

**TM 9-1990**

**WAR DEPARTMENT**

**TECHNICAL MANUAL**



**SMALL-ARMS AMMUNITION**

**May 23, 1942**

SMALL-ARMS AMMUNITION

CHANGES }  
No. 1 }

WAR DEPARTMENT,  
WASHINGTON, September 22, 1942.

TM 9-1990, May 23, 1942, is changed as follows:

21. Identification of ammunition types.

\* \* \* \* \*

c. Color.

\* \* \* \* \*

[A. G. 062.11 (9-19-42).] (C 1, Sept. 22, 1942.)

(3) A light blue tip on the bullet indicates incendiary ammunition.

\* \* \* \* \*

25. Color markings.

\* \* \* \* \*

b. The following color bands are used for each type:

<i>Type</i>	<i>Band</i>
* * * * *	* * * * *
Ball and tracer-----	Red, yellow, and green.
* * * * *	* * * * *

[A. G. 062.11 (9-19-42).] (C 1, Sept. 22, 1942.)

102. Exterior ballistics.

\* \* \* \* \*

d. Accuracy.—When test fired, it will group within a mean radius of 4 inches at 300 yards.

[A. G. 062.11 (9-19-42).] (C 1, Sept. 22, 1942.)

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,  
*Chief of Staff.*

OFFICIAL:

J. A. ULIO,  
*Major General,  
The Adjutant General.*

## SMALL-ARMS AMMUNITION

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\*This manual supersedes TR 1350-A, May 18, 1934, including C 1, January 2, 1935; C 2, January 2, 1936; C 3, January 3, 1938; C 4, January 3, 1939; and C 5, October 20, 1939.

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## CHAPTER 1

## GENERAL

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## SECTION I

## GENERAL

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1. Purpose.—This manual is published for the information and guidance of all concerned. Personnel of the Ordnance Department who are responsible for the care, handling, storage, or issue of small-arms ammunition should be familiar with the provisions of this manual.

2. **Scope.**—The information contained is such as to furnish a ready means of identification and to permit intelligent care, handling, and use of small-arms ammunition. The precautions and instructions with reference to care, handling, and use are intended for peacetime, but they should be followed so far as practicable at all times.

3. **References.**—Wherever appropriate in the text, reference is made to publications containing additional information. These and other pertinent publications are listed in the appendix.

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4. **General.**—*a. Small arms.*—Small arms comprise those weapons normally accompanying foot troops (infantry). They include rifles, automatic rifles, pistols, and machine guns up to caliber .60 (0.60 in. diameter of bore) and also shotguns.

*b. Small-arms ammunition.*—In this manual, small-arms ammunition is restricted to mean ammunition for those small arms used in military service. These are—

- (1) Caliber .50 machine guns.
- (2) Caliber .30 carbines, rifles, semiautomatic rifles, automatic rifles, and machine guns.
- (3) Caliber .22 pistols, rifles, and machine guns (for gallery practice).
- (4) Shotguns of 12 gage.
- (5) Caliber .45 automatic pistols, revolvers, and submachine guns.
- (6) Subcaliber tubes and adapters for artillery weapons which use ammunition of similar size and type.

*c. Caliber and gage.*—(1) The caliber of a weapon is the diameter of the bore expressed in inches or, when specifically mentioned, in millimeters.

(2) The gage of a shotgun refers to the number of lead balls of the diameter of the bore required to weigh one pound. The bore of a 12-gage shotgun measures 0.785 inch in diameter.

5. **Nomenclature.**—*a.* Standard nomenclature is established in order that each item supplied by the Ordnance Department may be specifically identified by name. These names are published in Standard Nomenclature Lists (SNL's). The use of standard nomenclature is mandatory for all purposes of record. It will be used in this manual wherever reference is made to specific items as in the following paragraph. It should be noted that this nomenclature completely describes the ammunition as to type, caliber, and model.

*b.* The following items of small-arms ammunition will be described in detail in later chapters:

- (1) Cartridge, armor-piercing, caliber .30, M2.
- (2) Cartridge, ball, caliber .30, M1.
- (3) Cartridge, ball, caliber .30, M2.
- (4) Cartridge, tracer, caliber .30, M1.
- (5) Cartridge, blank, caliber .30, M1909.
- (6) Cartridge, dummy, caliber .30, M1906 (corrugated).
- (7) Cartridge, dummy, caliber .30, M2.
- (8) Cartridge, gallery practice, caliber .30, M1919.
- (9) Cartridge, guard, caliber .30, M1906.
- (10) Cartridge, guard, caliber .30, M1.
- (11) Cartridge, high-pressure test, caliber .30, M1.
- (12) Cartridge, subcaliber, caliber .30, M1925.
- (13) Cartridge, carbine, caliber .30, M1.
- (14) Cartridge, ball, caliber .45, M1911.
- (15) Cartridge, blank, revolver, caliber .45, M1.
- (16) Cartridge, dummy, caliber .45, M1921.
- (17) Cartridge, high-pressure test, caliber .45, M1.
- (18) Cartridge, tracer, caliber .45, M1.
- (19) Cartridge, armor-piercing, caliber .50, M2.
- (20) Cartridge, ball, caliber .50, M2.
- (21) Cartridge, tracer, caliber .50, M1.
- (22) Cartridge, blank, caliber .50, M1.
- (23) Cartridge, dummy, caliber .50, M1.
- (24) Cartridge, dummy, caliber .50, M2.
- (25) Cartridge, high-pressure test, caliber .50, M1.
- (26) Cartridge, ball, caliber .22, long rifle.
- (27) Cartridge, blank, caliber .22, field artillery trainer, M2.
- (28) Cartridge, blank, caliber .22, field artillery trainer, M2A1.
- (29) Shell, shotgun, 12-gage.
- (30) Cartridge, blank, 10-gage (formerly shell, shotgun, 10-gage, blank).

6. **Classification.**—Dependent upon its purpose, small-arms ammunition is classified as follows:

*a. Ball.*—This type is effective against personnel or light matériel targets.

*b. Armor-piercing.*—This type has a bullet containing a hardened steel core. It is intended for use against armored aircraft and vehicles, concrete shelters, and other bullet-resisting targets.

*c. Tracer.*—This type has a bullet containing a chemical composition which burns in flight. It is used for observation of fire, for incendiary purposes, and for signaling.

*d. Blank.*—This type contains no bullet. It is used for simulated fire, for signaling, and for salutes.

*e. Dummy.*—This type has no propelling charge or primer. It is used for training.

*f. Gallery practice.*—This type has a reduced charge. It was formerly used for gallery practice, but is now standard for guard purposes.

*g. Guard.*—This type has a reduced propelling charge. It is used for guard purposes.

*h. High-pressure test.*—This type has an augmented propelling charge. It is used only in proof firing.

*i. Incendiary.*—This type may be identified by the light-blue paint on the tip of the bullet.

*j. Subcaliber.*—This type has a rimmed cartridge case. It is used in subcaliber tubes and mounts of cannon.

*k. Shotgun shells.*—These are used for guard purposes, target practice, and hunting.

7. **Components of cartridge.**—A round of small-arms ammunition is called a cartridge. As a complete round, the cartridge contains all the components necessary to fire the weapon once. In general these are the cartridge case, primer, propelling charge, and bullet. Typical cartridges are illustrated in figures 1 and 2.

8. **Cartridge case.**—*a. Functions.*—The cartridge case is the means whereby the other components, primer, propelling charge, and bullet, are assembled into a unit. It also provides a waterproof container for the propelling charge. When the cartridge is fired, the thin brass is forced against the walls of the chamber by the pressure, thus preventing the escape of gases to the rear. This sealing process is known as obturation.

*b. Manufacture.*—The cartridge case is made from a circular disk of brass which is punched into the form of a cup and drawn through successive dies into shape (fig. 3). The closed end is pressed into shape to form the head which contains the primer pocket and vent.

An extractor groove is machined in the side of the head to provide a grip for the mechanical extractor of the weapon. The case for pistol ammunition is cylindrical; that for carbine ammunition tapers slightly; that for rifle and machine-gun ammunition tapers slightly from the head to the shoulder—approximately  $\frac{3}{4}$  of its length—then sharply at the shoulder to the cylindrical neck. After each punching or drawing operation, the case is annealed to remove strains.

*c. Assembly.*—The primer is pressed into the primer pocket and staked or crimped; the joint is then sealed by a drop of shellac or lacquer. The propelling charge is inserted and the inside of the neck coated with lacquer or other waterproofing compound, the bullet is inserted and the mouth of the case crimped into the cannellure of the bullet.

**9. Primer.**—The primer, which is crimped into the primer pocket in the head of the cartridge case, consists of a soft metal cup, a priming or percussion composition, a disk of shellacked manila paper, and an anvil. A blow from the firing pin on the primer cup compresses the priming composition between the cup and the anvil, thereby producing a flame which passes through the vents in the anvil and cartridge case, and ignites the propelling charge of smokeless powder. Figure 4 shows details of caliber .30, .45, and .50 primers. The cup of the caliber .30 or caliber .50 primer is made of brass, whereas the cup of the caliber .45 primer is made of gilding metal, because the lighter blow of the firing pins of pistols and revolvers necessitates a softer material. The priming composition is inserted into the cup and is held in place and protected from moisture and electrolytic action by the paper disk. The brass anvil is inserted last. The following table gives the designation and weight of primers and primer compositions:

Caliber of cartridge	Primer composition		Primer	
	Designation	Weight	Designation	Weight
Caliber .30.....	FA70.....	0.45 grain.....	Primer No. 26...	5.5 grains.
Caliber .45.....	FA70.....	0.37 grain.....	Primer No. 27...	4.5 grains.
Caliber .50.....	FA90A.....	2.0 grains.....	Primer No. 28...	19.0 grains.

Recent primers of the noncorrosive, nonmercuric type are used in some caliber .45 cartridges and in the caliber .30 carbine cartridge. To function properly, primers must be free from such surface defects as folds, wrinkles, scratches, scales or dents. Other primer defects are cocked, broken, or inverted anvils; scratched, torn, or dirty cups; and missing anvils, disks, or pellets.



**10. Bullet.**—*a. Parts.*—The bullet consists, in general, of a core covered by a gilding metal jacket. A cannellure is cut or rolled in the jacket to provide a recess into which the mouth of the case may be crimped at assembly (figs. 5 and 6).

*b. Shape.*—The body of the bullet is cylindrical. The nose may be round, as in the caliber .45 bullet, or ogival (curved taper) as in all service rifle and machine-gun bullets. The base may be "square"—that is, cylindrical, or "boat-tailed," that is, having a conical taper.

*c. Core.*—(1) Armor-piercing bullets contain a core of hardened steel. There may be point or base fillers of lead or aluminum filling the spaces between the steel core and jacket.

(2) Bullets of ball cartridges usually contain a slug of antimony-hardened lead except in the case of caliber .50, wherein the core is of soft steel in order to insure similar ballistic properties for ball and armor-piercing cartridges.

(3) Tracer bullets contain a lead slug in the forward position, and a chemical composition in the rear.

(4) Incendiary bullets contain an incendiary composition.

*d. Variations.*—Special purpose bullets may vary in shape or component parts. These will be described in the section on the particular cartridge.

**11. Propelling charge.**—*a. General.*—The propelling charge consists of a quantity of smokeless powder. The weight of the charge is not constant. It is adjusted for each powder lot to give the required velocity with pressure within the limits prescribed for the weapon in which it is fired. The powder charge is assembled loosely in the cartridge case. Acceptance requirements for small-arms smokeless powders are outlined in the U. S. Army specifications listed in paragraph 2, appendix.

*b. Characteristics.*—Smokeless powder for small-arms ammunition is usually glazed with graphite to facilitate machine loading, and thus presents a black polished appearance. Single-perforated grains are usually used as small-arms propellants. Since the powder grains are small, they ignite more rapidly and burn more quickly than cannon powder. When abnormal temperatures prevail, small-arms powders are subject to rapid deterioration. Smokeless powder is not as sensitive to friction as black powder, but all precautions used in handling black powder should be observed for small-arms powders.

*c. Types.*—In general, there are two types of small-arms propellants: the single-base nitrocellulose type and the double-base type. The double-base type is a mixture of nitrocellulose and nitroglycerin which burns more rapidly than the single-base type.

12. **Accessories.**—Those accessories which are connected with the use of small-arms ammunition, such as clips and metallic belt links, are described below. The packing of these items is also discussed.

*a. Clips.*—Caliber .30 cartridges for use in the M1903 and M1917 service rifles, or for both rifle and machine-gun use, are assembled in 5-round clips; those for the M1 rifle are assembled in 8-round clips. In time of peace 8-round clips are nonexpendable items.

(1) The 5-round clip (fig. 7) consists of a body and spring, both of brass. Stop lugs on the exterior sides of the body seat the clip in its slots in the receiver of the rifle. The top edges of the sides are folded inward, forming flanges which fit into the grooves in the cartridge case heads, holding the cartridge in place. The spring is provided with narrow tongues which, when the clip is filled, are pressed into the grooves of the outside cartridges, holding them securely in the clip.

(2) The 8-round clip (fig. 8) consists only of a case made of steel. It is indented near the base along the sides to form an inner rib which engages the extractor groove in the cartridges. The sides are inclined sufficiently to clamp the cartridges firmly in place. The cartridges are held in two staggered rows. It is immaterial whether the uppermost cartridge of the loaded clip is on the left or right side of the clip as the follower slide of the gun adjusts itself for either loading. Experience in the field shows, however, that it is preferable to have the uppermost cartridge in the right side of the clip. The sides are curved at the ends to hold the cartridges securely in the clip.

(3) Caliber .30 dummy cartridges were formerly assembled in a special clip. Present practice is to use the standard 5-round clip without tongues, marked for use with dummy cartridges. The corrugated type of dummy cartridge, cartridge, dummy, caliber .30, M1906, may be used for instruction in functioning when loaded in 8-round clips.

(4) When used in the revolver, it is necessary to assemble the cartridge, ball, caliber .45, M1911, into clips. These clips are illustrated in figure 9. They are packed separately for assembly in the field.

*b. Metallic belt links.*—For use in automatic weapons, caliber .30 and caliber .50 ammunition is issued in metallic link belts. These belts are assemblies of unit links, one for each cartridge. Each link (fig. 10) has two loops fitting about one cartridge and a third loop fitting around one adjacent cartridge. Thus each cartridge in a metallic link belt, except the cartridges on the ends, has two links attached to it (fig. 11). Each link is made from strip steel. A blank form is stamped from the strip and the blank is bent to form the circular loops. It is then heat-treated and processed to prevent rusting. The links are manufactured to meet specified extraction tests from pre-

scribed steel plugs made in the shape of cartridges. Link, metallic belt, caliber .30, M1, must withstand an extraction pull of 5 to 10 pounds and link, metallic belt, caliber .50, M1 or M2, must withstand an extraction pull of 10 to 25 pounds. Links designated for standard use are—

Link, metallic belt, caliber .30, M1.

Link, metallic belt, caliber .50, M2.

The M1 caliber .50 link differs slightly in design from the M2 link. A metallic belt end is required for some aircraft gun installations.

*c. Packing of accessories.*—Clips for caliber .30, .45, or .50 ammunition are packed as required. Metallic belt links are packed in cardboard cartons which are packed in wooden boxes without liners or in wire-bound paper-lined boxes. Caliber .30 links are packed 20 per carton and 250 cartons (5,000 links) per box. The volume of the wooden box is 1.65 cubic feet and the weight is 66 pounds; the volume of the wire-bound box is 1.55 cubic feet and the weight, 61 pounds. The caliber .50 links are packed 10 per carton and 100 cartons (1,000 links) per box. The volume of the wooden box is 1.22 cubic feet and the weight, 53 pounds; the volume of the wire-bound box is 1.15 cubic feet and weight, 49 pounds. See SNL T-1 for further information.

**13. Grades and uses.**—*a. General.*—Ammunition is manufactured to rigorous specifications and is inspected and tested thoroughly before acceptance. Since the various types of weapons—rifles, ground machine guns, aircraft machine guns, etc.—have different requirements, production orders and specifications call for the classification of lots for use in specific weapons. Variations in manufacture may occur because of problems of mass production of ammunition. Considering variations from lot to lot and the different requirements for each type of weapon, grades are assigned to each lot of ammunition, in accordance with acceptance tests, to designate their use in the different types of weapons.

*b. Grades.*—Current grades of all existing lots of small-arms ammunition are established by the Chief of Ordnance as a result of inspection and are published in OFSB 3-5. Grades are not marked on packing boxes or on slips inside the box. No lot other than that of grade appropriate for the weapon, as specified in the current publication of OFSB 3-5, will be fired.

(1) The grades for caliber .30 and .50 ammunition are as follows:

AC—Aircraft and antiaircraft machine guns.

R—Rifles and semiautomatic rifles.

MG—Ground machine guns.

3—Unserviceable, not to be used.

(2) The grades for caliber .45 ammunition are as follows:

1—Revolvers, automatic pistols, and submachine guns.

2—Automatic pistol and submachine guns, only.

RT—Not to be used. Requires roll test. Will be disposed of as directed in OFSB 3-5.

3—Unserviceable, not to be used.

(3) More than one grade may be authorized for certain weapons. For example, grade AC or R may also be used for ground machine guns and grade MG or R may also be used for antiaircraft machine guns. For use in rifles, armor-piercing and tracer ammunition of grade AC may be used.

(4) When small-arms ammunition becomes unserviceable, it is designated as grade 3 and withdrawn from service. Ammunition which cannot be identified will be considered as grade 3. However, unidentified ammunition will not be classified as unserviceable for this reason until every effort has been made to establish its identity.

*c. Examples.*—Some of the considerations taken in grading of ammunition are illustrated by the following examples:

(1) Ammunition to be used in the bolt-action rifle requires that the average net extraction effort shall not exceed 15 pounds. This is essential for uniform and reliable action in a manually operated weapon but is of lesser importance in automatic and semiautomatic weapons.

(2) Ammunition for use in synchronized and remote-controlled aircraft machine guns must be of selected uniformity and have a minimum variation in rate of ignition. These requirements are essential to assure continuous feeding during combat use of aircraft guns, where malfunctioning might result in destruction of propellers or create other hazards.

(3) Due to the rugged construction of ground-type machine guns, the continuous control exercised by the operator, and the lower rate of fire, less stringent test limits are required. Ammunition that meets the general specifications for accuracy, pressure, dimensions, etc., is satisfactory.

*d. Velocity, pressure, accuracy.*—Regardless of the weapon in which the ammunition is to be used, the requirements for velocity, pressure, and accuracy, are uniform. However, due to uncontrollable factors, an ammunition lot meeting the special requirements of aircraft machine guns might be less accurate or develop higher or lower pressures or velocities than a lot graded for ground machine guns or for rifles.

*e. Regrading.*—Ammunition in storage is periodically retested to insure that its characteristics have not changed. If changes have occurred, as shown by surveillance tests, the ammunition is regarded and the new grades published in OFSB 3-5.

14. **Priority of issue.**—*a.* Subject to special instructions from the Chief of Ordnance, ammunition of appropriate type and model will be issued in the following order: limited standard, substitute standard, standard. Following this rule, ammunition which has had the longest or least favorable storage will be issued first whenever practicable.

*b.* To prevent the building up of excess stocks in the field, transfers may be arranged within the corps area if no stock of appropriate grade for immediate use is on hand. Within any one grade priority of issue and use will be given those lots indicated in OFSB 3-5 and to lots containing less than 20,000 rounds.

*c.* Priority of issue for lots of small-arms ammunition is established by the Chief of Ordnance and published in OFSB 3-5, or in special instructions. See also AR 775-10.

15. **Danger zones and protection of personnel.**—AR 750-10 prescribes the regulations for firing ammunition in time of peace. It specifies the minimum thickness of various kinds of cover that is required for protection against bullets fired from small-arms weapons. The table below reproduces these data:

Nature of cover	Thickness in inches	
	Caliber .30	Caliber .50
Concrete.....	4	8
Sandstone or granite earth.....	6	10
Broken stone.....	20	30
Dry sand.....	24	32
Wet sand.....	36	48
Logs wired together (oak).....	40	60
Earth, packed or tamped.....	48	60
Undisturbed compact earth.....	52	66
Earth, freshly turned.....	56	72

16. **Firing tables.**—From proving-ground data, firing tables are prepared for the using arms. Complete firing tables are based on the use of small-arms ammunition in the several weapons and are published under the direction of the Chief of Ordnance. They are listed in SNL F-69.

