

UNCLASSIFIED

*Lieut. J. H. Haskell*

# U.S. NAVY PROJECTILES AND FUZES



UNCLASSIFIED CLASSIFICATION ~~(CANCELLED)~~ (CHANGED TO)  
 BY AUTHORITY OF *OPNAVINST 5573.3(28)*  
 ON *8-10-79* *Pat Staples* *SS-7*  
 (DATE) (SIGNATURE) (RANK)

JUNE 1945

~~CONFIDENTIAL~~

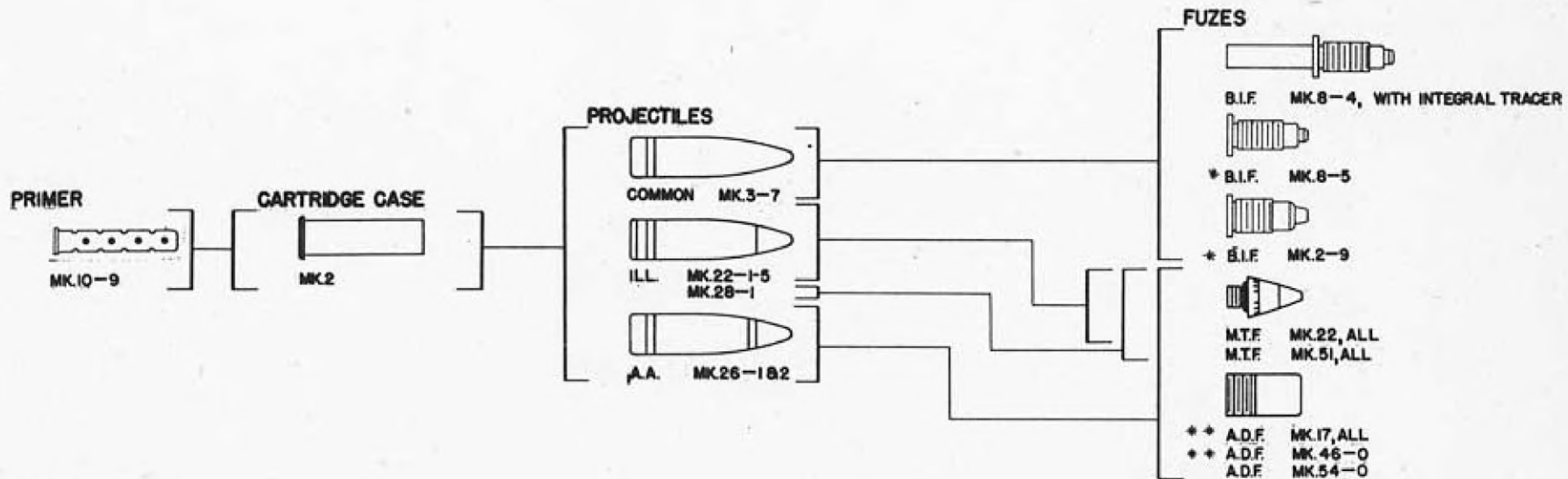
UNCLASSIFIED

# **COMPLETE ROUND CHARTS**

## **SECTION I**

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# COMPLETE SERVICE ROUNDS FOR 3"/23 CASE GUN (FIXED)

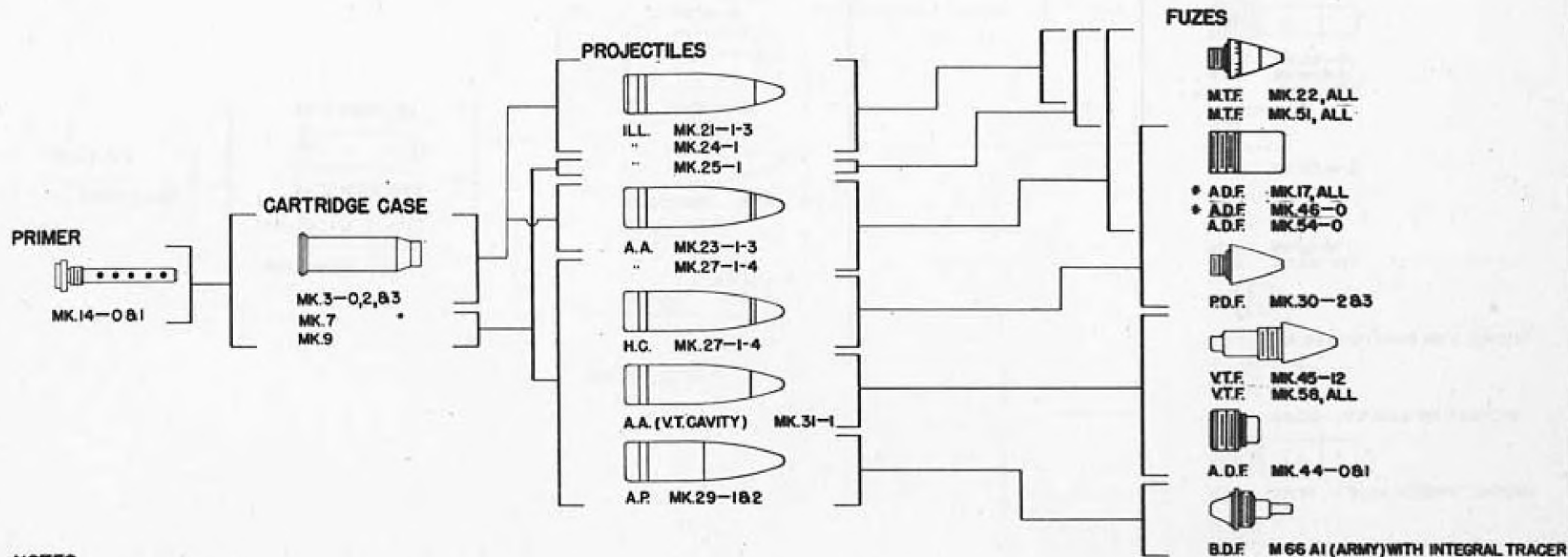


## NOTES

\* MAY BE USED, BUT MK. 8-4, IS PREFERRED ASSEMBLY

\*\* BEING REPLACED BY MK.54 FUZE

# COMPLETE SERVICE ROUNDS FOR 3"50 CASE GUN (FIXED)

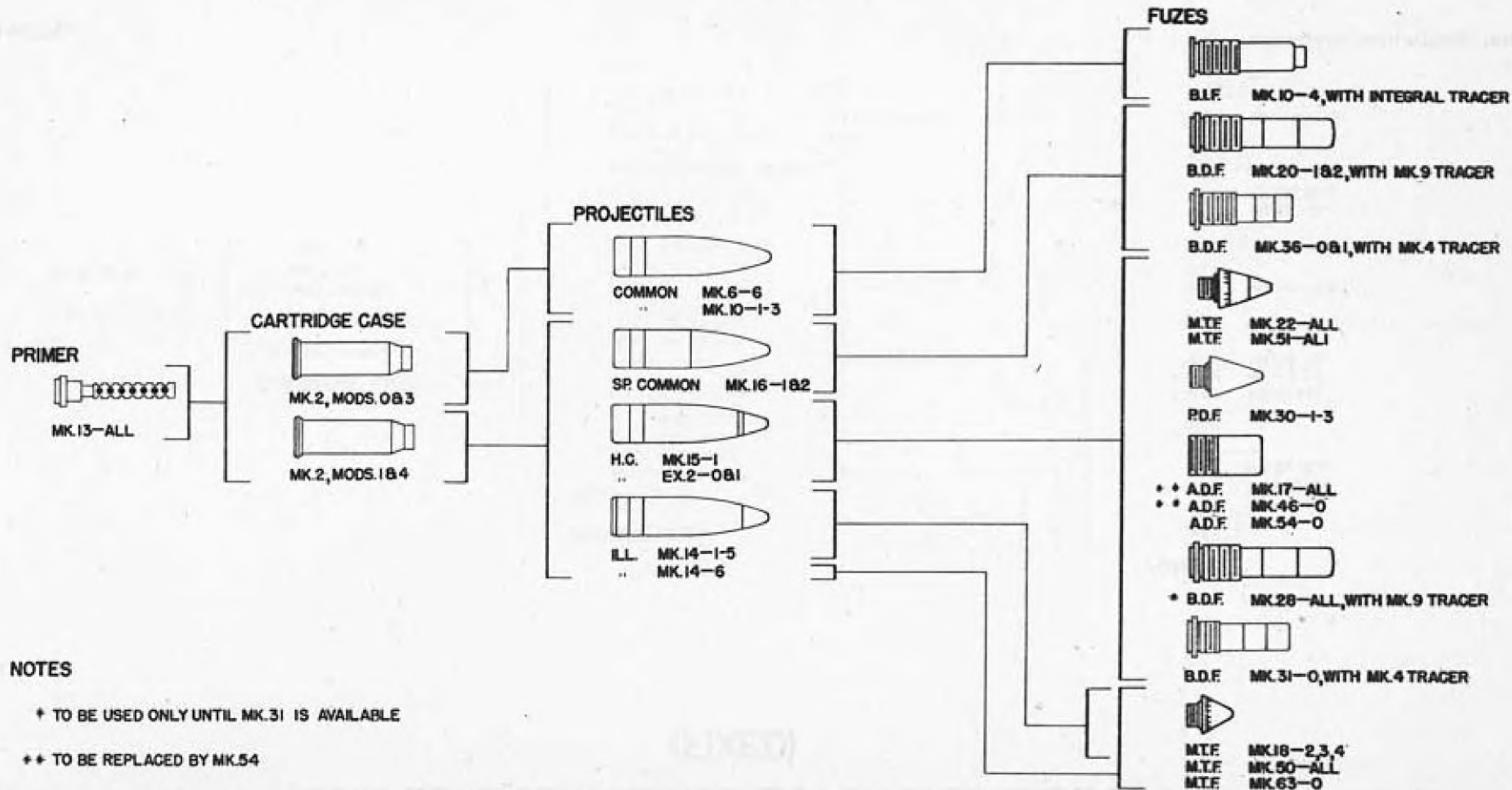


**NOTES**

\* BEING REPLACED BY MK.54 FUZE

MAY 1945

# COMPLETE SERVICE ROUNDS FOR 4" 50 CASE GUN (FIXED)



### NOTES

\* TO BE USED ONLY UNTIL MK.31 IS AVAILABLE

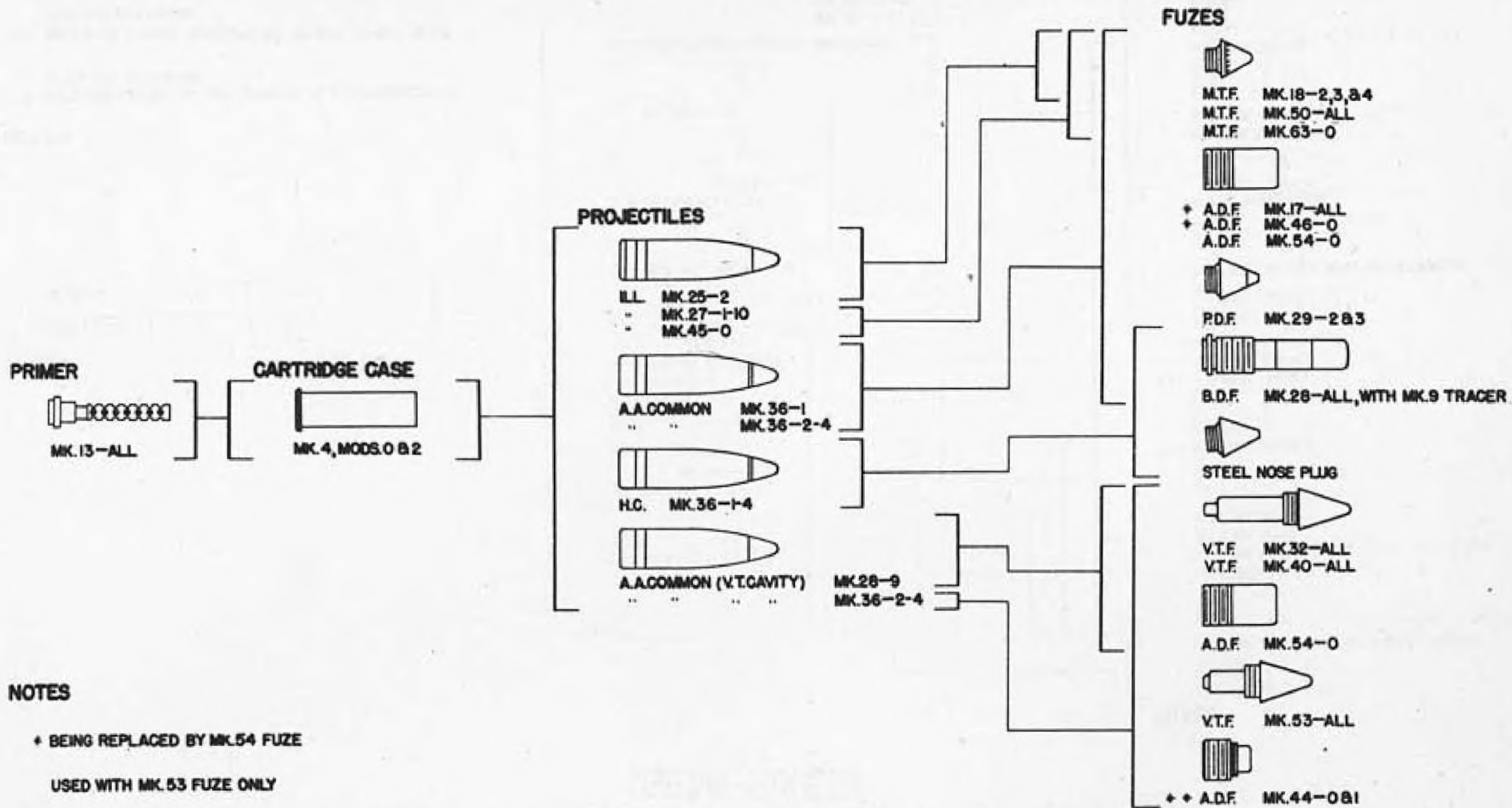
\*\* TO BE REPLACED BY MK.54

(FIXED)

COMPLETE SERVICE ROUNDS FOR 4" 50 CASE GUN (FIXED)

- 5 -

# COMPLETE SERVICE ROUNDS FOR 5 1/2" CASE GUN (FIXED)

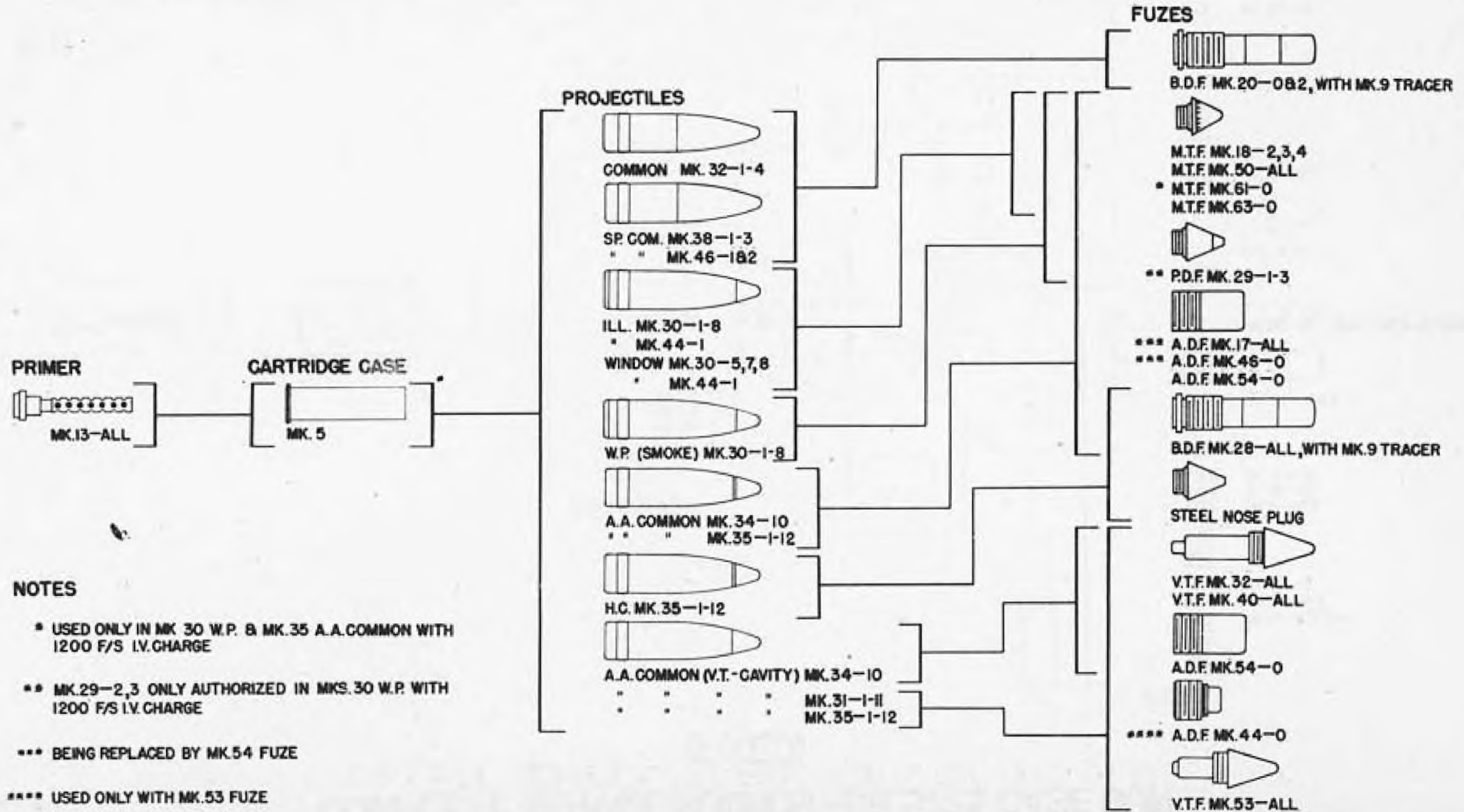


### NOTES

+ BEING REPLACED BY MK.54 FUZE

USED WITH MK.53 FUZE ONLY

# COMPLETE SERVICE ROUNDS FOR 5"/38 CASE GUN (SEMI-FIXED)



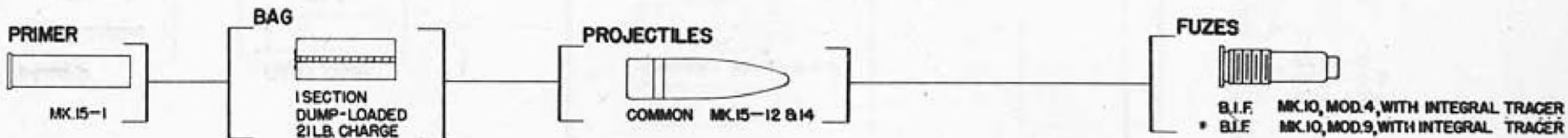
### NOTES

- \* USED ONLY IN MK. 30 W.P. & MK. 35 A.A. COMMON WITH 1200 F/S I.V. CHARGE
- \*\* MK. 29-2,3 ONLY AUTHORIZED IN MKS. 30 W.P. WITH 1200 F/S I.V. CHARGE
- \*\*\* BEING REPLACED BY MK. 54 FUZE
- \*\*\*\* USED ONLY WITH MK. 53 FUZE

7

25

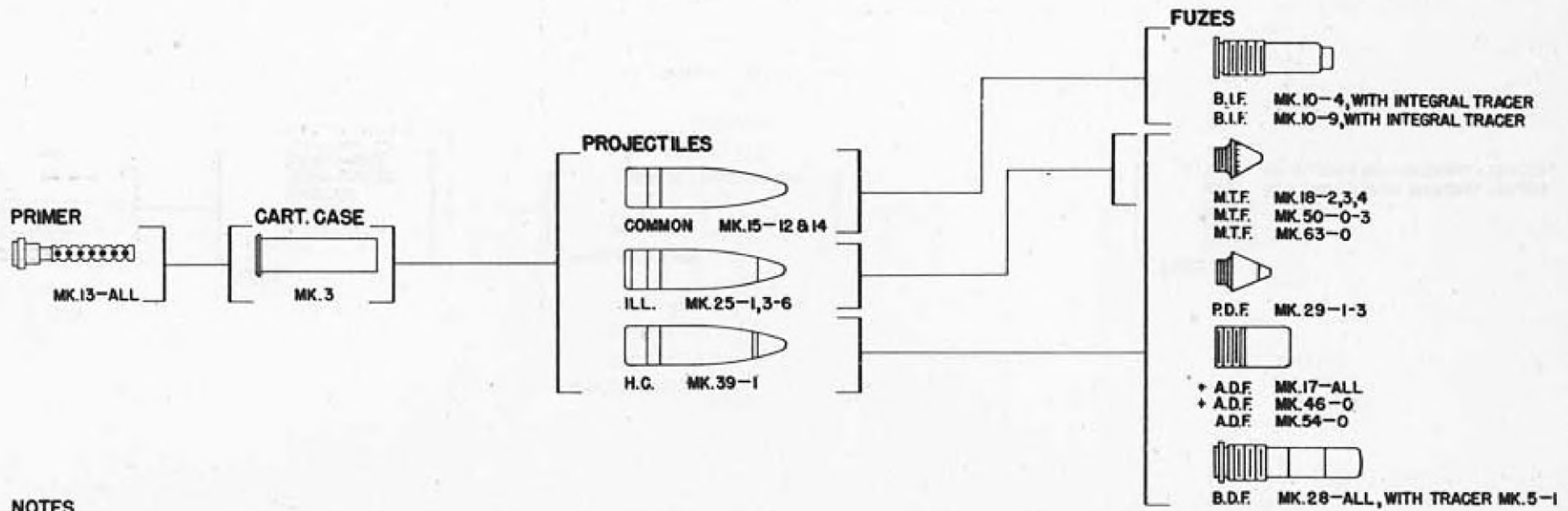
# COMPLETE SERVICE ROUNDS FOR 5"50 BAG GUN



## NOTES

\* TO BE USED ONLY IF MK.10, MOD.4 NOT AVAILABLE

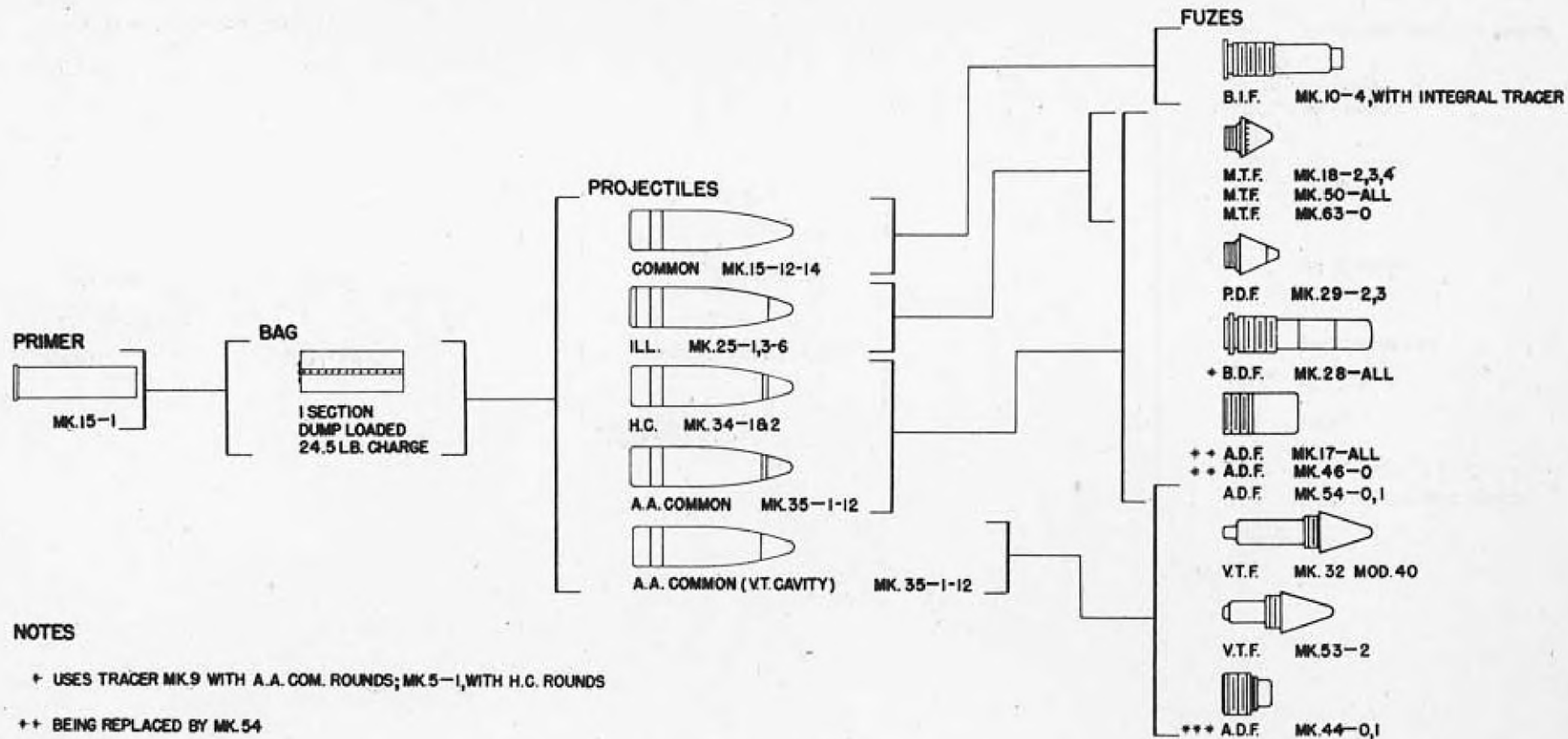
# COMPLETE SERVICE ROUNDS FOR 57/51 CASE GUN (SEMI-FIXED)



**NOTES**

\* BEING REPLACED BY MK.54 FUZE

# COMPLETE SERVICE ROUNDS FOR 5 1/2" BAG GUN



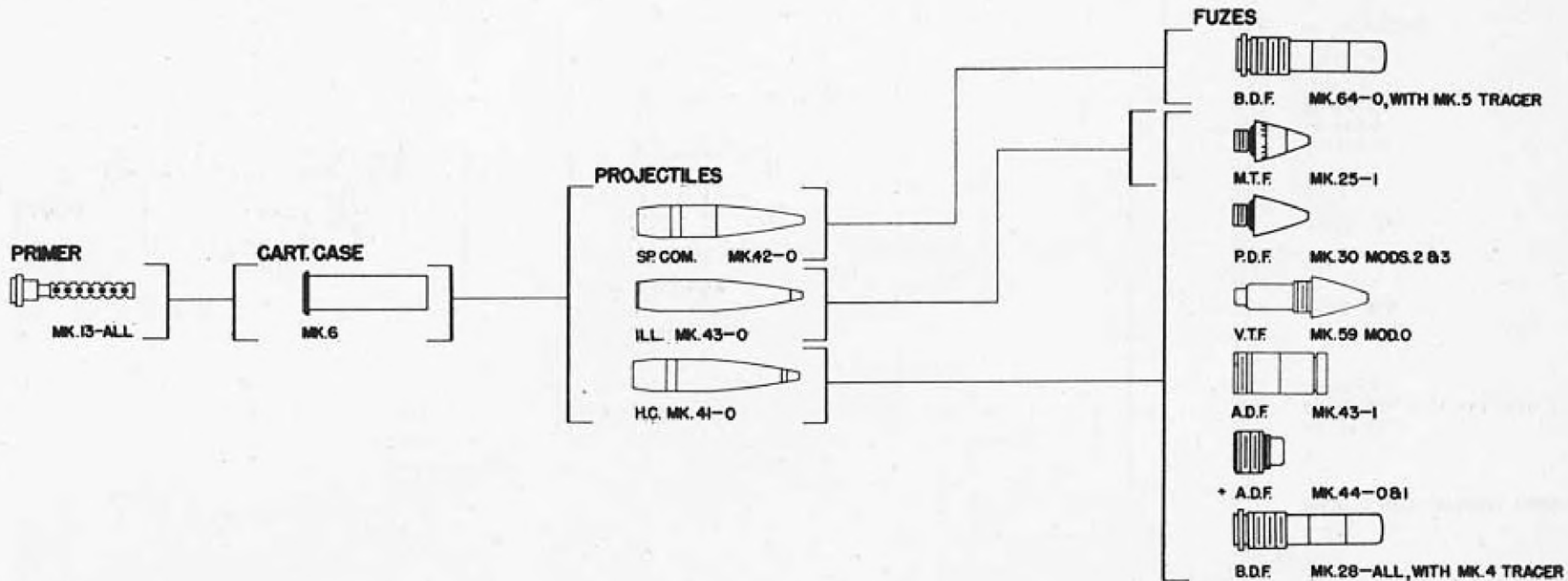
**NOTES**

+ USES TRACER MK.9 WITH A.A. COM. ROUNDS; MK.5-1, WITH H.C. ROUNDS

++ BEING REPLACED BY MK.54

+++ USED ONLY WITH MK.53 FUZE

# COMPLETE SERVICE ROUNDS FOR 5"/54 CASE GUN (SEMI-FIXED)

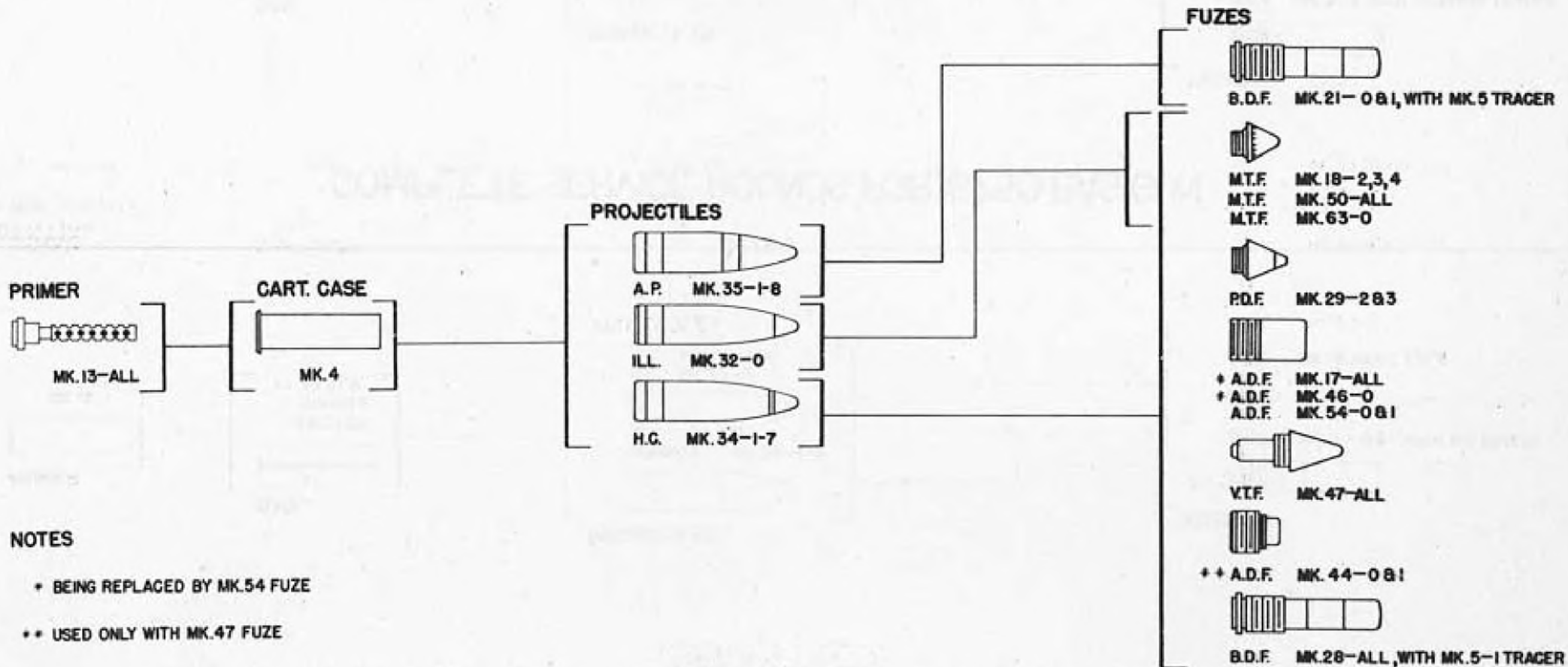


### NOTES

+ USED WITH MK. 59 FUZE ONLY

- TT -

# COMPLETE SERVICE ROUNDS FOR 6<sup>1</sup>/<sub>4</sub> CASE GUN SEMI-FIXED



**NOTES**

+ BEING REPLACED BY MK.54 FUZE

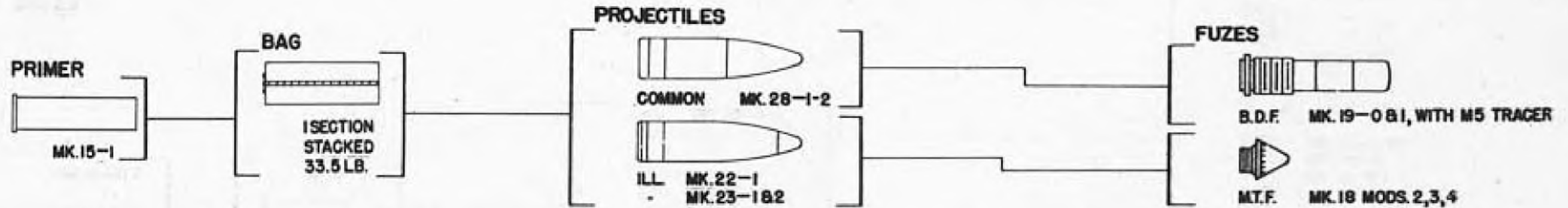
++ USED ONLY WITH MK.47 FUZE

- 2T -

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MAY 1945

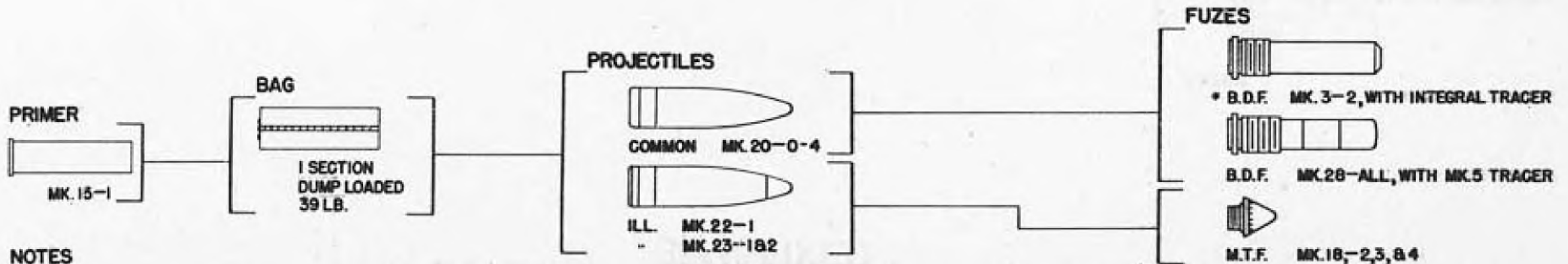
# COMPLETE SERVICE ROUNDS FOR 6"47 BAG GUN



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MAY 1945

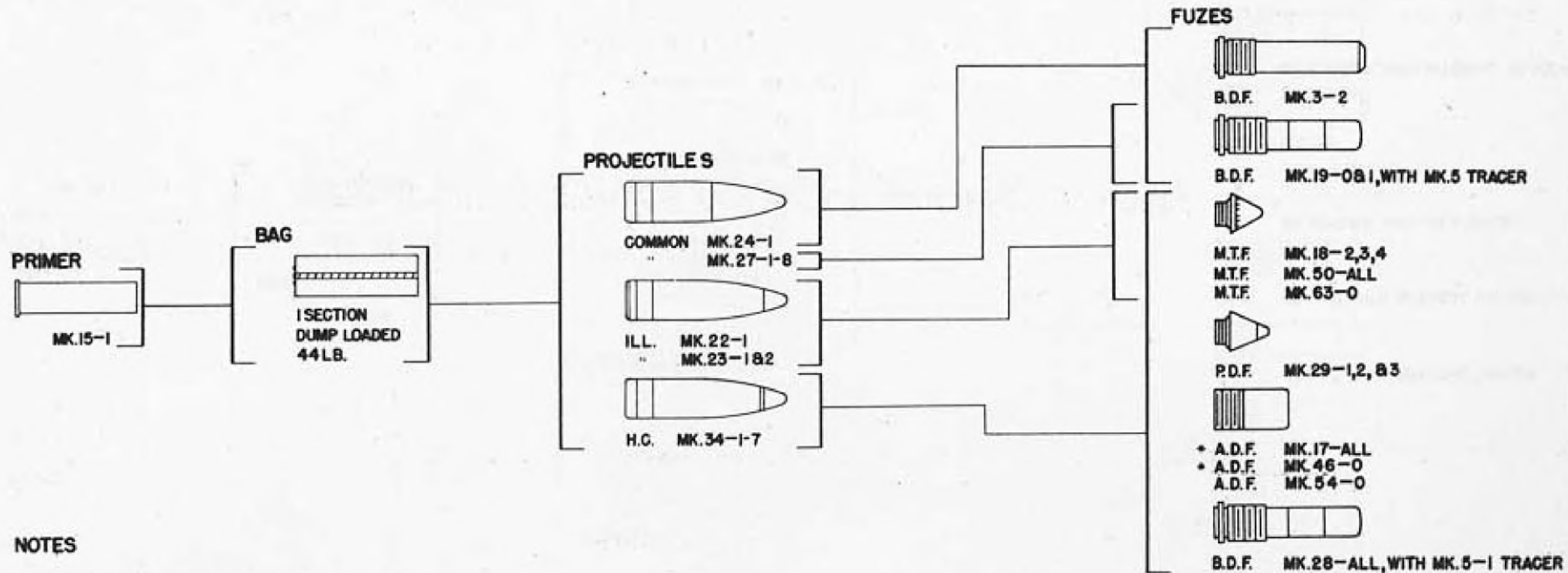
# COMPLETE SERVICE ROUNDS FOR 6"50 BAG GUN



NOTES

\* TO BE REPLACED BY MK.28

# COMPLETE SERVICE ROUNDS FOR 6"53 BAG GUN



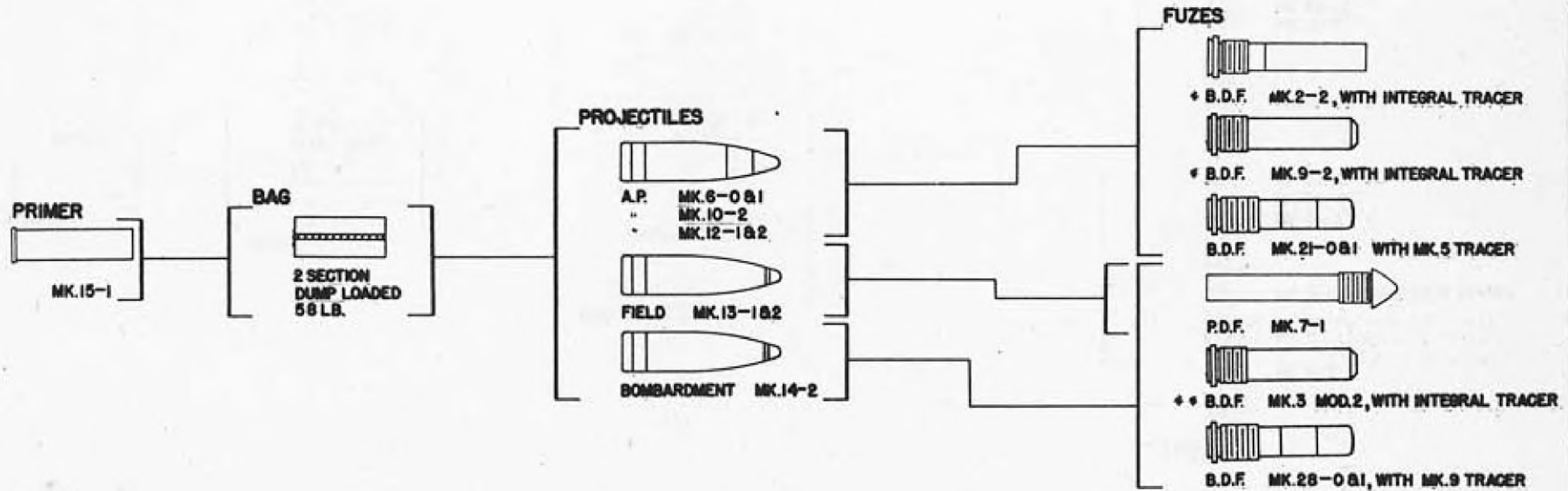
**NOTES**

+ BEING REPLACED BY MK.54 FUZE

- 14

14

# COMPLETE SERVICE ROUNDS FOR 7 1/4" BAG GUN



### NOTES

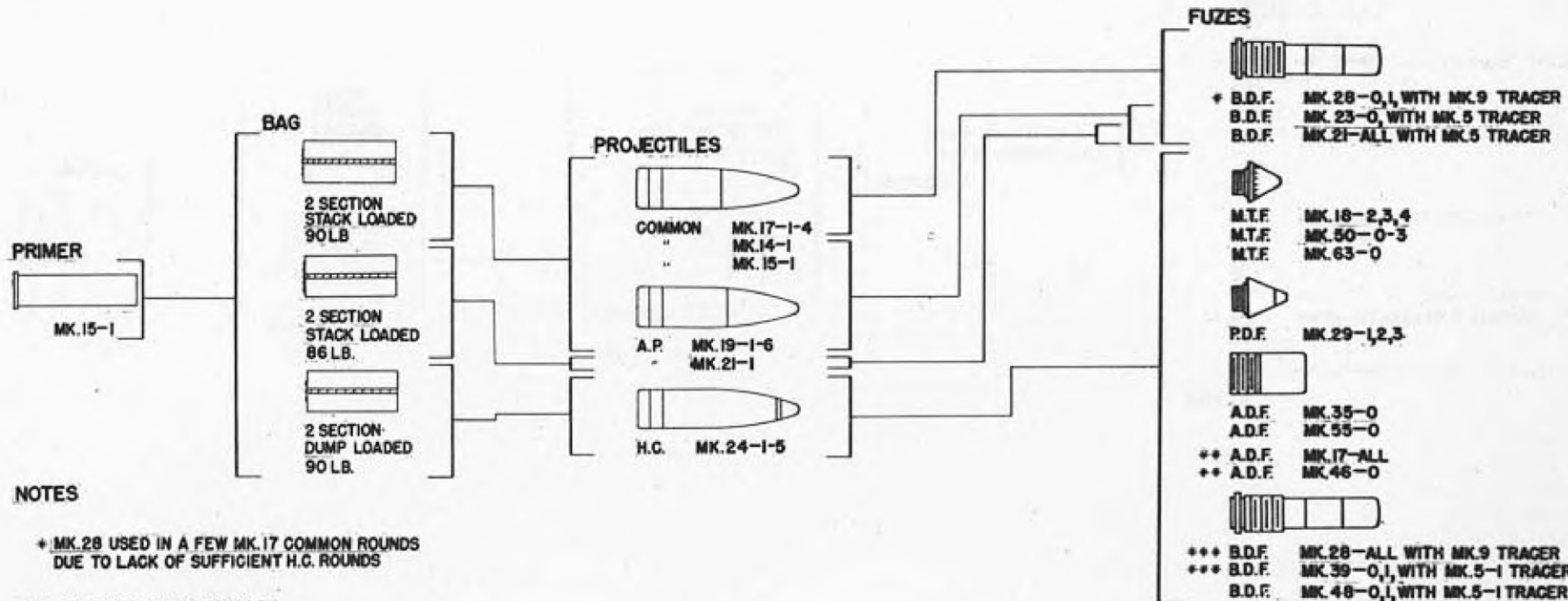
+ BEING REPLACED BY MK.21 FUZE

+ + BEING REPLACED BY MK.28 FUZE

- 5T -

100

# COMPLETE SERVICE ROUNDS FOR 8<sup>1</sup>/<sub>2</sub> BAG GUN



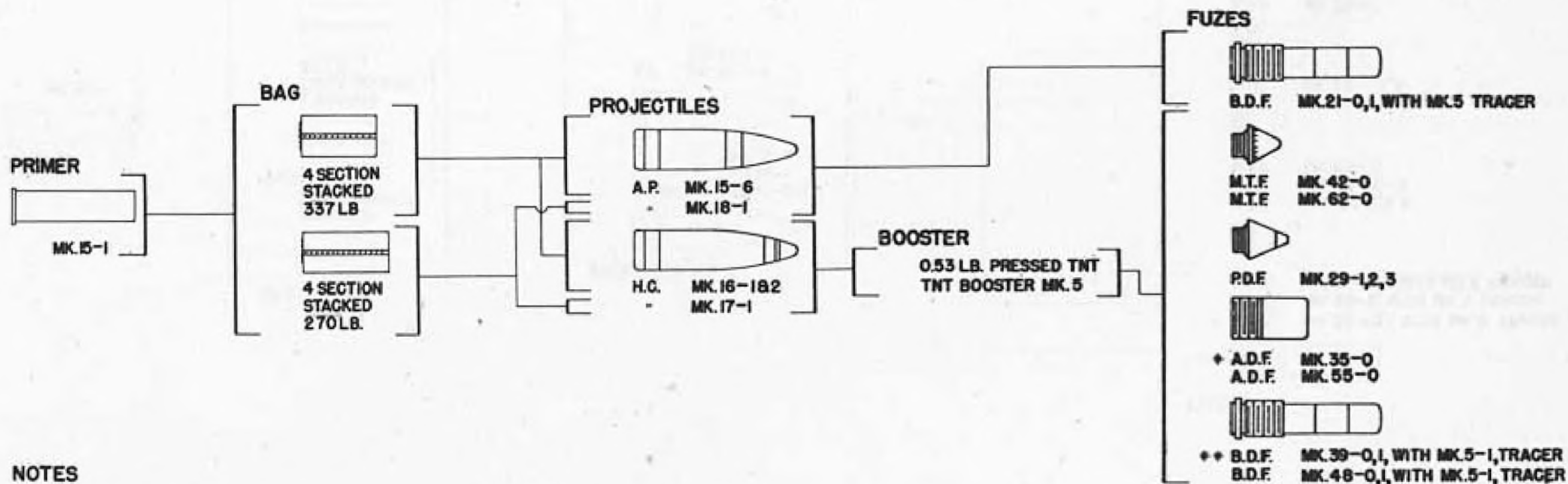
**NOTES**

+ MK.28 USED IN A FEW MK.17 COMMON ROUNDS DUE TO LACK OF SUFFICIENT H.C. ROUNDS

++ BEING REPLACED BY MK.55

+++ MAY BE USED BUT MK.48 PREFERRED ASSEMBLY

# COMPLETE SERVICE ROUNDS FOR 12"/50 BAG GUNS



**NOTES**

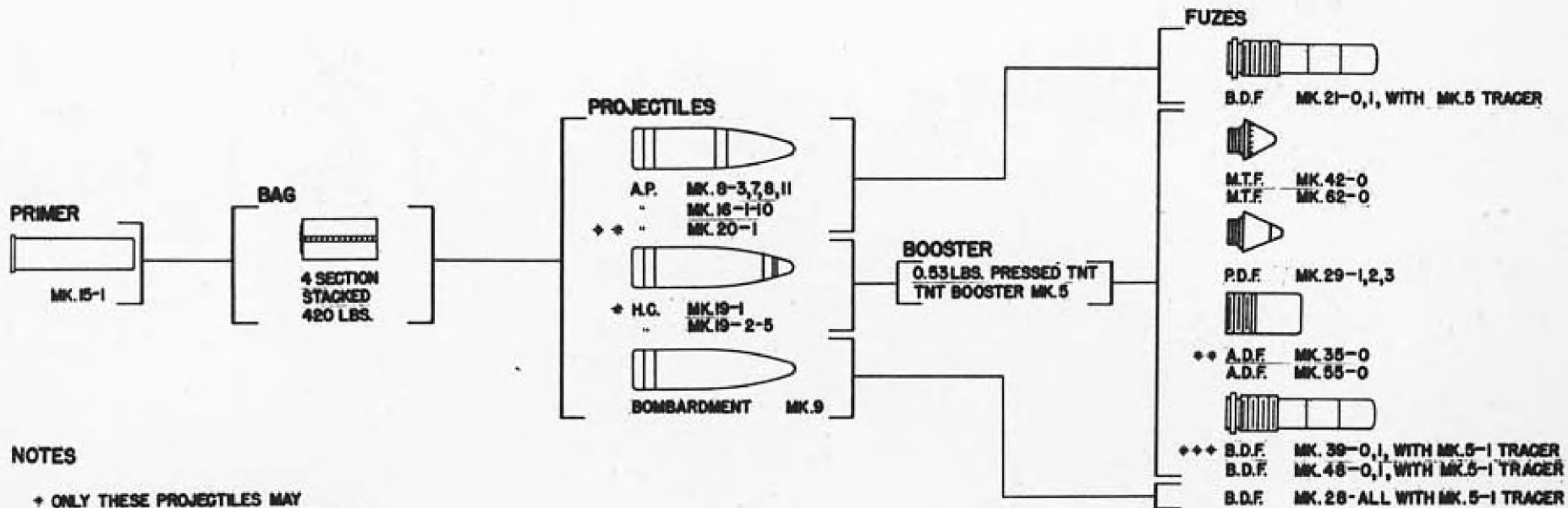
+ REPLACES "GREEN STRIPE" MK.17-8

++ REPLACES "GREEN STRIPE" MK.28

MAY 1945

# COMPLETE SERVICE ROUNDS FOR 14"45 & 14"50 BAG GUNS

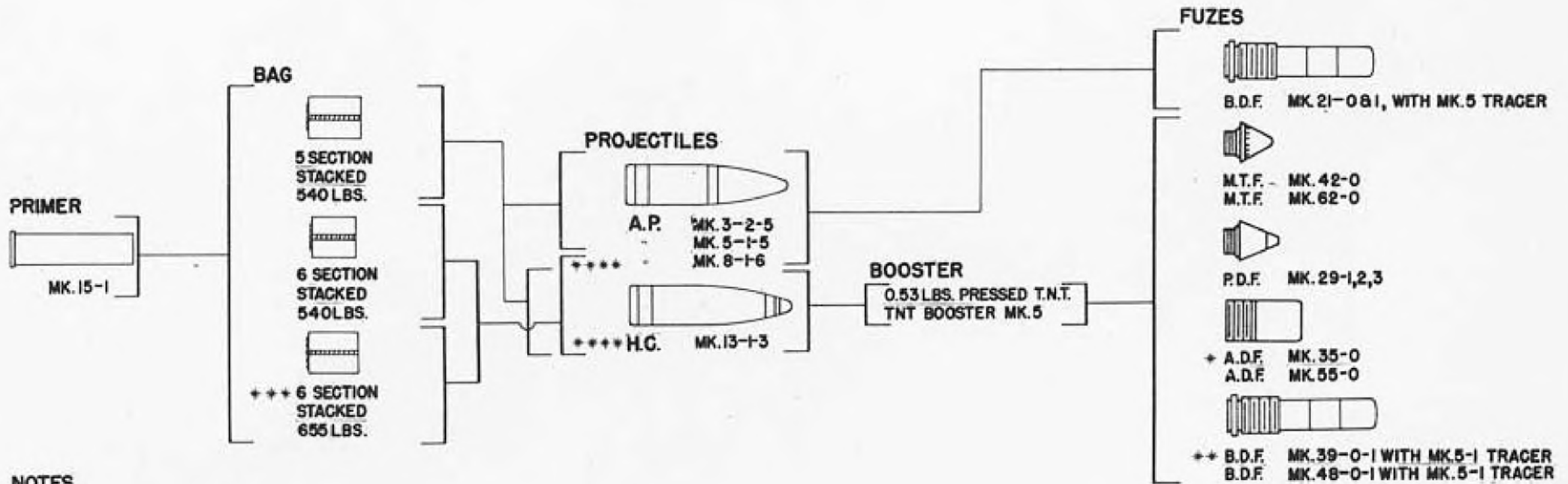
- 18 -



## NOTES

- + ONLY THESE PROJECTILES MAY BE USED IN U.S.S.'S NEW YORK & TEXAS
- REPLACES "GREEN STRIPE" MK. 17-8
- REPLACES "GREEN STRIPE" MK. 28
- + USED IN 14"45 GUNS ONLY

# COMPLETE SERVICE ROUNDS FOR 16"/45 & 16"/50 BAG GUNS



**NOTES**

- \* REPLACES "GREEN STRIPE" MK. 17-8
- \* \* REPLACES "GREEN STRIPE" MK. 28
- \* \* \* USED ONLY IN 16"/50 GUN
- \* \* \* \* ONLY THESE PROJECTILES USED IN 16"/50 GUN

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# **PROJECTILES**

## **SECTION 2**

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# PROJECTILES

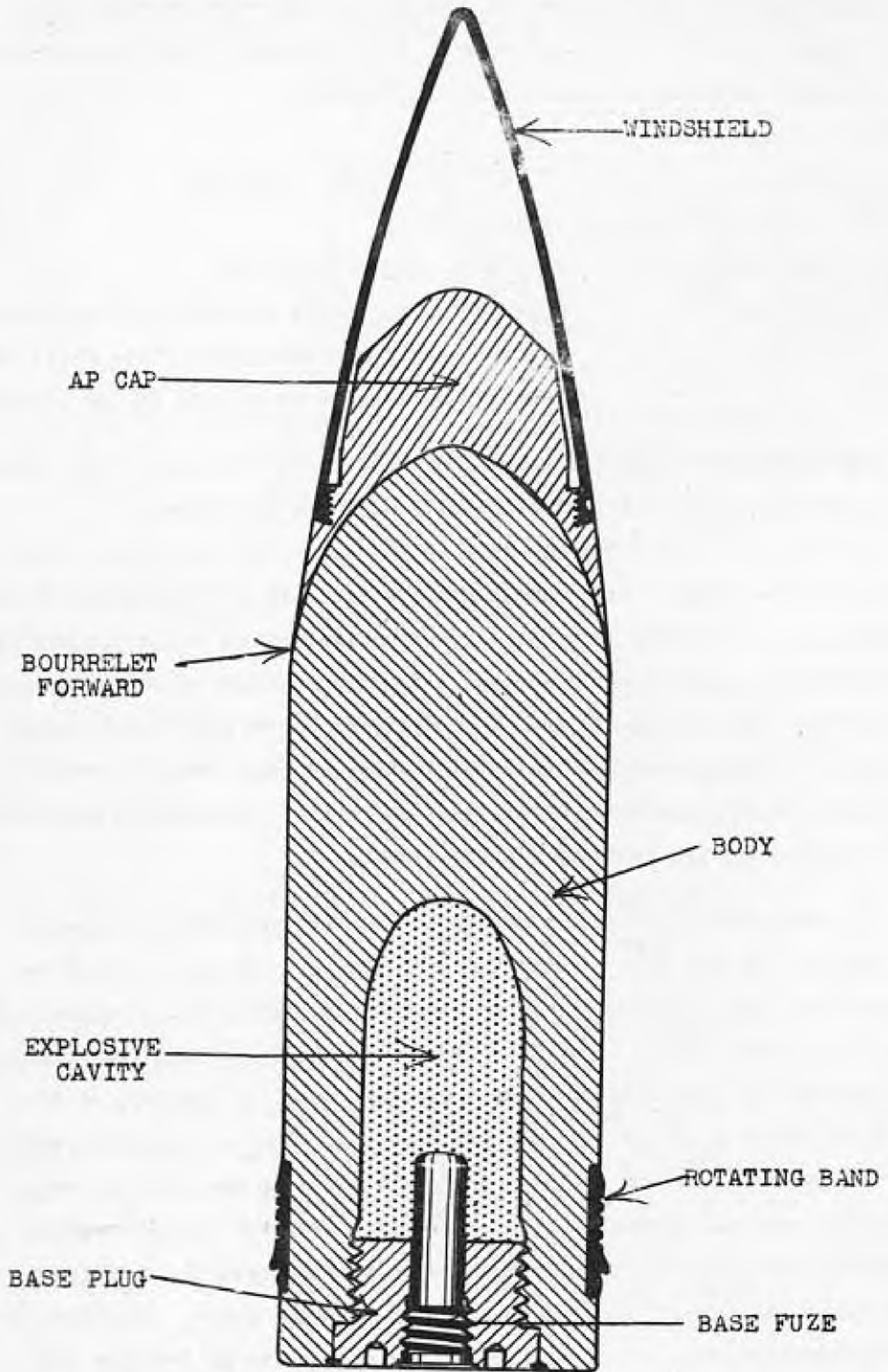
## INTRODUCTION

The following types of projectiles are in use in the U. S. Naval Service:

1. Armor Piercing (A.P.)
2. Special Common (Sp. Com.)
3. Common (Com.)
4. High Capacity (H.C.)
5. Anti-aircraft Common (A.A.C.)
6. Anti-aircraft (A.A.)
7. Illuminating (S.S.)

In addition to these, the following types of projectiles are used to a limited extent.

1. Field. These projectiles are for field use. They carry point detonating fuzes.
2. Smoke. This is a special projectile containing a smoke producing element designed solely to make a smoke screen. They are intended to be used in covering landings.
3. Shrapnel. Shrapnel projectiles contain steel balls which are expelled from a shrapnel case by means of a small charge of explosive, the case remaining intact. These projectiles are obsolescent.
4. Flat Nose. Flat nose projectiles are for use against submarines, and are designed to prevent ricocheting on water impact. These projectiles are obsolescent.
5. Tracer. These are special projectiles designed solely to leave a visible trace in the daytime. They do not have bursting charges. These are obsolescent.
6. Target. These are special projectiles designed for target practice, ranging and proving ground work. They are inert loaded.
7. Proof Shot. These are special projectiles designed not to ricochet on water impact and are for use in proving ground work. It is not contemplated that more of these projectiles will be procured when the present stocks are exhausted.
8. Window. These are illuminating projectile bodies filled with metal foil strips which are discharged in the air to disrupt enemy Radar operations.



**TYPICAL A.P. PROJECTILE**

ARMOR PIERCING PROJECTILES

Armor Piercing projectiles are designed to penetrate an equal caliber of Class A armor plate, according to test practice. The characteristics of armor piercing projectiles are as follows:

1. Overall Color: Black
2. Sizes: 3", 6", 7", 8", 12", 14", 16"
3. Explosive Filling: Explosive D
4. Load Factor: Will vary from 1.5% to 2.7%
5. Fuzing: Base detonating fuzes or base ignition fuzes are the only fuzes employed. These fuzes will have a long delay (.03 seconds to .05 seconds).

Functions of the labeled parts indicated on the drawing of the typical armor piercing projectile on the opposite page are as follows:

1. Because it is desirable to keep the center of gravity of a projectile to the rear of, or in the immediate vicinity of, the center of the form and as a relatively long ogive is conducive to long range, it has been advantageous to adopt light nose pieces or false ogivals which are termed windshields. The windshield is made of either forged mild steel, steel stamping, or aluminum and has no special strength other than to prevent destruction during handling and set-back on firing. Windshields are screwed to the cap and are "set" by a center punch.

2. The armor piercing cap is secured to the projectile by peening the skirt of the cap into notches cut into the ogive of the body and by soldering the cap to the body with a special low melting point solder. A low melting point solder is used to prevent the heat required for soldering from drawing the temper of the body. Caps are made, in general, of the same kind of steel as are the projectile bodies. The cap acts to break down the initial strength of the armor plate allowing the nose to reach an already strained surface, and then provides powerful circumferential support to the point and nose as they begin to penetrate the hard face, maintaining the support until they are well into the plate. In addition, the characteristically blunt outline of the cap serves to increase the effective angle of obliquity at which the projectile may hit and still penetrate.

3. The body is of high quality alloy steel carefully forged and heat treated and is the part which does the actual penetration. Between the forward bourrelet and the rotating band or rear bourrelet the diameter of the body is slightly reduced in order to provide a generous clearance

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INTRODUCTION - Continued

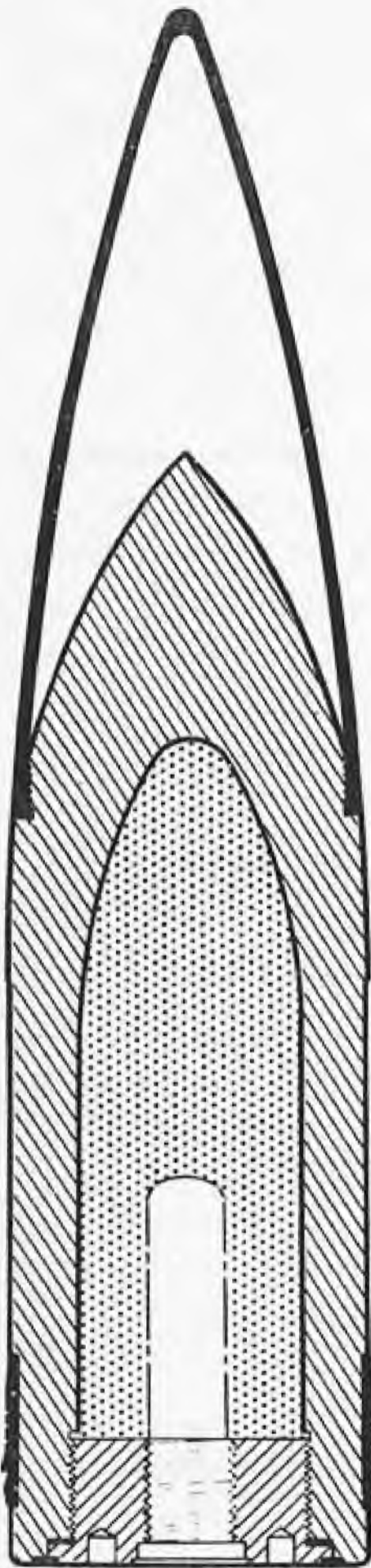
from the bore of the gun. The bourrelet is the bearing surface of the projectile and rides on the lands of the rifle. This bearing surface is usually about one-sixth caliber in width and its surface is generally ground to a fine finish in order to reduce friction and to minimize wear on the lands of the gun. With the major caliber projectiles it has become standard practice to provide a rear bourrelet or bourrelets in addition to the forward bourrelet. Rear bourrelet or bourrelets will be just forward and behind the rotating band. The projectile is thus provided with better support in the gun and during the ejection from the muzzle.

4. The rotating band has three primary functions -- to seal the bore, to position and center the rear end of the projectile, and to rotate the projectile. Secondary functions are to hold the projectile in place during loading and elevating for firing. The rotating band is made of commercially pure copper, or of cupro-nickel alloy containing 2.5% nickel, or in some cases a gilding metal consisting of 90% copper, 10% zinc. As a general rule, rotating bands are about one-third caliber in width.

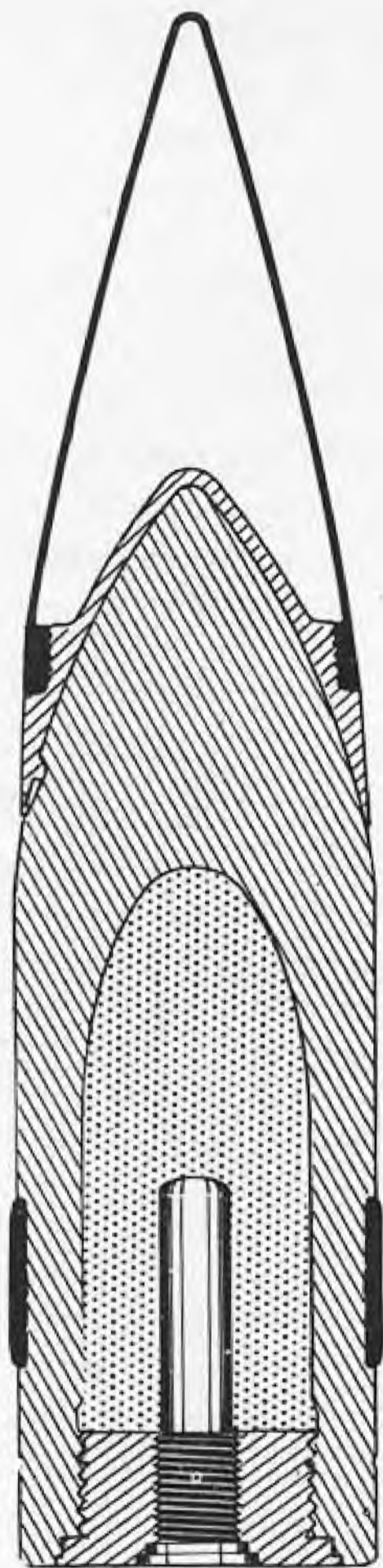
5. The base plug closes off the explosive cavity and holds the base fuze or base fuze adapter. Both the base plug and the base fuze adapter, if used, are sealed in place with a gas seal ring similar to that used on the base fuze.

6. The base fuze is inserted through the base plug or base fuze adapter and is designed to detonate the projectile after penetration. After insertion it is closed with a gas check ring of copper and lead put in under hydraulic pressure to prevent the propelling gases from affecting the explosive filling.

Armor piercing projectiles and the common projectiles having a windshield may carry a spotting dye which colors the water on impact in order that observers may spot the fall of shot. The spotting dye in powder form is placed in the windshield before it is screwed on to the nose of the projectile. Upon impact with the water, the forward end of the windshield, having water inlet holes covered by a copper inlet cover, forces through the inlet cover, dissolves the dye and forces its way out the outlet holes.



**TYPICAL  
COMMON  
PROJECTILE**



**TYPICAL  
SPECIAL COMMON  
PROJECTILE**

INTRODUCTION - ContinuedSPECIAL COMMON PROJECTILES

The term "Special Common" is not an official designation of the Bureau of Ordnance, which places this and all other types of Common projectiles in a single class. The "Special Common" designation is an unofficial classification widely employed by ordnance activities to describe those Common projectiles which are equipped with both windshields and hoods for windshield attachment. The term will be so used in this publication.

Special Common projectiles are designed to penetrate approximately one-third to one-half their caliber of armor. These projectiles differ from armor-piercing projectiles in that they do not have an armor-piercing cap and have a larger explosive cavity.

Characteristics of Special Common projectiles are as follows:

- |                       |  |
|-----------------------|--|
| 1. Overall Color:     | Slate gray   |
| 2. Sizes:             | 4", 5", 6", and 8"   |
| 3. Explosive Filling: | Explosive D  |
| 4. Loading Factor:    | 2.1% to 3.99%  |
| 5. Fuzing:            | Base detonating fuze with delay,<br>generally .01 seconds. |

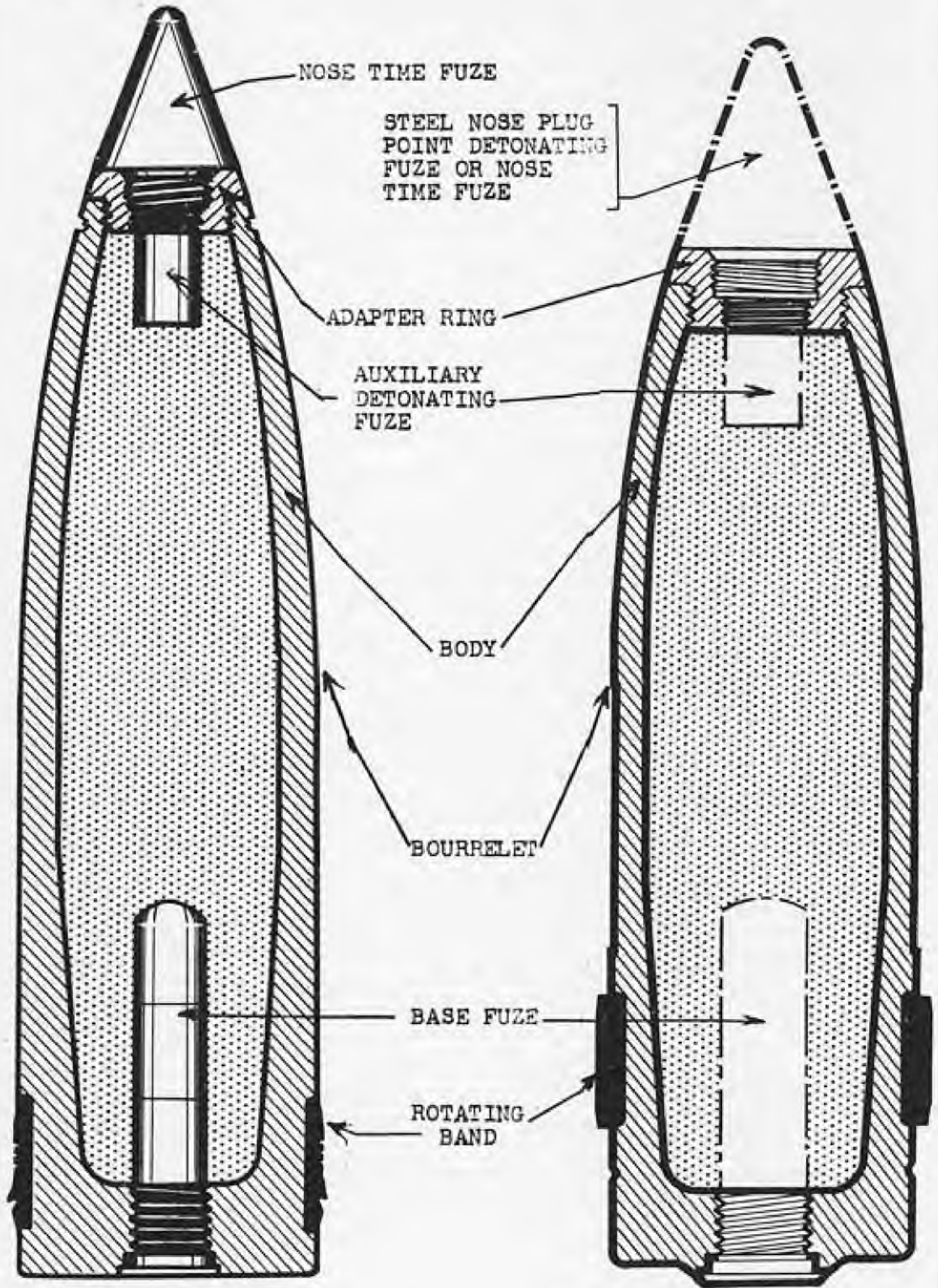
COMMON PROJECTILES

Common projectiles are designed to penetrate approximately one-third their caliber of armor. They differ from Armor-Piercing and Special Common projectiles in that they have no cap or hood, the windshield threading directly to the body, and the explosive cavity is slightly larger.

Characteristics of Common projectiles are as follows:

- |                       |  |
|-----------------------|--|
| 1. Overall Color:     | Slate gray   |
| 2. Sizes:             | 5", 6", and 8"   |
| 3. Explosive Filling: | Explosive D  |
| 4. Load Factor:       | 4.4% to 5.4%   |
| 5. Fuzing:            | Base detonating fuze with delay,<br>usually .01 seconds. |

In addition to these Special Common and Common projectiles described above, certain types of old common projectiles are still in use in the Naval service. These projectiles have neither cap nor windshield, are colored slate gray overall, are loaded with Explosive D or Black Powder/TNT mixture. In the latter case, they are fuzed with a base ignition fuze. This latter type is found in the 1, 3, and 6 pounder projectiles and in the 3", 4", and 5" sizes.



**TYPICAL  
A.A. COMMON  
PROJECTILE**

**TYPICAL  
HIGH CAPACITY  
PROJECTILE**

INTRODUCTION - Continued

HIGH CAPACITY PROJECTILES

These projectiles are designed to have a minimum wall thickness, and the largest explosive cavity, which is consistent with the force of set-back. They are assembled, generally, with no delay base fuzes, tracers, steel nose plug, and auxiliary detonating fuzes. The steel nose plug may be removed and a point detonating or nose time fuze substituted. These projectiles are used for shore bombardment, anti-aircraft, and for use against light ships and surface craft. An exception to this is the 3" High Capacity which has no base fuze.

Characteristics of High Capacity Projectiles are as follows:

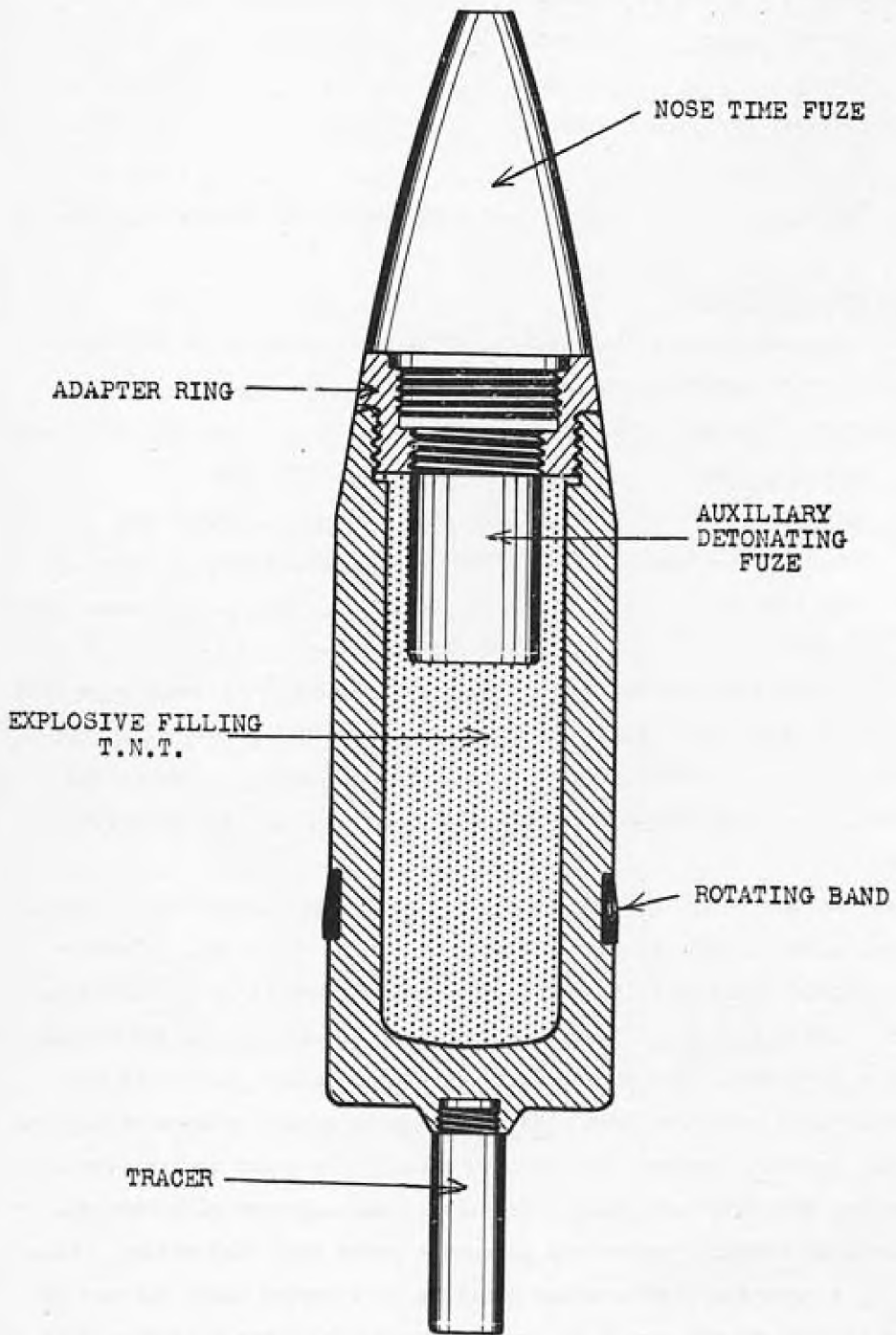
- 1. Overall Color: Green
- 2. Sizes: 3", 4", 5", 6", 8", 12", 14", 16"
- 3. Explosive Filling: Explosive D except the 3" High Capacity which is TNT loaded.
- 4. Load Factor: 7.0% - 12.6%
- 5. Fuzing: Indicated above. Only variation from the use of the no delay base fuzes is the Mark 48 base detonating fuze, with a .01 second delay currently being assembled in 8" through 16" High Capacity projectiles for bombardment. Also incorporated in the 12", 14" and 16" High Capacity projectile is a TNT booster fitting directly beneath the auxiliary detonating fuze and requiring the use of an additional adapter ring.

ANTI-AIRCRAFT COMMON

These projectiles are similar in construction to High Capacity projectiles except that a nose time fuze is always assembled. It can be used for anti-aircraft fire or, with the time fuze set on safe, it can be used for bombardment.

Characteristics of Anti-Aircraft Common projectiles are as follows:

- 1. Overall Color: Green
- 2. Sizes: 5" only
- 3. Explosive Filling: Explosive D
- 4. Load Factor: 13%
- 5. Fuzing: Nose time fuze. Auxiliary detonating fuze.  
No delay base detonating fuze.



**TYPICAL A.A. PROJECTILE**

ANTI-AIRCRAFT PROJECTILES

These projectiles are for use against aircraft. They vary from Anti-Aircraft Common in that no base detonating fuze is used.

Characteristics are as follows:

1. Overall Color: Green
2. Sizes: 3" only
3. Explosive Filling: TNT
4. Load Factor: 5.7%
5. Fuzing: Nose time fuze, auxiliary detonating fuze.

ILLUMINATING PROJECTILES

These projectiles are for use in illuminating enemy ships or targets by means of an illuminating element.

Characteristics are as follows:

1. Overall Color: Light blue with two white stars
2. Sizes: 3", 4", 5", and 6"
3. Explosive Filling: Black powder expelling charge
4. Load Factor:
5. Fuzing: Nose time fuze only.

The illuminating projectile is a thin case with a very small expelling charge in the front just behind the fuze, and an interior assembly of a star or candle with a parachute and a very lightly held base plug. The explosion of the expelling charge forces out the base and the interior assembly.

When the nose time fuze functions, it ignites the black powder expelling charge which in turn ignites the star or candle. The star or candle is a steel container in which is packed under heavy pressure an illuminating compound. The closed end of the star container is attached to the strand wires of a parachute. The parachute is carefully folded, and, with its strand wires, is rolled so that upon expulsion it opens, thereby suspending the candle or star. Because of the high velocity at which the projectile is traveling when ejection takes place, it is necessary to slow down the star-parachute assembly before the parachute comes into full action. This is done by a retarding device which consists of a center wire, one end of which is secured to the center of the parachute nearer the star than when in full release and causes the parachute to spill air thereby preventing a too heavy initial strain on the parachute. After the star has burned for a few seconds the end of the center wire is released from its point of attachment to the star. This permits the parachute to open fully and give its greatest support to the star.

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WINDOW PROJECTILES

Window Projectiles are designed to be fired from Naval vessels to disrupt enemy Radar operations. The projectile may be used to provide a false screen behind which our ships may maneuver or approach undetected, or to provide a false target for enemy Radar. The projectile itself consists of an illuminating projectile body fitted with a nose time fuze and expelling charge of black powder. Ignition of the expelling charge by the fuze discharges a payload of foil strips which form a reflecting cloud for Radar beams.

Characteristics of Window Projectiles are as follows:

- |                   |                                       |
|-------------------|---------------------------------------|
| 1. Overall Color: | Aluminum                              |
| 2. Sizes:         | 5" only                               |
| 3. Filling:       | Foil strips and B.P. expelling charge |
| 4. Fuzing:        | Nose time fuze                        |

"W.P." (SMOKE) PROJECTILES

Smoke projectiles are designed for shore bombardment purposes to produce a combination of screening, anti-personnel, and slight incendiary effects. These projectiles may also be used at sea to provide a surface screen behind which vessels may maneuver undetected. The projectile consists of an illuminating projectile body, fitted with a nose time fuze or point detonating fuze and a black powder expelling charge. The ignition of the expelling charge by the fuze discharges a number of W.P. filled steel tubes which ignite on contact with the air.

Characteristics of W.P. Projectiles are as follows:

- |                   |   |
|-------------------|---|
| 1. Overall Color: | Blue Gray                                 |
| 2. Sizes:         | 5" only                                   |
| 3. Filling:       | White phosphorous & B.P. expelling charge |
| 4. Fuzing:        | Nose time or point detonating fuze        |

V.T. - FUZED PROJECTILES

These projectiles are specially cavitized to receive the long-stemmed V.T. fuzes. They contain no tracer or nose fuze adapter, and no base fuzes are used except with the 6"/47 H.C. Mk 34 projectile. In all others the base is sealed with a gas-checked base fuze hole plug. V.T.-fuzed projectiles are identified by a 1/2" red band located 1/2" below the nose fuze or the protective shipping cap, if the latter is used. Other type nose fuzes may not be employed in these projectiles.

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NOSE FUZE UNPAINTED  
IF PRESENT

EXPLOSIVE INDICATOR  
1 CALIBER WIDE

TRACER BAND 1" WIDE  
3 DOTS SHOW COLOR OF  
TRACE.

SPOTTING BAND  
1" WIDE

FORWARD BOURRELET  
UNPAINTED

FOR STENCILING ON THIS  
SECTION OF BODY SEE  
NOTE 5

BODY PAINTED TO  
SHOW TYPE OF  
PROJECTILE

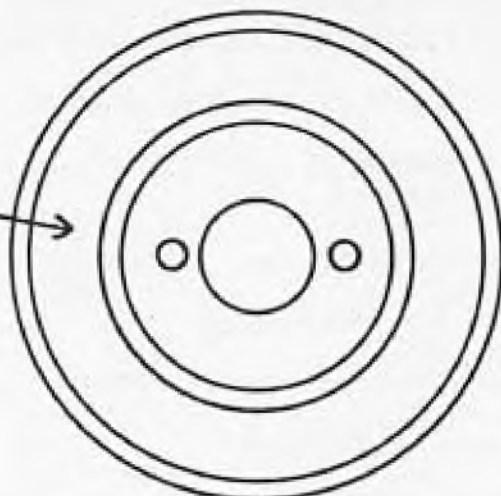
AFT BOURRELET  
UNPAINTED IF  
PRESENT

FOR STAMPING ON  
ROTATING BAND  
SEE NOTE 6

ROTATING BAND UNPAINTED

THIS SECTION OF BODY  
PAINTED ON BAG GUN  
PROJECTILES. UN-  
PAINTED ON OTHERS.

FOR STAMPING ON  
BASE SEE NOTE 7



**COLOR & MARKING OF PROJECTILES 3" & LARGER**

COLOR AND MARKINGS OF PROJECTILES 3" AND LARGER.

The various markings of the projectile on the opposite page are described below:

1. Explosive Indicator:

Yellow - Explosive D

Grey - Black Powder

Green - T.N.T.

1/2 Grey & 1/2 Green Band - T.N.T. & Black Powder Mix.

Red - Gas

2. Body Colors:

Black - A.P.

Slate Grey - Common (Old & new types)

Green - A.A., H.C., and A.A. Common.

Light Blue with 2 white stars - Illuminating.

White - Shrapnel

Unpainted or red - target ammunition

3. Tracer Band:

Color of band white.

Color of the three dots 120° apart indicates color of tracer.

4. Spotting Band:

Color indicates color of spotting charge.

5. Stencilling on Body:

The following information is stencilled on the side of the projectile:

1. Size, caliber, mark & modification of projectile.
2. Mk & Mod of fuzes
3. Explosive filling & density of loading.
4. Abbreviated name of loading depot.
5. Initials of Chief Inspector.
6. Date of filling, marking and painting.
7. Also any changes in filling, fuzing, etc.

6. Stamped on Rotating Band:

1. Mk & Mod of projectile.
2. Size & type of projectile.
3. Lot number and year of specification
4. Inspector's seal & initials
5. Sometimes the manufacturer's name is included here.

INTRODUCTION - Continued7. Stamped on base or on base plug:

1. Mark and Mod, size, and type of projectile.
2. Lot No., year of specification.
3. Inspector's seal and initial.
4. Manufacturer's name.
5. Previously (before 1 July 1944) had weights before and after filling.

8. The serial number of the projectile will also be stamped on the base plug, side of body, and on the windshield if present.

MINOR CALIBER PROJECTILES - INTRODUCTION & IDENTIFICATION20 mm AMMUNITION1. General:

Two types of 20 mm weapons are at present in service use in the Navy: the Oerlikon Anti-aircraft Gun, and the Hispano-Suiza Aircraft Gun. These two types of gun differ widely in construction and functioning, and it is emphasized that the ammunition, though somewhat similar in external appearance, IS NOT INTERCHANGEABLE.

2. Ammunition for 20 mm Oerlikon A.A. Gun:

The Oerlikon A.A. Gun and its ammunition are of Naval manufacture and design. The ammunition may be distinguished from that designed for the Hispano-Suiza Aircraft Gun by the reduced diameter of the extractor lip at the base of the cartridge case. For identification of individual types of rounds, the body of the projectile is painted a distinctive color, as follows:

<u>Type of Projectile</u>	<u>Filling</u>	<u>Color of Projectile</u>
HE, Mk 3	Tetryl	White
HE, Mk 3	Pentolite	Yellow
HE-I, Mk 3	Tetryl & Incend. Mix	Red
HE-I, Mk 3	Pentolite & Incend. Mix	Light Pink
*HE-T, Mks 4 & 7	Tetryl and Tracer	Light Gray
*HE-T, Mks 4 & 7	Pentolite and Tracer	Blue
AP-T, Mk 9	Tracer	Black
BL & P, Mk 3	Inert Loaded	Dark Green
BL & T, Mk 7	Inert Load and Tracer	Dark Green with Yellow Stripe
Drill	Empty	Seal Brown
HE-I-T		Bright Green

The Mark and Mod, manufacturer's initials or symbol, and lot number are stamped around the body of the projectile.

\*When assembled with "Dark Ignition" tracers, a 1/8" bright red band will be painted around the projectile midway between the bourrelet and the rotating band.

INTRODUCTION - Continued3. Ammunition for 20 mm Hispano-Suiza Aircraft Gun:

This gun and its ammunition are Army designed, but have been adopted as Naval service equipment with the installation of the gun on certain Naval planes. The ammunition is distinguished from that designed for the Oerlikon gun by the extractor lip on the base of the cartridge, which is the same diameter as the rest of the case. Two series of ammunition for this gun are at present in use. The "Old Series" consists of unmatched rounds, some adapted from British prototypes, others designed by the Army. The "New Series" is a set of ballistically matched rounds designed by the Army to supersede those of the Old Series. For identification of specific rounds, the projectile body is painted a specific color, as follows:

<u>Projectile Type</u>	<u>Series</u>	<u>Filling</u>	<u>Color of Projectile</u>
HE-I, Mk I	Old	Tetryl & Incend. Mix	Body - Red Bourrelet - Yellow Fuze - Brass Marking in Black
AP-T, M75	Old	Tracer & Inert Load	Black Overall Marking in White
Ball, Mk I	Old	Inert Loaded	Black Overall
Dummy Drill	Old	Empty	Zinc Coated
HE-I, M97	New	Tetryl & Incend. Mix	Body - Red Bourrelet - Yellow Fuze - Brass Marking in Black
Incendiary, M96	New	Incendiary Mix	Body - Blue Gray Nose - Light Blue Marking in Black
AP-T, M95	New	Tracer	Black Overall Marking in White
Practice, M99	New	Empty	Black Overall Marking in White

1.1"/75 AMMUNITION1. Identification:

The body of this projectile is unpainted except for two dots below the fuze, indicating as follows:

Explosive D - Yellow Dot  
Tracer - Red Dot

A new color marking has been proposed for the 1.1" ammunition. If adopted, the projectiles will be painted as follows:

<u>Projectile Type</u>	<u>Projectile Color</u>
HE-T	Light Gray with White Band
HE-T/SD	Dark Green with White Band
BL & P	Red Overall
BL & T	Red Overall with White Band

INTRODUCTION - Continued40 mm AMMUNITION

## 1. Identification:

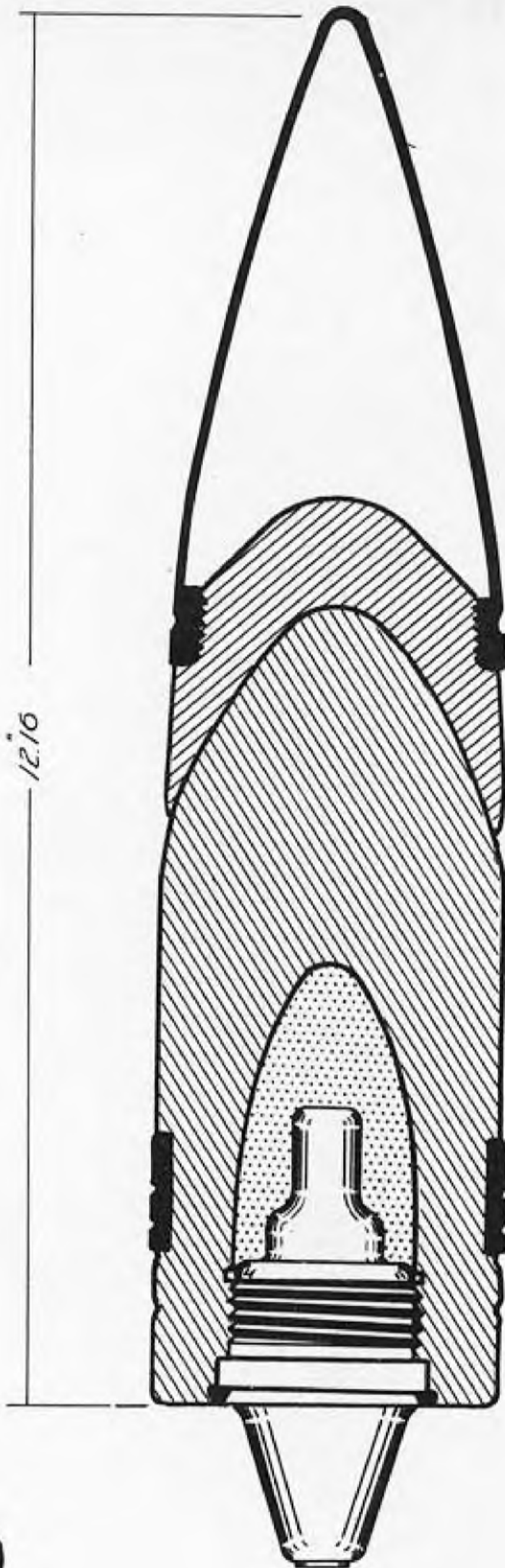
These projectiles are identified by distinctively colored bodies, as follows:

<u>Projectile Type</u>	<u>Color Identification</u>			<u>Remarks</u>
	<u>Body</u>	<u>Band</u>	<u>Tip</u>	
AP	Black	Black	Black	Plug in tracer.
AP-T	Black	White	Black	
HE-P	Green	Green	Green	Plug in base.
HE-T/SD	Green	White	Green	
HE/SD	Green	Black	Green	Non-luminous tracer.
HE-I-T/SD	Green	White	Red	
HE-I-P	Green	Red	Red	Plug in base.
HE-I/SD	Green	Black	Red	Non-luminous tracer.
HE-I-T	Green	White	Red	SD relay not loaded.
	with Black Band			
BL & T	Red	White	Red	Dummy fuze.
BL & P	Red	Red	Red	Dummy fuze and plug in base.

The tracer composition is either a red burning mixture in the tracer, "T", rounds, or a non-luminous burning compound in the "SD" rounds not designated "T".

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CONFIDENTIAL



**MK.29**  
**3" A.P. PROJECTILE**

**DATA**~~CONFIDENTIAL~~**U. S. NAVY****3" AP****MK.29 MODS.1,2**

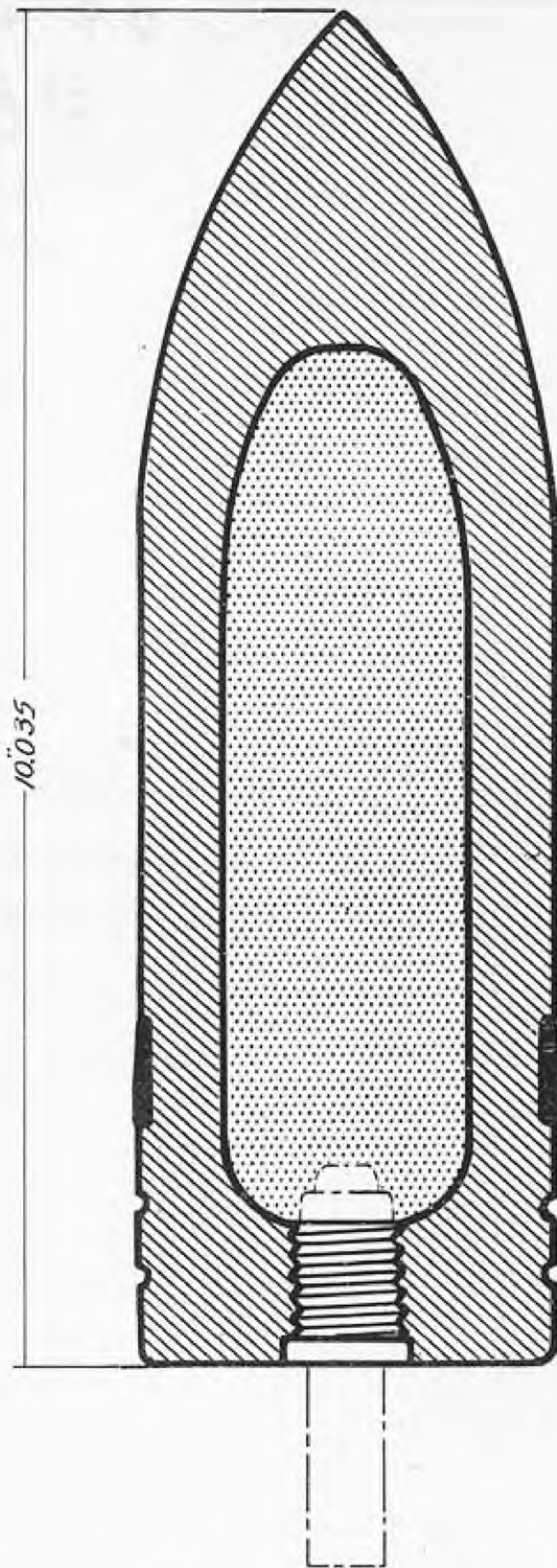
GUNS USED IN: 3"/50

OVERALL LENGTH	
With Cap & Windshield	12.16 in.
Without Cap & Windshield	6.91 in.
DIAMETER OF BASE	2.98 in.
DISTANCE - BASE TO BAND	1.35 in.
WIDTH OF BAND	1.0 in.
DIAMETER .T BOURRELET	2.985 in.
TYPE OF FILLING(When used)	Explosive D
WEIGHT OF FILLING(When used)	.3 lbs.
WEIGHT OF LOADED PROJECTILE	13.10 lbs.
CHARGE/WEIGHT RATIO(When filled)	2.28%
CARTRIDGE CASE	Mk 7 all, Mk 9
PRIMER	Mk 14, Mk 14 Mod 1
TRACER	Integral
FUZES WHICH MAY BE USED IN PROJECTILE	Army M-66-A1 in base. (B.D.F.)

## REMARKS:

- (a) This projectile was formerly issued without any explosive filling. It is now being loaded and at present is fuzed with the M 66 Army base fuze.
- (b) For cap and windshield data and method of painting and marking, see Introduction.
- (c) This projectile was previously issued with the Mk 4 tracer and no filling.

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**3" COM. PROJECTILE  
MK. 3**

**DATA**

~~CONFIDENTIAL~~

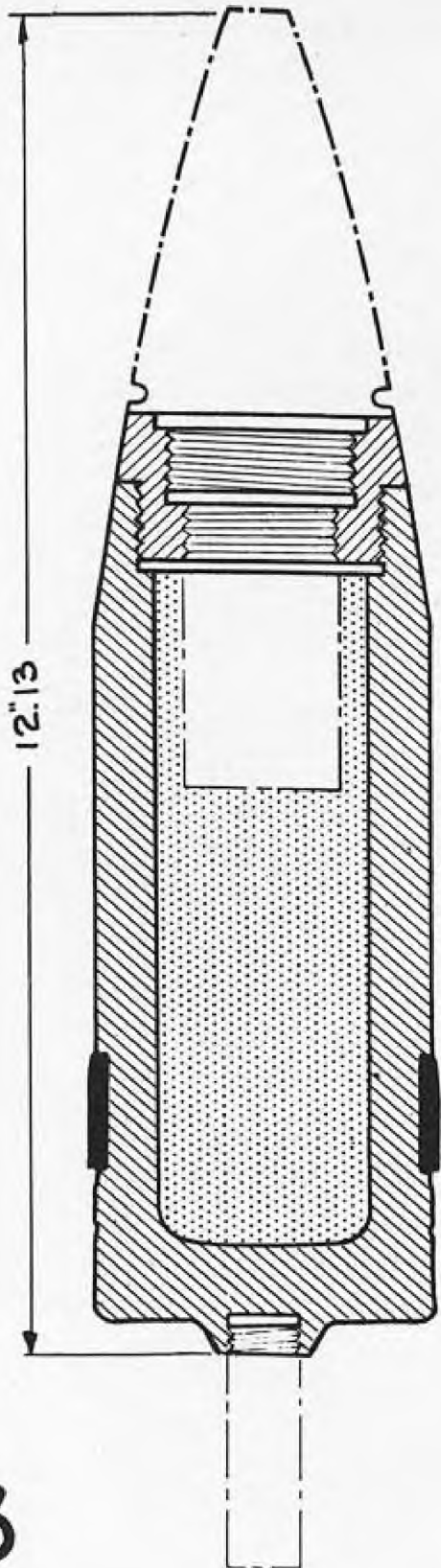
OVERALL LENGTH	10.035 in.
DIAMETER OF BASE	2.87 in.
DISTANCE - BASE TO BAND	1.80 in.
WIDTH OF BAND	0.70 in.
DIAMETER AT BOURRELET	2.97 in.
TYPE OF FILLING	Black Powder & TNT
WEIGHT OF FILLING	0.28 lbs.
WEIGHT OF LOADED PROJECTILE	13 lbs.
CHARGE/WEIGHT RATIO	2.15%
CARTRIDGE CASE	Mk 2
PRIMER	Mk 10 Mod 9
TRACER	Integral in fuze
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 8 Mod 4 (B.I.F.)

**U.S. NAVY****3" COM****MK. 3,  
MOD. 7**

GUNS USED IN: 3"/23

**REMARKS:**

- (a) Base Ignition Fuzes Mk 8 Mod 5 or Mk 2 Mod 9 (without tracers) may be used in this projectile, but the Mk 8 Mod 4 with integral tracer is preferred.
- (b) This round may also be issued BL & P or BL & T with the Mk 7 tracer for target practice.
- (c) For method of marking and painting, see Introduction.



**MK. 23**

**3" A.A. PROJECTILE**

**DATA**~~CONFIDENTIAL~~**U. S. NAVY****3"AA****MK.23 MODS.1,2,3**

OVERALL LENGTH	
With Nose Fuze	12.13 in.
Without Nose Fuze	8.11 in.
DIAMETER OF BASE	2.98 in.
DISTANCE - BASE TO BAND	1.60 in.
WIDTH OF BAND	.70 in.
DIAMETER AT BOURRELET	2.98 in.
TYPE OF FILLING	Cast T.N.T.
WEIGHT OF FILLING	.74 lbs.
WEIGHT OF LOADED PROJECTILE	13.05 lbs.
CHARGE/WEIGHT RATIO	5.67%
CARTRIDGE CASE	Mk. 3, Mk. 3 Mods 2 & 3
PRIMER	Mk 14
TRACER	Mk 4

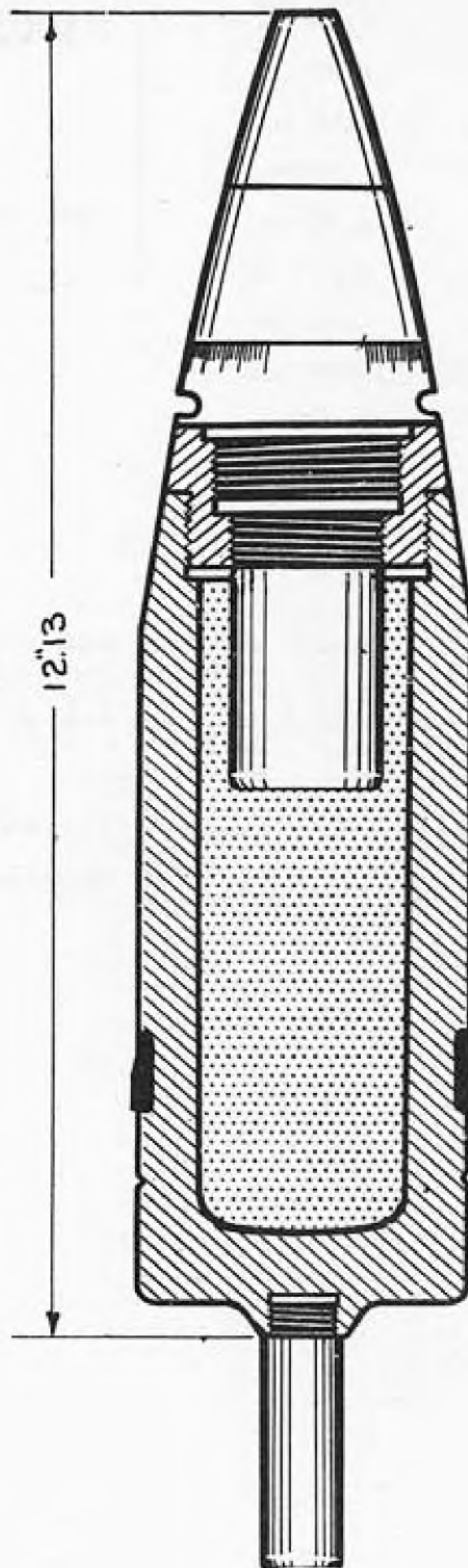
GUNS USED IN: 3"/50

**FUZES WHICH MAY BE USED  
IN PROJECTILE**

	Nose:	Mk 22 and Mods 1 through 5. (M.T.F.)
		Mk 30 and Mods 1, 2, 3. (P.D.F.)
		Mk 51 and Mods. (M.T.F.)
	Auxiliary Detonating Fuze	Mk 17 and Mods or Mk 46 Mk. 54 Mod 0

**REMARKS:**

- (a) For method of marking and painting, see Introduction.
- (b) The Mk 54 A.D.F. is replacing the Mk 17 and Mk 46 fuzes in all assemblies.



**3" A.A. PROJECTILE  
MK. 26**

**DATA**~~CONFIDENTIAL~~**U. S. NAVY****3"AA****MK.26 MODS.1-2**

GUNS USED IN: 3"/23

OVERALL LENGTH  
 With Nose Fuze 12.13 in.  
 Without Nose Fuze 8.11 in.

DIAMETER OF BASE 2.97 in.

DISTANCE - BASE TO BAND 1.80 in.

WIDTH OF BAND .70 in.

DIAMETER AT BOURRELET 2.98 in.

TYPE OF FILLING Cast T.N.T.

WEIGHT OF FILLING .74 lbs.

WEIGHT OF LOADED PROJECTILE 12.95 lbs.

CHARGE/WEIGHT RATIO 5.71%

CARTRIDGE CASE Mk 2

PRIMER Mk 10 Mod 9

TRACER Mk 4

**FUZES WHICH MAY BE USED  
 IN PROJECTILE**

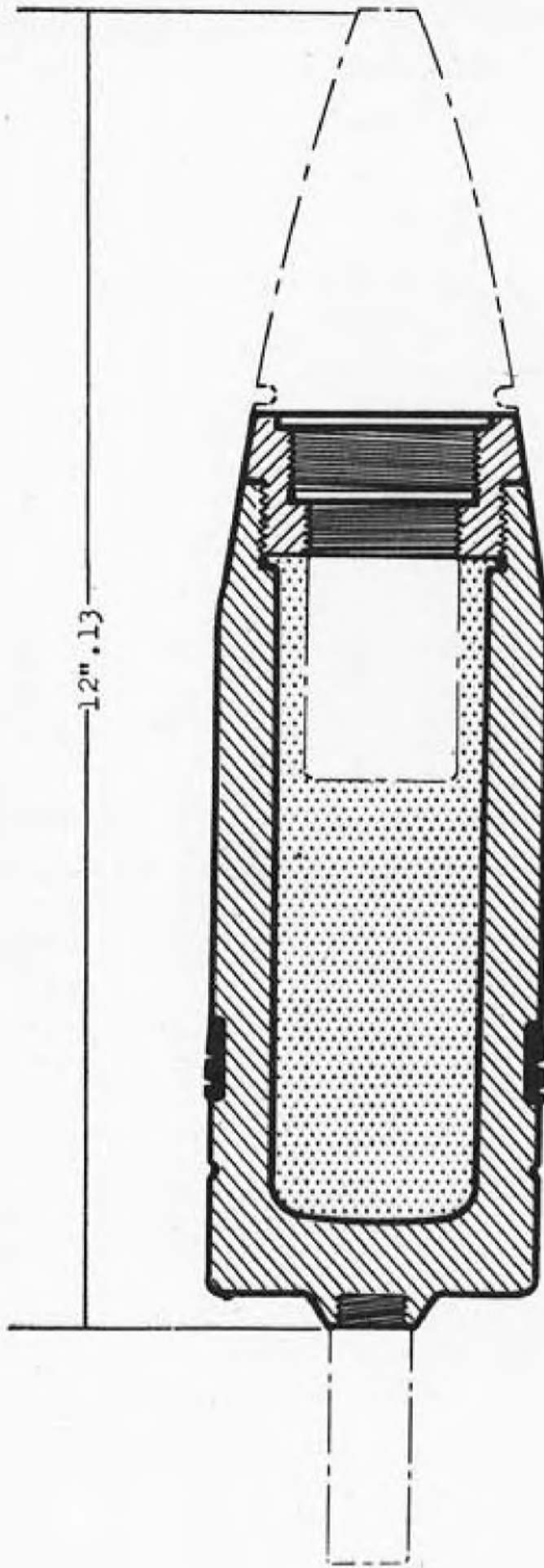
Nose: Mk 22 and Mods 1 through 5. (M.T.F.)  
 Mk 51 all Mods. (M.T.F.)

Auxiliary  
 Detonating Mk 17 and Mods or  
 Fuze Mk 46  
 Mk. 54 Mod 0

**REMARKS:**

- (a) For method of marking and painting, see Introduction.
- (b) The Mk 54 auxiliary detonating fuze is replacing the Mk 17 and the Mk 46 in all assemblies.

~~CONFIDENTIAL~~



**3" A.A. PROJECTILE  
MK. 27**

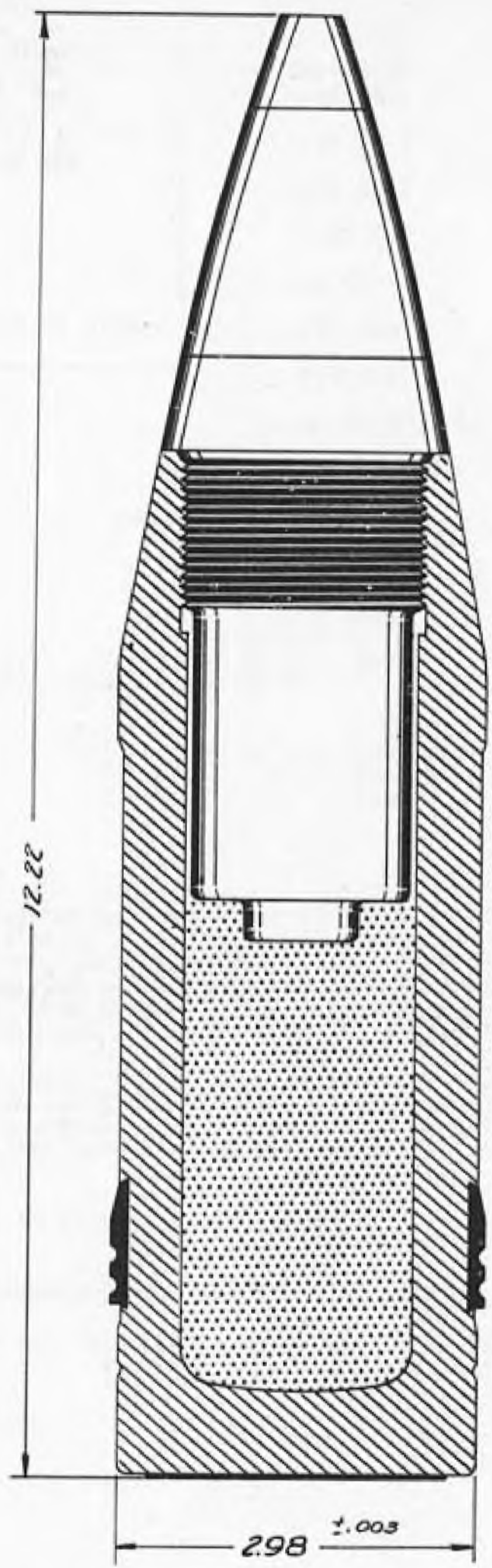
**DATA**~~CONFIDENTIAL~~**U. S. NAVY****3"AA****MK. 27 MODS. 1,2,3,4**

GUNS USED IN: 3"/50

OVERALL LENGTH		
With Nose Fuze	12.13 in.	
Without Nose Fuze	8.11 in.	
DIAMETER OF BASE	2.98 in.	
DISTANCE - BASE TO BAND	1.35 in.	
WIDTH OF BAND	1.00 in.	
DIAMETER AT BOURRELET	2.98 in.	
TYPE OF FILLING	Cast T.N.T.	
WEIGHT OF FILLING	.74 lbs.	
WEIGHT OF LOADED PROJECTILE	13.00 lbs.	
CHARGE/WEIGHT RATIO	5.67%	
CARTRIDGE CASE	Mk 7 all Mods, Mk 9 Mod 0	
PRIMER	Mk 14, Mk 14 Mod 1	
TRACER	Mk 4	
FUZES WHICH MAY BE USED IN PROJECTILE	Nose: Mk 22 and Mods 1 through 5. (M.T.F.) Mk 30, Mods 1, 2, 3. (P.D.F.) Mk 51 all Mods. (M.T.F.) Auxiliary Detonating Fuze Mk 17 and Mods Mk 46 Mk 54 Mod 0	

**REMARKS:**

- (a) For method of marking and painting, see Introduction.
- (b) This projectile becomes 3" H.C. when the Mk 30 fuze is substituted for the Mk 22.
- (c) The Mk 54 auxiliary detonating fuze is replacing the Mk 17 and the Mk 46 in all assemblies.



**MK. 31 MOD. 1**  
**3" A.A. PROJECTILE**

**DATA**~~CONFIDENTIAL~~**U. S. NAVY****3" A.A.****MK.31 MOD.1**

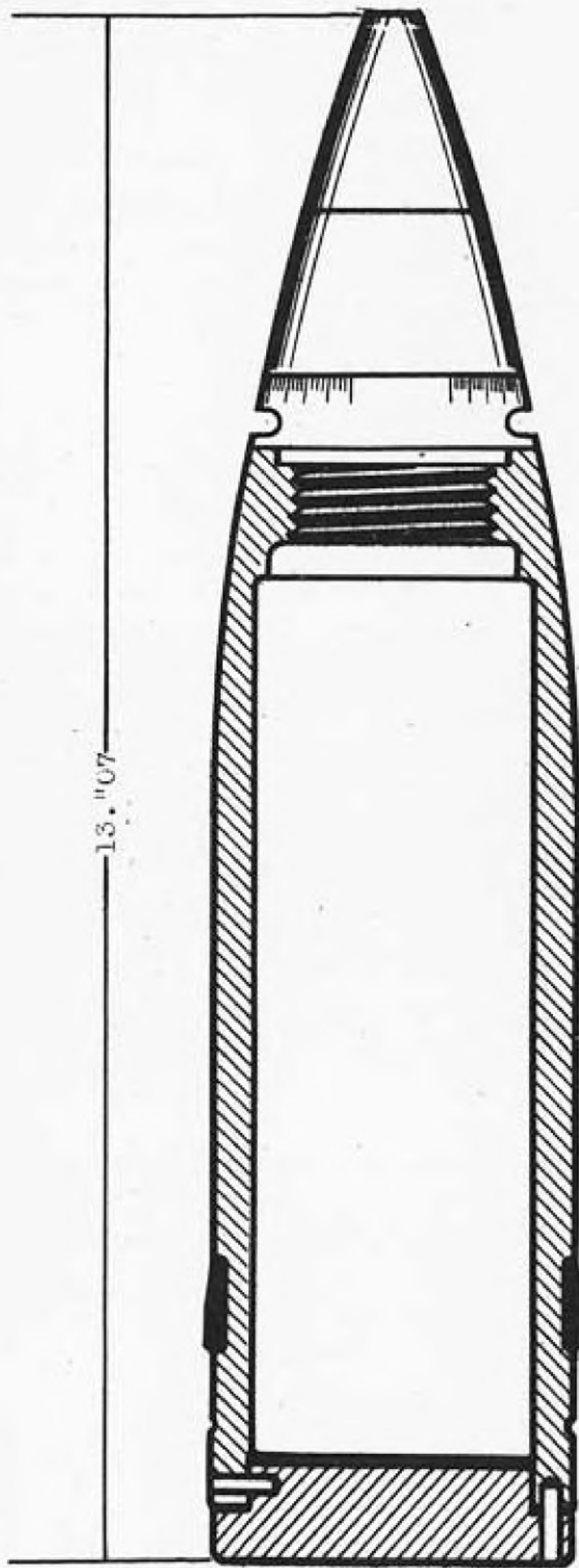
GUNS USED IN: 3"/50

OVERALL LENGTH	
With Nose Fuze	12.22 in.
Without Nose Fuze	8.50 in.
DIAMETER OF BASE	2.98 in.
DISTANCE - BASE TO BAND	1.35 in.
WIDTH OF BAND	1.0 in.
DIAMETER AT BOURRELET	2.985 in.
TYPE OF FILLING	Cast TNT
WEIGHT OF FILLING	0.54 lbs.
WEIGHT OF LOADED PROJECTILE	12.90 lbs.
CHARGE/WEIGHT RATIO	4.1%
CARTRIDGE CASE	Mk 7, Mk 9
PRIMER	Mk 14, Mk 14 Mod 1
TRACER	None
FUZES WHICH MAY BE USED IN PROJECTILE	Nose: Mk 45 Mod 12. (V.T.F.) Mk 58 and all Mods. (V.T.F.)

Auxiliary   Mk 44 Mods 0 & 1.  
Detonating  
Fuze:

**REMARKS:**

- (a) This projectile is specially cavitized to receive VT fuzes and their auxiliary detonating fuzes. No other fuzes may be assembled in this projectile. Since VT fuzing is employed, no tracer is assembled in the projectile. Instead, the base of the projectile is solid, and a special sheet steel base cover plate is welded on, .031 in. thick and 2.50 in. in diameter.
- (b) This projectile replaces the original Mk 31 Mod 0 which has been recalled from service use. The Mod 0 was cavitized to receive the VT fuze Mk 45 Mod 11, which differed from the Mod 12 by having a longer stem and has been declared unserviceable.
- (c) The Mk 58 VT fuze is currently replacing the Mk 45 Mod 12 in all assemblies.
- (d) For method of marking and painting, see Introduction.
- (e) V.T. cavitation is indicated by a red band 1/2" wide painted around the projectile 1/2" below the fuze.



**3" ILL. PROJECTILE  
MK. 21**

**DATA**~~CONFIDENTIAL~~

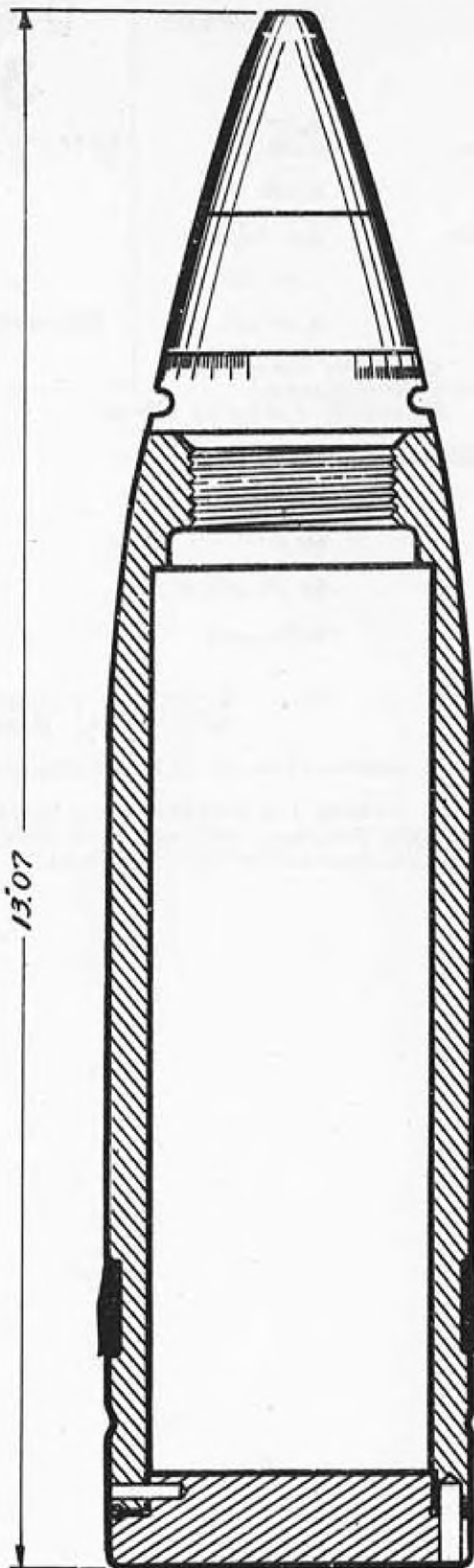
**U. S. NAVY**  
**3" ILL.**  
**MK. 21, MODS. 1, 2, 3**

OVERALL LENGTH	
With Nose Fuze	13.07 in.
Without Nose Fuze	9.32 in.
DIAMETER OF BASE	2.97 in.
DISTANCE - BASE TO BAND	1.8 in.
WIDTH OF BAND	.70 in.
DIAMETER AT BOURRELET	2.98 in.
TYPE OF FILLING	Black Powder Expelling charge. Magnesium flare.
WEIGHT OF FILLING	Expelling charge is 1 oz. Black Powder
WEIGHT OF LOADED PROJECTILE	13.00 lbs.
CHARGE/WEIGHT RATIO	
CARTRIDGE CASE	Mk 3 Mods 2 and 3
PRIMER	Mk 14, Mk 14 Mod 1
TRACER	None
FUZES WHICH MAY BE USED IN PROJECTILE	Nose: Mk 22 and Mods 1 through 5. (M.T.F.) Mk 51 and all Mods. (M.T.F.)

GUNS USED IN: 3"/50

**REMARKS:**

- (a) For details of construction of illuminating projectile, see Introduction.
- (b) For details of marking and painting, see Introduction.
- (c) Illuminating contents Mk. 3 are used with this projectile. See page 73 for illustration of Mk 3 contents.



**MK. 22**  
**3" ILL. PROJECTILE**

**DATA**~~CONFIDENTIAL~~

**U. S. NAVY**  
**3" ILL.**  
**MK. 22, MODS. 1-5**

OVERALL LENGTH  
 With Nose Fuze 13.07 in.  
 Without Nose Fuze 9.32 in.

DIAMETER OF BASE 2.965 in.

DISTANCE - BASE TO BAND 1.8 in.

WIDTH OF BAND .70 in.

DIAMETER AT BOURRELET 2.98 in.

GUNS USED IN: 3"/23

TYPE OF FILLING Expelling charge is  
 black powder. Flare is magnesium.

WEIGHT OF FILLING Expelling charge is 3/8 oz.

WEIGHT OF LOADED PROJECTILE 13.00 lbs.

CHARGE/WEIGHT RATIO

CARTRIDGE CASE Mk 2

PRIMER Mk 10 Mod 9

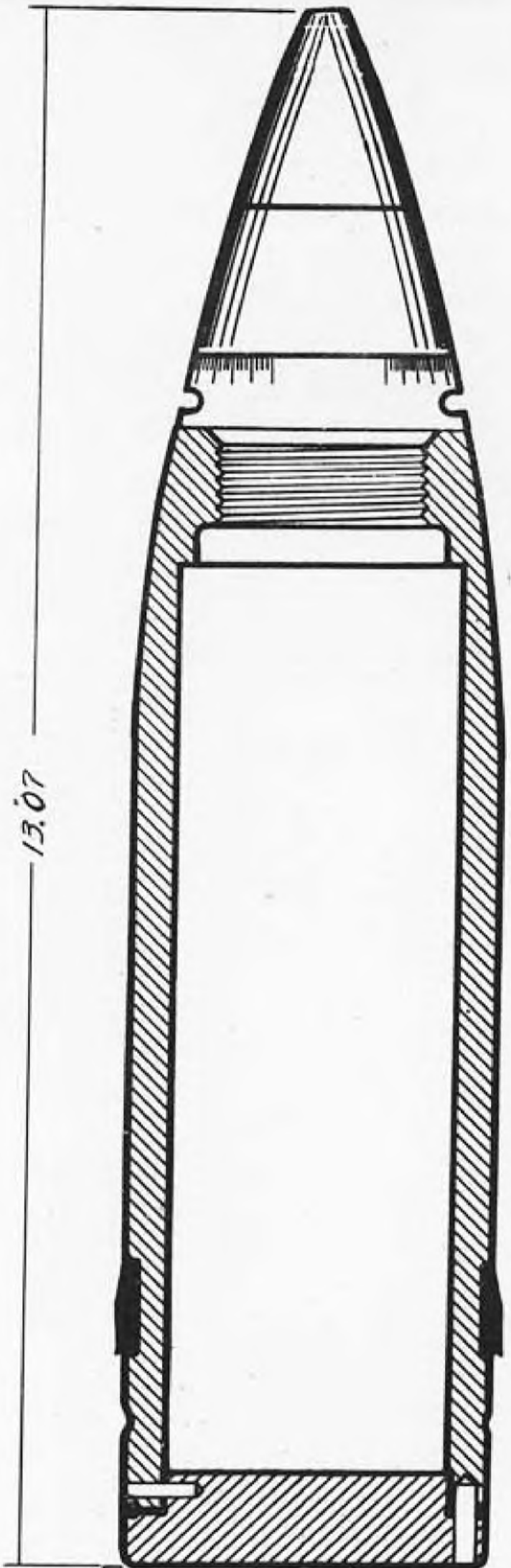
TRACER None used

FUZES WHICH MAY BE USED  
 IN PROJECTILE

Nose: Mk 22 Mods 1 through 5. (M.T.F.)  
 Mk 51 and all Mods. (M.T.F.)

