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FM 4-155

WAR DEPARTMENT

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ANTIAIRCRAFT ARTILLERY FIELD MANUAL

SERVICE OF THE PIECE CALIBER .50 AA MACHINE GUN

4 October 1943

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(For explanation of symbols see FM 21–6.)

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ANTIAIRCRAFT ARTILLERY FIELD MANUAL

SERVICE OF THE PIECE

CALIBER .50 AA MACHINE GUN

(This manual supersedes FM 4-135, 1 June 1940, and War Department Training Circular No. 22, 1943.)

CHAPTER 1

GENERAL

■ 1. PURPOSE AND SCOPE.—This manual is intended to prescribe the duties to be performed by the personnel manning antiaircraft machine guns, and to explain the mechanical action of the gun and the workings of related matériel so that antiaircraft machine-gun equipment may be properly operated and maintained.

■ 2. REFERENCES.—Publications containing related and additional information on subjects discussed in this manual, as well as other pertinent references, are listed in the appendix. This manual should be studied in conjunction with the listed references.

CHAPTER 2

ANTIAIRCRAFT MACHINE-GUN PERSONNEL

SECTION I

ANTIAIRCRAFT MACHINE-GUN CREW

■ 3. COMPOSITION.—The antiaircraft machine-gun crew is the basic unit. The crew consists of the men necessary to properly emplace the gun, operate it, and maintain it. For the water-cooled gun, the crew may at times consist of as few as three men: the gunner, the ammunition handler, and the water chest operator. (See fig. 1.) In an emergency two or even one man may operate it. If the gun is air-cooled, only two men are necessary as there is no water chest operator. Because of the many type organizations which are provided with antiaircraft machine guns, it is not possible to prescribe a drill that covers all situations in the employment of the antiaircraft machine gun. The duties of the crew

FIGURE 1.—Machine-gun crew.

as listed herein are stated as though the crew were operating as an individual unit. The crew may be part of any AAA fire unit. The duties of the crew as listed herein are not intended to change, in any way, the drill of the firing unit of which the antiaircraft machine-gun crew is a part.

■ 4. GUNNER.—The gunner is in command of the machine-gun crew. He is responsible for the matériel under his charge and for the efficiency and safety of his crew. He supervises and assists in the service of the piece, including the emplacement of the gun. He directs and assists in the work of care and preservation of the assigned matériel. He is responsible for carrying out the specified measures for field fortification and camouflage and maintenance of camouflage discipline. He is responsible for the conduct of fire and personally fires the gun. He is also responsible that all safety precautions are observed at his weapon.

■ 5. AMMUNITION HANDLER.—The ammunition handler is responsible for the care and handling of ammunition. He assists in putting the gun and mount into or taking them out of position. He sees that all ammunition chests are full, so long as there is available ammunition. He is charged with servicing the gun with ammunition before, during, and after firing. He is responsible for the collecting of empty cartridge cases and ammunition links. He is the "second in command" and acts as gunner in the absence of the gunner.

■ 6. WATER CHEST OPERATOR.—The water chest operator is responsible for the care and handling of the water chest and water hoses. He keeps the water chest filled and changes the water when necessary. He assists in putting the gun and mount into or taking them out of position. He also assists, when needed, in the loading of ammunition belts and boxes and in the gathering of empty cartridge cases and ammunition links. In the absence of either the gunner or the ammunition handler, the water chest operator, takes over the duties of the ammunition handler. If both are absent, the water chest operator fires the gun and services it to the best of his ability.

SECTION II

DRILL OF MACHINE-GUN CREW

■ 7. GENERAL.—In all drill tables and notes on drill of the machine gun crew, the following abbreviations are used:

Gunner—G
Ammunition handler—AH
Water chest operator—WCO

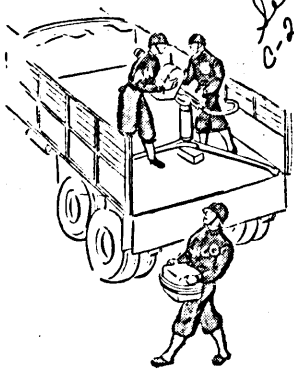
The drill as listed here is employed with the M2 water-cooled gun. Drill is conducted in silence, except for commands and reports. Commands and reports are given in a clear and positive manner. Errors are corrected instantly and on the spot. Drill is practiced until all reactions to commands are automatic, instant, and effective. The goal in drill is the achieving of the greatest precision and speed possible. Drill is conducted at the fastest pace at which the gun crew can operate smoothly. A short smart drill with meticulous correction of mistakes is always preferable to long boring drills carried out in a lackadaisical manner.

■ 8. PREPARE FOR ACTION.—Drill A is used when the M2A1 or M2 mount is used, drill B when the M3 mount is used.

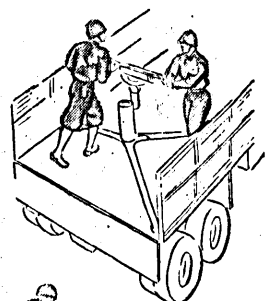
a. Drill A.—The machine gun being in firing position in its assigned truck—

G commands: PREPARE FOR ACTION, indicates the location of the emplacement, and checks to see that the gun is not loaded.

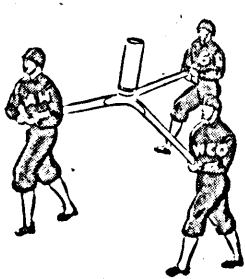
See c-2 *b. Drill B



1.—WCO and AH disconnect water hoses from gun, screw caps on hose connections of gun.
WCO coils hoses on water chest.
AH removes ammunition chest from mount, places it on floor of vehicle.
AH and G dismount gun from cradle.
WCO dismounts from truck and carries water chest and hoses to emplacement.

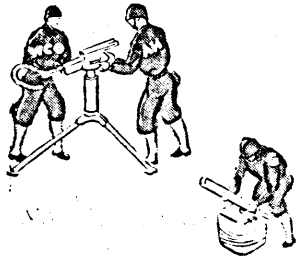


2.—WCO returns to vehicle, places ammunition chest on ground, receives gun from G and AH and places it on water chest.
G and AH lift gun cradle from pedestal and place it on truck floor towards front of vehicle.



3.—G and AH push mount to rear until WCO can take hold of one leg.
AH dismounts and takes hold of second leg.
Mount is drawn to rear until spade of third leg rests on edge of the truck.
G dismounts and takes remaining leg.
G, AH, and WCO carry mount to designated emplacement.

4.—G again mounts vehicle and moves cradle to rear of vehicle.
AH and WCO carry it to position, and mount it on pedestal.
G dismounts, takes gun from water chest and with aid of AH mounts it in cradle.



5.—WCO connects water hoses to gun.
AH connects ammunition chest.
G takes place ready to fire gun.
AH and WCO remove additional ammunition chests, water containers, link loading machine, and spare parts from truck.
Truck is moved to designated parking area.

6.—The machine gun crew in action.

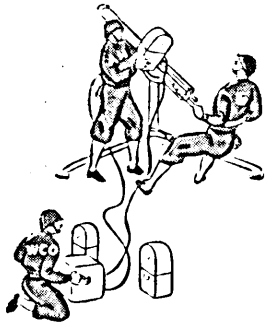


FIGURE 2.—Preparing for action.

b. Drill B (used with M3 mount).—Drill B is similar to drill A except the gun is not removed from the cradle. G unlocks the cradle lock, the cradle and gun are disconnected from the mount and placed in the forward part of the truck body. The mount is carried to the designated place as in drill A. The three crew members then return and carry the cradle and gun and mount it on the pedestal. G locks the cradle lock. During the emplacing, the azimuth motion of the gun should be locked.

9. EXAMINE EQUIPMENT.—The gun being emplaced and details at their posts—

G commands: EXAMINE EQUIPMENT, pulls machine-gun operating handle to rear, releases and presses the trigger to insure that gun will fire—examines firing pin striker for possible break or improper protrusion—checks oil buffer adjustment and insures that backplate is completely closed and latched—insures that lower recoil locking latch on lower right rear of the M2 or M2A1 mount is released—again pulls operating handle to rear and releases—checks head space adjustment—checks timing adjustment—insures that backplate buffer adjusting screw is tight—loads gun and, with operating handle, works several rounds through gun to insure proper feeding and loading—where situation permits, fires short burst at high angle, in safe field of fire, in order to test gun—unloads—makes adjustment if necessary—checks condition and alinement of antiaircraft sight (if furnished)—checks spare parts chest to see that it is complete.

AH sees that there is one ammunition chest on gun and there is another full chest conveniently close by—checks reserve ammunition and sees that ammunition belts are properly folded into chest with double link ahead (if metal links are used)—insures that belts feed freely through feed opening in chests—tests feed pawl spring and holding pawl spring by pressing with fingers—examines feed lever stud and bolt cam grooves for burs and excessive wear—sees that bolt switch is set for left hand feed—examines extractor and extractor switch for

flaws, burs, and faulty or missing springs—insures that automatic cartridge aliner is securely in place, and springs work freely—sees that metallic link chute is in proper alinement and that the link bag is attached (if metal links are being used). When all checks have been made he reports, "Ammunition in order."

WCO inspects water chest to see that it is filled and pumps water through gun—checks to see that all water plugs and hose connections are tight—checks hose for leaks and straightens out kinks. When all checks have been made he reports, "Water chest in order."

If any defects are found and reported they are corrected without delay. When defects have been corrected, a report to that effect is made.

■ 10. LOAD.

G commands: LOAD, raises the cover and unclamps the cradle.

AH opens the ammunition chest and feeds the end of the ammunition belt into the receiver until one round is beyond the belt holding pawl.

G lowers the cover and pulls the operating handle back twice.

■ 11. TARGET. Upon seeing a target any member of the crew commands: TARGET and points at the target.

G locates the target and tracks it.

■ 12. COMMENCE FIRING.

G commands: FIRE, continuously presses trigger and tracks target—if stoppages occur he clears them.

AH aids in clearing stoppages—replaces ammunition chests as required—removes, empties, and replaces link bag when necessary.

WCO continuously cranks water pump handle.

■ 13. CEASE FIRING.

G commands: CEASE FIRING—releases trigger, and continues to track target.

AH replaces ammunition chest with a full one if one on gun is not completely full—removes, empties, and replaces link bag if necessary.

WCO continues to operate water chest.

■ 14. CEASE TRACKING.

G commands: CEASE FIRING—releases trigger and ceases to track target—clamps cradle and unloads gun.

AH helps unload gun—replaces belt in chest, closes top of chest, and replaces chest if necessary—removes link bag, empties links into a suitable container, and replaces link bag.

WCO continues to crank handle of water chest for about 20 full turns—fills water chest if necessary.

G, AH, and WCO load ammunition belts and chests if the situation permits.

■ 15. REST.

G commands: REST, carries out instructions as to air guards, manning details, reliefs, gas discipline, camouflage, and internal security. He makes sure that full advantage is taken of the opportunity by the crew to improve position, prepare ammunition, and make tests and adjustments. The crew should be given a chance to relax and rest, but the command REST does not mean loaf.

AH and WCO carry out instructions of gunner.

■ 16. MARCH ORDER.—*a. Drill A.*—The machine gun being in firing position in its emplacement—

G commands: MARCH ORDER, orders truck moved from parking area to a point as close to gun as possible—checks to see that gun is not loaded.

AH and WCO disconnect water hoses from gun and screw caps on hose connections of gun.

WCO coils water hoses on water chest.

AH removes ammunition chest from mount.

G and AH dismantle gun from cradle—place gun on water chest—lift cradle from pedestal, carry it to vehicle, and place on truck.

G mounts truck—moves cradle to forward part of truck body—dismounts.
G, AH, and WCO each takes one leg of mount and carry to truck.
G rests spade of leg he is carrying on edge of truck—mounts truck—takes hold of leg resting on truck.
G, AH, and WCO move mount to its traveling position in truck body.
AH mounts truck.
G and AH mount cradle on pedestal.
WCO takes gun from water chest and carries to truck.
G and AH take gun from WCO and mount gun in cradle.
WCO carries ammunition box from emplacement to truck.
AH takes ammunition box from WCO and hangs it on mount—dismounts.
G takes position ready to fire.
AH and WCO carry water chest, ammunition boxes, water containers, and spare parts to truck—mount truck—connect hoses to gun and take places ready to travel.

The drill is similar to the emplacement drill except that it is in reverse.

b. Drill B (used with M3 mount).—Drill B is similar to drill A except that the gun is not removed from the cradle. G unlocks the cradle lock, the cradle and gun are disconnected from the mount and carried to the truck by G, AH, and WCO where it is placed in the forward part of the truck body. The three crew members then return and carry the mount to the truck as in drill A, and mount the cradle and gun on the pedestal. G locks the cradle lock and the drill is completed as in drill A.

■ 17. UNLOADING GUN.—The procedure in unloading the gun is to raise the cover, remove the ammunition belt, and retract the bolt. Make a visual inspection of the feedway, T-slot, and chamber to insure that the gun is unloaded.

■ 18. ALTERNATE METHOD OF EMPLACING.—When there are as many as six men available to help in the emplacing of the machine gun it is desirable that the gun and mount be

removed from its vehicle as a unit. This is easily done with the M2, M2A1, and M3 mounts by having two men lift each leg of the tripod and set the mount and gun in position. (See fig. 3.) The gun may easily be returned to a traveling position in the vehicle in the same manner when MARCH ORDER has been given. By using this method of emplacing the machine gun, the gun is out of action for only a matter of seconds and there is a minimum loss of machine-gun protection. This method of emplacing the gun or placing it on its vehicle should be used whenever there are sufficient men, even if men other than those assigned to the machine-gun crew are utilized.

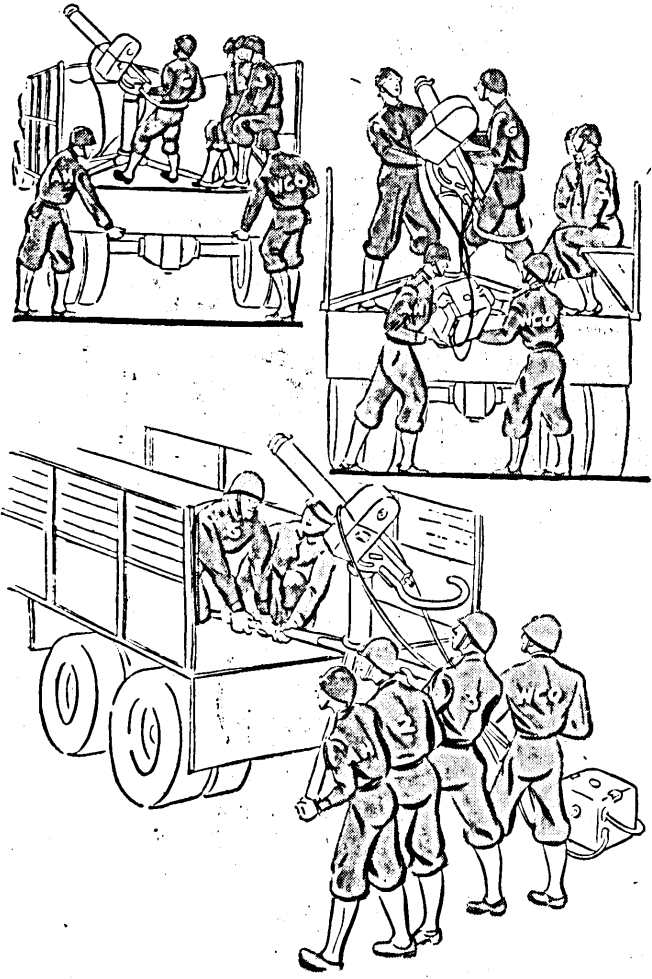


FIGURE 3.—Alternate method of emplacing.

■ 19. ACTION ON THE MARCH.—Drill and fire action on the march are conducted in the same manner and by the same commands. When there is possibility of hostile air action during a march, the gun is manned continuously, and the crew keep a careful watch for enemy aircraft. (See fig. 4.) At the command, TARGET, by any member of the crew or by any other person traveling in the column, the gunner directs the driver to stop his truck or take such other action as may be necessary. Before the march is begun each crew member is assigned a sector which he is to watch.

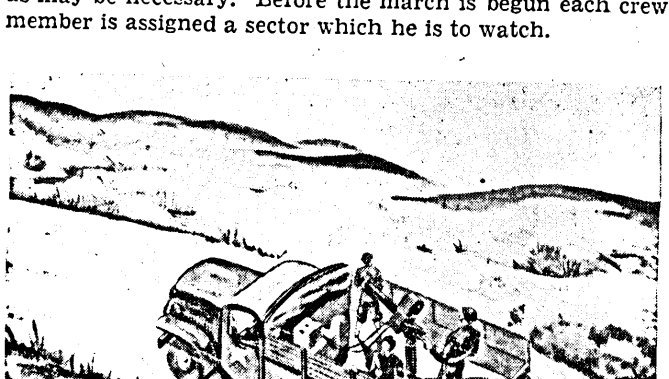


FIGURE 4.—Action on the march.

*■ 20. PREPARATION OF POSITION.—The preparation of position is discussed in FM 4-102. The selected position must have the maximum possible concealment. The personnel, weapons, and equipment must have the maximum possible protection consistent with the efficient employment of the matériel. Personnel are never needlessly exposed. The amount of protection and concealment largely depends upon the terrain and the time available.

■ 21. CHANGES OF POSITION.—Machine-gun units are often compelled to make frequent and rapid changes of position. All machine-gun units must be trained to perform all duties connected with emplacement, march order, and preparing to open fire with the greatest possible speed. Drills in competition with other squads or against time are valuable in attaining the required speed.

■ 22. VERSATILITY OF PERSONNEL.—Each man must know his exact duties under all possible conditions and in all possible situations. Drill should be held under simulated combat conditions, and as much realism as possible should be injected into the drill. The knowledge of the complete drill by each man must be insisted upon so that the operation of the gun may be carried on so long as there is one man to operate it. It is important that not only the men assigned to the machine gun but also all other men of the organization know the weapon and how to man it.

SECTION III

SELECTION OF PERSONNEL

■ 23. DESIRABLE CHARACTERISTICS.—The men of the antiaircraft machine-gun crew, and particularly the gunner, must be carefully selected. However, as all members of the crew must, of necessity, act as gunners in the absence or disablement of the gunner, all should be chosen with that thought in mind. A machine gunner must be mentally alert and have good vision. In addition, he must have considerable agility and strength and must be particularly well coordinated. He must be intelligent so that he understands the necessity for and the determination of proper leads. He must possess eye-hand-mind coordination so that he can manipulate the mount while viewing the target and determining the proper lead. He must be a good gun mechanic so that he may maintain the gun and mount properly. A mediocre marksman who maintains his gun properly is obviously better than a good marksman who cannot keep his gun operating. He must be able to think and act calmly and retain all his

faculties when exposed to the noise, shock, and excitement of firing.

■ 24. FIRING TESTS.—No man should be chosen as a machine gunner until he has been given firing tests. During firing tests, the reaction of the individual to the shock and sound of gunfire should be noted. His ability to manipulate the mount and point the gun smoothly and accurately should be observed. His ability to quickly "pick up" the target, track it, estimate a lead, and fire on it must be considered. His immediate reaction to failures or stoppages should be noted.

■ 25. QUALIFIED PERSONNEL ONLY.—The care and time spent on the selection of gunners pay dividends in combat. Merely because the machine-gun crew is part of a larger firing unit, it must not be considered of secondary importance. The selection of the best qualified men as machine gunners is of primary importance. Men must not be assigned as machine gunners because they do not qualify for any other duty.

SECTION IV

TRAINING OF PERSONNEL

■ 26. PHASES OF TRAINING.—The training of personnel is divided into two phases: Preliminary training and firing. As many men as possible should receive the training so that the maximum number of men qualify as machine gunners. The personnel that prove most apt must be given particular attention and should be assigned to the machine-gun crews.

■ 27. PRELIMINARY TRAINING.—During the preliminary training phase, all personnel should be trained thoroughly. They are taught the uses of the weapon, its general characteristics, and how it operates. They receive intensive practical training in adjustments and trouble shooting. Some of this training should be done in the dark and under actual or simulated field conditions. During this training, they are taught to care for and maintain their gun properly. Film strips and training films are valuable aids to training.

28. TRAINING SCHEDULE.—The preliminary phase of training should follow an orderly schedule and should thoroughly prepare the prospective gunner for the actual firings that are to follow. As much time as is necessary should be spent on each subject to insure that every man completely understands it. The men must be impressed during this period with the fact that no man is a satisfactory gunner unless he can properly maintain the matériel and keep it in firing condition. The following is a suggested sequence of *preliminary training:*

I. *Introduction.*—General characteristics and specifications of the machine gun, caliber .50, M2, its uses, and its importance as a military weapon.

II. *General description.*—A general description of the gun and the six main groups.

III. *General functioning.*—A brief description of the complete cycle of operation of the gun.

IV. *Functions and details.*—A. Detailed description of the gun by groups and parts.

B. Function of each group and part in the operation of the gun.

V. *Detailed functioning.*—A. A detailed description of the complete cycle of operation of the gun, step by step, covering firing, recoiling, counterrecoiling, cocking, automatic firing, feeding, and extracting and ejecting.

VI. *Disassembly and assembly.*—A detailed stripping and assembly of the gun. This should be as practical as possible. Every prospective gunner should be able to disassemble and assemble the gun under all possible conditions before this stage of training is considered complete. The change of feed from left to right or right to left should be taught at this time.

VII. *Adjustments.*—A. *Head space adjustment.*—This adjustment must be taught practically so that each man is certain how to make the adjustment with and without the use of the head space gage.

B. *Timing.*—Each man must know how to use the timing gage.

C. *Packing.*—All men should be required to pack the front and rear packing glands.

D. *Rate of fire.*—Each man must be taught how to adjust the rate of fire and to understand the functioning of the oil buffer tube.

VIII. *Stoppages.*—This training must be practical and include the degrees or positions of stoppages, the causes of stoppages, immediate action to correct stoppages, and the maintenance or precautions necessary to prevent stoppages.

IX. *Care and cleaning.*—A. Importance and proper method of keeping the gun clean and lubricated.

B. Points to be observed before, during, and after firing.

X. *Antiaircraft machine-gun mounts.*—A. Types and uses of antiaircraft machine-gun mounts.

B. Physical make-up, disassembly, and assembly of the type mount to be used.

C. Care and maintenance of the mount.

D. Adjustment of the recoil and side plate trigger mechanisms and the importance thereof.

XI. *Ammunition.*—A. Types of antiaircraft machine-gun ammunition and their uses.

B. Care, handling, preservation, and storage of ammunition.

C. Importance of the careful inspection of ammunition, ammunition links, and/or ammunition belts.

D. Operation of the link loading machine and/or belt loading machine.

XII. *Water chest and water hoses.*—A. Operation of the water chest and its physical make-up.

B. Care and preservation of chest and hoses.

XIII. *Spare parts and accessories.*—A. Importance of and the need for a complete supply of the necessary parts and accessories.

B. Uses of the tools.

XIV. *Manipulation of the gun and mount.*—Practical training in the handling of the gun and mount until proficiency is developed in the tracking of all possible types of targets under all possible firing conditions.

29. MANIPULATION OF WEAPON.—The ability to fire a machine gun effectively is directly dependent on hand-eye coordination. Practice alone will develop this. The machine

gunners must develop a "feel" of their weapons to get on targets and lead them smoothly and accurately just as a tennis player places his shots without looking at his racket. In order to develop this skill, moving targets must be tracked frequently. Airplanes, birds, and moving ground vehicles should be utilized as tracking targets. For training methods, see FM 4-151.

■ 30. FIRING.—For antiaircraft machine-gun training, there is no substitute for firing. When the preliminary phase of training is complete, actual firing is begun. However, because of the limited amounts of ammunition available for training, it is sometimes necessary to simulate firing or to substitute the firing of a .30 caliber machine gun. At the present time, the only adequate training device for machine gunners is the antiaircraft machine-gun trainer M9.

■ 31. .30 CALIBER FIRING.—The .30 caliber machine gun is extremely valuable in the training of antiaircraft gunners. Usually, the earlier firing is done with this weapon; however, training that includes only firing with the .30 caliber gun is incomplete. This is due to the difference in operation, ballistics, and tracer appearance between the two guns. The greatest difference is caused by using the .30 caliber gun on a .50 caliber mount. The present .50 caliber mounts are shock absorbing. The .50 caliber gun recoils and a stationary side plate trigger is used. These mounts when used for the .30 caliber gun serve only as supports. The recoil mechanism is inoperative and the side plate mechanism is not used. The caliber .30 gun must be fired by use of the pistol type trigger, with the right hand, instead of using the side plate trigger located at hip height on the left side of the back rest bracket. When using the .30 caliber gun on a .50 caliber mount, a standard counterweight adapter cradle is used.

■ 32. FAULTY TRAINING METHODS.—Static firing and firing service ammunition on miniature ranges must not be used as training methods. Not only is it a waste of costly and scarce ammunition, but it is valueless, if not harmful, to the antiaircraft machine gunner. Likewise, AA firing without use of tracers (except at balloons) is obviously wasteful and useless for training; errors cannot be seen and corrected, and

although a few hits may be obtained, the gunner never knows at what time and with what lead these hits were obtained.

■ 33. SEQUENCE OF FIRING TRAINING.—The firing phase of training must follow an orderly sequence as did the preliminary phase. The training should progress according to the target used. The usual order of progression for machine gunner training follows:

a. Antiaircraft machine gun trainer M9.
b. Free balloons.
c. Tower sleeve or flag targets.
d. Radio controlled airplane targets.
e. Rocket targets.
f. Antimechanized targets.

■ 34. AA MACHINE GUN TRAINER M9.—*a. Purpose.*—The AA machine gun trainer M9 is a training device which gives extensive and practical training prior to actual firing.

b. Description.—The trainer has the external appearance of a caliber .50 machine gun, water-cooled. It fires plastic pellets, white for daylight and red for nighttime. In order to see the red pellets in the dark they must be illuminated by ultraviolet light which makes them fluorescent. The gun is operated by compressed air. A scale model airplane is moved across a screen to simulate various courses. Sound

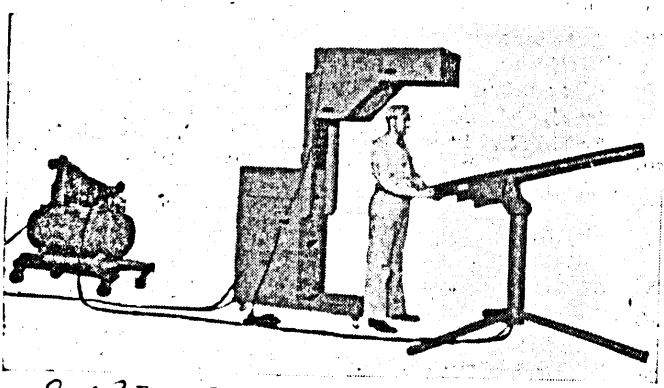


FIGURE 5.—AA machine-gun trainer M9.

effects are furnished to reproduce the firing noise of the machine gun and battle sounds. An electrical vibrating machine causes the backplate to vibrate in the same manner as a firing machine gun. (See fig. 5.) The range to the model is 50 feet. At this range, the target, time of flight, and trajectory are all proportionate to a scale 30 to 1 (simulated range=500 yds).

c. Use.—Training groups are kept small. The trainer requires three men: the machine gunner, the operator of the target towing mechanism, and the operator of the sound effects. As it is impossible to give instruction during the firing because of sound effects, the instructor gives necessary instructions before firing begins and at suitable intervals between courses. Instruction should emphasize that the leads taken with the trainer are the same as with the actual machine gun. However, the greater relative brilliance of the tracers may give the gunners a false impression that trainer leads appear smaller. Gunners should not sight along the barrel. Instead the eyes should be concentrated on the model plane and the tracer stream near it. Gunners must practice individual tracer control on the trainer just as they would when firing the machine gun. Gunners should wear a pair of glasses, one glass of which is opaqued or covered. In this manner depth preception, which is considerable at the short ranges involved, is made to more closely approximate the true conditions. The trainer develops hand-eye coordination so that the gunner instinctively traverses and elevates (or depresses) the gun smoothly and accurately in tracking. It also demonstrates the necessity of adequate opening leads since the gunner quickly discovers that it is much easier to drop back on the target than to catch up. The target rate can be varied at will, simulating actual target speeds. By changing the relative positions of the target and trainer a great variety of courses are possible. By changing the target support wire, the target can be made to dive at any desired angle.

d. Advanced training.—Those men who show the greatest promise in preliminary phase of training on the trainer M9 should be given more advanced training. More complex courses under difficult conditions are simulated. Casualty

drills (see par. 47) and operation with gas masks should be given as part of the training. The variety of courses should be increased and mixed up. Night as well as day practice should be given. As much realism as possible should be injected in the advanced training.

e. Records.—During the training period on the trainer M9, records should be kept on the performance of each man. The purpose of these records is to determine the relative ability of each man. Type of course, number of courses, hits, and remarks are generally sufficient.

■ 35. FIRING AT BALLOONS.—Free balloons are an excellent preliminary training target. When released in a wind, they permit firing at a moving aerial target. Firing at balloons gives only limited training in manipulation of the mount but serves to give the gunner a chance to observe the normal trajectory and time of flight. Hits are immediately apparent and adjustment is possible. It must be remembered that balloons have value only as a preliminary training target. A minimum of time and ammunition should be spent on balloon firings.

■ 36. TOWED TARGETS.—Towed sleeve or flag targets fulfill the requirements of an intermediate training target to a great extent. They are limited somewhat in speed and because of safety reasons all combat type courses cannot be flown. Despite the limitations, firing at towed targets is of great value, and all gunners should have ample opportunity for this type of firing. When it is necessary for several gunners to fire at one target, bullets dipped in specially prepared printer's inks of different color should be used. Hits obtained on the target by each gunner may be identified by the color. (See sec. IV, ch. 5.)

■ 37. RADIO CONTROLLED AIRPLANES.—Radio controlled airplane targets may be compared with towed targets, in that they offer approximately the same training opportunities and are limited somewhat in speed. On the other hand, they are maneuverable, independent of airplane safety considerations, and instantly controlled as desired. Practice on any type of course, including diving courses, is possible, and

hits on a vulnerable part of the plane are apparent. This type of target is excellent for intermediate training.

■ 38. ROCKET TARGETS.—The rocket target, at the present time, most closely fulfills the requirements for a machine-gun antiaircraft target. It is the only target that approaches service speeds. Courses are limited little by safety regulations, but the small size of the rocket and its curved course of flight somewhat limit its training value. The experience of firing on a target of this speed is invariably shocking and enlightening to gunners trained on slow targets. In fact, actual discouragement may be expected in the early stages of this phase of training. Generally, rockets are used for advanced training and the ammunition of untrained gunners is not wasted on this high speed target.

■ 39. ANTIMECHANIZED TARGETS.—Firings are conducted at antimechanized targets. Targets may be improvised by mounting a tank silhouette on wheels and towing it with a fast-moving vehicle. Trained antiaircraft machine gunners should experience no difficulty in developing firing skill against this type of target; however, the training should not be treated lightly as it is often of primary importance in the combat zone.

■ 40. SPACING OF GUNS.—Machine guns are spaced at a considerable distance from one another so that gunners firing on the same course may readily identify their tracer trajectory. To obtain full benefit from firing at a towed target, a radio controlled airplane or a rocket, guns on a firing line are spaced at least 200 yards apart.

■ 41. GUN POINTING.—Accuracy of machine-gun firing is dependent primarily on the ability of the gunner to aim the barrel of the gun the correct distance ahead of the nose of the target along its direction of flight. This correct distance, which changes constantly throughout the course of the target, is lead, or the distance that the target will travel during the time of flight of the projectile. A complete discussion of the computation and use of leads may be found in FM 4-110 and 4-151.

■ 42. OBSERVATION OF FIRE.—When firing at aerial targets, using ball ammunition alone, there is no way to determine where the shots are going. This difficulty is partially solved by using a certain percentage, normally 20 percent, of tracer ammunition. The bullet trajectory can be readily observed, but its position with relation to the target is still difficult to determine. This latter difficulty is of vital importance, for the high speed and maneuverability of machine-gun targets have, up to the present time, made accurate data computation impracticable. Effective fire is dependent on fire adjustment based on observation of tracers.

■ 43. INDIVIDUAL TRACER CONTROL.—Individual tracer control is a method of fire control in which each gunner observes the tracer trajectory of his own gun and makes the necessary corrections in pointing to bring his fire on to the target and keep it there. (See FM 4-110 and FM 4-151.)

■ 44. USE OF GLASSES.—The gunner's ability to observe tracers may be increased by having him use red eyeglasses or goggles. Under certain conditions of light, amber or neutral colored glasses may help but red is usually the best. Red glasses are particularly useful against a very bright sky or green vegetation.

■ 45. COACHING.—During instructional firing, it is necessary to have instructors or experienced gunners coach the trainee. The coach endeavors to describe the true relationship of the tracer to the target. The language used to describe the relationship of the tracer to the target must be standardized to prevent confusion and misunderstanding. The following terms are used:

Ahead—The tracer passes to the front of the target along its course of travel.

Astern—The tracer passes to the rear of the target along its course of travel.

Right—The tracer passes to the right of the target on an incoming course only.

Left—The tracer passes to the left of the target on an incoming course only.

High—The tracer passes the target above the line of sight.

Low—The tracer passes the target below the line of sight.

Hit—The bullet passes through the target.

Tracers that pass ahead and astern of the target are the result of an incorrect lead and are more difficult to sense. Shots that pass high, low, right, or left are usually more apparent.

■ 46. REALISTIC TRAINING.—Surprise attacks at very low altitudes and extremely short ranges, and diving attacks can be expected during combat. Every opportunity must be taken therefore to train the gunners for these attacks. The requirements of safety normally prevent firing at towed targets on these type courses. Radio controlled airplanes and rocket targets can be utilized for this training. Firing should be simulated at high speed, low-flying, and diving airplanes. When sufficient flying missions are available, special missions can be allotted during which these courses are flown. When flying missions are limited, a few courses of this type can be flown before the target is let out on a towing mission or after the target has been dropped and the towing mission complete. Care must be taken that no live ammunition is near the gun, and that the gun is unloaded when tracking the airplane.

■ 47. CASUALTY DRILLS.—Drills should be held in which casualties are simulated. When one man has been declared a casualty, his place must be promptly filled. Drills should also be conducted in which casualties are not replaced and the crew operates shorthanded. Drills are conducted frequently so that casualties cause a minimum loss of time and a minimum amount of confusion.

■ 48. AIRCRAFT RECOGNITION.—*a.* Every member of the machine-gun crew must be capable of recognizing the various aircraft. High-speed airplanes operating at low altitudes are in the field of fire for seconds only. Recognition must be instantaneous, otherwise the airplane is gone before it can be engaged. An airplane must be recognized as a unit

(that is, by its "total form") *not* by analyzing or by the use of individual characteristics. (See FM 30-30.) Recognition training depends upon proper instruction and continuous practice.

b. A number of training aids are available to assist in instruction. There are training films, film strips, and film slides (see FM 21-7). Scale models of airplanes, posters, clippings from papers and magazines, all can be worked into the instruction. Since the majority of targets engaged by machine guns are head on, this view should be stressed in studying the various airplanes from different angles of aspect. The actual airplane both on the ground and in the air must be studied.

c. The goal is to enable every man to instinctively recognize airplanes the instant he sees them.

