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FM 4-35

WAR DEPARTMENT

**COAST ARTILLERY  
FIELD MANUAL**

**SEACOAST ARTILLERY  
SERVICE OF THE PIECE**

**14-INCH GUN, M1920MII  
ON RAILWAY MOUNT, M1920**

**BATTERY "C"**  
**244th ARTILLERY, N. Y. N. G.**  
**125 WEST FOURTEENTH STREET, N. Y.**

# COAST ARTILLERY FIELD MANUAL



## SEACOAST ARTILLERY SERVICE OF THE PIECE

14-INCH GUN, M1920MII, ON RAILWAY  
MOUNT, M1920

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Prepared under direction of the  
Chief of Coast Artillery



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BY ORDER OF THE SECRETARY OF WAR:

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# COAST ARTILLERY FIELD MANUAL

## SEACOAST ARTILLERY

### SERVICE OF THE PIECE

#### 14-INCH GUN, M1920MII, ON RAILWAY MOUNT, M1920

(The matter contained herein supersedes TR 435-227, March 18, 1933.)

#### CHAPTER 1

##### GENERAL

■ 1. SCOPE.—*a.* This manual prescribes the service of the piece for the 14-inch gun, M1920MII, on railway mount, M1920. The duties of the members of the gun sections in the service of the piece are contained in chapter 3 and in the drill table, chapter 10.

*b.* The emplacing and the service of the piece as prescribed herein are intended as a guide for the battery commander. Changes in the details of the emplacing and the service of the piece may be made to meet local conditions.

■ 2. REFERENCES.—The references listed in the Appendix should be consulted, especially those pertaining to ammunition and to the operation, care, and maintenance of matériel.

## CHAPTER 2

### ORGANIZATION

■ 3. GUN SECTION.—Each emplacement of one gun is manned by a gun section consisting of a chief of section (gun commander), a gun squad, an ammunition squad, a staff sergeant (electrician), an artillery mechanic, and an engineman. The peace strength of the gun section is 38 enlisted men; the war strength is 40 enlisted men (T/O 4-57).

■ 4. GUN SQUAD.—The chief of section is in direct charge of the gun squad. The gun squad (23 enlisted men) at both peace and war strength consists of the chief of section (gun commander), gun pointer, elevation setter, battery commander telephone operator, two display board operators, recorder, aiming rule operator, chief of breech, and 14 cannoneers numbered from 1 to 14, inclusive. Men are assigned to permanent positions according to their aptitude but will be interchanged frequently in drill positions to develop flexibility and facilitate replacement.

■ 5. AMMUNITION SQUAD.—At peace strength the ammunition squad (12 enlisted men) consists of the chief of ammunition, a projectile detail numbered from 15 to 18, inclusive, and a powder detail numbered from 21 to 27, inclusive. At war strength the ammunition squad consists of 14 enlisted men, the projectile detail being increased by Nos. 19 and 20.

■ 6. FORMATION.—Each section assembles in two ranks with 4 inches between files and 40 inches between ranks. Unnumbered cannoneers form on the right of their squads in both front and rear ranks. Numbered cannoneers form in the order of their numbers from the right, even numbers in the front rank and odd numbers in the rear rank. The staff sergeant (electrician) forms 30 inches to the right of the chief of section. The chief of ammunition forms in the front rank on the right of his squad and is not covered off. The artillery mechanic and the engineman form on the left of the



gun section, the artillery mechanic in the front rank, and the engineman in the rear rank. After forming the section, the chief of section takes post in the front rank 30 inches to the right of the gun pointer. (See fig. 1.)

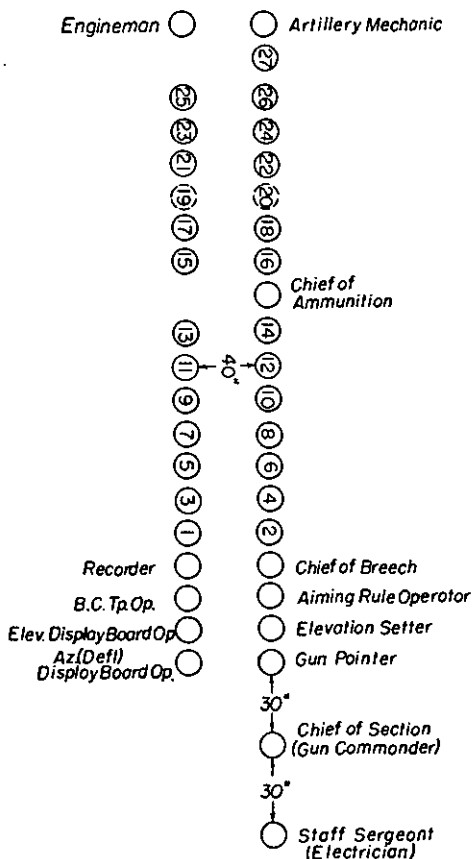


FIGURE 1.—Formation of gun section, war strength.

NOTE.—At peace strength Nos. 19 and 20 are eliminated.

## CHAPTER 3

### DUTIES OF PERSONNEL

■ 7. BATTERY EXECUTIVE.—*a.* The battery executive commands the firing section of the battery. He is responsible to the battery commander for the—

(1) Training and efficiency of the personnel of the firing section.

(2) Condition of the matériel under his charge.

(3) Police of all emplacements.

(4) Observance of all safety precautions pertaining to the service of the piece.

(5) Emplacement of the guns when they are moved into position, and their preparation for railroad travel when they are taken out of position.

*b.* He inspects the matériel under his charge and personally verifies the adjustment of all pointing devices as frequently as is necessary to insure accuracy. He or an assistant battery executive tests all firing circuits and firing devices before each drill or firing, paying special attention to the safety features.

*c.* He receives the reports of the assistant battery executives or chiefs of sections and reports to the battery commander, "Sir, firing section in order," or any defects he is unable to remedy without delay.

*d.* He exercises general supervision over the loading and pointing. If for any reason he desires to hold fire for one firing interval, he commands: RE-LAY, and reports his action to the battery commander.

*e.* At the conclusion of drill or firing, he commands: REPLACE EQUIPMENT, inspects the emplacements, and reports to the battery commander.

*f.* He selects the positions for, and supervises the emplacement and employment of, the machine guns of the firing section.

*g.* As battery railway officer he is responsible for the condition and maintenance of the railway matériel assigned to the battery.

■ 8. ASSISTANT BATTERY EXECUTIVES.—Each assistant battery executive will perform the duties of the battery executive insofar as they pertain to the emplacement or emplacements to which he is assigned.

■ 9. CHIEF OF SECTION.—*a.* The chief of section (gun commander), a noncommissioned officer, is in command of the gun section and is also chief of the gun squad. He is responsible to the officer in charge of the emplacement for the—

- (1) Training and efficiency of the personnel of his section.
- (2) Condition of the matériel under his charge.
- (3) Emplacement of the piece and its preparation for firing, including camouflage discipline and gas discipline when necessary.
- (4) Firing of the piece.
- (5) Observance of all safety precautions pertaining to the service of the piece.
- (6) Police of the emplacement.

*b.* He supervises the preparation of the firing position, the emplacement of the mount, removing the gun and mount from position, the loading of equipment, the service of the piece, and the service of ammunition. He personally directs the work of care and preservation of all matériel.

*c.* The gun being emplaced for firing, he commands: 1. DETAILS, 2. POSTS, when the section arrives at the emplacement, and supervises the procuring of equipment. After all details have reached their posts (fig. 2), he commands: EXAMINE GUN. He then makes an inspection of the gun, carriage, and other matériel, paying special attention to the recoil cylinders, firing mechanism, safety devices, recuperators, air compressor, the oiling of the various bearings, and the power plant. He receives the reports of the chief of ammunition and of the chiefs of the various details of the gun squad, and reports to the officer in charge of the emplacement, "Sir, No. ——— in order," or any defects he is unable to remedy without delay.

*d.* When necessary to verify the section, he commands: CALL OFF. The cannoneers in each squad call off their titles or numbers in succession, beginning with the unnum-

bered members of the section, followed by the numbered members in order.

e. He informs the chief of ammunition as to the projectile, fuze, and powder charge to be used.

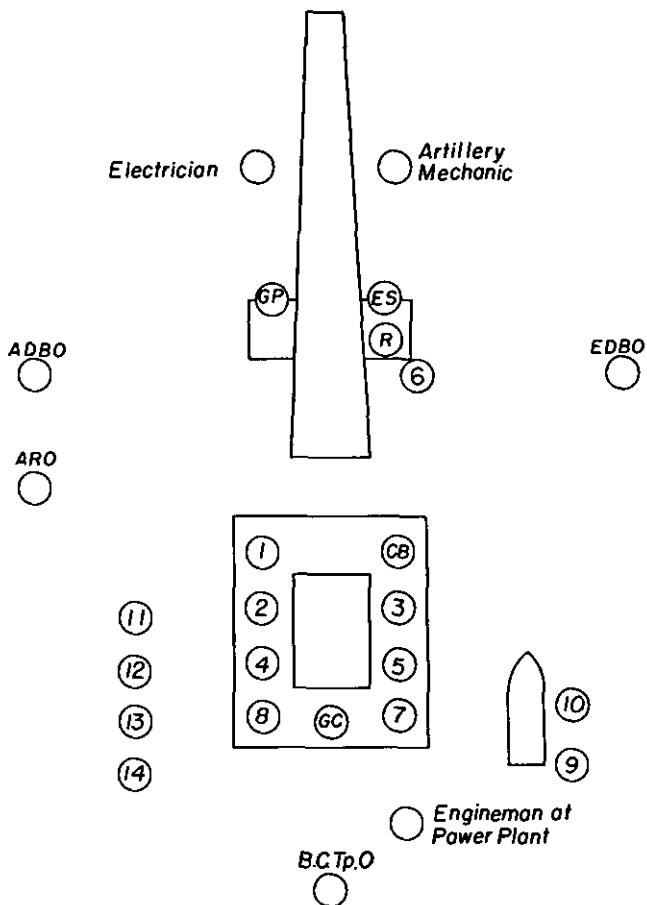


FIGURE 2.—Positions at DETAILS, POSTS.

*f.* At the command **TARGET**, he repeats the command and target designation. As soon as the gun pointer is on the target (or aiming point), he reports or signals to the officer in charge of the emplacement, "Sir, No. ——— on target."

*g.* At the command **LOAD**, he repeats the command and supervises the loading. After the piece is loaded and laid, he calls, "No. ——— ready." He also commands: **LOAD**, before each shot of a series. The piece is not fired, however, until the command **COMMENCE FIRING** is given and the proper firing signal received.

*h.* At the command **COMMENCE FIRING**, if the piece is unloaded, he commands: **LOAD**, and supervises the work of his section. After the piece is loaded and laid, he sees that all personnel are clear.

*i.* He commands: **CEASE FIRING**, when the number of shots specified has been fired. He repeats the command **CEASE FIRING** when it is received. At the conclusion of a series of shots he reports, "Sir, No. ——— (so many) rounds fired." When dummy ammunition is used, he commands: **UNLOAD**, and supervises the unloading.

*j.* During firing he stations himself in such a position as best to observe the functioning of the gun squad and the gun. He pays particular attention to the action of the gun in recoil and counterrecoil in order that a loss of oil by leakage may be corrected.

*k.* In case of a misfire, he calls "No. ———, misfire." He sees that the precautions described in paragraph 47 are observed.

*l.* When firing on a time interval signal, he commands: **RE-LAY**, in case the time interval signal fails to sound at the gun, or in case his gun is not ready to fire when the time interval signal sounds. He repeats the command **RE-LAY** when it is received.

*m.* At the command **REPLACE EQUIPMENT**, he supervises the replacing of all equipment, sees that all matériel is properly secured and the emplacement policed, and then unless otherwise directed forms his section.

■ 10. **GUN POINTER.**—The gun pointer (noncommissioned officer) is charged with the duty of pointing the piece in di-

rection. He is responsible to the gun commander for the proper operation and care of the sighting apparatus, azimuth index, aiming rule, traversing mechanism, and electric firing circuit. For detailed duties of the gun pointer, see drill table, chapter 10.

■ 11. ELEVATION SETTER.—The elevation setter (noncommissioned officer) is charged with the duty of laying the piece in elevation. He is responsible to the gun commander for the proper operation and care of the quadrant and elevating mechanism. For detailed duties of the elevation setter see drill table, chapter 10.

■ 12. CHIEF OF BREECH.—The chief of breech (noncommissioned officer) is responsible to the gun commander for the—

*a.* Efficiency of the personnel of the breech detail.

*b.* Care and preservation of the breech mechanism, breech-block, breech recess, firing mechanism, chamber, and bore.

*c.* Observance of all safety precautions insofar as they pertain to his detail.

*d.* Proper loading of the piece. He pays particular attention to the seating of the projectile and sees that the igniter is on the rear end of the last section of the powder charge. He listens for the explosion of the primer which may be audible if the powder charge fails to ignite. For detailed duties of the chief of breech, see drill table, chapter 10.

■ 13. BATTERY COMMANDER'S TELEPHONE OPERATOR.—*a.* The battery commander's telephone operator is charged with the duty of receiving and transmitting all messages passing between the battery commander and the officer in charge of the emplacement and with the keeping of such records as may be directed.

