitting to a bomb having a base plate and access doors in its tail cone.

3. BOMB IN WHICH USED.

250 Kg Type 99 , S.A.P. bomb. - Navy type

4. COLOUR.

Recognition -

(a) Outside tail cone. GALVANISED STEEL vanes, BRASS arming barrel and adaptor painted BLACK.

(b) Inside tail cone. BRASS locking ring, other parts CADMIUM PLATED.

5. DESCRIPTION. (See diagram)

Fuze B.2(A) assembly consists of the following separate parts -

(a) Tail arming assembly.

A shaped adaptor (1) is welded to the apex of the tail cone to house an arming barrel (5) secured by two screw pins (6). A short arming shaft (3) passes through the barrel. Six-bladed arming vanes are fitted at the upper end; the middle portion is left-hand threaded for screwing into the barrel (5); the slotted lower end fits into and engages over a pin through the central rod (7).

A detachable central rod (7) passes through the tail cone to connect the tail arming assembly with the fuze proper in a similar manner.

(b) Fuze proper.

The fuze body (8) screws into the base plate of the bomb. A locking ring (14) ensures a tight fit in the bomb after adjustment has been made to suit all parts during assembling.

A short arming spindle (9) passes through the retaining collar (10) and is screwed left-hand thread through a safety collar (11) and into the inertia block (12). The retaining collar is secured by a set screw through the fuze body, and both the safety collar and the inertia block are prevented from rotating by steel pins engaging in a keyway in each part as shown.

A steel creep spring (13) restrains inward movement of the inertia weight whilst the fuze is in an armed condition.

Two transit safety forks, one through the arming assembly outside the tail cone and the other through the retaining collar of the fuze proper, are both withdrawn on loading into the bomb rack.

6. ACTION.

On release, the arming vanes rotate, turning and raising the arming shaft which transfers the motions to the arming spindle per medium of the central rod. Owing to the respective lengths of the shaft and the spindle, the shaft does not completely unscrew from the arming barrel until after the spindle has been completely unscrewed from the inertia block. The fuze is then in an armed condition

On impact, the inertia block moves inwards overcoming the creep spring, and the striker needle pierces the initiator in the gaine.

7. DISPOSAL.

(a) Destruction. When the bomb is to be destroyed in situ, the fuze should be blown up with the bomb

(b) Rendering safe for handling.

(i) If the tail cone is missing, as will most often be the case, and it can be seen that the short arming spindle is missing from the fuze, it should be assumed that the striker needle has pierced and is held in the initiator cap. In this condition the bomb is dangerous and, BEFORE handling, the fuze should be treated with the explosive neutralizer or the solidifying mixture method (see BDTI B/10/93, para 14, and BDTI E/22/118 respectively).

(ii) If bomb is complete with tail cone, the tail arming assembly will be either present or missing

If the tail arming assembly is present, it is probable that the arming spindle has NOT completely unscrewed from the inertia block. Before examining the fuze proper through the cone access doors secure with adhesive tape and/or thin pliable wire all movable parts against rotation. As an added precaution the fuze proper may then be dealt with through the access doors by securing the arming spindle against rotation with adhesive tape BEFORE dismantling the tail arming assembly and detaching the central rod. If the striker block guide pin is accessible, it may sometimes be advisable to remove it and inject an explosive neutralizer through the hole into the fuze cavity.

If the tail arming assembly is missing the fuze will no doubt be in the condition as described in (i) above and the method adopted for treating the fuze will have to be applied through the access doors.

(c) Fuze removal.

- (i) After performing (b) (i) or (ii) above, the tail cone should be separated if present
- (ii) Unscrew locking ring whilst holding main fuze body with Special BD Tool No 4 (large C-spanner)
- (iii) Unscrew main fuze body by means of the remote controlled Fuze Extractor Design III (Aust), if available

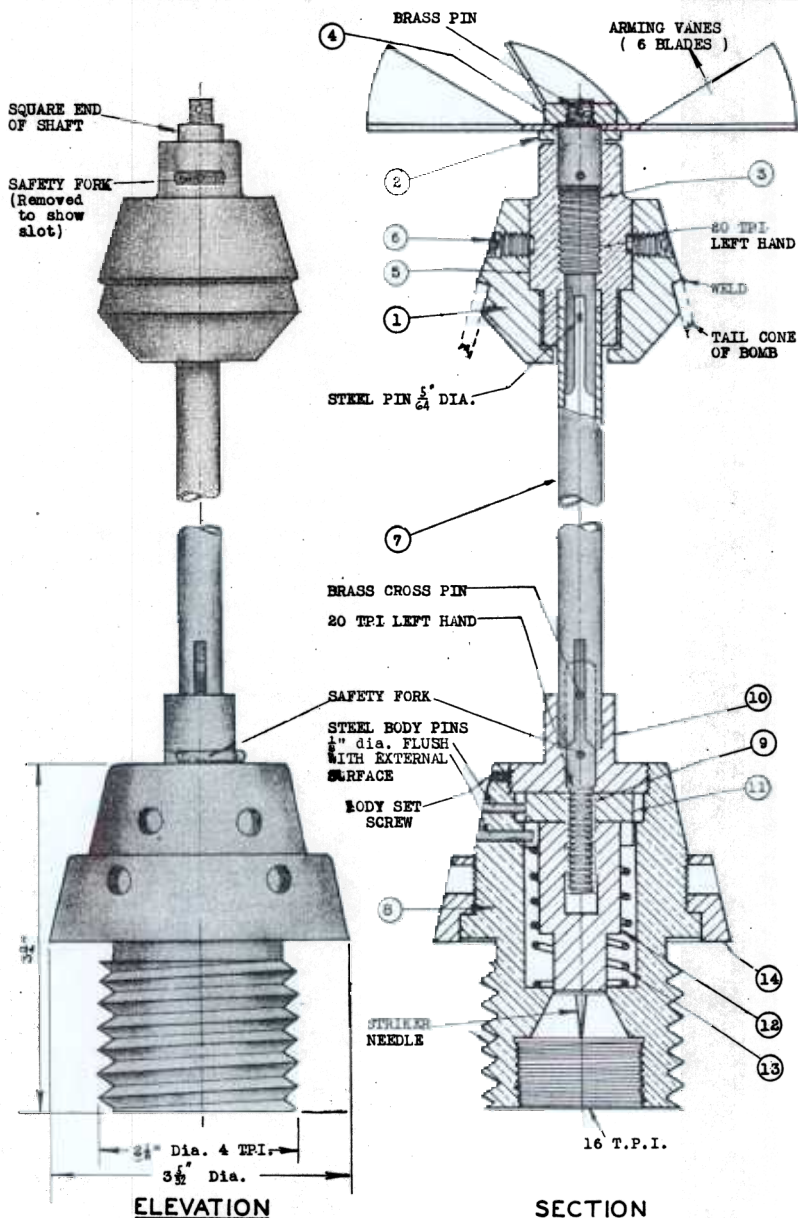
Alternatively, unscrew fuze a partial turn with the hand, or tool if necessary, and complete removal by remote control.

NOTES

JAPANESE BOMB FUZE - B. 2(A)

TYPE - MECHANICAL IMPACT
USE - NAVY AIRFORCE

REFER E IN C BDTI B/7/67



ELEVATION

SECTION

1 0 1 2
Scale in Inches

LEGEND

- | | |
|-------------------|----------------------|
| 1. SHAPED ADAPTOR | 8. FUZE BODY |
| 2. WASHER | 9. ARMING SPINDLE |
| 3. ARMING SHAFT | 10. RETAINING COLLAR |
| 4. BRASS NUT | 11. SAFETY COLLAR |
| 5. ARMING BARREL | 12. INERTIA BLOCK |
| 6. SCREW PINS | 13. CREEP SPRING |
| 7. CENTRAL ROD | 14. LOCKING RING |

JAPANESE BOMB FUZE - D.2(B)

1. JAPANESE DESIGNATION.

Type 99, No 3 (probably Mk II) Bomb Fuze.

2. TYPE.

NAVY Airforce clockwork air-burst tail fuze.

3. BOMBS IN WHICH USED

250 Kg Incendiary bomb - see BDTI B/4/99
32 Kg " " " " B/4/111

4. COLOUR.

WHITE METAL (cadmium-plated brass).

5. DESCRIPTION. (See drawings)

Fuze D.2(B) is identical with fuze D.2(A) (described in BDTI B/9/98) in all respects except those detailed as under :-

(a) Colour - White metal colour. (Fuze is made of brass same as D.2(A) but is cadmium plated.)

(b) Shape of Arming Vanes - Blades of arming vanes are narrower than those of D.2(A). Compare the diagrams.

(c) Time-setting scale - The range in this fuze is 0 to 20 secs in $\frac{1}{2}$ -sec graduations from 5 to 20.

(d) Clockwork Mechanism - There is only one pallet stop as against 2 in the D.2(A).

(e) Retaining Collar - has 2 spanner holes in lieu of spanner flats, and friction spring is of different form.

(f) Body Casing - has 2 blind holes for time-setting tool.

(g) Setting Piece - has 2 blind holes for capstan bar in lieu of 1.

6. ACTION.

As for fuze D.2(A) - (refer BDTI B/9/98).

7. DISPOSAL.

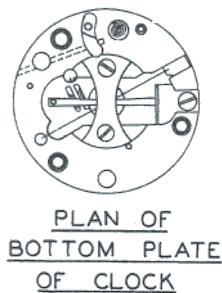
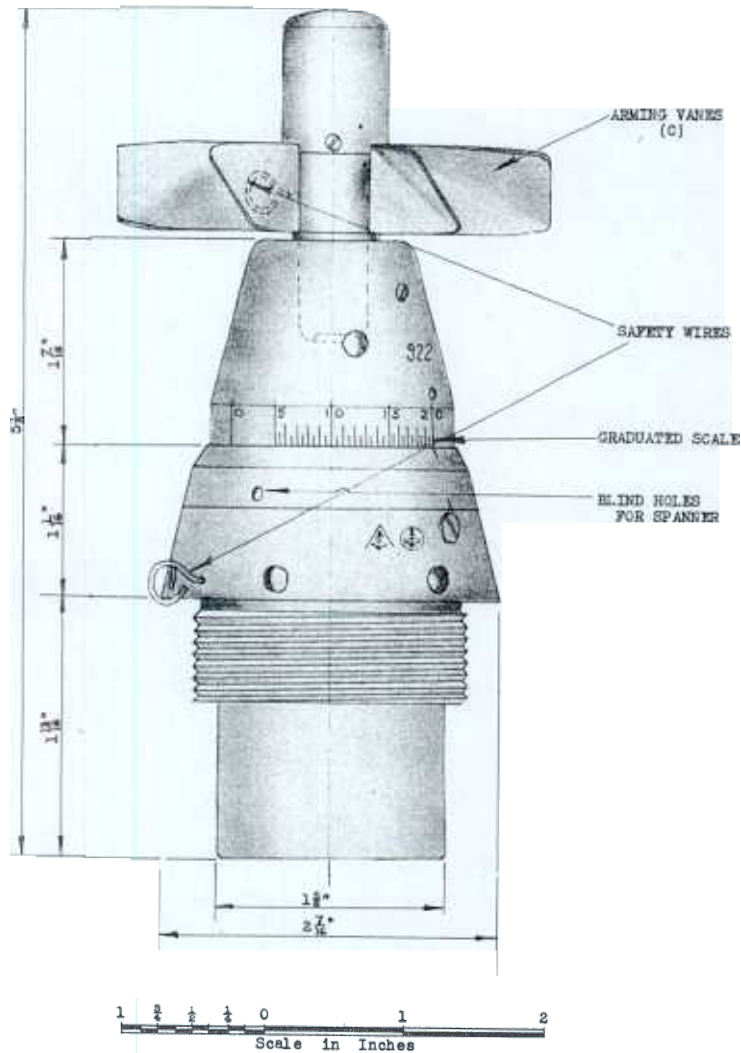
As for fuze D.2(A).

NOTE 1 :- This fuze is apparently a predecessor to D.2(A) but a modification of D.2(C).

JAPANESE BOMB FUZE - D.2(B)

TYPE - CLOCKWORK AIR-BURST
USE - NAVY AIRFORCE

REFER E INC B.D.T.I. B/9/113



NOTES:-

EXTERNAL SURFACES OF THIS FUZE ARE CADMIUM PLATED.

FOR DETAIL OF CLOCKWORK MECHANISM AND LEGEND SEE B.D.T.I. B/9/98.

JAPANESE BOMB FUZE - D.2(C)

1. JAPANESE DESIGNATION.

Test Model. Type 99, No 3 (probably Mk I) bomb fuze, 14

2. TYPE.

NAVY Airforce clockwork air-burst tail fuze.

3. BOMBS IN WHICH USED

250 Kg Incendiary bomb - see BDTI B/4/99
32 Kg " " " " B/4/111

4. COLOUR.

WHITE METAL (cadmium-plated brass).

5. DESCRIPTION. (See diagram)

Fuze D.2(C) is identical with fuze D.2(B)
(described in BDTI B/9/113) in all respects except those
detailed as under :-

- (a) Setting Spindle - has no shoulder above fuze body
- (b) Body Casing - is provided with 2 spanner flats in lieu of blind holes for time-setting tool
- (c) Retaining Collar - has 2 spanner notches in lieu of spanner holes, also friction spring is of different form.
- (d) Time-setting Graduations - are in 1-sec graduations from 0 to 20.
- (e) Rotor - is of different shape
- (f) Actuator - This component is not incorporated in this fuze.
- (g) Clock-winding Aperture - This fuze is NOT provided with one.
- (h) Striker Safety Catch - is connected to a small spring wire, whereas it abuts component (6) in fuze D.2(B).

6. ACTION.

As for fuze D.2(A) - see BDTI B/9/98.

7. DISPOSAL.

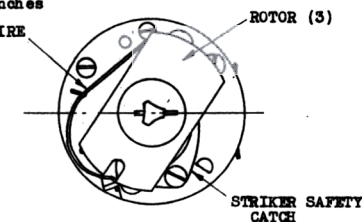
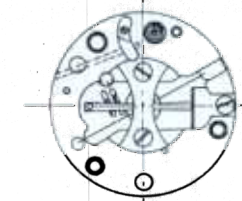
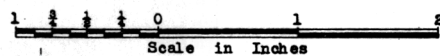
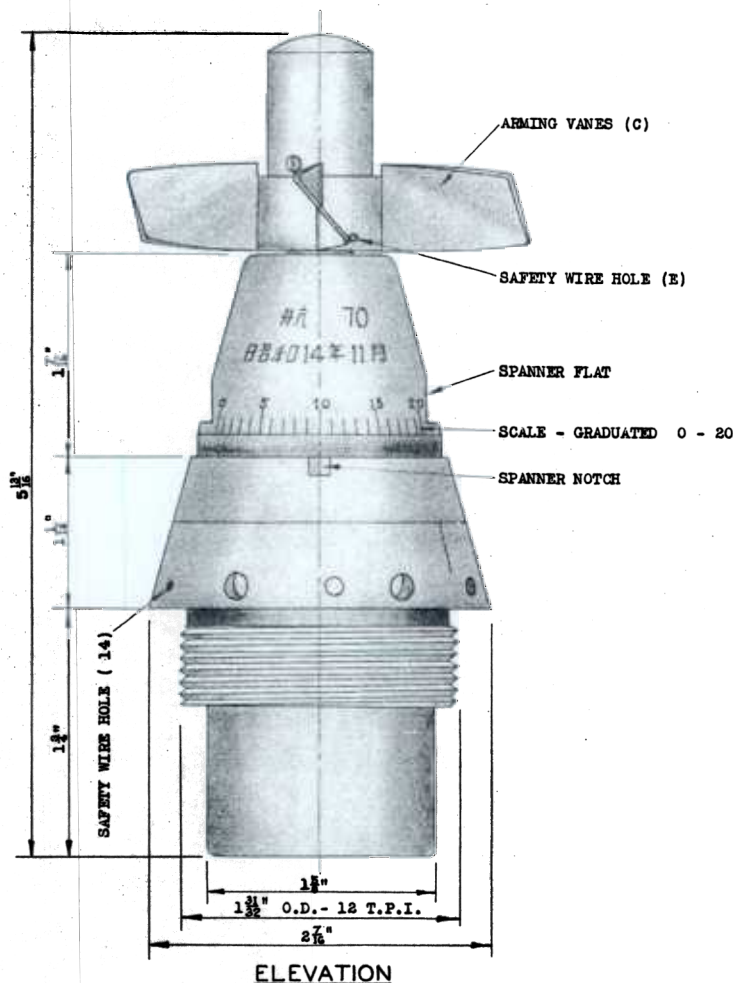
As for fuze D.2(A).

NOTE 1 :- This fuze is apparently the predecessor to fuze D.2(B).

JAPANESE BOMB FUZE - D.2(C)

TYPE - CLOCKWORK AIR-BURST
USE - NAVY AIRFORCE

REFER E IN C B.D.T.I. B/9/120



NOTES:-

EXTERNAL SURFACES OF THIS FUZE ARE CADMIUM PLATED.

FOR DETAIL OF CLOCKWORK MECHANISM AND LEGEND SEE B.D.T.I. B/9/98

JAPANESE PARACHUTE FLARE FUZE - D.3(A)

1. JAPANESE DESIGNATION.

2. TYPE.

NAVY Airforce mechanical nose fuze designed to operate in the air after a limited fall. A delay component is attached as an integral part of the fuze.

3. BOMBS IN WHICH USED.

Aircraft Parachute Flare Container - Navy type (see BDTI B/5/106).

4. COLOUR.

Natural BRASS.

5. DESCRIPTION. (See diagram)

The fuze assembly comprises 3 portions which screw together.

- (a) The upper fuze body houses the arming mechanism. The ARMING BUSH is restricted to rotary movement by 2 LOCKING PINS inserted through holes in the fuze body and engaging in a groove around the arming bush

The ARMING VANES screw on to the upper end of the arming bush and secured by a LOCK NUT. A ball-bearing thrust race beneath prevents their binding with the fuze head

A TRANSIT SAFETY FORK let into the side of the fuze body has a prong passing through a hole in the arming bush and is retained by a dull-pointed SPRING-LOADED PIN. The fork prevents the bush from being rotated by the vanes during handling.

- (b) The lower fuze body houses the striker mechanism. An ARMING SLEEVE screws into the lower end of the arming bush. A keyway cut along one side is engaged by 2 SCREW GUIDE PINS to ensure vertical movement only. STOP STUDS on the bush and the sleeve prevent these parts from binding

The hollow end of the arming sleeve houses the STRIKER which is retained therein by 3 STEEL BALLS projecting into slots in the arming sleeve and the concave side of the striker. The hollow end of the striker is spring-loaded with 2 HELICAL SPRINGS one inside the other. A STRIKER NEEDLE is fitted to the base of the striker. An INITIATOR GAP screws into the base of the fuze body

- (c) Delay Container. This screws into and forms an extension of the lower fuze body. (It presumably contains a pellet of flash powder, a pyrotechnic composition filling the central channel, and a flash plug screwed into its base.)

6. ACTION.

On release of the flare container the arming bush is rotated clockwise by the vanes so causing the sleeve to move inwards until the 3 steel balls, under pressure of the spring-loaded striker, move away from the striker into the recessed portion lower down in the fuze body. The striker, when freed, is driven inward under action of its own springs, the initiator cap is pierced, and the several constituents in the delay container are ignited in turn.

A charge to propel the flare candles from the flare container is finally initiated.

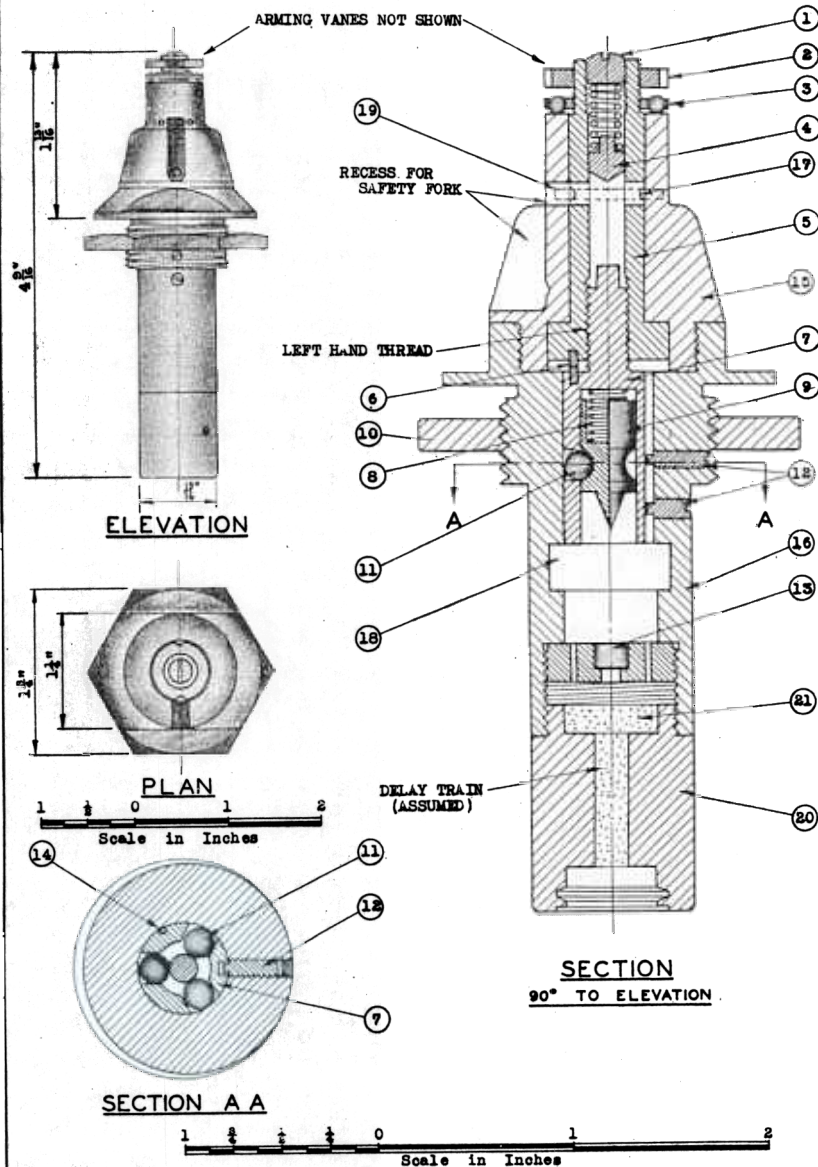
7. DISPOSAL. (For flare which has failed to function. This may be discerned by inspection through the rear end of the flare container.)
- (a) Rendering safe for handling. Secure the vane locking nut, threaded end of arming bush and vanes (if still attached) against rotary movement with adhesive tape and/or thin pliable wire in the event that rotation of the arming bush in the air has been insufficient to release the striker
 - (b) Fuze removal. Loosen fuze locking ring and unscrew fuze using a Stillson Wrench.

NOTE 1 :- If for any special reason the fuze is to be dismantled, first soak in kerosene for at least 2 hours.

JAPANESE PARACHUTE FLARE FUZE D. 3(A)

TYPE - MECHANICAL AIRBURST
USE - NAVY AIRFORCE

REFER E IN C B.D.T.I. B/9/103



LEGEND

1. RETAINING SCREW	12. SCREW GUIDE PINS (2)
2. LOCK NUT	13. INITIATOR CAP.
3. THRUST RACE	14. GAS ESCAPE
4. SPRING LOADED PIN	15. UPPER FUZE BODY
5. ARMING BUSH	16. LOWER FUZE BODY
6. STOP STUDS (2)	17. GROOVE FOR LOCKING PIN
7. ARMING SLEEVE	18. BALL ESCAPE RECESS
8. STRIKER SPRINGS (2)	19. LOCKING PIN
9. STRIKER	20. DELAY CONTAINER
10. FUZE LOCKING RING	21. FLASH POWDER PELLET (ASSUMED)
11. STEEL BALLS (3)	

JAPANESE BOMB CANISTER FUZE - D.4(A)
(Provisional)

1. JAPANESE DESIGNATION.

2. TYPE.

NAVY Airforce type nose fuze mechanically operating in mid-air and initiating a pyrotechnic delay.

3. HOW USED.

As nose fuze in bomb canister described in BDTI B/5/13. Suitable fuze for release at low level flying.

4. COLOUR.

BRASS (natural).

5. DESCRIPTION. (See diagram)

The fuze consists of 3 main structural parts :

(a) Upper fuze body. Actual arming assembly is not known but it is assumed that it consists of a spindle fitting to the striker cup, then engages in threads in the head of the fuze and is finally secured in a vane boss which has arming vanes attached. The fuze head is threaded so that the vanes must rotate clockwise to raise the spindle.

Two holes in the fuze head are probably for a 3-pronged transit safety fork, the third prong of which would fit into the vane boss.

The threaded hole in the side of the fuze head is probably for a safety screw to engage in the spindle

(b) Lower fuze body. This screws into the upper body with a r.h. thread which is extended for screwing fuze into the container and to receive a locking ring. A screw pin secures the 2 fuze portions as shown.

A striker needle is fitted to the base of the striker cup which holds a steel spring under compression. It is prevented from inward movement by a steel retaining ball engaging on a shoulder of the fuze body and bearing against the spindle through a hole in its side.

An initiator plug screws into the base of the lower fuze body.

(c) Fuze extension piece. This screws into the lower body and forms an extension to it of same diameter. The pyrotechnic delay train is contained in a hole which passes centrally along its full length.

6. ACTION.

On release of the container from the aircraft the arming vanes and boss rotate and raise the spindle. Due to pressure of the spring, the steel retaining ball will be forced into the striker cup cavity as soon as the end of the spindle clears it. The striker cup is now free to move and is driven inwards by the compressed spring. The striker needle pierces the initiator cap and the delay train is finally ignited.

7. DISPOSAL.

Whenever possible, the complete fuze should be removed BEFORE the container is disturbed (see NOTE 1) Suggested method of removal is as follows :-

- (a) Loosen locking ring with C-spanner or Stillson Wrench
- (b) Unscrew fuze only a partial turn with C-spanner or Stillson Wrench and complete removal by remote control.

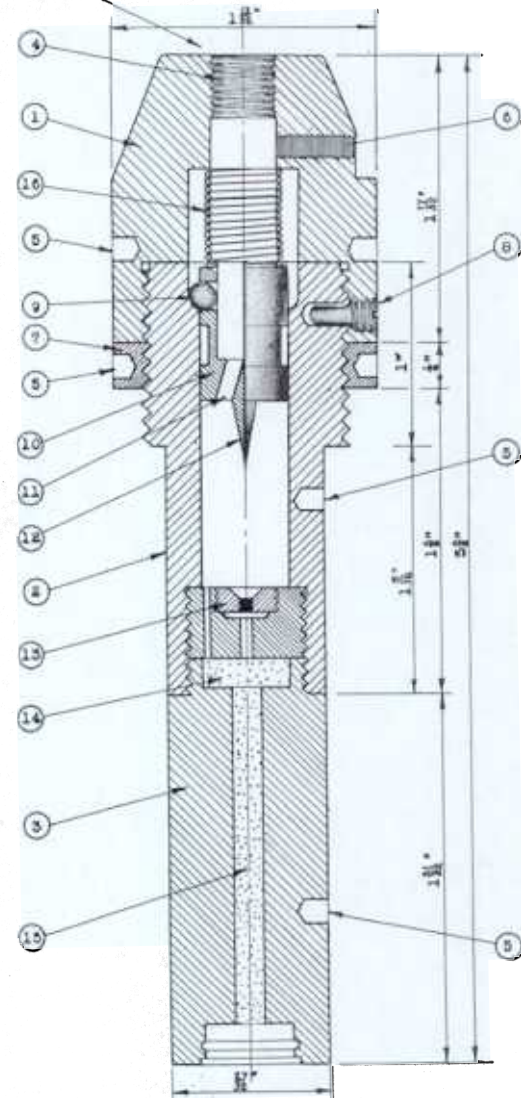
NOTE 1 :- Canisters which have failed to separate and release the bombs in the air will probably collapse on impact and the heavy nose, if still attached, may be driven into the container. The condition of the bombs inside may not be known.

JAPANESE BOMB FUZE - D.4(A)

TYPE - MECHANICAL AIRBURST
USE - NAVY AIRFORCE

REFER E INC B.D.T.I. B/9/121

ARMING VANES AND ARMING
SPINDLE NOT SHOWN



SECTION
1 1/2 1 1/4 1 1/2 0
Scale in Inches

MATERIALS:-

BRASS THROUGHOUT EXCEPT STEEL STRIKER NEEDLE AND PROBABLY STEEL BALL.

LEGEND

1. UPPER FUZE BODY	9. RETAINING BALL
2. LOWER FUZE BODY	10. STRIKER CUP
3. FUZE EXTENSION PIECE	11. AIR ESCAPE
4. THREADED FOR SPINDLE	12. STRIKER NEEDLE
5. TOOL ASSEMBLY HOLES	13. INITIATOR
6. HOLE FOR SAFETY SCREW (ASSUMED)	14. BLACK POWDER PELLET
7. LOCKING RING	15. PYROTECHNIC TRAIN
8. SCREW PIN	16. STRIKER SPRING

GAINES, BOOSTER SYSTEMS - JAPANESE BOMBS

(A) - EXPLANATORY

1. DETONATING SYSTEMS.

The JAPANESE systems for detonating a burster charge generally follow in principle the sequence set out in BDTI D/20/27, para 4.

2. TWO SYSTEMS IN USE.

Two distinct systems have been identified as of NAVY and ARMY design respectively. Distinguishing features are -

(a) Navy Design - known as a "STANDARD GAINES" employs a standard type container to house ALL explosive constituents of a fuze (but see NOTE 2 below). The container is screwed hand tight into the main body of the fuze

(b) Army Design - known as a "BOOSTER ASSEMBLY" in which components of the system screw or fit individually into the main body of the fuze

NOTE 1 :- Hence in 2 (a) above, unscrewing of the Standard gaines separates all explosives from the striker mechanism, but in 2 (b) the various components must be removed individually when dismantling fuze.

NOTE 2 :- Exception - D.2 serial fuzes incorporate an initiator in the fuze body.

3. VARIATIONS WITHIN THE SYSTEMS.

The functions of components employed in both systems are identical though the number and design of components used are varied to suit the purpose for which a particular bomb is intended. Such variation is mainly concerned with the time lag desired between initiation of the initiator and detonation of burster charge. TABLE 1 shows the relation between TIME LAG and PURPOSE OF BOMB.

(B) - USE OF TABLES AND DIAGRAMS

4. TABLES 1 to 4 (AND RELEVANT FIGS) constitute a ready means for identifying Detonating Systems and Component Parts. Particulars contained herein are summarised and compiled in the following form -

- (a) TABLE 1 - Relation between Time Lag and Purpose of Bomb
- (b) TABLE 2 - Types of Standard Gaines Plugs in Use, and their functions
- (c) TABLE 3 - Types of Standard Gaines in Use, and their components
- (d) TABLE 4 - Types of Booster Assemblies in Use and their components

5. DESIGNATION OF TYPE SYSTEMS AND COMPONENT PARTS.

(a) For convenience, these are temporarily designated by SER NOS. Japanese designations are also given where known

(b) For clarity, and to simplify classification -

(i) A KEY or common SER NO is given to each particular Standard Gaine or Booster Assembly and its component parts

(ii) This SER NO denotes the purpose of use of the bomb and is derived from TABLE 1.

(c) Examples :

(i) "Standard Gaine Detonator SER 1" refers to the tetryl filled detonator of a Standard Gaine used in a Navy fuze to obtain a surface burst

(ii) "Booster Assembly Detonator SER 4" refers to the detonator used in the Booster Assembly of Army fuzes such as A.2(A), A.2(C) or A.4(A), in a bomb where choice between instantaneous action and fractional delay is desired

(iii) "Standard Gaine SER 3a" refers to a complete Gaine used in a Navy Fuze to obtain a fractional delay of 0.014 secs.

6. From the above it will be seen that Tables are complementary, and if read inter-alia with relevant FIGS standardise a quick means of identification.

(C) - NAVY STANDARD GAINES - DESCRIPTION

7. The Standard Gaines are self-contained units (see para 2 (a) above) and are interchangeable with all NAVY fuzes, viz -

A.1(A), A.3(A), A.3(B), A.6(A).
B.2(A), B.2(B), B.3(A).
C.1(A), C.2(A).
D.2(A), D.2(B), D.2(C).

NOTE 3 :- Navy Type Cluster bombs are excepted. Some of these may employ a small edition of SER 1 type Standard Gaine (e.g. 1 Kg H.E. bomb).

8. Component parts are as follows -

(a) CONTAINER, of tinned high strength brass (see NOTE 3a) lacquered a greenish yellow, which -

(i) externally is of standard shape and size, having a standard male thread to fit fuzes of para 7 (see FIG I). It has a painted or plain tip, the colour denoting the slight delay period of the particular gaine (see TABLE 3)

(ii) internally the design is varied to accommodate the desired combination of plugs (see TABLES 1, 2 and 3 and FIG III)

NOTE 3a :- An exception is the blue tipped Gaine which is made of steel.

(b) PLUGS (see FIG III) of tinned high strength brass which contain the explosive constituents leading up to detonation of the booster. These are located in the container in order from the top as follows:-

- (i) Initiators (Screwed in and staked)
- (ii) Delay Trains .. (Slip fit)
- (iii) Detonators (Screwed in, or slip fit)

TABLE 2 lists explosive constituents and functions of various types of Plugs.

(c) BOOSTER PELLET (see FIG II). This consists of a cylindrical plug of pressed powdered PICRIC ACID, covered with waxed paper. The flat end fits flush with the underside of detonator, the other end is rounded for a snug fit in the container tip. Lengths vary with type of gaine, weights ranging from 27 gms to about 36 gms. Stuck unsymmetrically on the rounded end may be a small piece of cotton fabric about $\frac{1}{2}$ -in diam red or white in colour.

9. TABLE 3 and FIG III lists and illustrates type of Gaine recorded up to DEC 43.

(D) - ARMY BOOSTER ASSEMBLIES -
DESCRIPTION (see TABLE 4).

10. COMPONENTS.

The various components are constructed of brass and comprise -

- (a) Initiator, a cylindrical shaped copper cap containing a detonant and flash powder. The cap usually fits into a plug which is positioned within the main fuze body immediately beneath striker point
- (b) Delay Train Plug (when used) which contains flash powder and the pyrotechnic delay composition. It is usually cylindrical in shape and is normally positioned beneath the initiator (see NOTE 4(b) below)
- (c) Detonator, of tubular shape and varying length. It has a male thread for screwing into fuze body and is positioned beneath (a) or (b) according to whether induced delay is incorporated or not. It is screwed hand tight, but is securely staked. Constituents are normally -
 - (i) Gunpowder to build up flash
 - (ii) Either Lead Azide (immediately beneath the gunpowder) and Cyclonite, OR Mercury Fulminate and Tetryl.
- (d) Picric Acid booster pellets, consisting of a long solid cylindrical pellet of pressed powdered Picric Acid, and a short ring pellet of the same explosive into which the detonator fits. The booster may be incorporated either in the fuze or the bursting charge
 - (i) In some fuzes the booster pellets are contained in a brass tube having a female thread which screws on to the fuze body. This is normally hand tight

- (ii) Booster pellets which are NOT enclosed in a brass tube, slide into a pocket formed in the bursting charge. When the fuze is screwed into the bomb, the detonator fits into the short upper pellet as before. Conversely, on removal of fuze, the picric pellets do NOT withdraw but must be eased out separately.

NOTE 4 :-

- (a) Fuze C.3(A) has a large diam brass cup-shaped booster
- (b) Fuze B.1(B) is an exception. A delay train ring is incorporated in fuze body and receives flash from initiator horizontally
- (c) Fuze B.5(A) has a cyclonite booster in the form of a ring pellet and a short solid cylindrical pellet which are both contained in the bomb.

11. COMPLETE ASSEMBLIES.

See TABLE 4 for -

- (a) appropriate SER NOS which lists -
 - (i) all present known Booster Assemblies
 - (ii) component parts
 - (iii) fuzes in which incorporated
- (b) relevant BDTIs in which the particular Booster Assembly and its Fuze are illustrated by SCALE DRAWINGS.

(E) - REMOVAL AND DISMANTLING OF GAINES
AND BOOSTER ASSEMBLIES

12. CAUTION.

When dealing with fuzed bombs that have failed to explode the likelihood of striker points being embedded in Initiator caps must always be borne in mind. An explosion is always a possibility when a striker point is moved relative to the Initiator. Even slow rotation or gentle withdrawal may grind or crush flaked particles of the explosive against the edges of the pierced opening and so cause initiation.

13. PROCEDURE.

- (a) When the bomb is to be destroyed in situ, the fuze should be blown up with the bomb
- (b) When it is necessary to defuze a bomb, the complete fuze assembly should be destroyed intact except as may be laid down for a particular fuze (e.g. Serial C fuzes)
- (c) When it is necessary to strip a fuze for any special reason, the warning in para 12 must be constantly borne in mind. Unless absolutely certain that striker point is clear of initiator cap, procedure will be as follows -

NO attempt should be made to remove Standard Gaines, or to interfere with any part of a fuze so as to cause relative movement between striker point and initiator, unless -

- (i) a neutralizing agent has first been injected as described in para 14, or -
- (ii) dismantling of parts dangerous to move is done by remote control.

14. INJECTION OF NEUTRALIZING AGENT.

- (a) KEROSENE has a deadening effect on initiator compositions, provided saturation can be ensured
- (b) It can be injected by an oil can, and if access can be facilitated by careful removal of a screw, or other fuze component safe to move, this should be done. Luting or suitable plastic material should be used to stop leaks and ensure voids in the fuze being filled with kerosene. Similarly a leak-proof method of injection may be improvised (ref BDTI E/22/27, para 4, SER 6)
- (c) After treating as in (b), a period of AT LEAST TWO HOURS should elapse before dismantling proceeds. This period should be extended wherever practicable up to 24 hours if possible
- (d) WARNING :- Although saturated initiator compositions have been successfully sectioned with a hacksaw, neutralization must by NO means be regarded as foolproof. Apart from the uncertainty as to penetration of the kerosene, the behaviour of some sensitive compositions is not reliable in the circumstances. Hence observe strict caution and guard against carelessness.

15. INSPECTION OF COMPONENTS OF DISMANTLED FUZING SYSTEMS.

Before destroying these should always be examined and compared with detailed information issued. If any appear to differ they should be labelled with a reference tag, packed in cotton wool or other soft material and despatched through Engineer channels to E in C for examination. A report will be enclosed, AND a copy forwarded separately (adding route and means of despatch of specimen) Always state size and type of bomb and fuze from which recovered, also place and date of dropping.

NOTE :- Stripping of Standard Gages :

Improvised 2-pin tools are required to remove threaded plugs (initiator is staked) which are screwed in very tight. Slip-fit plugs and picric booster pellet normally slide out easily.

