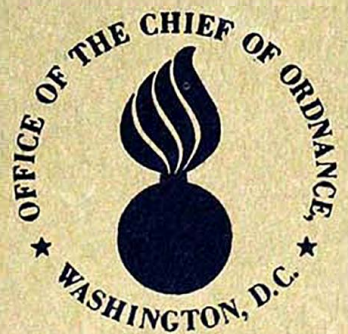
Record of Army Ordnance Research and Development

VOLUME 2

SMALL ARMS AND SMALL ARMS AMMUNITION

BOOK 2

Small Arms Ammunition



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CHAPTER 18—PACKAGING OF SMALL-ARMS AMMUNITION

INTRODUCTION

The manufacture of small-arms ammunition, the characteristics of which meet the requirements of the using services, is but the initial step in the supply and issue of this materiel to the military forces. Because of transport and storage hazards, it is necessary that ammunition be adequately packaged to withstand rough handling and improper storage, since small-arms cartridges are particularly susceptible to damage and corrosion which render them unserviceable.

Before World War II, as well as during its early stages, small-arms ammunition was packaged in sealed terneplate metal liners in wood boxes. The metal liners were solder sealed, and a wire hand grip attached to the cover served to tear or rip the cover from the liner. The wooden boxes were of nailed type construction, and the cover was secured to the box by means of six bolts and thumb nuts. The standard container for caliber .30 and caliber .50 ammunition was the M1917 wood box with liner, which had a volume displacement of 1.5 cubic feet and gross weight, packed, of from 92 to 110 pounds, dependent on the type of cartridge and its packaging. The standard shipping container for caliber .45 ammunition was the M1911 wood box and liner, which had a displacement of 1 cubic foot and a gross weight, filled, of approximately 120 pounds. The majority of all cartridges was packed in bulk, in paperboard cartons.

Comparatively small quantities of ammunition were packaged in functional assemblies designed for ready use:

a. In fabric belts and metallic link belts for machine guns.

b. In 5- and 8-round clips for rifles.

In general, assembly for use with a particular weapon was accomplished by troop loading in the field.

Although experience in peacetime had ordinarily been satisfactory, reports from various combat theaters indicated that the M1911 and M1917 packing boxes for small-arms ammunition were unsatisfactory in service because of:

a. Excessive weight and bulk for individual transport by troops or native bearers.

b. The large number of ruptured liners and broken boxes in transport and by rough handling.

c. Ammunition corroded and rendered unserviceable by leaky containers.

The most common reports received from the field relating to desirable characteristics of small-arms ammunition packaging stressed the need for small unit containers of gross weights which made possible easy transport by individuals over the difficult terrain of mountain and jungle as well as directly to front line areas. It was further desired that containers preserve their contents in waterproof condition under adverse conditions; be of sufficiently rugged construction to withstand ordinary battle usage, yet be classed as expendable items; be constructed of nonflammable materials; and the packing to be in assemblies adaptable to ready use with the appropriate weapons.

Because of the large quantities of ammunition required for use with ground machine guns, the field belting of which would present problems of special equipment and man power, expendable small metal boxes were developed and adopted as containers for prebelted cartridges. This type box was suitable both as a shipping and storage container, and could be used as an ammunition ready box with the appropriate weapon. These boxes were packed initially at factory or depot and their contents could be fed directly to a gun without the necessity of transferring the ammunition to special chests or feed boxes before firing.

Quantity production of expendable metal boxes for both caliber .30 and caliber .50 ground machine gun ammunition enabled supply of that type container to reach combat theaters in 1943. Experience gained from field storage and combat use indicated that the design of the boxes was satisfactory except that the rubber composition gaskets used to close the boxes did not maintain watertight seals. The development of synthetic rubbers and new compounds resulted in improved gaskets with better waterproof qualities.

After the United States entered World War II, there was a critical shortage of tin and other metals. To conserve stocks of those materials, development projects were conducted to test wax-impregnated or wax-dipped paperboard cartons as ammunition box liners. This type packing was standardized for caliber .45 ammunition, and was employed for a limited time, but field experience with ammunition in this type container dumped on beachheads and exposed to the weather for some time indicated conclusively that the waxed liner was a failure as protective packing, particularly when subjected to high temperatures and extreme humidity. The use of waxed containers for ammunition packed for overseas shipment

FIGURE 141—SMALL-ARMS AMMUNITION AT IWO JIMA

was terminated in July 1943, except where such containers were further inclosed in metal liners, or were used solely for items shipped from manufacturing facilities to depots for repacking before shipment to combat theaters.

Development of other new packagings to replace the M1911 and M1917 boxes was projected in accordance with field experience that gross weight of small-arms ammunition packs wherever possible should not exceed 50 pounds. Where it was not feasible to adhere to the 50-pound weight limit, the package should break down into self-contained units sufficiently light to be transported by troops or native bearers over difficult terrain. To afford a maximum of protection under conditions of rough handling and adverse climate, rolled-seam hermetically-sealed metal cans were designed as unit containers. Desirable features incorporated in such cans included the following:

a. Wire carrying handles.

b. Conventional tear strip method of opening the can with a hand-operated key.

c. Enamel coating to provide protection against corrosion and to serve as a camouflage agent.

Special cleated end type nailed wood boxes reinforced with tie bolts and metal strapping were designed as packing and shipping boxes for the several different sizes of metal cans. Those boxes were made strong enough to meet the most severe transportation hazards which might be encountered.

The initial rolled-seam type hermetically-sealed can was adopted in November 1943, and packing operations were instituted in March 1944. The success of this type of packing was followed by the design and adoption of that type container for all small-arms ammunition, other than for ground machine guns, employed in field operations. Evidence that these containers successfully met requirements of the using services was contained in reports from combat theaters and by statements of personnel experienced in handling of small-arms ammunition.

Modern packages for small-arms ammunition items have been developed to replace all old packages in existence at the outset of World War II (figs. 142 and 143).

PART I — AMMUNITION CONTAINERS FOR GROUND USE

Before 1940, four types of packaging were authorized by the Ordnance Department for caliber .30 ammunition for use of Ground Forces:

(a) Bulk in cartons:
Twenty rounds per carton; seventy-five cartons per metal lined M1917 wood box.

(b) In clips in cartons:
Five rounds per clip; four clips per carton; 75 cartons per metal lined M1917 wood box.

(c) In clips in bandoleers:
Five rounds per clip; twelve clips per bandoleer; 20 bandoleers per metal lined M1917 wood box.

(d) Machine gun belts (ground use):
250 rounds per fabric belt; five belts per metal lined M1917 wood box.

It had long been the desire of the using services that small-arms ammunition be issued in packagings appropriate to its end use, particularly that for machine gun use. With the opening of the military reequipment program in 1939, a study of the broad aspects of ammunition requirements indicated the impracticability of supplying small-arms types in using assemblies because:

(a) Consumption of ammunition at that time was not immediate; the issue of oldest lots first effected the turnover in war reserve stocks during approximately 8 years.

(b) Deterioration of ammunition in storage necessitated continuous surveillance and repacking.

(c) The types of loading ratios and functional assemblies required by the different services were too numerous.

In March 1940,[1] the Chief of Ordnance recommended that **for peacetime only**, caliber .30 ammunition be supplied to the using services in two packagings only:

(a) The 20-round carton; the ammunition to be loaded by troops into clips or belts as required by the weapon and the tactical mission.

(b) In 5-round clips loaded at arsenals; still the clip was not well suited to filling by hand.

This policy in general was concurred in by the Chiefs of Infantry[2] and Cavalry.[3] The Chief of the Air Corps[4] concurred in the basic packing provided that before issue to Air Corps units such ammunition be repacked at Ordnance Arsenals or Field Service establishments in metallic link belts as required. At that time such a procedure was not impossible since the ammunition requirements of the Air Corps were relatively small.

SECTION I — EXPENDABLE METAL BOXES

A. CALIBER .30 AMMUNITION FOR MACHINE GUNS

The acceleration of the military training program and defense preparations indicated that the separate issue of ammunition and machine gun belts, which required belting be accomplished by troops (fig. 144), introduced a serious problem in field operation and made it difficult to keep machine guns in operation. Troops in the field had neither time nor facilities for repacking ammunition in functional assemblies (fig. 145). This reopened the question of supply of ammunition to the services in assemblies packaged for ready use with small-arms weapons. A communication[6] from Armored Force Headquarters requested that: "a project be initiated without delay to supply units of the Armored Force with .30 caliber ammunition, loaded in expendable belts of approximately 250 rounds, in the ratio four armor-piercing, one tracer, and that these belts be loaded in expendable metal containers attachable to gun or tank."

FIGURE 142—CONTAINERS FOR SMALL-ARMS AMMUNITION

TOP ROW: OLD CONTAINERS
BOTTOM ROW: NEW CONTAINERS

STANDARD PACKAGING OF SMALL-ARMS AMMUNITION

1 January 1946

		CONTAINER				SHIPPING CASE					
	UNITS PACKED per container	CONTAINER	ROUNDS	WEIGHT lb. oz.	LENGTH width height	CASE	CONTAINERS per case	ROUNDS	WEIGHT lb. oz.	LENGTH width height	VOLUME cu. ft.
Cal. .22 Long Rifle	10-50 rnd cartons in commercial carton	M10 Can	3,000	24	6.162" 5.476 8.438	M12 Box	2 M10 Cans	6,000	58	14 3/16 10 1/8 7 7/8	.7
Cal. .22 M 24	1 50 rnd carton	Waterproof envelope.	50	7	2.5 1.35 1.2	Packed in E-14 Jungle Kits, for Army Air Forces.					
Cal. .30 Carbine	16-50 rnd cartons	M6 Can	800	24 12	7.912 4.226 7.812	M7 Box	2-M6 Cans	1,600	58	11 13/16 9 1/2 9 11/16	.6
Caliber .30 Rifle — Bulk pack	12-20 rnd cartons	M8 Can	240	16	6.917 4.167 10.56	M9 Box	2-M8 Cans	480	42	13 15/16 10 1/8 8 5/8	.7
Caliber .30 Rifle	4-60 rnd bandoleers 5 rnd clips	M8 Can	240	17	6.917 4.167 10.56	M9 Box	2-M8 Cans	480	44	13 15/16 10 1/8 8 5/8	.7
Caliber .30 Rifle	5-48 rnd bandoleers 8 rnd clips	M8 Can	240	18	same as above	M9 Box	2-M8 Cans	480	46	same as above	.7
Caliber .30 M. G.	1-275 rnd belt metal link	M1A1 Box metal	275	22	11 3 13/16 7 1/4	Wirebound Box	4-M1A1 boxes	1,100	92	17 3/8 11 7/16 8 1/16	1
Caliber .45 M 15 Shot	12-50 rnd cartons	M5 Can	600	28 4	6.162 5.476 8.031	M3 Box	2-M5 Cans	1,200	67	14 3/16 9 11/16 7 7/8	.6
Caliber .45 M 15 Shot	1-20 rnd carton	Waterproof envelope.	20	12	5 1.5 1.2	Packed in E-12 Jungle Kits, for Army Air Forces.					
Caliber .50	1-105 rnd belt metal link	M2 Box metal	105	34 12	12 1/4 6 11/32 7 1/2	Wirebound Box	2-M2 Boxes	210	75	14 11/16 12 11/16 8 1/16	.92
Caliber .50	1-55 rnd belt metal link	M10 Can	55	17 8	6.162 5.476 8.438	M12 Box	2-M10 Cans	110	45	14 3/16 10 1/8 7 7/8	.7
Caliber .50	6-10 rnd cartons	M10 Can	60	17	same as above	M12 Box	2-M10 Cans	120	44	same as above	.7
Grenade Cartridges	"A" Assortment 10-M3, 6-M6, 5-M7.	M13 Can	21	12	3 49/64 1 61/64 3	Packed with grenades, (rifle).					
Grenade Cartridges	"B" Assortment 10-M3, 6-M6.	"	16	10	"						
Grenade Cartridges	"C" Assortment 10-M3, 6-M6, 10-M7.	"	26	14	"						
12 ga. Shotgun No. 8	12-10 rnd cartons	M10 Can	120	15	6.162 5.476 8.438	M15 Box	3-M10 Cans	360	55	19 3/4 10 1/8 7 7/8	.9
12 ga. Shotgun 00 Buck	12-10 rnd cartons each in waterproof env.	M10 Can	120	19	same as above	M12 Box	2-M10 Cans	240	48	14 3/16 10 1/8 7 7/8	.7

FIGURE 143—STANDARD PACKAGING OF SMALL-ARMS AMMUNITION

FIGURE 144—BELTING CALIBER .30 MACHINE GUN AMMUNITION IN THE FIELD

FIGURE 145—AMMUNITION STACKED ON BEACH AT RENDOVA AFTER ATTACK AND LANDING BY AMERICAN TROOPS

The use of a single standard size container for packing belted ammunition for issue and use with machine guns in the manner requested by the Armored Force, while considered ideal and desirable, appeared attainable in part only. The supply problem was complicated by:

(a) The number of types of weapons.
(b) The different ammunition loading ratios required.
(c) There were some 20 different sizes of stowage and feed containers in use with the existing armored vehicles.
(d) Container size was restricted by movement of the gun mount through various degrees of elevation, depression, and traverse.

Factory packing of machine gun ammunition in expendable belts and shipment in expendable containers which were waterproof and gasproof was recommended in 1936 by the Infantry Board.[7] With the reemphasis placed by the Armored Force in 1940—1941 on expendable waterproof containers to supply armored units with factory packed small arms ammunition for employment with machine guns, there was authorized and initiated early in 1941 a project[8] to standardize a limited number of boxes for caliber .30 and for caliber .50 machine gun ammunition which would be adaptable to all possible using services.

The first phase of the project was the development of an expendable container for the 250-round fabric belt for use with caliber .30 machine guns. The standard ammunition box employed at that time for ground guns was the Chest, Ammunition Belt, Caliber .30,[9] which was constructed of wood, was not expendable, and was issued as an accessory to the weapon. In order to guide development of expendable type containers adaptable to factory packaging of ammunition and shipment to the using services in ready for use assembly, the following tentative specifications were set up:

(a) Airtight and watertight under all climatic conditions.
(b) Capable of preserving contents in storage for an indefinite period.
(c) To package one 250-round belt of ammunition weighing approximately 16 pounds.
(d) Sufficiently rugged to withstand rough usage when transported as an individual container.
(e) A carrying handle which will not interfere with stacking of boxes.
(f) Easily opened without tools.
(g) Maximum exterior dimensions: 3⅞ x 7⅜ x 12¼ inches.

In collaboration with the U. S. Bureau of Standards and several trade facilities of the container industry, extensive study and examination were conducted of container designs and materials. The investigation included ferrous metals, paperboard, wood, and plastic materials. Experimental containers made of plastic compositions were procured through Rock Island Arsenal and shipped to the Armored Board,[10] Cavalry Board,[11] and Infantry Board[12] for tests to determine its suitability for use with the M1917A1 tripod mount. Before the plastic box tests, sample metal boxes which incorporated improved designs were submitted. The metal boxes proved very promising and Headquarters, Army Ground Forces,[13] stated that testing of the plastic containers was not necessary. Since plastic products contained considerable percentages of extremely critical raw materials, further work on containers manufactured of plastics was discontinued.

Sample containers for 250-round belts of caliber .30 ammunition were produced by interested manufacturing facilities for submission to the Ordnance Department and the using services for examination and evaluation. In general, sheet metal or fiberboard materials were used in construction of the various items. Types selected for further development were those which incorporated characteristics required by the services. Procurement of adequate quantities of the following designs for experimental and service tests was authorized by the Ordnance Technical Committee:[14]

a. DEVELOPMENT TYPES

1. **Box, Ammunition, Caliber .30, T4**[15]

Facility —City Auto Stamping Company, Toledo, Ohio.

Quantity —1,500 boxes.

Design —Rectangular box with removable cover. An indented section on each end of the box just under the body rim was designed for smooth feeding of the belt over the rim.

Material —Sheet steel stamping.

Dimensions —Exterior: 3⅞ x 7⅜ x 12½ inches.

Weight —Empty: 3 lb., 10 oz.
Loaded: 19 lb.

Volume —350 cu. in.

Hardware —Cover secured to box by a revolving cam-operated latch at each end of the box, a lip on the latch engaging a catch on the cover rim. D-ring handles on the latches facilitated removal of boxes from stowage racks.

Seal —Luting compound (putty) applied to cover channel.

Handle —A separate web harness with hand holds.

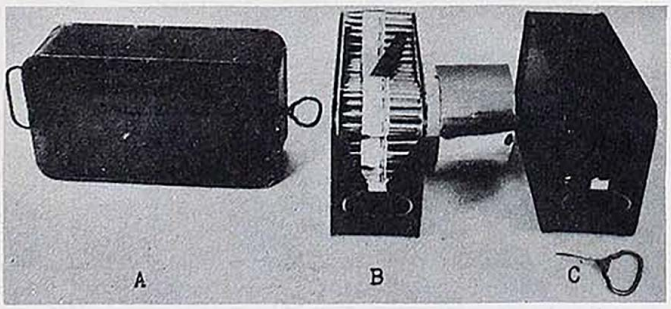

FIGURE 146—BOX, AMMUNITION, CALIBER .30, T4 SERIES
A—T4 BOX (UNSATISFACTORY SWIVEL TYPE LATCH)
B—T4 BOX, TOP VIEW (NO CARRYING STRAP)
C—T4 BOX, OPEN
D—T4E1 BOX (EXCELLENT LEVER TYPE LATCH)
E—T4E1 BOX, TOP VIEW (EXCELLENT WEB CARRYING STRAP)
F—PIN TYPE HINGE ON T4E1 BOX
G—SHOWING HINGED TOP OF T4E1 BOX
(NOTE: T4E1 BOX IS SATISFACTORY IN EVERY RESPECT)

The T4 box (fig. 146) was tested by the Infantry Board,[16] the Cavalry Board,[17] the Armored Force Board,[18] and the Aberdeen Proving Ground[19] with the following results:

A. **Advantages:**

Sufficiently durable for transport in pack equipment, or in regular shipping containers.

Good waterproof qualities.

Ease of handling due to light weight.

Small cubic volume facilitated packing in armored vehicles, weapons carriers and ammunition trucks. Regular shape facilitated storage.

Box unaffected by temperature ranges between 10° F and 200° F.

B. **Disadvantages:**

Cover latches inadequate to keep cover secured to box when subjected to rough handling.

Dimensions of box did not permit its use in pack hangers or in stowage compartments of standard tanks.

No means for attaching box to machine gun mount brackets which facilitated feeding belted ammunition to weapons.

Cover not attached to box with cover in open position.

Web carrying strap not attached to box and subject to being lost.

Metal handles (D-rings) rattle against box body and create noise during pack transport.

Cartridges hang on rim of box body while belt is fed from box to weapon.

C. **Conclusions:**

The T4 box in the form presented was not acceptable.

A pin type hinge should be installed in place of one cover latch.

A trunk type latch would be more adaptable to securing the cover to the box.

The web carrying strap should be fixed to the box cover.

