

# ADDENDUM

To

History of Modern U.S. Military  
Small Arms Ammunition

Volume II,  
1940-1945

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## History of Modern U.S. Military Small Arms Ammunition, Volume II, 1940-1945

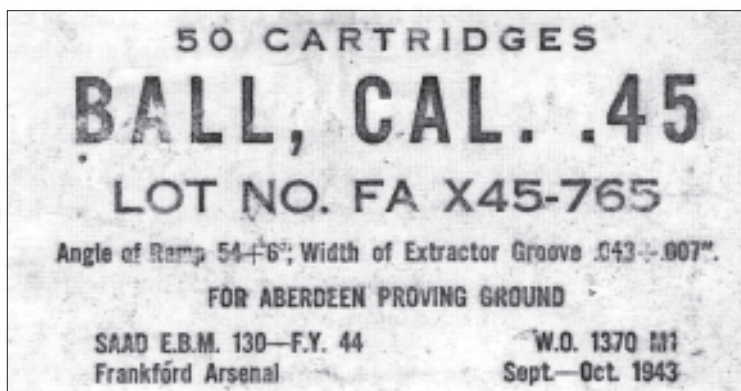
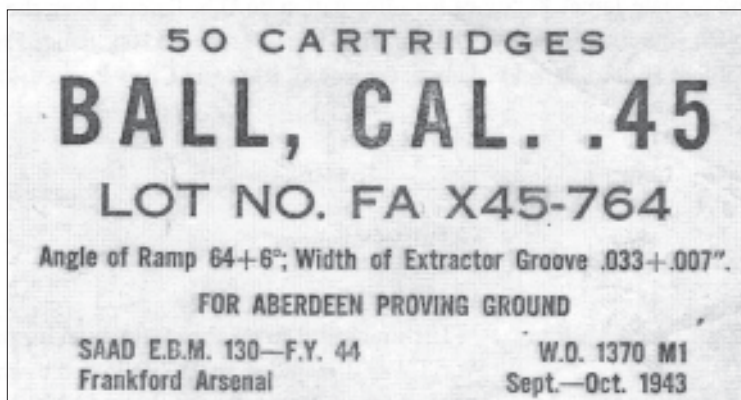
### Introduction and Acknowledgments

Since Volume II was published in 1978, additional information and corrections of the original text have been compiled on U.S. military small arms ammunition, particularly covering commercial contract and experimental cartridges and components. This has come from a number of sources—including additional research by the authors and information provided by historians, collectors and other interested parties. Pending the publication of a completely revised edition of Volume II, this Addendum serves as a means to provide the information which has become available. The format used lists the additions and corrections to Volume II by page number, column (left or right) and line number, counted from the top of the page, excluding headings, captions for illustrations and photographs. In addition, a number of illustrations have been added and box label photographs replaced to improve clarity.

The information contained in this Addendum could not have been compiled without the assistance and contributions from many sources and individuals. The following deserve special thanks and appreciation for their cooperation and assistance: The Remington Society of America, particularly Louis F. Behling for providing information, drawings and technical data on contract ammunition; Norman D. Hower for his continued assistance and research on U.S. military small arms ammunition; Daniel L. Shuey for providing information on the Winchester Repeating Arms Co. files covering contract ammunition, and the late James K. Sones for information on U.S. Patents from the 1940-1945 period. Thanks are also extended to Dr. Robert H. Bouilly, Freddie Butt, David Frederickson, James Frigiola, Ron and Ron J. Fuchs, Stephen L. Fuller, William Hindin, Jarrel F. Janick, George G. Kass and Chris Punnett for their assistance.


PAGE	COL	LINE	REMARKS
xiv	R	48	Add after "loadings": pilot
xiv	R	48	Add after "lots": The Frankford Arsenal experimental lot prefix system used during World War II included an "X" followed by the caliber then the lot serial number. Examples would be FAX 30-89, FAX 45-87 and FAX 50-345 for Cal. .30, Cal. .45 and Cal. .50 experimental lots. When known, the lot numbers are listed in the text to further document significant cartridge developments.
xv	L	8	Add after "period": In 1941, a joint Army-Navy Standardization Board was created which designated common-use Army "Model" and U.S. Navy "Mark" items with an A-N prefix. Some of these prefixes were assigned to small arms cartridges during the World War II period and are included in Appendix B.
xv	R	17	After "Development," delete word: in
3	L	9	Change line to read: Cal. .38 Colt Police Positive and Cal. .38 S&W Victory Revolvers.


PAGE	COL	LINE	REMARKS
5	R	5	Change headstamp to: REM-UMC 38 SPL
12	L	6	Add after sentence ending with "Company": (The first lot was reportedly headstamped W 40.)
12	L	8	Add new sentence after "Department.4*": Each contractor was allowed to use their own primer to increase delivery schedules.
12	L	18	Add after sentence ending with "month": (headstamped PC 4 2).
12	R	6	Delete lines 6-13 and substitute: At least two lots of Cal. .45 Ball cartridges with steel cases, having modified extractor grooves, were loaded during September-October 1943 at Frankford Arsenal. These were lots FA X45-764 (ramp angle 64 + 6° and width 0.033 + .007 in.) and FA X45-765 (ramp angle 54 + 6° and width 0.043 + .007 in.) for testing at Aberdeen Proving Ground. Rounds examined from these lots have zinc-plated steel cases, copper primers and are headstamped F A 4 3. The standard steel case extractor groove ramp angle was 26 - 6° with a width of 0.033 + .007 in.
12	R		Add box labels.





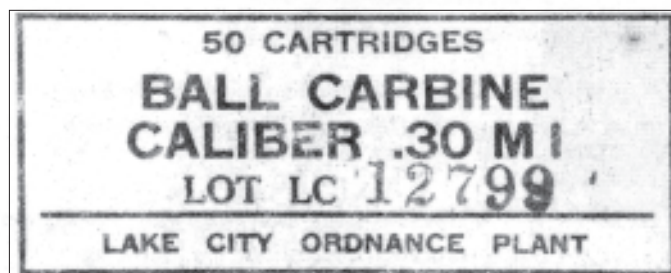
PAGE	COL.	LINE	REMARKS
13	R	20	Delete word "test" and substitute word: "evaluate"
13	R	30	Add after "tests.10": Apparently, some of the early steel cartridge case development effort used cut-down cal. .30 cases modified with a wider extractor groove and commercial-size cal. .45 primer pocket. A case answering this description has been examined, which is unplated and headstamped F A 4 2.
14	R	21	Add after sentence ending with "Plant": A fired copper-coated steel case with copper primer cup has been examined headstamped S R 4 2. The manufacturers code "SR" was assigned by the Ordnance Dept. to Struthers-Dunn, Inc., Philadelphia, PA. This company made steel products, but no mention could be found in the Ordnance records of any cal. .45 steel case development contracts made to this firm.
15	L	15	Add after sentence ending with "Aug. 3, 1943": Remington Arms Co. also used the zinc plating as a steel case finish on a production basis; rounds have been examined headstamped R A 4 2 and R A 4 3 with copper primer and purple sealant loaded with bullets having both GM and GMCS jackets.
18	R	17	Delete word "straight" and substitute word: standard
18	R	25	Add after sentence ending with "0.877 in.": A FAT1E1 blank was also developed for use in both revolvers and automatic pistols. The case was straight with a slight taper near the mouth which was closed by a three-petal rose crimp. The FAT1E1 failed tests in the revolver because it was difficult to align all three rounds in the half-moon clip with the revolver cylinder chambers. Both the FAT1 and FAT1E1 were designed to be made from the service case.
19	R	4	Add after sentence ending with "cartridge": (Actually, both the T31 and M9, because of greater overall length, were made from untrimmed final draw service cartridge cases.)
20	L	6	Add after sentence ending with "tion)". The 50-round carton included half-moon clips packed loose with the cartridges.
21	L	33	Add after sentence ending with "mechanism": (FA Laboratory Dwg. BLX-F1-1, 10-6-42)
21	L	Fig. 14	Above left side of caption change "Wad" to Mouth
22	R	14	Delete "One" and substitute word: "A"
22	R	21	Add after end of sentence "R A 42": Another dummy round has three grooves on the upper portion of a tinned case headstamped F A 42 with an empty primer pocket. Dummy rounds have also been examined from full boxes marked M1921 Lot F.A. 5 and 6 which have tinned cases without holes, no primer, and are headstamped F A 42.

