TECHNICAL REGULATIONS
No. 1350-37A

WAR DEPARTMENT,
WASHINGTON, *August 1, 1932.*

INFANTRY AND AIRCRAFT AMMUNITION

AMMUNITION FOR 37-MM GUN, M1916

Prepared under direction of the
Chief of Ordnance

1. Purpose and scope.—The purpose of these regulations is to furnish personnel of the Army information pertaining to the construction, functioning, and identification of the different types of ammunition for the 37-mm gun, M1916. They do not cover the principles common to all types of ammunition such as safety precautions and methods of storing and shipping, nor are they a technical treatise designed to give all the information required by ordnance personnel.

2. References.—*a.* Need may arise for information other than that contained herein which applies to ammunition in general. That information will be found in TR 1370–A, which contains, among other information, sections on deterioration, transporting, malfunctioning, inspection in storage, and explosive agents.

b. For the preparation and use of blank ammunition generally, see TR 1370–B.

c. Drill ammunition generally is described in TR 1370–D.

d. Nomenclature for the ammunition described herein is given in Standard Nomenclature List No. R–1, "Ammunition, Fixed, All Types, for Pack, Light, and Medium Field Artillery." The use of that nomenclature is mandatory and will be used for all purposes.

* This pamphlet supersedes TR 1350–37A, April 23, 1928.

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e. The operation, care, and maintenance of the 37-mm gun matériel for which this ammunition is designed are given in TR 1300–37A and 1300–37B.

f. Firing tables for the ammunition described herein are as follows:

For high-explosive shell	37–A–1. 37–A–1 abridged.
For low-explosive shell	37–A–1. 37–B–1 abridged.
For canister, M1	No table.

3. Ammunition.—*a.* The ammunition authorized for use in the 37-mm gun, M1916, is fixed ammunition and consists of—

High-explosive shell [1]	When used as tank armament.
Canister, fixed, M1	
Target-practice shell [2]	
High-explosive shell	When used other than tank armament.
Low-explosive shell	

b. The components of the three types of ammunition now in use are given in the following table:

Components of complete rounds [1]

Components	High-explosive ammunition (fig. 1)	Low-explosive ammunition (fig. 2)	Canister ammunition (fig. 3)
Projectile	High-explosive shell, Mk. II.	Low-explosive shell, Mk. I.	Canister, M1.
Fuze	Base detonating, Mk. IV.	Base percussion, Mk. I.	No fuze.
Bursting charge	TNT.	Black powder.	Shrapnel balls.
Cartridge case	Mk. I.	Mk. I.	Mk. I.
Primer	20-grain percussion, Mk. IIA1.	20-grain percussion, Mk. IIA1.	20-grain percussion, Mk. IIA1.
Propelling charge	Nitrocellulose smokeless powder.	Nitrocellulose smokeless powder.	Nitrocellulose smokeless powder.

[1] A complete round as referred to herein means all the necessary components of the round of ammunition assembled into one unit for firing the gun once.

4. Marking.—Service marking by means of painting, stenciling, and stamping on the complete rounds is shown in Figures 4, 5, and 6.

[1] The 37-mm gun is of low power and the armor penetration is limited. Therefore no armor-piercing projectile is being developed for this gun. The high-explosive shell, Mk. II, is fairly satisfactory against thin plate.

[2] Low-explosive shell "limited standard" will be substituted for target-practice shell in lieu of a standard for that purpose.