2. **Box, Ammunition, Caliber .30, T4E1**

Facility —City Auto Stamping Company, Toledo, Ohio.

Quantity —15 items.

Design —The T4E1 design (fig. 146) was a modification of the T4 model. It was rectangular and fitted with a cover which could be removed after opening if desired, particularly in tanks with stringent space limitations. A small sheet metal roll was attached inside and below the body rim on each end of the box to facilitate feeding ammunition from box to weapon (fig. 147).

Material —Sheet steel stamping.

Dimensions —Exterior: 3⅞ x 7⅜ x 12¼ inches.

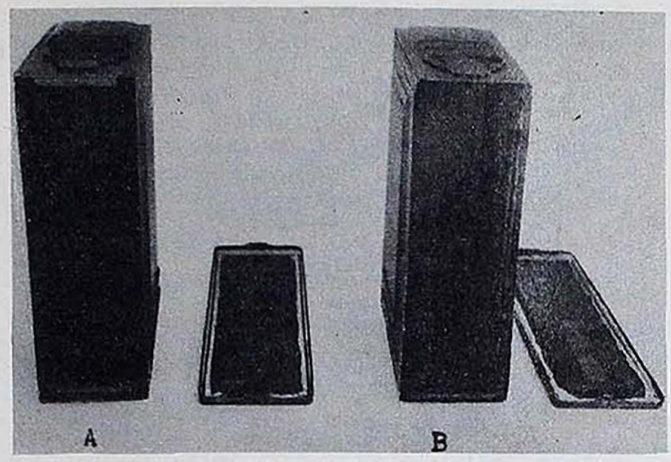

FIGURE 147—BOXES, AMMUNITION, CALIBER .30, T4 AND T4E1

A—AMMUNITION BOX T4 MODIFIED. SHOWING WELDED ROLL FOR EASIER FEEDING OF BELT
B—AMMUNTION BOX T4 UNMODIFIED
(NOTE: TESTS SHOW ROLL IN "A" IS UNNECESSARY)

Weight	—Empty: 3 lb., 13 oz. Loaded: 19 lb.
Volume	—350 cu. in.
Hardware	—Cover hinged to one end of box by simple pin which was easily removed when desired. A trunk type draw-down latch secured the cover.
Sealing	—Luting compound (putty).
Handle	—Web strap attached to box cover.

Results of tests of the T4E1 box by the Infantry Board,[20] the Cavalry Board,[21] the Armored Force Board,[22] and Aberdeen Proving Ground[23] were as follows:

A. **Advantages:**

Sturdiness, durability and shape generally satisfactory.
Easily disposed of when empty.
Carrying strap attached to box cover.
Trunk type pull-down latch.
Ammunition belt fed from box with the cover partially open, protecting box contents from rain.

B. **Disadvantages:**

Dimensions of box too large to stow in medium tanks.
No means for attaching box to caliber .30 machine gun mount M1917A1.
Sealing compound not completely effective for waterproofing the container.
Weight greater than that of the T5, T6, T7, and T8 types.

C. **Conclusions:**

The T4E1 box was the best of the types tested by the Infantry Board and was considered suitable for infantry use.
With certain modifications, the T4E1 was considered suitable by the Cavalry Board for use by cavalry troops.
Excess dimensions of the T4E1 box made it unsuitable for use by the Armored Force.

3. **Box, Ammunition, Caliber .30, T5**[24]

Facility	—American Can Company, New York, New York.
Quantity	—400 items.
Design	—Rectangular roll-seam type metal can. A conventional tear strip operated with a wire hand hold on the starting end enabled opening the top side of the container for the ammunition belt to feed from.
Material	—Terneplated sheet metal.
Dimensions	—Exterior: 4 x 7 x 11¾ inches.
Weight	—Empty: 2 lb. Loaded: 17 lb.
Volume	—329 cu. in.
Hardware	—Heavy wire carrying handle.
Sealing	—Hermetically sealed (roll seamed).
Handle	—Wire ring carrying handle attached to end of can.

Testing of T5 containers (fig. 148) by the Infantry Board,[20] the Armored Force Board,[25] and Aberdeen Proving Ground[23] resulted in the following findings:

A. **Advantages:**

Light weight.
Excellent waterproof qualities.
Shape of container suitable for easy stowage.
Withstands considerable abuse.
Easily disposed of when empty.

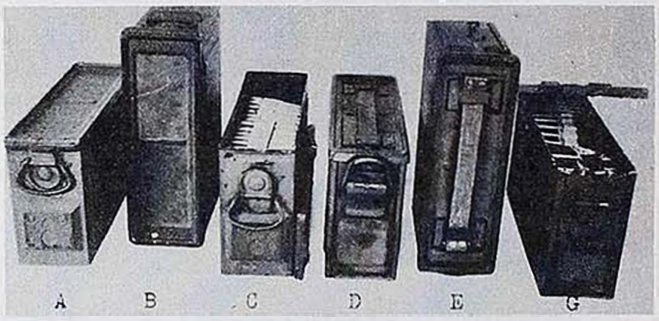

FIGURE 148—BOX, AMMUNITION, CALIBER .30, T5

A—T5 BOX SHOWING CARRYING RING AND RING FOR RIPPING HERMETIC SEAL
B—T5 BOX WITH HERMETICALLY-SEALED TOP RIPPED OFF
C—SHOWING FREQUENTLY RECURRING FAILURE OF "SARDINE CAN" OPENER

B. **Disadvantages:**

Solder seam of cover section at opener ring is easily ruptured, with resultant leaky containers.
Similarity of opener ring and carrying handle leads to mistaken identity and often results in inadvertent grasping of opener ring and ripping container open.
The tendency of the cover tear strip to rip elsewhere than along the scored seam.

Carrying handle not comfortable and unsuitable for easy transport.
No means of attaching box to machine gun mounts and cradles.
Dimensions of box too great to fit stowage compartments in tanks.

C. **Conclusions:**

The T5 container was not satisfactory for field use. Container had limited suitability for ammunition storage, shipment and use in static defense.

4. **Box, Ammunition, Caliber .30, T6**[26]

Facility —Woodall Industries, Inc., Detroit, Michigan.
Quantity —1,500 items.
Design —A rectangular fiberboard carton of the set-up type, dipped in wax after loading to waterproof. A rip cord with pull tab attached was incorporated in the cover assembly to assist in easy opening of the box.
Material —Solid fiberboard, and pressure sensitive adhesive tape.
Dimensions —Exterior: 3¾ x 7 x 11¾ inches.
Weight —Empty: 1 lb., 3 oz.
Loaded: 16 lb., 9 oz.
Volume —309 cu. in.
Sealing —Fiberboard cover secured to box body by adhesive tape. Rip cord with starting tab affixed under the tape for quick removal of the cover.
Handle —No carrying handle. A separate web harness with hand grips was proposed for carrying.

Service tests of the T6 container (fig. 149) by the Infantry Board,[27] the Armored Force Board,[18] and Aberdeen Proving Ground[19] resulted in the following conclusions:

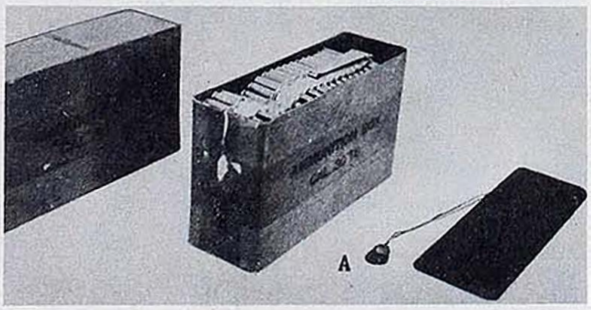

FIGURE 149—BOX, AMMUNITION, CALIBER .30, T6
(NOTE THAT A PULL ON THE TAB "A" CAUSES PARAFFIN PAPER SEAL TO BE CUT BY STRING. RIPPING TOP OFF)

A. **Advantages:**

Light weight.
Small volume.
Shape facilitates stowage in weapon carriers, ammunition trucks and armored vehicles.
Easily disposed of when empty.

B. **Disadvantages:**

Box not sufficiently rugged to withstand rough usage without splitting open at the edges (fig. 150).
Cover seal and opening tab are easily damaged.

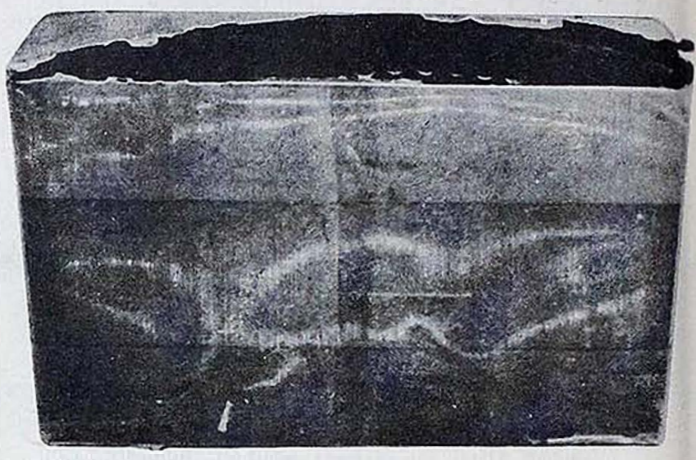

FIGURE 150—BOX, AMMUNITION, CALIBER .30, T6—DAMAGE RESULTING FROM ROUGH HANDLING

Waterproof qualities are inferior under prolonged immersion.
Wax coating becomes soft at high temperatures (approximately 150° F) making the container slick and difficult to handle.
No carrying handle provided.
No device for attaching box to machine gun mounts.
Dimensions of box too great to stow in tank compartments.

C. **Conclusions:**

The T6 type container was not suitable to meet the requirements of the Ground Forces.

5. **Box, Ammunition, Caliber .30, T7**

Facility —Reynolds Metals Company, Richmond, Virginia.
Quantity —400 items.
Design —A knock-down rectangular fiberboard box which after loading was inclosed in a moistureproof outer envelope. Opening of the container was accomplished by inserting a finger in a puncture hole on the end of the box wrapper, then stripping off part of the outer wrapper and lifting the top from the inner carton.
Material —The inner box was made of asphalt-impregnated solid fiberboard. The outer envelope or bag was made of a laminated material composed of a layer of asphalt kraft paper, a thin layer of lead foil, and a layer of thermoplastic film.
Dimensions —Exterior: 4 x 7½ x 12 inches.
Weight —Empty: 1 lb., 10 oz.
Loaded: 16 lb., 10 oz.

Sealing —Outer waterproof wrapper or envelope sealed by heat applied to seam closure, to effect an airproof and waterproof container.

Service tests of the T7 container (fig. 151) by the Infantry Board,[20] the Armored Force Board,[28] and Aberdeen Proving Ground[29] gave the following results:

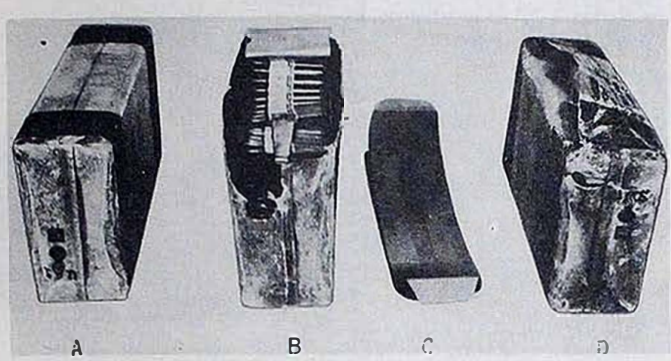

FIGURE 151—BOX, AMMUNITION, CALIBER .30, T7

A—T7 BOX
B AND C—SHOWING MOISTUREPROOF LINER AND FIBER TOP RIPPED OFF (NOTE LEAD FOIL INNER LINER)
D—SHOWING DAMAGE TO CORNERS AND TOP FROM ROUGH HANDLING

A. **Advantages:**

Light weight and small bulk.

Regular shape facilitates storage and stowage.

Easily disposed of when empty.

Waterproof and sandproof qualities.

B. **Disadvantages:**

No self-contained carrying strap or ring.

Inability to withstand considerable rough handling.

Dimensions too large to fit then standard tanks and armored cars.

No means of attaching box to the M1917A1 machine gun mount.

Combustible materials of which box was fabricated unsatisfactory for use in tanks.

C. **Conclusions and Recommendations:**

Container not satisfactory for field use by the infantry, but might be suitable for storage, shipment and use in static defense.

Container failed to meet requirements of the Armored Forces.

6. **Box, Ammunition, Caliber .30, T8**

Facility —Reeves Steel and Manufacturing Company, Dover, Ohio.

Quantity —200 items.

Design —A rectangular box with separate cover. Embossings in bottom, sides, and top to add stiffness and strength.

Material —Sheet metal stampings.

Dimensions —Exterior: 4 x 7½ x 12½ inches.

Weight —Empty: 3 lb.
Loaded: 18 lb.

Volume —375 cu. in.

Hardware —Positive action small trunk type pull-down latches on each end secured the cover to the box. Carrying handles on each end facilitate transport by hand and removal from stowage racks. Bottom double lock seamed to box body; body joined by a single vertical lock seam.

Seal —Luting compound (putty) applied to rim channel of the box cover.

Handle —Wire rings on each end of box.

Service tests of the T8 box (fig. 152) by the Infantry Board,[20] the Armored Force Board,[25] and Aberdeen Proving Ground[30] resulted in the following reports:

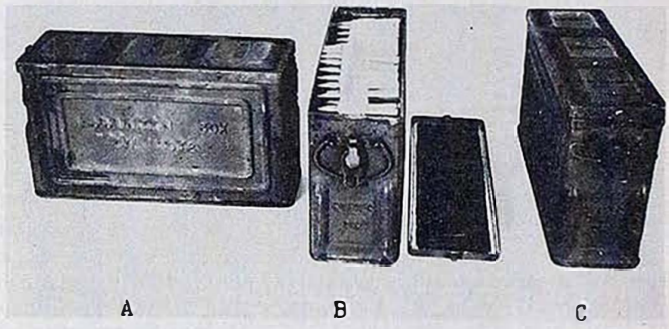

FIGURE 152—BOX, AMMUNITION, CALIBER .30, T8

A—T8 BOX. SIDE VIEW
B—T8 BOX. OPEN (CARRYING RING AND SPRING LATCH ARE IDENTICAL ON BOTH ENDS)
C—SHOWING DAMAGE TO CARRYING RING FROM ROUGH HANDLING

A. **Advantages:**

Sturdiness of box body demonstrated under rough handling and vehicular transport.
Cover latch an excellent closing device.
Light weight and easily portable.
Shape lends itself to ready storage.

B. **Disadvantages:**

No means of attaching box to machine gun mount brackets.
Carrying ring uncomfortable to hand.
Carrying ring too frail.
Luting compound seal not effective as waterproofing agent.
Size of box prevents stowage in standard tanks.

C. **Conclusions and Recommendations:**

The T8 box as presented not suitable for infantry use.

Dimensions of T8 box too large for use in standard Armored Force tanks.

Replace carrying rings with strap handle on box cover.

Replace one cover latch with a hinge similar to T4E1 box.

b. BOX, AMMUNITION, CALIBER .30, M1[31]

Service tests indicated that although each type container possessed certain desirable features, none of the experimental items (fig. 153) in the form presented met all requirements of the using arms.

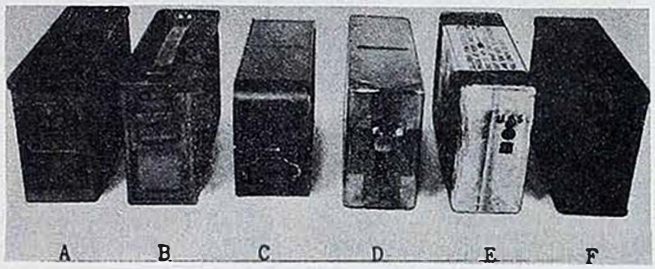

FIGURE 153—EXPERIMENTAL MODELS OF CALIBER .30 AMMUNITION CONTAINERS

A—T4 BOX—WEIGHT FULL—19 LB.
B—T4E1 BOX—WEIGHT FULL—18.85 LB.
C—T5 BOX—WEIGHT FULL—17 LB.
D—T6 BOX—WEIGHT FULL—16.56 LB.
E—T7 BOX—WEIGHT FULL—16.64 LB.
F—T8 BOX—WEIGHT FULL—18 LB.

Either the T4E1 or T8 boxes with minor modifications most nearly incorporated all desirable features. In order to obtain agreement of the interested services on further development, a conference was held on 16 April 1942 in Washington attended by representatives of the Army Ground Forces, the Infantry Board, the Cavalry Board, and the Armored Force Board. The meeting resulted in the suggestion for immediate standardization, without further development and service testing, of a metal container of the general design of the T4E1 and T8 boxes which would incorporate the best features of these models and certain desired features and dimensional changes agreed upon by all services. The general characteristics set up for such a container were:

(1) Airtight and watertight under all climatic conditions and for an indefinite period of storage.

(2) Sufficiently rugged to withstand rough usage when transported as an individual container.

(3) Metal carrying handle permanently attached to box.

(4) Easily opened without special tools.

(5) Cover to be removable or, if desired, to remain hinged to the box.

(6) Capable of being reclosed.

(7) Employ termite-proof and noncombustible materials.

(8) Adaptable to packing with ammunition at Field Service depots.

(9) Capable of attachment to the Mount, Tripod, Machine Gun, Caliber .30, M1917A1.

(10) Maximum exterior dimensions: Width—3¾ in.
Length—11 in.
Depth—7¼ in.

A container with the above features was standardized as Box, Ammunition, Caliber .30, M1,[32] as the packing container for all 250-round fabric belts of ammunition for caliber .30 ground machine guns (figs. 154 through 163). Although considered an expendable item, the M1 box was salvageable and could be reused. The item was in quantity production in the early fall of 1942.

FIGURE 154—BOX, AMMUNITION, CALIBER .30, M1 (HARASSING FIRE COVERING INFANTRY ADVANCE, SAINLEZ, BELGIUM, 9 JANUARY 1945)

FIGURE 155—BOX, AMMUNITION, CALIBER .30, M1 (FIRING AT JAPS, SITPUR, MYITKYINA, 8 SEPTEMBER 1944)

FIGURE 156—BOX, AMMUNITION, CALIBER .30, M1, ATTACHED TO MOUNT, TRIPOD, MACHINE GUN, CALIBER .30, M1917A1 (ON SIEGFRIED LINE, HABSCHIED, GERMANY)

FIGURE 158—BOX, AMMUNITION, CALIBER .30, M1 (ROZAL PROVINCE, P. I.)

FIGURE 157—BOX, AMMUNITION, CALIBER .30, M1 (PARACHUTE INFANTRY, CORREGIDOR, 19 FEBRUARY 1945)

FIGURE 159—BOX, AMMUNITION, CALIBER .30, M1 (COVERING ADVANCE MARIKINA RIVER, WAWA DAM, LUZON, P. I. 28 MAY 1945)

The shipping box adopted for use with the caliber .30, M1 metal box is described in the section on wood packing and shipping boxes for small-arms ammunition.

