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TECHNICAL MEMORANDUM 1363  
PROPAGATION TEST  
OF  
PROPOSED EXPLOSIVE TRAIN  
FOR  
FUZE. MT. XM563

JACK BROTHERS

DA PROJECT 1C542709D367

AMCMS 5545.12.54208

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FEBRUARY 1964

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FUZE, MT, XM563

BY

JACK BROTHERS

FEBRUARY 1964

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#### SUMMARY

An explosive train utilizing the M46 Stab Detonator instead of the T37 Stab Detonator was proposed for use with the Fuze, MT, XM563. The fuze will be used with field artillery Beehive type ammunition. Propagation tests were conducted to evaluate the output and establish the reliability of the proposed explosive train.

Of the 193 fuzes tested, all propagated satisfactorily -- producing a hole about  $\frac{1}{4}$ -inch in diameter in mild steel plate 0.051 inches thick.

The indicated reliability of the explosive train is 98.48% at a 95% confidence level.

#### CONCLUSIONS

The proposed explosive train performs satisfactorily within the temperature range from  $-65^{\circ}\text{F}$  to  $+160^{\circ}\text{F}$ .

The lead cup assembly is capable of producing a hole about  $\frac{1}{4}$ -inch in diameter in mild steel plate 0.051 inches thick.

## RECOMMENDATION

It is recommended that the proposed explosive train be adopted for use in Fuze, MT, XM563.

## INTRODUCTION

The objective of this project was to establish the feasibility of the explosive train proposed for Fuze, MT, XM563, which will be used with field artillery Beehive type ammunition.

The proposed explosive train (Figure 1), includes an M46 Stab Detonator instead of a T37 Stab Detonator used in a previous design. Use of the M46 Detonator, which is considerably shorter than the T37 Detonator, provides room for additional mechanisms in the nose of the fuze.

Modified M564 Fuzes were used to simulate the proposed explosive train in the XM563 Fuze. Static propagation tests were conducted to evaluate output and establish reliability.

## STUDY

To produce the test fuze, M564 Fuzes were modified to test the explosive train shown in Figure 2 (Sketch DR5-231) proposed for Fuze, MT, XM563.

The nose section of the M564 Fuze was modified to provide a means of initiating the M46 Detonator statically. To accomplish this the depth of the detonator cavity in the adapter (X10520262) was increased to meet the design requirement of 2.5 inches maximum distance between the output end of the M46 Detonator and the sensitive end of the M7 Relay in the closing plug. A spacer (DR5-227) then was designed to occupy the space above the detonator in the detonator cavity. To permit initiation of the M46 Detonator by external means the detent safety mechanism assembly was omitted from the head and, in addition, the head was modified by drilling the firing pin assembly cavity all the way through. Converter (DR5-228) was designed to occupy the detent safety mechanism cavity as well as the firing pin cavity. An axial hole in the converter was included to permit use of a firing pin (DR5-229) for initiating the M46 Detonator. A sectioned model of the test fuze is shown in Figure 3.

The following groups of test fuzes were conditioned for a minimum of 18 hours just before testing: 50 at +160°F, 50 at testing room temperature (72°F), and 93 at -65°F.

The test setup is shown in Figure 4. The test fuze was placed on a 0.051-inch thick mild steel plate. Damage to the plate was used as a basis for evaluating the output of the test fuze. A one-pound weight was dropped five inches to impact the firing pin.

All fuzes performed satisfactorily. There were no misfires or low order functions. No unusual events occurred.

A functioned fuze and typical output test plates are shown in Figures 5 and 6.

The total quantity of fuzes tested was used as the sample size for establishing the indicated reliability 98.48% at a 95% confidence level.

Although it is not part of this test, it should be noted that the use of the M7 Relay in new fuze designs is discouraged. This is because the M7 Relay is open-faced; that is, there is no covering over the lead azide. It has been proven that the lead

azide in the M7 Relay can flake or crumble (Reference 1); thus there is a possibility of loose lead azide getting into the fuze mechanism. This condition is considered dangerous and could cause prematures. The XM10 Explosive Relay is one explosive train element which can be considered as a replacement for the M7 Relay.