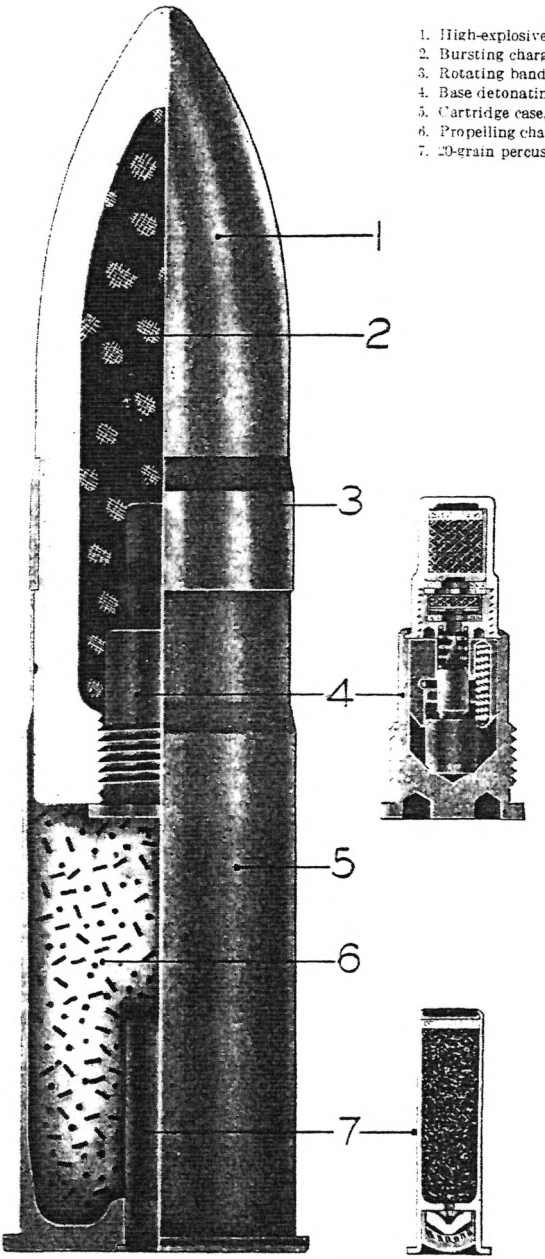
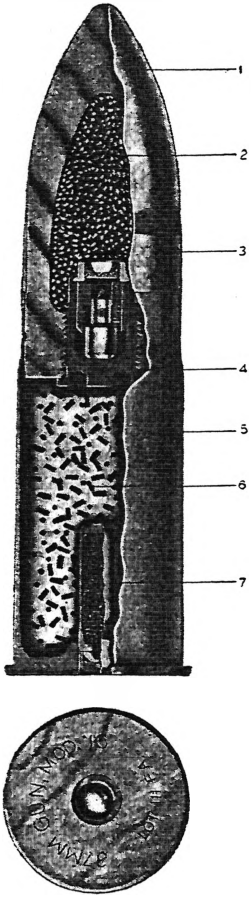


FIGURE 1.—Complete round of 37-mm high-explosive ammunition

5. **Projectiles.**—*a. Description.*—See paragraph 29, TR 1370–A.

b. Canister, fixed, M1.—(1) *Description.*

(*a*) The canister used with the 37-mm. gun (tank armament) is known as canister, fixed, M1 (see fig. 3).

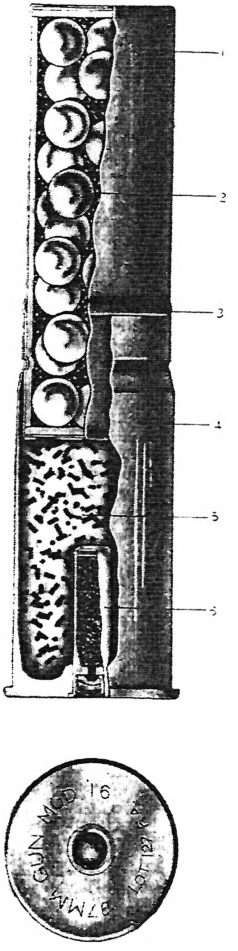


1. Low-explosive shell, Mk. I.
2. Bursting charge (black powder).
3. Rotating band.
4. Base percussion fuze, Mk. I.
5. Cartridge case, Mk I.
6. Propelling charge (smokeless powder).
7. 20-grain percussion primer, Mk. IIA1.

FIGURE 2.—Complete round of 37-mm low-explosive ammunition

(*b*) The filling consists of 32 lead shrapnel balls and a resinous substance forming a matrix. The case is provided with three longitudinal slots. When assembled, the edges of the segments are about 0.1 inch to the right or left of the corresponding slots in the case. The raised bead on the case serves to stop the canister at its proper seating

in the cartridge case. It will be noted that the canister filling consists only of inert materials and does not require a fuze. It is painted with a black waterproof paint.



