1 - 3 FM 6-50

WAR DEPARTMENT

FIELD ARTILLERY FIELD MANUAL

SERVICE OF THE PIECE

75-MM GUN, M1897 AND M1897A4, HORSE-DRAWN AND TRUCK-DRAWN

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Prepared under direction of the
Chief of Field Artillery

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BY ORDER OF THE SECRETARY OF WAR:

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Major General,
The Adjutant General.

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SERVICE OF THE PIECE

75-MM GUN, M1897 AND M1897A4, HORSE-DRAWN AND TRUCK-DRAWN

(The matter contained in this manual supersedes TR 430–15, November 1, 1932, and TR 430–16, June 28, 1934.)

SECTION I

GENERAL

■ 1. PURPOSE AND SCOPE.—This manual prescribes the duties to be performed in the service of the piece by the personnel normally assigned to one gun section of the firing battery.

■ 2. REFERENCES.—*a. Description, operation, functioning, and care of matériel.*—(1) TR 1305–A; SNL C–5.

(2) TR 1305–75A (now TR 320–95); SNL C–4; SNL C–25.

b. Description and operation of fire-control and sighting equipment.—TR 1320–C (now TR 310–20); SNL F–11; SNL F–28.

c. Ammunition.—TR 1355–75A; TR 1370–A; SNL R–1; SNL R–3.

d. Cleaning and preserving materials.—TR 1395–A; SNL K–1.

e. The field artillery driver.—Part Two, FM 6–5.

f. Maneuvers of the battery.—Part Two, FM 6–5.

g. Safety precautions in firing.—AR 750–10; chapter 4, FM 6–40.

h. The firing battery.—Chapter 1, FM 6–40.

i. Gunnery.—FM 6–40.

j. Reconnaissance, occupation, and organization of position.—Part One, FM 6–20.

■ 3. DEFINITIONS AND TERMS.—*a. Section.*—Tables of Organization prescribe the personnel and matériel comprising a section of a battery. In this manual the term is frequently

used to designate a section of the firing battery. In this restricted sense, a gun section is composed of one piece and the additional matériel and the personnel required to serve that piece.

b. Limbered.—A piece (caisson) is said to be limbered when its lunette is attached to the pintle of its limber.

c. Unlimbered.—A piece (caisson) is said to be unlimbered when its lunette has been detached from the pintle of the limber and the trail (caisson prop) rests on the ground.

d. Coupled.—A piece is said to be coupled when its lunette is attached to the pintle of a truck or other prime mover.

e. Uncoupled.—A piece is said to be uncoupled when its lunette is detached from the pintle of a truck or other prime mover and the trail rests on the ground.

f. Front.—The front in a section, carriages limbered or coupled, is the direction in which the trail points; carriages unlimbered or uncoupled, the direction in which the muzzle of the piece points.

g. Right (left).—The direction right (left) is the right (left) of one facing to the front.

h. In battery.—The term "in battery" is used to designate the position of the gun when it is in its normal firing position.

SECTION II

ORGANIZATION

■ 4. COMPOSITION.—*a. Gun squad.*—A gun squad consists of the gunner and five cannoneers numbered from 1 to 5. The remaining cannoneers of the gun section act as reliefs or are assigned such other duties as the chief of section may direct. When the battery unlimbers or uncouples for drill or for firing, the chief of section remains at the firing position and commands the gun squad.

b. Ammunition squad.—(1) An ammunition squad consists of an ammunition corporal and cannoneers as prescribed in Tables of Organization. These cannoneers are numbered consecutively, beginning with No. 1, and are assigned to the ammunition vehicles of the ammunition (fifth) section. In organizations equipped with caissons, the cannoneers are equally divided between the two caissons, the

lower-numbered cannoneers being assigned to the first caisson.

(2) Posts and movements prescribed hereinafter for the gun squad apply, with obvious modifications, to an ammunition squad.

■ 5. FORMATION.—*a. Order of formation.*—A gun squad is formed as shown in figure 1.

FIGURE 1.—Formation of the gun squad.

Higher-numbered cannoneers, if present, form in order on the left of No. 5.

b. To form.—(1) The place of formation is indicated and the command given thus, for example: 1. IN FRONT (REAR) OF YOUR PIECES (CAISSONS), or 1. ON THE ROAD FACING THE PARK, 2. FALL IN. Each gunner repeats the command FALL IN and hastens to place himself, faced in the proper direction, at the point where the right of his squad is to rest. The cannoneers move at the double time and assemble at attention in their proper places. For the first formation of the gun squads for any drill or exercise, the caution, "As gun squads," precedes the command. The chief of section, if present, supervises the formation.

(2) In case the front or rear of the carriages is designated, each squad falls in at its post (par. 6).

c. To call off.—(1) The command is: CALL OFF. The cannoneer on the left of the gunner calls off "One"; the cannoneer on the left of No. 1, "Two"; and so on.

(2) After having called off, if a subsequent formation is ordered, the cannoneers fall in at once in their proper order.

SECTION III

POSTS; MOUNTING AND DISMOUNTING

■ 6. POSTS OF THE GUN SQUAD.—*a. Carriages limbered or coupled.*—(1) *In front of the piece or caisson.*—The squad is in line facing to the front, its center two paces from the end of the pole, from the heads of the lead horses, or from the front of the truck.

(2) *In rear of the piece or caisson.*—The squad is in line facing to the front, its center two paces from the muzzle of the piece or from the rear of the caisson.

b. Carriages unlimbered or uncoupled.—The squad is in rear of the piece, in line facing to the front, its center two paces from the end of the trail of the piece.

■ 7. To POST THE GUN SQUADS.—The squads having been marched to the vicinity of the carriages are posted at the command SQUADS IN FRONT (REAR) OF YOUR PIECE (CAISSONS). Each gunner marches his squad to its carriages and posts it in the position indicated.

■ 8. POSTS OF THE CANNONEERS.—*a. Carriages limbered or coupled.*—The cannoneers of the gun squad are posted as shown in figures 2 and 4. All are 2 feet outside the wheels and facing to the front. Higher-numbered cannoneers, if present, are posted as prescribed by the chief of section.

b. Carriages unlimbered or uncoupled.—See paragraphs 19 and 22.

■ 9. To POST THE CANNONEERS.—*a.* The command is: 1. CANNONEERS, 2. POSTS. Each gunner repeats the command POSTS. The cannoneers leave the ranks, if formed, and move at the double time to their posts.

b. For preliminary instruction, the squads on entering the park are first posted with their carriages, and the cannoneers are then sent to their posts by the foregoing command. The command is general, however, and is applicable when the cannoneers are in or out of ranks, at a halt or marching, and when the carriages are limbered (coupled) or unlimbered (uncoupled).

■ 10. To MOUNT THE CANNONEERS.—*a.* (1) *Horse-drawn batteries.*—In each gun squad the personnel is mounted as shown in figure 3. Higher-numbered cannoneers are mounted as prescribed by the chief of section.

(2) *Truck-drawn batteries.*—In each squad the personnel is seated in the body of the truck in the order prescribed by the battery commander. The chief of section is seated beside the driver.

b. The command is: 1. CANNONEERS, PREPARE TO MOUNT, 2. MOUNT.

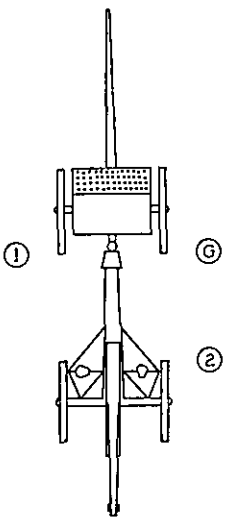


FIGURE 2.—Posts of the cannoneers, carriages limbered.

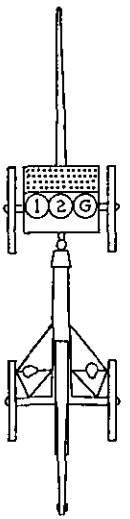


FIGURE 3.—Cannoneers mounted, horse-drawn.

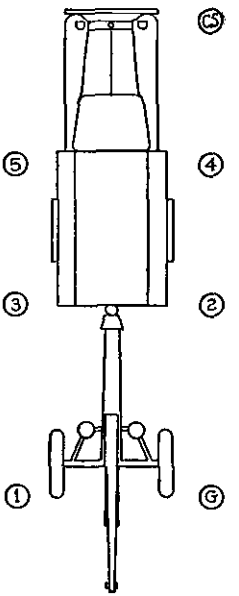
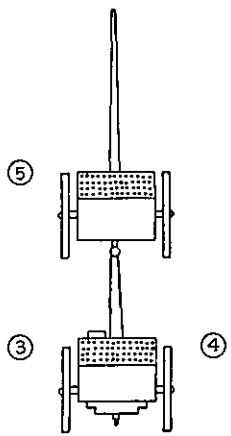
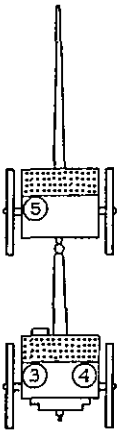


FIGURE 4.—Posts of the cannoneers, carriages coupled.





(1) *Horse-drawn batteries.*—At the first command, the cannoneers who mount the limber chests and those who mount the caisson chests move at the double time to the rear and front of those chests, respectively. Each cannoneer who mounts the limber chest, except No. 2, places the foot nearest the wheel on the step, grasps the chest handle with the hand nearest the wheel, and with the other hand grasps the hand of the cannoneer opposite him. Each cannoneer who mounts the caisson chest places the foot farthest from the wheel on the caisson trail, and grasps the chest handle with the hand nearest the wheel and the hand of the cannoneer opposite him with the other hand. At the second command, all except No. 2 spring up and seat themselves, faced to the front. No. 2 then mounts and seats himself between the gunner and No. 1. Higher-numbered cannoneers, if present, mount as prescribed by the chief of section.

(2) *Truck-drawn batteries.*—At the first command, the cannoneers move at the double time to positions on the ground convenient for mounting the truck. At the second command, all mount as prescribed by the battery commander.

c. If the command is: 1. CANNONEERS, 2. MOUNT, the cannoneers execute, at the command MOUNT, all that has been prescribed for the commands CANNONEERS, PREPARE TO MOUNT and MOUNT.

■ 11. To DISMOUNT THE CANNONEERS.—*a.* The command is: 1. CANNONEERS, PREPARE TO DISMOUNT, 2. DISMOUNT.

(1) *Horse-drawn batteries.*—At the first command, the cannoneers seated on the chests stand up on the footboards; at the second command, all jump to the ground and take their posts at the double time.

(2) *Truck-drawn batteries.*—At the first command, the cannoneers assume positions from which they can dismount promptly; at the second command, they jump to the ground and take their posts at the double time.

b. If the command is: 1. CANNONEERS, 2. DISMOUNT, the cannoneers execute, at the command DISMOUNT, all that has been prescribed for the commands CANNONEERS, PREPARE TO DISMOUNT and DISMOUNT.

SECTION IV

MOVEMENTS OF THE CARRIAGES BY HAND

■ 12. LIMBERED OR COUPLED.—*a. Horse-drawn batteries.*—(1) *To the front.*—The command is: 1. PIECES (CAISSONS) FORWARD, 2. MARCH, 3. HALT. In each squad at the first command the gunner and No. 1 hasten to the end of the pole; Nos. 2 and 5 to the limber wheels; Nos. 3 and 4 to the piece (caisson) wheels; higher-numbered cannoneers, if present, to posts as directed by the chief of section; the gunner and the even numbers working on the right side of the carriage, odd numbers on the left. When the piece is to be moved, No. 3 releases the brake. When the caisson is to be moved, No. 4 releases the brake; when the brake is released, Nos. 3 and 4 raise and secure the caisson prop. At the command MARCH, all assist in moving the carriage to the front. At the command HALT, the carriage is stopped. In the case of the piece, No. 3 sets the brake. In the case of the caisson, Nos. 3 and 4 lower the caisson prop and No. 4 sets the brake. All cannoneers resume their posts.

(2) *To the rear.*—The command is: 1. PIECES (CAISSONS) BACKWARD, 2. MARCH, 3. HALT. Executed as prescribed above, except that at the command MARCH the cannoneers move the carriage to the rear.

b. Truck-drawn batteries.—The carriages are not moved by hand when coupled.

■ 13. UNLIMBERED OR UNCOUPLED.—The command is: 1. PIECES (CAISSONS) FORWARD (BACKWARD), 2. MARCH, 3. HALT.

a. Piece.—(1) *First command.*—(*a*) *Horse-drawn batteries.*—At the first command, Nos. 3 and 4 grasp the trail handles, No. 3 on the right, No. 4 on the left; No. 2 grasps the left wheel and No. 5 the right wheel; the gunner and No. 1 place themselves so as to work advantageously at the breech of the piece in moving forward, at the muzzle in moving backward; higher-numbered cannoneers, if present, are employed as directed by the chief of section.

(*b*) *Truck-drawn batteries.*—At the first command, No. 2 places the trail handspike, for those carriages thus equipped, in the firing position if it is not already there; Nos. 2 and 3 grasp the trail handles, No. 3 on the right, No. 2 on the

left; No. 5 grasps the trail handspike for those carriages thus equipped; the gunner places himself where he can operate the brakes; No. 1 places himself on the right of the breech, No. 4 at the muzzle; higher-numbered cannoneers, if present, are employed as directed by the chief of section.

(2) *Second command.*—At the command MARCH, all working together move the piece forward (backward) under the direction of the chief of section. In truck-drawn batteries, when moving up or down steep slopes, the gunner assists by alternately setting and releasing the right and left brakes, thus permitting the piece to be pivoted about the locked wheel. At the command HALT, they stop the piece, in truck-drawn batteries the gunner sets the brake, and all resume their posts (pars. 19 and 22).

b. Caisson.—Executed as explained for the piece, except that No. 4 releases the caisson brake and No. 3, when the trail is raised, raises and secures the caisson prop. The gunner and No. 1 are at the footboard when moving forward and at the front of the caisson chest when moving backward, the gunner on the left. At the command HALT, No. 3 lowers the caisson prop and No. 4 sets the caisson brake. All take their posts (par. 19).

