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TECHNICAL GROUP

MECHANICAL DEPARTMENT

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TECHNICAL REPORT

SERIAL NO. 1241

DATE March 11, 1943

SUBJECT: Description of Unfired 47 mm. A.P., M.C. (Long Nose) Complete Round of Italian Ammunition

FIRST AND FINAL REPORT

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SYNOPSIS

One 47 mm. A.P., H.E. Complete Round of Italian Ammunition was received for examination. The complete round consists of an uncapped armor piercing projectile, with windshield, assembled in a primed brass cartridge case. The projectile is loaded with an Ammonium Nitrate - Cyclonite bursting charge and fuzed with a base detonating fuze containing a tracer. The cartridge case contains a double base strip type propelling charge with a black powder igniter and a short aluminum dummy primer.

[redacted]

[redacted]

Technical Report No.1241
Picatinny Arsenal, Dover, N.J.
March 11, 1943.

TECHNICAL GROUP
MECHANICAL DEPARTMENT
ARTILLERY AMMUNITION DIVISION

First and Final Report

Examination of Unfired 47 mm. A.P., H.E. (Long Nose)
Complete Round of Italian Ammunition.

INTRODUCTION:

1. In accordance with the request from the Office, Chief of Ordnance, reference "A", one unfired 47 mm. A.P., H.E. Complete Round, received from the Military Attache, Cairo, Egypt, was subjected to a technical examination. Metallurgical examination of the cartridge case was made by Frankford Arsenal, reference "B", metallurgical examination of the projectile was made by Watertown Arsenal, reference "C" and a general and chemical examination of other components was made at Picatinny Arsenal.

OBJECT:

2. To conduct a technical examination, including preparation of photographs, dimensioned sketches, a complete round drawing, chemical analysis of explosives and metallurgical examination of the projectile and cartridge case.

DESCRIPTION:

3. Shipping Container.- The 47 mm. A.P., H.E. Complete Round was received packed in an improvised wooden box.

4. Complete Round.- The complete round, shown on Inclosure 1 (Photograph P-1720A) and Inclosure 4 (Drawing P-6476), weighs 4.90 lbs. and is 10.7 inches long. The projectile was covered with a grey metallic paint and bands in shades red, white, green and black maple were painted. The following markings were painted on the body:

Above the white band -	K1.43
Below the white band -	H-T-F
Between white and green bands -	77-3-1 L.C.F.
In green band	42/43

[redacted]

-1-

3-G

The projectile is a loose fit in the cartridge case, and the space between the cartridge case and projectile is filled with a luting compound. No crimp is used to attach the cartridge case to the projectile. Marking on the cartridge case was in blue ink. Most of the lettering was not distinguishable but that which was decipherable is as follows:

CARICA Jz 47/32 gr.
- - - - - - - - - - - - - -
- - - - - - - - - 4002.013
- - - - - - - - - - - - - -

5. Projectile.- The projectile weighs 3.10 lbs. as fired. It is of monoblock design with windshield and explosive cavity. There is no crimping groove for securing the projectile in the cartridge case. The ballistic windshield is attached to the forward end and presents a smooth contour at the junction with the projectile. No marking appears below the rotating band or on the base.

6. Fuze.- In the base of the projectile is a base detonating fuze. This fuze bears no marking. A tracer assemoly is screwed into the base of the fuze body. The fuze, complete with tracer and detonator assembly, is 3.75 inches long and weighs .46 lb.

7. Cartridge Case.- The brass cartridge case is of conventional design having a tapered wall, a thin section at the mouth and a heavy base section. The base is threaded and counterbored to receive a primer.

Stamping on the head is shown below:

at 12 o'clock 1940
10-A17
at 2 o'clock 
at 6 o'clock 47/32
at 10 o'clock M1

8. Primer.- No service primer was found in the cartridge case. In its place an aluminum plug, or dummy primer, had been inserted. There is no marking on this dummy primer.

DISCUSSION OF RESULTS:

9. Shipping Container.- The 47 mm. A.P. [illegible] Italian Ammunition was received packed in an improvised [illegible].

No information is available as to the method of packing [illegible] for shipment to the field.

10. Complete Round.- After photographing the complete round, as received, the round was disassembled into its principal components, Inclosure 1 (Photograph M-13294). The base fuze was disassembled and is shown on Inclosure 2 (Photograph M-13979). A complete round Drawing P-62176 (Inclosure 4) and dimensioned sketches (Inclosure 5) were prepared.

