MINE DISPOSAL HANDBOOK

PART II

UNITED STATES UNDERWATER ORDNANCE

TABLE OF CONTENTS

PART II - UNITED STATES UNDERWATER ORDNANCE

CHAPTER 1

U. S. INFLUENCE MINES

CHAPTER 2

U. S. CONTACT MINES

CHAPTER 3

U. S. TORPEDOES

CHAPTER 4

U. S. DEPTH CHARGES

CHAPTER 5

U. S. DEPTH BOMBS

(U. S. DEPTH BOMBS, CONT'D.)

CHAPTER 6

U. S. AHEAD-THROWN ANTI-SUBMARINE WEAPONS

CHAPTER 7

U. S. CONTROLLED MINES

MINE DISPOSAL HANDBOOK

Influence Mines

PART II

UNITED STATES UNDERWATER ORDNANCE

CHAPTER 1

U. S. INFLUENCE MINES

Table 1 - U.S. Influence Mines

Mine	Type	Laid By	Nature	Firing Mechs	Length (in.)	Diameter (in.)	Case Depth (ft.)	Type & Wt of Charge (lb.)	Total Wt (lb.)	Extender	Clock Starter	Clock	Other Fittings	Remarks
10-5	Moored	Sub	Needle	M5-0, M5-1	92 1/2	20 13/16	40	420 TNT	820	Ex 12 Mod 5, Ex 14	CS-1 Mod 5	CD-9	AC-1,10-3 Anchor, AR-1 sw,B-4-1,SD 4 or 4-1	Field
10-6	"	Aircraft	"	"	"	"	"	"	"	Ex 14 Mod 2	CS-1 Mod 3	"	AC-1,10-5 Anchor, AR-1 sw,B-4-1,Para 3-2,SD 4 or 4-1	Obsolescent
10-7	"	P.T.Boat	"	"	"	"	"	"	"	Ex 14, Ex 14 Mod 2	CS-1 Mod 5	"	AC-1,10-4 Anchor, AR-1 sw,B-4-1,SD 4 or 4-1	"
10-8	"	Aircraft	"	"	"	"	"	"	"	Ex 14 Mod 2	CS-1 Mod 4	"	AC-1, 10-5 Anchor, AR-1 sw,B-4-1,Para 3-2,SD 4 or 4-1	"
10-9	"	"	"	"	"	"	"	"	"	"	"	"	"	Field
12-0	Ground	Sub	"	M3 Mods 0,1, 2, or 3	94 1/4	"	16 - 125 (500)	1095 TNT 1225 TPX	1415 or 1545	Ex 12, Ex 12 Mod 5	CS-1,CS-1 Mod 5	CD-1,CD-1 Mod 4,CD-9	B-3-1, SD-5	Obsolescent
12-1	"	Aircraft	"	"	131	"	"	"	1595 or 1725	Ex 12 Mod 4, Ex 12 Mod 1	CS-1 Mod 1,CS-1 Mod 4	CD-1,CD-1 Mod 4,CD-9	B-3-1, Para Mk 1 Mod 0, Para 5-0 or 5-1, SD-5	"
12-3	"	Sub	"	M3 Mod 2 or M3 Mod 4	94 1/4	"	"	1065 TNT 1195 TPX	1305 or 1515	Ex 12 Mod 5, Ex 14	CS-1 Mod 5	CD-9	B-3-1, SD-4 or 4-1	Field
12-4	"	Aircraft	"	"	131	"	"	1065 TNT 1195 TPX	1565 or 1695	Ex 12 Mod 4, Ex 14 Mod 2	CS-1 Mod 4	"	B-3-1, Para Mk 1 Mod 0, Para 5-0,or 5-1 SD 4 or 4-1	"
13-0	"	"	Induction	M4,M4 Mod 1, or M4 Mod 2	68	19 7/8	"	640 TNT 700 TPX	1030 or 1090	Ex 12 Mod 2, Ex 12 Mod 4	CS-1 Mod 2, CS-1 Mod 4	CD-1 Mod 1, CD-6	B-6, SD-4 or 4-1	"
13-3	"	"	"	"	"	"	"	"	"	"	"	"	"	None issued
13-4	"	"	"	"	"	"	"	"	"	Ex 12 Mod 2, Ex 12 Mod 4, Ex 14 Mod 2	"	"	"	Same as 13-0 for shallow water.
13-5	"	"	Acoustic	A-3 or A-3 Mod 1	"	"	40 - 100	430 TNT 490 TPX	1000 or 1060	Ex 12 Mod 2, Ex 12 Mod 4	"	CD-5,CD-7	B-15,B-18, SD-4 or 4-1	Field
13-6	"	"	"	A-3, A-3 Mod 1, or A-3 Mod 2	"	"	"	"	"	"	"	"	Para Mk 2 Mod 0, SD-4 or 4-1	Same as 13-5 for high alt.
16-0	Moored	Surface Craft	Induction	M-6 or M-6 Mod 1	51	36	40 - 240	600 TNT	2020	Ex 12 Mod 3, Ex 14 Mod 1	CS-1 Mod 3	CD-1 Mod 1, CD-6	AC-1, Anchor 16, B-6	None issued
16-2	"	"	Acoustic	A-3 Mod 1	"	"	"	"	"	Ex 12 Mod 3	"	CD-5,CD-7	Attenuator Mk 1 Mod 0, Anchor 16, B-15,B-18,SD-4 or 4-1, Mi-2	Field

Mine	Type	Laid By	Nature	Firing Mechs.	Length (in.)	Diameter (in.)	Case Depth (ft.)	Type & Wt. of Charge (lb.)	Total Wt. (lb.)	Extender	Clock Starter	Clock	Other Fittings	Remarks
18-0	Ground	Surface Craft	Induc-tion	M-9	70	42	35 - 150 (500)	1350 TNT	2050	Ex 14 Mod 1, Ex 12 Mod 3	CS-1 Mod 3	CD-4	AC-1, B-6	Field
21-0	"	"	"	SRA 1			Random						HS-1, SC-1 or SC-13 DB-1	May use any charge or case
25-0	"	Aircraft	"	M-11, or M-11 Mod 1, or Mod 2	82 1/8	22 7/16	40 - 100 (400)	1120 TNT 1250 TPX	1850 or 1980	Ex 12 Mod 4, Ex 14 Mod 2	CS-1 Mod 4	CD-1, CD-8	B-17, B-18, Circuit Breaker Mk 1-0, Para 2-0, SD-4-1	Field
25-1	"	"	Acous-tic	A-5	"	"	40 - 150 (400)	"	1790 or 1930	"	"	"	B-21, Para 3-3 or Para 3-4, SD-4-1, Mi-4	"
25-2	"	"	See MDIB 1-S-45	A-6	86	"	"	1120 TNT 1275 TPX	1885 or 2015	"	"	CD-8 and 2 CD-14's	B-6, Para 3-3 or Para 3-4, SD-4-1	"
AN Mk 26-0	Ground	Aircraft	Induc-tion	M-9 Mod 1	68	18 5/8	16 - 120 (500)	465 TNT 525 TPX	1000 or 1060	Ex 12 Mod 4, Ex 14 Mod 2	CS-1 Mod 4	CD-10	B-6, SD-4 or 4-1	Superseded by AN 26-1
AN Mk 26-1	"	"	"	"	"	"	"	"	"	"	"	"	B-6, Para 2-0, SD-4 or 4-1,	Army-Navy Field
27	"	Sub	"	"	20.2'	20 13/16	30 - 140	880 TPX	2630	Ex Mk 14	CS-1 Mod 9	"	SD-4 or SD-4 Mod 1 TB 10, TB 11, 2 BG's, SR 7 or SR 7 Mod 1	Field
36-0	"	Aircraft	"	"	74	18 5/8	16 - 120 (500)	510 TNT 635 TPX	1020 or 1085	Ex 12 Mod 4, Ex 14 Mod 2	CS-1 Mod 4	"	B-6, Para 2-0, SD-4 or 4-1	"
36-1	"	"	"	"	"	"	"	"	"	"	"	"	"	"

Table I (Cont'd.)

Added 1 July 1945 (Change No. 8)

U. S. INFLUENCE MINES

Introduction

1. This chapter includes information on the U. S. influence mines now in service. Since most of these mines are laid offensively and become inert after a set period, few disposal operations are necessary.

2. The mine cases are made of either aluminum or steel, are usually cylindrical, and have charges varying from 400 to 1400 lbs. of TNT or Torpex. Granular TNT boosters and mercury fulminate detonators are used in all cases.

3. The devices or mechanisms installed in these mines can be grouped with regard to their specific function in the four main stages of mine operation which are:

   (a) Mooring

   (b) Arming

   (c) Firing

   (d) Scuttling or sterilizing

   (a) and/or (d) above may not be pertinent depending on the type of mine, and the judgment of the Officer in Charge of the mine assembly detail.

4. Mooring devices

   (a) Moored influence mines which are laid from surface craft (except the Mk. 10-7) take their mooring depth by the plummet method.

   (b) Moored influence mines laid from submarines take their mooring depth by the loose-bight hydrostat method.

5. Arming devices

   (a) Extenders (EX)

   All the extenders now in service are hydrostatically operated, and fall into two classifications; the "lazy tong" type and the direct action type. ~~Those fitted in mines laid from surface craft all have soluble washers, and those fitted in mines laid by aircraft have arming wires, and either a soluble washer or a spacer sleeve.~~ Extenders fitted on submarine-laid mines have a special safety bar and locking ball arrangement to prevent premature arming. All extenders now in service are designed to retract upon release of hydrostatic pressure except when fitted with devices which lock the extender in.

   (b) Clocks (CD) and clock starters (CS)

   Clock starters are simply hydrostatically operated plungers which, when depressed, remove a stop from the escapement of the arming clock. The various Marks and Mods. are equipped with the same safety devices as the extenders with which they are used. The clocks are all spring-wound, and serve to arm the firing mechanism after a set period which may vary from 45 minutes to three hours, depending on the particular Mark and Mod. of clock used. As with the extenders the clock starter will retract upon release of hydrostatic pressure, will stop the clock if it is still in its run-off period, and thus prevent arming of the mine.

   (c) Soluble washers

   Although these are usually classed as safety devices, they also provide an arming delay. They are fitted on extenders and clock starters as noted above, and consist of five types, designed to provide 10-minute, 45-minute, one-day, two-day, and three-day delays respectively.

6. Firing devices

   (a) Magnetic dip-needle device

   This type of firing device operates when the total change in the surrounding magnetic field is sufficient to force a compass type needle down onto an electric contact, closing the firing circuit.

   (b) Magnet induction device

   This type of firing device operates when the rate of change of the surrounding magnetic field is sufficient to generate current in a search coil, and close the firing circuit through an electrical relay system.

Those fitted in mines laid from surface craft all have soluble washers; those fitted in mines laid by aircraft have either a soluble washer or a spacer sleeve and arming wire.

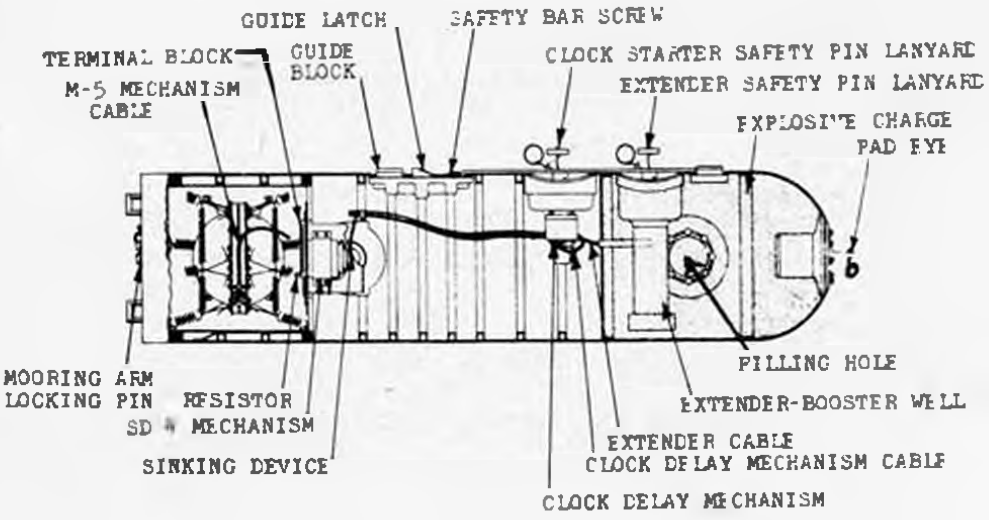

Fig. 1-- Mk. 10-3 Mine, Sectional View

(c) Acoustic device

This type of firing device operates when sound waves impinge on a microphone and are converted into electrical energy, closing the firing circuit through an electrical relay system.

Any of the three types of firing devices listed above could be fitted with a ships-counter, although no acoustic units now in service are so fitted. The ships-counters fitted in the various magnetic devices may be set from 0 to maximum of 8 or 10, depending on the Mark and Mod. fitted.

7. Scuttling of sterilizing devices (SD)

Scuttling devices, of which there is but one type in service, render the mine inert by blowing a small hole in the mine case, causing it to sink. They operate by means of an anti-recovery switch fitted on the extender.

Sterilizing devices, the most common of which are the SD-4 and SD-5, consist of an electrolytic cell, which reacts on a copper plate. This plate holds back a spring-loaded plunger which is allowed to fly forward when the electrolyte has eaten away a sufficient amount of the copper. When the plunger fires, it closes switches which short circuit the mine detonator and battery, and fires the scuttling detonator (if fitted). If any one of these operations should not be completed, one of the others would make the mine a dud. The sterilizer may be set for periods varying from five to 100 days by varying the resistance in the cell circuit.

8. The life of these mines depends on whether they are the moored or ground type, and whether or not there is a constant drain on the battery after the mine has armed. The life of a moored mine is generally dependent on the life of its mooring cable, while the life of those which have the constant battery drain will vary directly with the amount of current used. A ground magnetic mine with no constant battery drain must be considered to be alive for a period of eight years after laying if no sterilizing device is fitted.

Mark 10-3 (10-6, 10-7, 10-8 & 10-9)

General

1. Moored, magnetic dip-needle mine.

2. Laid by submarine.

3. Laid offensively in depths of water from 100 to 500 ft. against surface craft. Case depth is normally 40 ft.

Description

1. Case

Shape	Cylindrical, with hemispherical nose
Color	Black
Material	Aluminum
Diameter	20 13/16"
Length	92½"
Charge	420 lbs. TNT with granular TNT booster
Total weight in air	820 lbs.

2. External Fittings

Extender	Mk. 12-5 or 14, on top center line, 22" aft nose
Clock starter	Mk. 1-5 on top center line, 34" aft nose
Guide block and latch	On top center line, 46" aft nose
Filling hole	18" aft nose, 270 degrees from top center line
Lifting eye	On nose

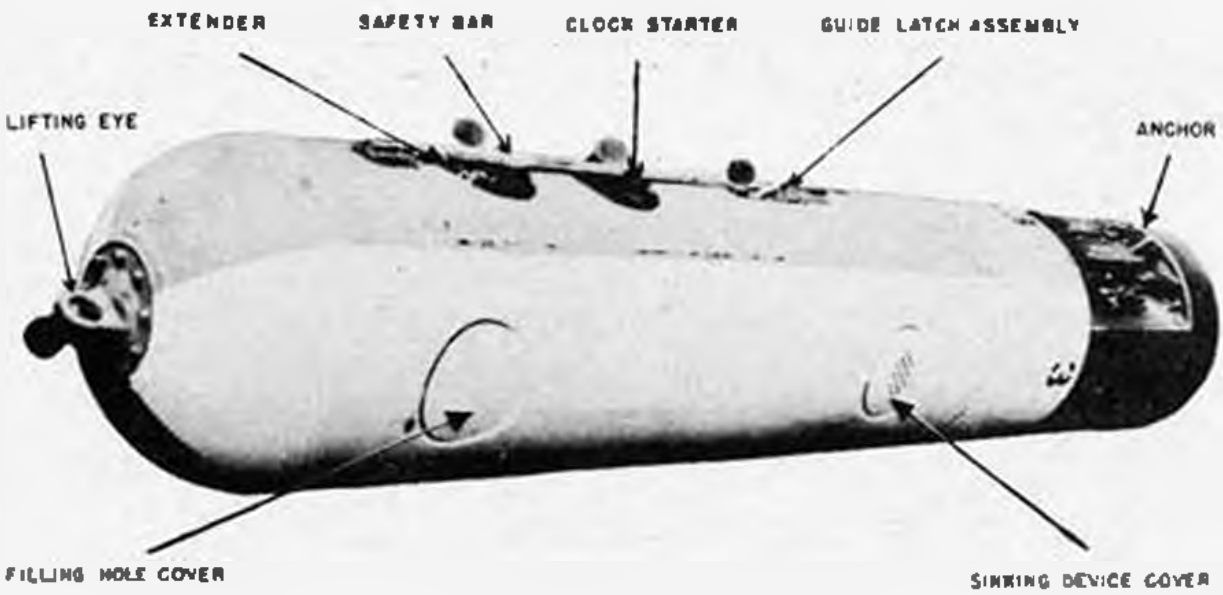

Fig. 2-- Mk. 10-3 Mine

Flooder cover	26" forward of tail, 270° from top center line
Inspection bung	27" forward of tail, 10° from top center line
Mooring eye	On tail (Mk. 10-3 anchor is used)

3. The Mk. 10-6 mine differs from the Mk. 10-3 as noted below:

   (a) It is laid from aircraft, and fitted with a Mark 3 parachute and parachute release on its tail.

   (b) The safety bar and guide latch are removed.

   (c) It is fitted with a Mk. 14-2 extender and a Mk. 1-4 clock starter.

   (d) Minor changes have been made in the wiring circuit.

   (e) A Mk. 10-5 anchor is fitted.

4. The Mk. 10-7 mine differs from the Mk. 10-5 as noted below:

   (a) The firing circuit is the same as that in the Mk. 10-3.

   (b) It is laid from PT boat without parachute.

5. The Mk. 10-8 is a production design of the Mk. 10-6.

6. The Mk. 10-9 mine differs from the Mk. 10-8 as noted below:

   (a) The wiring circuit is the same as the Mk. 10-3.

7. The changes noted above are not the only differences between the various modifications of the Mk. 10. The other changes, however, are minor and do not affect recovery or disposal techniques.

8. The Mk. 10-6 and 10-8 were only produced in limited quantities, both being superseded by the Mk. 10-9. The Mk. 10-3, 10-7, and 10-9 are the only service models, although a few Mk. 10-6 and 10-8 mines have been laid.

Operation

1. Mine takes depth by a loose-bight hydrostat system. Extender and clock starter operate in 16 ft. of water. Clock (CD-9) runs off in 170 min. and the mine is armed.

2. Firing device (M-5) operates when subjected to a sufficient change in the surrounding magnetic field to force the firing needle down onto its contacts, firing the detonator. A mechanically operated anti-countermining device (AC-1) prevents the mine from firing when subjected to sudden shock or motion. An anti-recovery switch fitted on the extender fires a flooder, consisting of a Mk. 1-1 electric detonator covered by a plastic bung, if the extender retracts, thereby sinking the mine. An SD-4 mechanism may be fitted to render the mine inert after a set period.

3. Extender is designed to retract upon release of hydrostatic pressure, but the anti-recovery switch on the Mk. 12-5 will not allow it to retract fully.

Precautions

1. Do not attempt RMS unless absolutely necessary.

2. Allow no movement of magnetic material near the mine.

3. Do not move or jar the mine except from a safe distance.

4. When the Mk. 12-5 extender starts to retract, it closes its anti-recovery switch and locks with scuttling circuit closed and the mine detonator housed in the booster. The Mk. 14 extender, however, retracts completely and closes its anti-recovery switch only momentarily during retraction. Keep clear of the flooder cover when performing RMS.

5. Do not attempt underwater RMS. If the mine is found floating or submerged, pull it ashore from a safe distance.

RMS

1. Remove the clock.

2. Slit the clock cable, and cut and tape each lead separately. There are six leads. Cut the blue, brown and purple leads first in that order. If the cable cannot be cut, wind the clock if a key is available.

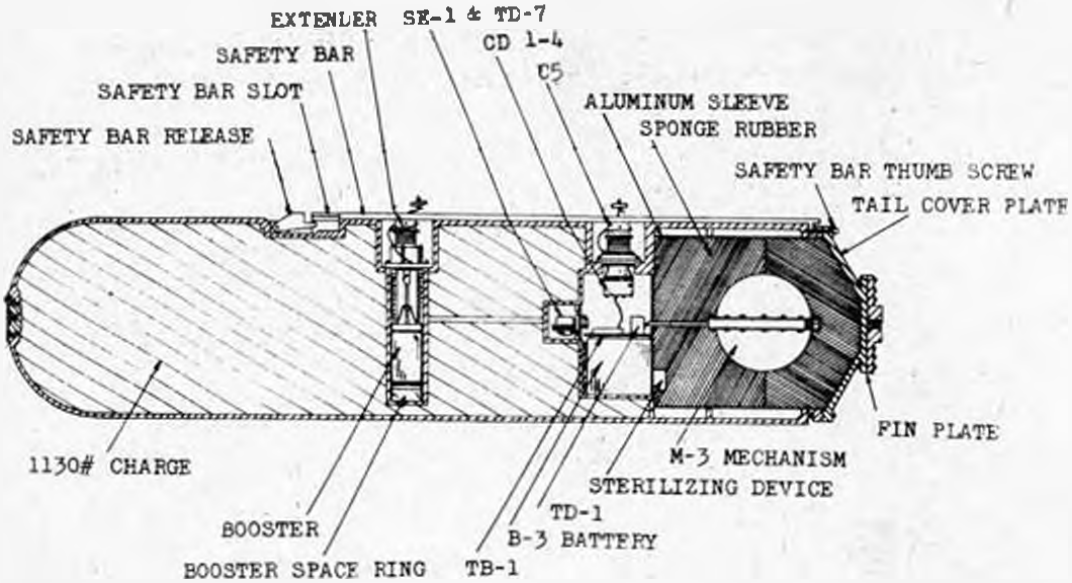

Fig. 3-- Mk. 12 Mine, Sectional View

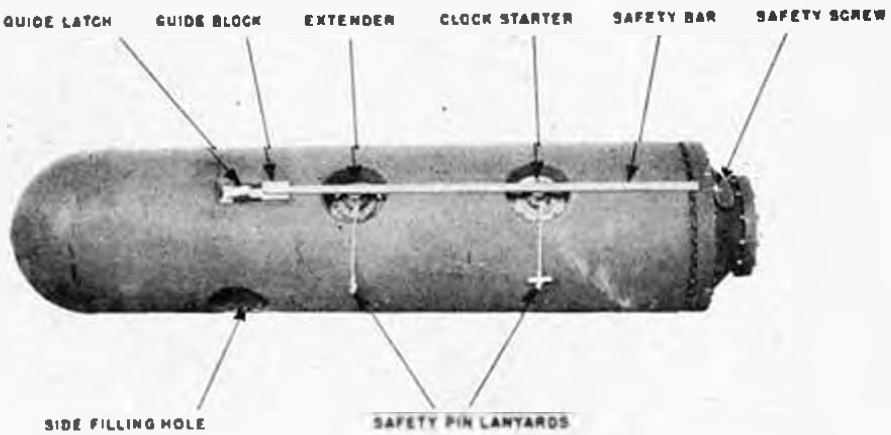

Fig. 4-- Mk. 12 Mine

3. Remove the extender.

4. Cut and tape the detonator leads separately.

5. Slit the extender cable, and cut and tape each lead separately.

6. Remove the scuttling detonator as prescribed below:

   (a) Remove the flooder cover.

   (b) Remove the flooder bung.

   (c) Cut and tape the detonator leads.

   (d) Remove the large brass screw from the inner side of the flooder bung and shake or pull out the detonator.

7. Dispose of both detonators, booster, and charge.

Mark 12

General

1. Ground, magnetic dip-needle mine.

2. Laid by submarine.

3. Laid offensively in depths of water from 16 to 125 ft. against surface craft, and up to 500 ft. against submarines.

Description

1. Case

Shape	Cylindrical with hemispherical nose and tail cap
Color	Black
Material	Aluminum
Diameter	20 13/16"
Length	94"
Charge	1095 lbs. TNT, or 1225 lbs. Torpex
Total weight in air	1415 lbs. or 1545 lbs.

2. External Fittings

Extender	Mk. 12 or 12-5, in pocket on top center line 49" forward of tail cap
Clock starter	CS-1 or 1-5 in pocket on top center line 27" forward of tail cap
Filling holes	2, one in nose and one 270° from top center line, 25" aft the nose

Spring guide and latch on top center line, 8" forward of the extender.

Operation

1. Extender and clock starter operate in 15 ft. of water. The clock runs off in 45 min. (CD-1) or 170 min. CD-1-5 or 9) and the mine is armed.

2. Firing device (M-3, 3-1, 3-2) operates when subjected to a change of the surrounding magnetic field sufficient to force the firing needle down onto its contacts, firing the detonator or advancing the 10-place ships-counter (SE-1) one step. An SD-5 mechanism may be fitted to render the mine inert after a set period.

3. Extender is designed to retract upon release of hydrostatic pressure.

Precautions

1. Do not attempt RMS unless absolutely necessary.

2. Allow no movement of magnetic material near the mine.

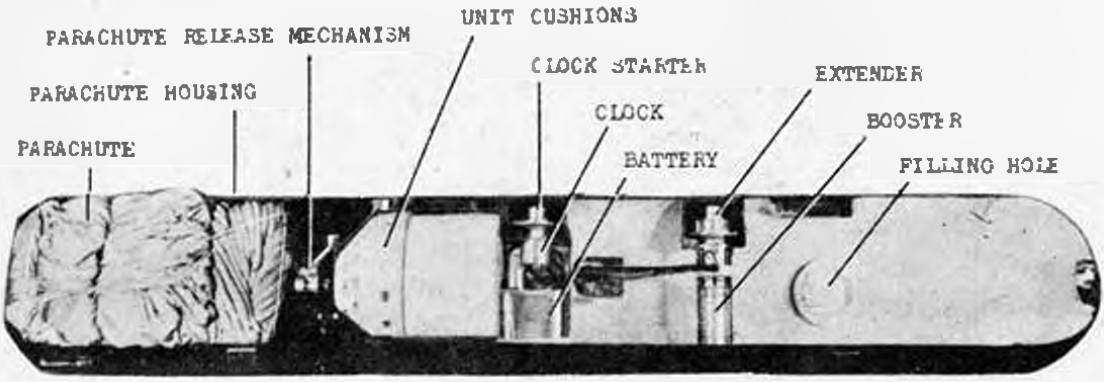

Fig. 5-- Mk. 12-1 Mine, Cutaway View

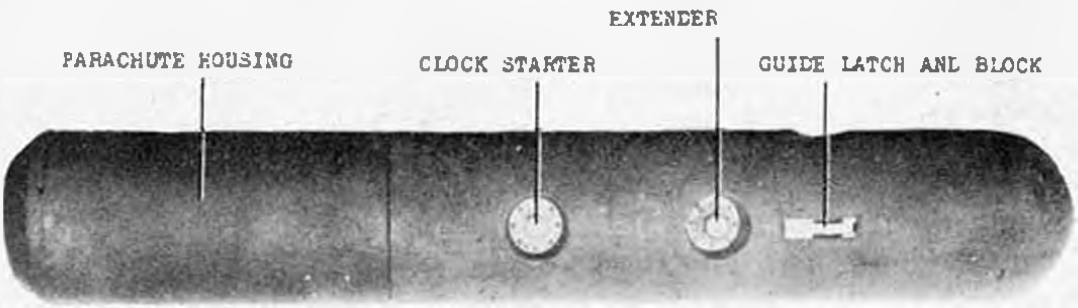

Fig. 6-- Mk. 12-1 Mine

3. Do not move or jar the mine except from a safe distance.

4. Extender may fail to retract upon release of hydrostatic pressure.

RMS

1. Cut retaining wire and remove plastic cap and spring from extender.

2. Check the extender. If it is retracted, an extender safety pin (7/32" in diam.) inserted into the hole in the spindle housing will lock it out. If it is not retracted, insert pin into the ball-retaining holes and pry the spindle out. The pin will now fit through the safety-pin hole. (See note) If the mine is underwater, it must be raised before removing the clock.

3. Remove the clock.

4. Slit the clock cable and cut and tape all leads separately.

5. Remove the extender.

6. Cut and tape the detonator leads separately.

7. Dispose of detonator, booster and charge.

Mark 12-1

General

1. Same as the Mk. 12, except that it is aircraft laid, and fitted with a parachute and parachute release Mk. 1 or 1-1.

Description

1. Case

Shape	Cylindrical, with hemispherical nose. Cylindrical parachute housing attached to the tail
Length	130" (with parachute housing)
Total weight in air	1595 lbs. or 1725 lbs.

All other data same as in Mk. 12.

2. External fittings

Extender	Mk. 12-1 or 12-4 pocket on top center line 45" aft nose
Clock starter	CS1-1 (with 12-1 extender) or 1-4 (with 12-4 extender) in pocket on top center line 67" aft nose
Key band and Key	Band extends circumferentially around case, 50" aft nose. Key on band, 180° from extender
Filling holes	Two, one in nose and one 28" aft nose, 270° from top center line.

Operation

1. The mine operates in the same manner as the Mk. 12, except that the clock starter and extender may be fitted with soluble washers, causing an additional delay in arming. (EX. 12-1 and CS 1-1 have washers)

2. Safety features are the same as in the Mk. 12.

Precautions

1. Same as Mk. 12.

RMS

1. Retract and lock out the extender, using the extender wing nut and the wooden washer from the Mk. 6 tool kit for the 12-1, and the wooden washer and safety nut from the tool kit for the 12-4. If the mine is underwater, it must be raised before removing the clock.

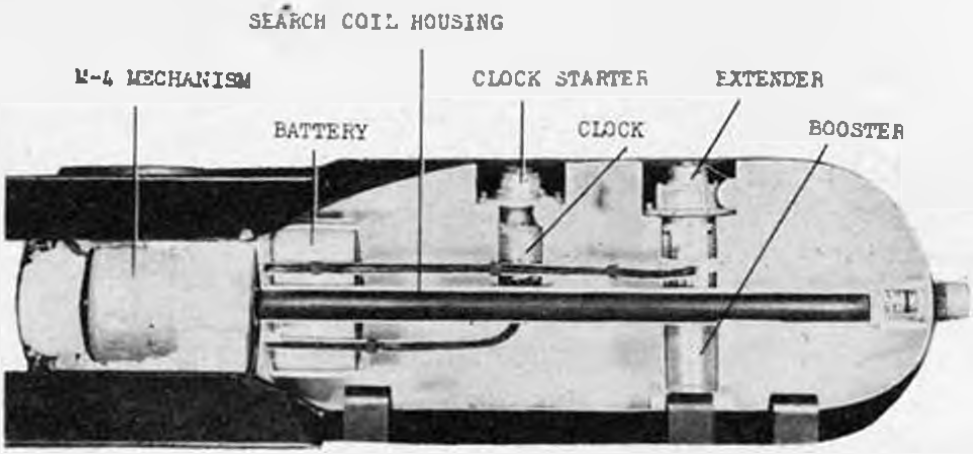

Fig. 7-- Mk. 13 Mine, Cutaway View

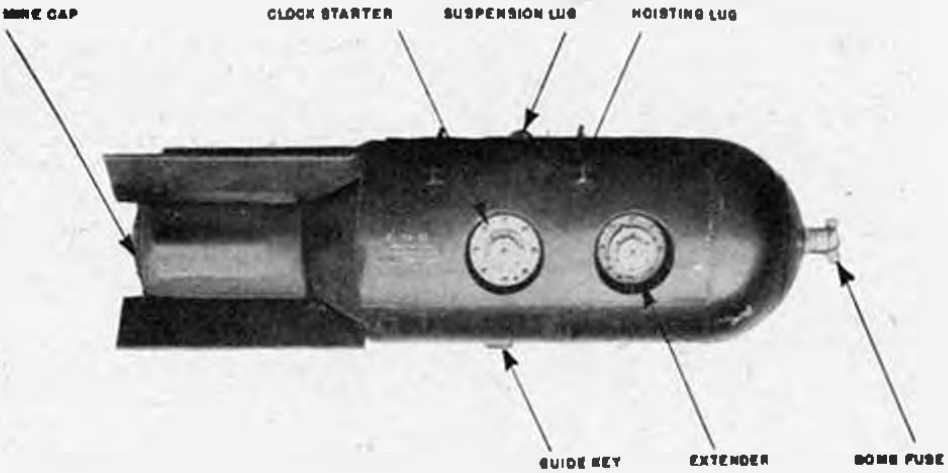

Fig. 8-- Mk. 13 Mine

2. The remaining steps in RMS are the same as for the Mk. 12.

Mark 12-3 & 12-4

General

1. The Mk. 12-3 and 12-4 mines are improved designs of the Mk. 12 and 12-1 respectively, differing chiefly in that all electrical connections are of the plug-socket type, making for easier assembly. The Mk. 12-3 may be fitted with a Mk. 14 extender.

2. The external appearance, safety features and operational characteristics of these mines are not materially altered from the Mk. 12 and 12-1, although the charge weight and total weight are each 30 lbs. less than in the Mk. 12 and 12-1 respectively.

3. RMS is the same as for the Mk. 12 and 12-1.

Note: The Mk. 12 and 12-5 extenders used in Mk. 12 mine can be retracted by the above procedure only in shallow water. The Mk. 12-3 mine uses Mks. 12-5 and 14 extenders. No proven underwater procedure is available for the Mk. 14 extender. Although the possibility of recovery of Mk. 12 and 12-3 submarine-laid ground mines underwater is remote, satisfactory procedures are being developed for such an eventuality.

Mark 13 (13-3, 13-4)

General

1. Ground, magnetic induction mine.

2. Aircraft laid, without parachute.

3. Laid offensively in depths of water from 16 to 75 ft. against surface craft, and up to 500 ft. against submarines.

4. May be used as a bomb if fitted with Mk. 219, 221 or AN-M 103 impact nose fuses.

5. The Mk. 13-4 differs from the Mk. 13 in that it is designed to be laid in waters as shallow as 10 ft. by removing the extender and clock starter springs. The Mk. 13-3 is a Mk. 13 mine fitted with Mk. 2 parachute.

Description

1. Case

Shape	Cylindrical, bomb-shaped with fins
Color	Black
Material	Steel
Diameter	
Forward section	19 7/8"
Tail Section	15 1/4"
Fins (span)	25½"
Length	68 3/4"
Charge	640 lbs. TNT, or 700 lbs. Torpex, with granular TNT booster
Total weight in air	1030 lbs. or 1090 lbs.

2. External fittings

Bomb fuse	Mk. 219, 221, or AN-M 103 in pocket in nose
Extender	Mk. 12-2 or 12-4, in pocket 17" aft nose
Clock starter	Mk. 1-2 (with 12-2 extender) or Mk. 1-4 (with 12-4 extender) in pocket 30" aft nose
Filling hole	180 degrees from clock.

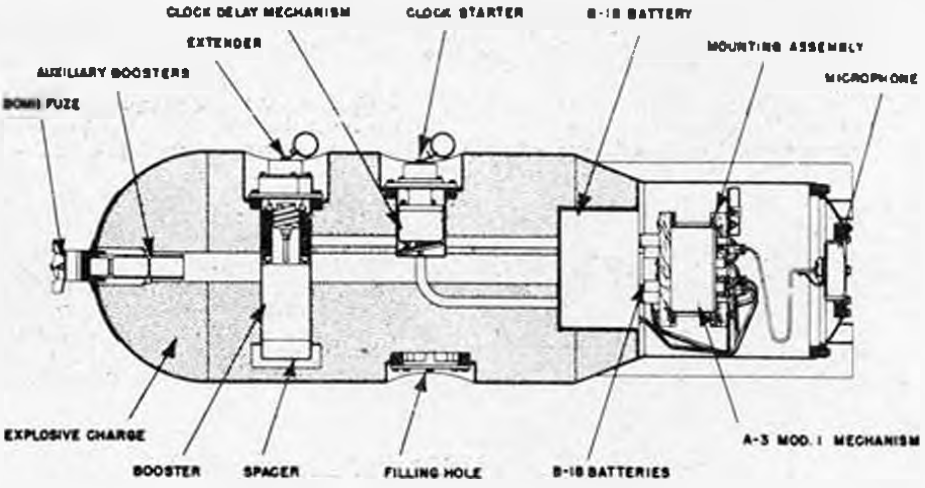

Fig. 9-- Mk. 13-5 Mine, Sectional View

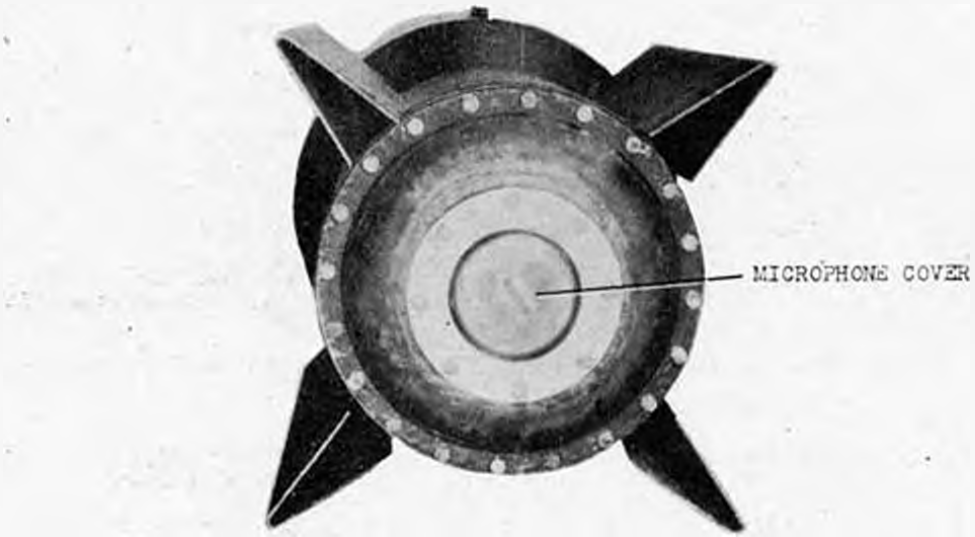

Fig. 10-- Mk. 13-5 Mine, Rear View

Operation

1. When the soluble washers dissolve (EX 12-4 and CS 1-4 do not use soluble washers), extender and clock starter operate in 16 ft. of water. The clock (CD-1-1 or CD-6) runs off in 45 min., and mine is armed.

2. The firing device (M-4-1 or M-4-2) operates upon receipt of the proper number of "looks" properly spaced, either firing the detonator, or advancing the eight-place ships counter (SS-1) one step. An SD-4 mechanism may be used to render the mine inert after a set period. If the unit is faulty, the mine will destroy itself upon arming.

3. Extender is designed to retract upon release of hydrostatic pressure.

Precautions

1. Do not attempt RMS unless absolutely necessary.

2. Do not move or jar the mine except from a distance.

3. Allow no movement of magnetic material near the mine.

4. Extender may fail to retract upon release of hydrostatic pressure.

5. At one time, anti-recovery switches, used only as mechanical detents to lock in the extender, were issued. No extenders so fitted are now being issued.

RMS

1. See Part II, Chapter 5 for rendering safe fuzes.

2. Retract and lock out the extender using the cap and wing nut from the extender with a wooden plug for the Mk 12-2, and the wooden plug and safety nut from the Mk 6 tool kit for the 12-4. If the mine is underwater, it must be raised before removing the clock. If the extender cannot be retracted, RMS must not be attempted. Dispose of the mine by other means.

3. Remove the clock from a safe distance.

4. Slit the clock cable, and cut and tape each lead separately.

5. Remove the extender from a safe distance.

6. Cut and tape the detonator leads separately.

7. Dispose of detonator, booster and charge.

Mark 13-5 (13-6)

General

1. Ground, acoustic mine, laid by aircraft.

2. Laid offensively in depths of water from 40 to 100 ft. against surface craft. May be used as a bomb if fitted with Mk 219, 221, or AN-M 103 nose fuzes.

Description

1. Case

Charge	430 lb. TNT or 490 lb. Torpex with granular TNT booster
Total weight in air	1000 lb. or 1060 lb.

All other data and dimensions are the same as in the Mk 13.

2. External fittings

Microphone pocket	On tail cover plate of mine, inside 8" cover plate ring. Microphone is covered by a 5" rubber diaphragm, which is stamped with the word "BRUSH."

All other external fittings are the same as on the Mk 13.

3. The 13-6 differs from the 13-5 in that it is designed for laying from high altitudes with parachute.

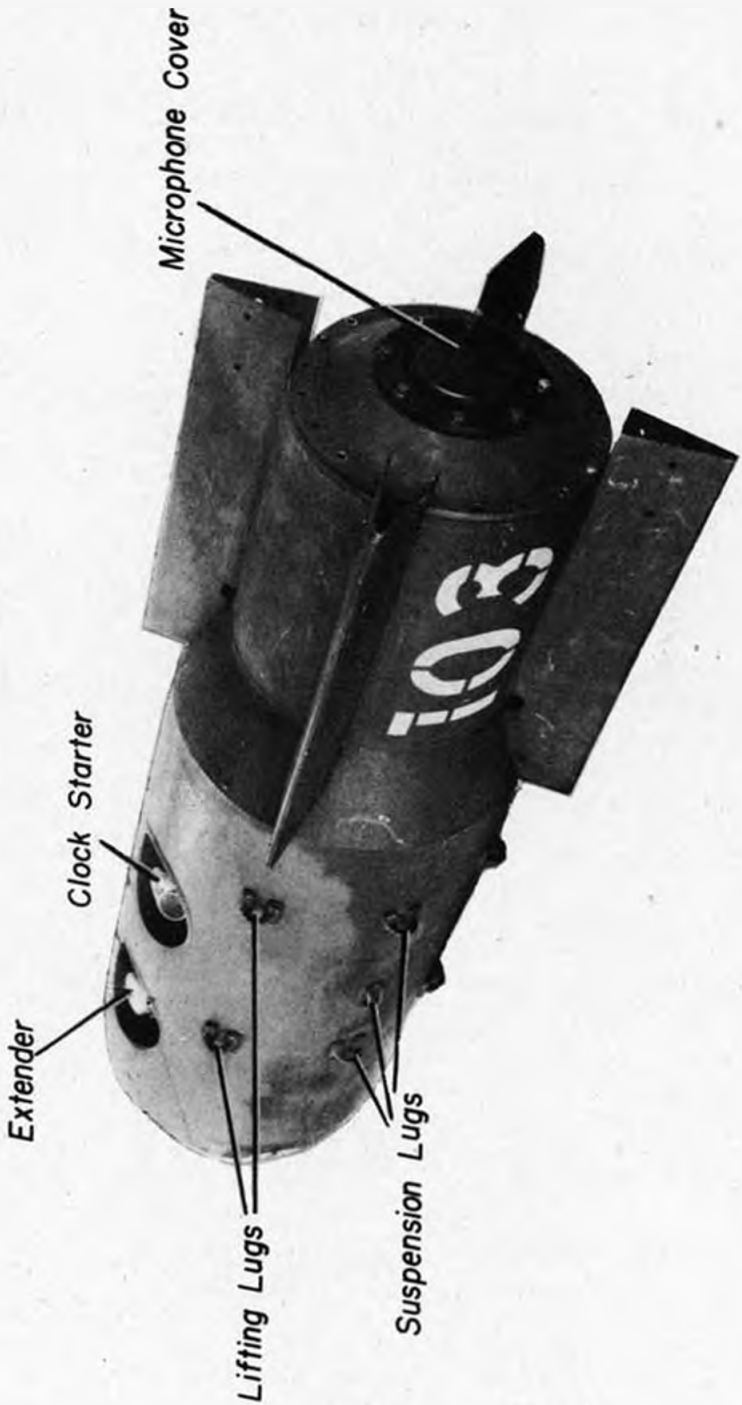

Fig. 11 - Mk 13-5 Mine

(Mk 13-5 (13-6), Cont'd.)

Operation

1. After soluble washers dissolve, (may not be used) extender and clock starter operate in 16 ft. of water. Clock (CD-1, 5, or 7) runs off in 45 min., and the mine is armed.

2. Firing device (A-3, A-3-1, or A-3-2) operates when microphone receives a sound of proper frequency, intensity and duration, firing the detonator. An anti-countermining device, built into the A-3 unit, prevents the mine from firing when subjected to sudden noise or shock.

3. Extender is designed to retract upon release of hydrostatic pressure.

Precautions

1. Do not attempt RMS unless absolutely necessary.

2. Keep all noise to an absolute minimum. The firing device, although designed to operate by a sound of two second's duration, will often fire when this time interval has been cut to less than 1/2 second.

3. Extender may fail to retract upon release of hydrostatic pressure. DO NOT ATTEMPT TO RETRACT IT.

4. See Part II, Chapter 5 for rendering safe fuzes.

RMS

1. On land

   (a) Prepare Cavity Charge Liner Type 1, (Part I, Chapter 5) and pack it with 1/3 lb. plastic explosive C or C-2. Place the filled liner between any two fins on the tail in an athwartships position, 9 1/2" from the after end of the cover plate, and centered between the two fins. A 1" stand-off from the case must be used, an empty C or C-2 box being handy for this purpose.

   (b) Insert the detonator in the charge, secure the detonator leads and firing leads, and fire the charge from a safe distance.

   (c) Inspect the interior of the mine case to insure that all leads to the unit have been severed.

   (d) Remove the extender from a safe distance.

   (e) Dispose of detonator, booster and charge.

2. Underwater

   (a) Prepare Cavity Charge Container Type 2 (Part I. Chapter 5) and pack it with 1/3 lb. C or C-2 plastic explosive. Place the filled liner on the mine case as described in Par. (a) above, using the distance pieces to facilitate positioning.

   (b) Insert the detonator in the charge, secure the detonator leads and firing leads, and fire the charge from a safe distance.

   (c) Wait at least 12 hours for the battery to become inert.

   (d) Raise or beach the mine, and remove the extender.

   (e) Dispose of detonator, booster and charge.

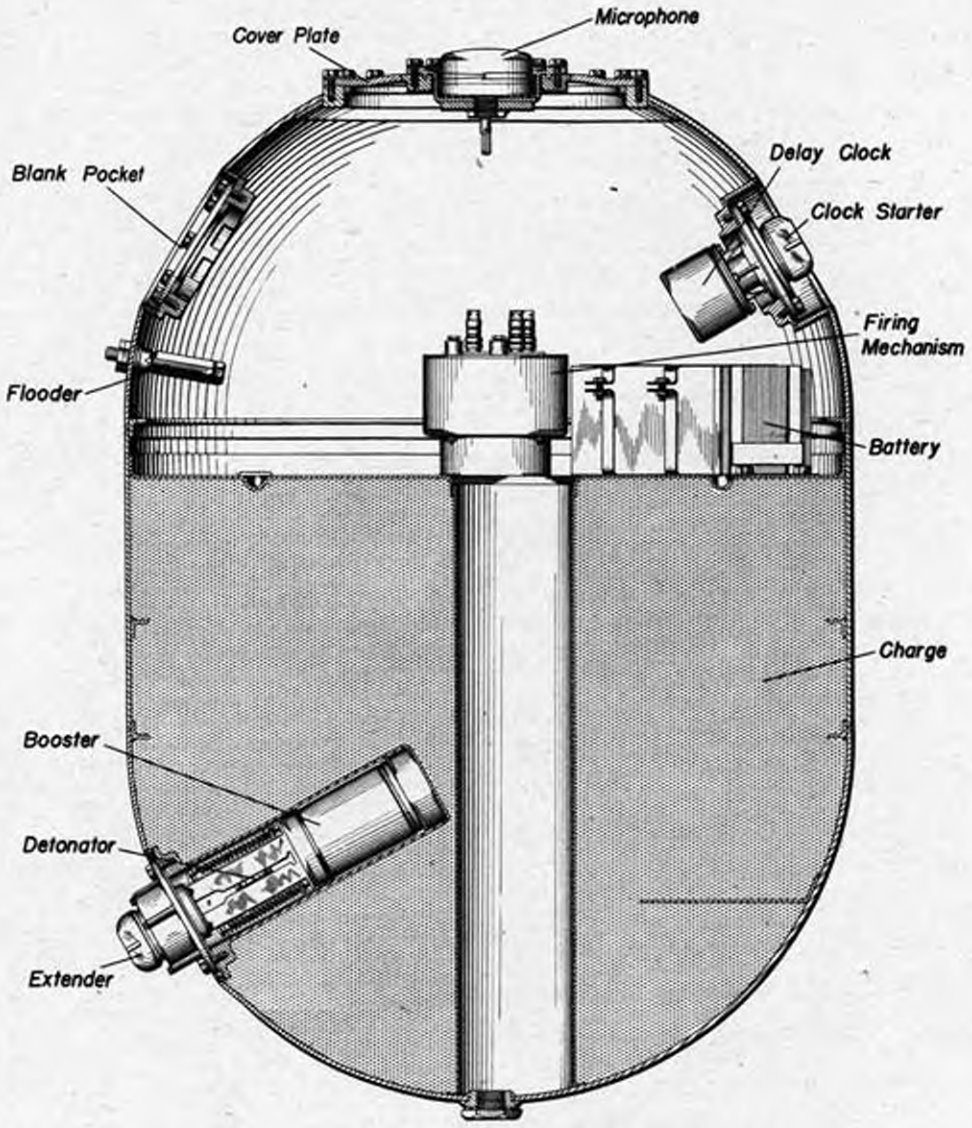

Fig. 12- Mk 16-2 Mine Sectional View

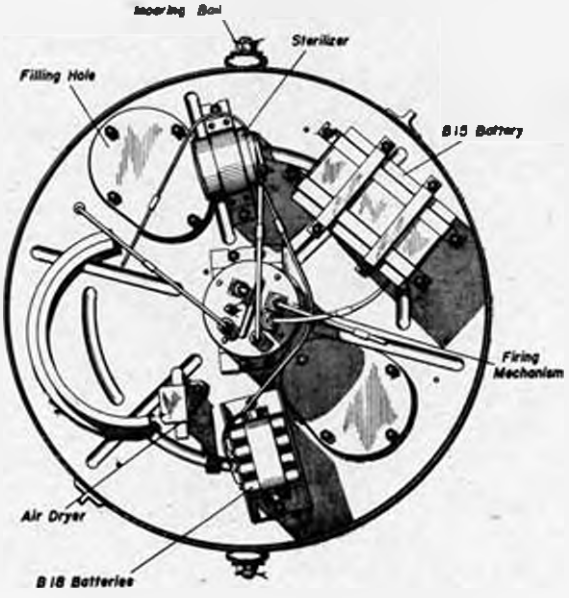

Fig. 12a - Mk 16-2 Mine, Top View, Cover Plate Removed

Mark 16-2

General

1. Moored, acoustic mine, laid by surface craft.

2. Offensive or defensive mine, for use in maximum depth of water of 2800 ft. Maximum depth of case when moored is 240 ft.

Description

1. Case

   (a) Same as Mk 16-1 (Part II, Chapter 2) except that its total weight in air is 1070 lb.

2. External fittings on the case differ from those on the Mk 16-1 as follows:

   (a) The horns are not fitted and the respective horn pockets are blanked off. A scuttling detonator may be fitted in place of one of the horn plugs.

   (b) One of the blank pockets on the upper hemisphere contains the clock starter Mk 1-3.

   (c) A microphone, MI-2, is fitted to the center of the cover plate and replaces the K-device.

   (d) A Mk 14-1 extender may be fitted.

Operation

1. Mine takes depth by plummet. Dissolution of soluble plugs allows the extender and clock starter to operate in 16 ft. of water. The clock (CD-5 or 7) runs off in 45 min. and the mine is armed.

2. The firing device (A3-2) operates when sound of the proper frequency and amplitude build-up is incident upon the microphone, firing the detonator. An anti-countermining device built into the firing device prevents the mine's firing when subjected to sudden noise or shock.

3. The extender is designed to retract upon release of hydrostatic pressure.

Precautions

1. Do not attempt RMS unless absolutely necessary.

2. Keep all noise to an absolute minimum. The firing device is designed to be operated by a sound of two second's duration, but will often fire on a sound of less than 1/2 second's duration.

3. Note that the extender may fail to retract upon release of hydrostatic pressure.

RMS

1. Under development.

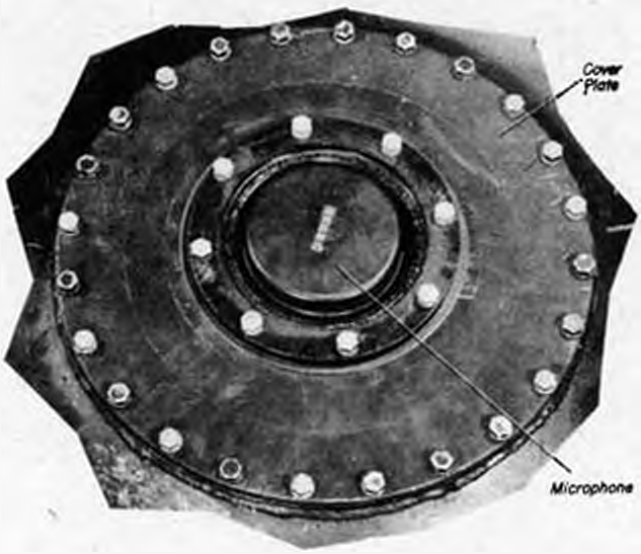

Fig. 12b - Mk 16-2 Mine, Cover Plate, Showing Microphone.

Added 15 April 1945
(Change No. 3)

Fig. 13- Mk 16-2 Mine

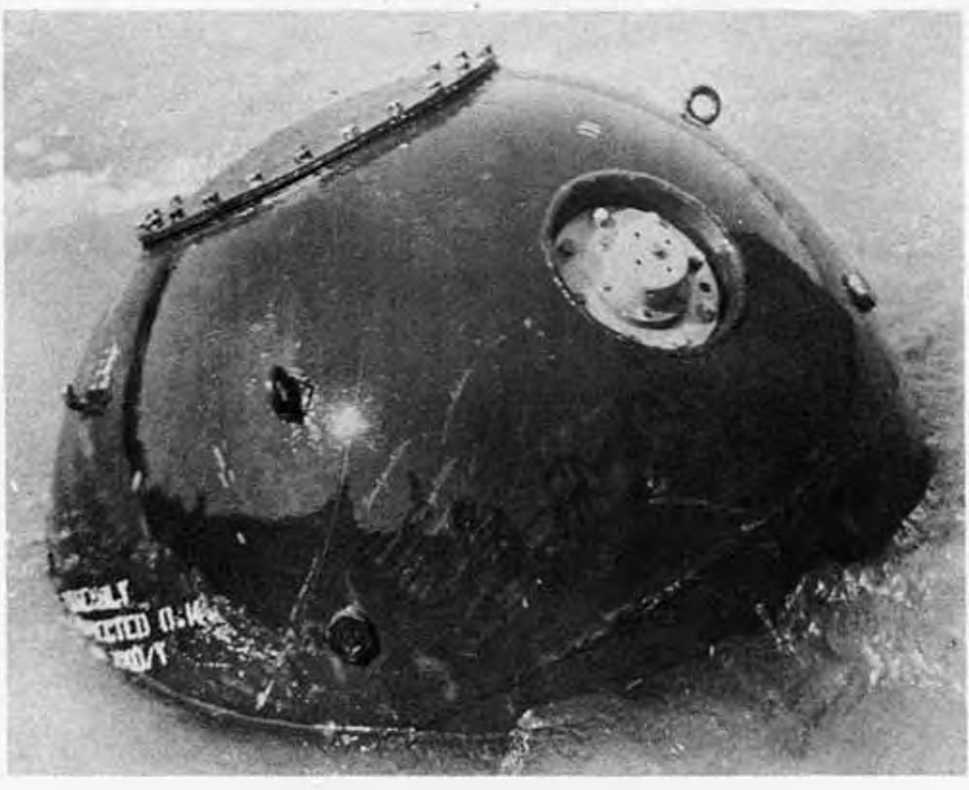

Fig. 14- Mk 16-2 Mine, Floating

(Mark 16-2, Cont'd.)

RMS

1. After the mine has positively been identified, prepare a Cavity Charge Container Type 2 (Part I, Chapter 5, Page 17) and pack it with 1/3 lb. Composition C, C-2 or C-3 plastic explosive.

2. Place the charge container on the mine as follows:

   (a) Locate the lifting eye on the upper hemisphere which is most nearly in line with the extender pocket on the lower hemisphere.

   (b) Position the charge container so that its longitudinal axis is parallel to and 1 1/2" below the upper transverse weld on the mine case and its right extremity is bounded by an imaginary line which runs parallel to the longitudinal axis of the case through the above-mentioned lifting eye.

3. Secure the charge in place by any means available, observing the acoustic precautions stated above.

4. Insert an Army Engineer Special detonator in the charge, secure the detonator leads and firing leads, and fire the charge from a safe distance.

5. Return to the mine after waiting a five minute safety period and inspect the interior of the case through the hole cut by the charge. The firing leads should be completely severed.

6. Remove the extender and booster.

7. Dispose of detonator, booster and charge.

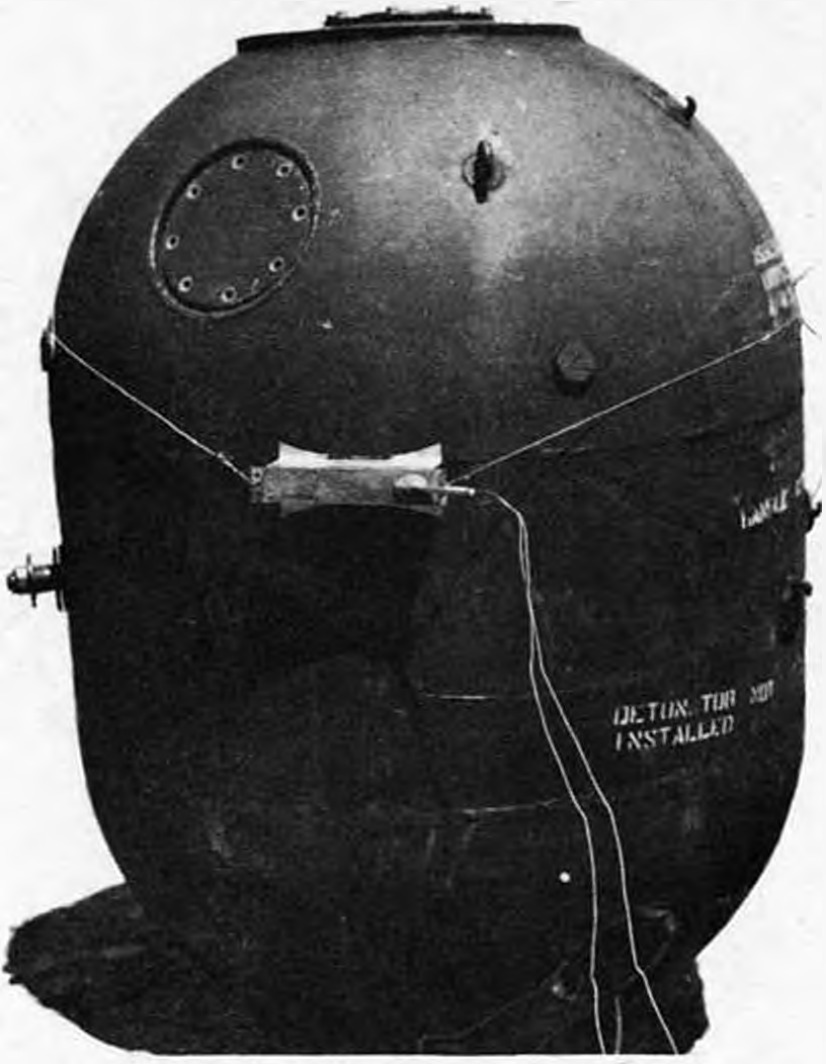

Fig 14a - Mk 16-2 Mine, Charge Container in Place for RMS

Fig 14b - Mk 16-2 Mine, Cut Made by Cavity Charge During RMS

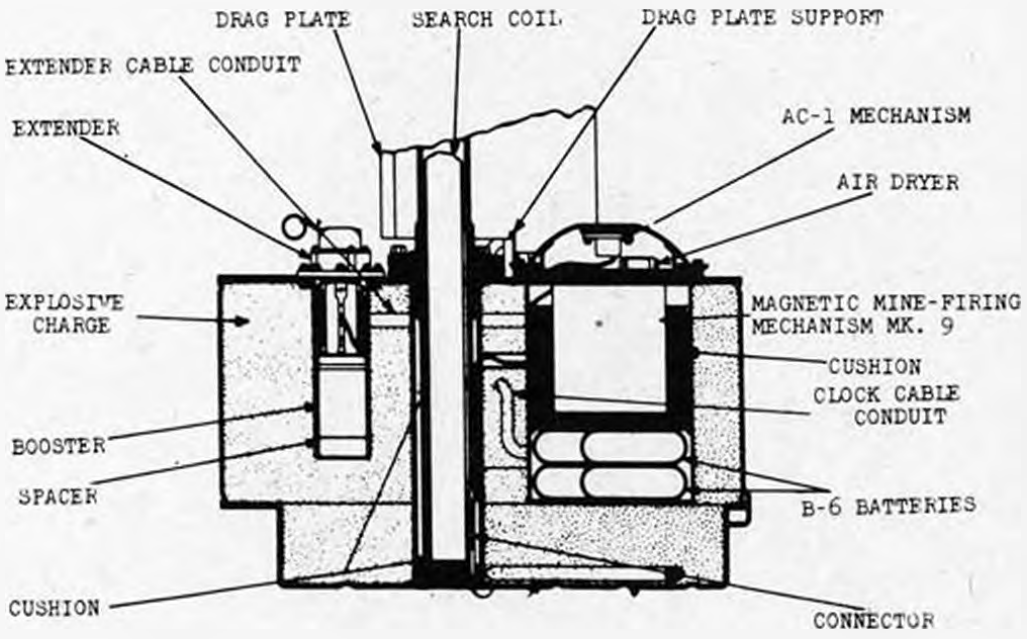

Fig. 15- Mk 18 Mine, Sectional View

Mark 18

General

1. Ground, magnetic induction mine.
2. Laid by surface craft.
3. Laid offensively or defensively in depths of water from 35 to 150 ft. against surface craft, and up to 500 ft. against submarines.