*b.* At the command DETAILS, POSTS, he procures a telephone with head set and hand set and takes post as directed. He reserves the hand set for the use of any person to whom the battery commander may wish to speak personally.

*c.* At the command EXAMINE GUN, he connects his telephone and establishes communication with the battery commander's station, reporting to the gun commander in case of failure to obtain satisfactory communication.

d. At the command **LOAD OR COMMENCE FIRING**, he transmits the command to the officer in charge of the emplacement and continues to transmit all messages until properly relieved from his duties.

■ 14. **DISPLAY BOARD OPERATORS.**—a. The azimuth (deflection) and elevation display board operators are responsible to the gun commander for the proper operation of their display boards and recording of all data received from the fire control car.

b. At the command **DETAILS, POSTS**, they procure chalk, blackboard erasers, forms for recording data, and telephones, and take post at their display boards.

c. At the command **EXAMINE GUN**, they clean their display boards, if necessary, put on the telephone head sets, test the telephones to the fire control car, and report to the gun commander, "Azimuth (deflection) display board and elevation display board in order," or report any defects they are unable to remedy without delay.

d. At the command **TARGET**, they receive azimuths (deflections) and elevations from the fire control car, post them on their display boards, and record them on the recorder's data sheet.

e. At the command **CEASE FIRING**, they continue posting and recording data received from the fire control car until **CEASE TRACKING** is received.

■ 15. **RECORDER.**—a. The recorder is charged with the duty of recording all elevations and azimuths (deflections) set on the piece.

b. At the command **DETAILS, POSTS**, he procures a pencil and forms for recording data and takes post in rear of the elevation setter, facing the piece.

c. At the command **EXAMINE GUN**, he assists the elevation setter in his duties.

d. At the command **TARGET**, after the piece has been laid he records each elevation and azimuth (deflection) set on the piece, reading himself the elevation actually set and obtaining the azimuth (deflection) from the gun pointer. He gives special attention to identifying properly the actual data upon which the piece is fired.

*e.* At the command RE-LAY, he performs the duties prescribed under the command TARGET.

*f.* At the command CEASE FIRING, he continues to record the data set on the piece until CEASE TRACKING is received.

*g.* If the aiming rule is not being used, the aiming rule operator may assist the recorder by recording the azimuths (deflections) set on the piece, in which case the duties of the recorder prescribed above are changed accordingly.

■ 16. AIMING RULE OPERATOR.—*a.* The aiming rule operator is responsible to the gun commander for the operation, care, and adjustment of the aiming rule and its sight.

*b.* At the command DETAILS, POSTS, he procures the aiming rule sight and crossbar, places them near the aiming rule stakes, and takes post behind the aiming rule stakes, facing the piece.

*c.* At the command EXAMINE GUN, he places the aiming rule crossbar in position on the stakes and places his sight in its bracket on the crossbar. He sets the data determined during orientation of the aiming rule on his sight, moves his sight along the bar until the vertical cross wire is exactly on the gun sight, and reports to the gun commander, "Aiming rule in order," or any defects he is unable to remedy without delay.

*d.* At the command TARGET, he keeps the vertical cross-wire of his sight exactly on the center of the gun sight by sliding his sight along the crossbar, without changing the data set on his sight.

*e.* At the command RE-LAY or CEASE FIRING, he continues to perform the duties prescribed under the command TARGET, unless otherwise directed.

*f.* If the aiming rule is not used, the aiming rule operator may be used as an azimuth (deflection) recorder, in which case he will perform the duties prescribed for the recorder in paragraph 15 insofar as they pertain to the recording of azimuths (deflections).

■ 17. CHIEF OF AMMUNITION.—*a.* The chief of ammunition (noncommissioned officer) is responsible to the chief of section for the—

(1) Efficiency of the personnel under his charge.



(2) Care and preservation of the ammunition, ammunition cars, and ammunition handling apparatus such as trolleys, cranes, blocks and chains, and powder serving trays.

(3) Camouflage discipline and gas discipline at the ammunition car or shelters pertaining to his section.

(4) Observance of all safety precautions in the care and service of ammunition.

(5) Security and careful handling of the ammunition and its protection against water, dampness, fire, and the direct rays of the sun.

(6) Uninterrupted service of ammunition during action, and that projectiles are placed within handling distance of the cranes before the beginning of an action.

b. He makes necessary changes in the number of cannoneers assigned to the projectile detail and powder detail if required by local conditions.

c. He keeps a record of all ammunition received and that used by his gun, exercising particular care that projectiles and fuzes are listed under proper name and type.

d. He keeps the chief of section informed regarding ammunition on hand, checks the weights of projectiles, and reports defects found in the ammunition.

e. He keeps a thermometer in a selected powder container and reports the temperature of the powder when directed.

f. At the command DETAILS, POSTS, he opens the ammunition cars or magazines and posts the members of his squad.

g. At the command EXAMINE GUN, he inspects the matériel under his charge, gives the necessary instructions for preparing ammunition and equipment for firing or drill, and reports to the chief of section, "Ammunition service in order," or any defects he is unable to remedy without delay.

h. At the command LOAD, he directs and supervises the service of ammunition.

i. At the command REPLACE EQUIPMENT, he supervises the replacing of equipment, sees that all matériel is properly secured, forms his squad, and reports to the chief of section.

■ 18. PROJECTILE DETAIL.—No. 15 is chief of this detail (at peace strength Nos. 15 to 18, inclusive; at war strength Nos. 15 to 20, inclusive). They obtain projectiles, as directed,

from the ammunition car or magazine and deliver them to the projectile serving detail, Nos. 9 and 10. Methods of delivery will depend upon available equipment. When not engaged in the delivery of projectiles they are available to the chief of ammunition for cleaning, painting, and marking projectiles, or such other duties as he may direct.

■ 19. POWDER DETAIL.—No. 21 is chief of this detail (Nos. 21 to 27, inclusive, at both peace and war strength). They remove the powder charges from the containers and check their weights and all pertinent data. They place the charges on powder trays, arranging the sections in proper order. They deliver the trays of powder charges to the powder serving detail, Nos. 11, 12, 13, and 14. When not engaged in the delivery of powder they are available to the chief of ammunition for repairing powder trays, preparing empty containers for disposal, or such other duties as he may direct.

■ 20. ELECTRICIAN.—*a.* The electrician, a staff sergeant, is responsible for the proper operation and maintenance of the electrical equipment on the gun and mount.

*b.* At the command EXAMINE GUN, he verifies the cable connections between the mount and power plant. When ready for power he signals "Power on" to the engineman. Before closing the line switches on the mount he checks the position of the drum controller handles to see that they are "off." He checks the operation of each electric motor.

*c.* During firing he observes the operation of the electrical equipment and stands ready to make any emergency repairs or adjustments which may be required.

*d.* When power is no longer required he signals "Power off" to the engineman.

*e.* He cleans and dries out the fuze boxes and terminal boxes whenever necessary.

■ 21. ARTILLERY MECHANICS.—*a.* The artillery mechanics assisted by other members of the gun sections make such minor repairs and adjustments as can be made with the means at hand. The chief artillery mechanic is the custodian of the supplies pertaining to the guns assigned to his battery. He is responsible for the condition of the supply

cars or storerooms pertaining to the guns and the supplies contained therein. The chief mechanic or his assistant issues such equipment, tools, oils, paints, and cleaning materials to the other members of the gun sections as may be necessary for the service and care of the guns and accessories.

b. During drill or firing, each artillery mechanic operates the air compressor on the mount to which he is assigned.

c. At the command **EXAMINE GUN**, he supervises the starting of the speed gears, starts the air compressor, and cleans and oils where necessary. He checks the gas and liquid pressures in the recuperator cylinders and the amount of liquid in the expansion chamber. Under the direction of the gun commander and assisted by the powder-serving detail he adds the required amount of gas or liquid. He immediately reports to the chief of section any defects he is unable to remedy without delay. He keeps constant watch over the air pressure at the air compressor to see that it is maintained at the proper amount (175 pounds per square inch), and observes closely the action of the gun and mount during firing.

d. He commands: **CEASE FIRING**, at any time when in his opinion firing would be unsafe due to improper functioning of the mount.

e. At the command **REPLACE EQUIPMENT**, he sees that the air compressor is turned off and that all speed gear controls are turned to the "neutral" position.

■ 22. **ENGINEMAN.**—a. The engineman is responsible, under the supervision of the electrician, for the proper operation and care of the power plant. He is responsible for the care and storage of the fuel and lubricating oils for the power plant and keeps all entries in the "Engine Book" up to date.

b. In preparation for drill or firing he verifies the oil, water, and gasoline, then primes and starts the engine. He throws the power on the mount cables at the signal "Power on" from the electrician. During the drill or firing he watches the engine to see that it does not overheat and so regulates the running as to keep the switchboard meters constantly at the proper settings. He makes certain that

there is an ample supply of water, oil, and gasoline for the continuous running of the plant. He stops the engine at the signal "Power off" from the electrician. Before leaving the power plant he examines it carefully, shuts off the gas feed, fills the oil, water, and gas tanks, if necessary, and properly secures and locks the doors of the power unit after replacing all tools and other materials.

**JAMES L. SQUIRE**  
**CAPTAIN, BATTERY C**  
**10TH COAST ARTILLERY**

## NOTES ON THE SERVICE OF THE PIECE

■ 23. GENERAL.—*a.* The service of the piece will be conducted with dispatch and precision and with as few orders as possible. Except for the necessary orders, reports, and instructions, no talking will be permitted. Cannoneers change positions as rapidly as practicable.

*b.* Commands will be given in the prescribed forms (see FM 4-5). Signals may be substituted for commands whenever practicable (see FM 4-20).

*c.* When there is a lull in the firing or drill, each member of the gun section will inspect, clean, and place in the best possible condition the matériel under his charge.

*d.* Short periods of drill without electric power should be held frequently during training.

■ 24. ADDITIONAL PERSONNEL.—In case of failure of electric power, the service of the piece requires additional cannoneers as indicated below. This personnel should be designated on the manning tables and taken from the battery maintenance section and the machine gun detail.

*a.* Nos. 28 and 29 (traversing detail), to assist the gun pointer in traversing the piece.

*b.* No. 30 (elevating detail), to assist No. 6 in elevating the piece.

*c.* Nos. 31 to 34, inclusive (projectile hoist detail), two reliefs to operate the projectile hoist under the supervision of No. 7.

*d.* Nos. 35 and 36 (powder hoist detail), to operate the powder hoist under the supervision of No. 8.

■ 25. SERVICE OF AMMUNITION.—During the training period a complete plan for the service of ammunition will be prepared. This plan should be based on the use of the smallest number of men practicable. A sufficient number of projectiles for any expected action should be placed about the emplacement

so as to be accessible readily to the projectile serving detail. The ammunition car or cars containing powder charges should be placed behind the emplacement.

■ 26. OPERATION OF BREECH.—The operations required for opening and closing the breech are fully covered in \*TM 9-425. Members of the breech detail should *stand clear of the operating lever when closing the breech.*

■ 27. ELEVATING PIECE.—*a. By power.*—(1) The piece is elevated and depressed by power by No. 6 under the supervision of the elevation setter. The clearance will be ascertained by the use of the clearance gage before attempting to elevate.

(2) The power-elevating mechanism is used in the following manner: Ascertain that the control shaft of the A-end of the speed gear is in neutral by rocking the control handwheel (see fig. 3) back and forth and feeling the snap of the detent. The control handwheel is located between the elevating brake drum and the cradle trunnion. The elevating motor located on the top of the right side frame near the upper pintle is started. The clutch handwheel located below and to the right of the elevating brake drum is turned as far as possible in the direction marked "Motor." The elevating brake is released by raising the lever before turning the control handwheel. The control handwheel is turned counterclockwise to elevate and clockwise to depress. To stop movement of the piece the control handwheel is turned to neutral and the brake lever is lowered.

*b. By hand.*—(1) The piece is elevated and depressed by hand by No. 6 under the supervision of the elevation setter. No. 30 relieves him when necessary.

(2) The hand-elevating mechanism is used in the following manner: The clutch handwheel (see fig. 3) is turned as far as possible in the direction marked "Hand." The elevating brake is released by raising the lever. The brake drum is turned by its handle in a counterclockwise direction to elevate and in a clockwise direction to depress. The brake drum lever is lowered to stop movement of the piece.

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\*See Appendix.

