FM 6-20

WAR DEPARTMENT

FIELD ARTILLERY FIELD MANUAL

TACTICS AND TECHNIQUE

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FM 6–20
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FIELD ARTILLERY FIELD MANUAL

TACTICS AND TECHNIQUE

CHANGES No. 1

WAR DEPARTMENT,
WASHINGTON, *January 2, 1941.*

FM 6–20, July 10, 1940, is changed as follows:

■ 82. GENERAL.

* * * * * * *

f. The number of available noninterfering radio channels (frequencies) is the controlling factor in the number of radio sets of any type which may be used in any area. The number of channels needed by the triangular (square) division artillery is as follows:

(1) Three (eight) frequencies for the division artillery tactical net and (four) for the medium battalion liaison nets.

(2) Four (four) frequencies for the division artillery air-ground net.

(3) One (one) frequency for the division artillery anti-aircraft-antitank warning and control net.

(4) Eighteen (twenty-six) frequencies for the battalion liaison and battery observer nets distributed as follows: Five to each light battalion and three to each medium battalion.

g. Paragraphs 89 to 91, inclusive, describe a method of employment of the artillery radio sets. Within the limitations of the equipment and the available frequency channels, they do not preclude other methods of employment or the establishment of additional nets.

h. All of the division artillery antitank weapons are concentrated in the antitank battery of the medium battalion(s) and the bulk of the antiaircraft weapons in the antiaircraft-antitank platoons of all battalions. On the march, elements of these weapons are distributed throughout the column or placed at danger points along the route of march. When the artillery is in position, a proper use of these weapons demands considerable dispersion laterally and

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in depth, and in the event of a break-through, a means of quickly concentrating elements not then engaged. Considering the speed with which modern tanks and airplanes can make an attack, a means of rapid intercommunication between all antiaircraft-antitank elements is essential. Radio offers the only solution. The radio set thus employed must be capable of instantaneous operation at all times, on the march and in position. Time will not be available to set up the radio or to take it down when it becomes necessary to move.

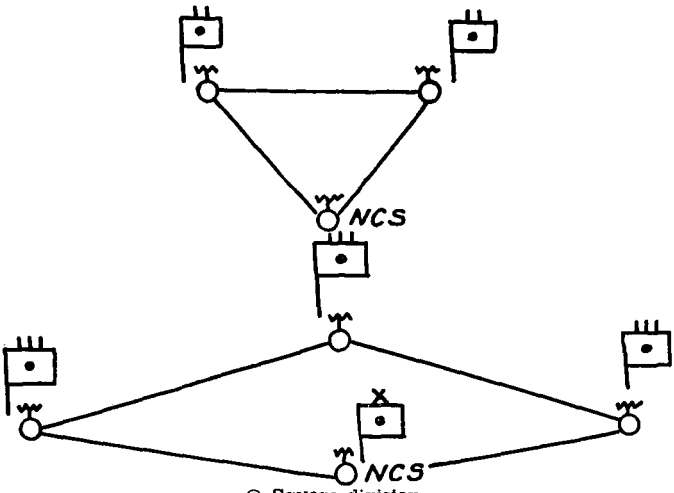
[A. G. 062.11 (12–13–40).] (C 1, Jan. 2, 1941.)

■ 89. TACTICAL RADIO NETS (fig. 8).—*a. The division artillery (brigade) tactical net* includes the headquarters station (NCS) and the battalion (regimental) stations. This net is placed in operation prior to the installation of the wire system and during its interruption. When not in operation, the nets should be checked at scheduled intervals to insure their continued functioning. The operators of the radio stations in this net are used to operate the telegraph instruments simplexed on the wire circuits. When the wire circuits are in operation, wire telegraph, not radio, should be used for communication between the headquarters concerned.

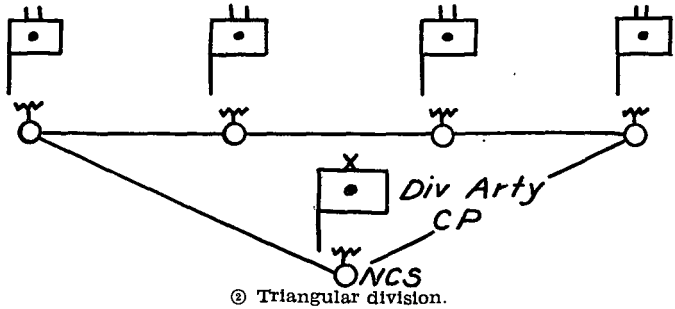
b. The *antiaircraft-antitank radio net* provides a means of warning, alerting, and controlling all antiaircraft-antitank units of the division artillery. This net includes the division artillery headquarters station, battalion stations, antitank battery of medium battalion(s), and all antiaircraft-antitank platoons. Normally, messages having to do with the approach and attack of hostile tanks and airplanes will be transmitted by voice and in clear text.

c. Artillery-infantry intercommunication is obtained when practicable by radio sets of either arm entering the net of the other.

[A. G. 062.11 (12–13–40).] (C 1, Jan. 2, 1941.)

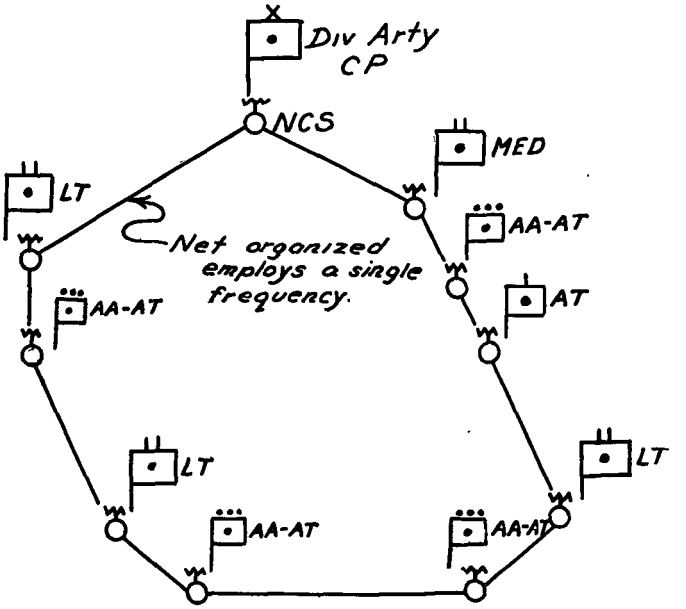


① Square division.



② Triangular division.

FIGURE 8.—Division artillery tactical nets.



③ Division artillery antiaircraft-antitank radio net (as applied in triangular division).

FIGURE 8.—Division artillery tactical nets—Continued.

[A. G. 062.11 (12–13–40).] (C 1, Jan. 2, 1941.)

■ 90. LIAISON AND FORWARD OBSERVER NETS.—*a. Light battalion nets* (fig. 9).—(1) Radio sets in the headquarters battery and in each of the firing batteries of the light battalion provide radio communication for liaison officers, battery and battalion observers, and alternative channels of communication to supplement wire in an area usually swept by hostile small-arms and artillery fire. The sets are sufficient in number to provide a flexibility in their use which will meet most of the tactical requirements of this battalion.

(2) The sets issued to each battery provide the battery commander with radio communication with his executive prior to the installation of the wire system. They supple-

ment the wire communication between the observation post and the firing battery after the battery is in position. The sets should be used to—

(*a*) Provide radio communication for the battery forward observer. The forward observer may be directed to report targets by radio directly to the battalion fire direction center.

(*b*) Leapfrog observation posts when the terrain permits.

(*c*) Provide communication between the battery and the battalion fire direction center prior to the installation and during interruptions of the battery-battalion wire circuit.

(3) The sets issued to the battalion headquarters provide—

(*a*) The battalion commander with radio communication with the elements of his battalion.

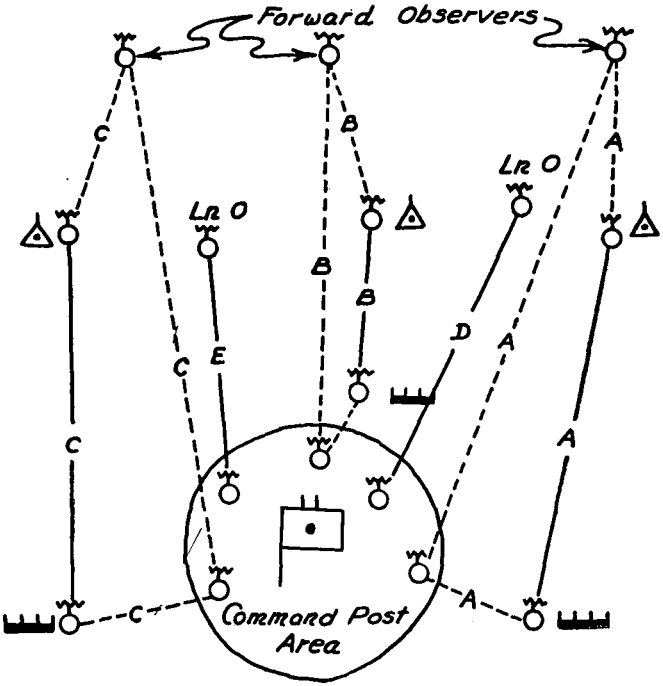
(*b*) Radio communication between the liaison officers and the battalion command post, and also between the battery forward observers and the battalion command post (fire direction center).

(*c*) Uninterrupted communication with liaison officers and batteries during displacement of the batteries or of the battalion command post.

b. Medium battalion nets.—(1) The battalion liaison and observer nets include stations at the battalion command post and those with liaison officers and battalion and battery forward observers. The nets are used by liaison officers in requesting reinforcing fires for the light artillery and in reporting the effectiveness thereof, and by forward and flank observers of the battalion in the adjustment and surveillance of fires of the battalion.

(2) The battery forward observer nets are organized, in general, similar to those of the light battalion. It may be desirable to have the battery forward observers report all targets by radio directly to the battalion fire direction center. In situations where that procedure is desirable, one radio set should be taken from each battery and installed at the battalion fire direction center.

[A. G. 062.11 (12–13–40).] (C 1, Jan. 2, 1941.)

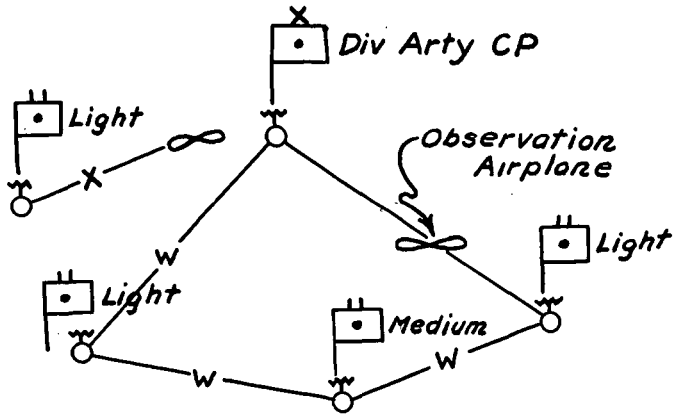


Solid lines indicate primary use.
Broken lines indicate secondary use.
In general, no attempt should be made to operate more than two SCR–194 sets at a time in a single net.
Five frequencies, A, B, C, D, and E, are assigned to the battalion.

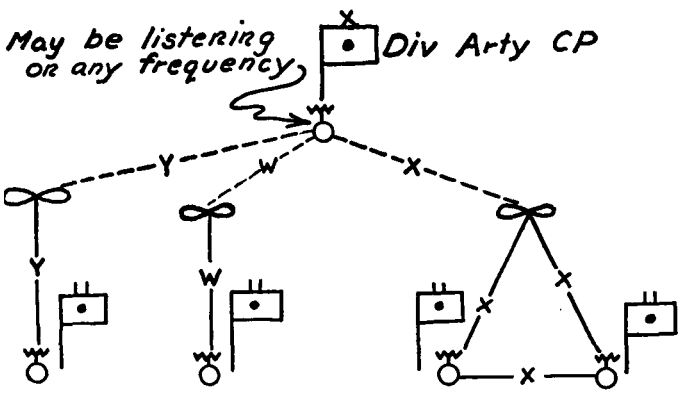
FIGURE 9.—A method of employment of liaison and forward observer sets of a light battalion.

[A. G. 062.11 (12–13–40).] (C 1, Jan. 2, 1941.)

91. AIR-GROUND RADIO NET (fig. 10.)—*a.* The air-ground net of the division artillery includes the division artillery headquarters station (NCS) and the battalion stations. The net is organized on a given frequency (W) as a directed net when a single airplane is present or expected, or on a schedule prescribed by the division artillery headquarters. At all other times the net is silent.



① Net showing three airplanes working with division artillery, details as to frequency and assignment having been prearranged.



② Net showing one airplane working with three battalions while another works with the fourth battalion.

FIGURE 10.—Examples of air-ground radio nets.

[A. G. 062.11 (12–13–40).] (C 1, Jan. 2, 1941.)

b. If more than one airplane is available, each is assigned to a regiment (square division only), a battalion, or a group of battalions, and a frequency (**W**, **X**, **Y**, or **Z**) is designated for each airplane. These arrangements are made by the division artillery headquarters prior to the take-off of the airplane. Each airplane then reports directly on the prearranged frequency to the station that will control its mission. It will be unusual to require an airplane to change frequency while in flight; if a change in frequency is necessary, ground stations shift to the frequency of the airplane.

[A. G. 062.11 (12–13–40).] (C 1, Jan. 2, 1941.)

■ 141. FIRE DIRECTION.

* * * * * * *

d. Control by higher units.—Commanders of higher units exercise general control by allocating reinforcing artillery, by organizing the artillery for combat, by assigning normal and contingent zones, by specifying the locality or localities where units must be prepared to mass their fires, by providing for the issue of maps, photomaps, and air photos, by coordinating the surveys, and by procuring and coordinating air observation. Such specific instructions as may be necessary are issued concerning communications, methods of target designation, registrations, and fires to be prepared. In order to concentrate effective fire on important targets, higher commanders endeavor by their control measures to insure that an adequate number of battalions are prepared to fire promptly and accurately in critical areas, and that the assignment of targets to subordinate units can be made instantly and unmistakably by reference to maps, photomaps, air photos, or concentrations for which data have been prepared.

[A. G. 062.11 (1–25–41).] (C 1, Jan. 2, 1941.)

■ 171. EARLY RESUMPTION OF OFFENSIVE NOT CONTEMPLATED.—*a. General.*—(1) * * * fires are coordinated, and the systems of command, signal communication, observation, liaison, and ammunition supply are developed as time permits. * * *

* * * * * * *

[A. G. 062.11 (1–2–41).] (C 1, Jan. 2, 1941.)

■ 204. GENERAL.—* * *

* * * * * * *

f. Continual care must be exercised to protect ammunition from the action of the weather. (FM 7–40 and FM 6–130.)

[A. G. 062.11 (1–2–41).] (C 1, Jan. 2, 1941.)

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

E. S. ADAMS,
Major General,
The Adjutant General.

U. S. GOVERNMENT PRINTING OFFICE: 1941

FM 6–20

FIELD ARTILLERY FIELD MANUAL

TACTICS AND TECHNIQUE

Prepared under direction of the
Chief of Field Artillery

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WAR DEPARTMENT,
WASHINGTON, *July 10, 1940.*

FM 6–20, Field Artillery Field Manual, Tactics and Technique, is published for the information and guidance of all concerned.

[A. G. 062.11 (6–16–39).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
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E. S. ADAMS,
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FIELD ARTILLERY FIELD MANUAL

TACTICS AND TECHNIQUE

(The matter contained herein supersedes parts two, three, four, and five, FAFM volume II, December 28, 1931, and TR 430-135, April 18, 1934.)

PART ONF

RECONNAISSANCE, OCCUPATION, AND ORGANIZATION OF POSITION

CHAPTER 1

GENERAL

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SECTION I

POSITIONS

■ 1. GENERAL.—*a.* The term "position" has reference primarily to the position occupied or to be occupied by the pieces. Observation posts, command posts, battalion ammunition trains, and other artillery services and installations are located for effective employment of the pieces.

b. Positions are selected for the pieces and for all other elements of the command, such as observation posts, command posts, aid stations, rear echelons, limbers (trucks, tractors), auxiliary weapons, and trains.

■ 2. CLASSIFICATION.—Positions are classified as follows:

a. General.—(1) *Laying.*—A position behind a mask, in which indirect laying is necessary, is an indirect laying position. A position from which the target can be seen through the sights is a direct laying position.

(2) *Concealment.*—The terms "concealed" and "unconcealed" are used to indicate whether or not a battery may be seen by enemy observers. When these terms are used, the type of enemy observation (ground, balloon, or airplane) should be indicated.

(3) *Defilade.*—The term "defilade" is relative and implies a degree of protection from fire or concealment from observers through the presence of intervening ground forms; thus, flash defilade implies the concealment of the flash of the pieces from enemy ground observation. Defilade is also used with reference to protection from hostile fire.

(4) *Cover.*—Cover refers to artificial or natural protection from enemy fire.

(5) *Open position.*—An open position is one affording neither cover nor concealment other than camouflage.

b. Tactical.—(1) An *alternate* position is an additional position prepared by a battery from which it may execute its prescribed missions. When the situation permits, one or more alternate positions are prepared and kept concealed in order that a battery whose position has been located by the enemy may avoid the effect of hostile fire on that position by moving, generally under cover of darkness, to an alternate position.

(2) A *dummy* position is one prepared to simulate an occupied battery position in order to deceive the enemy either as to the amount of artillery present or as to the position of a battery firing from the vicinity of the dummy position. When the situation permits, a piece may be registered from the dummy position in order to mislead the enemy. Results of the registration may be referred to the occupied position by survey.

(3) An artillery unit is "in position" when the pieces are in position and ready to fire and the necessary systems of observation and communication have been established.

(4) An artillery unit is posted "in readiness" when it is held near one or more possible positions, prepared to move quickly into position when ordered. Cover and concealment are major considerations in the selection of positions in readiness. While posted in readiness, a unit makes all possible preparations to expedite its entry into action. When the firing positions to be occupied are known, they are organized as far as practicable and firing data are prepared.

■ 3. CONSIDERATIONS GOVERNING SELECTION.—*a. The primary requisite in the selection of a battery position is to choose one from which the pieces can carry out effectively the mission*

assigned. The range is a deciding factor, since the pieces must be able to reach the target area, and within this area, dead space must be at a minimum.

b. Selection is governed first by considerations affecting delivery of fire as follows:

(1) Range.

(2) Field of fire and dead space.

(3) Observation.

(4) Signal communication.

(5) Character of ground at emplacement.

c. Next, by considerations affecting defense of the position as follows:

(1) Concealment, including defilade.

(2) Concealment and protection for limbers, motor vehicles, ammunition trains, and auxiliary installations.

(3) Terrain minimizing effect of chemical attack.

(4) Security as afforded by proximity of other arms, characteristics for close defense, defense against mechanized attack, and antiaircraft defense.

(5) Availability of alternate and dummy positions.

d. Finally by administrative considerations as follows:

(1) Facility of movement and supply.

(2) Interference with operations of other troops.

(3) Facilities for providing shelter and comfort for personnel.

■ 4. RANGE.—Due regard having been given to the tactical situation, artillery positions in general should be well forward to permit full use of the available range of the weapons if occasion demands.

■ 5. FIELD OF FIRE AND DEAD SPACE (FM 6–40).—*a.* Technically, the field of fire of a battery includes all the ground in the direction of the enemy that the battery can cover effectively with fire. Usually, when the field of fire of a battery is spoken of, it includes only that part of the battery's possible field of fire within which the orders of the higher artillery commander indicate that it is expected to employ its fire power. Pieces should be so sited as to cover this field of fire.

b. The terrain between the mask and the points of impact of trajectories just clearing the mask is dead space. The

limits of the dead space for available ammunition with the lowest muzzle velocity should be determined as soon as possible and marked on a map or chart together with the field of fire. Dead space for howitzers seldom exists.

c. By the skillful selection of gun positions, dead space may be reduced to a minimum.

d. In a battalion, the extent of dead space may be greatly reduced and the field of fire enlarged by disposing the batteries so that a dead space for one battery will be within the field of fire of another.

e. In occupying positions behind a mask, clearance of the mask at the anticipated minimum range should be assured before the guns arrive.

■ 6. OBSERVATION.—Proximity of good observation posts (OP's) usually has a decided influence upon the selection of artillery positions, especially when quick action is required. Ground observation is of importance under all circumstances.

■ 7. SIGNAL COMMUNICATION (pt. two).—In the selection of artillery positions, due consideration must be given to the possibilities of successful establishment and maintenance of suitable signal communication. The telephone is the primary means of communication but the establishment of auxiliary means, such as radio, visual, and messenger, should not be neglected. The main points to be considered in this connection are—

a. Desirability of short lines.
b. Simplicity of the system.
c. Utilization of existing wire lines when authorized.
d. Roads and trails for reels, messengers, etc.
e. Ease of maintenance, especially at night.
f. Concealment and cover for wire lines and personnel.
g. Avoidance of interference by traffic and troops.
h. Possibility of raising wire lines off the ground.
i. Possibility of using visual signaling.

■ 8. CHARACTER OF GROUND AT EMPLACEMENT.—Character of the soil is important because rocks, loose sand, and mud afford insecure trail seating and complicate trail shifting for light weapons; for heavy weapons, particularly the 240-mm howitzer, unsuitable ground may preclude effective oper-

ation. Furthermore, pronounced slope of the position area may preclude securing the desired elevation for light weapons; even a slight slope increases the difficulty of emplacing the 240-mm howitzer.

■ 9. CONCEALMENT INCLUDING DEFILADE.—*a.* Positions selected should be suitable for indirect laying, except for antitank guns or in situations where there is little danger to be expected from hostile artillery or long range machine-gun fire. It is only by concealing all elements of the command or by rendering them inconspicuous by suitable use of camouflage, that the sustained service of an artillery command can be insured in the face of an active enemy.

b. When practicable, pieces should have at least flash defilade from all points within the enemy's position. In daylight, this distance below the plane of defilade is about 5 yards for light artillery and 10 yards for medium and heavy. During darkness, flash-ranging units may be able to obtain fairly accurate locations of pieces which have considerably greater defilade.

c. To save time before making a ground reconnaissance, the map should be studied for a position of desired defilade. Since, in general, the security of a position increases with its defilade and balloon observation may be attempted by the enemy, positions having the maximum defilade compatible with the mission and permissible dead space are desirable.

d. Positions on or near the crest of a reverse slope facilitate running the pieces up to the crest should direct laying be necessary. However, if the position is discovered by the enemy, and the crest is plainly seen by him, the pieces are in a very vulnerable position, since the reverse slope may be searched very effectively by fire. Protection against gas is more easily accomplished in a crest position and drainage of the position is simplified. Positions of deep defilade are generally easier of access and of greater security but may have the tactical disadvantage of increased dead space, are subject to accumulations of gas, and may present difficulties with respect to underground shelter and drainage.

e. Every advantage of natural and artificial means should be taken to conceal positions. All indications of the occupa-

tion and improvement of a position and the approaches thereto should be carefully concealed from air observation, including air photography. Good positions affording concealment, particularly when considered relative to possibilities for camouflage, may be found (par. 57)—

(1) On the edge of a road or trail. Such positions are easily accessible for supply of ammunition, may be taken up with the minimum evidences of occupancy, and are particularly appropriate for heavy artillery. However, if the road is much used, the firing and the supplying of ammunition may obstruct traffic. Positions close to and on the leeward side of dusty roads or too close to roads subject to artillery fire should be avoided.

(2) In slightly wooded areas of considerable extent consisting of small trees or brush, particularly where the cutting down of trees is unnecessary, or in isolated open spaces in a large wood. While positions at the forward edge of small clumps of woods or under a line of trees have certain advantages over positions in the open, they are easy to locate accurately and facilitate hostile fire adjustment.

(3) In ruins or in a village. Such positions generally facilitate concealment, especially if the pieces are irregularly spaced. They permit construction of camouflage and defenses without attracting attention and make it simpler to avoid evidences of occupancy.

(4) Irregularly spaced over open ground. Such positions may frequently prove most satisfactory in situations involving rapid movements. However, they are difficult to conceal, especially from air photography. This difficulty is greater if there are visible routes of supply and other evidences of occupancy.

■ 10. CONCEALMENT AND PROTECTION FOR LIMBERS, MOTOR VEHICLES, AND BATTALION AMMUNITION TRAIN.—*a. Limbers and motor vehicles.*—(1) Maximum concealment and protection and free and prompt access to the positions are the objects sought in the choice of positions for limbers and motor vehicles. The position to be occupied and the formation to be taken by these vehicles depend upon the nature of the concealment and protection available.

(2) Concealment may be obtained best by utilizing woods or broken terrain; camouflage of vehicles in the open is difficult.

(3) Ridges having gentle slopes afford concealment from ground view but little protection from searching fire. The effect of searching fire in such cases may be avoided or greatly reduced by placing the vehicles more than 400 yards in rear of the covering crest. If they cannot be withdrawn to a flank, they should be at least 500 yards in rear of the pieces. In truck-drawn artillery, the trucks, because of their greater speed, may be placed farther from the gun position.

(4) When it is impracticable to conceal the limbers and motor vehicles from the view of the enemy, they should be posted as far from the pieces as conditions warrant and be scattered irregularly.

b. Battalion ammunition train.—(1) The battalion ammunition train is posted in accordance with instructions of the battalion commander. The main considerations in selecting positions are concealed approaches to the positions of firing batteries, protection from hostile fire, and concealment from hostile air observation. Other considerations are ample space to permit parking the vehicles with considerable intervals and ease of access to roads running toward the ammunition supply point and toward the batteries.

