

RESTRICTED

OS 9-18
Vol. 2

THE ORDNANCE SCHOOL

ORDNANCE SCHOOL TEXT

AMMUNITION - GENERAL

VOLUME 2

Parts II (Cont'd) - III
Pages 80 - 161

SMALL-ARMS AMMUNITION (CONT'D)

AIRCRAFT CANNON AMMUNITION

PREPARED BY
THE ORDNANCE SCHOOL
ABERDEEN PROVING GROUND, MARYLAND

THIRD EDITION
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NOTE

This publication is a temporary expedient pending the incorporation of the information contained herein in an approved War Department Manual.

ERRATA

<u>Page</u>	<u>Par.</u>	<u>Line</u>	<u>Change</u>
135	143 <u>a</u> .	5	Change "yellow" to "olive drab"
156	166 <u>b</u> .(6)	2	Change "a bright yellow" to "olive drab."

Reason for change: Paragraph 3b. of OCM Item 19298, dated December 10, 1942, contains the following: "That the yellow color now in use as a base color on H.E. ammunition be changed to a lustreless olive drab with No. 4 yellow stencil to designate H.E. filler."

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Prepared under the direction of
the Commandant, The Ordnance School

Third Edition, November 1942

Supersedes OS 9-18 dated October 1941

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Reproduction Plant
The Ordnance School
Aberdeen Proving Ground, Maryland

AMMUNITION - GENERAL

VOLUME 2

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BLANK CARTRIDGES

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SECTION I

GENERAL

	Paragraph
General -----	80

80. GENERAL. - Blank cartridges are used to simulate fire. They are used in all small arms for the purpose mentioned, in maneuvers, in ceremonies, and may be used in certain instances for signaling. All blank cartridges make use of second-class cartridge cases accruing from the manufacture of service ammunition. These are cases with small dents, scratches, or other minor defects which do not effect their functioning when loaded with the light powder charge used in blank cartridges. The principle in blank ammunition is to create noise and for this purpose a certain kind of powder charge is used. This is E. C. blank powder, described in paragraph 24. The powder is loaded into the case in a small quantity and closed with a cup of a light material. Blank cartridges, now available for issue, are safe to use in machine guns which are adapted for automatic fire by the use of blank firing attachment.

SECTION II

CARTRIDGE, BLANK, CAL..30, M1909

	Paragraph
General description -----	81
Identification -----	82
Packing -----	83

81. GENERAL DESCRIPTION. - The cartridge, blank, cal..30, M1909, consists of a cartridge case, primer, powder charge and paper cup. A description of these components follows (see fig. 20):

a. Case. - The cartridge case is the same case as is assembled in cal..30 service ammunition with the exceptions noted in section I of this chapter. A cannelure is rolled into the neck of the case to serve as a seat for the cup. After the powder charge and the cup are assembled in the cartridge the case is roll-crimped at the mouth thus preventing loss of the cup.

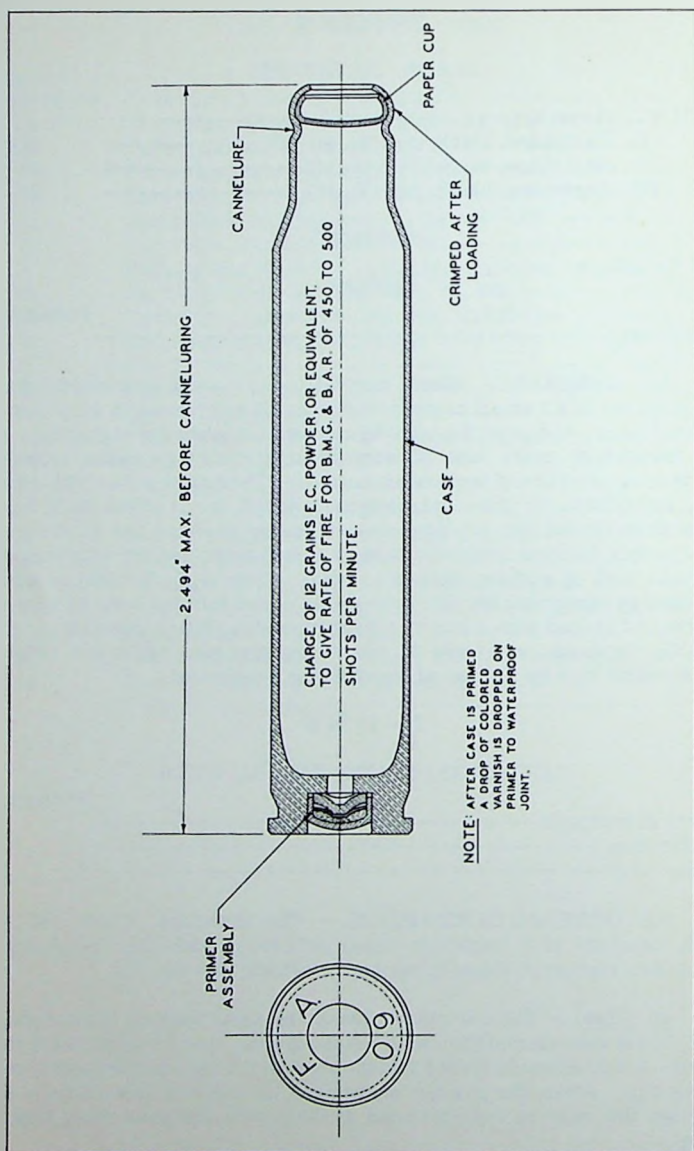


FIGURE 20. - CARTRIDGE, BLANK, CAL..30, M1909.

b. Primer. - The primer is the standard cal..30 primer, primer No. 26 (see par. 22). It is placed in the recess in the head of the case by a slight force fit, not crimped, and is waterproofed in the usual manner.

c. Powder charge. - Approximately 12 grains of E. C. powder is loaded into the case. This is sufficient to provide a rate of fire in the Browning automatic rifle and the Browning machine gun of 450 to 500 shots per minute.

d. Cup. - The cup is made of rope manilla paper, 0.015" thick and 0.08" deep at the rim. It is placed in the mouth of the case so that it rests flatly against the cannellure. It is waterproofed by the application of varnish.

82. IDENTIFICATION. - The cartridge may be readily identified by the fact that it has no bullet. In addition it has a cannellure pressed into the neck. The cartridge should be identified by lot number prior to issue. Personnel should note the table of color stripes and the description of cartons and packing boxes in paragraph 25, volume 1.

83. PACKING. - The cartridge is packed 5 per clip, 4 clips per carton, 100 cartons (2,000 rds.) per box. The box is metal-lined at the present time and is marked as explained in paragraph 25, volume 1.

SECTION III

CARTRIDGE, REVOLVER BLANK, CAL..45, M1

	Paragraph
General description -----	84
Identification -----	85
Packing -----	86

84. GENERAL DESCRIPTION. - The cartridge, revolver blank, cal..45, M1, consists of a cartridge case, primer, powder charge, and wad. The components are described as follows (see fig. 21):

a. Case. - The cartridge case assembled with this cartridge is unusually shaped, since the forward part is beveled so that the mouth is reduced in diameter by about 25%. The case is made of brass and has an extracting groove machined into the head. There is no cannellure pressed into the case.

b. Primer. - The primer is the same as that assembled in the cartridge, ball, cal..45, M1911.

c. Powder charge. - Approximately 6 grains of E. C. blank powder is loaded into the case.

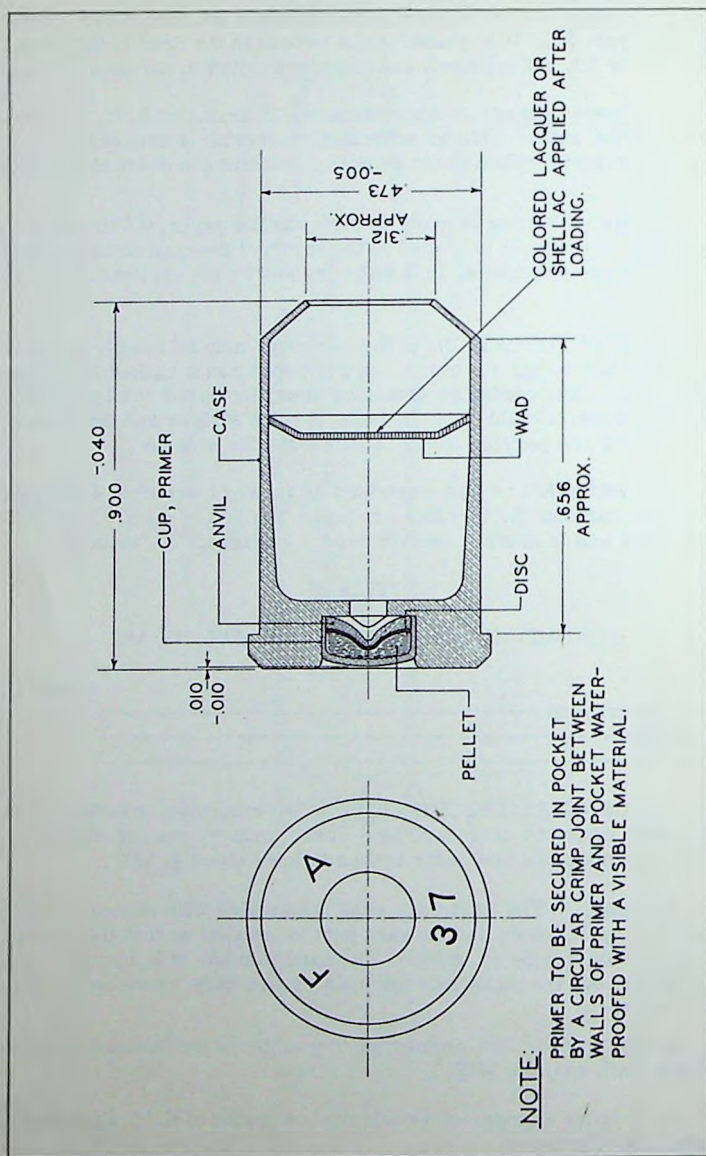


FIGURE 21. - CARTRIDGE, BLANK, REVOLVER, CAL..45, M1.

d. Wad. - The wad is made of paper and is placed in the case after the powder charge. Once seated it is waterproofed with a colored lacquer or a shellac.

85. IDENTIFICATION. - The cartridge may be readily identified by its characteristic size and shape. The peculiar shape of the case will assist in distinguishing the cartridge from the dummy cartridge. The cartridge should be positively identified prior to issue. Personnel should note the table of color stripes and the description of cartons and packing boxes in paragraph 25, volume 1.

86. PACKING. - The cartridge is packed 24 per carton, 240 cartons (5,760 rds.) per metal-lined box.

SECTION IV

CARTRIDGE, BLANK, CAL..50, M1

	Paragraph
General description -----	87
Identification -----	88
Packing -----	89

87. GENERAL DESCRIPTION. - a. The cartridge, blank, cal..50, M1, standardized in 1935 is fired by means of a blank firing attachment, from cal..50 machine guns. The cartridge consists of a case, primer, powder charge, and wad.

b. The components are described as follows (see fig. 22):

(1) Case. - The cartridge case is the same as that assembled with cal..50 service ammunition with the exceptions noted in section I of this chapter. A cannellure is rolled into the neck of the case as in the cal..30 blank cartridge, and similarly the case is closed by crimping.

(2) Powder charge. - Approximately 43 grains of E. C. powder is loaded into the case, which is sufficient to give the specified rate of fire.

(3) Primer. - The primer is the standard cal..50 primer, primer No. 28. It is optional with the manufacturer whether the primer be crimped into the recess in the head of the cartridge case. The joint between the primer and the case is waterproofed in the usual manner.

(4) Wad. - The wad is made of strawboard and is approximately 0.1" thick. It is assembled in the mouth of the case, resting on the cannellure. Before the mouth of the case is crimped a heavy coat of red (tracer bullet) lacquer is applied to the wad for waterproofing.

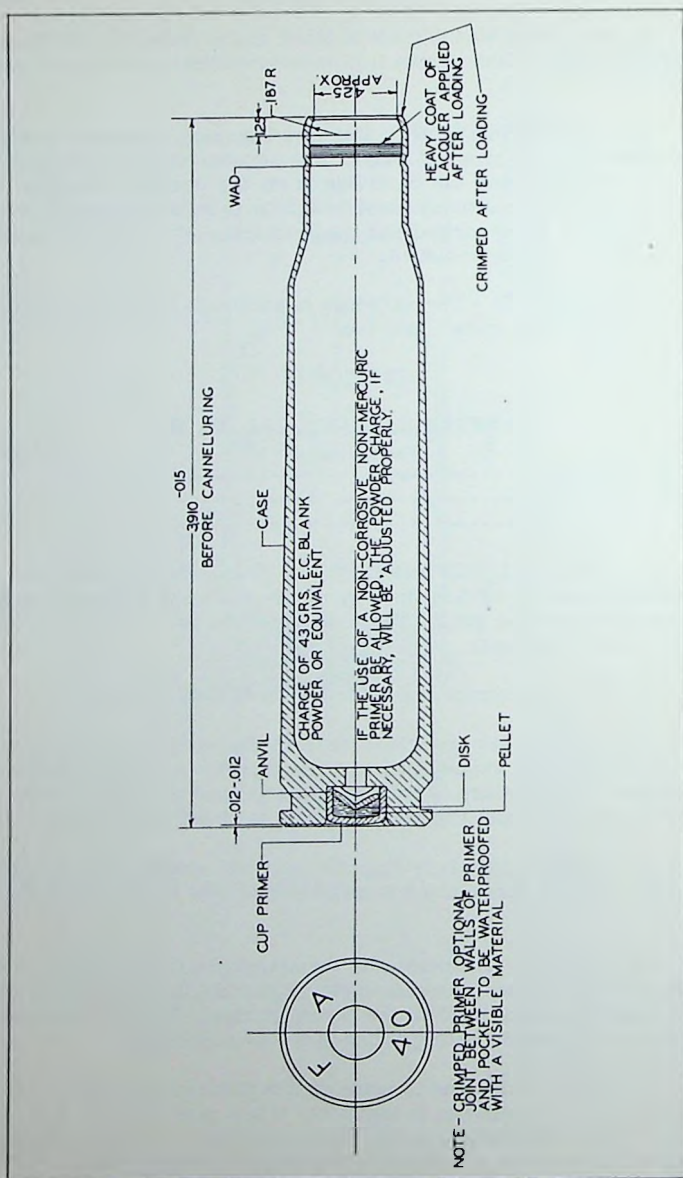


FIGURE 22. - CARTRIDGE, BLANK, CAL..50, M1.

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88. IDENTIFICATION. - The cartridge may be readily identified by the fact that it has no bullet. Further identifying features are the cannelure pressed into the neck of the bullet and the red color of the wad. This cartridge should be positively identified prior to issuance. Personnel should note the table of color stripes and the description of cartons and packing boxes in paragraph 25, volume 1.

89. PACKING. - The cartridge, blank, cal..50, M1, is packed in cartons, in metal-lined wooden packing boxes. It is marked as explained in paragraph 25, volume 1.

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CHAPTER 7

DUMMY CARTRIDGES

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III. Cartridge, dummy, cal..45, M1921 -----	94-96
IV. Cartridge, dummy, cal..50, M1, and M2 -----	97-99

SECTION I

GENERAL

	Paragraph
General -----	90

90. GENERAL. - Dummy cartridges are used to give personnel practice in loading weapons; to detect flinching in firing the weapons; and to simulate firing. The cartridge cases of all dummy ammunition are tin-coated and for further identification either the primer is not assembled, or holes are drilled through the case. The cartridges in any case are completely inert and simulate service rounds in fair detail.

SECTION II

CARTRIDGE, DUMMY, CAL..30, M1906

	Paragraph
General -----	91
Identification -----	92
Packing -----	93

91. GENERAL. - This cartridge is the only dummy cartridge standard for issue for cal..30 weapons. The cartridge, dummy, cal..30, M2, is not for issue to the service and is used only in ordnance industrial establishments. The dummy cartridge, M1906, has a tin-coated case with 6 longitudinal corrugations (see fig. 23). Since January 1940, the inert primer has been removed and the 3 holes are no longer drilled in the case. The M1 or M2 ball cartridge bullets are assembled with the round.

92. IDENTIFICATION. - The cartridge may be readily identified by its tinned corrugated case. In later lots the primer has been removed, and no holes are drilled in the case. The color stripes found on the carton and the packing box are described in paragraph 25.

93. PACKING. - The cartridge is packed 5 per clip (see par. 25), 4 clips per carton, 75 cartons (1,500 rounds) per wooden packing box, without metal liner.

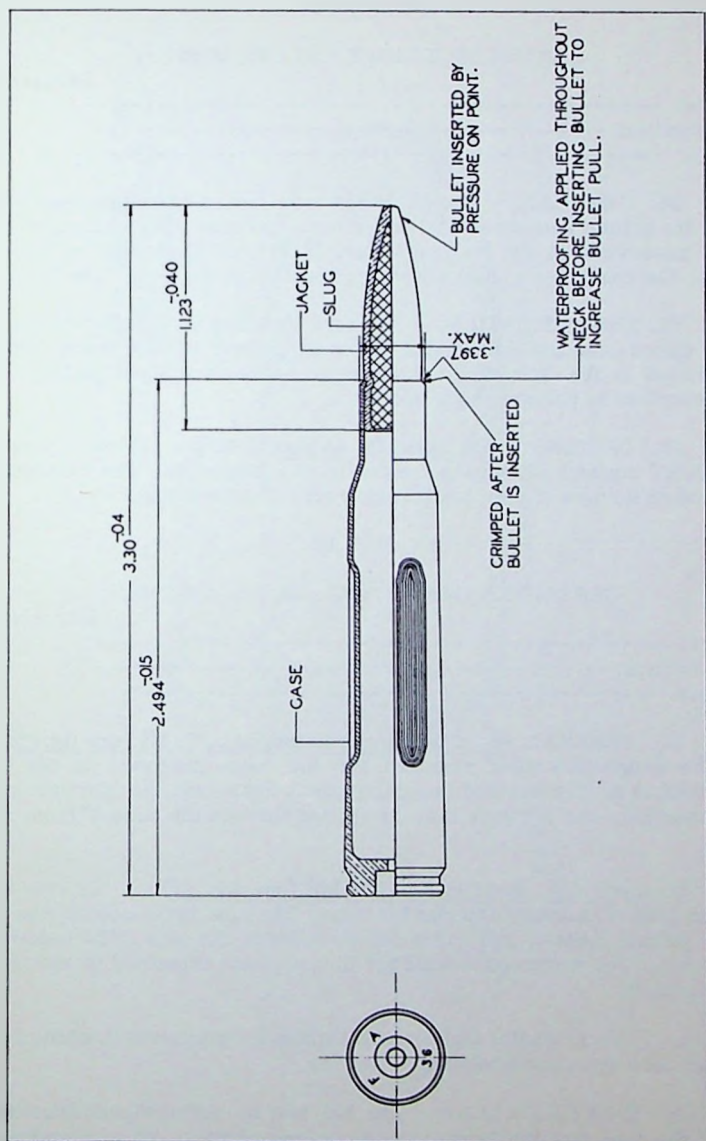


FIGURE 23. - CARTRIDGE, DUMMY, CAL. 30, M1906.

SECTION III

CARTRIDGE, DUMMY, CAL..45, M1921

	Paragraph
General -----	94
Identification -----	95
Packing -----	96

94. GENERAL. - The cartridge has a tinned cartridge case with either the primer removed or holes drilled in the case. The ball cartridge bullet assembled in the ball cartridge, M1911, is assembled with this round. The cartridge case has an extracting rim in the head. (See fig. 24.)

95. IDENTIFICATION. - The cartridge may be readily identified by its tinned case and the fact that either the primer is removed or holes are drilled in the case. The color stripes on the carton and packing box are described in paragraph 25, volume 1.

96. PACKING. - The cartridge is packed 20 per carton, 100 cartons (2,000 rounds) per wooden, metal-lined packing box. The extracting rim makes the use of clips unnecessary with this cartridge.

SECTION IV

CARTRIDGE, DUMMY, CAL..50, M1, AND M2

	Paragraph
General -----	97
Identification -----	98
Packing -----	99

97. GENERAL. - a. Cartridge, dummy, cal..50, M1 (see fig. 25). - This cartridge is limited standard for the same purposes as the M2 described in b. The bullet of this cartridge is not tinned, the inert primer is assembled, and a single hole is drilled through the case 2" from the head.

b. Cartridge, dummy, cal..50, M2 (see fig. 25). - This is the standard cal..50 dummy cartridge for issue. The case is tin-coated, has an empty primer pocket, and three holes drilled in the side. The bullet is tin-coated. The cartridge is used for the purposes explained in section I of this chapter.

c. Both cartridges make use of standard components in assembly, although they are completely inert.