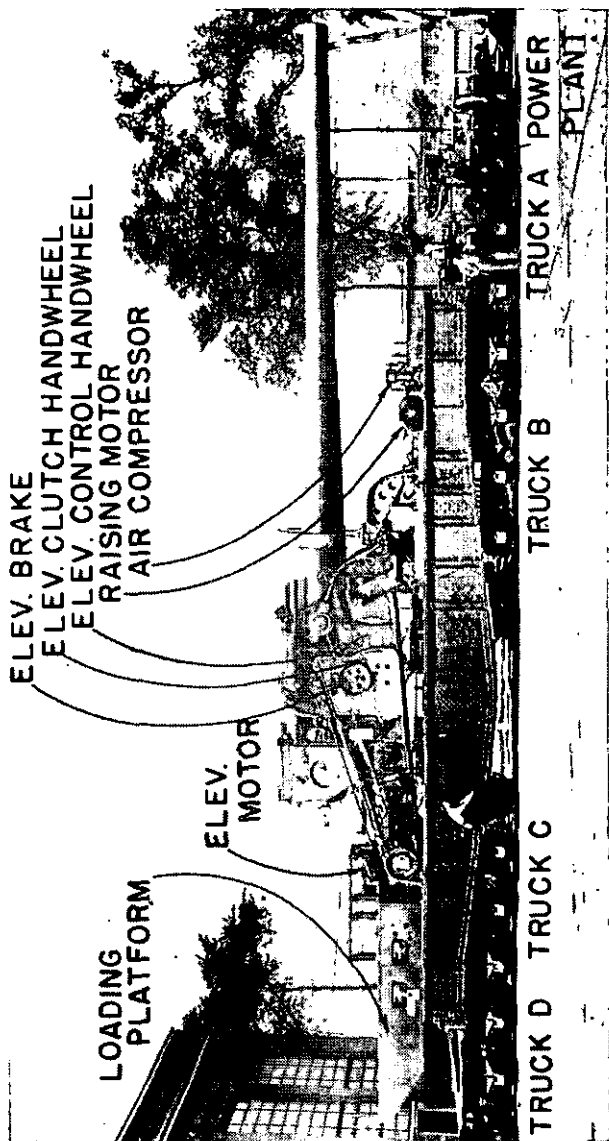


FIGURE 3.—14-inch gun railway mount, M1920.

NOTE.—Top carriage raised; some parts of mount not in place.

■ 28. TRAVERSING MOUNT.—*a. By power.*—(1) Traversing the mount by power is possible only when it is emplaced on the permanent emplacement. Power is furnished by the top carriage raising motor. The speed of traversing is governed by the amount the slow motion crank is turned from its neutral position.

(2) When the sight is used the mount is traversed by the gun pointer. When the azimuth circle and index are used the gun pointer is assisted by No. 28.

(3) The power traversing mechanism is used in the following manner: The clutch fork located on top of the left girder is moved to the position marked "Motor." The slow motion crank located near the sight bracket is rocked back and forth to ascertain that the A-end of the speed gear is in neutral. The clutch lever located at the front of the right raising gear bracket is shifted to the position marked "Power traverse of mount," and the main line switch in the control panel is closed. The handle of the drum controller of the top carriage raising motor is turned in a clockwise direction as far as possible. The motor and A-end of the speed gear are now running at full speed. The slow motion crank is turned in a clockwise direction to move the muzzle to the right and counterclockwise for a left movement. Traversing of the mount is stopped by turning the crank back to neutral.

*b. By hand.*—The mount may be traversed by hand by either slow motion or fast motion. For hand traversing, the gun pointer is assisted by No. 28 and when necessary by No. 29.

(1) For *slow motion* the hand traversing mechanism is used in the following manner: The clutch fork is moved to the position marked "Hand." The slow motion crank is turned in a clockwise direction to move the muzzle to the right and counterclockwise for a left movement.

(2) For *fast motion* the hand traversing mechanism is used in the following manner: The clutch fork is moved to the position marked "Off." The cranks on each end of the mount traversing beam are turned in the direction as indicated on the direction plate. If the piece is pointed by means of the sight, both Nos. 28 and 29 are required to traverse the mount.



■ 29. TRAVERSING TOP CARRIAGE.—*a.* The top carriage is traversed by hand only. It is used only when the piece is emplaced on the field emplacement. Nos. 28 and 29 are required to assist the gun pointer.

*b.* The top carriage is traversed in the following manner: The firing locks (fig. 4) which clamp the top carriage in the center position are unlatched and thrown outward. The traversing handwheels located above each end of the firing support are turned in the required direction.

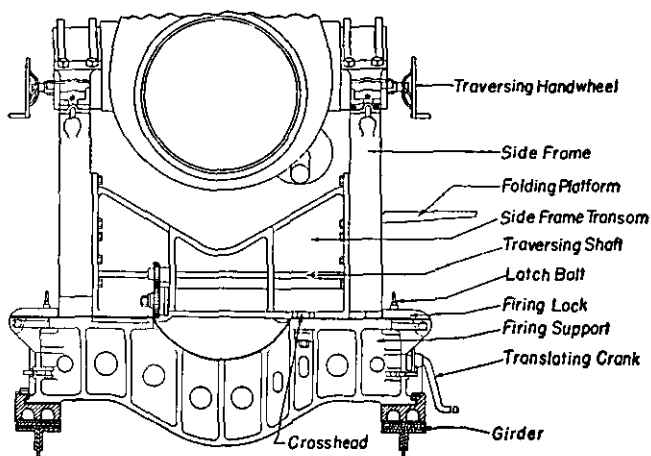


FIGURE 4.—Firing support and top carriage traversing mechanism.

■ 30. OPERATION OF AMMUNITION CRANES.—*a. By power.*—(1) The two ammunition cranes (fig. 5) are similar in construction and operation. They may be used interchangeably for either projectiles or powder charges by changing the shot tongs and powder tray. Each crane has a separate winch for hoisting and a separate sluing mechanism for swinging the crane. Nos. 7 and 8 operate the cranes.

(2) The cranes are operated by power in the following manner: Each crane is operated by means of two removable control levers which are attached to shafts projecting through the floor of the loading platform. The hoisting



FIGURE 5.—Mounts on field emplacements.

lever is straight and the sluing lever is L-shaped. The hoisting control shaft is nearer the loading tray than the sluing control shaft. To connect the mechanism for power operation each control lever is rocked back and forth to ascertain that the speed gears are in the neutral position. The clutches on each side of the loading platform are moved to the position marked "Motor." The clutch treadles near the crane masts are pushed down and the toggle pins inserted. The handwheel at each crane is raised until the pinion at the bottom is disengaged from its gear and held in this raised position by inserting the yoke between the shoulder on the shaft and the upper bracket. The motor located under the loading platform is started by turning the controller located in a box on the right side of the loading platform near the upper pintle. The control levers are moved in the desired direction for moving the projectile or powder charge.

(3) *Stops* are provided so that each crane can be swung from the center line of the mount in front, outward, to the center line of the mount in rear of the crane. The sheave block (above the tongs or tray) can be raised until it is 4 inches below the sheave pin and lowered until it is slightly more than 30 feet below its maximum raised position. A no-load stop operates to stop the mechanism if the projectile or powder tray comes to rest on anything within the above hoisting limits. The no-load stop is automatically disengaged when the hoisting mechanism is moved in the direction for raising.

b. *By hand.*—The ammunition cranes are operated by hand by Nos. 7 and 8, and 31 to 36, inclusive.

(1) The *hoisting mechanisms* are provided with both fast and slow motion crankshafts for hand operation. These shafts project through the sides of the loading platform and are marked with appropriate direction plates. The hoisting mechanisms are operated by hand in the following manner: The control shafts for power hoisting are placed in the neutral position. The clutches on the side of the loading platform are moved to the position marked "Hand." If the clutches will not engage, the hand cranks are turned slowly until they do engage. The cranks are turned in the direction

indicated for raising or lowering. In addition to the stops described under power operation of the cranes, the hoisting mechanisms are provided with automatic brakes which prevent the mechanisms from turning when the hands are removed from the cranks.

(2) Hand sluing is provided by a handwheel at each crane. A pinion attached to the end of the shaft engages in a stationary gear. The sluing mechanisms are operated by hand in the following manner: The control shafts for power sluing are placed in the neutral position. The clutch treadles are pulled out, the toggle pins inserted, the yokes which hold the pinions disengaged removed, the shafts lowered, and the pinions engaged in the gears. The handwheels and shafts turn with the cranes. Stops prevent the mechanism from turning beyond the limits described for power operation.

■ 31. **LOADING.**—*a.* At the command **LOAD**, No. 7 hoists a projectile and places it on the loading tray (fig. 6) as prescribed in paragraph 30. The gun is depressed to the loading position (minus  $7^{\circ}$ ), the breech platform pushed down until it latches, and the breechblock opened. The spanning tray is pushed into the breech recess. The shell stop on the right side of the loading tray is released, and the projectile is pushed down the tray and into the gun. The powder charge is loaded in a similar manner. The spanning tray is pulled back, the breechblock closed, the primer inserted, the breech platform raised, and the chief of breech commands or signals: **ELEVATE.**

*b.* Loading of the projectile is done by hand. No rammer is used. The shell trough and top of the spanning tray must be kept smooth, free from paint, and lightly greased before use. Care must be exercised to insure that the shell stop is in the proper position when the projectile is released from the shot tongs.

■ 32. **POINTING AND FIRING.**—*a.* The normal method of pointing these guns is case III.

*b.* For *case III firing*, the gun pointer sets the azimuth posted on the display board and traverses the piece, or causes the piece to be traversed, until the vertical crosswire of the sight is on the aiming point or until the azimuth pointer is

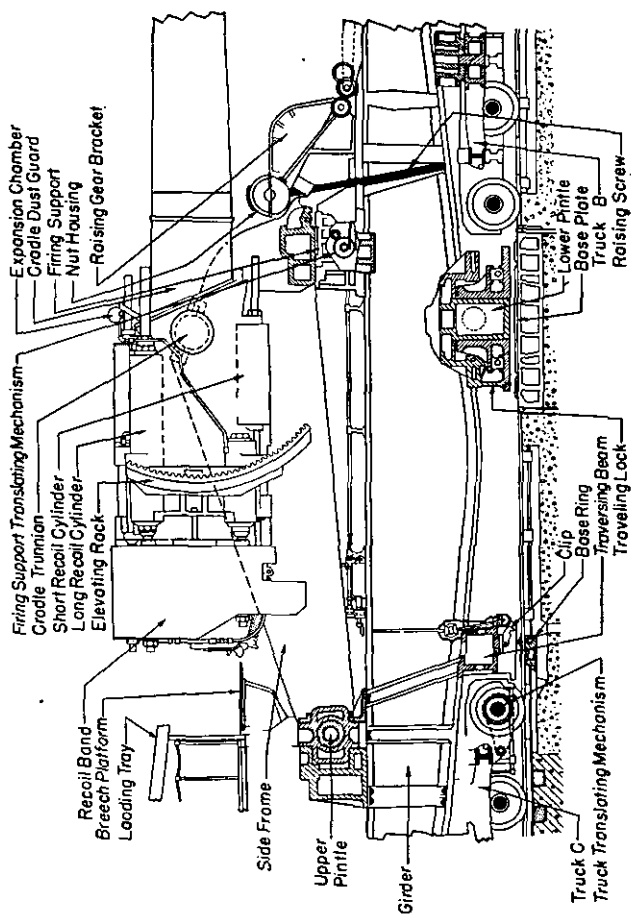


FIGURE 6.—Right side of mount.

at the proper setting. The elevation setter sets his quadrant to correspond to the elevation posted on the display board, directs No. 6 to elevate the piece until the level bubble is centered, and calls or signals, "Elevation set." The gun pointer then centers the crosslevel bubbles, traverses the piece until the vertical crosswire of the sight is accurately on the aiming point, and calls or signals, "Azimuth set." The gun commander commands or signals: FIRE, at the sounding of the proper time interval signal.

c. For case II firing, the gun pointer sets the deflection and traverses the piece, keeping his line of sight on the target. Concurrently the elevation setter elevates the piece as prescribed above. After the report "Elevation set," and the piece is ready to fire, the gun commander calls, "Ready." The gun pointer then fires the piece, if firing by magneto, or commands: FIRE, if firing by lanyard.

d. At the command or signal FIRE, if firing by magneto, the gun pointer pulls the handle of the firing magneto. If firing by lanyard No. 1 pulls the lanyard. As soon as the piece is fired, the gun is depressed to the loading position, the breech platform lowered, the lanyard unhooked, and the breech opened. As soon as the mushroom head is wiped, the chief of breech makes an inspection of the bore and chamber to see—

(1) That the bore and chamber are clear of burning fragments.

(2) If by day, that daylight can be seen through the bore.

(3) If by night, that the entire bore is clear of flame or luminous gases.

He then closes the gas ejector air valve and calls, "Bore clear." The piece is then loaded as prescribed in paragraph 31.

■ 33. RECOIL PARTS LOCK.—The recoil parts lock consists of a stud and nut located below and to the left of the recoil band, and locks the recoiling parts to the cradle. This nut should be unscrewed prior to firing, but it must not be unscrewed if there is insufficient air pressure in the recuperators. If it should happen that the nut is not removed and the gun is fired, the nut will break and no damage will result to the gun or cradle.

■ 34. MEASURING LENGTH OF RECOIL.—The length of recoil (normal, 35 inches; maximum, 37 inches) should be checked frequently during firing. The upper right pull rod is provided with graduations and an indicator to measure the length of recoil. (See fig. 8.)

■ 35. SETTLING OF MOUNT DURING FIRING.—During high angle firing from a field emplacement, the roadbed will settle under the lower pintle base plate (fig. 6) and the mount traversing beam. The rear outrigger floats will settle at low angle firing. Therefore after each round the front and rear span bolsters should be moved slightly back and forth by means of the truck translating mechanism to see if the mount tends to move. If the mount moves, both ends should be lowered until it is possible to move the span bolsters without moving the mount. Each outrigger should then be again screwed to a solid bearing in its float.