(2) It is desirable that ammunition-train positions be relatively close to the firing batteries which they serve. The distances will depend upon the nature of the transportation and the availability of cover. In horse-drawn units, the distances preferably should not exceed 1,200 yards.

■ 11. EFFECT OF TERRAIN ON CHEMICAL ATTACK (par. 65).— Tall grass, bushes, trees, and buildings increase the danger from gas. They add to the chances of contamination from contact with persistent gas unless steps are taken to provide clear routes for intercommunication within and movement from the battery position. They retard the movement of air, thus prolonging the effects of nonpersistent gas concentrations as well as increasing the vapor concentrations of persistent gas.

■ 12. SECURITY (sec. III, ch. 3).—An important consideration, particularly for batteries on a flank and when mechanized attack is to be guarded against, is the location of troops of other arms. The artillery commander should determine whether these troops have organized the ground on the flank, the location of such works, and whether they will afford security against the operations of mechanized vehicles. Whenever consistent with the performance of assigned missions, the position selected should be such that it favors the siting of the pieces so as to permit their employment in close defense.

■ 13. ALTERNATE AND DUMMY POSITIONS.—Alternate and dummy positions should be available (par. 2*b*). They should be so located that fire directed at them will not endanger the principal battery position.

■ 14. FACILITY OF MOVEMENT AND SUPPLY.—The ideal position permits concealed and defiladed movement to the front, rear, and flanks. In selecting a position, therefore, due consideration must be given to ease of movement in and out of the position and to the effect of different weather conditions. A few hours of rain or a sudden thawing of the ground may render movement impossible in an otherwise good position. Facility of ammunition supply is of primary importance and concealed approaches for daytime ammunition supply make for less interruption by hostile fire.

■ 15. INTERFERENCE WITH OTHER TROOPS.—Sites selected for battery positions are usually far enough in rear of the front line to avoid interference with other troops. It may be necessary, however, to select battery positions in close proximity to supports or reserves, or even on the ground which they actually occupy. In such cases, the superior commander usually will make the ground available to the artillery unless it has some other tactical use of greater importance. Care should be taken to avoid placing a battery so close in rear of another that the blast will interfere with the service of the latter's pieces.

■ 16. FACILITIES FOR SHELTER AND COMFORT OF PERSONNEL.—Morale of personnel is furthered by steps taken for their security and comfort. Chief among these are prompt and ade-

quate supply of food and water, medical attention, suitable shelter, and timely reliefs.

■ 17. OBSERVATION POSTS.—Positions selected for observation posts should give an extensive and clear view of the zone of fire, facilitate prompt establishment and maintenance of signal communication, afford cover and concealment, and be as near to the front and the line of fire as practicable. Tree tops, shell holes, ruins, steel towers, windmills, chimneys, church steeples, and front line trenches may be used on occasion as observation posts. Construction of observation posts may vary from hastily prepared cover and concealment to a well-equipped concrete dugout. (See FM 5–15.)

■ 18. COMMAND POSTS.—*a.* The various elements of a command post, such as the telephone central, message center, radio station or stations, and fire-direction center, are habitually dispersed for purposes of concealment, protection, and avoidance of congestion. Positions selected should facilitate the transmission of messages, provide ample space for command post activities, and be concealed or lend themselves to effective camouflage. Cover, if not available, may be constructed if warranted by the situation. The location must be such as will facilitate to the maximum the exercise of command and preferably will insure close association with the commanders of supported troops. The amount of circulation in the proximity of command posts necessitates the careful camouflage of approaches and strict camouflage discipline. In a rapidly moving situation, it is not unusual for artillery battalion and battery commanders initially to place the elements of observation posts and command posts together or near together. Under these circumstances, the respective personnel should be kept separated; command post elements should be placed at such distance away from the observation post as the performance of their duties and concealment permit. Separate positions should be selected for the two posts as soon as feasible.

b. The controlling feature in the location of command posts of battalions is facility of communication with batteries and with the artillery regimental command post; when prac-

ticable, a battalion command post is placed in proximity to that of the commander of the supported troops.

c. While normally regimental command posts are near those of commanders of supported troops, locations should facilitate communication with battalions and with the next higher artillery commander.

d. Command posts of division and corps artillery officers should be near the division and corps commanders, respectively.

■ 19. REAR ECHELONS.—*a.* Selection of positions for the rear echelons, which include battery maintenance sections and administrative elements, is made with a view to obtaining the maximum concealment and protection consistent with the exercise of their proper functions and minimum interference with combat troops.

b. In stabilized situations, the various administrative units of the battalion and batteries and the maintenance sections, limbers, and trucks may be located at or near the position of the battalion ammunition train, which may be established farther to the rear than when in fast-moving situations. This is generally called the rear echelon of the battalion. Batteries seldom establish separate rear echelons.

■ 20. AID STATIONS.—*a.* The ideal site for the battalion aid station is one centrally located in rear of the battery positions along the natural line of drift for the wounded from the combat installations in front. A position in close proximity to an installation likely to draw fire is avoided. Desirable features sought are—

(1) Protection and concealment.
(2) Proximity to concealed routes from the firing batteries.
(3) Ease of contact with the firing batteries.
(4) Ease of access by ambulances.
(5) Proximity to water.
(6) Shelter from weather.

b. The veterinary aid station (normally one per animal-drawn regiment) is established at or near the point where the animals of the unit are assembled. In selecting the location, the following points should be considered:

(1) Accessibility to the animals of the firing batteries, battalion and regimental headquarters, and battalion ammunition trains.

(2) Concealment and protection.

(3) Adequate water supply.

(4) Concealed and protected routes to the rear.

SECTION II

RECONNAISSANCE

■ 21. GENERAL.—*a*. Reconnaissance consists of the examination of territory by one or more individuals for the purpose of obtaining information; as affecting Field Artillery, it comprises reconnaissance for positions, routes, and information concerning targets.

b. This section deals primarily with that reconnaissance which seeks information to facilitate the entry of artillery into action; that is, reconnaissance for suitable locations for the various installations and routes thereto. Such reconnaissance must precede the occupation of position by the maximum amount of time available; the available amount of time determines the amount of detail possible in the reconnaissance.

c. The following doctrines are applicable to all artillery reconnaissance.

(1) Reconnaissance is carefully planned with a definite object in view and should be made in conjunction with a suitable map or air photo.

(2) It must be active, timely, and continuous, in order to insure the uninterrupted movement of artillery units into position and the delivery of effective fire.

(3) Reconnoitering parties must be limited to the individuals and vehicles actually required and advantage must be taken of all available concealment.

(4) An early study from a high point overlooking the area to be reconnoitered facilitates prompt decisions, allows the remaining reconnaissance to be planned effectively, and lessens probability of being observed by the enemy.

(5) Artillery reconnaissance should be progressive (par. 26).

■ 22. FOR POSITIONS.—*a*. The tactical situation and the plan of action decided upon by the commander of the troops limit the area within which artillery takes position. Thus the artillery usually is not entirely free to choose its own locations, but must make the best use of terrain within the limits imposed as determined by reconnaissance of the allotted area.

b. When positions for artillery elements of a particular command are selected in the area of another command, provision for the reservation of the positions to be occupied must be made by a higher commander.

■ 23. FOR ROUTES.—Reconnaissance for suitable routes includes search for concealment and for ground over which the vehicles may be moved with the least difficulty and danger from enemy fire or from persistent gas.

■ 24. COMMUNICATION PERSONNEL WITH COMMANDER.—Whenever possible, personnel accompanying the commander on his reconnaissance should include the communication officer or noncommissioned officer. This procedure will greatly facilitate the installation of the initial communication system by furnishing early information regarding the location of the command post, observation post, and routes for wire lines.

■ 25. FOR INFORMATION CONCERNING THE ENEMY.—*a*. While reconnaissance for locating the enemy and for gaining preliminary information concerning him devolves in large part upon troops of other arms, the artillery must utilize to the utmost its available intelligence agencies, especially for locating enemy artillery. Artillery commanders employ every means in their power to establish such relations with commanders of other arms as will insure prompt transmission of information to the artillery, since successful artillery support depends in large measure upon prompt receipt of such information.

b. The artillery must determine, by consultation with the supported unit commander, the fire desired by that unit. However, continuous reconnaissance and observation is essential to determine additional targets on which artillery fire should be placed; the artillery cannot depend exclusively upon the troops it is supporting to tell it when, where, and how to employ all its fire. Artillery liaison officers accom-

panying the commanders of supported units determine and report information of tactical and technical value to the artillery command to which they belong, including the effect of both hostile and friendly artillery fire and the description and location of suitable artillery targets.

c. In addition to liaison personnel, reconnaissance parties are sent out by battalion and higher commanders to gain special information.

■ 26. PROGRESSIVE RECONNAISSANCE.—*a. All field artillery commanders habitually precede their commands to the position to be occupied.*

b. In order to obtain early information of the plan of action and missions of artillery, the artillery commander keeps in close touch with the force commander and should accompany him on reconnaissance. As early as practicable, the artillery commander formulates his artillery plan and communicates it at the earliest opportunity by an oral, dictated, or written order to his next subordinates. Thus commences an artillery reconnaissance that is taken up as soon as practicable by each commander down to include that of the battery.

c. In large commands, this progressive reconnaissance is made first by brigade commanders to determine suitable areas for the employment of their regiments; second, by regimental commanders to select the general location of battalion position areas; third, by battalion commanders in greater detail, to locate within narrow limits the positions for the batteries, battalion ammunition trains, and other elements of the battalions; and finally, by battery commanders to determine the exact positions for the pieces and other battery elements. Two or more of these various steps frequently are carried out concurrently or merge together. *It is essential that sufficient time is provided to allow appropriate reconnaissance by the lower units and for formulation of plans by subordinate commanders.*

d. Brigade commanders will rarely be able to make a ground reconnaissance of the regimental areas but will usually find it necessary to assign them from a map reconnaissance, supplemented by information received from all other available sources. Reconnaissance on the ground is always

to be preferred but should be preceded by as detailed a study of the map as time will permit.

■ 27. MARCH RECONNAISSANCE.—During marches in the presence of the enemy, artillery reconnaissance is continuous. Artillery commanders, by a study of maps and air photos and by use of their reconnaissance personnel, keep themselves informed as to possible observation posts and positions near the line of march or probable assembly positions and routes thereto. As contact becomes imminent and the general area in which it will occur becomes evident, reconnaissance is intensified and preparations for an early entry into action are completed. Artillery reconnaissance personnel accompanies the advanced elements of the command for the purpose of locating artillery targets, suitable observation posts, positions, and routes of advance. Such personnel conducts a reconnaissance based on instructions from the artillery commander in conjunction with the reconnaissance personnel sent out by the column commander.

■ 28. INSTRUCTIONS TO UNITS DURING RECONNAISSANCE.—*a.* When a commander goes forward on reconnaissance, he instructs the officer left in command on the following points, as far as may be appropriate:

(1) The tactical situation.

(2) Whether the command is to follow at once; if so, the route to be followed, rate of march, and a destination called the "rendezvous" to which the command will proceed.

b. Additional instructions may be transmitted from time to time by markers, who should be left at places where uncertainty as to the route may arise or where there are difficulties to be avoided. As soon as the battery positions and the best routes for approaching them have been selected, the battalions or batteries are sent for and guided to their respective positions.

■ 29. TIME AVAILABLE.—*a.* Under some circumstances, a reconnaissance may be carried on for days, as in the preparation for an offensive on a large scale. Under other circumstances, the reconnaissance must be completed within a few hours, or even a few minutes, while artillery units are marching toward the positions they are to occupy.

b. When it is necessary to bring artillery into action quickly for the support of other troops, delay occasioned by a protracted search for positions affording technical and tactical advantages is unwarranted. The main consideration is to place the pieces in a position from which they can render effective support as promptly as possible. Such reconnaissance should be as thorough as time permits, but should be completed in time to allow the batteries to march to their positions without halting.

c. Generally, the speed at which the truck-drawn firing batteries are capable of moving does not allow the reconnaissance parties as much time for reconnaissance as in the case of horse-drawn artillery. It is, therefore, especially important in the case of truck-drawn artillery that reconnaissance be initiated as early as possible and be made with the greatest practicable speed. To restrict the speed of the batteries in order to gain more time for reconnaissance would sacrifice a most valuable characteristic.

■ 30. FOR HEAVY ARTILLERY.—The reconnaissance for positions for heavy artillery usually commences with a reconnaissance of roads and an examination of bridges to determine whether they are strong enough for the passage of the heavy loads involved. It is desirable to have the engineers assist the artillery in this reconnaissance. The selection of positions for the very heavy units depends largely upon the location of suitable roads for advance and for supply, and upon the availability of narrow or standard gage railroads for the supply of ammunition.

■ 31. LOCATION OF ARTILLERY COMMANDERS AND DETAILS DURING MARCH INTO ACTION.—*a.* No definite location and formation can be prescribed for artillery units on the march when contact with the enemy is expected. Artillery commanders, in accordance with orders of the force commander, give the necessary instructions in each case to place their troops in the most advantageous positions practicable to meet the anticipated requirements of the tactical situation. For this reason, the march formations of the headquarters personnel and matériel provided for the purpose of reconnaissance, security, observation, and signal communication are made as flexible as possible.

b. An artillery unit commander may order his subordinate commanders, with all or parts of their parties, to join his party or detail (par. 33) during the march into action. In general, a unit commander reporting to a superior will not accompany this superior to a still higher superior unless specifically ordered to do so. A party, when not with a superior unit, marches with the remainder of the detail. When reporting to the next higher commander for orders, subordinate commanders may be able to echelon their details forward to the vicinity of the rendezvous, making them more quickly available for subsequent use.

CHAPTER 2

PROCEDURE

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SECTION I

GENERAL

■ 32. GENERAL.—Instructions in this chapter apply primarily to light artillery but the principles apply equally to medium and heavy artillery. The methods employed by the larger calibers are in general the same as those employed by the light artillery, with obvious modifications incident to differences in transportation, mobility, and time available. No fixed rules can be laid down for the employment of details. The method of employment must be sufficiently flexible to be adaptable to varied circumstances. The methods outlined herein must be considered as a guide only.

■ 33. PERSONNEL.—*a. Artillery details.*—Each unit commander, from the battery to the brigade, inclusive, has a group of officers and enlisted men known as "the detail" to assist him in operations incident to reconnaissance and occupation of position. It includes sufficient personnel for the reconnaissance, installation, and operation of the communication system; operation of instruments; messenger service; route marking; survey operations; operation of observation posts and command posts; fire direction; and where appropriate, liaison. Constant effort must be made to restrict these details to the smallest number of individuals consistent with efficient performance of essential functions.

b. Organization of details.—In general, a detail consists of the commander's "party" and the "remainder of the detail." The party contains certain key officers and men who usually accompany the commander on the march and assist him in

reconnaissance, in issuing his initial orders, in initiating the movement forward to position, and in the occupation and organization of position. The actual organization of the detail varies with the organization, type of matériel, caliber of weapon, and means of transport. To meet the requirements of the average case, members of details are assigned normal duties in accordance with the individual aptitudes of the men; but duties of individuals are variable, interchangeable, and elastic, and details should be trained with this in view.

■ 34. ORDERS (ch. 6, pt. three).—During reconnaissance and occupation of position, formal written field orders are never issued by a battery commander; such orders may be issued by higher commanders if a high degree of stabilization exists. In a moving situation, orders of all artillery commanders usually are issued orally and in fragmentary form. Each individual is given his instructions as the situation requires. Oral and fragmentary orders of regimental and higher commanders usually should be confirmed later by written orders only when such written orders can be issued in sufficient time to be of some use to subordinates in planning their operations.

SECTION II

THE BATTERY

■ 35. RECONNAISSANCE BY BATTERY COMMANDER.—*a.* The battery commander must reach the position in ample time for reconnaissance, formulation of a definite plan, and issuance of necessary orders so that the position may be occupied and effective fire opened without delay.

b. The battery commander is usually accompanied by the battery commander's party when he reports to the battalion commander for reconnaissance. The remainder of the detail remains with the firing battery until sent for, or proceeds to a rendezvous designated by the battalion commander. The battery detail must be close at hand when the reconnaissance is completed so that it can commence at once to organize the position selected, establish observation and communication, compute firing data, and transmit or carry messages to the firing battery.

c. After receiving essential instructions from his battalion commander (par. 42), the battery commander, accompanied by the battery commander's party or some part of it, makes a detailed reconnaissance. During his reconnaissance, he comes to a decision, based on the battalion commander's orders, as to such of the following as are appropriate:

(1) Mission and method of laying.

(2) Position of firing battery.

(3) Routes of access and concealment for the battery in approaching the position.

(4) Time of occupation of position and of opening fire.

(5) Location of observation and command posts.

(6) Signal communication to be established.

(7) Survey to be performed.

(8) Positions of led horses, limbers (trucks or tractors), and the maintenance section.

(9) Construction of camouflage and protection of position.

(10) Other necessary instructions to insure the prompt opening of fire.

■ **36. BATTERY COMMANDER'S ORDER.**—*a.* The battery commander, having made his decision, gives orders to the reconnaissance officer and to the party for the occupation and organization of the position. These orders may be given to the reconnaissance officer and party as a whole, but generally appropriate parts of the orders are given separately to the individuals concerned.

b. The remainder of the detail is sent for, and instructions relative to bringing up the battery and placing it in position are transmitted to the executive.

c. The orders of the battery commander should include a brief description of the situation, mission of the battery, pertinent orders respecting points enumerated in paragraph 35, instructions concerning administrative details, and information as to the battalion aid station. Appropriate parts of this order should be communicated to the executive. In some cases, the battery commander may direct the executive or assistant executive to accompany the party, in which event the executive (assistant executive), after hearing the battery commander's orders, returns to the firing battery and marches it into position in accordance with the orders received.

■ 37. MEASURES PREPARATORY TO OCCUPATION.—*a.* As soon as the orders of the battery commander have been issued, organization of the position proceeds without delay. The remainder of the detail comes up, and work is started at once to complete the establishment of observation and communication and to perform the necessary survey. Prior to the arrival of the firing battery, firing data are computed and arrangements completed for the prompt opening of fire.

b. If the executive is not with the party, the battery commander usually sends back a member of the party to act as a guide and to transmit instructions to the executive relative to the occupation of the firing position. For an approach to and occupation of position during darkness, the route and all details of movement should, when practicable, be determined in advance by reconnaissance during daylight and markers posted before nightfall along the route to be followed. When the route to be followed is unusually difficult or hazardous, the battery commander himself may lead the battery into position. When the pieces are to be staggered, the position of each piece should be indicated to the gun marker, preferably by the use of a stake at each position. The use of stakes to mark piece positions is especially applicable to night occupation of position. Where the battery is to occupy a position in line at normal intervals, one man is posted to mark the position of the right (left) piece, after the exact position has been selected, by standing at the fixed flank of the battery and facing in the direction of fire, one arm extended in the direction of fire, the other in the direction of the line of pieces.

c. Under supervision of the reconnaissance officer, instrument personnel bring up the instruments, organize the observation post, assist the battery commander in the preparation and tabulation of firing data, perform the necessary survey, and assist in the observation of fire and of the zone of fire.

d. Under supervision of the signal sergeant, signal personnel establish, operate, and maintain signal communication within the battery. The signal sergeant should reconnoiter exact routes for the wire lines, if time permits, and should decide, if not already prescribed, whether the lines will be laid by battery reel or by hand. He meets the detail and

transmits information and instructions as to the situation, positions of elements of the command, and signal communication to be established.

e. When bringing the battery forward, the executive should ride well in advance thereof so that he may have time to study the terrain and decide upon the best way to go into action without halting the battery. To avoid disclosing the occupation by dust, movements in the neighborhood of a masked position should be made at a reduced speed (walk) unless speed is essential. If exposure at points in the route of approach is unavoidable, such points should be passed at a rapid speed (gait), and, if necessary, by successive movements of vehicles. Exposed crests may be crossed by the battery in line moving at an increased speed (gait).

■ 38. OCCUPATION AND SUBSEQUENT ORGANIZATION.—*a.* Unnecessary movement of the pieces by hand should be avoided by selecting positions such that the pieces can be placed close to or in their positions before being uncoupled (unlimbered). When not well defiladed, a horse-drawn battery should approach the position, if practicable, from the flank in double section column. Dismounting drivers and cannoneers of horse or horse-drawn units may facilitate the concealment of the approach. The drivers should not be dismounted, however, if the battery is likely to come under fire. If the pieces are to be posted individually, the executive and chiefs of section precede the firing battery to the position. After the exact location for each piece is determined, each chief of section posts his piece individually; this is habitual in truck-drawn batteries.

b. As soon as the pieces (carriages) have been uncoupled (unlimbered), the first sergeant, who usually marches with the firing battery, conducts the trucks (or limbers) to the position designated for them and forms them to facilitate prompt movement and to take advantage of available cover and concealment. He supervises this position and insures that motor vehicles (or horses) are cared for and preparations made for further movement.

c. Antiaircraft weapons are disposed as prescribed by the battalion commander for defense against low-flying airplanes and local attack by ground troops.

d. While the battery is occupying position, the battery commander completes all preparations for opening a timely and effective fire. Initial firing data should be at the gun position in the hands of the telephone operator or the gun marker when the pieces arrive.

e. The signal sergeant with his signal personnel improves the initial system of signal communication by preparing alternate means (visual or messenger), placing lines on poles or trees where possible, providing concealment and cover for the installations, establishing lateral lines when prescribed, and, in general, taking all steps to insure rapid and uninterrupted communication within the battery.

f. The reconnaissance officer takes steps to develop and improve the system of observation. Auxiliary observation posts are established when needed and arrangements made with adjacent units with a view to possible use of their observation posts. Concealment and cover are provided for the observers and arrangements are made for their relief if the position is to be occupied for some time. The command post facilities and installations are improved and concealment and protection provided. Messing of the detail, especially for individuals on distant duties, is provided for. The reconnaissance officer continues the survey operations necessary to assist the battery commander in the preparation and conduct of fire, in observation of the zone of fire, and in location of targets. The battery commander normally indicates the survey operations to be performed in conformity with instructions of the battalion commander.

g. The executive, immediately upon establishing the pieces in position, makes all preparations necessary to expedite the opening of fire. He continues organization of the position, which includes constant improvement for greater concealment and for protection against enemy fire, aircraft, ground troops, mechanized vehicles, and gas.

h. Reconnaissance is continued for the purpose of locating routes for probable movement, observation posts, command posts, etc., and to gain additional information concerning the enemy and the location of our own troops.

■ 39. BATTERY OPERATING ALONE.—When a battery is employed independently, reconnaissance and occupation of

position are conducted in accordance with the same principles as when employed as part of a battalion. The battery commander assumes the functions of the artillery commander in addition to those properly his own. Under certain circumstances, he may delegate a part of his duties to a lieutenant when the necessity for close association with the commander of troops interferes with the battery commander's performing his normal command duties. Before a battery is detached, the battalion commander furnishes the battery with the necessary additional communication and liaison personnel and equipment and with an appropriate portion of the battalion ammunition train.

■ 40. CHANGE OF POSITION (DISPLACEMENT).—The usual procedure of the battery in a forward displacement is as follows:

a. The battalion commander informs the battery commander of the proposed movement and directs him to report for reconnaissance.

b. The battery commander informs his executive of the displacement and gives him instructions for moving the battery, including the route and a definite point beyond which the battery will not advance; informs his reconnaissance officer of the proposed movement and gives him instructions relative to closing station and to future movements of the detail; and, with appropriate personnel from his party, reports to the battalion commander for reconnaissance.

c. The reconnaissance officer prepares the detail for the advance and closes station at the time indicated. When circumstances permit, serviceable wire is recovered; if not recovered immediately, it should, if practicable, be recovered later.

d. The detail, under the reconnaissance officer, then proceeds to the designated point where it is met and the reconnaissance officer advised of the situation and given his instructions; thereafter, the detail proceeds to perform its duties as heretofore described.

e. The executive causes the firing battery to be coupled (limbered) and marches it via the designated route until

met by a guide or until he reaches the point previously indicated in his instructions. Reconnaissance and other preliminary work should be completed in time for the firing battery to march to its position without halting and to open fire as soon as the position is occupied.

f. The procedure in a displacement to the rear is similar to that in a forward displacement. In general, in an advance, the battery commander will go on reconnaissance and the reconnaissance officer will close station and bring up the main part of the detail; in a withdrawal, the reconnaissance officer makes the reconnaissance, the battery commander remaining with the battery or going where his presence is most needed.

g. When the battery commander knows in advance that his battery will move but that the fire will be continued from the present position for an indefinite period (as in the case of a battalion advancing by battery), it will often be advisable for him to send forward his reconnaissance officer with a part of the detail to prepare the new position while he himself remains with the battery to conduct the fire. This advance party should strive to have a complete system of command and observation established for the new position before the battery arrives.