98. IDENTIFICATION. - The M1 may be distinguished from the M2 by the fact that the former has an untinned bullet, and a primer and

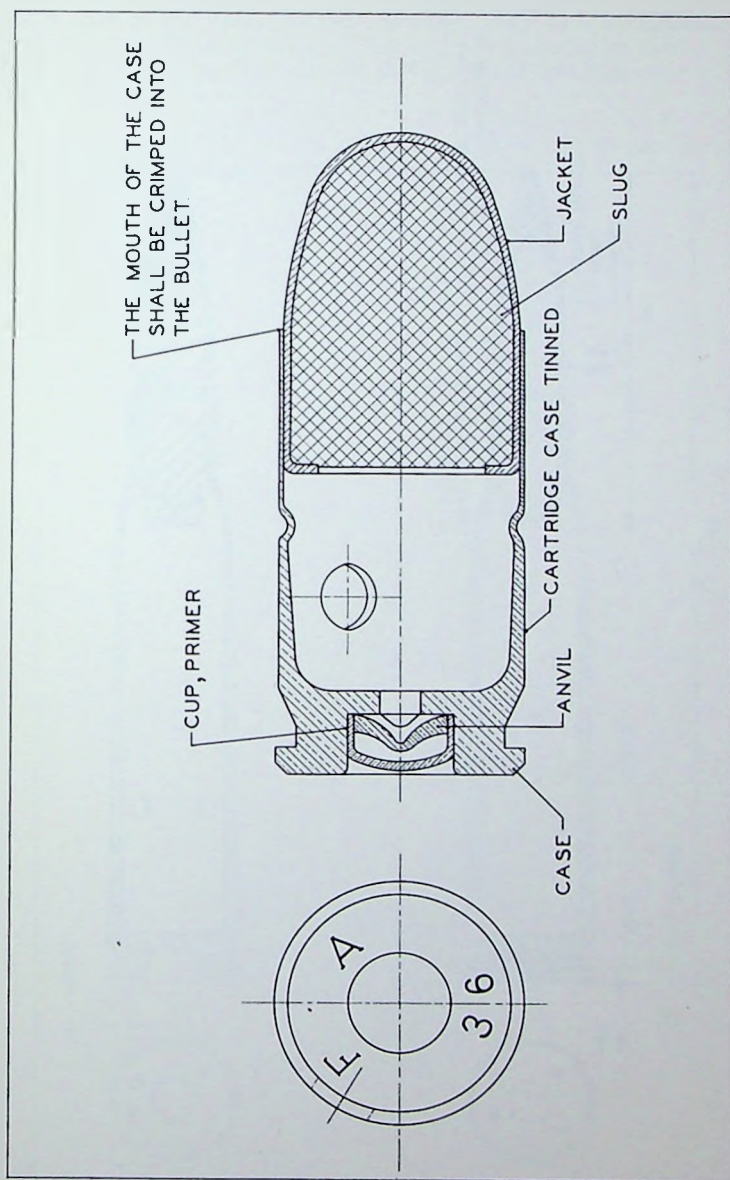


FIGURE 24. - CARTRIDGE, DUMMY, CAL. 45, M1921.

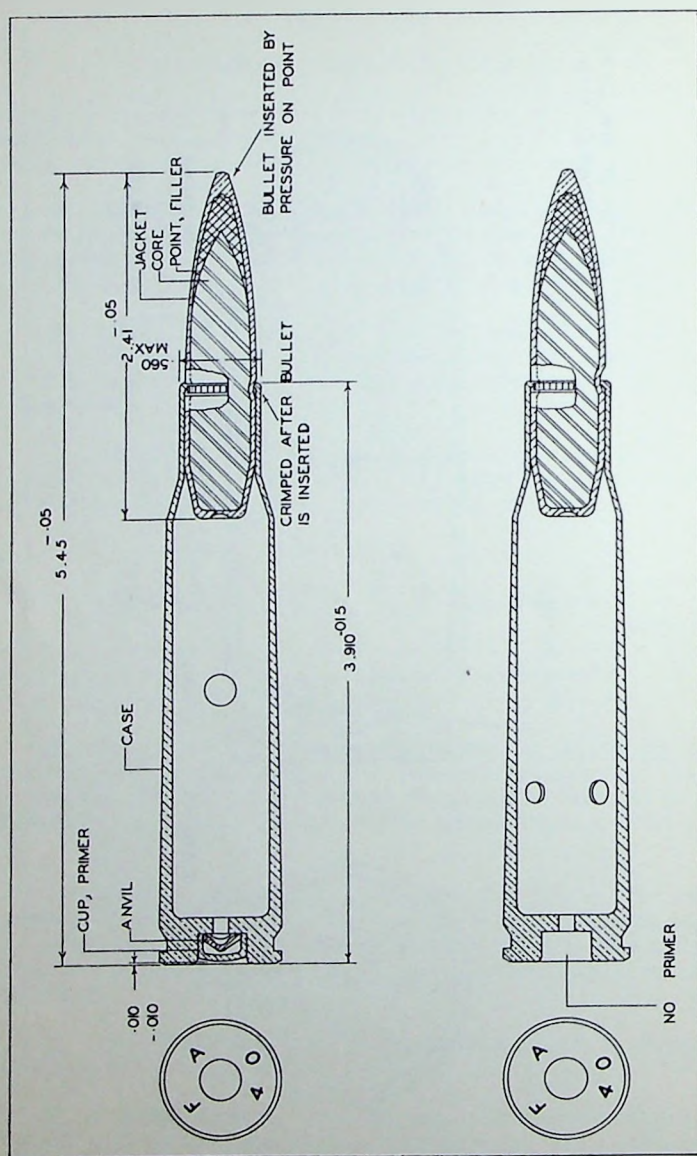


FIGURE 25. - CARTRIDGES, DUMMY, CAL..50, M1 AND M2.

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single hole in the case. Either cartridge may be distinguished from service ammunition by the fact that they are partially or wholly tinned. Color stripes on the cartons and packing boxes are described in paragraph 25, volume 1.

99. PACKING. - Both cartridges are packed 10 per carton, 35 cartons (350 rounds) per metal-lined packing box.

CHAPTER 8

MISCELLANEOUS CARTRIDGES

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V. Cartridge, guard, cal..30, M1 -----	116-118
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SECTION I

CARTRIDGE, BALL, CAL..22, LONG RIFLE

	Paragraph
General description -----	100
Identification -----	101
Packing -----	102
Exterior ballistics -----	103

100. GENERAL DESCRIPTION. - This cartridge has superseded the cal..30 gallery practice cartridge, M1919, for training purposes and is used in the cal..22 U. S. Rifles, M1922, M1922M1, and M2, also in cal..22 machine guns and pistols.

a. These cartridges are purchased by the Ordnance Department from commercial manufacturers. They are all of the same general appearance, but differ slightly in the shape of the bullet, powder used, and ballistic qualities. The cartridge complete weighs approximately 53 grains and consists of the case, priming composition, powder charge, and bullet.

b. The cartridge case is made of gilding metal and is of the rim-fire type — that is, the priming composition is spun into a circular recess inside the rim instead of being seated in the center of the case head as a separate component. A blow from the firing pin at any position on the rim compresses the priming composition causing it to explode and ignite the powder charge.

c. The priming composition and charge of smokeless powder may differ for each manufacturer. All standard, cal..22 long rifle ammunition purchased since 1928 contains a noncorrosive primer composition. The type of propellant powder used is usually marked on the containers and the charge weighs approximately 2.86 grains.

d. The cal..22 long rifle bullet is made of lead. Bullets of differ-

ent manufacture differ slightly in shape, but all weigh approximately 40 grains.

101. IDENTIFICATION. - a. Containers of this ammunition are marked by the manufacturer with the caliber, type, and such trade names as "Klean-bore," "Lubaloy," "Rustless," "Stainless," "Tackhole," "Copper-heads," etc. The manufacturer of these cartridges can be determined by the following marks which are stamped on the head of the case:

Federal cartridges have an initial "F."
Peters cartridges have an initial "P."
Remington cartridges have an initial "U."
U. S. cartridges have the initials "US."
Winchester cartridges have an initial "H."
Western cartridges have the figure of a diamond.

b. Cal..22 ammunition of recent manufacture has the manufacturer's lot number stamped on the wooden packing box. This provides a means of identifying and reporting any ammunition of this type which may become defective.

102. PACKING. - a. The cartridges are packed 50 in a cardboard box and 10 of these boxes (500 cartridges) are packed in a paper carton. The outside wooden packing box contains either 5,000 or 10,000 cartridges, 10 or 20 cartons respectively. The packing boxes are marked with the manufacturer's name, quantity, and type of ammunition. Boxes of this ammunition procured for overseas shipment contain the air-tight terne-plate liner.

b. A case of 10,000 cartridges without metal liner weighs 85 lbs. A case of 5,000 cartridges without metal liner weighs 44 lbs. Additional weights and dimensions are shown in Standard Nomenclature List No. T-1.

103. EXTERIOR BALLISTICS. - Cal..22 long rifle cartridges of different manufacture vary somewhat in velocity and pressure. The following data is only approximate:

a. The maximum range is approximately 1,500 yards at an angle of 30°.

b. The average muzzle velocity is from 1,080 to 1,100 ft./sec., and pressure in the chamber averages 16,000 lbs./sq.in.

SECTION II

CARTRIDGE, CARBINE, CAL..30, M1

	Paragraph
General description -----	104
Identification -----	105
Grades and uses -----	106
Packing -----	107
Exterior ballistics -----	108

104. GENERAL DESCRIPTION. - The cartridge, carbine, cal..30, M1 (see fig. 26) was made standard early in 1941. Extended experimentation was unnecessary as several commercial cartridges were available that differed little from the contemplated cartridge. The ammunition was developed for use in a light rifle or carbine, the latter being standardized in 1942. The cartridge finally adopted and standardized was adapted from the commercial Winchester, self-loading, cal..32 cartridge.

a. Complete round. - The complete round consists of the cartridge case, primer, charge of smokeless powder, and the bullet. The primer, by reason of a recent modification, is now crimped to the cartridge case. Waterproofing is accomplished by shellacking or varnishing the inside of the neck of the case prior to seating the bullet; by placing a drop of colored shellac on the joint between the primer and the case.

b. Bullet. - The bullet is of the round nose type. A recent change in specifications calls for a flat base to replace the concavity in the older bullet. This concavity had a radius of 0.120" and a depth of 0.072". The bullet has a varying radius of ogive (from rear to front - 0.938", 0.366", 0.090") and its base is not tapered.

(1) The component parts of the bullet are the jacket and the slug. The jacket is made of gilding metal and has a thickness of 0.020". The slug is an alloy of lead and antimony in the usual proportions and is completely covered by the jacket except for a portion of the base where the slug is exposed (see fig. 26).

c. Cartridge case. - The case is made of cartridge case brass, annealed. It has a maximum length of 1.290" and tapers from a width of 0.360" at the head to 0.3165" at the throat. The dimensions just given are those most recently specified and represent a change in design. The older case had less taper and consequently carbines were rechambered to fit the new case. For this reason the new cartridge may be fired in carbines that are or are not rechambered, but the cartridge assembled with the unmodified case may not be fired without danger, in the chambers of the new carbines. The inner diameter of the case at the throat is 0.3055" and as the bullet is 0.308" in diameter at the base the forced fit of insertion

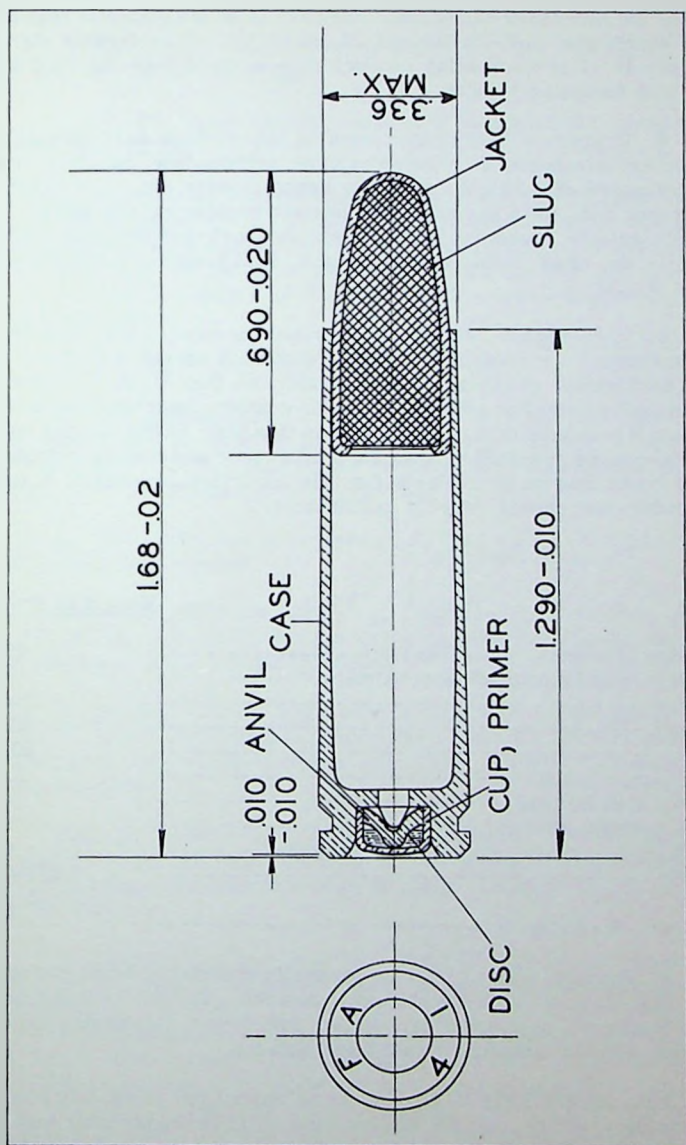


FIGURE 26. - CARTRIDGE, CARBINE, CAL. 30, M1.

provides the necessary bullet pull. The case is an adaptation of that used in the Winchester self-loading cal..32, cartridge. Considerable experimentation is at present being conducted on a steel case for this cartridge with favorable results.

d. Primer. - The primer used in the carbine cartridge is the commercial Winchester #116, noncorrosive, self-loading, cal..32 primer. It is composed of a brass primer, a brass primer cup, a shellacked, green paper disk, and a nonmercuric and noncorrosive primer pellet. The complete primer assembly is fitted and then crimped into the primer recess in the head of the cartridge case. It is known in the service as primer No. 30.

e. Propellant. - Two types of propelling powder have undergone experimentation for acceptance. That one initially accepted was an FNH, single perforated, granular powder, known as Dupont 4227. Recently Western ball powder has replaced the grain powder. Information concerning the ball powder may not be included in this text. Suffice to say that it has proven more satisfactory than its predecessor and that experimentation is continuing on propellants for this cartridge, as neither of these two powders has proven entirely satisfactory.

f. Component weights. -

<u>Item</u>	<u>Weight in grains.</u>
Cartridge (complete, approximate) -----	193.0
Cartridge case (unprimed), approximate -----	66.0
Bullet -----	110. -3
Jacket -----	20. -1
Slug -----	90. -2
Primer, approximate -----	3.065
Anvil, approximate -----	0.75
Cup, primer, approximate -----	1.91
Disk, approximate -----	0.03
Pellet -----	0.375-0.06 (dry)
Propellant, approximate -----	14.0

g. Results. - The cartridge presently manufactured is giving the required results but it is not all that is desired. Trouble is found in the bullets fouling the bore and other similar difficulties. Continuing experimentation will undoubtedly correct these defects.

105. IDENTIFICATION. - Personnel cannot fail to readily identify the cartridge, carbine, cal..30, M1, because of its characteristic size and shape (see fig. 26). The cartridge is 1.68" long and has no neck to the

case. Other identifying features (see fig. 27):

a. The original packing box is clearly marked "CARBINE, CALIBER .30, M1," in letters 1" high.

b. The 45-round cartons also clearly indicate their contents to be carbine ammunition.

c. Both carton and packing box have color identification stripes. The stripe on the carton is of a flag red color and is 1" wide. The stripes on the packing box are of a flag red color and are located in two positions on the box. A 2" stripe is painted vertically on the front and rear faces and a 1" stripe is painted 1/4" below the top edge of each end, and just above the handle cuts.

d. An ammunition identification card.

e. The manufacturer's initials, e.g., "W.R.A.," and the numerals 42 or above are stamped on the head of the case. On the older types of cases are stamped "W.R.A.," and the caliber and commercial designation, ".30 S.L.," "S.L." standing for "self-loading."

f. The bullet has a copper colored jacket. Personnel may see steel jackets in the future.

106. GRADES AND USES. - a. Uses. - The cartridge, carbine, cal..30, M1 is exclusively for use in the carbine, cal..30, M1, and is not authorized for use in any other weapon.

b. Grades. - There are 2 grades for the cartridge; grade "R" and grade "3". Grade "R" indicates those cartridges for service use, grade "3" indicates unserviceable ammunition that must not be used under any circumstances.

107. PACKING. - a. Cartons. - Cartridges, carbine, cal..30, M1, are packed 15 per carton, 3 cartons per heavy paper carton holder. It is the carton holder that bears the color stripe and identifying printed matter. (See fig. 27.)

b. Packing box (see fig. 27). - Sixty 45-round carton holders are packed per wooden packing box. This box has the following approximate dimensions - 16-7/16" x 12-11/16" x 7-5/8". It is lined at the present time with terneplate, and the cover of the box is held in place by 6 thumb nuts and 6 hook screws. The stenciling on the box is in yellow when the box itself is painted brown; black when the box is unpainted. The weight of the packing box and liner, without ammunition, is 13 lbs. The complete box with a prescribed content of 2,700 cartridges weighs 91 lbs.

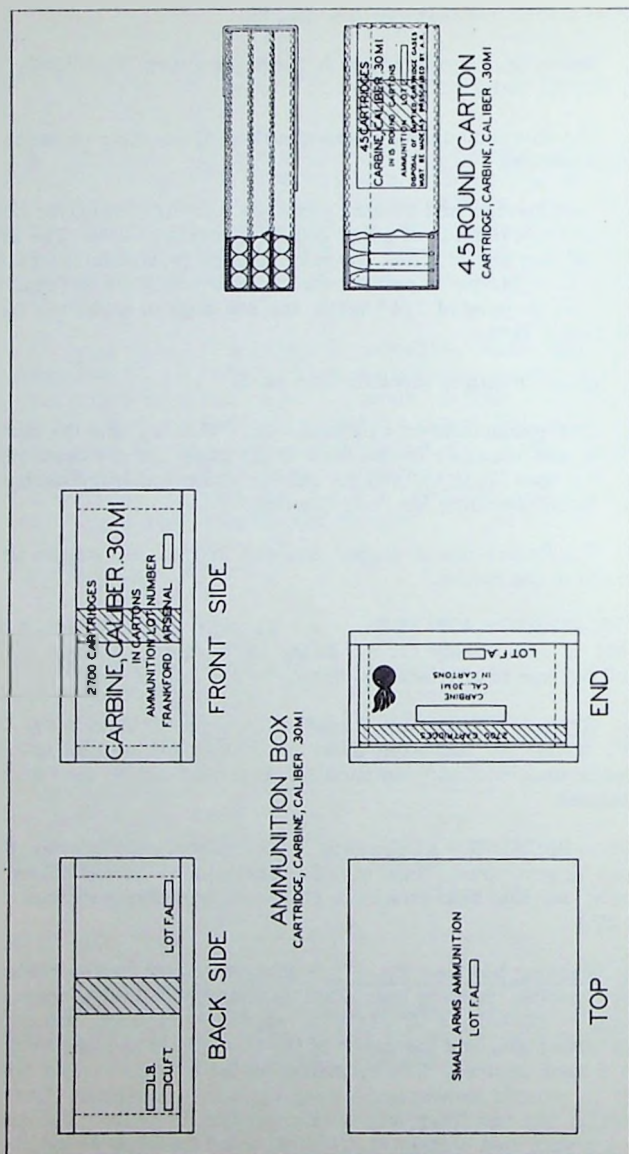


FIGURE 27. - PACKING AND MARKING, CARTRIDGE, CARBINE, CAL..30, M1.