SECTION V

SAFETY PRECAUTIONS

See C. 2

*■ 49. SAFETY PRECAUTIONS.—*a.* Safety precautions to be observed in training are prescribed in AR 750-10 and FM 4-118. The principles indicated should be applied under combat conditions where circumstances permit.

b. The following precautions are prescribed in training for the safety of towing airplanes or personnel on the firing line:

(1) At the command CEASE FIRING, the ammunition handler hits the gunner smartly on the back or hand. In some cases it may be necessary to physically remove the gunner's hand from the trigger.

(2) No live ammunition is allowed near the emplacements except when firing is to take place.

(3) The covers on all machine guns are partially raised and the guns unloaded except when the guns are firing or are about to fire.

(4) When tracking a target, the gunner does not touch the trigger until his sights are alined with the target and the field of fire has been indicated as safe.

(5) At the beginning of courses, machine guns must be kept depressed considerably below the elevation of the towing airplane until it has cleared the line of sight.

(6) While a stoppage is being cleared, the machine gun is pointed at a safe part of the field of fire. This requirement does not prevent continued tracking of the target so long as the field of fire is safe.

(7) Men are trained always to pass in rear of the gun in going from one side to the other.

2* (8) If malfunctioning of the gun causes it to fire continuously while the trigger is not being pressed, the firing can be halted by grasping the ammunition belt and twisting it with force so that the rounds cannot enter the feedway, or by pulling and holding the belt to the rear.

(9) *During training firing* where guns are arranged to simulate combat positions, extreme care must be taken to observe every possible precaution against accident to personnel. The measures taken include the use of machine-gun pits, sandbags, and minimum elevation stops for the machine guns.

(10) In all cases where aerial targets are towed over or close to the gun positions at low altitudes, provision must be made for the safety of personnel against a *dragging towline cable.* The cable may drag if the target is accidentally released or when the last target is dropped.

2* (11) On a misfire, always wait 10 seconds before raising the cover to avoid the possibility of a delayed explosion taking place after the cartridge has been removed from the chamber.

2* (12) Before dismounting guns or before any man is permitted to pass in front of the firing line, clearance must be given by an officer who passes a ramrod down the barrel to insure that there is no round in the chamber.

CHAPTER 3

BROWNING MACHINE GUN, CALIBER .50, M2

SECTION I

CHARACTERISTICS AND DATA

■ 50. GENERAL.—The basic antiaircraft machine gun is the Browning machine gun, caliber .50, M2, water-cooled. There is another type of antiaircraft machine gun, the machine gun, caliber .50, M2, heavy barrel. The guns are basically the same and for that reason only the caliber .50, M2, water-cooled gun is discussed fully in this manual. The uses of the other gun as well as the differences between the two types, are discussed in section V of this chapter.

■ 51. CHARACTERISTICS OF THE GUN.—*a.* The Browning machine gun, caliber .50, M2, water-cooled, is a highly efficient automatic weapon built to precision standards. In order to properly maintain and adjust the gun, it is essential that its mechanical action be thoroughly understood. It is an alternate feed gun and as such may be fed from either the right or left side. Manual cocking and loading of the gun is necessary before it is ready to function automatically. It is fired by a mechanical accessory or by a manual trigger and trigger bar. While firing, all mechanical action is automatically performed by the gun itself. Some of the general characteristics of the gun are:

Weight of gun (with water).	121.5 pounds.
Weight of gun (without water).	100.5 pounds.
Weight of bullet	750 grains (1.71 ounces).
Weight of powder charge.	200 grains (0.46 ounce).
Weight of cartridge	4.20 ounces.

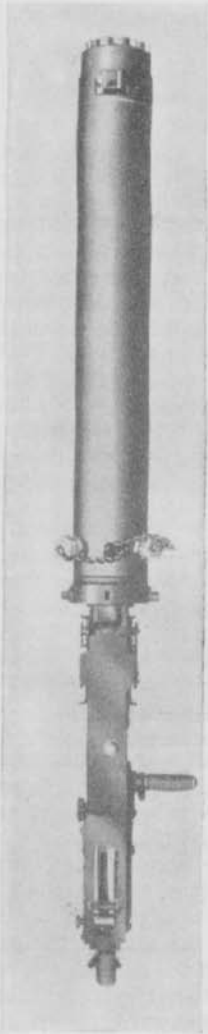
Weight of 100 cartridges in metallic links.	30.25 pounds.
Weight of barrel	16 pounds.
Length of barrel	45 inches.
Number of lands	8.
Twist, right-hand	1 turn in 15 inches.
Over-all length	65.93 inches.
Muzzle velocity	2,900 feet per second (approximate) with M2 ammunition. 2,800 feet per second (approximate) with M1 ammunition.
Rate of fire	600 rounds per minute (approximate).
Maximum range	7,500 yards (4.25 miles) (approximate).

b. The general appearance of this gun may be noted in figure 6, which shows top and side views of the water-cooled gun.

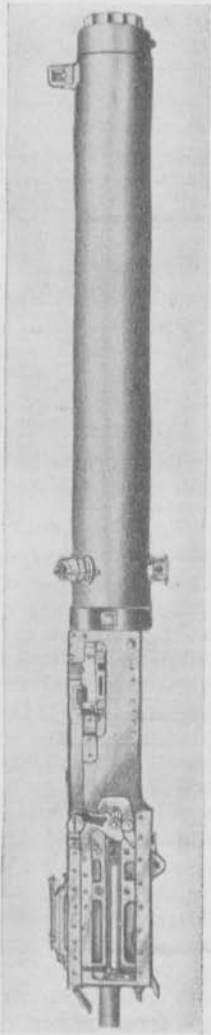
SECTION II

GENERAL OPERATION

52. GENERAL OPERATION.—Although the .50 caliber antiaircraft machine gun is an automatic weapon, it is necessary to manually "cock" it to start the operating sequence. Assume that the gun is cocked, and that the first cartridge is in its firing position in the chamber in the rear portion of the gun barrel. When the cartridge is fired, the burning powder exerts a tremendous pressure. This pressure reaches 50,000 pounds per square inch which means that a driving force of 5 tons pushes the bullet out of the barrel. This same force tries to drive the cartridge case out of the chamber toward the rear. Such action, however, is prevented by the bolt which is positively locked against the rear of the cartridge case at the instant of firing. When the cartridge is fired the force of recoil carries the barrel, barrel extension, and bolt (known as the recoiling portion) backward a short distance. This motion unlocks the bolt from the barrel and barrel



① Top view.



② Side view.

FIGURE 6.—Caliber .50, M2, water-cooled gun.

extension. The bolt continues to move toward the rear against a spring (which a moment later serves to drive the bolt forward). The empty case is withdrawn by the bolt from the barrel chamber and the next cartridge is extracted from the supply belt. The rearward motion of the bolt is checked and as the spring drives it forward the empty case is ejected and the next cartridge is moved into the barrel chamber. The oil buffer checks the short, rearward motion of the barrel and barrel extension. The compressed oil buffer spring now pushes the barrel and barrel extension forward. This motion locks the bolt to the barrel. The last forward motion of the bolt and barrel causes the firing pin to strike the cartridge, if the sear is released. This cycle continues as long as trigger action is maintained and as long as ammunition is supplied. For a detailed description of the mechanical cycle, see section IV of this chapter.

SECTION III

NOMENCLATURE, DISASSEMBLY AND ASSEMBLY

■ 53. GROUPS.—*a.* For convenience in instruction in the nomenclature, operation, and care and maintenance of the .50 caliber machine gun, the gun is divided into six main groups or assemblies:

(1) Casing group.
(2) Backplate group.
(3) Bolt group.
(4) Oil buffer group.
(5) Barrel extension group.
(6) Cover group.

b. Each group is composed of a number of components or parts which function together and is usually assembled or disassembled as a unit.

■ 54. GENERAL.—*a.* The disassembling, assembling, and adjusting of the machine gun are duties which are performed daily during the care and maintenance of the gun.

b. Removal of groups from the gun, or field stripping, is the disassembling of the machine gun into its several part groups (see fig. 8). The various part groups may be similarly

FIGURE 7.—Cutaway view of the gun.

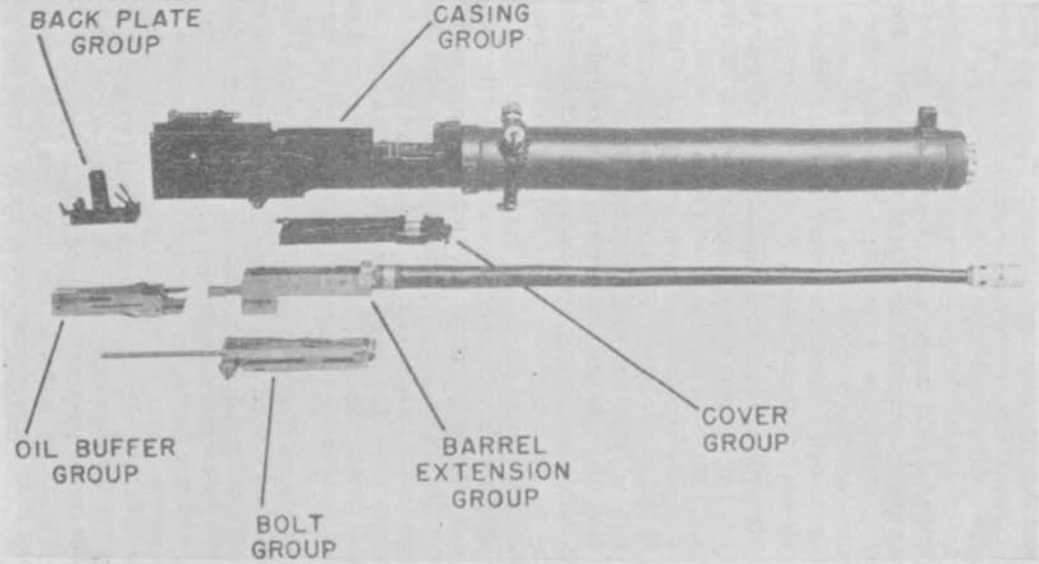


FIGURE 8.—Part groups.

disassembled into their several parts. This is not normally done except where parts must be repaired or replaced, or before the cleaning and oiling of the component parts.

c. In all disassembling and assembling, proper *tools* for the performance of the job must be employed. Failure to do this can cause considerable damage to the matériel. For field stripping, a cartridge is the only tool required. For complete disassembling, a pair of pliers, a monkey wrench, a combination wrench (or separate wrenches), and a screw driver of a suitable size are necessary.

■ 55. REMOVING GROUPS FROM GUN.—The cover may be removed or left assembled to the gun as desired. To remove the cover, release the cover latch and raise the cover. Withdraw the cotter pin from the cover pin. Pull out the cover pin and remove the cover. Release the backplate latch lock and latch and lift out the backplate. Press forward and away from the side plate on the end of the driving spring rod to release the retaining pin in the head of the rod from the hole in the side plate. Draw the bolt to the rear until the bolt stud can be withdrawn through the opening in the right side of the receiver of the gun. Remove the complete bolt from the rear end of the casing. Compress the oil buffer spring lock, using a cartridge point inserted through the hole in the right side plate, and remove the oil buffer, barrel extension, and barrel assembly from the rear of the casing. Detach the oil buffer group from the barrel extension by pressing the accelerator forward. (See fig. 9.)

■ 56. REPLACING GROUPS IN GUN.—Lock the oil buffer assembly to the barrel extension by holding the accelerator up under the barrel extension shank, start the breech lock depressors into the guideways in the barrel extension, and press forward, allowing the barrel extension shank to engage in the cross groove of the piston rod. Push forward on the oil buffer until it is fully locked to the barrel extension. Insert the barrel, barrel extension, and oil buffer assembly as a unit into the casing, pushing it forward until the oil buffer spring lock seats in the recess in the right side plate. Press the cocking lever forward and insert the bolt into the casing, guiding the extractor from the front with the fingers of the

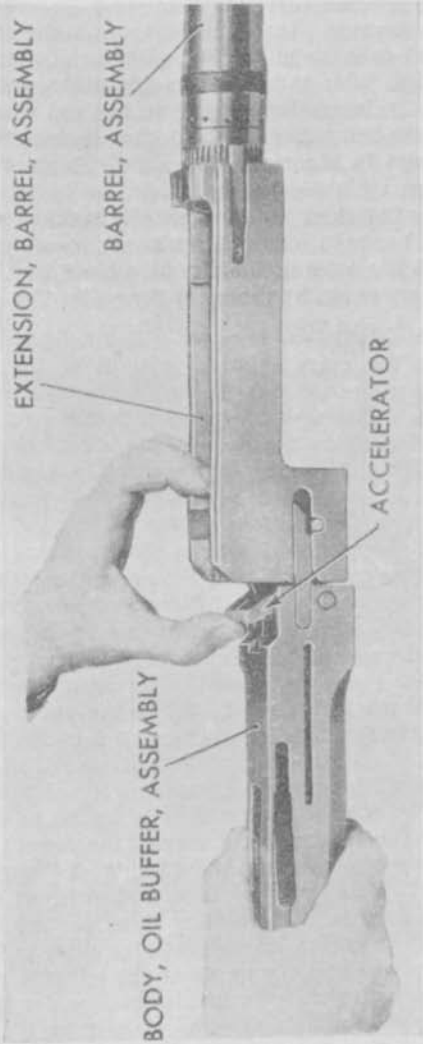


FIGURE 9.—Detaching the oil buffer group.

left hand to prevent it from catching and the bolt from tripping the accelerator. Insert the bolt stud in the bolt through the enlarged opening in the slot in the right side plate so that the stud collar is inside the side plate, and push the bolt forward. Insert the driving spring rod assembly into the hole in the bolt. Engage the driving spring rod retaining pin in its slot in the right side plate. Replace the backplate. When replacing the backplate, make sure the latch lock is in the unlocked position until the backplate is latched. If the cover has been removed, replace it, inserting the cover pin through the holes in the trunnion block and cover, and locking the cover pin by means of the cotter pin.

■ 57. CASING GROUP.—*a. Receiver.*—The receiver and water jacket form the main exterior portions of the gun. The receiver is the backbone or main strength member of the gun. As such it includes the mountings by which the gun is supported. In addition it forms a strong, accurate housing to protect and position the working parts of the gun. It also contains a part of, and supports the remainder of, the ammunition feeding mechanism. The receiver is made of two steel side plates riveted at their forward portion to a trunnion block, with top and bottom plates riveted to the side plates toward the rear. Directly below the trunnion block cover is a detent pawl which meshes with the cover to retain it in one of three open or raised positions. The top front of the receiver is open to permit access to the bolt and belt feed mechanism. Riveted to the under side of the top plate is the top plate bracket which supports the trigger bar pin on which the trigger bar pivots. The top plate bracket has suitable cams for engaging the cocking lever of the bolt. The rear of the receiver is slotted to receive the backplate. The bottom plate carries the breech lock cam which because of a machine shoulder "floats" slightly when bolted down. This cam may have a steel insert or plug in the wearing surface. The bottom front portion of the receiver is open to permit empty cartridge cases to be ejected. A switch is pivoted on the inside of the left side plate, with a hairpin spring in a recess in the plate under the switch. The front end of the receiver is formed by the trunnion

block which is threaded to fit into the trunnion adapter. A suitable shim is inserted between the trunnion block and adapter so that the adapter when screwed on will line up with the other mountings. The side plates are notched at the top front portion so that a cartridge belt may be fed into the gun from either side. At these notches the belt holding pawl brackets are riveted to each side plate. These brackets support the belt holding pawl and the cartridge stops, and are so built that parts may be assembled on either right or left side to permit feeding ammunition from either side. The rear right-hand cartridge stop assembly is used for left-hand feed only. A link stripper and rear cartridge stop are provided to replace the rear right-hand

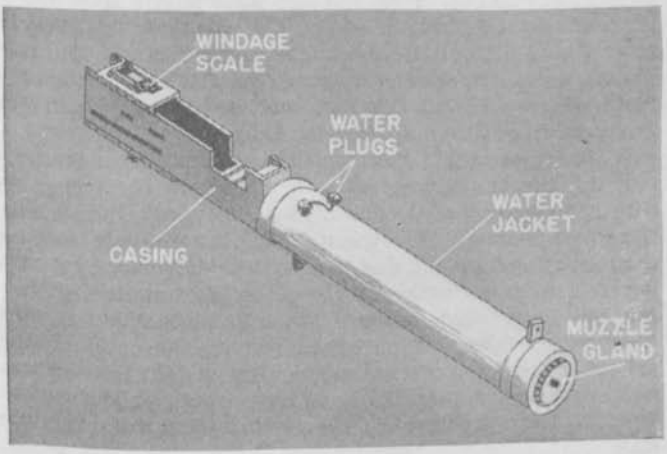


FIGURE 10.—Casing group.

cartridge stop assembly when right-hand feed is used. The rear right-hand cartridge stop assembly has a rear cartridge stop, a cartridge alining pawl which corrects for short rounds, and a link stripper.

b. Water jacket.—The water jacket is supported by the receiver. This jacket surrounds the barrel and prevents overheating when firing for prolonged periods. The water jacket

when filled contains 10 quarts of water, and is kept filled during fire by a hand pump from an auxiliary water chest which has a capacity of about 8 gallons. The water jacket is screwed on to the trunnion block. The barrel moves inside the jacket during firing and packing glands are provided near the breech and muzzle ends of the barrel to prevent water from escaping.

58. DETAILED DISASSEMBLING OF CASING GROUP.—*a.* To remove the side plate trigger assembly from the casing, withdraw the cotter pin from the side plate trigger bolt and unscrew the side plate trigger nut. To disassemble the assembly, unscrew the side plate trigger extension screw, lift off the side plate trigger extension, and remove the side plate trigger slide spring. Push the side plate trigger slide out of its guides in the housing. Swing the side plate trigger cam upward and lift out the side plate trigger spring. The side plate trigger cam can be removed by driving out the side plate trigger pin, but this is not done unless necessary for replacement of the cam. (See fig. 11.)

b. To remove the retracting slide assembly from the casing, pull out the locking wires and unscrew the retracting slide bracket screws. To disassemble the assembly, withdraw the cotter pin from the retracting slide bracket bolt, unscrew the retracting slide nut, and remove the bolt from the retracting slide bracket. Withdraw the cotter pin from the retracting slide lever stud, unscrew the retracting slide nut, and remove the washer. Remove the retracting slide lever and the grip assembly from the lever stud. Remove the lever spring. Remove the retracting slide from the retracting slide bracket. Unscrew the retracting slide lever stop from the retracting slide.

c. To remove the trigger bar from the casing, lift the end of the trigger bar pin lock from its seat in the side plate, rotate downward about 90°, and pull out the trigger bar pin.

d. To remove the switch and switch spring, withdraw the cotter pin and unscrew the switch pivot nut.

e. To remove the belt-holding pawl, draw the pawl pin out to the rear, taking care that the belt-holding pawl spring does not fly out upon removal of the pawl.

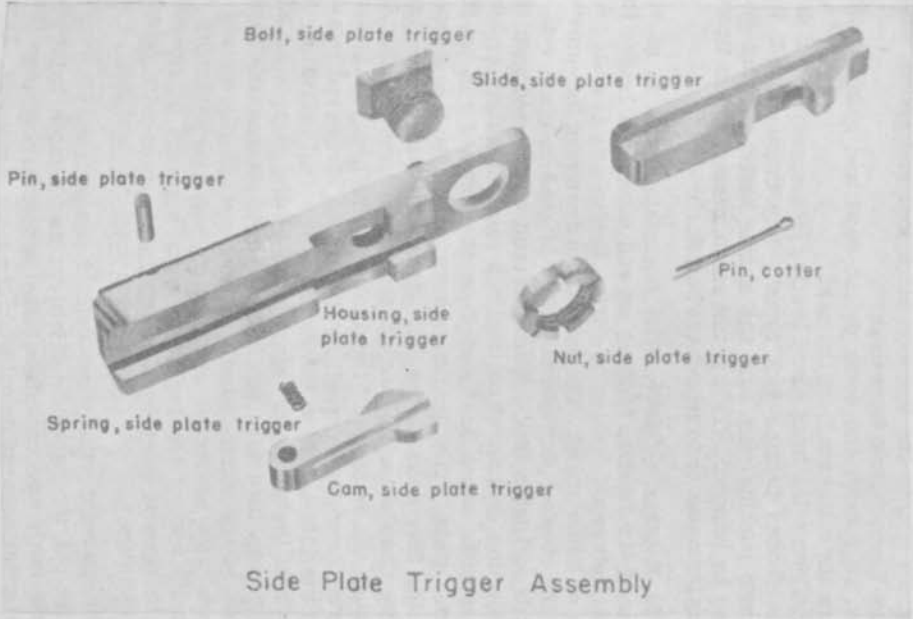


FIGURE 11.—Side plate trigger assembly.

f. To remove the link stripper and the front and rear cartridge stops, draw the belt-holding pawl pin to the rear.

g. To remove the trunnion block lock and spring, withdraw the cotter pin from the lock.

h. To remove the cover detent pawl and spring, withdraw the cotter pin from the pawl.

i. Unscrew the front barrel bearing lock screw jam nut and front barrel bearing lock screw. The muzzle gland, the muzzle packing ring, and the muzzle barrel packing may then be removed. This is not recommended unless necessary for repair or to repack the barrel.

59. BACKPLATE GROUP.—The backplate group is at the rear of the receiver forming an end cover, and houses the final bolt recoil cushioning parts. It also acts as a stop for the oil buffer group. The plate slides downward into grooves in the receiver side plates and is latched in place with a latch and latch lock. Assembled and compressed into the projecting cylindrical portion is a stack of lightly greased fiber disks which are headed on the forward end by the buffer plate. The final movement of the bolt is stopped by the fiber disks as the bolt strikes this buffer plate, and these disks assist in starting the forward movement. Although the back end of the driving spring group is retained during assembly by inserting the driving spring rod retaining pin into a hole in the receiver, in actual operation the force of the spring is counteracted by the backplate. Except when used with the M43 and M46 mounts, the backplate of the water-cooled gun does not usually include a spade grip assembly. A "butterfly" trigger assembly is usually part of the backplate group but may be removed if the gun is fired by a solenoid or a side plate trigger mechanism.

60. DETAILED DISASSEMBLING OF BACKPLATE GROUP.—*a.* Drive out the backplate latch pin and remove the backplate latch and backplate latch spring, taking care that the spring does not fly out when the latch is removed. Drive out the latch lock pin and remove the latch lock, latch lock spacers, and latch lock spring. Drive out the trigger

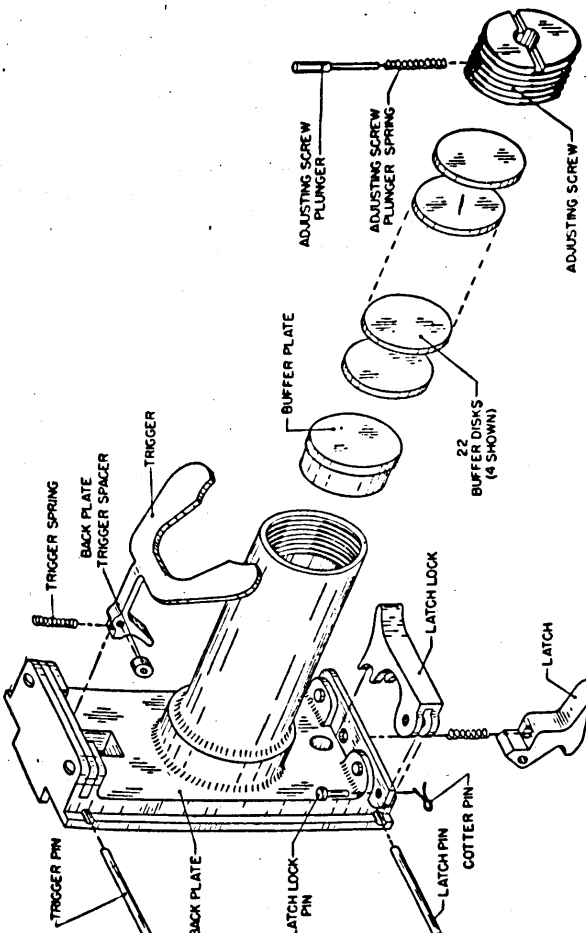


FIGURE 12.—Backplate group.

pin, being careful that the trigger spring does not fly out upon removal of the trigger.

b. The adjusting screw, buffer disks, and buffer plate are not removed except for repair or adjustment. If it is necessary to remove these parts, unscrew the adjusting screw and remove the adjusting screw plunger and the adjusting screw plunger spring. Remove the buffer disks and the buffer plate through the rear end of the buffer tube.

c. When the backplate group is fully assembled, the adjusting screw must always be kept screwed tight against the buffer disks. If the top of the adjusting screw becomes flush with the end of the buffer tube when screwed tight, remove the adjusting screw and add one or more buffer disks.

★■ 61. BOLT GROUP.—*a.* The bolt group holds the cartridge firmly in the chamber when it is fired. It withdraws the empty case and ejects it. It extracts a fresh cartridge from the bolt and inserts it in the chamber. It actuates the belt feed mechanism. The sear mechanism, when actuated by a trigger, trips the cocked firing pin, causing the gun to fire. The sear, which moves vertically in the back end of the bolt, may be depressed by pushing down on the small protrusion which extends up beyond the top of the bolt. When a manual trigger is supplied, the sear is depressed in this manner by means of the trigger bar in the top of the receiver. The downward motion of the sear unhooks or releases the firing pin extension. This extension, along with the firing pin, snaps forward under the action of the cocked or compressed firing pin spring, and the tip of the firing pin protrudes from the front end of the bolt striking the cartridge primer. The sear may also be actuated by side pressure on the end of the sear slide as with a side plate trigger mechanism. This slide may be assembled either right or left hand, and suitable openings in both side plates of the receiver permit the gun to be fired from either the right or the left side. Although the sear is constantly being forced upward by the sear spring, it is retained in its slot by the sear slide. The sear stop pin projects downward through the body of the bolt to act as a stop for the firing pin spring.

b. The cocking lever, which at its lower end engages with a slot in the firing pin extension, has its top end projecting above the bolt. This top end engages with a cam in the top plate bracket of the receiver to cock the firing pin.

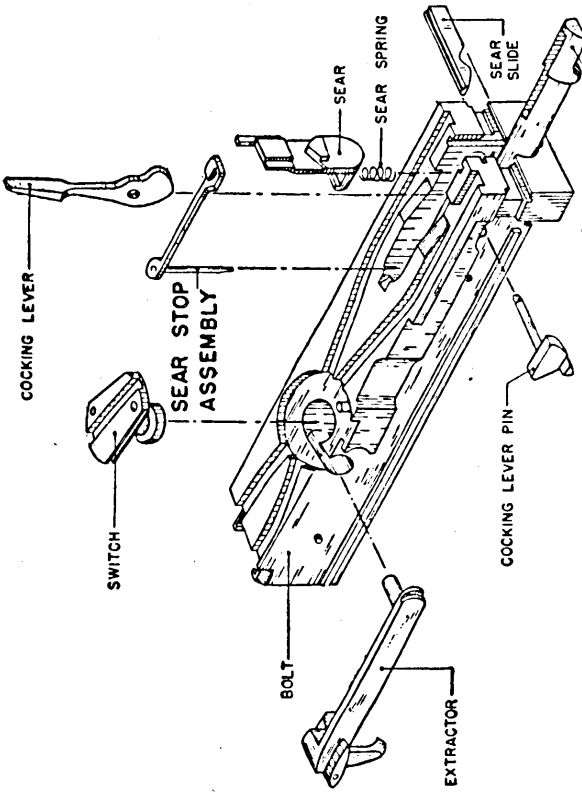


FIGURE 13.—Bolt group.

c. The top surface of the bolt has two diagonal bolt cam grooves which act as cams to actuate the belt feed mechanism in the cover. The bolt switch fits into the circular depression on top of the bolt and may be assembled to make one or the other of these two ways continuous, the selection

depending on whether ammunition will be fed from the right or left side. See paragraph 159 for changing feed from right to left side.

d. The extractor which fits into a circular hole on the left-hand side of the bolt, withdraws a cartridge from the belt and places it in the T-slot at the front end of the bolt. The extractor stop pin stops the extractor in its downward swing on the counterrecoil stroke.

e. The ejector is fastened to the end of the extractor and

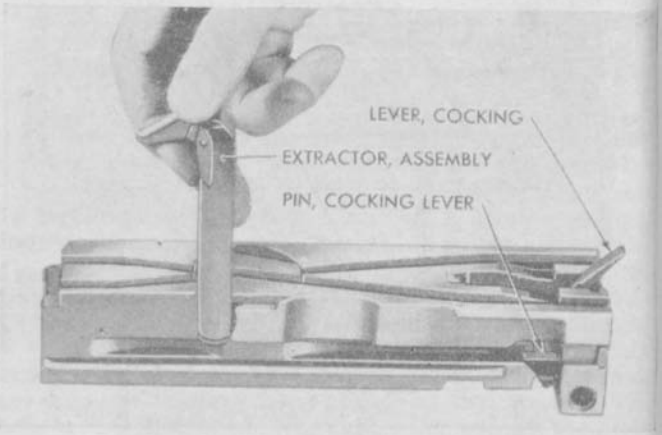


FIGURE 14.—Removing the extractor.

helps to position a new cartridge in the feedway when ammunition is being fed from the right-hand side. It also guides a new cartridge into the chamber and pushes the last empty case out of the T-slot.

f. A driving spring rod assembly fits into a lengthwise hole in the bolt and is compressed by the rearward motion of the bolt. After the bolt recoil has been stopped by the backplate, the spring drives the bolt forward. This assembly actually has two springs, one nested inside the other, and both are slipped over a rod with suitable end retaining parts.

■ 62. DETAILED DISASSEMBLING OF BOLT GROUP.—*a*. The driving spring rod assembly is normally disassembled only when it is necessary to replace the driving spring. To disassemble it, drive out the collar stop pin from the driving spring rod and remove the collar and the driving spring. Next, disassemble the bolt assembly. Remove the extractor by rotating it upward and pulling it out from the bolt. (See fig. 14.) Do not disassemble the ejector from the extractor unless absolutely necessary. To disassemble the ejector, drive out the ejector pin and remove the ejector and ejector spring. Remove the bolt switch from the bolt.

b. Rotate the cocking lever fully to the rear and release the firing pin by pushing down the sear. Remove the cock-

FIGURE 15.—Removing sear slide.

ing lever pin and cocking lever. With the thin end of the cocking lever, push the sear stop to the right until it is in the center of the slot, then turn the bolt over and push the sear stop out of engagement with the firing pin spring. Reverse the bolt and remove the sear stop from the slot. Remove the sear, sear slide, and sear spring. (See fig. 15.) Elevate the front end of the bolt, allowing the firing pin extension and firing pin to slide out. The firing pin spring can be removed from the firing pin extension by driving out the

firing pin spring stop pin. Take precautions to prevent the firing pin spring from flying out during the operation.

■ 63. OIL BUFFER GROUP.—*a.* The oil buffer group is contained in the lower rear portion of the receiver. It consists of the oil buffer and oil buffer body. The bolt slides over the top of the oil buffer body during the back portion of the stroke. On the recoil or rearward stroke of the barrel extension, the breech lock pin is engaged by the breech lock depressors which are riveted to the oil buffer body. The depressors cause the breech lock to unlock the bolt from the barrel extension. C 2 *b.* The accelerator is assembled into the forward portion of the oil buffer body. On the recoil stroke, it assists in driving the bolt to the rear. During the forward stroke, the claws on the accelerator bear against the shoulders on the barrel extension shank, thus locking and preventing the barrel extension from moving forward until the bolt strikes and moves the accelerator forward. Thus the locking movement of the breech lock is timed so as to bring the lock up exactly when the notch in the bolt is in position.

C 2 *c.* A flat spring in a groove in the bottom of the oil buffer body exerts pressure against the bottom of the accelerator to keep it in the locked position until released by the bolt. The back end of the spring projects beyond the buffer body in such a way that a bevel on the bottom edge of the backplate forces the spring forward. This insures that the spring will hold the accelerator very firmly in the locked position; thus the main body of the bolt will pass over the accelerator without interference until the back lug on the bolt actually strikes the accelerator.

d. The oil buffer serves to absorb and partially store the recoil energy of the barrel and barrel extension during the recoil stroke. This stored energy is given up by the oil buffer spring to drive the barrel extension and barrel forward. The shock absorbing action of the spring is supplemented by a piston and oil cylinder in the rear of the oil buffer spring. The degree of oil leakage across the piston valve on the recoil stroke controls the rate of fire. This may be adjusted manually.

e. The piston rod and head may slide but are prevented from rotating by the guide key seating in the slot in the oil

buffer body. The piston valve may be rotated to change the leakage aperture at the edge of the piston by turning the oil

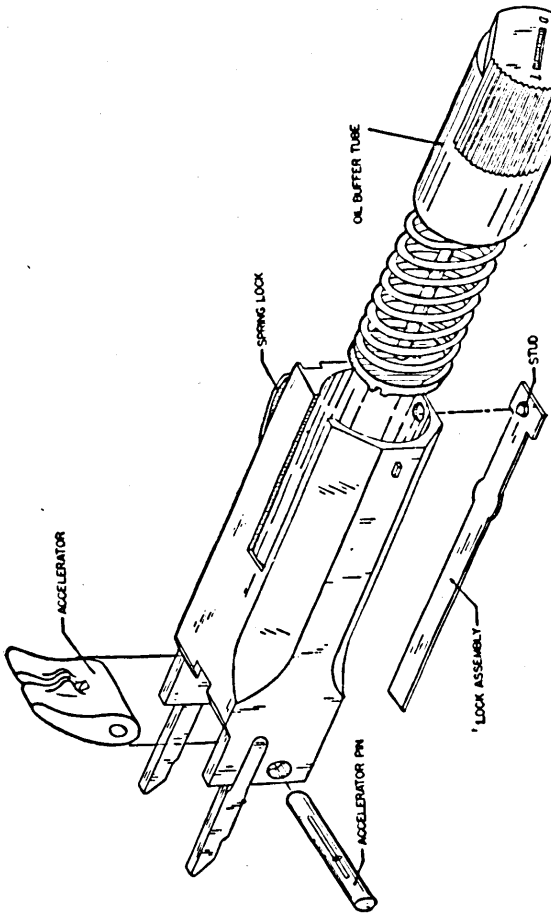


FIGURE 16.—Oil buffer group.

buffer tube against the restraining action of the tube lock in the tube serrations. A relief valve in the oil buffer tube cap

permits some oil to escape on the initial recoil stroke as the piston rod crowds into the oil filled cylinder. It also allows for oil expansion due to temperature rise.