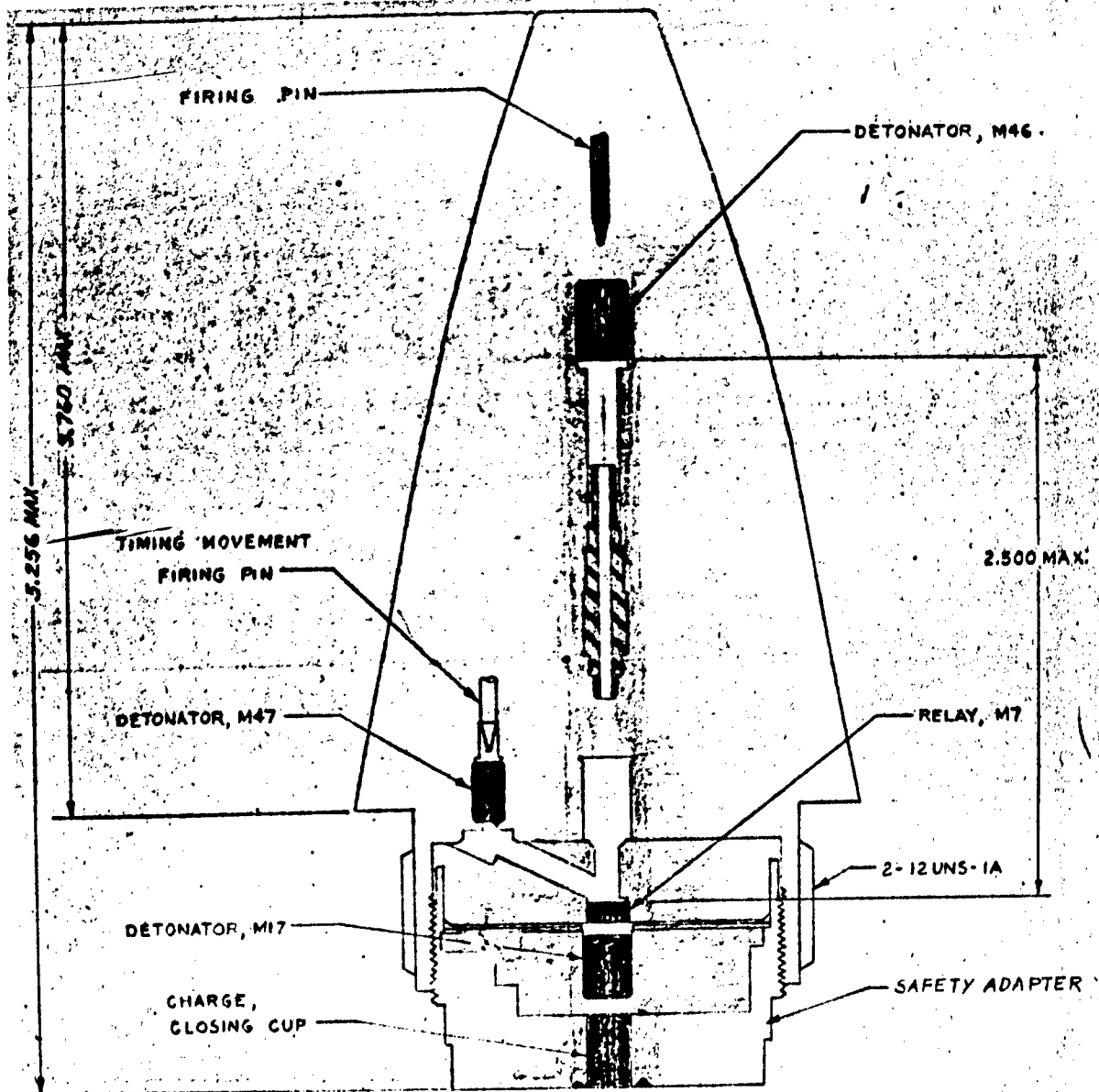
REFERENCE

1. Picatinny Arsenal Technical Report 2418, Evaluation of the NOL 60 Primer Mixture for Use in the M29A1 Percussion Primer, Page 7, Paragraph 23, July 1957.

