FM 4–80

WAR DEPARTMENT

COAST ARTILLERY FIELD MANUAL

SEACOAST ARTILLERY

SERVICE OF THE PIECE

12- AND 14-INCH GUNS
(DISAPPEARING CARRIAGE)

FM 4-80

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SERVICE OF THE PIECE

12- AND 14-INCH GUNS (DISAPPEARING CARRIAGE)

Prepared under direction of the
Chief of Coast Artillery

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BY ORDER OF THE SECRETARY OF WAR:

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The Adjutant General.

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12- AND 14-INCH GUNS (DISAPPEARING CARRIAGE)

(The matter contained herein supersedes TR 435-270, May 7, 1924, including C 1, January 3, 1928, and C 2, January 2, 1929.)

SECTION I

GENERAL

■ 1. SCOPE.—*a.* Guns, carriages, and batteries differ in type, arrangement, and design, and for this reason the service of the piece as prescribed herein is intended only as a guide for the battery commander in the assignment of individuals and duties. Changes in the details of the service of the piece to meet local conditions may be made.

b. The duties of the members of the gun section in the service of the piece which are not covered in the body of the text are shown in the drill table in section VII.

■ 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.

SECTION II

ORGANIZATION OF GUN SECTION

■ 3. COMPOSITION.—*a.* Each emplacement of one gun is manned by a gun section consisting of a chief of section, a gun squad, and an ammunition squad.

b. Under war strength organization, the gun section consists of 51 enlisted men. Under peace strength organization, it consists of 47 enlisted men.

■ 4. GUN SQUAD.—The gun squad, under both peace and war strength organization (30 enlisted men), consists of the gun commander, the gun pointer, the range setter, two dis-

play board operators, two recorders, the chief of breech, and 22 cannoneers, numbered from 1 to 22, inclusive.

■ 5. AMMUNITION SQUAD.—*a.* (1) Under war strength organization, the ammunition squad (20 enlisted men) consists of the chief of ammunition and 19 cannoneers, numbered from 23 to 41, inclusive.

(2) Under peace strength organization, the squad (16 enlisted men) consists of the chief of ammunition and 15 cannoneers, numbered from 23 to 37, inclusive.

b. The squad is divided by the chief of ammunition into details for the service of powder and projectiles.

■ 6. FORMATION.—Each section assembles in two ranks with 4 inches between files and 40 inches between ranks. The post of the chief of section is in the front rank, 1 pace to the right of his section. The artillery mechanics, who are members of the maintenance section, normally form with the firing section and take post in the front rank on the left of the first and last gun sections. (See fig. 1.)

SECTION III

DUTIES OF PERSONNEL

■ 7. BATTERY EXECUTIVE.—*a.* The battery executive commands the firing section of the battery and is in charge of the gun emplacements and accessories.

b. He is responsible to the battery commander for the training and efficiency of the personnel of the firing section, for the condition of the matériel under his charge, for the observance of all safety precautions pertaining to the service of the piece, and for the police of the emplacements.

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

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

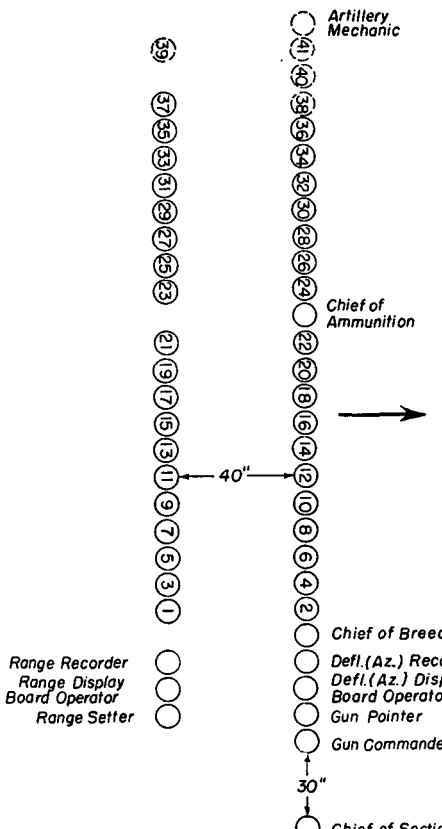

FIGURE 1.—Formation of gun section.

NOTE.—Cannoneers Nos. 38 to 41, inclusive, are included in the war strength organization only.

e. When firing on time interval signal, he is responsible that the guns are fired immediately upon receipt of the proper firing signal, safety precautions permitting. If it becomes necessary to suspend fire for a time interval, he commands: RE-LAY, and reports his action to the battery commander.

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

■ 8. ASSISTANT BATTERY EXECUTIVE.—The assistant battery executive performs 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 (noncommissioned officer) is in command of the gun section. He supervises the service of the piece and the service of ammunition, and personally directs the work of care and preservation at the emplacement to which his section is assigned. He is responsible to the officer in charge of the emplacement for the training and efficiency of the personnel of his section, for the condition of the matériel under his charge, for the observance of all safety precautions at the emplacement, and for the police of the emplacement.

b. When his section arrives at the emplacement he commands: 1. DETAILS, 2. POSTS, and supervises the procurement 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.

c. He receives the reports of the gun commander and the chief of ammunition 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 of the section call off their titles or numbers in succession, beginning with the unnumbered members of the section, followed by the numbered members in order.