Description

1. Case

Shape	Flat cylinder with search coil, projecting vertically from top
Color	Black
Material	Steel
Diameter	42"
Height	
Including search coil	70"
Less search coil	28"
Charge	1350 lb. TNT with granular TNT booster

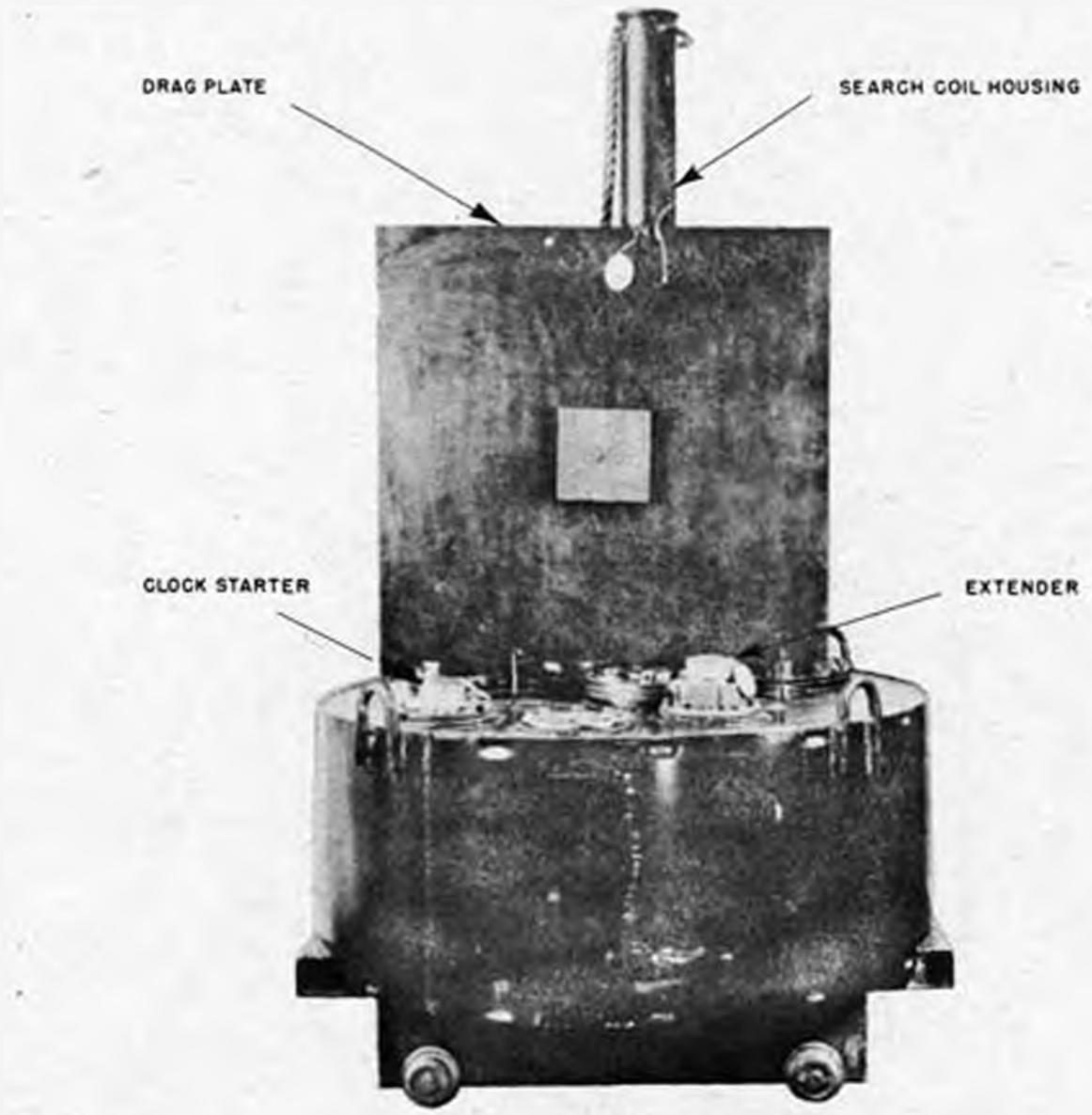

Fig. 13-- Mk. 18 Mine

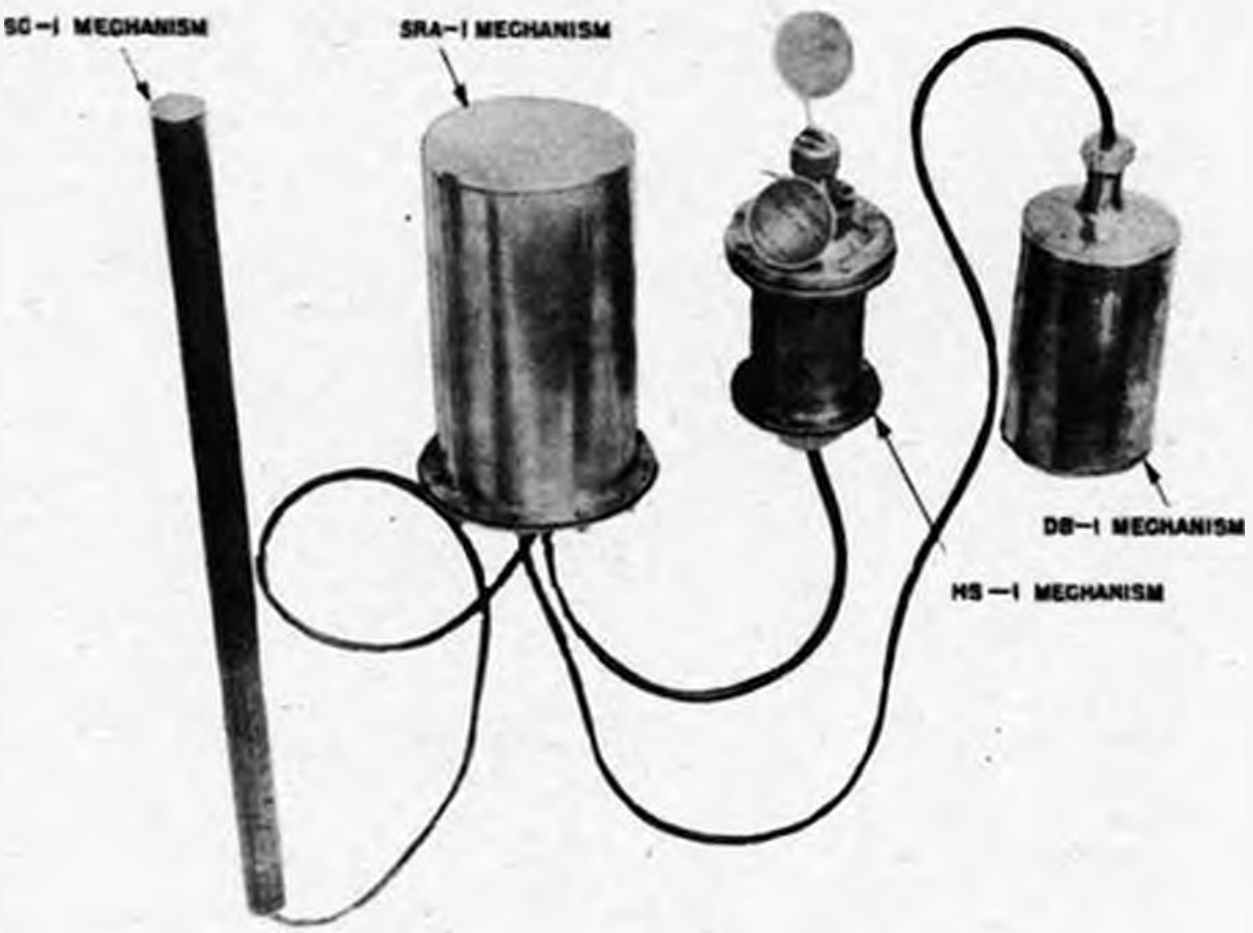

Fig. 14-- Mk. 21 Mine Assembled

Total weight in air	2050 lb.

2. External fittings

Drag plate and release mechanism	Mk 3-3, on search coil housing
Launching wheels	Four, beneath case
Extender	Mk 12-3 or 14-1, in pocket on top of case
Clock starter	Mk 1-3, in pocket on top of case
Filling holes	One large and one small, on top of case
Firing device	M-9, in hole on top of case

Operation

1. Drag plate keeps the mine upright during descent until it is cast off at a depth of 30'. When soluble washers dissolve, clock starter and extender operate in 16' of water. The clock (CD-4) runs off in 45 min., and the mine is armed.

2. The firing device operates upon receipt of two "looks" of opposite polarity with in a set time limit, firing the mine. An impact-operated anti-countermining device (AC-1) prevents the mine from firing when subjected to sudden shock or motion.

3. Extender is designed to retract upon release of hydrostatic pressure.

Precautions

1. Do not attempt RMS unless absolutely necessary.

2. Do not move or jar the mine except from a distance.

3. Allow no movement of magnetic material near the mine.

4. Extender may fail to retract upon release of hydrostatic pressure.

RMS

1. Retract and lock out the extender. Use the wooden washer and safety nut from the Mk 6 tool kit for the 12-3. For the 14-1, use the Type 2 non-magnetic extender retractor. When using the Type 2 extender retractor with the Mk 14-1 extender, the metal extender cap, with its transparent plastic cover, must be removed in order to remove the soluble washer retainer nut and cotter pin from the threaded extender spindle. The plastic cover should then be unscrewed from the metal cap and the cap replaced on the spindle in order to provide leverage for the retractor tool. If the mine is underwater, it must be raised before the clock is removed.

2. Remove the clock from a safe distance.

3. Slit the clock cable, and cut and tape each lead separately.

4. Remove the extender from a distance.

5. Cut and tape the detonator leads separately.

6. Dispose of detonator, booster and charge.

Note: Because the mine is extremely sensitive, and may be actuated by the diver's telephone, diving should be attempted only under excellent bottom conditions and visibility, and with shallow water gear.

Mark 22

General

1. Ground, magnetic induction mine (mechanism assembly)

2. Not a complete mine in the usual sense. In its entirety it consists only of the simple internal parts of a magnetic induction mine. It is designed to be used by operational units in remote or isolated areas where transport is limited. May be planted from surface craft or manually.

Diameter	42"
Height	
Including search coil	70"
Less search coil	28"
Charge	1350 lbs. TNT with granular TNT booster
Total weight in air	2050 lbs.

2. External fittings

Drag plate and release mechanism	Mk. 3-3, on search coil housing
Launching wheels	Four, beneath case
Extender	Mk. 12-3 or 14-1, in pocket on top of case
Clock starter	Mk. 1-3, in pocket on top of case
Filling holes	One large and one small, on top of case
Firing device	M-9, in hole on top of case.

Operation

1. Drag plate keeps the mine upright during descent until it is case off at a depth of 30'. When soluble washers dissolve, clock starter and extender operate in 16' of water. The clock (CD-4) runs off in 45 min., and the mine is armed.

2. The firing device operates upon receipt of two "looks" of opposite polarity with in a set time limit, firing the mine. An impact-operated anti-countermining device (AC-1) prevents the mine from firing when subjected to sudden shock or motion.

3. Extender is designed to retract upon release of hydrostatic pressure.

Precautions

1. Do not attempt RMS unless absolutely necessary.

2. Do not move or jar the mine except from a distance.

3. Allow no movement of magnetic material near the mine.

4. Extender may fail to retract upon release of hydrostatic pressure.

RMS

1. Retract and lock out the extender. Use the wooden washer and safety nut from the Mark 6 tool kit for the 12-3. For the 14-1, use the Type 2 non-magnetic extender retractor. If the mine is underwater, it must be raised before removing the clock.

2. Remove the clock from a safe distance.

3. Slit the clock cable, and cut and tape each lead separately.

4. Remove the extender from a distance.

5. Cut and tape the detonator leads separately.

6. Dispose of detonator, booster and charge.

Note: Because the mine is extremely sensitive, and may be actuated by the driver's telephone, diving should be attempted only under excellent bottom conditions and visibility, and with shallow water gear.

Mark 21

General

1. Ground, magnetic induction mine (mechanism assembly)

2. Not a complete mine in the usual sense. In its entirety it consists only of the simple internal parts of a magnetic induction mine. It is designed to be used by operational units in remote or isolated areas where transport is limited. May be planted from surface craft or manually.

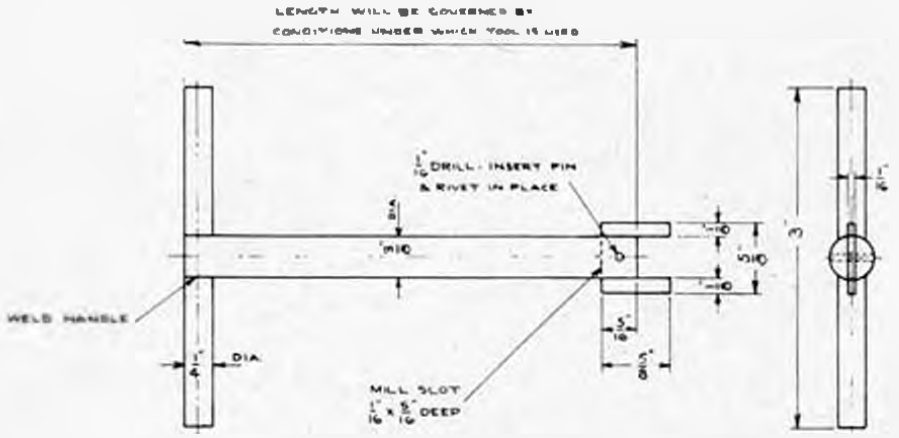

Fig. 15-Non-magnetic spanner for use in rendering safe procedure in Mine Mark 21. This tool may be used to remove the small castellated nut on the outer end of the hydrostat spindle of the HS-1 mechanism in Mine Mk. 21.

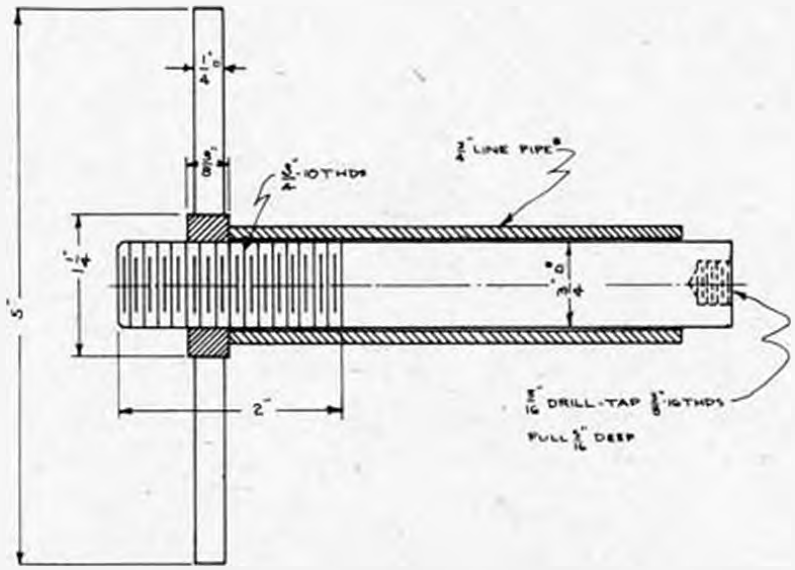

Fig. 16-Non-magnetic retracting tool for rendering safe procedure in Mine Mk. 21. This tool is used to retract and lock out the hydrostat spindle of the HS-1 mechanism in the mine Mk. 21.

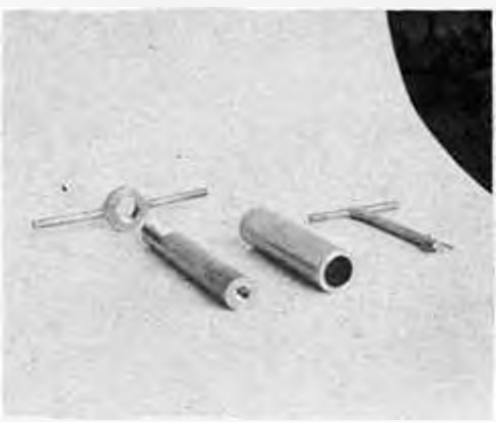

Fig. 17-Three components of the retracting tool. Spanner wrench on right.

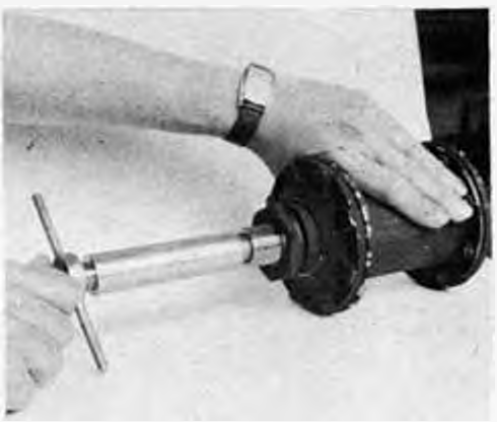

Fig. 18-Shows retracting tool being inserted into the HS-1 mechanism.

3. Laid offensively or defensively in depths of water from 10 to 100 ft. against surface craft. May be used as a land mine.

Description

1. Mine is issued in four parts with connecting cables, but without case or charge. The four parts issued are:

   (a) Firing mechanism (SRA-1) consisting of a moving coil relay and eight 1½ volt flashlight batteries housed in a cylindrical container 8½" long and 5" in diameter. Weight is 8½ lbs.

   (b) A search coil 34½" or 46½" long, sealed in a bakelite tube.

   (c) Detonator-booster assembly, (DB-1) including a Mk. 1-1 detonator and a Mk. 6-3 booster, permanently married, and housed in a cylindrical container, 6½" long and 4½" in diameter.

   (d) Hydrostatic switch (HS-1) consisting of a diaphragm-type hydrostat housed in a cylindrical container 5" long and 3" in diameter. The plunger of the hydrostat operates three arming switches.

2. All parts, including the connecting cables, are water-tight.

Operation

1. After soluble plug dissolves, the three switches on the hydrostat will operate in 10' of water. One switch operates resetting jaws which center the firing needle, another removes a short from the firing relay, and the third places the detonator in the firing circuit.

2. The firing device operates when subjected to a sufficient rate of change of the surrounding magnetic field, firing the detonator. There is no delay in firing, nor is there any anti-countermining feature.

3. Hydrostat is designed to retract upon release of hydrostatic pressure.

Precautions

1. Mine may be difficult to identify because of its nondescript appearance. Substitutions for standard parts should be anticipated.

2. Never move or jar the mine except from a distance. If parts are found scattered, be especially careful not to move the search coil.

3. Allow no movement of magnetic material near the mine.

4. Hydrostat may fail to retract upon release of hydrostatic pressure.

5. Never attempt RMS unless absolutely necessary.

RMS

1. If possible, cut and tape any and all cables to the firing device. If the detonator or hydrostatic switch cables are cut, the mine is safe. If the mine cannot be rendered safe by these measures, follow the procedure listed below.

   (a) Locate the hydrostatic switch.

   (b) Remove, by means of a non-magnetic spanner, (see drawing for specifications) the small castellated nut from the outer end of the hydrostatic spindle.

   (c) Retract and lock out the hydrostatic spindle with the special non-magnetic retracting tool (See drawing for specifications).

   (d) Insert a safety pin in the hole 3/4" from the outer end of the spindle housing. If the mine is underwater, it must be raised before further stripping is attempted.

   (e) Dispose of detonator, booster and charge.

Mark 25

General

1. Ground, magnetic induction mine.

2. Aircraft laid, with parachute.

3. Laid offensively in depths of water from 40 to 100 ft. against surface craft, and up to 400 ft. against submarines.

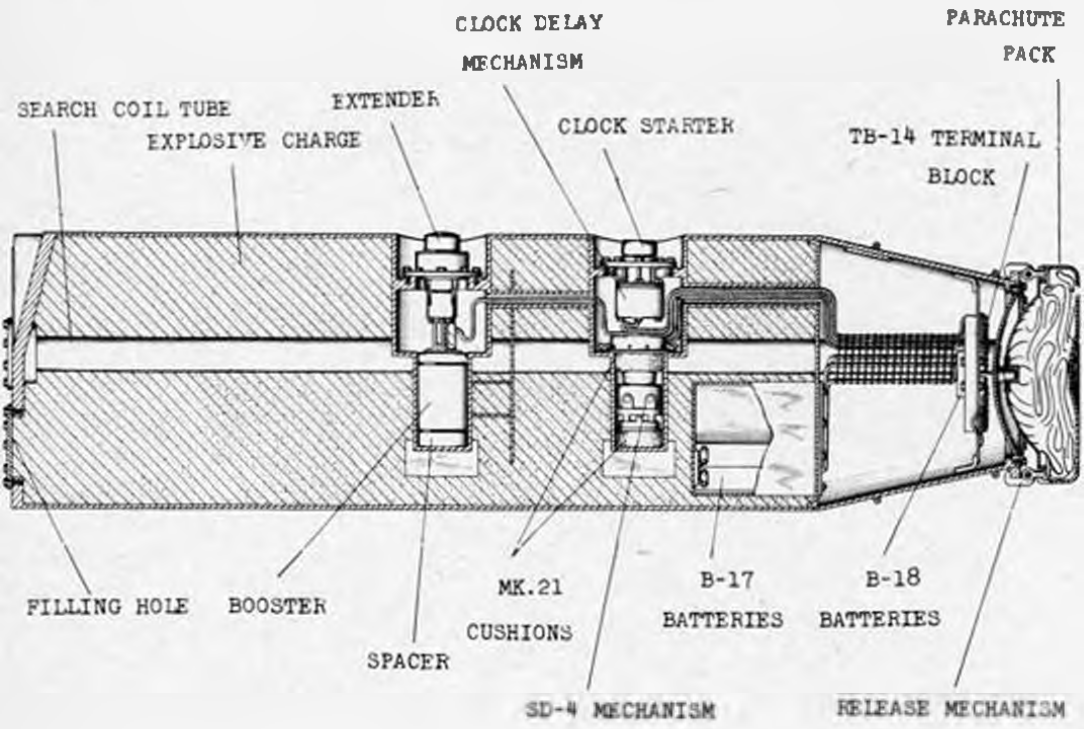

Fig. 19-- Mk. 25 Mine, Sectionnl View

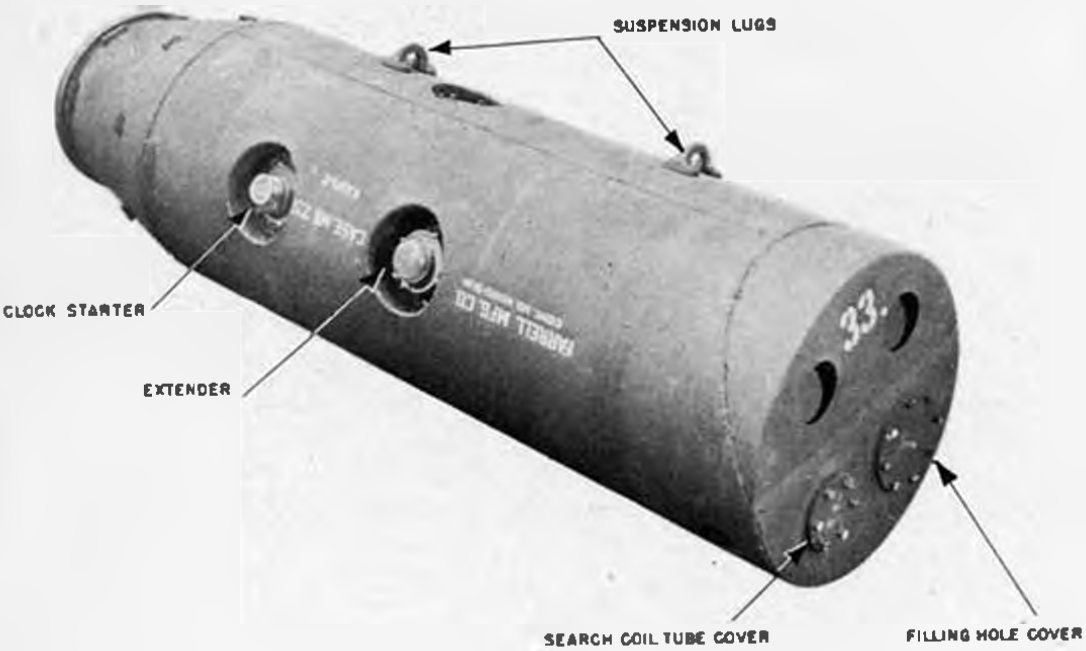

Fig. 20-- Mk. 25 Mine

Description

1. Case

Shape	Cylindrical, with truncated cone tail section
Color	Black
Material	Steel
Diameter	
Case	22 7/16"
End of tail	16"
Length overall	86"
Case (without parachute pack)	82 1/2"
Cylindrical Section	64 3/4"
Tail section	17 3/4"
Charge	1120 lb. TNT or 1250 lb. Torpex with granular TNT booster
Total weight in air	1850 or 1980 lb.

2. External fittings

Extender	Mk 12-4 or 14-2, in pocket 32" aft nose
Clock starter	Mk 1-4, in pocket 49" aft nose
Parachute	Mk 2-0 secured to tail
Filling holes	Two, one on flat section of nose, and one 270° from and 8 1/2" aft extender
Suspension lugs	Three, two standard type, 18.5" and 48.5" aft nose respectively, and 90° from the extender. One British type 34.5" aft nose and 270° from extender

Operation

1. After soluble washers dissolve (may not be used), extender and clock starter operate in 16 ft. of water. The clock runs off (CD-1 in 45 min., CD-8 in 170 min.) and mine is armed. One or two CD-14 clocks (maximum arming delay of 100 days) may be used in conjunction with the CD-8 to further delay arming.

CD-14 in 3-100 days

2. Firing device (M-11) operates upon receipt of two "looks" of opposite polarity and proper magnitude (separated by a period varying inversely with the strength of the first "look") within a set period. This fires the detonator or advances the eight-place ships counter (SE-3) one step. An SD-4-1 or one or two CD-14 clocks (maximum sterilizing delay of 145 days) may be fitted to render the mine safe after a set period.

Precautions

1. Do not attempt RAS unless absolutely necessary and unless the mine has positively been identified as the Mk 25-0 rather than the Mk 25-1 (Page 25). Examine all markings closely and never attempt RAS in any case unless the mine can positively be identified.

2. Do not move or jar the mine except from a safe distance.

3. Allow no movement of magnetic material near the mine.

4. Note that the extender may fail to retract upon release of hydrostatic pressure.

5. Note that the firing device is extremely sensitive and may be actuated by a diver's transceiver. Diving on this mine should be attempted only under ideal conditions, using shallow water diving gear if available.

6. Handle all electrical leads with great care. The mine battery may have a potential as high as 270 volts.

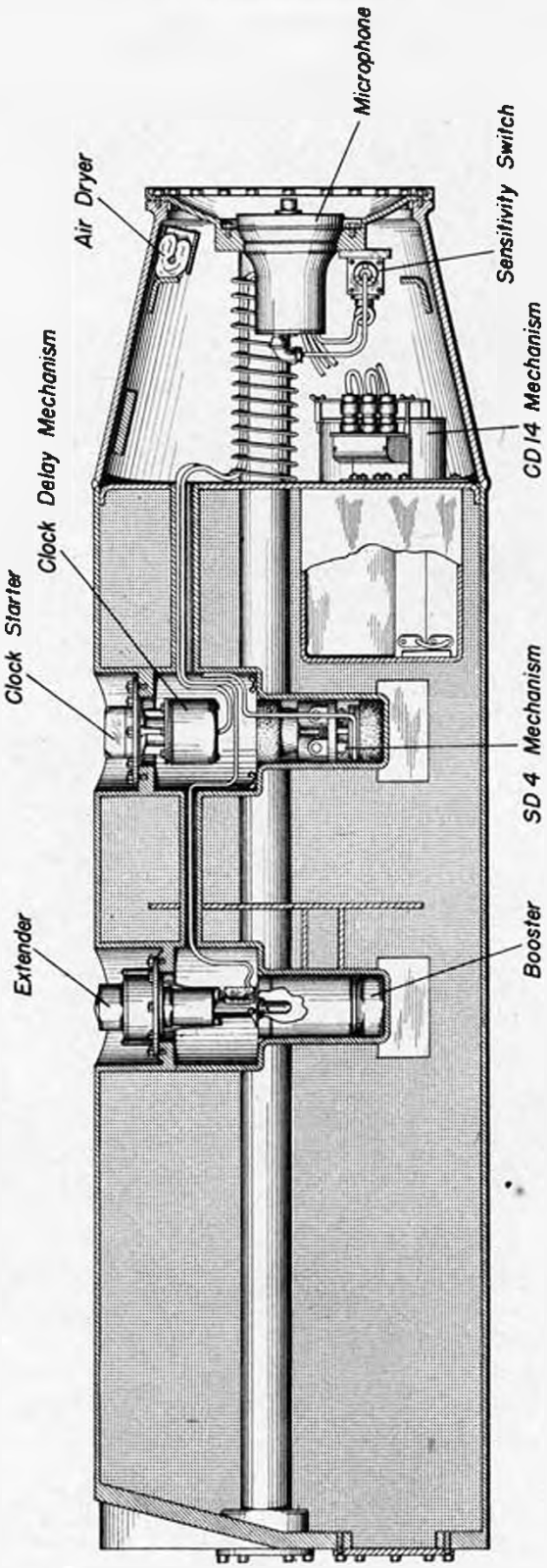

Fig 21 - Mk 25-1 Mine, Sectional View

RMS

1. Prepare two Cavity Charge Containers Type 3, and pack them with 1/4 to 1/3 lb. C or C-2 plastic explosive.

2. Place one of the charges on the tail of the mine so that the projecting spacer rests against the left side of the after of the two fin supports (which are 45° from the extender and clock starter) and flush against the tail flange.

3. Hook the two fixed wire lengths into the two fin supports nearest them.

4. Hook the two variable wire lengths into the two fin supports nearest them to complete the securing of the charge.

5. In the same manner, hook the other charge to the tail 180° from the first charge.

6. Insert the detonators in the charges, hook up the firing leads and detonators leads in series, and fire the charge from a safe distance.

7. Allow a safe period to elapse before returning to the mine. If the mine is underwater, wait about 24 hours to allow the battery to discharge completely.

8. Ascertain whether or not the leads marked "F" and "A" respectively have been cut. If convenient, tape them. If the mine is underwater, it must be raised before removing the extender.

9. Remove the extender.

10. Remove and dispose of detonator, booster and charge.

Mark 25-1

General

1. Ground, acoustic mine.

2. Aircraft laid, with parachute.

3. Laid offensively in depths of water from 30 to 120 ft. against surface craft.

Description

1. Case

   (a) Same as Mk 25-0 except that the overall length is slightly greater (91 1/8") due to the use of a different parachute and parachute pack.

2. External fittings

Microphone	MI-3 or MI-4, in center of tail cover plate.
Parachute	Mk 3-3, secured to tail.

All other external fittings are the same as on the Mk 25-0.

Operation

1. After soluble washers dissolve (may not be used), extender and clock starter operate in 16 ft. of water. The clock runs off (CD-1 in 45 min., CD-8 in 170 min.) and mine is armed. One or two CD-14 clocks (maximum arming delay of 100 days) may be used in conjunction with the CD-8 to further delay arming.

2. Firing device (A-5) operates when sound of proper frequency, intensity, and duration impinges on the microphone, firing the detonator or advancing the eight-place ships counter (SE-3) one step. An SD-4-1 or one or two CD-14 clocks (maximum sterilizing delay of 145 days) may be fitted to render the mine safe after a set period.

Precautions

1. Never attempt RMS under any conditions. The sensitivity of the mine firing mechanism is so great that the dangers involved in any RMS procedure are prohibitive.

RMS

1. None known.

Added 1 May 1945
(Change No. 4)

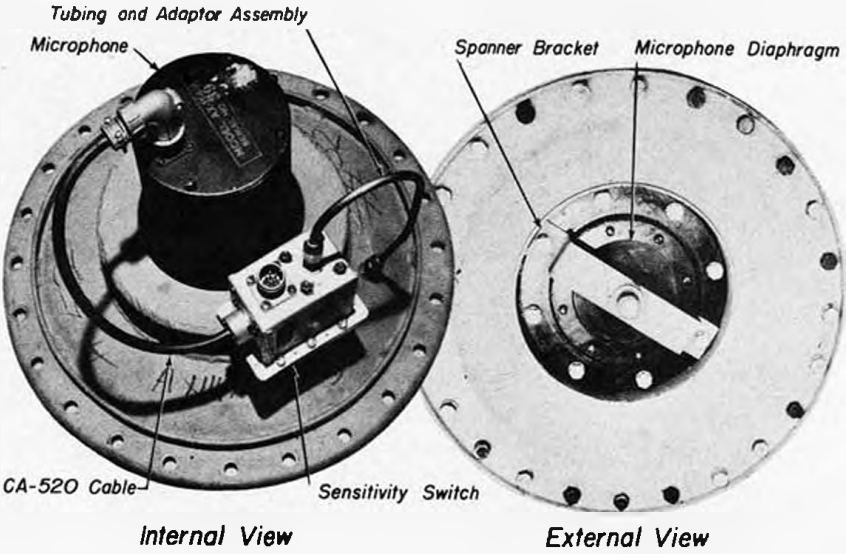

Fig. 23 - Mk 25-1 Mine, Tail Plate Assembly

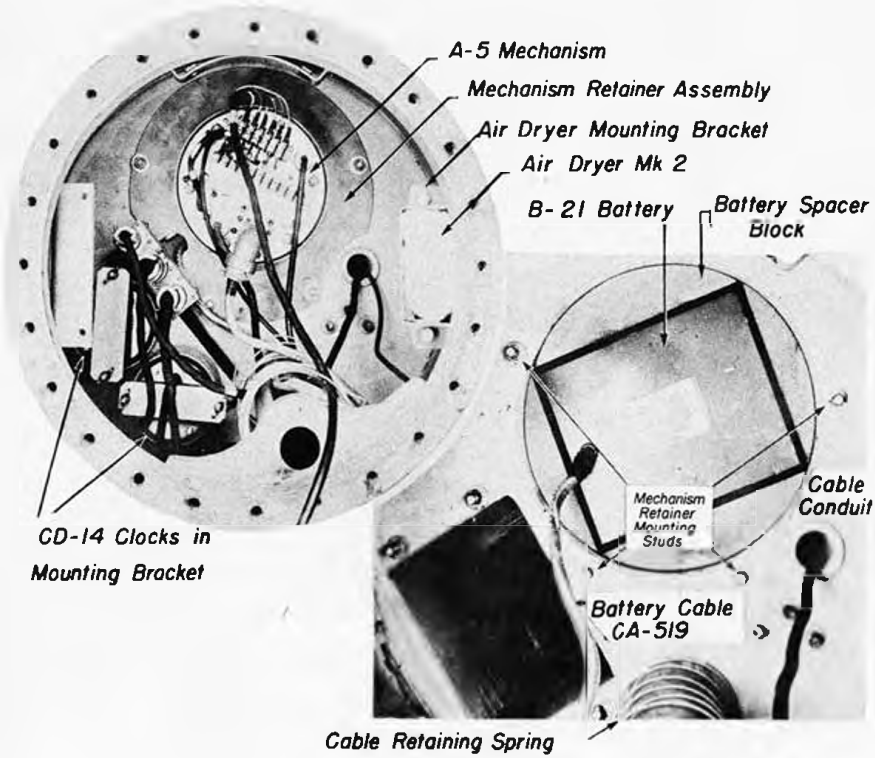

Fig. 24 - Mk 25-1 Mine, Mechanism Compartment Assembly

Mark 25-2

General

1. Ground, magnetic-pressure mine.
2. Aircraft laid, with parachute.
3. Offensive mine for use in maximum depth of water of 150 ft. against surface craft.

Description

1. Case

Shape	Cylindrical with truncated cone tail section and half slant nose.
Color	Black
Material	Steel
Diameter	
Case	22"45
End of tail	18"25
Length overall	91"1
Charge	1120 lb. TNT or 1275 lb. Torpex
Total weight in air	1885 lb. or 2015 lb.

2. External fittings

Firing mechanism plate	Recessed in center of tail cover plate.

All other external fittings are the same as on the Mark 25-0.

Operation

1. After soluble washers dissolve (not always used), extender and clock starter operate in 16 ft. of water. The clock runs off (CD-8 in 170 min., CD-14 in up to 145 days) and mine is armed.
2. Firing device (A-6) operates upon receipt of the proper combination of magnetic and pressure actuations, firing the detonator. Two CD-14's or an SD-4 mechanism may be fitted to render the mine inert after a set period.
3. Extender is designed to retract upon release of hydrostatic pressure.

Precautions

1. Do not attempt RMS unless absolutely necessary.
2. Even under emergency conditions, do not attempt RMS unless the mine has been positively identified. Diving on the mine should be attempted only if visibility is excellent and with the transceiver removed from the diving helmet.
3. Do not move or jar the mine except from a safe distance.
4. Allow no movement of magnetic material near the mine.
5. Bear in mind that the extender may fail to retract upon release of hydrostatic pressure. The mine incorporates no anti-recovery switch but the nature of the firing mechanism is such that recovery operations will probably actuate the mechanism and fire the detonator.

RMS

1. Remove the threaded plastic cap from the extender.
2. Remove the washer or castellated nut from the extender.
3. Screw the extender retracting tool (Fig.25c) onto the extender stem.
4. Retract the extender by turning the lower cross bar of the tool.
5. If the mine is underwater, it should now be raised to the surface using remote lifting gear.

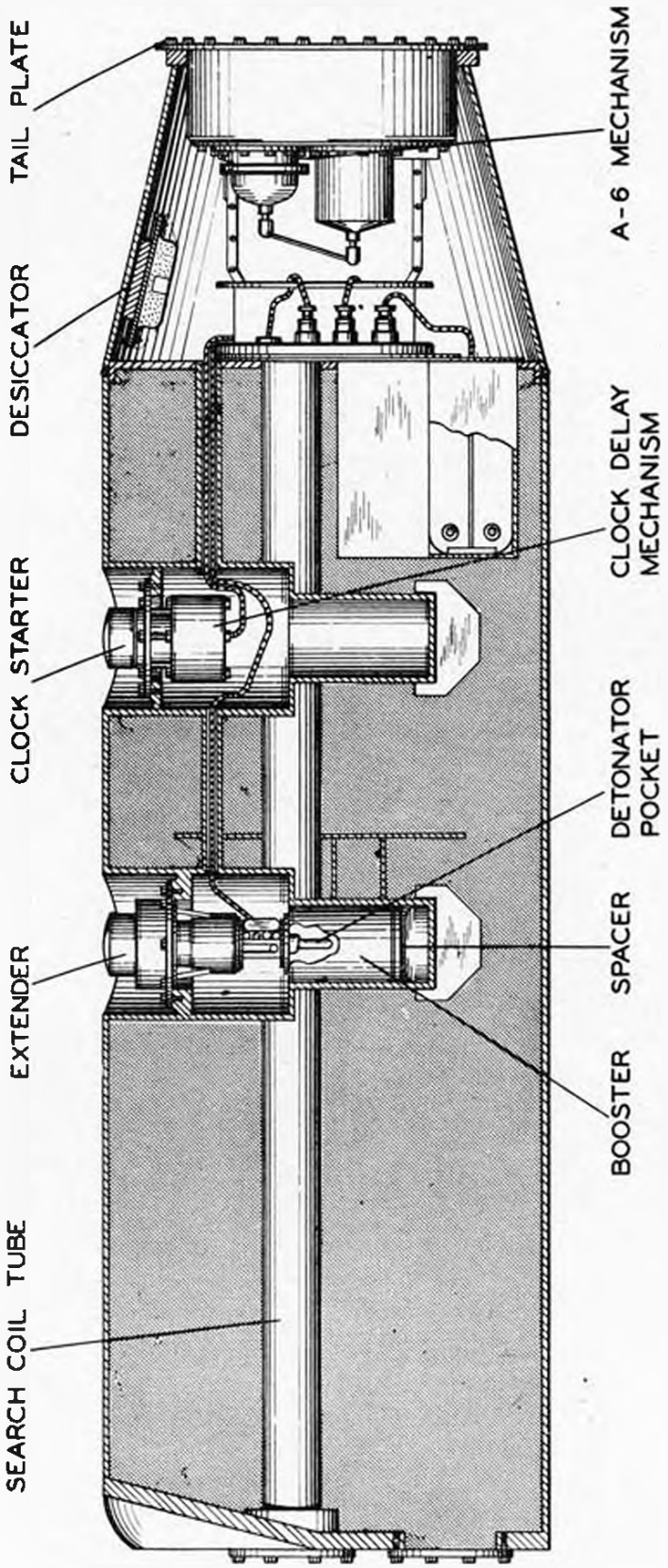

Fig. 25a - Mine Mk 25-2, Sectional View

(Mark 25-2, Cont'd.)

6. Having brought the mine ashore, remove the clock and cut and tape the leads separately in the following sequence:

   (a) Green and yellow.

   (b) Red and white.

   (c) Blue and black.

7. Remove the extender and cut and tape the detonator leads separately.

8. Dispose of detonator, booster and charge.

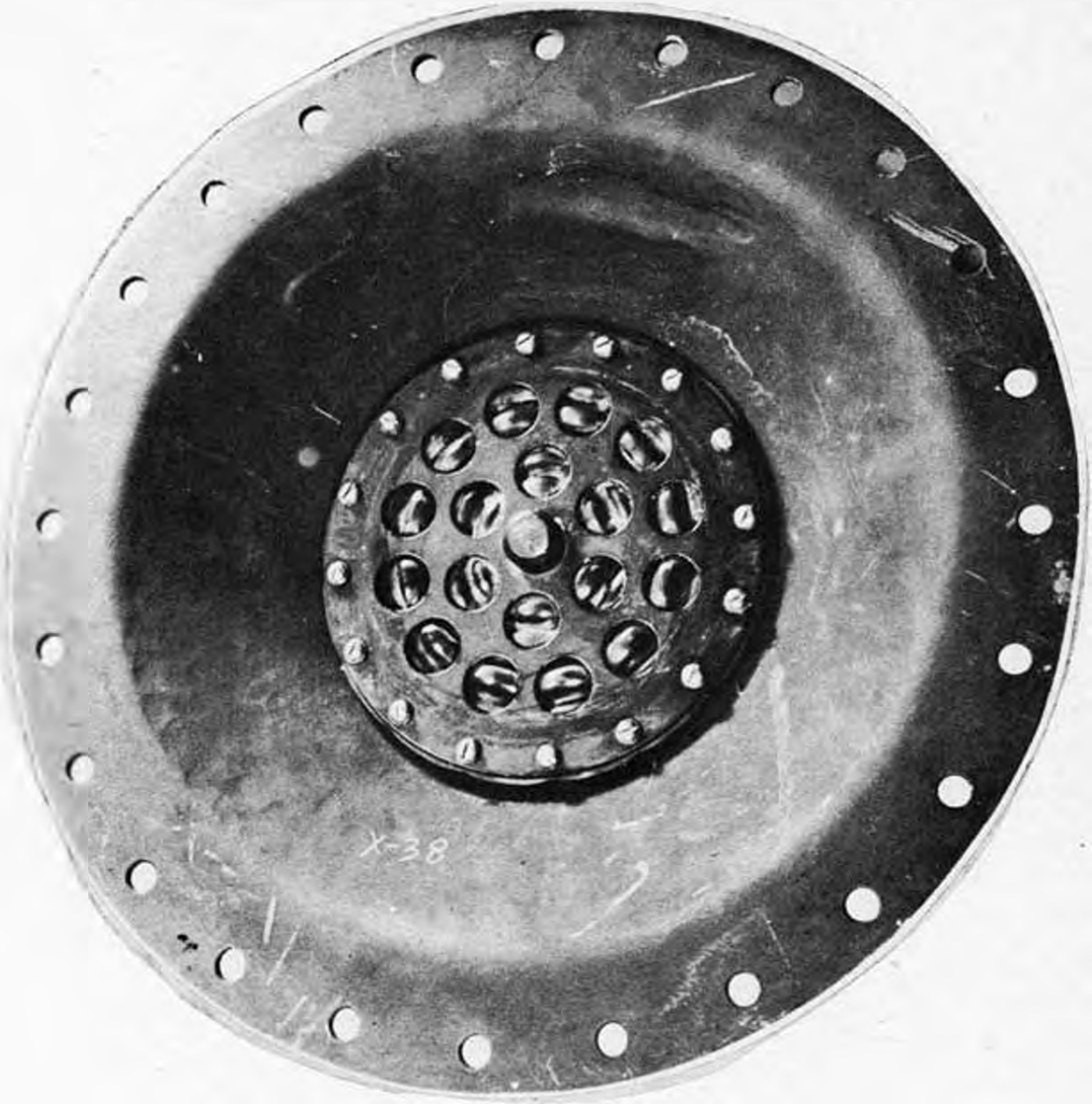

Fig. 25b - Mine Mk 25-2, Tail Cover Plate showing Firing Mechanism A-6-0

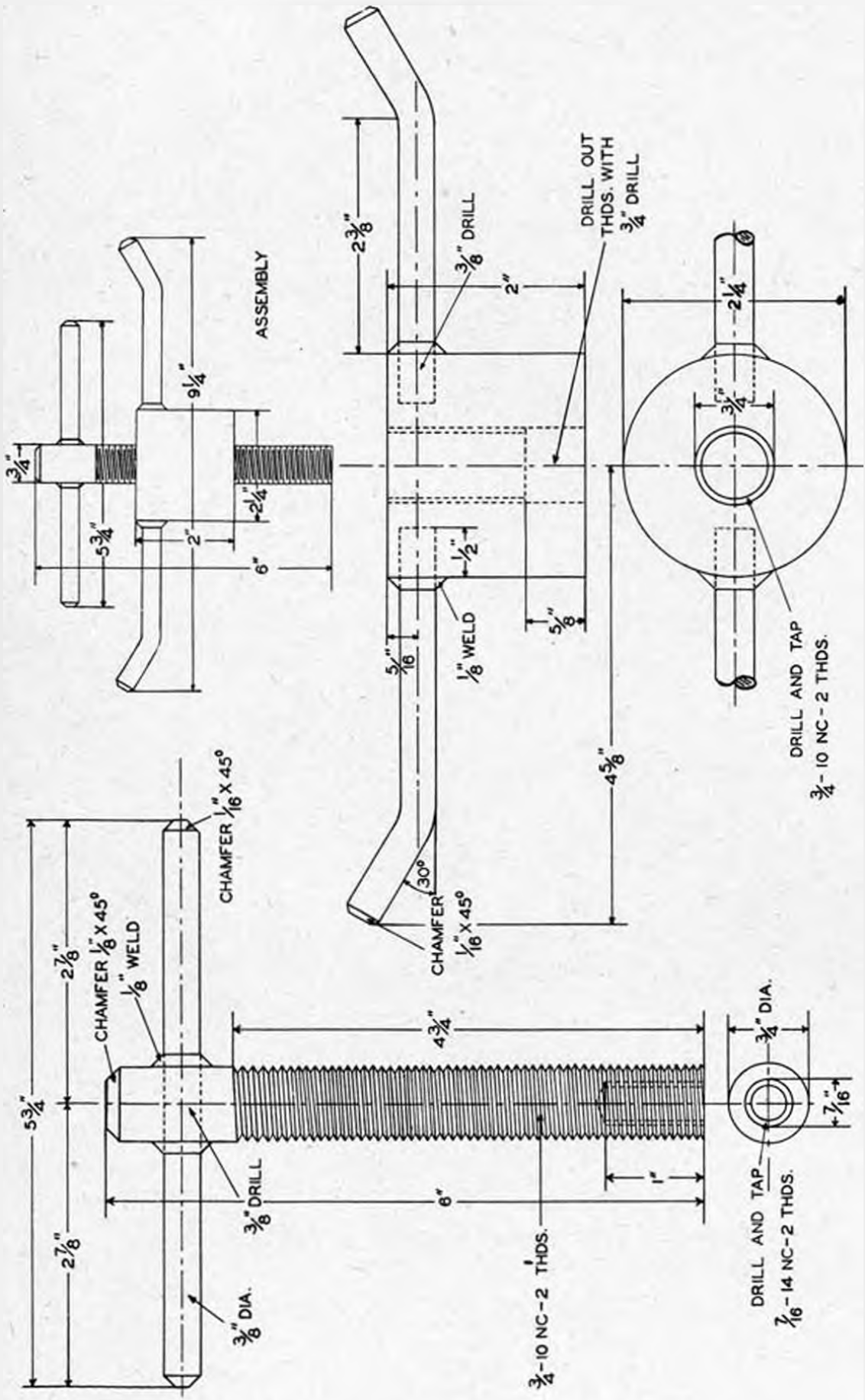

Fig. 25c - Mine Mk 25-2, Extender Retracting Tool

AN Mark 26-1 (Mark 36 & 36-1)

General

1. Ground, magnetic induction mine.

2. Aircraft laid, with parachute.

3. Laid offensively in depths of water from 16 to 150 ft. against surface craft, and up to 500 ft. against submarines.

4. The Mk 36 differs from the AN Mk 26-1 in that its case is slightly longer, has a half slant nose, and carries a larger explosive charge. The Mk 36-1 differs from the Mk 36 in that it has removable suspension and hoisting lugs.

Description

1. Case

Shape	Cylindrical, with hemispherical nose and truncated cone tail section
Color	Black or olive drab
Material	Steel
Diameter	
Case	18 5/8"
Tail section	15 3/4"
Length overall	68"(70 11/16" for 36 & 36-1)
Case (without parachute pack)	64 1/2"(66 9/16" for 36 & 36-1)
Cylindrical section	44 3/4"(46 7/8" for 36 & 36-1)
Tail section	19 1/2"
Charge	465 lb. TNT or 525 lb. Torpex with granular TNT booster. (36 & 36-1 have 570 lb. TNT or 635 lb. TPX)
Total weight in air	1000 lb. or 1060 lb. (1020 or 1085 lb. for 36 & 36-1)

2. External fittings

Extender	Mk 12-4 or 14-2, in pocket 32" aft nose
Clock starter	Mk 1-4, in pocket 16" aft nose
Fuze pocket	In nose
Suspension lugs	Three, two standard type 270° from extender 19 1/2" and 34" aft nose respectively) and one British type 45° from extender and 29" aft nose
Parachute	Mk 2, secured to tail of mine

Operation

1. Extender and clock starter operate in 16 ft. of water. ~~Clock (CD-10 runs off in 170 min. and mine is armed.~~ Clock runs off (CD-10 in 170 min, CD-14 in 3-100 days) and mine is armed.
2. Firing device (M-9-1) operates on receipt of two "looks" of opposite polarity and proper magnitude within a set time limit, either firing the detonator, or advancing the slant-place snips counter one step. An SD-4 device may be fitted to render the mine inert after a set period.
3. Extender is designed to [illegible] upon release of hydrostatic pressure.

Precautions

1. Do not attempt RD 3 unless absolutely necessary.
2. Do not move or jar the mine except from a safe distance.
3. Allow no movement of magnetic material near the mine.

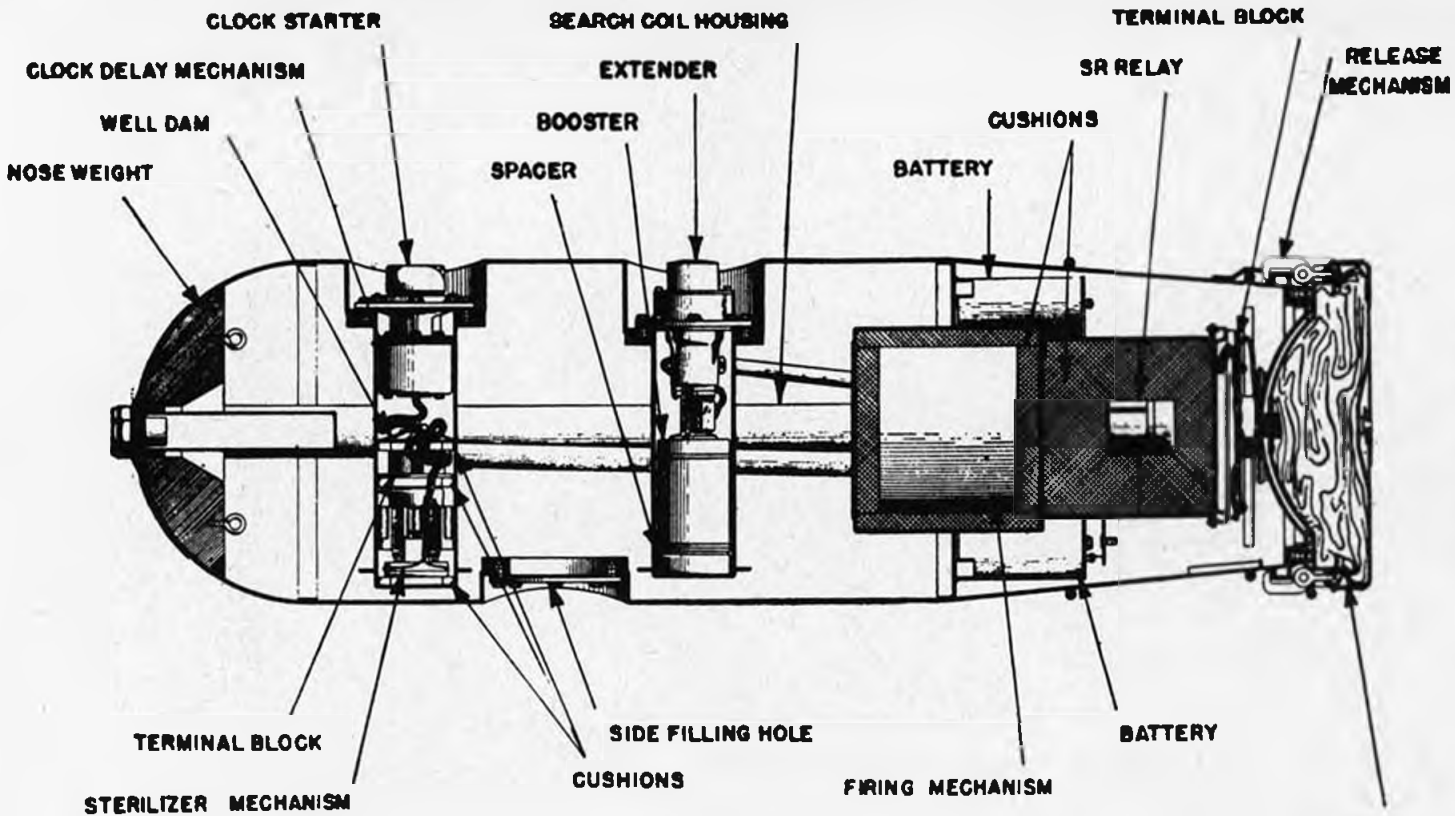

Fig. 25-AN-Mk 26-1 Mine, Sectional View

(AN Mk 26-1 (Mk 36 & 36-1), Cont'd.)

4. Extender may fail to retract upon release of hydrostatic pressure.

RMS

1. Retract and lock out the extender. Use the wooden washer and safety nut from the Mk 6 tool kit for the 12-4, and the Type 2 non-magnetic extender retractor for the 14-2. If the mine is underwater, it must be raised before removing the clock.
2. Remove the clock from a safe distance.
3. Slit the clock cable, and cut and tape each lead separately.
4. Remove the extender from a safe distance.
5. Cut and tape the detonator leads separately.
6. Dispose of detonator, booster ! charge.

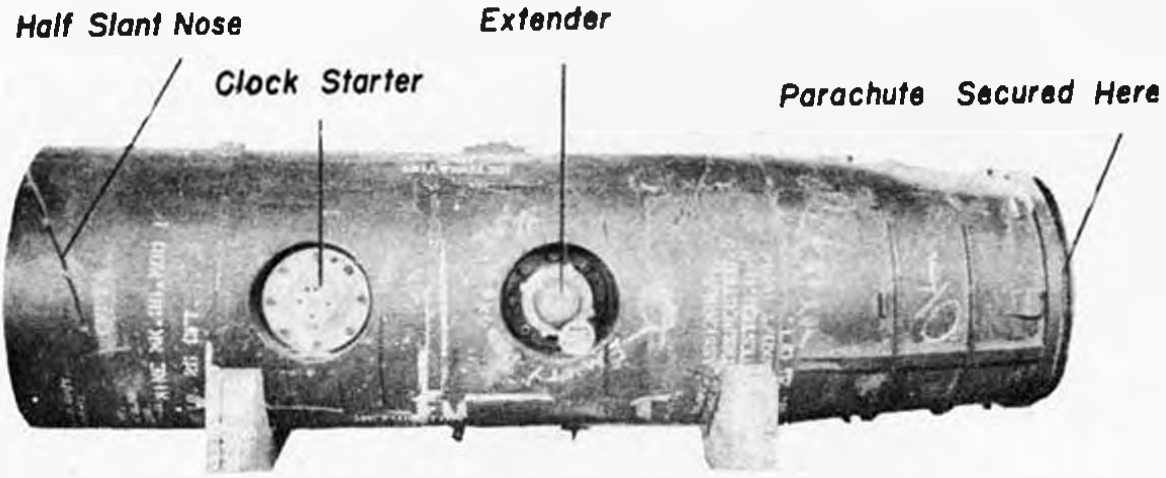

Fig. 26- Mk 36-1 Mine

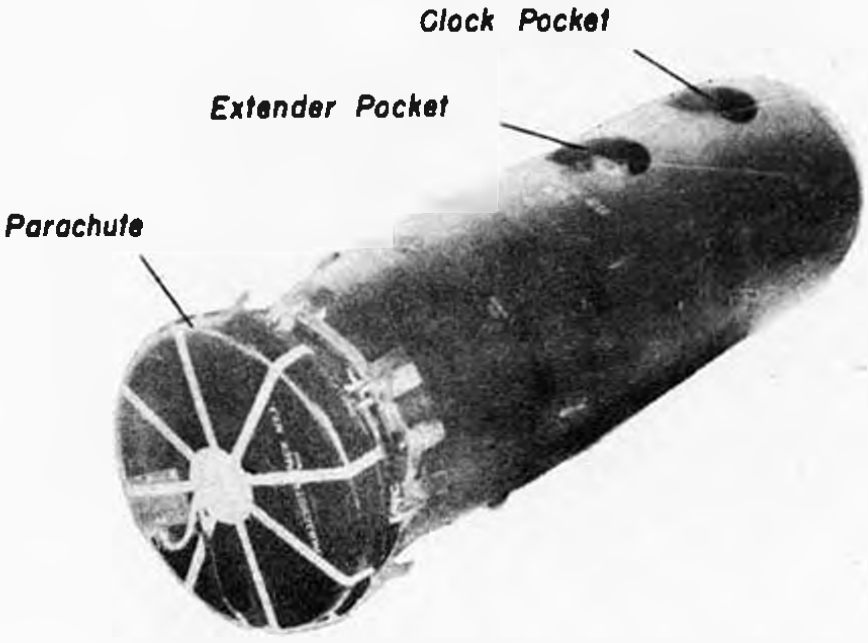

Fig. 27- AN-Mk 26-1 Mine

Mark 36-2

General

1. Ground, acoustic mine.

2. Aircraft laid, with parachute.

3. Laid offensively in depths of water from 30 to 120 ft. against surface craft.

Description

1. Case

   (a) Same as Mark 36-0 or 36-1.