TABLE 1 - TIME LAG AND PURPOSE OF BOMB

SER NO (Key to de- tonat- ing system)	TIME LAG OF DETONATING SYSTEM	PURPOSE OF BOMB	
		ACTION	OBJECT
1	Minimum time lag possible by use of full detonating initiator cap (Referred to as "Improved Instantaneous")	Achieves "surface burst" with little or no penetration (only forms small and shallow crater)	Blast and fragmentation damage
2	Fractional time lag inherent with flash type initiator cap used (Referred to as "Ordinary Instantaneous")	Permits limited penetration	(a) Less blast and frag. effects than SER 1 (b) Demolition of light constructions.
3 (a, b, c and d)	Induced fractional delays - Less than 1 sec (For individual values see TABLE 3)	Permits more penetration than SER 2	(a) Cratering damage (b) Demolish structures more than 1 storey (c) Underground installations (d) Shipping
4	Selective - Ranges from time lag of SER 2 to short delays of up to 1.5 secs	As in SERS 2 and 3 - (according to time setting)	As for SERS 2 and 3 - (according to time setting)
5	Short delays - (about 9 secs)	Action delayed, e.g. to allow low-flying aircraft to get clear	As for SERS 1, 2 and 3 (b) and (d)

NOTE 5 :- Long Delay Fuzes and some Aerial Burst fuzes are fitted with SERS 1 or 2 Detonating Systems. Induced delays are obviously NOT needed.

TABLE 2 - PLUGS CONTAINED IN STANDARD
GAINES - (NAVY)

(REFER TO FIGS III and IV)

SER NO VIDE TABLE 1	EXPLOSIVE CONSTITUENTS	FUNCTION
---------------------------	---------------------------	----------

(a) INITIATOR CAPS

1	Mercury Fulminate over Tetryl, in an inverted copper cup	To initiate detonator by shock (NOT flash) when pierced
2	Detonating composition over Gunpowder	To initiate detonator by flash when pierced
All 3	As for SER 2	To initiate delay train
4	As for SER 2	As for SERs 3, 4 and 5. Rotation of this plug determines burning time of delay train

(b) - DELAY TRAINS

3 (a)	Flash powder over pressed mealed gunpowder over flash powder	To introduce a slight delay of 0.014 secs (approx) in explosive train
3 (b)	As for SER 3 (a)	As for SER 3 (a) but slight delay is 0.017 secs (approx)
3 (c)	As for SER 3 (a)	As for SER 3 (a) but slight delay is 0.025 secs (approx)
3 (d)	As for SER 3 (a)	As for SER 3 (a) but slight delay is 0.031 secs (approx)
4	Pressed mealed gun powder in a semi-circular channel	As for SER 3 (a) but delay is selective from fractional to 1.5 secs

(c) - DETONATORS

1	Tetryl	Is detonated by shock NOT flash. Detonates picric booster
2) 3)	Lead Azide over Tetryl stemming over Tetryl	Detonates by flash from primer. Initiates picric booster
4	As in SER 2/3 but plug is more shallow	As for SER 2/3

NOTE 6:- Up to date, all above have had right-hand threads

TABLE 3 - TYPES OF STANDARD GAINES - (NAVY)
(REFER TO FIG IV)

SER NO vide TABLE 1	EXPLOSIVE COMPONENTS Vide TABLE 2	JAPANESE DESIGNATIONS (Translations)	COLOUR OF TIP
1	Initiator Cap Ser 1	"Type 92 Land Use Bomb Fuze Improvement 2. Fuze cap explosive M26"	None
2	Initiator Cap Ser 2 Detonator Ser 2 Picric Booster	"Type 96"	None
3(a)	Initiator Cap Ser 3 Delay Train Ser 3(a) Detonator Ser 3 Picric Booster	"Temporary name Type 99 Ordinary Special Bomb Fuze C. Fuze cap explosive M26"	Brown
3(b)	Initiator Cap Ser 3 Delay train Ser 3 (b) Detonator Ser 3 Picric Booster	"Type 97 Land Use Bomb Fuze B. Fuze cap explosive M60"	Red
3(c)	Initiator Cap Ser 3 Delay Train Ser 3 (c) Detonator Ser 3 Picric booster	"Type 97 Land Use Fuze A Fuze Cap explosive M71"	Green
3(d)	Initiator cap Ser 3 Delay Train Ser 3 (d) Detonator Ser 3 Picric Booster	"Temporary name Type 99 Bomb Fuze A. Fuze cap explosive M21"	Blue
4	Initiator cap Ser 4 Delay Train Ser 4 Detonator Ser 4 Picric Booster	"Type No 15"	None

NOTE 7 :- Up to date all gaines screw into fuzes with a
r.h. thread.

TABLE 4 - TYPES OF BOOSTER ASSEMBLIES AND COMPONENTS - (ARMY)

FUZES IN WHICH INCORPORATED	BDTI REF NO (For Drawings)	COMPONENT PARTS EMPLOYED
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SER 1 - (VIDE TABLE 1)

B.5(A)	B/7/101	Initiator cap Detonator (slip fit) 2 Booster pellets (cyclon-ite)
--------	---------	---

SER 2 - (VIDE TABLE 1)

A.2(B)	B/6/73	Initiator cap screwed into Detonator Detonator Booster pellets in bomb
B.1(A)	B/7/17	Initiator cap Detonator Booster Tube
B.4(A)	B/7/21	Initiator cap Detonator Booster Tube
C.3(A)	B/8/95	Initiator cap (fits in wall of fuze) Flash Powder Holder Detonator Booster cup

SER 4 - (VIDE TABLE 1)

A.2(A)	B/6/18	{ Initiator cap Delay Train Detonator Booster pellets in bomb
A.2(C)	B/6/97	
A.4(A)	B/6/20	Initiator cap Delay train Detonator Booster tube

SER 5 - (VIDE TABLE 1)

B.1(B)	B/7/105	Initiator cap Delay Train Ring (incorporated in fuze body) Gunpowder relay (screwed into detonator) Detonator Booster Tube
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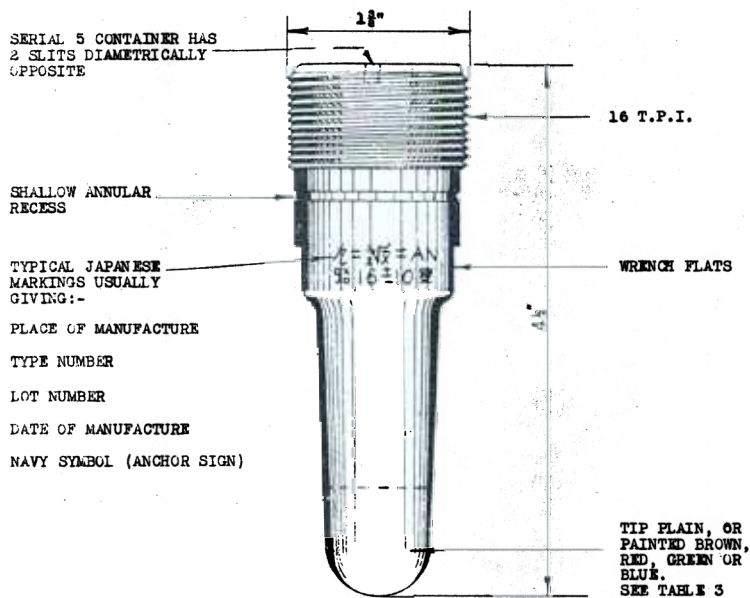
NOTE 8 :- Up to date all right-hand threads have been used.

JAPANESE STANDARD GAINES

USE - NAVY AIRFORCE
TYPE BOMB FUZES

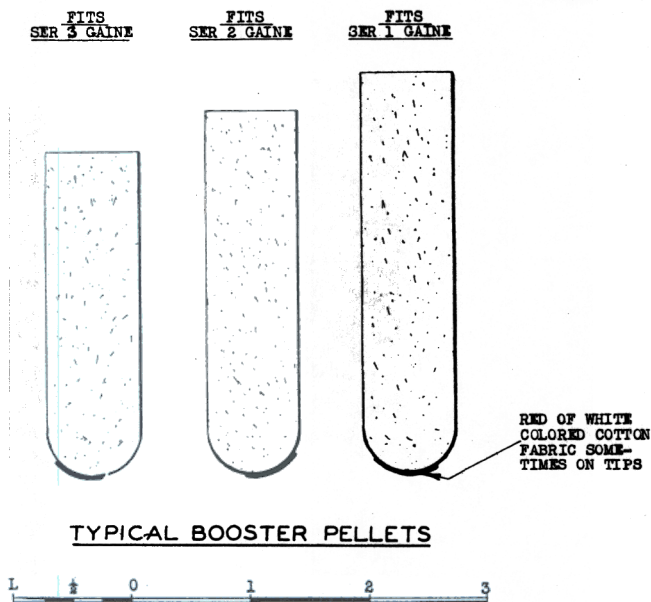
REFER E IN C. BDTI B/10/93

FIG. 1



TYPICAL ELEVATION

FIG. 11



TYPICAL BOOSTER PELLETS

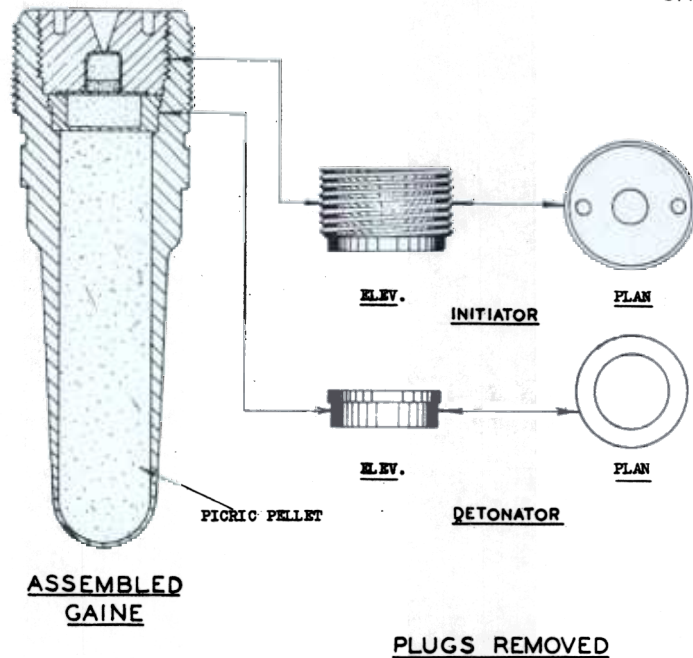
JAPANESE STANDARD GAINES

USE — NAVY AIRFORCE
TYPE BOMB FUZES

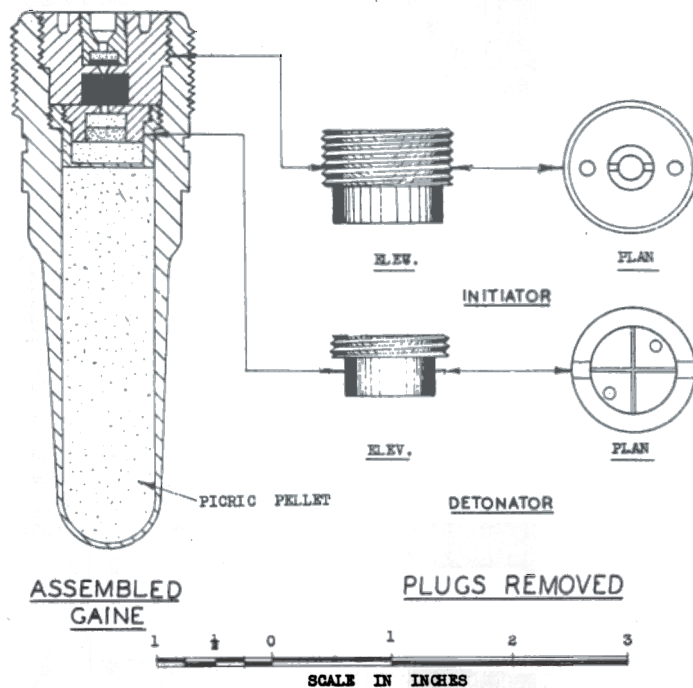
REFER E IN C BDTI B/10/93

SER. 1. — IMPROVED INSTANTANEOUS

FIG. III.
SHEET
1.



SER. 2 — ORDINARY INSTANTANEOUS



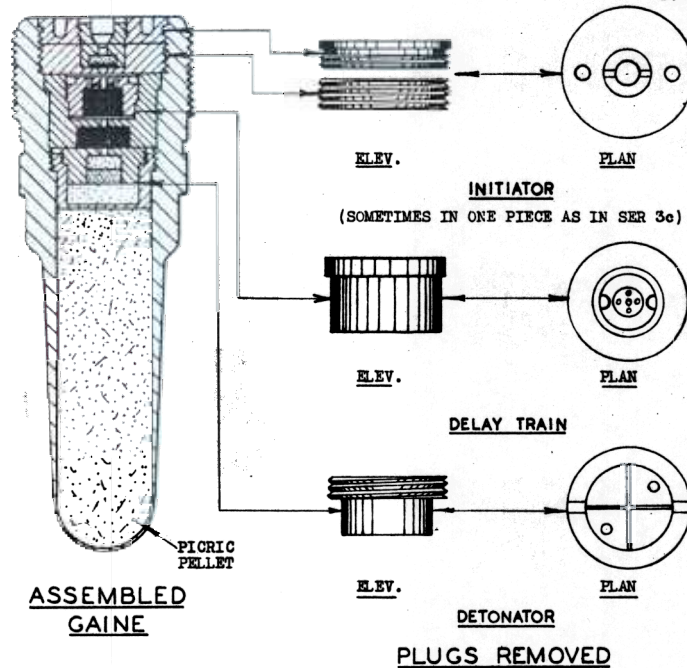
JAPANESE STANDARD GAINES

USE - NAVY AIRFORCE
TYPE BOMB FUZES

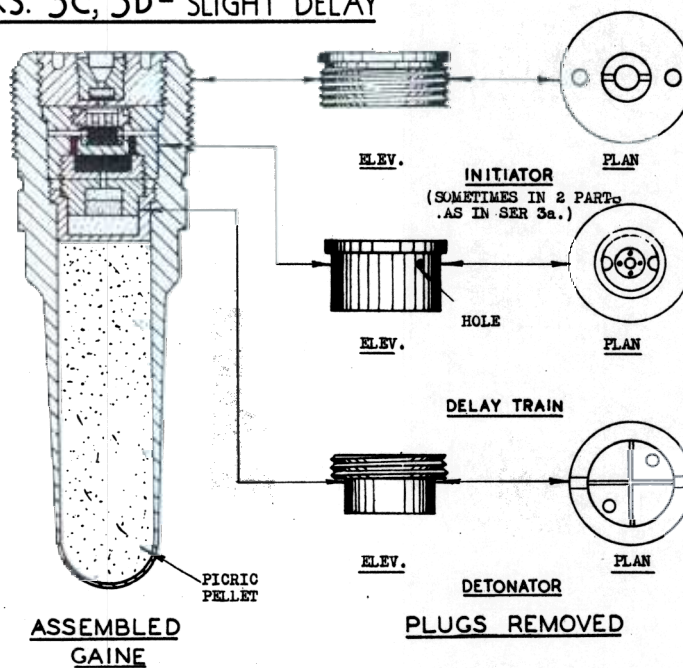
REFER E IN C BDTI B/10/'93

SERS. 3A, 3B - SLIGHT DELAY

FIG. 111.
SHEET
2



SERS. 3C, 3D - SLIGHT DELAY



1 1/2 0 1 2 3
SCALE IN INCHES

13.

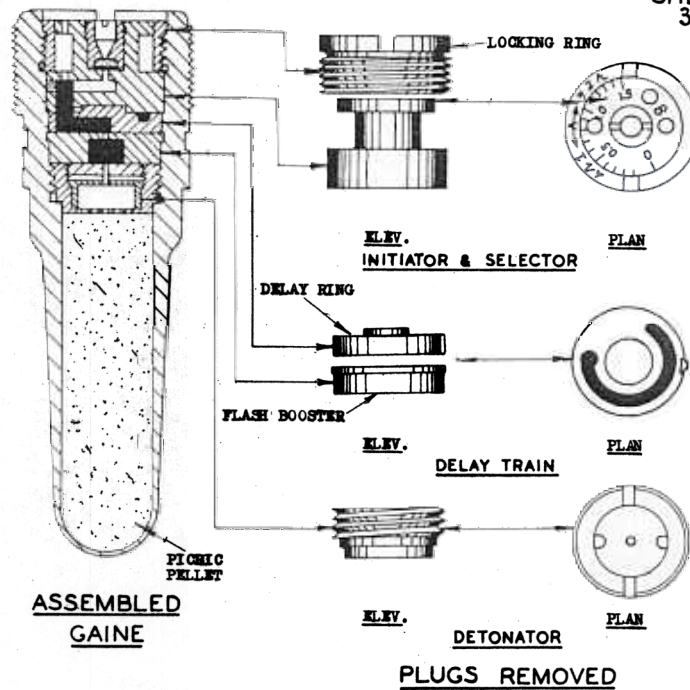
JAPANESE STANDARD GAINES

USE - NAVY AIRFORCE
TYPE BOMB FUZES

REFER E IN C BDTI B/10/93

SER 4 - SELECTIVE

FIG. III
SHEET
3



MAGAZINES, FUZE, INCENDIARY BOMB - JAPANESE

1. INTRODUCTION.

- (a) The term "MAGAZINE", when used in respect of JAPANESE bombs, means the explosive component of a NAVY Fuze used for initiation of certain incendiary bombs
- (b) The function of a Magazine is to initiate a LOW explosive ignition charge, e.g. BLACK POWDER; hence its use in the fuze system of such bombs as 60 Kg Type 98 (Solid Oil) and 60 Kg Type 97 (electron) incendiary bombs
- (c) A Magazine is NEVER used where H.E. is to be initiated
- (d) It is a self-contained unit, housing all the explosive constituents of the fuze system
- (e) It can be screwed into any fuze which will take a Navy type Standard Gaine (see BDTI B/10/93), the upper portion of which it is a replica.

NOTE 1 :- Specimens recovered to date have been found in A.3(A) fuzes only.

2. DESIGNATION OF TYPES.

- (a) As for Gainses and Booster Systems, Magazines and component parts are temporarily designated by a common SER NO.
- (b) The particular SER NO is derived from TABLE 1 of BDTI B/10/93, and thus denotes time lag in the initiating system, which in turn is a clue to purpose of the bomb in which used.

NOTE 2 :- When referring to abovementioned TABLE read fire damage as the ultimate object of the bomb and disregard all reference to cratering

3. DESCRIPTION. (See FIGS I and II)

Component parts comprise :-

- (a) CONTAINER of tinned high strength brass lacquered a dull greenish yellow, which is -
 - (i) externally of a standard shape and size, having a standard male r.h. thread for screwing into fuzes named in para 1 (e).
 - (ii) internally of construction shown in drawings to accommodate the particular combination of plugs used.
- (b) INITIATOR CAP PLUGS of high strength brass and identical in all respects to the corresponding plugs used in Standard Gainses (BDTI B/10/93, TABLE 2), the SER NOS of which they bear. It is actuated by piercing of a striker point.

(c) DELAY TRAIN PLUGS (when used) of high strength brass and identical in all respects to the corresponding plugs used in Standard Gaines, SER NOS of which they bear (see NOTE 3). Is initiated by flash from (b)

(d) BOOSTER PLUGS of high strength brass containing GUNPOWDER ONLY which is ignited by flash from (b) or (c) above. Function is to boost flash to ensure initiation of the black powder charge in the bomb. The plug may screw into container with a r.h. thread, or it may be a slip fit.

NOTE 3 :- Actual delay has not been timed, but is practically certain to be a fractional part of a second.

4. TYPES OF MAGAZINES RECOVERED TO DATE.

See TABLE I and FIGS I and II.

5. DISPOSAL.

See BDTI B/10/93, para 15, giving procedure which should be followed with the EXCEPTION that where a Magazine is to be demolished, it will be placed in a pit and destroyed by fire, care being taken to see that adequate safety precautions are observed.

TABLE I - TYPES OF MAGAZINES - (DEC 43)
(REFER TO FIGS I and II)

SER NO. See NOTE 4	PLUG COMBINATIONS	JAP. DESIGNATION	REMARKS
1	(i) Ser. 1 Initiator (ii) Booster	"Type No 6 Mark 2"	Improved Instantaneous action. No colour markings.
2			No specimens yet recovered
3	(i) Ser. 3 Initiator (ii) Ser. 3 Delay Train (iii) Booster	"Type No 6"	Fractional Delay Action. No colour markings

NOTE 4 :- See para 2 for significance of SER NO.

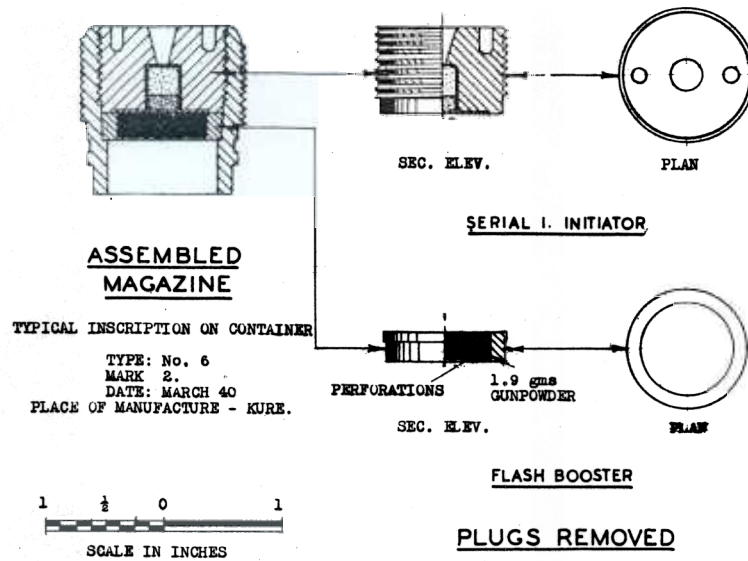
JAPANESE MAGAZINES, FUZE, INCENDIARY BOMB

USE - NAVY AIRFORCE
TYPE BOMB FUZES

REFER E IN C BDTI B/10/94

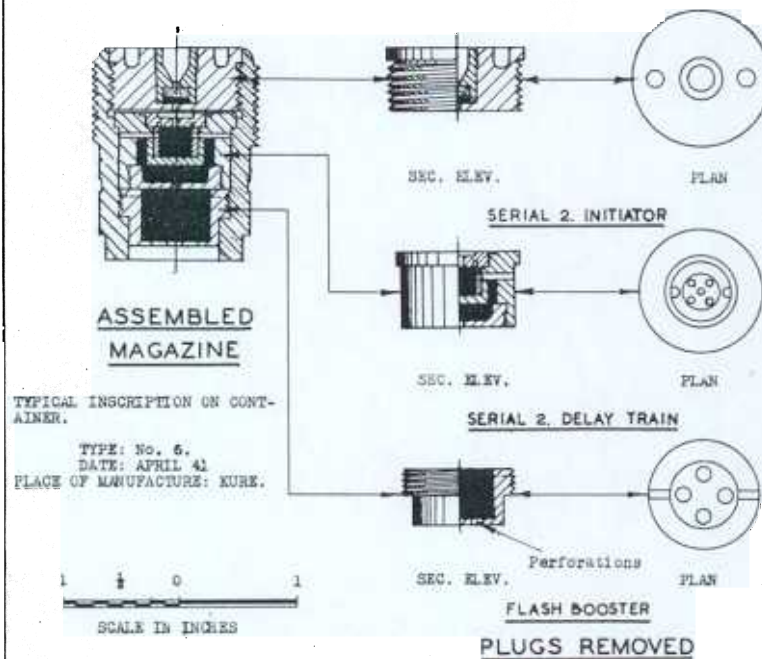
SER. 1 - IMPROVED INSTANTANEOUS

FIG. 1



SER. 1 - SLIGHT DELAY

FIG. 11



JAPANESE AMMUNITION

20 mm

1. PRELIMINARY.

Ammunition of this type may be encountered in a "safe" condition, or may possibly have been fired but failed to explode, in which case it is then in a very DANGEROUS state and methods laid down for handling must be strictly adhered to by RAE personnel when called upon to dispose of it.

The weapons in which this ammunition is used are aircraft cannon, AA guns and AA/A.Tk guns.

2. TYPES OF AMMUNITION.

Owing to similarity in fuzing and construction a typical description applicable to all present known 20 mm ammunition will first be given, followed by tabulated details of the various types as illustrated by diagrams.

3. TYPICAL DESCRIPTION. (See diagrams)

- (a) Cartridge Cases. These are solid brass of the rimless type, a recess providing the means of extraction. The brass percussion caps are pressed into the cap chambers of the primers which are fitted to the cartridge bases. The case is crimped onto the shell.

Note that there are 3 different sized cases in use corresponding to Types 97, 98 and 99 weapons.

- (b) Propellant. This is graphited nitro cellulose powder in tubular or flake form.
- (c) Projectiles. These comprise a cylindrical steel body fitted with a copper driving band near rear end, the diam. and wall thickness at the forward end being increased and internally threaded to receive the standard type fuze fitted. Projectiles are lacquered different colours according to nature of filling.
- (d) Fuizing. Fuzes are of brass having a male thread for screwing into projectile.
- At the nose of the fuze a brass diaphragm is secured by spinning over the lip of the fuze body. Beneath this is an aluminium striker pin supported on a centrifugal bolt and housed at the lower end in a striker guide. The centrifugal bolt is locked into the fuze body by a detent and spring; beneath the striker guide is the detonator.
- Both striker guide and gaine screw into the fuze body with a left hand thread.
- (e) Gaines. Gaines comprise either a long or a short type, and contain PETN or Cyclonite with a lead azide core
- (f) Action of fuze. On set back on firing the detent compresses the spring beneath it and releases the centrifugal bolt which is then free to fly out

radially under centrifugal force clear of the shell when acceleration ceases. The fuze is now armed and on impact the striker is free to drive into the detonator. For fuze variations see diagrams, Sers 2, 3, 4.

4. PRECAUTIONS WHEN HANDLING.

(a) UNFIRED ROUNDS. Unfired Rounds, such as may be recovered from a crashed aircraft, are relatively safe to handle

(b) FIRED ROUNDS. In handling fired rounds, CARE must be taken -

(i) To hold them by the middle and keep them horizontal or with the nose slightly downward

(ii) To avoid jolting or sudden change of direction

(iii) NOT TO DROP THEM

(iv) When carrying, place not more than 2 shells in a small box, etc., lined with a soft material and separated by a wad of the same material.

5. PRECAUTIONS WHEN BREAKING DOWN.

When it is necessary for some special reason to break down this type of ammunition, extreme care and strict Safety Precautions must be exercised as the fuze components are very delicate and the fillings extremely sensitive.

WARNING :- Yellow phosphorous incendiary filling will burn furiously when EXPOSED TO AIR. The container must NOT be broken down where fire damage will result.

6. DISPOSAL.

Normal method of disposal should be -

(a) UNFIRED ROUNDS.

(i) Drown in deep water, or -

(ii) In a safe area, place in close contact in an excavation about 3-ft x 1-ft x 1-ft deep, but NOT more than four rounds in any one excavation and destroy with a demolition charge.

If necessary, cover the rounds with a filled sandbag as protection against flying splinters

(b) FIRED ROUNDS. Observing special precautions as in para 4 (b) above, either -

(i) Drown in deep water, but the round must NOT be released until the hand holding it is under water, or -

(ii) Proceed as in para 6 (a) (ii) above.

JAPANESE AMMUNITION - 20 m.m.

REFER E IN C B.D.T.I. B/11/72

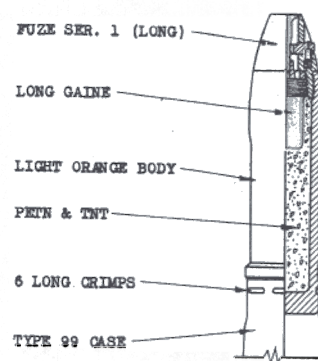
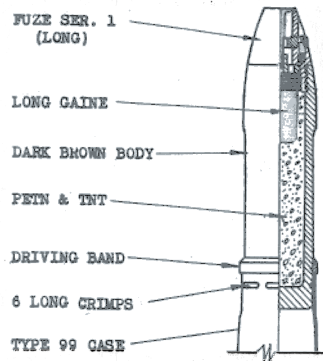
H. E. ONLY

H. E.

SER
A

H. E.

SER
F

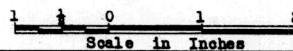
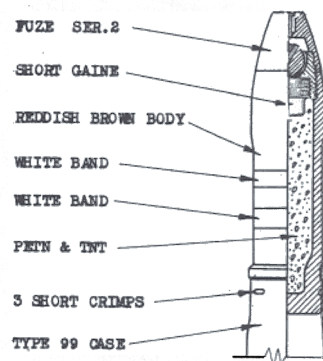
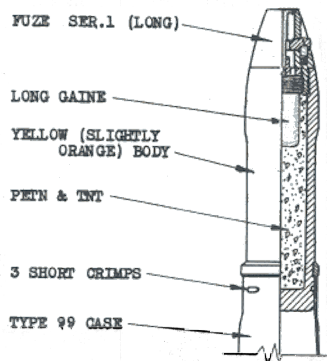


H. E.

SER
G

H. E.

SER
H



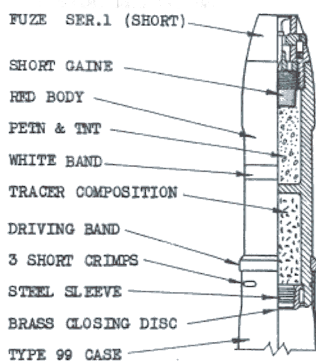
JAPANESE AMMUNITION - 20 m.m.

REFER E IN C B.D.T.I. B/11/72

H.E. WITH TRACER

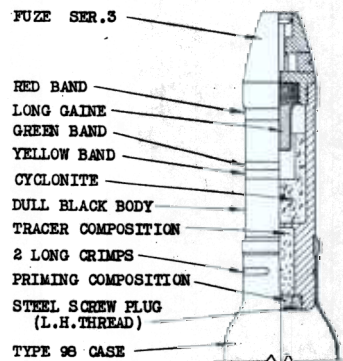
H.E. WITH TRACER

SER
C



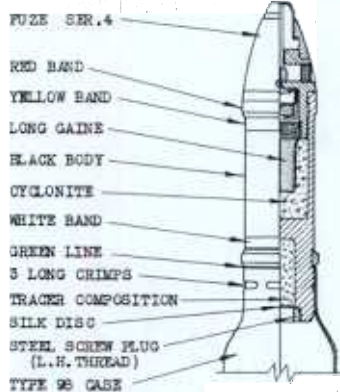
H.E. WITH TRACER

SER
J



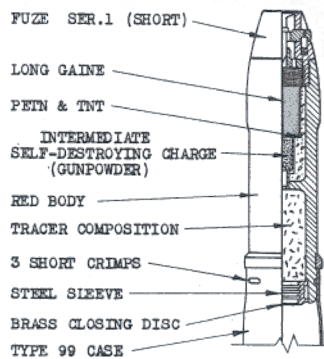
H.E. WITH TRACER

SER
L



H.E. WITH TRACER

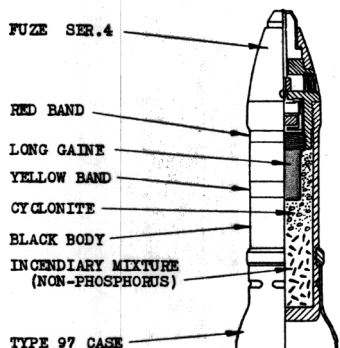
SER
E



H. E. - INCENDIARY

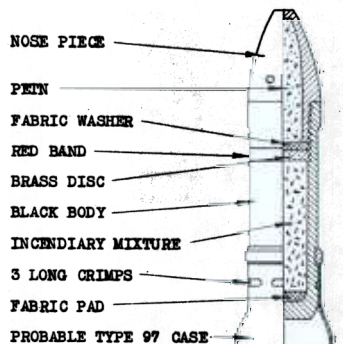
H.E.-INCENDIARY

SER
K



H.E.-INCENDIARY

SER
M



Scale in Inches

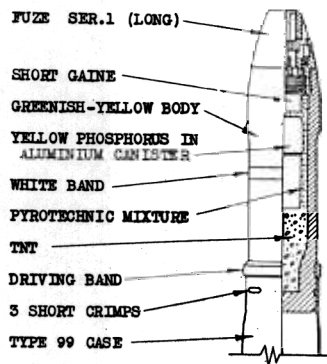
JAPANESE AMMUNITION - 20 m.m.

REFER E IN C B.D.T.I. B/11/72

INCENDIARY

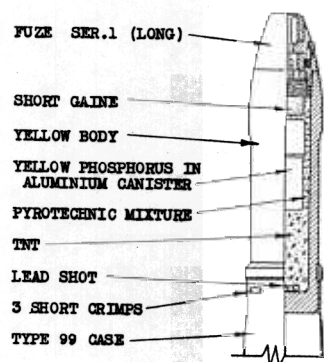
INCENDIARY

SER
B



INCENDIARY

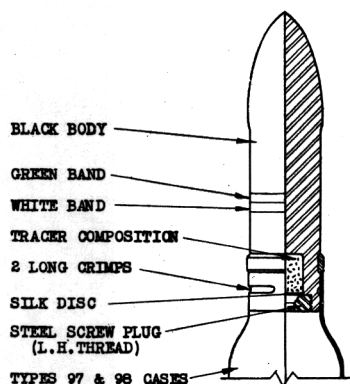
SER
D



A.P.

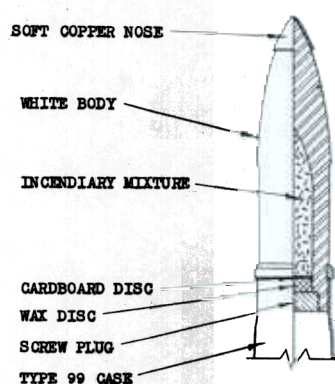
A.P. WITH TRACER

SER
J1



A.P.-INCENDIARY

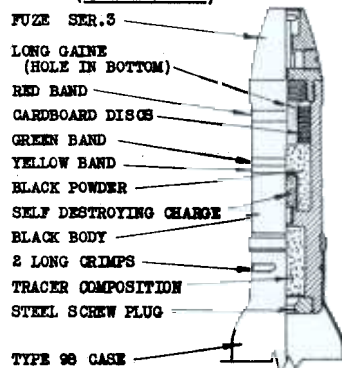
SER
I



PRACTICE ROUNDS

PRACTICE ROUND (EXPLOSIVE)

SER
N



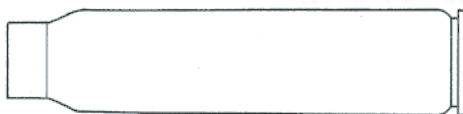
1 0 1 2
Scale in Inches

JAPANESE AMMUNITION - 20 m.m.

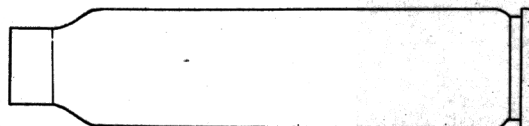
REFER E IN C B.D.T.I. B/11/72

TYPES OF CARTRIDGE CASES

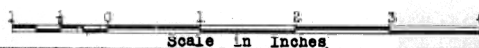
TYPE - 97



TYPE - 98



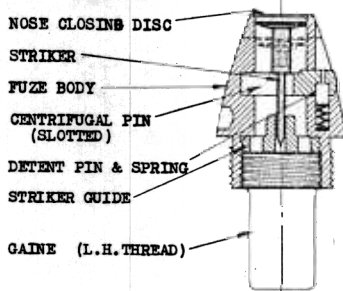
TYPE - 99



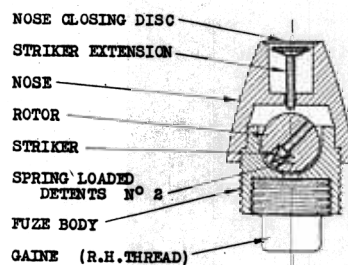
TYPES OF FUZES

SER 1

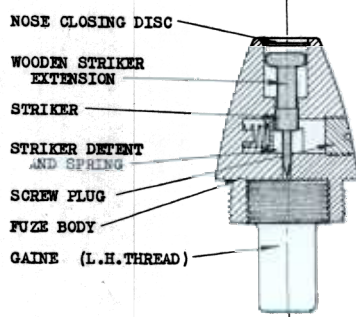
NOTE:- DOTTED LINES SHOW SECTION FOR SHORTER FUZE OF SAME TYPE.



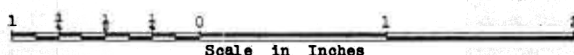
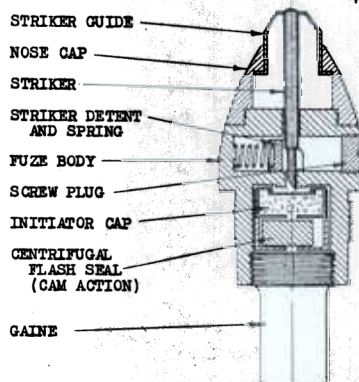
SER 2



SER 3



SER 4



C

**GERMAN
BOMBS, AMMUNITION, ETC.**

- Sec. 12 : H.E. Bombs**
- 13 : Anti-personnel Bombs**
- 14 : Incendiary Bombs**
- 15 : Miscellaneous Aerial Missiles**
- 16 : Fuzes**
- 17 : Disposal Techniques**
- 18 : Miscellaneous Data.**

**MISCELLANEOUS
TECHNICAL INSTRUCTIONS**

Sec. 19 : Destruction of Bombs, Ammunition, Etc.
20 : General

D

DESTRUCTION OF A HE BOMB BY DETONATION

1. WHEN BOMB IS EXPOSED.

A simple way of destroying a fuze HE bomb is to detonate a charge of explosive in close contact with -

- (a) the barrel of the bomb, which would be usual for END-fuzed bombs (e.g. most Japanese types), or
- (b) the fuze of SIDE-fuzed bombs (e.g. German types) if easily accessible, otherwise as (a) above.

2. WHEN BOMB HAS BEEN DEFUZED.

- (a) Detonation of most JAPANESE HE bombs can be achieved by inserting through the fuze opening a CE primer (or equivalent) in direct contact with the main filling and firing with a detonator
- (b) In GERMAN type bombs when the fuze has been withdrawn but the picric pellets remain in the pockets (in a dry state), detonation of the bomb can be achieved by inserting a CE primer (or equivalent) in contact with the picric pellets and detonating it. When a filled fuze gaine is available, the bomb can be detonated by inserting the gaine in its picric ring in the fuze pocket and firing with a detonator.