108. EXTERIOR BALLISTICS. - The following proving ground data give the general characteristics of the cartridge, carbine, cal..30, M1, when fired from the carbine, cal..30, M1:

Maximum range (approximate) -----	2,500 yds.
Effective range -----	300 yds.
Muzzle energy -----	1,672 ft./lbs.
Pressure (approximate) -----	35,000 p.s.i.
Muzzle velocity -----	1,850 ft./sec.

SECTION III

CARTRIDGE, RIFLE GRENADE, CAL..30, M3

	Paragraph
General description -----	109
Identification -----	110
Packing -----	111

109. GENERAL DESCRIPTION. - a. The cartridge, rifle grenade was developed for use in the cal..30 rifles, M1903, M1903A1, and M1917. Its function is to propel the antitank grenades launched from either of the above 3 rifles. (See vol. 3, OS 9-18.)

b. The cartridge consists of a cartridge case, a wad, a primer, and a propellant. The components are described as follows (see fig. 28):

(1) Cartridge case. - The cartridge case is the standard cal..30 case, 2.494" long before canneluring and crimping. A cannelure is pressed into the case at a point midway on the neck of the cartridge case. The cannelure is deep enough to provide a rest for the wad that is inserted in the mouth of the case. After the wad is inserted the mouth of the case is closed by a 5-point crimp, providing a rosette appearance to the mouth of the case (see fig. 28).

(2) Wad. - The wad is made of a thin, stiff paper. It is seated flatly immediately above the cannelure. After seating, a drop of red (tracer bullet) lacquer is placed on the wad, and while the lacquer is still plastic the case is closed in the manner described above. The red dot formed by the plastic is visible in the opening formed by the crimped case.

(3) Primer. - The primer is the standard primer for cal..30 ammunition, primer No. 26. The primer assembly is crimped into the cartridge case pocket by a circular crimp and waterproofing is accomplished with a visible material in the usual manner.

(4) Propellant. - The propellant used in this cartridge is a combination of two powders. The case is loaded first with a charge of 5

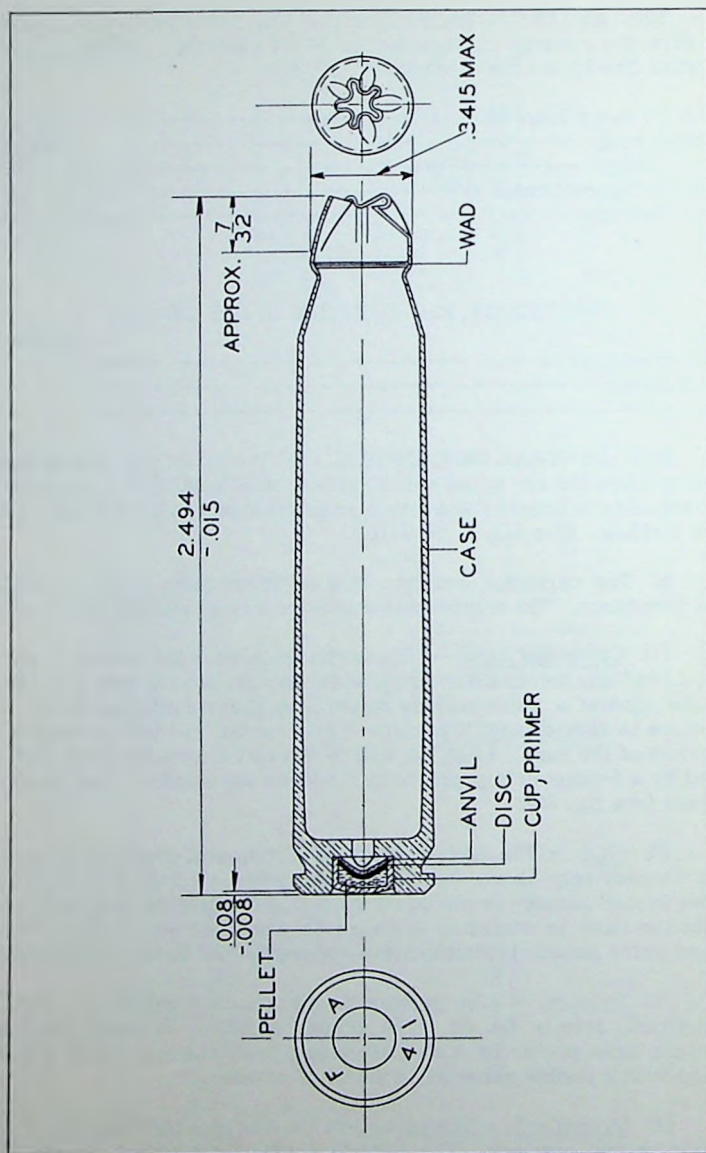


FIGURE 28. - CARTRIDGE, RIFLE GRENADE, CAL..30, M3.

grains of black rifle powder and then is brought to the correct weight of propellant to attain the appropriate velocity of 165 ± 5 ft./sec. at 5.5' from the launcher by the addition of approximately 46 grains of a progressive burning powder, IMR 4676.

110. IDENTIFICATION. - a. The cartridge, rifle grenade, M3, should be positively identified before issue in the manner described in paragraph 44.

b. The cartridge may be readily distinguished from cal..30 cartridges of other types by the crimping in the neck of the case, the red drop of lacquer in the wad, and the cannellure pressed into the neck of the case.

c. Personnel should refer to paragraph 25 to familiarize themselves with the color bands on the packing box as this will serve as an important means of identification.

d. An ammunition identification card will be included (see par. 25).

111. PACKING. - a. The cartridge, rifle grenade, M3, will ordinarily be issued to the using service with the antitank grenade. It will be found, wrapped in a cellophane envelope in the stabilizer assembly tube, and held in this location by the plug (see vol. 3, OS 9-18).

b. It is also packed in the standard cal..30 packing box. It is not known whether it is packed in cartons inside this box or whether some special packing has been devised. No information is available concerning this question. For the identifying color stripes see table in paragraph 25.

SECTION IV

CARTRIDGE, SUBCALIBER, CAL..30, M1925

	Paragraph
General description -----	112
Identification -----	113
Packing -----	114
Exterior ballistics -----	115

112. GENERAL DESCRIPTION. - a. Use. - The cartridge, sub-caliber, cal..30, M1925, is fired from a subcaliber cartridge inserted in the bore of the 3" seacoast guns, its use for subcaliber practice with other types of cannon having been discontinued. The use of subcaliber ammunition permits the training of personnel in the handling and operation of the larger weapons at less expense than if the service rounds were being fired.

b. The cartridge consists of a case, primer, propellant, and

bullet. The components are described as follows (see fig. 29):

(1) Cartridge case. - The case is made of brass and in general is similar to the standard cal..30 case. An extracting groove is situated on the head of the case, however, which lends the case a distinctive appearance. The case is crimped into the cannellure of the bullet but is not waterproofed in the usual manner.

(2) Primer. - The primer consists of a primer pellet, FA#70, a paper disk, a brass anvil, and a monel metal primer cup. The primer is assembled in the standard method and is placed in the primer recess in the head of the case without crimping or waterproofing. The monel metal case functions equally well under the relatively light blow of a rifle or the heavy blow of the firing pin of the 3" gun.

(3) Propellant. - Information is not available as to the type of powder loaded into the case of this cartridge. The charge is adjusted to give the specified velocity causing a variance in the powder pressure for each lot.

(4) Bullet. - The bullet is the same as that assembled in the cartridge, ball, cal..30, M1.

c. Note. - The cartridge, carbine, cal..30, M1 is beginning to find extensive use as a subcaliber cartridge.

113. IDENTIFICATION. - The cartridge may be identified by the extracting rim on the cartridge case. In addition the cartons, packing box, and identification card, bear identifying printed matter (see par. 25). The manufacturer's initials and numerals indicating the year of manufacture are stamped on the head of the case.

114. PACKING. - The cartridge is packed in cartons, in metal-lined wooden packing boxes. No information is available concerning the identifying color stripes but it is assumed that there are no color stripes on the box.

115. EXTERIOR BALLISTICS. - The maximum range of the cartridge is 4,300 yards and the muzzle velocity is 1,990 ft./sec. The powder pressure varies as explained above.

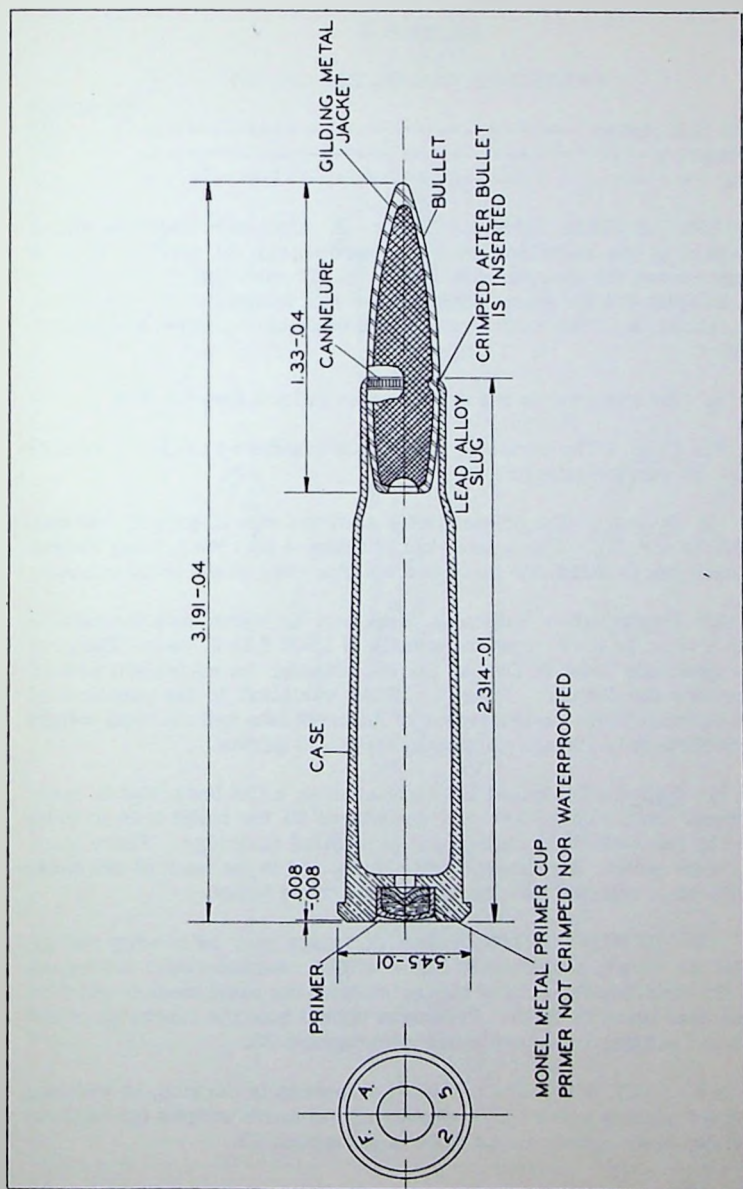


FIGURE 29. - CARTRIDGE, SUBCALIBER, CAL..30, M1925.

ORDNANCE SCHOOL

SECTION V

CARTRIDGE, GUARD, CAL..30, M1

	Paragraph
General description -----	116
Identification -----	117
Packing -----	118

116. GENERAL DESCRIPTION. - a. This cartridge was known in the past as the cartridge, gallery practice, cal..30, M1919. When it was superseded for that purpose by the cal..22 cartridge it was decided that it was suitable for guard purposes and was designated the cartridge, guard, cal..30, M1. The cartridge consists of a case, primer, propellant, and bullet.

b. The components are described as follows (see fig. 30):

(1) Case. - The cartridge case is the standard case for assembly with cal..30 service ammunition.

(2) Primer. - The primer is the standard cal..30 primer, primer No. 26 (see par. 22). The primer is not crimped into the primer recess of the case, but is fitted into place and waterproofed in the usual manner.

(3) Propellant. - Sufficient propellant is loaded into the case to provide a velocity at 53' from the muzzle of $1,100 \pm 25$ ft./sec. The propellant generally used is Dupont No. 80, although an equivalent powder may replace the former. There is little variation in the amounts of propellant loaded into the cartridges of different lots and the total weight of the propellant is normally approximately 10.5 grains.

(4) Bullet. - The bullet has a round nose, a flat base, and is made of hardened lead. There are two cannelures in the bullet both of them covered by the neck of the case in the assembled cartridge. There is no jacket on the bullet. No waterproofing is applied in the neck of the case, nor is the case crimped into the cannelures in the bullet.

117. IDENTIFICATION. - The cartridge may be readily recognized by the short, round-nosed bullet with a characteristic lead-gray color. Positive identification of the cartridge in the usual manner must be accomplished prior to issue. Personnel should note the markings of the cartons and packing boxes explained in paragraph 25.

118. PACKING. - The cartridge is packed in cartons, in wooden, metal-lined packing boxes. The characteristic color stripes for cartons and packing boxes appear in the table in paragraph 25.

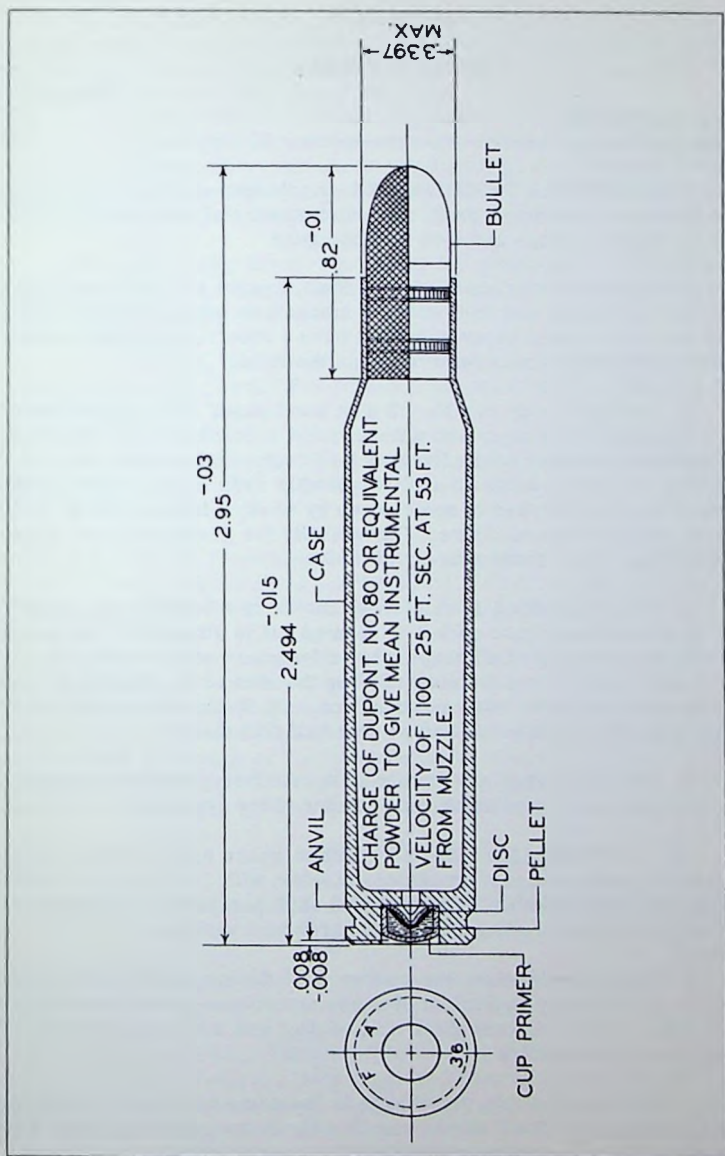


FIGURE 30. - CARTRIDGE, GUARD, CAL..30, M1.

ORDNANCE SCHOOL

SECTION VI

SHOTGUN SHELLS

	Paragraph
General description -----	119
Powder and load -----	120

119. GENERAL DESCRIPTION. - a. Shotgun shells are procured by the Ordnance Department from several commercial manufacturers for use in 12-gage sporting- and riot-type shotguns.

b. The shell consists of a brass head, a paper case or shell body, a primer, cardboard and felt wads, a smokeless powder charge, and a load of lead shot. Some paper shotshell have a steel reinforcement under the brass head, sometimes referred to as the lining.

c. The shell body is a No. 12 shot shell paper case manufactured from first class body paper and waterproofed according to the manufacturer's practice. Paper shells for guard and combat use are waterproofed by soaking the paper tubes in melted paraffin before they are cut into cartridge lengths, followed in some cases by soaking in china wood oil to increase resistance to moisture. Other shells for guard and combat use have cartridge cases made entirely of brass.

d. The brass head is reinforced inside by a base of compressed paper in which the primer pocket is formed. It is attached to the paper shell body by crimping. On shotgun shells for guard and combat use, the brass heads extend for a distance of 1" up the side of the shell body to a point opposite the lower over-powder wad. On shells for trap-shooting or hawk load, the brass heads extend only half this distance.

e. The shell cases are primed with standard percussion primers suitable for the ignition of smokeless powder of the type used.

120. POWDER AND LOAD. - a. For guard and combat use, the charge is 26 grains of dense smokeless powder, with 1-1/8 ounces of No. 00 (eastern size) buckshot (3 layers of 3 shot per layer, or 9 shot per shell) and a suitable quantity of felt and cardboard wadding.

b. For trap-shooting, the charge is 3 drams of bulk smokeless powder or its ballistic equivalent of dense smokeless powder with 1-1/4 ounces of No. 7-1/2 (eastern size) chilled shot and a suitable quantity of felt and cardboard wadding.

c. For hawk loading, the charge is the same as for trap-shooting but 1-1/8 ounces of No. 6 (American Standard) drop shot are used with the required felt and cardboard wadding.

d. In addition to the markings on the pasteboard cartons and packing boxes, symbols indicating the powder charge and shot load are stamped on the closing wad. These shells can be further identified by the following markings on the head of the case:

(1) Winchester Repeating Arms Co. shells for guard and combat use have the gage number, initials of manufacturer, and the word "Leaded." The shells for trap-shooting and hawk loading have the gage number, initials of manufacturer, and the words "Ranger."

(2) Remington Arms Co. shells for guard and combat use have "Rem. UMC No. 12, Arrow." For trap-shooting and hawk loading have "Rem., No. 12, Economy."

(3) Western Cartridge Co. shells for guard and combat use have "Western No. 12, Record." For trap-shooting and hawk loading, the shells have "Western No. 12, XPert."

(4) U. S. Cartridge Co. shells for guard and combat use have "U. S. No. 12, Ajax." For trap-shooting and hawk loading, the shells have "U. S. No. 12 Defiance."

(5) Peters Cartridge Co. shells for guard and combat use have "P" and "Peters No. 12 Ideal (or Premier)." For trap-shooting and hawk loading, the shells have "P" and "Peters No. 12, Victor."

e. Five hundred shells in 20 paper boxes of 25 rounds each are packed by the manufacturer in either a wooden or heavy fiber packing case. For overseas shipment, the box is of wood and has a waterproof metal liner to protect the ammunition. Cases of this ammunition bear the commercial markings of the manufacturer with the additional phrases: "Guard or combat use," "Trap-shooting," or "Hawk loading." Particular care must be taken to protect this ammunition from exposure to moisture.

SECTION VII

AMMUNITION FOR FIELD ARTILLERY TRAINER, M2, AND M2A1

	Paragraph
General description -----	121
Packing -----	122

121. GENERAL DESCRIPTION. - a. The ammunition for the limited standard field artillery trainers consists of a cal..22 short blank cartridge and a 1-inch steel ball. The standard field artillery trainer, M3, utilizing compressed air as a propellant has proved highly satisfactory and has replaced the cal..22 cartridge.

ORDNANCE SCHOOL

b. Cartridge, blank, cal..22, short. - This cartridge is a rim-fire cartridge of commercial manufacture weighing approximately 11.2 grains and containing 2.7 grains of black powder. The powder is held in place by a paper wad which is retained by crimping the neck of the cartridge case. The cartridge is used as the propellant in the trainer.

(1) As the ordinary commercial blank cartridge is designed to produce loudness of report, and as much smoke as practicable, the type now available is not wholly satisfactory. A special cal..22 blank cartridge is now available, that is issued on requisition, in place of the ordinary blank cartridge. No information is available concerning it.

c. Ball, steel, 1-inch. This ball is 1" in diameter and of polished steel, similar to the balls used in ball bearings. It weighs approximately 1,024 grains and is used as the projectile in the trainer. These balls are not readily injured in use, and if kept clear and polished immediately after use, may be reused frequently.

122. PACKING. - a. Cartridge, blank, cal..22, short (commercial). - This cartridge is packed 50 to a paper carton in commercial shipping containers holding 10,000 cartridges. As packed the approximate weight is 23 pounds.

b. Ball, steel, 1-inch. - No standard method of packing has been prescribed for these steel balls.