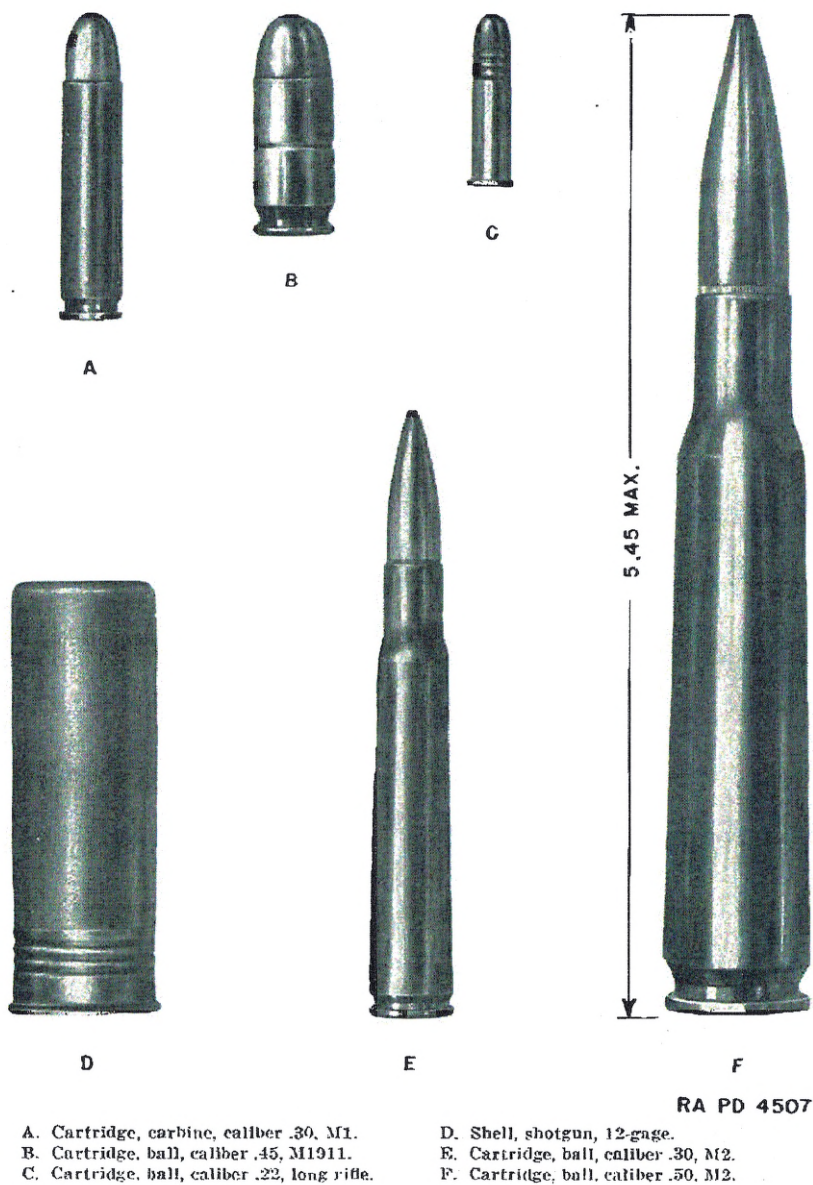
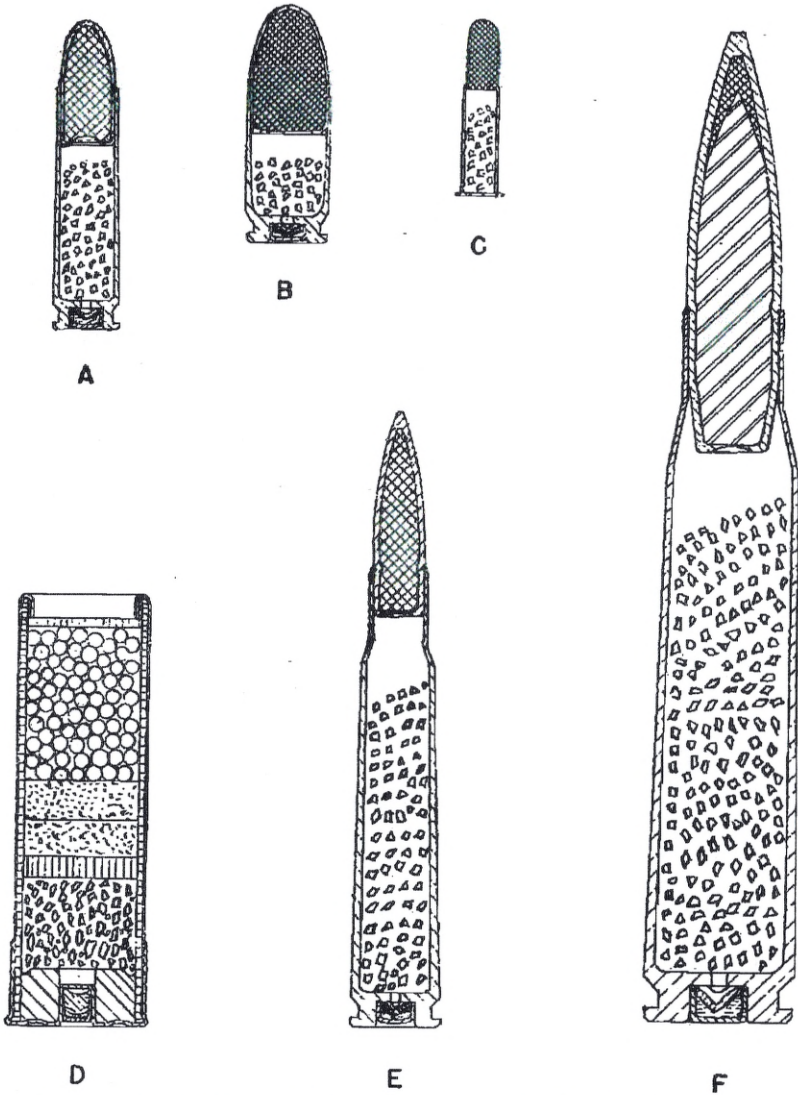


FIGURE 1.—Types of small-arms ammunition.

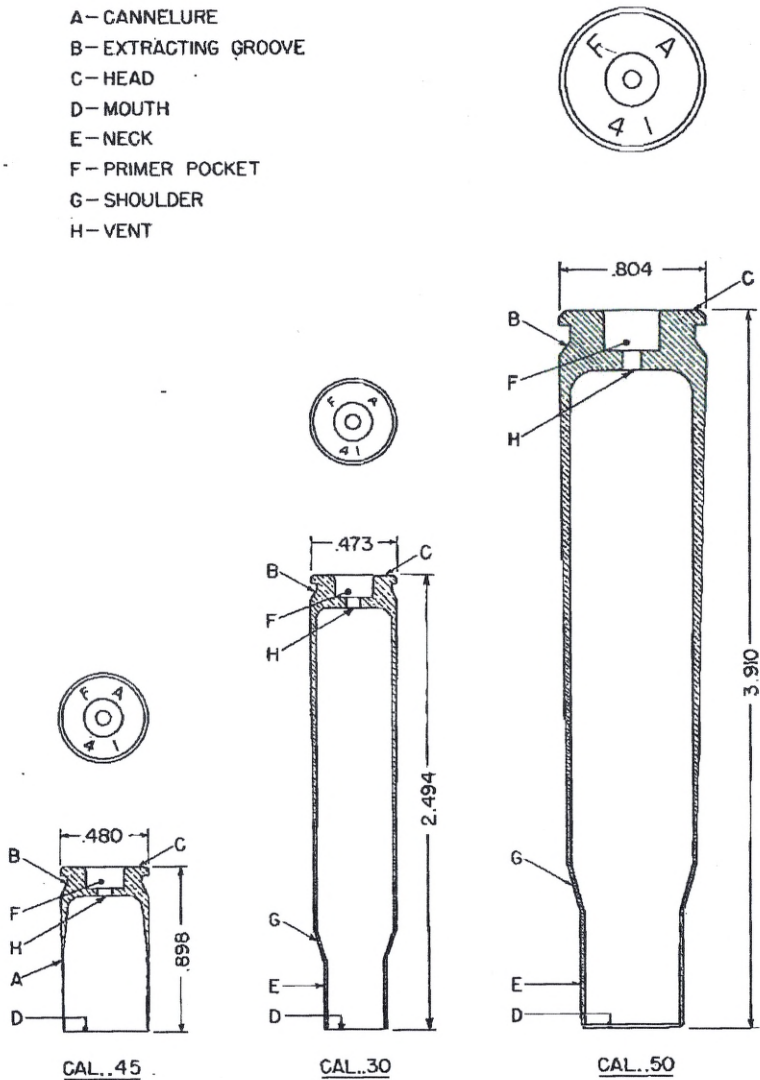


A. Cartridge, carbine, caliber .30, M1.  
 B. Cartridge, ball, caliber .45, M1911.  
 C. Cartridge, ball, caliber .22, long rifle.

D. Shell, shotgun, 12-gauge.  
 E. Cartridge, ball, caliber .30, M2.  
 F. Cartridge, ball, caliber .50, M2.

FIGURE 2.—Cartridges in section.

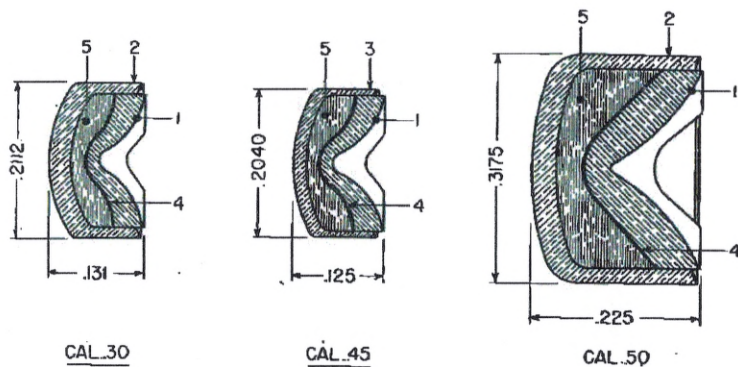
- A- CANNELURE
- B- EXTRACTING GROOVE
- C- HEAD
- D- MOUTH
- E- NECK
- F- PRIMER POCKET
- G- SHOULDER
- H- VENT



RA PD 4509

FIGURE 3.—Cartridge cases in section.





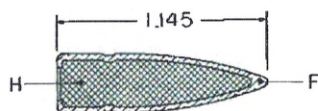
1. Brass anvil.  
2. Brass cup.

3. Gilding metal cup.  
4. Paper disk.

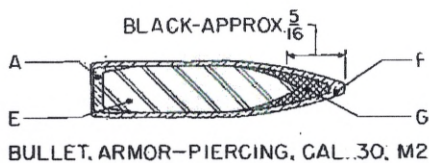
5. Pellet.

RA PD 4510

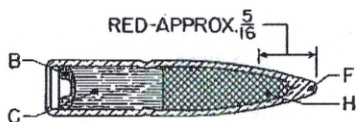
FIGURE 4.—Primers in section.



BULLET, BALL, CAL. .30, M2



BULLET, ARMOR-PIERCING, CAL. .30, M2



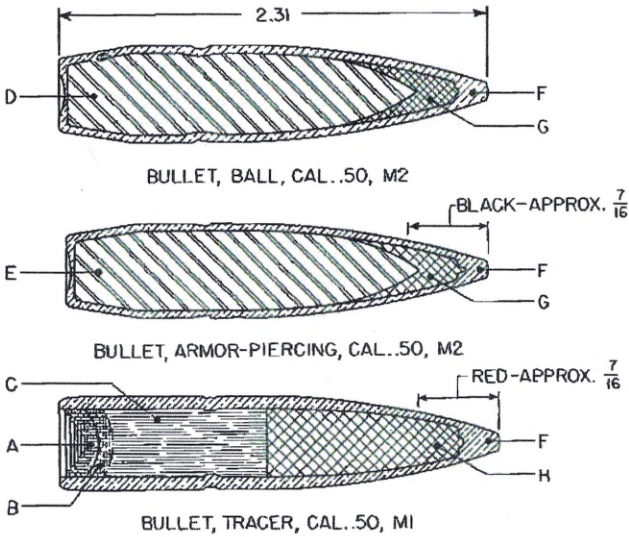
BULLET, TRACER, CAL. .30, M1.

RA PD 4511

- A. Base filler—gilding metal.  
B. Composition, igniter.  
C. Composition, tracer.  
D. Core—steel.

- E. Core—tungsten chrome-steel.  
F. Jacket—gilding metal.  
G. Point filler—lead "T" shot.  
H. Slug—lead with antimony.

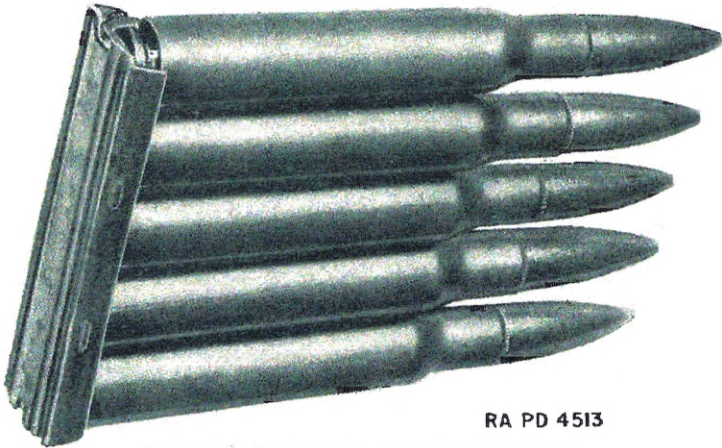
FIGURE 3.—Representative bullets, caliber .30, in section.



RA PD 4512

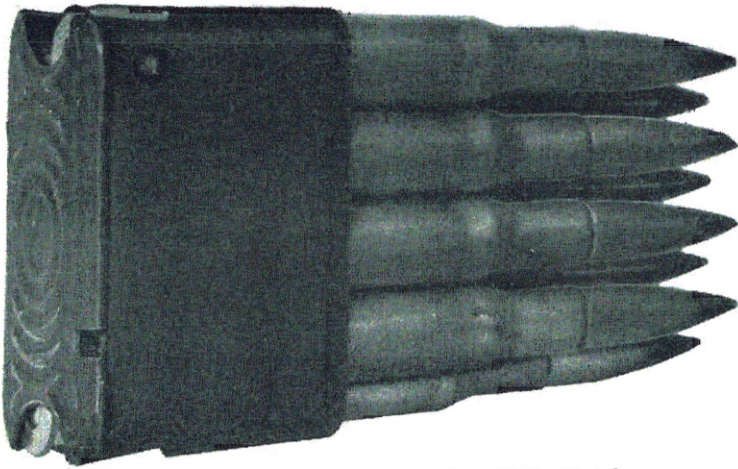
- |                              |                                     |
|------------------------------|-------------------------------------|
| A. Composition, igniter.     | F. Core—tungsten chrome-steel.      |
| B. Composition, sub-igniter. | F. Jacket—gilding metal.            |
| C. Composition, tracer.      | G. Point filler—lead with antimony. |
| D. Core—steel.               | H. Slug—lead with antimony.         |

FIGURE 6.—Representative bullets, caliber .50, in section



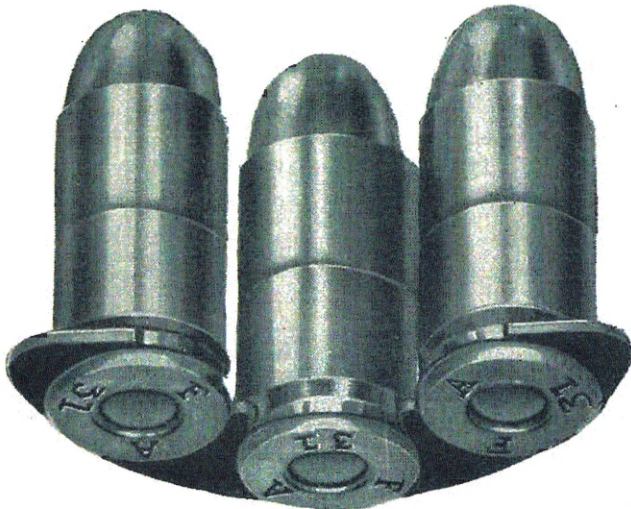
RA PD 4513

FIGURE 7.—5-round clip of caliber .30 cartridges.

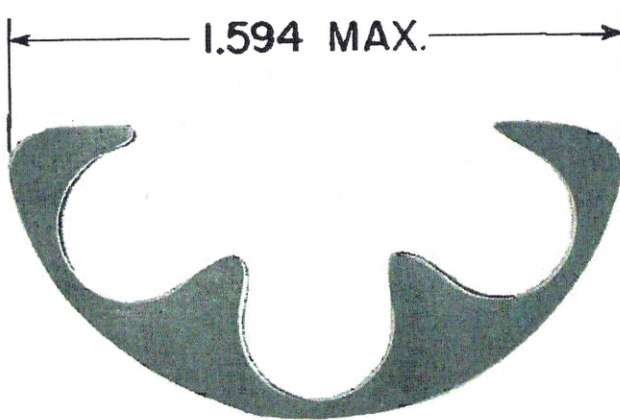


RA FSD 1948

FIGURE 8.—8-round clip of caliber .30 cartridges.



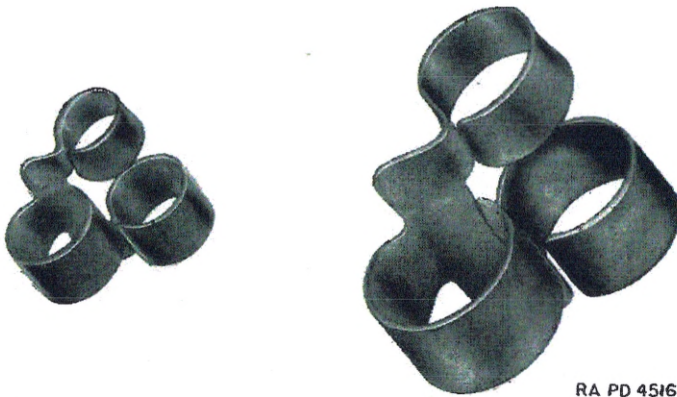
A. Loaded.



RA PD 4515

B. Unloaded.

FIGURE 9.—Clip, cartridge, caliber .45, for revolver ball cartridge.

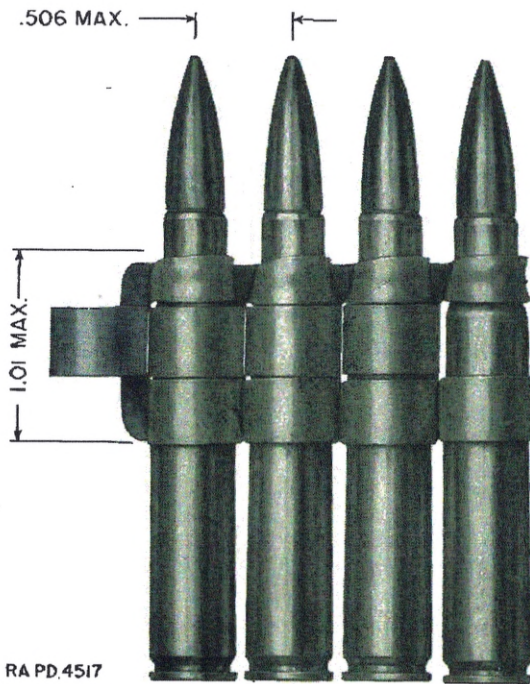


A. Link, metallic belt, caliber .30, M1.

B. Link, metallic belt, caliber .30, M2.

RA PD 4516

FIGURE 10.



RA PD 4517

FIGURE 11.—Section of link belt loaded with cartridges, ball, caliber .30, M2.

## SECTION III

## IDENTIFICATION

	Paragraph
General.....	17
Model.....	18
Ammunition lot number.....	19
Identification card.....	20
Identification of ammunition types.....	21
Identification in target practice.....	22

17. **General.**—*a.* The type, caliber, ammunition lot number, and the symbol of the manufacturer are the essential factors for the identification of ammunition. Because of its small size, the marking on small-arms ammunition is the stamping of the manufacturer's initials and year of original loading on the base of the cartridge case. For example, F. A. 38 means the lot was loaded at Frankford Arsenal in 1938. On lots manufactured prior to 1940, the caliber is also stamped on the base of some cartridge cases. National Match ammunition has the initials N. M. stamped alongside the date of loading. The ammunition is clearly and fully identified, except as to grade, from the markings on the original packing boxes and cartons. In addition to the marking, colored bands painted on the ammunition boxes and on certain labels, provide a ready means of identification as to type. See section IV.

*b.* The following means are used to identify ammunition:

(1) Marking on the original packing box and on each carton. See section IV.

(2) An identification card, usually 6½ by 15 inches, sealed inside the metal liner on top of ammunition in each box (par. 20).

(3) A reference card inserted in the bandoleer, if ammunition is packed in clips and bandoleers.

(4) The stamping on the base of the cartridge case.

(5) The appearance of the cartridge and the painting on the bullet (see section on each cartridge).

18. **Model.**—To distinguish a particular design, a model designation is assigned at the time it is classified as an adopted type. The model designation becomes an essential part of the standard nomenclature of the item and one of the means of identification. Prior to July 1, 1925, it was the practice to use the year in which the design was adopted as the model designation, for example, cartridge, ball, caliber .45, M1911. The present system of model designation is to use the letter M followed by an Arabic numeral, for example, cartridge, ball, caliber .50, M2.

## CHAPTER 5

## AMMUNITION, MISCELLANEOUS

	Paragraphs
SECTION I. General.....	95
II. Cartridge, ball, caliber .22, long rifle.....	96-97
III. Field artillery trainer ammunition.....	98-100
IV. Cartridge, carbine, caliber .30, M1.....	101-102
V. Cartridge, rifle grenade, caliber .30, M3.....	103-104
VI. Cartridge, subcaliber, caliber .30.....	105-106
VII. Cartridge, blank, 10-gage, for 37-mm guns, M1916, M3, and M5.....	107
VIII. Shell, shotgun, 12-gage.....	108-109

## SECTION I

## GENERAL

	Paragraph
Scope.....	95.

95. **Scope.**—In this chapter the following cartridges are described: caliber .22 ammunition; shotgun ammunition; and several caliber .30 cartridges which are not included in chapter 2 because they do not have the standard caliber .30 cartridge case. Ammunition lot numbers are ordinarily assigned by the manufacturer and should be used for reporting any defect or malfunctioning. Special ballistic and surveillance tests are directed by the Chief of Ordnance should there be any indications of unfitnes for use.

## SECTION II

## CARTRIDGE, BALL, CALIBER .22, LONG RIFLE

	Paragraph
Description.....	96
Exterior ballistics.....	97

96. **Description.**—*a. General.*—This cartridge (fig. 26) has superseded the caliber .30 gallery practice cartridge, M1919, and is used in the caliber .22 U. S. rifles, M1922, M1922M1, and M2, and in caliber .22 machine guns, machine-gun trainers, and pistols for gallery practice and training purposes.

*b. Component parts.*—These cartridges are purchased by the Ordnance Department from several commercial manufacturers. They are all of the same general appearance, but differ slightly in the shape of

bullet, powder used, and ballistic qualities. The cartridge complete weighs approximately 53 grains and consists of cartridge case, priming composition, propelling charge, and bullet. The cartridge case is made of brass or 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. The priming composition and charge of smokeless powder may differ for each manufacturer. Caliber .22 long rifle ammunition contains a noncorrosive, nonmercuric primer composition. The type of powder used is usually marked on the containers and the charge weighs approximately 1.7 grains. The bullet is made of lead. Bullets of different manufacture differ slightly in shape, but all weigh approximately 40 grains.