3. WHEN BOMB IS NOT VISIBLE AND/OR FUZE UNIDENTIFIED.

If an attempt is made to blow up a bomb of 50 Kg and over which -

- (a) is not visible, or
- (b) the fuze has not been identified,

and the bomb fails to detonate, there is a possibility that it is a CLOCKWORK type fuze and the clock has re-started. This being so, always assume that such is the case and again apply the usual Safety Period (unless it is a CATEGORY A bomb).

It will be seen that, whenever possible, it is far preferable to uncover the bomb before adopting either of the following alternative methods for destroying the bomb.

(a) Hole of Entry Method.

- (i) Instances sometimes occur, especially in clay soils, where the hole of entry is found to be clear right down to the bomb, the tail fins having remained attached to the bomb and probably crumpled up. In some of these instances it will be possible to place a charge of explosive touching the tail cone or near enough to the bomb to cause detonation (but see NOTE 1 and para 4 below) and exploding bomb with a charge as indicated in TABLE 1.

NOTE 1 :- This method is not suitable for those bombs which have tail cones empty of explosive. Clear evidence of the type of bomb is therefore necessary.

DEMOLITION OF BOMBS IN DUMPS

1. OBJECT.

To safely destroy dumps of bombs with maximum speed and efficiency.

2. PRELIMINARY.

It must be borne in mind that normally the detonation of a bomb is produced by a detonator surrounded by a booster which is in close contact with the main filling.

When blowing up bombs, the demolition charge can rarely be in such a favourable position as the booster with regard to proximity to main bomb filling. An exception is when the demolition charge can be placed in the fuze pocket of the bomb, but normally fuzes will NOT be removed for this purpose.

NOTE 1 :- The demolition of an individual bomb is dealt with in BDTI D/19/63

NOTE 2 :- To demolish a small number of bombs simultaneously, suitable contact charges are placed between the bombs.

3. METHOD OF DEMOLISHING BOMBS IN STACKS. (HE Bombs)

A STACK is defined as a row of bombs one or more tiers in height.

To demolish a STACK of bombs, special precautions must be taken in order to obtain reliable results. Such special precautions are -

(a) BOMBS MUST BE IN CONTACT. All the bombs in a stack, whether in one or more tiers, MUST touch their neighbours. When bombs are gathered and stacked, aim at "line" contact rather than "point" contact. Some arrangement may be necessary for bombs having projecting rivet heads. Bombs not parallel-sided should alternate head to tail.

(b) CHARGES MUST BE ADEQUATE. The charge to be used at each firing point must be of requisite power. See TABLE 1 for quantities of explosive required in various cases.

(c) LIMITATION OF NUMBER OF BOMBS IN A STACK. The number of bombs in a stack should be limited by con-

TABLE I
CHARGES REQUIRED FOR DETONATING THROUGH
BOMB CASING

BOMB TYPES	WHETHER FUZED OR NOT	CHARGE REQUIRED AND PLACEMENT
JAPANESE Small Cluster Bombs	Fuzed	One 1 oz CE primer (or equivalent) in contact with barrel of bomb
JAPANESE GP Types	Fuzed or unfuzed	Two 1 lb slabs TNT (or equivalent) in contact with barrel of bomb
JAPANESE SAP and AP Types	Fuzed or unfuzed	Four 1 lb slabs TNT (or equivalent) in contact with barrel of bomb
GERMAN Small Anti-Pers types	Fuzed or unfuzed	One 1 oz CE primer (or equivalent) in contact with bomb body
GERMAN S.C. (thin wall) types	Fuzed	1 lb slab TNT (or equivalent) in contact with head of electric fuze
Do	(a) Fuze fitted but inaccessible (b) Unfuzed	Two 1 lb slabs TNT (or equivalent) in contact with barrel of bomb
GERMAN SD (thick wall) types	Fuzed	Two 1 lb slabs TNT (or equivalent) in contact with head of electric fuze
Do	(a) Fuze fitted but inaccessible (b) Unfuzed	Four 1 lb slabs TNT (or equivalent) in contact with barrel of bomb

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- (b) CHARGES MUST BE ADEQUATE. The charge to be used at each firing point must be of requisite power. See TABLE 1 for quantities of explosive required in various cases.
- (c) LIMITATION OF NUMBER OF BOMBS IN A STACK. The number of bombs in a stack should be limited by consideration of the estimated blast and fragmentation effect in relation to available cover for personnel in the vicinity.

The number of bombs recommended to be detonated together in one stack is given in TABLE 1 below.

- (d) SAFETY DISTANCE. For stacks as per TABLE 1, a MINIMUM distance of 1,000 yards from a stack should be observed.
- (e) DEMOLISHING SEVERAL STACKS TOGETHER. Several stacks may be blown up together if joined by primacord or equivalent instantaneous detonating fuze.

In such a case, or if the size of an individual stack is greater than that recommended in TABLE 1, the safety distance must be suitably increased.

- (f) FIRING POINTS. The number of firing points employed depends on the number and type of bombs. When thick-walled bombs larger than 50 Kg are to be detonated, smaller thin-walled bombs, if available, should be placed over a row of the thick-walled bombs at the firing points, and the charge placed between the thick and thin walled bombs. TABLE 1 gives the number of firing points per stack for common types of bombs.
- (g) LOCATION OF CHARGES.
- (i) To obtain the best results the charges must be placed as described below. They must NOT be concentrated near the bottom and/or midlength
 - (ii) If the stacks are higher than two tiers, the charges should be placed below the top tier, and where two charges must be used they are normally placed at one quarter and three quarters the length of the stack measured from one end.
- (h) STACKS MORE THAN 50 YARDS APART. If the stacks are located at distances greater than 50 yds apart boosters in the form of C.E. primers or gellignite should be attached to the detonating fuze at intervals no greater than 100-ft.

NOTE 3 :- When necessary to demolish larger stacks than those given in TABLE 1, the weight of charges used will be as given, but the number of firing points will be increased.

NOTE 4 :- The number of firing points for bombs greater than 500 Kg should be reckoned as ONE PER THREE BOMBS.

NOTE 5 :- Bombs of weight greater than 1,000 Kg should be demolished singly.

TABLE 1

Weight of Bomb in Kgs	Thin-walled			Thick-walled		
	No. of bombs in stack	TNT per charge lbs.	No. of Firing Points	No of bombs in stack	TNT per charge	No. of Firing Points
10-15				100	1	2
50	100	1	2	50	2	3
100	50	1	2	30	2	3
200	40	2	2	-	-	-
250	40	2	2	20	4	3
500	20	3	5	10	5	3
800	12	4	4	-	-	-
1000	4	4	2	1	6	1
Greater than 1000	1	4	1	1	6	1

DESTRUCTION OF BOFORS AMMN 40 m.m.
(Subjected to Bomb Blast)

1. FOREWORD.

- (a) RAE may be called upon to dispose of a quantity of Bofors Ammn 40 m.m. which has been subjected to bomb blast. Instructions for the safe handling of such damaged ammunition is therefore given and should be STRICTLY adhered to.
- (b) Only in the most exceptional circumstances and where it is obvious that the ammunition has been rendered unserviceable and/or dangerous will action be taken and then NOT until an I.O.O. has certified that it should be destroyed.

2. SENSITIVITY OF COMPONENTS.

The possible effects of damage to this type of ammunition resulting from bomb blast are assessed as follows :-

- (a) Primer. This might be rendered a little more sensitive to shock as a result of portion of the detonating composition from the cap having been shaken free. This does not constitute a source of danger if a damaged round is handled carefully.
- (b) Propellant. Stabilized and relatively safe to handle.
- (c) Igniter Shell, No 12, Mk I. As in the case of the Primer, loose composition in the cap might cause an increase in the sensitivity to shock, and careful handling is necessary.
- (d) Shell Filling. The several high and low explosives constituting the shell filling are relatively safe if handled carefully, but ammunition showing signs of having been subject to considerable heat, must be handled with special care.
- (e) Fuze. A nearby explosion may be sufficient to release the arming mechanism and set free the hammer and needle. This constitutes the greatest danger. Shock from explosion may also release the shutter, thus leaving the detonator pellet free to move.

3. METHOD OF DISPOSAL RECOMMENDED.

The normal method of disposal should be dumping in deep water. The following precautions must be STRICTLY followed :-

Precautions.

- (a) Hold a damaged round at or near the point of balance whilst raising, carrying or lowering.
ALWAYS KEEP HORIZONTAL.
- (b) Avoid jolting, sudden change of direction, and above all, do NOT drop it.

- (c) For transporting, spread a layer of sand not less than 6" thick on floor of truck, separate the rounds and embed in sand to prevent movement. The number of rounds which should be carried in any one trip is dependent on circumstances, such as number to be dealt with, time available, etc., but minimum loading should be aimed at. The back of the driver's cabin should be protected by filled sandbags.
- (d) In lowering into water, do not release round until the hand is under water.
- (e) Employ only the minimum number of personnel.

DISADVANTAGES IN OTHER METHODS OF DISPOSAL.

- (a) Destroying singly. Recommended only if small quantities are involved. Destruction singly of large quantities means wastage of demolition stores, excessive handling and time involved.
- (b) Destroying in bulk. Because of the long tapering shell case and smallness of shell, close contact between shells is difficult to obtain, and explosion of all components is uncertain. Excessive handling is involved.
- (c) Burying. Not permissible.

ELEMENTARY SAFETY PRECAUTIONS FOR BOMB DISPOSAL

1. ONLY THE MINIMUM NUMBER OF MEN REQUIRED FOR THE JOB ARE TO BE ALLOWED NEAR THE BOMB.

2. SAFETY DISTANCES must always be observed by all ranks not detailed for work near the bomb; and on completion of a task.

Men are safe against bombs up to 500 Kg :-

(a) In a trench 80 ft from the bomb

(b) Behind a 14" brick wall, or 2'6" sandbag wall, 80 ft from the bomb

NOTE :- For bombs over 500 Kg those distances must be doubled.

Bomb splinters may travel 1,200 yds, therefore always keep under cover if possible. If you must be in the open, lie down. When lying down, men are reasonably safe against a buried bomb at 100 yds and against a bomb on the surface at 300 yds.

3. Transport and plant not in use must be parked at a safe distance or behind a suitable intervening structure.

4. Excavations which may fall in must be timbered from the start. Timbering cannot be done in safety after the sides start to cave-in.

5. Camoufllets, which are underground chambers filled with poisonous gas, are most likely to occur with bombs up to 100 Kg, but can occur with larger bombs. Remember that :-

(a) A rope, fixed at the top and with a loop tied at the bottom, must be kept hanging down in the excavation to serve as a life-line

(b) The floor of the excavation should be frequently probed to see if there is a cavity below. Gas hissing out of a probe hole or the sudden petering-out of the track are signs of a camoufllet. The NCO in charge of the digging party may use the probe for this purpose but must NOT use it in places where it is likely the bomb will be met unless he has attended a Course in Bomb Disposal.

(c) If there is the slightest suspicion of a camoufllet, men excavating must WEAR life-lines

(d) If a camoufllet is detected, the excavation will be quitted until further orders from the responsible RAE officer or NCO

(e) THE SERVICE RESPIRATOR GIVES NO PROTECTION AGAINST THE GASES IN A CAMOUFLET.

6. Men digging down to a bomb must not hit it with a pick or other tool.

7. Before work is started each day (this refers to other than CATEGORY A bombs) the NCO in charge of the dig-

ging party must find out from the responsible RAE officer or NCO if, when the bomb is reached, work should continue until the fuze/s are exposed.

8. After completing the work ordered, the whole digging party will retire to a safe distance until the responsible RAE Officer or NCO arrives and takes charge.

9. If, during the absence of the responsible RAE officer or NCO, there are obvious signs that a Category "A" bomb is being neared and will be reached ahead of his expected time of return, the NCO or senior sapper in charge of the digging party will at once despatch a message to that Officer or NCO stating altered time the bomb is expected to be uncovered.

10. When exposing fuzes, the earth must be carefully scraped away from around them, taking care not to move the bomb, or undercut the ground beneath it so causing it to move of its own accord.

11. BOMBS WILL NEVER BE MOVED UNTIL THE RESPONSIBLE RAE OFFICER OR NCO GIVES THE ORDER.

12. When it is intended to destroy a bomb in situ, only sufficient of the body of the bomb will be uncovered so as to enable placement of a demolition charge.

13. When the fuze of a bomb is identified as being of CLOCKWORK type and the bomb is accidentally moved, the digging party must retire to safety and await orders before proceeding UNLESS an Electric Stethoscope is available on the spot and NO ticking is heard when listening with it. Similar action should be taken in the case of a fuze which has not been identified.

14. When ordered to "expose the fuze", remember that some types of Japanese bombs are fuze'd at nose and tail, and that both ends of such types must be uncovered. Immediately on exposing the fuze or fuzes, the digging party will at once retire to safety and await further orders of the responsible RAE Officer or NCO.

No fuze, base plate or attached fins will be interfered with except on the order of the responsible RAE Officer or NCO.

SAFETY PRECAUTIONS SUMMARIZED

(A) FOR BOMBS OF ANY NATIONALITY

1. Only the minimum number of men required for the work should be allowed near the bomb.
2. Safety Distances as laid down must always be observed.
3. All special equipment likely to be required for the rendering safe or disposal of a bomb must be on the site before the bomb is uncovered.
4. All special equipment must be maintained in first class order ready for instant use.
5. Excavations must be timbered from the start when there is any possibility that the sides may cave in.
6. The possibility of a Camouflet must be constantly kept in mind and precautions taken as laid down in BDTI D/20/29, Part B.
7. A probe should be constantly used during excavation with a view to locating the bomb, or the presence of a camouflet, at the earliest possible moment (but see BDTI E/21/90, Para 6).
8. Non-magnetic probe and non-magnetic tools must always be used within 2 feet of a mine suspected of being activated by magnetic influence (e.g. German "G" type or similar mine).
9. As the bomb is approached during excavation, and thereafter until final disposal, care must be taken NOT to -
 - (a) cause unnecessary vibration
 - (b) hit the bomb with tools, timbers, etc.
 - (c) jump into the excavation.
10. A bomb must never be moved or disturbed until the fuze or fuzes have been identified.
11. No method involving the application of heat for removing bomb fillings must be used on a bomb retaining a chemical long delay type fuze, or on a bomb containing stemmed ammonal filling.
12. When bombs are being steamed-out, the process must be continuous until the filling is completely expelled.
13. When high explosive is touched with the bare hands or settles on the skin, the contaminated part must be washed with soap and water (preferably warm) as soon as possible.
14. If for any special reason it is necessary to transport a fused bomb, fired ammunition, etc., only one man should accompany the driver in the lorry.
15. Safety Precautions will be strictly observed during final disposal, especially when burning-out bombs and destroying bombs, ammunition and explosives. Always place the bomb, etc., in an excavation.

16. It must be constantly borne in mind that no bomb, etc., can be considered safe until it is finally disposed of.

(B) SPECIAL FOR JAPANESE BOMBS

17. When the bomb is being approached during excavation, and thereafter until it is dealt with, no pressure must be applied in the immediate proximity of the bomb as might be transmitted to and cause a sensitive fuze to function.

18. Power tools should not be used within 2 ft of the bomb after it has been located by probing.

19. When attempting to expose a fuze in the end of a bomb which is slanting, remove only sufficient earth for the purpose, taking care not to undermine the bomb and so cause it to slide.

20. Before a bomb is moved or disturbed, the fuze or fuzes should first be rendered safe for handling by the method laid down for the particular fuze or fuzes found fitted.

21. Bombs should be defuzed before being brought to the surface unless there is a strong reason for acting otherwise.

22. When a fuze is extracted from a bomb the complete fuze assembly (including gaine, detonator or booster) will be destroyed remote from the filled bomb or expelled filling. The parts must not be separated unless there is special reason for doing so.

23. If it is necessary to strip a fuze assembly and it is not absolutely certain that the striker needle is clear of the initiator cap, do NOT attempt to unscrew the gaine, detonator or booster unless -

(a) the fuze has first been treated with an explosive neutralizer, or

(b) dismantling of parts dangerous to move is done by remote control.

24. Never employ the burning-out method (especially where damage will result from an explosion) unless absolutely certain that the bomb filling is of a type which will not be instantly detonated thereby.

PRECAUTIONS WHEN HANDLING EXPLOSIVES

REFERENCE. Refer BDTI D/20/57.

1. PRECAUTIONS AGAINST SKIN DISEASES.

- (a) If high explosive filling from bombs and mines is handled for any length of time or allowed to come in contact with the skin, it may be introduced into the system (especially through cuts and scratches) and, if so, it may produce severe indisposition or cause dermatitis. Skin diseases are very easily contracted from fillings of most Japanese bombs if precautions are neglected.
- (b) If DRY explosives are handled whilst cold, the hands and forearms must be washed immediately afterwards with soap and water (preferably warm). If the handling extends over a period, washing as above must be repeated at frequent intervals during the handling. Rubber gloves as issued should be worn whenever possible and the gloves thoroughly washed and dried afterwards.
- (c) Infection may be easily contracted when fragments of bombs (especially some Japanese types) are handled whilst "HOT". Rubber gloves should always be worn when fragments of freshly exploded bombs are being handled and care taken not to inhale fumes.
- (d) When bombs are being steamed-out, rubber boots and gloves anti-gas should be worn. Ordinary rubber gloves (housewife pattern) do not give adequate protection. Hexanite and Anisol especially, in addition to being poisonous, have an effect upon the mucous membrane of the mouth and nose, and on the lungs, and are of an extremely painful and harmful nature. In steaming-out operations and during cleaning of apparatus later, the respirator MUST be worn if the work is being done in a closed space. Care must be taken to see that the respirator and other anti-gas equipment are thoroughly cleaned and dried afterwards. As an added precaution, locate the boiler, wherever possible, up wind of the site where the operation is being carried out.
- (e) Contact between hand and face should be avoided and hands MUST be washed if food is taken before steaming-out is completed.
- (f) Splashes of wet explosive should be wiped off clothing immediately and any part contaminated should be washed as soon as possible.
- (g) For washing any part of the body, sodium bicarbonate (1 teaspoonful to 1 pint of warm water) is preferable to soap. Sodium bicarbonate should be carried in each sterilizing lorry.
- (h) When steaming-out mines, rigid precautions as above must be taken.
- (i) Medical attention must be obtained immediately any skin irritation or a deep yellow staining of the skin is noticed.

2. SAFETY DISTANCES.

Filled bombs (and fillings extracted from them) may detonate if they reach a detonating heat, either applied externally or from their own heat. Some types of explosives do so more readily than others. Full safety distances and precautions must always be observed when bomb fillings are being burnt in the open and when bombs are being burnt out. These rules should be impressed on all ranks and steps taken to ensure they are observed.

3. BURNING EXPLOSIVES.

The greater the quantity of explosives burnt at any one time, the greater is the likelihood of detonation. For this reason, no more will be burnt at any one time than the quantities laid down in BDTI D/20/57 for explosives specially mentioned as able to be burned.

4. BURNING WASHED-OUT EXPLOSIVES.

H.E. filling which has been expelled from a bomb by steaming-out or washing-out process must not be allowed to soak into the ground. Corrugated iron or other iron sheeting must be placed in the bottom of the pit or trench and the resultant mass (subject to para 3) burnt in situ the same day.

A gaine or magazine must never be destroyed by the use of an explosive charge in the neighbourhood of the whole or any portion of the expelled mass.

PRECAUTIONS IN USE OF STEAMING-OUT EQUIPMENT

1. REFERENCES. BDTIs E/21/109. D/20/62.

(A) - WHEN STEAMING-OUT PLANT MUST NEVER BE USED

2. CHEMICAL LONG DELAY FUZES.

Bombs having Long Delay Fuzes of the ACETONE - CELLULOID or other CHEMICAL type should NEVER be steamed-out for the reason that heat vastly increases the rate of the chemical action.

3. GERMAN 17 Type FUZES.

Unless fuzes of this type have been immunised by the Stevens' Stopper (refer BDTI E/23/87) bombs fitted with same should NOT be steamed-out as there is danger of heat melting the detent pellet and thus starting the clock.

4. STEMMED AMMONAL FILLINGS.

Bombs containing stemmed AMMONAL fillings must NOT be steamed-out on account of the possibility of formation of a heat sensitive compound of ammonia (by the action of moist ammonia nitrate and aluminium, or by bacterial action in the soil). and TNT (see BDTI D/20/117 for removal of such fillings).

(B) - SPECIAL PRECAUTIONS

5. To prevent building up of high temperatures, the following procedure must be adopted :-

(a) STEAM PRESSURE (at Boiler end of Steaming-out Hose) must NOT exceed 50 lbs per sq-in

(b) The bomb must be UNLAGGED, and wherever possible, completely uncovered

6. LENGTH OF HOSE EMPLOYED.

This must NOT be less than 180-ft.

7. CONTINUITY.

The steaming-out process must be continuous until the filling is completely expelled.

8. PICRIC FILLINGS.

For special precautions see BDTI D/20/62.

(C) - BOMBS FILLED WITH SEPARATELY WRAPPED BLOCKS

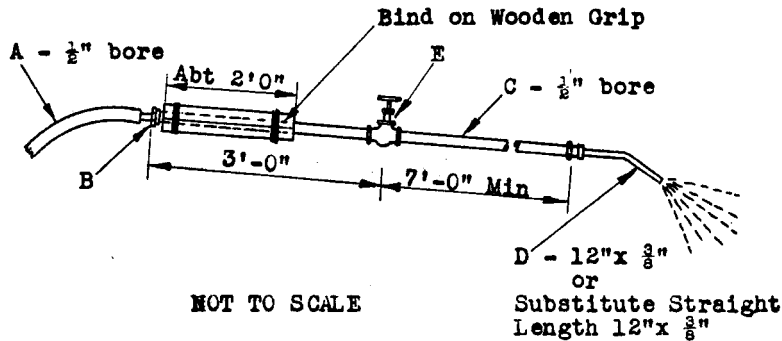
9. Normal procedure using standard hose equipment as described in BDTI E/21/109 is NOT satisfactory with bombs of this type due to clogging action of the wrapping material employed. Methods of removal of such fillings come under two headings :-

(a) Base-plate type bombs, procedure in which case is described in BDTI D/20/117, and -

(b) Non-Base-plate type bombs (which cannot be dismantled). These may be dealt with in an emergency as described in para 10 below.

10. IMPROVISED HAND STEAMING-OUT ATTACHMENT.

- (a) CAUTION :- This method is NOT suitable for use in an excavation and must only be used on bombs which, for some reason sufficiently important to justify the use of this method, must be dealt with by the steaming-out technique.
- (b) The improvised attachment should comprise the following (see sketch below) :-
- (i) Short length of steam hose (A) fitted with Albany Type couplings (B), one end connecting with Y piece of the main steam hose, the other connecting with -
 - (ii) A short length of steam pipe (C) fitted with a Vapour Nozzle (D) and a Nozzle Valve (E).



- (c) Procedure is as follows :-
- (i) The operator must wear full protective clothing including goggles and gloves.
 - (ii) He must work on the upwind side of the bomb.
 - (iii) The steam pipe jet is inserted through the trepanned hole, and/or fuze pocket, and the filling broken down by the action of the steam and soda solution, will be ejected by the pressure. From time to time wrapping material from the explosive must be removed by hand using a wooden rod, during which operation the jet of steam will NOT be in action on the bomb.
 - (iv) The same safety precautions apply as for normal steaming-out, except that this operation cannot be performed by remote control. Hence its restricted use for EMERGENCIES only, (vide sub-para 10 (a) above, and NOTE 1 below).

NOTE 1. RESTRICTED USE OF ATTACHMENT DESCRIBED IN PARA 10 ABOVE.

The only circumstance (other than that of para 10 (a) above), under which this attachment may be used, is if standard eqpt is NOT available, breaks down or parts are defective, and the work is of so urgent a nature that steaming-out must be attempted without delay.

PRECAUTIONS WHEN TREPPANNING AND STEAMING-OUT
PICRIC FILLINGS - (Provisional)

1. REFERENCES: E/21/109, D/20/31, D/20/117.
2. WARNING.
 - (a) A proportion of JAPANESE (and FRENCH) bombs are filled with PICRIC ACID explosive in cast (as Lyddite) or powder form, or with an explosive containing various proportions of PICRIC ACID.
 - (b) Dangerous characteristics of this type of filling are :-
 - (i) During steaming-out, sensitive salts may be formed, which could cause whole or partial detonation
 - (ii) If Picric Acid in a dry condition is ground between metallic surfaces, explosion will result.
3. ESSENTIAL PRECAUTIONS.

It has been found that bombs filled with picric can be trepanned and steamed-out with reasonable safety PROVIDED the following Instructions are carefully followed :-

- (a) The lubrication of the cutter must be fully efficient and maintained
- (b) All surfaces coming in contact with the bomb throughout these operations must be kept wet
- (c) Before the trepanning or steaming-out units are removed from the bomb, the whole bomb and apparatus must first be flooded with one or more buckets of water (preferably hot water)
- (d) While the cutting is proceeding, a stream of water should be allowed to run over the trepanning unit and bomb body
- (e) All picric displaced from the bomb and lodged either on the bomb body or the apparatus must be washed off first by the copious use of water and subsequently by the use of a soft cloth and warm water
- (f) All metal surfaces, particularly those of non-ferrous material, which are brought into contact with the picric or have picric deposited on them, must be thoroughly washed down and carefully cleaned after use
- (g) Precautions should be taken to exclude dirt, grit sand, etc. from all working parts or rubbing surfaces
- (h) Steaming-out should be continuous until the filling has been completely removed from the bomb
- (i) The site, after removal of the filling from the bomb, should be kept damp until all operations are complete. Any accumulation of picric should be destroyed by burning, but this must be done in small quantities as the chances of detonation are much greater than with TNT.

4. REMOVAL OF FILLING.

- (a) To remove the filling, washing soda solution should be introduced into the steam supply. The solution is made up by dissolving 30 lbs washing soda crystals in every 10 gallons of water. About 10 gallons of solution will be needed for a 50 Kg bomb, and 50 gallons of solution for a 250 Kg bomb. (see NOTE 1 below).
- (b) The solution is mixed in the 50 gallon tank of the Trepanning and Steaming-out Plant, and should be kept hot by injecting steam. Washing soda solution should be forced into the steam pipe at the rate of ten strokes of the hand pump per minute from the time the main steam valve is turned on until the bomb has been emptied. The picric acid will not be melted by the steam but will be broken down and ejected from the bomb in the form of a Sludge
- (c) It is estimated that a 50 Kg thin-walled bomb will be emptied in about 1 hour, and a 250 Kg thin-walled bomb may take 3-4 hours
- (d) Particular care should be taken on completion of these operations to see that the hoses are well blown through with pure steam and all traces of the washing soda removed from the hoses and all appliances, as washing soda in contact with picric acid forms sensitive picrates.

5. SPECIAL CAUTION.

Any grinding of picric between metal surfaces in a dry condition will probably lead to detonation and almost certainly so if grit is present. If operations have to be suspended for any special reason after picric has been exposed, all surfaces, tools and implements must be cleaned down as stated above before work is resumed.

6. ON BOARD SHIPS.

These operations are not normally suitable for application afloat, unless the bomb has lodged in such a position that subsequent removal of all ejected picric can be ensured. On no account should picric acid be allowed to find its way into bilges, double bottom spaces, pipes or stop cocks.

NOTE 1 :- The large quantity of washing soda crystals is necessary when steaming-out by remote control as the sludge must pass through the small ejection openings of the steaming-out nozzle. If the jet method of steaming-out by hand is resorted to, a weaker soda solution will probably suffice.

EXPLOSIVES USED IN BOMBS

1. FOREWORD.

It is important that the Properties of the various explosives used in bombs should be appreciated by those responsible for bomb disposal in order to -

- (a) Clearly understand treatment laid down for disposal having regard to risk due to the relative sensitivity of the various explosives
- (b) Compute the probable danger from detonants, and
- (c) Identify explosives which may be encountered

The following brief notes describe, in so far as bomb disposal is concerned, the explosives commonly used in aircraft bombs.

LOW EXPLOSIVES

2. BLACK POWDER.

Appearance : Shiny or dull black grain

Use : Ignition charges, flash relaying and timing in fuzes.

3. PYROTECHNICS.

These are of 2 classes :-

- (a) Those commonly called Pyrotechnic delays which are simply black or smokeless powder trains compressed and possibly treated with powdered aluminium or magnesium to vary and control the burning speed
- (b) Those used in Flares for illumination purposes, and in Smoke Signals.

HIGH EXPLOSIVES

4. INTRODUCTION.

High explosives for use in bombs may be divided into 3 classes :-

- (a) Initiators, Detonants or Primary Explosives
- (b) Intermediary or Booster Explosives
- (c) Bursting Explosives.

The explosive train in a bomb is a series of steps by which energy is built up to explode the comparatively insensitive burster charge. The usual sequence is as follows :-

- (1) A DETONATOR containing a small quantity of sensitive detonant which is initiated either directly by pricking, or indirectly by the flash produced on pricking an igniferous cap or detonator situated above it

NOTE 1 :- Delays in the explosive train are usually introduced between the igniferous cap or detonator and the detonant.

(ii) An INTERMEDIARY or BOOSTER EXPLOSIVE which is initiated by the detonator. These explosives are usually easily initiated high explosives whose bulk is kept small for safety reasons. They are much less sensitive to impact than the detonants but are more sensitive than (iii) below.

(iii) A BURSTER CHARGE. Bursting explosives are used as the main filling of bombs and are relatively insensitive to impact, but are initiated by the impulse transmitted by the intermediary.

(A) INITIATORS, DETONANTS OR PRIMARY EXPLOSIVES.

5. DETONATING COMPOSITIONS and CAP COMPOSITIONS.

Mixtures of Mercury Fulminate, Potassium Chlorate and Antimony Sulphide with or without the addition of Gunpowder, Sulphur or Powdered Glass.

Appearance : Dark or light grey crystalline powder.

Use : As these compositions produce a flash when subjected to shock, they are used for igniting either delay trains or detonants. They are always pressed into some sort of percussion cap. The flash is sometimes reinforced by an underlying gunpowder increment.

Sensitivity : Very sensitive to friction, shock or flame.

6. MERCURY FULMINATE.

Appearance : White grey or brown crystalline powder

Use : Mainly as an initiator in detonators but is becoming less commonly used.

Sensitivity : Extremely sensitive to flame, impact and friction. Will always detonate if exposed to flame.

Properties : Stable except for heat and pressure. Ignites at 160 deg C.

Toxicity : Extremely poisonous.

7. LEAD AZIDE.

Appearance : White to buff crystalline powder.

Use : An initiator in detonators.

Sensitivity : Sensitive to flame and impact but not always certain of detonation from impact of a striker.

Properties : Very stable. Explodes at 320-390 deg C.

8. LEAD STYPHNATE.

Appearance : Pale yellow to red-brown crystalline powder.

Use : Commonly used, in combination with Lead Azide, in gaine detonators under German bomb fuzes.

Sensitivity : Extremely sensitive to flame and impact.

Properties : Chemically stable. Ignites at 255 deg C.

(B) INTERMEDIARIES or BOOSTER EXPLOSIVES.

9. TETRYL (CE - Composition Exploding).

Appearance : Canary yellow crystalline powder or amorphous granules (pressed into pellets)

Use : Used in pressed form mainly as a booster because of its high detonating velocity and strength. (Sometimes used in Japanese detonator plugs.)

Sensitivity : Ignites and burns in small quantities but is readily detonated by Lead Azide and Mercury Fulminate

Properties : Insoluble in water. Does not melt under boiling water. Melting point 129 Deg C.

Toxicity : Slight. May cause skin irritation.

Remarks : Acetone is probably the best solvent. Benzene and alcohol also suitable.

POWDERED PICRIC ACID.

See para 14.

RDX (Cyclonite, Hexagen or T4).

Appearance : White finely crystalline substance with chalky appearance..

Use : As an intermediary in many Japanese gaines and small bombs (e.g. 1/3 Kg H.E. Cluster bomb). Usually in the pressed form. Sometimes used in combination with TNT as a burster.

Sensitivity : More sensitive to impact than Picric Acid or TNT.

Properties : Insoluble in water. Does not melt under boiling water. Melting point 203 deg C.

P E T N (Pentaerythritol Tetranitrate).

Appearance : White to greyish crystalline powder.

Use : As an intermediary (e.g. by the Japanese in some shell gainses, and by the Germans in conjunction with a desensitising wax).

Sensitivity : More sensitive to impact than Tetryl.

Properties : Insoluble in water. Melting point 140 deg C.

Toxicity : Not appreciable.

(C) BURSTING EXPLOSIVES.13. TNT (Trinitrotoluene).

Appearance : Usual colour in the bomb is light straw

Use : May be used either in cast or pressed form.
(Cast - as a burster charge in some US, British, German and Italian bombs.)

Sensitivity : Comparatively insensitive to shock and friction. If ignited, burns quietly in small quantities.

Properties : Not soluble in water. Melting point 76-80.5 deg C. Melts to an oily liquid in boiling water.

Toxicity : May cause skin irritation in certain individuals. Inhaled fumes or dust produce a form of jaundice.

Remarks : (a) In the open it will burn without detonating PROVIDED that the quantity is NOT more than would be extracted from a 250 Kg bomb (i.e. 240-275 lbs of explosive) and thinly spread.

(b) When END-fuzed bombs (fuzed) are filled entirely with TNT, the filling can be sometimes almost wholly burnt out before the initiator or booster is detonated.

(c) Bomb may be trepanned (but a German (17) type fuze, if fitted, should first be immunised).

(d) Bomb may be steamed-out PROVIDED fuze is NOT chemical type. Soft soap as a softener should be introduced into the steam supply.

PICRIC ACID (Known as LYDDITE when in cast form).

Appearance : A lemon yellow crystalline substance. Imparts a yellow stain to everything with which it comes in contact.

Use : In a bomb, may be used as a booster or a burster, or both. As a booster it is usually in pressed powder form wrapped in waxed paper. As a burster it may be in (i) preformed blocks of pressed powder, or (ii) cast in blocks, or (iii) cast in the bomb case. In (i) and (ii) the blocks are usually wrapped in waxed paper and embedded in paraffin wax.

Sensitivity : More sensitive than TNT to direct impact.

Properties : Slightly soluble in water. Melting point 120-121 deg C.

Toxicity : A weak poison and harmful if inhaled.

Remarks : (a) Forms dangerous metallic salts with all metals except aluminium and tin. Especially dangerous with lead and iron. Most metallic picrates are primary explosives; note sensitivity of Lead Picrate.

(b) In the open it may be burnt in SMALL QUANTITIES NOT EXCEEDING 25 lbs. Spread in a thin layer.

(c) Transport WET when removing extracted explosive for destruction elsewhere.

(d) Bombs filled with Picric Acid (or Lyddite) and bombs containing a picric acid core, should NEVER be burnt-out as detonation is practically certain.

(e) Bomb may be trepanned PROVIDED method laid down in BDTI D/20/62 is STRICTLY followed. (A German (17) type fuze, if fitted, should first be immunised)

(f) Bomb may be steamed-out by method laid down in BDTI D/20/62 and PROVIDED that a chemical type fuze is NOT fitted. Sodium carbonate should be introduced into the steam supply.

15. HEXANITRODIPHENYLAMINE and TRINITROANISOL.
(Abbrev :- HEXANITE and ANISOL)

Appearance : Distinguishable by its intense orange yellow colour imparted by the Hexanite. Stains the skin orange yellow.

Use : As a bursting charge in the proportion approx 40% Hexanite and 60% Anisol. May be either -

- (a) Cast in the bomb case (Japanese bombs in which the sections are cast in separate operations have a felt and cardboard disc inserted between the fillings on assembly), or
- (b) In the form of pressed blocks wrapped in waxed paper. Sometimes the blocks are embedded in paraffin wax.

NOTE 2 :- A booster, consisting of a cylinder of this explosive in compressed powder form, is sometimes introduced as a tail core in some Japanese 250 Kg H.E. bombs. The cylinder is waxed-paper covered, weighs 1 lb 15 ozs and measures 1'6½" length by 1½" diameter.

Sensitivity : Slightly more sensitive to impact than TNT.

Properties : Will flow at 70 deg C and melts to a mush at about 80 deg C.

Toxicity : Contact with the skin causes severe dermatitis to some individuals. Inhaled fumes are harmful to the mucous membrane of the mouth and nose and to the lungs.

Remarks: (a) May be burnt in the open same as for TNT (see para 13).
(b) END-fuzed bomb may be burnt-out same as for TNT (see para 13).
(c) Bomb may be trepanned (a German (17) type fuze, if fitted, should first be immunised).
(d) Bomb may be steamed-out PROVIDED a chemical type fuze is NOT fitted. No softener is necessary in steam supply.

16. TRINITROANISOL. (Abbrev :- ANISOL).

Appearance : A colourless crystalline substance in pure form. As a burster in bombs, colour is pale yellow and has a crystalline appearance.

Use : As a bursting charge usually in pressed block form (Japanese wrap blocks in waxed paper with an outer layer of cotton-flannelette cloth, and embed the blocks in paraffin wax).

NOTE 3 : Anisol is also used as a constituent in Hexanite and Anisol.

Sensitivity : About same as Picric Acid.

Properties : Melts to an oily liquid under hot water. Melting point 68 deg C.

Toxicity : Is poisonous and gives rise to severe dermatitis in some individuals.

Remarks : (a) May be burnt in the open same as for Picric Acid (see para 14).
(b) Burster charges should NOT be burnt-out. Will probably behave much the same as Picric Acid.
(c) Bomb may be trepanned (but a German (17) type fuze, if fitted, should first be immunised).

- (d) Bomb may be steamed-out PROVIDED a chemical type fuze is NOT fitted. No softener is necessary in steam supply.

17. RDX/TNT.

Appearance : A whitish crystalline substance of hard appearance.

Use : RDX/TNT (approx. 50/50 mixture) may be used as a burster in cast or block form (e.g. Japanese 30 Kg H.E. bomb in which the blocks are wax-paper wrapped).

Sensitivity : About equal to Picric Acid to impact.

Properties : No details.

Toxicity : As for TNT (see para 13).

Remarks : (a) May be burnt in the open same as for Picric Acid (see para 14).

(b) Bombs containing this filling should NOT be burnt-out as detonation is fairly certain.

(c) Bomb may be trepanned. If fuze is a German (17) type it must first be immunised.

(d) Bomb may be steamed-out PROVIDED fuze is NOT chemical type.

(e) No dangerous reaction with metals.

18. AMATOLS.

These are a group of explosives containing AMMONIUM NITRATE and TNT in various proportions.

Appearance : Colour varies according to proportion :-

- (a) 50/50 - slightly lighter than TNT
- (b) 60/40 - slightly darker than TNT
- (c) 80/20 - about the colour of brown sugar.

Use : As a bursting charge (some US, British and German bombs)

Sensitivity : Less sensitive to shock than Picric Acid. Need efficient intermediary explosive to ensure full detonation.