SECTION III

THE BATTALION

■ **41. THE MARCH WHEN CONTACT IS PROBABLE.**—*a.* No definite formation for the battalion on the march, when contact with the enemy is probable, can be prescribed. The battalion commander must give the necessary instructions in each case. Ordinarily, the "battalion detail" will march at the head of the battalion column. When no other artillery is present, the battalion commander with his party marches with the commander of troops. Liaison sections may accompany supported units.

b. Battery commanders with their parties march at the heads of their batteries, at the head of the battalion, or with the battalion commander, as the latter may direct. Battery details (less battery commanders' parties) march with their

batteries or, assembled in appropriate order, at the head of the leading battery.

c. When leaving the column, the battalion marches to its position as directed by the battalion commander.

d. Positions of battalion ammunition trains on the march are prescribed by higher authority.

e. In case the supported troops are advancing in a partially deployed formation securing successive terrain lines, the artillery battalion may be divided into echelons, usually two. Each echelon may move forward by bounds from position to position so as to have one echelon always in position ready to render effective support. The commander, with a reduced party, normally marches with or near the commander of the supported troops. The remainder of the battalion detail should be so conducted that it will be readily available when needed, and when in a rendezvous, it will be near a suitable location for the battalion command post. One or both liaison sections, depending upon conditions, may be advancing with the supported units or moving by bounds from observation to observation.

■ 42. RECONNAISSANCE AND SELECTION OF POSITION.—*a.* The battalion commander, assisted by appropriate members of his staff, makes a reconnaissance of the area assigned his battalion. In conformity with the tactical situation or orders of higher authority, he comes to a decision as to the following, or so much thereof as is appropriate to the existing situation:

(1) Battery missions, including—
(*a*) Normal and contingent zones.
(*b*) Minimum and distant range lines.
(*c*) Fire missions, including registration and special fires.
(2) Positions for batteries, including routes.
(3) Liaison to be established.
(4) Survey operations.
(5) Firing chart, type to be used.
(6) Ammunition allowances or rates of fire.
(7) Organization of position for defense.
(8) Ammunition supply and location of battalion ammunition train.
(9) Location of rear echelon and battalion aid station.

(10) Communication to be installed.
(11) Observation.
(12) Location of command post.

b. The battalion commander, keeping in mind his mission, examines the terrain and uses his staff and detail to the best advantage. The area within which the battery positions are to be located is either assigned to the battalion by higher authority or, under instructions, selected by the battalion commander in accordance with the tactical plan. Battery positions or areas are designated by the battalion commander with a degree of exactitude which will insure the accomplishment of subsequent fire missions. The battalion commander either selects a position for the battalion ammunition train or merely indicates its general location, leaving the selection of the exact position to the commander of the ammunition train. The battalion commander selects his own command-post area early and takes prompt measures to insure observation of the dispositions and movements of the enemy. He may be accompanied on his reconnaissance by the battery commanders, in which case he assigns them positions or areas for their batteries as soon as selected. If the battery commanders or battery reconnaissance officers are not present, the battalion commander communicates, by means of an officer if practicable, otherwise by means of the battery agents, the necessary orders for occupation of the positions selected. He may send for the battery commanders and communicate his orders in person either during or upon completion of his reconnaissance.

■ 43. BATTALION COMMANDER'S ORDER.—The battalion commander's order should follow the sequence of the field-order form. Where appropriate, it should be accompanied by tables, marked maps, or charts. (See par. 34 and ch. 6, pt. three.)

■ 44. OCCUPATION OF POSITION.—Normally, the battalion should be held closely in hand to facilitate control. When it is part of a larger force of artillery, the area assigned it will be relatively small and the battalion commander has little latitude in placing his batteries. Within the battalion area, batteries should be echeloned at least sufficiently to

avoid presenting too compact a target. Occupation of the position is conducted by the batteries as described in section II in accordance with the battalion commander's orders and under his supervision.

■ 45. SIGNAL COMMUNICATION (pt. two).—The battalion is responsible for the establishment and maintenance of signal communication with its batteries, with the units supported, and with such other units on either flank as may be ordered by higher authority. As soon as the reconnaissance has progressed sufficiently to determine the lines to be laid and their routes and the radio installation needed, the communication officer instructs the signal communication personnel relative thereto and proceeds to establish the communication system ordered by the battalion commander. Throughout occupation of the position, the communication officer continues to perfect the system by laying new circuits, improving existing circuits, establishing alternate means, and providing concealment and cover.

■ 46. CHANGE OF POSITION (DISPLACEMENT).—A change of position by a battalion in general support, operating with other artillery, may be conducted by a simultaneous movement of batteries; if the battalion is in direct support, the move may be by battery. When the batteries of a battalion move simultaneously, other artillery in position must take over the missions and liaison functions of the displacing battalion during the movement. In an advance, the battalion commander will ordinarily precede the batteries to select and reconnoiter the position, taking with him his party and the battery commanders with their parties. He may begin this reconnaissance while his batteries are still firing, leaving his executive in charge. In a withdrawal, the battalion commander will usually remain with his batteries, sending the executive to make the necessary reconnaissance. In general, the change of position is conducted in accordance with the doctrine already described for the battery. When other artillery is not present, the need for maintaining continuity of fire will usually make it necessary to move by echelon. Reconnaissance should be made by the battalion commander or the executive before or during the move of the first battery.

The move should be so timed that at least one battery is always in action. In case of a forward displacement, the battalion commander should ordinarily be at his forward command post by the time the first battery to move is in position. In a withdrawal, the battalion commander ordinarily remains at his command post nearer the enemy as long as any of the batteries can be controlled from that point, the executive making the necessary reconnaissance for the withdrawal.

SECTION IV

THE REGIMENT

■ 47. GENERAL.—The tactical functions of the regimental commander in relation to his battalions are, in general, analogous to those of the battalion commander in relation to his batteries. His exercise of fire direction is along broader lines than that of the battalion commander, consisting usually of the assignment of zones, missions, position areas, and at times specific targets or areas. It also includes coordination of fires between battalions during displacement.

■ 48. THE MARCH WHEN CONTACT IS PROBABLE.—*a.* Ordinarily the regimental detail will march at the head of the regimental column. The regimental commander with his party may be with the brigade commander; if the regimental commander is the senior officer present, he, as artillery officer, will be with the commander of troops. The regimental commander may frequently require either the battalion commanders with their parties or the battalion reconnaissance officers with designated individuals of battalion details to march with the regimental detail.

b. The regiment usually does not march into action as a unit. Subject to orders of higher authority, the regimental commander releases his battalions at such time and place as will allow them to reach their positions most advantageously, considering time, security, and interference with other troops.

■ 49. RECONNAISSANCE AND SELECTION OF POSITION.—Reconnaissance by the regimental commander is conducted along the same general lines as the reconnaissance by the battalion commander. After making an assignment of areas to the

battalions, either on the ground or from the map, it may be desirable in some situations for him to make a more detailed reconnaissance of each area, accompanied by the battalion commanders in turn.

■ 50. REGIMENTAL COMMANDER'S ORDER.—In moving situations, regimental orders are generally dictated or oral and are often fragmentary. They follow the usual field order form and are supplemented, whenever possible, by tables, diagrams, and marked maps or tracings; they do not cover routine functions. (See par. 34 and ch. 6, pt. three.)

■ 51. SIGNAL COMMUNICATION (pt. two).—In the establishment and maintenance of signal communication the procedure (with obvious changes in the designation of units) is, in general, similar to that of the battalion.

■ 52. CHANGE OF POSITION (DISPLACEMENT).—A change of position is executed in the same general manner as described for the battalion. Normally the movement should be so timed that not more than the equivalent of one battalion will be out of action at one time. The method of movement will frequently be influenced by the availability of roads. Movement may be either by battalion or by battery within each battalion. When issuing orders for a change of position by battalion, the regimental commander must make such redistribution of missions as will insure that no essential mission is neglected during the move.

SECTION V

THE BRIGADE (OR DIVISION ARTILLERY)

■ 53. GENERAL.—*a.* The artillery brigade rarely marches into action as a unit; each regiment moves, usually by battalion (par. 48), under the direction of its respective commander.

b. Whether regimental areas are located by actual reconnaissance on the ground or whether they are selected from a map or air photo is governed by the time available. A combination of both map and ground reconnaissance should be normal when time permits. In covering the extensive brigade area, the brigade commander utilizes his staff to the fullest extent practicable.

■ 54. DIVISION ARTILLERY.—*a. Reconnaissance.*—During an advance into action and in cases where the division commander makes a ground reconnaissance, the division artillery commander, with some or all of his party, usually accompanies the division commander.

b. Brigade detail.—(1) When the artillery is organized as a brigade, individual duties of members of the brigade detail correspond in general to those of a regimental detail. March formations should be such as to meet best the requirements of the tactical situation.

(2) When the division artillery is not organized as a brigade, the members of the artillery section of division headquarters perform the necessary operations, including meteorological and survey functions.

c. Artillery commander's order.—The artillery commander, as the division artillery officer, and his staff assist the staff of the division commander in preparing such parts of the division field order as relate to the employment of the artillery. Based on this, the artillery commander issues his orders. (See par. 35, and ch. 6, pt. three.)

d. Signal communication.—(1) When the artillery is organized as a brigade, communication established by the brigade with its regiments and associated units is similar, in general, to that established by the regiment with its battalions and associated units.

(2) When the division artillery is not organized as a brigade, the division signal company is responsible for establishing such communication as is necessary for the control of the artillery.

e. Change of position (displacement).—During an engagement, regiments may be moved simultaneously or a single regiment may be moved as the tactical situation of the unit it is supporting may demand. A change of position by one or more regiments does not, in itself, make necessary any redistribution of missions by the artillery commander, since throughout the move, each regiment moving by echelon within the regiment carries on its assigned missions.

■ 55. CORPS ARTILLERY.—The general fundamentals of employment of a corps artillery brigade correspond to that described for the division artillery brigade.

CHAPTER 3

PROTECTION OF UNITS IN POSITION

(A more detailed treatment of the subject matter contained in this chapter is found in FM 5–15, FM 5–20, FM 6–130, and FM 21–40.)

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SECTION I

CAMOUFLAGE

■ 56. GENERAL.—*a.* Military camouflage is work done for the purpose of deceiving the enemy as to the existence, nature, or location of matériel, troops, or military works. The best camouflage is that which makes the object appear as a part of its surroundings. All camouflage should be completed before the enemy observes or photographs the troops, matériel, or works to be protected. Deception of the enemy is gained by suppressing all signs of abnormal activity near the object or by deceiving the enemy as to the purpose of such activity; rendering the object indistinguishable from its surroundings; and making the object appear to be something else.

b. The patterns formed on the air photo by the features of the terrain influence to a large degree the measures taken toward deception. Patterns are made by form, shadow, texture, or color.

(1) Form is the most important element. Regular forms quickly attract the eye. Irregular forms of human origin are lost in the irregular forms of the natural features.

(2) Shadow discloses form. The problem is one of concealing or reducing the shadow. Three possible solutions are to take positions so that the shadows merge with existing shadows cast by features already on the terrain; to take position in such varied and broken terrain that the intricate and complex shadows already existing render it almost im-

possible to discover anything abnormal; and to reduce the shadow by a gradual thinning of the camouflage material toward the edge.

(3) Texture in camouflage is a quality opposed to smoothness or polish. Grass and other vegetation possess this quality to a marked degree; the longer it is, the darker it appears in a photograph; when pressed down by the feet or by the wheels of a vehicle, the amount of shadow is lessened and it appears light in a photograph. A path which is quite inconspicuous on the ground is obvious from the air and reproduces plainly on an air photo. If the texture of an area is uniform, satisfactory camouflage results are difficult to attain because, while it is easy to match the color, it is impossible to match the grain or texture. If the texture is broken and varied, the camouflage blur will not be noticed. Good camouflage photographs as a blur.

(4) The color of the camouflage must be approximately the same as the surroundings since big differences in color are picked up by the aerial observer and by modern panchromatic emulsions and color films.

■ 57. SELECTION OF POSITION.—*a.* The proper selection of the battery position is paramount in the effective value of camouflage. Skillful use of natural overhead concealment combined with strict camouflage discipline will greatly reduce and may obviate the necessity for camouflage construction.

b. Batteries are usually disclosed on an air photo because the camouflage materials, especially the edges, are visible; guns are in line and spaced regularly; evidences of excavation appear; roads and trails lead to the battery; existing roads and trails are more used near the battery and vehicles turn around there, leaving characteristic marks; piles of ammunition show; dugouts or bivouacs or perhaps kitchens are discernible; slashings (felled trees) are made in woods where the pieces are located; and motor parts or limber and horse lines can be identified. Guns ordinarily are easily concealed but the above evidences are more difficult to hide. They must be broken up and caused to blend with existing marks in the area.

c. Having reference to camouflage only, the following characteristics should be sought in the selection of battery positions:

(1) Natural overhead cover should be available.

(2) When there is no natural overhead cover, the area should be one permitting ease of camouflage, such as broken terrain, weeds, or brush (par. 9).

(3) They should afford means of access by existing roads or trails.

(4) The positions should be capable of occupation with a minimum of disturbance of existing surroundings to avoid changing the pattern of the area as revealed on an air photo.

(5) The area should be one not previously occupied by artillery or other military installations.

d. In the actual location of individual guns, the following precautions should be observed:

(1) Avoid regularity in spacing.

(2) Guard against formation of blast marks by siting the guns, whenever possible, so that they fire over roads, railroads, bare ground, or water. When it is impossible to avoid formation of blast marks, they should be camouflaged as described in FM 6–130.

■ 58. DISCIPLINE.—Next to the proper choice of position, camouflage discipline is the important factor in the effective value of camouflage. It involves confining movements to designated routes by wiring in roads and paths used; keeping blast marks constantly concealed; closing embrasures when not firing; repairing or changing overhead material when necessary; keeping men under cover or immobile when airplanes are overhead; keeping ammunition covered; and permitting no smoke to appear near the battery and no vehicles to stop on the road near the battery during daylight or to turn around near it at any time.

■ 59. CAMOUFLAGE OF POSITION.—*a. Materials.*—(1) The principal natural materials for camouflage include grass, weeds, foliage, branches, vegetation of all kinds, sod, debris, etc. They possess the texture of the locality and match surroundings in color infrared panchromatic aerial photographs.

(2) The most important artificial materials are wire netting and fish net, both garnished with burlap, grass, or other materials in colors suited to the time of year and to the terrain where they will be used.

(3) For further discussion of camouflage materials, procedure, and methods of construction, see FM 6–130.

b. Auxiliary elements.—(1) *Observation posts.*—These often may be concealed successfully in such positions as old buildings, cellars, and trees. It is essential that the exterior of loopholes is irregular in shape and that the light from behind does not show through.

(2) *Command posts.*—These should be well camouflaged, traffic to them kept to a minimum, nearby vehicles screened, and telephone lines within a radius of 300 yards hidden to conceal their destination. This latter usually is accomplished by having the wires follow natural ground lines, such as hedges, roadsides, and field lines.

(3) *Motor parks (horse lines), kitchens, and bivouacs.*—(*a*) These installations should be at such a distance from the firing battery that they will not be affected by fire aimed at the guns. Where possible, the distance should be 500 yards or more. The selected area should provide natural overhead cover, offer protection against shell fire and air and mechanized attack (sec. III), and be large enough to permit scattering elements.

(*b*) Tents and vehicles should be spaced irregularly, slashing of trees and underbrush should be avoided, paths (even those under trees) should be camouflaged.

(*c*) The spoil from excavations for personnel shelters, latrines, kitchen pits, etc., should be removed or camouflaged.

(*d*) Whenever possible, bivouacs of other troops should be at least 300 yards from artillery positions.

(4) *Ammunition dumps.*—Unless extreme precautions are taken, ammunition dumps, because of their size and the heavy traffic around them, become very obvious on an air photo. Dumps should be so located and built that they are accessible, difficult to locate, offer a poor target from the air, and require only a small amount of pioneer work. Natural cover should be used as far as possible and piles

should be kept low; regularity of piles and telltale turnarounds in the vicinity should be avoided. (See ch. 2, pt. four.)

c. Dummy positions.—The factors of time and labor usually preclude the erection of dummy positions. When they are used, they must be constructed as faithful reproductions. Poorly constructed fake installations are easily recognized as such. Dummy positions should be placed 500 or more yards from real positions because they attract attention to the area in which they are located.

SECTION II

FIELD FORTIFICATIONS

■ 60. GENERAL.—*a.* Immediately upon the occupation of position, steps are taken to insure protection (cover and concealment) for the pieces and for the men serving them. The work is undertaken with the idea of future development and is progressive and continuous throughout occupancy.

b. Hasty field fortifications are those constructed of material available locally. Generally, they are constructed just prior to the placing of the pieces in position or immediately after the positions are occupied.

c. Deliberate fortifications are of a semipermanent nature and are constructed when the tactical situation permits and sufficient time and material are available.

d. The doctrine outlined in section I is of great importance in considering field fortifications. It is axiomatic that field works must be concealed.

e. Overhead cover for protection of pieces and the cannoneers while serving them from direct hits of artillery projectiles is not practicable. Protection against small-arms fire, shrapnel, and shell fragments can frequently be obtained and should be provided whenever practicable.

f. Protection for signal communication installations is of great importance.

■ 61. EMPLACEMENTS (FM 6–130).—*a. Sunken emplacements.*—An emplacement is sunken if the area on which the piece rests is below the level of the ground. When the carriage is lowered, the undisturbed earth around the excavation

gives some cover to the men at the piece. Parapets around the emplacement are easily built and give additional cover. Camouflage nets may be lowered. A suitable ramp for the removal of the piece from the emplacement must be provided. The advantages of sunken emplacements may be secured for howitzers more easily than for guns because of their high angle of fire. In moving situations, there seldom is time for the sinking of light artillery before opening fire, nor is there time during lulls in the firing.

b. Trenches for cannoneers.—As soon as possible after the occupation of position, or prior to the occupation when time permits, work is started on narrow slit trenches for the cannoneers. These trenches may be dug during intervals in firing or at the first available opportunity. The trenches are so sited that the men can enter them promptly and also be ready to return to their posts at a moment's notice. They are as close to the pieces as the service of the piece will permit. When trenches are dug, care is taken that they will not interfere later with the trail when the direction of laying is changed. A sufficient bank of solid ground is left between the trail and the trench to sustain the thrust of the trail. Trenches should be offset if possible, so that a single hit may not enfilade both trenches.

c. Parapets.—After the piece is in the firing position and narrow trenches have been dug for the cannoneers, a parapet is thrown up around the piece to protect matériel and personnel. In addition to giving some protection, the parapet gives the men a greater sense of security and has an effect on morale that increases the efficiency of the cannoneers under fire. The height of the parapet should be not less than 4 feet from the bottom of the emplacement. It should be made splinterproof, which requires a thickness at the top of at least 2 feet 6 inches.

d. Platforms.—When practicable and appropriate, platforms are built to support the pieces. They insure stability of the piece, facilitate a change of direction, increase accuracy of fire, and facilitate adjustment of fire. They are indispensable in soft or muddy ground and are usually constructed when a position is to be occupied for any considerable period. In a hasty position, they are improvised from materials

found at the site or immediately available. Brush, logs, planks, or broken stone can be used for this purpose.

e. Trail supports.—Where appropriate, a trench for the trail spade is dug immediately upon the occupation of position. For continuous firing, additional support must be given the spades. In a hasty position, the support consists of a log or timber set in the earth behind the spade to distribute the force of recoil transmitted through the trail. When time permits, a more permanent support is built. (FM 5–15.)

■ 62. COMMAND POSTS.—*a. Hasty type* (FM 6–130).—In a hasty position, the command post may consist of a trench to contain the personnel if shell holes, other natural protection, or buildings are not available. The trench is dug deep enough to give cover to the men occupying it and of sufficient length to accommodate the personnel required to use it. A trench 3 feet deep with a parapet 1 foot 6 inches high gives cover to men in a sitting position. It is then made splinterproof by covering it with a layer of logs and at least 1 foot of earth. For continued occupancy, splinterproof compartments are made in the side of the trench and the depth is increased.

b. Deliberate type (FM 5–15).—A bombproof structure is constructed when time and available material permit.

■ 63. OBSERVATION POSTS.—Concealment is practically the only protection that can be provided in the early stages of occupation. If the observation post is on the ground, a trench is usually the first means of protection. (See FM 6–130.) Later this may be made splinterproof by a covering of logs and earth. As time permits, an observation post fortified against a 3-inch shell may be developed. Cover which is proof against a 6-inch shell may be constructed in the vicinity for observation post personnel. (See FM 5–15.)

■ 64. *Shelter for personnel.*—See FM 6–130 and FM 5–15.

SECTION III

DEFENSE AGAINST CHEMICAL ATTACK, AIRCRAFT, AND GROUND TROOPS

■ 65. DEFENSE AGAINST CHEMICAL ATTACK.—This subject is covered in detail in FM 21–40. Principal items in chemical defense of the battery are as follows:

a. Location of gas alarms and orders specifying their use.

b. Posting of gas sentinels.

c. Precautions to prevent contamination of food, water, guns, ammunition, and other equipment.

d. Location and preparation of gas shelters.

e. Provision for decontamination of matériel and ground.

f. Provision for first aid for gas casualties.

g. Provision for protection of personnel and matériel in case of air chemical attack.

h. Preparation for rapid and safe movement to an alternate position when ordered by the battery commander after attack with persistent gas.

i. Preparation and dissemination of orders to apply generally in case of gas attack, such orders to include at least the following:

(1) The designated alarm to be sounded immediately by the gas sentinel when he detects gas or upon order of the gas noncommissioned officer.

(2) All personnel to adjust masks upon the sounding of the alarm, masks to be kept adjusted until ordered removed by an officer or noncommissioned officer.

(3) Gasproof shelters to be prepared for occupancy by putting out fires and open lights, lowering gasproof curtains, and operation of collective protectors.

(4) All personnel not immediately needed at the guns or elsewhere to enter gasproof shelters and remain there until ordered to their duties.

(5) A gas sentinel to be posted at each gasproof shelter entrance to insure the correct use of blanket doors.

(6) All unnecessary movements to cease.

(7) Fire missions to be fired without interruption except in case of air chemical attack. In this case, unless the emergency demands that fire missions be continued, personnel not

operating automatic rifles to seek cover under raincoats, paulins, or other overhead cover until the attack ceases.

(8) After a persistent gas attack, all contact with the contaminated area to be avoided, except for specially equipped personnel, until decontamination has been completed.

(9) Decontamination supplies to be used under the direction of the gas noncommissioned officer.

■ 66. PROTECTION FOR ARTILLERY IN POSITION.—Primarily, the necessary protection for artillery in position is furnished by the protection and security measures taken for the command as a whole. However, artillery is equipped with certain auxiliary weapons for its immediate protection.

■ 67. DEFENSE OF POSITIONS AGAINST AIRCRAFT.—In the occupation of position by a battalion, each battery commander normally places his automatic rifles in positions suitable for rendering immediate protection to the battery. As soon as the battalion is in position, the battalion executive or other designated staff officer coordinates the defense of the entire battalion by placing the automatic rifles of the gun batteries and headquarters battery in mutually supporting positions with such assigned sectors of observation as will insure the maximum defense of the battalion area.

■ 68. DEFENSE OF POSITIONS AGAINST GROUND TROOPS.—Requirements for immediate protection for artillery in position are met by the fire of the pieces themselves, by the pistol as an individual weapon, and by the automatic rifles of the batteries. When the likelihood of mechanized attack is foreseen, positions should be selected having natural obstacles such as a marsh, stream, cut, or woods in the most probable direction from which attack may come. Artificial tank obstacles should be erected to supplement natural obstacles. Tank mines may be employed in connection with natural or artificial obstacles or in the open. When tank mines are employed, care must be exercised to divert friendly traffic from the mined area.

PART TWO

SIGNAL COMMUNICATION

CHAPTER 1

GENERAL

■ 69. GENERAL.—*a.* This part deals with the basic doctrines, systems, and tactical employment of field artillery communication. Technical details of training personnel in the installation and operation of communication systems are contained in FM 24–5 and in pamphlets issued for use by the Army and the Navy. Standard procedures in the training of personnel and in the installation and operation of communication systems are essential in the Field Artillery to insure coordinated action with the other arms.

b. The commander of each field artillery unit is responsible for the establishment of signal communication within his own unit, with supported and attached units, and with such other units as may be directed by higher authority. The execution of this function may be delegated to a subordinate in the same manner as other tactical functions are delegated to subordinates and staff officers, but responsibility for the establishment and proper use of a signal communication system remains wholly that of the commander.

c. Technical control of a system of signal communication standardizes the technical installation, operation, maintenance, and inspection of the various signal agencies of the command. It is a staff function exercised by authority of the commander.

d. Tactical control of a system of signal communication insures establishment of the necessary signal communication between tactical units and development of the system in accordance with the tactical plan. It is a command function; responsibility rests with the commander.

e. The communication personnel of a field artillery unit is charged directly with the installation, operation, and maintenance of signal communication as follows:

(1) To, but not including, headquarters of its next subordinate units.

(2) To, but not including, headquarters of the unit or units it supports.

(3) To its observation post when established.

(4) To its liaison officers and forward observers.

(5) To local establishments.

(6) To, but not including, headquarters of the corresponding adjacent unit in accordance with instructions from higher authority.

(7) To such other units as may be specifically prescribed by higher authority.

f. The Air Corps ordinarily will install, operate, and maintain visual, radio, and other necessary communication apparatus in aircraft for communication between aircraft and ground troops. The necessary wire communication between artillery units and Air Corps ground stations is established by arrangement with the headquarters of which the artillery is a part.

■ 70. OFFICERS.—*a.* In artillery units, a communication officer is assigned by the commanding officer. In the gun and howitzer batteries, the reconnaissance officer acts as communication officer.

b. Except in a battery, a communication officer is both a staff officer and a headquarters battery commander. In addition to his command duties, he is responsible as a staff officer to his commanding officer for technical and tactical supervision of signal communication within subordinate units and for the maintenance of efficient signal communication within his own unit. He should be prepared to furnish his commanding officer with information and advice on all questions affecting signal communication.