*c. Identification.*—Containers of this ammunition are marked by the manufacturer with the caliber, type, and such trade names as "Klean-bore," "Lubaloy," "Rustless," "Tackhole," "Copperheads," etc. Caliber .22 ammunition 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.

*d. Packing.*—The cartridges are packed 50 in a cardboard box and 10 such boxes (500 cartridges) are packed in a paper carton. The outside wooden packing cases contain 10,000 cartridges, 20 cartons. The packing cases are marked with the manufacturer's name, quantity, and type of ammunition. Boxes of this ammunition procured for oversea shipment contain an air-tight metal liner. A case of 10,000 cartridges without metal liner weighs 85 pounds. See SNL T-1.

97. *Exterior ballistics.*—Caliber .22 long rifle cartridges of different manufacture vary somewhat in velocity and pressure. The following tables and data are approximate:

*a.* The *maximum range* is approximately 1,500 yards with the piece elevated at an angle in the order of 30°.

*b.* The *average muzzle velocity* is 1,100 feet per second.

*c.* *Pressure* in the chamber averages 16,000 pounds per square inch.

*d.* *Accuracy.*—As determined by firings to date.

Range	Diameter of group circle
<i>Yards</i>	<i>Inches</i>
25	0.5
50	1.0
100	3.0
200	8.0



*e. Penetration.*—When fired into 1-inch pine boards, spaced 1 inch apart at a range of 15 feet, the bullet will penetrate the first five boards and  $\frac{1}{8}$  inch into the sixth board.

*f. Table of fire.*—Cartridge, ball, caliber .22, long rifle.

Range (yards)	Velocity	Bullet energy	Time of flight	Drop at target	Ordnate of trajectory half range	Mean ac- curacy	Angle of departure
	<i>Feet per second</i>	<i>Foot- pounds</i>	<i>Seconds</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Minutes</i>
0	1, 100	102					
25	1, 070	95	0. 068	0. 89	0. 24	0. 14	3. 5
50	1, 020	89	. 140	3. 17	. 98	. 33	7. 6
75	980	84	. 214	8. 06	2. 28	. 45	11. 7
100	950	79	. 292	14. 82	4. 08	. 57	15. 8
125	920	75	. 372	24. 73	6. 78	. 80	20. 5
150	890	71	. 455	36. 64	10. 02	. 98	24. 9
175	860	67	. 541	50. 80	14. 20	1. 13	29. 6
200	840	64	. 630	72. 93	19. 10	1. 25	34. 3
225	810	61	. 720	93. 04	28. 30	1. 45	39. 7
250	790	58	. 812	118. 21	31. 87	1. 65	44. 7
275	770	55	. 911	147. 20	39. 87	1. 88	50. 8
300	750	52	1. 005	177. 12	48. 69	2. 12	55. 7

## SECTION III

## FIELD ARTILLERY TRAINER AMMUNITION

Paragraph

Ball, steel, 1-inch diameter, field artillery trainer, M2 and M2A1	98
Cartridge, blank, caliber .22, field artillery trainer, M2 and M2A1	99
Exterior ballistics	100

**98. Ball, steel, 1-inch diameter, field artillery trainer, M2 and M2A1.**—This is an ordinary commercial steel ball which has been hardened, ground, and polished. It is used as the projectile in the field artillery trainer M2 and M2A1. A caliber .22 blank cartridge (see par. 99) serves as the propelling charge. The ball weighs approximately 1,024 grains, and may be reused if kept clean and polished. It is packed as required. See SNL T-1.

**99. Cartridge, blank, caliber .22, field artillery trainer, M2 and M2A1.**—This cartridge (fig. 26) is a rim fire cartridge of commercial manufacture. It is the standard item to be used as the propelling charge for the 1-inch steel ball projectile in the field artillery trainer M2 and M2A1 (par. 98). The powder is held in place by a paper wad which is retained by crimping the mouth of the case. Cartridge, blank, caliber .22, field artillery trainer, M2 and M2A1, is packed 10,000 per box without metal liner (commercial). Packing box data are as follows:

Dimensions (inches)	Square feet	Cubic feet	Weight (pounds)
18 by 9½ by 4½-----	1.19	0.45	21

100. Exterior ballistics.—See FT 1-A-1 (or TM 6-225) for complete range and elevation table of field artillery trainer, M2, firing 1-inch steel ball, approximate weight 1,024 grains. The range of the projectile is changed or adjusted by micrometer adjustment of the interior length of the barrel, and by spacers inserted in the barrel, thereby changing the length of travel of the ball within the barrel. Adjustments in length of barrel may be made to calibrate the individual trainers with any battery, also to obtain for any given range setting with the trainer, 1/100 of the range of the weapon being simulated. The range scale on the trainer is graduated 1/100 of the range of the 75-mm gun, M1897, firing Mk. I, HE, shell (M46 or M47 fuze), for which the maximum range is 9,000 yards. The estimated velocity is 100 feet per second.

## SECTION IV

## CARTRIDGE, CARBINE, CALIBER .30, M1

Description-----	Paragraph 101
Exterior ballistics-----	102

101. Description.—*a. General.*—The cartridge, carbine, caliber .30, M1 (fig. 25), is a current standard item of issue for use in the carbine, caliber .30, M1.

*b. Visual identification.*—This cartridge can be readily identified by its characteristic shape.

*c. Component parts.*—The cartridge consists of a cartridge case, primer, propelling charge, and bullet. The complete assembly weighs 195 grains. The cartridge case has a slight taper for its entire length. The bullet consists of two parts, a lead alloy core, and the jacket. The bullet weighs 110 grains.

*d. Packing and marking.*—It is packed similar to caliber .45 ammunition, 2,700 rounds in a metal lined box, in 60 cartons of 45 rounds each with separators containing 15 rounds each.

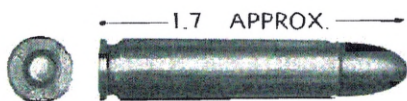
102. Exterior ballistics.—*a. Range.*—This ammunition is intended for use for ranges up to 300 yards.

*b. Maximum pressure.*—31,000 pounds per square inch.

*c. Velocity.*—(1) At muzzle, 2,000 feet per second.

(2) At 53 feet, 1,900 feet per second.

*d. Accuracy.*—When test fired, it will group within a mean radius of 4 inches at 300 feet.



CARTRIDGE, CARBINE, CAL. .30, M1



CARTRIDGE, SUBCALIBER, CAL. .30, M1925

RA PD 4532

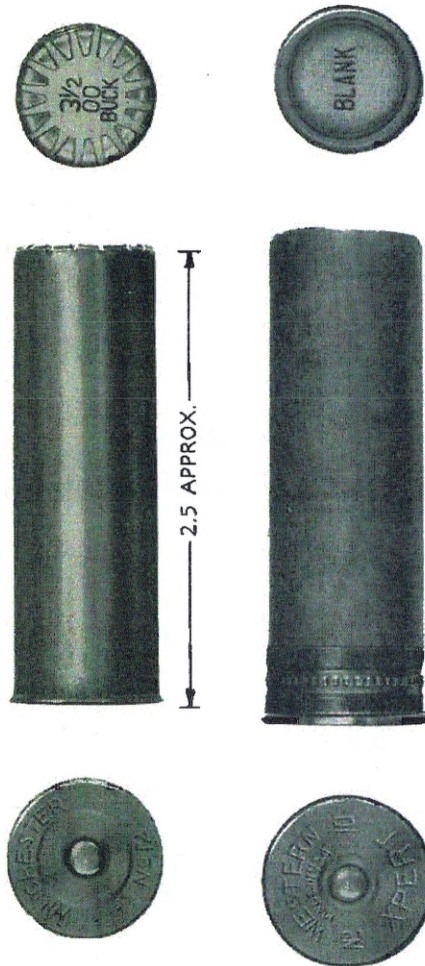
FIGURE 25.—Cartridges, carbine and subcaliber.

CARTRIDGE, BLANK, CAL. .22, FIELD ARTILLERY TRAINER,  
M2 AND M2A1

CARTRIDGE, BALL, CAL. .22, LONG RIFLE

RA PD 4531

FIGURE 26.—Cartridges, caliber .22.



RA PD 4533  
A. Shell, shotgun, 12-gauge, brass, loaded with smokeless powder and No. 00 buckshot.  
B. Cartridge, blank, 10-gauge, 37-mm, guns, M3, M5, and M1016.

FIGURE 27.—Shot shells.

SECTION V

CARTRIDGE, RIFLE GRENADE, CALIBER .30, M3

	Paragraph
Description .....	103
Exterior ballistics .....	104

103. Description.—*a. General.*—This cartridge is used in caliber .30 rifles, M1903, M1903A1, and M1917, for discharging antitank grenades. This cartridge will not be used in lieu of the caliber .30, M1909 blank cartridge in automatic weapons, nor will it be fired in the direction of personnel.

b. *Visual identification.*—This cartridge may be identified by the five-petal-rose crimp in the mouth of the case.

c. *Components.*—The case is the same as the standard caliber .30 case except for a cannellure located about 1/4 inch from the mouth. A wad is seated immediately above the cannellure after the propelling charge has been inserted. A drop of red lacquer is applied to wad and the mouth of the case is closed by crimping in the shape of a five-leaf rosette. See section II, chapter 1, for description of case construction and primer. The cartridge is first loaded with a charge of five grains of black rifle powder, then with a progressive-burning small-arms powder. The component weights are as follows:

	<i>Grains</i>
Case .....	200
Wad .....	Negligible
Primer .....	5.594
Propelling powder M3 .....	51
Total weight of cartridge .....	246

d. *Packing.*—Twenty cartridges are packed in a paper carton, 100 cartons (2,000 cartridges) to the standard metal-lined packing box.

e. *Marking.*—The label for cartons containing this ammunition is described in paragraph 26. The information given on identification card is as follows:

- Line*
- 1 2,000 cartridges
  - 2 Rifle grenade
  - 3 Caliber .30, M3
  - 4 In cartons
  - 5 For grenade use only
  - 6 Ammunition lot number
  - 7 Name of manufacturer

The marking on boxes is as described in section IV, chapter 1. The box for this ammunition is further distinguished by two color bands of blue, 1/2 inch wide and separated from each other by 1 inch.

104. *Exterior ballistics.*—The cartridge, grenade, caliber .30, M3, is loaded to obtain a grenade velocity of 165 feet per second at 5.5 feet.

SECTION VI

CARTRIDGE, SUBCALIBER, CALIBER .30

	<i>Paragraph</i>
Description .....	105
Exterior ballistics .....	106

105. *Description.*—*a. General.*—The cartridge, subcaliber, caliber .30 (fig. 25), is designed for firing from the subcaliber tube of the 3-inch (15 pdr.) seacoast gun. Its use for subcaliber practice with other types of cannon has been discontinued. There are two types of caliber .30 subcaliber cartridges: the cartridge, subcaliber caliber .30, M1925; and the cartridge, subcaliber, caliber .30, old stock. Both types of caliber .30 subcaliber cartridges are limited standard; the old stock on hand is given priority of issue. Under no circumstances will the cartridge, subcaliber, caliber .30, be used in other than "Krag" type rifle barrel chambers.

*b. Visual identification.*—Subcaliber cartridges are distinguished from other caliber .30 types by the presence of an extracting rim on the cartridge case.

*c. Component parts.*—(1) This cartridge consists of cartridge case primer, propelling charge, and bullet.

(2) The cartridge case differs from that of other caliber .30 types in that it has an extracting rim instead of a groove.

(3) The primer is assembled in a monel metal primer cup in order that it may function on the light blow of a rifle firing pin as well as on the heavy blow of that of a gun.

(4) The propelling charge consists of approximately 35 grains of pyro D. G. powder.

(5) The bullet of the old style cartridge is cylindrical, with a round nose; the jacket is cupro-nickel; the filler, hardened lead. The bullet of the M1925 is boat-tailed and pointed; the jacket is gilding metal.

*Component weights*

Item	Weight in grains <sup>1</sup>	
	Old type	M1925
Cartridge, complete (approximate) .....	438.5	385.5
Cartridge case (unprimed) .....	173	173
Primer (loaded) .....	10.1	5.37
Bullet .....	220	172
Jacket .....	57	63
Lead slug .....	163	109
Propelling charge (approximate) .....	35	35

<sup>1</sup> 7,000 grains = 1 pound avoirdupois.

*d. Packing and marking.*—(1) *Old stock.*—Cartridges of this type are packed in two different boxes, one holding 1,000 rounds, and the other 1,400. The box containing 1,400 rounds is the standard packing box. In it are packed 70 cartons of 20 rounds each; total weight

with contents is 112 pounds. The 1,000-round box is smaller, accommodating 50 cartons of 20 rounds each, weighing when packed 81 pounds. The marking on the outside of both boxes is, respectively, as follows:

*Box of 1,000 rounds*

Line	On side of box	Line	On ends of box
1.....	1,000 subcaliber.....		(Day, month, and year cartridges were loaded.)
2.....	Cartridges, caliber .30.....		
3.....	For subcaliber.....		
4.....	Cartridge.....		
5.....	Manufactured by (name of manufacturer).....		

*Box of 1,400 rounds*

Line	On side of box	Line	On ends of box
1.....	1,400 caliber .30 cartridges.....	1.....	1,400 caliber .30.
2.....	Subcaliber.....	2.....	Subcaliber.
3.....	For subcaliber cartridges <sup>1</sup> .....	3.....	Cartridge.
4.....	Packed in cartons.....	4.....	Packed in.
5.....	Cartridge lot number.....	5.....	Cartons.
6.....	(Name of manufacturer).....	6.....	(Shell and flame.)
7.....	Loaded (day-month-year).....	7.....	(Initials of manufacturer.)

<sup>1</sup> This refers to the subcaliber cartridge (for 3-inch seaonst guns) from which the caliber .30 subcaliber cartridges are fired.

(2) *M1925 cartridges* are packed 75 cartons of 20 rounds each (1,500 rounds) in the standard packing box, a gross weight of 107 pounds. Boxes of this ammunition packed since April 1933 are marked as follows:

Line	On side of box	Line	On ends of box
1.....	1,500 cartridges.....	1.....	1,500 cartridges.
2.....	Subcaliber.....	2.....	Subcaliber.
3.....	Caliber .30, M1925.....	3.....	Caliber .30, M1925.
4.....	In cartons.....	4.....	In cartons.
5.....	For subcaliber firings.....	5.....	(Shell and flame.)
6.....	Ammunition lot number.....	6.....	Lot (manufacturer's initials, number of lot).
7.....	(Manufacturer, number of lot).....		

*The ammunition lot number should be shown on the lid and address side of box.*

**106. Exterior ballistics.**—The maximum range of the M1925 subcaliber cartridge, caliber .30, is 4,300 yards. The powder pressure may vary slightly for each lot of powder as the weight of charge is

adjusted to give the required muzzle velocity. This is 2,025 feet per second for the old type and 1,990 feet per second for the M1925. The average maximum breech pressure is 40,000 pounds per square inch. The old type bullet will penetrate 58 pine boards  $\frac{7}{8}$  inch thick.

## SECTION VII

CARTRIDGE, BLANK, 10-GAGE, FOR 37-MM GUNS, M1916,  
M3 AND M5

Description.....	Paragraph
Description.....	107

107. **Description.**—*a. General.*—The cartridge, blank, 10-gage (fig. 27), is used with appropriate adapters in lieu of blank ammunition for 37-mm guns, M3, M5, and M1916. The adapters consist of a standard cartridge case modified in accordance with GA 1785 for the M3 and M5 guns, and with GA 1786 for the M1916 gun. This cartridge was formerly listed as shell, shotgun, 10-gage, blank. This ammunition is of commercial manufacture. The charge is black powder weighing 8 grains, and is kept in place by means of dry felt pads.

*b. Packing.*—Cartridge, blank, 10-gage, is packed 25 rounds per carton, 20 cartons (500 rounds) per box. The box may be of wood or heavy fiber. The box is  $15\frac{7}{8}$  by  $9\frac{5}{8}$  by  $9\frac{3}{8}$  inches. The volume is 0.83 cubic feet. It weighs 37.5 pounds.

## SECTION VIII

## SHELL, SHOTGUN, 12-GAGE

Description.....	Paragraph
Description.....	108
Packing and marking.....	109

108. **Description.**—*a. General.*—Shotgun shells (shot shells) (fig. 27) are procured by the Ordnance Department from several manufacturers for use in 12-gage sporting and riot-type shotguns. They are intended for guard or combat use and for hunting or trap shooting.

*b. Visual identification.*—Shells for guard and combat use have a brass head extending at least 1 inch along the case. Shells for sporting uses have a head extending only  $\frac{1}{2}$  inch along the case.

*c. Components.*—(1) The shell consists of a case, a primer, several wads, a propelling charge, and a load of lead shot.

(2) The case consists of a brass head and a paper case or shell body. In guard or combat shells, the head extends a distance of 1 inch along



the case. (In some shells, the entire case is of brass.) In sporting shells, the head extends 1/2 inch. The head is reinforced by a base of compressed paper in which the primer pocket is formed. Some paper shells have a steel reinforcement, called the lining, under the brass head. The shell body is made of paper and waterproofed. The head is attached to the shell body by crimping.

(3) The primer is a commercial type suitable for ignition of the smokeless powder used.

(4) The propelling charge and shot load for each type are shown in the following table.

Type of shell	Propelling charge		Shot	
	Weight	Type	Weight in ounces	Size
Guard or combat.....	26 grains.....	Dense smokeless.....	1.125	00
Trap shooting.....	3 drams.....	Bulk smokeless.....	1.25	7½
Hawk load.....	do.....	do.....	1.125	6

(5) The arrangement of paper and felt wads is shown in figure 2.

**109. Packing and marking.**—*a. Packing.*—(1) Shot shells are packed twenty-five per carton, twenty such cartons (500 rounds) per case. The case for domestic shipment may be wood or fiber; for oversea shipment, it will be metal-lined wood.

(2) *Packing box data.*—(a) *Size* in inches, 15 by 10¾ by 9¾.

(b) *Area.*—1.08 square feet.

(c) *Volume.*—0.88 cubic foot.

(d) *Weight.*—65 pounds.

*b. Marking.*—In addition to the markings on the cartons and boxes, symbols indicating the powder charge and shot load are stamped on the closing wad. These shells can be identified further by the following, stamped on the head of the shell:

Manufacturer	Marking on head for—	
	Guard and combat load	Sporting load
Winchester Repeating Arms Co.	WRA 12 Leader.....	WRA 12 Ranger.
Remington Arms Co.....	Rem. UMC No. 12 Arrow.....	Rem. No. 12 Economy.
Western Cartridge Co....	Western No. 12 Record.....	Western No. 12 XPert.
U. S. Cartridge Co.....	U. S. No. 12 Ajax.....	U. S. No. 12 Defiance.
Peters Cartridge Co.....	P-Peters No. 12 Ideal.....	P-Peters No. 12 Victor.
	P-Peters No. 12 Premier.....	

## APPENDIX

## LIST OF REFERENCES

## 1. Standard Nomenclature Lists.

*a. Ammunition.*

Ammunition, blank, for pack, light, and medium field artillery. SNL R-5.

Ammunition, fixed, for harbor defense, heavy field and railway artillery. SNL P-4.

Ammunition, revolver and automatic pistol. SNL T-2.

Ammunition, rifle and automatic gun. SNL T-1.

Ammunition, small-arms, obsolete and non-standard. SNL T-6.

Ground mines and fuzes. SNL R-7.

Miscellaneous service components of small-arms ammunition. SNL T-4.

Shells, shotgun. SNL T-3.

*b. Cleaning, preserving, and lubricating materials.* SNL K-1.

*c. Firing tables and trajectory charts.* SNL F-69.

*d. Current Standard Nomenclature Lists are as tabulated here. An up-to-date list of SNL's is maintained as the "Ordnance Publications for Supply Index."* (OPSI.)

## 2. Explanatory publications.

*a. Ammunition.*

Ammunition condition report. O.O. 7235.

Ammunition, general. TM 9-1900.

Military explosives. TM 9-2900.

Qualifications in arms and ammunition training allowances. AR 775-10.

Range regulations for firing ammunition in time of peace. AR 750-10.

Small-arms ammunition. OFSB 3-5.

Smokeless powder for caliber .30 U. S. Army Specification service ammunition. 50-12-9.

Smokeless powder for caliber .45 U. S. Army Specification ammunition. 50-12-11.

Smokeless powder for caliber .50 U. S. Army Specification ammunition. 50-12-2.

*b. Cleaning, preserving, and lubricating materials.* TM 9-850.

## SMALL-ARMS AMMUNITION

*c. Gun matériel.*

Aircraft machine gun, caliber .30.....	TR 1400-30G.
Automatic pistol, caliber .45, M1911 and M1911A1.	FM 23-35.
Browning automatic and machine rifles.....	TR 1400-30E.
Browning automatic rifle, caliber .30, M1918A2, with bipod.	FM 23-15.
Browning automatic rifle, caliber .30, M1918A2, without bipod.	FM 23-20.
Browning machine gun, caliber .30, ground, tank, and antiaircraft types.	TM 9-1205.
Browning machine gun, caliber .30, HB, M1919A4, ground.	FM 23-45.
Browning machine gun, caliber .30, HB, M1919A4 (Mounted in combat vehicles).	FM 23-50.
Browning machine gun, caliber .30, M1917. ....	FM 23-55.
Browning aircraft machine guns, caliber .30, M1918M1 and M1919.	TR 1300-30G.
Browning machine gun, caliber .50, HB, M2, ground.	FM 23-60.
Browning machine gun, caliber .50, HB, M2 (Mounted in combat vehicles).	FM 23-65.
Browning machine gun, caliber .50, M1921, aircraft, fixed and flexible.	TM 9-220.
Browning machine gun, caliber .50, M2, aircraft, fixed and flexible.	TM 9-225.
Browning machine gun, caliber .50, M2, watercooled, and mounts.	TM 9-226.
Pistols and revolvers.....	TM 9-1295.
Thompson submachine gun, caliber .45, M1928A1.	FM 23-40.
U. S. rifle, caliber .30, M1.....	FM 23-5.
U. S. rifle, caliber .30, M1903.....	FM 23-10.
U. S. rifle, caliber .30, M1903, M1903A1, and M1917.	TR 1400-30A.
U. S. rifle, caliber .22, M1922, M1922A1, and M2.	TM 9-280.