2. External fittings

Microphone	Mi-4, in recessed cup offset from center of tail cover.

All other external fittings are the same as those on the Mark 36-0.

Operation

1. Extender and clock starter operate in 16 ft. of water. The clock runs off (CD-8 in 170 minutes, CD-14 in 3-145 days) and the mine is armed.

2. Firing mechanism (A-5-0 or A-5-1) operates when sound of proper frequency, intensity and duration impinges upon the microphone, firing the detonator or advancing the 10-place ship counter (SE-3) one step. Two CD-14's in parallel or an SD-4-1, or a single CD-14 in combination with an SD-4-1 may be fitted to render the mine inert after a set period.

Precautions

1. Never attempt RMS under any circumstances. The sensitivity of the firing mechanism is so great that the dangers involved in any RMS procedure are prohibitive.

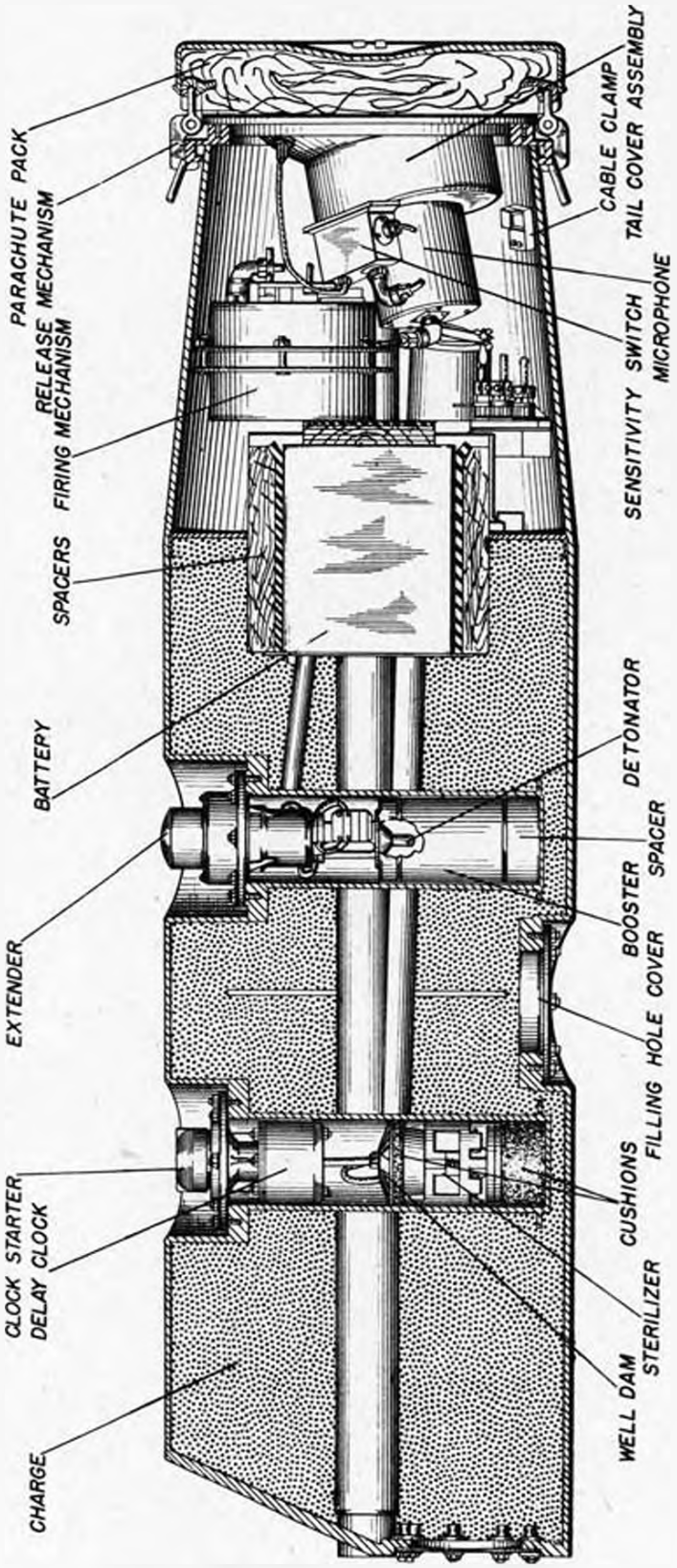

Fig. 28 - Mine Mk 36-2, Sectional View

Mark 27 Mod 0

General

1. The Mark 27-0 is a torpedo-mine which combines an electric torpedo propulsion mechanism with a magnetic induction firing mechanism. It is designed to be launched from a torpedo tube, travel a distance between 1000 and 5000 yards at a depth between 10 and 60 ft, and then sink and become a ground mine. The weapon is designed to be effective as a mine in depths between 16 and 200 ft.

2. This mine is designed primarily for use against surface craft in harbors, anchorages, and other locations which are inaccessible to surface mine-laying craft.

Description

1. Case

Shape	Torpedo-shaped, with ogival nose and finned tail.
Color	Yellowish brown (shellacked surface).
Material	Steel
Length	
Overall	20'6"
Warhead	3'11"
Battery Compartment	10'6"
Afterbody	4'6"
Tail	1'7"
Diameter	21"
Charge	847 lb. HBX with 2 1/2 lb. granular grade A TNT booster.
Total weight in air	2620 lb.

2. External fittings

(a) Warhead

Impeller base	8" diam., on bottom center line. 2' 5" forward of battery Compartment joint.
Flood valves	Two, on top and bottom center lines, respectively 3' 6" forward of battery compartment joint

(b) Battery Compartment

Guide studs	Three, on top center line; one 11 1/2" abaft warhead joint; two, 5' 5" and 7 1/2" forward, respectively, of afterbody joint.
Extender	Mk 14-0, in pocket on top center line, 2' 9 1/2" abaft warhead joint.
Clock starter	Mk 1-9, in pocket on top center line, 20 1/2" abaft warhead joint.
Flood valves	Two; one on top center line, 4' 8 1/2" forward of afterbody joint; one on bottom center line, 3' 8" forward of afterbody joint.
Priming switch	7 1/2" to starboard from top center line, 11" forward of afterbody joint.
Filling hole	90° to port from top center line, 2' 3" abaft warhead joint.
Access hole to battery discharge compartment	On top center line, 8" forward of afterbody joint.

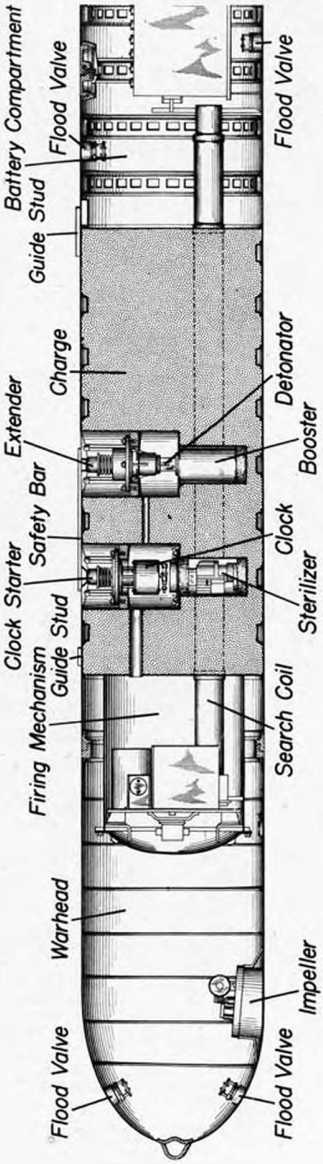

Fig. 28 - Mk 27-0 Mine, Sectional View, Forward Half

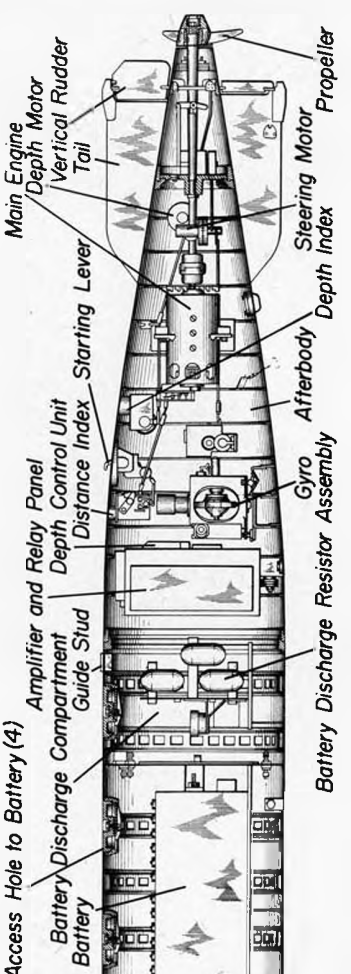

Fig 29 - Mk 27-0 Mine, Sectional View, After Half

(Mark 27 Mod 0, Cont'd.)

Access holes to battery	On top center line, 3' 11", 2' 10", and 1' 9", respectively forward of afterbody joint.

(c) Afterbody

Distance index	On top center line, 14 1/2" abaft battery compartment joint.
Starting lever	3 1/2" to starboard from top center line, 21" abaft battery compartment joint.
Depth index	1" to starboard from top center line, 2' 3 1/2" abaft battery compartment joint.
Gyro angling setting spindle and dial	Two, 19" to starboard and to port, respectively, from top center line, 23" abaft battery compartment joint.
Flood valve	14 1/2" to port from top center line, 2' 3 1/2" abaft battery compartment joint.
Heater flange	On bottom center line, 3' 4 1/2" abaft battery compartment joint.
Access holes to gyro and motor	Two; one 90° to starboard from top center line, 2' 6" abaft battery compartment joint; one 19 1/2" to port from top center line, 17 1/2" abaft battery compartment joint.

(d) Tail

Fins

Upper vertical	Length, including rudder, 2' 1 1/2"
Lower vertical	Length, including rudder, 23 1/2"
Horizontal	Two; length, including rudders, 23 1/2"
Propeller (one)	Three-bladed, 6" span.

3. Internal arrangement of parts

(a) Warhead - contains the following:

(1) An impeller mounted in the base of the warhead.

(2) Two flood valves. It should be noted that the explosive charge of this mine is not contained in the warhead.

(b) Battery Compartment - consists of three main parts as follows:

(1) The firing mechanism and charge compartment which contains not only the firing mechanism and charge but also the various firing mechanism accessories.

(2) The battery chamber, separated from the firing mechanism and charge container by a bulkhead, which contains the following:

(i) The battery, consisting of two sections rated at 72 and 24 volts, respectively.

(ii) Three flood valves.

(3) The battery discharge compartment, separated from the battery chamber by a bulkhead, which contains the following:

(i) The battery discharge resistor assembly which allows two sections of the battery to discharge at the end of the laying run.

(ii) The priming switch which is used to open or close the control circuits.

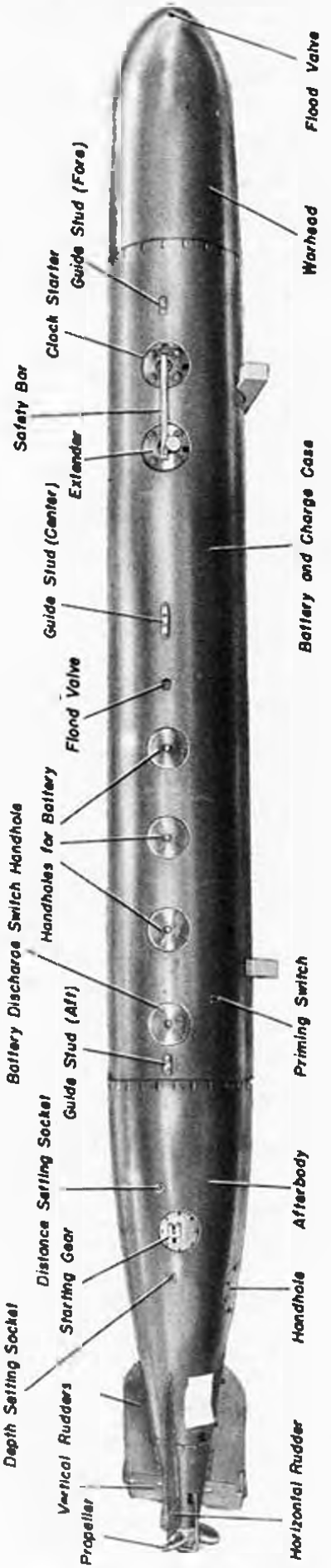

Fig. 30 - Mk 27-0 Mine

(Mark 27 Mod 0, Cont'd.)

(c) Afterbody - contains the following:

(1) The depth control assembly composed of:

(i) The depth control unit.

(ii) The depth setting unit.

(iii) An amplifier.

(iv) The depth motor.

(2) The steering assembly composed of:

(i) The gyro.

(ii) The gyro angling setting unit

(iii) An amplifier.

(iv) The steering motor.

(3) A relay panel containing the protective and supervisory relays.

(4) The distance assembly composed of:

(i) Distance setting unit.

(ii) Distance gear.

(5) The starting gear.

(6) The main engine.

(7) A circuit testing plug.

(d) Tail - contains the following:

(1) The rudder control linkages from the depth and steering motors.

(2) The propeller drive shaft.

4. Method of Assembly

(a) The various sections of the mine are attached by means of joint screws similar to those used in U.S. torpedo assembly.

Operation

1. Prior to launching the mine:

(a) The batteries are heated through the heater flange.

(b) The desired distance, gyro angling, and depth of run are set on the respective control units.

(c) The priming switch is turned on, thereby energizing the control circuits.

2. When the mine is launched, the starting lever is tripped, starting the motor. As the mine leaves the tube, the safety bar springs off, allowing the clock starter and extender to operate if the mine is in more than 16 ft. of water. The mine then travels through the water, with the various control assemblies operating as follows:

(a) The depth control assembly keeps the mine at its set depth. The depth control unit records the actual depth which is relayed to the depth setting unit which compares it with the set depth. Any deviation from the set depth is noted and a correction is made by the amplifier which controls the depth motor. As a special precaution a ceiling switch in the depth control unit cuts off the propulsion engine if the mine rises above a depth of 1j 1/2 ft. at any time during the run, and allows the engine to start again as soon as the mine sinks to a depth of 20 ft. This feature prevents the mine from broaching, running on the surface, or running up on the beach.

(b) The steering assembly controls the mine's course. The gyro records the actual course which is relayed to the gyro angling device which compares it with the set course. Any deviation from the set course is thereby noted and a correction made by the amplifier which controls the steering motor.

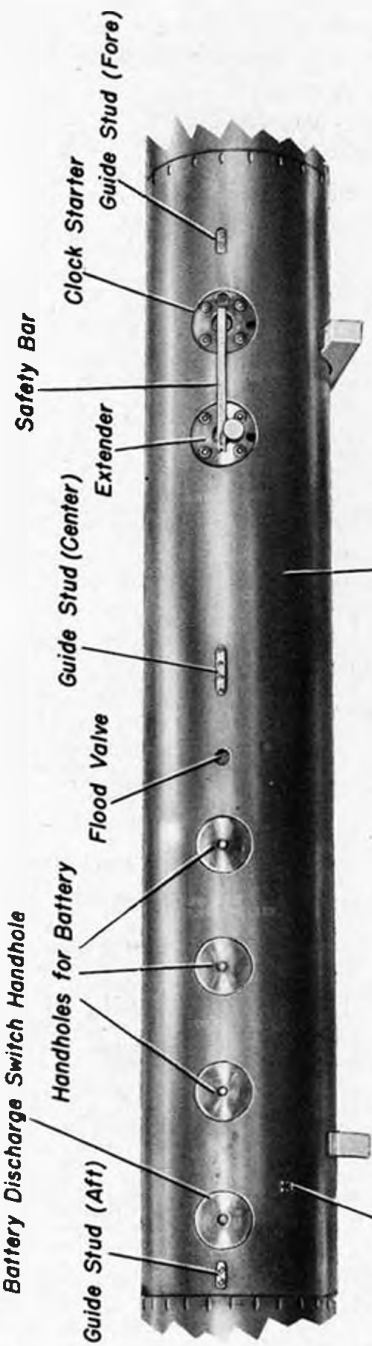

Fig. 31 - Mk 27-0 Mine, Battery Compartment (Including Firing Unit and Charge)

(Mark 27 Mod 0, Cont'd.)

(c) The impeller revolves and after the mine has traveled at least 350 yards it closes the impeller switch which provides a connection from one side of the 24 volt battery to the solder pot.

3. When the mine has run the desired distance as determined by the mechanical motion transmitted by the distance gear, which is run by the propulsion motor, to the distance setting unit, the distance switch in the distance setting unit closes and performs the following functions:

(a) It stops the propulsion engine, and removes power from the control mechanisms after the horizontal rudders have been placed in the down position.

(b) It opens the various flood valves, allowing the mine to sink.

(c) It closes a switch, thus completing the circuit to the solder pot and allowing current from the 24 volt battery to flow through a solder pot and close a relay which completes one side of the mine firing circuit.

(d) It closes a relay to allow the battery to discharge through the discharge resistor.

4. When the mine sinks, the extender and clock starter operate if they have not done so previously. The clock (CD-10-0) runs off in 170 minutes and the mine is armed.

5. The firing mechanism (M-9-1) operates upon receipt of two "looks" of proper magnitude and opposite polarity within a preset time limit, firing the detonator or advancing the eight-place stepping switch (SS-9) one step thus "counting" one ship. An SD-4-1 mechanism is fitted to render the mine inert after a set period.

Precautions

1. Do not attempt RMS unless absolutely necessary.

2. Do not move or jar the mine except from a safe distance.

3. Allow no movement of magnetic material near the mine.

4. Extender may fail to retract upon release of hydrostatic pressure.

RMS

1. Under development

MINE DISPOSAL HANDBOOK

Contact Mines

PART II

UNITED STATES UNDERWATER ORDNANCE

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CHAPTER 2

U. S. CONTACT MINES

Mark	Laid By	How Fired	Length (in.)	Diameter (in.)	Case Depth (ft.)	Type & Wt. of Charge (lbs.)	Total Wt. (lbs.)	Extender	Notes
5	Surface Craft	Chem. Horn	40 5/8	36	25 to 500	500 TNT	800 (appr)		
6	Surface Craft	Sea Battery		34 1/4	15 to 320	300 TNT	495	Mk. 6-2	All Mods. of Mk. 6 use K2-2, K2-3, K3 K4 and K4-1.
6-2	Surface Craft	Sea Battery		34 1/4	15 to 320	300 TNT	495	Mk. 6-2	Rising mine
6-3	Surface Craft	Sea Battery		35 13/16	15 to 320	300 TNT	540	Mk. 6-2	Lower Antenna
6-4	Surface Craft	Sea Battery		34 1/4	15 to 320	300 TNT	495	Mk. 6-2	"
7	Surface Craft	Sea Battery		34 1/4	15 to 320	300 TNT	495	Mk. 6-2	Drifter
10-1	Sub-marine	Chem. Horn	91 5/8	20 3/4	10 to 65	300 TNT	700	Mk. 6-4	
11-1	Sub. or Surface Craft	Sea Battery	40	35 3/4		500 TNT	700 approx	Mk. 6-3	Uses K3-1A
19	Aircraft	Impact Inertia	57	18 5/8		210 TPX	550	Mk. 14-5	Drifting Oscillator
23	Surface Craft	Impact	44	18 maximum	18 to 30	2 TNT	77		Sweep Obstructor

Table II--Contact Mines

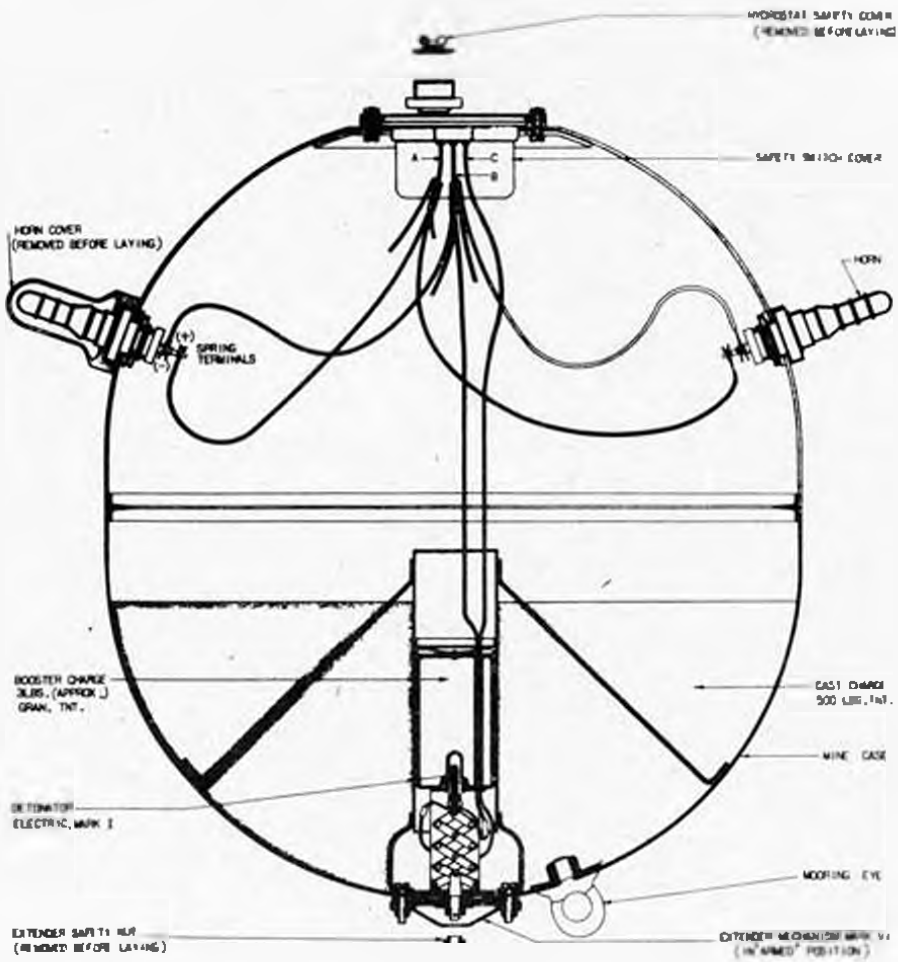


Fig. 1 - Mk. 5 Mine, Sectional View

Introduction

1. Most of the mines are spherical or cylindrical in shape, and have four copper horns equally spaced around the upper hemisphere. A "K" device is fitted in the top of the mine, and an extender in the base, both depending on hydrostatic action for their operation. Copper antennae, both upper and lower, may be fitted.

2. The firing mechanisms depend upon galvanic action for operation, with the exception of those fitted in the Mk. 5 and Mk. 10-1 which use chemical horns.

3. All mines laid from surface craft take depth by means of a plummet fitted on the anchor, while the submarine-laid mines take depth by means of a loose bight-hydrostat system.

4. All mines have mild steel cases, and the explosive train is made up as listed below:

(a)	Detonator	Mercury fulminate
(b)	Booster	Granular TNT
(c)	Main charge	Cast Grade A TNT or Torpex

5. All mines, whatever the firing device fitted, depend upon hydrostatic action for arming and disarming. The safety switches and extenders tend to jam due to marine growth after they have been planted for a short time, and cannot be depended upon to disarm the mine upon release of hydrostatic pressure. Therefore, all mines found must be considered dangerous until they are proven by inspection to be otherwise. When possible, a mine that is found in the armed condition should not be rendered safe, but should be countermined or sunk in deep water.

Mark 5

General

1. Moored, contact, chemical horn mine.

2. Laid by surface craft.

3. Laid defensively in depths of water from 40 to 2800 ft. against surface craft or submarines. Case depth is from 25 to 500 ft.

Description

1. Case

Shape	Two hemispheres with a cylindrical mid-section 4 5/8" wide
Color	Black
Material	Steel
Diameter	36"
Length	40 5/8"
Charge	500 lbs. TNT with granular TNT booster
Total weight in air	800 lbs. (approx.).

2. External fittings

Horns	Four, lead, evenly spaced around upper hemisphere
Lifting lug	One, on lower hemisphere
Hydrostatic safety switch	Mk. 1, fitted to opening on top
Extender	Fitted to opening on bottom.

3. Anchor

Mk. 6 anchor is used.

Operation

1. Mine takes depth by plummet. Extender operates in 24 ft. of water,

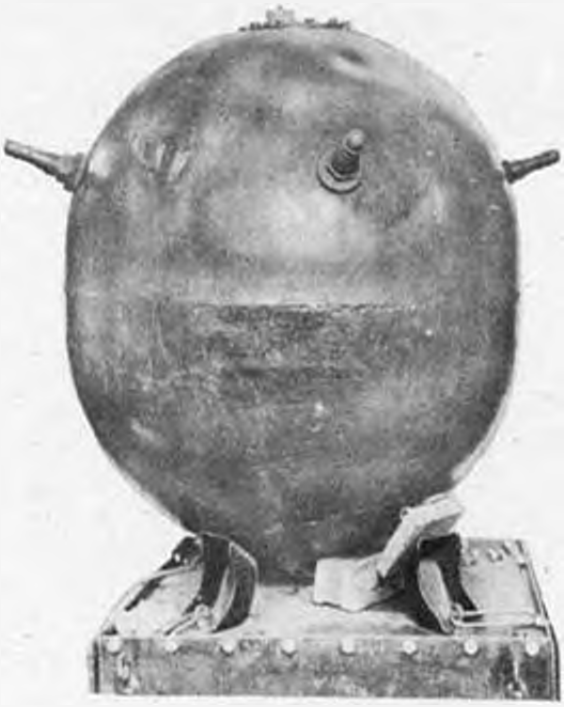


Fig. 2-- Mk. 5 Mine

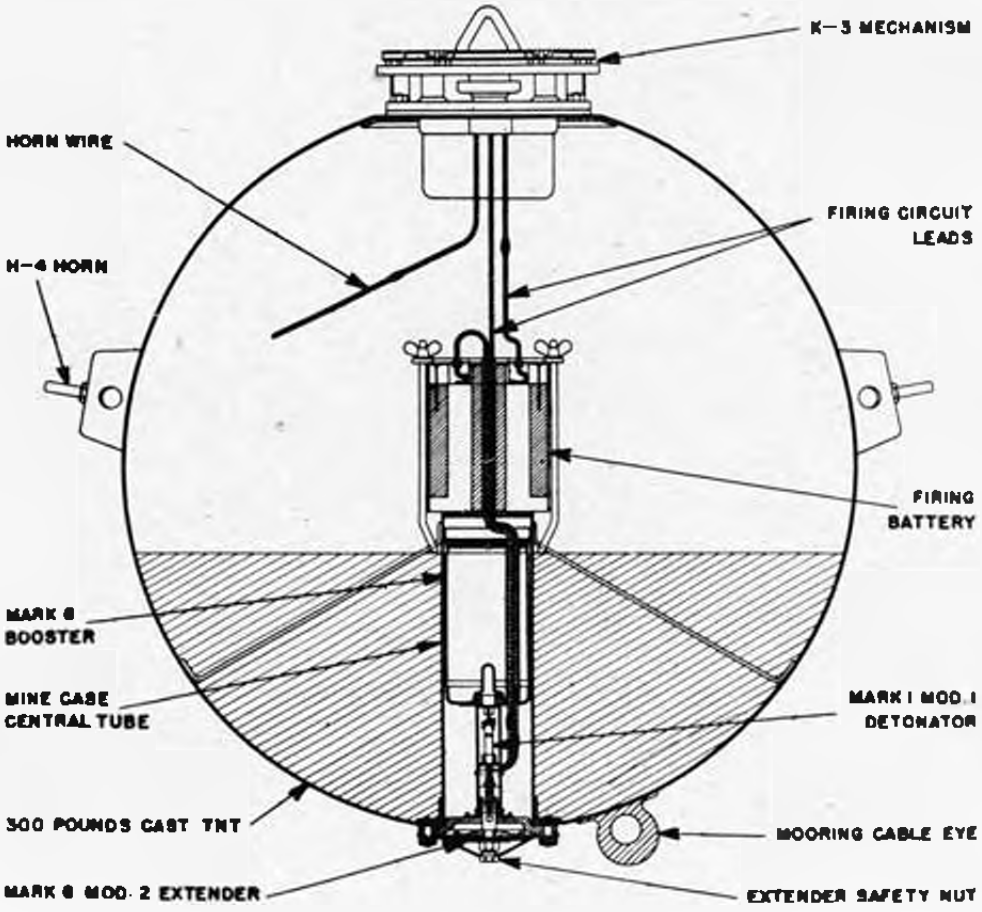


Fig. 3 - Mk. 6 Mine, Sectional View

and, after the soluble washer dissolves, the hydrostatic safety switch will close, and the mine is armed.

2. Mine fires when the glass vial in a chemical horn is broken.

3. The hydrostatic safety switch and extender are designed to retract upon release of hydrostatic pressure.

Precautions

1. Take care not to damage the horns in any way.

2. Hydrostatic safety switch and extender may fail to retract upon release of hydrostatic pressure.

RMS

1. Retract and lock out the hydrostatic safety switch by screwing the soluble washer cap and nut down, or by using the dummy soluble washer from the Mk. 6 tool kit.

2. Retract and lock out the extender.

3. Remove the extender.

4 Cut and tape the detonator leads separately.

5. Dispose of detonator, booster and charge.

Mark 6

General

1. Moored, contact, antenna mine.

2. Laid by surface craft.

3. Laid offensively or defensively in depths of water from 40 to 2800 ft. against surface craft or submarines. Case depth is from 15 to 320 ft.

4. The Mk. 6 may be modified for planting in depths shallower than 15 ft. by removing the springs from the hydrostatic safety switch and extender.

Description

1. Case

Shape	Spherical
Color	Black
Material	Steel
Diameter	34 1/4"
Charge	300 lbs. TNT with granular TNT booster
Total weight in air	495 lbs.

2. External fittings

K device	K2-2, 2-3, 3, or 4, fitted to the upper end of the central tube
Extender	Mk. 6-2, fitted to lower end of central tube
Horns	Four, H-4, evenly spaced around upper hemisphere
Antenna	Connects eye in K device with the antenna float
Hydrostatic safety switch	On K device
Mooring cable eye	One, on lower hemisphere
Lifting eye	One, on upper hemisphere

3. Anchor

Mk. 6 anchor is used.

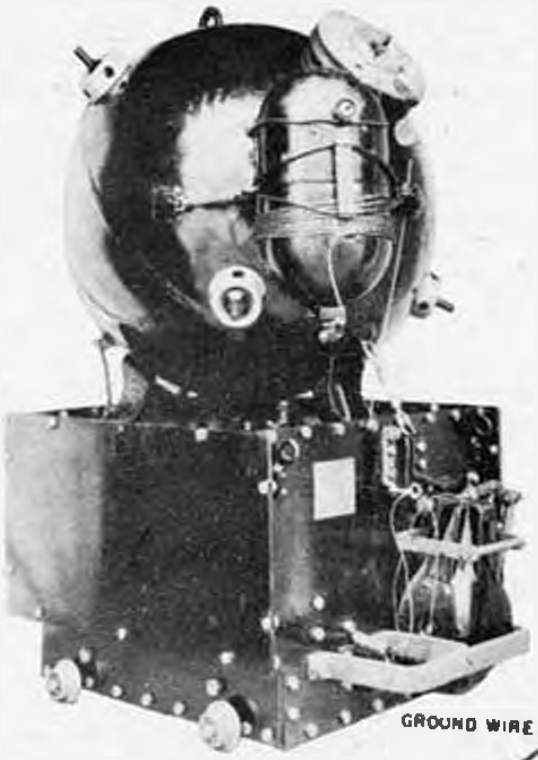


Fig. 4-- Mk. 6 Mine

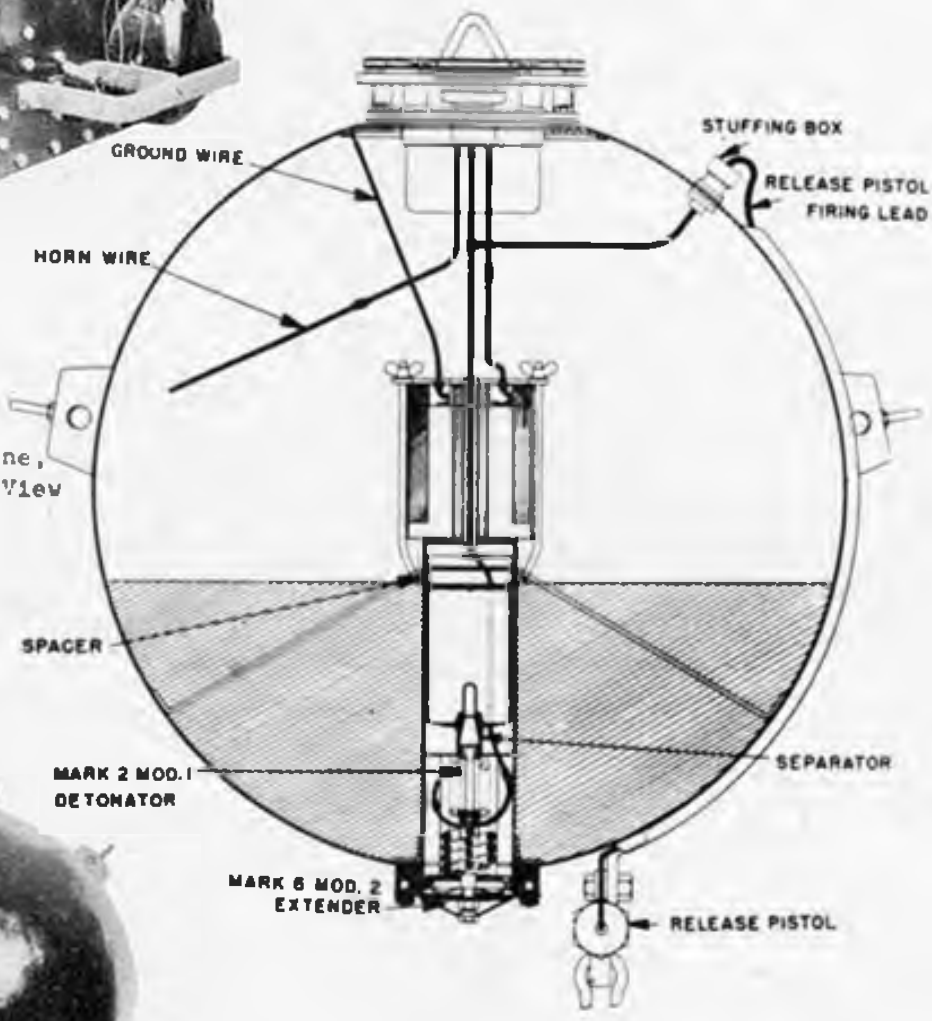


Fig. 5-- Mk. 6-2 Mine, Sectional View

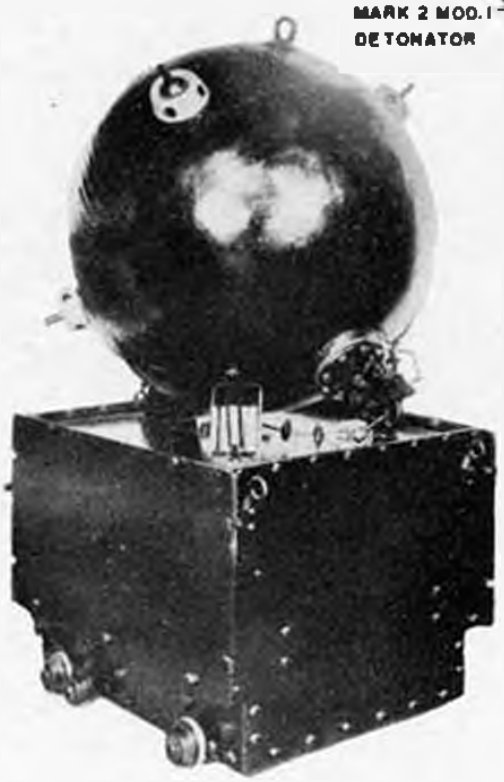


Fig. 6-- Mk. 6-2 Mine

4. The antenna floats used with the Mk 6 are the D-4, D-4-3 and D 4-6. The D-4 is a small float 20" long and 10" in diameter, consisting of two hemispheres joined by a cylindrical mid-section. The D-4-3 and D-4-6 differ from the D-4 in that they are fitted with three and four H-6 horns respectively which are electrically connected to the antenna.

Operation

1. Mine takes depth by plummet. The extender operates in 24 ft. of water, and after the soluble washer dissolves, the hydrostatic safety switch will close, and the mine is armed.

2. Mine fires when a steel object contacts the antenna or an H-4 horn, or when an H-4 or H-6 horn is forced against its horn guard. This creates a sea battery, the current from which will operate a relay and close the firing circuit.

3. The hydrostatic safety switch and extender are designed to retract upon release of hydrostatic pressure.

Precautions

1. Do not allow the horns or antenna to contact any metallic objects.

2. Hydrostatic safety switch and extender may fail to retract upon release of hydrostatic pressure.

RMS

1. Place a copper short-circuiting clip on the K device, being certain that contact is made with both copper plates. (See note below).

2. Retract and lock out the extender. Any necessary movement of the mine must be done from a safe distance.

3. Retract and lock out the hydrostatic safety switch using the appropriate device, whether it be the retracting tool, splash cap or dummy soluble washer with nut.

4. Remove the extender.

5. Cut and tape the detonator leads separately.

6. Remove the K device.

7. Dispose of detonator, booster and charge.

Note: Any U. S. antenna mine may be fitted with an anti-sweeping crown, which so modifies the K device that a short-circuiting clip cannot be used. In this case, the K device should be short-circuited by thrusting a non-magnetic screwdriver firmly between the two plates. The screwdriver should be of the standard beryllium-copper type issued in the RMS tool kit. The K-4, which has a layer of plastic between the plates and cannot be shorted with a screwdriver, may be disarmed by contacting both plates with a bent piece of copper wire in the shape of a "V".

Mark 6-2

General

1. Same as the Mk. 6 except that it is a rising mine.

Description

1. Mk 6 case is used.

2. External fittings

Release pistol	On bottom of case near extender
Stuffing box	On side of upper hemisphere
Firing lead	On outside of case, runs from stuffing box to release pistol

All other fittings are the same as on the Mk. 6

Operation

1. Same as the Mk. 6, except that when contact is made, the release pistol is fired, opening a release hook, and freeing the mine, which rises approximately 3½ ft. before the delay detonator fires.

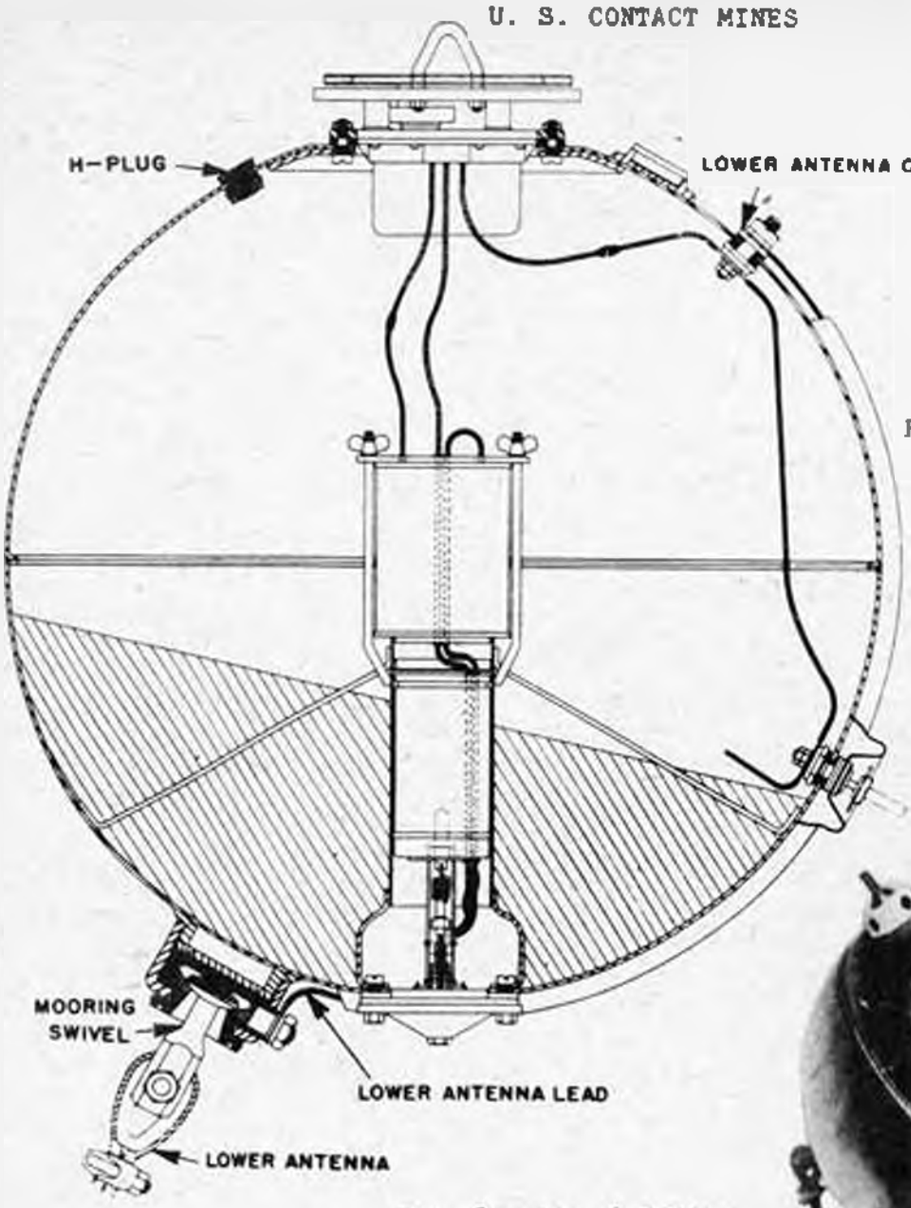
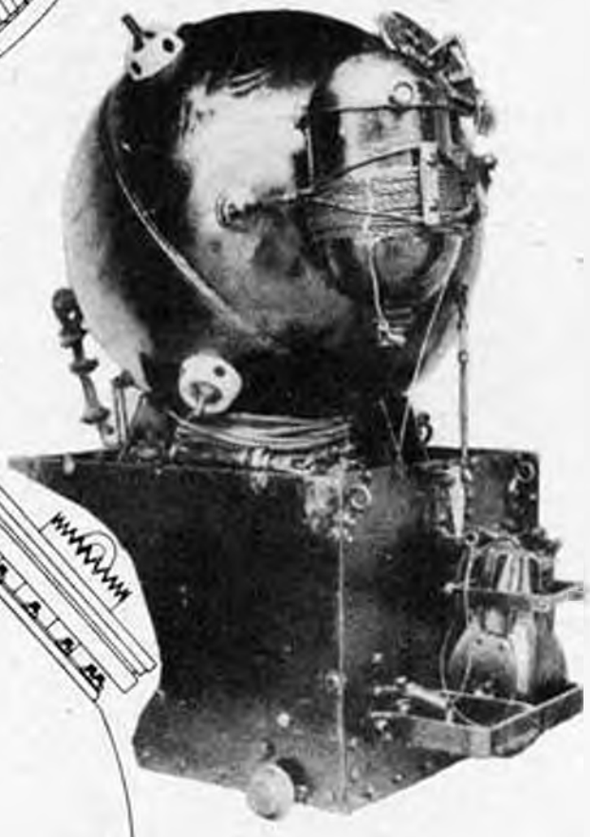


Fig. 7-- Mk. 6-3 Mine, Sectional View

Fig. 8-- Mk. 6-3 Mine



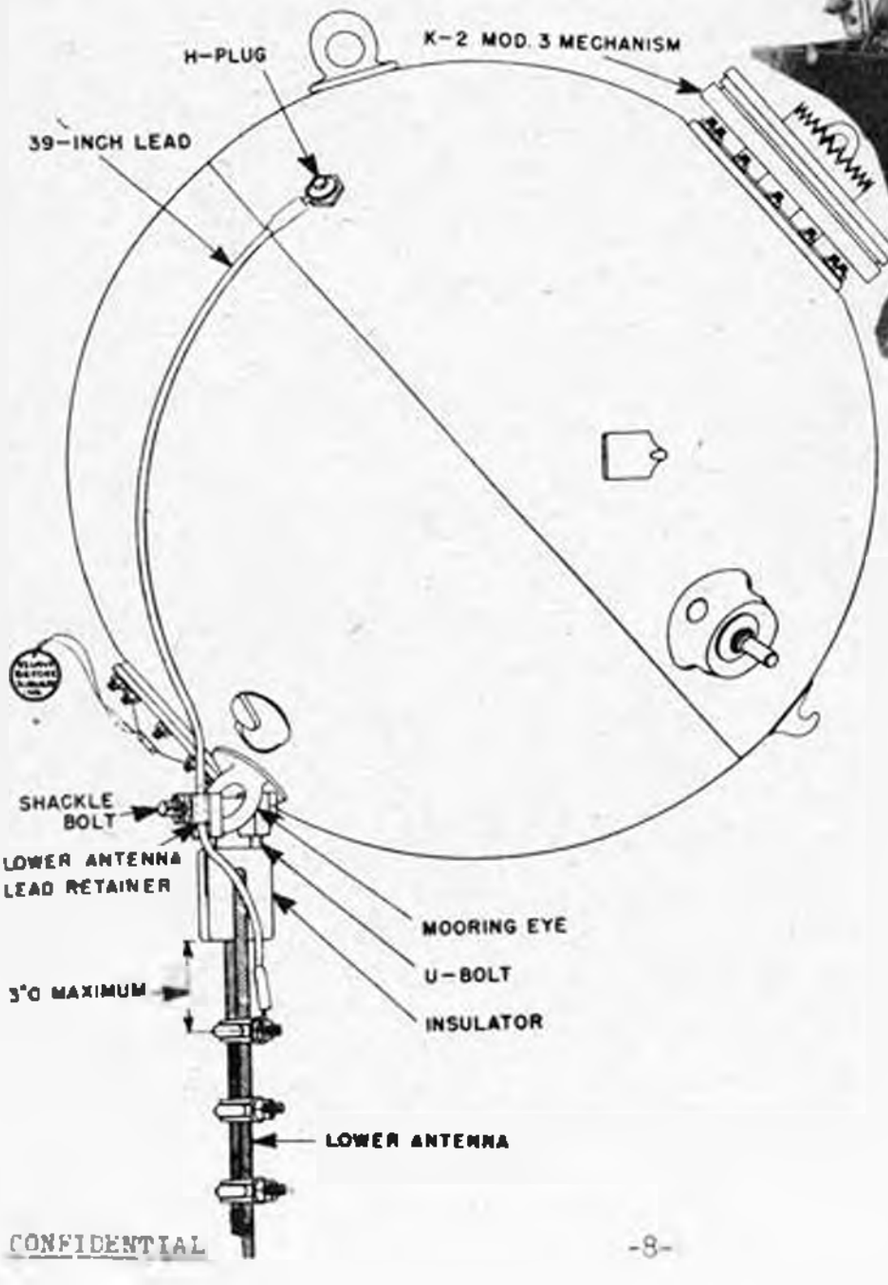


Fig. 9-- Mk. 6-4 Mine, Sectional View

Precautions

1. Same as the Mk. 6, except that additional care must be exercised when handling the release pistol.

RMS

1. Same as the Mk. 6.

Mark 6-3

General

1. Moored, contact, upper and lower antenna mine.
2. Laid by surface craft.
3. Laid defensively in depths of water from 40 to 2800 ft. primarily against submarines. Case depth is from 15 to 320 ft.

Description

1. Case (Mk 9 modified)

Shape	Spherical
Color	Black
Material	Steel
Diameter	35 13/16"
Charge	300 lbs. TNT with granular TNT booster
Total weight in air	540 lbs.

2. External fittings

Mooring swivel	Near extender
Lower antenna	Streamed from mooring swivel
Stuffing box	Near K device
Lower antenna lead	Runs along case from lower antenna to the lower antenna connection, and is electrically insulated from case.
Horns	Four, H-4, two above and two below the center weld

All other fittings are the same as on the Mk. 6.

3. Anchor

Mark 6-3 anchor is used.

Operation

1. Same as the Mk. 6 except that the firing device may also be actuated by a steel contact on the lower antenna.

Precautions and RMS

1. Same as the Mk. 6.

Mark 6-4

General

1. Same as the Mk. 6-3.

Description

1. Mk. 6 case is used.
2. External fittings

Horns	Three, H-4, on upper hemisphere
Stuffing box	In place of removed horn

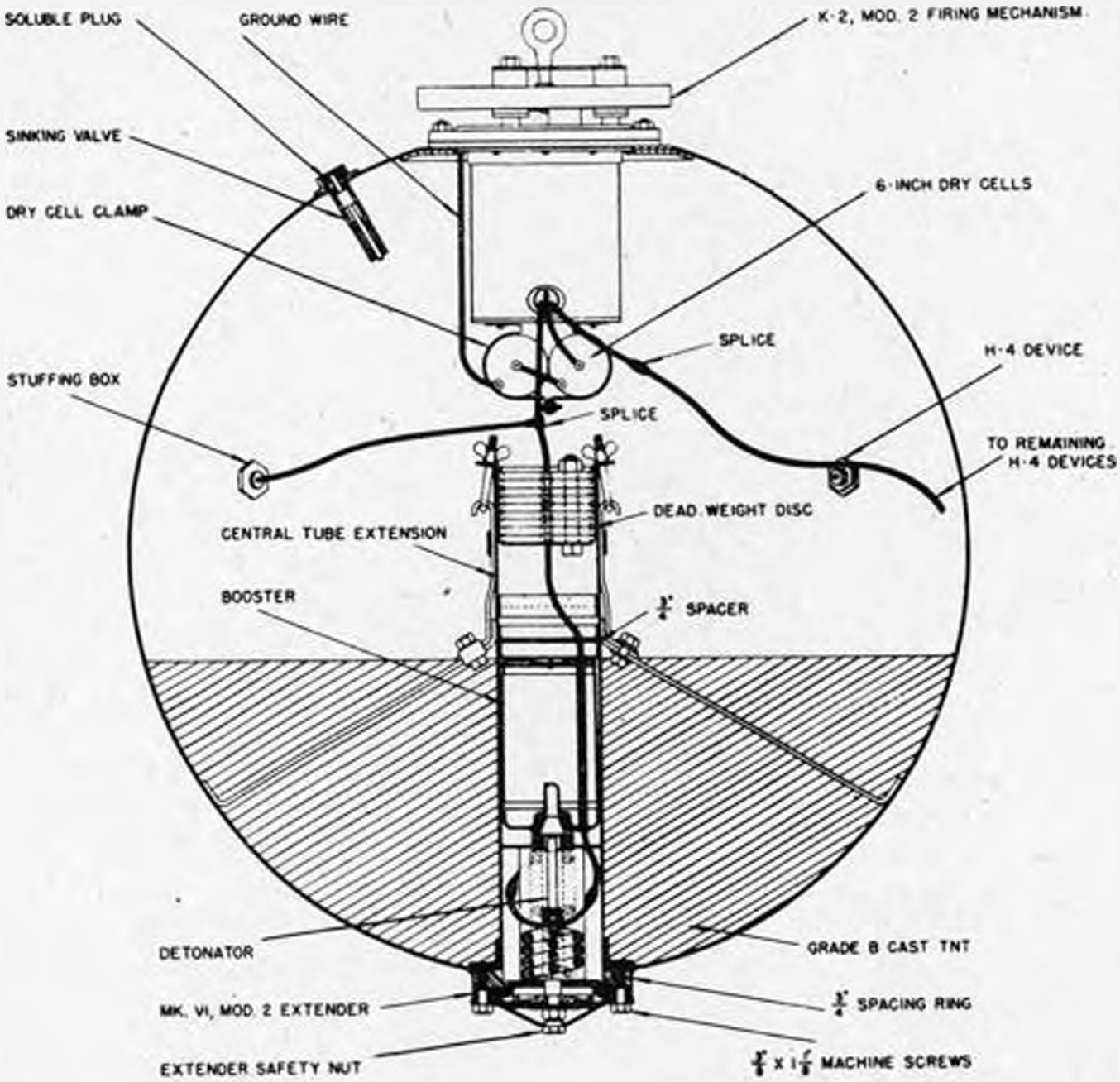


Fig. 10-- Mk. 7 Mine, Sectional View

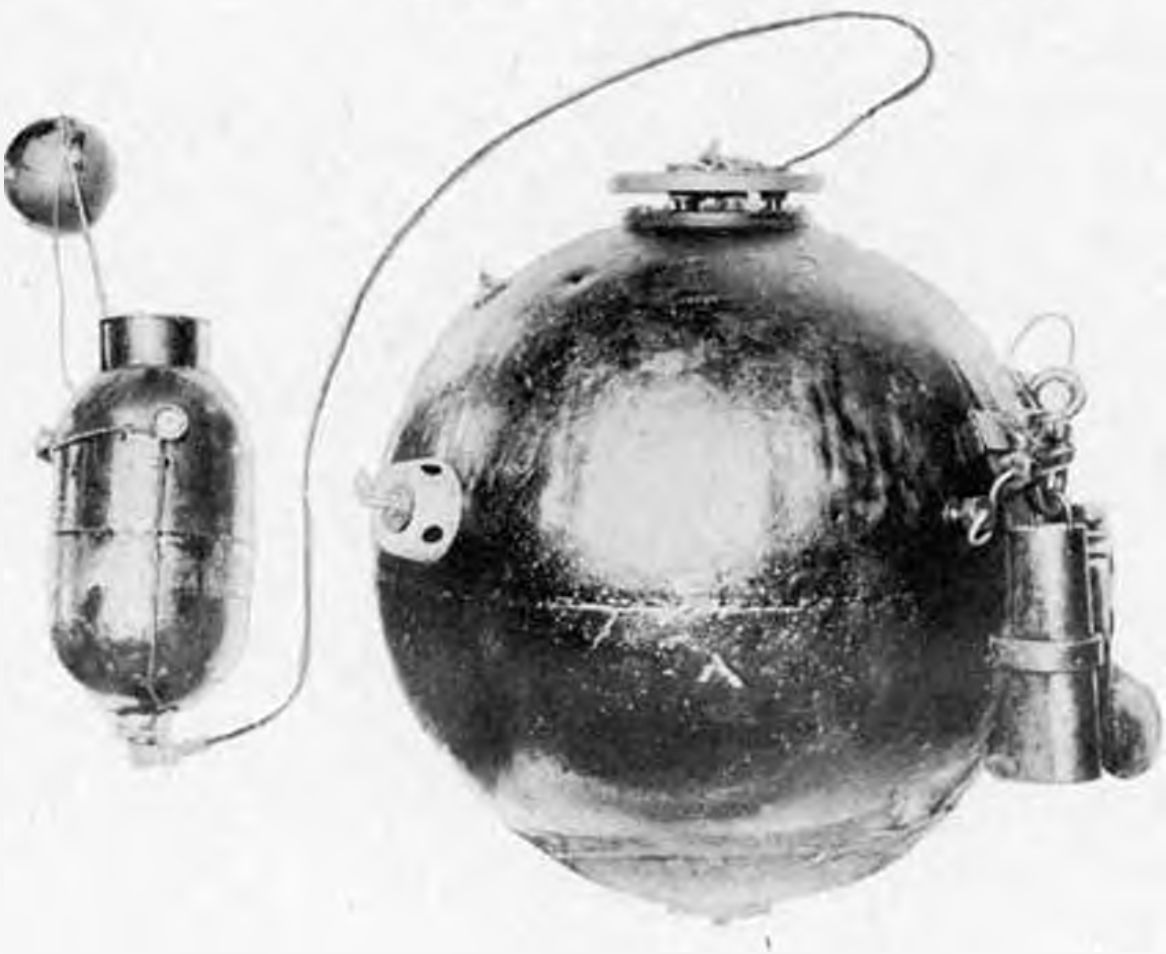


Fig. 11-- Mk. 7 Mine

Insulator	On mooring attachment
Lower antenna lead	Runs outside case from lower antenna to stuffing box

All other fittings are the same as on the Mk. 6.

3. Anchor

Mk. 6 anchor is used.

Operation, Precautions and RMS

1. Same as the Mk. 6.

Mark 7

General

1. Drifting, tactical mine.
2. Laid by surface craft.
3. Laid tactically or offensively against surface craft and designed to float about 37 ft. below the surface.

Description

1. Mk. 6 case is used.
2. External fittings

Horns	Three, H-4, around upper hemisphere
Stuffing box	In place of removed horn
Ballaster depth taking device	Directly below lifting eye
Flooder valve	Near K device on upper hemisphere
Release pistol	Secured to bracket

All other fittings are the same as on the Mk. 6.

3. Anchor

A special truck or dolly is used to launch the mine and assist in initial depth taking.

4. An additional D-8 spherical float, 5" in diameter, is connected to the top of the D-4-3 float by 10 ft. of white line.

Operation

1. Mine takes depth by the hydrostatically controlled ballister device, and the depth is maintained by the positive buoyancy of the D-8 float.
2. When contact with the antenna or D-4-3 float is made, the release pistol fires, releasing an attached weight, and allowing the mine to rise about 34 ft. before the delay detonator fires.
3. If the mine has not fired one hour after laying, a soluble washer in the flooder valve dissolves, allowing water pressure to depress the valve and flood the mine.
4. The safety features are the same as in the Mk. 6.

Precautions and RMS

1. Same as for the Mk. 6.

Mark 10-1

General

1. Moored, contact, chemical horn mine.
2. Laid by submarine.

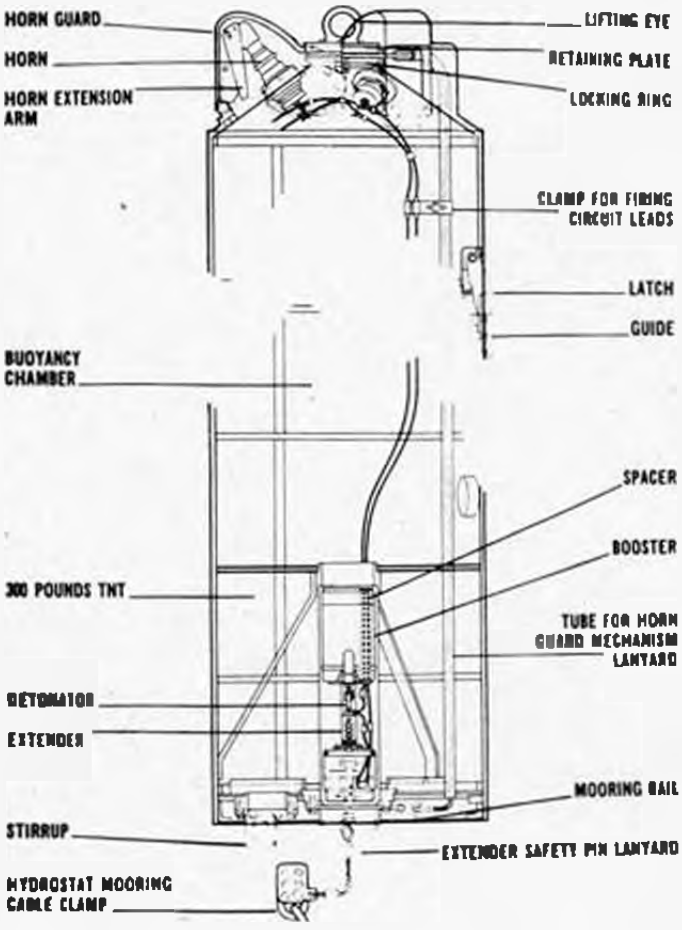


Fig. 12-- Mk. 10-1 Mine, Sectional View

Fig. 13-- Mk. 10-1 Mine

Fig. 14-- Mk. 10-1 Mine,
Bottom View

Fig. 15-- Mk. 10-1 Mine,
Top View

3. Laid offensively in depths of water from 50 to 500 ft. against surface craft. Case depth is from 10 to 65 ft.

Description

1. Case

Shape	Cylindrical with conical nose
Color	Black
Material	Steel
Diameter	20 3/4"
Length	91 5/8"
Charge	300 lbs. TNT with granular TNT booster
Total weight in air	About 700 lbs.

