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WAR DEPARTMENT

TECHNICAL MANUAL

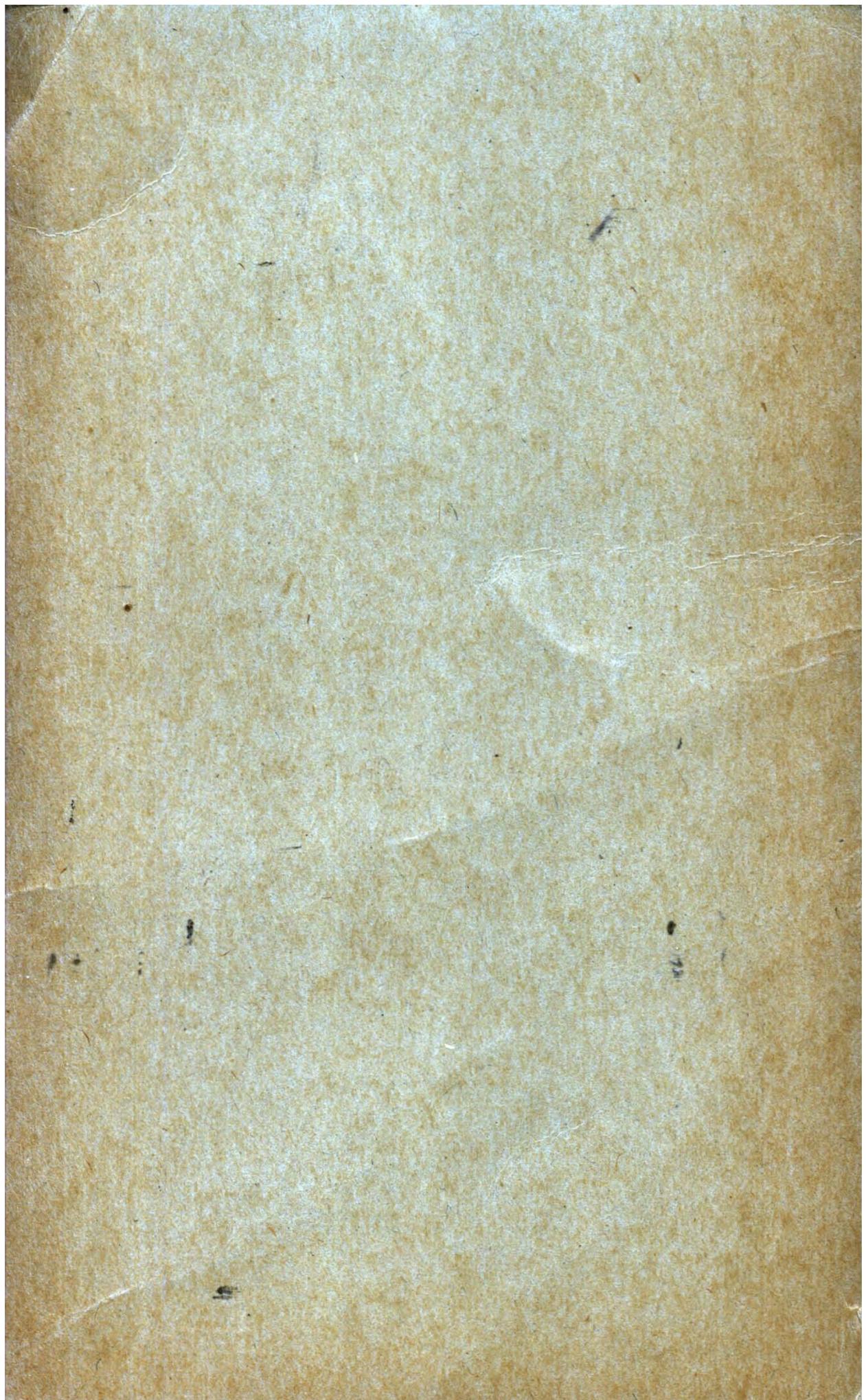


**BROWNING MACHINE GUN  
CALIBER .50, M2, AIRCRAFT,  
FIXED AND FLEXIBLE**

April 30, 1942

**NON-CIRCULATING**

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TECHNICAL MANUAL }  
No. 9-225 }

WAR DEPARTMENT,  
WASHINGTON, April 30, 1942.

**BROWNING MACHINE GUN, CALIBER .50, M2, AIRCRAFT,  
FIXED AND FLEXIBLE**

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\*This manual supersedes TM 9-225, November 8, 1940.

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SECTION I  
GENERAL

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1. **Scope.**—*a.* This manual is published for the information and guidance of the using arms and services.

*b.* In addition to a description of the Browning machine gun, caliber .50, M2, aircraft, fixed and flexible, this manual contains technical information required for the identification, use, and care of the matériel.

*c.* The disassembling outlined herein is the only disassembling which the using troops are authorized to perform.

*d.* In all cases where the nature of the repair, modification, or adjustment is beyond the scope or facilities of the unit, the responsible ordnance service should be informed in order that trained personnel with suitable tools and equipment may be provided, or proper instructions issued.

2. **Data.**

Weight of gun (fixed).....	pounds..	61.4
Weight of gun (flexible).....	do.....	65.4
Weight of barrel assembly.....	do.....	10.2
Over-all length of gun (fixed).....	inches..	57.09
Over-all length of gun (flexible).....	do.....	56.4
Over-all length of barrel.....	do.....	36.0
Rate of automatic fire.....	rounds per minute..	700 to 850

**3. Description.**—The Browning machine gun, caliber .50, M2, aircraft, is a recoil-operated, belt-fed, air-cooled machine gun. The metallic link disintegrating belt is used in all firing of the gun. This gun is designed for both fixed and flexible use. By repositioning some of the component parts the gun may be fed from either the right or left side.

*a. Basic gun.*—This gun is now furnished as a basic gun (figs. 1 and 2) which may be described as a Browning machine gun, caliber .50, M2, aircraft, fixed, from which the operating slide group assembly has been removed and to which a trigger bar and trigger bar pin assembly have been added. This gun can be made into either the fixed or flexible type by addition of an operating slide group assembly (for the fixed type) or a retracting slide group assembly (for the flexible type). The fixed type of gun obtained by adding an operating slide group assembly to a basic type of gun differs from the Browning machine gun, caliber .50, M2, aircraft, fixed, by having a trigger bar and trigger bar pin assembly, whereas the latter gun does not.

*b. Types.*—(1) *Fixed gun.*—The fixed gun (fig. 3) is designed for installation on or adjacent to the airplane engine; or for mounting in or on the wings. It is provided with an operating slide which connects with the bolt by means of the bolt stud. The operating slide is provided for retraction of the breech mechanism by hand and for use in loading, unloading, and reduction of stoppages in firing. It can be drawn back to its full extent or to a position with the bolt not fully home and the bolt retained there by engaging the slot provided in the lower surface of the operating slide on the operating slide rear guide. The bolt should never be locked in a position other than to the rear, to prevent overheating of a round and to insure that maximum spring action is obtained to return the bolt to firing position.

(a) The fixed gun is normally assembled with a back plate having a horizontal buffer, although it may have a vertical buffer back plate due to previous practice or to limitation in mounting space.

(b) The fixed type of gun when mounted adjacent to the engine is fired by means of a synchronized mechanical trigger motor attached to the gun receiver. The trigger motor is operated by an impulse generator which is an integral part of the airplane engine. The impulse generator and trigger motor are connected through a solenoid and semiflexible tube and wire controlled by a switch operated by the pilot. This mechanism allows the gun to deliver semiautomatic fire. Wing-mounted guns are not synchronized. When wing-mounted, the gun is fired through a remote-controlled solenoid attached to the gun receiver, the gun delivering automatic fire. The synchronizing

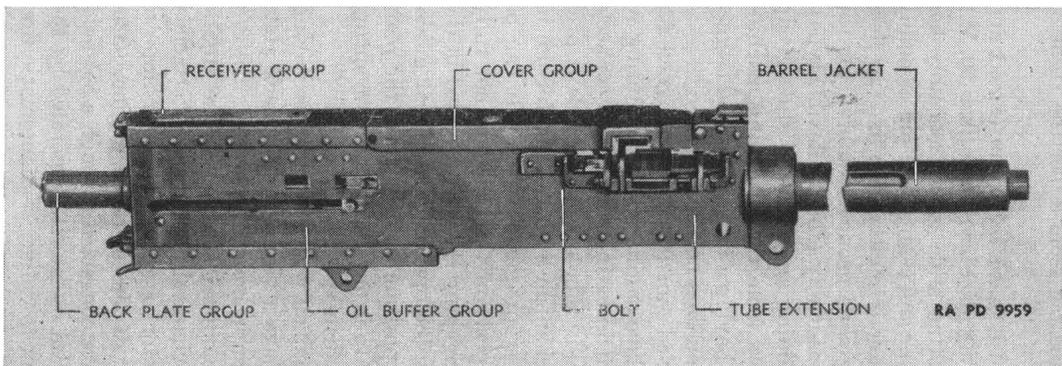


FIGURE 1.—Browning machine gun, caliber .50, M2, aircraft, basic—location of major subassemblies.

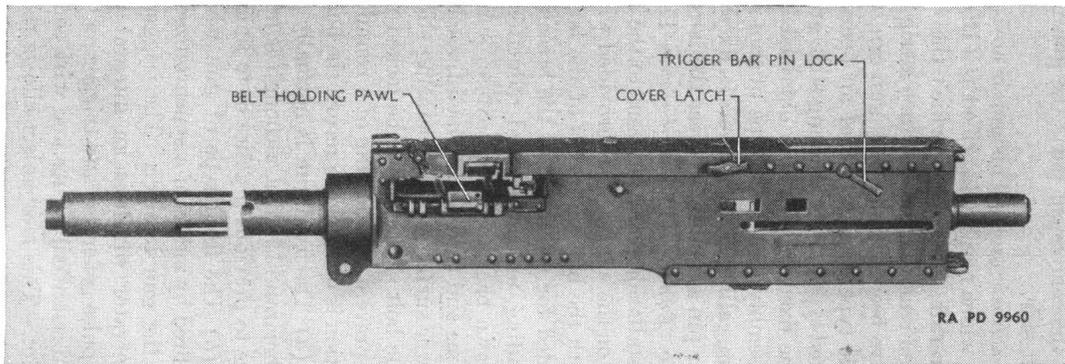


FIGURE 2.—Browning machine gun, caliber .50, M2, aircraft, basic—left side view.

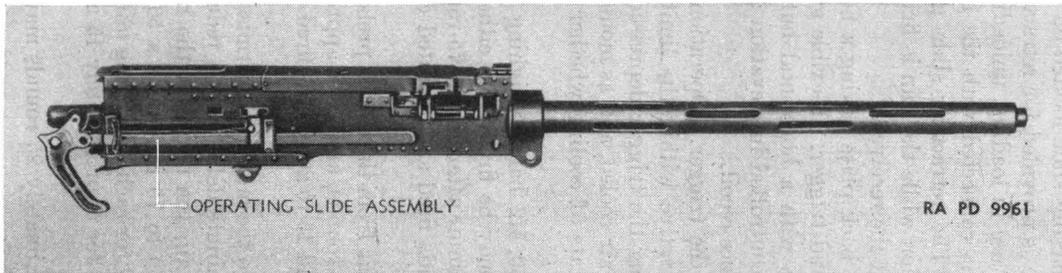


FIGURE 3.—Browning machine gun, caliber .50, M2, aircraft, fixed—right side view.

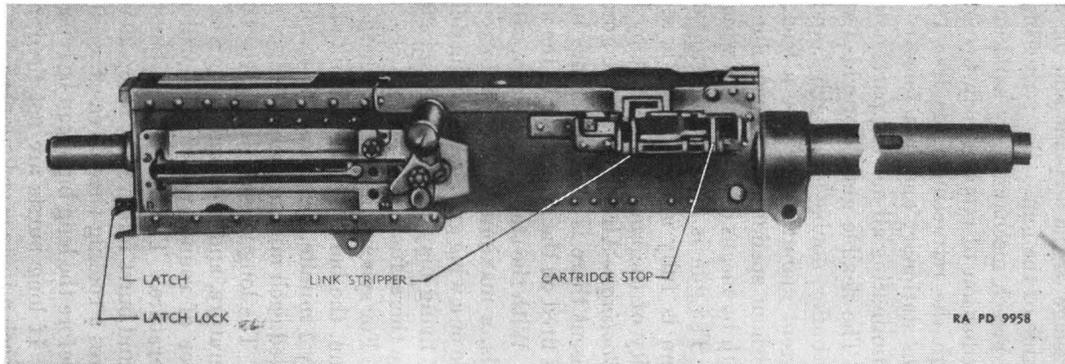


FIGURE 4.—Browning machine gun, caliber .50, M2, aircraft, flexible—right side view.

5

mechanism including the trigger motor and the remote control mechanism including the solenoid are supplied by the Army Air Forces.

(2) *Flexible gun.*—The flexible gun (figs. 4 and 5) is installed in the fuselage of the airplane and has a retracting slide located on the right side of the gun. The retracting slide is provided for retraction of the breech mechanism by hand and for use in loading, unloading, and reduction of stoppages in firing. It is connected with the bolt through the retracting slide lever stud. The retracting slide grip remains stationary and in a forward position while the gun is firing, thus eliminating all moving parts outside of the receiver.

(a) The flexible gun is provided with a back plate having a horizontal buffer, double spade grips, and a hand trigger. Flexible guns of present manufacture have a back plate with a horizontal buffer, but without spade grips. Such guns are controlled in elevation and azimuth by means of the mounts which reduce recoil.

(b) The gun is fired by pressing down the trigger. Operation of the gun is fully automatic; it is self-operative within the limit of capacity of the ammunition belt by keeping the trigger depressed.

*c. Cooling.*—Aircraft machine guns are air-cooled, and as mounted at present there is little difference in the rate of cooling whether the gun is fired on the ground or in the air.

(1) With the standard 36-inch, caliber .50, M2, barrel weighing 10.2 pounds, a maximum burst of 75 rounds may be fired from either a flexible or a wing gun. Approximately 1 minute after firing a 75-round burst, firing may be resumed and 20 rounds fired and repeated each minute thereafter.

(2) For synchronized guns where the heat from the engine preheats the gun, the burst should be limited to 50 rounds, and after approximately 1 minute, firing may be resumed and 15 to 20 rounds fired and repeated each minute thereafter.

(3) The long burst will heat the barrel to the maximum permissible temperature, and repeated firing after 1-minute delay with a reduced number of rounds per minute will maintain the barrel at the high temperature. Thus the initial burst of 50 to 75 rounds or a 50- to 75-round burst followed by firing 20 rounds for each succeeding minute requires a cooling time or cessation of fire for approximately 15 minutes before the long burst can be repeated.

(4) If long bursts are not fired, approximately 25 rounds may be fired each minute over long periods.