■ 64. DETAILED DISASSEMBLING OF OIL BUFFER GROUP.—Drive out the accelerator pin and remove the accelerator. The remainder of the oil buffer assembly is not disassembled

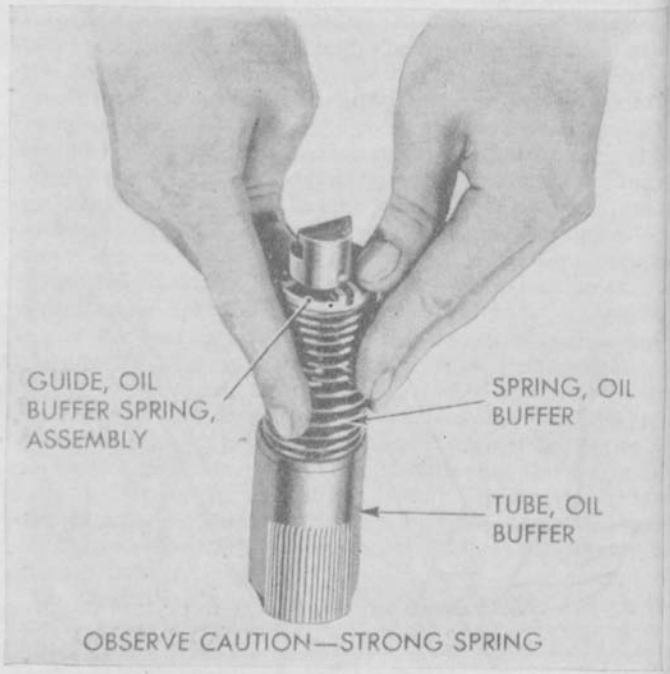


FIGURE 17.—Removing oil buffer spring and guide.

unless absolutely necessary for repairs or replacement. To remove the oil buffer tube, raise the oil buffer tube lock from its engagement in the oil buffer tube and push in on the end of the oil buffer piston rod so that the tube may be gripped by hand and pulled to the rear. The oil buffer spring guide is depressed until it clears the piston rod pin and then is

turned until the pin will pass through the slots provided in the guide. Remove the guide and spring. (See fig. 17.)

■ 65. BARREL EXTENSION GROUP.—*a.* The barrel extension is screwed onto the breech end of the barrel; together they form a unit. The barrel slides inside the water jacket while the normal position of the barrel extension is in the lower portion of the receiver.

b. The function of the barrel is to direct the discharged projectile. The rifling or grooving causes the projectile to rotate and maintain direction and prevent tumbling. The barrel is of one piece, threaded at the rear or breech end to screw into the barrel extension. The barrel tapers toward the front or muzzle end, but the last portion is ground straight. A chamber is formed in the barrel at the breech end which has the exact contour of the cartridge. A series of notches or serrations is formed in the rear cylindrical outer surface. When the barrel is screwed into the barrel extension, one end of the barrel locking spring fits into these serrations to prevent any change in the degree of engagement between the barrel and barrel extension during firing. Should adjustment be necessary it can readily be made against the tension of the barrel locking spring.

c. The barrel extension has lengthwise grooves in which the bolt rides, and also it houses the breech lock. The breech lock serves to lock the bolt to the barrel extension during and after firing. Fastened to the back end of the barrel extension is the barrel extension shank which engages the oil buffer. The shank is fastened very securely into the extension by a pin.

■ 66. DETAILED DISASSEMBLING OF BARREL EXTENSION GROUP.—Unscrew the barrel from the barrel extension. Remove the barrel-locking spring by sliding it forward out of its seat in the barrel extension. Push out the breech lock pin and remove the breech lock.

■ 67. COVER GROUP.—*a.* The cover permits access to the bolt and belt holding parts. On the under side of the cover is the belt feed mechanism. The front, or hinge end, of the cover is serrated so that it may be retained in one of several open positions. A latch is built into the back end of the

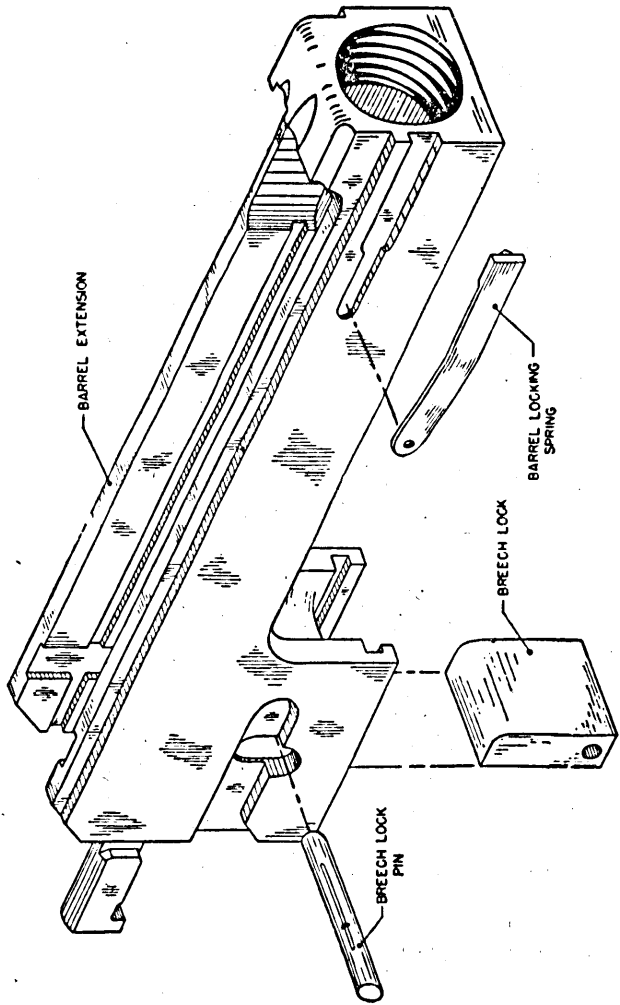


FIGURE 18.—Barrel extension group.

cover so as to lock it securely to the receiver. This latch may be assembled right or left hand, depending on the type of slide used.

b. Operating in a crosswise groove on the under side of the cover is the belt feed slide. This is actuated by the belt feed lever, one end of which rides in the ways on top of the bolt. The belt feed slide carries the belt feed pawl which on each stroke snaps over a new cartridge and pushes it into position so that it may be extracted from the belt. The pawl, slide, and lever may be reversed to change the direction of feed.

c. The cover extractor cam is riveted to the under side of the cover. This cam forces the extractor and new cartridge downward as the bolt travels toward the rear. The cover extractor spring which is also assembled to the under side of the cover limits the upward movement of the extractor during the final forward motion of the bolt. See figure 19 for complete details of the cover group.

■ 68. DETAILED DISASSEMBLING OF COVER GROUP.—Remove the cover as described in paragraph 55. Withdraw the belt feed lever pivot stud cotter pin and pry the belt feed lever off its stud, taking care that the lever plunger and spring do not fly out. To withdraw the belt feed lever, the toe of the lever must be in line with the slot in the cover. Remove the belt feed slide and drive out the belt feed pawl pin. This allows the belt feed pawl, spring, and pawl arm to be separated. Drive out the cover latch pin and remove the cover latch. Remove the cover latch spring by lifting its front end out of the slot in the cover and sliding it forward. Remove the cover extractor spring by releasing its rear end from its seat in the cover extractor cam and sliding it to the rear.

■ 69. SEQUENCE IN ASSEMBLING.—*a.* In general, the groups are assembled and replaced in the gun in the reverse order to that in which they are removed and disassembled. There are certain precautions in connection with assembling which are outlined below and must be observed in order that the parts may be placed in the gun and in order that they may function properly after the gun is assembled. In most cases, even if the gun can be assembled, failure to observe these points results in failure of the bolt to go fully forward on the closing movement.

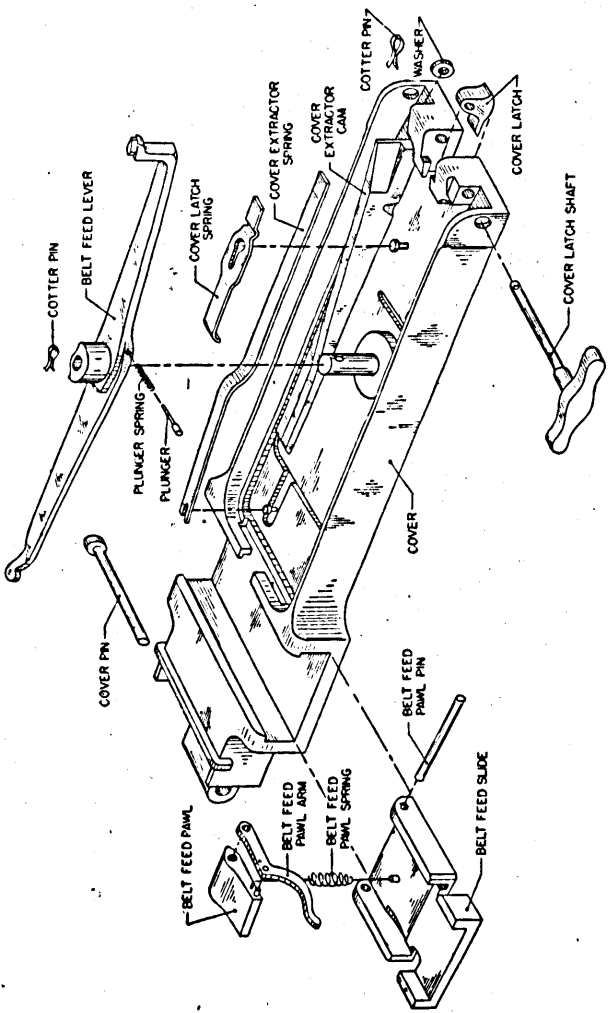


FIGURE 19.—Cover group.

b. Be sure that in assembling the part groups they are all properly assembled either for a left-hand or right-hand feed. The following instructions are for assembly for left-hand feeding:

(1) The cam groove in the bolt switch must line up with the cam groove in the bolt marked "L." If it is opposite the groove marked "R," lift up the bolt switch high enough to be

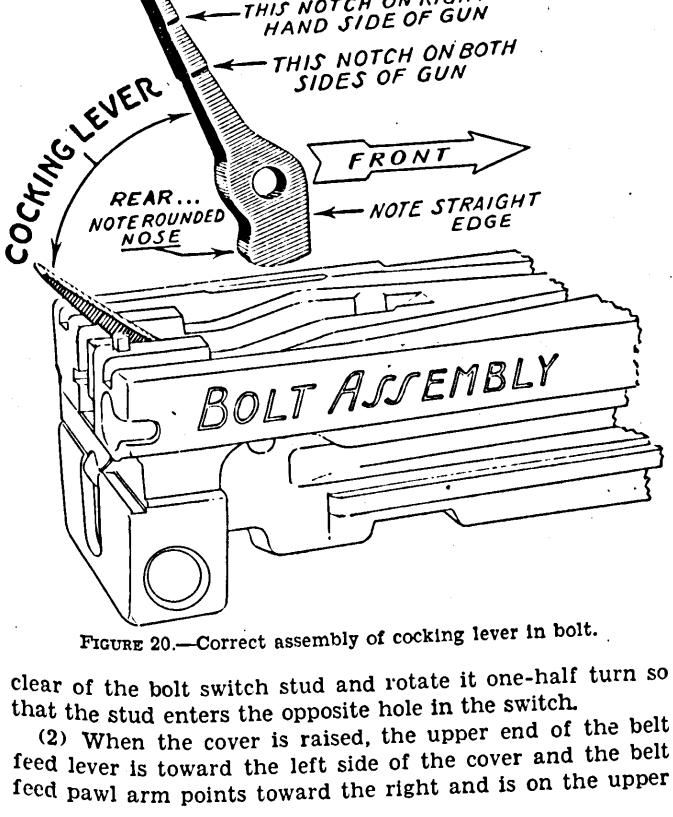


FIGURE 20.—Correct assembly of cocking lever in bolt.

clear of the bolt switch stud and rotate it one-half turn so that the stud enters the opposite hole in the switch.

(2) When the cover is raised, the upper end of the belt feed lever is toward the left side of the cover and the belt feed pawl arm points toward the right and is on the upper

side of the pawl. Belt feed lever plunger and spring shou be in upper hole for left-hand feed.

(3) The front and rear cartridge stops and the link stripp are assembled on the right side of the feedway, and the be holding pawl on the left side of the feedway.

c. In assembling the barrel extension, make sure that t breech lock is inserted with the bevel faces to the front a the double bevel on top.

d. The accelerator is assembled in the oil buffer body wi the accelerator tips up and rounded surface to the front.

C-2 *e.* The cocking lever is assembled in the bolt with t rounded nose on the lower end of the lever to the rear of t bolt so that it will properly engage the rear of the slot in t firing pin extension.

f. In assembling the fiber buffer disks, be sure that th are clean and free of rough edges and surfaces. Assemb them in the tube one at a time, firmly seating each disk a using sufficient disks so that when the adjusting screw inserted and tightened its outer face extends slightly outsi the buffer tube.

g. When reassembling the backplate to the gun, keep t lock in the unlocked position until the backplate is latched.

C-2 *(4) Added

SECTION IV

DETAILED FUNCTIONING

70. GENERAL.—In the description of the detailed functio ing of the caliber .50 Browning machine gun which appea in the paragraphs below, it is assumed that, first, the ammu nition belt has been properly started into the gun and th cover has been closed and latched; second, the gun has bee manually cocked and a cartridge is in its proper position the chamber and ready to be fired. In order to simplify th explanation of the operation of the gun, a manual trigger used. Each time a cartridge is fired, the mechanical actio within the gun involves many parts moving simultaneous or in their proper order. To gain a working knowledge of th operation of these parts and their relationship to each othe the action has been separated into various phases. These a described in the following order:

a. Firing.
b. Recoiling.
c. Counterrecoiling.
d. Cocking.
e. Automatic firing.
f. Feeding.
g. Extracting and ejecting.

■ 71. FIRING.—When the gun has been loaded and the firing pin spring has been cocked or compressed manually, the firing mechanism is as shown in figure 21. The gun is now ready to fire. When the trigger is pressed it raises the back end of the trigger bar. The trigger bar pivots on the trigger bar pin, causing the front end to press down on the top of the sear. The sear is forced down until the notch in the sear is disengaged from the shoulder of the firing pin extension. The firing pin and firing pin extension are driven forward by the firing pin spring to fire the cartridge. (See fig. 22.) If a side plate trigger mechanism is used, the sear is forced down by the lateral movement of the sear slide.

See C-2

■ 72. RECOILING.—The complete cycle of the recoiling portion of the gun, which takes place as each cartridge is fired, consists of the recoil stroke when certain parts of the gun move rearward and the counterrecoil stroke when the same parts move forward. At the instant of firing, the barrel, barrel extension and bolt, known as the recoiling portion, are in the forward position in the gun as shown in figure 23. At this time the bolt is held securely against the base of the cartridge by the breech lock which extends up from the barrel extension into a notch in the under side of the bolt. (See fig. 24.) After the cartridge explodes and as the bullet travels out of the barrel, the force of the recoil drives the recoiling portion rearward. During the first ¾ inch of travel the breech lock is pushed back off the breech lock cam step. (See fig. 25.) This permits the breech lock to be forced down out of the notch in the bolt by the breech lock depressors engaging the breech lock pin. This unlocks the bolt. As the recoiling portion moves toward the rear, the barrel extension rolls the accelerator rearward. The tip of the accelerator strikes the lower projection on the bolt and

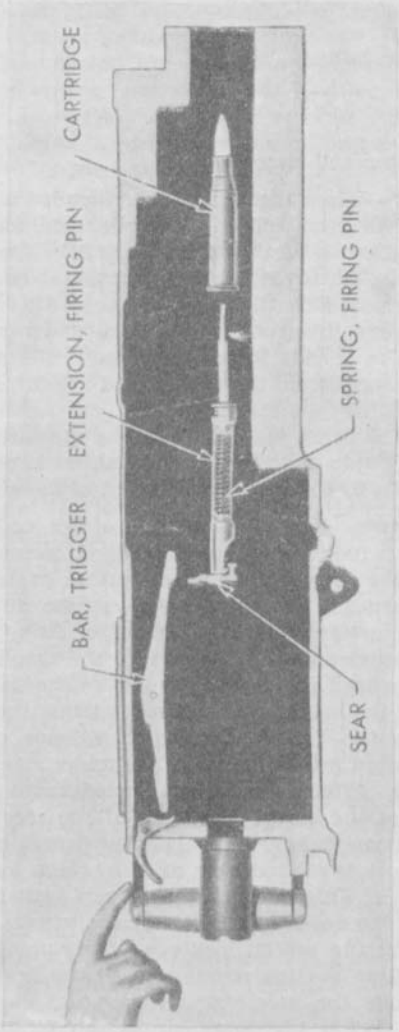


FIGURE 21.—Ready to fire.

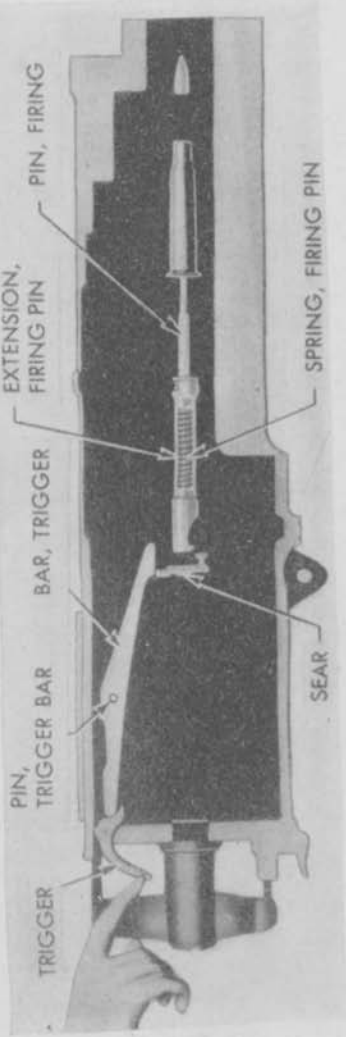


FIGURE 22.—Firing pin action.

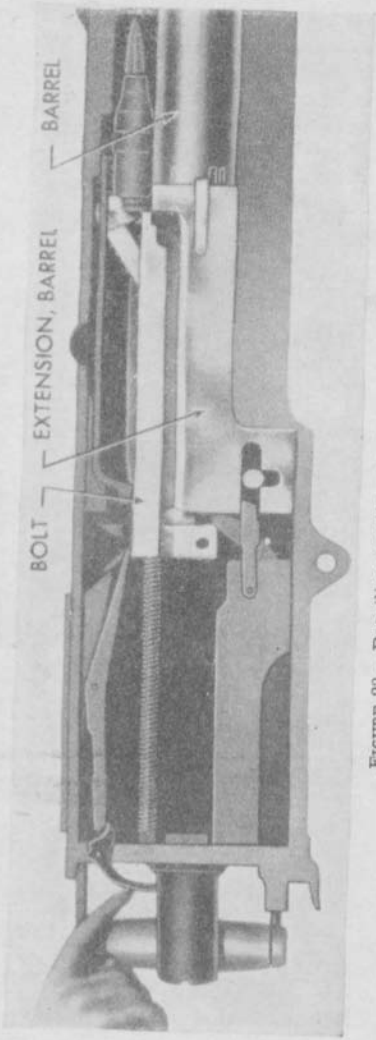


FIGURE 23.—Recoiling portion at instant of firing.

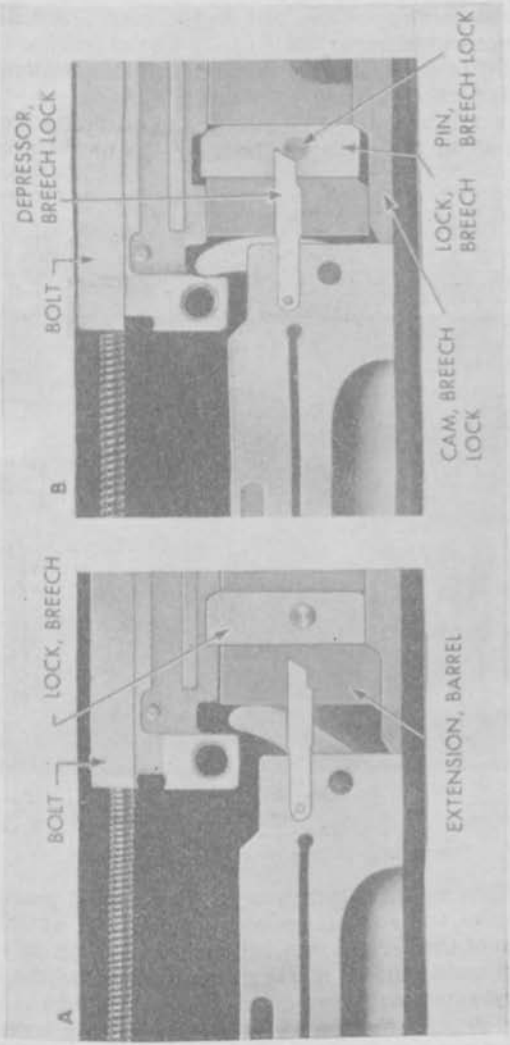


FIGURE 24.—Action of breech lock.

FIGURE 25.—Action of breech lock depressor.

hastens or accelerates the bolt to the rear. (See fig. 26
The barrel and barrel extension have a total rearward trav
of 1⅛ inches at which time they are completely stopped
the oil buffer body assembly. (See fig. 27.)

During this recoil of 1⅛ inches, the oil buffer spring
compressed in the oil buffer body by the barrel extensio

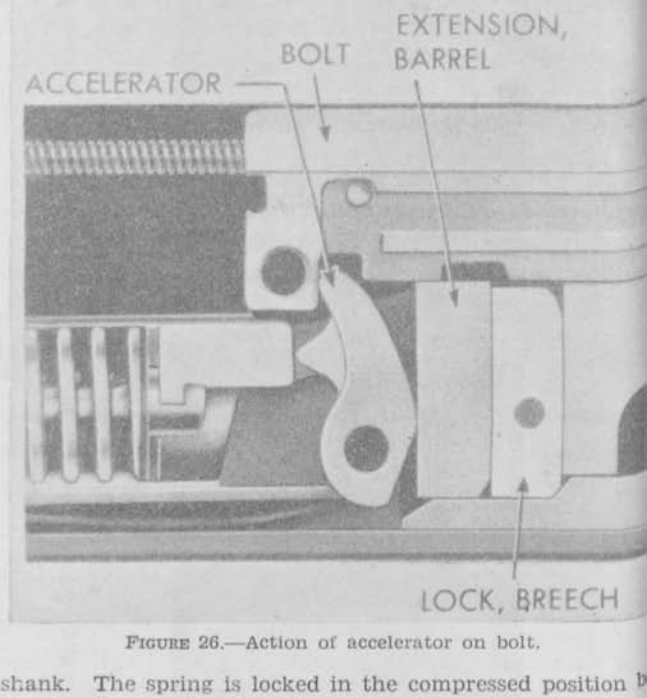


FIGURE 26.—Action of accelerator on bolt.

shank. The spring is locked in the compressed position b
the claws of the accelerator which are moved against th
shoulders of the barrel extension shank. (See fig. 28.) Th
oil buffer assists the oil buffer spring in bringing the barr
and barrel extension to rest during the recoil stroke as show
in figure 29. During the 1⅛ inch of rearward travel, th
piston rod head is forced from the forward end of the o

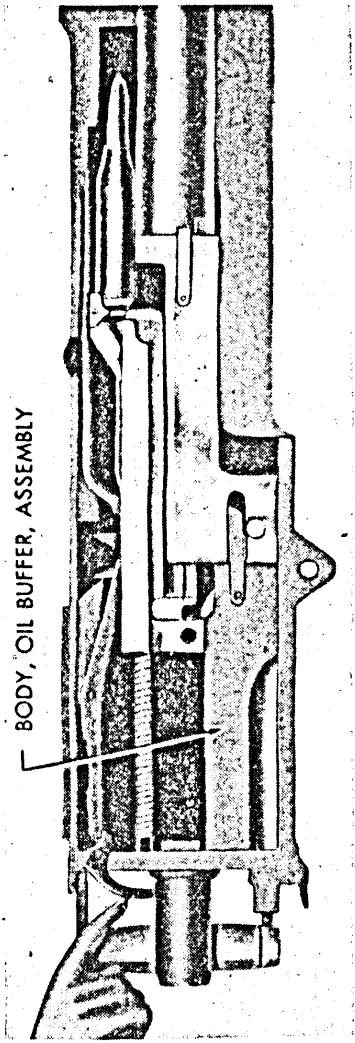


FIGURE 27.—Full recoil of barrel and barrel extension.

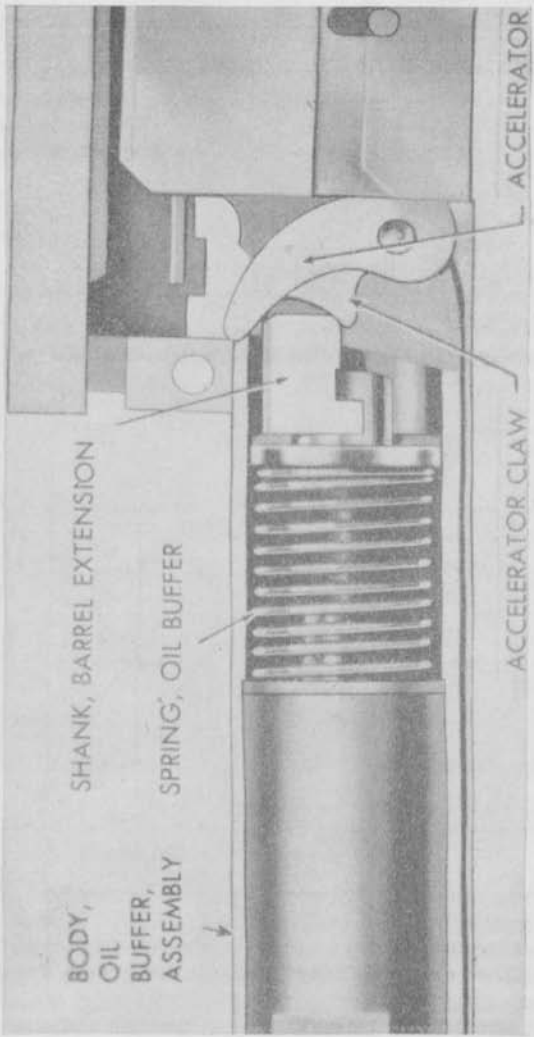


FIGURE 28.—Action of oil buffer spring.

buffer tube to the rear. The oil at the rear of the oil buffer tube under pressure of the piston escapes to the front side of the piston. Its only path is through restricted notches between the edges of the piston rod head and oil buffer tube.

The bolt travels rearward for a total of 7⅛ inches. During this travel, the two nested driving springs are compressed. The rearward stroke of the bolt is finally stopped as the bolt strikes the buffer plate as shown in figure 30. Thus, part of the recoil energy of the bolt is stored in the driving springs and the remainder is absorbed by the buffer disks in the backplate.

■ 73. COUNTERRECOILING.—After completion of the recoil stroke, the bolt is forced forward by the energy stored in the driving spring and the compressed buffer disks. When the bolt has moved forward about 5 inches, the tip of the accelerator is struck by a projection on the bottom of the bolt. (See fig. 31.) This rolls the accelerator forward.

As the accelerator rolls forward, the accelerator claws are moved away from the shoulders of the barrel extension shank. This releases the oil buffer spring and the energy stored in the spring shoves the barrel extension and barrel forward. (See figure 32.) No restriction to motion is desired on the forward or counterrecoil stroke of the barrel and barrel extension; therefore, on the forward stroke additional openings for oil flow are provided in the piston rod head of the oil buffer assembly. The piston valve is forced away from the piston-rod head as the parts move forward, uncovering these additional openings. This provides an additional path and permits oil to escape freely at the opening in the center of the piston valve as well as the edge of the piston valve next to the tube wall as shown in figure 33. As the barrel extension moves forward the breech lock engages the breech lock cam and is forced upward. The bolt, which has been continuing its forward motion since striking the accelerator, has at this instant reached a position where the notch on the under side is directly above the breech lock, thus permitting the breech lock to engage the bolt. (See fig. 34.) The bolt is thereby locked to the breech end of the barrel just before the recoiling portion reaches the firing position.

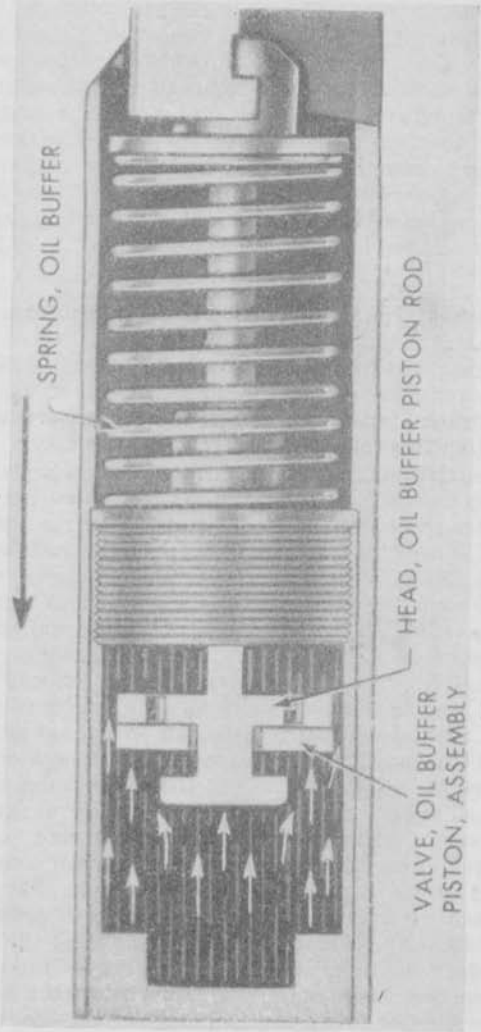


FIGURE 29.—Hydraulic action of oil buffer.

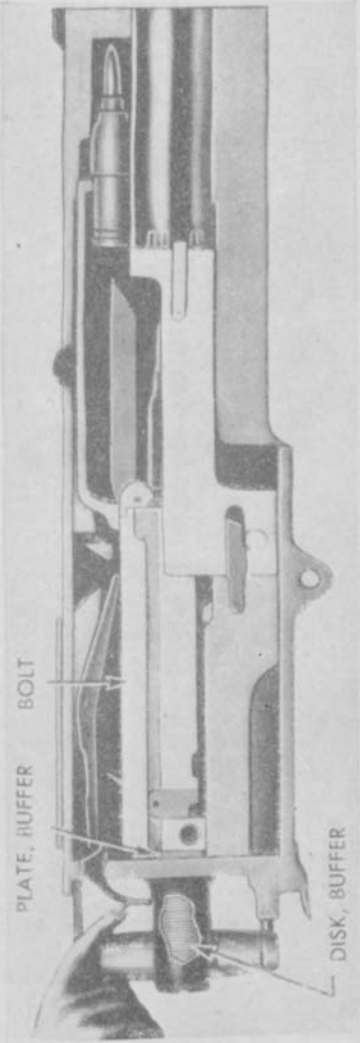


FIGURE 30.—Action of buffer plate on bolt.

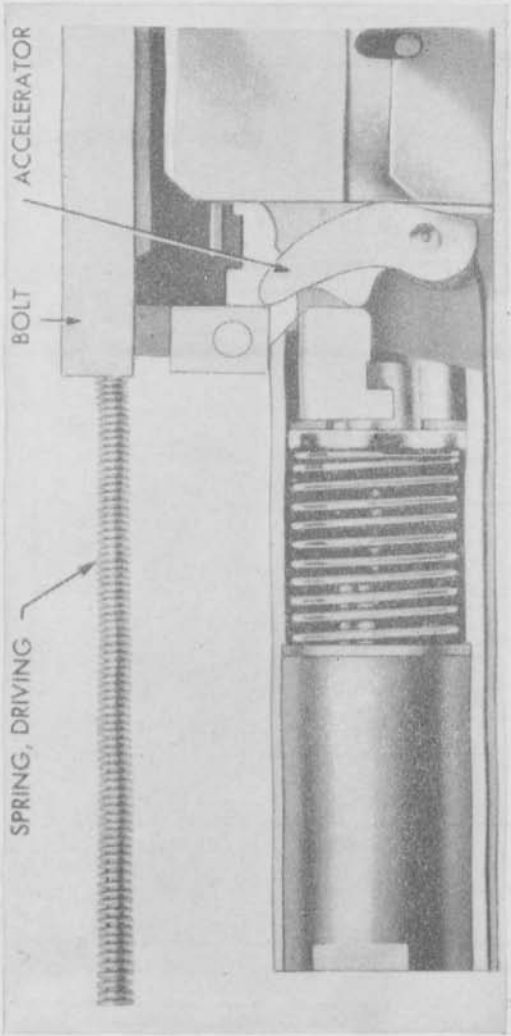


FIGURE 31.—Action of bolt on accelerator.

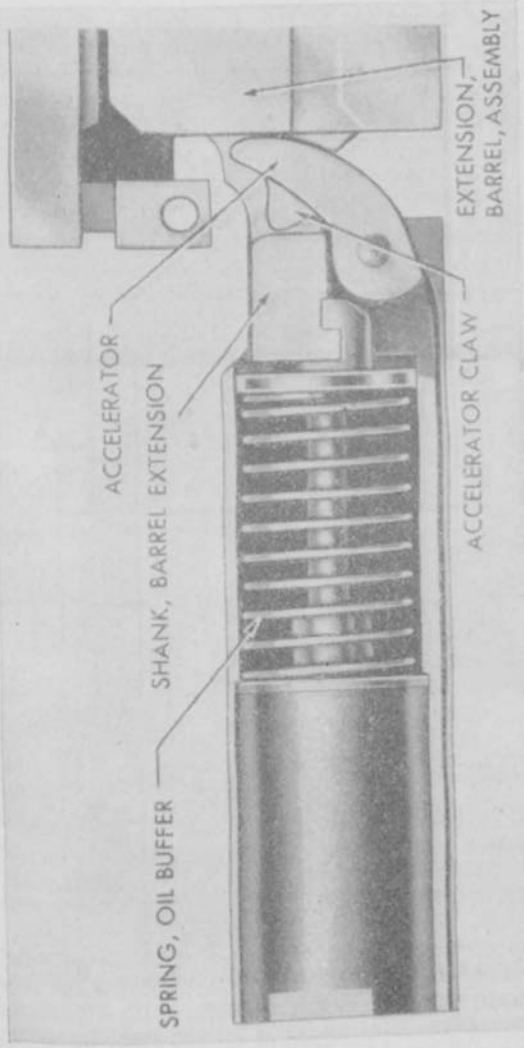


FIGURE 32.—Action of oil buffer spring on barrel extension and barrel.

FIGURE 33.—Action of piston valve in oil buffer.

74. COCKING.—The act of cocking the gun is begun as the bolt starts to recoil immediately after firing. The tip of the cocking lever which is in the V-slot in the top plate bracket, as shown in figure 35, is forced forward. The cocking lever is pivoted so that the lower end forces the firing pin extension rearward. The firing spring is thus compressed against the

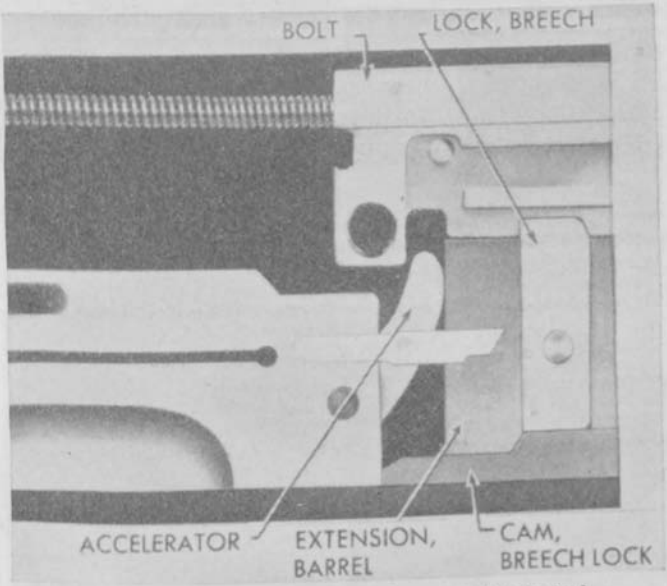


FIGURE 34.—Action of breech lock cam on breech lock.

sear stop pin. The shoulder at the back end of the firing pin extension is hooked over the notch at the bottom of the sear under pressure of the sear spring. (See fig. 36.) During the forward motion of the bolt, the tip of the cocking lever enters the V-slot of the top plate bracket. (See fig. 37.) This action swings the bottom of the cocking lever out of the path of the firing-pin extension, as shown in figure 38, thus permitting the firing pin to snap forward to fire the cartridge. When the recoiling portion is almost in the forward position, the gun is ready to fire. If no trigger action is given at this

instant, the recoiling portion assumes its final forward position, as shown in figure 38, and the gun ceases to fire. The parts are now in the position shown in figure 21 and the gun is again ready to fire.