Waterproofing was of major importance in the M1 box. The watertight seal was to be effected by a gasket between the box rim and the cover. Because of the critical shortage of rubber and the severe restrictions on its use, rubber compounds were not available for manufacture of ammunition box gaskets, and difficulty was encountered in providing a substitute material which would effect a satisfactory closure and permit several reclosures. Research and development projects relating to sealing agents and compounds were conducted by various commercial facilities.[33] The first boxes produced were sealed with luting compounds (putty) which became hard after ageing, lost their resiliency, and were ineffective in maintaining waterproof closures. When reclaimed rubber, and later, synthetic rubbers, particularly Buna-S, became available, they were used for gaskets. Generally, compounds in plastic form were "flowed in" the gasket groove of covers and subjected to heat baking to provide a permanent sponge type gasket. Field reports have indicated varying percentages of failures of the M1 type box to be waterproof due to the seal being inadequate. No gasket seal has been found that assures 100 percent protection against water and permanent resistance to deterioration under weathering exposure and storage conditions.

FIGURE 160—BOX, AMMUNITION, CALIBER .30, M1
(KOLSCHEID, GERMANY, 16 OCTOBER 1944)

FIGURE 161—SNOW AND ICE ENCOUNTERED IN THE FIELD
(BELGIUM, 1 JANUARY 1945)

In order to determine whether production items of the M1 box met service requirements, tests were conducted by the Armored Force Board[34] and the Infantry Board[35] of items of initial production. The following general faults were reported:

(a) Design of and materials employed in gaskets did not produce waterproof closure.

(b) Shape of rear of box was such that when subjected to rough handling five or six bent rounds of ammunition resulted from the "bridging" effect.

(c) Difficulty of "nesting" boxes when stacked in piles.

(d) Design of cover hinge allowed covers to fall off easily. Hinge location caused wiping action on gasket when lid was closed.

(e) Paint coat was poor protection against rust.

To remedy the bent cartridges reported in subparagraph (b) above, pending correction of the fault in manufacturing set-ups, authorization[36] was given for a solid fiberboard pad 3 inches wide, 5 inches long, and 3/16 inch thick to be placed in the embossed section of the hinge end of each M1 box to reduce the "bridge" effect.

In March 1943 the Ordnance Committee[37] recommended the following changes in design and fabrication of the M1 box to correct the complaints noted above:

(a) Revise specifications covering box gasket so as to assure a better and more nearly waterproof seal.

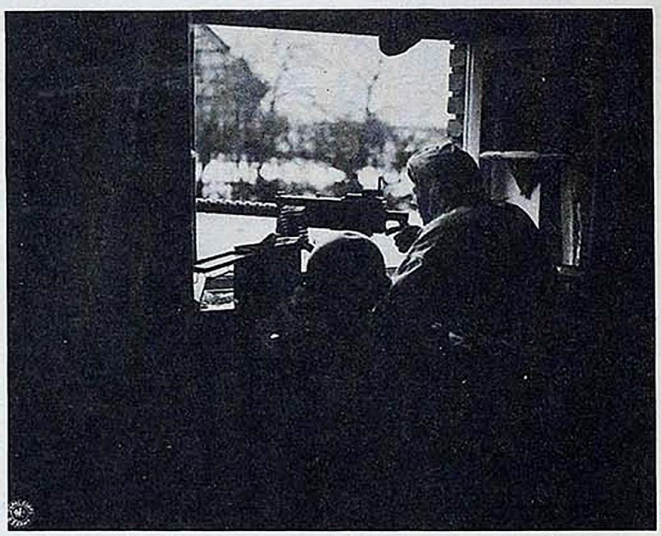

FIGURE 162—BOX, AMMUNITION, CALIBER .30, M1
(HERHAHN, GERMANY, 4 FEBRUARY 1945)

(b) Change contour of hinge end of box body to eliminate the "bridging" effect to cartridges and the necessity for a fiberboard filler pad.

(c) Modify embossing on bottom of box to improve its stacking.

(d) Adopt a slide-on hinge to replace the hook-on type.

(e) Require more stringent specifications for paint to assure adequate protection to box against rust and corrosion.

Informal tests and reports indicated that the M1 type boxes manufactured in accordance with the above authorized design changes and modifications were a decided improvement. Minor changes in manufacturing specifications were incorporated from time to time which further improved the container.

c. BOX, AMMUNITION, CALIBER .30, M1A1[38]

Reports from theaters of operations, based on actual experience in use, indicated the following most common

FIGURE 163—BOX, AMMUNITION, CALIBER .30, M1 (ACTION AT AACHEN, GERMANY, 15 OCTOBER 1944)

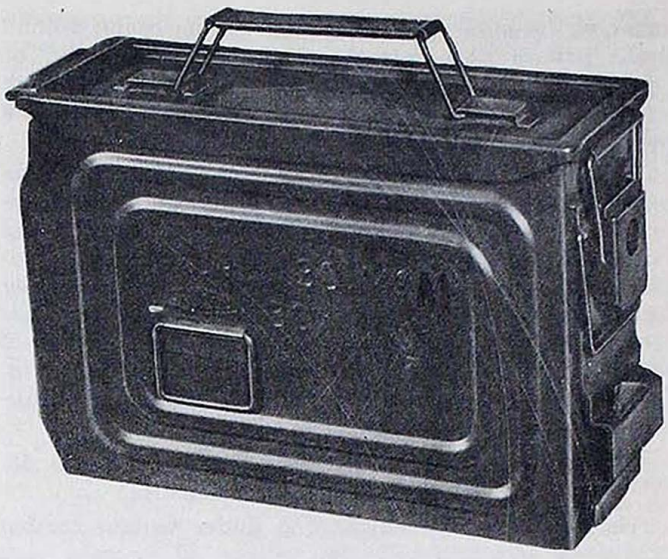

FIGURE 164—BOX, AMMUNITION, CALIBER .30, M1A1 (M1E1)

and serious complaints concerning the M1 ammunition box:

(a) Cover gasket did not provide a satisfactory watertight closure. This resulted in corroded cartridges and damp or water-soaked fabric belts.

(b) Volume inadequate to contain a 250-round belt of ammunition without undue pressure on cartridges, especially at the numerous folds of the belt, which resulted in M1 boxed ammunition reaching the field with dented and bent rounds.

(c) Type of cover hinge and its position on box contribute to the wiping action between the box rim and the cover gasket. This resulted in displaced gaskets and leaking containers.

(d) Cover handle link distorted when subjected to unduly rough handling. This permitted the handle to separate from the box.

To correct or eliminate the reported unsatisfactory features of the M1 box, improvement of the basic item was initiated by the Ordnance Department. The work was undertaken by the United Metal Box Company, Brooklyn, New York. The project covered modifications and changes to the standard box in order to provide a container with:

(a) Greater volume.

(b) Improved resistance to moisture penetration.

(c) Longer storage life.

(d) Hardware with improved functional features.

1. Box, Ammunition, Caliber .30, M1E1 (M1A1)

Samples of a container designated, Box, Ammunition, Caliber .30, M1E1(fig. 164) were presented to Headquarters, Army Ground Forces, for examination and informal tests by the interested services. The modifications incorporated in the M1E1 model did not affect the military characteristics set up for a container of this type, but were limited to refinement in design and improvement of functional features. The M1E1 box performed satisfactorily when subjected to tests at Fort Knox, Kentucky, and Aberdeen Proving Ground, Maryland, for stowage and use in ammunition compartments and weapons brackets of various automotive and armored vehicles. The design of the M1E1 incorporated the following features:

(a) Adequate volume to contain one 250-round fabric belt of ammunition.

(b) Suitable both for storage of ammunition and issue to combat troops.

(c) A cut or molded rubber compound cover gasket.

(d) Redesigned cover to accommodate the new type gasket.

(e) Carrying handle on top of box cover.

(f) Redesigned cover hinge, relocated to prevent the wiping action.

(g) Hemmed or rolled edge on box body rim.

(h) Redesigned closing hasp.

(i) New adapter to provide for more secure attachment of the box to the Mount, Tripod, Machine Gun, Caliber .30, M1917A1.

(j) Base of box welded to box body.

(k) Elimination of embossing on bottom. This increased the volume without change of exterior dimensions.

(l) Over-all exterior dimensions: Width—3 13/16 in.
Height—7 1/4 in.
Length—11 in.

(m) Weight—Empty: 3 lb., 9 oz.
Loaded: 18½ lb.

In an effort to reduce the number of dented and damaged cartridges, a new method of packing fabric belted caliber .30 ammunition in M1 or M1E1 boxes was devised. Belts of ammunition were prefolded on a jig so that when placed in the box, the belt packed in rectangular U-shaped layers with the belt feed tab located on the top

center of the pack. The belt fed from the center section of the box or pack into the weapon. Firing tests[39] of ammunition packed according to the new method in both M1 and M1E1 boxes indicated that the pack afforded a maximum of protection and a more uniform pack.

Although the M1E1 box did not fill the ultimate requirement for a waterproof container suitable for indefinite storage and protection to ammunition, it did incorporate definite tactical advantages and was an improvement over the M1 box. The M1E1 model container accordingly was standardized as Box, Ammunition, Caliber .30, M1A1, on 21 June 1945,[40] for the packing of belted ammunition for caliber .30 ground machine guns. The same action reclassified the Box, Ammunition Caliber .30, M1 as Limited Standard.

2. Adoption of Link, Metallic Belt, Caliber .30, M1 for Ground Machine Gun Use.

The unsatisfactory functioning under various combat conditions of fabric belts for caliber .30 machine gun ammunition was noted in numerous reports from the field, and comprehensive test programs were conducted in the spring of 1945 to determine the suitability of metallic links for belting ammunition for ground machine guns. The satisfactory functioning, as indicated by the tests of link belts of ammunition with standard caliber .30 ground machine guns, led to the adoption of the Link, Metallic Belt, Caliber .30, M1 for belting ammunition to be used with ground type weapons.[41] The packing of metallic-linked cartridges was in 275-round lengths of belt in the M1A1 box (fig. 165).

d. CONTINUING DEVELOPMENT

It was recognized that the M1A1 box, although an improvement over the M1 model, did not meet all military requirements for this type container.

A project was initiated in December 1944 to modify standard type boxes or to design a new container for caliber .30 machine gun ammunition. Investigation of various hermetically-sealed metal containers and of methods of manufacture indicated that it was not possible to incorporate in a hermetically-sealed container such required characteristics as: quick opening design, yet capable of effective reclosure; removable cover which could be reattached at will; and capable of being attached directly to the machine gun mount M1917A1.

Development work under Research and Development Order SPOTS 3883[42] was accomplished by the Lockwood Manufacturing Company, Cincinnati, Ohio, relating to metal containers of new designs with the following general characteristics:

(a) Waterproof qualities suitable for storage and field use of caliber .30 belted ammunition.
(b) Volume adequate to contain one 250-round belt of caliber .30 ammunition.
(c) Speedy and positive attachment to the M1917A1 mount.
(d) Simplicity of design for economy and ready manufacture of item in peacetime quantities.

1. Box, Ammunition, Caliber .30, T33 (fig. 166)

Design —Plain, rectangular, wrap-around body, seam-welded on one end and around the bottom; hemmed-edge at body rims; smooth surface, narrow-skirted cover.
Material —Sheet metal stampings.
Dimensions —Width—3 13/16 in.
Length—11 in.
Depth—7 1/4 in.

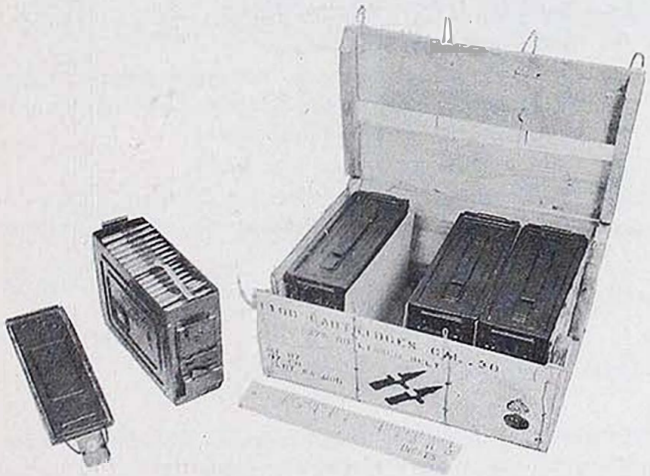

FIGURE 165—BOX, AMMUNITION, CALIBER .30, M1A1, CONTAINING 275 CARTRIDGES IN METALLIC LINK BELT PACKED IN WIREBOUND BOX FOR SHIPMENT

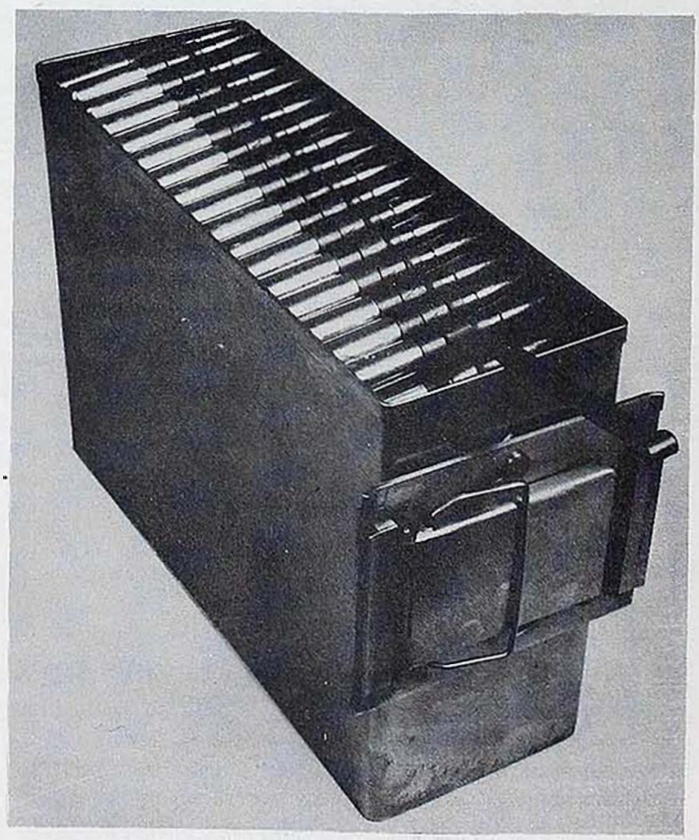

FIGURE 166—BOX, AMMUNITION, CALIBER .30, T33

Weight —3 lb., 13 oz.

Volume —Approximately 304 cu. in.

Hardware —Hinge on one end of box and cover of three-section pin-and-barrel type, permitting easy detaching and reattaching of cover to box. Adapter device with side channels to fit over the edges of the bracket on the M1917A1 mount. Adapter designed to rotate through a 90-degree arc to position the box for firing position. Closing hasp mounted on box adapter device.

Seal —Rubber composition gasket, 5/32 in. thick, secured in cover by metal retainer welded to inside of top.

Handle —Formed wire with formed sheet metal hand ferrule, mounted vertically on hinge end of box.

No sample lots were procured and no tests conducted on the T33 model, since other experimental types incorporated more desirable features and characteristics.

2. Box, Ammunition, Caliber .30, T33E1

Design —Box body and cover same as the T33 model.

Material —Sheet metal stampings.

Dimensions —Same as the T33 box.

Weight —3 lb., 11 oz.

Volume —Same as T33 box.

Hardware —Slide-on hinge similar to M1A1 box. Push-down toggle type closing hasp the same as on the M1A1 box. Same spring operated adapter device as on the M1A1 box.

Seal —Same rubber composition type gasket as the T33 box and secured by the metal retainer welded to the inside of the cover.

Handle —Hand ferrule type same as the M1A1 box, but attached to hinge end of box in a vertical position.

No experimental samples of the T33E1 box were procured, and no tests were conducted, since it was indicated upon examination by competent personnel that other models offered greater advantages.

3. Box, Ammunition, Caliber .30, T33E2

Design —Box body similar to the T33 model, but with external ribs embossed parallel to and contiguous to side rims of box.

Plain box cover similar to T33, but with the side skirts approximately 1 inch wider at the free end of the cover than at the hinged end, and having detents in the lower front portion of the skirts to engage the embossed ribs on the box and retain the cover in a fixed partially open position to permit feeding of the ammunition belt directly from the box to the weapon with the cover affording protection against rain, snow or other foreign material on ammunition remaining in the box.

Material —Sheet metal stampings.

Dimensions —Same as the T33 box.

Weight —3 lb., 10 oz.

Volume —Same as T33 box.

Hardware —Simple one piece adapter which hooked over and into the bracket of the M1917A1 mount.

Simple pull-down toggle type closing hasp separate from the adapter. Hinge of same three-section pin and barrel type as the T33 box.

Seal —Same rubber compound gasket as the T33 box.

Handle —Same formed wire handle with hand ferrule as the T33 box, and attached to hinge end of box.

No procurement of sample T33E2 boxes was made and no tests were conducted of this model, as it was believed the most promising container was another model.

4. Box, Ammunition, Caliber .30, T33E3

The T33E3 box (fig. 167) was identical with the T33E2 model, except that the external embossed ribs just below the box body rim were omitted. Detents in the front edge of the side skirts engaged the box body rim hem and maintained the cover in the partially open position.

A sample lot of two hundred T33E3 type boxes was procured for test and experimental purposes. Tests were conducted and reports of performance made by the following:

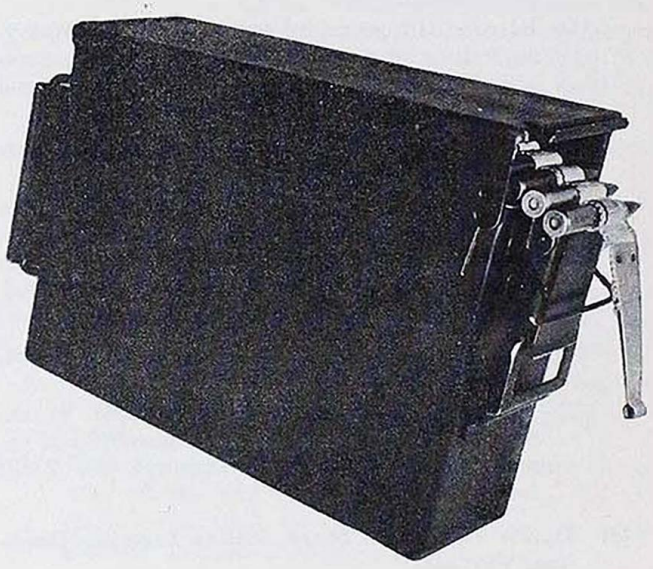

FIGURE 167—BOX, AMMUNITION, CALIBER .30, T33E3

(a) **Aberdeen Proving Ground:**[43]

After extended transport in open vehicles over rough terrain and during severe weather, it was indicated that:

(1) Neither box nor contents were damaged during transport.

(2) The box was satisfactory for use with ground weapons.

(3) Test boxes were dry inside after being subjected to open transport, indicating the gasket in the T33E3 afforded a better waterproof seal than M1A1 type boxes.