SECTION V

UNLIMBERING AND LIMBERING

■ 14. UNLIMBERING.—*a. Disposition of the carriages.*—(1) *Before unlimbering.*—The piece and its caisson are placed abreast of each other, 2 yards apart, poles pointing in the direction of movement. This formation of the carriages is called a double section. The interval of 2 yards should not be materially changed, otherwise the amount of movement of the carriages by hand is greatly increased. If it is intended to fire to the front, the caisson should be placed on the left of the piece before the command for unlimbering is given; if it is intended to fire to the rear, the caisson should be on the right of the piece; if to the flank, on either side of the piece. In emergencies the carriages may be unlimbered from any formation.

(2) *After unlimbering.*—(*a*) The adjacent wheels of the piece and the caisson are about 1 foot apart, trails of the

piece and the caisson pointing to the rear, the piece on the right and about 1 foot in advance of the caisson.

(*b*) Normally, the piece is placed slightly in advance to allow for recoil at the first shot, which ordinarily is about 1 foot.

(c) The interval of 1 foot may be increased to permit wide movements of the trail if they are expected, but efforts should be made to preserve to the fullest extent possible the protection afforded by the shields.

(*d*) In emergencies the caisson may be placed temporarily on the right of the piece. As this position is not favorable to the service of ammunition, the caisson should be moved to the left of the piece as soon as practicable.

(e) At ceremonies and drills, limbers are posted 25 yards in rear of their carriages, moving to their post at a trot. In active service and in instruction simulating it, limbers are conducted by the first sergeant to a place previously designated by the battery commander, where they are disposed so as to take the best advantage of cover and concealment. If no cover and concealment are available, they are located in rear of either flank, faced toward the front, with wide intervals between them.

b. To unlimber.—(1) *General.*—In unlimbering to fire to the front or rear, the caisson establishes the position; in unlimbering to fire to the flank, the element (piece or caisson) on the side toward which fire is to be directed establishes the position. If the carriages, after unlimbering, have to be moved by hand, each carriage is moved, as prescribed in paragraph 13, in the order designated by the chief of section. If the teams are not hitched, the carriages are unlimbered successively, the one which establishes the position being unlimbered first. Limbers are moved to their position by cannoneers designated by the chief of section.

(2) *To fire to the front.*—The carriages being in double section, the caisson on the left, the command is: ACTION FRONT. If marching, the carriages halt at the command or signal. The cannoneers, if mounted, dismount after the carriages have halted.

(*a*) *The caisson.*—Nos. 3 and 4 hasten to the trail handles; No. 4 unlatches the pintle; Nos. 3 and 4 raise the trail from

the pintle, and No. 4 commands or signals DRIVE ON. Nos. 3 and 4, assisted by the higher-numbered cannoneers at the wheels, then carry the trail away from the piece, turning the caisson 180°. No. 3, assisted by No. 4 lowers the caisson prop; No. 4 sets the caisson brake, and Nos. 3 and 4 take their posts.

(*b*) *The piece.*—The gunner and No. 1 hasten to the trail handles; No. 2 grasps the right wheel and places himself so as to be ready to turn the wheel toward the muzzle; No. 5 grasps the left wheel and places himself so as to be ready to turn the wheel toward the trail. The gunner unlatches the pintle and, assisted by No. 1, raises the trail from the pintle. The gunner then commands or signals DRIVE ON. The gunner and No. 1 carry the trail away from the caisson, and all the cannoneers working together turn the piece 180°. The gunner causes the piece to be placed beside the caisson (*a* (2) above). The gunner and No. 1 lower the trail to the ground, and all the cannoneers at the piece take their posts (pars. 18*c* and 19).

(*c*) *Limbers.*—At the command DRIVE ON, the limbers take their prescribed positions. To take post in rear of the carriages, the caisson limber executes a left-about, moves straight to the rear, executes another left-about, and halts so that the heads of the lead horses (or the end of the pole if teams are not hitched) will be 25 yards from the rear of the caisson. The piece limber follows the caisson limber, passes around its rear, and halts so as to be abreast of it and 2 yards to its right.

(3) *To fire to the rear.*—The carriages being in double section, caisson on the right, the command is: ACTION REAR. If marching, the carriages halt at the command or signal. The cannoneers, if mounted, dismount after the carriages have halted.

(*a*) *The caisson.*—Nos. 3 and 4 hasten to the trail handles; No. 4 unlatches the pintle; Nos. 3 and 4 raise the trail from the pintle, and No. 4 commands or signals DRIVE ON. No. 3, assisted by No. 4, then lowers the caisson prop; No. 4 sets the brake, and Nos. 3 and 4 take their posts.

(*b*) *The piece.*—The gunner and No. 1 hasten to the trail handles of the piece; No. 2 grasps the right wheel and No.

5 grasps the left wheel of the piece and both stand ready to assist in such movements of the carriage as may be necessary. The gunner unlatches the pintle and assisted by No. 1, raises the trail from the pintle. The gunner then commands or signals DRIVE ON. All working together place the piece beside the caisson (*a* (2) above). The gunner and No. 1 lower the trail to the ground, and the cannoneers at the piece take their posts (pars. 18c and 19). Higher-numbered cannoneers, when present, assist in the movement as directed by the chief of section.

(c) *Limbers.*—At the command or signal DRIVE ON, the limbers take their prescribed positions. To take post in rear of the carriages, the caisson limber inclines well to the right, moves to the rear, executes a left-about, and halts so that the heads of the lead horses (or the end of the pole if teams are not hitched) will be 25 yards from the rear of the caisson. The piece limber follows the caisson limber, passes around its rear, and halts so as to be abreast of it and 2 yards to its right.

(4) *To fire to the flank.*—(*a*) The carriages being in double section, the caisson on either side of the piece, the command is: ACTION RIGHT (LEFT). The movement is executed according to the principles of ACTION FRONT and ACTION REAR, with the following modifications: After the carriages are unlimbered, the muzzle of the piece is turned in the direction of fire and the trail of the caisson in the opposite direction; the carriage in rear is run up to its proper position on the line. The carriage on the side toward which fire is to be delivered is first established in position, and then all the cannoneers assist in bringing the carriage in rear up to its proper position (*a* (2) above).

(*b*) At the command or signal DRIVE ON, the limbers take their prescribed positions. To take post in rear of the carriages, the limber away from the flank toward which fire is to be delivered moves out first, wheels away from the direction of fire, and after having gained sufficient distance to the rear executes an about, and halts so that the heads of the lead horses (or the end of the pole if teams are not hitched) will be 25 yards from the rear of its carriage. The other limber follows and takes post in a similar manner.

■ 15. LIMBERING.—*a. To limber front and rear.*—The carriages being in position and in march order (par. 20), the command is: LIMBER FRONT AND REAR.

(1) No. 4 releases the caisson brake and hastens to the caisson trail; Nos. 3 and 4 raise the trail, and when the trail is raised No. 3 raises and secures the caisson prop. Nos. 3 and 4 working at the trail, all other cannoneers assisting, turn the caisson 180°, carrying the trail away from the piece, the gunner and even numbers working on the right and odd numbers on the left. The movement being completed, Nos. 3 and 4 lower the caisson prop; No. 4 sets the caisson brake, and the cannoneers take posts for limbering as follows: The gunner and No. 1 face to the rear at their posts; No. 2 places himself on the right of the gunner and faces to the rear; No. 5 places himself on the left of No. 1 and faces to the rear. Nos. 3 and 4 place themselves with their backs toward the caisson chest close up against the footboard, No. 4 on the right and No. 3 on the left of the trail. Higher-numbered cannoneers take post as directed by the chief of section.

(2) The limbers are brought up as described in Part Two, FM 6–5. As soon as the limber has halted in prolongation of the trail, the gunner and No. 1 spring to the trail handles and raise the trail. Nos. 2 and 5 hasten to the piece wheels and prepare to assist in any movement of the carriage that may be necessary. The gunner and No. 1 place the lunette over the pintle; the gunner then latches the pintle. The caisson is limbered simultaneously in the same manner; Nos. 3 and 4 handle the trail, No. 4 latching the pintle. Higher-numbered cannoneers assist by working at the wheels of the caisson in any movement of the carriage. As soon as the carriages are limbered, cannoneers take their posts at the carriages limbered (fig. 2).

b. To limber rear.—The carriages being in position and in march order (par. 20), the command is: LIMBER REAR.

(1) No. 4 releases the caisson brake; Nos. 3 and 4 raise and secure the caisson prop. All cannoneers working together run the caisson 15 yards straight to the rear of the line of spades. Nos. 3 and 4 lower the caisson prop, No. 4 sets the caisson brake, and all the cannoneers take posts for limbering (*a* (1) above).

(2) The limbers are brought up and the limbering is completed as prescribed in *a* (2) above.

SECTION VI

UNCOUPLING AND COUPLING

■ 16. UNCOUPLING.—*a. General.*—At drills, trucks are posted as directed by the battery commander. In active service and in instruction simulating it, the trucks are conducted by the first sergeant to a place previously designated by the battery commander, where they are disposed so as to take the best advantage of cover and concealment. If no cover and concealment are available, they are located in rear of either flank, faced to the front, with wide intervals between them.

b. To fire to the front.—The command is: ACTION FRONT. If marching, the trucks halt at the command or signal. The cannoneers, if mounted, dismount after the trucks have halted.

(1) *The piece.*—The gunner and No. 1 hasten to the wheels nearest their respective posts. Nos. 2 and 5 hasten to the trail handles, No. 2 on the right; No. 3 hastens to the muzzle. No. 2 unlatches the pintle and, assisted by No. 5, raises the trail from the pintle; Nos. 2 and 5, assisted by No. 1 at the wheel and No. 3 at the muzzle, swing the piece 180° clockwise. Prior to the turn, the gunner sets the brake on the pivot wheel (the wheel adjacent to the gunner's post) and when the turn is completed, sets the other brake. Assisted by No. 3 at the muzzle, Nos. 2 and 5 raise the trail and place the lunette in the firing position, then lower the trail to the ground. No. 4 starts unloading ammunition, tools, and accessories from the truck, and places them to the left of the piece as directed by the chief of section. When the trail has been lowered to the ground, the gunner and Nos. 1, 2, 3, and 5 assist No. 4 in completing the unloading. When the unloading has been completed, the chief of section commands or signals DRIVE ON. The gunner and all cannoneers take their posts (par. 22).

(2) *The trucks.*—At the command DRIVE ON, the trucks move out and are conducted by the first sergeant to their previously designated position.

c. *To fire to the rear.*—The command is: ACTION REAR. The movement is executed according to the principles of ACTION FRONT except that the piece is not turned after uncoupling.

d. To fire to the flank.—The command is: ACTION RIGHT (LEFT). The movement is executed according to the principles of ACTION FRONT, with the following modifications: After uncoupling, the trail is turned 90° away from the direction of fire, and the piece is run forward sufficiently to clear the track made by the truck; articles unloaded from the truck are placed on the ground so as to clear the track made by the truck.

■ 17. COUPLING.—*a.* The pieces being in position and in march order, the command is: COUPLE. The trucks, under the command of the first sergeant, approach the position from the right (left) flank. As each truck approaches its piece, it turns to the left (right) and halts in prolongation of the trail of the piece.

b. All cannoneers working together under the direction of the chief of section load the tools, accessories, and unexpended ammunition. Then Nos. 2 and 5 hasten to the trail handles. The gunner releases the brakes. The truck, upon signal from the chief of section, is maneuvered backward until the pintle is almost over the lunette. Nos. 2 and 5, assisted by No. 3 at the muzzle, raise the trail and place the lunette in the traveling position and over the pintle. No. 2 latches the pintle. All cannoneers take their posts (par. 8).

SECTION VII

PREPARATION FOR ACTION AND MARCH ORDER, HORSE-DRAWN UNITS

■ 18. TO PREPARE FOR ACTION.—*a.* The carriage being in position, unlimbered, the command is: PREPARE FOR ACTION. Duties of individuals are as follows:

(1) *Chief of section.*—(*a*) Supervises the work of the cannoneers.

(*b*) Inspects the matériel; verifies the fact that the recoil mechanism contains the proper amount of oil (TR 1305–75A (now TR 320–95)); and, when the operations have been

completed, reports to the executive, "Sir, No. (so and so) in order," or reports any defects which the section cannot remedy without delay.

(2) *Gunner.*—(*a*) Removes the sight-support cover.

(*b*) Receives the sight from No. 1, seats it, and sees that the deflection setting is plateau 0, drum 100.

(*c*) Releases the elevating latch; operates the elevating and the traversing mechanisms, leaving the piece in the center of its traverse on the axle.

(*d*) Sets site zero and levels the bubble.

(*e*) Opens the sight-extension-bar case.

(*f*) Takes his post.

(3) *No. 1.*—(*a*) Removes the sight from its case and passes it to the gunner.

(*b*) Operates the range-crank handle; sets the range at 3,000.

(*c*) Gives waste to No. 2 for distribution to the cannoneers.

(*d*) Operates the breech mechanism; sets the safety piece in the firing position.

(*e*) Examines the breechlock, chamber, and bore, cleaning any parts requiring it; leaves the breech open.

(*f*) Removes the sponge-and-rammer staff from the traveling position, assembles it, and leans it against the front of the caisson, sponge up.

(*g*) Takes his post.

(4) *No. 2.*—(*a*) Runs around the right of the piece and lowers the right piece apron.

(*b*) Removes the breech cover and places it on top of the caisson.

(*c*) Places the trail handspike in the firing position.

(*d*) Distributes waste to the cannoneers.

(*e*) Takes his post.

(5) *No. 3.*—(*a*) Assists No. 4 to lower the caisson apron and to raise the caisson door.

(*b*) Opens the fuze setter, leaving it in the raised position.

(*c*) Removes the fuze-setter cover, placing it on the caisson.

(*d*) Sets the fuze-setter scales at corrector 30, range 3,000.

(*e*) Takes his post.

(6) *No. 4.*—(*a*) Assists No. 3 to lower the caisson apron and to raise the caisson door.

(*b*) Takes a fuze box from the caisson rack and places it on the footboard.

(c) Puts a round of shrapnel in the fuze setter.

(*d*) Takes his post.

(7) *No. 5*—(*a*) Removes the aiming stakes, runs around the left of the caisson, and leans them against the left front of the caisson, point down.

(*b*) Lowers the left piece apron.

(c) Removes the muzzle cover, placing it on the caisson pintle.

(*d*) Removes the breech cover from the top of the caisson and hangs it over the muzzle cover on the caisson pintle.

(*e*) Sets out the aiming stakes when directed by the chief of section (par. 38).