*d. Gunnery.*

Gunnery, fire control, and position finding, antiaircraft guns.	FM 4-110.
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*d. Gunnery—Continued.*

Gunnery, fire control, and position finding, antiaircraft automatic weapons. FM 4-112.

Marksmanship and service of the piece— antiaircraft machine gun. FM 4-135.

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*f. Transportation.*

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[A. G. 062.11 (2-25-42).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,  
*Chief of Staff.*

OFFICIAL:

J. A. ULIO,  
*Major General,*  
*The Adjutant General.*

DISTRIBUTION:

Bn 9(1); C 9(3).  
(For explanation of symbols see FM 21-6.)



## SECTION VIII

## CARTRIDGE, HIGH-PRESSURE TEST, CALIBER .50, M1

Description	Paragraph 93
-------------	-----------------

93. **Description.**—*a. General.*—The cartridge, high-pressure test, caliber .50, M1 (fig. 22), is used for proof-firing caliber .50 machine guns at the place of manufacture. The cartridge is loaded with a powder charge sufficient to develop a breech pressure averaging 62,500 pounds per square inch for any ten consecutive shots. Due to this excessive pressure and the danger involved in firing, the guns under test are fired from a fixed rest under a hood by means of a mechanical firing device. This cartridge should be fired only by authorized personnel.

*b. Visual identification.*—This cartridge is distinguished from other caliber .50 cartridges by the tinned cartridge case. Dummy cartridges, which also have tinned cases, have holes drilled through the case.

*c. Components.*—(1) The cartridge consists of a cartridge case, primer, propelling charge, and bullet. The entire assembly weighs 1,980 grains.

(2) The case is made of tinned cartridge brass; in other respects it is the same as the cases of other cartridges of this caliber.

(3) The primer is described in paragraph 9.

(4) The bullet consists of a gilding metal jacket and a core made up of 2 slugs, a front slug and a rear slug. The mouth of the case is crimped into the cannellure at assembly and a minimum pull of 100 pounds is required to extract the bullet from the case.

## SECTION IX

## CARTRIDGE, INCENDIARY, CALIBER .50, M1

General	Paragraph 94
---------	-----------------

94. **General.**—This cartridge is a standard item of issue for use in caliber .50 machine guns. The cartridge resembles the cartridge, ball, caliber .50, M2, in outward appearance, but it may be identified by the light blue paint on the tip of the bullet. Other information about this ammunition is not available at this time.

**19. Ammunition lot number.**—When ammunition is manufactured, an ammunition lot number, which becomes an essential part of the marking, is assigned in accordance with pertinent specifications. This lot number is marked on all packing containers and on the identification card inclosed in each packing box. It is required for all purposes of record, including grading, use, and reports on condition, functioning, and accidents, in which the ammunition might be involved. No lot other than that of a current grade (as published in OFSB 3-5) appropriate for the weapon will be fired (par. 13). Since it is impracticable to mark the ammunition lot number on each individual cartridge, every effort should be made to maintain the ammunition lot number of the cartridges once they are removed from their original packing. Cartridges for which the ammunition lot number has been lost automatically become grade 3. Therefore, when cartridges are removed from their original packings they should be so marked that the ammunition lot number may be preserved.

**20. Identification card.**—An identification card, approximately 6½ by 15 inches, showing the quantity, type, caliber, model, ammunition lot number, and the symbol of the manufacturer is sealed inside the metal liner on top of the ammunition in each box. A card, 10 by 13 inches, is packed with some caliber .45 ball ammunition.

**21. Identification of ammunition types.**—*a. General.*—In general, all types of cartridges of one caliber have the same profile, and they may be identified, except as to ammunition lot number and grade, by the physical characteristics outlined below. Care should be taken not to confuse original markings with any subsequent markings made with lithographic marking ink, which is used for an entirely different purpose, as described in paragraph 22.

*b. Tinned cartridge case.*—A tinned cartridge case indicates high-pressure test or dummy cartridges. All dummy cartridges of recent manufacture are without primers. Those of older manufacture have inert primers and holes are drilled in the cartridge case for identification.

*c. Color.*—(1) A black tip on the bullet indicates armor-piercing ammunition.

(2) A red tip on the bullet indicates tracer ammunition.

(3) A purple tip on the bullet indicates incendiary ammunition.

*d. No bullet present.*—Indicates blank ammunition.

**22. Identification in target practice.**—The number of hits made upon a target by a certain machine gun or group of machine guns when others are firing upon the same target is sometimes determined by coating the tips of the bullets with lithographic ink. The bullets

of the cartridges for each weapon or group of weapons are coated with a distinctive color of ink which, upon striking the target leaves a smear indicating the source of fire. Cartridges which have been so coated must have the ink removed before return to storage. Methods of marking bullets for antiaircraft machine guns are described in paragraphs 31 to 37, inclusive, FM 4-135.

SECTION IV

MARKING

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**23. General.**—Small-arms ammunition boxes are painted brown and marked with color bands. The painting aids in the preservation of the boxes and the marking serves as a means of identification, making it unnecessary to open a box to identify its contents.

**24. Marking on boxes.**—*a.* In addition to color bands, described in paragraph 25, below, each box of small-arms ammunition is marked with complete information necessary for shipping, care, handling, and use.

*b.* The markings (fig. 12) include—

- (1) Name and address of consignee (one side).
- (2) Shipping designation of contents (top).
- (3) Quantity and standard nomenclature of contents (4 sides).
- (4) Gross weight in pounds and displacement in cubic feet (1 side).
- (5) Number of shipping ticket and number of package (1 side).
- (6) The letters U. S. (in several conspicuous places).
- (7) Order number or contract number (1 side).
- (8) Ordnance insignia and escutcheons (both ends).
- (9) Name or designation of consignor (1 side).
- (10) Ammunition lot number (top and 4 sides).
- (11) Month and year packed.
- (12) Inspector's stamp.

*c.* Grade symbols will not be marked on ammunition boxes. However, prior to April 1933, descriptive phrases such as "for rifle use," "for aircraft use," were marked on boxes. These indications will be disregarded and the grade determined from the current publication of OFSB 3-5.

**25. Color markings.**—*a.* To provide a ready means of identification as to type, small-arms ammunition boxes are marked with color

(2) The case has a slight annular groove about  $\frac{1}{4}$  inch from the mouth, which serves as the seat for the wad.

(3) The wad is a disk punched out of strawboard sheet,  $\frac{1}{16}$  inch thick, and is lacquered on both sides before the blanking operation.

(4) The powder charge consists of 43 grains of E. C. blank powder or equivalent.

(5) The primer is described in paragraph 9. After loading, a heavy coat of lacquer is applied to the wad and the mouth is crimped.

## SECTION VI

### CARTRIDGE, DUMMY, CALIBER .50, M2

Description.....	Paragraph 91
------------------	-----------------

**91. Description.**—*a. General.*—This cartridge (fig. 24) is standard for use in all caliber .50 machine guns for training purposes. It may also be used for testing the mechanism of the gun.

*b. Visual identification.*—This cartridge is distinguished from live ammunition by the cartridge case, which is tin-coated, has three holes drilled in the side, and an empty primer pocket. It is distinguished from the cartridge, dummy, caliber .50, M1, by the bullet which is tin coated.

*c. Components.*—(1) This cartridge consists of cartridge case and bullet.

(2) The cartridge case is identical with service cases except, as noted above, it is tin-coated and has three holes drilled about the midpoint.

(3) The bullet consists of three parts, a tin-coated gilding-metal jacket, a soft steel core, and a point filler of hardened lead. The mouth of the case is crimped into the cannellure at assembly and a minimum pull of 100 pounds is required to extract the bullet from the case.

## SECTION VII

### CARTRIDGE, DUMMY, CALIBER .50, M1

Description.....	Paragraph 92
------------------	-----------------

**92. Description.**—*a. General.*—This cartridge is limited standard for the same purposes and weapons as the dummy M2.

*b. Visual identification.*—This cartridge may be distinguished from the M2 by the bullet, which is not coated, and the fact that it has a single hole drilled in the case 2 inches from the base.

*c. Components.*—Except as noted above, this cartridge is identical with the cartridge, dummy, caliber .50, M2, for which see paragraph 91.

*b. Visual identification.*—This cartridge may be identified by the point of the bullet, which is painted red to indicate the color of the trace.

*c. Components.*—(1) The cartridge consists of cartridge case, primer, propelling charge, and bullet. The complete assembly weighs 1,760 grains.

(2) The cartridge case, primer, and propelling charge are described in section II, chapter 1.

(3) The bullet (fig. 22) consists of three parts—a gilding metal jacket, a hardened lead slug which fills the forward end of the jacket, and tracer and igniter compositions which fill the balance. Unlike the bullets for armor-piercing and ball cartridges, this bullet is cylindrical to the base which is open to permit the propelling charge to ignite the tracer composition. The over-all length of the bullet is 2.4 inches. The mouth of the case is crimped into the cannellure at assembly and a minimum pull of 100 pounds is required to extract the bullet from the case.

**89. Exterior ballistics.**—*a. Maximum range.*—(1) *Bullet.*—3,500 yards.

(2) *Trace.*—The trace begins at a distance not greater than 250 feet from the weapon; the range of the trace is about 1,600 yards.

*b. Maximum pressure.*—52,000 pounds per square inch.

*c. Velocity.*—(1) At 78 feet, 2,830 feet per second.

(2) *Muzzle,* 2,865 feet per second.

*d. Accuracy.*—At the time of acceptance, this ammunition will group within a mean radii not greater than 20 inches at 600 yards.

*e. Trajectory.*—The trajectory of this ammunition approximates that of the caliber .50 ball and armor-piercing M2 ammunition at ranges near 1,000 yards.

## SECTION V

### CARTRIDGE, BLANK, CALIBER .50, M1

Description.....	Paragraph
	90

**90. Description.**—*a. General.*—The cartridge, blank, caliber .50, M1 (fig. 24) is standard item of issue designed for use in caliber .50 machine gun with a blank firing attachment in order to operate the weapon for training purposes.

*b. Visual identification.*—This cartridge is identified by the absence of the bullet.

*c. Components.*—(1) This cartridge consists of case, wad, primer, and propelling charge.



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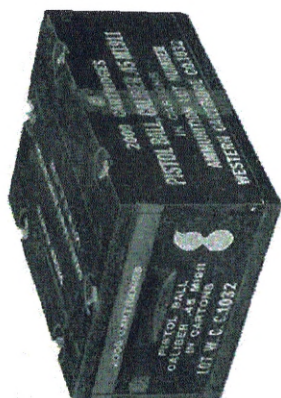


FIGURE 12.—Packing boxes for small-arms ammunition.

bands. On boxes for caliber .30 and caliber .45 cartridges, the band is painted vertically on the sides and horizontally on the ends. On boxes for caliber .50 cartridges, the bands are painted diagonally on ends and sides. Prior to 1933 the band was also painted across the top.

b. The following color bands are used for each type:

<i>Type</i>	<i>Band</i>
Ball.....	Red.
Blank.....	Blue.
Dummy.....	Green.
Gallery practice.....	Brown.
Guard.....	Orange.
High-pressure test.....	Yellow.
Armor-piercing.....	Blue on yellow.
Tracer.....	Green on yellow.
Incendiary.....	Red on yellow.
Rifle grenade.....	2 blue bands 1/2 inch wide, 1/2 inch apart.
Armor-piercing and tracer.....	Blue, yellow, green (3 stripe band).
Ball and tracer.....	Yellow, red, and green.

c. Wherever yellow bands on boxes interfere with the legibility of the stenciled yellow markings, the former will be given a different color.

26. **Markings on cartons.**—Carton labels are marked to show the quantity, type, caliber, model, ammunition lot number, kind of propelling charge, and manufacturer. Color stripes similar to those on the packing boxes are marked on the labels, except that for blank ammunition the label itself is blue, and for dummy ammunition it is green. The printing on the label is black, except in the case of high-pressure test cartridges, where it is red. In addition, the carton label for high-pressure test cartridges is marked with the word "Dangerous" and that for blank revolver cartridges, caliber .45, "Dangerous within 10 feet."

## SECTION V PACKING

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27. **General.**—a. The containers and methods for packing small-arms ammunition are given in the drawings, specifications, and stand-

## SECTION III

## CARTRIDGE, BALL, CALIBER .50, M2

	Paragraph
Description.....	86
Exterior ballistics.....	87

**86. Description.**—*a. General.*—This cartridge (fig. 23) is a standard cartridge for caliber .50 machine guns.

*b. Visual identification.*—This cartridge does not have any identification markings and the tip of the bullet is not painted.

*a. Components.*—(1) The cartridge consists of cartridge case, primer, propelling charge, and bullet. The complete assembly weighs 1,800 grains.

(2) The cartridge case, primer, and propelling charge are described in section II, chapter 1.

(3) The bullet (fig. 22) consists of three parts: a gilding metal jacket, a soft steel core, and a point filler of antimony-lead alloy. The over-all length of the bullet is 2.29 inches. The base has a 9° taper beginning at a point .386 inch from the base. The mouth of the case is crimped into the cannelure at assembly and a minimum pull of 100 pounds is required to extract the bullet from the case.

**87. Exterior ballistics.**—*a. Maximum range.*—Approximately 7,200 yards.

*b. Maximum pressure.*—52,000 pounds per square inch.

*c. Velocity.*—(1) At 78 feet, 2,900 feet per second.

(2) Muzzle, 2,935 feet per second.

*d. Accuracy.*—At the time of acceptance, this ammunition will group within a mean radii not greater than 8.0 inches at 500 yards, or 9.0 inches at 600 yards, when fired from an accuracy rifle held in a V-block.

*e. Trajectory.*—The trajectory of this ammunition is the same as the trajectory of the cartridge, armor-piercing, caliber .50, M2.

## SECTION IV

## CARTRIDGE, TRACER, CALIBER .50, M1

	Paragraph
Description.....	88
Exterior ballistics.....	89

**88. Description.**—*a. General.*—This cartridge (fig. 23) is standard for observation of fire in all caliber .50 machine guns. It may also serve as an incendiary against balloons and other readily inflammable targets. Care must be exercised in the use of this cartridge to guard against its igniting dry vegetation on the range.



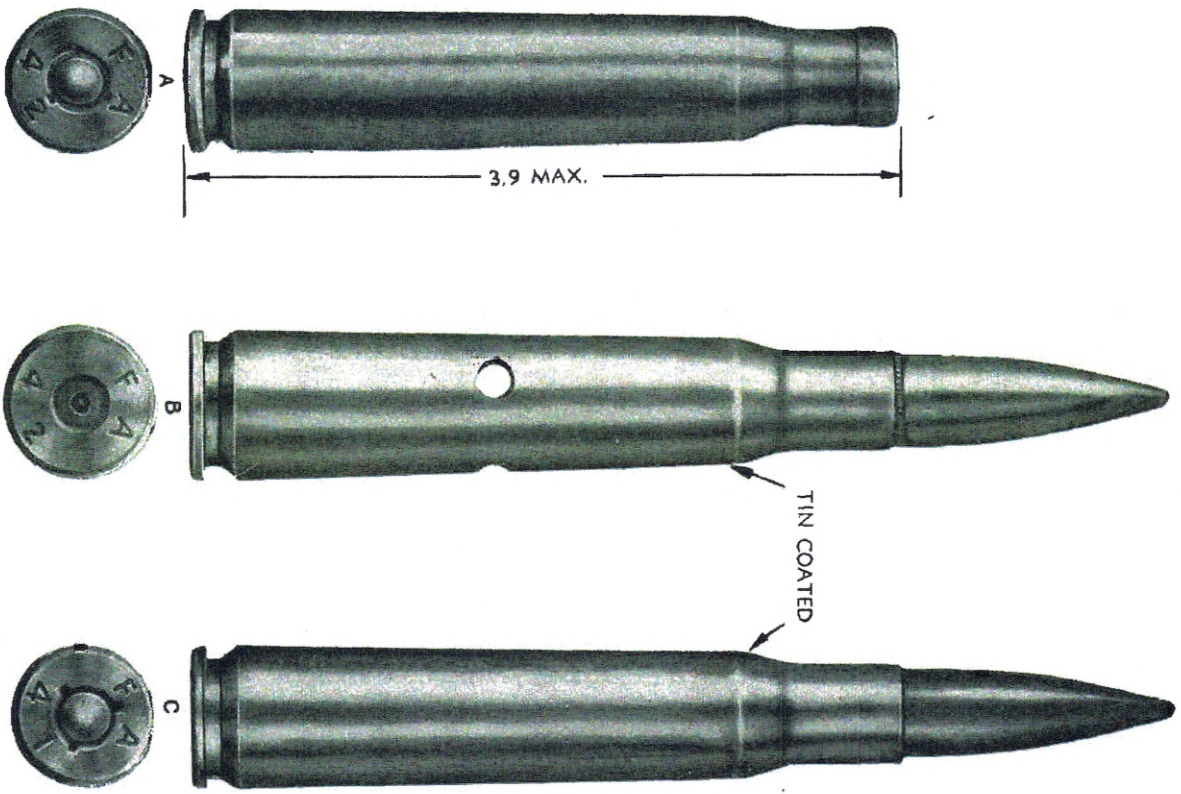
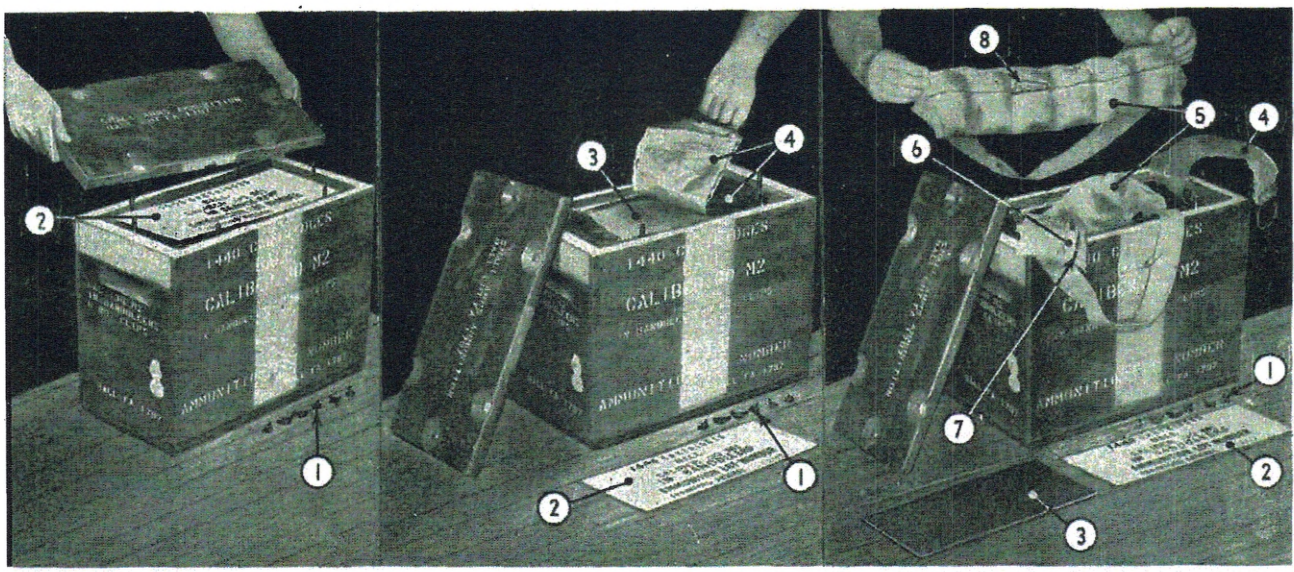


FIGURE 24.—Blank, dummy, and high-pressure test cartridges, caliber .50.

RA PD 4530



A. Removing wooden cover.  
 1. Wing nuts.  
 2. Identification.  
 3. Felt liner (top).  
 B. Opening metal liner.  
 4. Metal liner.  
 5. Bandoleers.  
 6. Bandoleer carton.  
 C. Box open—bandoleers removed.  
 7. 8-round clip.  
 8. Reference card (one for each bandoleer).

FIGURE 13.—Correct method of opening standard ammunition box (cartridge, ball, cal. .30, M2, packed in clips and bandoleers).

ard nomenclature lists. The containers for this ammunition are reduced to a few standard types and are designed to withstand all conditions commonly encountered in handling, storage, and transportation—while at the same time complying with Interstate Commerce Commission regulations.

b. With few exceptions, as noted in subsequent chapters, small-arms ammunition is issued in the standard wooden packing box with moisture-proof metal liner. In these boxes, cartridges are packed in cartons, bandoleers, and in machine-gun belts. Caliber .50 ammunition in link belts is usually packed directly into the metal liner. Wherever there is a possibility that cartridges may be jumbled together during transportation, they are packed first in cartons or bandoleers. The clips and machine-gun belts in which certain cartridges are packed are not in themselves packing items, but are accessories designed for the functioning of ammunition in a specific weapon. They are described in paragraph 12. Packing data are given in tables in chapters 2, 3, 4, and 5.

**28. Packing boxes.**—Standard wooden packing boxes are illustrated in figure 12. The outer wooden cover of the box is held in place by six wing nuts. These boxes have watertight, metal liners. The cover is closed by soldering but can readily be torn or ripped off by use of a wire handle provided for this purpose. Correct procedure for opening this box is shown in figure 13. The boxes are sealed and marked at the place where packed. Unless the entire marking surface has been defaced, the contents of the boxes can be determined without opening them. The standard packing box, with metal liner used for both caliber .30 and caliber .50 ammunition, weighs approximately 20 pounds when empty. Its dimensions, in inches, are  $18\frac{7}{16}$  by  $9\frac{7}{16}$  by  $14\frac{1}{16}$ , and its volume is 1.49 cubic feet. The caliber .45 ammunition packing box weighs approximately 19 pounds. Its dimensions, in inches, are  $16\frac{7}{16}$  by  $12\frac{1}{16}$  by  $7\frac{5}{8}$ , and its volume is .92 cubic feet.