**REMARKS:**

- (a) For details of construction of illuminating projectile, see Introduction.
- (b) For details of marking and painting, see Introduction.
- (c) Mk 3 Illuminating Contents are used with this projectile. See page 73 for illustration of Mk 3 contents.



**MK.24**  
**3" ILL. PROJECTILE**

**DATA**~~CONFIDENTIAL~~

**U. S. NAVY  
3" ILL.  
MK. 24, MOD. I**

OVERALL LENGTH  
 . With Nose Fuze 13<sup>07</sup>  
 Without Nose Fuze 9<sup>35</sup>

DIAMETER OF BASE 2<sup>972</sup>

DISTANCE - BASE TO BAND 1<sup>80</sup>

WIDTH OF BAND <sup>70</sup>

DIAMETER AT BOURRELET 2<sup>98</sup>

TYPE OF FILLING Black powder expelling  
 charge. Magnesium flare.

WEIGHT OF FILLING Expelling charge is 3/8 oz.

WEIGHT OF LOADED PROJECTILE 13.04 lbs.

CHARGE/WEIGHT RATIO

CARTRIDGE CASE Mk 3, 3-2, or 3-3

PRIMER Mk 14, Mk 14 Mod 1

TRACER None

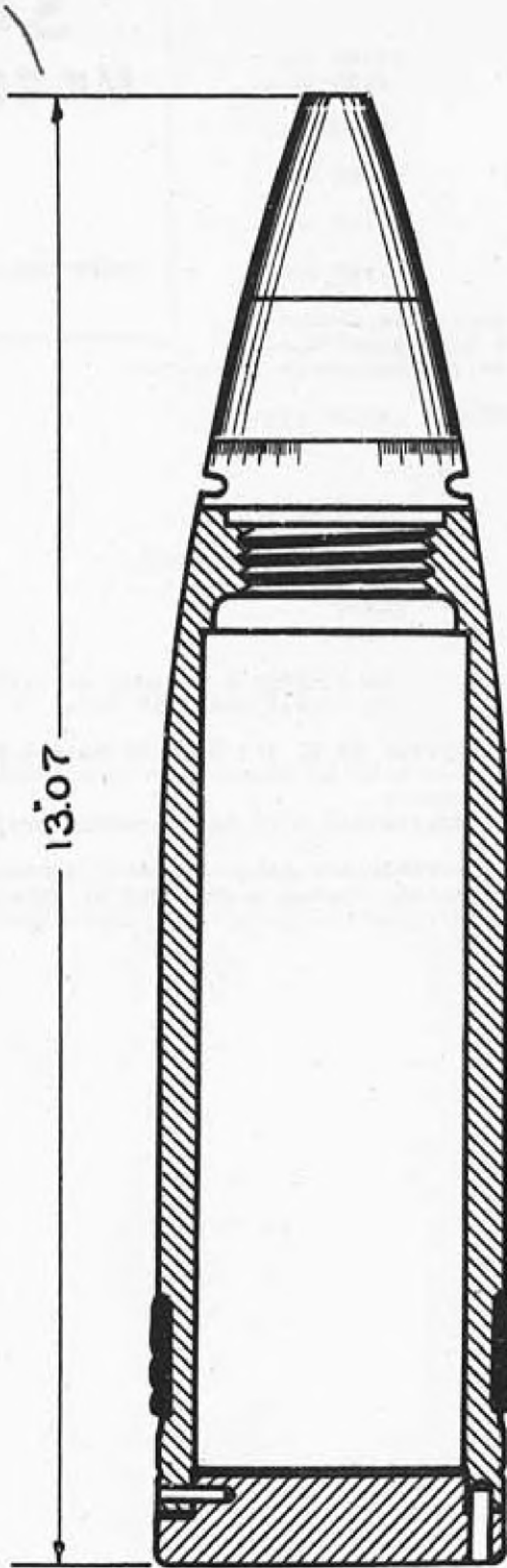
FUZES WHICH MAY BE USED  
 IN PROJECTILE Nose: Mk 22 and Mods 1-5. (M.T.F.)  
 Mk 51 and all Mods. (M.T.F.)

GUNS USED IN: 3"/50

## REMARKS:

- (a) For details of construction of illuminating projectile, see Introduction.
- (b) For details of marking and painting, see Introduction.
- (c) The Mk 3 Illuminating Contents are used in this projectile. See page 72 for illustration of Mk 3 contents.

~~CONFIDENTIAL~~



**3" ILL. PROJECTILE  
MK. 25**

**DATA**~~CONFIDENTIAL~~**U. S. NAVY  
3" ILL.  
MK. 25, MOD. 1**

OVERALL LENGTH  
    With Nose Fuze                   13.07 in.  
    Without Nose Fuze                9.35 in.

DIAMETER OF BASE                    2.962 in.

DISTANCE - BASE TO BAND            1.35 in.

WIDTH OF BAND                       1.00 in.

DIAMETER AT BOURRELET             2.98 in.

TYPE OF FILLING                    Expelling charge is  
    black powder. Flare is magnesium.

WEIGHT OF FILLING                  Expelling charge is 3/8 oz.

WEIGHT OF LOADED PROJECTILE       13.07 lbs.

CHARGE/WEIGHT RATIO

CARTRIDGE CASE                     Mk 7 or Mk 9

PRIMER                              Mk 14, Mk 14 Mod 1

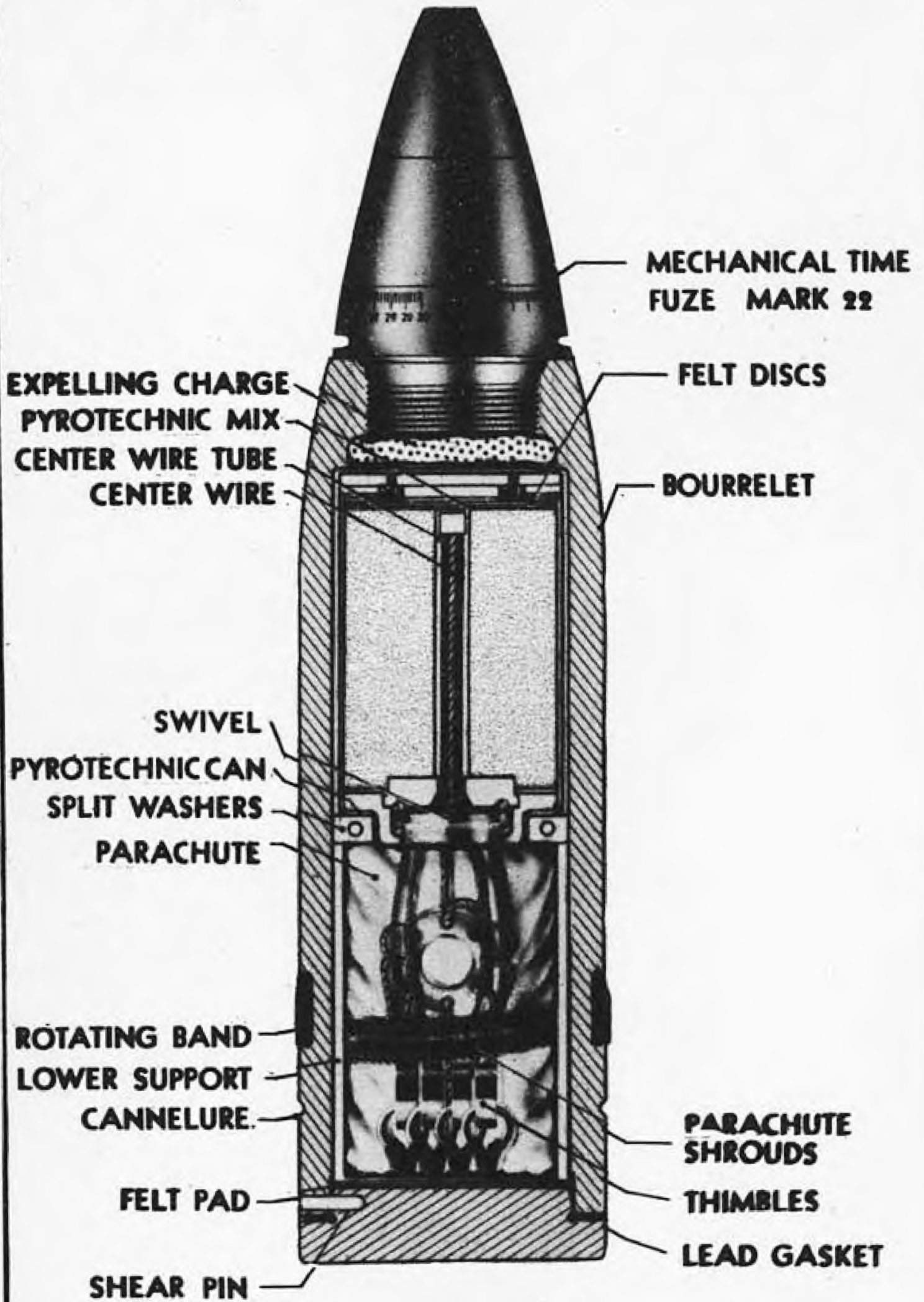
TRACER                              None

FUZES WHICH MAY BE USED  
    IN PROJECTILE                    Mk 22 Mods 1 through 5. (M.T.F.)  
                                      Mk 51 all Mods. (M.T.F.)

GUNS USED IN: 3"/50

**REMARKS:**

- (a) Lot numbers 9 through 98 of the Mark 22 Mods 2 & 3 fuze are authorized for use with Mk 25 and Mods projectile in the Mk 21 and Mk 22 guns.
- (b) For details of construction of illuminating projectile, see Introduction.
- (c) For details of marking and painting, see Introduction.
- (d) The Mk 3 Illuminating Contents are used in this projectile. See page 72 for illustration of Mk 3 contents.



# MK. 28

## 3" ILL. PROJECTILE

# DATA

~~CONFIDENTIAL~~

U. S. NAVY  
3" ILL.  
MK. 28, MOD. I

OVERALL LENGTH  
    With Nose Fuze                   13.07 in.  
    Without Nose Fuze                9.35 in.

DIAMETER OF BASE                    2.965 in.

DISTANCE - BASE TO BAND            1.8 in.

WIDTH OF BAND                       .70 in.

DIAMETER AT BOURRELET              2.98 in.

TYPE OF FILLING                    Expelling charge is  
    black powder. Flare is magnesium.

WEIGHT OF FILLING                  Expelling charge is 3/8 oz.

GUNS USED IN:           3"/23

WEIGHT OF LOADED PROJECTILE       13.00 lbs.

CHARGE/WEIGHT RATIO

CARTRIDGE CASE                    Mk 2

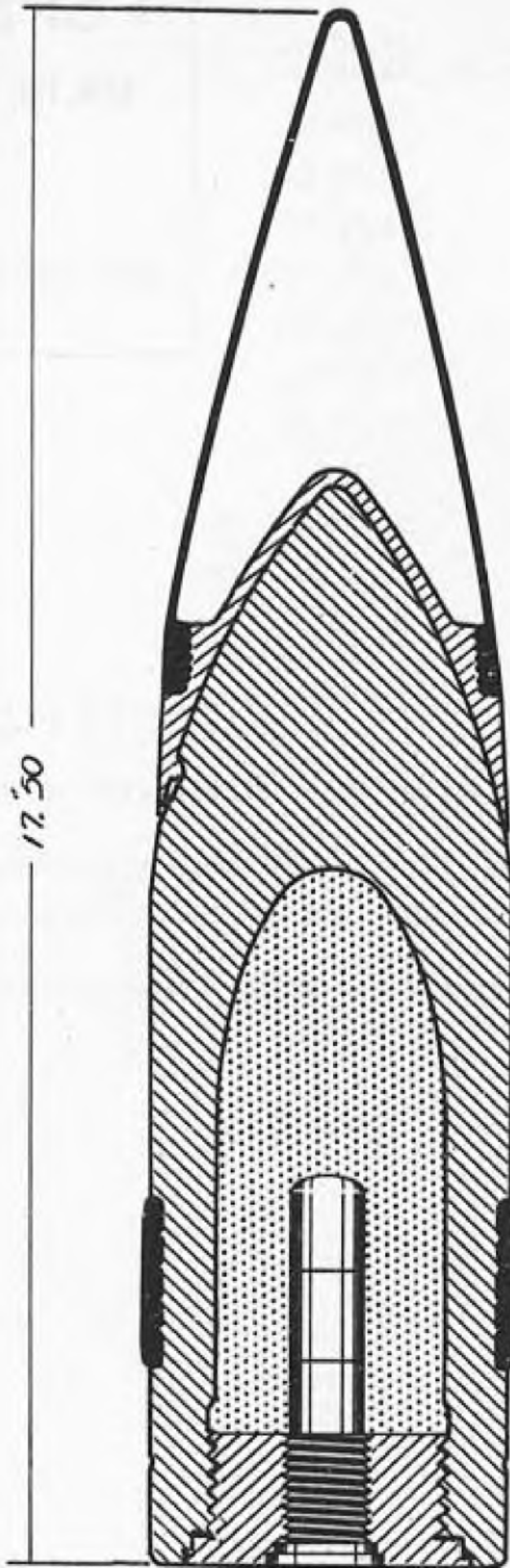
PRIMER                             Mk 10 Mod 9

TRACER                             None used

FUZES WHICH MAY BE USED  
    IN PROJECTILE                   Nose: Mk 22 Mods 1 through 5. (M.T.F.)  
                                      Mk 51 all Mods. (M.T.F.)

## REMARKS:

- (a) For details of construction of illuminating projectile, see Introduction.
- (b) For details of marking and painting, see Introduction.
- (c) The Mk 4 Mod 3 Illuminating Contents are used in this projectile.



MK.16

4" SPEC. COM. PROJECTILE

**DATA**~~CONFIDENTIAL~~**U. S. NAVY  
4" SPEC. COM****MK.16, MODS. 1, 2****GUNS USED IN: 4"/50**

OVERALL LENGTH  
    With Cap & Windshield 17.50 in.  
    Without Cap & Windshield 11.42 in.

DIAMETER OF BASE 3.96 in.

DISTANCE - BASE TO BAND 2.25 in.

WIDTH OF BAND 1.85 in.

DIAMETER AT BOURRELET 3.985 in.

TYPE OF FILLING Explosive D

WEIGHT OF FILLING 1.16 lbs.

WEIGHT OF LOADED PROJECTILE 33.00 lbs.

CHARGE/WEIGHT RATIO 3.03%

CARTRIDGE CASE Mk 2 Mod 1 or Mk 2 Mod 4

PRIMER Mk 13 and Mods.

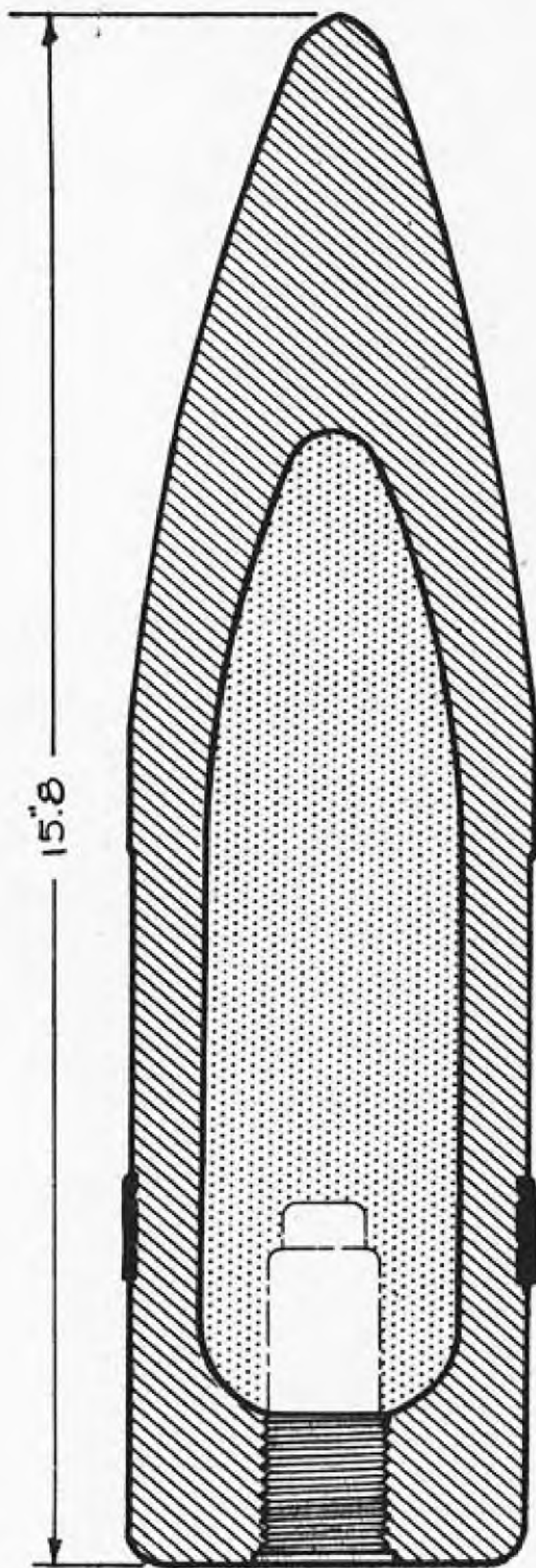
TRACER Mk 4

**FUZES WHICH MAY BE USED  
IN PROJECTILE**

Base: Mk 36 Mods. 0 & 1. (B.D.F.)  
Mk 20 Mods. 1 & 2. (B.D.F.)

**REMARKS:**

- (a) The Mk 36 fuze is the preferred assembly and is replacing the Mk 20.
- (b) For details of cap and windshield construction, see Introduction.
- (c) This projectile is specially strengthened for extra armor piercing qualities.
- (d) For method of marking and painting, see Introduction.



**4" COM. PROJECTILE  
MK. 6**

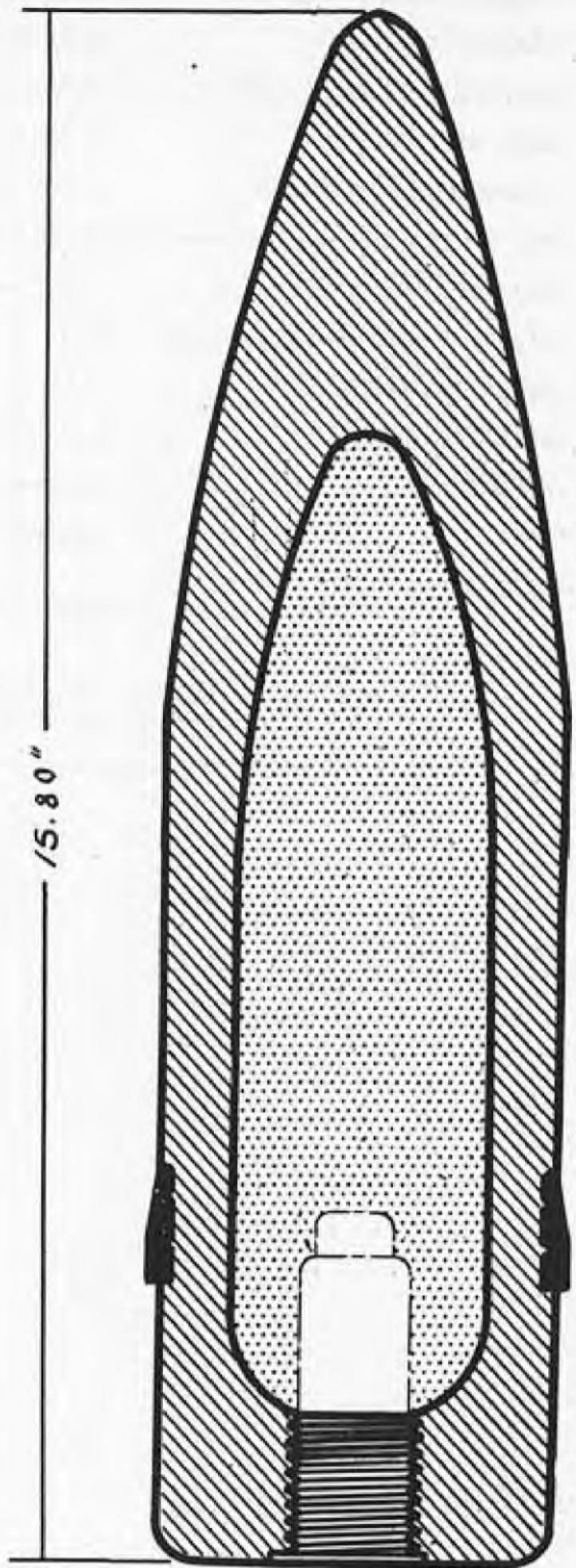
**DATA**~~CONFIDENTIAL~~**U.S. NAVY  
4" COM****MK. 6, MOD. 6**

GUNS USED IN: 4"/50

OVERALL LENGTH	15.8 in.
DIAMETER OF BASE	3.96 in.
DISTANCE - BASE TO BAND	2.90 in.
WIDTH OF BAND	1.02 in.
DIAMETER AT BOURRELET	3.985 in.
TYPE OF FILLING	Black powder & T.N.T.
WEIGHT OF FILLING	1.39 lbs.
WEIGHT OF LOADED PROJECTILE	33.0 lbs.
CHARGE/WEIGHT RATIO	4.21 %
CARTRIDGE CASE	Mk 2 or Mk 2 Mod 3
PRIMER	Mk 13 and Mods.
TRACER	Integral
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 10 Mod 4

**REMARKS:**

- (a) This round may be issued BL & P or BL & T with tracer Mk 6 Mod 1 and adapter for target practice.
- (b) For method of marking and painting, see Introduction.



**4" COM. PROJECTILE  
MK. 10**

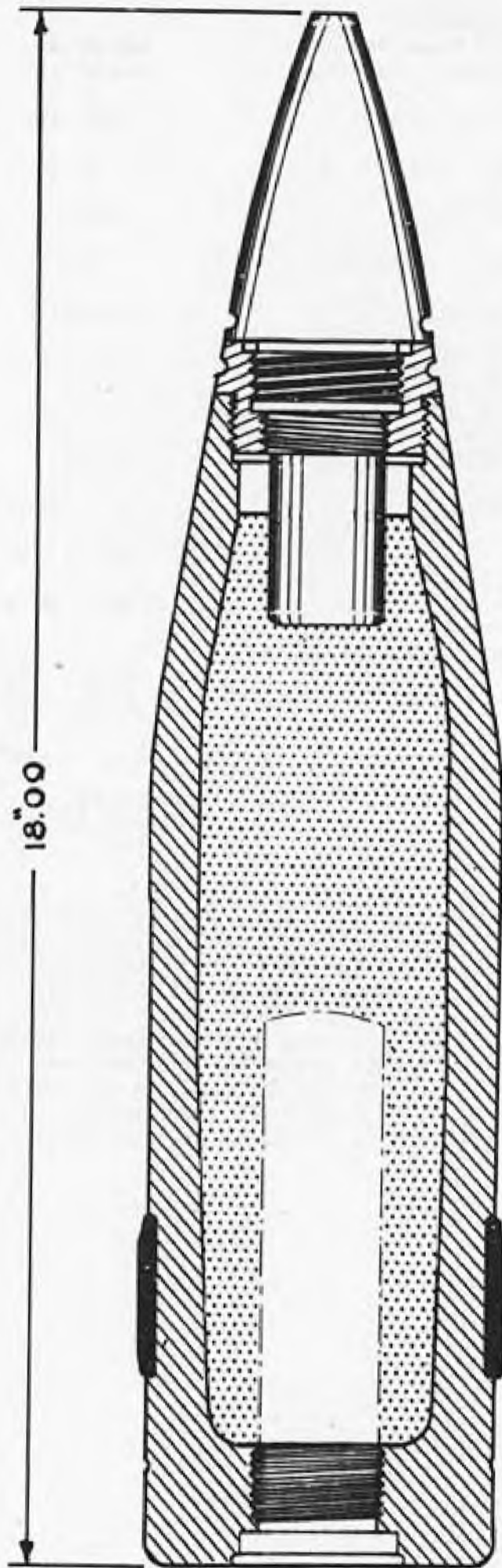
**DATA**~~CONFIDENTIAL~~**U.S. NAVY****4" COM****MK. 10, & MODS. 1, 2, 3**

GUNS USED IN: 4"/50

OVERALL LENGTH	15.80 in.
DIAMETER OF BASE	3.96 in.
DISTANCE - BASE TO BAND	2.75 in.
WIDTH OF BAND	1.33 in.
DIAMETER AT BOURRELET	3.985 in.
TYPE OF FILLING	Black powder and TNT
WEIGHT OF FILLING	1.39 lbs.
WEIGHT OF LOADED PROJECTILE	33.0 lbs.
CHARGE/WEIGHT RATIO	4.21 %
CARTRIDGE CASE	Mk 2 or Mk 2 Mod 3
PRIMER	Mk 13 and Mods.
TRACER	Integral in fuze
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 10 Mod 4

## REMARKS:

- (a) For target practice, this round is also issued BL & P or BL & T with adapter and Mk 6 Mod 1 tracer.
- (b) For method of marking and painting, see Introduction.



**4" H.C. PROJECTILE  
 MK. 15**

# DATA

U. S. NAVY

4" HC

MK.15, MOD.1

GUNS USED IN: 4"/50

OVERALL LENGTH  
With Nose Fuze 18.00 in.  
Without Nose Fuze 14.28 in.

DIAMETER OF BASE 3.96 in.

DISTANCE - BASE TO BAND 2.25 in.

WIDTH OF BAND 1.85 in.

DIAMETER AT BOURRELET 3.985 in.

TYPE OF FILLING Explosive D

WEIGHT OF FILLING 2.71 lbs.

WEIGHT OF LOADED PROJECTILE 33.00 lbs.

CHARGE/WEIGHT RATIO 8.21%

CARTRIDGE CASE Mk 2 Mods 1 & 4

PRIMER Mk 13 and all Mods.

TRACER Mk 4 or Mk 9

## FUZES WHICH MAY BE USED IN PROJECTILE :

Base: Mk 31 or Mk 28 (B.D.F.)  
Nose: Mk 30 Mods 1, 2, 3 (P.D.F.)  
Mk 22 Mods 1 - 5 (M.T.F.)  
Steel nose plug  
Mk.51 and all Mods. (M.T.F.)

Auxiliary  
Detonating Mk 17 or Mk 46  
Fuze Mk 54 Mod 0

## REMARKS :

- (a) The Mk 31 fuze is preferred for this projectile but until it is in field service the Mk 28 is being used.
- (b) With the Mk 28 fuze the Mk 9 tracer is used. Mk 4 tracer will be used with the Mk 31 fuze.
- (c) The 4"/50 EX-2 and EX 2-1 are identical to Mk 15 projectile except they are one pound heavier. Approximately 18,000 of the EX projectiles have been manufactured and issued.
- (d) For method of marking and painting projectile, see Introduction.
- (e) The Mk 54 auxiliary detonating fuze is replacing the Mk 17 and the Mk 46 fuzes in all assemblies.



M.T.F. Mk 18, 50, 63

EXPELLING CHARGE

BAFFLE PLATE

STARTER MIX

PYROTECHNIC

CENTER WIRE

CENTER WIRE TUBE

UPPER SUPPORT CANISTER

SPLIT WASHERS

SWIVEL

THIMBLES

SHROUDS

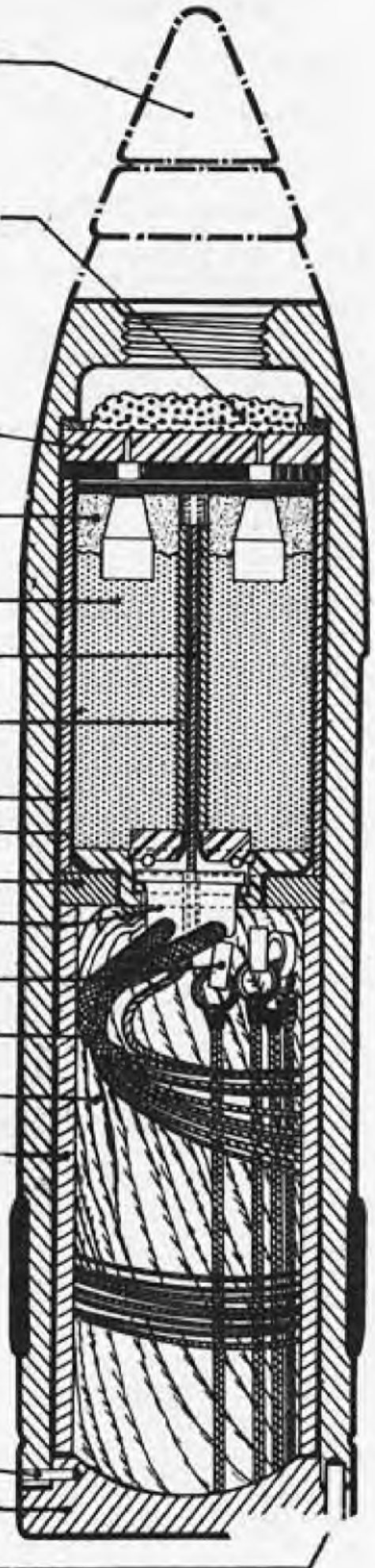
PARACHUTE

LOWER SUPPORT

SHEAR PIN

BASE PLUG

TWIST PIN



# MK.14

## 4" ILL. PROJECTILE

**DATA**

**U. S. NAVY**  
**4" ILL.**  
**MK.14, MOD.1-6**

OVERALL LENGTH  
 With Nose Fuze 18.40 in.  
 Without Nose Fuze 14.92 in.

DIAMETER OF BASE 3.933 in.

DISTANCE - BASE TO BAND 2.25 in.

WIDTH OF BAND 1.85 in.

DIAMETER AT BOURRELET 3.985 in.

TYPE OF FILLING Expelling charge is  
 black powder. Flare is magnesium.

WEIGHT OF FILLING Expelling charge is 1.25 oz.

WEIGHT OF LOADED PROJECTILE 34.66 lbs.

CHARGE/WEIGHT RATIO

CARTRIDGE CASE Mk 2 Mods 1 and 4

PRIMER Mk 13 and all Mods.

TRACER None

GUNS USED IN: 4"/50

FUZES WHICH MAY BE USED  
IN PROJECTILE

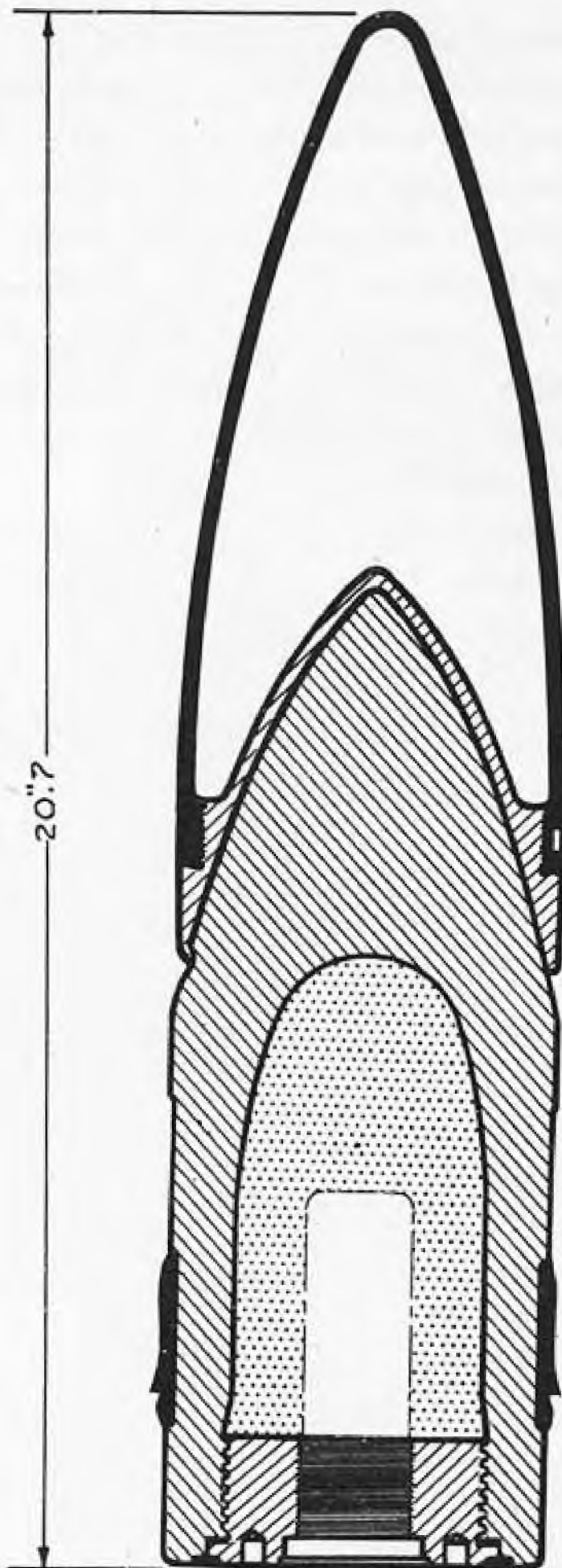
Mk 18 Mods 2, 3, & 4. (M.T.F.)  
 Mk 50 all Mods. (M.T.F.) - (See note)  
 Mk 63 Mod 0. (M.T.F.)

## REMARKS:

- (a) For details of construction of illuminating projectile, see Introduction.
- (b) For details of marking and painting, see Introduction.
- (c) The Mk 18 fuze may be used in all Mods of this projectile; the Mk 50 and Mk 63 fuzes are used only in the Mod 6 projectile
- (d) Mk 3 Illuminating Contents are used in projectiles Mods 1 - 5; the Mk 4 Mod 4 Illuminating Contents are used in the Mod 6 projectile.



5"/38 COM. MK. 38-1 L & F. 1918  
EXP. "D" 2.64 LBS. DEN. 1.48  
TRA. MK 5 BRANJE TREP. G-22  
INSP. E.G.O. N.A.D. CRANE, INC.  
OFF. J.W.H. FOR USE IN MK. 38  
5"/38 GUNS ONLY ARM. 101 1918



20.7

# 5" SPEC. COM. PROJECTILE MK. 38

**DATA**

OVERALL LENGTH	20.7 in.
DIAMETER OF BASE	4.985 in.
DISTANCE - BASE TO BAND	2.43 in.
WIDTH OF BAND	2.25 in.
DIAMETER AT BOURRELET	4.985 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	2.04 lbs.
WEIGHT OF LOADED PROJECTILE	55.18 lbs.
CHARGE/WEIGHT RATIO	3.69%
CARTRIDGE CASE	Mk 5
PRIMER	Mk 13 and all Mods.
TRACER	Mk 9
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 20 and all Mods. (B.D.F.)

**REMARKS:**

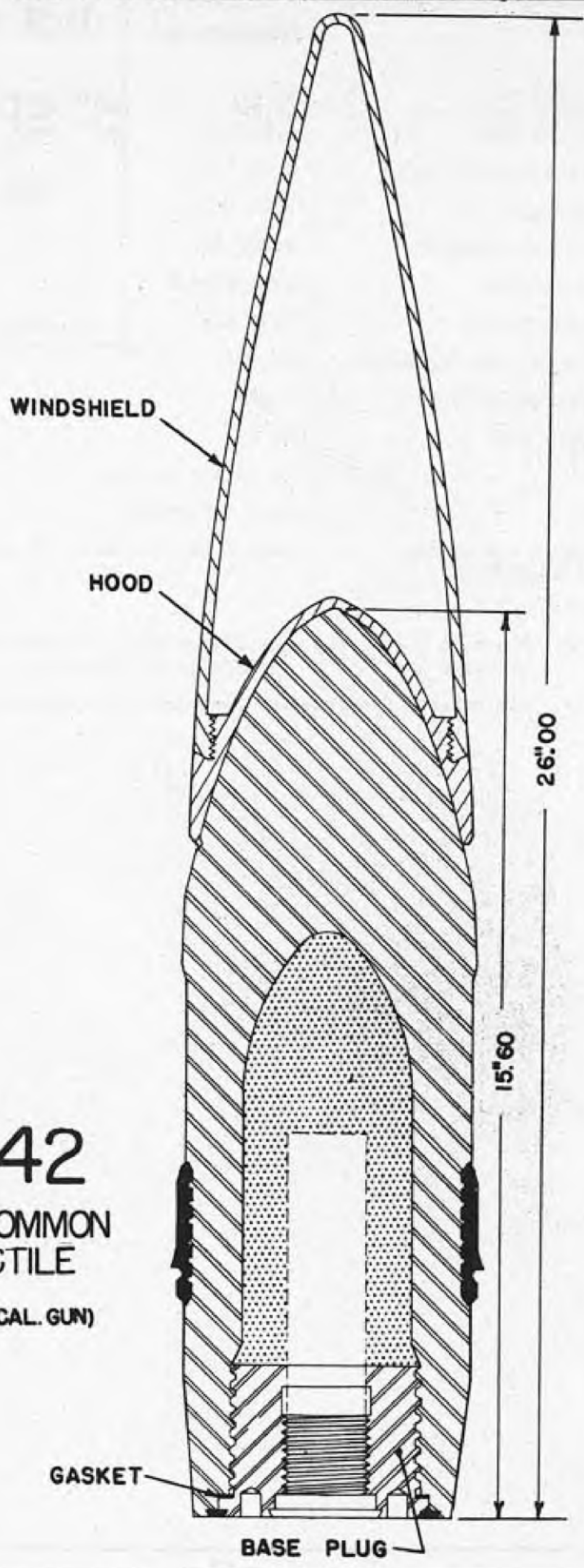
(a) For method of marking and painting, see Introduction.

**U.S. NAVY**  
**5" SPEC. COM**  
**MK. 38 MOD. 1-3**

GUNS USED IN: 5"/38

~~CONFIDENTIAL~~

**MK. 42**  
**5" SPEC COMMON**  
**PROJECTILE**  
**(FOR 5754 CAL. GUN)**



**DATA**~~CONFIDENTIAL~~**U.S. NAVY****5" SPEC. COM.****MK.42 MOD.0 & 1**

Guns Used In: 5"/54

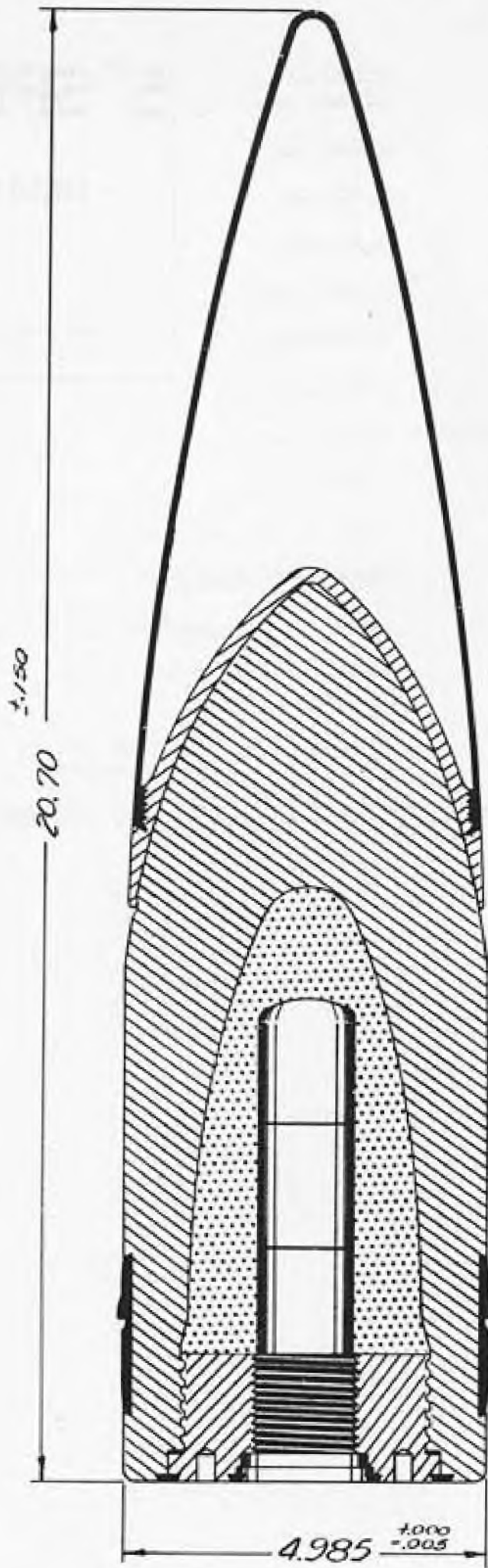
OVERALL LENGTH	26.0 in.
Without Windshield	15.605 in.
DIAMETER OF BASE	4.26 in.
DISTANCE - BASE TO BAND	3.75 in.
WIDTH OF BAND	2.25 in.
DIAMETER AT BOURRELET	4.985 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	2.14 lbs.
WEIGHT OF LOADED PROJECTILE	70 lbs.
CHARGE/WEIGHT RATIO	3.06%
CARTRIDGE CASE	Mk 6
PRIMER	Mk 13 and all Mods.
TRACER	Mk 5 (probably)
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk. 64 Mod 0. (B.D.F.)

**REMARKS:**

- (a) The Mk 9 tracer may possibly be used in this projectile, although the Mk 5 is the preferred assembly.
- (b) For method of marking and painting, see Introduction.

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~



MK.46

5" SPEC. COM. PROJECTILE

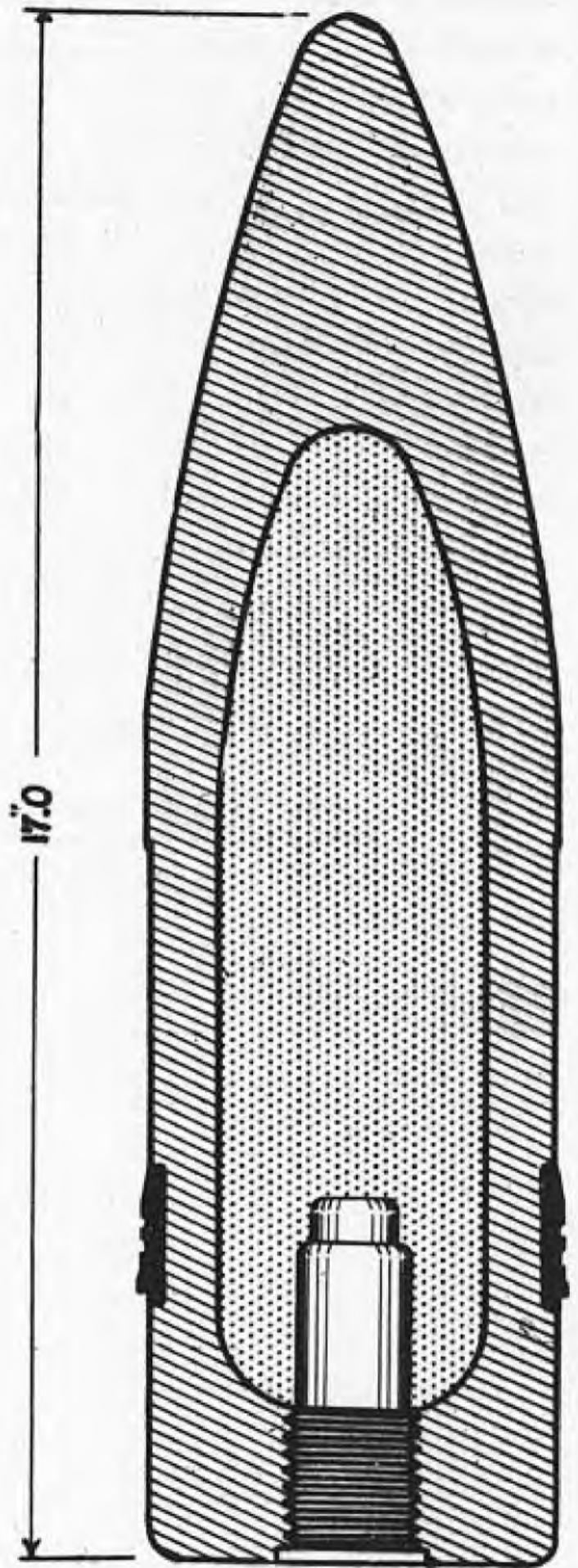
**DATA**~~CONFIDENTIAL~~**U. S. NAVY****5" SPEC. COM.****MK. 46 MODS. 1&2****GUNS USED IN: 5"/38**

OVERALL LENGTH	
With Cap	20.70 in.
Without Cap	12.485 in.
DIAMETER OF BASE	4.985 in.
DISTANCE - BASE TO BAND	2.43 in.
WIDTH OF BAND	2.25 in.
DIAMETER OF BOURRELET	4.985 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	2.04 lbs.
WEIGHT OF LOADED PROJECTILE	55.18 lbs.
CHARGE/WEIGHT RATIO	3.69%
CARTRIDGE CASE	Mk 5
PRIMER	Mk 13 and all Mods
TRACER	Mk 9
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 20 Mods 0 - 2. (B.D.F.)

**REMARKS:**

(a) For method of marking and painting, see Introduction.

~~CONFIDENTIAL~~



**5" COM. PROJECTILE  
MK.15**

**DATA**~~CONFIDENTIAL~~

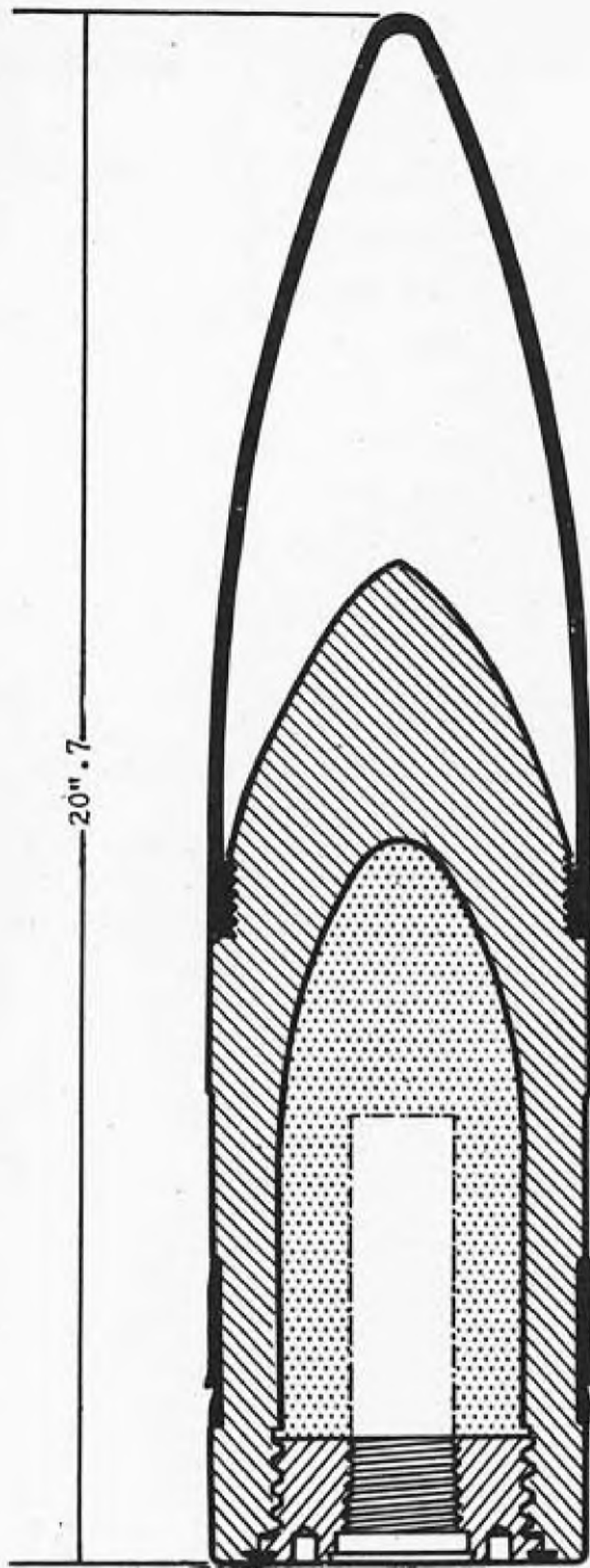
U.S. NAVY

**5" COM****MK. 15, MOD. 12, 14**GUNS USED IN: 5"/50 (bag)  
5"/51 (bag)  
5"/51 (case)

OVERALL LENGTH	17.0 in.
DIAMETER OF BASE	4.96 in.
DISTANCE - BASE TO BAND	0.65 in.
WIDTH OF BAND	1.67 in.
DIAMETER AT BOURRELET	4.985 in.
TYPE OF FILLING	Black powder and TNT
WEIGHT OF FILLING	1.70 lbs.
WEIGHT OF LOADED PROJECTILE	50.0 lbs.
CHARGE/WEIGHT RATIO	3.46 %
CARTRIDGE CASE	Bag gun
PRIMER	Mk 15 Mod 1
TRACER	Integral in fuze
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 10 Mod 4. (B.I.F.)

## REMARKS:

- (a) When used in the 5"/51 case gun, cartridge case Mk 3 and primer Mk 13 and all mods are employed.
- (b) The Mk 10 Mod 9 fuze may be used if the Mk 10 Mod 4 is unavailable.
- (c) The Mod 14 projectile may be issued BL & P or BL & T with adapter and tracer Mk 6 Mod 1 for target practice.
- (d) For method of marking and painting, see Introduction.



**5" COM. PROJECTILE  
MK. 32**

**DATA**~~CONFIDENTIAL~~

U. S. NAVY

5" COM

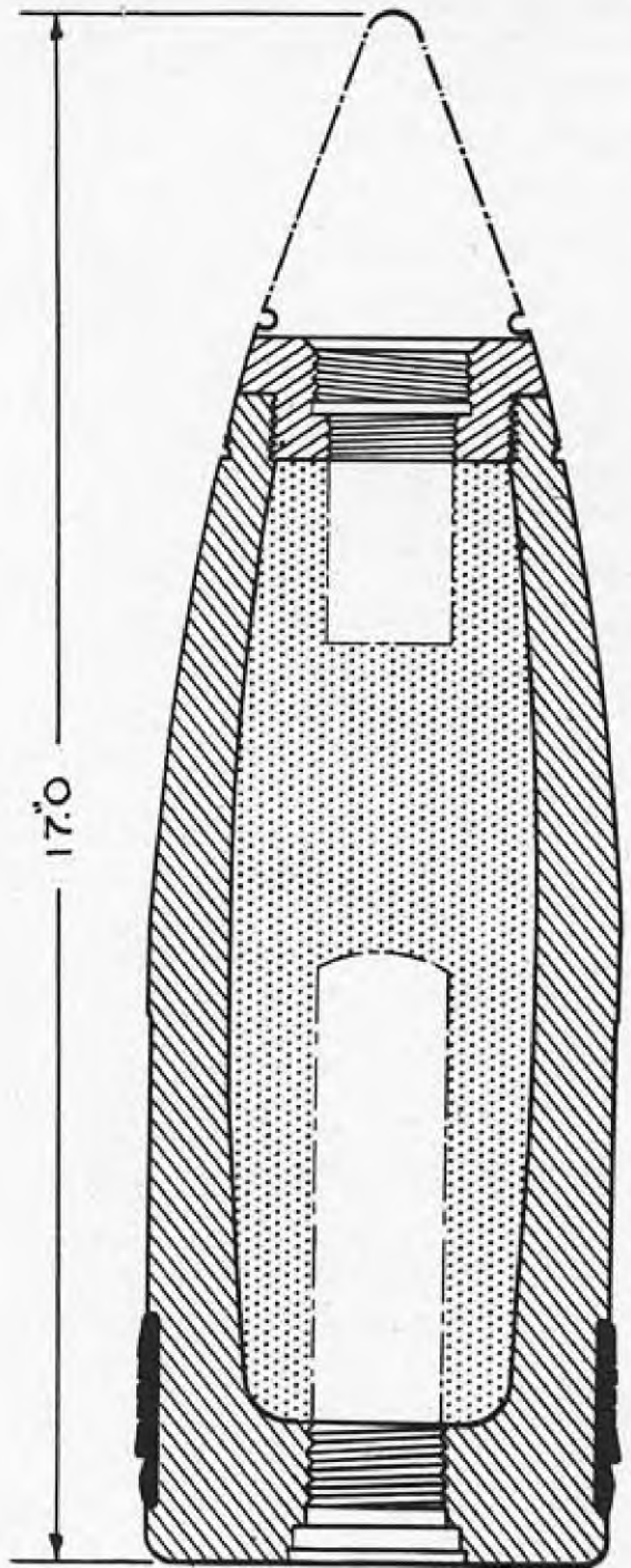
MK. 32 MODS. 1-4

GUNS USED IN: 5"/38

OVERALL LENGTH	
With Cap & Windshield	20.7 in.
Without Cap & Windshield	13.6 in.
DIAMETER OF BASE	4.973 in.
DISTANCE - BASE TO BAND	2.43 in.
WIDTH OF BAND	2.25 in.
DIAMETER AT BOURRELET	4.985 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	2.58 lbs.
WEIGHT OF LOADED PROJECTILE	54.00 lbs.
CHARGE/WEIGHT RATIO	5.0 %
CARTRIDGE CASE	Mk 5
PRIMER	Mk 13 and all Mods.
TRACER	Mk 9
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 20 and all Mods. (B.D.F.)

## REMARKS:

- (a) For method of marking and painting, see Introduction.
- (b) For details of cap and windshield construction, see Introduction.



**5" H.C. PROJECTILE  
MK. 39**

**DATA**~~CONFIDENTIAL~~**U. S. NAVY**

OVERALL LENGTH  
 With Nose Fuze 17.0 in.  
 Without Nose Fuze 13.18 in.

DIAMETER OF BASE 4.985 in.

DISTANCE - BASE TO BAND 1.15 in.

WIDTH OF BAND 2.0 in.

DIAMETER AT BOURNELET 4.985 in.

TYPE OF FILLING Explosive D

WEIGHT OF FILLING 3.65 lbs.

WEIGHT OF LOADED PROJECTILE 50.0 lbs.

CHARGE/WEIGHT RATIO 7.0%

CARTRIDGE CASE Bag Gun

PRIMER Mk 15 Mod 1

TRACER Mk 5 Mod 1

**5" HC**  
**MK. 39, MOD. 1, 2**

GUNS USED IN: 5"/51  
 (bag or case guns)

**FUZES WHICH MAY BE USED  
 IN PROJECTILE**

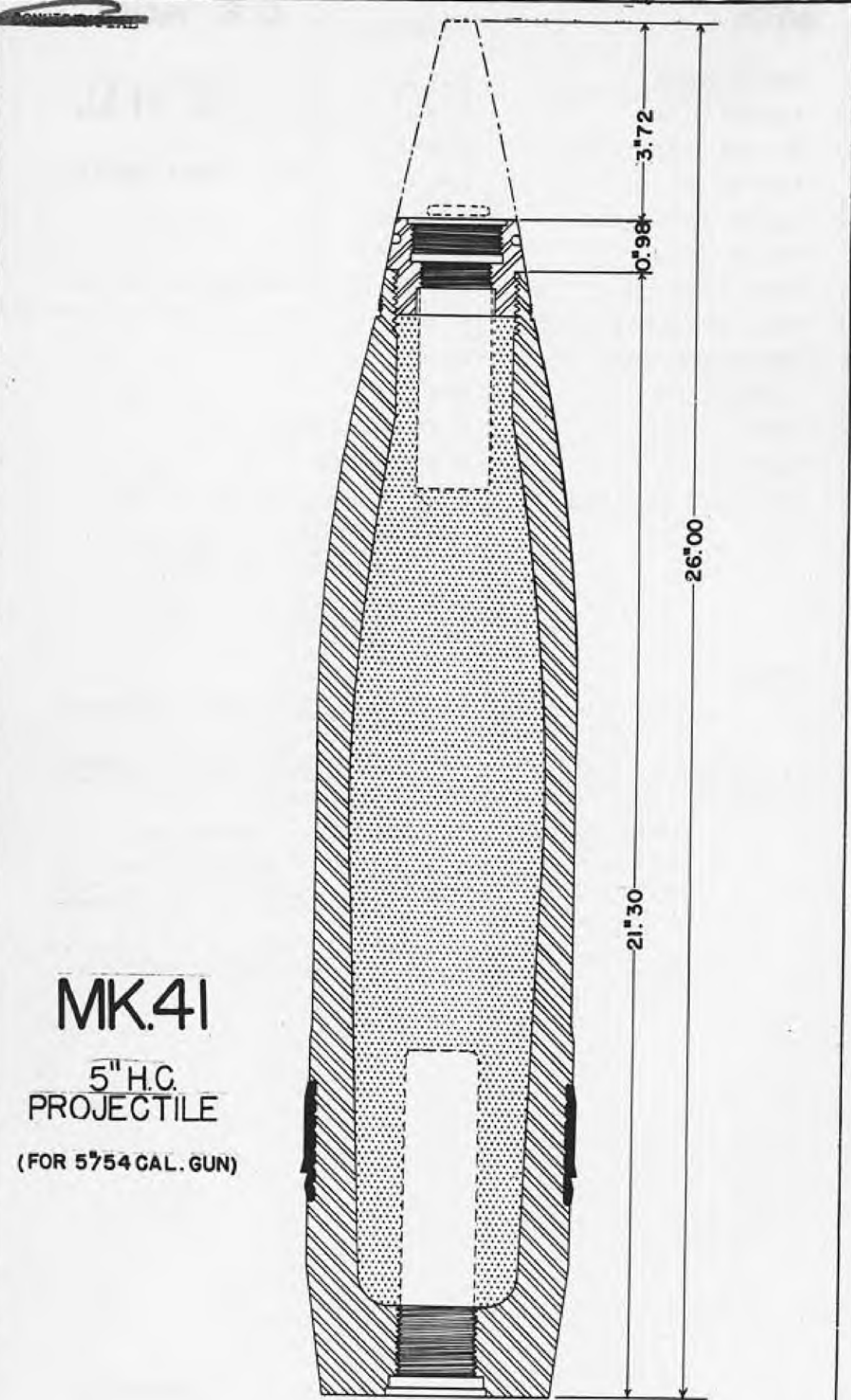
Base: Mk 28 and Mods. (B.D.F.)

Nose: Mk 29 Mods 2 & 3. (P.D.F.)  
 Mk 18 Mods 2, 3, & 4. (M.T.F.)  
 Mk 50 and all Mods. (M.T.F.)  
 Mk 63 Mod 0. (M.T.F.)  
 Steel Nose Plug

Auxiliary Detonating Fuze: Mk 17 and Mods  
 Mk 46 Mod 0  
 Mk 54 Mods 0 & 1

**REMARKS:**

- (a) Only a very few 5"/51 guns are in service in the fleet.
- (b) When employed in the 5"/51 case gun, cartridge case Mk 3 and primer Mk 13 and all Mods are used.
- (c) The Mk 54 auxiliary detonating fuze is replacing the Mk 17 and Mk 46 in all assemblies.
- (d) For method of marking and painting, see Introduction.



**MK.41**

**5" H.C.  
PROJECTILE**

**(FOR 5.754 CAL. GUN)**

**DATA****U.S. NAVY****5" H.C.****MK. 41 MOD. 0**

Guns Used In: 5"/54

OVERALL LENGTH	26.0 in.
Without Nose Fuze	22.28 in.
DIAMETER OF BASE	4.26 in.
DISTANCE - BASE TO BAND	3.75 in.
WIDTH OF BAND	2.25 in.
DIAMETER AT BOURRELET	4.985 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	7.59 lbs.
WEIGHT OF LOADED PROJECTILE	70 lbs.
CHARGE/WEIGHT RATIO	10.84%
CARTRIDGE CASE	Mk 6
PRIMER	Mk 13 and all Mods.
TRACER	Mk 9 (probably)
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 28 and all Mods. (B.D.F.) Nose: Mk 25 Mod 1. (M.T.F.) Mk 30 Mods 2 & 3. (P.D.F.) Mk 59 Mod 0. (V.T.F.)  Auxiliary Mk 43 Mod 1. Detonating Mk 44 Mods 0 & 1. Fuze:

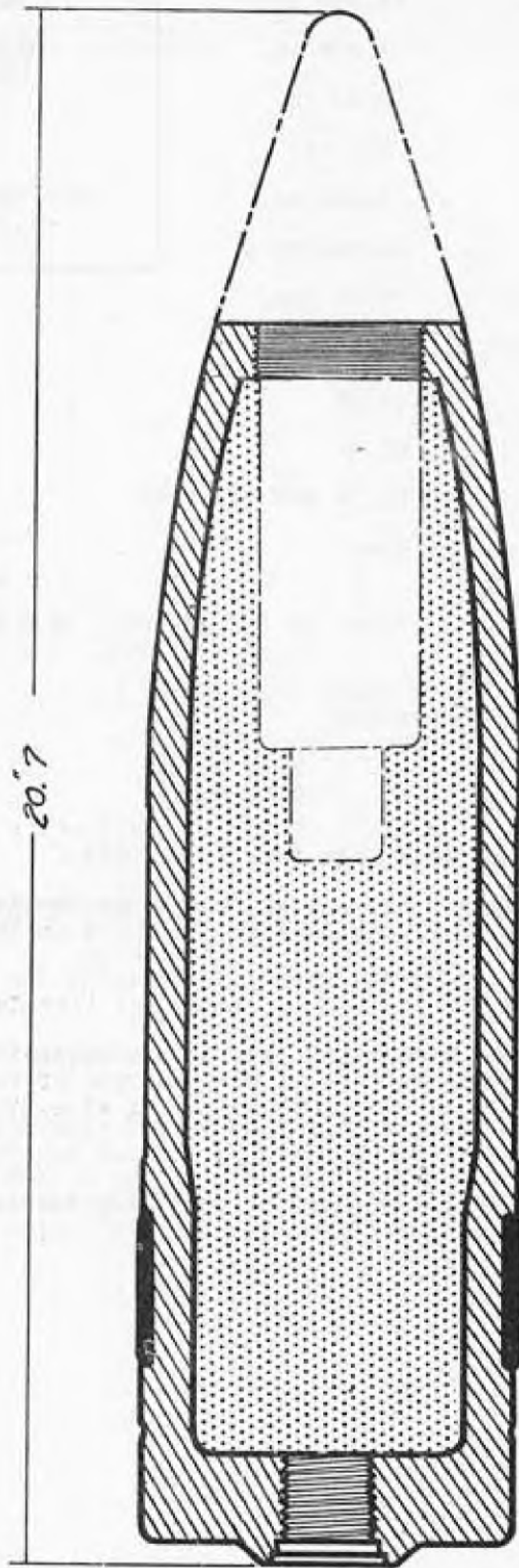
**REMARKS:**

- (a) The Mk 5 tracer may be used in this projectile, although the Mk 9 is the preferred assembly.
- (b) When the Mk 59 V.T. fuze is employed, the projectile adapter is removed, and no base fuze or tracer is employed. The base is closed by a gas-checked base fuze plug.
- (c) For method of marking and painting, see Introduction.
- (d) When the Mk 59 VT fuze is used in this projectile, the Mk 44 auxiliary detonating fuze is used instead of the Mk 43. With all other types of nose fuzing, the Mk 43 auxiliary detonator is employed.
- (e) V.T. fuzing, when used, is indicated by a 1/2" red band painted around the projectile 1/2" below the protective shipping cap.

~~CONFIDENTIAL~~

4730

MOO A. A. P.  
A. A. P.



**5" A.A. COM. PROJECTILE  
MK. 28**

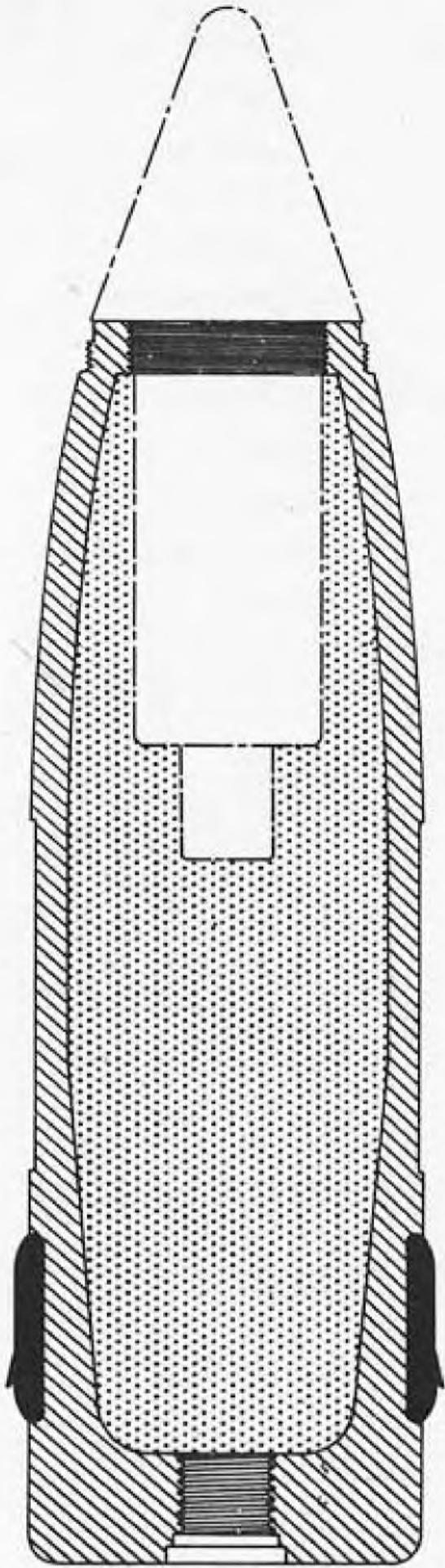
**DATA**~~CONFIDENTIAL~~**U. S. NAVY  
5" A.A. COM.****MK. 28  
MOD. 9**

GUNS USED IN: 5"/25

OVERALL LENGTH	
With Nose Fuze	20.70 in.
Without Nose Fuze	16.945 in.
DIAMETER OF BASE	4.973 in.
DISTANCE - BASE TO BAND	2.43 in.
WIDTH OF BAND	2.0 in.
DIAMETER AT BOURRELET	4.985 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	7.33 lbs.
WEIGHT OF LOADED PROJECTILE	51.7 lbs.
CHARGE/WEIGHT RATIO	14.0%
CARTRIDGE CASE	Mk 4
PRIMER	Mk 13 and all Mods.
TRACER	None
FUZES WHICH MAY BE USED IN PROJECTILE	Nose: Mk 32 all Mods. (V.T.F.) Mk 40 all Mods. (V.T.F.)
	Auxiliary Detonating Fuze: Mk 17 and Mods Mk 46 Mod 0 Mk 54 Mod 0

**REMARKS:**

- (a) This projectile is fuzed with V.T. fuzes only.
- (b) The projectile adapter is removed, and a gas-checked base plug is inserted. No tracer or base fuze is used with this projectile.
- (c) The Mk 40 fuze and Mods is currently replacing the Mk 32 and Mods in all assemblies.
- (d) The Mk 54 auxiliary detonating fuze is replacing the Mk 17 and Mk 46 fuzes in all assemblies.
- (e) This round is also issued BL & P or BL & T with the Mk 6 tracer and adapter (or a cut off Mk 13 fuze) for target practice.
- (f) For method of marking and painting, see Introduction. V.T. fuzing, is indicated by a 1/2" red band located 1/2" below the fuze.



**MK.31**

**5" A.A. COM. PROJECTILE**

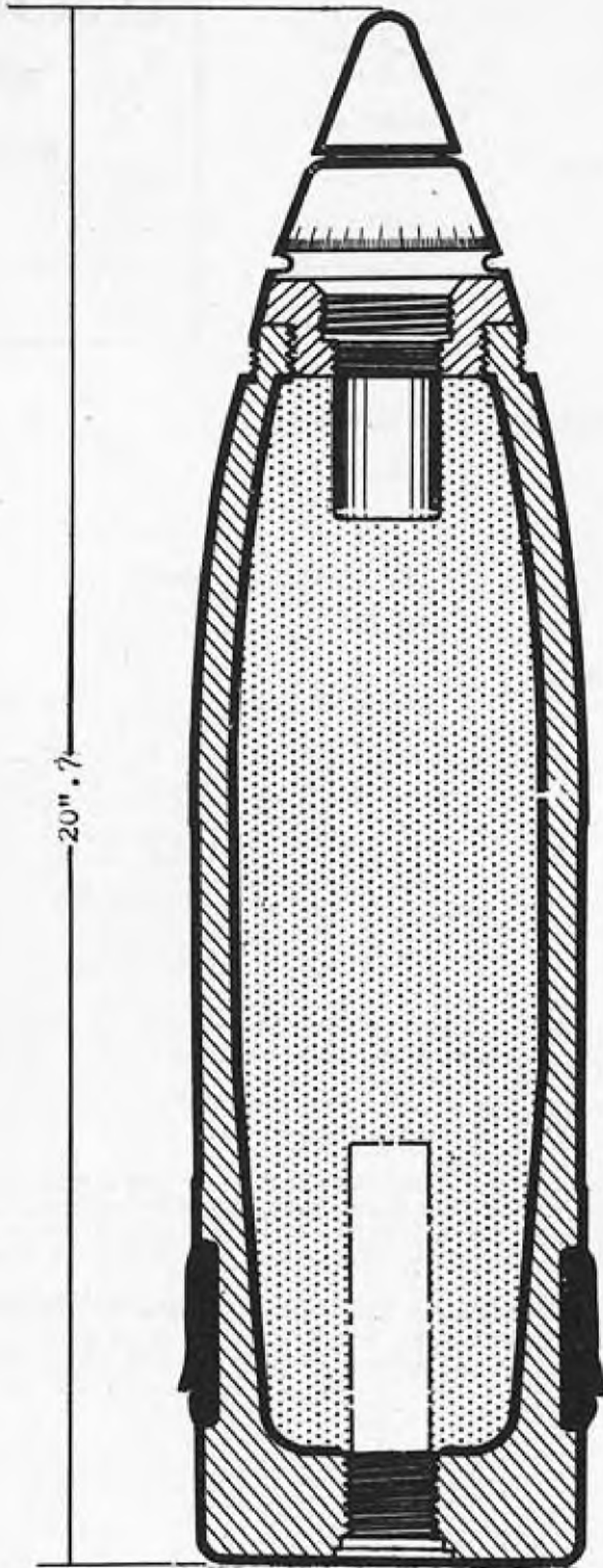
**DATA**~~CONFIDENTIAL~~**U.S. NAVY****5" A.A. COM.****MK.31****MODS. I THRU. II**

GUNS USED IN: 5"/38

OVERALL LENGTH	20.7 in.
With Nose Fuze	16.625 in.
Without Nose Fuze	
DIAMETER OF BASE	4.97 in.
DISTANCE - BASE TO BAND	2.43 in.
WIDTH OF BAND	2.25 in.
DIAMETER .T BOURRELET	4.985 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	7.25 lbs.
WEIGHT OF LOADED PROJECTILE	55.12 lbs.
CHARGE/WEIGHT RATIO	13.33%
CARTRIDGE CASE	Mk 5
PRIMER	Mk 13 and all Mods.
TRACER	None
FUZES WHICH MAY BE USED IN PROJECTILE	Nose: Mk 32 and all Mods. (V.T.F.) Mk 40 and all Mods. (V.T.F.) Mk 53 and all Mods. (V.T.F.)
	Auxiliary
	Detonating Mk 17 and all Mods.
	Fuze: Mk 44 Mod 0 & 1. Mk 46 Mod 0. Mk 54 Mod 0 & 1.

**REMARKS:**

- (a) The Mk 31 projectile was originally designed to receive the Mk 13 base fuze, which is now obsolete. The projectile will now be found fitted only with V.T. fuzes and a plug in the base.
- (b) The Mk 40 fuze is replacing the Mk 32 and mods. With these fuzes, the projectile adapter will be removed, and the Mk 54 auxiliary detonating fuze will be employed, replacing the previously used Mk 17 and Mk 46 fuzes.
- (c) When the Mk 53 V.T. fuze is used, the projectile adapter will be removed and the Mk 44 auxiliary detonating fuze employed.
- (d) This projectile is also issued BL & P or BL & T with adapter and Mk 6 tracer (or cut off Mk 13 base fuze) for target practice.
- (e) For method of marking and painting, see Introduction. V.T. fuzing is indicated by a 1/2" red band painted around the projectile 1/2" below the fuze protective cap.



**MK.34**  
**5" A.A. COM. PROJECTILE**

# DATA

~~CONFIDENTIAL~~

U. S. NAVY  
5" A.A. COM.

MK. 34

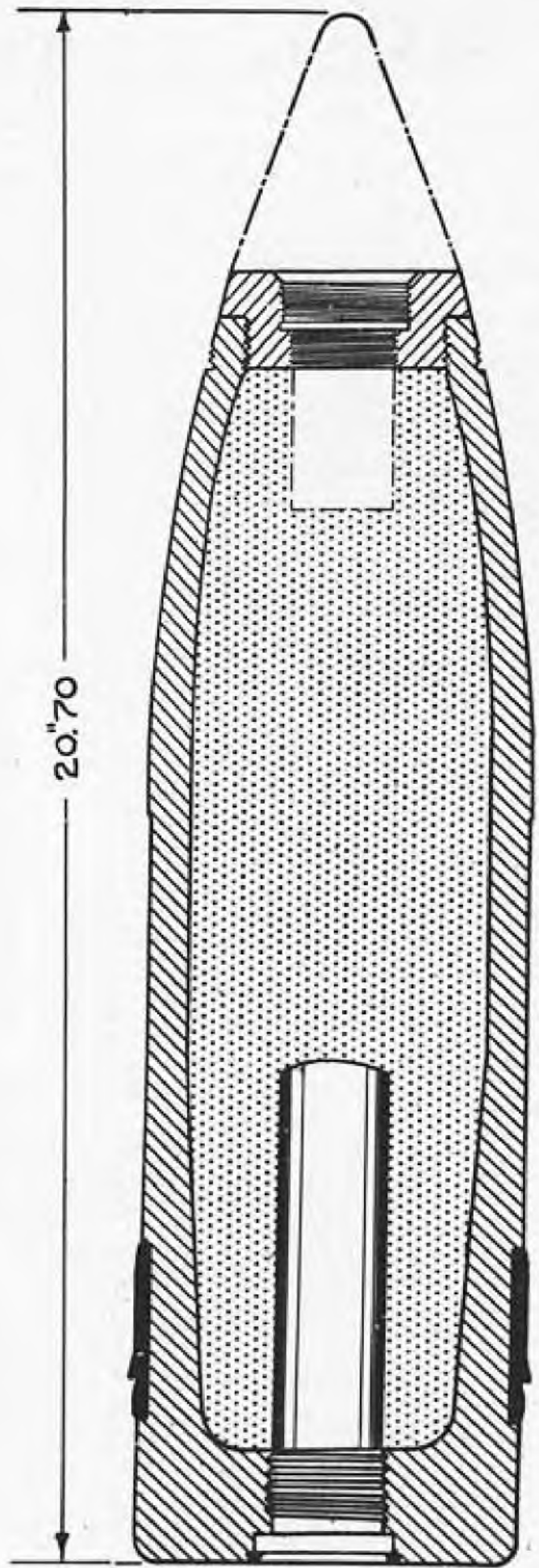
MOD 10

GUNS USED IN: 5"/38

OVERALL LENGTH	20.7 in.
With Nose Fuze	17.2 in.
Without Nose Fuze	
DIAMETER OF BASE	4.97 in.
DISTANCE - BASE TO BAND	2.43 in.
WIDTH OF BAND	2.25 in.
DIAMETER AT BOURRELET	4.985 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	7.25 lbs.
WEIGHT OF LOADED PROJECTILE	55.18 lbs.
CHARGE/WEIGHT RATIO	13.33%
CARTRIDGE CASE	Mk 5
PRIMER	Mk 13 and all Mods.
TRACER	Mk 9
FUZES WHICH MAY BE USED IN PROJECTILE :	Base: Mk 28 and all Mods. (B.D.F.) Nose: Mk 18 Mods 2, 3, & 4. (M.T.F.) Mk 50 Mods 0 - 4. (M.T.F.) Mk 29 Mods 2 & 3. (P.D.F.) Mk 32 and all Mods. (V.T.F.) Mk 40 and all Mods. (V.T.F.) Mk 63 Mod 0. (M.T.F.) Auxiliary Mk 17 and all Mods. Detonating Mk 46 Mod 0. Fuze: Mk 54 Mods 0 & 1.

## REMARKS:

- (a) This projectile consists of a Mk 31 Mod 10 projectile modified to receive a Mk 28 base fuze.
- (b) The Mk 54 auxiliary detonating fuze is replacing the Mk 17 and Mk 46 fuzes in all assemblies.
- (c) The Mk 40 V.T. fuze and its Mods are replacing the Mk 32 and Mods. When these fuzes are used in this projectile, no base fuze or tracer is employed. The projectile adapter is removed, and a gas-checked fuze hole plug is fitted in the base.
- (d) For method of marking and painting, see Introduction. V.T. fuzing is indicated by a 1/2" red band painted around the projectile 1/2" below the protective shipping cap.



# 5" A.A. COM. PROJECTILE MK. 35

# DATA

~~UNCLASSIFIED~~

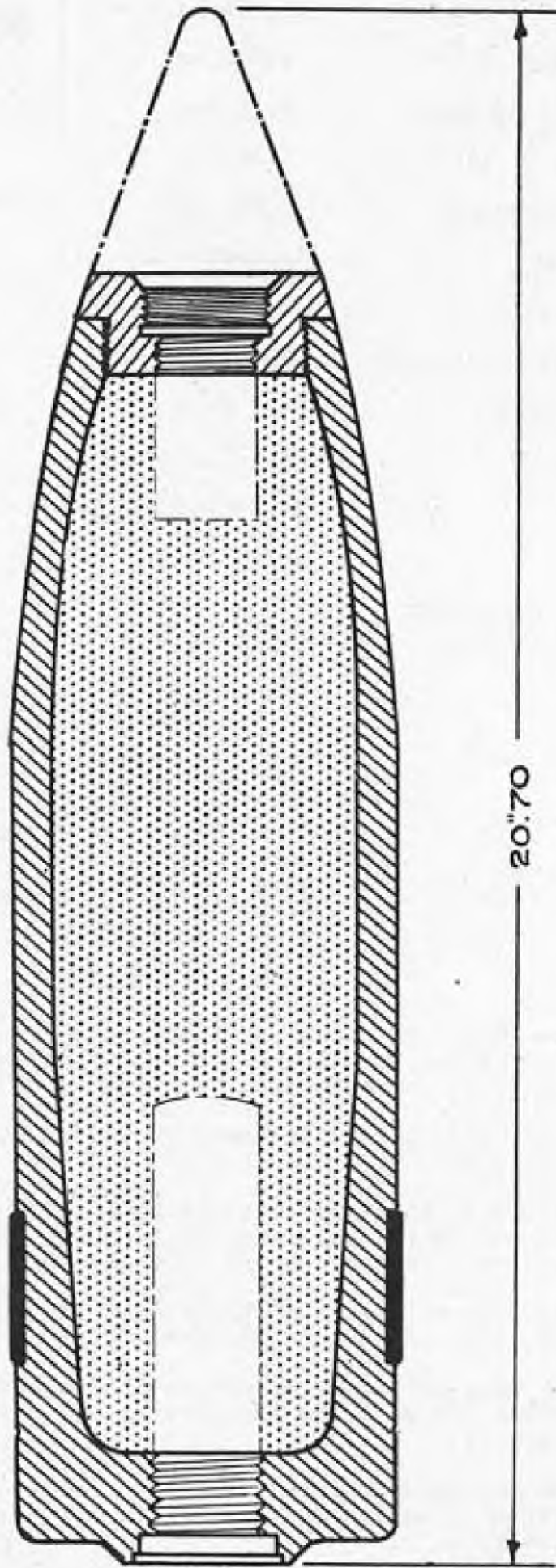
## U. S. NAVY 5" A. A. COM. MK. 35 MODS. 1 THRU. 12

GUNS USED IN: 5"/38 (case)  
5"/51 (bag)

OVERALL LENGTH	
With Nose Fuze	20.70 in.
Without Nose Fuze	17.225 in.
DIAMETER OF BASE	4.973 in.
DISTANCE - BASE TO BAND	2.43 in.
WIDTH OF BAND	2.25 in.
DIAMETER AT BOURRELET	4.985 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	7.25 lbs.
WEIGHT OF LOADED PROJECTILE	55.18 lbs.
CHARGE/WEIGHT RATIO	13.1 %
CARTRIDGE CASE	Mk 5
PRIMER	Mk 13 and all Mods.
TRACER	Mk 9
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 28 and all Mods. (B.D.F.) Nose: Mk 18 Mods 2, 3, & 4. (M.T.F.) Mk 50 and all Mods. (M.T.F.) Mk 61 Mod 0. (M.T.F.) - (see note) Mk 29 Mods 2 & 3. (P.D.F.) Mk 32 and all Mods. (V.T.F.) Mk 40 and all Mods. (V.T.F.) Mk 53 and all Mods. (V.T.F.) Mk 63 Mod 0. (M.T.F.) Auxiliary Detonating Fuze: Mk 17 and all Mods. Mk 44 Mods 0 & 1 Mk 46 Mod 0 Mk 54 Mods 0 & 1

### REMARKS:

- The Mk 40 fuze is replacing the Mk 32 when used in the 5"/38 gun. With the 5"/51 bag gun, however, fuze Mk 32 Mod 40, rather than the Mk 40 fuze, is employed. When these fuzes are used, the projectile adapter is removed, a gas-checked base fuze plug (with no tracer) is fitted into the base, and the Mk 54 auxiliary detonating fuze is employed.
- When the Mk 53 V.T. fuze is used, the base is fitted with a gas-checked base fuze plug (with no tracer), the projectile adapter is removed, and the Mk 44 auxiliary detonating fuze is employed.
- The Mk 54 auxiliary detonating fuze is replacing the Mk 17 and Mk 46 fuzes in all assemblies.
- With the 1200 f/s I.V. reduced charge for the 5"/38 gun, fuzes Mk 61 and Mk 29 Mods 2 and 3 with the Mk 54 auxiliary detonating fuze will be employed.
- All Mods of this projectile, except Mod 6, may be issued BL & P or BL & T with the Mk 9 tracer and adapter for target practice.
- When these projectiles are used in the 5"/51 bag gun, the Mk 15 Mod 1 primer is used.
- For method of marking and painting, see Introduction. A 1/2" red band painted 1/2" below the protective cap indicates V.T. fuzing.



**5" A.A. COM. PROJECTILE  
MK. 36**

# DATA

~~CONFIDENTIAL~~

U. S. NAVY  
5" A. A. COM.

MK. 36 MODS. 1, 2, 3, 4

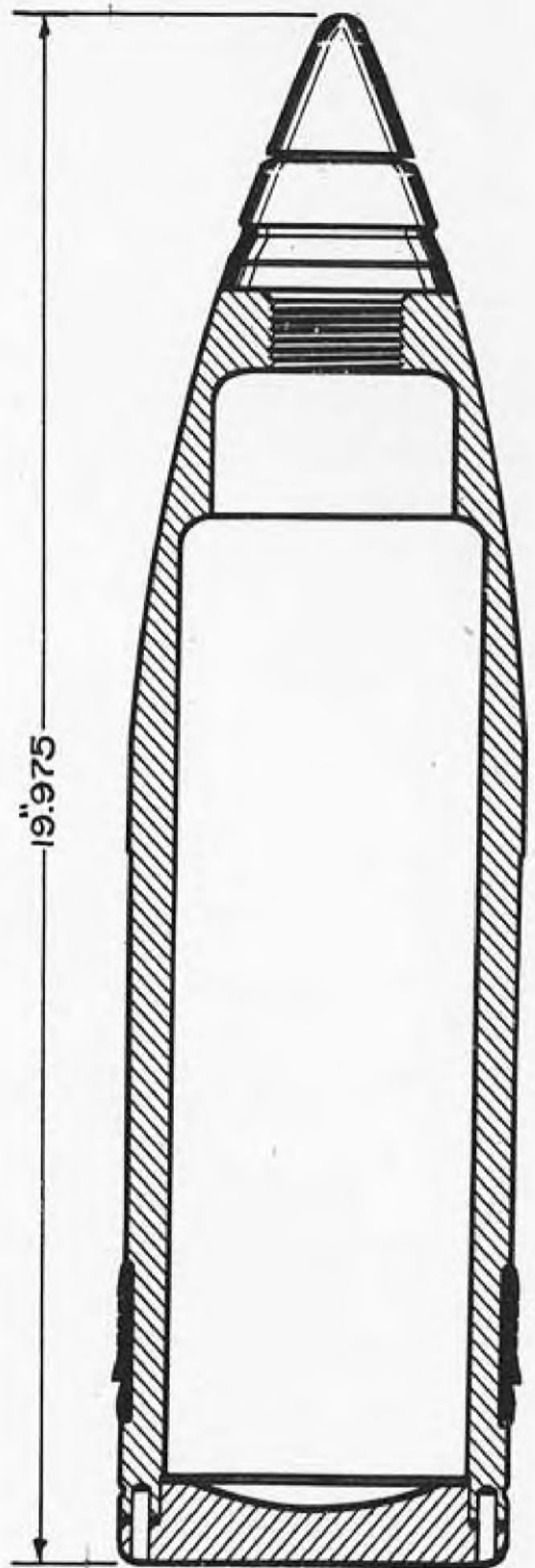
GUNS USED IN: 5"/25

OVERALL LENGTH	
With Nose Fuze	20.70 in.
Without Nose Fuze	17.225 in.
DIAMETER OF BASE	4.973 in.
DISTANCE - BASE TO BAND	2.43 in.
WIDTH OF BAND	2.00 in.
DIAMETER AT BOURRELET	4.985 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	7.25 lbs.
WEIGHT OF LOADED PROJECTILE	53.85 lbs.
CHARGE/WEIGHT RATIO	13.5 %
CARTRIDGE CASE	Mk 4, Mk 4 Mod 2
PRIMER	Mk 13 and all Mods.
TRACER	Mk 9
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 28 and all Mods. (B.D.F.)  Nose: Mk 18 Mods 2, 3, & 4. (M.T.F.) Mk 50 and all Mods. (M.T.F.) Mk 29 Mods 1, 2, & 3. (P.D.F.) Mk 32 and all Mods. (V.T.F.) Mk 40 and all Mods. (V.T.F.) Mk 53 and all Mods. (V.T.F.) Mk 63 Mod 0. (M.T.F.) Auxiliary Detonating Fuze: Mk 17 and all Mods. Mk 46 Mod 0. Mk 44 Mod 0 & 1. Mk 54 Mod 0.

## REMARKS :

- (a) When the V.T. fuzes are used, the projectile adapter is removed, and a gas-checked base fuze plug (with no tracer) is fitted into the base.
- (b) V.T. fuzes are authorized for use in Mods 2 - 4 only of this projectile.
- (c) The Mk 54 auxiliary detonating fuze is replacing the Mk 17 and the Mk 46 fuzes. The Mk 44 auxiliary detonating fuze is used only in conjunction with the Mk 53 V.T. fuze.
- (d) All Mods of the Mk 36 projectile are authorized for use with A.P. steel nose caps and designated as "H.C." projectiles.
- (e) All Mods of the Mk 36 projectile may also be issued BL & P or B L & T with the Mk 9 tracer and adapter for target practice.
- (f) For method of marking and painting see Introduction. V.T. fuze is indicated by a 1/2" red band located 1/2" below the nose fuze.

ORIGINAL DRAWING



**5" ILL. PROJECTILE  
MK. 25**

# DATA

~~CONFIDENTIAL~~

## U. S. NAVY 5" ILL. MK.25

a. MODS. 1, 3, 4, 5, 6

b. MOD. 2

GUNS USED IN: (a) 5"/51 (bag  
or case)  
(b) 5"/25 (case)

OVERALL LENGTH  
With Nose Fuze 19.975 in.  
Without Nose Fuze 15.865 in.

DIAMETER OF BASE 4.948 in.

DISTANCE - BASE TO BAND 2.43 in.

WIDTH OF BAND 2.0 in.

DIAMETER AT BOURRELET 4.985 in.

TYPE OF FILLING Black powder  
expelling charge;  
magnesium flare.

WEIGHT OF FILLING 2.5 oz. black powder.

WEIGHT OF LOADED  
PROJECTILE 54.5 lbs.

CHARGE/WEIGHT RATIO

CARTRIDGE CASE (a) Mk 3.  
(b) Mk 4, Mk 4 Mod 3.

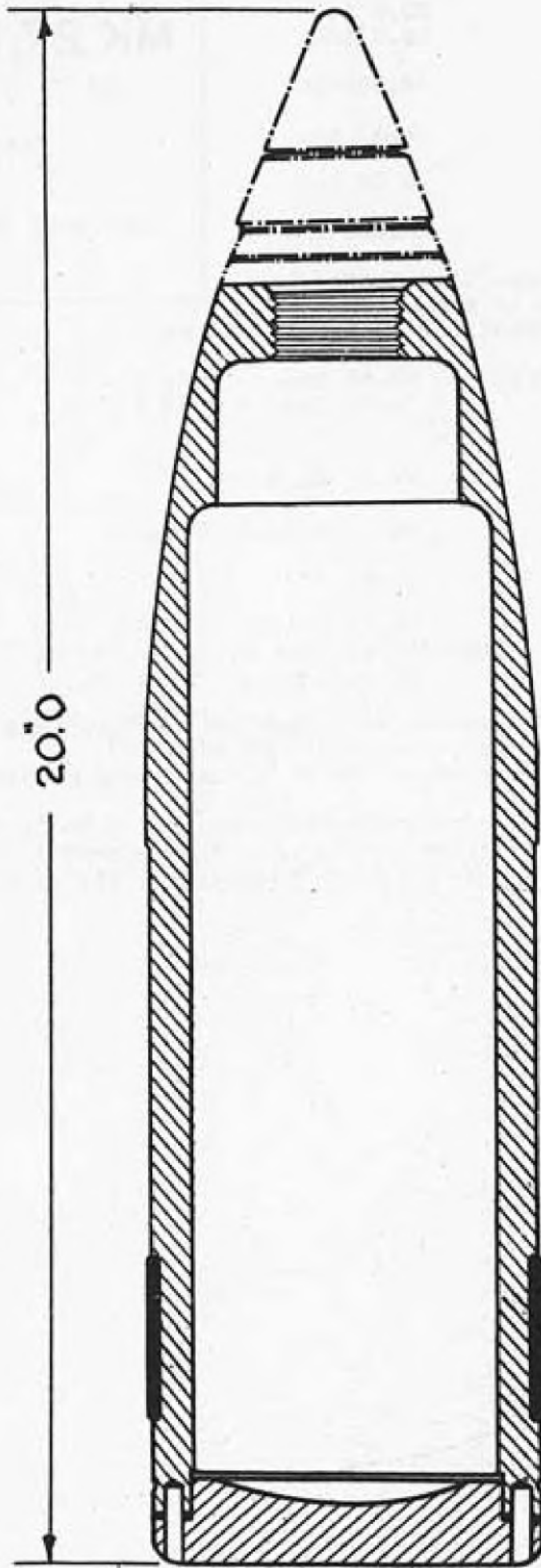
PRIMER Mk 13 and all Mods.

TRACER None

FUZES WHICH MAY BE USED  
IN PROJECTILE Nose: Mk 18 Mods 2, 3, & 4. (M.T.F.)  
Mk 50 and all Mods. (M.T.F.)  
Mk 63 Mod 0. (M.T.F.)

### REMARKS:

- (a) The Mod 2 projectile, used in the 5"/25 gun, is identical to the Mod 1, except for modification of the rotating band.
- (b) When these projectiles are used in the 5"/51 bag gun, the Mk 15 Mod 1 primer is used, and the Mk 50 and Mk 63 fuzes may be employed.
- (c) Use of the Mk 50 and Mk 63 fuzes is not authorized with rounds used in the 5"/25 and 5"/51 case guns.
- (d) For details of construction of Illuminating Projectiles, see Introduction.
- (e) The Mk 3 Illuminating Contents are used with projectiles Mods 1 thru 4; projectiles Mods 5 & 6 are assembled with contents Mk 4 Mod 5 when used in the 5"/51 bag gun, contents Mk 3 when used in the 5"/51 case gun. Mk 3 Illuminating Contents are illustrated on page 72; Mk 4 Mod 5 contents, on page 102.
- (f) For details of marking and painting, see Introduction.



**5" ILL. PROJECTILE  
MK. 27**

**DATA**

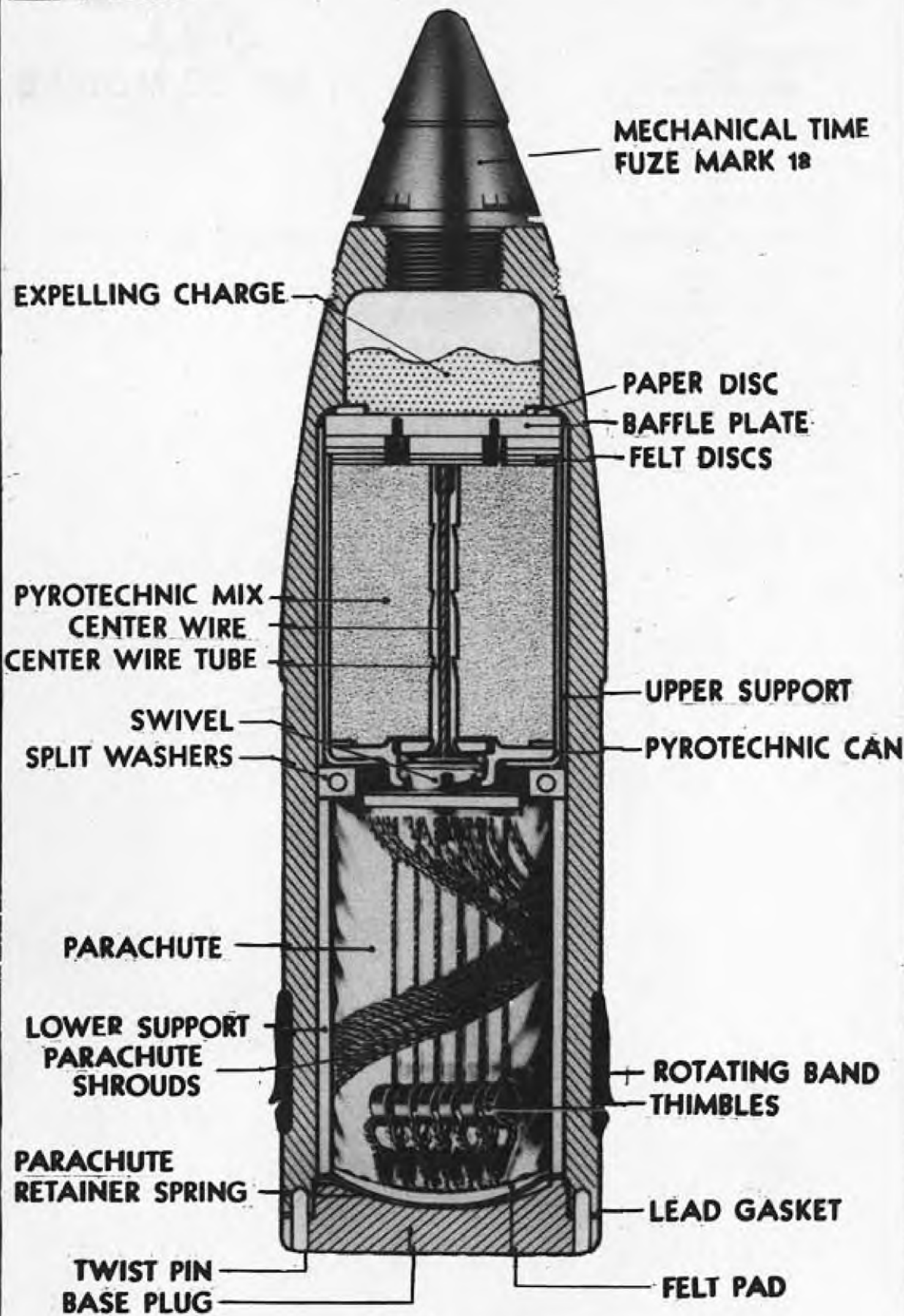
**U. S. NAVY**  
**5" ILL.**  
**MK. 27, MODS. 1-10**

OVERALL LENGTH	
With Nose Fuze	20.0 in.
Without Nose Fuze	15.8 in.
DIAMETER OF BASE	4.968 in.
DISTANCE - BASE TO BAND	1.93 in.
WIDTH OF BAND	2.00 in.
DIAMETER AT BOURRELET	4.985 in.
TYPE OF FILLING	Expelling charge is black powder. Flare is magnesium.
WEIGHT OF FILLING	Expelling charge is 2.5 oz.
WEIGHT OF LOADED PROJECTILE	53.65 lbs. - Mods 1 - 4 54.50 lbs. - Mods 5 - 10
CHARGE/WEIGHT RATIO	
CARTRIDGE CASE	Mk 4, Mk 4 Mod 2
PRIMER	Mk 13 and all Mods.
TRACER	None
FUZES WHICH MAY BE USED IN PROJECTILE	Mk 63 Mod 0. (M.T.F.) Nose: Mk 18 Mods 2, 3, 4. (M.T.F.) Mk 50 and all Mods. (M.T.F.)

GUNS USED IN: 5"/25

**REMARKS:**

- (a) Mods 1, 2, 3, 4 have a band diameter of 5.10" and Mods 5, 6, 7, 8, 9, and 10 have a band diameter of 5.12".
- (b) For details of construction of illuminating projectile, see Introduction.
- (c) For details of marking and painting, see Introduction.
- (d) The Mk 4 Mod 5 Illuminating Contents are used in this projectile. For illustration of Mk 4 Mod 5 contents, see page 102.



# MK. 30

## 5" ILL. PROJECTILE

**DATA****U. S. NAVY  
5" ILL.  
MK. 30, MOD. F-8**

**OVERALL LENGTH**  
With Nose Fuze 20.0 in.  
Without Nose Fuze 15.8 in.

**DIAMETER OF BASE** 4.968 in.

**DISTANCE - BASE TO BAND** 2.43 in.

**WIDTH OF BAND** 2.25 in.

**DIAMETER AT BOURRELET** 4.985 in.

**TYPE OF FILLING** Expelling charge is  
black powder. Flare is magnesium.

**WEIGHT OF FILLING** Expelling charge is 2.5 oz.

**WEIGHT OF LOADED PROJECTILE** 54.5 lbs.

**CHARGE/WEIGHT RATIO**

**CARTRIDGE CASE** Mk 5

**PRIMER** Mk 13 and all Mods.

**TRACER** None

**FUZES WHICH MAY BE USED  
IN PROJECTILE** Mk 63 Mod 0. (M.T.F.)  
Nose: Mk 18 Mods 2, 3, 4. (M.T.F.)  
Mk 50 and all Mods. (M.T.F.)

GUNS USED IN: 5"/38

**REMARKS:**

- (a) For details of construction of illuminating projectile, see Introduction.
- (b) For details of marking and painting, see Introduction.
- (c) The Mk 4 Mod 5 Illuminating Contents are used in this projectile.

5" ILL

WK 43 MOD 0

June 1954

58.0  
58.0  
4.87

OVERALL LENGTH  
Without nose cone  
Diameter of base

HEIGHT OF BASE TO HEAD

WEIGHT OF HEAD

WEIGHT OF BODY

TYPE OF WILTING HIGH POWER ELECTRON CATHODE

WEIGHT OF WILTING

WEIGHT OF COILS

WEIGHT OF HEAD

WEIGHT OF TUBE

WEIGHT OF HEAD

WEIGHT OF TUBE

WEIGHT OF HEAD

WEIGHT OF TUBE

The weight of the head and tube is given in the table below.

The weight of the head and tube is given in the table below.

The weight of the head and tube is given in the table below.

The weight of the head and tube is given in the table below.

**DATA**~~CONFIDENTIAL~~**U.S. NAVY**

OVERALL LENGTH 26.0 in.  
Without Nose Fuze 22.28 in.  
DIAMETER OF BASE 4.973 in.  
DISTANCE - BASE TO BAND  
WIDTH OF BAND  
DIAMETER AT BOURRELET 4.985 in.  
TYPE OF FILLING Black Powder Ejection Charge  
WEIGHT OF FILLING 2.5 oz.  
WEIGHT OF LOADED PROJECTILE 70 lbs.  
CHARGE/WEIGHT RATIO  
CARTRIDGE CASE Mk 6  
PRIMER Mk 13 and all Mods.  
TRACER None  
FUZES WHICH MAY BE USED IN PROJECTILE Nose: Mk 25 Mod 1. (M.T.F.)

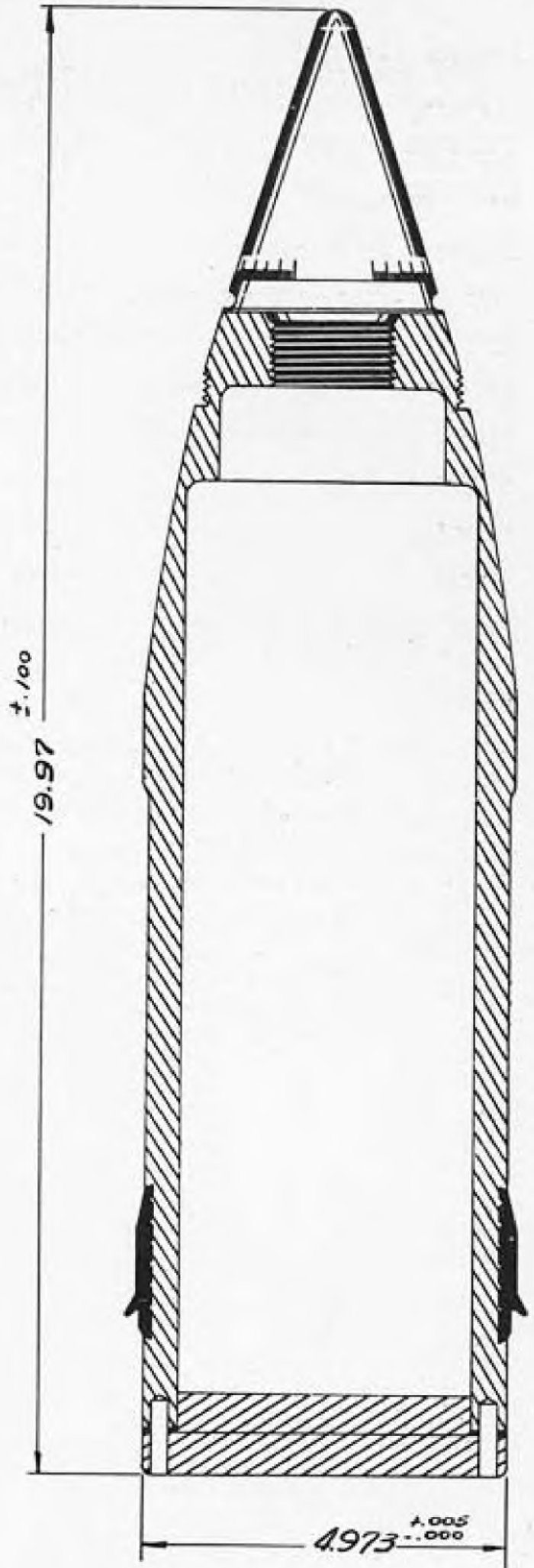
**5" ILL.****MK.43 MOD.0**

Guns Used In: 5"/54

**REMARKS:**

- (a) The Mk 4 Mod 5 Illuminating Contents are used in this projectile, modified to use a lengthened spacer sleeve.
- (b) For method of operation of Illuminating projectiles, see Introduction.
- (c) For method of marking and painting, see Introduction. Mk 4 Mod 5 Illuminating contents are illustrated on page 102.
- (d) Note: The final design of this projectile has not yet been approved. Two experimental models have been developed, the Ex. 15 and the Ex. 16. These models are identical in all respects, except that the latter has a double rotating band.

~~CONFIDENTIAL~~



MK.44  
5" ILL. PROJECTILE

**DATA****U. S. NAVY**

OVERALL LENGTH  
With Nose Fuze 19.97 in.  
Without Nose Fuze 16.465 in.

DIAMETER OF BASE 4.973 in.

DISTANCE - BASE TO BAND 2.43 in.

WIDTH OF BAND 2.25 in.

DIAMETER AT BOURRELET 4.985 in.

TYPE OF FILLING Black Powder ejection charge

WEIGHT OF FILLING 2.5 oz.

WEIGHT OF LOADED PROJECTILE 54.5 lbs.

CARTRIDGE CASE Mk 5

PRIMER Mk 13 and all Mods

TRACER None

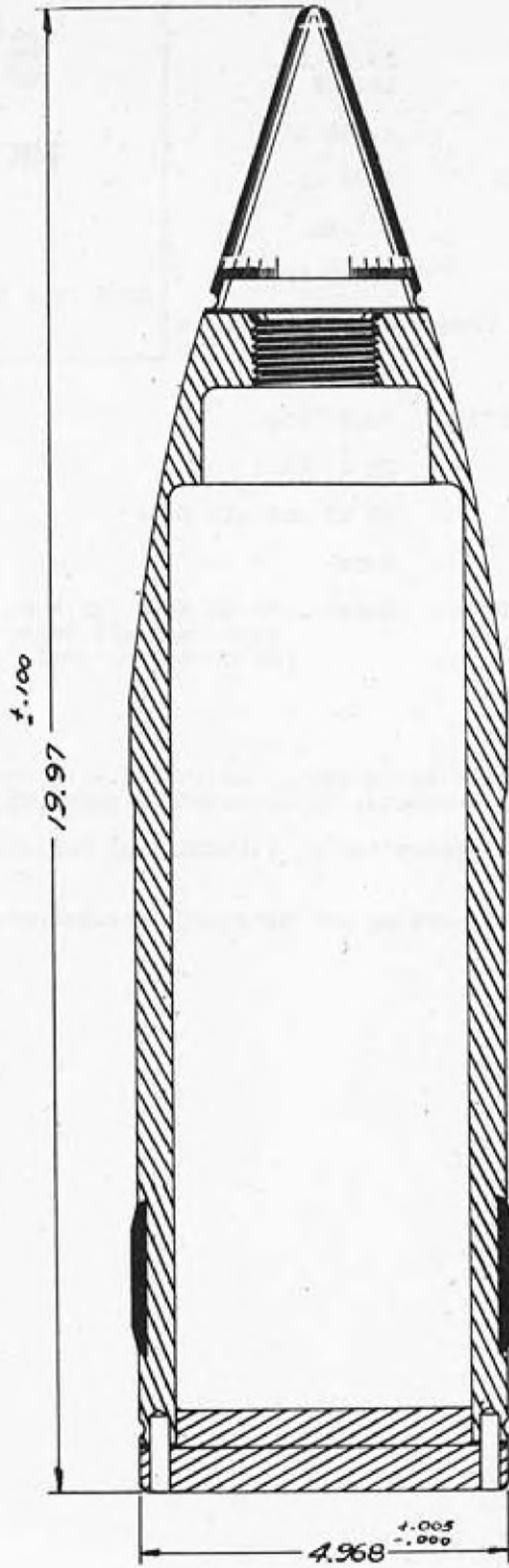
FUZES WHICH MAY BE USED  
IN PROJECTILE Nose: Mk 18 Mods 2,3,& 4. (M.T.F.)  
Mk 50 Mods 0-4. (M.T.F.)  
Mk 63 Mod 0. (M.T.F.)

**5" ILL.****MK.44 MOD.1**

GUNS USED IN: 5"/38

**REMARKS:**

- (a) This projectile is currently assembled with the Mk 4 Mod 5 Illuminating Contents, illustrated on page 102.
- (b) For method of operation of Illuminating projectiles, see Introduction.
- (c) For method of marking and painting, see Introduction.



**MK. 45**  
**5" ILL. PROJECTILE**

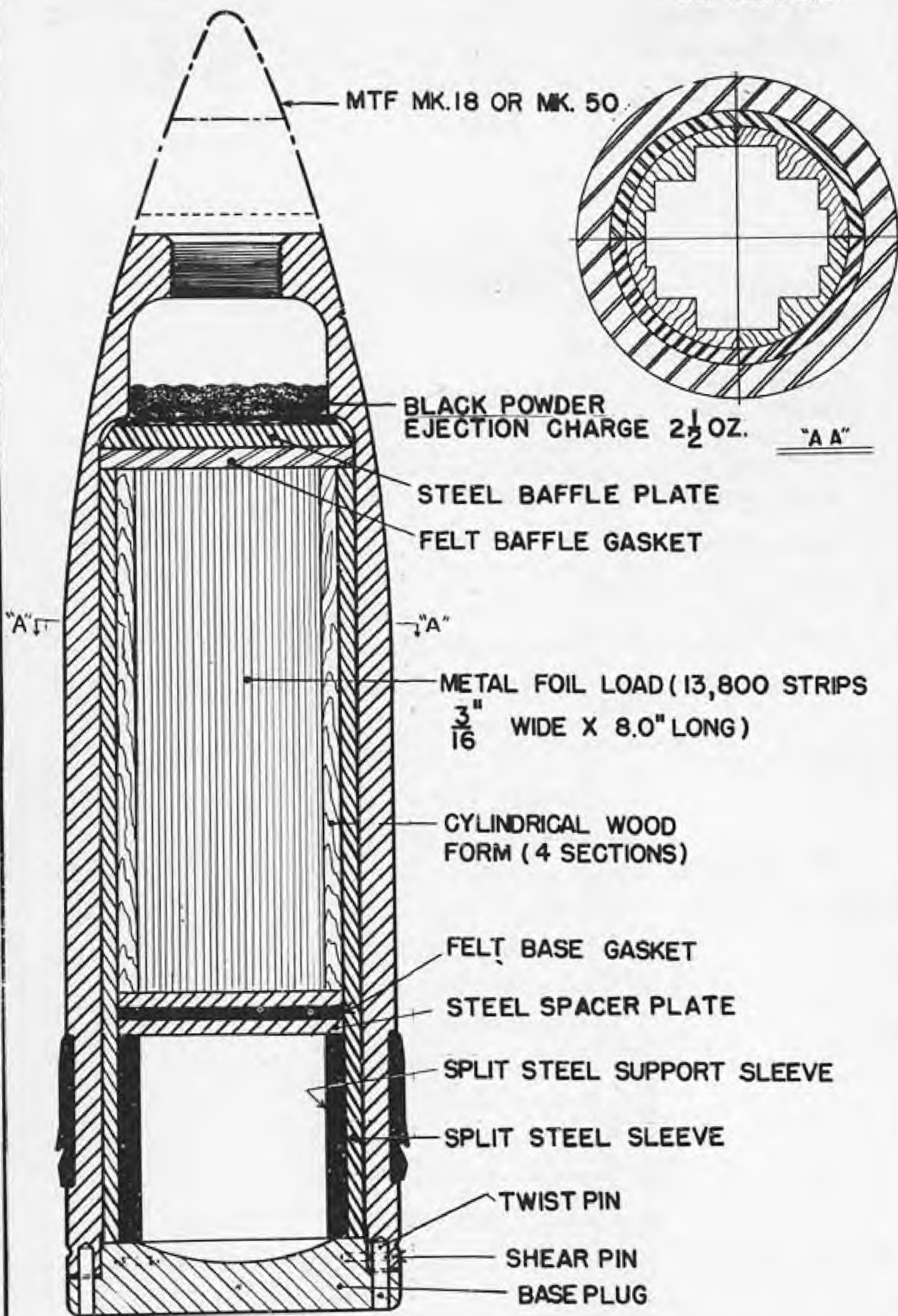
**DATA**~~CONFIDENTIAL~~**U. S. NAVY****5" ILL.****MK. 45 MOD. 0**

GUNS USED IN: 5"/25

OVERALL LENGTH	
With Nose Fuze	19.97 in.
Without Nose Fuze	16.465 in.
DIAMETER OF BASE	4.968 in.
DISTANCE - BASE TO BAND	1.93 in.
WIDTH OF BAND	2.0 in.
DIAMETER AT BOURRELET	4.985 in.
TYPE OF FILLING	Black Powder ejection charge
WEIGHT OF FILLING	2.5 oz.
WEIGHT OF LOADED PROJECTILE	54.5 lbs.
CARTRIDGE CASE	Mk 4, Mk 4 Mod 2
PRIMER	Mk 13 and all Mods
TRACER	None
FUZES WHICH MAY BE USED IN PROJECTILE	Nose: Mk 18 Mods 2, 3, & 4. (M.T.F.) Mk 50 and all Mods. (M.T.F.) Mk 63 Mod 0. (M.T.F.)

**REMARKS:**

- (a) This projectile is currently assembled with the Mk 4 Mod 5 Illuminating Contents, illustrated on page 102.
- (b) For method of operation of Illuminating Projectiles, see Introduction.
- (c) For method of marking and painting, see Introduction.



5/38 WINDOW PROJECTILE  
WITH PROJECTILE LOAD MK.I, MOD.I

BLACK POWDER  
EJECTION CHARGE  
2 1/2 OZ.

MTF MK. 18  
OR MK. 50

STEEL  
BAFFLE PLATE

ROLL OF  
METAL FOIL  
(ROPE)  
0.5" WIDE X  
600' LONG

CARDBOARD  
DISC-FIXED  
TO END OF  
FOIL ROLL

ALUMINUM DISC

ALUMINUM  
SPLIT  
RETAINER RING

TWIST PIN  
BASE PLUG

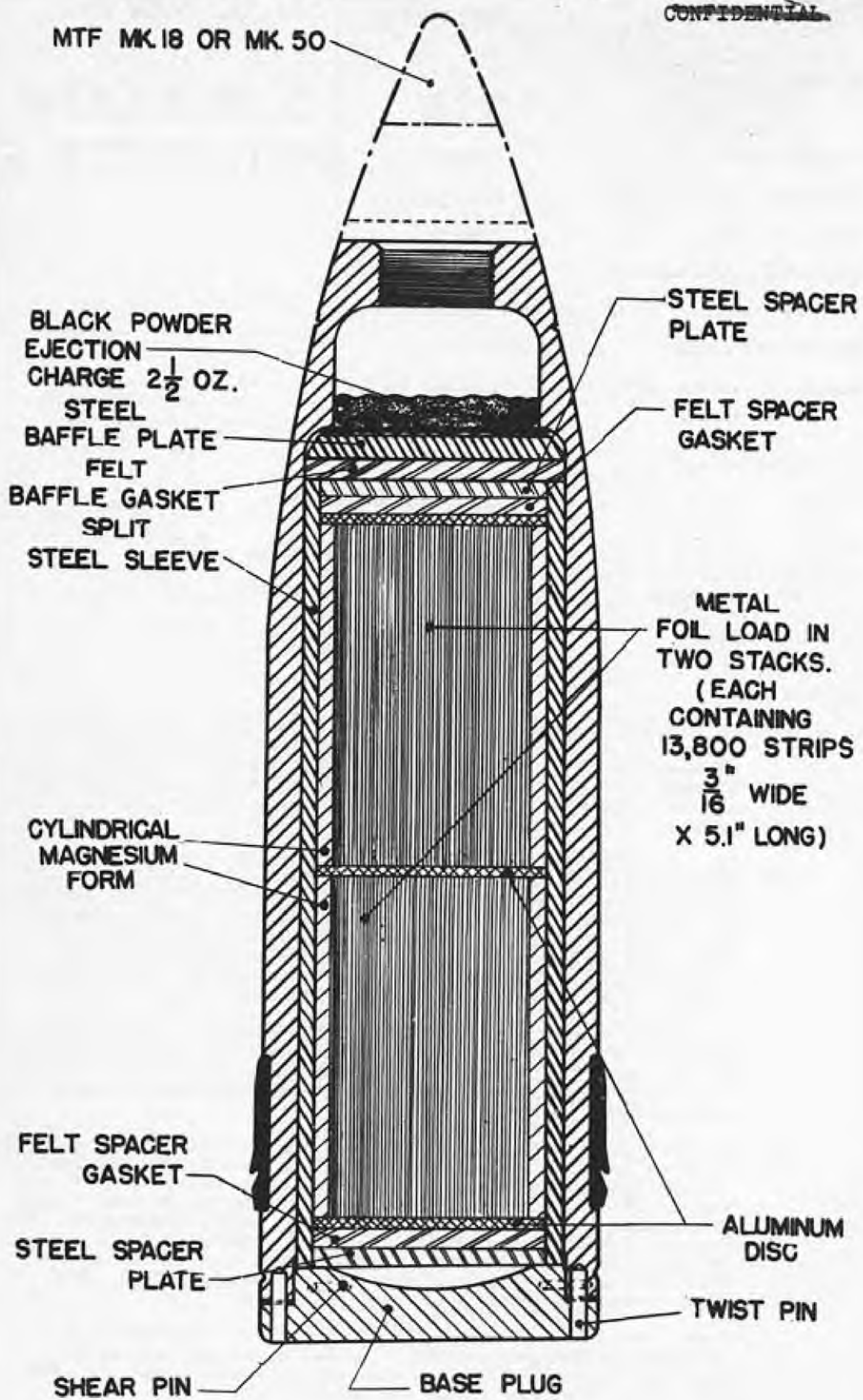
FELT BAFFLE  
GASKET  
FELT SPACER  
GASKET

SPLIT STEEL  
SLEEVE

SHEAR PIN  
STEEL  
SPACER  
PLATE

### 5/38 WINDOW PROJECTILE

### WITH PROJECTILE LOAD MK.2,MOD.0



**5/38 WINDOW PROJECTILE  
WITH PROJECTILE LOAD MK.4,MOD.0**

**DATA**~~CONFIDENTIAL~~**U. S. NAVY****5" WINDOW  
PROJECTILE**

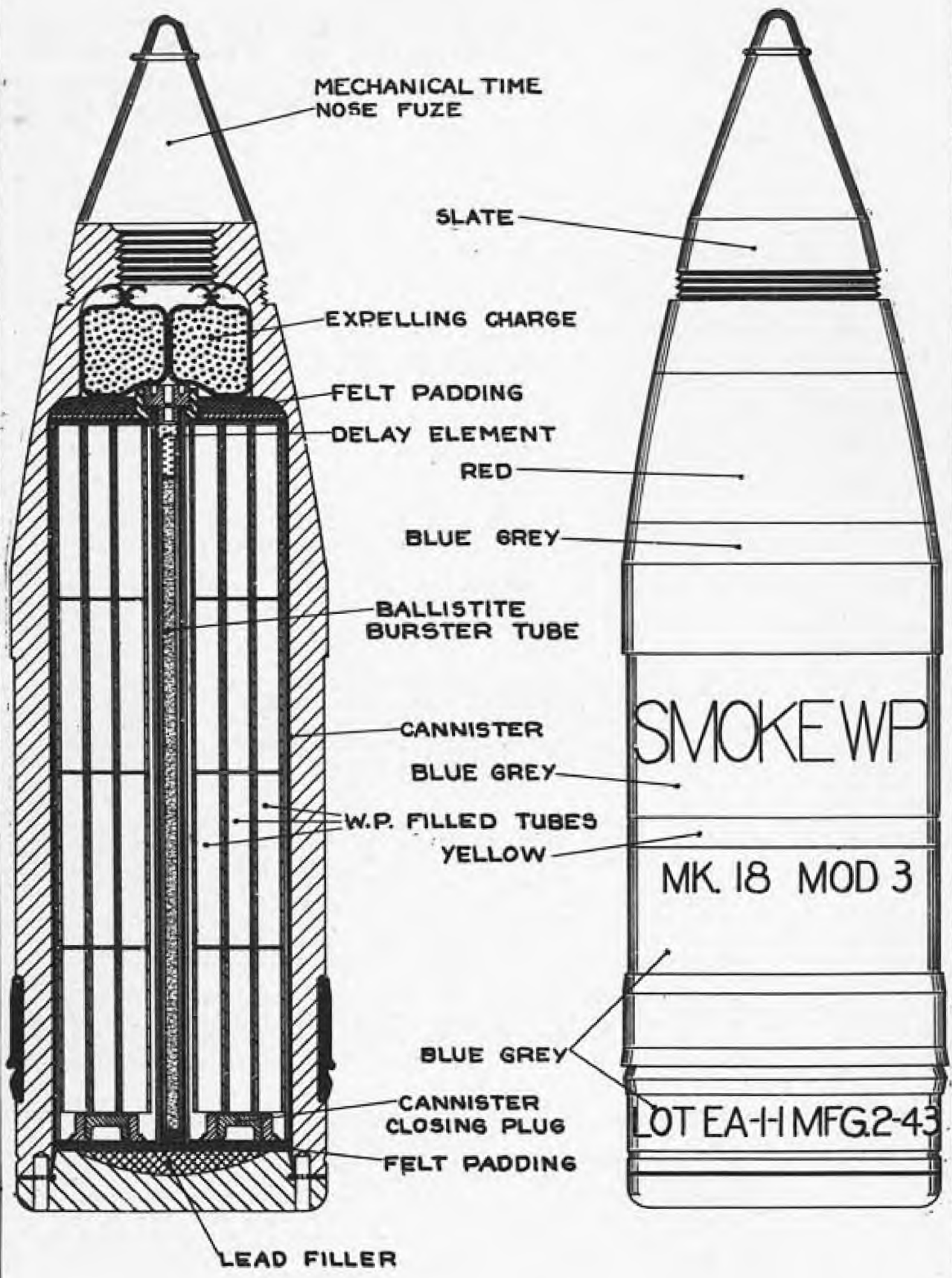
GUNS USED IN: 5"/38

OVERALL LENGTH	20.0 in.
With Nose Fuze	15.8 in.
Without Nose Fuze	
DIAMETER OF BASE	4.968 in.
DISTANCE - BASE TO BAND	2.45 in.
WIDTH OF BAND	2.25 in.
DIAMETER .T BOURRELET	4.985 in.
TYPE OF FILLING	Black Powder Ejection Charge
WEIGHT OF FILLING	2.5 oz.
WEIGHT OF LOADED PROJECTILE	a. Load Mk 1 Mod 1 - 53.9 lbs. (approx.) b. Load Mk 2 Mod 0 - 54.6 lbs. (approx.) c. Load Mk 4 Mod 0 - 53.0 lbs. (approx.)
CARTRIDGE CASE	Mk 5
PRIMER	Mk 13 and all Mods.
TRACER	None
FUZES WHICH MAY BE USED IN PROJECTILE	Mk 63 Mod 0. (M.T.F.) Nose: Mk 18 Mods 2, 3, and 4. (M.T.F.) Mk 50 and all Mods. (M.T.F.)
PROJECTILE BODY	5" Ill. Mk 30 Mods 5, 7, and 8. 5" Ill. Mk 44 Mod 1.