2. External fittings

Horns	Three, lead, extension type, on top
Extender	Mk. 6-4 on bottom
Depth taking hydrostat	Mk. 1, on bottom
Mooring eye	Bail type, on bottom
Lifting eye	On top

3. Anchor

Mk. 10-1 anchor is used.

Operation

1. Mine takes depth by the loose bight hydrostat system. Extender operates in 15 ft. of water, and releases clockwork. Clock runs off in a maximum of 52 min. and mine is armed.
2. Mine fires when the glass vial in a chemical horn is broken.
3. Extender is designed to retract upon release of hydrostatic pressure.

Precautions

1. Take care not to damage the horns in any way.
2. Extender may fail to retract upon release of hydrostatic pressure.

RMS

1. Retract the extender, close the jaws around the hydrostatic piston, and insert a cotter key or pin in the hole provided.
2. Remove the extender.
3. Cut and tape the detonator leads separately.
4. Dispose of detonator, booster and charge.

Mark 11-1

General

1. Moored, contact antenna mine.
2. Designed to be laid offensively from a special submarine, but may be laid from surface craft.

Description

1. Case

Shape	Two hemispheres, joined by a cylindrical mid-section 4 1/4" wide
Color	Black
Material	Steel

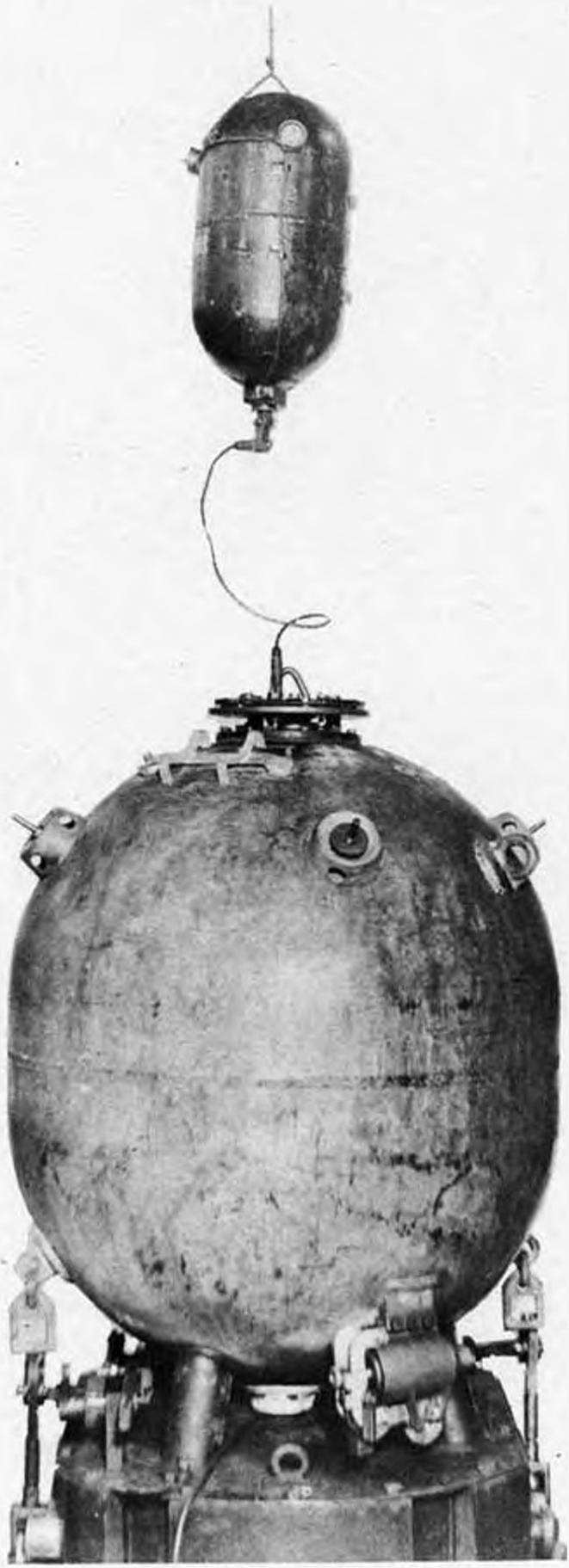


Fig 16 – Mk 11-1 Mine

Diameter	35 3/4"
Length	40"
Charge	500 lbs. TNT with granular TNT booster
Total weight in air	About 700 lbs.

2. External fittings

Horns	Four, H-4, evenly spaced around upper hemisphere
K device	K-3-1, fitted to top of central tube
Extender	Mk. 6-3, fitted to bottom of central tube
Hydrostatic safety switch	On K device
Lifting eyes	Two, on lower hemisphere
Depth-taking hydrostat	Mk. 1, on lower hemisphere near extender

Operation

1. Mine takes depth by the loose bight hydrostat system. Extender operates in 24 ft. of water. Hydrostat in K device releases clockwork. Clock runs off in maximum of one hour and mine is armed.
2. Mine fires in the same manner as the Mk. 6 except that there is no float or antenna firing.
3. The safety features are the same as in the Mk. 6.

Precautions

1. Same as the Mk. 6.

RMS

1. Place a short-circuiting clip on the K device.
2. Retract and lock out the hydrostatic safety switch.
3. Retract and lock out the extender as on the Mk. 10-1.
4. Remove the extender.
5. Cut and tape the detonator leads separately.
6. Remove the K device.
7. Dispose of detonator, booster and charge.

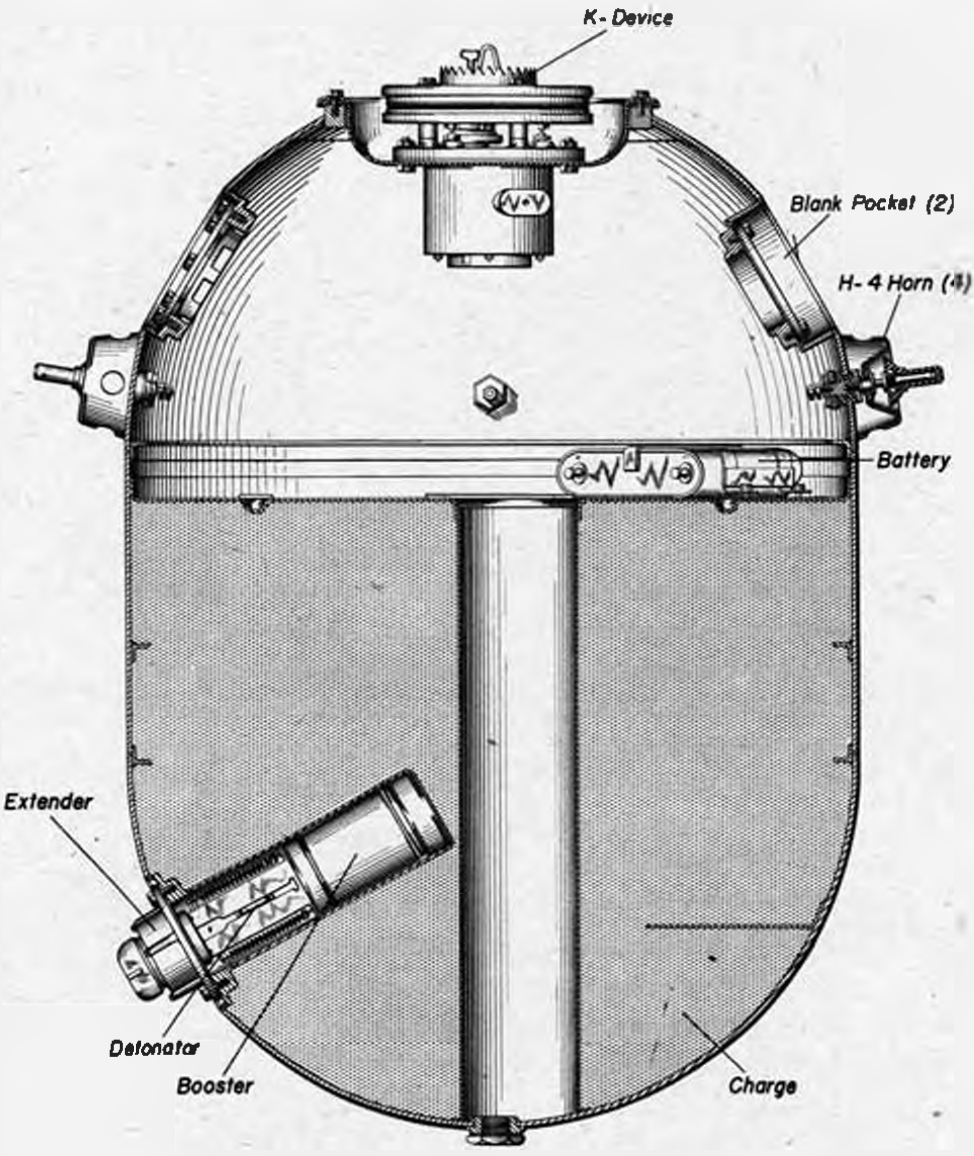


Fig 17- Mk 16-1 Mine, Sectional View

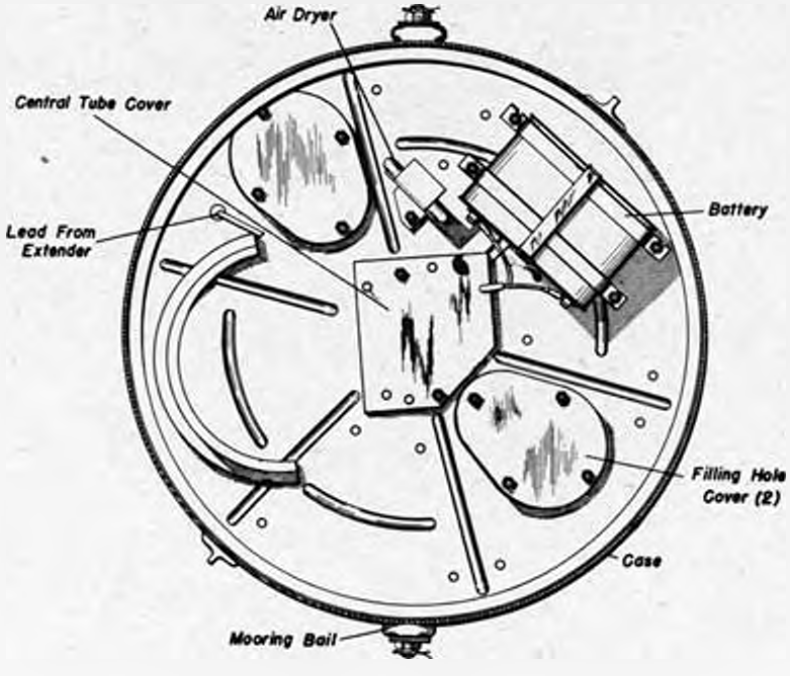


Fig 17a- Mk 16-1 Mine, Top View- Cover Plate Removed

Mark 16-1

General

1. Moored, contact, upper antenna mine, laid by surface craft.

2. Defensive mine, for use in maximum depth of water of 2400 ft. against surface craft or submarines. Maximum depth of case when moored is 300 ft.

Description

1. Case

Shape	Two hemispheres, joined by a 15" cylindrical mid-section
Color	Black
Material	Steel
Diameter	30"
Length	50 1/2"
Charge	600 lb. cast TNT with TNT booster
Total weight in air	1090 lb.

2. External fittings

Cover plate	16" diam., in center of upper hemisphere, flush type, secured by 24 bolts. Fitted with K device (probably K4, K4-1, possibly K3, K2-3).
Horns	Four, H-4, equally spaced around upper hemisphere, 17" from center. If a flooder is fitted, one of the horns is removed and a short length of pipe substituted.
Extender	Mk 12-3, on lower hemisphere, 17" from center.
Lifting eyes	Three, equally spaced around upper hemisphere, 25" from center.
Float securing lugs	Two; one on upper hemisphere, 15" from center; one on cylindrical mid-section, 37" from center of upper hemisphere.
Anchor securing lugs	Three; two on lower hemisphere, 9" from center; one on lower weld, 29" from center of lower hemisphere.
Blank cover plates	Two, 7 1/2" diam., recessed, on upper hemisphere, 19" from center, secured by 8 bolts.
Blank plug	2 3/4" diam., screwed into center of lower hemisphere.
Mooring bail	Secured to two pivot posts, 180° apart on mid-section, 36" from center of upper hemisphere.

Operation

1. Same as Mk 6 except that an SD-4 device and flooder may be used to sink the mine after a set period.

Precautions

1. Note that other models of this mine are fitted with influence firing mechanisms and take appropriate precautions.

2. Keep clear of the flooder during RMS.

RMS

1. Same as Mk 6 except as follows:

   (a) If a flooder is fitted, reach in the top of the mine case after removing the K device and cut and tape separately each of the five leads.

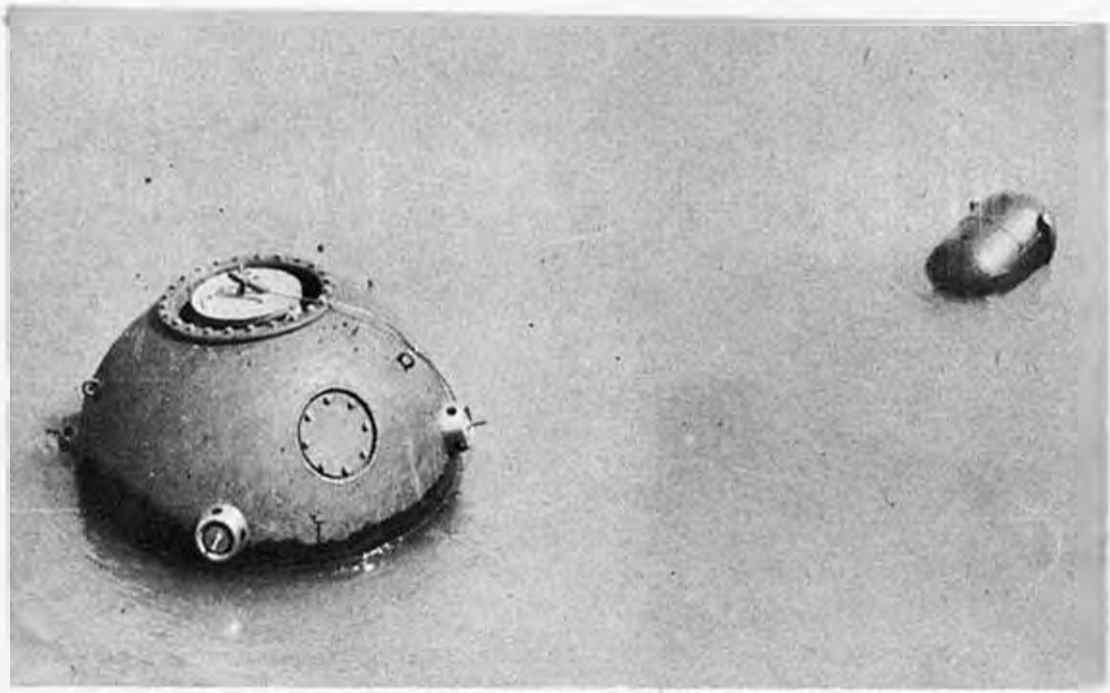


Fig. 18 - Mk 16-1 Mine, Floating

Fig. 19 - Mk 16-1 Mine

Mark 19 (19-1, 19-2)

General

1. Drifting, contact, oscillating mine.

2. Laid by aircraft.

3. Laid offensively in rivers, harbors and anchorages. Designed to oscillate near a set depth, drift with the current, and to destroy shipping, docks, dams, bridges, etc.

Description

1. Case

Shape	Cylindrical, with conical tail section and fins
Color	Gray
Material	Steel
Diameter	
Case	18 5/8"
Fins	25 1/2"
Length	67"
Charge	210 lb. Torpex, with granular TNT booster
Total weight in air	550 lb.

2. External fittings

Propeller	Three bladed, 7" span, in tail section housing
Extender	Mk 14-5, in pocket on top center line 9" aft nose
Suspension lugs	Two sets of two, on longitudinal axis of case, 150° and 270° respectively from top center line
Hydrostatic switch	HS-2, in pocket on top center line, 14" forward of joint between case and tail section

3. The Mk 19-1 differs from the Mk 19 as follows:

   (a) It is fitted with a Mk 14-6 extender which differs from the 14-5 only in the type of lock fitted.

   (b) Small ballast weights are added to the tail and to the interior of the case.

   (c) Minor wiring changes are made to vary the firing delay from 0-60 seconds.

4. The Mk 19-2 differs from the Mk 19-1 as follows:

   (a) Its firing delay may vary from 0-7 seconds due to minor wiring changes.

Operation

1. The HS-2 which controls the depth at which the mine oscillates can be set from 10-60 ft. When the mine is launched, it sinks to a depth of 30 ft. due to momentum with the extender operating in 5-9 ft. of water. At 30 ft., HS-2 makes one of its contacts, starting the motor and ballast intake and automatically sending the mine toward its set depth. When the propeller rotates clockwise, the mine rises and ejects ballast. Counterclockwise rotation of the propeller causes the mine to sink and take on ballast. The mine oscillates between its set depth and a point six ft. below until oscillation is sufficiently slow to require 15 seconds for a single traverse between the two depths, at which time a heater coil arms the C-4 firing device.

2. The firing device operates on receipt of a lateral blow or when tilted more than 50°. Firing may be instantaneous or incorporate a 15-30 second delay. The design of the C-4 prevents a countermining shock from firing the mine. When battery potential falls below four volts, the mine destroys itself.

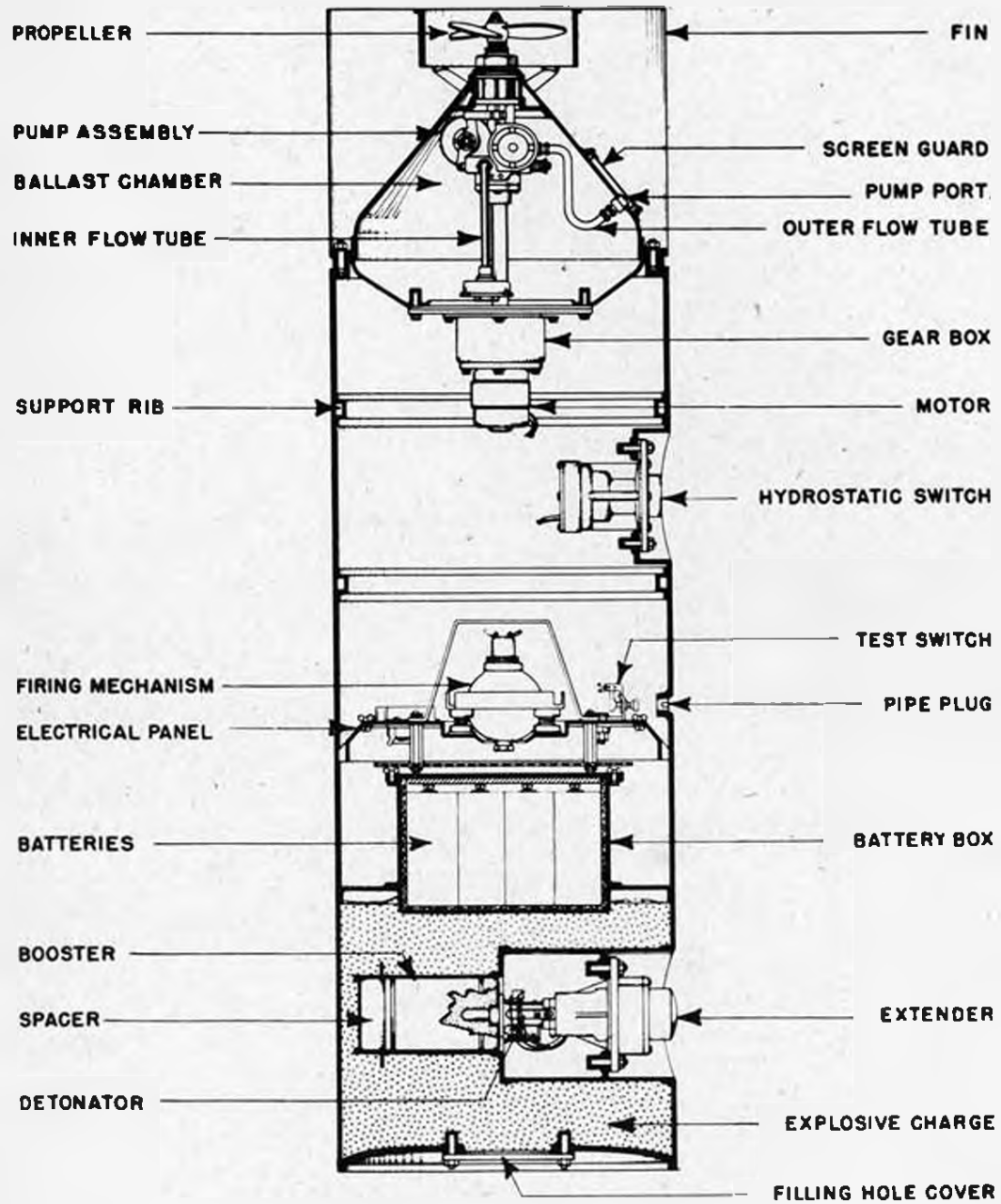


Fig 20- Mk 19 Mine, Sectional View

Mark 19 (19-1, 19-2) (Cont'd.)

3. No self-disarming devices are fitted.

Precautions

1. Do not attempt RMS unless absolutely necessary.
2. Do not move or jar the mine except from a safe distance.
3. Extender will not retract upon release of hydrostatic pressure.
4. Do not attempt underwater RMS. If the mine is found floating or submerged, pull it ashore from a safe distance.

RMS

1. Prepare Shaped Charge Liner, Type 1 (Part I, Chap. 5) and pack it with 1/3 lb. C or C-2 plastic explosive. Place the charge on the mine case in an athwartships position 300° from the top center line and 32" from the flange of the tail section.
2. Insert the detonator in the charge, secure the detonator leads and firing leads, and fire the charge from a safe distance.
3. Examine the mine to insure that the green wires from the battery to the detonator and to the extender switch are severed.
4. Remove the extender.
5. Dispose of detonator, booster and charge.

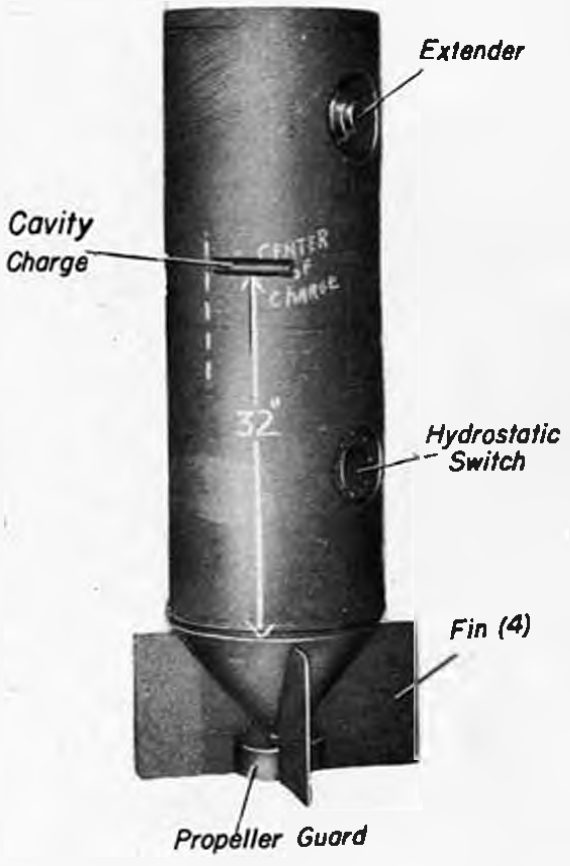


Fig 21 - Mk 19 Mine With Cavity Charge Fitted For R.M.S.

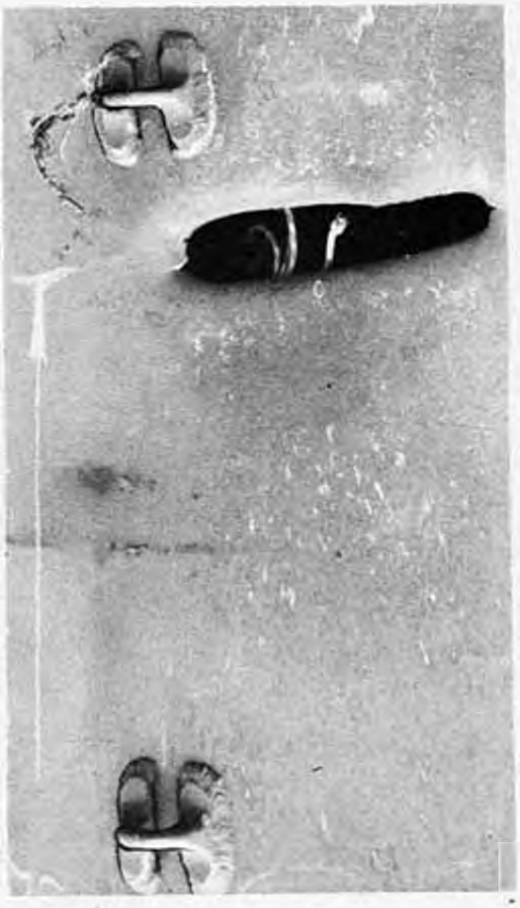


Fig 22 - Mk 19 Mine, Leads cut by Cavity Charge

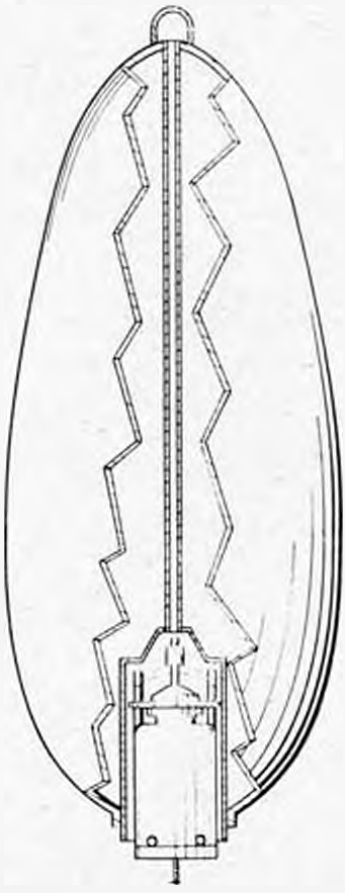


Fig. 23 - Mk 23 Mine

Fig. 24 - Mk C-1 Mechanism

Mark 23

General

1. Moored, contact sweep obstructor.
2. Laid by surface craft.
3. Laid offensively or defensively in depths of water from 35 to 750 ft. Case depth is from 18 to 30 ft.
4. Laid in our own mine fields to destroy enemy minesweeping gear.

Description

1. Case (D-10 float)

Shape	Ovoid
Color	Black
Material	Steel
Diameter	18" maximum
Length	44"
Charge	2 lb. TNT
Total weight in air	77 lb.

2. External fittings

Lifting eye	Top of case
Firing device well	Bottom of case
C-1 firing device	In well

3. The complete unit consists of the case, the firing device, and a Mk 3-5 anchor with Mk 1 buoyancy chamber attached, and weighs about 1100 lb.

Operation

1. Mine takes depth by plummet. After the soluble washer dissolves, the firing device arms in 15 ft. of water.
2. Firing device operates when a sweep wire, riding up the mooring cable, exerts pressure on the firing ring, releasing locking balls which hold a spring-loaded percussion striker.
3. No self-disarming devices are fitted.

Precautions

1. Do not attempt RMS by disassembly or underwater. If the mine is found in the surf or submerged, pull it ashore from a safe distance.
2. When the float is armed, a firing ring protrudes about 1/2" from the housing of the firing mechanism. Never set the mine on its base, and take all possible precautions to prevent pressure from bearing on the firing ring. If the firing ring is not protruding when the mine is found, it should have fired, and is extremely dangerous.
3. Do not move or jar the mine except from a safe distance.

RMS

1. If necessary to move the mine before destroying it, wedge the firing ring in the "out" position.
2. Place 2/3 lb. to 1 lb. plastic explosive (or any equivalent charge) against the case 6 to 8" from the base.
3. Insert the detonator in the charge, secure the detonator leads and firing leads, and fire the charge from a safe distance.

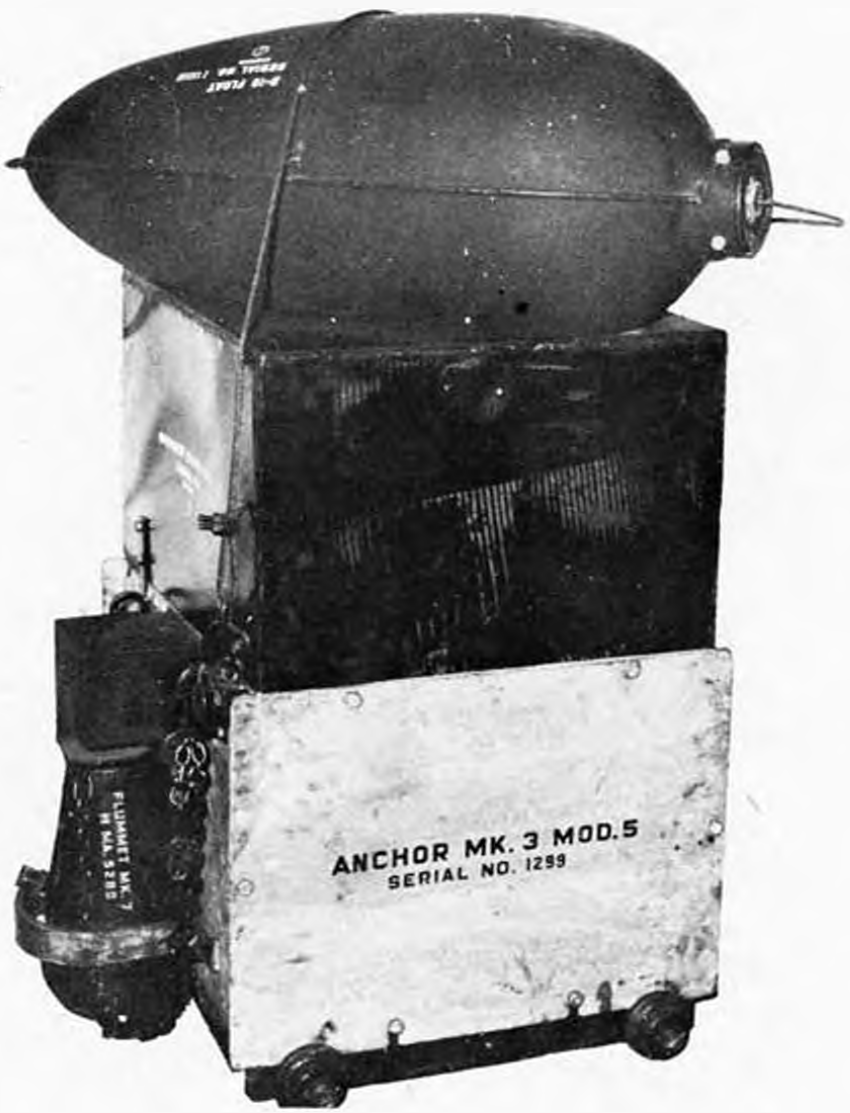


Fig 25 - Mk 23 Mine With Anchor

MINE DISPOSAL HANDBOOK

PART II

UNITED STATES UNDERWATER ORDNANCE

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CHAPTER 3

U. S. TORPEDOES

Torpedo Mark	Launched From	Length Overall Including Warhead	Diameter	Power Source	Speed and Range Knots/Yards	Warhead Length (in.)	Remarks
8-3C 8-3D	Destroyer	20'8"	21"	Steam turbine	27/13,500	27	Obsolescent
13 and Mods	Aircraft or PT	13'5"	22¾	"	See table #5	54	See table #5 for details of several Mods
14-3A	Submarine	20'6"	21"	"	31-32/9000 45-47/4500	47	
15-1 15-2 15-3	Surface Craft except PT	24'0"	"	"	27/15,000 34/10,000 46/6,000	58	
18-1 18-2	Submarine	20'6"	"	Storage battery	29/4,000	47	Electric
23 23-1	"	Same as 14-3A	"	Steam turbine	45-47/4500	41 or 47	Same as 14-3A except has single high speed

Table 1 - U.S. Torpedoes

Warhead Mark	Torpedo Fitted on	Exploder Used	Type and Wt.(lb.) of Charge	Total Wt. (lb.)	Length (in.)	Material	Remarks
8-2	8-3C 8-3D	Mk 3-2 Mk 3-4	371 TNT	510	27	Steel	Obsolescent
8-3	"	"	384 TNT	523	"	"	"
13-1	Mk 13 and all Mods	4-1, 4-3, 4-5, 4-8, 4-8A, 4-8B, 4-9	600 TNT or TPX	825	54	"	
13-2	"	8, 8-2, 8-4, 8-6	600 TNT or 554 TPX	826	"	"	Nose cap of TNT used with Torpex
13-3	"	"	554 TPX	826	"	"	"
15	14-3A, 15-1, 15-2, 23, 23-1	6-1, 6-1A, 6-1B, 6-4A, 6-4B, 6-5, 6-6, 6-7, 6-8, 10-3	494 TNT	845	41	Bronze	Used only with Mk 1 extension
15-1	14-3A, 23, 23-1	6-1, 6-1A, 6-4A, 6-5, 6-7, 10-3	588 TNT	996	47	"	Same as Mk 15 plus Mk 1 Extension
15-2	15-1, 15-2, 15-3	6-1, 6-1B, 6-4B, 6-6 6-8	789 TNT	1224	58	"	Same as Mk 15 plus Mk 2 Extension
16	14-3A, 23 23-1	Same as 15-1	594 TNT or 589 TPX	956	47	"	Nose cap of TNT used with Torpex
16-1	"	"	621 TPX	1053	"	"	Nose cap of TNT
16-4	14-3A, 23 23-1	"	613 TPX	1057	"	"	"
17	15-1, 15-2 15-3	Same as 15-2	807 TNT	1229	58	"	
17-2	"	"	800 TNT	1234	"	"	
18-1	18-1, 18-2	8-1, 8-3, 8-5, 8-7	570 TPX	711	47	Steel	Nose cap of TNT
18-2	"	"	600 TPX	736	"	"	"

Table 2 - U.S. Torpedo Warheads

Mark	Length (in.)	Diameter (in.)	Type and Wt. (lb.) of Charge	Weight (lb.)	Remarks
Mk 1	6	21	94 TNT	151	
Mk 2	17	21	295 TNT	379	

Table 3 - U.S. Torpedo Warhead Extensions

Exploder	Shape of Base Plate	Base Plate Dimensions (in.)	Approx. Weight (lb.)	Fits in Following Warheads	Firing Mechanism	Remarks
Mk 3, Mods 2 and 4	Round	3 1/2 diam.	5 1/4	Mk 8 Mods 2 and 3	Inertia Ball Type	Obsolescent
Mks 4-1, 4-1A, 4-3, 4-5, 4-8 4-8A, 4-8B, 4-9	Oval	7 x 13	32	Mk 13-1	Inertia Ring Type	Fits forward in warhead
Mks 8, 8-2, 8-4, 8-6	Round	8 diam.	26	Mks 13-2, 13-3	"	Fits aft in warhead
Mks 8-1, 8-3, 8-5, 8-7	"	"	"	Mks 18-1, 18-2	"	Mk 18 electric torpedo only. Fits aft in warhead
Mks 6-1, 6-1A, 6-1B, 6-4A, 6-4B, 6-7, 6-8	Rectangular. Round corners	14 1/2 x 12	90	See Warhead table	Combination Inertia Ring and Magnetic	Powered by Generator
Mks 6-5, 6-6	"	"	"	"	Combination Inertia Ball Switch and Magnetic	"
Mks 5-1, 5-2, 5-3, 5-4, 5-4A, 5-4B, 5-5	"	"	"	Mk 15, 16, 17 and Mods	Inertia Ring Type	Same as Mk 6-1 type less Magnetic Section
Mk 10-3	"	"	"	Mks 15, 15-1 and 16, 17 and Mods	Combination Inertia Ring and Magnetic	Battery Power

Table 4 - U.S. Torpedo Exploders

Introduction

1. The U. S. Navy has more than 15 marks and modifications of torpedoes in service. All of these, however, represent but a few basic design types. Each torpedo is composed of the following main parts:

   (a) Warhead and exploder.

   (b) Air flask section or battery compartment.

   (c) After body.

   (d) Tail section.

2. The interest of disposal personnel is centered around the warheads and exploder mechanisms and each of these is treated in detail in this chapter. General descriptive material on the torpedo, including physical characteristics and performance ratings, is also included to give background information and also to aid in identification.

3. All torpedoes of this security classification now in service are air driven with the exception of the Mk 18 which utilizes electric drive. A 21" diameter is standard for all types except the Mk 13 aircraft torpedo which is 22.42 in diameter.

4. The warheads used are of the same diameter as the torpedoes, the 22.42 Mk 13 series being used with the Mk 13 torpedoes. Each warhead consists of a thin steel or bronze shell and contains an athwartships exploder pocket on its bottom center line, directly forward or abaft its transverse center line, and a lifting eye in the center of its nose. The charges vary in weight from 400 to 800 lb. and may be of either TNT, Torpex, or HBX.

5. The more than 35 marks and modifications of service exploders discussed herein represent three impact-inertia and two magnetic induction design types, the many small modifications not being significant from a disposal viewpoint. It will be noted that the rendering-safe procedures for many of the exploders are almost identical due to the fact that the exploders are very similar with respect to the alignment of their internal parts.

6. The component parts of the torpedo assembly are joined by means of screws which pass through holes which are set at an angle in the forward edge of the after of the two sections making up the joint and screw into threaded holes which are also set at an angle in the forward of the two sections. Torpedo tool #49 may be used to remove these screws. The various exploders, except the Mk 3, are secured in the warheads by similar screws which may also be removed by tool #49.

7. Rendering these torpedoes safe involves disposing of the particular exploder which may be fitted. Consequently, the rendering-safe procedures are given with the treatment of the individual exploders rather than with the torpedoes.

Identifying Features

1. Any U. S. torpedo may be readily identified by an examination of its markings. The mark number, modification number and register number of each torpedo are all stamped in the following places:

   (a) On the top center line of the air flask section or battery compartment near the forward joint.

   (b) On the top center line of the afterbody near the forward joint.

   (c) On the tail section, adjacent to the top fin.

2. The mark and modification numbers of each warhead are stamped on its top center line near the after end.

3. Most exploders have the mark and modification numbers stamped near the edge of the base plate.

General Precautions

1. The following precautions, in addition to those prescribed for the individual exploders, should generally be observed when dealing with U. S. air-driven torpedoes (Special precautions for the Mk 18 electric torpedo will be included under that heading):

   (a) Block the propellers before rendering safe. Specially designed propeller locks, chain, wire or manila rope may be used for this purpose. Since the two propellers rotate in opposite directions, binding them together provides an effective lock.

   (b) Avoid contact with the starting lever and water trip valve.

(Introduction, Cont'd.)

(c) If possible, close the main stop valve before rendering safe in order to avoid starting the motor. To close the stop valve, rotate it clockwise using torpedo tool #13-14. The words MAIN STOP VALVE are always stamped around the valve spindle.

(d) If the torpedo has not completed its full run, air pressures as high as 2800 lb./in^2 may be present. Due precautions should be taken.

Torpedo Mk 8 Mods 3C and 3D

General

1. 21" air-driven torpedo, designed to be launched from submarines or surface craft. This torpedo is obsolescent and is now issued only to older types of destroyers.

2. Fitted with Warhead Mk 8 Mod 2 or Mk 8 Mod 3.

3. The torpedo is driven by a steam turbine engine and is capable of running 13,500 yards at a speed of 27 knots.

Description

1. Lengths

Overall	20'8"
Warhead	2'3"
Air flask section	12'3"
Afterbody	4'8"
Tail	1'6"

2. Total weight in air — 3026 lb.

3. External fittings

(a) Air flask section

Guide studs	Two; one each on the top and bottom center lines, 11'7" forward of after end.
Stop valve	On top center line, 6'5" forward of after end.
Charging valve	1 1/2" to port from top center line, 6'5" forward of after end.

(b) Afterbody

Depth index	On top center line, 4'10" forward of after end.
Starting lever	2" to starboard from top center line, 4'4" from after end.
Distance gear dial	3 1/2" to starboard from top center line, 4'4" forward of after end.
Gyro setting socket	20" to port from top center line, 4'2" forward of after end.

(c) Tail

Propellers	
Forward	Four-bladed, 19" span.
After	Four-bladed, 17 3/4" span.
Fins	Two vertical and two horizontal; length, including rudders, 13".

4. Internal arrangement of parts

(a) The general arrangement of internal parts is very similar to that of the Mk 14-3A, the main differences being as follows:

(1) The speed change mechanism is omitted from the air flask section.

(2) The control valve is omitted from the afterbody.

(3) A sylphon-type reducing valve is added to the valve assembly in the air flask section and performs the same functions as the control and reducing valves in the Mk 14-3A.

Operation

1. Similar to Mk 14-3A.

Torpedoes Mark 13-2A, 13-3, 13-5, 13-5, 13-6, 13-7, 13-8, 13-9.

General

1. 22?4 air-driven torpedo, designed to be launched from aircraft; some models may now be launched from motor torpedo boats (see Table #5).

2. Fitted with Warhead Mk 13 Mods 1, 2 or 3.

3. The torpedo is driven by a steam turbine engine. Some modifications are capable of running 4000 yards at a speed of 40 knots and others, 6000 yards at 33 1/2 knots (see Table #5).

Description

1. Lengths

Overall	13'5"
Warhead	4'6"
Air flask section	4'5"
Afterbody	3'1"
Tail	1'5"

2. The weights of the various modifications are given in Table #5

3. External fittings

(a) Air flask section

Stop valve	On top center line, 4'10" forward of after end.
Charging valve	1 1/2" to port from top center line, 4'10" forward of after end.

(b) Afterbody

Depth index	2" to starboard from top center line, 3'2" forward of after end.
Starting lever	On top center line, 2'4" forward of after end.

(c) Tail

Propellers	
Forward	Four-bladed, 16" span.
After	Four-bladed, 14" span.
Fins	Two vertical and two horizontal; length, including rudders, 17". A horizontal tail blade extension may be added to PT boat launched torpedoes if a shallow run is desired. A shroud ring may be fitted around the outer extremities of the fins.

4. Internal arrangement of parts

(a) The general arrangement of internal parts is very similar to that of the Mk 14-3A, the main differences being as follows:

(1) A water trip valve, added to the midship section of the air flask, prevents the igniter from firing before the torpedo is waterborne. The torpedo runs cold during air travel.

(2) The speed change mechanism is omitted from the midship section of the air flask.

(3) The control valve is omitted from the afterbody.

(4) A sylphon-type reducing valve is added to the valve assembly in the midship section of the air flask and performs the same function as the control valve and reducing valve in the Mk 14-3A.

(5) The gyro angling setting device is omitted from the afterbody of the Mk 13-2A, 13-5, 13-6 and 13-9.

Operation

1. Similar to Mk 14-3A.

	13-2A	13-3	13-5	13-6	13-7	13-8	13-9
Speed (kts)	40	40	33 1/2	40	40	40	33 1/2
Range (yds)	4000	4000	6000	4000	4000	4000	6000
Gyro Angling	No	Yes	No	No	Yes	Yes	No
Shroud Ring	No	No	No	Yes	Yes	Yes	Yes
Used on PT Boats	Yes	Yes	Yes	No	No	No	No
Total Weight (lb)	2125	2125	1925	2125	2125	2125	2125

Table 5 - Design Differences in Mods of the Mk 13 Torpedo

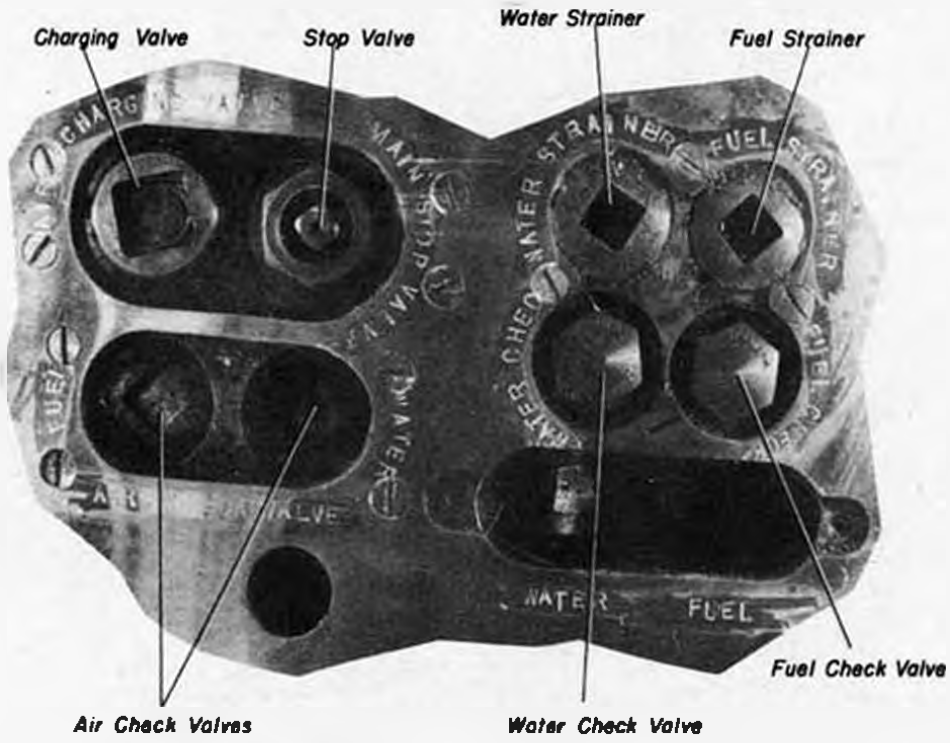


Fig. B - U.S. Torpedo Mk 13-3, After End of Airflask, Top View

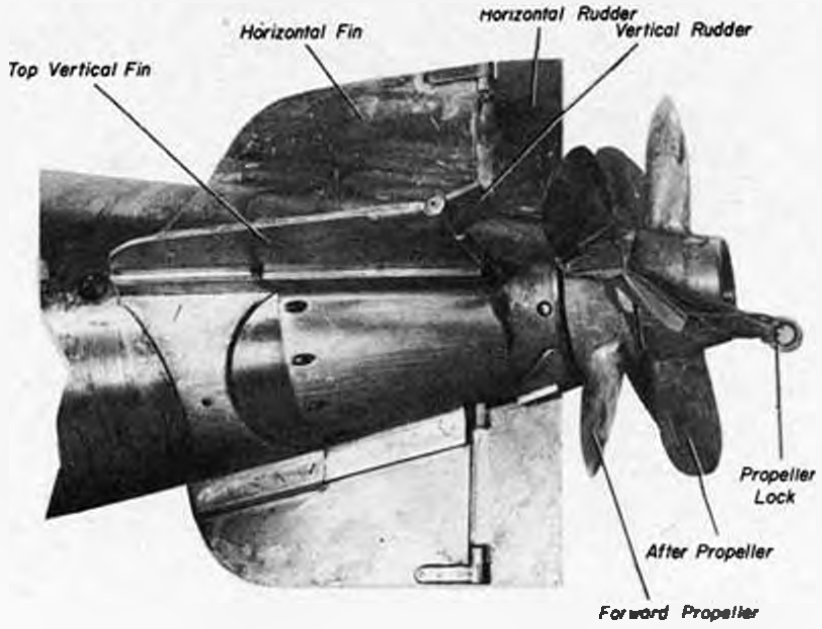


Fig. C - U.S. Torpedo Mk 13-3, Tail Section

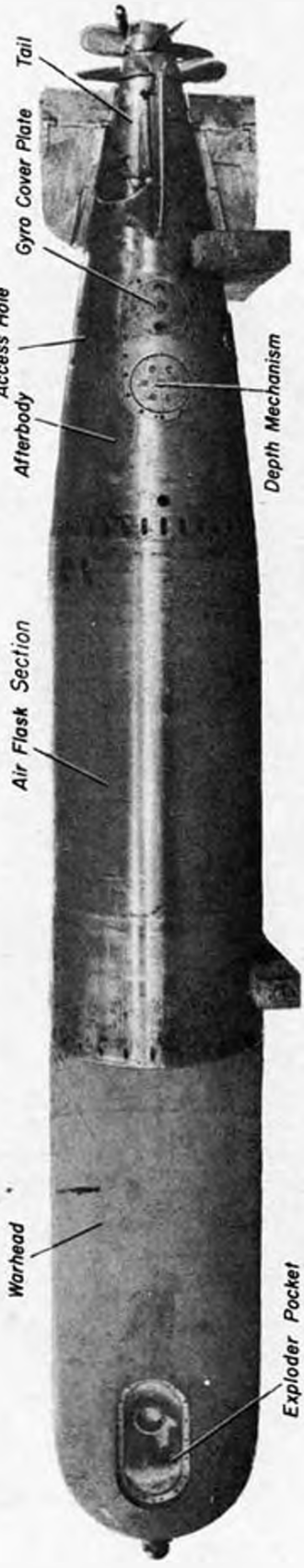


Fig A - U.S Torpedo Mk 13-3, Bottom View

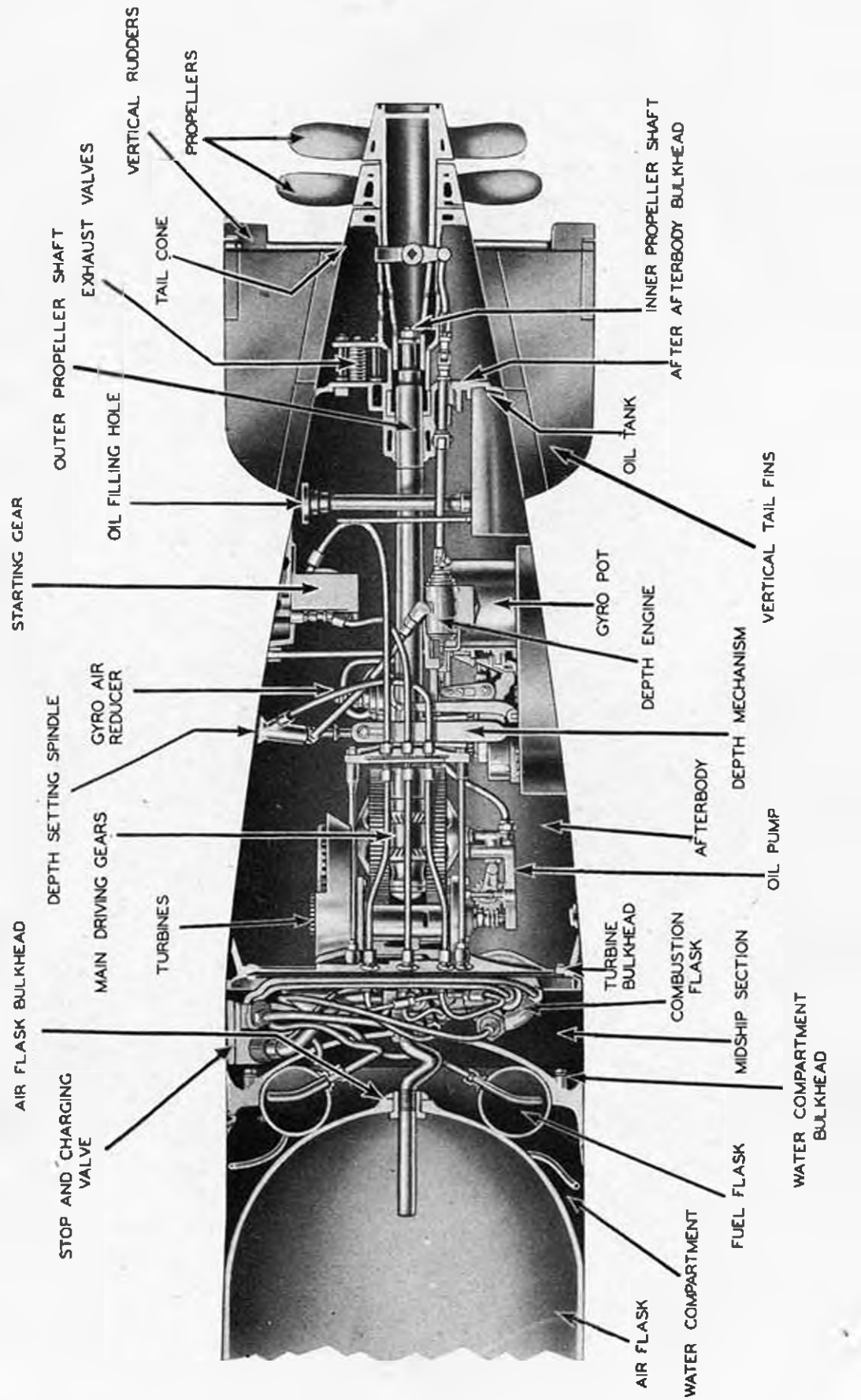


Fig. D - U.S. Torpedo Mk 13-3, After End, Sectional View

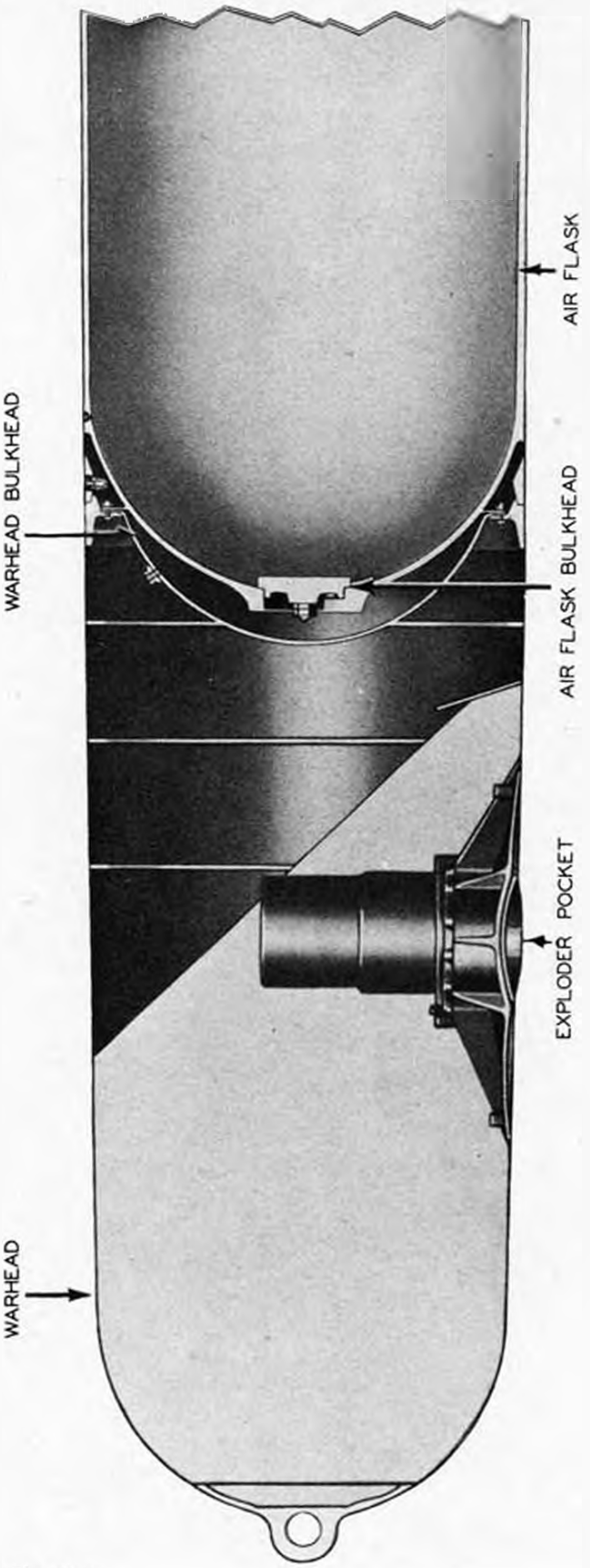


Fig. E - U.S. Torpedo Mk 13-3, Forward End, Sectional View

Torpedo Mark 14-3A (Mark 23 Mod 0 and Mark 23 Mod 1)

General

1. 21" air-driven torpedo, designed to be launched from submarines; may be launched from surface craft.

2. Fitted with warheads Mk 15-0, 15-1, 16-0, 16-1 or 16-4.

3. The torpedo is driven by a steam turbine engine and is capable of running 9000 yards at a speed between 31 and 32 knots or 4500 yards at a speed of between 45 and 47 knots.

Description

1. Lengths

Overall	20'5"
Warhead	3'11"
Air flask section	9'8"
Afterbody	5'3"
Tail	1'7"

2. Total weight in air — 3200 lb.

3. External fittings

(a) Air flask section

Guide stud	On top center line, 11'6" forward of after end.
Speed setting hole	7" to starboard from top center line, 7' forward of after end.
Stop valve	On top center line, 7'2" forward of after end.
Charging valve	1 1/2" to port from top center line, 7'2" forward of after end.

(b) Afterbody

Depth index	On top center line, 4'10" forward of after end.
Starting lever	2" to starboard from top center line, 4'5" from after end.
Gyro setting sockets	Two, 22" to starboard and to port, respectively, from top center line, 4'2" forward of after end.

*(c) Tail

Propellers	
Forward	Four-bladed, 19" span.
After	Four-bladed, 17" span.
Fins	Two vertical and two horizontal; length, including rudders, 13".

4. Internal arrangement of parts

(a) Air Flask Section - contains the following main parts:

(1) The air flask proper, a hollow cylinder of uniform outside diameter, closed at each end by a dome-shaped, steel bulkhead. Both the sides and the end bulkheads are built to withstand extremely high internal pressures.

(2) The water compartment, directly abaft the flask, is formed by the air flask forging. Its forward and after limits consist of the after bulkhead of the flask and a third dome-shaped bulkhead. The fuel flask is centrally located inside the compartment. The main air line to the air flask passes through the compartment. Access to the water compartment and fuel flask for filling purposes is gained through the top of the water compartment.

(3) The midship section, a short, cylindrical extension of the air flask and water compartment, connects the air flask section to the afterbody. The stop and charging valves and the air, fuel, and water check valves are all mounted around the shell

(Torpedo Mark 14-3A (Mark 23 Mod 0 and Mark 23 Mod 1), Cont'd.)

of the section. The space in the center of the section accommodates the following parts, each of which is attached to the forward end of the afterbody:

(i) A valve group, consisting of the starting, reduction and restriction valves. The starting valve opens when the starting gear is actuated, allowing air to pass through the reducing and restriction valves which reduce the air pressure until it is suitable for operating the turbine motor.

(ii) A combustion pot, wherein the burning fuel and air mix with water to form high-pressure gases and steam.

(iii) An igniter, mounted on the combustion pot, consisting of a small cap and a powder cartridge.

(iv) The speed-change mechanism.

(4) Access to the various fittings in the midship section may be gained through openings in the shell. During its run, the combustion pot is cooled by sea water entering these openings.

(b) Afterbody - contains the following main parts:

(1) The propelling mechanism consisting of:

(i) Two counter-rotating horizontal turbines.

(ii) Turbine nozzles mounted on the turbine bulkhead.

(iii) High- and low-pressure air leads.

(iv) A turbine reduction gear system.

(v) The propeller drive shafts.

(vi) The turbine exhaust system.

(2) The depth control and steering mechanisms consisting of:

(i) The steering gyroscope.

(ii) The hydrostatic pendulum depth mechanism.

(iii) The steering and depth engines.

(iv) The gyro angle setting device and rudder connections.

(c) Tail - contains the following main parts:

(1) Connections for both the vertical and horizontal rudders.

(2) Propeller drive shafts and sleeves. The two counter-rotating propellers are mounted on the sleeves directly abaft the case.

5. The Mk 23-0 and the Mk 23-1 differ from the Mk 14-3A only in that the lower speed range (31-32 knots) is omitted from their design. The Mk 23-0 is a modified Mk 14-3A whereas the Mk 23-1 is the production model of the single speed torpedo.