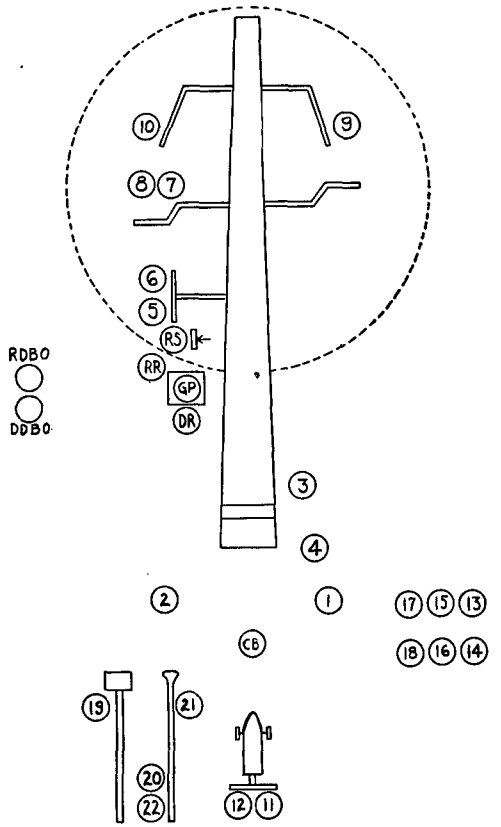

FIGURE 2.—DETAILS, POSTS.

e. At the command TARGET, he repeats the command and target designation. As soon as the gun pointer is on target, the chief of section reports or signals to the officer in charge of the emplacement, "Sir, No. ——— on target."

f. He indicates to the chief of ammunition the projectile, fuze, and powder to be served.

g. At the command LOAD, the chief of section repeats the command and supervises the loading. Under no circumstances will he permit his gun to be fired prior to the receipt of the command COMMENCE FIRING from the battery commander.

h. At the command COMMENCE FIRING, if the piece is unloaded, the chief of section commands: LOAD. He also commands: LOAD, before each shot of a series.

i. He commands: CEASE FIRING, when the number of shots specified has been fired. When the number of shots has not been specified, the chief of section repeats the command CEASE FIRING when it is given by the battery commander.

j. In case of a misfire, he reports to the officer in charge of the emplacement, "No.——— misfire," and sees that the precautions described in paragraph 41 are observed.

k. He keeps a record of the number of rounds fired by his gun, showing the date and approximate time, in order that the emplacement book may be kept posted accurately and up to date.

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

■ 10. GUN COMMANDER.—*a.* The gun commander (noncommissioned officer) is in command of the gun squad. He is responsible to the chief of section for the efficiency of the personnel of his squad, for the condition of the matériel under his charge, for the observance of all safety precautions pertaining to his gun, and for the police of the emplacement.

b. At the command EXAMINE GUN, given by the chief of section, he personally makes an inspection of the gun, carriage, and other matériel, paying special attention to the recoil cylinders, firing mechanism, safety devices, and the oiling of all movable parts. He also gives special attention to those parts most likely to cause trouble and to which special attention is directed by this manual and Technical Manuals.

c. He receives the reports of the chiefs of the various details of the gun squad and reports to the chief of section, "No. ——— in order," or any defects he is unable to remedy without delay.

d. At the command LOAD, he supervises the work of his squad.

e. At the command TRIP, he supervises the tripping of the gun and sees that it goes fully into battery.

f. In case II firing, after receiving the report "Range set" from the range setter, the gun commander calls and signals "Ready," indicating to the gun pointer that the piece is ready to fire.

g. In case III firing, after receiving the reports "Range set" and "Azimuth set" from the range setter and gun pointer, respectively, he calls and signals "No. ——— ready," indicating that the piece is ready to fire. At the sounding of the proper time interval signal, he commands and signals: FIRE.

h. When firing on time interval signal, he is responsible to the chief of section that the piece is fired immediately upon the proper signal, safety precautions permitting. 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 given by the chief of section.

i. In case of a misfire, he calls "No. ——— misfire," and sees that the precautions described in paragraph 41 are observed.

j. At the command CEASE FIRING, when dummy ammunition is used, he sees that the piece is unloaded.

k. At the command REPLACE EQUIPMENT, the gun commander supervises the replacing of equipment, sees that all matériel is properly secured, and then unless otherwise directed, forms his squad and reports to the chief of section.

■ 11. GUN POINTER.—The gun pointer (noncommissioned officer) is charged with the duty of pointing the piece in direction. He is responsible to the gun commander for the proper operation, care, and adjustment of the sight, the traversing mechanism, and the electric firing circuit (if used). For detailed duties, see drill table, section VII.

■ 12. RANGE SETTER.—The range setter is charged with the duty of laying the piece in range. He is responsible to the gun commander for the proper operation, care, and adjustment of the elevating and retracting mechanism. For detailed duties, see drill table, section VII.

■ 13. CHIEF OF BREECH.—The chief of breech (noncommissioned officer) is responsible to the gun commander for the efficiency of the personnel of the breech detail. He is specially charged with the observance of safety precautions insofar as they pertain to his detail. In firing, he listens for the explosion of the primer which may be audible if the powder charge fails to explode. For detailed duties, see drill table, section VII.

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

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

c. At the command EXAMINE GUN, they clean the display boards if necessary, put on the telephone head sets, test the telephones to the plotting room, and report to the gun commander, "Deflection (azimuth) display board and range display board in order," or report any defects they are unable to remedy without delay.

d. At the command TARGET, they receive deflections (azimuths) and ranges from the plotting room, post them on the display boards, and record them on the data forms.

e. At the command CEASE FIRING, they continue posting and recording data received from the plotting room.

■ 15. RECORDERS.—*a.* The deflection (azimuth) recorder and the range recorder are responsible for the checking and recording of all deflections (azimuths) and ranges, respectively, set on the gun.

b. At the command DETAILS, POSTS, they procure pencils and forms for recording data. The deflection (azimuth) recorder

takes post convenient to the gun pointer, and the range recorder takes post convenient to the range setter.

c. At the command TARGET, they keep a continuous record of the data at which the gun is set, being especially careful to record, check, and identify the data at which the gun is actually fired.

d. At the command CEASE FIRING, they continue to record data as long as data are being set on the gun.