**29. Cartons.**—Cartons are made of single, manila-lined chipboard. Cartons for caliber .30 ammunition are designed to contain 20 cartridges. Cartons for caliber .50 cartridges contain 10 cartridges. Cartons of caliber .30 cartridges are packed 75 to the standard packing box; cartons of caliber .50, 35 to the box. Older packings for caliber .50 ammunition contain only 30 cartons per box. After packing, the carton is sealed by pasting a label over the top and sides. Some types of cartons have tearing strips or strings, but generally a small semicircular recess in the chipboard at the top of one of the sides is left as a means of opening the carton. The paper over

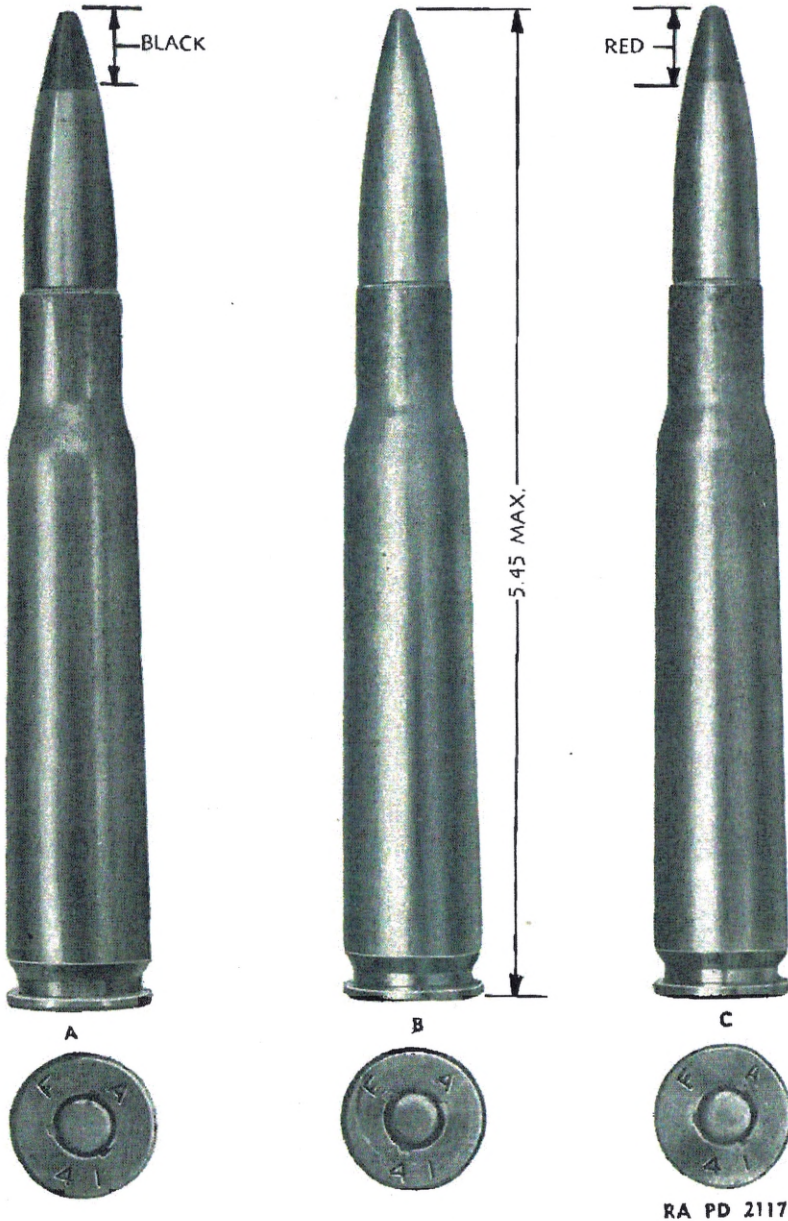


FIGURE 23.—Armor-piercing, ball, and tracer cartridges, caliber .50.



BULLET, BALL, CAL. .50, M2



BULLET, ARMOR-PIERCING, CAL. .50, M2



BULLET, TRACER, CAL. .50, M1

RA PD 4526

FIGURE 22.—Bullets, caliber .50.

this recess is easily punctured by the thumb and the carton opened by pulling up on the cover, shearing the paper label.

30. **Bandoleers.**—*a.* The purpose of the bandoleer is to afford an easy means of carrying ammunition in an accessible manner. The bandoleer is made of olive-drab cotton cloth and is divided into six pockets. A shoulder strap of webbing and a safety pin are attached to provide an easy means of carrying it on the person. In one pocket of the bandoleer a reference card is inserted showing the type, ammunition lot number, manufacturer, and powder lot with which the ammunition is loaded. Twenty-five bandoleers are packed in the standard packing box; older packings had 20 bandoleers per box.

*b.* The bandoleer, M1906, is designed to hold a carton of two 5-round clips in each pocket. The packed bandoleer weighs approximately 4 pounds.

*c.* The bandoleer M1 is designed to hold a carton containing one 8-round clip in each pocket. The packed bandoleer weighs about 3½ pounds.

## SECTION VI

### SURVEILLANCE

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31. **General.**—Surveillance includes, in part, the observation, inspection, investigation, and test of explosives and ammunition both in storage and in use. The Chief of Ordnance exercises general supervision over the surveillance of explosives and ammunition, prescribes the tests, and maintains records of the condition of all lots in service and in storage.

32. **Description of tests.**—Tests to which small-arms ammunition is subjected for acceptance and, subsequently, for surveillance and grading are visual examination; velocity test; pressure test; functioning and casualty tests in specified weapons; hangfire test; bolt-lift test; accuracy test; tracer test; loading and unloading test. Some of these tests are described below.

*a. Visual inspection.*—Examination of sample for season cracks, corrosion, or other visual defects is described in paragraph 33.

*b. Velocity test.*—Standard methods are used for conducting velocity tests. Screens are placed a definite distance apart and the velocity of the bullet is calculated from the time of flight in traveling from the first screen to the second. In the Boulenge test, the first

screen is placed 3 feet from the gun muzzle and the second screen is placed 150 feet from the first. The velocity determined from the time of flight between the two screens is the velocity at 78 feet from the muzzle. A modification of the above test where distance is not available requires the screens to be spaced 100 feet apart, and the calculated velocity is the velocity at 53 feet from the muzzle of the gun. Other modifications of the test are to ascertain the velocities at the same average distance from the muzzle of the gun.

*c. Pressure test.*—This test is conducted in a pressure barrel. The barrel has a small hole drilled in the side of the chamber into which is inserted a small piston (fig. 14). On firing the cartridge, the pressure of the gases forces the piston against a copper cylinder and compresses it. The amount of compression of the cylinder is an index of the pressure developed.

*d. Hangfire test.*—In this test the cartridges are fired in a machine gun at a disk revolving at a prescribed speed. By means of a mechanical device the gun is synchronized with the disk; that is, the gun is mechanically timed to fire at a given point on the disk each time it makes a complete revolution. A small group of holes is produced on the disk; which must not exceed 15° for grade AC ammunition, nor 28° for other grades, when the disk speed is 1,800 r.p.m.

*e. Machine-gun functioning test.*—A number of cartridges are fired in a machine gun to determine the number of jams, ruptures, or other mechanical defects.

*f. Rifle functioning test.*—A number of rounds are fired in a rifle whose head space is specified.

*g. Tracer test.*—Tracer ammunition is given a tracer test in which the ammunition is fired in a machine gun. The number of shots failing to trace the required distance and the number of muzzle bursts, blinds, or other erratics are recorded.

**33. Defects found on visual examination.**—The following defects may be found in cartridges during examination. The various types of splits that may occur in cartridge cases are shown in fig. 15.

*a. Defects found on visual examination before firing.*

Name of defect	How to recognize	Common causes—precautions
(1) Body or shoulder splits.	Pressing with the thumb on cartridge case, near neck.	Improper annealing, weak structure and strain. Should not be fired.
(2) Corrosion.....	Coloring of cases (green, blue, yellow, or white colors). Also appearance of chemical deposit. Not to be confused with true discoloration: blackening of case.	Metal eaten into and weakened; will cause rupture when cartridge is fired. Deposit interferes with chambering. Cartridges showing advanced corrosion should not be fired.

SECTION II

CARTRIDGE, ARMOR-PIERCING, CALIBER .50, M2

Description.....	Paragraph 84
Exterior ballistics.....	85

**84. Description.**—*a. General.*—This cartridge (fig. 22) is a current standard item of issue for all caliber .50 machine guns. It is designed for use against armored aircraft, armored vehicles, concrete shelters, and similar bullet-resisting targets.

*b. Visual identification.*—This cartridge may be identified by the blackened tip of the bullet.

*c. Components.*—(1) The cartridge consists of a cartridge case, primer, propelling charge, and bullet. The complete assembly weighs 1,800 grains.

(2) The cartridge case, primer, and propelling charge are described in section II, chapter 1.

(3) The bullet (fig. 21) consists of three parts—a gilding metal jacket, a hardened steel core, and a point filler of an antimony-lead alloy. The over-all length of the bullet is 2.29 inches and the point is blackened for approximately  $\frac{1}{16}$  inch. The base has a 9° taper beginning .386 inch from the base. The mouth of the case is crimped into cannellure at assembly and a minimum pull of 100 pounds is required to extract the bullet from the case.

**85. Exterior ballistics.**—*a. Maximum range.*—Approximately 7,200 yards.

*b. Maximum pressure.*—52,000 pounds per square inch.

*c. Velocity.*—(1) At 78 feet, 2,900 feet per second.

(2) Muzzle, 2,935 feet per second.

*d. Accuracy.*—At the time of acceptance, this ammunition will group within a mean radius not greater than 8.0 inches at 500 yards or 9.0 inches at 600 yards.

*e. Table of fire.*

Range	Angle of elevation	Time of flight	Maximum ordinate	Angle of fall
Yards	Mils	Seconds	Yards	
0	0	0	0	0
200	1. 2	. 22	. 1	1. 4
400	2. 7	. 46	. 3	3. 3
600	4. 3	. 72	. 7	5. 2
800	6. 1	1. 00	1. 4	7. 4
1, 000	8. 2	1. 32	2. 4	10. 5
1, 200	10. 7	1. 69	3. 9	15. 4
1, 400	13. 7	2. 10	6. 0	22. 0
1, 600	17. 3	2. 56	8. 9	30. 5
1, 800	21. 5	3. 07	12. 7	40. 6
2, 000	26. 3	3. 61	17. 5	52. 3

83. Component weights.—The following table gives the weights of the caliber .50 cartridges. The weights listed are the maximum limits permitted in the manufacture of these cartridges.

Component weights (in grains)	Weight of complete cartridge (approximate)	Weight of cartridge case	Weight of primer	Weight of propelling charge	Weight of bullet	Weight of core	Weight of jacket	Weight of filler
AP M2.....	1, 837	850	19.06	250	718	410	253	56.5
AP M2 (alternate).....	1, 829	850	19.06	250	710	402	253	56.5
Ball M2.....	1, 830	850	19.06	43	711.5	402	253	56.5
Blank M1.....	1, 889	850	19.06	43	753	405	266	82
Dummy M1.....	1, 620	850	16.9			405	266	82
Dummy M2.....	1, 560	850				405	266	82
High-pressure test M1.....	2, 110	850	19.06	240	1, 002	487	263	
Tracer M1.....	1, 789	850	19.06	240	881	207	408	70
Incendiary M1.....		850	19.06					

<sup>1</sup> Front slug.

<sup>2</sup> Rear slug.

<sup>3</sup> Tracer composition.



Name of defect	How to recognize	Common causes—precautions
(3) Crease.....	Similar to a fold in case neck or shoulder.	Thin metal at crease spot.
(4) Draw scratch...	Longitudinal scratch on case.	Caused by grit in the final draw die. Deep scratch will open up on firing.
(5) Folded neck....	Overlapping of metal in case and neck indicated by longitudinal protuberance.	Metal thinner on one side; insufficient annealing.
(6) Indent and bur.	Indentations and burring...	Rough handling during manufacturing process. Dangerous pressure only if dent is large.
(7) Inset primer ...	Primer set too deep in pocket.	Likely to misfire. Should not be used.
(8) Loose rounds...	Bullet loose in case.....	Should not be fired.
(9) Mouth pull-down.	Mouth of case shoved to one side by bullet when seated in case.	Mouth annealed very soft.
(10) Oil dent.....	Smooth surface indent in or near shoulder or neck of case.	Excess of oil used in tapering operation. Negligible defect unless extremely large.
(11) Round head...	Head of cartridge case beveled on outer edge so that it is practically round.	Too little metal in head to form properly; also a thick-headed cartridge appears as a round head. Causes trouble in extraction.
(12) Scale.....	Inclusions of impurities in the metal, sometimes observable to the eye, sometimes hidden.	Causes irregular break in cartridge case and loss of velocity due to escape of gas when fired.
(13) Season crack..	Split in the neck of case. Definite longitudinal cracking when exposed to severe weathering conditions or certain reagents.	Due to the distortion of the normal crystalline structure of the metal as result of drawing and tapering operations (not to be confused with split necks occurring after firing).
(14) Short rounds..	Bullet seated too deep.....	Not serious unless it is so deep as to affect density of charge.
(15) Shoulder bulge.	Pucker at the junction of shoulder and body.	Metal too soft or thin at this point. Also by forceful seating of bullet.
(16) Split bullets (tracer).	Longitudinal cracks in the bullet.	Ruptures neck of cartridge case. Free mercury from tracer mixture amalgamates with metal of bullet causing the split. Serious defect; to be reported when found.
(17) Split mouth...	Split in edge of case.....	Often result of plugging operation.
(18) Thick head....	Head of case has a thickness of metal greater than the maximum allowed.	Extractor may not be able to function.
(19) Thin head.....	Head of case has a thickness of metal less than minimum allowed.	Extractor may pull through thin metal of the head.

*b. Machine-gun belts.*—These defects may be found in ammunition loaded in belts for use in machine guns:

- (1) The cartridges are not properly alined in the belts.
- (2) There is an improper proportion or spacing of tracer ammunition, when used.
- (3) Web belts may be dirty, wet, and have torn loops.
- (4) When caliber .50 ammunition is used, it must be loaded into belts for left-hand feed so that when the points of the bullets are toward the front, the double loop of each link will be to the right. When loading for right-hand feed, the double link must be to the left.

**34. Defects found during and after firing.**—*a. Misfire.*—(1) The primer shows a normal impression of the firing pin indicating that a blow sufficiently hard to ignite a primer in perfect condition has been delivered (fig. 16). Such a misfire indicates that the primer is defective. This defect may be caused by—

- (a) Thick metal in the base of the primer cup.
- (b) Thick primer pellet which cushions the blow.
- (c) No priming mixture.
- (d) No anvil.
- (e) No vent.
- (f) Various combinations of these defects.

(2) Primer shows light impression of firing pin indicating that the force of the blow struck was not sufficient to ignite the primer. This may be caused by—

- (a) A mechanical defect in the weapon.
- (b) A short or broken firing pin.
- (c) A weak firing-pin spring.
- (d) The bolt of the weapon is not being completely locked.
- (e) Grease in the firing pin hole which cushions the blow of the firing pin.

(f) A very short primer cup being inserted in a very deep primer pocket; the primer travels deeper into the pocket with the motion of the firing pin.

- (g) Primer being seated too deep in the primer pocket.
- (h) Improper angle of the shoulder of the cartridge case which allows the cartridge case to go forward.
- (i) A defective primer as in (1) above.

(3) Primer shows normal impression of firing pin, but off center. This is caused by a defect in the weapon.

*b. Hangfire.*—Delayed ignition of the powder in the cartridge may be caused by a small or decomposed primer pellet, damp powder, or a light blow of the firing pin caused by dirt or a defect in the weapon. While a hangfire is a serious defect if the delay is long enough to per-

Packing cartridges, caliber .50	Cartridges per carton	Cartons per box	Total rounds per box	Total weight of box, pounds	Cartridges per link belt packed in carton	Total rounds link belt assembled cartridges per box	Weight of box of assembled cartridges
AP M2.....	10	35	350	113			
AP M2 <sup>1</sup> .....					100	200	83
Ball M2.....	10	35	350	113			
Ball M2 <sup>1</sup> .....					100	200	83
Blank M1.....	10	45	450	81			
Dummy M1 or M2.....	10	35	350	99			
High-pressure test M1.....	10	30	300	108			
Tracer M1.....	10	35	350	111			
AP M2 (80) and tracer M1 (20).....					100	200	83
Ball M2 (80) and tracer M1 (20).....					100	200	83
AP M2 (40) and ball M2 (40) and tracer M1 (20).....					100	200	81
Incendiary M1.....	10	35	350				

<sup>1</sup> Also packed 265 cartridges in link belts.

**82. Component parts.**—The following table lists component parts of caliber .50 cartridges. For description of the parts see section II, chapter 1. Components which differ from the standard type are described in the section on the specific cartridge.

	Cartridge case	Propellant powder	Bullet		
			Jacket	Filler	Core
AP M2.....	Brass.....	IMR 4814	Gilding metal.	Antimony lead.	Hard steel
Ball M2.....	Brass.....	IMR 4814	Gilding metal.	Antimony lead.	Soft steel.
Tracer M1.....	} Brass.....	IMR 4814	Gilding metal.	Point lead, rear tracer composition.	None.
Tracer M2.....					
Blank M1.....	Brass.....	IMR 4814	None.....	None.....	None.
Dummy M1.....	Tinned brass.	None.	Gilding metal.	Antimony lead.	Soft steel.
Dummy M2.....	Tinned brass.	None.	Tin coated gilding metal.	Antimony lead.	Soft steel.
High-pressure test M1.....	Tinned brass.	IMR 4814	Gilding metal.	Forward slug antimony lead; rear antimony lead.	None.
Incendiary M1.....	Brass.....	IMR 4814	Gilding metal.		

## CHAPTER 4

## AMMUNITION, CALIBER .50

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VII. Cartridge, dummy, caliber .50, M1.....	92
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## SECTION I

## GENERAL

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**78. Types.**—The ammunition described in this chapter is designed for use in all caliber .50 machine guns. It includes cartridges of the following types: armor-piercing, ball, tracer, incendiary, blank, dummy, and high-pressure test.

**79. Identification.**—*a.* In common with all other small-arms ammunition, caliber .50 cartridges are identified by the marking on the packing boxes and cartons and the identification card. These include the type, caliber, model, manufacturer's symbol, and ammunition lot number. For further information see section III, chapter 1.

*b.* Physical differences in the cartridges are described in the sections on the several cartridges.

**80. Grades and uses.**—For information concerning grades and uses see paragraph 13 and OFSB No. 3-5.

**81. Packing and marking.**—*a. Marking.*—The markings on boxes and cartons are described in section IV, chapter 1.

*b. Packing.*—The following table of packing data includes packing for all standard caliber .50 cartridges. Further information will be found in section V, chapter 1.

mit the bolt to be opened before the powder burns completely, such delay is rarely found in practice. Should a hangfire of several seconds delay occur, and the bolt be opened before the powder explodes, injury to the firer or damage to the weapon, or both, may result. For precautions to be observed in case of hangfire, see paragraph 36.

*c. Pierced primer.*—Perforation of the primer cup by the firing pin. This may be caused by an imperfect pin or very thin metal in the base of the primer cup. There are various degrees of this perforation. A very small perforation will show, by means of a discoloration around the indent made by the firing pin, the escape of gas. The disk from a large perforation may be blown into the action of the gun with such an escape of gas as to lower the velocity of the bullet.

*d. Primer leak.*—Gas generated by the explosion of the powder charge escapes between the walls of the primer cup and the primer pocket, causing discoloration around the primer and the head of the cartridge case. The discoloration may be slight indicating a small primer leak, or heavy, indicating a large primer leak. The primer leak may be because of too small a primer, too large a primer hole, or excessive pressure generated by the propelling charge.

*e. Blown primer.*—On firing the cartridge, the primer is blown completely from the pocket of the cartridge case. Although this is a serious defect, it is seldom encountered.

*f. Primer setback.*—Pressure developed by the explosion of the propellant charge forces the primer back against the face of the bolt. On examination it will be seen that the primer protrudes above the head of the cartridge case. The setback of the primer may be slight or heavy and is due to a defective bolt, cartridge, or excessive pressure.

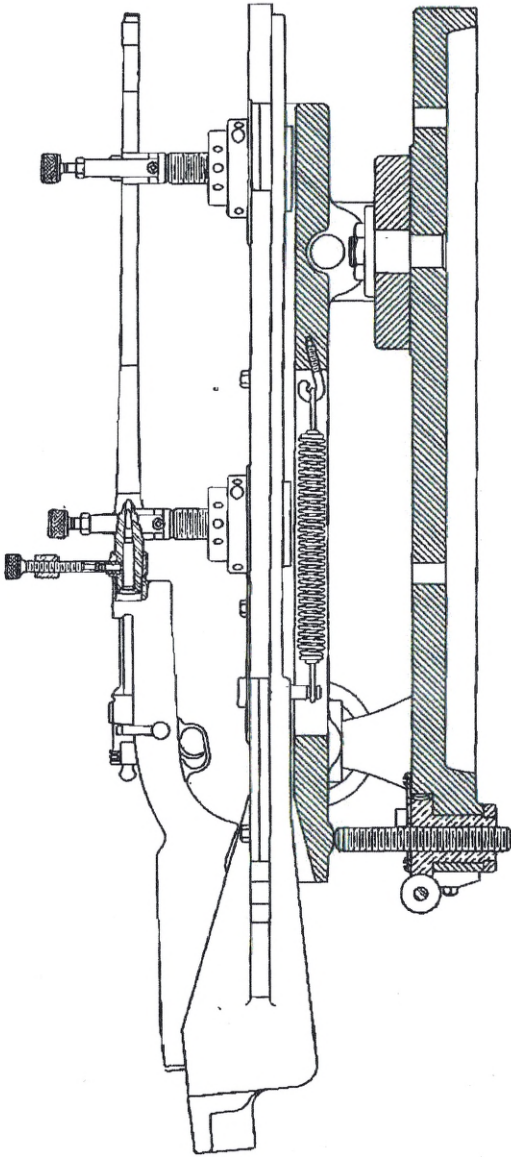
*g. Leak at back of case.*—The gas escapes into the action of the weapon. The discoloration due to this escape of gas is along the body of the cartridge case.