(b) **Tank Destroyer Board, Camp Hood, Texas:**[44]

The type of carrying handle was satisfactory and its position relieved strain on box cover and seal. The cover gasket afforded a more reliable moisture-proof seal. The skirted type cover was desirable and particularly advantageous in inclement weather. It was concluded that the T33E3 box:

(1) Is moisture proof.

(2) Is sufficiently durable to withstand ordinary rough handling.

(3) Possesses desirable design features of simplicity, hand grip, position of carrying handle, improved gasket, and hinge.

(c) **Infantry Board, Ft. Benning, Georgia:**[45]

Essential facts and results of testing the T33E3 model box:

(1) Weight, form and dimensions were suitable for packing and storage of belted ammunition.

(2) Type, form and location of the handle make the box unsatisfactory for hand transport.

(3) Adequately sturdy to withstand ordinary usage and cross country transport in vehicles, not sufficiently sturdy to withstand extreme rough handling.

(4) Its use with standard machine guns, employing either fabric or metallic link-belted ammunition, caused no interference with normal function of the weapon.

(5) Waterproof qualities of the box equal to those of the M1A1 type.

(6) The effect of the side skirts on the cover gave little or no protection to the contained ammunition against entry of rain and other foreign material while in position with the gun loaded.

Conclusions of the Infantry Board were that:

(1) The T33E3 box was inferior to the M1A1 box, and unsatisfactory in the present form.

(2) Changing the design and location of the handle, and strengthening the fastening of the mounting bracket would improve the T33E3 box.

(d) **Marine Equipment Board, Marine Barracks, Quantico, Virginia:**[46]

Examination and test of the T33E3 box in comparison with the M1A1 box disclosed the following:

(1) After an 8-hour salt water submersion, the T33E3 was found to be watertight, while the ammunition in the M1A1 was rendered unserviceable by gasket failure.

(2) The T33E3 box is satisfactorily durable.

(3) The carrying handle of the T33E3 is not desirable because:

a. It is free to rotate and causes the box to seem unbalanced.

b. The sharp edges of the handle have a tendency to cut into the hand.

c. It is placed on the end of the box and the lower end hangs down so low that it strikes the lower portion of the leg when the box is carried over logs or other obstructions.

d. In stowing the subject box in the storage racks on the deck of an LVT, it was found that the handle was useless.

(4) The T33E3 box can be mounted satisfactorily on the cradle of the .30 caliber, M1917A1 machine gun but must be placed on the ground when used with the 1919A4 machine gun.

(5) The feeding of ammunition from the T33E3 box is satisfactory.

Based on reports of Service Board tests, the Headquarters, Army Ground Forces,[47] recommended the following modifications of the T33E3 box, and procurement of samples for additional tests:

(a) Locate carrying handle on cover.

(b) Incorporate handle of the M1A1 box.

(c) Adapter bracket should be more securely arrached to box body.

(d) Closing latch should be redesigned for easier opening.

5. Box, Ammunition, Caliber .30, T33E4[48]

The T33E4 box was proposed as embodying desired characteristics of the using services, and incorporating simple design features which made it suitable for manufacture in peacetime quantities without the elaborate and expensive tooling required for the M1A1 type box.

The following modifications to the T33E3 model were tentatively agreed to by Headquarters, Army Ground Forces:[49]

(a) Volume reduced sufficiently to contain only a 250-round belt of linked caliber .30 ammunition.

(b) Height of box body and cover reduced from 7½ to 6⅞ inches.

(c) Carrying handle attached to box cover.

(d) Carrying handle to be same type as that of the standard M1A1 box.

(e) A wire handle or ring attached to one end of box to facilitate removal of box from vehicle stowage compartments.

(f) Closing latch to enable opening the box with a single operation.

(g) Any device eliminated for attaching the box directly to Mount, Tripod, Machine Gun, Caliber .30, M1917A1.

It is estimated the T33E4 box incorporating the above features would effect a reduction in weight of approximately 2½ pounds compared to the T33E3 or M1A1 box containing a 275-round link belt of ammunition, or a gross weight of approximately 19½ pounds, with a 250-round belt of linked ammunition.

The T33E4 box was recommended by the Ordnance Technical Committee[50] as a service test type, and procurement of a sufficient number of sample items for test purposes was authorized. Fabrication of the items is to be accomplished by the United Metal Box Company, Brooklyn, New York, under Research and Development contract.

6. Adaptability of Lightweight Metals to Container Construction

The reduction in container weight which can be effected and its greater resistance to corrosion, is the basis for investigating the use of lightweight metals in construction of ammunition containers. Aluminum and magnesium metals are the most promising. Presently, the Dow Chemical Company is studying the caliber .30, T33E4 box drawings relative to construction of samples of that container from magnesium.

B. CONTAINERS FOR CALIBER .50 MACHINE GUN AMMUNITION

The development of a container designed for factory packaging of caliber .50 ammunition to meet requirements for use with machine guns employed by Ground Forces was authorized in 1941 by the Ordnance Technical Committee.[8] Standard procedure at that time was field belting or linking of cartridges prior to use, and loading belts in "ready" boxes or feed chests, such as:

a. Chest, Ammunition, Caliber .50, M2[51] (200-round box employed mainly with antiaircraft mounts).

b. Chest, Ammunition, Caliber .50, M3[52] (constructed of aluminum).

c. Chest, Ammunition, Caliber .50, M17[53] constructed of steel).

These chests were not designed to protect the contents from varying climatic conditions encountered and therefore not suitable for factory packing or ammunition storage.

Work on the project for a caliber .50 container was not initiated until April 1942, pending adoption of a caliber .30 container, since similar required characteristics for the two items indicated the major problems encountered with the caliber .30 box would likewise apply to the caliber .50 item. Manufacturing experience and results of testing experimental caliber .30 items enabled avoidance of similar difficulties in work on caliber .50 boxes.

The essential characteristics of an expendable container for link-belted caliber .50 ammunition were:

a. Airtight and watertight under all climatic conditions.

b. Strength adequate to withstand transport and rough usage.

c. After initial opening, container to be capable of effective reclosure.

d. A carrying handle.

e. Constructed of termite-proof and noncombustible materials.

f. Box capacity to be 100 rounds of metallic link-belted caliber .50 cartridges.

g. Maximum exterior dimensions: Depth—7½ in.
Width—6⅛ in.
Length—12¼ in.

Sample caliber .50 containers designed to include those features were fabricated by several commercial facilities. Three of the models were judged to merit further development. Sample quantities of each model were procured for experimental use in various testing programs. The Armored Force Board, Fort Knox, Kentucky, was selected as the testing agency since that service was a major user of caliber .50 weapons in ground operations.

a. DEVELOPMENT TYPES

1. Box, Ammunition, Caliber .50, T12[54]

Facility —Owens-Illinois Can Company, Baltimore, Maryland.

Quantity —10 items.

Design —Shape of box, rectangular. Cover attached by fixed hinge. Hinge designed for easy removal of cover from box when required. Box surfaces embossed for structural rigidity. Wrap-around type box body with welded seam. Bottom roll seam crimped to box body. Rolled or hemmed edge on box body.

Material —Sheet metal.

Weight —Empty: 5½ lb.
Loaded: 35½ lb.

Hardware —Two fixed hinges of hook-on type on one long side of body. Cover secured to box by a push-down clamp which engaged a wire bail extending approximately ¾ length of side of cover. A D-shaped pull ring on one end of box to facilitate removal from racks.

Seal —A plastic material flowed into round embossed groove in box cover.

Handle —Metal handle of type used on M1 box, attached to cover by stirrup holders and links.

As a result of the test program conducted by the Armored Force Board,[6] it was concluded that the T12 box (fig. 168) was unsatisfactory for the following reasons:

a. Gasket seal was distorted upon closing the box cover due to wiping action between box rim and gasket.

b. Gasket failed as a waterproof seal both as an original seal and as a reclosure.

c. No positive latch to maintain unbroken seal or to prevent accidental opening of box.

2. Box, Ammunition, Caliber .50, T15

Facility —C. E. Erickson Co., Des Moines, Iowa.

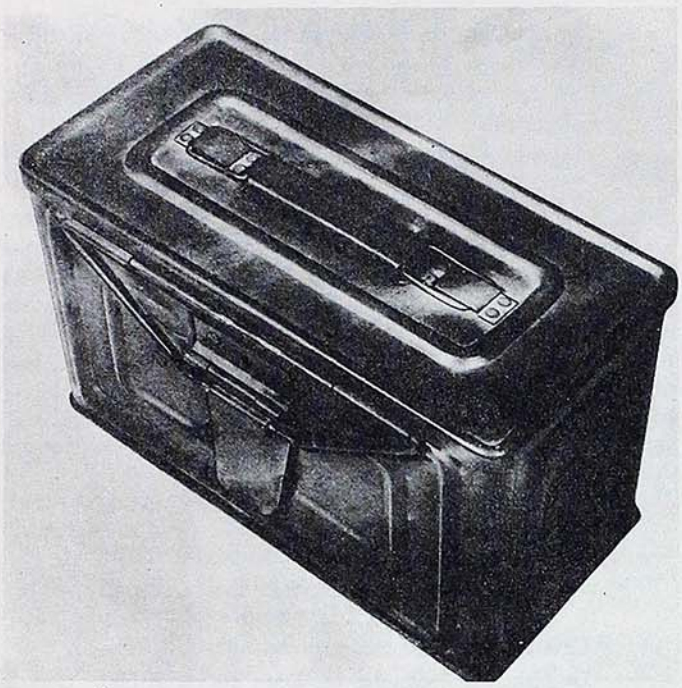

FIGURE 168—BOX, AMMUNITION, CALIBER .50, T12

Quantity —5 items.
Design —Rectangular; cover not rigidly attached to box, double latches being employed—one latch on each long side of box; box surfaces embossed for structural rigidity; body formed of a single sheet of metal, the four vertical corners being gas welded.
Material —Sheet metal.
Weight —Empty: 5½ lb.
Loaded: 35½ lb.
Hardware —The type of latching device to secure the cover to the box was complicated. It consisted of separate locking clamps on each side of the cover. A D-shaped ring was attached to one end of the box (fig. 169).
Seal —A die-cut gasket which fitted into a square groove in the cover.
Handle —Metal handle attached to cover by wire links fitting into metal stirrups.

The Armored Force Board,[55] after testing the T15 box (fig. 170), concluded that it was unsatisfactory in the following respects:

a. Gasket not secured in cover of box.
b. The two locking clamps on front and rear were not sufficiently positive to prevent accidental opening.
c. The top edge of the box was sharp, permitting cartridges to catch when feeding from the box to the weapon.

FIGURE 169—COVER LATCH DEVICES ON BOX, AMMUNITION, CALIBER .50, T15

d. Impossible to raise carrying handle by pushing on end of handle.
e. The lip on the front locking clamp to assist in opening the box was too small for gloved fingers.
f. Both front and rear latches open under a weight of approximately 200 pounds placed on the cover.

3. **Box, Ammunition, Caliber .50, Modern Steel**

Facility —Modern Steel Equipment Company, Geneva, Illinois.
Quantity —50 items.
Design —Rectangular. Cover attached by a hinge on one long side of the body. Hinge design allows complete removal of cover if desired. Flat embossings on box surfaces impart structural rigidity. Box body fabricated of a single piece of metal with welded vertical corners.
Material —Sheet metal.
Weight —Empty: 5½ lb.
Loaded: 35½ lb.
Hardware —Cover hinge of interrupted pin-and-barrel design to facilitate demounting the cover. Cover attached by a downward operating clamp which

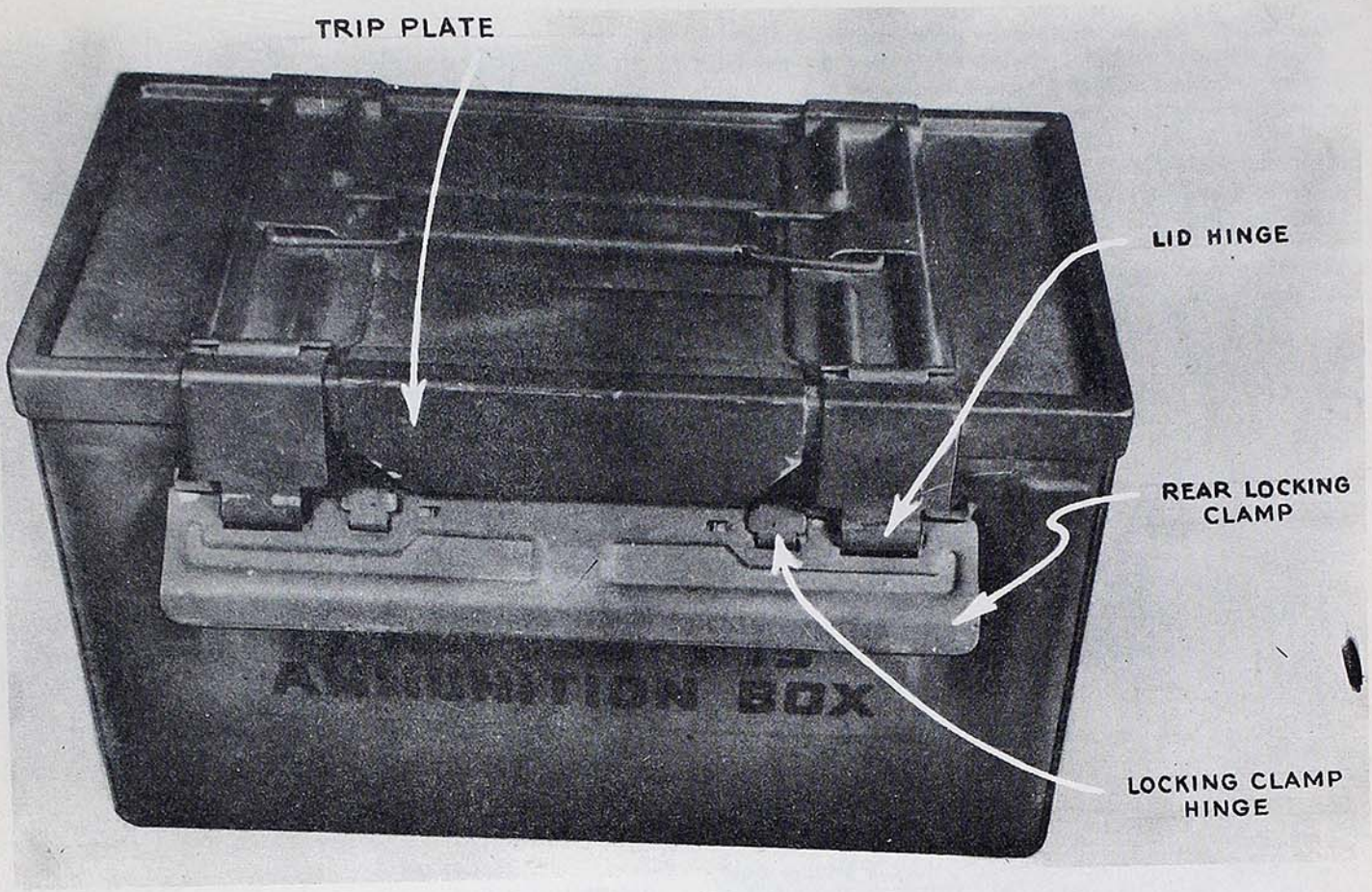

FIGURE 170—BOX, AMMUNITION, CALIBER .50, T15

engaged a wire bail on the front side of the cover. Clamp retained in locked position by a cotter pin inserted in an eye holder. A D-shaped pull ring on one end of box provided a means for removal from stowage racks.

Seal —Rubber compound die-cut gasket fitting into groove in cover.

Handle —Metal carrying handle attached to cover by wire links and metal stirrups.

The Modern Steel container (fig. 171) was the most satisfactory of the designs and incorporated the best features of the several models tested. With the following modifications recommended to increase the structural strength and functional characteristics of that box, the Armored Force Board[55] concluded that the Modern Steel design box would be suitable for Armored Force use:

a. Heavier gage metal on front hinge and latch.
b. Spot weld ends of roll on cover which holds latch wire bail.
c. Modify the embossing on bottom of box to enable positive nesting.
d. Add groove in cover hinge pin and matching crimp in hinge barrel to prevent cover from falling off when box was opened. This would not prevent cover from being removed when pressure was exerted.

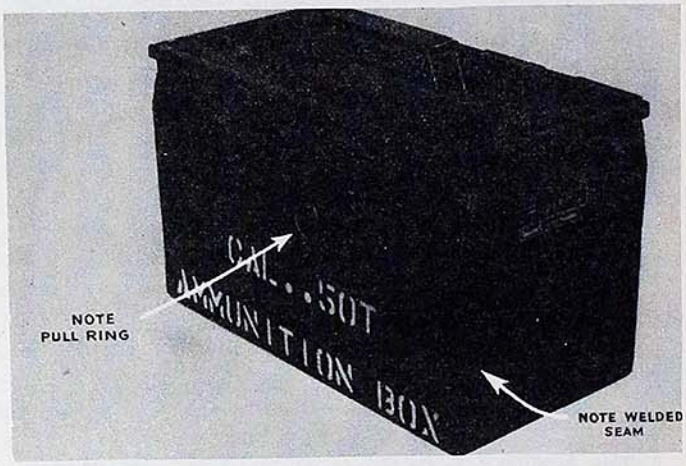

FIGURE 171—BOX, AMMUNITION, CALIBER .50, MODERN STEEL

b. BOX, AMMUNITION, CALIBER .50, M2[56]

The experimental container, Box, Ammunition, Caliber .50, Modern Steel, modified to incorporate the changes recommended by the Armored Force Board, was adopted as the Standard article by the Ordnance Technical Com-

mittee[57] on 3 September 1942 for packaging of caliber .50 ammunition in metallic link belts intended for use with ground machine guns. The nomenclature assigned this container was, Box, Ammunition, Caliber .50, M2 (figs. 172, 173, and 174), and the Chest, Ammunition, Caliber .50, M17 was made Limited Standard and later obsolete.[58]

Service tests of the experimental caliber .50 containers indicated that the type of material used in gaskets

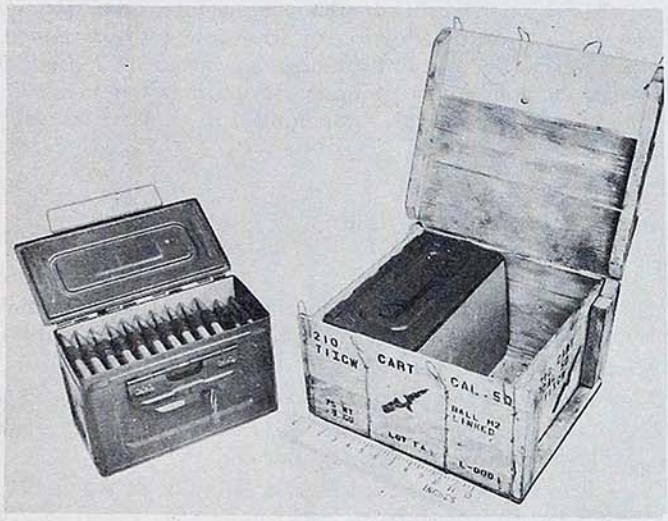

FIGURE 172—BOX, AMMUNITION, CALIBER .50, M2 AND WIREBOUND SHIPPING CONTAINER

FIGURE 173—BOX, AMMUNITION, CALIBER .50, M2 (BIAK ISLAND, DUTCH NEW GUINEA, 22 JUNE 1944)

FIGURE 174—BOX, AMMUNITION, CALIBER .50, M2 (ACTION AT BOUGAINVILLE, SOLOMON ISLANDS, 14 JULY 1944)

determined whether or not the box was airtight and watertight. To facilitate development work on gasket materials, as well as to test the M2 box with cavalry pack equipment and in combat vehicles, 50 boxes manufactured according to standard specifications were procured[59] in September 1942. Tests conducted by the Armored Force Board indicated that rubber compound gaskets were the most effective seals.[60]

At the time the M2 box was standardized, metallic links were used for belting caliber .50 ammunition for ground weapons. Because of the large requirement for links and the shortage of metal strip and of manufacturing facilities, a fabric cartridge belt, Belt, Ammunition, Fabric, Caliber .50, M7,[61] was adopted as Standard for ground use.[62] Originally designed for 100 rounds of ammunition, its capacity was increased to 110 cartridges[63] when it was ascertained that a belt of that length could be placed in the M2 box. Unsatisfactory results obtained with fabric belts in field use, and the availablilty of metallic links and manufacturing facilities to meet requirements, led to reclassification of the fabric belt as a Limited Standard article and the readoption of metallic links for belting ammunition used in ground installations.[64] Through improved packing procedures, it was found possible to place a metallic link belt containing 105 cartridges in the M2 box and this quantity was authorized as the contents for each M2 box.