Properties : Softens or melts (depending on constitution) about melting point of TNT. (Boiling water will melt TNT and dissolve Ammonium Nitrate readily)

Toxicity : Same as for TNT (see para 13)

Remarks : (a) The mixture forms dangerous compounds with tin and copper

(b) The mixture becomes heat-sensitive after prolonged contact with moisture. Bombs which have been in the ground for some time should NEVER be heated.

- (c) May be burnt in the open same as for Picric Acid (see para 14)
- (d) Will behave much the same as TNT (see para 13) when burning-out END-fuzed bombs
- (e) Bomb may be trepanned PROVIDED the method as laid down for PICRIC ACID (see BDTI D/20/62) is STRICTLY followed. If fuze is a German (17) type, it must first be immunised.
- (f) Bombs must NEVER be steamed-out. They may only be washed-out as laid down in BDTI D/20/117, para 4.

METHODS FOR REMOVING BOMB FILLINGS

REFERENCES: BDTIs -

- E/22/37 - Sterilization of Jap Bombs, Use of Thermit Eqpt.
- E/21/109 - Trepanning and Steaming-out Plant Des III
- D/20/31 - Precautions in the use of Steaming-out Eqpt.
- D/20/49 - Precautions when Handling Explosives
- D/20/57 - Explosive Fillings in Bombs
- D/20/62 - Precautions when Steaming-out Picric Fillings

1. FOREWORD.

(a) Permissible cases in which fillings may be removed from a bomb are when -

- (i) for some reason a bomb, either with or without fuze/s, cannot be moved but must be sterilized where it lies
- (ii) for some sufficient reason it is NOT desirable to destroy the bomb by blowing it up
- (iii) salvage of bomb cases and/or fuzes, and samples of filling are required for research or other necessary reasons
- (iv) training purposes.

(b) When it is necessary to remove bomb fillings for reasons stated above, method adopted should be in accordance with a number of governing factors as set out in TABLE 1.

METHODS OF REMOVAL AND FACTORS AFFECTING REMOVAL

2. TABLE 1 lists the approved methods and conditions under which each method applies. Any method involving the application of heat must NEVER be used on a bomb retaining a chemical long delay type fuze, or on a bomb containing a stemmed ammonal filling.

The following methods are described in BDTIs referred to in Col 2 :-

- SER. 1 - Trepanning and Steaming-out
- SER. 2 - Steaming-out through a base filling hole
- SER. 3 - Steaming-out with improvised eqpt.
- SER. 6 - Burning-out with thermit.

3. SER 4 - SIMPLE METHODS FOR BOMBS HAVING DETACHABLE SECTIONS.

As a general rule, DEFUZED bombs having easy detachable sections (i.e. removable base-plates, or nose pieces) should be dealt with simply by unscrewing the detachable portion and then applying steam (or boiling water) externally around the metal of the separated portions with the object of softening the outer skin of a cast filling or, in the case of block fillings, the paraffin wax packing, and so permitting the mass to drop out or be eased out. If the mass fails to come out easily then methods (a), (b) or (c) below should be employed.

Sometimes a base-plate or a nose section is difficult to budge. In this case a steam jet played on the bomb casing all around near the thread will soften the luting or cement on the thread.

Test from time to time with a wrench to see if the plate or section is eased in order to ensure that no more heat is employed than is necessary. In applying heat, the guiding principle is to keep temperatures down as low as possible.

- (a) Cast fillings. Expel by steaming-out or melting-out the explosive by suspending the separated portion of the bomb in a drum of boiling water (no fire under)
- (b) Block fillings in dismantled sections. Expel by means of a jet of steam using an improvised hand attachment, or by melting-out the explosive by suspending the separated portion of the bomb in a drum of boiling water (no fire under)
- (c) Block fillings in base-plate type bombs, using force to push out the complete blocks.

Temporarily plug the nose fuze opening with a wooden plug, tilt the bomb with nose slightly upward, then play a jet of steam all round the bomb body to soften the paraffin wax packing.

Through the nose fuze opening exert firm pressure only with the flat end of a wooden rod of slightly less diameter than the fuze opening (a broom handle is suitable) against the end block and eject the blocks through the base opening. If the blocks do not budge or move with ease, re-plug the nose opening and repeat the steam operation.

ON NO ACCOUNT must the bomb be subjected to blows, the blocks tapped out or other than a flat-ended wooden ram used.

4. SER 5 - IMPROVISED WASHING-OUT (For use on bombs having STEMMED AMMONAL fillings.

STEMMED AMMONAL fillings must NEVER be steamed out (see BDTI D/20/31). Provisional methods of removal are :-

- (a) Where water in sufficient quantity is available, by washing-out the filling with a jet of COLD water
- (b) Where water supply is limited, by dissolving the filling in WARM water. It must be possible to comfortably immerse the hand in the water as it enters the bomb. Boiling water must NOT be used.
- (c) Where no water is available, by removing the filling with a wooden spade or scoop.

After the stemmed filling has been removed by one of the above methods, any cast TNT which has been in contact with the stemmed filling should be disposed of by removing the bomb to a suitable safe area and blowing it up.

TABLE 1

Ser No.	METHODS OF REMOVAL	SUITABLE CONDITIONS		
		TYPE OF FILLING	FORM OF FILLING	TYPE OF BOMB CASE
1	Trepanning a hole in bomb case and steaming-out filling by remote control See E/21/109	All known types EXCEPT STEMMED AMMONAL	Cast in the bomb	Casings which are not easily detachable (See NOTE 1)
2	Steaming-out through the filling hole of a GERMAN bomb. See E/21/109	As for SER. 1	As for SER. 1	GERMAN type with easily removable filling plug
3	Steaming-out, using improvised Hand Attachment See D/20/31	As for Ser. 1	Separately wrapped blocks	Any type
4	Simple methods for detachable bomb cases (para 3 refers)	As for SER. 1	Any form	Base-plate type, or casings fairly easily dismantled (See NOTE 2)
5	Improvised Washing-out See para 4 and NOTE 4 below	STEMMED AMMONAL	Any form	As for SER. 4 only
6	Burning-out with Thermit See E/22/37, NOTE 3 below	All known JAP types EXCEPT PICRIC ACID	Any form	Any type

NOTE 1. It may be necessary to use this method on bombs where base-plates are NOT easily removable, and the risk of jarring the bomb is NOT permissible.

NOTE 2. But method SER. 1 may be necessary if conditions as in NOTE 1 obtain. For use on defuzed bombs.

NOTE 3. This method does NOT allow for recovery of complete bomb cases, as partial detonation at least may occur. For the same reason its use is restricted to tasks WHERE RISK OF FULL OR PARTIAL DETONATION CAN BE ACCEPTED (See para 1 (a) (1)).

NOTE 4. For use on defuzed bombs only.

DISPOSAL OF GAS BOMBS AND MISSILES

1. ABBREVIATIONS USED.

UXB - Unexploded high explosive bomb
UXGAS - Unexploded gas bomb or missile
CW - Chemical Warfare
GIO - Gas Identification Officer (Civil)
A/GAS - Anti-Gas.

2. INTRODUCTION.

As RAE may be called upon to dispose of Gas bombs and missiles which have failed to function or burst open on impact, or may have to dispose of unexploded HE bombs in heavily contaminated areas, the difficulties become negligible if the use of gas as a tactical weapon is fully understood.

To suitably trained personnel with the necessary A/Gas equipment, gas bombs present less hazard and damage than HE bombs, but training in CW is essential if disposal work is to proceed without a hitch. Rapid disposal of gas missiles may be vital from both military and civil points of view.

3. TACTICAL USE OF GAS.

(a) Surprise - Gas should cause NO casualties to bomb disposal personnel unless they are taken completely by surprise. Heavy low spray or other contamination with blister gas may complicate disposal of UXBs but should not interfere seriously therewith.

(b) Harassing effect on morale. When work is to be done in contaminated areas, inconvenience and discomfort is bound to be caused by having to work in respirators and perhaps protective clothing. A high standard of training in the use of A/Gas equipment will reduce inconvenience to a minimum.

Careful administration of the work and imaginative attention to detail can do much towards reduction of discomfort and ensure welfare of those working. The morale of bomb disposal personnel can be maintained by the RAE officer in charge understanding the effects and limitations of the use of gas.

(c) Delaying effect. It is logical to expect that gas would be used in conjunction with HE bombs. Gas would delay repair and rescue work, but should not cause delay to disposal operations if the Unit has been well trained in A/Gas routine.

4. RESPONSIBILITIES.

(a) Gas missiles dropped by aircraft may be in the form of -

- (i) A canister without a fuze,
- (ii) A bomb fuze to function in the air, or
- (iii) A bomb fuze to function on impact, and charged with either blister or choking gas.

A canister will normally burst open on impact with the surface except perhaps in very soft ground, and even in the latter case it will probably be found leaking. In either condition, its treatment is not the responsibility of RAE. The same applies to gas bombs from which gas is issuing except that RAE may be called upon to deal with a fuze if necessary.

- (b) If whilst digging down to a bomb believed to be an unexploded HE bomb the responsible RAE Officer finds that it is a gas bomb which has functioned, the bottom of the excavation should be lightly covered with earth and the incident reported to -

- (i) HQ Formation, if it is a military area, or
- (ii) Local Civil Defence Authorities, if in a Civil area

for further action by (i) or (ii), as the case may be.

Buried gas bombs may sometimes be diagnosed as having functioned by signs of contamination at the mouth of or in the hole of entry, or by emission of gas from the hole itself as digging progresses.

- (c) TABLE 1 defines the responsibilities for dealing with gas canisters and bombs under the several conditions in which they may be found.

TABLE 1

SER	CONDITION OF MISSILE	DECONTAMINATION	
		Military Areas	Civil Areas
1	Broken gas canisters and bombs on the surface	Unit	Civil Defence Services
2	Broken gas canisters and bombs which are buried	do.	do.
3	Intact gas canisters and bombs	DISPOSAL	
		Suspected UXGAS should be reported through same channels as for HE bombs for disposal by RAE	

5. IDENTIFICATION OF GAS CONTENT IN INTACT MISSILE.

On occasions when identification of the gas content in an intact missile is required, the responsible RAE officer should first remove or make safe any fuze which may be fitted and then pass the missile to the Technical Officer CW or GIO (Civil), for further action.

6. NORMAL DISPOSAL OF UNBURIED INTACT GAS MISSILES.

- (a) Rendering safe. For fuzed gas bombs, either remove the fuze or render it safe (as deemed advisable) in the prescribed manner for the particular fuze found fitted.

- (b) Transportation. If necessary to transport the missile to a suitable site for destruction, the floor of the vehicle should be covered with 8" of damp earth. If it is suspected that its seams are strained and may leak, if practicable, place in an empty receptacle such as a 40 gl. drum, otherwise attach a suitable rope or wire sling to facilitate handling. (Gas bombs too large for a 40 gl. drum are not likely to be used.) If leakage occurs during transit dump all contaminated material into the excavation which receives the bomb.

The above applies to bombs charged with liquid vesicant. Leakage from bombs charged with choking gas (i.e. phosgene, diposgene or prussic acid) causes no contamination but respirators must be worn during handling.

- (c) Destruction. Normal method of disposal is to bury the missile in an excavation 8 ft deep and burst the casing with an explosive charge AFTER the excavation has been filled in.

7. NORMAL DISPOSAL OF BURIED INTACT GAS MISSILES
(usually bombs).

- (a) Rendering safe for transportation. If handling, transportation and destruction elsewhere are necessary, proceed as in para 6 (a), (b) and (c) above
- (b) Destruction in situ. Only in open country may intact missiles be destroyed in situ with an explosive charge AFTER the excavation has been filled in PROVIDED -
- (i) the lie of the bomb is at least 8 ft deep, and
 - (ii) para 9, items (d), (e), (f) and (g) are obtained.

8. EMERGENCY DISPOSAL OF INTACT GAS MISSILES.

Under emergency conditions, the following steps may be taken to dispose of intact gas missiles as temporary measures only.

(a) Burying.

- (i) Fuze (if fitted) to be removed.
- (ii) Remove missile to the nearest uninhabited area and bury it 3 ft below ground.
- (iii) Mark the spot with a notice board inscribed "UXGAS" and record the incident with a view to later permanent disposal. (In civil areas, a record should also be kept by the local Civil Defence Authorities.)

(b) Dumping in the sea. (preferred to (a) above)

Where convenient to the sea, intact missiles should first be defuzed (if a fuze is fitted) and then dumped in deep water.

They should NOT be dumped in any creek, river, lake, harbour or other inland water. This rule will be STRICTLY followed in respect of the whole of the mainland of AUSTRALIA.

9. SUITABLE SITES FOR DESTRUCTION OF GAS MISSILES.

All the following points determine the suitability of permanent sites for the destruction of gas bombs in civil areas. Most of them also apply for forward Base Areas :-

- (a) Location to be outside inhabited areas (but not too distant because of transportation problems).
- (b) Accessible from a road (if possible, by the side of a made road or track which will bear vehicles up to 4 tons laden weight).
- (c) Not liable to flooding (because of excavation difficulties at certain periods of the year).
- (d) At least 1/4 mile from a well used for domestic water supply.
- (e) Not within 1/4 mile of the edge of storage reservoirs.
- (f) Sufficiently far from water mains to ensure that no damage to mains can be caused by exploding bombs underground. Normally, 50 yds should be ample safe distance.
- (g) Where a water supply is drawn from underground sources, the site should not be immediately above the supply channels nor within 200 yds of known or suspected fissures.
- (h) Clay or gravel subsoils are more suitable for the burial of gas missiles than sandy soils.

AMENDMENTS

TREATMENT OF IGNITED INCENDIARY MATERIALS

1. INTRODUCTION.

The main incendiary agent used in bombs, etc., for obtaining incendiary action is generally either -

- (A) a metallic substance (e.g. electron)
- (B) an inflammable oil, or
- (C) white (or yellow) phosphorus

Though (A), (B) and (C) may vary as regards composition of mixture and form in which used, the incendiary reaction is always that of the main incendiary agent and it is easily identifiable.

Because of the different methods which must be used to combat various types of incendiary materials, it is essential that the reaction of the main incendiary agent should first be identified, especially when encountered in some strange form or shape of missile.

The following notes give a guide whereby the reaction of the main incendiary agent may be recognised, and describe basic principles proper for treating that particular agent and therefore employed to extinguish the ignited bomb, missile, material, etc., and localize its effectiveness.

NOTE 1 :- These notes do not take into account -

- (a) special precautions for bombs, etc., with an anti-personnel attachment
- (b) extinguishing of resultant conflagrations.

(A) - METALLIC SUBSTANCES

2. ELECTRON METAL CASINGS.

- (a) How used. Electron metal may be used as the outer casing of a small fire bomb or as the casing of a fire-pot housed in an ordinary bomb, and charged THERMIT to ignite it
- (b) Identification. Explodes as it bursts into flame and burns furiously with a DAZZLING WHITE LIGHT. Due to the thermit it will attain a very high temperature (about 3000 deg C) and will throw off burning fragments which will ignite nearby combustible material.

3. METALLIC SUBSTANCES AS INGREDIENTS IN MIXTURES.

- (a) How used. As a mixture of an inflammable rubber-like material (for binding the mass) and into it is pressed either -
 - (i) a modified thermit consisting of separate particles of aluminium and magnesium (e.g. incendiary material described in BDTI B/4/11, NOTE 3) or
 - (ii) particles of electron metal (e.g. incendiary material described in BDTI B/4/99).

- (b) Identification. The mixture burns according to the proportion and kind of metallic ingredients but will range between a slow and quiet burning as for (i) above to a fierce spluttering with a whitish yellow light as for (ii) above.

In all cases a BLACK SMOKE is given off but density varies according to proportion and nature of the binding material.

4. TREATMENT.

- (a) Whenever possible, gather up or rake clear of combustible material, otherwise/and
- (b) Smother with sand, dirt or numerous wet mats (and kept wet), or
- (c) Play on jet of water with stirrup pump or hose (see NOTE 2)
- (d) Localize its effectiveness by removing inflammable material from the vicinity and play hose on surrounding structural parts to prevent flames from spreading.

NOTE 2 :- Water sprayed on electron merely causes it to burn more fiercely.

5. PERSONAL PROTECTION.

Wet clothes thoroughly before approaching an electron body which is fiercely throwing off burning fragments. When using a mat, hold it level with the eyes as a shield. It is not necessary to approach nearer than 3 ft.

(B) - INFLAMMABLE OILS

6. OIL MIXTURES.

- (a) How used. Inflammable oil mixtures are most likely to be contained within the casing of an ordinary bomb in jelly-like or semi-solid form in bulk. Ignition occurs within the bomb
- (b) Identification. The mixture is emitted as a burning oily liquid with a BRIGHT RED FLAME and giving off dense clouds of BLACK SMOKE. It may flow out of a burst bomb case or be splashed all round by explosion of the bomb.

7. TREATMENT.

- (a) A burning mass may quickly become a major conflagration, in which case fire fighting appliances will be required.

If reached in the early stages, however, individuals should treat the material with a hand foam extinguisher (if available) or smother with sand, dirt or mats. For pools of oil, first tackle the edges.

- (b) Splashes of burning oil should be dealt with similarly before they link up and form a major conflagration.
- (c) Localize its effectiveness by removing inflammable materials from the vicinity, and play a hose on the surrounding structural parts to prevent flames from spreading.

8. PRECAUTION.

Be careful NOT to play water on any burning oil mixture as water will not extinguish it but will merely cause spreading of the burning material.

(C) WHITE (OR YELLOW) PHOSPHORUS

9. BOMB CHARGED WHITE PHOSPHORUS.

- (a) How used. A special seamless and sealed bomb case may be charged white phosphorus in solidified form.
- (b) Identification. On bursting of bomb by a burster charge, the phosphorus is scattered from small pieces to powder. It spontaneously ignites on exposure to the air and will ignite combustible material upon which it lodges. The spread will cause a dense CLOUD OF WHITE SMOKE.

10. SHRAPNEL PELLETS WITH PHOSPHORUS FILLER.

- (a) How used. The material may be used as a filler in numerous small hollow steel missiles housed within a bomb case (e.g. Japanese 32 Kg incendiary bomb)
- (b) Identification. On bursting of bomb by a substantial burster charge the missiles are scattered and penetrate as shrapnel. The phosphorus spontaneously ignites on exposure to the air, emits a jet of flame from the missile, gives off WHITE SMOKE and ignites combustible material contacted.

11. RUBBER PELLETS IMPREGNATED PHOSPHORUS.

- (a) How used. Numerous small rubber pellets impregnated with a solution of white phosphorus and carbon disulphide and housed in an ordinary bomb case (e.g. Japanese 50 Kg, Types 97 and O, incendiary bombs)
- (b) Identification. On bursting of bomb by a substantial burster charge the pellets are scattered and ignite immediately upon drying out. Each burns with a flame 4"-6" high at low temperature, gives off a GREY SMOKE, and a smell of burning rubber.

12. DISCS (OR LEAVES).

- (a) How used. Numerous discs (or leaves) ranging in size between 4" x 3" to 9" x 6", and generally composed of a layer of soft rubber, coated one side with white phosphorus. These are normally carried in the aircraft packed in water within a container
- (b) Identification. The phosphorus spontaneously ignites on drying-out, giving off a GREY SMOKE, and a smell of burning rubber.

13. TREATMENT.

- (a) Gather up, or rake clear of combustible material, otherwise/and
- (b) Smother with sand, dirt or wet mat, or
- (c) Extinguish with a spray of water, or beat out with a wet fire-beater-

- (d) Localise its effectiveness by removing inflammable material from the vicinity and play hose on surrounding structural parts to prevent fire from spreading.

NOTE 3 :- Effectiveness of isolated ignited phosphorus is somewhat less than electron as its combustion is comparatively slow and quiet, enabling better opportunity to control the fire in the early stages.

14. PRECAUTIONS.

- (a) As phosphorus burns when dry -
 - (i) after extinguishing, gather up and keep submerged in water until burnt in a safe place
 - (ii) water will flow phosphorus into cracks in floor boards, etc., and contaminated material may ignite some time after phosphorus has been removed. Continual inspection is therefore necessary
- (b) When using a hose, be careful not to drive phosphorus pellets, etc., into inaccessible places by the force of water
- (c) Some contaminated surfaces can be cleaned up with dirt or mopping. Inflammable material should be washed with a solution of copper sulphate ($\frac{1}{2}$ lb of copper sulphate, i.e. bluestone, to 1 gl of water) or scrub with paste of calcium carbonate, i.e. whiting.
- (d) Use metal implements for preference. Keep inflammable implements wet whilst sweeping or gathering phosphorus. Thoroughly wash them immediately after use and temporarily leave in the open.

15. PERSONAL PROTECTION.

As phosphorus will cause severe burns -

- (a) Do NOT allow it to contact the skin or clothing. If skin becomes contaminated, keep the effected surface wet until medical attention is obtained.
- (b) Wear wet gloves, if available, and keep boots wet. Be careful not to contaminate other surfaces per medium of the boots.
- (c) Keep contaminated clothing wet until it can be removed and treated with a solution of copper sulphate.
- (d) Wear the service respirator as protection for the eyes and lungs if necessary to work in heavy clouds of phosphorus smoke for long periods.

TYPES OF CAMOUFLETS AND SAFETY PRECAUTIONS

(A) TYPES OF CAMOUFLETS

1. INTRODUCTION.

A camouflet (underground chamber) may be formed when a bomb penetrates the ground and explodes at a depth too great to displace the ground above and so form a crater. When a camouflet occurs, it is normally formed by a small bomb up to 100 Kg. Larger bombs generally form craters but 250 Kg bombs often form camouflets when penetration is very deep in ground of a porous nature (e.g. coral).

Camouflets are grouped in 3 types (A, B and C)

2. TYPE A. (See Fig 1)

The most shallow type of camouflet is closely related to the deepest type of camouflet (TYPE C) but in this case the shear platforms are vertical. The ground contained between the shear platforms may be disrupted but not completely ejected, so that a heap of debris is formed. The debris will normally be sub-soil, lighter in colour than the surrounding soil, in a heap up to 10 ft in diameter for a 100 Kg bomb.

The heap may subsequently collapse into the chamber, thus disclosing the vertical shear platforms which up till then are obscured.

3. TYPE B. (See Fig 2)

In the case of camouflets formed by bombs exploding at intermediate depths, the ground above the bomb is heaved into a mound but, although cracked, is not disrupted. No debris is ejected and no shear platform is developed.

If the bomb has offset far before exploding, the shaft of entry may still be visible but may be partially collapsed and blackened. The camouflet mound will be of same texture as the surrounding ground (e.g. covered with grass). The mound caused by a 100 Kg bomb may be up to 10 ft in diameter and 2 ft high. Similar mounds may be caused by some types of incendiary bombs which have a comparatively high HE charge (e.g. German Sprengbrand C.50)

4. TYPE C. (See Fig 3)

In the case of the deepest type of camouflet there may be no indication whatever on the surface that a camouflet has been formed. The shaft of entry of the bomb may still be visible but will be blocked with soil at its lower end, probably to the point where the tail of the bomb broke off should this happen.

5. DANGER OF CAVE-IN.

Dangerous gases (carbon monoxide) are formed as the result of explosion and these become trapped in the chamber. Once a camouflet has been diagnosed, the ground surface immediately above should be kept roped or lightly fenced off until the gases have been expelled and the

ground filled in and made good, in order to prevent a cave-in under weight of personnel or vehicles passing directly over it.

6. PROBING AHEAD OF EXCAVATION.

- (a) A suspected TYPE A camouflet may often be confirmed by probing from the surface. When doing so, always wear a life-line as there is danger of a cave-in.
- (b) During excavation, early warning of a camouflet can be obtained by probing ahead of digging. The path of the bomb should be constantly probed. In addition, the base of the excavation should also be probed to avoid digging into, and collapse of, a camouflet roof. An earth auger might be found useful in some types of ground.

(B) SAFETY PRECAUTIONS

7. EVIDENCE OF A CAMOUFLET (DURING EXCAVATION).

When the presence of a camouflet is detected during excavation by -

- (a) blackening of soil,
- (b) splinters of bomb casing,
- (c) Detectors ITP indicating presence of CO gases, or
- (d) a noise of bubbling or welling of water is noticed following withdrawal of probe,

then the Safety Precautions detailed below should be observed immediately, as there is a definite danger to personnel. A little further excavation, carefully undertaken, may sometimes be necessary to establish the fact that a camouflet has actually been produced.

8. SAFETY PRECAUTIONS DETAILED.

- (a) IN EVERY EXCAVATION, and especially in the case of smaller bombs, a life-line secured at the surface and with a loop tied in its lower end, should hang down to facilitate escape or, if necessary, rescue work.
- (b) When evidence indicates the presence of a camouflet all personnel should at once leave the excavation. Any man feeling the effect of CO gas must be immediately taken to the surface and there treated, NOT in the excavation.
- (c) Before work is recommenced the air in the excavation should be tested with the Detector ITP to make sure that there is no danger to personnel. It may be some hours or days before it is safe to enter the excavation unless wearing APPARATUS BREATHING.

NOTE 1. Remember that the service respirator gives NO protection against carbon-monoxide.

- (d) If it is necessary to re-enter an excavation, all men in the excavation must wear life-lines and sufficient men must be at the surface to pull those working to safety if they are overcome. Life-lines should be tied tightly round the chest immediately under the arm-pits with a bowline

(e) An unconscious man should be roped either -

(i) with a loop, tied with a bowline, round his chest; his arms should then be pinioned to the side of his body with a belt or short length of lashing, or

(ii) with a bowline on a bight, one loop under the arms and one behind the knees. (This method is not suitable if a man is to be pulled through a small hole.)

9. SYMPTOMS OF CO POISONING.

First signs of poisoning are giddiness, vomiting and indistinct vision followed by breathlessness, palpitation and collapse. Loss of muscular power often prevents a man from withdrawing from danger. The face may be leaden, pale, moist with perspiration or pink with vivid carmine lips. Loss of consciousness may be very rapid and death follows unless a man is removed quickly.

10. FIRST AID.

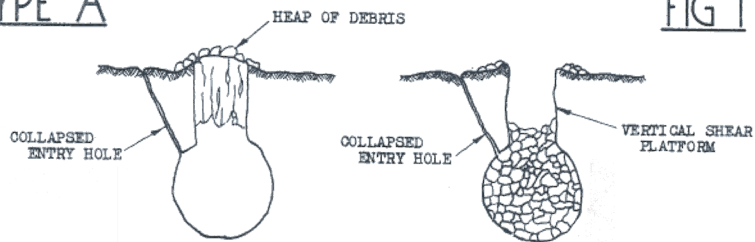
Open the collar, keep warm, give hot sweet tea but NO alcohol and keep very quiet. If the patient is unconscious, artificial respiration should be commenced at once (see BDTI D/20/125). In all cases send for a doctor and keep the patient warm and still until he arrives.

TYPICAL CAMOUFLETS

REFER E IN C B.D.T.I D/20/29

TYPE A

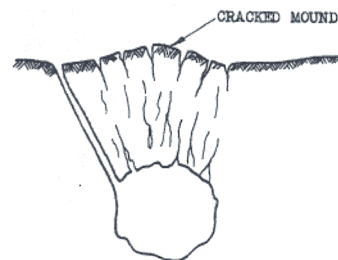
FIG I



BEFORE AND AFTER COLLAPSE
SHALLOW CAMOUFLET

TYPE B

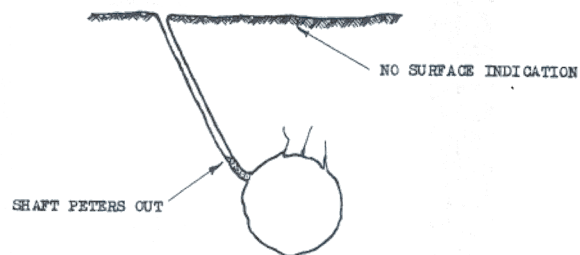
FIG II



AT INTERMEDIATE DEPTH

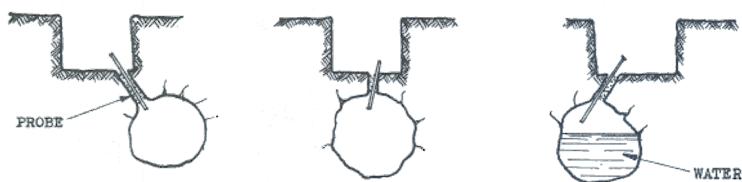
TYPE C

FIG III



DEEP CAMOUFLET

FIG IV



PROBING DURING EXCAVATION

NOT TO SCALE

MAKING CAMOUFLETS SAFE

1. TO DESTROY WITH EXPLOSIVES.

The following method is suitable, especially for shallow camouflnets, where the use of explosives to destroy the camouflnet chamber is permissible (see Fig 1).

- (a) Bore a hole (e.g. with earth auger) until it breaks into the crown of the camouflnet
- (b) Suspend a prepared charge of Gelignite (or equivalent) in the bore hole about 2 in. above the crown of the cavity. The charge weight should be 1 lb. of explosive for every 1 ft depth of bore hole (see Fig 1)
- (c) Tamp the charge and fire. This should collapse and fill the camouflnet chamber forming a surface crater (see Fig 2)
- (d) The safety distance for light buildings for this purpose may be taken as 30 yds.

2. TO EXPEL CO GASES BEFORE EXCAVATING.

Where the use of explosives is NOT permissible it is necessary to excavate. In order to avoid the possibility of men being gassed during the process it is advisable first to clear the camouflnet chamber of carbon-monoxide gas. This can be effected as follows :-

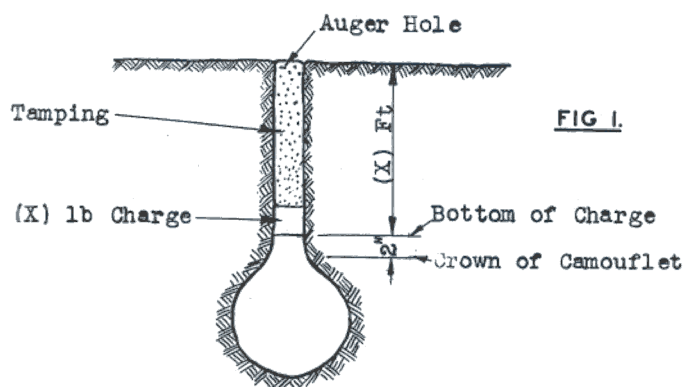
- (a) Bore a hole (e.g. with earth auger) until it breaks into the crown of the camouflnet. Then blow out the gas with compressed air, and test for absence of carbon-monoxide gas with Detectors I.T.P. (Indicator Test Paper).
- (b) Alternatively (see Fig 3), bore two holes into the camouflnet chamber. This should ventilate the chamber and release most of the gas. The process can be accelerated by inserting two tubes into the bore holes, one facing towards and the other away from the prevailing wind. The camouflnet should be tested for absence of carbon-monoxide gas before excavation is started.

3. PRECAUTIONS.

- (a) All men working over the camouflnet on the above operations should wear life lines.
- (b) Safety precautions when excavating for camouflnets are detailed in BDTI D/20/29, and methods of artificial respiration in BDTI D/20/125
- (c) Camouflnets and suspected camouflnets should be roped off and frequently inspected until made safe.

2.

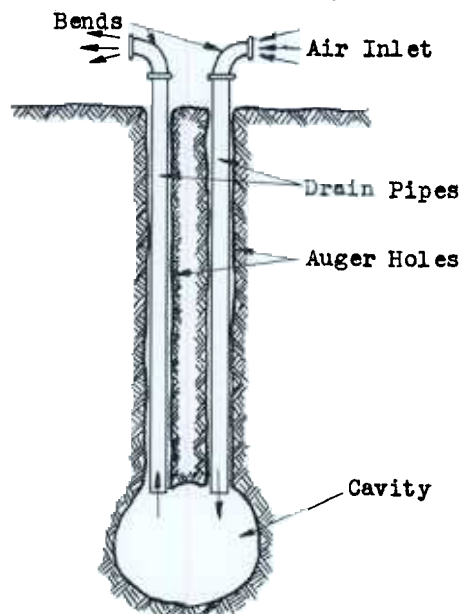
MAKING CAMOUFLETS SAFE.
(Diagrammatic Sketches)



BEFORE EXPLODING CHARGE.



PROBABLE CRATER FORMED
AFTER EXPLODING CHARGE



VENTILATION OF CAVITY

ARTIFICIAL RESPIRATION

FOREWORD.

The following notes refer to methods of artificial respiration of personnel gassed by carbon monoxide (BDTI D/20/29 refers) and in cases of electrocution and drowning.

PRONE PRESSURE (SCHAEFER) METHOD

1. Lay the patient on his belly, one arm extended directly overhead, the other arm bent at elbow and with the face turned outward and resting on hand or forearm so that the nose and mouth are free for breathing (see figure 1).

2. Kneel straddling the patient's thighs, with your knees placed at such a distance from the hip bones as will allow you to assume the position shown in figure 1.

Place the palms of the hands on the small of the back with fingers resting on the ribs, the little finger in natural position, and the tips of the fingers just out of sight with the thumbs parallel and nearly touching (see figs. 1 and 2).

3. With arms held straight, swing forward slowly so that the weight of the body is gradually brought to bear upon the patient. The shoulder should be directly over the heel of the hand at the end of the forward swing (see figure 2). Do not bend your elbows. This operation should take about two seconds.

4. Now immediately swing backward so as to remove the pressure completely (see figure 3).

5. After two seconds, swing forward again. Thus repeat deliberately twelve to fifteen times a minute the double movement of compression and release, a complete respiration in four or five seconds.

6. Continue artificial respiration without interruption until natural breathing is restored (if necessary for one or two hours or longer) or until a doctor declares the patient dead.

7. As soon as this artificial respiration has been started and while it is being continued, an assistant should loosen any tight clothing about the patient's neck, chest and waist. **KEEP THE PATIENT WARM.** Do not give any liquids whatever by mouth until the patient is fully conscious.

8. To avoid strain on the heart when the patient revives, he should be kept lying down and not allowed to stand or sit up. If the doctor has not arrived by the time the patient has revived, he should be given some stimulant, such as one teaspoonful of aromatic spirits of ammonia in a small glass of water, or a hot drink of coffee or tea, etc. The patient should be kept warm.

9. Resuscitation should be carried on at the nearest possible point to where the patient received his injuries. He should not be removed from this point until he is breathing normally of his own volition and then moved only in a lying position. Should it be necessary, due to extreme weather conditions etc. to move the patient before he is breathing normally, resuscitation should be carried on during the time that he is being moved.

10. A brief return of natural respiration is not a certain indication for stopping the resuscitation. Not infrequently the patient, after a temporary recovery of respiration, stops breathing again. The patient must be watched and if natural breathing stops, artificial respiration should be resumed at once.

11. In carrying out resuscitation it may be necessary to change the operator. This change must be made without losing the rhythm of respiration. By this procedure no confusion results at the time of change of operator and a regular rhythm is kept up.

NOTES.

(a) Alternatively the operator may kneel at the side of the patient

(b) Care must be taken especially with very old people or children not to exert too much pressure

(c) If patient is placed on a door or table which is inclined at about 30° to the horizontal with head lower than the feet it is advantageous.
This will improve circulation and help in draining fluid from air passages.

(d) Make sure air-way is not blocked by tongue

(e) If patient has recently had abdominal operation (or is a woman in the later stages of pregnancy) or has other injury which would render prone pressure method dangerous, the supine (or back) method of Silvester should be used

In this method the patient is laid on the back with arms bent and elbows resting partly on the lower part of the chest. The operator, who kneels beyond the patient's head, grasps the patient's elbows and extends the arms beyond the patient's head through a vertical arc, (straight up and over)

The patient's arms are then returned to the former position by following the reverse direction; and expiration aided by moderate pressure of the arms against the chest.

(f) Patient should be kept warm

In severe poisoning there may be great reduction of body temperature. In such cases artificial respiration should be given with a blanket covering the patient.

(g) Artificial respiration should be used if there is the slightest suspicion that the patient's breathing is inadequate

(h) Artificial respiration must be continued for hours (even up to 10 hours and therefore reliefs for operators are necessary) or until patient is pronounced dead by a doctor

ADMINISTRATION OF OXYGEN COMBINED WITH
ARTIFICIAL RESPIRATION

12. The administration of oxygen is of the utmost value in cases of carbon monoxide gas poisoning. It drives out the carbon monoxide from the blood five times more quickly than air.

13. The APPARATUS REVIVING is provided for this purpose, so that wherever this eqpt (together with oxygen supply) is available, it should be used in combination with the prone pressure method of artificial respiration described above.

14. Oxygen should still be administered for some time after natural breathing has fairly begun and artificial respiration has been discontinued. This has the effect of lessening the severity of the after-effects of gas poisoning - headache, giddiness, etc., and the patient will more rapidly recover the use of his legs.

15. METHOD OF USE. (Refer to BDTI E/21/85 for details of Apparatus Reviving)

- (a) See that all joints and connections of the Apparatus Reviving are airtight
- (b) Place patient in prone position (see directions above describing Schaefer method)
- (c) Making sure that the Fine Adjustment Valve is closed, open Main Cylinder Valve with the Key Wheel provided
- (d) Apply the Mask to the patient's face, securing in position by means of the Rubber Harness provided.
- (e) Open Fine Adjustment Valve quickly to fill Breathing Bag, thus admitting oxygen to the patient (but see that this valve is controlled as in (g) below)
- (f) Commence Artificial Respiration as described above, and continue same until natural breathing has fairly begun
- (g) See that Fine Adjustment Valve is controlled so that the Breathing Bag is kept well distended throughout the period during which oxygen is administered
- (h) Continue to administer oxygen for about 10 to 15 mins after natural breathing has been fairly restored and artificial respiration has been discontinued.

NOTE (1): The Fine Adjustment Valve serves both as a control and as a meter for estimating the volume of breathing, so that the supply of oxygen can be adjusted to any volume.

ARTIFICIAL RESPIRATION SCHAEFER METHOD

REFER B. D. T. I. D/20/125



FIG 1



FIG 2



FIG 3

PROTECTIVE WORKS

INTRODUCTION.

MTP 45 (1941) (re-printed 13 Apr 42) has not yet been modified and re-published by AMF to include Japanese Aerial Munitions. Pending this being done, these notes are issued for RAE instruction and may be followed by all Arms.

Sec 2, para 3 of above pamphlet reads :-

"3. Units of all arms are trained in bomb reconnaissance. This includes detection of the existence of an unexploded bomb, and the safety precautions to be taken pending the arrival of a bomb disposal party. Units of all arms also assist bomb disposal parties by providing unskilled labour when necessary.

Digging down to bombs must be undertaken only with RE assistance or under RE supervision."

1. GENERAL.

(a) Unexploded bombs may fall in places where their explosion would cause great damage to important buildings, fortifications or installations and certain precautionary measures can often be taken immediately the bomb falls with a view to minimizing the damage should explosion take place before it has been rendered safe by the bomb disposal party. These measures consist of :-

- (i) Preventive trenching to minimize damage to foundations, buried pipes, etc.
- (ii) Packing basements with sandbags
- (iii) Sandbag walling
- (iv) Digging down to the bomb to form a vent

It is most important that any work carried out by Units other than RAE shall not hinder the work of the ultimate disposal of the bomb.