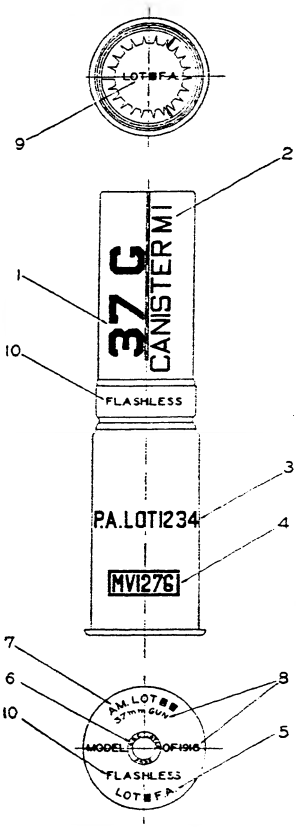
1. Canister case.
2. Shrapnel balls.
3. Resinous substance (matrix).
4. Cartridge case, Mk. I.
5. Propelling charge (smokeless powder).
6. 20-grain percussion primer, Mk. IIA1.

FIGURE 3.—Complete round of 37-mm canister ammunition

(2) *Action on firing.*—When the gun is fired, the shock of discharge ruptures the case and the resinous matrix disintegrates and frees the balls. When the case bursts, the balls leave in a cone-shaped pattern, with a velocity practically equal to that of the muzzle velocity, which is 1,276 feet per second. The canister bursts within 100 feet of the muzzle and the penetration of wood, earth, or brick by the

balls is very small. The following hits and penetrations have been made on spruce screens 2 inches thick:

Range (feet)	Number of hits	Penetrations
150	26	10
225	19	6
300	7	3



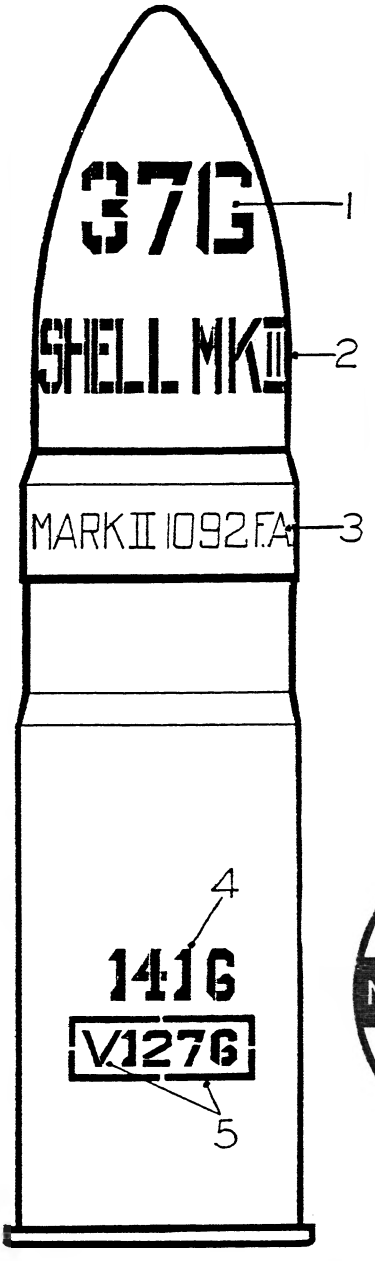
1. Caliber and type of cannon.
2. Type and model of projectile.
3. Lot number of propelling charge powder.
4. Muzzle velocity of projectile (in feet per second). Rectangle as shown denotes service charge.
5. Lot number of cartridge case and initials or symbol of manufacturer.
6. Head of primer is stamped to show initials or symbol of loader, lot number of loaded primer, and year of loading.
7. Ammunition lot number.
8. Caliber, type of cannon, and model of gun.
9. Canister lot number.
10. When flashless powder is used.