PAGE	COL	LINE	REMARKS
24	L	8	Add after "1943": Frankford Arsenal high pressure rounds made in 1942 have been examined with tinned case headstamped F A • 4 2. The dot is probably an internal Arsenal marking.
24	R	6-8	Delete sentence starting with "A" and ending with F A 4." Substitute: However, the companion steel case drawing B501A dated Mar 6, 1943 (revision 5, 3-7-44) indicates the case is to be zinc plated for identification when used as high pressure test.
26	L	Fig. 18	The cartridge illustrated as "A" should be "B" and "B" should be "A"
27	-	Fig. 20	Add under caption: Bullet Length 1.02".
27	-	Fig. 21	Add under caption: Bullet Length 0.908".
28	L	40	Add after "EC 43.": A T31 with 1.11 in. overall length has also been examined with a smooth cannellure on the case body located 0.32 in. from the base. Headstamp is E C 4.
30	L	5	Insert "FA" before "T2"
30	L	9	Insert "FA" before "T2"
30	L	19	Insert "FA" before "T3"
32	-	Fig. 31	Under caption change "Diam. .4595" to "Diam. .4495"
33	R	27	Add after "bullet": (Dwg. FB 22497, Oct. 30, 1945)
35	R	5	Add after "1945": The Frankford Arsenal drawing of the T92 cartridge was FB 22522, Jan. 16, 1946.
39	R	21	Change "0.355-in." to 0.351-in.
39	R	26	Add after "108 grs.": (W.R.A. Dwg., .30 Win. S.L., Oct. 10, 1940)
40	-	Fig. 35	Add caption: Original Winchester sketch of Cal. .30 Short Rifle Cartridge
40	L	17	Add after ".30 S.L.24": (W.R.A. Dwg. Cal. .30 S.L. Ctg. Shell, Jan. 11, 1941)
40	R	Fig. 36	Delete illustration and substitute new illustration
			
40	R	11	Delete this line and substitute: A third order consisting of
41	L	5	Add after "40,000 p.s.i.": The concave base of the bullet was also changed to make it

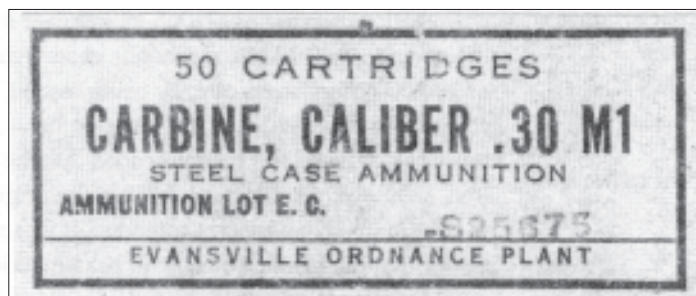
PAGE	COL	LINE	REMARKS
			slightly shallower. In addition, the antimony content of the bullet core was increased to maintain bullet weight.
41	L	18-19	Delete last sentence starting with "More" and ending with "later."  Add new Figure 36a:
			
			FIG. 36a. <i>Early W.R.A. Bullet with Concave Base</i> (from <i>W.R.A. Dwg. .30 Win. S. L. Bullet, Oct. 10, 1940</i> )
41	L	20-30	Delete paragraph starting with "Production" and ending with "waterproofing." Substitute the following:  During firings in the various weapons at Aberdeen Proving Ground with rounds from the second lot, it was also discovered that an excess of gilding metal was forming in the barrel bullet seat and occasionally causing chambering problems. Fired cases were also found distorted at the mouth. To correct this and prevent reducing the powder space, Winchester recommended increasing the case thickness by enlarging the body and head outer diameter by .010 in. When this was submitted to the Ordnance Office for approval, it was changed to a maximum of .005 in. increase in case outside diameter (head diameter 0.354 in. on rounds examined). Since the third order of 300,000 rounds was already being loaded, the new larger-diameter case was to be introduced into the first full-scale production contract to follow. Winchester recommended that the "new" cases be identified, should problems develop when the original cartridges were used in maximum-size weapon chambers. It was agreed by the Ordnance Office that the planned change in head marking to W.R.A. and date would suffice to keep the old and new cases identified. <sup>27</sup> Some W.R.A. .30 S.L.-headstamped cases were made, however, with the larger case diameter. Ball, dummy, and prototype blank rounds have all been examined with the new case dimensions, possibly made for early testing. Early ball loadings were also made up by Western and Remington; the rounds examined were headstamped REM-UMC 3 SL (the number 2 and letter R were struck out of the original 32 SLR headstamp) and Western .32 S.L.R. The Remington load had a copper primer cup; the Western had a nickel-plated primer sealed with purple waterproofing.
41	R	6	Add following after "- 0.02 in.": The case drawing was B200957 dated Sept. 13, 1941, which shows the increased head diameter of 0.357-.006 in.
42	L	11	Delete line beginning with "Besides" and ending with "Arsenal,"
42	L	12	Begin paragraph with "Contracts"
42	L	23	Delete "F A 42" and substitute WCC 42.



PAGE	COL	LINE	REMARKS
42	L	26	After "1943" add comma and reportedly. Line now reads: January, 1943, reportedly with a brass-cased ball round
42	L	32	Add after "cases": (headstamped W.R.A. 44)
42	L		Replace box label bottom of page



43	L	41	Add after "finish),": RA 43 (without finish),
43	L	32	Add steel case box label after end of paragraph



43	R	33	Delete "In 1943 and 1944" Substitute: During the 1942-1944 period,
44	R	38	Add after "Arsenal.": This lot was tested at Springfield Armory during May, 1945 for functioning and barrel (gas piston) corrosion (471.41/1467, 30 May 45 RG156, SA File)
44	R	46	Add after "manufactured." Reportedly, this lot was headstamped P C 4 and had a larger primer pocket.
45	L	16	Add after "signed.": Experiments were started with ball bullets using cores made from copper-plated drill rod and copper-clad screw machine stock but these were not successful.
45	L	17	Add after "first": armor-piercing

PAGE	COL	LINE	REMARKS
47			Replace box label top of page



48	R	20-33	Delete lines
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48	R	20	Add the following:
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The first grenade cartridge developed at Frankford Arsenal had a tapered mouth closure and smooth cannellure located approximately 0.291 in. from the mouth. This was designed by the Experimental Dept. drafting room (Fig. 45A). Testing of this round was not successful and a second type was designed with a heavy three-point crimp at the mouth closed by a white cardboard wad beneath the crimp (Fig. 45B). Both these rounds used standard carbine cases headstamped W.R.A. .30 S.L.

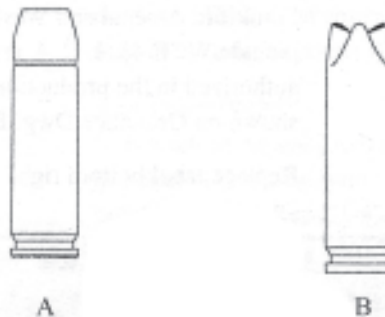


FIG. 45. Cal. .30 Carbine experimental grenade cartridges  
(from specimens headstamped W.R.A. .30 S. L.).

49	L	1-24	Delete all lines and substitute the following after Fig. 45 caption:
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Both the first and second types of grenade cartridges had low temperature ignition problems and to solve this a cartridge with heavier mouth crimp and different propelling charge was designed. It was called the Cartridge, Grenade, Cal. .30 (Experimental), Rose Crimp and was shown on drawing FB 18912 dated April 7, 1942 (Fig. 46).

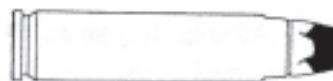
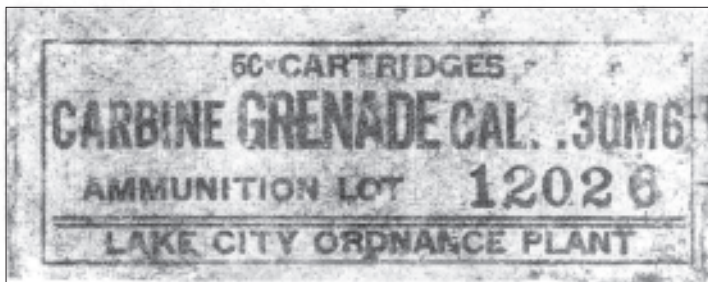


FIG. 46. Cal. .30 Carbine Grenade Cartridge (experimental)  
(from Dwg. FB 18912, Apr. 7, 1942).