■ 71. COMMAND POSTS.—*a. General.*—The forward echelon of a headquarters constitutes the command post. It consists of personnel and equipment immediately available to the commander in the exercise of control of his unit. The term is frequently used to mean the area or locality in which are located the several establishments used by the commander in the exercise of command of his unit. As commonly used, the term applies to battalion and higher headquarters, although in a limited sense it may apply to batteries.

b. Movement.—The communication officer should be kept informed of contemplated movements of the command posts of his own, superior, subordinate, and supported units. Such timely information permits him to make plans which will reduce to a minimum the attendant disruption of communication. In the movement of a command post, the situation usually requires the installation of a communication system at the new location while that in the old location continues in operation. The plan for a communication system, therefore, should designate the detail of men and the equipment to be utilized in case of a sudden move.

■ 72. AXIS OF SIGNAL COMMUNICATION.—When the movement of a command post can be foreseen, the probable successive locations should be selected in advance. The axis of signal communication is designated by naming these successive locations in the direction of movement. When the axis of signal communication for an artillery unit can be designated, it will usually follow that of the supported infantry unit. When it cannot be foreseen when and to what position area an artillery unit will displace, it will be impracticable to designate its axis of signal communication. In such situations, the subordinate unit will report its successive command post locations as early as the tactical situation will permit of their selection.

■ 73. RECONNAISSANCE.—The communication officer should accompany the commander on reconnaissance and make a careful study of the terrain and the plan of the commander. At the appropriate time, he should make such recommendations regarding the communication system as are indicated by the terrain and the tactical situation. The time required to install the communication system, its capabilities and limitations, and the difficulties of maintenance should be considered by the communication officer in formulating his recommendations.

CHAPTER 2

MEANS OF COMMUNICATION

■ 74. GENERAL.—The means of signal communication used in the Field Artillery are wire (telephone and telegraph), radio (telephone and telegraph), messengers (motor car, motorcycle, mounted, and dismounted), visual (lamps, flags, panels, and pyrotechnics), and sound (whistle, bugle, sirens, etc.). The primary means, except in mechanized artillery and for communication with aircraft, is wire.

■ 75. WIRE.—The tactical situation dictates the wire system to be installed. Time may require the simplest installation that will give the desired communication but this system must be improved continuously, as time and available equipment permit, until the best possible system is in operation.

a. Installation of wire circuits.—(1) The primary considerations in the installation of a wire circuit are that it arrives at its destination in working order and as quickly as possible. During laying of the wire, sufficient servicing to insure operation of the circuit must be performed. Complete and thorough servicing and protection of the circuit should be completed after the circuit is in operation.

(2) Prior to actual installation of a wire circuit, a reconnaissance should be made to locate a route which can be traversed by an available wire-laying device, which has cover from hostile observation and fire, is not subject to shell fire, is free from gassed areas, will make maintenance possible, and is free from friendly traffic.

(3) In general, circuits are installed in order of their importance to the commander.

(4) Trunk circuits and long local circuits should be laid with wire-laying devices, while the short local circuits are laid by hand.

(5) Every effort should be made to conserve personnel and equipment. In units equipped with two motor reels, both reels should be used to make the installation. In units

equipped with two horse-drawn reels, the installation should usually be made with one reel, the other reel being held in readiness for a displacement. In units equipped with a motor reel and a horse-drawn reel, the motor reel should be used first.

(6) In order to conserve wire for future needs and to secure rapidity of installation, decreased maintenance, and more reliable operation, wire circuits should be as short as possible.

(7) When wire crosses roads or trails, it should be buried at least 6 inches or elevated at least 14 feet. Where especially subject to shell fire, it should be buried or placed in a ditch.

(8) Wire should be tagged and tied at frequent intervals along the route, at bends in the road, at critical points (where passing under bridges or crossing over or under roads, railroads, etc.), and at its extremities.

(9) Wire should be laid with plenty of slack so that it will lie loosely on the ground. To provide sufficient slack for service and repair at critical points, several yards of wire should be pulled from the reel, bundled, and tied to some solid object.

(10) In estimating wire requirements from a map, the map distance plus 20 percent must be allowed for slack and wire ties.

(11) Two or more circuits between the same two points should be installed over different routes or separated from each other as much as possible.

b. Telephone centrals.—(1) A central should be located centrally with respect to the activities it serves. It should be protected, as far as practicable, from traffic, dampness, noise, and hostile fire. Switchboard operators should have sufficient privacy and protection to enable them to concentrate fully upon their work. Protection from observation is necessary so that lights may be used at night.

(2) Circuits to be terminated at a switchboard should be brought to a central point. From that point to the switchboard they should be loosely cabled and elevated above traffic or buried.

c. Maintenance of wire circuits.—A unit is responsible for maintenance of all circuits connected to its switchboard.

When a wire circuit becomes inoperative, linemen must be sent out from each end of the circuit, working toward each other as they test the circuit. Sufficient personnel should always be on duty at a switchboard to repair any circuits that become inoperative. Constant supervision and a well-planned procedure for maintenance are vital and should be initiated as soon as the wire circuits are installed.

d. Recovering wire.—In a change of position, when time permits, serviceable wire is recovered, but in many cases it will be necessary to abandon it temporarily, recovering it later as time permits. In recovering wire, it should be inspected, repaired, and tested so that it will be ready for use.

e. Telegraph.—Telegraph communication is employed between the artillery brigade (or the division) and each of its regiments and between the regiment and each of its battalions. It provides direct communication between headquarters for the transmission of written messages. It is accomplished by superimposing the telegraph circuit over the telephone circuit by a method known as simplexing. Both telephone and telegraph communication may be used over a wire circuit at the same time without mutual interference. In transmission, the International Morse Code is used and the general provisions of radio procedure are followed. Telegraph instruments operate on direct current and the messages transmitted cannot be picked up by ground intercept stations. Messages may be sent in clear text.

■ 76. RADIO.—Radio is the primary means of communication for mechanized artillery and between observation aircraft and ground stations. For all other purposes, radio is a secondary means used to supplement wire communication and messenger service. Radio may be used prior to the installation of wire communication or during its interruption. Radio may be used under conditions which prohibit the installation and maintenance of wire.

a. Limitations.—Radio equipment does not provide secret communication. Messages may be intercepted with equal facility by friendly and hostile stations. This necessitates the utmost care in the maintenance of radio security. The approximate number and types of radio stations can be determined by hostile intercept. The location of radio sta-

tions may be determined by enemy position-finding radio stations. From this information and a knowledge of our radio systems, the enemy may readily estimate the organization and location of the artillery in a given area. Unless channel assignments are carefully planned and frequencies are rigidly adhered to by each station, stations may interfere with each other. The enemy may cause our stations to accept erroneous or misleading information, instructions, or orders. A hostile station may obstruct the use of certain channels. These limitations may necessitate "radio silence" during a period when important preparations are being made or certain operations are executed.

b. Radio nets.—In order that radio communication may follow the proper tactical channels of command, the radio stations of an artillery unit and radio stations of subordinate units, or two or more stations within the unit, may be grouped together for operation. Groups thus formed are termed radio nets. On a functional basis the nets are classed as follows:

(1) *Tactical nets.*—Brigade nets and regimental nets whose normal function is the transmission and reception of tactical messages.

(2) *Liaison and forward observer nets.*—Those nets which transmit and receive messages between artillery liaison officers or forward observers and the batteries or the battalion command post.

(3) *Air-ground nets.*—Those nets whose normal function is the transmission and reception of messages having to do with the surveillance and air observation of artillery fires.

c. Radio systems.—The radio stations and radio nets over which an artillery unit has control comprise the radio system of that unit.

d. Net-control station (NCS).—In every net, one of the stations is designated the net-control station. The NCS is charged with maintaining the net on the assigned frequency and keeping order within the net. The authority of the NCS extends only to the operation of the net on the air. In no way is it concerned with the interior administration of any station, its tactical operation, or its movement. Within its sphere, however, the authority of the NCS is absolute and its orders will be strictly obeyed. The NCS designation is given

to the station of the senior organization in the net or to a station so located that it can be under the direct control of the officer or the noncommissioned officer responsible for the operation of the radio nets within the organization. All other stations in the net are known as secondary stations.

e. Frequencies.—Each radio net is assigned a definite frequency, sometimes referred to as a channel or dial setting, upon which to operate, and each station is assigned a call sign. All frequencies and call signs are normally assigned to an artillery unit by the signal operation instructions of the division or higher headquarters.

f. Operation.—Methods of establishing communication, use of procedure signs and signals, and procedure of transmitting messages are prescribed in pamphlets used by the Army and the Navy. The abbreviated form procedure described therein for the transmission of field messages will be used by all artillery units. Operating regulations and general procedures are prescribed in FM 24–5.

g. Records.—All messages received by a radio station will be copied in duplicate except messages having to do with fire direction, which may be relayed orally to the individual concerned. A radio station log may be kept at each radio station. The station log and any other records connected with the operation of the station for the radio day (midnight to midnight) will be turned over to the unit communication officer for disposition.

■ 77. MESSENGER.—*a.* Messengers are employed by all units as required. Certain individuals are designated as messengers, and as far as practicable, provide this service for their unit, but all communication personnel are trained in the delivery of written and oral messages and may be so employed.

b. Messengers generally are used when other signal means fail, when distances are so short that this means is the most rapid ~~agency~~, or when the character of the message precludes the use of other means.

c. Messengers are classified according to the type of service rendered, as special and scheduled messengers, and according to the type of transportation used, as motorcar, motorcycle, mounted, and dismounted.

d. While not exclusively a messenger, an agent is frequently used to carry orders and messages. He is a specially selected noncommissioned officer sent from each unit to the next higher commander and employed by that commander to carry orders and information, both written and oral, to his own unit, to act as a guide, and in general to maintain contact between the two commanders.

■ 78. VISUAL.—*a.* Visual communication is unsuited for the transmission of long messages but is well suited for transmitting prearranged signals and short code groups such as those of the Fire Control Code. In gun and howitzer batteries, flags are particularly valuable for the transmission of firing commands when wire communication has not yet been installed or has been interrupted. Over short distances, arms may be used in place of semaphore flags.

b. Visual signaling should not be used when it is likely to disclose a position or to draw fire on other troops or when the signals may be read by the enemy. Accordingly, great care must be exercised in the establishment of visual stations, especially those signaling from rear to front. These considerations, therefore, often preclude two-way visual communication.

■ 79. VOICE.—Voice communication is used principally between the observation post and the guns of a battery, and between the observation post of a battalion and those of its batteries. It is thus used to supplement wire and, particularly in fast-moving situations, may replace it.

■ 80. MESSAGE CENTER.—*a.* The message center is an establishment at all command posts charged with the transmission, reception, and delivery of messages from and to the headquarters of the unit. It provides a fixed locality to which messengers or messages may be sent and provides coordination of the use of the various means of signal communication. (FM 24–5.)

b. Personnel required to operate the message center varies upward from one clerk, depending upon the traffic to be handled. Duties of a message center chief, messenger dispatcher, code clerk, messengers, and operators are outlined

in FM 24–5. All message center personnel are trained to perform all duties incident to message center operation.

c. Message center procedure is not dependent on forms. No equipment other than pencil, paper, authorized codes, and the cipher device are required. Certain forms, such as delivery list, message center log, field message book, and message envelope may be provided for convenience.

d. The message center keeps only such records as are required to insure rapid and accurate handling of messages. The following records are usually kept:

(1) *Message center log.*—A combined record of serviceability of the various means of signal communication and a number sheet. The record of serviceability shows the time each means of signal communication was established, time each means was out of operation, and time communication was reestablished. The number sheet shows the message center number of each outgoing message and indicates those for which a receipt has been obtained. A new series of numbers begins at midnight each day. At midnight, the message center log is closed out and turned over to the individual responsible for keeping the unit journal.

(2) *Live file.*—The live file consists of a duplicate or skeleton copy of each *outgoing* message which has been turned over to a signal agency for transmission but for which a receipt has not yet been obtained.

e. Duplicate or skeleton copies of all receipted *outgoing* messages, receipted delivery lists or message envelopes, and receipted duplicates of all clear text copies of all *incoming* messages are turned over to the individual at a headquarters charged with keeping the unit journal.

f. The following messages do not pass through the message center:

(1) Those pertaining to immediate fire missions.

(2) Those transmitted directly from the originator to the addressee in person, by telephone or postal service, or by special messenger directed by the originator.

(3) Those authorized by the commander to be sent directly from originator to transmitting agency.

■ 81. CODES AND CIPHERS.—*a.* Codes and ciphers are employed by the Field Artillery for secrecy and brevity. When

likelihood of hostile intercept exists, the Division Field Code, Air-Ground Liaison Code, Map Coordinate Code, Pyrotechnic Code, and M–94 Cipher Device are used. The Fire Control Code and Meteorological Code provide brevity in transmitting and recording fire commands, firing data, and meteorological data sent by radiotelegraph.

b. When danger of hostile intercept exists, all messages must be placed in a confidential code or cipher except in the following cases:

(1) In emergencies, commanders or their authorized representatives may direct that a message be transmitted in clear text. Such messages must be of no military value to the enemy or they must be so urgent that the speed of transmission outweighs the value of the information to the enemy. *Messages of this type must be written and marked "Send in clear" over the signature of the commander or his authorized representative* before they will be accepted by a transmitting agency. (FM 24–5.)

(2) Firing commands and firing data may be sent in clear text.

(3) Prearranged messages may be used when their meanings are known only to the individuals concerned and are changed frequently. Use of prearranged messages is subject to the general rules for employment of codes and ciphers.

CHAPTER 3

COMMUNICATION SYSTEMS OF FIELD ARTILLERY UNITS

Paragraphs

SECTION I. Infantry division artillery 82–92
II. Cavalry division, corps, and army artillery 93–95

SECTION I

INFANTRY DIVISION ARTILLERY

■ 82. GENERAL.—*a.* The tactical situation dictates the communication system to be installed. The decision as to what type of communication system will be employed is a command decision, responsibility for which rests wholly with the commander. However in most situations, recommendations of the communication officer should be sought by the commander. *In planning a signal communication system, it must be constantly borne in mind that no one means of signal communication can ever be considered infallible; appropriate alternative means must be immediately available, if not in actual operation.*

b. A battery signal communication system should provide for the simultaneous transmission, without interference, of two general types of commands and orders as follows:

(1) Firing commands, which are transmitted directly from the battery observation post or command post to the guns.

(2) Fire directions, such as the designation of targets, which are transmitted from the battalion observation post or command post to the battery observation post, command post, or directly to the guns. Other tactical and administrative orders and instructions also are transmitted over this channel.

c. Each battalion communication system must be planned so that communication will not be interrupted during displacement, thus insuring continuous close support of the infantry. The system must be such that forward or air

observers can report targets quickly to the battalion commander and, if necessary, observe, adjust, or actually conduct the fire of single batteries or the battalion as a whole. Every facility must be placed at the disposal of the battalion commander for the direction of fire on proper targets at appropriate times.

d. The communication systems in the regiment and the brigade are similar to those in the battalion. Visual signaling has little application and seldom is used.

e. When an artillery regiment or higher unit is increased by the addition of attached units, tactical control and signal communication are facilitated by the formation of temporary units, each composed of several organic or attached units under a single command.

(1) Regardless of the amount and types of attached artillery, the communication system for the organic unit should remain the basic system but should be expanded to handle increased traffic. The entire system must remain under control of the superior organic unit.

(2) Since the commander of a groupment or subgroupment exercises complete tactical control within the groupment or subgroupment, he is responsible for communication therein.

■ 83. BATTERY WIRE SYSTEMS.—The battery wire system must be such that the collective communication system will provide for adjustment of fire by the best available form of observation. A battery acting as part of a battalion must install the wire system prescribed by the battalion commander. However, the system prescribed by the battalion commander represents the minimum installation required by the battalion and does not prevent the battery commander from installing additional circuits if he so desires. A battery acting alone may install any wire system which will permit its fire to be conducted properly. In many cases where a battery is acting alone, its wire system may consist initially of a single wire circuit between the gun position and observation post.

a. Circuits to switchboards at gun positions (observation posts) (figs. 1 and 2).—The most flexible wire system for a firing battery consists of a switchboard with two wire circuits from it to the gun position and two wire circuits from it to the observation post. The switchboard may be installed in the

vicinity of the observation post or gun position, depending on the particular situation, location of the battalion command post, and length of the wire circuit from the battalion to the battery switchboard. The decision is made by the battalion commander and announced in his order; as, "Circuits to switchboards at gun positions," or "Circuits to switchboards at observation posts." Either statement indicates to the battery commander the location at which his switchboard will be installed and requires two circuits to the gun position and two to the observation post. In organizations equipped

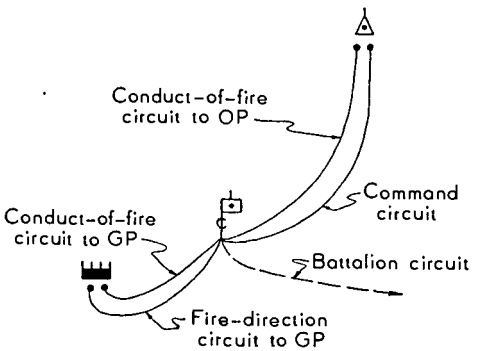


FIGURE 1.—A battery wire system (battery equipped with switchboards not having repeating coils).

NOTE.—The switchboard may be at the gun position or at the observation post as prescribed in the battalion order.

with switchboards having repeating coils, the battalion wire circuit is simplexed and direct ground return telephony is employed between the battalion command post and the battery gun position. This ground return circuit replaces the fire direction circuits otherwise installed from the switchboard to the gun position (fig. 2).

b. Circuits to gun positions (observation posts).—In some situations, it may be undesirable or impossible to have one or more of the batteries install a switchboard. In such a situa-

tion, the battalion commander would prescribe, "Circuits to gun positions," or "Circuits to observation posts," in his order. The battery would then install a single wire circuit between its gun position and its observation post and would have a telephone operator available at the indicated terminus of the battalion circuit.

c. Forward observation.—When it becomes necessary for a battery to displace its observation, wire communication should be established to the new observation post either by extending one of the circuits from the old observation post

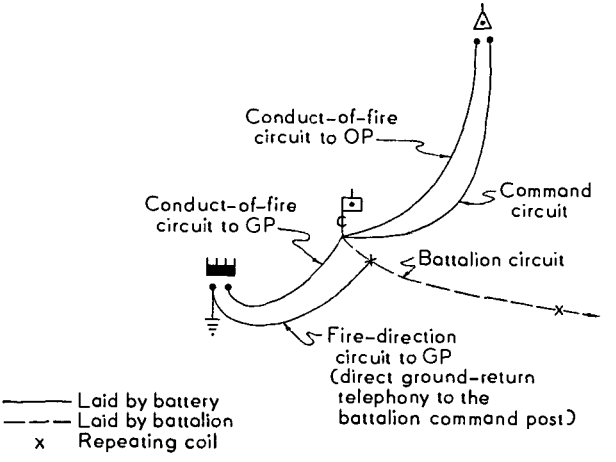


FIGURE 2.—A battery wire system (battery equipped with switchboards having repeating coils).

or by installing a new circuit from the switchboard or the gun position.

■ 84. WIRE SYSTEMS IN LIGHT BATTALIONS.—*a. General.*—(1) The initial wire system installed by a field artillery battalion depends on the immediate wire needs of the commander. It must be such that some reliable means of communication is available for placing the fire of one battery or the entire battalion on a target and for communication to the supported unit. Targets may be observed by liaison officers, battalion

observers, or battery observers. Some reliable means of communication, preferably telephone, must be available between the command post and battalion and battery observers, and between the command post and firing batteries.

(2) Wire circuits between the command post and the firing batteries are the most critical circuits of the battalion wire system. Since they are not usually supplemented by radio communication as are the circuits to observers, reliance must be placed entirely upon them. They should be the first circuits installed when the battalion occupies position and every effort should be made to keep them as short as possible.

(3) To give flexibility to the wire system, an artillery battalion normally installs a switchboard (telephone central) in the command post area, and connects all wire circuits of the system into it. A second switchboard (switching central) may be installed somewhere in the wire system when it is needed to save wire or to add to the flexibility of the system. Its use in the battalion, however, should be rare.

(4) A field artillery battalion invariably installs a wire circuit to the switchboard of the supported infantry unit or to the switchboard of the supported or reinforced field artillery unit, *even though their command posts are together.*

(5) Wire circuits are installed to liaison officers with front line infantry battalions. Each circuit is a local circuit and terminates at a telephone at the position of the liaison officer. It is not connected into the infantry switchboard. It may be necessary to designate a point to which the battalion wire section will lay the circuit and beyond which the liaison section will lay it; or it may be necessary to delay installation until nightfall. Two telephones and at least 1 mile of wire should be carried by each liaison section, so that the liaison section may extend the liaison wire circuit forward as the liaison officer advances with the Infantry. If radio or visual communication is being used between the liaison officer and the battalion, it may be necessary to leave the radio or visual station in a concealed position while the liaison officer moves to a position from which he can observe. The two telephones and the wire may then be used to communicate between the liaison officer and his radio or visual station.

b. The system.—The wire system of a battalion should consist of a switchboard installed in the command post area, trunk circuits to the batteries and to the supported unit, and local circuits to the liaison officers, forward observers, and command post installations as required by the particular situation. If a battalion observation post is established, two circuits should be installed to it from the switchboard. The number of local circuits in the command post area depends on the needs of the commander but should always include one

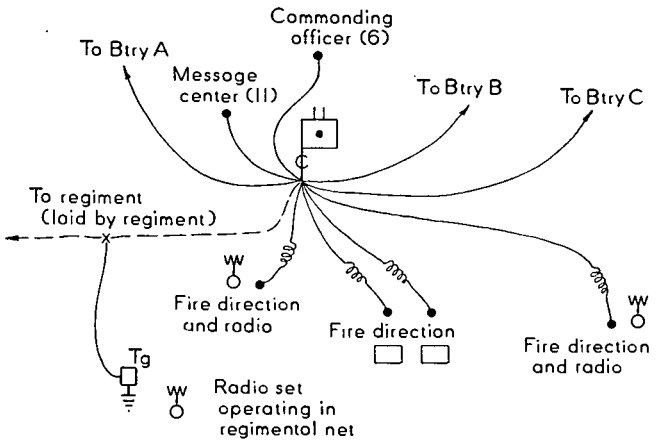


FIGURE 3.—Example of local circuits in a battalion command post area (organizations equipped with switchboards not having repeating coils).

NOTE.—A local circuit may be installed to the air-ground radio set if it is located at the battalion command post.

circuit to the location of the commander and sufficient circuits to provide for proper fire direction of the entire battalion (fig. 3). In organizations equipped with switchboards having repeating coils, the circuit to each battery is simplexed for ground-return telephony between the battery and the command post. When such an installation is made, not more than two metallic circuits need to be installed for fire direction (fig. 4). Figure 5 shows an example of the wire communication installed in a light battalion.

c. Alternative wire systems.—(1) In some situations, it may be impossible or undesirable to have one or more of the batteries install a switchboard. The battalion may install the circuits from its switchboard direct to the gun positions or to the observation posts. Such a system is indicated by the statement, "Circuits to gun positions," or "Circuits to observation posts," in the battalion commander's order.

(2) If it is necessary to install a battalion wire system and switchboards are not available, the initial installation

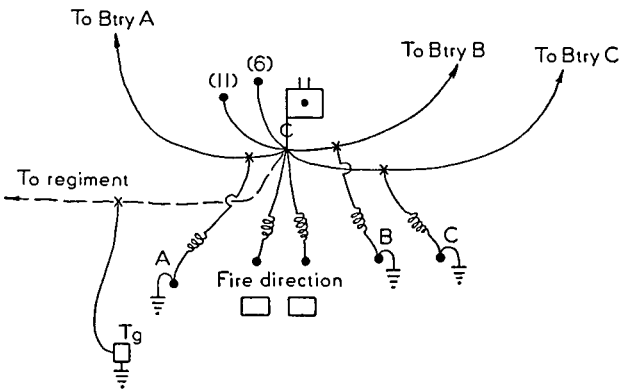


FIGURE 4.—Example of local circuits in a battalion command post area (organizations equipped with switchboards having repeating coils).

NOTE.—A, B, and C are telephones directly connected by ground return circuits to the gun positions of batteries A, B, and C, respectively. These telephones may be located at any radio station or convenient to the staff as required and must be used only for fire direction. When the telephone operator at A calls, the operator at battery A gun position answers.

A local circuit may be installed to the air-ground radio set if it is located at the battalion command post.

may consist of direct wire circuits between the battalion command post and the gun positions. Such an installation is indicated by the statement, "Direct circuits," in the battalion commander's order.