Operation

1. Before the torpedo is launched, its stop valve is opened slowly, allowing high pressure air (2800 lb/in^2) from the air flask to leak through the upper part of the starting valve and build up a pressure head behind the starting piston of the starting gear. When the torpedo is launched, the starting lever is tripped, raising the starting piston and allowing air to pass through the starting gear, thereby reducing pressure on top of the starting valve and allowing it to open. Opening the starting valve allows high pressure air to flow as follows:

(a) To the gyro spin where it quickly brings the gyro wheel up to its required speed, at which point the air is automatically shut off.

(b) To the reducing valve where its pressure is reduced to about 400 lb/in^2.

2. From the reducing valve, the air flows as follows:

(a) To the top of the fuel flask and water compartment where it forces fuel and water into the combustion flask.

(Torpedo Mark 14-3A (Mark 23 Mod 0 and Mark 23 Mod 1), Cont'd.)

(b) To the gyro, where it sustains the rate of gyro spin after the initial impetus of the high pressure air has been removed.

(c) To the depth and steering engines where it furnishes the power to operate the horizontal and vertical rudders.

(d) To the combustion flask where it mixes with the fuel and water.

(e) To the igniter on the combustion pot where it shears a thin shear plate, allowing a spring-loaded firing pin to impinge on the two igniter caps.

3. When the igniter fires, it shoots flame into the combustion pot for a few seconds, ignited the fuel and forming hot gases. The gases are cooled slightly by the water which turns into steam. The resulting mixture of hot gas and steam then passes, at high velocity, to the two turbines turning them at high speed. The turbines, in turn, rotate the impeller shafts through a simple reduction gear transmission.

4. The depth mechanism, consisting of a pendulum, a hydrostat, the depth engine and the horizontal rudders, keeps the torpedo at the depth set on the depth index prior to launching.

5. The steering mechanism, consisting of the gyro, a pallet mechanism, the steering engine and the vertical rudders, keeps the torpedo on the course set prior to launching.

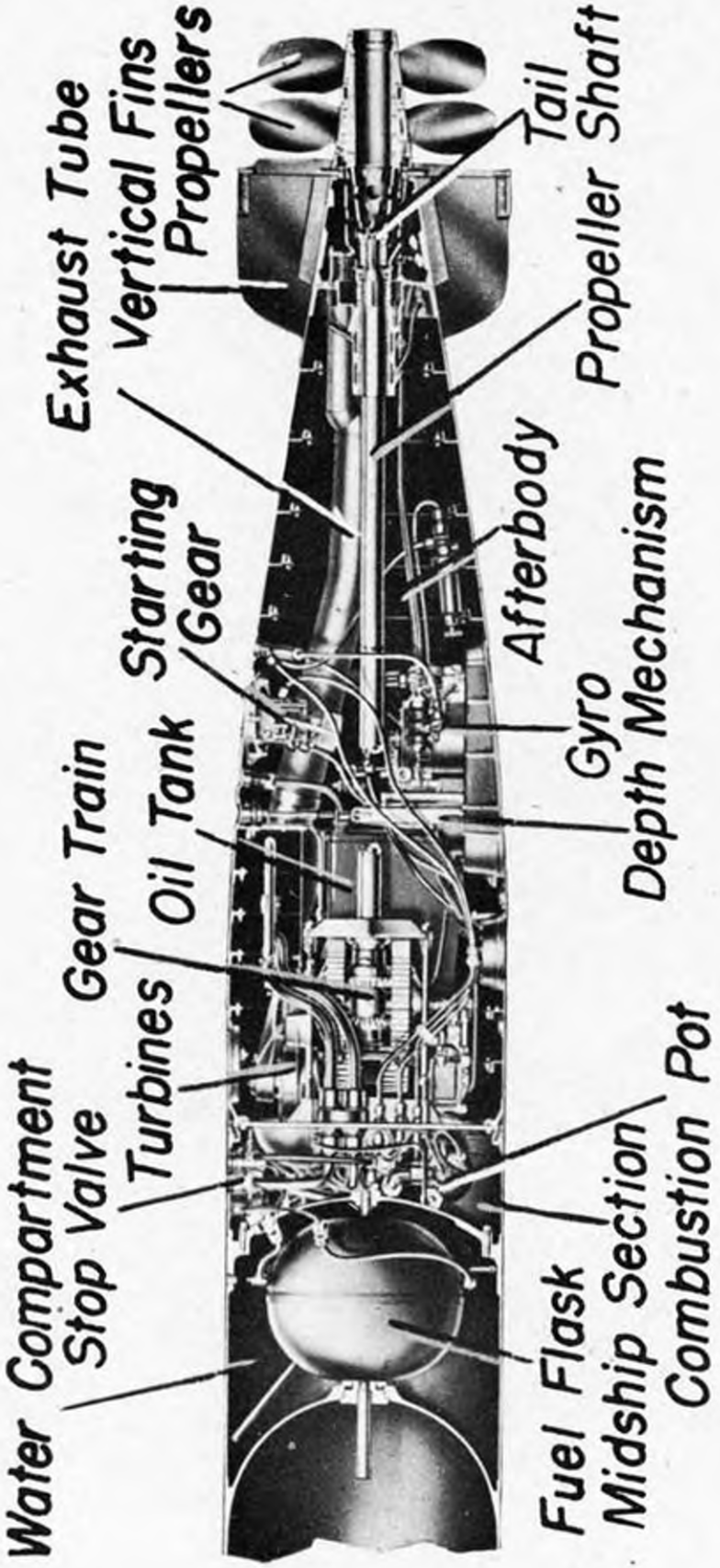


Fig. F - U.S. Torpedo Mk 15-1, After End, Sectional View

Torpedo Mark 15 Mods 1 and 2 (Mark 15 Mod 3)

General

1. 21" air-driven torpedo, designed to be launched from surface craft; may be launched from submarines.

2. Fitted with warheads Mk 15-0, 15-2, 17-0 and 17-2.

3. The torpedo is driven by a steam turbine engine and is capable of running 6000 yards at a speed of 49 knots, 10,000 yards at 34 knots, or 15,000 yards at 27 knots.

Description

1. Lengths

Overall	23'11"
Warhead	4'10"
Air flask section	12'3"
Afterbody	5'3"
Tail	1'7"

2. Total weight in air — 3850 lb.

3. External fittings

(a) Air flask

Guide stud	On top center line, 12'3" from after end.
Stop valve	On top center line, 8'6" forward of after end.
Charging valve	1 1/2" to port of top center line, 8'6" forward of after end.
Speed setting hole	7" to starboard from top center line, 7' forward of after end.

(b) Afterbody

Depth index	On top center line, 4'10" forward of after end.
Starting lever	2" to starboard from top center line, 4'5" forward of after end.
Gyro setting sockets	Two, 22" to starboard and to port respectively from top center line, 4'2" forward of after end.

(c) Tail

Propellers	
Forward	Four-bladed, 19" span.
After	Four-bladed, 17" span.
Fins	Two vertical and two horizontal; length, including rudders, 14".

4. Internal arrangement of parts

(a) The general arrangement of internal parts is very similar to the Mk 14-3A.

5. The Mk 15-3 differs from the Mk 15-1 and 15-2 in that it employs only a single gyro setting socket, located on the bottom center line.

Operation

1. Similar to Mk 14-3A.

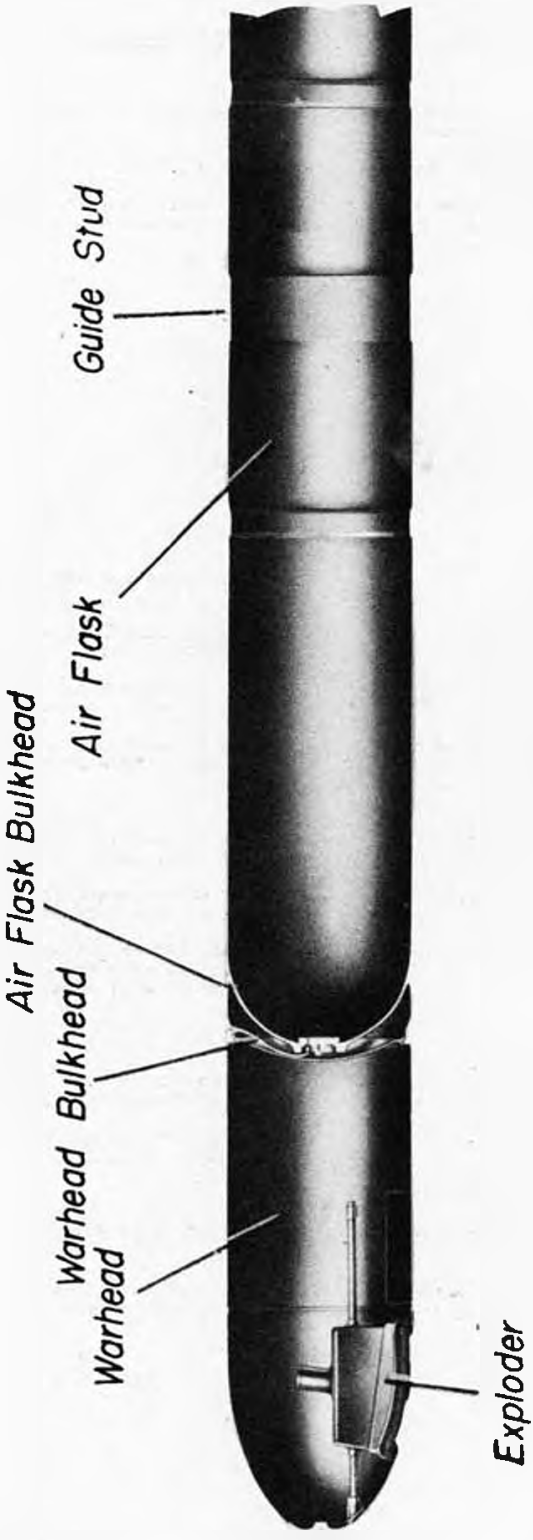


Fig. G - U.S. Torpedo Mk 15-1, Forward End, Sectional View

Torpedo Mark 18 Mod 1 (Mark 18 Mod 2)

General

1. 21" electrically-driven torpedo, launched from submarines.
2. Fitted with warhead Mk 18-1 or Mk 18-2.
3. The torpedo is driven by a DC-powered, series-wound motor and is capable of running 4000 yards at a speed of 29 knots.

Description

1. Lengths

Overall	20'6"
Warhead	3'11"
Battery compartment	10'6"
Afterbody	4'6"
Tail	1'7"

2. Total weight in air — 3000 lb.

3. External fittings

(a) Battery compartment

Guide stud	On top center line, 11'8" forward of after end.
Access holes	Eight; seven on top center line, three forward and four abaft the guide stud; one to port from top center line, near after end of section.

(b) Afterbody

Depth index	On top center line, 4'10" forward of after end.
Starting lever	2" to starboard from top center line, 4'5" forward of after end.
Stop valve	On top center line, 3'9" forward of after end.
Charging valve	1 1/2" to port from top center line, 3'9" forward of after end.
Gyro setting sockets	Two, 22" to starboard and to port respectively from top center line, 4' forward of after end.
Access holes	Two, to starboard and to port respectively from top center line, just forward of gyro setting sockets.

(c) Tail

Propellers	
Forward	Two-bladed, 17" span.
After	Two-bladed, 16" span.
Fins	Two vertical and two horizontal; length, including rudders, 25".

4. Internal arrangement of parts

(a) Battery Compartment - contains the following main parts:

(1) The propulsion battery, consisting of 80 lead-acid storage cells connected in series. The 80 cells are divided into three sections, each of which is further subdivided into units of six cells each (Mk 18-2 contains 72 cells in two sections). This arrangement supplies about 140 volts to the motor.

(2) The motor operating compartment, separated from the battery mounting by a watertight bulkhead, comprises the after part of the battery compartment section and houses the battery switch, charging plug (mounted in tail in Mk 18-2), battery heater relay switch and poppet valve. Part of the motor, which is mounted in the afterbody, protrudes into the motor operating compartment.

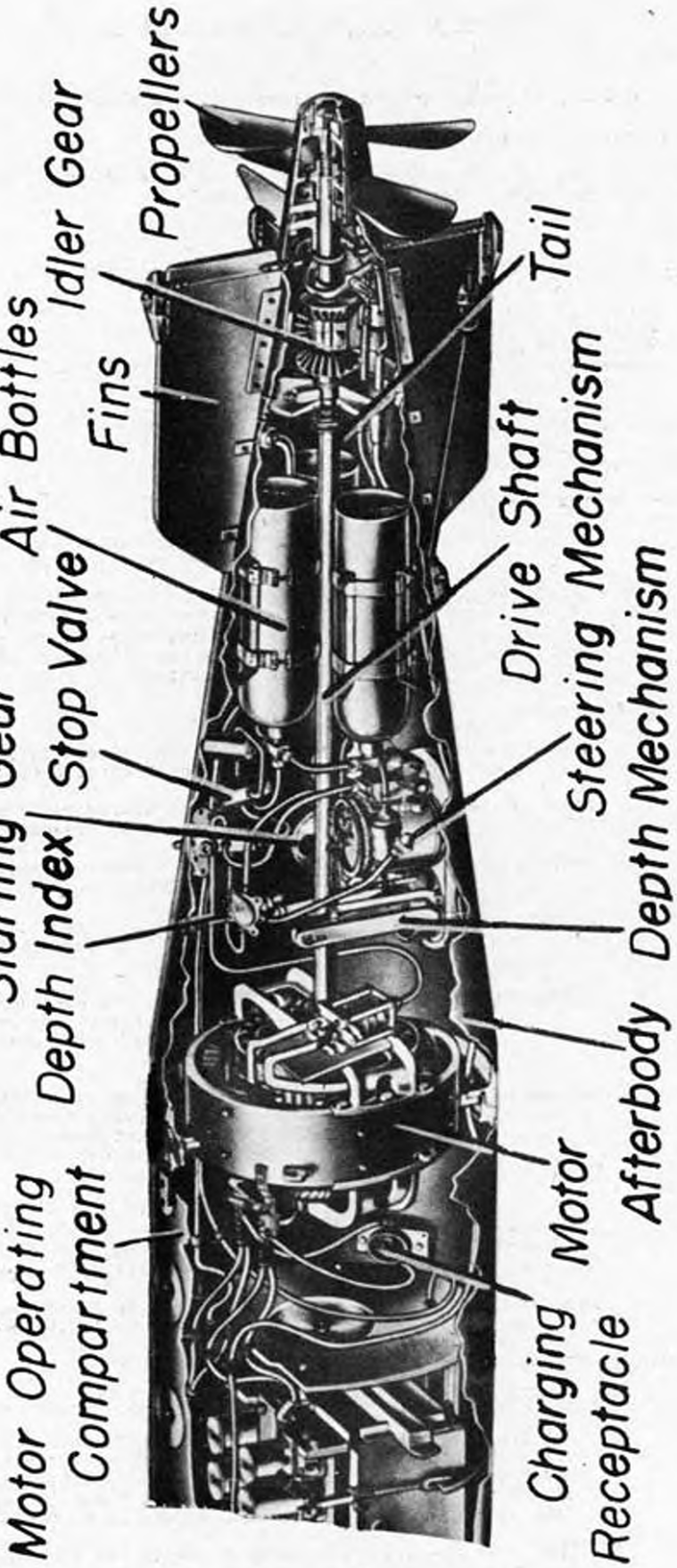


Fig. H - U.S. Torpedo Mk 18-1, After End, Sectional View

(Torpedo Mark 18 Mod 1 (Mark 18 Mod 2), Cont'd.)

(b) Afterbody - contains the following main parts:

(1) A six-pole, D. C. series motor at the forward end.

(2) The propeller shafts.

(3) The depth control and steering mechanism with their associated parts. High pressure air, stored in three small bottles near the after end, is used to start the gyro and propulsion motor. Air from these same bottles is passed through a reducing valve and then used as low-pressure air to operate the steering and depth control engines which are located in the after part of the section.

(c) Tail - contains the following:

(1) An idler gear system which transmits rotary motion from the main drive shaft to the propeller drive shafts.

Operation

1. Before launching the torpedo, its stop valve is opened, allowing high pressure air (2800 lb/in^2) from the air bottles to flow to and build up pressure behind the starting valve in the starting gear body. When the torpedo is launched, the starting lever is tripped, thereby unseating the starting valve and allowing high pressure air to flow as follows:

(a) To the gyro spin where it quickly brings the gyro wheel up to the required speed, at which point the air is automatically shut off.

(b) To the motor switch where it operates the switch, starting the motor.

(c) To the reducing valve where its pressure is reduced to about 400 lb/in^2. From the reducing valve, the air flows to the depth and steering engines, where it furnishes the power to operate the horizontal and vertical rudders, and to the power cylinder of the motor control unit.

2. When the motor switch operates, it makes two contacts, allowing current to flow from the battery through the motor which then turns at a speed of 1620 R. P. M. A motor control unit, consisting of a governor and a hydraulic cylinder, regulates motor speed and maintains the 1620 R. P. M. speed, regardless of battery potential, for the first 4000 yards of the torpedo's run. The motor revolves the two propellers through an idler gear assembly.

3. The depth and steering mechanisms are very similar to those in the Mk 14-3A, the main difference being that no further air is supplied to the gyro after the high pressure starting air is cut off.

Special Precautions

1. Note that the batteries may evolve hydrogen which is particularly sensitive to static electric discharges. Should quantities of this gas be collected in the battery compartment, an extremely dangerous condition prevails which is likely to result in a serious explosion. As a preventative measure, always remove one of the access hole covers from the battery compartment before rendering the torpedo safe.

2. Reach in through the after access hole of the battery compartment and rotate the hand-operated knob of the disconnect switch clockwise to its limit stop. The switch is mounted in the motor operating compartment on the starboard side and rotation of the knob as prescribed above disconnects the battery and motor.

3. Lock the propellers (See Introduction) but bear in mind that no lock may be relied upon when dealing with electric torpedoes. If the motor is able to overcome starting torque when a strong propeller lock is fitted, the drive shaft may break. If this occurs, the motor, running free with no load, will probably fly apart.

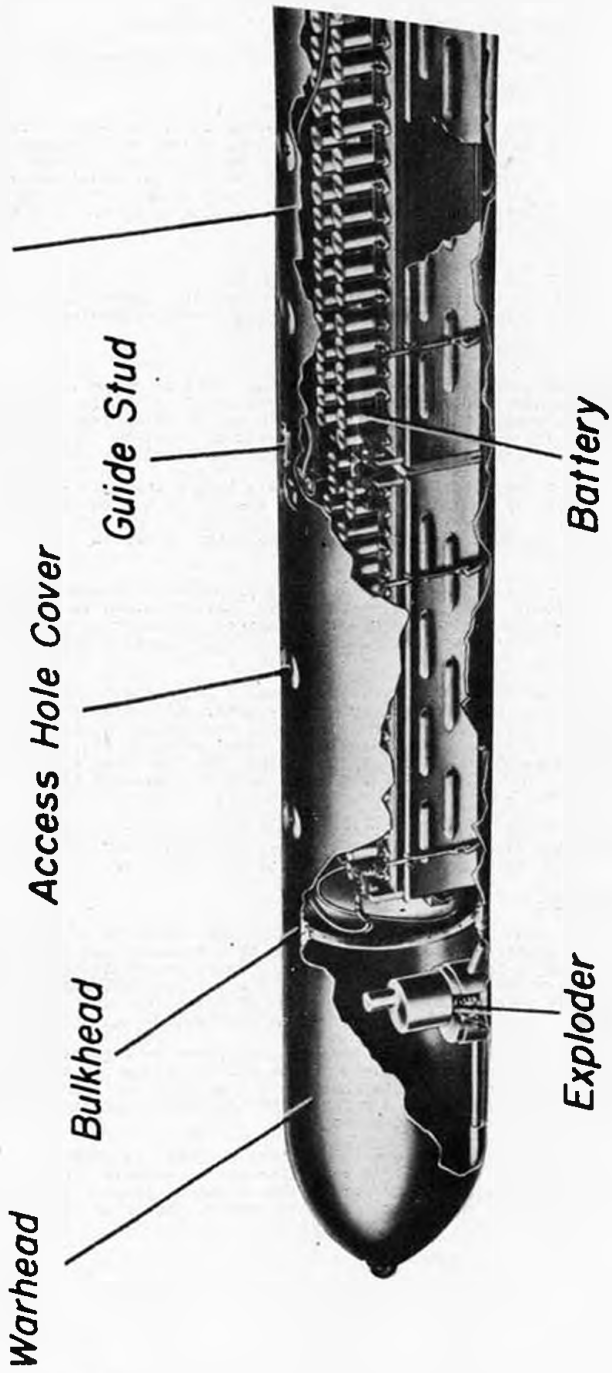


Fig 1 - U.S. Torpedo Mk 18, Forward End, Sectional View

Exploders Mk. 3-1, 3-2, 3-3, 3-4

General

1. Impact-inertia type.

2. Fits in the bottom of the warhead, forward of the transverse center line.

Description

1. The exploder is mounted on a round base plate 3½" in diameter, and secured in the warhead by six screws. The exploder weighs 5 1/4 lbs.

2. The main working parts are:

   (a) A three-bladed arming impeller set in a well alongside the exploder pocket.

   (b) An arming gear, operated by the impeller through a gear train.

   (c) An arming screw, threaded to the arming gear internally.

   (d) An inertia ball-and-trigger assembly for releasing the spring-loaded firing pin.

   (e) A detonator carrier, screwed into a detonator safety chamber mounted on top of the exploder and secured to the arming gear by four screws.

Operation

1. After the torpedo has been launched, the impeller revolves, due to the water travel, driving the gear train and rotating the arming gear. Th. performs three functions:

   (a) It moves the detonator carrier into the booster by the rotary motion of the detonator safety chamber.

   (b) It compresses the firing spring by the upward movement of the arming screws

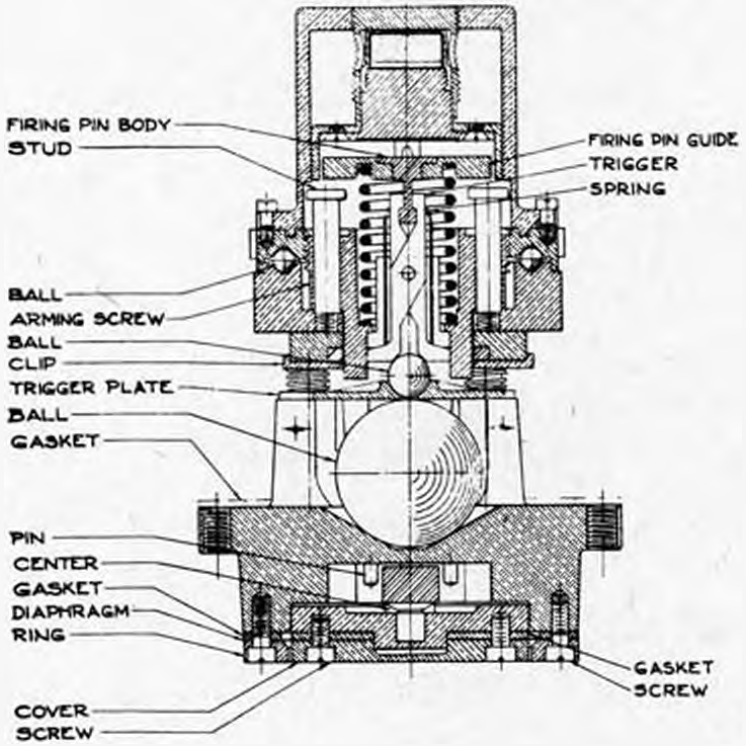


Fig. 1-- Mk. 3 Type Exploder, Unarmed

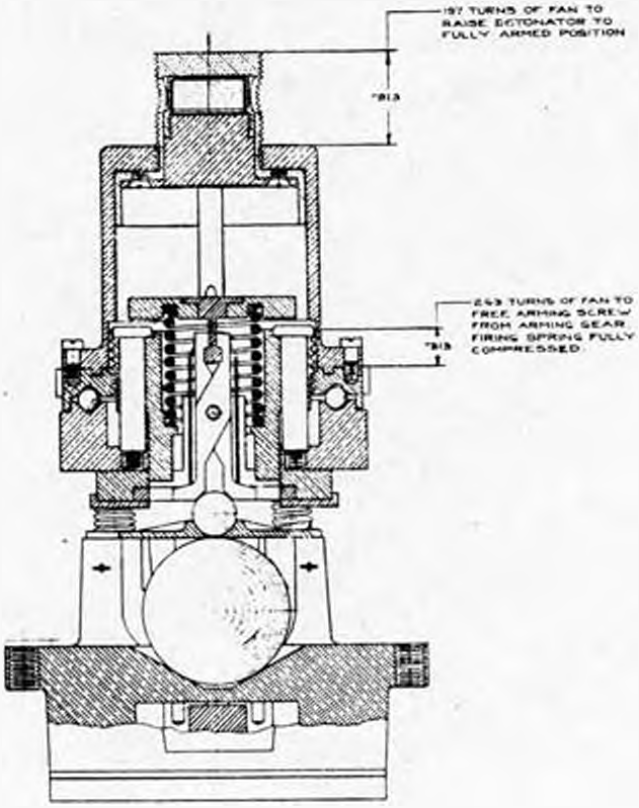


Fig. 2-- Mk. 3 Type Exploder, Armed

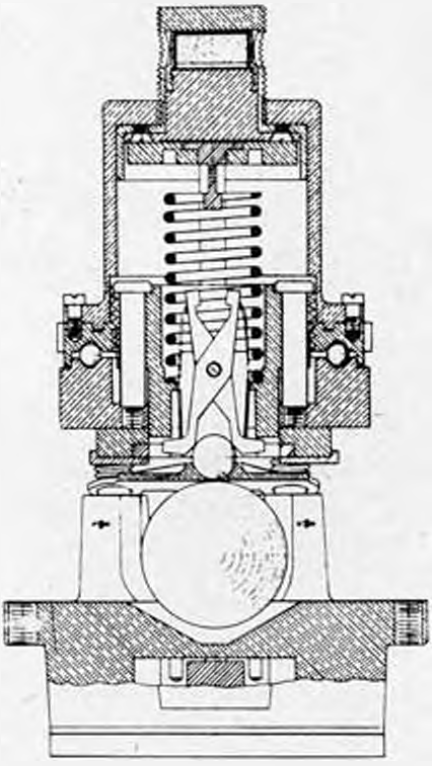


Fig. 3-- Mk. 3 Type Exploder, Fired

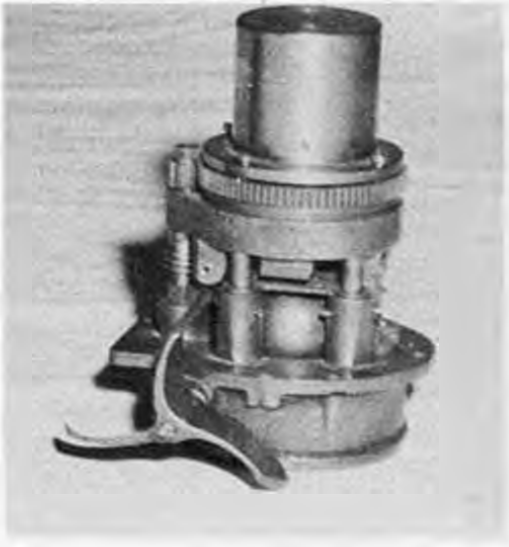


Fig. 4-- Mk. 3-2 Exploder, Unarmed

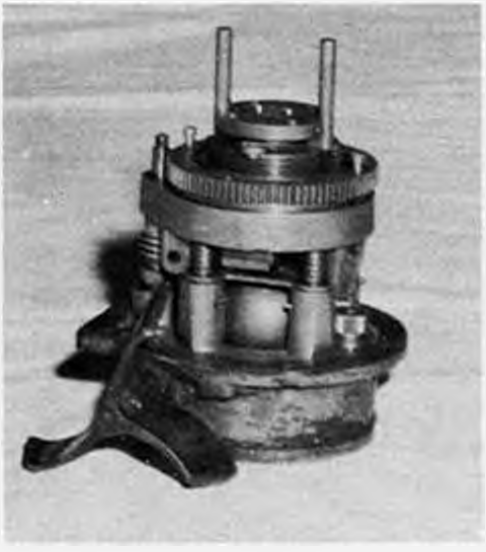


Fig. 5-- Mk. 3-2 Exploder Armed With Safety Chamber Removed

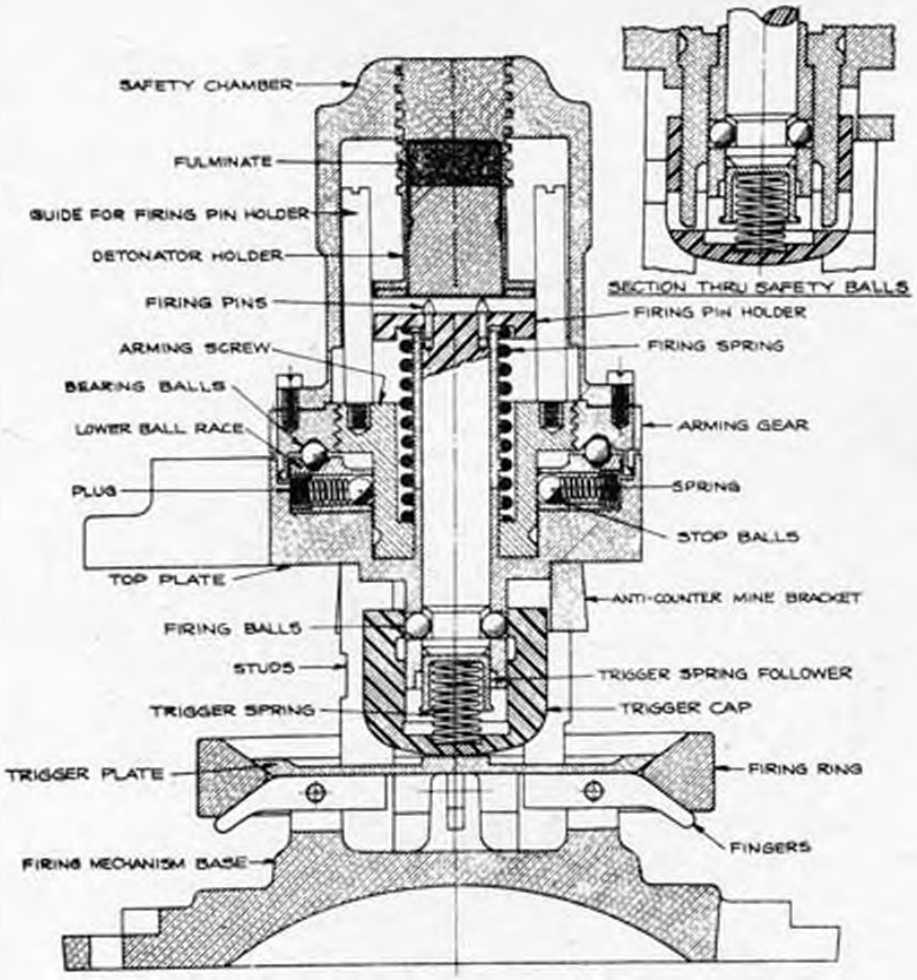


Fig. 6-- Mk. 4 Type Exploder, Unarmed

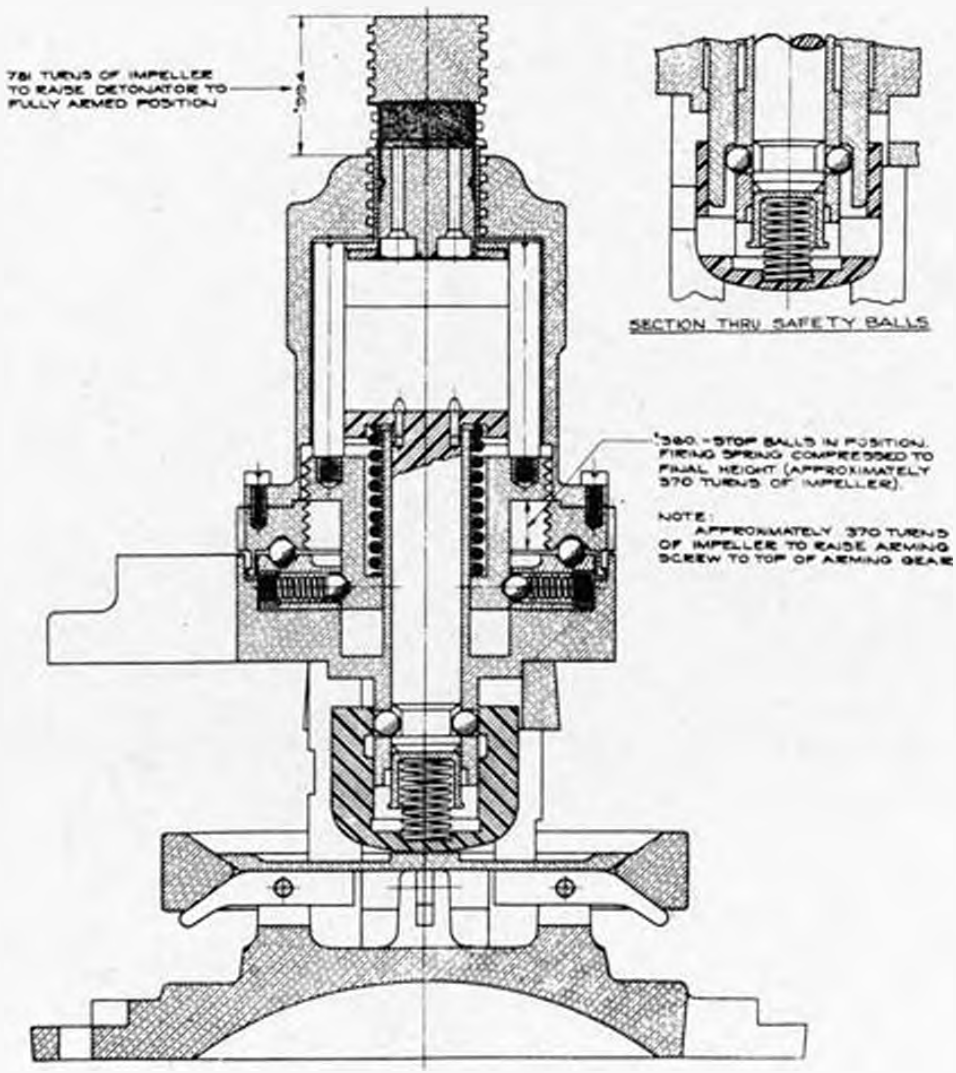


Fig. 7-- Mk. 4 Type Exploder, Armed

(c) It unlocks the trigger mechanism by the upward movement of the arming screw.

Arming is normally completed in approximately 140 yards of water travel.

2. The exploder operates when the torpedo receives a blow sufficient to cause a large inertia ball to roll up the slope of a dish-shaped seat in which it rests. This upward movement operates the trigger device, unlocking a scissors which holds the spring-loaded striker, allowing it to impinge on the detonator.

Precautions

1. Do not attempt to render safe unless absolutely necessary.

2. Assume that the exploder is armed, since its condition cannot be determined by an examination of the exterior. A blow of less than five lbs. will fire the exploder.

3. Lock the torpedo propeller (or propellers) with a standard torpedo lock or a suitable length of chain. Should the motor start to run, the propeller is very dangerous.

4. Do not move or jar the torpedo except from a safe distance. In handling the exploder, do not move the inertia-firing device.

Rendering-Safe Procedure

1. Lock the impeller with tape or other suitable means.

2. Remove the exploder from a safe distance.

3. Remove the safety chamber from the exploder body. This unit contains the detonator carrier, and is secured to arming gear by four screws.

4. Remove the booster from the warhead.

5. Dispose of detonator, booster and charge.

Exploders Mark 4 and 8 and Mods.

General

1. Inertia-impact type.

2. Fits in bottom of warhead, forward of the transverse center line. The Mk. 8-1, 8-3, 8-5 and 8-7 exploders, which are used with the Mk. 18 warheads, fit aft the transverse center line.

Description

1. The exploder is mounted on a heavy brass base plate. The weights of the various modifications and the dimensions of the different plates are given in Table IV. The exploders fitted with round base plates are secured to the warhead pocket by 12 countersunk screws. Those with oval base plates are secured by 18 screws.

2. The main working parts of the exploder are:

(a) A detonator and safety chamber assembly almost identical to that fitted in the Mk. 3 and Mods.

(b) A 15-bladed arming impeller housed in a channel in the base plate.

(c) An arming gear assembly similar to that fitted in the Mk. 3 and Mods.

(d) An inertia firing-ring assembly (not similar to that fitted in the Mk. 3) which releases locking balls and a spring-loaded firing pin.

Operation

1. The arming gear revolves, driving the gear train as in the Mk. 3, performing three functions:

(a) It houses the detonator carrier in the booster.

(b) It compresses the arming screw compressing the firing spring.

(c) It allows the lug extensions on the arming screw to release the safety balls, and unlocks the firing pin and the inertia firing assembly.

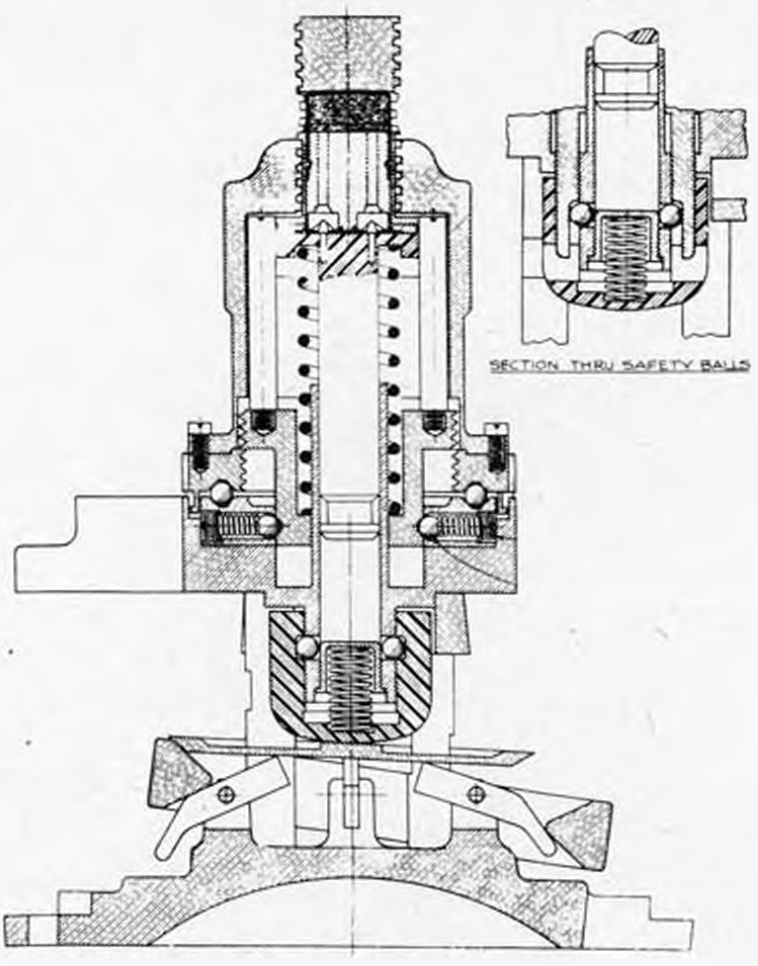


Fig. 8-- Mk. 4 Type Exploder, Fired

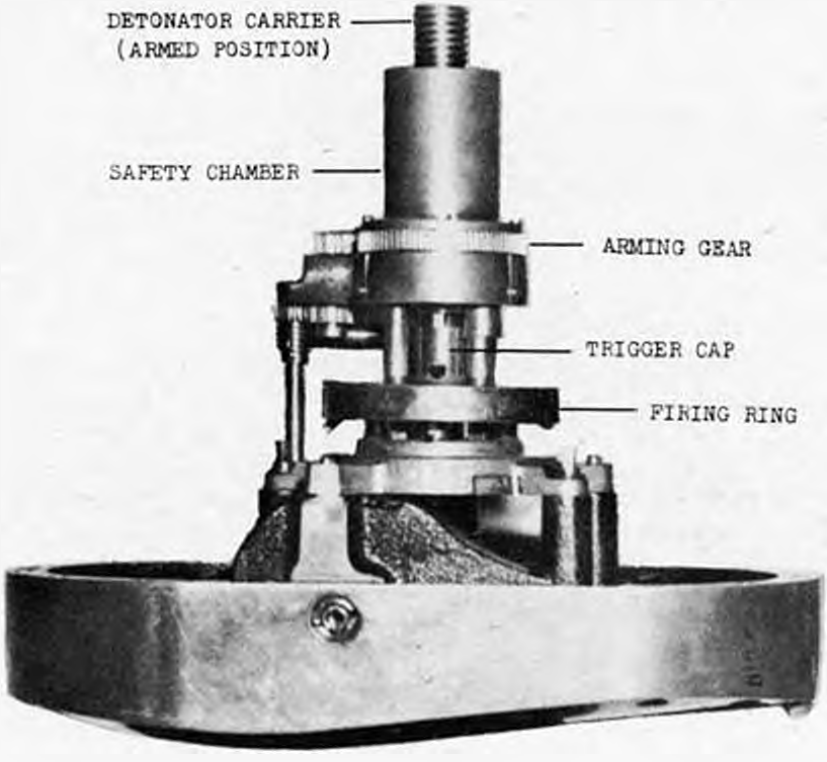


Fig. 9-- Mk. 4-1 Exploder

Arming is normally completed in approximately 350 yards of water travel.

2. The exploder operates when the torpedo receives a blow sufficiently heavy to cause movement of the inertia firing ring. Movement in any direction will lift a trigger cap, releasing locking balls, and allowing the spring loaded striker to impinge on the detonator.

Precautions

1. Same as for the Mk. 3.

Rendering-Safe Procedure

1. Stuff rags or other suitable material into the channel of the base plate to lock the impeller.

2. Using a standard exploder socket wrench, remove the 12 (18 if the base plate is oval) countersunk screws which secure the exploder to the warhead.

3. Screw standard exploder-handling tools into the two extra holes tapped in the base plate on the fore-and-aft center line of the exploder. These holes will not have screws fitted in them.

4. Secure a bridle to the handling tools, and remove the exploder from a safe distance.

5. Remove the detonator safety chamber as prescribed for the Mk. 3, and dispose of it, along with the booster and the charge.

Exploders Mark 6 and Mods. (except Mk. 6-5 and 6-6)

General

1. Impact-inertia and magnetic influence type.

2. Fits in bottom of warhead, forward of the transverse center line.

Description

1. The exploder is mounted on a rectangular, brass base plate, 14½" by 12", and is secured in the warhead by 24 countersunk screws. The exploder weighs 90 lbs.

2. (a) The impact-inertia firing device is identical to the Mk. 4 type.

   (b) The magnetic firing device is of the induction type. The search coil is housed in a short cylindrical container 12" long and 4" in diameter. The core rod is 34" long, and is inserted through a plug in the nose of the warhead, passing through the warhead and search coil longitudinally. The unit is energized by a small generator driven by a 15-bladed water wheel mounted in the base plate. Other parts include a thyratron firing tube; a voltage control tube which controls generator voltage; and a solenoid. The latter converts electrical energy into mechanical energy to trigger the firing ring of the inertia-impact firing mechanism through a lever system.

Operation

1. (a) The impact-inertia firing device is armed in the same manner as the Mk. 4.

   (b) The magnetic firing device arms by the action of a small, spring-loaded switch that operates at the end of the torpedoe's safety run, allowing the generator to energize the unit. The solenoid lever system is unlocked by an additional safety lug on the arming screw when it rises upward during arming.

2. (a) The impact-inertia section fires in the same manner as the Mk. 4.

   (b) The torpedo must be in motion for the magnetic section to operate. As the torpedo passes the target at a range between 5 and 20 ft., the magnetic field of the target will induce an EMF in the search coil. This current alters the charge on the control grid of the thyratron tube, allowing the tube to pass high-voltage generator current which has previously been blocked by the control grid. This current energizes the solenoid, moving a push rod sharply upward, thereby tripping the solenoid lever system, and operating the impact-inertia firing ring mechanism.

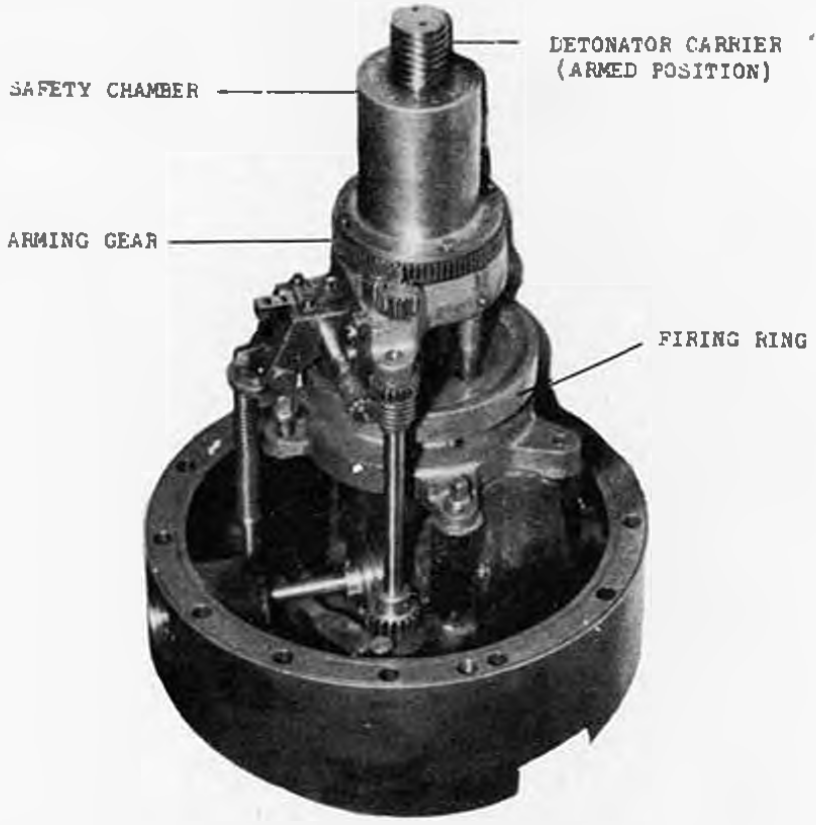


Fig. 10-- Mk. 4-2 Exploder

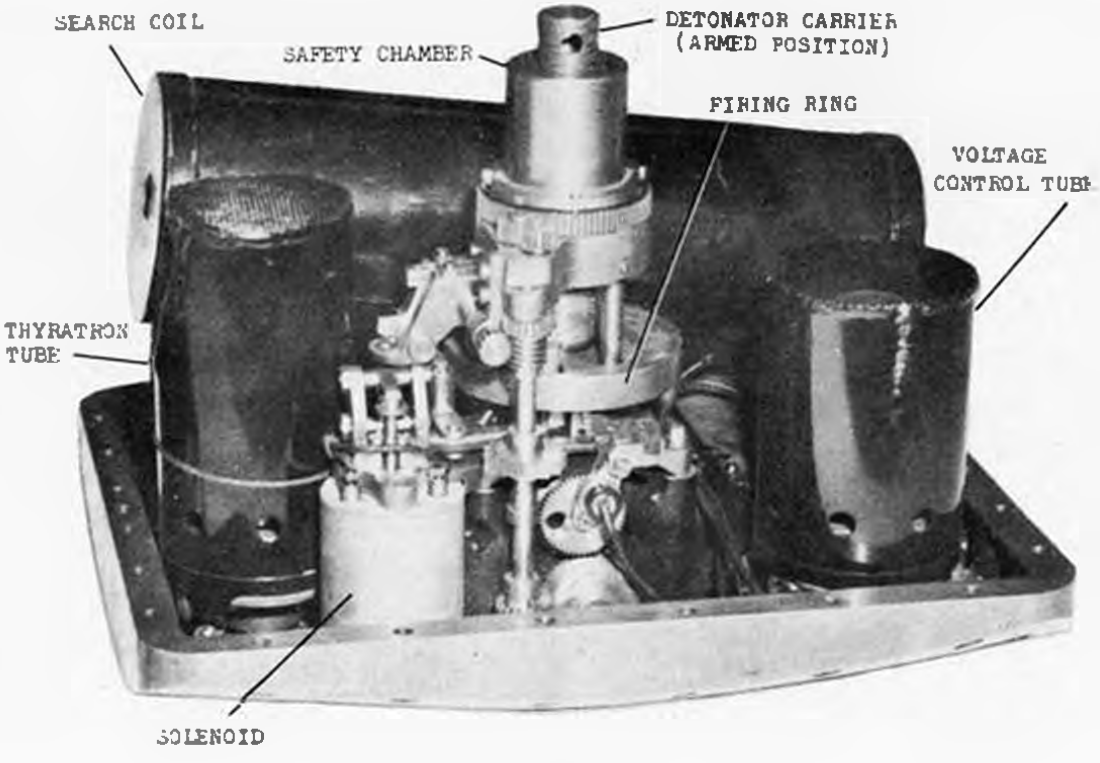


Fig. 11-- Mk. 6-1 Exploder

Precautions

1. Same as for the Mk. 3.

Rendering-Safe Procedure

1. Same as for the Mk. 4 with the following exceptions:

   (a) The exploder is secured to the warhead by 24 countersunk screws.

   (b) Before the exploder can be removed from the warhead, the core rod must first be removed. This may be done by removing the screwed-in plug, washer and felt pad from the small opening near the nose of the warhead, and then removing the core rod.

Exploders Mark 6-5 and 6-6

General

1. Same as the Mk. 6.

Description

1. These exploders differ from the other modifications of the Mk. 6 as noted below:

   (a) The firing speed of the impact-inertia device has been increased considerably through use of an electric detonator. This is mounted in the same manner as the percussion detonator in the other exploders, except that it has leads connecting it to an 8-mf. condenser, mounted on the base plate. A small, impact-operated inertia switch is also mounted on the exploder to close the detonator circuit on impact. This switch consists of a small leaf spring, which holds an inertia ball in a socket. Movement of the ball bends the spring to close the firing circuit. Since electric firing is employed, the percussion striker and trigger assemblies are removed.

   (b) The presence of the electric detonator does away with the need for the solenoid and lever assembly in the magnetic firing device.

   (c) Dummy weights have been added to the exploder framework to compensate for the loss of weight due to the various changes.

Operation

1. (a) The inertia-impact firing device is armed when, at the end of a safety run, the condenser is charged by the generator.

   (b) The magnetic firing device arms in the same manner as the Mk. 6.

2. (a) The impact-inertia firing device fires when the inertia switch closes, allowing the condenser charge to fire the detonator. An impact of only 28 oz. will close the inertia switch.

   (b) The magnetic device fires in the same manner as the Mk. 6, except that the thyratron tube passes current directly to the detonator instead of energizing a solenoid.

Precautions

1. Same as for the Mk. 3. Note, however, that the impact-inertia firing mechanism is much more sensitive, and should be handled accordingly.

Rendering Safe Procedure

1. Same as for the Mk. 6, except that the electric detonator leads must be cut before removing the detonator safety chamber.

Exploder Mark 5 and Mods.

General

1. Impact-inertia exploder.

2. Fits in bottom of warhead, forward of the transverse center line.

Description

1. This exploder is essentially a Mk. 6 type exploder with the magnetic firing device removed. Dummy parts are mounted on the base plate to compensate for the loss of weight caused by the modification.

Fig. 12-- Mk. 13 Warhead With Mk. 4-1 Pistol

Fig. 13-- Mk. 15 Warhead With Magnetic Pistol Removed

Operation and Precautions

1. Same as for the impact-inertia firing device on the Mk 6.

Rendering Safe Procedure

1. Same as for the Mk 6, except that no core rod is fitted.

Exploder Mark 10 Mod 3

General

1. Combination magnetic-induction, impact-inertia type exploder.

2. Fits in pocket of all warheads which receive Mk 6 and Mods exploder. However, it is intended for use at present in submarine torpedoes Mk 14 and 23 and Mods which are fitted with warheads Mk 15, 16 and Mods.

Description

1. The Mk 10-3 employs the same type base as the Mk 6-1 and the mechanical arming and impact firing assemblies are the same except for minor modifications. The magnetic firing device, however, differs radically from the Mk 6-1 type.

2. The magnetic firing device consists of the following:

   (a) A coil and core rod, identical to the type employed in the Mk 6 type exploder.

   (b) Two dry battery sections enclosed in a watertight brass housing and mounted in the base of the exploder on the forward edge. Section "B" supplies 100 volts, Section "A" 6 volts, to the electronic unit.

   (c) An electronic unit, consisting of the electronic circuit components, the arming switch and the terminal plate, is contained in a second watertight brass housing opposite the battery at the after edge of the base plate. The terminal plate is beneath a rectangular cover on top of the housing.

   (d) An arming switch, mounted in the electronic unit, consisting of 6 cam-operated sections on a cam shaft. The switches are mounted in such a manner that the three normally open and three normally closed switches operate after 3/4 turn of the cam shaft which is rotated by the arming switch gear train and the impeller.

   (e) An inactivating switch, mounted on one side of the electronic unit housing. A slotted shaft, which operates the switch, protrudes down from the switch mounting. Clockwise rotation of the shaft closes a pair of contacts, shorting out the filament of the thyratron and preventing it from heating, thus rendering the magnetic firing device inert. Access to the slotted shaft of the inactivating switch may be gained through the small plug on the exploder base. The plug consists of a screw, 1/2" in diameter, located in the center of the exploder base plate, 4 3/4" forward of the after edge.

   (f) An electric cap gun, mounted between the induction coil housing and the mechanical firing device on two vertical support studs of the mechanical firing device. Leads from the electronic unit pass into the cap gun and are wired to a small electric cap. A small brass pellet is sealed in the gun directly above the impact firing ring in such a position as to impinge on the ring when the gun fires.

   (g) Eight external leads, led through a rubber packing gland to the terminal plate in the electronic unit housing, four from the battery and two each from the coil and cap gun.

3. Method of Mounting

   (a) The exploder is slipped into the warhead and is secured by 24 screws.

Operation

1. (a) Impact section.

   Same as Mk 4 and 8 type exploders. Arming is complete after a 350 yard run or 780 turns of the impeller.

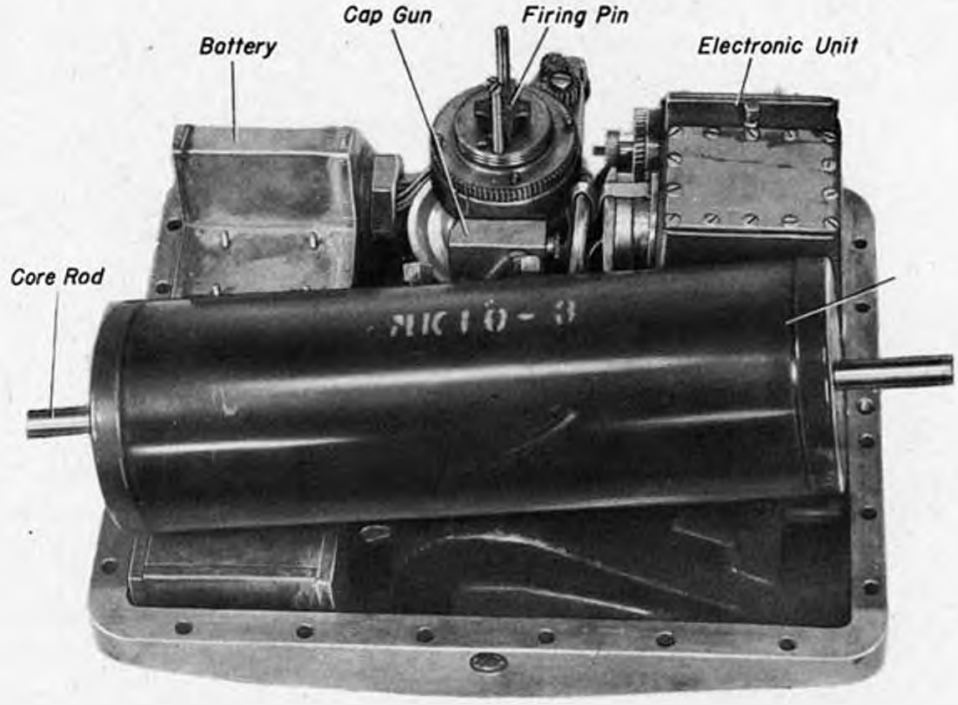


Fig. 14 - Mk 10-3 Exploder

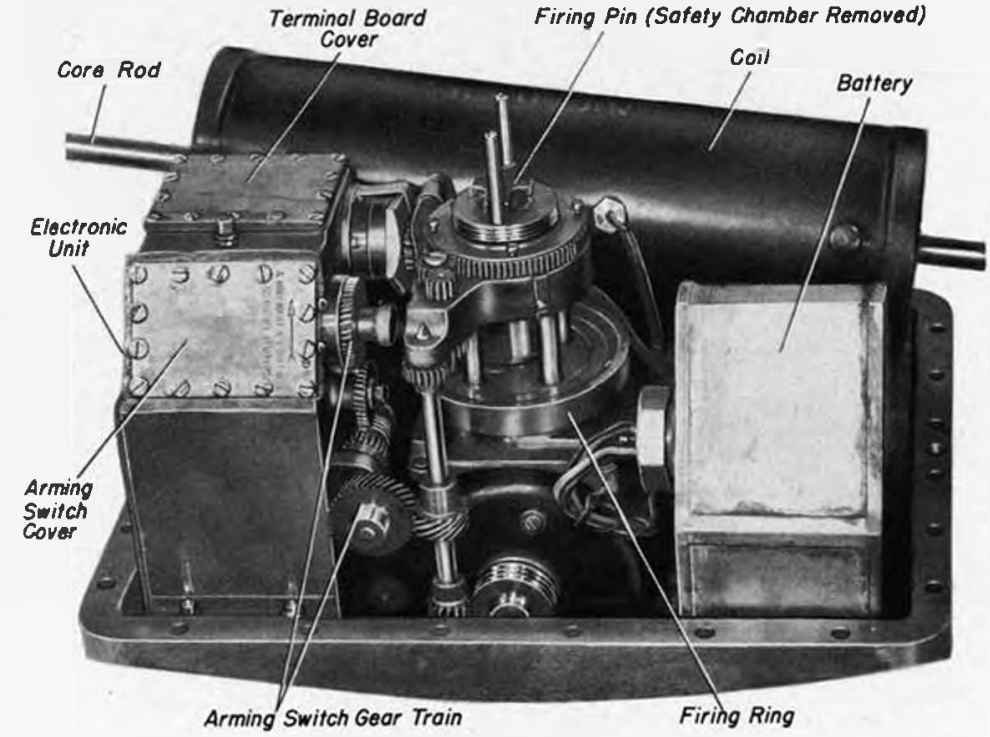


Fig. 15 - Mk 10-3 Exploder

(b) Magnetic section.

The vertical drive shaft geared to the impeller rotates the arming switch gear train. The partial spur gear of the gear train rotates the cam shaft. The cam shaft rotates about 3/4 of a turn and operates the six switches in sequence. When the sixth switch is operated after approximately 525 yards of water travel and 1175 impeller turns, the magnetic section is fully alive and armed. At this point the 45° cutout section of the partial spur gear disengages the gear train and the cam shaft ceases to revolve.

2. (a) Impact section.

Same as Mk 4 and 8 type exploders.

(b) Magnetic section.

When the torpedo passes within the magnetic field of a target, the resultant change in the surrounding magnetic field causes the core rod and coil to generate voltage which is rectified by a diode network and applied to the grid of the triode amplifier. The output of this triode is coupled to the firing thyratron through a diode arrangement which permits the thyratron to fire only when the amplifier output has reached a peak and started to decrease. At this point, usually just before the warhead reaches the keel of the ship, the thyratron fires and discharges the firing condenser through the electric cap. Detonation of the cap ejects the brass pellet which impinges on top of the firing ring, actuating the mechanical exploder.

Precautions

1. Normal torpedo and magnetic precautions.

2. Wait a minimum period of eight hours, preferably longer, before commencing RMS. This will permit the operating voltage from the battery to drop below the minimum required to keep the magnetic section alive. Tests indicate that the battery will drain below the minimum in four hours.

3. If necessary to move a torpedo with a live magnetic exploder, it should be moved slowly along, or rolled on, its longitudinal axis to minimize signals from earth's field.

