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DEPARTMENT OF THE AIR
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TM 9-2210
TO 39A-5A-6

SMALL ARMS ACCIDENTS MALFUNCTIONS AND THEIR CAUSES

DEPARTMENTS OF THE ARMY AND THE AIR FORCE
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CHAPTER 1
GENERAL

1. Purpose

This manual is an instruction guide for both using arms and ordnance maintenance personnel and provides information on possible accidents and malfunctions with emphasis on preventive measures.

2. Scope

a. The information contained in this manual pertains to accidents and malfunctions occurring in 11 types of commonly used small arms:

(1) Revolvers.
(2) Pistols.
(3) Rifles.
(4) Shotguns.
(5) Automatic rifles.
(6) Submachine guns.
(7) Carbines.
(8) Cal..30 machine guns.
(9) Cal..50 machine guns.
(10) Rocket launchers.
(11) Recoilless rifles.

b. The material in this manual represents those accidents and malfunctions which have occurred with sufficient frequency to attract attention. Other and unusual accidents may be encountered in the field. In order to maintain this technical manual up to date and to assist in improving weapons for reliability and safety, all accidents and frequently occurring malfunctions should be reported through channels to the Office, Chief of Ordnance, U.S. Army, Washington 25, D. C. (ORDFM). When reporting an accident, leave the damaged weapon in exactly the same condition as when the accident occurred. (Make no attempt to remove lodged bullets, etc.) A more accurate analysis of the accident can be made when the damaged cartridge and bullet, along with any cartridges remaining in the magazine, are retained with the damaged weapon.

3. Definitions

For the purposes of this manual the following definitions will apply:

a. A *malfunction* is the faulty action of a part or assembly of the weapon or failure of its ammunition to function in a normal or expected manner. A malfunction results in a stoppage of the weapon.

b. A *stoppage* is the accidental stopping of fire of a weapon, caused by a faulty action of the weapon or of the ammunition.

c. Preventive maintenance is care and servicing by using personnel for the purpose of maintaining equipment in satisfactory operating condition by providing for the systematic inspection, detection, and correction of incipient failures either before they occur or before they develop into major defects.

d. A *bolt out-of-battery* is a bolt that is not fully forward.

e. A *seam* in the barrel of a weapon is a defect in the metal which occurred during manufacture. This type of defect is of varying depth and has the (surface) appearance of a fine crevice running lengthwise along the barrel.

f. A *cook-off* is the functioning of a chambered round of ammunition, initiated by the heat of the weapon.

g. A *hangfire* is a delayed firing caused by faulty ammunition. For a few seconds, a hangfire cannot be distinguished from a misfire.

h. A *misfire* is the failure of a weapon to fire when the trigger is squeezed.

CHAPTER 2
CAUSES OF MALFUNCTIONS

4. General

Malfunctions and accidents in the use of small arms are caused by failure of materiel or mishandling by the operator. Although the designer of a weapon attempts to foresee most of the mechanical troubles which that weapon might encounter in service, the soldier must cooperate in this effort and give some attention and care to the equipment.

5. Materiel

Failure to practice preventive maintenance, which includes proper lubrication and inspection for worn, loose, or damaged parts, is the cause of most malfunctions and accidents. Improper maintenance under extreme weather conditions, such as arctic cold or excessive dry heat, can cause a weapon to cease functioning in very short periods of time. Improper handling and storage of ammunition, as well as of weapons themselves, causes malfunctions. In determining the cause of a small arms failure or malfunction, a visual examination of the cartridge case involved is important.

6. Personnel

Abuse of a weapon by a soldier is almost certain to cause malfunctions. In combat areas, a soldier soon learns that it is to his advantage to keep his weapon in proper functioning condition. Even in training, carelessness or laziness in looking after equipment is costly through injury to personnel, damage to weapons, and loss of time.

CHAPTER 3
PREVENTION OF MALFUNCTIONS

7. General

Safety in the handling of firearms is a matter of good training. If weapons and ammunition have been properly tested, danger in their use is negligible unless the user is careless. Two practical rules for safety are:

a. Never point a weapon at anyone whom you do not wish to kill (This rule applies to the person who is handling the firearm as well as to persons in his vicinity; the operator should not get in front of the muzzle himself.)

b. Every weapon is loaded unless you can see that it is unloaded.

8. General Practices

Prevention is the best remedy for all malfunctions. Any user of weapons should form certain general practices to prevent malfunctions:

a. Use equipment only for the purpose for which it was originally intended.

b. Examine all equipment daily to discover any unusual conditions or missing parts.

c. Observe all applicable instructions (in TM's and FM's pertaining to the weapon).

d. Call the attention of your supervisor or mechanic to any unusual conditions.

e. Do not attempt to make alterations or repairs that you are not authorized to do, unless extremely urgent conditions exist which require that you take every possible measure to keep your weapon operating.

f. Remember that any weapon is dangerous if you use it carelessly or thoughtlessly.

g. Under conditions of extreme cold, use a weapon with no lubricant if the specified lubricant is not available.

9. Inspection

The general purpose of inspection is to determine the condition of a weapon and any repairs, adjustments, or replacements it may require for efficient operation. The immediate aim of inspection is the detection of conditions likely to cause a malfunction before it occurs. Inspection enables the discovery of evidence of improper treatment received by the materiel. Always accompany inspection by corrective measures, because worn, damaged, or dirty parts can cause malfunctions.

10. Modifications

Make modifications only when and as authorized. Sometimes special conditions seem to indicate that a modification that could be made locally would be very helpful. Do not take such action without authorization, however, because there may be factors involved that cannot be satisfactorily checked in the field. For example, some metals have to be given special heat treatments; some designs are very carefully balanced, and one change might affect the life of many parts; limited tests can rarely establish the safety or reliability of a change in a completely satisfactory manner; and changes that may appear to be desirable for certain combat conditions may actually be undesirable (or even dangerous) for others.

CHAPTER 4
REVOLVERS

Section I. GENERAL

11. Characteristics

The various models of revolvers used by the U. S. Army are light, defensive hand weapons generally used for ranges of less than 30 yards. They function either single or double action and have swing-out type cylinders that hold six cartridges. The ammunition for the cal..45 revolver is usually loaded in clips that contain three cartridges. The cocking of the hammer causes the cylinder to rotate and aline the next cartridge in the cylinder with the barrel. The weapon is small and light and the firer can point it inadvertently at himself or someone else and pull the trigger.

12. Operating Instructions

The accidents and malfunctions described in this chapter result chiefly from mishandling by persons using the weapons. FM 23–35 contains instructions for operating revolvers.

Section II. PRECAUTIONARY MEASURES

13. Maintenance and Inspection

a. Practice preventive maintenance at all times.

b. Make frequent visual inspections for loose, cracked, or otherwise unserviceable parts. Manipulate the trigger to determine that the trigger pull is adequate for safety.

14. Danger Points

a. Check all ammunition.

(1) Prior to release for issue and use, check ammunition for proper type and grade. Refer to TB 9–AMM 4, for all small arms ammunition grades.

(2) Before loading ammunition into the weapon, check for dirt, oil, grease, malformation, loose bullet, and other defects. Do not expose ammunition to direct sun rays or other high temperatures or to prolonged submersion in water.

b. Never point the weapon at any person whom you do not wish to kill.

c. Check the bore prior to firing, to be sure that it is free of foreign matter or obstructions. Keep the weapon pointed in a safe direction when doing so. If, during firing, there is any evidence of misfire or weak charge, make sure that the bullet is not lodged in the weapon.

d. To obviate *danger from hangfire,* wait 10 seconds after a misfire, then clear the weapon quickly. In the event weapon cannot be cleared quickly and the barrel is hot, *danger of cook-off exists.* Keep round locked in cylinder, point weapon in a safe direction (for personnel and property), and allow weapon to cool before removing misfired round.

e. Keep your finger off the trigger and outside the trigger guard except when firing or in training.

f. Never raise hammer to cocked position until ready to fire.

Section III. EFFECTS AND PROBABLE CAUSES OF ACCIDENTS AND MALFUNCTIONS

15. General

The principal causes of accidents and malfunctions of revolvers

Figure 1. Damage from firing round with double charge of powder, cal..45 colt revolver M1917.

are a loose bullet in a cartridge case, defective ammunition, obstructions of the bore, and abnormal trigger operation which will fire the weapon with less than the prescribed minimum trigger pull.

16. Typical Cases

a. Loose Bullet in Cartridge Case. The recoil of a revolver after successive rounds are fired will sometimes cause the bullet of one of the remaining rounds to work loose from its case and prevent the cylinder from rotating.

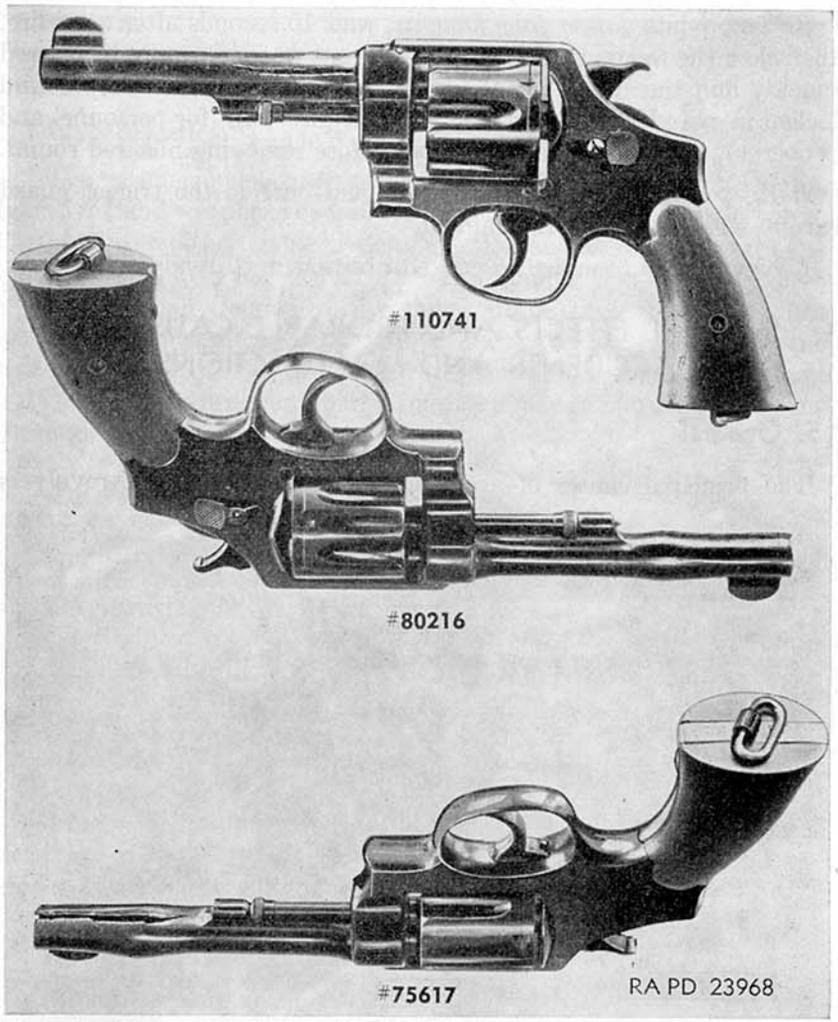

Figure 2. Damage from firing with bullet lodged in bore, cal..45 Smith and Wesson revolvers M1917.

b. Defective Ammunition. Figure 1 is a photograph of a revolver that was damaged by firing a round containing a double charge of powder. The charge created excessive pressure in the chamber of the weapon, ruptured the cylinder and cartridge case, and bent the ejector rod.

c. Bore Obstruction.

(1) Figure 2 pictures three revolvers that were damaged by firing a normal round with a bullet lodged in the bore. A cartridge that contains damp powder may have insufficient power on igniting to force the bullet from the muzzle, or the bullet may remain in the barrel because of other defects in the ammunition. Note, in all three weapons, the bulge produced at the point of obstruction and the split in the barrel.

(2) Rust and pits in the bore of a revolver may obstruct the passage of a bullet and cause an accident.

CHAPTER 5
PISTOLS

Section I. GENERAL

17. Characteristics

The U. S. Army uses several types of automatic pistols. The cal..22 pistol is used for training purposes, and the other models are primarily defensive weapons generally used for ranges of less than 30 yards. Automatic pistols are magazine-fed and recoil-operated. The pistol is so small and light that the firer can point it inadvertently at himself or someone else and squeeze the trigger.

18. Operating Instructions

The accidents and malfunctions described in this chapter result chiefly from mishandling by persons using the weapons. FM 23-35 contains instructions for operating pistols.

Section II. PRECAUTIONARY MEASURES

19. Maintenance and Inspection

a. Practice preventive maintenance at all times.

b. Make frequent visual inspections for loose, cracked, or otherwise unserviceable parts. More pistol barrels are replaced because of rust than for any other reason. Manipulate the trigger to determine that the trigger pull is adequate for safety.

20. Danger Points

a. Check all ammunition.

(1) Prior to release for issue and use, check ammunition for proper type and grade. Refer to TB 9-AMM 4 for all small arms ammunition grades.

(2) Before loading ammunition into the magazine, check for dirt, oil, grease, malformation, and other defects. Do not expose ammunition to direct sun rays or other high temperatures or to prolonged submersion in water.

b. Never point the weapon at any person whom you do not wish to kill.

c. When unloading the weapon, remember that one round may still be *in chamber* with magazine removed.

d. Check the bore prior to firing, to be sure that it is free of foreign matter or obstructions. Keep the pistol pointed in a safe direction when doing so. If there is any evidence of misfire or weak charge during firing, make sure that the bullet is not lodged in the barrel or that a loose bullet has not jammed the magazine to cause an accident on firing the next round.

e. To obviate danger from *hangfire,* wait 10 seconds after a misfire, then clear the weapon quickly. In the event weapon cannot be cleared quickly and the barrel is hot, *danger of cook-off exists.* Keep round locked in chamber, point weapon in a safe direction (for personnel and property), and allow weapon to cool before removing misfired round.

f. Keep your finger off the trigger and outside the trigger guard except when firing or in training.

g. Keep safety lock in its safe position until ready to fire. Keep hammer fully down when pistol is not loaded (on pistols having a hammer).

Section III. EFFECTS AND PROBABLE CAUSES OF ACCIDENTS AND MALFUNCTIONS

21. General

The principal causes of accidents and malfunctions of pistols are worn and defective parts, defective ammunition, and obstructions of the bore.

22. Typical Cases

a. Worn and Defective Parts.

(1) Malfunctions are often caused by the following:

(*a*) Burs, dents, kinks, and bending of magazine parts and loss of tension in the springs.

(*b*) Excessive wear and looseness of moving parts.

(*c*) Pits, bulges, rust, burs, and uneven and indistinct lands in the barrel (figs. 3, 4, and 5).

(2) Figure 6 shows damage to an automatic pistol barrel caused by opening a seam in the steel. Figure 7 shows damage to

the breech end of another pistol after the metal had become fatigued by long usage. Note the coarse structure of the metal at the break.

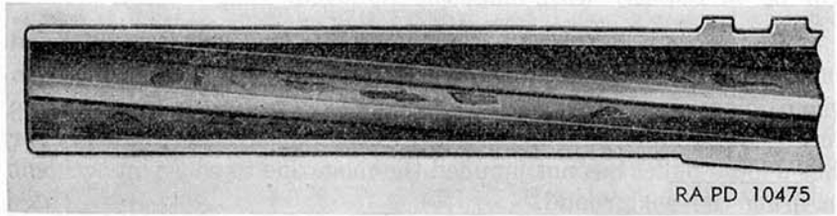

Figure 3. Interior of barrel, pistol M1911A1, showing slight fitting (but free from bulges) and sharp lands.

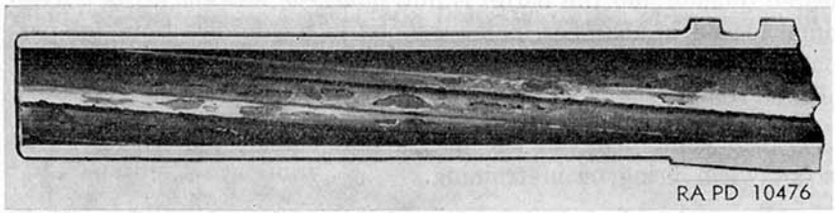

Figure 4. Interior of barrel, pistol M1911A1, showing pitting and dull lands.

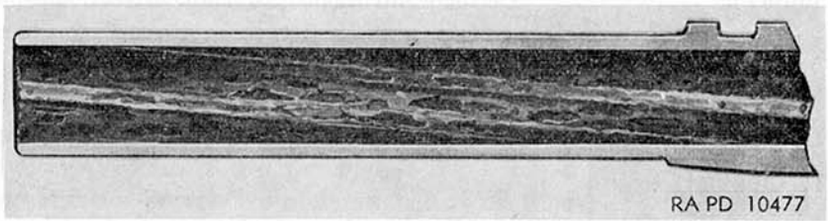

Figure 5. Interior of barrel, pistol M1911A1, showing pitting, worn lands, and burs on interior of muzzle.

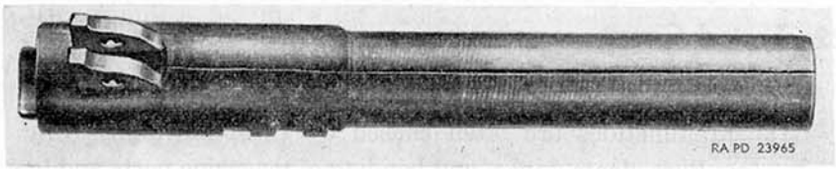

Figure 6. Failure of barrel caused by opening a seam in metal, cal. .45 automatic pistol M1911.

b. Defective Ammunition. Figure 8 shows typical damage to a pistol caused by firing a round that developed excessive pressure from a double charge of powder. This is a manufacturing defect in the ammunition and cannot be detected by the firer.