■ 16. CHIEF OF AMMUNITION.—*a.* The chief of ammunition (noncommissioned officer) is responsible to the chief of section for the efficiency of the personnel of his squad, for the care of the ammunition and ammunition-handling apparatus, for the uninterrupted service of ammunition, for the observance of all safety precautions in the care and service of ammunition, and for the police of the magazines and galleries under his charge.

b. He keeps a record of all ammunition received into or delivered from the magazines and galleries under his charge, exercising particular care that the projectiles, fuzes, and powder charges are listed under proper name and type. He keeps the chief of section informed regarding the ammunition on hand and reports any defects found.

c. At the command DETAILS, POSTS, the chief of ammunition opens the galleries (and magazines, if necessary) and posts the members of his squad.

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

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

f. At the command CEASE FIRING, when dummy ammunition is used, he causes the dummy projectiles and dummy powder charges to be put in their proper places in the gallery.

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

■ 17. AMMUNITION SQUAD.—The chief of ammunition divides the cannoneers of the ammunition squad into two details, the projectile detail and the powder detail. The size of the two details depends on local conditions and is determined by the battery commander.

a. Projectile detail.—The chief of ammunition designates one of the cannoneers as chief of detail who supervises the work of the detail. Previous to and during firing, the detail places projectiles on the delivery tables, loads them on shot trucks, runs the loaded trucks to the emplacement, turns them over to the truck detail, and receives the empty trucks to be run to the delivery tables and reloaded. In addition, the detail maintains the ammunition and ammunition-handling apparatus, and polices the magazines and corridors.

b. Powder detail.—The chief of ammunition designates one of the cannoneers as chief of detail who supervises the work of the detail. The detail keeps a record of all pertinent data including weights of charges, lot number of powder, and temperature of magazines. In the service of powder, the detail removes from containers the powder charge which is to be served to the gun for the next round, places it with igniter end to the rear on a powder tray, removes the powder tag, and sees that the powder bag is not defective. The detail carries the loaded tray to the emplacement and turns it over to the powder-serving detail of the gun squad, and receives an empty tray to be brought back to the magazine for reloading. In addition, the detail maintains the powder-handling devices and assists the projectile detail.

■ 18. ARTILLERY MECHANICS.—The artillery mechanics, assisted by members of the gun sections, make such minor repairs and adjustments as can be made with the means available. The chief artillery mechanic is the custodian of the supplies pertaining to the gun emplacements to which his battery is assigned. He is responsible for the condition of the storerooms pertaining to the gun emplacements and the supplies contained therein. The chief mechanic or his assistant issues such equipment, tools, oils, paints, and cleaning materials to the members of the gun sections as are necessary for the service and care of the guns and accessories.

SECTION IV

NOTES ON THE SERVICE OF THE PIECE

■ 19. GENERAL.—The service of the piece should be conducted with dispatch and precision and with as few orders as possible. Loading with dummy ammunition and pointing the piece as for firing is the normal practice at drill. Cannoneers change position at a run. Except for the necessary orders, reports, and instructions, no talking should be permitted. Commands should be given in the prescribed forms. Signals may be substituted for commands whenever desirable. (See FM 4–5 and FM 4–20.)

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

■ 21. THE COMMAND RE-LAY.—At the command RE-LAY, the display board operators post the new data on the display boards, the gun pointer and range setter continue to point the gun in direction and elevation according to the new data, and No. 3 slacks the lanyard (if used).

■ 22. FIRING MECHANISM.—*a.* Before firing, No. 3 assembles firing mechanism to the gun and sees that vent is clear and that primer seat is clean and unpitted. He sees that firing leaf cannot be drawn back until slide has been closed and breechblock closed and locked.

b. In firing, the chief of breech hooks lanyard (if used) and No. 3 inserts a primer after breechblock is closed and locked. No. 3 completely closes slide of the firing mechanism before attempting to fire the gun, otherwise the primer may be blown to the rear endangering the gun squad. After the gun has been fired, the chief of breech unhooks lanyard, and as soon as the breech is open No. 3 removes fired primer.

c. It is of great importance that No. 3 clean primer seat and vent after each shot, for when a primer sticks it is usually due to powder residue having collected between the primer and the primer seat or vent or the primer seat having become pitted. A fired primer that has become stuck may be

removed by using a drift through the vent at the same time opening the firing mechanism slide.

■ 23. OPERATION OF BREECH, M1895.—The service of the piece as given in section VII is for a gun fitted with an M1895 breech mechanism.

a. (1) *To open.*—The chief of breech unhooks lanyard (if used) from eye of firing leaf; No. 4 turns crank continuously in a clockwise direction until tray comes to rest against hinge plate.

(2) *To close.*—No. 4 turns crank in a counterclockwise direction until projecting shoulder on rotating lug striking the gear prevents further motion.

b. Additional notes.—With this breech mechanism, it will be found convenient to fasten a wire around the piece back of the elevating band. This wire should have a loop in it in which the safety lanyard (if used) may be hooked during the loading. The chief of breech after unhooking the lanyard swings it over the teeth of the breech mechanism, and hooks it in the loop of the wire. Thus it is kept from being caught in the mechanism and is convenient to the chief of breech when the time comes to hook it again.

■ 24. OPERATION OF BREECH, M1888.—If the gun is fitted with an M1888 breech mechanism the duties of Nos. 1 and 2 are changed.

a. To open.—No. 2 releases rotating crank by turning wing nut of catch to the left and then turns rotating crank clockwise as indicated by the "open" arrow until it is stopped in a horizontal position and is secured by its catch; No. 1 turns translating crank briskly counterclockwise. When the shoulders of the grooves strike against the ends of the rails, the block stops short and the shock frees the tray latch from its catch; No. 1 swings tray and block to the right until securing latch engages in catch.

b. To close.—No. 2 releases securing latch from its catch; No. 1 swings tray and block around to the left smartly; No. 2 seizes handle of tray and continues swinging of block until tray butts against and is latched to face of breech; then he turns translating crank clockwise until breech is translated completely; No. 1 releases rotating crank by turn-

ing wing nut and turns rotating crank counterclockwise, as indicated by the "close" arrow, until it is stopped in a vertical position and is secured by its catch.