Information concerning the shipping box adopted for use with the caliber .50, M2 metal box is to be found in the section relating to wood packing and shipping boxes for small-arms ammunition.

c. CONTINUING DEVELOPMENT

1. Adaptability of Lightweight Metals

The adaptability of lightweight metals for ammunition containers is under experimental development, with reduction in container weight and greater resistance to metal corrosion in view.

A project is being pursued by the Parish Pressed Steel Company, Reading, Pennsylvania, employing aluminum for box construction.[65] The feasibility has been established of forming box bodies of caliber .50, M2 size from aluminum, employing deep draw methods of fabrication. Bodies were successfully drawn from .060-inch sheet stock in two draw operations with no indication of metal cracks.[66] Compared to 3¼ pounds for the standard M2 box body, that of aluminum weighed 1¾ pounds, or a reduction in weight of approximately 46 percent. A sample lot of complete boxes fabricated of aluminum using the deep drawn bodies is being procured for information and test purposes.

An experimental design box to package caliber .50 link-belted ammunition has been fabricated of magnesium alloy metal by the Dow Chemical Company, Midland, Michigan. As compared with 4¾ pounds for the caliber .50, M2 box, weight of the magnesium box was 1¾ pounds, a weight reduction of approximately 63 percent. Negotiations are presently being conducted for the manufacture of a quantity of boxes for submission to service boards and interested arms, and for use in corrosion resistance tests.

PART I—AMMUNITION CONTAINERS FOR GROUND USE

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3. O.O. 471.87/3427—2nd Ind
4. O.O. 471.87/3427—3rd Ind
5. OCM 16706
6. O.O. 471.41/324
7. O.O. 472.54/4672, OCM 12761
8. OCM 16707
9. Ordnance Department Drawing 49-1-84
10. O.O. 472.54/11912
11. O.O. 472.54/11913
12. O.O. 472.54/11914
13. O.O. 472.54/11915—1st Ind
14. OCM 17405
15. Ordnance Department Drawing D-35299
16. Infantry Board Report No. 1304, 4 February 1942, "Boxes, Ammunition, Caliber .30, MG, T4"
17. Cavalry Board Report, File O.O. 471.87/6112, 7 February 1942, "Service Test of Box, Ammunition, Caliber .30, T4"
18. Armored Force Board Report No. 211, 1st Partial, 19 February 1942, "Ammunition Box, Caliber .30, T4, Ammunition Box, Caliber .30, T6 and Webbing Carrying Straps for Handling These Boxes"
19. Ordnance Project No. 5374, 11 February 1942
20. Infantry Board Report No. 1331, 23 March 1942, "Ammunition Boxes, Caliber .30, T4E1, T5, T7, and T8"
21. Letter from the Cavalry Board, File O.O. 471.87, dated 27 March 1942, to the President, Infantry Board, Fort Benning, Georgia and the President, Armored Force Board, Fort Knox, Kentucky, IN TURN: Subject: "Results of Service Test of Box, Ammunition, Caliber .30, T4E1"
22. Armored Force Board Report No. 211, 3rd Partial, 27 March 1942, "Ammunition Box, Caliber .30, T4E1"
23. Ordnance Project No. 5805, 27 March 1942
24. Ordnance Department Drawing D-44018
25. Armored Force Board Report No. 211, 2nd Partial, 20 March 1942, "Test of Ammunition Boxes, Caliber .30, T5 and T8"
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27. Infantry Board Report No. 1308, 9 February 1942, "Ammunition Boxes, Caliber .30, T6"
28. Armored Force Board Report No. 211, 27 April 1942, "Ammunition Boxes, Caliber .30, T4, T4E1, T5, T6, T7, and T8"
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30. Ordnance Project No. 5805, 15 April 1942
31. Ordnance Department Drawing D-44070
32. OCM 18104
33. OCM 19736
34. Armored Force Board Report No. 211, 17 February 1943, "Test of Caliber .30 Ammunition Box M1"
35. O.O. 471.87/14254
36. O.O. 471.87/12758
37. OCM 19900
38. Ordnance Department Drawing D-7692092A
39. Ordnance Research and Development Center Firing Record S-42983, 9 April 1945
40. OCM 28042
41. OCM 28608
42. O.O. 400.112/13742; O.O. 471.87/21589; O.O. 471.87/21956
43. Ordnance Research and Development Center Firing Record No. S-42979, 28—30 July 1945
44. Tank Destroyer Board Report No. 333, 31 July 1945, "Report on Comparative Tests of Caliber .30 Machine Gun Ammunition Box M1A1 and Box T33E3"
45. Infantry Board Report No. 1872, 25 September 1945, "Ammunition Boxes, Machine Gun, Caliber .30, T33E3"
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50. OCM 30175

51. Ordnance Department Drawing D-28399
52. Ordnance Department Drawing D-7260
53. Ordnance Department Drawing D-39091
54. Ordnance Department Drawing D-44073
55. Armored Force Board Report No. 281, 14 August 1942, "Test of Caliber .50 Expendable Ammunition Box"
56. Ordnance Department Drawing No. D-7690845B
57. OCM 18810 (C)
58. OCM 24924
59. O.O. 160/6648, RAD No. 285
60. Armored Force Board Report No. 281, 4 December 1942, and 14 January 1943, "Test of Gaskets for Caliber .50 Ammunition Box M2"
61. Ordnance Department Drawing C-113699
62. OCM 19403 (C), OCM 19576
63. OCM 19974
64. OCM 21591 (C)
65. Research and Development Order No. SPOTS 4445
66. O.O. 160/9318 Parish Pressed Steel Co.

PART II—AMMUNITION CONTAINERS FOR AIR FORCES

The use of machine gun ammunition by the Army Air Forces, both in training and combat, made the requirements for the packaging of such ammunition different from those of the Ground Forces. Ammunition was removed from shipping containers and stowed in special trays and feed boxes aboard aircraft. This made the type and size of packing and shipping containers of relatively minor importance, and was the reason why the Air Forces were not interested in development of a "ready-box" for the packaging of machine gun ammunition.

A. Caliber .30 Containers

Prior to 1941, caliber .30 link-belted ammunition for the Air Forces was packed in cardboard cartons which were sealed with tape and then shellacked for waterproofing. One belt of 100-round length was packed in a carton and twelve cartons in a terneplate-lined M1917 wood box for shipping. The shortage of tin and ferrous metals early in World War II stimulated the investigation of noncritical materials adaptable to ammunition packages. The promising results obtained in tests of the experimental Box, Ammunition, Caliber .30, T7, designed for ground machine gun ammunition, suggested the use of waterproof materials for bags or envelopes to contain small quantities of ammunition. The project for such an item was actively initiated in May 1942 by procurement of experimental lots for test purposes.

a. DEVELOPMENT TYPES

1. **Carton, Ammunition, Caliber .30, T14**

Facility —Reynolds Metals Company, Richmond, Virginia

Quantity —1,200 items

Design — (a) Outer envelope or bag:
A flat rectangular bag with side seams closed with a heat seal to resist water penetration. After insertion of cartoned ammunition, the mouth of the bag was closed with a heat sealed seam. The bag was constructed of a laminated material possessing high waterproof qualities, made by combining a sheet of heavy kraft paper coated with a layer of asphaltic compound, a sheet of lead foil .001 inch thick, and a film of thermoplastic. Dimensions of interior of envelope: 11⅛ x 9¾ inches, with approximately ½-inch side seams.

(b) Collapsible corrugated boxboard carton:
Ends of the carton were fastened with cloth tape so that the sides folded inward and the bottom outward, making a completely collapsed and flat carton for storage and shipment. When set up, a locking chipboard insert was placed inside the carton for rigidity, and a chipboard insert placed on top of the bullet points to prevent rupturing the carton top and envelope.

Dimensions —Exterior (set up) approximate:
depth—3⅞ in.
width—4 in.
length—7½ in.

Weight —Loaded: 7¼ lb.

2. **Carton, Ammunition, Caliber .30, T16**

Facility —Cincinnati Industries, Inc., Cincinnati, Ohio

Quantity —1,200 items

Design — (a) Outer envelope or bag:
A flat rectangular type bag when collapsed. Bag made of "X-Crepe," which was a waterproof material made by lamination of two layers of creped kraft paper bonded with asphalt and including a thin sheet of lead foil in the center section.

(b) Corrugated boxboard carton:
A collapsible type carton similar to that used with the T14 container.

Dimensions —Exterior (set up) approximate:
depth—4 in.
width—4¼ in.
length—7½ in.

Weight —Loaded: 7¼ lb.

Laboratory tests of both T14 and T16 containers were conducted at Frankford Arsenal. The tests included prolonged temperature cycling, rough handling, and water immersion. Results indicated that the T14 carton possessed good resistance qualities against water penetration, even after being subjected to the above tests. Under similar test conditions, the T16 model failed, largely due to failure of envelope seams at low temperatures.

Based on satisfactory experience in packing the experimental lot of T14 containers and the successful manner in which the container withstood transport when loaded with ammunition, it was recommended by Field Service[1] that 5,000,000 containers of the T14 type be procured for packaging of caliber .30 linked ammunition for the Army Air Forces. This procurement was authorized and the initial packing operations were inaugurated in October 1942.

b. CARTON, AIRCRAFT AMMUNITION, CALIBER .30, M1[2]

Experience with the extensive use of the T14 container in packaging ammunition and its indicated efficiency as a storage container, justified Field Service to recommend its adoption for packing caliber .30 link-belted ammunition for the Army Air Forces.[3] The superiority of the T14 carton over the 100-round taped cartons in terneplate liners, and the absence of complaints from the field relative to the T14 type of packaging, caused the Air Forces to recommend its standardization[4] for packing all caliber .30 ammunition in metallic link belts for the Army Air Forces.

The T14 carton assembly was adopted as Standard in August 1943[5] and designated, Carton, Aircraft Ammunition, Caliber .30, M1. For storage and shipment, 12 filled cartons were packed in the M1917 wood box without terneplate liner (fig. 175). Shields of cardboard were placed about the inner surfaces of the wood box to minimize abrasion and possible rupture of the outer envelope.

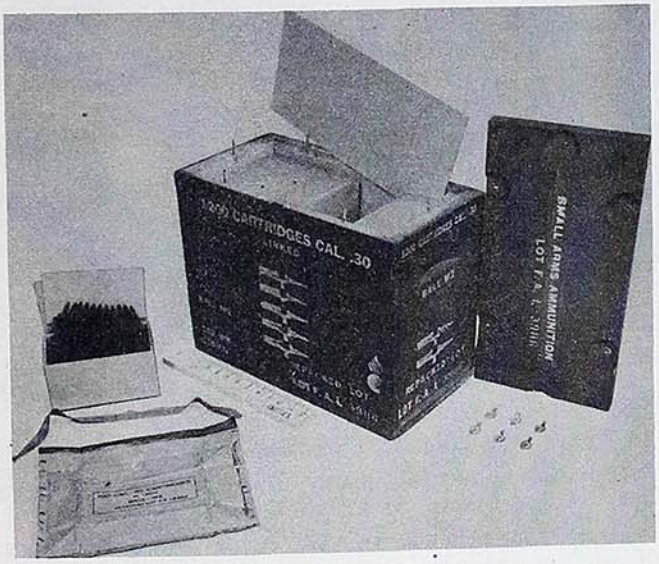

FIGURE 175—CARTON, AIRCRAFT AMMUNITION, CALIBER .30, M1 PACKED IN WOOD BOX M1917

The utility of waterproof laminated material of the type used as the outer envelope of the M1 carton and its satisfactory performance for packaging caliber .30 linked ammunition, led to its employment as the outer waterproof container material for small units of several other types of small arms ammunition:

20-round carton for Cartridge, Shot, Caliber .45, M12 and M15.
50-round carton for Cartridge, Ball, Long Rifle, Caliber .22, M24.
6-round carton for Cartridge, Grenade, Carbine, Caliber .30, M6.
10-round carton for Cartridge, Rifle Grenade, Caliber .30, M3.
5-round carton for Cartridge, Grenade, Auxiliary, M7.
25-round carton for Shells, Shotgun, 12-gage, for overseas shipment.
10-round carton for Shell, Shotgun, All-brass, 12-gage, No. 00 Buck, M19.
20-round carton for Cartridge, Tracer, Caliber .45, T30.

B. Caliber .50 Containers

Before October 1943, the standard packing used for link-belted caliber .50 ammunition for the Army Air

FIGURE 176—EXPEDIENT PACKAGING OF CALIBER .50 LINK-BELTED AMMUNITION FOR ARMY AIR FORCES

Forces was 265-round lengths of belt in the terneplate lined M1917 wood box. Numerous reports from Air Force units in combat theaters stated that considerable quantities of caliber .50 ammunition in that packing were reaching the field in corroded and otherwise unserviceable conditions. This resulted in the adoption in October 1943 of an expedient packaging especially for the Air Forces. It consisted of wax-dipped paperboard cartons packed and sealed in terneplate lined M1917 wood boxes.[6] Each carton contained 60 rounds of link-belted cartridges, and four cartons were packed in each lined box (fig. 176). Although this method theoretically afforded double protection to the ammunition packed therein, there was no economy of space and the method was discontinued upon completion of development of the Can, Ammunition Packing, M10.

a. CAN, AMMUNITION PACKING, M10

The development and adoption of the M10 container for link-belted caliber .50 ammunition for the Air Forces and for cartoned caliber .50 for general use is recorded in Part III of this chapter—"Hermetically-sealed Metal Containers."

PART II—AMMUNITION CONTAINERS FOR AIR FORCES

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3. O.O. 471.87/16426
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5. OCM 21285
6. O.O. 472.8/16898

PART III—HERMETICALLY-SEALED METAL CONTAINERS

Reports from combat theaters in the middle of 1943 indicated that large quantities of small-arms ammunition were arriving in the field in unserviceable condition. This fault was attributed mainly to inadequate packaging. Too, the types of packagings were not designed to meet conditions encountered in combat zones, particularly in the tropics. In general, complaints were of the following nature:

(a) Excess weight of packaged ammunition units:
Packagings in the M1917 type wood box ranged in weight from approximately 100 pounds for a 265-round link belt of caliber .50 cartridges to 120 pounds for the box containing 1,500 caliber .30 cartridges in 5-round clips in bandoleers (fig. 177). The weight range of packagings in the M1911 type wood box was from 101 pounds for 3,150 rounds of caliber .30 carbine to 109 pounds for 2,000 caliber .45 ball cartridges. The weight of individual boxes made transport by man power difficult, particularly over rough terrain and jungle country.

(b) Damaged boxes and leaky liners:
The heavy weight of boxed ammunition resulted in numerous damaged and broken boxes and ruptured liners in the normal course of transport and rough handling. This exposed box contents to ravages of weather conditions.

(c) Corroded cartridges:
Moisture in metal liners corroded the ammunition. The moisture entered through broken liners and liner closures, and this breakage was due to the use inside the liners of filler materials, especially wood blocks, to fill excess box space.

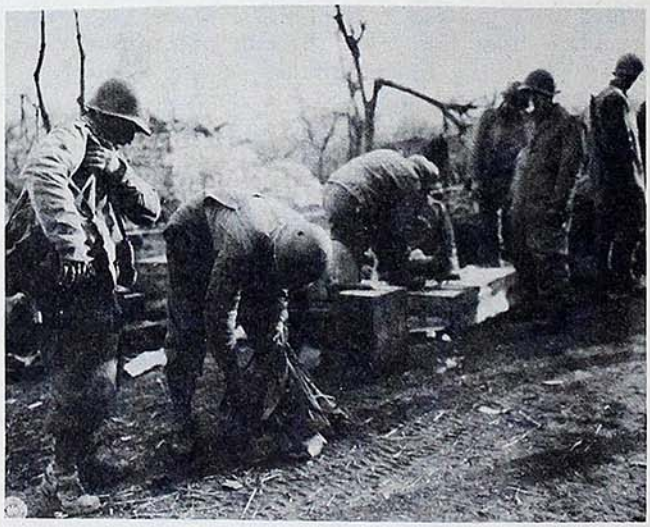

FIGURE 177—DISTRIBUTING BANDOLEERS OF CLIPPED CALIBER .30 AMMUNITION TO TROOPS (MT. PORCHIA, ITALY)

Aside from expendable boxes for ground machine gun ammunition, no new metal containers were adopted for small-arms ammunition until development of hermetically-sealed type cans, except that the employment of wax-

dipped fiberboard cartons for packaging cartridges was undertaken as a conservation measure because of the critical status of supplies of tin and other metals. Experimental work on this type container was accomplished at Frankford Arsenal. The container consisted principally of a solid fiberboard folding box with a corrugated liner. Filled containers were waterproofed by sealing with special glue and subjecting the container to a dipping process in heated vats of special wax. The waxed containers were packed for shipment in wooden boxes. Laboratory and Service Board tests indicated wax-dipped containers retained their waterproof characteristics under rough handling conditions and at extreme temperature ranges of −40° F to 140° F.

The apparent advantage and suitability of the waxed container method of packaging resulted in Ordnance Technical Committee action[1] on 11 February 1943 to adopt Container, Ammunition, Caliber .45, M1,[2] and Box, Ammunition Packing, Caliber .45, M1[3] as alternative packings for caliber .45 ammunition. Similar containers were employed extensively for shipments of ammunition between factory and depots, but were not adopted for packing other than caliber .45 cartridges intended for shipment direct to combat theaters. However, some carbine ammunition in waxed containers inadvertently reached combat theaters.