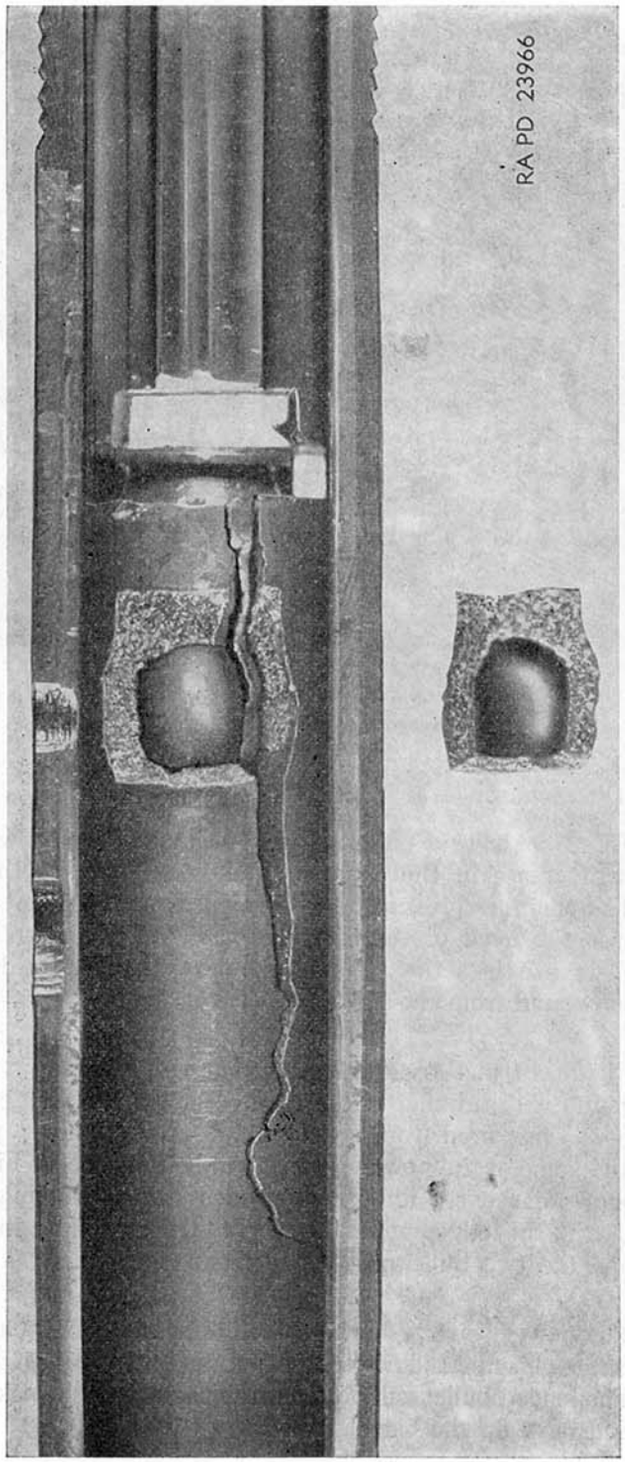

Figure 7. Damage to breech end of barrel caused by fatigue of metal, cal..45 automatic pistol M1911.

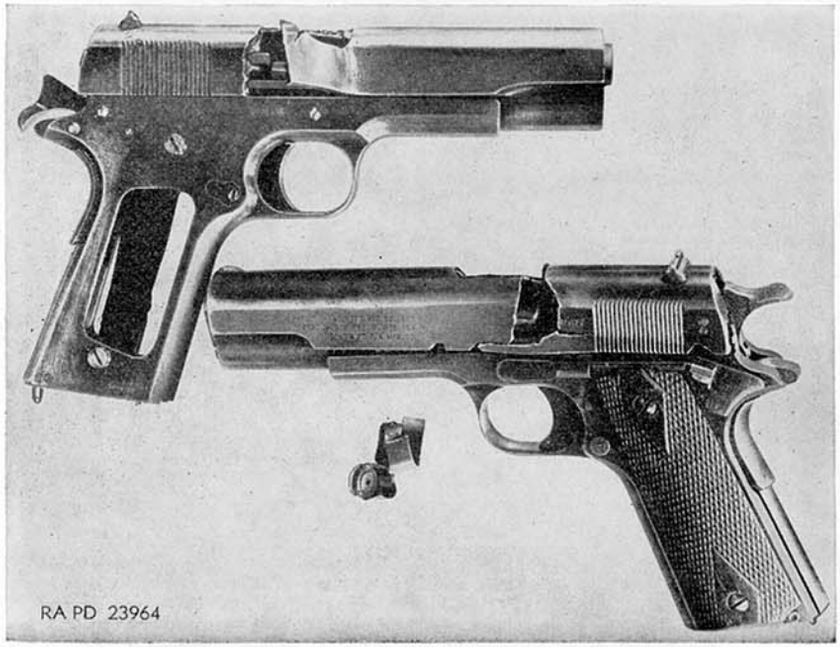

Figure 8. Damage from firing round with double charge of powder, cal..45 automatic pistol M1911.

c. Bore Obstruction.

(1) Figure 9 shows a pistol in which a normal round was fired with grease in the chamber and breech end of the bore. The chamber pressure that developed was sufficient to rupture the head of the cartridge case, releasing the powder gases into the action. Note the bulged slide and the damaged top round from the magazine.

(2) Figure 10 pictures the damage caused by firing a normal round with a bullet in the bore. A bullet may lodge in the bore when fired from a cartridge containing damp powder, and some of the powder grains will be unburned. Figure 11 shows darkened, unburned powder grains adhering to the base of the lodged bullet. Observe the long split in the barrel and the two bullets recovered from the bore.

(3) The powder charge in the cal..45 pistol cartridge sometimes creates insufficient power to expel the bullet from the barrel. The lodged bullet will obstruct the passage of the next round and blow up the barrel.

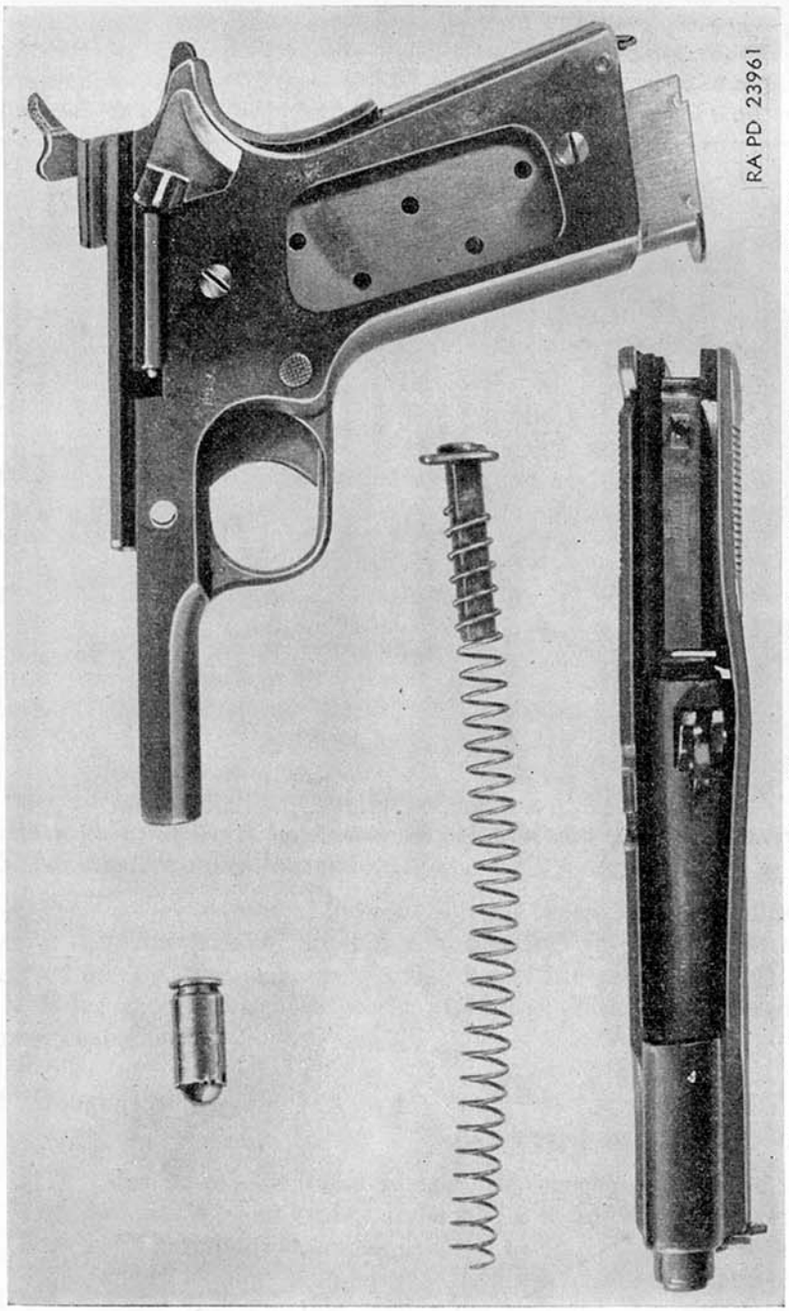

Figure 9. Damage caused by firing with grease in chamber and bore, cal..45 automatic pistol M1911.

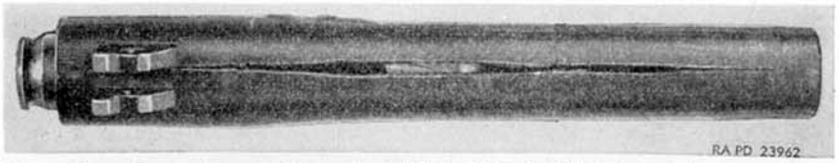

Figure 10. Damage caused by firing with bullet lodged in bore, cal..45 automatic pistol M1911.

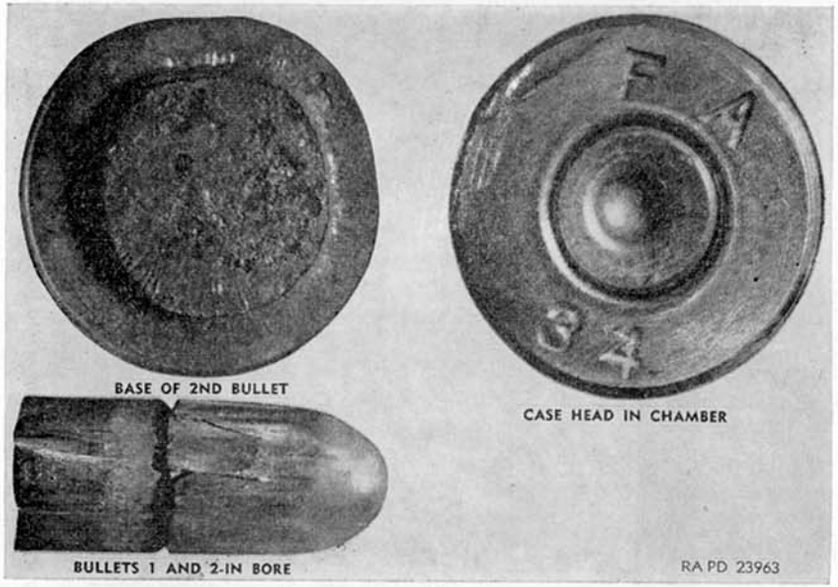

Figure 11. Ammunition damaged by bore obstruction in cal..45 automatic pistol M1911.

CHAPTER 6
RIFLES

Section I. GENERAL

23. Characteristics

Rifles may be either gas-operated or manually operated. The rifle most commonly used by the U. S. Army is the cal..30 M1, a gas-operated weapon that feeds cartridges from a clip. It is an anti-personnel weapon and, therefore, careless or improper handling is extremely dangerous. Even though the user is sure the safety is locked or that the weapon is not loaded, he must always be aware of the direction in which the gun is pointed so as to avoid inadvertently pointing it at himself or other persons.

24. Operating Instructions

The accidents and malfunctions described in this chapter result chiefly from mishandling by persons using the weapons. FM 23–5, FM 23–10, TM 9–270, and TM 9–280 contain instructions for operating rifles.

Section II. PRECAUTIONARY MEASURES

25. Maintenance and Inspection

a. Practice preventive maintenance at all times. Be particularly careful to follow latest maintenance instructions in cleaning the assembled gas cylinder lock screw and valve of the cal..30 rifle M1.

b. Make frequent visual inspections for loose, cracked, or otherwise unserviceable parts.

26. Danger Points

a. Check all ammunition.

(1) Prior to release for issue and use, check ammunition for proper type and grade. Refer to TB 9–AMM 4 for all small arms ammunition grades.

(2) Before loading ammunition in clips, check for dirt, oil, grease, malformation, and other defects. Do not expose ammunition to direct sun rays or other high temperatures or to prolonged submersion in water.

b. Check the bore prior to firing, to be sure that it is free of foreign matter or obstructions. Keep the weapon pointed in a safe direction when doing so. If a misfire occurs, make sure that the bullet is not lodged in the barrel. To obviate *danger from hangfire,* wait 10 seconds after a misfire, then clear the weapon quickly. In the event weapon cannot be cleared quickly and the barrel is hot, *danger of cook-off exists.* Keep round locked in chamber, point weapon in a safe direction (for personnel and property), and allow weapon to cool before removing misfired round.

c. Do not fire ball cartridges to launch grenades. Use special cartridges.

d. Keep the finger away from the trigger except when firing or in training.

e. Rest the butt of the rifle on the ground, never the muzzle, and avoid clogging the muzzle with dirt, mud, or snow.

f. When firing the cal..22 rifle, do not force the bolt home if there is difficulty in feeding. Attempting to force the bolt home may ignite a rim fire cartridge before the cartridge is seated in the chamber.

g. Never point the weapon at any person whom you do not wish to kill.

h. Do not use a rifle M1 that has a bulged or cracked receiver. These are fatigue cracks and can cause damage to other components of the rifle as well as injury to personnel. Close visual inspection will ordinarily reveal such wear, and black-light inspection equipment should be used where available. Rifles with worn or damaged receivers should be taken out of service.

Section III. EFFECTS AND PROBABLE CAUSES OF ACCIDENTS AND MALFUNCTIONS

27. General

The principal causes of accidents and malfunctions of rifles are defective parts and ammunition, obstruction of the bore, improper use of ball cartridges, and dirty mechanisms.

28. Typical Cases

a. Defective Parts.

(1) Misfires and general operating inefficiency will result from cracked, excessively worn, or loose parts.

(2) Excessive wear of the bore near the muzzle will affect accuracy to some extent, but excessive wear of the bore at the breech end will have a much greater effect on accuracy. Refer to TB ORD 366 for acceptable bore tolerances.

(3) A loose gas cylinder will produce short recoil in a weapon, although it has little bearing on accuracy.

(4) Looseness of the front hand guard is not detrimental to proper functioning of a rifle, but a warped front hand guard may hamper the movement of the operating rod.

(5) A bulged or cracked receiver, produced by repeated hammering of the bolt at the rear of the bolt well or by malfunctions occurring in the launching of grenades, may damage other components of the rifle or injure personnel. Malfunctions in launching of grenades may occur through failure to use a gas cylinder lock screw with a valve, use of a screw with a defective valve, or use of a grenade launcher that does not open the valve. A malfunction of the grenade in launching may also damage the weapon.

(6) An undetected seam in the rifle barrel can cause the barrel to split.

(7) A broken firing pin or a weak or broken firing spring may fail to fire the cartridge when the trigger is squeezed.

(8) A broken ejector assembly or a weak, broken, or fouled ejector spring may cause failure to eject.

b. Defective Ammunition. Figure 12 shows a cal..30 rifle M1 after an accident which was believed to be caused by a soft cartridge case head, as there was no evidence of bore obstruction or development of excessive chamber pressure. The malfunction resulted in a crack in the bolt extending from the extractor shank hole to the intersection of the lower lip and bolt face.

Figure 12. Cal..30 rifle M1 damaged by firing defective cartridge.

c. Bore Obstruction

(1) Grease, unexpelled bullets, cleaning materials, and other foreign matter in the bore will cause malfunctions that usually result in damage to the rifle and injury to the firer (figs. 13 and 14). Examination of one rifle that did not eject properly revealed that the barrel was split back from the muzzle about three-quarters of an inch, the lock

nut was split open, and the gas cylinder was moved forward about one-half inch, and that the damage was apparently caused by an obstruction in the bore. Figure 13 shows a section of the barrel of a cal..30 rifle M1 that was damaged by a bore obstruction. A defective cartridge had failed to expel its bullet, and the lodged bullet obstructed the bore for the next round. Experience has shown that firing a ball cartridge through a bore that is obstructed by a bullet will burst the barrel unless the base of the obstructing bullet is less than 1 inch from the point of the chambered round.

(2) Figure 15 pictures damage to a rifle M1 after an accident caused by a longitudinal steel defect (seam) in the bore. The blank cartridge wads that were being fired became slightly frayed and shredded in passing through the bore by contact with the sharp edges of the defect. Accumulation of the shreddings in the converging muzzle end of the defect obstructed the bore and caused the damage.

d. Firing Wi.h Bolt Open.

(1) In some commercial rifles that are procured by Ordnance Corps, there is a position of the bolt when it is not locked at which squeezing of the trigger will release the hammer and ignite the cartridge. It is therefore important to avoid squeezing the trigger at all times except when you want to fire the gun.

(2) The cal..22 Remington rifle has a double extractor that may fire the cartridge while the bolt is being closed. If the extractor claws strike against the head of the cartridge case instead of hooking around it (fig. 16), the pressure of the extractor claws on the rim of the case may fire the (rim fire) cartridge. This condition is caused by strong extractor springs that hinder easy passage of the extractors around the rim of the case.

e. Improper Use of Ball Cartridge. Use of a ball cartridge instead of a special cartridge when launching a grenade is likely to explode the grenade, which will damage the weapon (fig. 17) and cause serious injury to personnel.

f. Dirt and Residue in Mechanism.