CHAPTER 9

STORAGE

SECTION I. Defects found on visual examination -----	Paragraphs 123-124
II. Care and handling -----	125-129

SECTION I

DEFECTS FOUND ON VISUAL EXAMINATION

Inspection -----	Paragraph 123
Defects found after firing -----	124

123. INSPECTION. - a. Season crack. - Working the metal in the drawing and tapering operations, in the manufacture of the cartridge case, produces internal stresses or strains due to distortion of the normal crystalline structure. This condition is further aggravated by the insertion of the bullet. Rearrangement of the crystalline structure leads to failure of the metal along definite longitudinal lines of least resistance. This is known as season cracking, and may be evidenced by a split in the neck of the cartridge case. Exposure to severe weathering conditions or certain reagents hastens the time of cracking. In order to prevent or decrease the tendency to season crack, a final anneal is applied to the neck of the cartridge case. This annealing allows the crystals to rearrange themselves in their natural state without the metal cracking. In reporting season crack in ammunition, care should be taken not to confuse this defect with that known as "split necks," which occur when the ammunition is fired.

b. Corrosion. - There are different stages of corrosion. The minor stages do not necessarily raise the surface of the metal but are more in the nature of a harmless discoloration of the cartridge case. An examination of the case should indicate whether the corrosion has eaten into and weakened the metal to such an extent as may cause it to rupture when the cartridge is fired. True discoloration is the blackening of the cartridge case, whereas corrosion adds other colors such as green, red, yellow, blue, and white. Corrosion in advanced stages, through some chemical action, appears to deposit a substance on the case which will interfere with chambering the cartridge. In reporting corrosion, the degree of corrosion should be described. Discoloration is really of minor importance since ammunition that is discolored will function as well as good ammunition. Advanced corrosion, however, is a serious defect and ammunition thus affected should not be fired. The use of steel wool or other abrasives to remove corrosion from cartridge cases is prohibited.

c. Mouth pull down. - The mouth of the cartridge case was not

concentric, and when the bullet was seated it struck one side of the mouth of the case and shoved the metal down. This defect occurs much more frequently with a cartridge case whose mouth is annealed very soft, than with a cartridge case whose mouth has no, or a very slight, anneal. It is also possible that this defect may be caused by improper alinement of the bullet loading machine.

d. Shoulder bulge. - A pucker in the metal of the cartridge case at the junction of the shoulder and body. This defect is generally caused by the metal being either too thin or too soft. It is also caused by a maximum diameter bullet being seated in a cartridge case having a neck of minimum diameter.

e. Oil dent. - A smooth-surfaced indent in the cartridge case generally in or near the shoulder or neck. This defect is caused by an excess of oil used in the tapering operation. Unless extremely large, so as to greatly increase the density of loading, thereby increasing the pressure, this defect is negligible.

f. Draw scratch. - A longitudinal scratch, varying in degree, on the cartridge case. This defect is caused by grit or some other foreign substance in the final draw die and is due to improper washing of the material before reaching that operation. A cartridge having a deep draw scratch will probably open up on firing with a consequent loss in velocity. Also, cartridges containing this defect will probably split in storage sooner than normal cartridges.

g. Split mouth. - A split in the edge of the cartridge case. This defect is caused by the plugging operation.

h. Folded neck. - Overlapping of metal in the neck of the cartridge case indicated by a longitudinal protuberance on the outside. This defect is caused by the metal in the neck of the cartridge case being thinner on one side than on the other and by insufficient annealing.

i. Scale. - Inclusions of impurities in the metal which are sometimes visible to the eye and are sometimes hidden. If hidden, and not discovered by the inspectors, it often causes an irregular break in the cartridge case and loss of velocity due to the escape of gas when fired. This defect is inherent in the metal and is not caused by faulty manufacture. Scaly metal shortens the life of the cartridge-making tools considerably.

j. Indent and burr. - These defects generally arise from rough handling of the cartridge case during the process of manufacture. If cartridges with these defects chamber in the rifle there is no danger in using them, unless the dent is so large that the density of loading is increased to such an extent that a dangerous pressure would result.

k. Crease. - This is very similar to a fold, and generally occurs in the neck or shoulder of the cartridge case. It is caused by thin metal.

l. Thick head. - The head of the cartridge case has a thickness of metal greater than the maximum allowed. This defect generally occurs during the adjustment of the head-trimming machine. It is also sometimes caused by a chip of metal getting on the push-in feed rod, thereby causing a cartridge case to be improperly chucked. Such a defect will probably give trouble in extraction, as the extractor is not able to function with an extremely thick head.

m. Thin head. - The head of the cartridge case has a thickness of metal less than the minimum allowed. This defect happens during the adjustment of the head-trimming machine. It will be the probable cause of the extractor failing to function because it pulls through the thin metal of the head and does not extract the case.

n. Round head. - The head of the cartridge case which is beveled on the outer edge so that it is practically round. This defect is generally found in a case which has been pocketed but not headed. It also sometimes happens with a thin case which contains too little metal in the head to properly form it. This defect causes trouble in extraction. At times a thick-headed cartridge, on account of the bevel given it, has an appearance of a round head.

o. Split bullets (tracer ammunition). - Longitudinal cracks in the bullet which often rupture the neck of the cartridge case. In most cases, this is due to impure tracer mixture which either has absorbed too much moisture or liberated free mercury which amalgamates the metal of the bullet causing the split. This defect is very serious and when found should be immediately reported.

124. DEFECTS FOUND AFTER FIRING. - a. Misfire (heavy blow). - The primer shows an impression of the firing pin which indicates that a blow sufficiently hard to ignite a perfect primer has been delivered. Such a misfire as described indicates that the primer is defective. This defect may be from:

- (1) Thick metal in the base of the primer cup.
- (2) Thick primer pellet which cushions the blow.
- (3) No priming pellet in the primer.
- (4) No primer pellet mixture between the primer cup and anvil.
- (5) No anvil.
- (6) No vent hole.
- (7) Various combinations of these defects.

b. Misfire (light blow). - The primer is so lightly marked by the

impression of the firing pin that it indicates that the force of the blow struck was not sufficient to ignite the primer. This is generally caused by some mechanical defect in the weapon, such as a short or broken firing pin, a weak firing pin spring, or by the bolt of the weapon not being completely locked. It can also be caused by a bolt having so much grease in it that the blow of the pin is retarded. It can, however, be caused by a very short primer cup being inserted in a very deep primer pocket, in which case, upon the blow of the firing pin, the primer does not offer the proper amount of resistance, but travels deeper into the pocket with the motion of the firing pin. This may also be caused by a primer being seated too deep in the primer pocket, in which case the travel of the firing pin is not sufficient to strike the blow required to ignite the primer. It may also be caused by an improper angle of the shoulder of the cartridge case, which, under the blow, allows the cartridge case to go forward, thereby cushioning the striking of the firing pin. It sometimes happens, however, that the firing pin of a rifle has a very short spring, and immediately after firing, the pin recedes, so that a disk from the center of the primer cup is blown through the firing pin hole in the bolt. This disk of primer brass, when in the bolt, causes an interference with the action, whereby on the succeeding shots the firing pin strikes a light blow.

c. Misfire (off center). - The primer shows by the indent that the blow made by the firing pin was so far off center that it did not strike the primer on or near the point under which the apex of the anvil lies. This is caused by a defect in the weapon. It is not thought that a cartridge could be obtained with the head so eccentric that the firing pin of a normal weapon could strike such an off-center blow as to cause a misfire.

d. Hangfire (delayed ignition of the powder in the cartridge). - This can be caused by a small primer pellet or damp powder. It is an extremely serious defect, as it may be taken for a misfire, the bolt opened and the cartridge then explode injuring the shooter. This may also be due to a light blow caused by a defect in the weapon, which is much more dangerous in a rifle than in a machine gun.

e. Pierced primer (perforation of the primer cup by the firing pin). - This may be caused by:

(1) An imperfect firing pin.

(2) Very thin metal in the base of the primer cup. There are various degrees of this perforation. A very small perforation will show the escape of gas in or around the indent made by the firing pin. A large perforation may be such as to allow a metal disk from the base of the primer cup to be blown back into the action of the gun with such an escape of gas as to cause the velocity of the ammunition to drop.

f. Primer leak (small). - Gas generated by the explosion of the powder charge escapes between the walls of a primer cup and the primer pocket, causing some discoloration around the primer and the head of the cartridge case. This primer leak may be due to:

(1) Primer having diameter less than minimum, seated in a normal primer pocket.

(2) Normal primer seated in a pocket having diameter more than maximum.

(3) Excessive pressure generated by the propellant charge.

g. Primer leak (large). - The gas generated by the explosion of the powder escapes between the walls of the primer pocket causing heavy discoloration around the primer pocket and head of the case. This may be due to:

(1) Primer having diameter less than minimum, seated in a normal primer pocket.

(2) Normal primer cup seated in a pocket, having diameter more than maximum.

(3) Excessive pressure generated by the propellant charge. It is generally found, however, that this defect occurs in cartridges, the metal in the head of which is softer than in the head of the normal cartridge.

h. Blown primer. - On firing the cartridge the primer is blown completely from the pocket of the cartridge case. This may be caused by:

(1) Excessive pressure developed by the powder charge.

(2) A cartridge case with a soft head. This is a very serious defect.

i. Primer set-back (slight). - Pressure developed by the explosion of the propellant charge forces the primer back against the face of the bolt and upon examination it will be seen that the primer protrudes slightly above the head of the cartridge case.

j. Primer set-back (heavy). - The pressure developed by the explosion of the propellant charge forces the primer back against the face of the bolt and upon examination it will be seen that the primer protrudes considerably above the head of the cartridge case. Both classes of primer set-backs, slight and heavy, indicate that the metal in the head of the cartridge case may be softer than it should be. Protrusion of primers may

also be due to a defective bolt.

k. Case leaked back. - The escape of gas into the action of the weapon. The discoloration due to this escape of gas is along the body of the cartridge.

l. Case failed to extract. - The failure to extract the fired cartridge case from the chamber of the weapon. This may be due to poorly formed or weak extractor. It is also caused by the following cartridge defects:

(1) A round head over which the extractor slips without gripping.

(2) A thin head case through which the extractor jaws pull.

(3) A soft case (one which is not properly annealed) which, upon firing, expands and locks itself against the chamber walls so tightly that normal methods of extraction fail.

m. Split neck. - The neck of the cartridge case splits in firing and there is an escape of gas, thereby reducing the velocity of the bullet. This must not be confused with the split neck due to season or corrosive cracking.

n. Split body. - A more or less regular longitudinal split in the body of the case which allows the gas to escape, thereby reducing the velocity of the bullet. This defect is generally found in cartridge cases which have a deep draw scratch or in those which are made from defective brass.

o. Stretch. - A continuous ring around the body of a fired cartridge case which shows that the metal stretched when the cartridge was fired and with slightly more stretching a complete or partial rupture would probably result. This is usually due to improper head space.

p. Complete rupture. - A circumferential separation of the metal around the body of the fired cartridge case causes it to separate into two parts. If such a casualty occurs, upon extraction, the forward portion of the fired cartridge case remains in the chamber of the weapon.

SECTION II

CARE AND HANDLING

	Paragraph
General -----	125
Notes on propellant powder -----	126
Storage -----	127
Precautions in firing blank ammunition -----	128
General rules -----	129

125. GENERAL. - a. The provisions contained in this section are of a general nature only. Specific regulations which govern posts, camps and stations which store limited quantities of ammunition are published in a separate chapter. Regulations prescribed for ordnance depots and establishments are set forth in Ordnance Safety Manual No. 7224. Care and handling is a very important phase of an adequate supply of serviceable ammunition to the fighting forces and as such should receive the careful attention of all ordnance personnel.

(1) Small-arms ammunition, as compared with other types, is not dangerous to handle. Care, however, must be observed to keep the boxes from becoming broken and damaged. All broken boxes must be immediately repaired, and careful attention should be given that all markings are transferred to the new parts of the box. The metal liner should be air tested and sealed if equipment for this work is available.

(2) Boxes should always be opened by breaking the seals and unscrewing the wing nuts, and never by destructive force, as the wooden boxes are used again as long as they are serviceable. If the cover of the metal lining sticks, place a piece of wood inside the handle so as to get a better grip and jerk loose with an angular pull. With the new waxed paper liner there should be no difficulty in opening. The metal liner is expendable but should be turned in for salvage, whenever practicable. The ammunition box, M1, made of metal should be turned in whenever practicable.

(3) It is well never to open a box of ammunition unless it is known positively that the ammunition will be required for immediate use, as it is apt to deteriorate more quickly if taken out of the airtight container. This is particularly true in damp climates, where the brass cartridge cases are apt to corrode to the extent of making the ammunition unserviceable after a period of exposure.

126. NOTES ON PROPELLANT POWDER. - a. Volatiles. - The volatile material in smokeless powder is composed of residual solvent (usually ether and alcohol) and moisture. A certain amount of solvent is allowed to remain in the finished powder in order to insure toughness of

the colloid. It also serves to retard decomposition of the powder. Grains that have lost a considerable part of their residual solvent become brittle and burn faster, giving rise to high pressures and frequently to erratic ballistics.

(1) The amount of moisture which powder will absorb increases with the humidity of the atmosphere. A definite percentage of moisture is therefore left in the finished powder in order to minimize the tendency to lose or gain moisture as atmospheric conditions change. It is necessary to keep as nearly as possible the original content of both solvent and moisture in the powder in order to avoid changes in pressure and velocity of the fixed powder charge. Hence, powder is always kept tightly sealed in fixed ammunition or standard packing containers.

b. Effect of excessive moisture. - Storage in damp atmosphere will cause powder to absorb moisture. This will result in deterioration, especially in a hot climate, as the absorbed moisture has a tendency to displace the solvent and increase the porosity of the grains. If the powder is later exposed to dry atmosphere, so that it loses the absorbed moisture, it will be found to give higher pressures in the gun as a result of the loss of volatiles.

c. Effect of heat. - (1) Smokeless powder burns faster as its temperature is increased, and the temperature at which powder is fired has a direct effect on the velocity attained. The weight of charge for a given lot of powder is usually established by test firings with the powder temperature at 70° F. The instrumental velocity of a charge so established will increase if fired at a temperature above 70° F., and decrease if the temperature falls below 70° F. It is not always possible to control the powder temperature at exactly 70° F., and velocity corrections for temperature variations have therefore been calculated. The change in velocity per degree F. is 1.5' per second for pyro D. G. powder. For coated powders the change in velocity is 1.7' per second for each degree F.

(2) Smokeless powders in storage should be kept from extreme heat in order to avoid decomposition. Powder stored in the tropics tends to become unstable and develop high pressures more quickly than similar powder stored in a cooler climate. The combination of high temperatures and a damp atmosphere is particularly detrimental to the stability of powder.

d. Life of smokeless powder. - The "life" of powder, or the period during which it remains serviceable, may vary from about 5 to 20 years or more, depending on the care with which it is manufactured and stored. Powder made in smaller grains has a tendency to decompose more rapidly than larger grains because of the greater surface exposed.

Powder which is in a state of actual decomposition is unsafe to store because of the danger of spontaneous combustion.

127. STORAGE. - a. Small-arms ammunition should be stored and piled according to type and ammunition lot number and in accordance with any special requirements that may be covered in official bulletins. Extreme care must be used to prevent the mixing of ammunition lots in one pile. When small-arms ammunition is received, issued, stacked or restacked, reliable personnel should be in charge and a check made of the ammunition lot number on each box.

(1) It should never become necessary in depots to store serviceable small-arms ammunition in the open. Although there is a metal lining in the case, actual tests have shown that leaks in the liner are developed with handling and shipping, sometimes to an average of 8% in newly packed ammunition while in the older lots, leaks have been found in as high as 70% of the liners. The leaks, though small, would admit some moisture if the ammunition was exposed to the weather. Should it become necessary to leave small-arms ammunition in the open due to an unavoidable emergency, it should be raised on dunnage at least 6" from the ground and the pile covered with a double thickness of serviceable paulin. Suitable trenches should be dug to prevent water flowing under the pile.

(2) Tracer and shotgun ammunition should always be stored under permanent cover. There are valid reasons for this. Tracer ammunition is subject to quick deterioration if allowed to become damp, and it is then apt to cause spontaneous ignition. Shotgun ammunition except for overseas shipment is not packed in waterproof metal-lined boxes, and would therefore deteriorate quickly if exposed to severe weathering conditions. Tracer ammunition should be stored, if possible, separate from other ammunition.

b. Fire hazard. - If fired into or placed in a fire, small-arms ammunition does not explode violently. There are small individual explosions of each cartridge, the case flying in one direction and the bullet in another. In case of fire, it is advisable to keep everybody not engaged in fighting the fire at least 200 yards from the fire and have them lie on the ground. It is unlikely that the bullets or cases will fly over 200 yards.

128. PRECAUTIONS IN FIRING BLANK AMMUNITION. - a. It is dangerous to fire a rifle loaded with a blank cartridge at a representative enemy at distances of less than 20 yards, as the wad, or paper cup, may fail to break up. There are some blank cartridges loaded with wooden bullets, and others loaded with heavy charges for use in firing grenades. These cartridges should, under no conditions, be used for blank firing.

b. All cartons are plainly marked and markings should be strictly

checked before the ammunition is issued. The M1909, cal..30, blank cartridge is similar in appearance to some of the M1909, cal..30, rifle grenade, blank cartridges and only the carton markings show the difference. Both of these cartridges are now limited standard and little occasion for such a mistake should again arise as blank cartridges and rifle grenade cartridges are now clearly distinguished.

c. Blank ammunition once removed from original package or carton and on hand (usually termed broken or loose ammunition) should be reissued only for use in service rifles. Only blank ammunition packed in original package or carton should be used in machine guns. These instructions are for the purpose of eliminating the danger of firing a high pressure blank cartridge (as a rifle grenade cartridge) in an automatic weapon equipped with a blank ammunition firing attachment, which would greatly endanger personnel and probably damage the gun.

d. Blank ammunition, cal..30, M1909, should be inspected when issued, and those rounds found to contain a felt wad should be marked "for use in the service rifle only."

(1) Ammunition containing a felt wad is distinguished from that containing a paper cup by the depth of seating of the material closing the mouth of the case. The depth of seating of the felt wad is approximately 1/16". This ammunition is unsuitable for use in automatic arms. The depth of seating the paper cup is approximately 1/4". This ammunition is suitable for use in automatic arms.

(2) It will be further noted that ammunition containing the felt wad is cannellured at a point approximately 0.1" from the mouth of the cartridge, whereas that containing the paper cup is cannellured at approximately 0.2" from the mouth of the cartridge case.

(3) Ammunition containing the felt wads have been found to be dangerous when used in automatic arms for the reason that the felt wads will accumulate in the blank firing attachment, clog the gas-escape holes, and eventually build up to a point where excess pressures will be developed on firing. It has been determined by experiments that the excessive pressure sets up a hammering action which, after about 100 rounds, may occasionally cause the blowing off of the backplate of the cal..30 machine gun.

e. Misfires in which the primer explodes but fails to ignite the powder charge have proved dangerous when blank ammunition is being fired from automatic arms. This type of misfire results in some of the powder being blown into the bore and lodging in the blank firing attachment. A series of short rounds, in which the powder fails to ignite due to moisture or other causes, will deposit an accumulation of powder sufficient

to cause serious damage when ignited by a normal cartridge. When misfires are encountered in excess of 5% in firing blank ammunition, the firing of the lot will be suspended and reported to the Chief of Ordnance.

129. GENERAL RULES. - The following general rules should be observed in the care and use of small-arms ammunition.

a. Do not open a case or break the metal liner until the ammunition is required for use.

b. After a box of ammunition has been opened and the cartridges issued, each man should take care of his own ammunition. While it is not dangerous in ordinary handling, care should be taken to guard the primer from any blows by sharp instruments, as a sharp blow on the primer might explode the cartridge.

c. Protect the ammunition carefully from mud, sand, dirt, and water and wipe it off at once if it does become wet or dirty. Cartridges should not be polished to make them look brighter, but if verdigris or light corrosion forms on them it should be wiped off.

d. The use of oil or grease on cartridges is prohibited. Greasing or oiling cartridges used in machine guns and other automatic arms causes the collection of dust and other abrasives which are injurious. Grease or oil on cartridges used in the service rifle or on the walls of the rifle chamber creates excessive and hazardous pressure on the rifle bolt. A dry cartridge case when fired is expanded against the walls of the chamber and thus cushions the blow on the case head and the bolt to a certain extent. When there is oil on the case there is no adhesion of the case to the chamber, the case slips back, and the bolt and case head receive a greater rearward thrust.

e. If a misfire occurs, do not open the bolt immediately. It is better to wait at least 10 seconds, as it may be a hangfire instead of a misfire. The term "hangfire" applies to a cartridge in which an appreciable delay occurs between the striking of the primer by the firing pin, and the combustion of the powder charge. If the rifleman opens the bolt of his rifle at once on a misfire, and it happens to be a hangfire, it will probably explode when the bolt is opened, seriously injuring him.

f. Turn in all dented cartridges, cartridges with loose bullets, or otherwise defective rounds.

g. Do not allow the ammunition to be exposed to the direct rays of the sun for any length of time. This is liable to seriously affect its firing qualities.

h. The use of armor-piercing cartridges is prohibited in demonstrations in which tanks participate.

