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AUTHORITY
NSWC ltr 29 Jan 1976 ; NSWC ltr 29 Jan 1976

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U. S NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

REPORT NO 1064

5"/54 PROJECTILES TYPE EX 23 MOD 1; TEST OF

15th Partial Report

- -

RECOVERY FIRING OF 5"/54 PROJECTILES
TYPE EX 23 MOD 1 IN A WORN GUN

FINAL Report

Task
Assignment NPG-Re3b-207-2-52

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NPG REPORT NO. 1064

Recovery Firing of 5"/54 Projectiles
Type EX 23 Mod 1 in a Worn Gun

- -

PART A

SYNOPSIS

1. Three (3) 5"/54 projectiles Type EX 23 Mod 1 were fired for spin and recovery from a 5"/54 Mk 18 gun in the last quarter of its life, at a charge that gave 28 tsi (copper) proof pressure in a new barrel. This test was fired to determine the performance of the projectiles in a worn gun.

2. It is concluded that the performance of the projectile Type EX 23 Mod 1 when fired in a worn gun (1358 ESR), at approximately 3050 ft./sec. velocity, is unsatisfactory because of excessive body engraving, yaw and erratic flight as noted by yaw cards.

[redacted]

Recovery Firing of 5"/54 Projectiles
Type EX 23 Mod 1 in a Worn Gun

TABLE OF CONTENTS

	Page
SYNOPSIS	1
TABLE OF CONTENTS	2
AUTHORITY	3
REFERENCES	3
BACKGROUND	3
OBJECT OF TEST	3
PERIOD OF TEST	3
DESCRIPTION OF ITEMS UNDER TEST	4
PROCEDURE	4
RESULTS AND DISCUSSION	4
CONCLUSION	5
APPENDIX A - NPG PHOTOGRAPHS AND SKETCH	FIGURES 1-5 (Incl)
APPENDIX B - WIRE IMPRESSION METHOD OF DETERMINING SPIN	1 (Only)
APPENDIX C - DISTRIBUTION	1 (Only)

Recovery Firing of 5"/54 Projectiles
Type EX 23 Mod 1 in a Worn Gun

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PART B

INTRODUCTION

1. AUTHORITY:

This test was authorized by reference (a).

2. REFERENCES:

a. BUORD ltr Re3b-PB:mt S78-1(5") Ser 14521 of 16 Feb 1952 to NAVPROV
b. NPG Report No. 984 of 18 Aug 1952
c. NPG Report No. 505 of 2 Mar 1950
d. NPG Report No. 437 of 1 Dec 1949
e. BUORD SK. No. 238969 - 5"/54 Projectile Type EX 23 Mod 1

3. BACKGROUND:

The Bureau of Ordnance requested a recovery firing program as outlined in reference (a) to determine the performance of the projectile band in a worn barrel. Previous firings of the subject projectiles for recovery from new barrels (references (b), (c), and (d)) have been reported.

4. OBJECT OF TEST:

The object of this test was to determine the pressure, velocity, spin, and condition upon recovery of projectiles Type EX 23 Mod 1 fired from a worn 5"/54 caliber gun.

5. PERIOD OF TEST:

a.	Date of Directive	16 February 1952
b.	Date Commenced Test	4 May 1952
c.	Date Test Completed	6 May 1952

Recovery Firing of 5"/54 Projectiles
Type EX 23 Mod 1 in a Worn Gun

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PART C

DETAILS OF TEST

6. DESCRIPTION OF ITEMS UNDER TEST:

a. Projectiles: 5"/54 projectiles Type EX 23 Mod 1 in accordance with reference (e) (See Figure 1).

b. Gun: 5"/54 gun Mk 18 Mod 1, Serial No. 16064. This gun has a 1 in 25 caliber twist, a standard service velocity of 2650 ft./sec., and had an origin enlargement before firing (1358 ESR) of 0".290.