*d. Mounting.*—(1) *Fixed gun.*—The mounting is for fixed synchronized fire and the mount is arranged to locate the gun as far forward

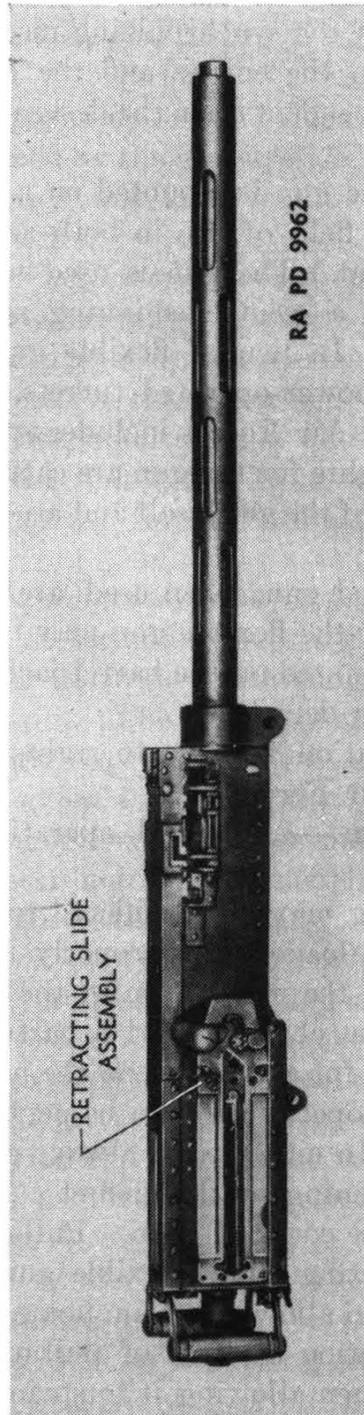


FIGURE 5.—Browning machine gun, caliber .50, M2, aircraft, flexible—right side view, with spade grip back plate.

of the pilot as possible, usually within the cowling. The mount is rigid with respect to the airplane and the gun fires in a line approximately parallel to the direction of flight and directly through the path of propeller rotation. The gunfire is controlled so as to miss the propeller blades by action of the synchronizing mechanism, which is the device operating between the engine and the gun for this purpose. The wing mounting is dependent upon the design of the wings and may be interior or exterior.

(2) *Flexible gun.*—The gun is mounted on a flexible mount which permits a large angular field of fire in both azimuth and elevation. The gun is fired by hand. The gun is used with various kinds of equipment, usually with a recoil cushioning adapter in hand- and power-operated turrets. In lieu of flexible guns, most planes have fixed guns mounted on power-operated turrets. The adapter which is supplied by the Army Air Forces includes spade grips.

*e. Sights.*—(1) The sights for the gun are carried as airplane equipment rather than as part of the gun itself and are supplied by the Army Air Forces.

(2) Sights for the fixed gun, when used, are normally attached to the airplane. Sights for the flexible gun may be attached to the two sight bases which are mounted on the barrel jacket of the gun. They can readily be installed or detached.

(3) Complete information relative to sights is available in publications of the Army Air Forces.

**4. Manual operation.**—*a.* Manual operation is operation performed by the gunner.

(1) *To load.*—Loading may be considered to include two distinct operations: entering the loaded belt properly into the belt opening, and thereafter operating the mechanism of the gun until it is closed with the cartridge in the chamber and a cartridge in the feedway gripped by the extractor for extraction on the next recoil stroke.

(*a*) The first of these operations may be performed with the cover either open or closed. In either case, always enter double loop end of belt through feed opening until the first cartridge is beyond the belt holding pawl. Close cover, if open. Pull bolt completely to the rear by means of retracting slide (flexible gun) or operating slide (fixed gun), release it, and allow it to slam home.

(*b*) The second operation consists of pulling the bolt once completely to the rear and then allowing it to spring forward. This operation must start with the action and cover fully closed and the extractor gripping the cartridge in the feedway.

(2) *To unload.*—(a) Lift cover, remove belt, retract bolt, and make visual inspection of feedway, T-slot, and chamber to make certain that gun is unloaded.

(b) Release bolt and lower cover.

(c) Press trigger or sear mechanism to relieve tension on firing pin spring.

**5. Mechanical operation.**—Mechanical operation is operation automatically performed by the gun itself when fired. The following description of mechanical operation begins with the gun assumed to be loaded and ready to fire.

*a. Back plate trigger action on first shot (flexible gun only).*—When the rear end of the trigger, which is pivoted in the center, is pressed down, its forward end pushes up the rear end of the trigger bar; the trigger bar being pivoted in the center acts as a lever and causes the front end to press down upon the top of the sear, forcing the sear down and releasing the sear notch from the shoulder of the firing pin. The firing pin spring forces the firing pin forward to fire the cartridge.

*b. Synchronizing mechanism action in firing (fixed gun only).*—A stroke of the trigger motor slide forces the sear slide inward. This in turn forces the sear downward, releasing the sear notch from the shoulder of the firing pin. The firing pin spring forces the firing pin forward to fire the cartridge.

*c. Remote control action in firing (fixed gun only).*—A stroke of the solenoid sear plunger forces the sear slide inward and sear downward, releasing the sear notch from the shoulder of the firing pin. The firing pin spring forces the firing pin forward to fire the cartridge.

*d. Backward movement of recoiling parts.*—Explosion of the cartridge forces the barrel to the rear, carrying with it the barrel extension and the bolt which is locked to the barrel extension by the breech lock. When the barrel has recoiled about  $\frac{3}{4}$  inch, the breech lock pin strikes the cam surfaces of the breech lock depressors. This unlocks the bolt from the barrel extension and permits the bolt to continue to the rear. As the barrel extension moves to the rear, it strikes the accelerator and turns it backward.

*e. Backward action of accelerator.*—As the accelerator turns backward, it strikes the bottom projection on the bolt and accelerates it to the rear. The shoulders on the barrel extension shank engage behind the claws of the accelerator, locking the barrel and barrel extension in a rearmost position to the oil buffer body.

*f. Backward movement of bolt.*—As the bolt moves backward, the driving springs are compressed. There are two driving springs, one

within the other. They function as a single spring. The bolt brings with it a cartridge from the belt gripped by the extractor and an empty case from the chamber gripped in the T-slot. The cam lug on the extractor rides along on top of the switch until near the end of the backward movement of the bolt. Then the extractor by action of the cover extractor cam is forced downward until its cam lug is below the switch.

*g. Action of oil buffer.*—As the barrel and barrel extension move backward together, and since the oil buffer piston rod is linked directly with the barrel extension by means of the hook on the shank projecting from the rear of the barrel extension and the hook on the forward end of the oil buffer piston rod, the oil buffer spring is compressed. The oil buffer piston rod head and the oil buffer piston valve are driven rearward in the oil buffer tube, forcing the oil through the restricted openings in both the piston rod head and valve. This supplements the action of the oil buffer spring in bringing the heavy recoiling parts to rest without damaging shock or strain on the gun. On the counter-recoil or forward movement of the barrel and barrel extension, the oil in front of the piston rod head will force back the oil buffer piston valve, uncovering the throttling ports and permitting the oil to pass readily from the forward to the rear side of the piston rod head and valve. This permits rapid return of the parts to the firing position.

*h. First action of feeding.*—As the bolt moves backward, the stud on the belt feed lever, riding in its cam groove in the top of the bolt, moves the belt feed pawl laterally into position behind the next cartridge. The ammunition belt is prevented from falling out of the gun by the belt holding pawl.

*i. Cocking action.*—As the bolt moves backward, the upper end of the cocking lever is forced forward by the top plate bracket attached to the top plate which brings the lower end to the rear. When the lower end of the cocking lever moves to the rear, it brings with it the firing pin, withdrawing the firing pin from the face of the bolt and compressing the firing pin spring against the sear stop pin. The shoulder of the firing pin (extension) engages in the notch in the sear under pressure of the sear spring.

*j. Action of driving springs.*—When the rear end of the bolt strikes the buffer plate (horizontal buffer type), its remaining force is absorbed in the fiber buffer disks, but when the rear end of the bolt strikes the lower buffer (vertical buffer type), its remaining force is absorbed in the fiber buffer disks and friction of the lower buffer and the upper buffer. The driving springs which have been compressed by the backward action of the bolt then force the bolt forward.

*k. Forward movement of bolt.*—When the bolt starts forward, the cam lug on the extractor, riding under the switch, rotates the extractor downward. This causes the extractor to force the cartridge down the T-slot in line with the chamber. The ejector knocks the empty case from the T-slot and holds the cartridge in line with the chamber. (The empty case may already have fallen out without the action of the ejector.) The upper end of the cocking lever is forced backward and the lower end moves forward away from the rear of the firing pin.

*l. Release of recoiling parts.*—The lug on the lower rear end of the bolt strikes the accelerator and rotates it forward. This unlocks the barrel extension from the oil buffer body. The barrel extension remains linked with the oil buffer piston rod (par. 5b(7)). When the accelerator has been tripped, the barrel extension and barrel move forward, assisted by the oil buffer spring. Part of the forward force of the bolt acts through the accelerator to push the barrel extension forward.

*m. Loading and locking action.*—The extractor rises as its cam lug moves along the top of the extractor cam and the ejector moves outward, leaving the cartridge in the chamber engaged by the T-slot. The extractor grips the first round in the belt and is held down firmly, ready to extract it, by the cover extractor spring. The breech lock is forced upward by the breech lock cam and locks the breech just before the recoiling parts reach the firing position. The breech lock engages in a recess cut in the bottom of the bolt and thus locks it firmly to the barrel extension and against the rear end of the barrel.

*n. Second action of feeding.*—As the bolt goes forward, the stud on the end of the belt feed lever, riding in its cam groove in the top of the bolt, moves the belt feed slide and belt feed pawl in a lateral direction. The belt feed pawl carries the first cartridge against the cartridge stops, ready to be gripped by the extractor. The next cartridge is carried over the belt holding pawl, which rises behind it and holds it in position to be engaged by the belt feed pawl on its return movement.

*o. Trigger action in automatic fire.*—If the hand trigger is held down, the sear is disengaged just before the bolt has reached its forward position, thereby releasing the firing pin. The gun thus fires automatically, repeating the operations already described. The release of the firing pin actually takes place when the recoiling parts are still about  $\frac{1}{8}$  inch from the forward position but after the breech is locked.

SECTION II

DISASSEMBLY, ASSEMBLY, AND HEAD SPACE

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Detailed disassembling.....	10
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**6. General.**—The only disassembling authorized for using troops for the care, cleaning, and replacing of parts is that given herein. The manner of disassembling and assembling the gun for left-hand feed is described. To change the gun to right-hand feed, see paragraph 12.

**7. Removal of groups from gun.**—*a. Cover.*—Release cover latch and open cover. The cover need not be removed, as the other parts of the gun may be taken out without removing it.

**NOTE.**—Removal of the cover group is not recommended unless necessary for repair, as it is difficult to reassemble due to the force required to compress the cover detent pawl spring.

*b. Back plate.*—Release back plate latch lock and back plate latch and lift out back plate.

*c. Bolt group.*—Press forward and away from right side plate on end of driving spring rod to release retaining pin in the head of the rod from hole in the side plate. Remove driving spring rod. Draw bolt to the rear until bolt stud is in line with the hole in center of slot in the side plate. Remove bolt stud from bolt. Remove bolt, complete, out of the rear end of gun receiver group.

*d. Oil buffer.*—Compress oil buffer body spring lock, using a cartridge point or a drift through the hole in right-hand side plate. Remove oil buffer, barrel extension, and barrel assembly by pulling out to the rear. Detach oil buffer assembly from barrel extension by pressing accelerator forward.

**NOTE.**—When guns are mounted in a close or remote position, the release tool is used to compress the oil buffer body spring lock.

**8. Replacing groups in gun.**—*a.* Hold barrel and barrel extension in the left hand and oil buffer assembly in the right hand. With the index finger holding accelerator up under barrel extension shank, start breech lock depressors into guideways in barrel extension and press forward, allowing shank of barrel extension to engage in cross

groove of piston rod. Push forward as far as oil buffer will go, having accelerator back as far as possible. This will lock these components together so that the barrel, barrel extension, and oil buffer assembly may be placed in the casing of the gun as a unit. Push this unit forward in the receiver group until lock of oil buffer seats in recess in the side plate.

*b.* Press cocking lever forward in bolt and insert bolt into receiver group. Push bolt forward until hole for bolt stud is in line with enlarged opening in center of slot in the side plate. Insert bolt stud in bolt, being sure that the collar on bolt stud is inside the side plate. Push bolt completely forward, guiding extractor from the front with the fingers to prevent it from catching.

*c.* Insert driving spring rod assembly into hole in the bolt. Engage driving spring rod retaining pin in its seat in the right-hand side plate.

*d.* Replace back plate. Tighten the buffer disk screw as tight as possible. When replacing back plate, make sure latch lock is in the unlocked position until back plate is latched.

*e.* Close and latch cover.

**9. Head space.**—*a. General.*—The head space of a military weapon with a 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, the head space is adjusted by obtaining the proper distance between the forward part of the bolt and the rear end of the barrel. The head space adjustment must be checked before firing.

*b. Head space adjustment.*—(1) In the past, the head space has been adjusted with the barrel, barrel extension, and bolt out of the gun. However, the best adjustment is obtained with the gun fully assembled.

(2) To adjust the head space with the gun assembled, screw barrel into barrel extension, using the point of a cartridge, until the action will just close without being forced. Then unscrew the barrel two notches.

**Caution:** Care must be exercised to avoid roughening the barrel surface during adjustment.

*c. Checking head space and timing.*—Where head space and timing gage, caliber .50, BMG, A196228, is available, head space and timing of the gun should be checked as herein prescribed, using this gage, instead of usual methods.

(1) *To check head space.*—(a) Head space the gun in the manner prescribed.

(b) Cock the firing pin.

(c) Retract the bolt slightly in order to relieve the pressure between the bolt and the end of the barrel which is caused by the driving spring.

Then insert the gage in the T-slot between the face of the bolt and the end of the barrel. If the gun is head spaced too tightly, it will not be possible to enter the gage between the face of the bolt and the end of the barrel, and if such is the case, the barrel should be unscrewed one notch at a time from the barrel extension until the gage will enter. If the gun has been head spaced in the manner prescribed, and if the head space gage can be entered between the face of the bolt and the end of the barrel, 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 where tight head space adjustment would cause serious trouble. However, the gage 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 not enter and then unscrewing the barrel one notch so that the gage will enter.

(2) *To check timing.*—(a) The purpose of this check is to insure that the aircraft machine gun is not fired too early by the trigger motor or solenoid. 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 another cartridge in the belt. It has been demonstrated that even when the time of firing is not so extremely early that the gun stops after firing two shots, firing may be early enough to cause inferior performance of the gun in lifting long ammunition belts.

(b) *Procedure.*

1. Adjust the head space of the gun if it is not known definitely that the gun has been head spaced properly and then cock the firing pin.
2. Raise the cover and retract the bolt slightly.
3. Insert the gage between the front of the barrel extension and the trunnion block; the curved portion of the gage is designed to permit this operation as it conforms to the contour of the barrel.
4. Release the bolt so that the timing gage is pressed against the trunnion block by the barrel extension.
5. With the gage in place between the barrel extension and the trunnion block, an attempt should be made to release the firing pin by means of the trigger motor or the solenoid. If the firing pin is released, the solenoid or trigger motor must be adjusted so that it will fail to release the firing pin when the gage is in place.

*d. Effect of head space adjustment.*—Probably the most important adjustment of the machine gun is the head space adjustment. Tests show that shot patterns are not adversely affected by the head space when the guns are adjusted as outlined above. In fact, better uniformity of shot patterns will be obtained when the guns are operated with the above adjustment, which is based on the fundamental design of the weapon. Tests have also proved that guns may be damaged and in some cases put out of action by using unapproved methods of adjusting the head space.