PART III

AIRCRAFT-CANNON AMMUNITION

CHAPTER 1

GENERAL

SECTION I. General -----	Paragraphs 130-132
--------------------------	-----------------------

SECTION I

GENERAL

Purpose -----	Paragraph 130
Scope -----	131
Definition -----	132

130. PURPOSE. - The purpose of including aircraft-cannon ammunition in volume 2 is to provide aviation ordnance personnel with a two-volume reference of all ammunition fired from aircraft. The ammunition fired from cal..30 and cal..50 machine guns, from the 20-mm aircraft cannon, and from the 37-mm aircraft cannon, is included.

131. SCOPE. - Information is included in this part that will enable ordnance personnel to recognize, packed or unpacked, aircraft cannon ammunition. In addition, information is included concerning the characteristics of the different rounds, their ballistics, and their tactical uses. A brief description of the weapons is given.

132. DEFINITION. - Aircraft cannon is artillery. By extending the definition of small arms, artillery is any weapon having a diameter of bore exceeding 0.6". Both the 20-mm and the 37-mm cannon have bores whose diameter exceeds 0.6" and are classified as artillery. Because the two weapons are mounted in and fired from aircraft, they are referred to as aircraft cannon and are considered separately from artillery.

CHAPTER 2

AMMUNITION FOR THE 20-MM AIRCRAFT CANNON

	Paragraphs
SECTION I. The gun -----	133
II. The ammunition -----	134-141
III. Shell, H.E.I., Mk. I -----	142-145
IV. Shot, A.P., M75 -----	146-150
V. Projectile, ball -----	151-155

SECTION I

THE GUN

	Paragraph
General description -----	133

133. GENERAL DESCRIPTION. - a. The 20-mm, 2,850 fps automatic gun, AN-M2, is a combination gas and blowback-operated aircraft weapon (see fig. 31). The gun is air-cooled and is capable of delivering fire at the rate of 600-700 rounds per minute. Designed for mounting on "in-line" airplane engines, it may be fired either through the hub of the propeller or as a fixed gun mounted in the wing.

b. The gun consists of two distinct portions, recoiling and non-recoiling. Recoil is absorbed partly by a muzzle brake and partly by a recoil spring placed between the muzzle brake and the front mount. The recoil spring serves also as a recuperating spring. Its assembled height can be varied by turning the mounting sleeve nut. The muzzle brake is of the conventional type except as to its internal construction, which is fundamentally similar to that of a compensator. A number of ports are cut in the muzzle brake which, being at an angle of 45° to the axis of the bore, deflect the blast gases to the rear. The tendency of the reduction is to force the gun to the front and reduce the total recoil energy.

c. The only difference between the M1 and AN-M2 guns is in the dimensions and shapes of some of the receiver parts. The AN-M2 receiver is slightly longer. In the 20-mm gun, AN-M2, the receiver slide bolts are locked by cotter pins and in the 20-mm gun, M1, by locking wire. Each receiver slide in the 20-mm gun, M1, has a head flange which overlaps the bottom face of the receiver side. In the 20-mm gun, AN-M2, each receiver slide has a projection which fits into a slot in the receiver side.

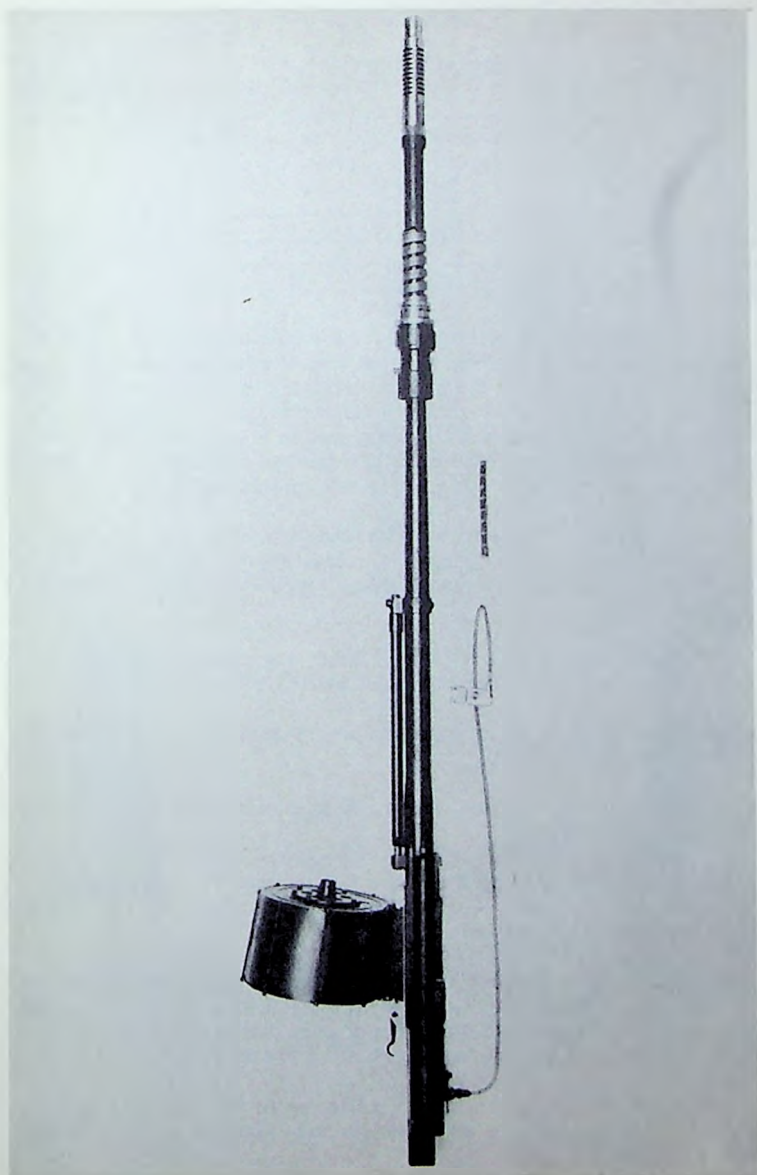


FIGURE 31. - THE 20-MM GUN.

SECTION II

THE AMMUNITION

	Paragraph
General-----	134
Types -----	135
Projectile -----	136
Cartridge case -----	137
Primer -----	138
Propellant -----	139
Identification -----	140
Packing -----	141

134. GENERAL. - Ammunition for the 20-mm automatic gun, M1 and AN-M2, is issued in the form of fixed rounds with the cartridge case containing the propellant and the primer crimped rigidly to the projectile (see fig. 32). The complete round is loaded into the gun as a unit. The fused complete round includes all the ammunition components used in the gun to fire once. After firing, the cartridge case is extracted and ejected, then the next round is loaded into the gun, all automatically.

135. TYPES. - Ammunition authorized for use in the 20-mm guns, M1 and AN-M2, is of three types: high explosive incendiary, armor-piercing, and practice. The correct nomenclature describing these three rounds is as follows:

a. Shell, fixed, H.E.I., Mk. I, w/fuze, percussion, DA, No. 253, Mk. I/A/, 20-mm automatic guns, M1 and AN-M2. (Shell, H.E.I., Mk. I.)

b. Shot, fixed, A.P., M75, w/tracer, 20-mm automatic guns, M1 and AN-M2. (Shot, A.P., M75.)

c. Shell, fixed, practice, Mk. I, 20-mm automatic guns, M1 and AN-M2. (Projectile, ball.)

d. In this volume, the ammunition will be referred to by shortened nomenclature for the sake of space and convenience. The shortened nomenclature appears in parentheses above.

e. All three authorized rounds consist of a projectile, cartridge case, primer, and propellant. Each of these components will be discussed in the following paragraphs. Components peculiar to one round will be contained and discussed in the section relating to that round.

136. PROJECTILE. - The projectile varies for each of the three rounds and therefore will be discussed in the sections devoted to the respective rounds.



FIGURE 32. - THE 20-MM AMMUNITION.

137. CARTRIDGE CASE. - a. Cartridge case, M21A1. - (1) General description. - This is the standard cartridge case for assembly with the three standard rounds of 20-mm ammunition. It is made of cartridge brass, has an over-all length of 4.342", and weighs 0.205 lbs. The primer recess in the head of the case has a diameter of 0.135" and the flash vent has a diameter approximately 1/3 as great. The case has a shoulder formed in the drawing operation and an extracting groove is machined into the head. The case is for use in the 20-mm guns, M1, and AN-M2.

(2) Marking. - The case has stamped upon the rear face the caliber and designation of the case, the symbol or initials of the manufacturer, and the year of loading, all in letters 1/16" high (see fig. 34).

b. Cartridge case, M21A1B1. - This case is identical to the M21A1 case except that it is made of steel and has a deeper extracting groove machined in the head. It is marked similarly to the M21A1. This case is substitute standard for the M21A1 and will be found assembled with many rounds. It is authorized for use in the same gun as the M21A1. No major difficulties have been encountered in its use and more extensive use will be made of this case in the near future.

c. Cartridge case, M21. - This case is limited standard and its manufacture has ceased. It is made of cartridge-case brass and varies from the M21A1 in that the primer recess is designed to receive the M37 (Berdan) primer. In this type of primer the anvil is not a component of the primer but is a part of the cartridge case. The case has several flash vents rather than the single vent found in the M21A1. Since the case is limited standard no detailed description will be included. Few of these cases will be encountered in the field. The case is marked similarly to the M21A1.

138. PRIMER. - a. Primer, M36 (see fig. 33). - (1) General description. - The primer, M36, weighing 19.57 grains, is the standard primer for assembly in the standard cartridge case M21A1 and the substitute standard case M21A1B1 (steel). It is the American type of primer with the anvil an integral part. The primer is staked into the case with 5 equally spaced stab crimps, and must not protrude beyond the rear face of the cartridge case.

b. The primer, M36, consists of a brass primer cup, a strip brass anvil, a foiling paper cover, and a primer mixture charge. The components are described as follows:

(1) Primer cup. - The cup is made of cartridge brass, having a maximum exterior height of 0.241", an interior depth of 0.185" and an interior diameter of 0.2765" maximum. Its greatest diameter is 0.332" and it weighs 12.00 grains.

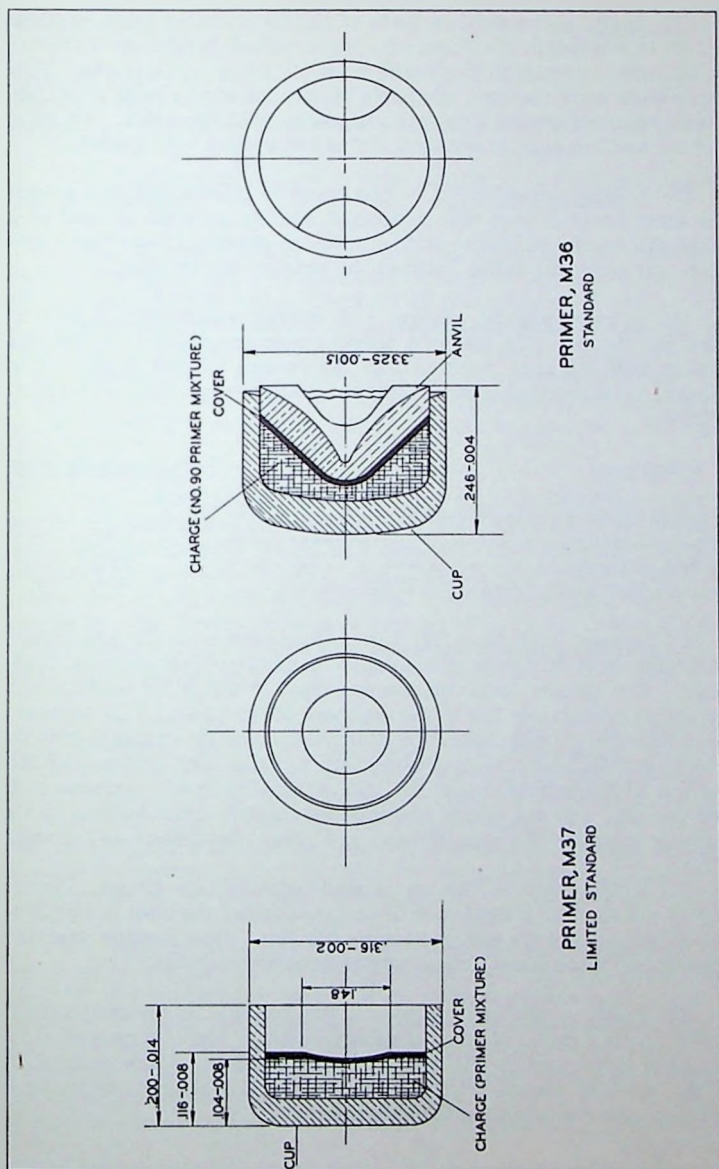


FIGURE 33. - THE 20-MM PRIMERS.

(2) Anvil. - The anvil is made of lightly annealed strip cartridge brass. It is shaped in the form of a cone whose height is 0.158" and whose diameter is equal to the inside diameter of the primer cup. From two opposite faces of the cone segments of circles whose radii are 0.086", have been removed, giving a tunneled appearance to the anvil. The thickness of the anvil is approximately 0.05" and it weighs 5.40 grains.

(3) Foiling paper cover. - The cover is placed over the priming charge after being coated with a special shellac varnish applied to the side that will be placed next to primer mixture charge. The coated cover prevents any chemical action between the primer and the anvil.

(4) Primer mixture charge. - A charge weighing 2.10 grains is pressed into the cup. The cover is pressed over the charge and the anvil assembled with its apex pointing into the recess formed in the charge. The charge is designated as No. 90 primer mixture and has the following composition:

<u>Component</u>	<u>Percentage by weight</u>
Lead sulphocyanate -----	25%
Antimony sulphide -----	17%
Potassium chlorate -----	53%
Pentaerythritol tetranitrate -----	5%

c. Primer, M37 (see fig. 33). - This primer is for assembly in the cartridge case, M21, both primer and case being classified as limited standard. The primer is of the Berdan type, in which the anvil is not a component of the primer but is a component of the case. This primer is smaller than the primer, M36. Its dimensions are generally 0.1" to 0.3" less (see fig. 33), and it is approximately 3 grains lighter than the M36. The bottom of the primer cup of the M37 is parallel in all surfaces to the rim of the cup, and the walls are tapered slightly from bottom to rim. The primer consists of a cup, charge, and cover, described as follows:

(1) Primer cup. - The cup is made of cartridge brass. Prior to loading of the charge, a light coat of orange shellac varnish is applied to the inner surfaces of the cup and allowed to dry. This coating assists in the prevention of chemical action between charge and cup.

(2) Priming mixture charge. - The charge is pressed into the cup uniformly to a depth of approximately 0.06". A shallow recess 0.148" in diameter is formed in the center of the surface of the charge into which the anvil of the cartridge case rests. The charge, weighing 2.5 -0.2 grains, has the following composition:

<u>Component</u>	<u>Percentage of weight</u>
Mercury fulminate -----	37.5%
Potassium chlorate -----	37.5%
Antimony sulphide -----	25%

(3) Foiling paper cover. - This component is identical to that used in the primer M36.

139. PROPELLANT. - The propellant standard for loading in the standard rounds of 20-mm ammunition is an FNH powder. In the M75 shot, and the practice round, Type I FNH powder is used. Type I powder is composed of grains with 7 longitudinal perforations. In the H.E.I. round Type II powder is used which is composed of single perforation grains. The grains of both types are a light brown color and are approximately 0.15" long and 0.05" in diameter. The amounts of powder loaded into the three different rounds varies and will be included in the data for each round.

140. IDENTIFICATION. - a. By round. - Identifying marking is stamped or stencilled on the surface of the projectile or on the rotating band. The marking or stencilling varies for the different rounds but in every case clearly identifies the round. On the head of the cartridge case appears the informative marking described in paragraph 137. The two types of service ammunition may be identified by the colors with which they are painted. The colors will be included with the information pertaining to the individual round.

b. By packing. - (1) Cartons (see fig. 34). - The carton bears certain identifying marks that clearly indicate the contents. A label extends over the top of the carton and half way down the front and backsides. On each side and on the top of the label is printed the contents of the carton, i.e., the number and type of round (on the label the ammunition is referred to as "cartridges," a British designation); the caliber of the gun and ammunition and the designation of the gun. On the sides appears the lot number of the ammunition as additional information.

(2) Packing box (see fig. 34). - The wooden packing box bears a great many identifying marks clearly indicative of the type of ammunition contained, the weapon for which it is to be used, the type of projectile (explosive or empty), the number of rounds, and the consignee and consignor. Personnel should note that the ammunition is termed small-arms ammunition. This is another British designation and does not coincide with the definition adopted by this country. The box is covered with information and no attempt will be made to include it all in this text.

141. PACKING. - The three complete rounds authorized for use

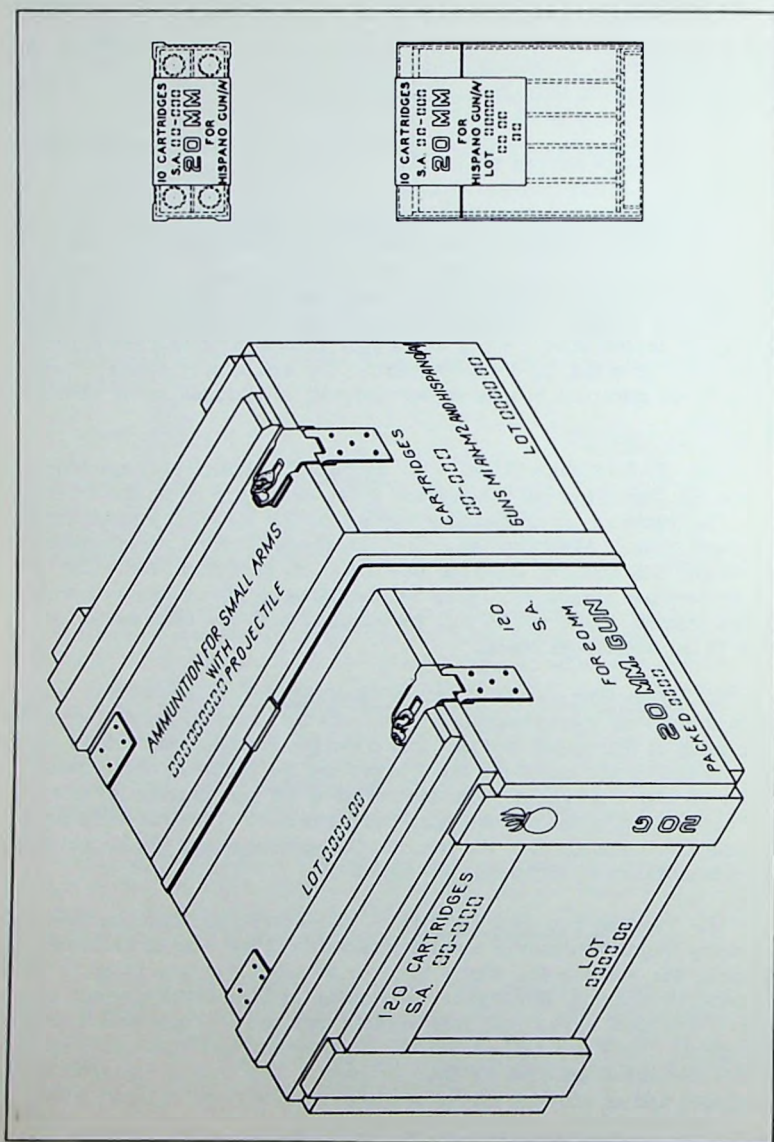


FIGURE 34. - PACKING AND MARKING OF 20-MM AMMUNITION.

are packed similarly. Ten rounds are packed in a carton and twelve cartons are packed in a wooden, metal-lined packing box. The carton and packing box are described as follows:

a. Carton. - The carton is made of heavy chipboard with the following dimensions: length 7-19/32", height 2-3/8", depth 5-5/8". The label that covers the top and extends half way down the front and back-sides is made of white gummed paper, 10-3/8" long and 3-1/2" wide. It is marked as explained in paragraph 140. The carton is in two sections one of which is a cover that closes the open end of the carton after the ten cartridges are inserted. The cartridges are placed in the carton, nose down, fuze, in two vertical rows of five. The cover is then placed and the label glued into place.

b. Packing box. - The box, made of wood, is approximately 16-1/2" long, 8" high, and 12" wide. It is marked as described in paragraph 140. It is unpainted and all marking is stencilled in black. The 12 cartons are placed in the metal liner in two vertical rows. One carton is provided with a tape trace passing under the center of the carton with the excess tape equally divided on the sides. This tape is provided to facilitate the removal of the first carton which is frequently difficult when the cartons are tightly packed. The metal liner is sealed and additional fillers are added between the top of the liner and the cover of the packing box in order to provide a tight fit for the cover. Hasps are provided to close the cover and a length of strapping is provided to prevent the cover from opening. If the packing box contains practice ammunition, a 2" blue stripe is painted around the middle of the box under the strapping; two alternate cleats on either end of the box are also painted blue.