*h. Failure of case to extract.*—This may be due to a poorly formed or weak extractor, or a defective cartridge.

*i. Blow back.*—An escape of gas under pressure to the rear is commonly referred to as a blow back. Pierced primer, primer leak, blown primer, primer setback, and ruptured cartridge, are known as blow backs.

*j. Split neck.*—The neck of the cartridge case splits in firing and is accompanied by an escape of gas. This should not be confused with a split neck due to season cracking which can be observed before firing.

*k. Split body.*—A more or less regular longitudinal split in the body of the case which allows gas to escape, thereby reducing the velocity of the bullet. This defect is generally found in cartridge



RA PD 4519

FIGURE 14.—Pressure barrel for caliber .30 cartridges.

operation of loading and unloading revolvers and to simulate firing. It is also used as a range dummy cartridge in the automatic pistol. In this latter case it is mixed with live ammunition in pistol magazines, the purpose being to detect and correct flinching and faulty trigger squeeze.

*b. Visual identification.*—This cartridge is identified by its tinned case which either has no primer or has holes drilled in the side.

*c. Components.*—The cartridge consists of a cartridge case and a bullet. The complete assembly weighs approximately 313 grains.

(1) The case of earlier design contained three  $\frac{1}{8}$ -inch holes drilled in the body of the case equally distant from each other, and an inert primer. In later design, the holes and the inert primer are omitted. Both cases are tinned for further identification.

(2) The bullet is the same as that in the cartridge, ball, M1911, described in paragraph 71.

## SECTION VI

### CARTRIDGE, HIGH-PRESSURE TEST, CALIBER .45, M1

Description.....	Paragraph 77
------------------	-----------------

**77. Description.**—*a. General.*—This cartridge (fig. 21) is used for proof-firing caliber .45 weapons at the place of their manufacture. It contains a powder charge that will develop a breech pressure of approximately 20,000 pounds per square inch, this pressure being 4,000 pounds in excess of that required in caliber .45 service ammunition. Due to the danger involved in firing this cartridge, it should only be fired from a fixed rest under a hood, by means of a mechanical firing device, and only by authorized personnel.

*b. Visual identification.*—It is readily identified by its tinned cartridge case.

*c. Components.*—The cartridge consists of the cartridge case, primer, propelling charge, and bullet. The complete assembly weighs approximately 327 grains.

(1) The case, primer, and powder charge for this cartridge are described in section II, chapter 1.

(2) The bullet is the same as that in the cartridge, ball, M1911, described in paragraph 71.

(2) The bullet has a round nose and a flat base. It consists of three parts—a gilding metal jacket, which is painted red for a distance of approximately  $\frac{3}{16}$  inch from the tip, a slug of lead hardened with antimony in the forward portion of the jacket, and a tracer mixture in the rear portion. The over-all length of the bullet is .857 inch. The case may be crimped to the bullet and a pull of approximately 40 pounds is required to extract the bullet from the case.

74. **Exterior ballistics.**—*a. Average maximum pressure.*—18,000 pounds per square inch.

*b. Velocity.*—From submachine gun, 975 feet per second at 25.5 feet from muzzle.

*c. Accuracy.*—Fires within a mean radius of 8 inches at 100 yards.

*d. Range of trace.*—200 yards.

#### SECTION IV

### CARTRIDGE, BLANK, REVOLVER, CALIBER .45, M1

Description.....	Paragraph 75
------------------	-----------------

75. **Description.**—*a. General.*—This cartridge (fig. 21) is a current standard item of issue for use in the Colt, and Smith and Wesson .45 caliber revolvers, M1917. It is used for signaling purposes, firing salutes, training cavalry horses, and in maneuvers where simulated fire is desired. It is fired from the revolver without the use of clips, as the cartridge case has a rim for extracting purposes.

*b. Visual identification.*—This cartridge is identified by the absence of a bullet.

*c. Components.*—The cartridge consists of the cartridge case, primer, propelling charge, and a paper wad. The complete assembly weighs approximately 123 grains.

(1) The cartridge case differs from the standard caliber .45 cartridge case in that it is heavier and has a rim for extracting purposes.

(2) The primer and propelling charge for this cartridge are described in paragraphs 9 and 11.

(3) The paper wad, inserted over the powder charge, is sealed in with a coat of varnish, and the mouth of the case is roll crimped to a diameter of  $\frac{5}{16}$  inch.

#### SECTION V

### CARTRIDGE, DUMMY, CALIBER .45, M1921

Description.....	Paragraph 76
------------------	-----------------

76. **Description.**—*a. General.*—This cartridge (fig. 21) is a current standard item of issue and is used for training personnel in the



cases which have a deep draw scratch or in those which are made from defective brass.

*l. Stretch.*—A continuous ring around the body of a fired cartridge case which shows that the metal was stretched to such an extent when the cartridge was fired that slightly more stretching would probably result in a partial or complete rupture. This is generally due to improper head space.

*m. Complete rupture.*—A circumferential separation of the metal completely around the body of the fired cartridge case causing it to

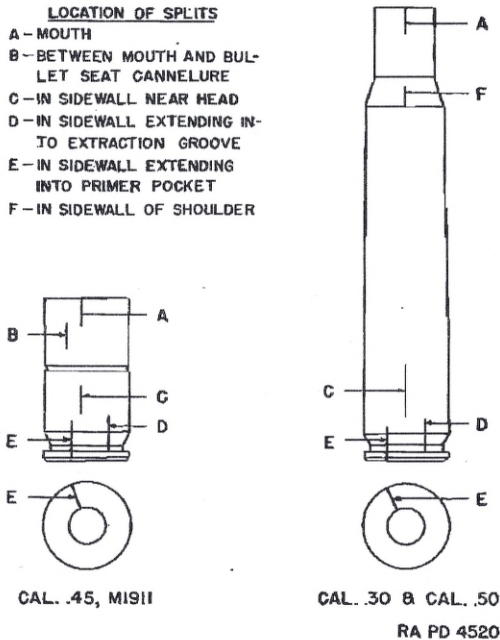


FIGURE 15.—Location of splits in cartridge cases.

separate into two parts. If such a rupture occurs, upon extraction, the forward portion of the fired cartridge case remains in the chamber of the weapon. This is a serious defect, and will cause the next round of ammunition to jam. It is usually due to bad bolt locking or a defective cartridge case.

*n. Partial rupture.*—A partial circumferential separation around the body of the fired cartridge case. Like a complete rupture, this is a serious defect, as upon extraction the portion of the metal holding the two parts of the cartridge case may give way, thereby leaving the



A. Light.



B. Normal.



RA PD 4514  
C. Heavy.

FIGURE 16.—Light, normal, and heavy blow of firing pin.

forward portion of the fired cartridge case in the chamber of the weapon. This defect is also usually due to bad bolt locking or a defective cartridge case.

## SECTION VII

### CARE, HANDLING, AND PRESERVATION

	Paragraph
General .....	35
Care and precautions in handling.....	36
Storage.....	37
Precautions in firing blank ammunition.....	38
Propellant powder .....	39

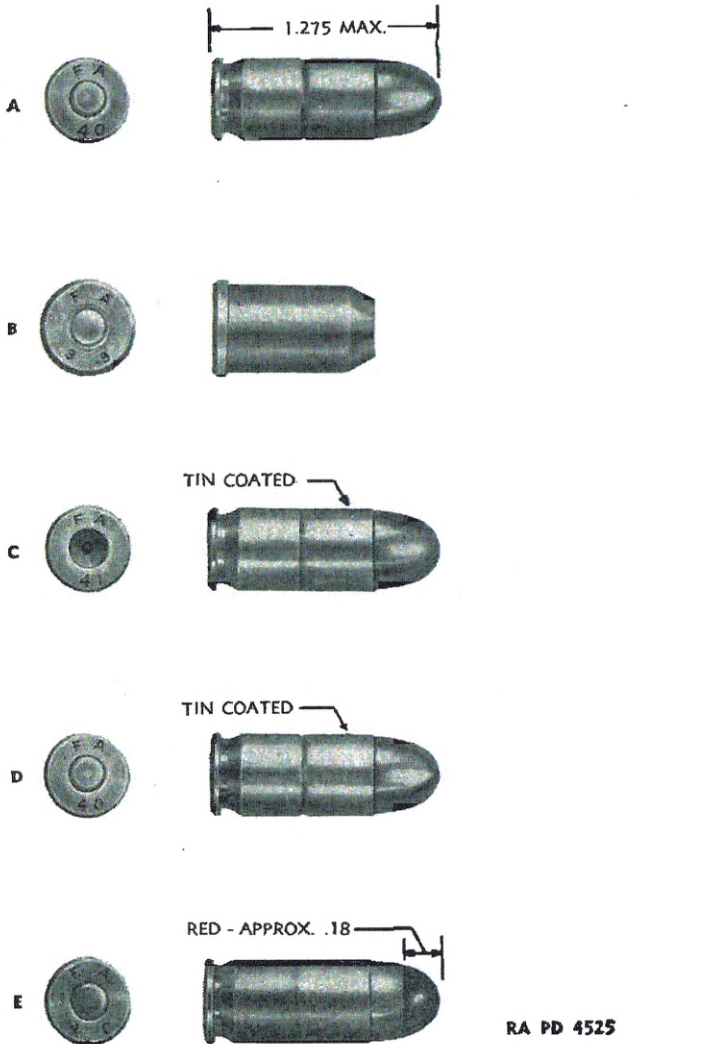
**35. General.**—The provisions contained in this section are of a specific nature for small-arms ammunition only. Regulations which govern posts, camps, and stations which store limited quantities of ammunition are published in TM 9-1900. Regulations prescribed for ordnance depots and establishments are set forth in the Ordnance Safety Manual, O.O. 7224.

**36. Care and precautions in handling.**—*a. Boxes.*—(1) Small-arms ammunition, as compared with other types of ammunition, is not dangerous to handle. Care, however, must be observed to keep the boxes from becoming broken or damaged. All broken boxes must be repaired immediately. Transfer all markings 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, as shown in figure 13. They should be opened carefully, as the wooden boxes are used as long as they are serviceable. If the cover of the metal lining sticks, it may be loosened by placing a piece of wood inside the handle so as to get a better grip and jerked loose with an angular pull. The metal lining is expendable but should be turned in for salvage.

(3) Ammunition boxes should not be opened nor the metal liner

SMALL-ARMS AMMUNITION



- A. Cartridge, ball, caliber .45, M1911. D. Cartridge, high-pressure test, caliber .45, M1.  
 B. Cartridge, blank, revolver, caliber .45, M1.  
 C. Cartridge, dummy, caliber .45, M1921. E. Cartridge, tracer, caliber .45, M1.

FIGURE 21.—Cartridges, caliber .45.

*c. Components.*—The cartridge consists of the cartridge case, primer, propelling charge, and bullet. The complete assembly weighs approximately 303 grains.

(1) The cartridge case, primer, and propelling charge for this cartridge are described in section II, chapter 1.

*e. Accuracy with muzzle test.**Mean variations for several targets*

Range	Mean radii
<i>Yards</i>	<i>Inches</i>
25	0.86
50	1.36
75	2.24

*f. Penetration.—In white pine.*

Range	Depth
<i>Yards</i>	<i>Inches</i>
25	6.0
100	5.5
250	4.0

The penetration in moist loam at 25 yards is about 10 inches. The penetration in dry sand at 25 yards is about 8 inches.

*g. Table of fire.*

Range	Time of flight	Drop	Deflection due to drift <sup>1</sup>
<i>Yards</i>	<i>Seconds</i>	<i>Inches</i>	<i>Inches</i>
10	0.037	0.3	0.1
20	.75	1.1	.2
30	.113	2.4	.3
40	.151	4.4	.4
60	.229	9.9	.8
80	.308	18	1.3
100	.388	28	2.0

<sup>1</sup> Drift is to the left. Based on a velocity of 800 feet per second, 25 feet from muzzle.

## SECTION III

## CARTRIDGE, TRACER, CALIBER .45, M1

Description.....	73
Exterior ballistics.....	74

**73. Description.—a. General.**—This cartridge (fig. 21) is a current standard item of issue for use in the Thompson submachine gun, M1928A1, for observation of fire, and incendiary purposes. It may, however, also be used for signal purposes in the automatic pistol.

*b. Visual identification.*—The cartridge is readily identified by its red-tipped bullet, and the fact that the cartridge case has no cannelure.

broken until the ammunition is required for issue or use. Ammunition removed from the airtight container, particularly in damp climates, is apt to corrode, thereby causing the ammunition to become unserviceable.

*b. Handling cartridges.*—(1) After a box of ammunition has been opened and cartridges issued, each man should take care of his own ammunition. The primer should be protected from blows by sharp instruments as such a blow might explode the cartridge.

(2) Ammunition should be protected from mud, sand, dirt, and water. If it gets wet or dirty, it should be wiped off at once. Verdigris or light corrosion should be wiped off. However, cartridges should not be polished to make them look better or brighter. The use of abrasives is forbidden. If a cartridge case becomes so corroded that a perceptible amount of metal is eaten away, it is dangerous to fire and should not be used.

(3) Ammunition should not be exposed to the direct rays of the sun for any length of time. If the powder is heated, it is likely to cause excessive pressure when fired and will affect the performance of the ammunition.

(4) The use of oil or grease on cartridge cases is prohibited. Greasing or oiling cartridges used in machine guns and automatic arms causes the collection of dust and other abrasives which are injurious. Grease or oil on cartridge cases or on the walls of the chamber in non-automatic rifles creates excessive and hazardous pressure on the rifle bolt. When there is oil on the cartridge case, there is no adhesion of the case to the chamber. When the case expands upon firing, the case slips back, and the bolt receives a greater rearward thrust. An apparent exception exists in the case of lead bullets. However, only the bullet is waxed or greased as issued.

(5) Whenever cartridges are taken from cartons and loaded into belts or clips, the latter will be tagged or otherwise so marked that the ammunition may be identified as to lot number. Such identification is necessary to prevent otherwise serviceable ammunition from being placed in grade 3, because of loss of lot number.

*c. Defective cartridges.*—(1) Dented cartridges, cartridges with loose bullets, or otherwise defective rounds should not be fired. Lots having more than 5 percent of defective cartridges will be subjected to 100 percent inspection. Defective rounds will be culled out, the serviceable cartridges repacked prior to issue, and a report will be made to the Chief of Ordnance. If 20 percent or more are defective, the lot is withdrawn from service and held for disposition. Particular attention should be paid to incipient cracks which are not easily detected unless the thumb is pressed against the bullet, thus exposing

the crack in the cartridge case. Defective cartridges will be considered as grade 3 ammunition.

(2) During firing, the general precautions concerning the firing of ammunition in the field as prescribed in AR 750-10 and in TM 9-1900 will be observed.

(3) No small-arms ammunition—other than blank ammunition, caliber .22 cartridges, and shotgun shells—will be fired until it has been positively identified by ammunition lot number and grade, as published in the latest revision or change to OFSB 3-5.

(4) The use of armor-piercing cartridges is prohibited in demonstrations in which tanks participate.

(5) In using armor-piercing ammunition, it is well to remember that the cores of bullets that fail to penetrate the target will rebound. The radius of rebound for armor-piercing ammunition depends on several factors but may safely be taken at a maximum of 100 yards for caliber .30 and 200 yards for caliber .50.

*d. Misfires and hangfires.*—(1) Because a misfire cannot immediately be distinguished from a hangfire, it is unsafe to open the bolt of a rifle immediately when a misfire occurs. When the rifle, caliber .30, M1, fails to fire, it should be recocked by operating the trigger guard, and refired before opening the bolt.

(2) For other rifles, in the event of a misfire, the rifle should be recocked by drawing back on the cocking piece and refired before opening the bolt.

(3) When a hangfire occurs in any lot, its use should be suspended and a report made to the post ordnance officer, giving the number of the lot involved. The lot thus affected will be withdrawn and replaced by serviceable ammunition.

*e. Weapon.*—(1) Before firing, the firer must be sure that the bore of the weapon is free from any foreign matter such as cleaning patches, mud, sand, snow, and the like. A weapon fired with any obstruction in the bore will be damaged and may injure the firer.

(2) When a bullet lodges in the bore of a rifle, pistol, or machine gun, it should be removed by the application of pressure from the muzzle end of the weapon. To attempt to shoot the bullet out with another cartridge is dangerous and is prohibited.

*f. Destruction of ammunition.*—When it is necessary to destroy unserviceable small-arms ammunition locally, such destruction will be accomplished in accordance with TM 9-1900.

**37. Storage.**—*a. Piling by lot.*—Small-arms ammunition should be stored and piled according to type and ammunition lot number. Extreme care must be exercised to prevent the mixing of ammunition lots in one pile. When small-arms ammunition is received,

## SECTION II

## CARTRIDGE, BALL, CALIBER .45, M1911

	Paragraph
Description.....	71
Exterior ballistics.....	72

**71. Description.**—*a. General.*—This cartridge (fig. 21) is a current standard item of issue and is used in the automatic pistol, M1911 and M1911A1, the Colt revolver M1917, the Smith and Wesson revolver M1917, and the Thompson submachine gun M1928 and M1928A1, against personnel. To adapt it for use in the revolvers, it must be assembled in clips designed for this purpose. These clips are described in paragraph 12.

*b. Components.*—(1) The cartridge consists of the cartridge case, primer, propelling charge, and the bullet. The complete assembly weighs approximately 327 grains.

(2) The case, primer, and propelling charge for this cartridge are described in section II, chapter 1.

(3) The bullet has a round nose and a flat base. It consists of two parts, a gilding metal jacket and slug of lead hardened with antimony. In early designs bullet jackets were made of cupro-nickel and these have a silvery appearance. This was later changed to gilding metal which was given thin tin wash which has a close resemblance to the cupro-nickel jacket. The practice of tinning the jackets has since been discontinued and the bullets of current design have the natural copper color of gilding metal. The over-all length of the bullet is 0.68 inch. The mouth of the case may be crimped to the bullet and a pull of approximately 40 pounds is required to remove the bullet from the case.

**72. Exterior ballistics.**—*a. Maximum range.*—(1) In pistol, 1,600 yards.

(2) In submachine gun, 1,700 yards.

*b. Pressure.*—14,000 pounds per square inch.

*c. Velocity.*—(1) *Pistol.*—(a) 25.5 feet, 820 feet per second.

(b) Muzzle, 825 feet per second.

(2) *Submachine gun.*—(a) At 25.5 feet, 885 feet per second.

(b) At muzzle, 990 feet per second.

*d. Muzzle energy.*—(1) 329 foot-pounds in pistol.

(2) 383 foot-pounds in submachine gun.

Packing data for caliber .45 cartridges

	Ball, M1911	Tracer, M1	Dummy, M1921	High-pressure test	Blank, revolver, M1
Cartridges per carton	20	20	20	20	24
Cartons per box	100	100	100	100	240
Total rounds per box	2,000	2,000	2,000	2,000	5,760
Weight of box and carton	110	103	105	110	135
Dimensions of box	16 $\frac{1}{8}$ x 12 $\frac{1}{4}$ x 7 $\frac{1}{2}$			18 $\frac{1}{2}$ x 9 $\frac{1}{2}$ x 14 $\frac{1}{8}$	
Area of box	1.45 sq. ft.			1.21 sq. ft.	
Volume of box	0.92 cu. ft.			1.49 cu. ft.	

69. Component parts.—The following table lists the component parts of caliber .45 cartridges. For description of the parts see section II, chapter 1. Components which differ from the standard type are described in the section on the specific cartridge.

Component parts	Ball, M1911	Tracer, M1	Dummy, M1921	High-pressure test	Blank, revolver, M1
Cartridge case.	Brass	Brass	Tinned brass.	Brass	Brass.
Bullet jacket.	Gilding metal.	Gilding metal.	Gilding metal.	Gilding metal.	Gilding metal.
Bullet slug.	39 lead.	39 lead.	39 lead.	39 lead.	
Primer cup.	1 antimony Gilding metal.	1 antimony Gilding metal.	1 antimony None.	1 antimony Gilding metal.	Gilding metal.
Primer anvil.	Brass.	Brass.	None.	Brass.	
Primer disk.	Paper.	Paper.	None.	Paper.	Paper.
Primer pellet.	F. A. 70.	F. A. 70.	None.	F. A. 70.	F. A. 70.
Propellant powder.	Smokeless powder.	Smokeless powder.	None.	Smokeless powder.	Smokeless powder.
Wad.	None.	None.	None.	None.	Paper.

70. Component weights.—The following table gives the weights of the components of all caliber .45 cartridges. The weights listed below are the maximum limits permitted in the manufacture of the cartridges:

Caliber .45	Weight of complete cartridge	Weight of bullet	Weight of jacket	Weight of slug	Weight of tracer composition	Weight of primer	Weight of propellant powder	Weight of cartridge case
Ball, M1911	327	234	37	197		4.524	5.	87
Ball, M1911	325	234	37	197		4.422	5.	87
Tracer, M1	303	195	75	100	Igniter composition 20.	4.524	5.	87
Blank, revolver, M1	123	( <sup>1</sup> )				4.524	6.	120
High-pressure test, M1.	327	234	37	197		4.524	7.	87
Dummy, M1921	313	234	37	197				87
Dummy, M1921	318	234	37	197		4.11		85.5

<sup>1</sup> Wad .7.



issued, checked, stacked, or restacked, reliable personnel should be in charge and a check made of the ammunition lot number on each box.