(3) The situation may indicate some combination of the wire systems enumerated. One battery may be directed to

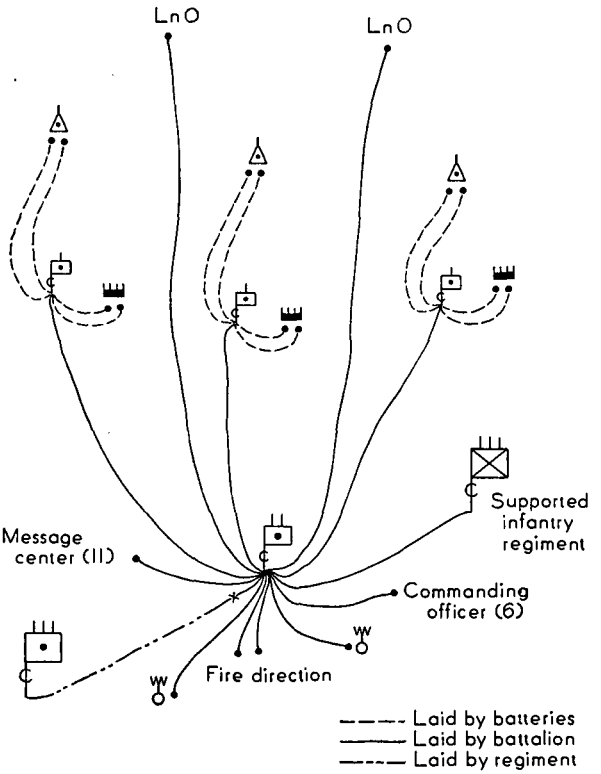


FIGURE 5.—Example of wire communication installed in a light battalion.

NOTE.—The regimental wire circuit is simplexed for telegraph communication. A local circuit may be installed to the air-ground radio set if it is located at the battalion command post. Organizations equipped with switchboards having repeating coils may simplex circuits for ground return telephony as indicated in figures 2 and 4.

install a switchboard while another may have the battalion circuit installed to its observation post or to its gun position. However, the system should be improved as time and equipment permit.

■ 85. WIRE SYSTEMS IN MEDIUM BATTALIONS.—The principles prescribed for the light battalion are with obvious modifications applicable to medium battalions. A medium battalion usually establishes liaison communication with the light artillery unit which it supports by reinforcing fires. It installs a wire circuit from its switchboard to the switchboard of the light unit, and the liaison officer uses the switching facilities of the light unit for communication to his battalion.

■ 86. REGIMENTAL WIRE SYSTEM.—The wire system of a field artillery regiment consists of trunk wire circuits to its subordinate units and to the supported infantry unit, and such local circuits as are required at the regimental command post. A switchboard is always installed in the command post area. Switching centrals are rarely used. The wire circuits to subordinate units and to the artillery brigade (or division) are simplexed for telegraph. Figure 6 shows a wire system of an artillery regiment.

■ 87. BRIGADE WIRE SYSTEM.—*a.* When the artillery is organized as a brigade, the wire system consists of trunk circuits to the regiments and such local circuits as are required in the command post area. Two circuits are installed to the brigade switchboard by the division. The brigade invariably installs a switchboard in order to interlace the infantry and artillery wire systems. A switching central may be installed in a brigade wire system to increase the flexibility of the system or to save wire. However, when a switching central is installed, special arrangements must be made for bridging the circuits around it in order to have telegraph communication to the regiments.

b. When the division artillery is not organized as a brigade, the division signal company lays such signal communication as is necessary for control of the artillery.

■ 88. GROUPMENT WIRE SYSTEMS.—When groupments are formed, the headquarters of the groupment commander in-

stalls wire communication with each subgroupment or subordinate unit of the groupment. In many cases, the attached units because of lack of time are unable initially to install extensive wire systems. It then becomes necessary for the organic units to install not only the circuits normally required for communication to the attached units, but also those

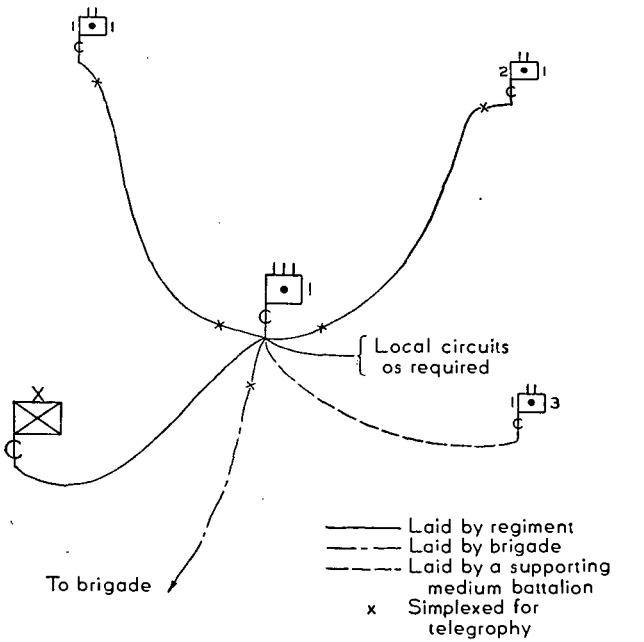


FIGURE 6.—A regimental wire system, 75-mm, in a square infantry division.

necessary for communication within the attached units. This is done prior to the arrival of the attached units. Figure 7 illustrates a wire communication system within a groupment. Frequently, in attack, the attached artillery remains in position and takes over the missions of the organic artillery when it displaces. To permit this to be done smoothly and without

interruption, it is desirable that their command posts be together and the command post installations be duplicated.

■ 89. TACTICAL RADIO NETS.—*a.* The brigade and regimental nets shown in figure 8 (or the nets of the division artillery when it is not organized as a brigade) are usually placed in operation prior to installation of the wire systems. After installation of the wire systems, these nets must be available to supplement wire communication and to provide communication during interruption of wire communication. When not in continuous operation, the nets are checked at scheduled intervals of time to insure their continued functioning. Radio

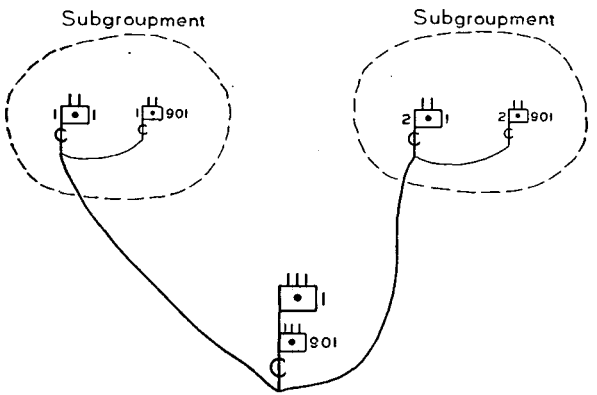


FIGURE 7.—A wire system for a groupment of light artillery in a square infantry division.

operators when not operating in the radio net are used to operate the telegraph instruments simplexed on the wire circuits. When the wire circuits are in operation, wire-telegraph communication should be used in preference to radio communication.

b. Tactical nets are normally operated free but the NCS, if it is unable otherwise to maintain proper control, may order a change to directed net operation at any time.

c. When division artillery is not organized as a brigade, the artillery regiments are in a radio net with division headquarters.

■ 90. LIAISON AND FORWARD OBSERVER NETS.—*a.* The use of radio by liaison officers and forward observers for communication with the battalion command post and the firing batteries is of primary importance to the Field Artillery.

b. It is essential that the radio station of the observer is in direct communication with a radio station which is either at a battery or in direct telephone communication with a battery.

c. Unless the firing batteries are equipped with radio sets, it should be habitual under the following conditions for the

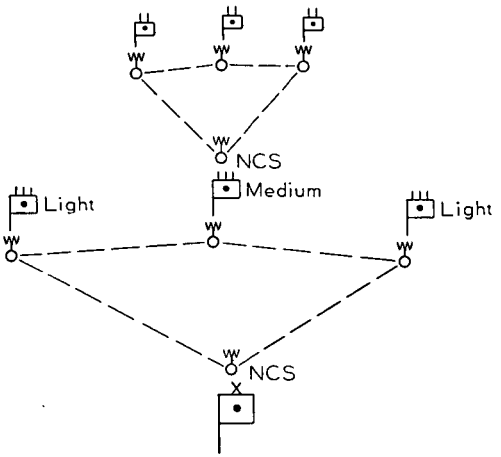


FIGURE 8.—Tactical radio nets of the brigade and the regiment in a square infantry division.

battalion to furnish them with radio sets, operators, and a frequency upon which to operate:

(1) When a battery is detached from the battalion and operating with a security detachment.

(2) When it is impracticable for the battery to install and maintain wire circuits to battery observers in forward areas.

d. Typical liaison and forward observer radio nets of the light battalion are shown in figure 9. The type and number of nets in operation depend upon the number of liaison or forward observers required by the situation, availability of

frequencies upon which to operate, number and characteristics of the available radio sets, and typical dispositions of the battalion.

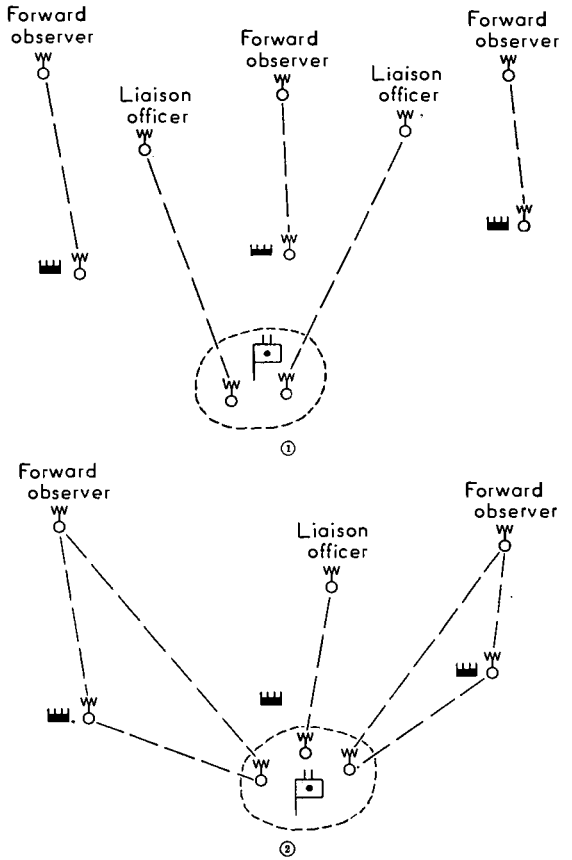


FIGURE 9.—Examples of liaison and forward-observer nets.

e. The control of artillery fire by radio requires a procedure designed for economy of time. When two stations are known to be within easy radio range of one another, it is unnecessary

to include any routine procedure which obviously slows the delivery of fire.

■ 91. AIR-GROUND NETS.—*a.* The air-ground net of an artillery brigade includes the brigade station (NCS), the battalion stations, and such airplanes as may be operating with the brigade (fig. 10).

b. When division artillery is not organized as a brigade, air-ground radio communication for control of air observation and adjustment of artillery fire will be essentially as provided for the brigade except that the two artillery regimental command posts will be in the air-ground net. When

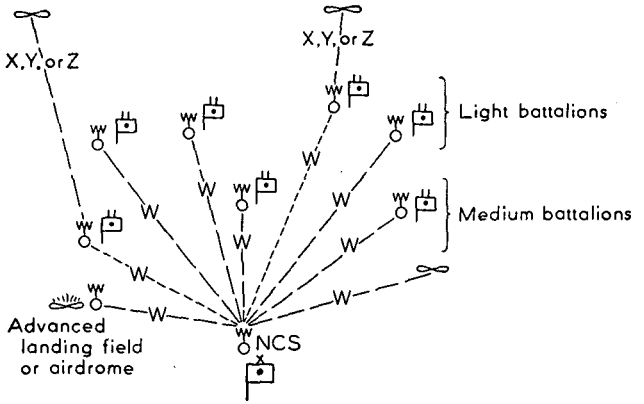


FIGURE 10.—An air-ground radio net, square infantry division.

decentralized control is appropriate, particularly when reinforcing artillery is present, two artillery air-ground nets may be established with the net control stations at the artillery regimental command posts; one net normally will comprise the general support artillery.

c. The procedure used in control of artillery fire by air observers is similar to that for liaison and forward observers.

■ 92. RADIO SYSTEMS IN GROUPMENTS.—Regardless of the amount and types of attached artillery, the radio nets described herein for the organic artillery should remain the

basic system. A limited number of noninterfering radio channels are available in a given area. Tactical nets should be employed between groupments and subgroupments and between subgroupments and battalions as described for brigade and regimental nets. In most situations, liaison and forward-observer nets are limited by the allowable density for noninterfering channels in the area. The allowable density is dependent upon the types of radio equipment used for that purpose. There will usually be restrictions upon the number of stations which can be handled in the air-ground net. Since practically all air-ground missions are fired by medium artillery, the light battalions usually are the ones so restricted.

SECTION II

CAVALRY DIVISION, CORPS, AND ARMY ARTILLERY

■ 93. CAVALRY DIVISION ARTILLERY.—In general, the doctrines of signal communication are the same as for the corresponding units of the organic artillery of an infantry division. Because of the relatively short time ordinarily available for installation, the wire circuits are usually comparatively short and are limited to those absolutely necessary. Other means of communication are frequently used, especially visual signaling and radio. Communication between the artillery regiment and the command post of the division normally is established by the division. An artillery battalion, when attached to or in direct support of a cavalry brigade, normally establishes communication with such brigade.

■ 94. CORPS ARTILLERY.—*a.* The corps lays the necessary circuits to the command posts of the corps artillery brigade and of corps artillery units not a part of the brigade. The telephone communication of a corps artillery brigade corresponds in principle to that of a division artillery brigade.

b. Corps artillery units, when placed in support of or given the mission of reinforcing the fires of divisions or lower units, lay circuits to the command posts of those units.

c. The observation (sound-and-flash) battalion lays circuits to the command posts of the units which it serves or obtains communication with them through the corps.

■ 95. ARMY ARTILLERY.—For heavy field artillery units retained under army control, the doctrines of signal communication and the means available are similar to those of corresponding units of the corps artillery. Units of army artillery do not establish direct telephone communication with divisions or lower units. When assigned missions in direct support of a corps, direct telephone communication is established with the corps artillery officer or with the corps artillery brigade, according to circumstances. Communication may be established with subordinate units of corps artillery when close coordination of fire renders such communication necessary or desirable.

PART THREE

TACTICAL EMPLOYMENT

CHAPTER 1

GENERAL

■ 96. ARTILLERY TACTICS.—Artillery tactics is the art of disposing artillery troops, matériel, ammunition, and means of signal communication in the presence of the enemy, and the directing of artillery fire in combat so as to carry out most effectively the mission assigned.

■ 97. CHARACTERISTICS OF FIELD ARTILLERY.—*a. General.*—(1) Field Artillery is an army of relatively long-range combat. Fire is its sole means of combat. It contributes to the movement of the entire force through the fire support which it renders other arms; its own movement is to insure this support.

(2) Artillery fire possesses great power of destruction and neutralization. It is the principal means of attack against material objectives. Its curved trajectories enable fire to reach personnel defiladed against flat trajectory weapons or protected by ordinary overhead cover. The wide radius of effect of artillery projectiles compels hostile troops in the open to move in widely deployed formations. Artillery fire also produces great moral effect.

(3) Artillery fire possesses a high degree of flexibility. Field Artillery is thus capable of intervening over a zone of great width and depth and of rapidly shifting and concentrating its fire in accordance with the situation without changing its positions. This characteristic makes it possible to concentrate the fire of large masses of Field Artillery under a common fire direction. Such heavy concentrations of fire are, under certain conditions, capable of being directed with annihilating effects against critical objectives in the zone of combat. Through maneuver of artillery fire, higher commanders possess a powerful means of influencing the

course of combat. The efficiency with which artillery fires are maneuvered is dependent upon adequate control, close liaison with supported troops, and efficient communication and observation. Deficient observation causes a great increase in consumption of ammunition. Poor signal communication prevents concentration of fire both in time and place.

(4) The power of artillery is limited by its inability to act otherwise than by fire action; by its vulnerability when in movement; and by its comparative vulnerability, even when in position, to attack by fire at medium or short ranges, especially from the flanks or rear. These limitations prevent the employment of the artillery as an independent, self-sustaining arm.

b. Tactical characteristics of various types.—(1) *Light artillery.*—By reason of its range, mobility on the battlefield, and high rate of fire, light artillery is able to render continuous direct support to Infantry and Cavalry. In general, the methods of employment of truck-drawn and horse-drawn artillery are similar.

(*a*) *Horse-drawn.*—Horse-drawn light artillery has great mobility across country, particularly on the battlefield, but is handicapped when long rapid road marches are required.

(*b*) *Horse.*—The mobility of horse artillery is greater than that of horse-drawn artillery and enables it to march and maneuver with Cavalry.

(*c*) *Pack.*—Pack artillery has reasonably rapid, quiet, and reliable mobility over ground difficult or impossible of maneuver by other types of artillery. It is especially suitable for operations in mountains and jungles and may be employed advantageously in landing operations and as an accompanying weapon, its matériel being readily moved by hand. It is incapable of moving at increased gaits.

(*d*) *Truck-drawn.*—The mobility of truck-drawn light artillery across country approximates that of horse-drawn artillery. Where necessary, it can accompany foot troops for prolonged periods. It has great advantage when long rapid moves are required.

(2) *Medium artillery.*—The mobility of truck-drawn medium artillery on good roads compares favorably with that of truck-drawn light artillery under similar conditions; on

poor roads and across country, that of the light artillery is appreciably greater. Tactically, medium artillery may be used advantageously for counterbattery, for destruction fire, for interdiction, and to give depth and increased destructive effect to the supporting fires of light artillery.

(3) *Heavy artillery.*—(*a*) Heavy artillery has the distinctive characteristics of long range, a slow rate of fire, and fire of great destructive power. When compared with the light and medium types, it lacks mobility and requires considerable time for emplacement and displacement.

(*b*) Tactically, heavy artillery may be employed advantageously for interdiction fire on important points deep within the enemy lines, for neutralization or destruction of enemy batteries and installations, and as necessary for reinforcing the fires of corps or division artillery.

■ 98. SUPPORTING ARTILLERY.—Supporting artillery may be in general support or in direct support. General-support artillery supports the entire unit; the power of concentrating its fire is at a maximum. Direct-support artillery has the primary mission of supporting a designated subdivision of the unit and a secondary mission of acting in general support; fire may be concentrated with reasonable facility. The assignment of direct-support missions to artillery units permits direct cooperation with the supported units and enables it to act with greater promptness in meeting the requirements of the rapidly changing situation on the front of the supported units. Such assignment does not, however, imply subordination of the artillery units to the commander of the unit supported. In the division, light artillery is normally employed in direct support, each artillery battalion normally forming a combat team with an infantry regiment. Medium artillery normally is in general support; all or a part may be designated to reinforce the fires of the light artillery. In the corps, the corps artillery may be in general support of the corps as a whole; or part of it may be in general support and part in direct support of one or more divisions; or, in appropriate situations, all may be in direct support of divisions.

■ 99. ATTACHED ARTILLERY.—When circumstances are such that the superior commander cannot efficiently direct the fire of the supporting artillery, it should be attached to the supported unit. Artillery temporarily attached to another command to serve under orders of the commander of the unit to which attached is designated "attached artillery." The term includes artillery units attached to subordinate infantry or cavalry commands for combat, artillery units attached to security detachments, and artillery attached by a higher to a lower echelon.

a. Army.—Relatively few of the artillery units allotted to the army from the GHQ reserve will be retained by the army. The units retained will usually be of a type capable of covering the front of more than one corps; however, the army may retain for special missions certain units not capable of long-range fire; ultimate employment of the latter units usually will be under direction of the corps or divisions.

b. Corps.—The corps retains under its own control such units of attached artillery as are necessary for carrying out corps fire missions. Normally, light artillery units allotted to the corps are attached to divisions. Certain light artillery units may be retained by the corps for special missions; however, their ultimate employment will normally be under the direction of the divisions.

c. Division.—The effect of attaching units of division artillery to infantry units of the division is to render the artillery less effective in delivering concentrated fire when and where needed; as a result, the division commander is less able to influence the progress of the action as a whole. Consequently, he retains it normally under his own control exercised through the commander of the division artillery. When combat breaks into disconnected local engagements or in a situation where the division cannot be employed as a whole in coordinated action, the division commander may attach to infantry units a part of or all the division artillery.

■ 100. ACCOMPANYING ARTILLERY.—In some cases it may be foreseen that liaison and communication between the assault infantry and the supporting artillery will be unde-

pendable as a result of the breaking up of the engagement into a series of local combats. Under such conditions, and when the division commander can afford to sacrifice the power of concentration inherent in his artillery in order to take advantage of the more direct and immediate communication, single batteries, platoons, or pieces may be attached to assault infantry regiments or battalions for their close support. Such artillery, known as accompanying artillery, follows the assault infantry units closely, attacking rapidly at short ranges such targets as the Infantry cannot overcome with its own fire power. *The use of accompanying artillery is rarely justified if taken from the direct-support artillery.*

■ 101. DETACHED PIECES.—*a. Roving guns.*—Roving guns are pieces of artillery withdrawn from their regular positions and posted in temporary positions for the execution of specific missions upon the conclusion of which they rejoin their batteries. They may be employed to deceive the enemy as to the strength of the artillery or true positions of the batteries, or to fire particular missions which cannot be executed from the regular positions, especially harassing and interdiction fires.

b. Antitank guns.—Antitank guns, when furnished by the division Field Artillery, are usually light artillery pieces detached from their organic command and placed in positions with the exclusive mission of firing upon enemy tanks. In order to conserve the power of the direct-support artillery for its primary mission, the number of guns detached for defense against tanks should be held to the minimum demanded by the situation. The use of antitank guns is normally limited to defensive actions and to terrain which favors a tank attack. Antitank guns should be posted so as to cover the most probable lanes of tank approach, particularly terrain defiladed from the fire of supporting artillery. Their employment should be coordinated with other means of antitank defense. Echelonment of the antitank guns is desirable. They should be in concealed or camouflaged direct-laying positions from which they can be withdrawn quickly after firing.

■ 102. ARTILLERY RESERVES.—*a*. The true reserve of the artillery is its ability to concentrate and intensify its fire. This characteristic is wholly dependent upon adequate ammunition supply.

b. When the combat situation remains obscure, a portion of the artillery may be held in readiness for movement to any point where developments in the situation require its employment. The mobility of truck-drawn artillery renders this type especially adapted to such use. Furthermore, although the mass of the artillery must be in a position to participate in the action as soon as the battle front has been definitely established, some units may be directed to remain silent pending the development of certain contingencies during the battle.

CHAPTER 2

GENERAL COMBAT DUTIES OF ARTILLERY OFFICERS, ARTILLERY COMMANDERS, AND ARTILLERY STAFFS

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SECTION I

GENERAL

■ 103. STAFF FUNCTIONS.—The subject of staff functions covered in FM 101–5 applies in general to the duties of artillery staffs.

■ 104. CHAIN OF COMMAND.—There is no direct chain of artillery command extending from armies to corps or from corps to divisions. Instructions originating with an army (corps) artillery officer (par. 105a) for the corps (division) artillery will be directed in the name of the army (corps) commander to the corps (division) commander, who will be responsible for issuing appropriate orders to his artillery officer.

SECTION II

ARTILLERY OFFICERS

■ 105. GENERAL.—*a.* The term "artillery officer" is used to designate the senior officer in the field artillery section of GHQ, army, corps, and division.

b. The artillery officer, GHQ, exercises no tactical command. His special duties as a staff officer of the force commander are shown in paragraph 106. The role of the artillery officer, army, corps, or division, is dual. He commands all the artillery, both organic and attached, which has not been attached to subordinate units; he is a member of

the special staff of his commander, in which capacity he is assistant and advisor regarding all artillery matters.

■ 106. ARTILLERY OFFICER, GHQ.—His duties are to—

a. Determine the amounts and types of artillery and artillery munitions needed for the command as a whole.

b. Weigh the relative needs and demands of the various armies or groups of armies for artillery and to recommend the allotment or withdrawal of units of the GHQ reserve artillery in accordance with such needs, also recommend the transfer of artillery from one command to another or to the GHQ reserve.

c. Supervise such artillery schools as are under control of the commander of the field forces.

d. Recommend assignment of artillery personnel and determine number of replacements to be provided for the artillery.

e. Supervise the training of artillery personnel.

■ 107. ARMY ARTILLERY OFFICER.—Control of the artillery with the corps by the army artillery officer, exercised through the normal chain of command, consists of assignment of only such general missions and zones to be covered by fire as are required for coordination of all the artillery with the army. His duties are to—

a. Recommend and prepare plans for employment of the artillery with the army, covering particularly—

(1) Amount of GHQ reserve artillery or other reinforcing units needed; composition of the army artillery; and allotments to corps of such artillery as is not retained as army artillery.

(2) Positions, observation facilities, and locations of rear establishments to be reserved for the army artillery.

(3) Assignment of missions and zones of action to army artillery and general instructions to corps governing the employment of artillery with the corps.

(4) Coordination of missions and liaison between army artillery and artillery with the corps and with adjacent armies.

(5) Air observation for army artillery.

(6) Coordination of army artillery missions with Air Corps attack and bombardment missions.

b. Prepare the artillery annex to army field orders.

c. Regulate combat of the artillery with the army in accordance with instructions of the army commander.

d. Determine the needs of the army in artillery ammunition and allot artillery ammunition to the army artillery and to corps.

e. Coordinate artillery observation within the army.

f. Make recommendations regarding artillery personnel, matériel, methods, and training.

■ 108. CORPS ARTILLERY OFFICER.—Control of division artillery by the corps artillery officer, exercised through the normal chain of command, consists mainly of the assignment of zones and missions necessary to coordinate the fire of the artillery with the corps. His duties are to—

a. Recommend and prepare plans for employment of the artillery with the corps, covering particularly—

(1) Allotment of reinforcing artillery to divisions.

(2) Temporary control to be exercised over division artillery during certain preparatory phases of combat and in reinforcing the counterbattery fire of the corps artillery.