(1) *Insufficient head space.*—When the head space adjustment is too tight, poor functioning will result, as the breech lock will not fully enter its recess in the bolt. This condition may damage the barrel extension, bolt, or breech lock. Extraction trouble may also occur due to improper timing of locking and unlocking. Furthermore, with a tight head space adjustment the gun operates sluggishly because of binding of the moving parts.

(2) *Excessive head space.*—If the head space is too great, a separation of the cartridge case may occur. Should there be any weakness in the base of the cartridge case, such as a split case, the possibility of a rupture is increased by excessive head space. In synchronized use, excessive head space may contribute to a fluctuation in the position of the zero shot and in the synchronized shot pattern.

**10. Detailed disassembling.**—*a. Bolt group* (fig. 6).—(1) Remove bolt group from gun.

(2) Remove extractor by rotating upward and pulling out from bolt. Drive out ejector pin and remove ejector and ejector spring.

(3) Lift bolt switch off bolt switch stud.

(4) Rotate cocking lever fully backward and release firing pin by pushing down sear. Remove cocking lever pin and cocking lever.

(5) With thin end of cocking lever, swing sear stop out of its groove in the bolt into center of slot in the bolt; then turn bolt over and push sear stop out of engagement with firing pin spring. Reverse bolt and remove sear stop from slot.

(6) Depress sear and remove sear slide. Pull out sear and sear spring.

(7) By holding the bolt with the front end slightly elevated, the firing pin extension and firing pin will drop 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 firing pin spring from flying out during the operation. See that the firing pin spring has a free length of  $4.70 \pm .06$  inches.

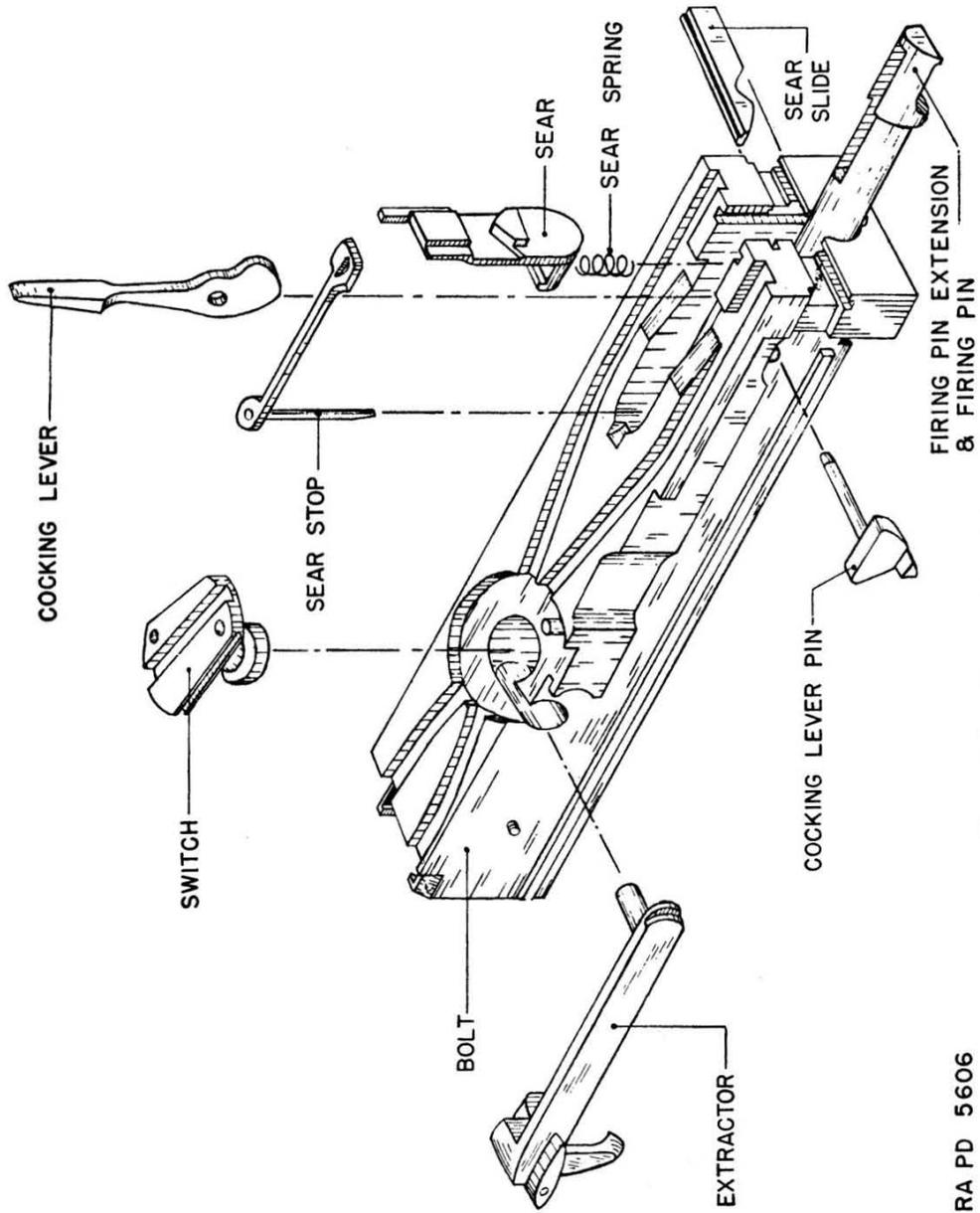


FIGURE 6.—Disassembly of bolt group.

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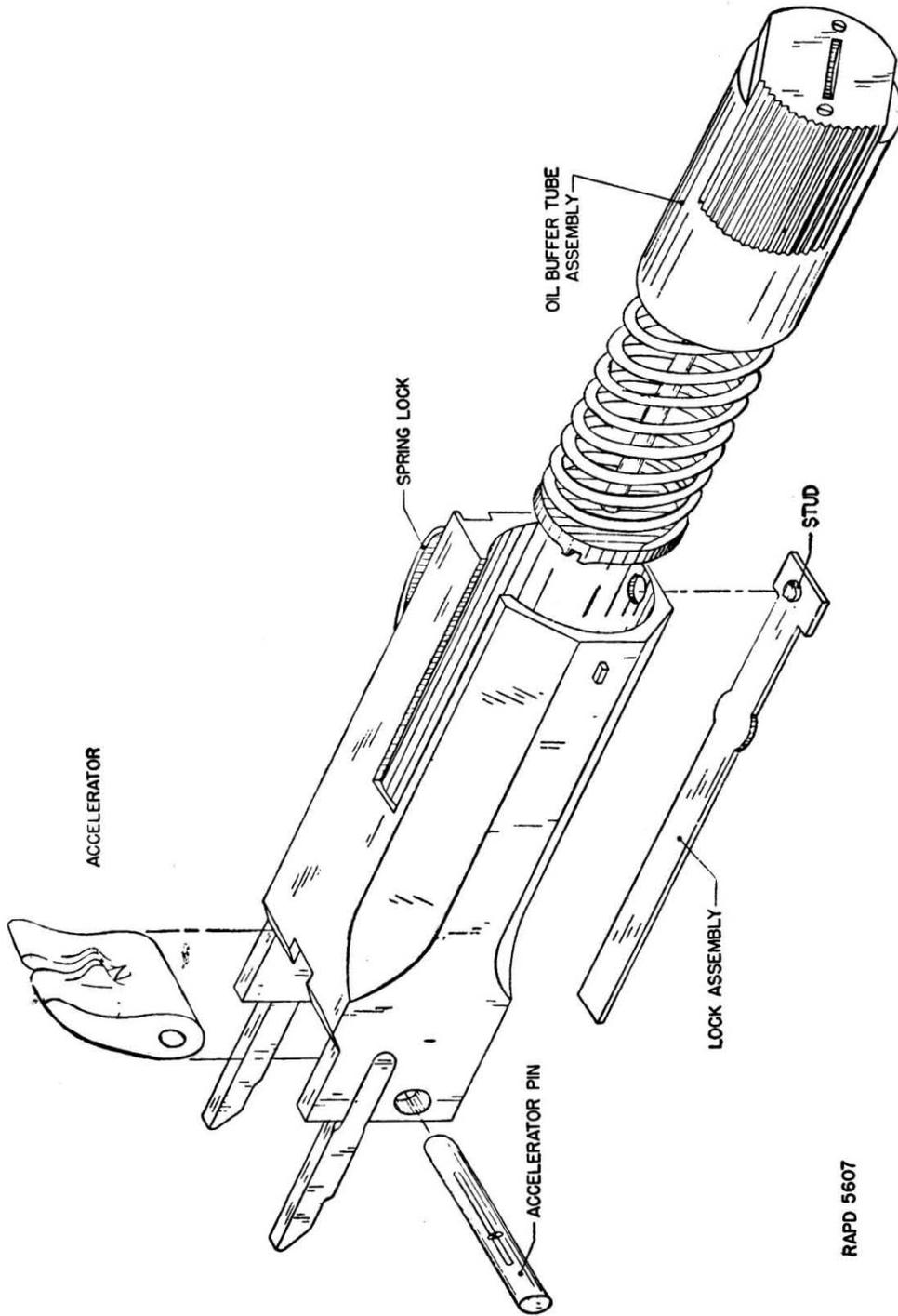


FIGURE 7.—Disassembly of oil buffer group.

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*b. Oil buffer group* (fig. 7).—(1) Remove oil buffer, barrel extension, and barrel assembly from gun. Detach oil buffer from barrel extension by pressing accelerator forward.

(2) Remove oil buffer body spring lock by pulling it to the rear.

(3) Hold oil buffer body bottom up in the left hand, with the index finger between depressors and prongs of accelerator. With the point of a cartridge, press stud on end of oil buffer tube lock assembly to disengage it from its hole in oil buffer tube body. At the same time, raise accelerator upward and rotate to the rear. Remove oil buffer tube lock assembly.

(4) Drive out accelerator pin and remove accelerator.

(5) The oil buffer tube assembly should not be disassembled unless absolutely necessary to replace the oil buffer spring. To disassemble, depress oil buffer spring guide sufficiently to clear oil buffer piston rod pin; turn oil buffer spring guide until oil buffer piston rod pin will pass through slots in the guide. Remove guide and spring.

**Caution:** The oil buffer spring is under sufficient compression to cause injury to personnel.

*c. Barrel group*.—(1) Remove barrel by unscrewing from barrel extension (fig. 8).

(2) Remove barrel locking spring by sliding it forward out of its seat in barrel extension. It may be necessary to drive it out, using point of shell inserted in small hole near rear of locking spring.

(3) Push out breech lock pin and remove breech lock.

(4) The barrel sleeve is permanently assembled to the barrel and should not be removed.

*d. Cover group* (fig. 9).—(1) Remove cover pin cotter pin. Drive out cover pin and lift cover free from trunnion block.

(2) Remove belt feed lever pivot stud cotter pin and pry belt feed lever off its pivot stud, taking care while doing so that belt feed lever plunger and spring do not fly out. In removing belt feed lever, see that toe of lever is in line with slot in cover, otherwise it will not pass out.

(3) Remove belt feed lever plunger and belt feed lever plunger spring from belt feed lever.

(4) Remove belt feed slide, complete, from its guides in the cover.

(5) Push out belt feed pawl pin, which will enable belt feed pawl, belt feed pawl spring, and belt feed pawl arm to be separated.

(6) Remove cover latch spring by lifting its front end out of slot in cover and sliding it forward.

(7) Remove cover extractor spring by releasing its rear end from its seat in cover extractor cam and sliding to the rear.

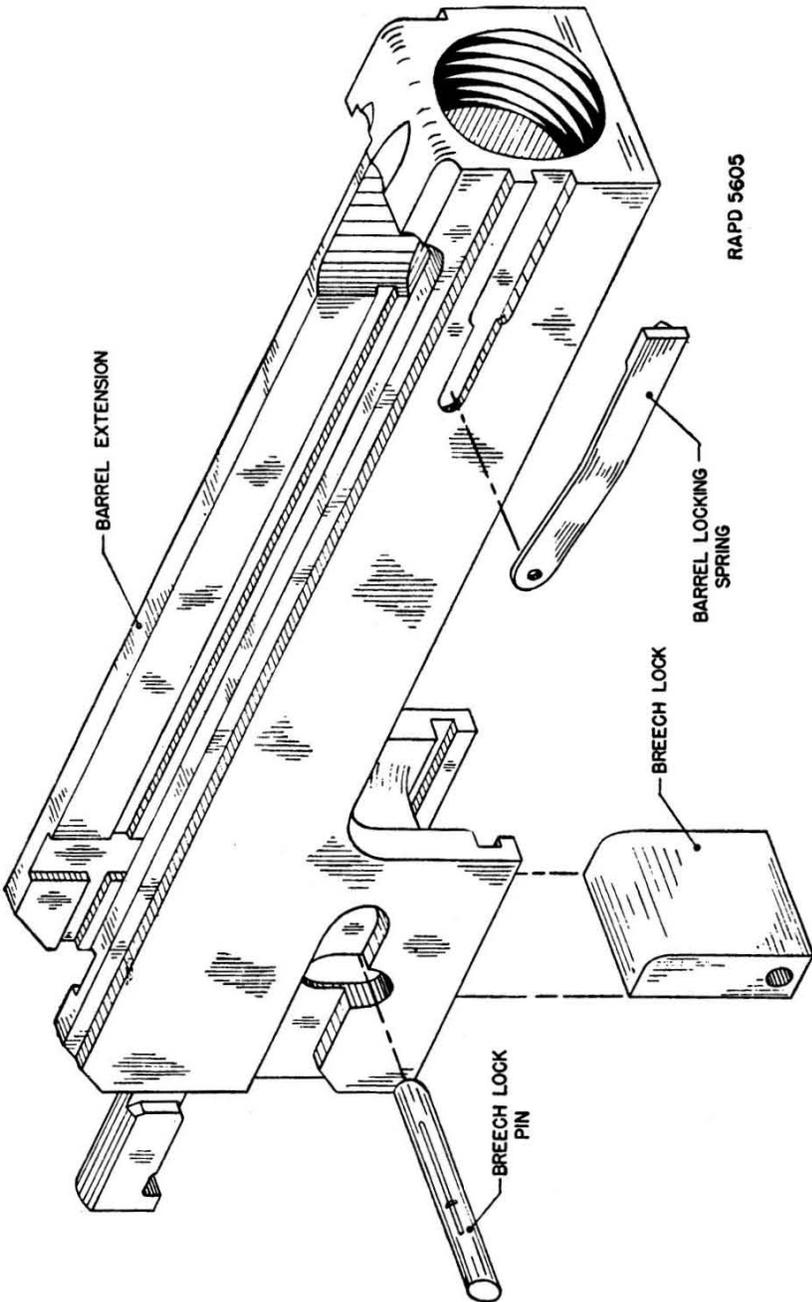


FIGURE 8.—Exploded view of barrel extension.