11. Projectile. - The projectile with windshield assembled is 7.42 inches long, and weighs 2.76 lbs. The projectile body is a silicon-chromium-nickel alloy steel having a carbon content of about .53%. Longitudinal flow lines and tool marks indicate that the projectile was formed by forging and finished by machining. A shoulder on the body, at the forward end of the bourrelet is provided for seating of the windshield. A knurled surface, 5/16 inch wide, is on the projectile forward of the shoulder. The knurl is used to assure against rotation of the windshield which is pressed on over this surface. Above the knurled surface evidence is found of rough machining of the nose for approximately 5/16 inch. Above this rough machining and extending to within $\frac{1}{2}$ inch of the tip are fine machine marks. Around the tip, rough machining is again indicated by the tool marks.

Results of a hardness survey indicate an average hardness of Rockwell "C" 57 at the tip of the body with a gradual decrease in hardness to Rockwell "C" 25 at the base. The windshield is a low carbon copper bearing steel. The copper rotating band has a Rockwell "B" 42 hardness. It is made from annealed seamless tubing, and pressed into the band seat. Results of a complete metallurgical examination of the projectile and caulking ring are contained in reference "C". The weight of explosive charge is approximately 1.7% of the total weight of the projectile.

The bursting charge is 20.5 grams of the following composition:

Ammonium Nitrate,%	73.4
Cyclonite,%	22.0
Wax,%	4.6

12. Fuze.- The base fuze assembly is shown on sheet 4 of Inclosure 5 and on the complete round Drawing P-62179, Inclosure 4. The steel body has a threaded recess in the base end to receive the tracer assembly. This tracer is a separate assembly consisting of a body, a sleeve, a closing disc, an igniter and tracer. The forward end of the sleeve is open presumably for loading the igniter and tracer composition. Closure for this end of the sleeve is provided by the bottom of the tracer cavity in the fuze body after assembly of the tracer into the fuze. The surface of the igniter charge is flat and has a waffle pattern. The igniter charge weighs 0.9 gram and is composed of 75% barium peroxide, 25% magnesium and

2% binder. The tracer charge, which weighs 2.3 grams, is composed of 63.0% Barium Nitrate, 34.3% Magnesium and 2.7% binder. The fuze has an explosive train consisting of a primer, a black powder delay pellet, of ring form, and a detonator. Complete analysis of the charges contained in the fuze and tracer composition are contained in Inclosure 3. A lead caulking ring is located between the shoulder of the fuze and the fuze seat of the projectile body. A paper washer is assembled between the forward shoulder of the fuze body and the bursting charge. Functioning of the fuze is believed to be as follows: (The nomenclature referred to is that used on sheet 4 of Inclosure 5). The fuze is in the safe condition when all parts are positioned, as shown. A brass safety sleeve which has a longitudinal slot .04-inch wide, serves as a support for the primer holder. The primer holder is machined on the outside to two diameters, one of which is a light force fit in the safety sleeve. The larger diameter of the primer holder requires the expansion of the slotted sleeve to permit arming. Pressure required to expand the brass sleeve to permit entry of the primer holder is 42 lbs. dead weight. Upon firing the round, setback causes the sleeve to move rearward over the primer holder. A safety spring restrains the primer holder from moving forward against the firing pin during flight. Upon impact the set forward force acting on the primer holder, which has become incased by the safety sleeve, compresses the safety spring and impacts the primer against the fixed firing pin. Gases or flame from the primer ignites the black powder ring pellet which initiates the detonator.

13. Cartridge Case.- The cartridge case is manufactured from brass. The case weighs 432 grams, is 7.66 inches long and has a total volume of 325 milliliters (19.8 cubic inches). The chemical analysis of the brass shows a 72-28 copper-zinc alloy containing slight amounts of impurities. The U.S. army Specification for cartridge brass is 68.5-71.5% copper. The tensile strength is lower, in general, than the requirements for the U.S. 75 mm. M5A1 Howitzer cartridge case. A hardness survey shows a Vickers number 138 (Rockwell B-75 by conversion) at the mouth and increasing to a maximum of 160 (Rockwell B-83.5 by conversion) at 5.5 inches from the mouth.

Complete chemical and spectrographic analysis and tables containing the tensile properties of the Italian 47 mm. Brass Cartridge Case are contained in Frankford Arsenal Ordnance Laboratory Report No. T-1156, reference "C".

14. Primer. - The primer cavity in the cartridge case contained an aluminum plug which appears to be a dummy primer. No charges are present nor are there any markings on this hollow plug.

15. Propellant.- The propellent charge, which weighs 167 grams, exclusive of the igniter, was found to be of the following chemical composition:

Nitrocellulose,%		63.7
Nitrogen,%	12.04	
Nitroglycerin,%		34.0
Centralite,%		1.8
Vaseline,%		0.5

The average length of the strips was 5.49 inches, the width .31 inch and the thickness .028 inch. A complete chemical analysis and tabulation of physical measurements of the powder grains are contained in Inclosure 3. A small tin foil wad is located at the forward end of the propellent charge. On top of the tin foil wad is a small thin paper tag which is believed to be an inspectors tag. A cup shaped propelling charge retainer made from a tough fiberboard approximately 1/16 inch thick is assembled, mouth forward, on the propelling charge and tin foil. The cup has a central hole in the base which permits the tracer to extend through and contact the tin foil.