■ 25. LOADING.—*a.* At the command LOAD, the breech is opened and the truck detail moves the truck up to the face of the breech. Nos. 1, 2, 9, 10, 20, 21, and 22 man rammer as near the outer end as possible. Nos. 21, 1, and 9 are on the right of the rammer and Nos. 2, 10, 20, and 22 are on the left, in the order named, from the head of the rammer to the rear. The chief of breech also assists on the right side of the rammer. No. 21 places head of rammer against base of projectile. As soon as the truck is brought up against the face of the breech, No. 12 sets brake. At the command HOME, given by the chief of breech, the men on the rammer carefully push projectile off truck. The projectile is seated at the command RAM given by the chief of breech as soon as the base of the projectile is just inside the powder chamber. The projectile is rushed forward in one motion at increasing speed so that it will have its fastest movement when it comes up hard against its seat. The truck is withdrawn and run off to one side. Nos. 9 and 10 quit rammer for tripping levers. Nos. 1, 2, 20, 21, and 22 move back far enough so that the powder-serving detail can place the nose of the powder tray in the breech recess. No. 21 places head of rammer against base of powder charge, and at the command RAM, given by the chief of breech, the men on the rammer push powder into powder chamber to such distance that the breechblock in closing will give the powder a final push into the chamber. Nos. 20, 21, and 22 carry rammer back to position preparatory to ramming the next round.

b. An alternate method of powder service may be employed in batteries where the shot trucks are equipped with powder trays. In such cases a shot truck is loaded with a projectile by the projectile detail and then with a powder charge by the powder detail. The truck detail takes the completely loaded shot truck to the gun. After the truck is run up to the breech, the rammer detail rams the projectile and then the powder directly from the shot truck. The empty truck is withdrawn and turned over to the projectile detail.

■ 26. TRIPPING GUN.—*a.* The gun is held from battery by the engagement of pawls with the teeth in the crosshead which prevents the counterweight from descending. Raising the tripping levers releases the pawls from the crosshead teeth enabling the counterweight to descend and the gun to rise into battery, while safety latches retain the pawls clear of the descending crosshead teeth. At the command IN BATTERY, Nos. 9 and 10 seize the tripping levers, and at the command, TRIP, raise them quickly to the full limit of upward movement. A slight downward movement on the tripping levers will indicate if the safety latches have engaged.

b. If the gun fails to go completely into battery, the gun commander orders Nos. 4, 9, 10, and 20 to use the pinch bars. These are engaged in the notches on the chassis and the gun is forced into battery. Battery commanders will observe defects which prevent the gun going completely into battery at drill and have them remedied before firing.

■ 27. RETRACTING GUN BY HAND.—*a.* At the command FROM BATTERY, given by the gun commander, No. 7 releases retaining pawl and turns speed crank to permit pulling out of cables. Nos. 3 and 4 mount chassis and Nos. 9 and 10 mount gun levers. Nos. 1 and 2 pull out cables to their full length and pass the ends to Nos. 3 and 4, who pass them to Nos. 9 and 10, who place the ends of cables on hooks. No. 7 then throws on retaining pawl and turns speed crank to take up all slack. No. 8 pushes in clutch; Nos. 3 and 4 watch cables to see that they take the grooves of the drums. As soon as the slack has been taken up, Nos. 3, 4, 9, and 10 return to loading platform, and Nos. 7 and 8 put on retraction cranks.

b. The gun squad is divided into two reliefs by the gun commander. The first relief takes post at the retraction cranks and at the command HEAVE starts to retract the gun. The reliefs alternate as directed by the gun commander. Care is taken to see that the cables are under equal tension and are guided to the pulleys without kinks. As soon as the crosshead teeth engage their pawls, the retraction shaft retaining pawl is thrown off and remains off until the cables have been unhooked from the gun levers.

c. The gun commander designates a cannoneer to call off the notches of recoil indicated by the engagement of the pawl teeth with the crosshead teeth. When the gun has reached the loading position, the gun commander commands: HALT. At this command Nos. 7 and 8 remove retraction cranks. No. 7, using speed crank, lets out enough slack to enable Nos. 1 and 2 to unhook cables. After the cables are unhooked, No. 7 takes up all slack with speed crank and then throws retaining pawl on. No. 8 then pulls out clutch.

■ 28. RETRACTING GUN BY POWER.—Assuming the idler to be out of gear, the cables to be hooked to the gun levers, the slack taken out by No. 7, and the clutch thrown in by No. 8, at the command HEAVE, given by the gun commander, No. 8 throws the idler in gear. As soon as this is done, the range setter closes the main switch of the controller cabinet and moves the arm so as to turn on the power. The movements at the command HALT are the same as those prescribed for hand retraction, except that the range setter pulls the main switch of the controller cabinet, after which No. 8 throws the idler out of gear. The cables are then unhooked and the slack taken up as prescribed for hand retraction.

■ 29. CARRIAGES WITH FRICTION BRAKES.—On carriages equipped with friction brakes on the retraction crank shaft, it is not necessary to unhook the cables from the gun levers, and the drill may be modified accordingly.

■ 30. ADJUSTMENT OF SHOT TRUCKS.—Before firing, shot trucks are adjusted to the highest point to which it is anticipated that the gun will recoil, since a downward adjustment is much more easily and rapidly made than an upward one. Marks corresponding to "notches of recoil" may be placed on the shot trucks to facilitate loading after the first round has been fired.

SECTION V

SAFETY PRECAUTIONS

■ 31. 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 personnel concerned 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.