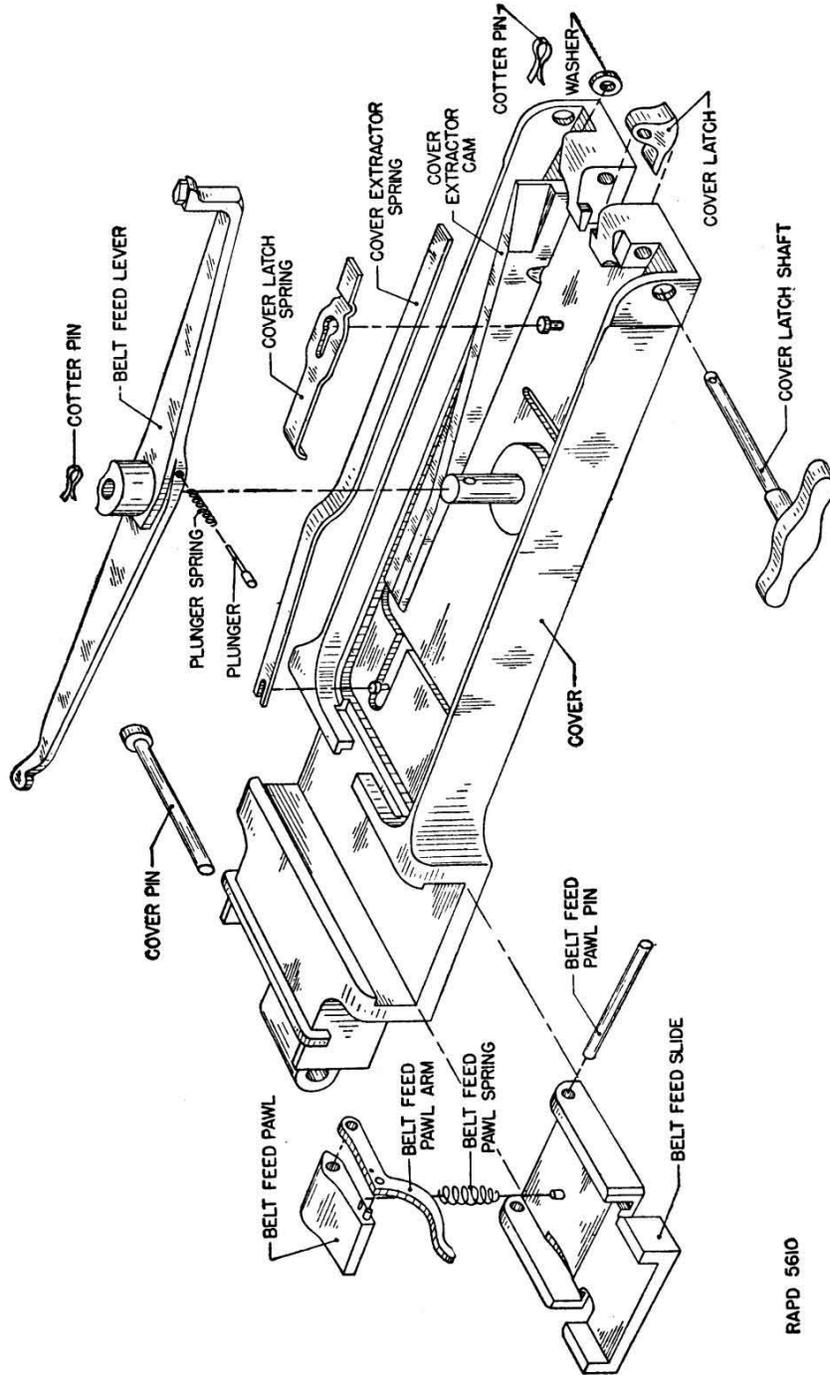


FIGURE 9.—Disassembly of cover group.

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(8) Withdraw cotter pin from end of cover latch shaft and remove cover latch shaft assembly.

*e. Back plate.*—(1) *Vertical buffer (fixed type).*—(a) Drive out back plate latch pin, being careful that back plate latch spring does not fly out upon removal of back plate latch.

(b) Drive out latch lock pin and remove latch lock, latch lock plunger, and latch lock spring.

(c) Unscrew adjusting screw and remove adjusting screw plunger and adjusting screw plunger spring.

(d) Remove buffer disks and upper and lower buffers.

(2) *Horizontal buffer (fixed and flexible type) (fig. 10).*—(a) Drive out back plate latch pin, being careful that back plate latch spring does not fly out upon removal of back plate latch.

(b) Remove cotter pin, drive out back plate latch pin, and remove back plate latch lock and back plate latch spring.

(c) Drive out trigger pin (flexible type only), being careful that trigger spring does not fly out upon removal of trigger and trigger spacer.

(d) Unscrew adjusting screw. Remove adjusting screw plunger and adjusting screw plunger spring.

(e) Remove buffer disks and buffer plate through the rear end of buffer tube.

*f. Receiver group.*—(1) To remove operating slide assembly from casing (fixed gun only), draw out locking wire and unscrew operating slide guide screws. Lift off operating slide guides, front and rear. This frees operating slide assembly.

(a) Withdraw cotter pin from operating slide roller pin. Push out roller pin and remove operating slide roller.

(b) Withdraw cotter pin from operating slide handle hinge pin. Push out pin and remove operating slide handle, handle plunger, and handle spring.

(2) To remove retracting slide assembly from casing (flexible gun only), pull out locking wires and unscrew retracting slide bracket screws. This frees retracting slide assembly.

(a) Withdraw cotter pin from retracting slide bracket bolt. Unscrew retracting slide nut and remove bolt from retracting slide bracket.

(b) Withdraw cotter pin from retracting slide lever stud. Unscrew retracting slide nut and remove retracting slide lever stud washer. Remove retracting slide lever and retracting slide grip assembly from retracting slide lever stud. Remove retracting slide lever spring.

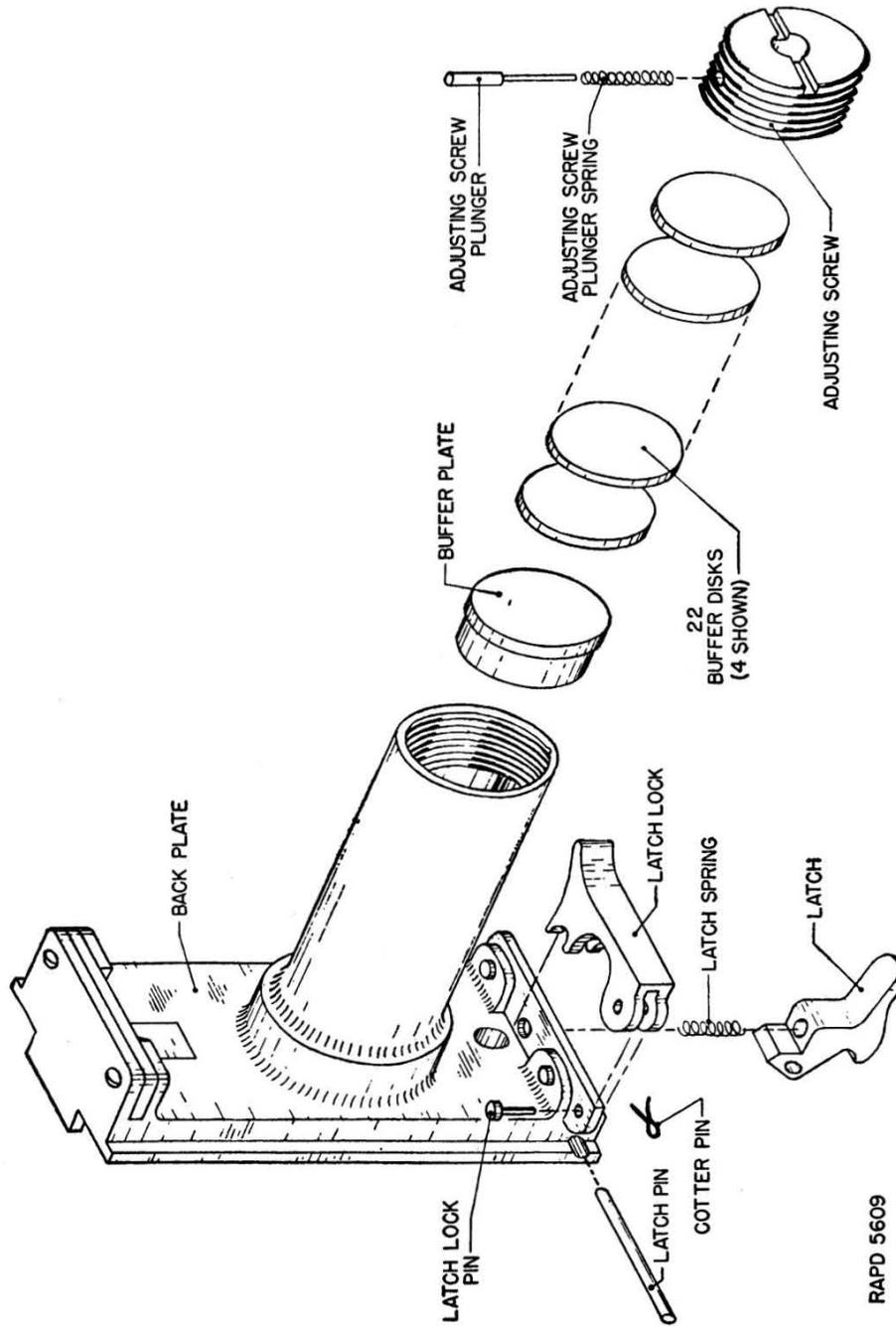


FIGURE 10.—Disassembly of back plate group.

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(c) Remove retracting slide from retracting slide bracket.

(d) The retracting slide stud can be removed from retracting slide bracket but this should not be done unless necessary for replacement, as the stud is staked in place.

(e) Lift end of trigger bar pin lock from its seat in side plate, rotate downward about 90°, and pull out trigger bar pin. Remove trigger bar.

(f) Withdraw cotter pin from switch pivot nut. Unscrew switch pivot nut and remove switch and switch spring.

(g) Draw belt holding pawl pin out to the rear, taking care that belt holding pawl spring does not fly out upon removal of the pawl, and remove belt holding pawl and spring.

(h) Draw belt holding pawl pin, located on the opposite side of feedway, out to the rear and remove link stripper and cartridge stops, front and rear.

(i) Remove front barrel bearing screw and unscrew front barrel bearing from barrel jacket.

**11. Assembling.**—*a. Receiver group.*—(1) Screw front barrel bearing on barrel jacket and replace front barrel bearing screw.

(2) Position link stripper and cartridge stops, front and rear, on the right side of feedway and insert belt holding pawl pin.

(3) Place belt holding pawl spring in its seat in left side of feedway. Position belt holding pawl over spring, compressing spring to allow insertion of belt holding pawl pin. Insert belt holding pawl pin.

(4) Place switch and switch spring in position on left-hand side plate. Screw on switch pivot nut and insert cotter pin.

(5) Place trigger bar in its slot in top plate bracket so that hole in trigger bar is in line with holes in the casing, with long end of trigger bar to the front and cammed surface down. Insert trigger bar pin with lock down and rotate lock into its seat in side plate.

(6) *Flexible gun.*—(a) Replace retracting slide stud if it has been removed from retracting slide. Stake retracting slide stud to retracting slide. Replace retracting slide in retracting slide bracket with stud on slide to the front. Position retracting slide lever spring in its seat in retracting slide lever, with large loop of spring over hole for retracting slide lever stud. Place retracting slide lever and spring on retracting slide stud with small loop of spring over retracting slide stop. Rotate retracting slide lever until it clears the stop. Depress lever, making certain that large loop of retracting slide lever spring clears the collar of retracting slide lever stud. Replace retracting slide lever stud washer and nut. Replace cotter pin in retracting

slide lever stud nut. Place retracting slide bracket bolt in its hole in retracting slide bracket. Screw on retracting slide bracket nut loosely.

(b) Place retracting slide assembly on right side of casing with the holes in slide in line with holes in side plate. Screw in retracting slide bracket screws and replace locking wires. Tighten retracting slide bracket nut and replace cotter pin.

(7) *Fixed gun.*—(a) Replace operating slide handle spring, handle plunger, and handle, and insert hinge pin. Insert cotter pin in operating slide handle hinge pin. Replace operating slide roller and insert roller pin. Insert cotter pin in operating slide roller pin.

(b) Position operating slide assembly on right-hand side of casing and replace operating slide guides, front and rear, over the slide, with the holes in guides in line with holes in side plate. Screw in operating slide guide screws, taking care that in operating slide guide rear, operating slide guide rear upper screw (long screw) is in the upper hole and operating slide guide rear lower screw (short screw) is in the lower hole. Replace locking wire.

b. *Back plate group.*—(1) *Vertical buffer (fixed type).*—(a) Insert upper and lower buffers and buffer disks in buffer tube. The disks should be clean and free of rough edges and surfaces and should be assembled in the buffer tube one at a time. Make sure each disk is firmly seated.

(b) Replace adjusting screw plunger and spring in adjusting screw. Insert adjusting screw into buffer tube and tighten.

(c) Position latch lock spring and latch lock plunger on back plate, place latch lock over plunger and spring, and insert latch lock pin.

(d) Replace back plate latch spring and back plate latch and insert back plate latch pin.

(2) *Horizontal buffer (fixed and flexible types)* (fig. 10).—(a) Insert buffer plate and buffer disks in buffer tube. The disks should be clean and free from rough edges and surfaces and should be assembled in the tube one at a time. Make sure each disk is firmly seated.

(b) Replace adjusting screw plunger and spring in adjusting screw. Insert adjusting screw in buffer tube and tighten.

(c) Replace trigger, trigger spacer, and trigger spring. Insert trigger pin (flexible type only).

(d) Replace latch lock spring and latch lock. Insert latch lock pin and cotter pin.

(e) Replace back plate latch spring and back plate latch. Insert back plate latch pin.

c. *Cover group* (fig. 9).—(1) Insert cover latch shaft assembly in the hole in cover and replace cotter pin.

(2) Place forked end of cover extractor spring over stud in cover and engage the other end of spring in the slot in cover extractor cam.

(3) Place cover latch spring over stud in cover and slide forward, making certain that the rear end rests on cover latch.

(4) Hold belt feed pawl with recess for belt feed pawl spring up and studs to the right. Place belt feed arm over studs on belt feed pawl, with belt feed arm pointing to the right and holes in belt feed pawl and arm in alinement. Place belt feed pawl spring in its seat in the pawl with large end of spring in belt feed pawl recess, and position belt feed pawl in belt feed slide. Insert belt feed pawl pin. Insert belt feed slide, complete, in its guides in cover, making certain that belt feed pawl arm is to the rear.

(5) Place belt feed lever plunger and spring in rear hole of belt feed lever. Insert toe of belt feed lever through slot in cover and engaging belt feed slide. Position belt feed lever so that it goes over the stud in the cover, and at the same time compress belt feed lever plunger and spring so that they clear the side of the cover. Insert cotter pin in stud.

(6) Place cover assembly on trunnion block and insert cover pin. Insert cotter pin in cover pin.

*d. Barrel group* (fig. 8).—(1) Insert breech lock in its guides in barrel extension, making certain that bevel faces of breech lock are to the front with double bevel on the top. Insert breech lock pin, taking care that both ends of pin are flush with the sides of barrel extension.

(2) Replace barrel locking spring by sliding it into its seat in barrel extension.

(3) Screw barrel into barrel extension.

*e. Oil buffer group* (fig. 7).—(1) If the oil buffer tube has been disassembled, place oil buffer spring over oil buffer piston rod. Position oil buffer spring guide so that the slot in the guide is in line with pin on oil buffer piston rod. Press down on oil buffer piston guide so that oil buffer piston rod pin passes through the slot in the guide, and rotate guide until recesses in the guide are alined with the pin in the rod. Allow pin to seat itself in the recesses.

(2) Insert oil buffer body spring lock in its groove in the body and push forward.

(3) Position oil buffer tube lock spring over slot in oil buffer body, with flanges of spring over enlarged cut in slot. Depress spring into cut and slide forward, raising stud end of spring up and over the end of oil buffer body to seat stud in hole in oil buffer body.