(*f*) Takes his post.

b. The limbered carriages may be partially prepared for action before reaching the firing position. The duties of the cannoneers are the same as when the carriages are unlimbered, but only such operations as are practicable are carried out before the carriages are unlimbered. Immediately after establishing the carriages in position, preparation for action is completed without command, and the cannoneers take their posts for firing the piece.

c. If PREPARE FOR ACTION has not been ordered before the carriages are established in the firing position, the command habitually is given by the chief of section as soon as the carriages have been unlimbered. In case this is not desired, the caution, "Do not prepare for action," must be given.

■ 19. POSTS OF THE CANNONEERS, CARRIAGES UNLIMBERED.—*a.* The carriages having been unlimbered, posts are taken as follows:

(1) *Chief of section.*—The chief of section goes where he can control the service of the piece, hear commands, and perform his duties effectively. A convenient post is 2 yards from the end of the trail, on the side opposite the executive.

(2) *Gunner.*—Immediately in rear of the cannoneer's seat, on the left of the trail of the piece.

(3) *No. 1.*—Immediately in rear of the cannoneer's seat, on the right of the trail of the piece.

(4) *No. 2.*—Two feet in rear of the gunner, covering him.

(5) *No. 3.*—Two feet in rear of the caisson chest, on the right of the caisson trail.

(6) *No. 4.*—Two feet in rear of No. 3, covering him.

(7) *No. 5.*—Two feet in rear of No. 2, covering him.

b. At drill all stand at attention at their posts (fig. 5), facing the front. In firing and in combat, minor modifications of these posts are required for the more efficient performance of the duties in the service of the piece and to secure the protection afforded by the matériel. Higher-numbered cannoneers, if present, take posts as prescribed by the chief of section.

c. In order to exercise the cannoneers in all the duties connected with the service of the piece and to lend variety to the drill, the posts of individual cannoneers should be changed frequently.

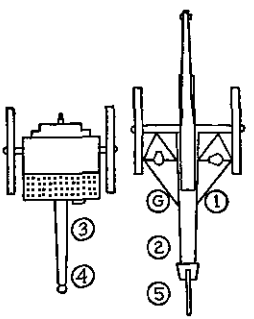


FIGURE 5.—Posts of the cannoneers, carriages unlimbered.

■ 20. MARCH ORDER.—*a. Duties of individuals.*—The carriages being unlimbered and prepared for action, to resume the order for marching, the command is: MARCH ORDER. Duties of individuals are as follows:

(1) *Chief of section.*—(*a*) Supervises the work of the cannoneers.

(*b*) Inspects the matériel; *makes sure that the piece is not left loaded;* and, when the operations have been completed, reports to the executive, "Sir, No. (so and so) in order," or reports any defects which the section cannot remedy without delay.

(2) *Gunner.*—(*a*) Sets the deflection at plateau 0, drum 100.

(*b*) Removes the sight, taking care to lift the sight column directly upward with both hands so as not to bend it, and passes it to No. 1.

(*c*) Traverses the piece to the center of the axle and elevates it until it rests on the traveling lug.

(*d*) Locks the elevating handwheel.

(*e*) Closes the vial cover of the site level, first removing the dust and grit.

(*f*) Assists No. 1 in raising the brake, if lowered.

(*g*) Puts on the sight-support cover.

(*h*) Secures the sight extension bar.

(*i*) Takes his post.

(3) *No. 1.*—(*a*) Assists the gunner in elevating the piece on to its traveling lug, keeping the range setting between 3,500 and 5,500, but habitually at a different setting.

(*b*) Receives the sight from the gunner and replaces it in the case, collimator toward the inside.

(*c*) Closes the breech and sets the safety piece in the traveling position.

(*d*) Assists the gunner in raising the brake, if lowered.

(*e*) Unscrews the sponge-and-rammer staff and places it in the traveling position.

(*f*) Takes his post.

(4) *No. 2.*—(*a*) Secures the trail handspike in the traveling position.

(*b*) Replaces the breech cover and secures it.

(*c*) Raises and secures the right piece apron.

(*d*) Takes his post.

(5) *No. 3.*—(*a*) Sees that any fuzes which have been set are set back at safe.

(*b*) Sets the fuze setter at corrector 30, range 3,000.

(*c*) Returns unused fuzes to the fuze box.

(*d*) Replaces the fuze-setter cover.

(*e*) Secures the fuze setter in the traveling position.

(*f*) Assists No. 4 to lower and secure the caisson door and to raise and secure the caisson apron.

(*g*) Takes his post.

(6) *No. 4.*—(*a*) Assists No. 3 in setting fuzes back at safe.

(*b*) Replaces or otherwise disposes of unused ammunition. *Before replacing any round in the caisson chest, he will assure himself that the fuze is set at safe.*

(*c*) Runs around the left of the caisson and replaces the fuze box in the caisson rack.

(*d*) Assists No. 3 to lower and secure the caisson door and to raise and secure the caisson apron.

(*e*) Takes his post.

(7) *No. 5.*—(*a*) Runs around the left of the caisson and removes the breech cover from the caisson pintle and places it on top of the caisson.

(*b*) Replaces the muzzle cover.

(c) Raises and secures the left piece apron.

(*d*) Secures the aiming stakes and places them in the traveling position.

(*e*) Takes his post.

b. To resume fire in another position.—(1) If it is intended to resume firing shortly, but in another position, so that the limbering of the pieces is necessitated, the command MARCH ORDER is not given. In this case, at the command for limbering, only such of the operations incident to march order are performed as are necessary for the movement of the piece and caisson and for the care and security of the equipment.

(2) If the command MARCH ORDER is given while the pieces are limbered, the operations pertaining to march order are completed as described above.

SECTION VIII

PREPARATION FOR ACTION AND MARCH ORDER, TRUCK-DRAWN UNITS

■ 21. TO PREPARE FOR ACTION.—*a.* The pieces being in position, uncoupled, the command is: PREPARE FOR ACTION. The gunner and Nos. 1, 2, and 5, working together under the supervision of the chief of section, remove the gun cover. No. 5 folds it neatly and places it on the ground 1 yard to the right of the right piece wheel. Thereafter the duties of individuals are as follows:

(1) *Chief of section.*—(*a*) Supervises the work of the cannoneers.

(*b*) Inspects the matériel; verifies the fact that the recoil mechanism contains the proper amount of oil (TR 1305–75 A (now TR 320–95)); and, when the operations have been completed, reports to the executive, "Sir, No. (so and so) in order," or reports any defects which the section cannot remedy without delay.

(2) *Gunner.*—(*a*) Removes the sight-support cover.

(*b*) Receives the sight from No. 1, seats it, and sees that the deflection setting is plateau 0, drum 100.

(*c*) Releases the elevating latch; operates the elevating and the traversing mechanisms, leaving the piece in the center of its traverse on the axle.

(*d*) Sets the site at zero and levels the bubble.

(*e*) Opens the sight-extension-bar case.

(*f*) Takes his post.

(3) *No. 1.*—(*a*) Removes the sight from its case and passes it to the gunner.

(*b*) Operates the range-crank handle; sets the range at 3,000.

(*c*) Operates the breech mechanism; sets the safety piece in the firing position.

(*d*) Examines the breechblock, chamber, and bore, cleaning any parts requiring it; leaves the breech open.

(*e*) Removes the sponge-and-rammer staff from the traveling position, assembles it, and places it on the gun cover.

(*f*) Takes his post.

(4) *No. 2.*—(*a*) Lowers the left piece apron.

(*b*) Removes the breech cover and places it on the gun cover.

(*c*) Places the trail handspike, for those carriages thus equipped, in the firing position.

(*d*) Distributes waste to the cannoneers.

(*e*) Takes his post.

(5) *No. 3.*—(*a*) Places the fuze setter in position.

(*b*) Gives waste to No. 2 for distribution to the cannoneers.

(*c*) Sets the fuze-setter scales at corrector 30, range 3,000.

(*d*) Puts a round of shrapnel in the fuze setter.

(*e*) Assisted by No. 4, arranges the ammunition and tools in an orderly and convenient manner to the left of the piece.

(*f*) Takes his post.

(6) *No. 4.*—(*a*) Assists No. 3 to arrange the ammunition and tools.

(*b*) Takes his post.

(7) *No. 5.*—(*a*) Lowers the right piece apron.

(*b*) Removes the muzzle cover and places it on the gun cover.

(*c*) Removes the aiming stakes and places them beside the sponge-and-rammer staff, or sets out the aiming stakes when so directed by the chief of section.

(*d*) Takes his post.

b. The coupled pieces may be partially prepared for action before reaching the firing position. The duties of the cannoneers are the same as when the pieces are uncoupled, but only such operations as are practicable are carried out before the pieces are uncoupled. Immediately after establishing the piece in position, preparation for action is completed without command, and the cannoneers take their posts for firing the piece.

c. If PREPARE FOR ACTION has not been ordered before the piece is established in the firing position, the command habitually is given by the chief of section as soon as the piece has been uncoupled. In case this is not desired, the caution, "Do not prepare for action," must be given.

■ 22. POSTS OF THE CANNONEERS, PIECES UNCOUPLED.—The posts of the cannoneers, pieces uncoupled, are as given for the horse-drawn battery except that the position of No. 3 is 2 feet to the left of and on line with No. 2 (par. 19 and fig. 5).

■ 23. MARCH ORDER.—*a. Duties of individuals.*—The pieces being uncoupled and prepared for action, to resume the order for marching, the command is: MARCH ORDER. Duties of individuals are as follows:

(1) *Chief of section.*—(*a*) Supervises the work of the cannoneers.

(*b*) Inspects the matériel; *makes sure that the piece is not left loaded;* and, when the operations have been completed, reports to the executive, "Sir, No. (so and so) in order," or reports any defects which the section cannot remedy without delay.

(2) *Gunner.*—(*a*) Sets the deflection at plateau 0, drum 100.

(*b*) Removes the sight, taking care to lift the sight column directly upward with both hands so as not to bend it, and passes it to No. 1.

(*c*) Traverses the piece to the center of the axle and elevates it until it rests on the traveling lug.

(*d*) Locks the elevating handwheel.

(*e*) Closes the vial cover of the site level, first removing the dust and grit.

(*f*) Puts on the sight-support cover.

(*g*) Secures the sight extension bar.

(*h*) Takes his post.

(3) *No. 1.*—(*a*) Assists the gunner in elevating the piece on to its traveling lug, keeping the range setting between 3,500 and 5,500, but habitually at a different setting.

(*b*) Receives the sight from the gunner and replaces it in the case, collimator toward the inside.

(*c*) Closes the breech and sets the safety piece in the traveling position.

(*d*) Unscrews the sponge-and-rammer staff and places it in the traveling position.

(*e*) Takes his post.

(4) *No. 2.*—(*a*) Secures the trail handspike in the traveling position.

(*b*) Replaces the breech cover and secures it.

(*c*) Raises and secures the left piece apron.

(*d*) Takes his post.

(5) *No. 3.*—(*a*) Sees that any fuzes which have been set are set back at safe.

(*b*) Sets the fuze setter at corrector 30, range 3,000.

(*c*) Returns unused fuzes to the fuze box.

(*d*) Replaces the fuze setter in the box.

(*e*) Assisted by No. 4, prepares ammunition and tools for loading into the truck. *He will assure himself that all fuzes have been set at safe.*

(*f*) Takes his post.

(6) *No. 4.*—(*a*) Assists No. 3 to prepare ammunition and tools for loading into the truck.

(*b*) Takes his post.

(7) *No. 5.*—(*a*) Replaces the muzzle cover.

(*b*) Raises and secures the right piece apron.

(*c*) Secures the aiming stakes.

(*d*) Takes his post.

(8) The gunner and Nos. 1, 2, and 5, working together under the supervision of the chief of section, replace the gun cover.

b. To resume fire in another position.—(1) If it is intended to resume firing shortly, but in another position, so that the coupling of the pieces is necessitated, the command MARCH ORDER is not given. In this case, at the command for coupling, only such of the operations incident to march order are performed as are necessary for the movement of the piece and for the care and security of the equipment.

(2) If the command MARCH ORDER is given while the pieces are coupled, the operations pertaining to march order are completed as described above.

SECTION IX

DUTIES IN FIRING

■ 24. GENERAL.—*a.* In general, the duties in firing are as follows:

(1) The chief of section is responsible that all duties are properly performed, all commands executed, and all safety precautions observed.

(2) The gunner sets the announced site and deflection, and lays and refers the piece.

(3) No. 1 sets the announced range, opens and closes the breech, and fires the piece.

(4) No. 2 loads the piece.

(5) No. 3 operates the fuze setter and screws fuzes in shell.

(6) No. 4 prepares ammunition and passes rounds to No. 2 for loading; in time fire he keeps rounds in the fuze setter and sets the fuze.

(7) No. 5 gives general direction to the piece.

b. The duties of the gunner and Nos. 1, 2, and 5 are mutually dependent. The same is true of Nos. 3 and 4.

■ 25. CHIEF OF SECTION.—*a. Enumeration of duties.*—(1) Assisted by the gunner, to lay for elevation when the gunner's quadrant is used.

(2) To measure the elevation.

(3) (*a*) To measure the minimum quadrant elevation.

(*b*) To measure the minimum range.

(4) To indicate to the gunner the aiming point, the referring point, or the target.

(5) To follow fire commands.

(6) To indicate when the piece is ready to fire.

(7) To give the command to fire, except when firing at moving targets with direct laying.

(8) To report errors and other unusual incidents of fire to the executive.

(9) To conduct prearranged fire schedules.

(10) To record basic data.

(11) To observe and check frequently the functioning of the matériel.

(12) To assign duties when firing with reduced personnel.

b. Detailed description of certain duties.—(1) *To lay for elevation when the gunner's quadrant is used.*—(*a*) The chief of section is first taught to read settings on the gunner's quadrant and then to set the elevations announced. To set an elevation on the gunner's quadrant, for example 361.8 mils, the chief of section sets the upper edge of the head of the index arm opposite the 360 mark of the graduated arc on the quadrant frame and slides the slide level along the index arm until its index is opposite the 1.8 mark of the scale on the index arm. Care must be taken in setting the slide to use the scale on the index arm which is on the same side of the quadrant as the graduated arc on the frame which was used in setting the index arm at 360 mils. After the slide has been set, the clamp is tightened just sufficiently to hold the slide in place.

(*b*) The command QUADRANT (SO MUCH) indicates that the gunner's quadrant is to be used.