■ 32. THE COMMAND CEASE FIRING.—Any individual in the military service will command or signal CEASE FIRING if he observes any conditions which make it unsafe to fire. At the command CEASE FIRING, lanyards will be detached if firing by lanyard, or the safety firing switch opened if firing electrically.

■ 33. FIRING MECHANISM.—The firing mechanism will be inspected and tested frequently to insure proper operation and functioning of the safety features. Just before firing, the mechanism will be tested with a friction primer which will be inserted before the breechblock is rotated. A strong pull will be exerted on the lanyard while the block is rotated to ascertain if it is possible to fire the primer before the breech is closed and locked.

■ 34. LANYARD.—*a.* The lanyard will be pulled with a quick, strong pull (not a jerk) from a position as near the rear of the piece as convenient, and sufficiently to the right of the line of recoil to insure safety.

b. There is a safety device to prevent the possible firing of the gun by lanyard except when fully in battery or nearly so. The device consists of a short lanyard running from the firing mechanism to a ring on the end of a cord wound on a reel. The reel is carried in a housing attached to the elevating band on the gun. One end of the firing lanyard is attached to a ring on the reel cord, the other is held by the cannoneer who is to fire the piece. The short lanyard can be pulled to the rear so as to fire the primer only by first unwinding the reel cord from the drum. This is prevented while the gun is from battery by the action of a pawl which engages a ratchet on the drum. When the gun rises into battery, this pawl is automatically tripped by a cam attached to the rear face of the elevating arm. This permits the reel to be unwound and the pull to come upon the short lanyard

attached to the primer. The reel is provided with a spiral spring which causes it to rotate and wind up the reel cord as soon as the pull on the lanyard is released. The initial tension of this spring should be such as to cause the reel cord to be wound up with certainty with the lanyard attached.

c. A safety device on the firing mechanism prevents possible firing of the primer by lanyard until the breechblock is locked, whether the gun is in the loading or in the firing position.

■ 35. 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 testing safety devices, primers will not be inserted until after the breechblock has been closed and locked.

d. Primers will never be inserted or removed by means of the button or wire.

e. Care will be exercised in moving the leaf of the firing mechanism to the firing position.

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

g. Precautions will be taken to prevent any attempt to use primers that have failed. They will be handled with great care due to the possibility of a primer hangfire. These primers will be turned in to the ordnance officer for inspection.

■ 36. FUZES.—*a.* Projectiles equipped with base detonating fuzes will normally be received properly fuzed for firing.

b. Projectiles equipped with point detonating fuzes will normally be received unfuzed and will be fuzed as required in the following manner:

(1) Unscrew the plug from the fuze socket.

(2) Insert the fuze, being careful to see that it is fitted with its felt or rubber washer, and screw it home by hand.

(3) Screw up the fuze with the fuze wrench but without using any great force.

(4) If there is any difficulty in screwing the fuze home, it should be removed and another inserted. If the same trouble is experience with the second fuze, the shell should be rejected.

c. For further instructions on the care and handling of fuzes, see FM 4–20 and appropriate Technical Manuals.

■ 37. POWDER CHARGES.—In the magazines, 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 of the gun until the preceding round has been fired, the powder chamber sponged, and the face of the mushroom head wiped.

■ 38. SPONGING POWDER CHAMBER.—After each shot the powder chamber will be sponged and the face of the mushroom head wiped with the liquid provided for this purpose.

■ 39. COVER FOR GUN SECTION.—When firing high-explosive shells and cover is prescribed, each member of the gun section will be required to take adequate shelter each time the piece is fired. (See AR 750–10.)

■ 40. 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.

■ 41. MISFIRES.—*a. Discharge of primer heard but powder charge fails to ignite.*—At least 10 minutes must elapse after the firing of the primer before the old primer is removed or the breechblock is opened. During this period all persons will stand clear of the breech. The piece will be kept directed on the target or on a safe place in the field of fire.

b. Discharge of primer not heard.—If a special device is available which permits removal of the primer by a person entirely clear of the path of recoil, the primer may be removed after 2 minutes have elapsed since the last attempt to fire. If after removal it is found that the primer actually failed to fire, no further wait is necessary before inserting a new primer or opening the breech. If, on the other hand, examination shows that the primer has fired, the precautions prescribed in *a* above will be observed. If no special device

can be employed for the removal of the primer, observe the same precautions.

SECTION VI

CARE AND ADJUSTMENT OF MATÉRIEL

■ 42. 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 in other publications issued by the War Department, a thorough understanding of which is required of all officers and others having matériel in charge.

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

d. Cleaning and preserving materials will be used in strict compliance with Ordnance regulations.

■ 43. FIRING MECHANISM.—*a. General.*—(1) While this mechanism forms part of a heavy gun, the parts are very closely adjusted and the clearances very small. The greatest care must be exercised, therefore, in keeping the mechanism well oiled and free from rust and dirt. It will be removed from the gun when not in use, kept in a small box provided for it, and stored in the armament chest.

(2) Distortion of the firing leaf or battering of the safety bar seat in the side of the firing leaf may be caused by the application of force under the firing leaf to raise it. The application of force in this manner is prohibited.

b. Inspection and tests.—(1) From time to time and before firing, the firing mechanism will be carefully inspected to insure that all parts are in good condition. Any firing leaf that is damaged to the extent that firing the gun is possible before the breechblock is closed and locked, or any spring found too weak to keep the firing leaf pressed against the slide, will be replaced.

(2) Previous to firing, each of the primers to be used in target practice will be inserted in the obturator spindle in order to test the proper fit of each primer. The firing leaf

and slide will be lowered to the firing position in order to demonstrate that these parts will properly function with each primer.

(3) A firing mechanism which has been tried and is known to function satisfactorily on a particular gun will be stamped with the serial number of that gun, and will be used with that gun in order to insure proper functioning.