7. PROCEDURE:

Three (3) 5"/54 projectiles Type EX 23 Mod 1 were prepared for recovery firing by fitting with flat dummy nose plugs (Figure 5) and Epsom salt loading to a total weight of 60 lbs.

Spin was measured by the wire impression method, described in Appendix (B). Pictures were taken of the recovered projectiles. The projectiles were fired with a charge equivalent to that which gave approximately 28 tsi and 3290 ft./sec. in a new gun previously tested (reference (b)).

8. RESULTS AND DISCUSSION:

The firing data are as follows:

Rd. No.	Proj. No.	Powder Charge EX 6882 (lbs.)	Breech Pressure (t.s.i.)	Muzzle Velocity (ft./sec.)	% Nominal Spin	Yaw Max. Dia. Hole in Yaw Card (in.)
1	1293	23.0	19.6	3047	98.1	5-1/2
2	1294	23.0	20.5	3070	98.2	5-1/2
3	1295	23.0	18.7	3053	99.1	6-1/2

The after-firing pictures are included as Figures 2-4, inclusive.

Recovery Firing of 5"/54 Projectiles
Type EX 23 Mod 1 in a Worn Gun

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Body engraving and partial failure of the bands occurred on rounds 2 and 3. Round 1 (warming round) did not body engrave.

The velocity and spin were uniform, but the attainment of full spin can probably be attributed to the fact that the projectiles body-engraved. The pressure variations shown are considered normal for this type of powder under these conditions.

The yaw card at the recovery bin showed yaw and a rather large dispersion pattern at 447 feet from the gun.

PART D

CONCLUSION

9. It is concluded that:

The performance of the projectile Type EX 23 Mod 1 when fired in a worn gun (1358 ESR), at approximately 3050 ft./sec. velocity, is unsatisfactory because of excessive body engraving, yaw and erratic flight as noted by yaw cards.