(1) It is difficult to thoroughly clean the assembled gas cylinder lock screw and valve of the cal..30 rifle M1. This assembly traps powder and primer salt residues on critical internal surfaces that are not accessible to normal cleaning operations. If possible, extra gas cylinder lock screw and valve assemblies should be kept on hand, so that a clean replace-

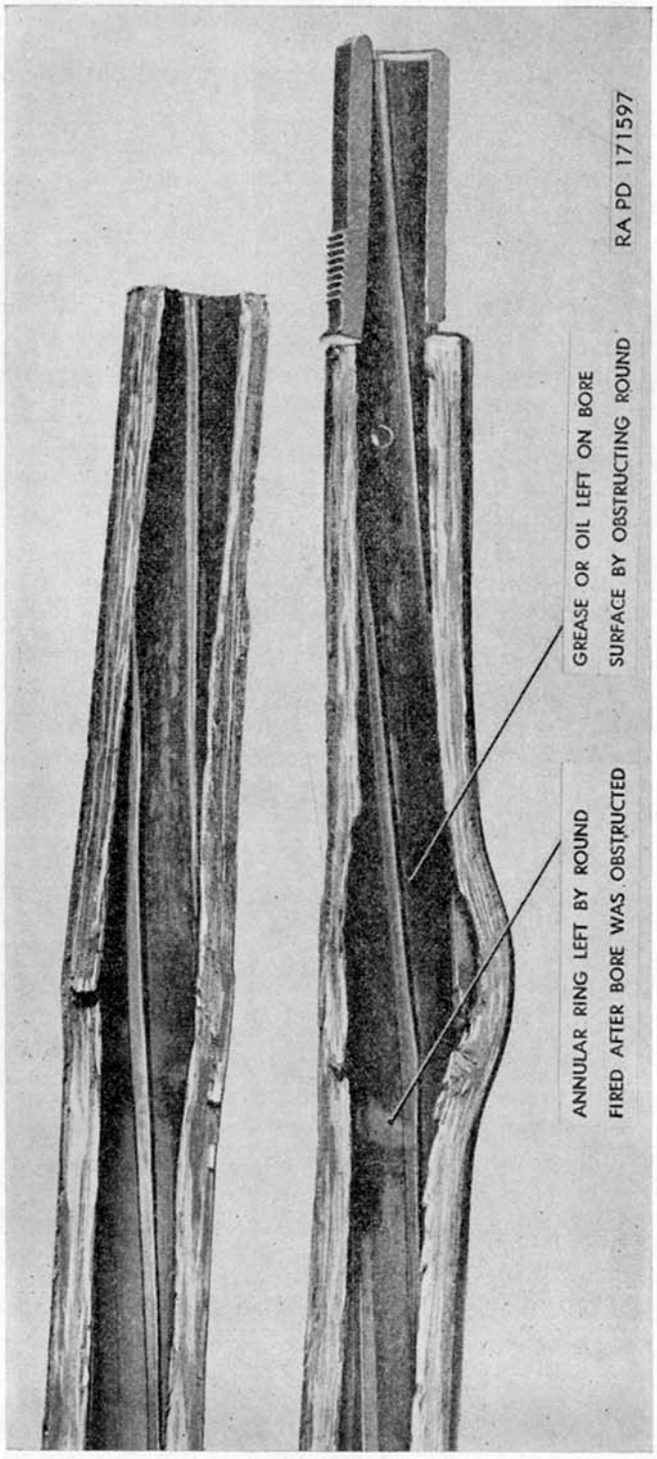

Figure 13. Cal..30 rifle M1 bore damaged by unexpelled bullet.

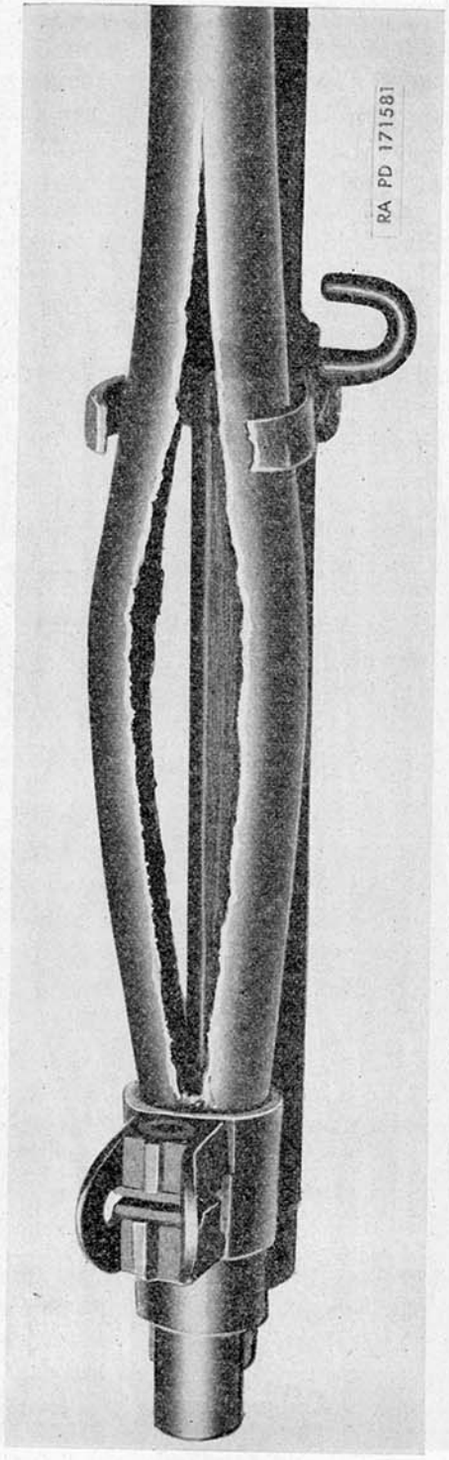

Figure 14. Cal..30 rifle M1 damaged by cleaning rod left in bore.

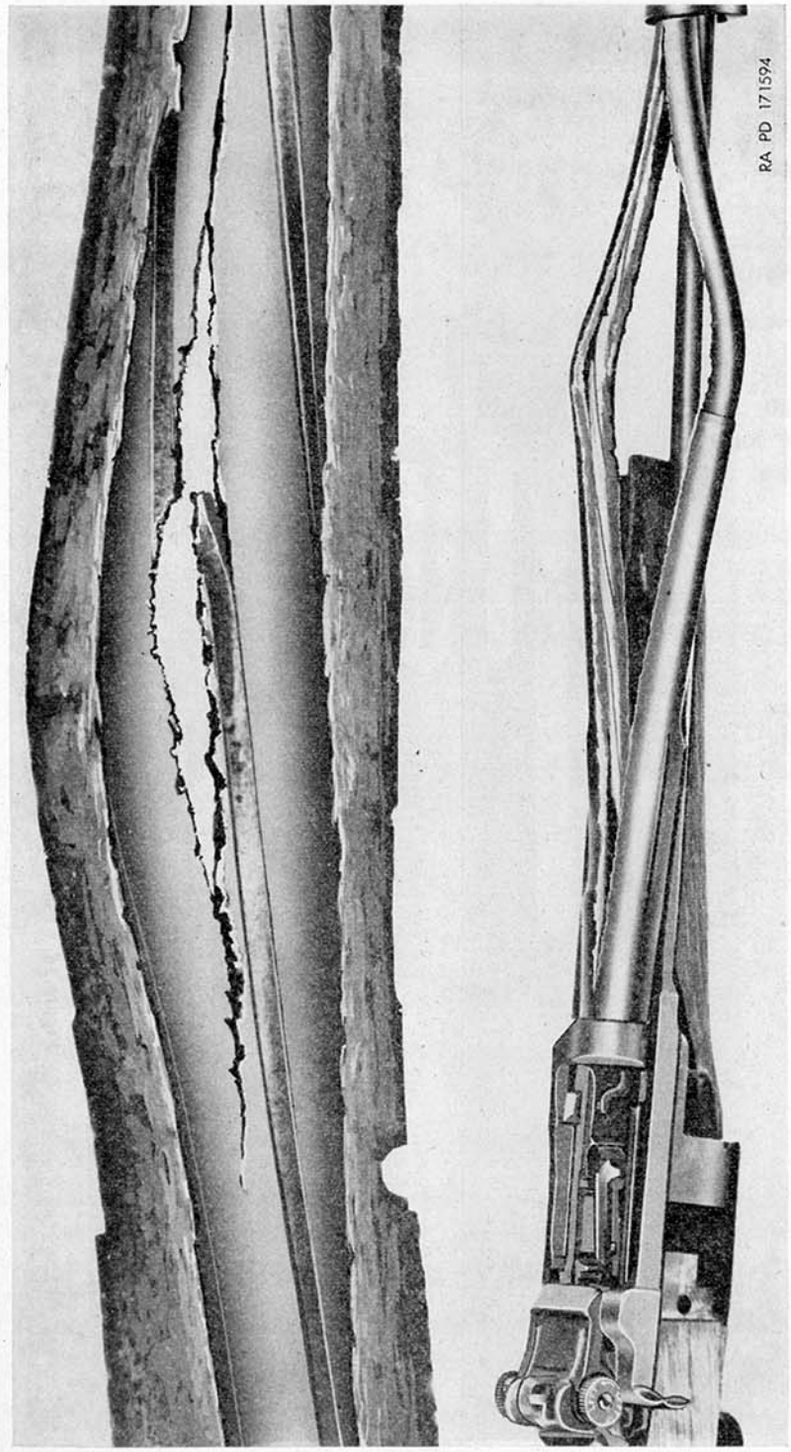

Figure 15. Cal..30 rifle M1 barrel damaged by bore obstruction, with magnified view of portion of barrel.

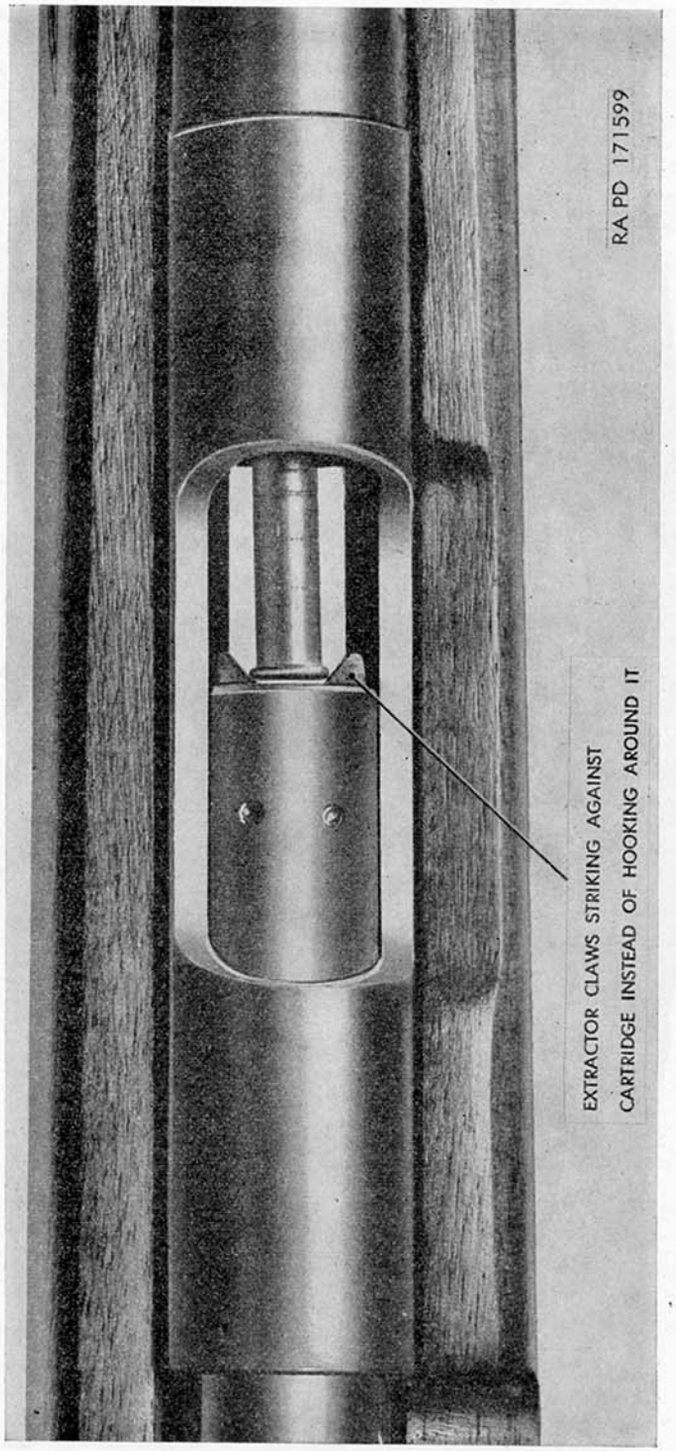

Figure 16. Positions of double extractor, cal..22 Remington rifle.

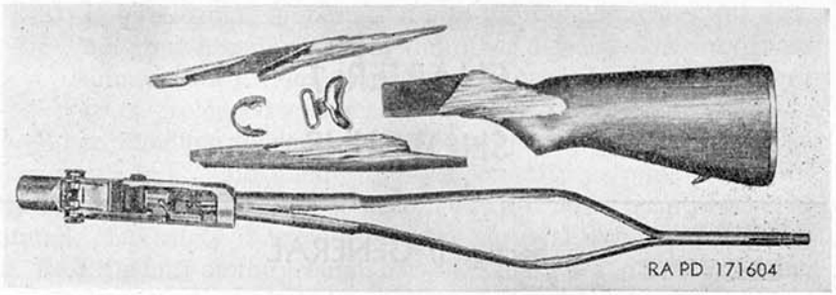

Figure 17. Cal..30 rifle M1 with barrel split from firing ball cartridge to launch a grenade.

ment is always available if an assembly is taken out for cleaning. Dipping of fouled assemblies in clean hot water, followed by immersing in rifle-bore cleaner, will assist in cleaning.

(2) Accumulated powder fouling on the firing pin shoulder or in the firing pin recess may cause the cartridge not to fire when the trigger is squeezed.

CHAPTER 7
SHOTGUNS

Section I. GENERAL

29. Characteristics

a. All shotguns are procured from commercial manufacturers and are used by the U. S. Army for guard duty, special training purposes, and suppression of riots. The only shotguns in military use, except for survival weapon in *b* below, are 12 gage. Efforts are constantly made to secure standardization and interchangeability of parts between the various models to reduce supply and maintenance difficulties. A difference in nomenclature, even when parts correspond, adds to the difficulty of interchanging parts.

b. Cal..22/.410 gage survival rifle-shotgun M6 is issued to Air Force personnel for use as a hunting weapon, in case of a forced landing in isolated locations. The general instructions in this chapter apply to the survival weapon as well as to the 12-gage shot guns.

30. Operating Instructions

The accidents and malfunctions described in this chapter result chiefly from mishandling by persons using the weapons. TM 9–285 contains instructions for operating shotguns.

Section II. PRECAUTIONARY MEASURES

31. Maintenance and Inspection

a. Practice preventive maintenance at all times. Take particular care to avoid breakage, since organizational spare parts are not provided for shotguns.

b. Clean the receiver often. The receivers of slide action and autoloading guns are comparatively open, and foreign matter can easily enter and clog the mechanisms.

32. Danger Points

a. Check all ammunition.

(1) Prior to release for issue and use, check ammunition for proper type and grade. Refer to TB 9–AMM 4 for all small arms ammunition grades.

(2) Before loading ammunition into the weapon, check for dirt, oil, grease, malformation, and other defects. Do not expose ammunition to direct sun rays or other high temperatures or to prolonged submersion in water.

b. When handling loaded weapons after a malfunction, place the safety at "SAFE" and handle the weapon with extreme care until fully unloaded, being careful to keep it pointed away from persons or materiel. No safety is provided on the survival weapon (par. 29*b*).

c. Rest the butt on the ground, never the muzzle, and avoid clogging the muzzle with dirt, mud, or snow.

d. Do not press the trigger as you push the action slide hand'e forward, because if there is pressure on the trigger a shotgun will sometimes fire as the breech bolt locks.

e. If a cartridge becomes jammed in the magazine, do not strike the base of the shell or use a sharp instrument to remove it, as you may detonate the primer and fire the cartridge.

f. Use only issue ammunition with issue guns.

g. When loading the shotgun of the cal..22/.410 gage survival rifle-shotgun M6, do not attempt to close weapon if the firing pin jams, as the shell may be fired before breech lock locks the weapon.

Section III. EFFECTS AND PROBABLE CAUSES OF ACCIDENTS AND MALFUNCTIONS

33. General

The principal causes of accidents and malfunctions of shotguns are use of wrong size ammunition and excessive chamber wear.

34. Typical Cases

a. Use of Wrong Size Ammunition.

(1) Although all Army shotguns are 12 gage, the cartridges of commercially manufactured 16- and 20-gage shotguns, being smaller, can be loaded in a 12-gage chamber. If the smaller shell is loaded into the 12-gage gun, it may drop down into the barrel and obstruct the bore when a proper cartridge is fired, bulging the barrel and possibly bursting it.

(2) The proper chamber for a cartridge is slightly longer than the shell, so that when the gun is fired there will be room for the paper case to open without constricting the bore. It is possible to chamber a cartridge that is too long to be fired in the chamber, and, if such a cartridge is fired, the opened end of the case will constrict the bore, raise the pressure, and blow up the gun.

b. Cut-off. If the chamber is too large for the cartridge, because the shell is of the wrong gage, because of excessive head space, or

because the chamber has been enlarged in diameter by wear, a cut-off may occur when the cartridge is fired; that is, the walls of the chamber will not support the paper case and the paper will shear off immediately forward of the brass cup. Often the entire assembly of paper, pellets, and wads will go down the bore as a unit and damage the barrel. More often, in such instances, the hollow paper tube will remain in the barrel to prevent normal chambering of the next shell or will advance sufficiently in the barrel to become a bore obstruction in firing the following round. Figure 18 shows damage to a shotgun caused by a cut-off.