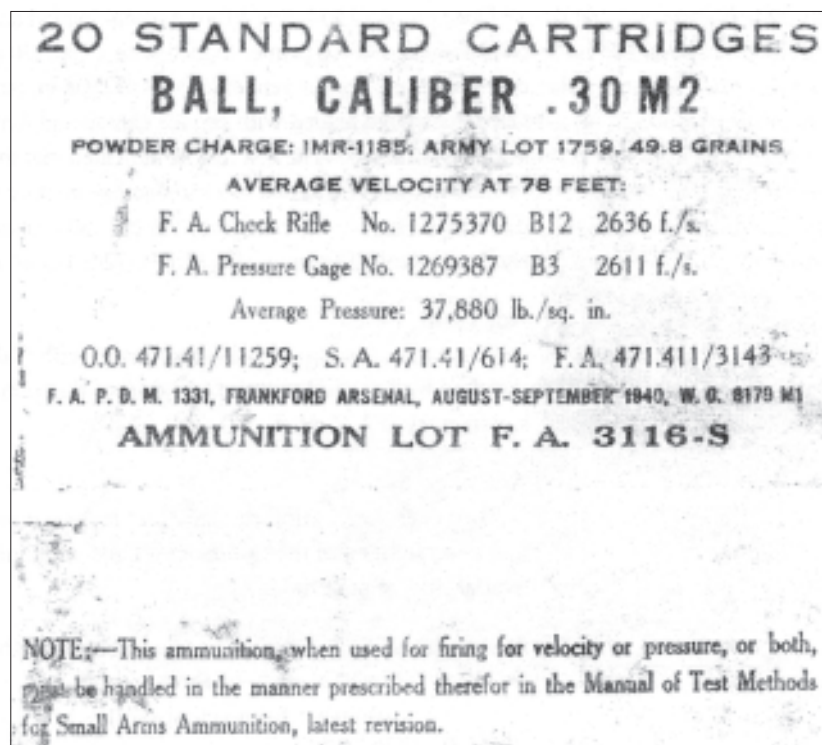
Length 1.68-.02"



PAGE	COL	LINE	REMARKS
			This cartridge measured 1.68 in. overall and was closed at the mouth with a five-petal rose crimp. The powder charge was protected by a waterproofed paper wad inserted beneath the crimp, and a smooth cannellure was located on the case below the crimp to keep the wad in place. The powder charge was 20 grs. of du Pont EX-4809-6 powder, with 1 gr. of 60mm mortar ignition powder placed next to the primer. This charge gave the M11A1 Rifle Grenade (the practice version of the M9A1) a velocity of 144 f.p.s. and a range of approximately 200 yds. One 50-round carton has been examined containing rounds loaded by Frankford Arsenal on November 21, 1942, using cases headstamped WCC 42. The five-petal rose crimp was colored red (using the same identification as the FAT1 blank). The box label is illustrated. On October 13, 1942, this round was designated by the Ordnance Committee as Cartridge, Grenade, Carbine, Cal. .30, T6.
49	R	6-24	Delete all lines and substitute the following: The T6 was adopted as the M6 by the Ordnance Committee on February 11, 1943, and was released for immediate procurement. The Ordnance Committee recommended that further development work be done in an effort to increase the range of the M9A1 Grenade. Orders totaling 20 million rounds were released. Because of the lack of carbine ammunition production facilities at Frankford Arsenal, most of the production was assigned to Lake City and Evansville Ordnance Plants. <sup>17</sup> Some manufacture, however, took place at Frankford Arsenal and Western Cartridge Company. Headstamps include WCC 43, L C 4, and E C 4. Only the brass case was authorized in the production of this round. The M6 cartridge is shown on Ordnance Dwg. B 181079, dated March 22, 1943.
49	R		Replace label bottom right.
			
50	L	15	Add after "portion": The cases were ordered from Western Cartridge Co. who based the extended configuration on their .22 shotshell design. Rounds answering this description have been examined measuring 1.674 in. overall, headstamped WCC 42 with a beveled case mouth closure and two smooth cannellures on the extended neck (Fig. 47.).
50	L	22	Add Fig. 47 from pg. 49 with same caption after end of paragraph:
50	R	Fig 48	Caption line 2, delete M18 and M18 Alternate and substitute M1.
51	L	15	Delete line in parenthesis.
53	L	29	Change "0.25 gr." to: 0.5 gr.

PAGE	COL	LINE	REMARKS
54	-	-	Chart of Major Case Types, .30 Self Loading (Winchester Dwg. unnumbered). Add after 5th line of REMARKS: Case head diam. 0.351 in.  Cal. .30 Carbine M1 (Dwg. B 200954). Delete "FA 41" on 4th line of IDENTIFICATION, and add after 5th line of REMARKS: Case head diam. increased to 0.357 in.  Add to REFERENCES: 27. Letter W.R.A. to E.F. Thompson, Nov. 24, 1941.
55	R	17	After "F A 41". Add: It is of interest that two sealed boxes from this lot, when opened, have disclosed in one case, all 20 rounds without color tip and in the other, 5 rounds with silver tip and 15 without.
56	L	Fig. 52	Change caption after Length: "M2 1.114-.04" to: M2 1.123-.04"
60	L	25	Add new paragraph after "Conditions <sup>11</sup> ": During early 1944, Frankford Arsenal loaded and tested the Cal. .30 case with the No. 26 primer loaded with a Cal. .50 primer mixture. The cases used had primer vent diameters of 0.08 in. (standard) and 0.10 in. Cartridges were loaded with service charge and Armor-Piercing M2 and Tracer M1 bullets. The test results indicated that the cal. .50 FA 90A primer mixture performed in a satisfactory manner with the 0.08-in. vent diameter. Thus, in an emergency the cal. .50 primer mixture could be used in the cal. .30 primer (FA M.F.R. 724, 1-3-44 & SGTP#192-44).
61	L	34	Add after "1942. <sup>14</sup> ": Frankford Arsenal also experimented with Cal. .30 Ball M2 steel-jacketed bullets clad with bronze during this period but tests were not satisfactory (FA Rept. T-470, Jan. 42).
61	R	26	Add after "jackets.": However, production of clad-steel jackets continued with commercial contractors and the Ordnance Plants depending on their stock and availability of material.
62	R	-	Add under STEEL CASES box label photograph: Photo courtesy of Fred Precht (reduced from actual size)
65	L	21	Add after footnote 96: Recently, additional examples of steel cases developed at Federal or Twin Cities have been reported, including rounds with brass, cadmium, copper and tin finishes. These are headstamped 4 2 T W and 4 3 T W and loaded into ball M2 cartridges with GMCS jacketed bullets.
65	L	34	Add new paragraph after "test.": During September, 1942, St. Louis Ordnance Plant started experimental fabrication of Cal. .30 steel cases, initially using cups provided by Frankford Arsenal. Case lots 100-104 were produced and assembled into Ball M2 cartridges for ballistic tests. Case lots

PAGE	COL	LINE	REMARKS
			100-103 used a cuprodine finish; lot 103A, a Houghto-Black finish (produced a brown finish on steel); lots 104 and 104A had no finish. All case lots were headstamped S L 4 2 ( <i>Dev of Steel Ctg Cases</i> , SL Ord Plt, U.S. Ctg Co., Dec. 42).
67	L	Fig. 57	Caption 2nd line, change "(reconstruction)" to: (from photograph)
69	L	2	Add after "examined": Apparently, development of the Cal. .30 aluminum case was carried out to gain experience in the fabrication of the .30 Light Rifle case, because Cal. .30 case forming tooling was readily available. Cases fabricated in late 1945 included those with brass and steel primer inserts. Aluminum cups made from alloys called ZG 42 and ZG 43 were used to form the cases, which were not headstamped (FA Rept. R-876, Nov 48).
69	-	T2E19	Third line under T2E19, delete word "flash" and substitute: barrel friction.
70			Bottom of page, replace label



71	R	5	Add new paragraph after "barrels": The assignment of lot number prefixes during the period was not always consistent for standard and check ammunition. A box of primed cases marked: 20 CASES Cal. .30 PRIMED LOT FAP 30-399 may be for standard or check purposes. The box contained Cal. .30 brass cases headstamped 43 TW with flat primer cups sealed with black waterproofing sealant. The inside of the case mouth appears to be reamed out or perhaps resized. The neck shows no evidence of case mouth anneal, although this could have been removed, since the cases are shiny and may have been tumbled to clean them.
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PAGE	COL	LINE	REMARKS
73	L	18	Add after "cannelure": (Only noted on rounds of Frankford Arsenal and St. Louis Ordnance Plant manufacture)
73	L	18-21	Change paren. phrase starting with "(A round" to read: Rounds headstamped F A 4 2 and F A 4 3 have also been examined with two extra knurled cannelures, the significance of which is not known.
73	L	35	Add new paragraph after "- molybdenum.": During May, 1940, Frankford Arsenal loaded a small lot (FA X30-131) of Cal. .30 Armor-Piercing M2 cartridges to an average pressure of 56,000 lbs. per sq. in. for testing at Aberdeen Proving Ground. These were loaded to over maximum pressure to give the highest velocity obtainable with current weapons to increase penetration. Firing of this lot against ¼ in. and ½ in. RHA plate was not conclusive (NA RG 156 FA 471.414/556, May 27, 1940).
74	L	16	Add new paragraph after "Ball. <sup>38</sup> ": Cal. .30 Armor-Piercing M2 cartridges were also assembled with steel cases in 1942 and 1943 by Frankford Arsenal. These were loaded on a pilot line basis to provide a heavier bullet on rounds made for testing and evaluation of the steel case. A round examined with lacquered steel case headstamped F A 42 loaded with a black-tipped M2 Armor-Piercing bullet is probably an example.
82	-	FAT2E1	Change "hold" to: hole
83	L	8-10	Delete last sentence starting with "Nothing" and ending with "ammunition." Substitute following: During March, 1942, Frankford Arsenal shipped 500 T1E2 A.P. Short Trace bullets to Aberdeen Proving Ground for hand-loading. These traced to 270 yds. average and were equal to the Cal. .30 M2 Armor-Piercing in penetration. These were loaded to an average velocity of 2839 f.p.s. At the same time, 500 Type A2 A.P. Short Trace, Delay Action bullets were also shipped. These had a 48-yd. delay, then traced to 248 yds. average. Aberdeen Proving Ground loaded these bullets to an average velocity of 2830 f.p.s. (APG FR #68 Jul. 7, 1942).
83	L	23	Add after "cup. <sup>45</sup> ": Blank M1909 rounds headstamped F A 4 1 and F A 4 2 have also been examined with nickel-plated primer cups which may be additional loadings using commercial primers.
84	R	22	Add after "0.04 in.": Rounds dated 1942 and 1943 have also been noted with M2 ball bullets having an additional bullet seating cannelure.