*b. Protection.*—(1) Whenever practicable, small-arms ammunition should be stored under cover. This applies particularly to tracer and shotgun ammunition. Tracer ammunition is subject to rapid deterioration if it becomes damp, and may even ignite spontaneously. Shotgun shells are not packed in waterproof metal-lined boxes except for oversea shipment.

(2) Although small-arms ammunition is packed in boxes with metal liners, actual tests have shown that leaks in the liners are developed in handling and shipping to the extent of 8 percent in newly packed ammunition, while in the older lots leaks have been found in as high as 70 percent of the liners. The leaks, though small, will admit moisture if the ammunition is exposed to the weather or extreme variations in temperature.

(3) Should it become necessary to leave small-arms ammunition in the open, it should be raised on dunnage at least 6 inches from the ground and the pile covered with a double thickness of serviceable tarpaulin. Suitable trenches should be dug to prevent water flowing under the pile.

*c. Tracer ammunition storage.*—If practicable, tracer ammunition should be stored separately from other ammunition.

*d. High temperatures.*—Small-arms ammunition in storage should be protected from extreme heat to avoid decomposition of the propellant powder. The combination of high temperature and a damp atmosphere is particularly detrimental to the powder.

*e. Opened boxes.*—When only a part of a box is used, the remaining ammunition in the box should be protected against unauthorized handling and use by fastening the cover firmly in place.

*f. Fire hazard.*—If 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 bullet in another. In case of fire, it is advisable to keep personnel not engaged in fighting the fire at least 200 yards distant, and have them lie on the ground. It is unlikely that the bullets and cases will fly over 200 yards.

**38. Precautions in firing blank ammunition.**—*a.* It is dangerous to fire blank cartridges at personnel representing an enemy at distances less than 20 yards as the wad or paper cup may fail to break up.

*b.* No blank cartridges, other than those authorized below, will be used for blank firing.

(1) All cartons are plainly marked and markings should be strictly

checked before the ammunition is issued. The cartridge, blank, caliber .30, M1909, is similar in appearance to some of the M1909 caliber .30, high-pressure blank cartridges, formerly used for propelling rifle grenades. The carton markings, however, show the difference. Moreover, the heads of these high-pressure blank cartridges are stamped R. G., RIF. G., or ILL. G. They are dangerous to use in automatic or semiautomatic guns.

(2) Only blank ammunition packed in the original package or carton will be issued for use in machine guns or automatic rifles. Ammunition once removed from the original package or carton and on hand (usually termed broken or loose ammunition) should be reissued for use in bolt-action rifles only. These instructions are for the purpose of eliminating the danger of firing a high-pressure blank cartridge or a blank cartridge fitted with a felt or thick paper wad in an automatic weapon equipped with a blank ammunition firing attachment, which would greatly endanger personnel and probably damage the gun.

(3) All blank cartridges with felt or thick paper wads will be issued for use in bolt-action rifles only. The mark of distinction between the paper cup and felt wad closing is the depth of seating in the neck of the cartridge; the paper cup being seated much deeper (approximately  $\frac{1}{4}$  inch) than the felt wad, which is approximately  $\frac{1}{16}$  inch deep. It will be further noted that ammunition containing the felt wad is cannellured at a point approximately  $\frac{1}{10}$  inch from the mouth of the cartridge case whereas that containing the paper cup is cannellured at  $\frac{3}{10}$  inch from the mouth (fig. 18). Only ammunition containing the paper cup will be used in automatic arms.

(4) Ammunition containing the felt wad has been found to be dangerous when used in automatic arms for the reason that the wads may 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 experiment that the excessive pressure sets up a hammering action which, after about 100 rounds, may cause the blowing off of the back plate of the caliber .30 Browning machine gun.

c. Misfires in which the primer explodes but fails to ignite the powder charge may prove dangerous when blank ammunition is fired in automatic arms. In misfires of this kind some of the powder is blown into the bore of the weapon. A series of such rounds in which the powder fails to ignite will result in an accumulation of powder sufficient to cause serious damage when ignited by a normal cartridge. When misfires are encountered in blank ammunition in excess of 5

## CHAPTER 3

## AMMUNITION, CALIBER .45

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## SECTION I

## GENERAL

	Paragraph
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Marking and packing.....	68
Component parts.....	69
Component weights.....	70

**65. Types.**—Caliber .45 ammunition consists of ball cartridges, blank cartridges, dummy cartridges, high-pressure test cartridges, and tracer cartridges.

**66. Identification.**—*a.* In common with all other small-arms ammunition, caliber .45 cartridges are identified by the marking on the packing boxes and cartons and by the identification card. These include the type, caliber, model, manufacturer's symbol, and ammunition lot number. For further information see section III, chapter 1.

*b.* Physical differences in the cartridges are described in the sections on the several cartridges.

**67. Grades and uses.**—For information concerning grades and uses, see paragraph 13 and OFSB No. 3-5.

**68. Marking and packing.**—*a. Marking.*—For information concerning markings and color schemes see section IV, chapter 1.

*b. Packing.*—All caliber .45 ammunition is packed 20 per carton, 100 cartons per box with the exception of the cartridge, blank, revolver, M1, which is packed 24 per carton, 240 cartons per box.

*c. Packing data.*—The following table of packing data includes packing for all standard caliber .45 cartridges. Further information will be found in section V, chapter 1.

(2) The primer and propelling charge for this cartridge are described in paragraphs 9 and 11.

(3) The bullet consists of a gilding metal jacket encasing a hardened lead core, and has a cylindrical base. Its over-all length is 1.235 inches. The mouth of the case is crimped into the knurled cannelure after assembly and a pull of not less than 40 pounds is required to remove the bullet from the case.

### SECTION XIII

#### CARTRIDGE, INCENDIARY, CALIBER .30, M1

Description.....	Paragraph 64
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**64. Description.**—This cartridge is a standard item of issue. The cartridge resembles the cartridge, ball, caliber .30, M2, in outward appearance, but it may be identified by the light blue paint on the tip of the bullet. Other information is not available at this time.

percent, the lot will be suspended and reported to the Chief of Ordnance.

**39. Propellant powder.**—*a. Volatiles.*—(1) The volatile material in smokeless powder is composed of residual amounts of solvent (alcohol-ether mixture) and moisture. A certain amount of residual solvent is allowed to remain in the finished powder to insure toughness of the colloid and also 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 performance.

(2) 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 to minimize changes in moisture content of the powder as atmospheric conditions change. By keeping constant the original content of both solvent and moisture, changes in pressure and velocity are avoided. Hence, smokeless powder is always kept tightly sealed either 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.

*c. Effect of heat.*—The weight of charge for a given lot of powder is usually established by test firings with a powder temperature of 70° F. A weight of charge is determined which will cause a certain muzzle velocity of the bullet. When the temperature of smokeless powder is increased, the powder burns faster and consequently can produce a greater muzzle velocity. An increase in temperature above 70° F. increases the muzzle velocity above the established muzzle velocity and a decrease in powder temperature below 70° F. decreases the muzzle velocity below established velocity. Since it is not always possible to have the powder temperature at exactly 70° F., velocity corrections for temperature variations have been calculated. The change in velocity per degree F. is 1.5 feet per second for pyro DG powder and 1.7 feet per second for coated 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, dependent upon the care exercised in its manufacture and storage. Smaller grains tend to decompose more rapidly than larger grains because of the greater surface exposed. Powder in the state of decomposition is unsafe to store because of the danger of spontaneous combustion, since heat is emitted during the process of decomposition. An accumulation of such heat further increases decomposition, producing more heat until the ignition temperature is reached.

## SECTION VIII

## FIELD REPORT OF ACCIDENTS

Paragraph

Field report of accidents..... 40

40. Field report of accidents.—*a.* Any serious malfunctions of ammunition must be promptly reported to the ordnance officer under whose supervision the material is maintained and issued. It is only by making immediate and complete reports of all abnormal functioning of ammunition, thereby permitting prompt investigation, that possible danger may be eliminated and a reliable supply of ammunition maintained. Hangfires, which are especially dangerous in rifles, and other dangerous malfunctions should be promptly reported and the lot of ammunition temporarily suspended from use. Immediately after the occurrence of an accident, all parts of the gun, the cartridge case involved in the accident, and the remaining cartridges in the box from which the defective cartridge was taken should be collected and carefully preserved, pending instructions from the ordnance officer or the board appointed to investigate the accident.

*b.* Paragraph 7, AR 45-30, requires an immediate report of accidents by the ordnance officer to the Chief of Ordnance. In making reports of malfunctions, as much of the following information as possible should be promptly furnished the post ordnance officer:

- (1) *Data pertaining to weapon.*
  - (a) Caliber, type, and model.
  - (b) Name of manufacturer.
  - (c) Serial number.
  - (d) Type of fire.
  - (e) Elevation.
  - (f) Recoil.
  - (g) Range to target.
  - (h) Condition of weapon before occurrence of the malfunctioning.
  - (i) Detailed description of condition of weapon after accident (including photographs, sketches, and measurements of important features).
  - (j) Number of rounds fired in weapon just prior to the malfunctioning.
  - (k) Total number of rounds fired in weapon.
  - (l) Such other pertinent information as may be available.
- (2) *Ammunition markings.*
  - (a) Standard nomenclature (type, caliber, and model).
  - (b) Manufacturer.

purposes. Second-class bullets and cartridge cases may be used in the assembly of this cartridge.

*b. Visual identification.*—This cartridge is easily recognized by its six short corrugations just below the neck of the cartridge case.

*c. Components.*—The cartridge consists of a cartridge case, primer, propelling charge, and bullet. The complete assembly weighs approximately 355 grains.

(1) The cartridge case is essentially the same as the caliber .30 case described in paragraph 8, except that it has six short flutes or corrugations just below the neck (fig. 20).

(2) The primer and propelling charge for this cartridge are described in paragraphs 9 and 11.

(3) The bullet consists of a cupro-nickel jacket encasing a lead alloy slug. It has a cylindrical base.

**62. Exterior ballistics.**—*a. Maximum range.*—Approximately 2,000 yards.

*b. Average maximum pressure.*—Approximately 15,000 pounds per square inch.

*c. Muzzle velocity.*—Approximately 1,200 feet per second.

*d. Muzzle energy.*—Approximately 479 foot-pounds.

## SECTION XII

### CARTRIDGE, HIGH-PRESSURE TEST, CALIBER .30, M1

Description.....	Paragraph 63
------------------	-----------------

**63. Description.**—*a. General.*—This cartridge (fig. 20) is used for proof-firing rifles, automatic rifles, and machine guns. It is loaded with a powder charge sufficient to give a breech pressure of approximately 68,000 pounds per square inch. Due to this excessive pressure, and the consequent danger involved in firing, the guns under test are fired from a fixed rest under a hood by means of a mechanical firing device. This cartridge will be fired only by authorized personnel.

*b. Visual identification.*—This cartridge is identified by its tinned cartridge case. Some models have the word "Test" stamped on the head.

*c.* The cartridge consists of a cartridge case, primer, propelling charge, and bullet. The complete assembly weighs approximately 433 grains.

(1) The cartridge case is the same as those used in service cartridges and is further identified by being tinned. Its construction is further described in paragraph 8.

when the supply of cartridge, guard, caliber .30, M1906, is exhausted. Cartridges of older manufacture are labeled cartridge, gallery practice, but new manufacture will be designated cartridge, guard, caliber .30, M1. This cartridge is described under that designation in paragraph 59.

## SECTION X

## CARTRIDGE, GUARD, CALIBER .30, M1

Description.....	Paragraph
Exterior ballistics.....	59
	60

59. **Description.**—*a. General.*—This cartridge (fig. 20) was formerly the cartridge, gallery practice, caliber .30, M1919. It is now standard for guard purposes, and is used only in the caliber .30 rifle.

*b. Visual identification.*—It is easily identified by its short, round nose, lead bullet.

*c. Components.*—The cartridge consists of a cartridge case, primer, propelling charge, and bullet. The complete assembly weighs approximately 346 grains.

(1) The cartridge case, primer, and propelling charge for this cartridge are described in section II, chapter 1.

(2) The bullet is composed of a lead alloy and has a round nose and a cylindrical base. Its over-all length is approximately .815 inch and it has two knurled cannelures. A pull of not less than 45 pounds is required to remove the bullet from the case.

60. **Exterior ballistics.**—*a. Maximum range.*—2,500 yards (approximate).

*b. Average maximum pressure.*—15,000 pounds per square inch.

*c. Velocity.*—The standard instrumental velocity at 53 feet is 1,100 feet per second. The muzzle velocity is approximately 1,200 feet per second.

*d. Muzzle energy.*—376 foot-pounds.

*e. Accuracy.*—At 100 yards the group diameter will be not greater than 6 inches.

*f. Penetration.*—The bullet will penetrate 7.87 inches through 1-inch pine boards placed 1 inch apart at a distance of 45 feet.

## SECTION XI

## CARTRIDGE, GUARD, CALIBER .30, M1906

Description.....	Paragraph
Exterior ballistics.....	61
	62

61. **Description.**—*a. General.*—This cartridge (fig. 20) is a limited standard item of issue and is used in the caliber .30 rifle for guard



(c) Lot number (given on outside of packing box and on identification card).

(d) Lot number (as shown on bandoleer ticket, machine-gun belt tag, or carton).

(e) Initials marked on head of cartridge case.

(f) Method packed (whether in bandoleers, metallic link or web belts, or cartons).

(3) *Visual inspection.*

(a) Total number of rounds visually inspected.

(b) Number of season cracks found out of total inspected.

(c) Condition of case as to corrosion and cause of corrosion—either caused by stains (strains) or actual verdigris formed above the surface of the cartridge.

(d) Number of bullets that can be extracted by hand from the cartridge case.

(e) Condition of box and metal liner.

(f) Nature of other defects; whether deformed cartridge cases are found.

(g) Condition of storage with reference to type of building; whether boxes were properly separated by spacers.

(h) Quantity remaining on hand.

(4) *Firing data for defective lot of ammunition.*

(a) Approximate number of rounds fired.

(b) Number of hangfires and approximate time of each.

(c) Number of blown-out primers.

(d) Number of cartridge cases failing to extract normally.

(e) Number of cartridge cases which were difficult to extract normally.

(f) Number of ruptured cartridge cases.

(g) Number of shots failing to reach target.

(h) Number of shots failing to leave the bore.

(5) *Additional data pertaining to tracer ammunition.*

(a) Number of muzzle bursts.

(b) Number of bullets failing to trace the required distance.

(c) Other defects encountered.

(6) *Details of accident.*

(a) Name of man firing weapon.

(b) List of eyewitnesses.

(c) A detailed description of the accident, and other pertinent data not covered above.

## CHAPTER 2

## AMMUNITION, CALIBER .30

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VII. Cartridge, drummy, caliber .30, M1906.....	56
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XI. Cartridge, guard, caliber .30, M1906.....	61-62
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## SECTION I

## GENERAL

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Component weights.....	46

**41. Types.**—*a.* The ammunition described in this chapter is designed for use in all standard rifles and machine guns of caliber .30. It includes cartridges of the following types: armor-piercing, ball, tracer, incendiary, blank, dummy, guard, and high-pressure test. (See figs. 17-20.)

*b.* Cartridges which differ in the type of cartridge case, such as subcaliber, caliber .30, and carbine, caliber .30, are described in chapter 5.

**42. Identification.**—*a.* In common with all other small-arms ammunition, caliber .30 cartridges are identified by the markings on the packing boxes and cartons and by the identification card. These included the type, caliber, model, manufacturer's symbol, and ammunition lot number. For further information see section III, chapter 1.

*b.* Physical differences in the cartridges are described in the sections on the several cartridges.

**43. Grades and uses.**—For information concerning grades and uses see paragraph 13 and OFSB No. 3-5.

*b. Visual identification.*—There are still six longitudinal corrugations on the tinned cartridge case. Before January 15, 1940, the cartridge case contained an inert primer and 3 holes, 0.125 inch in diameter, drilled through the case in alternate corrugations. Since that date the cartridge has been assembled without the inert primer and the holes are omitted.

*c. Components.*—The cartridge consists of a cartridge case and a bullet. The complete assembly weighs 339 grains when assembled with either the M2 or M1906 ball bullet and 363 grains when assembled with the M1 ball bullet. Second class components are used in the cartridge assembly. The cartridge case (fig. 20) is essentially the caliber .30 case described in paragraph 8, but it is corrugated and tinned for identification purposes.

## SECTION VIII

### CARTRIDGE, DUMMY, CALIBER .30, M2

Description.....	Paragraph 57
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**57. Description.**—*a. General.*—This cartridge (fig. 20) is used only in the inspection of weapons and will not be issued to the service.

*b. Visual identification.*—This cartridge is easily identified by its tinned brass cartridge case and the absence of a primer. It differs from the dummy M1906 in not having corrugations in the case.

*c. Components.*—The cartridge consists of a cartridge case and bullet. Second class components may be used in the assembly of this cartridge. The complete assembly weighs approximately 341 grains.

(1) The cartridge case is described in paragraph 8. It is tinned for identification purposes.

(2) The bullet consists of a gilding metal jacket encasing a lead alloy core. It is a ball M2 bullet, and prior to September 20, 1940, was tin-coated for further identification.

## SECTION IX

### CARTRIDGE, GALLERY PRACTICE, CALIBER .30, M1919

Description.....	Paragraph 58
------------------	-----------------

**58. Description.**—This cartridge is now superseded by the cartridge, ball, caliber .22, long rifle (see ch. 5) for gallery practice. Stocks on hand, however, are retained for guard purposes, for use

SECTION VI

CARTRIDGE, BLANK, CALIBER .30, M1909

Description..... Paragraph 55

55. *Description.*—*a. General.*—This cartridge (fig. 20) is a current standard item of issue and is used in the U. S. rifles, M1903 and M1917, for simulated fire during maneuvers, for signaling purposes, and for firing salutes. It is also used in machine guns and automatic rifles equipped with blank firing attachments, in order to operate these weapons for instructional purposes.

*b. Visual identification.*—It is readily identified since it has no bullet, and furthermore, a cannellure is present in the neck of the case.

*c. Components.*—The cartridge consists of a cartridge case, primer, propelling charge, and a paper cup or wad of thin paper (fig. 18). Prior to January 1925, a felt wad was used but was discontinued due to the occurrence of accidents caused by the clogging of gas escape holes in the blank firing attachment of machine guns and automatic rifles. The complete assembly weighs approximately 207 grains.

(1) The cartridge case differs from the standard caliber .30 cartridge case described in paragraph 8, only in that the neck has a cannellure and that the mouth is slightly rounded. Second-class cartridge cases having small dents, scratches, or other minor defects may be used in the assembly of this ammunition.

(2) The primer and propelling charge for this cartridge are described in paragraphs 9 and 11.

(3) The paper cup or wad is inserted in the neck against the cannellure and sealed in place with a few drops of shellac. The mouth of the case is then rose-crimped to keep the wad in place.

SECTION VII

CARTRIDGE, DUMMY, CALIBER .30, M1906

Description..... Paragraph 56

56. *Description.*—*a. General.*—This cartridge (fig. 20) is a current standard item of issue and is used for training personnel in the operation of loading and unloading rifles, and simulating rifle fire. Prior to January 15, 1940, this cartridge was assembled only with the M1906 ball bullet. Since then, however, it has been permissible also to use either the M2 or the M1 ball bullet.

44. Marking and packing.—*a. Marking.*—The markings on boxes and cartons and coloring on bullets are described in section IV, chapter 1.

*b. Packing.*—The following table of packing data includes packing for all standard caliber .30 cartridges. Further information will be found in section V, chapter 1.

Caliber .30 <sup>1</sup>	Cartridges per clip	Cartridges per carton	Cartridges per metallic link belt in carton	Cartridges per machine-gun belt	Clips per carton	Clips per bandoleer	Cartons per box	Bandoleers per box	Machine-gun belts per box	Total cartridges per box	Total weight—pounds
Armor-piercing, M2		20					75			1, 500	108
Armor-piercing, M2 <sup>2 3</sup>			100				12			1, 200	107
Armor-piercing, M2 (tracer, M1) <sup>2</sup>			{80-AP 20-trac}				12			1, 200	107
Ball, M1		20					75			1, 500	115
Ball, M1	5				4		75			1, 500	117
Ball, M1	5					4	12	25		1, 500	120
Ball, M1	5					4	12	20		1, 200	100
Ball, M1	8					6		25		1, 200	101
Ball, M1				250					5	1, 250	101
Ball, M1 <sup>2</sup>			100				12			1, 200	108
Ball, M1 (tracer) <sup>2</sup>			{80-ball 20-trac}				12			1, 200	108
Ball, M1, national match.	5				4		75			1, 500	117
Ball, M2		20					75			1, 500	110
Ball, M2	5				4		75			1, 500	116
Ball, M2	5					4	12	25		1, 500	120
Ball, M2	5					4	12	20		1, 500	98
Ball, M2	8					6		25		1, 200	101
Ball, M2				250					5	1, 250	96
Ball, M2 national match.	5				4		75			1, 500	116
Ball, M2 <sup>2</sup>			100				12			1, 200	105
Ball, M2 (tracer) <sup>2</sup>			{80-ball 20-trac}				12			1, 200	105
Ball, M2 (armor-piercing, M2 and tracer, M1) <sup>3</sup>			{40-ball 40-AP 20-trac}				12			1, 200	106
Blank, M1909		20					100			2, 000	90
Blank, M1909											
Dummy, M2	5				4		100			2, 000	90
Dummy, M1906—Corrugated.	5				4		75			1, 500	99
Dummy, M1906—Corrugated.	5						91			1, 820	116
Gallery practice, M1919	{20 10						62			1, 250	87
Guard, M1	20						84			1, 680	110
Guard, M1906	5				4		82			1, 640	106
High-pressure test, M1		20					75			1, 500	116
Incendiary, M1		20					75			1, 500	110
Tracer, M1 <sup>6</sup>		20					75			1, 500	110

<sup>1</sup> All rounds are packed in boxes 18<sup>3</sup>/<sub>16</sub> by 9<sup>5</sup>/<sub>16</sub> by 14<sup>1</sup>/<sub>16</sub> inches which occupy 1.21 square feet and 1.40 cubic feet. <sup>2</sup> Special packing for Army Air Forces. <sup>3</sup> See also ball, M2 (armor-piercing and tracer).  
<sup>4</sup> Bandoleer, M1906. <sup>5</sup> See also ball, M2 (armor-piercing and tracer). <sup>6</sup> Bandoleer, M1.  
<sup>6</sup> See also armor-piercing, M2 (tracer); ball, M2 (tracer); ball, M2 (armor-piercing and tracer); ball, M1 (tracer).