(3) Positions and observation facilities to be reserved for the corps artillery.

(4) Assignment of missions and zones of action to corps and division artillery.

(5) Coordination between units of artillery with the corps.

(6) Control of counterbattery within the corps.

(7) Air observation for corps artillery.

(8) Displacement of artillery with the corps.

b. Prepare the artillery annex to corps field orders.

c. Regulate combat of the artillery with the corps according to instructions of the corps commander.

d. Organize corps artillery for combat so as to prescribe for efficient execution of counterbattery and other special missions.

e. Arrange with the army artillery and with the artillery of adjacent corps for mutual reinforcement and coordination of fires.

f. Coordinate the fire of the artillery with the corps with combat aviation and with tanks assigned missions in the corps zone of action.

g. Allocate artillery ammunition to the divisions and to the corps artillery and to supervise its distribution.

h. Submit recommendations regarding artillery personnel, matériel, and methods.

■ 109. DIVISION ARTILLERY OFFICER.—The principal duties of the division artillery officer are as follows:

a. Commander of artillery with the division.

b. Tactical and technical advisor to the division commander on artillery matters.

c. Responsibility for training of the organic division artillery.

d. Preparation of plans for the allotment and use of artillery.

e. Supervision of observation, signal communication, and liaison within the division artillery.

f. Coordination of the survey system within the division artillery.

g. Furnishing meteorological data to the division artillery.

h. Allocation of artillery ammunition and general supervision of its distribution.

i. Coordination of fires of the division artillery.

j. Preparation of plans for employment of air observation for the division artillery and for cooperation of the division artillery with tanks and with Air Corps units assigned attack or bombardment missions within the division area.

k. Preparation of the artillery subparagraph of the division order and of the artillery annex (when required).

l. Collection and dissemination of artillery information through artillery intelligence agencies.

SECTION III

CORPS ARTILLERY BRIGADE COMMANDERS; REGIMENTAL, BATTALION, AND BATTERY COMMANDERS

■ 110. CORPS ARTILLERY BRIGADE COMMANDER.—The corps artillery brigade commander exercises immediate command of the corps artillery brigade as a subordinate of the corps artillery officer. During combat, he may be placed in command of all the reinforcing artillery retained under corps control, or where considerable amounts of reinforcing artillery are

involved, he may be placed in command of one of the large groupments into which the corps artillery may be divided.

■ 111. REGIMENTAL COMMANDER.—*a. General.*—When a regimental commander is the senior artillery officer with a combined arms force, his functions are analogous to those of the division artillery officer. His usual functions are both tactical and administrative.

b. Tactical duties.—The principal tactical duties of the regimental commander are to—

(1) Supervise training to keep his regiment prepared for efficient operation in peace and war.

(2) As an informational agency, assist the battalion commanders by securing and disseminating to them information of the enemy and of the plans and actions of supported and associated troops.

(3) Formulate plans for the tactical employment of the regiment and assign definite missions by orders to his subordinates in conformity with these plans.

(4) Supervise the execution of missions assigned to subordinates.

(5) Plan ahead in order to be prepared to bring the fire power of the regiment to the assistance of supported units in all changes of the situation.

(6) Allocate to battalions ammunition placed at the disposal of the regiment and supervise ammunition distribution.

■ 112. BATTALION COMMANDER.—Tactically, the disposition and employment of artillery resolves itself eventually into the movement, locations, missions, and ammunition supply of battalions. Fire direction culminates in the battalion. The battalion commander's principal tactical duties are to—

a. Keep constantly informed of the enemy situation, of the plans of higher commanders, and of the disposition, missions, and plans of supported troops.

b. In accordance with plans of higher commanders and supported troops, prepare plans for the movement, emplacement, tactical employment, and ammunition supply of his battalion, the details of which include—

(1) Reconnaissance of position for the battalion, routes thereto, and assignment of positions to subordinate units.

(2) Directions regarding organization of the position, including establishment of suitable command, liaison, observation, and signal communication. Insofar as is compatible with a proper exercise of his functions of command, a battalion commander charged with the duty of direct support establishes his own command post in close proximity to that of the commander of the supported unit and maintains personal liaison with him. He maintains contact with assault unit commanders by means of his liaison officers.

(3) Missions to subordinate units which may be assigned to batteries by designating normal and contingent zones involving fire on targets of opportunity within these zones, by assigning specific fire missions to each battery, or by a combination of both methods.

(4) Fire direction. The functions of the battalion commander regarding fire direction are treated in FM 6–40.

(5) Ammunition supply of the battalion which requires careful supervision of ammunition expenditures. When batteries are assigned zones of fire, a limitation on ammunition expenditures is necessary; when assigned specific fire missions, the number of rounds for each is prescribed.

■ 113. BATTERY COMMANDER.—The battery commander commands the battery and supervises all its activities; reconnoiters and selects positions; determines objectives and the character of fire in accordance with instructions of the battalion commander; prepares and conducts fire; and provides for replacement of personnel, ammunition, and equipment. For training and administration of the battery, the battery commander may divide the battery into departments as described in FM 6–5.

SECTION IV

FIELD ARTILLERY STAFFS

■ 114. GENERAL.—*a. Battalions and higher units.*—Commanders of battalions and higher units of artillery, including the respective artillery officers, have staffs which in general are similarly organized but vary in the number of their personnel and in the number, magnitude, and complexity of their functions. Those staff officers assigned functions corresponding

to the chief of staff, G–1, G–2, G–3, and G–4 sections of the general staff are referred to as the executive, S–1, S–2, S–3, and S–4. While an organization for each staff and the duties of each staff officer are prescribed, the artillery commander varies the organization and functions of his staff to meet best the demands of each particular situation. (See FM 101–5.)

b. Battery.—The battery has no staff sections corresponding to higher headquarters. The reconnaissance officer, executive, and assistant executive perform such staff duties corresponding to the several staff sections as are required.

(1) The reconnaissance officer's duties in combat include assistance of the battery commander in reconnaissance, preparation of fire, and observation; survey operations; supervision of establishment of the observation post, communication, and other functions of the battery detail; intelligence; and preparation of maps and sketches.

(2) The duties of the executive and assistant executive are treated in FM 6–40.

c. Forms.—For forms used by various staff sections, see FM 6–130.

■ 115. THE EXECUTIVE.—The executive is the principal assistant and adviser of the commander. He transmits the will of the commander to those who execute it and is the principal coordinating agency which insures efficient functioning of the staff and of all troops of the command. He performs the following specific duties:

a. Formulates and announces policies for general operation of the staff.

b. Directs and coordinates the work of the four staff sections in all their relations with the special staff, with the troops, and with each other.

c. Keeps the commander informed of the enemy situation and of the situation of the command as to location, strength, morale, training, equipment, supply, and general effectiveness.

d. Represents the commander during his temporary absence or when authorized to do so. Normally, the executive refers all matters of importance to the commander for deci-

sion. However, in the absence of the commander, the executive does not hesitate to assume the responsibility for making a decision on any pressing matter regardless of its importance, acting always in accordance with his knowledge of the commander's plans.

e. Obtains basic decisions from the commander and takes the following action:

(1) Makes necessary decisions supplementary thereto and gives necessary instructions to the staff in furtherance of the basic decisions of the commander.

(2) Allots detailed work of preparing plans and orders, obtains drafts of plans and orders from the four staff sections, and submits to the commander a completed plan developed from the section plans.

f. Reviews and coordinates all instructions that are to be published to the command and assures himself that they are strictly in accord with policies and plans of the commander.

g. By personal observation and through the four staff sections, sees that orders and instructions of the commander are executed both in spirit and in letter.

h. Makes a continuous study of the situation with a view to being prepared for further contingencies.

i. Establishes the command post in the location designated by the commander; insures that the various elements thereof are disposed to facilitate operation and are properly protected and concealed. The executive is assisted in this duty by the communication officer.

j. Supervises the keeping of the unit journal.

k. Assembles data for and prepares the unit report; after its approval by the commander, forwards a copy to the next higher headquarters.

■ 116. S–1 (PERSONNEL) SECTION.—*a. General.*—(1) The S–1 section of a field artillery staff consists of a chief of section (the adjutant) and such enlisted assistants as are provided in Tables of Organization. It is charged with the handling of all matters relating to personnel as individuals. No S–1 section is provided in the staff of the corps artillery officer, nor in the staff of the division artillery officer when the divi-

sion artillery is not organized as a brigade. Such S–1 duties as may be required of these staffs are handled by an aide.

(2) *Duties.*—The more important duties of S–1 are—

(*a*) Handling of all official correspondence (except that pertaining to combat orders and instructions) in accordance with regulations and approved policies. In cases for which no policy has been established, S–1 initiates action to secure a policy.

(*b*) Authentication and distribution of all orders and instructions except those pertaining to combat operations.

(*c*) Maintenance of the headquarters office of record.

(*d*) Operation of the postal service.

(*e*) Operation, in accordance with approved policies, of activities at the headquarters pertaining to—

1. Classification of all individuals of the command; their assignment, promotion, transfer, retirement, and discharge.
2. Procurement and replacement of personnel in accordance with priorities formulated by the plans and training section.
3. Decorations, citations, honors, and awards.
4. Leaves of absence and furloughs.
5. Education, recreation, and welfare, exclusive of religious matters.

(*f*) Custody of records of all personnel belonging to the command which are not kept in some subordinate unit.

(*g*) Supplying of blank forms, publications, and instructional matter furnished by the Adjutant General's Department.

(*h*) Operation of a general follow-up system for the headquarters as regards administrative matters, including recommendations as to similar arrangements in headquarters of subordinate units.

(*i*) Supervision of operation of medical personnel in sanitation.

(*j*) Supervision of headquarters arrangements including the officers' mess.

(*k*) Furnishing information relative to shelter necessary for the command and assigning shelter.

(*l*) When directed, acting as agent of the division finance officer in the payment of troops.

(*m*) Command of the rear echelon.

(*n*) Keeping in close touch with the tactical situation so that he may replace or temporarily perform the duties of any other staff officer.

(*o*) When required, furnishing the executive with pertinent data for inclusion in the unit report.

b. Brigade S–1.—The duties of the brigade S–1 are very limited since in practically all matters the regimental S–1 sections deal directly with division (corps, army) headquarters. The duties of S–1 relate principally to the personnel and administrative matters pertaining to the artillery headquarters and the headquarters battery or detachment and to matters relating to quartering.

c. Regimental S–1.—Since the regiment is an administrative unit, the regimental S–1 is concerned with all the duties listed in *a*(2) above. In addition, the regimental S–1 becomes the custodian of all funds of subordinate combat units when the latter enter the combat zone and commands the band when one is assigned by Tables of Organization.

d. Battalion S–1.—(1) The battalion, when present with its regiment, is not an administrative unit; the regimental S–1 section handles practically all personnel matters directly with the battery commanders. In this case, the duties of the battalion S–1 are similar to those of the brigade S–1.

(2) When the battalion is absent from the regiment, the battalion S–1 assumes the personnel and administrative duties normally performed by the regimental S–1.

■ 117. S–2 (INTELLIGENCE) SECTION.—*a. General.*—(1) Artillery units seek continuously for information of the enemy by all available means. Information is gathered and evaluated by S–2 sections and disseminated, not only in the command of which the section is a part, but to subordinate, higher, and adjacent commands as well. It is of special importance that information be transmitted promptly through artillery channels to the intelligence section of the corps artillery officer. In principle, each individual of an artillery unit, whether con-

nected with the S–2 section or not, is an intelligence agent and should forward without delay all enemy information secured by him, even though it may seem unimportant from his point of view. Many items of apparent minor importance, when fitted together, build up a useful picture of enemy activities and intentions.

(*a*) Complete information is sought regarding location, disposition, strength by caliber, composition, and general efficiency of enemy artillery; location of appropriate artillery targets; enemy dispositions including location of strong points and centers of resistance; movement of enemy artillery and location of enemy artillery in reserve; antitank and roving guns; observation posts and command posts; airplane landing fields and balloon beds; location of ammunition dumps and distributing points; and routes used by the enemy. A record is kept of the date and time enemy batteries fire, types and calibers, character of emplacements if known, targets fired at, number of rounds fired, types of ammunition and fuzes used, results obtained and when possible the designation and exact location of each unit firing.

(*b*) The sources available to the artillery are higher headquarters, including the intelligence sections of army, corps, division, brigade, and regiment; adjacent units; supported units, including infantry regiments and battalions; associated units, including air observation units, sound-and-flash units, engineer topographic units, radio-intercept and goniometric units, and meteorological sections; subordinate units, including their observation posts and liaison officers; and examination of captured matériel or of fragments of hostile projectiles.

(2) *Duties.*—The principal duties of S–2 may be summarized as follows:

(*a*) To initiate a systematic and coordinated search for required information by all available collecting agencies.

(*b*) To collate, evaluate, and interpret information from all possible sources.

(c) To reduce intelligence to a systematic form and distribute it to all concerned in time to be of value to the recipients. Prompt distribution of items affecting the direction or conduct of artillery fire is particularly important.

(*d*) To work in close coordination with the S–3 section of the staff and to assist in the preparation of combat orders. S–2 usually writes the paragraph of the field order covering information of the enemy, and when an operation map is issued as an annex to the field order, places the enemy situation on the operation map.

(*e*) To coordinate, through the normal chain of command, the work of intelligence personnel within the unit.

(*f*) To keep in close touch with intelligence sections of higher, lower, adjacent, and supported units for the purpose of interchange of information.

(*g*) To obtain and distribute maps and map substitutes.

(*h*) To keep the S–2 work sheet, S–2 situation map, and such other records pertaining to S–2 duties as the situation may require.

(*i*) To furnish the executive with pertinent data for inclusion in the unit report.

b. S–2, staff of corps artillery officer.—(1) *Functions.*—The S–2 section of the staff of the corps artillery officer is the principal link in the artillery intelligence activities. Here, all information of interest to the artillery (*a*(1) above) is centralized, transformed into intelligence, and disseminated to the artillery with the corps and to higher and adjacent units. One of the principal functions of this section is the location of enemy batteries, maintenance of a record and study of their activities, and cooperation with the S–3 section in effecting counterbattery. Through the normal chain of command, the S–2 section coordinates the work of the intelligence personnel of subordinate units and coordinates and utilizes the observation facilities available to the artillery including ground, air, and sound-and-flash. It maintains a study of the enemy artillery and prepares and issues this information every 24 hours or at longer intervals by means of an S–2 (intelligence) bulletin which is distributed to the army artillery officer, to the artillery with the corps to include battalions, to each division with the corps, and to adjacent corps. It maintains close contact with the corps G–2 and assists in the preparation of the corps Intelligence Annex, the G–2 Report, and enemy situation maps.

(2) *Organization.*—The S–2 section provided in Tables of Organization is organized at the discretion of the senior. To insure effective performance of its functions careful planning of individual duties is essential. A workable organization with individual duties is outlined as follows:

(*a*) *Chief of section.*

1. To keep in close touch, by personal visits, with the corps G–2 and with the S–2's of subordinate and adjacent artillery units; to determine the nature of any specific information which is required and plan with the corps G–2 for use of intelligence agencies not under control of the corps artillery officer.

2. To keep constantly informed of the enemy artillery situation and acquaint the corps artillery officer and other members of the staff with important information or changes.

3. To prepare special studies of the enemy artillery situation.

4. To coordinate, through the normal chain of command, the work of intelligence personnel of subordinate units to insure the constant flow of information to the corps S–2 section.

5. To assist the S–3 section in the preparation of combat orders.

6. To supervise the work of the entire S–2 section.

(*b*) *Current activities subsection.*

1. To receive incoming information and determine whether it requires immediate action or is for use of the research subsection.

2. To transmit information requiring immediate action to the proper destination for quick exploitation.

3. To transmit appropriate information to the research subsection.

4. To assist in the routine work of the research subsection when time permits.

(*c*) *Research subsection.*

1. To study, evaluate, and interpret information of the enemy's artillery.

2. To keep the current activities subsection and the counterbattery office of the S–3 section informed of important results of its research.
3. To keep the enemy battery file wherein is recorded all available information of the enemy artillery.
4. To keep the S–2 work sheet and post the S–2 situation map.
5. To prepare the S–2 bulletin by means of which enemy information is disseminated daily to all the artillery with the corps.
6. To supervise the keeping of the necessary S–2 files.

c. Bridge S–2, division artillery.—(1) The brigade S–2 coordinates the establishment of special artillery intelligence observation posts when conditions warrant their use.

(2) When the division is acting alone, S–2 is called upon to perform the duties usually pertaining to the S–2 on the staff of the corps artillery officer, in addition to those applicable when the division is part of a corps. In such cases, the S–2 bulletin form should be used for dissemination of intelligence of importance to the artillery.

(3) When the division artillery is not organized as a brigade, Tables of Organization do not provide an S–2 section in the division artillery officer's staff; in such case, one of the aides functions as S–2.

d. Regimental S–2.—(1) The primary function of the regimental S–2 is to locate appropriate artillery targets within the zone of action of the regiment and to transmit this information without delay to the regimental S–3 section or the brigade S–2 section, depending upon the nature of the target. As a result of the restricted viewpoint of the regimental S–2, his mission is primarily collecting and distributing information and secondarily, interpretation. Interpretation can be done more effectively at the higher headquarters. When the artillery regiment is acting alone, for example when attached to an independent force of Infantry or Cavalry, the regimental S–2 performs in addition to his normal functions such of the duties prescribed for the brigade S–2 section as are appropriate to the situation.

(2) The regimental S–2 has few sources of information under his direct control. He must depend mostly on the S–2

sections of lower, supported, adjacent, and higher units for information.

e. Battalion S–2.—(1) With his restricted point of view, the function of the battalion S–2 becomes primarily and almost entirely the collection and distribution of information. Interpretation, except in a general way, is impracticable. His primary mission is to obtain and pass on to S–3 information of targets appropriate for the immediate action of the battalion and transmit promptly to the regimental S–2 section all information on targets not suitable for battalion fire missions.

(2) The principal sources of enemy information available to the battalion S–2 are liaison officers, observation posts, reconnaissance personnel, and supported troops.

(3) In addition to his purely intelligence functions, S–2 is usually required to—

(*a*) Assist the battalion commander in reconnaissance.

(*b*) Recommend the location of the observation posts within the battalion.

(*c*) Assist the officer in charge of fire direction.

■ 118. S–3 (PLANS AND TRAINING) SECTION.—*a. General.*—(1) The S–3 section of a field artillery staff consists of a chief of section and such commissioned and enlisted assistants as are provided in Tables of Organization. The S–3 section is charged in general with those functions of the staff which relate to organization, training, and operations. It is the duty of this section to keep the commander informed on all matters pertaining to the training, combat efficiency, and disposition of the units of the command. The S–3 section assists the commander and the executive in formulating plans, and is responsible for the preparation and issue of combat orders. From the nature of its duties, it must maintain the closest cooperation and collaboration with the staff and with subordinate commanders.

(2) *Duties.*—S–3 performs the following specific duties:

(*a*) Prepares plans for, secures approval thereof, and supervises—

1. Mobilization of the unit.

2. Organization and equipment of the unit.

3. Training, including preparation of training programs and orders, organization and conduct of schools, and rendition of training reports and maintenance of records of training.
4. Assignment and attachment of units.
5. Movement of troops.
6. Tactical disposition of troops.

(*b*) Keeps informed of, studies, and keeps the commander informed of—

1. Location, effective strength, and morale of subordinate units.
2. Needs for replacements.
3. State of equipment and supplies.
4. Enemy situation.
5. Adaptability of terrain to combat operations.
6. Location and plans of supported unit.
7. Instructions and orders received from higher units.

(*c*) Prepares field orders and, when approved, is responsible for their timely delivery to the troops.

(*d*) Recommends priorities for the assignment of replacement and equipment.

(*e*) Makes a continuous study of the situation in order to be prepared for contingencies that may arise.

(*f*) Executes such reconnaissance as the commander may direct.

(*g*) Assists the commander in fire direction by assigning targets to subordinate units.

(*h*) Keeps the diary of the unit.

(*i*) Keeps the S–3 work sheet, S–3 situation map, and such other records pertaining to S–3 duties as the situation may require.

(*j*) Furnishes the executive with pertinent data for inclusion in the unit report.

(3) The following S–3 duties in the preparation and issue of combat orders are particularly important:

(*a*) When the commander issues a field order in fragmentary form, S–3 is responsible, when time and facilities permit, that the fragmentary orders are confirmed as soon as practicable by the issuance of the order in complete

form when such procedure will be of some use to subordinates in planning their operations.

(*b*) When the commander issues an oral field order, S–3 takes notes of the order and, when time and facilities permit, converts them into a written field order to be issued to the troops as soon as practicable when such procedure will be of some use to subordinates in planning their operations.

(*c*) When the commander issues a dictated order, S–3 takes down the order verbatim; his copy then becomes the official record of the provisions of the order.

(*d*) When the commander issues a complete written field order, S–3 is responsible for the actual preparation of the order. Usually those parts of the order that pertain to other staff sections are drafted in such sections and transmitted to S–3 for incorporation in the order. After the completed order is signed by the commander or executive, its distribution is the responsibility of S–3.

(*e*) The preparation of operation maps is the responsibility of S–3.

b. S–3, staff of corps artillery officer.—(1) S–3 is primarily concerned with preparing detailed plans for the tactical organization and employment of the artillery with the corps, to include the movement and disposition of reinforcing artillery, and counterbattery.

(2) Since the mission of counterbattery (par. 134) is the principal function of the corps artillery, the S–3 section must be highly organized to direct it efficiently; an officer specially designated as counterbattery officer, whose time will be devoted solely to this function, often will be required.

c. Brigade S–3.—(1) The duties of the brigade S–3 are as outlined in *a*(2) above; in addition, he is responsible for the coordination of the fires of the regiments of the brigade.

(2) Although counterbattery is primarily a function of the corps artillery, it may be necessary in some situations to operate a counterbattery system within the division artillery. If so, responsibility for the organization and operation of the system falls to the brigade S–3.

(3) When the division artillery is not organized as a brigade, the S–3 on the staff of the division artillery officer performs the duties ordinarily performed by a brigade S–3.

d. Regimental S–3.—The duties of the regimental S–3 are as outlined in *a*(2) above; in addition, he is responsible for coordination of the fires of the battalions.

e. Battalion S–3.—The battalion S–3 is in charge of the fire direction center. He is responsible, under direction of the battalion commander, for the assignment of targets to batteries and for the transmittal of orders for firing. He keeps in part II of his work sheet or on the fire mission form a record of target assignments and the effect of the fire, and is careful to assign missions to batteries that are available and best suited to the accomplishment of such missions. If all the batteries are firing, S–3 determines, under policies announced by the battalion commander, which battery, if any, must change to the new objective.

■ 119. S–4 (SUPPLY) SECTION.—*a. General.*—(1) The S–4 section of a field artillery staff consists of a chief of section and such commissioned and enlisted assistants as are provided in Tables of Organization. This section is charged in general with all supply arrangements. It keeps in constant touch with the S–3 section so as to keep informed of changes in the tactical situation which will necessitate changing the supply arrangements. It is responsible for the assurance of such supply arrangements as will permit the utmost freedom of action to the command.

(2) *Duties.*—S–4 performs the following specific duties:

(*a*) Prepares and submits requisitions for supplies (except class I supply, which is automatic). In an emergency, such requisition may be merely an informal request made by telephone.

(*b*) Prepares plans for the drawing and issue of supplies.

(*c*) Draws and issues supplies (other than ammunition, which is drawn and issued by the commanders of the ammunition trains).

(*d*) Supervises the operating agencies concerned with ammunition supply to include the care, protection, and concealment of ammunition.

(*e*) Recommends such administrative and supply details as need to go in field orders.

(*f*) Plans and supervises construction work.

(*g*) Is responsible for salvage operations.

(*h*) Keeps the S–4 work sheet.

(*i*) Prepares the ammunition report.

(*j*) Furnishes the executive with pertinent data for inclusion in the unit report.

b. S–4, staff of corps artillery officer.—The principal function of S–4 is to assist the corps artillery officer in all matters pertaining to the allocation and distribution of ammunition to the artillery with the corps. In this capacity, the S–4 section is concerned principally with estimates of ammunition requirements and with plans for allocation. This involves a complete knowledge of the quantities and kinds of ammunition with the troops and available to the corps at each ammunition supply point or corps establishment; suitability of the road net; transportation facilities of the several divisions and corps; and feasibility of distributing the estimated requirements in the time available. The S–4 section concerns itself with matters other than munitions only to the extent that such supply may affect the efficiency of the artillery with the corps.

c. Brigade S–4.—(1) Since the brigade is not an administrative unit, the brigade S–4 is concerned with supply, other than ammunition supply, only to the extent of insuring that supplies are adequate for anticipated operations. S–4's primary concern has to do with the ammunition supply of the artillery regiments.

(2) In preparing plans for the procurement and issue of ammunition for the artillery, S–4 works in close collaboration with division G–4 (or S–4 of the staff of the Corps Artillery Officer, if a corps artillery brigade). In this connection, S–4 must—

(*a*) Obtain from G–4 the location of the ammunition supply point, the hour at which it will open, and the amount of ammunition available to the artillery.

(*b*) Reconnoiter and recommend to G–4 the locations of artillery ammunition distributing points (when required),

their stockage (if any), the hour at which they will open, and the units they will serve.

(c) Keep informed of the location, amount, and disposition (whether dumped or on wheels) of the artillery ammunition within the brigade, and pass on this information to the artillery commander and the staff.