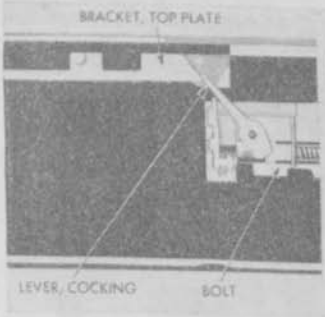


FIGURE 35.—Action of cocking lever at start of recoil.

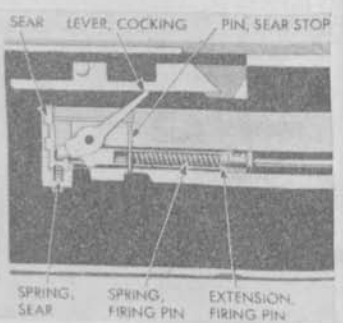


FIGURE 36.—Action of cocking lever at end of recoil.

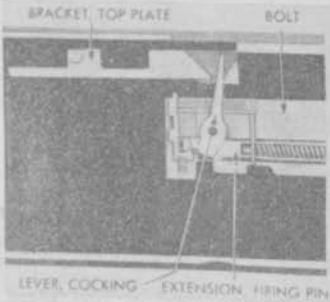


FIGURE 37.—Action of cocking lever during counterrecoil.

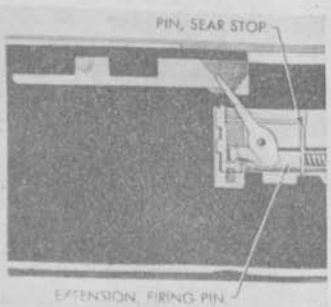


FIGURE 38.—Position of cocking lever bolt in forward position.

■ 75. AUTOMATIC FIRING.—For automatic firing the trigger is pressed and held down. The sear is depressed as its tip is carried against the cam surface of the trigger bar by the forward movement of the bolt near the end of the counterrecoil stroke. (See fig. 39.) The notch in the bottom of the sear releases the firing pin extension and the firing pin,

thus automatically firing the next cartridge just before the completion of the forward stroke. The explosion of the next cartridge thus absorbs the final shock of counterrecoil. The gun fires automatically as long as trigger action is maintained and until the ammunition supply is exhausted.

■ 76. FEEDING.—The belt feed mechanism is actuated by the bolt. When the bolt is in the forward position, the belt

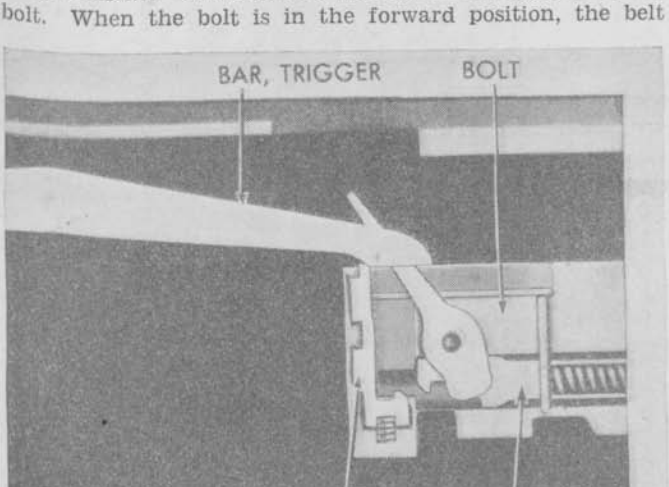


FIGURE 39.—Action of trigger bar on sear in continuous fire.

feed slide is within the confines of the gun. Figure 40 shows the mechanism as from above with the cover removed. A stud at the rear of the belt feed lever is engaged in the diagonal groove or way in the top of the bolt. The belt feed lever is pivoted in the center on a stud located in the cover. As the bolt moves rearward during recoil, the forward end of the belt feed lever moves the belt feed slide out of the side of the gun and over the ammunition belt.

NOTE.—Ammunition feed as in figure 41 is from the left side of the gun. Feed from either side is possible with all caliber .50, M2 guns.

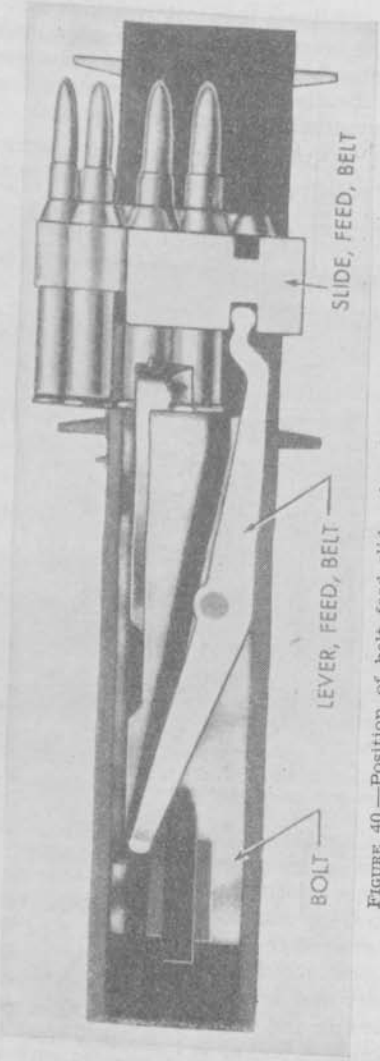


FIGURE 40.—Position of belt feed slide when bolt is all the way forward.

FIGURE 40.—Position of belt feed slide when bolt is all the way forward.

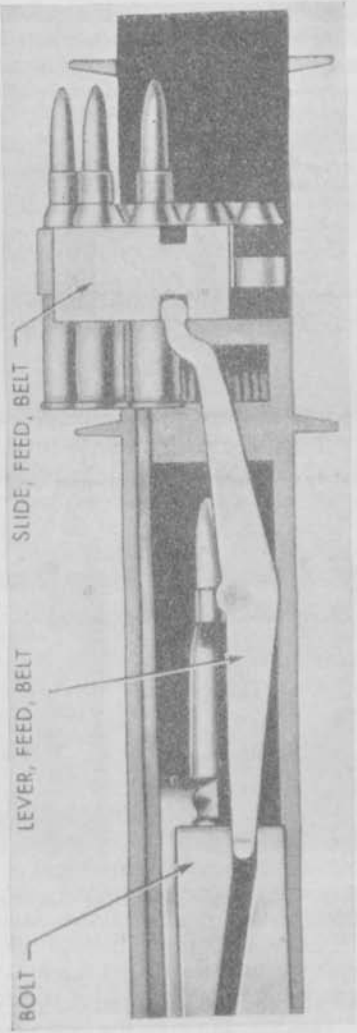


FIGURE 41.—Position of belt feed slide when bolt has recoiled all the way to the rear.

The ammunition belt is pulled into the gun by the belt feed pawl which is attached to the belt feed slide. When the bolt is forward, the belt feed pawl has positioned a cartridge

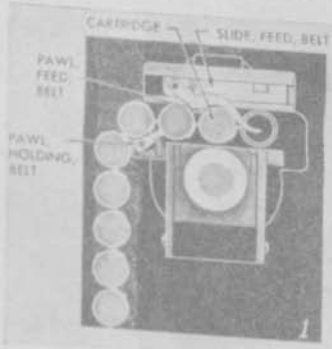


FIGURE 42.—Action of belt feed pawl, bolt completely forward.

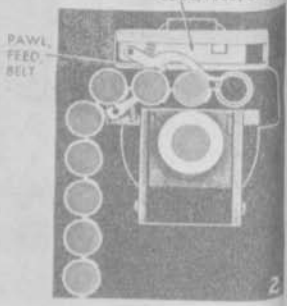


FIGURE 43.—Action of belt feed pawl, and belt holding pawl, bolt recoiling.

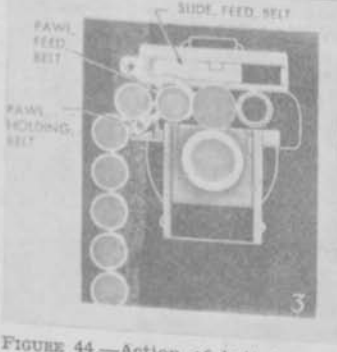


FIGURE 44.—Action of belt feed pawl, bolt completely to rear.

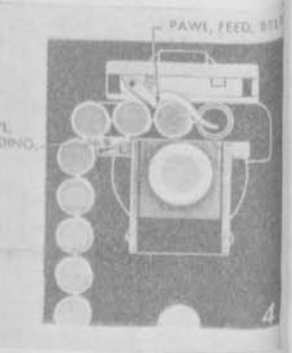


FIGURE 45.—Action of belt feed pawl and belt holding pawl, counterrecoil of bolt.

directly above the chamber. The belt holding pawl is in a raised position to prevent the ammunition belt from falling out of the gun. (See fig. 42.) As the bolt recoils, the belt

feed slide is moved out over the belt and the belt feed pawl pivots so as to ride over the next cartridge as shown in figure 43. At the end of the recoil stroke, the travel of the belt feed slide is sufficient to permit the belt feed pawl to snap down behind the next cartridge in order to pull the belt into the gun. (See fig. 44.) As the bolt moves forward on the counterrecoil stroke the belt is pulled into the gun by the belt feed pawl. The belt feed pawl arm holds the cartridges down in their proper position in the feedway. The belt holding pawl is forced downward as a cartridge is pulled over it as shown in figure 45. When the forward stroke of the bolt is completed the belt holding pawl snaps up behind the cartridge as shown in figure 42.

■ 77. EXTRACTING AND EJECTING.—*a.* As recoil starts, a cartridge is drawn from the ammunition belt by the extractor. If the extractor fails to withdraw a cartridge from the belt, the belt feed pawl arm prevents the belt feed pawl from moving another round into position directly above the chamber. The empty case is withdrawn from the chamber by the T-slot in the front face of the bolt. (See fig. 46.)

b. The empty case having been expanded by the force of explosion fits the chamber very snugly and the possibility exists of tearing the case if the withdrawal is too rapid. To prevent this and to insure slow initial withdrawal, the top front edge of the breech lock and front side of the notch in the bolt are beveled as shown in figure 47. Thus, as the breech lock is disengaged, the bolt separates from the barrel and barrel extension gradually.

c. As the bolt moves to the rear the cover extractor cam forces the extractor down, causing the cartridge to enter the T-slot in the bolt, as shown in figure 48.

d. As the extractor is forced down, a lug on the side of the extractor rides against the top of the switch causing the switch to pivot downward at the rear, as can be seen in figure 49. Near the end of the rearward movement of the bolt the lug on the extractor overrides the end of the switch, and the switch snaps up to its normal position.

e. On counterrecoil the extractor and cartridge are forced farther downward by the extractor lug riding on the under

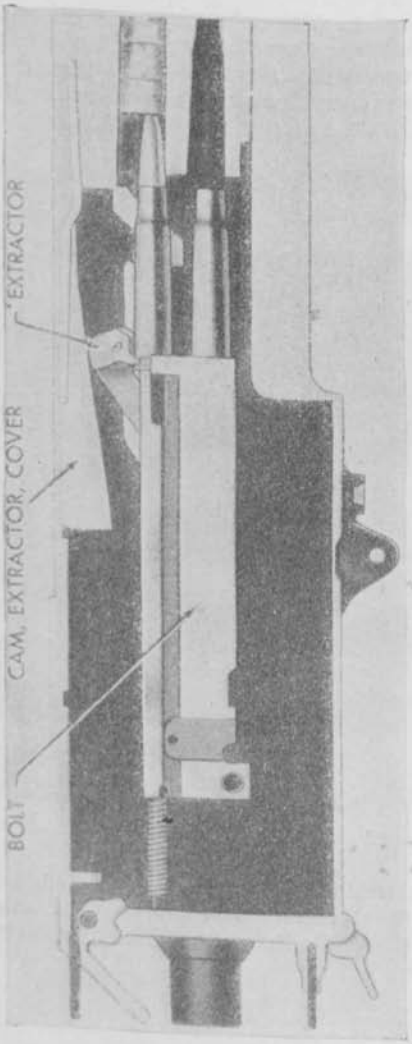


FIGURE 48.—Extractor feeding new round into T-slot on bolt.

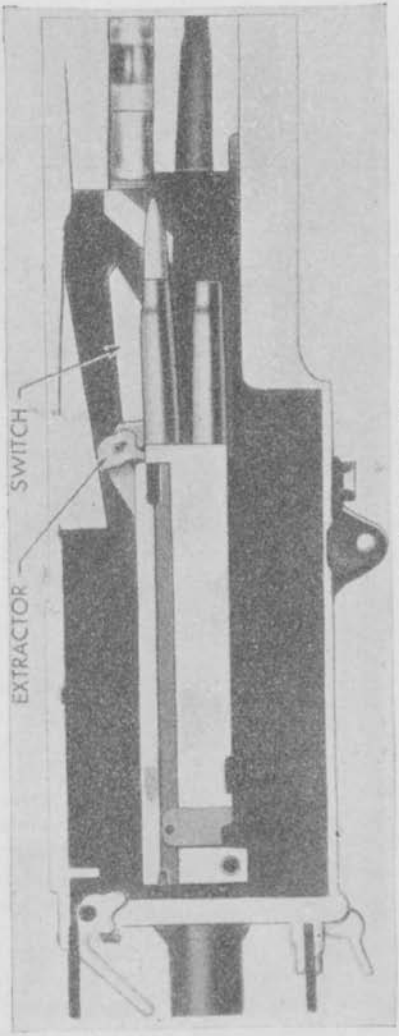


FIGURE 49.—Action of switch.

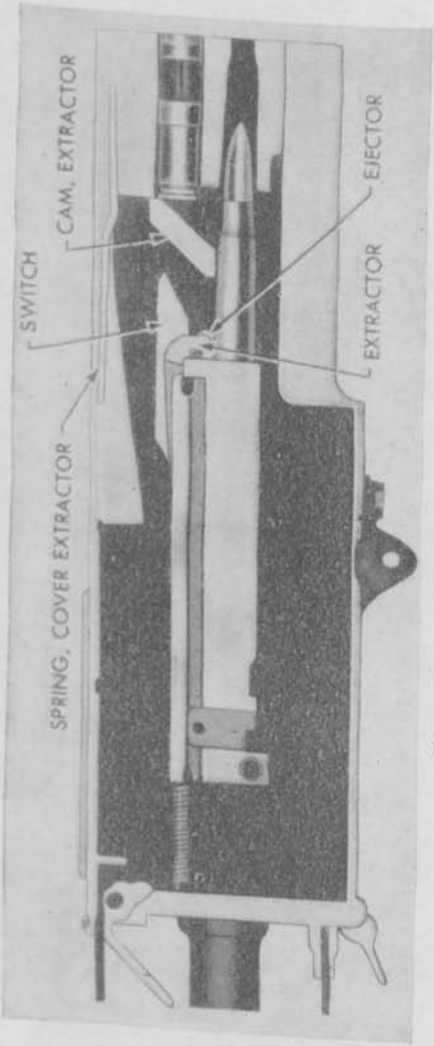


FIGURE 50.—Feeding new round into chamber.

SECTION V

HEAVY BARREL GUN

78. CHARACTERISTICS AND DATA.—*a.* The Browning machine gun, caliber .50, HB, M2, is an air-cooled gun having a much heavier barrel than has the water-cooled gun. Its general appearance may be noted in figure 51. The gun is normally fired in short bursts or in rapid single shots. When used in this manner firing may be continued for an appreciable length of time because the heavy barrel retards overheating. Some of the general characteristics of the gun are:

*Weight of gun	81 pounds.
Weight of barrel	27.5 pounds.
Length of barrel	45 inches.
Number of lands	8.
Twist, right-hand	1 turn in 15 inches.
Overall length of gun	65.125 inches.
Muzzle velocity	2,900 feet per second (approx.) with M2 ammunition.
	2,800 feet per second (approx.) with M1 ammunition.
*Rate of fire	450 rounds per minute (approx.).
Maximum range	7,500 yards (4.25 miles) (approx.).

b. In place of the water jacket on the water-cooled gun, this gun uses a short, perforated barrel support. The heavy barrel is removed from the gun by unscrewing it from the barrel extension and withdrawing it toward the front. This permits removing a hot barrel and installing a cool one without disassembling the remaining mechanism of the gun. The handle assembly, shown just ahead of the barrel support is used for carrying the gun or as a means of turning the barrel when assembling, disassembling, or adjusting the head space. It is moved to one side or down when the gun is being fired. The handle should be disengaged before turning so that head space adjustment will not be altered.

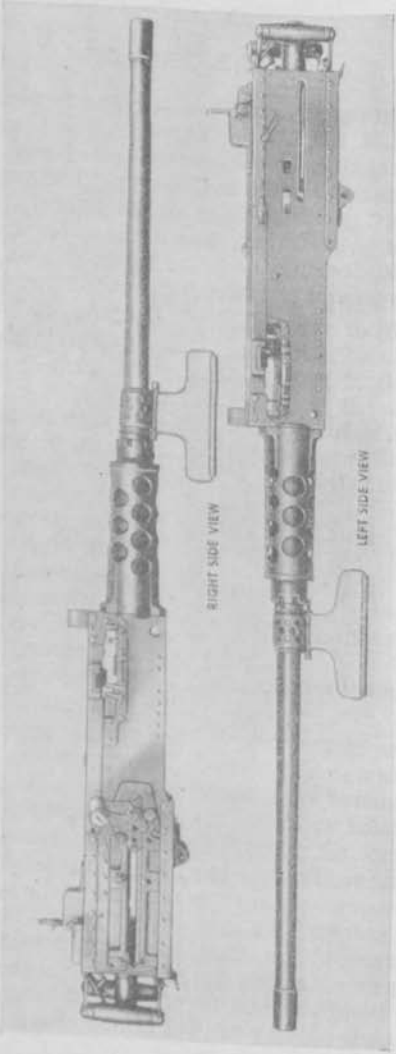


FIGURE 51.—Caliber .50, Machine Gun, HB, M2.

79. BOLT LATCH.—A bolt latch is provided in all flexible heavy barrel guns to allow the gun to be fired semiautomatically. It also serves to hold the bolt to the rear in order to keep the cartridge out of the hot chamber when firing has been suspended. The bolt latch is forced downward by the bolt latch plunger spring. As the bolt reaches its rearward position, the bolt latch engages a notch on the upper rear surface of the bolt and holds the bolt to the rear, thus causing the gun to cease firing (see fig. 52.) The counterrecoil stroke is completed by pressing down on the bolt latch release to raise the bolt latch, thereby allowing counterrecoil to take place. Providing a cartridge is in the chamber, firing will be resumed when trigger action is supplied. If the bolt latch release is held down manually, or if it is locked down by the lock on the buffer tube sleeve, the gun will fire automatically. If the bolt latch release is pressed down but not retained in that position, the gun will fire only once when trigger action is given.

80. SPADE GRIP.—A backplate spade grip assembly is used which includes a buffer tube sleeve assembly and the bolt latch release and spring.

81. OIL BUFFER.—*a.* Since the recoiling portion is much heavier than in the water-cooled gun, its rearward motion is not quite so rapid. It is unnecessary to have restriction in the oil buffer on the recoil stroke. Accordingly, the oil buffer piston valve assembly is omitted from the heavy barrel gun, and the following parts should also be removed if the weapon functions sluggishly:

1 packing, oil buffer gland.
1 ring, oil buffer, packing gland.
1 screw, oil buffer, relief valve.
1 spring, oil buffer, packing gland.
1 spring, oil buffer, relief valve.
1 valve, relief oil buffer.

b. The oil buffer of the heavy barrel gun should not be filled with oil if the above parts are omitted.—With these exceptions the heavy barrel gun is identical with the water-cooled.

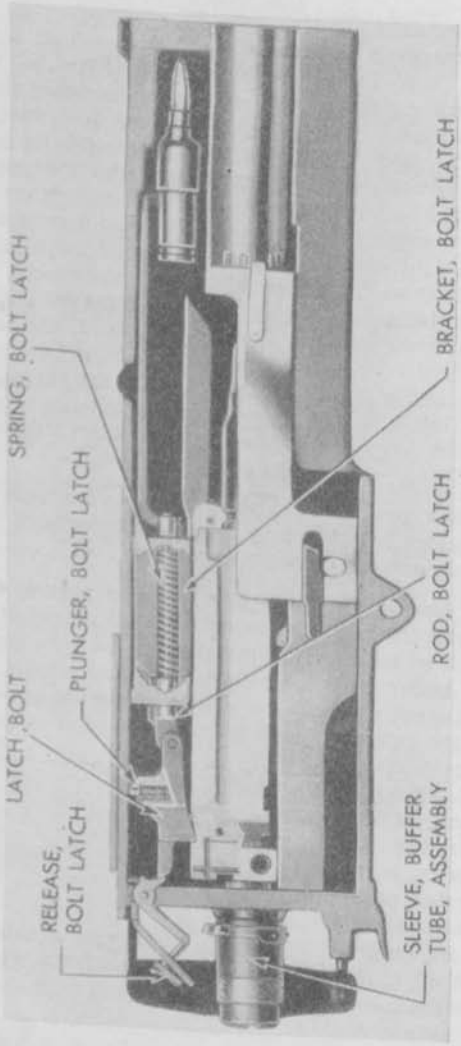


FIGURE 52.—Cut-away view of gun with bolt latch.

■ 82. USES.—The heavy barrel gun is used as an antiaircraft weapon when the saving of weight or space is a primary consideration. The gun is especially suited for turret or truck type mounts where the water-cooled gun with water chest and containers would occupy too much space. It is also well suited for airborne and amphibious operations where the saving of weight as well as space is important. In any situation where the supply of water is limited, the heavy barrel gun may be advantageously employed. Where the gun and the mount have to be carried by the operating personnel into front line positions the heavy barrel gun, because it is lighter than the water-cooled gun and water is not needed, is more suitable.

■ 83. DISADVANTAGES.—The heavy barrel gun quickly overheats when fired in long bursts. This is partially overcome by the speed and ease with which the barrel may be changed. The cyclic rate of the heavy barrel gun is somewhat slower than the water-cooled gun as the increased weight of the barrel slows up recoil. The heavy barrel gun does not function as smoothly as the water-cooled gun when used in a flexible mount. The heavy barrel gun functions best when used in a fixed, nonrecoiling mount.

c - 2. X CHARACTERISTICS OF ANTIAIRCRAFT MACHINE-GUN MOUNTS

	M1	M2	M2A1	M3	M32	M43
Type of mount	Tripod	Tripod or pedestal.	Tripod or pedestal.	Tripod	Truck	Pedestal.
Gun used with mount	Water-cooled	Water-cooled or heavy barrel.	Water-cooled or heavy barrel.	Water-cooled or heavy barrel.	Heavy barrel.	Water-cooled or heavy barrel.
Elevation, maximum, degrees	80	68.75	68.75	90	85	80.
Depression, minimum, degrees	10	15	15	15	10	10.
Traverse, degrees	360	360	360	360	360	360.
Weight of mount complete w/o gun; pounds.	284	391.50	370	350	(Built into truck cab.)	725.
Height at trunnion, inches	65	49	49	37		44.
Armor protection	None	¼-inch shield	¼-inch shield	¼-inch shield	None	½-inch shield

CHAPTER 4

ANTIAIRCRAFT MACHINE-GUN MOUNTS AND SIGHTS

SECTION I

GENERAL

■ 84. GENERAL.—There are several types of antiaircraft machine gun mounts. Although some of the earlier mounts are no longer considered standard, they are in the hands of troops, and still serve the purpose for which they were intended. For this reason, all mounts (except multiple mounts) are discussed briefly in this chapter with particular stress being placed on the standard types. For a complete discussion of multiple machine gun mounts refer to the following manuals:

- *FM 4–157—Service of the Piece, Multiple Machine Gun Power Turrets.
- *FM 4–159—Service of the Piece, Multiple Gun Motor Carriage M15.

■ 85. CHARACTERISTICS.—Some of the general characteristics of the antiaircraft machine gun mounts now in use may be found in the following table:

c - 2 ✗ CHARACTERISTICS OF ANTIAIRCRAFT MACHINE-GUN MOUNTS

	M1	M2	M2A1	M3	M32	M43
Type of mount	Tripod	Tripod or pedestal.	Tripod or pedestal.	Tripod	Truck	Pedestal.
Gun used with mount	Water-cooled	Water-cooled or heavy barrel.	Water-cooled or heavy barrel.	Water-cooled or heavy barrel.	Heavy barrel.	Water-cooled or heavy barrel.
Elevation, maximum, degrees	80	68.75	68.75	90	85	80.
Depression, minimum, degrees	10	15	15	15	10	10.
Traverse, degrees	360	360	360	360	360	360.
Weight of mount complete w/o gun; pounds.	284	391.50	370	350	(Built into truck cab.)	725.
Height at trunnion, inches	65	49	49	37		44.
Armor protection	None	¼-inch shield	¼-inch shield	¼-inch shield	None	½-inch shield

SECTION II

ANTIAIRCRAFT MACHINE-GUN TRIPOD MOUNT M1

■ 86. GENERAL.—The antiaircraft machine-gun mount M1 is of the tripod type in which the cradle and yoke are supported

FIGURE 53.—M1 mount.

on a center support so that the gun can be moved freely by hand in azimuth through 360°. All positions of elevation are allowed from approximately −10° to +80°. A shoulder stock known as the shoulder stock M2 is considered a part of the

tripod mount and is provided for the purpose of assisting the gunner in steadying the gun while firing AA fire. When the locking handle is unscrewed a part turn, the adjusting bracket is free to slide on the center support permitting the tripod legs and lower braces to be folded. (See fig. 53.) This mount is no longer standard.

SECTION III

ANTIAIRCRAFT MACHINE-GUN MOUNT M2

87. GENERAL.—The antiaircraft machine-gun mount M2 was the standard mount for use with the central tracer control sighting equipment. Since the discontinuance of the use

FIGURE 54.—M2 mount with central tracer control sighting equipment.

of the central tracer control equipment, the mount has been used without the sighting equipment for fire by individual tracer control. The M2 mounts now in use have been or will be modified by the removal of the brackets on the right-side plate and the elimination of the sighting equipment. These are considered M2A1 mounts.

■ 88. ADJUSTMENT.—In order to have accurate sustained fire when using this mount, the recoil mechanism and side plate trigger mechanism must be kept in proper adjustment. Improper adjustment affects the rate of fire and causes intense vibration which makes accurate tracking difficult, if not impossible. For complete description and instructions in the adjustment see paragraphs 93 and 94.

SECTION IV

ANTIAIRCRAFT MACHINE-GUN MOUNT M2A1

■ 89. GENERAL.—The antiaircraft machine-gun mount M2A1 differs from the M2 mount only in that it is not equipped with the central tracer control sighting equipment. It is normally assembled with tripod legs, but the tripod legs may be removed and the mount assembled with a pedestal base for use in permanent positions.

■ 90. DESCRIPTION.—The mount consists principally of the pedestal, tripod legs, cradle, pintle, and back rest. (See fig. 55.) It may be rotated in azimuth throughout 360° and elevation limits vary from a minimum of −15° to a maximum of about +69°. A spring recoil mechanism is incorporated in this mount to reduce the intense vibration caused by the firing of a .50 caliber machine gun. This mechanism must be kept properly adjusted. When it is not properly adjusted the gunner is subjected to considerable physical shock and is unable to track the target with any accuracy. The mount is equipped with a trigger lever to be used with a side plate trigger. Improper adjustment of this mechanism and of the recoil mechanism has a serious effect on the rate of fire and on the size of the cone of fire. Adjustments of the recoil and trigger control mechanisms should be made only by designated trained machine-gun personnel.

■ 91. ARMOR SHIELDS.—Armor shields are provided for the protection of gunners. (See fig. 56.) This protection for M2 (and M2A1) mounts, consists of an upper and a lower shield of armor plate, each ¼ inch thick and 32 inches wide. The lower shield is bolted to the pintle of the mount by means of

a steel bracket and is attached by one bolt. The upper shield is bolted to the counterrecoil buffer housing by means of two thumbscrews. Both shields are easily and quickly mounted or removed. The additional weight of the shields causes no appreciable difference in the effort required to traverse the gun. To eliminate any increase in effort required to elevate or depress the gun, a 28-pound bag of lead shot is provided

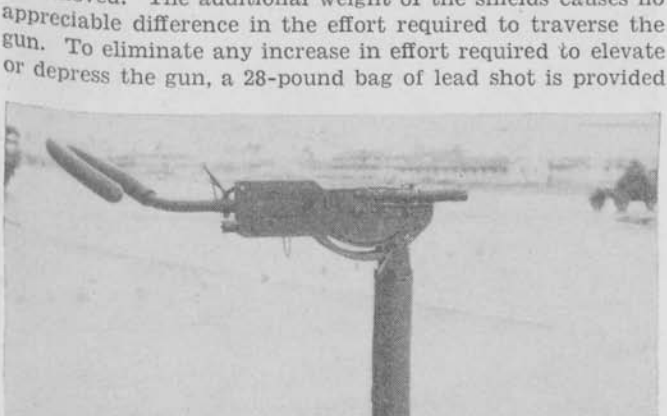


FIGURE 55.—M2A1 mount.

with each shield to be poured into the circular backrest as a counterweight.

■ 92. MANIPULATION.—*a*. The gunner assumes a stance with his feet well apart, his knees slightly bent, and his body leaning slightly backward so that his back exerts a firm pressure against the back rest. He moves the gun in elevation by increasing or decreasing his knee bend, and moves the gun in

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azimuth by short, rapid shifts of his feet along a circle around the mount pedestal. The gun is fired with the left

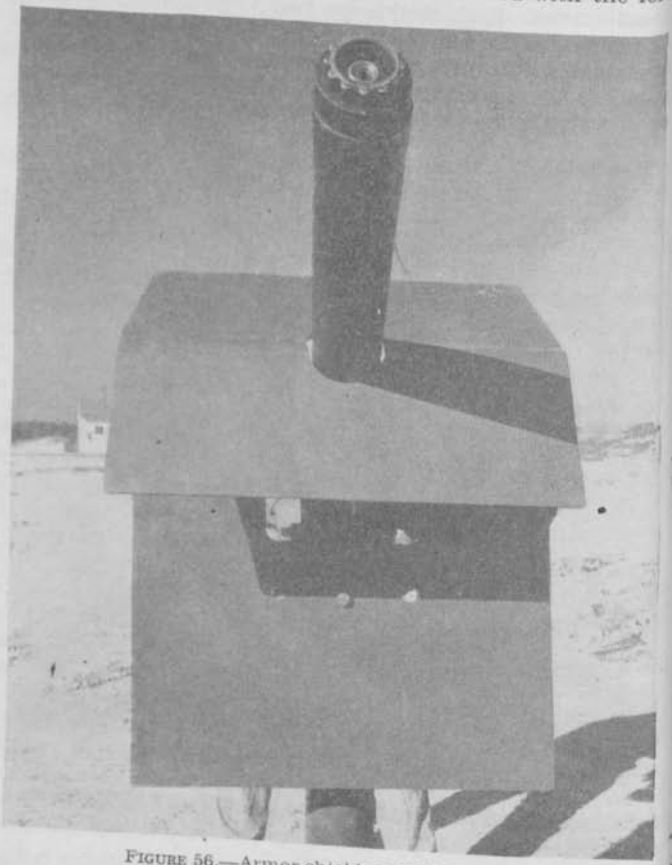

FIGURE 56.—Armor shield on M2A1 mount.

hand and the right hand is used to brace the body by gripping the end of the back rest. (See fig. 57.)

b. Another method of manipulating the mount utilizes the back rest as a lever to elevate and traverse the gun. The

gunner stands inside the back rest. He grasps the rear of the back rest with his left hand and operates the firing lever with his right hand. (See fig. 58.) The gunner's body is turned to the left and he traverses the gun by walking forward or backward around the mount. The gun is elevated or depressed by raising or lowering the back rest with his left hand. Control of the mount is much easier using this method as the gunner does not have to get into an awkward or uncomfortable position to elevate the gun. This method is particularly good when firing from the body of a truck or any other cramped emplacement

93. RECOIL MECHANISM.—*a.* The recoil mechanism consists of three recoil springs, one component spring, two counterrecoil buffer springs, and related guides, slides, and housings. The lower recoil spring and the component spring are housed in the lower recoil spring housing, which is located between the side plates at the rear of the cradle. One upper recoil spring and one counterrecoil buffer spring are located in each of two housings on opposite sides of the trunnion bearing at the front of the cradle.

b. As the gun recoils, the trunnion bearing slides and the lower recoil slide move to the rear, compressing all three recoil springs and the component spring. The built-up spring pressure brings the gun to rest and then returns it to battery during counterrecoil. Counterrecoil is checked by the two counterrecoil buffer springs. Except on the last round fired, the buffer springs are aided at the end of counterrecoil by the impulse of recoil from the next round, which occurs when the barrel extension is within approximately $\frac{1}{32}$ inch of the trunnion block. The purpose of the component spring is to compensate for the weight component of the gun at different elevations. This is accomplished by a gear and rack arrangement which controls the compression of the spring.

c. (1) *Adjustment of counterrecoil buffer springs.*—With trunnion slide assembly set and blocked to hold upper buffer recoil springs at assembled height of $2\frac{3}{32}$ inches, counterrecoil spring adjusting plugs are set so that their front faces (face with the slots) are $7\frac{9}{32}$ inches ahead of the front faces of trunnion slide assembly. The springs are adjusted, when

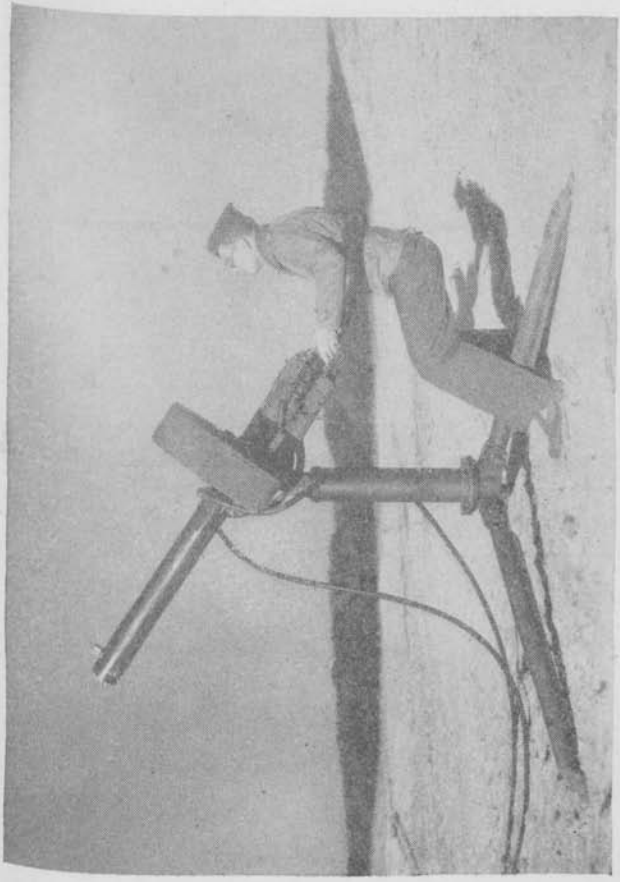

FIGURE 57.—Manipulating M2A1 mount.