(c) The announced elevation having been set on the gunner's quadrant, the piece loaded, and the breechblock closed, the chief of section places the quadrant on the quadrant seat on the breech hoop, with the words "line of fire" at the bottom and the arrow pointing toward the muzzle.

The chief of section must be sure to use the arrow which appears on the same side of the quadrant as the scale which he is using. He stands squarely opposite the side of the quadrant and holds it firmly on the quadrant seat, parallel to the axis of the bore. It is important that he take the same position and hold the quadrant in the same manner for each subsequent setting, so that the quadrant bubble will in each case be viewed from the same angle.

(*d*) The chief of section causes the gunner to set the site at zero (when the required elevation permits) and to center the bubble of the angle-of-site level by manipulating the elevating handwheel. No. 1 operates the range crank until the quadrant bubble is slightly in front of the center. The chief of section then causes the gunner to elevate or depress the piece until the bubble is centered, *being careful that the last motion of the bubble is from front to rear.*

(2) *To measure the elevation.*—At the command MEASURE THE ELEVATION, the piece having been laid, the chief of section sets the slide level of the index arm of the gunner's quadrant at zero and places the quadrant on the quadrant seat as in laying for elevation ((1) above). He then moves the index arm until the bubble passes to the end of the vial away from the hinge of the index arm. He then slowly lowers the index arm until the bubble just passes to the end of the vial toward the hinge. He then allows the index arm to engage the arc and slides the level along the index arm until the bubble is accurately centered. He then removes the quadrant and reads and announces the elevation thus set, for example, "Elevation No. (so and so), (so much)."

(3) *To measure the minimum elevation or minimum range.*

(*a*) *1. Elevation.*—The command is: MEASURE THE MINIMUM ELEVATION. The chief of section, sighting along the lowest element of the bore, causes the gunner to operate the elevating mechanism until the line of sight just clears the crest. He then measures the quadrant elevation as described in (2) above and reports the angle read from the gunner's quadrant to the executive, thus, "Minimum elevation, No. (so and so), (so much)."

2. *Range.*—The command is: MEASURE THE MINIMUM RANGE, SITE (SO MUCH). The chief of section causes the gunner to set the site announced and to center the bubble of the angle-of-site level by operating the elevating handwheel. Sighting along the lowest element of the bore, he then causes No. 1 to operate the range crank until the line of sight just clears the crest. No. 1 then reads the range setting, and the chief of section reports this range as the minimum range to the executive, thus, "Minimum range, No. (so and so), (so much), site (so much)."

(*b*) When the executive announces the corrected minimum elevation or the corrected minimum range and site, the chief of section records it in a notebook and causes the gunner to chalk it on the shield.

(4) *To indicate to the gunner the aiming point, the referring point, or the target.*—Whenever an aiming point, a referring point, or a target has been designated by the executive, the chief of section will make sure that he has properly identified the point in question. He will then indicate it to the gunner. If there is any possibility of misunderstanding, the chief of section will turn the sight until the horizontal and vertical lines are on the point designated.

(5) *To follow fire commands.*—The chief of section will follow the fire commands mentally. He will not repeat the commands, but will be prepared to give any element of the last command to any cannoneer who has failed to hear it.

(6) *To indicate when the piece is ready to fire.*—When arm signals between the chief of section and the executive can be observed, the chief of section will extend his right arm vertically as soon as the gunner has called "Ready," as a signal to indicate that the piece is ready to fire. When arm signals cannot be observed, the chief of section reports orally to the executive, "No. (so and so), ready."

(7) *To give the command to fire.*—When No. 1 can see arm signals made by the chief of section, the chief of section will give the command to fire by dropping his right arm

sharply to his side. When arm signals cannot be used, the command NO. (SO AND SO) FIRE will be given orally. *The chief of section will not give the signal or command to fire until all the cannoneers are in their proper places. He will require the cannoneers to stand clear of the piece for the first round.*

(8) *To report errors and other unusual incidents of fire to the executive.*—If for any reason the piece cannot be fired, the chief of section will report promptly to the executive that fact and the reason therefor; for example, "No. (so and so) out, misfire." Whenever it is discovered that the piece has been fired with an error in laying, the chief of section will report that fact at once; for example, "No. (so and so) fired with incorrect deflection." Whenever the gunner reports that the aiming stakes are out of alinement with the sight, the chief of section will report that fact and request instructions (par. 39). Likewise, other unusual incidents that affect the service of the piece are promptly reported by the chief of section.

(9) *To conduct prearranged fire schedules.*—Whenever the execution of prearranged fires is ordered, the chief of section will conduct the fire of his section in strict conformity to the schedules prescribed.

(10) *To record basic data.*—Data of a semipermanent nature will be recorded in a notebook by the chief of section. This includes such data as minimum elevations; base deflections, including aiming points used; prearranged fires when prepared schedules are not furnished; safety limits in elevation and deflection; number of rounds fired, with the date and hour; and calibration corrections when appropriate.

(11) *To observe and check the functioning of the matériel.*—The functioning of all parts of the matériel will be observed closely during firing. Before the piece is fired, the chief of section verifies the fact that the recoil mechanism contains the proper amount of oil and thereafter carefully observes the functioning of the recoil system. Any evidence of trouble (par. 53) is reported promptly to the executive.

(12) *To assign duties when firing with reduced personnel.*—Whenever the personnel of the section serving the piece

is temporarily reduced in numbers below that indicated in this manual, the chief of section will make such redistribution of duties as will best facilitate the service of the piece.

■ 26. GUNNER.—*a. Enumeration of duties.*—(1) (*a*) To set or change the deflection.

(*b*) To apply the deflection difference.

(*c*) To set the angle of site.

(*d*) To lay for direction.

(*e*) To lay for elevation.

(*f*) To call "Ready."

(*g*) To refer the piece.

(*h*) To record base deflection.

(*i*) To measure a deflection.

(*j*) To measure an angle of site.

(*k*) To give the command to fire during direct laying on a moving target.

(2) For indirect laying *without the gunner's quadrant*, the gunner performs duties prescribed in (1) (*a*), (*b*), (*c*), (*d*), (*e*), and (*f*) above.

(3) For indirect laying *with the gunner's quadrant*, the gunner performs duties prescribed in (1) (*a*), (*b*), (*d*), (*e*), and (*f*) above.

(4) For direct laying, the gunner performs duties prescribed in (1) (*a*), (*d*), (*e*), (*f*), and (*k*) above.

(5) When directed, the gunner performs duties prescribed in (1), (*g*), (*h*), (*i*), and (*j*) above.

b. Detailed description of certain duties.—(1) *To set or change the deflection.*—(*a*) *To set the deflection.*—The gunner is first taught to read deflections set on the sight and then to set the deflections announced. At the command, for example, PLATEAU 4, DRUM 125, the gunner first presses down the collimator cover with his right hand, at the same time turning the sight column so that the index is opposite the plateau graduation (4 in this case), and releases the sight column. He then loosens the clamp lever of the drum, turns the drum with the left hand until the graduation 125 is opposite the index, and tightens the clamp lever. The last motion of the drum should always be in the direction of increasing deflection.

(*b*) *To change the deflection.*

1. The gunner should be trained always to grasp the deflection drum with the left thumb on top, since the command for changing the deflection, when applied on the drum alone, then will indicate the direction in which he should move his thumb in turning the drum ((2) (*d*) below). He also should be taught that turning the drum toward the muzzle (away from him) decreases the deflection set on the sight and results in moving the muzzle to the right when the piece is laid at the new deflection. Similarly, turning the drum toward the breech (toward himself) increases the deflection and results in moving the muzzle to the left when the piece is laid.

2. When the deflection change can be made on the drum alone, the gunner uses the drum as a counter and turns it in the proper direction until the number of tens and units have passed the index. The deflection having been set at plateau 4, drum 125, if a subsequent command be, for example, RIGHT 65, the gunner turns the drum by moving his thumb toward the muzzle (away from him), setting off six tens and five units. *As turning the drum toward the muzzle decreases the deflection,* the result will be read on the drum as 125 minus 65 equals 60, or plateau 4, drum 60, the plateau reading remaining unchanged.

3. If the change, although less than 200 mils, cannot be made on the drum alone, the gunner mentally subtracts the change from 200, changes the plateau one division in the direction announced without turning the drum, and then applies the result of the subtraction to the drum in the opposite sense. For example, if the setting be plateau 4, drum 125, and the command LEFT 170 were given, 200 minus 170 equals 30. The sight column is turned left (increasing deflection) one division to plateau 6; the drum is then turned toward the muzzle (decreasing deflection) three tens or 30

mils. The resultant setting would thus be plateau 6, drum 95.

4. A deflection change of more than 200 mils can be separated into a change of one or more divisions on the plateau, which is applied at once, and a remainder less than 200 mils, which is applied in the manner described above. Thus, RIGHT 540 requires a change of two divisions (400 mils) on the plateau and 140 mils on the drum.

5. A new setting, after a deflection change, also can be calculated arithmetically. The initial setting is converted into mils. The change is then added or subtracted from this number, the result converted into plateau and drum, and the setting changed accordingly. For example, if the initial setting were plateau 14, drum 55, and the command RIGHT 625 were given:

	Mils
Plateau 14, drum 55 equals	1,455
Right (decreasing the deflection)	625
Result	830

Converted to a new setting, 830 mils equals plateau 8, drum 30.

(2) *To apply the deflection difference.*—(*a*) The command is: ON NO. (SO AND SO) OPEN (CLOSE) (SO MUCH). The gunner of the piece indicated in the command does not change the deflection set on his sight. Each of the other gunners changes his sight setting by the number of mils specified in the command if his piece is next in line to the piece indicated; by twice this number of mils if his piece is the second in line from the piece indicated; by three times this number of mils if his piece is third in line from the piece indicated.

(*b*) When the deflection difference can be applied on the drum alone, if the command is, for example, ON NO. 1 OPEN 5, the gunner on No. 1 makes no change; the gunner on No. 2 turns his drum so as to move the muzzle away from No. 1, setting off 5 mils once; the gunner on No. 3 turns his drum so as to move the muzzle away from No. 1, setting off 5 mils twice, a total of 10 mils; the gunner on No. 4 turns his drum so as to move the muzzle away from No. 1, setting off 5 mils three times, a total of 15 mils.

(*c*) Should the command be, for example, ON NO. 3 CLOSE 10, the gunner on No. 1 turns his drum so as to move the muzzle toward No. 3, setting off 10 mils twice, a total of 20 mils; the gunner on No. 2 turns his drum so as to move the muzzle toward No. 3, setting off 10 mils once; the gunner on No. 3 makes no change; the gunner on No. 4 turns his drum so as to move the muzzle toward No. 3, setting off 10 mils once.

(*d*) In turning the drum the gunner must remember that the movement of the muzzle will follow the movement of his thumb. For example, grasping the drum with his left thumb on top, to move the muzzle to the right, his thumb moves toward the muzzle, and he can be taught to visualize the movement as pushing the muzzle away from him (to the right); to move the muzzle to the left, his thumb moves toward the breech, and he can be taught to visualize this movement as pulling the muzzle toward him (to the left).

(*e*) When the deflection difference cannot be applied on the drum alone, the gunner mentally calculates the change and applies it in a manner similar to that previously described for a deflection change.

(*f*) In order to insure rapid and accurate deflection changes, the gunner must be given much practice, with constant checking of results. He must be trained and instructed so thoroughly in this respect that he instinctively will turn the sight column and the drum in the proper direction in response to the command RIGHT (LEFT).

(*g*) When a deflection change and a deflection difference are announced at the same time, for example, RIGHT 30, ON NO. 1 CLOSE 5, both of which affect the gunner's piece, he will first set off the deflection change and then apply the deflection difference.

(3) *To set the angle of site.*—The gunner is first taught to read angle-of-site settings and then to set announced angles of site. To set an angle of site, the gunner turns the wing knob until the graduation announced is opposite the index. In setting the angle of site, it is necessary that the gunner look squarely at the angle-of-site dial.

(4) *To lay for direction.*—(*a*) *Direct laying.*—The deflection having been set, the gunner traverses the piece by

turning the traversing handwheel with his right hand until the vertical line of the sight is on his part of the target. If the amount of movement necessary to lay on the target is greater than can be obtained by traversing, the trail must be shifted. To shift the trail, the gunner commands or signals MUZZLE RIGHT (LEFT). No. 5 at the trail handspike (par. 31), sighting along the line of metal, points the piece directly at the target (except when firing by individual sections at fast-moving targets as prescribed in par. 37), and the gunner brings the vertical line of the sight accurately on the target by means of the traversing handwheel.

(*b*) *Indirect laying.*—The deflection having been set, the gunner brings the vertical line of the sight on the aiming point either by traversing the piece or by shifting the trail and traversing the piece. To shift the trail, the gunner commands or signals MUZZLE RIGHT (LEFT). No. 5 shifts the trail as indicated by the gunner until the vertical line of the sight is approximately on the aiming point. The gunner then completes the laying by operating the traversing handwheel until the vertical line of the sight is on the aiming point.

(*c*) *Procedure to insure accuracy.*—To take up lost motion, the final movement of the traversing handwheel should be such as to cause the vertical line of the sight to approach the aiming point from the left. The gunner should habitually lay with the vertical line of the sight on exactly the same portion of the aiming point or target for each round.

(5) *To lay for elevation.*—(*a*) *Direct laying.*—When the target is stationary, the range having been set, the gunner lays for elevation with the sight for the first round by manipulating the elevating handwheel until the horizontal line of the sight is at the base of the target. Then, without changing the laying of the piece, he centers the bubble of the angle-of-site level by changing the angle-of-site setting. Laying for subsequent rounds is accomplished by means of the angle-of-site level, without changing the site setting. When the target is moving, for each round, the range having been set, the piece is laid for elevation by means of the horizontal line of the sight (par. 37).

(b) *Indirect laying.*

1. Without the gunner's quadrant.—The angle of site and the range having been set, the gunner turns the elevating handwheel with his right hand until the bubble of the angle-of-site level is centered. He keeps the bubble centered throughout the firing. The last movement of the handwheel must be such that the bubble moves from front to rear. In centering the bubble, the gunner must be careful to look squarely at it.

2. With the gunner's quadrant.—See paragraph 25.

(c) *In all cases of laying for elevation, the last movement of the elevating handwheel must be in the direction of depression so as to raise the breech, thereby taking up any lost motion in the elevating mechanism.*

(6) *To call "Ready."*—The piece having been laid for direction and No. 1 having called "Set," the gunner verifies the laying, moves his head clear of the sight, and calls "Ready" to indicate that his piece is ready to be fired.