- (b) It is necessary carefully to note and mark the path of the bomb as the digging proceeds. In digging down to a bomb, great care must be taken not to move it, strike it, subject it to vibration or put pressure upon it. The uncovering of the bomb should be left to the bomb disposal party. (If it is intended to destroy the bomb in situ, only sufficient of the bomb body should be uncovered to enable placement of the demolition charge.)
- (c) Although unexploded bombs may include both "duds" and time bombs, it must be assumed that every buried bomb of 50 Kg or over may be fitted with a time fuze
- (d) Any of the following protective works will only be found necessary for CATEGORY A bombs and only then when the work involved can be completed BEFORE the estimated time for digging down to the bomb.
- (e) Some of the methods advocated below involve estimating the depth of the bomb. This should be done as soon as possible before the hole has caved in. If the hole has caved in, it should be pos-

sible by probing with flexible rods, such as drain rods, to assess whether the depth is over or under 10 ft. Probing should only be performed by RAE personnel trained at a bomb disposal course.

2. PROTECTIVE TRENCHES.

The following TABLE I shows the distances which pipes, cables, foundations, etc. are liable to damage from explosion of a buried bomb.

TABLE I

Size of Bomb	Cast-iron mains or concrete pipes	Earthenware or brick sewers	Electric cables, steel pipes	Foundations
50/60 Kg	26 ft	40 ft	20 ft	50 ft
100 Kg	30 ft	45 ft	24 ft	60 ft
250 Kg	40 ft	65 ft	30 ft	100 ft
500 Kg	45 ft	80 ft	35 ft	150 ft
1000 Kg and over	65 ft	120 ft	50 ft	250 ft

If a buried bomb is within the above distances of vulnerable objects, damage can be minimized by digging a trench about 2 ft wide, 2 ft deeper than, and as near as possible to, the object to be protected. Thus, a cast-iron pipe (Fig 1) buried 4 ft below surface 30 ft from a 250 Kg bomb buried 15 ft, would be protected by a trench 6 ft deep. Such trenches need only be of minimum width required for excavation (about 2 ft) and should not exceed 6 ft depth. Trenches should not be dug in ground which will not remain in repose unrevetted as digging proceeds.

Owing to the size of the crater made by the explosion of the bomb, no protection could be given by a trench within 10 ft of a 50/60 Kg bomb, 12 ft of a 100 Kg bomb, 20 ft of a 250 Kg bomb, and 30 ft of a 500 Kg bomb.

3. SANDBAG ABUTMENTS.

- (a) The packing of basements, cellars, etc. with sandbags to avoid damage to foundations and walls may be useful in cases where the bomb is so near the building, or the foundations are so deep, that the depth of the protective trench required would be prohibitive.

The method consists of packing sandbags into the internal space against the outer wall so as to support it against the explosion (Fig 2). It is not possible to lay down depth (d) to which sandbags behind the wall should extend, but generally speaking the tighter they are packed, and the deeper the pile, the more effective will be the support. In practice, a depth of 10 ft will probably be effective, but the sandbags should not extend as far as an internal weight - carrying wall, or bear against an internal column for fear of damage by transmitted force.

- (b) Another method of minimizing damage to foundations is given in para 5 which, in certain cases, can with advantage be combined with the above method.

4. SANDBAG WALLS.

- (a) The building of sandbag walls to minimize damage from splinters, blast, etc., is applicable in the case of a bomb which is buried or on the surface close to a building. It may also be used to isolate the effects of a bomb inside the building.

The basic principle is that the wall must be built just outside the crater which would be formed if the buried bomb exploded. For practical purposes suitable radii from the hole of entry are shown in TABLE II

TABLE II

Size of Bomb	Radius of Walling from Entry Hole.	Remarks
50/60 Kg	10 ft	} Bomb at over 15 ft } depth camouflet pro- } bable and wall useless
100 Kg	12 ft	
250 Kg	20 ft	
500 Kg	30 ft	
The figures in Col 2 make an allowance for the fact that the path of a bomb in earth is not always straight.		

- (b) The circumstances in which it is desirable to build a sandbag wall are as follow :-

- (i) Bombs falling in open ground usually penetrate at least to the depth given in TABLE III. In such cases there are no serious splinter effects, and there should be no danger due to falling debris outside the area given in TABLE III.

The effect of blast, however, may still be very serious, and can be deflected upwards by a sandbag wall built outside the crater area (TABLE II)

TABLE III

Size of Bomb	Depth of Penetration	Area (approx) to which dangerous debris is confined
50/60 Kg.	10 ft	Circle 30 ft radius from bomb.
100 Kg.	12 ft	Circle 35 ft radius from bomb.
250 Kg.	15 ft	Circle 50 ft radius from bomb.
500 Kg.	20 ft	Circle 75 ft radius from bomb.

- (ii) At distances greater than those given for foundations in TABLE I, little or no structural damage to buildings is to be expected from a buried bomb.

In the case of an unburied bomb, damage will be limited to windows and roof if a sandbag wall is provided.

(c) The following points should be noted in the construction of sandbag walls :-

- (i) Walls should invariably be 2'6" thick at the top and not more than 10'0" high. Open faces should be sloped at 1/6. This involves a base wider than 2'6" (say, 4'2").
- (ii) Walls must not be built nearer to the bomb than the distances given in TABLE II.
- (iii) Bonded walling gives maximum strength.
- (iv) For curved walling constructed of a series of straight lengths, ensure that the bond is unbroken at intersections.

5. VENTS TO REDUCE AND DIRECT THE FORCE OF EXPLOSION OF A BURIED BOMB.

When a shaft is excavated to gain access to a bomb, and the bomb is exploded at the bottom of the shaft, there is appreciably less earth shock and earth movement than if the same bomb had exploded before the excavation was made. Further, a smaller crater would result. On the other hand, damage by blast will probably be greater where a shaft has been excavated.

In cases where it is vitally important to diminish earth shock and movement, (e.g. railway lines, bridges, dams, important gas and water mains and foundations) and where the effect of blast would not be serious it is advantageous to excavate an 8 ft by 4 ft shaft down to the bomb at once (Fig 3).

A further reduction in blast effect can be obtained by covering over the shaft with 2 ft of earth supported on light planking.

In some cases it is advantageous to direct the force of explosion away from the structure it is desired to protect. This can be done by excavating a trench about 12 ft by 4 ft as shown in Fig 4. If the bomb then explodes before it can be dealt with by a bomb disposal party, the minimum damage will be done to the structure.

In deciding to use the methods described in this paragraph, the damage likely to be done by blast, chiefly to windows and roofs, must be balanced against that likely to be done to foundations, basements, etc.

PROTECTIVE WORKS

TYPICAL EXAMPLES

REFER E IN C B.D.T.I. D/20/83

FIG. 1

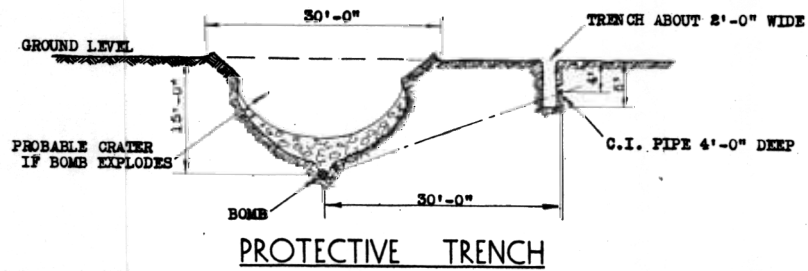


FIG. 2

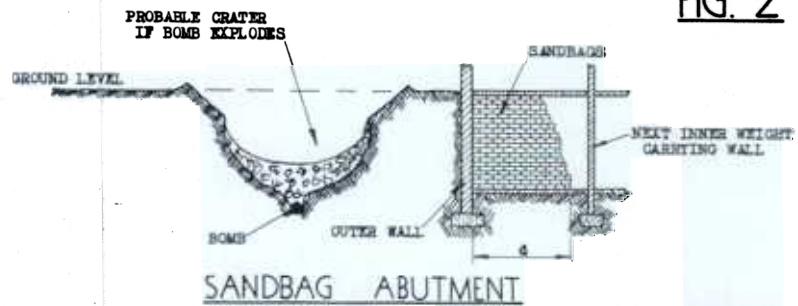
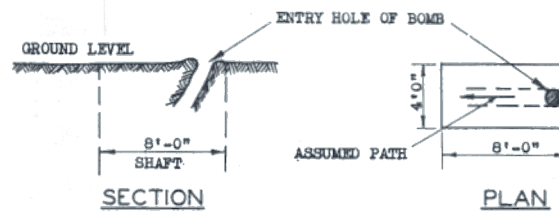
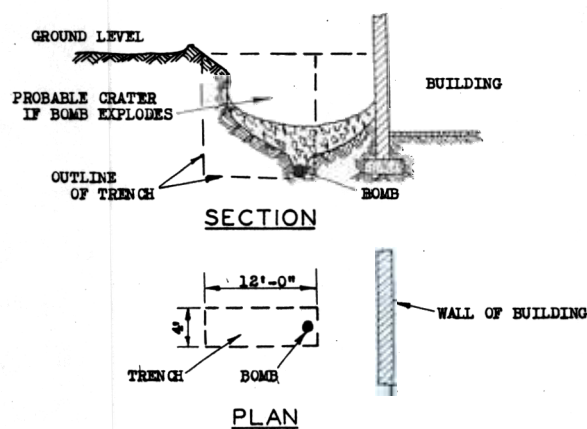


FIG. 3



VENT TO REDUCE EARTH SHOCK

FIG. 4



TRENCH TO LESSEN DAMAGE BY EXPLOSION

EQUIPMENT AND PLANT

- Sec. 21 : General Use**
- 22 : Anti-Japanese**
- 23 : Anti-German**

E

PROBES, BOMB, 6 FT.

1. SCALE OF ISSUE.

The probe, bomb, 6 ft., and 6 ft. screw extension piece, is issued on a scale of 2 sets per Unit RAE having bomb disposal duties.

2. OBJECTS.

When used CAREFULLY, it constitutes a valuable aid to locating a bomb and by so doing it -

- (a) Speeds up excavation. (Continual use of the probe will indicate when digging has to be proceeded with more cautiously.)
- (b) Reduces the danger of striking the bomb with a tool, thereby causing possible explosion of the bomb.
- (c) Ascertains from the surface the possible nearness of the bomb to the surface (knowledge of which affects advice given as to necessity of protective works, also estimates for time, labour, stores and plant required)
- (d) Serves to detect a camoufler (when testing the floor of an excavation).

3. DESCRIPTION.

The probe (Aust pattern), which is a rigid implement, is made of piping approx 3/4" diam. One end is fitted with a tapered and rounded brass point whilst the other has a screwed union to receive a hand grip or alternatively the screw extension piece also fitted to take the hand grip. The point is expressly made of brass so as to eliminate the risk of a spark should the probe strike a flint in the vicinity of a camoufler.

NOTE 1. The probe at present issued is NOT non-magnetic and must never be used where a German type "G" or similar mine is suspected.

4. WHEN TO USE.

- (a) GERMAN bombs. The probe should always be used as the bomb is approached in order to avoid striking it with a pick, etc. which might cause fuzes of the 50 and "Y" types to function, or the clock of 17 type fuzes to restart (but see para 6 below).
- (b) JAPANESE bombs. At present there is no record of Japanese using fuzes of the anti-handling type but there is a possibility of explosion if -
 - (i) Certain fuze heads or their projecting spindles are struck. (The risk is somewhat lessened if the nose fuze is distorted or the tail fins have curled over the tail fuze, both of which conditions often occur)
 - (ii) The resistance offered by a partially softened soluble plug or ring in chemical long delay fuzes is nullified by the shock.
 - (iii) A clockwork type fuze is struck.

Though the above risks are present, the advantages of probing makes the use of the implement essential (but see para 6 below).

5. METHOD OF USE.

By means of the hand grip, controlled pressure can be applied and the thrust of the probe halted immediately an obstruction is met. For deep probing in those cases where bombs are thought to have made a straight path into the ground, an extension piece can be screwed on, the hand grip being transferred from the probe to extension piece accordingly.

6. RESTRICTION IN USERS OF PROBE.

As there is a risk ever present when probing to LOCATE a bomb, it is essential that the probe be used with common sense and expert judgment.

In LOCATING a bomb, therefore, the probe will NOT be used by other than an Officer or NCO, RAE who has attended a Bomb Disposal Course.

7. SUBSTITUTE OR IMPROVISED PROBES.

(a) In the few cases where the hole of entry is clear of soil, the position of the bomb can be estimated by probing down the hole with a flexible rod if available (e.g. spring drain rods) but it must have an end tapered to a rounded point of non-ferreous material especially if a Japanese bomb is diagnosed or suspected.

(b) A garden cane or 1/2" steel rod will make a useful probe if made so as to follow the principles of design as outlined in para 3 above.

8. DANGER OF EXPLOSION OF CO GASES.

(a) When a camouflet is formed by a bomb containing phosphorous filling and unconsumed phosphorous is present, there is a possibility of trapped CO gases exploding on admission of air into the chamber. On locating a camouflet with the probe, the general practice of plugging a probe hole immediately on withdrawal of the probe and keeping it plugged until ready to destroy the chamber is particularly important in cases where a constituent of the bomb filling is suspected to be phosphorous.

(b) When probing in ground of a flinty nature only a brass or wooden tipped probe should be used as a spark may cause explosion of trapped CO gases if a camouflet is present.

EXCAVATING AND TIMBERING

PART I - LOCATION AND EXCAVATION

1. LOCATION OF SHAFT.

- (a) The excavation should be dug vertically over the spot where it is estimated that the bomb is lying. The line and the angle of entry of the bomb coupled with a knowledge of the average penetration and offset of the size of bomb diagnosed, in the soil concerned, should provide a fair indication of its probable position. As a guide, figures on the average penetration of bombs from high level bombing are :-
- (i) GERMAN bombs dropped in UK - 9-ft for a 50 KG, 14-ft for a 250 KG, 18-ft for a 500 KG and 22-ft for a 1000 KG bomb
 - (ii) JAPANESE bombs dropped in NEW GUINEA and DARWIN areas - 9-ft for 60 KG, 18-ft for 250 Kg. The average offset lies between one-third and one-half the depth to which the bomb penetrates.
- (b) Units RAE should additionally keep careful records of penetration and offsets met with in practice in their own areas. These may vary appreciably from average figures on account of peculiarities in local ground conditions. Such records should then be available to any other Unit taking over work in that area.

2. SIZE OF EXCAVATION.

Shafts of standard dimension should be adopted as far as possible, and it has been found that shafts about 6-ft x 6-ft in plan are generally satisfactory for bombs buried up to 20-ft, and about 8-ft x 6-ft in plan for the larger bombs at deeper penetrations (FIGS II A and II B)

3. EXCAVATING.

- (a) Digging Eqpt :- Picks, Shovels RE, Spades (for trimming), Mattocks (for use in clay), Miners' Picks Pneumatic Tools (supplied with air compressor) are provided.
- (b) Spoil Removal :- The simplest way of removing spoil from the bottom of the excavation is by throwing it up on to successive platforms or stagings. These stagings consist of planks supported by the frames with a lip on the outer plank to prevent spoil from falling down into the excavation. Stages should not normally be used for a greater depth than about 12-ft. For greater depths spoil should be removed by other methods -
- (i) A small bucket, with tripod and jenny wheel or a windlass is suitable for use with poling boards or in cramped locations in buildings.
 - (ii) A light swinging jib and latrine bucket (see FIG I) is suitable for all outdoor locations particularly when runners are used, since the jib enables the bucket to be lifted over and swung clear of runners projecting above the ground.
 - (iii) In large or deep excavations, e.g. 1000 Kg bomb in clay, a power operated crane and large skip used from the start will save valuable time.

- (c) Miscellaneous :- The digging party must work methodically, points to be remembered being :-
- (i) Keep one side of the excavation (i.e. the side most suitable for approach) free of spoil and easy of access
 - (ii) Maintain a berm not less than 4-ft between the sides of excavation and the toe of spoil banks
 - (iii) Keep all tools NOT in use clear of the excavation and spoil, and arranged in an orderly manner
 - (iv) Take means to prevent surface water entering the excavation
 - (v) If necessary, arrange programme of work suitable for climatic conditions.

4. PUMPING.

- (a) Eqt carried consists of -
- (i) The "AJAX" L5 L and F manually operated pump capacity 1200 gals/hour at 80 single strokes per min
 - (ii) The SUMP PUMP (supplied with air compressor plant), an air-operated centrifugal type, capacity 150 gals/min (approx) at 80 lbs/sq-in pressure.
- (b) Points to remember :-
- (i) As soon as excavation makes water, grade floor of shaft to one corner and dig a sump.
 - (ii) With a wooden board position pump strainer so that same is NOT in contact with muddy floor of sump
 - (iii) If discharge falls off during pumping, inspect strainer for clogging matter in mesh.
 - (iv) Ensure that outlet of delivery hose is led well away from the vicinity of the shaft, and is located on the low side with no possibility of the water draining back into the neighbourhood of the excavation.
 - (v) WARNING :- If a petrol driven pump is taken down a shaft, a lead from the exhaust must be taken out of the shaft or fresh air continually circulated in the shaft by means of the air compressor otherwise CO gases given off will seriously affect the men working.

PART II - METHODS OF TIMBERING

5. EXCAVATIONS.

- (a) Even in fairly shallow shafts, excavations must always be timbered no matter how good the ground. The inherent tendency to collapse apart from such contributory causes as rain, necessitates timbering although framework only may suffice
- (b) BEFORE excavations are begun, the sides of the shaft should be marked out by MARKER BOARDS (FIG IV) to enclose a rectangle of the size required to accommodate the scantlings it is proposed to employ (FIGS II A and II B)
- (c) Considerable saving in time and economy in the use of material can be effected by the adoption of standard lengths of timber, in which case no cutting should be necessary on the job
- (d) Shafts may be timbered either with POLING BOARDS (FIG III A) for good ground or with RUNNERS (FIG III B) for bad ground
- (e) The following lengths and equivalent scantlings which have proved to be satisfactory in fairly bad ground are recommended for general use -

Members	Lgth.	Scantling Recommended	Min. Cross Sec.	Min. Thickness
Short Walings	6'0"	9" x 4" } 6" x 6" in wet ground with running sand	24	3"
Long Walings	8'0"		27	3"
Long Walings	6'0"		24	3"
Corner Boards	3'9"	4" x 2" to 4" x 1/2"	14	2"
Poling Boards	4'6"		12	1 1/2"
Runners	10'0"		12	1 1/2"
Wedges	1'0"			
and based on the use of the above scantlings :-				
Spreaders	5'4"	4" x 3"	12	3"
Punchions	3'0"	4" x 4"	9	3"
	or			
	3'9"			
Staging Planks	6'0"	9" x 2"		

The minimum sizes should only be used in good ground and additional struts or spreaders may be required for the lighter walings. In the case of poling boards, if the lighter sections are used, it may be necessary to provide two frames in each length, i.e., reduce the spacing from 4 feet 6 inches to 3 feet 0 inches centres.

These considerations must be governed by ground conditions. With either system of timbering the framing members, i.e., long or short walings and spreaders, are held in position by "folding" wedges (i.e., twin wedges) inserted at one end only and at alternate corners (FIGS II A and II B)

When driven home both wedges of a pair should have at least two-thirds of the length of their adjoining faces in contact, but it should not be possible to drive them so far that the thin end of one wedge projects beyond the thick end of the second wedge. ALL WEDGES SHOULD BE TIGHTENED DAILY BEFORE WORK BEGINS (more frequently in bad ground). In the case of all runners, and wherever necessary in the case of poling boards, wedges should be driven in between the board and the waling so that boards are forced hard against the sides of the shaft. This is of the utmost importance because movement of the ground behind timber encourages progressive collapse very quickly.

If the sides have not been timbered properly hollows may develop behind the timber, and any such hollows should be stuffed tightly with excavated or other material or trouble is sure to result. To leave a hollow behind timber in wet ground is to invite failure.

In most clays it is possible to excavate using poling boards, but if the ground is wet, or if the soil is gravel, sand or wet sandy clay, runners are best. If runners are deemed necessary, it indicates that the shaft should be close boarded whereas the use of poling boards presupposes fairly good ground, in which case, close boarding will quite often not be necessary. For instance, open boarding will usually suffice in certain clay soils.

When open boarding is employed the boards in successive stages should be staggered. If there are patches of wet on any wall of the shaft it is advisable to close board that side.

If possible, timbering should be completed before work ceases for the day, and if a pit ever has to be left for more than 24 hours, the requisite timbering should always be put in beforehand. If the original bomb hole fills with water, the face of the pit nearest to the hole should also be timbered and watched carefully.

6. TIMBERING WITH POLING BOARDS (FIG III A)

- (a) When timbering with poling boards two boards should be set carefully in each corner of the excavation and plumbed as accurately as possible (FIG IV STAGE 2). The two short walings followed by the two long walings, and which together form the frame, should then be placed in position in the middle of the boards, so that frames occur at 4 ft 6 in. centres, and be wedged up tightly (FIG IV STAGE 3). The spreaders should then be placed in position in a similar manner, care being taken to ensure that the ends have a full bearing on the long walings and not on wedges which secure walings. Long walings and spreaders should be wedged against the unwedged ends of short walings and long walings respectively (FIG II A). No nails should be used.
- (b) Additional boards can then be tucked into position and wedged up as may be necessary. Where wedges are employed care should be taken to see that the poling boards are set back sufficiently far to enable the wedge to be entered firmly between the boards and the waling.
- (c) When timbering is complete excavation proceeds again for a depth of about 5 feet when the process can be repeated, care being taken to keep the corner poling boards truly vertical. As soon as the second and subsequent frames are in position puncheons should be set in each corner clear of any wedges. The erection of any staging should not be allowed until the puncheons beneath the frame or frames below have been put in.

7. TIMBERING WITH RUNNERS (FIG III B)

- (a) The top corners of the runners should be cut off for about $1\frac{1}{2}$ inches on each side of the corner to reduce the risk of splitting the timber when driving and the INNER face should be chamfered at the bottom to form a chisel edge to prevent the tendency of the toe to work inwards.
- (b) When the excavation has been taken out to a depth of about 4 feet to 5 feet set two corner boards in each corner and proceed exactly as described for poling boards until the first frame has been erected. Place the runners in position with chamfered ends facing inwards and drive in a wedge between each runner and the waling. Once corner boards and their frame are in position they should not be moved.
- (c) If the conditions of soil permit the excavation can be continued until the next set of corner boards can be set into position while the runners, each having its wedge removed in turn, are allowed to follow down before being wedged back in position again. As soon as the second set of corner boards have been placed the second frame is erected at their mid-point, the runners being passed down behind it and re-wedged. In this case the frames will occur at 3 feet 9 inch centres.
- (d) In bad ground the runners must be driven down with a maul well ahead of the digging. Where it is necessary to drive runners it is advisable to insert the piling wedges BELOW the walings in order to ensure that the toes of the runners are kept out as far as possible before driving begins. Until such a time as corner boards can be placed in position, the soil at the corners should be supported by cross poling boards (FIG IV B). Lengths of boarding about 2 feet long, up to 1 inch thick and from 6 inches to 9 inches wide may be used for this purpose. The end runner at each corner should be driven and then a cross poling board should be driven in behind

it to support the side of the excavation pending insertion of the corner board. The second runner should then be driven over the end of the cross poling board. This process should be repeated as excavation proceeds until sufficient depth is reached for the next set of corner boards to be placed in position over the exposed ends of the cross poling boards. The next frame can then be erected in position, but until this can be done the runners will need temporary support. This can be achieved most readily by the erection of temporary walings held in position by Acrow Struts. Alternatively, a temporary frame may be put in at the foot of the last corner board.

- (e) When the tops of the first set of runners have been driven down to ground level, it will usually be possible to continue to drive them with a second set of runners; the bottom ends of these "followers" should not be chamfered. For very deep excavations in bad ground it may be necessary to start driving a fresh set of runners inside the bottom frame but this method of inseting should not normally be necessary.

8. HEADINGS (FIGS V A and V B).

As the travel of a bomb through the ground is erratic it is frequently not found to lie within the vertical excavation. A short heading thus becomes necessary and there is a strong tendency for the inexperienced to make it too small for a man to work in properly, in which case it will probably take longer to reach the bomb than if a proper size heading had been constructed. Except for very short offsets of 1 foot or so, in good firm ground, headings should always be timbered with at least the same care as vertical excavations.

- (a) One method of timbering a heading is described in the R.E. Pocket Book (1936) and illustrated at Chapter VI Fig 1 Plate 4 thereof. This illustration is reproduced at FIG V A. This method shown is a good one particularly in bad ground where there is reason to believe that the track to be followed by the heading will be straight. Frequently, however, bomb tracks do not keep straight either in the horizontal or vertical planes and so this method may have to be modified.

Possible variations are :-

- (i) In good ground (e.g. dry clay) timbering with 9 inch x 3 inch frames only at about foot intervals (FIG V B)
 - (ii) In wet ground (e.g. wet clay) as (i) above but close timbered, with frames butting against each other
 - (iii) In sandy soils and where a short heading of, say, 4 to 5 feet only is expected - a modification of FIG V A method but driving one set of, say, 5 foot chisel-ended header boards horizontally and supporting these with frames at intervals of, say, 2 to 3 feet
- (b) The main principles to bear in mind in driving headings are :-
- (i) Keep the heading large enough. Not less than 5 ft high and 4 ft wide (overall excavation)
 - (ii) Never use less than 9 inches x 3 inches scantlings for main frames or less than 2 inch thickness for header boards (if used).
 - (iii) The level at which the heading should be driven out from the runners should be such that the initial bomb track is slightly above the centre of the opening of the heading.

NOTE 1. The bomb track rarely turns at right angles and will probably (though not certainly) have a general downward direction.

NOTE 2. It is easier to extract a bomb from a heading that is level or slopes slightly upwards than from one that slopes downwards at a steep angle.

NOTE 3. A heading which slopes slightly upwards will be an advantage in draining off water in a wet hole.

- (iv) When digging in a heading never leave the roof face unsupported for any great length. If work must cease for the night, or for some hours, before the roof is properly shored up with permanent frames, then put in some temporary strutting (FIG V B)
- (v) In really bad ground, such as running sand, wet sandy clay, or where there is a large volume of water to be dealt with, and assuming the bomb is known to be more than say 2 to 3 feet from the side of the excavation, it will frequently pay to sink another excavation from the surface over the assumed position of the bomb rather than attempt to drive a heading
- (c) FIG V B Phases 1 to 3 represent stages of excavation in a heading

PHASE 1. Cut away at the bottom of the face to set in the sill A, leaving slope B at the face of the heading to help support the roof

PHASES 2. Next, cut back at sides of slope B just sufficient room for the final position of the legs (or trees) C, still leaving centre core of earth D to help support the roof. If work has to be stopped, fix temporary shoring of the untimbered face as at E.

PHASE 3. Finally cut away the core of the earth D (Phase 2), working from the roof downwards, and fit in the cap F.

The cap will first be placed in position and the legs C which have been removed temporarily will be fitted and driven outwards at top or bottom to give a tight "lift" to the roof. The above method has the advantage that some support is given to the roof until the last stage of cutting away the core D, which can be done quite quickly.

9. SALVAGE OF TIMBER.

The removal of timber from a shaft should be carried out in stages working from the bottom upwards. Except in really firm ground, the shaft should be back-filled with spoil as timber removal proceeds in order to prevent collapse of the shaft.

- (a) With poling boards, remove alternate boards until only the frame and corner boards are left in position, then knock out the wedges and allow the frame to collapse into the hole. Back fill with spoil and remove the next set of boards and frame in the same manner
- (b) When runners are used, the normal procedure is similar, but great care must be exercised owing to the considerable risk if the ground is bad. The soil should be filled back and rammed as withdrawal of the runners proceeds, filling keeping ahead of withdrawal so that the sides of the excavation are not left exposed. When the runners have been raised to the underside of the lowest frame, this frame may be removed, and then the same procedure continued
- (c) When no form of crane or similar lifting tackle is available the removal of runners may be facilitated greatly by the use of a chain, slotted crowbar and fulcrum.

- (d) Where distance of the nearest side of the shaft from a house is less than half the depth of the shaft all the timber should be left in place, otherwise the shaft may fall in and thereby cause a partial collapse of the building. If the ground is at all bad, the distance should be doubled.
- (e) Where shafts are excavated in roads, timber may have to be left in place because of the probable proximity of water mains, sewers and other public services.

USE - REMOVAL OF SPOIL FROM EXCAVATIONS	REFER E IN C B.D.T.I. E/21/36
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REMOVAL OF SPOIL
FROM EXCAVATIONS



Scale in Feet

TIME 1/2 - (WITH VERY WET SOIL) " " " " "

By loosening the three "KB-KL-MPS" (K) and removing the upright from its base, the JIB can be easily dismantled for transport if necessary.

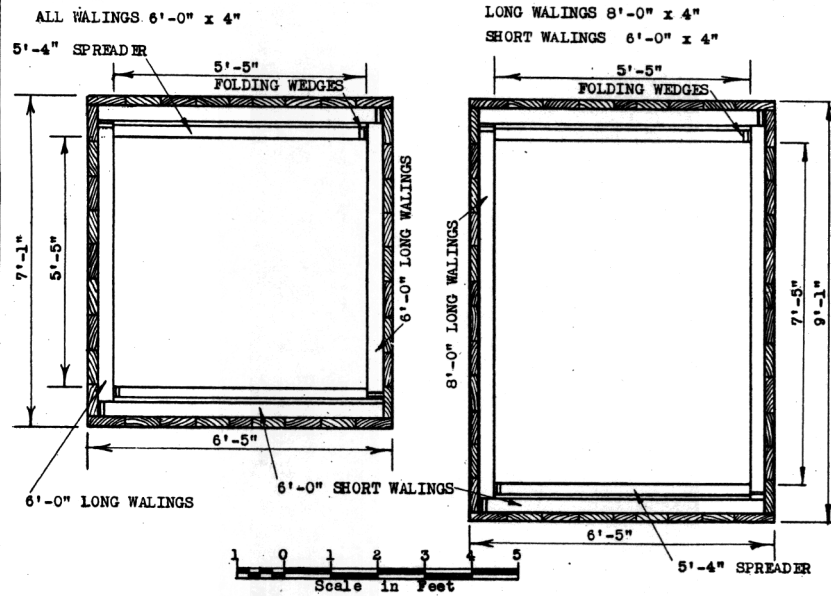
STANDARD EXCAVATIONS

TYPICAL LAYOUTS

REFER. EINC B.D.T.I. E/21/36

USING 2" POLING BOARDS

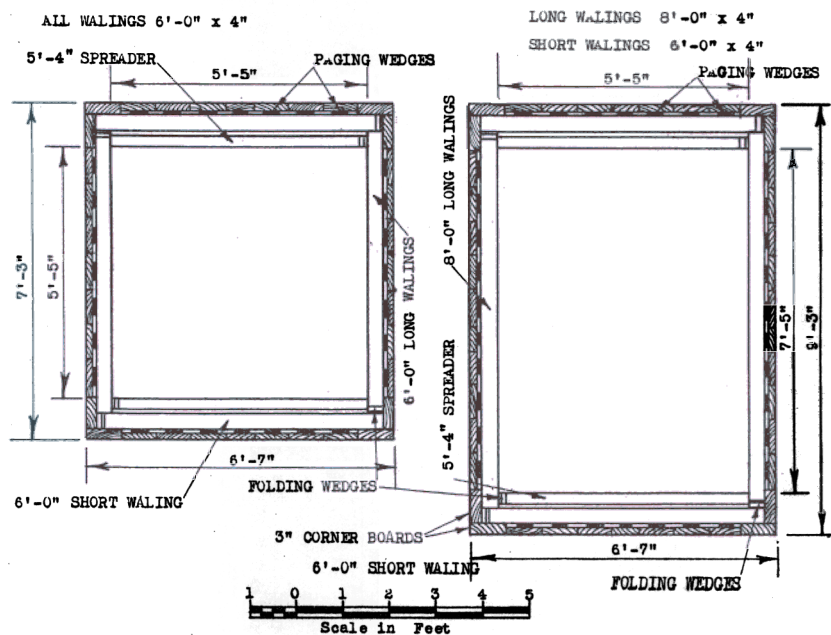
FIG II A



NOTE:- ALL DIMENSIONS INCLUDE AN ALLOWANCE OF 1" FOR WEDGES

USING 2" RUNNERS

FIG II B



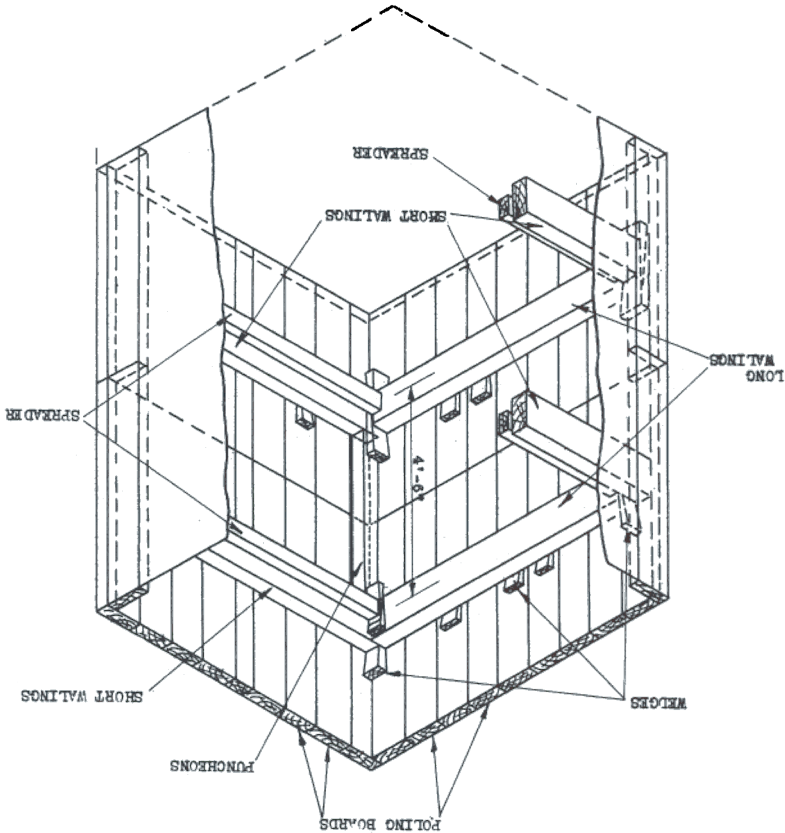
NOTE:- ALL DIMENSIONS INCLUDE AN ALLOWANCE OF 1" FOR WEDGES

STANDARD TIMBERING

USING POLING BOARDS

REFER E I N C B.D.T.I. E/21/36

FIG IIIA



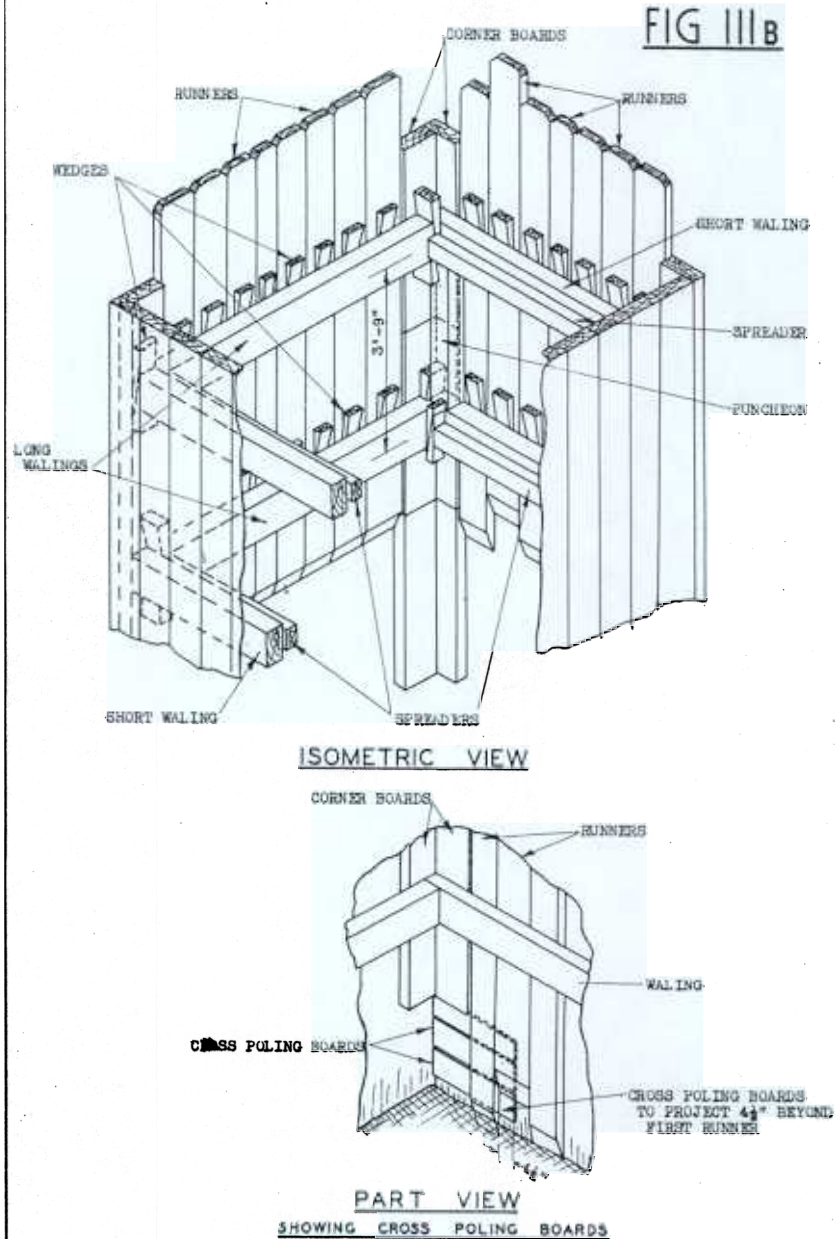
ISOMETRIC VIEW

POLING BOARDS	6" x 2"	4'-0" LONG
SHORT WALINGS	6" x 4"	6'-0" "
LONG WALINGS	6" x 4"	6'-0" " - OF 8'-0"
SPREADERS	4" x 3"	5'-4" "
WEDGES	4" x 2"	1'-0" "
PUNCHIONS	4" x 3"	3'-0" "

STANDARD TIMBERING

USING RUNNERS

REFER E IN C B.D.T.I. E/21/36



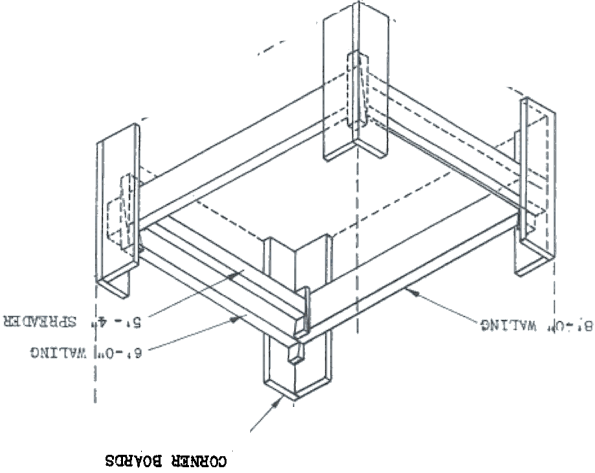
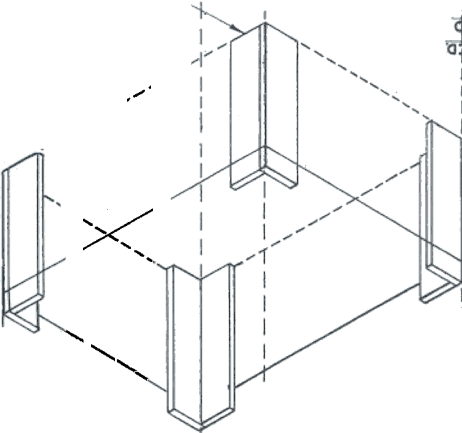
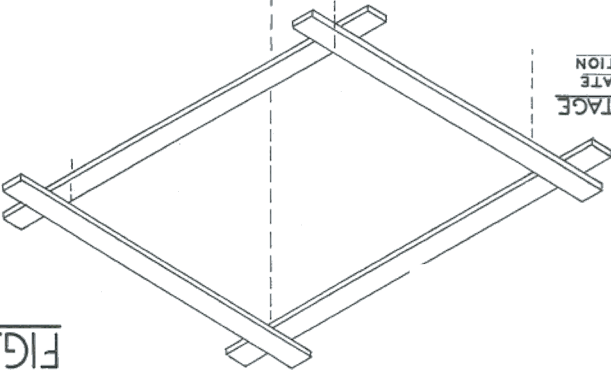
CORNER BOARDS	9" x 3"	3'-9" LONG	
SHORT WALINGS	9" x 4"	6'-0" "	
LONG WALINGS	9" x 4"	6'-0" "	or 8'-0"
SPREADERS	4" x 3"	5'-4" "	
RUNNERS	9" x 2"	10'-0" "	
WEDGES	4" x 2"	1'-0" "	
PUNCHIONS	4" x 3"	3'-0" "	

STANDARD TIMBERING

SEQUENCE OF OPERATIONS
IN SHAFT TIMBERING

REFER E IN C B.D.T.L. E/21/36

FIG. IV



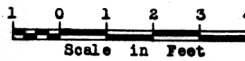
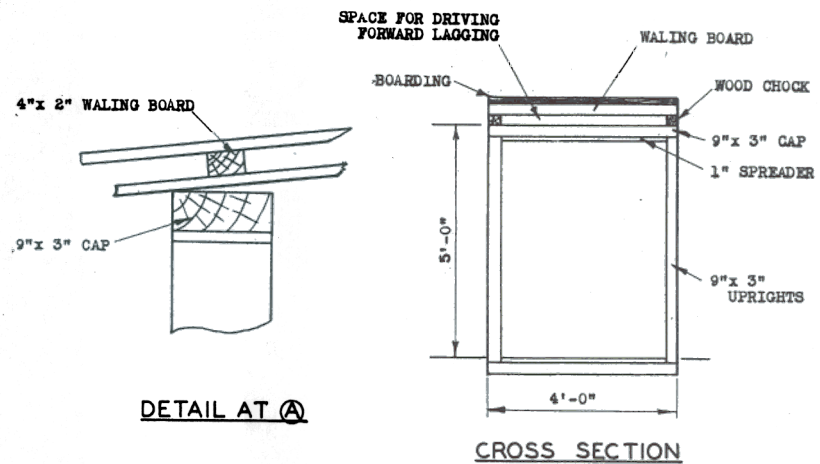
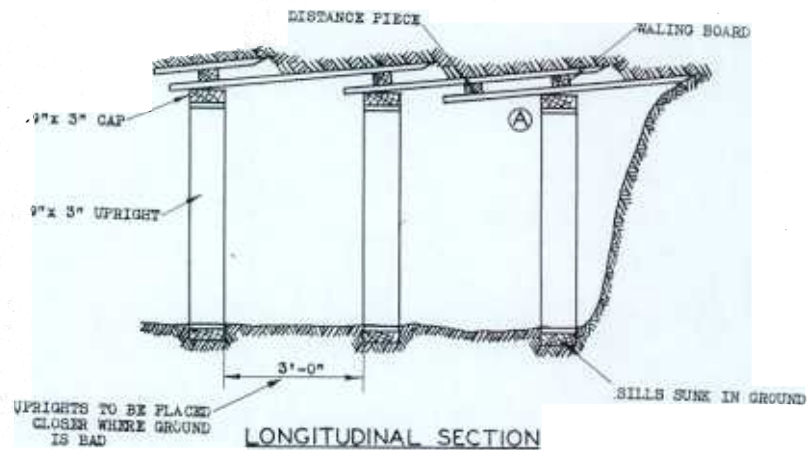
TIMBERS PLACED IN THE FOLLOWING ORDER -
SHORT WALINGS, LONG WALINGS,
SPREADERS.