■ 36. WITHDRAWAL OF DUMMY AMMUNITION.—*a.* Hand extractors are inadequate to pull the dummy projectile up the 7° incline and lift it over the edges of the spanning tray and loading tray. At the command UNLOAD or CEASE FIRING, when dummy ammunition is used, the piece should be unloaded in the following manner: The breech is opened, the spanning tray placed in it, and the sections of the dummy powder charge are withdrawn by means of the hand extractor. They are placed on the powder tray and lowered to the powder serving detail. Blocks and tackle are used to withdraw the dummy projectiles. One block is attached to the rear end of the loading tray (fig. 7). The projectile is unseated from the forcing cone and withdrawn into the powder chamber by means of the hand extractor. The other block is attached to the base of the projectile, and the projectile is pulled onto the loading tray by the blocks and tackle.

*b.* The spanning tray must be held in its position in the breech recess so that it will not slide back when the base of the projectile hits it and while the projectile is sliding over it. Care must also be exercised as the projectile is raised from the spanning tray to the loading tray. Be sure the projectile is resting against the shell stop before the spanning tray is withdrawn from its position in the breech.

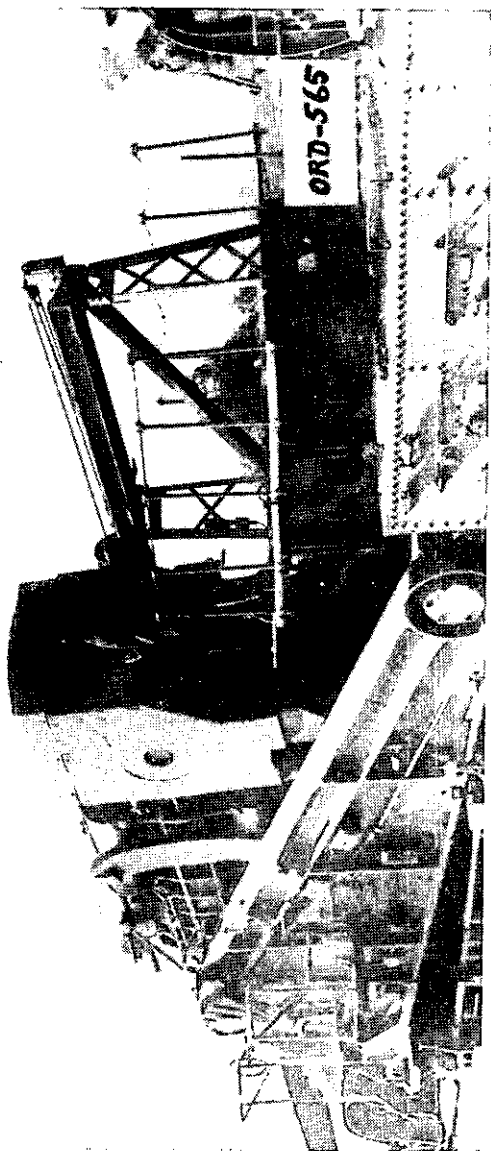


FIGURE 7.—Extracting dummy projectile.



■ 37. THE COMMAND RE-LAY.—At the command RE-LAY, the display board operators post new data as soon as received on their display boards, and No. 1 slacks his lanyard. The gun pointer and the elevation setter set the new azimuth and elevation, respectively, and point the piece as described in paragraph 32.

■ 38. THE COMMAND STAND FAST.—If it is desired to halt all movements of matériel and personnel, the officer in charge of the emplacement or the chief of section commands: STAND FAST.

## CHAPTER 5

### SAFETY PRECAUTIONS

■ 39. GENERAL.—*a.* The following safety precautions are prescribed for peacetime conditions. They indicate, as well, the principles to be followed in war service conditions, but should be interpreted by the battery executive according to the circumstances existing at the time of any particular emergency.

*b.* Further instructions concerning safety precautions to be followed will be found in AR 750-10 and FM 4-20.

■ 40. THE COMMAND CEASE FIRING.—*a.* Any individual in the military service will command or signal CEASE FIRING if he observes any condition which makes it unsafe to fire.

*b.* At the command CEASE FIRING, given when the piece is loaded, lanyards will be detached.

■ 41. FIRING LOCK, MK. I.—*a.* The firing lock, Mk. I, will be inspected and tested frequently, and immediately before firing, to insure proper operation and functioning of the safety features.

*b.* To test the safety features of the mechanism, a combination electric and percussion primer will be inserted before the breech is fully rotated. A strong pull will be exerted on the lanyard while the block is rotated manually to ascertain if it is possible to fire the primer before the breech is closed and locked. The electric features of the mechanism will be similarly tested.

■ 42. LANYARD.—The lanyard will be pulled with a quick, strong pull (not a jerk) from a position as near the rear of the piece as is convenient.

■ 43. PRIMERS.—Precautions in the care and handling of primers will be observed as follows:

*a.* Prior to firing, the primer pouch will be examined to make certain that it contains live primers only.

*b.* Care will be taken not to drop primers.

c. Except when used in test of safety features, primers will not be inserted until after the breechblock has been closed and locked in its recess.

d. Fired primers will be discarded as soon as they are removed from the firing mechanism.

e. Necessary precautions will be taken to prevent any attempt to use a primer that has failed.

f. Any primer removed after an attempt to fire will be handled with great care because of the possibility of a primer hangfire.

■ 44. SERVICE OF POWDER CHARGES.—In the ammunition car (or at the field magazine) all powder charges will be kept in their containers except the charge which is to be served to the piece for the next succeeding round. The powder charge for any given round will not be brought near the breech until the preceding round has been fired, the face of the mushroom head wiped, and the bore announced "clear" by the chief of breech. (See par. 32 d.)

■ 45. SPONGING POWDER CHAMBER.—In case of failure of the air supply, the powder chamber will be sponged and the face of the mushroom head wiped after each shot with the liquid provided for that purpose. (See par. 67.)

■ 46. POOR VISIBILITY.—During target practice, firing will be stopped at once if visibility becomes so poor as to endanger the tug or shipping in the field of fire.

■ 47. MISFIRES.—a. A misfire occurs if the piece fails to fire when desired. In case of a misfire all personnel will remain clear of the path of recoil and the piece will be kept pointed at the target or at a safe place in the field of fire.

b. *If the primer is heard to fire* it will not be removed nor the breechblock opened until 10 minutes have elapsed since the primer fired.

c. *If the primer is not heard to fire* at least three attempts will be made to fire it. If a special device, by which the primer can be removed by an individual standing clear of the path of recoil, is available, the primer may be removed and examined 2 minutes after the last attempt to fire. If the

primer *has not fired*, a new one may be inserted and firing continued. If the primer *has fired*, a new primer will not be inserted nor the breechblock opened until at least 10 minutes have elapsed since the last attempt to fire. If such a special device is not available, the primer will not be removed nor the breechblock opened until 10 minutes have elapsed since the last attempt to fire. (See FM 4-20.)

## CHAPTER 6

### CARE AND ADJUSTMENT OF MATÉRIEL

■ 48. GENERAL.—*a.* Officers will be held strictly responsible for the proper care and preservation of all artillery matériel in their charge.

*b.* The methods prescribed for the operation, care, and preservation of matériel are those described herein and those contained in other publications issued by the War Department, a thorough understanding of which is required on the part of all officers and others having matériel in their charge.

*c.* Major repairs will be made by the services concerned. Adjustments and minor repairs will be made by battery personnel.

■ 49. RECUPERATOR SYSTEM.—The recuperator system is hydro-pneumatic and consists of two cylinders, one above the gun and one below the gun. (See fig. 8.) A floating piston separates the liquid from the gas in each cylinder. At the rear

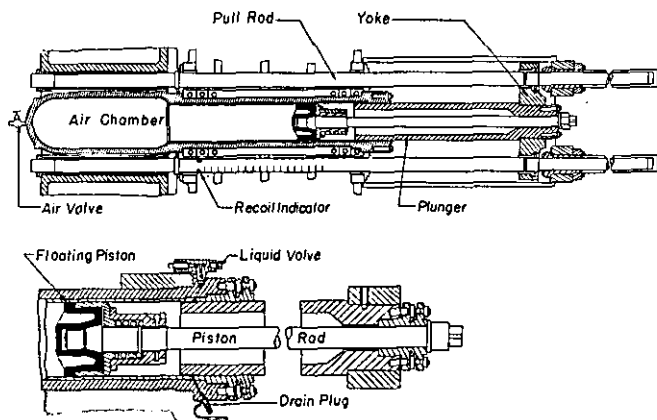


FIGURE 8.—Recuperator cylinder.

of each cylinder is an air valve, and on the top of the upper cylinder and the bottom of the lower cylinder is a liquid valve. The air chambers and liquid chambers are connected by tubing and are also connected to the air and the liquid pressure gages. The liquid chambers are also connected to the liquid pump. The liquid used in the recuperator system is a mixture of glycerin and water described in paragraph 66. Nitrogen is authorized for use in the air chambers.

■ 50. FILLING LIQUID CHAMBER.—*a.* The liquid capacity of each of the recuperator cylinders is  $6\frac{3}{4}$  gallons. If the cylinders are empty or partially filled, tubing and a funnel can be attached to each liquid valve and the liquid poured into the cylinders without using the liquid pump.

*b.* Each liquid valve is connected by tubing (see fig. 9) to the liquid pipe connection on the cradle. A tube connects the liquid pipe connection with the liquid pressure gage, and a third tube connects it with the liquid pump.

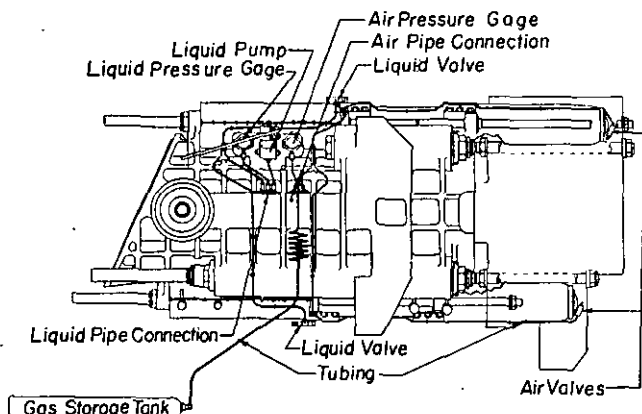


FIGURE 9.—Piping for filling recuperator cylinders.

*c.* The liquid pump is fastened to the same support as the pressure gages. It is filled by unscrewing a cap in the cover and drained by unscrewing a plug in the bottom. The relief valve is designed to blow off at a pressure of 2,200 to 2,500 pounds per square inch and insures no damage to the

pump from excessive back pressure. This relief valve is adjusted and tested by the manufacturer and should not be tampered with.

d. To fill the cylinders, open the liquid valves and read the pressure registered on the liquid pressure gage. If the pressure is less than the normal indicated on the scale, pump more oil into the system by operating the lever of the liquid pump. When the gage indicates the proper pressure, cease pumping and close the liquid valves.

■ 51. FILLING AIR CHAMBER.—a. The air valve (fig. 9) located at the rear end of each recuperator cylinder is fitted with two needle valves, one for emptying and one for filling. For use of the emptying valve, see paragraph 54e. The filling valves are connected by tubing with the air pipe connection fastened to the cradle. This connection is connected by tubing to the air gage. The air pipe connection has an inlet, with plug, by which the coiled tubing from the compressed gas cylinder is attached.

b. The filling valves are opened and the gas pressure in each cylinder is read. If the pressure is below 1,980 pounds per square inch more gas is required. The filling valves are closed. The compressed gas cylinder is attached to the air pipe connection by means of the coiled tubing. The filling valves are opened. The valve on the compressed gas cylinder is opened and the cylinders charged until the air pressure gage indicates 1,980 pounds per square inch. The valve on the compressed gas cylinder is closed. The filling valve on each air valve is closed, the coiled tube disconnected, and the plug in the air pipe connection screwed home.

c. If the pressure in the cylinders is low, more than one compressed gas cylinder of gas may be required.

■ 52. RECOIL MECHANISM.—a. The recoil mechanism (fig. 6) consists of 4 cylinders, 2 short and 2 long. The cylinders are fastened to the cradle. They are filled with the mixture of glycerin and water described in paragraph 66. The capacity of each of the short cylinders is 17 gallons. The capacity of each of the long cylinders is 27½ gallons.

b. The expansion chamber located on top of and at the front end of the cradle is so placed that at any elevation of the gun it is the highest unit of the recoil system. It is connected by pipes to the forward end of all the recoil cylinders. Its purpose is to keep the entire system filled with liquid and also to provide space for the liquid to expand when heated.

■ 53. FILLING RECOIL CYLINDERS.—*a.* Each of the short recoil cylinders has a drain plug at the bottom of its rear end. Each of the long cylinders has a drain plug at the rear end, and in addition the pipe plug at the front end can be readily removed for the purpose of draining the bottom of the front part.

*b.* The gun will be set at zero elevation. The recoil cylinders are filled through a funnel which is to be attached to the expansion chamber. Close the drain plug at the lower rear end of each cylinder. Open the filling plug or vent at the upper rear end of each cylinder to permit the escape of air. Close each vent when the liquid starts flowing out of it. Pour in liquid until each cylinder is completely filled.