SECTION III

SHELL, H.E.I., MK. I

	Paragraph
General description -----	142
Identification -----	143
Packing -----	144
Exterior ballistics -----	145

142. GENERAL DESCRIPTION. - a. The shell, fixed, H.E.I., Mk. I, w/fuze, percussion, DA, No. 253, Mk. I /A/, 20-mm automatic guns, M1 and AN-M2, was adopted from the British early in 1941 and standardized in August, 1941. Little modification has ensued except in the redesign of the cartridge case and primer. The fuze projectile remains essentially the same as may be deduced from the adopted British nomenclature. (/A/ is the British symbol for shell used in aircraft). The shell is fired from aircraft guns against aircraft primarily, although it may be directed against ground targets. The over-all length of the shell is 7.19"

and it weighs a maximum 0.57 lb. The projectile is rigidly attached to the cartridge case. The complete round consists of the fuze, projectile, explosive incendiary charge, cartridge case, propellant, and primer.

b. The components are described as follows:

(1) Fuze. - The fuze, percussion, DA, No. 253, Mk. I/A/ is made of brass and weighs approximately 0.06 lb. It is threaded into the nose of the projectile and is secured by staking the metal of the projectile into the fuze, in three places. On the surface of the fuze appears the lot number of the fuze, the nomenclature (brief) of the fuze, and the manufacturer's initials or symbol. WARNING: FUZES WILL NOT BE DISASSEMBLED. Any attempt to disassemble fuzes in the field is dangerous and is prohibited except under the specific directions of the Chief of Ordnance. The details of construction and functioning of the fuze are classified as confidential.

(2) Projectile. - The projectile, or shell body, is made from cold-drawn steel. It is 2.61" long and the walls vary in thickness according to the shape of the explosive charge recess. Two recesses are machined into the body, one to receive the rotating band, the other being the cannelure. The latter is machined with sharp edges to assist in crimping the cartridge case to the body. The fuze opening is threaded and has a diameter of 0.630". Sharp edges are left on the rim of this opening to assist in staking the fuze after assembly. The rotating band, made of copper tubing is pressed into the recess and provides a diameter of the shell at this point of 0.828". The thickness of the body at the base is only 0.15" and in order to prevent a premature detonation of the explosive charge a base cover is added. This cover prevents the possibility of the flame from the propellant initiating the charge through flaws or cracks in the base of the shell. The base cover is made of sheet steel and has a diameter of 0.600". It is secured to the base of the shell by means of a continuous resistance weld around the edge of the base cover. The shell is painted as explained in paragraph 143. The following information is stamped into the body midway between band and bourrelet: the manufacturer's symbol or initials. Below this appears the lot number of the shell, and on the bottom line appears the month and year of manufacture. The projectile unfuzed and without charge, weighs 1,438 grains; complete it weighs 2,020 grains.

(3) Charge. - The charge is classified as confidential.

(4) Cartridge case. - This component is described in section II, paragraph 137.

(5) Propellant. - This component is described in section II, paragraph 139; 0.07 lb. of the powder is loaded into the case.

(6) Primer. - The primer, M36, standard for assembly in the case, M21A1 (M21A1B1, substitute standard case) is described in section II, paragraph 138.

143. IDENTIFICATION. - a. The complete round may be readily identified by the colors of the projectile and the fact that the projectile is fuzed. These two facts distinguish the round from either of the other two standard rounds. From the rearmost portion of the bourrelet forward the surface of the projectile is painted yellow with the letters "H.E.I.", indicating type of filler, stencilled in black. The remainder of the surface of the projectile as far to the rear as the rotating band is painted red. This painting of the projectile is primarily to assist in rust prevention, and secondarily to assist in identification.

b. The case bears the identifying marks mentioned in section II, paragraph 137.

c. The cartons and packing box bear identifying information as described in section II, paragraph 140.

d. The ammunition data card gives complete information concerning all components of the ammunition. This card appears on the top layer of the ammunition inside the metal liner.

144. PACKING. - The packing is described in section II, paragraph 141. The weight of box and ammunition complete is approximately 94.5 lbs.

145. EXTERIOR BALLISTICS. - The following data provides a fairly accurate, though incomplete, picture of the exterior ballistics of the shell, H.E.I., Mk. I.

Maximum range -----	yards	6,800
Effective range (aerial combat) -----	yards	1,500
Pressure -----	lbs./sq.in.	47,000

Velocity

Feet per second

Standard instrumental velocity at 90' from muzzle -----	2,820
Standard theoretical velocity at the muzzle -----	2,884

SECTION IV

SHOT, A.P., M75

	Paragraph
General description -----	146
Description of components -----	147
Identification -----	148
Packing -----	149
Exterior ballistics -----	150

146. GENERAL DESCRIPTION. - The shot, A.P., M75, w/tracer was standardized in early November, 1941. Little modification has occurred other than the adoption of the M21A1 case and the M26 primer to replace the M21 case and the M37 primer. The projectile is inert and has a tracer in the tail for assistance in directing the cone of fire. The shot is used primarily from aircraft against the armored surfaces of other aircraft although it may be put to good use against lightly armored ground vehicles and water-borne vessels. The maximum length of the round is 7.22" and it has a maximum weight of 0.639 lb. The projectile is rigidly attached to the cartridge case. The complete round consists of the projectile with tracer, the cartridge case, propellant, and primer (see fig. 35).

147. DESCRIPTION OF COMPONENTS. - a. Projectile. - (1) The projectile is rolled from cold-drawn bar stock steel to the following dimensions: length 3.25 $\pm$ 0.02"; diameter at bourrelet 0.784 $\pm$ 0.002"; minimum diameter to rear of bourrelet 0.782 $\pm$ 0.005"; diameter at base of projectile 0.770 $\pm$ 0.004". The bourrelet is machined from the forward section of the projectile and provides a bearing surface for the projectile in its travel through the tube. A recess is machined into the projectile for the rotating band and another recess forms the sharp-edged cannellure into which the cartridge case is crimped. The radius of ogive of the projectile is 1.875" and the ogival radius of the pointed tip is 0.125".

(2) The rotating band is made of copper tubing and is pressed into the recess provided. The forward edge of the rotating band is beveled and the total diameter of the projectile at the rotating band is 0.828 $\pm$ 0.004".

(3) The tracer mixture is charged into a recess in the tail of the projectile having a depth of 0.65" and a diameter of 0.375". The base of the tracer recess is conical and has an apex angle of 118°.

(4) The external surfaces of the projectile, except the rotating band, are painted with a black lacquer enamel. The interior surfaces of the tracer cavity are painted with an acid-proof black ink. After the tracer charge is loaded it is sealed by the assembling of a celluloid closing cup

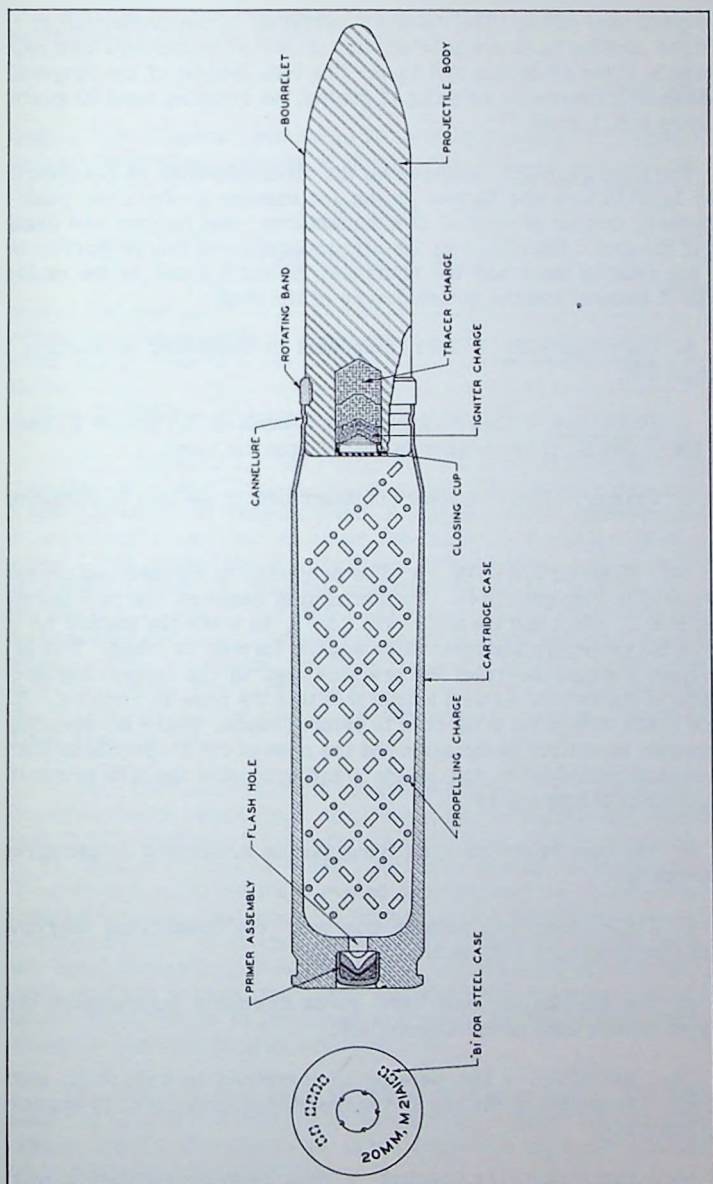


FIGURE 35. - SHOT, A.P., M75.

that is glued into place. The exterior surfaces of the projectile to the rear of the rotating band are painted with an N.R.C. compound just prior to assembly of the projectile and case. The total weight of the projectile is 2,543 grains; the tracer weighing 42 grains, the rotating band 80 grains, the closing cup, 1 grain.

(5) Identification. - Stamped on the circumference of the rotating band in 1/16" letters and figures is the lot number of the shot, year of manufacture, initials or symbol of manufacturer, and caliber and designation of the shot. Stencilled on the circumference of the projectile between the rotating band and the bourrelet, in white paint, is the caliber and type of weapon, and the nomenclature of the shot.

b. Cartridge case. - This component is described in section II, paragraph 137.

c. Propellant. - This component is described in section II, paragraph 139: 0.066 lb. of the powder is loaded into the case.

d. Primer. - This component is described in section II, paragraph 138.

148. IDENTIFICATION. - a. The projectile is painted and marked as explained in paragraph 147. To distinguish between the two service rounds, H.E.I., Mk. I and the shot, A.P., M75, is a simple matter as the colors of the projectile are dissimilar and the former is fuzed. The M75 shot may be distinguished from the practice shell by the stencilling on the projectile of the former as well as the fact that its nose is rounded. The practice shell, though its projectile is painted black, bears no stencilled nomenclature or caliber designation and the nose of its projectile is blunt. There is additional identification on the rotating band of the M75 projectile as explained in paragraph 147.

b. The case bears the identifying marks mentioned in paragraph 137, section II.

c. The cartons and packing box bear the identifying markings described in paragraph 140, section II.

d. The ammunition data card gives complete information concerning all components of the ammunition.

149. PACKING. - The packing is described in section II, paragraph 141. The weight of the box and ammunition, complete, is approximately 103 lbs.

150. EXTERIOR BALLISTICS. - The exterior ballistics of the

shot, A.P., M75, are the same as those for the shell, H.E.I., Mk. I, except that the velocities are as follows:

	<u>Feet per second</u>
Standard instrumental velocity at 90' from the muzzle -	2,450
Standard theoretical velocity at the muzzle -----	2,510

SECTION V

PROJECTILE, BALL

	<u>Paragraph</u>
General description -----	151
Description of components -----	152
Identification -----	153
Packing -----	154
Exterior ballistics -----	155

151. GENERAL DESCRIPTION. - The projectile, ball (standard nomenclature — shell, fixed, practice, Mk. I for 20-mm automatic guns, M1 and AN-M2) was standardized in August, 1941. Little modification has occurred other than to adopt the modified cartridge case and new primer. The projectile is completely inert, hollow, and has no tracer. The round is used for practice and proof firing and is designed to simulate the H.E.I., Mk. I, for firing purposes. The projectile is cheap and easy to manufacture and its use for practice firing effects a considerable economy. The maximum length of the round is 7.23" and its maximum weight is 0.56 lb. The cartridge case is rigidly attached to the projectile. The components of the round are the projectile, case, propellant, and primer (see fig. 36).

152. DESCRIPTION OF COMPONENTS. - a. Projectile. - (1) The projectile is rolled from steel bar stock to the following dimensions: length 3.30" maximum; diameter at bourrelet 0.784"; minimum diameter to rear of bourrelet 0.782"; diameter at base of projectile 0.770". The bourrelet provides the forward bearing surface of the projectile in its travel through the tube. A recess is machined into the projectile approximately 0.5" from the base of the projectile for seating the rotating band. Approximately 0.2" to the rear of the circumferential rotating band recess, another recess, narrower and shallower than the former is machined. This recess is the cannellure and is machined with sharp edges to assist in the crimping of the case.

(2) The rotating band is made of copper tubing and weighs 80 grains. It is pressed into the recess and the forward edge is bevelled at an angle of 30°. The diameter of the projectile after the seating of the band is increased to 0.828".

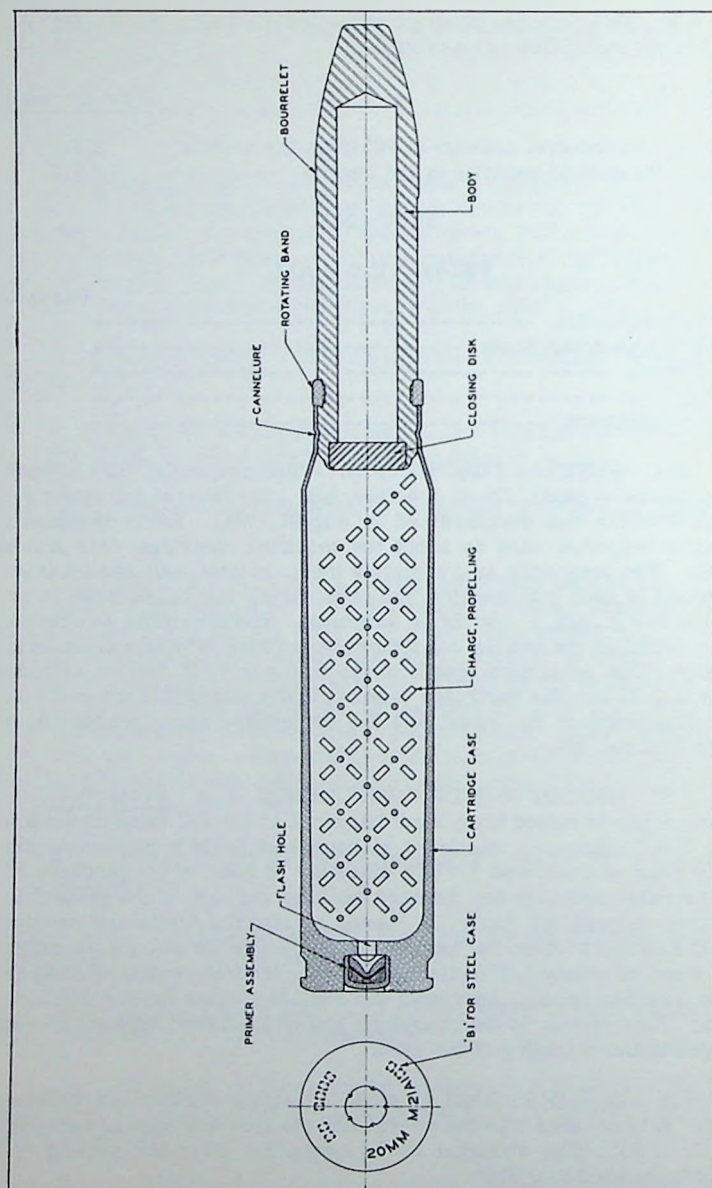


FIGURE 36. - PROJECTILE, BALL.

(3) The projectile is hollow, the cavity being cylindrical with a diameter of 0.427" and extending from an opening in the rear forward approximately 7/8 the length of the projectile. The walls of the projectile are thick enough to approximate the weight of the H.E.I., Mk. I, shell. A steel closing disk 0.55" in diameter with a 45° chamfer is fitted into a recess in the base of the cartridge. Two lips machined out of the rear walls of the projectile are crimped over the disk firmly holding it in place.

(4) The nose of the projectile curves with an ogival radius of 2.56" to a flattened tip. The entire projectile except the rotating band is painted with black enamel including the rear face of the closing disk. Stamped with 1/8" letters and symbols on the projectile midway between bourrelet and band is the manufacturer's initials or symbol, the lot number of the projectile, and the month and year of manufacture (e.g., 9-42), (see fig. 36).

b. Cartridge case. - This component is described in section II, paragraph 137.

c. Propellant. - This component is described in section II, paragraph 139; 0.07 lb. of the powder is loaded into the case.

d. Primer. - This component is described in section II, paragraph 138.

153. IDENTIFICATION. - a. To identify the projectile ball from the A.P. shot, M75, refer to the explanation in paragraph 148. Briefly the identifying features of the projectile ball are its flat nose and lack of stencilled markings on the projectile. In addition the A.P. shot has its stamped identifying information on the rotating band. Personnel cannot mistake the projectile ball for the H.E.I., Mk. I, as the two rounds are entirely dissimilar in appearance.

b. The case bears the identification mentioned in paragraph 137, section II.

c. The cartons and packing box bear the identifying marks described in paragraph 140, section II.

d. The ammunition data card gives complete information concerning all components of the ammunition.

154. PACKING. - The packing is described in section II, paragraph 141. The weight of the box and ammunition, complete, is approximately 93.3 lbs.

155. EXTERIOR BALLISTICS. - The exterior ballistics of this round are the same as those for the shell, H.E.I., Mk. I.

CHAPTER 3

AMMUNITION FOR THE 37-MM AIRCRAFT CANNON

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II. The ammunition -----	157-164
III. Shell, H.E., 37-mm, M54 -----	165-169
IV. Shot, A.P., 37-mm, M80 -----	170-174
V. Shell, practice, 37-mm, M55A1 -----	175

SECTION I

THE GUN

	Paragraph
General description -----	156

156. GENERAL DESCRIPTION. - a. Use. - The 37-mm automatic gun, M4 (see fig. 37) was designed primarily for use as an aircraft cannon. It may be used in either fixed or flexible mountings. In a fixed mount, the weapon is placed to fire through the propeller shaft, or at some point outside the radius of propeller rotation. In a flexible mounting the gun is generally fired from a turret; its use in other places is undergoing experimentation. It is not used as a synchronized weapon.

b. Characteristics. - This weapon is a high velocity, automatic, long-recoil-operated gun. It is capable of firing a high-explosive projectile weighing 1.34 lbs. at the rate of about 150 rounds per minute.

c. Ammunition feeding. - The ammunition is fed by one of three methods:

(1) A 5-round feeder.

(2) A 15-round articulated link belt, housed in a magazine.

(3) A 30-round endless, articulated, nondisintegrating link belt housed about the magazine, M6.

d. Components of gun. - The gun consists essentially, of the tube, group, the receiver group, and recuperator housing with their assemblies, and the feed box. The receiver group houses the following assemblies; the tube extension assembly, the breechblock assembly, the lock frame assembly, and the backplate assembly. The recuperator housing contains the recuperator; the driving spring tube guard assemblies on each side of the housing act as guide ways for the driving spring assemblies. The feed box group is attached to the top of the receiver group.