16. Igniter.- The black powder igniter charge is contained in a small silk bag, colored red. The weight of igniter charge is 2.04 grams. The chemical composition follows:

Potassium Nitrate,%	76.2
Sulphur, %	9.8
Carbon, %	14.0

The markings on the top of the igniter bag were indistinguishable.

REFERENCES:

A. O.O. 471/1934, (P.A. 471/1-151).

B. Frankford Arsenal Ordnance Laboratory Report No. T-1156, dated September, 1943, Subject: Metallurgical Investigation of three Italian 47 mm. Brass Cartridge Cases.

C. Watertown Metallurgical Report No. 762/144, dated September 24, 1943, Subject: Metallurgical Examination of two Italian 47 mm. Armor Piercing Projectiles.

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INCLOSURES:

Incl. 1 - Photograph M-13294
Incl. 2 - Photograph M-13979
Incl. 3 - P.A. Chemical Lab. Rpt. No. 90020
Incl. 4 - Photocopy of Drg. P-62176
Incl. 5 - Blueprints of Sketches, Sheets
1 to 10 inclusive.

[redacted]

REPORT FROM THE CHEMICAL LABORATORY	[redacted] PICATINNY ARSENAL, DOVER, N. J. December 16, 1942 MISCELLANEOUS lrg	REPORT NO. 90020

Kind of Sample	Foreign Ammunition, 47 mm. Armor Piercing, Long Nose, Italian
Received From	Foreign Ammunition Section - Mr. Wood
Date Received	August, 1942 19
Ref. Ltr. X.O. Laboratory No.	OO 471/19934 Photo No. 13294 PA 471/1-151
Representing	A complete round of 47 mm. Italian ammunition.

OBJECT:

To determine the weight of charge and chemical composition of the explosive components of the assembly.

RESULTS:

1. Cartridge Case Primer:

The Foreign Ammunition Section stated that in place of a service primer this round was found to contain a dummy primer manufactured from aluminum.

2. Propellant Assembly:

(a) Igniter Propellant Powder:

Weight of charge, gms.	2.04
Chemical composition:	
Potassium nitrate, %	76.2
Sulphur, %	9.8
Carbon, %	14.0

(b) Propellant Powder:

Weight of charge, gms.		167
Chemical composition:		
Nitrocellulose, %		63.7
Nitrogen, %	12.04	
Nitroglycerin, %		34.0
Centralite, %		1.8
Vaseline, %		0.5
Measurements, inch:		
Length	[redacted]	5.4914
Width		0.3109
Thickness		0.0287
L : W ratio		17.06

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12-C

3. Projectile: [redacted]

(A) Fuze:

(1) Primer:

Weight of charge, gm.	0.134
Chemical composition:	
Binder, %	1.5
Mercury fulminate, %	6.0
Antimony sulphide, %	42.5
Potassium chlorate, %	48.0
Abrasive, %	1.9

(2) Ring Pellet:

Weight of charge, gm.	0.13
Chemical composition:	
Sulphur, %	9.6
Potassium nitrate, %	74.9
Carbon, %	15.5

(3) Detonator:

(a) Upper charge:

Weight of charge, gm.	0.384
Chemical composition:	
Lead azide, %	55
Lead styphnate, %	44
Binder, %	1

(b) Lower charge:

Weight of charge, gm.	0.889
Chemical composition	Cyclonite

(B) Tracer Assembly:

(1) Igniter:

Weight of charge, gm.	0.9
Chemical composition:	
Barium peroxide, %	75.0
Magnesium, %	23.0
Binder, %	2.0

(2) Tracer:

Weight of charge, gms.	2.3
Chemical composition:	
[redacted] Barium nitrate, %	63.0
Magnesium, %	34.3
Binder, %	2.7

REPORT FROM THE CHEMICAL LABORATORY	PICATINNY ARSENAL, DOVER, N. J. December 16, 1942	REPORT NO. 90020

(C) High Explosive Charge:
Weight of charge, gms. [redacted] Only a portion of the charge supplied for analysis.

Chemical composition:

Wax, %	4.6
Ammonium nitrate, %	73.4
Cyclonite, %	22.0

4. Miscellaneous - Tin Foil:
Weight, gms. Only a portion of the tin foil supplied for analysis.

Chemical composition:

Tin, %	59.4
Lead, %	40.4
Antimony, %	0.1

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