**REMARKS:**

- (a) Mk 1 Mod 1 Window Load: Consists of about 13,800 aluminum foil strips, each 8" long, 3/16" wide, and .00035" thick, backed on either side by 12 lb. tissue paper, solid glued. The strips are stacked within a four-section cylindrical wood form, which is encased in a split steel sleeve, the whole inserted into the projectile cavity.
- (b) Mk 2 Mod 0 Window Load: Consists of 19 rolls of aluminum foil stacked within a split steel sleeve. Each roll contains continuous foil 600 ft. long, 1/2" wide, and .0009" thick. One end of the foil is attached to a cardboard disc by a rayon leader 15 ft long, insuring streaming out of the foil roll. The foil rolls with their cardboard discs are each encased in a split retainer ring, forming a load unit. The units are separated by aluminum discs when loaded in the split steel sleeve.
- (c) Mk 4 Mod 0 Window Load: Consists of two stacks of 13,800 aluminum foil strips each separated by an aluminum disc. Each strip is 5 1/2" long by 3/16" wide. The strips are stacked within two four-section cylindrical magnesium forms, which are encased in a split steel sleeve.
- (d) Identification - Marking & Painting: The projectiles are painted aluminum overall, with two 1" black "W"s stencilled 180° apart between the bourrelet and the rotating band. Below each "W" is stencilled the appropriate Mk and Mod of the window load. Other information is stencilled in 3/8" black letters between the "W"s. Original issues of the projectiles, with load Mk 1 Mod 1, bore two aluminum "W"s, 1 1/4" high, on two square blue fields located 180° apart between the bourrelet and the rotating band. This latter method of marking has been abandoned.
- (e) Operation: The explosion of the black powder ejection charge, initiated by the fuze, exerts a pressure against the baffle plate and forces the split steel sleeve, window load, and base plug out of the base end of the projectile.

CONFIDENTIAL



# 5" W.P.(SMOKE) PROJECTILE

**DATA**~~CONFIDENTIAL~~

**U. S. NAVY**  
**5" W.P.**  
**SMOKE**  
**PROJECTILE**

GUNS USED IN: 5"/38

OVERALL LENGTH	
With Nose Fuze	20.0 in.
Without Nose Fuze	15.8 in.
DIAMETER OF BASE	4.968 in.
DISTANCE - BASE TO BAND	2.43 in.
WIDTH OF BAND	2.25 in.
DIAMETER .T BOURRELET	4.985 in.
TYPE OF FILLING	Black Powder Ejection Charge
WEIGHT OF FILLING	2.5 oz.
WEIGHT OF LOADED PROJECTILE	53.0 lbs.
CHARGE/WEIGHT RATIO	
CARTRIDGE CASE	Mk 5
PRIMER	Mk 13 and all Mods.
TRACER	None
FUZES WHICH MAY BE USED IN PROJECTILE	Nose: Mk. 63 Mod O. (M.T.F.) Mk 18 Mods 2, 3, & 4. (M.T.F.) Mk 50 & Mods. (M.T.F.) Mk 29 Mod 3. (P.D.F.) Mk 61 Mod O. (M.T.F.) - for use with 1200 f/s initial velocity reduced charge.
PROJECTILE BODY	5" Illuminating Mk 30 Mods 1 - 8.

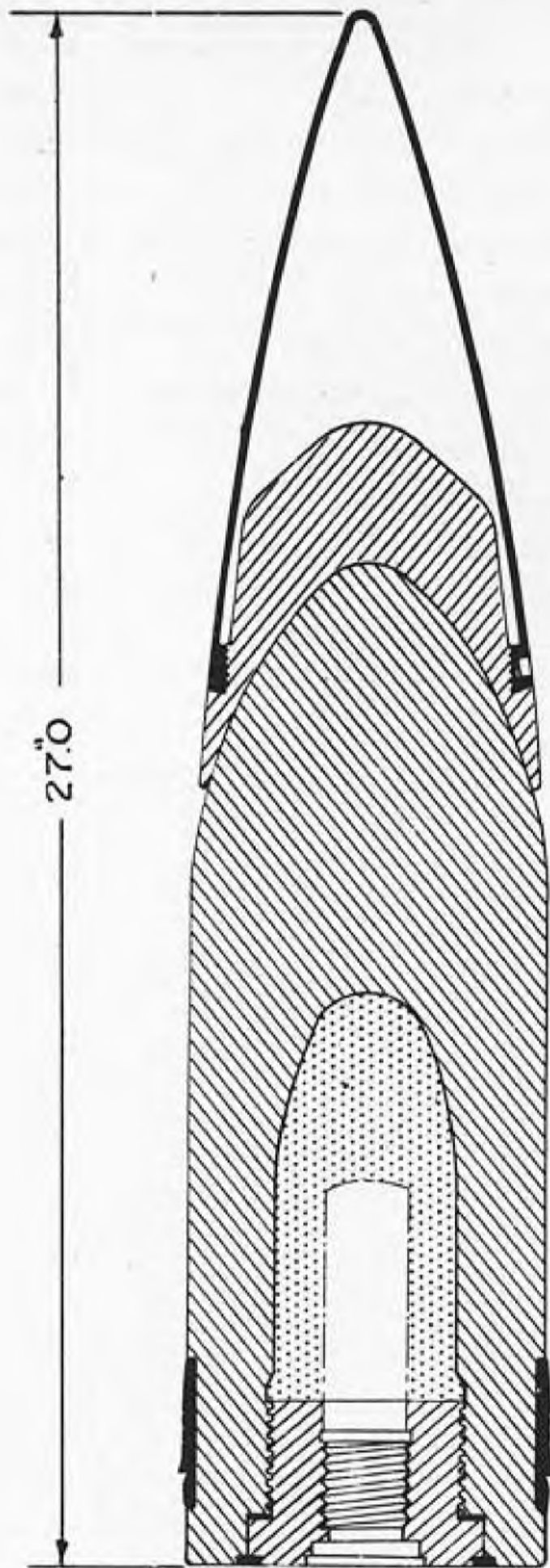
**REMARKS:**

- (a) The projectile body, base plate, and expelling charge are the same as those for the Mk 30 5" Illuminating Projectile (see page 102).
- (b) The canister holding the W.P. filled tubes is of 0#03 thick sheet steel and measures 12#03 long by 3#9 in diameter. It is painted olive drab overall. Through the center of the canister is inserted a burster tube containing the ballistite burster charge, with a black powder delay fitted to the upper end of the tube. The canister is divided into four sections internally, with each section containing 42 W.P. filled steel tubes 0#5 in diameter and 2#88 long (168 tubes in all). The canister is filled through the base with molten W.P. and closed with two 1/2" pipe plugs.
- (c) Identification - Marking and Painting - the projectile is specially painted and marked to indicate its contents, as follows: the nose fuze is unpainted; just aft of the nose fuze is located a 2#5 band of slate gray, followed by a 2#5 red band; the bourrelet is unpainted; a 0#5 yellow band is painted 2 7/8" below the bourrelet; the rotating band is unpainted; the remainder of the body is blue gray overall. Lettering on the body is stencilled with yellow spraying lacquer. Other data is stamped on the base of the projectile.
- (d) Type of filling:
- |                  |                             |
|------------------|-----------------------------|
| Expelling Charge | 2 oz. Black Powder          |
| Bursting Charge  | 14 grams Ballistite         |
| Smoke Filling    | 7.06 lbs. White Phosphorous |
- (e) The black powder expelling charge, ignited by the fuze, initiates the delay element at the upper end of the burster tube and forces off the base plate, ejecting the canister rearward. The delay initiates the burster, which ruptures the canister and scatters the W.P. filled steel tubes. The smoke cloud thus formed is about 30-40 yards in diameter. The projectile combines screening, anti-personnel, and slight incendiary effect.

CONFIDENTIAL



B.O. 1 89 LBR  
B.D. FMK 21 LOT 10123  
TR. MK 5-0 LOT 619 25  
CMX LOT NO CA 61 L149  
LOT J 6 48, 10V11, 12, 48



27.0

# 6" A.P. PROJECTILE MK. 35

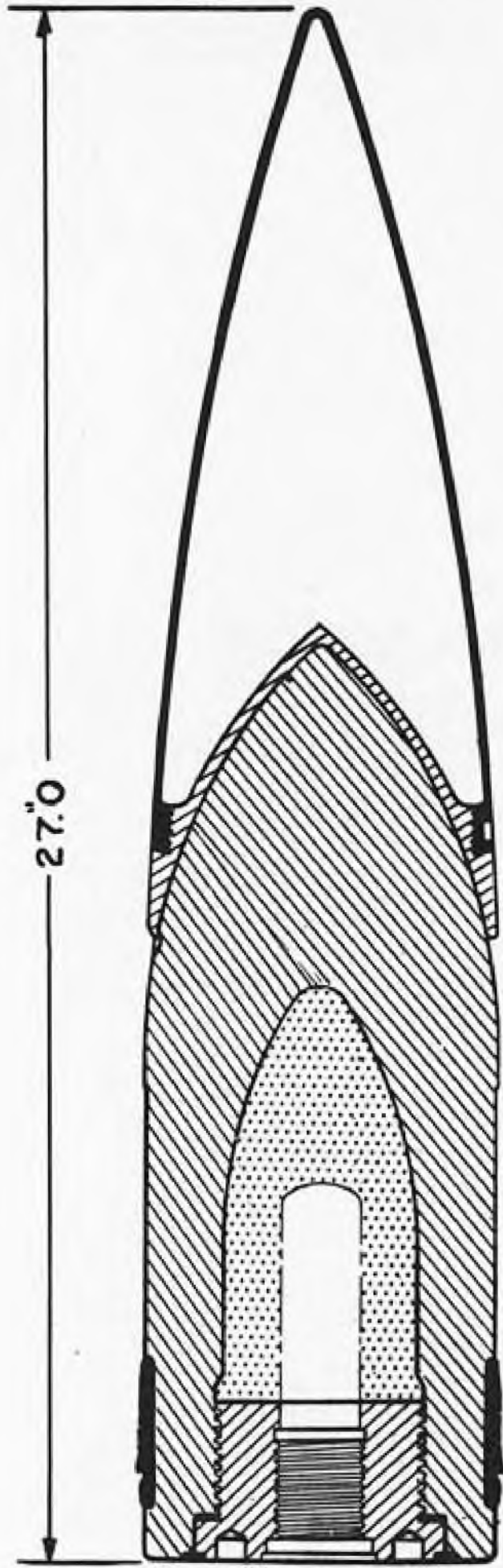
**DATA**~~CONFIDENTIAL~~**U. S. NAVY****6" AP****MK. 35 MODS. 1-8**

GUNS USED IN: 6"/47

OVERALL LENGTH	
With Cap & Windshield	27.0 in.
Without Cap & Windshield	17.19 in.
DIAMETER OF BASE	5.985 in.
DISTANCE - BASE TO BAND	1.55 in.
WIDTH OF BAND	2.50 in.
DIAMETER .T BOURRELET	5.985 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	1.95 lbs.
WEIGHT OF LOADED PROJECTILE	130 lbs.
CHARGE/WEIGHT RATIO	1.5 %
CARTRIDGE CASE	Mk 4
PRIMER	Mk 13 and all Mods.
TRACER	Mk 5
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 21 Mods 0 & 1. (B.D.F.)

**REMARKS:**

(a) For method of marking and painting, see Introduction.



# 6" SPEC. COM. PROJECTILE MK.27

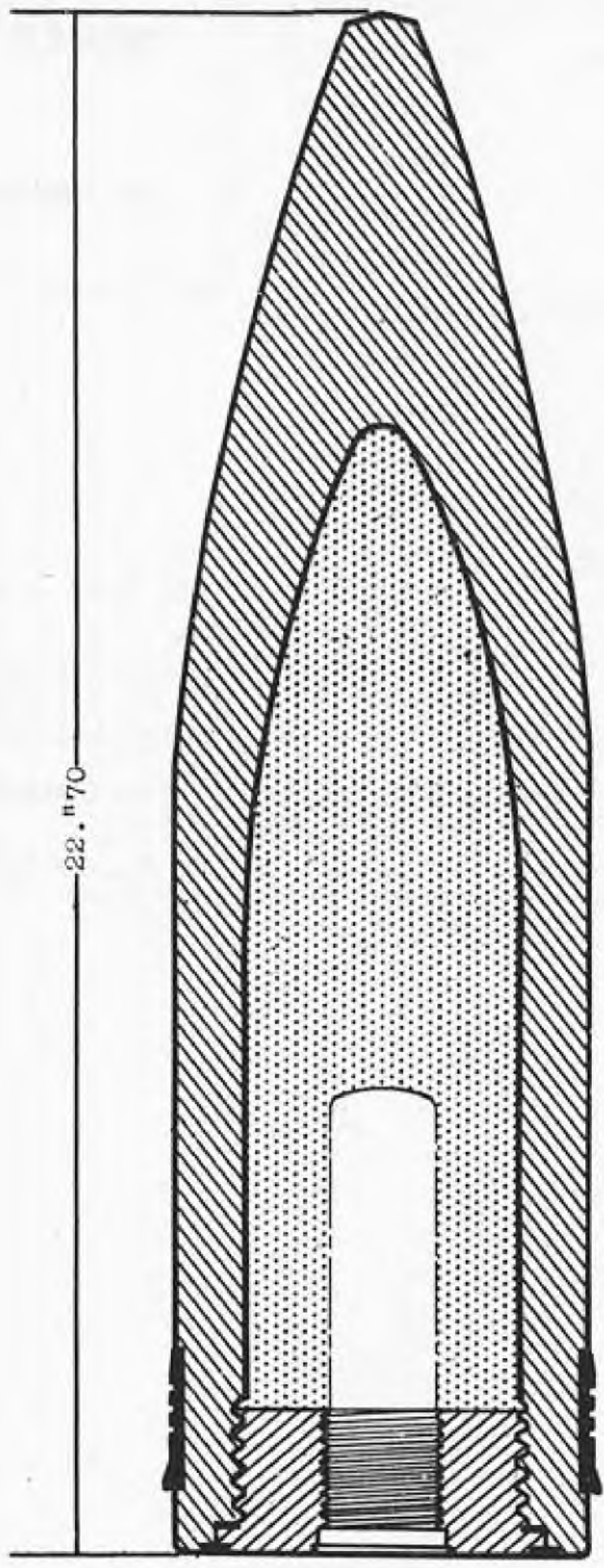
**DATA**~~CONFIDENTIAL~~**U. S. NAVY  
6" SPEC. COM****MK. 27 MODS. 1-8**

GUNS USED IN: 6"/53 (bag)

OVERALL LENGTH	
With Cap & Windshield	27.0 in.
Without Cap & Windshield	15.95 in.
DIAMETER OF BASE	5.985 in.
DISTANCE - BASE TO BAND	1.55 in.
WIDTH OF BAND	2.50 in.
DIAMETER AT BOURRELET	5.985 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	2.20 lbs.
WEIGHT OF LOADED PROJECTILE	105 lbs.
CHARGE/WEIGHT RATIO	2.1 %
CARTRIDGE CASE	None (Bag gun)
PRIMER	Mk 15 Mod 1
TRACER	Mk 5
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 19 Mods 0 & 1. (B.D.F.)

**REMARKS:**

- (a) The Mk 27 Mods 2 and 5 have 2.50 lbs. of explosive rather than the 2.20 lbs. contained in the other Mods.
- (b) For method of marking and painting, see introduction.
- (c) For details of cap and windshield construction, see Introduction.



**6" COM. PROJECTILE  
MK.20**

**DATA**~~CONFIDENTIAL~~**U.S. NAVY****6" COM****MK. 20 MODS. 0-4**

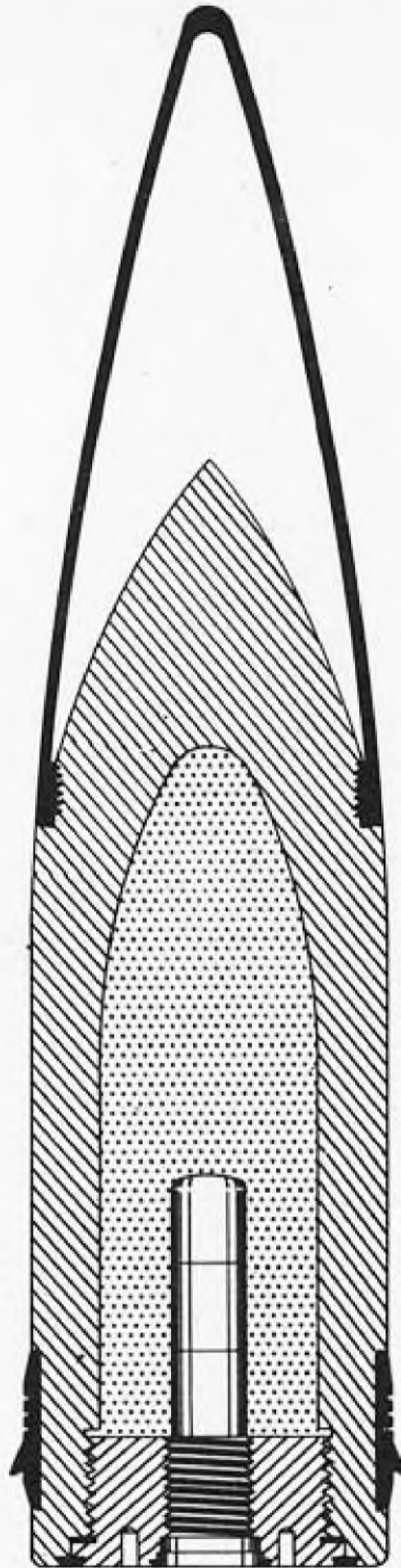
GUNS USED IN: 6"/50

OVERALL LENGTH	22.70 in.
DIAMETER OF BASE	5.94 in.
DISTANCE - BASE TO BAND	1.0 in.
WIDTH OF BAND	2.0 in.
DIAMETER AT BOURRELET	5.985 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	7.08 lbs.
WEIGHT OF LOADED PROJECTILE	105 lbs.
CHARGE/WEIGHT RATIO	5.97 %
CARTRIDGE CASE	Bag gun
PRIMER	Mk 15 Mod 1
TRACER	Mk 5

FUZES WHICH MAY BE USED  
IN PROJECTILE                      Base: Mk 28 and all Mods. (B.D.F.)

**REMARKS:**

- (a) This projectile is fuzeed with Mk 3 and Mods base fuze at the present time but fuzeing will be changed as indicated.
- (b) For method of marking and painting, see Introduction.
- (c) Mods 0, 2, & 4 may also be issued BL & T with adapter and tracer Mk 5 Mod 1 for target practice.
- (d) This projectile is now loaded with 6.25 lbs. of Explosive D, but loading will be changed as indicated above.



**6" COM. PROJECTILE  
MK. 24**

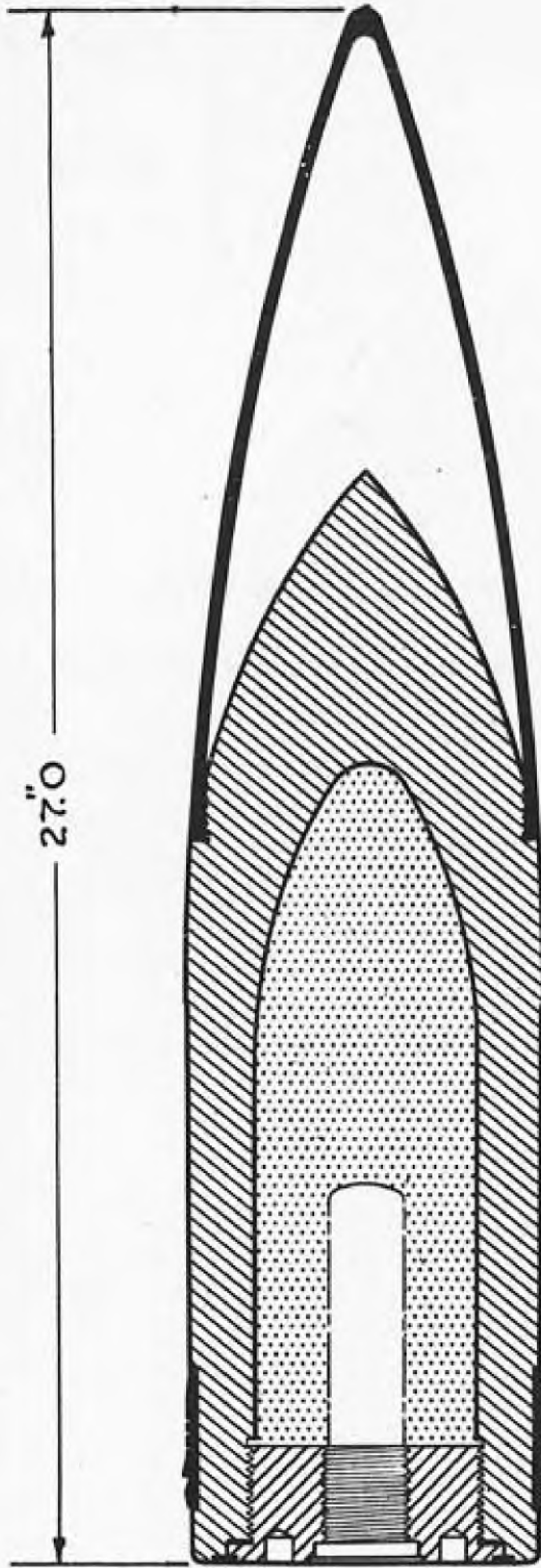
**DATA**~~CONFIDENTIAL~~**U.S. NAVY  
6" COM****MK. 24 MOD. 1**

GUNS USED IN: 6"/53 (bag)

OVERALL LENGTH	27.0 in.
DIAMETER OF BASE	5.985 in.
DISTANCE - BASE TO BAND	1.0 in.
WIDTH OF BAND	2.50 in.
DIAMETER AT BOURRELET	5.985 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	5.73 lbs.
WEIGHT OF LOADED PROJECTILE	105 lbs.
CHARGE/WEIGHT RATIO	5.46 %
CARTRIDGE CASE	Bag gun
PRIMER	Mk 15 Mod 1
TRACER	Mk 5
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 19 Mods 0 & 1. (B.D.F.)

**REMARKS:**

- (a) This projectile is now fuzed with Mk 3 and Mods fuzes. It is to be reloaded and refuzed with the Mk 19.
- (b) This projectile is reserved for submarines.
- (c) For method of marking and painting, see Introduction.
- (d) This projectile is also issued BL & T with adapter and tracer Mk 5 Mod 1 for target practice.



**6" COM. PROJECTILE  
MK.28**

**DATA****U.S. NAVY****6" COM****M K. 28 MODS. 1-2**

GUNS USED IN: 6"/47

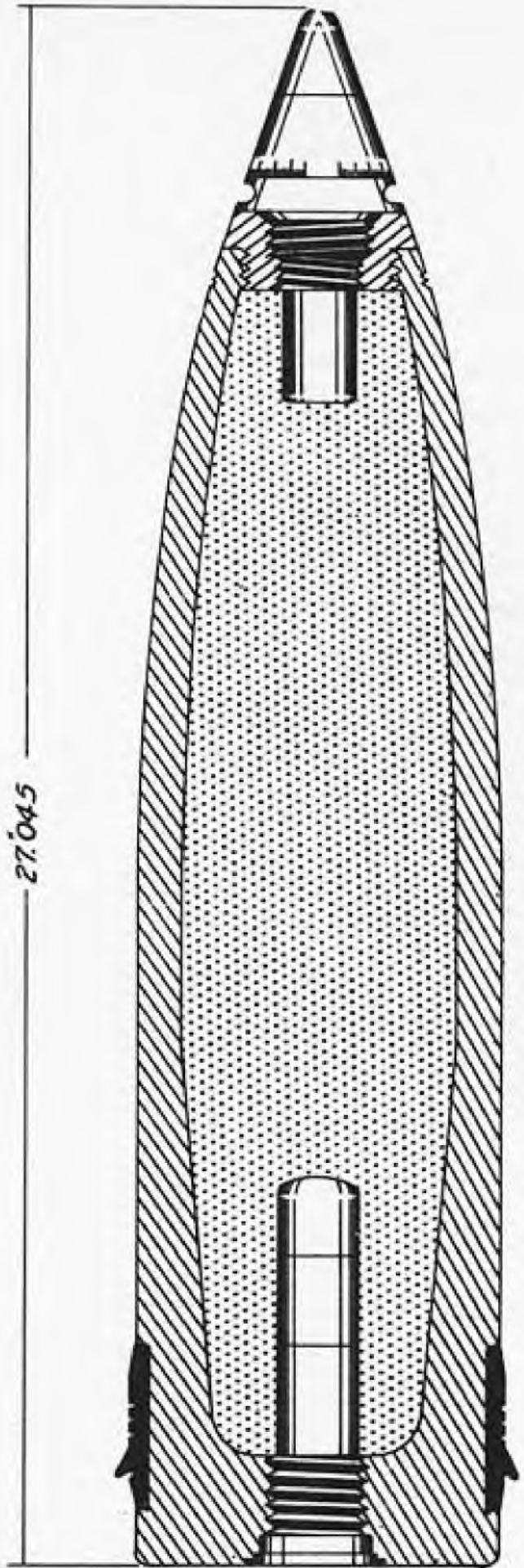
OVERALL LENGTH	27.0 in.
DIAMETER OF BASE	5.985 in.
DISTANCE - BASE TO BAND	1.55 in.
WIDTH OF BAND	2.50 in.
DIAMETER AT BOURRELET	5.985 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	5.72 lbs.
WEIGHT OF LOADED PROJECTILE	105 lbs.
CHARGE/WEIGHT RATIO	5.45 %
CARTRIDGE CASE	Bag gun
PRIMER	Mk 15 Mod 1
TRACER	Mk 5

FUZES WHICH MAY BE USED  
IN PROJECTILE

Base: Mk 19 Mods 0 &amp; 1. (B.D.F.)

## REMARKS:

(a) For method of marking and painting, see Introduction.



**6" H.C. PROJECTILE  
MK. 34**

# DATA

OVERALL LENGTH  
With Nose Fuze 27.045 in.  
Without Nose Fuze 22.225 in.

DIAMETER OF BASE 5.985 in.

DISTANCE - BASE TO BAND 1.55 in.

WIDTH OF BAND 2.50 in.

DIAMETER AT BOURRELET 5.985 in.

TYPE OF FILLING Explosive D

WEIGHT OF FILLING 13.22 lbs.

WEIGHT OF LOADED PROJECTILE 105 lbs.

CHARGE/WEIGHT RATIO 12.65

CARTRIDGE CASE Mk 4

PRIMER Mk 13 and all Mods.

TRACER Mk 5; Mk 5 Mod 1.

## FUZES WHICH MAY BE USED IN PROJECTILE:

Base: Mk 28 Mods 0 & 1. (B.D.F.)

Nose: Mk 29 Mods 2 & 3. (P.D.F.)  
Steel Nose Plug  
Mk 18 Mods 2, 3, & 4. (M.T.F.)  
Mk 50 and all Mods. (M.T.F.)  
Mk 63 Mod 0. (M.T.F.)  
Mk 47 Mod 0. (V.T.F.) (see note "e").

Auxiliary: Mk 17 and all Mods.  
Detonating Mk 46 Mod 0.  
Fuze Mk 54 Mods 0 & 1.  
Mk 44 Mods 0 & 1. (see note "e").

## REMARKS:

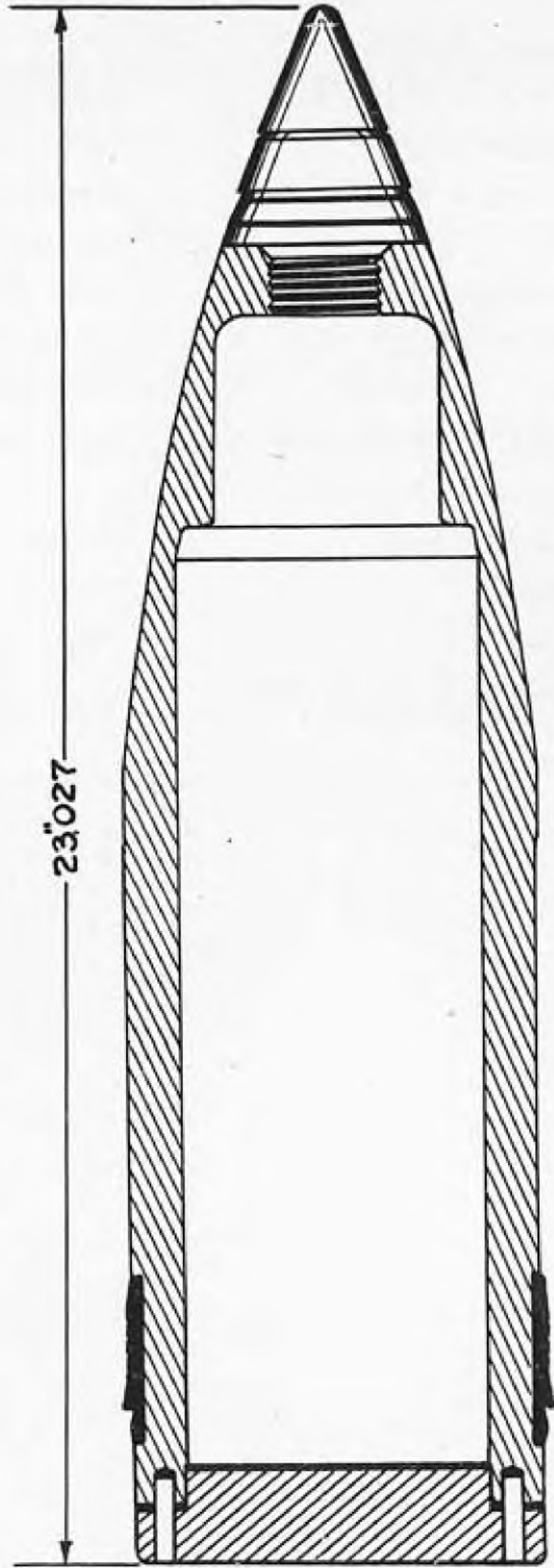
- (a) For method of marking and painting, see Introduction.
- (b) A nose cap may be threaded to the projectile body over the nose fuze for moisture-proofing purposes.
- (c) When this projectile is used in the 6"/53 bag gun, the Mk 15 Mod 1 primer is used.
- (d) The auxiliary detonating fuze Mk 54 is replacing the Mk 17 and Mk 46 fuzes in all assemblies.
- (e) A specially cavitized Mk 34 round, designed for use in the 6"/47 gun only, is being produced for assembly with the Mk 47 V.T. fuze. When this fuze is used, the Mk 28 base fuze is also employed (without tracer). This feature differs from other V.T. fuzed projectiles, which take no base fuze. The Mk 44 auxiliary detonating fuze will be used only in conjunction with the Mk 47 V.T. fuze. V.T. cavitation is indicated by a 1/2" red band painted around the projectile 1/2" below the protective shipping cap.

# U. S. NAVY

# 6" HC

## MK. 34, MODS. 1-7

GUNS USED IN: 6"/47 case  
6"/53 bag

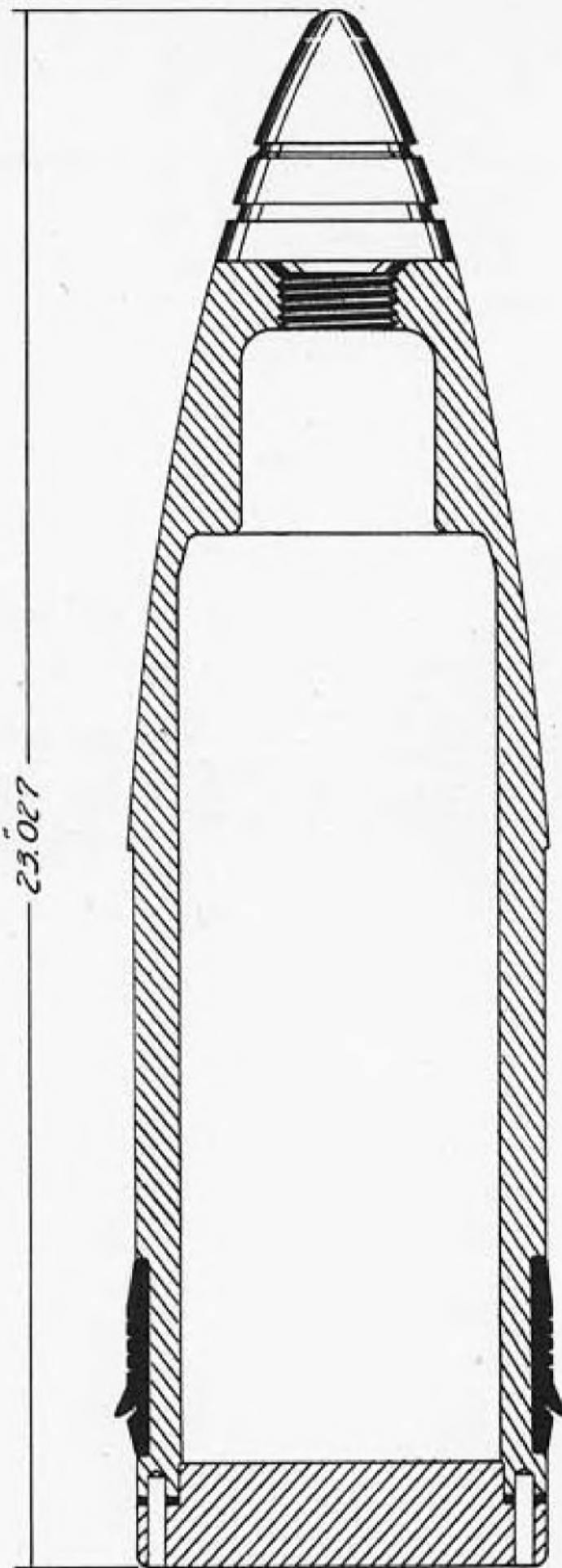


**6" ILL. PROJECTILE  
MK. 22**

**DATA****U. S. NAVY  
6" ILL.  
MK. 22, MOD. 1**

OVERALL LENGTH	
With Nose Fuze	23.027 in.
Without Nose Fuze	18.697 in.
DIAMETER OF BASE	5.94 in.
DISTANCE - BASE TO BAND	2.35 in.
WIDTH OF BAND	2.50 in.
DIAMETER AT BOURRELET	5.985 in.
TYPE OF FILLING	Black Powder Expelling charge. Magnesium flare.
WEIGHT OF FILLING	Black Powder Expelling Charge 3.5 oz.
WEIGHT OF LOADED PROJECTILE	95.40 lbs.
CHARGE/WEIGHT RATIO	
CARTRIDGE CASE	Bag gun
PRIMER	Mk 15 Mod 1
TRACER	None
FUZES WHICH MAY BE USED IN PROJECTILE	Mk 63 Mod 0. (M.T.F.) Nose: Mk 18 Mods 2, 3 and 4. (M.T.F.) Mk 50 and all Mods. (M.T.F.)
REMARKS:	
(a)	For details of construction of illuminating projectile, see Introduction.
(b)	For details of marking and painting, see Introduction.
(c)	The Mk 50 fuze is authorized for assembly in this projectile only when used in the 6"/53 bag gun.
(d)	The Mk 3 Illuminating Contents are used in this projectile. These contents are illustrated on page <u>72</u> .

GUNS USED IN: 6"/47 (bag)  
6"/50 (bag)  
6"/53 (bag)



**6" ILL. PROJECTILE  
MK.23**

# DATA

U. S. NAVY

OVERALL LENGTH  
With Nose Fuze 23.027 in.  
Without Nose Fuze 18.697 in.

DIAMETER OF BASE 5.94 in.

DISTANCE - BASE TO BAND 2.35 in.

WIDTH OF BAND 2.50 in.

DIAMETER AT BOURRELET 5.985 in.

TYPE OF FILLING Black powder  
expelling charge;  
magnesium flare.

WEIGHT OF FILLING 3.5 oz. black powder.

WEIGHT OF LOADED  
PROJECTILE 96.0 lbs.

CARTRIDGE CASE Bag gun

PRIMER Mk 15 Mod 1

TRACER None

FUZES WHICH MAY BE USED  
IN PROJECTILE Nose: Mk 18 Mods 2, 3, & 4. (M.T.F.)  
Mk 50 and all Mods. (M.T.F.)  
Mk 63 Mod O. (M.T.F.)

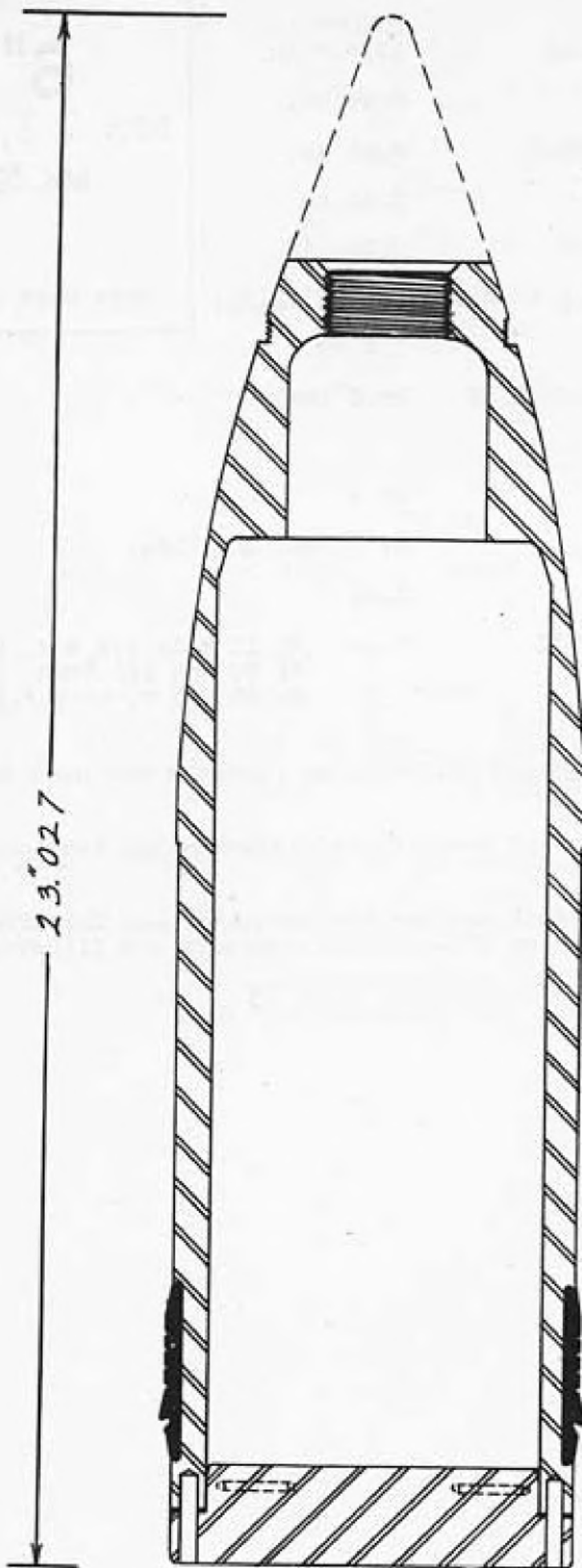
# 6" ILL.

## MK. 23, MOD. 1, 2

GUNS USED IN: 6"/47 (bag)  
6"/50 (bag)  
6"/53 (bag)

### REMARKS:

- (a) For details of construction of illuminating projectiles and details of marking and painting, see Introduction.
- (b) The Mk 50 and Mk 63 fuzes are authorized for assembly in this projectile only when used in the 6"/53 bag gun.
- (c) The Mk 3 Illuminating Contents are used in this projectile. These contents are illustrated on page 72.



**MK. 32**  
**6" ILL. PROJECTILE**

**DATA**~~CONFIDENTIAL~~**U. S. NAVY****6" ILL.****MK.32 MOD.0**

Guns Used In: 6"/47 (case)

OVERALL LENGTH  
 With Nose Fuze 23.027 in.  
 Without Nose Fuze 19.517 in.

DIAMETER OF BASE 5.94 in.

DISTANCE - BASE TO BAND 2.05 in.

WIDTH OF BAND 2.50 in.

DIAMETER AT BOURRELET 5.985 in.

TYPE OF FILLING Black Powder Ejection Charge

WEIGHT OF FILLING 3.5 oz.

WEIGHT OF LOADED PROJECTILE 94.5 lbs.

CHARGE/WEIGHT RATIO

CARTRIDGE CASE Mk 4

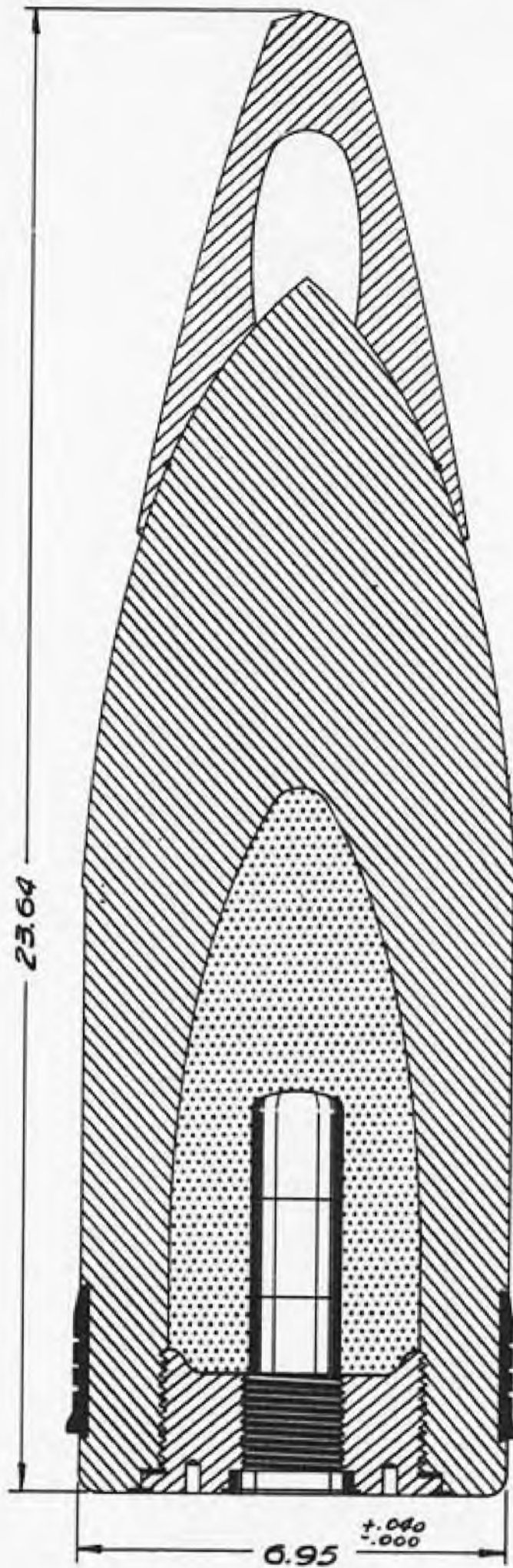
PRIMER Mk 13 and all Mods.

TRACER None

FUZES WHICH MAY BE USED  
 IN PROJECTILE Nose: Mk 18 Mods 2, 3, & 4. (M.T.F.)  
 Mk 50 and all Mods. (M.T.F.)  
 Mk 63 Mod 0. (M.T.F.)

**REMARKS:**

- (a) The Mk 4 Mod 6 Illuminating Contents are used in this projectile.
- (b) For method of operation of Illuminating Projectiles, see Introduction.
- (c) For method of marking and painting, see Introduction. The Mk 4 type Illuminating contents are illustrated on page 102.



**MK. 6**  
**7" A.P. PROJECTILE**

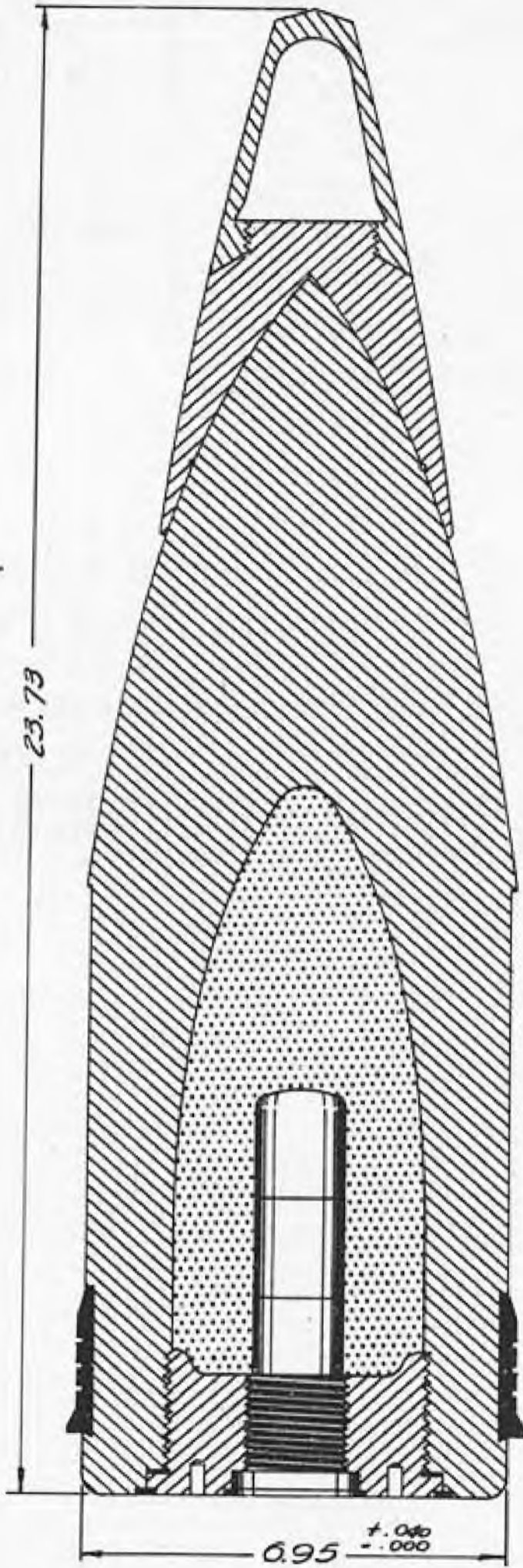
**DATA**~~CONFIDENTIAL~~**U. S. NAVY****7" AP****MK. 6 AND MOD I**

GUNS USED IN: 7"/45 (bag)

OVERALL LENGTH	
With Cap & Windshield	23.54 in.
Without Cap & Windshield	19.79 in.
DIAMETER OF BASE	6.94 in.
DISTANCE - BASE TO BAND	1.0 in.
WIDTH OF BAND	2.33 in.
DIAMETER AT BOURRELET	6.99 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	4.31 lbs.
WEIGHT OF LOADED PROJECTILE	165 lbs.
CHARGE/WEIGHT RATIO	2.61%
CARTRIDGE CASE	Bag gun
PRIMER	Mk 15 Mod 1
TRACER	Integral in fuze; Mk 5
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 2 Mod 2. (B.I.F.) Mk 9 . (B.I.F.) Mk 21 Mods 0 & 1. (B.D.F.)

**REMARKS:**

- (a) Marking and painting of this projectile are as described in the Introduction.
- (b) This is an old type projectile, without windshield, which is not in common use.
- (c) These projectiles are now assembled with the Mk 2 Mod 2 and Mk 9 fuzes. However, these are being replaced by the Mk 21 fuze, which requires the use of the Mk 5 tracer.



**MK. 10**  
**7" A.P. PROJECTILE**

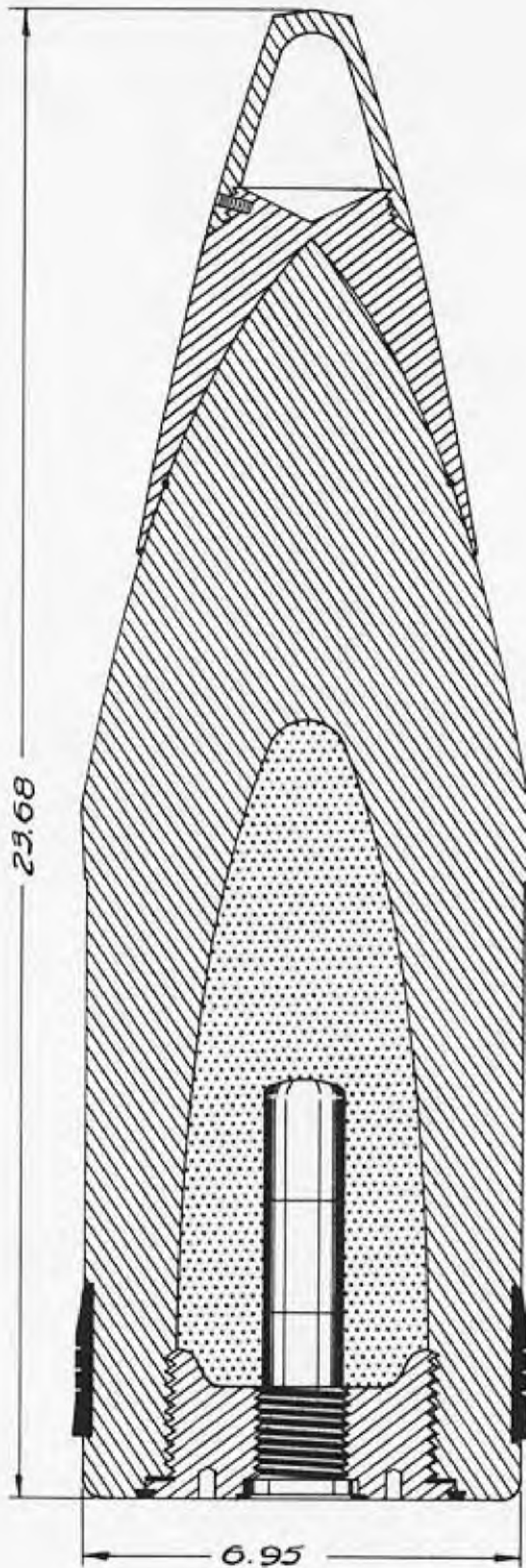
**DATA**~~SECRET~~**U. S. NAVY****7" AP****M K. 10 MOD 2**

GUNS USED IN: 7"/45 (bag)

OVERALL LENGTH	23.73 in.
With Cap & Windshield	
Without Cap & Windshield	
DIAMETER OF BASE	6.94 in.
DISTANCE - BASE TO BAND	1.0 in.
WIDTH OF BAND	2.33 in.
DIAMETER .T. BOURRELET	6.99 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	4.31 lbs.
WEIGHT OF LOADED PROJECTILE	165 lbs.
CHARGE/WEIGHT RATIO	2.61%
CARTRIDGE CASE	Bag gun
PRIMER	Mk 15 Mod 1
TRACER	Integral in fuze; Mk 5
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 2 Mod 2. (B.I.F.) Mk 9. (B.I.F.) Mk 21 Mods 0 & 1. (B.D.F.)

**REMARKS:**

- (a) Marking and painting of this projectile are as described in the Introduction.
- (b) This is an old type projectile, without windshield, which is not in common use.
- (c) This projectile is now assembled with the Mk 2 Mod 2 or the Mk 9 fuzes. However, these are being replaced by the Mk 21 fuze, which requires the Mk 5 tracer.



MK.12

7" A.P. PROJECTILE

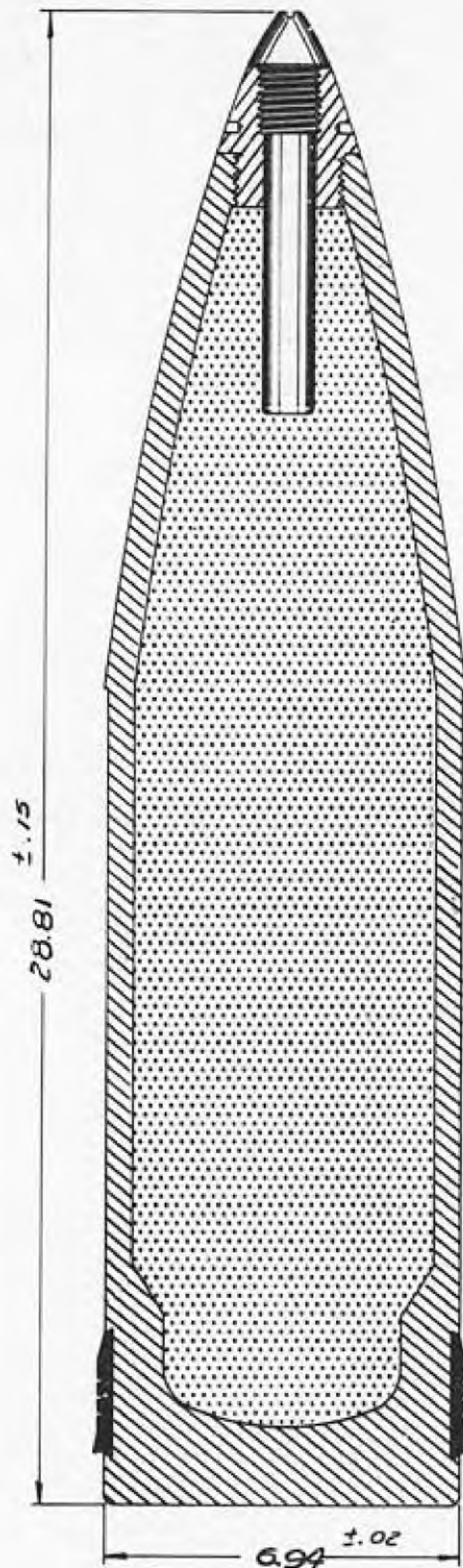
**DATA****U. S. NAVY****7" AP****MK.12 MODS.1-2**

GUNS USED IN: 7"/45 (bag)

OVERALL LENGTH	23.68 in.
With Cap & Windshield	
Without Cap & Windshield	
DIAMETER OF BASE	6.94 in.
DISTANCE - BASE TO BAND	1.0 in.
WIDTH OF BAND	2.33 in.
DIAMETER AT BOURRELET	6.985 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	Mk 1 - 4.0 lbs.; Mk 2 - 3.5 lbs.
WEIGHT OF LOADED PROJECTILE	165 lbs.
CHARGE/WEIGHT RATIO	
CARTRIDGE CASE	Bag gun
PRIMER	Mk 15 Mod 1
TRACER	Integral in fuze; Mk 5.
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 2 Mod 2. (B.I.F.) Mk 9. (B.I.F.) Mk 21 Mods 0 & 1. (B.D.F.)

**REMARKS:**

- (a) Marking and painting of this projectile are as described in the Introduction.
- (b) This is an old type projectile, without windshield, which is not in common use.
- (c) This projectile is now assembled with the Mk 2 Mod 2 or Mk 9 fuzes. However, these are being replaced by the Mk 21 fuze, which requires the Mk 5 tracer.



**MK.13**  
**7" FIELD PROJECTILE**

**DATA**~~CLASSIFICATION~~**U. S. NAVY****7" FIELD****MK. 13 MODS. 1 & 2**

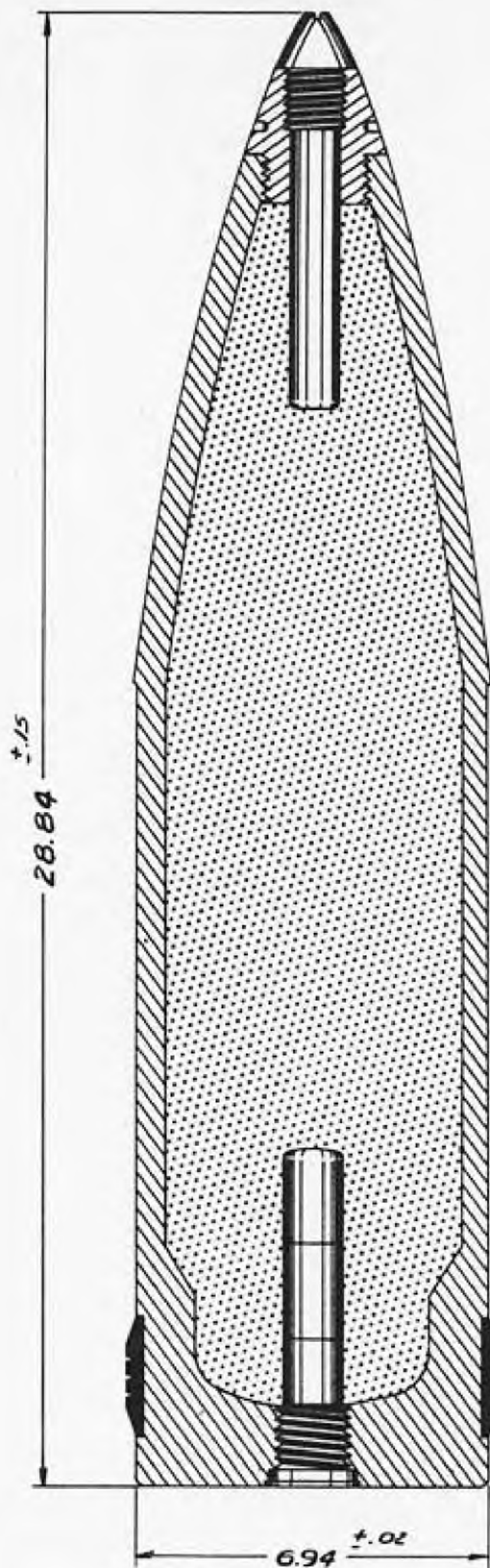
GUNS USED IN: 7"/45

OVERALL LENGTH	
With Nose Fuze	29.58 in.
Without Nose Fuze	28.0 in.
DIAMETER OF BASE	6.94 in.
DISTANCE - BASE TO BAND	1.0 in.
WIDTH OF BAND	2.33 in.
DIAMETER AT BOURRELET	6.985 in.
TYPE OF FILLING	Cast TNT
WEIGHT OF FILLING	24 lbs.
WEIGHT OF LOADED PROJECTILE	152 lbs.
CHARGE/WEIGHT RATIO	15.1%
CARTRIDGE CASE	Bag Gun
PRIMER	Mk 15 Mod 1
TRACER	None
FUZES WHICH MAY BE USED IN PROJECTILE	Nose: Mk 7 Mod 1. (P.D.F.)

**REMARKS:**

- (a) This is an old type projectile not in common use.
- (b) For method of marking and painting, see Introduction.

~~CONFIDENTIAL~~



**MK.14**  
**7" BBT. PROJECTILE**

**DATA**~~CONFIDENTIAL~~**U. S. NAVY**

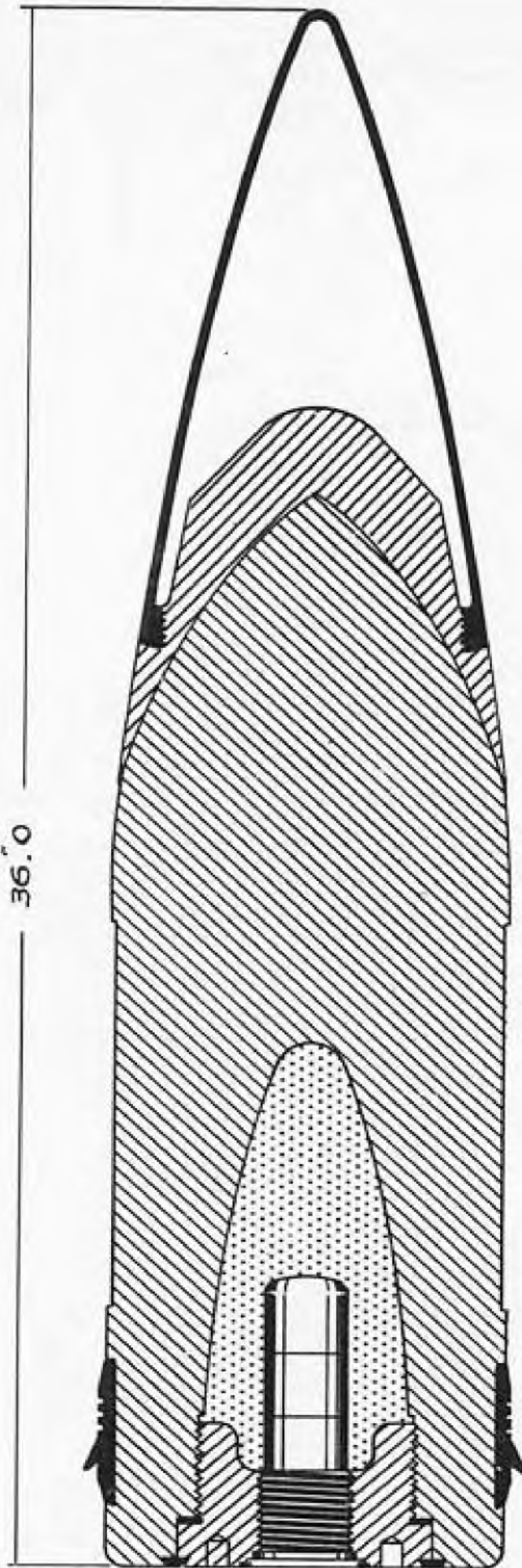
OVERALL LENGTH	
With Nose Fuze	28.84 in.
Without Nose Fuze	24.80 in.
DIAMETER OF BASE	6.94 in.
DISTANCE - BASE TO BAND	1.0 in.
WIDTH OF BAND	2.33 in.
DIAMETER AT BOURRELET	6.985 in.
TYPE OF FILLING	Cast T.N.T.
WEIGHT OF FILLING	24 lbs.
WEIGHT OF LOADED PROJECTILE	153.8 lbs.
CHARGE/WEIGHT RATIO	15.6%
CARTRIDGE CASE	Bag Gun
PRIMER	Mk 15 Mod 1
TRACER	Mk 9
FUZES WHICH MAY BE USED IN PROJECTILE	Nose: Mk 7 Mod 1. (P.D.F.) Base: Mk 3 Mod 2. (B.D.F.) Mk 28 Mods 0 & 1. (B.D.F.)

**7" BBT.****MK.14 MOD.2**

GUNS USED IN: 7"/45

**REMARKS:**

- (a) This is an old type projectile not in common use.
- (b) For method of marking and painting, see Introduction.
- (c) The Mk 3 Mod 2 base fuze contains an integral tracer, but is being replaced in all assemblies by the Mk 28 base fuze, which takes a Mk 9 tracer.



**8" A.P. PROJECTILE  
MK. 19**

**DATA**~~CONFIDENTIAL~~**U. S. NAVY****8" AP****MK. 19 MODS. 1-6**

GUNS USED IN: 8"/55

OVERALL LENGTH  
 With Cap & Windshield 36.0 in.  
 Without Cap & Windshield 19.4 in.

DIAMETER OF BASE 7.977 in.

DISTANCE - BASE TO BAND 2.56 in.

WIDTH OF BAND 3.30 in.

DIAMETER AT BOURRELET 7.977 in.

TYPE OF FILLING Explosive D

WEIGHT OF FILLING 3.64 lbs.

WEIGHT OF LOADED PROJECTILE 260 lbs.

CHARGE/WEIGHT RATIO 1.4 %

CARTRIDGE CASE None

PRIMER Mk 15 Mod 1

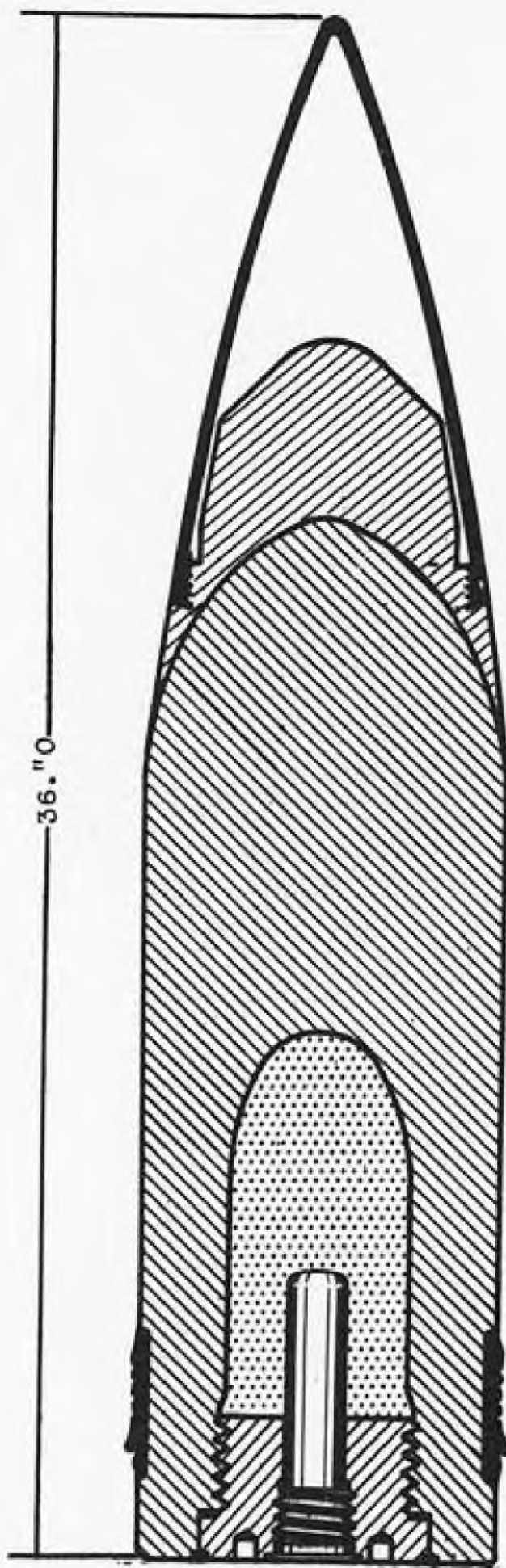
TRACER Mk 5

FUZES WHICH MAY BE USED  
 IN PROJECTILE : Base: Mk 21 Mod 0 & 1. (B.D.F.)  
 Mk 23 Mod 0. (B.D.F.)

**REMARKS:**

- (a) Mk 21 fuze is preferred. Mk 23 to be used only when Mk 21 is not available.
- (b) For cap and windshield data and method of painting and marking, see Introduction.

~~CONFIDENTIAL~~



# 8" A.P. PROJECTILE MK. 21

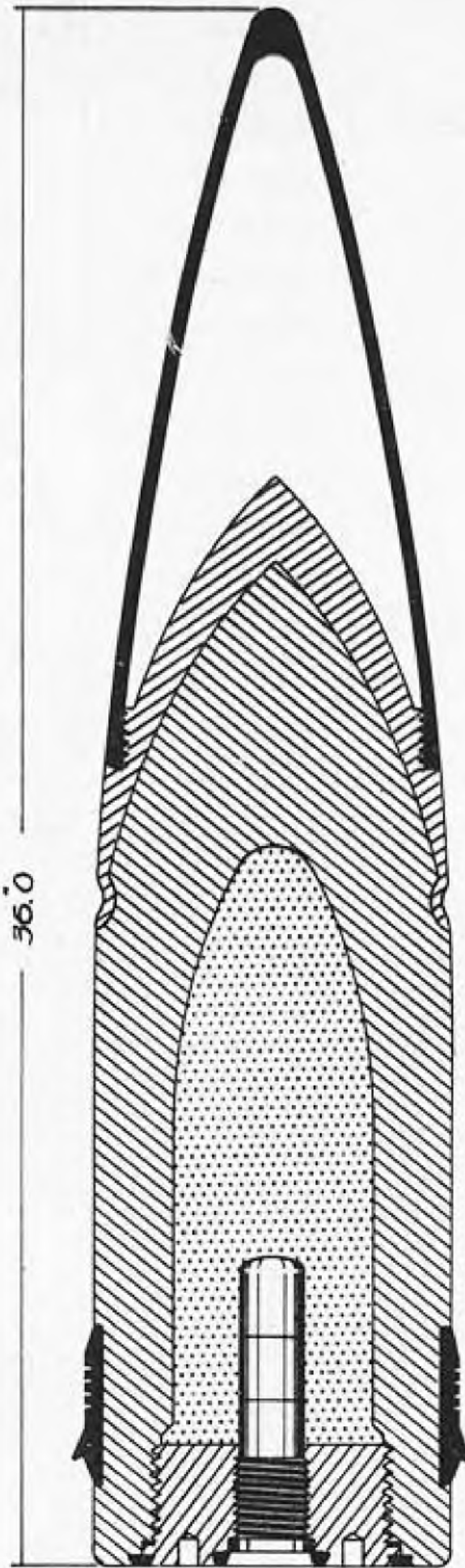
**DATA****U. S. NAVY****8" AP****MK. 21 MOD I-3**

GUNS USED IN: 8"/55

OVERALL LENGTH	
With Cap & Windshield	36.0 in.
Without Cap & Windshield	24.5 in.
DIAMETER OF BASE	7.977 in.
DISTANCE - BASE TO BAND	2.56 in.
WIDTH OF BAND	3.30 in.
DIAMETER .T BOURRELET	7.977 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	5.03 lbs.
WEIGHT OF LOADED PROJECTILE	335 lbs.
CHARGE/WEIGHT RATIO	1.5%
CARTRIDGE CASE	None
PRIMER	Mk 15 Mod 1
TRACER	Mk 5
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 21 Mods 0 & 1. (B.D.F.) Mk 23 Mod 0. (B.D.F.)

## REMARKS:

- (a) Mk 21 fuze is preferred. Mk 23 to be used only when Mk 21 is not available.
- (b) For cap and windshield data and method of painting and marking, see Introduction.



**MK.17**

**8" SPEC. COM. PROJECTILE**

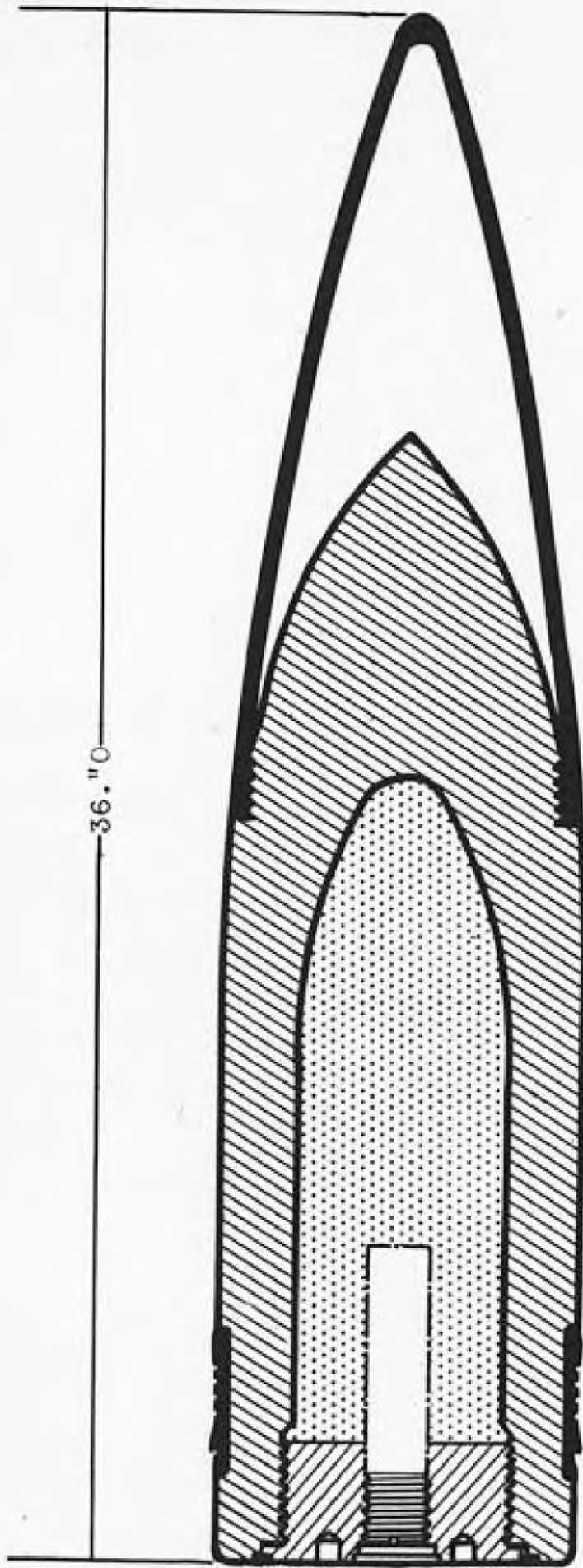
**DATA****U.S. NAVY  
8" SPEC. COM  
MK. 17, MODS. 1-4**

GUNS USED IN: 8"/55

OVERALL LENGTH	36.0 in.
DIAMETER OF BASE	7.977 in.
DISTANCE - BASE TO BAND	2.56 in.
WIDTH OF BAND	3.30 in.
DIAMETER AT BOURRELET	7.977 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	10.38 lbs.
WEIGHT OF LOADED PROJECTILE	260 lbs.
CHARGE/WEIGHT RATIO	3.99 %
CARTRIDGE CASE	Bag gun
PRIMER	Mk 15 Mod 1
TRACER	Mk 5

**FUZES WHICH MAY BE USED  
IN PROJECTILE**Base: Mk 21 Mods 0. & 1. (B.D.F.)  
Mk 23 Mod 0. (B.D.F.)**REMARKS:**

- (a) The Mk 21 fuze is preferable for this projectile. Several have also been fuzed with the Mk 28 due to a lack of sufficient HC projectiles.
- (b) For method of marking and painting, see Introduction.



**8" COM. PROJECTILE  
MK.14**

**DATA**~~XXXXXXXXXX~~**U. S. NAVY****8" COM****MK.14 MOD.1**

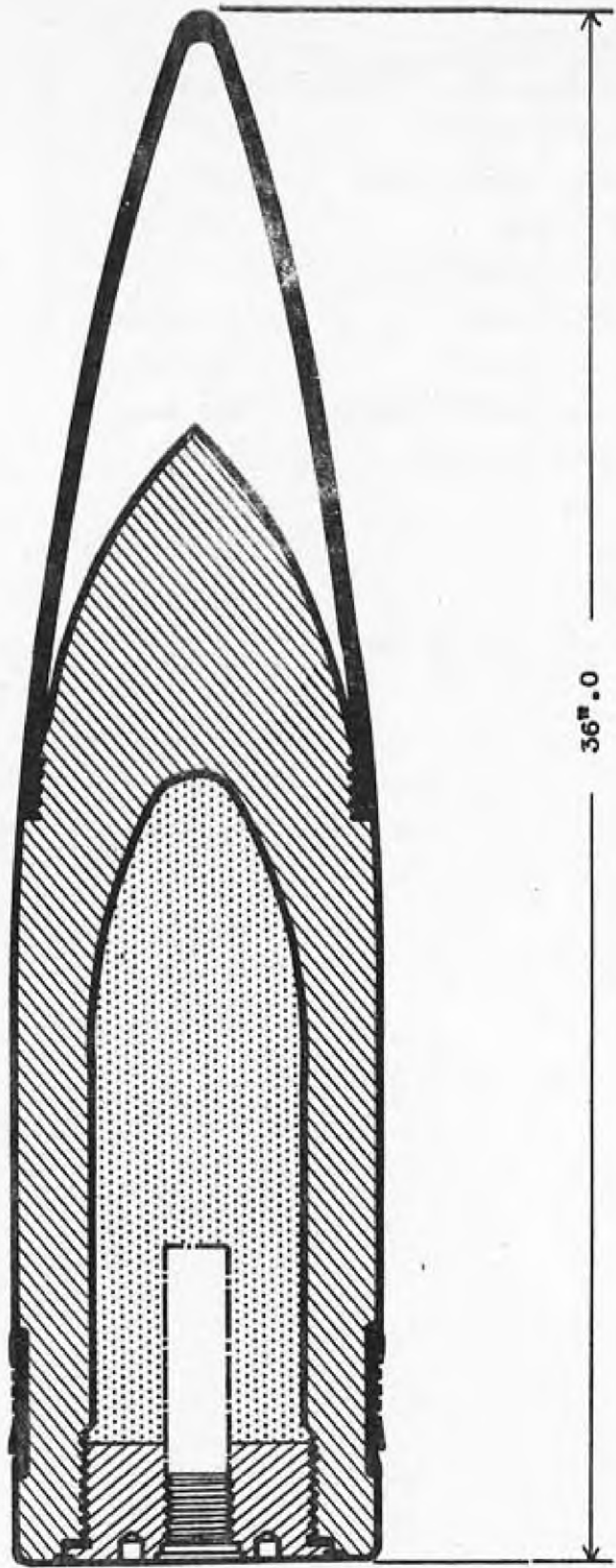
GUNS USED IN: 8"/55

OVERALL LENGTH	
With Cap & Windshield	36.0 in.
Without Cap & Windshield	26.19 in.
DIAMETER OF BASE	7.977 in.
DISTANCE - BASE TO BAND	2.56 in.
WIDTH OF BAND	3.30 in.
DIAMETER .T BOURRELET	7.977 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	10.91 lbs.
WEIGHT OF LOADED PROJECTILE	260 lbs.
CHARGE/WEIGHT RATIO	4.4 %
CARTRIDGE CASE	Bag gun
PRIMER	Mk 15 Mod 1
TRACE <sub>h</sub>	Mk 5

FUZES WHICH MAY BE USED  
IN PROJECTILEBase: Mk 21 Mods 0 & 1. (B.D.F.)  
Mk 23 Mod 0. (B.D.F.)

## REMARKS:

- (a) The Mk 23 fuze is used only when the Mk 21 is not available.
- (b) For method of painting and marking, see Introduction.



**8" COM. PROJECTILE  
MK. 15**

**DATA**~~CONFIDENTIAL~~**U. S. NAVY  
8" COM****MK.15 MOD.1**

GUNS USED IN: 8"/55

OVERALL LENGTH  
With Cap & Windshield 36.0 in.  
Without Cap & Windshield 26.19 in.

DIAMETER OF BASE 7.977 in.

DISTANCE - BASE TO BAND 2.56 in.

WIDTH OF BAND 3.30 in.

DIAMETER .T BOURRELET 7.977 in.

TYPE OF FILLING Explosive D

WEIGHT OF FILLING 11.46 lbs.

WEIGHT OF LOADED PROJECTILE 260 lbs.

CHARGE/WEIGHT RATIO 4.4 %

CARTRIDGE CASE Bag Gun

PRIMER Mk 15 Mod 1

TRACER Mk 5

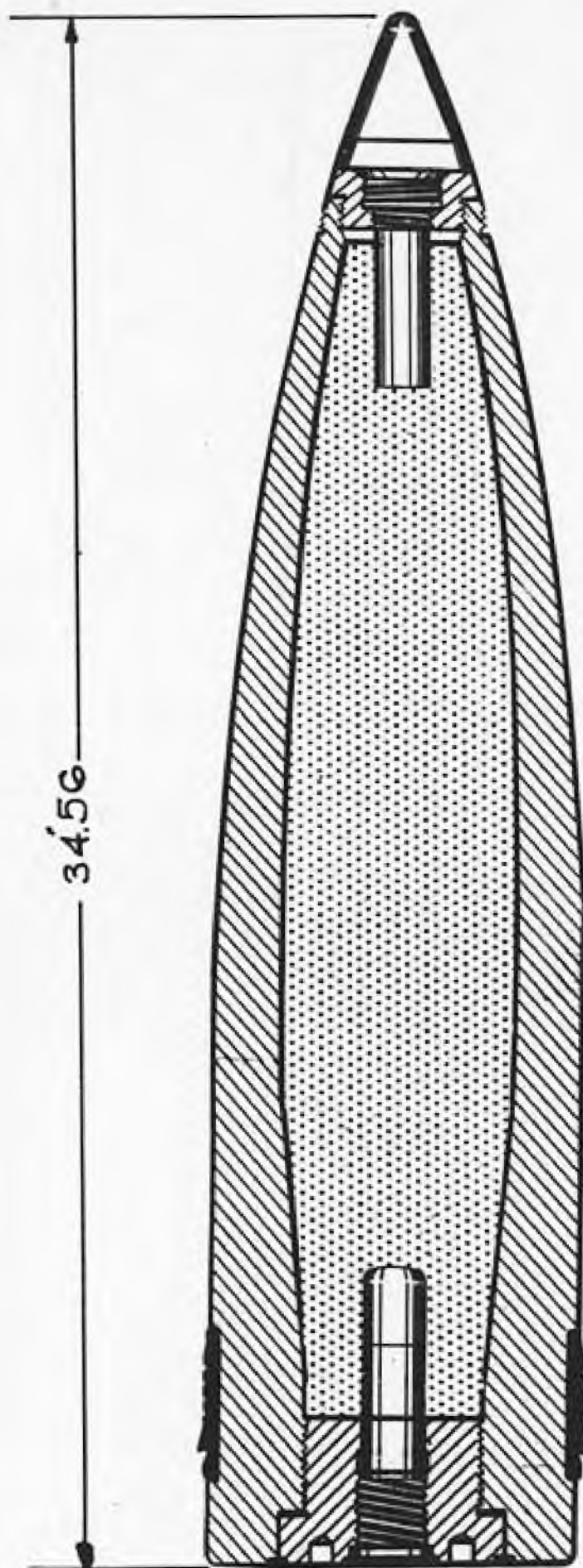
**FUZES WHICH MAY BE USED  
IN PROJECTILE**Base: Mk 21 Mods 0 & 1. (B.D.F.)  
Mk 23 Mod 0. (B.D.F.)**REMARKS:**

- (a) The Mk 23 fuze is used only when the Mk 21 is not available.
- (b) For method of marking and painting, see Introduction.
- (c) For details of cap and windshield construction, see Introduction.

~~CONFIDENTIAL~~



NO 914 100  
EXD.F.MK. 17-11 LOT 10 W  
X.D.F.MK. 20-8 LOT 11 P  
TR.MK. 6-10 LOT 120 W  
AMM. LOT NO DD 4 11 43  
1 I. D-48



# 8" H.C. PROJECTILE MK. 24

# DATA

U. S. NAVY

8" HC

MK. 24

MODS. 1, 2, 3, 4, 5

GUNS USED IN: 8"/55

OVERALL LENGTH  
With Nose Fuze 34.56 in.  
Without Nose Fuze 31.08 in.

DIAMETER OF BASE 7.977 in.

DISTANCE - BASE TO BAND 2.56 in.

WIDTH OF BAND 3.30 in.

DIAMETER AT BOURRELET 7.977 in.

TYPE OF FILLING Explosive D

WEIGHT OF FILLING 21.34 lbs.

WEIGHT OF LOADED PROJECTILE 260 lbs.

CHARGE/WEIGHT RATIO 8.21%

CARTRIDGE CASE None

PRIMER Mk 15 Mod 1

TRACER Mk 5 Mod 1

## FUZES WHICH MAY BE USED IN PROJECTILE:

Base: Mk 28 and all Mods. (B.D.F.)  
Mk 39 Mods 0 & 1. (B.D.F.)  
Mk 48 Mods 0 & 1. (B.D.F.)

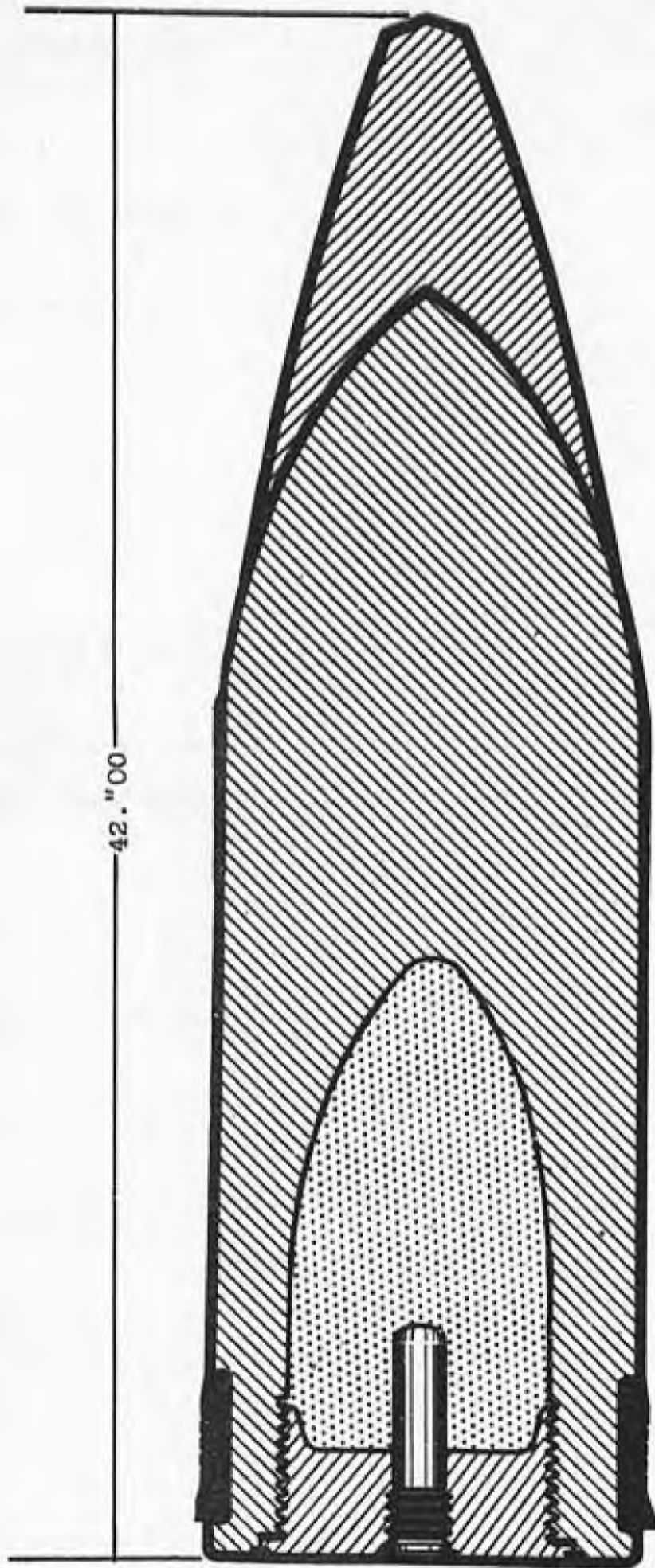
Nose: Mk 18 Mods 2, 3, & 4. (M.T.F.)  
Mk 50 Mods 0 - 3. (M.T.F.)  
Mk 29 Mods 1, 2, & 3. (P.D.F.)  
Mk 63 Mod 0. (M.T.F.)

Auxiliary Detonating Fuze: Mk 17 and all Mods.  
Mk 46 Mod 0.  
Mk 35 Mod 0.  
Mk 55 Mod 0.

## REMARKS:

- (a) Base fuze Mk 48 (and mods) is the current and preferred assembly for this projectile. However, the Mk 39 or Mk 28 fuzes may be used.
- (b) The Mk 55 auxiliary detonating fuze is the preferred assembly in this projectile. The Mk 17 and Mk 46 fuzes, however, may be used.
- (c) For method of marking and painting, see Introduction.

~~CONFIDENTIAL~~



**12" A.P. PROJECTILE  
MK. 15**

**DATA****U. S. NAVY****12" AP****MK.15 MOD 6**

OVERALL LENGTH 42.00 in.  
With Cap & Windshield  
Without Cap & Windshield

DIAMETER OF BASE 11.94 in.

DISTANCE - BASE TO BAND 1.00 in.

WIDTH OF BAND 4.00 in.

DIAMETER .T BOURRELET 11.977 in.

TYPE OF FILLING Explosive D

WEIGHT OF FILLING 25.0 lbs.

WEIGHT OF LOADED PROJECTILE 870 lbs.

CHARGE/WEIGHT RATIO 2.87%

CARTRIDGE CASE Bag gun

PRIMER Mk 15 Mod 1

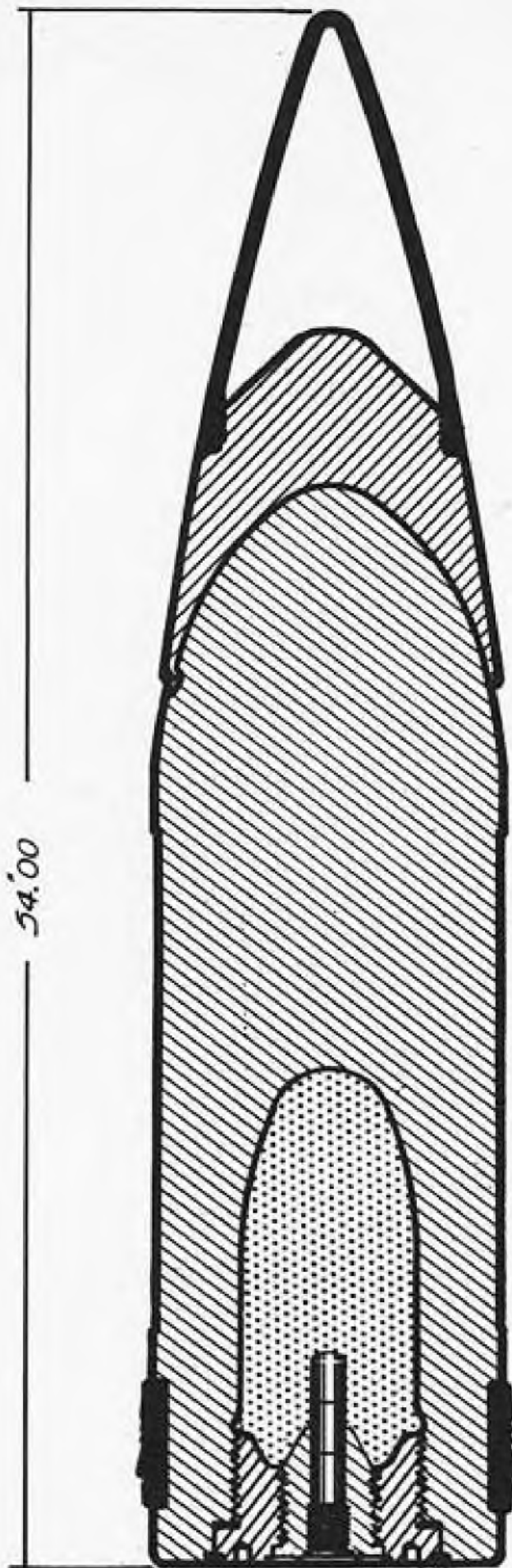
TRACER Mk .5

FUZES WHICH MAY BE USED  
IN PROJECTILE Base: Mk 21 Mods 0 & 1. (B.D.F.)

GUNS USED IN: 12"/50

**REMARKS:**

- (a) Marking and painting of this projectile are as described in the Introduction.
- (b) This is an old type projectile, without windshield, which is not in common use.



**12" A.P. PROJECTILE  
MK.18**

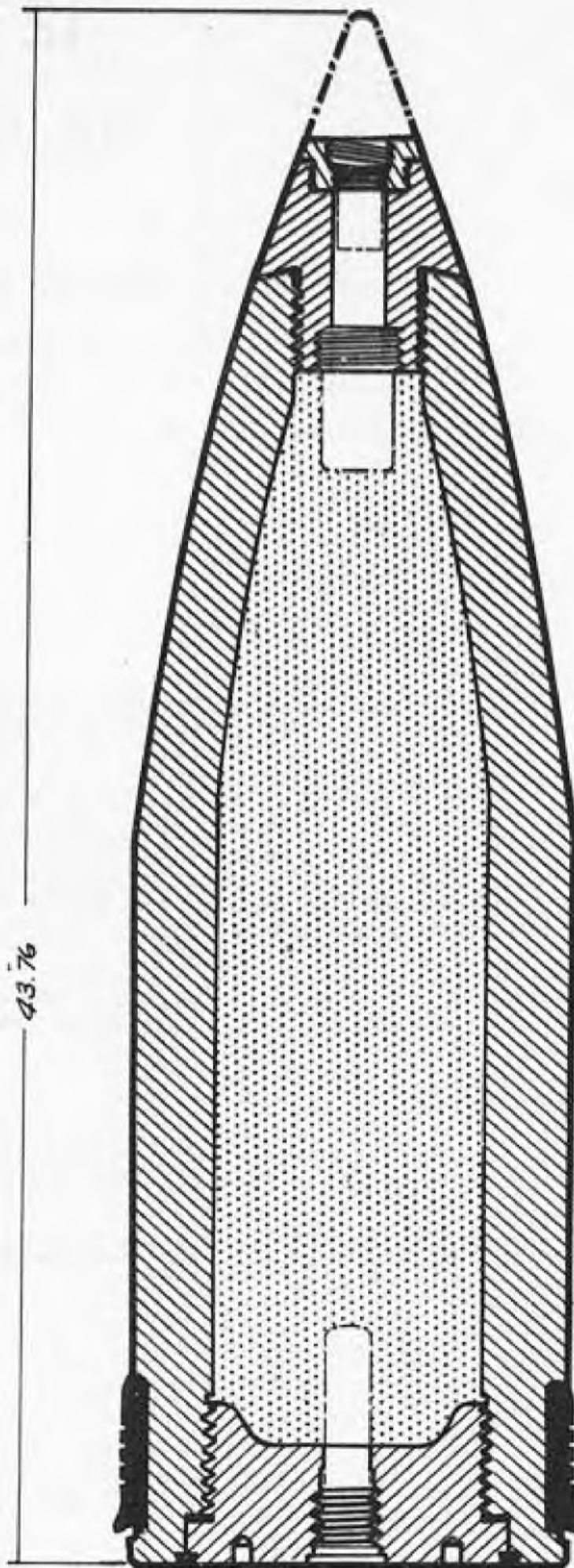
**DATA**~~SECRET~~**U. S. NAVY****12" AP****MK. 18 MOD I**

GUNS USED IN: 12"/50

OVERALL LENGTH	
With Cap & Windshield	54.00 in.
Without Cap & Windshield	38.39 in.
DIAMETER OF BASE	11.977 in.
DISTANCE - BASE TO BAND	3.10 in.
WIDTH OF BAND	4.0 in.
DIAMETER AT BOURRELET	11.977 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	17.4 lbs.
WEIGHT OF LOADED PROJECTILE	1140 lbs.
CHARGE/WEIGHT RATIO	1.52 %
CARTRIDGE CASE	Bag gun
PRIMER	Mk 15 Mod 1
TRACER	Mk 5
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 21 Mod 0 & 1. (B.D.F.)

**REMARKS:**

- (a) Marking and painting of this projectile are as described in the Introduction.
- (b) The windshield is threaded to the A.P. cap and held in place by five equally spaced notches which are staked. The A.P. cap weights 110.98 lbs. and is soldered to the nose. In addition to the solder the cap is also secured by seven crimp caps equally spaced on the periphery of the nose.



**12" H.C. PROJECTILE  
MK. 16**

# DATA

U. S. NAVY  
12" HC

MK. 16, MOD. 1, 2

GUNS USED IN: 12"/50

OVERALL LENGTH  
    With Nose Fuze 43.76 in.  
    Without Nose Fuze 40.285 in.

DIAMETER OF BASE 11.977 in.

DISTANCE - BASE TO BAND 1.0 in.

WIDTH OF BAND 4.0 in.

DIAMETER AT BOURRELET 11.977 in.

TYPE OF FILLING Explosive D

WEIGHT OF FILLING 58.20 lbs.

WEIGHT OF LOADED PROJECTILE 740 lbs.

CHARGE/WEIGHT RATIO 7.86%

CARTRIDGE CASE Bag gun

PRIMER Mk 15 Mod 1

TRACER Mk 5 Mod 1

## FUZES WHICH MAY BE USED IN PROJECTILE:

Base: Mk 28 "green stripe" (B.D.F.)  
      Mk 39 Mods 0 & 1. (B.D.F.)  
      Mk 48 Mods 0 & 1. (B.D.F.)

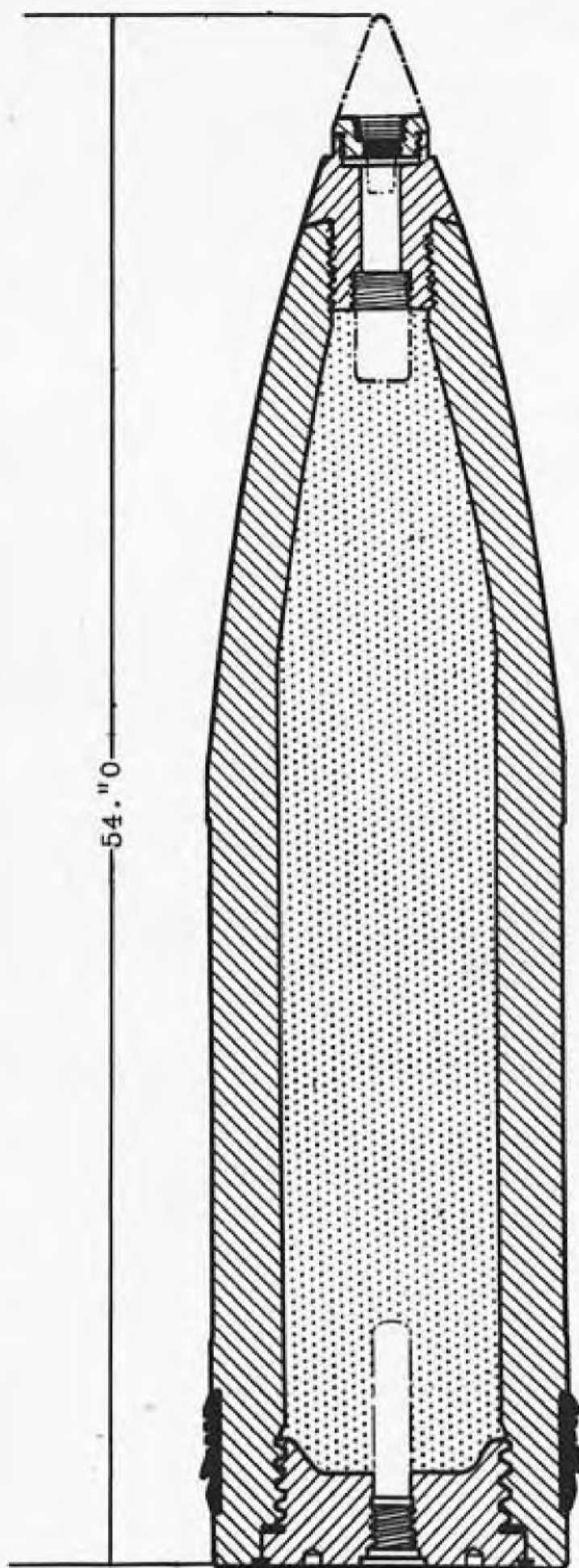
Nose: Mk 29 Mods 1, 2, & 3. (P.D.F.)  
      Mk 42 Mod 0. (M.T.F.)  
      Mk 62 Mod 0. (M.T.F.)

Auxiliary Mk 17 Mod 8 "green stripe".  
Detonating Mk 35 Mod 0.  
Fuze: Mk 55 Mod 0.

Booster Mk 5, or a special 0.53 lb. pressed T.N.T. booster, is also used under the auxiliary detonating fuze.

## REMARKS:

- (1) The Mk 39 base fuze replaces the special "green stripe" Mk 28; the Mk 35 auxiliary detonating fuze replaces the special "green stripe" Mk 17 Mod 8 fuze.
- (2) For method of marking and painting, see Introduction.



**12" H.C. PROJECTILE  
MK. 17**

**DATA**~~CONFIDENTIAL~~**U. S. NAVY****12" HC****MK.17, MOD.1**

GUNS USED IN: 12"/50

OVERALL LENGTH  
 With Nose Fuze 54.0 in.  
 Without Nose Fuze 50.18 in.

DIAMETER OF BASE 11.977 in.

DISTANCE - BASE TO BAND 3.1 in.

WIDTH OF BAND 4.0 in.

DIAMETER AT BOURRELET 11.977 in.

TYPE OF FILLING Explosive D

WEIGHT OF FILLING 79.44 lbs.

WEIGHT OF LOADED PROJECTILE 940 lbs.

CHARGE/WEIGHT RATIO 8.45%

CARTRIDGE CASE Bag gun

PRIMER Mk 15 Mod 1

TRACER Mk 5 Mod 1

FUZES WHICH MAY BE USED  
IN PROJECTILE:

Base: Mk 28 "green stripe". (B.D.F.)  
 Mk 39 Mods 0 & 1. (B.D.F.)  
 Mk 48 Mods 0 & 1. (B.D.F.)

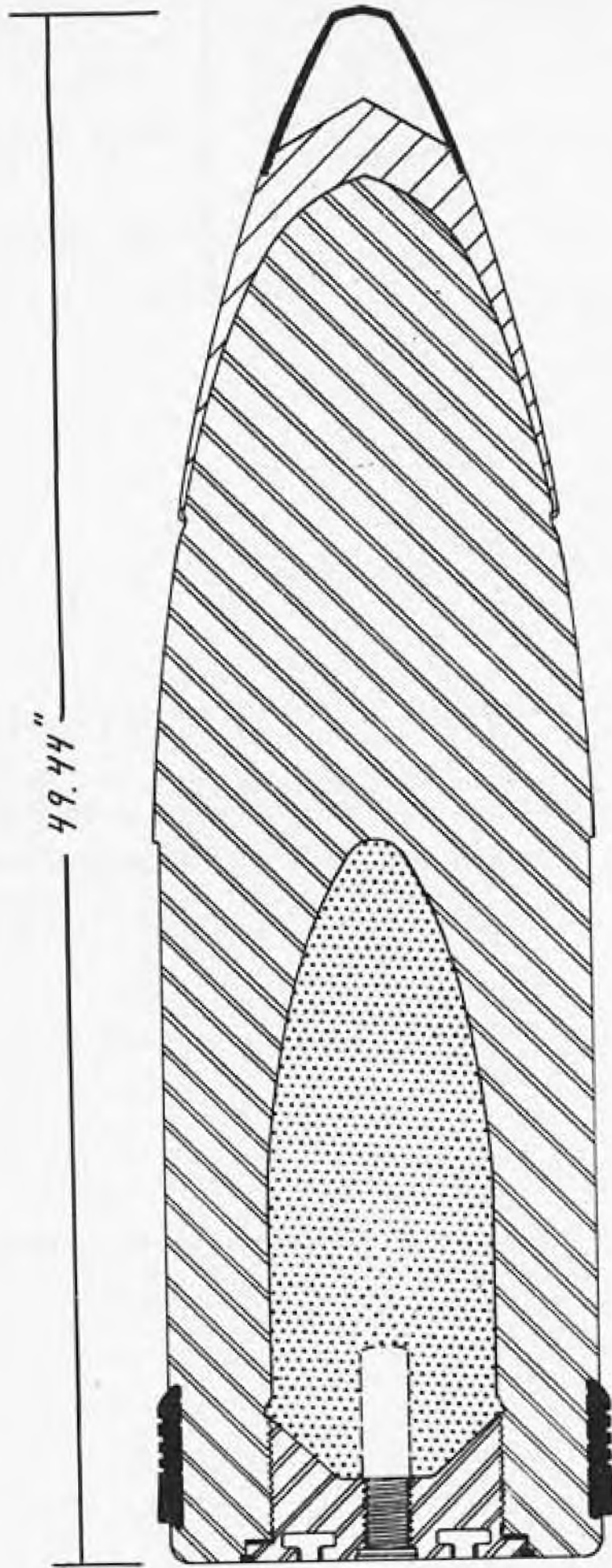
Nose: Mk 29 and Mods 1, 2, & 3. (P.D.F.)  
 Mk 42 Mod 0. (M.T.F.)  
 Mk 62 Mod 0. (M.T.F.)  
 Steel Nose Plug.

Auxiliary Mk 17 Mod 8 "green stripe".  
 Detonating Mk 35 Mod 0.  
 Fuze: Mk 55 Mod 0.

Mk 5 booster, or special 0.53 lb. pressed T.N.T. booster,  
 is used under the auxiliary detonating fuze.

## REMARKS:

- (a) The Mk 39 base fuze replaces the original special "green stripe" fuze Mk 28; the Mk 35 auxiliary detonating fuze replaces the original special "green stripe" fuze Mk 17 Mod 8.
- (b) For method of marking and painting, see Introduction.



14" A.P. PROJECTILE  
MK. 8

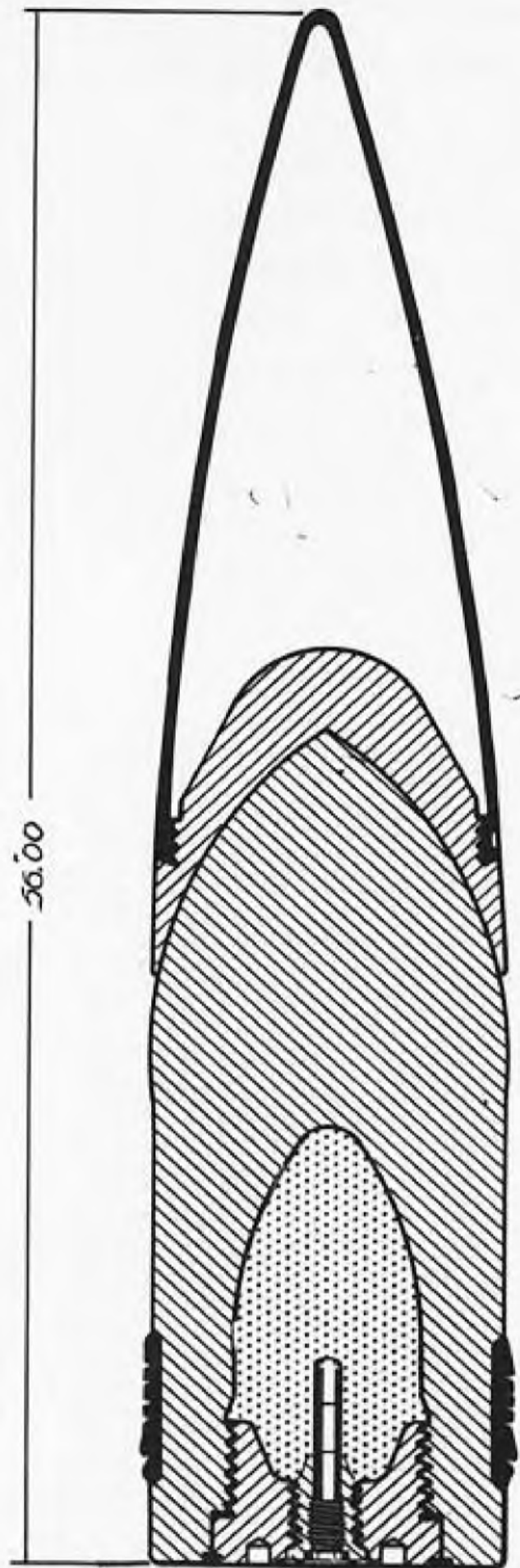
**DATA**~~CONFIDENTIAL~~**U.S. NAVY**

OVERALL LENGTH 49.44 in.  
Without Cap & Windshield 41.92 in.  
DIAMETER OF BASE 13.94 in.  
DISTANCE - BASE TO BAND 1.0 in.  
WIDTH OF BAND 4.66 in.  
DIAMETER AT BOURRELET 13.977 in.  
TYPE OF FILLING Explosive D  
WEIGHT OF FILLING 34.30 lbs.  
WEIGHT OF LOADED PROJECTILE 1402 lbs.  
CHARGE/WEIGHT RATIO 2:1 $\frac{5}{8}$   
CARTRIDGE CASE Bag Gun  
PRIMER Mk 15 Mod 1  
TRACER Mk 5  
FUZES WHICH MAY BE USED IN PROJECTILE Base: Mk 21 Mods 0- & 1. (B.D.F.)

**14" A.P.****MK. 8 MODS. 3, 7, 8, & 11**Guns Used In: 14"/45  
14"/50**REMARKS:**

- (a) A special adapter with 1 $\frac{5}{8}$  diameter outside threads is required to fit Mk 21 base fuzes in these projectiles.
- (b) The Mod 7 projectile may also issued BL & P or BL & T with adapter and Mk 5 Mod 1 tracer for target practice.
- (c) For method of marking and painting, see Introduction.

CONFIDENTIAL



**14" A.P. PROJECTILE  
MK.16**

**DATA**~~CONFIDENTIAL~~**U. S. NAVY****14" AP****M K. 16 MODS. 1-10**GUNS USED IN: 14"/45  
14"/50

OVERALL LENGTH	
With Cap & Windshield	56.00 in.
Without Cap & Windshield	36.72 in.
DIAMETER OF BASE	13.977 in.
DISTANCE - BASE TO BAND	3.46 in.
WIDTH OF BAND	4.66 in.
DIAMETER AT BOURRELET	13.977 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	22.90 lbs.
WEIGHT OF LOADED PROJECTILE	1500 lbs.
CHARGE/WEIGHT RATIO	1.5%
CARTRIDGE CASE	Bag gun
PRIMER	Mk 15 Mod 1
TRACER	Mk 5
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 21 Mods 0 & 1. (B.D.F.)

**REMARKS:**

(a) Marking and painting of this projectile are as described in the Introduction.



# 14" A.P. PROJECTILE MK. 20

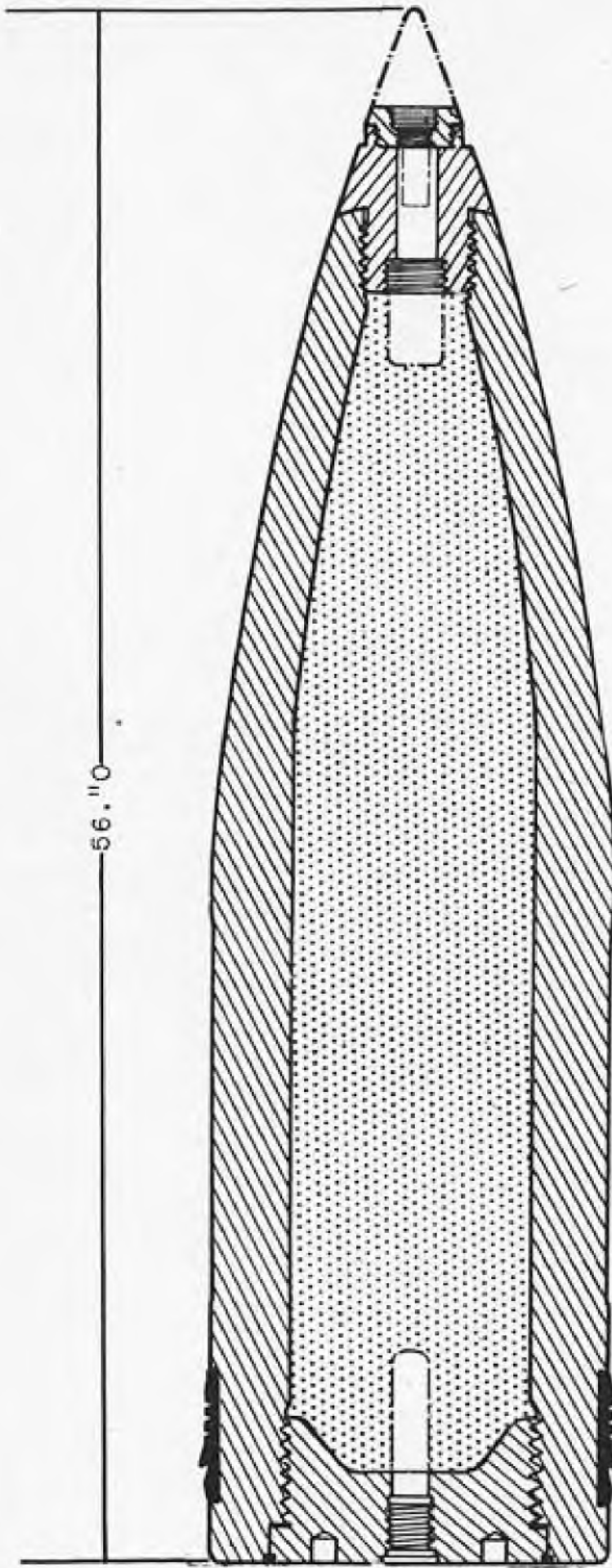
**DATA**~~CONFIDENTIAL~~**U. S. NAVY****14" AP****MK.20 MOD I**

GUNS USED IN: 14"/45

OVERALL LENGTH	54.38 in.
With Cap & Windshield	
Without Cap & Windshield	
DIAMETER OF BASE	13.977 in.
DISTANCE - BASE TO BAND	3.46 in.
WIDTH OF BAND	4.66 in.
DIAMETER AT BOURRELET	13.977 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	22.90 lbs.
WEIGHT OF LOADED PROJECTILE	1500 lbs.
CHARGE/WEIGHT RATIO	1.5 %
CARTRIDGE CASE	Bag gun
PRIMER	Mk 15 Mod 1
TRACER	Mk 5
FUZES WHICH MAY BE USED IN PROJECTILE	Mk 21 Mods 0 & 1. (B.D.F.)

**REMARKS:**

- (a) This projectile is used only on BB New York and Texas. It is the same as the Mk 16 Mod 8 except for a shortened windshield.
- (b) Marking and painting of this projectile are as described in the Introduction.



**14" H.C. PROJECTILE  
MK. 19**

# DATA

# U. S. NAVY 14" HC MK.19, MOD. I-5

OVERALL LENGTH  
With Nose Fuze 56.0 in.  
Without Nose Fuze 52.18 in.

DIAMETER OF BASE 13.977 in.

DISTANCE - BASE TO BAND 3.46 in.

WIDTH OF BAND 4.66 in.

DIAMETER AT BOURRELET 13.977 in.

TYPE OF FILLING Explosive D

WEIGHT OF FILLING 104.21 lbs.

WEIGHT OF LOADED PROJECTILE 1275 lbs.

CHARGE/WEIGHT RATIO 8.01%

CARTRIDGE CASE None

PRIMER Mk 15 Mod 1

TRACER Mk 5 Mod 1

GUNS USED IN: 14"/45  
14"/50

## FUZES WHICH MAY BE USED IN PROJECTILE:

Base: Mk 28 "green stripe". (B.D.F.)  
Mk 39 Mods 0 & 1. (B.D.F.)  
Mk 48 Mods 0 & 1. (B.D.F.)

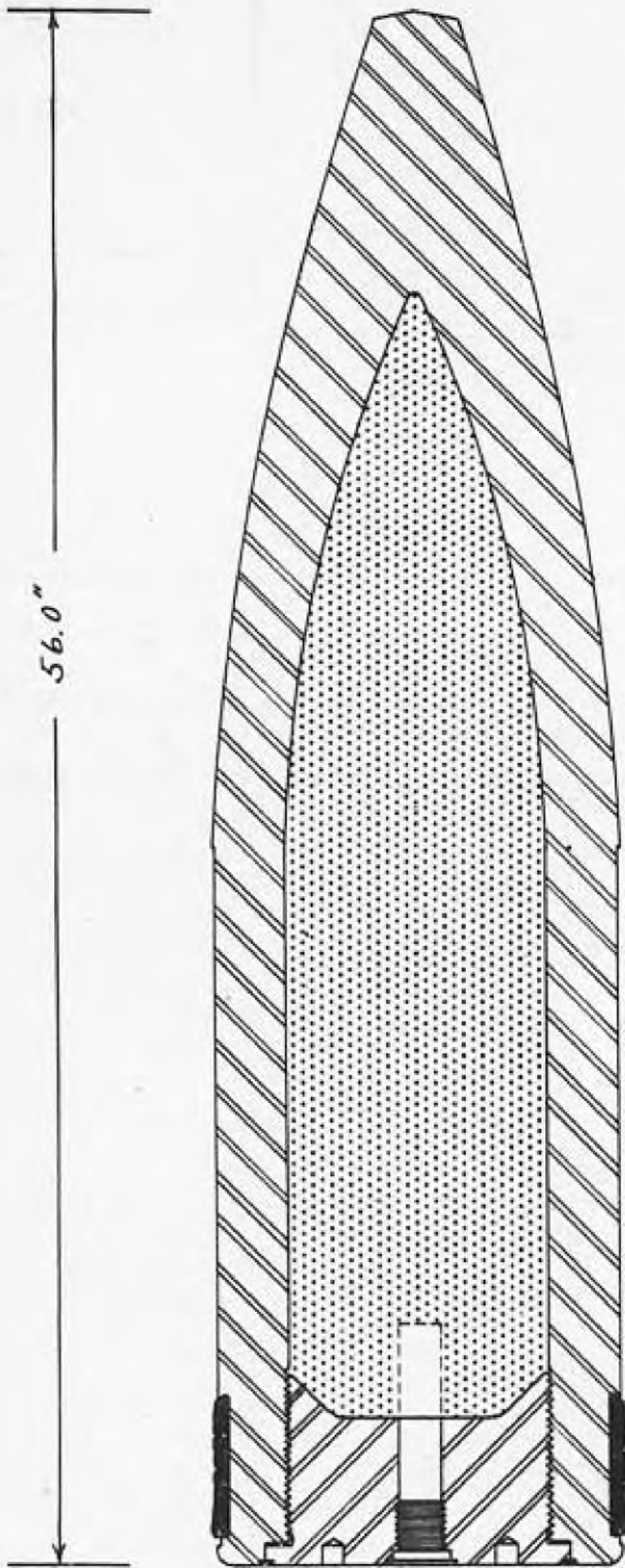
Nose: Mk 29 Mods 1, 2, & 3. (P.D.F.)  
Mk 42 Mod 0. (M.T.F.)  
Mk 62 Mod 0. (M.T.F.)  
Steel Nose Plug.

Auxiliary Detonating Fuze: Mk 17 Mod 8 "green stripe".  
Mk 35 Mod 0.  
Mk 55 Mod 0.

Booster Mk 5, or a special 0.53 lb. pressed T.N.T. booster, will be used under the auxiliary detonating fuze.

## REMARKS:

- (a) The Mk 39 base fuze replaces the original special "green stripe" Mk 21; the Mk 35 replaces the special "green stripe" Mk 17 Mod 8 auxiliary detonating fuze.
- (b) Projectile Mk 19 Mod 1 only is suitable for use in 14"/45 guns on U.S.S. New York and Texas.
- (c) For method of marking and painting, see Introduction.



14" BBT. PROJECTILE  
MK.9

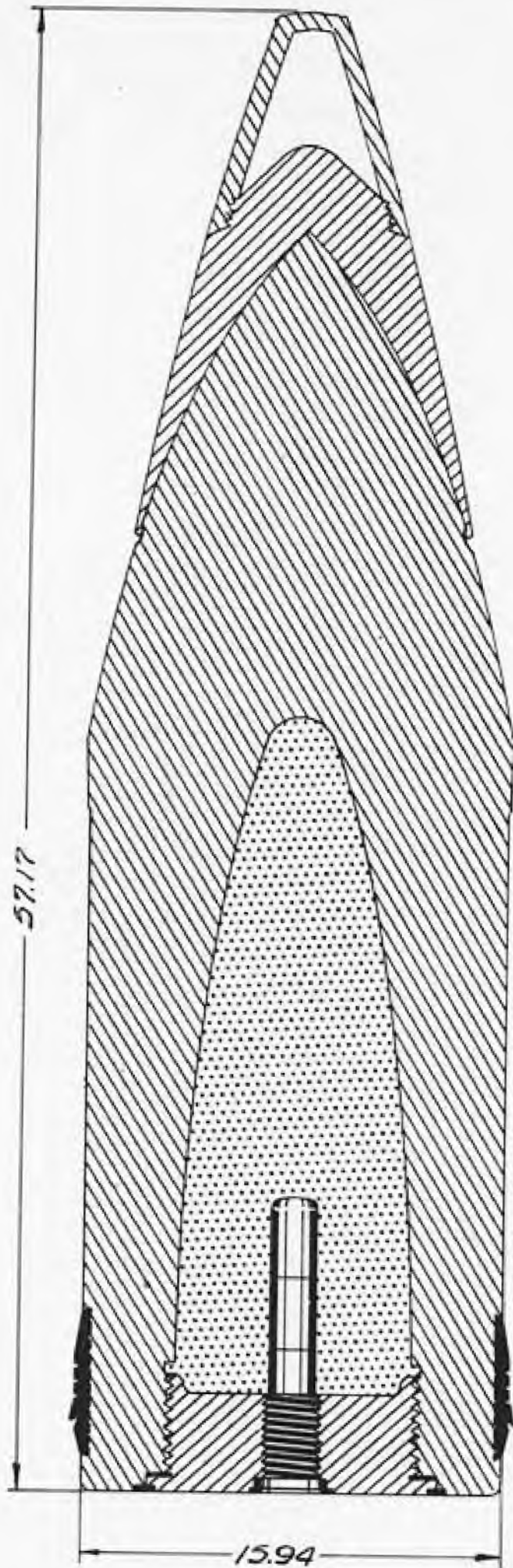
**DATA****U.S. NAVY****14" BBT.****MK. 9**Guns Used In: 14"/45  
14"/50

OVERALL LENGTH	56.0 in.
DIAMETER OF BASE	13.94 in.
DISTANCE - BASE TO BAND	1.0 in.
WIDTH OF BAND	4.66 in.
DIAMETER AT BOURRELET	13.977 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	105 lbs.
WEIGHT OF LOADED PROJECTILE	1410 lbs.
CHARGE/WEIGHT RATIO	7.44%
CARTRIDGE CASE	Bag Gun
PRIMER	Mk 15 Mod 1
TRACER	Mk 5, Mk 5 Mod 1
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 28 and all Mods. (B.D.F.)

**REMARKS:**

- (a) The Mk 28 base fuze replaces the previously used Mk 3 Mod 2 base fuze with integral tracer.
- (b) For method of marking and painting, see Introduction.