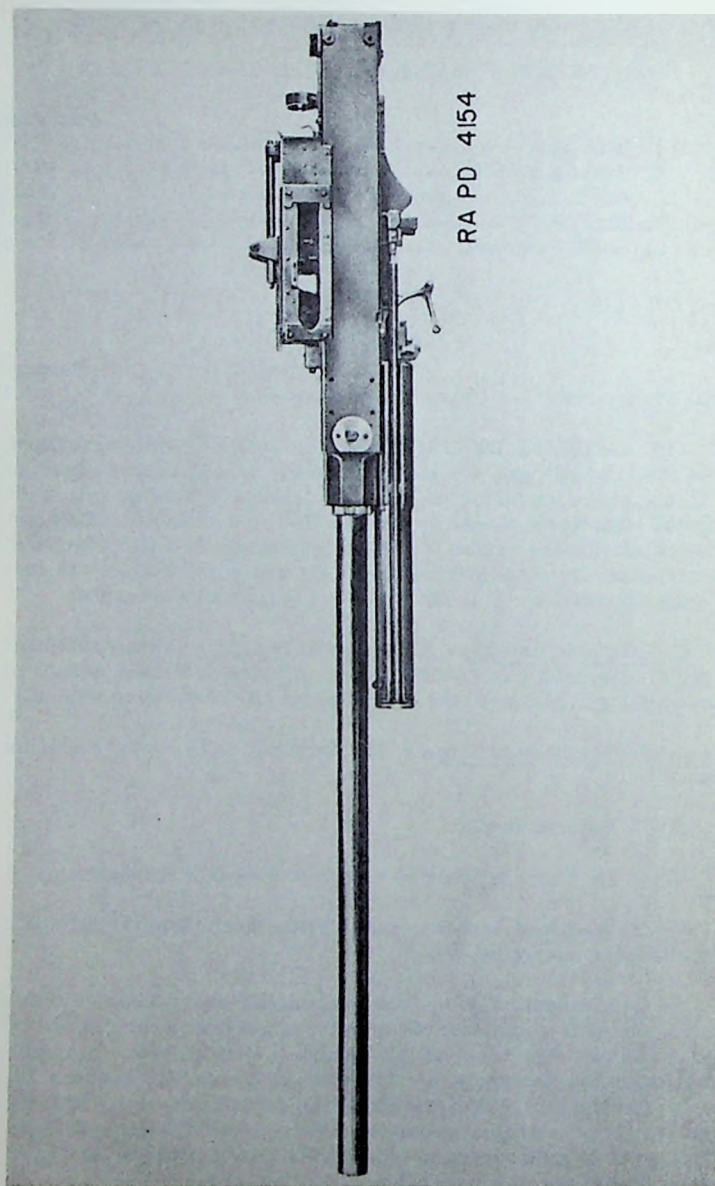


FIGURE 37. - THE 37-MM AUTOMATIC GUN, M4.

e. Reference. - For a complete description of the operation, nomenclature, assembly, disassembly, care and handling of this weapon refer to OS 9-50, 37-MM AUTOMATIC GUN, M4

SECTION II

THE AMMUNITION

	Paragraph
General -----	157
Types -----	158
Projectile -----	159
Cartridge case -----	160
Primer -----	161
Propellant -----	162
Identification -----	163
Packing -----	164

157. GENERAL. - Ammunition for the 37-mm automatic gun, M4, is issued in the form of fixed rounds with the cartridge case containing the propellant and primer crimped rigidly to the projectile (see fig. 38). The complete round is loaded into the gun as a unit. The fuze complete round includes all the ammunition components used in the gun to fire once. After firing, the cartridge case is extracted and ejected, then the next round is loaded into the gun, all automatically.

158. TYPES. - Ammunition authorized for use in the 37-mm gun, M4, is of three types, high explosive, armor-piercing, and practice. The correct nomenclature describing these three rounds is as follows:

a. Shell, H.E., M54 (with shell destroying tracer), for gun, 37-mm, automatic, M4.

b. Shot, A.P., M80, for gun, 37-mm, automatic, M4.

c. Shell, practice, M55A1 (with tracer) for gun, 37-mm, automatic, M4.

d. In this volume, the ammunition will be referred to by shortened nomenclature for the sake of space and convenience.

e. All authorized rounds consist of a projectile, cartridge case, primer, and propellant. In the following paragraphs each of these components will be discussed. Components peculiar to one round will be contained and discussed in the section relating to that round.

159. PROJECTILE. - The projectile varies for each of the three rounds and will therefore be discussed in the sections devoted to the respective rounds.



FIGURE 38. - THE AMMUNITION FOR THE 37-MM GUN, M4.

160. CARTRIDGE CASE. - a. Cartridge case, Mk. IIIA2. - (1) General description. - This is the standard cartridge case for assembly with the three standard rounds of ammunition fired from the 37-mm gun, M4. It is made of cartridge brass, has an over-all length of 5.69" and weighs approximately 0.39 lb. The primer seat in the head of the case has a diameter of 0.630" and the diameter of the primer recess is 0.549". There is a slight shoulder in the case and it is tapered slightly from the head to the mouth. An extracting rim 0.082" thick is turned from the head. The case is for use in the 37-mm gun, M4, and the 1.457" subcaliber gun.

(2) Marking. - The marking on the head of the case is stamped in a series of circles. In a circle nearest the primer recess in letters and figures 3/32" high, is stamped the lot number of the case, initials or symbol of the manufacturer, and the year of manufacture. In the next circle, farther from the primer recess is stamped, in letters and figures 3/16" high, the caliber and designation of the case.

b. Cartridge case, Mk. IIIA2B1. - This case is substitute standard for all uses of the case, Mk. IIIA2. It is made of steel and to all intents and purposes is identical to the brass case. It is at present in manufacture and will be increasingly used for assembly with the three standard rounds of ammunition. Its length is the same as the Mk. IIIA2; it weighs approximately 0.03 lb. less; and it is marked in a similar manner.

161. PRIMER. - a. General description. - The primer, percussion, M23A2, is standard for assembly with the three authorized rounds of ammunition fired from the 37-mm gun, M4. The primer is made of brass, weighs 345 grains, and is held in place in the case by means of a force fit between the walls of the primer pocket. In seating the primer it must be at least flush with the rear face of the case if not below it. The primer is reasonably safe against light blows but personnel should exercise care to prevent such blows. On the rear face of the head is stamped with 1/24" letters and numerals, the lot number of the primer, initials of the loader, the year of loading, and the designation of the primer, M23A2.

b. Components. - The primer consists of an anvil, body, percussion element, primer charge, cover, battery cup, primer cup, closing disk, and firing plug (see fig. 39). The components are described as follows:

(1) Anvil. - The anvil is made of cartridge brass and weighs approximately 5.8 grains. It is formed and shaped in the same manner as the anvil for the primer, M36 (see par. 138).

(2) Body. - The body is made of brass and weighs 234.0 grains.

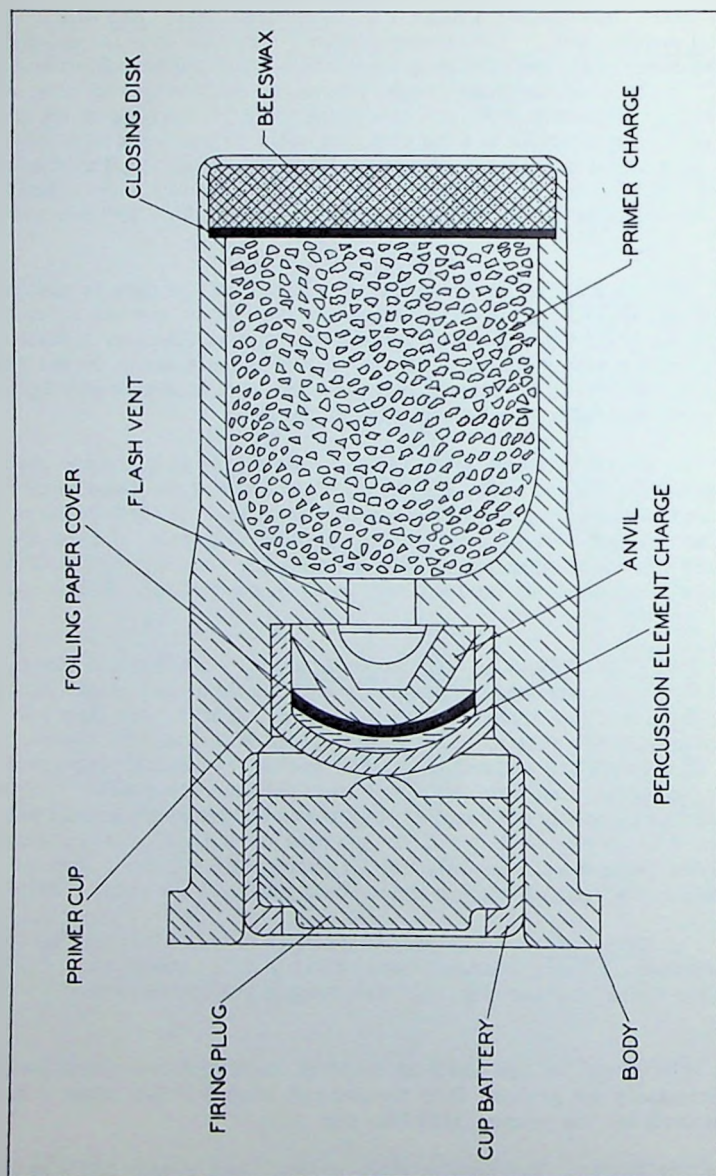


FIGURE 39. - PRIMER, PERCUSSION, M23A2.

It is machined so as to provide a series of chambers into which are fitted the various functioning assemblies; the percussion assembly, the primer charge assembly, and the firing plug assembly. The chamber housing the primer charge assembly opens to the chamber housing the percussion element assembly through a cylindrical port, designated as the flash vent. A rim is machined from the head of the body which fits into the primer recess of the case.

(3) Percussion element. - The percussion element consists of one grain of No. 70 primer mixture, in pellet form. The composition of this mixture is as follows:

<u>Component</u>	<u>Percent by weight</u>
Lead sulphocyanate -----	25%
Antimony sulphide -----	17%
Potassium chlorate -----	53%
Trinitrotoluene -----	5%

(4) Primer charge. - The primer charge consists of 20 grains of Army black powder which is sufficient to ignite the propellant.

(5) Cover. - The cover is made of foiling paper and is coated and assembled in the same manner as the cover in the primer, M36 (see par. 138).

(6) Battery cup. - The battery cup is made of cartridge brass and weighs 24.5 grains. It is tubular in shape and the rim at one end is turned inward. It is assembled after the firing plug and prevents the latter from falling out of the head, as the turned-in rim serves as a block.

(7) Primer cup. - The primer cup is made of cartridge brass and weighs 11.4 grains. It is similar in construction and function to the cup in the primer, M36 (see par. 138).

(8) Closing disk. - The closing disk is cut from onion-skin paper and is placed over the primer charge. After it is placed the void space of the primer charge recess is filled with molten beeswax.

(9) Firing plug. - The firing plug is made of commercial brass rod and weighs 32.7 grains. On its under side a knob is formed that acts as the firing pin. This knob strikes the primer cup. The firing plug enables a blow to be struck at the ideal point on the primer cup for maximum effect and at the same time widens the area for impact of the gun's firing pin. This enables the number of misfires and hangfires to be reduced to a minimum which is essential in aerial combat.

c. Assembly. - The components are assembled as illustrated in figure 39.

d. Action. - Under the impact of the sharp blow of the gun's firing pin the firing plug moves forward against the friction of the battery cup. The firing plug knob strikes the primer cup. The primer mixture is crushed against the anvil and ignited. The flame passes through the apertures of the anvil and then through the flash vent. The primer charge is ignited and initiates the deflagration of the propellant.

162. PROPELLANT. - The propellant standard for loading in the standard rounds of 37-mm ammunition is an FNH powder. In the M54 and the M55A1 shells type II, FNH powder is used. Type II powder is composed of grains having a single longitudinal perforation. In the M80 shot, type I, FNH powder is used. Type I powder consists of grains having seven longitudinal perforations. The grains of both types are a light brown color and are approximately 0.3" long and 0.09" in diameter. The amounts of powder loaded into the cases of the three different rounds varies and will be included in the data for each round.

163. IDENTIFICATION. - a. By round. - Identifying marking is stamped or stencilled on the surface of the projectile. This marking or stencilling varies for the different rounds but in every case clearly identifies the round. On the head of the cartridge case, appears the informative marking described in paragraph 159a. Additional marking is added at the time that one of the projectiles is assembled to the case (see fig. 43). The ammunition may also be identified by the characteristic colors that it is painted.

b. By packing. - (1) Carton. - The carton bears certain identification that is indicative of its contents. A label has printed on it the designation of the gun, the nomenclature of the round, the lot number, date of packing, and initials of the loader. The cover of the carton is closed with adhesive tape that is colored to indicate the contents.

(2) Packing box. - The wooden packing box bears a great many identifying marks clearly indicative of the types of ammunition contained, the weapon for which it is to be used, the type of projectile (explosive or empty), the number of rounds, and the consignee and consignor. Personnel should note that when the box contains practice ammunition it is painted with a blue stripe as shown in figure 40.

164. PACKING. - The three rounds authorized for use in the M4 gun are packed similarly. Each is packed one complete round per fiber container, M60; 40 rounds (in fiber containers) per wooden packing box.

a. Carton (see fig. 40). - (1) The container, M60, is made of

plain chipboard. It is laminated and painted with an acid-proof black paint. The chipboard of the cylinder is held in place by aterneplate disk at each end. The container is made in two parts, the body and the cover. The cover fits snugly over the neck of the container and is held in this position by a piece of adhesive tape passed over the joint of the cover and body. A supporting ring is fitted into the lower third of the container and a reinforcing ring of metal is crimped to the open end of the container body.

(2) Loading. - The round is inserted nose down into the mouth of the container so that the extracting rim of the cartridge case rests on the reinforcing ring. The projectile fits snugly into the fiber supporting ring thus preventing the nose of the projectile from touching the bottom of the container. A 0.06" thick chipboard filler is placed over the head of the cartridge case and the container cover slides into place. The joint between cover and body is closed and held firmly by adhesive tape. A white gummed paper label is then placed longitudinally to the container body. (The label may be omitted and the information on the label may be painted on the container body in the same relative position.) After the contents are packed, the sealing strip and label are attached and the whole assembly is dipped in melted paraffin wax.

b. Packing box. - (1) General description (see fig. 40). - The box is made of wood, is unpainted, and stencilled with black paint as shown in the drawing. The box is sturdily constructed and will stand the normal shocks of handling and transportation. If the box contains practice ammunition a 3" band is painted as shown by the cross-hatching in figure 40.

(2) Loading. - Forty rounds, in containers are packed horizontally in four layers with one filler between layers and one or more fillers on top as required to pack contents tightly. After the cover is closed and sealed a strapping is attached and tightened about the box. It is then ready for shipment or storage.

SECTION III

SHELL, H.E., 37-MM, M54

	Paragraph
General description -----	165
Description of components -----	166
Packing -----	167
Identification -----	168
Exterior ballistics -----	169

165. GENERAL DESCRIPTION. - The round, complete, shell, H.E., M54 (with shell destroying tracer) is designed for firing in aerial

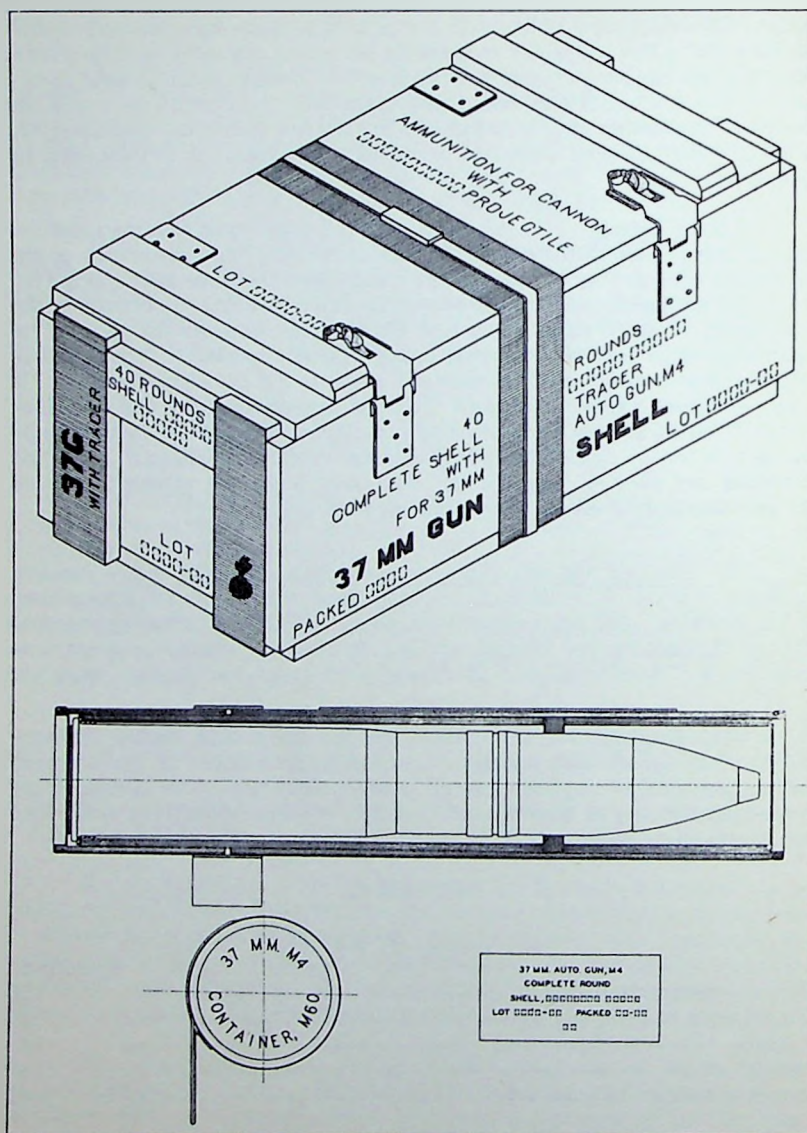


FIGURE 40. - PACKING AND MARKING FOR 37-MM AMMUNITION.

combat against light material targets. Since it is frequently fired over friendly territory, provision was made for the projectile to destroy itself in the event that the target was missed. The round is 9.75" long and weighs approximately 1.93 lbs. The projectile is rigidly attached to the cartridge case by crimping, from 4 to 25 crimps being used. The complete round consists of the fuze, projectile, explosive charge, tracer, cartridge case, propellant, and primer.

166. DESCRIPTION OF COMPONENTS. - The components are described as follows (see fig. 41):

a. Fuze. - (1) General description (see fig. 42). - The fuze, point detonating, M56 is made of an aluminum-alloy and weighs 0.17 lbs. complete. It is threaded so that it may be screwed into the nose of the projectile. The fuze is classified as "supersensitive" since it will function on impact against a light target, e.g., two thicknesses of airplane wing fabric. The fuze through a series of internal safety features is classified as bore-safe.

(2) Components. - The components of the fuze are labeled in figure 42.

(3) Action. - While the projectile is in the tube, the only action in the fuze is that caused by set-back; the slider is pressed down into its recess; the firing pin shoulders press firmly into the half blocks. After the projectile clears the muzzle of the gun, centrifugal force begins to exert an effect and the following occurs: the slider moves out of its recess against the force exerted by the slider spring, lining the slider charge up with the flash vent and the lower detonator; the half blocks move outward against the restraint of the half block spring forcing the firing pin forward. As the firing pin clears the half block recesses, it is free to move back and rest against the primer mixture. The fuze is now armed. Upon impact the firing pin crushes the primer mixture, the train of explosives successively function, and the projectile charge explodes.

b. Projectile. - (1) General description. - The projectile is manufactured from bar steel, is 4.13" long, and weighs 0.965 lbs. The projectile is hollow, the forward cavity, the largest, containing the explosive charge; the middle cavity, a narrow, short tunnel, contains the relay igniting charge housing; the end cavity containing the tracer composition. Two recesses are machined from the surface of the projectile, one for the rotating band, the other for the cannellure. The projectile has a tapered base, the walls tapering at an angle of approximately 9°.