FIGURE 58.—Alternate method of manipulating M2A1 mount.

necessary, by screwing in or unscrewing the adjusting plug with a spanner wrench after removing the locking nuts. The locking nuts should be assembled and securely tightened after adjustment. Care should be observed to adjust both springs evenly. The free length of these springs is 6.34±0.01 (approximately 6 5/16 inches).

Caution: If these springs are removed, care should be taken to avoid injury to personnel as the springs are under high tension. (See fig. 59.) If the plug is screwed in too far, the compression of the spring will be increased, thereby checking the gun too early in counterrecoil and affecting the gun's smoothness of operation. If the plug is unscrewed too far, the smoothness of action is aided, but the danger of metal to metal contact when the gun goes into battery is increased due to the reduced resistance of the buffer springs. This adjustment should be made with the gun in the mount.

(2) *Upper recoil springs.*—No adjustment is required. However, the slide guides must be kept lubricated with a light lubricating oil equivalent to SAE 10, 95–115 viscosity at 130° F. An oil hole is provided in the top of the slide.

(3) *Lower recoil spring.*—To make this adjustment remove the plate and head at the rear of the housing and withdraw the component spring and component spring rod. Adjustment of the recoil spring is made by means of a nut inside the housing. Screw this nut in or out until its rear face is 4 7/8 inches from rear end of the housing. Care must be taken to see that the measurement is made from the rear face of the nut and not from the bottom of the wrench slot in the nut. (See fig 60.) This is very important, for if the distance from the rear face of the nut to the rear of the housing is less than 4 7/8 inches, metal to metal contact may occur on recoil at high elevations. After completing the adjustment, reassemble the component spring and rod and the head and plate. Occasionally the adjusting nut should be unscrewed from the housing and the spring and interior of the housing cleaned. The spring should then be covered with a light grease to prevent corrosion.

(4) *Component spring.*—This adjustment is made by means of a plug in the front end of the lower recoil spring housing

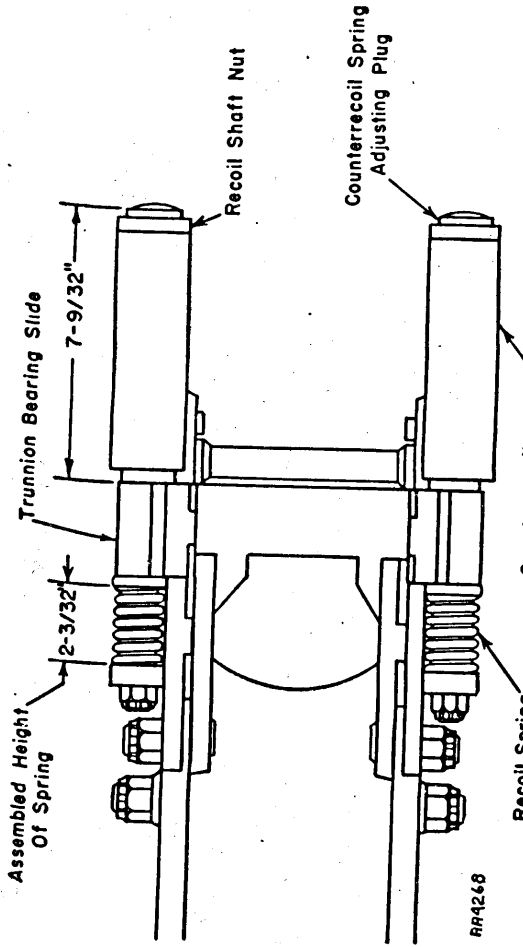

FIGURE 59.—Upper recoil and counterrecoil mechanism.

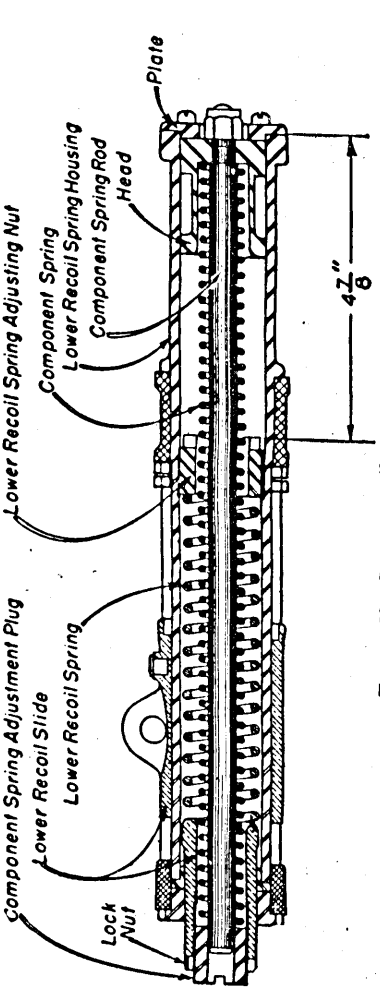

FIGURE 60.—Lower recoil mechanism.

The plug is set so that it will be flush with the lock nut when the lock nut is tightened and secured by bending the lock washer slightly until it fits into the wrench slot. No further adjustment is required.

(5) *Removal of springs.*—In removing springs, care must be taken to prevent injury to personnel. When loosening fittings which hold springs in place, keep personnel not directly engaged in the adjusting operation clear of the path a suddenly released spring might take.

(6) During firing if a gun is vibrating to a greater extent than normal, the length of recoil should be checked by spreading a thin film of grease on the lower recoil spring housing and firing the gun in a horizontal position. The length of recoil should be approximately ½ inch as shown by the distance the grease has been pushed back after the firing of the gun. If the recoil length is more or less than ½ inch, the adjustment of the lower recoil spring should be checked. If adjustment of lower recoil spring is correct or adjustment is made, and recoil length is still too long or short, the adjustment of the component spring should be checked. If the adjustment of the component spring is found to be correct or adjustment is made and recoil length is still too long or short, the gun may have a bad barrel.

94. TRIGGER CONTROL MECHANISM.—*a.* The trigger control mechanism (fig. 61) includes a lever, linkage, slide with lug, frame, and three springs. The lever is mounted on a bracket which is clamped to the back rest bracket on the left side of the cradle. The lever is connected through a linkage to the slide which contacts the side-plate trigger. The slide and two coil springs are supported by a frame which is attached to the left side frame of the cradle. A torsion spring is attached to the lever.

b. In firing, the gunner pushes the lever down by hand against the action of the torsion spring until it rests against the back rest. This movement of the lever, transmitted through the linkage, pulls the slide to the rear. By contact with a lug on the slide, the side-plate trigger slide on the machine gun, which operates the firing mechanism, is also pulled to the rear, causing the gun to fire automatically. A

coil spring in the rear part of the slide provides a yielding connection between the lever and the slide to prevent the trigger firing shock from being transmitted to the lever. A coil spring in the front part of the slide and the torsion spring attached to the lever return the mechanism to the disengaged position when the lever is released, causing the side-plate trigger slide of the gun to return to its neutral position.

c. In assembling the frame of the trigger control mechanism to the cradle side plate, the frame should be so placed that the index line on the upper edge of the frame is opposite the index line on the upper edge of the side plate. If the hand trigger bracket is then secured so that its rear face is 1 1/32 inches from the rear of the back rest bracket, the various parts of the mechanism are in the proper relative position. If this position does not permit proper trigger operation, the frame can be moved to the front or rear not more than 1/16 inch provided the hand-lever bracket is moved in the same direction an equal distance. This adjustment should never be made more than 1/32 inch at a time. Extension of the mechanism will place unnecessary loads on various parts, and contraction of the mechanism will cause loss of part of the lever throw. On some of the newer models of this mount there is a reference mark on the back rest bracket indicating the correct position of the hand trigger bracket. When such is the case, the hand trigger bracket should be brought to this position and not moved from it more than 1/16 inch in either direction. On such mounts the setting of 1 1/32 inches from the rear face of the hand trigger bracket to rear of the back rest bracket is not the correct setting.

d. There is a tubular side plate trigger container fastened to the left side of the cradle. The side plate trigger mechanism, when it is not in use, is kept in this container. The trigger mechanism must remain with the mount at all times as the mechanism from another mount, if used, may result in improper timing.

SECTION V

ANTIAIRCRAFT MACHINE-GUN MOUNT M3

95. GENERAL.—The antiaircraft machine-gun mount, caliber .50, M3 is designed for use with the water-cooled gun, but

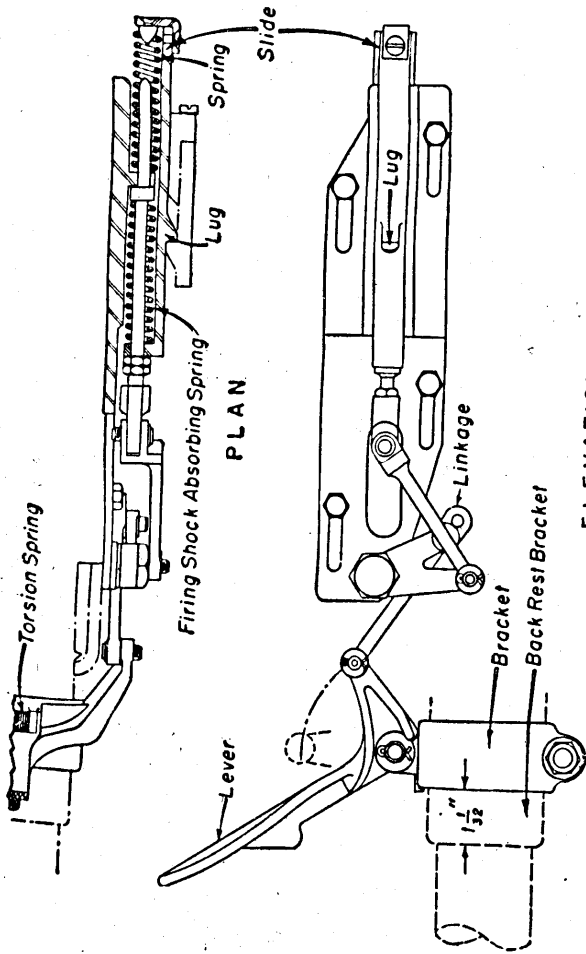

FIGURE 61.—Trigger control mechanism.

may be used with a heavy barrel gun by attaching a counterweight. The mount consists of a relatively short pedestal, supported by three legs, and a revolving pintle which carries the cradle. The gunner is protected by two sections of 26-inch wide, ¼-inch armor plate. One section of the armor plate is mounted across the front of the trigger rack. This section can be swung to one side when placing the gun in the

FIGURE 62.—M3 mount.

cradle. An upper section of armor plate is carried by two supports which straddle the water jacket and are fastened to the pintle. The recoil mechanism of the M3 mount is not as complicated as that of the M2 and M2A1 mounts, and is much easier to keep in proper adjustment. There is no back rest. A multiple trigger rack is used which permits firing at all elevations without altering the gunner's erect position. Elevations from −15° to +90° may be reached without caus-

ing the gunner to get into an awkward or uncomfortable position.

96. EMPLACING.—*a. Assembly of mount.*—The legs fit into openings in the lower part of the pedestal. A lug inside of each opening engages a groove on the end of the leg. This insures proper positioning of the legs when assembling the mount. The three legs and pedestal together compose the lower part of the mount. The pedestal is fitted with a heavy ball bearing, in which the pintle revolves. There is a locking handle on the bearing housing. The azimuth motion should be locked when emplacing the mount. At the top of the pintle is a heavy fitting consisting of two claws and a lug, by means of which the cradle is attached. These two claws and the lug engage corresponding members of the cradle. The cradle is locked firmly in place by the cradle lock.

b. Mounting the gun.—Before the gun is mounted, the azimuth and elevation motions of the mount must be locked. The gun is inserted in the cradle from the front of the mount. It is locked in position by the trunnion bracket pin and the rear gun joint pin. The gun cannot be mounted with the upper armor shield attached to the mount, or with the lower shield in firing position. Care must be exercised in mounting the gun to insure that the side plate trigger is properly engaged by the firing linkage from the trigger rack. The lower armor shield is pivoted into position after the gun is secured in place. The upper armor shield is attached by its two legs to the pintle and secured by two wing bolts. The ammunition chest is mounted on the left side of the cradle. No provision is made for right-hand feed. A link chute is mounted at the right side of the receiver. The gun must be depressed to 15° or elevated above 30° when changing ammunition chests to prevent interference by the upper armor shield.

97. TRIGGER RACK AND FIRING MECHANISM.—The trigger rack is a tubular support for three pairs of hand grips. Rotating any of the three left-hand grips moves a linkage which is connected to the side plate trigger. The gun is fired by turning any one of the left-hand grips in a counterclockwise motion. A knurled knob on the lower left-hand side of the

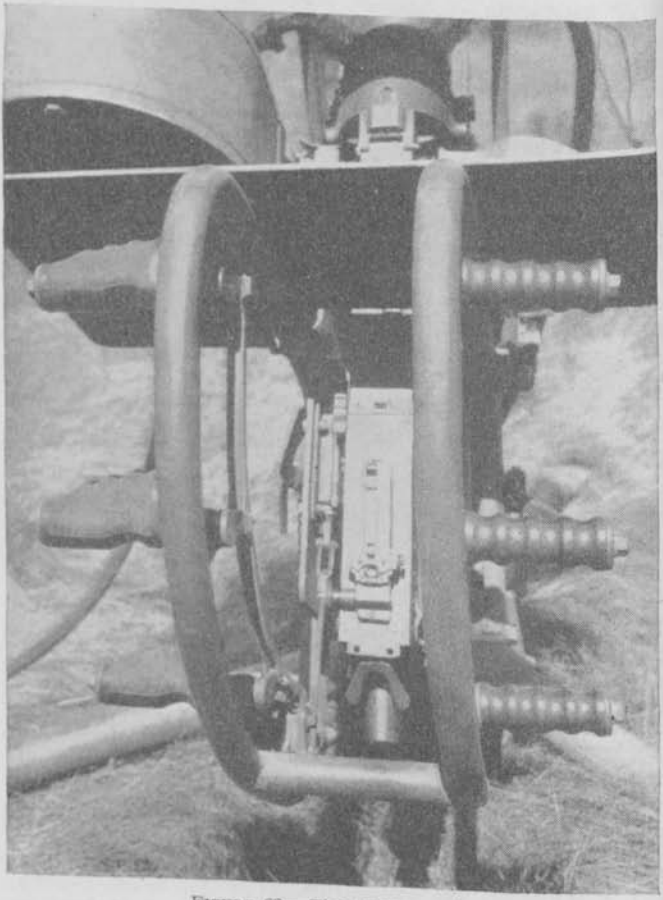

FIGURE 63.—The trigger rack.

trigger rack operates a trigger stop when turned. This is the only safety feature on the mount.

■ 98. RECOIL MECHANISM.—The recoil mechanism is the spring type. Two springs are mounted between recoiling slides. A cross member between the cradle side plates grips the springs and holds them in position. The gun is mounted on the recoiling slides and is held in position by two pins. As the gun recoils, the slide travels to the rear compressing the forward spring. As the gun returns to battery, the rear

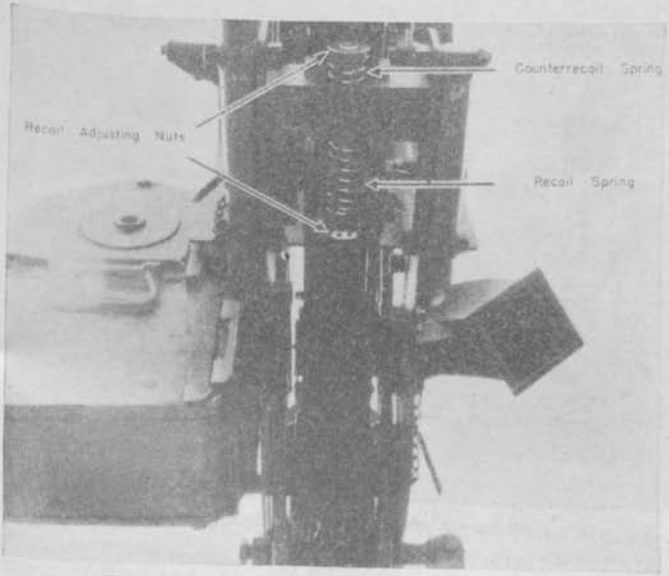

FIGURE 64.—Recoil mechanism of M3 mount.

spring is used to absorb the shock of counterrecoil. The tension in the recoil and counterrecoil springs can be adjusted with a capstan adjusting nut on either end of the recoil spring rod, which adjusts the length and speed of recoil.

■ 99. MANIPULATION.—When firing with the M3 mount, the gunner stands erect and makes changes in elevation by mov-

ing his hands and arms up and down. For changes in azimuth, he merely shifts his feet and moves around the pedestal. At all times he keeps his head well above the upper armor shield so that he may observe the tracers. The gun is fired with the left hand by turning any of the grips on that side of the trigger rack. The top pair of grips is used for fire at high angles of elevation, the middle pair for fire at moderate angles, and the lowest pair for fire at low angles.

FIGURE 65.—Manipulation of M3 mount.

SECTION VI

TRUCK MOUNT M32

■ 100. GENERAL.—The M32 truck mount was developed to fill the need for a gun and mount to provide immediate and effective self-protection for trucks against air attack both on route marches and in bivouacs. This mount carries a caliber .50 machine gun, heavy barrel, above the cab of the truck. There is a well in the roof of the cab. The gun may

be carried ready to fire and can be brought into action during the march or with the truck at a halt.

■ 101. DESCRIPTION.—*a. Mount proper.*—The mount proper consists of a race or large ring, permanently mounted above the cab body, and a skate to carry the gun. The machine gun is mounted on a simple cradle, which is carried in the skate by a yoke and pintle.

FIGURE 66.—M32 mount.

b. Race for skate.—The ring, which is about 3 feet in diameter, comprises a race for the skate. The gunner stands inside the ring and can slew the skate around the ring and lock it in any position. This ring is supported by a welded frame built up of plate and piping. This frame is bolted to the front corners of the truck body. The supporting frame is fastened to the outside of the ring, leaving the inner surface and the upper and lower edges of the ring clear for the skate to move freely.

c. Opening in roof of truck cab.—There is a large opening in the roof of the cab body, centered under the ring. The

edges of this opening are built up and rolled to remove sharp edges.

d. Ammunition.—Three special type ammunition boxes are carried in the angles formed by the support members for the ring. Each box carries two ammunition chests of 50 rounds capacity. Including the rounds in the 50-round chest carried on the gun, the supply of ammunition carried with the gun is 350 rounds.

e. Traveling brackets.—The mount is provided with two traveling brackets: One of these fixes the gun in traveling position across the rear of the mount with the barrel across the truck body to the left. The other fixes the gun in traveling position with the skate and cradle to the front of the ring, the barrel pointed to the left and rear. The gun barrel snaps in and out of the bracket.

■ 102. EMPLOYMENT.—*a.* When traveling on the alert with guns manned, the elevation locking pin may be engaged to keep the gun fixed against the motion of the truck. The pin can be withdrawn instantly for action. There is also an azimuth lock on the pintle.

b. The gun can be fired below the horizontal to the front and around either side to the rear quarter. Fire directly to the rear can only be brought down to the horizontal, due to interference by the front bow. If the truck is on steep ground, this can produce a masked zone for horizontal or low-angle fire which may be serious. When necessary, the truck bows should be removed to permit low-angle fire to the rear.

c. The gun is fired normally by the assistant driver standing in the seat beside the driver. The trunnion is about shoulder high for the average sized gunner. He can fire horizontally to the front very effectively by standing with one foot on the dashboard and the other on the window ledge of the truck door. This raises his body so that he is head and shoulders above the trunnions of the gun, and improves his observation of the tracer stream. Another position for fire against ground targets is for the gunner to sit on one edge of the opening in the cab roof and brace his feet on the far edge. This is especially useful for short men. High overhead fire

is conducted by the gunner squatting down in the seat of the truck.

■ 103. PROTECTIVE COVERING.—The machine gun is provided with a heavy canvas cover, for protection against dust and the elements when the gun is not in use. The canvas cover for the opening in the roof of the cab snaps over the raised and rolled edge of the opening. It is fastened with an

FIGURE 67.—Manipulation of M32 mount.

elastic binding and can be removed instantly. If traveling in good weather, it need not be in place.

SECTION VII

MACHINE-GUN MOUNT M43

■ 104. GENERAL.—The caliber .50 machine-gun mount M43 is a pedestal mount for fixed emplacements. The mount is made up of four major assemblies: pedestal, carriage, cradle and shield, and sight. The weight of mount complete with sights, but without gun or ammunition chest, is 725 pounds.

The mount is designed for the caliber .50 M2 type machine gun when employed from a fixed position. Armor is provided for full protection of the gunner's body. A hole in the upper portion of the armored shield is located in such a position that the gun may be sighted without interference from the shield. A wheel type forward area sight is provided and is mounted on the gun. The heavy barrel gun

FIGURE 68.—M43 mount.

may be used with this mount. Each type of barrel requires a particular equilibrating spring. A reversible name plate located on the sight storage box should indicate at all times the kind of equilibrating spring in place in the pedestal tube.

■ 105. OPERATION.—*a*. The weight of the shield, gun ammunition chest, and ammunition is equilibrated at all angles by means of a helical spring. The helical spring is contained in the pedestal tube.

b. The gun must be equipped for *left-hand* feed and *right-hand* charging with retracting slide grip assembly and with double spade grip backplate.

FIGURE 69.—Manipulation of M43 mount.

69.1 (Added)

c. The mount is traversed by hand through 360° and elevated from −10° to +80°.

d. The mount is provided with a back strap and two shoulder stocks (fig. 68). The back strap, made up of two heavy

leather straps, is so joined as to provide support for the back of the gunner's hips and buttocks. The back strap is most useful when firing at angles of high elevation as it provides support for the gunner's body. The length of the back strap may be adjusted to suit the requirements of the individual gunner by threading the shank of the hock through one of the oblong links of the chain and thence to the spool nuts located on the outside side plate at the rear. One or both of the back strap chains may be shortened in this manner. The shoulder stocks may be adjusted laterally to fit the individual gunner.

e. An adjustable depression stop, located on the right side of the carriage casting to the rear, may be set by means of a locking nut to prevent the mount being depressed below the safe angle determined by the requirements of the gun emplacement.

f. The carriage is locked both to the pedestal in traverse and to the side plate of the cradle in elevation by a single lever on the right side. The lever is held in the unlocked position by a stop and spring clip. Pulling the lever to the rear and up locks the carriage in both traverse and elevation. The lever can be adjusted by removing a spring pin from the locking nut and relocating the locking lever in the required position.

■ 106. PEDESTAL.—*a.* The pedestal is built up of ½- and ⅜-inch mild steel plate and tube, welded. The diameter at the base is 30 inches. The base is bolted to its foundations through six ¾-inch bolts. The vertical tube is supported by webbing welded to the base and tube (fig. 68). The top of the tube is machined to accommodate a four-way thrust ball bearing race housing.

b. The pedestal tube contains the equilibrator spring. The amount of spring compression may be varied to suit the gunner by adjusting the connecting rod. The lower end of the connecting rod is attached to a cross head at the top of the spring. The upper end is threaded into a trunnion block in the cradle. The connecting rod must not protrude more than ½ inch beyond the top of the trunnion block. This is necessary to provide adequate clearance for the cradle.

c. Balance or equilibration of cradle and shield may be readily adjusted in the field. The balance is adjusted as follows:

(1) Release jam nut on connecting rod.

(2) Turn rod (by hand or with wrench) to right to decrease spring tension or to left to increase spring tension.

(3) Tighten jam nut when desired balance is reached.

■ 107. CARRIAGE.—The carriage is a one-piece high strength casting. The base of the carriage forms the upper half of the main bearing race housing. The adjustable depression stop is located on the right rear of the casting. The carriage supports the trunnion to which the cradle is attached.

■ 108. CRADLE AND SHIELD.—The shield is constructed of ½-inch armor plate. The cradle consists of two outside side plates and two inner plates, held in position by spacer tubes. The mounting of the cradle has no recoil absorbing device and the inner plates are rigidly fixed to the outside side plates. A cartridge case chute fastened to the inner plates of the cradle, conducts the spent cartridge cases, when ejected from the gun, to an opening in the shield. A baffle extending downward from the forward end of the cradle causes the spent cartridge cases to drop to the ground. The gun is mounted on the cradle with the backplate removed but with the retracting handle in place. The breech end of the gun is inserted through the hole in the shield, twisting the gun in order to pass the retracting handle. Mounting points and pins are designed to accommodate all models of basic caliber .50 Browning machine guns.

■ 109. SIGHTS.—*a.* The sights are assembled to the gun and are provided with the mount.

b. The rear sight is fixed to the top plate of the machine gun by three machine screws set into standard holes in the top plate of the gun receiver used for other types of rear sights. The rear sight assembly consists of—

(1) A high strength cast bracket including a sight testing and adjustment device.

(2) A sight assembly consisting of a rear sight cross wire ring and retainer, a rubber eyepiece, and a sunshade or sun

filter device consisting of two lenses of duplex nonshatterable glass, each of a different tint, either of which or both may be used at the same time.

c. The front sight is a wheel-type forward area sight with 100, 200, and 300 knots per hour speed rings. It is held in place on the water-cooled gun by links which fit over the trunnion at the rear of the barrel water jacket. For a complete discussion of the use of the sight, refer to FM 4–151.

d. The forward sight ring, together with a spare sight ring, is stowed, when the mount is not in use, in a box welded to the lower right-hand corner of the shield.

e. To mount the forward sight ring, insert the stud all the way into the holding bracket with flat surface on stud forward, making sure that shoulder on stud is against top edge of bracket, then pull down the locking lever tightly.

f. To adjust sights.—(1) Set the mount level.

(2) Erect a target surface at right angles to the axis of the bore. The target surface should be approximately 6 feet in height and 25 feet from the rear sight cross wires.

(3) Set elevation of gun so that the axis of the bore is perpendicular to target surface and lock the mount.

(4) By sighting through the gun barrel, mark center of gun bore on the target surface.

(5) From center of bore as marked on the target surface, erect a vertical line 15 21/32 inches..

(6) At the end of the vertical line, construct a horizontal line to the right a distance of at least 2 inches.

(7) Intersect the horizontal line with a perpendicular line 2 inches from the vertical line mentioned in (5) above.

(8) This intersection locates the "sighting point" on which the sights are to be alined.

(9) Loosen upper two cap screws on back side of the rear sight housing. Keep sufficient tension on screws to hold surfaces of bracket and adjusting block together.

(10) Insert and tighten locating screw in front face of rear sight bracket housing in hole marked "TESTING."

(11) Insert forward sight ring, bringing stem against top surface of housing and tighten with clamp screw.

(12) Loosen bottom cap screw on back side of rear sight

housing holding sufficient tension with screw to keep surfaces of adjusting block and housing together.

(13) Coincide rear and front sight center cross wires with "sighting point" on target by adjusting rear sight in vertical position by means of screw in bottom of housing.

(14) Front and rear sights have been manufactured to line up in horizontal position without adjustment. If the front and rear sights do not line up with the target when the gun bore is in line with its mark on the target board, it is because the sight parts have been damaged by being sprung from position. This can be rectified by carefully springing the sight at fault into position.

(15) When front and rear sight cross wires line up with mark on target board, tighten lower cap screw on back side of rear sight housing.

(16) Remove locating screw from hole marked "TESTING" and reinsert it in hole marked "FIRING" and tighten.

(17) Tighten upper two cap screws on back side of rear sight housing. The gun mount is now ready for firing.

■ 110. LUBRICATION.—*a.* Grease is used throughout for lubrication of the mount. The mount is equipped with Alemite type grease connections at all points where greasing is required.

b. A grease gun, push type, 3-ounce capacity, supplied with each mount, is mounted on a spring clip holder on the pedestal.

c. The carriage bearing should be packed with grease only through the grease gun fitting located on lower flange of carriage casting.

Sec. * Section VII½. (Added)

SECTION VIII

ANTIAIRCRAFT MACHINE-GUN SIGHTS

■ 111. GENERAL.—Machine guns are fired using individual tracer control. It is desirable that the gunner be furnished a sight to enable him to place his initial fire close to the target, thereafter making adjustments by observation of the tracers. Sights are usually issued with each mount. The sight described in paragraph 109 is used exclusively on the M43 mount. Other type sights are described below and in FM 4-151.

112. RING SIGHTS.—*a.* The ring type sight shown in figure 70 is the M1A1 sight for antiaircraft machine guns. It may be used with any water-cooled gun. It is mounted onto the water jacket and clamped into place by two capstan type screw-in clamps. The forward element of the sight consists of four concentric circles mounted on supports. The rear element of the sight is merely a ½-inch peep ring on a support. For a complete discussion of the use of antiaircraft machine-gun sights see FM 4–151.

b. There are no adjustments, either laterally or vertically,

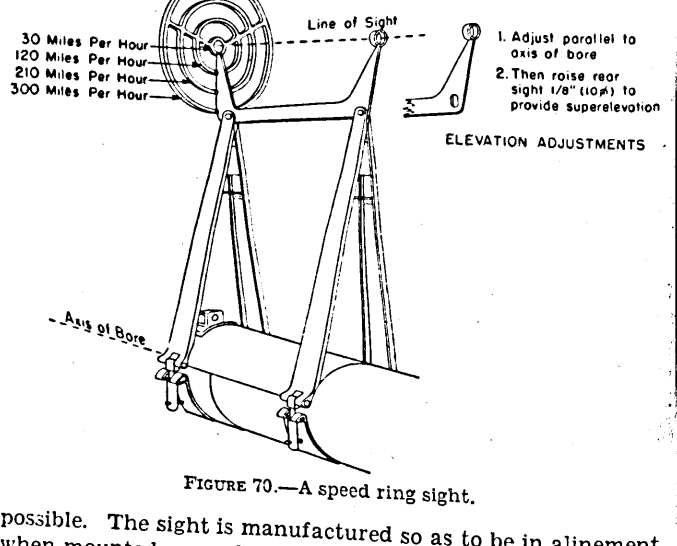

FIGURE 70.—A speed ring sight.

possible. The sight is manufactured so as to be in alinement when mounted properly on a water-cooled gun. If the sight is checked and found to be not in alinement it is probably due to the fact that it has been bent or damaged. An attempt should be made to force the bent or damaged element of the sight back into its proper position. The sight as manufactured includes no superelevation, but by elongating the hole at the rear end of the sight bar it is possible to take care of superelevation. (See fig. 70.)

■ 113. *Alinement Sights.*—An alinement sight is issued for use with the M3 mount and may be used on any water-cooled gun. (See fig. 71.) The front element of the sight is merely a small center alinement ring supported in a larger ring. The outer ring may be used to help estimate an initial lead. It is a 300 mile per hour midpoint speed ring. The rear element is

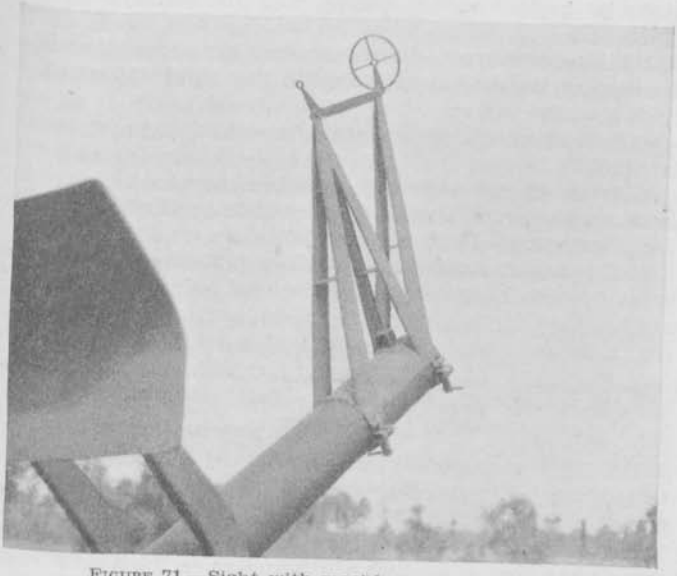

FIGURE 71.—Sight with machine gun mount M3.

merely a peep ring. The sight can be adjusted in the same manner as described for the ring sight. (See fig. 70.)

CHAPTER 5

ANTIAIRCRAFT MACHINE-GUN AMMUNITION

SECTION I

TYPES

■ 114. CLASSIFICATION.—Based upon use, the principal classifications of the ammunition used in the caliber .50 antiaircraft machine gun are:

a. Ball.—For use against personnel and light material targets.

b. Armor piercing.—For use against armored vehicles, concrete shelters, and similar bullet resisting targets.

c. Incendiary.—For incendiary purposes.

d. Tracer.—For observation of fire and incendiary purposes. Another type provided for special purposes is dummy ammunition for training (cartridges are inert). The M1 tracer ammunition is so loaded that a velocity is obtained that will make the trajectories of the ball, armor piercing, and tracer cross at 1,000 yards. Tracer ammunition burns out at a range of about 1,850 yards.

■ 115. IDENTIFICATION.—*a.* Even though the caliber .50 cartridges are not marked or stamped to indicate the type or model, each may be identified as described below. In general, the only stamping on the cartridge is the manufacturer's initials and year of loading which appear on the base of the cartridge case. On lots manufactured prior to 1940, "Cal. .50" is also stamped on the base of the cartridge case. However, the marking on all original packing containers, both boxes and cartons, clearly and fully identifies the ammunition except as to grade. In addition to the marking, colored bands painted on the ammunition boxes, and on carton labels, provide a ready means of identification as to type.

b. When removed from their original packing containers, cartridges may be identified, except as to ammunition lot number and grade, by physical characteristics as described

below. Care should be taken not to confuse these original markings with any subsequent markings made with lithographic marking ink, which is used for an entirely different purpose. (See par. 126.)

(1) *Ball.*—Cartridge, ball, caliber .50, M2, is the standard ball ammunition for this weapon. All caliber .50 ammunition have bullets with gilding metal jackets (copper-colored).

(2) *Armor piercing.*—All models of caliber .50 armor piercing ammunition may be distinguished by the nose of the bullet which is painted BLACK for a distance of approximately 7/16 inch from the tip.

(3) *Tracer.*—Caliber .50 tracer ammunition may be identified by the nose of the bullet which is painted RED for a distance of approximately 7/16 inch from the tip.

(4) *Incendiary.*—Caliber .50 incendiary ammunition may be identified by the light BLUE paint on the tip of the bullet.

(5) *Dummy.*—Caliber .50 dummy cartridge may be identified by a hole in the body of the cartridge case.

■ 116. LOT NUMBER.—*a.* When ammunition is manufactured, an ammunition lot number which becomes an essential part of the marking is assigned in accordance with pertinent specifications. This lot number is marked on all packing containers and on the identification card inclosed in each packing box. It is required for all purposes of record, including grading and use, reports on condition, functioning, and accidents in which the ammunition might be involved. No lot other than that of current grade appropriate for the weapon is fired.

b. Since it is impracticable to mark the ammunition lot number on each individual cartridge, every effort must be made to maintain the ammunition lot number of the cartridges once they are removed from their original packing. Cartridges which have been removed from original packing and for which the ammunition lot number has been lost are placed in grade 3. Therefore, when cartridges are removed from their original packings they must be marked so that the ammunition lot number may be preserved.