PAGE	COL	LINE	REMARKS
84			Replace label bottom of page

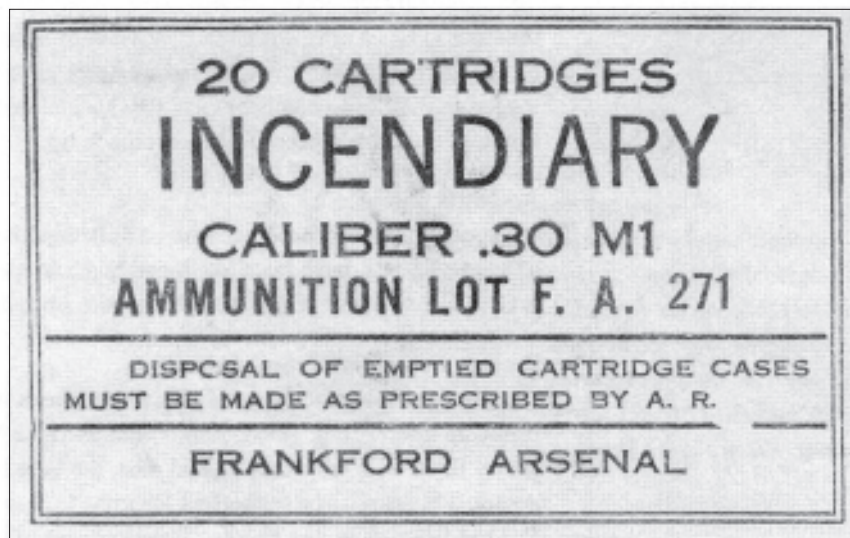


85	L	13	<p>Add new paragraph after "manufacture."</p> <p>In 1943, to promote the war effort, Frankford Arsenal set up an exhibit of small arms ammunition manufacturing in a hallway of Wanamaker's Department Store in Philadelphia and actually produced cal. .30 M1906 dummy ammunition on machinery relocated from the Arsenal. Components were shipped to the store each day and completed rounds returned to the Arsenal for shipment against orders. During the period July 15 to September 18, 1943 over one million rounds were assembled on the Wanamaker's Department Store line.</p>
86	L	4	Change "verison" to version.
86	R	2	<p>Add after "purposes."</p> <p>Apparently, Aberdeen Proving Ground fabricated solid Cal. .30 dummy cartridges from cold-roll steel bar stock for inspection of weapons. An example is shown on a drawing entitled DUMMY SHELL made up for the Base Shop Division, Aberdeen Proving Ground dated March 4, 1943 (<i>Ordnance Sergeant</i>, May 1943, 2d LT R.F. Young Ord Corps)</p>
87	R	11	<p>Add Army between "the" and "Air," change "Force" to Forces. Add after "Forces": Training Command, Fort Worth, Texas. Line now reads:</p> <p>Army Air Forces Training Command, Fort Worth, Texas.</p>
87	R	12	<p>Add after "with":</p> <p>the National Defense Research Committee at</p>
87	R	21	<p>Add after "project.":</p> <p>Bullets were also made from ceramic material provided by the Homer-Laughlin Co. and Rutgers University.</p>
87	R	22	<p>After "1943" delete "the glass bullet was" and substitute:</p> <p>bullets made from ceramic and glass were</p>
87	R	30	"bakelite" should be: Bakelite

PAGE	COL	LINE	REMARKS
88	L	5	Change "aircarft" to: aircraft
88	L	19	Add after "developed": (design B-30-14)
88	L	21	Add after "cent": RD-42-93
88	L	21	"bakelite" should be: Bakelite
88	L	24	Add after "1,360 f.p.s.": This design included a seating cannellure which was lightly applied to prevent weakening the bullet; however, the ordnance drawing (B7640951) shows a bullet without cannellure. Duke University also designed a frangible bullet for testing armor. It was made from the same bonded lead powder and Bakelite material used in the B-30-14 design and had a nose with sharp ogive with either a flat or rounded base. Apparently, these were hand-made to various lengths and loaded to different velocities to satisfy special test requirements. Some of these have been noted with black tip.
89	L	8	Add after "Moines.": Apparently, most production used bullets without cannellure, although rounds have been examined headstamped S L 4 3, S L 4, L C 4 4, F A 4 and WCC 4 5 which have smooth cannellures.
90	L	23-28	Rewrite lines after "firing" to read: A bullet made from pressed zinc alloy filings was tried but it also broke up upon firing. Next, Remington used the M2 Ball bullet jacket filled with lead shot or lead dust, the base being closed by solder, a brass plug or spatterless lead; these passed the penetration test but failed accuracy firings. Development of the T44E1 was canceled in early 1945. (Ltr, RAC, Subj. R&D work on Cal. .30 frangible bullet, dated Dec. 26, 1944.)
90	R	43	Add after "Armory.": It is of interest that the drawing of the T74 cartridge (B7641012, Jun. 1, 1945) shows the case with a vent seal, which may have been added to prevent the propellant from migrating into the primer pocket.
92	R	3-7	Rewrite last three sentences starting with "One" line 3: One lot (FA 6) loaded in 1941 used cases headstamped FA 41 RG. Another lot (FA 9) loaded in 1941 was headstamped F A 4 1. Still another lot (FA 17) loaded in 1942 used cases headstamped F A 4 2.
94	L	18	Start new paragraph with line 18.
94	R	T1E16	Third line after "cannellure." add: However, a specimen examined from a Frankford Arsenal labeled envelope measures 1.379 in. overall and has one knurled seating cannellure.
95	L	38	Add after "0.83 inch.": Apparently, a shorter length (approx. 1.25 in.) flat-based bullet was also experimented with, but details are lacking.

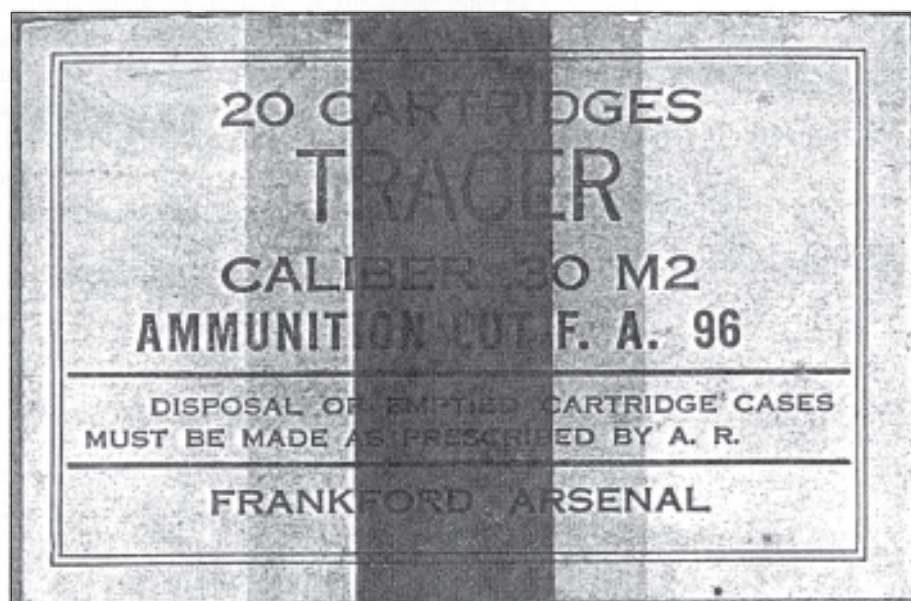


PAGE	COL	LINE	REMARKS
96	R	19	Delete last sentence starting with "A" and ending with "F A 4." Substitute: However, no rounds with this identification have been examined.
98	R	Fig. 78	First line of caption, change "Dqg." to: Dwg.
100	L	19	Add new paragraph after "penetration." During April, 1942, Aberdeen Proving Ground tested the M1 Incendiary bullet loaded with lead zirconium; however, results were not satisfactory.
100			Replace box label bottom of page



101	-	T1E1 (Inert)	Add after T1E1 (Inert): (Dwg. FB 19275, May 22, 1943)
102	-	T1E8	Add between "FAT1E8" and "FAT2":  (The numbers FAT1E9 through FAT1E19 were also assigned, but there is no record of any drawings made).
105	L	16	Add after "1945." The shades of the red bullet tip on M1 Tracers differed somewhat during World War II production. Some examples include: pink (S L 43), bright red (DEN 43, S L 43 and DM 4) and maroon (DEN 41 and F A 45). It is assumed these have no special significance other than being process variations associated with wartime production.
106	L	5	Add after "dates." A red bullet tip without extra cannellure was also loaded. Rounds examined from a box marked M2 Tracer, Lot F.A. 96 are headstamped F A 4 3 and have light red bullet tips with a single knurled cannellure at case mouth. In summary, M2 Tracers can be found with red or white bullet tip with or without an extra knurled bullet cannellure.