■ 54. EXERCISING RECOIL MECHANISM.—If firing is not conducted, the recoil mechanism will be exercised at intervals of approximately 6 months. The method to be employed in exercising the mechanism follows:

*a.* With the recuperator cylinders fully charged, the recoil cylinders filled, the gun well-lubricated in the cradle, and the cradle set at zero elevation, the maneuvering valve (if installed) is closed.

*b.* The gun is then set at maximum elevation (against the stops) and the firing parts lock nut unscrewed.

*c.* The air filling valves on the recuperator cylinders are opened.

*d.* The maneuvering valve is opened and the gas in the recuperators permitted to escape. The air pressure gage will indicate the existing pressures.

*e.* If a maneuvering valve has not been installed, the gas is released by means of the emptying needle valve in each air valve. The procedure is similar to that when a maneuvering valve is used.



f. When the air pressure has dropped sufficiently, the gun will slide back a short distance, being stopped by the building up of air pressure in the recuperators.

g. The gun is thus brought to the "full recoil" position by successive movements and the maneuvering valve closed.

h. The condition of all exposed parts is then ascertained.

i. To return the gun to battery, fully charged compressed gas cylinders are coupled to the maneuvering valve outlet or the air pipe connection and the recuperators filled as prescribed in paragraph 51.

■ 55. OBTURATOR.—The care and adjustment of the obturator are fully covered in \*TM 9-425. The obturator is of the steep coned type and is automatically kept in proper adjustment by a coil spring. It is keyed to the breechblock and constrained to rotate with the block.

■ 56. FIRING LOCK, Mk. I.—The care and adjustment of the firing lock, Mk. I, are fully covered in \*TM 9-425. It is used with combination electric and percussion primers.

■ 57. MOUNT LIFTING MECHANISM LOCKING DEVICES.—a. A *traveling stop* is provided on each body bolster to prevent vibration which may cause the mount to lower itself or move on the alining beam during railroad movement. Turning a handwheel on the top of each body bolster forces a plunger into a recess in one of the lifting gears. Each of these stops must be engaged when the mount is prepared for movement.

b. A locking pin, operated by a handwheel on the front end of the front body bolster, fits into a hole in the alining beam and prevents movement of the alining beam during railroad movement. This pin must be engaged when the mount is prepared for railway movement.

c. The *lifting screws* (fig. 13) in each body bolster are provided with automatic stops which are operated by the movement of the body bolsters at each end of their travel. This prevents damage to the mount lifting mechanism. The stops are released as soon as the mechanism is turned in the opposite direction.

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\* See Appendix.

■ 58. RAISING SCREWS.—*a.* Raising and lowering the top carriage is the most delicate operation in emplacing the gun. The raising screws (fig. 6) become very hot as they pass through the bronze nuts in the nut housings in the raising gear brackets. Each one must be carefully watched. It is advisable to have a cannoneer force grease into the nut housings continuously while the top carriage is being raised or lowered. The raising motor is operated at not more than one-half speed and at a slower speed if overheating occurs. Be sure that all the other gears are thoroughly greased.

*b.* When the mount is in the firing position, run down the raising screws.

*c.* When the mount is in the traveling position, the raising screws remain attached to the top carriage but they are lowered so that there is no tension on them.

*d.* Variable speed is obtained by use of the drum controller when using power. A limit switch operated by the raising mechanism is provided to stop the motor when the screws have reached either end of their travel. The contacts of this switch may require occasional cleaning but the adjustment should not be changed.

■ 59. TOP CARRIAGE RAISING MOTOR.—*a.* The top carriage raising motor (fig. 3) is rated at 40 horsepower when running at 800 revolutions per minute. Under a load of approximately 10 horsepower it will run as a shunt motor at a speed of 1,480 revolutions per minute. It is provided with a magnetic disk brake which stops it quickly when the current is turned off.

*b.* It is used to raise and lower the mount, raise and lower the top carriage, and also to operate the mount traversing mechanism. A clutch is provided for engaging the motor to the various mechanisms. The clutch lever is located in front of the right raising gear bracket. A direction plate shows the position of the clutch lever for operating the various mechanisms.

■ 60. TOP CARRIAGE TRAVERSING ANTIFRICTION DEVICE.—*a.* The weight of the front end of the top carriage is carried on two traversing rollers which are supported by an antifriction device. This device is very similar to the devices on the

cradle trunnions described in paragraph 62 and in figure 10. Each roller is carried on a roller pin by small steel bearings. Each roller lever is supported at one end by a hinge pin and at the other by a spring rod forced down by Belleville springs. Adjusting nuts are provided on the spring rod for adjusting the springs so that the side frames are carried 0.02 inch above the surface of the firing support. When the piece is fired, the springs are compressed and the side frames rest on the firing support.

b. The adjustment of this device is essential when firing from the field emplacement. If the mount is canted, these devices will probably require readjustment because of the unequal weight on each roller.

■ 61. MOUNT TRAVERSING ROLLERS.—The mount is moved in traverse on the permanent emplacement by means of two rollers in the mount traversing beam which roll on the surface of the base ring. The rollers are installed in a manner similar to the antifriction devices on the cradle trunnions described in paragraph 62 and in figure 10. The rollers support the mount through Belleville springs. Adjusting nuts are installed on the spring rod to provide clearance between the mount traversing beam and the base ring. When the piece is fired the springs are compressed, and the mount traversing beam rests on the base ring. This mechanism is very sturdy and should require no adjustment.

■ 62. CRADLE TRUNNION ANTIFRICTION DEVICES.—The cradle trunnion antifriction devices (fig. 10), one on each side frame, are similar to the standard crutch and lever antifriction devices except that the trunnions are supported on roller bearings. The lever is supported at one end by a hinge pin and at the other end by Belleville springs. The proper clearance is obtained by means of adjusting nuts on the spring rod. Gages are furnished by the Ordnance Department to assure that proper clearance is maintained. This clearance must be checked before each drill or firing by the elevation setter.

■ 63. ELEVATING BRAKE.—a. As the elevating gearing is all spur gearing, the unbalanced weight of the tipping parts would cause it to turn. In order to prevent this an elevating brake (fig. 3) is provided.

b. The elevating brake, on the right side frame, consists of a brake drum and a brake band, lined with commercial brake lining, which engages the outer surface of the drum. The brake is adjusted by means of the adjusting screw on the band.

c. The brake is always on. It is released by raising a lever located above the drum. This lever must be raised when elevating or depressing the gun by hand or power. A handle on the brake drum enables the drum to be used as a hand-wheel for elevating or depressing the gun by hand.

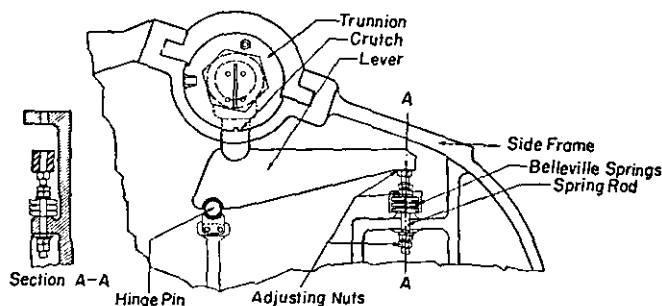


FIGURE 10.—Cradle trunnion antifriction device.

■ 64. ELEVATING STOPS.—a. In order to prevent elevating or depressing the gun beyond the limits of plus 50° and minus 7°, an elevation and depression stop is bolted to the left side of the cradle which strikes against stop pieces bolted to the inside of the left side frame.

b. An elevating cut-off is provided to stop the speed gear when the gun reaches maximum elevation or depression. This prevents damage to the power elevating mechanism which might occur if the piece were rammed hard against the stops. If the operator has hold of the handwheel when the cut-off mechanism functions, the handwheel will be rapidly turned out of his hand.

■ 65. AIR COMPRESSOR.—a. The air compressor (fig. 3) located on the top carriage raising motor transom is for the purpose of supplying compressed air for the ejection of powder gases

and closing the breechblock. It is driven by a 20 horsepower compound motor. It is an air cooled, two stage, three cylinder machine, compressing air to a final pressure of 175 pounds per square inch. It is designed for one-half time operation, with no continuous period of operation to exceed 1 hour.

b. The *oil pump* of the air compressor is provided with a regulating valve and a pressure gage which registers between 15 and 25 pounds' pressure when the bearings are in good condition and the oil pipes are not clogged nor leaking. The oil reservoir is in the lower part of the compressor and is filled through a hole in the side of the compressor. A glass gage shows the height of oil in the reservoir.

c. The intercoolers are equipped with a pressure gage and a *safety valve* set to blow off at a pressure of 90 pounds per square inch.

d. An *automatic unloading device*, connected to the main air line near the high pressure cylinder, is provided to limit the compressor to a working pressure of 175 pounds per square inch. It is provided with a trigger handle which is to be used for hand unloading. Hand unloading is intended for use only when starting the compressor motor.

e. The *air pipe line* running from the compressor to the two air storage tanks has a safety valve set to blow off at 225 pounds per square inch, a shut off valve, and a pressure gage. The line at the tanks has a shut off valve for each tank, and each tank has a safety valve set to blow off at 225 pounds per square inch. A shut off valve is provided in the line just to the rear of the flexible hose at the upper pintle. The three safety valves are additional protective devices in case the unloading device fails to work, and also in case, due to a sudden rise in temperature, the pressure of the air in storage should rise unduly due to expansion.

f. Each tank is provided with a *drain* on its lower side.

■ 66. LIQUID FOR RECOIL AND RECUPERATOR MECHANISMS.—1. The glycerin water mixture used in the recoil and recuperator cylinders will conform to the following:

Glycerin, grade A, USP, 50 parts by volume  
Distilled water, 50 parts by volume

To each gallon of mixture add 4 ounces of sodium hydroxide, CP (NaOH), sticks or pellets (1 pound sodium hydroxide to 20 gallons).

**CAUTION:** Caustic soda (lye) must not be used.

b. Water sufficiently pure for use in storage batteries, such as filtered rain water, will be used. In case of doubt, distilled water will be used.

c. Excess of sodium hydroxide will cause disintegration of the packings and corrosion of the bronze surfaces in the mechanisms. After the sodium hydroxide is thoroughly dissolved and well stirred in, the alkalinity of the solution may be tested by inserting a piece of red litmus paper which will turn blue if the solution has been properly mixed.

■ 67. SPONGING SOLUTION.—a. The sponging solution is a solution of water and castile soap. Its purpose is to provide a sponging liquid which will extinguish burning residue in the chamber of the gun and also serve to lubricate the breech recess. If the soap solution is not available, plain water may be used.

b. The preparation of the solution consists of dissolving 1 pound of castile soap in 4 gallons of water. Yellow soaps should not be used as they are likely to leave a gummy deposit in the breech recess. The soap is shaved from the bar to facilitate dissolving. It is then added to the water and the water heated until the soap is dissolved. The water should be stirred with as little agitation as possible to prevent foaming.

c. To avoid the necessity of handling large receptacles, as much soap as is required may be dissolved in one bucket of water. This concentrated soap solution can then be added to water in other receptacles in the prescribed proportions.

■ 68. CARE OF BORE.—a. As soon as possible after any period of firing, and every day thereafter until all "sweating" has stopped, the bore of the gun will be cleaned, dried, and oiled. The cleaning solution is made by dissolving  $\frac{1}{2}$  pound of soda ash in each gallon of boiling water. The bore is washed with this solution using a bore sponge wrapped with burlap. The bore is then wiped thoroughly dry with new

burlap. Finally, the bore is coated with medium or heavy rust preventive compound, depending upon local conditions.

b. Care must be exercised to prevent the staves of the sponges, slush, and cleaning brushes from rubbing against the lower portion of the bore, as excessive wear of the lands will result from such practice.

■ 69. STORAGE.—When the mount is in storage or in one place for an indefinite period, it should be let down on the track emplacement I-beams in order to remove the load from the truck springs.

## CHAPTER 7

### RAILWAY OPERATING EQUIPMENT

■ 70. GENERAL.—*a.* This chapter is intended to serve as a guide to battery commanders for the care and maintenance of the railway operating equipment, its preparation for movement, and for emergencies which may arise during movement. In time of peace, Interstate Commerce Commission and local railway regulations will govern. Equipment which is accepted by one railroad may not be acceptable to another. Therefore the battery commander must familiarize himself with the regulations of the railroad companies over which his equipment will be moved.

*b.* Figure 11 shows the mount in traveling position.

■ 71. ASSOCIATION OF AMERICAN RAILROADS CODE OF RULES.—*a.* Railroads will not accept railway equipment for movement or interchange which does not conform with the Association of American Railroads Code of Rules. Instructions concerning the care and upkeep of the running gear, air-brake equipment, and other strictly railway operating features contained in these rules will govern the maintenance operations on all railway matériel.

*b.* Copies of these rules should be in the files of all ordnance officers charged with the maintenance of railway matériel. They can be obtained by application through channels to the Commanding Officer, Raritan Arsenal, Metuchen, N. J.

■ 72. TRUCKS.—The four trucks are designated A, B, C, and D in order from front to rear. (See fig. 3.) Trucks A and D carry the car couplers and the brake rigging. Trucks B and C carry the hand translating mechanisms. Trucks A and B support the front span bolster and trucks C and D the rear span bolster upon which the girders rest. The center plate bearings and the surfaces upon which the ends of the girders rest must be kept well greased.