(4) Insert oil buffer tube assembly in oil buffer body and push forward as far as it will go. Place accelerator, with tips up and rounded surface to the front, between depressors on oil buffer body and insert accelerator pin, taking care that both ends of pin are flush with the sides of oil buffer body.

(5) See that the buffer is full of oil.

*f. Adjustment of oil buffer.*—(1) The oil buffer is so arranged that it is possible to adjust the speed of the firing of the machine gun. This is accomplished by turning the oil buffer tube the required number of clicks, depending on whether a high rate of fire or a slower rate is desired.

(2) Turning the buffer tube to the right tends to cut off or close the oil buffer, which allows it to absorb more recoil and to reduce the rate of fire.

(3) Turning the buffer tube to the left allows the oil buffer to open and the oil to pass through larger throttling ports, which results in an increased rate of fire.

(4) Normally, the buffer is set to obtain the highest rate of fire. This setting is two notches to the right of the open position.

(5) *Vertical buffer (fixed gun).*—On the back plate is a regulator with index finger, with the letter O on the left side and the letters CL on the right side of the graduated index, meaning open and closed. The index finger is provided with a key which fits in a slot in the rear of the buffer tube. Turning the index finger to the right turns the buffer tube to the right; turning the index finger to the left turns the buffer tube to the left, thereby opening or closing the oil buffer as desired.

(6) *Horizontal buffer (fixed and flexible gun).*—The oil buffer tube is turned by inserting a screw driver blade into the slot in the rear of the buffer tube through the hole in the back plate.

*g. Bolt group (fig. 6).*—(1) Assemble firing pin spring, firing pin, and firing pin extension and insert this assembly into firing pin hole in bolt, with notch of firing pin extension down. (A special tool for assembling the firing pin spring is being prepared for issuance.) Push forward until striker projects through small hole in the front of bolt.

**NOTE.**—See that it requires only a small force to push the firing pin and firing pin extension forward. Also see that firing pin hole is free from grease and foreign materials.

(2) Seat sear spring in its recess in bolt. Insert sear in its guides in bolt. Press down on sear enough to allow sear slide to be inserted

from left side of bolt. In inserting the sear slide, the bevel end should be inserted first and the V-cut in the sear slide should be on the bottom. When the cut on the sear slide is over the corresponding cam on the sear, release pressure on sear and the slide will be engaged.

(3) Insert pin of sear stop through firing pin extension and depress sear stop as far as it will go. With thin end of cocking lever, swing spring end of sear stop into its recess in the bolt.

(4) Insert cocking lever in the bolt, with the rounded nose on the lower end of cocking lever to the rear of bolt so that it will properly engage the rear of slot in firing pin extension. Line up hole in cocking lever with holes in bolt and insert cocking lever pin from the left side.

(5) Cock by pressing forward on cocking lever. Turn cocking lever to the rear and press in on sear slide to release firing pin and test correctness of the assembly.

(6) Place bolt switch over bolt switch stud with enlarged portion of bolt switch to the front of bolt.

(7) If ejector and ejector spring have been removed, replace them on extractor and insert ejector pin. Holding extractor in an upright position, insert stud of extractor into the hole in bolt and rotate downward, being sure that flange on extractor is under collar on bolt.

**12. Changing from left-hand feed to right-hand feed.**—In order to change the gun from left-hand feed to right-hand feed or vice versa, repositioning of parts must be carried out in the bolt assembly, belt feed mechanism, and certain parts of the receiver group. The following describes, in general terms, the manner of changing the gun from left-hand feed to right-hand feed. By reversing the process, the gun may be changed from right-hand feed to left-hand feed.

*a. Bolt assembly.*—(1) Remove bolt assembly from gun.

(2) Remove extractor assembly from bolt.

(3) Lift up bolt switch high enough to be clear of bolt switch stud; rotate one-half turn so that bolt switch stud enters opposite hole in bolt switch. The cam groove in the bolt switch must line up with the proper cam groove in the bolt. The cam grooves in the bolt are marked **R** (right) and **L** (left).

**NOTE.**—When assembled correctly for right-hand feed, the enlarged portion of the bolt switch is toward the rear of the bolt.

(4) Assemble extractor assembly to bolt.

*b. Belt feed mechanism.*—(1) Open cover and remove belt feed lever. Transfer belt feed lever plunger and spring from upper hole in belt feed lever to lower hole.

(2) Remove belt feed slide assembly from cover.

(3) Drive out belt feed pawl pin and remove belt feed pawl and arm from belt feed slide.

(4) Hold belt feed pawl with arm pointing toward the body (spring seat in pawl up and arm down) and change belt feed pawl arm from left side of pawl to right side of pawl.

(5) Reassemble belt feed pawl and arm to belt feed slide.

(6) Reassemble belt feed slide assembly to cover with belt feed pawl arm pointing toward left side of gun.

(7) Reassemble belt feed lever to cover.

*c. Receiver group.*—(1) Remove belt holding pawl pins from right and left sides.

(2) Transfer front cartridge stop from right side to left side. Remove rear cartridge stop right-hand assembly from right side of gun and assemble rear cartridge stop and link stripper to left side of gun.

NOTE.—When not actually assembled to the gun, the rear cartridge stop right-hand assembly or rear cartridge stop and link stripper, as the case may be, should be retained with the gun or should be readily obtainable in case it is desired to change the feed from one side to the other. The rear cartridge stop right-hand assembly prevents currents or short rounds.

(3) Transfer belt holding pawl and belt holding pawl spring from left side of gun to right side.

(4) Assemble belt holding pawl pins to gun.

(5) Assemble bolt assembly in gun and complete assembly of gun in the usual manner.

*d. Inspection before firing gun.*—After changing the gun from left-hand feed to right-hand feed, or vice versa, and also before firing, the gun should be inspected in order to determine that it has been properly assembled. Note should be made of the following when the gun is arranged for right-hand feed:

(1) When the cover is open, the upper end of belt feed lever should position itself toward the right side of cover.

(2) The belt feed pawl arm should point toward the left with arm assembled to upper side of pawl (cover raised).

(3) The front and rear cartridge stops and link stripper should be assembled on left side of feedway.

(4) The belt holding pawl should be in position on right side of feedway.

(5) Looking down on top of the bolt as it is assembled in the gun, the enlarged portion of the bolt switch should be toward the rear.

**13. Converting fixed gun into flexible gun.**—The manner of converting an aircraft fixed gun into a flexible gun is as follows:

- a. Remove trigger motor or solenoid from receiver.
- b. Remove operating slide assembly from gun.
- c. Remove back plate assembly of the fixed type (vertical or horizontal buffer).
- d. Attach retracting slide assembly to right- or left-hand side of gun to suit installation.

**NOTE.**—Be sure that retracting slide stud, retracting slide lever stud, and retracting slide lever stop are in the forward holes to insure clearance between retracting slide grip and back plate spade grip.

- e. Insert back plate assembly of the flexible type (double spade grip).

### SECTION III

#### STOPPAGES AND IMMEDIATE ACTION

	Paragraph
Stoppages.....	14
Immediate action.....	15

**14. Stoppages.**—*a. General.*—(1) A malfunction is an improper action of some part of the gun, resulting in a stoppage; for example, failure to extract the empty cartridge case.

(2) Any accidental cessation of fire is a stoppage. It may be a faulty cartridge or a malfunction of some part of the gun. The fact that all the ammunition in the belt being fed into the gun has been exhausted should not be called a malfunction, since it is a cessation of fire from natural results.

(3) Immediate action is the term applied to that operation required to clear a temporary stoppage.

(4) Proper care of the gun and attention to the points before, during, and after firing will greatly reduce the liability to stoppages, particularly if the gunner has an intelligent understanding of the reason why stoppages generally occur. *Prevention is the best remedy for all stoppages.*

**Caution:** 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 bullets lodging

in the bore, and in case this happens and another round is fired before the bore is cleared, the gun will be damaged seriously.

*b. Classes.*—Stoppages may be classed under two main headings:

(1) *Temporary.*—Temporary stoppages are caused by—

(a) Failure of some part, duplicate of which is carried with the gun.

(b) Faulty ammunition.

(c) Failure of personnel to inspect gun before or during firing.

(2) *Prolonged.*—Prolonged stoppages are caused by a failure of some part that, as a rule, cannot be replaced or repaired without skilled assistance. These necessarily put the gun out of action for a more or less prolonged period.

*c. Unusual malfunction.*—(1) *Recurring short rounds.*—Excessive wear of the parts of the feed mechanism may cause recurring short rounds. Inspection of the base of the first cartridge removed from the belt will show a dent in the rear end of the case made by the corner of the extractor. This stoppage is remedied by inspecting feed mechanism and replacing defective parts. Inspection of ammunition belts before firing will disclose short rounds inherent in the ammunition.

(2) *Loose bullets.*—In some lots of ammunition which have deteriorated from storage or exposure, the front end of the case is not securely crimped on the bullet. When the extractor withdraws the cartridge from the belt, the case only is withdrawn, leaving the bullet in the belt. Loose powder scattered in the mechanism may cause a stoppage. This stoppage is remedied by removing the obstruction. The best prevention of this type of stoppage is a rigid inspection of ammunition prior to firing.

(3) *Broken T-slot.*—A broken T-slot will fail to extract the empty case from the chamber and will usually scar the rim of the case. This stoppage is remedied by replacing the bolt.

(4) *Broken barrel extension.*—The bolt will not go home and the gun will generally stop firing. In rare cases, the gun will fire a few rounds with a broken barrel extension. This stoppage is remedied by disassembling the gun and replacing the broken part.

(5) *Uncontrolled automatic fire.*—Uncontrolled automatic fire is the continuation of fire when the trigger or sear mechanism is released. If the cause is present before the gun is fired, it will commence the moment the bolt is home the second time during loading; or if the defect occurs during firing, the gun will not stop firing when the trigger or sear mechanism is released.

(a) *Cause.*—The forward end of the trigger bar (flexible gun) sprung downward or the beveled surface of the trigger bar and sear burred.

(b) *To remedy.*

1. Keep gun directed on target.
2. Unlatch cover. For gun installation where cover is not accessible, allow operating slide to go forward until unloading notch engages rear bracket. Retract operating slide again completely to the rear, then let it go all the way forward. The action has now closed on an empty chamber.
3. Unload and disassemble gun. Replace broken or burred parts.

d. *Table of stoppages.*—The table below will serve as a guide during instruction in stoppages or immediate action.

TABLE OF STOPPAGES

Stoppages	Method of preparation of instruction in immediate action and stoppages
1. Misfire due to defective primer.	1. Place a dummy cartridge in belt.
2. Short round.	2. Place a short round in belt.
3. Bulged round.	3. Insert bulged round in belt.
4. Tight link in belt. <sup>1</sup>	4. Do not prepare. <sup>1</sup>
5. Thin rim, permitting nose of the bullet to drop below chamber. <sup>1</sup>	5. Do not prepare. <sup>1</sup>
6. Belt improperly loaded.	6. Pull a cartridge partly out of belt.
7. Battered or thick rim of cartridge.	7. Place a battered or a thick-rimmed cartridge in belt.
8. Failure to remove round from chamber.	8. Place a dummy cartridge with rim filed off in chamber.
9. Setback primer. <sup>1</sup>	9. Do not prepare. <sup>1</sup>
10. Separated case which is removed from chamber by new round when bolt is pulled to the rear.	10. Drive front part of a cartridge securely on a dummy cartridge. Pull bolt to the rear and place cartridge properly on face of bolt. Ease bolt forward.
11. Separated case, which stays in chamber when bolt is pulled to the rear. (Do not set up loose head space.)	11. Insert front end of a separated case in chamber and load.
12. Bullet loose in cartridge case. Cartridge case extracted from belt but bullet remains in belt. <sup>1</sup>	12. Do not prepare. <sup>1</sup>

See footnotes at end of table.

TABLE OF STOPPAGES—Continued

Stoppages	Method of preparation of instruction in immediate action and stoppages
13. Short or broken firing pin.	13. Place 5 or 6 successive range dummy cartridges in belt for instruction in immediate action.
14. Weak or broken firing pin spring.	14. Same as 13.
15. Faulty engagement of firing pin and sear notch.	15. Same as 13.
16. Broken sear spring.	16. Same as 13.
17. Bent or worn belt feed lever.	17. Assemble cover with defective part.
18. Belt feed pawl spring out or weak.	18. Remove belt feed pawl spring.
19. Belt feed pawl pin out or partially out.	19. Remove belt feed pawl pin.
20. Cover extractor spring out or weak.	20. Remove cover extractor spring.
21. Belt feed lever bent up (stud on lever jumps out of cam groove).	21. Assemble with defective part.
22. Damaged extractor.	22. Same as 21.
23. Belt holding pawl out or spring weak.	23. Remove belt holding pawl.
24. Belt holding pawl fails to depress.	24. Place obstruction in recess.
25. Broken or missing barrel locking spring. <sup>1</sup>	25. Do not prepare. <sup>1</sup>
26. Broken extractor or ejector.	26. Assemble bolt with defective part.
27. Broken or damaged T-slot in bolt. <sup>1</sup>	27. Do not prepare. <sup>1</sup>
28. Weak ejector spring.	28. Assemble with defective part.
29. Broken barrel extension.	29. Assemble with defective part.
30. Defective trigger mechanism. <sup>1 2</sup>	30. Do not prepare. <sup>1 2</sup>
31. Defective bolt switch. <sup>1</sup>	31. Do not prepare. <sup>1</sup>
32. Bent or broken belt feed pawl arm. <sup>1</sup>	32. Do not prepare. <sup>1</sup>

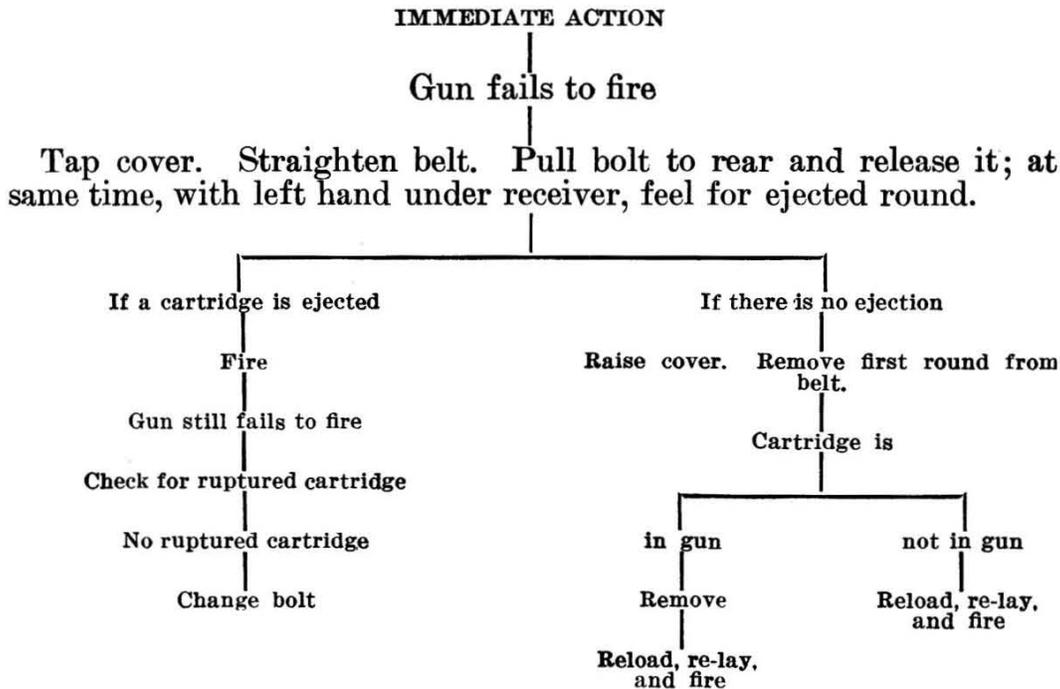
<sup>1</sup> Not prepared for instruction in immediate action.