PAGE	COL	LINE	REMARKS
106			Replace box label at bottom of page and add caption.



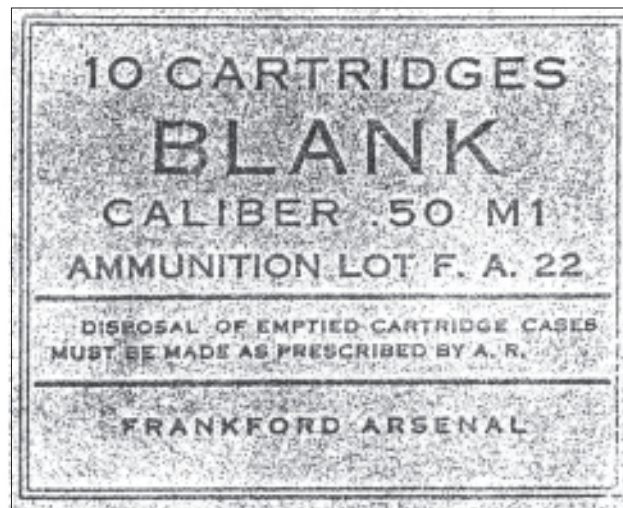
(Courtesy of J. Frigiola)

107	L	19	Add after "1940's" the following: (during late 1941 a night tracer experimental using I-194 was tested at Aberdeen Proving Ground)
107	R	27	Change "F A 4" to: F A 45
107	R	29	Change "without" to: with
107	R	40	Add after "1945": Rounds examined from what appears to be an early lot of T10 tracers made at St. Louis Ordnance Plant (from repacked lot S.L. C 91013) have cases headstamped S L 4 and a GMCS bullet jacket with single knurled cannellure and dull-orange tip. The bullets are shorter than the Frankford Arsenal T10 bullet, measuring approximately 1.34 in. overall, compared to 1.45 in., and have a gilding metal closure at the base, which was not added to the Frankford Arsenal bullet until later.
109	R	18	Change "F A 4 4" to: F A 4
109			Delete label top of page
111	R	21-22	Delete two lines after "F A 4 5;" starting with "no" ending with "light." Substitute the following: this could be the loading made at Frankford Arsenal in late 1945 to verify the performance of the Cal. .45 T92 Signal round. During November, 1945, 300 rounds were assembled for testing.
115	R	Fig. 88	Caption line 2 add close paren")" after "1940," delete "with revisions to Oct. 20, 1947)."

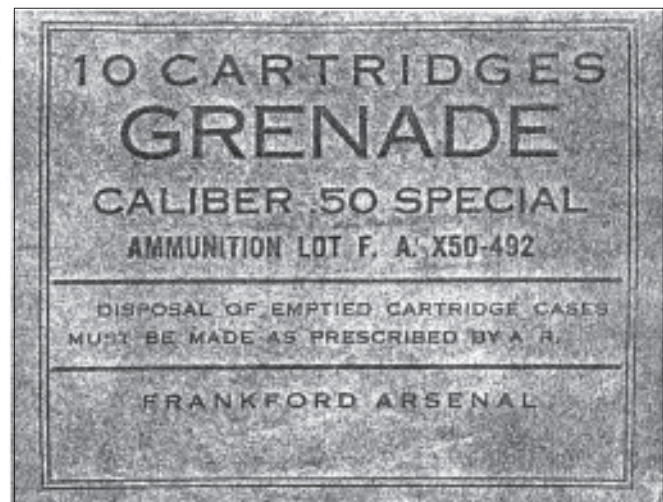
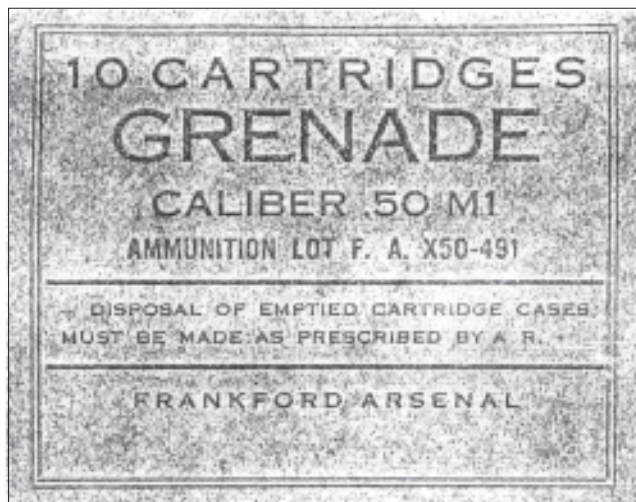
PAGE	COL	LINE	REMARKS
118	R	3-10	Delete lines 3-10, substitute the following: Development of a Cal. .50 steel case started at St. Louis Ordnance Plant during August, 1942, using the basic brass case process and tooling. Case lots 996-998 were made without a protective finish and loaded into Ball M2 cartridges for ballistic test; these were headstamped SL 42. Case lots 999-1002 (including sub-lots 1000 A-J and 1001A and B) were completed later in 1942 and used a Cuprodine plate finish; these were also headstamped SL 42. At least one case lot (1001-B) was loaded into M2 armor-piercing cartridges and submitted to Frankford Arsenal for testing in the M2 aircraft machinegun. (Dev of steel cartridge case, St. Louis Ordnance Plant, Dec. 1942). Similar work using both plated and unplated cases was also carried out at Des Moines Ordnance Plant in 1943.
118	R	19	Add after footnote 84: Apparently, steel case development work at Twin Cities was more extensive than originally reported. Cases headstamped 4 2 T W, 4 3 T W and without head marking have been noted with no finish and having copper, zinc and zinc-cronak plating.
119	L	6	Change "Allegheny" to: Allegany.
120	R	29	Delete "a second" and substitute: another.
122	L	37	Add after "cartridges. <sup>90)</sup> ": (U.S. Pat. 2,465,962, H.D. Allen and N.H. Smith, Mar. 29, 1949)
123	L	3	Delete period after "tip." Add: and knurled seating cannellure.
123	L	36	After "production," add: Apparently, during this period the T1E9 was also used for plate test; a round headstamped F A 4 0 has been noted with a silver over ivory bullet tip.
124	L	14	Change "legheny" to: legany.
125	R	25	Add after "finishes.": Allegany Ordnance Plant also made a steel-cased Cal. .50 Armor-Piercing M2 cartridge; a round has been examined without case finish headstamped K S 4 2.
125	R	32	Add after "S L 4 2.": St. Louis loaded at least one pre-production lot of M2 Armor-piercing cartridges with steel cases in late 1942 using case lot 1001-B which had a Cuprodine finish. These were for functioning tests in the M2 Aircraft Machinegun ( <i>Dev of Steel Ctg Case</i> , SL Ord Plt, U.S. Ctg Co. St. Louis MO, Dec 42).
129	L		Delete top box label
131	R	8-9	Close space between lines 8 and 9.
131	R	9	Change "Mt. Auconquilcha" to read Mt. Aucanquilcha
132	R	12	Add after "tip.": The drawing indicates a seating cannellure and extra knurled cannellure for identification; however, on bullets examined there is only the seating cannellure.