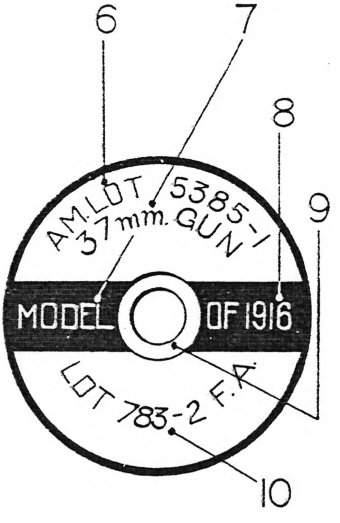
NOTE.—5, 6, 7, 8, and 9 are stamped; others are stenciled in white.

FIGURE 4.—Marking of complete round of canister ammunition

The maximum effective range of canister against personnel is 75 yards.

(3) *Weight.*—The weight of the complete round of canister is approximately 1.59 pounds.





1. Caliber and type of cannon (G=gun).
2. Mark number of shell.
3. Mark number and lot number of projectile and initials of manufacturer (stamped on rotating band).
4. Lot number of propelling charge powder.
5. Muzzle velocity of projectile (in feet per second). Rectangle as shown denotes service charge.
6. Ammunition lot number.
7. Caliber and type of cannon and model of gun.
8. One black stripe as shown denotes service charge.
9. Head of primer is stamped to show the initials or symbol of the loader, lot number of loaded primer, and the year of loading.
10. Lot number of cartridge case and initials or symbol of manufacturer.

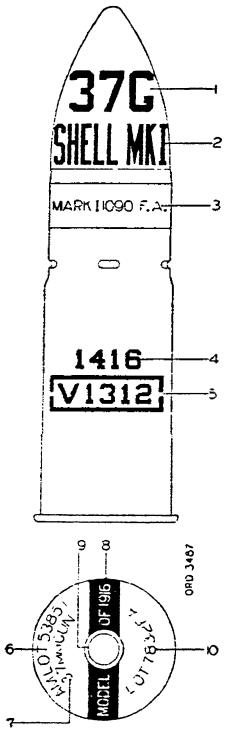
NOTE.—3, 6, 7, 9 and 10 are stamped; others are stenciled in black.

FIGURE 5.—Marking of complete round of high-explosive ammunition

(4) *Marking.*—The stenciling on the canister is lengthwise and in accordance with Figure 4 which shows the marking and stenciling of the complete round.

c. High-explosive shell, Mk. II.—(1) *Description.*

(*a*) The 37-mm high-explosive shell, Mk. II (fig. 1), has a sharp pointed nose, slightly rounded, the radius of the ogive being approximately 2¼ calibers, or approximately 83 mm (diameter of bore of gun measured between lands, 37 mm multiplied by 2¼). The bursting charge consists of 0.060 pound of pressed TNT.



1. Caliber and type of cannon (G=gun).
2. Mark number of shell.
3. Mark number and lot number of projectile and initials of manufacturer (stamped on rotating band).
4. Lot number of propelling charge powder.
5. Muzzle velocity of projectile (in feet per second). Rectangle as shown denotes service charge.
6. Ammunition lot number.
7. Caliber and type of cannon and model of gun.
8. One black stripe as shown denotes service charge.
9. Head of primer is stamped to show the initials or symbol of the loader, lot number of loaded primer, and the year of loading.
10. Lot number of cartridge case and initials or symbol of manufacturer.

NOTE.—3, 6, 7, 9, and 10 are stamped; others are stenciled in black.

FIGURE 6.—Marking of complete round of low-explosive ammunition

(*b*) The shell is made of steel, about 4.45 inches long, with an annular groove machined around it about midway between the rotating band and the base, for the purpose of crimping the cartridge case to the projectile. The rotating band is about 0.75 inch wide and is placed approximately 1.19 inches from the base. When assembled,

that portion of the projectile rearward of the rotating band extends into the mouth of the cartridge case.

(2) *Action on firing.*—See paragraph 6 *b* (2) and (3).