[redacted] NPG REPORT NO. 1064

Recovery Firing of 5"/54 Projectiles
Type EX 23 Mod 1 in a Worn Gun

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NPG REPORT NO. 1064

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

Fifteenth Partial Report

on

5"/54 Projectiles Type EX 23 Mod 1; Test of

- -

Final Report

on

Recovery Firing of 5"/54 Projectiles

Type EX 23 Mod 1 in a Worn Gun

Project No.: NPG-Re3b-207-2-52 Date:
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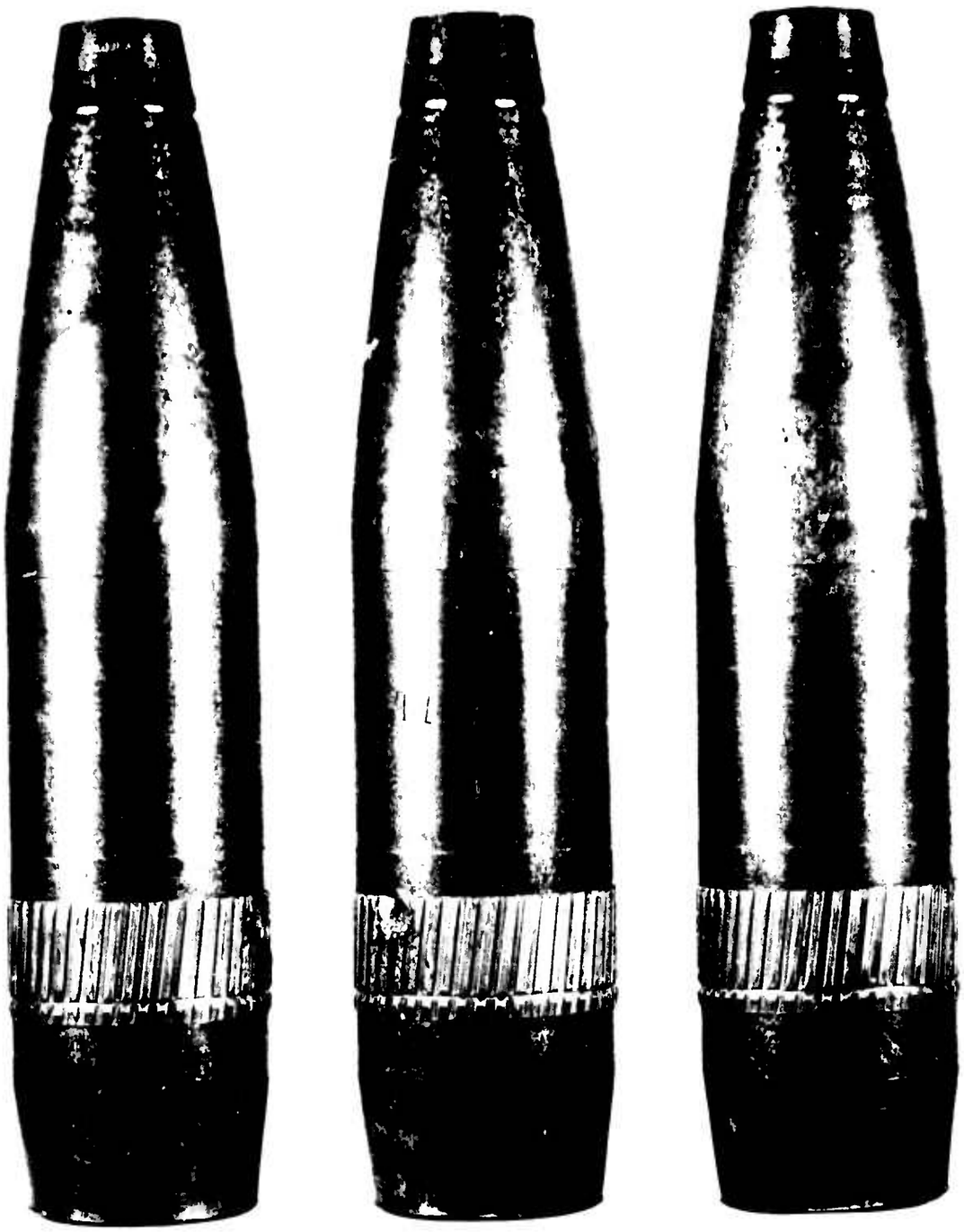
NP9-49159 6 May 1952 [redacted]

Photograph of 5"/54 Projectile Type EX 23 Mod 1 Before Firing
Figure 1

[redacted]