STANDARD TIMBERING

HEADING OUT
FROM A VERTICAL SHAFT

REFER. E.I.N.C. B.D.T.I. E/21/36

FIG VA

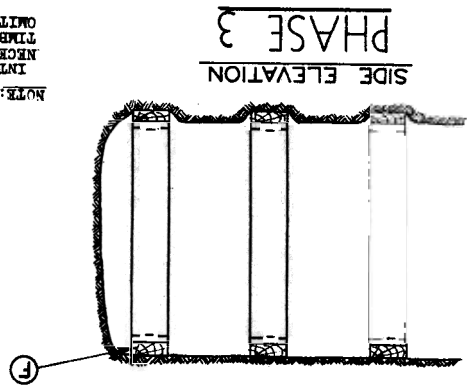
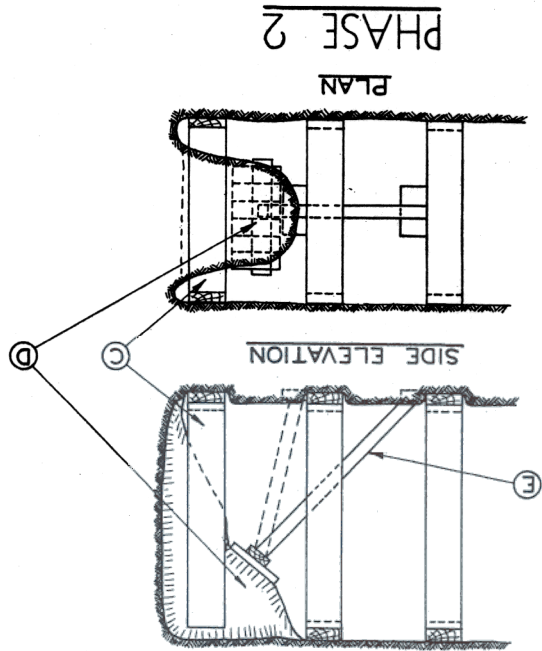
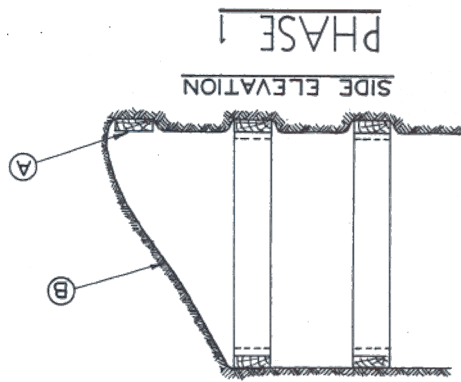


STANDARD TIMBERING

STAGES OF EXCAVATION
IN A HEADING

REFER E C B.D.T.I. E/21/36

FIG VB

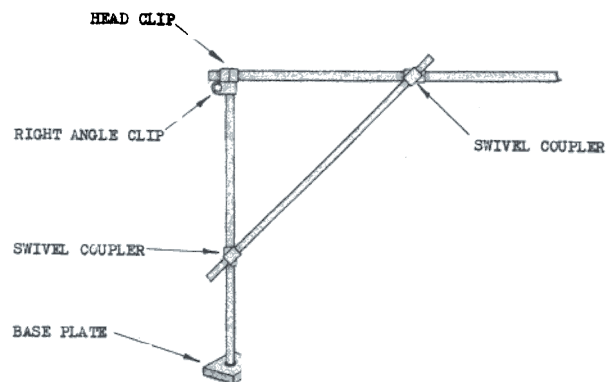
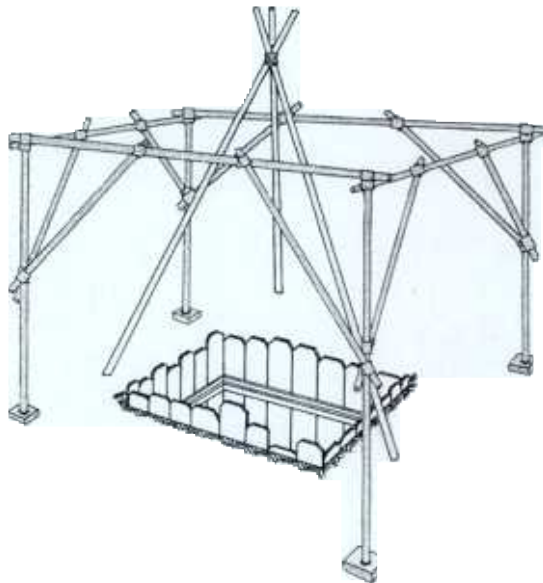


NOTE:- DIAGRAMMATIC ONLY
PHASE 3
SIDE ELEVATION
INTERMEDIATE FRAMES
NECESSARY FOR CLOSING
TIMBERING HAVE BEEN
OMITTED FOR CLARITY.

EXCAVATION SHELTER

TYPE - TUBULAR SCAFFOLDING

REFER E IN C B.D.T.I E/21/36



EACH SET OF SCAFFOLDING WILL CONSIST OF:-

- 4 No. CLIPS, HEAD
- 4 No. COUPLERS, 90°
- 4 No. COUPLERS, END TO END
- 16 No. COUPLERS, SWIVEL
- 4 No. PLATES, BASE
- 8 No. BRACES, 10 Ft LENGTHS
- 4 No. HORIZONTALS, 12-Ft LENGTHS
- 4 No. UPRIGHTS, 6-Ft LENGTHS
- 2 No. SPANNERS

DETECTORS - INDICATOR TEST PAPERS
(Operating Instns)

REFERENCES: The following are to be read in conjunction with this Instn :- BDTIs D/20/29 and D/20/79.

1. OBJECTS AND PERFORMANCE.

- (a) The function of Detectors I.T.P. is to indicate the presence of Carbon Monoxide Gas. This achieves the following objects :-
- (i) Constitutes an aid to safety of personnel engaged on works where the presence of carbon monoxide is suspected. Its value in this regard should be constantly borne in mind, full advantage being taken of it.
 - (ii) Assists in the diagnosis of camoufllets as distinct from UXBs but see NOTE 1 below.
- (b) The performance of Detectors I.T.P. is reliable, provided they are prepared, operated, and maintained as described in this instruction.

NOTE 1. The limitations of this type of Indicator should be clearly understood :-

- (i) As coal gas contains carbon monoxide, it should not be used in the neighbourhood of gas mains.
 - (ii) Some soils contain carbon monoxide, and other gases, which may similarly affect the palladium chloride of the test papers.
 - (iii) If the bomb hole remains open to a good depth, carbon monoxide gas may remain present for about a week; but if it has partially caved in, all traces of carbon monoxide may disappear very quickly.
- Nevertheless, when used on new bomb holes, at a distance from leaky or broken gas mains, it will often afford useless confirmation as to whether a bomb has exploded or not.

2. WHEN TO USE.

- (a) When A or B type camoufllets are suspected, in an endeavour to obtain confirmatory evidence before subsequent necessary action is taken. Refer BDTI D/20/29.
- (b) Immediately before re-commencement of work in a shaft, in which the probe has suddenly gone into a cavity, and all personnel have been withdrawn from the region of what has now become a suspected camoufllet. Refer BDTI D/20/29.
- (c) After action has been taken to make a camoufllet safe as described in BDTI D/20/79, and BEFORE repairs to same are allowed to be commenced. This is to ensure that all carbon monoxide has been expelled from the cavity.

3. DESCRIPTION.

- (a) The equipment is packed in 2 small tin boxes, which are painted dark green with 2 red bands across their lids. They are sealed with adhesive tape.
- (b) The smaller Box is labelled "BOX NO 1" and contains the following :- Test Paper Booklet (cellophane wrapped), Test Paper Holder, Spool of Cord, Reagent Spotting Bottle, Printed Instructions.
- (c) The larger BOX is labelled "BOX NO2" and contains 2 spare Test Paper Booklets (cellophane wrapped), Stock Reagent Bottle with rubber cap, a glass Filter Funnel, and printed instructions.

4. PREPARATION OF REAGENT.

- (a) The reagent used is subject to turbidity, which if not clarified, results in precipitation of a deposit on test paper. This affects colouration, thus nullifying the test. Hence reagent must be filtered :-
- (i) Immediately the equipment is received from AODs.
 - (ii) Periodically, as a maintenance drill, particularly when not in use.
 - (iii) Immediately before use, if a deposit forms.
- (b) To filter reagent, proceed as follows :-
- (i) Stand the Filter Funnel from BOX 2 in the Reagent Vial and insert a folded filter paper.
 - (ii) Pour Reagent from Stock Reagent bottle through the filter paper until the Reagent Vial is half full.
 - (iii) Discard the filter paper, rinse the funnel with water, dry and replace in BOX 2.
 - (iv) Stopper the Stock Reagent Bottle, fit the rubber cap correctly and replace in BOX 2.
 - (v) Screw up the cap of the Reagent Vial firmly and replace in BOX 1.

NOTE 2. The Reagent, once prepared, may be used until a deposit forms. When this occurs, the contents of the Reagent Vial should be returned to the Stock Reagent Bottle. The Vial and Cap should then be washed well with water, drained and refilled as described above.

5. METHOD OF USE.

If the Reagent Vial contains deposit, filter same as described in para 4. If it is clear, or alternatively after clarifying same, proceed as follows, using only the contents of BOX NO 1 :-

- (i) Take Test Paper Holder, loosen screw nuts
- (ii) Insert a leaf from Test Paper Booklet beneath the 2 holes and tighten screw nuts
- (iii) Immediately before test spot the paper in one hole only with reagent from Reagent Vial
- (iv) Lower the Holder into the bomb hole excavation cavity or crater, as the case may be, allow to remain for 5 MINS, then withdraw
- (v) Again spot the paper with reagent through the second hole. (See Note 3)
- (vi) Compare the colour of the 2 spots through back of Holder. (See Note 4)
- (vii) IF THE FIRST SPOT IS DARKER THAN THE SECOND, CARBON MONOXIDE IS PRESENT.

CAUTION. If the paper is spotted too soon before use, the test will fail. The paper must be lowered whilst the spot is still WET.

NOTE 3. The object of spotting paper through the second hole is to ensure the best standard of comparison.

NOTE 4. The colours of the spots are inspected through the BACK of the Holder so as to obviate shadow effects. The latter might occur when viewed from the front due to hole recesses on that side.

CARE AND MAINTENANCE.

- (a) See that both boxes are re-sealed with adhesive tape after use, and store in a dry place.
 - (b) Always fit the rubber cap correctly on the Stock Reagent Bottle.
 - (c) Periodically inspect reagent in Reagent Vial, and filter when necessary.
-

APPARATUS REVIVING - OPERATING INSTRUCTIONS

1. FOREWORD.

(a) Refer to BDTI D/20/125

(b) At this date special oxygen cylinders are being supplied to AUST BOMB DISPOSAL PLS RAE only, for whom one additional spare cylinder per PL is held by AODs in areas concerned.

2. OBJECT.

To administer oxygen to victims of carbon monoxide poisoning (see BDTI D/20/29 "Types of Camouflets and Safety Precautions" and D/20/79 "Making Camouflets Safe")

3. PERFORMANCE.

Oxygen drives out the carbon monoxide from the blood five times more quickly than air. This apparatus is easily applied and operated and administers oxygen efficiently.

4. DESCRIPTION.

The main parts consist of a MASK for placing over the victim's mouth and nostrils, with a quick-adjusting rubber HARNESS for securing same in position.

A rubber BREATHING BAG (2 gals capacity) is interposed as a reservoir between oxygen cylinder and mask

A FINE ADJUSTMENT VALVE for fitment to the oxygen cylinder serves both as a control and as a meter for estimating the volume of breathing, so that the supply to the victim can be adjusted to any volume. It is connected to the breathing bag by a short length of rubber tubing.

The breathing bag is connected to the mask by a length of corrugated rubber tubing,

The OXYGEN CYLINDER is of 40 cu ft capacity, weight about 30 lbs and is good for a period of about 2½ hours continuous use.

See para 7 for detailed parts list.

5. WHEN TO USE.

(a) As quickly as possible after patient has been removed from the vicinity of the polluted area, and simultaneous with the administration of artificial respiration

(b) For a short period after normal breathing has been restored, in order to lessen the severity of the after effects of the poisoning.

6. METHOD OF USE.

- (a) Make sure that the FINE ADJUSTMENT VALVE is closed, and fit same to OXYGEN cylinder
- (b) Open cylinder valve
- (c) Place MASK on victim's face and adjust HARNESS
- (d) Open FINE ADJUSTMENT VALVE quickly to fill BREATHING BAG
- (e) Control FINE ADJUSTMENT VALVE so that the BREATHING BAG is kept well distended
- (f) Use from TWENTY to THIRTY MINS.

7. PARTS LIST.

Item	Part No.	Ser.
Rubber Harness..	YR 2	(1)
Mask ..	DF 46	(11)
Exhale Valve ..	ME 1	(111)
Corrugated Rubber Tubing		(1v)
Incl Adaptor	T 91	
Adaptor (Its exhale Valve)	DM 206	(v)
Rubber Bag with Tefl		(v1)
2 gal capacity	YR 21	
Metal Union ..	YM 13	(v11)
Rubber Tubing (2 ft)	YR 15	(v111)
Fine Adjustment Valve ..	T 17	(1x)
Adaptor ..	R 50	(x)
Spanner ..	R 60	(x1)
Cylinder, oxygen		(x11)

TREPPANNING AND STEAMING-OUT PLANT - DESIGN III
(OPERATING INSTNS - PROVISIONAL)

INTRODUCTION.

- (a) IMPORTANT REFS: This TI to be read in conjunction with BDTIs D/20/62 and D/20/31
- (b) UNITS RAE GENERALLY. Only BOMB DISPOSAL PLS carry this eqpt. Other Units RAE require a knowledge of its operation as, in case of emergency, they may -
 - (i) borrow and operate the complete plant without assistance, or -
 - (ii) assist a limited crew and control the operation of borrowed plant, or -
 - (iii) select and prepare a suitable site for this plant.
- (c) COMPARISON - BRITISH AND AUST BOILERS. Some boilers and accessories are of AUST manufacture. However, performances are identical. For differences in minor details see APPENDIX F.

OBJECT AND PERFORMANCE

1. The object of this apparatus is to remove from a bomb various forms of explosive filling, including picric acid whether cast or powdered, under conditions of safety for the operators.

2. Performance.

- (a) A hole $4\frac{3}{8}$ -in. diam. can be trepanned in a bomb of 2" wall thickness in 30 mins, and of $\frac{1}{2}$ " wall thickness in 10 mins. The filling can then be steamed-out through the hole thus made by remote control in 1 hour for 50 kg bombs, $1\frac{1}{2}$ hours for 250 kg, $2\frac{1}{2}$ hrs for 500 kg and 4 hours for 1000 kg bombs, having cast TNT fillings. Corresponding figures for JAP bombs are not yet available.
- (b) Alternatively, if the base of the bomb can be removed, the filling can be steamed-out through the opening without the necessity of trepanning a hole in the bomb casing.
- (c) Crew required. A trained leader and four others, at least one of whom should be trained, are required to operate the plant.

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 - (c) Crew required. A trained leader and four others, at least one of whom should be trained, are required to operate the plant.
3. When to use. (Refer BDTI D/20/31)

Normal place for steaming-out is the bomb cemetery or other suitable open area, but the process may sometimes be necessary for dealing in situ with those bombs which cannot be moved or immunized.

NOTE 1 :- Bombs fitted with CHEMICAL LONG DELAY FUZES must NEVER be steamed out (see BDTI D/20/62)

NOTE 2 :- Bombs containing STEMMED AMMONAL filling must NEVER be steamed-out (see BDTI D/20/31)

DESCRIPTION

The complete Apparatus consists of :-

4. THE STEAM DRIVEN TREPANNING UNIT & ACCESSORIES,
(FIG 1) comprising :-

- (a) A BASE PLATE which can be attached to the bomb by adjustable chains, tightened by turnbuckles and
- (b) A detachable TREPANNING HEAD provided with a built in pump for supplying lubricant to the cutter from a separate container, and with a clutch for disengaging the Cutter Spindle from the geared drive.
- (c) A STEAM MOTOR, which is governed, and which drives the cutter spindle at from 50 to 60 RPM when the boiler pressure is from 85 to 100 lbs per square in.
- (d) Two types of detachable CUTTERS, viz., SHALLOW for thin walled bombs (used with a distance piece), and DEEP for thick walled bombs.

NOTE 3 :- The cutter advances .0015-in. per revolution, hence from figures given, the time taken to cut through a bomb of known thickness can be estimated, due allowance being made for cutter clearance and the curvature of the bomb.

NOTE 4 :- See APPENDIX B for Packing List showing accessories tools, spare parts, etc. normally packed with this unit in the 2 boxes provided. See APPENDIX C for additional spares normally held by Pls.

5. THE STEAM BOILER & ACCESSORIES (FIGS II and III) has a capacity of 500 lbs of steam per hour at 100 lbs per square in. pressure. It is oil fired, uses about 6½ to 7 gals of fuel per hour, and at full load evaporates 50 gals of water per hour. The following accessories are provided :

- (a) An auxiliary Liquid Fuel Burner for starting (primus type)
- (b) An Injector, also a Hand Pump, for the introduction of feed water
- (c) A Boiler Feed Tank (100 gal) fitted with Hand Boiler Feed Pump (see (b) above)
- (d) A Solution Tank (50 gal) fitted with a Hand Pump
- (e) Carrying poles for insertion in sockets attached to items (c) and (d) above.
- (f) A Steam Hose (60 yds) on drum, and other Hoses. See APPENDIX A for details.
- (g) A Wheeled Carriage (or "Rickshaw") to facilitate loading and unloading from a lorry.

NOTE 5 :- See APPENDIX D for list of accessories and spare parts carried with the Boiler. See APPENDIX E for list of spares normally held at Unit HQ.

6. THE STEAMING-OUT ATTACHMENT which is operated by remote control, and consists of :-

- (a) A Saddle, incorporating an adjustable Belt for attaching it to the bomb, and
- (b) A Hand Hose Feeder, which screws into the Saddle

NOTE 6 :- See APPENDIX B Sec. 2 (ii) for details and packing.

7. A SET OF LORRY FITTINGS (FIG IV) consisting of :-

- (a) Three plates for fixing to the lorry floor, to hold the boiler in position when travelling
- (b) Two steel channel and unloading ramps
- (c) Bar with 2 brackets for fixing to lorry, to take the unloading ramps
- (d) Block and Tackle for raising and lowering boiler on ramps
- (e) Wood fillets to secure 50 gal and 100 gal tanks when travelling.

8. NECESSARY STORES, etc. which should be loaded on the lorry and accompany the plant -

- (a) Oil, type M220 for the Steam Motor and Trepanning Unit
- (b) Paraffin
- (c) Fuel Oil (Dieseline)
- (d) Spare Hose Coupling Washers
- (e) Spare gauge glass and rings
- (f) Cotton waste, sandbags, etc.
- (g) Solvent (Washing Soda Crystals)

METHOD OF USE

(A) - OPERATING THE BOILER

9. PRELIMINARIES.

- (a) Site :- The boiler should be placed on a level site, about 50 yds from the bomb, and where adequate cover for boiler and crew exists or can readily be provided by the erection of a suitable sandbag wall.
- (b) Water :- Arrangements should be made for a supply of clean water. Approximately 60 gals per hour will be required.
- (c) Connecting Up :- Connect up the boiler, and tanks and hoses as shown in FIG V, taking care to ensure that all hoses are clear and free from grit, etc., before doing so.
- (d) Filling :- Proceed as follows :-
 - (i) Fill the boiler fuel tank with fuel oil (Dieseline if procurable) and the 100 gal and 50 gal tanks with clean water (see NOTE 6)
 - (ii) Close all valves and cocks (see FIGS II and III) EXCEPT (a) the Top and Bottom Water Level Gauge Cocks (which should never be closed unless the gauge leaks or the glass is broken) and (b) the Upper and Lower Water Level Test Cocks.
 - (iii) Fill the Boiler, using the hand feed pump on the 100 gal tank until water issues freely from the Lower Water Level Test Cock. This Cock should then be closed.
- (e) Lighting Up :- Light up the Auxiliary Burner in the same way as for a primus stove, place it in the fire box and direct the flame on to the boiler tubes by means of the sight hole. Leave the Upper Water Level Test Cock open to allow escape of air until steam issues from the cock when it should be closed.

(If the Auxiliary Burner is out of action, the boiler can be heated up in an emergency by using a wood fire in the firebox, but coal must NOT be used.)

10. RUNNING.

- (a) When pressure on Boiler Gauge reads 12 to 15 lbs the main burner should be brought into use.
- (b) Open Blast Cock, open Fuel Valve about one-quarter turn to allow oil just to dribble out of burner, then open Burner Steam Valve fully. Regulate the valves so that the flame consists of a yellow ring with a blue centre; there should then be a faint brown haze at the chimney. If the flame is too yellow and gives off black smoke, reduce fuel supply. Too blue a flame means too little fuel or too much steam, with danger of popping back and blowing out. Remove auxiliary burner when flame is satisfactory.
- (c) If Main Burner blows out, close Burner Steam Valve and increase oil supply, leaving Blast Cock open. To re-light, use a rod about 3-ft long with a torch of oil-soaked rag or asbestos yarn; as soon as burner re-lights, open Burner Steam Valve as in (b) above.
- (d) The Injector should be used to maintain water supply to the boiler; the Hand Feed Pump may be used in an emergency. To operate the Injector, wait until pressure reaches about 50-lbs, then :-
 - Firstly : Open Injector Cock fully
 - Secondly: Open Injector Suction Cock fully
 - Thirdly : Open Injector Steam Cock fully
 - Fourthly: Close Injector Suction Cock gradually until only a trickle of water issues from overflow pipe.
- (e) The water level should be maintained at about half way gauge glass, but check water level frequently by opening and closing Water Level Gauge Drain Cock, so ensuring that water level in the gauge is a true one.
- (f) If Injector fails, or steam issues from overflow pipe, open Injector Suction Cock wide and so cool down the Injector. If this fails, cover the Injector with a rag soaked in cold water, and replenish cold rags until Injector is cooled sufficiently to restart. When cooled adjust as before.
- (g) If the Main Burner is out for any length of time during operations, e.g., due to fuel shortage, the hose from the Hand Pump feeder should be disconnected at the Pump and left open to air. If this is not done, water may be drawn in as steam in the boiler and condensed until the boiler is completely full of water.
- (h) When the pressure on the Boiler Gauge shows 95 lbs per sq-in, check the Safety Valve to ensure that it is in working order.
- (j) Boiler pressure should be maintained as nearly as possible at 100-lbs per sq-in on both Gauges throughout the operation. One man will be required to act as Boilerman during the whole time the boiler is working

11. SOLVENT.

In cases where a Solvent is required (as in a Picric filled bomb), steam should now be turned on to the 50 gal Solution Tank at the Solution Heating Steam Valve on the Boiler. Add the necessary solvent to the tank and stir thoroughly (30 lbs washing soda crystals per 10 gals of water for Picric Acid).

12. MAIN STEAM HOSE.

This should now be run out until it is near enough to the bomb to be attached to the Steam Power Unit or direct to the Steaming-Out Hose, whichever may be required for subsequent operations as described below. The near end of the Main Steam Hose should then be attached to the main coupling on the boiler.

NOTE 7 :- Even when no solvent is required the 50 gal tank should be connected up. It can then be used to supply hot water for cleaning the apparatus, washing hands, etc. On no account should any traces of oil, grease or explosive be allowed to get into the 100 gal food-water tank.

NOTE 8 :- The above operations (a-j) provide a supply of steam for steaming-out the filling. Subsequent operations will depend on whether the bomb is to be steamed-out by :-

- (a) inserting the steaming-out hose through the filling hole of the bomb.
- (b) trepanning a hole in the bomb and feeding the steaming-out hose into the bomb through the trepanned hole.

In all cases the steaming-out hose should be introduced into the bomb at the highest possible point in order that the bomb may be full of boiling liquid throughout the operation.

(B) - TREPPANNING A HOLE IN A BOMB
PREPARATORY TO STEAMING-OUT

13. If it is impossible or undesirable to remove the baseplate of a JAP bomb, or the filling plug of a GERMAN bomb, a hole can be trepanned in the case of the bomb as follows :-

(a) Setting up. Thoroughly clean the surface of the bomb and place the detachable base of the trepanning unit on it, preferably near the highest point of the bomb and in a position where the nozzle when fed into the bomb will not foul a fuze pocket. Pass the two chains round the bomb, attach them to the chainhooks at a convenient point, and tighten up the coupling boxes (turnbuckles) with the spanner provided until the base is securely held in position. Undue force must NOT be USED or the casting may be distorted and the trepanning head will not fit on its spigot.

(b) Trepanner Head. (FIG I). Mount the trepanning head (complete with Steam Power unit) on the base and secure with the three Quick Release Cramps. Great care must be taken not to jar the cutter, as it is made of hard steel and is easily damaged by impact

(c) Adjustment of Cutter. With the feed clutch disengaged, rotate the handwheel slowly in an anti-clockwise direction until the cutter gently engages the bomb surface. Then withdraw the cutter slightly by rotating the handwheel for 2 complete turns

Neglect of this precaution will result in damage to the cutter. Re-engage the clutch.

- (d) Cutter Lubrication. Erect the cutting oil container in a convenient position so that it is level with or higher than the bomb. Attach the long petroflex oil tube to the container and to the left hand connector on the Trepanning Head, and connect the short petroflex oil tube between the right hand connector on the Trepanning Head and the connector on the base below. Turn on the container oil tap and ensure that there is a small flow of cutting oil even when the machine is not running. If there is no flow, clear the tube by blowing through it or if necessary dismantling the couplings. When steam is turned on check that the supply of oil is increased by the operation of the automatic pump when the power unit starts to rotate.

NOTE :- The soluble cutting oil is supplied in concentrated form and is to be mixed with clean water at the rate of one part of cutting oil to twenty parts of water. Make sure that the filter is in position before filling with oil. If cutting oil is not available, soapy water may be used.

- (e) Trepanner Lubrication. Check oil level in the trepanner head. The correct grade is M220 and the oil level should be visible through the oil filler hole. Use oil gun, with M220 on the oil nipple below the hand wheel. Put a small quantity of oil M220 in the cavity between feed screw and cap
- (f) Steam Inlet and Outlet. Screw the "air line" lubricator firmly to the body of the steam power unit. Screw the exhaust pipe into the exhaust port of the steam power unit.
- (g) Power Unit Lubrication. Fill the "air line" lubricator unit with oil M220, through the filler cap. Screw back the filler cap tightly. Use the oil gun, with M220, on the two oil nipples of the steam power unit.
- (h) Examine the cutter. This must be sharp; a blunt or chipped cutter will strain the machine and cause vibration. No attempt should be made to sharpen a blunt cutter as this can only be done by expert personnel.
- (j) Fit the cutter and secure with the 3 "allon" cap-screws, tightening up with the special key provided. When the short cutter is used (for S.C. or thin walled bombs), the distance piece is inserted between the cutter and the main shaft, the long capscrews being used in this case.
- (k) Adjustment of Cutter. The mainshaft should now be fully withdrawn by rotating the handwheel in a clockwise direction, with the clutch disengaged. It is most important that the cutters should not foul the bomb when the trepanning head is fitted to the base.
- (l) Starting Up. When a pressure of 85-100 lbs per square inch is available at the boiler, blow steam through the main steam hose until all condensed water has been ejected. Then connect the hose to the "air line" Lubricator and open wide both the control cock and the drain cock on the steam power unit.

Turn on full steam at the boiler main steam valve and allow the trepanning unit to accelerate to full speed (experience will soon determine the "note" when full speed is reached). The run-up period will be sufficient to clear the driving end bearing of any water which has accumulated there. The drain cock should then be closed.

NOTE 9 :- If the machine fails to start, close the control valve on the steam power unit for a few seconds (leaving steam turned at the boiler) then open it quickly. By this means a "water hammer" effect is obtained and this will cause the machine to start.

(m) Cessation of Cut. Because of the governor fitted to the steam power unit there is no noticeable change of note when the cutter has completed its operation. It should not be necessary to go back to the bomb until the cutting is completed unless the machine stalls. In this case the whine of the machine will cease and steam should at once be turned off at the boiler, the cutter completely withdrawn from the cutting face by disengaging the clutch and rotating the handwheel clockwise. At the same time the coupling boxes should be inspected to ensure that the base has not worked loose. The cutter tooth will be broken if these instructions are disregarded when the machine stalls. If for any reason the machine is stopped before the cutting operation is completed the cutter should be withdrawn slightly before the machine is re-started. The maximum times normally taken for the trepanning of bombs are :-

(German) S.C. bombs; cases up to $\frac{1}{2}$ " thick - 10 mins
(German) S.D. bombs; cases from $\frac{7}{8}$ "- $1\frac{5}{8}$ " thick-30 "

(n) Completion of Cut. When the times shown above have elapsed, shut off steam at the boiler and inspect the machine. If the cut has been completed, open drain cock on the steam power unit and blow through before shutting off steam, disengage the feed clutch and withdraw the cutter to its fullest extent by means of the hand wheel. Turn off the cutting oil tap, take off the flexible tubes, uncouple the engine hose, and remove the trepanning Head from the Baseplate, and the Baseplate itself from the bomb. (The Trepanning Unit should subsequently be cleaned carefully, oiled, and repacked in the boxes provided.)

14. CLEANING STEAM POWER UNIT.

- (a) Unless the Steam Power Unit is to be used again within 48 hrs, it should be dismantled after use and should be thoroughly dried out and lubricated with Oil M220 before being re-assembled and packed away.
- (b) The following special equipment will be required for dismantling the Steam Power Unit :
 - (i) Wheel puller, for removing driving gear wheel
 - (ii) Key for removing governor
 - (iii) $\frac{1}{2}$ " gas plug (supplied with the machine)
 - (iv) Steel rod, 2-13/16" x $\frac{1}{4}$ " diameter (to be made up locally).
- (c) The Steam Power Unit should be dismantled as follows (see APPENDIX G and FIG 6 for nomenclature and parts numbers)

- (i) Remove the airline lubricator, steam control cock and exhaust piping and shake as much water as possible out of the machine
- (ii) Remove the driving pinion and flange (63374)
- (iii) Inspect the steam gland (64191), which is a push fit and replace if necessary
- (iv) Clean, oil and re-assemble the driving end except for the driving pinion
- (v) Hold the Unit vertically and remove the four rotor case bolts (54448)
- (vi) Place the 2-13/16" rod in the steam inlet so that one end rests on the governor valve. Screw the 1/2" gas plug into the steam inlet, bearing on the other end of the rod, and so draw the casing off the ball bearing. Catch the governor valve, spring and rod as they spring out
- (vii) Remove the governor body and balls
- (viii) Remove the ball housing by turning anti-clockwise
 - (ix) Lever ball bearing out gently
 - (x) Lift out the rotor case lining and rotor and remove the blades
- (xi) Clean and oil all parts and re-assemble carefully in the reverse order. Ensure that the rotor is re-assembled with the recessed end down, and that the slot in plate 483726 corresponds with the inlet passage in the cylinder casing. Tighten the rotor case bolts evenly.
- (xii) Before replacing the driving pinion ensure that the shaft turns freely in all positions.
- (xiii) Replace the driving gear, and pack the Unit away
- (xiv) When possible store the Unit horizontally exhaust downwards, and with the 1/2" gas plug screwed in. From time to time turn a few times by hand.

NOTE 10:- On no account should a screwdriver be used to break the joint between inlet casing and rotor case as the latter is made of aluminium and is easily damaged.

(C) - STEAMING OUT BY REMOTE CONTROL THROUGH
A TREPPANNED HOLE

15. Proceed as follows :-

- (a) Saddle Attachment. Place the saddle attachment in position over the trepanned hole, taking care to ensure that the steaming-out hose when fed in will not foul the edges of the bomb casing, and secure by passing the belt round the bomb and tightening up on both tensioning bolts.
- (b) Hand Hose Feeder. Fix the spring pressure spindle to the Hand Hose Feeder, screw the apparatus into the socket of the saddle and tighten up with the tommy bar provided.
- (c) Steaming-out Hose. Attach the steaming-out hose to the main steam hose and, with the pressure adjusting spring slack, push the nozzle through the hand hose feeder tube until the former is just clear of the bomb filling.
- (d) Feed Adjustment. Tighten the wing nut until there is just enough pressure (and no more) to ensure that the pressure rollers grip the armour of the steaming-out hose. If the wing nut is tightened too much it will be difficult to work the feeder by remote control.

- (e) Operating Cord. Attach a 70 yard length of cord (e.g. as used with a Fuze Extractor Design 2) to the brass thimble and lead the cord back to the boiler position.
- (f) Steaming-out. When all personnel have been withdrawn under cover, turn on the steam at the boiler; a light pull on the cord will then bring the nozzle down to the explosive. A pull every few minutes in the first half hour will ensure that the nozzle works its way well into the explosive, but thereafter it will only be necessary to apply a light pull to the cord about once every 20 minutes. Too frequent or too heavy pulls on the cord will only tend to bore a hole through the filling without completely melting it.
- (g) Emptying the Bomb. When the contents of the bomb are melted and have run out or the bomb is full of liquid only, steam can be turned off and the complete steaming-out attachment removed. If the bomb is partly full of liquid, it should be rolled over to allow all the liquid to drain out. If this does not remove all traces of the filling, steam should be left on for some time longer until the liquid in the bomb is almost entirely water, which can then be emptied out as before.