(2) Rotating band. - The rotating band is made of gilding metal and weighs 0.08 lb. It is pressed into the recess provided for it and a recess is pressed into the band so that an effect of two bands is achieved.

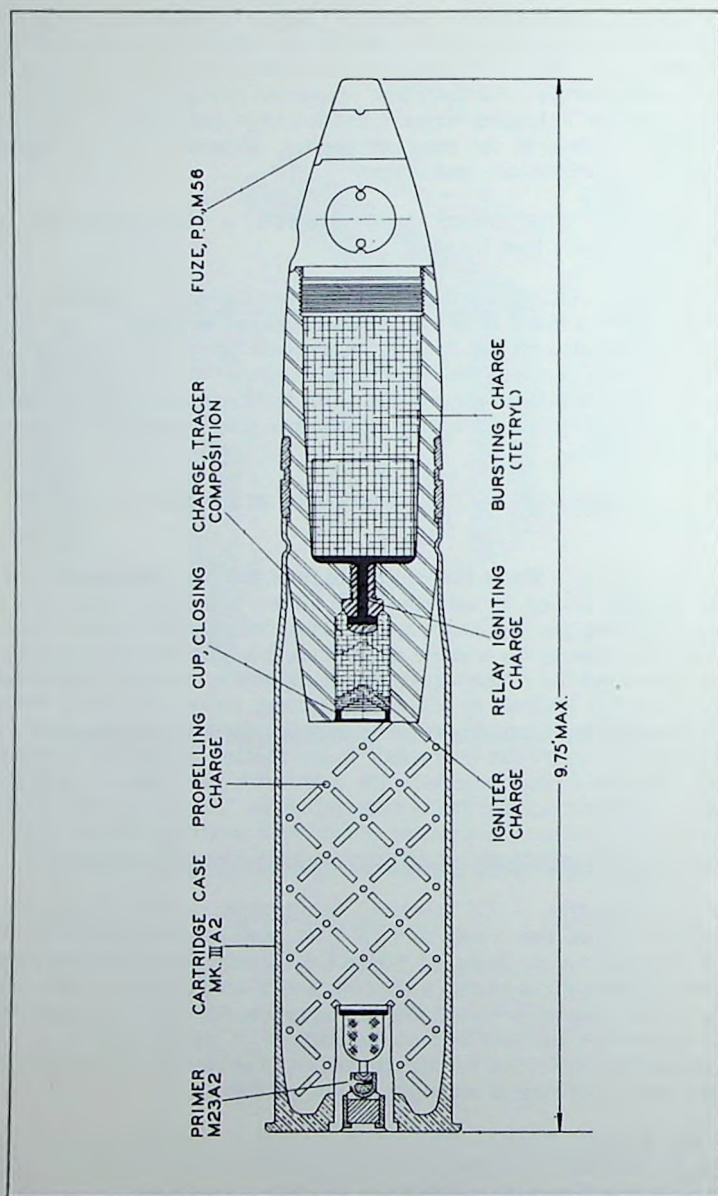


FIGURE 41. - ROUND, COMPLETE, SHELL, H.E., M54, FOR 37-MM GUN, M4.

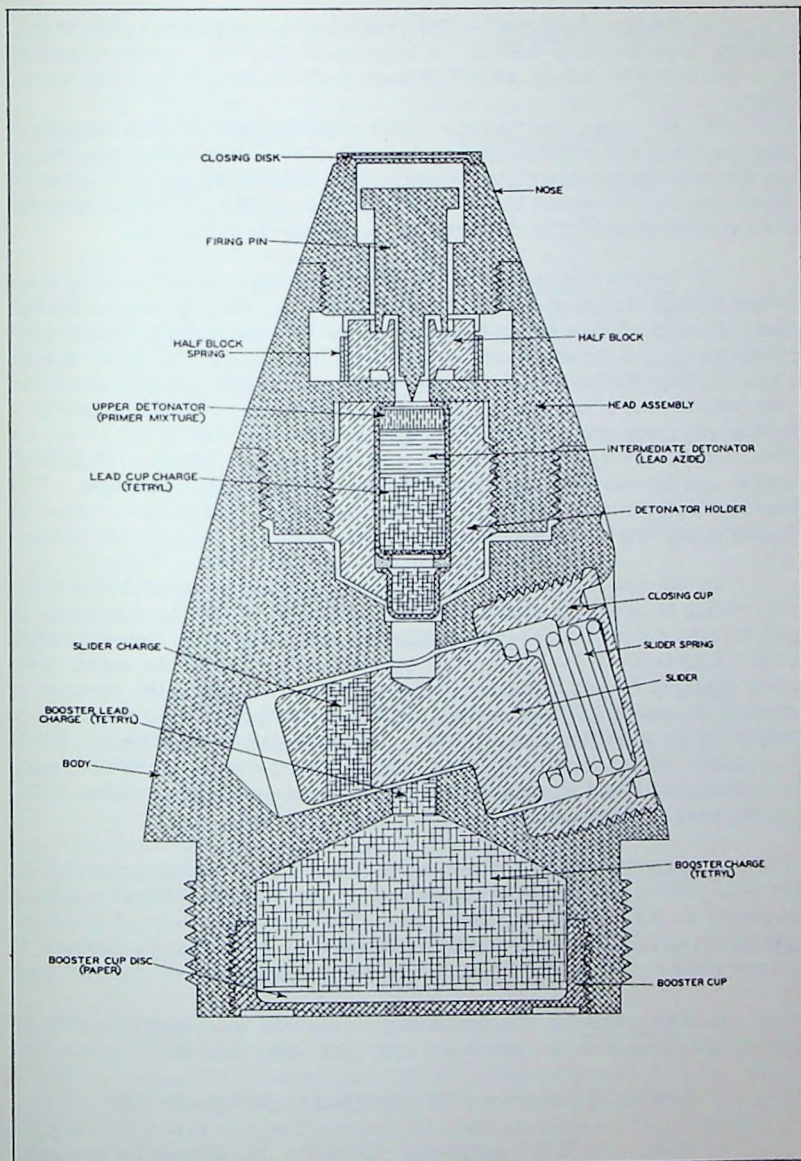


FIGURE 42. - FUZE, POINT DETONATING, M56.

(3) Explosive charge. - The explosive charge is pressed tetryl, weighing approximately 0.07 lb. It is pressed into the cavity in two or more pellets under a dead weight of from 9,000 to 10,000 lbs. per sq. in.

(4) Relay igniting charge. - The relay igniting charge serves to transmit the flame of the tracer to the explosive charge after the tracer has virtually burned out. This provides the shell destroying element of this projectile. The relay igniting charge consists of 1.68 grains of Army black powder pressed into a corrosion-resisting steel housing.

(5) Tracer composition. - The tracer composition consists of an igniter charge weighing approximately 20 grains that is ignited by the flame of the propellant and in turn ignites the tracer pellets. The tracer pellets are two in number and are pressed into the cavity under a dead weight of 110,000 lbs. per sq. in. Pellet #1 is hollow and fits about the rearmost section of the relay igniting charge housing. It weighs approximately 38 grains and provides a bright red flame. Pellet #2 is to the rear of pellet #1 and is in contact with the igniter charge. Pellet #2 weighs approximately 51 grains and burns with a bright red flame. The tracer composition is protected against chemical action by a celluloid closing cup which closes the tracer cavity.

(6) Identification. - All external surfaces of the projectile except the rotating band are painted a bright yellow. This paint is primarily to prevent rust but also serves to identify the projectile as a high explosive shell. Stencilled on the surface of the projectile above the band, with black marking ink, is the nomenclature of the round and the weapon in which it is used "37 G SHELL M54" and on the opposite side of the projectile appears the designation of the explosive charge "TETRYL WITH TRACER." On the rotating band is stamped the lot number of the shell, initials or symbol of the manufacturer, caliber and designation of the shell, and the year of manufacture.

c. Cartridge case. - The case is described in paragraph 160. At the time that the projectile is assembled to the case additional marking is placed on the head of the case. Near the circumference of the head appears in letters and numerals 1/8" high the ammunition lot number of the complete round and the loaders initials or symbol.

d. Propellant. - The propellant described in paragraph 162, is loaded into the case in the amount of approximately 0.15 lb.

e. Primer. - The primer is described in paragraph 151.

f. Note. - An H.E.I. explosive charge for the projectile has been recently standardized but no information other than that of a confidential nature is available.

167. PACKING. - The shell, H.E., M54, is packed as explained in paragraph 164.

168. IDENTIFICATION. - The complete round may be readily identified by its characteristic color and the fact that the projectile is fuzeed with an active fuze. The carton is sealed with a bright yellow strip of adhesive tape. The case and the projectile, the carton and packing box all bear identifying information.

169. EXTERIOR BALLISTICS. -

Maximum range -----	9,200 yards
Effective range (aerial combat) -----	2,000 yards
Muzzle velocity -----	2,000 ft./sec.
Burning range of trace -----	2,000 yards

SECTION IV

SHOT, A.P., 37-MM, M80

	Paragraph
General description -----	170
Description of components -----	171
Packing -----	172
Identification -----	173
Exterior ballistics -----	174

170. GENERAL DESCRIPTION. - The round, complete, shot, A.P., M80, is designed for firing from aircraft against lightly armored ground vehicles and water-borne vessels. The round is 9.34" long and weighs approximately 2.25 lbs., complete. The projectile is rigidly crimped to the cartridge case. Prior to crimping, the external surfaces to the rear of the rotating band are coated with N.R.C. compound and the projectile assembled to the case while the compound is still wet. In this way a tight, waterproof fit is obtained. The complete round consists of the projectile with tracer, the case, propellant, and primer.

171. DESCRIPTION OF COMPONENTS. - The components are described as follows (see fig. 43):

a. Projectile. - The projectile is solid and made of steel. It is 4.23" long and weighs 1.66 lbs. The nose is curved with an ogival radius of 2.35". A cavity 0.6" deep and 0.5" in diameter is machined out of the rear to house the tracer assembly. A seat is machined for the rotating band and a groove is machined for crimping the case to the projectile.

(1) Rotating band. - The rotating band is made of gilding metal tubing and weighs 0.09 lb. It is seated in the projectile and a groove is

pressed circumferentially through its center giving the effect of two bands.

(2) External surfaces. - All external surfaces of the projectile, except the rotating band, are coated with a black lacquer enamel. The tracer cavity is painted with acid-proof black paint.

(3) Tracer. - The tracer assembly is pressed into the cavity in two charges. Approximately 49 grains of red tracer composition in pellet form is first inserted, followed by approximately 20 grains of igniter composition. A clear, celluloid closing cup is placed in the rear of the cavity and sealed in with N.R.C. compound.

(4) Identification. - The projectile is painted black as explained above. On the rotating band is stamped in letters and numerals 0.08" high, the lot number of the shot, year of manufacture, initials or symbol of manufacturer, and caliber and designation of shot. On the surface of the projectile is stencilled in white ink, the nomenclature of the shot and the ammunition lot number (see fig. 43).

b. Cartridge case. - The cartridge case, Mk. IIIA2, is described in paragraph 160. At the time that the projectile is assembled to the case, the ammunition lot number and the designation of the round are stencilled on the head of the cartridge case (see fig. 43).

c. Propellant. - 0.14 lb. of the propellant, described in paragraph 162 is loaded into the case.

d. Primer. - The primer, M23A2, is assembled with this round. It is described in paragraph 161.

172. PACKING. - The shot, A.P., M80, is packed as described in paragraph 164.

173. IDENTIFICATION. - The complete round may be readily identified by its characteristic color and the fact that the projectile is unfuzed. The carton and packing box bear complete identifying information.

174. EXTERIOR BALLISTICS. - No information is available.

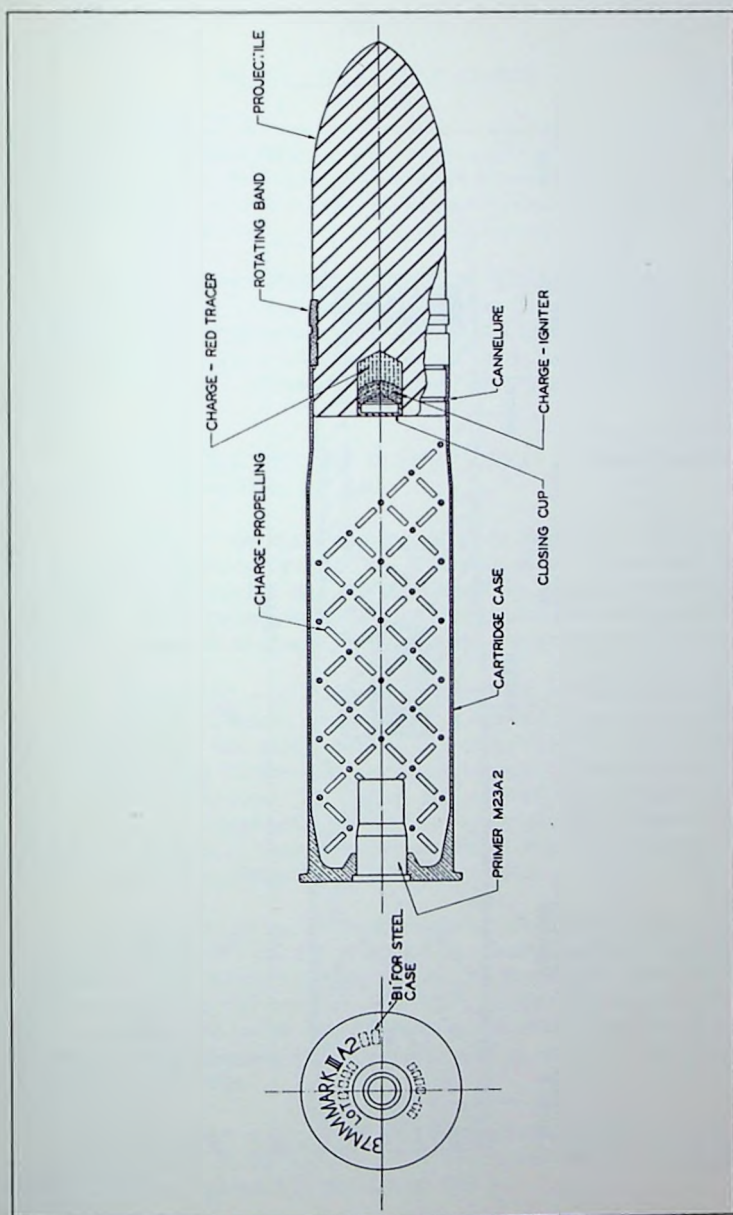


FIGURE 43. - ROUND, COMPLETE, SHOT, A.P., M80, FOR 37-MM GUN, M4.

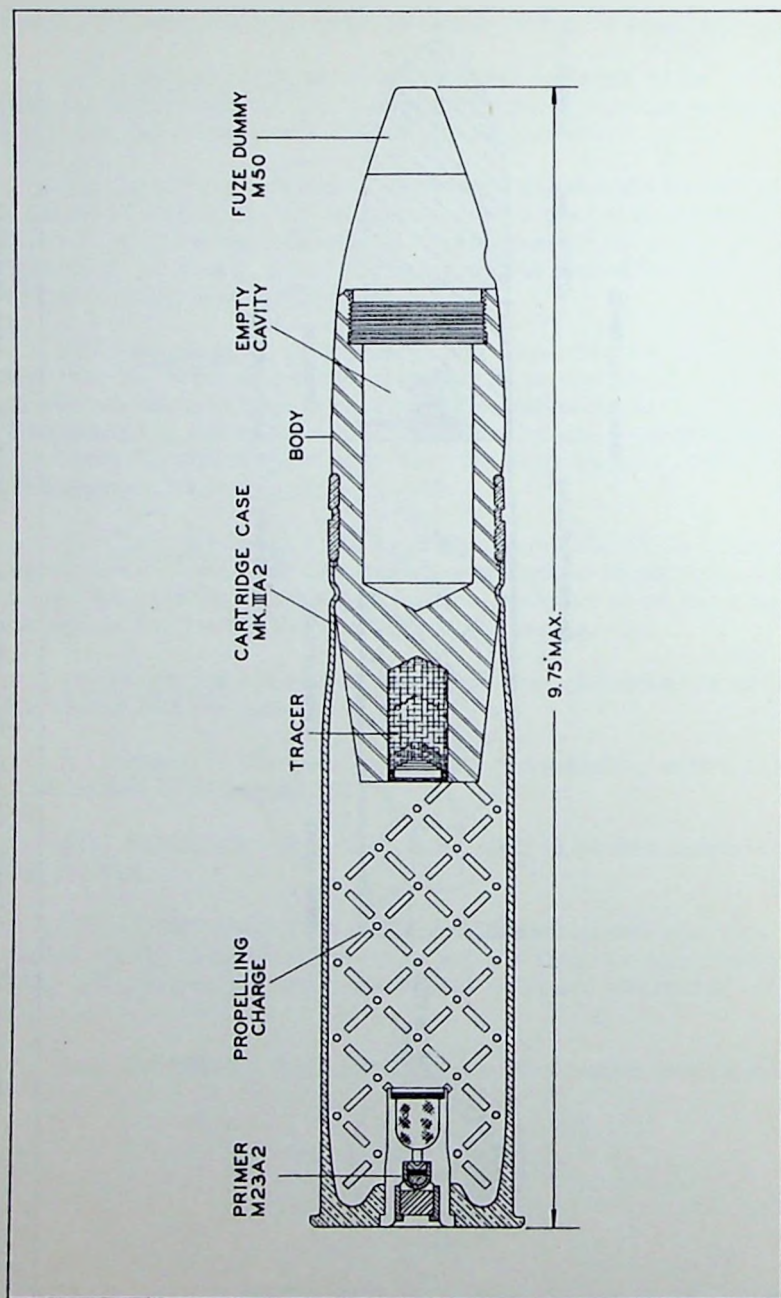


FIGURE 44. - ROUND, COMPLETE, SHELL, PRACTICE, M55A1, FOR 37-MM GUN, M4.

SECTION V

SHELL, PRACTICE, 37-MM, M55A1

	Paragraph
General description -----	175
Description of components -----	176
Packing -----	177
Identification -----	178
Exterior ballistics -----	179

175. GENERAL DESCRIPTION. - The shell, practice, 37-mm, M55A1, is designed for practice firing in the 37-mm gun, M4. The round is 9.75" long and weighs approximately 1.95 lbs. complete. The projectile is rigidly attached to the cartridge case by crimping. The complete round consists of the fuze, projectile, tracer, cartridge case, propellant, and primer.

176. DESCRIPTION OF COMPONENTS. - The components are described as follows (see fig. 44):

a. Fuze. - The fuze, dummy, M50, is made of an aluminum-alloy and weighs approximately 0.16 lb. It has the same streamlined shape as the M56 fuze, but is solid and has no projections of any kind on its surface. The body of the fuze below the flange is threaded to seat the fuze into the projectile. The fuze is stamped with its nomenclature just above the flange.

b. Projectile. - (1) General description. - The projectile is 4.13" long and weighs 1.34 lbs., complete. It has the same general shape as the projectile for the shell, M54. The projectile has two cavities, the larger one opening off the fuze seat being empty. The second at the rear of the projectile houses the tracer and igniter compositions. The two cavities are not connected. The tracer composition is similar to that in the H.E. shell and is closed with a celluloid cup. The rotating band is similar to that assembled in the H.E. projectile.

(2) Identification. - All external surfaces of the projectile, except the rotating band, are painted a light blue. On the surface of the projectile is stencilled with white marking ink, approximately the same information as that stamped on the surface of the H.E. projectile. The changes made in the marking are those appropriate to the round (see fig. 44). On the rotating band is stamped the same information as is stamped on the band of the H.E. projectile.

c. Cartridge case. - The cartridge case, Mk. IIIA2, is described in paragraph 160. When the projectile is assembled the same marking is applied as that explained in paragraph 166 c.

d. Propellant. - Approximately 0.17 lb. of the propellant described in paragraph 162, is loaded into the case.

e. Primer. - The primer, M23A2, is described in paragraph 162.

177. PACKING. - The complete round is packed in cartons and packing box as described in paragraph 164. The packing box, when loaded with this ammunition is encircled with a 3" blue stripe and the end cleats are similarly painted (see fig. 40).

178. IDENTIFICATION. - The complete round may be readily identified by its characteristic color and the fact that the projectile is fuzed with a dummy fuze. The carton is sealed with a strip of light blue adhesive tape. The case and the projectile, the carton and the packing box, all bear identifying information.

179. EXTERIOR BALLISTICS. - The round has approximately the same range, velocity, and burning distance of trace as the H.E. shell, M54.

AMMUNITION - GENERAL

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