■ 44. CARE OF CARRIAGE.—*a.* Carriages will be traversed and guns elevated and depressed at least twice a month throughout their entire allowed movement. From time to time the azimuth at which they stand should be changed to prevent uneven settling of the platform.

b. The habitual position of guns on disappearing carriages is "from battery," but at least once a month the guns will be allowed to rise to the firing position.

c. The action of the pawls should be tested before all firings to see that their action is not sluggish due to weak springs or lack of lubrication. The pawl teeth and crosshead teeth should be carefully inspected to see that they are not burred.

d. All parts of carriages must be kept free from rust at all times. If rust is found it should be removed immediately. Its removal from all bearing parts, and especially piston rods, requires particular attention in order that clearances shall not be unduly increased. The use of sandpaper or emery cloth for this purpose by battery personnel is forbidden, and nothing more abrasive than crocus cloth may be used.

e. The retracting wire ropes should be kept well oiled at all times with gear, chain, and wire rope lubricating oil.

f. If any leakage occurs from the hydraulic recoil system it should be remedied immediately, calling upon the ordnance officer if necessary for the services of trained ordnance personnel.

g. The repacking of stuffing boxes may be done, when necessary, by trained enlisted men under the supervision of an officer, but will preferably be done by trained ordnance personnel.

h. Before removing a cylinder head containing a stuffing box, or drawing a piston rod through a stuffing box, the pres-

sure of the packing on the rod should be released by unscrewing the follower several turns.

i. The vulcanized fiber or copper gaskets between cylinders and their heads should be in good condition, and consequently should be replaced whenever necessary in order to prevent leakage.

j. Recoil cylinders should be emptied and refilled at least every 3 months and thoroughly cleaned every 6 months.

k. Oil holes, where provided, must be cleaned out frequently to keep them free from sand and grit, and will habitually be kept closed by the screw plugs or screws provided, except in the act of oiling. Before oiling at any oil hole, wipe off carefully any dirt or grit near the opening that might be carried down into the bearing by the oil.

l. When the carriage is to be kept in readiness for service, and is in daily or frequent use, all bearing parts must be kept thoroughly cleaned and lubricated. Special attention should be given to the lubrication of trunnion beds, crosshead guides, rollers, pintle surfaces, shaft bearings, and sliding surfaces; gun-lever axle beds, crosshead pins, elevating rack, elevating-band trunnions; and the elevating, traversing, tripping, and retracting mechanisms; including the teeth of all gears. These parts should be lubricated at frequent intervals whether the carriage is maneuvered or not. In preparation for firing, heavy grease should be removed from the crosshead and guides to permit prompt return to battery. When carriages are in use for daily drills, a thorough lubrication twice each week should be sufficient for all but the most severely used parts.

■ 45. FILLING RECOIL CYLINDERS.—Light recoil oil is prescribed. In filling, any air that may be present in the cylinders is allowed to escape. After filling, No. 9 reports to the gun commander that the cylinders are ready for inspection.

a. Carriages mounting 12-inch guns.—Nos. 9 and 10 mount chassis, each carrying a wrench, and remove filling plugs from recoil cyinders. If oil is needed, No. 9 calls on No. 22 for funnel and measure and pours oil into right cylinder slowly. No. 10 watches oil in left cylinder and notifies No. 9

when cylinder is filled to level of filling holes. After the inspection by the gun commander, Nos. 9 and 10 screw plugs well home and replace their implements.

b. Carriages mounting 14-inch guns.—Nos. 9 and 10 mount to the top of recoil cylinder at the front of the carriage, each carrying a wrench, and remove filling plugs. If oil is required No. 9 calls on No. 22 for measure and funnel, and pours oil into right oil hole slowly. No. 10 watches left oil hole and notifies No. 9 when cylinder is full. After inspection by the gun commander the plugs are replaced. Nos. 9 and 10 then mount to tops of buffer cylinders, No. 9 on the right cylinder and No. 10 on the left cylinder, and remove filling plugs from the two cylinders. If oil is needed, No. 22 passes oil and funnel up to No. 9 who pours oil in right cylinder. No. 10 watches left cylinder and notifies No. 9 when it is filled. No. 9 hands measure and funnel back to No. 22 who puts them in a convenient place. After inspection by the gun commander, Nos. 9 and 10 screw plugs well home and replace their implements.

■ 46. OBTURATOR.—*a.* With the breechblock in the loading (open) position, the spindle, with split rings, gas check pad, and filling-in disk upon it, is inserted into the block. Special care must be taken that the front and rear split rings are not interchanged. The spindle washers, bearing or spring depending on the model of gun, are put in place upon the rear end of the spindle projecting through the block, and the spindle is secured by screwing up the spindle nut by hand. The breechblock is then translated and rotated halfway into the firing position. The spindle nut is then screwed up with the wrenches provided for that purpose and locked in place. The spindle will be properly adjusted if, while it has no play longitudinally, it can be turned around freely by taking hold of the mushroom head with both hands.

b. If after firing a few rounds the spindle is found to have longitudinal play, the adjusting operation described above will be repeated.

c. The proper adjustment of the obturator is of great importance. It will not be made with the breechblock open, as this will cause injury to the gas check pad.

d. Under no circumstances will the obturator spindle nut be removed from the end of the spindle when the breechblock is locked, otherwise an attempt to open the mechanism will jam the gas check pad and injure the split rings.

e. Mushroom heads, obturator spindles, and split rings require continual care to prevent rusting and pitting. Gas check pads when removed from the gun should be inclosed in suitable containers to preserve them from deformation or contact with moisture.

■ 47. 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 liable to leave a gummy deposit in the breech recess. The soap should be 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 will be 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.

■ 48. 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 ½ pound of soda ash in each gallon of boiling water. Wash the bore with this solution using a bore sponge around which burlap has been wrapped. Then wipe the bore thoroughly dry with new burlap. Finally, coat the bore with heavy or medium rust preventive compound depending on local conditions.

b. Care must be exercised to prevent 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.