NOTE 11 :- When the main steam valve is turned off always ensure that the relief opens, tapping down the central vertical rod if necessary. If this precaution is neglected the partial vacuum created as steam condenses in the main steam hose will cause melted explosive to be sucked into the steaming-out hose.

(D) - STEAMING-OUT THROUGH THE FILLING HOLE
OF A GERMAN BOMB

16. When the filling plug can be removed without difficulty there is usually no need to trepan a hole through the bomb as the filling can be steamed-out most easily through the filling hole. In this case the Steaming-out Hose is attached direct to the main steam hose, care being taken to ensure that the latter has been run out (as in para 12 above), so that there is enough slack at the bomb for the nozzle ultimately to reach the most distant point inside the bomb. The operations then proceed as follows :-

- (a) When hose is fed by hand.
 - (i) The nozzle should be wedged in position (usually with sandbags) so that steam will blow on to the filling exposed at the filling plug. All personnel should be withdrawn to a safe distance and then steam turned on for 5 minutes. Steam should then be turned off and the nozzle inserted as far as it will go into the filling. Steam should then be turned on again, and, after half an hour, the procedure should be repeated. It should not be necessary to approach the bomb again until all the filling has been melted (See NOTE 11).
 - (ii) Steam can now be turned off, the steaming-out hose removed and procedure adopted as in para 15 (g) above.

(b) When hose is to be fed by remote control.

When it is desirable to complete the steaming-out operation entirely by remote control the filling plug in the base of the bomb should be replaced by a special plug drilled and tapped to take the Hand Hose Feeder.

The Hand Hose Feeder is screwed in position and procedure is the same as in para 15 (b) to (g).

NOTE 12 :- Once Steaming-out has commenced it MUST be continued until all the filling has been removed.

(E) - CLOSING DOWN THE BOILER

17. To close down Boiler -

- (a) Turn off Main Steam Valve (after having checked the operation of Relief Valve)
- (b) Turn off Fuel Supply Valve and Burner Steam Valve
- (c) Disconnect Water Feed Pipe (before allowing the pressure to drop)

(F) - FINAL OPERATIONS

18. Clean all Eqpt; coil hoses and pack away in the 50 gal Solution Tank. Repack the items of the Trepanning Machine and Steaming-out Attachment after cleaning all parts carefully, and oiling as described. Return items to the Lorry, stowing away as shown in FIG 4.

SPECIAL PRECAUTIONS

- 19. (a) Attention is drawn to the Special Precautions which must be observed when Steaming-out Picric filled bombs (see BDTI D/20/62). Any and every portion of the Trepanning Unit and Steaming-out Attachments must be thoroughly washed down with clean water before removal from the bomb.
- (b) Before blowing up a filled fuze pocket in a bomb which has been steamed out, the Officer in charge of the operation must make certain that all the explosive has, in fact, been removed or the explosion may otherwise be more violent than had been anticipated.
- (c) Thorough and careful probing inside the bomb will generally show whether any solid explosive filling remains but if a bomb case is to be sent to salvage after being steamed out, it is essential that the Officer in charge of the operation should satisfy himself not only by probing but also by visual inspection THROUGH THE FILLING HOLE that the bomb has been completely emptied, and also that no fuze or picric acid remains in the fuze pocket.

APPENDIX A

DETAIL OF HOSES FOR TREPPANNING & STEAMING-OUT
PLANT DESIGN III.

No.	Description	No. per set	Schedule of parts, each complete hose.
1	<u>Main steam hose 180' x 1" bore</u> Comprising one length of reinforced rubber hose, 180' long by 1" bore with Albany coupling cap and chain for 1" hose secured by 3 No Jubilee Clips on one end. To the other end of the hose is secured by 3 No Jubilee clips the 1" branch of a Y piece. One branch of the Y is employed as above, the remaining two being of $\frac{1}{2}$ " bore and fitted with Albany couplings caps and chains. Rubber and canvas washers, description as below, are fitted to the three Albany couplings.	1	Albany coupling 1" No. 1. Albany coupling $\frac{1}{2}$ " No. 2. Y pieces. No. 1. Jubilee clips 1" No. 6. Hose 180' x 1" boreNo. 1. Washers 1" coupling No. 1. do $\frac{1}{2}$ " No. 2.
2	<u>Engine Hose 12' x $\frac{1}{2}$" bore.</u> Comprising one length of reinforced rubber hose, 12' long by $\frac{1}{2}$ " bore, with $\frac{1}{2}$ " Albany coupling cap and chain at each end. The couplings are fitted with rubber and canvas washers, and secured to the hose by Jubilee clips	2	Albany coupling $\frac{1}{2}$ " No. 4. Jubilee Clips $\frac{1}{2}$ " No. 4. Hose 12' x $\frac{1}{2}$ " bore No. 4. Washers $\frac{1}{2}$ " coupling No. 4.
3	<u>Steaming out Hose.</u> With nozzle and flexible metallic hose. Two complete hoses are supplied, similar in all respects, each comprising one 15' length of $\frac{1}{2}$ " bore reinforced rubber hose, width $\frac{1}{2}$ " Albany coupling, cap and chain and washer at one end, secured by a Jubilee clip. To the other end is secured a rotating nozzle and a 8' length of metallic hose. See L.I. Drg. "F" Feed Pipe Mechanism.	2	Albany coupling $\frac{1}{2}$ " No. 1. Jubilee clips $\frac{1}{2}$ " No. 2. Hose 15' x $\frac{1}{2}$ " bore No. 1. Washers $\frac{1}{2}$ " coupling No. 1. NozzleNo. 1. Metallic hose No. 1.
4	<u>Injector Suction Hose 8' x $\frac{5}{8}$" bore.</u> Comprising one length of reinforced hose, 8' long by $\frac{5}{8}$ " bore, with female "Merryweather" screwed couplings one end, each secured by a single Jubilee clip. The female coupling screws on to the injector, the male on to the strainer. Lead washer in female coupling. Part No. 460. Boilers Parts List.	1	Screwed coupling "Merryweather" male No. 1. -do- female No. 1. Jubilee clips $\frac{1}{2}$ " No. 2. Lead washer No. 1. Hose 8' x $\frac{5}{8}$ " bore No. 1.

No.	Description	No. per set	Schedule of parts, each complete hose												
5	<u>Water Hose.</u> 10' x $\frac{5}{8}$ " bore, from hand feed pump to boiler. Comprising one length of reinforced rubber hose 10' in length by $\frac{5}{8}$ " bore, with female "Merryweather" screwed coupling at each end, each secured by a single Jubilee clip. Lead washers to each coupling. Part No. 459. Boiler Parts List.	1	Screwed couplings "Merryweather" female.....No. 2. Jubilee Clips $\frac{5}{8}$ " No. 2. Lead washers No. 2. No. 2 Hose 10' x $\frac{5}{8}$ " bore No. 1.												
6	<u>Solution Feed Pipe.</u> 10' x $\frac{5}{8}$ " bore. Comprising one length of reinforced rubber hose with male "Merryweather" Screwed coupling one end, female ditto, the other end, each secured by a single Jubilee clip. Lead washer in female coupling. Female end fixes to hand pump, male end to special fitting on boiler. Part No 458. Boiler Parts List	1	Screwed couplings "Merryweather" female No. 1. - do - male No. 1. Jubilee Clips $\frac{5}{8}$ " No. 2. Lead Washers No. 2. Hose 10' x $\frac{5}{8}$ " bore No. 1.												
7	<u>Solution heating pipe - 12'x$\frac{1}{2}$"</u> Comprising one length of reinforced rubber hose, 12' long by $\frac{1}{2}$ " bore, with $\frac{1}{2}$ " Albany coupling secured by Jubilee clip <u>on one end only</u> . The other end <u>plain</u> . Rubber and canvas washer in coupling. Coupling fixes to special fitting on boiler.	1	Albany coupling $\frac{1}{2}$ " No.1. Jubilee clip $\frac{1}{2}$ " No. 1. Hose 12' x $\frac{1}{2}$ " No. 1. Rubber and canvas washer $\frac{1}{2}$ " No. 1.												
8	Rubber and canvas washers, for Albany couplings. Soft rubber with canvas backing on one side <table><tr><td></td><td><u>1" Coupling</u></td><td><u>$\frac{1}{2}$" Coupling</u></td></tr><tr><td>Ext dia</td><td>1-5/16"</td><td>7/8"</td></tr><tr><td>Hole "</td><td>13/16"</td><td>7/16"</td></tr><tr><td>Thickness</td><td>3/16"</td><td>1/8"</td></tr></table>		<u>1" Coupling</u>	<u>$\frac{1}{2}$" Coupling</u>	Ext dia	1-5/16"	7/8"	Hole "	13/16"	7/16"	Thickness	3/16"	1/8"		Number of washers employed to connect all hoses. R & C 1" No. 2. R & C $\frac{1}{2}$ " No. 8. Lead No. 6.
	<u>1" Coupling</u>	<u>$\frac{1}{2}$" Coupling</u>													
Ext dia	1-5/16"	7/8"													
Hole "	13/16"	7/16"													
Thickness	3/16"	1/8"													
9	Lead washers for "Merryweather" screwed couplings <table><tr><td>Ext dia</td><td>13/16"</td></tr><tr><td>Hole dia</td><td>5/8"</td></tr><tr><td>Thickness</td><td>3/32"</td></tr></table>	Ext dia	13/16"	Hole dia	5/8"	Thickness	3/32"								
Ext dia	13/16"														
Hole dia	5/8"														
Thickness	3/32"														

APPENDIX B

Details of Packing for Trepanning Machine
and Steaming-Out Attachment

1. This apparatus is carried in three wooden boxes :-

Large Box - A 2'4" x 2'6" x 2'
Small Box - B 2'5" x 1'3" x 2'
Small Box - C (packed inside box A) 16½" x 9½" x 7½".

2. A complete list of all parts supplied is shown below, the letter after each item indicating the box in which the item is carried.

(i) <u>TREPANNING MACHINE</u>		<u>Box</u>
(a) Detachable base		A
(b) Chains (2), chain hooks (2) coupling boxes (turnbuckles) 4		A
(c) Petroflex tubing, 1 long, 1 short		B
(d) Trepanning Head with shallow cutter and distance piece attached (with steam power unit attached)		A
(e) 2 gal tin of cutting oil		B
(f) Cutting oil container with tap and filter		B
(g) Tool kit		B
Keys, hex ½" No. 2.		
" " 3/16" No. 2.		
" " 5/16" No. 2.		
Screwdriver, London Pattern 4" blade No 1		
Spanners D.E. 3/16" x ¼" No. 1		
" " 5/16" x ⅜" No. 1		
" " 7/16" x ½" No. 1		
" 3.E. 1/3" No. 2		
" Box. 7/16" No. 1		
Tommy bar No. 1		
" " extension No. 1		
Oil gun No. 1		
(h) Shallow cutters (3) 1 fitted to machine 2 spare		B
(i) Deep cutters (3)		B
(j) 7/16" x ¾" capscrews (6) 3 on machine 3 spare		B
(k) 7/16" x 2½" capscrews (6)		B
(l) Split pins (12) (spare)		B
(m) Steam power unit (attached to trepanning head)		A
(n) Set rotor blades for steam power unit head (spare)		B
(o) Set (4) rotor case bolts and nuts (spare)		B
(p) Grease gun		B
(q) Spare steam sealing ring		B
(r) Special tools for steam power unit		B
Pinion withdrawal tool (1)		
Box spanner with tommy bar (1)		
Key for governor ball housing (1)		
(ii) <u>STEAMING-OUT ATTACHMENT</u>		
(a) Saddle and belly band		A
(b) Hand hose feeder (1)		C
(c) Spring assembly (1)		C
(d) Rubber tyred rollers (4) (spare)		C
(e) Spring (1) (spare)		C
(f) Wing Nut (1) (spare)		C
(g) Washers (2) (spare)		C
(h) Taper pins for locating rollers (4) (spare)		C

APPENDIX C

Class A Spares for Pass Trepanning Machine
(To be carried with the Unit)

<u>Part No.</u>	<u>Description</u>	<u>No.</u>
5	Plug for oil filler	1
21	Trepanning cutter, long	6
24	Petroflex tube	1
32	Elbow $\frac{1}{4}$ " B.S.P. thread	1
36	Petroflex tube	1
41/3	Spring clip	1
58	Oil Nipple	2
59	$\frac{1}{4}$ " Instantair coupling female	1
61	Clutch spring	1
64	$\frac{1}{4}$ " Instantair coupling male	1
65	Trepanning cutter, short	6
71	Oil seal	1
72	Oil seal	1
76	Cutter lubricant tube	1
85/2	Filter	1

Class A Spares for Steam Power Unit
(To be carried with the Unit)

64191	Sealing ring, new type	1
504413	Rotor blades	4
54448	Rotor casing bolts and nuts	4

APPENDIX D

Accessories and Parts with 500 lbs. Boiler

<u>Description.</u>	<u>No.</u>
Tanks, G.I. 100 gals, with hand pump and sockets for carrying poles	1
Tanks, G.I. 50 gals, fitted as above	1
Hose, R. and C., hand feed pump to boiler	1
Hose, Injector suction, with strainer	1
Hose, Solution feed pipe	1
Hose, Solution heating pipe	1
Boiler fittings comprising :-	1
Safety valve	
Burner steam valves and pipes	
Fuel tank, valves and pipes	
Oil burner	
Main stop valve and "Special Fitting"	
Blast cock and pipe	
Boiler uptake	
Water gauge glass with protector and three cocks	
Upper and lower level test cocks	
Injector with steam and water valves, check valve and piping	
Hand feed pump check valve	
Blowdown cock	
Gauges pressure (2)	
Sockets for carrying poles	
Trunnions for carriage	
Mud plug and filler plug	
Lighting up set (auxiliary burner)	1
Carriage for boiler	1
Carrying poles	2

APPENDIX E

Class A Spares for 500 lbs Boiler
(To be carried with Unit)

<u>Part No.</u>	<u>Description</u>	<u>No.</u>
302	Bottom shell joint	2
303	Top shell joint	2
328	Oil Burner	1
337	Fuel tank strainer	1
354	Strainer	1
394	Test cock	1
409	Gauge glass	6
418	Gauge glass rings	12
420	Connection for oil pipe	1
423	Connection for steam pipe	1
452	Lead Washers	12
455	Jubilee clips	6
471	Steam pipe lower	1
472	Fuel pipe lower	1
480 part	Lighting up set jets	6
480 part	Cup washers	4
458	Hose 10' solution	1
459	Hose 10' water	1
460	Hose 6' water	1
-	Washers, Albany coupling large	4
-	Washers, Albany coupling small	20
-	Engine hose	1
-	Steaming-out hose, with sheath	1
-	Soap solution heating pipe	1
461	Albany coupling	1
462	Albany coupling	1
463	Coupling nut	1
397	Asbestos string	2
357-372	Hand pump complete	1
477	Leather washers	4
-	"Y" piece for main steam nose	1
-	$\frac{1}{2}$ " Albany couplings for hose	2
-	1" Albany couplings for hose	1

APPENDIX F

LAIRD'S 500 LB STEAM BOILER
(Aust equivalent to ENGLISH "Merryweather"
Steam Boiler)

The AUSTRALIAN manufactured boiler differs from the ENGLISH "MERRYWEATHER" as regards the following details :-

1. Has welded tubes, in lieu of expanded tubes.
2. Firing door differs slightly in design.
3. Standard galv wrought iron and steel piping and fittings are used in place of copper steam piping and fittings.
4. Has a welded foundation ring at bottom of water jacket.
5. Is fitted with 2 x $\frac{1}{2}$ " safety valves.
6. Has seating pads to take fittings, welded to boiler.
7. Is marked "Merryweather type boiler, made by G.T.L. and Co. Melbourne".

APPENDIX G

Parts List of TYPE MR3 STEAM POWER UNIT
(See FIG 6)

<u>Part No.</u>	<u>Description</u>	<u>No.</u> <u>Off</u>	<u>Notes</u>
64177	$\frac{1}{2}$ " Plug Cock complete with lever	1	
64178	$\frac{1}{2}$ " Airline Lubricator	1	
40722	$\frac{1}{2}$ " x $\frac{3}{4}$ " Nipple	1	
49357	Air Inlet Chamber	1	
504412	Spring Adjusting Screw	1	
493210	Governor valve spring	1	
49175	Governor valve bush	1	
60495	Governor valve	1	
60492	Governor body thrust bush	1	
60494	Governor body	1	
376711	$\frac{3}{8}$ " dia governor ball	6	
483720	Governor plate	1	
483726	Back end plate	1	
54443	Rotor case liner	1	
49335	Front end plate	1	
504411	Front end	1	
64179	$\frac{1}{8}$ " gas grease nipple	2	
M.S. 10.	Hoffman Brg $2\frac{1}{2}$ " O/D x 1" bore x $\frac{3}{4}$ "	1	
63374	Flange	1	
37595	$\frac{1}{4}$ " Whit hex set screw	1	
54448	Rotor case bolt and nut	4	
493513	Rotor case	1	
504413	Rotor blade	1	
493319	Rotor key	1	
63372	Rotor shaft	1	
55222	Rotor	1	
37543	$\frac{1}{4}$ " spring washer	1	
37473	$\frac{1}{4}$ " Whit bright nut	1	
37343	$\frac{1}{4}$ " Whit stud	1	
493521	Exhaust cover	1	
37372	7/16" Whit stud	3	
64191	Gits oil seal	1	
50447L	$\frac{3}{8}$ " gas locknut	1	
N677	Hoffman Brg. 1-13/16" O/D x $\frac{3}{8}$ " wide x $\frac{3}{8}$ " bore Non- corrosive	1	
49337	Bearing wing	1	
493520	1" gas exhaust pipe	1	
37806	1" gas socket	1	
37796	1" gas bend	1	
64188	Set screw for $\frac{3}{8}$ " gas lock nut	1	

TREPANNING AND STEAMING OUT PLANT DESIGN III

TREPANNING UNIT
WITH STEAM MOTOR

REFER E M C B.D.T. E/21/109

FIG 1

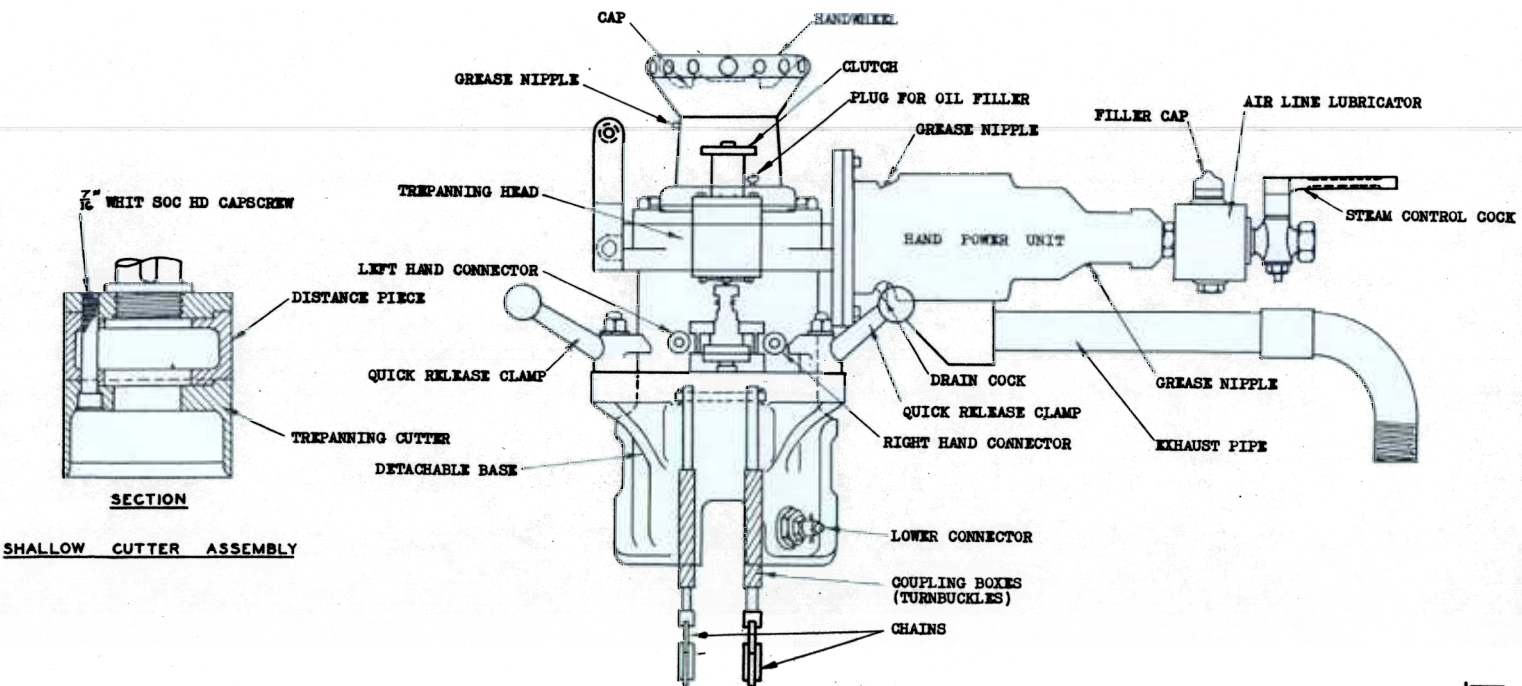
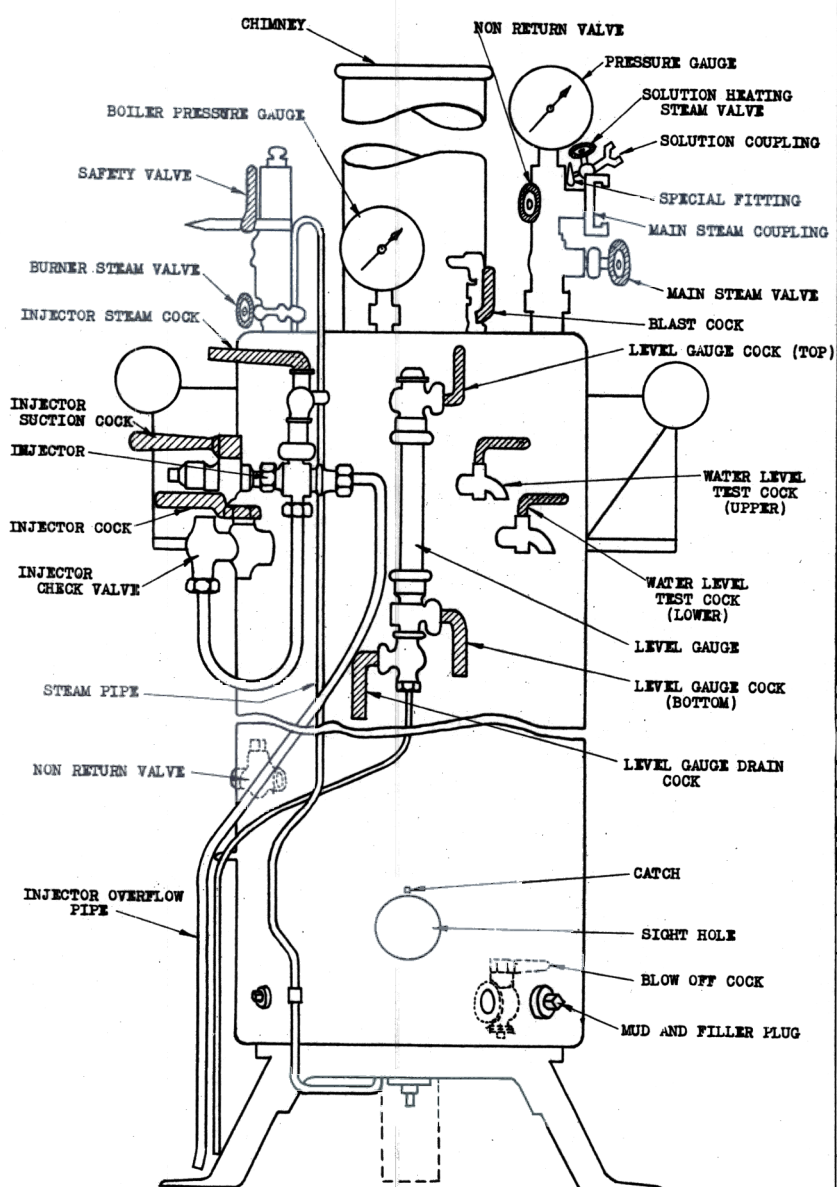


DIAGRAM SHOWING LOCATION OF FITTINGS ON STEAM BOILER

FIG II



DIAGRAMMATIC PLAN OF BOILER TO SHOW COCKS & FITTINGS

FIG III

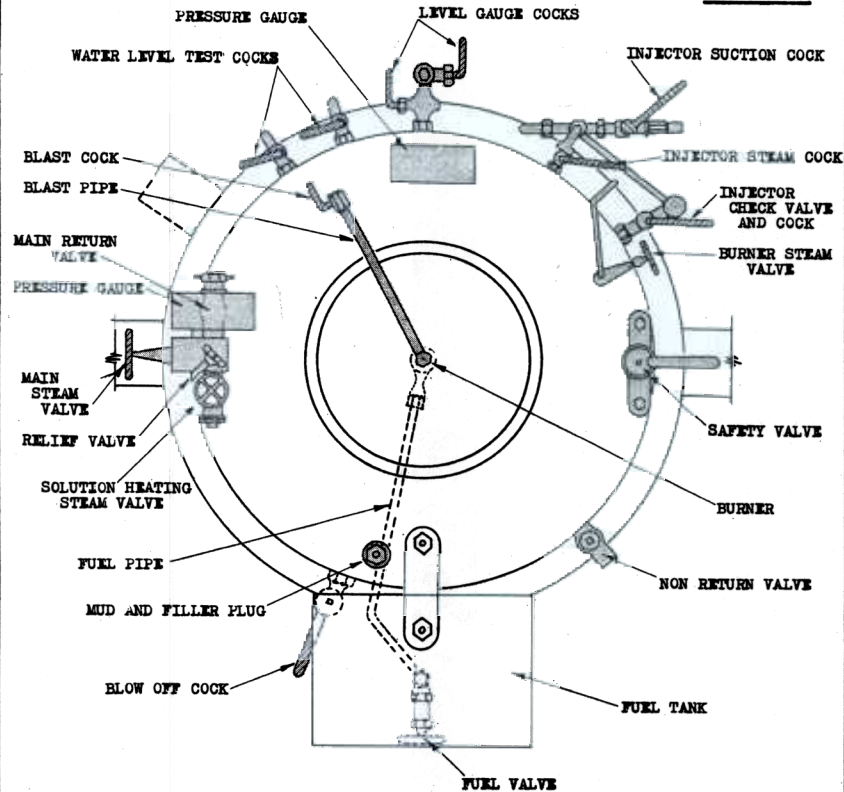
LOADING ARRANGEMENT
PLAN OF LORRY WITH EQUIPMENT IN POSITION

FIG IV

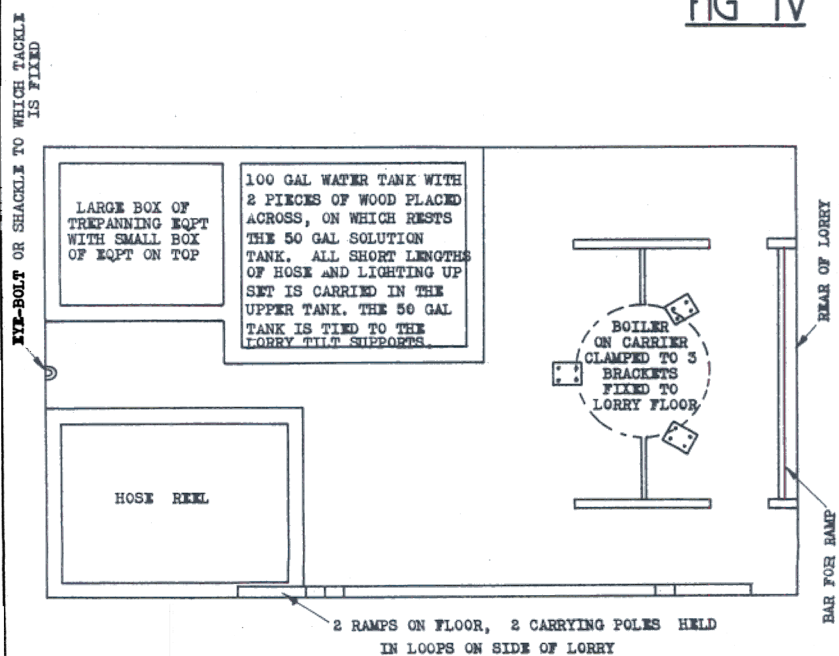
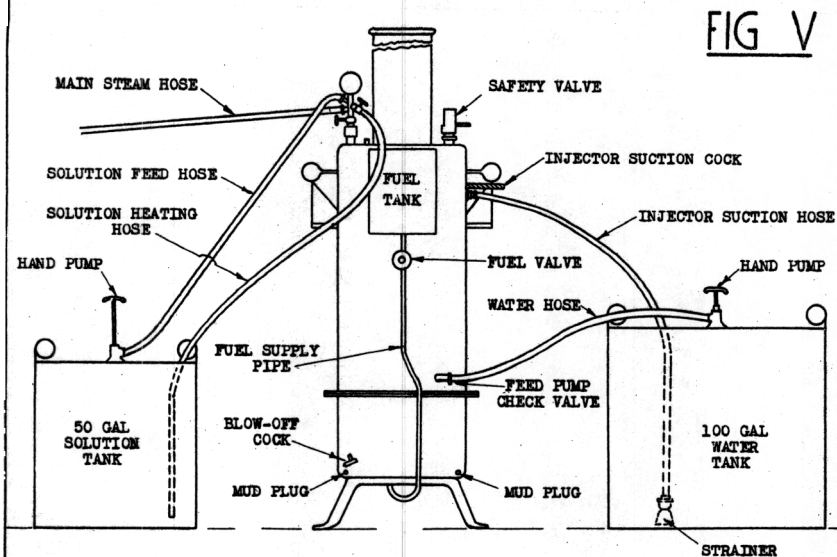
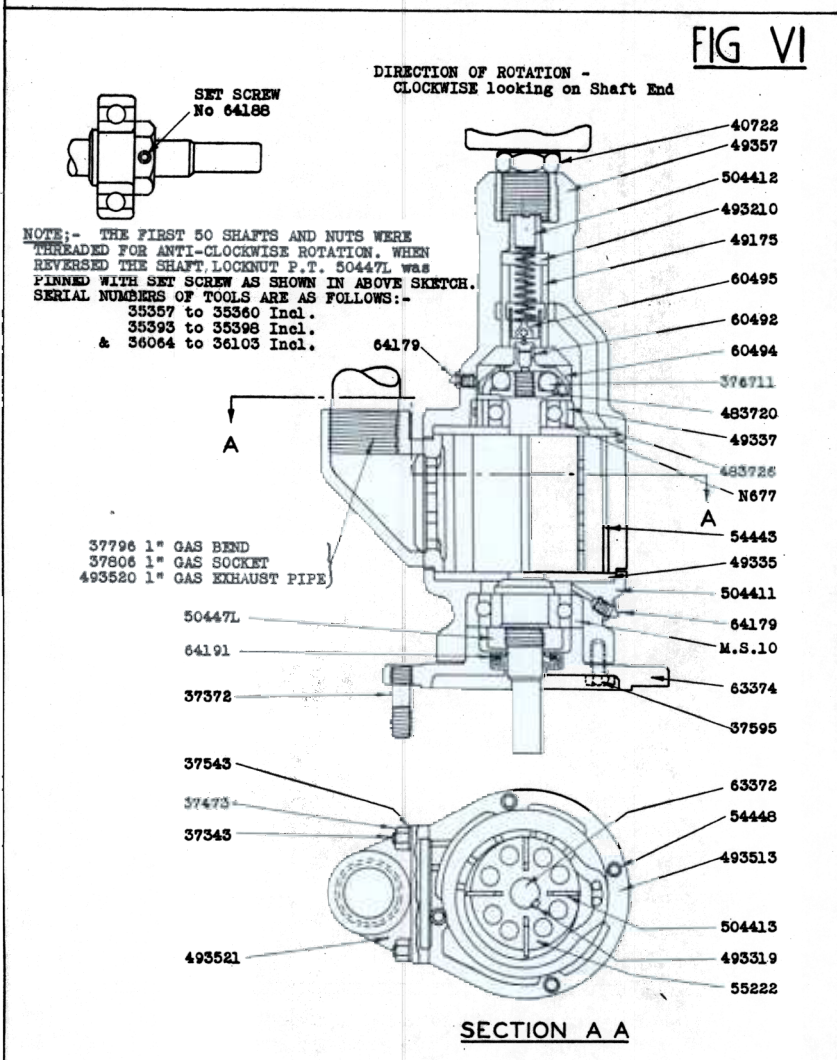


DIAGRAM SHOWING LAYOUT OF BOILER, TANKS & HOSES



SPECIAL PURPOSE M.R.3. STEAM POWER UNIT.



SPECIAL BOMB DISPOSAL TOOLS AND ESSENTIAL
COMMON HAND TOOLS, ETC. - (ANTI-JAPANESE)

1. REFERENCES :- Chap B, Secs 6 to 10 (incl.) -
JAPANESE fuzes.

2. TABULATION :- TABLE 1 summarizes tools used for the
rendering safe and preparation for removal of JAPANESE
fuzes.

NOTE 1 :- Items are grouped in probable order of use.

TABLE 1

SER NO.	I T E M	O B J E C T
------------	---------	-------------

(A) IDENTIFICATION AND ACCESS -

1	SPECIAL TOOL NO 7 (Fuze mirror)	To identify inaccessible fuzes
2	SPECIAL TOOL NO 6 (Slotted Bar)	To straighten out tail fins for access to tail fuzes

(B) TO RENDER FUZES SAFE -

3	SPECIAL TOOL NO 1 (Gripping Tool)	To secure striker spindle of A.3(A) type fuzes against move- ment
4	SPECIAL TOOL NO 2 (Gripping Tool)	To secure striker spindles in certain circumstances against inward movement
5	ADHESIVE TAPE and/or Pliable Wire	To secure movable parts of arm- ing mechanisms against movement in any direction
6	OIL CAN (and Kerosene, or other approved agent)	To inject explosive neutraliz- ing agent into fuzes in certain circumstances
7	OIL GUN	To inject solidifying mixtures into certain types of fuzes

(C) TO REMOVE GRUBSCREWS

8	SCREWDRIVER (having $\frac{1}{8}$ -in blade)	To unscrew grubscrew securing fuze in bomb
9	HACKSAW FRAME (and blades)	To re-cut slots in damaged grubscrews
10	"EZI-OUTS", BREAST DRILL (and drills)	To unscrew grubscrews not re- movable by SERs 8 and 9

(D) TO LOOSEN FUZES AND LOCKING RINGS -

11	SPECIAL TOOLS NOS 3 and 4 (C-spanners)	For loosening where tool holes are provided
12	STILLSON WRENCHES (18-in and 10-in)	For loosening where - (i) Tool holes are absent (ii) Tight fits are encountered
13	SPECIAL TOOL NO 5 (Spanner)	For loosening A.3(A) type fuzes and Standard Gaines

3. DESCRIPTION.

See FIGS I to VII for details of Special Tools.

4. METHOD OF USE. (SER NOS as per TABLE 1 above).

SER 1 - SPECIAL TOOL NO 7 :- This tool is designed to facilitate recognition of a fuze by appearance or stamped inscriptions on the fuze/s whilst in a bomb and BEFORE it is moved. The fuze/s should be exposed as soon as the bomb is reached and the fuze mirror projected up to the fuze. Care should be taken not to dislodge the bomb by undercutting. Length of telescopic shaft and angle of mirror are adjustable for most convenient use in the circumstances. The light is switched on by turning knob at rear end of shaft. (Test light regularly and replace run-down batteries and defective bulbs.)

SER 2 - SPECIAL TOOL NO 6:- Apply the slotted end of the bar to the obstructing tail fin/s and gently lever clear until the tail fuze is accessible for rendering safe or removal. This tool must be used with GREAT CARE to ensure that NO part of a tail fuze is contacted by the tool itself or the tail fins during the process.

SER 3 - SPECIAL TOOL NO 1 :- (Usable only on A.3(A) type fuzes.) Open out the arms of the tool by pivoting the thumbscrew out of the slot and place the tool over the brass cap on the fuze. The top face of the tool must bear against the brass cap of the fuze before the tool is clamped to the body. If this is not possible the shoulder of the body of the fuze and the brass cap should be clamped together. (Prior to clamping the tool over the spindle, the wing nut should be set so that only a few clockwise turns are required to clamp the tool in position.)

NOTE 2 :- Be careful to impart NO ROTARY MOTION to the spindle during the above operation.

SER 4 - SPECIAL TOOL NO 2 :- Set the wing nut and open out the tool as described for SPECIAL TOOL NO 1, and place the tool over the spindle of the fuze. The underside of the tool must bear against the top of the fuze body before clamping. This prevents inward movement only of the spindle. Bear in mind caution of NOTE 2 above.

NOTE 3 :- WARNING: This tool ONLY to be used where top of spindle projects $\frac{1}{4}$ " or more above top of fuze body in which case the striker needle is not likely to have pierced the detonator. Otherwise use adhesive tape and/or wire (see SER 5 below).

NOTE 4 :- Use the small serrated recess on spindles of diameter as in fuze B.3(A), and the large recess for spindles as in A.2(A), B.1(A), C.1(A) and similar fuzes.

SER 5 - ADHESIVE TAPE AND/OR PLIABLE WIRE :-
For reasons given in (a) below NO specific drill can be laid down; but certain essential principles (see (b) below) must be adhered to

(a) Factors affecting manner of use -

(i) Extent of damage due to impact -

Arming vanes, bosses and/or arming spindles almost invariably suffer damage in a nose fuze, and to a lesser extent in a tail fuze

(ii) Diversity of types -

There are different actions in various types of arming mechanisms employed, e.g. in some cases arming vanes rotate off, separating from the fuze in mid air

(b) General principles -

(i) The object to bear in mind is that movable parts of the arming mechanism must be securely bound in position so as to prevent INWARD, OUTWARD or ROTARY movement

(ii) To meet conditions as in (a), common sense must be used and some ingenuity exercised in the manipulation of this medium, so as to achieve the object in the most efficient manner.

NOTE 5 :- As a guide refer to para "Rendering Safe for Handling" of the BDTI describing the particular fuze under consideration.

SER 6 - OIL CAN (and Kerosene) :-

(a) Initiator compositions can be deadened by an explosive neutralizer (e.g. kerosene), provided that saturation of the former can be assured. Consequently this method is used where striker points are suspected of being embedded in initiator caps, in an endeavour to prevent functioning of the latter should relative movement subsequently occur

(b) Means of entry -

(i) JAPANESE initiator compositions are normally protected by a covering of tin foil or copper, which of course is punctured and the composition accessible in the case under consideration

(ii) Accessibility to the initiator via the fuze body is a problem depending upon the type of fuze. In some cases this is simple, as there is a passage via clearances around spindles and through keyways, etc, from the top of the fuze to the initiator. In others a screwed stud can be removed giving direct access to the interior. See relevant BDTI for the particular fuze under consideration.