CONFIDENTIAL



**16" A.P. PROJECTILE  
MK. 3**

**DATA**~~CONFIDENTIAL~~**U. S. NAVY****16" AP****MK.3 MODS. 2,3,4,5**

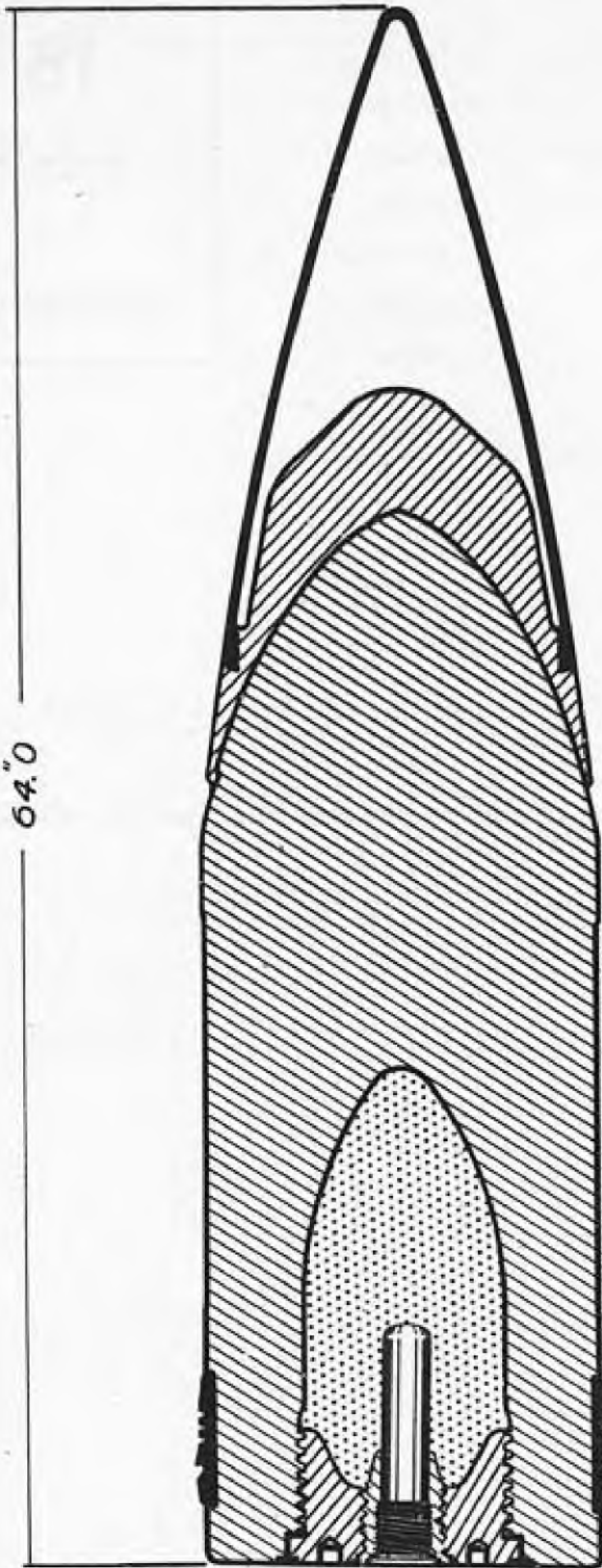
GUNS USED IN: 16"/45

OVERALL LENGTH	56.5 in.
With Cap & Windshield	
Without Cap & Windshield	
DIAMETER OF BASE	15.94 in.
DISTANCE - BASE TO BAND	3.03 in.
WIDTH OF BAND	5.30 in.
DIAMETER AT BOURRELET	15.977 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	57.5 lbs.
WEIGHT OF LOADED PROJECTILE	2110 lbs.
CHARGE/WEIGHT RATIO	2.74 %
CARTRIDGE CASE	None
PRIMER	Mk 15 Mod 1
TRACER	Mk 5

FUZES WHICH MAY BE USED  
IN PROJECTILE                      Base: Mk 21 Mods 0 & 1. (B.D.F.)

**REMARKS:**

- (a) This projectile was originally issued without windshield, but has since been modified.
- (b) The Mk 3 Mod 2 projectile has been declared unserviceable until caps and windshields have been modified.
- (c) Mods 2 & 3 may be blind loaded and plugged or traced with the Mk 5 Mod 1 tracer for target practice.
- (d) For method of marking and painting, see Introduction.



**16" A.P. PROJECTILE  
MK. 5**

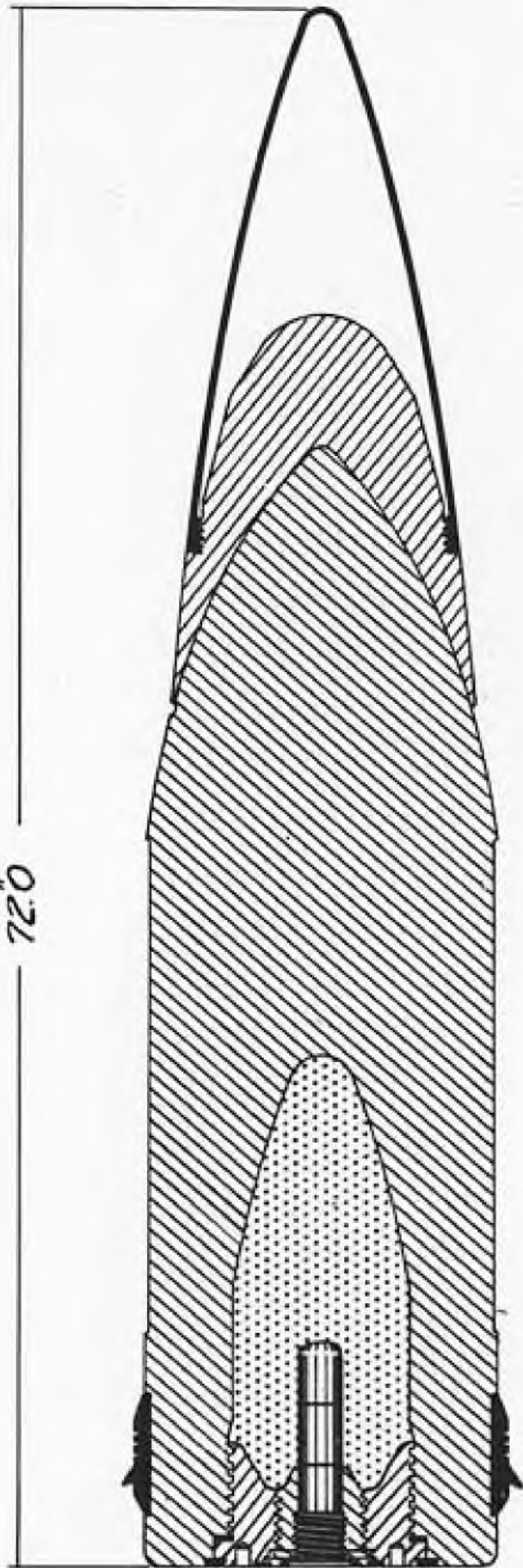
**DATA**~~CONFIDENTIAL~~**U. S. NAVY****16" AP****MK.5 MODS. 1-5**

GUNS USED IN: 16"/45

OVERALL LENGTH	
With Cap & Windshield	64.0 in.
Without Cap & Windshield	43.387 in.
DIAMETER OF BASE	15.977 in.
DISTANCE - BASE TO BAND	4.03 in.
WIDTH OF BAND	5.32 in.
DIAMETER AT BOURRELET	15.977 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	34.0 lbs.
WEIGHT OF LOADED PROJECTILE	2240 lbs.
CHARGE/WEIGHT RATIO	1.5%
CARTRIDGE CASE	Bag Gun
PRIMER	Mk 15 Mod 1
TRACER	Mk 5
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 21 Mods 0 & 1. (B.D.F.)

**REMARKS:**

(a) For method of marking and painting, see Introduction.



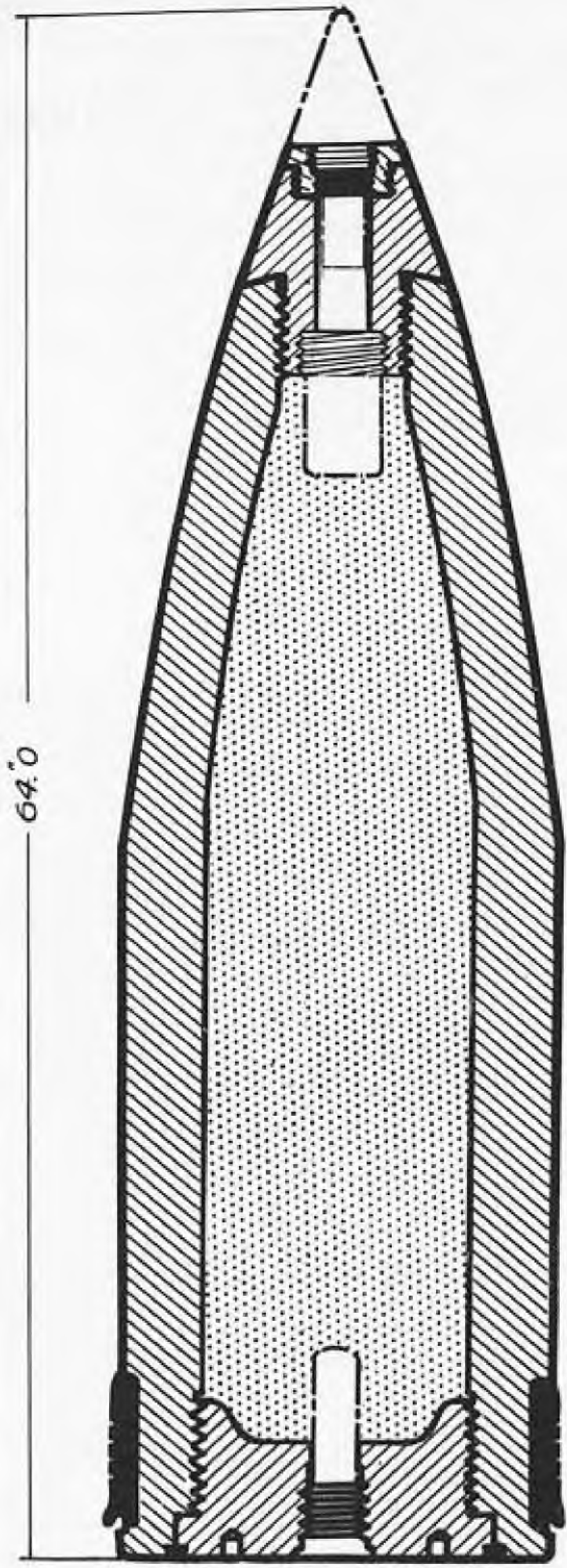
# 16" A.P. PROJECTILE MK. 8

**DATA**~~CONFIDENTIAL~~**U. S. NAVY****16" AP****MK. 8 MODS. 1-6**GUNS USED IN: 16"/45  
16"/50

OVERALL LENGTH	
With Cap & Windshield	72.0 in.
Without Cap & Windshield	51.6 in.
DIAMETER OF BASE	15.977 in.
DISTANCE - BASE TO BAND	4.03 in.
WIDTH OF BAND	5.32 in.
DIAMETER .T BOURRELET	15.977 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	40.90 lbs.
WEIGHT OF LOADED PROJECTILE	2700 lbs.
CHARGE/WEIGHT RATIO	1.5%
CARTRIDGE CASE	None
PRIMER	Mk 15 Mod 1
TRACER	Mk 5
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 21 Mods 0 & 1. (B.D.F.)

**REMARKS:**

- (a) Marking and painting of this projectile are as described in the Introduction.



**16" H.C. PROJECTILE  
MK. 13**

**DATA****U. S. NAVY****16" HC****MK.13 MODS.1,2,3**GUNS USED IN: 16"/45  
16"/50

OVERALL LENGTH  
With Nose Fuze 64.0 in.  
Without Nose Fuze 60.18 in.

DIAMETER OF BASE 15.977 in.

DISTANCE - BASE TO BAND 4.03 in.

WIDTH OF BAND 5.32 in.

DIAMETER AT BOURRELET 15.977 in.

TYPE OF FILLING Explosive D

WEIGHT OF FILLING 153.6 lbs.

WEIGHT OF LOADED PROJECTILE 1900 lbs.

CHARGE/WEIGHT RATIO 8.08%

CARTRIDGE CASE None

PRIMER Mk 15 Mod 1

TRACER Mk 5 Mod 1

FUZES WHICH MAY BE USED  
IN PROJECTILE:

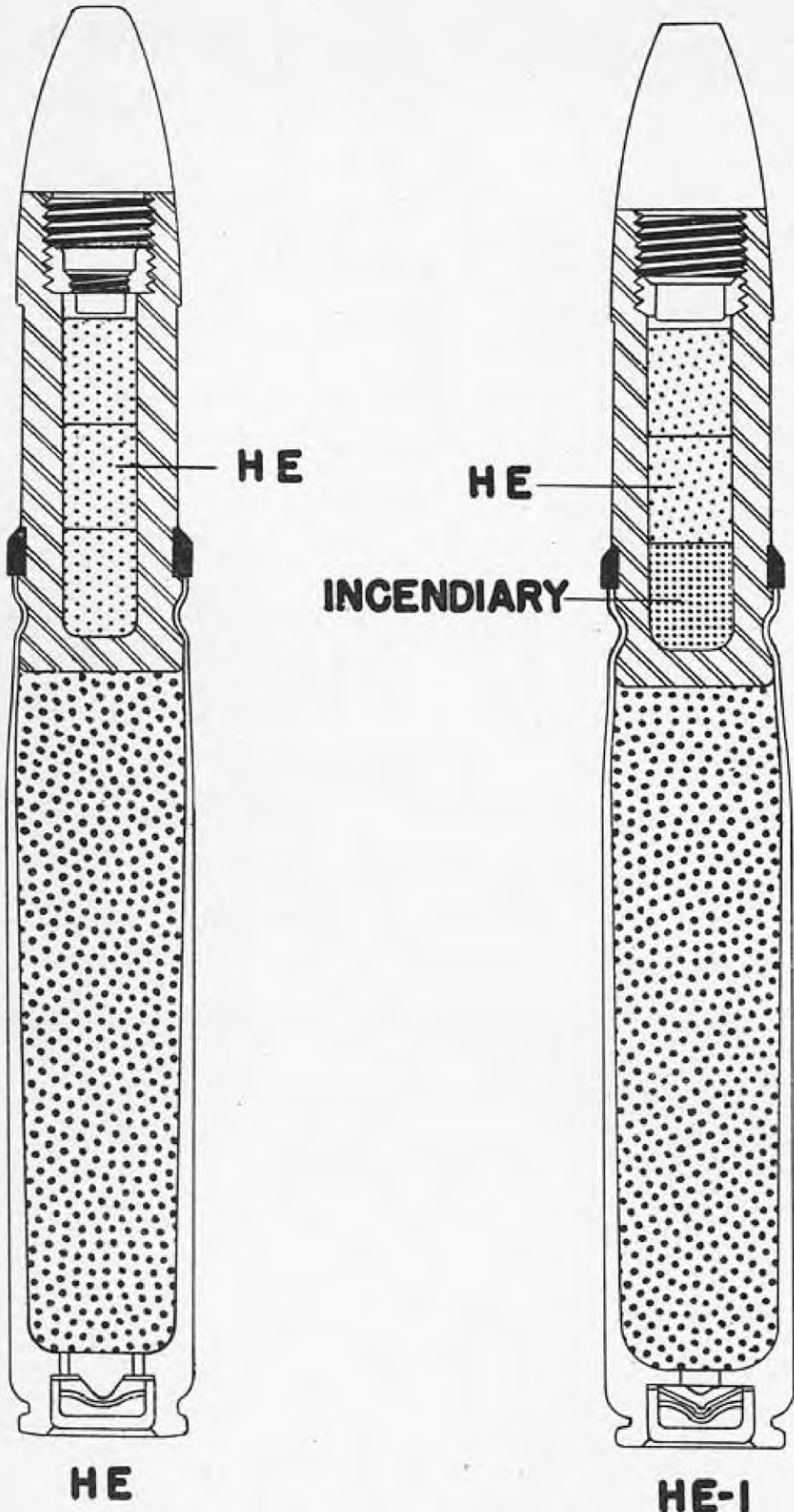
Base: Mk 28 "green stripe". (B.D.F.)  
Mk 39 Mods 0 & 1. (B.D.F.)  
Mk 48 Mods 0 & 1. (B.D.F.)

Nose: Mk 29 Mods 1, 2, & 3. (P.D.F.)  
Mk 42 Mod 0. (M.T.F.)  
Mk 62 Mod 0. (M.T.F.)  
Steel Nose Plug.

Auxiliary Mk 17 Mod 8 "green stripe".  
Detonating Mk 35 Mod 0.  
Fuze: Mk 55 Mod 0.

## REMARKS:

- (a) Booster Mk 5, or a special 0.53 lb. pressed T.N.T. booster, will be used under the auxiliary detonating fuze.
- (b) This projectile is normally issued with an A.P. nose plug.
- (c) The Mk 13 Mod 1 H.C. projectile was originally issued as the 16" E.X.-1.
- (d) The Mk 39 fuze replaces the original special "green stripe" Mk 28 base fuze; the Mk 35 auxiliary detonating fuze replaces the original special "green stripe" Mk 17 Mod 8.
- (e) For method of marking and painting, see Introduction.



**20MM A.A. MK.3**

**DATA****U.S. NAVY****20 MM A.A.****HE****HE-I****MK-3**

OVERALL LENGTH - With Nose Fuze 3.275 in.  
 Without Nose Fuze 2.625 in.  
 DIAMETER OF BASE 0.74 in.  
 DISTANCE - BASE TO BAND 0.374 in.  
 WIDTH OF BAND 0.16 in.  
 DIAMETER AT BOURRELET 0.78 in.

TYPE & WEIGHT OF FILLING HE: .0243 lbs. Tetryl or Pentolite.  
HE-I: .0072 lbs. Incendiary Mix; .0171 lbs. Tetryl or Pentolite.

WEIGHT OF LOADED PROJECTILE 0.2714 lbs.

CHARGE/WEIGHT RATIO 8.9%

CARTRIDGE CASE HE: Mk 2; HE-I: Mks. 2,3, or 4.

PRIMER HE: Mk 30; HE-I: Mks 30 or 31.

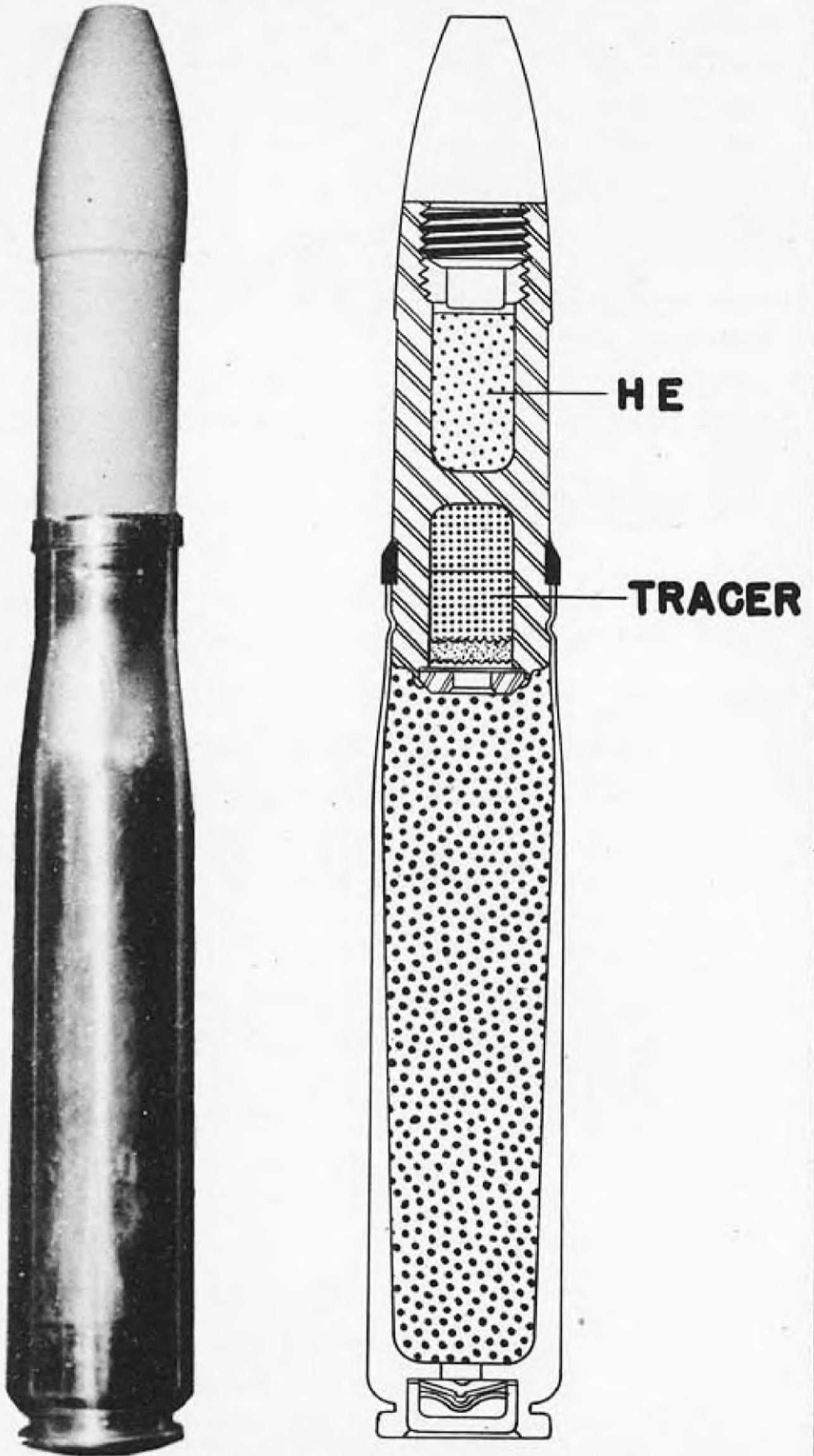
TRACER None

FUZES WHICH MAY BE USED IN PROJECTILE Nose: Mk 26 Mods 0 & 1. (P.D.F.)

**REMARKS:**

- (a) The explosive filling of the HE projectile is press-loaded in three equal increments. The HE-I projectile is similarly loaded, but the first increment consists of an incendiary mixture, the other two of HE (either tetryl or pentolite).
- (b) This round is also issued BL & P, with an inert filler and a dummy nose cap.
- (c) Identification - Marking and Painting:

<u>Projectile Type</u>	<u>Projectile Color</u>
HE (Tetryl)	White
HE (Pentolite)	Yellow
HE-I (Tetryl)	Red
HE-I (Pentolite)	Light Pink
BL & P	Dark Gray Green



**20MM A.A. MK. 7**

**HE-T**

**DATA**~~RESTRICTED~~**U.S. NAVY****20MM A.A.****HE-T****MK. 4, 7**

	<u>Mark 4</u>	<u>Mark 7</u>
OVERALL LENGTH	3.025"	3.025"
Without nose fuze	2.525"	2.525"
DIAMETER OF BASE	0.74"	0.74"
DISTANCE - BASE TO BAND	0.397"	0.397"
WIDTH OF BAND	0.16"	0.16"
DIAMETER AT BOURRELET	0.78"	0.78"
TYPE OF FILLING	Tetryl or Pentolite	
WEIGHT OF FILLING - HE:	.01 lbs.	.01 lbs.
TRACER:	.0173 lbs.	.0147 lbs.
WEIGHT OF LOADED PROJECTILE	.2621 lbs.	.2714 lbs.

CHARGE/WEIGHT RATIO

CARTRIDGE CASE	Mk 2	Mks 2,3, or 4
PRIMER	Mk 30	Mk 31
TRACER	Integral	Integral
FUZES WHICH MAY BE USED IN PROJECTILE	Nose: Mk 4 projectile - Mk 26 Mods 0 or 2 (P.D.F.) Mk 7 projectile - Mk 26 Mods 0 or 1 (P.D.F.)	

LENGTH OF TRACER CAVITY	1.107"	1.062"
DIAMETER OF TRACER CAVITY	0.51"	0.47"

REMARKS:

- (a) The Mk 4 and Mk 7 rounds are identical except for the dimensions of the tracer cavity, which is slightly greater in diameter and length in the Mk 4 than in the Mk 7. This somewhat reduces the tracer filling of the Mk 7.
- (b) The Mk 7 round is also issued BL & T with an inert filler in the HE cavity and a dummy nose plug. The tracer cavity contains the standard tracer mixture.
- (c) The burster charge of the 20 mm is more sensitive than the usual projectile burster charge. Accordingly, greater caution should be observed in handling.
- (d) The tracer element in these projectiles is loaded in two increments: (1) First increment is the tracer composition which is pressed in the after compartment by hydraulic pressure; (2) The second increment is the "starter" mixture which is pressed in on top of the tracer composition and is more sensitive than the latter. When the projectile is fired, the heat from the propellant charge ignites the starter which, in turn, sets off the tracer composition.

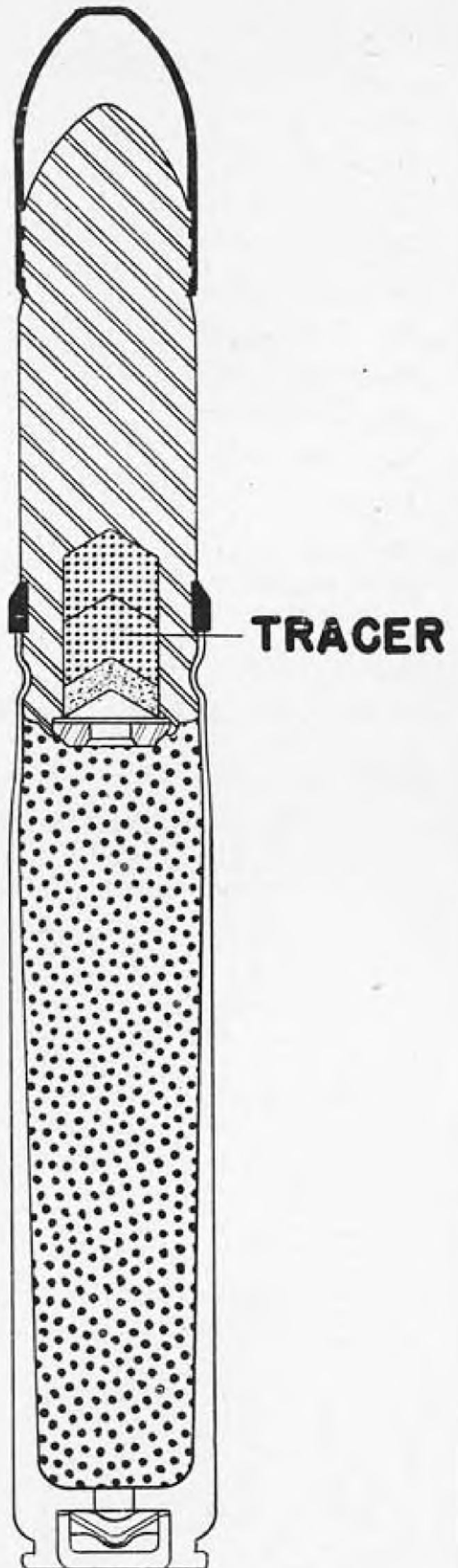
- (e) Identification - Marking and Painting:

<u>Projectile Type</u>	<u>Projectile Color</u>
*HE-T (Tetryl)	Light Gray
*HE-T (Pentolite)	Blue
BL & T	Dark Gray Green, with 1/8" Yellow Band.

\* When assembled with "Dark Ignition" tracers, a 1/8" bright red band will be painted around the projectile midway between the bourrelet and the rotating band.

- (f) To eliminate the blinding flash characteristic of standard 20 mm tracers when fired at night, a special "Dark Ignition" tracer has been developed which does not light up until about 100 yds from the gun muzzle. Rounds are designated "HE-T-DI".

RESTRICTED



**20MM A.A. MK.9  
AP-T**

# DATA

U. S. NAVY

20 MM A. A.

AP-T

MK. 9

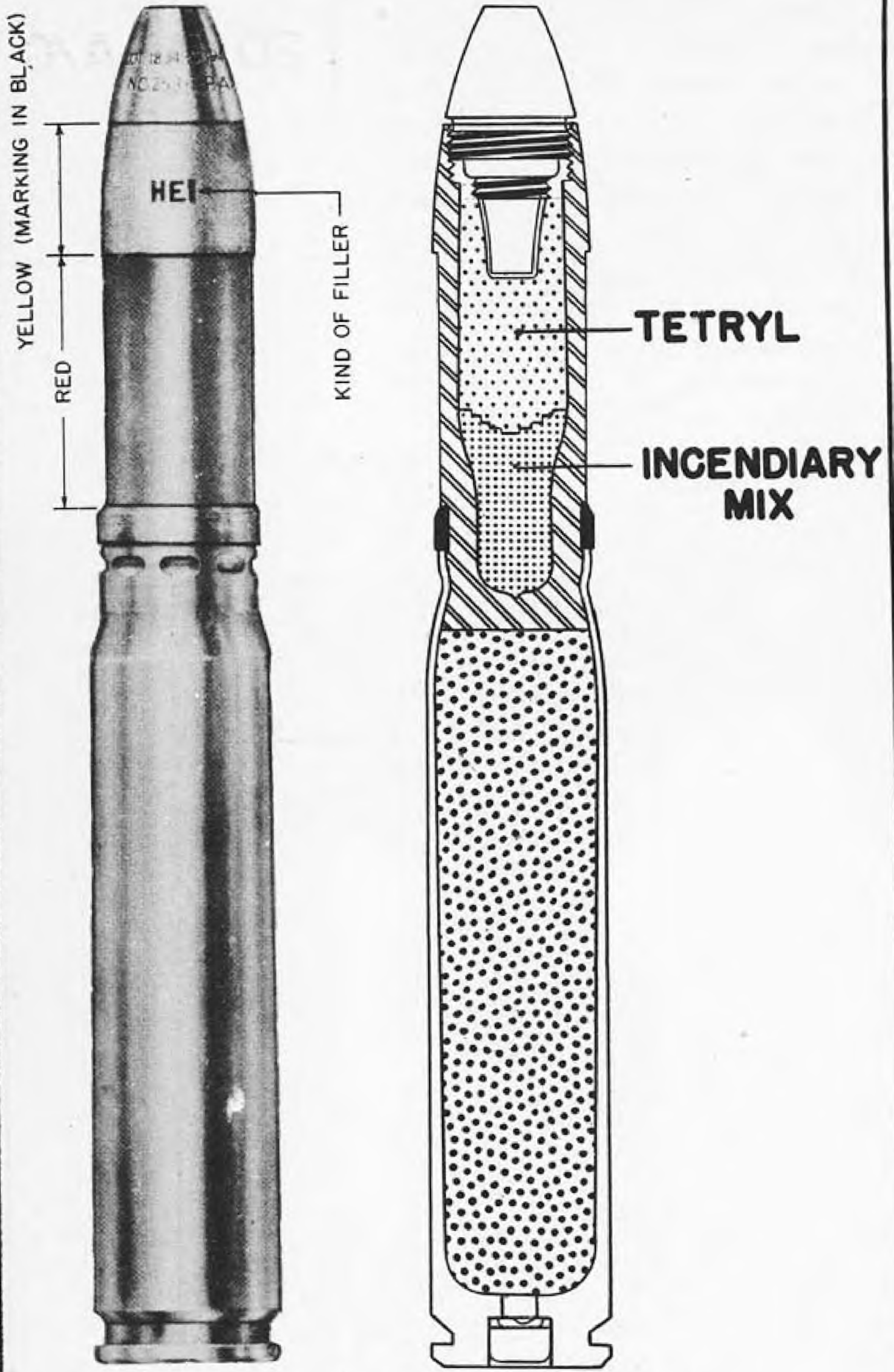
OVERALL LENGTH	
With Cap & Windshield	3.051 in.
Without Cap & Windshield	2.449 in.
DIAMETER OF BASE	0.742 in.
DISTANCE - BASE TO BAND	0.315 in.
WIDTH OF BAND	0.154 in.
DIAMETER .T BOURRELET	0.784 in.
TYPE OF FILLING	None
WEIGHT OF FILLING	
WEIGHT OF LOADED PROJECTILE	0.2686 lbs.
CHARGE/WEIGHT RATIO	
CARTRIDGE CASE	Mks 3 & 4
PRIMER	Mk 31
TRACER	Integral
FUZES WHICH MAY BE USED IN PROJECTILE	None

## REMARKS:

(a) This is an AP projectile, without burster charge. Therefore, no fuze is employed.

(b) Identification - Marking & Painting:

<u>Projectile Type</u>	<u>Projectile Color</u>
AP-T	Black



**20 MM A/C MK. I**  
**HE-I**

**DATA**~~RESTRICTED~~**U.S. ARMY****20 MM. A/C  
HE-I****MK. I**

(Old Series)

OVERALL LENGTH	3.22 in.
DIAMETER OF BASE	0.770 in.
DISTANCE - BASE TO BAND	0.50 in.
WIDTH OF BAND	0.203 in.
DIAMETER AT BOURRELET	0.784 in.
TYPE OF FILLING	Tetryl & Incendiary Mix
WEIGHT OF FILLING	0.025 lbs.
WEIGHT OF LOADED PROJECTILE	0.290 lbs.
CHARGE/WEIGHT RATIO	
CARTRIDGE CASE	M21A1
PRIMER	M36
TRACER	None
FUZES WHICH MAY BE USED IN PROJECTILE	No. 253 Mk I (P.D.F.)

**REMARKS:**

(a) This round is to be superseded by the HE-I, M97 round of the new ballistically matched series. The HE-I Mk I round is to be classified "UNSERVICEABLE" by Naval activities as soon as replacement allowances or stocks of the M97 round are received.

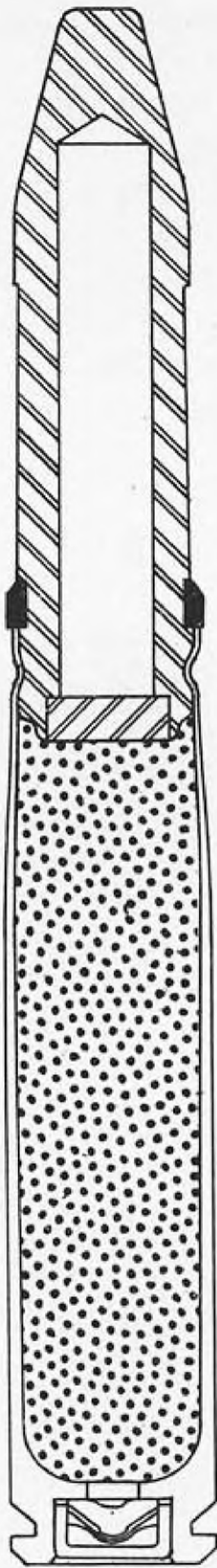
(b) Identification - Marking & Painting:

Projectile Type

HE-I, Mk I

Projectile Color

Body - Red  
 Bourrelet - Yellow  
 Fuze - Unpainted Brass  
 Stencilling in Black



**20MM A/C MK.1  
BALL**

**DATA**~~RESTRICTED~~**U.S. ARMY****20MM. A/C  
BALL****MK. I**

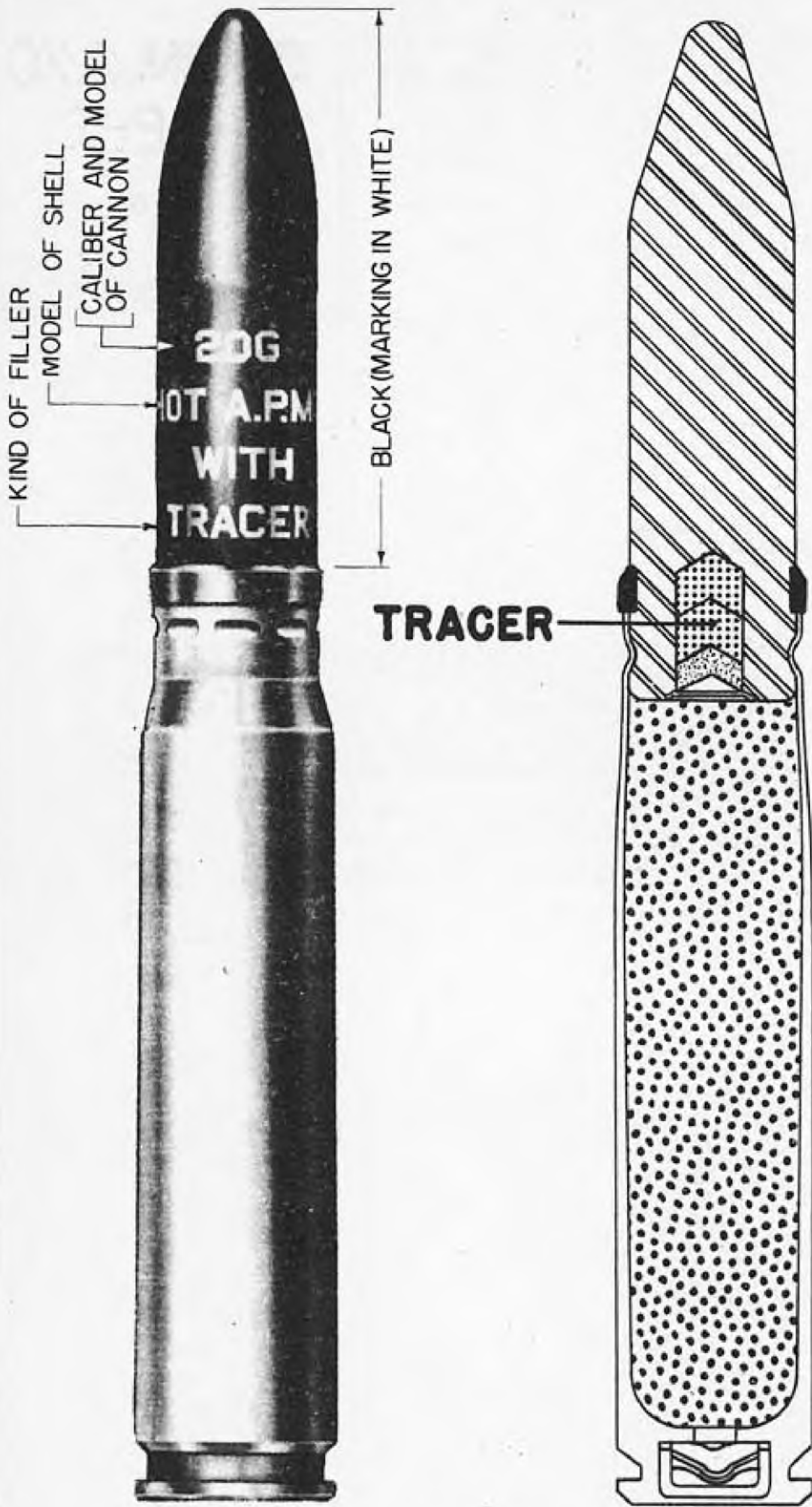
(Old Series)

OVERALL LENGTH	3.31 in.
DIAMETER OF BASE	0.770 in.
DISTANCE - BASE TO BAND	0.50 in.
WIDTH OF BAND	0.203 in.
DIAMETER AT BOURRELET	0.784 in.
TYPE OF FILLING	None
WEIGHT OF FILLING	
WEIGHT OF LOADED PROJECTILE	0.28 lbs.
CHARGE/WEIGHT RATIO	
CARTRIDGE CASE	M21A1
PRIMER	M36
TRACER	None
FUZES WHICH MAY BE USED IN PROJECTILE	None

**REMARKS:**

- (a) This round is to be superseded by the Practice round M99 of the new ballistically matched series. The Ball Mk I round is to be classified "UNSERVICABLE" by Naval activities as soon as replacement allowances or stocks of the M97 round are received.
- (b) Identification - Marking & Painting:

<u>Projectile Type</u>	<u>Projectile Color</u>
Ball, Mk I	Black Overall No Stencilling



**20MM A/C M. 75  
AP-T**

**DATA**~~RESTRICTED~~**U.S. ARMY****20MM. A/C  
A.P.-T.****M75****(Old Series)**

OVERALL LENGTH	3.25 in.
DIAMETER OF BASE	0.770 in.
DISTANCE - BASE TO BAND	0.5 in.
WIDTH OF BAND	0.203 in.
DIAMETER AT BOURRELET	0.784 in.
TYPE OF FILLING	None
WEIGHT OF FILLING	
WEIGHT OF LOADED PROJECTILE	0.370 lbs.
CHARGE/WEIGHT RATIO	
CARTRIDGE CASE	M21A1
PRIMER	M36
TRACER	Integral
FUZES WHICH MAY BE USED IN PROJECTILE	None

**REMARKS:**

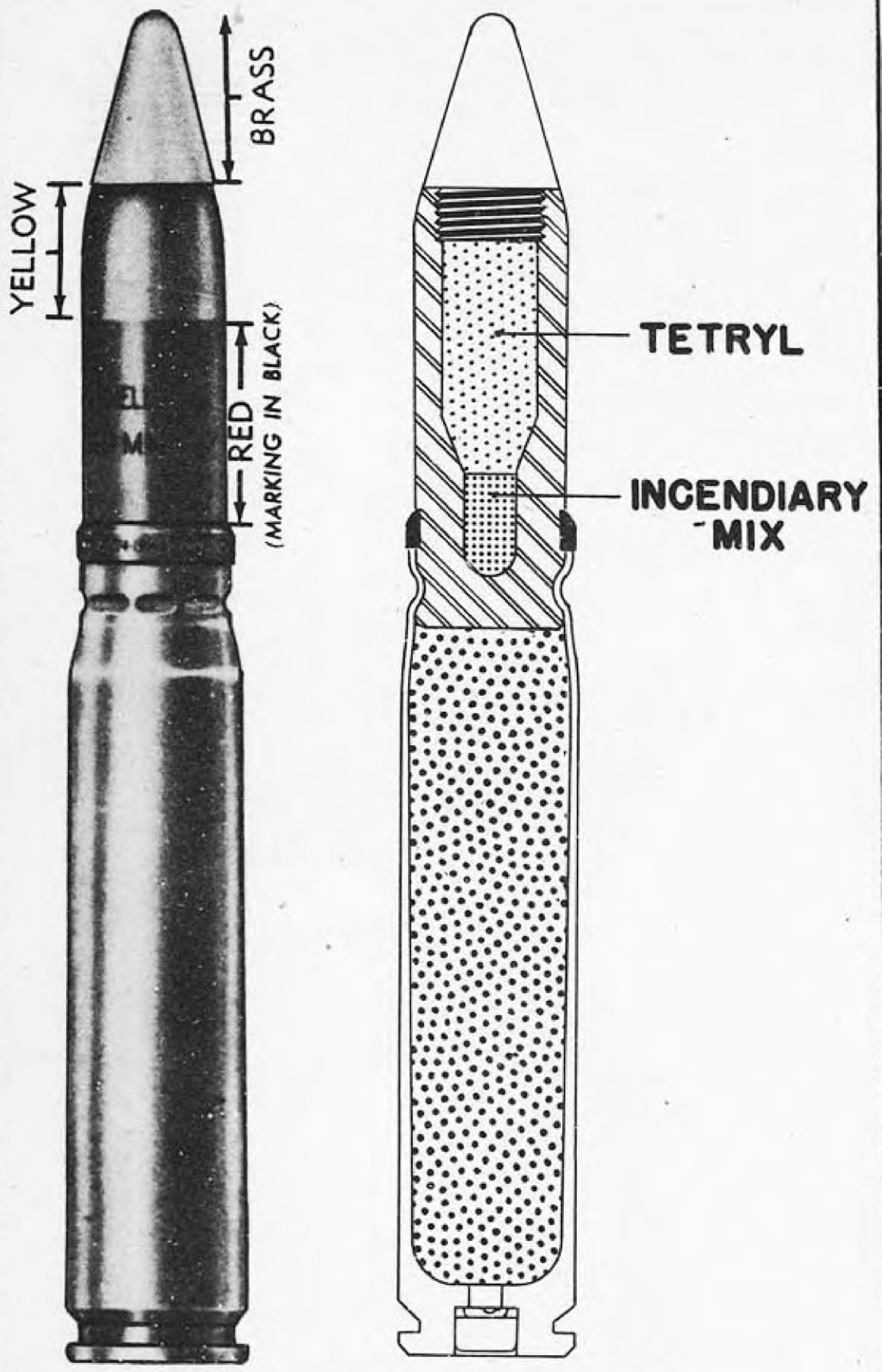
- (a) The tracer is red in color and burns for about 4 seconds, equivalent to a range of about 3000 yds.
- (b) This round is to be superseded by the AP-T, M 95 round of the new ballistically matched series. The AP-T, M75, round is to be classified "UNSERVICEABLE" by Naval activities as soon as replacement allowances or stocks of the M95 round are received.
- (c) Identification - Marking & Painting:

Projectile Type

AP-T, M75

Projectile ColorBlack Overall  
Stencilling in White

11502110-2110



20MM A/C M97  
HE-I

**DATA**

RESTRICTED

**U. S. ARMY****20MM. A/C  
HE-I****M97****(New Series)**

OVERALL LENGTH	
With Nose Fuze	3.28 in.
Without Nose Fuze	2.44 in.
DIAMETER OF BASE	0.76 in.
DISTANCE - BASE TO BAND	0.39 in.
WIDTH OF BAND	0.203 in.
DIAMETER AT BOURRELET	0.76 in.
TYPE OF FILLING	Tetryl & Incendiary Mix
WEIGHT OF FILLING	0.017 lbs.
WEIGHT OF LOADED PROJECTILE	0.29 lbs.
CHARGE/WEIGHT RATIO	
CARTRIDGE CASE	M21A1
PRIMER	M36A1
TRACER	None
FUZES WHICH MAY BE USED IN PROJECTILE	Nose: M75 (P.D.F.)

## REMARKS:

- (a) This round is superseding the HE-I Mk I round of the Old Series.
- (b) Identification - Marking & Painting:

Projectile Type

HE-I, M97

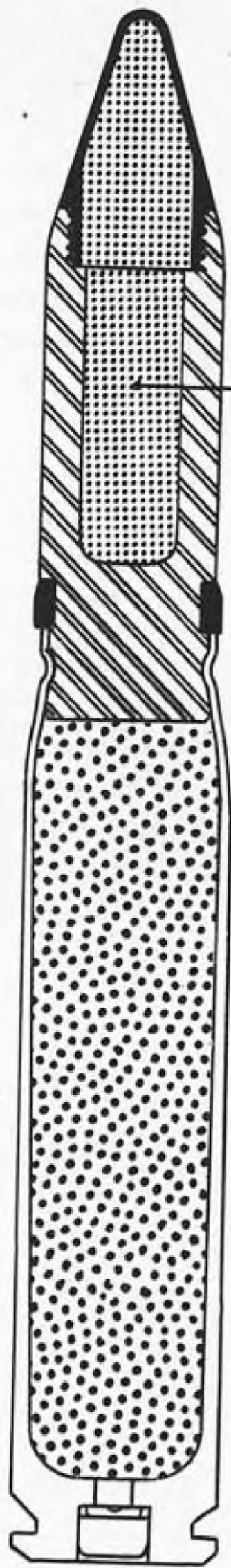
Projectile Color

Body - Red  
 Bourrelet - Yellow  
 Fuze - Unpainted Brass  
 Stencilling in Black



← LIGHT →  
BLUE

← BLUE - GRAY →  
(MARKING IN BLACK)



INCENDIARY  
MIX

**20MM A/C M96  
INCENDIARY**

**DATA**

RESTRICTED

**U. S. ARMY****20MM. A/C  
INCENDIARY****M96****(New Series)**

OVERALL LENGTH	
With Nose Cap	3.245 in.
Without Nose Cap	2.30 in.
DIAMETER OF BASE	0.76 in.
DISTANCE - BASE TO BAND	0.39 in.
WIDTH OF BAND	0.203 in.
DIAMETER .T BOURRELET	0.76 in.
TYPE OF FILLING	Incendiary Mixture
WEIGHT OF FILLING	0.020 lbs.
WEIGHT OF LOADED PROJECTILE	0.27 lbs.
CHARGE/WEIGHT RATIO	
CARTRIDGE CASE	M21A1
PRIMER	M36A1
TRACER	None
FUZES WHICH MAY BE USED IN PROJECTILE	None

**REMARKS:**

- (a) The incendiary mixture fills both the nose cap and the projectile body. No fuze is required, as the functioning is initiated by impact of the nose with the target.
- (b) Identification - Marking & Painting:

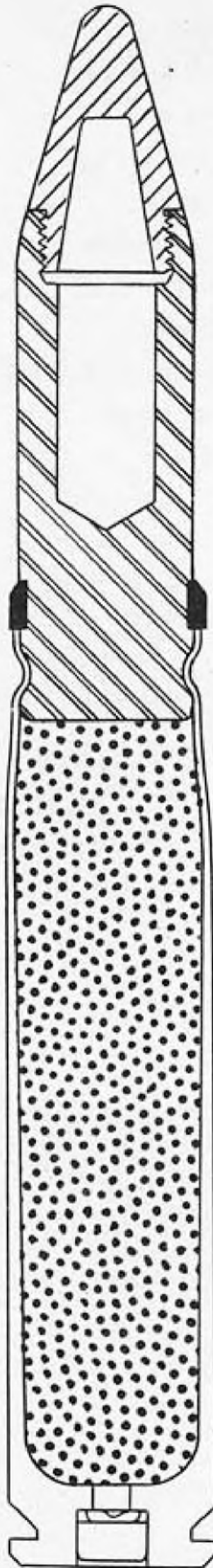
Projectile Type

Incendiary, M96

Projectile Color

Body - Blue Gray  
 Nose Cap - Light Blue  
 Stencilling in Black

BLACK  
(MARKING IN WHITE)



**20MM A/C M99  
PRACTICE**

**DATA**

RESTRICTED

**U. S. ARMY****20MM. A/C  
PRACTICE****M99****(New Series)**

OVERALL LENGTH	
With Nose Cap	3.27 in.
Without Nose Cap	2.30 in.
DIAMETER OF BASE	0.76 in.
DISTANCE - BASE TO BAND	0.39 in.
WIDTH OF BAND	0.203 in.
DIAMETER .T BOURRELET	0.78 in.
TYPE OF FILLING	None
WEIGHT OF FILLING	
WEIGHT OF LOADED PROJECTILE	0.29 lbs.
CHARGE/WEIGHT RATIO	
CARTRIDGE CASE	M21A1
PRIMER	M36A1
TRACER	None
FUZES WHICH MAY BE USED IN PROJECTILE	None

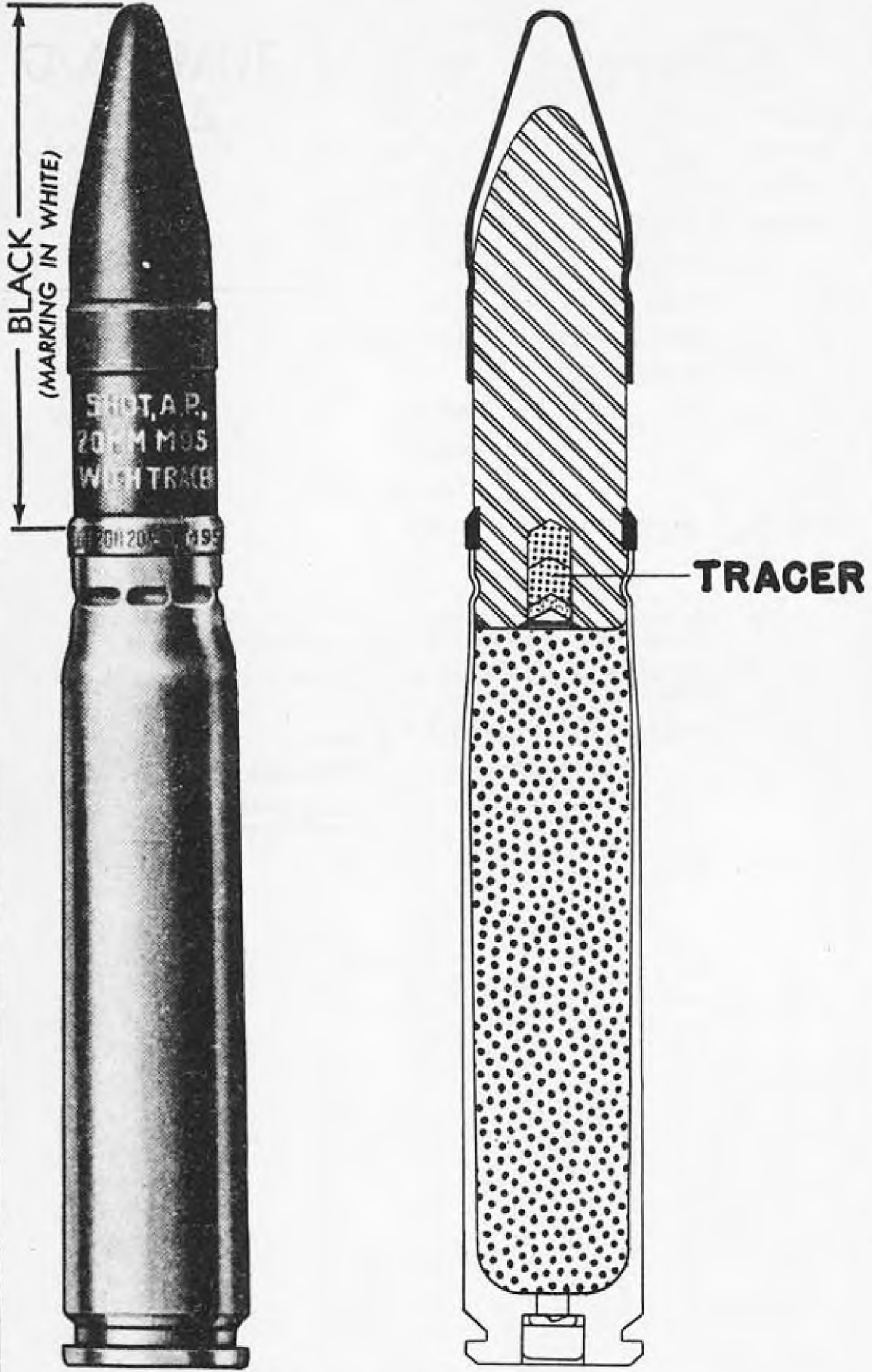
## REMARKS:

- (a) This round is superseding the Ball Mk I round of the Old Series.
- (b) Identification - Marking and Painting:

Projectile Type

Practice, M99

Projectile ColorBlack Overall  
Stencilling in White



20MM A/C M95  
AP-T

**DATA**

RESTRICTED

**U. S. ARMY****20MM. A/C  
A.P.-T.****M95****(New Series)**

OVERALL LENGTH	
With Cap & Windshield	3.27 in.
Without Cap & Windshield	2.40 in.
DIAMETER OF BASE	0.76 in.
DISTANCE - BASE TO BAND	0.39 in.
WIDTH OF BAND	0.203 in.
DIAMETER .T BOURRELET	0.78 in.
TYPE OF FILLING	None
WEIGHT OF FILLING	
WEIGHT OF LOADED PROJECTILE	0.29 lbs.
CHARGE/WEIGHT RATIO	
CARTRIDGE CASE	M21A1
PRIMER	M36A1
TRACER	Integral
FUZES WHICH MAY BE USED IN PROJECTILE	None

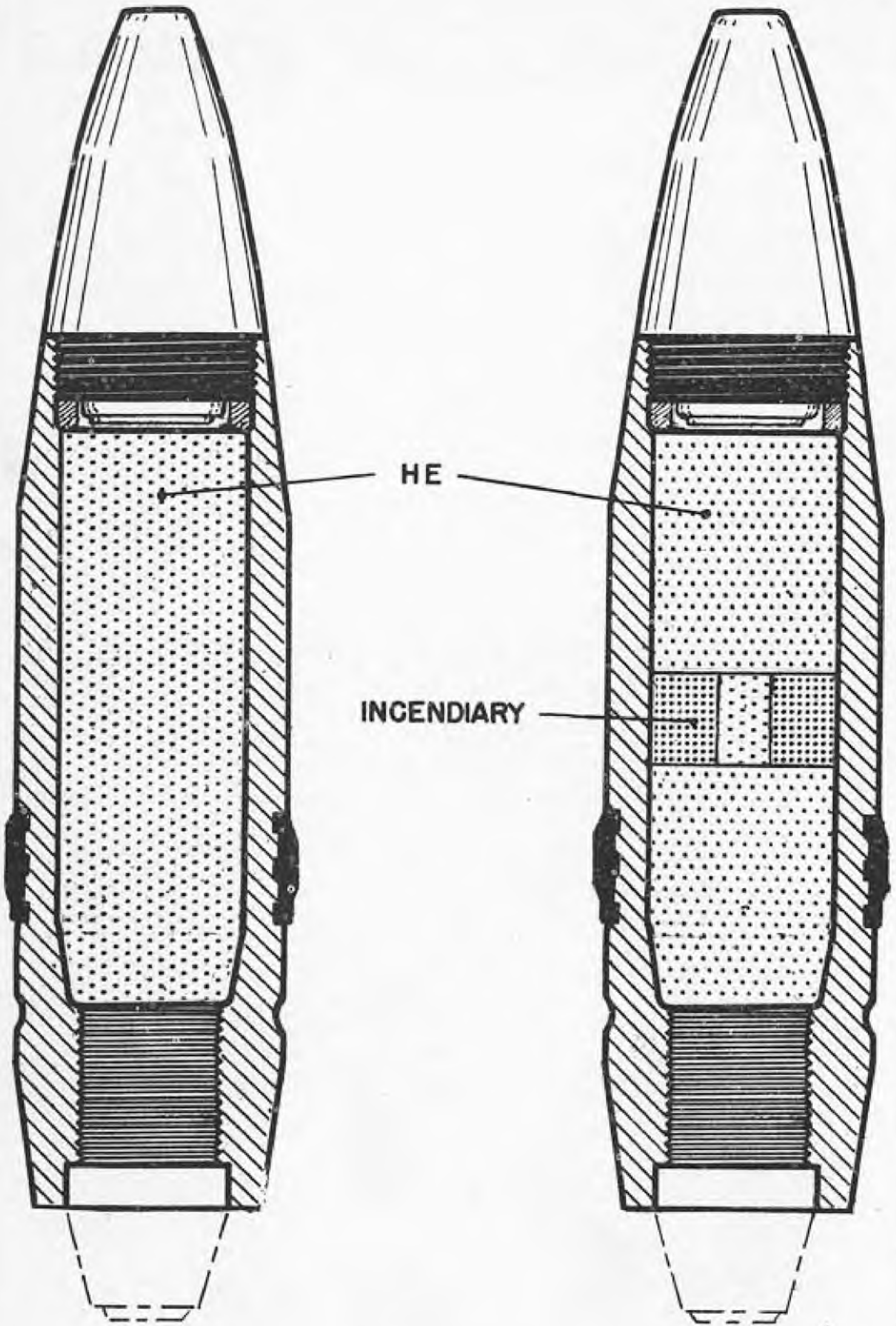
**REMARKS:**

- (a) The tracer is red in color and burns for a period of about 2.25 seconds, equivalent to a range of about 1400 yds.
- (b) This round is superseding the AP-T M75 round of the Old Series.
- (c) Identification - Marking & Painting:

Projectile Type

AP-T, M95

Projectile ColorBlack Overall  
Stencilling in White



HE

MK 2

HE-1

40 MM PROJECTILE

**DATA**~~RESTRICTED~~**U. S. NAVY****40 MM A.A.**(a) **MK. 1**(b) **MK. 2****HE, HE-I**

OVERALL LENGTH  
 With Nose Fuze 7.1 in.  
 Without Nose Fuze 5.2 in.

DIAMETER OF BASE 1.3 in.

DISTANCE - BASE TO BAND (a) 1.675 in.  
 (b) 1.730 in.

WIDTH OF BAND 0.6 in.

DIAMETER .T BOURRELET 1.57 in.

TYPE OF FILLING HE: Cast TNT  
 HE-I: Cast TNT & Incendiary

WEIGHT OF FILLING (a) 0.148 lbs.  
 (b) 0.150 lbs.

WEIGHT OF LOADED PROJECTILE 1.985 lbs.

CHARGE/WEIGHT RATIO 5.0%

CARTRIDGE CASE Mk 1, Mk 2, Mk 3

PRIMER Mk 21 Mods 2 & 3; Mk 22 Mods 0 & 1

TRACER Mk 10, Mk 11

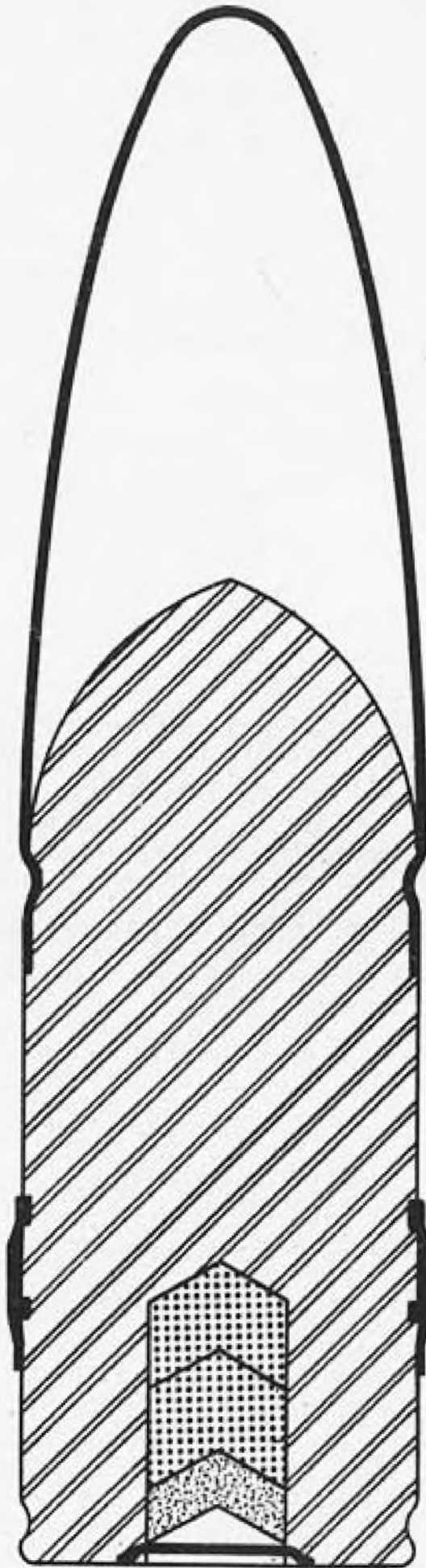
FUZES WHICH MAY BE USED IN PROJECTILE Nose: Mk 27 Mods 0 & 1. (P.D.F.)

**REMARKS:**

- (a) The Mk 1 projectile was manufactured first. The Mk 2 was then produced with only minor manufacturing differences. Both Mks are now in production.
- (b) The Mk 1 and the Mk 2 projectiles are both loaded HE in three increments. The Mk 2 may also be loaded HE-I with the central increment an incendiary composition.
- (c) The Mk 2 HE-I round may be issued plugged instead of traced.
- (d) Both projectile bodies may be issued BL & P or BL & T for target practice or deicing.
- (e) Tracer Mk 10 has been declared Unserviceable and is being replaced by the Mk 11 in all assemblies.
- (f) Identification - Marking & Painting:

Projectile Type	Color Identification			Remarks
	Body	Band	Tip	
HE-P	Green	Green	Green	Plug in tracer.
HE-T/SD	Green	White	Green	
HE/SD	Green	Black	Green	Non-luminous tracer.
HE-I-T/SD	Green	White	Red	
HE-I-P	Green	Red	Red	Plug in base.
HE-I/SD	Green	Black	Red	Non-luminous tracer.
HE-I-T	Green	White	Red	SD relay not loaded.
		with Black Band.		
BL & T	Red	White	Red	Dummy fuze.
BL & P	Red	Red	Red	Dummy fuze and plug in base.

- (g) The tracer composition is either a red burning mixture in the tracer (T) rounds or a non-luminous burning compound in the SD rounds not designated "T".



**40 MM PROJECTILE  
M81 A1  
AP-T**

**DATA**~~RESTRICTED~~**U. S. NAVY****40 MM A.A.****M81 A1****AP****AP-T**

OVERALL LENGTH  
 With Cap & Windshield 6.19 in.  
 Without Cap & Windshield

DIAMETER OF BASE 1.55 in.

DISTANCE - BASE TO BAND 0.803 in.

WIDTH OF BAND 0.64 in.

DIAMETER .T BOURRELET 1.55 in.

TYPE OF FILLING None

WEIGHT OF FILLING

WEIGHT OF LOADED PROJECTILE 1.96 lbs.

CHARGE/WEIGHT RATIO

CARTRIDGE CASE Mk 1, Mk 2, Mk 3

PRIMER Mk 21, Mk 22

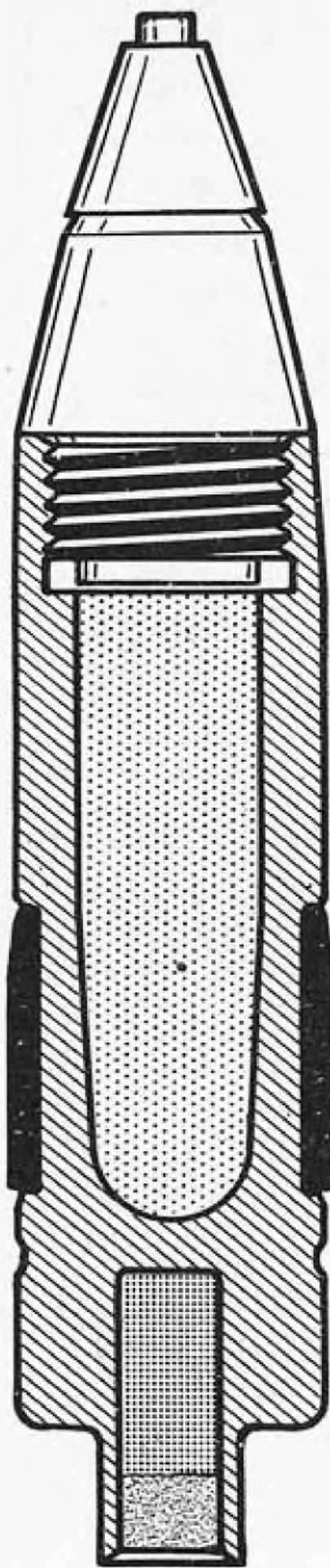
TRACER Integral

FUZES WHICH MAY BE USED IN PROJECTILE None

**REMARKS:**

- (a) This projectile is an Army design manufactured for the Navy to Naval specifications.
- (b) Identification - Marking & Painting:

<u>Projectile Type</u>	<u>Color Identification</u>			<u>Remarks</u>
	<u>Body</u>	<u>Band</u>	<u>Tip</u>	
AP	Black	Black	Black	Plug in tracer cavity. Integral tracer (red).
AP-T	Black	White	Black	



MK.1

1.1" A.A. PROJECTILE

**DATA****U. S. NAVY****1.1" A.A.****MK. I****M K. SD I**

OVERALL LENGTH	
With Nose Fuze	5.8 in.
Without Nose Fuze	4.1 in.
DIAMETER OF BASE	1.085 in.
DISTANCE - BASE TO BAND	0.87 in.
WIDTH OF BAND	1.0 in.
DIAMETER AT BOURRELET	1.095 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	(a) 0.037 lbs.
	(b) 0.034 lbs.
WEIGHT OF LOADED PROJECTILE	0.917 lbs.
CHARGE/WEIGHT RATIO	4.0%
CARTRIDGE CASE	Mk 1

PRIMER

Mk 19 and Mods 1,2, &amp; 3.

TRACER

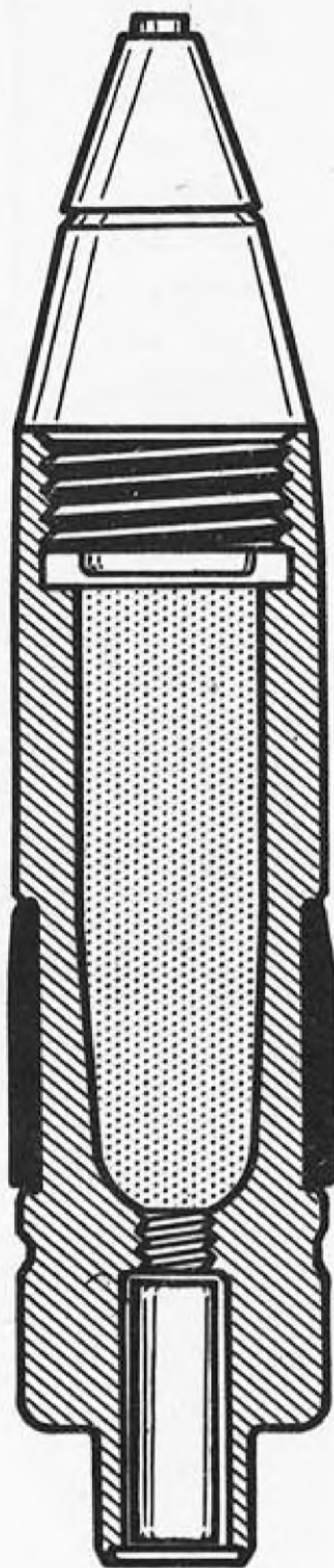
The tracer composition is inserted in the recess at the base of the projectile. The tracer element is divided into two increments and pressed into the recess by hydraulic pressure. The tracer is ignited by the propellant charge from the cartridge case. A capsule tracer may also be used.

FUZES WHICH MAY BE USED  
IN PROJECTILE

Nose: Modified Mk 12 Mods 2 & 3. (P.D.F.)  
Mk 34 and all Mods. (P.D.F.)

REMARKS:

- (a) It is to be noted that the 1.1" Mk I is not the self-destroying projectile. The 1.1" Mk II is self-destroying. This is the primary distinguishing feature between the two projectiles.
- (b) The Mk SD 1 consists of a Mk 1 projectile body modified for self-destruction by drilling through the wall between the tracer and HE cavities.
- (c) The Mk 1 projectile may also be issued BL & T for target practice or de-icing.
- (d) For method of marking and painting, see Introduction.



1.1" A.A. PROJECTILE  
MK.2

# DATA

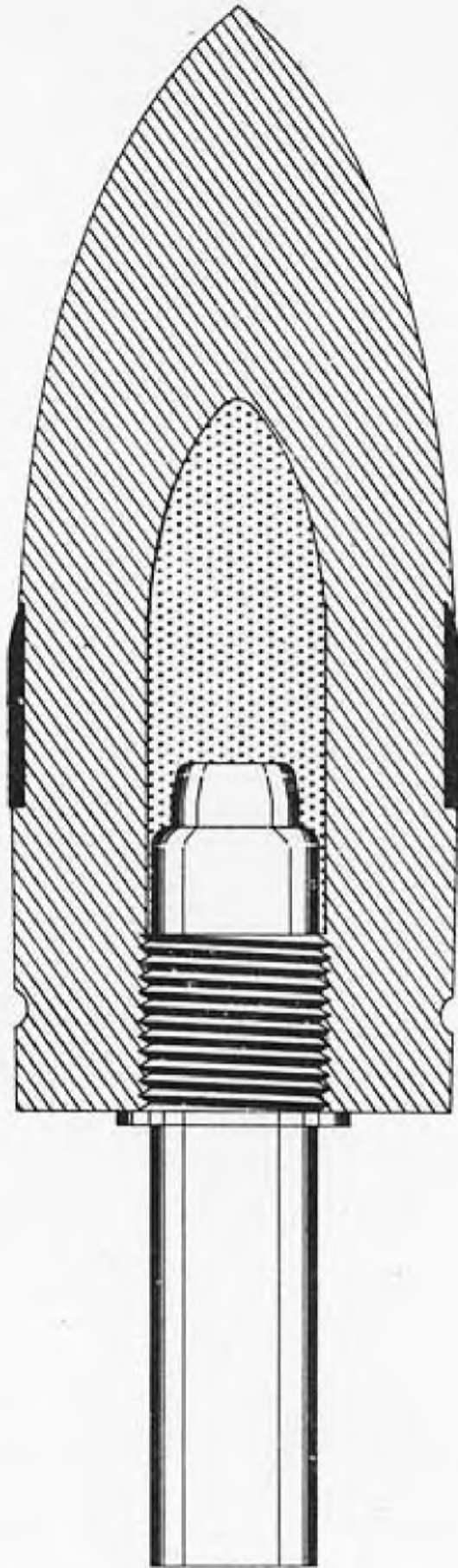
U.S. NAVY  
1.1" A.A.  
MK. 2

OVERALL LENGTH	
With Nose Fuze	5.7 in.
Without Nose Fuze	4.1 in.
DIAMETER OF BASE	1.085 in.
DISTANCE - BASE TO BAND	0.87 in.
WIDTH OF BAND	1.0 in.
DIAMETER AT BOURRELET	1.095 in.
TYPE OF FILLING	Explosive D
WEIGHT OF FILLING	.034 lbs.
WEIGHT OF LOADED PROJECTILE	.917 lbs.
CHARGE/WEIGHT RATIO	3.7%
CARTRIDGE CASE	Mk I
PRIMER	Mk 19 and Mods 1,2, & 3.
TRACER	The tracer composition is inserted in the recess at the base of the projectile. The tracer element is divided into two increments and pressed into the recess by hydraulic pressure. The tracer is ignited by the propellant charge from the cartridge case. A capsule tracer may also be used.
FUZES WHICH MAY BE USED IN PROJECTILE	Nose: Modified Mk 12 Mods 2 & 3. (P.D.F.) Mk 34 and all Mods. (P.D.F.)

## REMARKS:

It is to be noted that in the case of the 1.1" Mk 2, the projectile detonates itself at the end of its aerial flight even though there is no contact with the target. The purpose of this feature is to prevent the projectile from returning to the earth and detonating on impact when the aircraft target is missed. Obviously, this projectile is desirable at land bases.

The feature of self-destruction is incorporated in the projectile itself. As illustrated by the drawing on opposite page, there is a hollow shaft connecting the tracer cavity and burster charge cavity. A small cap of black powder is inserted in the shaft. When the tracer burns down to the bottom of the tracer cavity, the heat will ignite the black powder cap which in turn sets off the burster charge and destroys the projectile while in flight.



MK.2

I PDR COM. PROJECTILE

# DATA

~~CONFIDENTIAL~~

U.S. NAVY

I PDR COM.

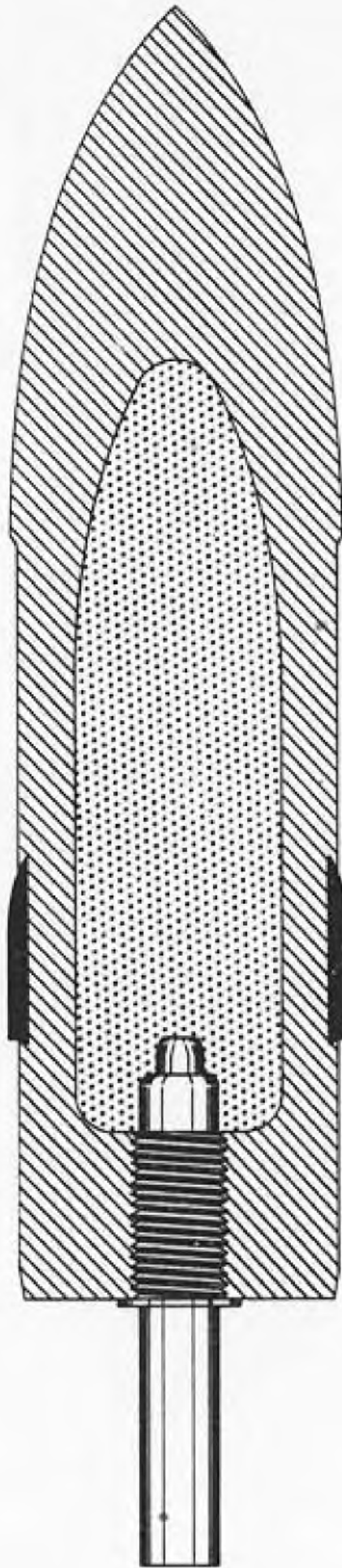
MK.2 MODS. 0 & 1

Guns Used In: 1 pdr./40

OVERALL LENGTH	3.56 in.
DIAMETER OF BASE	1.441 in.
DISTANCE - BASE TO BAND	.829 in.
WIDTH OF BAND	.731 in.
DIAMETER AT BOURRELET	1.445 in.
TYPE OF FILLING	Black powder
WEIGHT OF FILLING	0.026 lbs.
WEIGHT OF LOADED PROJECTILE	1.088 lbs.
CHARGE/WEIGHT RATIO	2.07%
CARTRIDGE CASE	Mk 2
PRIMER	Mk 10 Mod 9
TRACER	Integral
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 8 Mod 4. (B.I.F.)

## REMARKS:

- (a) This ammunition is used in coast guard guns. Their bursting charge is Black Powder and T.N.T. or Black Powder alone. Black Powder is very sensitive and this should be kept in mind when unscrewing the fuze as some of the powder may have fallen down into the threads and the friction would cause detonation.
- (b) The Mk 10 Mod 8 primer may be used for saluting charges only.
- (c) Base fuzes Mk 2 Mod 9 and Mk 8 Mod 5 (without tracers) may be used, but the Mk 8 Mod 4 is the preferred assembly.
- (d) This round may be issued BL & P for target practice.



**MK.4 MOD. 1  
3 PDR COM. PROJECTILE**

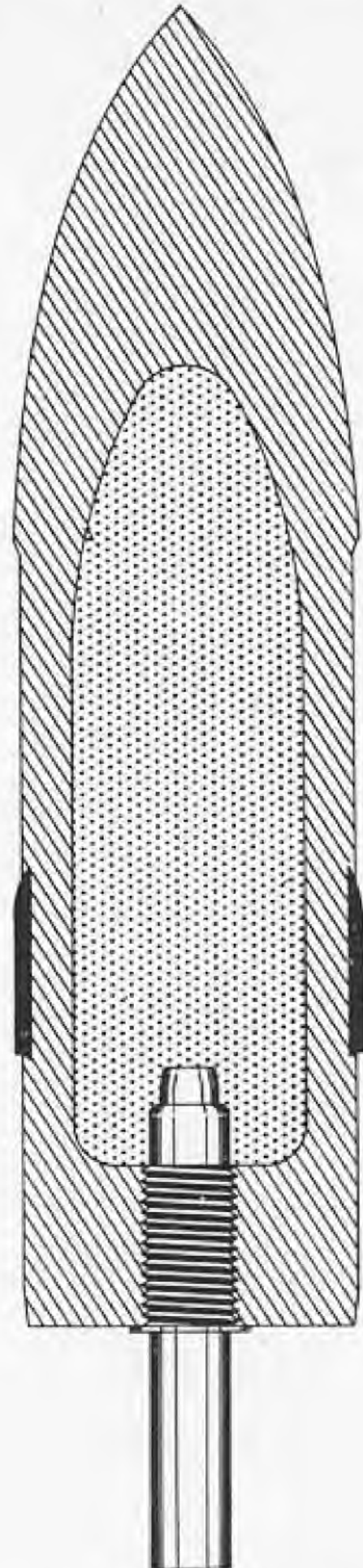
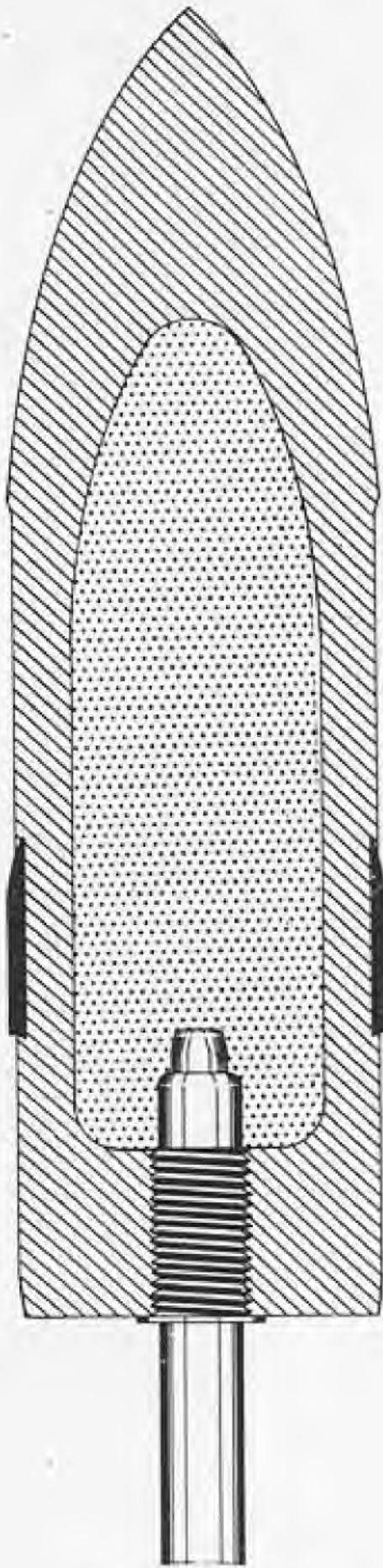
**DATA**~~CONFIDENTIAL~~**U.S. NAVY****3 PDR COM.****MK. 4 MOD.1**

Guns Used In: 3 pdr./50

OVERALL LENGTH	6.681 in.
DIAMETER OF BASE	1.75 in.
DISTANCE - BASE TO BAND	1.185 in.
WIDTH OF BAND	.787 in.
DIAMETER AT BOURRELET	1.845 in.
TYPE OF FILLING	Black Powder & T.N.T.
WEIGHT OF FILLING	.13 lbs.
WEIGHT OF LOADED PROJECTILE	3.30 lbs.
CHARGE/WEIGHT RATIO	3.93%
CARTRIDGE CASE	Mk 1
PRIMER	Mk 10 Mod 9
TRACER	Integral
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 8 Mod 4. (B.I.F.)

**REMARKS:**

- (a) This ammunition is used in coast guard guns. The bursting charge is black powder and T.N.T. or black powder alone. Black powder is very sensitive and this should be kept in mind when unscrewing the fuze as some of the powder may have fallen down into the threads and the friction would cause detonation.
- (b) Primer Mk 10 Mod 8 may be used for saluting charges only.
- (c) Fuzes Mk 8 Mod 5 and Mk 2 Mod 9 (without tracers) may be used, but the Mk 8 Mod 4 fuze is the preferred assembly.
- (d) This round may be issued BL & P or BL & T with the Mk 7 tracer for target practice.



MK.3 MOD.3

MK.3 MOD 4

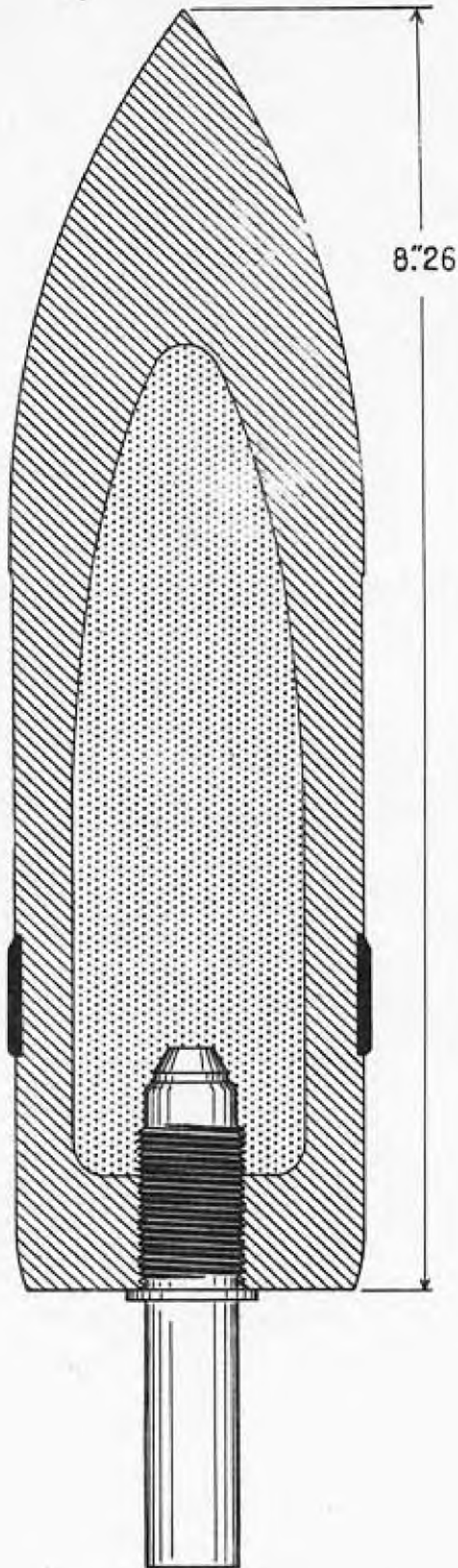
6 PDR COM. PROJECTILE

**DATA**~~CONFIDENTIAL~~**U.S. NAVY****6 PDR COM.****MK.3 MODS. 3,4**Guns Used In: 6 pdr/40, /42,  
6 pdr/45, /50

OVERALL LENGTH	8.45 in.
DIAMETER OF BASE	2.224 in.
DISTANCE - BASE TO BAND	1.493 in.
WIDTH OF BAND	.787 in.
DIAMETER AT BOURRELET	2.239 in.
TYPE OF FILLING	Black Powder & T.N.T.
WEIGHT OF FILLING	.24 lbs.
WEIGHT OF LOADED PROJECTILE	6.00 lbs.
CHARGE/WEIGHT RATIO	4.00 %
CARTRIDGE CASE	Mk 1
PRIMER	Mk 10 Mod 9
TRACER	Integral
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 8 Mod 4. (B.I.F.)

## REMARKS:

- (a) This ammunition is used in coast guard guns. The bursting charge is black powder and T.N.T. or black powder alone. Black powder is very sensitive and this should be kept in mind when unscrewing the fuze as some of the powder may have fallen down into the threads and the friction would cause detonation.
- (b) Base fuzes Mk 2 Mod 9 and Mk 8 Mod 5 (without tracers) may be used in this projectile, but the Mk 8 Mod 4 is the preferred assembly.
- (c) The Mk 10 Mod 8 primer may be used for saluting charges only.
- (d) This round may be issued BL & P or BL & T with the Mk 7 tracer for target practice.



MK.5

6 PDR. COM. PROJECTILE

**DATA**~~CONFIDENTIAL~~**U.S. NAVY****6 PDR. COM.****MK. 5 MODS. 0 & 3**Guns Used In: 6 pdr/40, 42,  
6 pdr/45, 50

OVERALL LENGTH	8.26 in.
DIAMETER OF BASE	2.22 in.
DISTANCE - BASE TO BAND	1.493 in.
WIDTH OF BAND	0.787 in.
DIAMETER AT BOURRELET	2.237 in.
TYPE OF FILLING	Black Powder & TNT
WEIGHT OF FILLING	0.23 lbs.
WEIGHT OF LOADED PROJECTILE	6.0 lbs.
CHARGE/WEIGHT RATIO	4.0%
CARTRIDGE CASE	Mk 1
PRIMER	Mk 10 Mod 9
TRACER	Integral in fuze
FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk 8 Mod 4. (B.I.F.)

**REMARKS:**

- (a) This ammunition is used in coast guard guns. The bursting charge is black powder and TNT. Black powder is very sensitive, and this should be kept in mind when unscrewing the fuze, as some of the powder may have fallen down into the threads, and the friction would cause detonation.
- (b) Base fuzes Mk 2 Mod 9 and Mk 8 Mod 5 (without tracers) may be used in this projectile, but the Mk 8 Mod 4 is the preferred assembly.
- (c) The Mk 10 Mod 8 primer may be used for saluting charges only.
- (d) This round may be issued BL & P or BL & T with the Mk 7 tracer for target practice.

~~CONFIDENTIAL~~

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(d)

**CARTRIDGE CASES  
&  
BAG CHARGES**

**SECTION 3**

# INTRODUCTION

## CARTRIDGE CASES & BAG CHARGES

### I. CARTRIDGE CASES

#### General

Propellant charges for small and medium caliber guns are assembled with primer and powder enclosed in a brass or steel container or "Cartridge Case". This assembly of the entire charge in a single, rigid, protecting case increases the ease and rapidity of loading and reduces the danger to personnel from flare-backs. On the other hand, additional care in handling must be exercised with this type of ammunition, since the cartridge case contains the powder charge and the primer.

#### Fixed Ammunition

Smaller caliber guns use "fixed ammunition", with the cartridge case firmly crimped to the base of the projectile. The following guns employ fixed ammunition:

20 mm A.A.  
40 mm A.A.  
1.1" A.A.  
1 pdr.  
3 pdr.  
6 pdr.  
3"/23  
3"/50  
4"/50  
5"/25

#### Semi-Fixed Ammunition

Guns of larger caliber, for ease of handling, require separate loading of powder and projectile, or "semi-fixed ammunition". With this type of ammunition the powder and primer are contained in a cartridge case, but the case is not crimped to the projectile. In semi-fixed ammunition the powder is held firmly in place by a cardboard spacer and/or a cork closing plug. The following guns employ semi-fixed ammunition:

5"/38  
5"/51  
6"/47

#### Gas Seal

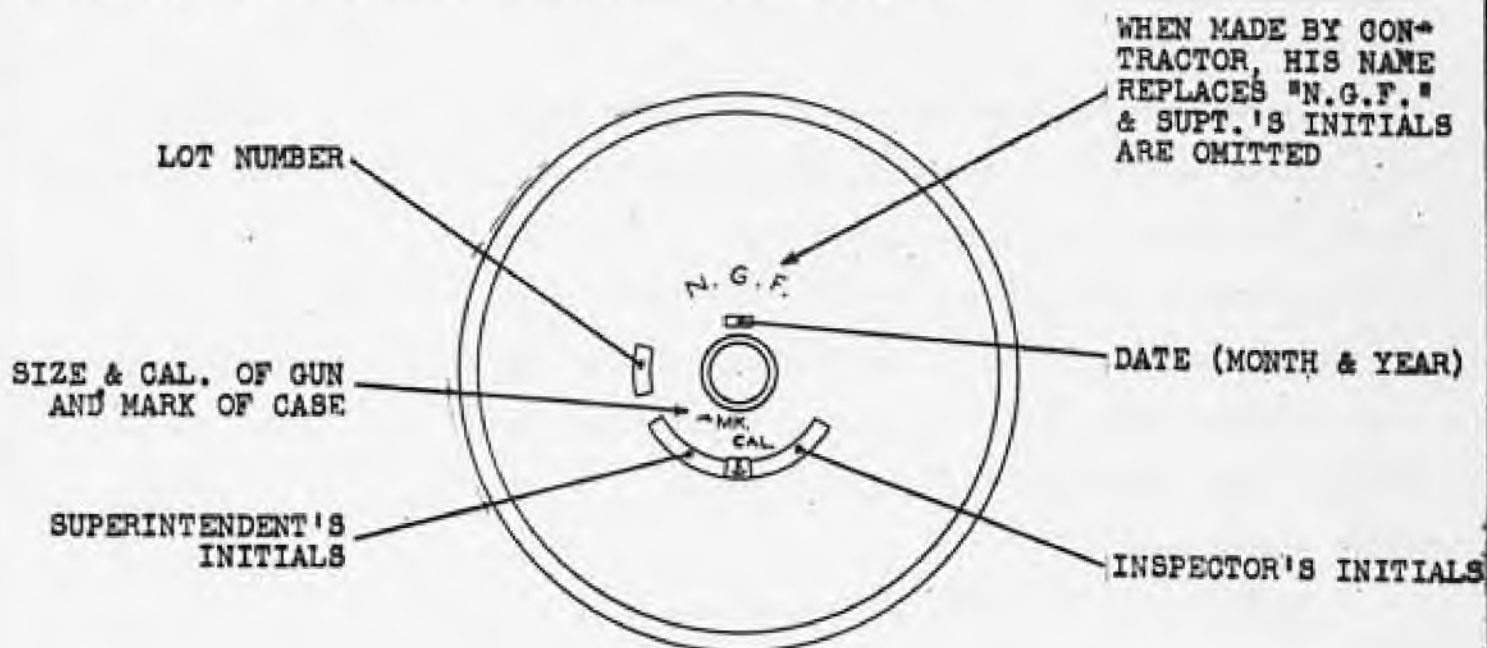
Besides affording a safe and convenient method of loading, the cartridge case performs the further important function of preventing the escape of gases through the breech of the gun. The cartridge case has a fairly snug fit in the gun chamber and forms an effective gas seal due to its expansion when the gun is fired,

## PROPELLANT CHARGES

## Introduction (Continued)

I. CARTRIDGE CASES (Continued)Markings

Cartridge cases may be identified by stamped markings on the base of the case. The following information will be found:

**CARTRIDGE CASE MARKINGS**Special Cartridge Cases

Aside from those employed to propel projectiles, certain special types of cartridge cases are also in use. These include saluting charges for 3"/23 and 1, 3, and 6 Pounder guns; impulse charges for torpedoes, depth charges, and projector charges; and charges for line-throwing apparatus. These cases will not be described in this publication, since they are not primarily concerned with projectiles. One group of special cases, however, deserves consideration. These cases are specially adapted "short cartridge cases" for use in clearing projectiles lodged in bores of guns. Short cartridge cases are made by cutting down standard cartridge cases. The following short cases are now in service use:

<u>Gun</u>	<u>Cartridge Case</u>	<u>Propellant Weight</u>	<u>Primer</u>
1.1"	Mk 1 (Modified)	85 grams	Mk 19 Mods 1, 2, & 3
3"/23	Mk 2 (Modified)	385 grams	Mk 10 Mod 9
3"/50	Mk 3 & Mods 2 & 3 (Modified)	3.8 lbs.	Mk 14
4"/50	Mk 2 & Mod 3 (Modified)	14.0 lbs.	Mk 13 & all Mods
5"/25	Mk 4 (Modified)	9.0 lbs.	Mk 13 & all Mods
5"/38	Mk 5 (Modified)	9.0 lbs.	Mk 13 & all Mods
6"/47	Mk 4 (Modified)	23.0 lbs.	Mk 13 & all Mods

# POWDER SECTIONS - BAG AMMUNITION

## FULL (SERVICE) CHARGES

GUNS USED IN	NUMBER OF SECTIONS	LENGTH OF SECTION		DIAMETER OF SECTION		TOTAL WEIGHT OF CHARGE	TYPE OF LOADING	BAG	IGNITION CHARGE PER SECTION	DIAMETER OF IGNITION CIRCLE
		MAXIMUM	MINIMUM	MAXIMUM	MINIMUM					
16"/50 Mk 7	6	17.25"	15.25"	16.00"	11.25"	655 lbs.	Stack	Mk 3	350 grams	10.00"
16"/45 Mk 6 Mod 1	6	15.00"	13.10"	16.00"	11.25"	540 lbs.	Stack	Mk 3	290 grams	10.00"
16"/45 Mk 6 Mod 2 & Mk 8	5	18.00"	16.10"	16.00"	11.25"	540 lbs.	Stack	Mk 3	350 grams	10.00"
14"/50 Mks 7 & 11	4	19.70"	17.90"	14.25"	10.00"	420 lbs.	Stack	Mk 3	300 grams	10.00"
14"/45 Mks 8,9,10,& 12	4	19.90"	18.10"	14.00"	10.00"	420 lbs.	Stack	Mk 3	300 grams	10.00"
12"/50 Mk 7	4	19.90"	18.25"	13.00"	9.40"	337 lbs.	Stack	Mk 3	300 grams	8.50"
12"/50 Mk 8	4	19.00"	17.35"	11.50"	8.60"	270 lbs.	Stack	Mk 3	300 grams	8.50"
3"/55 Mks 12,14,& 15	2	28.00"	26.85"	8.10"	6.70"	86 lbs. 90 lbs.	Stack Dump	Mk 3 #53417	200 grams	6.70"
7"/45 Mk 2	2	24.00"	23.00"	8.00"	6.50"	58 lbs.	Dump	#53417	150 grams	6.25"
6"/53 Mks 12,14,& 18	1	46.50"	45.60"	6.60"	5.10"	44 lbs.	Dump	#53417	150 grams	5.00"
6"/50 Mks 6 & 8	1	39.50"	38.60"	6.35"	5.00"	39 lbs.	Dump	#53417	100 grams	5.00"
6"/47 Mk 17	1	34.00"	33.00"	6.50"	5.25"	33.5 lbs	Stack Dump	Mk 3 #53417	150 grams	5.00"
5"/51 Mks 7,8,& 15	1	30.00"	29.25"	6.00"	4.50"	24.5 lbs	Dump	#53417	75 grams	4.50"
5"/50 Mks 5 & 6	1	29.25"	28.50"	6.00"	5.10"	21 lbs.	Dump	#53417	75 grams	5.00"

## Introduction (Continued)

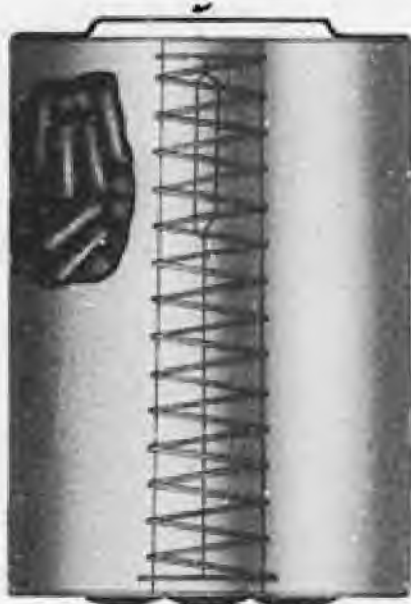
II. BAG CHARGESGeneral

Due principally to the difficulty in handling very large cartridge cases and especially in disposing of empties, the cartridge case in very large caliber guns is replaced by a powder charge assembled in a silk bag. The gas checking is accomplished by the mushroom and pads on the breech plug, and the primer is fired by a lock attached to the breech plug.

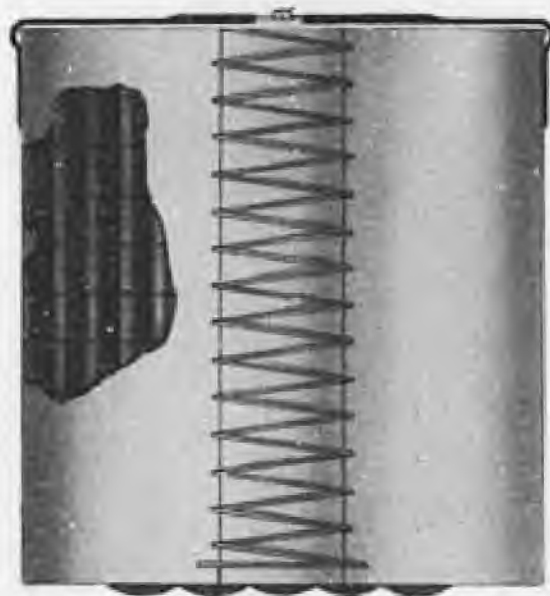
Bags used for bag charges are manufactured of pure silk without the admixture of any material other than sizing for the yarn. Heavy cloth is used for the body of the bags; light cloth, for the ignition ends. The ignition end of each bag consists of a red-colored quilted pocket containing an ignition charge of black powder.

Loading

Bag charges are either "dump" or "stack" loaded. In dump loading, the powder, after weighing, is dumped loosely into the bag, and the bag is then rolled and tightly laced to form a compact unit. For larger caliber guns stacked bags have almost completely replaced dump loaded bags. Stacking places the powder grains on end in layers so that a tight, compact and uniform charge is obtained. Stacking results in greater ease for loading crews, a smaller charge bundle, a consistently uniform charge, and a longer life for the bag, as there is less chance for the sharp edges of the powder grains to cut the cloth of the bag. The arrangement of rows and number of grains in stacked charges is so fixed that the finished section will be the proper length according to Bureau of Ordnance standards. This arrangement differs with each bag index and is found by actually loading a test charge. Typical stack and dump loaded charges are shown below:



DUMP LOADED SECTION



STACKED SECTION

## Introduction (Continued)

## II. BAG CHARGES (Cont'd.)

Nomenclature

At present time the following types of bag charges are being assembled:

- (a) Service - for use with AP or HC projectiles at full velocity.
- (b) Target - for use with target projectiles.
- (c) High Capacity (HC) - for use with HC projectiles.
- (d) Special - any charge other than those listed above.

Charges suitable for use with either HC or target projectiles have hitherto been known as "HC Special Charges".

In order to provide the fleet with a single charge for use with either HC or target projectiles, a new "Reduced Charge" is planned by the Bureau of Ordnance to be assembled in the near future. As the term "Service Charge" has also resulted in confusion, the new standard nomenclature will be as follows:

- (a) Full Charge - for use with HC or AP projectiles at full velocity.
- (b) Reduced Charge - for use with AP, target, or HC projectiles at reduced velocities.
- (c) Special - any charge other than those listed above.

The new Reduced Charges will use different granulations of smokeless powder than are now being used for HC and Target Charges and will result in different velocities than are now being obtained. Until the powder granulations for the new Reduced Charges are available, the present HC and Target Charges will be prepared and issued. The following chart indicates the Charges now in use and those planned for future issue.

CHARGE CALIBER & TYPE	CALIBER OF POWDER	DIMENSIONS OF POWDER GRAINS				VELOCITY & TYPE PROJECTILE
		DIAMETER		LENGTH		
		SPDN	SPD	SPDN	SPD	
<u>16"/50:</u>						
Full	16"/50		.95"		2.1"	2500 - AP; 2690 -HC
HC	12"/50		.72"		1.6"	1900 - HC
Target	16"/50 or 12"/45		.95"		2.1"	1800 - Target
Reduced	12"/45 8"/55	.78"	.66"	1.8"	1.6"	1800 - Target
		.50"	.50"	1.2"	1.2"	2075 - HC; 1800 - Target
<u>16"/45:</u> (8 section)						
Full	16"/45		.86"		1.9"	2300 - AP; 2525 - HC
HC	12"/45	.78"	.66"	1.8"	1.6"	1900 - HC
Target	16"/45 or 12"/45		.86"		1.9"	1800 - Target
Reduced	12"/45 8"/55	.78"	.66"	1.8"	1.6"	1800 - Target
		.50"	.50"	1.2"	1.2"	2075 - HC; 1800 - Target
<u>16"/45:</u> (5 section)						
Full	16"/45		.81"		1.9"	2520 - AP; 2635 - HC
HC	12"/45	.78"	.66"	1.8"	1.6"	2000 - HC
Target	16"/45 or 12"/45		.86"		1.9"	1935 - Target
Reduced	12"/45 8"/55	.78"	.66"	1.8"	1.6"	1935 - Target
		.50"	.50"	1.2"	1.2"	2075 - HC; 1935 - Target

## Introduction (Continued)

## II. BAG CHARGES (Cont'd.)

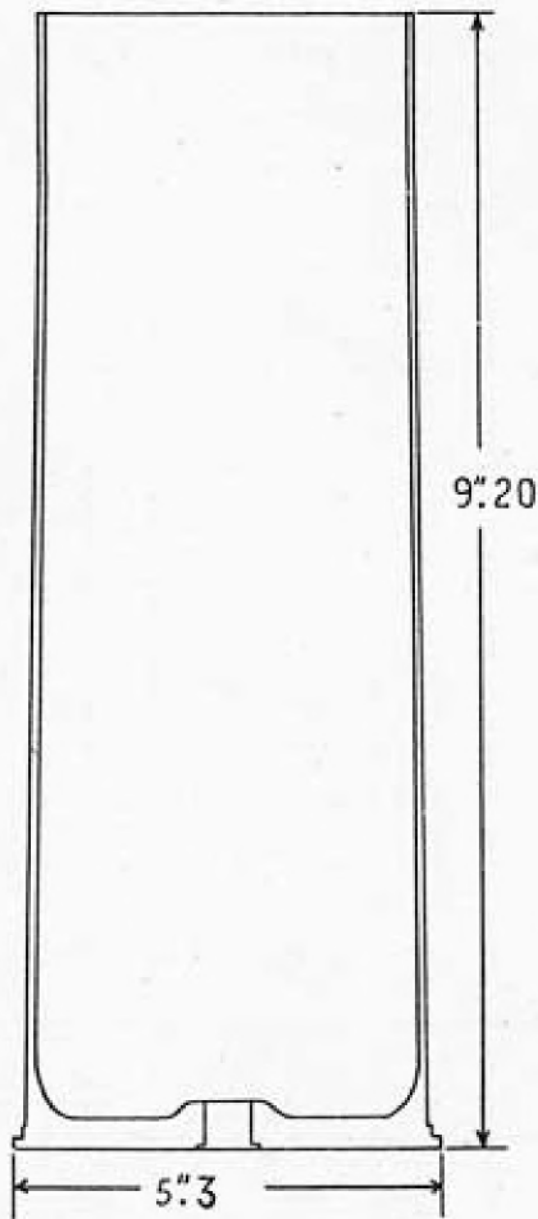
CHARGE CALIBER & TYPE	CALIBER OF POWDER	DIMENSIONS OF POWDER GRAINS				INITIAL VELOCITY (FT/SEC) AND TYPE OF PROJECTILE
		DIAMETER		LENGTH		
		*SPDN**SPD	**SPD	SPDN	SPD	
<u>14"/50:</u>						
Full	14"/50		.79"		1.8"	2700 - AP; 2825 - HC
HC	12"/45	.78"	.66"	1.8"	1.6"	2000 - HC
Target	14"/50		.79"		1.8"	1935 - Target
Reduced	6"/47	.44"	.39"	1.0"	.92"	2065 - HC; 1935 - Target
<u>14"/45:</u>						
Full	14"/45		.76"		1.8"	2600 - AP; 2735 - HC
HC	12"/45	.78"	.66"	1.8"	1.6"	2000 - HC
Target	14"/45		.76"		1.8"	1935 - Target
Reduced	6"/47	.44"	.39"	1.0"	.92"	2065 - HC; 1935 - Target
<u>12"/50:</u> (CB)						
Full	12"/50		.72"		1.6"	2500 - AP; 2650 - HC
HC	12"/45	.78"	.66"	1.8"	1.6"	1850 - HC
Target	12"/50		.72"		1.6"	1800 - Target
Reduced	8" single perforated	.29"	.27"	.78"	.75"	1965 - HC; 1800 - Target
<u>12"/50:</u> (ARKANSAS)						
Full	12"/50		.72"		1.6"	2900 - AP; 3000 - HC
Reduced	12"/50		.72"		1.6"	2125 - HC; 2100 - Target
<u>8"/55:</u> (335 lb.)						
Full	8"/55	.50"	.50"	1.2"	1.2"	2500 - AP; 2700 - HC
***Reduced	8"/55	.50"	.50"	1.2"	1.2"	2160 - HC; 2000 - Target
Reduced	8" single perforated	.29"	.27"	.78"	.75"	2220 - HC; 2000 - Target
<u>8"/55:</u> (260 lb.)						
Full	8"/55	.50"	.50"	1.2"	1.2"	2800 - AP; 2800 - HC
Reduced	8"/55	.50"	.50"	1.2"	1.2"	2300 - HC; 2300 - Target
<u>6"/53:</u>						
Full	6"/53	.47"	.42"	1.1"	.93"	3000 - Common
HC	6"/53	.47"	.42"	1.1"	.93"	2400 - HC
Target	6"/54	.47"	.42"	1.1"	.93"	2300 - Target
<u>6"/50:</u>						
Full	6"/50		.38"		.85"	2800 - Common
Target	6"/50		.38"		.85"	2100 - Target
<u>6"/47:</u>						
Full	6"/47	.44"	.39"	1.0"	.92"	2800 - Common
Target	6"/47	.44"	.39"	1.0"	.92"	2300 - Target
<u>5"/51:</u>						
Full	5"/51	.31"	.35"	.75"	.79"	3150 - Common
Target	5"/51	.31"	.35"	.75"	.79"	2300 - Target
<u>5"/50:</u>						
Full	5"/50	.28"	.28"	.64"	.64"	3000 - Common

\* SPDN Powder: This is a nonhygroscopic powder, a stabilized smokeless powder with the further addition of certain non-volatile materials to reduce hygroscopicity and increase service life.

\*\* SPD Powder: This is a smokeless powder stabilized by the addition of diphenylamine.

\*\*\* This is an old Reduced Charge, to be replaced by that containing the 8" single perforated powder.

Other types of powders used include SPDW, reworked powder for target use; SPDX, water-dried stabilized smokeless powder; SPDF, flashless smokeless powder; SPOG, a flashless double base smokeless powder containing nitro-glycerine and stabilized with carbamite.