■ 49. SLIP FRICTION ADJUSTMENT.—Before firing, the elevating mechanism slip friction device on the 12-inch disappearing carriage, M1896 or M1897, should be tested. The friction test can be made by bringing the gun against the depression stops, then continuing in the direction of depression. Slip of the friction device should result from the combined maximum effort of three men. If slippage is too free, the nut should be tightened to increase friction. Unless the elevating mechanism is adjusted so as to provide the above slippage at the time of firing, the elevating mechanism may be damaged.

APPENDIX

LIST OF REFERENCES

Ammunition, general	TM 9–905 (Now published as TR 1370–A)
Care and preservation of matériel	TM 4–245 (Now published as TR 1160–20)
Cleaning and preserving materials	TM 9–850 (Now published as TR 1395–A)
Coast artillery ammunition	TM 4–205
Coast artillery weapons and matériel	TM 4–210
Drill ammunition	TM 9–905 (Now published as TR 1370–D)
Examination for gunners	FM 4–150
Fire control and position finding	FM 4–15
Formations, inspections, service and care of matériel	FM 4–20
Gunnery	FM 4–10
Organization and tactics	FM 4–5
Safety precautions	AR 750–10 FM 4–20

SECTION VII

DRILL TABLE

Service of the piece, 12- and 14-inch guns (disappearing carriage)