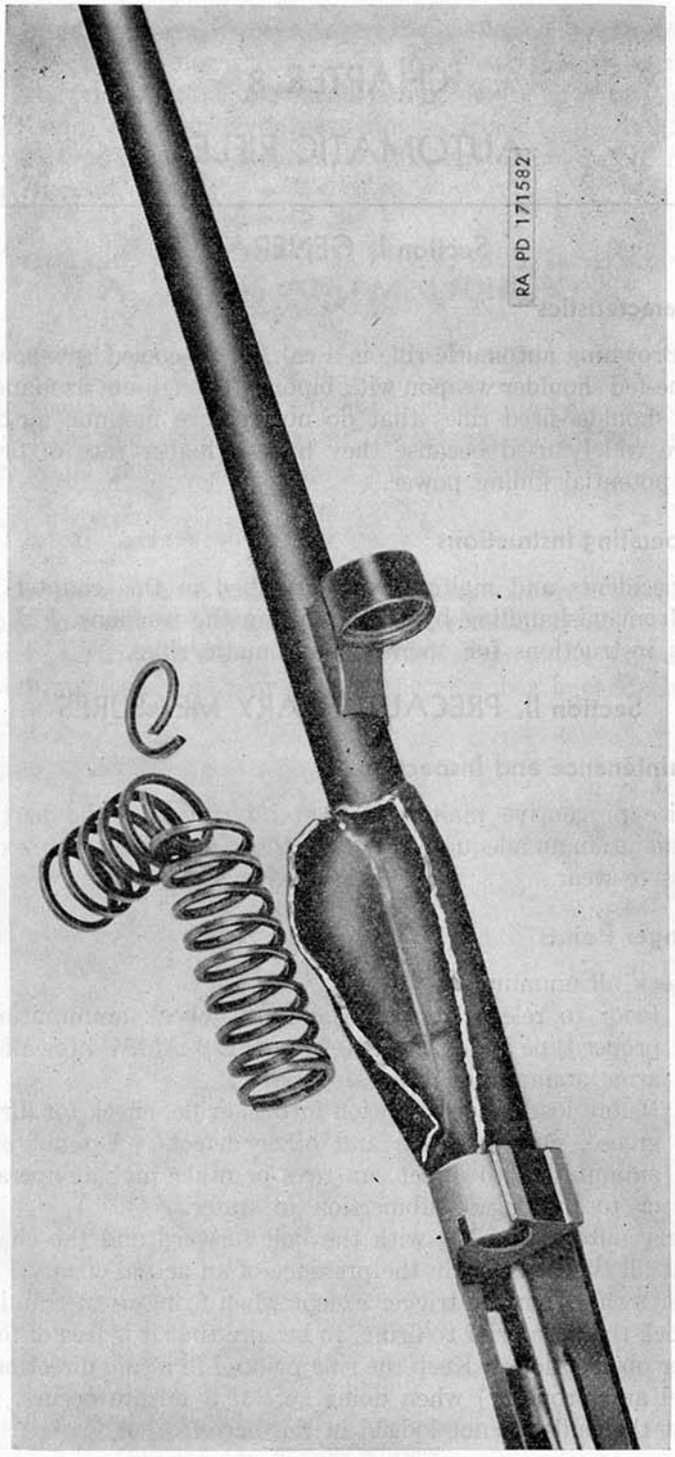

Figure 18. Damage to shotgun barrel caused by a cut-off.

CHAPTER 8

AUTOMATIC RIFLES

Section I. GENERAL

35. Characteristics

The Browning automatic rifle is a cal..30, air-cooled, gas-operated, magazine-fed shoulder weapon with bipod. Though not as maneuverable as shoulder-fired rifles that do not require mounts, automatic rifles are widely used because they have a higher rate of fire and greater potential killing power.

36. Operating Instructions

The accidents and malfunctions described in this chapter result chiefly from mishandling by persons using the weapons. FM 23–15 contains instructions for operating automatic rifles.

Section II. PRECAUTIONARY MEASURES

37. Maintenance and Inspection

Practice preventive maintenance at all times. Take particular care to maintain an adequate supply of those parts which are exposed to excessive wear.

38. Danger Points

a. Check all ammunition.

(1) Prior to release for issue and use, check ammunition for proper type and grade. Refer to TB 9–AMM 4 for all small arms ammunition grades.

(2) Before loading ammunition into the rifle, check for dirt, oil, grease, malformation, and other defects. Do not expose ammunition to direct sun rays or other high temperatures or to prolonged submersion in water.

b. Carry automatic rifles with the bolt forward and the chamber empty at all times except in the presence of an actual enemy. Keep the finger away from the trigger except when firing or in training.

c. Check the bore prior to firing, to be sure that it is free of foreign matter or obstructions. Keep the rifle pointed in a safe direction (for personnel and property) when doing so. If a misfire occurs, make sure that the bullet is not lodged in the barrel.

d. To obviate *danger from hangfire*, wait 10 seconds after a misfire, then clear the weapon quickly. In the event that weapon cannot be cleared quickly and the barrel is hot, *danger of a cook-off exists.* Keep round locked in chamber, point weapon in safe direction (for personnel and property) and allow weapon to cool before removing misfired round.

Section III. EFFECTS AND PROBABLE CAUSES OF ACCIDENTS AND MALFUNCTIONS

39. General

The principal causes of accidents of automatic rifles are defective ammunition and mishandling by the user, such as accidental discharge while carrying the weapon without having the bolt forward.

40. Typical Cases

a. Cartridge With Excessive Powder Charge. Figure 19 illustrates damage to a cal..30 Browning automatic rifle M1918A2 caused by a defective cartridge that developed excessive pressure. The abnormal pressure stretched the rear end of the chamber beyond the elastic

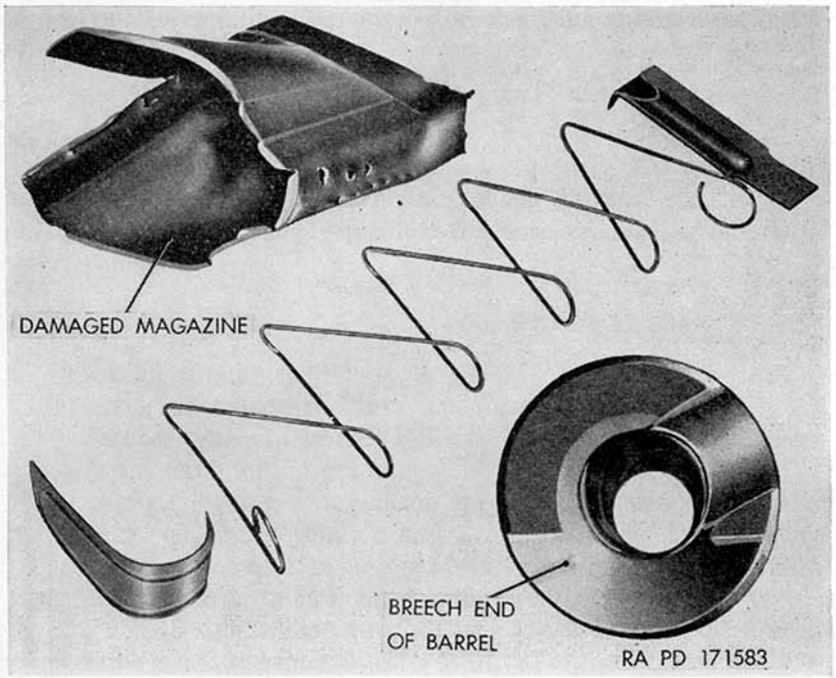

Figure 19. Magazine parts and barrel of Browning automatic rifle damaged by defective cartridge.

limit of the steel and caused the deformation shown. The magazine blew open, releasing the bottom plate and 19 cartridges, and the bolt cracked at the extractor seat. The cartridge case of the accident round stayed in the chamber and the bullet lodged in the bore. The sides of the receiver bulged at the magazine and trigger group, and the chamber stretched out-of-round at the extractor cut.

b. Soft Head. A cartr dge with a soft head can detonate other cartr dges in the magazine and damage gun parts, as shown in figure 20.

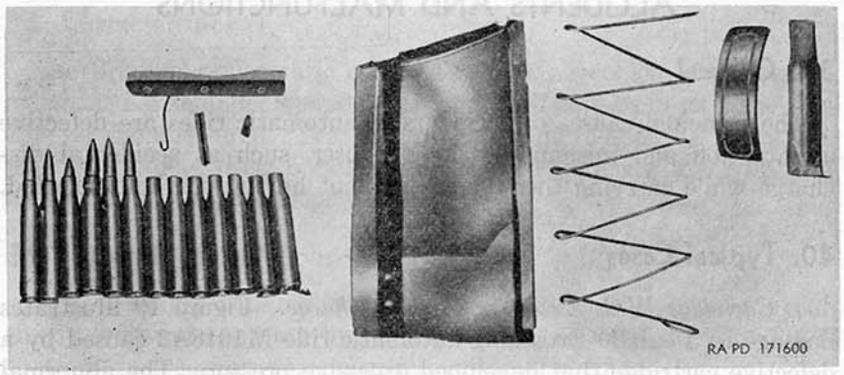

Figure 20. Browning automatic rifle and cartridges damaged by cartridge with soft head.

CHAPTER 9
SUBMACHINE GUNS

Section I. GENERAL

41. Characteristics

The submachine gun is a defensive shoulder weapon generally used for ranges of not more than 100 yards. Some models have no provision for firing single shots and others are capable of both automatic and semiautomatic fire. These guns are not considered safe when a loaded magazine is in place and the bolt is forward in the receiver or chamber except under certain conditions which will be dealt with more fully in paragraphs 43 and 44.

42. Operating Instructions

The accidents and malfunctions described in this chapter result chiefly from mishandling by persons using the weapons. FM 23–41 and TM 9–215 contain instructions for operating submachine guns.

Section II. PRECAUTIONARY MEASURES

43. Maintenance and Inspection

a. Practice preventive maintenance at all times.

b. Make frequent visual inspections for loose, cracked, or otherwise unserviceable parts.

44. Danger Points

a. Check all ammunition.

(1) Prior to release for issue and use, check ammunition for proper type and grade. Refer to TB 9–AMM 4 for all small arms ammunition grades.

(2) Before loading ammunition into the magazine, check for dirt, oil, grease, malformation, and other defects. Do not expose ammunition to direct sun rays or other high temperatures or to prolonged submersion in water.

b. The cal..45 submachine gun M3 and M3A1 are safe only when the magazine is out and the bolt is forward. If either of these weapons is carried with a loaded magazine in place, bolt forward, and cover down; dropping the weapon may jar the cover open and the bolt far

enough to the rear to remove a round from the magazine, chamber, and fire it.

c. The cal..45 Thompson submachine gun M1928A1 is *not* considered safe when a loaded magazine is in place and the bolt forward in the receiver unless the manual safety is turned to the "SAFE" position. Keep the manual safety turned to the "SAFE" position if a loaded magazine is in place and the bolt is forward in the receiver. If the gun is dropped on the butt or severely jarred, with the safety in the "FIRE" position, the bolt may move rearward far enough so that on its forward movement it may remove a round from the magazine, chamber, and fire it.

d. To obviate *danger from hangfire,* wait 10 seconds after a misfire, then clear the weapon quickly. In the event weapon cannot be cleared quickly and the barrel is hot, danger of cook-off exists. Keep round locked in chamber, point weapon in safe direction (for personnel and property), and allow weapon to cool before removing misfired round.

Section III. EFFECTS AND PROBABLE CAUSES OF ACCIDENTS AND MALFUNCTIONS

45. General

The principal causes of accidents and malfunctions of submachine guns are defective ammunition or accidental dropping or jarring of the guns with a loaded magazine in the weapon.

46. Typical Cases

a. Insufficient Powder Charge. Cartridge charges are loaded by automatic machines designed to deliver a uniform weight of propellant, within the tolerance limit, to each cartridge. Occasionally, from various causes, a machine will load an insufficient amount of powder or will load powder to which some foreign material has accidentally been added. If the charge is not sufficient to fire the cartridge from the weapon, the bullet will obstruct the barrel for the succeeding round.

b. Bore Obstructions. Check the bore prior to firing to be sure that it is free of foreign matter or obstructions. Keep the weapon pointed in a safe direction (for personnel and property) while doing so. If, during firing, there is any evidence of misfire or weak charge, make sure that the bullet is not lodged in the barrel to cause an accident on firing the next round.

CHAPTER 10
CARBINES

Section I. GENERAL

47. Characteristics

The operating mechanism of the carbine is generally similar to that of the rifle M1. The carbine has a gas-operated rotating bolt action operated by a reciprocating slide. The care and malfunctioning conditions of both weapons are similar; however, the shorter length of the carbine adds to the danger of accidental discharge when pointed in an unsafe direction. As in all magazine-fed weapons, the shape, position, and condition of the magazine lips are extremely critical and if dented out of shape will interfere with proper feeding of the cartridge into the chamber. A dent in the side of the magazine will present the same difficulty in feeding. Because of the thick walls and hard metal in a magazine, it is usually more practicable to replace a damaged magazine rather than attempt to have it repaired.

48. Operating Instructions

The accidents and malfunctions described in this chapter result chiefly from mishandling by persons using the weapons. FM 23–7 contains instructions for operating carbines.

Section II. PRECAUTIONARY MEASURES

49. Maintenance and Inspection

a. Practice preventive maintenance at all times. Take particular care to maintain an adequate supply of those parts which are exposed to excessive wear.

b. Make frequent visual inspections for cracked bolts and other signs of unserviceability.

50. Danger Points

a. Check all ammunition.

(1) Prior to release for issue and use, check ammunition for proper type and grade. Refer to TB 9–AMM 4, for all small arms ammunition grades.

(2) Before loading ammunition into the magazine, check for dirt, oil, grease, malformation, and other defects. Do not

expose ammunition to direct sun rays or other high temperatures or to prolonged submersion in water.

b. Keep your finger away from the trigger except when firing or during training.

c. Check the bore prior to firing to be sure that it is free of foreign matter or obstructions. If a misfire occurs, make sure that the bullet is not lodged in the barrel to cause an accident on firing the next round. To obviate *danger from hangfire,* wait 10 seconds after a misfire, then clear the weapon quickly. In the event weapon cannot be cleared quickly and the barrel is hot, *danger of cook-off exists.* Keep round locked in chamber, point weapon in safe direction (for personnel and property) and allow weapon to cool before removing misfired round.

d. Rest the butt of the carbine on the ground, never the muzzle, and avoid clogging the muzzle with dirt, mud, or snow.

e. When firing a carbine, be sure the selector is set correctly for the type of fire intended. Unexpected automatic fire, when single fire is anticipated, can cause an accident.

Section III. EFFECTS AND PROBABLE CAUSES OF ACCIDENTS AND MALFUNCTIONS

51. General

The principal causes of accidents and malfunctions of carbines are worn or defective parts, and insufficient lubrication.

52. Typical Cases

a. Cracked Bolt. Figure 21 shows damage to a cal..30 carbine M1 that resulted from continued firing with a cracked bolt. Examination after the malfunction revealed that the right-hand locking lug was broken and the left-hand lug was damaged. The extractor was blown out of the gun. The number of holes in the right locking lug of the carbine weakens it, sometimes causing this critical component to break off. Figure 22 is another example of damage from the same type of malfunction.

b. Failure of Operating Slide Spring. Reports from combat areas reveal that the operating slide spring of the carbine at times does not entirely close the bolt. This failure has been attributed to the following causes:

(1) Kinks and/or weakness in the operating slide spring.
(2) Foreign material such as rust or dirt.
(3) Deformed, burred, or worn operating slide spring guide, or burred nose on guide. (Nose of guide should be free from burs to insure positive seating in its recess.)

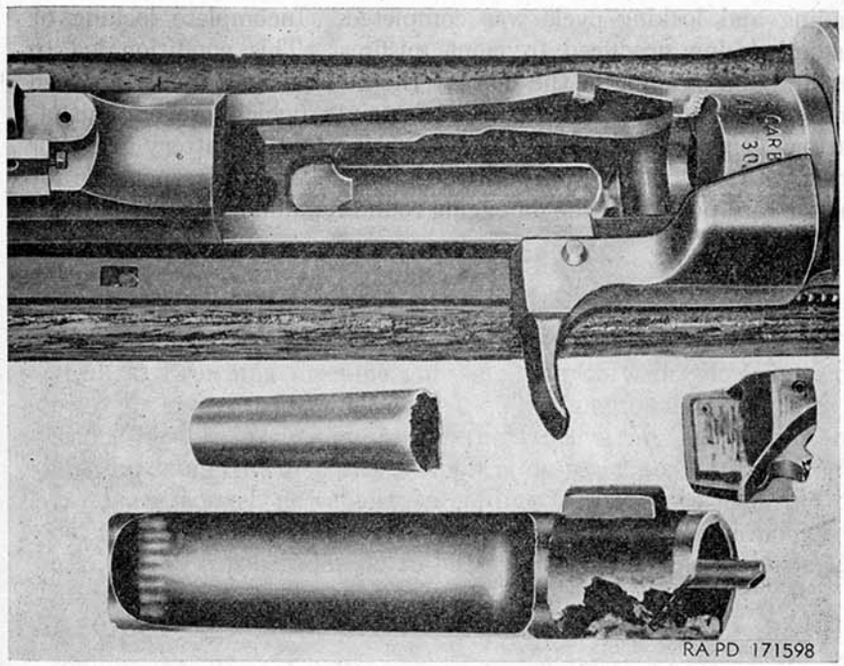

Figure 21. Parts of cal..30 carbine damaged by firing with cracked bolt.