Under conditions to which it was subjected in the field, particularly tropic areas, the waxed container packagings failed to provide the degree of protection required. Deterioration was rapid when packages were unloaded on beachheads and allowed to remain for long periods, or when packages were stored in open dumps exposed to the elements. Extreme corrosion resulted under such conditions and the ammunition became unserviceable.[4] In July 1943 orders were issued that no further shipments of small-arms ammunition were to be made to tropical theaters except if packed in metal-lined boxes.

Reports from the field stressed the need for improved types of packagings, completely waterproof, and gross weight such that transport by combat troops or native bearers could be easily accomplished. In general, opinions stated that a gross weight of 50 pounds was the maximum desired for box and contents; the contents to be packaged in small unit containers adaptable to combat requirements, each unit container in itself to be waterproof and provided with a suitable carrying handle. It was also stressed that the wood shipping boxes be strong enough to transport safely the interior containers and that they be equipped with carrying handles for ease of transport and removal of boxes from stacks. In February 1944 the Ordnance Committee[5] recommended a 50-pound weight as the maximum for boxed ammunition except where it was possible to break down the gross container into lighter units.

The program for development of ammunition containers to meet service requirements was guided by the following general military requirements:

(a) Unit containers or box liners:
  (1) Completely airtight and moisturetight under all climatic conditions and for an indefinite period in storage.
  (2) Weight of containers and contents not to exceed approximately 25 pounds.
  (3) Fabricated of metal.
  (4) Strength adequate to withstand rough usage when transported as an individual battle container.
  (5) Provided with a handle for easy transport.
  (6) Capable of easy opening in the field without use of special tools unless tools were provided with each container.

(b) Wood shipping box:
  (1) Weight with contents not greater than 75 pounds.
  (2) Strength adequate to protect contents from damage under repeated rough handling and during periods of unprotected storage.

In order to achieve as thorough waterproofing as possible, the most promising container which could be easily manufactured and readily obtained appeared to be the conventional tin can type of container. Some experimental work was done by Owens-Illinois Can Company on a metal box of the caliber .30, M1 type with dimensional changes to accommodate it to caliber .30 carbine, caliber .30, and caliber .45 ammunition in cartons. Because of difficulty in obtaining perfect closures with sealing gaskets, and the known suitability of metal cans for packing commercial products, the decision was made to continue development of metal cans designed specifically for the several calibers and packagings of small-arms ammunition.

Rolled-seam metal cans with hermetically-sealed and friction plug type closures were designed and samples tested for caliber .45 and caliber .30 carbine cartridges. Results of tests of the two type containers at Evansville Ordnance Plant indicated the rolled-seam, hermetically-sealed can afforded the more positive closure and was more suitable for long term storage of ammunition. Experiments with a herringbone tear strip which was removed from the can by the conventional opening key indicated that the rolled-seam hermetically-sealed can was more easily opened than the friction cover. The reclosure feature of the friction closure type, though advantageous, was not considered a positive requirement, since the number of rounds packaged in each container, except caliber .45 and caliber .30 carbine cartridges, was comparatively small. Consequently, the types of containers adopted have incorporated the following features:

(a) Rolled-seam, hermetically-sealed construction.
(b) Herringbone scored design of tear strip for opening can.
(c) Key attached to end tab of tear strip to facilitate quick opening of containers.
(d) Carrying handle provided on each container.

SECTION I—CONTAINERS FOR CALIBER .45 AMMUNITION

The development of hermetically-sealed type metal containers for caliber .45 and caliber .30 carbine ammunition was initiated in July 1943 at the Evansville Ordnance Plant in collaboration with the American Can Company. The first experimental items were large metal cans to contain two or more unit packages of ammunition, each

unit package was made of waterproof, moistureproof, and vaporproof laminated materials. However, it was apparent that such containers would possess the same inherent weaknesses as the terneplate liner for M1911 and M1917 wood boxes. Development was then directed toward small size metal containers.

A. DEVELOPMENT TYPES

1. Can, Ammunition Packing, Caliber .45, T1

The T1 can was made of terneplated sheet metal, hermetically-sealed. The can was rectangular and was designed to contain 600 caliber .45 cartridges packed in 50-round cartons. To enable easy transport by individuals, the can had a carrying handle on one side. An inner collar centered with the tear strip enabled replacement of the cover once the can was opened. To effect a temporary seal against entry of moisture and foreign matter into a reclosed container, a length of water-resistant fabric adhesive tape was placed in each can for use in affixing the cover to the container body.

Extensive tests conducted at the Evansville Plant indicated that loaded T1 containers would withstand considerable rough handling and abuse without rupturing can seams and developing leaks when submerged under a head of water.

2. Can, Ammunition Packing, Caliber .45, T2

The T2 metal can was designed with a friction type plug closure on top. Dimensionally, the T2 model was identical with the T1 type. The advantage of a friction closure was that the can could be reclosed an indefinite number of times. However, tests of T2 cans at Evansville indicated that a friction type closure was inferior to the hermetic seal in effecting and maintaining moistureproof and airtight closures, and was not capable of withstanding the hazards of transport and rough handling. Under transport and field conditions encountered, it would be possible for the friction type cover to be dislodged and expose the contents.

B. CAN, AMMUNITION PACKING, CALIBER .45, M5[6]

The satisfactory results of informal tests of the T1 container were the basis for Ordnance Committee action[7] on 25 November 1943 recommending adoption of that container for packing caliber .45 ammunition. As the T1 type was of conventional design and its manufacture conformed to standard commercial practice, the using services agreed, after examination and informal tests, that it be standardized without formal Service Board tests.

The T1 container was assigned the nomenclature, Can, Ammunition Packing, Caliber .45, M5. Gross weight of the M5 can with contents (600 rounds) was approximately 28 pounds. For shipment, two M5 cans of ammunition were packed in the wood Box, Ammunition Packing, Caliber .45, M3 (fig. 178).

The standardization of the M5 can classified as obsolete the waxed Container, Ammunition, Caliber .45, M1[2] and the wood Box, Ammunition Packing, Caliber .45, M1;[3] and classified as Limited Standard the packing of caliber .45 ammunition in the M1911 wood box and terneplate liner.[8]

Packing of ammunition in M5 containers was effected in March 1944 at the Evansville Plant. In addition to packing regular production ammunition, a repacking program of ammunition from wax-dipped containers stored in this country was accomplished.

SECTION II—CONTAINERS FOR CALIBER .30 CARBINE AMMUNITION

A. DEVELOPMENT TYPES

1. Can, Ammunition Packing, Carbine, T3

The development of metal containers for carbine ammunition was begun in July 1943 through the Evansville Ordnance Plant. The T3 model was designed with the caliber .45, M5 (T1) container as the prototype. The T3 features were: fabricated of terneplate metal; rectangular; hermetically sealed, opened by means of a key operated tear strip; provided with an inner collar located under

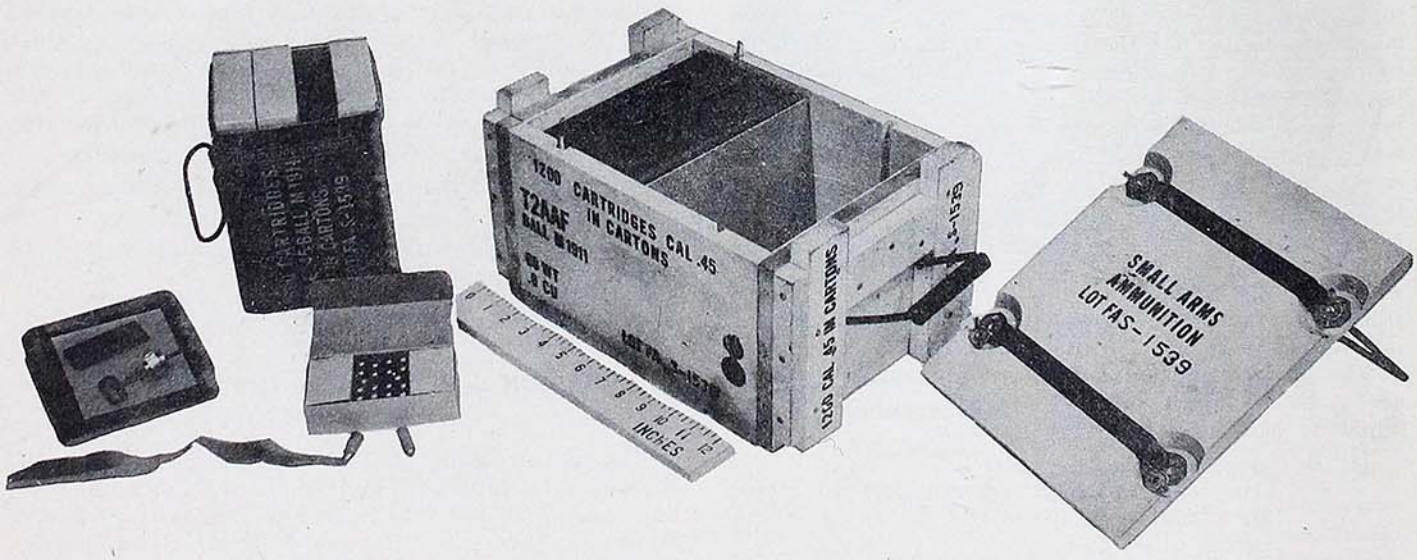

FIGURE 178—CAN, AMMUNITION PACKING, CALIBER .45, M5, PACKED IN BOX, AMMUNITION PACKING, CALIBER .45, M3

the tear strip to enable temporary reclosure; and a formed wire carrying handle. Rough handling and immersion tests of sample T3 containers packed with ammunition indicated its suitability for carbine cartridges packaged in 50-round paperboard cartons.

2. Can, Ammunition Packing, Carbine, T4

The T4 type container was designed with a friction plug type closure. The general dimensions, shape, metal of which constructed, and the handle of the T4 can were identical with those of the T3 type. After experimental tests at Evansville indicated the doubtful efficiency of friction plug closures to maintain containers airtight, moisturetight and watertight under conditions of transport, rough handling and field usage, further development of friction plug closures was discontinued.

B. CAN, AMMUNITION PACKING, CARBINE, M6[9]

Informal tests of experimental T3 cans packed with ammunition gave satisfactory results and the Ordnance Committee[7] recommended adoption of that container for the packing of caliber .30 carbine ammunition. The designation, Can, Ammunition Packing, Carbine, M6, was assigned the standardized T3 model.

Designed to contain 800 cartridges packed in 50-round cartons, the M6 can and contents weighed approximately 24 pounds (fig. 179). For shipment, three M6 cans of ammunition were packed in the wood Box, Ammunition Packing, Carbine, M4.

The M1911 wood box and terneplate liner for packaging carbine ammunition was made Limited Standard upon adoption of the M6 can.

The first packaging of ammunition in M6 cans and M4 boxes was accomplished by the Evansville Ordnance Plant early in April 1944.

SECTION III—CONTAINERS FOR CALIBER .30 RIFLE AMMUNITION

Development of a metal container or containers for caliber .30 ammunition used in rifles and weapons other than machine guns was initiated in December 1943.

A. DEVELOPMENT TYPES

1. Can, Ammunition Packing, Caliber .30, T5

The T5 model was a hermetically-sealed container similar in design and features to the M5 and M6 cans, except that it had no inner collar for effecting can reclosure. Originally intended as a container for bandoleers filled with caliber .30 cartridges in 5-round clips, tests conducted by Frankford Arsenal with sample T5 cans indicated the following items were adaptable to packaging therein:

a. 5-round clips of cartridges in bandoleers.

b. 8-round clips of cartridges in bandoleers.

c. 20-round cartons of cartridges.

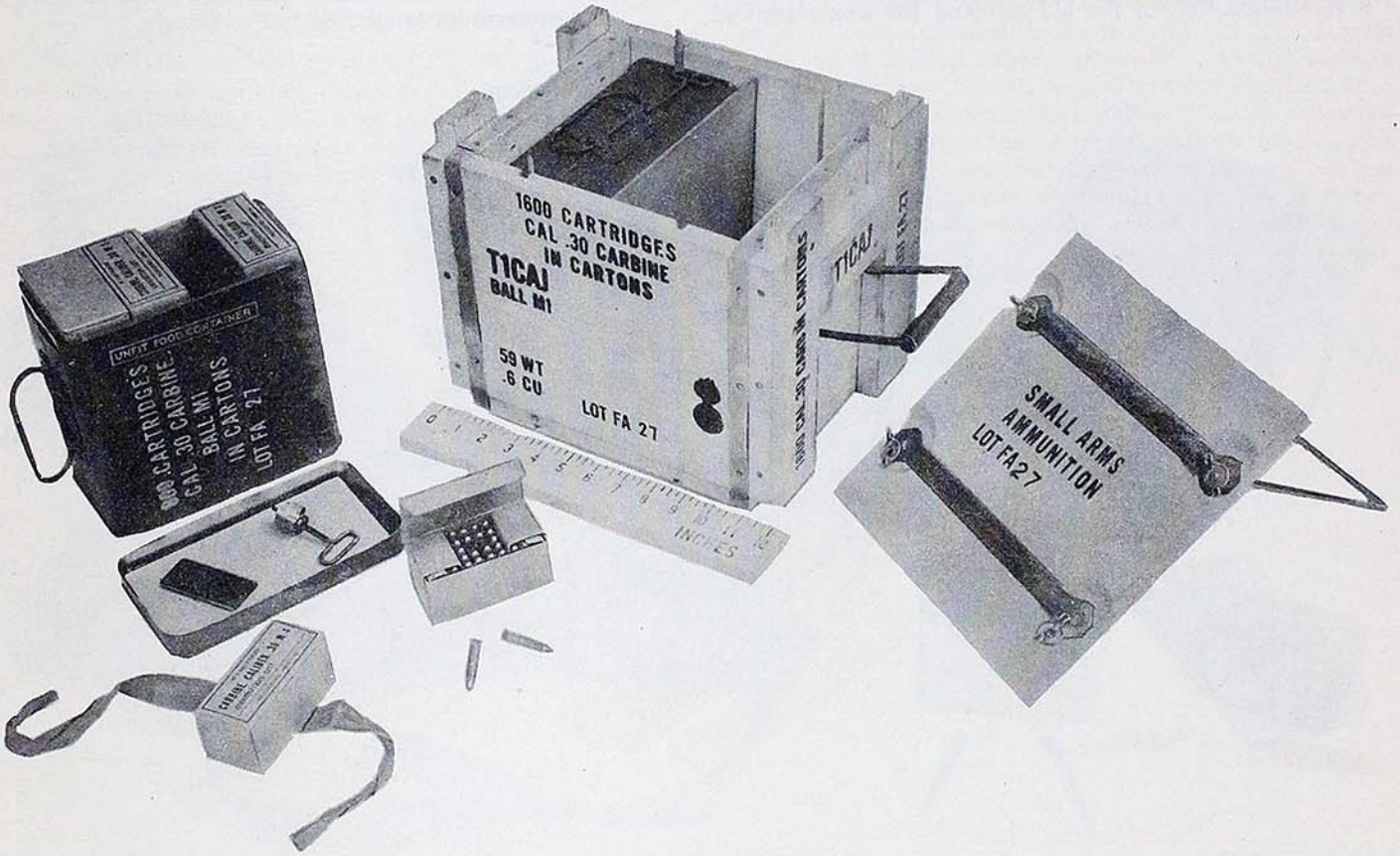

FIGURE 179—CAN, AMMUNITION PACKING, CARBINE, M6 AND BOX, AMMUNITION PACKING, CARBINE, M7, CONTAINING CARTONED CARBINE AMMUNITION

d. Metallic link-belted cartridges. Packaging of the linked cartridges was in 120-round cartons, two cartons to each can.

2. Can, Ammunition Packing, Caliber .30, T6

The T6 model can was a hermetically-sealed type similar to the T5 model except for its dimensions. The T6 was designed to pack bandoleers of caliber .30 cartridges assembled in 8-round rifle clips. The Frankford Arsenal determined that 8-round clipped ammunition could be packed in T5 cans and further work on the T6 container ended.

B. CAN, AMMUNITION PACKING, CALIBER .30, M8[10]

The satisfactory test results of T5 model containers and the adaptability of that type to the packaging of several different packs of rifle ammunition led to Ordnance Technical Committee action[11] standardizing that container as Can, Ammunition Packing, Caliber .30, M8, for the packaging of the following caliber .30 ammunition:

a. 20-round cartons; 12 cartons per can; weight of can and contents approximately 16 pounds (fig. 180).

b. 8-round clips in bandoleers; 5 bandoleers (48 rounds each) per can; weight of can and contents approximately 18 pounds (fig. 181).

c. 5-round clips in bandoleers; 4 bandoleers (60 rounds each) per can; weight of can and contents approximately 17 pounds (fig. 182).

For shipment, two filled M8 cans were packed in the wood Box, Ammunition Packing, Caliber .30, M9.

Standardization of the M8 can and M9 box classified as Limited Standard the M1917 wood box and terneplate liner for packing cartoned and clipped ammunition, except to meet Navy requirements. Magazines and stowage compartments of Navy ships were designed to accommodate containers of the dimensions of the M1917 wood box and it was necessary to furnish the Navy with ammunition in that packing until the Navy developed another container to meet their dimensional requirements, and which would accommodate standard hermetically-sealed containers.

SECTION IV—CONTAINERS FOR RIFLE GRENADE CARTRIDGES

Rifle grenade cartridges as manufactured are designed with either a rose crimped or an open mouth, the propellent charge is retained by a sealed-in paper wad waterproofed with lacquer. This type closure has low moisture-resistant qualities and after rough handling of cartridges and exposure to heat and moisture, performance of ammunition has been adversely affected as demonstrated by the marked increase in the number of misfires encountered.

The following packaging methods were variously employed for grenade cartridges shipped to the field:

a. Inserted and plugged in grenade launcher tubes.

b. Packed in wax-dipped or paraffin-coated cardboard cartons, which were then placed in boxes with the grenades and launchers for shipment.

c. Same cardboard carton as **b** above, but inclosed in a waterproof laminated foil envelope.