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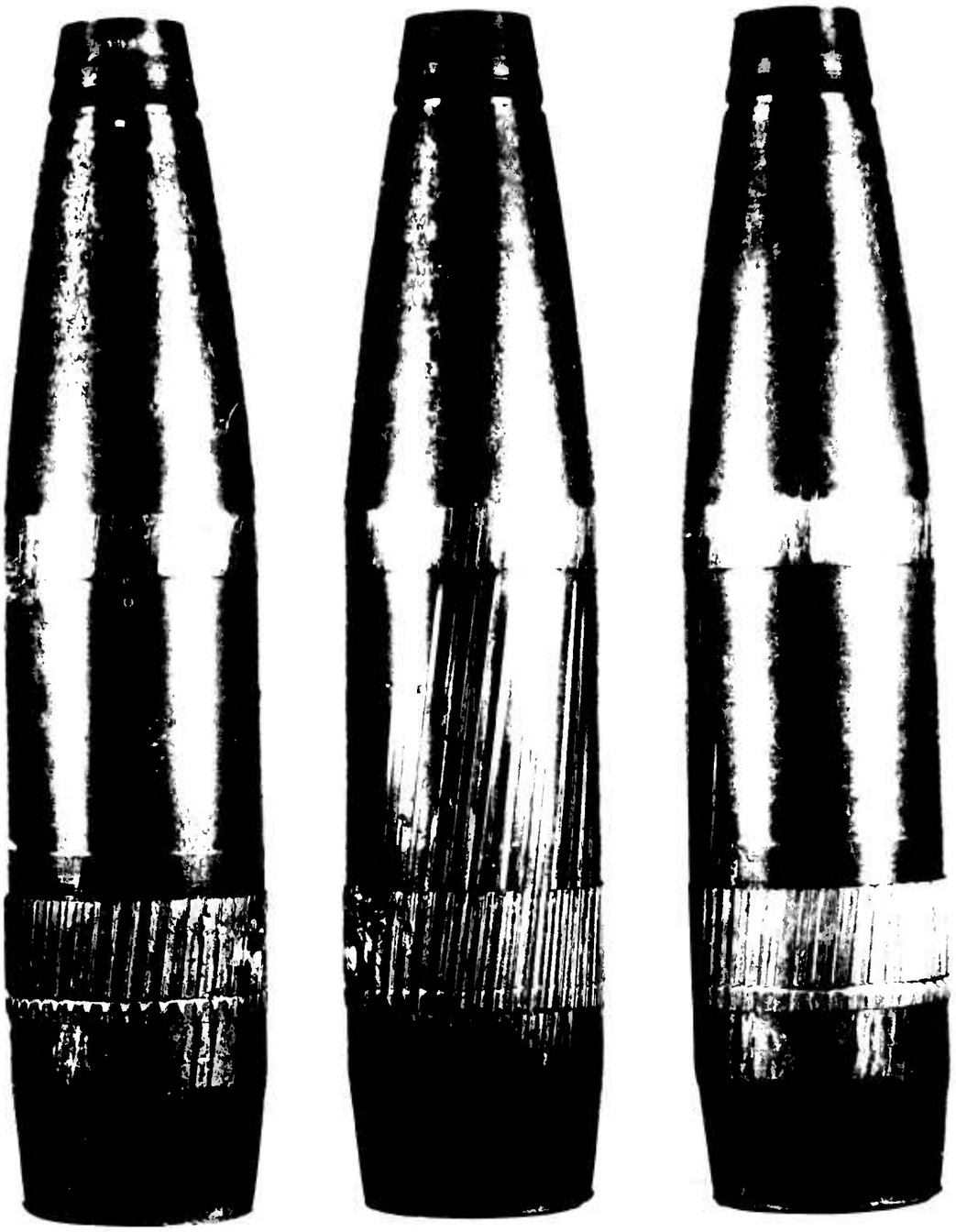
Three views (120° apart) of Recovered EX 23-1 Projectile No. 1293, Fired in Gun Mk 18 Mod 1 No. 16064.