(7) *To refer the piece.*—The piece having been laid for direction, to refer the piece, the command is: 1. AIMING POINT (SO AND SO), 2. REFER. Without disturbing the laying of the piece, the gunner brings the vertical line of the sight on the new aiming point (referring point). He then reads and announces the deflection thus set and records the deflection and the referring point on the shield. Two referring points usually are used, one for day and another for night. A referring point should be at least 50 yards from the sight, preferably to the left front. Frequently it will be necessary to use the aiming stakes as referring points, particularly for night use.

(8) *To record base deflection.*—At the command RECORD BASE DEFLECTION, the gunner records the deflection set on his sight upon some convenient part of the carriage or upon a data board (par. 48).

(9) *To measure a deflection.*—The command is: 1. AIMING POINT (SO AND SO), 2. MEASURE THE DEFLECTION. The piece having been established in direction, the gunner

turns the sight until the vertical line is on the aiming point. He then reads and announces the deflection.

(10) *To measure an angle of site.*—The command is: 1. TARGET (SO AND SO), 2. MEASURE THE SITE. The piece having been laid on the target for direction, the gunner, using the elevating handwheel, brings the horizontal line of the sight to the base of the target and centers the bubble of the angle-of-site level by changing the angle-of-site setting. He then reads and announces the angle of site.

(11) *To give the command to fire during direct laying on a moving target.*—When firing at moving targets with direct laying, whether the firing is by battery or by individual section, the piece is fired at the gunner's command FIRE.

■ 27. No. 1.—*a. Enumeration of duties.*—(1) To set the range.

(2) To open and close the breech.

(3) To call "Set."

(4) To fire the piece.

(5) To use the rammer.

b. Detailed description of certain duties.—(1) *To set the range.*—No. 1 is first taught to read range settings on the graduated range scale, and then to set ranges. To set a range, No. 1 grasps the range crank handle with his right hand, presses it in to release it, turns it until the graduation announced is opposite the index, and releases the handle. He is first taught to set off ranges to the nearest hundred and then to the nearest twenty-five. To take up lost motion, the last motion in setting the range should be in the direction of decreasing range.

(2) *To open and close the breech.*—(*a*) *To open the breech.*—For the first round, No. 1 cocks the latch by pushing forward the plunger in the handle; the recoil of the gun automatically cocks the latch for subsequent rounds. No. 1 then grasps the operating handle with both hands, palms down, with the fingers fully closed around it, and moves the handle upward so as to rotate the breechblock as far as it will go. The movement should be completed with a snap of the forearms and wrists so as to eject the cartridge case fully. *As soon as the breech is open, No. 1 looks through the bore to see that it is clear.* In firing, he opens

the breech as the gun returns to battery. In this operation he must be careful to close his fingers fully on the operating handle to avoid having them caught between the breech hoop and the end of the cradle. Should his fingers be caught in this manner, the tube must be uncoupled and moved to the rear, and, if caught in such a manner that the breechblock cannot be rotated, the lug of the safety bolt must be sheared off (TR 1305–75A (now TR 320–95)).

(*b*) *To close the breech.*—No. 1 grasps the operating handle with his left hand, moves the handle downward, and drops his hand to his side.

(*c*) *Opening and closing the breech.*—When No. 1 understands the functioning of the breech mechanism, Nos. 1 and 2 are instructed in loading and unloading the piece. The breech being open, No. 1 rests his left hand, palm open, lightly on the operating handle ready to close the breech. As the round is inserted and pushed home by No. 2, it causes a slight rotation of the breechblock which No. 1 immediately takes up by grasping the operating handle with his left hand and continues, closing the breech. If No. 1 resists the impulse of rotation, or starts to close the breech before the round is fully inserted, the round will rebound and prevent closing the breech. Whenever this occurs, No. 1, *not No. 2*, will reseat the round. For drill purposes in opening and closing the breech, the drill wedge, a small wooden wedge made locally, is inserted between the pawl and the plunger lug. The drill wedge is removed before firing service ammunition. The drill projectiles used for this instruction must be in good condition. To avoid damaging the projectiles when they are ejected, a mat or similar cushion should be placed at the point where they fall. If full-weight drill projectiles are used, No. 2, standing at the breech, receives the ejected round with both hands.

(3) *To call "Set."*—When No. 1 has completed his duties in laying the piece and closing the breech, he calls "Set."

(4) *To fire the piece.*—At the chief of section's command NO. (SO AND SO) FIRE or, for direct laying on a moving target, at the gunner's command FIRE, No. 1 grasps the handle of the lanyard with the left hand, without raising his hand pulls it to the rear and slightly downward as far as possible, and quickly releases it. *Under no circumstances will No. 1 grasp*

the lanyard until the gunner calls "Ready (Fire)." Ordinarily the piece is fired with No. 1 seated on the seat; if the chief of section gives the command STAND CLEAR, No. 1 steps clear of the wheel and, at the command or signal FIRE, leans forward, grasps the handle of the lanyard, and fires the piece. The chief of section may caution, "With the long lanyard." In this case No. 1 attaches the long lanyard to the firing link, steps clear, and fires as previously described. No. 1 detaches the long lanyard immediately after each round is fired. *In case of a misfire, the instructions contained in paragraph 46 will be followed.*

(5) *To use the rammer.—The sponge and rammer will be handled by No. 1 only.* The rammer is used to extract unfired rounds or cartridge cases which cannot be ejected by the extractor: To extract a cartridge case which cannot be ejected by the extractor, the bottom of the inside of the case is tapped lightly until it is loosened and can be pushed out of the chamber. No. 2, standing at the breech, receives the cartridge case in both hands. To extract an unfired round, the procedure prescribed in paragraph 45 will be followed.

■ 28. No. 2.—*a. Enumeration of duties.*—(1) To load the piece.

(2) In volley fire, to call out the number of the round.

(3) When necessary, to assist No. 5 in giving direction to the piece.

b. Detailed description of certain duties.—(1) *To load the piece.*—To receive the round, No. 2 steps with his left foot toward No. 4 and grasps the round with his right hand at the base of the cartridge case and his left hand in rear of the ogive. He then resumes his position facing the gunner and inserts the round in the breech, removing his left hand. He pushes the round home with his right hand. When about one third of the cartridge case still extends beyond the breech face, he gives the round a final impetus until his open hand comes in contact with the breech, then, continuing the motion, he rotates his hand upward and to the left, clearing the breech. *No. 2 will be particularly careful to avoid striking the fuze against any portion of the matériel. To prevent premature bursts caused by projectiles being struck on the fuze by the piece in recoil, a round to be*

loaded will be held well out of the path of recoil of the gun until the latter is again in battery. (AR 750–10.)

(2) *To call out the number of the round.*—To insure that the correct number of rounds is fired in volley fire, No. 2 calls out the range and the number of the round as he loads the piece; and, as he loads the last round, adds "Last Round." For example, when two rounds are to be fired at 2,800, he calls out, "2,800 one; 2,800 two, last round." He should not speak louder than necessary to insure his being heard by the members of his own gun squad.

■ 29. No. 3.—*a. Enumeration of duties.*—(1) To set the fuze setter.

(2) To set fuzes.

(3) To fuze shell.

(4) To remove fuzes from shell.

b. Detailed description of certain duties.—(1) *To set the fuze setter.*—(*a*) The series of fire commands for initially opening fire with time-fuzed projectiles will contain the data to be set on the fuze setter. These commands are, for example, CORRECTOR 28, 3,600. For subsequent rounds, the corrector setting is increased (decreased) at the command UP (DOWN) (SO MUCH).

(*b*) No. 3 is first taught to read data set on the fuze setter and then to set data announced. To set data on the bracket fuze setter, No. 3 turns the corrector-worm knob with his right hand until the graduation on the corrector scale, corresponding to the corrector announced, is opposite the index. He then turns the range-worm crank until the graduation on the range scale, corresponding to the range announced, is opposite the fixed index.

(c) To set data on the hand fuze setter, No. 3 turns the corrector-worm knob until the graduated line on the corrector scale, corresponding to the corrector announced, is in coincidence with the index engraved on the rim of the case. He then turns the knob on the range-scale worm until the graduation on the range scale, corresponding to the range announced, is in coincidence with the index on the index bar.

(*d*) If the range to be set on the fuze setter differs from that to be set on the piece, the command FUZE RANGE (SO

MUCH) will be given. In this case No. 3 sets the fuze range on the fuze setter, disregarding the range announced for the piece.

(*e*) If the command PERCUSSION is given, the fuze setter is not used. However, No. 3 keeps the range scale of the fuze setter set according to the ranges announced. He is thus ready to pass to time fire as soon as a corrector is announced.

(*f*) To insure accuracy in setting the scales of the fuze setter, it is necessary that No. 3 look squarely at the scales and their indexes. To take up lost motion, the final movement of the scales should always be in a counterclockwise direction.

(*g*) The fuze data having been set on the fuze setter, No. 3 calls "Cut" as a signal to No. 4 to set the fuze.

(2) *To set fuzes.*—No. 3 sets fuzes only when the hand fuze setter is used. The fuze data having been set on the fuze setter as indicated above, to set the fuze, the projectile being held by No. 4, No. 3 places the fuze setter over the fuze. The fuze setter is then turned in the direction indicated by the arrow on the fuze-setter case until the slot in the range-ring carrier engages the pin on the graduated time-train ring of the fuze. The guide plate and the range-ring carrier will then bear firmly on the fuze. No. 3 continues to turn the fuze setter in the direction indicated until the stop pin attached to the corrector-scale support engages with the fixed stop pin on the fuze and prevents further motion. When the fuze has been properly set, the pointer which is attached to the top of the corrector scale will register with the graduated line on the closing cap of the fuze. The fuze setter is then removed.

(3) *To fuze shell.*—At the command SHELL, No. 3 opens the fuze box and places it in a convenient position. The projectile being held by No. 4, No. 3 inserts the designated fuze, being careful to note that it is fitted with its felt or rubber washer, and screws it home by hand. The fuze is given its final seating by the use of the fuze wrench. No great force should be used. If there is any difficulty in screwing the fuze home, the fuze should be removed and another inserted. If the same trouble is encountered with the second fuze, the shell should be rejected.

(4) *To remove fuzes from shell.*—If for any reason a projectile which has been fuzed is not to be fired, the fuze will be removed. The operation of inserting a fuze is reversed. If the adapter starts to unscrew with the fuze, the unscrewing must be stopped at once and the shell disposed of as directed by the executive.

■ 30. No. 4.—*a. Enumeration of duties.*—(1) To remove ammunition from the chest or other container and to clean and prepare it for firing.

(2) To set the fuze when the bracket fuze setter is used.

(3) To hold the round while No. 3 sets the fuze, when the hand fuze setter is used.

(4) To hold the round while No. 3 screws the fuze into the shell.

(5) To pass the round to No. 2.

b. Detailed description of certain duties.—(1) *To remove ammunition from the chest or other container, and to clean and prepare it for firing.*—No. 4, when time permits, arranges the rounds so that they are within easy reach or partially removes them from their compartments. To remove a round from the chest (in units equipped with caissons), No. 4, standing with his left side toward the chest, grasps the base of the cartridge case with his right hand and pulls the round to the rear, across the front of his body, grasping the projectile in the rear of the ogive with his left hand at the proper time to prevent the round from falling. He inspects the projectile to see that it is free from sand and dirt and that the rotating band is not burred. Any foreign matter will be removed by wiping with a piece of waste. Projectiles having burred rotating bands should be placed aside temporarily until the burs can be removed with a file.

(2) *To set the fuze when the bracket fuze setter is used.*—When the command CORRECTOR (SO MUCH) is given, No. 4 procures a round of shrapnel, removes the waterproof cap of the fuze, and inserts the point of the projectile in the bracket fuze setter, taking care that the lug nearest the point of the fuze engages in the groove in the fuze setter. When No. 3 has called "Cut," No. 4 turns the projectile with steady and uniform motion in a clockwise direction

until further movement is stopped. In turning the projectile, No. 4 stands to the rear of the fuze setter, facing to the right front. His left hand, back down, grasps the round at or near the forward end of the cartridge case. The palm of the right hand is placed on the base of the cartridge case, the fingers grasping the edge of the base. While turning the projectile, No. 4 takes care to hold it firmly against the guide and to keep the fuze well engaged by a steady pressure on the base of the cartridge case with his right hand. No. 4 then removes the round by lifting it directly out of the fuze setter, taking care not to strike the lugs of the fuze against any part of the fuze setter. The time of burning may be read from the graduated ring of the fuze. When directed by the chief of section, No. 4 will read and announce the time of burning after setting the fuze. A time fuze which has been set for any desired time of burning can be reset to *S* (Safe) by setting the fuze-setter range ring to *S*, the corrector to normal (30), and resetting the fuze. The fuze should be inspected to see that the *S* on the graduated time ring of the fuze is in line with the marks on the upper time-train ring and on the body of the fuze. Fuzes set but not fired will be reset to *S* (Safe), inspected, and returned to the chest or other container by No. 4. If the command PERCUSSION is given, No. 4, after removing the waterproof cap, passes the round directly to No. 2 for loading.

(3) *To hold the round while No. 3 sets the fuze, when the hand fuze setter is used.*—No. 4 holds the round while No. 3 sets the fuze. No. 4 procures the round, removes the waterproof cap, faces to the right, and partially kneels on the right knee. He places the base of the cartridge case on his right thigh just above the knee. He grasps the round with both hands, the right arm resting on his right thigh, the left arm braced against his left thigh. The round is held firmly, pointing upward in the general direction of No. 3's head, while No. 3 sets the fuze.

(4) *To hold the round while No. 3 screws the fuze into the shell.*—When shell is being used, No. 4 holds the round while No. 3 screws in the fuze. The round having been removed from the chest or other container, cleaned, and

prepared for firing, No. 4 removes the fuze plug from the fuze socket and holds the round firmly on the footboard or other convenient support, while No. 3 screws in the fuze.

(5) *To pass the round to No. 2.*—No. 4 passes the round to No. 2 in the most expeditious manner and in such a way that No. 2 is enabled to grasp the base of the cartridge case with his right hand.

■ 31. No. 5.—*a. Enumeration of duties.*—(1) To shift the trail.