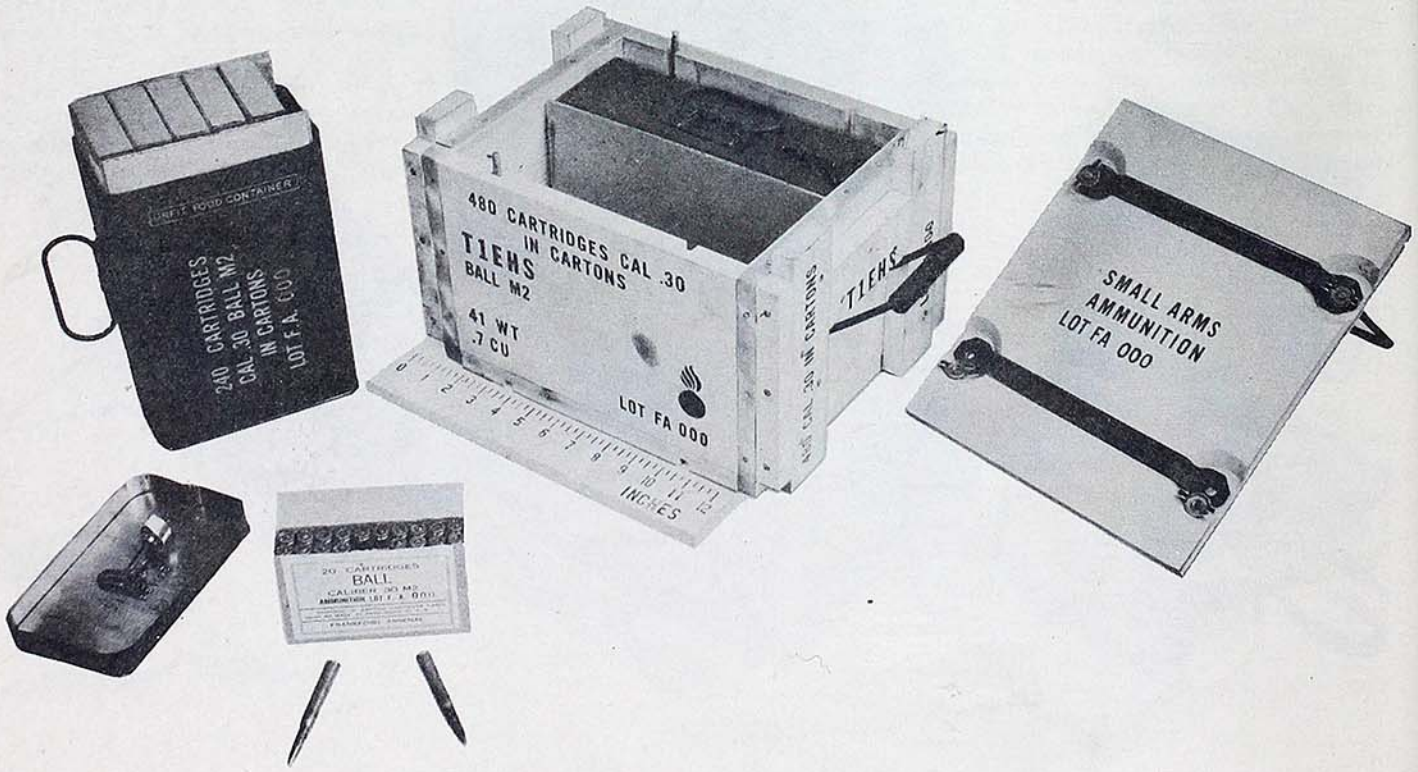

FIGURE 180—CALIBER .30 AMMUNITION IN 20-ROUND CARTONS IN M8 CANS, IN M9 BOX

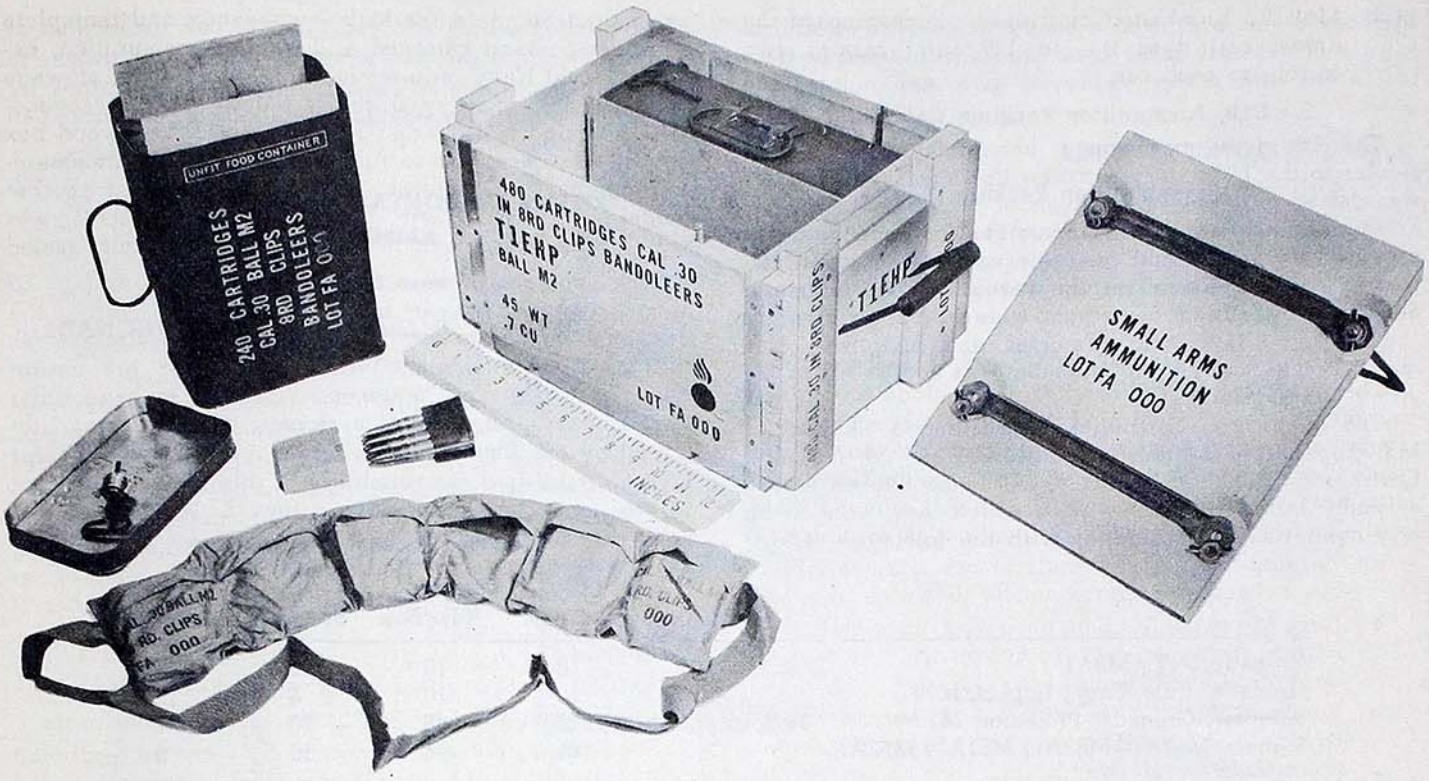

FIGURE 181—CALIBER .30 AMMUNITION IN 8-ROUND CLIPS; IN BANDOLEERS; IN M8 CANS; IN M9 BOX

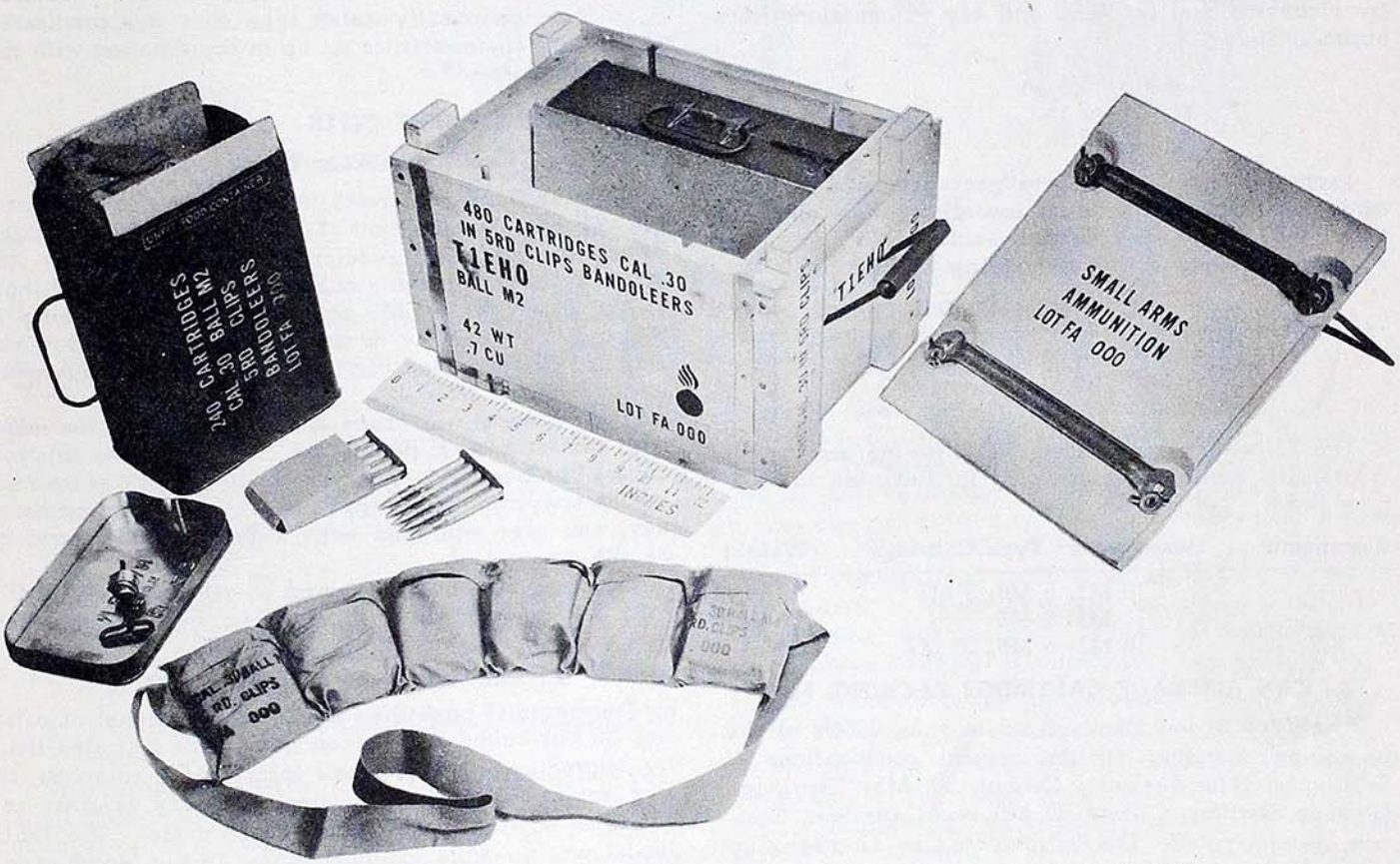

FIGURE 182—CALIBER .30 AMMUNITION IN 5-ROUND CLIPS; IN BANDOLEERS; IN M8 CANS; IN M9 BOX

Methods **a** and **b** showed a heavy percentage of failures to protect contents under conditions encountered in tropical areas, and **c** was employed as a **stop-gap method** only.

A. DEVELOPMENT TYPES

1. Can, Ammunition Packing, T7

Development of a metal container for packaging the several assortments and quantities of rifle grenade cartridges was undertaken at the request of the Industrial Service.[12] The filled containers were to be included in the shipping box with grenades and adapters. This method of packaging and shipment was acceptable to the Army Ground Forces.[13]

The quantity of Cartridges, Rifle Grenade, Caliber .30, M3; Cartridges, Grenade, Carbine, Caliber .30, M6; and Cartridges, Grenade, Auxiliary, M7 to be packed in the shipping boxes with items with which they were to be employed was in accordance with the following ratio:[14]

Items/Box	M3 Rds./Box	M6 Rds./Box	M7 Rds./Box
Grenade, A.T., M9A1	10	10	6	5
Grenade, Rifle, Frag., Impact, M17	10	10	6	5
Adapter, Grenade, Projector, M1	48	48	30	24
Signals, M17A1, M22A1, M51A1, M52A1	48	48	30	0

The T7 model container fabricated by the Continental Can Company was hermetically sealed and was opened by a conventional tear strip and key. Dimensions were approximately:

Length —3¾ in.
Width —2 in.
Depth —3 in.

Each type of cartridge was packaged in a separate cardboard carton in quantities according to the following table and each carton further enclosed in individual waterproof envelopes before packing in T7 cans:

	Rds./Carton
M3 cartridges	10
M6 cartridges	6
M7 cartridges	5

The T7 container packaged the following assortments of grenade cartridges as required for inclusion in shipping boxes:

Assortment	Quantity and Type Cartridge	Weight
"A"	10 M3; 6 M6; 5 M7	12 oz.
"B"	10 M3; 6 M6	10 oz.
"C"	10 M3; 6 M6; 10 M7	14 oz.

B. CAN, GRENADE CARTRIDGE PACKING, M13[15]

The T7 can was standardized in June 1944[16] as the packaging container for the several combinations of Cartridges, Rifle Grenade, Caliber .30, M3; Cartridges, Grenade, Carbine, Caliber .30, M6; and Cartridges, Grenade, Auxiliary, M7. The designation, Can, Grenade Cartridge Packing, M13 was assigned the container (fig. 183).

The action which adopted the M13 can reclassified as Limited Standard the packaging of grenade cartridges in wax-dipped or paraffin-coated cartons, or in cartons inclosed in waterproof envelopes unless further packed in a metal container.

SECTION V—CONTAINERS FOR CALIBER .50 AMMUNITION

Development of new type containers for caliber .50 ammunition was begun in November 1943. During the development of the metal Box, Ammunition, Caliber .50, M2 for Air Forces ammunition, a modified M2 design believed to be more water-resistant and to have other characteristics required of a storage container was submitted by the American Can Company. Tests by the Air Forces established the suitability of this type box, except for its lack of waterproof qualities.[17] A drum-shaped container fabricated of heavy sheet metal and dimensioned to contain a coiled belt of 250 linked cartridges was presented by Evansville Ordnance Plant. Research related to hermetically-sealed type cans was predicated on military characteristics set up in coordination with the Army Air Forces.[18]

A. DEVELOPMENT TYPES

1. Can, Ammunition Packing, T8

Tests at Frankford Arsenal indicated that it was possible to pack a 50-round belt of caliber .50 linked cartridges in the standard Can, Ammunition Packing, Caliber .45, M5; and that an increase of approximately one-half inch in the depth of the M5 can would permit packing a 55-round link belt, or 60 rounds packaged in 10-round cartons. The modified can was designated, Can, Ammunition Packing, T8.

The T8 model was of the same type and had the same base dimensions as the M5 can, but lacked the interior collar. The over-all height was 8⅞ inches. It was opened by the conventional herringbone tear strip operated by a key, and was equipped with a formed wire carrying handle.

A sample lot of five hundred T8 cans was procured[19] from the American Can Company for experimental and test purposes at Frankford.

2. Can, Ammunition Packing, T8E1

Experimental packaging at Frankford Arsenal of caliber .50 link-belted ammunition in T8 cans indicated that by rearrangement of the belt folds in the container, it was not necessary that container depth be as great for the same number of rounds as the T8 model. The T8E1 model was therefore identical to the T8 but modified to 8⅜ inches over-all depth. Procurement of five hundred

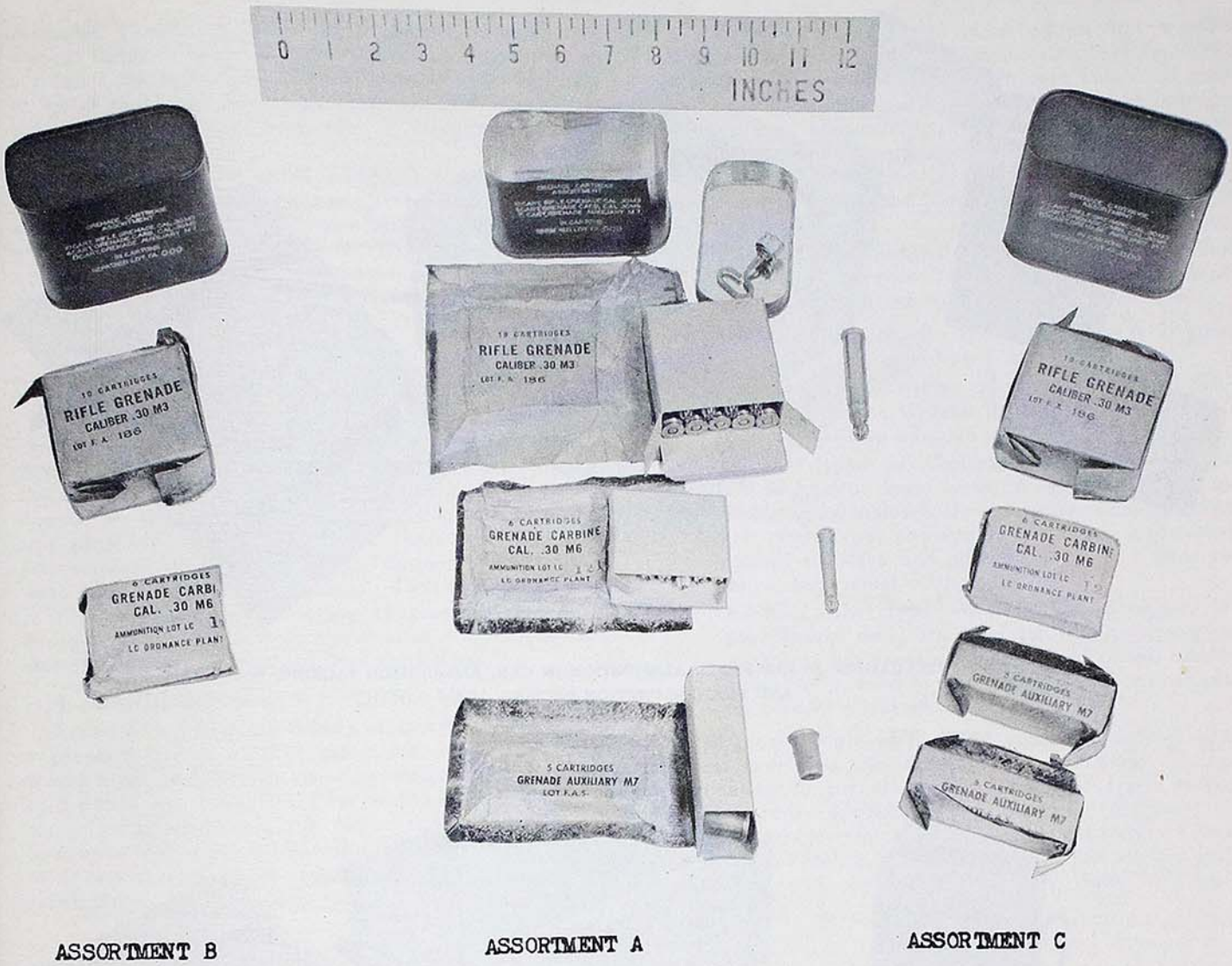

FIGURE 183—CAN, GRENADE CARTRIDGE PACKING, M13 AND THREE ASSORTMENTS OF AMMUNITION PACKAGED THEREIN

T8E1 cans was effected[20] for Frankford Arsenal tests; and two hundred fifty T8E1 containers were procured[21] and shipped to the Evansville Ordnance Plant for loading with ammunition and shipped to the field for test and information purposes.

Size of the T8E1 can was adequate to contain:

a. 55 cartridges in metallic link belts; weight of can and contents approximately 17½ pounds.
b. 60 cartridges in 10-round cartons; weight of can and contents approximately 16 pounds.