3" MK.2

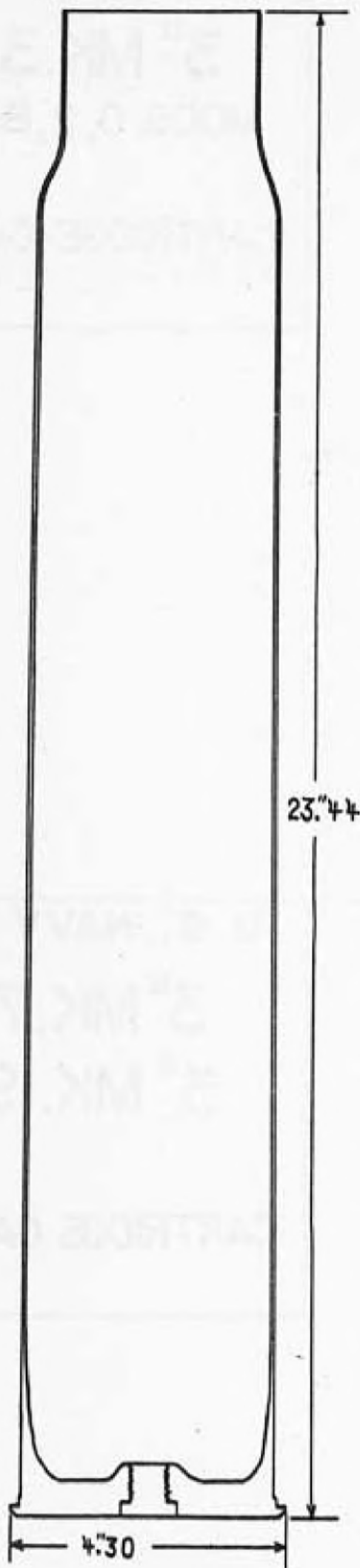
CARTRIDGE CASE

**DATA**

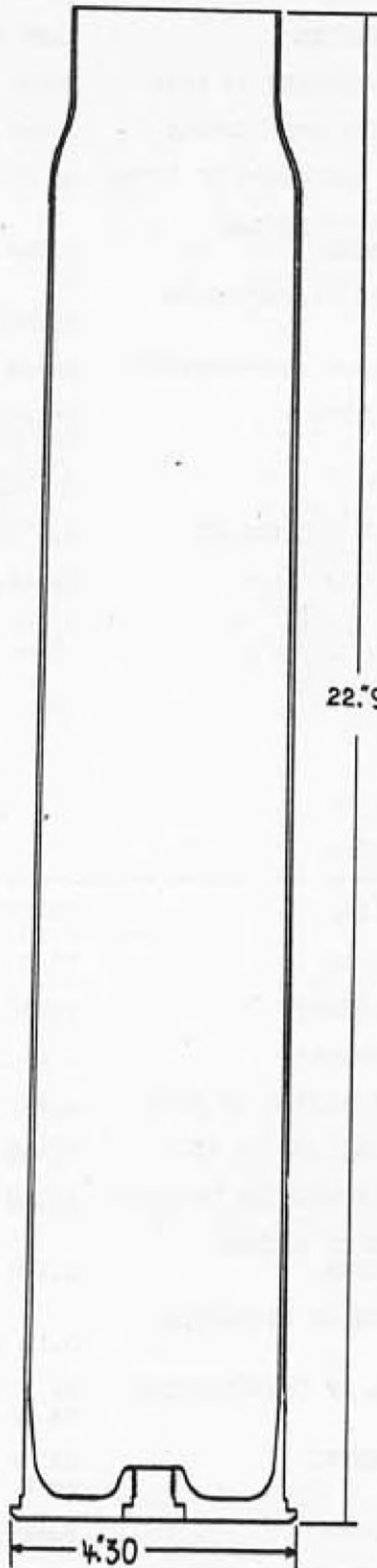
RESTRICTED

GUN USED IN	3"/23
OVERALL LENGTH	9.20 in.
BASE DIAMETER	3.46 in.
INSIDE DIAMETER AT NECK	2.96 in.
CASE THICKNESS AT NECK	0.032 in.
BASE TO BEGINNING OF TAPER	No taper
DIAMETER OF PRIMER CONTAINER	0.473 in.
THICKNESS OF EXTRACTOR LIP	0.05 in.
MATERIAL OF CONSTRUCTION	Brass
WEIGHT EMPTY	2.25 lbs.
PROPELLANT	Smokeless powder
WEIGHT OF PROPELLANT	580 grams
PRIMER USED	Mk 10 Mod 9
VOLUME OF CASE	
TYPE OF ROUND	Fixed

**U. S. NAVY****3" MK.2****CARTRIDGE CASE**



3" MK.3



3" MK.7

CARTRIDGE CASE

**DATA**

RESTRICTED

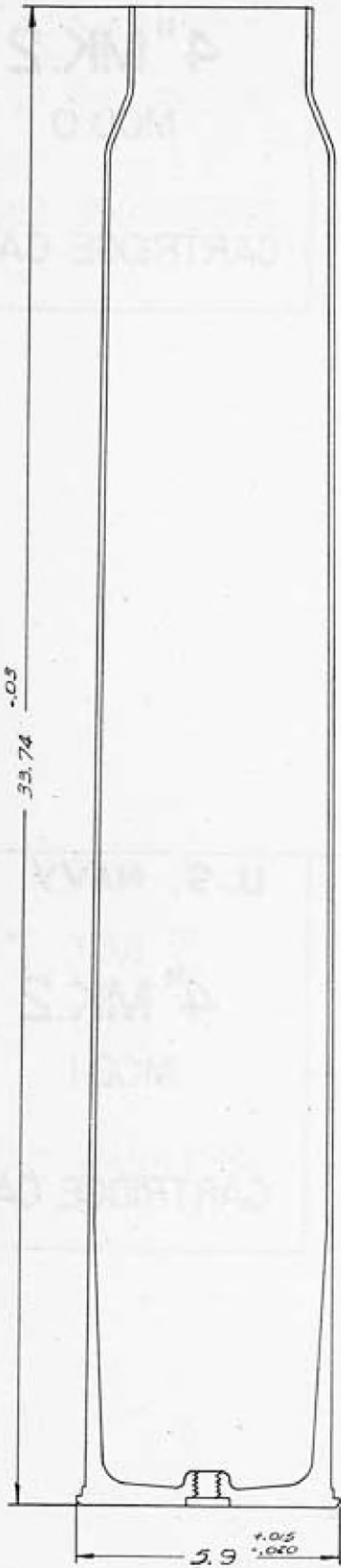
GUN USED IN	3"/50
OVERALL LENGTH	23.44 in.
BASE DIAMETER	4.30 in.
INSIDE DIAMETER AT NECK	2.975 in.
CASE THICKNESS AT NECK	0.045 in.
BASE TO BEGINNING OF TAPER	20.09 in.
DIAMETER OF PRIMER CONTAINER	0.806 in.
THICKNESS OF EXTRACTOR LIP	0.10 in.
MATERIAL OF CONSTRUCTION	Brass
WEIGHT EMPTY	Mods 0 & 3: 7.0 lbs. Mod 2: 7.88 lbs.
PROPELLANT	Smokeless powder
WEIGHT OF PROPELLANT	4.0 lbs.
PRIMER USED	Mk 14, Mk 14 Mod 1
TYPE OF ROUND	Fixed

**U. S. NAVY****3" MK.3**  
**MODS. 0, 2, & 3****CARTRIDGE CASE****DATA**

RESTRICTED

GUN USED IN	3"/50
OVERALL LENGTH	22.99 in.
BASE DIAMETER	4.30 in.
INSIDE DIAMETER AT NECK	2.975 in.
CASE THICKNESS AT NECK	0.045 in.
BASE TO BEGINNING OF TAPER	20.12 in.
DIAMETER OF PRIMER CONTAINER	0.806 in.
THICKNESS OF EXTRACTOR LIP	0.10 in.
MATERIAL OF CONSTRUCTION	Mk 7: Brass Mk 9: Steel
WEIGHT EMPTY	Mk 7: 7.0 lbs. Mk 9: 6.54 lbs.
PROPELLANT	Smokeless powder
WEIGHT OF PROPELLANT	4.0 lbs.
PRIMER USED	Mk 14, Mk 14 Mod 1
TYPE OF ROUND	Fixed

**U. S. NAVY****3" MK.7**  
**3" MK. 9****CARTRIDGE CASE**



MOD. 0

MK. 2

MOD. 1

CARTRIDGE CASE

34.840  
+.000  
-.030

4"

**DATA**

RESTRICTED

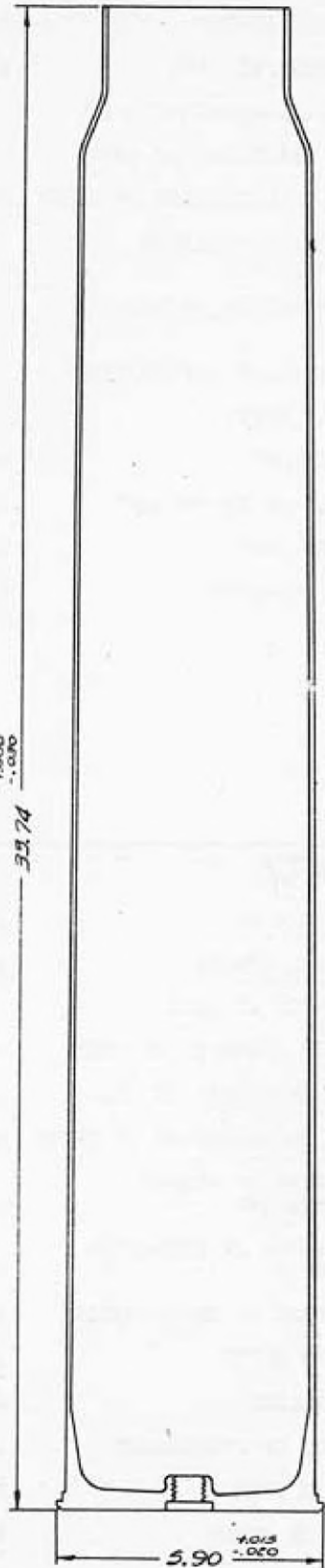
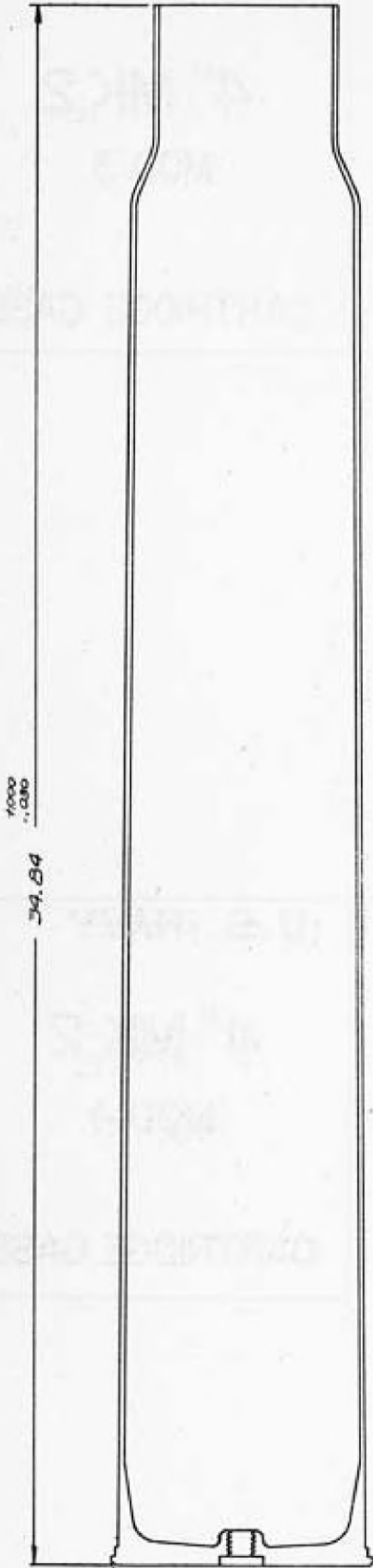
GUN USED IN	4"/50
OVERALL LENGTH	34.840 in.
BASE DIAMETER	5.90 in.
INSIDE DIAMETER AT NECK	3.95 in.
CASE THICKNESS AT NECK	0.050 in.
BASE TO BEGINNING OF TAPER	30.275 in.
DIAMETER OF PRIMER CONTAINER	0.806 in.
THICKNESS OF EXTRACTOR LIP	0.140 in.
MATERIAL OF CONSTRUCTION	Brass
WEIGHT EMPTY	17.25 lbs.
PROPELLANT	Smokeless powder
WEIGHT OF PROPELLANT	14.5 lbs.
PRIMER USED	Mk 13 and all Mods
TYPE OF ROUND	Fixed

**U. S. NAVY****4" MK.2****MOD.0****CARTRIDGE CASE****DATA**

RESTRICTED

GUN USED IN	4"/50
OVERALL LENGTH	33.74 in.
DIAMETER OF BASE	5.90 in.
INSIDE DIAMETER AT NECK	3.95 in.
CASE THICKNESS AT NECK	0.050 in.
BASE TO BEGINNING OF TAPER	30.275 in.
DIAMETER OF PRIMER CONTAINER	0.806 in.
THICKNESS OF EXTRACTOR LIP	0.140 in.
MATERIAL OF CONSTRUCTION	Brass
WEIGHT EMPTY	17.0 lbs.
PROPELLANT	Smokeless powder
WEIGHT OF PROPELLANT	14.5 lbs.
PRIMER USED	Mk 13 and all Mods
TYPE OF ROUND	Fixed

**U. S. NAVY****4" MK.2****MOD.1****CARTRIDGE CASE**



4"

MOD. 3

MK. 2

MOD. 4

CARTRIDGE CASE

**DATA**

RESTRICTED

GUN USED IN	4"/50
OVERALL LENGTH	34.94 in.
DIAMETER AT BASE	5.90 in.
INSIDE DIAMETER AT NECK	3.95 in.
CASE THICKNESS AT NECK	0.045 in.
BASE TO BEGINNING OF TAPER	30.305 in.
DIAMETER OF PRIMER CONTAINER	0.806 in.
THICKNESS OF EXTRACTOR LIP	0.140 in.
MATERIAL OF CONSTRUCTION	Brass
WEIGHT EMPTY	15.1 lbs.
PROPELLANT	Smokeless powder
WEIGHT OF PROPELLANT	14.5 lbs.
PRIMER USED	Mk 13 and all Mods
TYPE OF ROUND	Fixed

U. S. NAVY

**4" MK.2**  
**MOD.3**

**CARTRIDGE CASE****DATA**

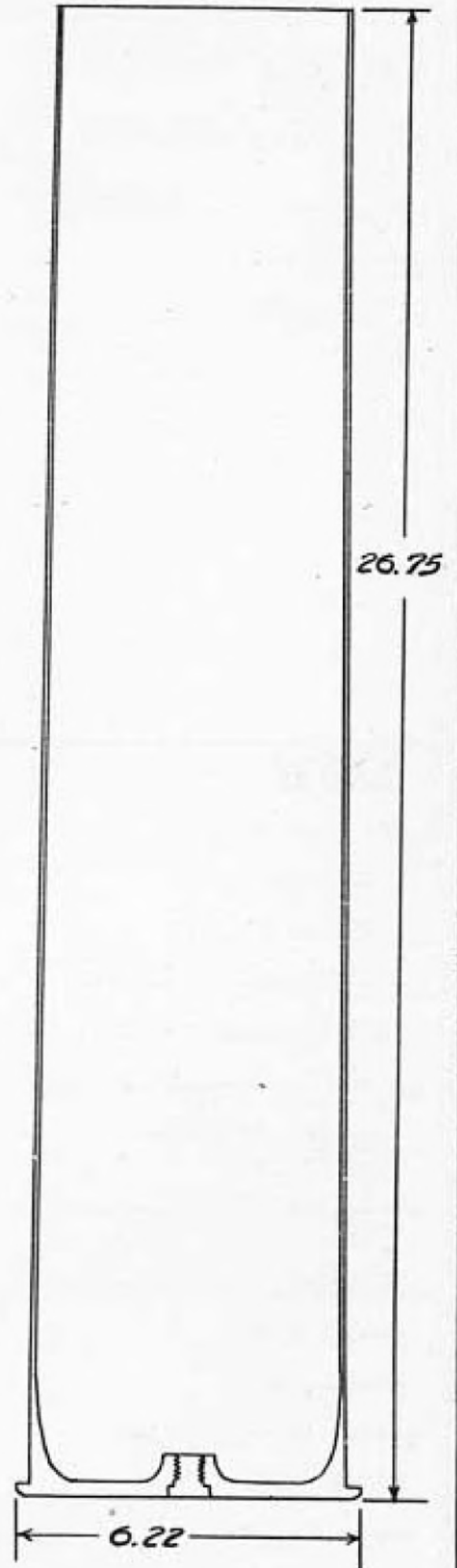
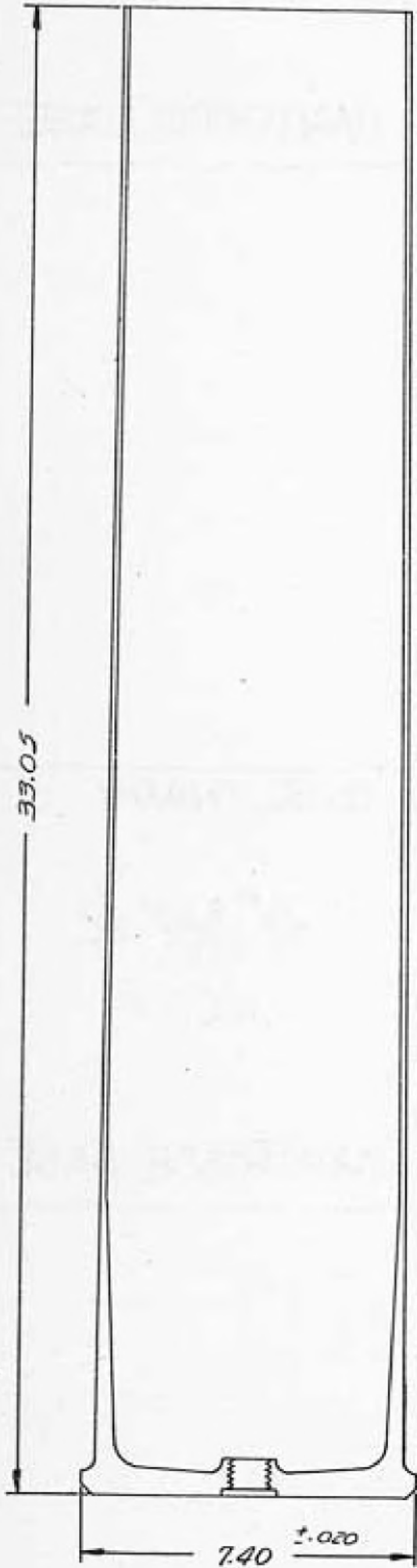
RESTRICTED

GUN USED IN	4"/50
OVERALL LENGTH	33.74 in.
DIAMETER AT BASE	5.90 in.
INSIDE DIAMETER AT NECK	3.95 in.
CASE THICKNESS AT NECK	0.045 in.
BASE TO BEGINNING OF TAPER	30.305 in.
DIAMETER OF PRIMER CONTAINER	0.806 in.
THICKNESS OF EXTRACTOR LIP	0.140 in.
MATERIAL OF CONSTRUCTION	Brass
WEIGHT EMPTY	14.9 lbs.
PROPELLANT	Smokeless powder
WEIGHT OF PROPELLANT	14.5 lbs.
PRIMER USED	Mk 13 and all Mods
TYPE OF ROUND	Fixed

U. S. NAVY

**4" MK.2**  
**MOD.4**

**CARTRIDGE CASE**



5"

MK.3

CARTRIDGE  
CASE

MK.5

**DATA**

RESTRICTED

GUN USED IN	5"/51
OVERALL LENGTH	33.05 in.
DIAMETER AT BASE	7.40 in.
INSIDE DIAMETER AT NECK	6.311 in.
CASE THICKNESS AT NECK	0.056 in.
BASE TO BEGINNING OF TAPER	No taper
DIAMETER OF PRIMER CONTAINER	0.806 in.
THICKNESS OF EXTRACTOR LIP	0.210 in.
MATERIAL OF CONSTRUCTION	Brass
WEIGHT EMPTY	27.38 lbs.
PROPELLANT	Smokeless powder
WEIGHT OF PROPELLANT	24.5 lbs.
PRIMER USED	Mk 13 and all Mods
TYPE OF ROUND	Semi-fixed

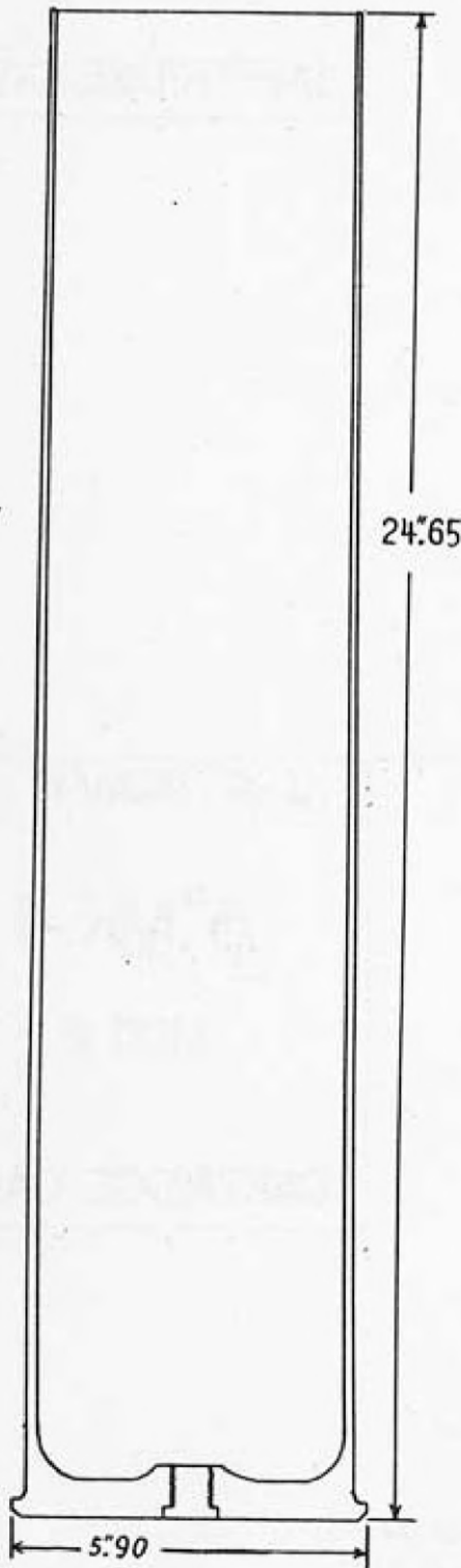
**U. S. NAVY****5" MK.3****CARTRIDGE CASE****DATA**

RESTRICTED

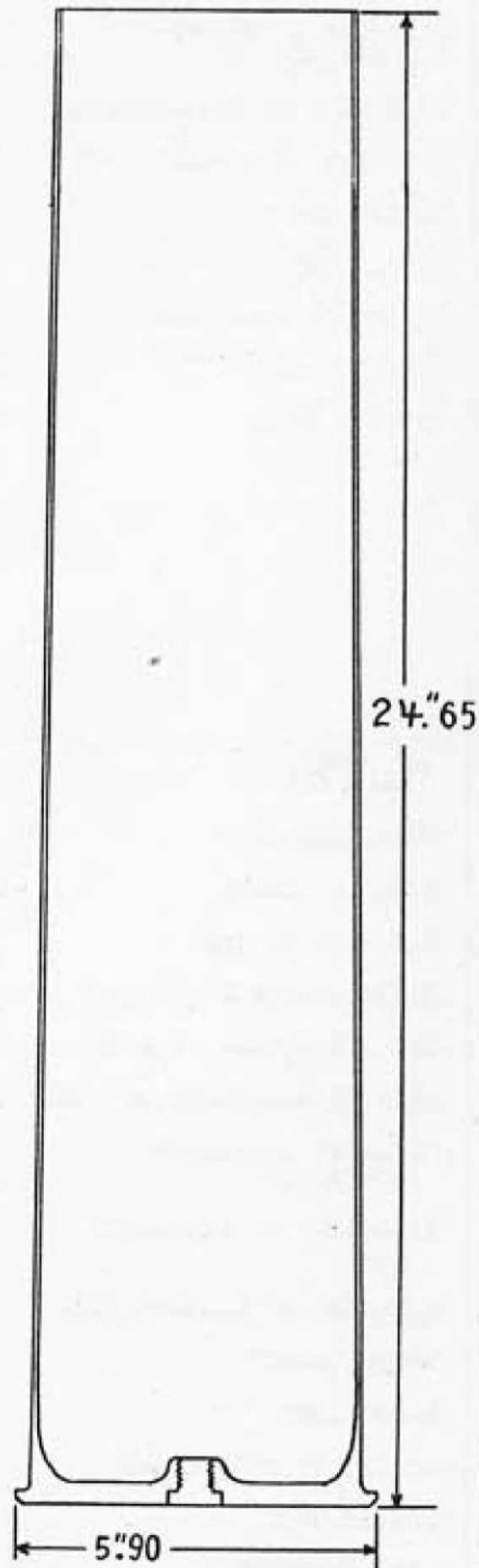
GUNS USED IN	5"/38
OVERALL LENGTH	26.75 in.
DIAMETER AT BASE	6.22 in.
INSIDE DIAMETER AT NECK	5.31 in.
CASE THICKNESS AT NECK	0.045 in.
BASE TO BEGINNING OF TAPER	No taper
DIAMETER OF PRIMER CONTAINER	0.906 in.
THICKNESS OF EXTRACTOR LIP	0.150 in.
MATERIAL OF CONSTRUCTION	Brass
WEIGHT EMPTY	12.31 lbs.
PROPELLANT	Smokeless powder
WEIGHT OF PROPELLANT	15.2 lbs.
PRIMER USED	Mk 13 and all Mods
TYPE OF ROUND	Semi-fixed

**U. S. NAVY****5" MK.5****CARTRIDGE CASE**

RESTRICTED



MOD. 0



MOD. 2

**5" MK. 4  
CARTRIDGE CASE**

**DATA**

RESTRICTED

GUNS USED IN	5"/25
OVERALL LENGTH	24.65 in.
DIAMETER AT BASE	5.90 in.
INSIDE DIAMETER AT NECK	4.969 in.
CASE THICKNESS AT NECK	0.046 in.
BASE TO BEGINNING OF TAPER	No taper
DIAMETER OF PRIMER CONTAINER	0.806 in.
THICKNESS OF EXTRACTOR LIP	0.15 in.
MATERIAL OF CONSTRUCTION	Brass
WEIGHT EMPTY	14.44 lbs.
PROPELLANT	Smokeless powder
WEIGHT OF PROPELLANT	9.6 lbs.
PRIMER USED	Mk 13 and all Mods
TYPE OF ROUND	Fixed

U. S. NAVY

**5" MK. 4**

MOD. 0

CARTRIDGE CASE

**DATA**

RESTRICTED

GUNS USED IN	5"/25
OVERALL LENGTH	24.65 in.
DIAMETER AT BASE	5.90 in.
INSIDE DIAMETER AT NECK	4.969 in.
CASE THICKNESS AT NECK	0.048 in.
BASE TO BEGINNING OF TAPER	No taper
DIAMETER OF PRIMER CONTAINER	0.806 in.
THICKNESS OF EXTRACTOR LIP	0.150 in.
MATERIAL OF CONSTRUCTION	Brass
WEIGHT EMPTY	11.4 lbs.
PROPELLANT	Smokeless powder
WEIGHT OF PROPELLANT	9.6 lbs.
PRIMER USED	Mk. 13 and all Mods
TYPE OF ROUND	Fixed

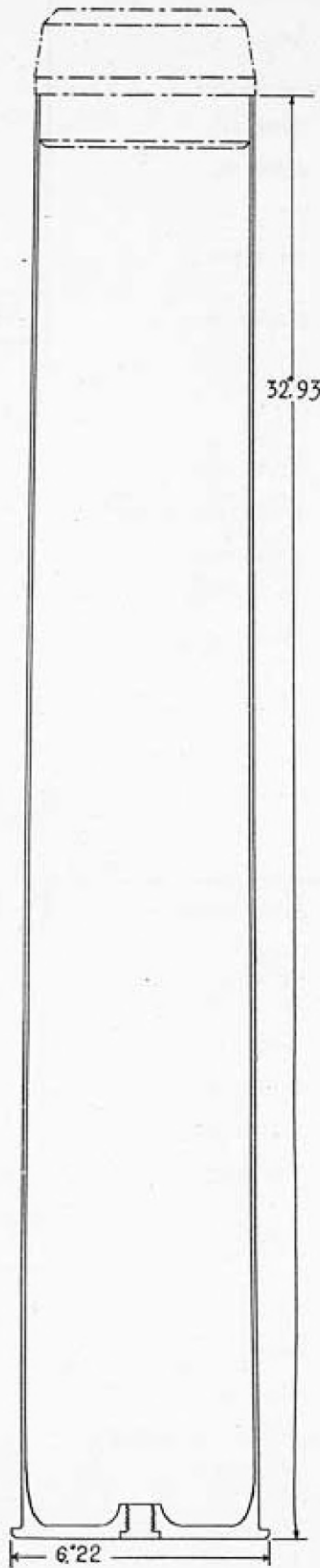
U. S. NAVY

**5" MK. 4**

MOD. 2

CARTRIDGE CASE

RESTRICTED



**5" MK.6  
CARTRIDGE CASE**

**DATA**

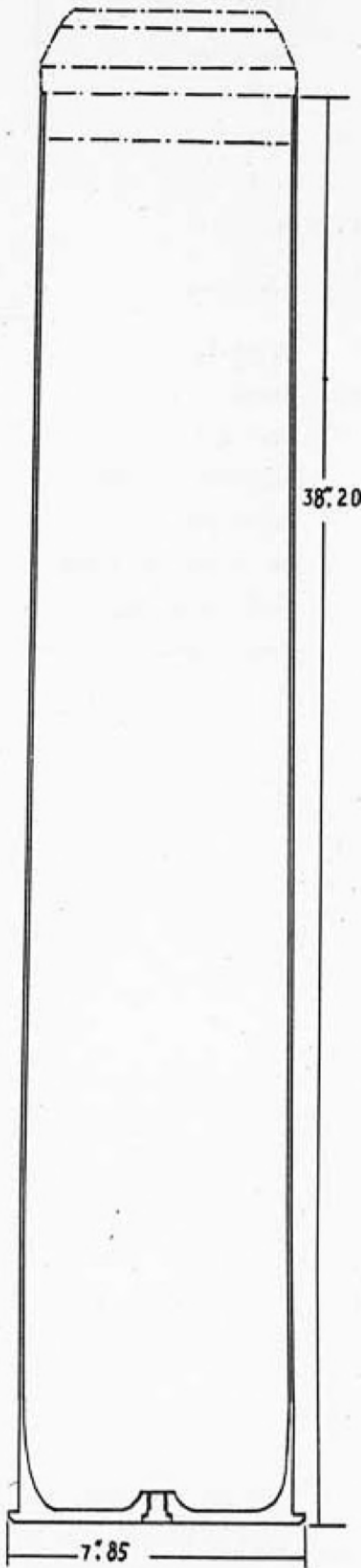
RESTRICTED

**U. S. NAVY**

GUN USED IN	5"/54
OVERALL LENGTH	32.93 in.
DIAMETER AT BASE	6.22 in.
OUTSIDE DIAMETER AT NECK	5.36 in.
CASE THICKNESS AT NECK	
BASE TO BEGINNING OF TAPER	No taper
DIAMETER OF PRIMER CONTAINER	0.806 in.
THICKNESS OF EXTRACTOR LIP	0.15 in.
MATERIAL OF CONSTRUCTION	Brass
WEIGHT EMPTY	13.04 lbs.
PROPELLANT	Smokeless powder
WEIGHT OF PROPELLANT	18.0 lbs.
PRIMER USED	Mk 13 and all Mods
TYPE OF ROUND	Semi-fixed

**5" MK.6****CARTRIDGE CASE**

RESTRICTED



6"

MK.4

CARTRIDGE CASE

**DATA**

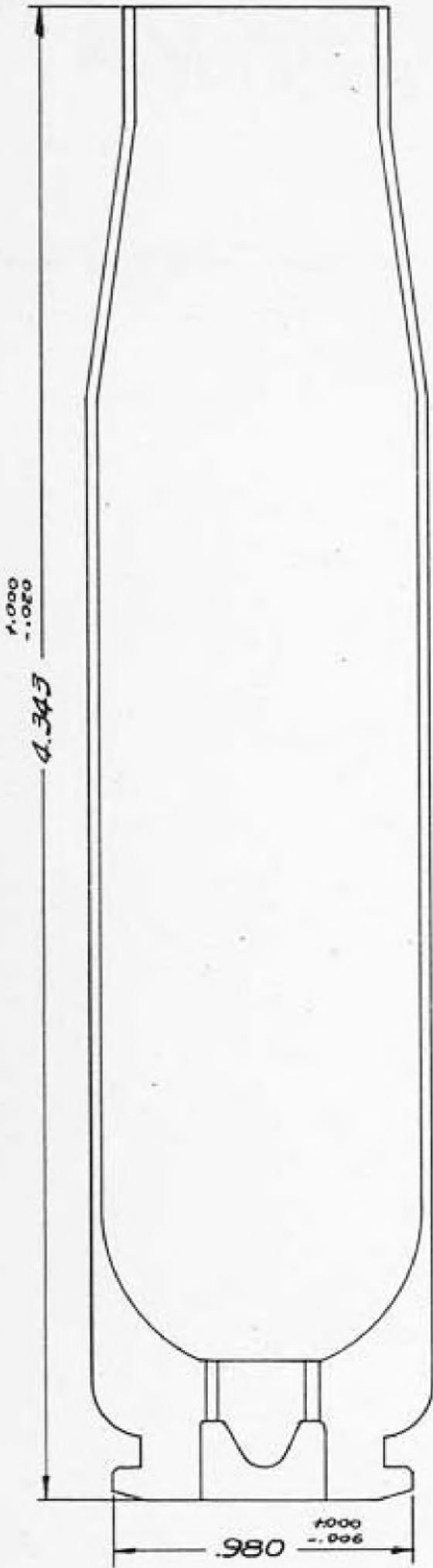
RESTRICTED

U. S. NAVY

GUN USED IN	6"/47
OVERALL LENGTH	38.20 in.
BASE DIAMETER	7.85 in.
INSIDE DIAMETER AT NECK	6.63 in.
CASE THICKNESS AT NECK	0.055 in.
BASE TO BEGINNING OF TAPER	No taper
DIAMETER OF PRIMER CONTAINER	0.806 in.
THICKNESS OF EXTRACTOR LIP	0.224 in.
MATERIAL OF CONSTRUCTION	Brass
WEIGHT EMPTY	28.2 lbs.
PROPELLANT	Smokeless powder
WEIGHT OF PROPELLANT	32.0 lbs.
PRIMER USED	Mk 13 and all Mods
VOLUME OF CASE	1383 cubic inches
TYPE OF ROUND	Semi-fixed

**6" MK.4****CARTRIDGE CASE**

RESTRICTED



**MK.2    20 MM.    MK.3**  
**CARTRIDGE CASE**

**DATA**

RESTRICTED

GUN USED IN	20 mm A.A.
OVERALL LENGTH	4.343 in.
DIAMETER AT BASE	0.874 in.
INSIDE DIAMETER AT NECK	0.740 in.
CASE THICKNESS AT NECK	0.0235 in.
BASE TO BEGINNING OF TAPER	3.28 in.
DIAMETER OF PRIMER CONTAINER	0.3095 in.
THICKNESS OF EXTRACTOR LIP	0.067 in.
MATERIAL OF CONSTRUCTION	Brass
WEIGHT EMPTY	0.190 lbs.
PROPELLANT	Smokeless powder
WEIGHT OF PROPELLANT	27.7 grams
PRIMER USED	Mk 30, Mk 31
TYPE OF ROUND	Fixed

U.S. NAVY

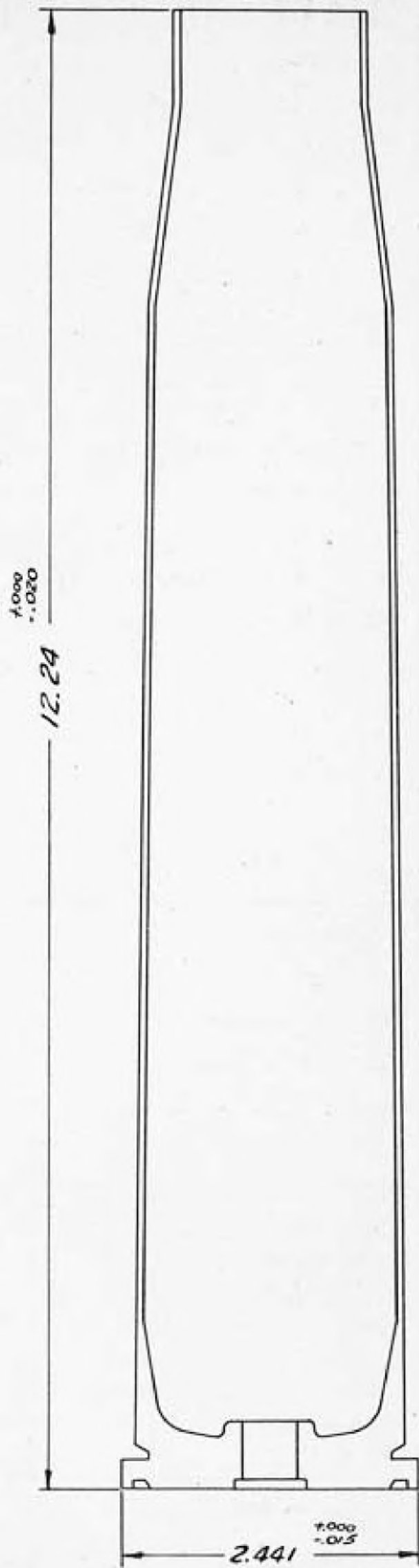
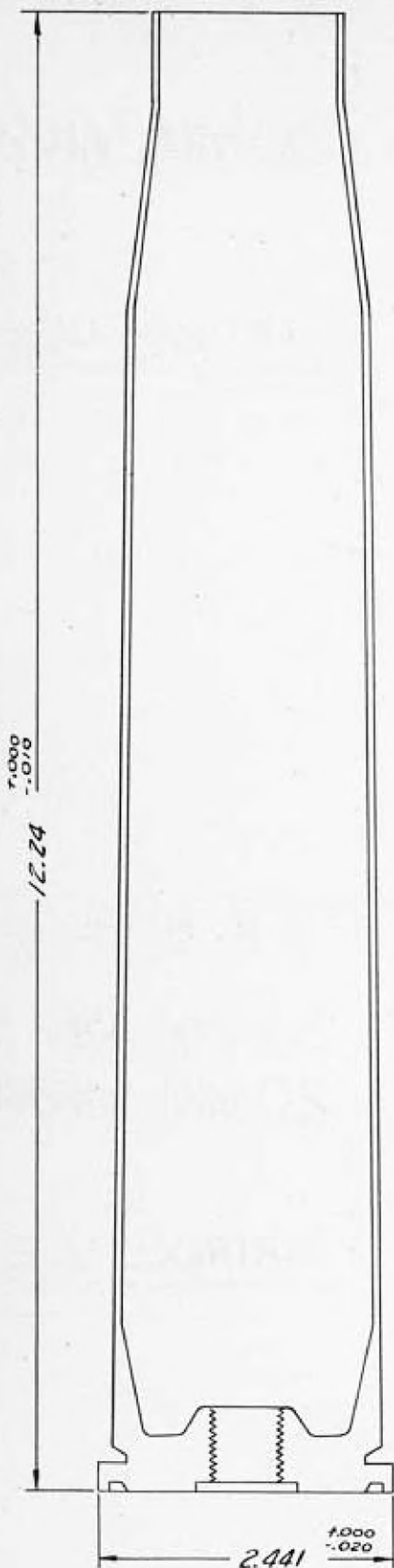
**20 MM. MK.2****CARTRIDGE CASE****DATA**

RESTRICTED

GUN USED IN	20 mm A.A.
OVERALL LENGTH	4.343 in.
DIAMETER AT BASE	0.874 in.
INSIDE DIAMETER AT NECK	0.740 in.
CASE THICKNESS AT NECK	0.0235 in.
BASE TO BEGINNING OF TAPER	3.28 in.
DIAMETER OF PRIMER CONTAINER	0.33 in.
THICKNESS OF EXTRACTOR LIP	0.067 in.
MATERIAL OF CONSTRUCTION	Mk 3: steel Mk 4: brass
WEIGHT EMPTY	0.190 lbs.
PROPELLANT	Smokeless powder
WEIGHT OF PROPELLANT	27.7 grams
PRIMER USED	Mk 31
TYPE OF ROUND	Fixed

U.S. NAVY

**20 MM. MK. 3  
20MM. MK. 4****CARTRIDGE CASE**



MK.1 40MM. MK.2  
CARTRIDGE CASE

**DATA**

RESTRICTED

GUN USED IN	40 mm A.A.
OVERALL LENGTH	12.24 in.
DIAMETER AT BASE	2.441 in.
INSIDE DIAMETER AT NECK	1.535 in.
CASE THICKNESS AT NECK	0.037 in.
BASE TO BEGINNING OF TAPER	9.74 in.
DIAMETER OF PRIMER CONTAINER	0.802 in.
THICKNESS OF EXTRACTOR LIP	0.240 in.
MATERIAL OF CONSTRUCTION	Brass
WEIGHT EMPTY	1.93 lbs.
PROPELLANT	Smokeless powder
WEIGHT OF PROPELLANT	300 grams
PRIMER USED	Mk 21
TYPE OF ROUND	Fixed

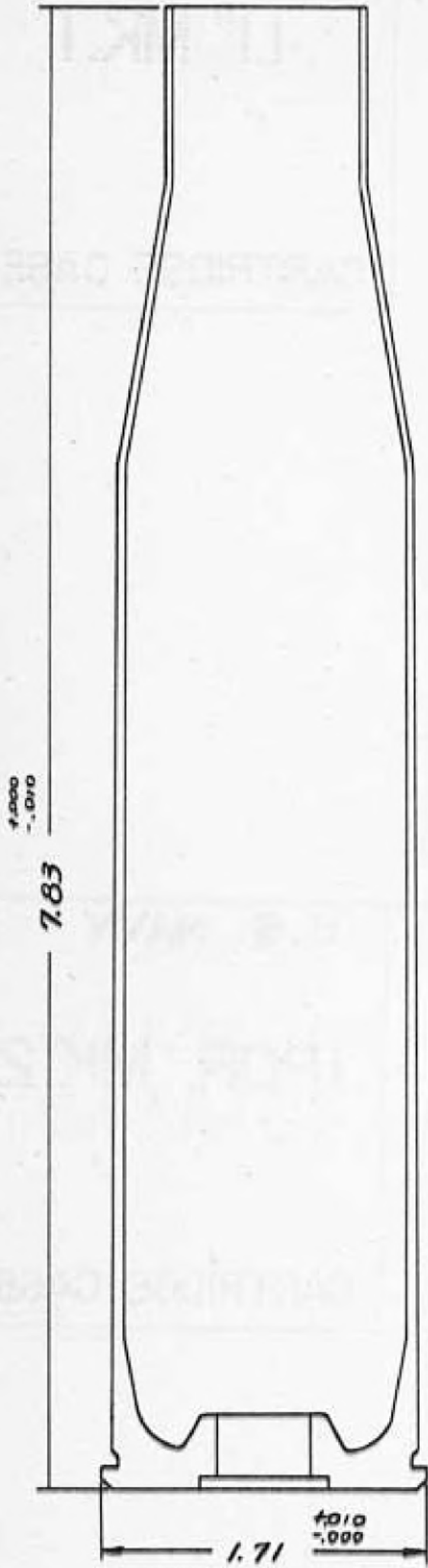
**U.S. NAVY****40 MM. MK. 1****CARTRIDGE CASE****DATA**

RESTRICTED

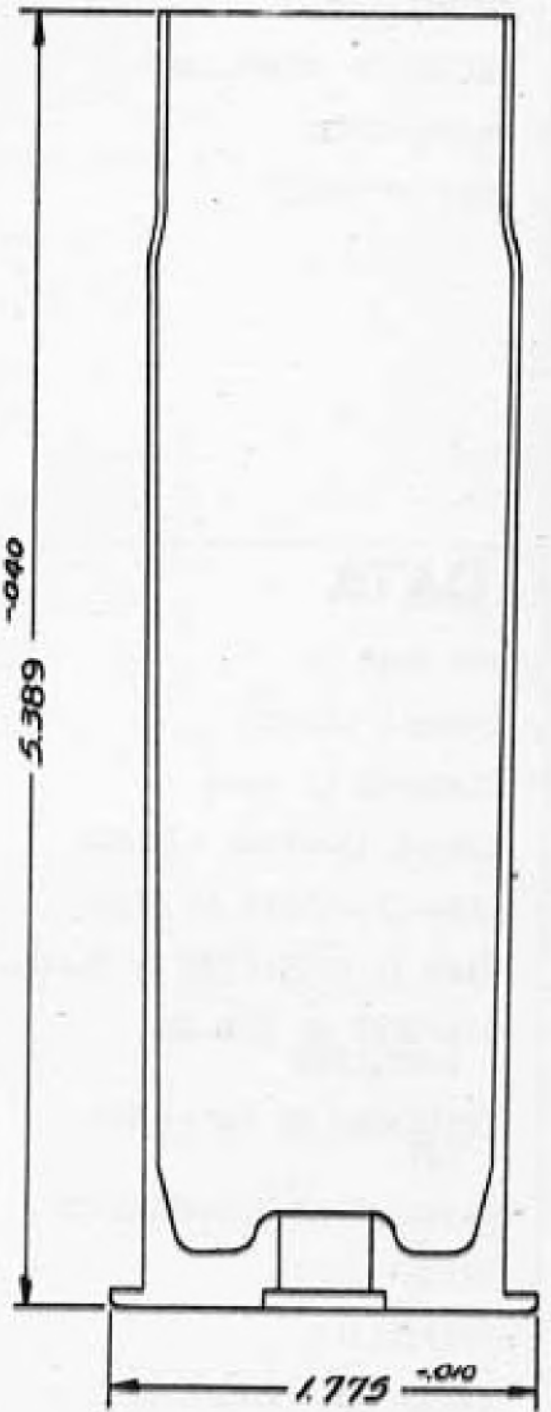
GUN USED IN	40 mm A.A.
OVERALL LENGTH	12.24 in.
DIAMETER AT BASE	2.441 in.
INSIDE DIAMETER AT NECK	1.533 in.
CASE THICKNESS AT NECK	0.037 in.
BASE TO BEGINNING OF TAPER	9.74 in.
DIAMETER OF PRIMER CONTAINER	0.630 in.
THICKNESS OF EXTRACTOR LIP	0.240 in.
MATERIAL OF CONSTRUCTION	Mk 2: Brass Mk 3: Steel
WEIGHT EMPTY	Mk 2: 1.89 lbs. Mk 3: 1.53 lbs.
PROPELLANT	Smokeless powder
WEIGHT OF PROPELLANT	300 grams
PRIMER USED	Mk 22
TYPE OF ROUND	Fixed

**U.S. NAVY****40 MM. MK. 2****40 MM. MK. 3****CARTRIDGE CASE**

RESTRICTED



1.1" MK.1



1 PDR. MK.2

CARTRIDGE CASE

**DATA**

RESTRICTED

GUN USED IN	1.1" A.A.
OVERALL LENGTH	7.83 in.
DIAMETER AT BASE	1.71 in.
INSIDE DIAMETER AT NECK	1.077 in.
CASE THICKNESS AT NECK	0.027 in.
BASE TO BEGINNING OF TAPER	6.93 in.
DIAMETER OF PRIMER CONTAINER	0.630 in.
THICKNESS OF EXTRACTOR LIP	0.065 in.
MATERIAL OF CONSTRUCTION	Brass
WEIGHT EMPTY	0.688 lbs.
PROPELLANT	Smokeless powder
WEIGHT OF PROPELLANT	120 grams
PRIMER USED	Mk 19 Mod 3
TYPE OF ROUND	Fixed

U.S. NAVY

1.1" MK. I

CARTRIDGE CASE

**DATA**

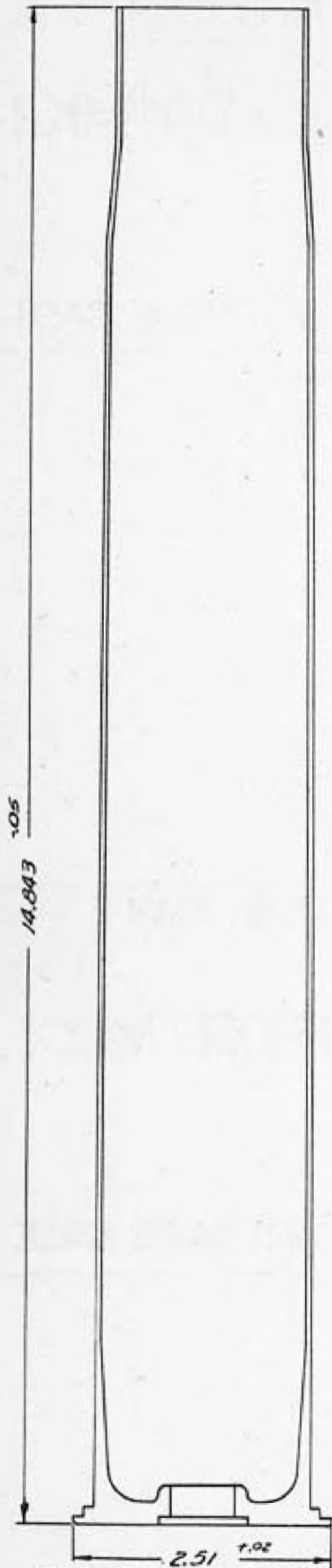
RESTRICTED

GUN USED IN	1 Pounder
OVERALL LENGTH	5.389 in.
DIAMETER AT BASE	1.775 in.
INSIDE DIAMETER AT NECK	1.433 in.
CASE THICKNESS AT NECK	0.014 in.
BASE TO BEGINNING OF TAPER	4.648 in.
DIAMETER OF PRIMER CONTAINER	0.473 in.
THICKNESS OF EXTRACTOR LIP	0.078 in.
MATERIAL OF CONSTRUCTION	Brass
WEIGHT EMPTY	0.406 lbs.
PROPELLANT	Smokeless powder
WEIGHT OF PROPELLANT	.70 grams
PRIMER USED	Mk 10 Mod 9
TYPE OF ROUND	Fixed

U.S. NAVY

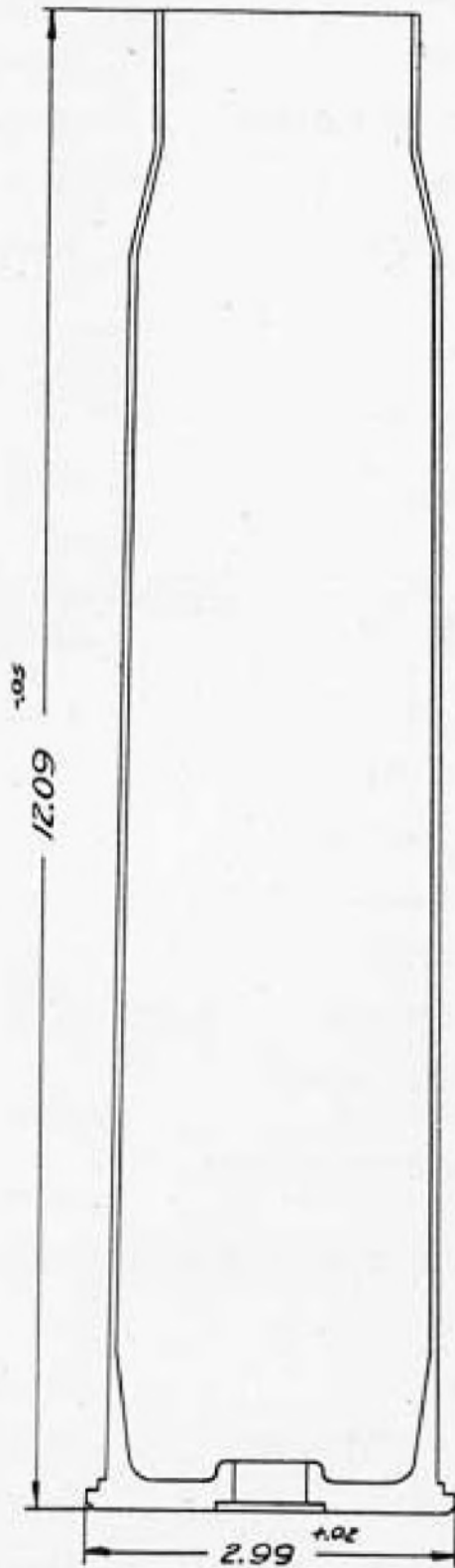
1 PDR. MK. 2

CARTRIDGE CASE



3 PDR. MK. I

CARTRIDGE



6 PDR. MK. I

CASE

**DATA**

RESTRICTED

GUN USED IN	3 Pounder
OVERALL LENGTH	14.843 in.
DIAMETER AT BASE	2.51 in.
INSIDE DIAMETER AT NECK	1.826 in.
CASE THICKNESS AT NECK	0.032 in.
BASE TO BEGINNING OF TAPER	12.60 in.
DIAMETER OF PRIMER CONTAINER	0.473 in.
THICKNESS OF EXTRACTOR LIP	0.059 in.
MATERIAL OF CONSTRUCTION	Brass
WEIGHT EMPTY	1.65 lbs.
PROPELLANT	Smokeless powder
WEIGHT OF PROPELLANT	300 grams
PRIMER USED	Mk 10 Mod 9
TYPE OF ROUND	Fixed

**U. S. NAVY****3 PDR. MK. I****CARTRIDGE CASE****DATA**

RESTRICTED

GUN USED IN	6 Pounder
OVERALL LENGTH	12.09 in.
DIAMETER AT BASE	2.99 in.
INSIDE DIAMETER AT NECK	2.209 in.
CASE THICKNESS AT NECK	0.034 in.
BASE TO BEGINNING OF TAPER	10.155 in.
DIAMETER OF PRIMER CONTAINER	0.473 in.
THICKNESS OF EXTRACTOR LIP	0.102 in.
MATERIAL OF CONSTRUCTION	Brass
WEIGHT EMPTY	2.13 lbs.
PROPELLANT	Smokeless powder
WEIGHT OF PROPELLANT	500 grams
PRIMER USED	Mk 10 Mod 9
TYPE OF ROUND	Fixed

**U. S. NAVY****6 PDR. MK. I****CARTRIDGE CASE**

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# FUZES

## SECTION 4

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# FUZES

## INTRODUCTION

### GENERAL

A fuze is a mechanism for igniting or detonating the bursting charge of a projectile at some time during flight or impact. The impact action may be either instantaneous or delay up to about 0.035 seconds.

### AERIAL BURST FUZES

An aerial burst fuze is essentially a device designed to detonate a projectile during its time of flight after a predetermined interval. This has been accomplished through the burning of a (variable) length of powder train or through the action of a spring or a centrifugal clock mechanism. Only the clockwork types are currently in use by the U.S. Navy. Powder train fuzes were previously used but have been declared unserviceable and obsolete.

### PROXIMITY FUZES (V.T.)

#### 1. General:

V.T. fuzes are automatic proximity fuzes designed to cause detonation of a projectile at the most advantageous point along its trajectory. The fuzes operate with equal effectiveness in daylight or at night, and they require no setting or adjustment before using, eliminating "fuze error". They are electrical fuzes which function auxiliary detonating fuzes after electrically integrating two conditions: (a) nearness to an object, and (b) rate of approach to the object. Both conditions must be fulfilled to a definite degree before an electric impulse in the fuze will discharge a charged condenser through an electric detonator, called a "squib".

V.T. fuzes may be employed for anti-aircraft purposes or for barrage fire against land or surface targets where air bursts will be effective against personnel and unarmored structures and equipment.

V.T. anti-aircraft fuzes are designed to detonate the projectile at the most advantageous point upon approach to an aircraft, if they pass close enough to ensure good probability of lethal fragmentation. The fuzes, moreover, will not function until the target is within the umbrella-shaped cone of fragmentation of the round.

The advantage of V.T. fuzing for short range AA work lies in its sensitivity to the presence of its target and the resulting increase of effective target area. Due to its sensitivity to its target's presence, a V.T. fuze comprehends a medium bomber as a target of about 7000 sq. ft. in area. The plane presents an actual surface of about 200 sq. ft. to an impact fuze. Thus V.T. fuzing increases the effective target area about 35 times.

~~CONFIDENTIAL~~

FUZES

INTRODUCTION  
(Continued)

PROXIMITY FUZES (V.T.) - Cont'd.

For medium and long range AA fire, V.T. fuzing has the additional advantages over nose time fuzes that "fuze error" is eliminated, no mechanical setting is required before firing, the fuze is effective at full range and time of flight of the gun employed, and there is no loss of effectiveness at night or in fog or smoke obscurement.

2. Wave Suppression :

One disadvantage encountered with early Mods of the Mk 32 and Mk 46 V.T. fuzes was their sensitivity to waves or choppy water, causing either premature or non-functioning when fired at low elevations at targets near the water. A wave-suppression feature has been incorporated in later models of V.T. fuzes which eliminates this disadvantage. This feature also makes the fuze less sensitive to large targets, such as land or water, so that detonation will not occur until the fuze is within 10 - 20 ft. of the surface.

3. Tracer Influence:

A second disadvantage in the use of V.T. fuzes is that no tracer may be employed, since the burning tracer will influence the fuze to cause functioning upon arming or to prevent functioning until the tracer has burned out.

4. Prematures:

All V.T. fuzes are subject to random premature bursts along the trajectory after arming but before approaching a target. This makes the fuze somewhat dangerous to use for bombardment fire to cover landing operations, as the prematures will occur over our own forces. However, other advantages of V.T. fuzes for this type of fire are deemed to outweigh this danger. Normal bursts against land installations will be obtained between 10 - 30 " or 50 - 200 feet above the target respectively for fuzes with and without W.S.F. The fuze will automatically adapt itself to varying terrain features.

5. Safety Features:

Because of the number and variety of safety features incorporated, V.T. fuzes are among the safest in use as regards handling, bore safety, and freedom from muzzle bursts. In addition to the bore and muzzle safety provided by the auxiliary detonating fuze, a centrifugal clock is incorporated in the Mks 32 and 40. The clock runs out in about 0.4 seconds, opening a safety gate between the electric squib and the auxiliary detonating fuze and breaking a shorting wire across the squib. In addition, an electrical arming delay is provided to control the rate of charging the firing condenser,

INTRODUCTION  
(Continued)

PROXIMITY FUZES (V.T.) - Cont'd.

which accumulates energy for firing the squib only after the power circuits are closed by set-back switches.

The Mk 45 and later models contain mercury short circuits across the squib in place of the centrifugal clockwork mechanism. These mercury unshorters are so designed that handling, tumbling, or shock will not cause them to open. Centrifugal force caused by the projectile rotation must be applied for 0.2 - 0.4 seconds (depending on the fuze) before the mercury shorts can be opened. In addition to this feature, these models incorporate a centrifugal switch which prevents charging of the firing condenser except when the round is rotating at or above a certain rate. This is called the "centrifugal handling switch".

All V.T. projectile fuzes, except the Mk 32, are powered with reserve batteries, wet batteries with the active ingredients contained in a glass ampoule until the round is fired. Upon set-back, the ampoule is broken, and the battery is automatically activated.

The battery ampoule is the weakest part of the fuze from the handling standpoint. While the complete round may be dropped 40 ft. on armor plate without making it unsafe to fire, the fuze cannot be expected to function properly. Battery ampoules in the Mk 53 fuze will withstand a 4 ft. drop against armor plate in any position without breakage or impaired functioning. Ampoules in the Mk 32 Mod 30 and Mk 40 fuzes may be broken by a 2 ft. drop on armor plate. If the ampoule is broken a considerable time before firing, the round will probably non-function, but safety is not reduced. If the ampoule breaks less than 30 seconds before firing, normal functioning may be expected.

V.T. fuzes operate effectively over a temperature range of 10° to 120° F. Outside of this range, a higher percentage of malfunctioning will occur.

6. Storage:

Exposure to high humidity conditions in storage reduces the service life of these fuzes. However, when properly shipped and stored, with protective nose caps in place, these fuzes may be stored for extended periods of time without excessive deterioration or impaired behavior. The Mk 32 fuze requires special treatment, as it is not a reserve battery fuze. The Mk 32 Mods 1 - 20 & 40 are re-energized by special Bureau of Ordnance personnel about every 6 months. The fuzes are opened with special tools, and new batteries are inserted. Re-energizing should not be attempted by unauthorized personnel.

FUZESINTRODUCTION  
(Continued)PROXIMITY FUZES (V.T.) - Cont'd.7. Supply:

V.T. fuzes are supplied in specially cavitized projectiles for Naval use, and the fuzes cannot be interchanged with nose time or point detonating fuzes. However, V.T. fuzes are ballistically similar to nose time fuzes; so no corrections need be made in practical fire control when V.T. fuzing is employed. Although all V.T. fuzes have formerly been supplied in complete rounds, the Mk 58 fuze will be issued to replace previously fitted Mk 45 Mod 12 fuzes in 3"/50 AA projectiles.

8. Security:

Classification of V.T. fuzes and material pertaining thereto has been delineated by action of Combined Chiefs of Staff and is in substance as follows:

- (a) Equipment, when stock-piled and in operational use:

RESTRICTED

- (b) Operational Information and Instructions, including technical documents and manuals:

CONFIDENTIAL

- (c) AA Action Reports, listing expenditure of ammunition by Mark of fuze and giving results of engagement:

CONFIDENTIAL

- (d) Technical Information, such as diagrams, frequencies, specifications, research and development, countermeasures, and information not listed above as Confidential:

SECRET

All fuzes of this type, regardless of application or missile in which employed, are considered to fall within the classification of V.T. fuzes. No publicity whatsoever regarding this type of equipment may be released.

POINT, BASE, AND AUXILIARY DETONATING FUZES

When classified according to assembled position in the projectile, fuzes are either Point fuzes, which are assembled in the nose of the projectile, or Base fuzes. In addition, Auxiliary Detonating fuzes are used in conjunction with point fuzes in all except Illuminating Projectiles.

FUZESINTRODUCTION  
(Continued)IGNITION AND DETONATING FUZES

The differentiation between fuzes as to whether Ignition or Detonating depends on the method of firing the bursting charge. The operating mechanism of the ignition fuze fires a black powder magazine, which may ignite the bursting charge of the projectile directly or function through an auxiliary detonating fuze, containing a detonating element. A detonating fuze contains a high explosive element directly within its own body.

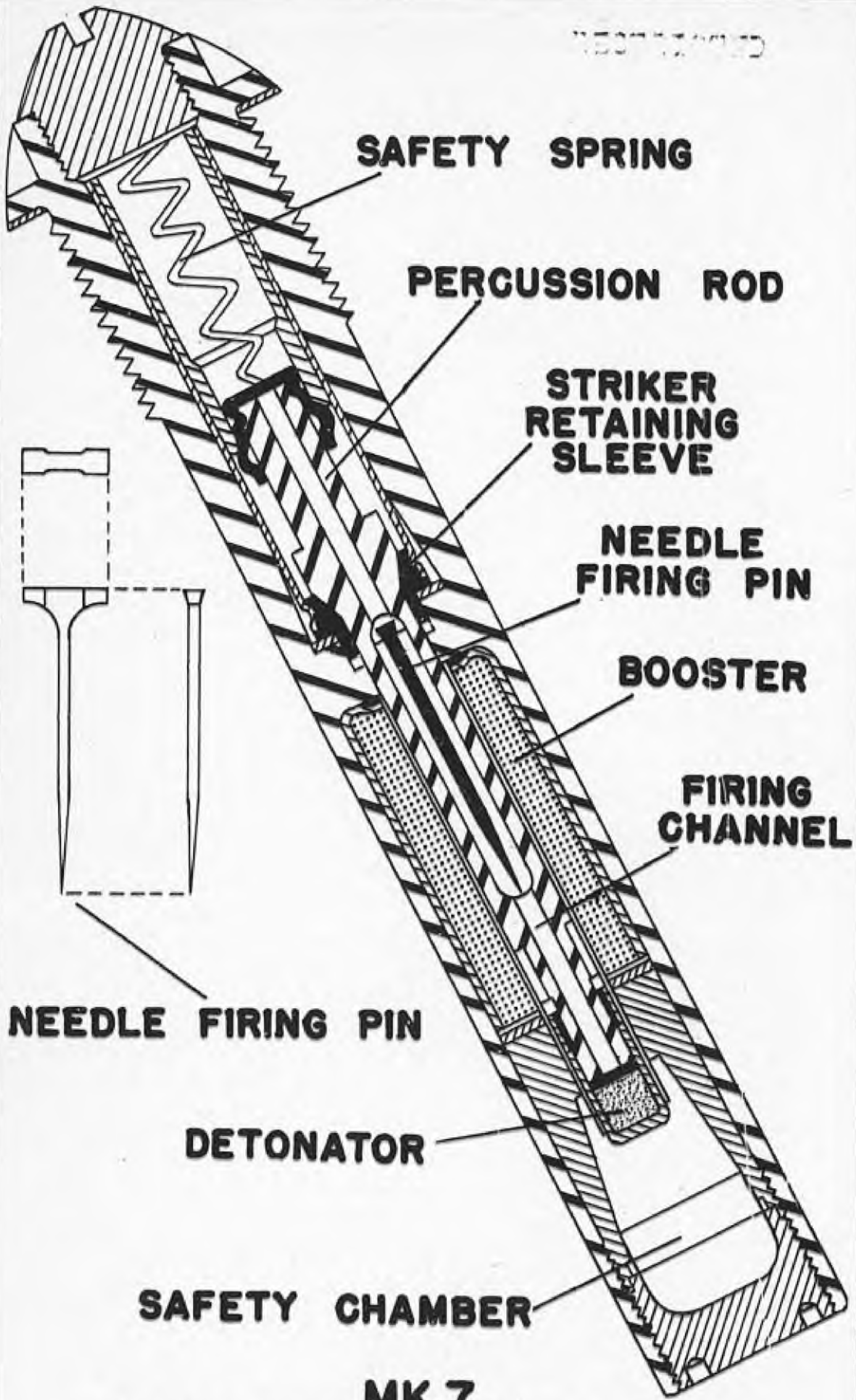
DELAY

The delay elements within impact fuzes consist either of slow-burning powder pellets of fixed size or pellets in which varying lengths burn before the action takes place. The delay element is designed to allow penetration of material targets before bursting the projectile. Delays are always used in armor piercing projectiles to obtain complete penetration before detonation. Instantaneous fuzes are employed against light armor or material targets for burst before penetration.

ARMING

The principal forces used in arming or preparing fuzes for action are (a) Setback, the force of inertia or resistance to linear acceleration of projectiles, and (2) Centrifugal Force, due to the rotation of the projectile. Many of the Navy fuzes employ a combination of these two forces in arming the fuze. The force of setback exists only during the acceleration stage of the projectile's flight, which ceases when the projectile leaves the bore of the gun. Centrifugal force, however, exists from the instant that the projectile begins its movement until detonation occurs. Setback is generally used to shear safety pins, fire percussion elements, and initiate the operation of mechanical clocks. Centrifugal force serves to release detents (or locking pins), drive and fire centrifugally operated clocks, revolve rotor blocks, etc., as is explained in detail in the individual fuze explanations.

REF ID: A66325



NEEDLE FIRING PIN

DETONATOR

SAFETY CHAMBER

**MK.7  
NOSE DETONATING FUZE**

**DATA**

RESTRICTED

**U. S. NAVY**

PROJECTILES USED IN	7"/45 Field & Bbt.
OVERALL LENGTH	7.81 in.
DIAMETER	Body: 1.12 in.
	Base of
	ogive: 1.62 in.
THREADED LENGTH	1.27 in.
THREADS	13 R.H.
MATERIAL OF CONSTRUCTION	Steel

**MK. 7****MOD. I**

NOSE DETONATING FUZE

**DESCRIPTION:**

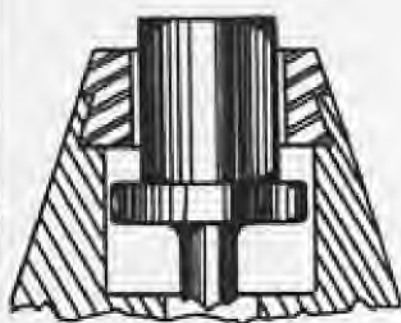
This fuze consists of a long, cylindrical body closed at either end by an ogival nose cap and a cylindrical base plug, each threaded into place. The central cavity of the body houses a safety spring, a long percussion rod assembly, a needle striker, a striker retaining sleeve, a detonator, and a ring booster pellet.

The percussion rod is closed at its upper end by a metal cap. The rolled edges of this cap and the safety spring tend to prevent the percussion rod from moving into the upper portion of the body. The long cylindrical portion of the percussion rod is slotted longitudinally to allow the eared striker to slide freely within the rod. The ears of the striker are engaged by the striker retaining sleeve, holding the striker permanently fixed. A detonator is fixed to the lower end of the percussion rod. In the unarmed position, this detonator is not adjacent to the ring booster charge but is encased in a safety chamber in the base of the fuze. Accidental explosion of the detonator in this position would spend itself harmlessly in the expansion chamber, and the booster charge would not be fired.

**OPERATION:**

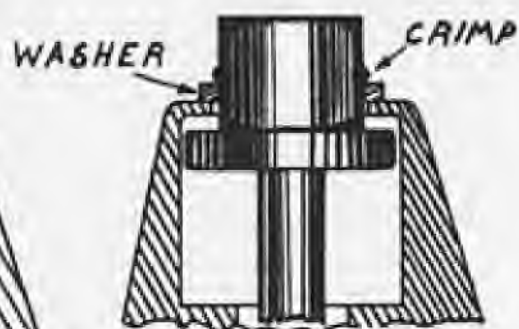
The fuze functions entirely on impact, when the inertia of the percussion rod drives the rolled edges of its upper cap past the shoulder of the cap retaining sleeve. The rod then continues into the upper portion of the fuze body, against the force of the safety spring. This action carries the detonator out of the safety chamber, adjacent to the ring booster, and against the fixed firing pin. The initiation of the detonator fires the booster and thus the main charge.

Rearward motion of the percussion rod during set-back is prevented by the conical shape of the percussion rod just above the striker retaining sleeve.

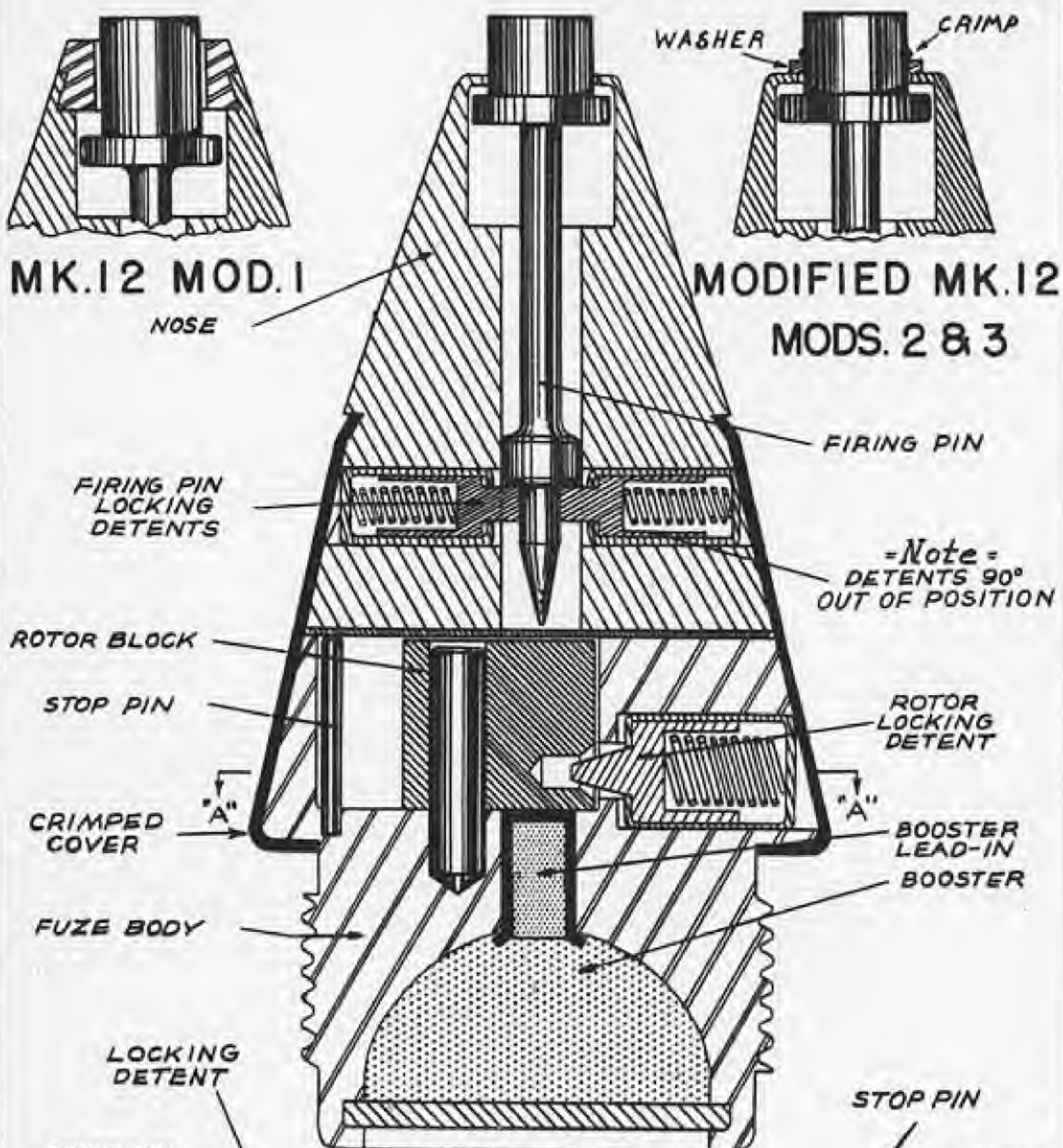


MK.12 MOD.1

NOSE

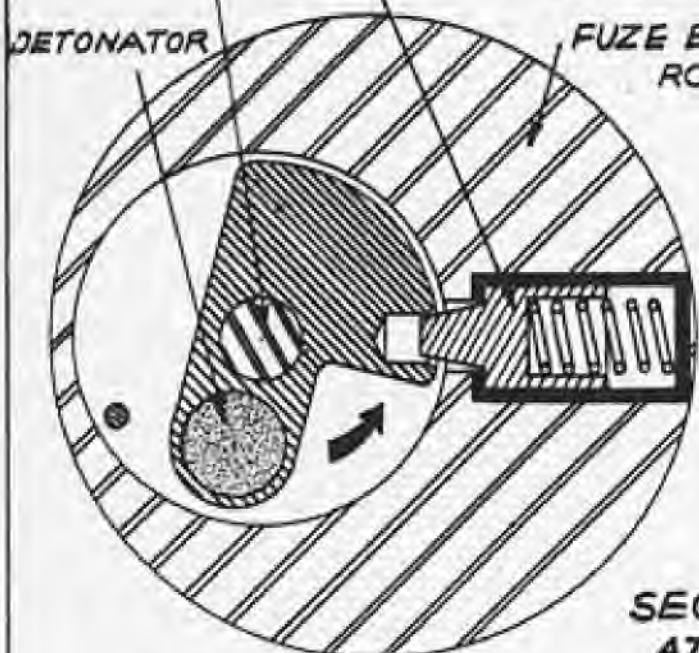


MODIFIED MK.12  
MODS. 2 & 3

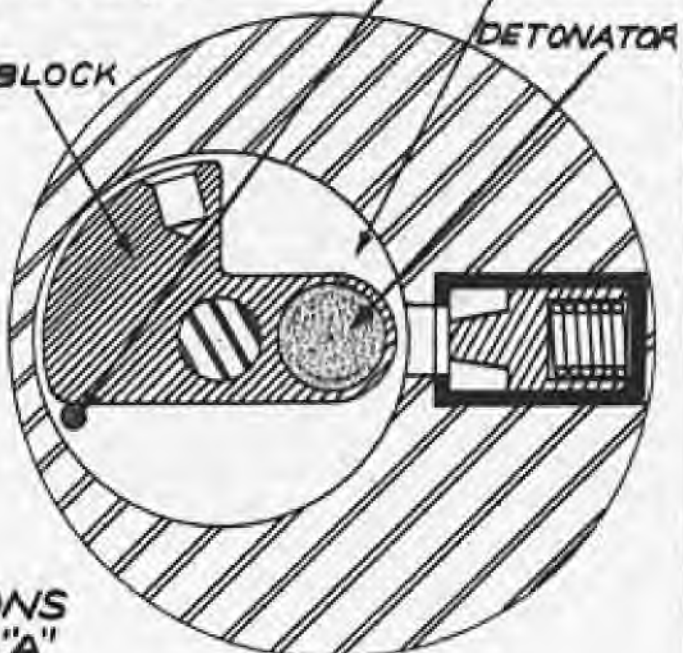


-Note-  
DETENTS 90°  
OUT OF POSITION

MK.12 MOD.2,3



UNARMED POSITION



ARMED POSITION

POINT DETONATING FUZE

**DATA**

RESTRICTED

**U. S. NAVY**PROJECTILES USED IN  
MARKINGS1.1" A.A.  
D.F. Mk 12 Mod \_\_\_\_  
Lot \_\_\_\_\_  
P M C H.D.B.OVERALL LENGTH  
DIAMETERS2.3 in.  
Firing Pin Head: 0.18 in.  
Base of Ogive: 1.08 in.THREADED LENGTH  
THREADS0.62 in.  
7 R.H.MATERIAL OF  
CONSTRUCTIONNose: Aluminum  
Base: Commercial brass  
Booster Cover: Sheet  
steel.WEIGHT  
ARMING SPEED85.3 grams  
Firing Pin: 5000 - 7500 R.P.M.  
Rotor: 1000 - 1600 R.P.M.**MK.12**

POINT DETONATING FUZE

DESCRIPTION:

The fuze consists of a nose and a fuze body, held firmly together by a metal jacket, which is crimped over at both ends, and separated from each other by a thin metal disc. The firing pin and firing pin detents are assembled in the nose portion, while the lower body portion of the fuze contains the rotor detent, rotor, detonator, and booster. The booster is held in the base of the fuze body by a metal closing disc, which is secured in position by the crimped over ends of the fuze body.

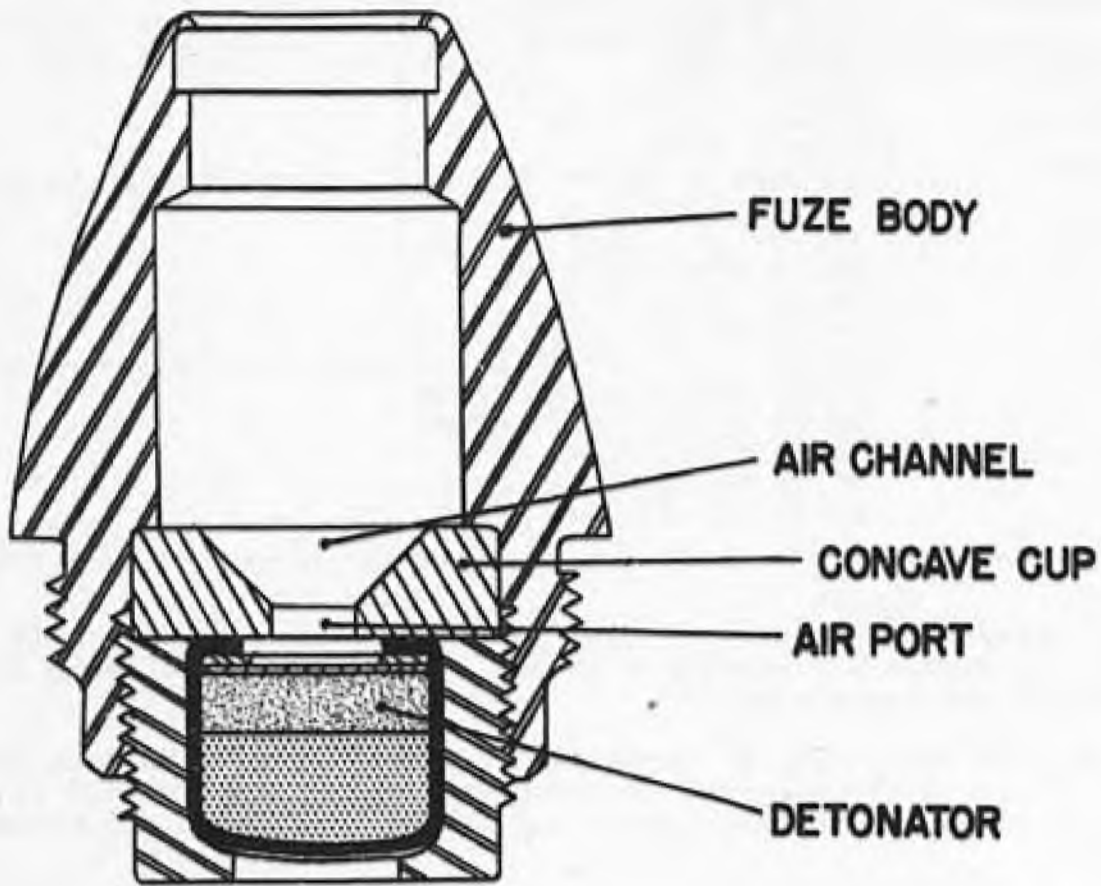
OPERATION:

In the unarmed position the striker is held upward by a pair of firing pin detents and the detonator rotor is held out of alignment with the firing pin and the booster lead-in by a rotor detent. When the projectile is fired from the gun, centrifugal force moves the firing pin and rotor detents outward against their springs, unlocking the firing pin and the rotor. Centrifugal force then causes the rotor to revolve about its pivot until brought up by the stop pin. In this position the detonator is fully aligned with the firing pin and the booster lead-in. On impact, the exposed firing pin is driven into the detonator, which initiates the booster lead-in and the booster. The fuze is designed to function on light duralumin sheets.

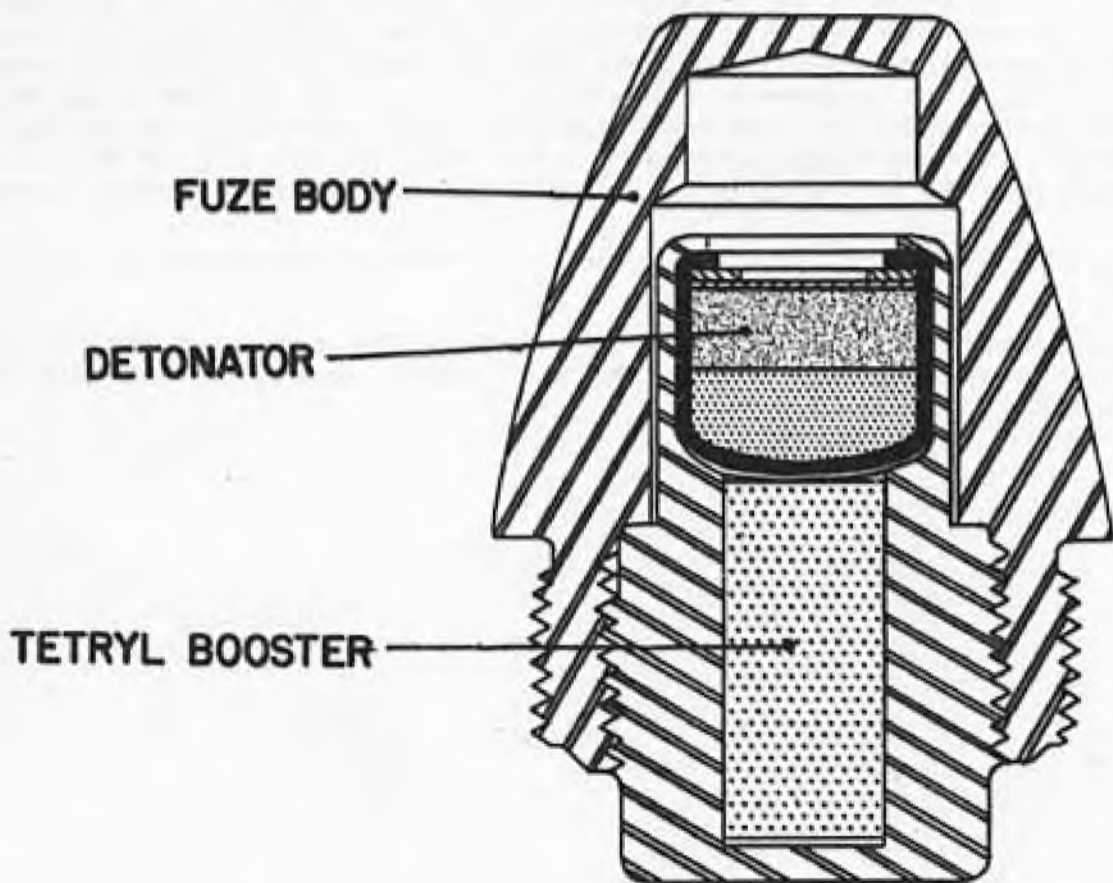
REMARKS:

- (a) Mk 12 Mod 1 is identical to the Mk 12, except that an extra striker-support piece is set in a groove in the nose.
- (b) Mk 12 Mods 2 & 3 differs from the Mod 1 in that the striker is held in the nose assembly by crimping over the end of the nose.
- (c) Modified Mk 12 (Mods 2 & 3): to decrease the sensitivity of the Mk 12 fuze, a washer has been placed above the firing pin, and the firing pin has been crimped above the washer. Thus on impact, both the crimp and the washer must be broken.

RESTRICTED



MOD. 0



MODS. 182

**MK. 26****POINT DETONATING FUZE**

**DATA**

RESTRICTED

**U. S. NAVY  
MK.26**

Projectiles Used in . . . 20 mm H.E., H.E.I,  
and H.E.T. (A.A.)

Markings . . . . . Mk 26 Mod  
MB Co Lot

Overall Length . . . . . 1<sup>11</sup>/<sub>16</sub>

Diameters . . . . . Nose - 0<sup>11</sup>/<sub>32</sub>  
At Base of Ogive  
- 0<sup>11</sup>/<sub>80</sub>

Threaded Length . . . . . Mk 26 - 0<sup>11</sup>/<sub>16</sub>  
Mk 26 Mod 1-0<sup>11</sup>/<sub>16</sub>

Threads . . . . . Mk 26 - 4 RH  
Mk 26 Mod 1- 7 RH

Weights . . . . . Mk 26 - 24.67 grams  
Mk 26 Mod 1- 23.37 grams  
Mk 26 Mod 2- 28.67 grams

Material of Construction. Mk 26 - All Brass  
Mk 26 Mod 1 - Zinc Body  
Mk 26 Mod 2 - All Brass

POINT DETONATING FUZE

**DESCRIPTION**

The Mk 26 consists essentially of four parts - the nose or body unit into which are fitted the Rear Disc or Air Channel and the Closing Unit which contains the Detonator.

The Mk 26 Mods 1 and 2 consist essentially of two pieces: the Nose or Main Body and the Magazine which contains the same detonator used in Mk 26 No Mod and an additional booster of tetryl below the lead azide detonator.

**OPERATION**

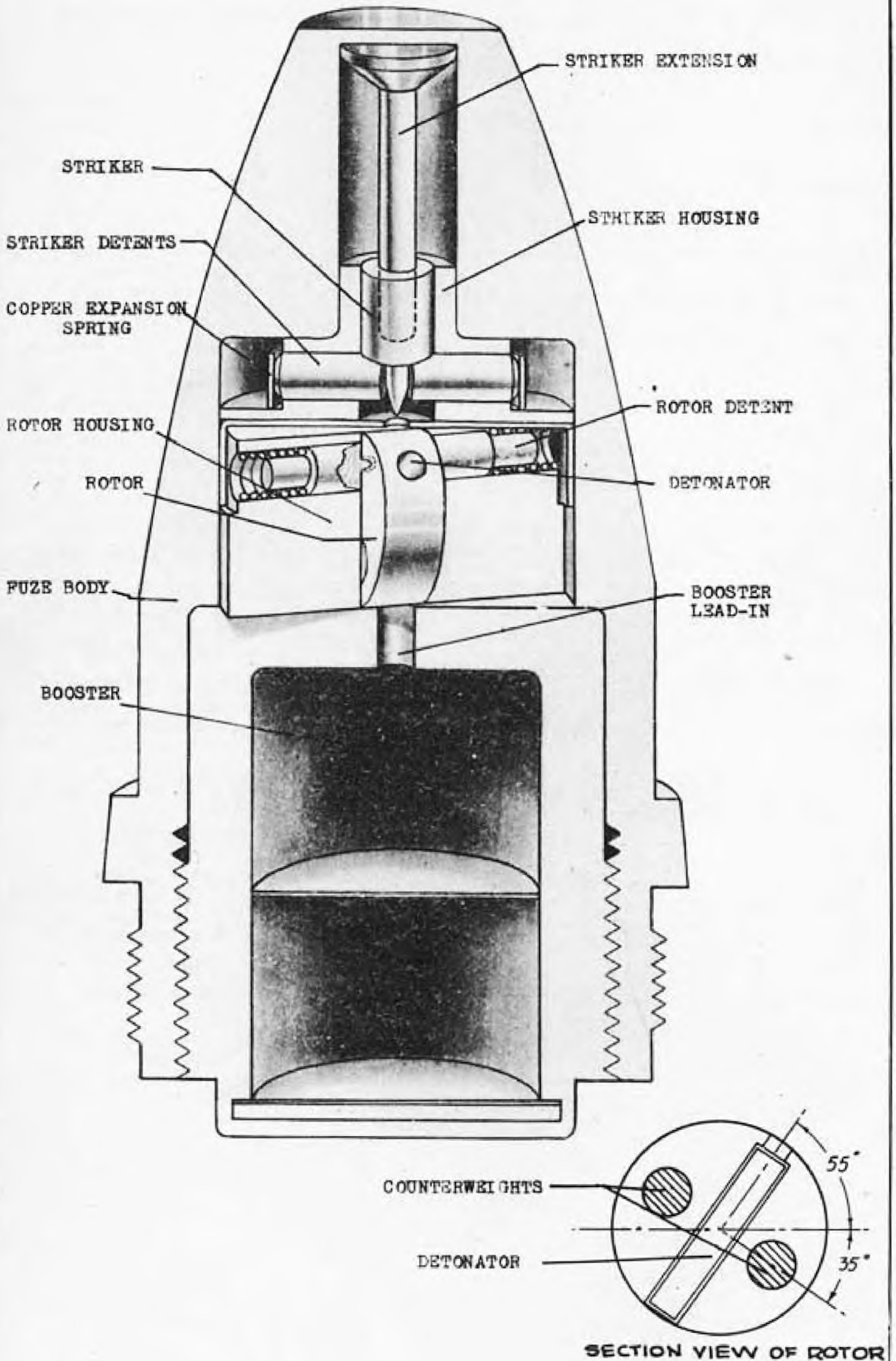
The fuze has no safety features in its design, but it will withstand a 40 foot drop on to armor plate without detonation. In the Mk 26 No Mod the nose cap is crushed on impact and this causes the air in the air channel to be compressed and forced through the hole in the concave disc. This action generates sufficient pressure and heat to set off the very sensitive lead azide detonator beneath the disc. In the Mod 1 and Mod 2 there is no air channel or disc and the fuze is fired entirely by the shock of impact. The very sensitive detonator will be set off by the shock of impact and it, in turn, will set off the magazine of tetryl beneath it.

**REMARKS**

These fuzes will not detonate on water impact but they will detonate on 1/8" mild steel. The Mods 1 and 2 are more sensitive than the No Mod to both impact and heat.

# MK.27

## POINT DETONATING FUZE



**DATA**

RESTRICTED

**U. S. NAVY  
MK.27**

Projectiles used in . . . 40 mm A.A., HE & HE-I  
 Markings . . . . . Mk 27 - Lot  
 Overall Length . . . . . 27.445  
 Diameters . . . . . Nose - 0.7344  
                                   At Base of Ogive  
                                   - 1.728  
 Threaded Length . . . . . 0.7507  
 Threads . . . . . 4 R.H.  
 Weight . . . . . 106.14 grams  
 Material of Construction. Die Cast aluminum  
                                   body. Plastic ham-  
                                   mer piece.  
 Arming Speed . . . . . Firing pin - 7000-14000 r.p.m.  
                                   Rotor - 10000-14000 r.p.m.

POINT DETONATING FUZE

DESCRIPTION

Internally the fuze consists of two major housings: the firing pin housing and the rotor housing. Contained within the firing pin housing is a metal firing pin held in place by two firing pin detents which are surrounded by a circular copper band which acts as a spring. Above the firing pin housing is a plastic firing pin extension which serves as a safety feature in the event that the fuze is dropped in the unarmed condition. The rotor housing consists of a rotor, complete with lead counterweights and detonator assembled in a rotor block. The axis of the detonator is inserted at an angle of about 55 degrees from the axis of the fuze. The line of center of the lead counterweights, being perpendicular to the axis of the detonator, is at an angle of about 35 degrees from the axis of the fuze. The rotor is held in this unarmed position by the two rotor detents, the tapered ends of which engage in the holes in the side of the rotor. In this position the detonator is not in line with either the firing pin or the booster.

OPERATION

This fuze is armed entirely by centrifugal force which accomplishes three things:

1. The firing pin detents are moved outward against the copper band thus freeing the firing pin. The copper band is arranged so that the ends of it overlap, thus allowing room for expansion.
2. The rotor detents are moved back against their springs, thus freeing the rotor.
3. The lead counterweights are caused to turn the rotor until they are at a maximum radius from the axis of rotation of the fuze. In this position, the detonator is aligned with the firing pin and booster. The rotor is held in this position by centrifugal force.

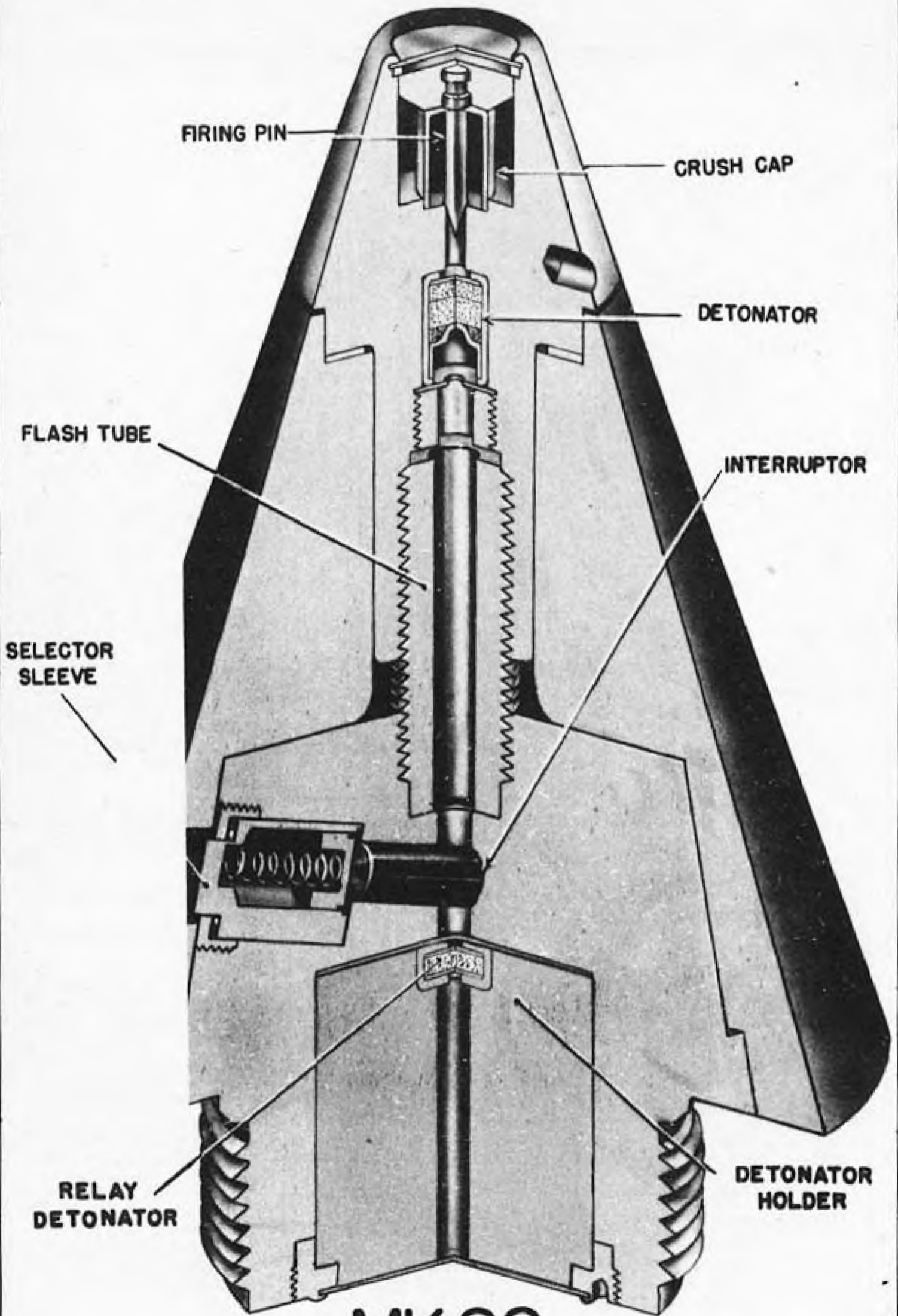
On impact the nose of the fuze is crushed and the firing pin extension pushes the firing pin into the detonator.

REMARKS

The Mk 27 Mod 1 differs in that the firing pin detents are of a different shape and are known as "hour-glass" detents. On setback the firing pin will move back against the detents and because of their shape, they will be held in place until the firing pin moves forward again under the influence of creep.

These fuzes will function on duralumin sheet but not on water impact.

The plastic firing pin extension is designed as a safety device in the event of accidental dropping. If the round is dropped, the plastic extension will shatter, whereas a one-piece metal firing pin might force its way past the firing pin detents and initiate the fuze.



**MK.29**  
**MOD.3**  
**POINT DETONATING FUZE**

**DATA**

RESTRICTED

U. S. NAVY

**PROJECTILES USED IN**

5"/25/38/51 A A Common  
 5"/38 W.P.  
 5"/51 H.C., 6"/47 H.C.  
 8"/55 H.C., 12"/50 H.C.  
 14"/45/50 H.C.  
 16"/45/50 H.C.

**MARKINGS**

Mk 29 NBF  
 Lot  
 N.G.F. J.J-O'D  
 1942

**MK.29****OVERALL LENGTH**

4.15 in.

**DIAMETER AT NOSE**

0.55 in.

**DIAMETER AT BASE OF OGIVE**

3.0 in.

**THREADED LENGTH**

0.80 in.

**THREADS**

7 R.H.

**WEIGHT**

1.49 lbs.

**MATERIAL OF CONSTRUCTION**

Steel base; Brass detonator body; Plastic ogive.

**ARMING SPEED**

1500-2000 r.p.m.

POINT DETONATING FUZE

**DESCRIPTION:**

The fuze consists of four principal parts: (a) the base, which contains the relay detonator and holder and the interruptor unit; (b) the nose or detonator assembly, which contains the striker assembly and the detonator; (c) the plastic ogive; and (d) the flash tube, which is fitted in the center of the ogive and holds the nose and the base together. A crush cup is located beneath the striker, holding the striker away from the detonator, and a centrifugal interruptor separates the detonator from the relay detonator in the base of the fuze. Two types of interruptor assemblies have been employed. In the earlier model, the interruptor bore against the upper blade of a forked setting sleeve in the "Delay" or "Off" position and thus could not move into the sleeve and clear the flash channel. Rotating the sleeve 90° in either direction to the "S.Q." or "On" position removed the end of the forked blade from the interruptor, and centrifugal force could move the interruptor into the sleeve and out of the flash channel. The interruptor system of later models has been slightly altered. A cylindrical setting sleeve with an eccentric bore is employed. In the "Delay" or "Off" position the eccentric bore is not aligned with the interruptor, and the interruptor cannot move into the sleeve and clear the channel. Turning the setting sleeve to the "S.Q." or "On" position aligns the bore with the interruptor, which can then be moved into the sleeve by centrifugal force. In either case, the end of the setting sleeve carries a slotted setting key.

**OPERATION:**

When the fuzed projectile is loaded into the gun, the setting key is turned to the "On" or "S.Q." position. On setback the interruptor sits down in the flash channel, but when the projectile leaves the gun centrifugal force moves the interruptor into the sleeve and clears the flash channel. On impact the closing disc above the striker is forced down, the crush cup beneath the striker is crushed, and the striker is driven into the detonator. The flash travels through the open flash channel and initiates the relay detonator in the base of the fuze.

**REMARKS:**

- (a) The differences between Mods of this fuze are as follows:

No Mod: Dark green ogive, made of easily chipped asbestos plastic, unsuitable for storage and handling.

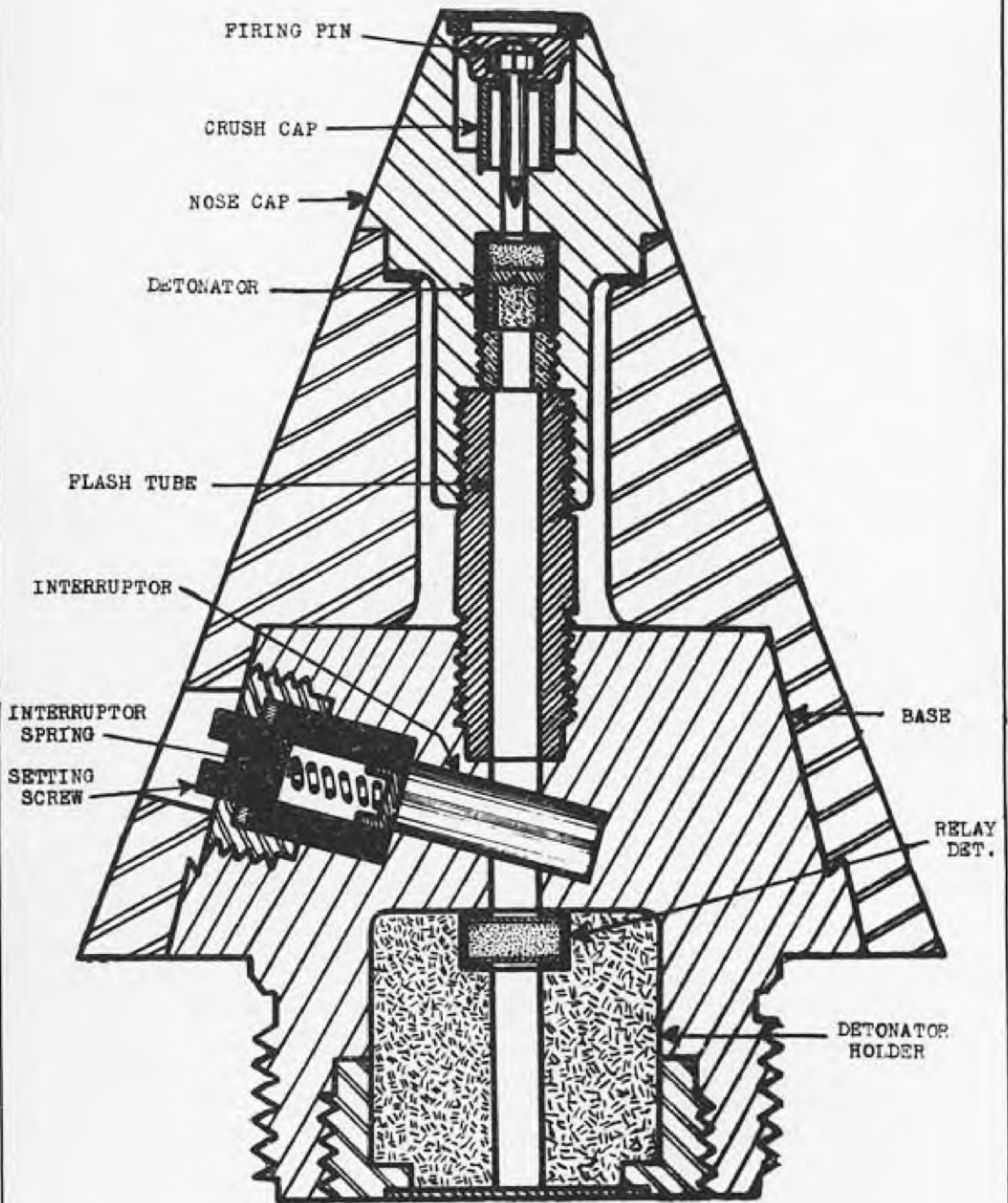
Mod 1: Chip-proof, resin-impregnated cloth, yellow plastic ogive.

Mod 2: Same as Mod 1, with strengthened flash channel.

Mod 3: Like Mod 2, with longer nose cap extending to base and giving additional support to flash channel. Brown plastic ogive.

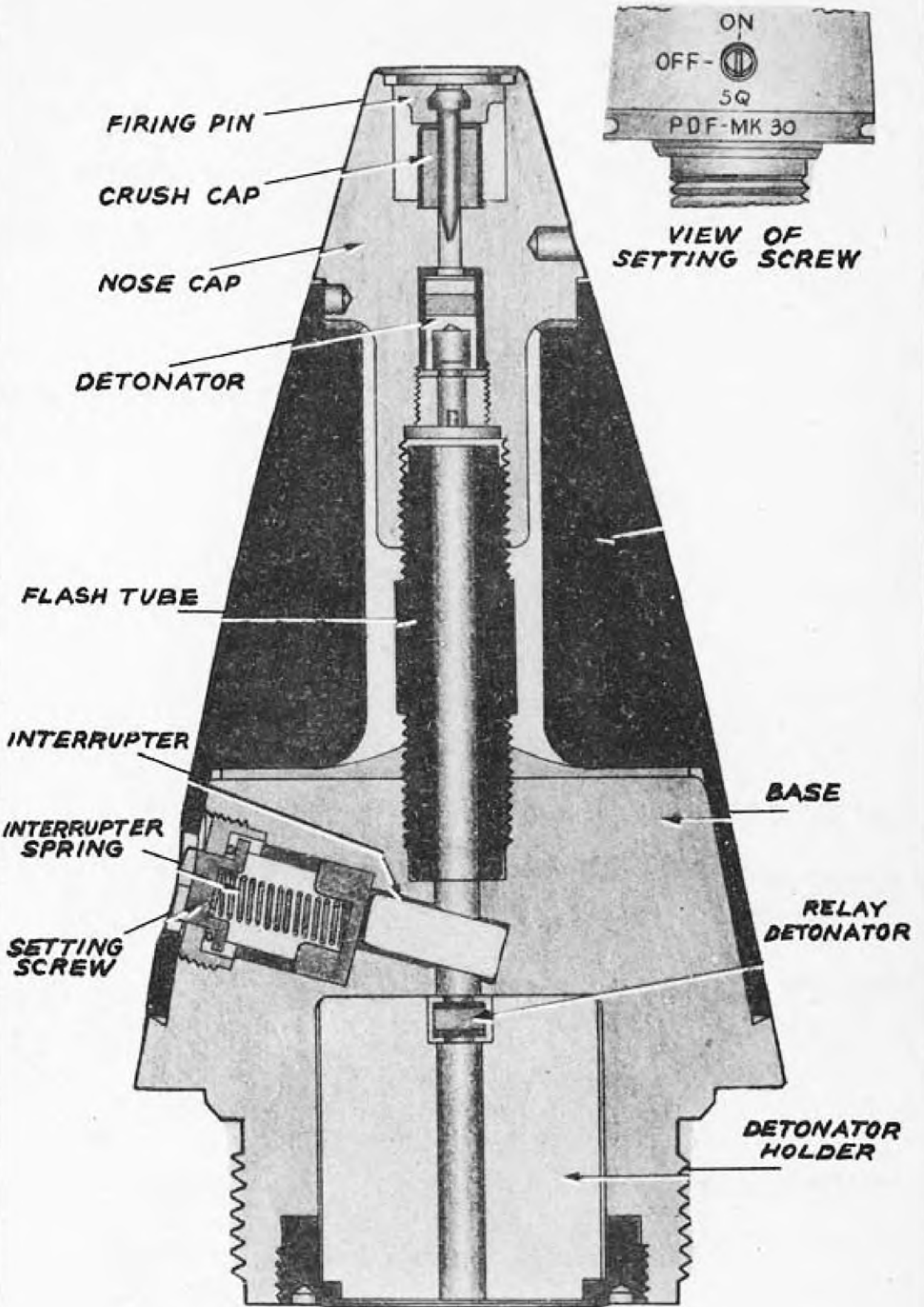
- (b) This fuze will function on thin plate and on water at angles over 6°.

- (c) A 0.01 in. thick disc is incorporated between the relay detonator and the flash channel of the Mod 3. This prevents gas pressure, which sometimes leaks past the unarmed interruptor, from setting off the relay detonator, if the nose of the fuze is accidentally struck during handling.



# MK.29 POINT DETONATING FUZE

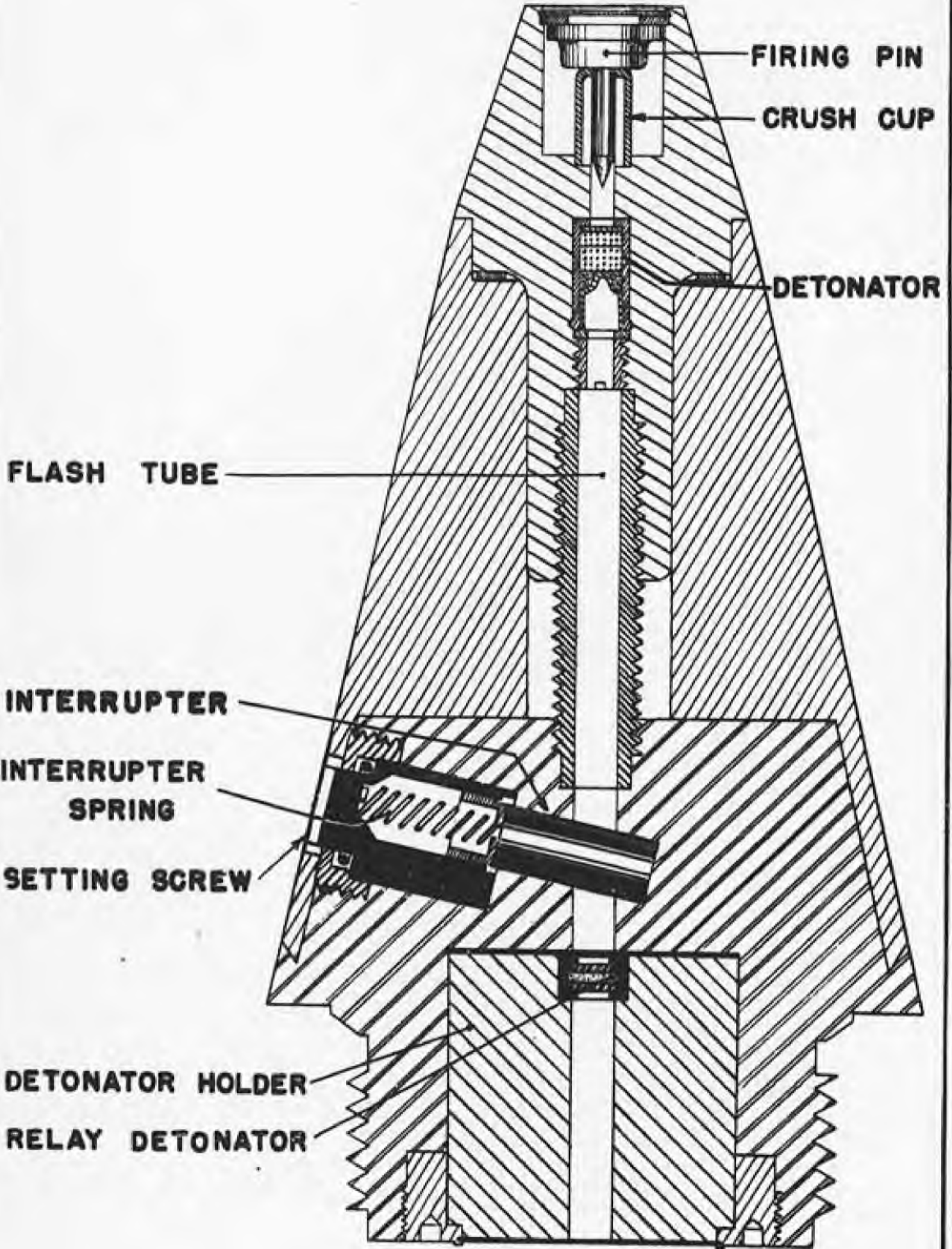
MODS. 1&2



# MK.30 POINT DETONATING FUZE

MODS. 1 & 2

RESTRICTED



**MK.30 MOD.3 POINT DETONATING FUZE**

# DATA

RESTRICTED

U. S. NAVY

PROJECTILES USED IN

3"/50 A.A.

3"/50 H.C.

4"/50 H.C.

5"/54 H.C.

MARKINGS

Mk 30 N.B.F.

Lot No

N.G.F. J.J-O'D

1942

OVERALL LENGTH

4.55 in.

DIAMETER AT NOSE

0.55 in.

DIAMETER AT BASE OF OGIVE

2.4 in.

THREADED LENGTH

0.80 in.

THREADS

7 R.H.

WEIGHT

1.51 lbs.

MATERIAL OF CONSTRUCTION

Steel base; Brass  
detonator body;  
Plastic ogive.

# MK.30

POINT DETONATING FUZE

## DESCRIPTION:

The fuze consists of four principal parts: (a) the base, which contains the relay detonator and holder and the interruptor unit; (b) the nose or detonator assembly, which contains the striker assembly and the detonator; (c) the plastic ogive; and (d) the flash tube which is fitted in the center of the ogive and holds the nose and base together. A crush cup is located beneath the striker, holding the striker away from the detonator, and a centrifugal interruptor separates the detonator from the relay detonator in the base of the fuze. Two types of interruptor assemblies have been employed. In the earlier model, the interruptor bore against the upper blade of a forked setting sleeve in the "Delay" or "Off" position and thus could not move into the sleeve and clear the flash channel. Rotating the sleeve 90° in either direction to the S.Q. or "On" position removed the end of the forked blade from the interruptor, and centrifugal force could move the interruptor into the sleeve and out of the flash channel. The interruptor system of later models has been slightly altered. A cylindrical setting sleeve with an eccentric bore is employed. In the "Delay" or "Off" position the eccentric bore is not aligned with the interruptor, and the interruptor cannot move into the sleeve and clear the channel. Turning the sleeve to the "S.Q." or "On" position aligns the bore with the interruptor, which can then be moved into the sleeve by centrifugal force. In either case, the end of the setting sleeve carries a slotted setting key.

## OPERATION:

When the fuzed projectile is loaded into the gun, the setting key is turned to the "On" or "S.Q." position. On setback the interruptor sits back in the flash channel, but when the projectile leaves the gun centrifugal force moves the interruptor into the sleeve and clears the flash channel. On impact the closing disc above the striker is forced down, the crush cup beneath the striker is crushed, and the striker is driven into the detonator. The flash travels through the open flash channel and initiates the relay detonator in the base of the fuze.

## REMARKS:

(a) The differences between Mods of this fuze are as follows:

No Mod: Dark green ogive, made of easily chipped asbestos plastic, unsuitable for storage and handling.

Mod 1: Chip-proof, resin-impregnated cloth, light green ogive.

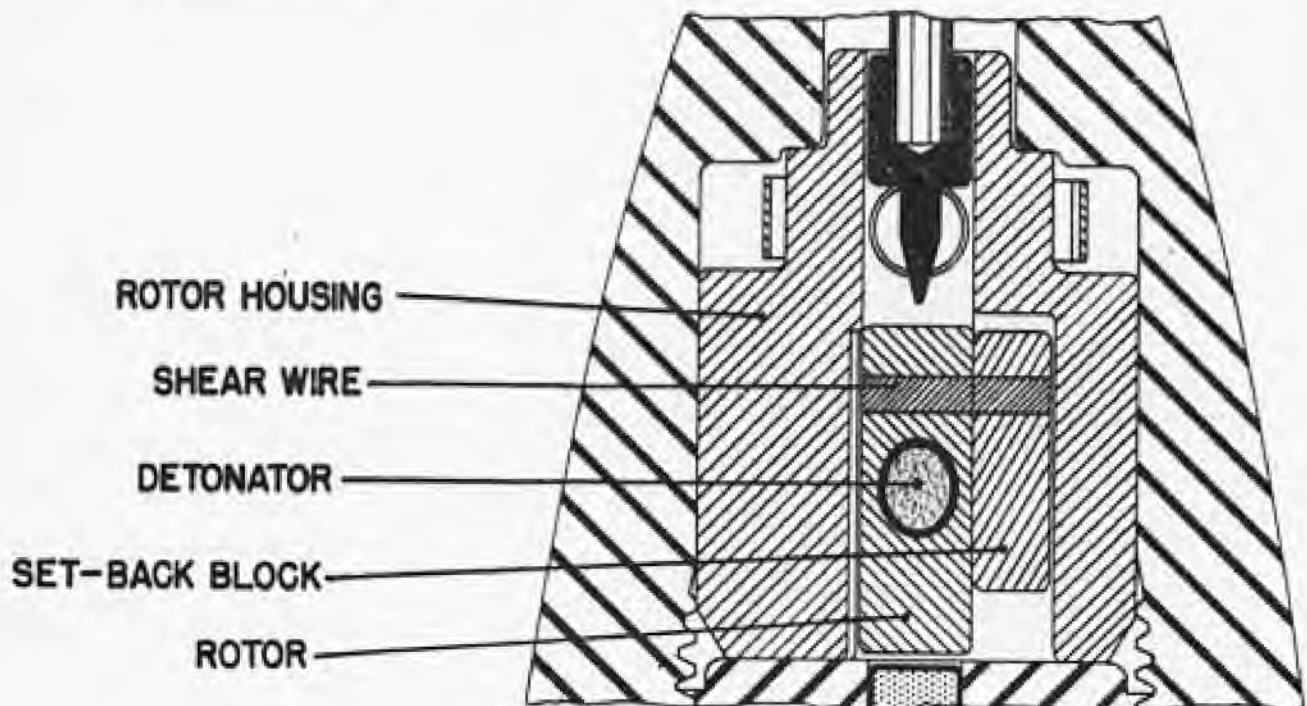
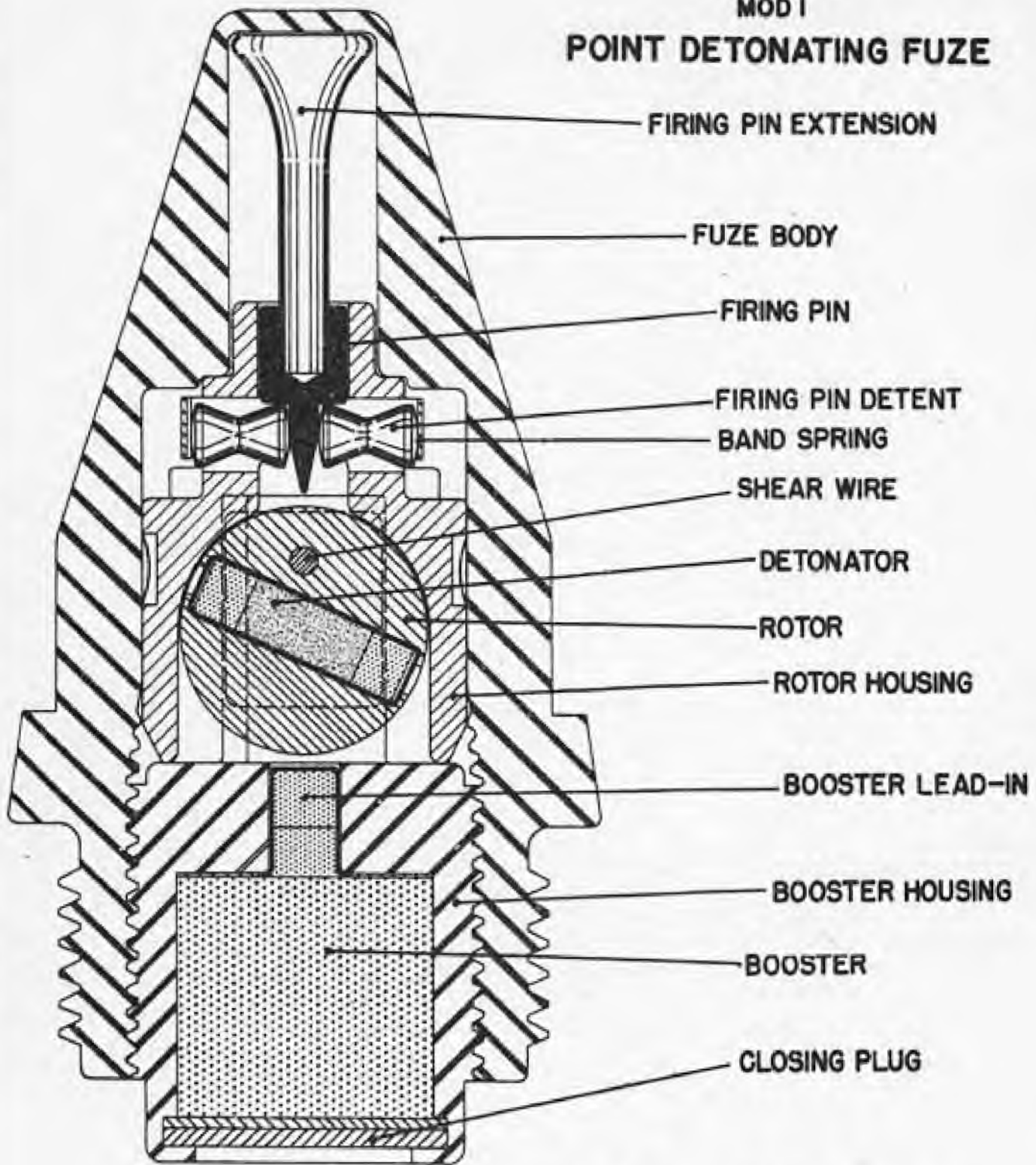
Mod 2: Same as Mod 1, with strengthened flash channel.

Mod 3: Same as Mod 2, with longer nose cap extending to base and giving additional support to flash channel. A 0.01 in. thick metal disc is incorporated between the relay detonator and the flash channel. This prevents gas pressure, which sometimes leaks past the unarmed interruptor, from setting off the relay detonator, if the nose of the fuze is accidentally struck during handling. Dark green ogive.

(b) This fuze is an adaptation of the U.S. Army M48 P.D.F.

(c) This fuze will function on thin plate and on water at angles over 6°.

# MK. 34 MOD I POINT DETONATING FUZE



# DATA

RESTRICTED

## U. S. NAVY

# MK.34

Projectiles Used in . . . 1 $\frac{1}{2}$  A.A. H.E.  
Markings . . . . . None  
Overall length . . . . . 2 $\frac{1}{8}$   
Diameters . . . . . Nose - 0 $\frac{3}{32}$   
At Base of Ogive  
- 1 $\frac{1}{16}$   
Threaded length . . . . . 0 $\frac{7}{16}$   
Threads . . . . . 7 R.H.  
Material of Construction. Body - Die Cast  
Alloy (Zinc  
Base)  
Magazine - Brass  
Firing Pin Extension - Plastic

POINT DETONATING FUZE

### DESCRIPTION

This fuze consists of one housing containing the firing pin and rotor units. Above the firing pin is a plastic firing pin extension and the firing pin is being held up by two firing pin detents. The detents are held in place by a circular copper band which surrounds them and acts as a spring. Beneath the firing pin is the rotor with the detonator at an angle of about 55 degrees from the axis of the fuze. The rotor is held in the unarmed position by means of a setback clock which is connected to it by a copper shear wire. In this position the detonator is out of line with both the firing pin and the booster.

### OPERATION

On setback the setback block moves back breaking the shearing wire that has been holding it to the rotor. Centrifugal force causes the firing pin detents to move outward and to turn the rotor so that the detonator is aligned with the firing pin. The rotor is held in this position by centrifugal force and on impact the nose of the fuze is crushed and the firing pin extension drives the firing pin into the detonator.

### REMARKS

The Mark 34 Mod 1 differs in that the firing pin detents are of a different shape and are known as "hour-glass" detents. On setback the firing pin will move back against the detents and because of their shape, they will be held in place until the firing pin moves forward again under the influence of creep.

The plastic firing pin extension is designed as a safety device in the event of accidental dropping. If the round is dropped, the plastic extension will shatter, where-as a one piece metal firing pin might force its way past the firing pin detents and initiate the fuze.

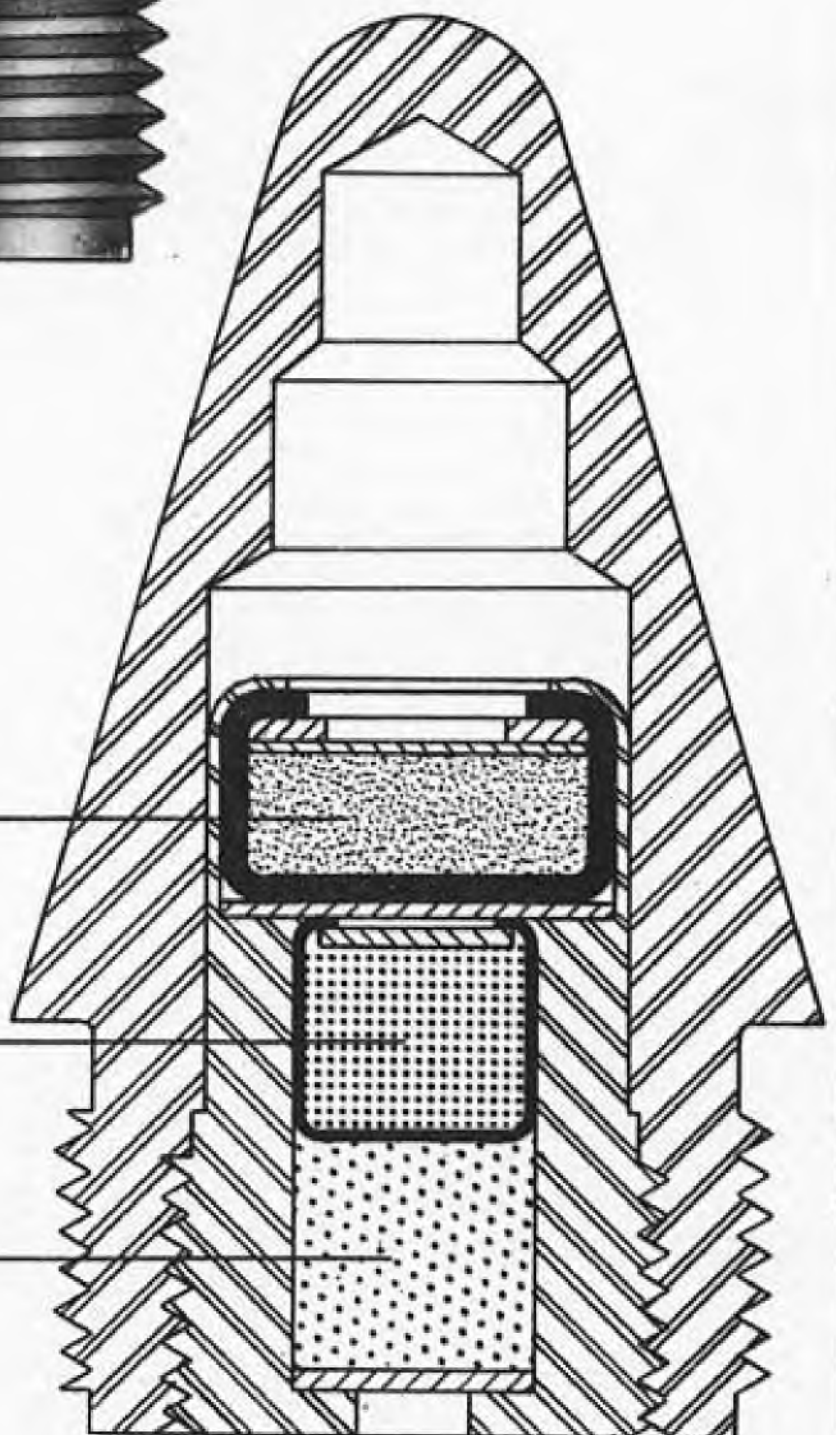
# M 75 POINT DETONATING FUZE



**DETONATOR**

**RELAY**

**BOOSTER**



# DATA

RESTRICTED

# U. S. ARMY

PROJECTILES USED IN	20 mm (Army) HE-I, M97
MARKINGS	Fuze, P.D., M75
OVERALL LENGTH	1.20 in.
DIAMETER AT BASE OF OGIVE	0.64 in.
THREADED LENGTH	0.20 in.
THREADS	7 R.H.
WEIGHT	0.0497 lbs.
MATERIAL OF CONSTRUCTION	Brass
FILLING	Detonator: mercury fulminate
	Relay Charge: lead azide
	Booster: tetryl

# M75

POINT DETONATING FUZE

## DESCRIPTION:

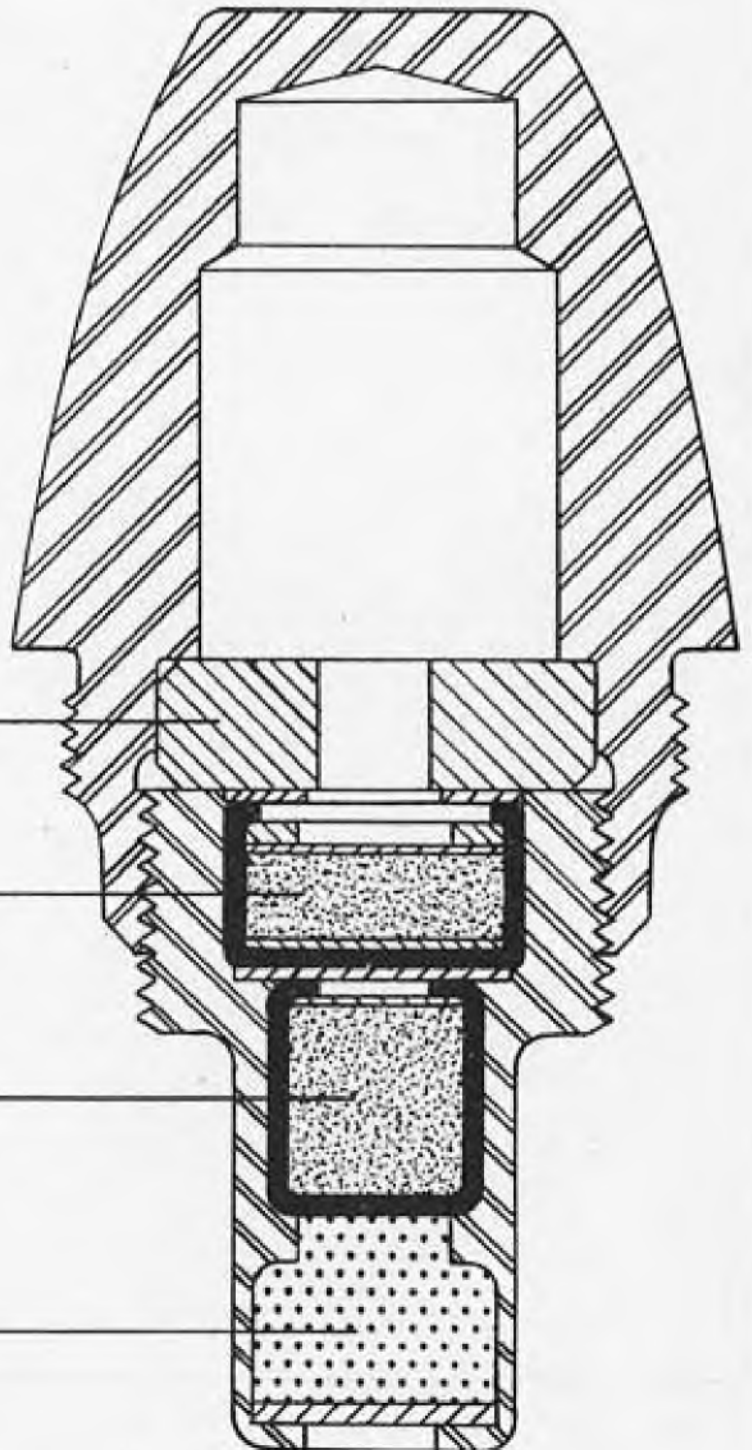
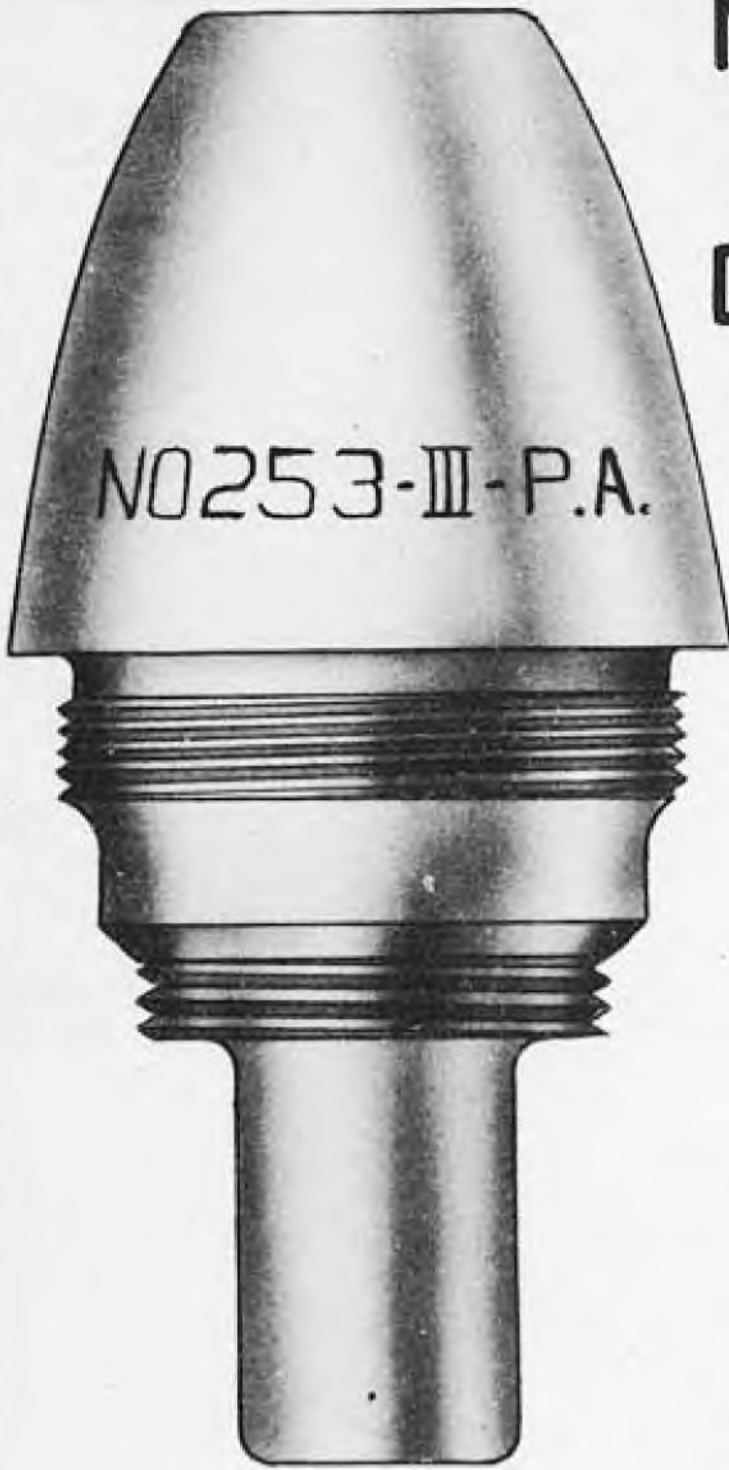
This fuze is designed to function with instantaneous action on impact with light material surfaces. The fuze is initiated on impact by the set-forward motion of the detonator charge, or by pieces of metal from the body striking the detonator charge.

The fuze is constructed of two major parts: a body with an air space in the forepart of the fuze, and a magazine containing the explosive train which is screwed into the base of the body.