(3) *Performance data.*

(*a*) Maximum range at maximum elevation (394 mils = 22° 10′) at 1,276 feet per second is 4,300 yards for the ground gun. At maximum elevation (480 = 27°) maximum range of tank gun is 4,500 yards at 1,276 feet per second.

(*b*) Effective range—approximately 1,200 yards.

(*c*) Effective radius of exploding projectile—10 yards.

(*d*) Effect on armor plate—the high-explosive shell will not penetrate ⅜-inch to ½-inch armor plate of a good grade of homogeneous steel at 500 yards.

(*e*) The following table gives the time of flight and probable error in range and deflection for the high-explosive shell at 1,276 feet per second:

Range (yards)	Time of flight (seconds)	Probable error in	
		Range (yards)	Deflection (yards)
1,000	3.0	25	1
2,000	6.8	26	2
3,000	11.7	30	3

(4) *Weight.*—The weight of the complete round of high-explosive shell, Mk. II, is approximately 1.57 pounds.

(5) *Marking.*—The high-explosive shell is painted yellow and the complete round marked as shown in Figure 5.

d. Low-explosive shell, Mk. I.—(1) *Description.*

(*a*) The low-explosive shell, Mk. I (fig. 2), is the first shell designed for the 37-mm gun. It is limited standard and manufacture has been discontinued. The bursting charge consists of approximately 0.034 pound of black powder.

(*b*) This shell likewise is made of steel and is about 3.56 inches long. The details of its construction are the same as for high-explosive shell, Mk. II, possessing the same ogive, the only difference being that the high-explosive shell, Mk. II, is longer, heavier, and carries more explosive than the low-explosive shell, Mk. I.

(2) *Performance data.*

(*a*) The maximum range at 1,312 feet per second is 4,500 yards in the ground gun and 4,800 yards in the tank gun.

(*b*) *Effective range.*—See *c* (3) (*b*) above.

(*c*) *Effective radius of exploding projectile.*—See *c* (3) (*c*) above.

(*d*) The following table gives the time of flight and probable error in range and deflection for the low-explosive shell at 1,312 feet per second:

Range (yards)	Time of flight (seconds)	Probable error in	
		Range (yards)	Deflection (yards)
1,000	2.8	25	1
2,000	6.5	25	2
3,000	11.2	28	3

(3) *Weight.*—The weight of the complete round of low-explosive shell, Mk. I, is approximately 1.44 pounds.

(4) *Marking.*—The low-explosive shell is painted vermilion (red), and the complete round marked as shown in Figure 6.

e. Target-practice shell.—Until such time as a suitable shell is developed and adopted for target practice, low-explosive shell, Mk. I, will be issued as a substitute until supply is exhausted.

6. Fuzes.—*a. General.*—(1) *Description and issue.*—See paragraph 31, TR 1370–A.

(2) *Types.*—The two fuzes used with 37-mm ammunition are the base detonating fuze, Mk. IV, for high-explosive shell, Mk. II, and the base percussion fuze, Mk. I, for low-explosive shell, Mk. I.

(3) *Caution.*—See paragraph 31 *e*, TR 1370–A.

b. Base detonating fuze, Mk. IV.—(1) *Description.*—See paragraph 31, TR 1370–A, and Figure 7.

(2) When the gun is fired, the plunger (G), due to mass inertia or setback,[3] compresses the plunger spring (R) and at the same time

[3] The term "setback" is used to indicate the reaction to the force required to give any part of the projectile a forward movement in the bore of the gun. The expansion of the gases from the propelling charge creates a pressure in the chamber and bore of the gun, which results in a linear acceleration of the projectile. The inertia of any mass within the projectile resists this acceleration and tends to remain stationary. This resistance to the force accelerating the projectile is termed "setback" and is expressed in pounds per grain of the mass. Therefore, any mass not rigidly supported in the projectile will be given a relative motion toward the base of the projectile by this force, when the projectile is being accelerated in the bore of the gun.

shears or bends the shear pin (T). The firing pin (S) is restrained from creeping forward during retardation in flight by the creep spring (F).