Figure 2



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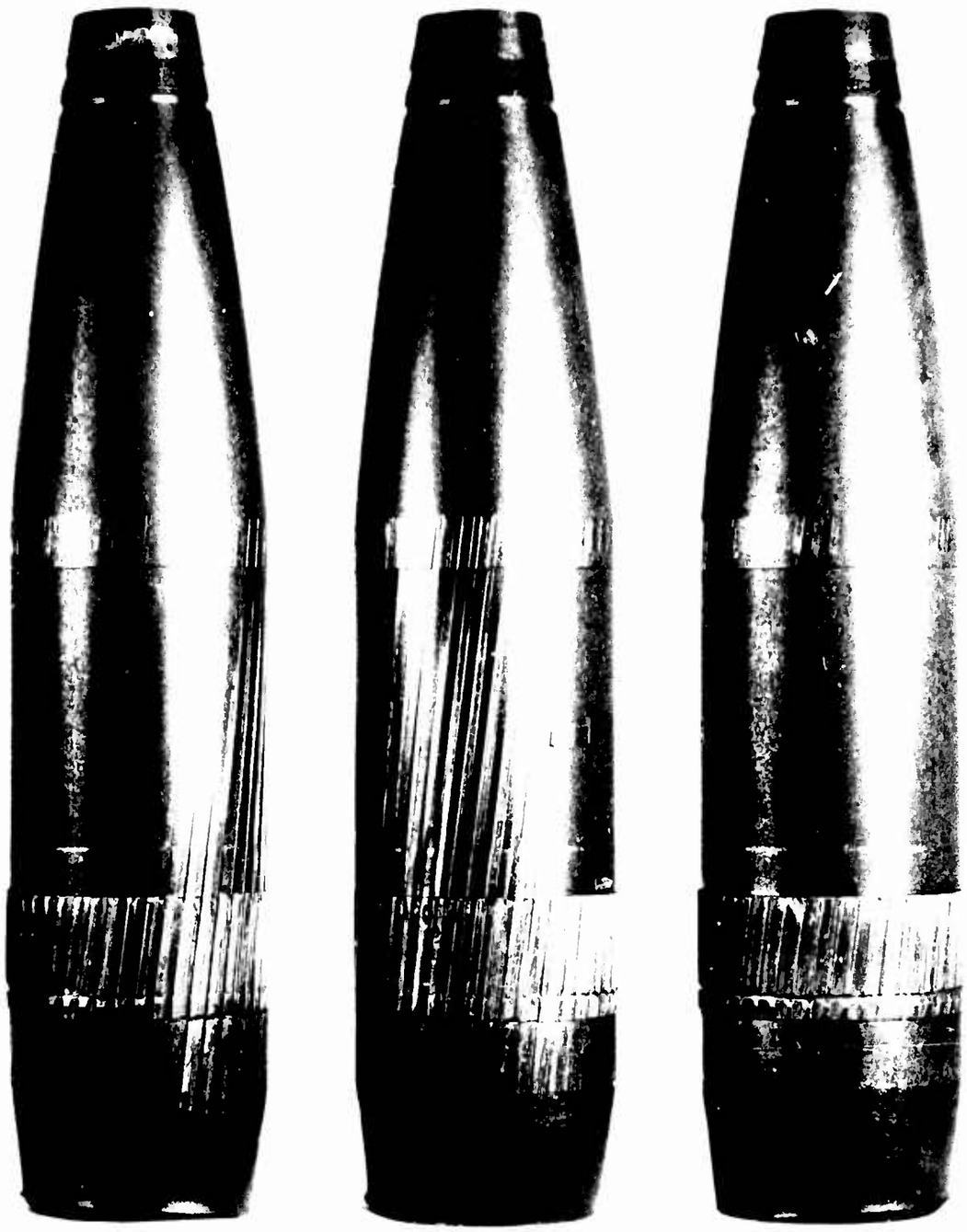
Three Views (120° apart) of Recovered EX 23-1 Projectile No. 1294, Fired in Gun Mk 18 Mod 1 No. 16064.
Figure 3