4. Avoid contact with firing ring of mechanical assembly.

RMS

1. Remove the small screw plug from the exploder base. Considerable force may be necessary to break the seal.

2. Insert a screwdriver in the plug hole, placing the blade in the slotted shaft of the inactivating switch. Rotate the shaft clockwise as far as it will go (about five full turns).

Note: If this operation is carried out on a live exploder, the magnetic sensitivity immediately increases 50% but drops off to zero in 30 seconds and the exploder is dead magnetically. There is no danger of firing if no magnetic material is moved in the vicinity. The switch may have been turned off prior to launching the torpedo.

3. Remove the exploder securing screws (tool #49).

4. Remove the core rod as in RMS Mk 6-1.

5. From a safe distance, retract the exploder using two lifting tools (tool MF-2).

6. Cut and tape the two leads to the cap gun.

7. Remove the safety chamber which houses the detonator. It is secured to the arming gear by four screws.

8. Unscrew the screwed plug in the cap gun.

9. Gently withdraw the plug, leads, packing gland and cap from the gun.

10. Dispose of all explosive elements.

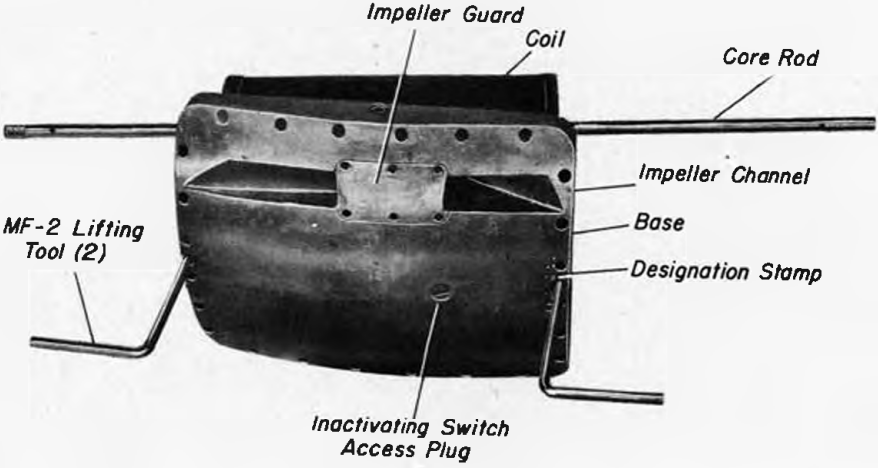


Fig. 16 - Mk 10-3 Exploder, Bottom View

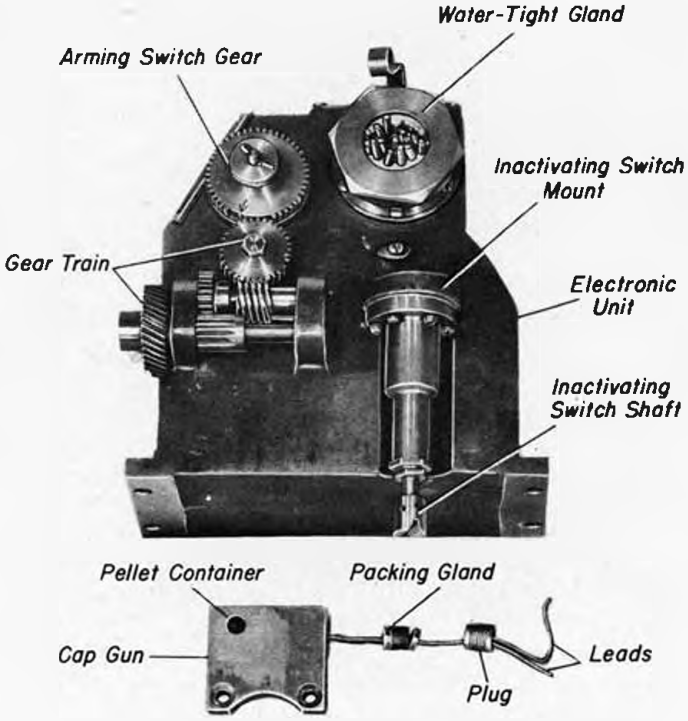


Fig. 17 - Mk 10-3 Exploder, Unit and Cap Gun

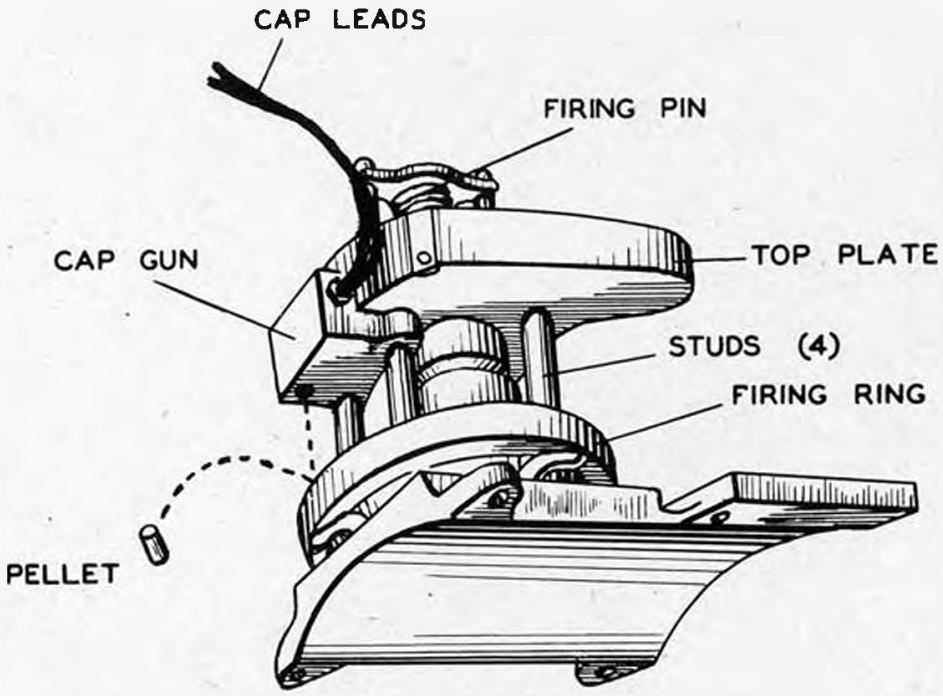


Fig 18 - Mk 10-3 Exploder, Partial Section

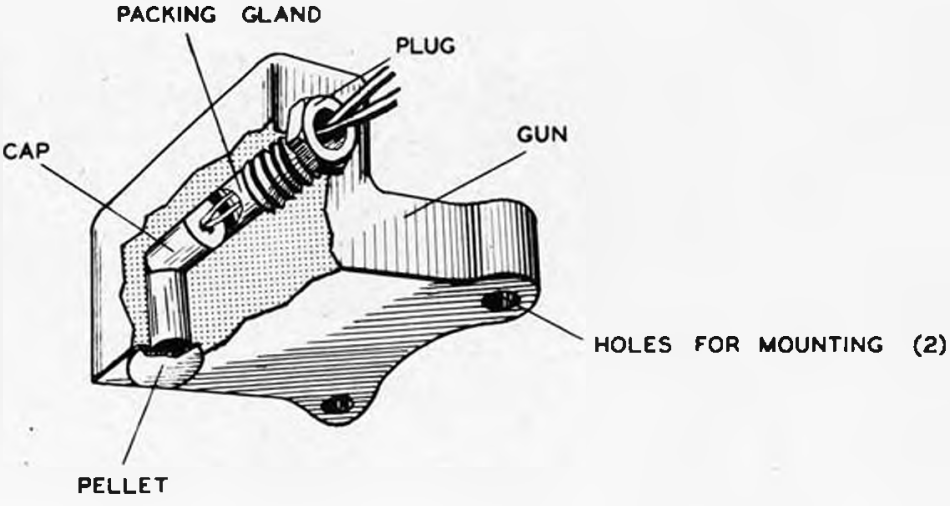


Fig 19 - Mk 10-3 Exploder Cap Gun, Cutaway View

Exploders Mark 9 Mod 0 and Mark 9 Mod 1

General

1. Combination magnetic-induction, impact-inertia type exploder.

2. Fits in pocket of Mk 13-4, Mk 16-5, and Mk 18-3 warheads.

Description

1. The Exploder Mk 9-0 employs the same type base as the Exploder Mk 8-6 and the mechanical arming and impact firing assemblies are the same except that the impeller linkage is modified so that impeller rotation also arms the magnetic section. This is accomplished by adding to the drive shaft a spur gear which operates a pinion gear and finger which in turn control a starwheel in the magnetic firing device.

2. The magnetic firing device consists of the following:

   (a) A gradiometer unit which is contained in a tube and consists essentially of two identical coils of wire, connected in series opposition. The coils are mounted several inches apart on a single highly permeable core rod. A cable extends from the coils to the electrical unit.

   (b) The electrical unit which is contained in a watertight case and consists of the following:

      (1) An electronic unit which includes a two-stage amplifier, a phase inverter, two thyratron tubes, and a firing condenser.

      (2) Two battery units.

      (3) A cartridge assembly consisting of an electric delay cap, a brass piston, a small shear plug, and a shear plate.

      (4) An arming assembly composed of a starwheel and shaft, a rotary switch, and a plunger.

      (5) Jack plugs which receive caules from the gradiometer and anticountermining units.

      (6) A test switch.

   (c) One of the following two devices:

      (1) An anticountermining unit (used when the exploder is fitted to the Warheads Mk 16-5 and Mk 18-3). This unit is contained in a watertight case and consists essentially of an inertia-operated pellet which controls a short in the exploder firing circuit. In the device, a steel ball rests between a thin, flat steel anvil and a plastic thrust button. The button is mounted on the center of the leaf of a cantilever leaf spring switch which is connected across the firing condenser by the cable connecting the electrical and anticountermining units. An inactivating screw, located under a screw plug on the base of the unit, may be used to short out the firing condenser permenently.

      (2) A combination ceiling and anticountermining unit (used when the exploder is fitted to the Warhead Mk 13-4). This unit is contained in a watertight case and consists essentially of a hydrostatic diaphragm and bellows assembly which controls a short in the exploder firing circuit. The hydrostatic diaphragm controls the bellows to which is fitted a spring and an actuating pin. The pin controls a plastic thrust button which is mounted in the center of a leaf spring. The leaf spring is fitted with a contact on each side and is mounted on a hinged arm which also contains two contacts, each of which is so positioned as to make the corresponding contact on the leaf spring if the spring moves in the proper direction. If either of the two sets of contacts is made, the firing condenser is shorted, the connection being made through the cable which connects the electrical and anticountermining units. The leaf spring is not closed to either contact if the torpedo is running at its proper depth. An inactivating screw, located in a dummy hole at the after end at the base of the unit, may be used to short out the firing condenser permanently.

3. Method of Mounting

   (a) The various components comprising the complete exploder are mounted as follows:

      (1) The impact exploder is slipped into the exploder pocket of the warhead and is secured by 12 screws.

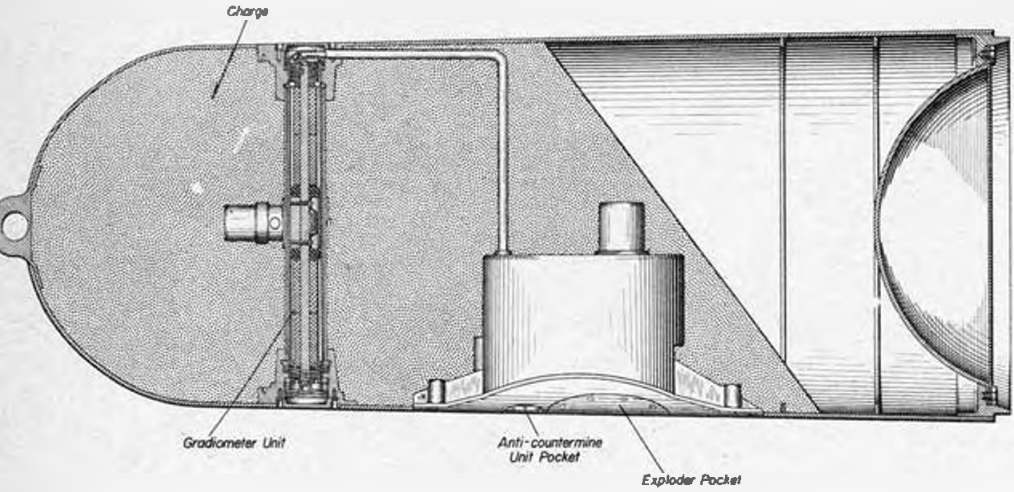


Fig. 20 - Mk 9 Exploder in Mk 13-4 Warhead, Sectional View

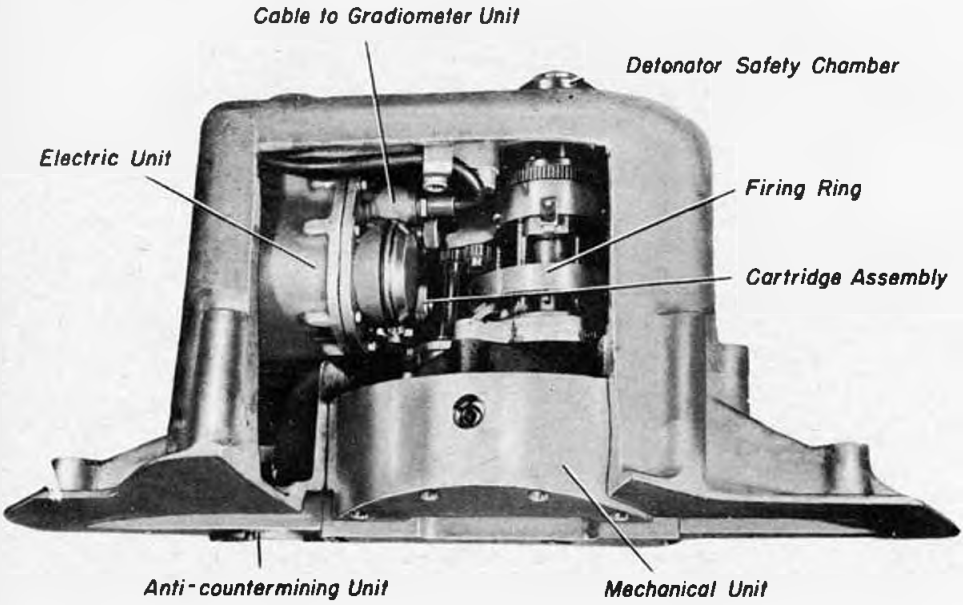


Fig. 21 - Mk 9 Exploder in Warhead Pocket, Cutaway View

(Exploders Mark 9 Mod 0 and Mark 9 Mod 1, Cont'd.)

(2) The gradiometer unit is permanently mounted in a vertical tube in the forward part of the warhead.

(3) The electrical unit is mounted on a bracket on the forward edge of the exploder pocket inboard of the impact exploder.

(4) The anticountermining unit or combination anticountermining and ceiling unit is mounted in a small pocket in the warhead shell just forward of the exploder pocket.

Operation

1. Arming

(a) Impact section

(1) Same as Mk 4 and Mk 8 type exploders except that arming is normally completed after approximately 185 yards of water travel.

(b) Magnetic section

(1) When the torpedo is launched, the vertical drive shaft geared to the impeller rotates the spur gear pinion and finger. The finger engages the starwheel on the electrical unit, turning it one notch for each finger revolution. The starwheel transmits its motion to the rotary switch, closing the switch and placing the amplifier in the battery circuit after about 80 yards of water travel. Further rotation of the starwheel pushes the plunger into the cartridge shear plug and shears a small wire after about 250 yards of water travel, thereby removing a short from the detonator circuit.

2. Firing

(a) Impact section

(1) Same as Mk 4 and Mk 8 type exploders.

(b) Magnetic section

(1) When the torpedo passes within a non-uniform vertical magnetic field such as that of a ship, voltages of different magnitudes are induced in each of the two gradiometer coils, producing a small net "signal" voltage. This is fed to the amplifier where it opposes a bias voltage on the grid of one of the thyratrons, the tube selected depending on the polarity of the signal. If the signal is sufficiently large, the thyratron fires and discharges the firing condenser, putting current through the electric delay cap in the cartridge assembly. After a 1/2 second delay, the cap fires and drives the piston through the shear plate against the firing ring of the impact exploder, firing the exploder.

3. Anticountermining

(a) With anticountermining unit only.

(1) This unit prevents the magnetic firing device from operating when the warhead is momentarily distorted by nearby large explosions. A large shock bounces the steel ball from the anvil against the thrust button on the cantilever spring switch, thereby closing the switch and discharging the firing condenser through the short circuit provided by the switch closure.

(b) With combination anticountermining and ceiling device.

(1) This unit prevents the magnetic firing device from operating when the warhead is momentarily distorted either by nearby large explosions or by the torpedo broaching. It also serves to inert the magnetic firing mechanism at the end of the torpedo's set run. The three functions are performed as follows:

(i) Any large shock is transmitted via the diaphragm to the bellows, forcing the actuating pin against the thrust button, making one set of contacts momentarily, and shorting out the firing condenser.

(ii) If the torpedo rises to a depth of water less than five ft., release of pressure on the diaphragm allows the bellows to retract and make one set of contacts, shorting out the firing condenser until the torpedo again descends to a depth greater than five ft.

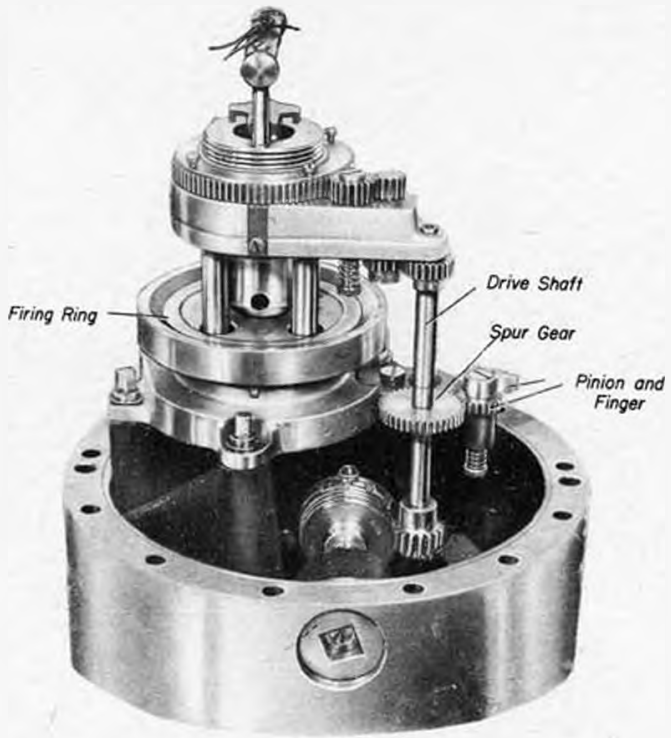


Fig. 22 - Mk 9 Exploder, Mechanical Unit

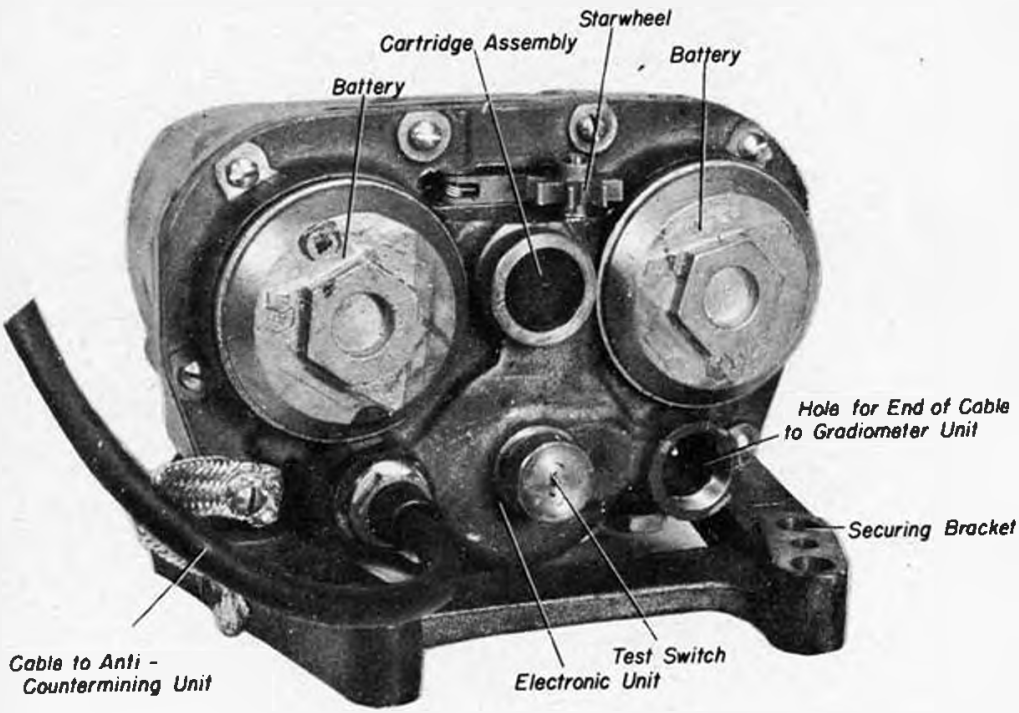


Fig. 23 - Mk 9 Exploder, Electrical Unit

(Exploders Mark 9 Mod 0 and Mark 9 Mod 1, Cont'd.)

(iii) When the torpedo sinks at the end of its run, hydrostatic pressure on the bellows forces the actuating pin against the thrust button and, at a depth of 75 feet, makes one set of contacts and shorts out the firing condenser permanently.

Precautions

1. Normal torpedo and magnetic precautions.

2. Wait a minimum of eight hours, preferably longer, before commencing to render safe. This will permit the operating battery voltage to drop below the minimum required to keep the magnetic section alive. The battery should discharge below the minimum operating voltage in about five hours.

3. Identify the warhead if possible with a view toward determining the type of anticountermining unit fitted.

4. Avoid all contact with the impact exploder firing ring.

Rendering Safe Procedure

1. For exploder fitted with anticountermining unit only.

   (a) Remove the screw plug from the base of the anticountermining unit.

   (b) Insert a screwdriver in the plug hole and turn the inactivating switch screw clockwise until the slot of the screw is aligned with the inscription OFF INF on the face of the unit. The magnetic firing device is now inoperative.

   (c) Carry out steps 1-5 of the rendering safe procedure for the Exploders Mk 4 and 8 and Mods.

   (d) Unscrew the gland nuts which secure the ends of the anticountermining and gradiometer cables in the electric unit and withdraw the ends.

   (e) Remove the electric unit from the exploder pocket.

   (f) Remove the cap and shear plate from over the cartridge unit. Remove the brass piston.

   (g) Screw a standard 6/32" machine screw into the tapped hole in the cartridge. Remove and destroy the cartridge.

   (h) Dispose of detonator, booster and charge.

2. For exploder fitted with combination anticountermining and ceiling device.

   (a) If the torpedo is beached or in less than three ft. of water, the magnetic section should be inoperative; proceed with steps (c) through (h) above.

   (b) If the torpedo is in three or more feet of water, remove the inactivating screw from the dummy hole at the after end of the base of the combination unit.

   (c) Place this screw in the center hole in the base of the combination unit and screw down as far as possible. The magnetic unit is now inoperative; proceed with steps (c) through (h) above.

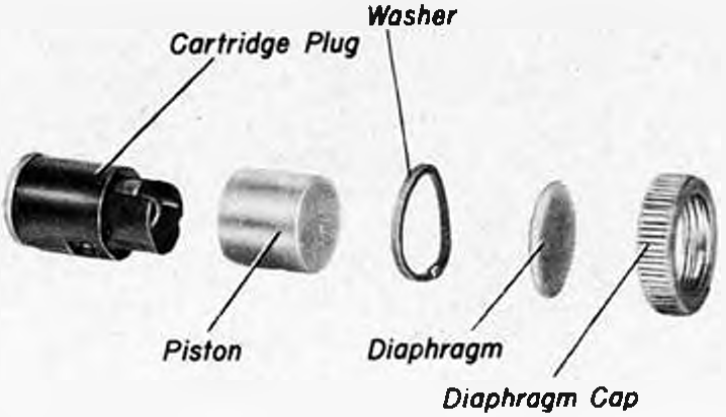


Fig. 24 - Mk 9 Exploder, Cartridge Assembly

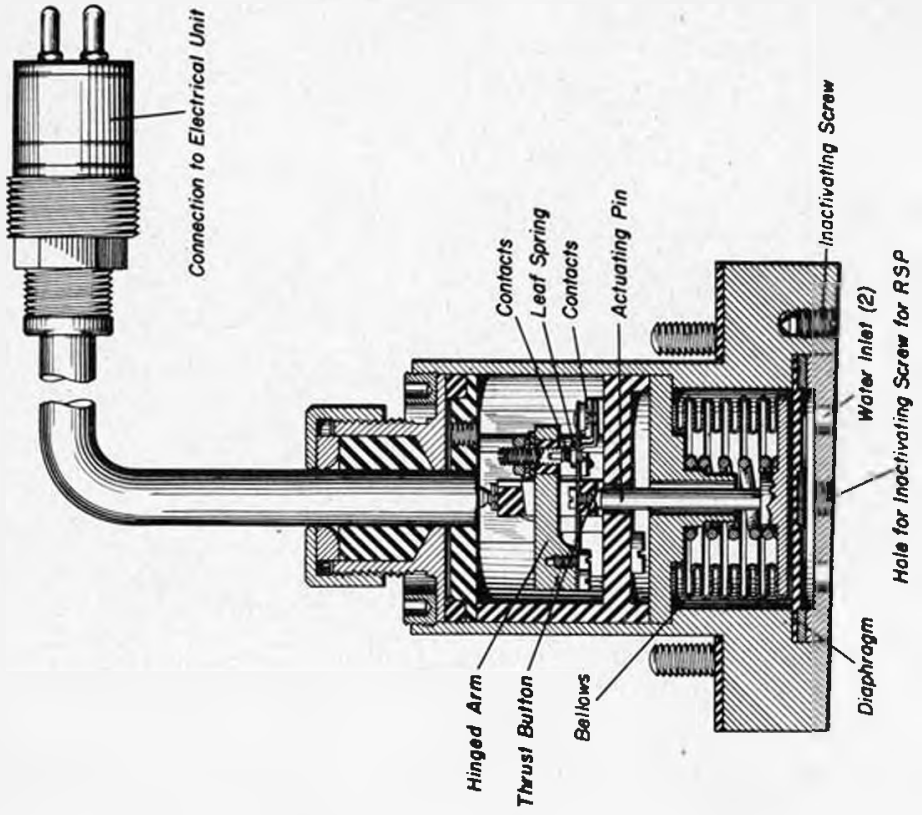


Fig 25 - Mk 9 Exploder, Combination Ceiling and Anticountermining Unit, Sectional View

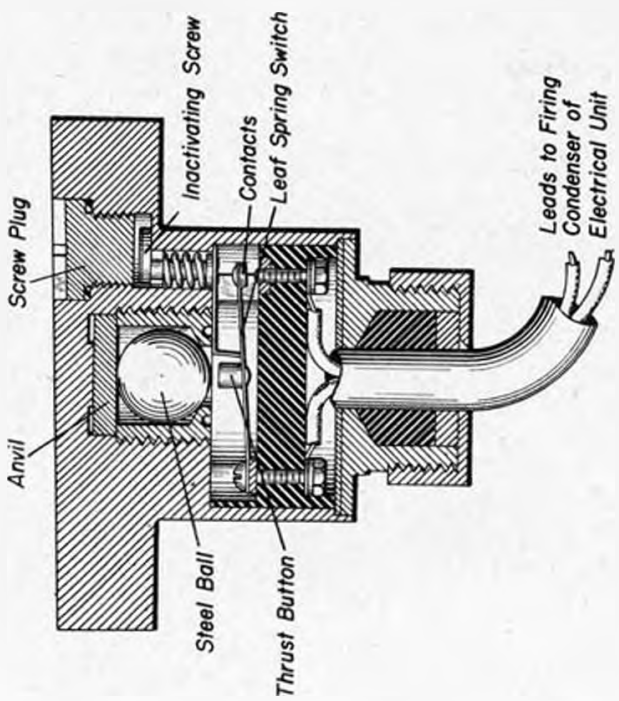


Fig 26 - Mk 9 Exploder, Anticountermining Unit, Sectional View

Fig. 27 - Mk 9 Exploder, Combination Ceiling and Anticountermining Unit

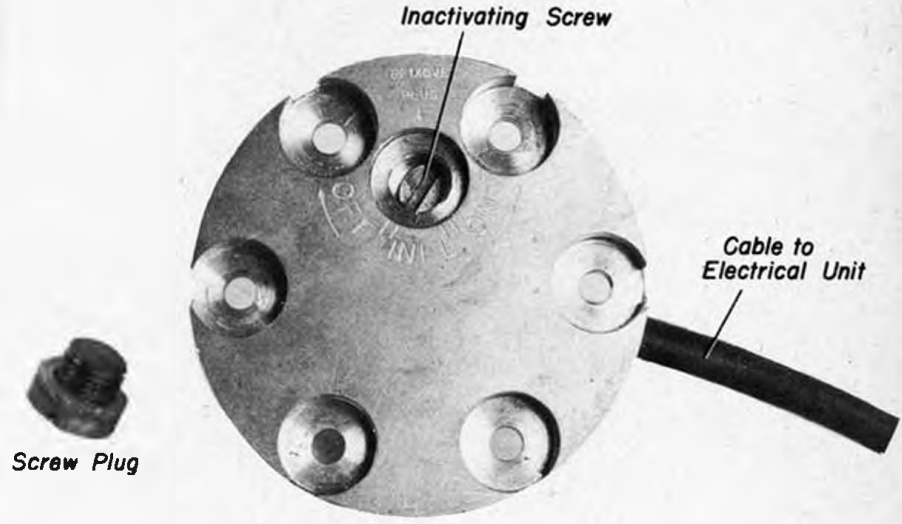


Fig. 28 - Mk 9 Exploder, Anticountermining Unit

MINE DISPOSAL HANDBOOK

PART II

UNITED STATES UNDERWATER ORDNANCE

. . . . . .

Depth Charges

CHAPTER 4

U. S. DEPTH CHARGES

Mark And Mod.	Total Weight (lbs.)	Chg. Wt. (lbs.) (TNT)	Shape	Length (inches)	Diameter (inches)	Pistol	Booster Extender	Depth Settings (ft.)	Arming Depth (ft.)	How Fired	Remarks
6	420	300	Cylindrical	27.6	17.6	Mk. 6	Mk. 6,6-1	30,50, 75,100, 150,200, 250,300	11-22 Average 15	Hydrostatic	
6-1	"	"	Cylindrical	"	"	Mk. 6-1	"	Same as above plus 350,400,450, 500,550,600	"	"	
6-2	"	"	Cylindrical	"	"	Mk. 6-2	Mk. 6-2	30,50,75,100, 150,200,250, 300,and 350 to 1000 in 50'	"	"	
7	765	600	Cylindrical	"	24.9	Mk. 6	"	Same as Mk. 6	"	"	
7-1	"	"	Cylindrical	"	"	Mk. 6-1	"	Same as Mk.6-1	"	"	
7-2	"	"	Cylindrical	"	"	Mk. 6-2	Mk. 6-2	Same as Mk.6-2	"	"	
8	520	270	Cylindrical	"	17.6	Mk. 7-1	None	50,75, 100,150, 200,300,350, 400,450,500	42-55 Average 50	Hydrostatic or magnetic	150 lbs. lead in pistol end. M-7 or M-7-2 mechanism is used.
9	320	200	Teardrop	27.6	17.6	Mk.6,6-1 6-2	Mk.6,6-1, 6-2	According to pistol used; see above	11-22 Average 15	Hydrostatic	8 fins set at 20° from longitudinal axis; 6" shroud on tail; fore and aft welded case; ring on nose.
9-1	"	"	Teardrop	"	"	"	"	"	"	"	Same as above except case is welded circumferentially. No booster extender used with Mk 7-1 Pistol.
9-2	340	190	Teardrop	"	"	"	"	"	"	"	8 fins set at 3° from longitudinal axis; 2 rings on tail instead of 6" shroud; all rings oval instead of rounded material.
9-3	"	"	Teardrop	"	"	"	"	"	"	"	Only difference from Mk. 9-2 is in a minor case change.
10	29	25	Cylindrical	9.69	8.5	Mk. 8 9 10	None	10-100 depending on pistol used	Armed when dropped	Delay fuze,or hydrostatic	Mk. 9 and 10 pistols obsolete; only few issued.

Table V -- Depth Charges

Introduction

1. The difficulties to be overcome in the recovery of depth charges are two-fold:

   (a) Locating the depth charge

   (b) Recovery or disposal of the depth charge

   Locating techniques and equipment are fully treated in Part I, Chap. 2. This chapter is concerned with the identification and rendering safe procedure to be followed after locating.

2. Before proceeding with locating or recovery, the following information should be obtained to the highest degree of accuracy possible:

   (a) Exact time charge was dropped

   (b) Course, speed, and location of ship

   (c) Weather conditions

   (d) Condition and rate of flow of tides and currents

   (e) Mark and Mod. of charge dropped

   (f) Pistol setting

   (g) Whether safety fork and cap were attached

   (h) How charge was dropped, i.e. from K-gun, Y-gun or rack

   (i) How and when the location was marked

3. If possible, allow at least one passage of high tide before diving on charge.

Depth Charges Mark 6, 6-1, 6-2, 7, 7-1, 7-2

General

1. Hydrostatic depth charges.
2. Anti-submarine weapons.
3. Launched from surface craft.

Description

1. Case (Mark 6)

Shape	Cylindrical, enclosed at each end by welded steel heads.
Color	Gray
Material	Steel
Diameter	17"6
Length	27"6
Charge	300 lbs. TNT with Mk. 6, 6-1, or 6-2 gran. TNT booster
Total weight in air	420 lbs.

2. External Fittings (Mark 6)

Central tube	4"2 diameter, extends longitudinally through case
Filling holes	One in each end
Pistol	Mk. 6, in end of central tube
Booster extender	Mk. 6, or 6-1, in opposite end of central tube from booster
Air vents	One in each end, adjacent to filling hole (may be omitted)

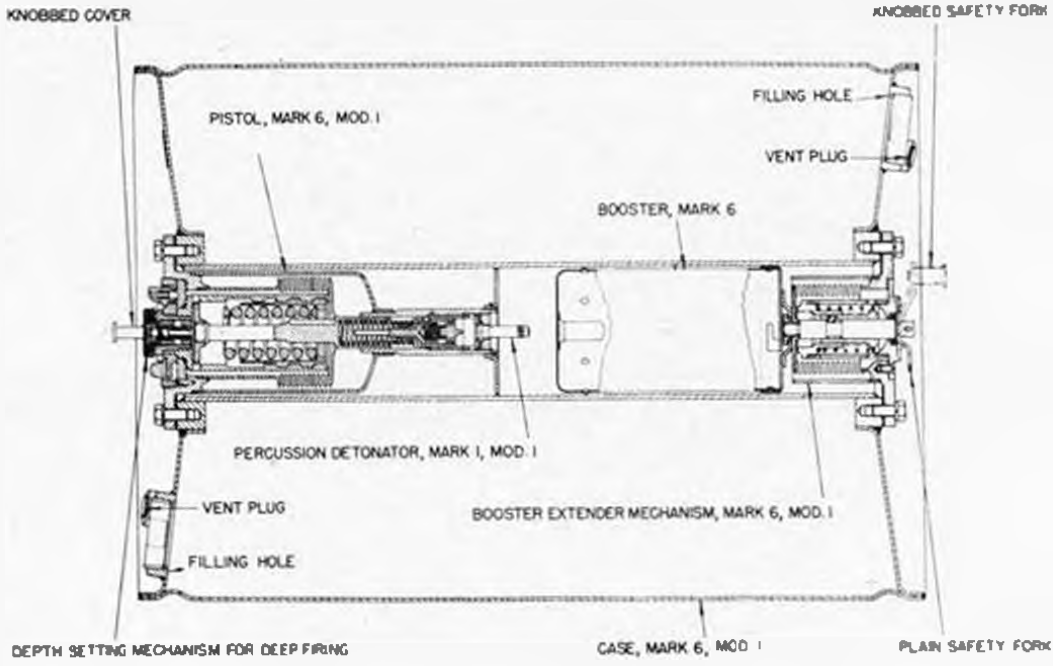


Fig. 1-- Mk. 6-1 Depth Charge, Sectional View

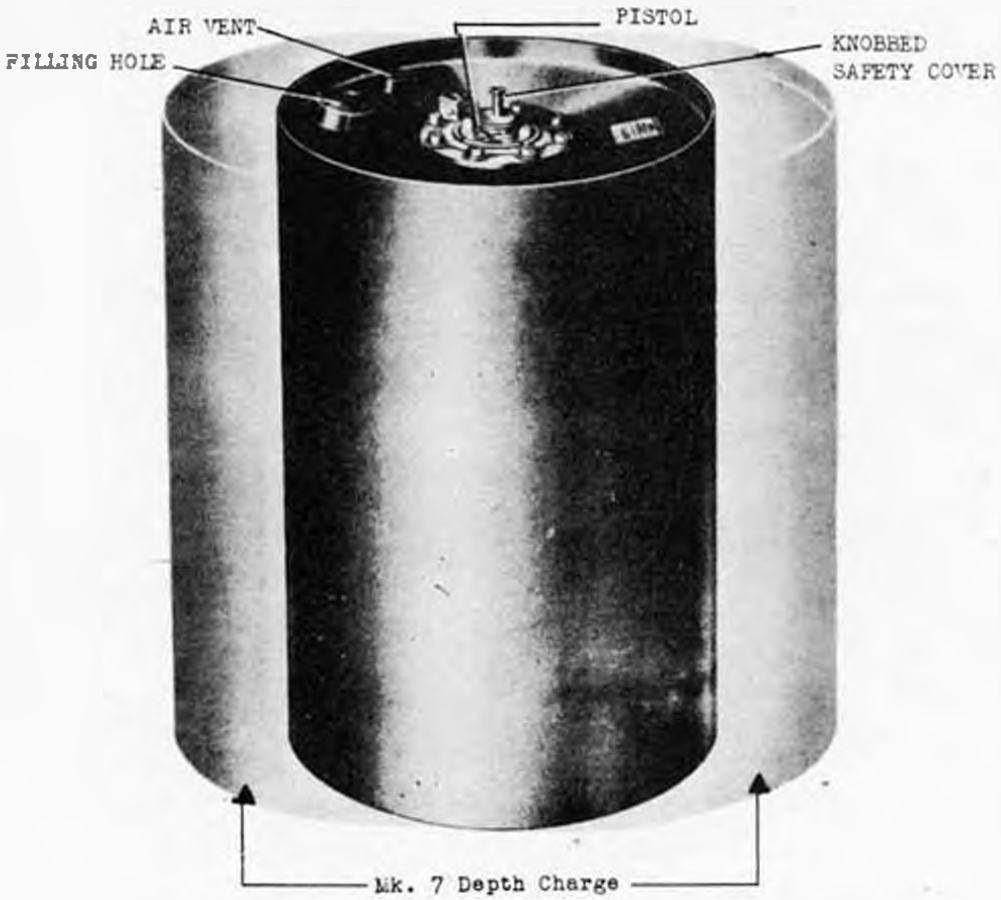


Fig. 2-- Mk. 6 Depth Charge

(a) The Mk. 6 pistol is a hydrostatically operated firing device 12" long and weighing 17.5 lbs. The parts include: a bellows, depth spring and setting device for determining the depth at which the pistol will fire; a plunger assembly for firing the detonator; an inlet valve which allows water to enter and operate the bellows; and a flange for securing the pistol to the case. Settings on the pistol dial are 30, 50, 75, 100, 150, 200, 300, (ft.) and SAFE. Variable depth control is accomplished by turning the depth setting dial to the desired firing depth. This in turn alters the position of the depth setting spring with respect to the hydrostatic piston, varying the amount of compression necessary to force the piston in far enough to free the firing plunger. The greater the pressure needed to compress the firing spring, the greater will be the firing depth.

3. The Mk. 6-1 and 6-2 depth charges are identical to the Mk. 6 except that they are fitted with Mk. 6-1 and 6-2 pistols respectively, and the Mk. 6-2 booster extender is always used with the Mk. 6-2 depth charge.

(a) The Mk. 6-1 pistol is very similar to the Mk. 6, the only difference being that it has been modified for deep firing by replacing the inlet valve assembly with a deep firing mechanism. The Mk. 6-1 has two concentric depth setting dials, the smaller one being calibrated for depths over 300 ft. Settings on the dials are 30, 50, 75, 100, 150, 200, 250, 300, 350, 400, 500, 600 (ft.) and SAFE.

(b) The Mk. 6-2 pistol is identical to the Mk. 6-1 except that it is modified for deep firing in depths from 300 ft. to 1000 ft. in 50 ft. steps. The bellows have been modified so that they will burst at crushing depths and render the charge safe.

4. The Mk. 7, 7-1 and 7-2 depth charges differ from the Mk. 6, 6-1 and 6-2 respectively in that their diameter is 24"9, the charge is 600 lbs. and the total weight is 765 lbs.

5. Boosters and Booster Extenders

(a) The boosters Mk. 6, 6-1 and 6-2 are interchangeable in all the depth charges listed above. The booster consists of a cylindrical container filled with granular TNT and fitted with an envelope on the inboard end for receiving a detonator. The Mk. 6 and 6-1 have charges of slightly more than 3½ lbs., and 6-2, which is replacing the earlier models, has a charge of slightly more than 3 lbs.

(b) The booster extenders Mk. 6, 6-1 and 6-2 are interchangeable in all the depth charges listed above. These devices house the detonator in the booster after the charge reaches a pre-determined depth, and retract it after release of hydrostatic pressure. The chief working parts include a spindle, hydrostatic piston, bellows, spring and locking balls, all housed in a cylindrical case which is fitted with a flange for securing the assembly to the depth charge case. The Mk. 6 and 6-1 booster extenders differ in minor constructional details only, while the Mk. 6-2 is fitted with a reinforced bellows and bellows stop, the latter being added to relieve pressure on the booster at lower depths and prevent its being crushed.

Operation

1. The knobbed safety fork and safety cap are wiped from the booster extender and pistol respectively upon launching. Upon removal of the fork, water enters the bellows, forcing the hydrostatic piston inward against the pressure of the extender spring as the charge sinks. The locking balls will release the spindle at the depth somewhere between 11 and 22 ft., allowing water pressure on the bellows to drive the booster to its armed position over the detonator. The Mk. 6, 6-1 and 6-2 booster extenders operate almost identically.

2. As the charge continues to sink, water entering the pistol bellows forces the hydrostatic piston inward, compressing the depth spring and firing spring. The piston forces a ball-release plunger in until, at the pre-set depth, the locking balls fall into a recess, allowing the firing plunger to move forward and fire the detonator.

3. When set on SAFE, the hydrostatic piston is mechanically prevented from moving in far enough to allow the pistol to fire unless subjected to crushing pressure. The inlet valve acts as an anti-countermining device, closing momentarily when subjected to a sudden and great increase in pressure, thereby blocking entry of water into the bellows.

4. The depth charges which use the Mk. 6-1 and 6-2 pistols operate in the same manner as the Mk. 6 except when the pistol is set for deep firing. In this case, the small dial is set for the depth desired, and the large dial is set at 100. The setting on the small dial adjusts tension on the deep firing valve spring so that no water can enter the pistol until the firing depth is reached. At that moment, the valve opens, water rushes in, and the pistol fires instantaneously. For shallow depths,

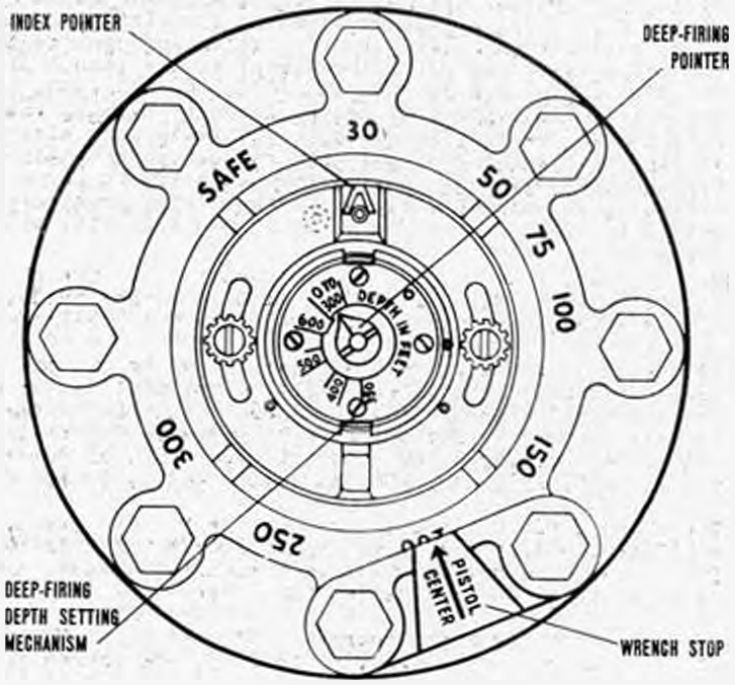


Fig. 3-- Deep-Firing Depth Setting Mechanism of Mk. 6-1 Pistol

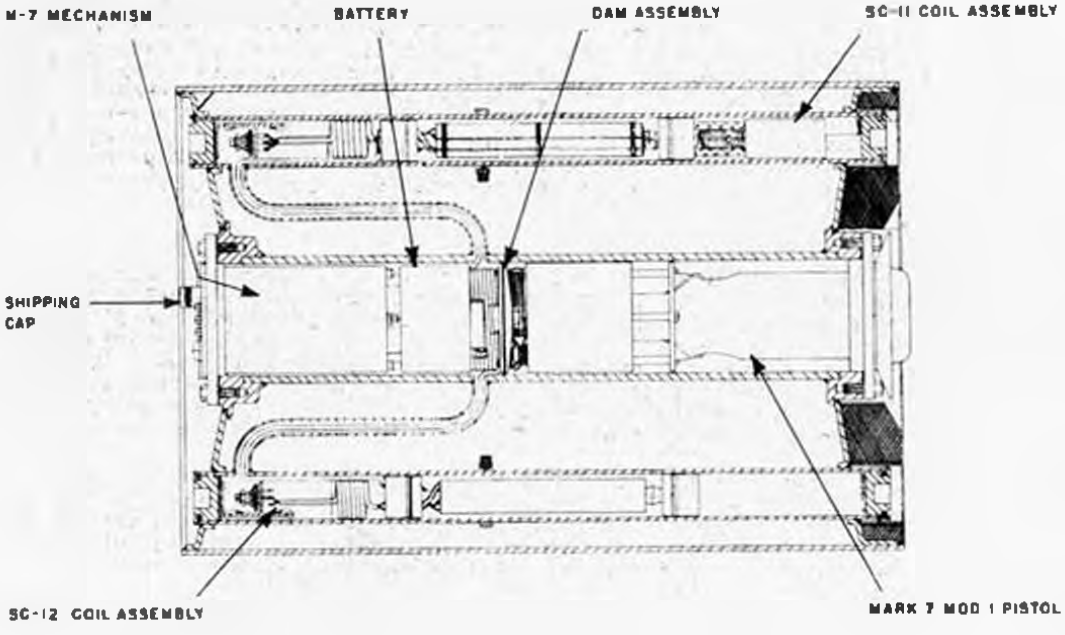


Fig. 4-- Mk. 8 Depth Charge, Sectional View

(300 ft. or less) the large depth setting dial is set for the desired depth, and the small dial is set at the mark "0 to 300". This keeps the deep firing valve open, allowing water to enter the pistol, and it operates in the same manner as the Mk. 6. It should be noted that the Mk. 6-1 and 6-2 have no anti-countermining feature, since the inlet valve has been removed.

5. The booster extender is designed to retract upon release of hydrostatic pressure.

Precautions

1. Do not attempt to render safe unless absolutely necessary.
2. Do not move or jar the charge unnecessarily.
3. If feasible, allow at least one passage of high tide before diving on the charge.
4. If the charge is found underwater, countermine it if the situation permits. In any case, where rendering safe is to be attempted, the charge must first be raised to the surface.
5. Booster extender may fail to retract upon release of hydrostatic pressure.

Rendering-Safe Procedure

1. Place a safety fork on the ~~pistol if possible~~ booster extender.
2. Remove the booster extender.
3. Remove the booster can from the extender.
4. Remove the pistol.
5. Remove the detonator by unscrewing the detonator holder from the end of the pistol. The holder has two holes which may be fitted by a small spanner. If the detonator cannot be removed readily, do not force it, but dispose of the pistol and detonator together.
6. Dispose of the booster and charge.

Depth Charge Mark 8

General

1. Hydrostatic-magnetic depth charge.
2. Anti-submarine weapon.
3. Launched from surface craft.

Description

1. Case

Shape	Cylindrical
Color	Gray
Material	Aluminum
Diameter	17.6"
Length	27.6"
Charge	270 lbs. TNT with granular TNT booster
Total weight in air	520 lbs. (includes 150 lbs. lead case in end containing pistol)

2. External Fittings

Central tube	4"2 diameter, extends longitudinally through case
Filling holes	Two, on unweighted end of case

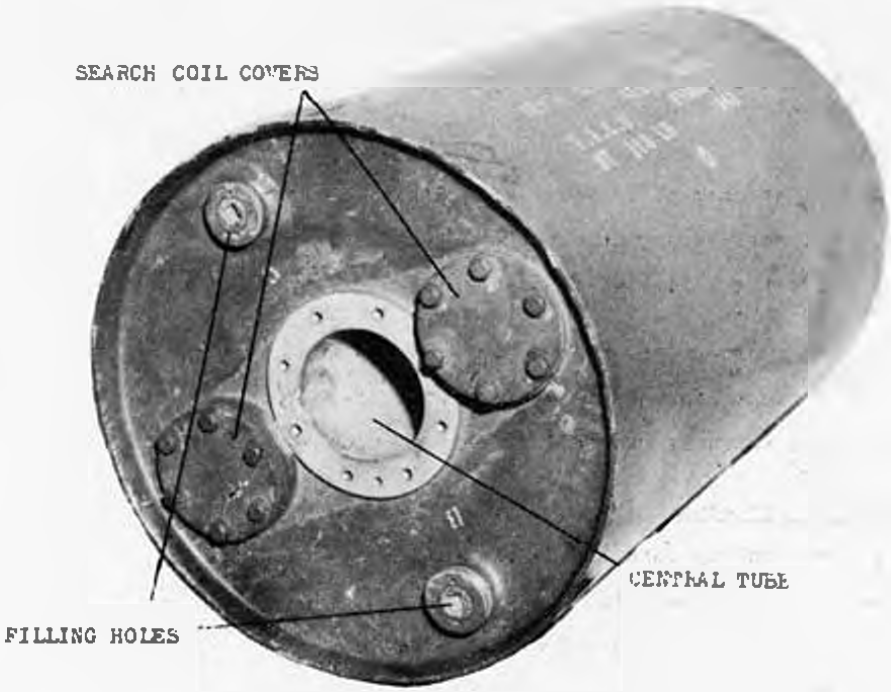


Fig. 5-- Mk. 8 Depth Charge, Pistol Removed

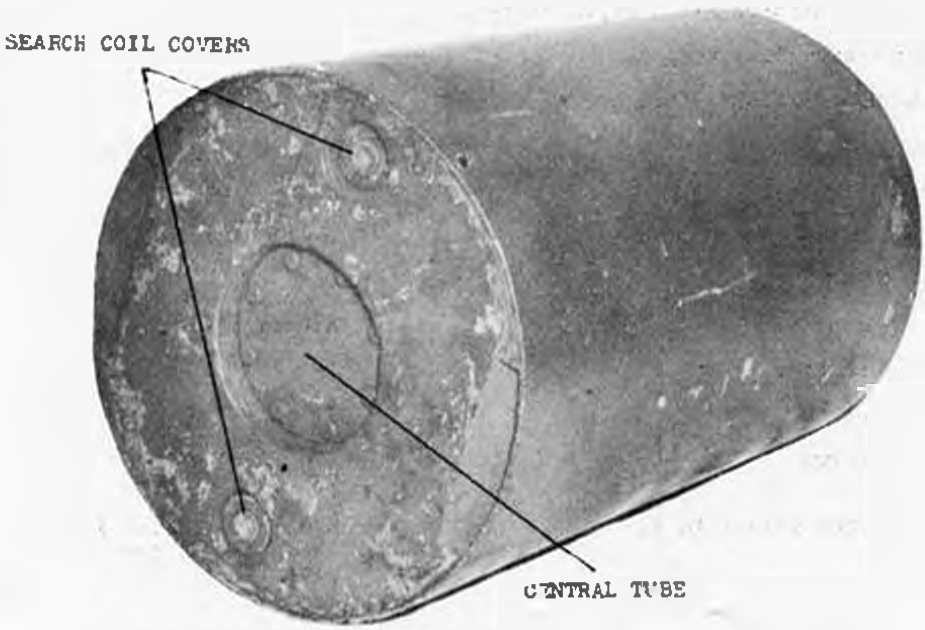


Fig. 6-- Mk. 8 Depth Charge, Weighted End

Search coils	Two, on either side of the central tube, extending longitudinally through case.
Pistol	Mk. 7-1 or Mk. 7-3 in weighted end of central tube.
Firing device	M-7 or M-7-2, in opposite end of central tube from pistol.

3. (a) The Mk. 7-1 pistol is a complete primary explosive unit containing a percussion detonator, electric detonator, tetryl leads through which the detonators fire the sub-booster and booster charges, and all the integral parts of a pistol. Settings on the pistol dial are "S" (safe, "M" (magnetic) 50, 75, 100, 150, 200, 300, 400, and 500. (Feet for hydrostatic firing.) These components are all housed in a cylindrical brass container 16 1/4" long.

   (b) The Mk. 7-3 pistol is now being issued for use in creeping attacks on submarines. It arms at a minimum depth of 200 feet and can be fired by magnetic influence only. The depth-setting dial has been covered with green paint, leaving only the marks "S" (safe) and "M" (magnetic) visible. The anti-countermine ring, inside the setting dial ring, is painted red. The Mk. 7-3 pistol is identical with the Mk. 7-1 except that the percussion detonator assembly has been removed and a washer has been placed over the depth-setting spring to provide added tension for arming the pistol. No Mk. 7-2 pistol has ever been issued.

4. The M-7 firing device is an amplifier assembly contained in a brass cylinder to which a battery is bracketed. The whole unit is 12 1/4" long. The M-7-2 device contains minor electrical changes. Both types are in general use. The changes were made to prevent premature firings due to spurious signals. No M-7-1 device has been issued.

Operation

1. Using Mk. 7-1 Pistol

   (a) Removal of a safety fork from the pistol upon launching permits the piston to advance under the action of water pressure building up within the piston bellows. The advancing piston compresses the shifting spring and after the former has moved inward 1/4 inch the balls securing the movable detonator plunger to the fixed sub-booster carrier are allowed to move into a recess in the piston extension allowing the detonator plunger to move forward under the force of the shifting spring. Such movement of the detonator plunger aligns the tetryl leads from the detonators to the sub-booster and in addition closes the electrical detonator spring contact completing the pistol part of the electrical firing circuit. Arming is normally completed at the depth between 40 and 54 feet, premature arming by inertia being prevented by a rocker-arm type inertia lock on the pistol.

   The M-7 or M-7-2 devices are armed during the same period as the pistol. The safety cover is pulled from the hydrostatic port number "1" during launching. Water enters, and depresses a small hydrostatic diaphragm and plunger. The plunger operates switches which arm the magnetic unit, and it also releases the escapement of a small, spring-wound clock which operates a chopper switch. The unit is now magnetically active, and remains active for a period of three minutes, or until the clock runs down. Arming is normally completed at a depth between 42 and 55 ft.

   (b) The charge will fire magnetically on any pistol setting except "S", but it will not fire hydrostatically if set on "M", except at depth of 1100 ft. or greater.

   When set for hydrostatic firing, further motion inward on the part of the hydrostatic piston causes a shoulder to move against the depth setting spring. The exact point at which this occurs is determined by the adjustment of the depth setting dial. As the piston moves in, the firing pin slides up a firing wedge compressing a leaf spring. When it is clear of the high point, the leaf spring snaps the firing pin down on the percussion detonator. When the depth setting dial is set on "M", mechanical interference prevents the percussion striker from impinging on the detonator.

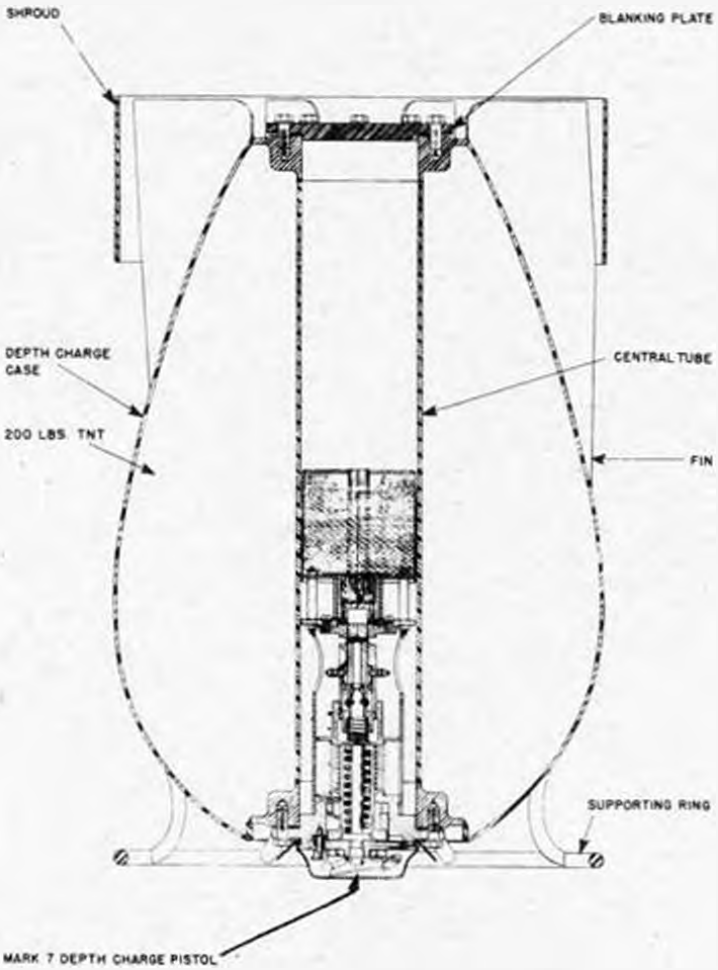


Fig. 7-- Mk. 9 Depth Charge, Sectional View

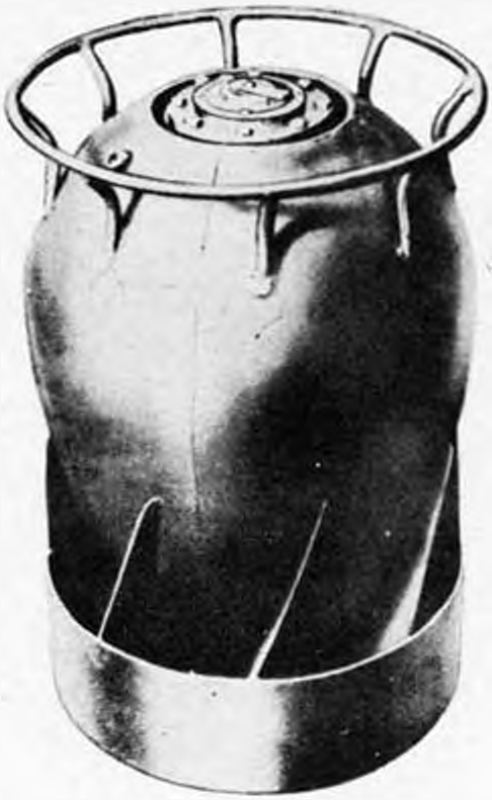


Fig. 8-- Mk. 9 Depth Charge

The search coils operating the magnetic device are connected so that motion in a uniform field, such as the earth's field, will cause little or no current to be sent to the amplifier. However, if the charge passes through a gradient field, such as that of a submarine, a much larger signal will be sent to the amplifier, and the firing circuit will close, putting current from the battery through the electric detonator.