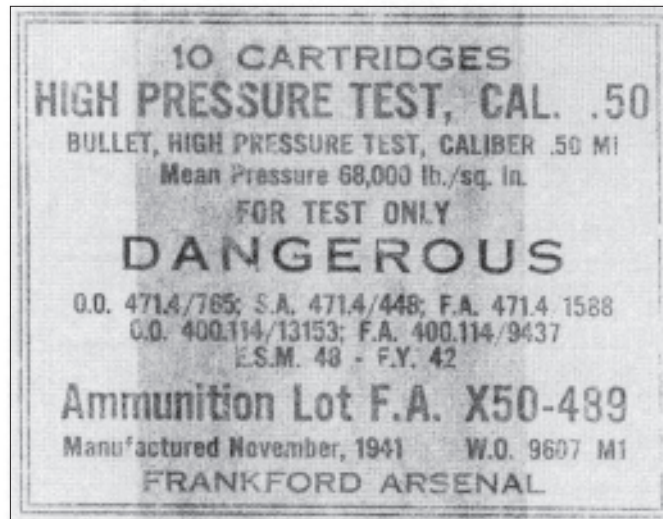
PAGE	COL	LINE	REMARKS
134	-	FAT2	Add below FAT2: FAT2E1 (Dwg. FB 19565, Nov 8, 1944). Below that add: FAT2E2 (no dwg.)
137	-	FAT3	Add after FAT3: (Dwg. FB 19555, Aug. 15, 1944)
139	L		Replace box label bottom of page



139	R	34	Delete line after "crimp" and rewrite to read: and a cannellure positioned to seat the red cardboard
146	R	9	Add new paragraph after "Special.": A grenade cartridge using an extended-neck case was also experimented with at Frankford Arsenal in 1943. This round used a cal. .50 cartridge case design similar to that shown in Fig. 106-B and was loaded with various powder charges in an effort to extend the range of the M10 grenade.
146	R	11	Delete from this line: "through 1942 and"
146	R&L		Replace the two box labels in left and right columns.



PAGE	COL	LINE	REMARKS
150	R	1-2	Delete paren. phrase starting with "(one" and ending with "jacket)."
152	-	FAT2E2	Add under "FAT2E2": Note: This series of bullets was also referred to as Incendiary-Explosive by Frankford Arsenal.
152	R		Replace box label in right column.



154	L	25	Add new paragraph after "1950.": In late 1941, an engineer named Frank Jervey, who was then assigned to the Ordnance Office, Washington, D.C., invented a Cal. .50 incendiary bullet called the T8. This design had a thick gilding metal sabot into which a pointed hollow steel core was inserted. Inside the core was a Cal. .25 rimfire case filled with an incendiary and explosive mixture. Upon impact the core moved to the rear, crushing the rim of the case and initiating the mixture. The sensitivity was controlled by the angle of a cam surface machined inside the core. Bullets with plain tip had a 1/64 in. step, those with red tip a 1/32 in., and green tip a 2/64 in. step. Firings of this bullet at Aberdeen Proving Ground during January, 1942 were unsatisfactory and further development work was canceled. (APG Ord Proj 5374, Apr 24, 1942)
155	R	41	Change U.S. Patent 2,036,966 to: U.S. Patent 2,033,966.
160	-	T1 (INERT)	On second line change "iner" to: inert
160	TIE 1		Add new sub-headings after TIE1: FATIE2 (SK#FSA-2229) FATIE3 - not assigned FATIE4 - (SK#FSA-2239A) FATIE4 - (SK#FSA-2239)
161	-	FAT3E5	Add: (Dwg. FB 19562, no date assigned).

PAGE	COL	LINE	REMARKS
161	-	FAT4E3	Add under FAT4E3: FAT5 (Dwg. FB 22296, Sept 12, 1945)
162	L	5	Add following after "project": Remington Arms Co. drawing ERL-216 dated Sept. 1, 1943, has been examined entitled: Incendiary Tracer Cal. .50. A bullet is shown without dimensions with gilding metal jacket having a nose cavity, lead slug in center and steel insert in a boattail base, recessed for a tracer.
162	R	1	Add after "targets": This was lot FAX50-928 loaded with a modified M1 Incendiary bullet with blue tip, headstamped F A 4 2.
164	R	2	Add after "ammunition.": Variations in the color of the red bullet tip have also been noted with Cal. .50 Tracer M1 wartime manufacture. Shades of light to dark red are common and at least one lot of St. Louis Ordnance Plant Cal. .50 Tracer M1 (SL 8730) was loaded with pink bullet tips. These rounds have a GMCS-jacketed bullet and are headstamped S L 4 3. It is doubtful that these different red shades have any significance. They are probably due to process variation found in wartime manufacturing operations.
164	R	19	Lot B: Change "varnished" to: coated. After "trichloroethylene." add: -based varnish.
165	L	10	Add after "I-181C. <sup>62</sup> ": In late 1943, Cal. .50 Tracer M1 cartridges assembled with GMCS-jacketed bullets and steel cases were authorized by the Ordnance Office to be loaded for Gun Functioning - per Dwg. C7669745 dated Oct. 6, 1943.
165	R	13	Add after "jacket.": Muzzle velocity was 2,740 ±30 f.p.s.
165	R	18	Add after "cannelure.": A M2 cartridge has been examined with red bullet tip, smooth crimping cannelure and a knurled cannelure above the case mouth, headstamped FA ★ 42.
180	L	10	Add after "ALX-H3-72.": The TS-4 bullet was also tested using GM, GMCS and steel (WD-1020) jackets during the 1942-43 period. Apparently, these early designs were being evaluated in an attempt to improve barrel wear and erosion. The modified TS-4 bullet with GM jacket was shown in Frankford Arsenal Dwg. ALX-H3-308 dated Aug. 4, 1944. There was also a bullet design designated TS-5 but details are lacking (FA Rept. R-766, Jan. 47).
184	L	11	Change "T38" to: T39
186	R	15-16	Delete "BLX-H2-10." Substitute: SK# FSA-1947, Apr 15, 1941.
187	-	Fig. 147	Second line of caption "Worchester" should be: Worcester



PAGE	COL	LINE	REMARKS
187	R	4	Add paragraph after "M36.": Apparently, the T1 series of cases were modified with flash tubes. Three Frankford Arsenal laboratory drawings (BLX-H2-17 and 18) all dated Sept. 20, 1943, show the primer pocket modified for the adaptation and a short and long flash tube design.
188	-	Fig. 150	First line of caption change "steel" to: brass
192	-	FAT1E4	Second line after "use." add: (SK# FSA 4002)
198	R	6	Add after "T68F.": The T68-B bullet is shown in Fig. 168.
203	-	FAT1E9	Third line after "cartridge." add: (Dwg. FB 22290 was copied from St. Louis Ord Plant Dwg. VEX-1502C., Feb. 10, 1945)
203	L	23	Add after "tip.": (However, only a light blue tip has been observed on T41 rounds examined.)
203	R	top drawing	Move to top of left column over FIG. 176.
203	R	bottom	Move caption FIG. 177 to bottom of left column under drawing.
209	R	13	Change "ternaplate" to: terneplate
210	L	17	Apparently, contracts were let during the late WW II period for 12 Gauge 00 Buck with reinforced mouth for use by military guards. A round examined has a waterproofed red paper case with high brass base crimped on place by three smooth grooves. Also, a brass collar has been added at the case mouth held by a single smooth groove (a variant has been noted with the collar rolled over the case mouth). The top wad is marked "00 BUCK" in black and the headstamp is FEDERAL No 12 HI POWER (FIG. 181A). The battery cup primer is sealed with a reddish lacquer. No documentation could be located on this type of shell except a note that these possibly dated from 1944. It is assumed that the added reinforcement to the mouth was to prevent damage caused by repeated chambering during guard mounts. Similar rounds loaded with a single round ball, No. 4, No. 6, No. 7½ and No. 8 shot have also been reported.

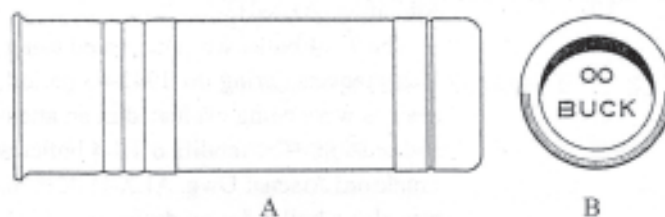


FIG. 181A (A) 12 Gauge Buck Shot for Military Guard use  
(from specimen headstamped FEDERAL HI-POWER No. 12)  
(B) Top Wad.