(3) When the artillery is not organized as a brigade, the S–4 on the staff of the artillery commander performs the duties ordinarily performed by a brigade S–4.

d. Regimental S–4.—(1) Since the regiment is an administrative unit, the regimental S–4 is concerned with all the duties listed in *a*(2) above.

(2) For all supplies and equipment, except ammunition, S–4 is the operating agency; that is, he is responsible for the actual drawing of supplies from the supply services and the reissue of these supplies to batteries.

(3) As regards ammunition supply, S–4 is responsible for keeping the regimental commander and staff informed of the ammunition situation within the regiment, and for the formulation and execution of an adequate plan for ammunition supply. The actual resupply of battalions is a function of battalion S–4's and ammunition train commanders.

e. Battalion S–4.—(1) When the battalion is operating with its regiment, the regimental S–4 procures and delivers to batteries all supplies except ammunition. The battalion S–4 is concerned with such supplies only to the extent of insuring their adequacy; his primary concern is with the ammunition supply.

(2) In preparing his ammunition supply plan, S–4 works in close collaboration with regimental S–4 and the battalion ammunition train commander. In this connection, S–4 must—

(*a*) Secure from regiment the location of the point from which the battalion ammunition train is to draw ammunition, the amount of credit available there for the battalion, and the times during which ammunition may be drawn.

(*b*) Reconnoiter and recommend to the battalion commander the location for the battalion ammunition train and, when required, the battalion ammunition dumps.

(c) Insure that the battalion has at all times sufficient ammunition in correct proportion as to kind to meet the needs of the situation, especially that all ammunition-carrying vehicles are fully loaded when the battalion moves. This necessitates his keeping in close touch with the batteries and the battalion staff as well as the ammunition train commander and regimental S–4.

(3) When a battalion is detached from its regiment, the battalion S–4 assumes all the supply functions normally performed by the regimental S–4. In such case, the battalion S–4 is provided with assistance by the attachment to the battalion of additional personnel and vehicles from the regimental supply and maintenance platoon. Personnel thus attached include the assistant regimental S–4 when authorized in Tables of Organization.

■ 120. COMMUNICATION OFFICER.—The communication officer, a member of the special staff of field artillery brigades, regiments, and battalions, functions in the dual capacity of staff officer and commander of headquarters battery. His duties as communication officer are covered in part two.

■ 121. RECONNAISSANCE OFFICER.—Each regiment and battalion of Field Artillery has a reconnaissance officer on its special staff. The principal duties of the reconnaissance officer are to—

a. Assist the commander in reconnaissance (part one).

b. Perform the necessary survey (FM 6–40).

c. Supervise the preparation of the necessary dead space and visibility charts (FM 6–40).

d. When not otherwise engaged, assist S–3 or other staff officer as directed by the executive.

■ 122. LIAISON OFFICER (par. 143).—The duties of the liaison officer may be summarized as follows:

a. To train and command his liaison section.

b. To represent his commander at the headquarters of the unit to which he is sent.

c. In action, after receipt of instructions from his commander, the liaison officer arranges with the communication officer the necessary details of communication; confers with S–3 to ascertain the location of base points and check con-

centrations, and to obtain overlays, if available, showing schedule fires. He then proceeds with his liaison section to join the unit to which he is sent. Upon arriving thereat, the liaison officer acts as artillery adviser to the supported-unit commander, keeps him informed of the possibilities of artillery support, and communicates to the artillery commander the desires of the supported troops for artillery fire. In addition, the liaison officer keeps the artillery commander advised at all times of the location of the elements of the supported troops and of the enemy situation, assists in observation, and when necessary in the adjustment of fire. He makes frequent reports by such means of communication as are available, such as wire, radio, visual signaling, and messengers.

■ 123. MOTOR OFFICER.—Each motorized regiment of Field Artillery is provided with a motor officer by Tables of Organization. In other units where appropriate, the unit commander designates a staff officer or other qualified officer to act as motor officer. His duties are covered in FM 25–10.

CHAPTER 3

FIRE IN COMBAT

■ 124. CLASSIFICATION OF FIRES.—Tactically, artillery fire is classified as to—

a. Effect sought.
(1) Destruction.
(2) Neutralization.

b. Form.
(1) Concentrations.
(2) Barrages.

c. *Prearrangement.*
(1) Schedule fires.
(2) Fires on targets of opportunity.

d. Tactical purpose.
(1) Supporting fire.
(2) Artillery preparation.
(3) Counterpreparation.
(4) Counterbattery.
(5) Interdiction fire.
(6) Harassing fire.

■ 125. DESTRUCTION FIRE.—The term "destruction" is applied to fire delivered for the express purpose of destruction and when it is reasonable to expect that relatively complete destruction can be attained. Fire for destruction requires a much greater expenditure of ammunition and time than fire for neutralization. Against most targets, medium and heavy artillery are better suited than light artillery for destruction fire.

■ 126. NEUTRALIZATION FIRE.—Neutralization fire is used for the purpose of causing severe losses, hampering or interrupting movement or action, and in general destroying the combat efficiency of enemy personnel. In the usual case, neutralization is only temporary and the target becomes active soon after fire ceases. Neutralization fire is begun by a sudden short burst of fire to secure the advantage and effect of sur-

prise. This initial fire is delivered as rapidly as possible. The desired effect having been secured in this manner, neutralization is maintained by subsequent bursts of fire in lesser amounts at varying intervals. Unlike destruction fire, neutralization fire may be delivered with reasonable effectiveness without observation, although observation greatly increases the effectiveness and is sought when possible.

■ 127. CONCENTRATIONS.—A concentration is a volume of fire placed on an area within a limited time. The term is applicable regardless of the tactical purpose of the fire, the tactical situation (such as attack or defense), and the conditions under which the fire is delivered. Thus "concentration" is a general and inclusive term.

a. In the defensive.—(1) In the defensive, concentrations are for the purpose of breaking up and defeating a hostile attack. In principle, the fire is delivered against the hostile assault units including local reserves. Effort is made to strike the enemy, not merely to place a barrier in front of him. Whenever possible, observed fire should be employed; prior to the enemy attack, however, concentrations are prepared to be fired successively as the enemy attack progresses. Schedule fires (par. 129) are abandoned when the artillery may be employed more advantageously against important targets that have developed during the action.

(2) Concentrations are prepared to prevent the enemy from occupying critical positions either immediately in front of or within the friendly lines; also to cover critical areas between centers of resistance and to break up an enemy attack in the event that it should succeed in making progress within the friendly lines.

b. In the offensive.—(1) *Direct-support artillery.*—In the attack, concentrations by direct-support artillery are placed on selected enemy locations, so timed and in such volume as to furnish the maximum possible support to the attacking Infantry. These concentrations may be prearranged by the infantry and artillery commanders or prepared and delivered on targets of opportunity as called for by the supported infantry units. The employment of concentrations on the offensive in support of advancing Infantry has an advantage over the use of rolling barrages in that, for a given amount

of ammunition, it permits placing a denser fire on the important points of the enemy positions while economizing on points of lesser importance.

(2) *Other artillery.*—Concentrations fired by other than direct-support artillery normally consist of fires in reinforcement of the direct-support artillery; neutralization harassing, and counterbattery fires; and interdiction of enemy installations deeper in enemy territory.

(3) *Safety limit.*—In order to avoid casualties from shell fragments, the Infantry should maintain a distance from the near edge of the concentration of 200 yards for light artillery and 500 yards for medium or heavy artillery.

■ 128. BARRAGES.—Barrages may be standing, rolling, or box; they are schedule fires (par. 129). The rate of fire prescribed will depend upon the tactical situation and the status of ammunition supply.

a. Standing barrage.—A standing barrage is a stationary line or lines of bursting projectiles placed immediately in front of an occupied line or position for the purpose of stopping an enemy advance. Such a barrage is appropriate in the defense and, in an advance, to cover troops while halted to reorganize on a captured objective. A barrage should be placed from about 200 to 400 yards (at least eight probable errors) in front of the line occupied by friendly troops. If the barrage line is within eight probable errors of friendly troops, some shots may fall in friendly lines. The location of the barrage lines is determined by the battalion commanders of the direct-support light artillery in consultation with the supported units. Higher artillery commanders successively coordinate the barrage scheme in order to avoid duplication, provide the necessary emergency barrages in adjacent sectors, and otherwise insure that the scheme conforms to the general plan. The standing barrage in defense is placed to fill in gaps or to reinforce the infantry close-in fires at critical points. Each light battery may be assigned two or more barrages on different parts of the front, one as its normal barrage (200 yards for 75-mm and 300 yards for 105-mm) and others as emergency barrages (300 yards for 75-mm and 450 yards for 105-mm). Standing barrages usually are fired by the light artillery.

(1) *Normal.*—The normal barrage of a battery is the standing barrage which the battery fires for the local protection of a supported command in the event of a hostile raid or attack. A battery is kept constantly laid on its normal barrage when not otherwise engaged, and fires the barrage on signal or call from the supported unit. Normally, only the sensitive points between or in front of the centers of resistance are covered by normal barrages, the intervening spaces being covered by emergency barrages and the fire of infantry weapons.

(2) *Emergency.*—The emergency barrages of a battery are standing barrages, any one of which may be fired as ordered instead of its normal barrage. Emergency barrages are employed in local attacks to cover gaps in the normal barrage line or to reinforce the normal barrage of another part of the line. Emergency barrages are fired on authority of the division artillery officer; this authority may be delegated to local artillery commanders.

b. Rolling barrage.—(1) A rolling barrage is artillery fire on successive lines, advancing according to a time schedule immediately ahead of the attacking troops. Normally, the barrage fire put down by the light artillery is deepened by concentrations fired by light and medium artillery placed on sensitive points in advance of the barrage line. To be effective, a rolling barrage should have a depth of at least 600 yards. A 75-mm battery, when firing in the first line of a rolling barrage, normally covers a front of 100 yards.

(2) Batteries should be afforded an opportunity to register before firing a rolling barrage; when registration is not practicable, fire should be carefully prepared and the initial line of the barrage should be 400 yards in front of the Infantry to be supported.

(3) The practicability of firing a rolling barrage is based on considerations of the front to be covered, batteries available, and ammunition supply.

(4) In the early stages of an attack, prior to the displacement of the artillery, a rolling barrage may be fired to be followed later by concentrations; or, when it is impracticable over the entire front, a rolling barrage may be fired on certain portions thereof.

(5) In general, concentrations should be employed when the front to be covered by each 75-mm battery would exceed 100 yards (par. 127*b*).

(6) The rate of advance, front to be covered, rate of fire, time of beginning, and duration of the barrage are fixed by the commander ordering the fire. He furnishes the battery commander with this information, usually in the form of a barrage chart. In order to take full advantage of the neutralizing effect of a barrage, the infantry should follow a 75-mm barrage at a distance not exceeding 100 to 150 yards.

c. Box barrage.—A box barrage is a specialized type of fire used when making raids on enemy organizations; the area to be raided is enclosed toward the enemy by standing barrages. The attack may be supported by a rolling barrage advancing at a rapid rate through the raided area and resting at the far limit.

■ 129. SCHEDULE FIRES.—Schedule fires are fires planned to be delivered according to a time schedule or on call or signal from the supported troops. To provide flexibility for a scheme of schedule fires and to permit close coordination with the actual progress of an attack, it is desirable that the entire operation be subdivided into maneuver phases, each terminating with the capture of a critical objective. For example, assume that in a certain situation the infantry regimental commander concludes that in order to reach an objective (as designated by higher authority) he must first capture a series of critical terrain features which, from the regimental point of view, are intermediate objectives. He decides on an appropriate scheme of maneuver. The operations necessary to capture each intermediate objective as well as the final objective constitute a maneuver phase so far as the infantry regiment and its direct-support artillery unit are concerned. Normally a separate schedule is prepared for each of these successive phases, the concluding fires for each phase, which provide defensive fires to cover the Infantry on the objective, usually coinciding with the initial fires for the next. Each series of fires can then be initiated or lifted by prearrangement or on call from the supported unit commander. The schedule is drawn initially to conform to the estimated rate and manner of advance of the supported

unit with relation to the beginning of each maneuver phase. To insure adapting supporting fires to variations in the rate of advance, provision must be made for moving the time of the schedule forward or backward and for repeating or eliminating any part of it.

■ 130. FIRES ON TARGETS OF OPPORTUNITY.—Many important targets are located which are not included in the schedule fires; they are designated "targets of opportunity." In case an important target presents itself to an artillery unit which is engaged on schedule fire missions, the artillery commander, in the absence of instructions, decides whether to continue his schedule fires or to attack the new target. Ordinarily it is inadvisable to designate artillery units exclusively for fire on targets of opportunity.

■ 131. SUPPORTING FIRE.—"Supporting fire" is a general term applied to artillery fire delivered while the supported troops are engaged either in the attack or in the defense; that is, after an attack has been launched either by the supported troops or by the enemy. The term is used to designate barrages or concentrations delivered for the immediate support or assistance of an infantry (cavalry) unit during an offensive or defensive action.

■ 132. ARTILLERY PREPARATION.—*a.* The term "artillery preparation" is used to designate intensive artillery fire delivered during the period immediately prior to the advance of the Infantry from its line of departure to attack. It is designed to secure domination over the hostile artillery and infantry elements. It may last from 15 minutes to several hours. It is generally schedule fire.

b. The superior commander determines whether there is to be an artillery preparation, and its kind and duration. He considers the question of tactical surprise, amount of detail known of the enemy's defensive organization, time available for gaining information upon which to base the preparation, extent to which tanks are to support the attack, and amount of ammunition available. The fire delivered and objectives attacked vary according to the length of the preparation; thus, in a short preparation, all the fire may be concentrated on the forward elements of the enemy's troops; while in a

long preparation, there is usually in addition much interdiction, counterbattery, and other long-range fire.

c. According to circumstances, the duration of the artillery preparation, when one is fired, may vary considerably as stated in *a* above. In a meeting engagement, the duration of the preparation, if any, is short. In an attack against a strongly fortified defensive system, the time available for reconnaissance and planning, amount of detail known of enemy dispositions and defensive works, and ammunition supply may permit a preparation of considerable duration.

d. All available artillery usually participates in the preparation if one is prescribed.

e. The preparation should be so planned as to avoid disclosing to the enemy the front of the main attack.

f. For the preparation fire, the artillery officer of the superior unit involved coordinates the fire of all the artillery with the unit.

g. To insure concentration of effect, an artillery preparation may be divided into phases.

(1) During the first phase, the army, corps, and division artillery are assigned missions in their respective normal zones to neutralize the defender's artillery, dislocate the most important hostile agencies of command and fire control, isolate the defender's forces from their communication with the rear, and protect our own troops from the enemy's counterpreparation fires. Artillery fire of the first phase of preparation thus comprises counterbattery fire; destruction or neutralization fire on command posts, message centers, and signal communication; interdiction and destruction fire on enemy communication; and neutralization fire on the hostile centers of resistance. During this phase, the army and division artillery reinforce the corps artillery in counterbattery.

(2) In the subsequent phase of the preparation, long-range heavy artillery continues interdiction and destruction fires on enemy rear areas, these missions increasing in importance as the enemy, being alerted, disposes his reserves and other elements to meet the attack. Sufficient corps artillery reinforces the division artillery. This corps artillery and the division artillery neutralize those hostile infantry weapons, centers of resistance, and other enemy elements in the ad-

vance zone of resistance most threatening to the launching of the attack.

■ 133. COUNTERPREPARATION.—A counterpreparation is prearranged fire delivered in a defensive action just prior to the enemy attack. Its purpose is to break up hostile attack formations; disorganize the enemy command, observation, and communication systems; interfere with his artillery preparation, and impair his morale. Counterpreparations should be planned to counter each of the probable enemy plans of attack. The assigned counterpreparation missions should be coordinated with other defensive missions, since the latter are usually fired immediately following the counterpreparation. Counterpreparations are classified as general, local, and emergency.

a. General.—A general counterpreparation is one planned to meet a general attack and involves all the artillery capable of firing on the threatened front. In an army, the army commander fixes the duration of the general counterpreparation and prescribes conditions under which corps and division commanders may order it to be fired. Based on the army plan of artillery employment, the corps commander prepares the plan for the general counterpreparation of the corps, and subject to conditions imposed by the army commander, gives orders for its delivery. General counterpreparation fire should be placed on enemy forces assembled for an attack, including the supports and reserves, and on localities where such assemblies are suspected; also on enemy command posts, on centers of signal communication, and on important lines of communication. The entire front threatened by the general attack is covered; the division artillery and part of the corps artillery are employed in fire on the enemy's forward elements, the remainder of the corps artillery and the army artillery being employed on distant interdiction and counterbattery missions. The duration of a general counterpreparation usually does not exceed 30 minutes. If several counterpreparations are planned, they are designated by letter; as, general counterpreparation A, B, etc.

b. Local.—A local counterpreparation covers only that portion of the front threatened by a local attack and normally only the division artillery is employed. Local coun-

terpreparation fires of the division artillery frequently are identical with its general counterpreparation fires and are placed on the enemy's forward elements; on enemy forces assembled for the attack, including supports and reserves, and on localities where such assemblies are suspected; on enemy command posts, centers of signal communication, and important lines of communication. Local counterpreparations are fired on the division commander's direct or delegated authority.

c. Emergency.—An emergency counterpreparation is fire planned by the artillery of one division to reinforce the local counterpreparations of other divisions. An emergency counterpreparation is fired on the order of the reinforcing division commander at the request of a reinforced division commander.

■ 134. COUNTERBATTERY.—*a.* Counterbattery fire is fire delivered for the neutralization or destruction of enemy batteries in position. It is a primary function of corps artillery.

b. Supervision of the counterbattery work of a corps is the function of the corps artillery officer. He designates an officer as counterbattery officer to function as a member of the plans and training (S–3) section, with duties pertaining exclusively to the coordination of counterbattery on the entire corps front. Information pertinent to the direction and conduct of counterbattery fire (par. 117) is furnished by the S–2 section of the staff of the corps artillery officer, with which section the counterbattery officer works in close cooperation.

c. The counterbattery system must contain the means for obtaining information of the enemy artillery situation, observation of fire, necessary communication, and sufficient firing units to deliver and maintain effective fire on the targets reported. The system is organized by the counterbattery officer, who is directly responsible for the preparation and supervision of the counterbattery plan. The plan should include—

(1) Types and amount of artillery required.
(2) Organization for combat.
(3) Zones of responsibility.
(4) Position areas.

(5) Assignment of specific fire missions.

(6) Provision for prompt fire on hostile batteries during the attack to include arranging for airplane and balloon observers and coordinating their employment, and coordinating (in conjunction with S–2) the employment of sound-and-flash units.

(7) Communication system to be installed.

d. The corps counterbattery artillery will usually contain medium howitzers and guns. When there are special immobile targets definitely located, the 240-mm howitzer or the 8-inch howitzer may be provided. The 240-mm howitzer must be emplaced initially to fire on specific targets because of the time necessary to put it into position and its limited traverse. In organizing the counterbattery units, it is desirable that each unit contain weapons having the range and other characteristics which will enable it to fire on targets located in its zone of action. When the number of enemy batteries exceeds the capabilities of the corps counterbattery artillery, the artillery of the divisions in the corps may be directed by the corps commander to reinforce the fires of the corps artillery with a number of units of different calibers for a definite period. In such case, the corps artillery normally furnishes the division artillery the information necessary for the direction and conduct of fire.

e. A counterbattery plan should provide for fire to be delivered on all known enemy batteries and those discovered during the action. Counterbattery is most effectively executed by concentrating the fire of several batteries, from divergent directions, if practicable, on a single enemy battery for the time necessary to establish neutralization, subsequent fire being by a battery or less to maintain neutralization.

f. To silence enemy batteries which may require immediate neutralization during an operation, the counterbattery officer must have authority to assign counterbattery missions direct to battalions and batteries which have been designated for the purpose, and to accomplish this he should be in direct communication with them.

■ 135. INTERDICTION FIRE.—Interdiction fire is fire delivered on points or areas which it is desired to prevent the enemy

from using. Characteristic targets are roads used for moving supplies or reserves, crossroads, assembly places, railroad stations, detraining points, defiles, bridges, and fords. Interdiction may consist of firing at targets as they appear. When observation is impossible, zone fire may be delivered intermittently throughout an extended period of time, avoiding regular intervals between rounds or bursts of fire.

■ 136. HARASSING FIRE.—Harassing fire is fire delivered during a relatively quiet period to interfere with and annoy the enemy, to keep his troops alerted unnecessarily, and to lower his efficiency and morale.

CHAPTER 4

TACTICAL FUNCTIONS

■ 137. TACTICAL ORGANIZATION.—For the purpose of carrying out tactical missions, organic field artillery units as such may be employed or units from different field artillery commands (organic, attached, or both) may be temporarily grouped for greater convenience in carrying out these missions. The term "groupment" is applied to the tactical command formed by the temporary grouping of two or more battalions or larger tactical units assembled from different organizations. When it becomes necessary to subdivide a groupment in order to obtain better coordination, such a subdivision is called a "subgroupment."

a. As a basis for forming a groupment or subgroupment, the units composing it should have a common mission. The organization of a groupment or subgroupment should be resorted to only when the normal artillery organization is inadequate or unsuitable.

b. In the division, organization for combat should provide for artillery in direct support and artillery in general support, and when necessary, for accompanying artillery and antitank guns; in the corps, groupments for counterbattery, for reinforcement of division artillery, and for long-range fire; in the army, groupments for long-range fire and for reinforcing corps and division artillery. Such subdivision, however, does not imply *exclusive* missions for a particular groupment.

■ 138. RECONNAISSANCE.—Timely reconnaissance by all artillery commanders is a prerequisite to the effective employment of artillery. The fundamentals of reconnaissance are covered in part one.

■ 139. ARTILLERY INTELLIGENCE.—The fundamentals of artillery intelligence and the intelligence functions of commanders and their S–2's are discussed in chapter 2.

■ 140. ENTRY OF ARTILLERY INTO ACTION.—*a. Positions* (pt. one).—(1) *Assignment.*—Position areas are delimited by

higher commanders only to the extent required by the particular situation.

(2) *Occupation.*—To avoid disclosing the plan of action of the commander of the forces and exposing the artillery positions, the artillery so far as practicable should be brought into position under cover of darkness; this is particularly important in the case of reinforcing artillery. The order in which reinforcing artillery is brought into position depends, in part, upon the degree of secrecy with which its positions can be occupied; those units whose positions afford the least concealment and cover are brought into position last. Units designated to occupy exposed positions may be brought into an area relatively early and assigned concealed and protected positions in readiness near the positions to be occupied in action. Those artillery units which are to be held awaiting a more complete development of the situation should be assigned positions in readiness.

b. Observation (pt. one).—All artillery fire is observed when possible.

(1) *Ground.*—Fire conducted with ground observation is several times as effective as unobserved fire and the ammunition and time consumed are correspondingly less. The selection of observation posts, when practicable, is left to the unit commanders concerned. However, to facilitate fire direction or because of congestion in the artillery areas, higher artillery commanders may allot observation posts to subordinate commanders. The necessity for observation posts to meet eventualities must be foreseen and appropriate map and ground reconnaissance made.

(2) *Air* (par. 144).—To obtain the best results, air observation for the conduct of fire should be by prearrangement, in which case definite plans for the use of air observation must be prepared in advance. When possible, the air observer should have a personal conference with the officers of the units for which he is to observe. During this conference, the location and character of targets, details relative to the method of fire, and means of signal communication (pt. two) to be employed should be discussed and determined. Allocation of airplanes and balloons for artillery observation in the corps and division is a function of the corps, with due

regard to requests from the division and from the corps artillery. Based on this allocation, the division and corps artillery officers respectively will prepare their plans for the employment of air observation.

(3) *Sound-and-flash ranging* (FM 6–120).—(*a*) Observation (sound-and-flash) units are important agencies of the artillery intelligence agencies. Their primary function is the location of enemy batteries. General plans for the employment of these units are prepared by the corps and army artillery officers; detailed plans are prepared by the commanders of artillery brigades (groupments) to which the units are assigned or attached.

(*b*) Sound ranging may be used to adjust fire by sound ranging on the burst of the projectile; such adjustment is most accurate when the location of the target is obtained by sound ranging and the adjustment follows promptly thereafter. Flash ranging is used to best advantage in making high burst ranging registrations; it may be used when conditions are favorable to locate enemy batteries and to adjust fire.

(*c*) The installation of a flash-ranging system requires from 4 to 6 hours, the installation of a sound-ranging arc from 5 to 10 hours. Under adverse conditions of terrain and weather, these times may be increased considerably. Adverse weather conditions may interfere with the employment of both flash and sound ranging; enemy or friendly artillery fire may interfere with the employment of sound ranging.

c. Signal communication.—Prompt establishment of adequate signal communication is imperative. The fundamentals of artillery signal communication are covered in part two.

■ 141. FIRE DIRECTION.—*a. General.*—(1) In general, fire in combat is delivered against those targets most dangerous to the success of the supported troops. Orders assigning missions specify or imply the purpose of the fire to be delivered. The artillery commander concerned should be in touch with the tactical situation in order to appraise properly the purpose of his particular fire in the general scheme. If the situation indicates the need for fire other than that being delivered in accordance with the orders of the higher com-

mander, the artillery commander concerned should immediately report the situation to the next higher commander and ask for instructions. If the urgency of the situation is such as to preclude this report, the artillery commander concerned will act on his own initiative in accordance with his knowledge of the general situation, reporting his action to the next higher commander as promptly as practicable. In general, artillery commanders of units in direct support should when in doubt accede to the requests of the Infantry which they support.