**APPENDIX**

**APPENDIX A**

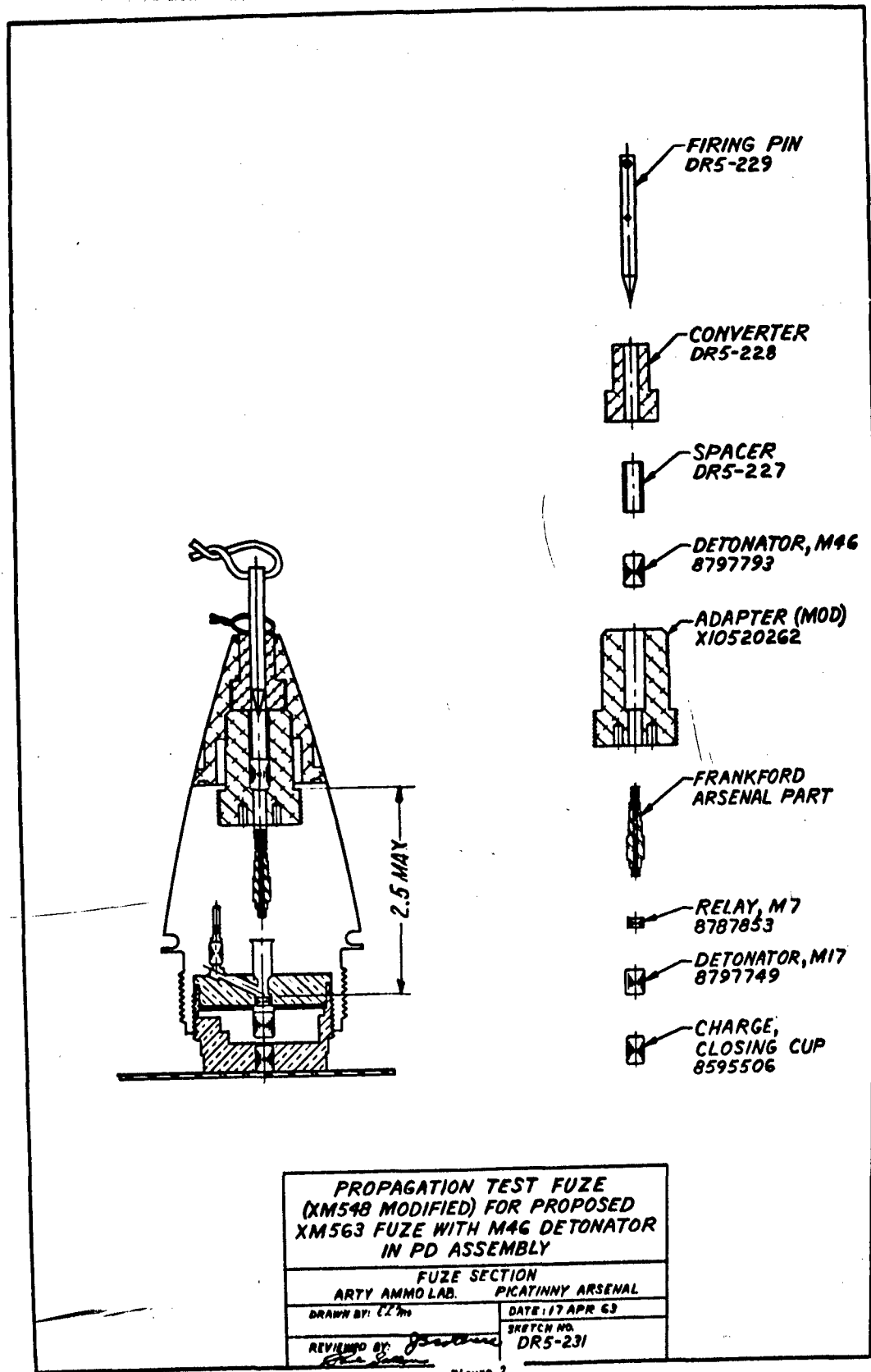
**FIGURES**



PROPOSED XM 563 FUZE EXPLOSIVE TRAIN  
 WITH M 46 DETONATOR  
 AND XM 548 SAFETY ADAPTER  
 FOR LABORATORY TESTS

FIGURE 1

26 MARCH 1963



**PROPAGATION TEST FUZE  
(XM548 MODIFIED) FOR PROPOSED  
XM563 FUZE WITH M46 DETONATOR  
IN PD ASSEMBLY**

<b>FUZE SECTION</b>	
ARTY AMMO LAB.	PICATINNY ARSENAL
DRAWN BY: <i>EL</i>	DATE: 17 APR 63
REVIEWED BY: <i>[Signature]</i>	DRAWING NO. DR5-231