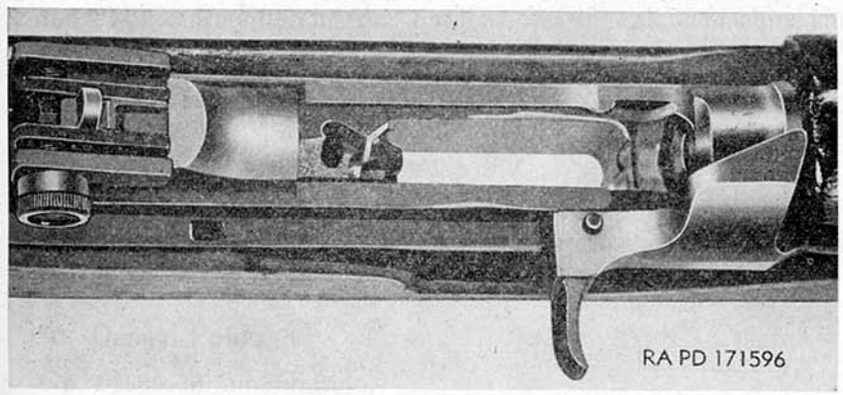

Figure 22. Cal..30 carbine after malfunction caused by firing with cracked bolt.

(4) Dents, splits, rust, and other foreign matter in slide spring housing.

c. Lack of Lubrication. Malfunctions have occurred through continued use of a weapon without lubricating the functional parts. A malfunction caused by this situation left the receiver cracked on both sides, the right-hand locking lug broken, the stock split, the magazine swelled, and the cartridge ruptured. Continued lack of lubrication on the functional parts resulted in frictional resistance which was sufficient to overcome the force of the driving spring before the

loading and locking cycle was completed. Incomplete locking or partial closing produced frequent misfires. This condition led to peening and swaging of the bolt by the hammer and finally reduced the designed mechanical interference points (which prevent out-of-battery firing) to a state of ineffectiveness. Out-of-battery firing, or firing with the bolt not fully forward and locked, was responsible for the forward portion of the damaging round remaining in the chamber.

CHAPTER 11
CAL..30 MACHINE GUNS

Section I. GENERAL

53. Characteristics

Cal..30 Browning machine guns are link or web belt fed, recoil-operated, and water- or air-cooled. The functional mechanisms of various models in current use by the U. S. Army are similar, but differ in details. This type weapon is designed to fire at materiel, aircraft, personnel, or vehicles, according to model; to fire from tripod, bipod or antiaircraft mounts or from various vehicle mounts or aircraft; and can be adapted to either fixed or flexible mountings.

54. Operating Instructions

The accidents and malfunctions described in this chapter result chiefly from mishandling by persons using the weapons. FM 23–55 and TM 9–205 contain instructions for operating cal..30 machine guns.

Section II. PRECAUTIONARY MEASURES

55. Maintenance and Inspection

Practice preventive maintenance at all times. Maintenance and repair of cal..30 Browning machine guns consists largely in the replacement of worn or broken parts.

56. Danger Points

a. Check all ammunition.

(1) Prior to release for issue and use, check ammunition for proper type and grade. Refer to TB 9–AMM 4 for all small arms ammunition grades.

(2) Before loading ammunition into the weapon, check for dirt, oil, grease, malformation, and other defects. Do not expose ammunition to direct sun rays or other high temperatures or to prolonged submersion in water.

b. Check the bore prior to firing, to be sure that it is free of foreign matter or obstructions. If a misfire occurs, make sure that the bullet is not lodged in the barrel.

c. When firing blank cartridges, clear the space for at least 20 yards in front of the gun in case the closing wads or paper cups fail to break up.

d. Attachments are used to adapt the M1917A1 and M1919A4 guns for firing blank ammunition M1909. These attachments must be removed before firing ball ammunition. Always remove the muzzle attachment before removing the cartridge-stop attachment to eliminate the possibility of firing ball ammunition with the muzzle attachment still in place. (The cartridge-stop attachment prevents the entrance of a live round into the feedway.)

e. Prior to initial use, periodically during continued use, and whenever gun barrels are changed; check and adjust head spacing of the machine gun barrel in accordance with FM 23–55 and TM 9–1205. Ascertain that barrel locking spring is properly engaged, to prevent any increase in head spacing due to rotation of the gun barrel during normal use.

f. To obviate *danger from hangfire,* wait 10 seconds after a misfire then clear the weapon quickly. In the event weapon cannot be cleared quickly and the barrel is hot, *danger of cook-off exists.* Keep round locked in chamber, point weapon in safe direction (for personnel and property) and allow weapon to cool before removing misfired round.

Section III. EFFECTS AND PROBABLE CAUSES OF ACCIDENTS AND MALFUNCTIONS

57. General

The principal causes of accidents and malfunctions of cal..30 machine guns are defective parts or ammunition, obstruction of the bore, and improperly adjusted head space.

58. Typical Cases

a. Excessive Head Space. This condition frequently causes trouble. There is a series of notches (serrations) around the breech end of the barrel in which a spring fits for locking the barrel into place. The spring sometimes sticks on the end of the barrel before slipping into the notches and thereby leaves too much head space. TM 9–1205 gives instructions for adjusting head space. When positioning the barrel, check to see that the notches are actually on the spring instead of merely against its end. Figure 23 illustrates typical effects of excessive head space on fired cartridge cases.

(1) Case "1" in figure 23 is that of a standard ball cartridge fired in a gun with standard head space of 1.942 inches. The appearance of the case is normal.

(2) Cases "2," "3", and "4" in figure 23 are those of ball cartridges fired in guns having excessive head space. The gun in each instance was undamaged. Note the deformation of the forward portion of each case: the lengthening of the first cone and shortening of the neck. Such case deformation occurs only when the case lies to the rear of its fully chambered position.

(*a*) Case "2" in figure 23 exhibits the effect of 3/16-inch excess head space with ammunition loaded to standard pressures. Note the shortened case neck and the annular bulge formed on the first cone of the case immediately to the rear of the chamber.

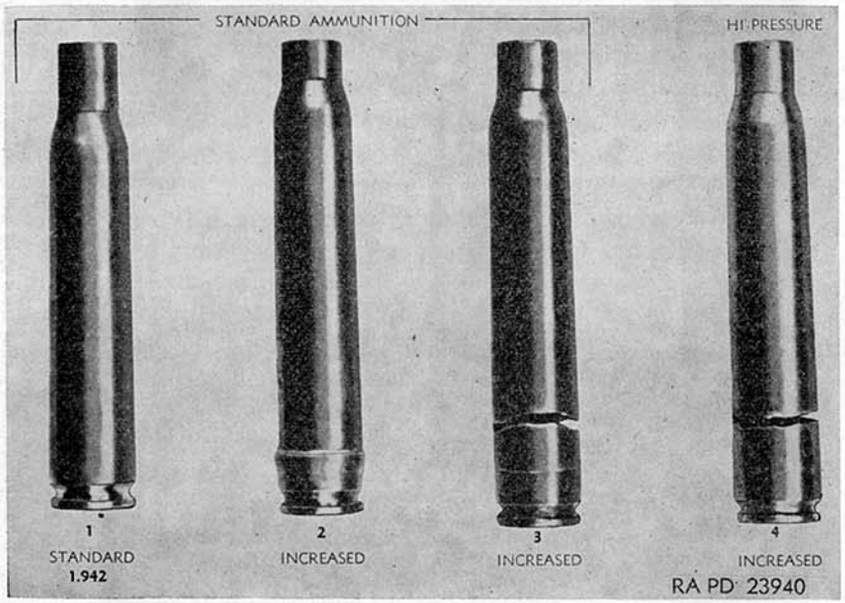

Figure 23. Effects of excessive head space on cartridge cases, cal..30 machine gun.

(*b*) Case "3" in figure 23 is that of a standard ball cartridge fired in a gun having 1/4-inch excess head space. Note the shortened neck and the separation of the case approximately one-half inch from the head.

(*c*) Case "4" in figure 23 shows the effect of firing a high pressure cartridge in a gun having 3/16-inch excess head space. Note evidence of excessive head space in the separation approximately one-half inch from the head of the case and in the shortened neck. Also, note evidence of high pressure in the heavy marking of the case by the chamber wall and in the relative sharpness of the newly formed shoulder crest joining the first and second cones.

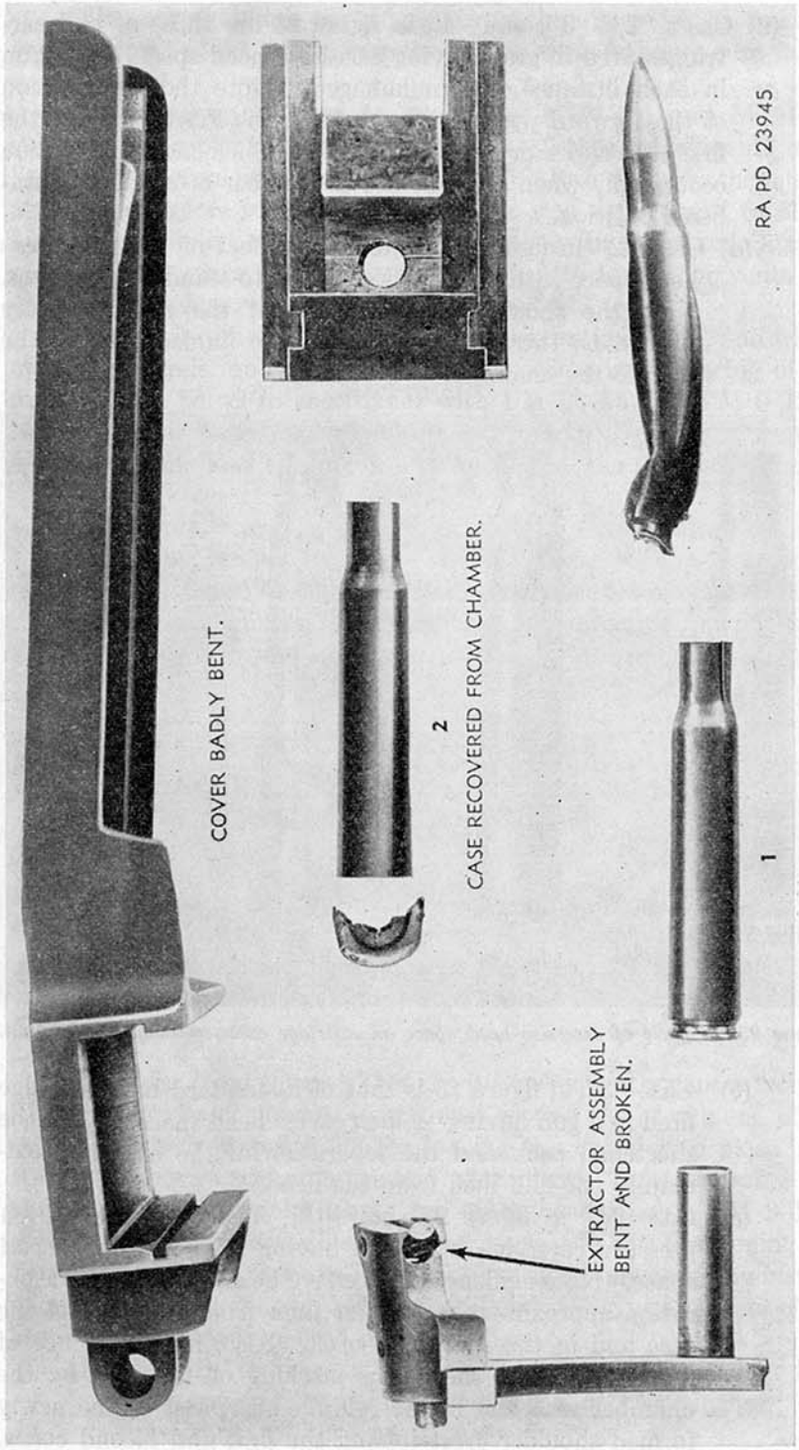

Figure 24. Damage caused by case with split neck, cal..30 machine gun.

b. Defective Ammunition.

(1) *Cartridge Case With Split Neck.* Figure 24 exhibits damage to a gun from a round having a case with split neck.

(*a*) A live round with a split case neck was chambered in the gun. For some reason the bolt was retracted, extracting the case, but leaving the bullet in the chamber. The extracted case was ejected (1, fig. 24) and a second live round chambered. When the chambered cartridge was fired the case ruptured (2, fig. 24). The explosion ignited the cartridge lying directly above in the feedway, rupturing the case, and releasing additional gases into the action (3, fig. 24).

(*b*) Note the bent cover of the gun, the bent breech lock cam, and the impressions on the cartridge case from the wall of the chamber. The presence of unburned powder grains in the action further indicates that a live case was extracted, leaving the bullet in the barrel.

(2) *Hangfire.*

(*a*) Figure 25 shows damage to a gun resulting from a hangfire. In an attempt to clear the defective round from the gun, the action was retracted by hand sufficiently to unlock the breech bolt and begin extraction of the round from the chamber. At this point in the operation, the delayed ignition of the defective round occurred. The resulting explosion separated the case head from the case body. The escaping gases bent the cover of the gun upward.

(*b*) Cartridge "1" (fig. 25) is a normal cal..30 live round. Cartridge "2" in figure 25 exhibits the deformed case body of the chambered round. Note the shortened neck. Cartridge "3" in figure 25 is a damaged round that lay in the feedway at the time of the explosion.

(3) *Excessive pressure.*

(*a*) Figure 26 illustrates damage to a gun caused by a high chamber pressure when firing a cartridge. A cartridge that develops excessive pressure will rupture the head of its case. In this instance it also broke the extractor and bent the cover of the gun.

(*b*) In all instances of high chamber pressure, the fired case will be heavily marked by the walls of the chamber.

(*c*) Accidents of this type should be attributed to excess chamber pressure only after careful examination of the evidence shows no other cause.

c. Bore Obstruction.

(1) An obstruction in the bore immediately forward of the

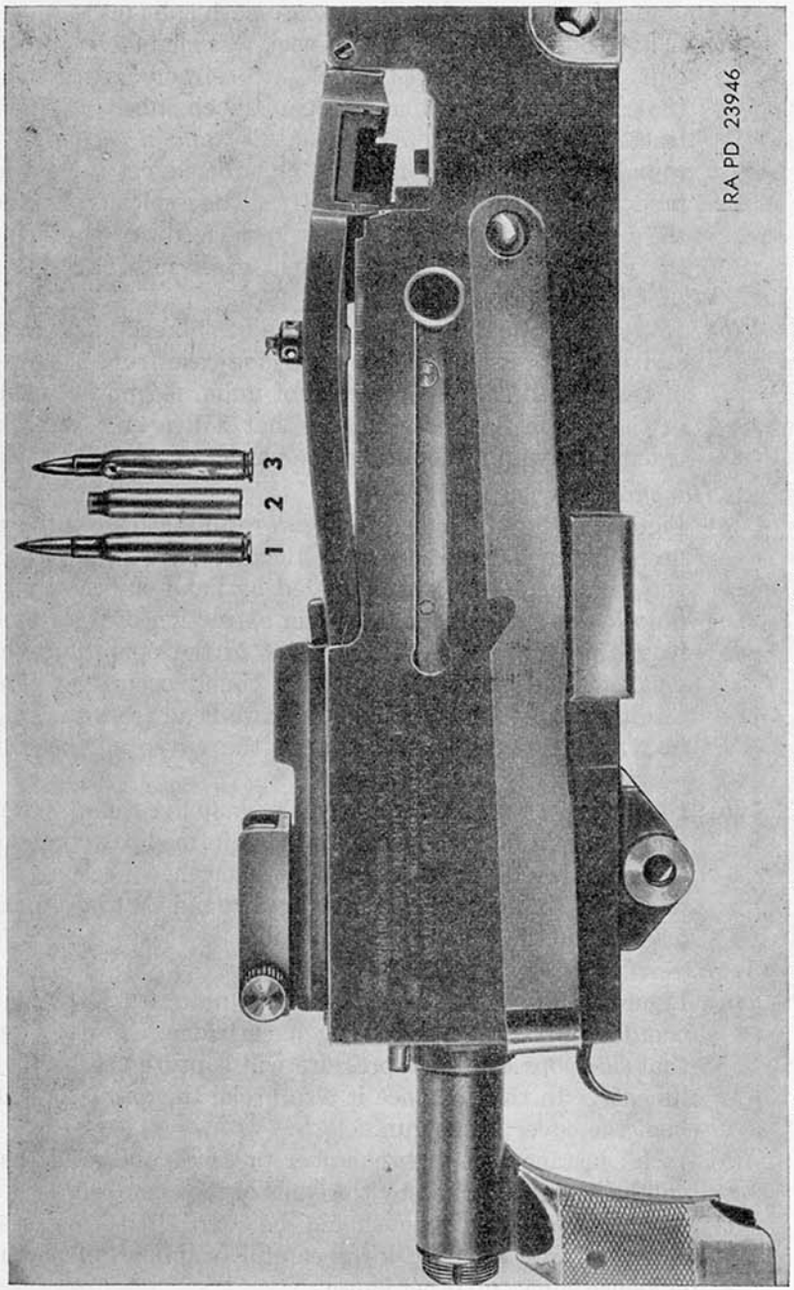

Figure 25. Damage from a hangfire occurring with breechbolt unlocked cal..30 machine gun.