■ 117. IDENTIFICATION CARD.—An identification card showing the quantity, type, caliber, model, ammunition lot number,

and manufacturer is sealed inside the metal liner on top of the ammunition in each box.

■ 118. MARKING.—*a.* Color bands painted on the sides and ends of the packing boxes further identify the various types of ammunition. The following color bands are used:

Cartridge, armor piercing	Blue on yellow
Cartridge, ball	Red
Cartridge, ball and tracer, in metallic link belt	Composite band of yellow, red, and green stripes (yellow on left, red in center, green on right)
Cartridge, blank	Blue
Cartridge, dummy	Green
Cartridge, tracer	Green on yellow
Cartridge, incendiary	Red on yellow

b. Carton labels are similarly marked to show the quantity, type, caliber, model, ammunition lot number, and manufacturer. Color stripes similar to those on the packing boxes are also printed on the labels, except that for blank ammunition the label itself is blue and for dummy ammunition it is green.

SECTION II

CARE OF AMMUNITION

■ 119. HANDLING AND PRESERVATION.—*a.* Ammunition boxes must not be opened until the ammunition is required for use. Ammunition removed from the airtight container, particularly in damp climates, corrodes and becomes unserviceable.

b. The ammunition must be protected from mud, sand, dirt, and water. If it gets wet or dirty, wipe it off at once. Verdigris or light corrosion must be wiped off. Cartridges must not be polished to make them look better or brighter.

c. The use of oil or grease on cartridges is prohibited.

d. Do not fire cartridges with loose bullets or other defects.

e. Ammunition must not be exposed to the direct rays of the sun for any length of time. This seriously affects its firing qualities.

f. Whenever cartridges are taken from cartons and loaded into belts, the belts are tagged so that the ammunition can

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f. Whenever cartridges are taken from cartons and loaded into belts, the belts are tagged so that the ammunition can

be identified as to lot number. Tagging is necessary in order to preserve the grade of the ammunition.

■ 120. STORAGE.—*a.* Whenever practicable, small-arms ammunition is stored under cover. This applies particularly to tracer ammunition which is subject to rapid deterioration if it becomes damp, and may even ignite spontaneously. When necessary to leave small-arms ammunition in the open, raise it on dunnage at least 6 inches from the ground and cover it with a double thickness of tarpaulin. Suitable drainage trenches should be dug to prevent water flowing under the pile.

b. If practicable, tracer ammunition should be stored separately from other ammunition.

c. If tossed into or placed in a fire, small-arms ammunition does not explode violently. There are small individual explosions of each cartridge, the case flying in one direction and the bullet in another. In case of fire, keep personnel not engaged in fighting the fire at least 200 yards from the fire and have them lie on the ground.

d. Cartridges which have been coated with lithographic ink to identify the hits of particular gunners on a target should have the ink removed before returning the ammunition to storage.

■ 121. INSPECTION.—Ammunition must be carefully inspected immediately after belting and then placed in ammunition boxes to protect it against damage in handling. Inspection of ammunition should include the following:

a. See that each round is serviceable; that is, that there are no loose rounds (bullets loose in case), short rounds (bullets pushed too far into the cartridge case), thick or thin rims, inset primers, or split, battered, or dented cases. Short rounds can be readily determined by stretching out the loaded belt and placing the bases against one flat board, resting a second flat board against the bullet points, and noting the rounds which do not touch the second board. Thick or thin rims are observed by comparison with the rims of adjacent rounds. Cases with mouth splits may be detected by exerting a bending force on the bullet. An empty cartridge case placed over the bullet aids in this inspection. Body or shoulder

splits may be detected by pressing on the cartridge case near the bullet. Inset primers are primers set too far in from the base of the cartridge.

b. See that the cartridges are properly alined in the belts.

c. See that the proper proportion of tracer, armor piercing, or incendiary ammunition is contained in each belt.

d. See that the web belts are clean and dry and have no torn loops and that the links of link belts are not bent or battered.

e. See that the belts are loaded for left-hand feed so that when the points of the bullets are toward the front and the flat side of the links is down, the double loop of each link will be to the right. When loading for right-hand feed, the double link must be to the left.

f. Ammunition should not be handled more than necessary.

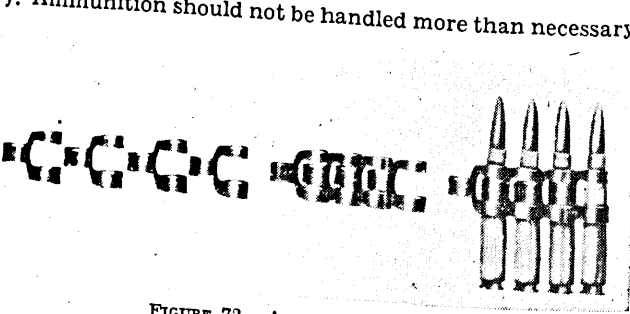

FIGURE 72.—Ammunition links.

If, for any reason, ammunition is removed from belts and later rebelted it should again be inspected when the belting operation is completed.

g. Check ammunition links to be sure they are not sprung or bent out of shape before reusing them. LINKS MUST NEVER BE REUSED MORE THAN THREE TIMES.

SECTION III

BELTING OF AMMUNITION

■ 122. MACHINE-GUN BELTS.—There are two types of antiaircraft machine-gun ammunition belts, the metallic link belt and the canvas web belt.

a. Metallic links.—Metallic links are used to assemble a series of single cartridges to form a flexible ammunition belt. The links nest together and are held in place by the inserted cartridge. (See fig. 72.) In this way, a belt of any length may be assembled. A belt when assembled has a single unused link on one end and a double link on the other. When loading, the double end is fed into the gun.

b. Canvas web belt.—The canvas web belt holds 100 rounds of caliber .50 ammunition. The loops for the twenty-fifth,

FIGURE 73.—Caliber .50 fabric belts.

fiftieth, seventy-fifth, and one hundredth rounds are marked so as to provide ready reference marks. The loops are woven to the shape of the cartridge so that it is difficult for a cartridge to be accidentally loosened. The belts are factory loaded with ammunition, and are issued in watertight chests holding two loaded belts containing 200 rounds of ammunition. The belt has a double loop at one end and a single loop at the other so that by nesting the single loop end of one belt into the double loop end of another and inserting

■ 125. PLACING AMMUNITION IN CHESTS.—*a.* In loading ammunition link belts into M2 ammunition chests, the end of the belt having the open single loop is rolled on the reel and the remainder of the belt folded into the body of the chest so that the end with the double loop lies on top ready to be fed into the receiver. (See fig. 75.)

b. If it becomes necessary to reload a canvas web belt into one of its ammunition chests, it should be folded into the

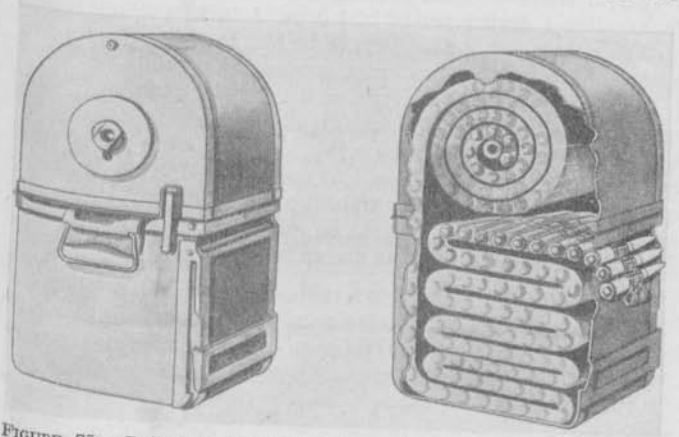

FIGURE 75.—Cut-away view of caliber .50 ammunition chest M2 showing correct method of folding ammunition belt.

chest so that the end to which the feeding tongue is attached is on top ready to be fed into the receiver. Sealed ammunition chests containing canvas web belts are loaded ready for use.

SECTION IV

METHODS FOR MARKING BULLETS

■ 126. GENERAL.—The procedure for marking bullets to permit identification of hits on towed targets, which was mentioned in paragraph 36, is contained in the paragraphs below. The best results with marked bullets are obtained when firing on a white target. Blue and green marking fluids on caliber .30 bullets leave markings on red targets which can be readily

identified in bright sunlight, but orange markings are unsatisfactory. Caliber .50 bullet markings on a red target are in general more difficult to distinguish. This is apparently due to the powder smudge deposited on the bullet when it is fired.

■ 127. PREPARATION OF MARKING FLUIDS.—*a.* The mixture selected as a marking fluid must mark the bullets with a thin, evenly distributed, solid coating of color which will become tacky after a drying period of 1 day. A tacky coating is one that is sticky, yet not so dry as to fail to mark the fingers when touched with a moderate amount of pressure.

b. Lithographic ink, a type of printer's ink, thinned to a proper consistency with commercially pure spirits of turpentine, is a satisfactory marking ink. Lithographic inks (Government Printing Office formulae as indicated below) in four colors: red, orange, green, and blue are used by antiaircraft artillery units. The amounts of inks to be mixed with one pint of spirits of turpentine are as follows:

Red, formula No. 11257—11 ounces.
Orange, formula No. 11256—2 pounds 3 ounces.
Green, formula No. 11258—3 pounds 4 ounces.
Blue, formula No. 11259—1 pound 8 ounces.

To obtain the correct drying rate, add a small amount of castor oil in the ratio of about 1 tablespoonful to 1 pint of ink mixture. Some experimentation, however, may be necessary to determine the proper amount of castor oil to use, since atmospheric conditions, which control the drying rate, vary from place to place and in a given place at different times of the year.

c. If the formula numbers above are not used, or mixing ratios are unknown, prepare each mixture of lithographic ink and spirits of turpentine to a consistency approximately that of heavy cream. Experiment with small amounts of the different inks and spirits of turpentine to determine the proportion to be used. It is necessary to repeat the experimentation for each color, for the viscosity is not the same in each case nor do like quantities of the different inks weigh the same. The mixing ratios given above may be of assistance in

determining proper mixing ratios for unknown inks. A simple means of checking the relative viscosities of different ink mixtures is to put several drops of each mixture on a clean pane of window glass, tilt the glass to an angle of about 45°, and observe the rates of flow.

■ 128. CLEANING BULLETS.—Before attempting to apply the marking fluid, wipe all grease and dirt from the bullets with a cloth moistened with turpentine. The ink does not adhere unless the bullets are clean.

■ 129. PROCEDURE IN MARKING CALIBER .30 BULLETS.—Either of two methods may be used, depending upon the amount of ammunition to be marked.

a. The first method is used when more than one belt of ammunition is to be marked. Coil up each loaded ammunition belt tightly, keeping the points of the bullets in the same plane, and tie securely with stout twine. Carefully dip the bullets to a depth of about ⅜ inch into a flat shallow pan, such as a lard can cover, which is level and contains the marking fluid. After dipping, place the coiled belt, with bullet points down, on a piece of newspaper or other absorbent material, and allow to drain. After about 5 minutes, move the belt to a clean part of the paper and again allow to drain. Repeat this after 10 minutes, and again after 15 minutes. By this time the draining process should be practically complete and the bullets, still in the coiled belt and with points down, are left to dry until the next day. The purpose of this draining and moving process is to remove the excess ink which gathers at the points of the bullets. Failure to do this may change the trajectory of the bullets.

b. The second method is used when one belt or less of ammunition is to be marked. Tack the loaded belt along a piece of 2- by 4-inch timber so that the points of the bullets extend beyond the edge about ⅛ inch. Next, support the timber at each end, by any convenient means, with the bullets pointing down. With a small receptacle containing marked fluid to a depth of about ⅜ inch, mark each bullet separately. The bullets stand away from the timber, permitting this operation. After marking, place the timber, with the loaded belt still attached, on a piece of newspaper or other

absorbent material so that the bullets are resting on their points, and proceed with the draining process as in the first method. This method of marking bullets is fairly rapid and is economical in the use of the marking fluid.

■ 130. PROCEDURE IN MARKING CALIBER .50 BULLETS.—A caliber .50 ammunition chest contains 200 rounds of ammunition. One hundred rounds, in the metallic link or fabric belt, may be conveniently marked in one dipping. The number of rounds to be marked is divided into sections of 100 rounds or less, and dipped and drained in the manner prescribed for the first method of marking caliber .30 bullets. Several rounds are marked separately and, after drying, are used to join 100-round sections into 200-round belts. The caliber .50 bullet is marked to a depth of about ½ inch measured along the ogive from the point.

■ 131. DRYING PERIOD.—Bullets marked on the day before the firing should become dry enough on the day of firing to permit handling and yet remain sufficiently tacky to afford excellent target-marking results. If necessary, the period of time between marking and firing may be extended to 3 days and still afford target markings which can be identified. The 1-day drying period, however, is considered the best. After a period of more than 3 days, the markings cannot be depended upon, and the bullets should be cleaned and remarked. Dry-cleaning solvent may be used effectively in cleaning marked bullets.

■ 132. MISCELLANEOUS.—*a.* It is considered impracticable to furnish prepared ink mixtures in lieu of the ingredients for mixing, for the reason that ready prepared mixtures would not have a drying rate satisfactory for all climates and all conditions.

b. When mixing the ingredients, stir thoroughly.

c. Four colors of ink normally suffice. Should a fifth identification be required, unmarked bullets can be used.

d. The approximate quantities of marking materials required for caliber .30 ammunition are:

(1) *Inks, lithographic.*

(a) *Red (Formula No. 11257).*—One pound for the first 1,000 rounds plus ⅓ pound for each additional 1,000 rounds.

(b) *Orange (Formula No. 11256).*—Three times the quantity required for red ink.

(c) *Green (Formula No. 11258).*—Five times the quantity required for red ink.

(d) *Blue (Formula No. 11259).*—Two times the quantity required for red ink.

(2) *Spirits of turpentine.*—Three pints for the first 1,000 rounds plus ⅜ pint for each additional 1,000 rounds.

(3) For marking caliber .50 ammunition, the quantities of ink and turpentine required are twice those necessary for marking caliber .30 ammunition.

(4) The quantity of castor oil required varies with climatic conditions. Normally 1 quart is sufficient for either caliber of ammunition for the entire training period.

CHAPTER 6

CARE AND MAINTENANCE

SECTION I

ROUTINE MAINTENANCE

■ 133. GENERAL.—It is essential that the gun and mount are maintained at all times in the best possible condition. They must always be kept clean and all unpainted parts covered with a light coating of oil. Accessories and ammunition must also be given careful attention. All parts of the gun are cleaned and lubricated daily and after firing. If there has been no firing, all parts handled during instruction periods should be cleaned and lubricated immediately. When in a combat zone, a cleaning schedule must be maintained so that only one gun is out of action at any one time. The guns must also be cleaned for at least 1 week after all firing is completed, the cleaning being repeated daily until sweating has ceased. Particular care must be employed in damp climates, during damp or rainy weather, or when the matériel is used at night.

■ 134. CLEANING BORE.—*a.* The bore is the part of the machine gun requiring the most careful attention. To clean the bore, the gun is disassembled. Thoroughly wipe the bore with cotton gun cleaning patches, wet with rifle bore cleaner, continuing the operation until several successive patches go through the bore without being soiled. When rifle bore cleaner is not available, an alternate method is to pump hot water and issue soap, or hot water and soda ash, through the bore. The use of rifle bore cleaner is preferred because of its effectiveness, combined with faster and easier application and a limited rust-preventive ability.

Caution: Rifle bore cleaner will freeze at temperatures below 32° F. If frozen, it must be thawed and shaken well before using. Closed containers should not be filled to more

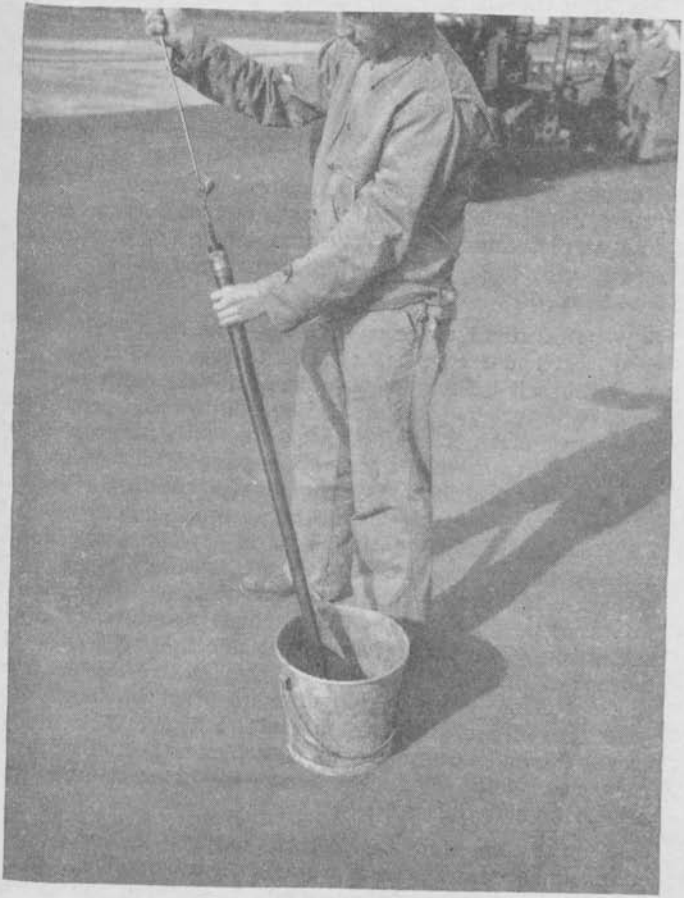

FIGURE 76.—Cleaning bore.

than 75 percent of capacity in freezing weather. Completely full containers will burst when contents freeze.

b. After thoroughly cleaning, wipe the bore dry by passing clean, dry patches through it, and apply a film of light preservative lubricating oil. Before firing again, run dry patches through the bore to remove oil and any dust and dirt which may have collected.

c. Inspect daily and repeat above treatment until bore shows no signs of corrosion.

d. The soda-ash solution is prepared by dissolving ½ to 1 pound, depending upon the strength desired, of soda ash, in 1 gallon of boiling water. The soda ash stands storage very well if kept dry. The solution is prepared at the time it is to be used.

■ 135. CLEANING REMAINDER OF GUN.—The receiver is wiped clean, particular care being taken to remove dirt and lint from the belt-holding pawl. Clean, lintless cloth must be used. The various parts of the gun and the part groups are then wiped clean, a small stick covered with a cotton patch being used to remove dirt from all recesses. The water jacket is wiped clean and the muzzle gland is tightened and repacked if necessary. Cleaning should be accomplished by wiping large parts and dipping small ones in dry-cleaning solvent, and wiping dry. Care should be taken in humid atmosphere to assure the use of completely moisture free patches for wiping dry. Wipe a light film of light preservative lubricating oil over all parts. Inspect periodically to detect development of rust and to renew the preservative oil film. At the end of the firing season or more often when weather conditions or prolonged action requires it, the various part groups should be completely disassembled and all component parts cleaned and oiled. For a complete list of cleaning and preserving materials refer to SNL K-1.

■ 136. CLEANING MOUNT.—Keep the parts of the mount free of dirt and grit, and exposed metal surfaces and moving parts lubricated with light lubricating oil. In addition, the various parts of the trigger control and recoil mechanisms must be carefully cleaned and oiled periodically. Lubricate the slides of the recoil mechanism every 2 hours of continuous firing.

When assembling the mount, contact surfaces to be assembled must be cleaned and all screw fastenings oiled to facilitate assembly and disassembly and to prevent corrosion. (See ch. 4.)

■ 137. LUBRICATION.—Proper oiling is second in importance only to intelligent cleaning. Oil all bearing surfaces of the gun with light preservative lubricating oil. Take particular care to see that the exterior of the barrel is oiled at the breech end. Oil the cover extractor spring, the cover extractor cam, the cocking lever, the belt feed lever groove in the bolt, the grooves in the barrel extension to take the bolt ribs, the breech lock cam, the switch, and the ways of the belt feed slide. Keep an oilcan filled with oil conveniently near the gun at all times. Use a cotton patch, lintless cloth, or brush to apply the oil when possible, as waste or rags leave lint and cause stoppages. For a complete list of lubricants to be used refer to SNL K–2.

■ 138. DAILY MAINTENANCE PRIOR TO FIRING.—*a. Gun.*—Make adjustments on the gun before placing it on the mount.

(1) Adjust for head space.

(2) Check the oil in the oil buffer and the adjustment of oil buffer.

(3) Check the muzzle and breech packings.

(4) Test the bolt operation and firing mechanism.

(5) Check lubrication.

(6) See that the adjusting screw on buffer is tight.

(7) Place the gun on the mount, attach the inlet water hose, fill the barrel jacket with water, refill the water chest, and attach the outlet hose.

b. Cradle and mount.—(1) Check adjustment of the recoil springs.

(2) Check adjustment of the side plate trigger mechanism.

(3) Check lubrication of the pintle.

c. Ammunition.—(1) Inspect belts for short rounds, corrosion, split cases, or thin rims. Check the spacing of tracers and the evenness of loading.

(2) See that the belt feeds into the gun with the double end of the links feeding first, if link belts are being used.

■ 139. CARE DURING FIRE.—*a.* Note correctness of the head space, and oil buffer adjustments.

b. Keep the water pump operating continuously during fire.

■ 140. CARE AFTER FIRING.—*a.* Clean the bore. Hot water can be drawn from the water jacket for cleaning. Inspect the bore carefully. Clean thoroughly, dry, and lubricate.

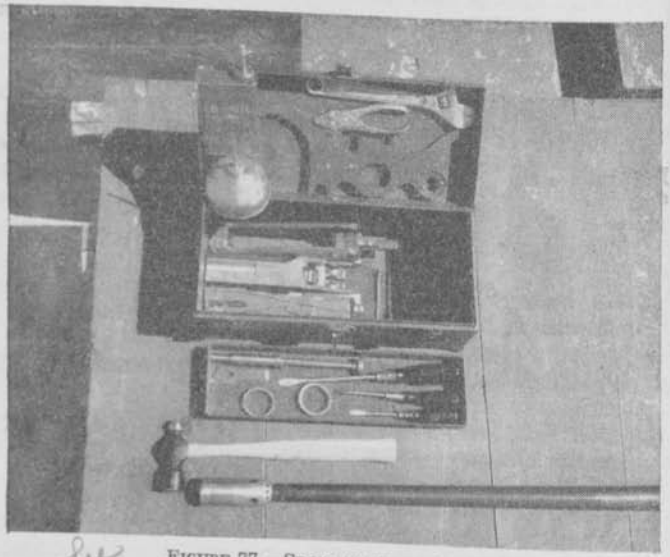

FIGURE 77.—Spare parts and tools.

*b. Field strip the gun, wipe dry, and lubricate. Examine all parts and make repairs or replacements if necessary.

c. Drain the water jacket thoroughly and dry.

d. Inspect the muzzle and breech packing and replace if necessary.

e. If stoppages have occurred, their cause must be determined and corrected immediately. Action must be taken to prevent recurrence of similar stoppages.

■ 141. SPARE PARTS AND TOOLS.—A complete set of tools and spare parts must remain with the gun at all times. The

parts and tools should be kept clean and oiled ready for instant use. All lost or broken parts and tools should be replaced immediately. See SNL A-35 and A-37 for a complete list of tools, spare parts, and accessories. Parts that are carried as assemblies should at all times be completely and correctly assembled ready for immediate insertion in the gun.

■ 142. PRECAUTIONS TO BE OBSERVED DURING COLD WEATHER.—*a. Antifreeze mixtures in water jacket.*—(1) During cold weather, it is necessary to guard against freezing of the water in the water jacket and circulating system of the gun. In locations where the atmospheric temperature is below 32° F., it is necessary to have antifreeze mixture available for use in the water jacket which will not freeze nor gum and yet will cool the barrel.

(2) Antifreeze compound (ethylene glycol type) is authorized for use in water jackets for machine guns for cold climates. It is satisfactory for temperatures as low as —60° F., when mixed with water in the proper proportions. It is important that the proper proportions of compound and water be maintained. Protection against freezing at temperatures as low as —62° F. can be obtained with a mixture consisting of 60 percent by volume of compound and 40 percent by volume of water.

(3) When compound and water mixture is used, it should be mixed in a container and then poured into the water jacket of the gun and the water chest to insure proper proportions and a thorough mixing of the ingredients.

(4) If a mixing container is not available, the compound can be poured directly into the water chest and water jacket, and water then added to the chest and water jacket until full. If this method is used, the proper amount of antifreeze compound should be computed to produce a mixture of the required strength, so that when water is added, the mixture will be correct. Cold water should not be poured into a cold chest or water jacket first, as freezing may take place before the ethylene glycol can be added. (Likewise cold water should not be poured in a hot jacket as it might crack the parts.) In this case the mixture should be thoroughly

mixed at once by circulating the ingredients for a few moments by means of the crank on the water chest. If such mixing is not thoroughly accomplished, the water in the mixture in chest or jacket may freeze due to lack of strength unless the gun is fired immediately and sufficiently to heat the water until mixing is complete. The crank on the water chest should always be turned in a clockwise direction as indicated by the arrow stamped on the crank cover of the chest. Capacities of water chests and water jackets are as follows:

Water chest, caliber .50, M3—8 gallons.
Water chest, caliber .50, M2—7 gallons.
Water jacket for 36-inch barrel—8 quarts.
Water jacket for 45-inch barrel—10 quarts.

(5) In an emergency, when a suitable antifreeze solution is not available, SAE 10 engine oil or used crankcase oil may be used in the water jacket of the gun. No circulating unit should be used in this case and the jacket should not be entirely filled, to allow for expansion. The (inlet) small union cap should be screwed on the small hose connection bushing on the jacket in place of the hose, and the outlet hose allowed to remain connected. This hose should then be stretched along the jacket and fastened at the muzzle end. By so doing, the oil will not be lost when the gun is elevated for high angle fire. (Either hose will serve in an emergency.) This mixture cannot be used satisfactorily where the temperature is in excess of 32° F. After the use of engine oil or engine crankcase "drainings" the water jacket should be disassembled and jacket, bearings, steam tube, and hose thoroughly cleaned out with dry-cleaning solvent or Diesel fuel, and bearings then lightly lubricated, before water or other cooling mixtures are used. If the oil gets into the circulating system, it will attack the rubber hose and clog the pump.

b. Oiling and lubrication.—(1) Oiling and lubrication should be kept at a minimum in low temperatures, and the gun and mount manually operated frequently to see that they function properly.

(2) During cold weather when the gun is not in use, the movable parts in the gun and the trigger control mechanism

of the mounts should be kept free of excess oil. Clean thoroughly with dry-cleaning solvent, then dry and oil parts lightly, wiping the oil off with a clean, dry wiping cloth. Before firing the gun, the moving parts should be lightly oiled at contacting points.

Caution: If it is necessary in an emergency to fire the gun with water in the jacket only, and without the circulating system, the (inlet) small union cap must be screwed on the small hose connection bushing and the outlet hose used as in *a*(5) above.

■ 143. PROTECTIVE MEASURES AGAINST CONTAMINATION.—*a.* All unpainted metal parts of the guns and mounts should be kept well coated with oil (where practical). This will assist in the decontamination.

b. Cover the gun and mount with a gasproof covering, if available, *during the attack.*

c. Clean the gun and mount after the attack.

d. Exposed ammunition should be cleaned. Corroded ammunition should either be cleaned thoroughly or discarded.

e. For detailed instructions see FM 21-40 and TM 3-series.

SECTION II

STOPPAGES AND IMMEDIATE ACTION

■ 144. GENERAL.—A stoppage is a malfunction or incomplete action of some part of the gun or its ammunition resulting in a cessation of fire. When describing or determining a stoppage, it is often important to designate the approximate position of the moving parts of the gun at the time the stoppage occurs. This is particularly true during training when gunners are being taught how to determine the cause of a stoppage. The position of stoppage may indicate the cause. There are three classifications of stoppage which are generally used:

a. First position stoppage.—One which occurs when all recoiling parts of the gun are in their extreme forward or battery position.

b. Second position stoppage.—One which occurs when the

recoiling parts are at any position from just out of battery to the position when the bolt is halfway back on either the recoil or counterrecoil stroke.

c. Third position stoppage.—One which occurs when the bolt is in any position from halfway back to all the way back on either the recoil or counterrecoil stroke.

■ 145. PREVENTION OF STOPPAGES.—Stoppages will be reduced to the minimum if the gunner has a practical working knowledge of his weapon and applies the points which should be observed before firing. *Prevention is the best remedy for all stoppages.*

■ 146. CAUSES OF STOPPAGES.—A stoppage occurs if the gun fails to feed, fails to load, or fails to fire.

a. If the gun fails to feed, the cause for stoppage is in the ammunition belt or feed mechanism.

b. If the gun feeds but fails to load, the cause is in the receiver. A broken part or an obstruction in the T-slot or in the chamber are the usual causes.

c. If the gun feeds and loads but fails to fire, the cause is in the firing mechanism unless the primer of the cartridge is defective. For a more complete discussion of stoppages and their causes see TM 9–226.

■ 147. IMMEDIATE ACTION.—*a.* The procedure prescribed for the reduction of stoppages is based on the frequency with which the various types of stoppages occur. Execution of this procedure by the gunner enables him to remedy the majority of stoppages immediately without attempting to analyze the cause. Immediate action is performed by the gunner. All personnel required to fire the machine gun must be proficient in immediate action. The procedure for immediate action is shown in the following diagram:

Gun fails to fire

Pull the bolt to the rear, release it, and attempt to fire

If the gun still fails to fire

See if cover is latched, straighten ammunition belt, place hand to feel rounds entering feedway, pull the bolt to the rear, and release it.

If belt feeds

Attempt to fire.

If gun still fails to fire

Change bolt.

If belt does not feed

Raise the cover, remove the first round from the belt, and look or feel for a cartridge in the gun

If a cartridge is

In the gun

Remove it (*b* below)

Reload, re-lay, and fire.

NOT in the gun

Reload, re-lay, and fire.

NOTE.—If application of the procedure does not remedy the stoppage, the gunner must examine the feed mechanism and other parts of the gun in order to locate and remedy the trouble.

b. To remove a cartridge from the T-slot, hold back bolt and raise extractor. The cartridge usually falls out unless it has a thick rim or the T-slot is defective. If cartridge does not fall out when extractor is raised, hold bolt to the rear with extractor raised, place a screw driver or similar tool through top of receiver into top of cannelure of cartridge, and drive cartridge downward out of T-slot by striking upper end of screw driver with the palm of the hand.

c. To remove a case stuck in the chamber, hold back bolt and remove next cartridge from the T-slot. Insert cleaning rod from muzzle and knock empty case from chamber. If several cases stick in the chamber in close succession, put some oil on chamber cleaning brush, thoroughly scrub chamber with brush, then wipe out chamber with a dry rag.

d. To remove a ruptured case from chamber, use ruptured

cartridge extractor, if available. If ruptured case cannot be removed, change barrels.

e. Never attempt to force the bolt forward to remedy a stoppage. After any stoppage which appears to be caused by insufficient recoil, make sure that the bore is clear before continuing firing. It is possible that such a stoppage, for example, one caused by incomplete ignition of the powder charge, may result in the bullet lodging in the bore. If the gun is fired under these conditions, serious damage results.

SECTION III

ADJUSTMENTS, CHECKS, AND SETTINGS

148. GENERAL.—There are certain very critical adjustments and settings of the M2 machine gun and its mounts. Failure to carefully and accurately make these settings and adjustments results in stoppages and inaccurate fire.

149. HEAD SPACE.—*a. General.*—Proper head space adjustment is vital to the proper functioning of the gun, and an understanding of its importance and significance is essential for personnel concerned.

(1) *Definition.*—The head space of a military weapon with the cartridge fully seated in the chamber is the distance between the base of the cartridge and the face of the bolt. In Browning machine guns, head space is adjusted by obtaining the proper distance between forward part of bolt and rear end of barrel.

(2) *Significance.*—When any cartridge is fired, the powder gases exert tremendous pressure in the chamber. This pressure forces the bullet out of the barrel; it also tends to force the cartridge case out of the chamber. The cartridge case therefore must be held snugly in the chamber from the time the round is fired until the bullet leaves the barrel. It is held there by the forward face of the bolt pressing against the rear face of the cartridge, the bolt being locked in this position by the breech lock. The breech lock engages a recess in the bottom of the bolt and locks it firmly to the barrel extension. As the recoiling parts move into battery after recoil, the breech lock is forced upward by the breech lock

cam and locks the bolt to the barrel extension just before they reach the battery position.

(3) *Insufficient head space.*—If the parts have been properly adjusted with too little head space, the bolt is held too far rearward by the barrel. This may cause—

(*a*) Failure of the recoiling parts to go completely into battery because the breech lock cannot fully enter the locking recess of the bolt.

(*b*) Failure to fire because the bolt may not go forward far enough for the sear to be released.

(*c*) Sluggish fire because of binding and excessive friction between the moving parts. (Particularly noticeable when pulling a long ammunition belt.)

(4) *Excessive head space.*—Too much head space may cause—

(*a*) Rupture or separation of the cartridge case because the bolt is not far enough forward to hold the cartridge snugly in the chamber.

(*b*) Inability to obtain proper timing.

(*c*) Poor shot patterns because of escape of powder pressure at the breech.

(*d*) Battering of the breech lock, bolt, and barrel extension because the locking surfaces of the breech lock and bolt recess are not in contact at the instant of firing. This will soon render these parts unfit for service.

(*e*) Battered T-slot lips due to the bolt striking the barrel extension.

b. Adjustment.—Head space must be adjusted each time the gun is assembled or the barrel packing is adjusted or whenever head space is in doubt. It should be checked and if necessary, adjusted before firing the gun. Before attempting to adjust head space be sure that the gun is completely unloaded, that there is no binding due to tight barrel packing, and that the threaded portion of the barrel is free from burs and is long enough to project slightly into the barrel extension when screwed all the way in. Adjustment must be made with gun fully assembled. To adjust—

(1) Raise the cover and retract the bolt about ½ inch (no more).

(2) Screw the barrel into the barrel extension (by applying a screwdriver to the notches on the rear end of the barrel) until the barrel comes into contact with the bolt.

(3) Check to make sure end of barrel extends through barrel extension.

(4) Then unscrew the barrel TWO notches.

(5) If the gun operates sluggishly, unscrew barrel ONE additional notch.

150. HEAD SPACE CHECKING.—*a.* Head space should be checked each time it is adjusted, before firing, during temporary discontinuance of firing, after adjustment of barrel packing, and whenever the adjustment is in doubt. Adjustment should be checked with the head space and timing gage A196228.

b. Checking head space adjustment by use of head space and timing gage A196228.—This combination gage provides a definite means for checking head space adjustment. The portion of the gage to be used for checking head space is marked "HEADSPACE—0.200." The following procedure should be followed in checking head space:

(1) After head spacing in the manner prescribed above, the barrel will protrude slightly beyond the inner face of the barrel extension.

(2) Cock the firing pin by fully retracting the recoiling parts, and then allowing them to go fully forward into battery.

(3) Retract the bolt slightly (not more than 1/16 inch) in order to relieve the driving spring pressure between the bolt and the rear end of the barrel, and place the forward face of the breech lock and bolt in close contact as when firing.