<sup>2</sup> Defective trigger mechanism may cause the gun to begin firing as soon as it is loaded, or continue firing when the trigger is released. To remedy, unlatch cover or twist belt, retract operating slide, unload, disassemble gun, and replace defective part or parts.

**15. Immediate action.**—*a. General.*—(1) Immediate action is the immediate and automatic application of a procedure designed to reduce the majority of stoppages and place the gun in action in the shortest possible time. Immediate action is concerned with the reduction of stoppages and not the cause.

(2) Proper preparation of the gun and inspection of the loaded belts to eliminate loose bullets, bulged rounds, etc., should practically eliminate the need of immediate action.

(3) When a stoppage occurs during firing, immediate action as described in the diagram below, or such portions of it as are required to reduce the stoppage, will be performed.



NOTE.—If the procedure outlined above does not place the gun in action, the gunner must inspect the feed mechanism and working parts of the gun, determine the cause of the stoppage, and eliminate it.

*b. On fixed aircraft guns.*—(1) Due to the fact that the attention of the operator of a fixed aircraft machine gun is directed on the operation of the airplane, only limited attention can be given to the gun. In fact, the only stoppages of fixed machine guns that can be relieved in the air are those which may be remedied by pulling back the operating slide. Nevertheless, it is of vital interest to the gunner to know as much as possible about the causes of, and remedies for, the various stoppages. Information contained in the table of stoppages listed in paragraph 14*d* and notes on immediate action in *a* above are to be considered primarily in relation to practice firing on the ground, as it is in such firing that the fundamentals of the operation of the gun are learned. The gunner may subsequently apply the knowledge of stoppages thus gained to operation in flight in order to determine quickly whether any particular stoppage can be readily corrected or if it requires more extensive repairs than he can make.

(2) If gun fails to fire, see that cover is latched properly. Pull operating slide to the rear and release quickly, allowing bolt to go forward smartly. If gun still fails to fire, repeat the operation.

*c. To remove a cartridge from T-slot.*—(1) Hold back bolt and raise extractor. The cartridge will usually fall out unless it has a thick rim or the T-slot is defective.

(2) If the cartridge will not fall out when extractor is raised, use a screw driver or similar tool. Hold bolt to the rear with extractor raised. Place screw driver through top of receiver into top of cannellure of cartridge and drive cartridge downward out of T-slot by striking the upper end of screw driver with the palm of the hand. Before attempting to drive the cartridge out of the T-slot, make certain that the firing pin striker is not protruding through the face of the bolt and imbedded in the primer of the cartridge. If it is, it will be necessary to disassemble the gun, remove the firing mechanism from the bolt, and then remove the cartridge from the T-slot.

*d. To remove a case from chamber.*—If there is an empty case with broken rim stuck in the chamber, hold back bolt and remove cartridge from T-slot if there is one. 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 the brush, then wipe out with a dry rag.

*e. To replace damaged parts.*—Remove damaged parts and replace as quickly as possible. If it is imperative that fire be maintained or immediately resumed, a broken minor part should be replaced by substituting the complete spare part which contains it. Thus a broken firing pin would be remedied by changing bolts; a broken ejector, by changing extractors. Later, as opportunity permits, the small parts will be repaired or replaced in order to make the large part again available for use. Where the complete bolt has been changed, a check should be made on head space.

## SECTION IV

### CARE AND PRESERVATION

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Points to be observed after flight.....	18
Care and cleaning of gun.....	19
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**16. General.**—The importance of a thorough knowledge of how to care for and clean the machine gun cannot be overemphasized. The kind of attention given to a weapon of this type determines largely

whether or not it will shoot accurately and function properly when needed. The bore and chamber must be kept in perfect condition for accurate shooting. Also, it is just as important that the receiver and moving parts be kept clean, lubricated, and in perfect condition for efficient functioning.

**17. Points to be observed before flight.**—The following points must be observed before leaving the ground:

- a.* Wipe bore and chamber of gun barrel.
- b.* See that adjusting screws are screwed in tight against buffer disks in back plate.
- c.* Test functioning of gun by hand, using dummy cartridges.
- d.* Test functioning of operating slide (fixed gun only) or retracting slide (flexible gun only).
- e.* Oil carefully.
- f.* See that sight bases are clamped securely in place (flexible gun only).
- g.* Make sure that ammunition belt is in good condition and loaded properly.

*h.* Place belt carefully in ammunition chest and see that metallic belt link chutes are in good condition and in proper alinement.

*i.* Load gun partially or completely as directed.

**18. Points to be observed after flight.**—The following points must be observed as soon after a flight as practicable:

- a.* Unload gun completely and remove belt from ammunition chest.
- b.* Clean bore and all working parts. If this cannot be done at once, oil carefully to prevent rust.
- c.* Release firing pin spring.
- d.* The armorer must get a detailed account from the gunner or pilot of the gun's behavior in the air. If stoppages have occurred, their cause must be determined and corrected immediately.
- e.* At the first opportunity, dismount gun; clean, oil, and inspect all parts; make needed repairs and replacements.
- f.* On assembling, check operation with dummy cartridges and release firing pin spring after insuring that functioning and adjustments are correct.

**19. Care and cleaning of gun.**—*a. Cleaning bore.*—The bore should be thoroughly cleaned with rifle bore cleaner. This cleaner is a combination solvent and preservative which is issued for use by troops in the field for cleaning small arms. When rifle bore cleaner is not available, the bore should be cleaned with hot soap and water solution, soda ash and water solution (1½ spoonfuls per

pint of water), hot water alone, or, in the absence of these, cold water. Before attempting to clean the gun, the groups should be disassembled from the gun.

*b. Use of rifle bore cleaner.*—(1) Saturate a clean patch with rifle bore cleaner and push it back and forth through the bore of the barrel by means of a cleaning rod.

(2) Repeat the operation with clean patches two or three times, and then use a clean dry patch to remove all the cleaner before applying the prescribed lubricating oil for aircraft instruments and machine guns.

(3) Engine oil, SAE 30, should be used to protect the bore if the weapon is to remain out of service for several days. For long-time storage, light rust preventive compound should be used in place of oil. (Refer to (4) below.) However, before use, the gun should be cleaned thoroughly and reoiled with lubricating oil for aircraft instruments and machine guns.

(4) When guns are left mounted in aircraft ready for immediate use, only lubricating oil for aircraft instruments and machine guns should be used. Guns should be inspected and lightly oiled daily.

(5) Bore and chamber should be wiped free of oil before firing.

*c. Use of soap and water solution.*—(1) Place barrel, muzzle down, in a vessel containing hot water and issue soap, a soda ash solution, or, lacking these, hot or cold water alone.

(2) Insert cleaning rod, with a flannel patch assembled, in breach. Move rod forward and back for about 1 minute, pumping water in and out of bore.

(3) Use a brass or bronze wire brush while the bore is wet, running it forward and back through the barrel three or four times.

(4) Pump water through bore again to clean.

(5) Dry the cleaning rod and remove barrel from water. Using dry, clean flannel patches, thoroughly swab bore until it is perfectly dry and clean. Thoroughly dry and clean chamber, using a flannel patch on a stick if necessary.

(6) Saturate a patch with sperm oil and swab bore and chamber with the patch. Allow a thin coat of oil to remain in the bore. (Refer to (b) (3) and (b) (4) above.)

(7) Guns should be cleaned not later than the evening of the day on which the gun is fired, preferably immediately after cessation of firing.

(8) Inspect and clean guns for 3 days following cessation of firing.

*d. Cleaning parts other than bore.*—(1) Wipe receiver clean, care being taken to remove dirt from belt holding pawl. Thoroughly

clean cover, bolt, barrel extension, oil buffer, and back plate, using a small stick covered with a flannel patch to remove dirt from all recesses.

(2) Wipe all parts with an oily rag.

*e. Care of guns in Arctic climates.*—In Arctic climates where excessively low ground temperatures are encountered, special care must be taken with the guns as follows:

(1) Where guns are left mounted in the aircraft, parts of the gun not protected by the aircraft should be covered with a tarpaulin or other suitable covering to protect them from the weather.

(2) Where guns are dismounted from the aircraft and taken into heated buildings for repair or adjustment, they should be thoroughly and completely cleaned and oiled immediately, because moisture condensing on cold metal in a warm room will cause rusting. After the guns reach room temperature, they should be wiped free of condensed water vapor and oiled again. Oiling is best done with a slightly oily cloth, using lubricating oil for aircraft instruments and machine guns.

(3) Low temperatures are encountered at high altitudes. Guns that are brought down from high altitudes should be treated with the same care as guns in Arctic climates.

*f. Preparation for storage.*—(1) Clean gun with particular care. All parts of gun should be cleaned and wiped thoroughly dry with rags. In damp climates, particular care must be taken to see that the rags are dry. After drying, the bare hands should not touch the parts; handle with an oily rag.

(2) Apply rust preventive compound to all metal parts of gun. Light rust preventive compound is used for short-time protection, but should not be used on guns put in permanent storage. It may be applied with a brush or by dipping. Application of the rust preventive compound to bore of the machine-gun barrel is done best by dipping cleaning brush in rust-preventive compound and running it through the bore two or three times. Prior to placing the weapon in storage, the bolt should be in the forward position, with firing pin released. It is good practice to relieve the firing pin tension whenever the weapon is not in use.

(3) The wooden supports in the packing box must be painted with rust preventive compound before storing the gun. Place gun in wooden packing box, handling it with oiled rags.

*g. Guns received from storage.*—Machine guns received from storage are coated completely with rust preventive compound. Use dry-cleaning solvent to remove all traces of this grease, particular care

being taken that all recesses in which springs or plungers operate are cleaned thoroughly. After using the dry-cleaning solvent, make sure it is completely removed from all parts by wiping thoroughly. The bore and chamber of the barrel must be cleaned thoroughly. After cleaning all surfaces thoroughly, apply a thin film of lubricating oil with a rag to protect the surfaces.

**NOTE.**—Failure to clean the firing pin, the driving spring, and recesses in the bolt in which they operate may result in gun failure at normal temperatures. It will certainly result in serious malfunctions if the gun is operated in low temperature areas, as rust preventive compound and other foreign matter will congeal or frost on the mechanism.

*h. Dry-cleaning solvent.*—This is a petroleum distillate of low inflammability and noncorrosive used for removing grease. It is applied usually with rag swabs to large parts and as a bath for small parts. The surfaces must be dried thoroughly immediately after removal of the solvent. To avoid leaving finger marks, which are ordinarily acid and induce corrosion, gloves should be worn by persons handling parts after such cleaning. Dry-cleaning solvent will attack and discolor rubber.

*i. Lubricating oil.*—(1) Proper oiling is second in importance only to intelligent cleaning. Oil is a vital necessity for the working parts but should be used sparingly. Apply oil to all bearing surfaces of gun before firing, taking particular care to see that exterior of barrel is oiled at breech end, also that cover extractor spring, cover extractor cam, and cover detent pawl are oiled. Oil cocking lever, groove in the bolt for belt feed lever, grooves in barrel extension to take bolt ribs, breech lock cam, switch, extractor cam, sear mechanism, and the ways of belt feed slide.

(2) In oiling aircraft guns, special care should be taken not to use an excess of oil, as low temperatures that may be encountered will thicken the oil and may cause the gun to malfunction. The parts are best oiled by wiping with a well oiled rag.

(3) Lubricating oil for aircraft instruments and machine guns should be used on all aircraft machine guns when operated in the air, regardless of the ground temperature.

(4) Lubricating oil for aircraft instruments and machine guns should not be considered as a suitable preservative. When so used, it should be renewed at least every 48 hours.

**20. Method of filling oil buffer.**—*a.* Remove the oil buffer tube filling screws from the base of the buffer tube. Use the oil buffer filling oiler filled with lubricating oil for aircraft instruments and machine guns.

b. Start flow of oil by pressing on base of oiler. While the oil continues to pour from the oiler, insert nozzle into either filling hole and with a continued pressure on base of oiler allow oil to flow into buffer tube. *Do not release pressure on oiler until nozzle has been removed from filling hole, thus avoiding air bubbles in buffer tube.* Repeat the operation until buffer is overflowing. Replace filling screws. Any excess oil in the buffer will be relieved by relief valve in the forward end of buffer body. The reason that two filling holes are provided is to show visually, by overflow, when the buffer tube is completely full.

**21. Matériel affected by gas.—a. Protective measures.—**(1) When in constant danger of gas attacks, whether from chemical clouds or chemical shells, care should be taken to keep all unpainted parts of the gun and accessories lightly coated with oil. Avoid contact of the oil with leather or canvas fittings.

(2) Ammunition should be kept in sealed containers. If exposed to gases, corrosion is likely to occur, particularly on brass parts. Never coat rounds with oil, as seepage is apt to cause malfunctioning of the primer, powder train, or charge.

(3) Ordinary fabrics offer practically no protection against mustard and lewisite. Rubber and oilcloth will be penetrated if sufficient time is given. The longer the period during which they are exposed, the greater the danger of wearing these articles. Rubber boots which have been worn in an area contaminated with mustard may offer a grave danger to men who wear them several days after the bombardment. Impermeable clothing will resist penetration more than an hour, but should not be worn longer than this.

b. *Decontamination of matériel.—*(1) *Cleaning.—*(a) All unpainted metal parts of matériel that have been exposed to any gas except mustard and lewisite must be cleaned as soon as possible with dry-cleaning solvent or denatured alcohol and wiped dry. Following this cleaning, all parts should be coated with engine oil or sperm oil. (Refer to par. 19.)

(b) Ammunition which has been exposed to gas must be cleaned thoroughly before it can be fired. To clean ammunition use non-corrosive decontaminating agent, or if this is not available, strong soap and cool water. After cleaning, wipe all ammunition dry with clean rags. *Do not use dry powdered decontaminating agent (chloride of lime), on or near ammunition supplies, as flaming occurs through the use of chloride of lime on liquid mustard.*

(2) *Decontamination.*—For the removal of liquid chemical (mustard, lewisite, etc.) from matériel, the steps given below should be taken. For all of these operations it is necessary that a complete suit of impermeable clothing and a service gas mask be worn. Immediately after the removal of the suit, a thorough bath with soap and water (preferably hot) must be taken. If any skin areas have come in contact with mustard, if even a very small drop of mustard gets into the eye, or if the vapor of mustard has been inhaled, it is imperative that complete first-aid measures be given within 20 or 30 minutes after exposure. First-aid instructions are given in TM 9-850 and FM 21-40. If the impermeable clothing has been exposed to vapor only it may be decontaminated by hanging in the open air, preferably sunlight, for several days. It may also be cleaned by steaming for 2 hours. If the impermeable clothing has been contaminated with liquid mustard, steaming for 6 to 8 hours will be required. Various kinds of steaming devices can be improvised from materials available in the field. Ordinary garments which come in contact with mustard may also be decontaminated.

(a) Commence by freeing matériel of dirt through the use of sticks, rags, etc., which must be burned or buried immediately after this operation.