Details	DETAILS, POSTS	(*a*) EXAMINE GUN (*b*) REPORT	TARGET	LOAD	CEASE FIRING
Gun pointer	Procures sight, places it in its seat, and takes post on gun pointer's platform.	(a) Examines sight and verifies adjustment of azimuth index; examines traversing mechanism and electric firing circuit. (*b*) Reports to gun commander, "Traversing in order," or defects he is unable to remedy.	See note 1	Keeps piece pointed in direction. In case II firing, repeats to deflection recorder data he sets on sight; fires piece or commands: FIRE, as soon after the gun commander has called or signaled "Ready" as piece is pointed. When so directed, endeavors to locate splash of shot and corrects his deflection, if necessary. In case III firing, sets azimuth index to azimuth posted on display board and calls "Azimuth set."	Keeps piece pointed in direction until command CEASE TRACKING is received.
Range setter	Takes post facing range scale	(*a*) Examines range scale and elevating and retracting mechanisms; assisted by Nos. 5 and 6 cleans and oils gears. (*b*) Reports to gun commander, "Elevation and retraction in order," or defects he is unable to remedy.	See note 2	Lays piece in range; calls "Range set"	Keeps piece laid in range until command CEASE TRACKING is received.
Chief of breech	Posts his detail after assuring himself that each man has procured necessary cleaning material and equipment; takes post 2 yards in rear of breech, facing it.	(*a*) Examines breech mechanism, breechblock, breech recess, chamber and bore, and gives necessary orders for cleaning and putting them in condition for service. (*b*) Reports to gun commander, "Breech in order," or defects he is unable to remedy.	No duties	Gives command HOME RAM for ramming projectile, giving HOME as projectile is being pushed off truck and RAM when base of projectile is just inside powder chamber; gives command RAM for ramming powder charge, assisting on rammer for both operations. After breechblock has been closed, hooks lanyard (if used) to firing leaf. After primer has been inserted and firing leaf completely lowered, commands: 1. IN BATTERY, 2. TRIP. After piece has been fired, unhooks lanyard.	Supervises unloading when dummy ammunition is used.
No. 1 (breech detail)	Procures cotton waste, can containing lubricating oil, and wiper, places them in a convenient place, and takes post 1 yard to rear and right of breech, facing it.	(*a*) Assisted by No. 4 removes breech cover and places it at the designated place; cleans and oils breechblock and breech mechanism. (*b*) No duties.	No duties	Assists in ramming projectile and powder charge; assists No. 4 in closing breech. After each shot, assists No. 19 in sponging chamber.	When dummy ammunition is used, hooks dummy extractor in base of dummy powder charge and assists in withdrawing charge; in similar manner, assists in removing dummy projectile.
No. 2 (breech detail)	Procures cotton waste and takes post 1 yard to rear and left of breech, facing it.	(*a*) Cleans and oils breech recess and gas check seat. (*b*) No duties.	No duties	Assists in ramming projectile and powder charge; assists No. 4 in closing breech. After each shot, assists No. 19 in sponging chamber and wipes off mushroom head, gas check seat, and breech recess.	When dummy ammunition is used, assists in withdrawing dummy powder charge and dummy projectile.
No. 3 (breech detail)	Procures lanyard (if used), primer pouch, primers, punch, drill, reamer, and firing mechanism, and takes post on right side of piece, 1 foot to right and in front of elevating band, facing to rear.	(*a*) Examines vent and firing mechanism; clears vent and cleans primer seat; places firing mechanism in position; coils lanyard (if used) and hangs it over elevating arm. (*b*) No duties.	No duties	Inserts primer after breechblock has been closed and locked and lanyard (if used) hooked; completely lowers leaf of firing device and steps to right rear as gun goes into battery. If firing is by lanyard, lets lanyard uncoil as piece goes into battery, pulls it at command FIRE, and then coils long lanyard and hangs it in the proper place. As soon as breechblock has been opened after piece has been fired, removes old primer, clears vent, and cleans primer seat.	Removes primer when so directed.
No. 4 (breech detail)	Procures operating crank for breech mechanism, places it in position, and takes post 2 feet to right of breech, on line with its face, facing it.	(*a*) Assists No. 1 in removing breech cover and placing it in its designated place. Assists in cleaning and oiling breechblock and breech mechanism. (*b*) No duties.	No duties	Opens breech and holds breech block until chief of breech commands CLOSE BREECH; closes breech, assisted by Nos. 1 and 2.	When dummy ammunition is used, opens breech and holds breechblock until dummy powder charge and projectile have been removed.
Nos. 5 and 6 (elevating detail).	Take post at elevating handwheel, on same side as range setter, facing piece.	(*a*) Assist range setter in examining elevating and retracting mechanisms and in cleaning and oiling gears. (*b*) No duties.	See note 2	Elevate piece as directed by range setter	No duties.
Nos. 7 and 8 (traversing detail).	Procure traversing cranks, place them on traversing shaft, and take post facing to rear at crank on same side of carriage as gun pointer.	(*a*) Remove drip pan and examine, test, clean, and oil traversing mechanism under supervision of gun pointer. No. 8 receives muzzle cover from No. 21 and places it in designated place. (*b*) No duties.	See note 1	Traverse piece as directed by gun pointer. They halt when piece is fired and resume traversing as soon as loading operations are completed.	No duties.
Nos. 9 and 10 (tripping detail).	No. 9 procures wrench for filling plugs, measure containing recoil oil, and funnel, places them in a convenient place, and takes post at right tripping lever, facing it. No. 10 procures wrench for filling plugs and takes post at left tripping lever, facing it.	(*a*) Examine recoil and buffer cylinders, and assisted by No. 22 fill them if necessary. After inspection of cylinders by gun commander, No. 9 takes post on right of rammer about 2 feet from rear end, and No. 10 takes post on left of rammer in front of No. 20. (*b*) No duties.	No duties	Assist in ramming projectile. As soon as projectile is seated, they quit rammer and run to tripping levers. At command IN BATTERY, they seize tripping levers, and at command TRIP raise them quickly to stops, hold them there for an instant, releasing them slightly to test engagement of safety catch, and then let go. When gun is in battery, they run back to their posts on rammer in preparation for next round. If firing is by electricity, No. 10 closes safety firing switch as soon as gun is in battery.	When dummy ammunition is used, they assist in starting dummy projectile from its seat.
Nos. 11 and 12 (truck detail).	Bring out shot trucks to be used and take post at handles of one of trucks, No. 11 on right and No. 12 on left.	(*a*) Examine and adjust trucks; clean and oil them if necessary, after which they turn them over to the ammunition squad for loading. (*b*) No duties.	See note 3	Run loaded truck forward so that tray enters breech recess squarely. As truck hits face of breech, No. 12 sets brake. After projectile has been pushed off truck, the detail withdraws truck and turns it over to ammunition squad; then takes post behind loaded truck in preparation for next round.	When dummy ammunition is used, they push truck into position at breech to receive dummy projectile. As soon as truck is loaded, they return it to loading position.
Nos. 13, 14, 15, 16, 17, and 18 (powder serving detail).	Take post convenient for receiving powder charges from ammunition squad. When dummy ammunition is used, the detail takes post at tray containing dummy powder charge, Nos. 17, 15, and 13 on right, and Nos. 18, 16, and 14 on left, in order named from front to rear.	(*a*) Examine powder trays and turn them over to ammunition squad for loading. (*b*) No duties.	No duties	No. 13 sees that powder sections are arranged in order in which they are to be inserted. As soon as rammer has been withdrawn after seating projectile, the detail carries powder tray to breech and inserts nose in breech recess. The rammer detail pushes powder off the tray into powder chamber. The tray is then removed and turned over to ammunition squad for refilling.	When dummy ammunition is used, they bring up empty powder tray to receive dummy powder sections and return loaded tray to a convenient point.
No. 19 (sponge detail)	Procures chamber sponge and vessel containing liquid for sponging, places them at a convenient distance from rammer, and takes post near sponge, facing gun.	(*a*) Brings up chamber sponge when called for by chief of breech and assists in sponging chamber. (*b*) No duties.	No duties	Dips sponge in liquid for sponging and allows excess liquid to run off. As soon as breech is open after each shot, assisted by Nos. 1 and 2 sponges chamber as quickly as practicable.	No duties.
Nos. 20, 21, and 22 (rammer detail).	Nos. 20 and 21 procure rammer and place it on emplacement, in rear of and to one side of gun, at convenient point for ramming. No. 20 takes post on left of and about 3 feet from rear end of rammer. No. 21 takes post on right, 4 feet from head of rammer. No. 22 procures extractor for dummy projectile, places it on rack, and takes post on left of rear end of rammer. All face to front.	(*a*) No. 20 assists breech detail if called upon. No. 21 passes around right of carriage, mounts to muzzle and removes muzzle cover, handing it to No. 8. No. 22 passes around left of carriage and assists tripping detail in filling recoil and buffer cylinders. The detail returns to its post on rammer. (*b*) No duties.	No duties	As truck is brought up to face of breech, rammer detail, assisted by chief of breech and Nos. 1, 2, 9, and 10, rams projectile. After powder serving detail places nose of powder tray in breech recess, rammer detail, assisted by Nos. 1 and 2, rams the powder. Rammer detail then carries rammer back to position preparatory to ramming next round.	When dummy ammunition is used, No. 22 brings dummy extractor and No. 1 hooks it in base of dummy powder charge. Rammer detail, assisted by Nos. 1 and 2, then withdraws dummy powder charge. The dummy projectile is removed in a similar manner.

NOTES

1. At the command TARGET, gun pointer in case II firing sets on sight the deflection recorded on display board; Nos. 7 and 8 traverse piece under direction of gun pointer so that line of sight is on target; the gun pointer calls "On target"; gun pointer continues to set data posted on display board, and assisted by Nos. 7 and 8 follows the target. In case III firing, Nos. 7 and 8 under direction of gun pointer traverse gun so that azimuth index is set to azimuth posted on display board; gun pointer calls "Azimuth set"; gun pointer assisted by Nos. 7 and 8 continues to traverse gun according to data posted on display board.
2. At the command TARGET, range setter assisted by Nos. 5 and 6 lays piece in range continuously according to data posted on the display board.
3. At the command TARGET, truck detail runs first loaded truck to convenient position in rear of breech.

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