211	R	13-16	Delete sentence starting with "The" and ending with "composition." Substitute:
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PAGE	COL	LINE	REMARKS
			Based on the Remington purchase order and description for this government order, the tracer pellet consisted of a steel capsule covered with lead and coated with the tracer composition. However, examination of several Remington tracer rounds from this period discloses they contain a copper alloy-coated steel capsule containing a lead pellet and tracer composition. This is positioned in the wads beneath the shot over a central flash opening from the powder charge to the base of the capsule.
211	R		Replace box label



212	R	19	Add new paragraph after "use.5": Both 24-Gauge and 28-Gauge shotgun blank shells were used in 100 lb. aircraft bombs as spotting charge igniters during the World War II period. The 24-Gauge blank was used in the M39 Practice Bomb nose and tail fuze, replacing the Mark IIB Primer Detonator. The 28-Gauge blank was used in the M38-series practice bomb as the igniter for the black powder spotting charge. Fired and recovered specimens of the 28-Gauge blank have commercial headstamps with brass or copper alloy-plated steel bases.
213	R	32	Add after "charge.": To retain the closure, the mouth of the case had a four-indentation serrated crimp.
213	R	46	After "discomfort.8": Relocate FIG. 190 from pg. 215 and renumber it FIG. 187.
214	L	21-23	Add period after "head". Delete rest of line 21-23 starting with "which" and ending with "process"

PAGE	COL	LINE	REMARKS
214	L	23	Change "(Fig. 187)" to: (Fig. 188)
214	L	Fig. 187	Change to Fig. 188.
215	-	FAT1E3	First line, change (Fig. 188) to: (Fig. 189)
215	-	FAT1E3	Change Fig. 188 caption to: Fig. 189
215	-	FAT1E4	Third line change (Fig. 89) to: (Fig. 190)
215	-	FAT1E4	Change Fig. 189 caption to: Fig. 190
215	L	5	Change "may" to: appear to
215	L	6	Change "Cal. .30" to: Cal. .45
217	L	25	Add after "density.": Frankford Arsenal assigned FAT2E6 to this length, but there was no drawing made.
217	R	1-13	Delete lines and substitute: The U.S. Navy and U.S. Coast Guard used Lyle line-throwing guns during the period to throw a metal projectile attached to a line for use in life saving and securing transfer lines between ships at sea. One type of line-throwing gun used a percussion firing mechanism to ignite the propellant charge. The ignition element consisted of a special Cal. .32 S&W blank cartridge. A packing can from the World War II period is marked:  CONTAINS 25 - .32 Cal. CARTRIDGES FOR LYLE GUN
218	R	2	Add after "1944-)." This is possibly a movie blank modified at a later date.
218	R	7	Add after "round.": Apparently, early loadings used a shell with brass head and pink paper case. The headstamp on a specimen examined is: WINCHES-TER 60mm with the wad marked: W.R.A. - 27626 60m/m 1-40. The head diameter is approximately 0.658 in., with a cartridge overall length of 2.00 in.
218	R	7	Change "special" to: shorter
218	R	9	Change "first" to: later
219	R	2	Add after "case.": Normally the cartridge lot, manufacturer code and date were stamped in the closing wad. The M3 cartridge was shown on Ordnance Dwg. 75-19-76, Jun. 25, 1940.
219	R	16	Add new paragraph after "primer. <sup>209</sup> ": The Mark I Ignition Cartridge for the 3-Inch Trench Mortar was also loaded and issued during the early World War II period. This used a 12 Gauge-size shell with green or off-white paper case, brass



PAGE	COL	LINE	REMARKS
			head (reinforced internally with a steel sleeve) and percussion primer. The propelling charge was 120 grs. of loose Ballistite powder. The brass head was stamped with the manufacturer's code and model. The cardboard closing wad at mouth usually was stamped with date of loading and lot number. A specimen examined is headstamped: FEDERAL 3 IN MKI; the closing wad is stamped FCC 3 IN 9-42 with a large figure 14 in the center.
219	R	23	Add after "green": or yellow
219	R	24	Add after (Fig. 201): Inside the base of the case there is a steel sleeve to reinforce the head.
220	L	9	After "and" add: a plain or
220	L	18	Change "1 in." to: 3/4 in.
220	L	19	Add new paragraph after "MKIIA4.": An unusual 12 Gage-type unprimed steel case has been examined that came from Frankford Arsenal. It appears to be made from a cal. .50 headed draw piece and has a dark brown lacquer finish with headstamp F A 4 3. The case has a partial rim normally formed during the cal. .50 heading operation and has a length of 2.487 in. Just above the rim is a heavy cross-hatch knurled band .285 in. wide, apparently added for either identification or to provide an interference fit in whatever chamber the case was designed for. It is possible this was fabricated for use in an ignition or propelling charge for a mortar, recoilless rifle or artillery round but details are not available.

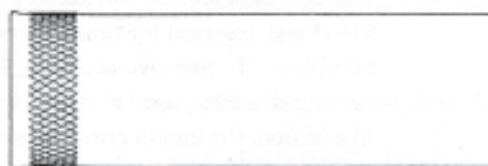


FIG. 202A. 12 Gage-Type Experimental Frankford Arsenal Steel Case (from specimen headstamped F A 4 3)

<i>Rim diam. .837"</i>	<i>Case mouth diam. .799"</i>
<i>Head diam. .816" (on knurl)</i>	<i>Case length 2.487"</i>
<i>Case body diam. .797" (above knurl)</i>	<i>Primer pocket diam. .308"</i>

221	L	8	Add new paragraph after sentence ending with "type" as follows: A 10 Gage Signal Green Star Mark II has been examined headstamped R L N° 10 but the identification of the R L code is not known. A 10 Gage Signal headstamped NMP N° 10 has also been reported, but this code is not known either.
221	R	11	Add after "M5.": The M4 was approximately 5.85 in. and the M5 2.68 in. overall. Both have the model, lot and loading date stamped on the wad at mouth of case.

PAGE	COL	LINE	REMARKS
222	L	12	Change "4.7 in." to: 4.6 in.
223	L	15	Delete "normally" and substitute: to be
223	L	16	Delete period after "U.S. PROPERTY." Substitute a comma and continue sentence to read: however, this marking practice does not seem to have been followed.
223	R	11	Change "zinc-plated" to: copper-plated
223	R	20	Delete word "apparently" add after "copper-": oxide (black) and zinc cronak
224	L	32	Add new paragraph after "cartridge." During the period Aug. 26, 1943 through Sept. 29, 1943, the Maryland Research Laboratories tested Cal. .22 Long Rifle cartridges loaded with bullets made from both gold and tungsten. This effort was for the Office of Strategic Services Silenced Cal. .22 Pistol Project and it was thought a heavier cal. .22 bullet would better function the modified Colt Woodsman pistol. ( <i>OSS Weapons</i> , John W. Brunner, p. 25.)
224	R	1-10	Rewrite first four sentences to read: During early January 1945, 10,000 T42 cartridges from Remington Lot No. 1 R&D were forwarded to Aberdeen Proving Ground for testing. The bullet had a hardened lead core with a smooth GM jacket and weighed about 41.5 grs. The case was the brass commercial type, having a knurled bullet seating cannelure 0.20 in. from the mouth. The accuracy of this lot was only marginal but testing was otherwise satisfactory and because of the urgent need the round was released for limited production at the Remington Bridgeport plant. To improve accuracy, Remington increased the bullet bearing diameter, used a softer (annealed) jacket and pure lead core. In addition, the mouth crimp was modified to accommodate the new bullet diameter. These changes were incorporated into the first production lot (RA 5000).
224	R		Replace box label



PAGE	COL	LINE	REMARKS
224	R	26	Add after "silencers. <sup>459</sup> ": There is some evidence that a subsonic loading of the T42 cartridge was made by Remington for the Office of Strategic Services. These are reportedly identified by having the U headstamp offset to a 7:30 position on the base of the case.
225	L	14	Add after "G-2.": (Dwg. ALX-1-334, Mar. 27, 1945.)
225	R	1	After "for": delete "loading into" — substitute: assembly with
225	R	7	Change "preured" to: procured
226	R	7	Add new heading: <i>Cal. .25 Automatic Pistol</i> The Office of Strategic Services procured 15,000 rounds of .25 Automatic Pistol ball from Remington Arms Co. on Jan. 1, 1944. It has been reported that these were to have a full metal jacket and no headstamp but confirmation is lacking. A cal. .25 Automatic Pistol blank cartridge was also developed under contract for the Office of Strategic Services BIGOT project. This was a silent weapon designed to fire a large dart from the cal. .45 pistol. The cal. .25 blank was used as the propelling charge. The standard cal. .25 Automatic Pistol case was modified by turning the rim to the case body diameter then loading with a propelling charge (0.17 grams of FNH-M2 was standard) and crimping the mouth over a waterproof wad. Development of this cartridge was accomplished by both Federal Laboratories and Remington Arms Co. in cooperation with the BIGOT contractor, New Products Corp., Benton Harbor, Michigan. The Cal. .25 Automatic Pistol Blank Cartridge is shown on New Products Corp. Drawing 332-13, May 18, 1945.
226	R	34	Add a space between "5" and "04" - headstamp should read: F A 5 04
227	-	-	Add caption under BLANK label: W.D. Kramer Collection
227	L	1	Add after "place.": Drawing
227	L	8	Delete "provided" and substitute: made
227	L	9-11	Delete paren. phrase starting with "(possibly" and ending with "cases."): Substitute: (Apparently these were loaded from earlier contract ball cartridges which were broken down to salvage the cases. Headstamps noted include: W.R.A. 30 and W.R.A. 31.)
228	L	40	Add new paragraph after "charge.": Apparently, a modified cal. .32 Long Colt blank cartridge with rim turned down to 0.318 in. was developed for use in the Office of Strategic Services BIGOT project. These were for propelling the short dart model which had a larger diameter body. This cartridge was probably provided by Remington Arms Co.
228	L	44	Add after "those": intelligence, investigative personnel and