(b) If the surface of the matériel is coated with grease or heavy oil, this grease or oil should be removed before decontamination is begun. Dry-cleaning solvent or other available solvents for oil should be used with rags attached to ends of sticks. Following this, decontaminate the matériel with bleaching solution made by mixing one part decontaminating agent (chloride of lime) with one part water. This solution should be swabbed over all surfaces. Wash off with water, dry, and oil all surfaces.

(c) All unpainted metal parts exposed to mustard or lewisite must be decontaminated with noncorrosive, decontaminating agent mixed 1 part solid to 15 parts solvent (acetylene tetrachloride). If this is not available, use warm water and soap. Bleaching solution must not be used, because of its corrosive action. Coat all metal surfaces lightly with engine oil. (Refer to par. 19.)

(d) The gun bore should be swabbed out with strong soap and water, dried thoroughly, and oiled.

(e) In the event that decontaminating agent (chloride of lime) is not available, matériel may be cleaned temporarily with large volumes of hot water. However, mustard lying in joints or in leather or canvas web is not removed by this procedure and will remain a constant source of danger until the matériel can be decontaminated

properly. All mustard washed from matériel in this manner lies unchanged on the ground, necessitating that the contaminated area be marked plainly with warning signs before abandonment.

(f) The cleaning or decontaminating of matériel contaminated with lewisite will wash arsenic compounds into the soil, poisoning many water supplies in the locality for both men and animals.

(g) Leather or canvas web that has been contaminated should be scrubbed thoroughly with bleaching solution. In the event this treatment is insufficient, it may be necessary to burn or bury such matériel.

(h) Detailed information on decontamination will be found in FM 21-40 and TM 9-850.

## SECTION V AMMUNITION

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**22. General.**—The information in this section pertaining to the several types of cartridges authorized for use in the Browning machine gun, caliber .50, M2, aircraft, fixed and flexible, includes a description of the cartridges, means of identification, care, use, and ballistic data.

**23. Nomenclature.**—Standard nomenclature is used herein in all references to specific items of issue.

**24. Classification.**—*a.* Based upon use, the principal classifications of the ammunition used in this machine gun are—

- (1) Ball, for use against personnel and light matériel targets.
- (2) Armor piercing, for use against armored aircraft, armored vehicles, concrete shelters, and similar bullet-resisting targets.
- (3) Tracer, for observation of fire.
- (4) Incendiary, for incendiary purposes.

*b.* Another type provided for special purposes is dummy ammunition for training. Cartridges are inert.

**25. Identification.**—*a.* Even though the caliber .50 cartridges are not marked or stamped to indicate the type or model, each type may be identified as described in *b* below. In general, the only stamping on the cartridge is the manufacturer's initials and the year of loading, which appear 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. (See par. 28.) For further identification, an identification card approximately 6½ by 15 inches, 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. 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. (See par. 29*a* and *b*.)

*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 and illustrated in figures 11 and 12. Care should be taken not to confuse the original markings with any subsequent markings made with lithographic marking ink, which is used for an entirely different purpose. (See par. 29*c*.)

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

(2) *Armor piercing.*—Caliber .50 armor piercing ammunition may be identified 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 nose of the bullet, which is painted purple.

(5) *Dummy.*—Caliber .50 dummy cartridges may be identified by three .2-inch holes in the bodies of their tin-coated cartridge cases, and also by the absence of a primer. The gilding metal bullet jacket of the dummy cartridge, caliber .50, M2, is tin coated, whereas that of the dummy cartridge, caliber .50, M1, is not, thereby retaining its copper color.

**26. Model.**—To identify a particular design, a model designation is assigned at the time an item is classified as the adopted type. The model designation becomes an essential part of the standard nomenclature of the item and one of the means of identification, for example, M2.

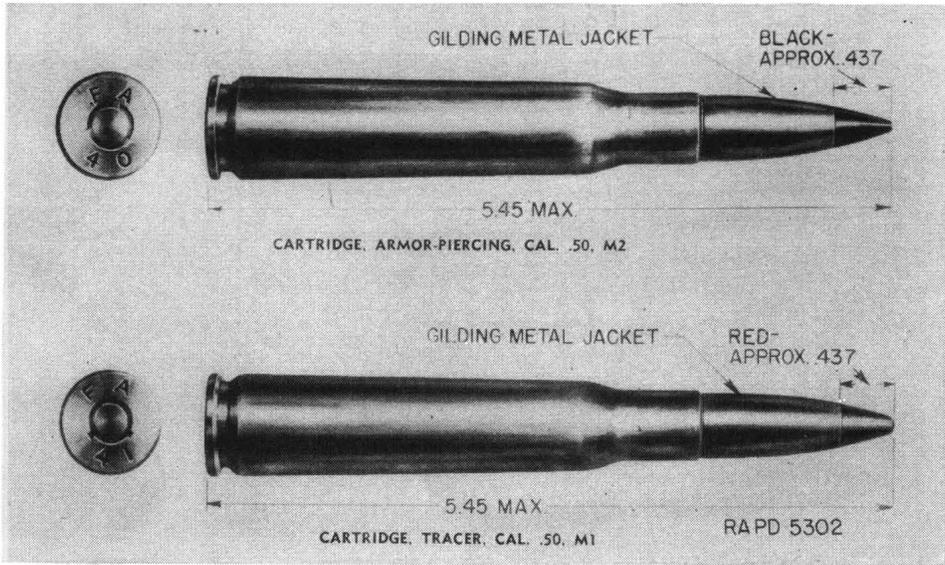


FIGURE 11.—Ammunition for Browning machine gun, caliber .50, M2, aircraft.

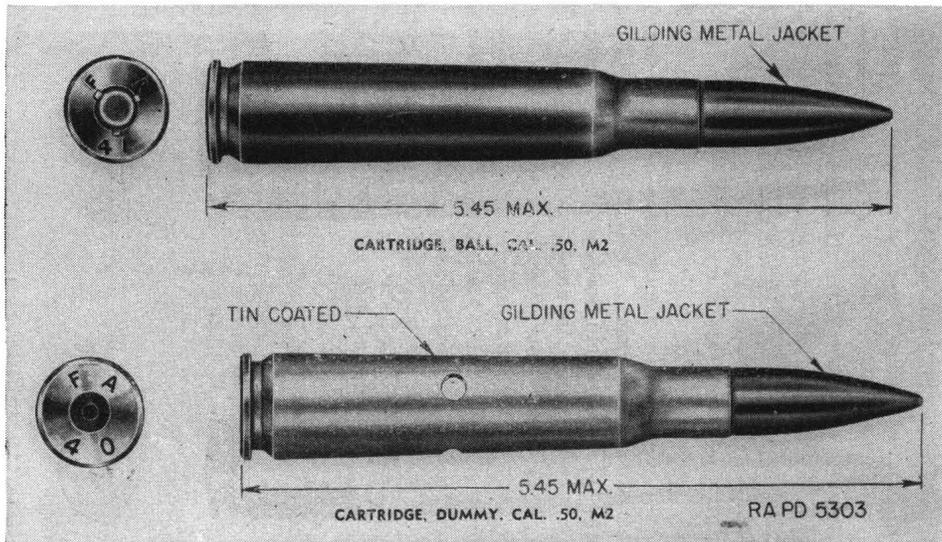


FIGURE 12.—Ammunition for Browning machine gun, caliber .50, M2, aircraft.

**27. Lot number.**—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, use, and 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 will be fired. (See par. 28.) Since it is impracticable to mark the ammunition lot number on each individual cartridge, every effort should be made to maintain the ammunition lot number of the cartridges after 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 (unserviceable ammunition which will not be fired). Therefore, when cartridges are removed from their original packings they should be marked so that the ammunition lot number may be preserved.

**28. Grade.**—Ordnance Field Service Bulletin 3-5 lists numerically each lot of ammunition with its correct grade as established by the Chief of Ordnance. Only lots of proper grade will be fired.

**29. Marking.**—*a.* Color bands painted on the sides and ends of the packing boxes may be used to identify the various types of ammunition. The following color bands are used:

Cartridge, armor piercing-----	Blue on yellow.
Cartridge, armor piercing, and cartridge, tracer, in metallic link belt.	Composite band of blue, yellow, and green stripes (blue on left, yellow in center, green on right).
Cartridge, ball-----	Red.
Cartridge, ball, and cartridge, tracer, in metallic link belt.	Composite band of yellow, red, and green stripes (yellow on left, red in center, green on right).
Cartridge, dummy-----	Green.
Cartridge, incendiary-----	Red on yellow.
Cartridge, tracer-----	Green 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 reproduced on the labels, except that for dummy ammunition the label itself is green.

*c.* The number of hits made upon a target by a certain machine gun or group of machine guns, when several are firing at the same target, is sometimes determined by coating the tips of the bullets with lithographic ink. The bullets from each weapon or group of weapons are coated with a distinctive color of ink which, upon striking the target, leaves a smear indicating the source of fire. Cartridges which have been so coated must have the ink removed before return to storage.

**30. Packing.**—*a.* Service ammunition for the Browning machine gun, caliber .50, M2, aircraft, fixed and flexible, is packed in three ways:

(1) 100 cartridges per metallic link belt; 1 metallic link belt per carton, 2 cartons per metal-lined packing box.

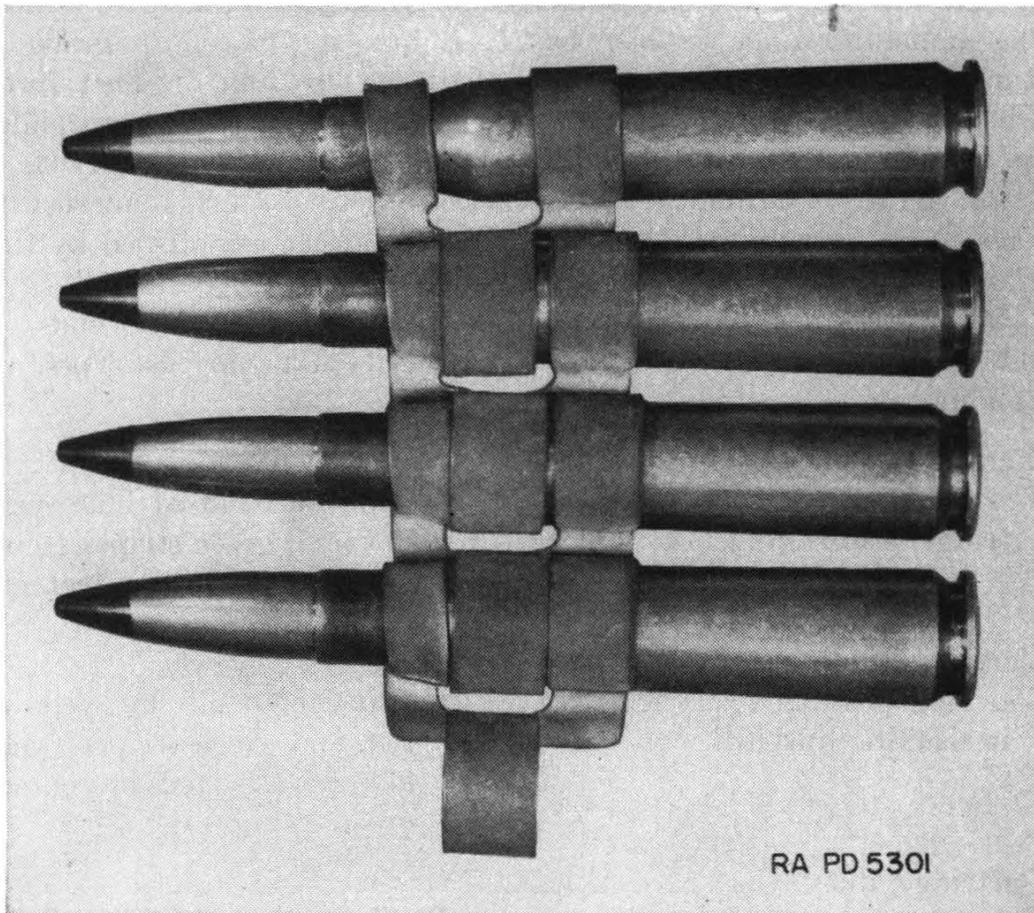


FIGURE 13.—Section of link belt, caliber .50, loaded with M2 armor piercing cartridges.

(2) 265 cartridges per metallic link belt; 1 metallic link belt per metal-lined packing box.

(3) 10 cartridges per carton; 35 cartons per metal-lined packing box.

*b.* The dimensions of the standard packing box for caliber .50 ammunition, in inches, are  $18\frac{7}{16}$  by  $9\frac{7}{16}$  by  $14\frac{13}{16}$ . For additional packing data see SNL T-1.

**31. Care, handling, and preservation.**—*a.* Ammunition boxes should not be opened until the ammunition is required for use. Ammunition removed from the airtight container, particularly in damp climates, is likely to corrode, thereby causing the ammunition to become unserviceable.

*b.* The ammunition should be protected from mud, sand, dirt, and water. If it gets wet or dirty, wipe it off at once. Verdigris or light corrosion should be wiped off. Cartridges should not be polished, however, 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 should not be exposed to the direct rays of the sun for any length of time. This is likely to affect seriously its firing qualities.

*f.* Whenever cartridges are taken from cartons and loaded into belts, the latter will be tagged so that the ammunition may be identified as to lot number. Tagging is necessary to preserve the grade of the ammunition.

**32. Storage.**—*a.* Whenever practicable, small arms ammunition should be 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 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. It is unlikely that the bullets and cases will fly over 200 yards.

**33. Authorized rounds.**—The following ammunition of appropriate grade (par. 28) is authorized for use in the Browning machine gun, caliber .50, M2, aircraft, fixed and flexible. It should be noted that the nomenclature used (standard nomenclature) completely describes the cartridge as to type, caliber, and model. Its use for all purposes of record is mandatory. All of the following

are standard items of issue with the exception of the dummy cartridge, caliber .50, M1, which is limited standard:

- Cartridge—Armor piercing, caliber .50, M2.
- Ball, caliber .50, M2.
- Dummy, caliber .50, M1.
- Dummy, caliber .50, M2.
- Incendiary, caliber .50, M1.
- Tracer, caliber .50, M1 or M2.

**34. Ballistic data.**—The average velocities of the several types and models of caliber .50 ammunition used with the Browning machine gun, caliber .50, M2, aircraft, fixed and flexible, are shown below:

Type and model	Average velocity 78 feet from muzzle (feet per second)
Cartridge, armor piercing, caliber .50, M2-----	2, 900
Cartridge, ball, caliber .50, M2-----	2, 900
Cartridge, incendiary, caliber .50, M1-----	-----
Cartridge, tracer, caliber .50, M1-----	2, 830

**35. Defects found after firing.**—*a. Misfire.*—(1) Primer shows normal impression of firing pin. Such a misfire indicates that the primer is defective.

(2) Primer shows light impression of firing pin. Such a misfire indicates that the force of the blow struck by the firing pin is not sufficient to ignite the primer. This is generally caused by some mechanical defect in the weapon, such as short or broken firing pin, a weak firing pin spring, the bolt of the weapon not being completely locked, or by grease in the firing pin hole in the bolt, which cushions the blow of the firing pin. It may also be caused by a defective cartridge or primer.

(3) Primer shows normal impression of firing pin but off center. This is caused by a defect in the weapon.