## REMARKS:

1. The fuze contains no interruptors or other safety devices and is therefore very sensitive.

# NO. 253 MK. III POINT DETONATING FUZE



**BRASS DISC**

**DETONATOR**

**RELAY**

**BOOSTER**

**DATA**

RESTRICTED

**U. S. ARMY**

PROJECTILES USED IN	20 mm (Army) HE-I Mk I
MARKINGS	No 253 - III - P.A.
OVERALL LENGTH	1.41 in.
DIAMETER AT NOSE	0.32 in.
DIAMETER AT BASE OF OGIVE	0.70 in.
THREADED LENGTH	0.12 in.
THREADS	4 R.H.
WEIGHT	0.058 lbs.
MATERIAL OF CONSTRUCTION	Brass
FILLING	Detonator: mercury fulminate
	Relay Charge: mercury fulminate
	Booster: tetryl

**NO. 253****MKS. I- III**

POINT DETONATING FUZE

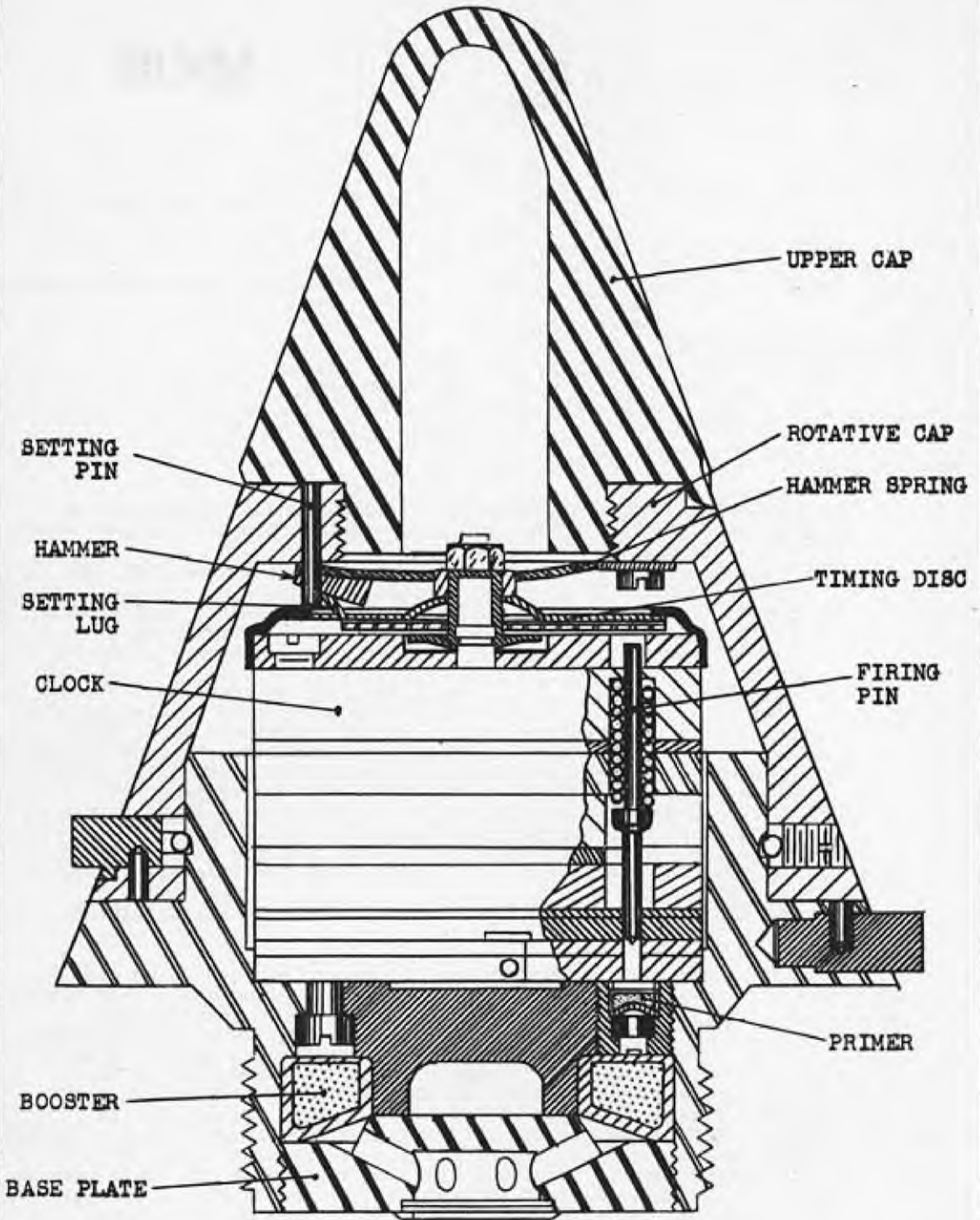
DESCRIPTION:

This fuze is designed to function with instantaneous action on impact with light material surfaces. The fuze is initiated on impact by the set-forward force of the detonator charge, or by pieces of metal from the body striking the detonator charge.

The fuze consists of two major parts: a brass body with an air chamber in its forward part, and a brass magazine containing the explosive train and externally threaded (L.H.) to screw into the base of the body. The magazine is covered with a brass disc separating the detonator from the air column. In the Mk I fuze, this disc is solid, but in the Mks II & III a small hole is drilled through the center of the disc to increase the fuze's sensitivity. In the Mks I & II the body cavity was closed at the forward end by a thin brass disc; in the Mk III fuze, the brass disc is omitted, and the nose is solid across this area.

REMARKS:

1. The fuze contains no interruptors or other safety devices and is therefore very sensitive.



# MK.18 NOSE TIME FUZE

**DATA**

RESTRICTED

**U. S. NAVY**

## PROJECTILES USED IN

4"/50 Ill.  
 5"/25/38/51 AA Common  
 5"/25/38/51 Ill.  
 5"/38 Window  
 5"/38 W.P.  
 5"/51 H.C.  
 6"/47/50/53 Ill.  
 6"/47/53 H.C.  
 8"/55 H.C.

**MK.18**

## MARKINGS

Mech. Time Fuze  
 Mk XVIII  
 F.A. EDB  
 Lot \_\_\_\_\_

NOSE TIME FUZE

## OVERALL LENGTH

3.54 in.

## DIAMETER AT BASE OF OGIVE

3.05 in.

## THREADED LENGTH

0.81 in.

## THREADS

7 R.H.

## WEIGHT

2.52 lbs.

## MATERIAL OF CONSTRUCTION

Brass

## SETTING TIMES

\*Mods 2,3,& 4: Min. - 0.8 secs.  
 Max. - 45 secs.  
 Mods 0 & 1: Min. - 2.4 secs.  
 Max. - 45 secs.

DESCRIPTION:

In its assembled form the fuze has a contour which corresponds to that of the U.S. Navy medium and major caliber projectiles and consists of four main units, as follows:

- (1) Movement Assembly - The movement assembly is attached to the inside of the body by three holding screws.
- (2) Body - The brass body contains the magazine charge (30 grains of black powder) and the bottom closing screw assembly. It is threaded to fit an adapter, which in turn is threaded into the nose of the projectile.
- (3) Lower Cap Assembly - The brass lower cap (or graduated rotative cap) is attached to the body by means of a joint consisting of a steel wire leading through grooves in the cap and body. This allows freedom of rotative relative motion between lower cap and body, while preventing axial relative motion between the lower cap and the body. It has a tensioning feature wherein the torsional resistance which restrains rotative relative motion is adjusted by four screws during assembly of the fuze.
- (4) Upper Cap - The brass upper cap screws into the lower cap and functions to complete the nose contour of the assembled fuze.

For purposes of explanation, the movement assembly may be divided into three main parts:

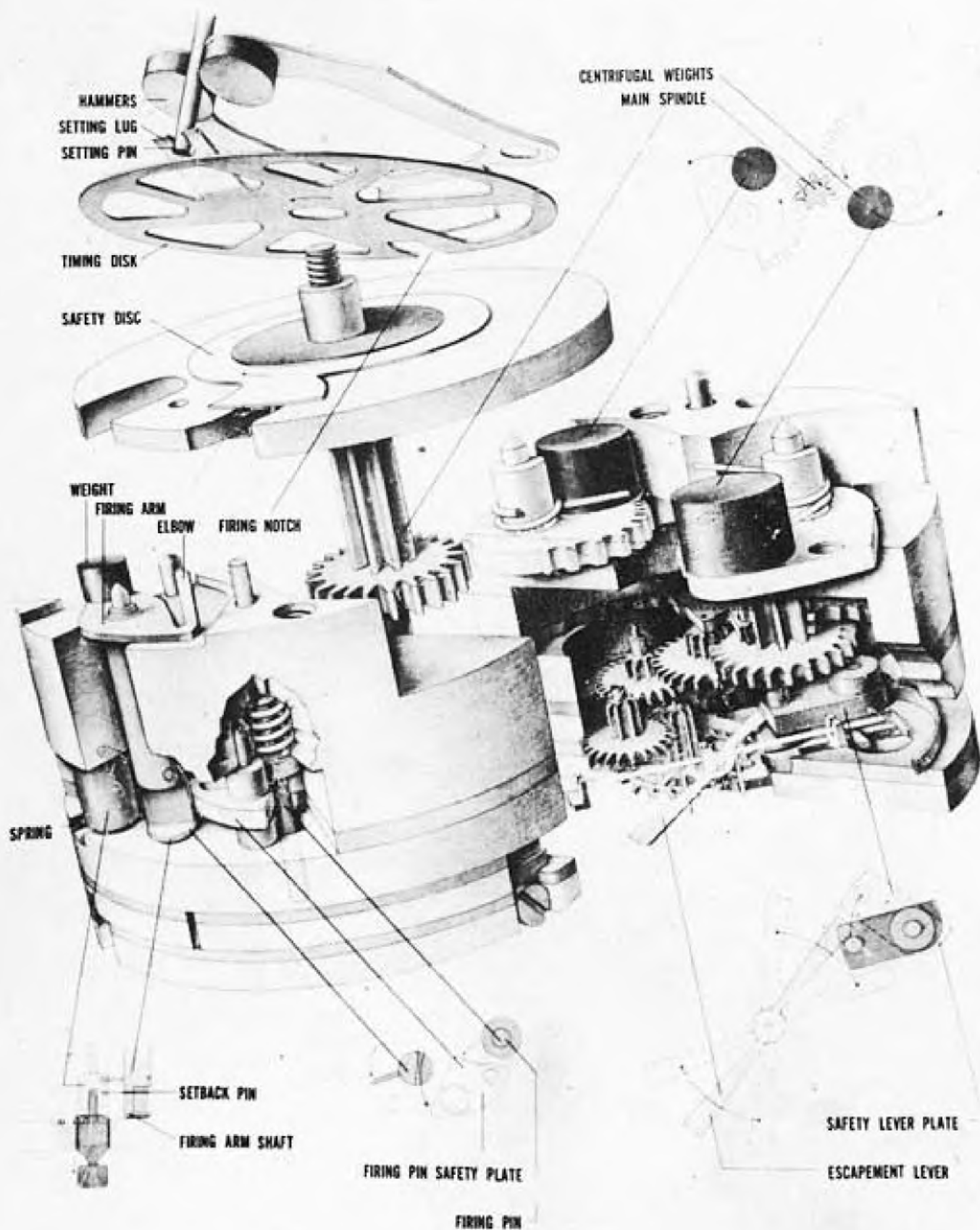
(1) The timing disc mechanism, which consists of the timing disc, a setting pin, a spring hammer assembly, and the central drive shaft. The timing disc has on one side of it a firing notch and on the other side a forked setting lug which engages the setting pin located in the top inside shoulder of the lower, rotative, cap. The timing disc is secured to the central drive shaft by a friction clutch so that it may be turned independantly of the central drive shaft. Around the top of the timing disc is a retaining ring which prevents the timing disc from riding forward when the projectile initially seats itself in the gun and also prevents the hammer from driving the setting lug down too far. Beneath the timing disc is a safety disc, the projection of which bears against the elbow piece of the firing arm. This part is rigidly secured to the central shaft so that it will rotate out of the way when the clock operates. Its purpose is to provide a safe and a minimum setting.

In setting the clock, the lower cap is rotated to turn the setting pin, which in turn will rotate the timing disc to the desired position, since the setting pin is engaged by the setting lug of the timing disc. Disengagement of these two parts is effected by the spring hammer assembly, which is fastened on one end to the top inside shoulder of the lower cap and on the opposite end has two small weights.

(2) The clock mechanism, which consists of two centrifugal gear arcs, a series of reduction gears, and the escapement mechanism. The centrifugal gear arcs are geared to the central drive shaft and are weighted on one side so that they will turn in a counter-clockwise direction, thus turning the central shaft and the timing disc in a clockwise direction.

\*Note: Mods 2,3, & 4 are identical, but are made by different manufacturers.

# Mk-18, 25 TIMING MECHANISM



CONTINUED

The gear arcs have starter springs on them which serve to prevent the gears from freezing. The reduction gears are similarly geared to the central spindle and their rotation is governed by the escapement mechanism which is connected to the lowest gear. The escapement mechanism consists of an escapement gear, escapement lever, escapement lever spring, safety lever plate, and safety lever plate spring. In the assembled position, the escapement lever is prevented from moving by the safety lever plate which has a pin protruding from the bottom of it and engages the escapement lever. The safety lever plate is pivoted with a weight on one end and is held in position by the safety lever plate spring. The escapement lever acts as a balance wheel and is caused to move back and forth by the escapement lever spring which is a hair-spring secured at both ends and attached to the escapement lever.

(3) The firing mechanism which consists of the firing arm, firing arm shaft, setback pin, firing pin safety plate, and the firing pin. The firing arm is pivoted and has on one end a weight, and on the opposite end an elbow piece which bears against the outer periphery of the timing disc. Rigidly secured to the firing arm is the firing arm shaft which is prevented from turning in the assembled condition by the setback pin. The setback pin is being held in position by the setback pin spring and is resting in front of a projection of the firing arm shaft, thus preventing the latter piece from rotating. In the bottom of the firing arm shaft is a notch and bearing against the shaft in such a position that it will pass through the notch when the shaft is rotated, is the firing pin safety plate. This safety plate is also pivoted and is fitting under a shoulder of the cocked firing pin thus holding it away from the primer beneath it.

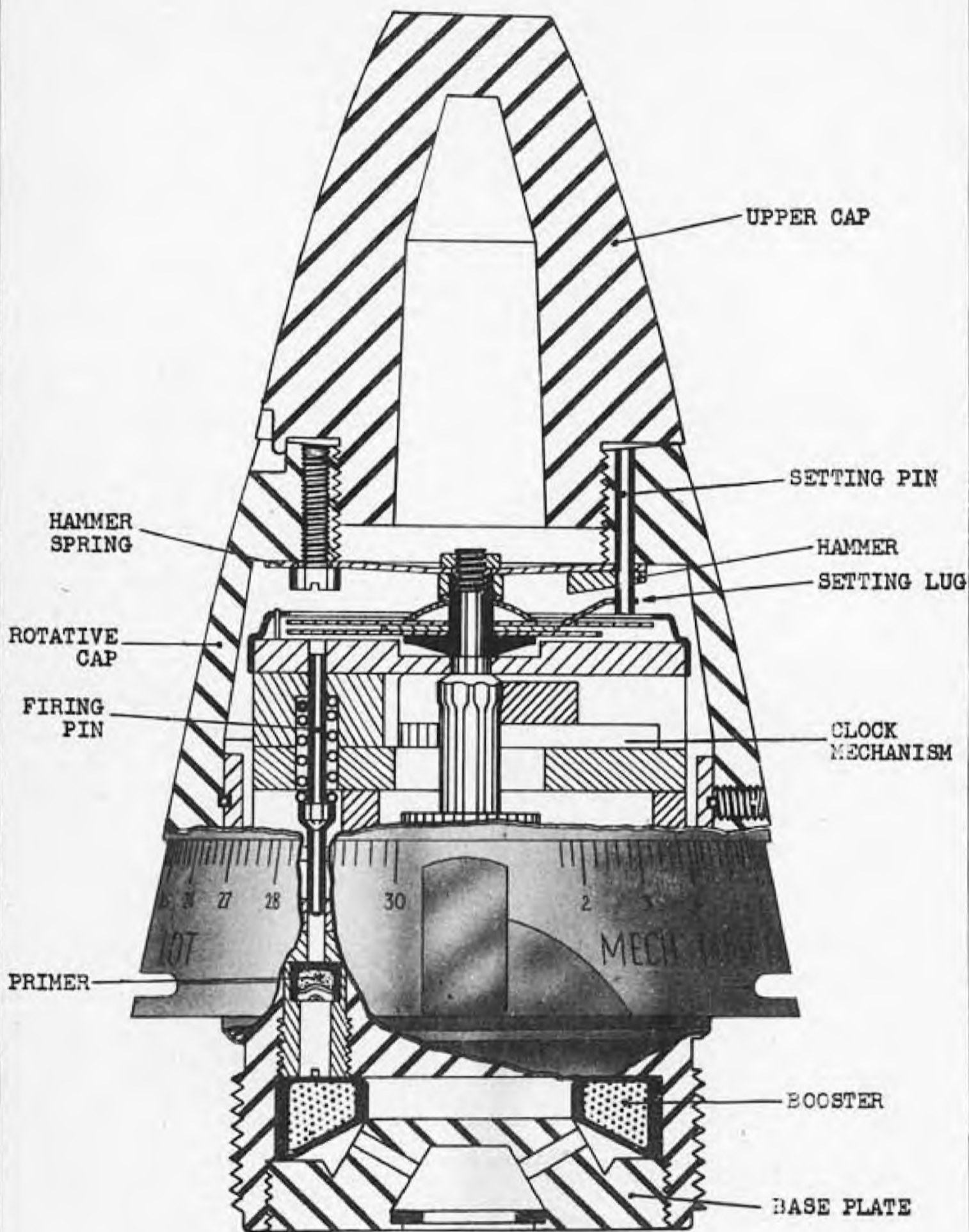
OPERATION

The fuze is armed by setback, driven by centrifugal force governed by an escapement mechanism, and fired by a spring driven firing pin. When the projectile is fired from the gun, the force of setback accomplishes two things:

1. The setback pin overcomes its spring and drops into the bottom of the fuze. This action frees the firing arm shaft for later rotation.
2. The hammer spring assembly pivots down and the weights on one end strike the setting lug thus depressing it and freeing it from the setting pin. When the force of creep sets in, the spring returns the weights to their original position, forward of the timing disc.

As the projectile rotates, centrifugal force accomplishes four things:

1. The safety lever plate of the escapement mechanism is pivoted out of the way, thus releasing the escapement lever and unlocking the escapement mechanism. This initial movement causes the escapement lever to oscillate thus acting as the balance wheel and governing the speed of operation.
2. As soon as the escapement mechanism has been unlocked, the weights on the centrifugal gear arcs tend to move outward thus causing the arcs to pivot and rotate the central shaft and, consequently, the timing disc. This rotation is slowed down by the series of reduction gears and its speed is determined by the escapement mechanism. This rotary motion of the timing disc turns the firing notch around to the elbow piece of the firing arm.
3. When the firing notch has been presented to the elbow piece of the firing arm the weight on the opposite end of the firing arm is moved outward turning the elbow into the slot and turning the firing arm shaft. This is now possible since the setback pin has been depressed when the projectile was initially fired.
4. As the firing arm shaft rotates, the notch in the bottom of it is presented to the firing pin safety plate which will pivot through this notch, thus moving out from under the shoulder of the firing pin. The firing pin will then be thrown downward onto the primer by its compressed spring. The primer will then ignite the black powder charge in the base of the fuze.



# MK.22 NOSE TIME FUZE

**DATA**

RESTRICTED

**U. S. NAVY**

PROJECTILES USED IN

3"/23/50 AA &amp; I11.

4"/50 H.C.

MARKINGS

Mech. Time Fuze

Mk 22 Mod \_\_\_\_\_

E.M. \_\_\_\_\_

Lot \_\_\_\_\_

OVERALL LENGTH

4.55 in.

DIAMETER AT BASE OF OGIVE

2.4 in.

THREADED LENGTH

0.81 in.

THREADS

7 R.H.

MATERIAL OF CONSTRUCTION

Upper Body: Zinc/lead alloy.

Center Body: Brass

Base: Aluminum

SETTING TIMES

Mods 0-3: Min. - 1.4

seconds.

Max. - 30 seconds.

\*Mods 4-6: Min. - 0.6 seconds.

Max. - 30 seconds.

**MK.22**

NOSE TIME FUZE

**DESCRIPTION:**

In its assembled form the fuze has a contour which corresponds to that of the U.S. Navy long point projectile and consists of four main units, as follows:

- (1) Movement Assembly - The movement assembly is attached to the inside of the body by three holding screws.
- (2) Body - The brass body contains the magazine charge (30 grains of black powder) and the bottom closing screw assembly. It is threaded to fit an adapter, which in turn is threaded to fit into the nose of the projectile.
- (3) Lower Cap Assembly - The brass lower cap (or graduated rotative cap) is attached to the body by means of a joint consisting of a steel wire leading through grooves in the cap and the body. This allows freedom of rotative relative motion between the lower cap and the body but prevents axial relative motion between them. It has a tensioning feature wherein the torsional resistance which restrains rotative relative motion is adjusted by four screws during assembly.
- (4) Upper Cap - The brass upper cap screws into the lower cap and functions to complete the nose contour of the assembled fuze.

For purposes of explanation, the movement assembly may be divided into three main parts:

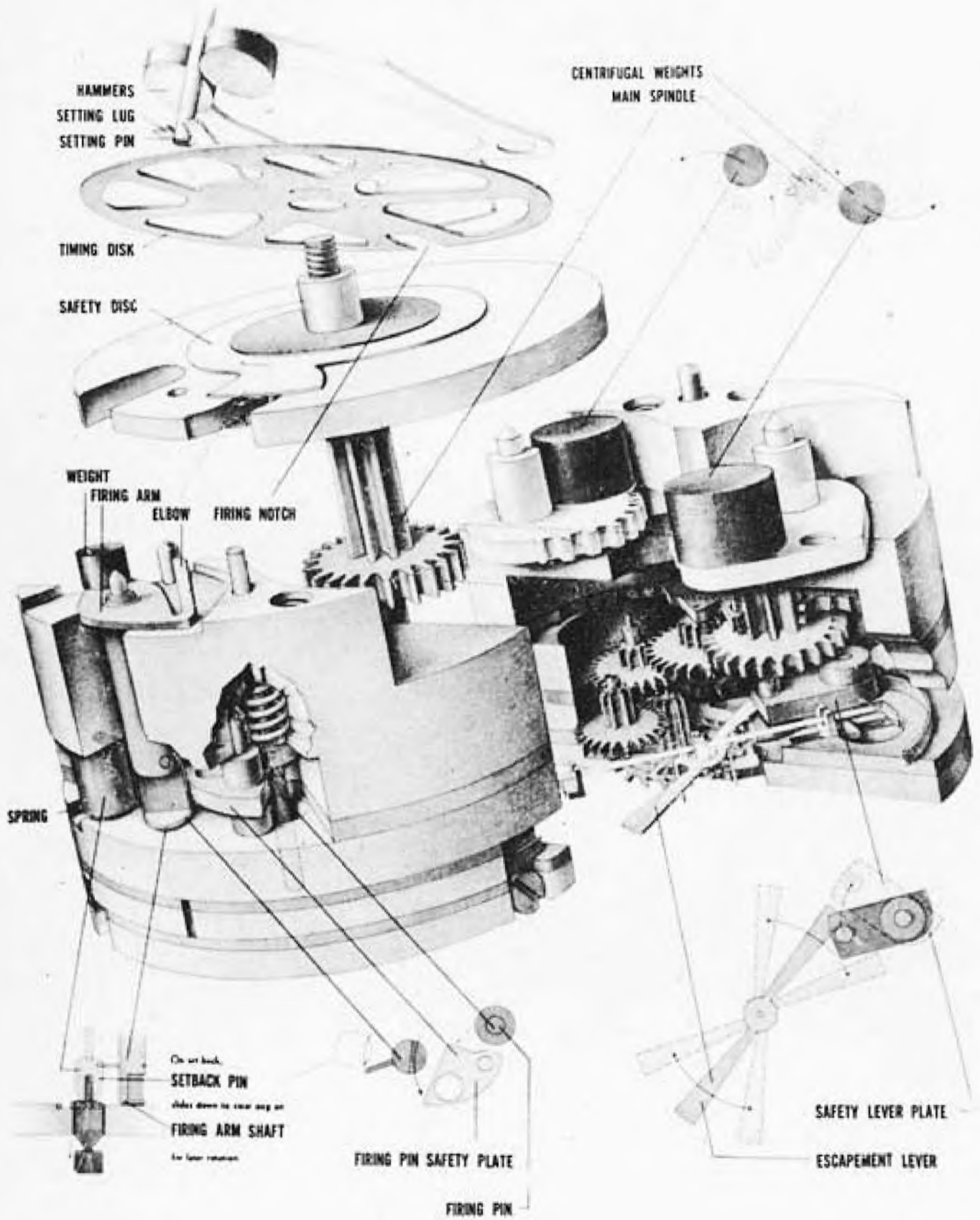
(1) The timing disc mechanism, which consists of the timing disc, a setting pin, a spring hammer assembly, and the central drive shaft. The timing disc has on one side of it a firing notch and on the other side a forked setting lug which engages the setting pin on the top inside shoulder of the lower (rotative) cap. The timing disc is secured to the central drive shaft by a friction clutch so that it may be turned independently of the central drive shaft. Around the top of the timing disc is a retaining ring which prevents the timing disc from riding forward when the projectile initially seats itself in the gun and also prevents the hammer from driving the setting lug down too far. Beneath the timing disc is a safety disc, the projection of which bears against the elbow piece of the firing arm. This part is rigidly secured to the central shaft so that it will rotate out of the way when the clock operates. Its purpose is to provide a safe and a minimum setting.

In setting the clock, the lower cap is rotated to turn the setting pin, which in turn will rotate the timing disc to the desired position, since the setting pin is engaged by the setting lug of the timing disc. Disengagement of these two parts is effected by the spring hammer assembly, which is fastened on one end to the top inside shoulder of the lower cap and on the other end has two small weights.

(2) The clock mechanism, which consists of two centrifugal gear arcs, a series of reduction gears, and the escapement mechanism. The centrifugal gear arcs are geared to the central drive shaft and are weighted on one side so that they will turn in a counter-clockwise direction, thus turning the central shaft and the timing disc in a clockwise direction. The reduction gears are similarly geared to the central spindle, and their rotation is governed by the escapement mechanism which is connected to the lowest gear. The escapement mechanism consists of an escapement lever, an escapement gear, an escapement lever spring, a safety lever plate, and a safety lever plate spring.

\*Note: Mods 4,5,&6 are identical, but are made by different manufacturers.

# Mk 22 TIMING MECHANISM



CONTINUED

## NOSE TIME FUZE

In the assembled position, the escapement lever is prevented from moving by the safety lever plate which has a pin protruding from the bottom of it and engages the escapement lever. The safety lever plate is pivoted with a weight on one end and is held in position by the safety lever plate spring. The escapement lever acts as a balance wheel and is caused to move back and forth by the escapement lever spring which is a hair-spring secured at both ends and attached to the escapement lever.

(3) The firing mechanism which consists of the firing arm, firing arm shaft, setback pin, firing pin safety plate, and the firing pin. The firing arm is pivoted and has on one end a weight, and on the opposite end an elbow piece which bears against the outer periphery of the timing disc. Rigidly secured to the firing arm is the firing arm shaft which is prevented from turning in the assembled condition by the setback pin. The setback pin is being held in position by the setback pin spring and is resting in front of a projection of the firing arm shaft, thus preventing the latter piece from rotating. In the bottom of the firing arm shaft is a notch and bearing against the shaft in such a position that it will pass through the notch when the shaft is rotated, is the firing pin safety plate. This safety plate is also pivoted and is fitting under a shoulder of the cocked firing pin thus holding it away from the primer beneath it.

OPERATION

The fuze is armed by setback, driven by centrifugal force governed by an escapement mechanism, and fired by a spring driven firing pin. When the projectile is fired from the gun, the force of setback accomplishes two things:

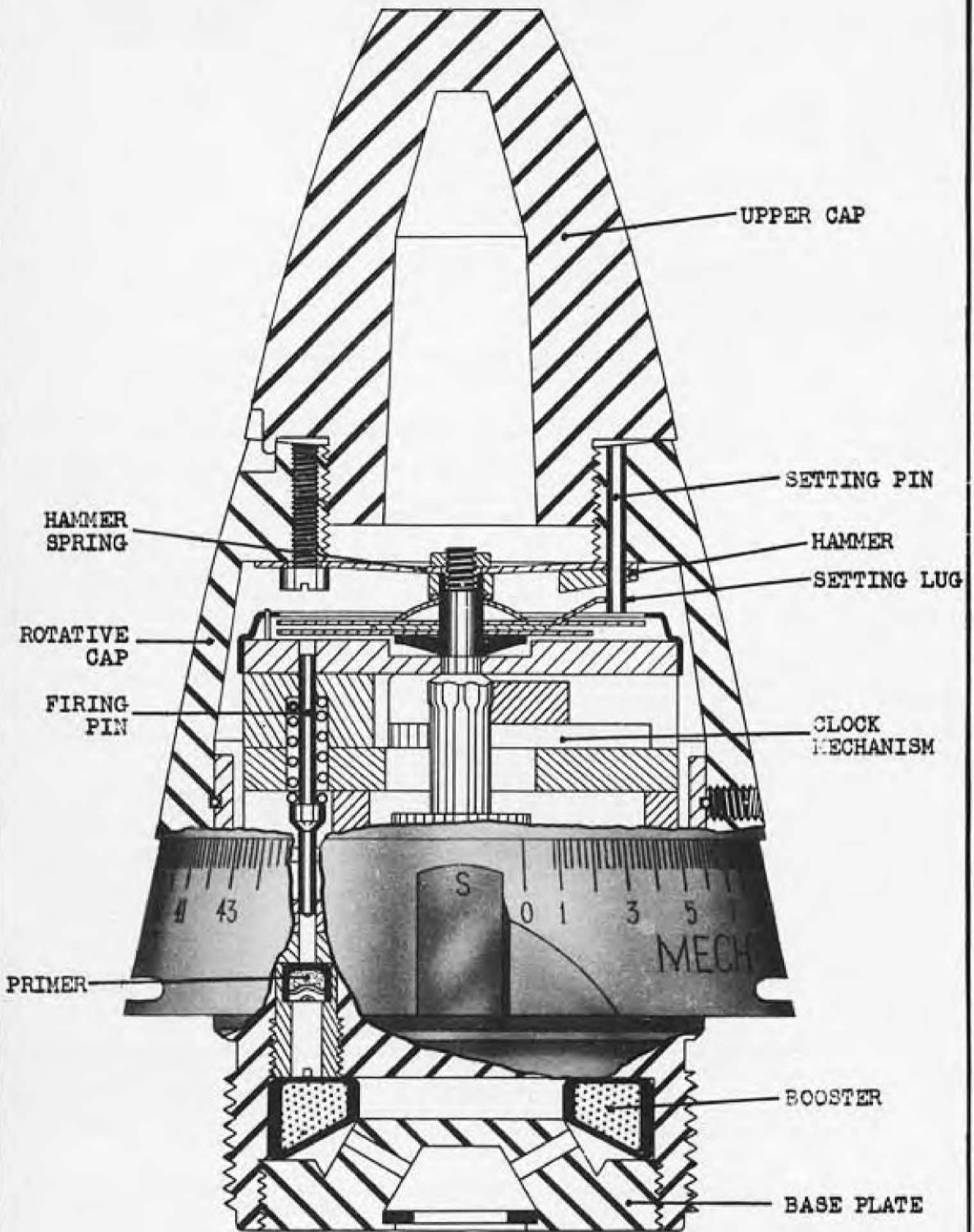
1. The setback pin overcomes its spring and drops into the bottom of the fuze. This action frees the firing arm shaft for later rotation.
2. The hammer spring assembly pivots down and the weights on one end strike the setting lug thus depressing it and freeing it from the setting pin. When the force of creep sets in, the spring returns the weights to their original position, forward of the timing disc.

As the projectile rotates, centrifugal force accomplishes four things:

1. The safety lever plate of the escapement mechanism is pivoted out of the way, thus releasing the escapement lever and unlocking the escapement mechanism. This initial movement causes the escapement lever to oscillate thus acting as the balance wheel and governing the speed of operation.
2. As soon as the escapement mechanism has been unlocked, the weights on the centrifugal gear arcs tend to move outward thus causing the arcs to pivot and rotate the central shaft and, consequently, the timing disc. This rotation is slowed down by the series of reduction gears and its speed is determined by the escapement mechanism. This rotary motion of the timing disc turns the firing notch around to the elbow piece of the firing arm.
3. When the firing notch has been presented to the elbow piece of the firing arm the weight on the opposite end of the firing arm is moved outward turning the elbow into the slot and turning the firing arm shaft. This is now possible since the setback pin has been depressed when the projectile was initially fired.
4. As the firing arm shaft rotates, the notch in the bottom of it is presented to the firing pin safety plate which will pivot through this notch, thus moving out from under the shoulder of the firing pin. The firing pin will then be thrown downward onto the primer by its compressed spring. The primer will then ignite the black powder charge in the base of the fuze.

REMARKS:

- (1) This fuze is slot-set, rather than lug-set like the Mk 18.
- (2) No springs assist the centrifugal gear arcs of this fuze.



# MK.25 NOSE TIME FUZE

**DATA**

RESTRICTED

**U. S. NAVY**

PROJECTILES USED IN 5<sup>#</sup>/54 H.C. & Ill.  
6<sup>#</sup>/47 (D.P.) H.C.

MARKINGS Mech. Time Fuze  
Mk 25 Mod \_\_\_\_\_  
EM  
Lot \_\_\_\_\_

OVERALL LENGTH 4.55 in.  
DIAMETER AT BASE OF OGIVE 2.40 in.  
THREADED LENGTH 0.81 in.  
THREADS 7 R.H.

MATERIAL OF CONSTRUCTION Nose: Die-cast Lead-Zinc Alloy.  
Body: Brass.  
Base: Aluminum.

SETTING TIMES Minimum: 0.6 seconds.  
Maximum: 45 seconds.

**MK.25****MOD. I**

NOSE TIME FUZE

**DESCRIPTION:**

In its assembled form the fuze has a contour which conforms to that of the U.S. Navy long pointed projectile and consists of four main units, as follows:

- (1) Movement Assembly - The movement assembly is attached to the inside of the body by three holding screws.
- (2) Body - The brass body contains the magazine charge (30 grains of black powder) and the bottom closing screw assembly. It is threaded to fit an adapter, which in turn is threaded to fit into the projectile.
- (3) Lower Cap Assembly - The brass lower cap (or graduated rotative cap) is attached to the body by means of a joint consisting of a steel wire leading through grooves in the cap and the body. This allows freedom of rotative relative motion between the lower cap and the body but prevents axial relative motion between them. It has a tensioning feature wherein the torsional resistance which restrains rotative relative motion is adjusted by four screws during assembly.
- (4) Upper Cap - The brass upper cap screws into the lower cap and functions to complete the nose contour of the assembled fuze.

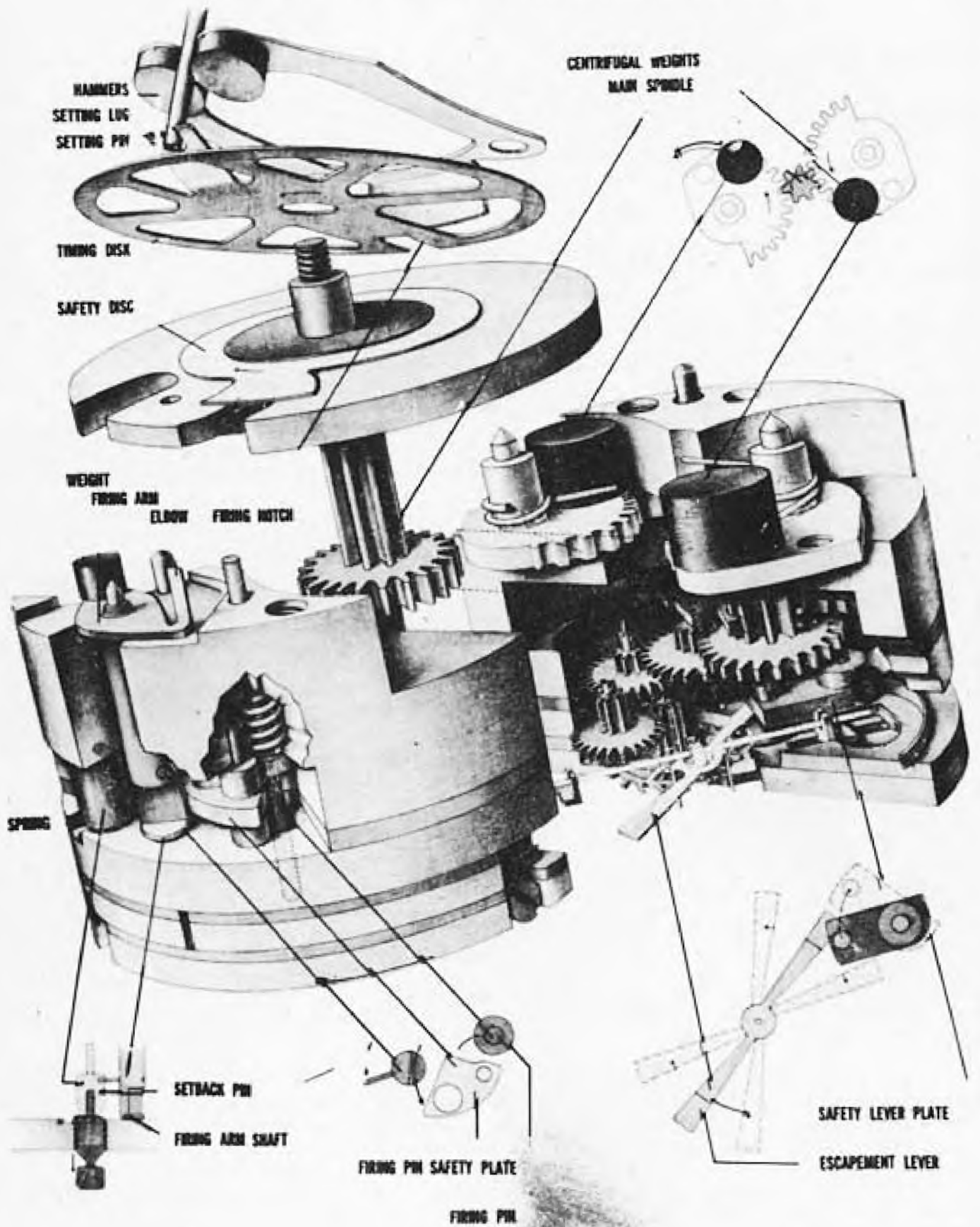
For purposes of explanation, the movement assembly may be divided into three main parts:

(1) The timing disc mechanism, which consists of a timing disc, a setting pin, a spring hammer assembly, and the central drive shaft. The timing disc has on one side of it a firing notch and on the other a forked setting lug which engages the setting pin located in the top inside shoulder of the lower (rotative) cap. The timing disc is secured to the central drive shaft by a friction clutch so that it may be turned independantly of the central drive shaft. Around the top of the timing disc is a retaining ring which prevents the timing disc from riding forward when the projectile initially seats itself in the gun and also prevents the hammer from driving the setting lug down too far. Beneath the timing disc is a safety disc, the projection of which bears against the elbow piece of the firing arm. This part is rigidly secured to the central shaft so that it will rotate out of the way when the clock operates. Its purpose is to provide a safe and a minimum setting.

In setting the clock, the lower cap is rotated to turn the setting pin, which in turn will rotate the timing disc to the desired position, since the setting pin is engaged by the setting lug of the timing disc. Disengagement of these two parts is effected by the spring hammer assembly, which is fastened on one end to the top inside shoulder of the lower cap and on the opposite end has two small weights.

(2) The Clock Mechanism, which consists of two centrifugal gear arcs, a series of reduction gears, and the escapement mechanism. The centrifugal gear arcs are geared to the central drive shaft and are weighted on one side so that they will turn in a counter-clockwise direction, thus turning the central shaft and the timing disc in a clockwise direction. The gear arcs have starter "kick-off" springs on them which serve to prevent the gears from freezing. The reduction gears are similarly geared to the central spindle, and their rotation is governed by the escapement mechanism which is connected to the lowest gear. The escapement mechanism consists of an escapement gear, an escapement lever, a lever spring, a safety lever plate, and a lever plate spring. In the assembled position, the escapement lever is prevented from moving by the safety lever plate, which has a pin protruding from the bottom and engages the escapement lever. The safety lever plate is pivoted, with a weight on one end, and is held in position by the lever plate spring. The escapement lever acts as a balance wheel and is caused to move back and forth by the escapement lever spring, which is a hair spring, secured at both ends and attached to the escapement lever.

# Mk-18, 25 TIMING MECHANISM



DATA

RESTRICTED

U. S. NAVY  
MK.25

MOD. I

NOSE TIME FUZE

CONTINUED

(3) The firing mechanism which consists of the firing arm, firing arm shaft, setback pin, firing pin safety plate, and the firing pin. The firing arm is pivoted and has on one end a weight, and on the opposite end an elbow piece which bears against the outer periphery of the timing disc. Rigidly secured to the firing arm is the firing arm shaft which is prevented from turning in the assembled condition by the setback pin. The setback pin is being held in position by the setback pin spring and is resting in front of a projection of the firing arm shaft, thus preventing the latter piece from rotating. In the bottom of the firing arm shaft is a notch and bearing against the shaft in such a position that it will pass through the notch when the shaft is rotated, is the firing pin safety plate. This safety plate is also pivoted and is fitting under a shoulder of the cocked firing pin thus holding it away from the primer beneath it.

OPERATION

The fuze is armed by setback, driven by centrifugal force governed by an escapement mechanism, and fired by a spring driven firing pin. When the projectile is fired from the gun, the force of setback accomplishes two things:

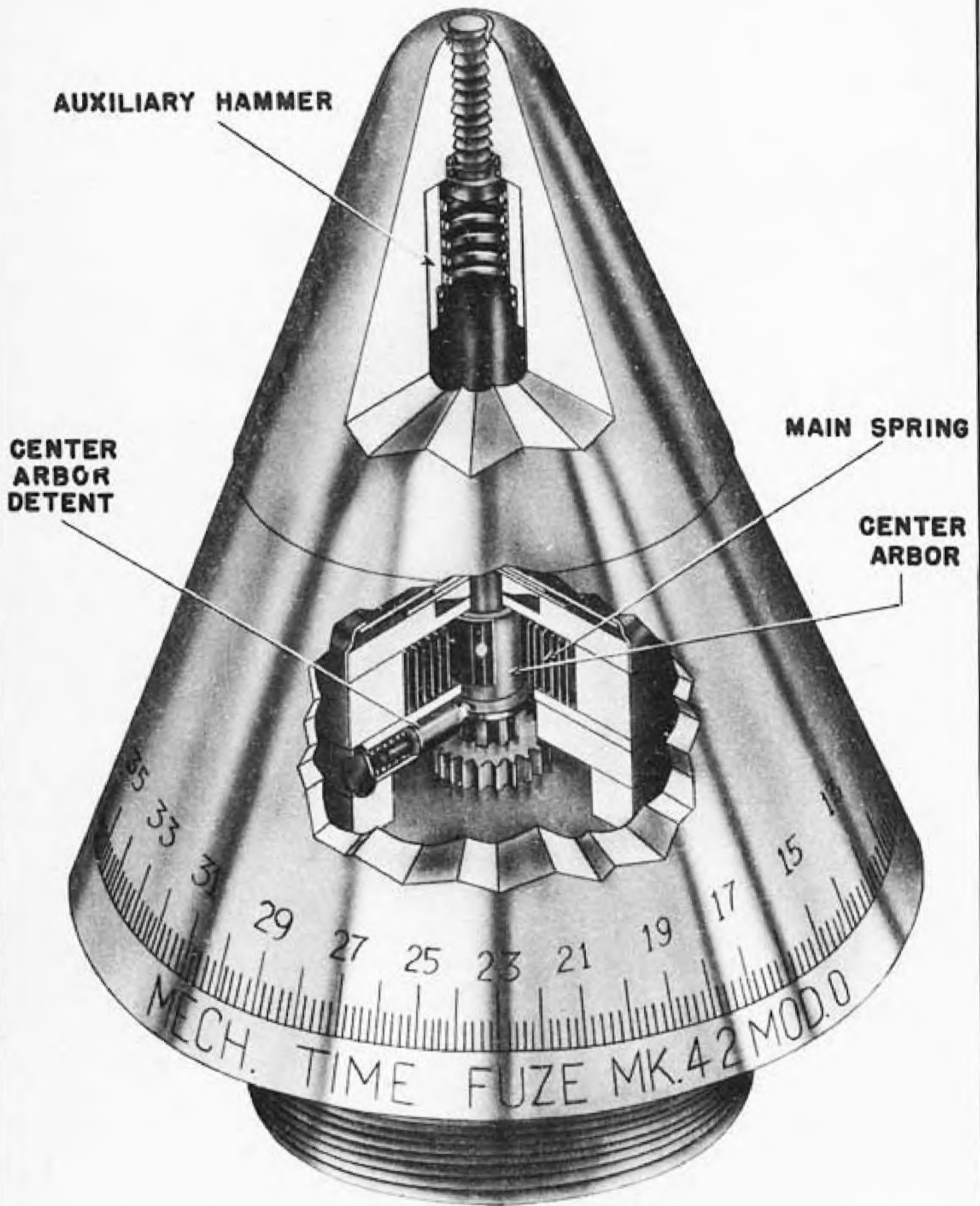
1. The setback pin overcomes its spring and drops into the bottom of the fuze. This action frees the firing arm shaft for later rotation.
2. The hammer spring assembly pivots down and the weights on one end strike the setting lug thus depressing it and freeing it from the setting pin. When the force of creep sets in, the spring returns the weights to their original position, forward of the timing disc.

As the projectile rotates, centrifugal force accomplishes four things:

1. The safety lever plate of the escapement mechanism is pivoted out of the way, thus releasing the escapement lever and unlocking the escapement mechanism. This initial movement causes the escapement lever to oscillate thus acting as the balance wheel and governing the speed of operation.
2. As soon as the escapement mechanism has been unlocked, the weights on the centrifugal gear arcs tend to move outward thus causing the arcs to pivot and rotate the central shaft, and, consequently, the timing disc. This rotation is slowed down by the series of reduction gears and its speed is determined by the escapement mechanism. This rotary motion of the timing disc turns the firing notch around to the elbow piece of the firing arm.
3. When the firing notch has been presented to the elbow piece of the firing arm the weight on the opposite end of the firing arm is moved outward turning the elbow into the slot and turning the firing arm shaft. This is now possible since the setback pin has been depressed when the projectile was initially fired.
4. As the firing arm shaft rotates, the notch in the bottom of it is presented to the firing pin safety plate which will pivot through this notch, thus moving out from under the shoulder of the firing pin. The firing pin will then be thrown downward onto the primer by its compressed spring. The primer will then ignite the black powder charge in the base of the fuze.

REMARKS:

1. This fuze is slot-set, rather than lug-set like the Mk 18.
2. This fuze is moisture-proofed completely, as outlined for the Mk 50 Nose Time Fuze.



**MK.42  
NOSE TIME FUZE**

**DATA**

RESTRICTED

**U. S. NAVY**

PROJECTILES USED IN	12"/50 H.C. 14"/45/50 H.C. 16"/45/50 H.C.
MARKINGS	Mech Time Fuze Mk 42 NGF Lot _____
OVERALL LENGTH	3.54 in.
DIAMETER AT BASE OF OGIVE	3.05 in.
THREADED LENGTH	0.81 in.
THREADS	7 R.H.
WEIGHT	2.5 lbs.
MATERIAL OF CONSTRUCTION	Brass
SETTING TIMES	Minimum: 0.6 seconds Maximum: 45 seconds

**MK. 42**

NOSE TIME FUZE

DESCRIPTION:

The Mk 42 fuze was developed to supersede the Mk 18 when used in major caliber H.C. projectiles because of the erratic performance of the latter fuze when so employed. The fuze is generally similar to the Mk 61 projectile fuze, differing only in that the primary driving force of the Mk 42 is provided by a heavy main spring instead of by centrifugal weights. The driving force for the clockwork mechanism thus becomes substantially independent of the rate of spin of the projectile and is applied during the entire running time of the fuze.

In addition to the spring-driven feature, the Mk 42 also differs from the Mk 61 fuze in that a heavy additional hammer is located in the recess in the nose cap of the fuze. This hammer is attached to the nose cap by a spring. On set-back, this hammer stretches the spring and strikes the conventional hammer, giving it additional force in striking the setting lug. This feature was found necessary because the low set-back of major caliber projectiles failed to provide sufficient force for the usual hammer arrangement to disengage the setting lug from the setting pin.

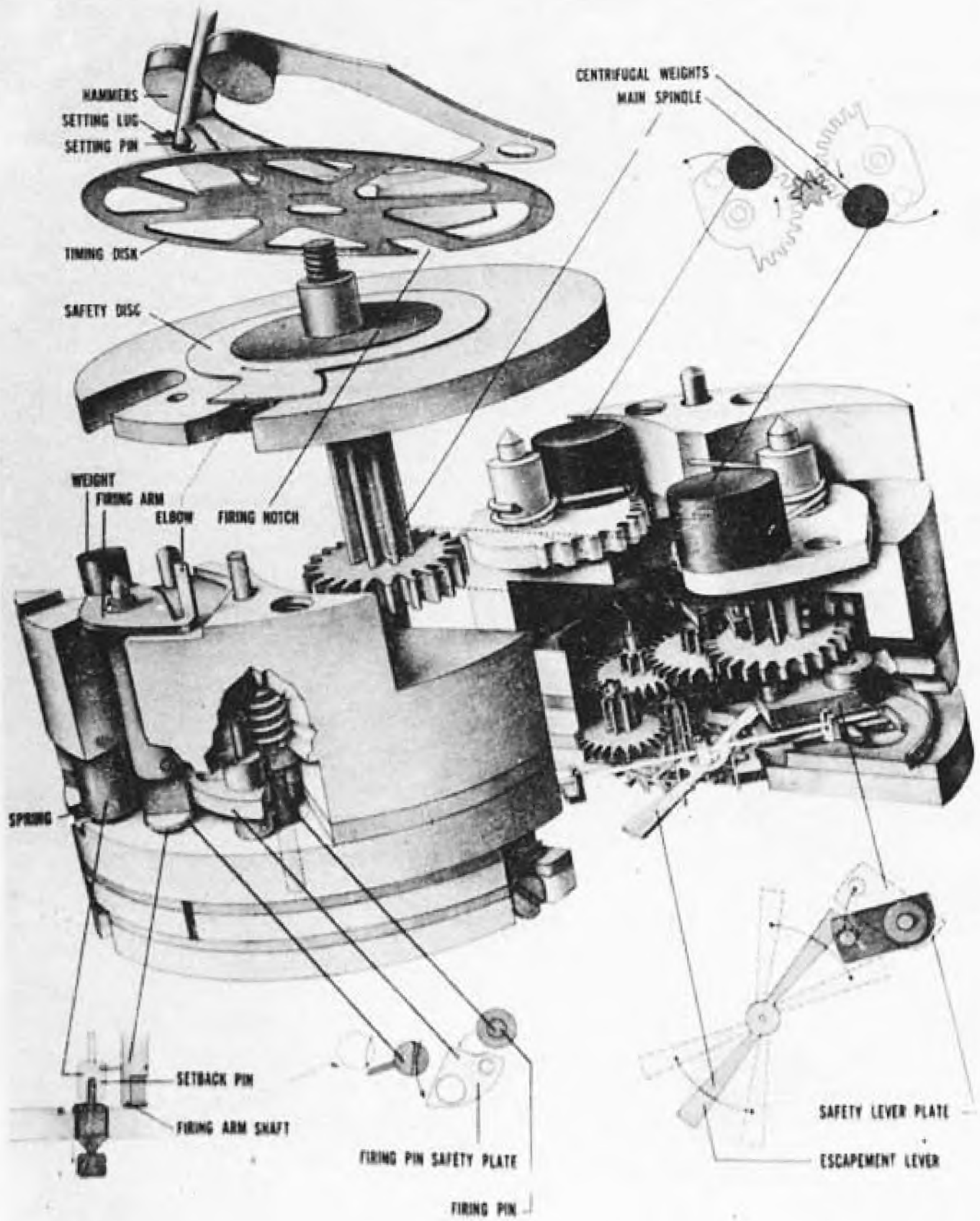
OPERATION:

The method of operation of this fuze is generally similar to that of the Mk 61, except of course that the driving force is supplied by a main spring. The force of set-back, when the gun is fired, causes the auxiliary hammer to descend against the main hammer, disengaging the setting lug from the setting pin.

Centrifugal force causes the center arbor detent to move outwards against its spring and out of engagement with the center arbor. The main spring is then allowed to exert its force on the center arbor, actuating the escapement-controlled clockwork mechanism. All other features of operation are identical to those of the Mk 61 fuze.

REMARKS:

This fuze is now considered obsolescent, and its production has been suspended. It was found during functioning trials that the auxiliary hammer did not function properly on set-back. The Mk 62 M.T.F. is designed to supersede this fuze in major caliber H.C. projectiles.



# MK.50,51

## NOSE TIME FUZE

**DATA**

RESTRICTED

**U. S. NAVY****PROJECTILES USED IN**

Mk 50  
 4"/50 Ill.  
 5"/25/38/51 AA Common  
 5"/25/38/51 Ill.  
 5"/38 Window  
 5"/38 W.P.  
 5"/51 H.C.  
 6"/47/53 H.C. & Ill.  
 8"/55 H.C.

**MK. 50**  
**MK. 51**

**MARKINGS**

Mk 51  
 3"/23/50 AA & Ill.  
 4"/50 H.C.  
 Mech Time Fuze  
 Mk 50  
 Lot \_\_\_\_\_

NOSE TIME FUZE

**SETTING TIMES**

Mk 50: 0.6 - 45 seconds.  
 Mk 51: 0.6 - 30 seconds.

**DESCRIPTION:**

The Mk 50 and Mk 51 fuzes are merely moisture-proofed versions of the Mk 18 Mods 2,3,& 4 and the Mk 22 Mods 4,5,& 6, respectively. The size, operation, component parts (except as noted below), firing train and setting times are identical to those of the Mk 18 and Mk 22 fuzes.

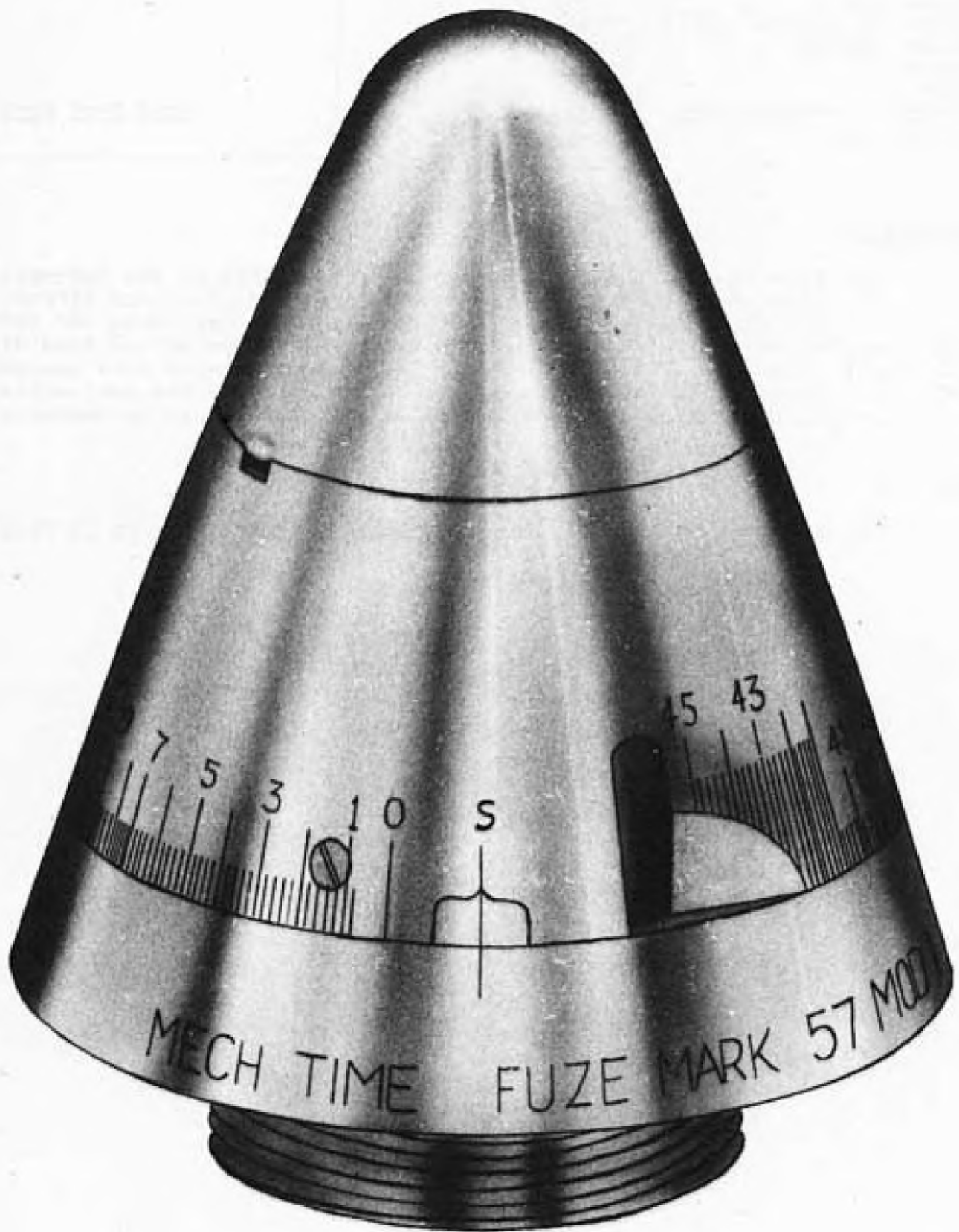
**Moisture-Proofing Measures:**

1. A silica gel bag to absorb moisture is placed in the base cavity of the fuze.
2. Special gaskets are placed between the upper cap and the lower cap, and between the lower cap and the body.
3. The joint between the upper cap and the lower cap is coated with Bakelite varnish.
4. The primer unit ends are covered with Bakelite varnish.
5. Thread luting compound is applied to the joint between the body and the bottom closing screw.
6. The brass disc at the center of the bottom closing screw is crimped in under a washer and then coated with Bakelite varnish.
7. All screw heads visible on the outside are coated with glyptol lacquer.

**REMARKS:**

1. Different modifications of these fuzes indicate nothing more than different manufacturers.

RESTRICTED



**MK.57**  
**NOSE TIME FUZE**

**DATA**

RESTRICTED

**U. S. NAVY**

PROJECTILES USED IN

8"/55 H.C. (for use  
in 8" Rapid Fire  
case gun.)

MARKINGS

Mech. Time Fuze  
Mk 57**MK. 57**

NGF \_\_\_\_\_

Lot \_\_\_\_\_

OVERALL LENGTH

4.305 in.

DIAMETER AT BASE OF OGIVE

2.983 in.

THREADED LENGTH

0.47 in.

THREADS

7 R.H.

WEIGHT

MATERIAL OF CONSTRUCTION

Brass

SETTING TIMES

Minimum: 0.8-1.0 sec

Maximum: 45 secs.

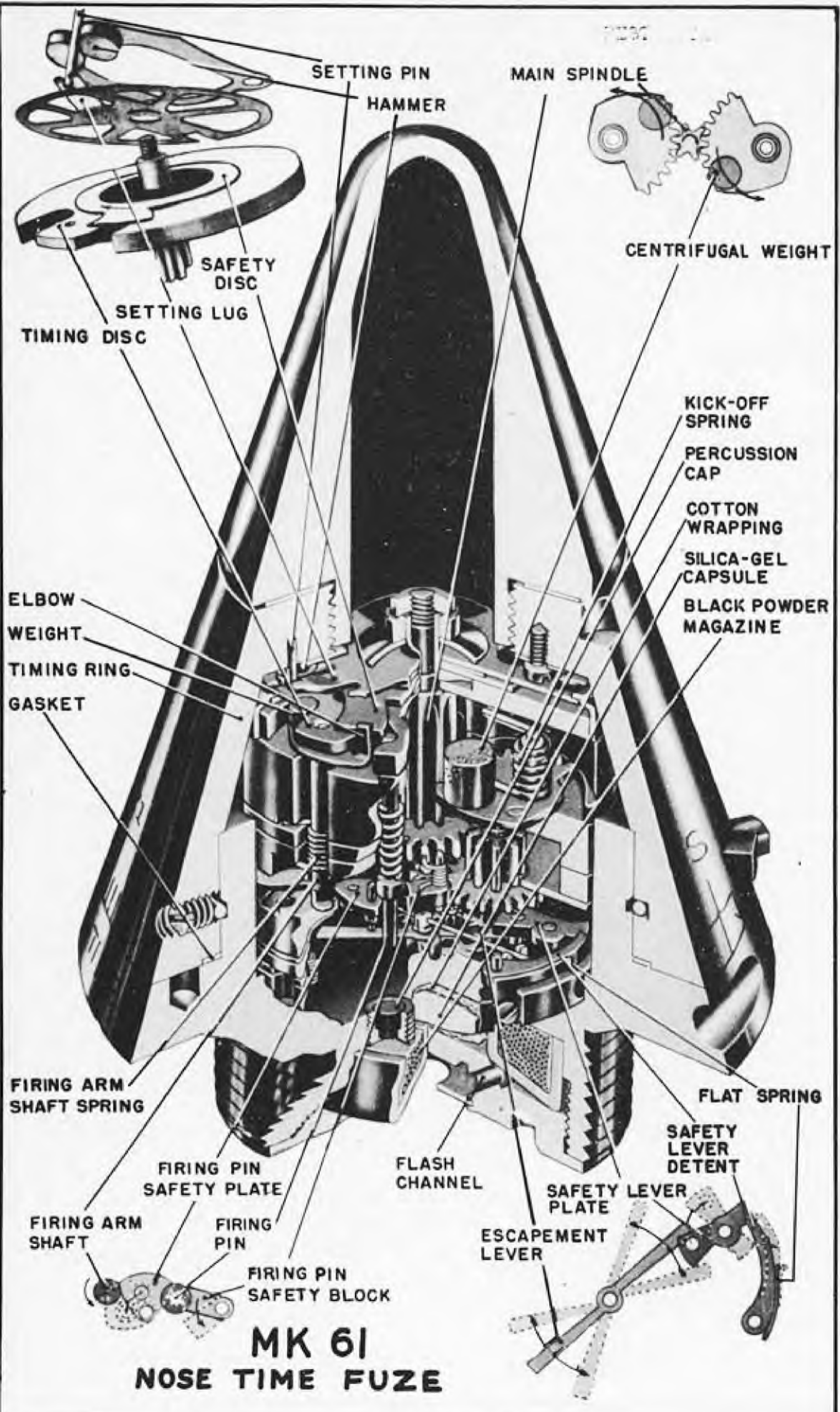
NOSE TIME FUZE

DESCRIPTION:

This fuze is identical the Mk 61 M.T.F. in so far as the internal mechanism and method of operation are concerned. The fuze differs from the Mk 61 in that it is provided with external slots for setting, rather than setting lugs. Furthermore the external contour of the fuze differs considerably from that of the Mk 61 fuze. The contour changes were necessary to allow the fuze to continue the more streamline shape of the projectile and to strengthen the fuze body and lower cap sufficiently to accommodate the setting slots.

OPERATION:

The operation of this fuze is identical to that of the Mk 61 fuze.



**MK 61  
NOSE TIME FUZE**

# DATA

RESTRICTED

# U. S. NAVY

A. MK.61  
B. MK.62  
C. MK.63

NOSE TIME FUZE

## PROJECTILES USED IN

- (a) 5"/38 AA Common  
5"/38 W.P.
- (b) 12"/50 H.C.  
14"/45/50 H.C.  
16"/45/50 H.C.
- (c) 4"/50 Ill.  
5"/25/38/51 A.A.  
Common  
5"/25/38/51 Ill.  
5"/38 W.P.  
5"/38 Window  
5"/51 H.C.  
6"/47/53 H.C.  
6"/47/53 Ill.  
8"/55 H.C.

## MARKINGS

Mech. Time Fuze  
Mk 6\_  
NGF \_\_\_\_\_  
Lot \_\_\_\_\_

## OVERALL LENGTH

3.54 in.

## DIAMETER AT BASE OF OGIVE

3.05 in.

## THREADED LENGTH

0.81 in.

## THREADS

7 R.H.

## WEIGHT

2.52 lbs.

## MATERIAL OF CONSTRUCTION

Brass

## SETTING TIMES

Minimum: 0.9 to 1.0 secs.

Maximum: 45 seconds.

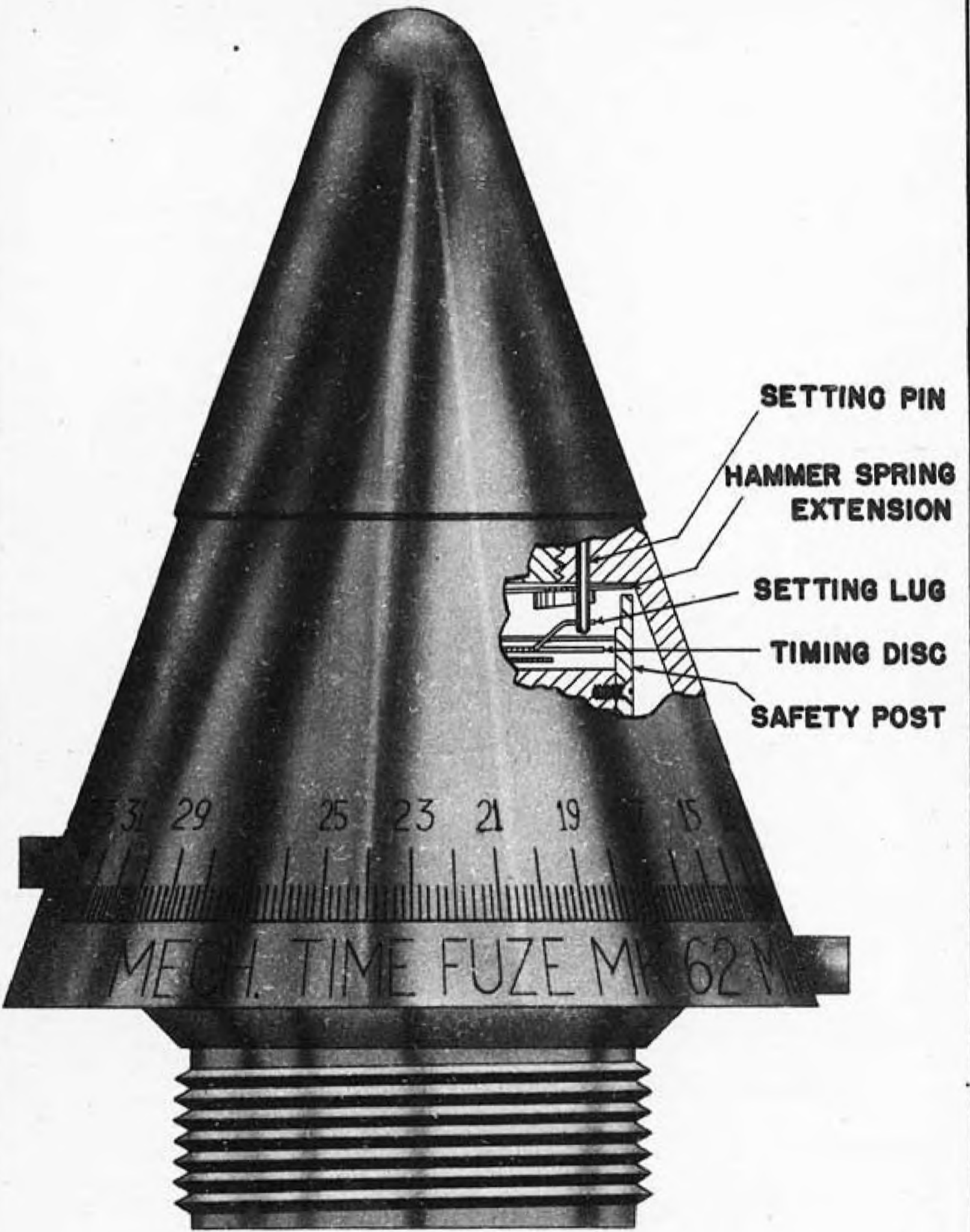
## DESCRIPTION:

1. The Mk 61 fuze is a modification of the mechanical time fuzes of the Mk 18 - Mk 50 type, designed specifically for the 5"/38 when the special 1200 ft. per sec. I. V. reduced charge is employed. The modifications, allowing the fuze to function at lower rotational velocities and decreased set-back, are as follows:
  - (a) A weaker hammer spring is used.
  - (b) The set-back pin has been eliminated.
  - (c) A centrifugally operated firing pin safety block has been added under the firing pin.
  - (d) A centrifugally operated detent or plate, retained by a flat spring, holds the safety lever plate, which locks the escapement mechanism.
  - (e) Heavier centrifugal weights are placed on the driving gears to drive the clock-work movement.
  - (f) Stronger centrifugal "kick-off" springs are incorporated on the centrifugal gears. These springs are actually driving springs and exert a strong force throughout the entire cycle.
  - (g) A spring is added to the firing arm shaft.
  - (h) Weight is added to the safety lever plate.
  - (i) The fuze body is slightly altered to provide clearance for the heavier driving weights.
  - (j) The safety setting is changed to 0.9 - 1.0 seconds.
2. The Mk 62 fuze is almost identical to the Mk 61 (above), but is slightly further modified to allow its use in the major caliber H.C. projectiles, where extremely low set back force on firing is encountered. The additional modifications incorporated in the Mk 62 are as follows:
  - (a) A still weaker hammer spring is used.
  - (b) A safety post is provided beneath the hammer spring, preventing arming of the fuze as the result of accidental dropping.
3. The Mk 63 fuze is designed to replace the Mk 18 and Mk 50 M.T.F.'s in all projectiles in which the Mk 50 is currently in use. Its internal construction is identical to that of the Mk 61 fuze, except that the escapement movement has been regulated for a higher spin rate of 210 R.P.S., which is the average spin rate of the 5"/38 projectile at service velocities. The Mk 63 fuze has not yet been placed in production.

## OPERATION:

This fuze is armed by a combination of set-back and centrifugal force. It is driven by centrifugal force regulated by an escapement mechanism

RESTRICTED



MK.62

NOSE TIME FUZE

**DATA**

RESTRICTED

**U. S. NAVY****MK. 61****MK. 62****MK. 63**

NOSE TIME FUZE

OPERATION (Continued):

and assisted by a pair of strong "kick-off" springs attached to the driving centrifugal weights and gears. These springs differ from those used in the Mk 18 & Mk 50 type fuzes in that they provide a positive driving force to the fuze throughout its entire cycle of operations. The fuze is fired by a spring-loaded firing pin. When the projectile is fired from the gun, the force of set-back causes the hammer spring assembly to pivot downward. The hammer weights strike the setting lug, depressing it and freeing it from the setting pin. When the force of creep sets in, the hammer weights are returned by their spring to their original position above the timing disc.

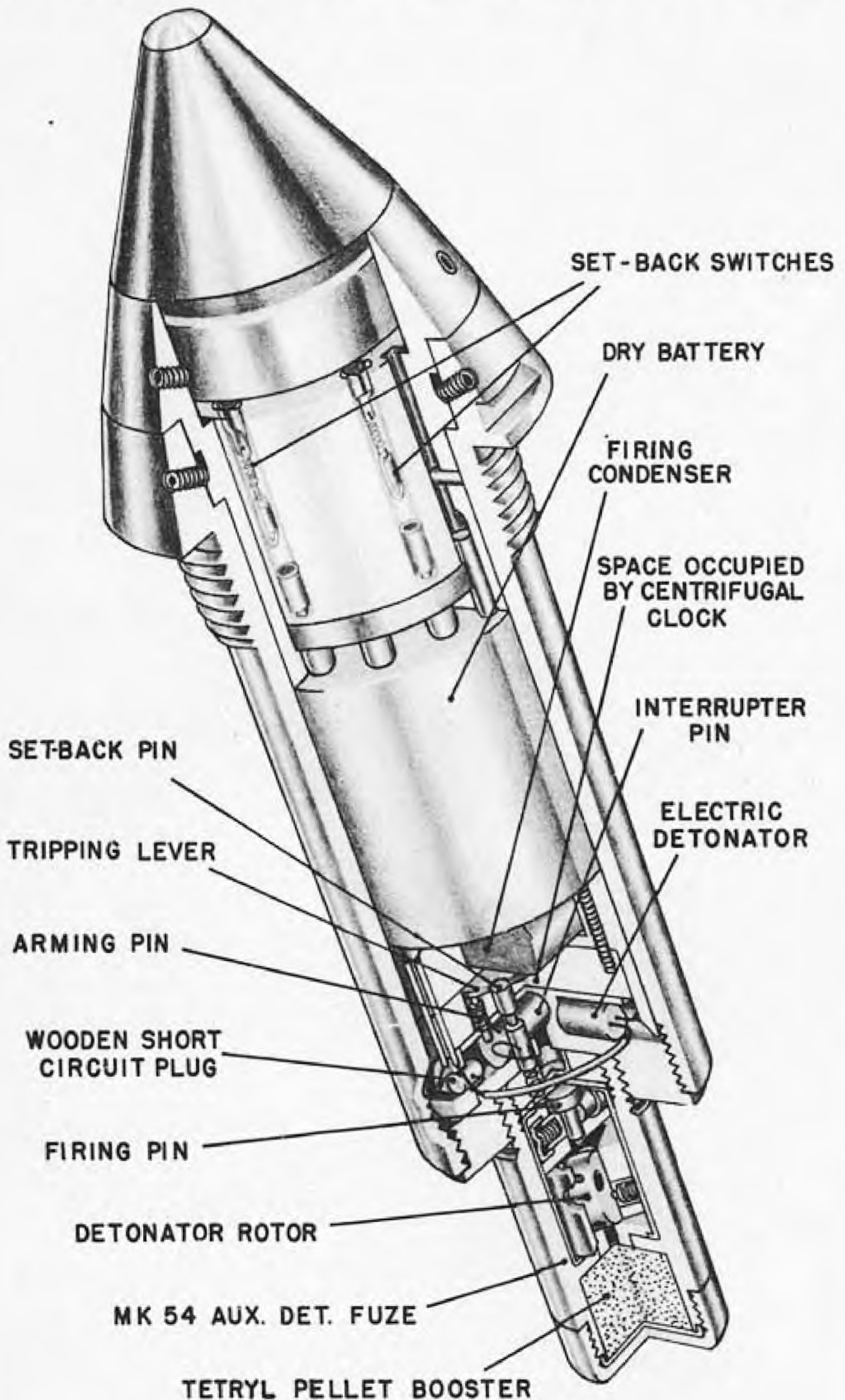
As the projectile rotates, centrifugal force accomplished five things:

- a. The safety lever plate pivots outward against the detent and the flat spring, releasing the escapement lever and unlocking the escapement mechanism. The initial movement of the escapement lever, caused by the swinging out of the plate, begins its oscillation. It then acts as a balance wheel and governs the speed at which the clock operates.
- b. The firing pin safety block moves outward from under the firing pin.
- c. As soon as the escapement mechanism is released, the weights on the centrifugal gear arcs, assisted by the strong "kick-off" springs, tend to move outward, causing the arcs to pivot and rotate the central shaft and the connected timing disc. This rotation is slowed down by a series of reduction gears, and its speed is determined by the escapement mechanism. This rotary motion of the timing disc moves the firing notch around toward the elbow piece of the firing arm.
- d. When the firing notch is presented to the elbow piece, the firing arm shaft is rotated by the weight on the far end of the firing arm assisted by the torsion spring on the firing arm shaft.
- e. As the firing arm shaft rotates, the notch near the base of the shaft is presented to the firing pin safety plate, which is then caused by centrifugal force to pivot through the notch, moving out from under the shoulder of the firing pin. The firing pin is then forced by its spring against the primer, which ignites the black powder charge in the base of the fuze.

REMARKS:

1. These fuzes, like the Mk 50 type, have complete moisture-proofing features incorporated. These measures include gaskets between the time setting ring and the upper cap and body assemblies; a silica-gel capsule is placed in the base of the fuze to absorb excess moisture; joints and openings are coated with approved luting or bakelite varnish.
2. The Mk 62 M.T.F. is designed to replace the Mk 42 spring-driven M.T.F. in all assemblies.
3. The Mk 62 fuze differs in operation from the Mk 61 only in the functioning of the safety post. This safety post consists merely of a stud fastened by a screw to the uppermost ring of the clockwork mechanism. With the fuze set on "Safe", this stud is located beneath a projecting end of the hammer spring, preventing the hammer from disengaging the setting lug from the setting pin as the result of accidental dropping. When the fuze is set off the "Safe" position preparatory to firing, the hammer assembly is moved away from above the safety post, allowing the hammer to move down on set-back.

# MKS 32 & 40 TYPE VT PROJECTILE NOSE FUZE (UNARMED)



~~CONFIDENTIAL~~

V.T. FUZES  
MKS. 32 & 40 TYPE  
OPERATION

When the round is fired, acceleration in the gun causes the three set-back switches to close. This action connects the battery to the electrical mechanism and initiates charging of the firing condenser through its high resistance delay circuit. Simultaneously, the set-back pin in the centrifugal clock moves back against its spring, freeing and starting the clock escapement mechanism. In the armed position the set-back pin is locked by the locking spring.

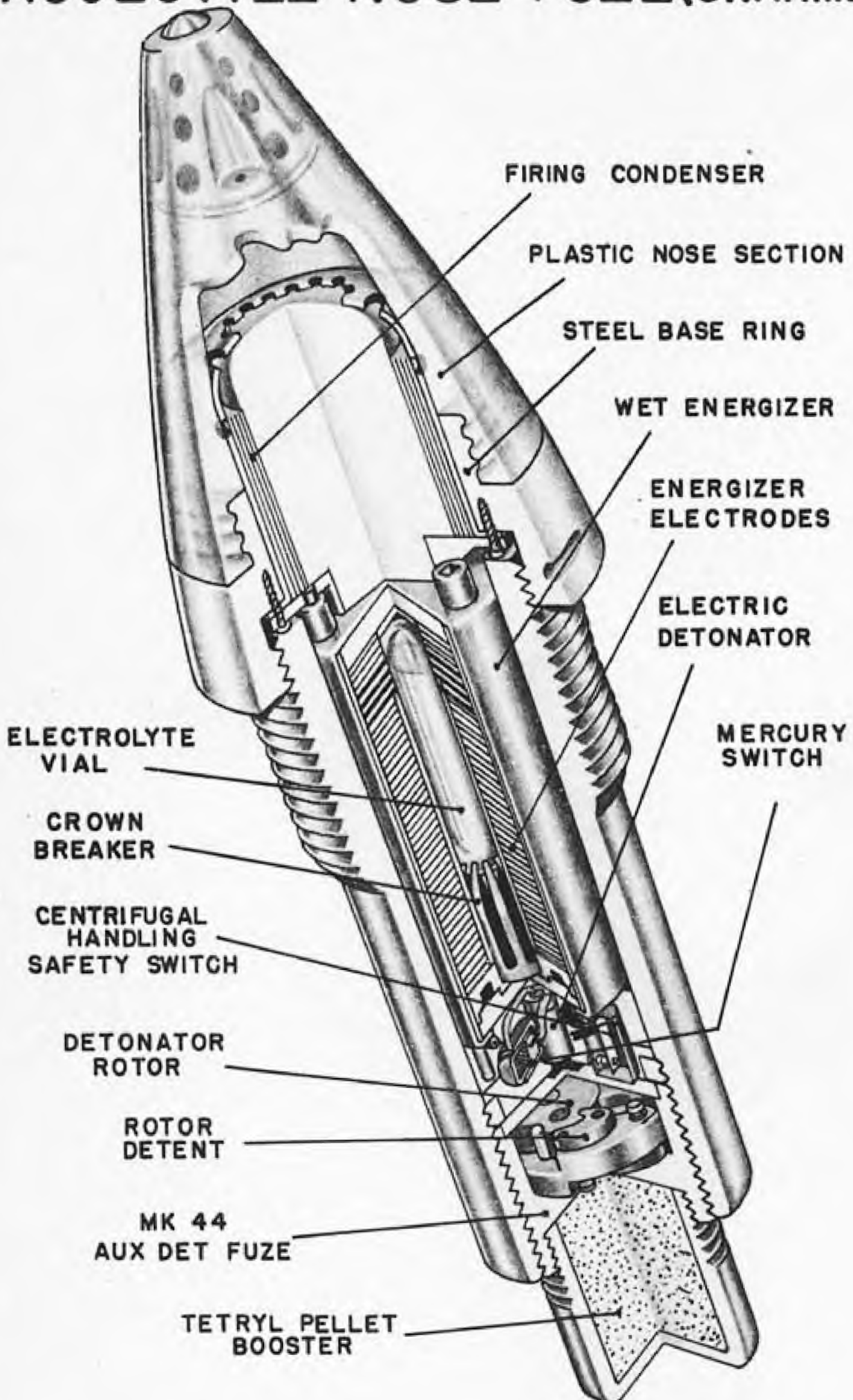
Centrifugal force drives the clock through its 0.4 to 0.6 seconds permanent setting, at which time the tripping lever moves over the spring-loaded arming pin. The arming pin moves forward, withdrawing from the interrupter cavity. This allows the interrupter pin to be moved outward by centrifugal force, thereby clearing the flash channel between the electric primer and the auxiliary detonating fuze, hitting the short circuit plug, and breaking the short circuit wire away from the electric primer leads.

Meanwhile the firing condenser has been accumulating an electric charge. When this charge is sufficient to allow firing of the electric primer (normally 0.6 to 0.8 seconds in the dry battery type fuze), the fuze is fully armed.

Upon approach to a target under the proper conditions, the reflected electromagnetic signal from the target causes the V.T. element to discharge the firing condenser through the electric primer. The blast from the primer operates the auxiliary detonating fuze, which in turn initiates detonation of the projectile.

Operation of the wet-energized fuzes of this type is identical, except that the electrolyte vial in the reserve energizer is broken by acceleration of the round, and centrifugal force distributes the electrolyte throughout the energizer. Charging of the firing condenser is not begun when the set-back switches close, but must wait until the electrolyte is uniformly distributed through the reserve energizer. This normally occurs 0.2 to 0.3 seconds after set-back, thereby delaying complete arming of the unit until 0.8 to 1.1 seconds after set-back.

# MKS 45,47,53,58,59 TYPE VT PROJECTILE NOSE FUZE (UNARMED)



~~CONFIDENTIAL~~

## V.T. FUZES

MKS. 45, 47, 53, 58, & 59 TYPE  
OPERATION

When the round is fired, acceleration in the gun barrel causes the fingers of the crown breaker to open up, allowing the electrolyte vial to break against the bottom of the breaker. Centrifugal force distributes the electrolyte throughout the energizer, activating it in 0.2 to 0.3 seconds. Centrifugal force also opens the handling safety switch, which previously had been shorting out the firing condenser.

The firing condenser begins to accumulate a charge through its high resistance electrical delay, and electrical energy is fed to the electric mechanism in the V.T. element. Centrifugal force causes the small globule of mercury in the mercury switch to move through a porous membrane into the lower chamber, thereby removing the electric short circuit across the primer leads. This requires from 0.2 to 0.9 seconds, depending on the fuze and the rate of rotation of the projectile. When the firing condenser has accumulated enough electrical energy to allow firing of the electric primer (0.6 to 1.0 seconds), the fuze is fully armed.

Upon approach to a target under proper conditions, the reflected electromagnetic signal from the target causes the V.T. element to discharge the firing condenser through the electric primer. The blast from the primer functions the auxiliary detonating fuze, which in turn initiates the detonation of the projectile.

The Mk 53, Mk 47, and Mk 59 V.T. fuzes are equipped with two mercury switches instead of the single switch incorporated in the Mk 45 and Mk 58. This feature is provided to insure additional safety; in all other respects, these five fuzes are mechanically identical.



**MK. 32**

**V.T. FUZE**

# DATA

~~UNCLASSIFIED~~

PROJECTILES USED IN 5"/38/25/(51\*) A.A.  
Common

MARKINGS Mk 32, Mod  
Model     , Lot     

OVERALL LENGTH 12 in. (approx.)  
DIAMETER AT BASE OF OGIVE 3.3 in. (approx.)  
THREADED LENGTH 0.6 in. (approx.)  
THREADS 6 R.H.  
MATERIAL OF CONSTRUCTION Steel base rings,  
black plastic nose  
ogive, aluminum  
nose cap or button  
tip.

WEIGHT 6.81 lbs.  
MINIMUM RANGE Mods 0-20, 40: 600  
yards  
Mod 30: 1000 yards  
Mod 0-20, 40: Dry  
Mod 30: Wet

TYPE OF ENERGIZER Mod 40 only

WAVE SUPPRESSION FEATURE None  
SELF DESTRUCTIVE FEATURE

# U.S. NAVY

## MK. 32

V.T. FUZE

### DESCRIPTION:

This fuze is designed to initiate detonation of the round at the most advantageous point upon approach to a target when passing within the maximum influence radius of about 60 ft. The Mod 40 has reduced sensitivity against low-flying aircraft because of the wave suppression feature. (For values, see Mk 40). Burst heights above water for all Mods without the wave suppression feature will be high at most ranges, averaging 130 ft. at 12,200 yds. in the 5"/38, with burst heights varying widely between rounds. Burst heights over water will average lower at shorter ranges, but a wide dispersion in heights will occur and are especially affected by water surface conditions. Burst heights of the Mod 40 above water (WSF) will vary between 10 and 50 ft.

Random premature bursts of rounds assembled with this fuze will occur along the trajectory after the fuze is armed but before it approaches a target. With targets at long range, 20% of the rounds may burst before approaching the target and a somewhat smaller percentage of prematures will occur at shorter ranges. If a target at long range is approached within the sensitivity limits of the fuze, 85% of the rounds should function at the most critical point to throw fragments against the target. The percentage of proper functions at shorter ranges is higher by the amount of decrease in premature functions. The remainder of the rounds will be duds. Because of ageing of the dry energizer, only about 50% of the rounds will function properly after 8 months. The dry energizers are changed about every 6 months by BuOrd personnel. Production has been suspended on this item, but large quantities are still in service.

### EMPLOYMENT:

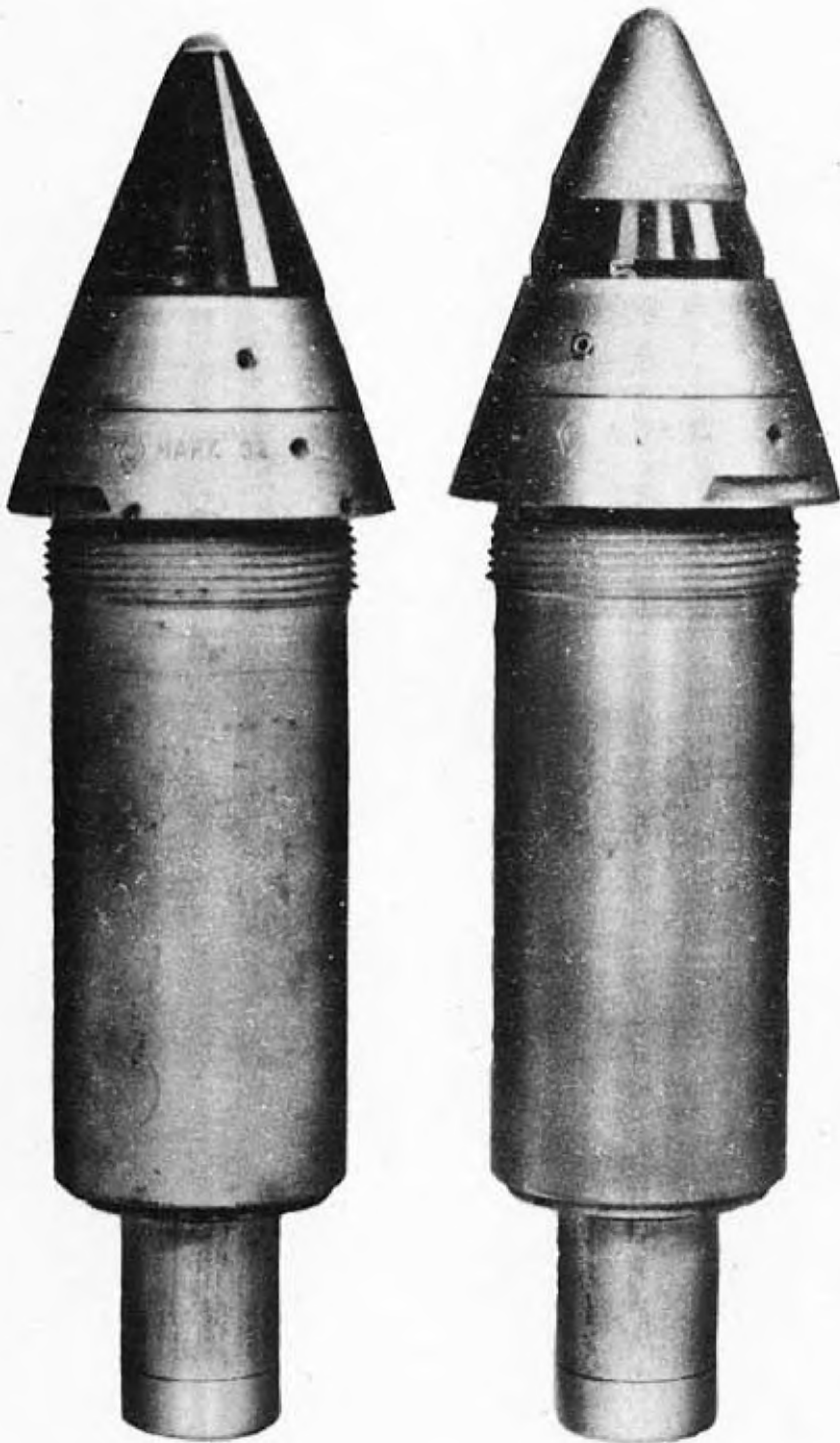
This fuze is used for anti-aircraft work from 600 yards minimum range to extreme range. The Mod 40, with WSP, is recommended for any gun elevation and can be used effectively against torpedo bomber attack and PT boat attack. It has normal sensitivity above about 200 ft. from the water but has automatically reduced sensitivity below this level. Mods 0-20 and 30 are not ordinarily used against surface craft because bursts at long range are too high for effective fragmentation damage, and those on low trajectory have a large dispersion in range. These mods may be used with reduced effectiveness against low-flying planes.

\*Note: Mods 0-20 & 40 of this fuze can be used in the 5"/51 gun at 2600 ft/sec I.V. reduced charge only. Mod 30 cannot be used in the 5"/51 rounds.

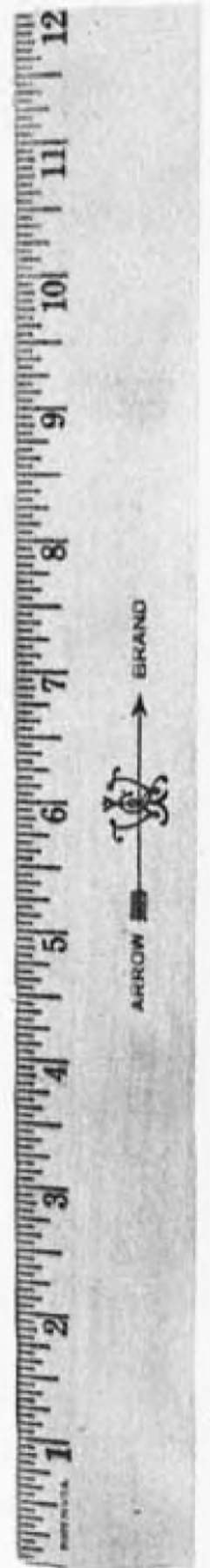
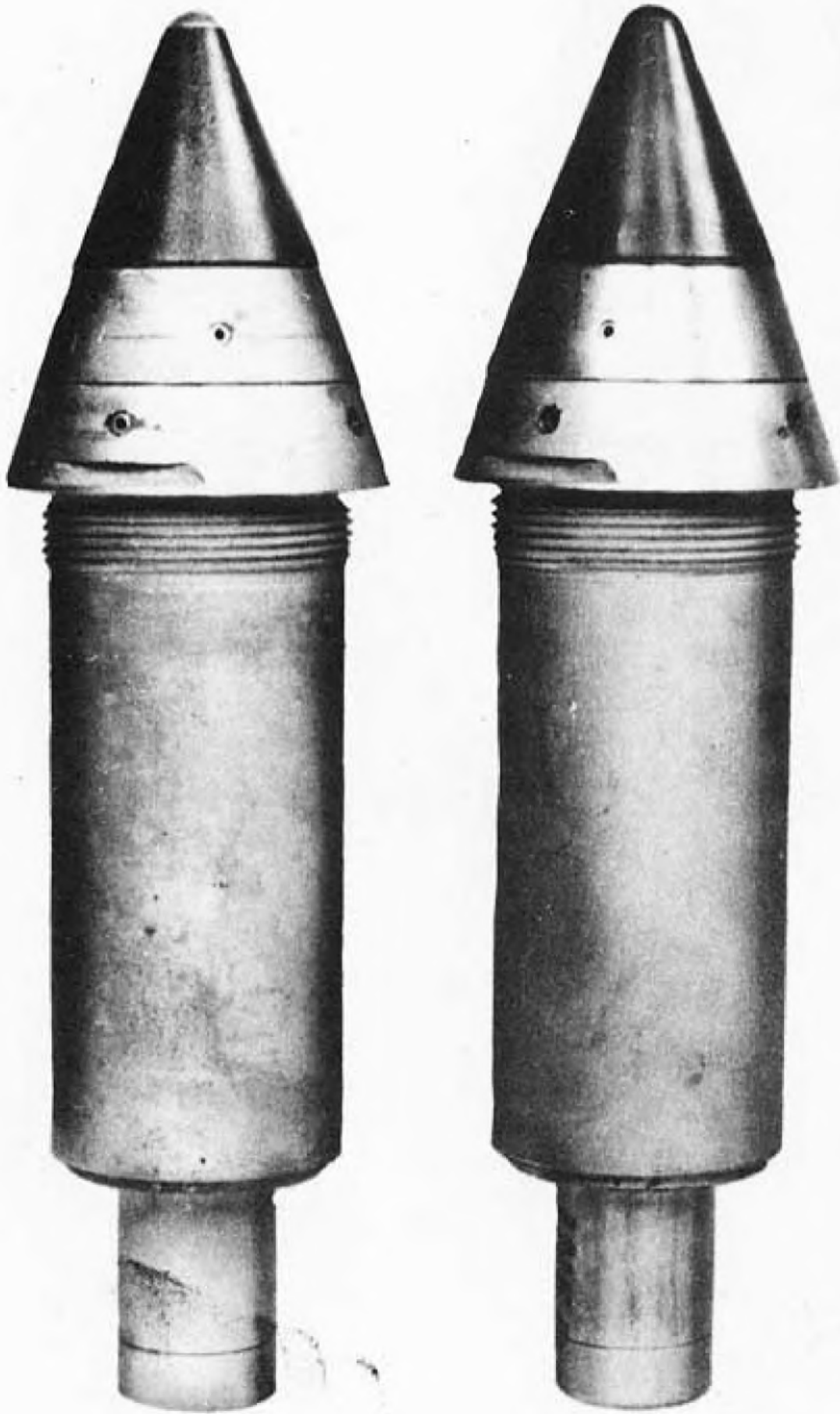
### REMARKS:

- (a) The Mk 54 auxiliary detonating fuze (replacing the Mks 17 & 46) is used in conjunction with this fuze.
- (b) This fuze is currently being replaced by the Mk 53 VT fuze.
- (c) The operation of this fuze is described on page 301.

# MK.32 V.T. FUZE



# MK.40 V. T. FUZE



MARKED PARTS

OP 2



**MK. 40**  
**V.T. FUZE**

**DATA**~~CONFIDENTIAL~~**U. S. NAVY**

PROJECTILES USED IN MARKINGS	5"/25/36 AA Common Mk 40, Mod
OVERALL LENGTH	Model _____, Lot _____ 12 in. (approx.)
DIAMETER AT BASE OF OGIVE	3.3 in. (approx.)
THREADED LENGTH	0.5 in. (approx.)
THREADS	8 R.H.
MATERIAL OF CONSTRUCTION	Steel base, black plastic ogive, may have button tip.
WEIGHT	6.81 lbs.
MINIMUM RANGE	800 yards
TYPE OF ENERGIZER	Wet
WAVE SUPPRESSION FEATURE	Present
SELF DESTRUCTIVE FEATURE	None

**MK. 40**

V.T. FUZE

DESCRIPTION:

This fuze is designed to initiate detonation of the round at the most advantageous point upon approach to an aircraft if the trajectory passes within the maximum influence radius of 70 ft. Against aircraft below 200 ft. altitude, operating radius is reduced depending on the altitude of the plane and the height of the waves, because of the wave suppression feature. Burst height over land or water may vary between 10 and 30 ft.

Random bursts will occur along the trajectory after arming, but before approaching a target. With a target at 12,200 yard range, 20% of the rounds will function prematurely, and at closer ranges a somewhat smaller percentage will function prematurely. If the target at 12,200 yard range is approached within the sensitivity limits of the fuze, 65% of the rounds will function when at the most advantageous point for hitting the targets with fragments. At closer ranges this percentage will be higher by the corresponding reduction in the number of premature bursts. The remaining rounds will be duds. (The above figures are obtained from test firings at 12,200 yard range, and it is to be understood that these figures will deviate considerably in different lots of ammunition, range variations, etc.).

These units have wet energizers of the reserve type; so effectiveness is not greatly diminished by normal storage for at least 18 months. Production has been suspended on this item, but large quantities are still in service.

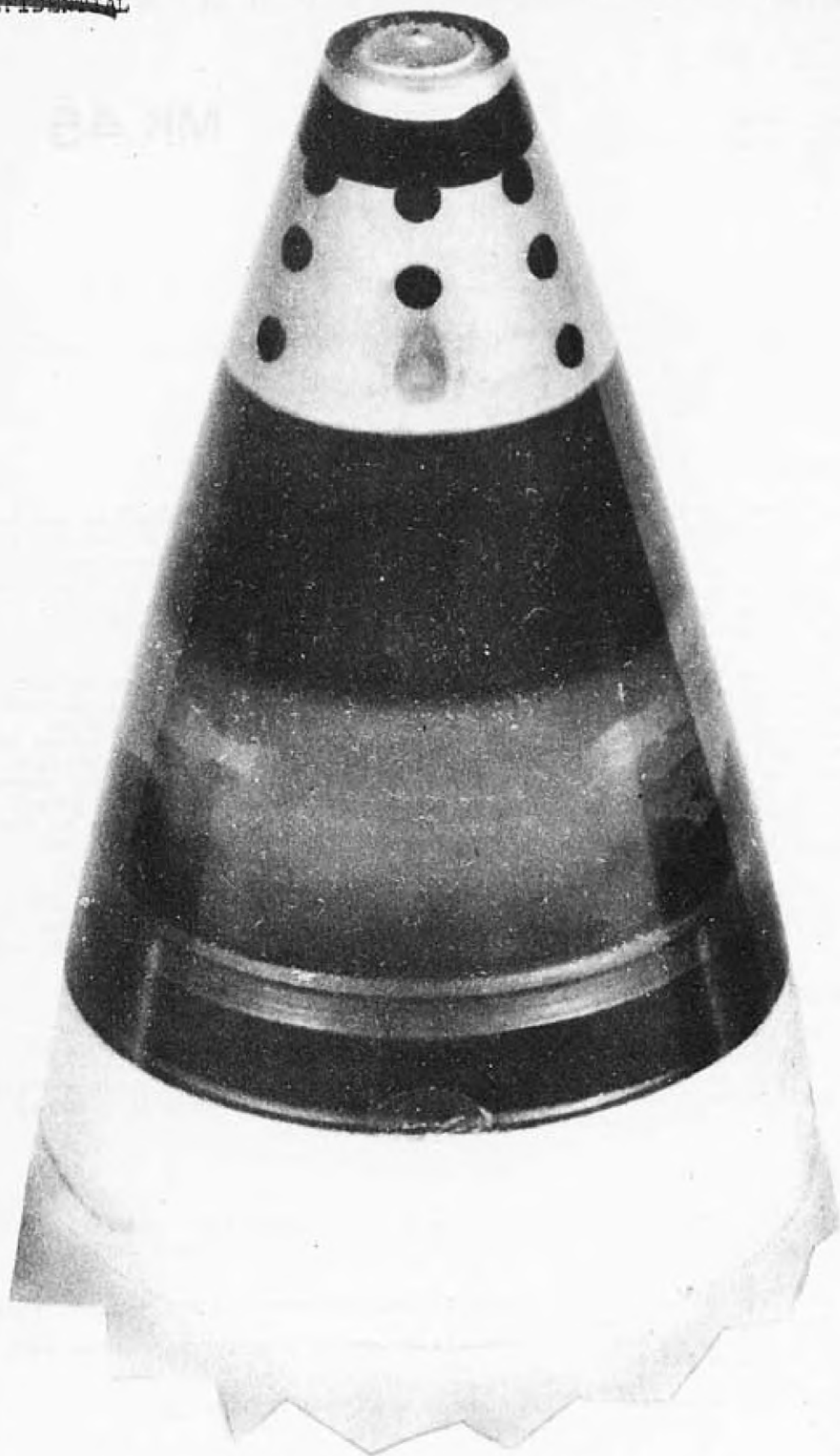
EMPLOYMENT:

This fuze is recommended for anti-aircraft work from a minimum range of 800 yards to the extreme range of the gun. The wave suppression feature makes this fuze useful against low-flying aircraft and surface targets, as it will not detonate on water influence above 15-20 ft., but it must pass somewhat closer to the target in order to function than in the case of high flying or diving targets. It may be used effectively for barrage of land targets where bursts at 10-30 feet will be effective against personnel and lightly protected installations.

REMARKS:

- (a) The Mk 54 auxiliary detonating fuze (replacing the Mks 17 & 46) is used in conjunction with this fuze.
- (b) This fuze is currently being replaced by the Mk 53 VT fuze.
- (c) The operation of this fuze is described on page 301.

~~CONFIDENTIAL~~



**MK. 45**  
**V.T. FUZE**

**DATA**~~CONFIDENTIAL~~**U. S. NAVY****PROJECTILES USED IN MARKINGS**3"/50 A.A.  
Mk 45, Mod 12,  
Model \_\_\_\_\_, Lot \_\_\_\_\_**OVERALL LENGTH**

7.7 in. (approx.)

**DIAMETER AT BASE OF OGIVE**

2.4 in. (approx.)

**THREADED LENGTH**

1.0 in. (approx.)

**THREADS**

12 R.H.

**MATERIAL OF CONSTRUCTION**

Plastic ogive molded integral to steel base. Perforated nose cap molded into forward end of plastic ogive.

**WEIGHT**

2.40 lbs.

**MINIMUM RANGE**

600 yards

**TYPE OF ENERGIZER**

Wet

**CENTRIFUGAL HANDLING-****SAFETY SWITCH**

Present

**MK.45**

V.T. FUZE

**DESCRIPTION:**

This fuze is designed to initiate detonation of the round at the most advantageous point upon approach to an aircraft, if the trajectory passes within the maximum influence radius of 50 ft. Burst heights over water at long range will average around 75 ft., with wide variations in burst height occurring due to wave effect and variations in sensitivity between rounds. Burst heights over water at shorter ranges will generally average to lower levels.

Random bursts will occur along the trajectory after arming so that approximately 30% of the rounds will have burst prematurely before approach to a target at extremely long range. In firing at shorter range, a smaller percentage of premature bursts will be encountered. At long range, after 30% of the rounds have functioned prematurely, 50% of the rounds will function when passing the target within the sensitivity limits of the fuze. At shorter ranges the percentage which will function properly when passing the target will be higher by the amount of reduction in premature functions due to the shorter range. These are average figures obtained from test firings, and considerable variation may be expected from individual lots.

These fuzes have wet energizers of the reserve type; so they will stand up well if stored under the proper conditions. Production has been suspended on this fuze, but a considerable quantity are still in service use.

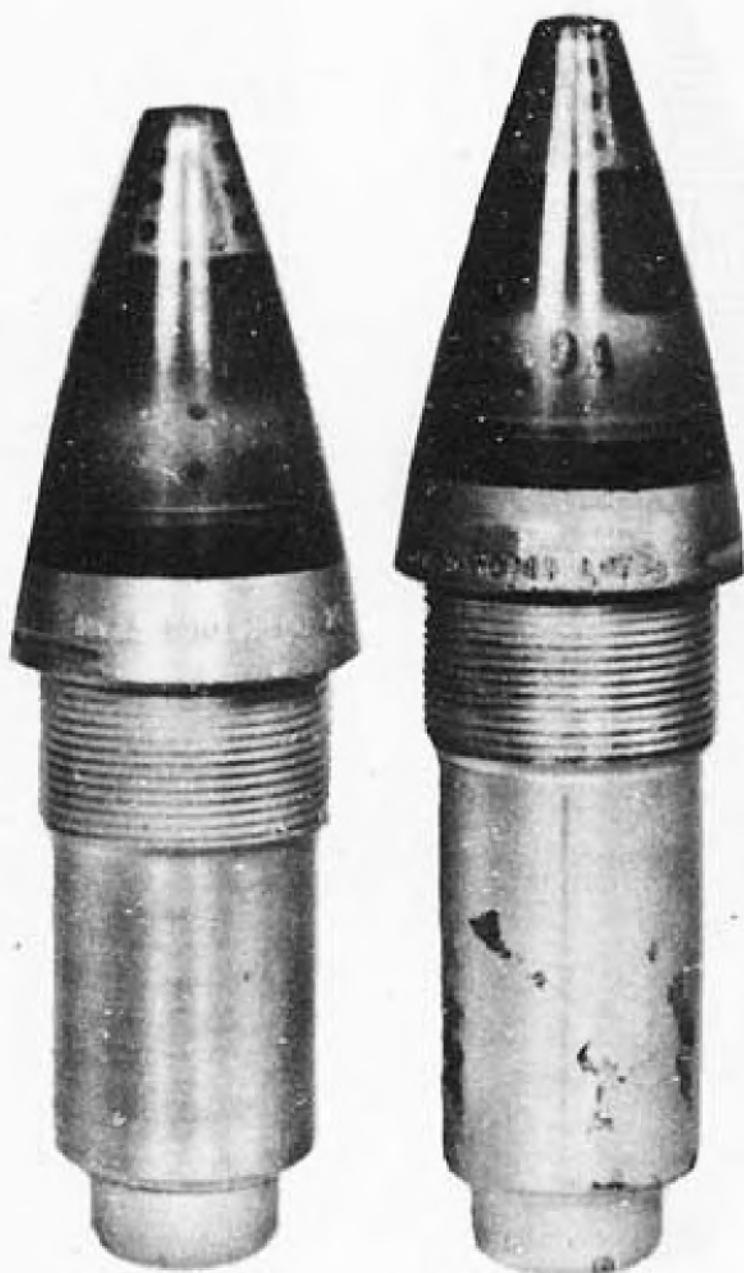
**EMPLOYMENT:**

This fuze is used for anti-aircraft work from a minimum range of 600 yards to the extreme range of the gun. The Mk 45 VT fuze is useful for low-level attack against torpedo bombers or surface craft, if it is realized that the fuze functions on approach to water as outlined above. The fuze is less sensitive at shorter ranges.

**REMARKS:**

- (a) The original Mk 45 Mod 11 fuze, with longer stem, has been declared unserviceable and recalled, to be replaced by the Mod 12.
- (b) The Mod 12 fuze is currently being replaced by the Mk 58 VT fuze.
- (c) The Mk 44 auxiliary detonating fuze is used in conjunction with these fuzes.
- (d) The operation of this fuze is described on page 303.

# MK. 45 V.T. FUZE

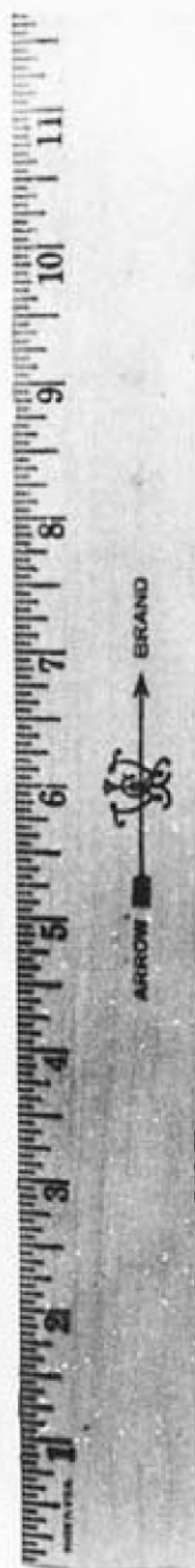


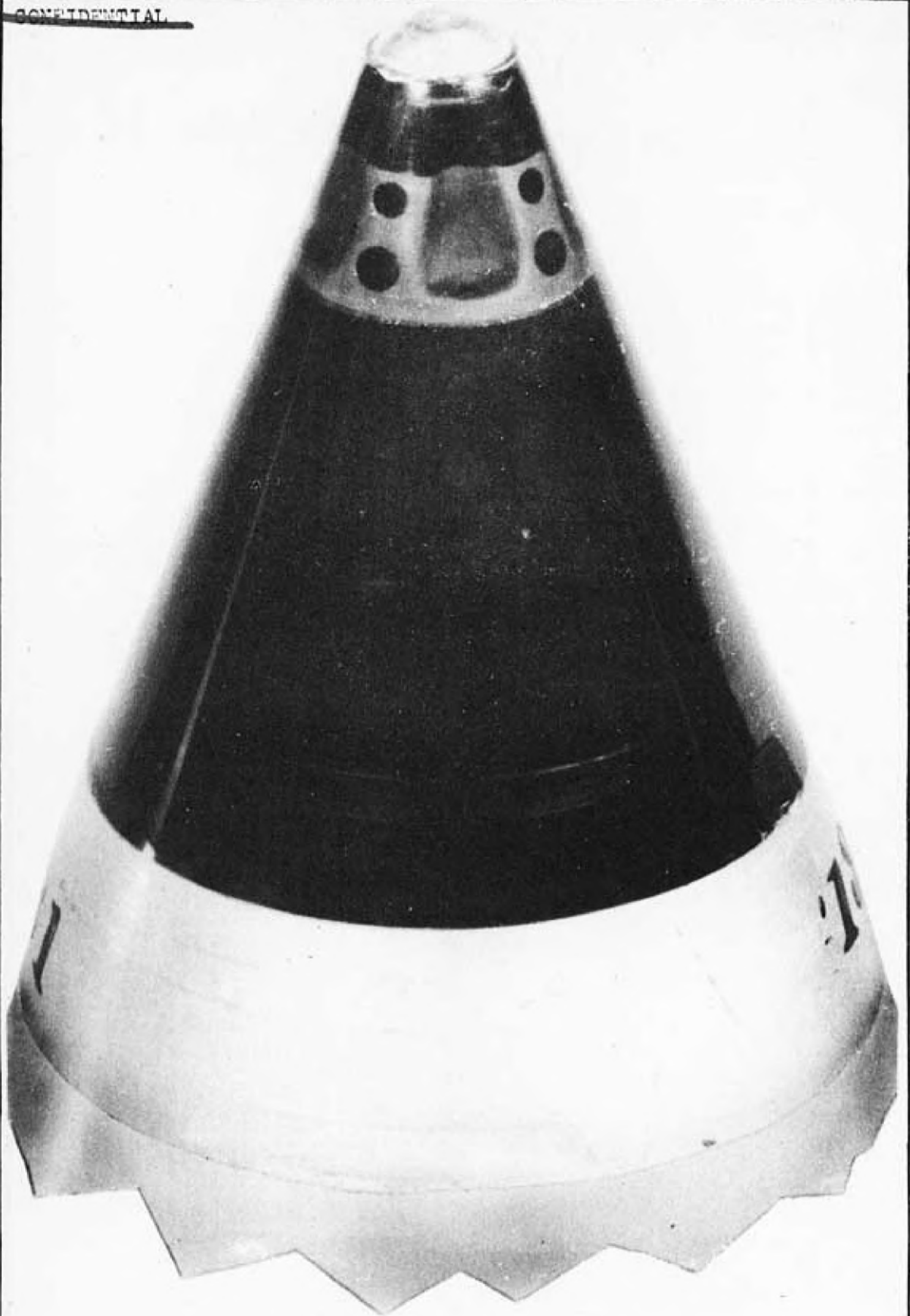
MOD. 12

MOD. II



# MK.47 V.T.FUZE





**MK. 47**  
**V.T. FUZE**

**DATA**~~CONFIDENTIAL~~**U. S. NAVY****PROJECTILES USED IN MARKINGS**6"/47 H.C.  
Mk 47 Mod  
Model \_\_\_\_\_, Lot \_\_\_\_\_**OVERALL LENGTH**  
**DIAMETER AT BASE OF OGIVE**  
**THREADED LENGTH**  
**THREADS**  
**MATERIAL OF CONSTRUCTION**8.9 in. {approx.}  
3.3 in. {approx.}  
0.5 in.  
6 R.H.  
Plastic ogive molded integral with steel base ring, and steel nose cap molded inside of forward end of plastic ogive.**MK. 47**

V.T. FUZE

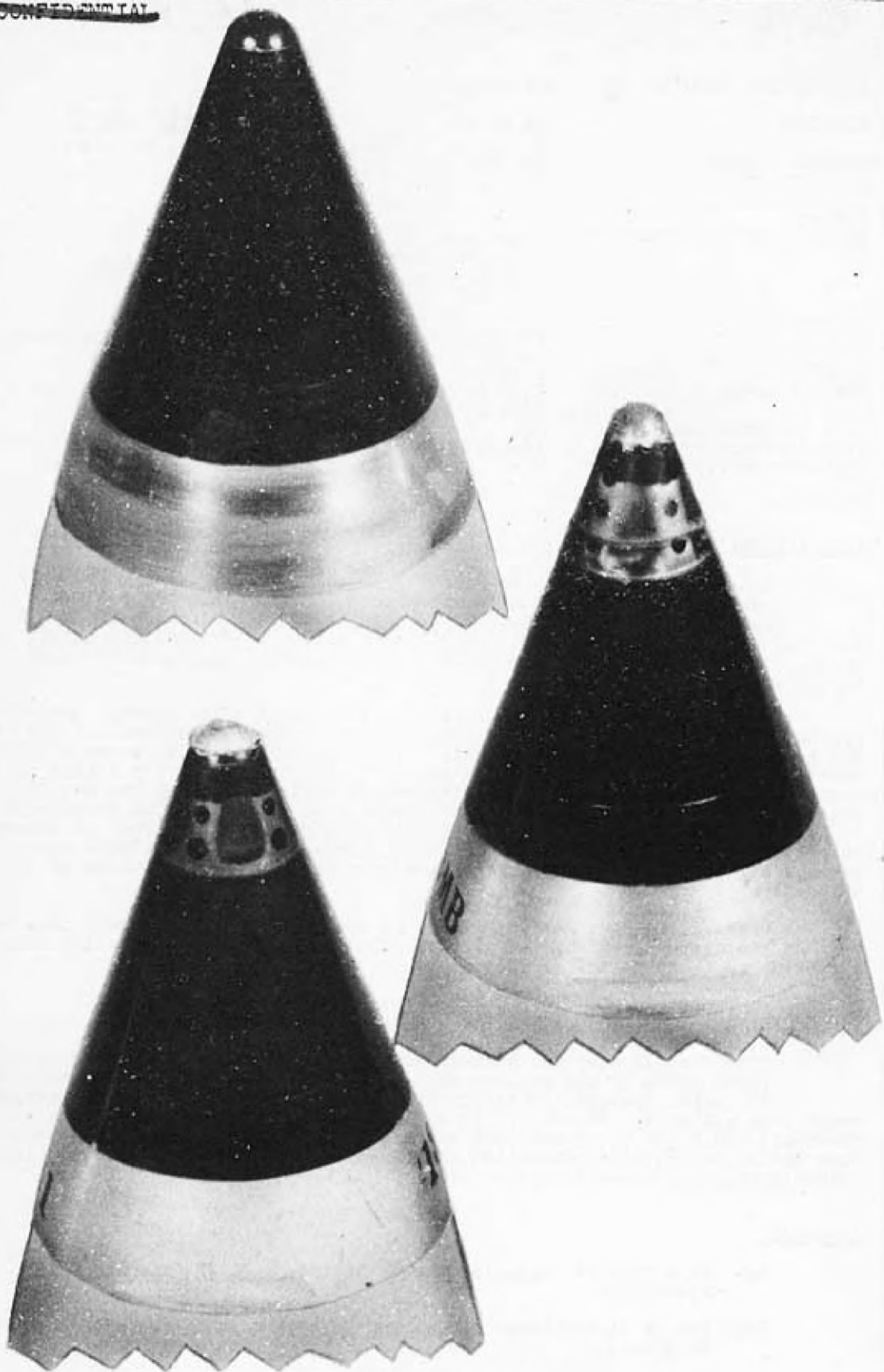
**WEIGHT**  
**MINIMUM RANGE**  
**TYPE OF ENERGIZER**  
**WAVE SUPPRESSION FEATURE**  
**SELF DESTRUCTIVE FEATURE**  
**CENTRIFUGAL HANDLING- SAFETY SWITCH**4.28 lbs.  
800 yards  
Wet  
Present  
None  
Present**DESCRIPTION:**

This fuze is still in the testing stage and has not yet been issued to the service. It is designed for the H.C. round of the 6"/47 gun, to be used against personnel and light installations on shore barrage, as well as for anti-aircraft work.

It is expected that sensitivity against aircraft will be of the same order as that of the Mk 53 fuze, and that burst heights for most effective fragmentation of this round against light shore installations will be obtained.

**REMARKS:**

- (a) The Mk 44 auxiliary detonating fuze is used in conjunction with this fuze.
- (b) The operation of this fuze is described on page 303.



**MK.53  
V.T.FUZE**

**DATA**~~CONFIDENTIAL~~**U. S. NAVY**

PROJECTILES USED IN	5"/25/38/51 A.A. Common	<b>MK.53</b>
MARKINGS	Mk 53 Mod _____ Lot _____	
OVERALL LENGTH	8.9 in. {approx.}	
DIAMETER AT BASE OF OGIVE	3.3 in. {approx.}	
THREADED LENGTH	0.5 in. {approx.}	
THREADS	6 R.H.	
MATERIAL OF CONSTRUCTION	Steel base with integral molded plastic nose. Some Mods may have steel insert molded in forward end of plastic nose.	
WEIGHT	4.28 lbs.	
MINIMUM RANGE	Mods 0-2: 700 yards Mods 3 and later: 500 yards	
TYPE OF ENERGIZER	Wet	
WAVE SUPPRESSION FEATURE	Present	
SELF-DESTRUCTIVE FEATURE	None. (Later mods may have self-destructive action after 10,000 yards).	

V.T. FUZE

DESCRIPTION:

This fuze is designed to initiate detonation of the round at the most advantageous point upon approach to a target within the maximum influence radius of about 80 ft. Sensitivity to aircraft below 200 ft. altitude will be somewhat less, depending on altitude of plane and height of waves, because of the wave suppression feature. Burst heights above water will vary between 10 and 30 ft.

Random bursts along the trajectory will occur after arming, but before reaching a target. At 12,200 yard range on test firing, approximately 10% of the rounds will function prematurely. This percentage will be decreased for shorter ranges. Upon approaching a target within the sensitivity limits of the fuze at 12,200 yards range, 80% of the rounds will function at the most advantageous point for enveloping the target with fragments. The percentage of normal functions at shorter ranges will be higher by the amount of decrease of premature bursts. The remainder of the rounds will be duds. These are average figures and results vary considerably between different lots of ammunition.

These fuzes have wet energizers of the reserve type and will hold up well in storage under proper conditions. These fuzes are in production and are being supplied to the service.

EMPLOYMENT:

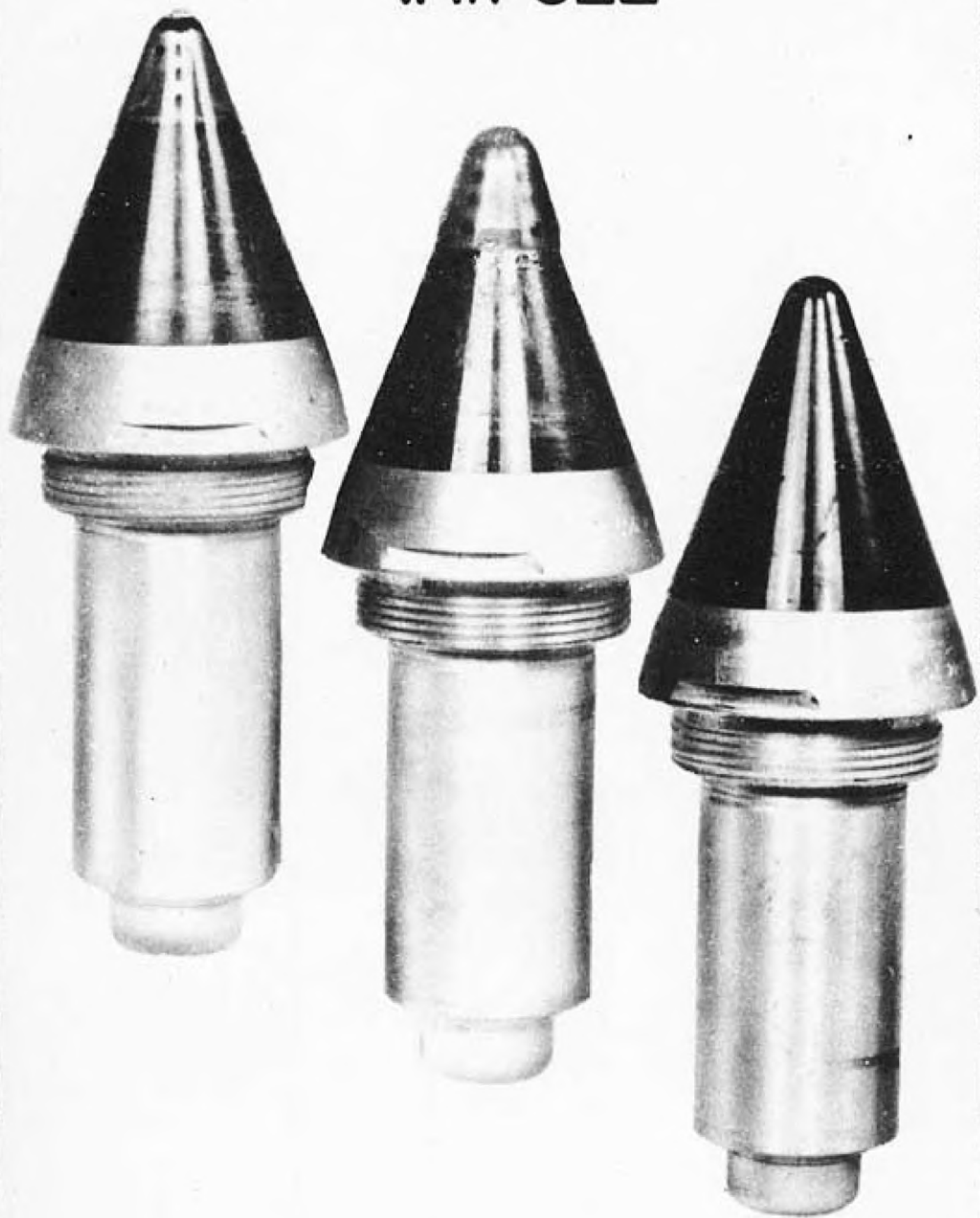
This fuze is used for anti-aircraft work from a minimum range as shown above to the maximum gun range of the gun at all elevations. It is useful against low-flying aircraft and surface craft where aerial burst fuze action is desired. It is also effective for barrage work against personnel and light equipment, land targets. Later mods may have self-destructive action to initiate detonation at around 10,000 yards to protect outlying friendly ships and troops on the beach.