(3) *Action on impact.*—On impact, the firing pin (S) travels forward, overcoming the resistance of the creep spring (F) and strikes the primer (M), and the explosion therefrom is transmitted to the detonator (K) which functions the shell charge.

c. Base percussion fuze, Mk. I.—This fuze is essentially the same as the base detonating fuze, Mk. IV. (See par. 31, TR 1370–A.)

7. Cartridge case.—*a.* The cartridge case used for 37-mm ammunition is known as the 37-mm cartridge case, Mk. I. It is stamped and marked as shown in Figures 4, 5, and 6.

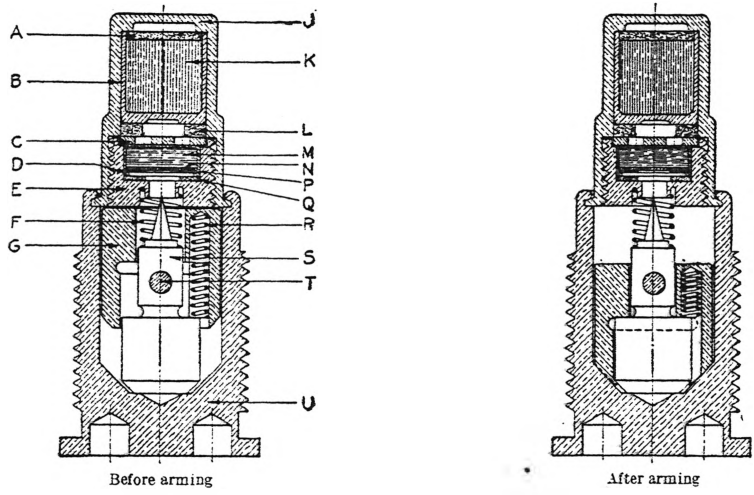


FIGURE 7.—Minor caliber base-detonating fuze, Mk. IV

b. The case is made of drawn brass and is 3.64 inches long. A projecting flange or rim is formed at the base of the case. This rim or flange functions as a stop for the round of ammunition when loaded into the gun. The extractor of the gun engages this rim to eject the cartridge case from the gun. The base of the cartridge case is drilled and counterbored to provide a seat for the primer.

c. For disposition of fired cartridge cases, see AR 775–10.

8. 20-grain percussion primer, Mk. IIA1.—(See par. 32, TR 1370–A.)

a. The primer used with 37-mm gun ammunition is the 20-grain percussion primer, Mk. IIA1, containing 20 grains of loose black powder.

b. Marking.—This primer is identified by the stamping on the head of the primer case as shown in Figure 4.

c. Shipment.—The primers are shipped assembled to the complete rounds of ammunition.

9. Propelling charge.—*a. General.*—(1) The propelling charge used in 37-mm gun ammunition is nitrocellulose smokeless powder. The quantity used is the same for high-explosive, low-explosive, and canister ammunition, the charge weighing approximately 500 grains, or slightly more than 1 ounce. Since the weight of the projectiles for high-explosive and canister ammunition is approximately the same, they have about the same velocity, which is 1,276 feet per second.

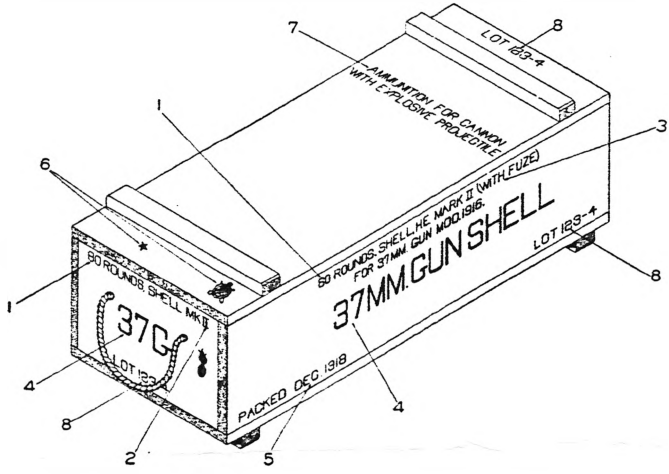


FIGURE 8.—Representative marking on packing box, 37-mm. ammunition

1. Number of complete rounds packed in box.
2. Mark number of shell.
3. To show that fuze is assembled in shell.
4. Caliber of gun for which ammunition is intended.
5. Month and year of packing.
6. Inspection stamps and name of place where packed.
7. To comply with I. C. C. Regulations ("Ammunition for cannon with explosive projectile").
8. Ammunition lot number.