(c) When set on "S", the Mk. 7-1 pistol will not arm except at depth of 1300 ft. or deeper, and consequently the electric detonator will be out of the circuit, and the explosive trains of both the percussion and electric detonators will be out of alignment. An anti-countermining device similar to that on the Mk. 6 pistol is used on the Mk. 7-1 to prevent firing due to a sudden increase in water pressure.

2. Operation using Mk. 7-3 pistol is similar to that using Mk. 7-1 with the following exceptions:

(a) Arming is not completed until charge reaches a depth of 200 feet.

(b) The Mk. 7-3 pistol does not alter magnetic firing of charge, but removal of the percussion detonator assembly eliminates hydrostatic firing.

(c) When set on "S", the Mk. 7-3 pistol will not arm the depth charge except at depth of 1300 ft. or deeper.

Precautions

1. Do not attempt to render safe unless absolutely necessary.

2. Do not move or jar the charge except from a safe distance.

3. Allow no movement of magnetic material near the charge. Although the magnetic life of the charge is normally limited to three minutes, the arming clock may run an additional five or six seconds if the charge is jarred.

4. Having once armed, the Mk. 7-1 pistol will never disarm. Arming results in all explosive elements being permanently married or aligned, and, for this reason, an armed pistol should never be disassembled.

(Continued on Page 11)

5. The small hydrostat in the M-7 should retract if the charge is raised above a depth of 50 ft., blocking the clock, and breaking the operating circuit of the magnetic section. However, as with other hydrostatically operated safety devices, it may fail to operate as designed.

6. If the charge is found underwater, countermine it if the situation permits. In any case where rendering safe is to be attempted, the charge must first be raised to the surface.

Rendering Safe Procedure

Procedure for both Mk. 7-1 and Mk. 7-3 pistols is identical. ~~except that when the latter is involved, the first two steps are omitted~~.

1. Place a safety fork on the pistol if possible.

2. Remove the pistol, and unplug the cable connection on the inboard end when clear of the charge case.

3. At this point, the condition of the pistol may be determined. A small port on the sleeve of the sub-booster will reveal the letter "C" if the pistol is cocked and safe, and the letter "A" if the pistol is armed.

4. If the pistol is unarmed, if may be disassembled as follows:

   (a) Remove the leaf-shaped firing pin and the wedge-shaped guide.

   (b) Carefully unscrew the percussion cap.

   (c) Remove the two firing leads from their terminals.

   (d) Unscrew the three hexagonal nuts holding the booster and booster end flange.

   (e) Remove the booster, booster-end spacer and sub-booster.

   (f) Carefully unscrew the three rod bolts holding the booster and flange, spacer tube and top flange. On separation of the firing and hydrostat assemblies, the shifting spring will cause the detonator plunger to fly out.

   (g) All explosive elements are now separated, and no further disassembly should be attempted.

5. Dispose of detonators, booster and charge.

Depth Charges Mark 9, 9-1, 9-2, 9-3

General

1. Hydrostatic depth charge.

2. Anti-submarine weapon.

3. Launched from surface craft.

Description

1. Case (Mark 9)

Shape	Teardrop, with tail and fins
Charge	200 lbs. TNT with granular TNT booster.
Total weight in air	320 lbs.

All other data and dimensions are the same as in the Mk. 6 D.C. case.

2. External Fittings

Filling Hole	In side of case
Central tube	Same as in Mk. 6
Support ring	Mounted on nose
Pistol and booster extender	Mk. 6 or 6-1, in opposite ends of the central tube
Fins	Eight, mounted on tail, set at angle of 20 degrees with longitudinal axis.
Shroud band	6" wide, encloses fins
Case weld	Runs fore and aft

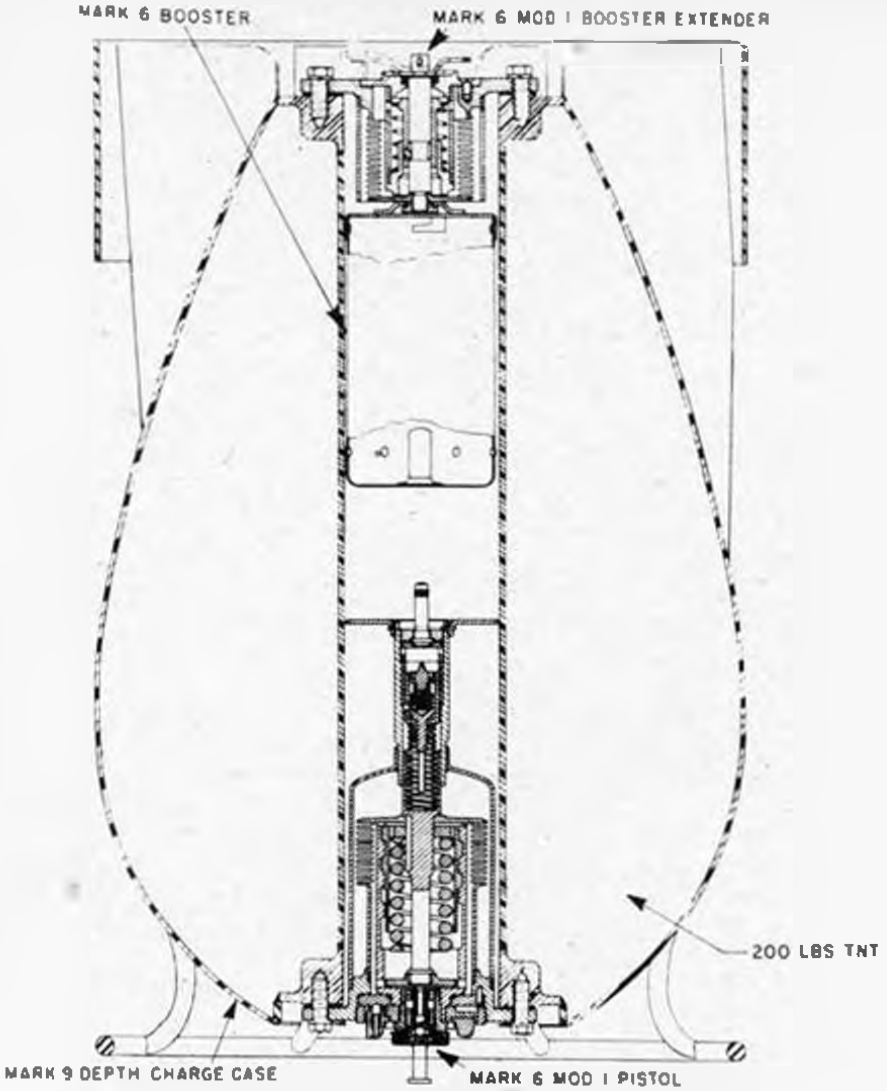


Fig. 9-- Mk. 9 Depth Charge with Mk. 6-1 Pistol and Booster Extender, Sectional View

Fig. 10-- Mk. 9-2 Depth Charge with Spoiler Plate

3. The Mk. 9-1 depth charge differs from the Mk. 9 as noted below:

   (a) The case weld is circumferential.

   (b) The Mk. 7-1 pistol may be used, and the opposite end of the central tube is then blanked off.

4. The Mk. 9-2 depth charge differs from the Mk. 9-1 as noted below:

   (a) The eight fins are set at an angle of three degrees.

   (b) Two tail rings are used instead of the shroud band.

   (c) Nose and tail rings are oval in cross section instead of circular.

   (d) 40 lbs. of lead is cast in the nose.

   (e) Charge is 190 lbs. TNT; total weight is 340 lbs.

5. The Mk. 9-3 depth charge differs from the Mk. 9-2 as noted below:

   (a) A minor manufacturing change has been made on the weld on the nose flange.

Operation

1. The operation of the Mk. 9 and Mods. is the same as that of the previously described charges which use the Mk. 6, 6-1 and 7-1 pistols.

Precautions and Rendering-Safe Procedure

1. Use the appropriate precautions and technique for the pistol that is fitted.

Depth Charge Mark 10

General

1. Hydrostatic or fuze delay depth charge.

2. Designed to be used in restricted waters or aboard small, slow craft where larger charges are not suitable, to destroy human torpedoes and small submarines, and to harass large submarines.

3. Launched by hand.

Description

1. Case

Shape	Cylindrical, looks like a two-gallon paint can
Color	Gray or black
Material	Steel
Diameter	8½"
Length	9 11/16"
Charge	25 lbs. TNT with pressed granular TNT booster
Total weight in air	29 lbs.

2. External Fittings

Pistol well	5" deep, in end of case. Has slots, spring latch, and bayonet joint on flange for securing the pistol
Pistol	Mk. 8, 9, or 10 in pistol well

3. The Mk. 8 pistol is of the hand-grenade type, and may have one of two settings, 50 to 100 ft., depending on the length of time fuze installed in the assembly. The pistol is 10" long, protrudes 5" from the case, and has a hand-grenade type of release handle and cotter pin on top. Its pre-set depth is painted on the outside by the numeral "50" or "100" as appropriate, and two or four black stripes.

4. The Mk. 9 pistol operates hydrostatically at one of four possible depths, which are pre-set during assembly; 25, 50, 75 or 100 ft. It is 11" long, protrudes 6" from the case, and has as its basic elements two small

Fig. 11-- Mk. 10 Depth Charge

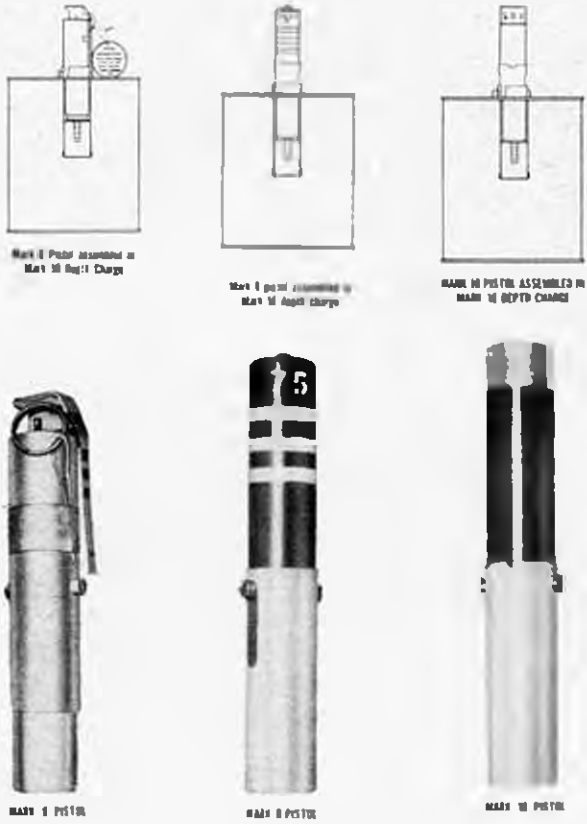


Fig. 12-- Mk. 10 Depth Charges with Mk. 8, 9, & 10 Pistols

switches with hydrostatic diaphragms, which are connected in series with a battery and detonator. Spring tension on the diaphragms, which controls the firing depth, is pre-set during assembly. The pre-set depth of the pistol is painted on the outside body with the appropriate numeral and white stripes. For example, a 75-ft. setting would be indicated by the numeral "75" and three white stripes indicating depth setting #3.

5. The Mk. 10 pistol is similar in operation to the Mk. 9, the main difference being that it can be adjusted to fire at depths from 30 to 100 ft. in 10 ft. steps by a hand dial on the face of the pistol. It is about the same size as the Mk. 9, but may be distinguished by the depth setting dial and the absence of the stripes and figures which indicate the depth setting on the Mk. 9.

Operation

1. The charge is armed as soon as the pistol is locked in the well.

2. (a) Mk. 8 operation

The cotter pin is removed from the handle just prior to dropping. Upon dropping, the handle flies home from the cocked position, igniting a firing train consisting of primer, black powder delay, "quick match", fuze and detonator.

(b) Mk. 9 and 10 operation

These pistols operate after water pressure becomes sufficient to depress the diaphragms, closing the hydrostatic switches and completing the circuit from the battery to the detonator.

3. There is no anti-countermining feature fitted, and the only safety features are two mechanically opposed switches in the Mk. 9 and 10 which prevent the firing circuit from closing in case of accidental dropping.

Precautions

1. Do not attempt to render safe unless absolutely necessary.

2. A charge found with the Mk. 8 pistol fitted to it should be classed as a dud hand-grenade, and should not be moved except from a safe distance and should not be handled except in case of an emergency. The Mk. 9 and 10 pistols may be handled if due care is exercised.

Rendering-Safe Procedure

1. Rendering this depth charge safe consists of disposing of the particular pistol that is fitted. The approved procedure for handling each pistol is given below:

2. Mark 8

(a) Remove the pistol from the well by releasing the locking catch and rotating the pistol to break the bayonet joint.

(b) Remove the two screws from the side of the pistol.

(c) Unscrew the inner parts of the pistol from the top. This should be done only if the safety pin has not been removed from the top of the pistol. If the safety pin is gone, and the handle is upright, the charge has fired as a dud, and must not be disassembled.

(d) Remove the inner parts of the pistol.

(e) Cut the detonator away from the safety fuze, 1/8" of which is exposed.

(f) Destroy the detonator and delay elements.

(g) Remove the booster from the well, and dispose of it and the main charge.

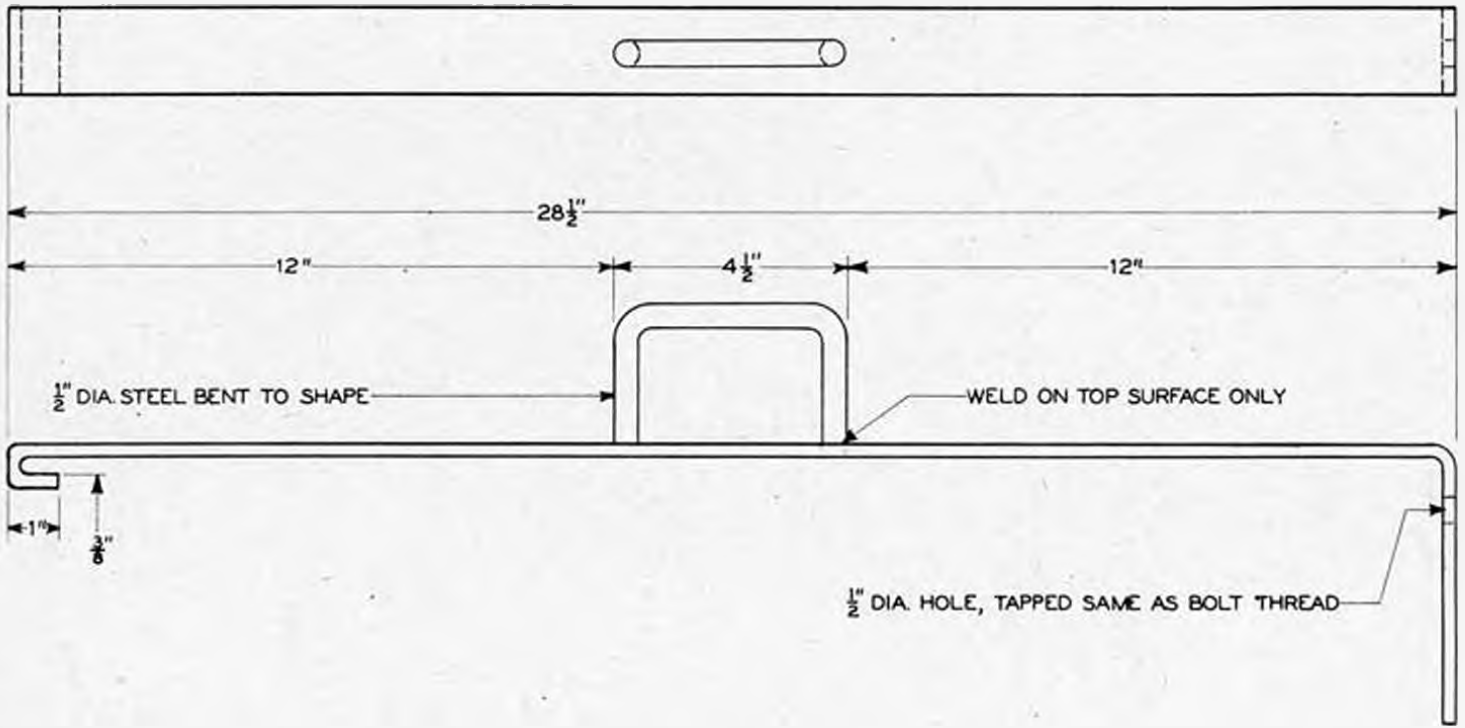
3. Mark 9

(a) Remove the pistol from the well by releasing the locking catch and rotating the pistol to break the bayonet joint.

(b) Remove the locking screw, and pry off the cap on the top of the pistol.

(c) Shake out the battery from the top end.

(d) Remove the two screws from the side of the pistol body.



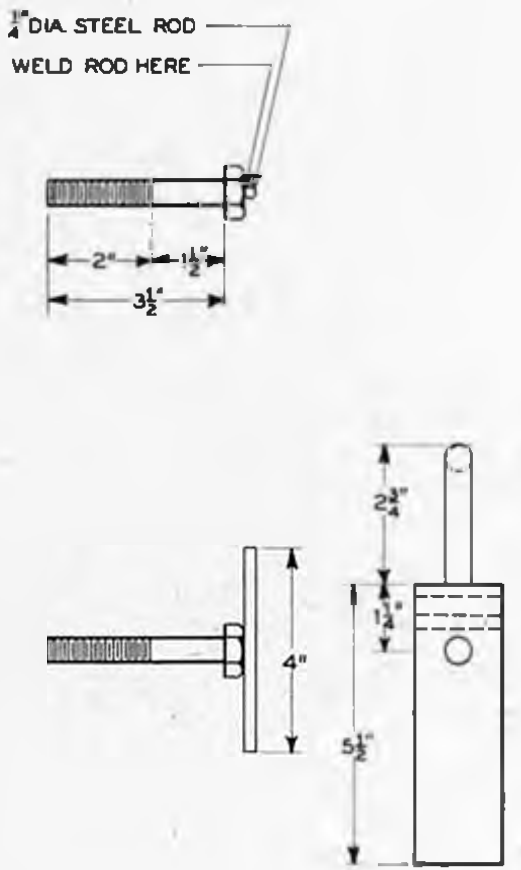


Fig. 13-- Depth Charge Recovery Sling

(e) Remove the four screws from the inner end of the pistol which secure the detonator mounting plate. Pry out the mounting plate.

(f) Using a screwdriver or appropriate tool, push the inner parts of the pistol out the end of the pistol case.

(g) Cut and tape the detonator leads.

(h) Remove the booster from the well, and dispose of detonator, booster and main charge.

4. Mark 10

(a) Through (e) same as Mk. 9.

(f) With a probing tool less than 1/4" in diameter, (to fit in the hole at the bottom of the battery case) push the inner parts of the pistol out the end of the pistol case.

(g) And (h) Same as Mk. 9.

Figure #13 may be used to construct a simple sling which will facilitate railing Mk. 6 and 7 type depth charges. The sling is secured to the charge by a diver, and may be made fast by taking up on the T-bolt clamp. The charge may then be raised by means of a hoisting line secured to the handle.

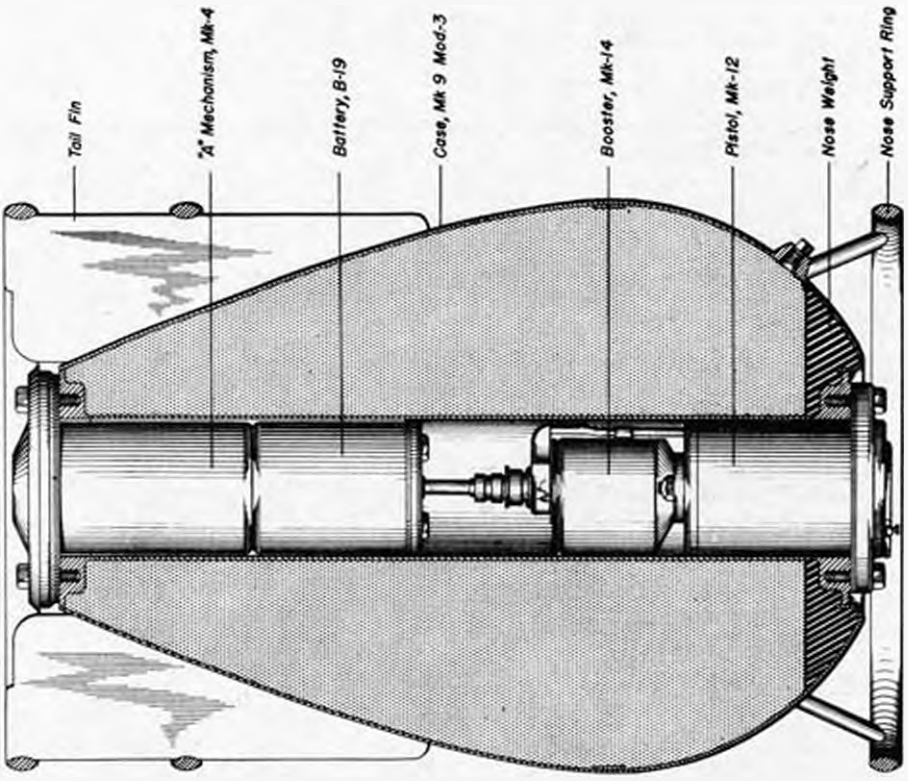


Fig. 14 - Mk 14-0 Depth Charge, Sectional View

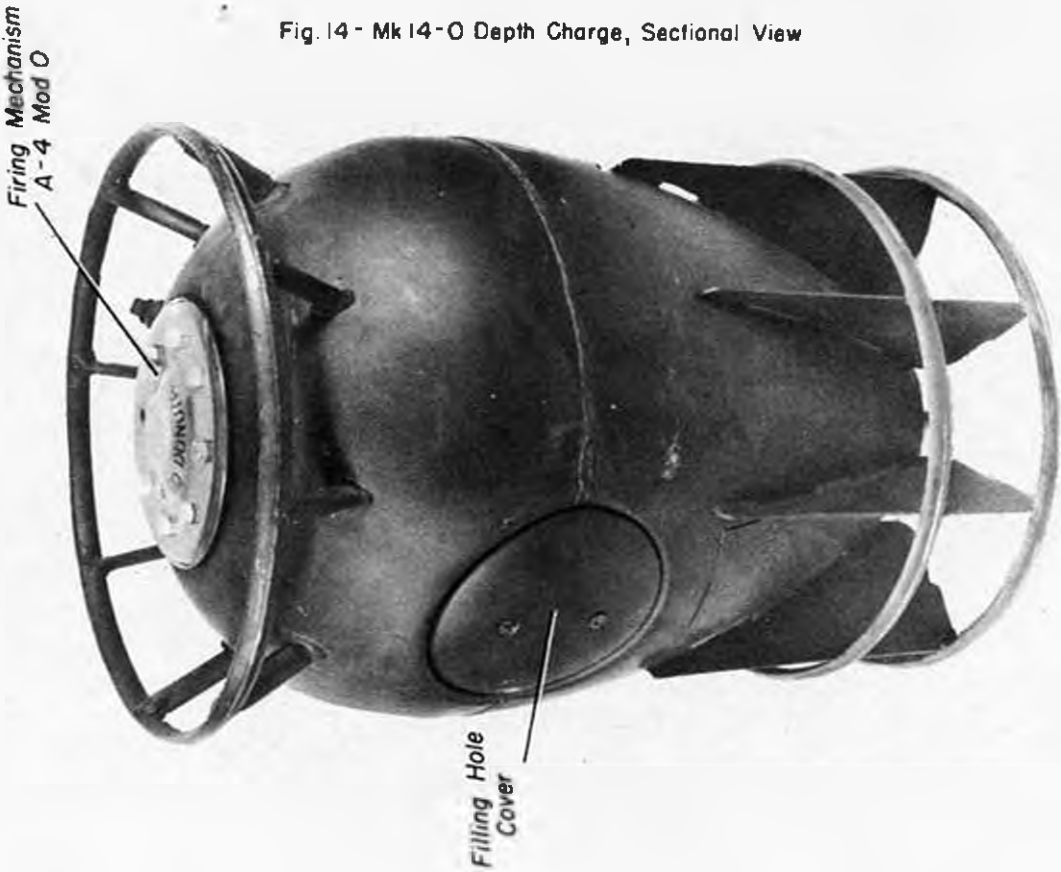


Fig. 15 - Mk 14-0 Depth Charge

Mark 14-0

General

1. Acoustic depth charge.
2. Anti-submarine weapon.
3. Launched from surface craft.

Description

1. Case — Mk 9 Mod 3 or Mod 4 (which has strengthened nose ring supports)

2. External fittings

Same as in Mk 9-3 depth charge except for:

(a) Depth Charge Pistol Mk 12 Mod 0 (with Detonator Mk 35 Mod 1).

(b) Depth Charge Booster Mk 14 Mod 0.

(c) Depth Charge Battery B-19 Mod 0.

(d) Depth Charge Firing Mechanism A-4 Mod 0.

3. Depth Charge Pistol Mk 12 Mod 0

(a) The Pistol Mk 12 Mod 0 is a hydrostatically-operated arming device embodying a 0.5 second delay electric detonator, an extender mechanism which moves the detonator from the safe to the armed position, and two hydrostatic switches, all housed in a brass casing.

(b) On the face of the pistol is mounted a safety lock having two settings: SAFE and SERVICE. When the lock is set on SAFE the extender mechanism is locked in the retracted position; when the setting is SERVICE the pistol is free to arm hydrostatically provided that the safety fork is removed. Ultimately, the safety lock is to be replaced by a deep arming lock with an extra setting for deep arming between the SAFE and SERVICE settings. The deep arming setting delays detonator arming until a depth between 200 and 350 ft. has been reached and is for use during creeping attacks.

(c) The safety lock consists of a movable disc with a clover-shaped hole in the center through which the extender rod protrudes. In the SAFE position the disc engages four lugs on the extender rod; in the SERVICE position the extender rod is free to move through the hole. The safety lock is secured in either position by a spring-loaded latch which fits into either of two notches in the edge of the disc. The latch must be depressed to permit rotation of the safety lock. The deep arming setting is provided when soft copper ears on the safety lock engage the four lugs on the extender rod. The ears bend and release the extender rod at a depth between 200 and 350 ft.

(d) The extender mechanism embodies a double bellows assembly, a detonator holder, a pair of extension springs, and a mechanical linkage between the bellows and the detonator holder. The springs normally retain the detonator holder in the safe position, in which the detonator is pointed away from the booster and the electrical circuit to the detonator is broken. When the extender rod running through the center of the bellows assembly is free to move, and when hydrostatic pressure acts upon the external bellows, the internal bellows expands and causes the mechanical linkage to swing the detonator through 180° to the armed position, in which it is pointed toward the booster and its electrical circuit is made by contacts on the sides of the detonator holder. The detonator is designed to retract upon release of hydrostatic pressure, but this action may not be depended upon.

(e) The external and internal bellows are mounted on either side of a mounting plate, with the extender rod running lengthwise through them and being secured to the free ends of both bellows. The external bellows, filled with fluid, is normally expanded; the internal bellows is normally contracted. The bellows are connected by a small orifice to permit the flow of the fluid from one bellows to the other. The action of hydrostatic pressure upon the external bellows causes it to contract and to force the fluid through the orifice and into the internal bellows, expanding the latter. The damping effect of the fluid, which must be forced steadily through the orifice, prevents the arming of the pistol by a sudden shock such as a countermining explosion or a drop on a hard surface.

(f) The two hydrostatic switches constitute the remaining essential features of the pistol. These are mounted in the same plate as is the bellows assembly, and are low pressure switches which arm the

Fig 16- Mk 14-0 Depth Charge, Top View

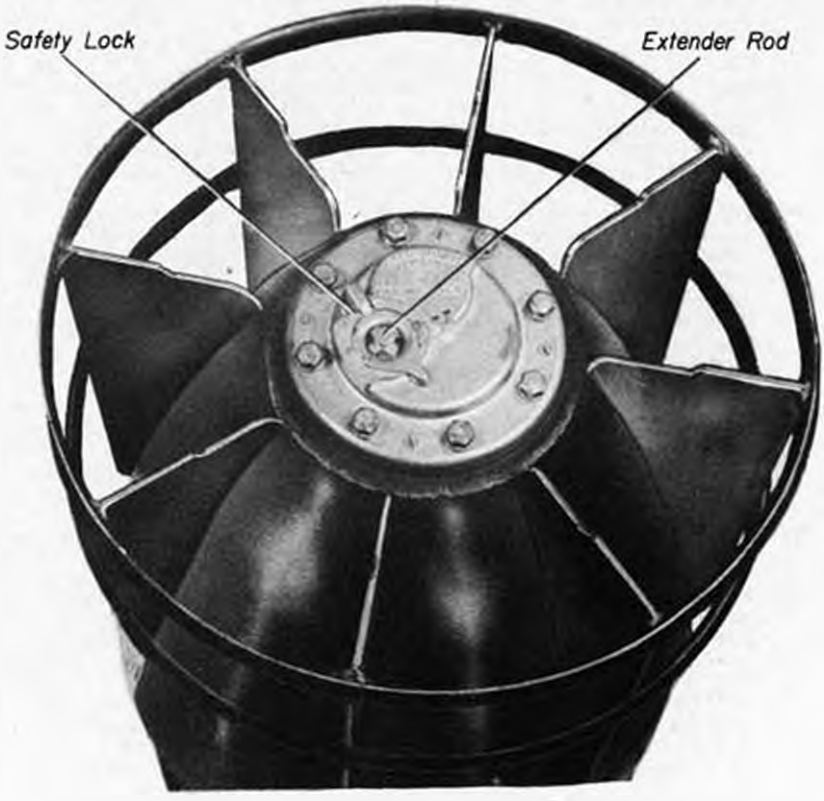


Fig. 17 - Mk 14-0 Depth Charge, Bottom View

(Mark 14-0, Cont'd.)

Mechanism A-4 Mod 0, one closing at approximately 10 feet, the other at approximately 35 feet. Because of their relatively low operating pressures these switches are fitted with fluid-filled damping chambers which prevent their being closed by countermining or other shocks. They are designed to open upon release or hydrostatic pressure.

4. Depth Charge Booster Mk 14 Mod 0

(a) The Booster Mk 14 Mod 0 consists of a cylindrical brass canister containing four tetryl pellets (1/4 lb.) and approximately 1 3/8 lb. of granulated Grade A TNT. It is secured to the inner end of the pistol by means of a bayonet mount. One side of the canister is flattened slightly to provide for the passage of the electrical leads between the pistol and the Mechanism A-4 Mod 0.

5. Depth Charge Battery B-19 Mod 0

(a) The Battery B-19 Mod 0, which supplies operating voltages to the Mechanism A-4 Mod 0, is contained in a steel canister approximately 5 inches long and 4 inches in diameter. It is mounted in the central tube of the depth charge case, between the booster and the Mechanism A-4 Mod 0.

6. Depth Charge Firing Mechanism A-4 Mod 0

(a) The Mechanism A-4 Mod 0, mounted in the opposite end of the central tube from the pistol, is a flanged canister approximately 7 1/2 inches long and 4 inches in diameter containing an electronic device which radiates a continuous signal ahead and to the sides of a sinking depth charge.

Operation

1. As the depth charge is launched from the rack the safety fork is wiped, freeing the extender rod and enabling hydrostatic pressure to operate the bellows assembly. In the case of projector launching, the safety fork is removed by hand.

2. The charge sinks at approximately 23 ft/sec. At a depth of 10 feet the first hydrostatic switch operates, allowing the tube filaments to warm up. At a depth of 35 feet, the second hydrostatic switch operates, energizing the Mechanism A-4 Mod 0. At 35 feet, also, the detonator completes its swing and is in position against the booster. The depth charge begins to radiate its signal upon closure of the second hydrostatic switch. It will not fire by influence, however, until a condenser is charged, the charging process requiring one second. Thus, the charge does not fire by influence until a depth of about 60 feet is reached.

3. When the transmitted signal strikes a reflecting surface such as the hull of a submarine, part of the signal is reflected back to the Mechanism A-4 Mod 0. The mechanism is designed to be actuated and to fire the detonator as the depth charge reaches the nearest point of approach, provided that it comes within about 35 feet of the target.

4. If it does not pass near enough to the target to actuate the Mechanism A-4 Mod 0, the charge will generally fire upon approaching the bottom, but may come to rest upon the bottom in a fully armed state. In the latter case, the charge usually will fire as the batteries run down, but may not do so. The mechanism is fitted with an anti-countermining device designed to prevent the charge from firing due to shock caused by underwater explosions.

5. A detailed description of this depth charge is contained in ORD 669.

Precautions

1. Do not attempt Disposal or Recovery except in cases of dire emergency or in cases where water depth is less than 25 feet.

2. Note that if the safety fork has been removed and the charge is in more than 35 (plus or minus 10) feet of water, it must be considered alive and extremely dangerous. Although the depth charge will not ordinarily fire in less than 60 feet of water when dropped operationally (Par. 2 of Operation above), it may fire in much shallower depths if it is lying on the bottom. Note also that if the depth charge comes to rest on the bottom without firing, it will ordinarily fire as the battery runs down.

3. When a charge of this type is lying on the bottom, the following precautions and considerations should be borne in mind with regard to diving on it:

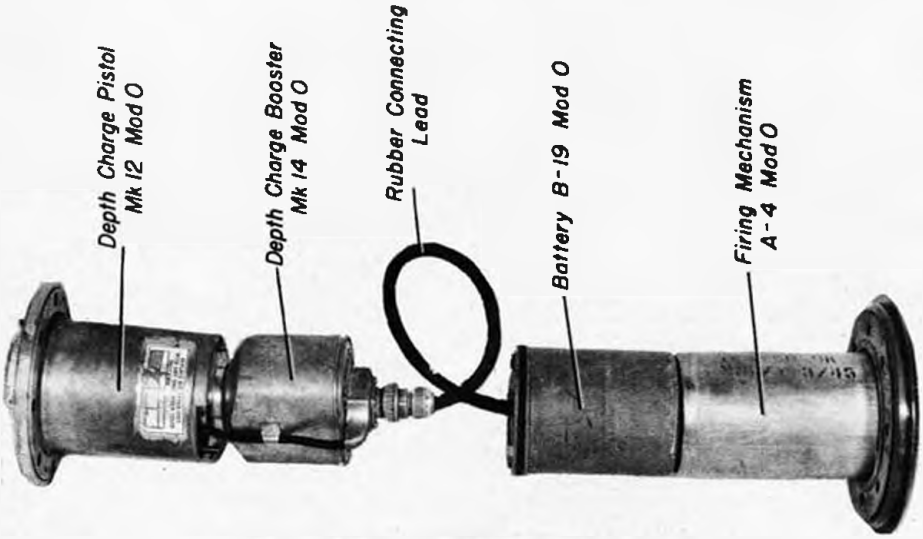


Fig. 18 - Mk 14-O Depth Charge Firing Assembly

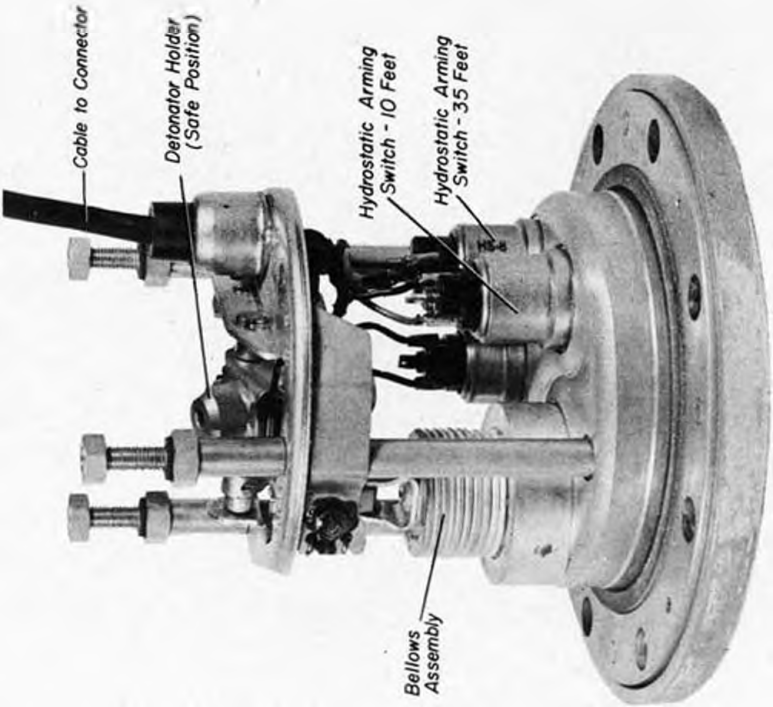


Fig. 19 - Mk 12-O Pistol, Cover Removed

(Mark 14-0, Cont'd.)

(a) If the charge lies in less than 25 feet of water, diving operations may be attempted. Due precautions must be observed, however, even though the charge may reasonably be assumed to be safe.

(b) If the charge lies in more than 25 feet of water, no attempt should be made to dive on it except in the direst emergency and then only under ideal conditions which should include excellent visibility and negligible currents. Even under emergency conditions no diving should be undertaken until a period of 24 hours has passed. As noted above, when a charge of this type comes to rest on the bottom, it ordinarily detonates as the battery runs down. (See chart below.) The battery usually runs down within the 24 hour period, resulting either in detonation of the charge or in inerting of the firing mechanism. Attention is invited, however, to the fact that certain rare firing mechanism defects may result in the charge's being alive and dangerous even after an elapsed period of 96 hours. It must, therefore, be reemphasized that only the direst emergency conditions justify diving on a charge of this type in more than 25 feet of water.

(c) Whenever possible, countermining should be attempted in preference to RSP.

Rendering Safe Procedure

1. Attach a line or sling to the charge and raise it to the surface by means of remote lifting gear.
2. Pry out and lock the extender rod.
3. Remove the pistol.
4. Disconnect the battery lead from the end of the booster can.
5. Remove the firing mechanism.
6. Dispose of all explosive elements.

Test No.	Unit No.	Operation Started	Detonator Fired	Total Time
1	2084	1330	2257	9 hrs. 27 min.
2	2066	1330	2145	8 hrs. 15 min.
3	2075	1330	2210	8 hrs. 40 min.
4	2365	1330	2237	9 hrs. 7 min.
5	2102	1330	2300	9 hrs. 30 min.
6	2080	1330	2250	9 hrs. 20 min.
7	2084	1330	1630	3 hrs.
8	2066	1330	2115	7 hrs. 45 min.
9	2075	1330	2230	9 hrs.
10	2365	1330	2120	7 hrs. 50 min.
11	2102	1330	1930	6 hrs.
12	2080	1330	2130	8 hrs.
13	2012	1615	0100	8 hrs. 45 min.
14	2061	1615	0015	8 hrs.
15	2302	1615	0015	8 hrs.
16	2365	1615	0120	9 hrs. 5 min.
17	2102	1615	2215	6 hrs.
18	2080	1615	0030	8 hrs. 15 min.
19	2012	0945	1945	10 hrs.
20	2061	0945	1900	9 hrs. 15 min.
21	2302	0945	1845	9 hrs.
22	2365	0945	1915	9 hrs. 30 min.
23	2102	0945	1855	9 hrs. 10 min.

Record of tests carried out at OIL, Indian Head, Md. to determine length of time re-

MINE DISPOSAL HANDBOOK

PART II

UNITED STATES UNDERWATER ORDNANCE

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CHAPTER 5

U. S. DEPTH BOMBS

Depth Bombs

U. S. DEPTH BOMBS

Bomb	Total Wt. (lb.)	Type & Wt. of Charge (lb.)	Shape of Nose	Length of Case (in.)	Dia. of Case (in.)	Fuzes Which May Be Fitted	Status
Mk 54	350	TPX 245	Flat	54.6	13.5	AN-Mk 103 (nose) or AN-Mk 219 (nose) AN-Mk 230 (tail) or Mk 231 Mod 0 (tail) (summer 1945)	Service
Mk 53	325	TNT 228	"	54.6	13.5	"	Never issued.
Mk 29	657	TNT 464	Round	74.1	17.7	AN-M 103 or AN-Mk 219 (nose) AN-Mk 224 or Mk 234 (transverse) Mk 229 (tail)	Obsolete now. May be found.
Mk 37	659	TNT 464	"	68.1	17.7	"	"
Mk 38	634	TNT 425	Flat	61.1	17.7	"	"
Mk 49	681	TPX 472	"	61.1	17.7	"	Obsolete and no more being issued.
AN-Mk 17-2	325	TNT 224	Round	55.5	15	AN-Mk 219 or AN-M 103 (nose) AN-Mk 224 or Mk 234 (transverse)	"
AN-Mk 44	350	TPX 249	"	55.5	15	"	"
AN-Mk 41	330	TNT 227	Flat	53.1	15	"	"
AN-Mk 47	335	TPX 252	"	53.1	15	"	"

Table VI--Depth Bombs

Fuze	Location in Bomb	Fitted in Following Bombs	Means of Arming	Means of Firing	Depth Setting	Arming Distance (ft.)	Remarks
AN-Mk 219	Nose	AN-Mk 17, 41, 44, 47: Mk 53, 54, 37, 38, 49, 29	Air Vane	Impact (land or water)	None	1000 (approx.)	Instaneous firing.
AN-M 103A1	"	"	"	Impact	"	500 to 1000 ft.	Instant. or delay firing. (0.1 sec.) Larger vanes must be used for flat nosed bombs.
M 139 A1	"	"	"	"	"	"	.01 sec. delay and instantaneous.
M 140 A1	"	"	"	"	"	"	.025 sec. delay and instantaneous.
Mk 224	Transverse pocket athwartships	Mk 29, 37, 38, 49, 17-1 AN-Mk 17-2 AN-Mk 44, 41, 47	Water Pressure	Water Pressure	25-50-75 100-125 ft. Preset in assembly.	15 to 20 ft. of water travel	Double-ended fuze. Used only in training. Obsolete.
Mk 234	"	"	"	"	25-50-75 100-125 ft. Set by hand.	15 to 20 ft. of water travel	Doubled-ended fuze.
Mk 229	Tail	Mk 37, 38 49, 29	Air Vane	"	"	400 ft.	Obsolete. Used in 650 lb. depth bomb.
AN-Mk 230	"	Mk 53, 54	"	"	"	"	To be replaced by Mk 231 Mod 0 fuze. Similar to Mk 229 Mods 1 & 3. Obsolete.
Mk 231 Mod 0	"	Mk 53, 54	"	"	Only 25 ft.	300 to 400	Fuze safe for take offs and landings anywhere. In general service about October 1945.

Table VII--Depth Bomb Fuzes

Introduction

1. Depth bombs are anti-submarine weapons, designed to be dropped from aircraft and fuzed to fire hydrostatically at pre-set depths. The U. S. models are all cylindrical in shape, vary in length from 53" to 74" and in diameter from 13"5 to 17"7. They are either flat or round-nosed and may contain fuze pockets in both the nose and tail. Certain models also include an athwartships pocket. It should be noted that, in certain instances, the 500 and 1000 lb. Army-Navy Standard General Purpose bomb cases may be fitted with hydrostatic tail fuzes and used as depth bombs.

2. As noted above, all depth bomb cases are designed to incorporate multiple fuzing, provision being made for use of a nose, impact type of fuze in addition to the tail and athwartships hydrostatic fuzes. It should be noted, however, that use of impact fuzes with depth bomb cases is not desirable, the cases being so light in construction that they often shatter before the fuze operates properly. It is unlikely that depth bombs will be found fuzed with both impact and hydrostatic fuzes.

3. It is probable that mine disposal personnel will be called upon to deal with depth bombs only when diving operations are necessary or when bomb disposal personnel is not available. In any event, because bomb disposal training comprises an extensive background in mechanical fuzes, bomb disposal personnel should be called in whenever practicable.

General Precautions

1. The following precautions should be observed when handling all depth bombs, however fuzed:

   (a) Obtain all possible information covering the type of bomb, and the type and condition of the fuze or fuzes fitted before attempting any disposal operations.

   (b) Destroy the bomb by countermining whenever feasible. Do not attempt to render safe unless absolutely necessary.

   (c) Do not move or jar the bomb unnecessarily.

   (d) Never move or rotate the arming vanes.

   (e) When diving operations are necessary, raise the bomb before proceding to render it safe.

   (f) If a fuze is jammed in its pocket, make every effort to dispose of the bomb by means other than withdrawal or disassembly of the fuze. If it is not feasible to countermine the bomb where it lies, it may be more desirable to transport it to a demolition area for countermining than to attempt to render it safe.

   (g) When dealing with a bomb which has multiple fuzing, dispose of the nose, tail and transverse fuzes in that order.

   (h) Mine Disposal personnel should not attempt disassembly of fuzes fitted except as indicated hereinafter.

Rendering-Safe Procedure

1. The procedure of rendering these bombs safe consists of disposing of the particular fuze or fuzes that may be fitted into them. A brief description and operation of each fuze, together with the approved procedure for rendering it safe, is included below.

Nose Fuze Mark 219

Description

1. Instantaneous, impact fuze, mechanically armed.

2. The fuze is 5 1/2" long, and protrudes about 3" from the pocket. The span of the four-bladed arming vane is 4 3/4".

3. The armed or unarmed condition of the fuze is indicated as follows:

   (a) When unarmed, the striker flange is adjacent to the outer sleeve of the fuze. An arming wire may or may not be present.

   (b) When armed, or partly armed, a 1/2" space will be present between the flange and the outer sleeve.

   (c) A fuze that has "dud" fired is identical in appearance to an unarmed fuze. The presence or absence of an arming wire would be the only indicator of the condition of the fuze.

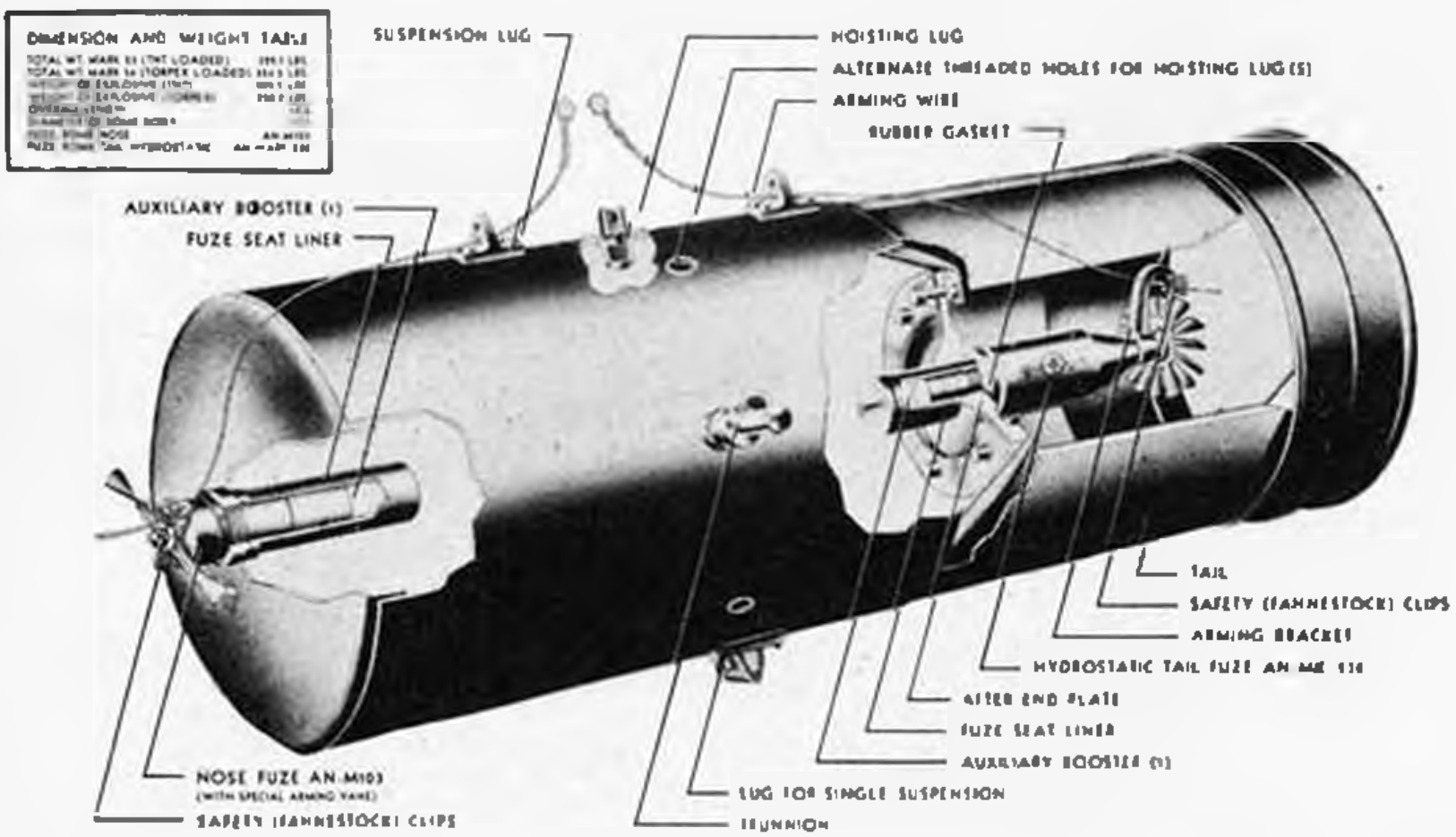

Fig. 1-- Mk. 53 and Mk. 54 Aircraft Depth Bomb

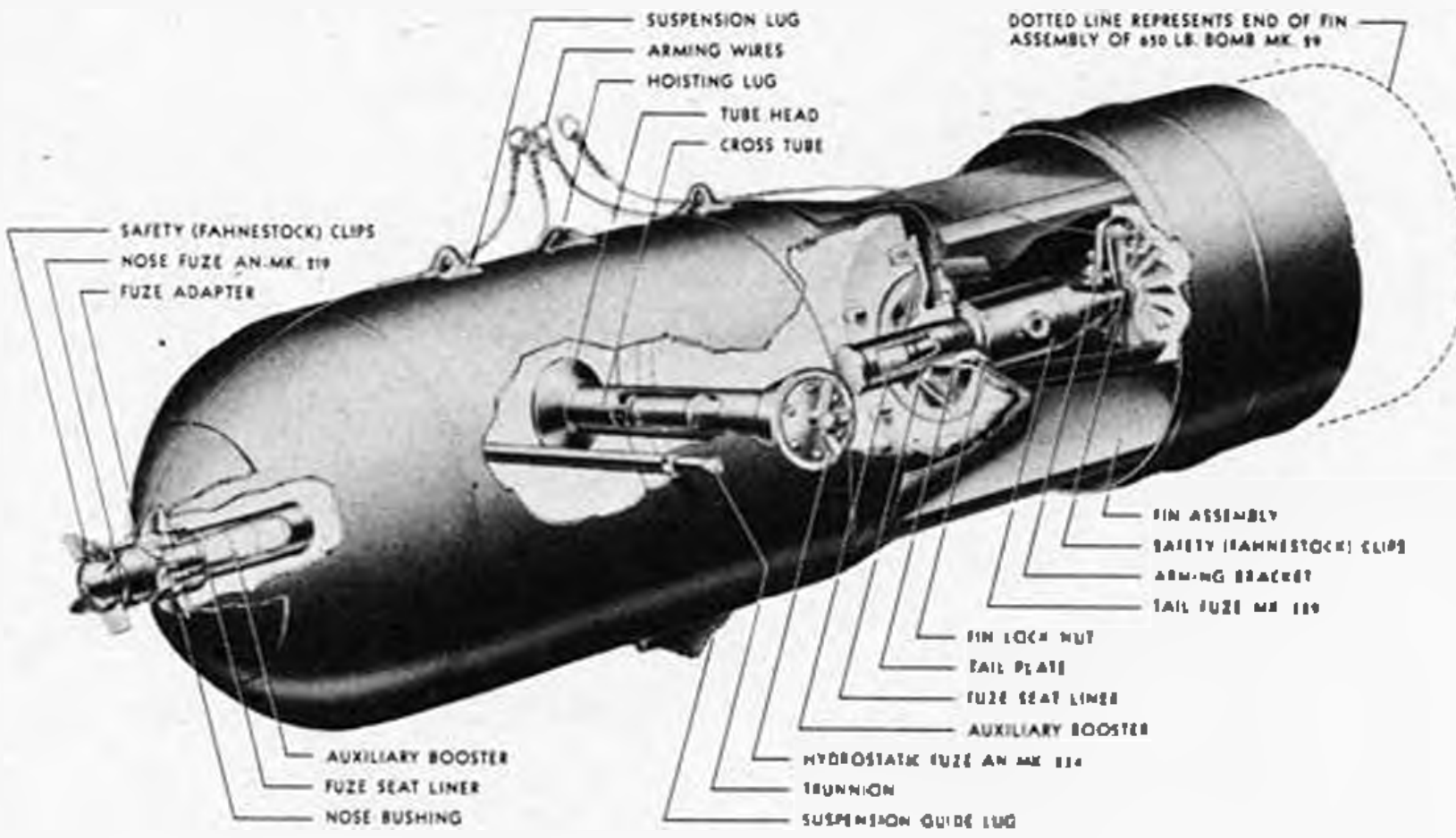

Fig. 2-- Mk. 29 and Mk. 37 Aircraft Depth Bomb

Operation

1. When the bomb is dropped, an arming wire is withdrawn from the air vane. Air travel then rotates the working parts of the fuze through a gear train until the firing pin and explosive train are aligned. Impact with land or water drives the firing pin down onto the detonator. For detailed operation, see accompanying drawing.

Rendering Safe Procedure

1. Tape the vanes to the fuze head to prevent rotation.
2. Remove the lock screw from the outer sleeve.
3. Grasp the vane and vane carrier, and gently lift the inner parts of the fuze out of the fuze body.
4. Unscrew the fuze body from the bomb.
5. Remove the auxiliary boosters from the fuze pocket and dispose of all explosive elements.

Nose Fuze AN-M 103

Description

1. Instantaneous or short delay impact fuze, mechanically armed. Delay settings are not used in depth bombs.
2. The fuze is 7" long and protrudes 2 1/4" from the pocket. Two sizes of two-bladed arming vanes may be fitted, with the smaller being used with round nosed bombs, and the larger with flat nosed bombs. The span of either sized vane is 6 1/4".
3. The armed or unarmed condition of the fuze is indicated as follows:
   (a) When unarmed, a small space or crack is present between the vane cup and the fuze body, through which the arming discs are visible.
   (b) When armed, the delay arming vane and vane cup will be missing from the fuze or they will have unscrewed far enough to release the arming discs, the space mentioned in (a) above being about 1/4" wide.
   (c) If the fuze has fired as a dud, the upper shoulder of the striker will have moved down in the space formerly occupied by the arming discs.

Operation

1. When the bomb is dropped, an arming wire is withdrawn from the air vane. Air travel then rotates the working parts of the fuze through a gear train until the firing pin and explosive train are aligned. Impact with land or water drives the firing pin down onto the detonator.

Rendering Safe Procedure

1. If the fuze is unarmed, tape the vane and vane cap to the fuze body, unscrew the fuze from the pocket, and dispose of the fuze and auxiliary booster.
2. If the fuze is armed, wedge the space between the firing pin flange and fuze body with friction tape or other suitable means, and proceed as in Par. #1 above.
3. No safe procedure can be recommended for a dud-fired fuze.

Transverse Fuze An-Mk 224

Description

1. Hydrostatically armed and fired.
2. The fuze is 17" long, 3 1/2" in diameter, and fits nearly flush with either end of the transverse pocket. The depth setting, which is preset in assembly, is marked on the pistol body.

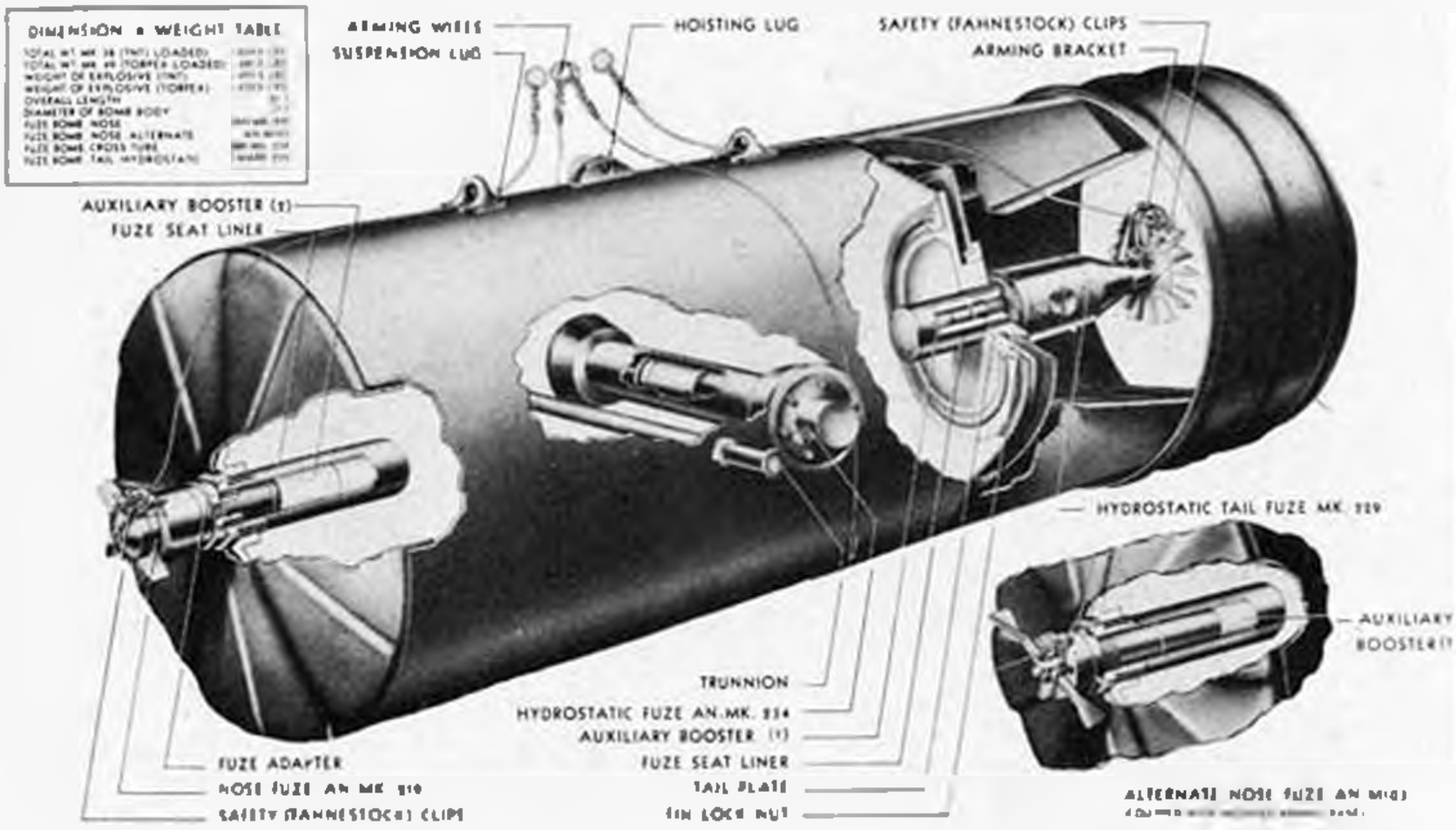

Fig. 3- Mk. 38 and Mk. 49 Aircraft Depth Bomb

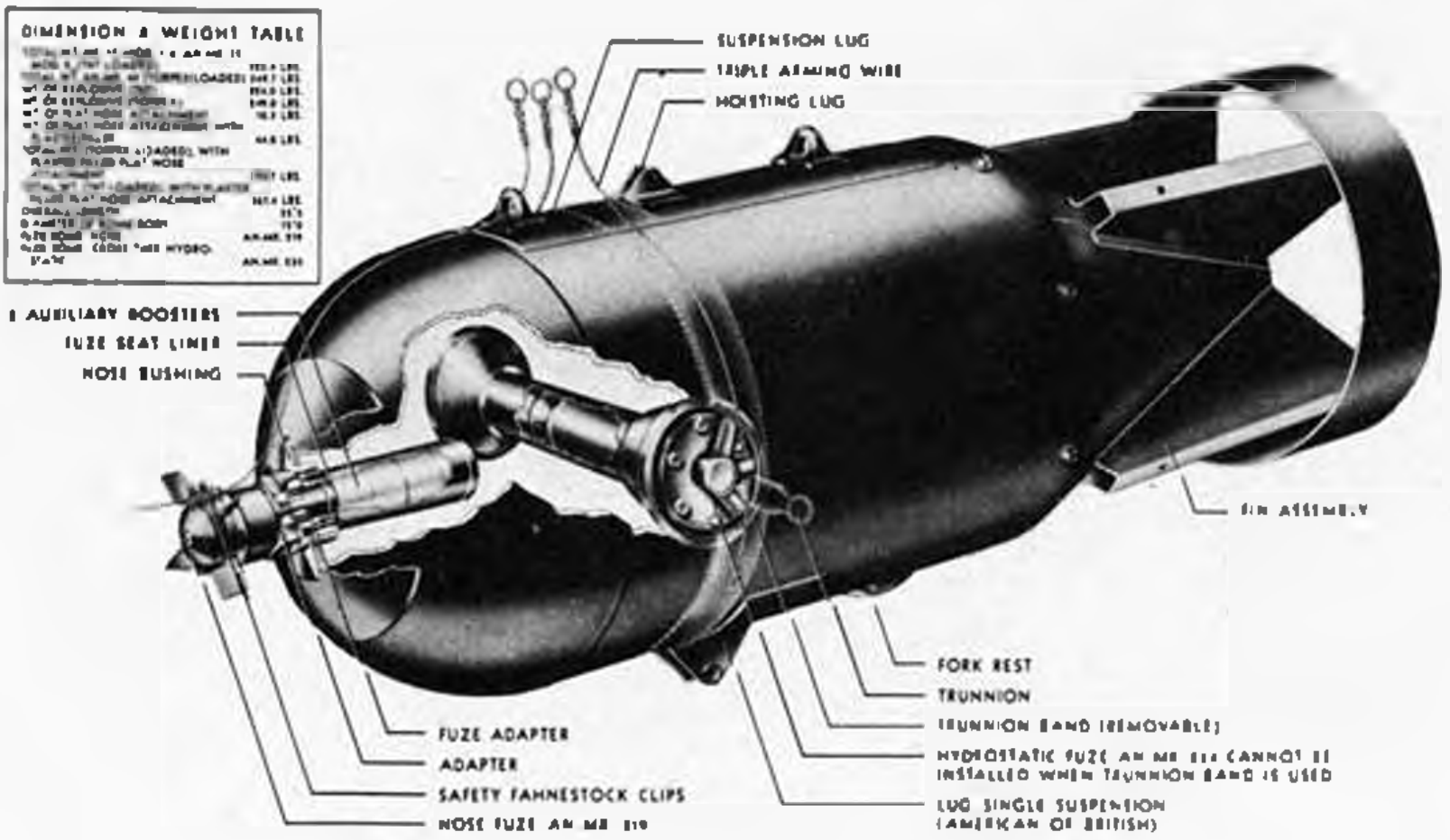

Fig. 4- Mk. 17-1, AN-Mk. 17-2 and AN-Mk. 44 Aircraft Depth Bomb

3. If the jump-out pin is in either end of the fuze when found, the fuze is safe. There is no other way of determining the condition of the fuze by visual examination.