FIGURE 11.—Mount in traveling position.

■ 73. HAND TRANSLATING MECHANISM.—The hand translating mechanism is a device for moving the mount short distances or for removing the trucks from under the mount when the gun is emplaced on the permanent emplacement. Trucks B and C each have two separate and distinct translating mechanisms. The mechanisms are operated by cranks which are attached to shafts extending through the sides of the trucks. A clutch provided with each mechanism must be disengaged when the mount is traveling.

■ 74. BRAKES.—*a.* Trucks A and D are equipped with both hand and air brakes which operate through the same system of levers. Trucks A and D are connected by hose couplings and an air pipe line attached to the under side of the left girder. The air-brake system is standard equipment. Oil holes are provided for the principal bearings.

*b.* Local railway officials are usually very willing to cooperate by instructing a limited number of men in the care and maintenance of air-brake equipment in the railway repair shops. This instruction should be utilized whenever practicable. The Association of American Railroads Code of Rules requires air brakes to be cleaned and tested annually and certain data to be stenciled on the equipment.

■ 75. COUPLERS.—The couplers on trucks A and D are standard M. C. B. (Master Car Builders) automatic freight type with friction draft gear.

■ 76. JOURNAL BOXES AND BEARINGS.—*a. Care.*—The journal box bearing is a babbitt-lined bronze casting. Before being installed it must be thoroughly clean, have a smooth bearing surface free from irregularities, and a proper bearing. Sandpaper, emery paper, or emery cloth should never be used for the purpose of removing irregularities from the bearing surface. A half round file or scraper should be used. Care must be taken that the wedge has a good contact on the crown of the journal bearing. The surface of the journal should be smooth and thoroughly clean before the bearing is installed. When installing a bearing, a coat of lubricating oil must be applied to the bearing surface. Never wipe the bearing surface of the journal bearings with waste.

*b. Packing.*—(1) *General.*—Colored wool waste is used for packing the journal boxes. New waste must be soaked in car journal oil for at least 48 hours at a temperature of not less than 70° F. before being packed into journal boxes.

(2) *Application.*—(a) *Inner.*—In packing a journal box, twist somewhat tightly a rope of packing and place it in the extreme back part of the box. Make sure that it is well up against the journal so as to lubricate properly the fillet on the journal and keep out the dust.

(b) *Main.*—Apply sufficient packing (preferably in one piece) to fill the space between the inner packing and the journal collar. Take care to have this packing bear evenly along the full length of the lower half of the journal. The packing should not be too tight but should be tight enough to overcome any tendency to settle away from the journal. The packing should extend to approximately the center line of the journal *but not above at any point*, and should be pressed down evenly at the sides so that no loose ends may work up under the journal bearing.

(c) *Outer.*—Apply a third piece of firmly twisted packing in front of the main packing and to the height of the bottom of the journal collar. Pack tightly in order to prevent displacement of the main packing. There must be no loose ends hanging out of the box as they tend to draw out the oil.

*c. Base for jacks.*—A piece of boiler plate or 4- by 6-inch oak plank sufficiently long to rest on two ties should be available as a base for each jack when changing bearings.

■ 77. WEIGHT.—The great weight of this gun and mount (750,000 pounds) makes it mandatory that the strength of all bridges, trestles, and culverts to be crossed is carefully checked either from data obtained from the Chief of Engineers or from the officials of the railway lines to be used.

■ 78. REQUIREMENTS OF GOOD TRACKS.—A good track must be regular in alinement and profile and without kinks or sharp bends. In going over the line to verify the profile by a glance of the eye, from time to time place the eye close to the rails, looking along the track as far as possible. The ends of the rails must not touch each other, as suf-

ficient space for expansion is required between them. Each joint must be made with 2 splice plates fastened with 4 bolts (6 bolts for heavy work). Every bent or broken rail must be replaced. Loose ties (insufficiently tamped) must be made solid by tamping. Broken and rotted ties which depress under the passing of trains must be replaced. The ballast must be porous and firm. If the base is wet or muddy it lacks resistance and must be drained or the track will not retain its profile.

■ 79. MOVEMENT OF EXPLOSIVES.—The movement of explosives by rail is covered by regulations of the Interstate Commerce Commission and also by the municipal ordinances of various cities. Local railway officials should be consulted in reference to those regulations.

■ 80. MISCELLANEOUS PREPARATIONS.—The following suggestions are given to assist the battery commander in training his organization and preparing his matériel for railway movement:

a. Instruct the individual in charge of a rail movement in the procedure to be followed if repair work on the road becomes necessary, such as the supply department to which bills are to be sent, limitations on the cost of repairs he may authorize, and necessary forms and reports to be accomplished.

b. Have personnel trained and equipment available for packing journal boxes and replacing bearings. At each stop, all journals should be inspected for overheating.

c. Arrange for a preliminary inspection of running gear by the receiving railway officials.

d. Exercise the running gear whenever possible. Equipment should be moved a sufficient distance so that the journals will become "warmed up."

e. Have spare air hoses available.

f. Whenever possible move the gun with the muzzle trailing.

g. If the gun is to be fired from the field emplacement, be sure that it arrives at the position with the muzzle pointing in the direction of fire.

*h.* Make up the train with an empty flatcar or gondola at each end of the gun car.

*i.* Be sure "explosive" labels are placed on ammunition cars.

*j.* Have sandbags and marlin available for revetments in case heavy rains threaten washouts on a firing spur.

## CHAPTER 8

### EMPLACEMENT AND WITHDRAWAL FROM POSITION

	Paragraphs
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II. Field emplacement.....	86-97
III. Permanent emplacement.....	98-107
IV. Withdrawal from position.....	108-113

#### SECTION I

##### GENERAL

■ 81. SCOPE.—*a.* The methods of emplacing covered in this chapter are for the field emplacement as well as the permanent or fixed emplacement. Many of the operations of emplacing the mount on both types of emplacement are similar. Because of the great weights of the parts to be maneuvered, power should be used wherever possible to avoid undue fatigue of the personnel.

*b.* In general, the various operations of emplacing the mount are performed in the same order as described in the following sections.

■ 82. REQUIREMENTS.—The location of the gun position having been determined, the access tracks are inspected to see that they are level for at least 100 feet immediately approaching the position. This is extremely important as it will be difficult to emplace and remove the gun if this requirement is not met. The ties must be sound and properly spaced (20 ties per 33-foot rail). The rails must be securely spiked and the track well-ballasted.

■ 83. DUTIES OF PERSONNEL.—*a.* All numbers of the gun section assist in emplacing the mount.

*b.* The battery executive or an assistant battery executive should check all the operations of emplacing or removing the mount. When the mount has been emplaced or made ready for movement, he should make a thorough inspection to assure himself that all parts are in proper condition.

c. In the instructions which follow, no attempt has been made to assign specific duties to the various members of the gun section. The gun commander should assign duties to the various cannoneers in accordance with their ability, experience, and physical qualifications. He should arrange reliefs for personnel performing strenuous manual labor such as digging pits for outrigger floats or raising or lowering the top carriage by hand.

■ 84. SAFETY OF PERSONNEL.—Because of the great weights of the various parts of the mount and its accessories, all personnel should be cautioned never to get underneath a part which is being raised or lowered. This is especially true when handling the outrigger floats and applies equally well when other parts of the mount are being raised or lowered.

■ 85. SIGNALS.—Appropriate hand or whistle signals are very convenient as the noise made by the moving parts makes oral commands practically useless.

## SECTION II

### FIELD EMPLACEMENT

■ 86. GENERAL.—*a.* The field emplacement (fig. 12), also called the track firing platform, is for the purpose of supporting the mount when firing from a track in the field. It can be built on a straight track or on a track with a maximum curve of not more than  $9\frac{1}{2}^{\circ}$ , radius 604 feet. I-beams are placed under the lower pintle base plate and the mount traversing beam. Six outriggers are used, four in rear and two in front. The trucks remain under the mount but do not carry any of the firing load. The piece can be traversed by the top carriage traversing mechanism only, which permits a maximum traverse of  $3\frac{1}{2}^{\circ}$  in either direction.

*b.* If the maximum traverse of  $7^{\circ}$  will not be sufficient for the field of fire required, the mount can be emplaced on a sufficiently long curved track, and several emplacements can be constructed so that the mount can be moved from one position to another. If the track has a curve of  $9\frac{1}{2}^{\circ}$  and the mount is moved 63 feet, the field of fire will be changed  $6\frac{1}{2}^{\circ}$ .

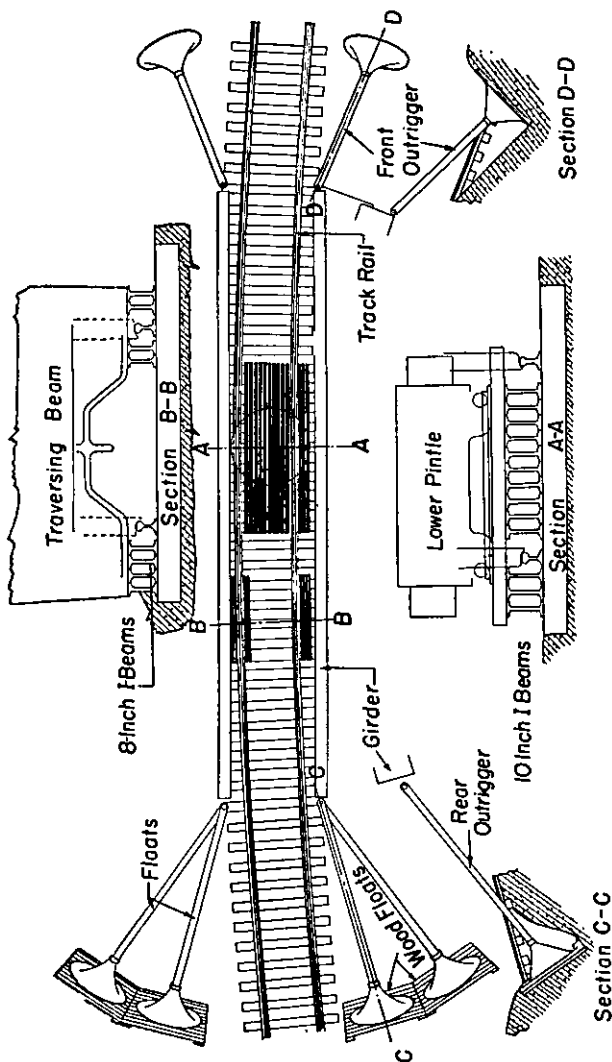


FIGURE 12.—Field emplacement.



■ 87. HOW TO EMPLACE.—*a.* The mount is emplaced for firing on the field emplacement by a series of separate and distinct operations enumerated below. Detailed instructions for each operation are described in the succeeding paragraphs.

(1) Place the I-beams on the ties under the lower pintle base plate and mount traversing beam.

(2) Dig holes for and emplace the outrigger floats.

(3) Lower the mount on the outriggers and I-beams.

(4) Set the outriggers.

(5) Raise the top carriage.

(6) Place the firing support in position.

(7) Run down the top carriage raising screws.

(8) Set up the ammunition cranes and the loading tray.

*b.* Some of the foregoing operations should be completed before the gun arrives at the emplacement. Some of the other operations can be performed simultaneously.

■ 88. PRELIMINARY PREPARATION.—*a.* The field emplacement should be constructed before the gun arrives at the position. All ties must be well bedded and tamped. The spikes must be driven in solidly and all rail joints bolted tightly. If the ground under the roadbed is soft, it is advisable to place extra ties or bridge timbers under the rails to provide additional bearing surface on the ground for the I-beams. If this is not done the weight of the gun will probably cause the platform to settle.

*b.* The pits for the outrigger floats should be excavated, and plenty of road ballast should be on hand for banking. The wooden floats should be placed in position in the pits. Figure 12 shows the location of the six outriggers and floats when the track has a curve of  $9\frac{1}{2}^{\circ}$ .

*c.* The twelve 10-inch I-beams are centered under the location for the lower pintle base plate (fig. 12). The number between and outside the rails will vary in accordance with the curvature of the track. The eight 8-inch I-beams are centered under the location for the mount traversing beam. The I-beams must have a solid bearing on all ties.

■ 89. MOVING MOUNT ON EMPLACEMENT.—*a.* If possible, use the locomotive which hauls the mount to the position to push

or pull it on the field emplacement. If this is not practicable use the battalion locomotive or the hand translating mechanism.

b. As the mount nears the emplacement the power plant is started. The power plant is connected to the mount by the short interconnecting cables. All the girder side platforms are unfolded.

c. The mount is moved slowly on the emplacement and stopped when the lower pintle base plate is centered over the I-beams. *Be sure to release the lower pintle traveling lock.* The firing wedges are placed under all the journal boxes of the trucks. The mount is now ready to be lowered on the platform.

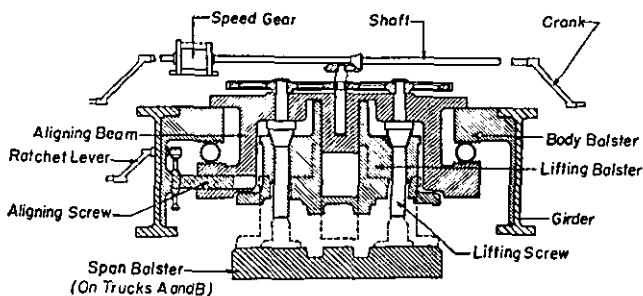


FIGURE 13.—Mount raising and aligning mechanism.