(4) Then, insert the gage in the T-slot between the face of the bolt and the rear end of the barrel. If the gun is head spaced too tightly, it will not be possible to insert the gage. If such is the case, the barrel should be unscrewed, ONE notch at a time, until the gage will just enter the full depth of the T-slot without being forced.

Caution: Never release the firing pin while the gage is inserted in the T-slot or the pin will be damaged.

(5) If the gun has been head spaced in the prescribed manner, and if the head space gage will just slide for its full

length between the face of the bolt and the end of the barrel without being pushed downward, the head space is correct. It must be clearly understood that the head space gage is a "GO" gage which was designed particularly for the purpose of checking guns in installations when tight head space would cause serious trouble.

(6) The gage, however, may be used to determine whether head space is unnecessarily loose by screwing the barrel into the barrel extension, ONE notch at a time, until the gage will

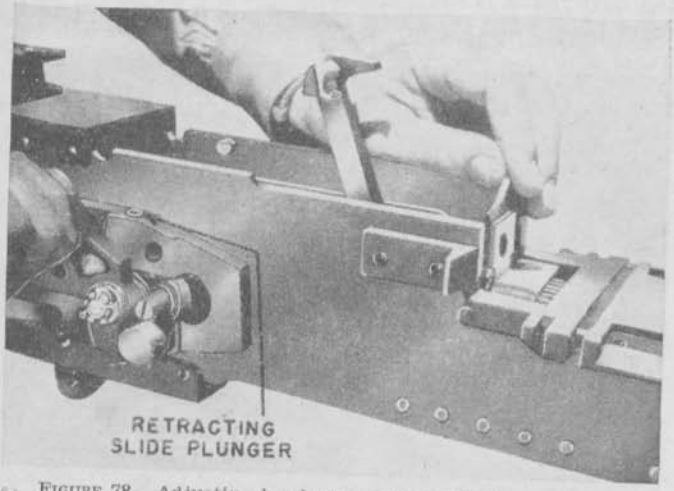

FIGURE 78.—Adjusting head space using a head space gage.

not enter, and then unscrewing the barrel ONE notch so the gage will enter properly.

151. CHECK FOR TIMING.—To insure that the machine is not fired too early or too late by the trigger mechanism, it is necessary that the timing be frequently checked. To make this check, the timing gage, which is the other end of the head space gage, is used. The retracting handle is pulled back, the timing gage inserted between the barrel extension and the trunnion block, and the retracting handle released. The trigger mechanism is then operated. The firing pin should

not be released by the operation of the trigger mechanism when the timing gage is in position. If the firing pin is released the gun is firing too soon and the trigger mechanism must be adjusted. The gun should fire when the barrel extension is $\frac{1}{32}$ inch from the trunnion block to prevent the barrel extension from striking the trunnion block. Further, the time of firing should be adjusted so that firing does take place at this point. If firing takes place when the barrel extension is more than $\frac{1}{32}$ inch from the trunnion block, the next round is not engaged by the extractor. If firing takes place when the barrel extension is less than $\frac{1}{32}$ inch

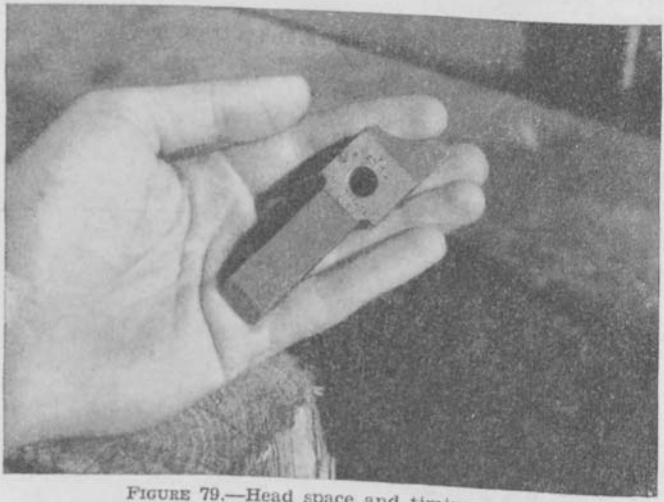

FIGURE 79.—Head space and timing gage.

from the trunnion block, the barrel extension strikes the trunnion block and eventually results in damage to the parts. In the instance where the gun is firing too late, the rear edge of the counterrecoil buffer spring housings is allowed to strike the forward face of the trunnion slide on the M2 or M2A1 mounts and results in damage to those parts also. Although there are no timing gages issued to check to see if the gun is firing late, one may be easily constructed by

making a gage similar to the timing gage but 1/64 inch or .0156 inch thick. When this gage is inserted in the same manner as the timing gage, the firing pin should be released when the trigger mechanism is operated. If the operation of the trigger mechanism does not release the firing pin, the gun is firing late and the trigger mechanism must be adjusted. This adjustment varies for each type of mount. For a discussion as to how this adjustment should be made, refer to chapter 4.

152. EFFECT OF BAD TIMING ADJUSTMENT.—If the gun is firing too early a stoppage occurs. The gun usually fires twice and ceases. Upon examination it is found that the gun has not reloaded as recoil from the second shot started before the extractor was permitted to engage the base of the next round. If the gun is firing too late, an increase of vibration in the gun and mount is noticeable. In either case the timing should be checked and adjustment made if necessary.

153. ADJUSTMENT OF RECOIL MECHANISMS.—The adjustment of the recoil mechanism various for each type of machine gun mount. (See ch. 4.)

154. TO CHANGE SPEED OF FIRING.—The speed of firing may be changed by turning the oil buffer tube, which is accessible when the backplate is removed. Turning the tube counterclockwise so that the arrow moves towards "O," meaning "Open," increases the speed, and turning it clockwise towards "C," meaning "Closed," decreases the speed. To obtain the maximum speed of firing consistent with proper functioning of the gun the arrow should be turned six notches counterclockwise from "C." The oil buffer should never be turned so far that the arrow goes beyond the "C" or "O" markings. During fire, the adjustment may be made by inserting a screw driver in the hole in the back plate and turning the oil buffer to the desired position. To obtain the best rate of fire the slot in the oil buffer tube should appear as shown in figure 80.

155. FILLING OIL BUFFER.—Remove the filler screws from the base of the oil buffer tube. Use the oil buffer filling oiler filled with light recoil oil. Have the oil flowing freely

before the nozzle is inserted in the filling hole, and keep the oil flowing until the nozzle is withdrawn to prevent admitting air bubbles into the buffer tube. Repeat the operation until

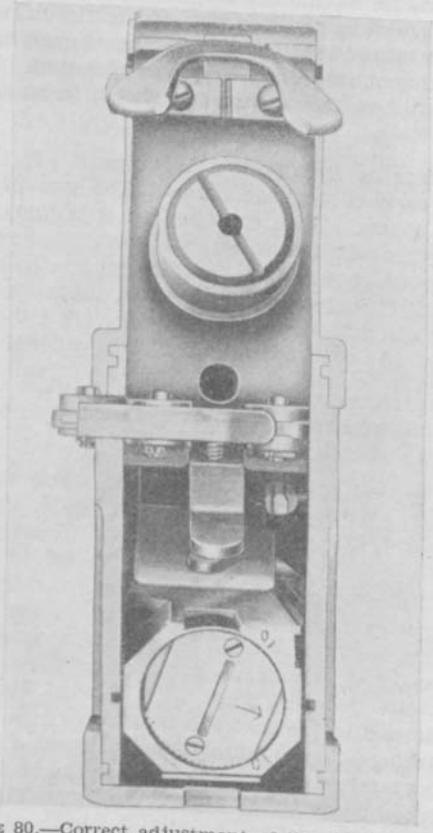

FIGURE 80.—Correct adjustment of the oil buffer tube.

the buffer is overflowing. Replace the filler screws. Any excess oil in the buffer is relieved by the relief valve in the forward end of the buffer body. Two filling holes are pro-

vided to show visually by overflow when the buffer tube is completely full and to prevent the formation of an air pocket within the tube. 155.1 } Added 155.2

■ 156. REPACKING BARREL.—Remove barrel assembly from gun.

a. To pack breech end.—Unscrew packing adjusting ring and remove old rear barrel packing. Clean recess in barrel and insert new rear barrel packing. Smooth barrel packing until ends meet. Screw packing adjusting ring against barrel packing to hold it in place.

b. To pack muzzle end.—Unscrew front barrel bearing lock screw jam nut and front barrel bearing lock screw. Unscrew and remove muzzle gland. Remove muzzle packing ring and old front barrel packing. Clean out inside of front barrel bearing. Insert new front barrel packing and replace muzzle packing ring and muzzle gland. Screw muzzle gland lightly against ring and packing as the gland is adjusted and locked in place after the barrel is reassembled in the gun.

c. Reassemble barrel assembly into gun being careful not to injure barrel packing.

d. Adjust front barrel packing (muzzle packing) by tightening or loosening muzzle gland, then lock in place with front barrel bearing lock screw and jam nut.

e. Adjust rear barrel packing (breech packing) by tightening or loosening packing adjusting ring. A packing ring adjusting wrench and a barrel holding wrench are provided for this purpose.

■ 157. CHANGING BARRELS.—*a.* Open drain valve and drain water from water jacket into water chest or other suitable receptacle. Remove backplate, bolt, and driving spring assemblies. Remove barrel, barrel extension, and oil buffer assembly by pulling out to the rear. Separate old barrel from barrel extension and replace with new one. Reassemble barrel, barrel extension, oil buffer, bolt, driving spring, and backplate assemblies to the gun. Care must be exercised in removing and assembling the barrel in order not to disarrange the barrel packing. Make head space adjustment as outlined in paragraph 149. Close drain valve and refill water jacket with water. Adjust breech and muzzle barrel packing if necessary.

b. If it is necessary to keep water in water jacket when changing barrels, the following method can be employed: Remove backplate, bolt, and driving spring assemblies. Screw union caps to inlet and outlet openings of water jacket and lower muzzle of gun to prevent loss of water at the breech end. Hold a plug at muzzle of barrel. Withdraw oil buffer, barrel extension, and barrel assemblies to the rear. As the barrel is withdrawn, follow it with the plug and insert plug in hole in muzzle gland through which the barrel has been withdrawn. Place a plug or twisted patch in muzzle of new barrel. Separate old barrel from barrel extension and replace with new one. Reassemble barrel, barrel extension, and oil buffer assemblies into gun. When the muzzle of the new barrel passes through hole in muzzle gland, remove plug in the hole. Remove plug in muzzle of barrel and run a cleaning patch through barrel. Reassemble bolt, driving spring, and backplate assemblies into gun. Make head space adjustment as outlined in paragraph 149. Adjust breech and muzzle barrel packing if necessary.

■ 158. INSPECTING BARREL FOR SERVICEABILITY.—Due to the high muzzle velocity and the high rate of fire of machine guns, barrel erosion, after several thousand rounds have been fired, results in an appreciable loss in muzzle velocity. This loss in muzzle velocity causes the trajectory to diverge from its normal path. If badly eroded barrels are used, the cone of fire is abnormally large, making adjustment of fire very difficult. The accuracy life of the barrel is largely dependent upon the number of rounds fired and the rate at which they have been fired. Barrels should be inspected frequently to determine whether they are still serviceable and to prevent their use after they become unserviceable. They should be inspected visually to determine whether the bore is free from bulges and pits and whether the lands are sharp and uniformly distinct. (See fig. 81.) If the lands are worn at the breech end so that the first 6 inches of the bore are smooth, the barrel is unserviceable and should be discarded. If a breech bore gage is available it should be used as an additional check (fig. 82). (See TM 9–1225.)

■ 159. To Change Feed.—To change the ammunition feed from left- to right-hand, change over parts as follows: Open the cover. Remove belt feed lever cotter pin and the belt feed lever. Change belt feed lever plunger and spring from the upper hole in the belt feed lever to the lower. Do not replace the belt feed lever but lay aside for the present. Remove the assembled belt feed slide from the cover. Push out the belt feed pawl pin and remove belt feed pawl and belt feed pawl arm and spring from the belt feed slide. Keep

Figure 81.—Visual inspection of a barrel.

spring from flying out while doing this. Change the belt feed pawl arm over from one side of the belt feed pawl to the other, so that when replaced in the belt feed slide it is to the rear in the assembled gun with cover closed. Replace the belt feed pawl, arm, and spring in the belt feed slide and replace the belt feed pawl pin. The belt feed slide is always placed in its way with the pawl end of the slide toward the side from which the gun is to be fed. Replace the assembled belt feed slide in the cover in correct position to feed right-hand. Note that feed pawl arm is to rear. Now replace the belt feed lever in the cover. In order to do so, have the gap in the belt feed slide in line with the cut-out

in the cover. Push belt feed lever completely down so that toe of the lever can work to and fro in the slot provided in the cover. Replace the belt feed lever cotter pin; the pin must be large enough to completely fill the cotter pin hole. Remove complete bolt from the gun. Remove the extractor. Raise the bolt switch to clear the bolt switch stud and give it a half turn to line up the other hole in the switch with the stud. Push bolt switch down into place. The cam groove in the bolt switch should now be adjacent to the mark "R"

FIGURE 82.—Checking serviceability of a barrel using a bore gage.

on top of the bolt. Replace the extractor. Replace the bolt in the gun. When necessary, reverse position of the sear slide to suit trigger or solenoid location. Pull out the two belt holding pawl pins. Take out the front cartridge stop and change to left-hand side. A rear cartridge stop and a link stripper should be placed in their grooves on the left-hand side. Remove the rear right-hand cartridge stop assembly and stow with spare parts. Change location of belt holding pawl and the belt holding pawl spring from left-hand side to right-hand side. Turn the pawl over when doing this. Replace the two belt holding pawl pins. The

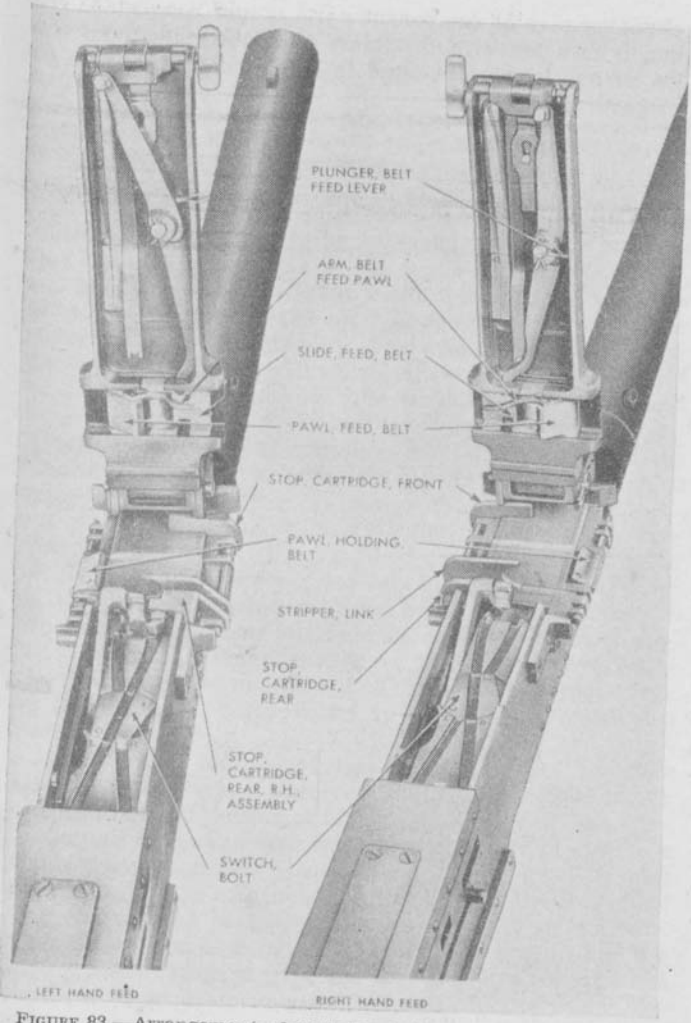

FIGURE 83.—Arrangement of parts for right- and left-hand feed.

changing over of component parts is now completed. The gun is now fed with cartridges from the right-hand side. To change from right-hand to left-hand feed, reverse the procedure.

■ 160. BUFFER DISKS.—The adjusting screw on the backplate must be tight. It should be checked and tightened during firing as vibration tends to loosen the adjusting screw and the buffer disks.

CHAPTER 7

DESTRUCTION

■ 161. DESTRUCTION.—All personnel must be taught the importance and method of destroying matériel to prevent its capture intact by the enemy. The methods taught must be adequate, uniform, and easily followed in the field. Destruction must be as complete as the available time, equipment, and personnel permit. If thorough destruction of all parts cannot be completed, the most important features of the matériel should be destroyed. Parts essential to the operation or use of the matériel which cannot be easily duplicated must be ruined or removed. The same essential parts must be destroyed on all like units to prevent the enemy's constructing one complete unit from several damaged ones by "cannibalization." Personnel will be instructed to demolish matériel using one of the following methods:

a. Machine gun, caliber .50 M2, water-cooled or heavy barrel.—(1) Field strip. Use barrel as a sledge. Knock point off firing pin. Raise cover; lay bolt in feedway; lower cover on bolt, smash cover down over bolt. Deform backplate. Wedge buffer into rear of casing allowing depressors to protrude; break off depressors by striking with barrel. Lay barrel extension on its side. Hold down with one foot, break off the shank. Deform casing by striking side plates just back of the feedway.

(2) Alternate method. Insert bullet point of complete round into muzzle and bend case slightly, distending mouth of case to permit pulling of bullet. Spill powder from case, retaining sufficient powder to cover the bottom of case to a depth of approximately ⅛ inch. Reinsert pulled bullet, point first, back into the case mouth. Chamber and fire this round with the reduced charge; the bullet will stick in the bore. Chamber one complete round, lay weapon on ground, and fire with a 30-foot lanyard. Use the best available cover as this means of destruction may be dangerous to the person destroying the weapon.

b. Antiaircraft machine-gun mounts.—(1) *Machine-gun tripod mount, caliber .50 M3.*—Use machine-gun barrel as a sledge. Deform pintle yoke. Deform traversing dial. Fold rear legs and deform so as to prevent unfolding. Remove front leg and knock off yoke. Extend elevating screw and bend screw by striking with barrel. Turn mount over; deform head assembly and knock off dial locking screw and pintle lock. Elapsed time: 3 minutes.

(2) *Other machine-gun mounts.*—Other machine-gun mounts may be destroyed in a manner similar to that outlined in (1) above.

c. Ammunition.—Heap the ammunition. Stack or pile most of the available gasoline in cans and drums around the ammunition. Throw onto the pile all available inflammable materials such as rags, scrap wood, and brush. Pour the remaining available gasoline over the pile. Sufficient inflammable material must be used to insure a very hot fire. Ignite the gasoline and take cover.

d. Water chest.—Fire several rounds of machine-gun or small-arms ammunition into the water chest to puncture it. Cut the water hoses into small pieces and burn.

APPENDIX

LIST OF REFERENCES

Cleaning and Preserving Materials	TM 9–850
Browning Machine Gun Cal. .50—Water-cooled and mounts	TM 9–226
Browning Machine Gun, Cal. .50, All Types	TM 9–1225
Small Arms Ammunition	TM 9–1990
Employment of AA Automatic Weapons	FM 4–102
Gunnery for Antiaircraft Artillery	FM 4–110
Formations, Inspections	FM 4–120
Service of the 40-mm Fire Unit (when published)	FM 4–160
AAA Fire Control, Automatic Weapons	FM 4–151
Browning Machine Gun, Caliber .30, M1917	FM 23–55
Browning Machine Gun, Caliber .50, HB, M2, Ground	FM 23–60
Chemical Decontamination Materials and Equipment	TM 3–220
Defense Against Chemical Attack	FM 21–40

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FM 4–155
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ANTIAIRCRAFT ARTILLERY FIELD MANUAL

SERVICE OF THE PIECE

CALIBER .50 AA MACHINE GUN

CHANGES No. 1

WAR DEPARTMENT,
WASHINGTON 25, D. C., 20 April 1944.

FM 4–155, 4 October 1943, is changed as follows:

97. TRIGGER RACK AND FIRING MECHANISM.—The trigger rack * * * on the mount.

a. (Added.) *Preliminary adjustment.*—The adjustment of the trigger-control mechanism is an entirely separate and distinct operation. Hence, prior to the adjustment of the trigger-control mechanism it is necessary to—

(1) Check and adjust head space. (See par. 150.)

(2) Check and adjust timing. (See par. 151.)

(3) Adjust recoil and counterrecoil springs on mount as given in detailed instructions for mount being used.

b. (Added.) *Adjustment of the trigger-control mechanism.*—The trigger-control mechanism must be adjusted so that the side plate trigger operates when a trigger control grip is rotated forward. There must, however, be no overtravel of the linkage as this will put an additional strain on the parts when the gun fires automatically. In addition, there must be sufficient clearance to preclude accidental firing of the gun when the mount is manipulated. This safety feature is obtained by providing a 5/16-inch clearance between the perpendicular face of the operating lug on the sideplate trigger slide and the corresponding face of the operating lug on the trigger-control slide when the gun is at rest and the trigger-control grips are in the released position. The adjustment is made as follows:

(1) Remove cotter pin and pin which hold trigger-control rod in position and disconnect rod.

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(2) Loosen four bolts on trigger-control body and shift it back and forward through slotted holes, as desired. Tighten the four bolts when satisfactory adjustment of 5/16-inch between lugs is obtained.

(3) Insure that trigger-control grips are in the released position. Loosen jam nut on trigger control rod and adjust length of rod by screwing it in or out of the yoke. The rod must be adjusted so that it will connect to linkage without changing the position of the trigger-control grips or the side-plate trigger slide.

(4) Replace the pin connecting the trigger-control rod to the linkage.

(5) Test the gun by cocking the firing pin and operating a trigger-control grip. If the gun does not fire, shorten the trigger-control rod by screwing into the yoke until the gun will fire using trigger-control grips.

(6) When trigger-control mechanism is operating properly, replace the cotter pin and tighten the jam nut on the trigger-control rod.

■ 98. RECOIL MECHANISM.—The recoil mechanism * * * speed of recoil. The counterrecoil (rear) spring should be adjusted so that the retaining nut is even with the large diameter of the bevel on the threaded end of the spring guide. The recoil (front) spring should be adjusted to give a recoil of 3/8 inch when the water-cooled gun is used and 1/8 inch when the heavy barrel gun is used.

■ 146. CAUSES OF STOPPAGES.

* * * * * * *

a. If the gun fails to feed, the cause for stoppage is in the ammunition belt, feed mechanism, or feed tray.

b. If the gun feeds but fails to load, the cause is in the receiver. A broken part or an obstruction in the T-slot or in the

chamber are the usual causes. A short round or improper timing are also causes.

* * * * * * *

■ 148. GENERAL (Superseded).—There are certain very critical adjustments and settings of the M2 machine gun and its mounts. Failure to make these settings and adjustments carefully and accurately results in stoppages and inaccurate fire. The correct order in which to perform these checks and adjustments is as follows:

a. Adjust and check head space.

b. Check and, when necessary, adjust timing, using all trigger mechanisms which are an integral part of the gun.

c. Check and, when necessary, adjust recoil and counterrecoil springs of mount.

d. When head space, timing, and adjustment of recoil and counterrecoil springs are correct, adjust remote control features of the firing mechanism as necessary.

■ 149. HEAD SPACE (Superseded).—*a. General.*—Proper head space adjustment is vital to the proper functioning of the gun, and an understanding of its importance and significance is essential for personnel concerned. Head space is the first and most important adjustment required in the M2 machine gun and when made correctly should never be changed in an attempt to eliminate any malfunction. All other adjustments depend upon correct head space.

(1) *Definition.*—The head space of a military weapon with the cartridge fully seated in the chamber is the distance between the base of the cartridge and the portion of the face of the bolt that presses against the base of the cartridge. In Browning machine guns, head space is adjusted by obtaining the proper distance between the forward face of the T-slot and the rear face of the barrel when the slack between the breech lock and the bolt, and between the breech lock and the barrel extension has been eliminated by relieving the forward pressure

of the driving spring. In the M2 machine gun, this distance must be from 0.202-inch to 0.206-inch, since this distance, when added to the exact depth of the barrel chamber, produces the required space to accommodate the cartridge case. (See fig. 77.1.) Correct head space provides sufficient support to prevent rupture of cartridges and binding of parts.

(2) *Significance.*—When any cartridge is fired, the powder gases exert tremendous pressure in the chamber. This pressure forces the bullet out of the barrel; and it also tends to force the cartridge case out of the chamber. The cartridge case, therefore, must be held snugly in the chamber from the time the round is fired until the bullet leaves the barrel. It is held there by the forward face of the T-slot pressing against the rear face of the cartridge, for the bolt is locked in this position by the breech lock in the following manner: As the recoiling parts move into battery after recoil, the breech lock, forced upward by the breech lock cam, locks the bolt to the barrel extension just before they reach the battery position.

(3) *Insufficient head space.*—If the parts have been adjusted with too little head space, the bolt is held too far rearward by the barrel. This may cause—

(*a*) Failure of the recoiling parts to go completely into battery because the breech lock cannot enter fully into the locking recess of the bolt.

(*b*) Failure to fire because the bolt may not go forward far enough for the sear to be released.

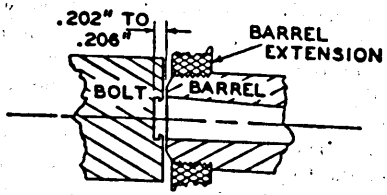

FIGURE 77.1.—Head space adjustment.

(*c*) Sluggish fire because of binding and excessive friction between the moving parts. (Particularly noticeable when pulling a long ammunition belt.)

(4) *Excessive head space.*—Too much head space may cause—

(*a*) Rupture or separation of the cartridge case because the bolt is not far enough forward to hold the cartridge snugly in the chamber.

(*b*) Poor shot patterns because of escape of gas pressure at the breech.

(*c*) Battering of the breech lock, bolt, and barrel extension because the locking surfaces of the breech lock and bolt recess are not in contact at the instant of firing. This condition would soon render these parts unfit for service.

(*d*) Battered T-slot lips due to the bolt striking the barrel extension.

b. Adjustment.—Head space must be adjusted each time the gun is assembled and should be checked whenever head space is in doubt. Before adjusting head space, it is necessary to insure that the gun is unloaded, that the barrel packing does not bind (in case of water-cooled guns), and that the threaded portion of the barrel is free from burs and is long enough to protrude slightly through the threaded portion of the barrel extension when the barrel is screwed all the way into the extension. (If the barrel does not protrude when screwed all the way into the extension, the dimension of the barrel or the barrel extension are incorrect and a true head space adjustment cannot be made. In such a case, the incorrect part should be replaced or corrected by ordnance personnel.) The adjustment must be made *after* the parts have been assembled into the gun and the methods are as follows:

(1) For caliber .50 M2 heavy barrel machine guns:

(*a*) With working parts assembled into the receiver and the bolt fully forward, screw the barrel by hand into the barrel extension until it comes into contact with the bolt.

(*b*) Then unscrew the barrel TWO notches. If the gun operates sluggishly or if the head space gauge indicates the necessity, in accordance with note 1, paragraph 150*a*(5), unscrew the barrel ONE additional notch. A total of THREE notches is commonly required.

(*c*) The method outlined in (2) below may also be used.

(2) For caliber .50 M2 water-cooled machine guns:

(*a*) Raise the cover and pull the bolt back about 1 inch by means of the retracting slide lever.

(*b*) Screw the barrel into the barrel extension (by applying a screw driver to the notches on the rear end of the barrel) until the recoiling parts will not go into battery position without being forced when the bolt is released. The recoiling parts are in battery when the barrel extension touches the trunnion block.

NOTE.—For ease in screwing the barrel into the barrel extension, remove the rear right-hand cartridge stop assembly.

(*c*) Screw barrel out of the barrel extension one notch at a time until the recoiling parts will just go into battery position when the bolt is released but is not forced forward.

NOTE.—Do not retract the bolt more than 1 inch when determining the point at which the recoiling parts will just go into battery position without being forced. Do not permit the barrel packing to bind the barrel and prevent its free return into battery position. Particular care must be exercised when new packing is installed.

(*d*) When this point is found, retract the bolt and unscrew the barrel TWO more notches. If the gun operates sluggishly or if the head space gauge indicates the necessity, in accordance with note 1, paragraph 150*a*(5), unscrew the barrel ONE additional notch. A total of THREE notches from the in battery position is commonly required.

(3) If either the head space and timing gauge assembly A351217 or the head space and timing gauge A196228 are available, the M2 water-cooled machine gun should be adjusted for

head space preferably by the method described in paragraph 150.

■ 150. HEAD SPACE CHECKING (Superseded).—Head space may be checked each time it is adjusted, prior to firing, during temporary discontinuance of firing, after adjustment of barrel packing and whenever the correctness of the adjustment is doubted. The adjustment may be checked with the head space gauge A351211 (GO–NO–GO) of the head space and timing

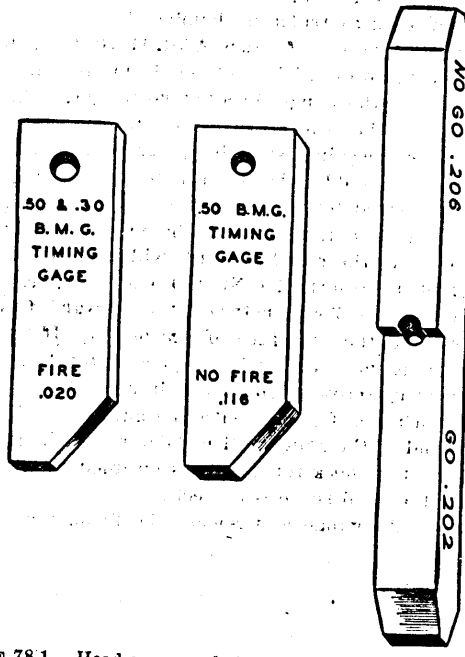

FIGURE 78.1.—Head space and timing gauge assembly A351217.

head space and timing gauge A196228. The methods are as follows:

a. When head space gauge A351211 is used:

(1) Cock the firing pin by fully retracting the recoiling parts and allowing them to return into battery position.

(2) Retract the bolt until the barrel extension and the trunnion block are separated approximately 1/16 inch in order to relieve the driving spring pressure between the bolt and the rear face of the barrel. This puts the locking surfaces of the breech lock and the bolt in contact, which is the position they will assume when a cartridge is chambered.

(3) Insert the GO end of gauge A351211 (0.202 inch) in the T-slot between the forward face of the T-slot and the rear face of the barrel. If the gauge does not go in, the head space is too tight; correct the adjustment by unscrewing the barrel one notch at a time, checking with the gauge each time, until the gauge enters. It should be borne in mind that the barrel never should be unscrewed more than three notches for the water-cooled gun or four notches for the heavy barreled gun from the position where the recoiling parts will just go into battery.

(4) Attempt to insert the NO–GO end of gauge A351211 (0.206 inch) in the T-slot between the forward face of the T-slot groove and the rear face of the barrel. If the NO–GO end of the gauge goes in, the head space is too loose; correct the adjustment by screwing the barrel into the barrel extension one notch at a time, checking with the gauge each time, until the NO–GO end of the gauge will not enter. If the gauge does not go in, and the check for tightness outlined in (3) above is satisfactory, the head space is correct.

(5) Remove the gauge and release the firing pin.

SERVICE OF THE PIECE

Caution: NEVER RELEASE THE FIRING PIN WITH THE GAUGE IN PLACE, AS TO DO SO WILL DAMAGE THE FIRING PIN.

NOTE 1: If the head space obtained either by the method given in 149b(1) or (2) above is not between the GO and NO–GO limits of the gauge, change the head space to suit the gauge.

NOTE 2: The gauge may be inserted from either the top or the bottom of the gun. In the event that the gauge is inserted from the bottom, the slack between the bolt and the breech lock may be taken up by inserting a screw driver between the bolt and the barrel. The gauge is made narrow so that this is possible.

b. When the head space gauge A196228 is used:

(1) Cock the firing pin by fully retracting the recoiling parts and allowing them to return into battery position.

(2) Retract the bolt until the barrel extension and the trunnion block are separated approximately 1/16 inch in order to relieve the driving spring pressure between the bolt and the rear face of the barrel. This puts the locking surfaces of the breech lock and the bolt in contact, which is the position they will assume when a cartridge is chambered.

(3) Insert the head space end of gauge A196228 (0.200 inch) in the T-slot between the forward face of the T-slot groove and the rear face of the barrel. If the gauge does not go in, the head space is too tight; correct the adjustment by unscrewing the barrel one notch at a time, checking with the gauge each time, until the gauge will just enter the full depth of the T-slot without being forced. (This means that, with the driving spring pressure relieved and the gun in the horizontal position, the gauge will enter the full depth of the T-slot by means of its own weight.)

(4) If the head space gauge is inserted as in (3) above and it enters the full depth of the T-slot loosely, the head space

is too loose; correct the adjustment by screwing the barrel into the barrel extension one notch at a time, checking with the gauge each time, until the gauge will not enter, and then unscrewing the barrel one notch so that the gauge will enter properly.

(5) Remove the gauge and release the firing pin.

Caution: NEVER RELEASE THE FIRING PIN WITH THE GAUGE IN PLACE, AS TO DO SO WILL DAMAGE THE FIRING PIN.

NOTE: If the head space obtained either by the method given in 149b(1) or (2) is not in agreement with the results determined from a check conducted as described in 150b, change the head space to suit the results of the check.

■ 151. (Superseded) TIMING.—*a. General.*—Timing is a characteristic which is built into the gun at the time of its manufacture. It is dependent exclusively upon critical dimensions of those parts of the gun which affect the release of the firing pin. Timing of the gun is from a practical point of view independent of the remote control trigger mechanism. The solenoid does influence the timing very slightly, but any changes in timing that can be accomplished by the solenoid will be within the limits of the timing of the gun itself. In the case of the side trigger mechanism, the remote control trigger mechanism can be so out of adjustment that the gun will either not fire or, when firing, it will not stop when the remote control trigger mechanism is released. The timing of the gun, however, cannot be affected by the adjustment of the remote control trigger mechanism.

(1) *Definition.*—In an internal combustion engine such as is used in an automobile, the ignition system must be *timed* to insure that the electric spark will occur at the exact instant

when the valves are closed and the piston bears the proper relative position to the cylinder. Similarly in the machine gun, the firing-pin control system must be *timed* to insure that the sear will release the firing pin extension at the exact instant that the bolt and the barrel extension are locked together and the barrel extension bears the proper relative position to the trunnion block. In the M2 machine gun, the firing pin must be released when the front of the barrel extension is within a certain minimum and maximum distance from the rear face of the trunnion block. The firing pin must not be released when this distance is 0.116 inch or more. It must be released when this distance is 0.020 inch or more. The procedure of making the adjustments and the point at which the firing pin is released are referred to as "timing."

(2) *Significance.*—Correct timing is essential to prevent excessive vibration and damaging of parts, and to insure proper functioning and control of the gun.

(3) *Early timing.*—In extreme cases of early timing, the gun will fire two shots and then stop because recoil from the second shot started before the extractor could engage the next cartridge in the belt.