(2) To keep empty cartridge cases out of the way.

b. Detailed description of certain duties.—(1) *To shift the trail.*—When laying for direction involves shifting the trail, the gunner and No. 5 work together. To shift the trail, No. 5 stands immediately in rear of the trail handspike (the lunette for pieces not equipped with the trail handspike), feet about 18 inches apart, and grasps the handspike (lunette) with both hands. The gunner causes the trail to be shifted by the command MUZZLE RIGHT (LEFT), or other suitable indication, until the vertical line of the sight is approximately on the target (aiming point). When direct laying is used, No. 5 sights along the line of metal and shifts the trail so as to point the piece directly at the target. In the case of direct laying on moving targets (except when firing by individual sections at fast-moving targets as prescribed in par. 37), No. 5, at the command TARGET (SO AND SO), points the piece directly at the target, but does not shift the trail again until the gunner commands or signals MUZZLE RIGHT (LEFT).

(2) *To keep empty cartridge cases out of the way.*—No. 5 takes the cases as they are ejected and throws them well to the rear of the piece.

SECTION X

ADDITIONAL INFORMATION ON THE SERVICE OF THE PIECE

■ 32. USE OF THE SIGHT LINES, COLLIMATOR SIGHT.—The sight lines in the collimator appear as a white cross on a black background. The lines are vertical and horizontal. The gunner is taught to discern these lines and to prolong

them outside the collimator to obtain coincidence with external objects. The general method used for this is as follows: Close the right (left) eye, look through the collimator along its axis from as great a distance as possible, then move the eye up and down rapidly so as to prolong the vertical line, then sideways to prolong the horizontal line. As the gunner becomes more experienced, the amount of movement of the eye necessary to obtain coincidence with external objects becomes less. Some men find it convenient to sight with both eyes open, thus avoiding the necessity of moving the eye.

■ 33. USE OF THE SIGHT EXTENSION BAR.—The use of the sight extension bar is exceptional and must be avoided whenever possible as it frequently leads to inaccuracy. When its use is necessary, the gunner places it in the sight socket. This raises the sight above the top of the shield and enables the gunner to sight on aiming points otherwise obscured from view. As soon as the piece has been laid, he removes the sight extension bar, replaces the sight column in the sight socket, and refers the piece. The sight extension bar must not be left in position during firing.

■ 34. ACCURACY IN LAYING.—Sighting and laying instruments, fuze setters, and elevating and traversing mechanisms will be manipulated so as to minimize the effects of lost motion. This requires that the last motions in setting instruments and in laying be always in the directions prescribed. To insure accurate laying, the gunner and any other cannoneers who have duties in connection with laying the piece invariably will be required to verify the laying after the breech has been closed. When the piece must be established on uneven ground, the amount of cant of the axle is measured with the gunner's quadrant and reported by the chief of section to the executive.

■ 35. TO RAISE AND LOWER THE BRAKE, 75-MM GUN, M1897, HORSE-DRAWN.—The chief of section may cause the brake to be lowered after the trail has been seated.

a. To lower the brake.—The gunner stands between the left wheel and the trail; No. 1 stands between the right wheel

and the trail. Each grasps the tie rod on his side near the brake beam. No. 1 turns the latch pin of the brake-beam carrier to the right, lifts it as high as possible, and calls "Heave." At this signal both lift the brake beam, No. 1 pulls back the brake-beam carrier, and when the brake beam is freed both allow it to fall to the ground of its own weight.

b. To raise the brake.—The gunner and No. 1 take the same positions as for lowering the brake. No. 1 calls "Heave" and both lift the brake beam. No. 1 then pushes the brake-beam carrier forward and replaces the latch pin. To secure the latch pin properly, it may be necessary to repeat the operation.

■ 36. FIRE AT WILL.—*a.* The piece being in position and prepared for action, in case of sudden attack, when the target appears at a range of less than 500 yards, the executive may command: 1. TARGET (SO AND SO), 2. FIRE AT WILL. The chief of section repeats this command.

(1) No. 1 sets the range at 500; No. 3 sets corrector 30, range zero; No. 4, if shrapnel is used, sets fuzes continuously. The gunner, assisted if necessary by No. 5 at the handspike, keeps the piece laid directly on his part of the target throughout the firing.

(2) Firing is commenced at the command of the chief of section NO. (SO AND SO) FIRE. The piece is loaded and fired as rapidly as possible until the command CEASE FIRING, or until the enemy disappears from view or actually reaches the piece.

b. In fire at will, refinements of laying are not attempted, rapidity of fire being of primary importance. Shrapnel, if available, will be used. If shrapnel is not available, shell, preferably with delay fuze, will be used. In general, the procedure in firing shell is the same as with shrapnel except that the gunner lays well below the lowest visible element of the target.

■ 37. TO FIRE BY INDIVIDUAL SECTIONS WITH DIRECT LAYING AT MOVING TARGETS.—*a.* The chief of section observes the target, estimates its range and speed, and gives such directions to the cannoneers as will aid them in laying and firing the piece.

b. The gunner traverses the piece to the center of its traverse and, when directed by the chief of section, sets a lead in mils for the target on the drum of the sight. Assisted by No. 5 at the handspike, who points the piece directly at the target, the gunner manipulates the elevating and traversing mechanisms until the vertical and horizontal lines of the sight intersect at the target. The piece is fired at the command FIRE of the gunner when the piece is laid, No. 1 has called "Set," and the chief of section has indicated that the executive has given the command or signal to commence firing. Subsequent rounds are fired at the command of the gunner as soon as the necessary corrections have been made and the piece is again laid on the target.

c. If the target is moving rapidly in a lateral direction, the gunner may cause No. 5 to lead the target by pointing the piece *ahead* of the target. In this case the gunner commands, for example, LEAD RIGHT (LEFT) (SO MANY) MILS. No. 5, using the graduated trail log, float, or shield to measure off the lead ordered (par. 40), points the piece *ahead* of the target by the number of mils announced by the gunner. The gunner gives the command to fire as the target reaches the intersection of the sight lines; if No. 5 has shifted too much, he traverses the piece to meet the target and gives the command to fire at the appropriate moment. For subsequent rounds, No. 5 shifts the trail by pointing the piece ahead of the target by the announced lead immediately after the piece is fired, until a new lead is announced or firing ceases. In case the target stops or moves to the front or rear, the gunner may require No. 5 to cease leading and point the piece directly at the target. In this case the gunner commands, for example, LEAD ZERO, MUZZLE RIGHT (LEFT). No. 5 ceases to lead the target, shifts the trail in the direction indicated, and points the piece directly at the target.

d. No. 1 sets the range announced by the chief of section, calls "Set," and fires the piece at the gunner's command FIRE.

e. No. 2 loads the piece at the command or signal to commence firing and continues to load the piece each time it has fired and returned to battery, until the command CEASE FIRING is given.

■ 38. AIMING STAKES.—When a suitable natural aiming point is not visible, the piece, after it has been laid initially for direction, is referred to the aiming stakes as described in paragraph 26*b* (7). Two aiming stakes are used for each piece. Each stake is equipped with a light for use in firing at night. One stake is set up in a convenient location at least 100 yards from the piece. The other stake is set up at the midpoint between the first stake and the piece, and is lined in by the gunner so that the vertical line of the collimator and the two aiming stakes are all in the same vertical plane. Any lateral displacement of the piece during firing can then be detected easily and corrected for as indicated in paragraph 39. For night use, the lights should be adjusted so that the far one will appear several feet higher than the near one. The two lights thus will clearly establish a vertical line on which the vertical line of the collimator can be laid.

■ 39. CORRECTION FOR LATERAL DISPLACEMENT.—When the gunner notes that the piece is out of line with reference to the aiming stakes, he reports that fact to the chief of section. The gunner continues to lay the piece, using the far stake, until correction is authorized by the executive. The piece is then moved back into its original position, or a correction is made as follows: The gunner lays the piece by using the far stake, then refers to the near stake, and finally lays on the far stake with the new reading. The stakes are then realined by moving the near stake. This correction is effective only when the stakes have been equally spaced as indicated in paragraph 38.

■ 40. TRAIL LOGS AND PLATFORMS.—*a.* When soil conditions are unfavorable and the necessary material can be procured, the handling of the piece will be greatly facilitated by the construction and use of improvised wheel mats, trail logs, and platforms.

b. In order to facilitate shifting the trail in fire against moving targets, a trail log should be constructed conforming to the arc described by the spade and permitting shifts of at least 800 mils. A block shaped to provide a smooth bearing surface against the trail log should be fastened to

to the spade. The trail log should be graduated every 50 mils; the upper part of the shield and the float should also be graduated in mils.

■ 41. REPORTING ERRORS.—Each member of the gun squad should be constantly impressed with the importance of reporting promptly to the chief of section any errors made by members of the gun squad. The chief of section will report errors immediately to the executive as prescribed in paragraph 25*b* (8).

■ 42. CEASE FIRING.—The command CEASE FIRING normally is given to the gun squad by the chief of section, but in emergencies anyone present may give the command. At this command, *regardless of its source*, firing will cease immediately. If the piece is loaded, the chief of section will report that fact to the executive. Firing is resumed at the announcement of the range or elevation.

■ 43. SUSPEND FIRING.—The command SUSPEND FIRING is given only when the battery is firing on a prearranged schedule and a temporary halt in the firing is desired. At this command, firing is stopped, but settings continue to be altered in conformity with the schedule. If the piece is loaded, the chief of section will report that fact to the executive. Firing will be resumed at the command RESUME FIRING.

■ 44. CHANGES IN DATA DURING FIRING.—The announcement to the gun squad of any new element of firing data serves as a signal to stop all firing *previously ordered but not yet executed.* If the piece is not loaded at the announcement of a new element of firing data, the new data will be set off and firing resumed at the announcement of the range or elevation. If the piece is loaded with shrapnel and the new data require a change in the fuze setting, the piece will be unloaded (par. 45). If no change in fuze setting is required or if the piece is loaded with shell, the new data are set off, and the firing is resumed.

■ 45. TO UNLOAD THE PIECE.—*a.* When the command UNLOAD is given, No. 1 opens the breech, and No. 2, standing

at the breech, receives the ejected round with both hands. In case the extractor fails to eject the round, the rammer must be used.

b. No. 1 takes the sponge-and-rammer staff and inspects the rammer head to see that it is thoroughly clean and that the recess for the fuze is free from any foreign matter. Under the direct supervision of an officer, he inserts the rammer head in the bore and pushes it carefully in until it encloses the the fuze and comes in contact with the projectile. He pushes the rammer head gently against the projectile and, if necessary, taps the rammer staff lightly to dislodge the projectile. He then pushes the projectile out of the breech while No. 2, standing at the breech, receives the round in both hands.

c. To unload a shell fitted with the M–46 or M–47 type fuze, the special rammer head for handling such fuzes must be used. When practicable, the procedure prescribed in TR 1370–A should be followed.

■ 46. MISFIRES.—In the event of a misfire, at least three attempts to fire the primer will be made. The breechblock will not be opened until at least 2 minutes have elapsed after the last attempt to fire (AR 750–10). Rounds which have misfired will be removed from the battery position and disposed of as prescribed in TR 1370–A.

■ 47. AMMUNITION.—*a.* Ammunition must be protected from damage, especially to rotating bands and cartridge cases. When it is received, it should be sorted into lots and placed in the best available storage. Ammunition data cards should be retained until after all ammunition pertaining thereto is expended. Fuzes must not be stored with other components, and all components should be kept in their waterproof containers until their early use is anticipated. Protection should be provided against moisture, dirt, the direct rays of the sun, and, so far as practicable, against hostile artillery fire and airplane bombs. Protection against weather, dirt, and sun may be obtained by the use of paulins below and above the ammunition, and suitable dunnage below and between the layers. Protection against hostile fire may be obtained by the use of small dispersed stacks, trenches, or dugouts.

b. Care must be exercised to keep sand and dirt out of the adapter threads of unfuzed ammunition. The fuze wrench must be used to seat fuzes.

c. With HE shell, Mk. I or Mk. IV, or chemical shell Mk. II, the M–46, M–47, Mk. IV, or Mk. V fuzes may be used. The M–35 fuze may be used with the normal charge.

■ 48. THE SECTION DATA BOARD.—When positions are occupied for more than a few hours, a data board may be used by each section for recording such items as base deflection, calibration corrections when appropriate, minimum range or elevation, data for primary defensive fire missions, and other data the need for which may be urgent.

SECTION XI

CARE AND MAINTENANCE OF MATÉRIEL

■ 49. GENERAL.—*a.* This section covers such operations in the care and maintenance of the matériel as may be performed by a battery in the field.

b. Complete instructions for battery maintenance, including disassemblies, are found in the Technical Regulations and Standard Nomenclature Lists referred to in paragraph 2, especially in TR 1305–75A (now TR 320–95), SNL C–4, and SNL C–25. Operations not covered therein are the function of the ordnance maintenance company.

c. In general, the battery is charged with *preventive* maintenance, that is, with routine cleaning, lubricating, and preserving. Certain classes of repairs, adjustments, and replacement of parts may also be made under the direction of an officer or the chief mechanic. Parts which may be drawn by a battery for replacement purposes are indicated in SNL C–4 for the M1897 gun, and in SNL C–25 for the M1897A4 gun, by the symbol %. Unless specifically prohibited, such parts may be installed by the battery mechanic. For routine care and maintenance, specific duties are assigned to individuals, squads, or sections, and a strict accountability for the proper performance of such duties is enforced.

d. Disassemblies which may be performed in the battery are the following:

(1) Breech and firing mechanism.
(2) Sweeper plate and guide.
(3) Piston-rod coupler key.
(4) Rocker-arm trunnion caps.
(5) Dismounting of gun from cradle.
(6) Dismounting of cradle from carriage.
(7) Removal of respirator.
(8) Removal of filling and drain plug.
(9) Shields.
(10) Axle.
(11) Elevating-screw pin and range-elevation screw.
(12) Range scale.
(13) Elevating-crank assembly.
(14) On M1897 carriage, removal of wheels, axle collars, axle washers, brake frames, brake shoes, and brakefork keys.
(15) On M1897A4 carriage, removal of major parts of high-speed adapter, including axle brackets, compensator assembly, brake assembly, radius rods, seat supports, wheels, and tires.