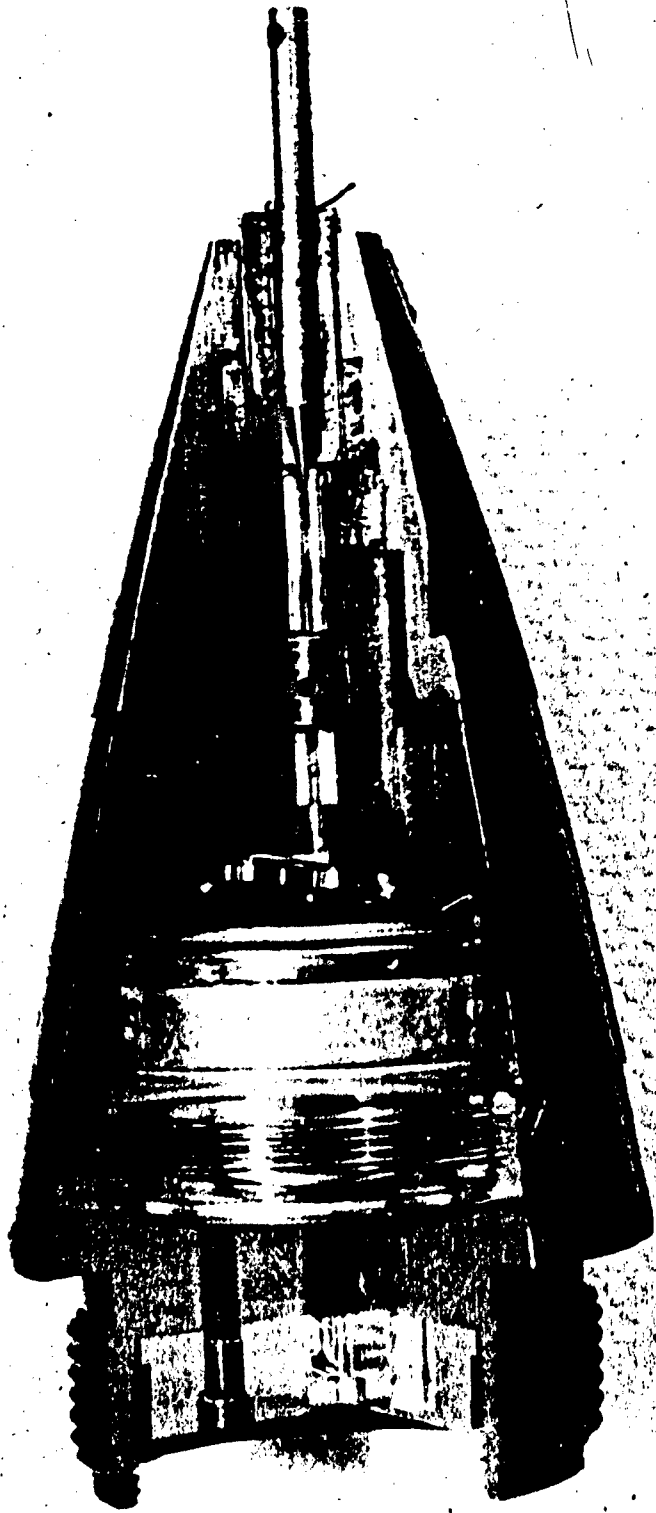


Figure 3 /



Figure 4