REMARKS:

- (a) This fuze is replacing the Mk 32 and Mk 40 VT fuzes in all assemblies.
- (b) The Mk 44 auxiliary detonating fuze is used in conjunction with this fuze.
- (c) The operation of this fuze is described on page 303.

~~CONFIDENTIAL~~

# MK.53 V.T.FUZE



~~CONFIDENTIAL~~

# MK.58 V.T.FUZE





**MK.58**  
**V.T.FUZE**

**DATA**~~CONFIDENTIAL~~**U. S. NAVY**PROJECTILES USED IN  
MARKINGS3"/50 A.A.  
Mk 58 ModOVERALL LENGTH  
DIAMETER AT BASE OF OGIVE  
THREADED LENGTH  
THREADSModel \_\_\_\_\_ Lot \_\_\_\_\_  
8.5 in. {approx.}  
2.4 in. {approx.}  
1.0 in. {approx.}

MATERIAL OF CONSTRUCTION

Plastic ogive molded  
integral to steel  
base. Steel cap  
molded in forward  
end of plastic ogive**MK.58**

V.T. FUZE

WEIGHT  
MINIMUM RANGE  
TYPE OF ENERGIZER  
WAVE SUPPRESSION FEATURE  
SELF DESTRUCTIVE ELEMENT1.98 lbs.  
500 yards  
Wet  
Present  
None. (Later Mods may have self destructive action  
after 8000 yards.)CENTRIFUGAL HANDLING-  
SAFETY SWITCH

Present

**DESCRIPTION:**

This is an automatic aerial burst fuze of the general class designated as VT. It is designed to initiate the round at the most advantageous point for putting lethal fragments into an aircraft. The maximum influence radius varies between 40 and 100 ft for different lots and Mods. Sensitivity to aircraft flying below 200 ft. altitude will be reduced by the wave suppression feature, the amount of reduction depending on the height of the aircraft and the condition of the waves. Burst heights over water will average between 5 and 15 ft.

Random bursts of rounds will occur along the trajectory after arming but before approaching a target, so that approximately 20% of the rounds will have functioned before reaching a target at long range. At shorter ranges a proportionately smaller percentage of rounds will burst prematurely. When firing at a target at long range, after 20% of the rounds have burst prematurely, 65% will function at the most advantageous point for enveloping the target with fragments, if the approach the target within the sensitivity limits of the fuze. The remaining rounds will be duds. The percentage of proper functions will be higher by the amount of reduction in premature bursts when firing at targets at closer ranges. These are average figures obtained by test firings, and values vary considerably among lots of ammunition. These fuzes are currently in production and are being supplied to the service.

**EMPLOYMENT:**

This fuze is used for anti-aircraft work for ranges of 500 yards to the extreme range of the gun at all elevations. This fuze is useful against low-flying aircraft, surface craft, and in land barrage against personnel and light equipment and installations.

**REMARKS:**

- (a) The Mk 44 auxiliary detonating fuze is used in conjunction with this fuze.
- (b) The Mk 58 VT fuze is currently replacing the Mk 45 Mod 12 in the 3"/50 assembly.
- (c) The operation of this fuze is described on page 303.

~~CONFIDENTIAL~~



**MK. 59**  
**V.T.FUZE**

# DATA

# U. S. NAVY

PROJECTILES USED IN  
MARKINGS

~~CONFIDENTIAL~~  
5"/54 H.C.  
Mk 59 Mod \_\_\_\_\_  
Model \_\_\_\_\_ Lot \_\_\_\_\_

## MK. 59

OVERALL LENGTH  
DIAMETER AT BASE OF OGIVE  
THREADED LENGTH  
THREADS

9-13/16 in.  
2.71 in.  
0.5 in.  
6 R.H.  
Capless plastic  
ogive molded integ-  
ral to steel base.

V. T. FUZE

MATERIAL OF CONSTRUCTION  
  
WEIGHT  
MINIMUM RANGE  
TYPE OF ENERGIZER  
WAVE SUPPRESSION FEATURE  
SELF DESTRUCTIVE ELEMENT  
CENTRIFUGAL HANDLING-  
SAFETY SWITCH

4.05 lbs.  
500 yards  
Wet  
Present  
None  
  
Present

### DESCRIPTION:

This round is designed for use in the H.C. round of the new 5"/54 guns for aircraft carriers. It has not as yet been tested in the proper round and is not yet in production; so accurate data are not available regarding its sensitivity to a target. Sensitivity is expected to be comparable to that of the Mk 53 fuze, however.

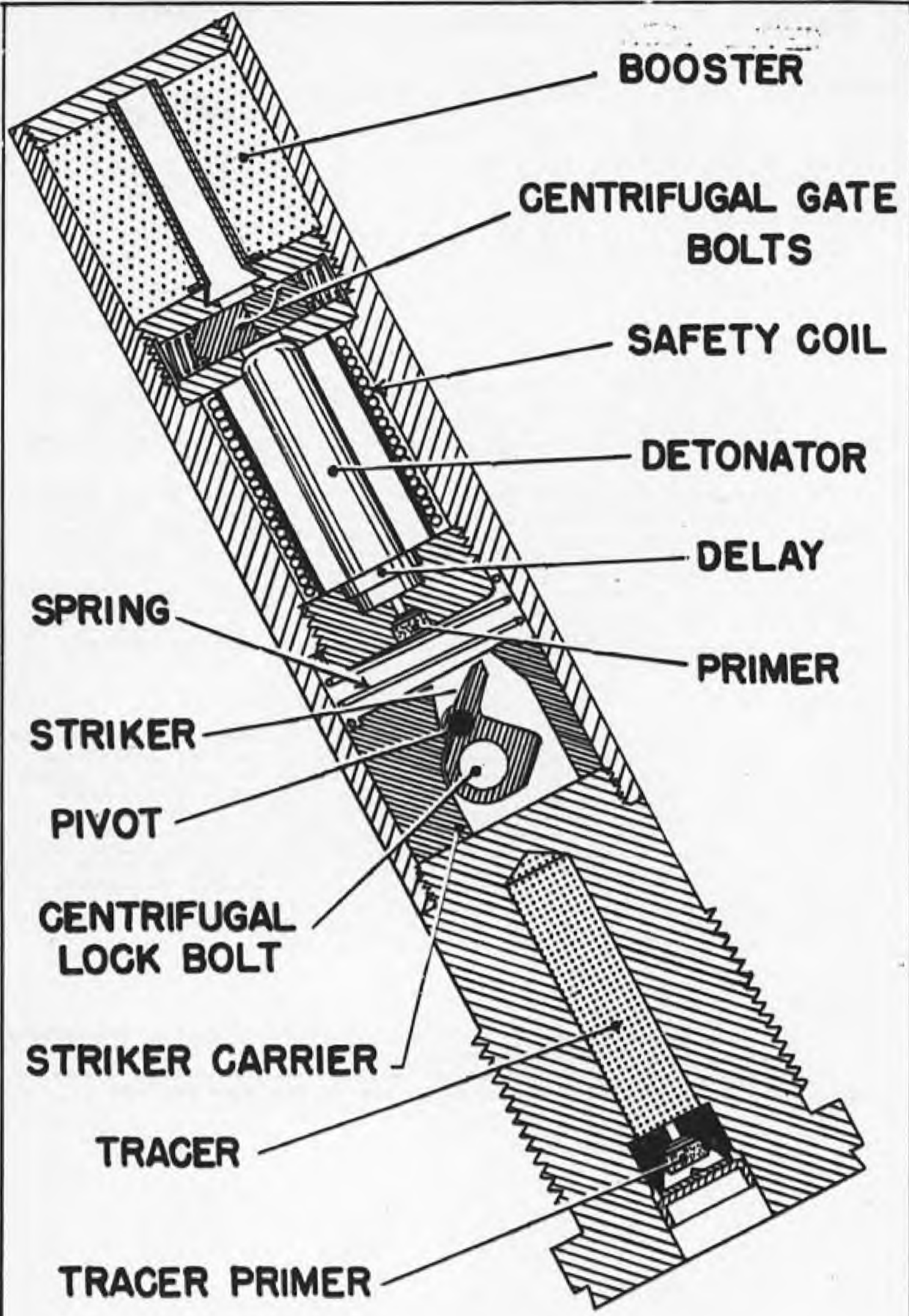
### EMPLOYMENT:

This fuze is designed for anti-aircraft work from a minimum range of 500 yards to the extreme range of the gun at all elevations. It should be useful against low-flying aircraft, surface craft, and for land barrage against personnel and light equipment and installations.

### REMARKS:

- (a) The Mk 44 Mod 0 auxiliary detonating fuze is used in conjunction with this fuze.
- (b) The operation of this fuze is described on page 303.





**BOOSTER**

**CENTRIFUGAL GATE BOLTS**

**SAFETY COIL**

**DETONATOR**

**DELAY**

**SPRING**

**PRIMER**

**STRIKER**

**PIVOT**

**CENTRIFUGAL LOCK BOLT**

**STRIKER CARRIER**

**TRACER**

**TRACER PRIMER**

**MK.2 MOD.2  
BASE DETONATING FUZE**

**DATA**

RESTRICTED

**U. S. NAVY**PROJECTILES USED IN  
MARKINGS7<sup>1</sup>/<sub>4</sub> A.P.  
Semple Tracer Detonator  
Mk II - A  
Lot No. \_\_\_\_\_OVERALL LENGTH  
DIAMETER OF BODY  
DIAMETER OF HEAD  
THREADED LENGTH  
THREADS  
MATERIAL OF CONSTRUCTIONRRA 1916  
7.25 in.  
1.38 in.  
1.80 in.  
1.25 in.  
13 L.H.  
Steel**MK.2****MOD. 2**

BASE DETONATING FUZE

DESCRIPTION:

This fuze consists of two major parts: (a) a tracer head, threaded externally to screw into the base of the projectile and containing the tracer primer and pyrotechnic components; (b) the fuze body, which houses the Semple striker and carrier unit, the primer detonator tube, the safety coil, the centrifugal bolt assembly, and the booster charge.

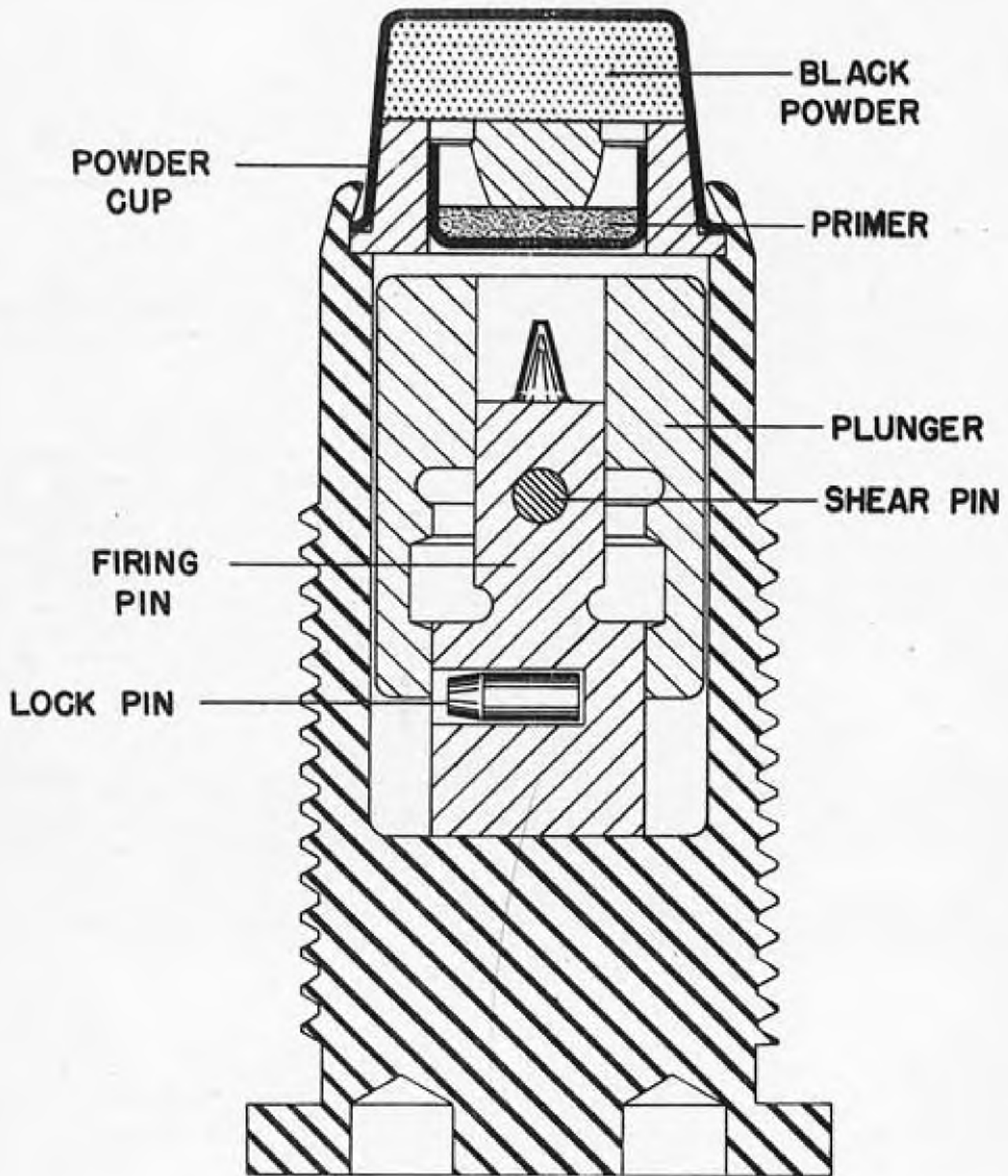
In the unarmed position the striker, which is pivoted in the striker carrier, is held in the offset position by a pair of centrifugal lock bolts. These bolts are housed in the striker carrier and engage the hole in the weighted end of the striker. Also in the unarmed position, the detonator is separated from the booster charge by a pair of centrifugal gate bolts. Additional safety is provided by encasing the detonator in a small expansion chamber surrounded by a heavy steel safety coil. Accidental explosion of the detonator will expend itself in the chamber and against the safety coil and will not penetrate past the gate bolts sufficiently to fire the booster.

OPERATION:

When the projectile is fired from the gun, the tracer primer functions and ignites the tracer element in the base of the fuze. Centrifugal force, imparted by the rotational velocity of the projectile, causes the centrifugal lock bolts and the centrifugal gate bolts to move outward against their springs. This provides free access between the detonator capsule and the booster charge and unlocks the pivoted striker. Since the striker is heavily weighted on its lower end, centrifugal force causes the striker to rotate around its pivot and align the striker point with the primer. On impact, the striker carrier moves forward against its spring, bringing the striker against the primer, which fires the delay element and the detonator. The flash from the detonator passes by the open gate bolts and initiates the booster charge, firing the projectile.

REMARKS:

1. Due to the shape of the striker, the force of initial acceleration prevents centrifugal force from producing alignment while the projectile is still in the bore of the gun. When acceleration ceases, centrifugal force revolves the pivoted striker to the armed position.



**MK. 2**  
**MOD. 9**  
**BASE IGNITION FUZE**

**DATA**

RESTRICTED

**U. S. NAVY****PROJECTILES USED IN**

3"/23 Common  
1 pdr/40 Common  
3 pdr/50 Common  
6 pdr/40/42/45/50  
Common

**OVERALL LENGTH**

1.75 in.

**DIAMETER OF HEAD**

0.875 in.

**DIAMETER OF BODY**

0.63 in.

**THREADED LENGTH**

0.80 in.

**THREADS**

16 L.H.

**MATERIAL OF CONSTRUCTION**

Body: Brass  
Plunger: Brass  
Firing Pin: Steel

**MK.2****MOD. 9**

BASE IGNITION FUZE

**DESCRIPTION:**

The fuze consists of a brass fuze body housing a firing pin and a plunger assembly. The firing pin and plunger are locked together by a copper shear pin, in the unarmed position. A primer and black powder magazine are crimped to the upper end of the fuze body.

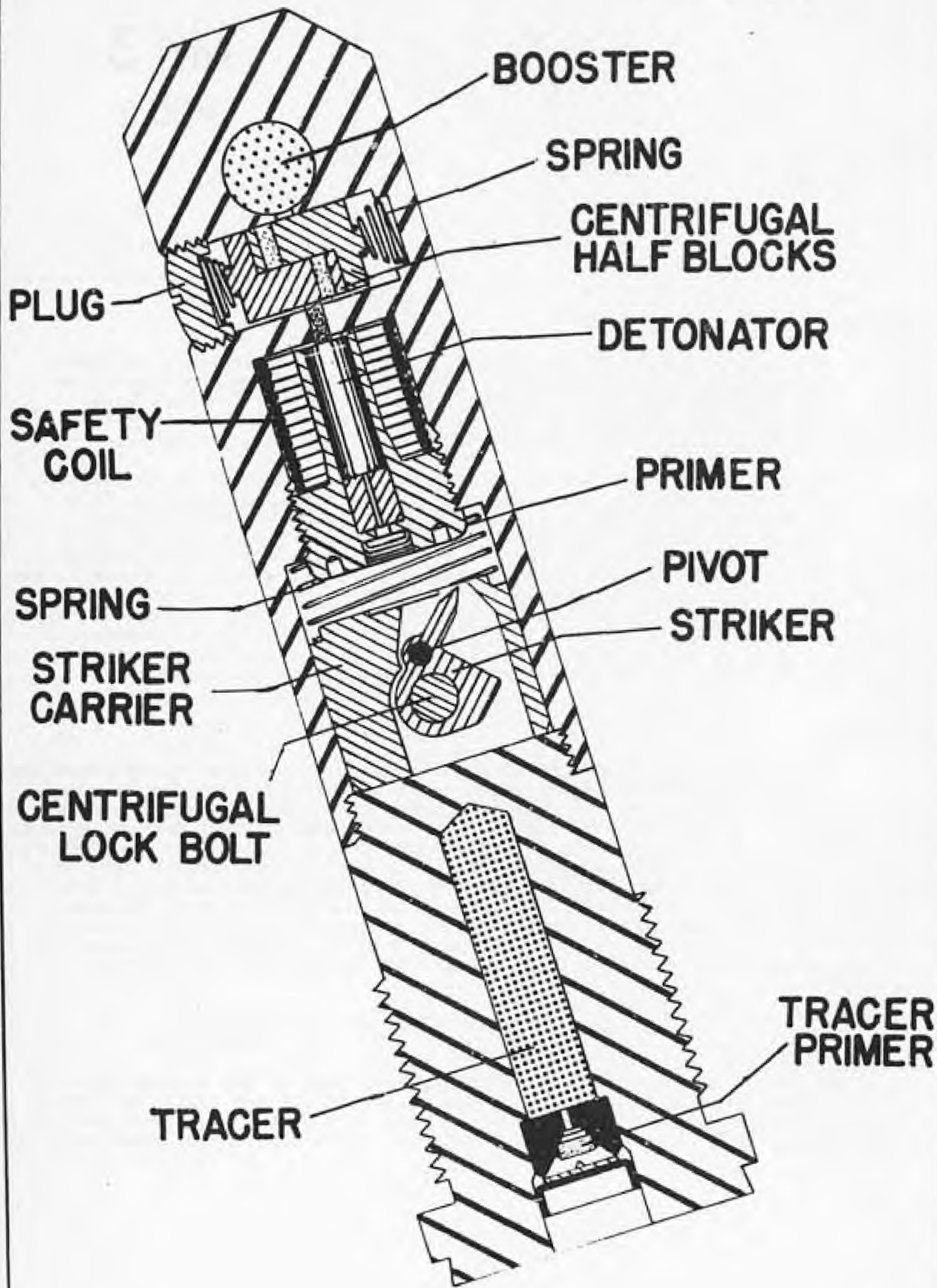
**OPERATION:**

When the projectile is fired from the gun, the force of set-back drives the plunger back towards the head of the fuze, shearing the copper pin locking the plunger to the firing pin. When the plunger has moved back sufficiently, the lock pin in the firing pin is caused by centrifugal force to move into the groove cut in the interior of the plunger body. The two units are again locked together, but the plunger is now in the lower position. On impact inertia forces both the plunger and the firing pin forward, driving the firing pin into the primer and initiating the black powder ignition charge. This fires the black powder/T.N.T. main charge in the projectile.

**REMARKS:**

1. It is of interest to note that no anti-creep spring is incorporated in the assembly of this fuze. Once set-back has ceased and the plunger and firing pin are locked together by the lock pin, there is nothing present in the fuze to prevent their movement forward towards the primer.

2. Existing stocks of this fuze will be exhausted, but no new quantities will be manufactured.



**MK. 3**  
**MOD. 2**  
**BASE DETONATING FUZE**

**DATA**

RESTRICTED

**U. S. NAVY**

PROJECTILES USED IN

6"/50/53 Common

7"/45 Bbt.

14"/45/50 Bbt.

MARKINGS

Semple

Tracer Detonator

Mk III-B

Lot

JHR 1916

OVERALL LENGTH

6.85 in.

BODY DIAMETER

1.375 in.

HEAD DIAMETER

1.80 in.

WEIGHT

2.58 lbs.

THREADED LENGTH

1.25 in.

THREADS

13 L.H.

MATERIAL OF CONSTRUCTION

Steel

**MK.3****MOD.2**

BASE DETONATING FUZE

DESCRIPTION:

This fuze consists of two major parts: (a) a Tracer Head, threaded externally to screw into the base of the projectile and containing the tracer primer and pyrotechnic components; (b) the Fuze Body, which houses the Semple firing pin and firing pin housing, the primer-detonator assembly, the centrifugal half-blocks, the safety coil, and the booster.

In the unarmed position the firing pin, which is pivoted in its housing, is held offset from the primer by a pair of centrifugal detents. These detents are housed in the firing pin housing and engage the hole in the weighted end of the firing pin. Also in the unarmed position, the detonator is separated from the booster by a pair of centrifugal half-blocks. Each half-block is TNT stemmed to form a booster lead-in, but the stemmed portions of the two half-blocks are out of alignment in the unarmed position, providing a safety interruption in the explosive train. Additional safety is provided by encasing the detonator in a small expansion chamber surrounded by a safety coil. Accidental explosion of the detonator will expend its force against the safety coil and will not fire the stemmed half-blocks or the booster.

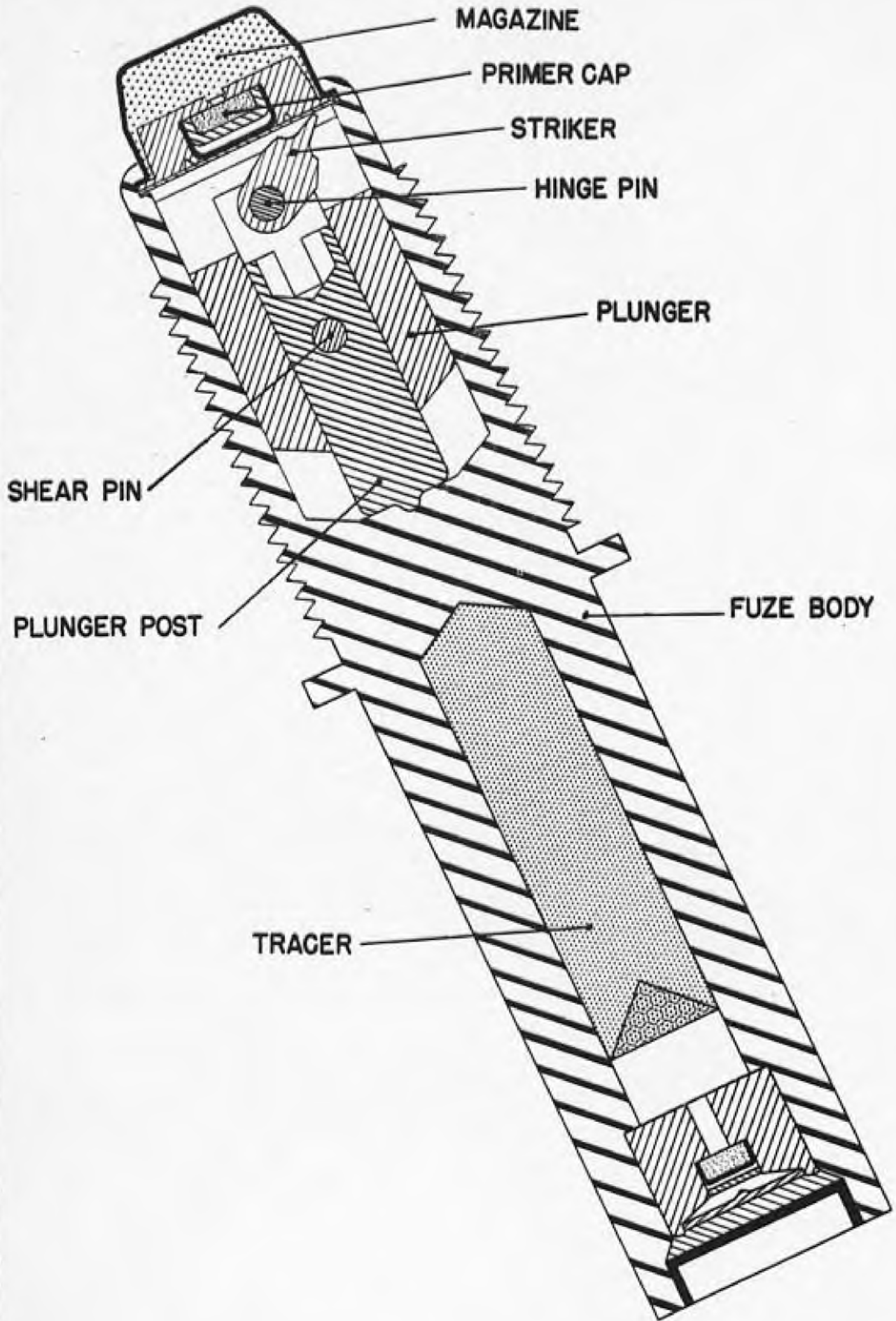
OPERATION:

When the projectile is fired from the gun, the tracer primer functions and ignites the tracer element in the base of the fuze. Centrifugal force, imparted by the rotational velocity of the projectile, causes the centrifugal detents and the centrifugal half-blocks to move outward against their springs. This aligns the booster lead-ins in the half-blocks and unlocks the pivoted firing pin. Since the firing pin is heavily weighted on its lower end, centrifugal force rotates it about its pivot and brings its point into alignment with the primer. On impact, the firing pin housing moves forward against the anti-creep spring, bringing the firing pin against the primer, which in turn fires the detonator. The flash from the detonator initiates the stemmed lead-ins in the half-blocks, the booster charge, and finally the projectile.

REMARKS:

1. Due to the shape of the striker, the force of the initial acceleration prevents centrifugal action from aligning the firing pin until after the projectile has left the bore of the gun. When acceleration ceases, centrifugal force revolves the pivoted firing pin to the armed position.

RESTRICTED



# MK. 8 MOD 4 BASE IGNITION FUZE

**DATA**

RESTRICTED

**U. S. NAVY**Projectiles Used In . . . 1, 3 & 6 Pounders  
3<sup>4</sup>/<sub>23</sub> CommonMarkings . . . . . Mod 4 -  
Sample Tracer Fuze  
Mk III  
Mod 5 -  
-7  
NMC  
Mk XII  
F.L.X.**MK. 8 MODS. 4,5****BASE IGNITION FUZE**Overall length . . . . . Mk 8 Mod 4 - 3<sup>1</sup>/<sub>61</sub>  
Mk 8 Mod 5 -  
Diameter . . . . . Head - 0<sup>1</sup>/<sub>875</sub>  
Body - 0<sup>1</sup>/<sub>625</sub>  
Weight . . . . . Mk 8 Mod 4 - 129.7 grams  
Mk 8 Mod 5 - 2.40 ozs.  
Threaded Length . . . . . 1<sup>1</sup>/<sub>0</sub>  
Threads . . . . . 18 L.H.  
Material of Construction. Body - Brass or Bronze  
Plunger Post & Plunger - Brass  
Striker - Cold Rolled SteelDESCRIPTION

The body of the fuze contains the plunger and the plunger post which is fitted to the plunger by a shear pin. The striker is attached by a hinge pin to the plunger. The primer-magazine unit is held to the body by upsetting the end inward.

OPERATION

The fuze is assembled and transported in the position shown with the plunger in the forward position and the striker rotated on the hinge pin, which fastens the striker to plunger so that it is not aligned with the primer. The force of setback cuts the shear pin allowing the plunger to ride back on the plunger post. This motion carries the striker, which straightens out as it enters the recess in the end of the plunger post and then points at the primer-cap.

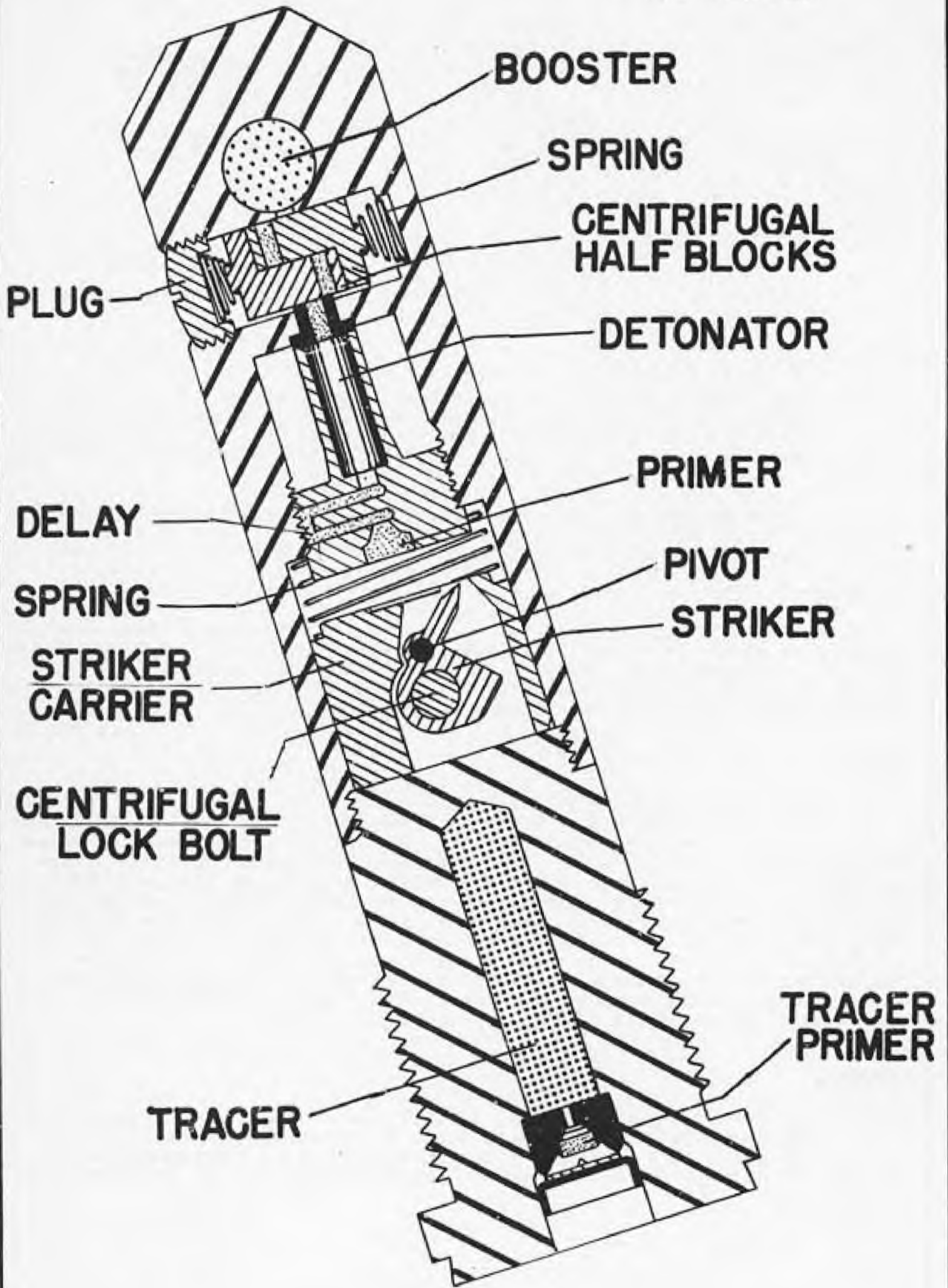
On impact the plunger and plunger post go forward together and fire the primer, which ignites the magazine.

REMARKS

While this is not a centrifugally actuated fuze, it is to be noted that the firing pin is not aligned with the primer until after setback and cannot be so aligned until the plunger has moved relative to the plunger post.

Mk 8 Mod 4 differs from Mod 5 only in that it has the longer body with the integral external tracer assembly.

Existing stocks of these fuzes will be used until exhausted, but no additional quantities will be manufactured.



**MK.9  
MOD.2  
BASE DETONATING FUZE**

**DATA**

RESTRICTED

**U. S. NAVY**PROJECTILES USED IN  
MARKINGS7"/45 A.P.  
Semple  
Tracer Detonator  
Mk IXOVERALL LENGTH  
BODY DIAMETER  
DIAMETER OF HEAD  
THREADED LENGTH  
THREADS  
MATERIAL OF CONSTRUCTIONLot  
JHR 1918  
6.62 in.  
1.38 in.  
1.80 in.  
1.25 in.  
13 L.H.  
Tracer head: steel  
Fuze body: brass**MK.9****MOD.2**

BASE DETONATING FUZE

DESCRIPTION:

This fuze consists of two major parts: (a) a tracer head, threaded externally to screw into the base of the projectile and containing the tracer primer and pyrotechnic components; (b) the fuze body, which houses the Semple striker and carrier unit, the primer-delay-detonator assembly, the centrifugal half blocks, and the booster.

In the unarmed position the striker, which is pivoted in the striker carrier, is held offset from the primer by a pair of centrifugal lock bolts. These bolts are housed in the striker carrier and engage the hole in the weighted end of the striker. Also in the unarmed position, the detonator is separated from the booster by a pair of centrifugal half-blocks. Each half-block is TNT stemmed to form a booster lead-in, but the two stemmed portions of the half-blocks are out of alignment in the unarmed position, providing a safety interruption in the explosive train. Additional safety is provided by encasing the detonator in a small expansion chamber. Accidental explosion of the detonator will expend itself in the expansion chamber and will not fire the stemmed half-blocks or the booster.

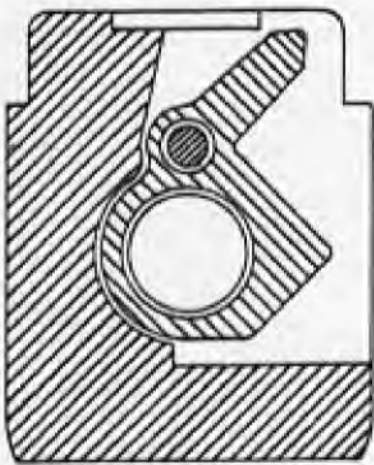
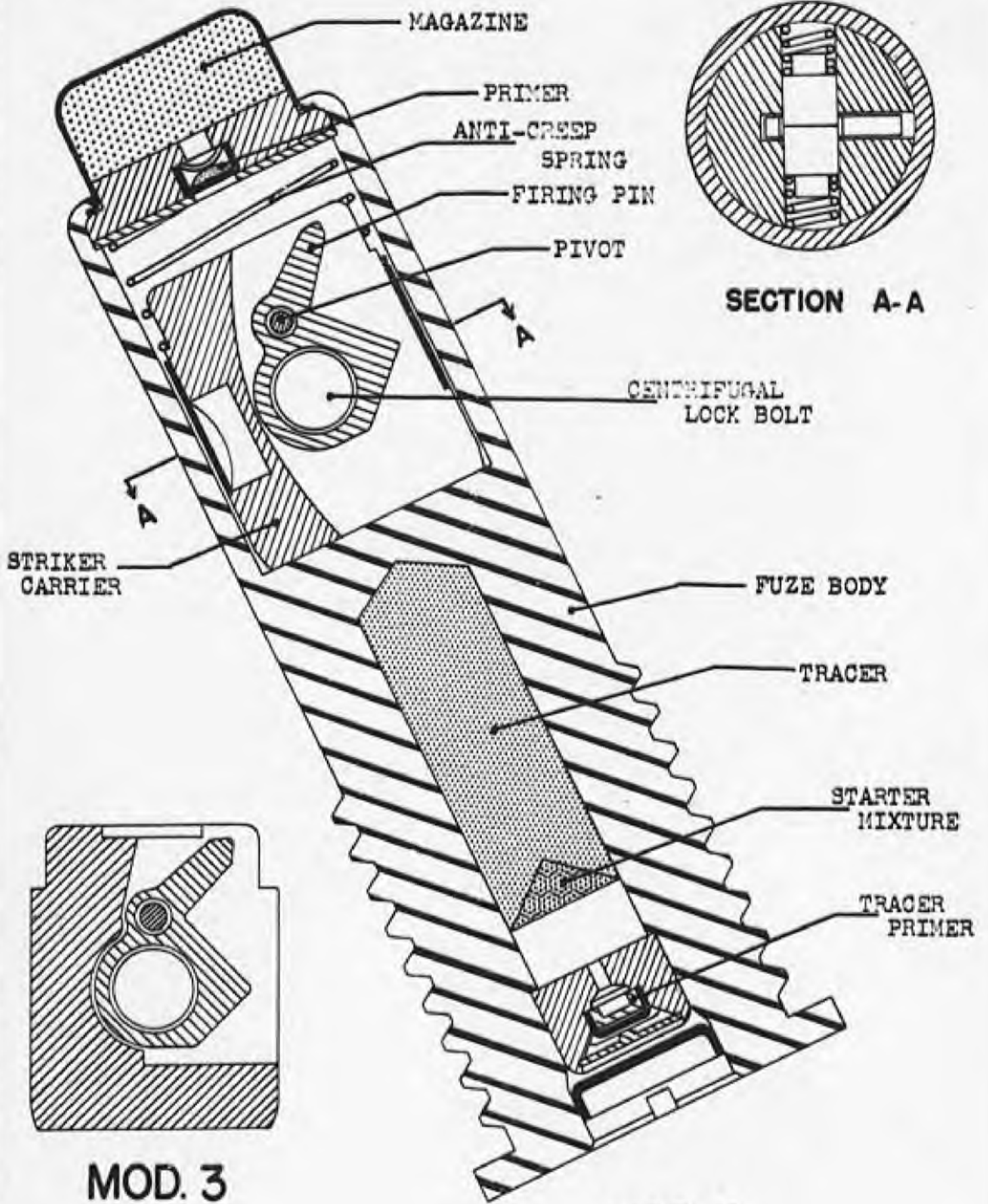
OPERATION:

When the projectile is fired from the gun, the tracer primer functions and ignites the tracer element in the base of the fuze. Centrifugal force, imparted by the rotational velocity of the projectile, causes the centrifugal lock bolts and the centrifugal half-blocks to move outward against their springs. This aligns the booster lead-ins in the half blocks and unlocks the pivoted striker. Since the striker is heavily weighted on its lower end, centrifugal force rotates the striker about its pivot and brings the striker point into alignment with the primer. On impact, the striker carrier moves forward against its spring, bringing the striker against the primer, which fires the delay element and the detonator. The flash from the detonator initiates the stemmed lead-ins in the half-blocks, the booster charge, and finally the projectile.

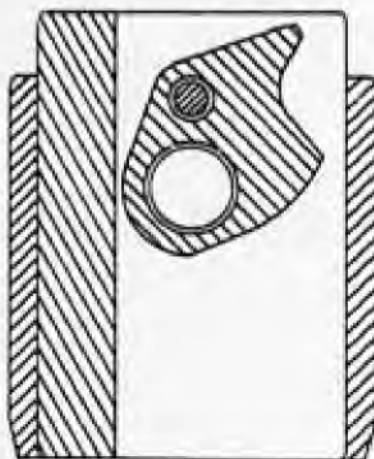
REMARKS:

1. Due to the shape of the striker, the force of the initial acceleration prevents centrifugal force from aligning the striker while the projectile is still in the bore of the gun. When acceleration ceases, centrifugal force revolves the pivoted striker to the armed position.

RESTRICTED



MOD. 3



MOD 9

MOD. 4

MK.10

BASE IGNITION FUZE

# DATA

RESTRICTED

U. S. NAVY

PROJECTILES USED IN

4"/50 Common  
5"/50/51 Common  
Semple Tracer Fuze  
Mk IVA

MARKINGS

Lot No. \_\_\_\_\_  
PRA 1917

OVERALL LENGTH  
DIAMETERS

4.12 in.  
Body: 1.05 in.  
Head: 1.40 in.

THREADED LENGTH  
THREADS

1.40 in.  
9 L.H.

WEIGHT

398 grams

MATERIAL OF  
CONSTRUCTION

Stock: Cold Rolled  
Steel  
Striker Carrier: Brass  
Firing Pin: Sheet Brass

# MK.10

BASE IGNITION FUZE

## DESCRIPTION:

This fuze consists of a single body unit containing a striker carrier, an anti-creep spring, and a primer-magazine head. An integral tracer is located in the after end of the fuze body. In the unarmed position, as illustrated, the firing pin is held offset from the primer by a pair of centrifugal lock bolts. The firing pin is pivoted in the movable striker carrier, which is held away from the primer by an anti-creep spring.

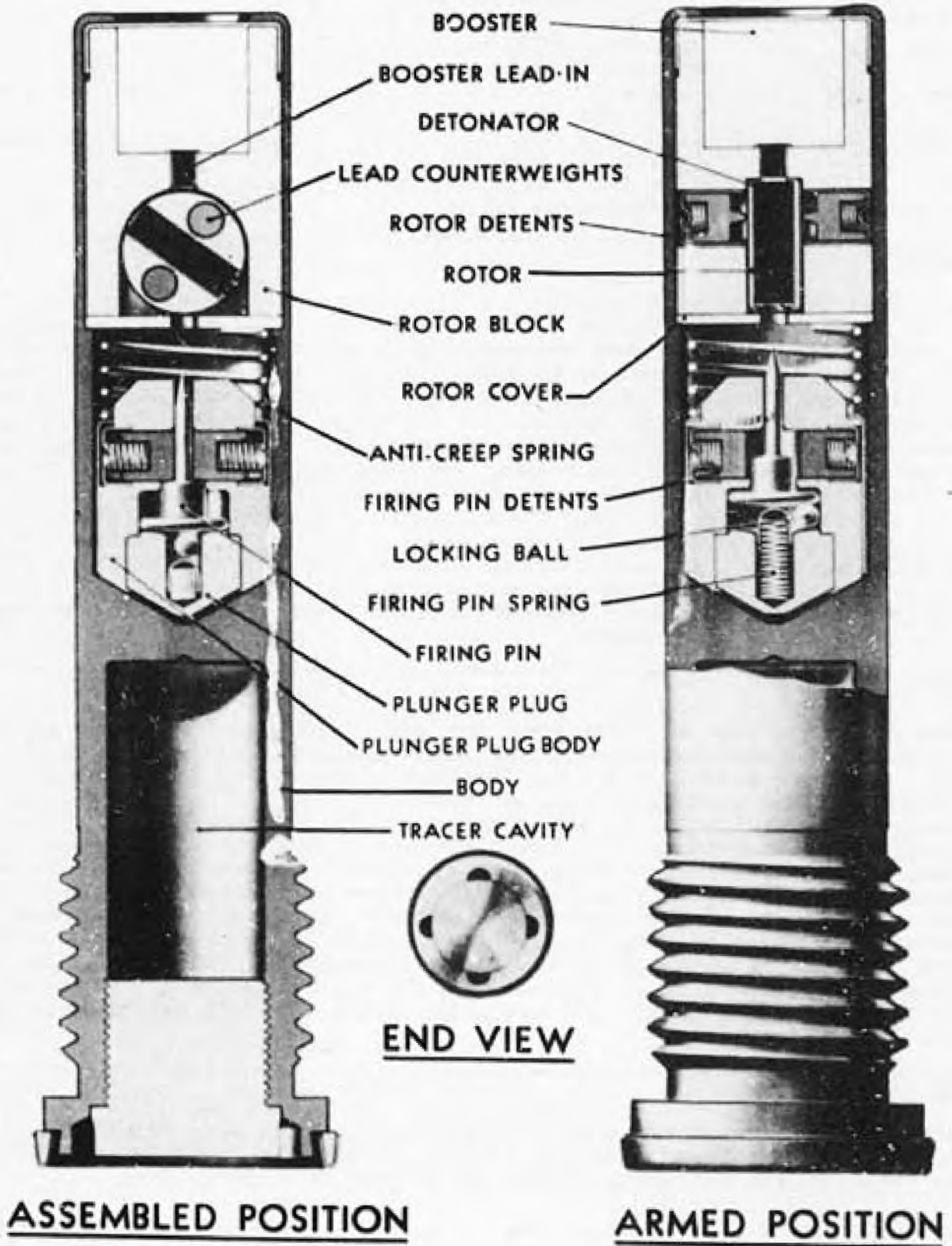
## OPERATION:

When the projectile is fired from the gun, the gases from the propelling charge force a small firing pin into the tracer primer, igniting the tracer starter mixture, which in turn initiates the tracer pyrotechnic. Centrifugal force causes the two lock bolts to move outward against their springs, unlocking the pivoted firing pin. The firing pin then rotates into the armed position, where it is aligned with the fuze primer. On impact the striker carrier moves forward against the anti-creep spring, bringing the firing pin against the primer and initiating the black powder in the fuze magazine.

## REMARKS:

- (a) Due to the peculiar shape of the firing pin, the effect of acceleration in the gun causes it to lag. This force is greater than centrifugal force; so during the acceleration stage the striker cannot align itself with the primer. When acceleration ceases, centrifugal force takes charge and rotates the firing pin into alignment.
- (b) Mods 3, 4, & 9 are at present in service use, although all are classified as obsolete. No new stocks will be manufactured, but stocks now available will be used until exhausted. The various Mods differ only in the construction and shape of the striker carrier, as illustrated.

RESTRICTED

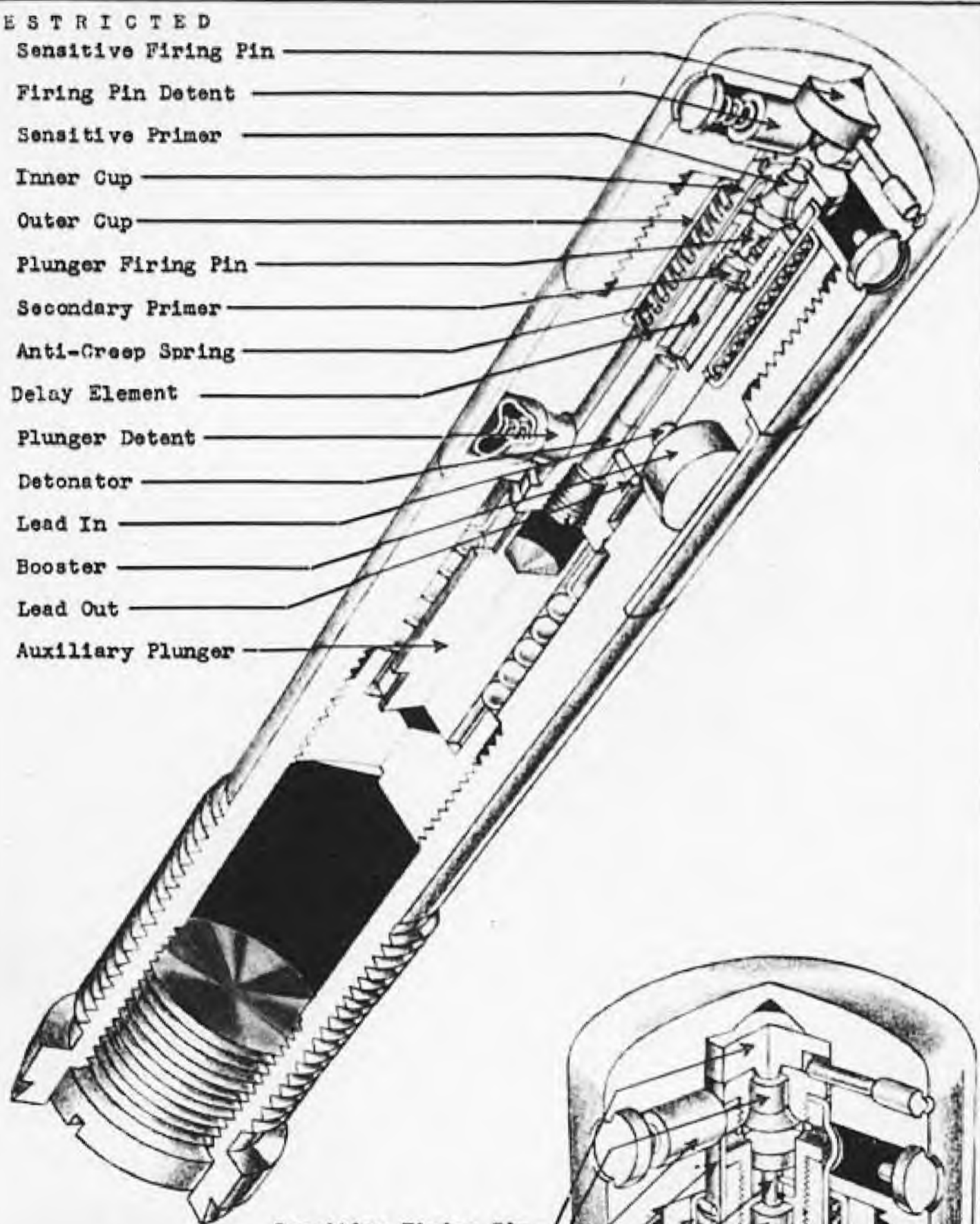


**MARK 13  
BASE DETONATING FUZE**

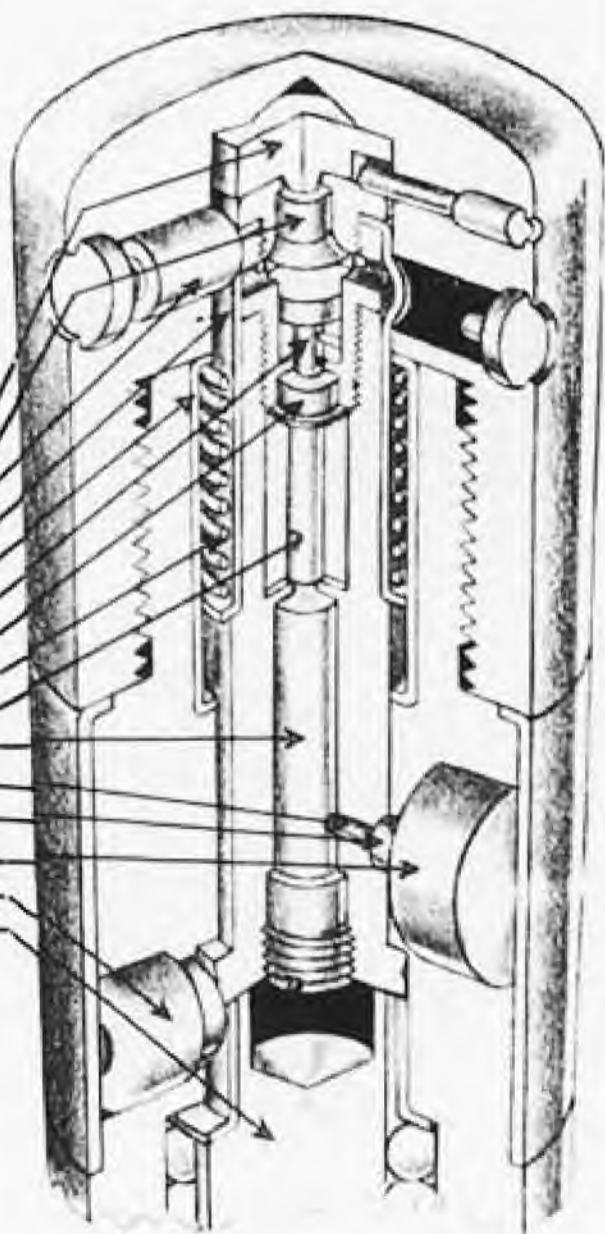


RESTRICTED

- Sensitive Firing Pin
- Firing Pin Detent
- Sensitive Primer
- Inner Cup
- Outer Cup
- Plunger Firing Pin
- Secondary Primer
- Anti-Creep Spring
- Delay Element
- Plunger Detent
- Detonator
- Lead In
- Booster
- Lead Out
- Auxiliary Plunger



- Sensitive Firing Pin
- Sensitive Primer
- Firing Pin Detent
- Inner Cup
- Outer Cup
- Plunger Firing Pin
- Secondary Primer
- Anti-Creep Spring
- Delay Element
- Detonator
- Lead Out
- Lead In
- Booster
- Plunger Detent
- Auxiliary Plunger



**MK:19**  
**BASE DETONATING FUZE**

**DATA**

RESTRICTED

**U. S. NAVY****MK.19**

Projectiles Used in . . . 6"/47/53 Common  
 6"/53 Sp. Common  
 Markings . . . . . TDF Mk. 19  
 Lot  
 B 742  
 Overall length . . . . . 6768  
 Diameters . . . . . Body - 1737  
 Head - 1780  
 Threaded Length . . . . . 1756  
 Threads . . . . . 18 L.H.  
 Material of Construction. Chrome Moly Steel  
 Body with duralumin  
 nose cap.  
 Delay . . . . . .01 sec.

BASE DETONATING FUZE

**DESCRIPTION**

The fuze is composed of two major parts: the fuze body and the nose cap. The body contains the auxiliary detonator plunger, the detonator plunger, the detonator plunger detents, the anti-creep spring assembly and the firing train. The auxiliary detonator is surrounded by twenty ball bearings and bears against the bottom of the detonator plunger. Fitted over the top of the detonator plunger is the anti-creep spring assembly consisting of an inner and an outer cup separated by an anti-creep spring. The outer cup will not move and the inner cup is crimped over the top of the detonator plunger and held in position by the sensitive primer holder. The firing train consists of the sensitive primer, secondary firing pin, secondary primer, delay element, detonator, and booster lead-ins and lead-outs which are out of line in the unarmed position.

The nose cap, which is secured to the end of the body by a threaded joint houses the sensitive firing pin and firing pin detents. The sensitive firing pin is held in place by two stakes, but is referred to as a "floating" firing pin since it can move downward slightly. Ninety degrees removed from the two detents are two holes in the nose cap. A locking pin is provided to lock the nose cap in position.

**OPERATION**

The force of setback causes the sensitive firing pin to move down on the firing pin detents thus creating friction and holding them in. When the projectile leaves the bore of the gun creep causes the firing pin to move forward again thus releasing the firing pin detents. Centrifugal force will move both sets of detents outward against their springs and the fuze is then completely armed. The detonator plunger is prevented from moving forward on creep because of the anti-creep spring, but on impact the auxiliary plunger acting as an inertia weight pushes the detonator plunger forward. This action moves the inner cup forward thus compressing the anti-creep spring, and brings the booster lead-ins and lead-outs in line. The sensitive primer in the top of the detonator plunger is carried on to the sensitive firing pin and the explosion of the sensitive primer accomplishes two things:

1. The gases resulting from the explosion pass through the port holes on the side of the primer container and build up a high pressure expanding that part of the cup which is adjacent to the holes in the nose cap. This action locks the detonator plunger in the fired position and keeps the firing train lined up.
2. The shear wire that has been holding up the secondary firing pin is broken and the secondary firing pin is driven down into the secondary primer thus setting off the delay element of .01 seconds and the detonator and booster elements.

**REMARKS**

This fuze will function on thin or 4" plate and on water.

The Mk 19 Mod 1 is fully moisture-proofed, as described for the Mk 28 base detonating fuze. This is its only difference from the Mod 0.

RESTRICTED

Sensitive Firing Pin

Firing Pin Detent

Sensitive Primer

Inner Cup

Outer Cup

Plunger Firing Pin

Secondary Primer

Anti-Creep Spring

Delay Element

Plunger Detent

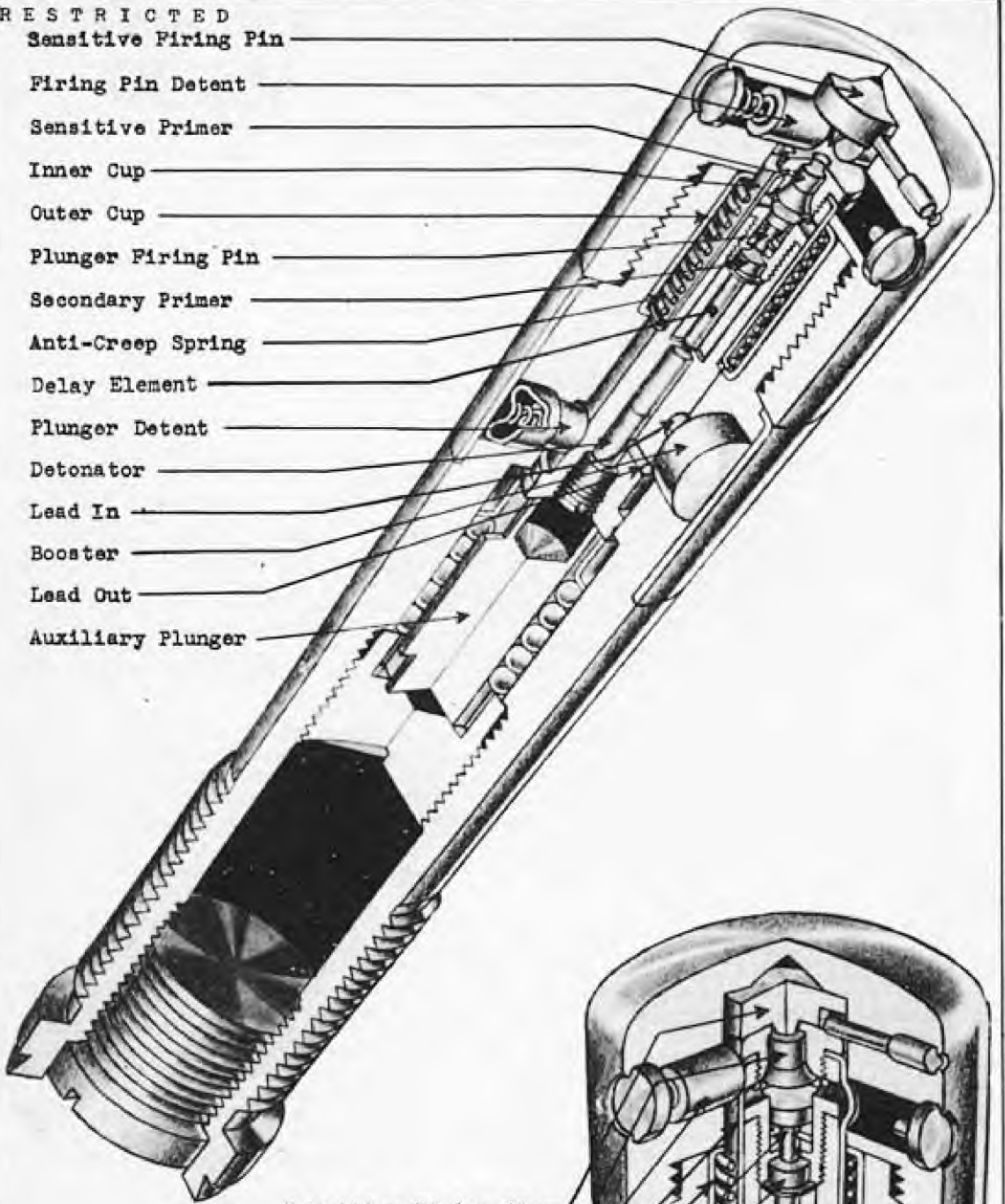
Detonator

Lead In

Booster

Lead Out

Auxiliary Plunger



Sensitive Firing Pin

Sensitive Primer

Firing Pin Detent

Inner Cup

Outer Cup

Plunger Firing Pin

Secondary Primer

Anti-Creep Spring

Delay Element

Detonator

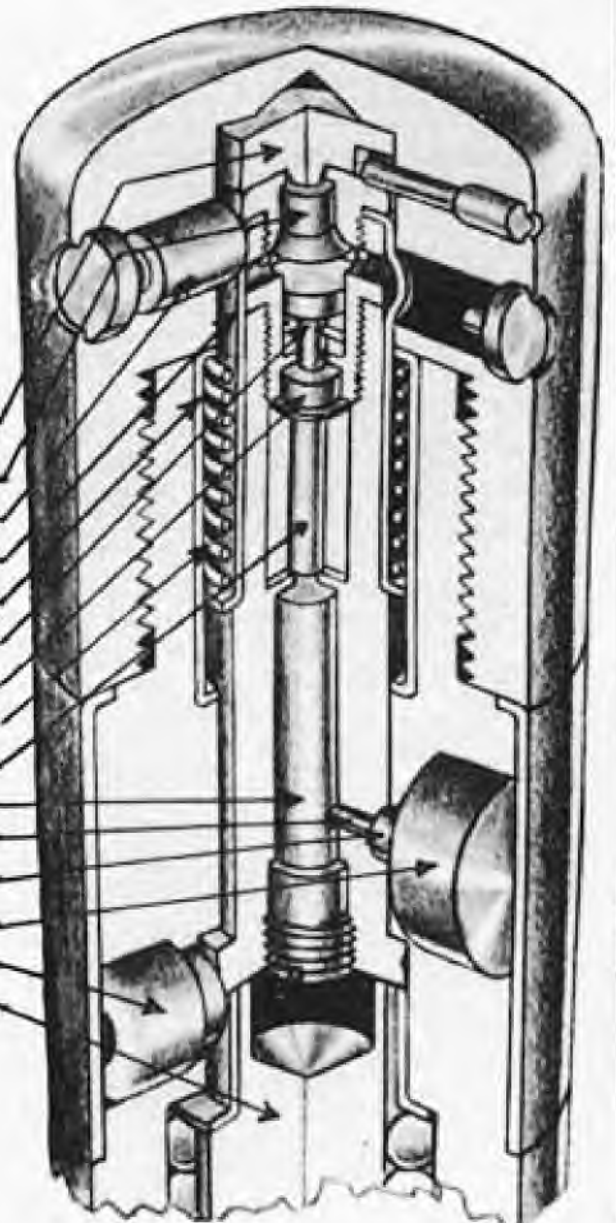
Lead Out

Lead In

Booster

Plunger Detent

Auxiliary Plunger



**MK.20**

**BASE DETONATING FUZE**

**DATA**

RESTRICTED

**U. S. NAVY  
MK.20**

Projectiles Used In . . . 4<sup>#</sup>/50 Sp. Common  
 5<sup>#</sup>/38 Sp. Common  
 5<sup>#</sup>/38 Common

Markings . . . . . TDF Mk 20  
 Lot  
 B 742

Overall Length . . . . . 6<sup>7</sup>/<sub>16</sub>8  
 Diameters . . . . . Body - 1<sup>7</sup>/<sub>16</sub>37  
 Head - 1<sup>7</sup>/<sub>16</sub>80

Threaded Length . . . . . 0<sup>7</sup>/<sub>16</sub>96  
 Threads . . . . . 11 L.H.

Material of Construction. Manganese Steel Body  
 with Duralumin Nose  
 Cap.

Delay . . . . . 0.01 seconds

BASE DETONATING FUZE

**DESCRIPTION**

The fuze is composed of two major parts: the fuze body and the nose cap. The body contains the auxiliary detonator plunger, the detonator plunger, the detonator plunger detents, the anti-creep spring assembly and the firing train. The auxiliary detonator is surrounded by twenty ball bearings and bears against the bottom of the detonator plunger. Fitted over the top of the detonator plunger is the anti-creep spring assembly consisting of an inner and an outer cup separated by an anti-creep spring. The outer cup will not move and the inner cup is crimped over the top of the detonator plunger and held in position by the sensitive primer holder. The firing train consists of the sensitive primer, secondary firing pin, secondary primer, detonator and booster lead-ins and lead-outs which are out of line in the unarmed position.

The nose cap, which is secured to the end of the body by a threaded joint houses the sensitive firing pin and firing pin detents. The sensitive firing pin is held in place by two stakes, but is referred to as a "floating" firing pin since it can move downward slightly. Ninety degrees removed from the two detents are two holes in the nose cap. A locking pin is provided to lock the nose cap in position.

**OPERATION**

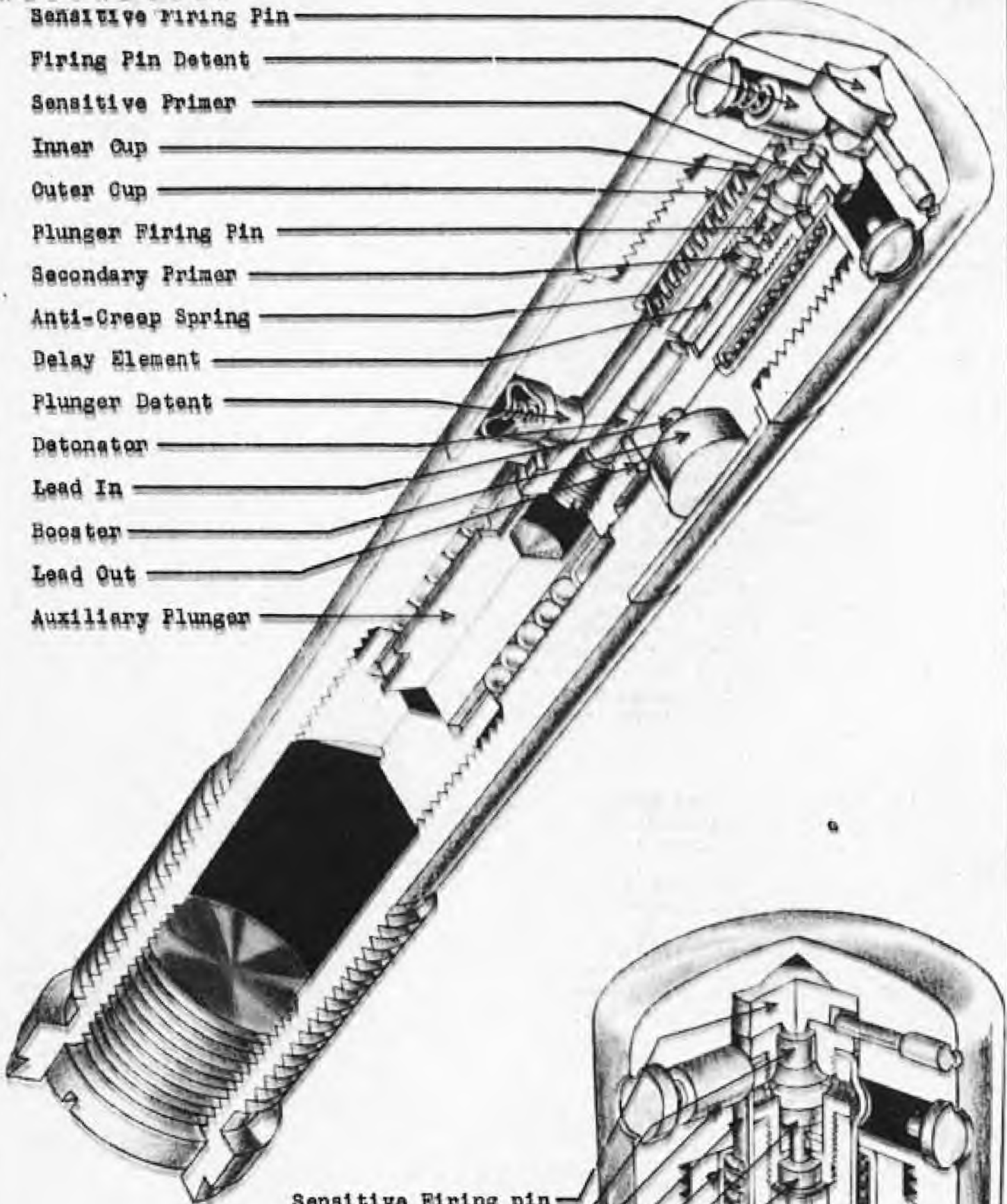
The force of setback causes the sensitive firing pin to move down on the firing pin detents thus creating friction and holding them in. When the projectile leaves the bore of the gun creep causes the firing pin to move forward again thus releasing the firing pin detents. Centrifugal force will move both sets of detents outward against their springs and the fuze is then completely armed. The detonator plunger is prevented from moving forward on creep because of the anti-creep spring, but on impact the auxiliary plunger acting as an inertia weight pushes the detonator plunger forward. This action moves the inner cup forward thus compressing the anti-creep spring and brings the booster lead-ins and lead-outs in line. The sensitive primer in the top of the detonator plunger is carried on to the sensitive firing pin and the explosion of the sensitive primer accomplishes two things:

1. The gases resulting from the explosion pass through the port holes on the side of the primer container and build up a high pressure expanding that part of the cup which is adjacent to the holes in the nose cap. This action locks the detonator plunger in the fired position and keeps the firing train lined up.
2. The shear wire that has been holding up the secondary firing pin is broken and the secondary firing pin is driven down into the secondary primer and the flash sets off the detonator and booster elements.

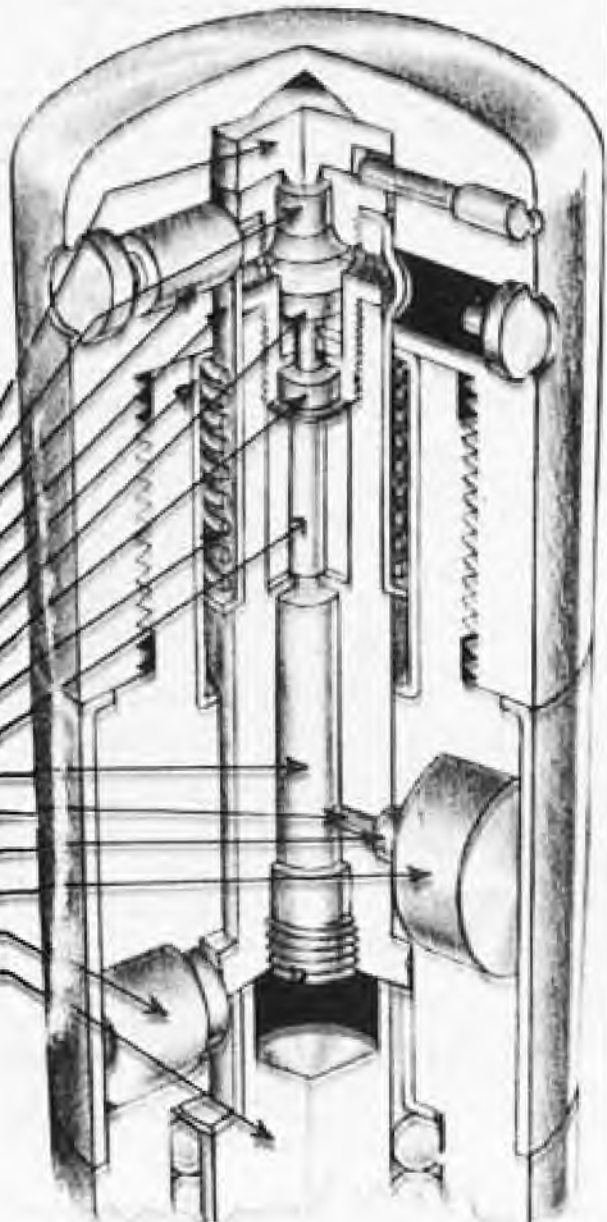
**REMARKS**

Modes 1 and 2 of this fuze (representing different manufacturers) differ from the Mod 1 only in being fully moisture-proofed, as described for the Mk 28 base detonating fuze.

RESTRICTED



- Sensitive Firing Pin
- Firing Pin Detent
- Sensitive Primer
- Inner Cup
- Outer Cup
- Plunger Firing Pin
- Secondary Primer
- Anti-Creep Spring
- Delay Element
- Plunger Detent
- Detonator
- Lead In
- Booster
- Lead Out
- Auxiliary Plunger



- Sensitive Firing pin
- Sensitive Primer
- Firing Pin Detent
- Inner Cup
- Outer Cup
- Plunger Firing Pin
- Secondary Primer
- Anti-Creep Spring
- Delay Element
- Detonator
- Lead Out
- Lead In
- Booster
- Plunger Detent
- Auxiliary Plunger

**MK.21**  
**BASE DETONATING FUZE**

# DATA

RESTRICTED

U. S. NAVY

## PROJECTILES USED IN

6"/47 A.P., 8"/55 Com.  
7"/45 A.P., 8"/55 Sp.  
8"/55 A.P. Common  
12"/50 A.P.  
14"/45/50 A.P.  
16"/45/50 A.P.  
T.D.F. Mk 21

# MK.21

## MARKINGS

OVERALL LENGTH Lot \_\_\_\_\_  
6.68 in.  
DIAMETER OF BODY 1.37 in.  
DIAMETER OF HEAD 1.80 in.  
THREADED LENGTH 0.96 in.  
THREADS 11 L.H.  
MATERIAL OF CONSTRUCTION Body: Manganese Steel  
Nose Cap: Duralumin  
DELAY 0.035 secs.

BASE DETONATING FUZE

## DESCRIPTION:

The fuze is composed of two major parts, the fuze body and the nose cap. The body contains the auxiliary detonator plunger, the detonator plunger, the detonator plunger detents, the anti-creep spring assembly and the firing train. The auxiliary detonator is surrounded by twenty ball bearings and bears against the bottom of the detonator plunger. Fitted over the top of the detonator plunger is the anti-creep spring assembly, consisting of an inner and an outer cup separated by an anti-creep spring. The outer cup will not move, and the inner cup is crimped over the top of the detonator plunger and held in position by the sensitive primer holder. The firing train consists of the sensitive primer, the secondary firing pin, the secondary primer, the delay element, the detonator, and the booster lead-ins and the detonator lead-outs, which are out of alignment in the unarmed position.

The nose cap, which is secured to the end of the body by a threaded joint, houses the sensitive firing pin and the firing pin detents. The sensitive firing pin is held in place by two stakes, but is referred to as a floating firing pin, since it can move downward slightly. Ninety degrees removed from the two detents are two holes in the nose cap. A locking pin is provided to lock the nose cap in position.

## OPERATION:

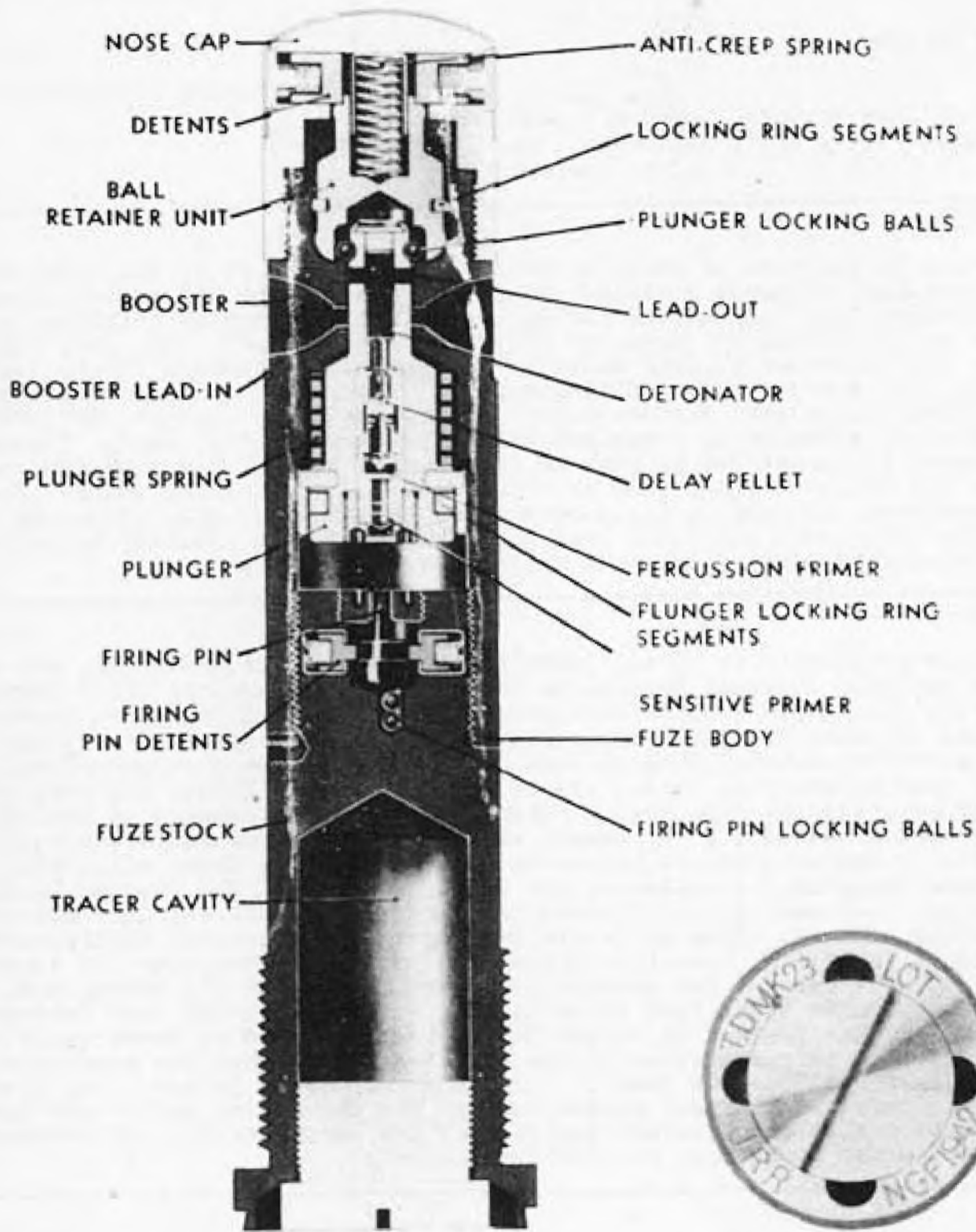
The force of set-back causes the sensitive firing pin to move down on the firing pin detents, creating friction and holding them in. When the projectile leaves the gun, creep causes the firing pin to move forward again, releasing the firing pin detents. Centrifugal force will then move both sets of detents outward against their springs, and the fuze is then completely armed. The detonator plunger is prevented from moving forward on creep because of the anti-creep spring, but on impact the auxiliary plunger acts as an inertia weight and pushes the detonator plunger forward. This action moves the inner cup forward, compressing the anti-creep spring, and brings the booster lead-ins and the lead-outs in line. The sensitive primer in the top of the detonator plunger is carried against the sensitive firing pin, and the explosion of the sensitive primer accomplishes two things:

1. The gases resulting from the explosion pass through the port holes on the side of the primer container and build up a high pressure expanding that part of the cup which is adjacent to the holes in the nose cap. This action locks the detonator plunger in the fired position and keeps the firing train aligned.
2. The shear wire retaining the secondary firing pin is broken, and the secondary firing pin is driven into the secondary primer, initiating the delay element of .035 seconds, the detonator, and the booster elements.

This fuze is designed with an additional plunger locking unit. The plunger body is drilled in four places, and four balls are placed in the holes. On forward motion of the plunger and under centrifugal action, the locking balls fly out of their recesses into the forward or larger diameter portion of the body, locking the plunger in the forward position. This locking feature is provided to insure alignment of booster lead-ins and detonator lead-outs during the long delay period, when the projectile is subjected to violent shocks of penetration.

## REMARKS:

1. The detent springs in this fuze are considerably weaker than those used in the Mk 28 base detonating fuze.
2. The Mod 1 of this fuze is identical to the Mod 0, except that it is fully moisture-proofed as described for the Mk 28 base detonating fuze.



SECTION



END VIEW

**MARK 23  
BASE DETONATING FUZE**

**DATA**

RESTRICTED

U. S. NAVY

MK.23

Projectiles used in . . . 8"/55 Common  
 8"/55 Sp. Common  
 8"/55 A.P.

Markings . . . . . T.D. Mk 23  
 Lot  
 JRR  
 NGP 1942

Overall Length . . . . . 7<sup>7</sup>/<sub>8</sub>0  
 Diameters . . . . . Head - 1<sup>7</sup>/<sub>8</sub>  
 Body - 1<sup>3</sup>/<sub>8</sub>  
 Threaded Length . . . . . 1<sup>7</sup>/<sub>8</sub>25  
 Threads . . . . . 13 L.H.  
 Weight . . . . . 2 lbs 7 oz. without tracer.  
 Material of Construction. Cadmium Plated Steel  
 Arming Speed . . . . . 1200-1400 r.p.m.  
 Delay . . . . . 0.035 seconds

BASE DETONATING FUZE

DESCRIPTION

The fuze is composed of three major parts: the head, body, and nose cap. The fuze head assembly contains the firing pin, firing pin detents, and two locking balls behind the firing pin. In the assembled position the point of the firing pin does not protrude from the head. The body contains the detonator plunger which is spring-loaded downward toward the firing pin by a very heavy firing spring. The firing train consisting of the sensitive primer, the secondary primer, the delay element, detonator, and booster elements is contained within the detonator plunger. Plunger alignment is maintained by pins in the plunger stock. The nose cap contains the ball retainer, ball retainer detents, and locking balls. The spring-loaded plunger is being held up by the locking balls which are in turn being held in by the ball retainer. The ball retainer is prevented from moving because of the ball retainer detents.

OPERATION

When the projectile is fired, centrifugal force causes the firing pin detents and ball retainer detents to be moved outward against their springs. When the firing pin detents have moved out, the firing pin moves forward because of creep and the locking balls drop into the space left by the forward movement of the firing pin and will be held outward by centrifugal force thus locking the firing pin in the forward position. The ball retainer is prevented from moving forward due to creep because of the anti-creep spring behind it. On impact the ball retainer moves forward until stopped by the nose and is locked in this position by three split ring segments engaging a shoulder at the end of the body. The plunger locking balls are released by this forward movement of the ball retainer and are projected outward. When the force of impact has diminished sufficiently to permit the firing spring to propel the plunger to the rear the sensitive primer in the base of the plunger is thrown down on to the firing pin. When the plunger moves down it brings the booster lead-ins and lead-outs in line and the plunger is locked in the rear position by three split ring segments in a manner similar to the ball retainer. When the sensitive primer is fired, the gas from it fires the percussion primer. The flash from the percussion primer passes through and around the baffle and ignites the delay pellet which defers ignition of the detonator for .02 seconds. This detonator then fires the booster elements.

REMARKS

This fuze will detonate on thin plate or heaviest armor and also on water impact after a slight mechanical delay.

R E S T R I C T E D

Sensitive Firing Pin

Firing Pin Detent

Sensitive Primer

Inner Cup

Outer Cup

Plunger Firing Pin

Secondary Primer

Anti-Creep Spring

Flash Channel

Plunger Detent

Detonator

Lead In

Booster

Lead Out

Auxiliary Plunger

Sensitive Firing Pin

Sensitive Primer

Firing Pin Detent

Inner Cup

Outer Cup

Plunger Firing Pin

Secondary Primer

Anti-Creep Spring

Flash Channel

Detonator

Lead Out

Lead In

Booster

Plunger Detent

Auxiliary Plunger

**MK. 28**

**BASE DETONATING FUZE**

**DATA**

RESTRICTED

**U. S. NAVY****MK.28**PROJECTILES USED IN

4"/50 H.C.	8"/55 H.C. & Sp.Com.
5"/25/38/51 AA Common	14"/45/50 Bbt.
5"/51/54 H.C.	<u>Special Green Stripe Fuze</u>
6"/50 Common	12"/50 H.C.
6"/47/53 H.C.	14"/45/50 H.C.
7"/45 Bbt.	16"/45/50 H.C.

Markings . . . . . TDF Mk. 28  
Lot  
B '42

Fuzes Found with . . . . . Mk 18 Mods 2-4;  
Mk 29 Mods 1-3  
Mk 17, Mk 46, Mk 35

Overall Length . . . . . 6"68

Diameters: . . . . . Body - 1"37; Head - 1"80

Threaded Length . . . . . 0"96

Threads . . . . . 11 L.H.

Weight . . . . . 2 lbs. 6 oz.

Material of Construction-Managanesse Steel Body with Duralumin.  
Nose cap - not painted.

Arming speed . . . . . 3000-4000 r.p.m.

Delay . . . . . None

BASE DETONATING FUZE

DESCRIPTION

The fuze is composed of two major parts: the fuze body and the nose cap. The body contains the auxiliary detonator plunger, the detonator plunger, the detonator plunger detents, the anti-creep spring assembly and the firing train. The auxiliary detonator is surrounded by twenty ball bearings and bears against the bottom of the detonator plunger. Fitted over the top of the detonator plunger is the anti-creep spring assembly consisting of an inner and an outer cup separated by an anti-creep spring. The outer cup will not move and the inner cup is crimped over the top of the detonator plunger and held in position by the sensitive primer holder. The firing train consists of the sensitive primer, secondary firing pin, secondary primer, detonator, and booster lead-ins and lead-outs which are out of line in the unarmed position.

The nose cap, which is secured to the end of the body by a threaded joint houses the sensitive firing pin and firing pin detents. The sensitive firing pin is held in place by two stakes, but is referred to as a "float'ng" firing pin since it can move downward slightly. Ninety degrees removed from the two detents are two holes in the nose cap. A locking pin is provided to lock the nose cap in position.

OPERATION

The force of setback causes the sensitive firing pin to move down on the firing pin detents thus creating friction and holding them in. When the projectile leaves the bore of the gun creep causes the firing pin to move forward again thus releasing the firing pin detents. Centrifugal force will move both sets of detents outward against their springs and the fuze is then completely armed. The detonator plunger is prevented from moving forward on creep because of the anti-creep spring, but on impact the auxiliary plunger acting as an inertia weight pushes the detonator plunger forward. This action moves the inner cup forward thus compressing the anti-creep spring and brings the booster lead-ins and lead-outs in line. The sensitive primer in the top of the detonator plunger is carried on to the sensitive firing pin and the explosion of the sensitive primer accomplishes two things:

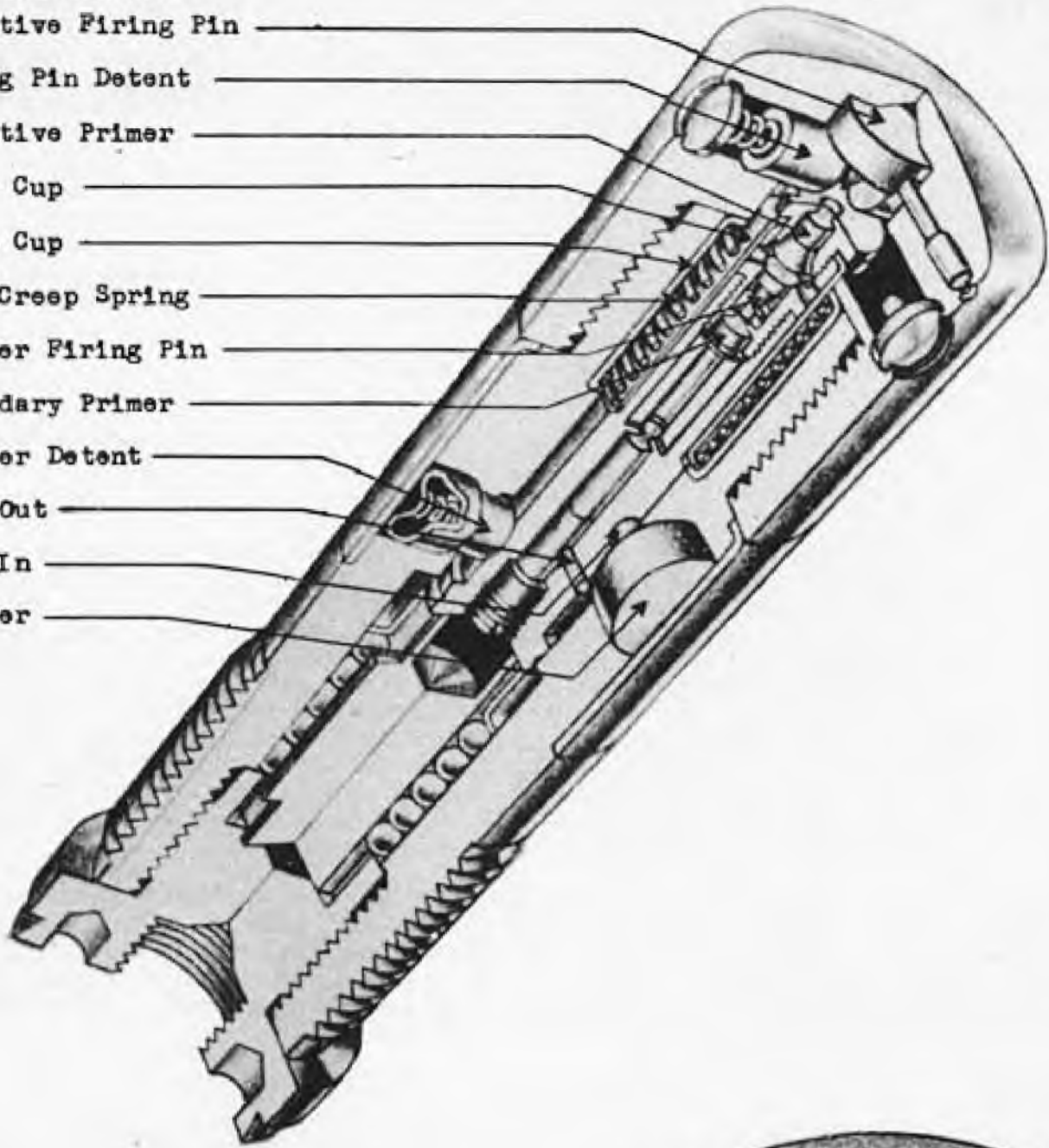
1. The gases resulting from the explosion pass through the port holes on the side of the primer container and build up a high pressure expanding that part of the cup which is adjacent to the holes in the nose cap. This action locks the detonator plunger in the fired position and keeps the firing train lined up.
2. The shear wire that has been holding up the secondary firing pin is broken and the secondary firing pin is driven down into the secondary primer and the flash sets off the detonator and booster elements.

REMARKS:

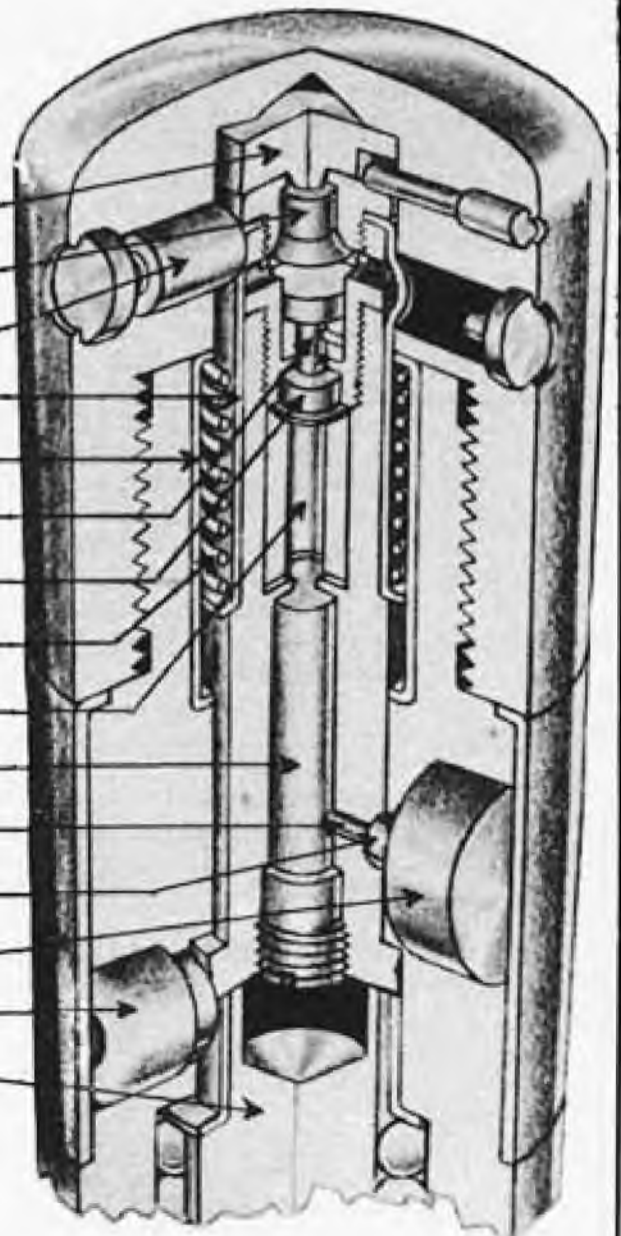
1. This fuze will function on 2-1/2 in. plate and on water.
2. A special "green stripe" Mk 28 was issued for major caliber H.C. projectiles, but is replaced by the Mk 39.
3. Mode 0 - 14 represent different manufacturers.
4. Mode 15 & 16 are identical to earlier mods but are fully moisture-proofed, as follows: (a) a silica gel capsule is placed in the auxiliary detonator plunger; and (b) all external joints are coated with Bakelite varnish over a lacquer base.

RESTRICTED

- Sensitive Firing Pin
- Firing Pin Detent
- Sensitive Primer
- Inner Cup
- Outer Cup
- Anti-Creep Spring
- Plunger Firing Pin
- Secondary Primer
- Plunger Detent
- Lead Out
- Lead In
- Booster



- Sensitive Firing Pin
- Sensitive Primer
- Firing Pin Detent
- Inner Cup
- Outer Cup
- Plunger Firing Pin
- Secondary Primer
- Anti-Creep Spring
- Flash Channel
- Detonator
- Lead Out
- Lead In
- Booster
- Plunger Detent
- Auxiliary Plunger



**MK. 31**  
**BASE DETONATING FUZE**



RESTRICTED

Sensitive Firing Pin

Firing Pin Detent

Sensitive Primer

Inner Cup

Outer Cup

Plunger Firing Pin

Secondary Primer

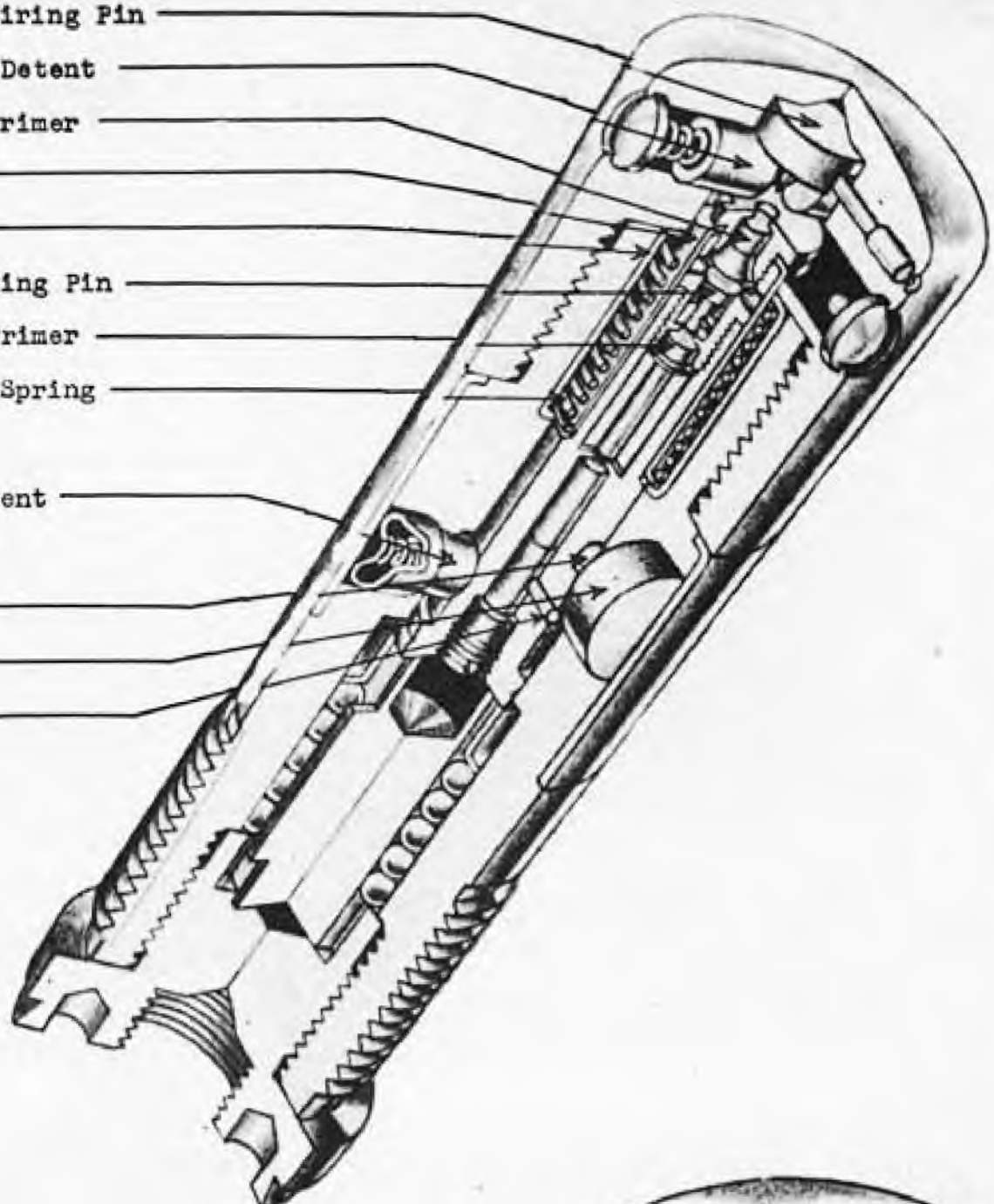
Anti-Creep Spring

Plunger Detent

Lead In

Booster

Lead Out



Sensitive Firing Pin

Sensitive Primer

Firing Pin Detent

Inner Cup

Outer Cup

Plunger Firing Pin

Secondary Primer

Anti-Creep Spring

Delay

Detonator

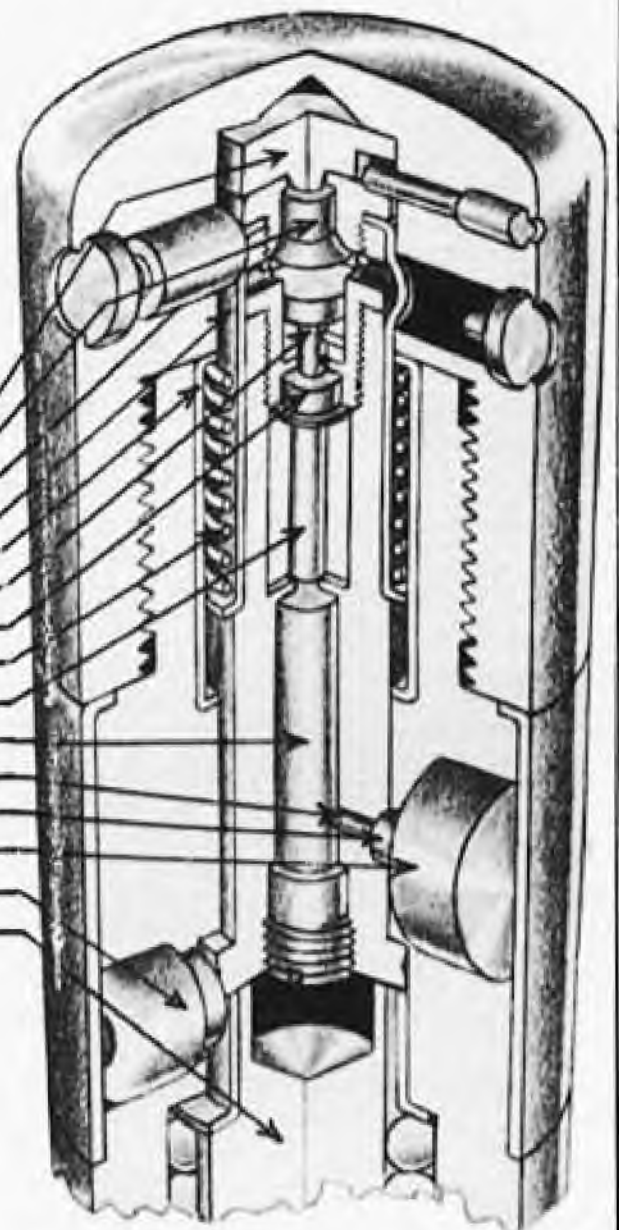
Lead Out

Lead In

Booster

Plunger Detent

Auxiliary Plunger



**MK.36**

**BASE DETONATING FUZE**

**DATA**

RESTRICTED

**U. S. NAVY  
MK. 36**

Projectiles Used in . . . 4"/50 Special Common  
Markings . . . . . TDF Mk 36  
Lot  
Overall Length . . . . . 4.68 in.  
Diameters . . . . . Body - 1 1/8"  
Head - 1 1/8"  
Threaded length . . . . . 1 1/2"  
Threads . . . . . 18 L.H.  
Material of Construction. Chrome Moly Steel  
Body with duralumin  
nose cap.  
Delay . . . . . .01 second.

BASE DETONATING FUZE

Description

The fuze is composed of two major parts; the fuze body and the nose cap. The body contains the auxiliary detonator plunger, the detonator plunger, the detonator plunger detents, the anti-creep spring assembly and the firing train. The auxiliary detonator is surrounded by twenty ball bearings and bears against the bottom of the detonator plunger. Fitted over the top of the detonator plunger is the anti-creep spring assembly consisting of an inner and an outer cup separated by an anti-creep spring. The outer cup will not move and the inner cup is crimped over the top of the detonator plunger and held in position by the sensitive primer holder. The firing train consists of the sensitive primer, secondary firing pin, secondary primer, delay element, detonator, and booster lead-ins and lead-outs which are out of line in the unarmed position.

The nose cap, which is secured to the end of the body by a threaded joint houses the sensitive firing pin and the firing pin detents. The sensitive firing pin is held in place by two stakes, but is referred to as a "floating" firing pin since it can move downward slightly. Ninety degrees removed from the two detents are two holes in the nose cap. A locking pin is provided to lock the nose cap in position.

Operation

The force of setback causes the sensitive firing pin to move down on the firing pin detents thus creating friction and holding them in. When the projectile leaves the bore of the gun creep causes the firing pin to move forward again thus releasing the firing pin detents. Centrifugal force will move both sets of detents outward against their springs and the fuze is then completely armed. The detonator plunger is prevented from moving forward on creep because of the anti-creep spring, but on impact the auxiliary plunger acting as an inertia weight pushes the detonator plunger forward. This action moves the inner cup forward thus compressing the anti-creep spring, and brings the booster lead-ins and lead-outs in line. The sensitive primer in the top of the detonator plunger is carried on to the sensitive firing pin and the explosion of the sensitive primer accomplishes two things:

1. The gases resulting from the explosion pass through the port holes on the side of the primer container and build up a high pressure expanding that part of the cup which is adjacent to the holes in the nose cap. This action locks the detonator plunger in the fired position and keeps the firing train lined up.
2. The shear wire that has been holding up the secondary firing pin is broken and the secondary firing pin is driven down into the secondary primer thus setting off the delay element of .01 seconds and the detonator and booster elements.

Remarks

The operation of this fuze is the same as that described for the Mk 28 base detonating fuze, differing only in length and the material used in its body construction. Due to the small explosive cavity in the 4" projectile, the Mk 36 fuze has been made two inches shorter with an external tracer.

This fuze is fully moisture-proofed, as described for the Mk 28 base detonating fuze.

R E S T R I C T E D

Sensitive Firing Pin

Firing Pin Detent

Sensitive Primer

Inner Cup

Outer Cup

Plunger Firing Pin

Secondary Primer

Anti-Creep Spring

Flash Channel

Plunger Detent

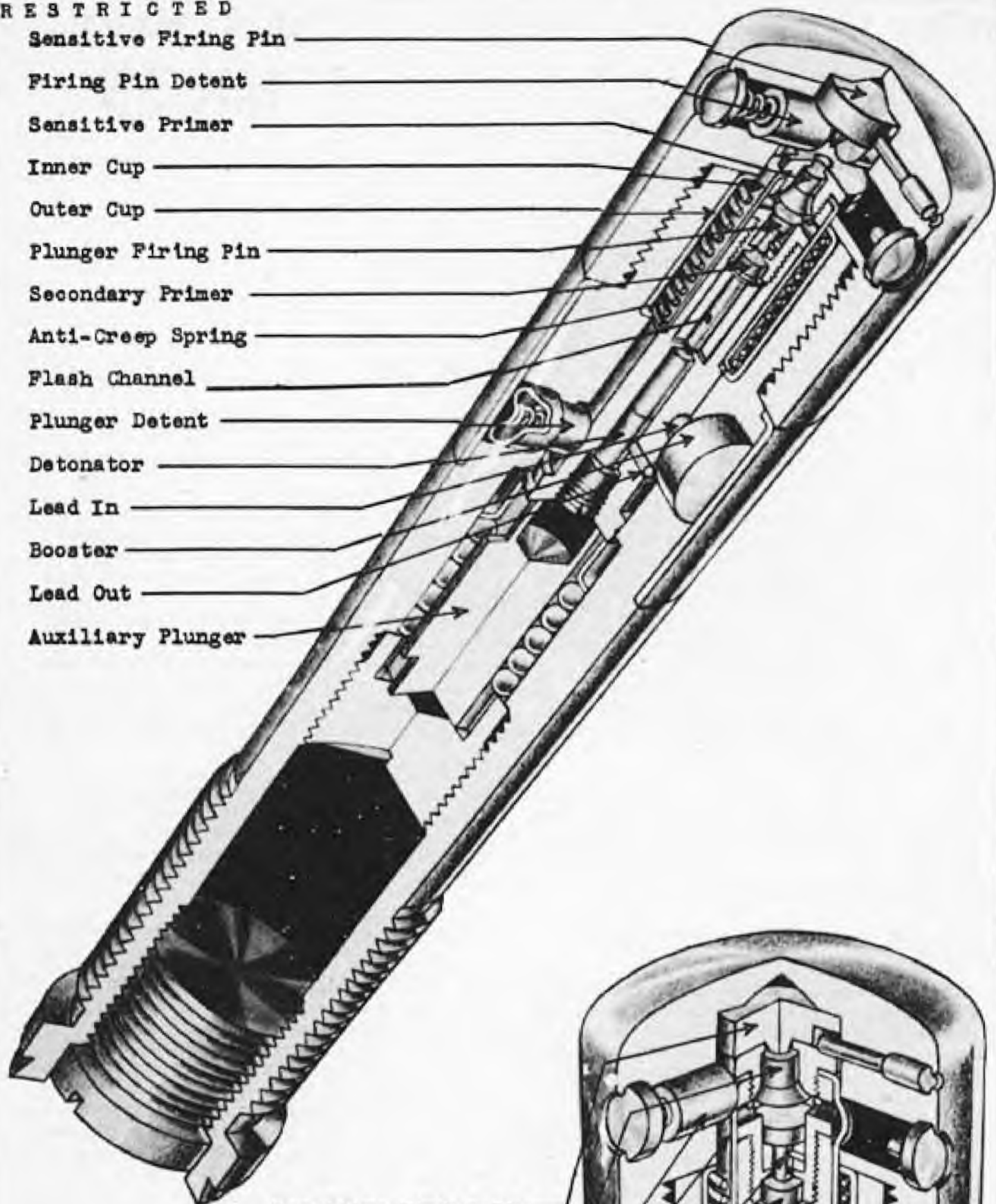
Detonator

Lead In

Booster

Lead Out

Auxiliary Plunger



Sensitive Firing Pin

Sensitive Primer

Firing Pin Detent

Inner Cup

Outer Cup

Plunger Firing Pin

Secondary Primer

Anti-Creep Spring

Flash Channel

Detonator

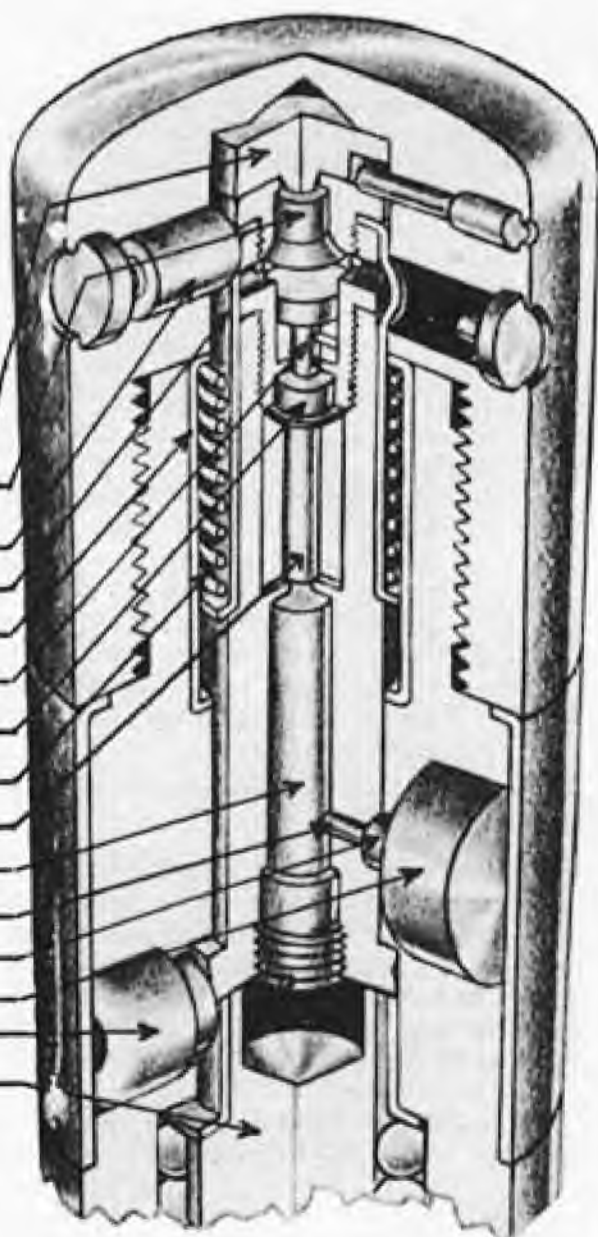
Lead Out

Lead In

Booster

Plunger Detent

Auxiliary Plunger



**MK.39**

**BASE DETONATING FUZE**

**DATA**

RESTRICTED

**U. S. NAVY  
MK.39**

MARK

Projectiles Used in . . . . . B<sup>n</sup>/55 H.C.  
 12<sup>n</sup>/50 HC  
 14<sup>n</sup>/45/50 HC  
 16<sup>n</sup>/45/50 HC

Markings . . . . . TDF Mk 39  
 Lot  
 B 743

Overall length . . . . . 6<sup>n</sup>68

Diameters . . . . . Body - 1<sup>n</sup>37  
 Head - 1<sup>n</sup>80

Threaded length . . . . . 0<sup>n</sup>96

Threads . . . . . 11 L.H.

Material of Construction. Manganese steel body  
 with Duralumin nose cap.

Delay . . . . . None

BASE DETONATING FUZE

DESCRIPTION

The fuze is composed of two major parts: the fuze body and the nose cap. The body contains the auxiliary detonator plunger, the detonator plunger, the detonator plunger detents, the anti-creep spring assembly and the firing train. The auxiliary detonator is surrounded by twenty ball bearings and bears against the bottom of the detonator plunger. Fitted over the top of the detonator plunger is the anti-creep spring assembly consisting of an inner and an outer cup separated by an anti-creep spring. The outer cup will not move and the inner cup is crimped over the top of the detonator plunger and held in position by the sensitive primer holder. The firing train consists of the sensitive primer, secondary firing pin, secondary primer, detonator and booster lead-ins and lead-outs which are out of line in the unarmed position.

The nose cap, which is secured to the end of the body by a threaded joint houses the sensitive firing pin and firing pin detents. The sensitive firing pin is held in place by two stakes, but is referred to as a "floating" firing pin since it can move downward slightly. Ninety degrees removed from the two detents are two holes in the nose cap. A locking pin is provided to lock the nose cap in position.

OPERATION

The force of setback causes the sensitive firing pin to move down on the firing pin detents thus creating friction and holding them in. When the projectile leaves the bore of the gun creep causes the firing pin to move forward again thus releasing the firing pin detents. Centrifugal force will move both sets of detents outward against their springs and the fuze is then completely armed. The detonator plunger is prevented from moving forward on creep because of the anti-creep spring, but on impact the auxiliary plunger acting as an inertia weight pushes the detonator plunger forward. This action moves the inner cup forward thus compressing the anti-creep spring and brings the booster lead-ins and lead-outs in line. The sensitive primer in the top of the detonator plunger is carried on to the sensitive firing pin and the explosion of the sensitive primer accomplishes two things:

1. The gases resulting from the explosion pass through the port holes on the side of the primer container and build up a high pressure expanding that part of the cup which is adjacent to the holes in the nose cap. This action locks the detonator plunger in the fired position and keeps the firing train lined up.
2. The shear wire that has been holding up the secondary firing pin is broken and the secondary firing pin is driven down into the secondary primer and the flash sets off the detonator and booster elements.

REMARKS

This fuze is a modified Mark 28 with the only change being that the springs behind the detents have been made weaker. In reality it is a Mk 28 with the detent springs of a Mk 21. The reason for this change was that at long ranges in major caliber guns there was not sufficient centrifugal force to keep the fuze in an armed condition. It was formerly designated the Mk 28 Sp and was identified by a green stripe around the body, but this has been replaced by the new Mark number.

This fuze is being replaced by the Mk 48 base detonating fuze and is no longer manufactured, although existing stocks will be used until exhausted.

RESTRICTED

Sensitive Firing Pin

Firing Pin Detent

Sensitive Primer

Inner Cup

Outer Cup

Plunger Firing Pin

Secondary Primer

Anti-Creep Spring

Delay Element

Plunger Detent

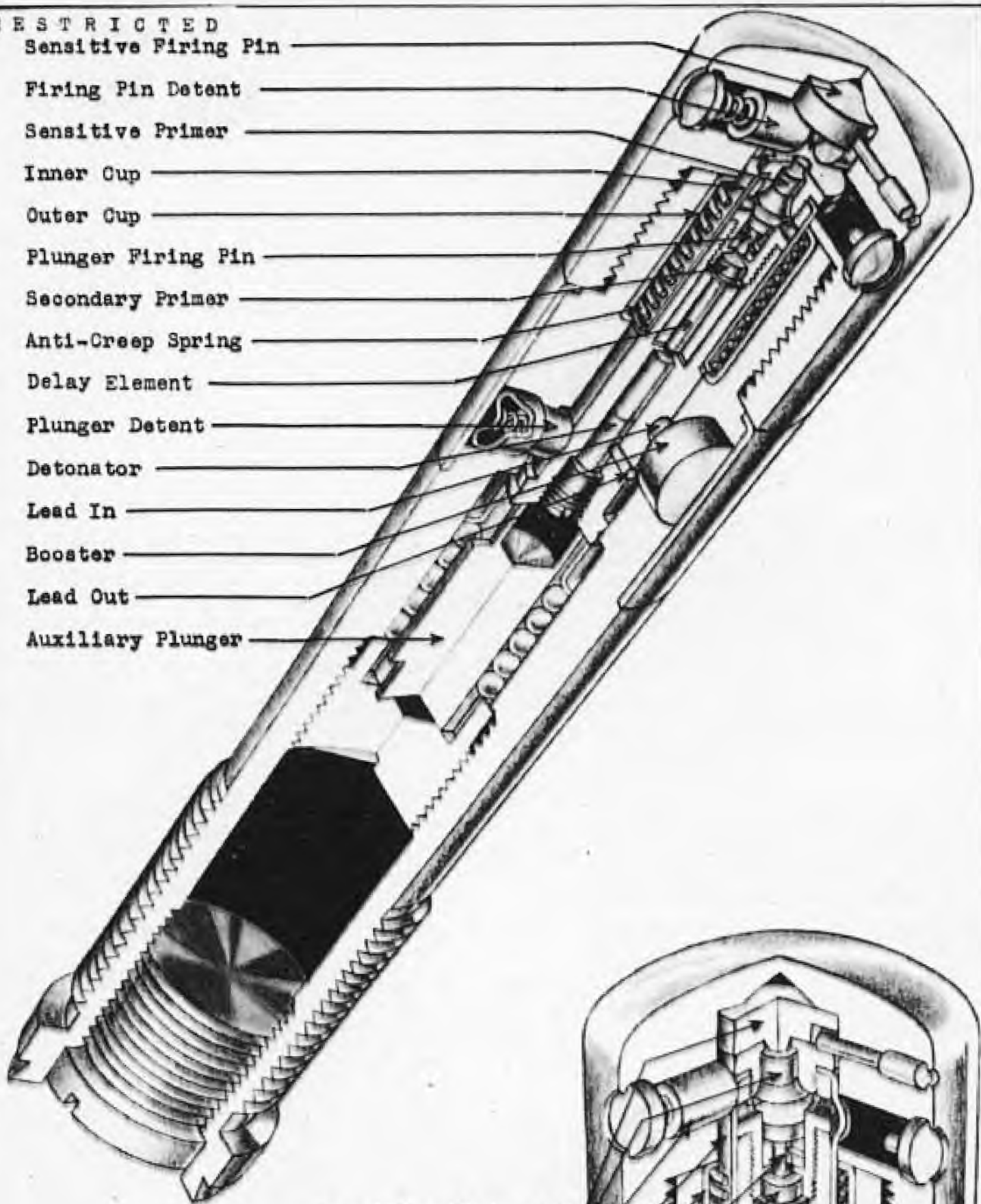
Detonator

Lead In

Booster

Lead Out

Auxiliary Plunger



Sensitive Firing Pin

Sensitive Primer

Firing Pin Detent

Inner Cup

Outer Cup

Plunger Firing Pin

Secondary Primer

Anti-Creep Spring

Delay Element

Detonator

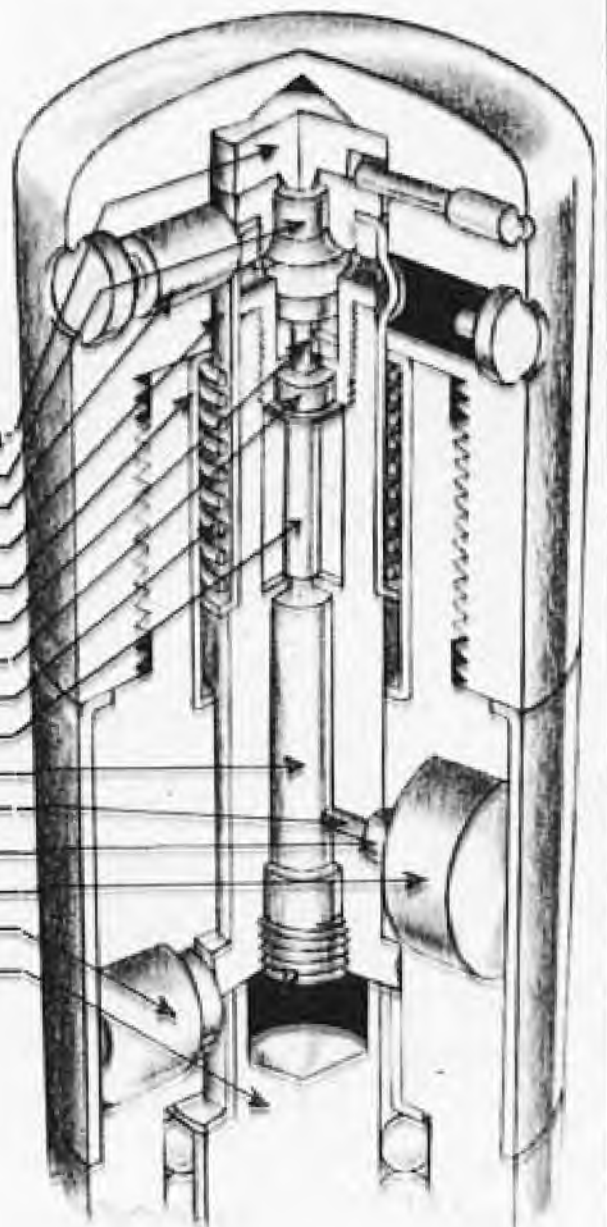
Lead Out

Lead In

Booster

Plunger Detent

Auxiliary Plunger



**MK.48**  
**BASE DETONATING FUZE**

**DATA**

RESTRICTED

**U.S. NAVY  
MK.48**

Projectiles Used in . . . . . 8"/55 HC  
 12"/50 HC  
 14"/45/50 HC  
 16"/45/50 HC

Markings . . . . . TDF Mk 48  
 Lot  
 B 144

Overall length . . . . . 6768

Diameters . . . . . Body - 1737  
 Head - 1780

Threaded length . . . . . 0796

Threads . . . . . 11 L.H.

Material of Construction. Manganese Steel body  
 with Duralumin Nose cap.

Delay . . . . . .01 sec.

BASE DETONATING FUZE

DESCRIPTION

The fuze is composed of two major parts: the fuze body and the nose cap. The body contains the auxiliary detonator plunger, the detonator plunger, the detonator plunger detents, the anti-creep spring assembly and the firing train. The auxiliary detonator is surrounded by twenty ball bearings and bears against the bottom of the detonator plunger. Fitted over the top of the detonator plunger is the anti-creep spring assembly consisting of an inner and an outer cup separated by an anti-creep spring. The outer cup will not move and the inner cup is crimped over the top of the detonator plunger and held in position by the sensitive primer holder. The firing train consists of the sensitive primer, secondary firing pin, secondary primer, delay element, detonator, and booster lead-ins and lead-outs which are out of line in the unarmed position.