■ 50. CLEANING.—*a.* Dirt and grit accumulated in traveling, or from the blast of the piece in firing, settle on the bearing surfaces, and in combination with the lubricant form a cutting compound. Powder fouling attracts moisture and hastens the formation of rust. Therefore, at lulls during firing and immediately after firing the piece must be thoroughly cleaned. At other times it should be cleaned at intervals not exceeding 2 weeks, depending upon the use and condition. Dirt on nonbearing surfaces can usually be removed by water; lubricated or other greasy parts must be cleaned with dry-cleaning solvent applied with a rag. The procedure in cleaning the bore and breech mechanism is described in paragraph 54*b*. The following cleaning materials are issued by the Ordnance Department for use in the field:

(1) *Soda ash* (dehydrated sal soda).—Used for cleaning the bore, breech mechanism, and firing mechanism after firing.

(2) *Dry-cleaning solvent.*—For removing grease. It is preferred to kerosene because it does not leave a corrosive film, and to gasoline because it is less inflammable.

(3) *Crocus cloth.*—This is the coarsest abrasive permitted for cleaning rust and stains from bearing surfaces.

(4) *Emery cloth.*—Used for cleaning unfinished or *nonbearing* steel surfaces only. Issued in five degrees of coarseness, of which 00 is the finest.

(5) *Burlap, jute.*—Issued for cleaning the bore.

(6) *Cotton waste, clean rags, and sponges.*—For general cleaning purposes.

b. A division of duties for members of the gun squad in routine cleaning and maintenance is as follows:

(1) The gunner—the sighting equipment, including the gunner's quadrant.

(2) Nos. 1 and 2—the breech mechanism and bore, the range scale, and the range-scale shaft.

(3) No. 3—the fuze setter.

(4) Nos. 4 and 5—the elevating and the traversing mechanisms, the axle, the roller paths, and the inclined planes for the gun slides.

(5) Higher-numbered cannoneers assist in the operations as directed by the chief of section.

■ 51. LUBRICATION.—*a.* Caisson and limber wheel bearings require ⅛ pint of lubricating oil daily, or every 25 miles. The oil is applied by means of the oiler at the valve in the center of the hub cap without removing the wheel. The automatic pole support on the limber should be packed with mineral lubricating grease at each disassembly. All other parts on these vehicles should be oiled with lubricating oil weekly.

b. To facilitate identification, all oil holes and grease fittings should be made conspicuous by circling with bright red enamel.

c. Lubrication instructions for the gun and carriage are covered in figures 6 and 7.

■ 52. PROTECTION AGAINST CHEMICALS.—Whenever chemical attacks are anticipated, all bright parts should be covered with oil. After a gas attack, the oil is wiped off and fresh oil applied. If mustard or other persistent gas is used, ab-

sorbent objects may be deeply contaminated, and even hard surfaces may be dangerous for 6 to 8 days if the chemical is not neutralized. Surfaces should be sprinkled with calcium hypochlorite or chloride of lime, or painted with a whitewash made from either. After 2 to 6 hours the lime is washed off and the matériel rinsed thoroughly with water. When large quantities of water are available, warm (but not boiling) water should be used instead of whitewash. In all cleaning operations, the gas mask and special gasproof gloves must be worn. All cleaning rags, sticks, etc. are disposed by *burying*. They must not be burned as the heat will disseminate dangerous vapor.

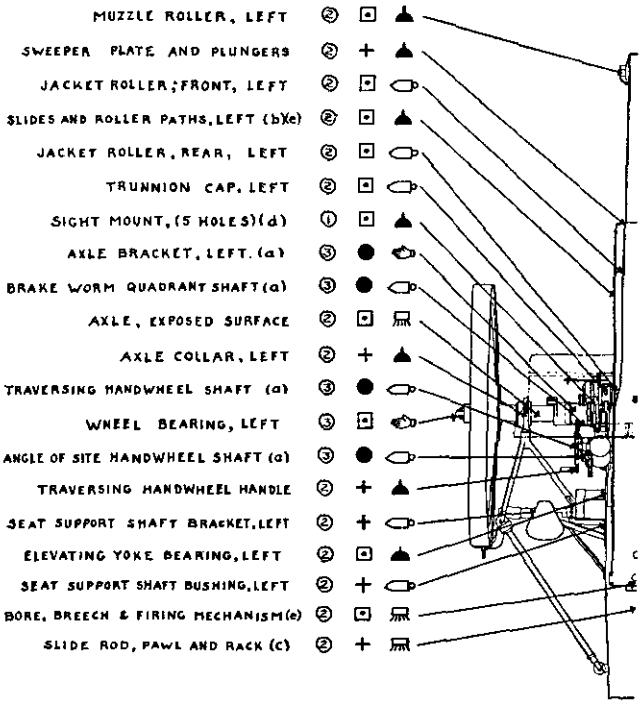
■ 53. RECOIL MECHANISM.—*a. General.*—Battery maintenance of the recoil mechanism is limited to exterior cleaning and lubrication, draining and filling with recoil oil, adjustment of the respirator, and disconnection of the piston rod from the coupler. Only the heavy low-pour-point recoil oil as issued by the Ordnance Department may be used in the recoil mechanism. It is especially important that this oil be kept free of dirt, water, and air bubbles, and that it be not mixed with other oils. A full reserve of oil for the recoil system amounts to approximately one-half the contents of the screw filler. In using the screw filler, care must be exercised to prevent crossing the threads. The screw handle must be turned with both hands. The amount of oil reserve in the system is shown by the position of the oil index with reference to the rear face of the counterrecoil-cylinder rear sealing plate at the rear of the cradle, as follows:

(1) *No reserve.*—The indicator is at the bottom of the recess. The piece must not be fired in this condition.

(2) *Full reserve.*—The end of the indicator is even with the rear face of the sealing plate.

(3) *Excess reserve.*—The indicator projects beyond the rear face of the sealing plate. The piece must not be fired in this condition.

b. Operation prior to traveling.—In order to hold the gun firmly in battery during travel, excess reserve oil should be added to the recoil system until the index shows excess oil reserve and stops moving to the rear. This requires about one screw filler of oil for filling from a no-reserve status.



NOTES:

(a) Packed by Ordnance at annual overhaul.
(b) Use brush when barrel is retracted.
(c) Partially lubricated by seepage from recoil mechanism.
(d) Lubricating oil may be used if neutral oil is not available.
(e) Lubricate bearing parts frequently during firing. Clean and lubricate oil parts immediately after firing.

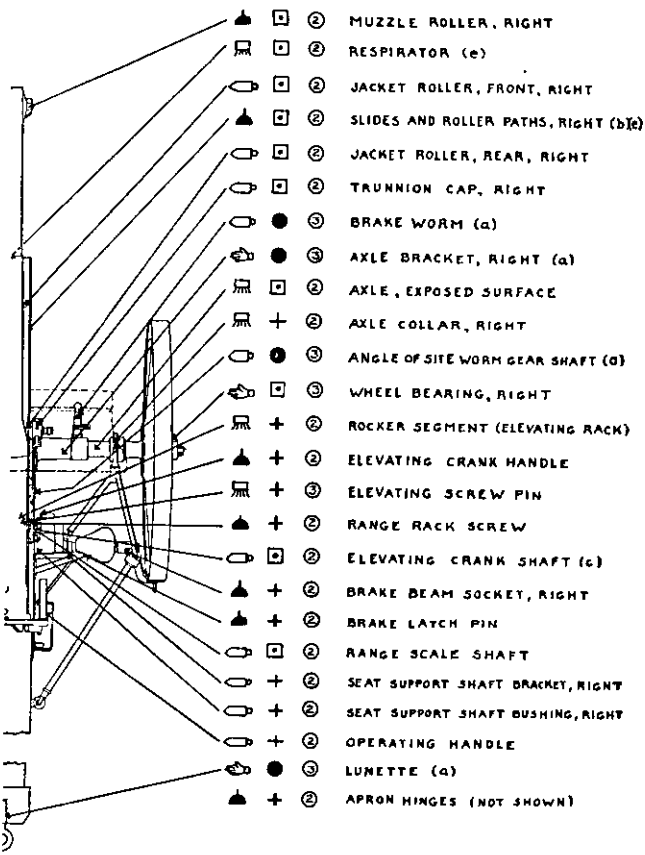
LUBRICANTS

① NEUTRAL OIL
② LUBRICATING OIL – LIGHT (SAE 20) IN COLD WEATHER; HEAVY (SAE 50) IN HOT WEATHER.
③ MINERAL LUBRICATING GREASE

HOW APPLIED

▲ OILER
⊂⊃ OIL GUN
▥ BRUSH OR CLOTH
☜ HAND PACKING

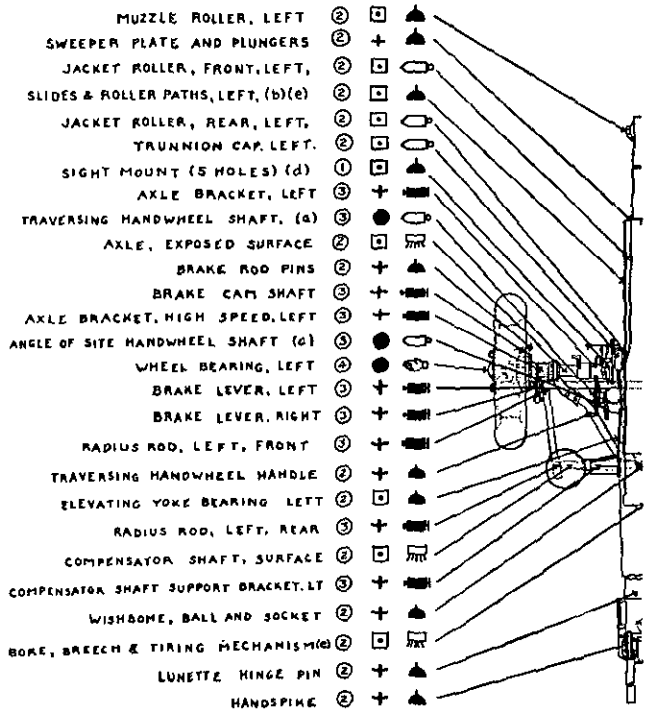
FIGURE 6.—Lubrication



WHEN APPLIED

- ⊡ DAILY, WHEN IN CONSTANT SERVICE, OTHERWISE WEEKLY.
- \+ WEEKLY, WHENIN CONSTAHT SERVICE, OTHERWISE TWICE MONTHLY
- ● EVERY SIX MONTHS

chart, 75-mm gun, M1897.



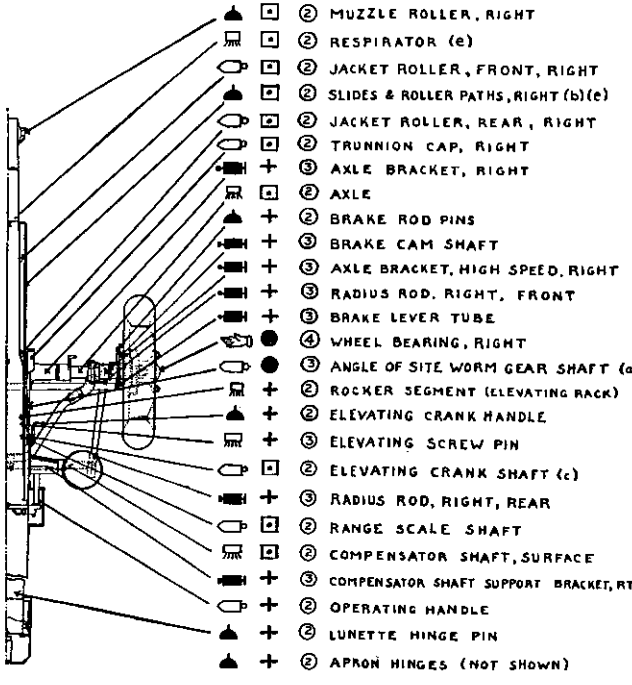
LUBRICANTS

① NEUTRAL OIL
② LUBRICATING OIL - LIGHT (SAE 20) IN COLD WEATHER; HEAVY (SAE 50) IN HOT WEATHER.
③ MINERAL LUBRICATING GREASE
④ FIBER WHEEL BEARING GREASE

HOW APPLIED

OILER
OIL GUN
GREASE GUN
BRUSH OR CLOTH
HAND PACKING

FIGURE 7.—Lubrication



NOTES:
(a)– Packed by Ordnance at annual overhaul.
(b)– Use brush when barrel is retracted.
(c)– Partially lubricated by seepage from recoil mechanism
(d)– Lubricating oil may be used if neutral oil is not available.
(e)– Lubricate bearing parts frequently during firing. Clean and lubricate all parts after firing.

WHEN APPLIED

- ⊡ DAILY, WHEN IN CONSTANT SERVICE, OTHERWISE WEEKLY
- \+ EVERY TWO WEEKS
- ● EVERY SIX MONTHS

chart, 75-mm gun, M1897A4.

c. Operations prior to firing.—(1) Before firing, the reserve oil should be extracted until an insufficient reserve is indicated, then a full reserve should be established by inserting oil until the index is flush with the rear face of the rear sealing plate.

(2) The respirator should be removed in order to clean the front interior of the recoil cylinder and to inspect for excess oil leakage.

(3) The front end of the recoil cylinder, the filling-and-drain-plug hole, and the oil-index recess should be examined for oil leakage. The presence of a few drops of oil at any of these places is not important, but if there is an undue leakage the piece must not be fired, and the condition should be reported to the Ordnance Department.

d. Operations during firing.—(1) During firing, the recoil mechanism should be maintained at full reserve, the respirator kept properly adjusted, and the rollers and slides kept clean and properly lubricated.

(2) The chief of section constantly verifies the complete return of the piece to battery. Firing may be continued as long as the cradle index (at right rear of breech hoop and cradle) remains between the two reference marks on the breech hoop.