(4) *Late timing.*—If the gun fires too late while firing automatically, the barrel extension will strike the trunnion block as the recoiling parts move forward on the counterrecoil stroke. Only when the first cartridge of a burst is being fired, should the firing pin be released with the recoiling parts in the battery position.

b. Adjustment.—Timing is a characteristic of design and is dependent upon the critical dimensions of those parts of the gun which affect the release of the firing pin. When the parts are made, these dimensions are controlled to within close

limits of measurement by means of accurate gauges. When the guns are assembled, the parts are carefully examined and an over-all check for correct timing is made. An adjustment for incorrect timing requires substitution or correction of some part or parts such as the bolt, firing pin extension, sear, trigger bar, sear slide, or side plate trigger cam. Care should be taken to prevent indiscriminate exchange of these parts during periods of instruction and maintenance.

152. (Superseded) CHECK FOR TIMING.—Timing should be checked when the gun is cleaned and reassembled for the first time, when parts are replaced or modified, and whenever the correctness of timing is doubted. The check may be made with the 0.116-inch thick timing gauge A351213 (NO FIRE) and the 0.020-inch thick timing gauge A351214 (FIRE) of the head space and timing gauge assembly A351217. The check may also be made with the 0.116-inch thick timing gauge end of the head space and timing gauge A196228 (NO FIRE) and a 0.020-inch feeler gauge (FIRE). The check may be made approximately with a dime and a nickel; since the gun is normally timed, when manufactured, to fire when the recoiling parts are between 0.040 inch and 0.080 inch out of battery position. A dime is approximately 0.040-inch thick and a nickel is approximately 0.080-inch thick. The methods are as follows:

a. When the head space and timing gauge assembly A351217 is used:

(1) Adjust and check the head space of the gun.

Caution: DO NOT ATTEMPT TO CHECK TIMING UNLESS THE HEAD SPACE HAS BEEN CHECKED AND PROPERLY ADJUSTED FIRST.

(2) Cock the firing pin by fully retracting the recoiling parts and allowing them to go forward into battery.

(3) Retract the recoiling parts slightly and insert the FIRE timing gauge A351214 between the barrel extension and the trunnion block.

(4) Allow the barrel extension to close slowly on the gauge. If the barrel extension slams on the gauge, its accuracy will not only be seriously impaired but it may also break the gauge.

*(5) Release the firing mechanism by means of the trigger bar or the sideplate trigger, or by operating the solenoid ONCE (use all available means separately, repeating the procedures in (2), (3), and (4) above as necessary). The firing pin should be released by any of the means employed.

NOTE 1: When attempting to release the firing mechanism by means of the trigger bar, a backplate equipped with a trigger should be used to activate the trigger bar. When a backplate trigger is not available remove the backplate filler piece (if necessary) and pry the rear end of the trigger bar upward by inserting the point of a screw driver through the backplate window.

NOTE 2: When attempting to release the firing mechanism by means of the remote control trigger mechanism or the solenoid, it should be understood that adjustment of these mechanisms cannot change the timing of the gun.

(6) Remove the FIRE gauge, cock the firing pin, and insert the NO FIRE gauge A351213 between the barrel extension and the trunnion block.

(7) Allow the barrel extension to close slowly on the gauge.

(8) Release the firing mechanism as in (5) above. The firing pin should not be released by any of the means employed.

*(9) If the firing pin is not released with the FIRE gauge in place, or is released with the NO FIRE gauge in place, adjustment or replacement of the trigger bar, solenoid, or other parts is necessary.

b. When the head space and timing gauge A196228 and a 0.020 inch feeler gauge are used:

(1) Adjust and check the head space of the gun.

Caution: DO NOT ATTEMPT TO CHECK TIMING UNLESS THE HEAD SPACE HAS BEEN CHECKED AND PROPERLY ADJUSTED FIRST.

(2) Cock the firing pin by fully retracting the recoiling parts and allowing them to go forward into battery.

(3) Retract the recoiling parts slightly and insert the 0.020 inch feeler gauge between the barrel extension and the trunnion block.

(4) Allow the barrel extension to close slowly on the gauge.

(5) Release the firing mechanism by means of the trigger bar or the side plate trigger or by operating the solenoid ONCE (use all available means separately, repeating the procedures in (2), (3), and (4) above as necessary). The firing pin should be released by any of the means employed.

Caution: Read carefully notes 1 and 2 in *a* (5) above.

(6) Remove the feeler gauge, cock the firing pin, and insert the NO FIRE gauge A196228 between the barrel extension and the trunnion block.

(7) Allow the barrel extension to close slowly on the gauge.

(8) Release the firing mechanism as in (5) above. The firing pin should not be released by any of the means employed.

(9) If the firing pin is not released with the feeler gauge in place, or is released with the NO FIRE gauge in place, adjustment or replacement of the trigger bar, solenoid, or other parts is necessary.

c. When the dime and the nickel are used:

(1) Adjust the head space.

Caution: DO NOT ATTEMPT TO CHECK TIMING UNLESS THE HEAD SPACE HAS BEEN PROPERLY ADJUSTED FIRST.

(2) Cock the firing pin by fully retracting the recoiling parts and allowing them to go forward into battery.

(3) Retract the recoiling parts slightly and insert a dime between the barrel extension and the trunnion block.

(4) Allow the barrel extension to close slowly on the dime.

*(5) Release the firing mechanism by means of the trigger bar or the side plate trigger, or by operating the solenoid ONCE (use all available means separately, repeating the procedures in (2), (3), and (4) above as necessary). The firing pin should be released by any of the means employed.

Caution: Read carefully notes 1 and 2 in *a* (5) above.

(6) Remove the dime, cock the firing pin, and insert a nickel between the barrel extension and the trunnion block.

(7) Allow the barrel extension to close slowly on the nickel.

(8) Release the firing mechanism as in (5) above. The firing pin ordinarily will not be released by any of the means employed.

(9) If the firing pin is not released with the nickel in place, proceed no further with the check.

(10) If the firing pin is released with the nickel in place, remove the nickel, cock the firing pin, and insert both a dime and a nickel between the barrel extension and the trunnion block.

(11) Allow the barrel extension to close slowly on these coins.

(12) Release the firing mechanism as in (5) above. The firing pin should not be released by any of the means employed.

*(13) If the firing pin is not released with a dime in place, or is released with both a dime and a nickel in place, the gun should be checked with accurate gauges as adjustment or replacement of the trigger bar, solenoid, or other parts may be necessary.

154. (Superseded) ADJUSTMENT OF OIL BUFFER TUBE.—The best adjustment of the oil buffer tube is TWO notches clockwise from "0" position. The adjustment is made by a screw driver in the slot. (See fig. 80.)

155. FILLING OIL BUFFER.—Remove the filler * * * within the tube.

ANTIAIRCRAFT ARTILLERY FIELD MANUAL

Caution: **DO NOT USE ANY OIL IN THE OIL BUFFER TUBE WITH HB OR TT M2 MACHINE GUNS.**

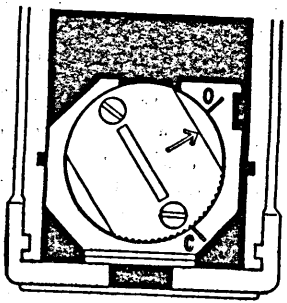

FIGURE 80.—Correct adjustment of oil buffer tube.

[A. G. 300.7 (11 Apr 44).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

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

DISTRIBUTION:

As prescribed in paragraph 9a, FM 21–6, except: AAA Sch (500), CA Sch (100); Bn & H 4, 44 (5); C 44 (15); 1 C 4 (10).

1 C 4: T/O 4–46, IIq & Hq Btry, CA Bn (Ry); 4–53, S/L Btry, 155 mm Gun Regt; 4–57, CA Btry (155 mm Gun) Mob; 4–104, CA Mine Planter (cable ship) Btry; 4–157, Btry CA Bn (155 mm Gun); 4–158, CA Btry (SIL) (Seacoast Arty) (SM).

For explanation of symbols, see FM 21–6.

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FM 4–155
C 2

ANTIAIRCRAFT ARTILLERY FIELD MANUAL

SERVICE OF THE PIECE

CALIBER .50 AA MACHINE GUN

CHANGES No. 2

WAR DEPARTMENT,
WASHINGTON 25, D. C., 15 September 1944.

FM 4–155, 4 October 1943, is changed as follows:

1.—**WCO and AH** * * * on water chest.

AH removes ammunition chest from mount, places it on floor of vehicle. **G sets lower recoil slide stop, assisted if necessary by AH. AH and G** dismount gun from cradle.

* * * * *

FIGURE 2.—Preparing for action.

■ 8. PREPARE FOR ACTION.

* * * * *

b Drill B (used with M3 mount).—Drill B is * * * from the cradle. **AH and G** remove the top shield. **G** unlocks the trunnion bracket clamping bolt, the cradle and gun are disconnected from the mount and placed in the forward part of the truck body. The mount is * * * in drill A. The three crew members then return and carry the cradle and gun to the mount and place it on the pedestal. **G** locks the trunnion bracket clamping bolt. **AH and G** replace the top shield. During the emplacing, the brake shoe clamping handle should be locked.

■ 9. EXAMINE EQUIPMENT.—The gun being emplaced and details at their posts—

G commands: EXAMINE EQUIPMENT, * * * insures that lower recoil slide stop on lower right rear of the M2 or M2A1 mount * * * checks timing adjustment—checks front and rear barrel packing—insures that backplate buffer adjusting screw is tight—loads * * * it is complete.

* * * * *

■ 12. COMMENCE FIRING.

* * * * *

WCO continuously cranks water pump handle, and acts as AA lookout.

■ 14. CEASE TRACKING.

G commands: CEASE TRACKING—releases trigger and ceases to track target—clamps cradle and unloads gun.

* * * * *

■ 16. MARCH ORDER.—*a. Drill A.*—The machine gun being in firing position in its emplacement—

* * * * *

AH removes ammunition chest from mount.

G sets lower recoil slide stop, assisted if necessary by AH.

G and AH dismantle gun from cradle—place gun on water chest—lift cradle from pedestal, carry it to vehicle, and place in truck.

* * * * *

b. Drill B (used with M3 mount).—Drill B is similar to drill A except that the gun is not removed from the cradle. AH and G remove the top shield. G unlocks the trunnion bracket clamping bolt, the cradle and gun are disconnected from the mount and carried to the truck by G, AH, and WCO where it is placed in the forward part of the truck body. The three crew members then return and carry the mount to the truck as in drill A, and mount the cradle and gun on the pedestal. G locks the trunnion bracket clamping bolt, AH and G replace the top shield, and the drill is completed as in drill A.

■ 20. PREPARATION OF POSITION.—The preparation of position is discussed in FM 44–2 (4–102). The selected position * * * the time available.

■ 29. MANIPULATION OF WEAPON.—The ability to * * * as tracking targets. For training methods, see FM 44–51.

■ 30. FIRING.—For antiaircraft machine gun * * * caliber machine gun. At the present time, the training devices for machine gunners are the antiaircraft machine gun trainer M9 and the machine gun trainer Mk. I.

■ 33. SEQUENCE OF FIRING.—The firing phase * * * the target used. The usual order or progression for machine gunner training follows:

a. Antiaircraft machine gun trainer M9.
b. **Machine gun trainer Mk. I.**
c. Free balloons.
d. Towed sleeve or flag target.
e. Radio controlled aircraft targets.
f. Rocket targets.
g. Antimechanized targets.

■ 34.1 MACHINE GUN TRAINER MK. I (Added).—*a. Purpose.*—The machine-gun trainer Mk. I, known as a polaroid trainer, is a training device for training gunners to fire by tracer control (see fig. 5.1). The gunner receives valuable practice in firing on targets flying at combat speeds.

b. Description.—The Mk. I trainer has the appearance of a caliber .50 machine gun and is fired by means of a trigger lever on the right handlebar of the mount. The targets are projected on a screen in front of the gunner by a specially prepared film. Each film consists of six sections, twelve courses to a section. The target courses are crossing, incoming, outgoing, diving, and maneuvering. Rays of light, representing tracers, are thrown upon the screen when the trigger lever is squeezed. The tracers remain in view for approximately 2½ seconds, and the illusion of a curved tracer stream is present. Special polaroid glasses, which give the effect of a third dimension to the target and tracers, are worn by the gunner. The sound track on the film reproduces the noise of aircraft motors. When hits are made on the target, the audio hit signal (or "beep") is heard. A counter records the number of shots each gunner fires, and the number of hits made.

c. Use.—The training group consists of six men for one showing of the film. Definite instructions are given to the gunner before he fires. The instructions emphasize how to fire, how to stand, at what the gunner should look, and the importance of tracking smoothly. The gunner must stand up straight in the mount; he must not sight along the top of the barrel; he must track smoothly and easily, in order to properly observe the

tracers and get hits. He must at all times keep his eyes on the target. This is an important fundamental, yet hard to master. By correcting the gunner's stance, his tracking habits, and his observation of tracers during performance, the coach gives valuable aid to the gunner. The principles learned by the gunner in firing the trainer are the same as those used when firing any weapon which uses tracer control.

d. Training.—During the early stage of training, the gunner is taught how to handle the gun and observe tracers. He should be permitted to fire two sections during one showing of the film in order that he may practice what he has learned while it is still fresh in his mind. During later stages of training, the gunner fires on one section of the film on succeeding days. A short period of firing is more beneficial than a prolonged session. The preliminary training on the Mark I trainer is done with the audio hit signal (beep) on. In later stages, the signal is not used.

e. Records.—The instructor keeps a record of each gunner's performance during training. The record consists of the number of rounds fired, the hits made, and the percentage of hits, so that a fair comparison of results may be made. Some comment on the gunner's performance is recorded. This record may be used as a basis for a critique following the firing period.

35. FIRING AT BALLOONS.—Free balloons are * * * adjustment is possible. The sight is used to obtain the initial lead on the target. Once fire is opened, tracer control is used. It must be * * * on balloon firings.

41. GUN POINTING.—Accuracy of machine-gun * * * of the projectile. A complete discussion of the computation and use of leads may be found in FM 44–10 (4–110) and 44–51.

43. TRACER CONTROL.—Individual tracer control * * * keep it there. (See FM 44–10 (4–110) and FM 44–51).

45. COACHING.—During instructional firing, * * * confusion and misunderstanding. The following terms are used:

Line—Any shot which pierces the cone of sight.

Hit—A line shot which pierces the cone of sight at the target; that is, any shot which hits the target.

High—A shot whose trajectory passes above the line of sight.

Low—A shot whose trajectory passes below the line of sight.

Ahead—A shot which passes ahead of the target, with reference to the course line.

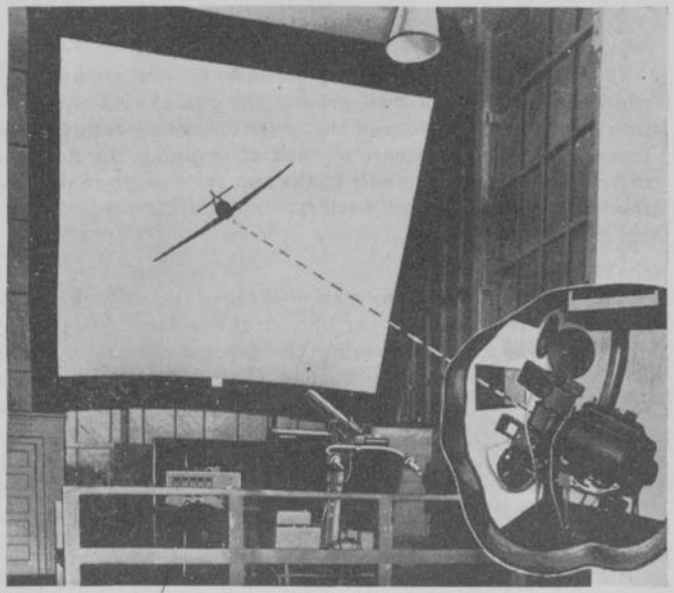

FIGURE 5.1.—Machine-gun trainer Mk. I.

Astern—A shot which passes astern of the target, with reference to the course line.

Right—A shot whose trajectory passes to the right of the line of sight, used only with respect to coming (going) target.

Left—A shot whose trajectory passes to the left of the line of sight, used only with respect to coming (going) target.

Tracers that pass * * * usually more apparent.

■ 49. SAFETY PRECAUTIONS.—*a.* Safety precautions to be observed in training are prescribed in AR 750–10 and TM 44–234 (4–234). The principles indicated * * * where circumstances permit.

b.

* * * * *

(8) If malfunctioning of the gun causes it to fire continuously while the trigger is not being pressed, the gun should be turned into a safe field of fire, and the cover opened by rotating the cover latch. An alternate method of stopping the firing is to hold the operating handle to the rear far enough to prevent the bolt from going into battery.

* * * * *

(11) Rescinded.

(12) Before dismounting guns or before any man is permitted to pass in front of the firing line, clearance must be given by an officer who has, by opening the cover and retracting the bolt, made a visual inspection of the breech and T-slot of each gun.

* * * * *

■ 51. CHARACTERISTICS OF THE GUN.—*a.* The Browning machine * * * the gun are:

* * * * *

Weight of barrel---------- 17 pounds

* * * * *

Rate of fire---------- 500 to 650 rounds per minute

* * * * *

■ 52. GENERAL OPERATION.—Although the .50 * * * barrel extension forward. This motion locks the bolt to the barrel and barrel extension. If trigger action has been maintained, the firing pin is released just before the recoiling portions

reach the battery (foremost) position. This fires the next cartridge and another cycle is started. This cycle continues * * * of this chapter.

55. REMOVING GROUPS FROM GUN.—The cover may * * * the side plate. Under no conditions should the bolt be retracted when the driving springs are in place, unless the backplate is on. Otherwise the driving springs retaining pin may be broken and personnel injured. Remove the driving spring rod. Draw the bolt * * * forward. (See fig. 9.)

58. DETAILED DISASSEMBLING OF CASING GROUP.—*a.* To remove the * * * plate trigger nut. To disassemble, push the side plate trigger slide out of its guides in the housing. Swing the side * * * cam. (See fig. 11.)

* * * * *

d. To remove the extractor switch and extractor switch spring, withdraw the cotter pin and unscrew the extractor switch pivot nut.

* * * * *

i. Unscrew the front barrel bearing lock screw jam nut and front barrel bearing lock screw. The muzzle gland lock, the muzzle gland, the muzzle packing ring, and the muzzle barrel packing may then be removed. This is not * * * repack the barrel.

60. DETAILED DISASSEMBLING OF BACKPLATE GROUP.

* * * * *

c. When the backplate * * * the buffer disks. If the end of the adjusting screw does not protrude approximately one-sixteenth of an inch or show one thread when screwed tight, remove the adjusting screw and add one buffer disk.

61. BOLT GROUP.—*a.* The bolt group * * * and ejects it. It extracts a fresh cartridge from the belt and inserts it in the chamber. It actuates the * * * the sear slide. The sear stop performs a similar function and would retain the sear if the sear slide were missing. The sear stop pin * * * firing pin spring.

* * * * *

d. The extractor stop pin stops the extractor in its downward swing on the counterrecoil stroke, helping to align the cartridge with the chamber.

■ 62. DETAILED DISASSEMBLING OF BOLT GROUP.—*a.* The driving spring * * * and ejector spring. Remove the bolt switch and the bolt switch stud from the bolt.

* * * * *

■ 63. OIL BUFFER GROUP.

* * * * *

b. The accelerator is * * * to the rear. When it has been turned backward, the claws on the accelerator bear against the shoulders on the barrel extension shank, thus locking and preventing the barrel extension from moving forward until the bolt strikes and moves the accelerator forward. Thus the locking * * * is in position.

c. A flat spring * * * strikes the accelerator. A stud on the rear end of the spring engages the serrations on the oil buffer tube through a hole in the oil buffer body, thus preventing the tube from rotating while the gun is being fired.

* * * * *

■ 67. BARREL EXTENSION GROUP.

* * * * *

b. Operating in a * * * from the belt. The belt feed pawl arm, which prevents double feeding, is attached to the belt feed pawl. The pawl, slide, arm, and lever may be reversed to change the direction of feed.

* * * * *

■ 69. SEQUENCE IN ASSEMBLING.

* * * * *

b.

* * * * *

(4) (Added.) *The cover pin should be assembled with the cotter pin on the opposite side from the feed so that there is no*

danger of an improperly installed cotter pin interfering with the rounds being fed into the gun.

* * * * *

e. The cocking lever is * * * firing pin extension. The cocking lever pin must be inserted from the left side of the bolt, otherwise the bolt will not go fully forward in the barrel extension when assembled. The cocking lever must be rotated forward before the bolt is inserted in the receiver to avoid jamming against the top plate bracket.

* * * * *

72. RECOILING.—The complete cycle * * * of the piston. Its only path is through restricted notches between the edges of the piston rod head, the piston valve, and the oil buffer tube. The bolt travels * * * in the backplate.

74. COCKING.—The act of * * * pin extension rearward. The firing pin spring is thus compressed against the sear stop pin. The shoulder at * * * bracket. (See fig. 37.) This action swings the bottom of the cocking lever out of the path of the firing-pin extension, as shown in figure 38, thus permitting the firing pin to snap forward to fire the cartridge, when the sear is released. When the recoiling * * * ready to fire.

78. CHARACTERISTICS AND DATA.—*a.* The Browning machine * * * the gun are:

Weight of gun ..... 82 pounds.

* * * * *

Rate of fire ..... 400 to 500 rounds per minute.

* * * * *

84. GENERAL.—There are several * * * the following manuals:

FM 44–57 (4–157)—Service of the Piece, Multiple Machine Gun Mounts.

FM 44–59 (4–159)—Service of the Piece, Multiple Gun Motor Carriages M15 and M15A1.

85. CHARACTERISTICS.—Some of the * * * the following table:

CHARACTERISTICS OF ANTIAIRCRAFT MACHINE-GUN MOUNTS

	M1	M2	M2A1	M3	M32	M43	M63
Type of mount	Tripod	Tripod or pedestal.	Tripod or pedestal.	Tripod or pedestal.	Truck	Pedestal	Four-legged.
Gun used with mount	Water-cooled	Water-cooled or heavy barrel.	Water-cooled or heavy barrel.	Water-cooled or heavy barrel.	Heavy barrel	Water-cooled or heavy barrel.	Heavy barrel or water-cooled.
Elevation, maximum degrees.	80	68.75	68.75	90	85	80	84.
Depression, minimum degrees.	−10	−15	−15	−15	−10	−10	−29.
Traverse, degrees	360	360	360	360	360	360	360.
Weight of mount complete w/o gun; pounds.	284	541	509	380	(Built into truck cab.)	725	144.
Height at trunnion, inches	65	49	49	37		44	28.
Armor protection	None	¼-inch shield	¼-inch shield	¼-inch shield	None	½-inch shield	None.

■ 91. ARMOR SHIELDS.—Armor shields are * * * traverse the gun. To eliminate any increase in effort required to elevate or depress the gun, a 23-pound bag of lead shot is provided to be poured into the circular backrest as a counterweight.

■ 93. RECOIL MECHANISM.

* * * * *

b. As the gun * * * counterrecoil buffer springs. Except on the last round fired, the buffer springs are aided at the end of counterrecoil by the impulse of recoil from the next round, which occurs when the barrel extension is within approximately 1/16 inch of the trunnion block. The purpose of * * * of the spring.

c. (1) *Adjustment of counterrecoil buffer springs.*—(*a*) With trunnion slide * * * in the mount.

(*b*) *Alternate method* (Added).—The counterrecoil spring adjusting plugs are set so that their front faces are $6\frac{15}{16}$ inches from the rear of the counterrecoil spring housings. The springs are adjusted, when necessary, by the same method employed in (*a*) above. This adjustment can be made with or without the gun in the mount.

* * * * *

■ 95. GENERAL.—The antiaircraft machine * * * attaching a counterweight. The mount is normally used as a tripod mount. With the legs removed, it may be assembled on a pedestal base for permanent installation. The mount consists of a relatively short pedestal, supported by three legs, and a trunnion bracket which carries the cradle. The gunner is * * * in the cradle. An upper section of armor plate is carried by two supports which straddle the water jacket and are fastened to the trunnion bracket. The recoil mechanism * * * or uncomfortable position.

■ 96. EMPLACING.—*a. Assembly of mount.*—The legs fit * * * of the mount. The pedestal is fitted with a heavy ball bearing, on which the trunnion bracket socket revolves. There is a * * * emplacing the mount. At the top of the trunnion bracket socket is a heavy fitting consisting of two claws and a

lug, by means of which the trunnion bracket is attached. These two claws and the lug engage corresponding members of the trunnion bracket. The cradle is * * * the cradle lock.

b. Mounting the gun.—Before the gun * * * of the mount. It is locked in position by the front gun joint pin and the rear gun joint pin. The gun cannot * * * secured in place. The upper armor shield is attached by its two legs to the trunnion bracket and secured by two wing bolts. The ammunition chest * * * of the receiver. The gun must be elevated above 30° when changing ammunition chests to prevent interference by the upper armor shield.

■ 98. RECOIL MECHANISM (As changed by C 1).—The recoil mechanism * * * the spring guide. With either the water-cooled or heavy barrel gun in the mount, the gun will counter-recoil the amount of recoil plus 1/16 inch. The recoil (front) * * * gun is used.

SECTION VII½ (Added)

ANTIAIRCRAFT MACHINE GUN MOUNT M63

■ 110.1. GENERAL.—The antiaircraft machine-gun mount M63 is a lightweight antiaircraft mount designed for the caliber .50 heavy barrel machine gun. For emergency firing, it will accommodate the caliber .50 water-cooled gun or the aircraft basic machine gun. This mount is used as a ground mount for cab-mounted machine guns of trucks and tractors. It can be transported in the same manner as pioneer tools, without sacrificing cargo space due to its lightness and compactness. It can be set up and made ready to fire in a very short time. To exploit its capabilities fully, the M63 mount should be properly dug in.

■ 110.2. DESCRIPTION.—*a.* The M63 mount weighs 144 pounds complete. When the mount is set up for fire with the heavy barrel gun and a chest of 200 rounds, its complete weight is 317 pounds.

b. The M63 mount consists of four principal groups. These groups are the legs, base, the elevator, and the cradle. (See fig. 69.1.)

(1) There are four tubular legs fitted with spades on the outer ends. The spade, when forced into the ground, increases the stability of the mount. A stud on the head of each leg is used in alining the leg when assembling to the base.

(2) The base is composed of a baseplate, traversing bearing, and four leg clamping sockets. The traversing bearing is equipped with a bearing lock, which when pushed in, permits the traversing bearing to be locked, and the elevator to be unscrewed from the base. A bolt protrudes from the baseplate into the bearing housing and fastens the elevator to the base.

(3) The elevator fits into the base socket and extends upward at an offset angle. A spring plunger (traverse lock) locks the elevator to the base in either of two positions. A removable pintle traverses as part of the elevator. A pintle lock, located on the elevator, locks the pintle in place.

(4) The cradle, attached to the pintle, consists of two side plates. Two sets of firing handles are provided at the rear of the cradle. The extension handles, used for firing at high angles of elevation, are locked into position by extension handle sleeves. The handles may be folded under the cradle and latched. The lower handles may be used when firing at any angle of elevation. Both handles located on the left side of the cradle are equipped with squeeze type firing levers connected by a linkage to the side plate trigger mechanism. At the left side of the cradle is an ammunition bracket designed to hold either the ammunition chest M2 (200-rounds capacity) or a tray adapted to accommodate the ammunition box M2 (110-rounds capacity). Three locking pins are provided. Two are used to secure the gun in the cradle. The third pin is used to lock the cradle in a horizontal or vertical position.

■ 110.3. EMPLACING.—*a.* To assemble the mount, the legs are inserted into the leg sockets of the base, alining each leg by means of the stud on the leg. The legs are locked by tightening the leg clamps. If any one of the leg clamps is broken, lock the leg by inserting the cotter pin through the holes in the leg and leg socket. Place the elevator in the base socket over the bolt, push in the bearing lock to lock the bearing, and screw the elevator into position, hand tight. Lock the elevator to the base

FIGURE 69.1.—M63 mount.

in azimuth by means of the traverse lock. Insert the pintle (with cradle attached) into the pintle socket of the elevator. The cradle must be on the *same* side as the bend in the elevator. Lock the cradle in the horizontal position. Carefully place the machine gun in the cradle, taking care that the side plate trigger and the side plate trigger control machanism are properly engaged. Secure the gun to the cradle by means of the two gun locking pins through the mounting bracket and the trunnion pin hole of the gun.

b. A circular trench is dug to a depth so that the gunner's eye is level with the gun trunnions. The extension handles are folded under the cradle and the lower handles are used for firing. The spoil from the trench is used to build a parapet. When emplaced in this manner, the mount can be used against ground or air targets.

■ 111. GENERAL.—Machine guns are * * * the M43 mount. Other type sights are described below and in FM 44–51.

■ 112. RING SIGHTS.—*a.* The ring type * * * on a support. For a complete discussion of the use of antiaircraft machine gun sights see FM 44–51.

* * * * *

■ 114. CLASSIFICATION.

* * * * *

e. Armor piercing—incendiary (Added).—For use against armor plate and for incendiary purposes.

■ 115. IDENTIFICATION.

* * * * *

b.

* * * * *

(6) *Armor piercing—Incendiary* (Added).—Cartridge, armor piercing incendiary, caliber .50, M8, is identified by the ALUMINUM paint on the nose of the bullet.

■ 125. PLACING AMMUNITION IN CHESTS.—*a.* In loading ammunition link belts into M2 ammunition chests, the cartridge filler piece is locked in place on the spindle by means of the set screw in the filler piece. (The position of the filler piece is dependent upon whether left- or right-hand feed is being used. The filler piece should be positioned over the front fin when the chest is mounted). The end of the belt having the open single loop is rolled on the reel with the fins of the filler piece between the bullet end of the first and second cartridge in the belt. Fill the spindle to approximately the height of the upper half of the chest. The remainder of the belt is folded into the lower half of the chest so that the end with the double loop lies on top ready to be fed into the receiver. (See fig. 75.)

* * * * *

■ 134. CLEANING BORE.

* * * * *

c. (Added.) The cleaning rod is inserted from the breech end of the barrel whenever possible to avoid wear at the muzzle. When using soap and water or a soda ash solution, the muzzle is placed in the cleaning solution to prevent damage to the breech barrel packing. When it is necessary to clean the bore during a lull in firing, the bore may be cleaned from the muzzle end. Care should be observed to hold the cleaning rod straight.

■ 135. CLEANING REMAINDER OF GUN.—The receiver is wiped clean, particular care being taken to remove dirt and lint from the belt-holding pawl, the breech lock cam, and the extractor switch. Clean, lintless cloth * * * for wiping dry. Until the parts are oiled, they should be handled as little as possible. Gloves should be used in handling if available. Wipe a light * * * to SNL K-1.

* * * * *

■ 138. DAILY MAINTENANCE PRIOR TO FIRING.—*a. Gun.*—Make adjustments on the gun before placing it on the mount.

(1) Check the muzzle and breech packings.

(2) Adjust for headspace.

(3) If parts have been replaced or modified, or if adjustment is in doubt, check the timing of the gun.

(4) Check the oil in the oil buffer and the adjustment of oil buffer.

(5) Test bolt operation and firing mechanism.

(6) Check lubrication.

(7) See that the adjusting screw on buffer is tight and protruding.

(8) Place the gun * * * the outlet hose.

* * * * *

■ 140. CARE AFTER CLEANING.

* * * * *

b. Field strip the gun, detail strip the bolt, clean, wipe dry, and lubricate. Examine all parts * * * replacements if necessary.

141. SPARE PARTS AND TOOLS.—A complete set * * * in the gun. All spare parts should be carefully examined and actually tried in the gun to make certain that they will work when needed. Spare barrels and barrel packings should be given particular attention.

150. HEAD SPACE CHECKING (As changed by C 1).—Head space may * * * adjustment is doubted. The adjustment may be checked with the head space gauge A351211 (GO–NO–GO) of the head space and timing gauge assembly A351217 or with the head space and timing gauge A196228.

* * * * *

152. CHECK FOR TIMING (As changed by C 1). * * *.

a. When the head space and timing gauge assembly M351217 is used:

* * * * *

(5) Release the firing mechanism by means of the trigger bar or the sideplate trigger, use all available means separately, repeating the procedures in (2), (3), and (4) above as necessary. The firing pin * * * the means employed.

* * * * *

(9) If the firing pin is not released with the FIRE gauge in place, or is released with the NO FIRE gauge in place, adjustment or replacement of the trigger bar sear, or other parts if necessary.

b. When the head space and timing gauge A196228 and a 0.020 inch feeler-gauge are used:

* * * * *

(5) Release the firing mechanism by means of the trigger bar or the side plate trigger (use all available means separately repeating the procedures in (2), (3), and (4) above as necessary). The firing pin * * * the means employed.

* * * * *

(9) If the firing pin is not released with the feeler gauge in place, or is released with the NO FIRE gauge in place, adjustment or replacement of the trigger bar, sear, or other parts if necessary.

c. When the dime and the nickel are used:

* * * * *

(5) Release the firing mechanism by means of the trigger bar or the side plate trigger (use all available means separately repeating the procedures in (2), (3), and (4), above, as necessary). The firing pin * * * the means employed.

* * * * * *

(13) If the firing pin it not released with a dime in place, or is released with both a dime and nickel in place, the gun should be checked with accurate gauges as adjustment or replacement of the trigger bar, sear, or other parts may be necessary.

■ 153. ADJUSTMENT OF RECOIL MECHANISMS.—The adjustment of the recoil mechanism varies for each type of machine gun mount (See ch. 4).

■ 155.1. (Added.) ADJUSTING BREECH LOCK CAM.—The breech lock cam is installed by positioning the lug on the bottom of the cam through the oblong slot in the bottom plate of the receiver. The beveled surface of the cam points to the rear. The breech lock cam bolt is inserted downward through the cam. The castellated nut is threaded on so that the cotter pin slots are against the lower face of the bottom plate. Screw the nut tight, then back it off just enough to install the cotter pin through the aligned hole in the bolt and the slots in the nut. The nut should be drawn just tight enough so that the cam will "float" slightly in the receiver, but should not be loose. The clearance between the cam and the bottom plate should be between 0.001 inch and 0.008 inch, measured at the U-shaped opening at the front of the cam.

■ 155.2. (Added.) ADJUSTMENT OF EXTRACTOR SWITCH.—When properly installed, the extractor switch should not bind nor have more than perceptible side play. Screw the nut snugly on the extractor stud. Back the nut off just enough to insert the cotter pin in the alined holes in the nut and the stud. This will normally require backing off one castellation, but should never be more than two castellations.

■ 160. BUFFER DISKS.—The adjusting screw on the backplate must be tight and protruding. It should be * * * the buffer disks.

APPENDIX

LIST OF REFERENCES

* * * * *

Employment of AA Automatic Weapons---- FM 44–2 (4–102)
Gunnery for Antiaircraft Artillery-------- FM 44–10 (4–110)

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Service of the 40-mm Fire Unit---------- FM 4–160
AAA Fire Control, Automatic Weapons---------- FM 44–51

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Browning Machine Gun, Caliber .50, HB, M2----- FM 23–65

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[A. G. 300.7 (9 Sep 44).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

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

DISTRIBUTION:

As prescribed in paragraph 9a, FM 21–6 except D4, 44 (5), AA Sch (500), CA Sch (100); Base C (5); Island C (5); Def C (5), Sectors (5), Sub-sectors (5); Base Sectors (5); HD (5); B 4, 44 (5); R 4, 44 (5); Bn 4, 44 (5); C 44 (15); IC 4 (10).

IC 4: T/O & E 4–46; 4–57; 4–58; 4–104; 4–137; 4–158.

For explanation of symbols, see FM 21–6.

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