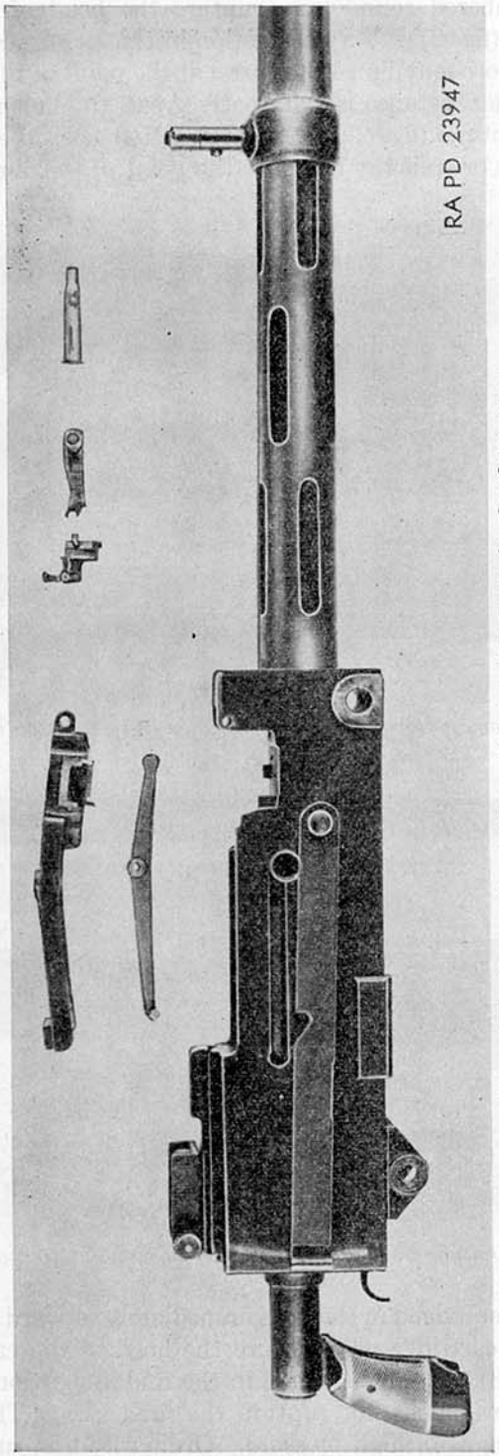

Figure 26. Damage to cal..30 machine gun from excessive chamber pressure.

chambered round may rupture the head of the cartridge case (fig. 27). An obstruction in the long middle portion of the bore may bulge the barrel at the point of the obstruction. If the resistance is sufficiently great, the bulge may become a rupture (fig. 29). An obstruction near the muzzle may bulge or split the barrel at the point of the obstruction.

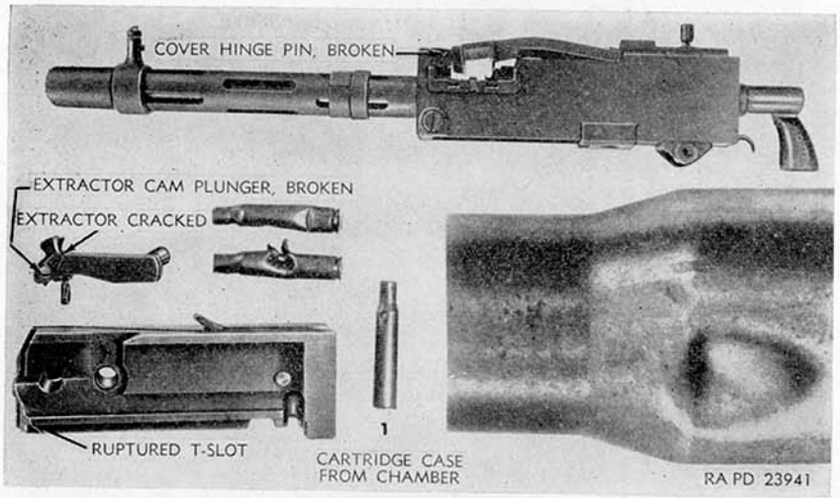

Figure 27. Damage from firing with obstruction in bore, ca'..30 machine gun.

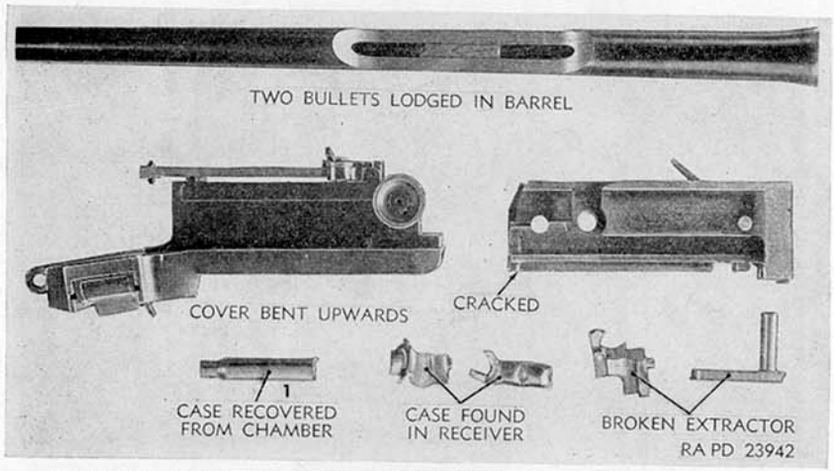

Figure 28. Damage from firing with bullet in bore, cal..30 machine gun.

(2) A bullet lodged in the bore immediately forward of the chambered cartridge will rupture the head of the cartridge case (fig. 28). A bullet lodged in the middle portion of the bore ordinarily does not rupture the fired case. The case may show signs of high pressure. Ordinarily, the rupture of the

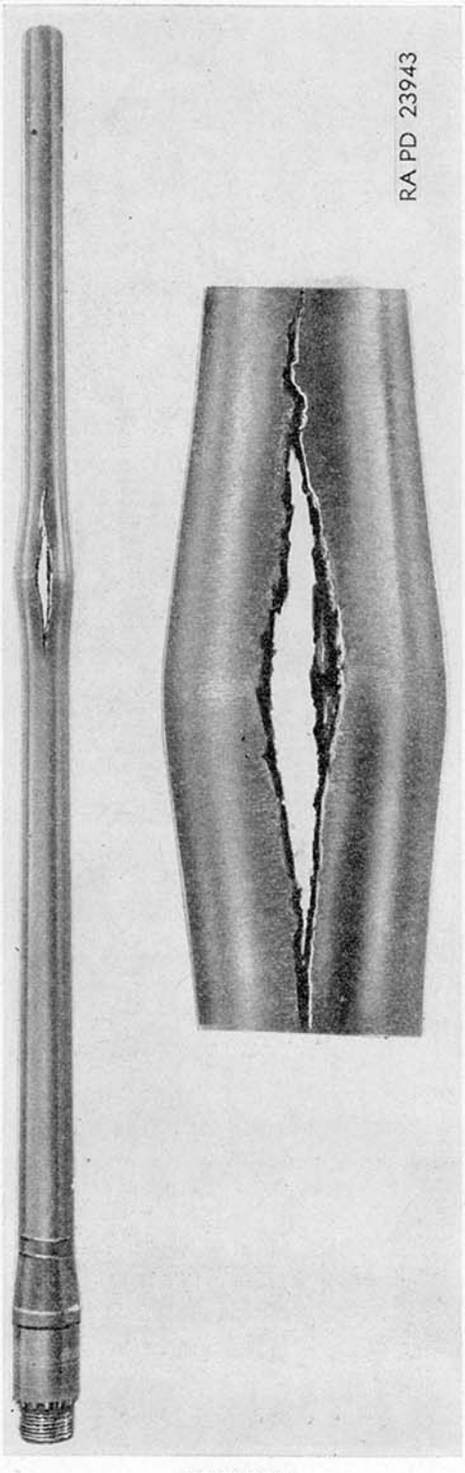

Figure 29. Damage from firing with hard object lodged in bore, cal..30 machine gun.

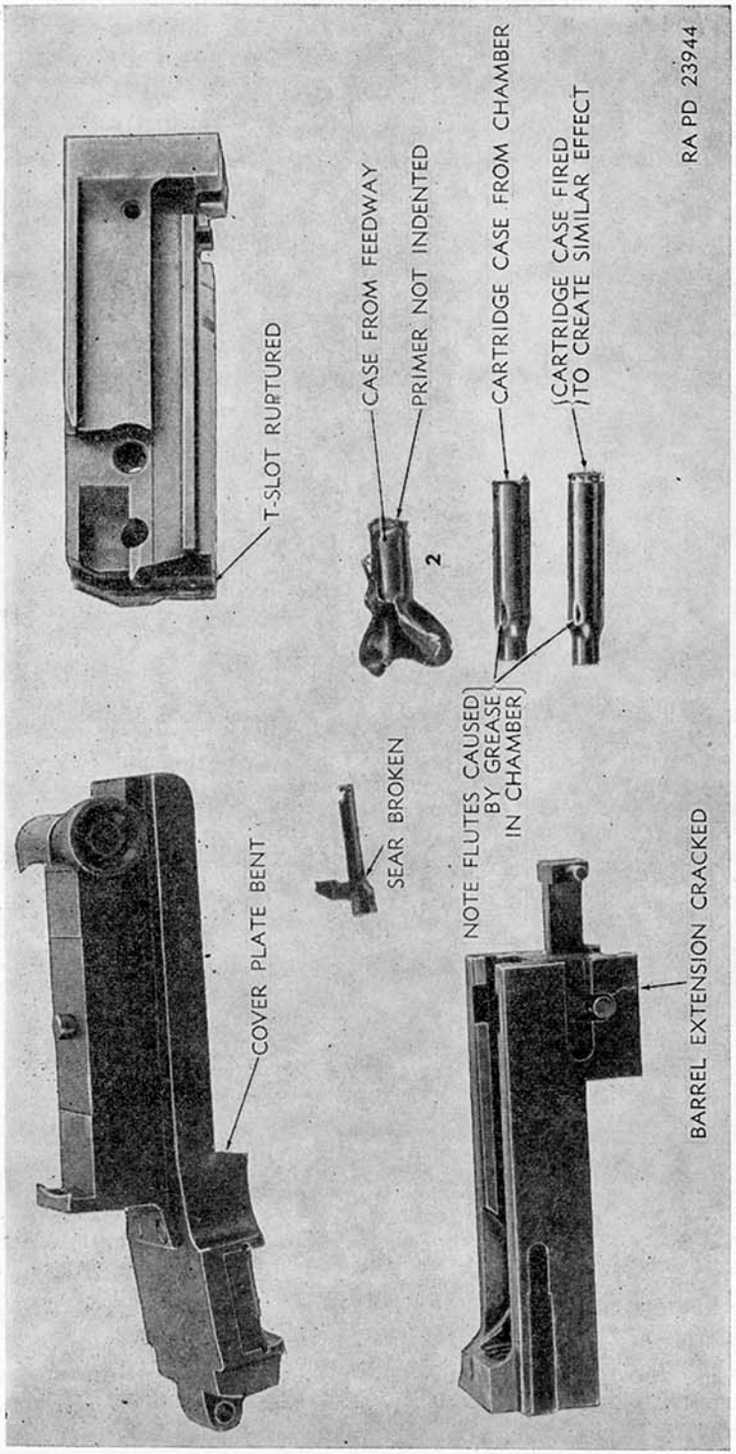

Figure 30. Damage from firing with grease in chamber and bore, cal..30 machine gun.

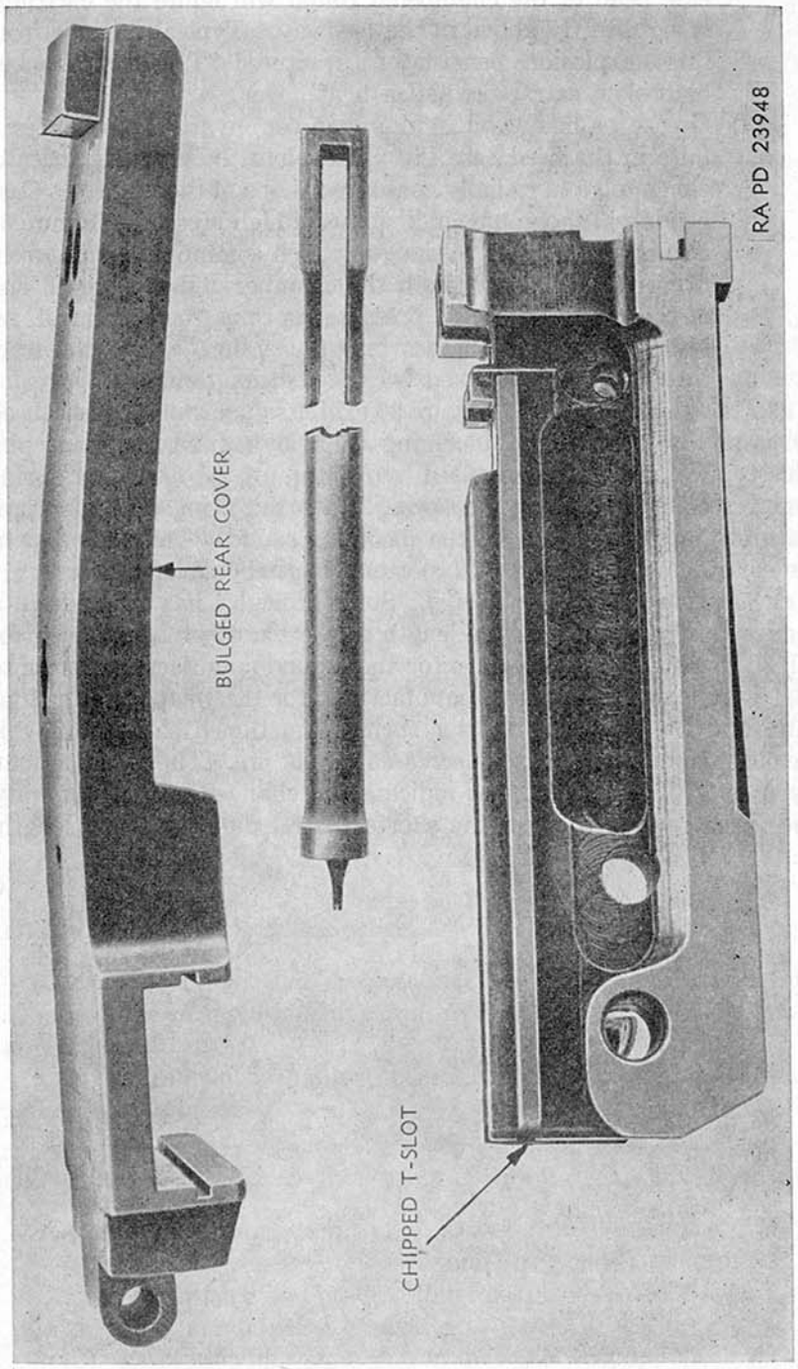

Figure 31. Damage from fractured firing pin causing premature ignition, cal..30 machine gun.

case head of the chambered round will ignite the cartridge lysng directly above in the feedway. Typical damage from thiese explosions consists of a fractured "T" slot, a cracked or broken extractor, and a bent cover.

(3) Grease or heavy oil in the chamber invariably produces a flute in the fired case (fig. 30). Note the characteristically elongated and radially contoured shape of these flutes. Case heads will show some indications of high pressure. Figure 30 also shows damage to the gun which commonly results from firing with grease in both the chamber and the breech end of the bore. The high pressure ruptures the case head, releasing the powder gases into the action. Note the fractured "T" slot, cracked barrel extension, and bent cover.

d. Fractured Firing Pin. Figure 31 exhibits damage to a gun caused by premature firing of the incoming round by a fractured firing pin. This typical accident was caused by fracture of the firing pin during counterrecoil. The firing pin spring drove the firing pin point prematurely into the primer of the incoming round. The explosion of the cartridge chipped the "T" slot and bent the cover upward.

e. Short Barrel-Plunger Spring. Some difficulty has arisen from a change that was made in the length of the barrel plunger spring for cal..30 machine guns. Springs for these guns manufactured prior to 1941 were longer than those manufactured for the weapons after that date, and the new-type shorter springs functioned satisfactorily is the old weapons except for a decreased rate of fire. The specificationn given in TM 9–1205 did not indicate the changed length but have since been revised to show the shorter barrel plunger spring length.

CHAPTER 12

CAL..50 MACHINE GUNS

Section I. GENERAL

59. Characteristics

Cal..50 machine guns are air-cooled or water-cooled, recoil-operated, and belt-fed. By repositioning some of the component parts, ammunition may be fed from either the right or left side. They may be mounted on rigid, turret, or hand-operated mounts and can be adapted to either fixed or flexible mountings, depending on the model. Fixed types of the cal..50 gun are fired by an external mechanical trigger, or side plate solenoid, attached to the receiver of the weapon. Flexible types have triggers for manual firing.

60. Operating Instructions

The accidents and malfunctions described in this chapter result chiefly from mishandling by persons using the weapons. TM 9-225, TM 9–226, and FM 23-65 contain instructions for operating cal.. 50 machine guns.

Section II. PRECAUTIONARY MEASURES

61. Maintenance and Inspection

a. Practice preventive maintenance at all times. General maintenance of the cal..50 machine gun involves the mount as well as the gun itself.

b. Make frequent visual inspections for loose, cracked, or otherwise unserviceable parts.

62. Danger Points

a. Check all ammunition.

(1) Prior to release for issue and use, check ammunition for proper type and grade. Refer to TB 9-AMM 4 for all small arms ammunition grades.

(2) Before loading ammunition into the weapon, check for dirt, oil, grease, malformation, and other defects. Do not expose

ammunition to direct sun rays or other high temperatures or to prolonged submersion in water.

b. Check the bore prior to firing, to be sure that it is free of foreign matter or obstructions.

c. If an unfired round is extracted, make sure the complete round is removed from the gun before attempting to chamber the next round. To obviate *danger from hangfire,* wait 10 seconds after a misfire, then clear weapon quickly. In the event that weapon cannot be cleared quickly and barrel is hot, *danger of cook-off exists.* Keep round locked in chamber, point weapon in safe direction (for personnel and property), and allow weapon to cool (at least 5 minutes) before removing misfired round.

d. Prior to initial use, periodically during continued use, and whenever the gun barrels are changed; check and adjust head spacing of the machine gun barrel in accordance with FM 23–65 and TM 9–1225. Ascertain that barrel locking lug is properly engaged to prevent any increase in head space due to rotation of the gun barrel during normal use.

e. Do not cock the gun with the back plate removed.

f. Do not fire the cal..50 machine gun for excessively long bursts that produce red or almost red barrel heat. To avoid possibility of cartridge cook-off due to heat of gun barrel, clear weapon quickly upon cessation of fire. Live cartridges must not be retained in a hot gun chamber longer than the minimum of time required to extract.

Section III. EFFECTS AND PROBABLE CAUSES OF ACCIDENTS AND MALFUNCTIONS

63. General

The principal causes of accidents and malfunctions of cal..50 machine guns are incorrect head space adjustment, rust and corrosion of parts, cocking with back plate removed, mishandling of cartridges, and excessive heat in the barrel.