*b. Hangfire.*—Delayed ignition of the powder in the cartridge may be caused by a small or decomposed primer pellet, damp powder, or a light blow of the firing pin caused by dirt or a defect in the weapon. While a hangfire is a serious defect if the delay is long enough to permit the bolt to be opened before the powder burns completely, such delay is rarely found in practice. Should a hangfire of several

seconds' delay occur and the bolt be opened before the powder burns, injury to the firer or damage to the weapon, or both, may result.

*c. Pierced primer.*—Perforation of the primer cup by the firing pin may be caused by an imperfect firing pin or very thin metal in the base of the primer cup. There are various degrees of this perforation. A very small perforation will show the escape of gas by means of a discoloration around the indent made by the firing pin. The disk from a large perforation may be blown into the action of the gun with such an escape of gas as to lower the velocity of the bullet.

*d. Primer leak.*—Gas generated by the explosion of the powder discharge escapes between the walls of the primer cap and the primer pocket, causing discoloration around the primer and the head of the cartridge case. The discoloration may be slight, indicating a small primer leak, or heavy, indicating a large primer leak.

*e. Blown primer.*—On firing the cartridge, the primer is blown completely from the pocket of the cartridge case. Although this is a serious defect, it is seldom encountered.

*f. Primer setback.*—Pressure developed by the explosion of the repellent charge forces the primer back against the face of the bolt. On examination, it will be seen that the primer protrudes above the head of the cartridge case. The setback of the primer may be slight or heavy and is due to a defective bolt or cartridge.

*g. Leak back of case.*—Escape of gas into the action of the weapon causes this leak. Discoloration due to this escape of gas is along the body of the cartridge case.

*h. Failure of case to extract.*—This may be due to a poorly formed or weak extractor, or a defective cartridge.

*i. Blowback.*—An escape of gas under pressure to the rear is commonly referred to as a blowback. Pierced primer, primer leak, blown primer, primer setback, and ruptured cartridge are known as blowbacks.

*j. Split neck.*—The neck of the cartridge case splits in firing and is accompanied by an escape of gas. Seasonal cracks are of two kinds; those which can be observed before firing, and those which are evident after firing.

*k. Split body.*—A more or less regular longitudinal split in the body of the case which allows gas to escape.

*l. Stretch.*—A continuous ring around the body of a fired cartridge case which shows that the metal stretched when the cartridge was fired and that with slightly more stretching a complete or partial rupture would probably result. This is almost always due to improper head space.

*m. Complete rupture.*—A circumferential separation of the metal completely around the body of the fired cartridge case causing it to separate into two parts. If such rupture occurs, upon extraction, the forward portion of the fired cartridge case remains in the chamber of the weapon. This is a serious defect, causing the next round of ammunition to jam. It is usually due to excessive head space or a defective cartridge case.

*n. Partial rupture.*—A partial circumferential separation around the body of the fired cartridge case, like a complete rupture, is a serious defect, as upon extraction, the portion of the metal holding the two parts of the cartridge case may give way, thereby leaving the forward portion of the fired cartridge case in the chamber of the weapon. This defect is also usually due to excessive head space or a defective cartridge case.

**36. Field reports of accidents.**—Any serious malfunctions of ammunition must be reported promptly to the ordnance officer under whose supervision the material is maintained and issued. (See par. 7, AR 45-30.)

## SECTION VI

### ORGANIZATION SPARE PARTS AND ACCESSORIES

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**37. Organization spare parts.**—*a.* A set of organization spare parts is supplied to the using arm for field replacement of those parts most likely to become broken, worn, or otherwise unserviceable. The set is kept complete by requisitioning new parts for those used. Organization spare parts are listed in SNL A-38.

*b.* Care of organization spare parts is covered in section IV.

**38. Accessories.**—*a. General.*—Accessories include tools and equipment required for such disassembling and assembling as the using arm is authorized to perform, and for the cleaning, preservation, and adjustment of matériel. They also include chests, covers, tool rolls, and other items necessary to protect the matériel when it is not in use or when traveling. Accessories should not be used for purposes other than as prescribed, and when not in use should be properly stored.

*b.* There are a number of accessories whose names or general characteristics indicate their use. Others embodying special uses are described below.

*c. Brush, cleaning, caliber .50, M4.*—This brush consists of a brass wire core with bristles and tip. The core is twisted in a spiral and holds the bronze bristles in place. The brass tip, which is threaded for attaching the brush to the cleaning rod, is soldered to the end of the core.

*d. Case, cleaning rod, M15.*—This case is a fabric container with six pockets, five of which hold the sections of the jointed cleaning rod, caliber .50, M7, while the sixth holds several of the cleaning brushes, caliber .50, M4. The contents are secured in their pockets by a flap which is held in place with a billet and buckle. A hook is provided to fasten the case to the ammunition belt.

*e. Cover, trigger motor slot.*—The trigger motor slot cover is used to cover the trigger motor slots to prevent dust or dirt from entering the gun. It consists of an aluminum body having a lug and a movable slide, both with beveled edges, which form a latch. The cover is retained on the side plate of the gun by a slide which is kept in an extended or locked position with a spring.

*f. Gage, head space and timing, caliber .50, Browning machine gun.*—This gage (fig. 14) is a feeler gage  $3\frac{1}{2}$  inches long, one end of which has a width of .99 inch and the other end  $\frac{5}{8}$  inch. The narrow end is marked HEADSPACE .200 and is used to check head space adjustment, while the wide end is marked TIMING .116 and is used to check timing with regard to the functioning of the firing pin relative to the locking of the bolt and the relative functioning of the extractor. For use see paragraph 9c.

*g. Machine, link loading, caliber .50, M2.*—The link loading machine is used for rapid loading of ammunition into metallic links. When in use, it may be screwed to a bench, ammunition box, or other suitable support, screw holes being provided in its base for this purpose. Links, properly assembled, are placed on the loading bed adjacent to the U-shaped stops, and cartridges are placed in the grooves provided. The loading is performed by the operation of the loading handle, which, when pushed forward to the stop, will load the cartridges to the correct depth in the links. Care should be taken to handle properly that portion of the loaded belt adjacent to the section being loaded.

*h. Oiler, filling, oil buffer.*—This oiler consists of a  $\frac{1}{2}$ -pint capacity oil can with a nozzle 5 inches long. It is used only for filling the oil buffer.

*i. Reflector, barrel.*—The barrel reflector is a small box-shaped device having a short tube which slips into the chamber of the gun barrel. It has a mirror and an opening through which the reflection

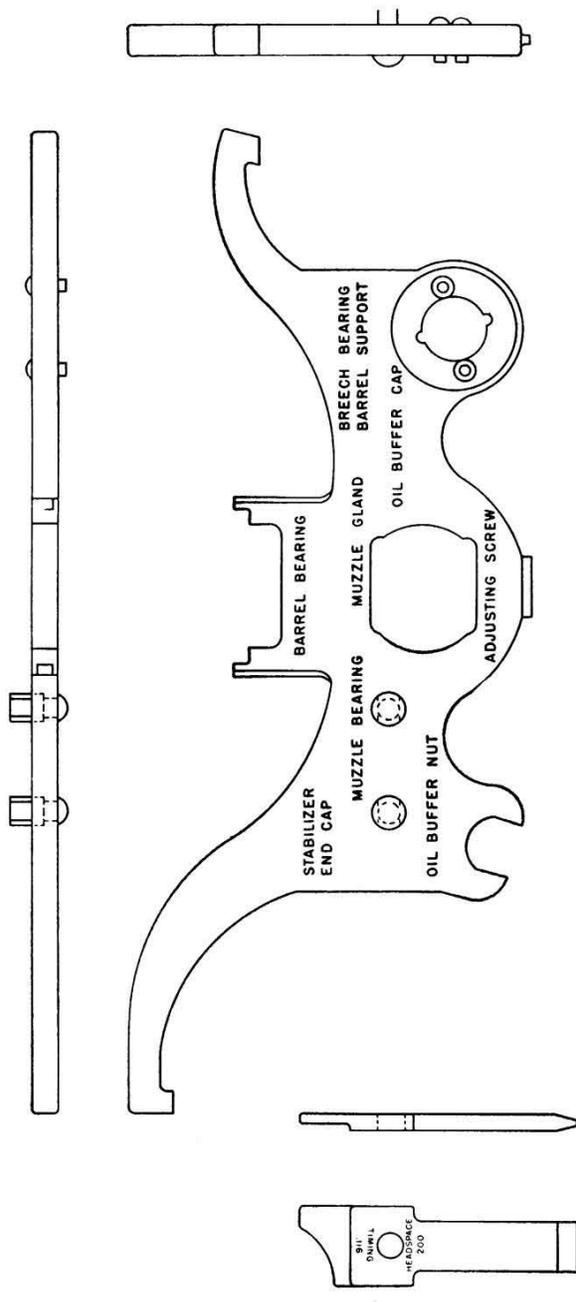
of the bore is obtained. The condition of the bore may thereby be readily determined.

*j. Rod, cleaning, jointed, caliber .50, M7.*—This steel rod consists of five sections. The first section has a slot formed for holding the cleaning patch and a threaded hole for attaching the cleaning brush. The rear section swivels in the one-piece cast handle and is secured with two steel pins. When assembled, this rod has a length of approximately  $48\frac{3}{4}$  inches forward of the handle.

*k. Rod, cleaning, caliber .50, M6.*—This is a solid steel device consisting of a rod and a one-piece case handle. The forward end has a slot formed for holding a cleaning patch and a threaded hole for attaching the cleaning brush. The rod swivels in the handle and is secured with two steel pins. This rod has a length of approximately  $48\frac{3}{4}$  inches forward of the handle.

*l. Tool, release.*—The release tool is a length of  $\frac{1}{4}$ -inch square steel rod having a wooden handle at one end and the other end bent at a right angle, the tip of which is turned down to  $\frac{1}{8}$ -inch diameter. It is used to depress the oil buffer body spring lock through the hole in the side plate when the gun is installed in a position where a drift cannot be used.

*m. Wrench, combination, caliber .50, M2.*—This is a special combination tool (fig. 14) for disassembling, assembling, and making adjustments of the gun. Each opening and projection are marked to show their purpose.



WRENCH, COMBINATION, M2

GAGE, HEADSPACE & TIMING CAL. .50 BMG

RA PD 5972

FIGURE 14.—Combination wrench M2 and head space and timing gage, caliber .50, Browning machine gun.

APPENDIX

LIST OF REFERENCES

1. Standard Nomenclature Lists.

a. *Cleaning and preserving.*

Cleaning, preserving, and lubricating material,  
recoil fluids, special oils, and similar items of  
issue----- SNL K-1.

b. *Gun matériel.*

Ammunition, rifle and automatic gun----- SNL T-1.

Gun, machine, caliber .50, Browning, M2, aircraft,  
fixed and flexible----- SNL A-38.

c. *Repair.*

Tools, special repair, automatic guns, automatic  
gun antiaircraft matériel, automatic and semi-  
automatic cannon, and mortars----- SNL A-35.

Truck, small arms, repair, M1----- SNL G-72.

Current Standard Nomenclature Lists are as tabu-  
lated here. An up-to-date list of SNL's is  
maintained as the Ordnance Publications for  
Supply Index----- (OPSI).

2. Explanatory publications.

a. Cleaning, preserving, lubricating, and welding  
materials and similar items issued by the  
Ordnance Department----- TM 9-850.

b. Synchronizing----- TM 1-510.

c. *Miscellaneous.*

Defense against chemical attack----- FM 21-40.

Ordnance field service in time of peace----- AR 45-30.

[A. G. 062.11 (3-2-42).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,  
*Chief of Staff.*

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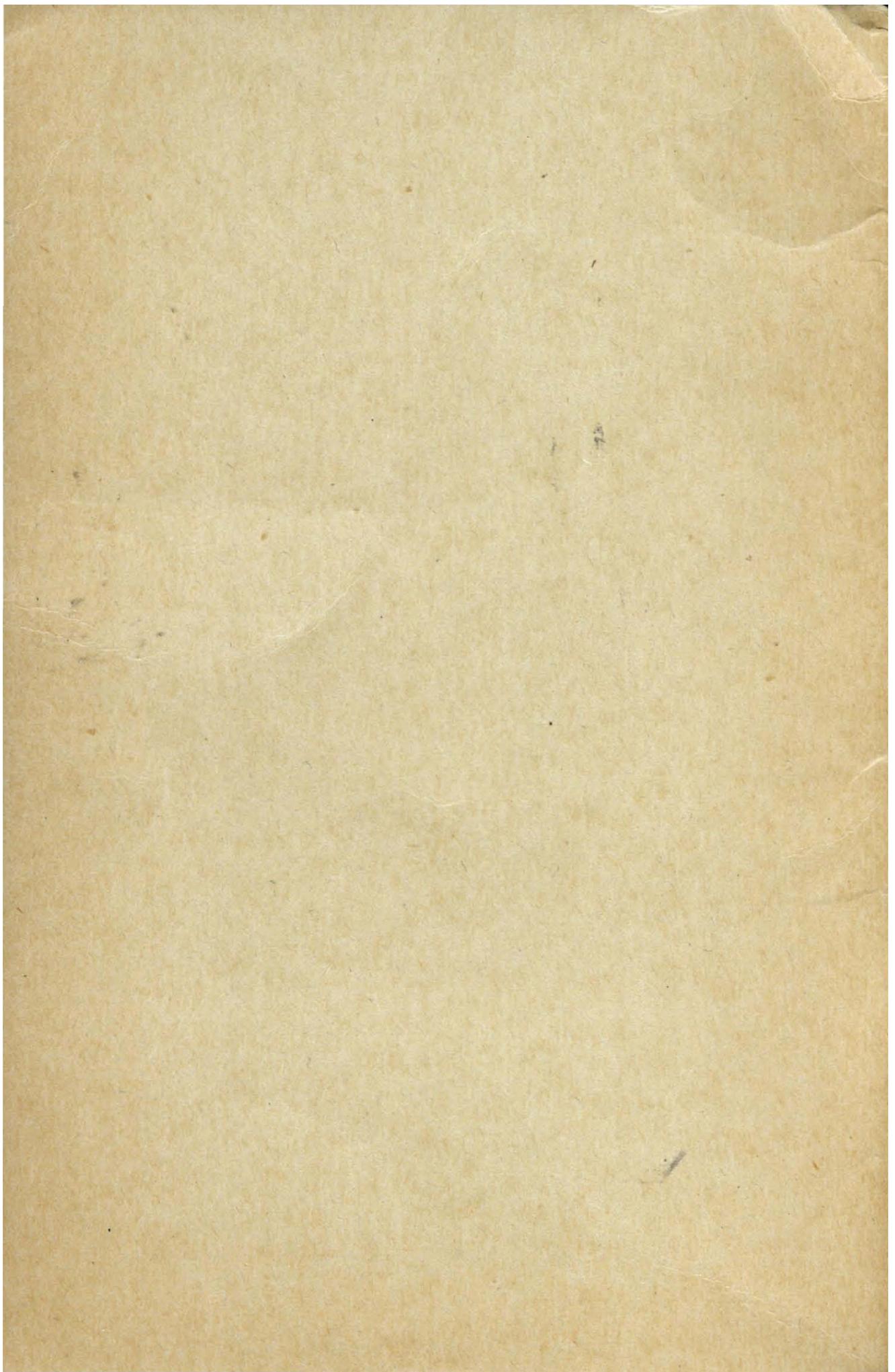
J. A. ULIO,  
*Major General,*  
*The Adjutant General.*

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R and H 1 (6); Bn 1 (10), 9 (2); IC 9 (3).  
(For explanation of symbols see FM 21-6.)







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