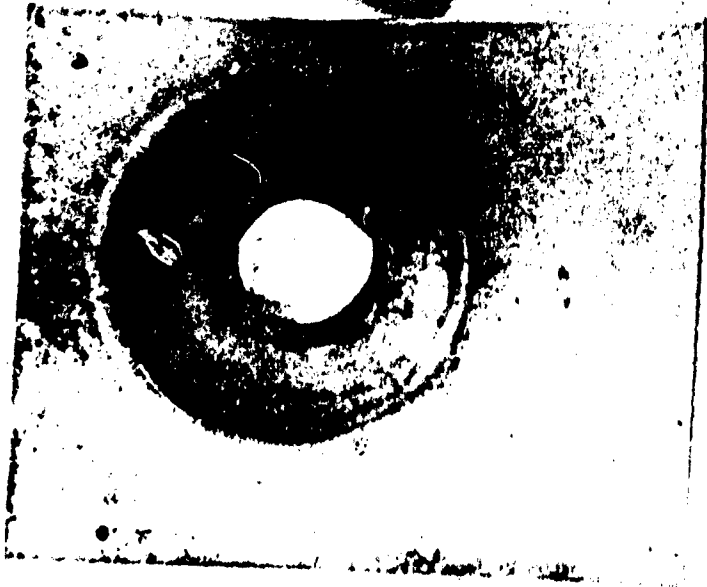
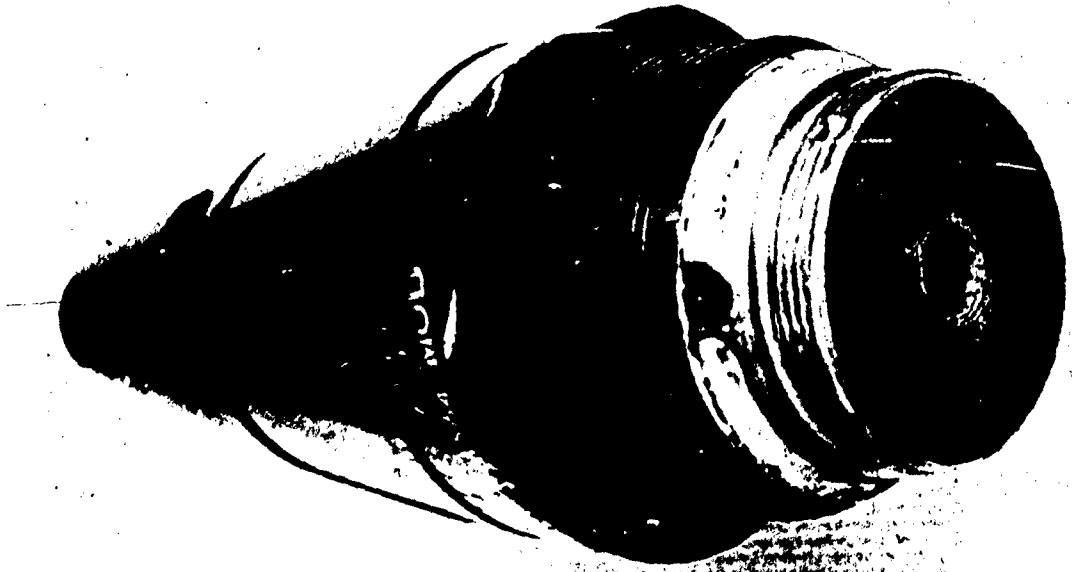