■ 90. LOWERING MOUNT.—a. *By power.*—The mount is lowered by power in the following manner: The traveling stops at both ends of the girders are withdrawn by turning the appropriate handwheels on each body bolster (fig. 13). The clutch levers which are on the left side of each body bolster are set at the position marked "Motor." The control shaft of the A-end of the hydraulic speed gear located near the top carriage raising motor is placed in the neutral position. The top carriage raising motor is started by shifting the clutch lever located at the front of the right raising gear bracket) to the position marked "Power raise or lower mount on trucks," the main line switch in the control panel is closed, and the handle of the drum controller is turned in a clockwise direction as far as it will go. The motor and the A-end

of the speed gear will now be running at full speed. The control shaft of the A-end of the speed gear is turned in the direction indicated for lowering. It is probable that one end of the mount will be lowered before the other, but the automatic stops will prevent damage to the mechanism.

*b. By hand.*—The mount is lowered by hand in the following manner: The cranks are placed on the fast motion shaft on each side of each body bolster. The traveling stops are withdrawn as prescribed in *a* above. The clutch levers which are on the left side of each body bolster are set at the position marked "Hand." The cranks are turned in the direction indicated on the direction plate to "Lower." Four men are required on each crank.

■ 91. SETTING OUTRIGGERS.—When the mount has been lowered so that the lower pintle base plate and the mount traversing beam (fig. 12) are resting on the I-beams, the top carriage raising motor is stopped by turning the drum controller handle to the "Off" position if the mount is being lowered by power. The six outriggers are swung into their positions in the sockets of the floats and the ends are screwed to a solid bearing. The front outriggers are swung into position by means of the 1-ton triplex blocks attached to each hanger (fig. 11). The ammunition cranes are used to swing the rear outriggers into position. The wooden floats are banked and tamped. If the ground is soft, the outriggers may not hold and it will be necessary to brace them with bridge timbers. When the outriggers have been screwed to a solid bearing in the steel float, slowly lower the mount until the lifting bolsters (fig. 13) are just touching the center plates of the span bolsters. The lifting bolsters are then run down until they just make contact with the span bolsters. The speed gears are stopped by turning the control shaft on the A-end to the neutral position.

■ 92. MOVING TRUCKS.—The trucks are left under the mount when it is emplaced in the field position, but they do not support any of the weight of the mount. If it is desired to move the trucks or the mount, the four cranks are placed on the shafts of the translating mechanism and clamped. Two cranks are placed on the B truck and two on the C

truck (fig. 3). The clutch levers on each translating mechanism are pulled out to the position marked "In." If the wheel brakes are on, they are released. The trucks without the mount can be moved by one man on each crank. If the mount is to be moved, two men are required on each crank. If the track is not perfectly level, the men will probably require the assistance of other cannoneers with car pushers to move the mount.

■ 93. RAISING TOP CARRIAGE.—*a. By power.*—The top carriage is raised by power in the following manner: The clutch lever at the front of the right raising gear bracket is shifted to the position marked "Power raise or lower top carriage." The gun traveling lock bracket (fig. 11) and all timbers or blocking which support the muzzle of the gun are removed. The top carriage raising screws are cleaned and well lubricated. All bolts and other parts which have worked loose and are liable to become caught between the girders and the side frames are tightened or removed. The drum controller is turned slowly in the direction for raising, the controller handle being held on each notch for a few moments until the one-half speed position is reached. A speed higher than one-half should not be used unless it is absolutely necessary. The raising mechanism, especially the raising screws, must be observed continuously for overheating caused by the great weight (140,000 pounds) on each screw. It may be necessary to force grease into the nut housings (fig. 6) frequently while the top carriage is being raised. The top carriage can be raised to the firing position in approximately 16 minutes. As the top carriage nears the firing position, the controller handle is turned back until the top carriage is rising very slowly and held at this position until it is stopped by the limit switch. *Be sure that the cranks for hand raising or lowering the top carriage are not on the ends of the cross shaft.*

*b. By hand.*—In case the electrical equipment is out of order it will be necessary to raise the top carriage by the hand-raising mechanism. It is raised by hand in the following manner: The clutch lever at the front of the right raising gear bracket is shifted to the position marked "Power traverse of mount also hand raising or lowering

of the top carriage or of mount on trucks." A crank is placed on each end of the cross shaft and turned in the direction marked "Raise." Four men are required on each crank. The reduction in the gear train is so great that it requires an exceedingly long time to raise or lower the top carriage by hand, and power should be used whenever possible.

■ 94. PLACING FIRING SUPPORT IN POSITION.—The firing support is placed in position (fig. 4) in the following manner: When the top carriage has been raised either by power or by hand to the firing position, the bolts which lock the firing support to the raising gear brackets are unlatched. The cranks are placed on the ends of the translating shafts, one on each side of the firing support, and turned in the direction to move the firing support to the rear. Two men are required on each crank. When translating the firing support to the rear, be sure that the large nut on the bottom of the side frame transom is in the correct position to receive the crosshead in the top of the firing support. The nut can be moved by turning the top carriage traversing handwheel. When the firing support has been moved to the rear as far as it will go, the latch bolts fastening it to the horizontal girder transom are tightened. The clip lever at the rear of the firing support is moved to a horizontal position. Unlatch and throw outward the firing locks located on each side of the firing support; otherwise these locks will prevent traversing of the top carriage.

■ 95. RUNNING DOWN RAISING SCREWS.—When the firing support has been locked in position under the top carriage, the raising screws are run down as far as they will go. If power is used the procedure is the reverse of that prescribed in paragraph 93. If the screws are to be lowered by hand, the crank on the right end of the cross shaft is moved to a shorter shaft a small distance to the rear which connects to the fast motion mechanism. The crank on the left side is not required and is removed.

■ 96. SETTING UP AMMUNITION CRANES.—a. The ammunition cranes should be set up at the same time as the mount is

being lowered on the I-beams so they will be available to swing the rear outriggers to their seats in the floats.

b. The ammunition cranes are set up in the following manner: The clutch levers on each side of the loading platform and below the cranes are shifted to the position marked "Hand." Cranks are placed on the fast motion shafts marked "Ammunition cranes," and turned in the direction marked "Raise." At the same time the tie rods are lifted until the pin which fastens them to the tie-rod post can be inserted. The pin is locked by giving it a one-half turn. The toggle pins which lock the boom extension to the boom are removed. The crank is turned, raising the boom extension until it can be locked to the boom at their junction by the lever pins. The pin is inserted and locked by giving it a one-half turn.

c. Shot tongs are attached to one crane, usually the right one, and the powder tray to the other one. The levers which operate the hoisting mechanisms and sluing mechanisms are placed on their shafts on the floor of the loading platform.

■ 97. SETTING UP LOADING TRAY.—The loading tray is set up in the following manner: The folding platform, which during traveling is folded in the loading platform trunk, is set up. The railings are placed about this platform. Using one of the ammunition cranes and a rope sling, the loading tray is raised to its position, and the pins at each end are inserted and given a one-half turn.

### SECTION III

#### PERMANENT EMPLACEMENT

■ 98. GENERAL.—The permanent or fixed emplacement (fig. 14) is a reinforced concrete emplacement with a base plate and base ring set in the concrete and bolted down. The lower pintle base plate is bolted to the base plate, and the mount traversing rollers rest and roll on the base ring. In order to run the mount on the emplacement, bridge rails are provided for crossing the base ring, hinge rails for crossing the openings between the base plate and base ring, and two rail faces with wheel flange grooves are provided on the

upper surface of the base plate. Fixed rails are used to connect the hinge rails to the base plate and the ends of the track to the bridge rails. The base plate and base ring have ducts in them to permit cables to be pulled to the center of the mount. This emplacement permits 360° traverse.

■ 99. HOW TO EMLACE.—*a.* The mount is emplaced for firing on the permanent emplacement by a series of separate and distinct operations very similar to those prescribed in section II. Detailed instructions for each operation are

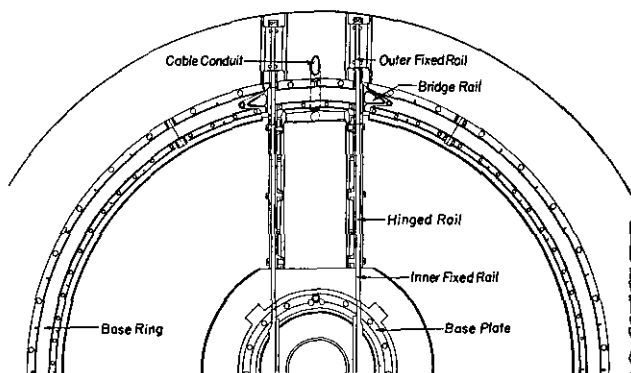


FIGURE 14.—Permanent emplacement.

described in section II and in the succeeding paragraphs. The various operations are enumerated below:

- (1) Prepare the emplacement.
- (2) Lower the mount on the emplacement.
- (3) Raise the top carriage.
- (4) Place the firing support in position.
- (5) Run down the top carriage raising screws.
- (6) Remove the trucks.
- (7) Connect the cables.
- (8) Set up the ammunition cranes and loading tray.

*b.* Some of the foregoing operations should be completed before the mount arrives at the emplacement. Some of the others can be performed simultaneously.

■ 100. PRELIMINARY PREPARATION.—*a.* The access tracks should be carefully inspected to insure that they conform with the requirements of paragraph 82.

*b.* Be sure that the four bridge rails (see fig. 14) are in place and bolted to the base ring and that the four hinged rails are in the proper position. Thoroughly clean the cable ducts, the tapped holes in the base plate, and the top surface of the base ring.

■ 101. MOVING MOUNT ON EMPLACEMENT.—*a.* As the mount nears the emplacement, start the power plant and unfold the girder side platforms.

*b.* Just before moving the mount on the emplacement, the under side of, and the bolt holes drilled in, the lower pintle base plate are cleaned thoroughly. The under surface of the mount traversing beam is cleaned and the traversing rollers are cleaned and oiled.

*c.* The mount is pushed on the emplacement by a locomotive, if one is available, so that the lower pintle base plate is centered as closely as possible over the base plate. *Release the lower pintle traveling lock.* The two rear bridge rails are removed and the rear hinged rails are swung into their recesses in the emplacement. The firing wedges are placed under all the journal boxes of the trucks.

■ 102. LOWERING MOUNT.—*a.* The mount lowering mechanism is operated by power or by hand as prescribed in paragraph 90.

*b.* Lowering of the mount is stopped when the lower surface of the lower pintle base plate is almost flush with the top surface of the base plate. Ascertain if the lower pintle base plate will enter the recess in the base plate. If the mount requires movement along the track, use the truck translating mechanism as prescribed in paragraph 92.

*c.* If the mount requires movement crosswise to the tracks, the mount alining mechanism (fig. 13) is used as follows: This mechanism is located in the front body bolster. The locking pin is unscrewed by turning the handwheel at the center of the front end of the body bolster. The ratchet lever is placed in position on its shaft on the right side of the body bolster. When the ratchet lever is turned in a clockwise direction the lower pintle base plate will move to



the left and, similarly, when the lever is turned in a counter-clockwise direction it will move to the right.

d. When the lower pintle base plate is centered over the base plate, the tap bolts are placed in the holes of the lower pintle base plate, and the lower pintle base plate is rotated until all the bolts can be screwed a few threads into the base plate. The mount is lowered until the mechanism stops or the cranks can be turned no farther. The speed gears are stopped. The tap bolts are screwed solidly into the base plate. The mount traversing clip on the under side of the mount traversing beam is unlatched, let down, engaged with the base ring, and latched in place.

■ 103. RAISING TOP CARRIAGE.—The top carriage is raised by power or hand in the same manner as prescribed in paragraph 93.

■ 104. PLACING FIRING SUPPORT IN POSITION.—The firing support is moved into position in the same manner as prescribed in paragraph 94. The firing locks located on the top of each side of the firing support are thrown against the top carriage and securely bolted down to prevent traversing of the top carriage.

■ 105. RUNNING DOWN RAISING SCREWS.—The raising screws are run down by power or by hand as far as they will go in the same manner as prescribed in paragraph 95.

■ 106. REMOVING TRUCKS.—The trucks are usually moved out of the way. A locomotive is used if there is one available, otherwise the hand translating mechanism is used as prescribed in paragraph 92. The rear trucks may be moved any desired distance from the mount. The front trucks cannot be moved more than 100 yards because of the length of cable for the power plant. As the front trucks are moved away from the mount, the cable on the reel is paid out and the end connected to the mount.

■ 107. SETTING UP LOADING GROUP.—a. After the trucks are removed the two front bridge rails are removed, and the remaining hinged rails are folded into their recesses in the emplacement.

b. The ammunition cranes and loading tray are set up as prescribed in paragraphs 96 and 97.

#### SECTION IV

#### WITHDRAWAL FROM POSITION

■ 108. GENERAL.—In general the operations of removing the mount from the field or permanent emplacement are the reverse of those for emplacing. All folding platforms and railings must be secured. All cranks must be removed from their shafts. All nuts and screws must be tightened.