The nose cap, which is secured to the end of the body by a threaded joint houses the sensitive firing pin and firing pin detents. The sensitive firing pin is held in place by two stakes, but is referred to as a "floating" firing pin since it can move downward slightly. Ninety degrees removed from the two detents are two holes in the nose cap. A locking pin is provided to lock the nose cap in position.

OPERATION

The force of setback causes the sensitive firing pin to move down on the firing pin detents thus creating friction and holding them in. When the projectile leaves the bore of the gun creep causes the firing pin to move forward again thus releasing the firing pin detents. Centrifugal force will move both sets of detents outward against their springs and the fuze is then completely armed. The detonator plunger is prevented from moving forward on creep because of the anti-creep spring, but on impact the auxiliary plunger acting as an inertia weight pushes the detonator plunger forward. This action moves the inner cup forward thus compressing the anti-creep spring, and brings the booster lead-ins and lead-outs in line. The sensitive primer in the top of the detonator plunger is carried on to the sensitive firing pin and the explosion of the sensitive primer accomplishes two things:

1. The gases resulting from the explosion pass through the port holes on the side of the primer container and build up a high pressure expanding that part of the cup which is adjacent to the holes in the nose cap. This action locks the detonator plunger in the fired position and keeps the firing train lined up.
2. The shear wire that has been holding up the secondary firing pin is broken and the secondary firing pin is driven down into the secondary primer thus setting off the delay element of .01 seconds and the detonator and booster elements.

REMARKS

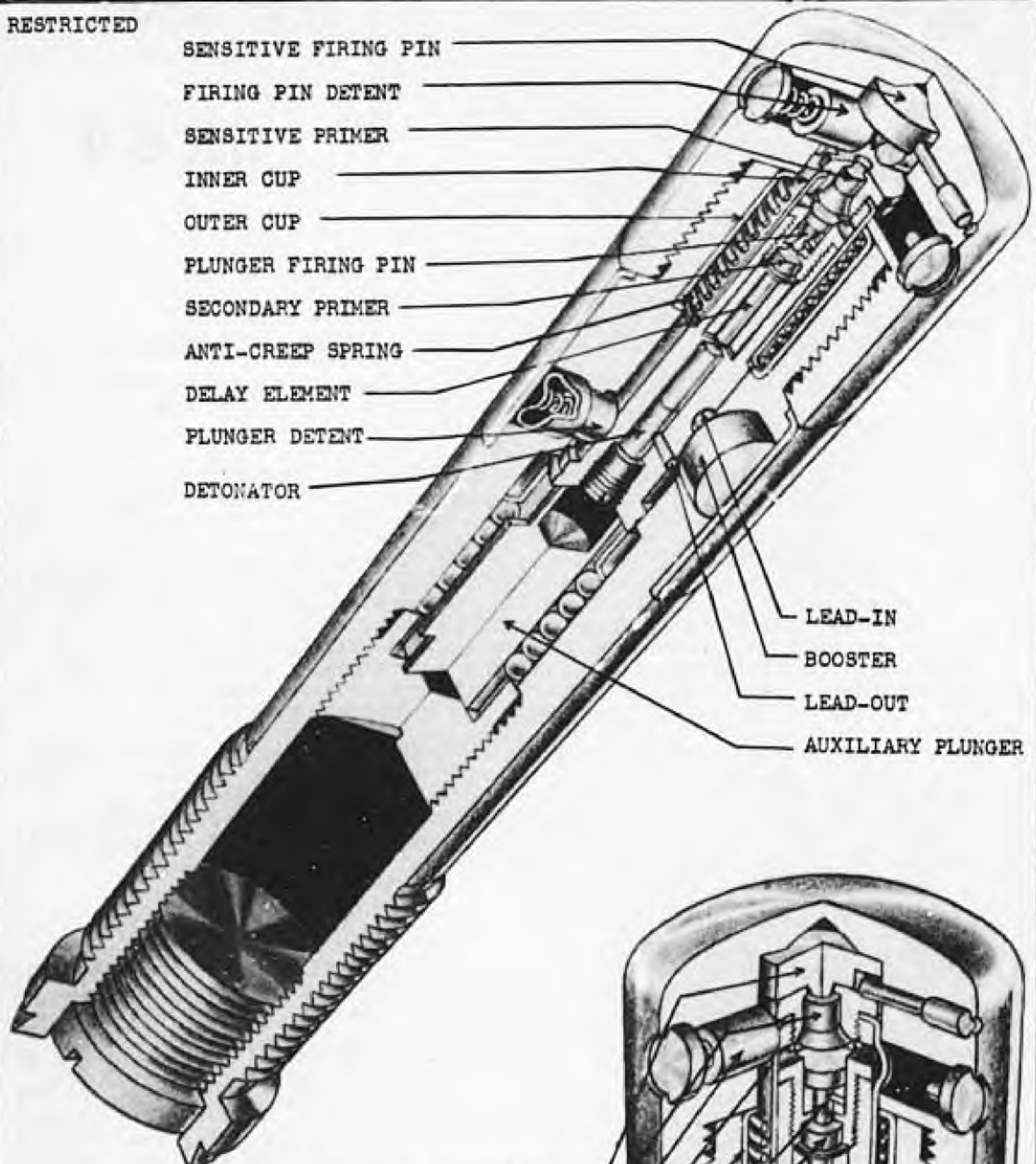
This fuze is a modified Mark 28 with two changes having been made:

1. The springs have been weakened behind the detents so that the fuze will stay armed at long ranges.
2. A .01 sec. delay element has been incorporated into the fuze in place of the non-delay feature of the Mk 28.

Thus, the fuze consists of the body and parts of the Mk 28, the detent springs of the Mk 21, and the delay element of the Mk 19.

Mods 0 & 1 of this fuze are fully moisture-proofed, as described for the Mk 28 base detonating fuze.

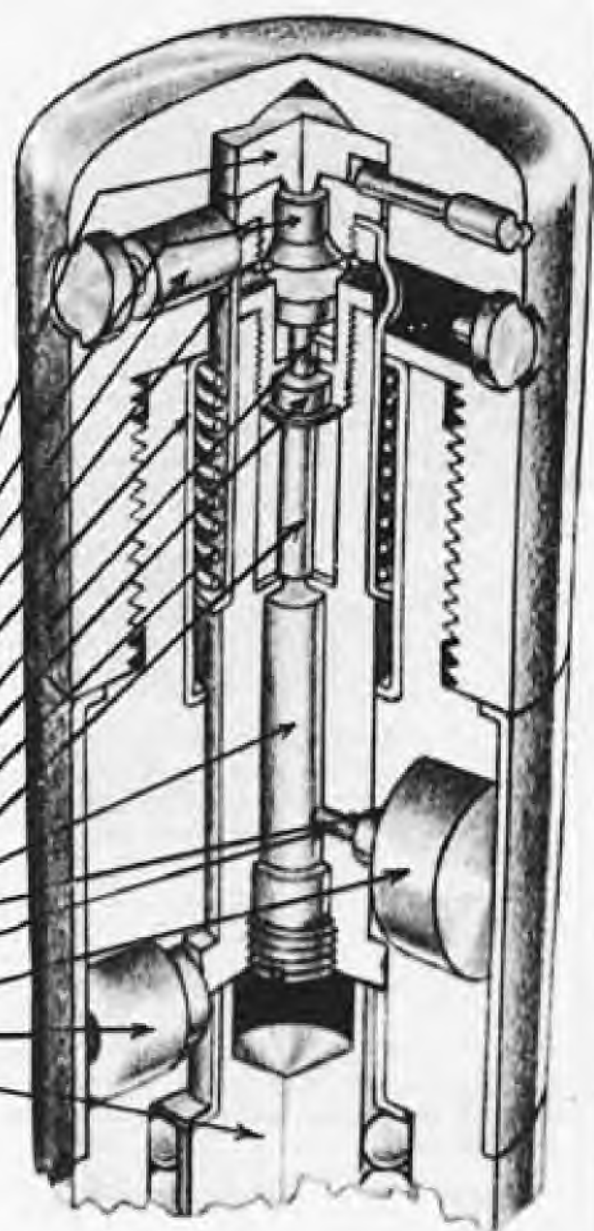
RESTRICTED



- SENSITIVE FIRING PIN
- FIRING PIN DETENT
- SENSITIVE PRIMER
- INNER CUP
- OUTER CUP
- PLUNGER FIRING PIN
- SECONDARY PRIMER
- ANTI-CREEP SPRING
- DELAY ELEMENT
- PLUNGER DETENT
- DETONATOR

- LEAD-IN
- BOOSTER
- LEAD-OUT
- AUXILIARY PLUNGER

- SENSITIVE FIRING PIN
- SENSITIVE PRIMER
- FIRING PIN DETENT
- INNER CUP
- OUTER CUP
- PLUNGER FIRING PIN
- SECONDARY PRIMER
- ANTI-CREEP SPRING
- DELAY ELEMENT
- DETONATOR
- LEAD-IN
- LEAD-OUT
- BOOSTER
- PLUNGER DETENT
- AUXILIARY PLUNGER



# MK.64

## BASE DETONATING FUZE

**DATA**

RESTRICTED

**U. S. NAVY**

PROJECTILES USED IN MARKINGS	5"/54 Special Common T.D.F. Mk 64 Lot _____
OVERALL LENGTH	6.68 in.
DIAMETER	Body: 1.37 in. Head: 1.80 in.
THREADED LENGTH	0.96 in.
THREADS	11 L.H.
MATERIAL OF CONSTRUCTION	Body: Manganese Steel
DELAY	Nose Cap: Duralumin 0.01 seconds

**MK.64**

BASE DETONATING FUZE

DESCRIPTION:

The fuze is composed of two major parts: the fuze body and the nose cap. The body contains the auxiliary detonator plunger, the detonator plunger, the detonator plunger detents, the anti-creep spring assembly and the firing train. The auxiliary detonator is surrounded by twenty ball bearings and bears against the bottom of the detonator plunger. Fitted over the top of the detonator plunger is the anti-creep spring assembly, consisting of an inner and an outer cup separated by an anti-creep spring. The outer cup will not move, and the inner cup is crimped over the top of the detonator plunger and held in position by the sensitive primer holder. The firing train consists of the sensitive primer, secondary firing pin, secondary primer, delay element, detonator, booster lead-ins, and booster lead-outs. The lead-ins and lead-outs are out of alignment in the unarmed position.

The nose cap, which is secured to the end of the body by a threaded joint, houses the sensitive firing pin and the firing pin detents. The sensitive firing pin is held in place by two stakes, but is referred to as a "floating" firing pin, since it can move downward slightly. Ninety degrees removed from the two detents are two holes in the nose cap. A locking pin is provided to lock the nose cap in position.

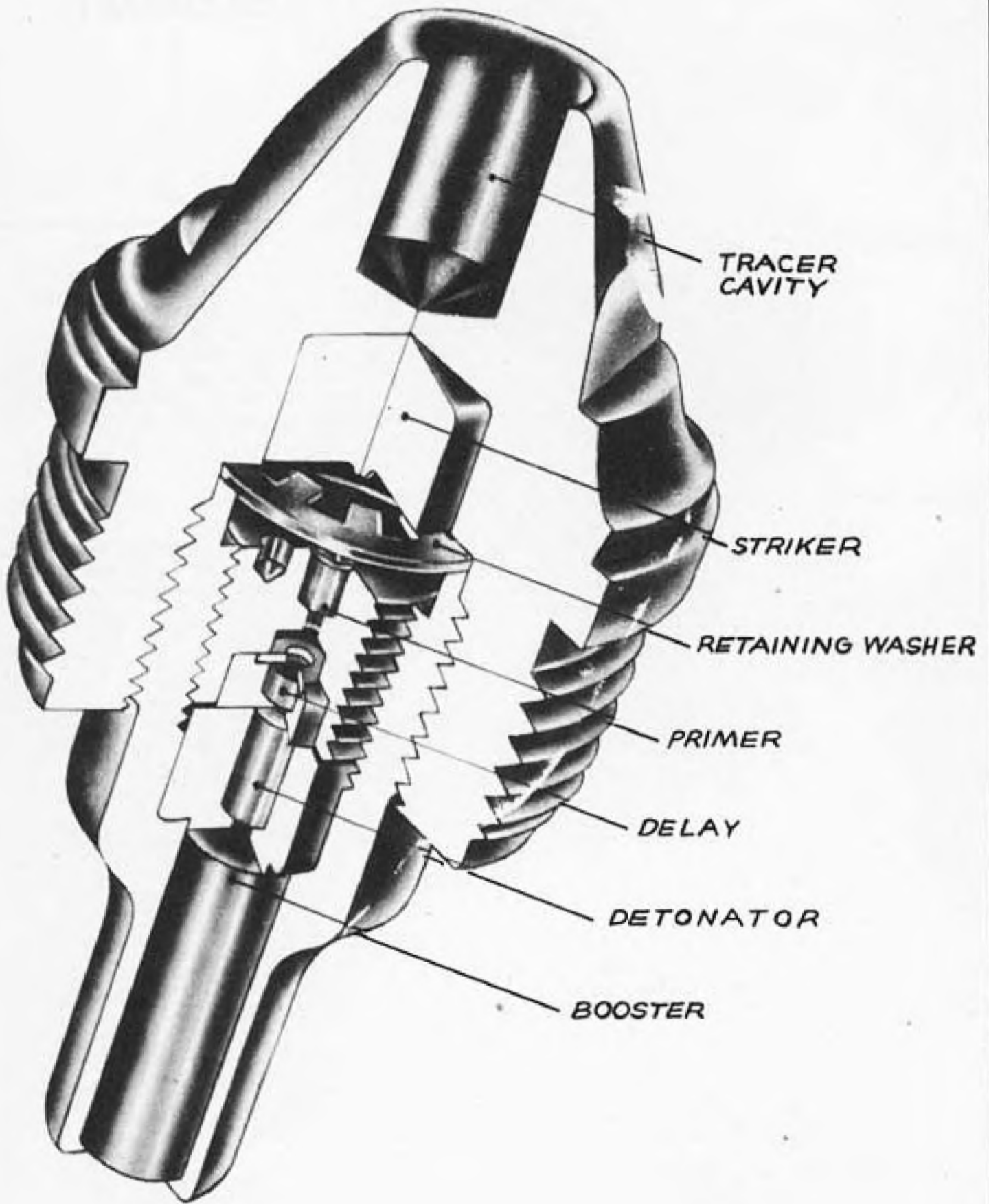
OPERATION:

The force of set-back causes the sensitive firing pin to move down on the firing pin detents, creating friction and holding them in. When the projectile leaves the bore of the gun, creep causes the firing pin to move forward again, releasing the firing pin detents. Centrifugal force will move both sets of detents outward against their springs, and the fuze is then completely armed. The detonator plunger is prevented from moving forward on creep because of the anti-creep spring, but on impact the auxiliary plunger acts as an inertia weight and pushes the detonator plunger forward. This action moves the inner cup forward, compressing the anti-creep spring, and aligns the booster lead-ins and lead-outs. The sensitive primer in the top of the detonator plunger is carried against the sensitive firing pin, and the explosion of the sensitive primer accomplishes the following:

1. The gases resulting from the explosion pass through the port holes on the side of the primer container and build up a high pressure, expanding that part of the cup which is adjacent to the holes in the nose cap. This action locks the detonator plunger in the fired position and keeps the firing train aligned.
2. The shear wire which has been holding up the secondary firing pin is broken, and the secondary firing pin is driven into the secondary primer, initiating the .01 second delay element, detonator, and booster elements.

REMARKS:

1. In order to incorporate the stronger body of the Mk 21 Mod 1 with the detonator plunger and the 0.01 second delay of the Mk 36 Mod 0, this fuze is constructed as follows: (a) fuze body, anti-creep spring outer cup, and plunger retaining cup of the Mk 21 Mod 1 fuze; (b) detonator plunger assembly of the Mk 36 Mod 0; (c) anti-creep spring and all other components of the Mk 31 Mod 0.
2. This fuze is fully moisture-proofed, as described for the Mk 28 base detonating fuze.



# M66A1 BASE DETONATING FUZE

**DATA**

RESTRICTED

**U. S. ARMY**PROJECTILES USED IN  
MARKINGS3"/50 A.P.  
(On head of fuze)  
FUZE B.D. M66A1  
(loaders initials or  
symbol, date loaded, &  
lot number)**M66A1**

OVERALL LENGTH

3.48 in.

THREADED LENGTH

0.5 in.

THREADS

5 L.H.

TOTAL WEIGHT

1.0 lbs.

MATERIAL OF CONSTRUCTION

Steel body with a  
brass striker.

DELAY

0.016 seconds

BASE DETONATING FUZE

DESCRIPTION:

This fuze is assembled in two parts, and when assembled in the projectile extends from the base of the projectile in the form of a boat-tail. Contained within the body itself is a heavy brass plunger, which acts as a striker, and fitting under the striker is a soft brass washer which acts as a shear washer. Beneath the striker, and contained in a separate unit which threads into the body, is a container for the delay element, detonator, and booster. The cavity in the head of the fuze houses the built-in tracer element.

OPERATION:

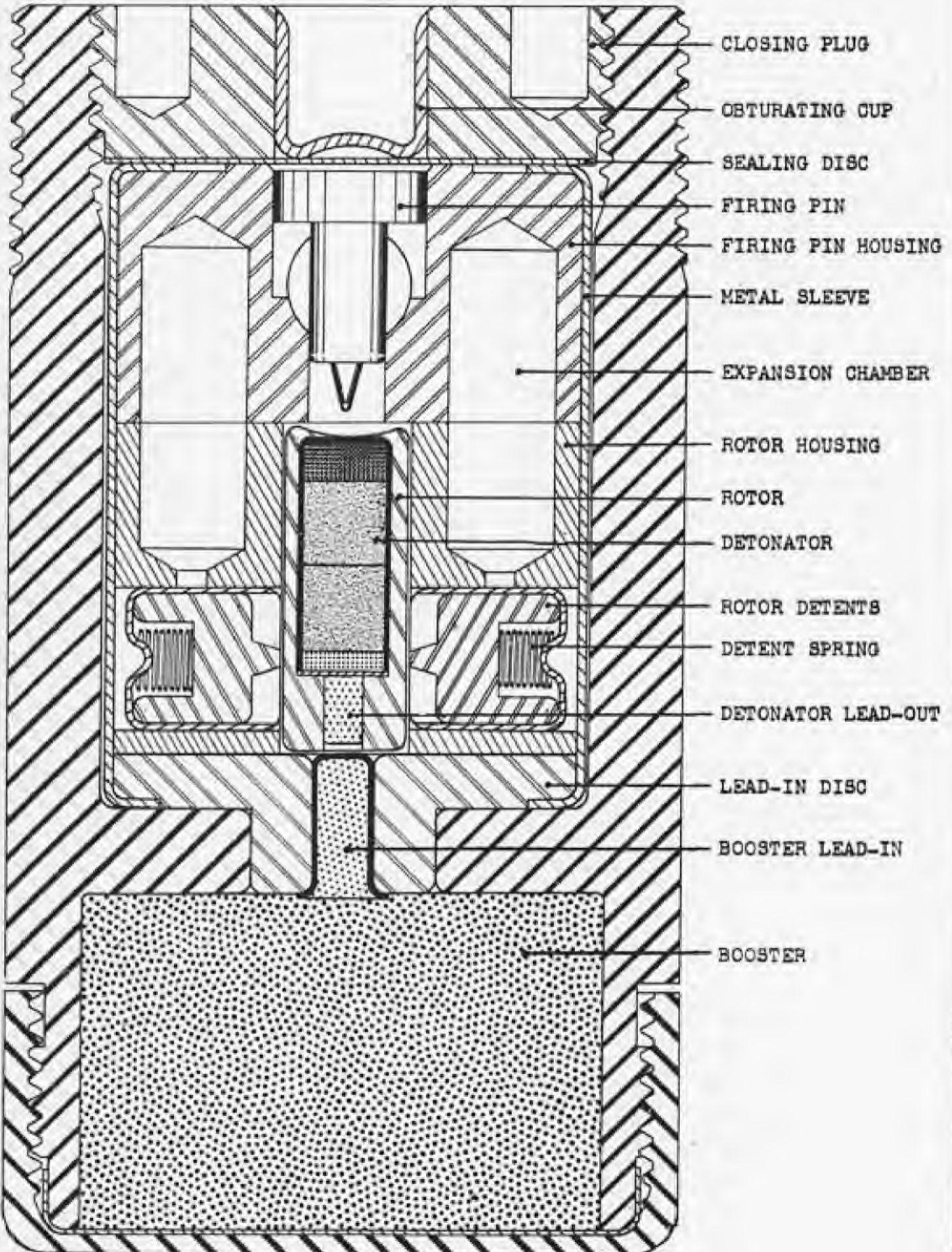
There are no arming principles in this fuze, and on impact the inertial action of the heavy striker collapses the brass washer, allowing the striker to initiate the primer, which sets off the detonator and booster after a short delay period.

REMARKS:

1. This is an Army fuze which has been adopted by the Navy. No Navy Mark No. has been assigned to this fuze, and it is referred to by its "N" designation.

# MKS. 43, 54, & 55 TYPE

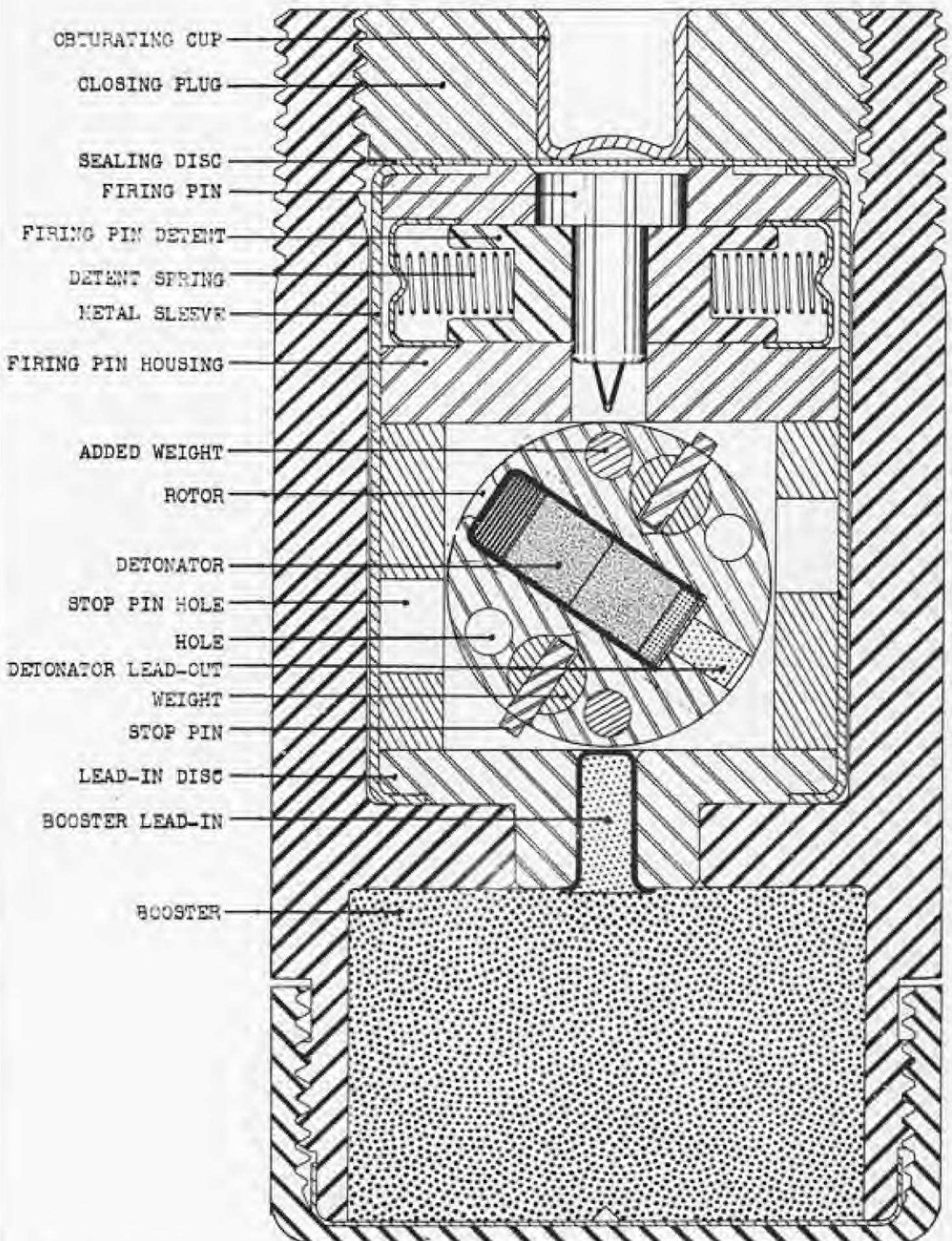
## AUXILIARY DETONATING FUZE



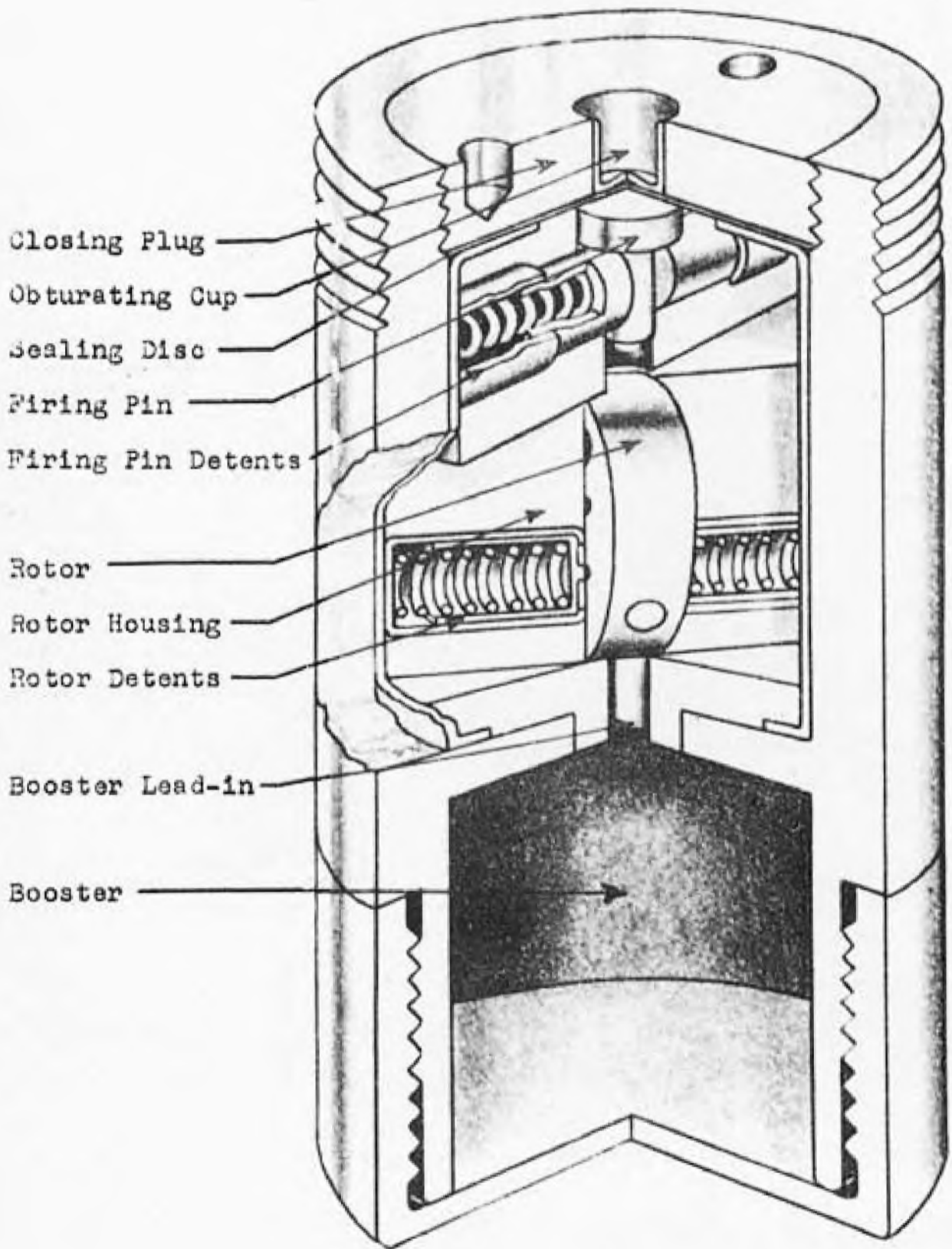
• The Mk 43 Auxiliary Detonating Fuze is identical in mechanical operation, but is longer and contains an additional booster pellet.

# MKS.\*43,54, &55 TYPE

## AUXILIARY DETONATING FUZE



\* The Mk 43 Auxiliary Detonating Fuze is identical in mechanical operation, but is longer and contains an additional booster pellet.



# MK17

## AUXILIARY DETONATING FUZE

**DATA**

RESTRICTED

**U.S. NAVY  
MK.17**

Projectiles Used in . . . 3"/23 AA  
 3"/50 AA & HC  
 4"/50 HC  
 5"/25/38/51 AA Common  
 5"/51 HC  
 6"/47 HC  
 6"/53 HC  
 8"/55 HC

Markings . . . . . (On Head of Fuze)  
 AUX  
 Det. Fuze  
 Mk 17 - 2

AUXILIARY DETONATING FUZE

Lot No.  
 PMC 1942  
 HDB

Fuzes found with . . . . . Mk 18 Mods 2-4, Mk 22 & Mods 1-5, Mk 29 Mods 1-3,  
 Mk 30 Mods 1-3

Overall length . . . . . 2<sup>1</sup>/<sub>5</sub>  
 Diameter . . . . . 1<sup>1</sup>/<sub>38</sub>  
 Weight . . . . . 348 grams  
 Threaded Length . . . . . 0<sup>7</sup>/<sub>96</sub>  
 Threads . . . . . 10 L.H.  
 Material of Construction. Steel body - not painted  
 Arming Speed . . . . . 3000-4000 r.p.m.

**DESCRIPTION**

The fuze is composed of a one piece body with a booster cap and plug closing the ends. The body assembly consists of the firing pin housing and rotor housing, both of which are contained in a thin metal sleeve. In the middle of the closing plug is an obdurating cup with a sealing disc between the plug and the firing pin housing. The firing pin housing contains a metal firing pin which is held in position by two firing pin detents. Contained within the rotor housing is a rotor and two rotor detents. The rotor, which contains two lead counterweights and the detonator, is assembled in the housing with the axis of the detonator at an angle of about 55 degrees from the axis of the fuze. The line of centers of the lead counterweights is at an angle of about 35 degrees from the axis. The rotor is held in the unarmed position by the two rotor detents, the tapered ends of which engage in holes in the side of the rotor.

**OPERATION**

As the projectile is fired from the gun, centrifugal force moves the firing pin and rotor detents back against their springs. Then centrifugal force, acting upon the lead counterweights in the rotor, will cause the rotor to turn until the detonator assembly is in line with the booster lead-in and firing pin. In this position the rotor is dynamically balanced, centrifugal force holding the two lead counterweights at a maximum radius from the axis of rotation of the fuze. When the nose fuze functions, the gas pressure from it forces the obdurating cup down, shearing the sealing disc adjacent to the firing pin and driving the firing pin down into the primer-detonator assembly which fires the booster lead-in and the booster.

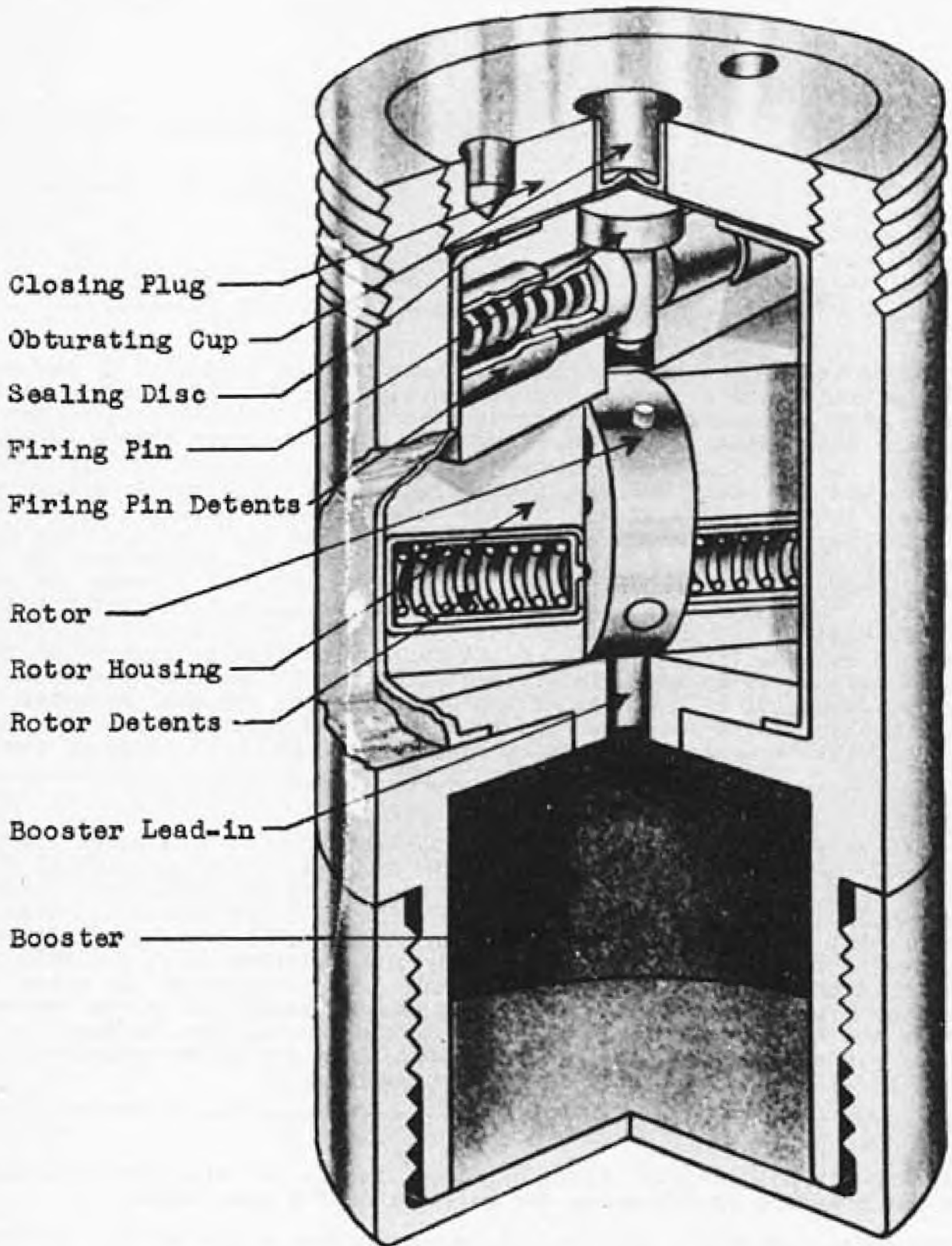
**REMARKS**

This fuze is not designed to function by itself, but will function only by the gas pressure from a nose fuze.

Mods 0-6, representing different manufacturers, were originally assigned for use in 3"-16" AA, AA Common, and H.C. projectiles. Later assignment restricted their use to 3"-6" projectiles. Mods 0-6 were then withdrawn from service and replaced by Mods 8-13 (later redesignated as the Mk 46). A special "green stripe" Mk 17 Mod 8 fuze with weaker detent springs was assigned to be used in major caliber H.C. ammunition. This fuze was later redesignated the Mk 35.

Mods 8-13 differ from Mods 0-6 as follows:

1. To insure positive rotation, two additional small lead counterweights were added to the rotor and two holes drilled in the rotor opposite these weights.
2. Two stop pins were added to the rotor, and two holes were cut in the rotor housing to engage the stop pins to prevent further rotation of the rotor after the detonator had become aligned with the firing pin.



# MK.35

## AUXILIARY DETONATING FUZE

**DATA**

RESTRICTED

**U. S. NAVY****MK.35****MK.55**

Projectiles Used in . . . 8"/55 H.C.  
 12"/50 HC  
 14"/45/50 HC  
 16"/45/50 HC  
 Markings . . . . . (On Head of Fuze)  
 AUX  
 DET FUZE  
 Mk 35

Lot No.  
 PMC 1943  
 HDB

Fuzes found with . . . . Mk 29 Mods 1-3;  
 Mk 39; Mk 48

Overall Length . . . . 2'5  
 Diameter . . . . . 1'38  
 Threaded length . . . . 0'96  
 Threads . . . . . 10 L.H.

Material of Construction. Steel body - not painted.

AUXILIARY DETONATING FUZE

DESCRIPTION

This fuze is identical to the Mk 46 except for the fact that it has weaker springs behind the detents. The reason for this is that in major caliber projectiles there was not sufficient centrifugal force at long ranges to keep the fuze armed. It is composed of a one piece body with a booster cap and plug closing the ends. The body assembly consists of the firing pin housing and the rotor housing, both of which are contained in a thin metal sleeve. In the middle of the closing plug is an obdurating cup, and there is a sealing disc between the plug and the firing pin housing. The firing pin housing contains a metal firing pin which is held in position by two firing pin detents. Contained within the rotor housing is a rotor and two rotor detents. The rotor, which contains two lead counterweights and the detonator is assembled in the housing with the axis of the detonator at an angle of about 55 degrees from the axis of the fuze. The line of centers of the lead counterweights is at an angle of about 30 degrees from the axis, and there are two stop-pins on the side of the rotor fitting through two holes in the rotor housing. The rotor is held in the unarmed position by the two rotor detents, the tapered ends of which engage in holes in the side of the rotor.

OPERATION

As the projectile is fired from the gun, centrifugal force moves the firing pin and rotor detents back against their springs. Then centrifugal force, acting upon the lead counterweights in the rotor, will cause the rotor to turn until the detonator assembly is in line with the booster lead-in and firing pin. In this position the rotor is prevented from turning further because of the stop pins and is held in this position since centrifugal force will hold the weights at a maximum radius from the axis of the rotation. When the nose fuze functions, the gas pressure generated by its detonation forces the obdurating cup down, shearing the sealing disc adjacent to the firing pin and driving the firing pin down into the primer-detonator assembly which fires the booster lead-in and the booster.

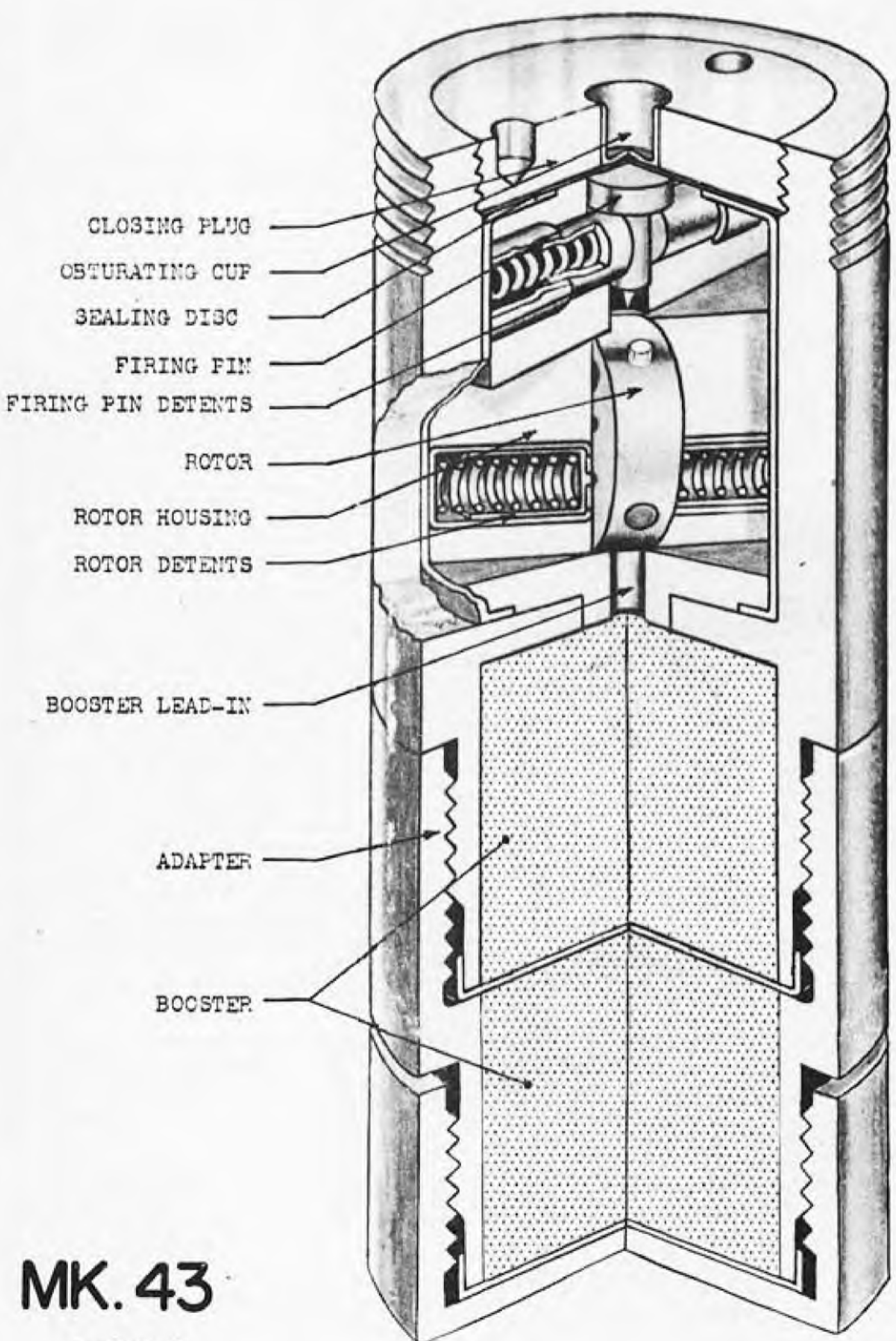
REMARKS

This fuze is not designed to function by itself, but will function only by the gas pressure generated by the detonation of a nose fuze.

A new fuze, the Mk 55, has been designed to replace the Mk 35. The Mk 55 is the same in operation as the Mk 35 but has a detonator of lead azide and a pointed firing pin.

The Mk 55 Mod 1 differs from the Mod 0 by having an aluminum body.

RESTRICTED



- CLOSING PLUG
- OBTURATING CUP
- SEALING DISC
- FIRING PIN
- FIRING PIN DETENTS
- ROTOR
- ROTOR HOUSING
- ROTOR DETENTS

BOOSTER LEAD-IN

ADAPTER

BOOSTER

**MK. 43**

**MOD. 1**

**AUXILIARY DETONATING FUZE**

**DATA**

RESTRICTED

**U. S. NAVY**

PROJECTILES USED IN

5"/54 H.C. Mk 41  
6"/47 H.C. Mk 39  
(for use in 6" D.P.  
guns.)

MARKINGS

(On head of fuze)  
AUX  
DET FUZE  
Mk 43  
Mod \_\_\_\_\_  
Lot No. \_\_\_\_\_  
PMC 194 \_\_\_\_\_  
HDB \_\_\_\_\_**MK.43****MODS. 0 & 1**

OVERALL LENGTH

3.18 in.

DIAMETER

1.38 in.

THREADED LENGTH

0.625 in.

THREADS

11 L.H.

MATERIAL OF CONSTRUCTION

Steel

ARMING SPEED

3000 - 4500 R.P.M.

AUXILIARY DETONATING FUZE

**DESCRIPTION:**

The Mk 43 auxiliary detonating fuze is identical to the Mk 54 and Mods except that it has a longer body and contains two booster pellets in tandem instead of the single booster in the Mk 54. This is necessitated by the longer and narrower nose cavities of the 5"/54 and 6"/47 H.C. rounds in which the fuze will be used.

The fuze is composed of a one piece body with a booster cap and a plug closing either end. The body assembly consists of a firing pin housing and a rotor housing, both of which are contained in a thin metal sleeve. In the middle of the closing plug is an obturating cup, and a sealing disc is located between the plug and the firing pin housing. The firing pin housing contains a pointed metal firing pin, which is held in position by two firing pin detents. Contained within the rotor housing is a rotor and two rotor detents. The rotor, which accommodates two lead counterweights and the detonator, is assembled in the housing with the axis of the detonator at an angle of about 55° from the axis of the fuze. The line of centers of the lead counterweights is about 30° from the axis of the fuze, and two stop pins are so positioned on the outer circumference of the rotor that they will engage two holes in the rotor housing. The rotor is held in the unarmed position by the two rotor detents, the tapered ends of which engage in holes in the side of the rotor.

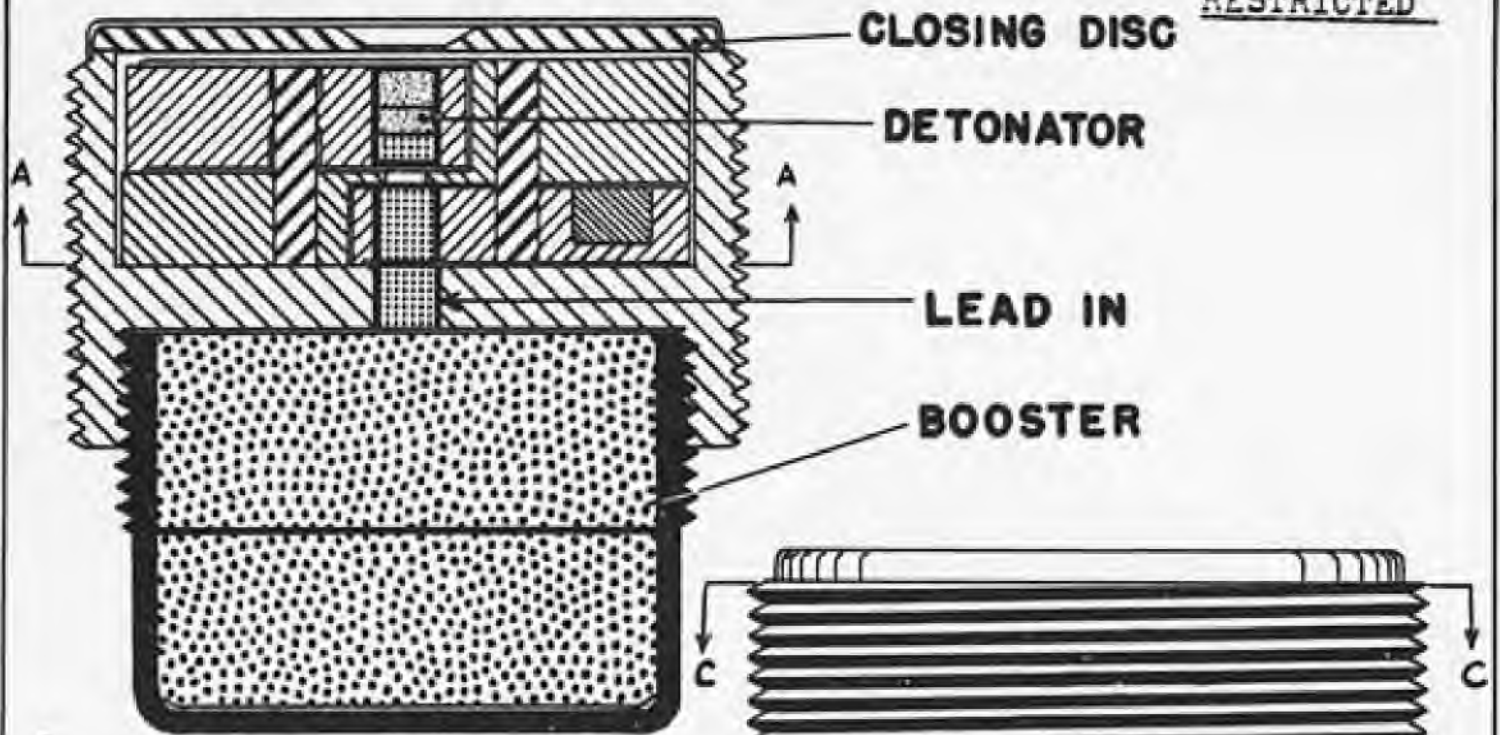
**OPERATION:**

When the projectile is fired from the gun, centrifugal force moves the firing pin and rotor detents back against their springs, and causes the lead counterweights to turn the rotor until the detonator is aligned with the firing pin and the booster lead-in. In this position the rotor is prevented from further turning by the stop pins, and is held in this position, since the weights will remain at the maximum radius from the axis of rotation.

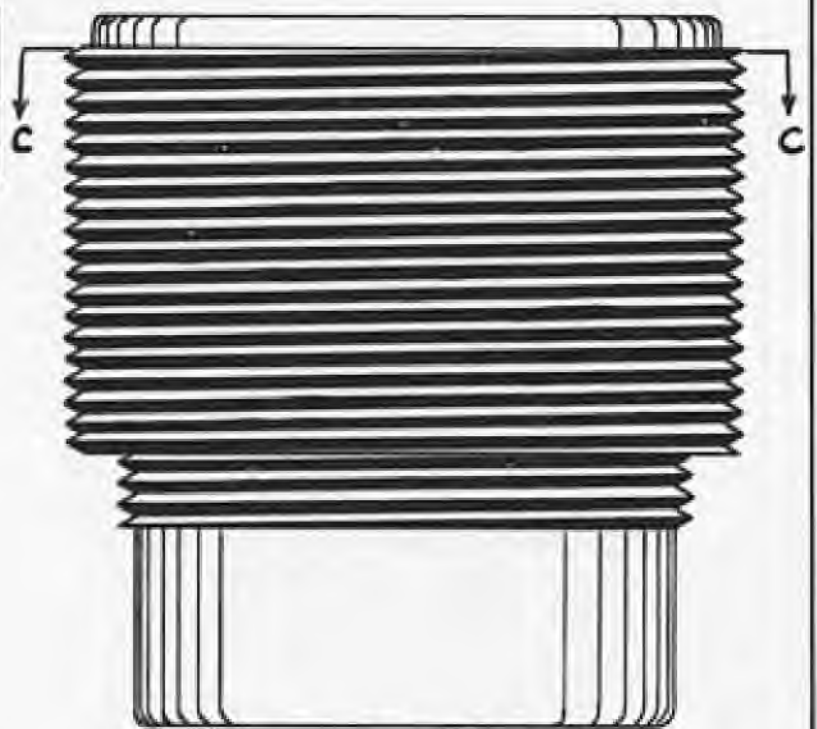
When the nose fuze functions, the gas pressure generated by its ignition forces the obturating cup down, shearing the sealing disc adjacent to the firing pin and driving the firing pin down into the detonator, which fires the booster lead-in and the booster.

**REMARKS:**

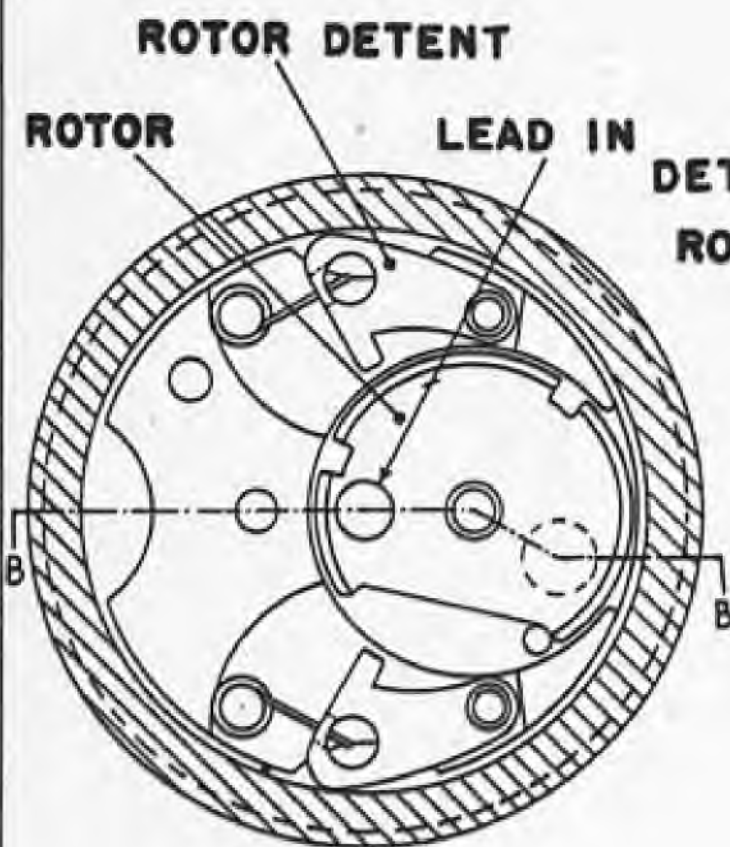
1. The Mk 43 Mod 1 (illustrated) consists of a Mk 54 fuze modified by threading an adapter and an additional booster pellet to the base of the Mk 54 fuze.
2. A lead azide detonator and a pointed firing pin are used in this fuze to secure greater stability in the detonator and prevent deterioration because of moisture.
3. This fuze is not designed to function alone, but will function only by the gas pressure generated by the firing of a nose fuze.



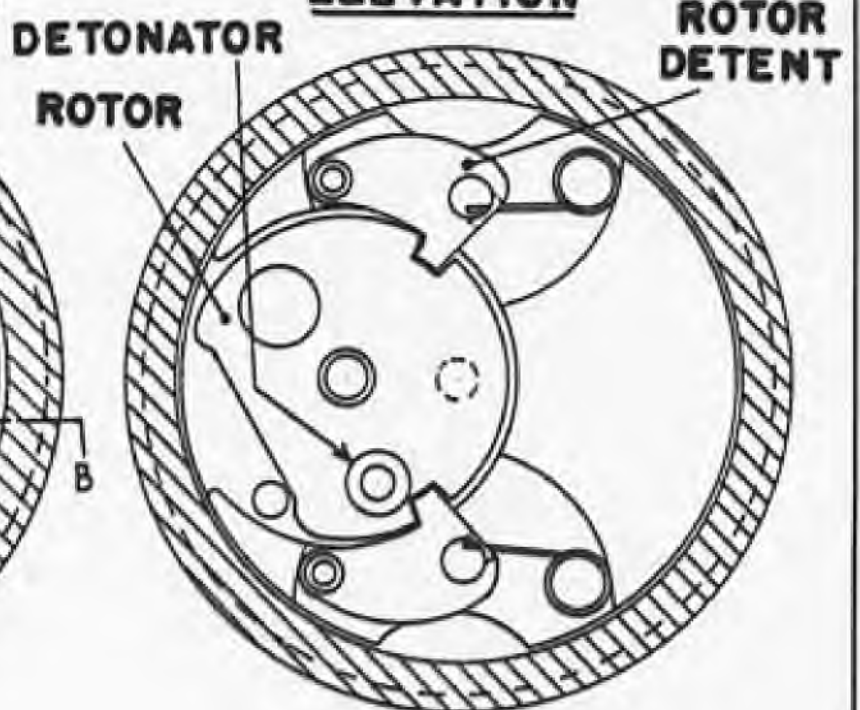
**SECTION B-B  
(ARMED)**



**ELEVATION**



**SECTION A-A  
(ARMED)**



**SECTION C-C  
(UNARMED)**

**MK. 44 MOD. I  
AUXILIARY DETONATING FUZE**

**DATA**

RESTRICTED

**U. S. NAVY**

## PROJECTILES USED IN

- (a) 3"/50 A.A.  
 5"/25/38/51 A.A.  
       Common  
 5"/54 H.C.  
 6"/47 H.C.  
 (b) 8"/55 H.C.  
 12"/50 H.C.  
 14"/45/50 H.C.  
 16"/45/50 H.C.

**A. MK. 44****B. MK. 52**

## MARKINGS

AUX. DET. FUZE  
Mk (44 or 52)OVERALL LENGTH  
DIAMETER

1-13/16 in.

Rotor Housing  
Booster Cup1.5 in.  
1.25 in.

AUXILIARY DETONATING FUZE

DESCRIPTION:

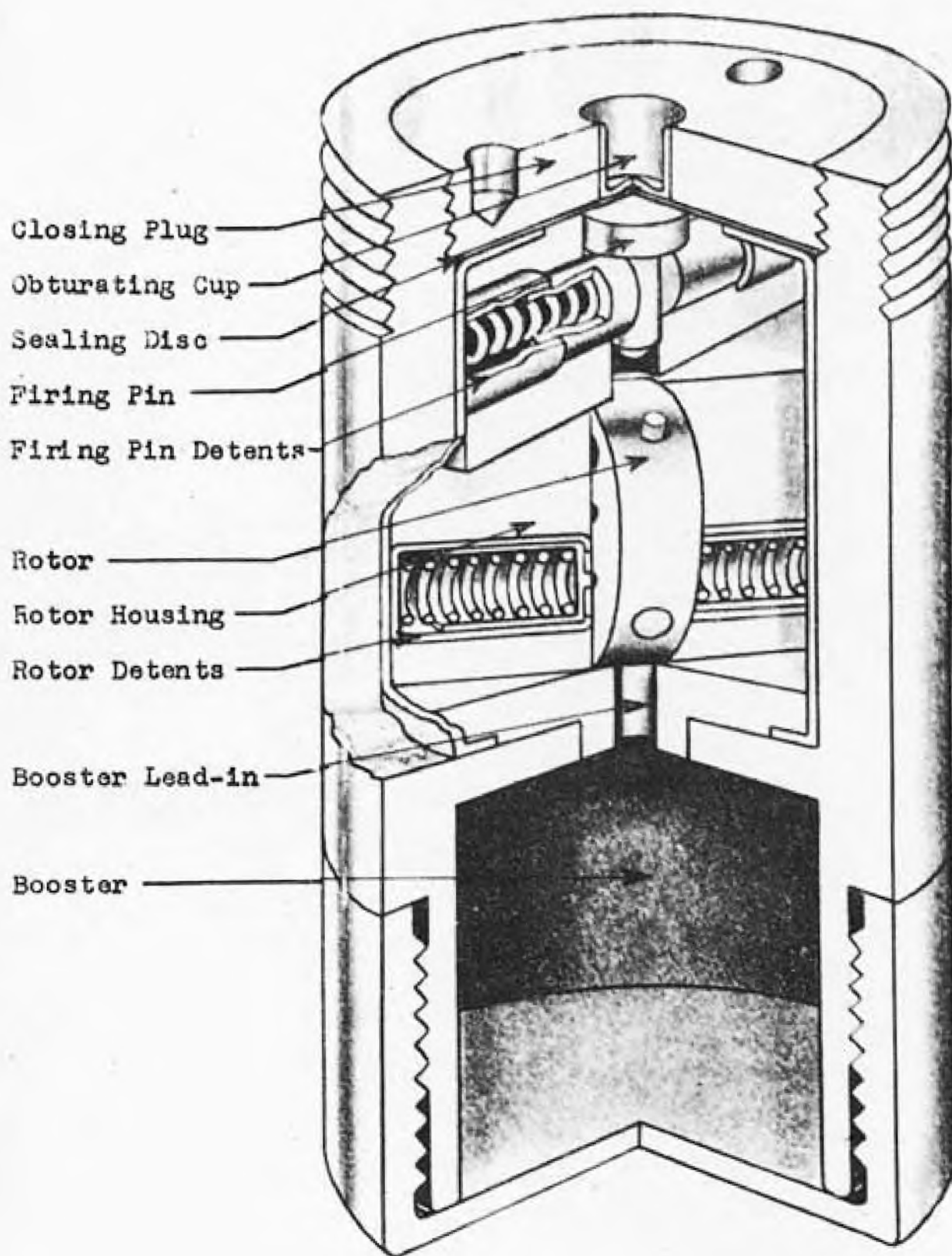
This fuze is constructed in two parts, a booster cup and a rotor housing into the base of which the former is screwed. The rotor housing contains a double rotor assembly, one rotor located above the other. The upper rotor contains a primer detonator incorporating lead azide. The lower rotor contains a booster lead-in of tetryl. In the assembled position each rotor is locked by two centrifugal detents so that the components of the firing train are out of alignment.

OPERATION:

The fuze is armed by centrifugal force, which causes the two sets of rotor detents to move outward against their springs, unlocking the rotors. The weighted rotors are then revolved by centrifugal force, until their motion is arrested by the stop pins. At this time the firing train is fully aligned, with the detonator immediately above the booster lead-in, and the fuze is armed. When the nose fuze functions, the gas pressure generated forces through the weakened part of the closing disc and fires the detonator, which initiates the booster lead-in and the booster.

REMARKS:

1. This fuze is not designed to function alone, but will function only by the gas pressure generated by the firing of the nose fuze.
2. The Mk 52 auxiliary detonating fuze is identical to the Mk 44 in all respects, except that the rotor detent springs have been considerably weakened, allowing arming at lower rotational velocities than the Mk 44. This alteration was necessitated since the Mk 52 is employed in the low spin major caliber H.C. projectiles.



# MK.46

## AUXILIARY DETONATING FUZE

**DATA**

RESTRICTED

**U. S. NAVY  
MK.46**

Projectiles Used in . . . 3"/23 AA  
 3"/50 AA & HC  
 4"/50 HC  
 5"/25/39/51 AA Common  
 5"/51 HC  
 6"/47 HC  
 6"/53 HC  
 8"/55 HC

Markings . . . . . (On Head of Fuze)

AUX  
 DET FUZE  
 Mk 46  
 Lot No.  
 PMC 1943

AUXILIARY DETONATING FUZE

Fuzes found with . . . . Mk 18 Mods 2-4, Mk22 and Mods 1-5, Mk 29 Mods 1-3,  
 Mk 30 Mods 1-3.

Overall length . . . . 215

Diameter . . . . 1 1/32

Threaded length . . . . 0 1/8

Threads . . . . 10 L.H.

Material of Construction. Steel body - not painted.

Arming speed . . . . 3000-4000 r.p.m.

DESCRIPTION

The fuze is composed of a one piece body with a booster cap and plug closing the ends. The body assembly consists of the firing pin housing and the rotor housing, both of which are contained in a thin metal sleeve. In the middle of the closing plug is an obdurating cup, and there is a sealing disc between the plug and the firing pin housing. The firing pin housing contains a metal firing pin which is held in position by two firing pin detents. Contained within the rotor housing is a rotor and two rotor detents. The rotor, which contains two lead counterweights and the detonator is assembled in the housing with the axis of the detonator at an angle of about 55 degrees from the axis of the fuze. There are two major changes between this fuze and its predecessor, the Mk 17:

1. Two stop-pins have been added to the sides of the rotor and two holes cut in the rotor housing so that when the detonator has become aligned with the firing pin, the stop pins will engage the sides of these holes and prevent further rotation of the rotor.
2. To make the rotor "positive arming", an additional weight was added on one side of the original weights in the rotor and a hole has been bored on the opposite side of the original weight. This serves the purpose of shifting the center of weight of the rotor and of making sure that it will align properly. In the fuzes being manufactured today, the original weight has been moved approximately 5 degrees closer to the detonator and the extra weights and holes eliminated, so that the same result is achieved by a simpler method.

The rotor is held in the unarmed position by the two rotor detents, the tapered ends of which engage in holes in the side of the rotor.

OPERATION

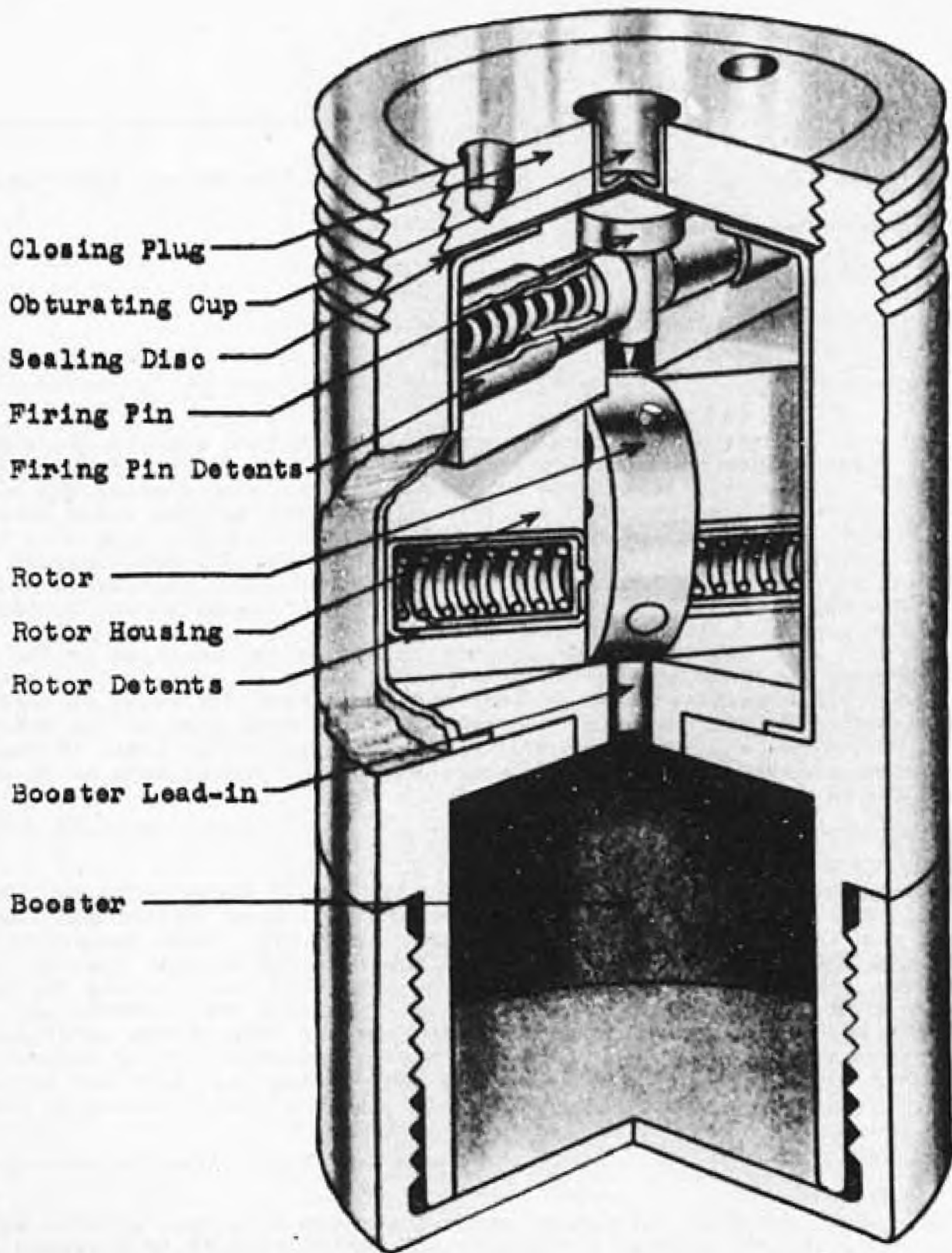
As the projectile is fired from the gun, centrifugal force moves the firing pin and rotor detents back against their springs. Then centrifugal force, acting upon the lead counterweights in the rotor, will cause the rotor to turn until the detonator assembly is in line with the booster lead-in and firing pin. In this position the rotor is prevented from turning further because of the stop pins and is held in this position since centrifugal force will hold the weights at a maximum radius from the axis of the rotation. When the nose fuze functions, the gas pressure generated by its detonation forces the obdurating cup down, shearing the sealing disc adjacent to the firing pin and driving the firing pin down into the primer-detonator assembly which fires the booster lead-in and the booster.

REMARKS

This fuze is sometimes referred to as the Mk 17 Mods 8-13, the differences in Mods being only a difference in manufacturers.

This fuze is not designed to function by itself, but will function only by the gas pressure generated by the detonation of a nose fuze.

This fuze is being replaced by the Mk 54 auxiliary detonating fuze.



# MK.54

## AUXILIARY DETONATING FUZE

**DATA**

RESTRICTED

**U. S. NAVY  
MK.54**

Projectiles Used in . . . 3"/23 AA  
 3"/50 AA & HC  
 4"/50 HC  
 5"/25/38/51 AA Common  
 5"/51 HC  
 6"/47 HC  
 6"/53 HC

Markings . . . . . (On Head of Fuze)

AUX  
 DET FUZE  
 Mk 54

AUXILIARY DETONATING FUZE

Lot No.  
 PMC 1944  
 HDB

Fuzes found with . . . . Mk 18 Mods 2-4; Mk 22, Mods 1-5; Mk 29, Mods 1-3;  
 Mk 30 Mods 1-3.

Overall length . . . . . 2<sup>1</sup>/<sub>5</sub>  
 Diameter . . . . . 1<sup>1</sup>/<sub>32</sub>  
 Threaded length . . . . . 0<sup>7</sup>/<sub>96</sub>  
 Threads . . . . . 10 L.H.  
 Material of Construction. Steel body - not painted  
 Arming speed . . . . . 3000-4000 r.p.m.

DESCRIPTION

This fuze is identical to the Mk 46 except for the fact that it has a primer of lead azide rather than fulminate of mercury, which the Mk 46 had. It is composed of a one piece body with a booster cup and plug closing the ends. The body assembly consists of the firing pin housing and the rotor housing, both of which are contained in a thin metal sleeve. In the middle of the closing plug is an obdurating cup, and there is a sealing disc between the plug and the firing pin housing. The firing pin housing contains a metal firing pin which is held in position by two firing pin detents. Contained within the rotor housing is a rotor and two rotor detents. The rotor, which contains two lead counterweights and the detonator is assembled in the housing with the axis of the detonator at an angle of about 55 degrees from the axis of the fuze. The line of centers of the lead counterweights is at an angle of about 30 degrees from the axis, and there are two stop pins on the side of rotor fitting through two holes in the rotor housing. The rotor is held in the unarmed position by the two rotor detents, the tapered ends of which engage in holes in the side of the rotor.

OPERATION

As the projectile is fired from the gun, centrifugal force moves the firing pin and rotor detents back against their springs. Then centrifugal force, acting upon the lead counterweights in the rotor, will cause the rotor to turn until the detonator assembly is in line with the booster lead-in and firing pin. In this position the rotor is prevented from turning further because of the stop pins and is held in this position since centrifugal force will hold the weights at a maximum radius from the axis of the rotation. When the nose fuze functions, the gas pressure generated by its detonation forces the obdurating cup down, shearing the sealing disc adjacent to the firing pin and driving the firing pin down into the primer-detonator assembly which fires the booster lead-in and the booster.

REMARKS

The purpose in changing the primer composition was to secure greater stability in the primer and to prevent it from deteriorating because of moisture.

This fuze is not designed to function by itself, but will function only by the gas pressure generated by the detonation of a nose fuze.

The Mk 54 further differs from the Mk 46 in that it has a pointed firing pin.

The Mk 54 Mod 1 (not yet in production) differs from the Mod 0 by having an aluminum body.

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41

# **PRIMERS & TRACERS**

## **SECTION 5**

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# PRIMERS & TRACERS

## INTRODUCTION

### PRIMERS

A primer is a device for initiating the burning or detonating of an explosive charge.

They are divided into three classes based on the method by which the primer is actuated.

1. Percussion:

Contains a sensitive explosive fired by impact or friction.

2. Combination:

Contains a sensitive explosive fired by either percussion or electrical means. Primers of this type which are used in bag guns are called "lock combination primers".

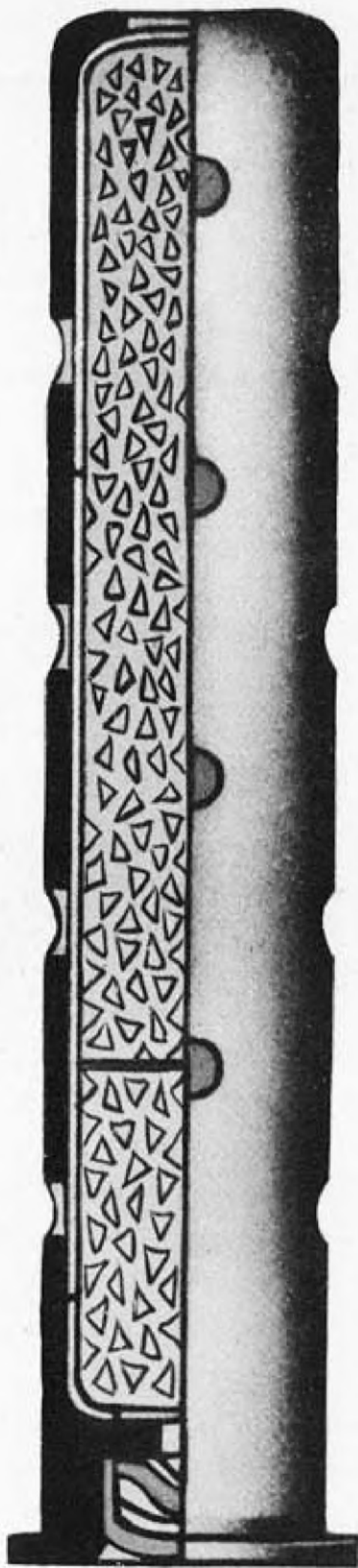
3. Electrical:

Contains a sensitive explosive fired by electrical means only. This type is used in rocket projectors and similar equipment.

### TRACERS

Tracers are devices which are designed to leave a trace of either smoke or flame showing the path of the projectile during its time of flight. Tracers are either screwed or pressed into the aft end of the projectile and may be set into the interior of the projectile, in which case they are internal tracers, or they may project from the end of the projectile in which case they are called external tracers. Tracers may be ignited by the heat from the burning of the propelling charge or may be equipped with a striker and detonator which ignites the tracer when the force of setback occurs.

Some tracers are designed to detonate the explosive charge in the projectile when the illuminant material has burned out by the flame from the tracer igniting a detonator which in turn ignites the main charge.



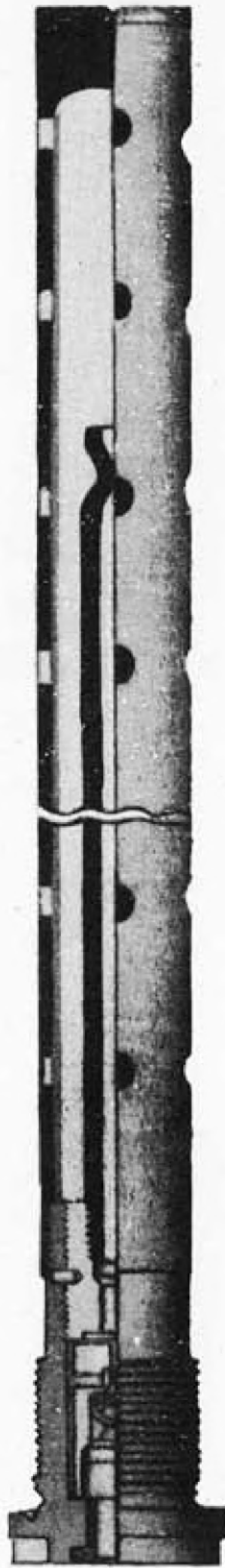
**MK. 10, MOD. 9  
PRIMER**

**DATA**

RESTRICTED

**U. S. NAVY  
MK. 10 MOD. 9****PERCUSSION PRIMER**

OVERALL LENGTH	2.21 in.
DIAMETER OF BODY	.375 in.
DIAMETER OF LIP	.473 in.
THICKNESS OF LIP	.025 in.
DIAMETER OF CAP CONTAINER	.2335 in.
WALL THICKNESS	.024 in.
NUMBER OF HOLES	16
DIAMETER OF HOLES	.089 in.
LENGTH OF IGNITION TUBE	None
MATERIAL OF CONSTRUCTION	Brass
HOW SECURED	Push Fit
MARKINGS	"Mk. 10-9", Manufacturer's symbol & year of manufacture.
NATURE OF CHARGE	Black Powder and Cannon Powder
WEIGHT OF CHARGE	10 grams black powder, 26 grams cannon powder.
COMPOSITION OF CAP	Commercial mixture of mercury fulminate, potassium chlorate and antimony sulfide.
GUNS USED IN:	3"/23; 1,3,& 6 Pounder.
REMARKS:	Primer Mk 10 Mod 8 is similar to the Mk 10 Mod 9, but is authorized for use only with saluting charges.



**MK.13  
PRIMER**

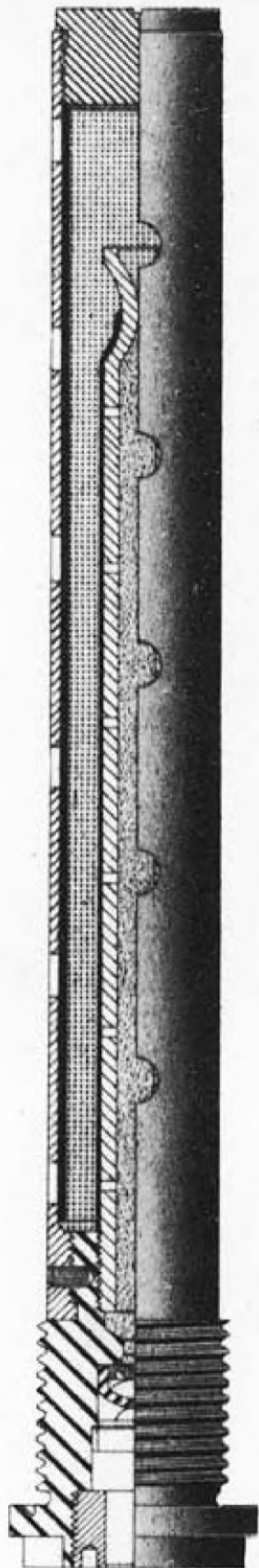
**DATA**

RESTRICTED

**U. S. NAVY****MK. 13****COMBINATION PRIMER**

OVERALL LENGTH	9.745 in.
DIAMETER OF BODY	.538 in.
DIAMETER OF LIP	.80 in.
THICKNESS OF LIP	.098 in.
DIAMETER OF CAP CONTAINER	.32 in.
WALL THICKNESS	.036 in.
NUMBER OF HOLES	24
DIAMETER OF HOLES	.141 in.
LENGTH OF IGNITION TUBE	7.0" Brass tubing screwed into primer.
MATERIAL OF CONSTRUCTION	Brass
HOW SECURED	Screwed into cartridge case
MARKINGS	Four circular holes in base for tool
NATURE OF CHARGE	Black powder in primer and ignition tube
WEIGHT OF CHARGE	265 grams in primer
COMPOSITION OF CAP	Mixture of Potassium Chlorate, Antimony Sulfide and Mercury Fulminate.
GUNS USED IN:	4"/50, 5"/38, 5"/25, 5"/51, 6"/47 case guns.

RESTRICTED



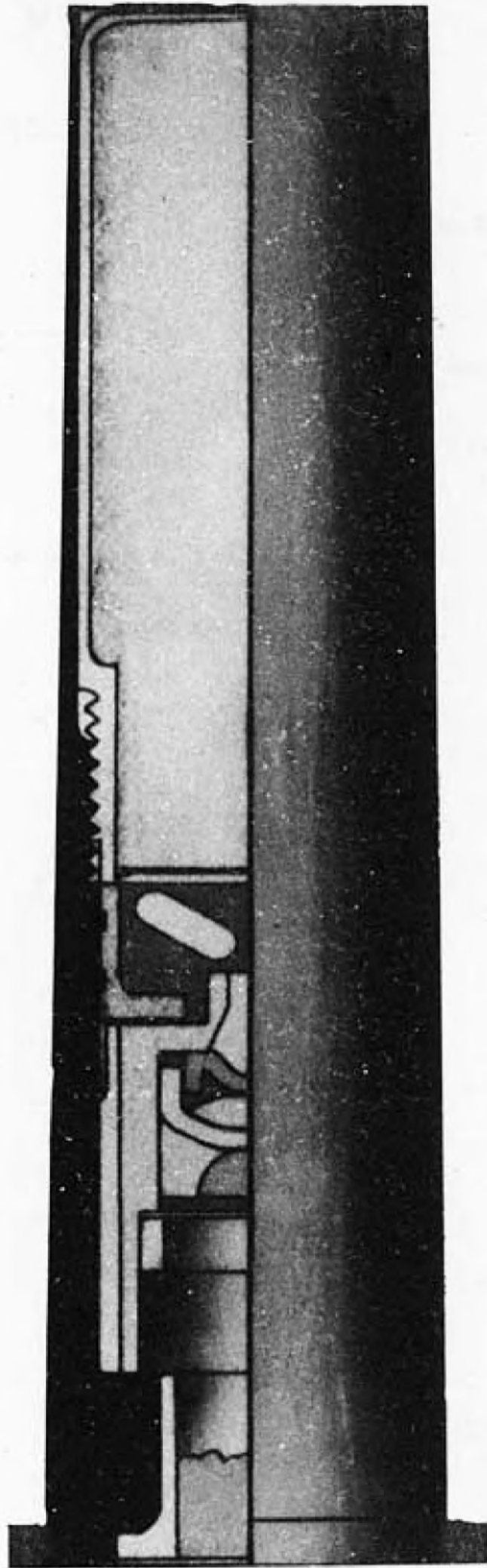
**PRIMER  
MK.14**

**DATA**

RESTRICTED

**U. S. NAVY****MK. 14****PERCUSSION  
PRIMER**

OVERALL LENGTH	5.021 in.
DIAMETER OF BODY	0.55 in.
DIAMETER OF LIP	0.80 in.
THICKNESS OF LIP	0.098 in.
DIAMETER OF CAP CONTAINER	0.358 in.
WALL THICKNESS	Outer tube: 0.0365" Inner tube: 0.047"
NUMBER OF HOLES	22
LENGTH OF IGNITION TUBE	Outer tube: 4.15 in. Inner tube: 3.407 in.
MATERIAL OF CONSTRUCTION	Brass
METHOD OF SECURING	Screwed into base of cartridge case by 11 R.H. threads
MARKINGS	Four semi-circular holes in base for wrench
NATURE OF CHARGE	Black powder
COMPOSITION OF CAP	Mercury fulminate, antimony sulfide, and potassium chlorate
GUNS USED IN	3"/50



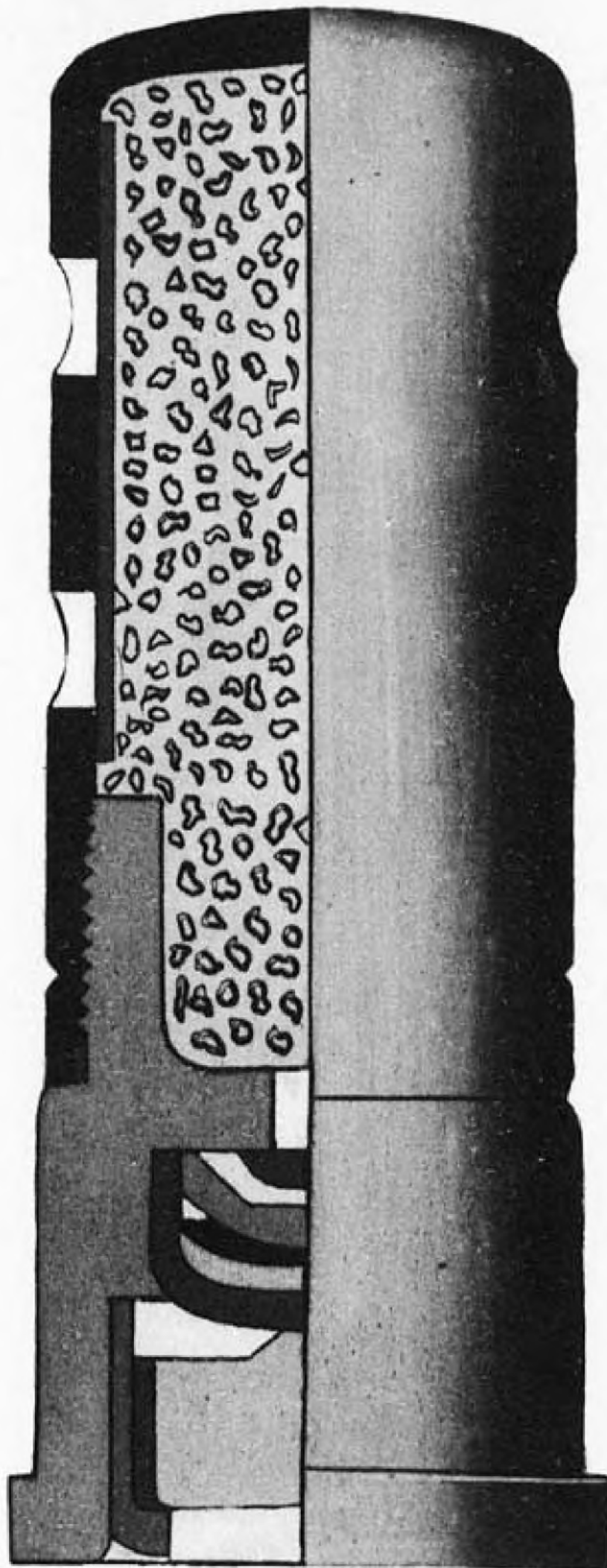
**MK.15, MOD.1  
PRIMER**

**DATA**

RESTRICTED

**U. S. NAVY  
MK.15 MOD.1****LOCK COMBINATION  
PRIMER**

OVERALL LENGTH	1.985 in.
DIAMETER OF BODY	.492 in.
DIAMETER OF LIP	.596 in.
THICKNESS OF LIP	.050 in.
DIAMETER OF CAP CONTAINER	.320 in.
WALL THICKNESS	.022 in.
NUMBER OF HOLES	None
MATERIAL OF CONSTRUCTION	Bronze
HOW SECURED	Push fit in breech plug of gun
NATURE OF CHARGE	Black powder
WEIGHT OF CHARGE	30 grams
COMPOSITION OF CAP	Mercury fulminate, antimony sulfide and potassium chlorate
GUNS USED IN:	All Bag Guns



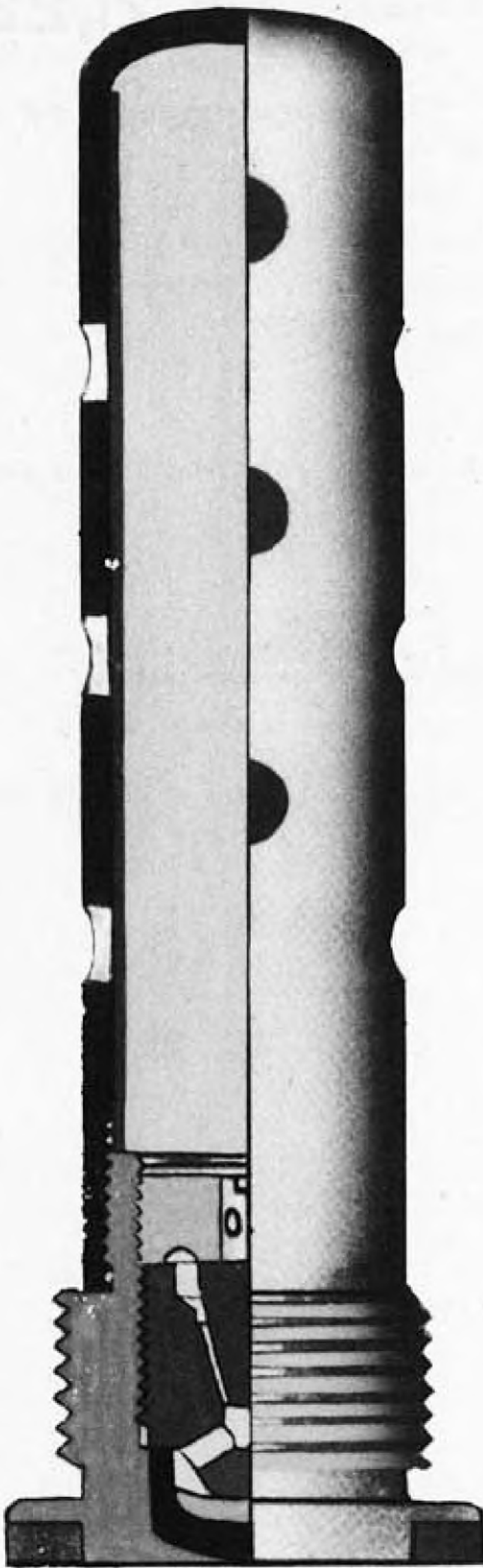
**MK.19  
PRIMER**

**DATA**

RESTRICTED

**U. S. NAVY****MK. 19****PERCUSSION PRIMER**

OVERALL LENGTH	1.71 in.
DIAMETER OF BODY	.54 in.
DIAMETER OF LIP	.62 in.
LIP THICKNESS	.079 in.
DIAMETER OF CAP CONTAINER	.401 in.
WALL THICKNESS	.035 in.
NUMBER OF HOLES	6
DIAMETER OF HOLES	.140 in.
LENGTH OF IGNITION TUBE	None
MATERIAL OF CONSTRUCTION	Brass
HOW SECURED	Push fit
MARKINGS	"Mk.XIX Mod 1", mfg's initials and lot number
NATURE OF CHARGE	Army black powder
WEIGHT OF CHARGE	28 grains
COMPOSITION OF CAP	Mixture of TNT, antimony sulfide and potassium chlorate
GUNS USED IN:	191



**MK. 21**



**MK. 22**

**PRIMERS**

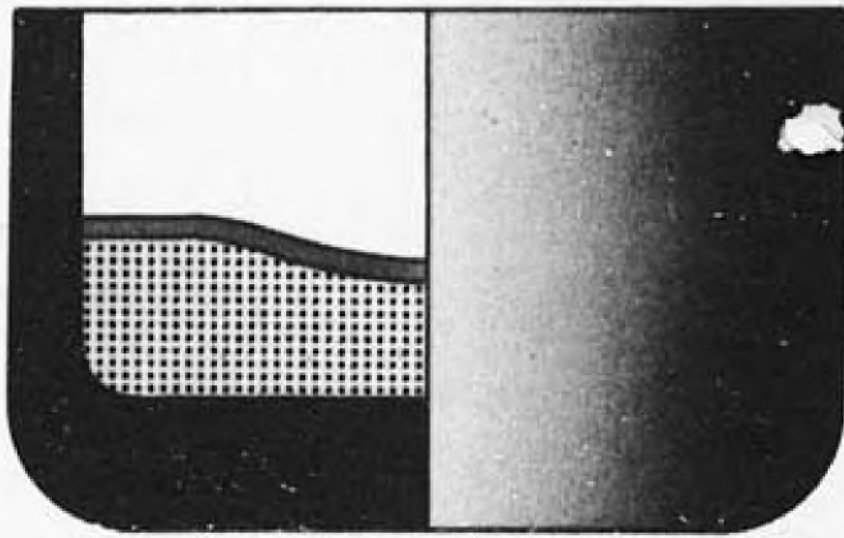
**DATA**

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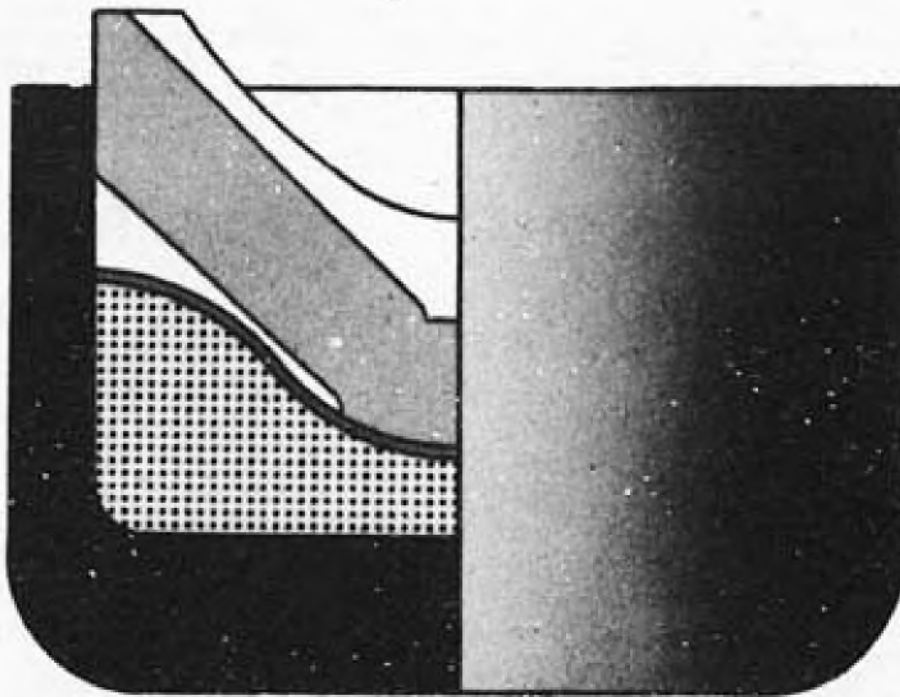
**U. S. NAVY****MK. 21, 22****PERCUSSION PRIMER**

	<u>Mk. 21</u>	<u>Mk. 22</u>
OVERALL LENGTH	2.9" (app.)	2.9" (app.)
DIAMETER OF BODY	.54 in.	.54 in.
WALL THICKNESS		.035 in.
NUMBER OF HOLES		12
DIAMETER OF HOLES		.140 in.
LENGTH OF IGNITION TUBE	None	None
MATERIAL OF CONSTRUCTION	Brass	Brass
HOW SECURED	Screws into car- tridge case. R.H. threads.	Push fit
MARKINGS		"Mk. 22" Mfg's initials, loading plant, lot number, year.
NATURE OF CHARGE	Black powder	
WEIGHT OF CHARGE	64 grains	64 grains
COMPOSITION OF CAP	1. Mixture of 1.2 grains fulminate of mercury, potassium chlorate and antimony sulfide. 2. The Mk 21 primer is used in the 40 mm Mk 1 (brass) case. 3. The Mk 22 primer is used in the 40 mm Mk 2 (brass) and Mk 3 (steel) cases.	

05700



**PERCUSSION PRIMER  
MK.30**



**PERCUSSION PRIMER  
MK.31**

**DATA**

RESTRICTED

OVERALL LENGTH	0.200 in.
DIAMETER OF BODY	0.314 in.
WALL THICKNESS	0.024 in.
NUMBER OF HOLES	None
MATERIAL OF CONSTRUCTION	Brass
METHOD OF SECURING	Press fit
MARKINGS	None
NATURE OF CHARGE	Fulminate of mercury, potassium chlorate, antimony sulfide
WEIGHT OF CHARGE	2.5 grains

**U. S. NAVY****MK.30****PERCUSSION PRIMER****REMARKS:**

This primer is employed in the 20 mm A.A. Mk 2 brass cartridge cases.

**DATA**

RESTRICTED

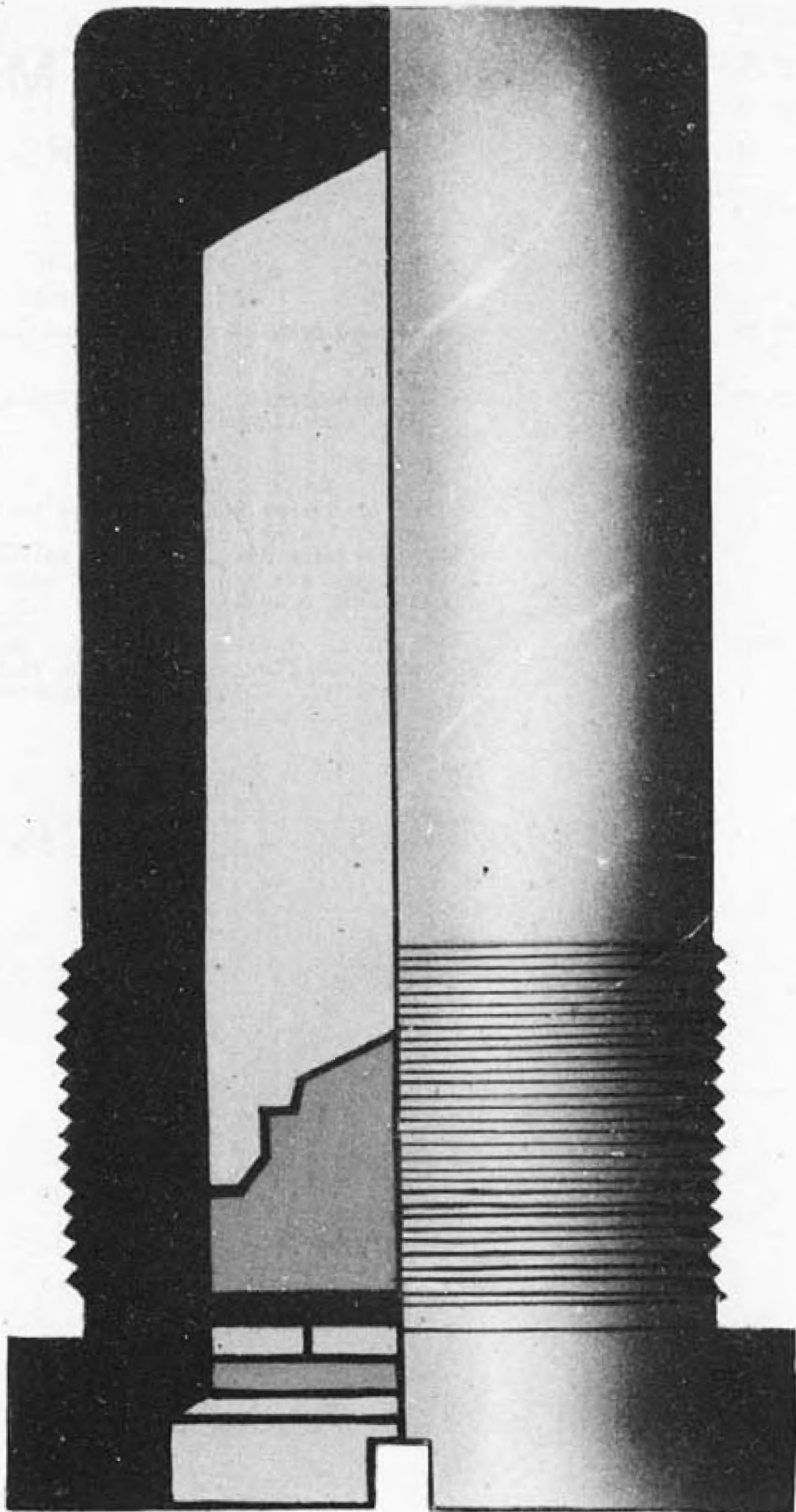
OVERALL LENGTH	0.250 in.
DIAMETER OF BODY	0.3325 in.
WALL THICKNESS	0.030 in.
NUMBER OF HOLES	None
MATERIAL OF CONSTRUCTION	Brass
METHOD OF SECURING	Press Fit
MARKINGS	None
NATURE OF CHARGE	Lead sulphocyanate, antimony sulfide, potassium chlorate, pentaerythritol tetranitrate.
WEIGHT OF CHARGE	2.10 grains

**U. S. NAVY****MK.31**

(U. S. ARMY M 36 TYPE)

**PERCUSSION PRIMER****REMARKS:**

This primer is the same as the Army M 36 and M 36A1 primers and is employed in the 20 mm A.A. Mk 3 (steel) and Mk 4 (brass) cases as well as the Army M 21A1 series cases for 20 mm Aircraft ammunition.



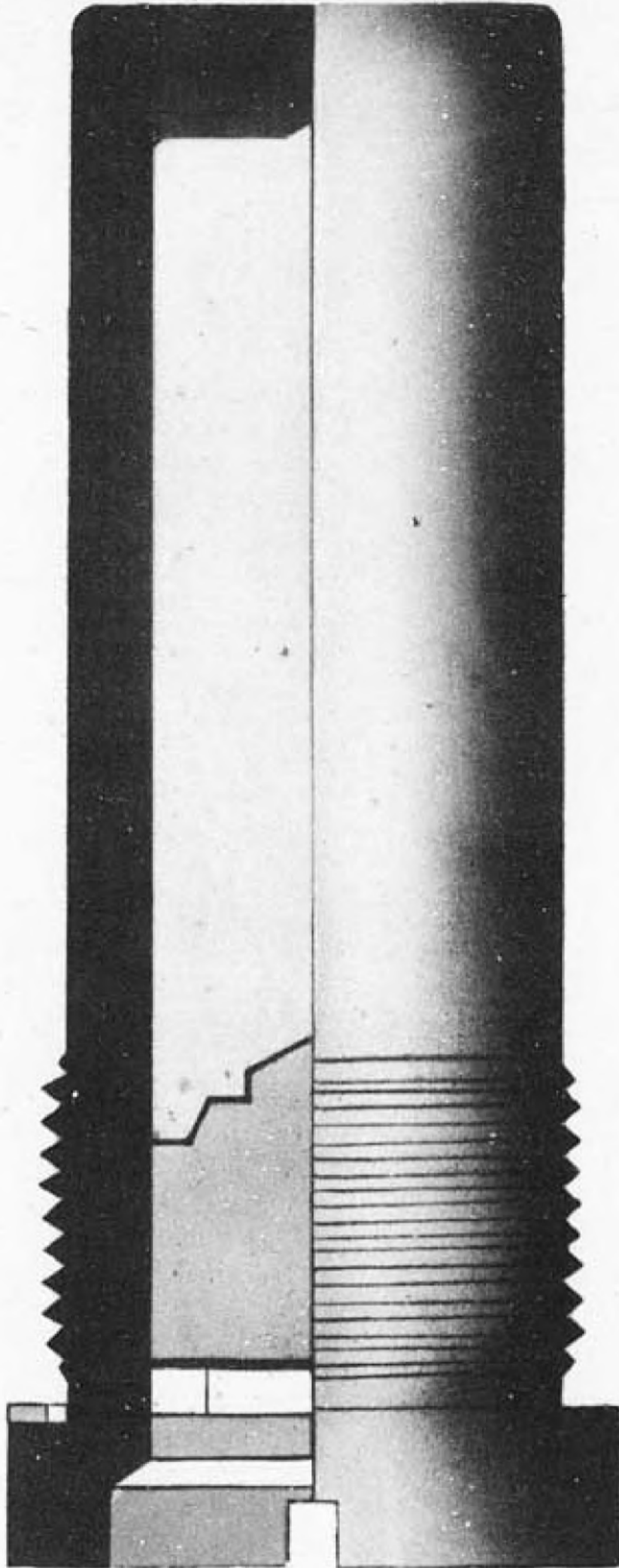
**MK.5, MOD. I  
TRACER**

**DATA**

RESTRICTED

**U. S. NAVY****MK.5****MK.5 MOD.1****TRACERS**

OVERALL LENGTH	2.48 in.
DIAMETER OF HEAD	1.248 in.
DIAMETER OF THREADS(MAJOR)	1.0625 in.
DIAMETER OF ILLUMINANT CAVITY	.625 in.
METHOD OF SECURING	Screws into base of projectile by 15 L.H. threads
COMPOSITION OF STARTER PYROTECHNIC	Barium peroxide and magnesium powder.
COMPOSITION OF ILLUMINANT	Sodium nitrate, calcium silicide, charcoal, and linseed oil.
COLORS USED	Orange
MARKINGS	End of tracer painted orange to indicate color. "Tr.Mk. 5(or 5-1) Lot _____," together with manufacturer's initials, loading date and initial of color; ("O" for orange)
IGNITION METHOD	The hot propellant gases burn through the celluloid disc, igniting the starter pyrotechnic which in turn ignites the orange illuminant.



**MK. 6  
TRACER**

# DATA

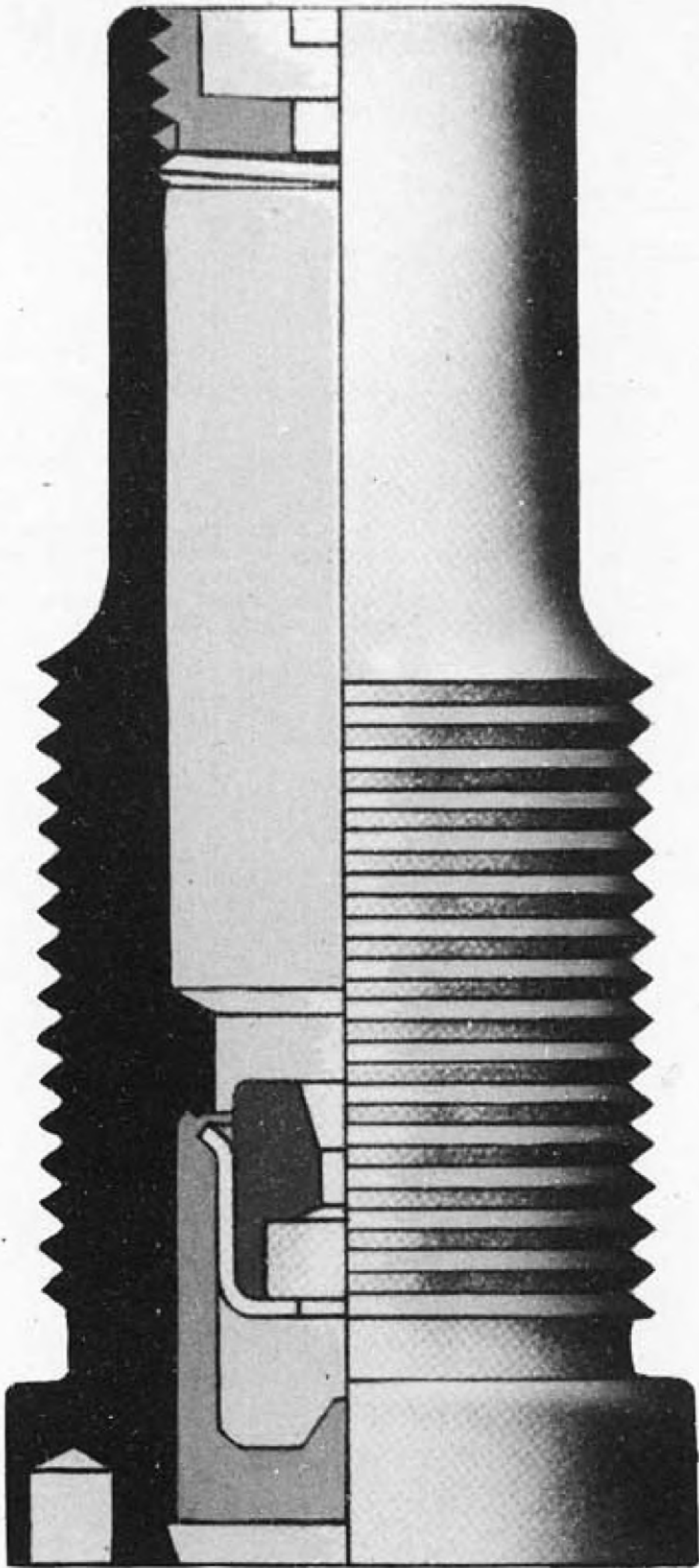
RESTRICTED

# U.S. NAVY MK. 6

Mods 0 & 1

# TRACER

OVERALL LENGTH	2.45 in.
DIAMETER OF HEAD	0.939 in.
DIAMETER OF THREADS	13/16 in.
DIAMETER OF ILLUMINATING CAVITY	0.5 in.
METHOD OF SECURING	Screws into base plate by means of 10 L.H. threads.
COMPOSITION OF STARTER PYROTECHNIC	Barium peroxide and magnesium powder.
COMPOSITION OF ILLUMINANT	RED: Strontium nitrate, ammonium perchlorate, magnesium powder, charcoal, and linseed oil. WHITE: Barium nitrate, barium peroxide, magnesium powder, aluminum powder, and wax.
COLORS USED:	Mod 0: Red and White. Mod 1: Orange.
MARKINGS:	End of tracer painted red, white, or orange to indicate tracer color. "Mk VI (Mod 1) LOT _____", with manufacturer's initials, year, and color abbreviation stamped on head.
IGNITION METHOD:	Hot gases of propellant burn through the celluloid disc and ignite the starter mixture which then fires the illuminant.
PROJECTILES USED IN:	Mod 0: with adapter in Mks 28 & 31 5"/25 & 5"/38 A.A. Common projectiles, blind loaded for target practice. Mod 1: with adapter in 4"/50 Mk 6 Mod 6 and Mk 10 Mods 0 - 3 Common and 5"/51 Mk 15 Mods 5 & 13 Common projectiles, blind loaded for target practice.



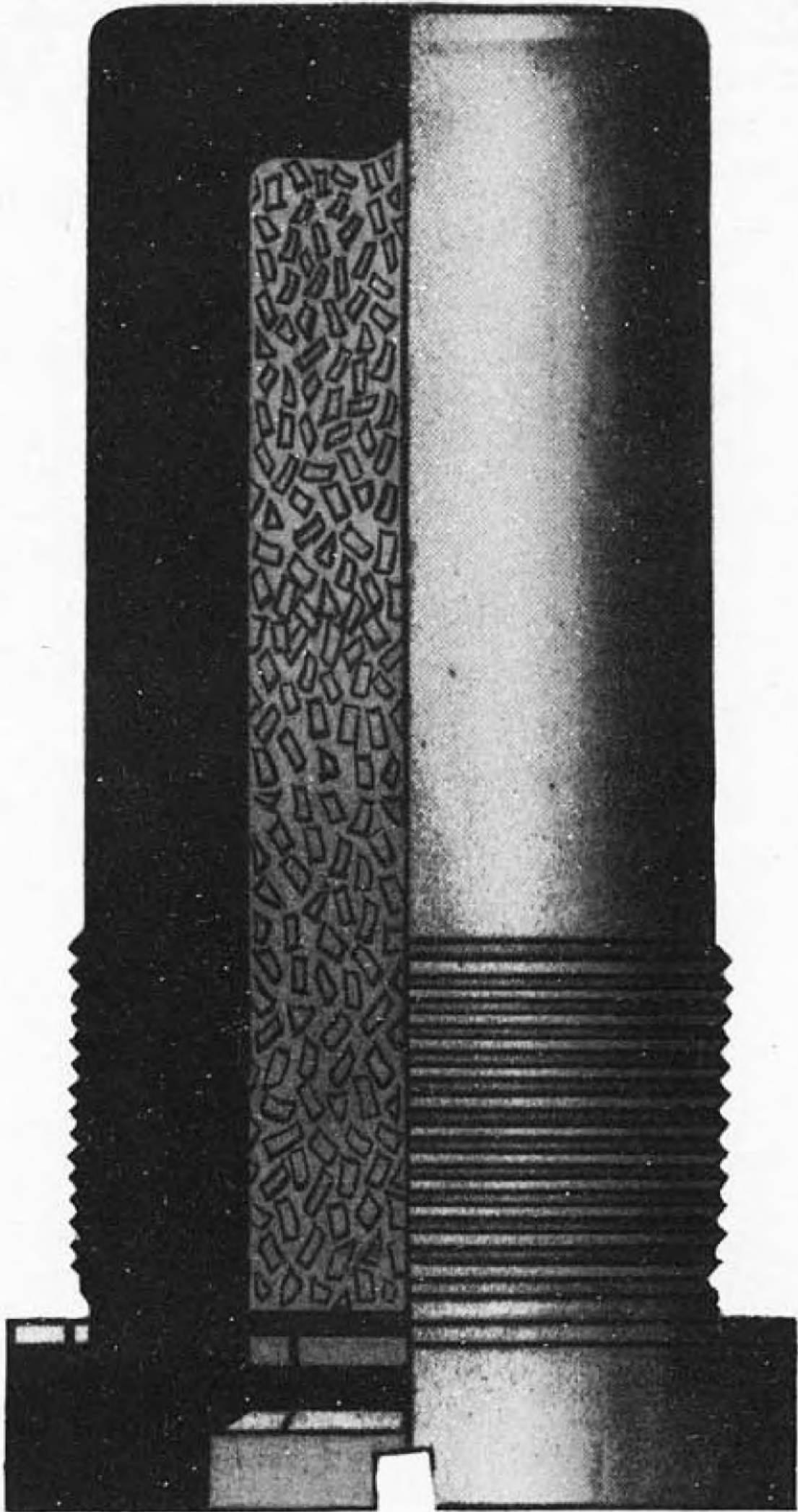
**MK. 8  
TRACER**

**DATA**

RESTRICTED

**U. S. NAVY****MK.8****TRACER**

OVERALL LENGTH	2.12 in.
DIAMETER OF HEAD	.925 in.
DIAMETER OF THREADS (MAJOR)	.830 in.
DIAMETER OF ILLUMINANT CAVITY	.475 in.
METHOD OF SECURING	Screws into shell base by 17 L.H. threads.
COMPOSITION OF STARTER PYROTECHNIC	Barium peroxide and magnesium powder.
MARKING	"MK.8 MOD ___ LOT ___", stamped on head.
IGNITION METHOD	The cap holder, when the shell is fired, sets back, thus overcoming the stirrup spring and forces itself against the anvil, igniting and initiating the action of the tracer and blowing out the sealing disc aft of the anvil.
PROJECTILES USED IN:	40 mm A.A.



**MK. 9  
TRACER**

**DATA**

RESTRICTED

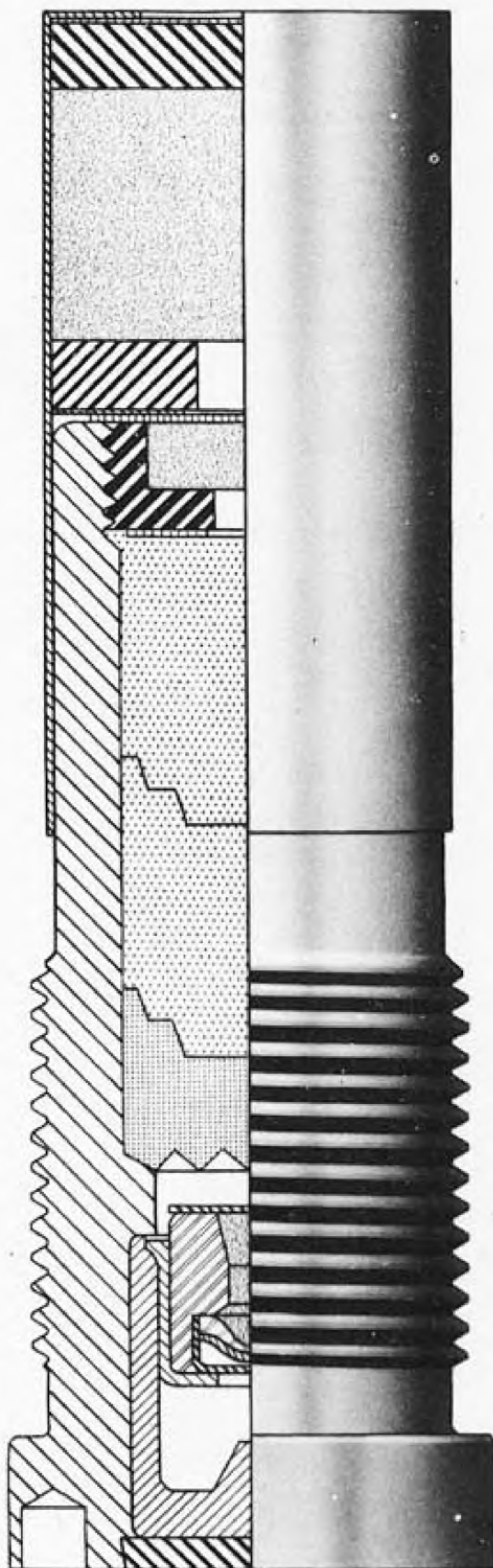
U. S. NAVY

MK. 9

TRACER

OVERALL LENGTH	2.48 in.
DIAMETER OF HEAD	1.248 in.
DIAMETER OF THREADS	1-1/16 in.
DIAMETER OF ILLUMINANT CAVITY	0.5 in.
METHOD OF SECURING	Screws into base by means of 15 L.H. threads
COMPOSITION OF STARTER MIXTURE	Barium peroxide, magnesium powder, barium nitrate.
COMPOSITION OF ILLUMINANT	WHITE: Aluminum powder and wax. RED: Strontium nitrate, ammonium perchlorate, magnesium powder, charcoal, and linseed oil.
COLORS USED	Red and White.
MARKINGS	End of tracer painted to indicate color. "MK 9, LOT ___" manufacturer's initials, year, and color initial stamped on head.
IGNITION METHOD	Propellant gases burn through a celluloid disc and ignite the starter which fires the illuminant.
PROJECTILES USED IN	4"/50, 5"/38, & 5"/25

# TRACER MK.10



**DATA**

RESTRICTED

**U. S. NAVY**

OVERALL LENGTH 2.9 in.  
 DIAMETER OF HEAD 0.93 in.  
 DIAMETER OF THREADS 0.825 in.  
 DIAMETER OF ILLUMINANT  
 CAVITY 0.475 in.  
 METHOD OF SECURING Screws into base of  
 projectile by means of  
 14 L.H. threads.

**MK.10**

COMPOSITION OF STARTER  
 PYROTECHNIC

Magnesium powder,  
 barium peroxide, &  
 aluminum.

**TRACER**

COMPOSITION OF  
 ILLUMINANT

Magnesium powder,  
 strontium nitrate, &  
 ammonium perchlorate.

COLORS USED  
 MARKINGS

Red

Mk 10 Mod \_\_\_\_\_  
 (Mfr's. initials) Lot \_\_\_\_\_  
 (Loading plant's initials)

IGNITION METHOD

Set-back forces the primer carrier back, bending  
 the ears on the stirrup spring and bringing the  
 primer against the fixed anvil. The flash from  
 the primer ignites the tracer starter, which  
 initiates the tracer illuminant.

PROJECTILES USED IN

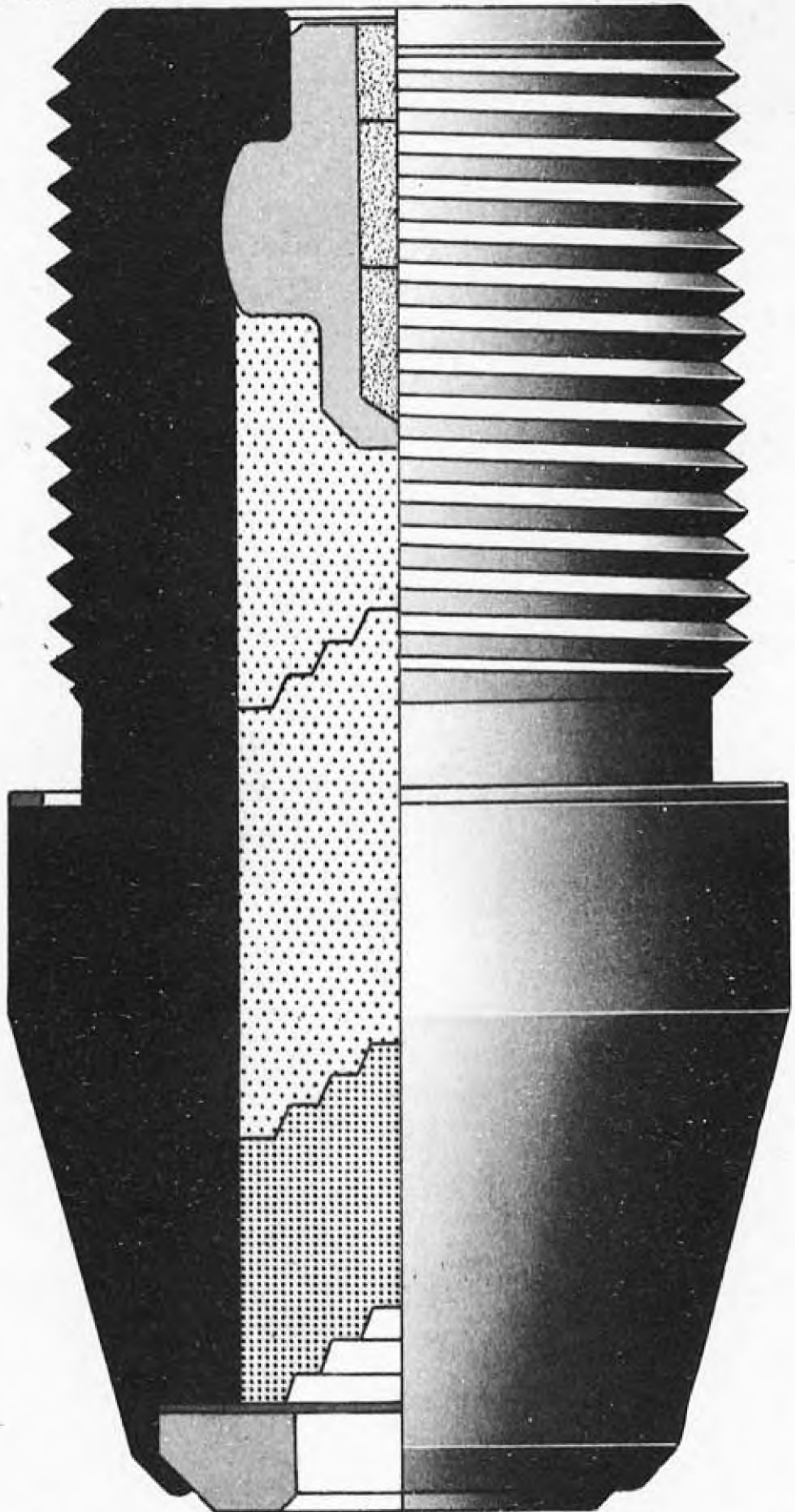
40 mm HE, HE-I, and BL.

REMARKS:

This tracer is being replaced by the Mk 11 in all assemblies.

This tracer is self-destroying, containing an igniter pellet of  
 6 grains of black powder and a 5.7 gram self-destroying black powder  
 pellet. When the tracer illuminant has burned through, the igniter  
 pellet is fired, initiating the self-destroying element, which in  
 turn explodes the projectile.

RESTRICTED



TRACER MK. II MOD. 2

**DATA**

RESTRICTED

**U. S. NAVY**

OVERALL LENGTH	1.78 in.
DIAMETER OF HEAD	0.925 in. tapering to 0.65 in.
DIAMETER OF THREADS	0.83 in.
DIAMETER OF ILLUMINANT CAVITY	0.375 in.
METHOD OF SECURING	Screws into base of projectile by means of 15 L.H. threads.
COMPOSITION OF STARTER PYROTECHNIC	Magnesium powder, barium peroxide, & aluminum.
COMPOSITION OF ILLUMINANT	Magnesium powder, strontium nitrate, ammonium perchlorate, charcoal, & wax.
COLORS USED	Red; non-luminous
MARKINGS	Mk 11 Mod (Mfr's. initials) Lot (Loading plant's initials) Date (Month & year)
IGNITION METHOD	Propellant gases heat or burn through the brass closing disc and ignite the starter, which initiates the illuminant.
PROJECTILES USED IN	40 mm HE, HE-I, and BL.

**MK. II****TRACER**REMARKS:

The only difference between the various Mods of this tracer is in the construction of the relay housing:

- Mod 0 - Housing is threaded
- Mod 2 - Housing is a push fit
- Mod 3 - Housing is an integral part of tracer body

The relay housing contains three black powder pellets, which are ignited at the end of the burning of the tracer. The pellets, in turn, initiate the main charge of the projectile, providing self-destroying action.