Figure 5

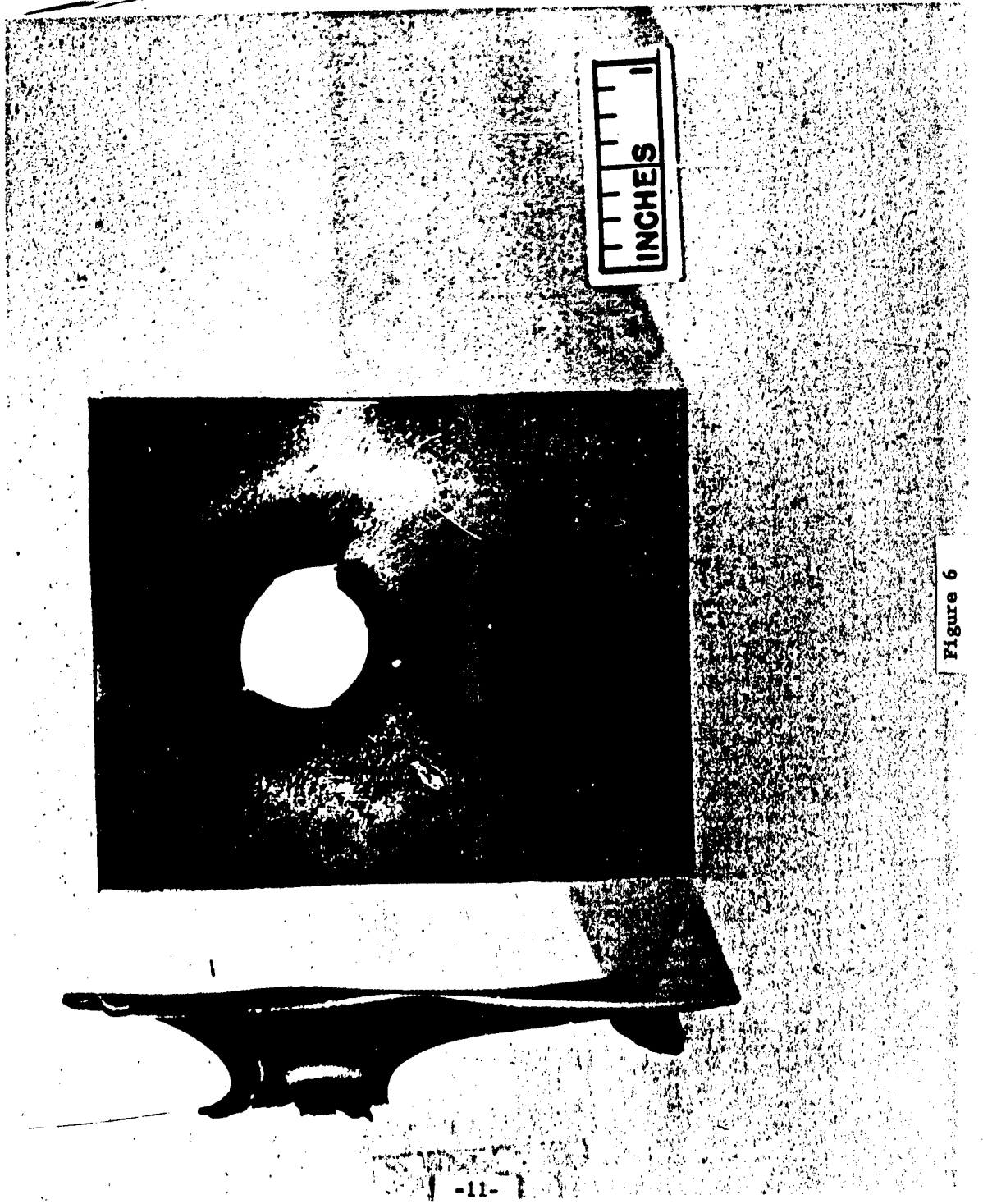


Figure 6

ABSTRACT DATA

ABSTRACT

Accession No. \_\_\_\_\_ AD \_\_\_\_\_

Picatinny Arsenal, Dover, New Jersey

PROPAGATION TEST OF PROPOSED EXPLOSIVE TRAIN  
FOR FUZE, MT, XM563

Jack Brothers

Technical Memorandum 1363, February 1964,  
13 pp, figures. Unclassified report from  
the Artillery Ammunition Laboratory,  
Ammunition Engineering Directorate.

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The proposed explosive train performs  
satisfactorily within the temperature range  
from -65° to +160°F.

UNCLASSIFIED

- I. Fuze -- Explosive Train
- I. Propagation Test of Proposed Explosive Train for Fuze, MT, XM563
- II. Brothers, J.

UNITERMS

M46 Stab Detonator  
T37 Stab Detonator  
Fuze, MT, XM563  
M564 Fuze  
M7 Relay  
Propagation Test  
Explosive Train  
Lead Cup Assembly  
Lead Azide  
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