Operation

1. The fuze is essentially a small scale model of a hydrostatic depth charge arming and firing mechanism, and it operates in a similar manner. When the booster extender houses the booster at a depth between 15 and 20 ft., it also operates the primer and detonator slider aligner, aligning the explosive train. The fuze then fires in the same manner as the Mk. 6 depth charge pistol. Possible depth settings are 25, 50, 75, 100 and 125 ft.

Rendering-Safe Procedure

1. Remove the six screws from each end of the fuze pocket, and withdraw the pistol and booster extender. These two parts are not distinguishable, one from the other, from an examination of the outside of the case.

2. Separate the booster can from the extender. This can contains a small tetryl sub-booster as well as the main TNT booster.

3. Unscrew the conical primer and detonator slide aligner from the inner end of the pistol. This assembly contains a small primer cap and detonator.

4. Dispose of all explosive elements.

Transverse Fuze AN-Mk. 234

1. This fuze is essentially a Mk. 224 modified to include a hand-operated depth-setting dial on the pistol face, permitting depth setting without disassembly.

2. It is rendered safe in the same manner as the Mk. 224 and it is recommended that the extender in this case distinguishable from the pistol, be removed first during disassembly.

Tail Fuze Mark 229

Description

1. Hydrostatic fuze, mechanically armed.

2. The fuze is 16 1/3" long, its maximum diameter is 3½", and it protrudes about 12" from the pocket. The span of the 16-bladed arming vane is 5 1/4".

3. If the arming wire is in the fuze when found, the fuze may be considered safe. There is no other way of determining the condition of the fuze by visual examination.

Operation

1. Armed by the air vane which unlocks the hydrostatic piston. The fuze then fires in a manner similar to the Mk. 6 depth charge pistol. Depth settings of 25, 50, 75, 100 and 125 ft. are made by a hand dial on the fuze body.

Rendering-Safe Procedure

1. Tape the vane to the fuze body to prevent rotation.

2. Unscrew the fuze from the pocket, and withdraw it.

3. Insert a safety pin or wire in the hole provided under the large shoulder of the fuze body, 3 1/4" from the inner end of the fuze. If the pin does not readily go all the way through, do not attempt to force it. The fuze must then be considered to have fired as a dud, and is highly dangerous.

4. Dispose of the fuze. Do not attempt disassembly.

Tail Fuze AN-Mk. 230

1. This fuze is similiar to the Mk. 229, except that it is only 15" long, the portion of the fuze that fits into the pocket being 1 1/3" shorter than the corresponding part of the Mk. 229. The two fuzes

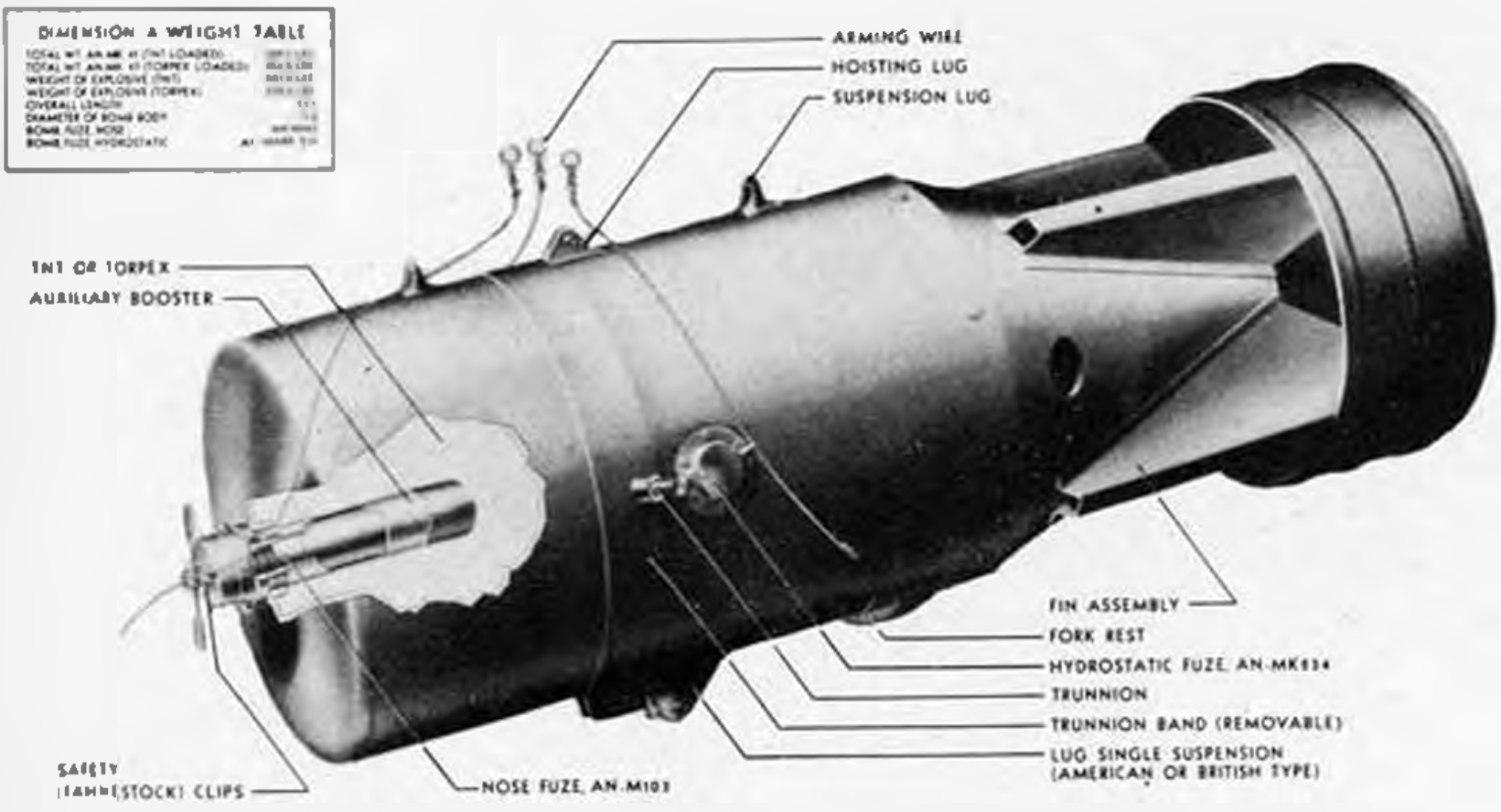

Fig. 5-- AN-Mk. 41 and AN-Mk. 47 Aircraft Depth Bomb

are therefore not interchangeable.

2. It is rendered safe in the same manner as the Mk 229.

Tail Fuze Mk 231 Mod 0

Description

1. Hydrostatic fuze, mechanically armed, designed to fire at a depth of 25 ft.

2. The fuze is approximately 12?5 long, ?738 in maximum diameter, and protrudes about 9?7 from the pocket. The span of the two-bladed arm-vane is 5 5/8".

3. There is no means of determining the armed or unarmed condition of the fuze from an exterior examination. However, it should be fairly safe to handle if out of water and absolutely safe if it has never been submerged to a depth of 20 ft.

Operation

1. When the bomb is dropped, an arming wire is withdrawn from the vane and fuze flange. Air travel rotates the vane and vane shaft, unscrewing the arming stem from the arming stem guide. After about 40-45 vane revolutions, the arming stem moves free of the arming balls which fall into the stem nut, freeing the hydrostatic piston and arming the fuze.

2. Upon impact with the water, an inertia counterbalance prevents the fuze from firing due to either initial impact or ricochet. As the bomb sinks, water enters around the baffle ring and through two ports on the upper fuze body. Water pressure then extends the bellows, forcing the hydrostatic piston downward and compressing the firing spring. After the hydrostatic piston has moved downward about 9/32", the six lock balls which lock the firing plunger to the plunger housing fly out into an annular recess in the hydrostatic piston, allowing the spring-loaded plunger to initiate the explosive train.

Rendering Safe Procedure

1. Tape the arming vane to the fuze body.

2. Unscrew the fuze from the pocket.

3. Dispose of the fuze. Do not attempt disassembly.

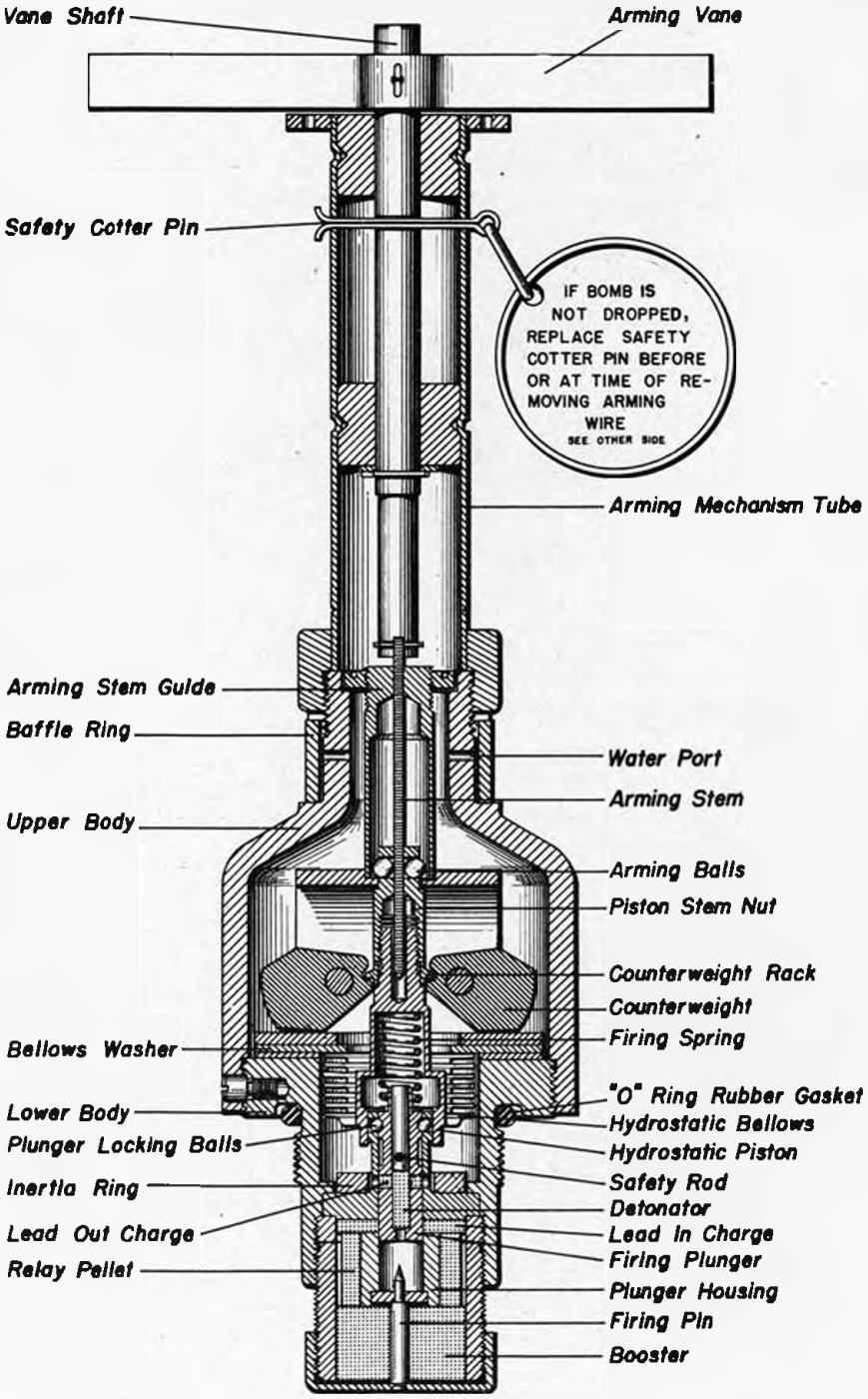

Fig 6 - Tail Fuze Mk 231-0, Sectional View

MINE DISPOSAL HANDBOOK

PART II

UNITED STATES UNDERWATER ORDNANCE

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CHAPTER 6

U. S. AHEAD-THROWN ANTI-SUBMARINE WEAPONS

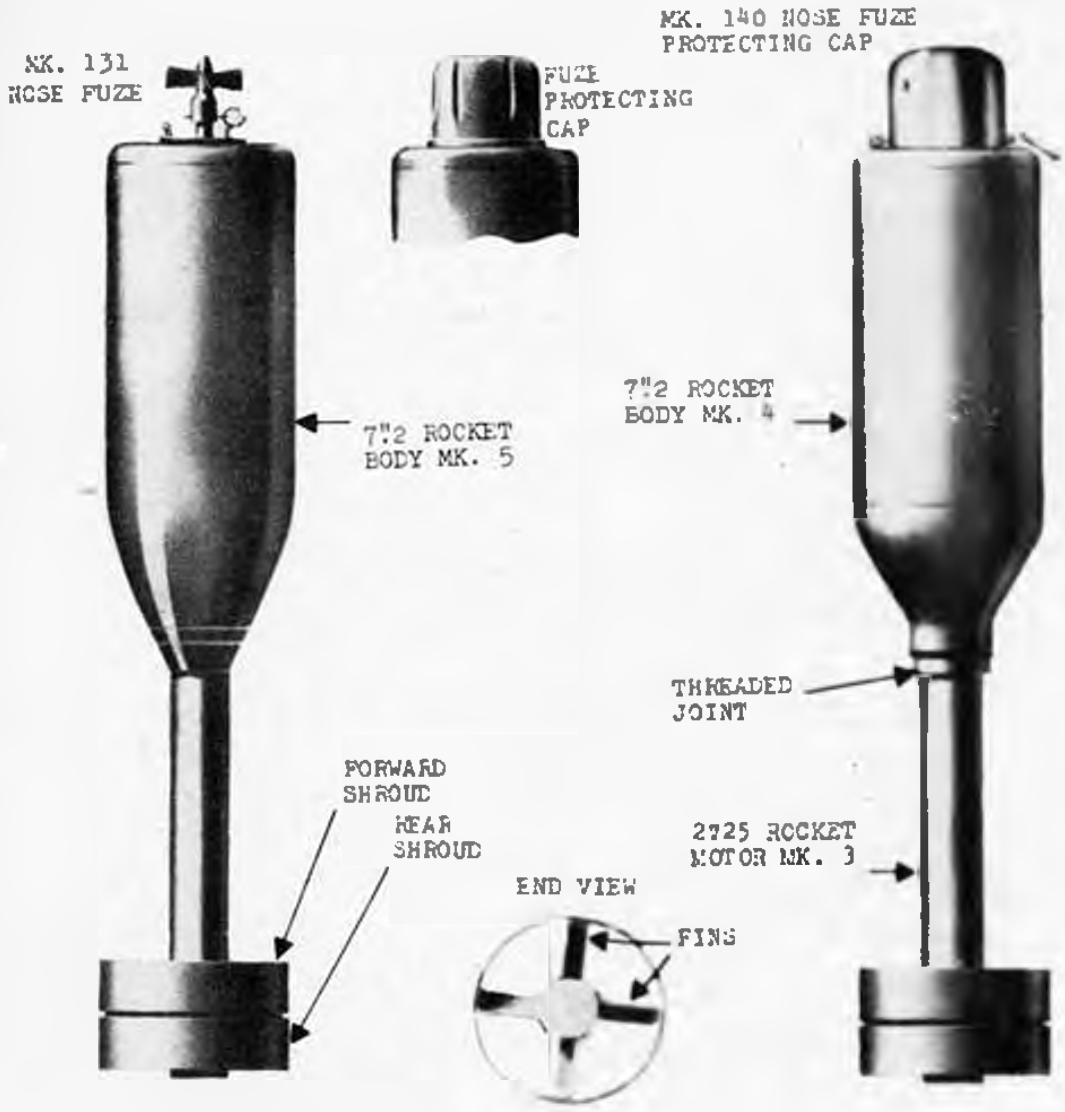


Fig. 1-- 7"2 Rocket (Mousetrap)

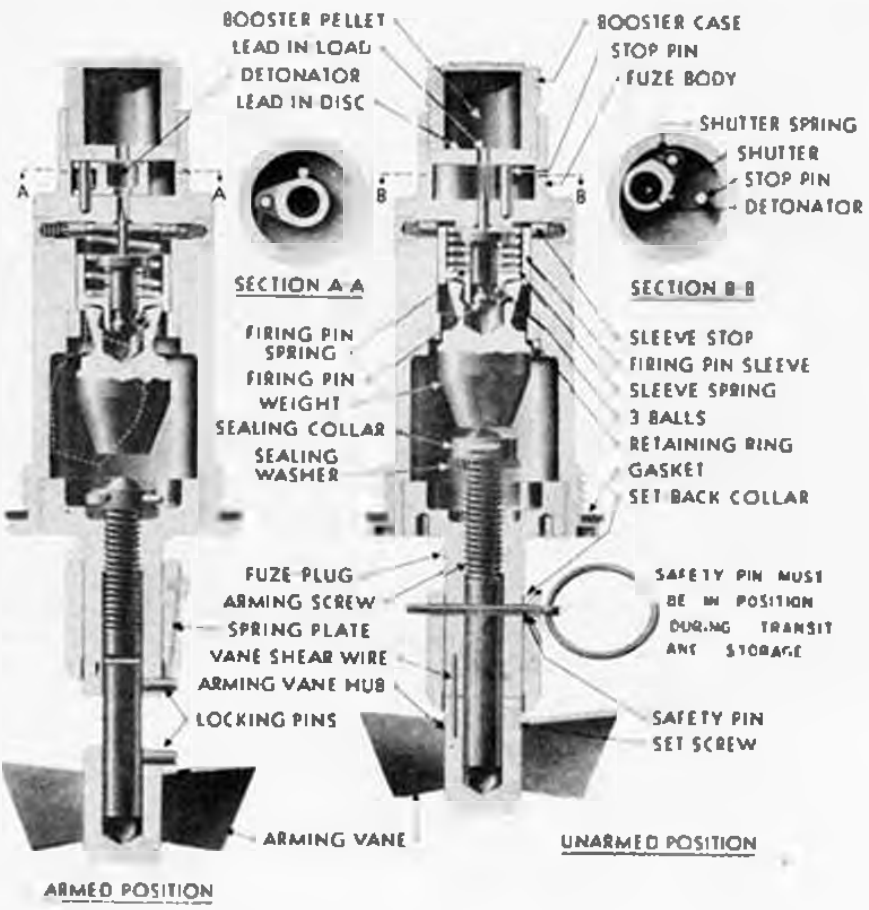


Fig. 2-- Mk. 131 Nose Fuze, Sectional View

Introduction

1. This chapter includes information on the U. S. Navy 7"2 ahead-thrown rocket, (Mousetrap) the 7"2 ahead-thrown projector charge (Hedgehog) and the fuzes which may be fitted in each.

2. The various services are developing many kinds of ahead-thrown weapons. The two listed above, being anti-submarine weapons, come under the general heading of underwater ordnance, and, as such, should be familiar to Mine Disposal personnel.

3. All the fuzes fitted are very sensitive, and dangerous to handle when armed. For this reason, they should be rendered safe only when absolutely necessary.

7"2 Rocket (Mousetrap)

General

1. Launched from multiple rail launchers on the forecastle of patrol vessels.

Description

1. The complete unit consists of the below listed parts:

   (a) Body

   The body is a cylindrical, welded case, 19" long and 7"2 in diameter, with a flat nose and a conical tail. It was originally designed for nose filling, with a fuze sent-liner pocket being screwed into the nose after filling. Later models are filled through the tail, and, in these, the fuze sent-liner is an integral part of the body.

   (b) Motor

   The motor is a steel tube, 16" long and 7"2 in diameter, secured to the after end of the body by a threaded joint. Four radial fins, set at an angle of ten degrees, are enclosed in a cylindrical shroud band, 7" in diameter, in the rear end. The motor propellant is a single long grain of ballastite which is ignited by an electric squib and a black powder primer.

   (c) Fuze

   One of three fuzes is fitted:

   1. Nose Fuze Mk. 131 and Mods.
   2. Nose Fuze Mk. 140 and Mods.
   3. Nose Fuze Mk. 135 and Mods.

2. The complete rocket is 38½" long, 7"2 in diameter, and is painted gray. The charge is either 30 lbs. TNT or 34 lbs. Torpex, and the total weight of the rocket in air is about 63 lbs.

Operation

1. When electric current is supplied to the launchers, the squib, igniter and propellant are fired. The burning propellant generates gases at pressures of several hundred pounds per square inch, forcing them out through a nozzle in the motor thus propelling the unit forward. The propellant burns for about .4 sec., or during the first 33 ft. of flight, momentum carrying the rocket an additional distance of approximately 850 ft. before it enters the water.

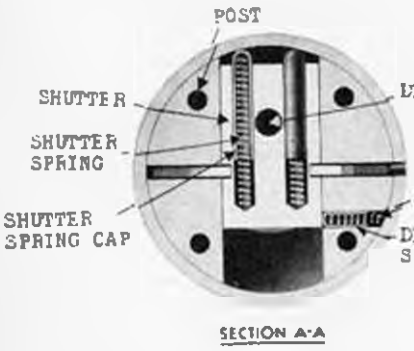
Rendering Safe Procedure

1. Rendering this rocket safe consists of disposing of the particular fuze that is fitted. A brief description and operation of each fuze, together with the approved procedure for rendering safe, is included below.

Nose Fuze Mark 131

Description

Fig. 3-- Mk. 131 Nose Fuze



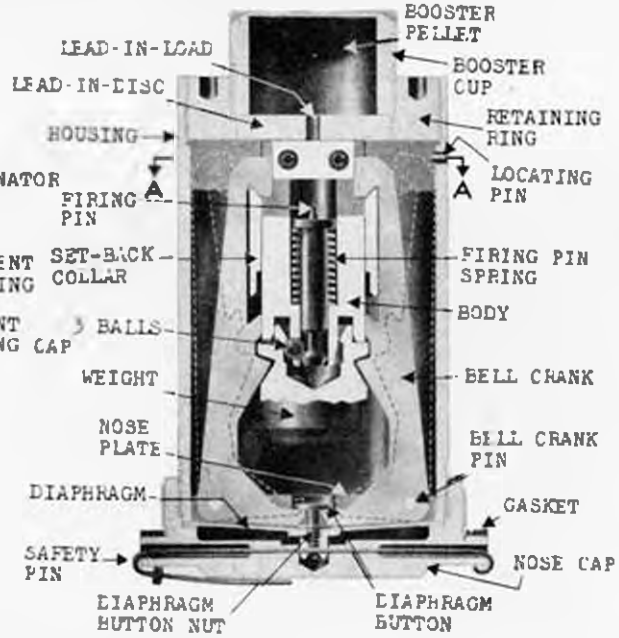


Fig. 4-- Mk. 135 Nose Fuze, Sectional View

Fig. 5-- Mk. 135 Nose Fuze

distinguish it from the Mk. 136.

3. If the fuze is unarmed, the vane hub will be snugly against the fuze plug. If unarmed or partly armed, there will be a space at this point up to ¼" wide.

Operation

1. Upon launching, a set-back collar moves aft, releasing the water vane. Impact with the water causes the shear wire through the arming vane hub and the fuze plug to be severed, and allows the vane to rotate. Seven turns of the vane, or between 10 and 15 ft. of water travel, are sufficient to arm the fuze completely, although firing is possible after only four complete revolutions of the vane. This arming process results in the alignment of the explosive train, and unlocking of the firing weight. Impact with a hard surface, either directly or by a glancing blow, will force the firing weight off its seat, releasing the locking balls, and allowing the spring loaded striker to impinge on the detonator.

Precautions

1. Do not move or jar the fuze unnecessarily.

2. Do not attempt to remove armed or partly armed fuzes unless absolutely necessary. Dispose of the complete assembly wherever feasible.

3. Never remove the vane and fuze plug from the fuze body as this will arm the fuze. Always withdraw the complete fuze as a unit.

Rendering-Safe Procedure

1. If the fuze is armed or partly armed, disarm it by carefully screwing the arming vane backward (counter-clockwise looking at the nose of the fuze) until the space (noted in Par. 3 under description) has been reduced to about 3/16". At this point the vane will no longer turn freely, and it should not be forced.

2. When unarmed, tape the vane securely to prevent rotation.

3. If feasible, destroy the complete rocket by countermining or sinking it in deep water. If absolutely necessary, the complete fuze may be removed from the bomb, and disposed of. Do not disassemble the fuze.

Note: Although it is contrary to general policy ever to turn an arming vane while rendering a fuze safe, in this case such a procedure is proper because of the construction of the fuze. Four spring-loaded pins lock the firing pin sleeve when the fuze arms, and prevent the firing pin from being forced down onto the detonator when the vane is rotated as described. These pins are installed for the expressed purpose of permitting disarming the fuze by reverse rotation.

Nose Fuze Mark 135

Description

1. Inertia, impact fuze, armed hydrostatically. Formerly designated "HIR type fuze Mk. 35".

2. Fuze is 5 3/4" long, diameter of body is 2 5/8", and diameter of nose cap is 3 1/4".

3. There is no way of determining, from an examination of the exterior, whether or not the fuze is armed.

Operation

1. A safety pin, which fits through the nose cap, is withdrawn before launching, thereby unlocking the diaphragm spindle. When the rocket enters the water, the safety-pin hole serves as a water intake, and when sufficient water pressure has been build up, the diaphragm "pops" like the bottom of an oil can from a convex to a concave position. This usually occurs in from 15 to 20 ft. of water, although 30 ft. of static water pressure would be required to make the diaphragm function. Operation of the diaphragm pivots two bell-crank arms outward, aligning the elements of the explosive train, and unlocking the firing weight. The fuze is then armed, and will fire in the same manner as the Mk. 131.

Precautions

1. Do not move or jar the fuze unnecessarily.

2. Do not attempt to remove armed or partly armed fuzes unless absolutely necessary. Dispose of the complet assembly wherever feasible.

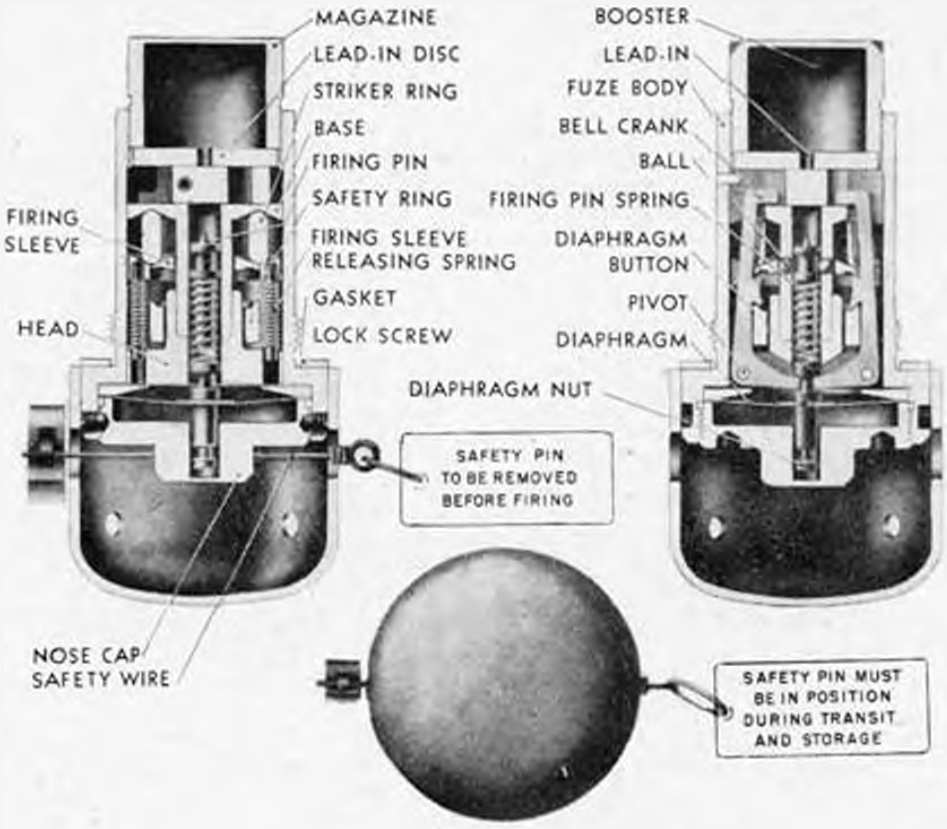


Fig. 6-- Mk. 140 Nose Fuze, Sectional View

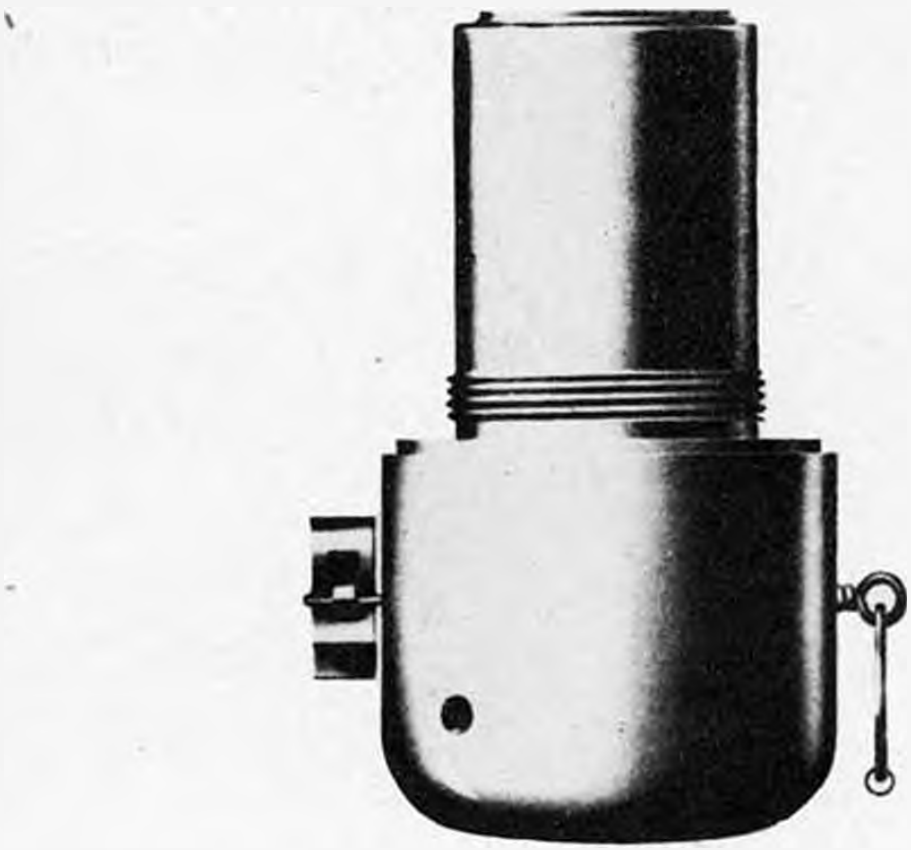


Fig. 7-- Mk. 140 Nose Fuze

3. Once armed, the fuze will not disarm upon release of hydrostatic pressure. It is extremely sensitive to shock when armed, and will fire when dropped 2" on a hard surface.

Rendering Safe Procedure

1. No safe procedure can be recommended. The only possible means of disposal known in to unscrew the fuze from the pocket and destroy it. This should be attempted only in an extreme emergency, and great caution must be exercised at all times.

Nose Fuze Mark 140

Description

1. Inertia, impact fuze, hydrostatically armed.

2. Fuze is 4½" long, and its maximum diameter is 2"7.

3. There is no way of determining, from a visual examination, whether or not the fuze is armed.

Operation

1. The fuze arms in the same manner as the Mk. 135 except that arming is usually completed in from 8 to 15 ft. of water. As is the case in the Mk. 135, 30 ft. of hydrostatic pressure is required to operate the diaphragm. A direct or glancing blow will cause the firing ring to be displaced, releasing locking balls, and allowing the spring loader striker to impinge on the detonator.

Precautions

1. Do not move or jar the fuze unnecessarily.

2. Do not attempt to remove armed or partly armed fuzes unless absolutely necessary. Dispose of the complete assembly wherever feasible.

3. Once armed, the fuze will not disarm upon release of hydrostatic pressure. It is extremely sensitive to shock when armed.

Rendering-Safe Procedure

1. Insert a safety wire through the water intake ports on the nose cap.

   (a) If the wire goes all the way through, the fuze has not armed, and may be safely unscrewed from the bomb and disposed of.

   (b) If the wire will not go through, the fuze is armed. No safe procedure can be recommended for this fuze when in the armed condition. The only possible means of disposal known is to unscrew the fuze from the bomb and destroy it. This should be attempted only in an extreme emergency, and great caution must be exercised at all times.

7"2 Projector Charge (Hedgehog)

General

1. Same as Mousetrap.

Description

1. This projectile is very similar to the Mousetrap in that the complete assembly consists of a body, tail tube and fuze, and in that the color, shape, dimensions charge and total weight are essentially the same. The chief external difference is that the tail tube is only 1 3/4" in diameter as compared with the 2 1/4" diameter of the Mousetrap motor.

2. One of two fuzes is fitted:

   (a) Nose Fuze Mk. 136 and Mods.
   (b) Nose Fuze Mk. 140 and Mods.

Operation

1. The Hedgehog is fired from projectors similar to those used with the Mousetrap. Electrical ignition of the primer sets up a cartridge in the tail of the projectile, throwing it forward and creating considerable recoil. This recoil and the fact that the projectile is not self-propelled constitute the main difference between the Hedgehog and Mousetrap, and limit the use of the projectile to ships which can withstand

Fig. 8-- 7.2 Projector Charge (Hedgehog)

Fig. 9-- Mk. 142 Fuse

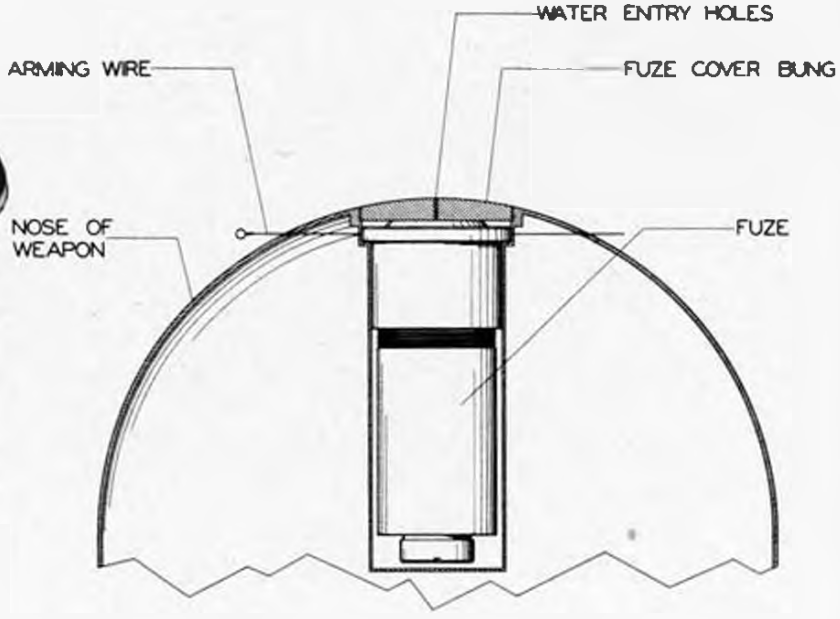


Fig. 10-- Mk. 142 Fuse in Weapon

these heavy stresses.

Rendering Safe Procedure

1. Rendering this projectile safe consists of disposing of the fuze that is fitted. A brief description and operation of each fuze, together with the approved procedure for rendering safe, is included below.

Nose Fuze Mark 136-0

1. The Mk 136-0 is identical with the Mk 131-0, except that it does not have red paint on the nose of the vane hub, and has an additional shear wire which secures the set-back collar in the forward position prior to launching.

Nose Fuze Mark 140-0

1. See Mousetrap.

Nose Fuze Mark 142-0

Description

1. Impact-inertia fuze, hydrostatically armed.

2. The fuze is 7 1/8" long, 2 5/8" in body diameter, 3 1/3" in maximum diameter at the nose cap, and weighs six lb. without its explosive elements.

3. The fuze is fitted in the warhead nose pocket of an aircraft-launched, anti-submarine weapon and is held in place by a cover bung. The warhead may be identified by its unusual color markings, being divided longitudinally into two equal sections, one of which is painted gray and the other, white.

Operation

1. The fuze arms and fires in a manner similar to the Nose Fuze Mk 135-0 (Part II, Chapter 6), except that arming is normally completed when the fuze is subjected to a pressure equivalent to a 23 ft. hydrostatic pressure head. The fuze fires, when in the armed condition, if dropped 1/2" on its nose or 8/10" on its side.

Precautions

1. Note the extreme sensitivity of the fuze when in the armed condition. No attempt should be made to withdraw an armed fuze from the warhead.

2. Check the condition of the fuze.

   (a) If the arming wire is present, the fuze is safe.

   (b) If the arming wire is not present, the fuze must be considered armed.

Rendering Safe Procedure

1. Unarmed

   (a) Using a pin spanner or other suitable tool, remove the cover bung.

   (b) Withdraw the fuze and destroy intact. DO NOT ATTEMPT DISASSEMBLY.

2. Armed

   (a) Pack the container described in Fig. 11 with C2 plastic explosive. Insert an Army Engineer Special Blasting cap in the explosive and place the container against the cover bung so that the two projections on the container fit into the holes on the cover bung.

   (b) Fire the charge from a safe distance.

   (c) Remove and destroy the warhead.

   (d) Return the rest of the weapon to the nearest Mine Assembly Depot.

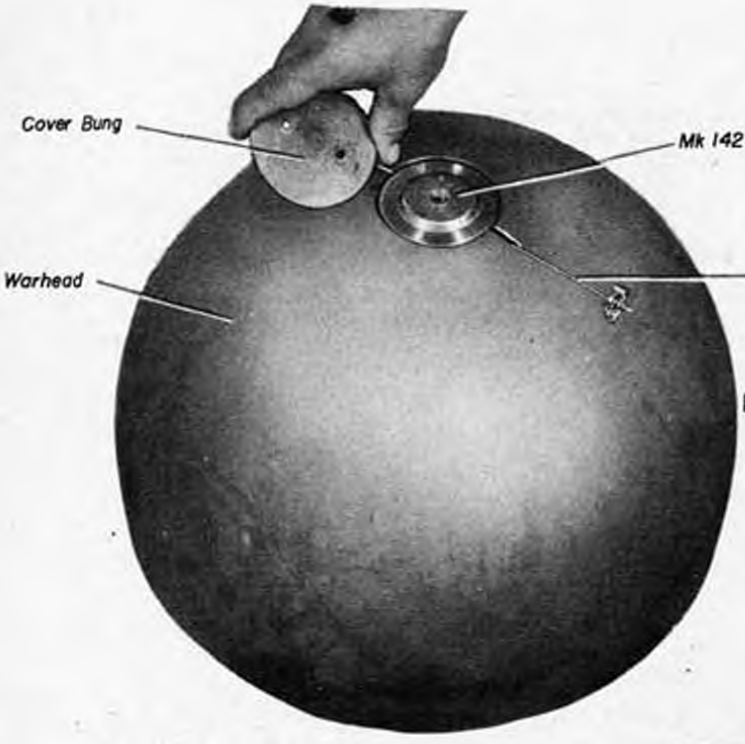


Fig. 11 - Nose Fuze Mk 142-O in Warhead

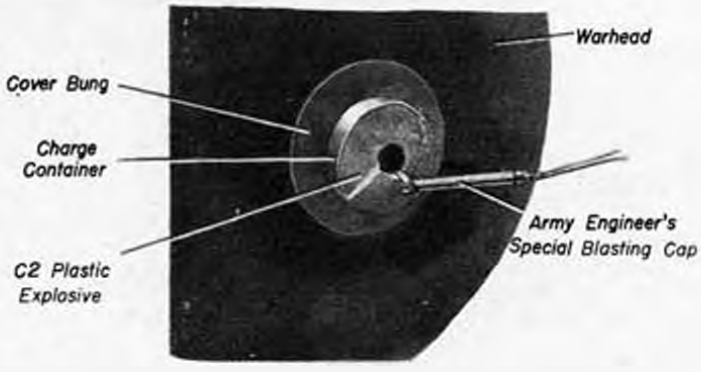


Fig. 12 - Nose Fuze Mk 142-O, Charge Container in Place for RSP

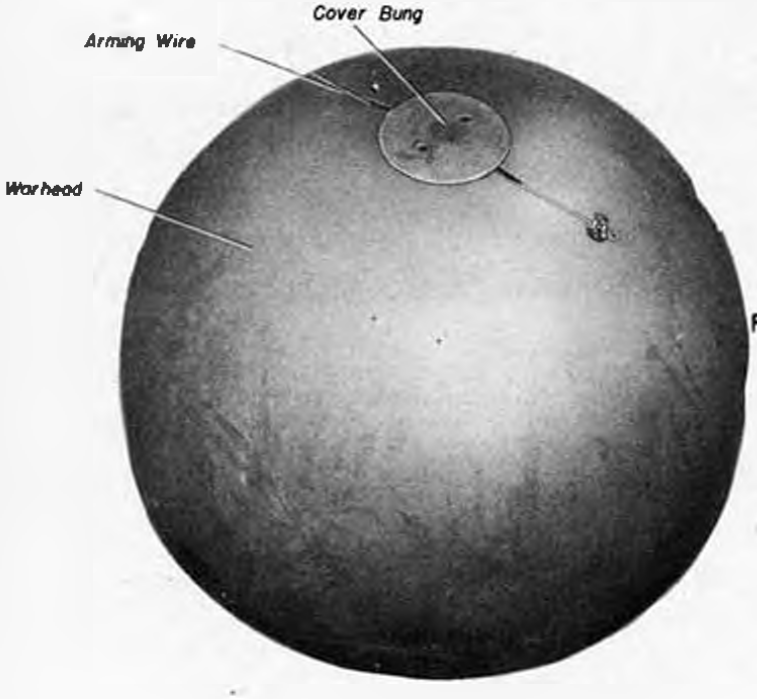
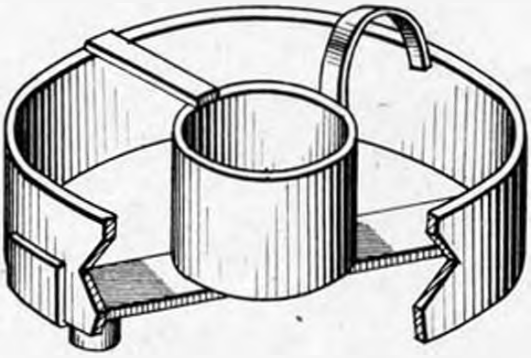


Fig. 13 - Nose Fuze Mk 142-O in Warhead with Cover Bung in Position



MATERIAL - $\frac{1}{32}$ BRASS

NOTE:
Solder All Joints

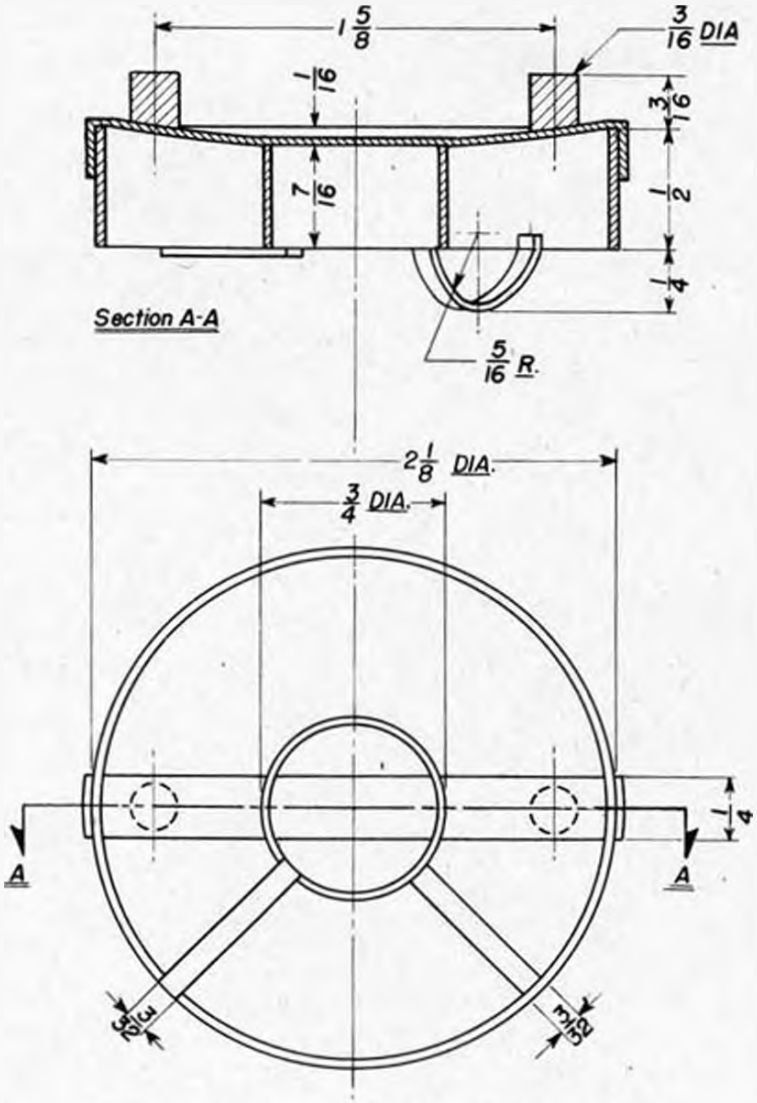


Fig. 14 - Nose Fuze Mk 142-0, Charge Container for RSP

MINE DISPOSAL HANDBOOK

PART II

UNITED STATES UNDERWATER ORDNANCE

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CHAPTER 7

U.S. CONTROLLED MINES

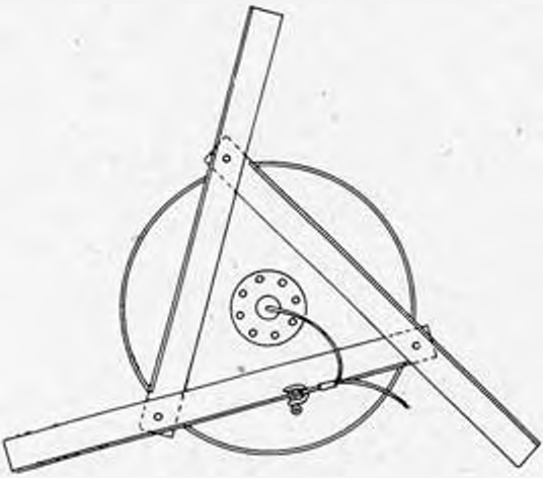


Fig. 1-- Steel Angle Framework

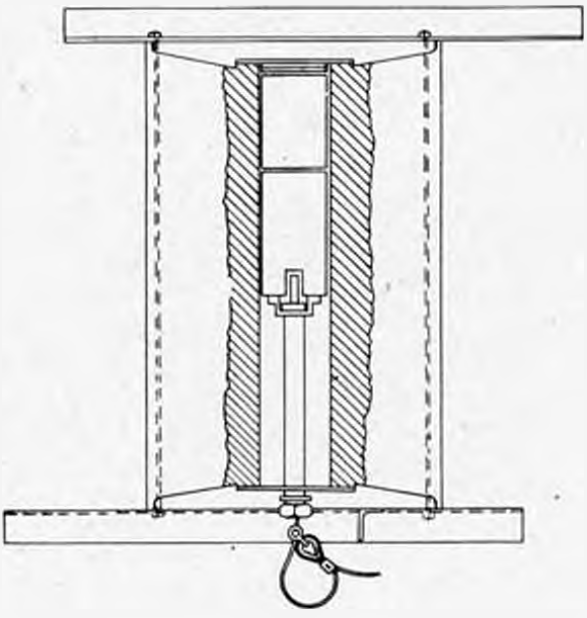


Fig. 2-- Mk. 20 Controlled Mine, Sectional View

Introduction

1. These mines are used to protect our own harbors and anchorages from surface craft and submarines. The two types covered in this chapter include one Army model, and one emergency model used by the Navy.

2. Controlled mines fall into two general operational categories:

   (a) Those which are in effect remote controlled demolition charges. This type consists of a mine case containing a simple firing mechanism and an explosive charge, and connected electrically to a source of power ashore. Either moored or ground type cases are used.

   (b) Those which contain an influence unit powered from a source ashore. Current from the power source put across the mine unit will arm it, and the unit will fire when subjected to a proper influence. All the known mines of this type are ground mines.

3. All of these mines are relatively safe to handle if cut off from their source of power. Routine precautions should be taken, however, to avoid jarring the electric detonators, and to avoid any sparking which might set up the TNT boosters and charge.

U.S. Navy Mine Mark 20

General

1. Emergency, controlled ground mine.

2. Laid by hand from surface craft.

3. Laid defensively in depths of water under 100 ft.

Description

1. The Mk. 20 case may be any one of the following depth charge cases, fully loaded:

   (a) Mk. 2-2

   (b) Mk. 3

   (c) Mk. 6

   (d) Mk. 6-1

2. The loaded cases are fitted with one each of the following:

   (a) Booster can Mk. 6

   (b) Electric detonator holder Mk. 2 (Depth Charge Adapter)

   (c) Electric detonator Mk. 1-1

   (d) A steel angle framework (Fig. #1) consisting of three steel angles 26" long, made of 2" x 2" steel, assembled in the form of a triangle end attached to each end of the case by longitudinal tie rods. This assembly prevents the mine from being disturbed by water currents after planting.

   (e) A suitable length of double-conducting cable.

Operation

1. The mine is laid in an armed condition.

2. The mine is fired by remote control from an external source of power such as a blasting machine.

3. No safety features are incorporated.

Precautions

1. This mine is always armed.

RMS

1. Cut the firing leads.

2. Remove the detonator holder.

3. Dispose of the detonator, booster and charge.

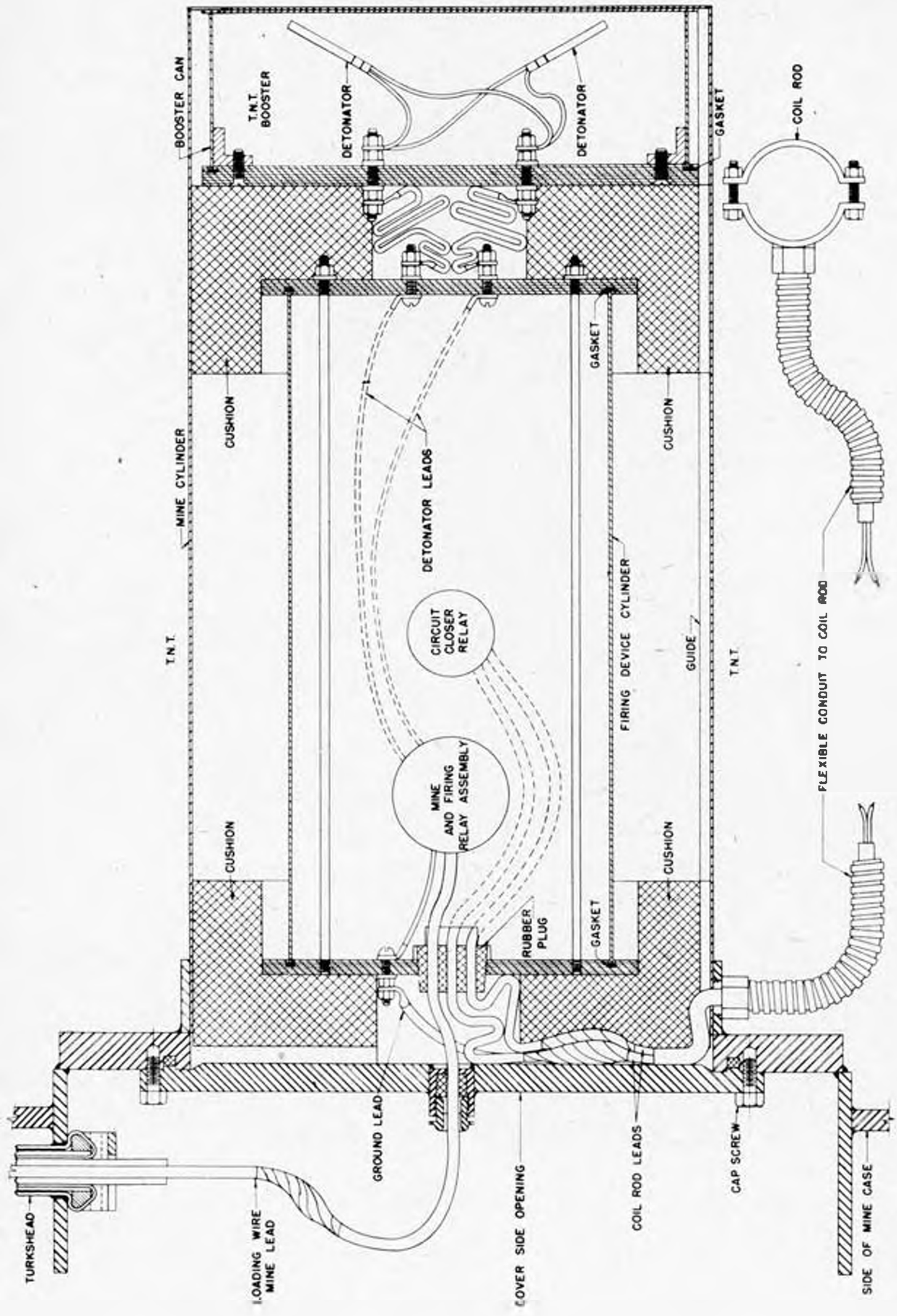


Fig. 3-- Schematic Horizontal Cross Section of Firing Device and Compound Plug for M4 Ground Mine.

Army Ground Mine M3

General

1. Controlled, magnetic induction mine.

2. This mine has a total weight when loaded of over 6000 lbs., and possibilities of recovery operations ever being necessary are very remote. Mine Disposal personnel may be asked for information on it from time to time, however, and the following data is included to provide a rough working knowledge of the cases and units that may be used.

Description

1. Two nearly identical cases are used (M3 & M3A1) with seven different coil rod firing assemblies. The cases are large cylindrical tanks with a truncated cone top section, the cylindrical section being about 90" in diameter and the overall unit being about 60" high. The general assembly set-up for the various coil rod units is shown in Figures 4 and 5. The firing devices fit over the booster in a pocket on the side of the cylindrical section.

Operation

1. All units operate on a sufficient rate of change of the surrounding magnetic field.

2. The mine may be fired in two ways:

   (a) If set on automatic, the mine fires whenever subjected to a proper influence, and need not be actuated from a control station.

   (b) When set on control, a magnetic influence will operate an indicator system, and the mine may be fired manually from the control station.

Precautions

1. The mine is safe when cut off from its external source of power.

RMS

1. The mine may be disassembled as follows: (Fig. #3)

   (a) Remove the side opening cover.

   (b) Disconnect the ground lead from the terminal.

   (c) Disconnect the coil rod leads from the firing device red leads.

   (d) Remove the cushions and firing device from the pocket.

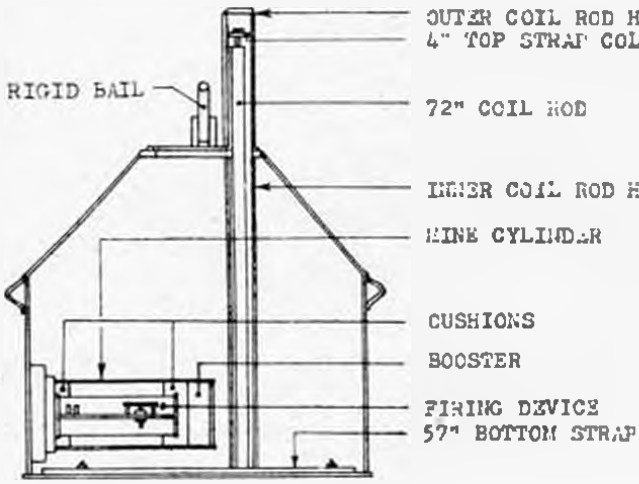
   (e) Disconnect the detonator leads from the firing device terminals.

   (f) Remove the booster can from the pocket.

   (g) Remove the booster can cover, and extract the electric detonators from the TNT booster.

   (h) Disconnect the detonators from the booster can cover.

   (i) Dispose of detonator, booster and charge.



M3-A1 MINE CASE WITH 72" COIL ROD
ASSEMBLIES C, E, AND G.

Fig. 4-- Army Ground Mine M4,
Sectional View

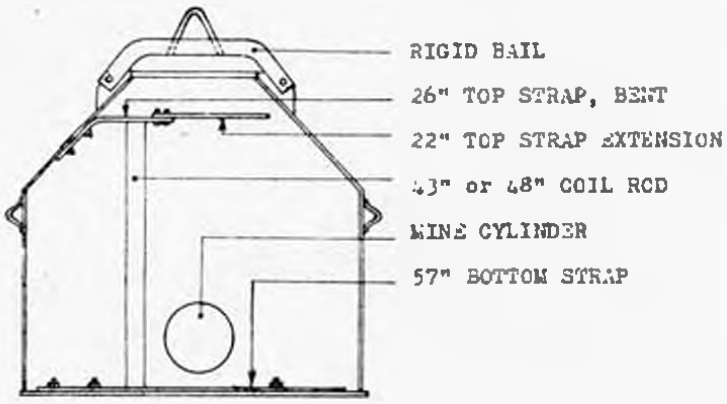


Fig. 5-- Army Ground Mine M4,
Sectional View

M3-A1 MINE CASE WITH 43" OR 48"
COIL ROD
ASSEMBLIES A, B, D, AND F.

Fig. 6-- Army Ground Mine M4