64. Typical Cases

a. Excessive Head Space. A frequent cause of malfunction in cal..50 machine guns is excessive head space. There is a series of notches (serrations) around the back end of the barrel in which a spring fits for locking the barrel into place. The spring sometimes sticks on the end of the barrel before slipping into the notches and therefore leaves too much head space. TM 9–1225 gives instructions for adjusting head space. When positioning the barrel, always check to see that the notches are actually on the spring instead of merely against its end, as in figure 32.

(1) In one reported case of malfunction due to excessive head space, the barrel had been working loose and had thus progressively lengthened the head space. Several cartridge cases that had been fired immediately preceding the accident round were ruptured; but as no separation occurred the case was extracted.

(2) Figure 33 shows six cartridge cases that were fired in the same cal..50 machine gun. The first four cases were fired with progressively lengthened head space. The ruptured case was the twenty-fourth round, and the last case was fired after the accident had occurred, but with proper head space. However, the gun may be damaged by firing with excessive head space (fig. 34).

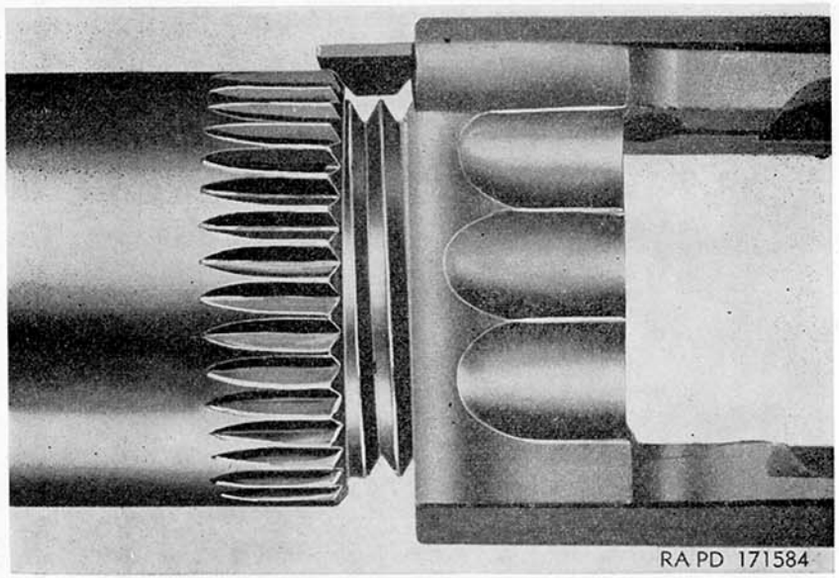

Figure 32. Cal..50 machine gun barrel engaging end of barrel locking spring.

(3) Figure 35 shows a case that was ruptured due to excess head space. The report on this malfunction stated that in adjusting head space the barrel was screwed into the extension as far as it would go and then backed off two or three clicks, without retracting the mechanism or looking to see that the barrel was screwed against the bolt.

b. Insufficient Head Space. Insufficient head space, over a period of time, will cause malfunctions. Insufficient head space results in the bolt being pushed back slightly to the rear of its normal locked position, preventing full and proper engagement of the breech lock. Figure 36 shows damage that resulted from this condition. The bolt

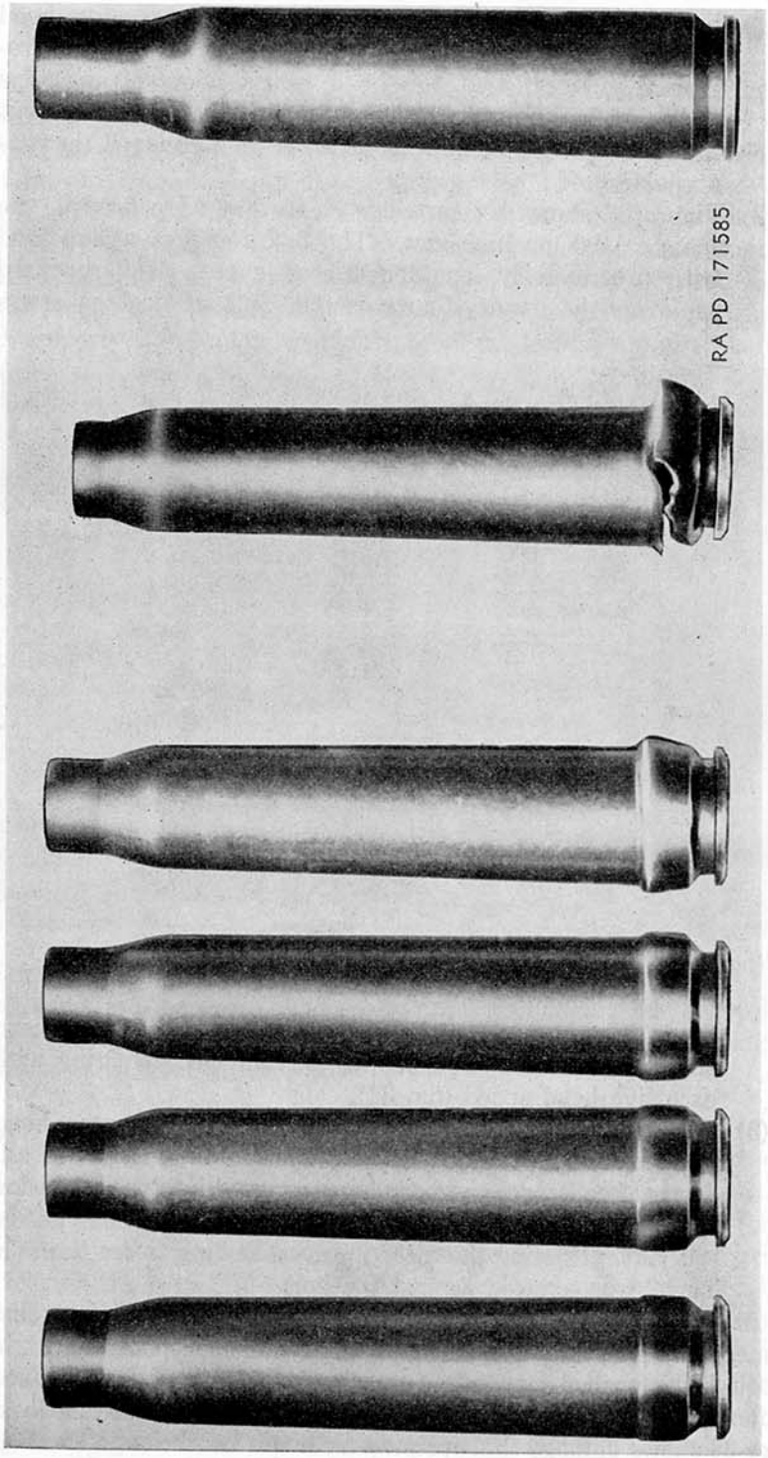

Figure 33. Cases of cal..50 machine gun fired with and without excessive head space.

overrode the breech lock and broke the breech lock cam. The receiver bulged up near the cover, and the bottom plate bulged down.

c. Rust and Corrosion. Lack of proper lubrication or preservative causes rust and corrosion to form in the moving parts of a gun or its mount and leads to operating failures. Figure 37 shows the base

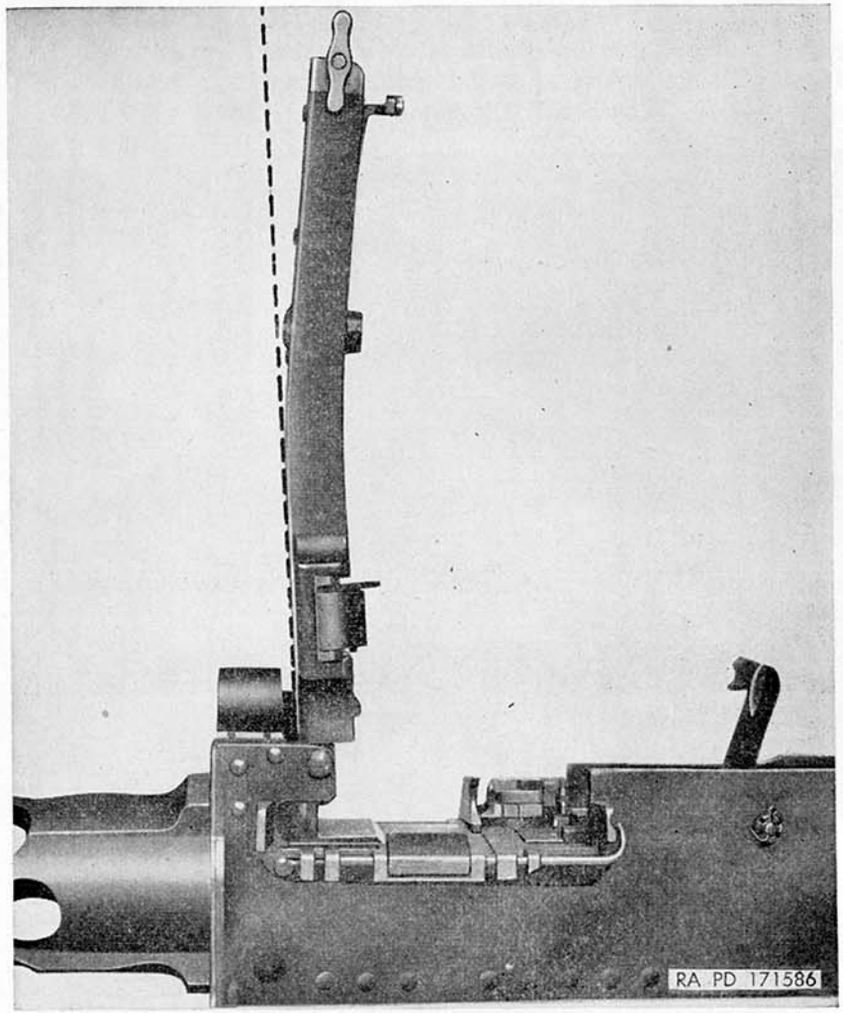

Figure 34. Cal..50 machine gun damaged by firing with excessive head space.

assembly of a cal..50 antiaircraft machine gun mount M63 that was evidently overlooked in a maintenance-in-storage reprocessing program for a large group of mounts. Conditions indicated that the base was assembled without lubricant and that after assembly someone attempted to lubricate the bearing through the grease fitting, identified by the dotted circle.

d. Cocking With Back Plate Removed. Cocking the gun against the tension of driving springs with the back plate removed from the gun

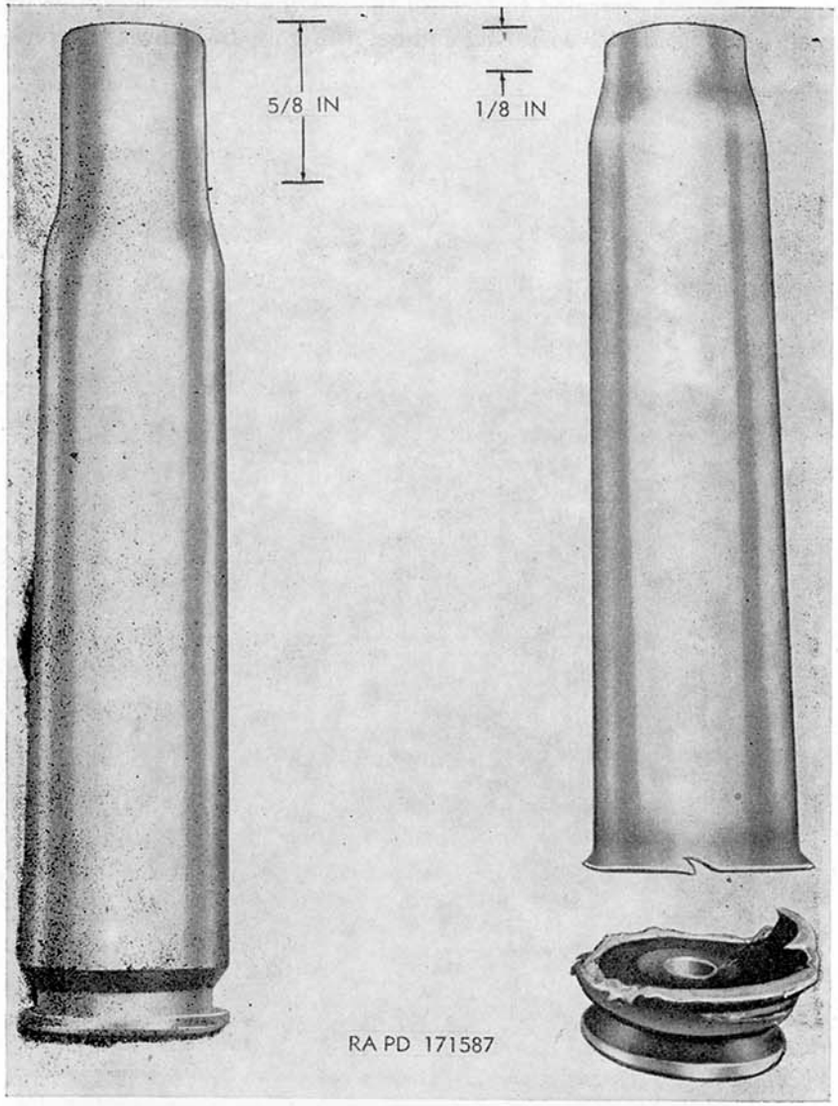

Figure 35. Cal..50 machine gun cartridge case ruptured due to excessive head space.

may result in serious injury to personnel if the retaining pin disengages from the receiver and permits the spring and rod to fly out.

e. Excessive Barrel Heat.

(1) Figure 38 shows a failure of the barrel liner due to excessive heat. The bullet has passed through the side of the barrel.

(2) Sometimes the excessive heat lowers the strength of the liner to such a degree that it crumbles and obstructs the bore, causing the bullet to jam. Figure 39 shows damage to a gun barrel resulting from long bursts fired during a ground strafing mission. The barrel ruptured at the breech end. Note that the threaded retainer and the rear end of the liner are missing.

(3) Figure 40 pictures damage after a cal..50 machine gun stoppage produced by firing bursts of more than 200 rounds. The gunner failed to notice that the bore of the barrel liner

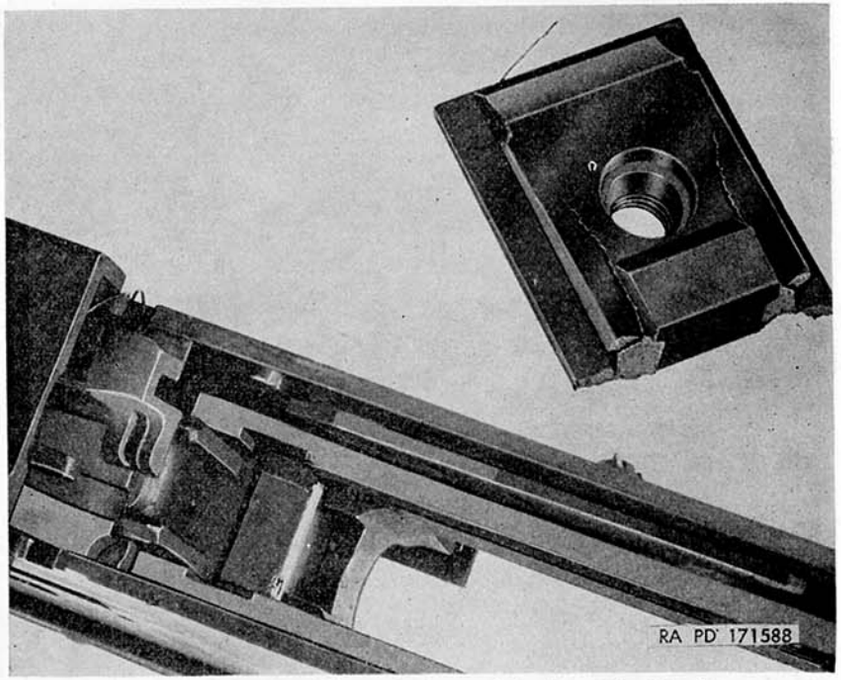

Figure 36. Cal..50 machine gun damaged by insufficient head space.

had developed deep heat cracks and severe erosion. Eventually, after continued use, the liner crumbled and moved forward with the bullet to position "A" in figure 40, obstructing the bore. The next rounds stopped at "B" and "C" in figure 40. The chamber wall ruptured and the trunnion block split. A cartridge case (E, fig. 40) with the neck cut off was removed from the chamber at the point of separation (D, fig. 40) between the liner and the retainer. It is surprising how quickly the barrel erodes when excessively long bursts approaching 200 rounds are fired. Damage comparable to that existing in this case can be developed from a new barrel in one long burst.