NOTE.—Both ends of box are marked alike. Side not shown is address side of box, containing shipping instructions, etc.

The greater velocity (1,312 feet per second) of the low-explosive ammunition is due to the lesser weight of the projectile. The weight of the charge may vary slightly with different lots of powder, as it is adjusted to give the prescribed muzzle velocity. In some of the older lots of ammunition, a felt wad was placed over the propelling charge, directly under the projectile. This practice is no longer in use.

(2) The propelling charge is contained in the cartridge case, as shown in Figure 1.

(3) The propelling charge powder used in 37-mm gun ammunition is granulated in the form of single perforated grains, each grain being about 0.03 inch in diameter and 0.085 inch long. The diameter of the perforation is about 0.007 inch, leaving a web thickness of approximately 0.012 inch.

(4) This powder is affected by moisture, and extreme care should be exercised to keep the complete round in a dry condition.

(5) The maximum allowable pressure for the 37-mm gun, M1916, is 18,500 pounds per square inch.

b. Action.—The propelling charge, which is ignited by means of the black powder in the primer, burns rapidly and generates a large volume of gas which forces the projectile from the bore. The rate of burning of the propelling charge is dependent upon the area

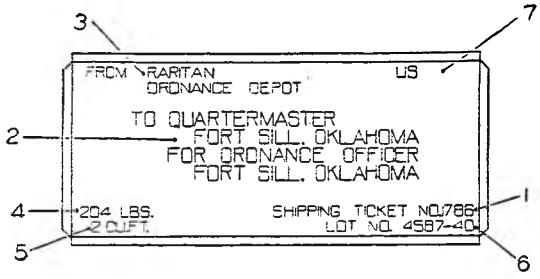


FIGURE 9.—Address side for all packing boxes

1. Number of shipping ticket.
2. Designation and address of consignee (as shown on shipping instructions).
3. Consignor.
4. Gross weight in pounds.
5. Cubic displacement in cubic feet.
6. Ammunition lot number.
7. To indicate United States property.

NOTE.—Shipping officers may omit 2 and 3 in carload shipments.

of the burning surface, which in turn is dependent upon the form of grain and grain dimensions.

10. Packing of assembled rounds.—*a. General.*—Complete rounds of ammunition for the 37-mm gun, M1916, are packed and shipped in wooden boxes (fig. 8), each box containing 60 rounds of either high-explosive shell, low-explosive shell, or canister. For further representative details, see TR 1370–A.

b. Packing box.—(1) *Dimensions.*—The packing boxes used for high-explosive shell and canister have the following dimensions: 20 inches long, 12¾ inches wide, 10⅜ inches high, including cleats; those used for low-explosive shell are 19$^{9}/_{16}$ inches long, 12$^{5}/_{16}$ inches wide, and 9⅞ inches high, including cleats. For representative marking, see Figure 8. The address side of all boxes is shown in Figure 9.

(2) *Weight.*—The weight of the packing box is approximately 20 pounds, and the weight of a box containing 60 complete rounds of high-explosive or canister ammunition is 121 pounds. The weight of a box containing 60 complete rounds of low-explosive ammunition is 105 pounds.

(3) *Care in handling.*—The high-explosive and low-explosive shell being loaded and fuzed, great care must be exercised at all times in handling and transportation to avoid accidents.

[A. G. 062.12 (5-15-29).]

BY ORDER OF THE SECRETARY OF WAR:

DOUGLAS MacARTHUR,
General,
Chief of Staff.

OFFICIAL:

C. H. BRIDGES,
Major General,
The Adjutant General.

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