B. CAN, AMMUNITION PACKING, CALIBER .50, M10[22]

The suitability of the T8E1 can for packaging both link-belted and cartoned caliber .50 ammunition was established by Frankford Arsenal tests. Subsequent to examination of the T8E1 packings and informal tests thereof, Headquarters, Army Air Forces concurred in its adoption for packing linked for Air Force use The T8E1 was standardized as Can, Ammunition Packing, Caliber .50, M10, by Ordnance Committee action[23] for packaging of caliber .50 link-belted ammunition for the Army Air Forces and of cartoned caliber .50 cartridges for general use (figs. 184 and 185). The same action reclassified as Limited Standard the packing of link-belted caliber .50 ammunition in waxed cartons in terneplate lined M1917 wood boxes, and cartoned caliber .50 ammunition in terneplate lined M1917 wood boxes.

Box, Ammunition Packing, Caliber .50, M12 was used as the shipping container for two filled M10 cans.

The M10 can conformed dimensionally with the requirements of the Navy for containers which could be packed in the metal Mk 1 Mod 0 box developed by that service for shipment of small-arms ammunition and its stowage in racks of ships' magazines.

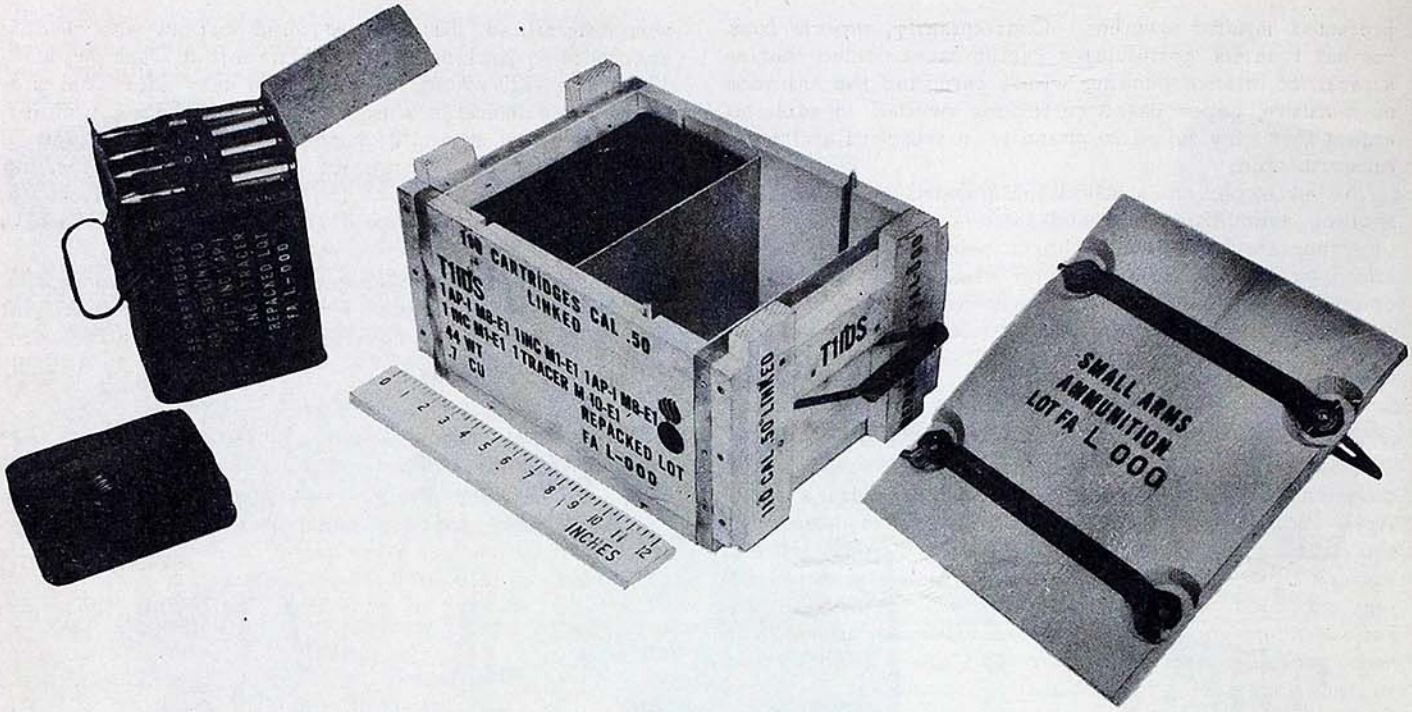

FIGURE 184—CALIBER .50 LINK-BELTED AMMUNITION IN CAN, AMMUNITION PACKING, M10 AND BOX, AMMUNITION PACKING, M12

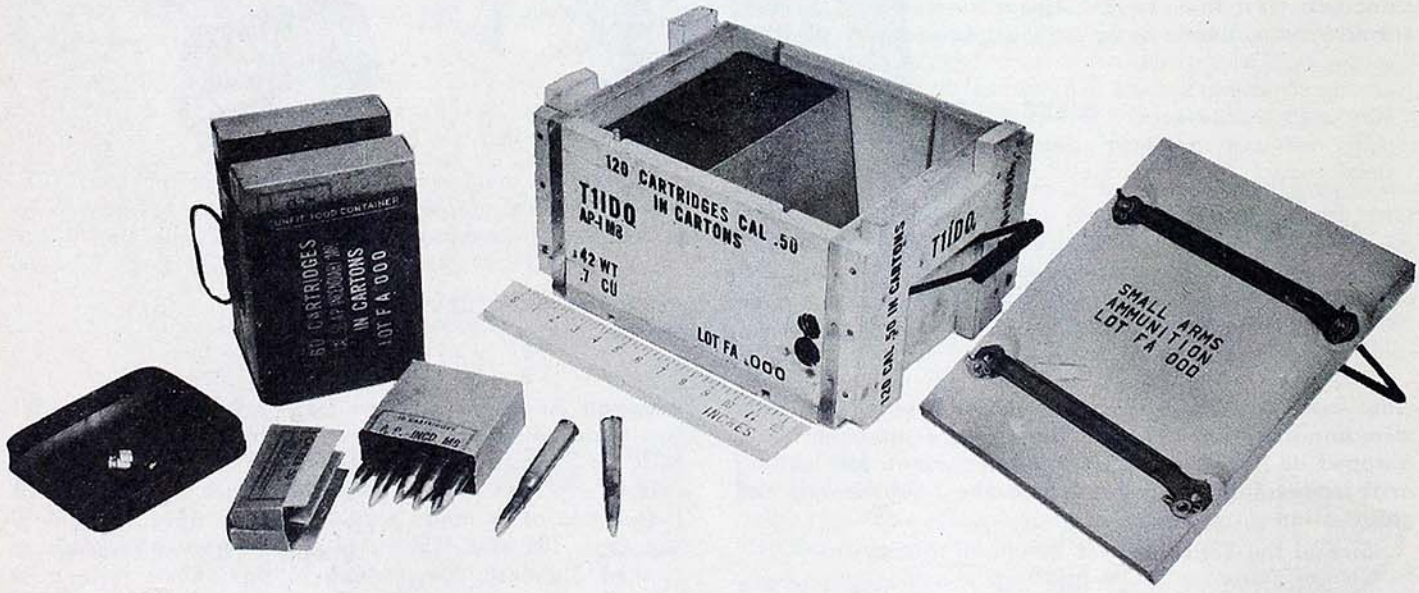

FIGURE 185—CALIBER .50 CARTONED AMMUNITION IN CAN, AMMUNITION PACKING, M10 AND BOX, AMMUNITION PACKING, M12

C. CAN, AMMUNITION PACKING, M10

To avoid any possibility of confusion due to nomenclature if the caliber .50 M10 can was adopted for packaging items other than caliber .50, the nomenclature, Can, Ammunition Packing, M10[24] was designated to replace Can, Ammunition Packing, Caliber .50, M10.

SECTION VI—CONTAINERS FOR 12-GAGE SHOTGUN CARTRIDGES

Ammunition for 12-gage shotguns used by military services had been procured from commercial facilities packed in 25-round paperboard cartons and shipped in wood boxes which were neither metal lined or otherwise

protected against weather. Consequently, reports from combat theaters, particularly Pacific areas, stated that as a result of inferior packing which permitted the entrance of moisture, paper cased cartridges swelled to such an extent that they failed to chamber in weapons and were unserviceable.

As an expedient method inaugurated early in 1944, shotgun ammunition destined for overseas was repacked in terneplate lined M1917 boxes prior to shipment. To afford protection to ammunition after a liner was once opened, each 25-round carton was further inclosed in a moistureproof and vaporproof envelope before packing in terneplate liners.

A. DEVELOPMENT TYPES

1. Can, Ammunition Packing, Shotgun, T9

The development of a suitable hermetically-sealed container for 12-gage shotgun shells was initiated in April 1944. The design of the T9 model was similar to the caliber .30, M8 and caliber .50, M10 cans. It was opened by the conventional key-operated tear strip, and was provided with a handle for individual transport. Four standard commercial 25-round cartons of ammunition were packed in each T9 container. Tests of filled T9 cans in the hot, cold, and humidity chambers at Frankford Arsenal indicated satisfactory protection was afforded the ammunition under simulated field conditions.

B. CAN, AMMUNITION PACKING, M10

Research work on packaging of shotgun shells led to a proposal that a smaller carton be developed which would more readily lend itself to requirements of troops in the field and which could be carried in clothing pockets or other equipment. A carton designed to contain 10 rounds was presented to representatives of the various using services for their comments and was considered satisfactory. In tests conducted at Frankford Arsenal, it was determined that the 10-round carton was readily adaptable to packing in Can, Ammunition Packing, M10, 12 cartons (120 rounds) per can. In case additional protection was desirable after removal from metal containers, each carton of ammunition could be further inclosed in moistureproof and vaporproof envelopes before packing in cans. Results obtained in humidity, rough handling, and packaging tests of the 10-round carton packed in M10 cans were satisfactory.

Standardization of packaging for shotgun ammunition was effected by Ordnance Committee action[25] in August 1944, which contained the following recommendations:

a. The packaging of all Cartridges, Shotgun, 12-gage be in 10-round paperboard cartons.

b. The packing of twelve 10-round cartons of Cartridges, Shotgun, 12-gage in the Can, Ammunition Packing, M10 be adopted as Standard.

c. Combat types of Cartridges, Shotgun, 12-gage (No. 00 buck in brass cases) in 10-round cartons be additionally inclosed in waterproof, moistureproof and vaporproof envelopes for further protection against moisture and climatic conditions after removal from metal containers.

d. As noncombat types of Cartridges, Shotgun, 12-gage (paper case) are used for training purposes only, it is not necessary that cartons of this ammunition be inclosed in waterproof, moistureproof and vaporproof envelopes.

The gross weight of the M10 container packed with combat cartridges (No. 00 buck in brass cases) was approximately 19 pounds; with noncombat types (paper cases), it was approximately 15 pounds. Shipment of combat cartridges was accomplished in the standard Box, Ammunition Packing, M12, two M10 cans per box (fig. 186). For shipment of noncombat cartridges, three M10 cans

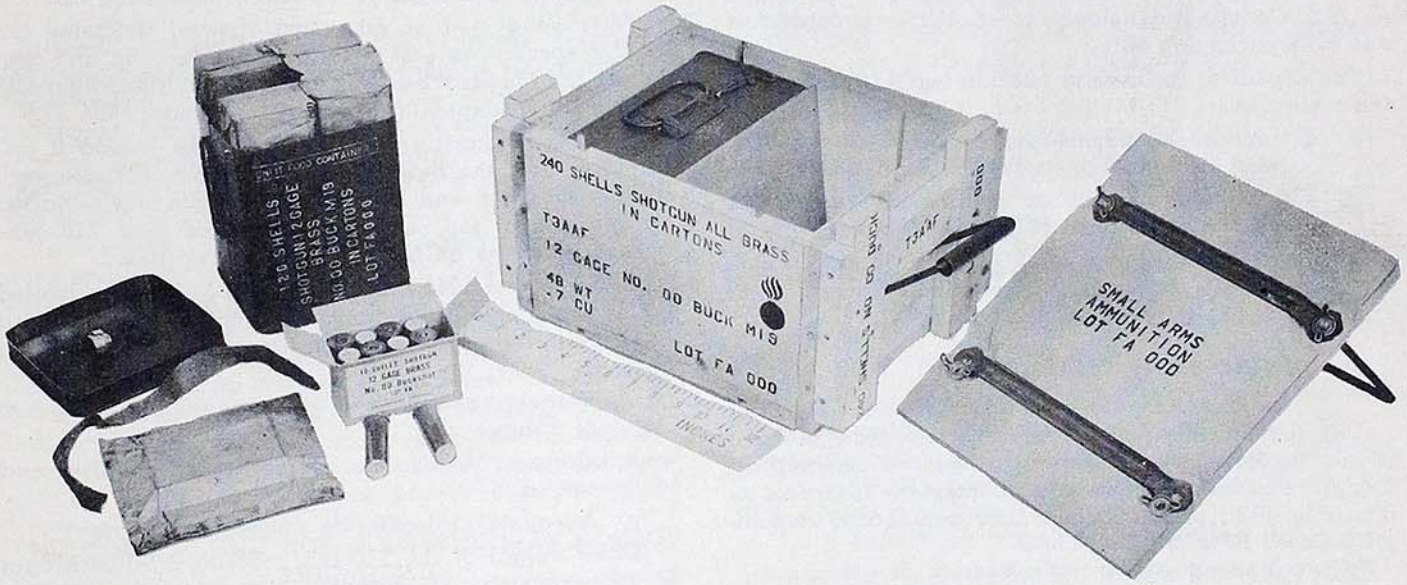

FIGURE 186—COMBAT PACKAGING OF 12-GAGE AMMUNITION IN CAN, AMMUNITION PACKING, M10 AND BOX, AMMUNITION PACKING, M12

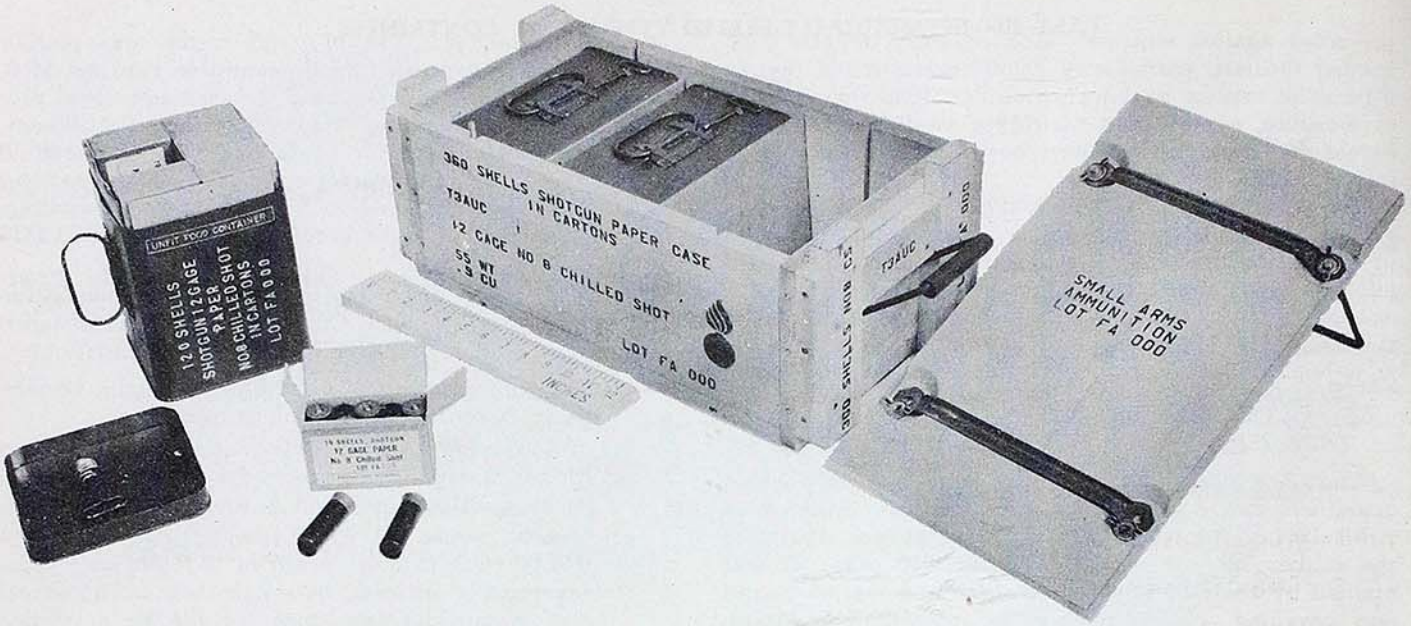

FIGURE 187—PACKING OF TRAINING TYPE 12-GAGE AMMUNITION IN CAN, AMMUNITION PACKING, M10 AND BOX, AMMUNITION PACKING, M15

were packed in a new designed Box, Ammunition Packing, M15 (fig. 187).

SECTION VII—CONTAINERS FOR CALIBER .60 AMMUNITION

The contour of the caliber .60 cartridge and the type of belt link designed for it, resulted in linked cartridges being too bulky for economical packaging in prebelted lengths. Container development was therefore concerned with bulk packaging only.

The expedient methods of packing caliber .60 ammunition were:

a. 25 rounds per paperboard carton, 4 cartons (100 rounds) per metal-lined M1917 wood box.

b. 154 rounds encased in paperboard tubes and packed in metal-lined M1917 wood boxes.

A project to develop a more suitable packing which met requirements for small unit containers for caliber .60 ammunition was initiated in April 1944.

A. DEVELOPMENT TYPES

1. Can, Ammunition Packing, Caliber .60, T10[26]

The hermetically-sealed metal can presented significant advantage for use in packaging caliber .60 ammunition, though consideration was given containers fabricated of plastic coated materials, and waxed paperboard containers inclosed in metal lined boxes.

The T10 model was of the conventional hermetically-sealed terneplate type adopted for other calibers, with an integral tear strip for easy opening and a handle for individual transport. The can was of adequate dimensions to contain 15 cartridges if packed with points in the same direction, or 20 cartridges if packed with alternate rounds reversed. The 20-round pack was more economical of space and made a more balanced and compact load.

To prevent metal to metal contact of rounds, two packing methods were tested:

a. Tubular collar chipboard spacers placed on cartridge bullets.

b. Perforated spacer boards to separate rounds and retain them rigidly in position inside the can.

Tests conducted at Frankford Arsenal indicated the tubular spacers were satisfactory in separating and protecting the rounds when subjected to rough handling and were readily adaptable to factory production.

To permit packing in the Navy's Mk 1 Mod 0 ammunition box, the base dimensions of the T10 can were slightly modified and the carrying handle was relocated on one end of the can. This permitted nine T10 cans instead of six to be packed in the Navy box.

In September 1944 the T10 can was adopted as limited procurement type by Ordnance Committee action[27] based on superiority of the 20-round pack in the following respects:

a. Economy of space, more cartridges per cubic foot of volume.

b. Compact load, less possibility of shifting and torque.

c. Adequate protection to individual rounds.

Gross weight of the T10 can containing 20 cartridges is approximately 13 pounds. The shipping container employed is the wood Box, Ammunition Packing, Caliber .60, T29 designed to contain three T10 cans.

Standardization of the T10 can awaits standardization of caliber .60 weapons and ammunition.