(c) Injection -

(i) An oil can is a convenient medium, and is desirable from the point of view that the method used must NOT EXERT STRONG PRESSURE ON THE LIQUID.

- (11) When using the oil can it may be found necessary to improvise a leak-proof method of injection and retention as prescribed for SER 7 (also see NOTE 6 below)

- (d) CAUTION - For precautions to be observed, time taken to neutralize and effectiveness of this technique refer to BDTI B/10/93, para 14.

SER 7 - OIL GUN (and Solidifying mixture) :-

- (a) After gaining access to the fuze interior (if this is necessary, see relevant BDTI describing the particular fuze), prepare the solidifying mixture and load gun
- (b) Carefully insert nozzle of gun into or against access hole, taking care NOT to jar the fuze NOR to make contact with the internal mechanism
- (c) Inject mixture into fuze until cavities are considered to be filled to requirements specified by the relevant fuze BDTI. Replace screw studs or otherwise seal access hole to prevent leakage (see NOTE 6).
- (d) Retire to a safe distance until a period NOT less than the setting time of the mixture has elapsed, at the expiration of which the fuze should be incapable of functioning in the normal manner

NOTE 6 :- According to lie of the bomb and/or location of access hole in fuze, some ingenuity may be required to inject the mixture and retain same in the fuze until solidification has taken place. Luting, putty clay or similar plastic substance may be used to improvise a leak-proof method of injection and retention of the mixture.

NOTE 7 :-

- (a) Suitable solidifying mixtures, their setting times and method of mixing are fully described in BDTI E/22/118. These mixtures should be used whenever possible
- (b) If necessary to improvise a mixture, Portland Cement could be used (quick-setting type if available), but it takes longer to set.

SERs 8, 9, 10 :- Grubscrews securing fuzes in bombs are often found with no slot to receive the blade of a screwdriver. In such cases -

- (a) If grub screw projects beyond, is flush with, or is slightly recessed below surface of bomb case, make a cut across the end of same with the Hacksaw slightly cutting into the bomb case if necessary. This only takes a minute or so.
- (b) If grub screw is well recessed below surface of bomb case use "Ezi-Outs" and drill -

- (1) Select a small drill about $\frac{1}{2}$ diam of grub-screw and drill a shallow hole endwise in latter

- (ii) Replace drill in bit by "ezi-out" of suitable size, insert latter in drilled hole and rotate brace anti-clockwise. (As soon as tapered thread of "ezi-out" grips grubscrew, it will commence to unscrew.)

NOTE 8 :- It is not necessary to completely unscrew grubscrew.

NOTE 9 :- Width of screwdriver blade must NOT be greater than $\frac{1}{8}$ -in.

SER 11 - SPECIAL TOOLS NOS 3 and 4 :- When fuze and/or fuze locking ring is provided with tool holes, select tool No 3 for smaller and tool No 4 for larger fuzes and proceed as follows -

Position C - shaped portion around the body of fuze (or locking ring) and insert lug in tool hole. Upon turning anti-clockwise, fuze (or locking ring) should commence to unscrew.

NOTE 10 :- If fuze (or locking ring) is too tight, use SER 12 (Stillson Wrench).

NOTE 11 :- CAUTION : Only unscrew a fraction of a turn just sufficient to loosen fuze.

NOTE 12 :- Fuzes are sometimes found hand-tight only, and minus grubscrews.

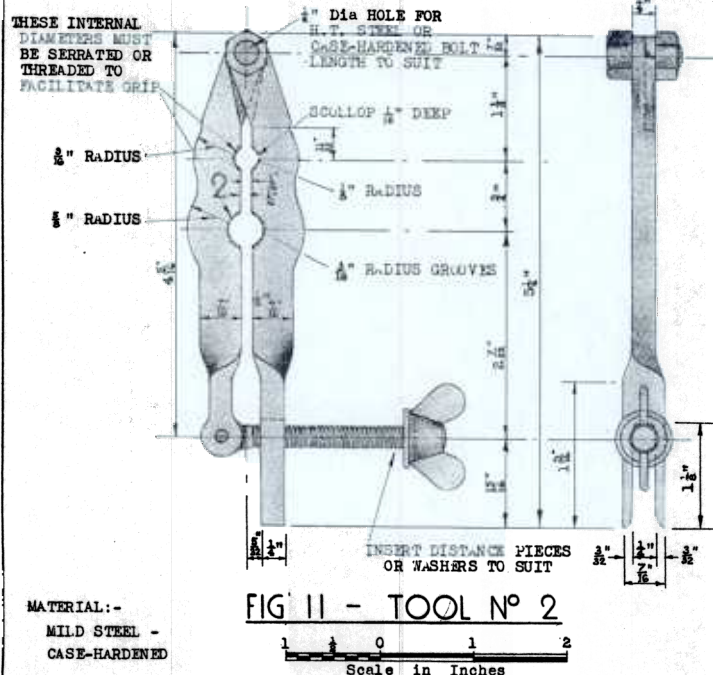
SER 12- STILLSON WRENCHES :- Two sizes are provided, viz 18-in and 10-in for use on very tight fuzes and fuzes having no tool holes. See NOTES 10, 11 and 12.

SER 13 - SPECIAL TOOL NO 5 :- Apply large end of spanner to flats on collet of A.3(A) type fuzes and turn anti-clockwise. NOTES 10, 11 and 12 also apply in this case.

The small end of the tool fits the spanner flats of the Navy Standard Gaine. Although latter is normally only hand-tight, this tool is useful when improvising a remote control method of separating gaine from striker mechanism in cases where embedment of striker point in detonator cap is suspected (see BDTI B/10/93, paras 9, 10, 11).

NOTES

REFER E IN C B.D.T.I. E/22/27



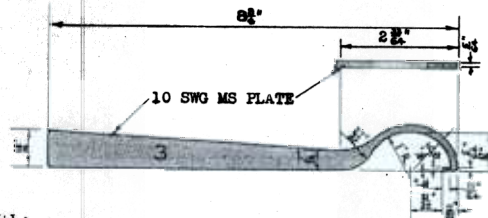
SPECIAL BOMB DISPOSAL TOOLS

ANTI - JAPANESE

USE - ACCESS, IDENTIFICATION,
AND FUZE LOOSENING.

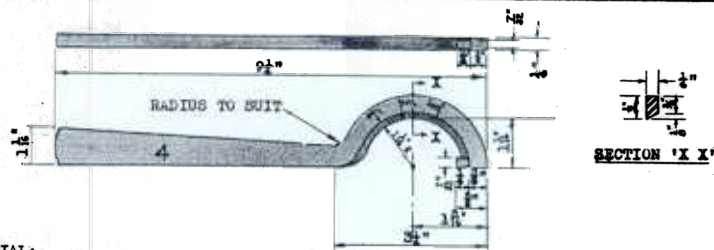
REFER E IN C B.D.T.I E/22/27

FIGS III TO VII



MATERIAL:-
MILD STEEL
CASE HARDENED
AT TIP

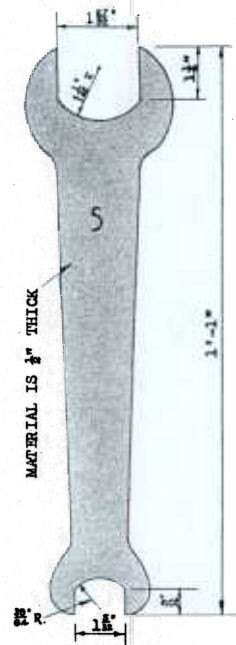
FIG III - TOOL N° 3



MATERIAL:-
MILD STEEL
CASE HARDENED
AT TIP

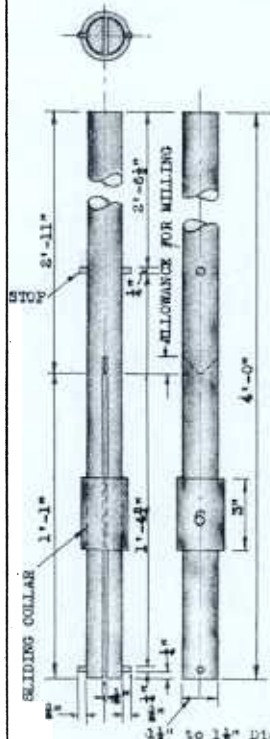
FIG IV - TOOL N° 4

NOTE:-
ALL EXTERNAL RADII
LEFT TO DISCRETION
OF WORKSHOPS



MATERIAL:-
MILD STEEL CASE-
HARDENED INSIDE JAWS

FIG V
TOOL N° 5



MATERIAL:- MILD STEEL

FIG VI
TOOL N° 6

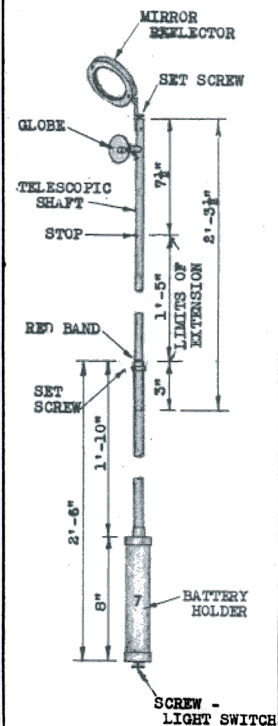


FIG VII
TOOL N° 7

STERILIZATION OF JAPANESE BOMBS
Use of Thermit Equipment

1. REFERENCES.

BDTIs D/20/57, D/20/49, D/20/117, D/20/27

2. OBJECT AND PERFORMANCE.

(a) Object: To sterilize a bomb, as it lies, by igniting the explosive filling, portion of which normally burns away before a reduced detonation of the remainder occurs.

(b) Performance

- (i) Method is useless on certain types of bomb fillings (see para 3(a) below)
- (ii) Will burn a hole approx 1-in. diam in bomb cases up to 1½-in. thick, in whatever position the bomb is lying
- (iii) Normally 50% of explosive filling will burn away, the remainder detonating (but see (iv) below)
- (iv) Full and instant detonation, or occasional complete burning out without detonation, are possible variations in the behaviour of ignited fillings.

3. WHEN TO USE.

(a) WARNING.

- (i) This technique must NEVER be used on bombs identified as being filled with PICRIC ACID in cast (Lyddite) or powdered form, or a mixture of PICRIC ACID and any other explosive, or on bombs having a central core of compressed PICRIC ACID powder
- (ii) It will ONLY be attempted on such bombs or mine fillings which may burn away in a confined space, and which should NOT produce instant detonation. (See BDTI D/20/27 for permissible cases)

(b) Until instructed otherwise, this process may be used on bombs or mines definitely recognized by colour markings, etc., as having main fillings composed of -

- (i) TNT, AMATOLS and mixture TNT/AMATOLS
- (ii) Mixture of HEXANITE and ANISOL, provided there is NOT a central core of compressed PICRIC ACID powder -
but subject to the following provisos -
- (iii) That the bomb is of a type which cannot be rendered safe or defuzed before removal
- (iv) That the risk of an instant, full, or partial detonation can be accepted
- (v) That it is a CATEGORY A2 bomb
- (vi) This method will NOT be used on GERMAN bombs.

(c) To aid in applying proviso (iv) above, recent tests have proved that the resultant explosion in many cases resembled more the bursting of a boiler than the detonation of a high explosive. Where a fuze or plug had been removed allowing greater escape for gases generated, complete burning out often resulted.

However, always regard -

- (i) Risk of partial detonation as ALMOST CERTAIN.
- (ii) Risk of full and instant detonation as POSSIBLE.

4. DESCRIPTION OF EQPT.

- (a) A special crucible, with sheet steel case, refractory lining and a $\frac{3}{8}$ -in. diam outlet hole; two types are provided, one with base outlet, the other with side outlet.
- (b) A disc of 20 gauge sheet steel for covering the outlet hole of the crucible.
- (c) A steel crucible clamp or holder.
- (d) "Military" Thermit, a mixture of aluminium and black iron oxide, which burns when ignited by a special igniter charge. (See NOTES 1 and 2 below)
- (e) A special Igniter charge, which is provided with dual methods of firing, i.e. electrically and by safety fuze. (See NOTE 3 below)
- (f) Sandbags, bricks or other suitable material on which to rest Holder.

NOTE 1 :- "Welding" Thermit must NOT be used.

NOTE 2 :- The "Military" Thermit required is supplied in 5 lb cans, hermetically sealed for tropical conditions.

NOTE 3 :- Igniter Bags supplied are each provided with an electric flash and a 6-ft length of safety fuze securely positioned in the bag ready for use. Bags are individually packed in hermetically sealed tins.

5. SCALE OF ISSUE.

Each unit RAE carries four sets of Thermit
Eqpt. A "set" comprises :-

- (a) 1 crucible and clamp
- (b) 4-20 gauge sheet steel discs
- (c) 2-5 lb charges of Thermit
- (d) 2 Igniter bags

6. METHOD OF USE.

- (a) Points of Attack. The process would rarely be used if the fuze had been withdrawn. If necessary to use under these circumstances, the point of attack should be in the centre of the bomb. In fused bombs, the point of attack should be chosen as far away as possible from the fuze or fuzes. (See NOTE 4 below). Suitable points are described as follows :-

JAP BOMBS (with nose and/or tail fuzes)

- (i) If Nose Fuze only, a point on the barrel about 3-in forward of where the tail piece joins the barrel
- (ii) If Tail Fuze only, a point on the barrel about 3-in back from the nose weld
- (iii) If both nose and tail fused, in the centre of the barrel.

NOTE 4 :- Detonation of fuzed bombs can easily occur when the sensitive constituents of exploder systems are heated beyond a certain temperature, hence the amount of filling which is burnt depends a great deal on the distance between the fuze and the point of attack. On no account must molten metal be allowed to flow over a fuze as instant detonation may result.

(b) Safety Precautions : The usual Safety Distances and Precautions must always be enforced.

(c) Setting Up and Firing : Set up crucible above point of attack -

- (i) With outlet 4 to 5-ins above point of attack on bombs lying horizontally or up to 70 deg from the horizontal, and using the base-outlet type.
- (ii) With outlet 1 to 2-ins from point of attack on bombs at an angle greater than 70 deg to the horizontal, using the side pour crucible.
- (iii) Insert the sheet steel disc in the bottom of the crucible over the outlet hole. (This is essential as it delays the exit of molten metal till the whole mass has properly heated up.)
- (iv) Charge the crucible with thermit as follows (see NOTE 5 below) :- Open thermit container by removing tear-off strip (see NOTE 6 below). Withdraw cambric bag containing the thermit and empty same back into the container. Tip container endwise several times to ensure perfect mixing of ingredients, then pour into the crucible letting the thermit run through the fingers (see NOTE 7 below).
Use 5-lb of thermit for bomb cases up to $\frac{1}{2}$ -in thick, and 10-lb where of greater thickness, but always use 10-lb in a side outlet crucible.
- (v) Insert Igniter Bag under the top surface of the thermit.
- (vi) To prevent slag unnecessarily heating the bomb case, build up with earth to throw the slag clear of the case or scoop out a hollow into which the slag can drop clear of the case.
- (vii) Connect up electric leads, retire to safety distance, and fire (see NOTE 8).

NOTE 5 :- If thermit is ignited in a damp crucible, the crucible may burst owing to rapid formation of steam. Crucibles must be kept dry and stored in a dry place. They can be dried out in an oven.

NOTE 6 :- Do NOT open thermit cans or igniter bag tins until required for use. Store them remote from each other.

NOTE 7 :- Ingredients tend to segregate during transport and storage, resulting in incomplete burning and excessive slagging.

NOTE 8 :- The safety fuze is provided -

- (1) in case electric flash misfires, in which event full Safety Precautions will be observed before the bomb is approached.
- (ii) in case means of firing electrically are NOT available.

7. ACTION.

- (a) When experience of this method has been gained it will be possible to judge from the colour of the smoke when combustion of the explosive commences. The stages are :-

First : Initial puff of igniter
Second : White smoke and sparks from burning
 thermit
Third : Smoke of burning explosive, which varies
 with the explosive but is distinguish-
 able from Second Stage being darker.

- (b) Large volumes of smoke are given off at first, but may die down for short periods and then begin again.

8. PRECAUTIONS.

- (a) It is difficult to judge from a distance when combustion is finished, and so, unless the bomb detonates, it should NOT be approached for one hour after the thermit has been applied, and only then if it is clear that combustion has ceased.
- (b) The heat of combustion will make the bomb red hot and those defuzed bombs which do NOT detonate are normally found with casings partially split. The process should NOT therefore be applied in places where a conflagration might result.

SOLIDIFYING MIXTURES
(Interim Instruction)

1. FOREWORD.

This technique is in the developmental stage. Details covering a wider application will be given later; but sufficient data is now available to serve as a guide for use in certain specific cases.

2. OBJECT.

To render inactive fuze firing mechanisms by preventing movement of the striker relative to the initiator.

3. ACTION.

After injection into the fuze in liquid or thin paste form, the mixture rapidly hardens, achieving the object (para 2) in the following manner -

(a) Cases where striker point is NOT in contact with Initiator.

(i) By interposition of a solid chock completely filling space between striker and initiator, and/or -

(ii) By immobilising springs, clockwork mechanism or other working parts which actuate strikers in certain fuzes.

(b) Cases where striker point is imbedded in initiator.
By filling up space in fuze body immediately above arming spindle, thus preventing outward movement of the striker.

NOTE 1 :- There is also a general clogging action due to blocking of clearances, air passages, etc., and the tendency for moving parts to be bound together.

4. PERFORMANCE

This depends upon the type of mixture and the method of use -

(a) Mixtures which depend upon cooling or air drying for solidification are dangerous to use, because of-

(i) Doubt as to penetration before cooling of the former type

(ii) Uncertainty as to setting time of the latter type

Such mixtures should only be used as substitutes in cases of extreme urgency.

(b) Mixtures described in paras 5 and 6 are suitable for use in the cases laid down, but satisfactory performance is dependent on-

(i) Preparation in strict accordance with directions given (these however are of a very simple nature)

(ii) Injection technique, which must ensure the rapid filling of certain spaces in the fuze.

5. SPECIAL GLUE SOLUTION.

(a) Specially designed for use where the mixture must be forced through fine clearances of the order of 0.08-in.

Example: Fuze C.3(A)

(b) How packed.

Ingredients (less water) sufficient to deal with one fuze are packed as a self-contained unit in an hermetically sealed can. The main body of the can contains the glue, which is separated from a bottle containing formalin by an inner container also graduated as a water measure and connected to the sides of the can by a soft soldered tear-off strip.

(c) Preparation for use. (Takes less than 1 min)

(i) Note local shade temperature to nearest ten degrees FAHR (i.e. 80, 90, 100, etc.)

(ii) Remove lid, tear-off strip and water measure from can.

(iii) Fill measure with common drinking water up to graduation mark corresponding to local shade temperature. Add the water to the glue stirring briskly for a few seconds.

(iv) Next add contents of formalin bottle to the glue, again stirring briskly for a few seconds

The mixture is now ready for use, AND WILL SET AT THE EXPIRATION OF TEN MINUTES.

(d) Injection in the fuze. When used on fuze C.3(A) the Tecalemite type grease gun, and the screwed fuze head adaptor are required

(e) Consistency.

(i) Pre-set. A homogeneous liquid comparable to a heavy gear oil

(ii) Set. At first a tacky gel, rapidly becoming tough like unvulcanized rubber.

6. PLASTER OF PARIS MIXTURE.

(a) For use where there is direct access to a vital cavity via an existing or a drilled hole. A good medium for the immobilising of compressed springs, e.g. FUZE C.2(A)

(b) How packed.

(i) Sufficient powder to deal with one fuze is packed in an hermetically sealed can, which must on no account be opened until just before use

- (ii) The lid, secured by a soft soldered tear-off strip, serves also as a water measure.
- (c) Preparation for use. (Takes about 2 mins)
 - (i) Remove lid and fill same to graduation mark with common drinking water
 - (ii) Add water to the powder in the tin and mix to a thin smooth paste.

The mixture is now ready for use, AND WILL SET HARD SUDDENLY AT THE EXPIRATION OF TEN MINUTES.

- (d) WARNING. Plaster of Paris mixtures are NOT suitable for grease gun injection into such fuzes as the C.3(A)
- (e) Injection into fuze. The oil gun is a suitable apparatus for injection through an opening.

7. CLEANING APPARATUS IMMEDIATELY AFTER USE.

ALL apparatus used must be cleaned out free of solidifying mixture immediately after the operation of injection has been completed.

NOTE 1 :- Running water through the apparatus will be found effective if done at an early stage, warm water being preferable where the Glue Solution is employed.

NOTE 2 :- Once having set, Glue Solution CANNOT be dissolved, AND IT IS NOT SOFTENED BY THE APPLICATION OF HEAT. It will then have to be picked out.

FUZE EXTRACTOR DESIGN III (AUST) (AND PNEUMATIC SHEARS)
INTERIM INSTRUCTION

1. FOREWORD.

- (a) As repeated references are made herein to this apparatus, advance information in the form of a brief description is set out below.
- (b) Detailed operating instructions will replace this BDTI at a later date.

2. OBJECT.

To unscrew by remote control all known types of JAPANESE fuzes, whether right or left hand thread, including fuzes with locking devices.

3. PERFORMANCE.

The apparatus can be quickly and securely positioned, and applies a torque capable of overcoming both a locking pin or a locking ball as used in present long delay type fuzes. The application of power is gradual and uniform with freedom from impact.

4. DESCRIPTION.

The machine incorporates a pneumatic engine operated by an air compressor supplying 80 lbs/sq.in. pressure. The design includes a compound piston which actuates a pair of lever arms connected to a ratchet wheel through suitable pawls.

A sleeve receives various types of grip rings to suit the different shaped fuzes.

The sleeve is moved axially towards its engagement position by air pressure, thus extending the remote control principle to the fitting of the extractor grip rings.

In view of the possibility of the enemy using left hand threads, provision is made for reversing the direction of rotation of the grip rings by remote control.

After fuze has been unscrewed, a spiral spring cushioned by compressed air, slowly withdraws the complete fuze from the bomb fuze pocket.

The following grip rings have been designed -

- (a) A Spanner type, which engages the flats on certain fuzes
- (b) A Wedge type, in which headed pins inserted into existing tommy bar holes in the fuze are used as wedges between the fuze faces and gripping rings.
- (c) A Thread Die type, which is fitted with a right and left hand set of dies. This type is intended for gripping plain parallel or plain conical surfaces of fuzes in either a right or left hand direction.

When mounted ready for use, the engine is supported by a crank connected to the attachment gear. The object of the crank is to enable quick and accurate radial adjustment of the grip ring to suit bombs ranging from 6-in. to 18-in. diam.

The attachment gear anchors the apparatus securely to the bomb.

A whistle for the purpose of audibly indicating progress of operations is fitted to the exhaust of the engine.

Complete weight of the apparatus is 50 to 60 lbs

5. AUXILIARY EQUIPMENT - PNEUMATIC SHEARS.

These shears will be supplied with the Fuze Extractor Design III (Aust), their function being to remove obstructing tail fins preparatory to the withdrawal of tail fuzes.

The shears will cut through mild steel sheet up to 3/16-in. thick with an air pressure of 80 lb/sq.in.

Two cutting blades are welded to operating arms linked to an hydraulically driven piston which is connected to an operating plunger and cylinder.

Operation is controlled by a trigger which is actuated by a finger or thumb.

In addition to the rear handle from which the operation is controlled, dual handles are provided so that close right or left hand cutting can be effected.

Cutting blades are suitably curved so that slipping away from the plate to be cut is obviated.

STETHOSCOPE, ELECTRICAL, DESIGN IVB
(Operating Instrns)

FOREWORD. The following instructions are written to apply to the use of the Electrical Stethoscope in detecting whether a GERMAN 17 type long delay clockwork fuze is ticking or not. These instructions may also be applied in principle to other types of long delay clockwork fuzes for a similar purpose.

1. OBJECT.

- (a) The object of the Electrical Stethoscope is to ascertain whether the clock of a German (17) or similar clockwork bomb fuze is working or not.
- (b) The portable type Stethoscope to be issued, viz. DESIGN IV B, is intended for use as follows :-
 - (i) To be taken down the bomb shaft so that men working near the bomb can themselves quickly listen for a ticking fuze.
 - (ii) For listening by remote control by means of the extra cable provided.

2. PERFORMANCE.

It is quite as sensitive as the Electrical Stethoscope Design II and, as it is fitted with a hand operated volume control, it is capable of better adjustment. With it a ticking (17) fuze has been heard through a 10-ft. metallic probe having a good metallic contact on the bomb.

3. DESCRIPTION. (See diagrams)

The Electrical Stethoscope Design IV B consists of :-

- (a) A valve amplifying set enclosed in a metal box, total weight 13-lb. To the box is attached a fabric pocket containing the following :-
 - (i) A pair of headphones on a 10-ft. lead connected to terminals in the instrument.
 - (ii) A crystal type microphone, Type C, incorporating a magnet for attachment to the bomb and connected to the terminals in the instrument by a 6-ft. lead. This lead is cut, one end being provided with a plug, and the other with a socket. The object of this is to enable an extension lead of cable (described in (c) below) to be connected up to microphone and instrument.
- (b) A second microphone Type B is carried. Since this microphone can be insulated from the magnet by two non-metallic distance pieces, it can be applied to a bomb while it is being steamed out without fear of damage by heat. ON NO ACCOUNT must the microphone Type C be used in connection with steaming-out of bombs.
- (c) Microphone extension cable 50-yds. long on a steel drum. This is a concentric cable.

NOTE 1 :- A circuit diagram and parts list are pasted inside the removable cover of the box.

NOTE 2 :- A spare 2.5V. tell-tale lamp bulb is carried inside the box.

4. TO PREPARE FOR USE.

- (a) Switch on the set (the red tell-tale lamp should then glow).
- (b) Test the set by placing a watch in contact with one end of the metal stethoscope box and the microphone (magnet) with the other end. Adjust the volume control to give the best signal.

NOTE 3 :- Do not bring the microphone too near the watch or damage may result to the watch.

5. WHEN TO USE.

The electrical Stethoscope is a valuable aid to safety, so full use should be made of it. If clockwork types of fuzes are suspected, it must be used :-

- (a) When the bomb is contacted by a metallic probe.
Place the magnet on the probe and listen. Great care must be taken to ensure that the probe makes continuous metallic contact with the bomb. If the clock is ticking it should normally be heard. If no ticking is heard, this must NOT be taken as definite proof that the clock is NOT ticking.
- (b) Immediately any part of the bomb is exposed.
Apply the microphone to the bomb and listen.
- (c) Thereafter at frequent intervals until the fuze/s have been exposed.
- (d) Immediately a (17) or similar clockwork fuze has been exposed and recognised.
- (e) Thereafter at intervals and by remote control, until the fuze has been destroyed or made permanently innocuous, particularly :-
 - (i) Immediately after any disturbance of the bomb
 - (ii) Immediately after the STEVENS STOPPER has been applied.
- (f) During and after trepanning and steaming-out.
(Using microphone B only)

NOTE 4 :- In an emergency the set will function, although not with strong signals, with only one L.T. battery provided the second pair of battery terminals is shorted across.

NOTE 5 :- H.T. battery leads are coloured :-

Yellow	-	positive
Blue	-	negative

NOTE 6 :- When replacing L.T. batteries care must be taken to ensure that they are properly seated in the container, behind the lip, so as to prevent the batteries slipping down and shorting the terminals on the case.

6. FACTORS AFFECTING PERFORMANCE AND USE.

The microphone must be placed in good metallic contact with the bomb and the points of contact should be clean.

The shorter the metallic path which separates the microphone from the fuze the greater will be the sensitivity of the instrument. Thus ticking heard through the headphones is normally louder when the microphone is applied at the fuze itself. Similarly the ticking may be only very faintly heard, if at all, through a metal probe 6-ft. long which is in metallic contact with the bomb (but refer to para 2).

Should the fuze pocket and fuze of a GERMAN bomb be sheared off below the fuze head in such a way that the clockwork fuze is not in metallic contact with the case of the bomb, it has been found that the ticking can nevertheless be heard with the microphone on any part of the bomb itself.

In order to ensure that the electrical stethoscope has the best possible performance, it is essential that batteries should be properly maintained, and that all terminals and connections should be tight. Even so, the performance of individual instruments may vary slightly and it is essential that every officer should frequently test out his own stethoscope under varying conditions.

Under certain conditions, such as listening through a metal probe, the signal strength of the ticking may be very weak. Hence it is necessary to accustom the ear, by practice, to these faint signals.

From the foregoing it is clear that the successive stages for listening as work proceeds are :-

- (i) Through a metal probe as soon as contact with the bomb is gained
- (ii) Immediately any part of the bomb is exposed
- (iii) Again, when a fuze is exposed and identified

If the clock is ticking, it MAY be heard through a probe, but if no ticking is then heard it is not positive proof that the clock is not ticking. Similarly, it is conceivable that under certain conditions a ticking clock might not be heard when the microphone was applied to the nose of a very large bomb.

7. METHODS OF USE.

CASE 1 :- Before and after fuze is exposed - This is the period during which the portable set herein described is particularly useful since listening can be conveniently carried out in the excavation itself at frequent intervals.

CASE 2 :- When it is required to listen at intervals to see if the clock has stopped or re-started. This is normally done by remote control.

CASE 3 :- When a bomb is being trepanned and steamed-out - As for Case 2 above, but microphone Type B must be used, and the extension pieces must be fitted to the microphone.

On no account must microphone Type C be used when steaming-out the bomb, or it will be irreparably damaged by the heat.

NOTE 7 :- See para 8 (c) for assembling instructions microphone Type B.

8. CARE AND MAINTENANCE.

- (a) The chief care should be to keep connections tight and to replace run-down batteries and worn out valves which are Ordnance supply. Their descriptions are :-

Battery, dry, H.T. 60 V. No. 1.	Eng. Cat. No. W.B. 1565
Cell, dry X, Mk. 11	" " " W.B. 0200
Valves, WT/A.R.P.12	" " " Z.A. 7023

(b) Electrical stethoscope can be put out of action or rendered less sensitive if they are subjected to jolting. They should be carefully handled at all times and cushioned from the lorry during transport. Sponge rubber strips fixed to the batteries under the box proved successful for this purpose.

(c) Instructions for the assembly of microphone Type B.

Figs 4 and 5 depict convenient method of assembling.

Particularly note that the bases of the extension rods must first be placed in their respective slots in the magnet prior to screwing on to the crystal box (under no circumstances endeavour to force the extension rods into magnet slots after screwing on to crystal box).

9. TESTING STETHOSCOPE FOR FAULTS.

The following tests should be applied for diagnosing faults :-

- (i) First test for general performance with a watch. If this test proves unsatisfactory proceed with the following tests in the order given.
- (ii) TEST L.T. BATTERY for voltage, with set switched on. If less than 2.5 V are shown on a pocket voltmeter, replace the L.T. battery.
- (iii) TEST THE H.T. BATTERY as above, and replace the battery if this reading is lower than 45 V.
- (iv) TEST FOR SUSPECTED FAULTY MICROPHONE by disconnecting the microphone and switching on the set. Listen with the headphones and tap the connections in the set to which the microphone is normally attached. Tap one of the holes in the socket into which the microphone cable plugs. If clicks then heard it proves that the rest of the set apart from the microphone is functioning.
- (v) TEST THE HEADPHONES by touching the two headphone connections simultaneously with leads connected to any 2 V. battery. Make the contacts on the screw terminals on the valve mounting block inside the case. Clicks should be heard if the headphones are in order.
- (vi) TEST THE VALVES, with the set switched on, by removing the valve caps ONE AT A TIME and tapping the valve terminal thus exposed. If a click is heard in the headphones, the valve under test is in order.

NOTE.8. The necessity for checking extension cables should not be overlooked.

STETHOSCOPE ELECTRICAL
DESIGN IVB

REFER B.D.T.I. E/23/104

SHEET No 1

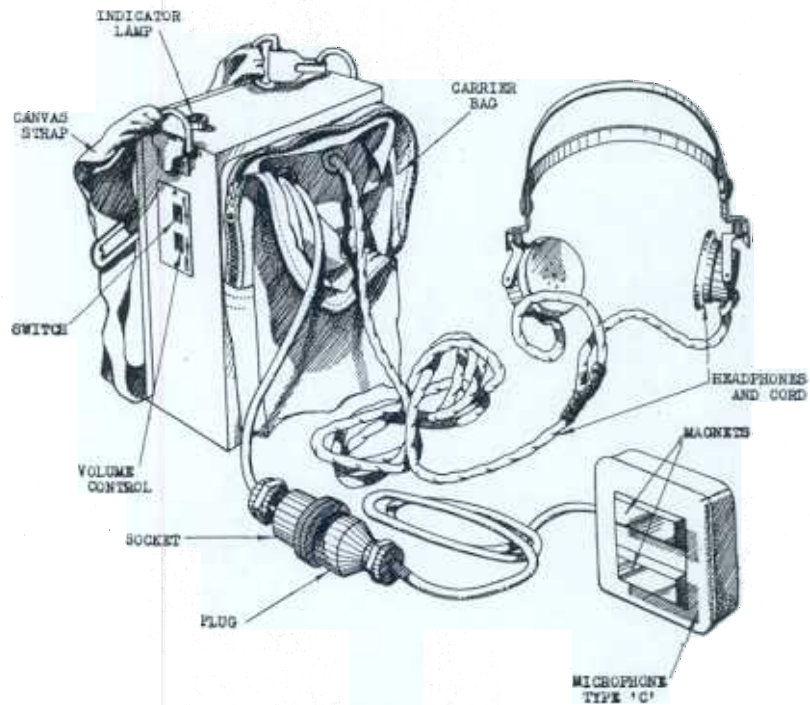


FIG 1



MICROPHONE TYPE 'C'
ATTACHED TO PROBE
IN METALLIC CONTACT
WITH BOMB

METHOD OF USE IN SHAF

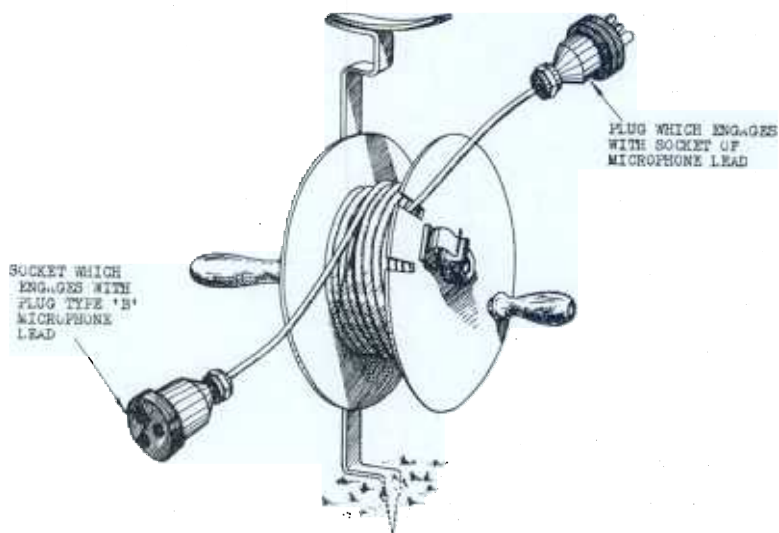
FIG 2

STETHOSCOPE ELECTRICAL

DESIGN IV B

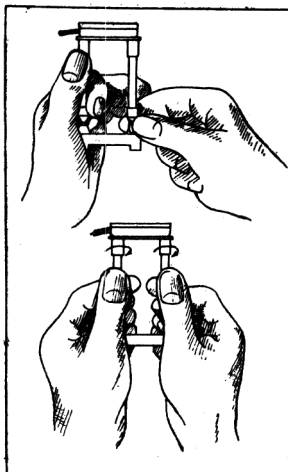
REFER B.D.T.I. E/23/104

SHEET NO 2



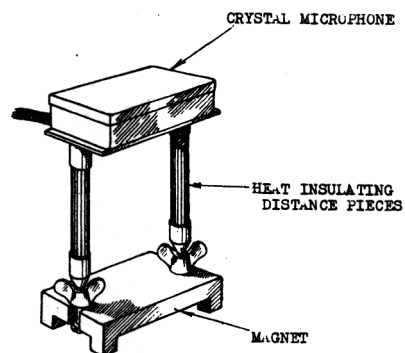
CABLE DRUM

FIG 3



METHOD OF ASSEMBLING

FIG. 4



STERILISING MICROPHONE TYPE 'B'

FIG. 5

**CONCERNING
CIVIL DEFENCE ORGANISATION**

F

E IN C., A M F.
BOMB DISPOSAL
TECHNICAL INSTRUCTION.

REF. NO.
F/24/33

ISSUED
20 DEC 43

CHAP. F
Sec. 24

BOMB CATEGORIES AND PRIORITIES

1.

Immediate disposal of bomb essential for the

The above order of disposal remains until a phase of invasion is imminent or in progress in which case no Safety Period will be observed in the area affected and all bombs, etc. will be dealt with as they fall. The Category given merely indicates the priority of tasks (see also para 5).

5. SUPERIMPOSED BOMB CATEGORIES.

- (a) CATEGORY M. This new category is brought into force in an area affected by invasion, either imminent or in progress. It is a priority superimposed by the Military upon the categories mentioned in para 2 above and refers to those unexploded bombs whose immediate disposal is essential for operational reasons. Category M bombs will be dealt with in preference to all others except P (see (b) below)
- (b) CATEGORY P. Under ordinary conditions parachute mines are allotted to Categories A, B and C but under conditions as in 5 (a) above they are allotted to Category P if affecting operations of the Armed Forces. German type 'G' and similar mines would be treated as parachute mines. Category P bombs take an equal precedence with Category M bombs.

6. BOMBS ON MILITARY PROPERTY.

Under ordinary conditions, bombs on military property are reported through the Police or Wardens' Service with an indication of the priority which should be attached to them from the Military point of view.

7. ALLOCATION OF PRIORITIES UNDER ABNORMAL CONDITIONS.

All the foregoing, except para 5, contemplates procedure and communications remaining uninterrupted under ordinary conditions, but under abnormal conditions as stated in para 5 above, a Commander may have cause to decentralise his bomb disposal resources to a particular area. When this is done, reports from Civil Defence sources of unexploded bombs and mines in the area for disposal would be transmitted through the most convenient civil channels direct to the Military HQ concerned, which will decide the priority.

8. BOMB CATEGORIES IN PURELY MILITARY AREAS.

The foregoing refers to procedure in areas where the Civil Defence Organization exists and co-operates.

In areas wholly under military control and where no Civil Defence Organization exists, all the above Categories and their application are followed in principle by the armed forces. The degree of urgency, i.e. a Category, is determined by a Commander.