PAGE	COL	LINE	REMARKS
228	L	46	Add after "protection." The Office of Strategic Services also issued this weapon to many of their field agents.
228	L	48	Add after "type." At least one order for 100,000 rounds was made to Remington Arms Co. in early 1944 for the Office of Strategic Services.
229	R	-	Delete "Cartridges" from Cal. .38 <i>Automatic Pistol</i> heading.
229	R	13	Add after "officers,": special operations and Office of Strategic Services field agents.
229	R	24	Change "RA 5000 and 5001)" to: RA 5000, 5001 and 5002)
229	R	-	At bottom of column add: In 1945, the Office of Strategic Services procured 16 million rounds through the Army Ordnance supply system. This order was later reduced to two million rounds. This was for ammunition with full metal jacket and was placed with Remington Arms Co. The tan cartons mentioned previously could be from this order. Rounds with soft point and "mushroom" bullets were also procured for the Office of Strategic Services.
230	L	-	Delete "Cartridges" from Cal. .45 <i>Blank Revolver</i> heading.
230	L	9-10	Close space between lines.
235	R	2	Add after "caliber.": (using the extrusion process).
235	R	8	Add after "1945.": (using the blank, cup and draw process).
236	-	Fig. 219	Second line of caption, change "BLX-E3-123" to: BLX-E2-123.
238	L	9	Delete word "apparently"
238	L	20	Add after "type." It is possible that two Frankford Arsenal Laboratory drawings both entitled: Case, Cartridge, Cal. .30 High Velocity and dated Oct. 17, 1942, are these. They are drawings BLX-E2-154 and 155 which show cases with an almost square shoulder with long and short necks respectively.
238	R	15	Add new paragraph after "FA 40." During early 1942, Frankford Arsenal started experimental loading and testing of a Cal. .50 high-velocity cartridge using the T1-series Cal. .60 case necked to Cal. .50 per Dwg. SK# FSA 1947A dated April 24, 1942. Rounds have been examined headstamped Cal. .60 lot 7663 W.S.M. CO. 41 and 42 loaded with experimental ball and armor-piercing bullets. Apparently, further work was done with the T1 case necked to Cal. .50 in 1944 as shown on Frankford Arsenal Laboratory Dwg. BLX-G2-114 dated Feb. 25, 1944.

PAGE	COL	LINE	REMARKS
238	R	21-22	Delete paren. phrase after "FA 45." starting with "(Cases" and ending with "trials.)" Substitute: (The T2E4 case necked to Cal. .50 is shown on Dwg. BLX-G2-115, dated Apr. 12, 1944.)
241	R	44	Add after "charges. <sup>21</sup> ": During firing tests in late 1941 upper body case separations started to take place with rounds loaded to higher pressures and velocities. To correct this problem, Frankford Arsenal redesigned the 20/15mm case by changing the shoulder angle and neck length.
245	R	10	Add after "length.": Both the Type 1 and Type 2 bullets were later covered by U.S. Pat. 2,482,132, R.R. Studler, et al., filed March 10, 1943.
247	L	1	Change heading " <i>Allegheny</i> " to: <i>Allegany</i>
247	L	11	Add after "KS 43).": A steel case process was also developed at this plant; cases without finish have been examined headstamped KS 42.
248	L	2	Delete period and footnote 32 after "process. <sup>32</sup> " and continue sentence to read: and attached to a solid head formed from brass rod. <sup>32</sup>
248	L	2	Add new paragraph before <i>Denver Ordnance Plant</i> : <i>Defence Industries Limited</i> , Verdun, Quebec, Canada. This commercial facility was operated by a subsidiary of Canadian Industries Limited and had a 1944 contract to provide Cal. .30 Ball M2 cartridges for the U.S. Government. See also Verdun Ordnance Works which was the designation for this plant that was used by the U.S. Ordnance Department.
248	L	21	Delete "Denver was" and substitute: The small arms ammunition lines were
248	L	23	Add after "ammunition <sup>7</sup> ": Production was then converted to artillery fuzes. The plant was finally closed August 15, 1945.
248	L	38	Add after "loadings.": In addition, Des Moines did a considerable amount of development on Cal. .30 and Cal. .50 steel cases and must be given the credit for redesigning the Cal. .50 Incendiary T48 bullet and getting this cartridge into production.
249	R	2	After "24-hour" add: a day
250	R	13	Change "form" to: firm
250	R	13	Add after "10 Gage": spotting charges and

PAGE	COL	LINE	REMARKS
251	L	10	<p>Add new heading and paragraph after "rounds.":</p> <p><i>Palmer Manufacturing Co.</i>, Hicksville, Long Island, New York. In January, 1943, this firm received a contract to reload 5,000 rounds of Cal. .45 Ball M1911 cartridges using fired and salvaged cases. The bullets and primers were furnished by Frankford Arsenal. During February, 1943, Frankford Arsenal had received a 2,000-round sample for testing, but further details are lacking (NA RG 156, 471.42/1715, Feb. 4, 1943).</p>
251	R	20	<p>Add new heading and paragraph after "P.C.":</p> <p><i>Rochester Fireworks Company</i>, East Rochester, New York. This firm apparently had a World War II contract for loading 10 Gage Very ammunition. Their manufacturing code was RFC, but this has not been examined on a headmarking. Rounds from a full box of Rochester Fireworks Co. White Star signals are headstamped P.C., the cases undoubtedly furnished by Peters Cartridge Co.</p>
252	L	37	<p>Add after "Department.<sup>25,26</sup>":</p> <p>It is of interest that U.S. Pat. 2,388,094, Oct. 30, 1945 (filed Dec. 5, 1941) by S.A. Snell describes a cartridge case made from tube stock with a machined head welded to the base.</p>
252	R	25-47	Delete Twin Cities Ordnance Plant starting with Page 252, line 25 and ending with Page 253, line 3.
253	L	1-3	<p>Substitute the following:</p> <p><i>Twin Cities Ordnance Plant</i>, Minneapolis, Minn. This was a "2<sup>nd</sup> Wave" plant owned by the U.S. Government and operated under contract by Federal Cartridge Co. The plant was originally built to manufacture Cal. .30 and Cal. .50 ammunition, although recently discovered reports indicate that a Cal. .45 ball cartridge line was also installed which was reportedly converted to tooling shops for artillery projectiles in 1944. However no Cal. .45 rounds made during this period have been examined and it is assumed the production of this caliber was never realized. The original headstamp code assigned to this plant in May, 1941 was "TC" and date, but this was changed to "TW" before quantity production started in February, 1942. This was apparently done to avoid confusion with Lake City's code "LC." Recently, a Cal. .30 Ball M2 round has been reported headstamped 4 2 T C with brass primer and black sealant, which is undoubtedly an example of the use of this early head marking. Twin Cities headstamps during this period usually reversed the position of the plant code and date and there has also been some variation in style and spacing of the letters and numbers noted. Some development work was conducted at this plant with Cal. .30 and Cal. .50 steel cases and limited production of Cal. .30 Ball M2 with steel cases took place in 1943. In addition, in 1944, the government established a repacking and salvage facility at this plant for small arms ammunition, which remained in operation during the post-war period. Twin Cities was closed during August, 1945, and total WWII production was 2.2 billion rounds of Cal. .30 and two billion Cal. .50 cartridges.</p>



PAGE	COL	LINE	REMARKS
253	L	23	Add after "status.": Both Cal. .30 and Cal. .50 rounds have been examined headstamped U 4 4 which were undoubtedly made in late 1943 using heading bunters made in advance for planned production in 1944.
253	L	28	Add after "Canada.": (This is the U.S. Ordnance Dept. Name for this plant, see Defence Industries Limited for proper designation).
253	L	48	Change "1941" to: 1940
253	R	8	Add after "pended.": Total U.S. military contract deliveries 1940-1945 exceeded 3.2 billion rounds.
253	R	38	Delete period after "Arsenal." Continue sentence to read: for testing.
256	-	M2 BULLET	On M2 .50 Tracer under "BULLET" change "Jacketed white tip" to: Jacketed red or white tip.
256	-	M4 REMARKS	On M4 Ignition Cartridge under "REMARKS" delete: 12 Ga. size
265			Delete Appendix D (pages 265-282)
283		BIBLIOGRAPHY	Add following: BRUNNER, JOHN W. 1994. <i>OSS Weapons</i> . Williamstown, NJ: Phillips Publications.  MINNERY, JOHN A., AND RAMOS, JOE 1980. <i>American Tools of Intrigue</i> . Cornville, AZ: Desert Publications.  PATE, CHARLES W. 1997. <i>U.S. Handguns of World War II</i> . Lincoln, RI: Andrew Mowbray Publishers.  PUNNETT, CHRIS 1997. <i>30-06</i> . Chadds Ford, PA: CTG Publishing.  U.S. CARTRIDGE CO. 1942. <i>Development of Steel Cartridge Cases</i> . St. Louis Ordnance Plant: St. Louis, MO.
285	L	31	Change INDEX "Allegheny" to: Allegany
291	R	5	Add: Frangible Tracer 91