■ 109. LOCKING DEVICES.—Ascertain that all locking devices are properly locked. This includes the recoil parts lock, the firing support locking bolts, the alining mechanism locking pin, the traveling stops in each body bolster, the lower pintle base plate traveling lock, and the gun traveling lock bracket.

■ 110. LOWERING TOP CARRIAGE.—a. The gun is set at an elevation of  $19^{\circ}$  before the top carriage is lowered. The gun and top carriage will then be lowered to the correct traveling position.

b. When the top carriage has been lowered and is resting on the lower pintle transom, the raising screws are lowered a small amount to relieve them of all strain.

■ 111. JOURNAL BOXES AND TRUCK CENTER PLATES.—a. All the firing wedges under the truck journal boxes must be removed.

b. Ascertain that the truck center plates and under side of the body bolsters are clean and well-lubricated.

c. Inspect all journal boxes to see that they are filled with the proper oil. When making this inspection, examine the bearings and wedges for any damage or displacement which may have occurred during firing and reset them if necessary.

■ 112. OUTRIGGERS.—When removing the mount from the field emplacement, use the ammunition cranes to pull the rear outrigger floats out of the ground and load them on a flat car or gondola. This is possible if the empty flat car or gondola is moved to a position directly in rear of the mount.

■ 113. INSPECTION.—The gun commander inspects to see that all equipment is properly secured and does not project from the side of the car. He inspects the journal boxes for proper lubrication. He inspects the gun position for proper police and to see that all tools and equipment have been loaded. He sees that the gun is locked in the traveling position. He tests the brakes (hand and air) or sees that they are tested before the gun is moved from the position.

## CHAPTER 9

### STATISTICAL DATA

#### ■ 114. 14-INCH GUN, M1920MIL.

Length-----	calibers--	50
Length-----	inches--	714
Weight-----	pounds--	232,300

#### ■ 115. 14-INCH GUN RAILWAY MOUNT, M1920.

Loading angle-----	degrees--	-7
Traveling angle (before lowering top carriage)-----	degrees--	+19
Firing angle-----	degrees--	0 to 50
Maximum elevation-----	degrees--	+50
Total traverse (permanent emplacement)-----	degrees--	360
Maximum curvature of track over which mount can be moved-----	degrees--	20
Radius-----	feet--	286.5
Over-all length of mount-----	feet--	80
Number of trucks-----		4
Number of wheels per truck, A and B-----		8
Number of wheels per truck, C and D-----		6
Total traveling weight-----	pounds--	750,000
Total weight of tipping parts-----	pounds--	300,000
Weight on each raising screw (approximate)-----	pounds--	140,000
Length of recoil-----	inches--	35
Time required to traverse 360°-----	minutes--	3

DRILL TABLE

Service of the piece, 14-inch gun, M1920MII, on railway mount, M1920

Details	DETAILS, POSTS	(a) EXAMINE GUN (b) REPORT	TARGET	LOAD	CEASE FIRING
Gun pointer (noncommissioned officer).	Procures sight, places it in its seat and takes post on sighting platform or at azimuth index box, facing piece.	(a) Examines and adjusts sight; verifies adjustment of azimuth index; examines and tests traversing mechanism, both hand and power, and electric firing circuit; and supervises and assists in adjustment of aiming rule. (b) Reports to gun commander, "Traversing in order," or any defects he is unable to remedy without delay.	See note 1 .....	Continues setting data as at command TARGET. When firing by case III, calls or signals, "Azimuth (deflection) set," and if firing by electricity fires piece at command FIRE, given by gun commander. When firing by case II, fires piece or commands: FIRE, to No. 1 after gun commander has called "Ready."	Continues setting data until CEASE TRACKING is received.
Elevation setter (noncommissioned officer).	Takes post at quadrant, facing it .....	(a) Assisted by No. 6, examines and adjusts quadrant; examines and adjusts elevating mechanism, both hand and power; and checks clearance of trunnions by means of clearance gage. (b) Reports to gun commander, "Elevation in order," or any defects he is unable to remedy without delay.	See note 2 .....	Continues setting elevations on his quadrant as posted on display board; at the command or signal ELEVATE, given by chief of breech, directs No. 6 to elevate piece until bubbles of quadrant levels are centered; sets elevating brake; and calls or signals "Elevation set." As soon as piece has been fired, directs No. 6 to depress piece to loading position as rapidly as practicable.	Continues setting data until CEASE TRACKING is received. When dummy ammunition is used, directs No. 6 to depress piece to loading position.
Chief of breech (noncommissioned officer).	Assists No. 1 in procuring his cleaning material and equipment and takes post on folding platform to right rear of breech, facing it.	(a) Assists No. 1 in removing breech cover; examines breech mechanism, breechblock, breech recess, chamber and bore, and gives necessary directions for cleaning and preparing them for firing or drill. (b) Reports to gun commander, "Breech in order," or any defects he is unable to remedy without delay.	Stands by .....	Assists No. 1 in opening breech; commands: HOME RAM, for seating projectile and checks loading of powder charge. As soon as piece is loaded, opens breech closing air valve. If there is no air, assists No. 1 in closing breech by hand. When piece is ready to elevate, commands or signals: ELEVATE, and takes his designated firing post. After piece is fired, assists No. 1 in opening breech, wipes off mushroom head, and as soon as chamber and bore are clear, shuts off gas ejection air valve and calls "Bore clear." If there is no air, assists No. 1 in sponging chamber and breech recess.	When dummy ammunition is used, assists in opening breech and supervises unloading.
No. 1 (Breech detail) .....	Procures firing mechanism, lanyard (if required), primer pouch, primers, drill, reamer, and cotton waste. Takes post on folding platform to left rear of breech, facing it.	(a) Assisted by chief of breech, removes breech cover and places it as directed; cleans and oils breechblock, breech mechanism, and breech recess; examines and cleans firing mechanism, vent, and primer seat; attaches firing mechanism; and places coiled lanyard within reach on left side of platform. If necessary, assists in sponging chamber and bore. (b) Reports to chief of breech any defects of matériel.	Stands by .....	As soon as breech is closed and locked, stands clear and inserts primer; raises sliding wedge; and steps off folding platform to left and rear, tripping platform as he does so. If firing by lanyard, fires piece. As soon as piece has been depressed to loading position, pushes down folding platform, pulls breech rotating lever, and assisted by chief of breech lowers breechblock. Assists Nos. 2 and 3 in seating spanning tray in breech recess. If necessary, assists loading tray detail in ramming home powder charge.	Unhooks lanyard, if used, and removes primer. When dummy ammunition is used, assists in withdrawing dummy powder charge and projectile.
No. 2 (chief) and Nos. 3, 4 and 5 (loading tray detail).	No. 2 procures cotton waste, and assisted by Nos. 11, 12, 13, and 14 brings up vessel containing sponging liquid (if used) and places it at designated position. No. 3 procures hand and power extractors and places them as designated. Nos. 4 and 5 procure chamber and bore sponges and place them in a convenient position. Nos. 2 and 4 take post on left and Nos. 3 and 5 on right of loading tray, all facing tray.	(a) No. 2 examines, cleans, and oils bearings of spanning tray. No. 3 examines, cleans, and oils projectile stop. Both men assist No. 1 on breech mechanism. No. 4 removes stop pin on loading tray and assisted by No. 5 insures that spanning tray will properly enter breech recess. All four men assist in sponging bore and chamber when directed. (b) No. 2 reports to gun commander, "Loading tray in order," or any defects he is unable to remedy without delay.	See note 3 .....	Nos. 4 and 5 guide projectile and powder tray to proper positions on loading tray. They release shot tongs and signal hoist operators when to raise and clear tongs and tray from loading tray. When chief of breech calls "Bore clear," No. 4 removes stop pin and assisted by No. 5 slides spanning tray forward to Nos. 2 and 3, who guide tray into breech recess. At command HOME RAM, No. 3 releases projectile stop and all four assist in pushing projectile into gun. The powder sections are pushed into chamber. No. 3 being responsible that last section has igniter on rear end. As soon as powder charge has cleared spanning tray, Nos. 4 and 5 slide tray back until No. 4 can secure it with stop pin.	When dummy ammunition is used, they assist in withdrawing dummy powder charge and projectile to their proper positions on loading tray and deliver same to hoists if so directed. No. 3 fixes tackle to projectile for withdrawing it from gun.
No. 6 (elevating detail) .....	Procures oil and cleaning material and takes post at elevating control mechanism, facing piece.	(a) Assists elevation setter in examining, cleaning, and oiling elevating mechanism, both hand and power, and in checking clearance of cradle trunnions. (b) No duties.	Depresses piece to loading position.	Operates elevating control mechanism as directed by elevation setter. As soon as piece is fired, depresses it as rapidly as possible to loading position.	Depresses piece to loading position unless otherwise directed.
Nos. 7 and 8 (hoist detail).	Procure operating levers for hoist controls and place them on their shafts. No. 7 takes post at projectile hoist and No. 8 at powder hoist.	(a) Examine, clean, and oil hoists, cables, and controls and test hoists with power to insure that stops are functioning. (b) No. 7 reports to gun commander, "Hoists in order," or any defects they are unable to remedy without delay.	See note 4 .....	No. 8 raises powder charge, swings it over, and lowers it on loading tray. When signaled by No. 4 or 5, raises tray, swings it out, and lowers it for next charge. As soon as piece is fired, No. 7 raises next projectile and places it on loading tray. When signaled by No. 4 or 5, raises tongs, swings them out, and lowers them for next projectile.	When dummy ammunition is used, No. 8 removes dummy powder charge from loading tray and lowers it to powder serving detail. No. 7 lowers dummy projectile to projectile serving detail or places it as directed.
Nos. 9 and 10 (projectile serving detail).	Procure cleaning material and take post at position from which projectiles are to be served.	(a) Examine projectiles to be used, clean them, see that they are properly marked for tongs and fasten tongs to first projectile. (b) No. 9 reports to gun commander, "Projectile service in order," or any defects they are unable to remedy without delay.	See note 5 .....	Fasten tongs to projectiles when tongs are lowered; No. 9 signals No. 7 when ready to hoist and has projectile stopped and lowered if it is not properly secured. Have next projectile ready for raising as soon as piece is fired.	When dummy ammunition is used, receive dummy projectile from hoist and place it in designated position.
No. 11 (chief) and Nos. 12, 13, and 14 (powder serving detail).	Procure powder tray; assist No. 2 in procuring sponging liquid; assist in procuring such other material as may be directed; and take posts at powder tray, facing piece.	(a) Nos. 11 and 12 examine and clean powder tray. Nos. 13 and 14 remove muzzle cover and place it as directed. Assist artillery mechanic in adding gas and liquid to recuperator and recoil systems if necessary. (b) No. 11 reports to gun commander, "Powder service in order," or any defects he is unable to remedy without delay.	No duties .....	Receive powder charge from powder detail; place it on powder tray; and No. 11 signals No. 8 to hoist charge. As tray is hoisted, guide it by two ropes attached to each end. No. 11 assures that igniter is placed at one end of powder tray.	When dummy ammunition is used, receive dummy powder charge from hoist and place it in designated position.

NOTES

- At command TARGET, gun pointer sets azimuth (deflection) posted on display board on his sight, traverses gun so as to sight on aiming point; centers bubbles on cross levels of sight; checks setting of sight on aiming point; and calls or signals "Azimuth (deflection) set." If azimuth circle is used, lays gun at azimuth posted on display board.
- At command TARGET, elevation setter sets elevations posted on display board on quadrant. Directs No. 6 to depress piece to loading position.
- At command TARGET, Nos. 2 and 3 stand by. Nos. 4 and 5 guide first projectile onto loading tray, release tongs, and signal No. 7 to raise and clear tongs from loading tray.
- At command TARGET, No. 7 raises projectile to loading tray, then returns tongs to projectile serving detail. No. 8 lowers powder tray to powder serving detail to receive powder charge.
- At command TARGET, No. 9 signals No. 7 to hoist first projectile to loading tray.

# APPENDIX

## LIST OF REFERENCES

Ammunition, drill-----	TM 9-905 (now published as TR 1370-D)
Ammunition for 14-inch guns, M1907, M1907MI, M1909, M1910, M1910MI, and M1920 -----	TM 9-915 (now published as TR 1365-14A)
Ammunition, harbor defense and railway artillery-----	TM 9-905 (now published as TR 1370-A)
Camouflage, cover, protection against air and chemical attacks, local security, machine-gun defense-----	FM 4-5
Commands -----	FM 4-5
Care and maintenance of matériel-----	TM 4-245 (now published as TR 1160-20)
	TM 9-850 (now published as TR 1395-A)
	FM 4-20
Examination for gunners-----	FM 4-150
Fire control and position finding----	FM 4-15
Gunnery -----	FM 4-10
Organization of the battery-----	FM 4-5
	T/O 4-57
Railway operating equipment-----	Association of American Railroads Code of Rules

Reconnaissance, selection, and occupation of positions.....	FM 4-5
Safety precautions in firing.....	{ AR 750-10
	{ FM 4-20
14-inch guns, M1920MI and M1920MIL.....	TM 9-425 (now published as TR 1315-14B)