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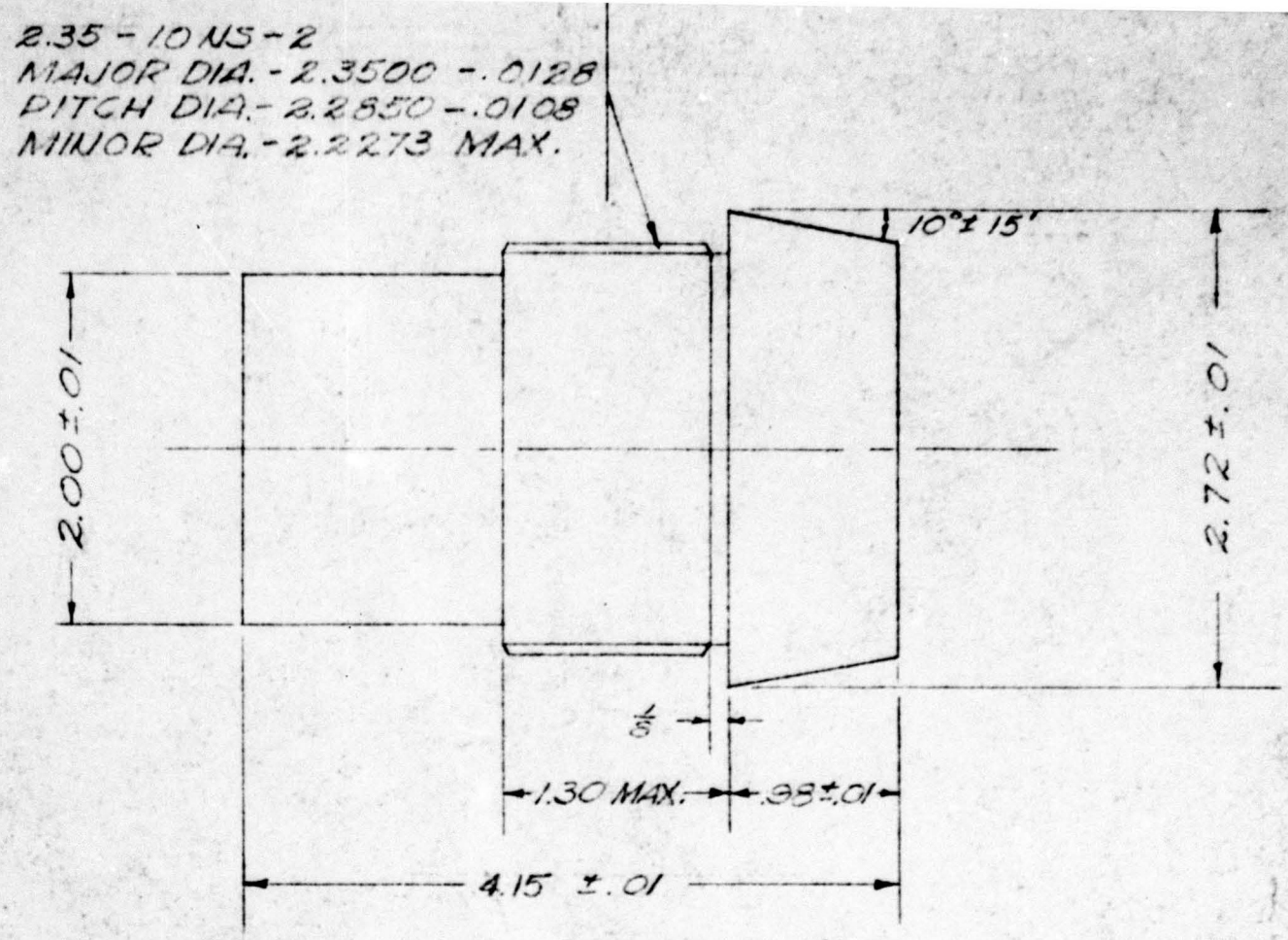
Three views (120° apart) of Recovered EX 23-1 Projectile No. 1295, Fired in Gun Mk 18 Mod 1 No. 16064.
Figure 4



WEIGHT = 4.19 LBS.

FIGURE 5

MODIFIED NOSE PLUG FOR RECOVERY FLYING

12 AUGUST 1949 W.A.T.

APL - 282

Recovery Firing of 5"/54 Projectiles
Type EX 23 Mod 1 in a Worn Gun

Wire Impression Method of Determining Spin

Two screens are set up 41'5 apart, each screen consisting of a metal frame with wood inserts, holding an array of parallel equidistant vertical copper wires. The spacing of the wires is 1/2" for the first screen and 3/4" for the second. The projectile is fitted with a flat-nosed dummy nose plug or the equivalent, so that after passing through the screens it bears two sets of impressions of the wires. The angle between the two sets of impressions is measured and from this measurement the rifling of the gun, the muzzle velocity, and the velocity at the spin screens, is computed the percentage of nominal spin. It is assumed that over the short distances involved the spin retardation is negligible.

Recovery Firing of 5"/54 Projectiles
Type EX 23 Mod 1 in a Worn Gun

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