(3) The chief of section constantly observes the behavior of the recoil mechanism in firing, and takes such action in the case of malfunctioning as is indicated below:

Malfunction	Cause	Correction
Oil index not functioning.	Index stuck or sluggish because of paint, dirt, or overtight packing.	Withdraw all reserve oil, then insert approximately one-half the capacity of the oil screw filler. Tap the oil index lightly as oil is being added. If it still fails to function notify the ordnance maintenance company. (In an emergency, after bleeding and refilling, the piece may be fired until the gun returns into battery with a shock, when reserve oil should be extracted, or the gun fails to return to battery, when additional oil should be inserted.)
Failure of gun to return to battery.	(1) Insufficient oil reserve. (2) Dirt or obstruction on the slides, roller paths, or rollers. (3) Low nitrogen pressure; excessive internal friction; damaged slides, piston rod, or piston.	(1) Insert sufficient fresh oil to bring the index even with the rear face of the rear sealing plate. (2) Clean and lubricate the slides, roller paths, and rollers. (3) Send recoil mechanism to the ordnance maintenance company for repair.
Return of gun to battery with a shock.	(1) Air from recoil cylinder escaping too fast through respirator. (2) Too much reserve oil.	(1) Adjust respirator to give smaller air-vent setting. (2) Withdraw reserve oil until the index indicates an insufficient reserve, then insert sufficient oil to bring the index even with the rear face of the rear sealing plate.

■ 54. BARREL ASSEMBLY, BREECH MECHANISM, AND FIRING MECHANISM.—*a. Operations during firing.*—(1) During firing, all exposed bearing surfaces must be kept clean and covered with a thin film of lubricating oil. The sweeper plate and sweeper-plate guide should not allow more than 0.06 inch side play.

(2) Whenever the rate of firing permits, the bore should be swabbed with clean water and a sponge.

(3) The causes and correction of malfunctioning of the breech and firing mechanism are given in the following table:

Malfunction	Cause	Correction
No momentum to swing of firing hammer.	Broken firing-rack spring.	Replace spring.
Failure to discharge when proper percussion on primer is obtained (misfire).	Defective primer.	See paragraph 46.
Failure to discharge until after several percussions on primer (primer struck weakly).	(1) Firing rack and hammer not working freely.	(1) Disassemble firing mechanism and examine all parts for burs or roughened bearing surfaces. Remove burs or rough spots with crocus cloth or oilstone. Clean off dirt and gummy oil with cleaning solvent. Dry and coat with lubricating oil.
	(2) Weak firing-rack spring.	(2) Replace spring.
	(3) Deformed firing-pin point.	(3) Replace firing pin.
	(4) Friction on lanyard.	(4) Allow less slack when firing with a long lanyard.
Failure to discherge; no percussion on primer at all.	(1) Safety piece not in firing position.	(1) Set safety piece plunger in the hole marked "Fire" or "Tir."
	(2) Breechblock not fully closed.	(2) Close breechblock.
	(3) Broken firing pin.	(3) Replace firing pin.
Failure to extract cartridge case.	Broken extractor.	See paragraph 45. Examine the edge of the chamber for burs or deformation. Replace extractor.
Pawl fails to operate.	Broken pawl spring or broken breechblock latch spring.	If latch spring is broken, replace it. If pawl spring is broken, replace breechblock latch assembly.
Breechblock does not rotate freely.	(1) Lack of lubrication.	(1) Remove block, clean recess and threads with solvent, wipe dry; coat lightly with lubricating oil; reassemble.
	(2) Burs or roughening of threads of breechblock or breech recess.	(2) Remove and clean as in (1) above. If burs or roughness are found, the correction must be made by ordnance maintenance company.
Safety bolt does not remain in upper position when coupler key is withdrawn.	Weak or broken safety-bolt spring, or spring and notch do not engage.	Replace safety-bolt assembly. If notch is deformed refer to ordnance maintenance company for correction.
Safety bolt fails to rise when coupler key is withdrawn.	Safety-bolt lug is shorn off.	Replace safety-bolt assembly. NOTE.—The safety bolt cannot rise when the breechblock is closed; forcing out the coupler key with the breech closed results in shearing off the lug.

b. Operations after firing.—(1) As soon as possible after firing, the breechblock and firing mechanism should be disassembled, the gun retracted on its slides, and all parts cleaned and lightly oiled.

(2) In disassembling the breech mechanism, the breechblock must be in the *closed* position before the extractor tang is disengaged from the extractor spindle. If the tang is disengaged with the block open, it will drop into the cam groove and jam the block.

(3) In order to retract the gun for cleaning the slides and roller paths, the piston rod must be disconnected from the coupler. To do this the breechblock must be *open*, or previously removed, and the cradle level.

(4) The bore, breech mechanism, and firing mechanism are washed with a solution of ½ pound of soda ash or 1 pound of sal soda in 1 gallon of water. Cleaning the bore is accomplished by means of a swab of burlap stitched around the end of the rammer staff. No attempt should be made to remove copper fouling. When all powder fouling has been removed, the bore should be swabbed with clear water and then wiped dry. Finally, it should be lightly coated with lubricating oil, either light or heavy, depending on the weather. The process may have to be repeated on successive days if there is evidence of sweating. If the piece is not to be kept in constant service, the bore should be slushed with rust-preventive compound instead of oil.

■ 55. MISCELLANEOUS PARTS OF CARRIAGES.—*a. Operations common to both M1897 and M1897A4 carriages.*—(1) The exposed rocker segment (elevating rack) must be kept clean and lubricated.

(2) The exposed sections of the axle must be kept clean and lubricated. In travel they should be covered and blocked to prevent traversing.

(3) The traversing mechanism should be checked for excessive lost motion. One-half turn of the handwheel is allowable. During traveling, the traversing handwheel should be strapped to prevent its turning.

(4) The elevating mechanism should be protected from vibration in travel by a strap or cable to hold the breech firmly on the traveling lug.

b. Operations pertaining to the M1897 carriage only.—(1) Looseness in the wooden parts of the wheel is taken up by periodic tightening of the hub bolts, which must be done at least twice a year. Shrinkage of the wood may be retarded by soaking the wood in raw linseed oil. Soaking the wheels in water is ineffective, because the water quickly dries, leaving the wood in worse condition than before.

(2) End play of the wheel is adjusted by placing leather washers between the hub and the axle collar, and between the hub and the axle cap. Until these become worn too thin, a temporary adjustment may be made by placing the linch pin in a shallower notch in the axle cap. If the linch pin is placed initially in the deepest notch, two additional adjustments are possible before new washers are needed.

c. Operations pertaining to the M1897A4 carriage only.—(1) Tires must be maintained at a pressure of 25 pounds. Treads are checked for excessive wear. Excessive wear will result if the piece is not held in the center of traverse in traveling. The amount of toe-in of the wheels can be adjusted by the ordnance maintenance company. Tires should be removed at least once a year, and the disk and rim cleaned and painted.

(2) The compensating shaft must be kept clean, oiled, and covered in traveling.

(3) The brakes are adjusted by means of brake adjusting wedges, which are turned clockwise to tighten. One or two notches at a time are sufficient to take up looseness due to the wear of the brake lining. The wheels should be jacked up to check that the brakes do not drag when the levers are in the "off" position. If the brakes do not release quickly, the retracting or compression springs may be replaced.

(4) To eliminate excessive side play in the wheel bearings, the carriage is jacked up, the hub cap removed, the cotter pin extracted from the wheel spindle, and the adjusting nut tightened, while the wheel is slowly rotated, until the wheel binds. The nut is then backed off until the wheel rotates freely but without side play. The cotter pin and hub cap are then reassembled.

(5) The wheels, hubs, and brake drums should be removed from the spindles every 2,000 miles, and at least twice yearly. All grease should be removed from the hub cavities, and the hub and inner and outer roller bearings washed clean with solvent. After being dried the hub and bearings should be packed with fresh, clean fiber wheel-bearing grease.

d. Automatic pole support on the M1918 limber.—The disassembly and adjustment of the automatic pole support are described in TR 1305–A. It must be adjusted to hold the pole assembly at a height of 29 inches without support from the harness, the carriage being limbered and loaded. Malfunctioning may be caused by lack of lubrication, the pole being loose in the pole socket, the support spring not being in proper adjustment, and by a worn pintle lug or lunette. To adjust the support it must be disassembled and the spring tightened sufficiently to support a 20-pound weight suspended from the pole assembly at the neck-yoke stop. If the pintle lug and the lunette are worn, shims must be placed under the pintle adjusting bolt.

e. Caisson band brake.—The brake mechanism is described in TR 1305–A. No dressing of any kind may be placed on the brake linings. Brake bands may slip if the linings are worn or greasy. If greasy, they should be washed with solvent and adjusted. If the lining is badly worn, it must be replaced by the ordnance maintenance company. Brakes must be adjusted to give equal action on the wheels. To adjust a brake, jack up the wheel, disconnect the adjusting nut, and tighten the link. When the brake is in the "on" position, the wheel should not turn when a man stands on the outer end of a horizontal spoke. When in the "off" position the brake should not drag. In adjusting, allowance should be made for subsequent wear of the lining; initially, the lever should not come into the last notch when "on."

■ 56. SIGHTING EQUIPMENT.—*a. General.*—Except on the range drum and the bracket fuze setter, battery personnel is not permitted to disassemble or adjust this equipment, but tests must be made before every firing to determine whether the tolerance of error is exceeded. If exceeded, the fact is reported to the ordnance maintenance company. In general, the sights are correct—

(1) In *direction,* if the deflection scales read plateau 0 drum 100 when the line of sighting is in a plane parallel to the vertical plane passing through the axis of the bore.

(2) In *elevation,* if the algebraic sum of the range and site settings indicate the same angle above the horizontal that is measured with an accurate gunner's quadrant on the tube.

(3) If there is no excessive lost motion between the sights and the tube.

b. Testing equipment.—Equipment used in testing sights consists of bore sights and a gunner's quadrant. The target for bore sighting may be a distant terrain object, more than 1,000 yards away, or a test target for use in close proximity. In the latter case the displacement of the axis of sighting from the axis of the bore must be correctly shown. For this gun the sight displacement is 9.5 inches to the left of and 6.81 inches higher than the axis of the bore. Aiming stakes with wooden blocks or markers attached make a suitable test target. In direction tests these may be canted as the carriage is canted, in which case leveling of the trunnions is unnecessary. Tests can be made without the bore sights by sighting through the firing pin recess or a brass cartridge case with the primer removed, using improvised cross hairs at the muzzle.

c. Gunner's quadrant.—To test the gunner's quadrant, set the scales at *zero,* place it on the leveling plates of the piece and level the quadrant bubble. Then reverse the quadrant on its seat. The bubble should center itself. If it does not, it should be adjusted at the earliest opportunity by the Ordnance Department. If it must be used, apply a correction in the appropriate sense equal to one-half of the measured error determined in the end-for-end test.

d. Collimator sight, M1901, and mount, M1901.—The following tests should be made:

(1) *Test for trunnion friction* (should be made first).—(*a*) Set any range and site. Do not change it during the test.

(*b*) Center the site bubble by *raising* the breech with the angle-of-site handwheel. If the bubble passes the center, start over.

(*c*) Read the elevation of the tube with the gunner's quadrant.

(*d*) Throw off the site bubble by raising the breech, then recenter bubble by *lowering* the breech. If the bubble passes the center, start over.

(*e*) Read the elevation again with the quadrant.

(*f*) The difference between the elevations read in (c) and (*e*) above is the error due to trunnion friction. If the error exceeds 1 mil, the trunnion bearings are examined, cleaned, and lubricated, and the test repeated. If the error is still excessive, the piece should be repaired by the Ordnance Department.

(2) *Test of site bubble for elevation.*—(*a*) Set range zero, site zero. Do not change it during the test.

(*b*) Center the site bubble by *raising* the breech with the angle-of-site handwheel. If the bubble passes the center, start over.

(*c*) Read the elevation of the tube with the gunner's quadrant.

(*d*) Throw off the site bubble by raising breech, then recenter the bubble by *lowering* the breech. If the bubble passes the center, start over.

(*e*) Read the elevation again with the quadrant.

(*f*) Take the *mean* of readings in (*c*) and (*e*) above. Both readings should be close to zero. The mean must be within 1 mil of zero. This test differs from the trunnion friction test in that in the test the error of trunnion friction is eliminated by taking the mean of the readings, thus giving the error of the site bubble itself.

(3) *Test of the collimator sight for direction.*—(*a*) Center the gun in the cradle. (Force a screw driver between the sweeper plate and the wall of the slide; force the gun to the opposite wall; make a fine vertical mark across the front of the sweeper plate and the front of the cradle. Force the gun on the opposite side with a screw driver. If the mark on the sweeper plate does not agree with that of the cradle, move the gun toward the middle by half the distance between the two marks.)

(*b*) Bore sight on the target.

(*c*) Starting near plateau 0 drum 200, turn the drum until the vertical hair is on the target. If the hair passes the target, start over. Record the reading.

(*d*) Starting near plateau 0 drum 0, turn the drum until the vertical hair is again on target. If the hair passes the target, start over. Record the reading.

(*e*) The readings in (*c*) and (*d*) above should be between plateau 0 drum 104 and plateau 0 drum 96, both inclusive, and should not differ by more than 5 mils. If the sight has a greater error, it should be adjusted by the Ordnance Department. Until adjusted apply a correction to deflection settings.

(4) *Test of collimator sight for elevation.*—(*a*) Set the range at zero.

(*b*) Bore sight on the target, using the angle-of-site handwheel.

(*c*) Read the elevation of the tube with the gunner's quadrant.

(*d*) Place the horizontal hair of the sight on the target by *lowering* the breech, using the angle-of-site handwheel. If the hair passes the target, start over.

(*e*) Read the elevation of the tube with the gunner's quadrant.

(*f*) Repeat (*d*) above by *raising* the breech. If the hair passes the target, start over.

(*g*) Read the elevation of the tube with the gunner's quadrant.

(*h*) Take the mean of (*e*) and (*g*) above. This mean should not differ by more than 1 mil from reading in (*c*) above.

e. Test of the range drum.—This is automatically tested in test *d* (2) above. An individual test may be made as follows:

(1) Set site and range scales at zero.

(2) Level the angle-of-site bubble with the angle-of site handwheel.

(3) Test the tube with a gunner's quadrant. If the tube is not horizontal, the range drum is in error. The correct assembly of the range drum may be checked by inspection. When set at *zero*, the index opposite the range *rack* scale

should also read zero. (For calibration purposes, the range drum may have been assembled at an off-zero reading.)

f. Adjustment of the bracket fuze setter, M1916.—(1) To eliminate looseness in either worm gear, loosen the set screw and with a teat wrench turn the adjusting plug clockwise. Retighten the set screw. The range crank should not fall of its own weight.

(2) To eliminate end play in either worm shaft, remove the crank handle or knob by driving out the tapered pin, loosen the set screw, and tighten the bearing cap with a teat wrench. Retighten the set screw. Replace the handle or knob.