(4) Figures 41 and 42 show bores of liners which have eroded badly. Further firing of a machine gun with bore erosion

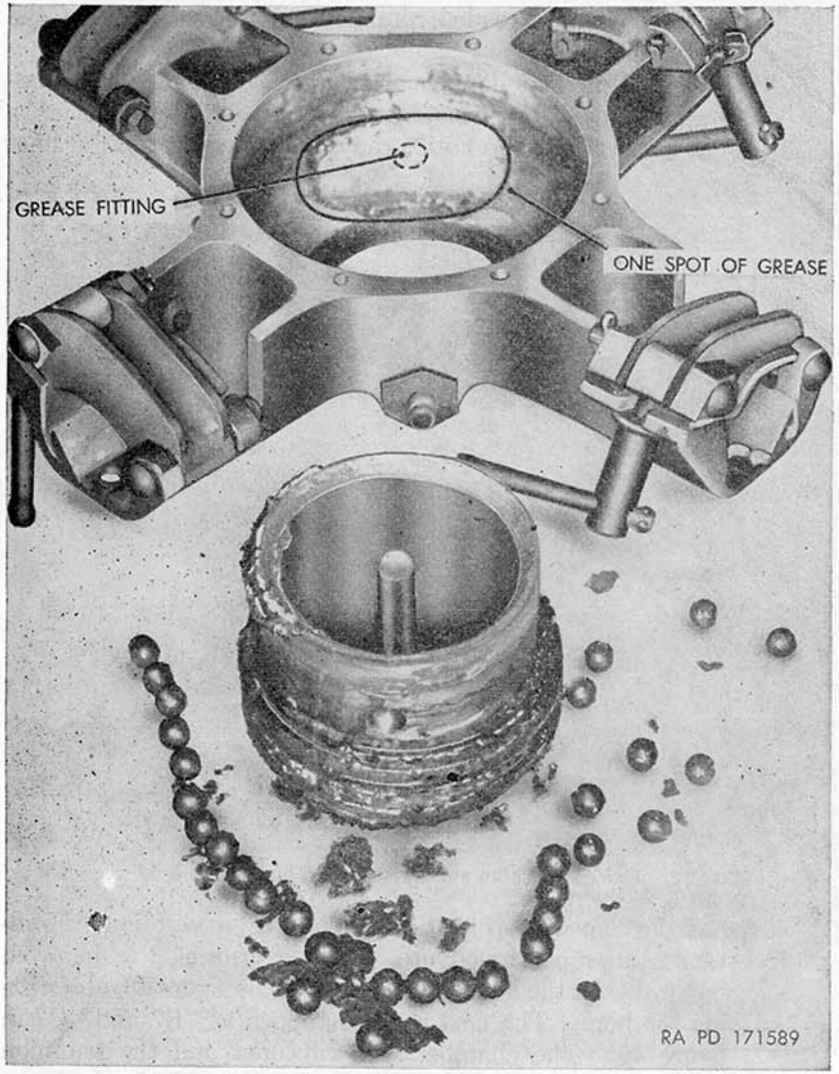

Figure 37. Disassembled base assembly of cal..50 antiaircraft machine gun mount M63.

similar to the conditions shown may rupture the liner and cause a stoppage.

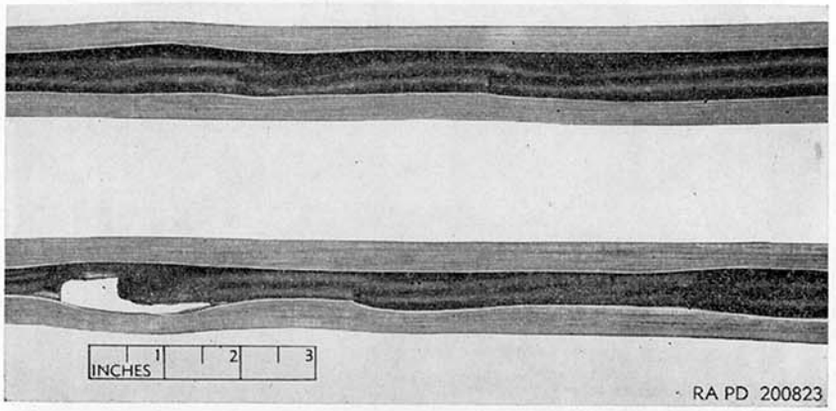

Figure 38. Barrel sections, cal..50 machine gun M3, damaged by firing when at excessive heat.

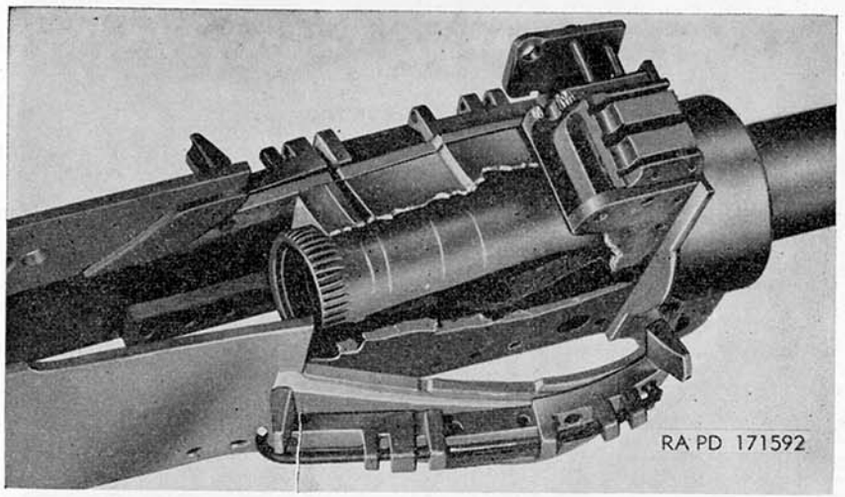

Figure 39. Barrel of cal..50 machine gun M3 damaged by bore obstruction due to excessive heat.

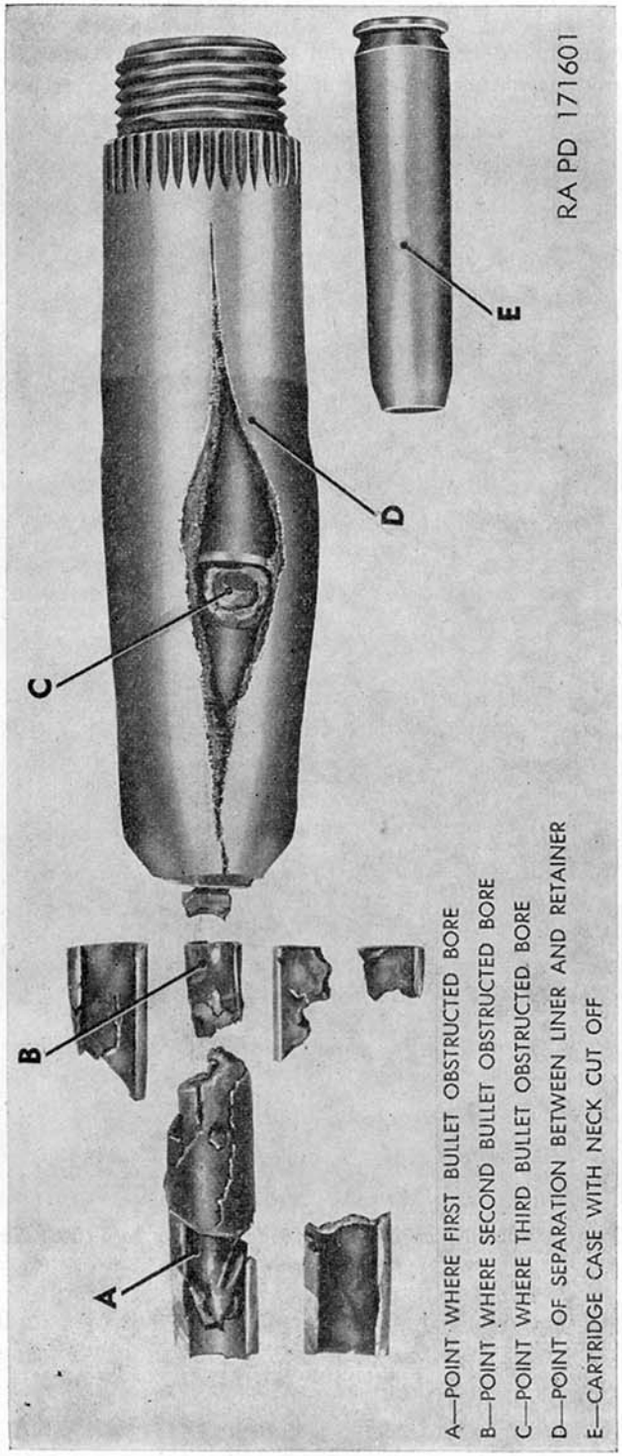

Figure 40. Breech end of barrel after excessive heat which caused bore obstruction, cal..50 machine gun.

Figure 41. Section of liner at bullet seat, cal..50 machine gun, showing heavy erosion with deep cracks.

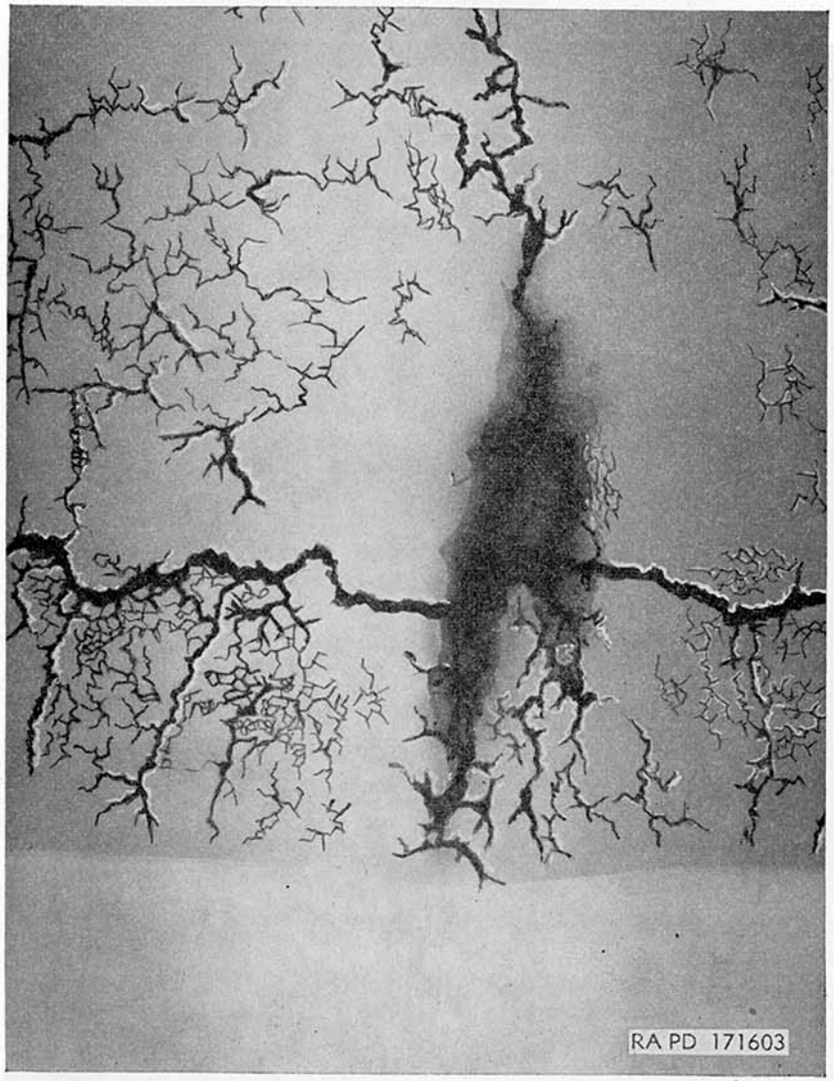

Figure 42. Severe liner rupture, cal..50 machine gun.

CHAPTER 13

ROCKET LAUNCHERS

Section I. GENERAL

65. Characteristics

Rocket launchers are used by troops chiefly to destroy armor or equipment at short ranges. The launcher is a simple type of weapon with low velocity and consequent short effective range. Since recoil forces against the launcher are not involved, it is possible to discharge large missiles from a shoulder-fired launcher. The U. S. Army currently uses 2.36-inch and 3.5-inch models. The launcher is fired by an electrical firing mechanism which ignites an electrical squib in the rocket.

66. Operating Instructions

The accidents and malfunctions described in this chapter result chiefly from mishandling by persons using the weapons. TM 9–294 and TM 9–2002 contain instructions for operating rocket launchers.

Section II. PRECAUTIONARY MEASURES

67. Maintenance and Inspection

a. Practice preventive maintenance at all times.

b. Make frequent visual inspections for loose, cracked, or otherwise unserviceable parts.

68. Danger Points

a. When loading the launcher, check to see that the rocket is properly positioned and that it is free of defects, oil, grease, and dirt. Do not expose rockets to direct sun rays or other high temperatures or to moisture.

b. Make certain that all personnel are out of range of the rearward blast.

c. Never allow any part of your body to be directly behind the launcher.

Section III. EFFECTS AND PROBABLE CAUSES OF ACCIDENTS AND MALFUNCTIONS

69. General

a. The principal causes of accidents and malfunctions of rocket launchers are defective parts or ammunition and improper positioning of a rocket in the breech of the launcher.

b. Rocket launchers have not been used sufficiently for the Ordnance Corps to acquire extensive records on malfunctions, and users of these weapons should make complete reports on all accidents so that an accident file may be built up for the protection of future users of rocket launchers.

70. Typical Cases

a. Defective Firing Mechanism. Defective firing mechanism, caused by such factors as spent magnets, loose or damaged connections, or broken parts, may cause the rocket not to fire.

b. Short Circuiting of Igniter Wire. The rocket igniter lead wire sometimes short circuits through contact with the wire breech guard. This situation has been remedied in part by manufacturing changes calling for additional insulation on the breech guard and top of the contactor latch assembly and on the igniter wire; however, operating personnel have been instructed to use tape insulation as an additional precaution.

c. Defective Ammunition. Manufacturing defects in the rocket or loosely connected contact wires will cause malfunctions in firing.

d. Improper positioning of rocket.

(1) A number of malfunctions have occurred because the 2.36-inch rocket was improperly positioned in the breech of the launcher. The most common faults in this respect are—

(*a*) Failure to enter the circular tail fin (shroud) in the tube of the launcher, allowing the fin to rest behind and against the contact latch.

(*b*) Failure to enter the shroud fully in the launcher, allowing the contact latch to contact the tail fin just forward of, but not in, the unpainted notch.

(2) Either of these conditions may cause the rocket to hang when fired, which in turn propels the launcher sharply forward and off the operator's shoulder. Malfunctions of this type have detonated the rocket and seriously injured personnel in the immediate vicinity.

CHAPTER 14

RECOILLESS RIFLES

Section I. GENERAL

71. Characteristics

The 57-mm and 75-mm rifles are single-shot, flat trajectory weapons operating on the recoilless principle. The 57-mm is a shoulder rifle, and the 75-mm rifle is fired from a machine gun tripod. Ammunition for both rifles includes high explosive, high explosive antitank, and white phosphorus. The operation of either rifle ordinarily requires a crew of two men, although in an emergency one man can operate the weapon. One man can carry the 57-mm rifle, sighting equipment, and carrying case a short distance, but two men are needed for longer distances. The 75-mm rifle, complete with tripod mount and sighting equipment, can be hand-carried by five men.

72. Operating Instructions

The accidents and malfunctions described in this chapter result chiefly from mishandling by persons using the weapons. TM 9–314, FM 23–80, and FM 23–81 contain instructions for operating 57-mm and 75-mm rifles.

Section II. PRECAUTIONARY MEASURES

73. Maintenance and Inspection

a. Practice preventive maintenance at all times.

b. Make frequent visual inspections for loose, cracked, or otherwise unserviceable parts.

74. Danger Points

a. Check all ammunition, before loading it into the rifle, for dirt, oil and grease, malformation, nicks, dents, and other defects. Do not expose ammunition to direct sun rays or other high temperatures.

b. Make certain that all personnel are out of range of the rearward blast of the cartridges.

c. Never allow any part of your body to be directly behind the recoilless rifle when opening or closing the breechblock.

d. When loading the rifle, check for and remove any foreign matter that may be in the chamber or rifle bore.

Section III. EFFECTS AND PROBABLE CAUSES OF ACCIDENTS AND MALFUNCTIONS

75. General

a. The principal causes of accidents and malfunctions of 57-mm and 75-mm rifles are defective or worn parts or exposure to breech blast.

b. Recoilless rifles have not been used sufficiently for the Ordnance Corps to acquire extensive records on malfunctions, and users of these guns should make complete reports on all accidents and malfunctions so that an accident file may be built up for the protection of future users of the weapons.

76. Typical Cases

A weak or broken firing spring, a broken firing pin, or accumulated powder fouling on the firing pin shoulder or in the firing pin recess will sometimes indent the primer of the round rather than detonate it, resulting in a misfire.

APPENDIX

REFERENCES

1. Publication Indexes

Special Regulations in the 310–20–series, SR 310–1–1, ORD 1, and FM 21–8 should be consulted frequently for latest changes or revisions of references given in this appendix and for new publications relating to materiel covered in this manual.

2. Other Publications

The following explanatory publications contain information pertinent to this materiel and associated equipment:

2.36-Inch Rocket Launchers M9, M9A1, and M18	TM 9–294
3.5-Inch Rocket Launcher M20 and M20B1	TM 9–2002
57-mm Rifles T15E13 and M18, 75-mm Rifles T21 and M20 (T25).	TM 9–314
Browning Automatic Rifle, Cal..30, M1918A2	FM 23–15
Browning Machine Gun, Caliber .30, All Types, and Ground Mounts.	TM 9–1205
Browning Machine Guns, Cal..30, M1917A1, M1919A4, and M1919A6.	FM 23–55
Browning Machine Gun, Cal..30, AN–M2, Aircraft Fixed and Flexible.	TM 9–205
Browning Machine Gun, Cal..50, AN–M2 Aircraft, Basic.	TM 9–225
Browning Machine Gun, Cal..50, HB, M2	FM 23–65
Browning Machine Gun, Cal..50, M2, All Types, and Ground Mounts.	TM 9–1225
Browning Machine Gun, Cal..50, M2, Watercooled,	TM 9–226
Caliber .22 Rifles, All Types	TM 9–280
Overhaul and Rebuild Standards for Small Arms Materiel.	TB ORD 366
Pistols and Revolvers	FM 23–35
Rifle, 57-mm, M18	FM 23–80
Rifle, 75-mm, M20	FM 23–81
Shotguns, All Types	TM 9–285

Small-Arms Ammunition: Lots and Grades	TB 9-AMM 4
Submachine Gun, Cal..45, M3 and M3A1	FM 23-41
Thompson Submachine Gun, Cal..45, M1	TM 9-215
U. S. Carbine, Cal..30, M1, M1A1, M2, and M3	FM 23-7
U. S. Rifle, Cal..30, M1	FM 23-5
U. S. Rifle, Cal..30, M1903	FM 23-10
U. S. Rifle, Cal..30, M1903A4 (Sniper's) Characteristics and Operation; Use of Telescopic Sight.	TM 9-270

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