SECTION V

CARTRIDGE, TRACER, CALIBER .30, M1

Description..... Paragraph 53  
Exterior ballistics..... 54

45. **Component parts.**—The following table lists the component parts of caliber .30 cartridges. For description of case, primer, and powder charge, see section II, chapter 1. Components which differ from the standard type are described in the section for the specific cartridge.

	Cartridge case	Propellent powder	Bullet			
			Jacket	Core	Point filler	
AP, M2.....	Brass.....	Smokeless.....	Gilding metal.....	Alloy steel.....	Lead shot.....	Gilding metal.
Ball M1.....	Brass.....	Smokeless.....	Gilding metal.....	1 antimony.....		
Ball M1—Alt.....	Brass.....	Smokeless.....	Gilding metal.....	1 antimony.....		Tracer compo- sition.
Tracer, M1.....	Brass.....	Smokeless.....	Gilding metal.....		1 antimony (39 lead).	
Blank, M1909.....	Brass.....	EC Blank powder.....		Paper cup or wad.....		
Dummy, M2.....	Brass tinned.....	None.....	Gilding metal.....	1 antimony 39 lead.....		
Dummy, M1906.....	Brass.....	None.....	Cupro-nickel or gilding metal.....			
Gallery practice, M1919.....	Brass.....	DuPont No. 80 smokeless.....		Lead.....		
Guard, M1.....	Brass.....	DuPont No. 80 smokeless.....		Lead.....		
Guard, M1906.....	Brass.....	Bullseye smokeless.....	Cupro-nickel.....	1 antimony 39 lead.....		
High-pressure test, M1.....	Brass tinned.....	IMR No. 25.....	Gilding metal.....	Lead.....		
Incendiary, M1.....	Brass.....	Smokeless.....	Gilding metal.....			

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53. **Description.**—*a. General.*—This cartridge (fig. 19) is a standard item of issue and is used in both machine guns and rifles. It is intended for use with other ammunition to show the gunner, by its trace, the path of the bullets. While tracer cartridges were primarily intended for machine-gun use, there are cases wherein they can be advantageously used in rifles; for example, for signal and incendiary purposes, target designation, and range estimation.

*b. Visual identification.*—The cartridge is readily identified by its characteristic red bullet point, red indicating the color of the trace.

*c. Components.*—The cartridge consists of a cartridge case, primer, propelling charge, and bullet. The complete assembly weighs approximately 396 grains.

(1) The cartridge case, primer, and propelling charge for this cartridge are described in section II, chapter 1.

(2) The bullet (fig. 17) consists of three parts: a gilding metal jacket, a lead alloy slug, and a tracer composition. The overall length of this bullet is 1.45 inches and point is painted red for a distance of approximately 5/16 inch. It has a square base which contains an inflammable substance which is ignited by the propelling charge when the cartridge is fired. The tracer composition burns with a bright red flame which enables the course of the bullet to be followed by the gunner. The mouth of the cartridge case is crimped into the knurled cannelure at assembly and a minimum pull of 45 pounds is required to remove the bullet from the case.

54. **Exterior ballistics.**—*a. Maximum range.*—(1) *Bullet.*—Approximately 3,450 yards.

(2) *Range of trace.*—Trace begins at a distance not greater than 125 yards from weapon and bullets continue tracing to 750 yards from weapon.

*b. Average maximum pressure.*—50,000 pounds per square inch.

*c. Velocity.*—(1) At 78 feet, 2,650 feet per second.

(2) At muzzle, 2,715 feet per second.

*d. Accuracy.*—Average of mean radii of all targets at 600 yards less than 15 inches.

*e. Trajectory.*—This ammunition is designed so that the bullet's trajectory will cross the trajectory of ball, M2, and AP, M2, ammunition of the same caliber at approximately 600 yards.

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*b. Visual identification.*—Cartridges of recent manufacture cannot be readily distinguished from the M1 cartridges by visual inspection, although this can be done by weight and date. Cartridges manufactured prior to September 20, 1940, could be readily distinguished from the M1 cartridges by their tin-coated, gilding metal bullet jackets.

*c. Components.*—The cartridge consists of a cartridge case, primer, propelling charge, and bullet. The complete assembly weighs approximately 396 grains.

(1) The cartridge case, primer, and propelling charge for this cartridge are described in section II, chapter 1.

(2) The bullet (fig. 17) consists of two parts, a lead alloy core, composed of 90 percent lead and 10 percent antimony, and a gilding metal jacket. An alternative bullet having a gilding metal jacket, and a core composed of 97½ percent lead and 2½ percent antimony may also be used. The base of the bullet retains its cylindrical shape to the base line. The over-all length of the M2 bullet is 1.125 inches, and that of the M2 alternative bullet, 1.103 inches.

**52. Exterior ballistics.**—*a. Maximum range.*—Approximately 3,500 yards.

*b. Average maximum pressure.*—50,000 pounds per square inch.

*c. Velocity.*—(1) At 78 feet, 2,740 feet per second.

(2) At 53 feet, 2,755 feet per second.

(3) Muzzle, 2,805 feet per second.

*d. Accuracy.*—From accuracy rifle—average of mean radii of all targets at 500 yards not greater than 6.5 inches; at 600 yards not greater than 7.5 inches.

*e. Table of fire.*

Range	Angle of elevation	Time of flight	Maximum ordinate	Angle of fall
<i>Yards</i>	<i>Mils</i>	<i>Seconds</i>	<i>Yards</i>	<i>Mils</i>
100	0.7	0.12	0	1
200	1.5	.25	.1	2
300	2.4	.38	.2	3
400	3.4	.53	.4	4
500	4.6	.70	.6	6
600	6.0	.89	1.0	9
700	7.7	1.11	1.7	12
800	9.6	1.35	2.4	17
900	11.9	1.62	3.6	22
1,000	14.6	1.91	5.1	28

Based on muzzle velocity of 2,700 feet per second.  
Data from FT 0.30-A-4.

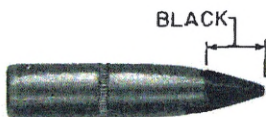
46. Component weights.—The following table gives the weights of all caliber .30 cartridges. The weights listed are the maximum limits permitted in manufacture.

Component weights (in grains)	Weight of complete cartridge (approximate)	Weight of cartridge case	Weight of powder charge (approximate)	Weight of bullet	Weight of jacket	Weight of core	Weight of point filler	Weight of primer	Weight of base filler	Weight of tracer composition
AP, M2	414	200	53	168.5	65	84	12.15	5.594	19	
Ball, M1	420	200	50	174.5	62	112.5	---	5.594	---	
Ball, M1—Alt	420	200	50	174	60	114	---	5.594	---	
Ball, M2	396	200	50	152	54.5	97.5	---	5.594	---	
Ball, M2—Alt	396	200	50	152	52.5	99.5	---	5.594	---	
Blank, M1909	207	200	12	---	---	---	---	5.594	---	
Dummy, M2	341	200	---	152	54.5	97.5	---	---	---	
Dummy, M1906 (M1)	363	200	---	174.5	62	112.5	---	---	---	
Dummy, M1906 (M2)	341	200	---	152	54.5	97.5	---	---	---	
Dummy, M1906 (06)	340	200	---	151	38.5	112.5	---	---	---	
Gallery practice, M1919	346	190	10.5	140	---	---	---	5.482	---	
Guard, M1	346	200	10.5	142	---	---	---	5.594	---	
Guard, M1906	354.5 433.5	190 213	9.1	150	38	112	---	5.482	---	
High-pressure test M1	or 420.5	or 200	52	174.5	62	112.5	---	5.594	---	
Tracer, M1	396	200	50	152.5	83	52.5	---	5.594	---	Ignition composition 17.
Incendiary M1	---	200	50	---	---	---	---	5.594	---	





BULLET, BALL, CAL. .30, M2



BULLET, ARMOR-PIERCING, CAL. .30, M2



BULLET, TRACER, CAL. .30, M1

RA PD 4521

FIGURE 17.—Bullets, caliber .30.



RA PD 4524

FIGURE 18.—Blank cartridges—necks in section showing wads.

Material	Penetration in inches					
	200 yards		600 yards		1,500 yards <sup>1</sup>	
	Average	Maximum <sup>2</sup>	Average	Maximum <sup>2</sup>	Average	Maximum <sup>2</sup>
¼-inch armor plate <sup>3</sup>	0.1		0		0	
Gravel	7.0	8.0	4.5	5.0	4.1	5.5
Brick masonry <sup>4</sup>	4.3	6.5	<sup>5</sup> 2.2	<sup>6</sup> 3.6	1.5	1.9
Concrete	4.0		1.0		0.5	
Solid oak	13.8	18.0	12.0	13.6	2.1	3.8
Dry sand <sup>6</sup>	6.5	8.2	7.1	8.5	8.2	9.0
Moist sand <sup>6</sup>	7.3	9.2	9.6	11.2	8.7	9.5
Loam	24.1	24.5	24.0	25.0	22.7	26.2
Greasy clay	24.6	29.0	22.0	23.0	14.2	15.0
Loose earth	<sup>7</sup> 19.0		15.8			

<sup>1</sup> Fired over 75-foot range with reduced charge to simulate remaining velocity at 1,500 yards.

<sup>2</sup> Maximum penetration for 2 single shot.

<sup>3</sup> Penetration shown is average for single shots. A recent test showed that the first shot weakened the structure of the plate so that succeeding shots in the same place effected appreciable penetration.

<sup>4</sup> Penetrations given in table are for single shots striking brick only. A bullet striking only mortar has penetrated 18.54 inches with a velocity corresponding to a range of 1,500 yards. A series of 6 shots, fired under these conditions at the same point, penetrated 6.72 inches of brick, and a seventh struck mortar, penetrating to 14.52 inches. A succession of 5 shots, with a charge to simulate 600 yards range, penetrated brick masonry to 6.36 inches.

<sup>5</sup> Fired over 75-foot range with reduced charge to simulate remaining velocity at 600 yards.

<sup>6</sup> Penetration at 600 yards is often greater than at 200 yards, due to the larger yaw of the bullet at 200 yards.

<sup>7</sup> Average penetration at 400 yards.

g. Table of fire.

Range	Angle of elevation	Time of flight	Maximum ordinate	Angle of fall
Yards	Mils	Seconds	Yards	Mils
0				
100	0.8	0.12		0.8
200	1.6	.25	0.1	1.8
300	2.5	.39	.2	3.0
400	3.5	.54	.39	4.4
500	4.7	.70	.67	6.0
600	6.0	.88	1.03	8.1
700	7.5	1.07	1.52	10.6
800	9.1	1.27	2.15	13.7
900	10.9	1.50	3.00	17.5
1,000	12.9	1.75	4.1	22.0

Based on muzzle velocity of 2,600 feet per second.  
Data from F.P. 0.30-C-4.

SECTION IV

CARTRIDGE, BALL, CALIBER .30, M2

Description	Paragraph
Exterior ballistics	51
	52

51. Description.—*a. General.*—This cartridge (figs. 1, 2, and 19) is a current standard item of issue and is used in machine guns and rifles against personnel and light matériel targets.

## SECTION III

## CARTRIDGE, BALL, CALIBER .30, M1

	Paragraph
Description .....	49
Exterior ballistics.....	50

**49. Description.**—*a. General.*—This cartridge (fig. 19) is a limited standard item of issue and is used in the same weapons and for the same purposes as the cartridge, ball, caliber .30, M2.

*b. Visual identification.*—This cartridge cannot be readily distinguished from the M2 ball cartridge of late manufacture except by weight and date.

*c. Components.*—The cartridge consists of a cartridge case, primer, propelling charge, and bullet. The complete assembly weighs approximately 420 grains.

(1) The cartridge case, primer, and propelling charge for this cartridge are described in section II, chapter 1.

(2) The bullet (fig. 17) consists of two parts, a lead alloy core, composed of 90 percent lead and 10 percent antimony, and a gilding metal jacket. An alternative bullet having a gilding metal jacket and a core composed of 97½ percent lead and 2½ percent antimony may also be used. The base of either bullet has a 9° taper, called a boat-tail. The over-all length of the M1 bullet is 1.32 inches, and that of the M1 alternative bullet, 1.265 inches. The mouth of the cartridge case is crimped into the knurled cannelure at assembly and a minimum pull of 45 pounds is required to remove the bullet from the case.

**50. Exterior ballistics.**—*a. Maximum range.*—5,500 yards (approximate).

*b. Average maximum pressure.*—48,000 pounds per square inch.

*a. Velocity.*—(1) At 78 feet, 2,600 feet per second.

(2) At 53 feet from muzzle, 2,620 feet per second.

(3) Muzzle, 2,647 feet per second.

*d. Muzzle energy.*—2,675 foot-pounds.

*e. Accuracy.*—Average of mean radii of all targets at 500 yards, not greater than 4.5 inches; at 600 yards, 5.5 inches, when fired from a Mann accuracy weapon. Dispersions obtained from firings under service condition at all ranges are published in firing tables for the weapons in which this ammunition is used.

*f. Penetration.*—Firings of caliber .30, M1, ball ammunition, into various materials resulted in the penetrations shown in the table below:

## SECTION II

## CARTRIDGE, ARMOR-PIERCING, CALIBER .30, M2

Description.....	Paragraph 47
Exterior ballistics.....	48

47. **Description.**—*a. General.*—This cartridge (fig. 19) is a current standard item of issue and is fired from machine guns and rifles. It is designed for use against armored aircraft, armored vehicles, concrete shelters, and similar bullet-resisting targets.

*b. Visual identification.*—This cartridge may be identified by the additional cannellure and the blackened tip of the bullet.

*c. Components.*—The cartridge consists of a cartridge case, primer, propelling charge, and bullet. The complete assembly weighs approximately 414 grains.

(1) The cartridge case, primer, and propelling charge for this cartridge are described in section II, chapter 1.

(2) The bullet (fig. 17) consists of four parts: a gilding metal jacket, a hardened steel core, a lead "T" shot point filler, and a gilding metal base filler. The over-all length of this bullet is 1.370 inches and its point is blackened for a distance of approximately  $\frac{9}{32}$  inch. The base is boat-tailed (has a 5° taper beginning at a point approximately 0.093 inch from the base line). The mouth of the case is crimped into the cut cannellure at assembly, and a minimum pull of 45 pounds is required to remove the bullet from the case.

48. **Exterior ballistics.**—*a. Maximum range.*—Approximately 3,500 yards.

*b. Average maximum pressure.*—50,000 pounds per square inch.

*c. Velocity.*—(1) At 78 feet, 2,715 feet per second.

(2) At 53 feet, 2,730 feet per second.

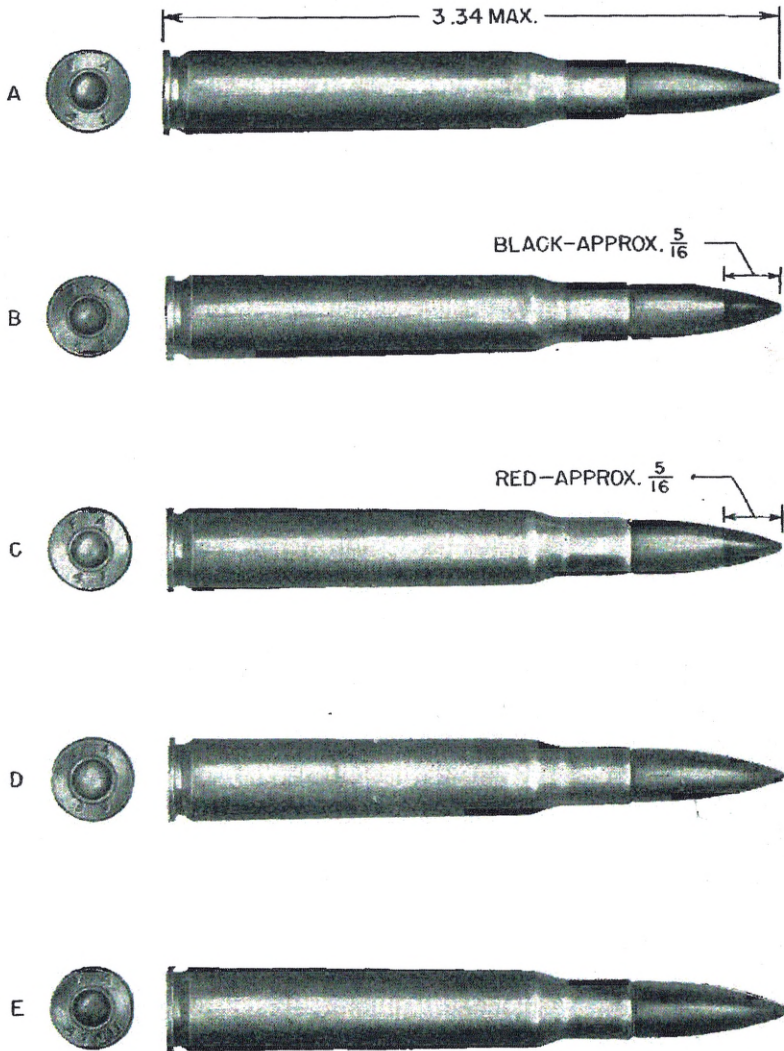
(3) Muzzle, 2,775 feet per second.

*d. Muzzle energy.*—2,780 foot pounds.

*e. Accuracy.*—Average of mean radii of all targets at 500 yards, not greater than 9.0 inches; at 600 yards, not greater than 10.0 inches.

*f. Table of fire.*

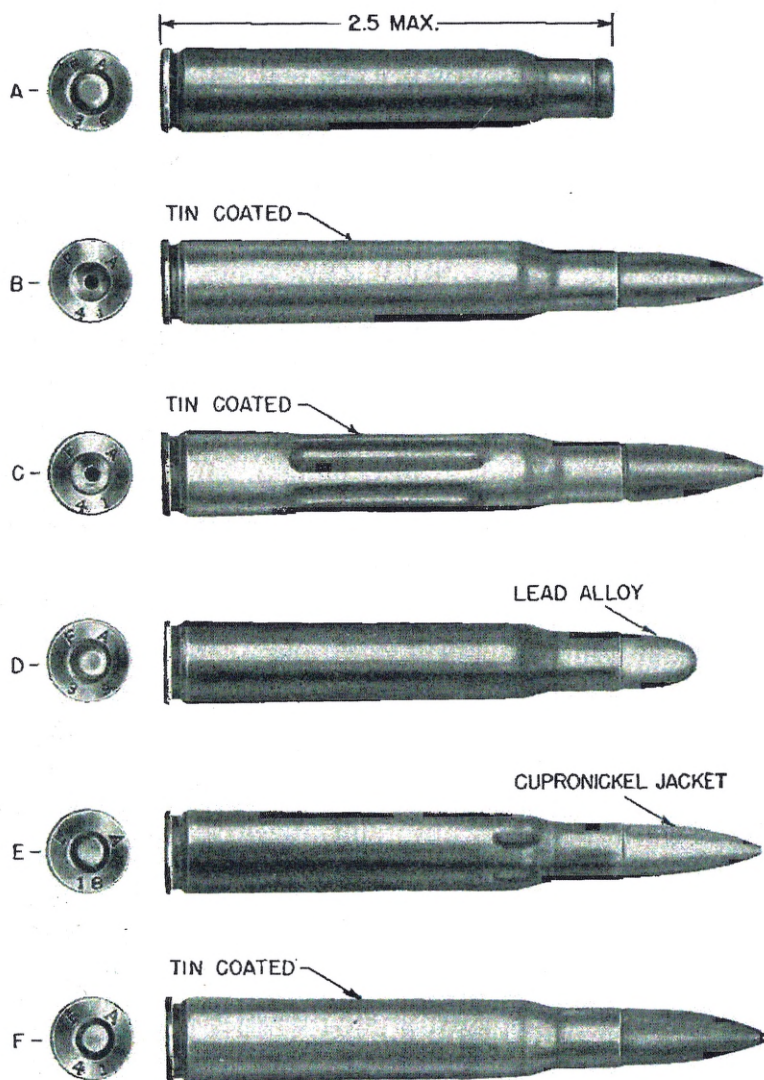
Range	Angle of elevation	Time of flight	Maximum ordinate	Angle of fall
Yards	Mils	Seconds	Yards	Mils
0	0	0	0	0
200	1.5	.24	.1	1.7
400	3.4	.52	.4	4.3
600	5.8	.87	1.0	8.8
800	9.1	1.30	2.3	16.0
1,000	13.7	1.82	4.5	26.7



RA PD 4522

- A. Cartridge, ball, caliber .30, M2. D. Cartridge, ball, caliber .30, M1.  
 B. Cartridge, armor-piercing, caliber .30, M2. E. Cartridge, ball, caliber .30, M2, national  
 C. Cartridge, tracer, caliber .30, M1. match.

FIGURE 19.—Armor-piercing, ball, and tracer cartridges, caliber .30.



RA PD 4523

- A. Cartridge, blank, caliber .30, M1909. D. Cartridge, guard, caliber .30, M1.  
 B. Cartridge, dummy, caliber .30, M2. E. Cartridge, guard, caliber .30, M1006.  
 C. Cartridge, dummy, caliber .30, M1906. F. Cartridge, high-pressure test, caliber .30, M1.

FIGURE 20.—Blank, dummy, guard, and high-pressure test cartridges, caliber .30.