(2) In its broadest sense, fire direction is the tactical command of one or more fire units for the purpose of bringing their fire to bear upon the proper targets at the appropriate time. In a more restricted sense, it comprises the tactical employment of artillery fire to include the location and selection of targets on which fire is to be placed, technique of delivery of fire thereon, and allocation of ammunition to fire missions. (See FM 6-40.)

b. Zones of fire.—The zone within which a particular artillery unit is to be prepared to deliver fire is termed "zone of fire." That portion of the zone of fire within which the fire of an artillery unit is ordinarily delivered is termed "normal zone." Areas within the zone of fire, other than the normal zone, within which an artillery unit may be called upon to fire in certain contingencies, are called "contingent zones." An artillery unit has but one normal zone; it may have several contingent zones.

(1) *Zones in width.*—(*a*) The normal zone of the division artillery coincides laterally with the division zone of action or sector. The normal zone of a division artillery unit in direct support generally coincides laterally with the zone of action or sector of the supported unit; thus a battalion of light artillery in direct support of an infantry regiment may have a normal zone coinciding with the zone of action or sector of the infantry regiment; the batteries in the battalion, not being assigned to the support of a specific infantry unit, have normal zones as designated by the battalion commander. The normal zone of division artillery in general support usually coincides with the zone of action or sector of the division; however, the normal zones of the battalions of a regi-

ment in general support may or may not coincide with the zones of action or sectors of the infantry elements (brigades, regiments, battalions).

(*b*) The normal zone of the corps artillery coincides with the zone of action or sector of the corps, but the normal zones of the elements of the corps artillery (regiments, battalions, groupments) may or may not coincide with the zones of action or sectors of the front-line divisions of the corps.

(*c*) The normal zone of the army artillery coincides with the zone of action or sector of the army; the normal zones of the elements of the army artillery may or may not coincide with the zones of action or sectors of the corps.

(2) *Zones in depth.*—In operations of the corps and larger units, zones limited in depth may be assigned, for designated types of fire, to division, corps, and army artillery; thus in an area included between the front line of the friendly troops and a line (usually designated XX) drawn within the enemy position, parallel to the front line, all interdiction and harassing fire missions and fire on targets of opportunity would be the responsibility of the division artillery; similarly, fires of these types between this line and a line (usually designated as ZZ) farther within the enemy position, parallel to the front, would be executed by corps artillery; and fire beyond the latter line would be executed by army artillery. Occasionally, when a long-range tactical unit is formed in the corps artillery, the corps zone is divided in depth by a line (usually designated as YY), parallel to the front; this line is used to divide the responsibility in depth between other tactical units and the long-range unit.

c. Degree of control.—The degree to which fire direction is exercised by an artillery commander depends upon his knowledge of the situation, time at his disposal, rapidity of the action, efficacy of signal communication, and degree to which operations are centralized. Whether operations are centralized or not, the subordinate artillery commanders are permitted sufficient latitude and initiative to meet local situations promptly and effectively.

d. By units larger than the battalion.—Commanders of these units control the fire of lower units by assigning normal and contingent zones, by specifying where the mass of the

fire will be placed, by designating specific important targets or areas to be covered by fire, by allocating reinforcing artillery, by organizing the artillery for combat, by procuring ammunition and allocating it to lower units, by coordinating survey and the use of radio, and by procuring and coordinating air observation. By directing the preparation of fires on areas of possible danger and by providing for indexing the terrain with the proper distribution of check concentrations, regimental and higher commanders are able to concentrate the fire of their artillery on important targets which develop during the action.

e. Within the battalion.—See FM 6–40.

■ 142. CONDUCT OF FIRE (FM 6–40).—*a.* To employ artillery fire most effectively with economy of time and ammunition there should be the most accurate preparation of fire possible, followed by observed adjustment and fire for effect.

b. Units employed in schedule fires should be afforded an opportunity for the necessary survey, for preparation of fire, and for registration. Such units may be precluded from registration by reason of lack of time or to prevent exposing the battery positions prematurely. In such an event, fire must be prepared as accurately as possible and adjustment obtained by observation during fire for effect. Preliminary registration is of the utmost importance to insure the maximum effect with the minimum ammunition expenditure.

c. For artillery units to occupy positions at night and fire therefrom during darkness, daylight reconnaissance and survey are indispensable.

■ 143. LIAISON (par. 122).—*a.* Liaison is established and maintained by the supporting unit at all times during active operations.

b. The division light artillery battalions maintain liaison officers and liaison sections with supported front-line battalions; furthermore, if in direct support of an infantry regiment, the artillery battalion commander maintains a liaison officer at the infantry regimental command post unless personal contact between the commanders is feasible.

c. A light artillery regiment maintains a liaison officer and so much of the liaison section as may be needed at the command post of the supported unit.

d. The artillery commander himself maintains liaison by as close personal contact with the commander of the supported unit as the tactical situation permits. Each artillery commander charged with direct-support missions should establish his command post near that of the supported unit if compatible with a proper exercise of his command and fire direction functions.

e. Liaison with the division commander is maintained through the close association between him and the division artillery officer in the latter's role as division staff officer (par. 109). To insure this close association, the artillery brigade command post, when the artillery is organized as a brigade, should be located as near as practicable to the division command post.

f. Light artillery units attached to divisions and in direct support of units thereof establish liaison with supported units as prescribed for division light artillery. If employed solely to reinforce the fire of division light artillery, attached light artillery establishes liaison with the light artillery units whose fires it has been directed to reinforce.

g. Division howitzer units (155-mm or 105-mm) and medium and heavy artillery attached to a division normally establish liaison with those light artillery units in direct support whose fires they have been directed to reinforce. In such instances, liaison sections are placed at the command posts of the light artillery units; they will be comparatively small, often consisting of an officer and one or two men only.

h. Artillery units under corps control establish liaison, when needed, with those units of the division artillery which have normal zones within those of the corps units concerned.

i. In the case of a front-line infantry battalion directly supported by more than one artillery battalion, the commander of such artillery designates the unit which will provide the liaison section for duty with the infantry battalion. This section represents all the artillery supporting the infantry battalion.

j. Medium and heavy artillery units normally do not establish liaison with other arms.

■ 144. COOPERATION WITH AVIATION (par. 140*b*(2)).—*a. General.*—The responsibility for this cooperation devolves equally

upon the artillery and aviation commanders concerned. While specific artillery battalions may be designated in advance to fire specific missions by air adjustments, all battalions are habitually prepared for such employment. Observation aviation is of particular importance to division artillery with security detachments, permitting air adjustment of fire when ground observation is not available.

b. Observation aviation.—(1) *Battle missions.*—When contact between the two hostile forces is imminent and the division zone of responsibility has been defined, division aviation begins to execute battle missions which include the artillery missions.

(2) *Airplanes.*—Observation airplanes assigned to artillery missions operate directly with the artillery commander. In accordance with his instructions, they adjust fire on previously designated targets or on targets located by the observer and perform surveillance on prearranged and previously adjusted fires. The airplane observer should be assigned only those missions which are beyond the capabilities of both ground and balloon observation.

(3) *Balloons.*—Balloons habitually observe for the corps and army artillery and may observe for the division artillery. Normally, the balloon may be given any of the missions of airplane observation except distant reconnaissance. Balloons may be attached to artillery units or they may be assigned to observe for the artillery; in the latter case they operate under the aviation commander.

■ 145. AMMUNITION SUPPLY.—Organization of the system of ammunition supply to meet the essential requirements of combat is always a major consideration of all artillery commanders. The ammunition supply system is discussed in part four.

■ 146. DISPLACEMENT (par. 46).—*a.* To insure continuous fire support during an attack or a retrograde movement, timely displacement of artillery units is necessary. The loss of artillery fire support may be minimized by so selecting the initial positions of the artillery units that they will be enabled to fire from such positions for a relatively long time, and by requiring that the displacements be of as great a length as practicable.

b. Plans for displacement should be sufficiently flexible to permit readjustments to meet unforeseen conditions arising during the course of the engagement. Essential fire missions of units being displaced should be distributed to units in position. Routes should be reconnoitered by the responsible artillery commander preparatory to a displacement. Since repair of routes for displacement of artillery units is a function of the engineers, reconnaissance of the responsible artillery commander may be made in conjunction with a designated engineer officer. Engineers may be attached to artillery units for making repairs to routes. When two or more units of different commands are required to use the same road, coordination of the movement is a function of the next higher commander.

c. So far as practicable, plans for the displacement of units should be prepared in advance. The division, corps, and army artillery officers prepare plans for the displacement of the artillery of their commands, the plans being submitted to their respective commanders for approval. Execution of the plan normally devolves on the regimental or groupment commanders who are responsible for prescribing the order of displacement and the redistribution of missions to assure continuity of fire. When changes in a displacement plan are effected by a regimental, groupment, or subordinate commander, an appropriate report of the action taken should be made to the next higher commander. In planning displacements, allowance must be made for delays caused by congested or damaged routes, hostile artillery fire, or air attacks.

d. In an attack, the displacement of units should be so timed that the number of batteries in position is the maximum possible at the time of the infantry assault on the enemy's main battle position. The necessity for howitzer fire to reinforce the fire of light artillery units operating in direct support will require the relatively early displacement of medium howitzer units. Long-range fire missions may require the early displacement of medium and heavy artillery. To forestall necessity for the early displacement of medium and heavy artillery, units may be held in positions in readiness during the preliminary stages of an en-

gagement. Displacement of medium and heavy artillery requires more time than does displacement of light artillery, and relatively greater care must be exercised in the selection and preparation of routes.

■ 147. PLANS AND ORDERS.—Plans and orders are covered in chapter 6.

CHAPTER 5

COMBAT CONSIDERATIONS

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SECTION I

GENERAL

148. METHOD OF EMPLOYMENT.—Artillery has no independent role in combat. It is employed in conformity with the plan of the commander of troops who uses its fire power to destroy the enemy and his defenses, to disorganize his command, and to neutralize his fire power.

a. Division artillery.—Division artillery (organic and attached) is employed against those enemy elements causing losses to the Infantry (or Cavalry), impeding its advance, or imperiling its security. Light artillery is normally employed in direct support principally against personnel, accompanying weapons, tanks, and material targets of small resistance. Medium artillery reinforces and deepens the fire of light artillery, undertaking missions beyond the range or power of the light artillery; fires on targets that the light artillery is unable to reach; and assists the corps artillery in counterbattery.

b. Corps artillery.—Corps artillery is used primarily for neutralization or destruction of hostile artillery (counterbattery). Its other principal uses are reinforcing the fires of division artillery, destruction of hostile defenses, neutralization of command posts and troop concentrations, and long-range interdiction fire.

c. Army artillery.—Army artillery is employed principally against material objectives of an especially resistant nature,

in counterbattery, and in distant interdiction and destruction fire.

■ 149. PLANS FOR EMPLOYMENT.—Prior to an engagement, plans for employment of artillery are prepared and definite missions assigned each unit in as great detail as time and the situation permit. Plans must provide for possible eventualities such as stabilization during the attack, a withdrawal, counterattack, relief during battle, and pursuit following a successful attack.

■ 150. PLANNING ARTILLERY FIRES.—*a.* Artillery fires are planned to provide powerful, deep, and continuous support. Power is obtained by concentrating the mass of fire at the decisive point at the critical time. Depth is effected by placing all artillery well forward in the attack and by echelonment of artillery positions in the defense, by taking advantage of the different range characteristics of the weapons, and by careful coordination of the fires of the division, corps, and army artillery, as well as fires of division artillery and infantry supporting weapons. Continuity is effected by taking advantage of the different range characteristics of the weapons and by timely displacement of the artillery by echelon.

b. The force commander through his artillery officer makes detailed plans for the use of the artillery held under his direct control; in addition, he makes general plans for the coordinated employment of all artillery with the force. In subordinate echelons the same methods are applied. Artillery battalion commanders of direct-support battalions perfect the details of support in conference with the supported-infantry commanders.

c. In arranging for coordination of the action of their units, the commander of the supported unit informs the commander of the supporting artillery unit of the location of his command post and leading troops, the results of battle reconnaissance, his plan of attack, and the terrain which can be covered by the heavy infantry weapons. Based upon the plan and the facilities for observation, the supporting artillery commander informs the commander of the supported unit of the number and general location of his batteries, present location of the artillery observation posts and those that must

be seized during the advance, and the terrain which the artillery commands with observation and fire. As a result of the above exchange of information, the associated commanders come to an agreement as to support to be given by the artillery and the heavy infantry weapons in the execution of the plan of attack. It is of prime importance that agreement be reached as to the known targets to be taken under fire respectively by the artillery and the heavy infantry weapons, and the areas to be kept under surveillance by these supporting weapons for targets appearing after the attack is launched, especially those targets in adjacent zones which are dangerous to the advance of the Infantry. In general, associated infantry and artillery commanders must arrange for mutual reinforcement of fire so that, should the support given by either the artillery or the heavy infantry weapons be deficient because of change of position or difficulties in conduct of fire, the other will compensate for this deficiency by increasing the intensity and effectiveness of its fire on the critical targets. The artillery commander meets the requests of the supported Infantry or Cavalry to the limit of his capabilities, subject only to orders received from higher authority.

■ 151. INFLUENCE OF TERRAIN.—Commanding elevations form the framework of the systems of observation, command, and fire control in combat. They directly determine the general location of artillery positions. Accordingly, the securing of such terrain prior to an attack and its retention during the defense exercise a decisive influence upon plans and decisions.

SECTION II

ON THE MARCH AND AT HALTS

■ 152. GENERAL.—When contact with the enemy is probable, tactical considerations govern march dispositions. These dispositions are made to provide security and to facilitate deployment in accordance with the probable order of entry of the units into combat. Artillery commanders march well forward in the column, intensive reconnaissance is conducted, and the units are subdivided for action.

■ 153. POSITION IN THE COLUMN.—Artillery should be located sufficiently well forward in the column to facilitate its early entry into action, but not so far forward as to necessitate a rearward movement to take position for firing; it should always have sufficient Infantry (Cavalry) in front of it to afford protection in event of an enemy surprise attack; and it should be so disposed in the column as to prevent its coming under enemy machine-gun fire while in a march formation. While truck-drawn artillery can march with Infantry for long periods, it marches more efficiently at greater speeds; accordingly, a position in the column should be sought which will permit it to move by bounds.

a. With security detachments.—As part of an advance guard, horse-drawn artillery usually marches at or near the tail of the reserve; as part of a rear guard, at the head of the reserve. Truck-drawn artillery usually moves by bounds in the interval between the advance or rear guard and the main body. As part of a flank guard, the artillery moves by parallel roads on the protected flank when the road net is favorable; otherwise, it marches so as best to facilitate its entry into action and its protection by the Infantry (Cavalry).

b. With the main body.—(1) *In the advance.*—The mass of horse-drawn artillery usually marches near the head of the main body. Truck-drawn artillery in the main body normally marches at the rear of the foot and animal combat elements of the column. If the division is marching in one or two columns only and the road or terrain conditions are such as would delay the prompt advance and entry of truck-drawn artillery into action, all or a portion of it may march near the head of the main body.

(2) *In the retirement.*—If the enemy is aggressive, the mass of the artillery should march at or near the tail of the several columns in order that it may render prompt assistance to the security detachments. When the enemy is not aggressive, the artillery may precede the main body, taking advantage of its relatively greater mobility to relieve congestion in the column of march.

c. Corps artillery.—Corps artillery not attached to divisions is usually subdivided and moved by stages.

■ 154. SUBDIVISIONS ON THE MARCH.—*a. March units.*—See FM 6–5.

b. Battalion ammunition trains.—In the division, ammunition trains of the artillery with the main body usually are grouped and march in rear of the last combat element of the main body, ammunition trains of the light artillery preceding those of the medium artillery. Ammunition trains of advance-guard artillery usually march with the main body when the columns are short. In long columns and when the terrain is unfavorable for rapid movement forward, they should be with the advance guard. An artillery battalion attached to a flank guard, a rear guard, or a reconnaissance detachment should be accompanied by its ammunition train. A detached battery is accompanied by an appropriate subdivision of the battalion ammunition train.

■ 155. ANTIAIRCRAFT DEFENSE.—It is essential that artillery units are prepared to defend themselves once hostile aircraft has reached the vicinity of a unit.

a. Warning.—Warning of an impending attack must be given. Two systems of signals are necessary. First, a system must be provided to warn the commander that an attack is imminent. This warning is given by friendly aviation or by a moving cordon of air guards provided by the ground troops. Next, a system must be provided to pass on the information rapidly to the various units in order that they may prepare for the attack.

b. Passive defense.—Passive defense includes the following:

(1) Concealment, by proper utilization of terrain features and by elimination of lights at night.

(2) Dispersion, by using increased distances on the road, by moving on a broad front in cross-country movements, and by scattering vehicles in roadside bivouacs and, when time permits, during halts.

(3) Halting the column during an attack to reduce damage caused by vehicles out of control.

c. Active defense.—The automatic rifle is the principal weapon of defense; the automatic pistol is capable of effect against low-flying airplanes. Antiaircraft defense of artillery in position is covered in part one.

■ 156. DEFENSE AGAINST MECHANIZED FORCES.—Although the protection of marching columns of artillery is primarily the responsibility of the supported arms, the artillery must be prepared to use all its means of defense against mechanized attacks.

a. Passive defense.—Through reconnaissance and liaison, every effort is made to secure information of the presence of mechanized forces. Where possible, the route is planned so as to use terrain unfavorable to the employment of mechanized forces. While there will be little opportunity to erect artificial obstacles, yet in some cases the artillery may use some of its own vehicles to block roads or defiles and thus gain time to allow the remainder of the column to escape. Obstacles must be covered by fire. In the case of truck-drawn artillery, speed of the vehicles may be used to avoid the attack. Use of increased distances will localize losses and may present a target so dispersed as not to warrant an attack by a mechanized force.

b. Active defense.—Active defense includes fire with automatic weapons and where practicable with field pieces. Defense against mechanized forces by artillery in position is covered in part one.

■ 157. NIGHT MARCHES.—*a.* Because of limitations in employment of artillery at night, it usually marches at the tail of the main body and the artillery components of security detachments are omitted. A long, close column of artillery is particularly vulnerable to air attack at night; when such attack is expected, artillery columns should be broken up into small march units with extended distances between individual vehicles. Special precautions must be taken to insure the maintenance of direction and connection within the column.

b. If the night march is to be extended into hours of daylight, the march is organized as for a daylight march (pars. 153, 154, and 160) or the necessary measures are taken at daylight for reinforcing the advance guard.

■ 158. HALTS IN PRESENCE OF THE ENEMY.—When contact with the enemy is probable or has been gained and the command is going into bivouac, the artillery with the main body

is located in proximity to previously reconnoitered positions from which it can support the outpost and assist in gaining the time necessary to enable the Infantry of the main body to deploy.

SECTION III

WITH SECURITY DETACHMENTS

■ 159. OUTPOSTS.—*a. March outposts.*—During halts on a march, the artillery with an advance or rear guard may be placed in position to cover probable avenues of enemy approach and to protect commanding ground in the vicinity of the route of march.

b. Troops in bivouac.—(1) *Artillery with main body.*—The commander of troops issues instructions as to artillery support to be rendered to the outpost by the artillery of the main body. Such instructions prescribe positions for the artillery, degree of readiness desired, and nature of the artillery support. The commander of the artillery so designated confers with the outpost commander, establishes liaison as necessary, and takes appropriate steps to render the prescribed artillery support.

(2) *Artillery attached to outpost.*—The outpost commander designates the general position of the artillery, prescribes whether it shall be in position or posted in readiness, and assigns the artillery mission. An important consideration in the designation of positions for the artillery and in assignment of missions is that the artillery be able to place fire on the enemy avenues of approach, on areas constituting dead spaces for infantry weapons, and on other critical areas. Defensive fires are prepared. The command post of the outpost artillery commander should be in close proximity to that of the outpost commander. Artillery liaison should be established with those elements of the support covering critical points of the line of resistance. When necessary, provision for artillery antitank defense is made.

c. Outposts covering a defensive position.—(1) *As a covering detachment.*—(*a*) When the mission of the covering detachment is to delay the enemy and withdraw before becoming closely engaged, only so much artillery is attached to it as is necessary for the long-range interdiction of the

main routes of hostile advance. The artillery is deployed on a wide front in positions affording a good field of fire at long range. Reconnaissance for screened routes of withdrawal should be instituted promptly.

(*b*) When the covering detachment's mission is to hold until ordered to withdraw, the strength in artillery is increased and the position occupied by the covering detachment is organized as a defensive position. Positions for reinforcing artillery are located and prepared so that artillery of the main body may be displaced forward in case the higher commander decides to resume the offensive or to hold the covering position.

(*c*) The withdrawal of the covering detachment is protected by a part of the artillery of the main body; this may require that some batteries be emplaced in temporary positions in front of the main battle position. Artillery of the covering detachment, upon reaching the main battle position, reverts to the control of the higher artillery commander.

(2) *As part of the defensive organization.*—Artillery support of the outpost area is furnished by artillery emplaced in the battle position unless the depth of the outpost area is so great as to preclude adequate support from such positions, in which event some artillery is emplaced in the outpost area.

■ 160. ADVANCE GUARDS.—*a.* Infantry strength of the advance guard, the situation, terrain, and time of day determine whether artillery will be attached to the advance guard as well as the amount to be attached. Except for special operations or when the terrain and road net are such that support by the artillery with the main body would be unduly delayed, it is seldom necessary to attach artillery to an advance guard the size of an infantry battalion. It is usual to support an advance guard of this size by artillery with the main body. When the attachment of artillery to such an advance guard becomes necessary, usually one battery is attached. For larger advance guards, the attachment of a battalion of light artillery is usually appropriate.

b. The advance guard artillery commander accompanies the advance guard commander during the march; artillery liaison personnel march with the support. A reconnaissance

party marches with the Cavalry or with the leading elements of the advance guard and conducts continuous reconnaissance for observation posts and position areas. When combat is imminent artillery of the advance guard, if more than one battery, may be echeloned forward, prepared to go into action promptly. One echelon is posted in readiness or in position so that it can give immediate support to the advance guard when required. The other echelon moves to a more advanced position. The artillery thus advances by echelon, continuously prepared to render immediate support if hostile resistance is encountered. To be of value, batteries thus placed in position must have observation posts readily accessible, air observation, or effective radio communication between the unit in position and the artillery liaison or forward observers with the Infantry.

c. If the mission of the advance guard is aggressive, the artillery supports the advance of the Infantry (or Cavalry) by fire on those enemy elements offering the greatest resistance to the advance of the supported unit. It seeks to neutralize the enemy artillery and infantry supporting weapons opposing the main attack and to break up counterattacks, particularly those opposing the main effort. Effective counterbattery fire is dependent upon good observation, which usually necessitates the use of observation aviation. Batteries are pushed well forward, with little echelonment in depth, to permit fire at maximum ranges.

d. If the mission of the advance guard is defensive, the artillery is employed to delay the advance of the enemy by forcing early deployment of his columns, to break up his attack formation, and to support counterattacks. While positions permitting fire well into the enemy lines are desirable, it is usual to echelon the batteries in depth in order to permit fires close in front of, or within, the position.

■ 161. REAR GUARDS.—*a.* Rear guards should be relatively strong in artillery. The rear guard of a division seldom includes less than a battalion of light artillery; it may include one or more regiments of light artillery and one or more battalions of medium artillery. Truck-drawn artil-

lery is especially suitable for use with rear guards. Its superior mobility under favorable conditions permits it to remain in action longer and to displace more rapidly than horse-drawn artillery. In the retirement of larger units, the rear guard may be reinforced by corps artillery. In the execution of its mission, the rear guard fights delaying actions in successive positions or in one position. Early and careful reconnaissance is necessary to insure that suitable routes are available for displacement of the artillery and that no obstruction will block the movement.

b. When in contact with the enemy, the rear guard deploys on a broad front, occupying the stronger tactical positions in strength and covering the intervals with fire. The artillery should be placed relatively near the front line with little or no disposition in depth, in order to be able to fire well into hostile territory, covering the principal routes of hostile advance and the flanks of the rear guard.

c. In general, fire of the artillery is directed against those enemy forces most menacing to the retiring column. Fire is opened on the heads of the enemy's columns thus forcing an early deployment and is continued on successive columns and bodies of the enemy as they appear. Interdiction and counterbattery missions are assigned as appropriate.

d. In withdrawal from a position, movement usually begins with a rearward displacement of the artillery by echelon followed by a rearward echelonment of the Infantry; the Cavalry, withdrawing last, covers the retirement of the artillery and Infantry. Routes selected for withdrawals should afford cover from enemy fire and should be such that during withdrawal the artillery will not mask the fire of friendly troops which have previously been echeloned to the rear. Throughout withdrawal of the rear guard, artillery fire support should be continuous; elements of artillery echeloned to the rear should open fire before the forward elements leave their positions. In order that the number of movements be reduced to a minimum, thus assuring a maximum of artillery fire support, each position should when practicable be such as to permit the artillery, without changing position, to support more than one of the delaying positions.

e. In a rear-guard action, the ammunition supply plan of the artillery should provide for resupply of the battalion ammunition trains by establishment of rolling reserves of ammunition at supply points along the route of withdrawal.

■ 162. FLANK GUARDS.—*a.* Artillery is usually attached to a flank guard when the need for considerable resistance is expected. When there is no artillery with the flank guard, the artillery of the main body is disposed in column so as to facilitate its early entry into action to support the flank guard. The use of truck-drawn artillery with flank guards provides the high degree of mobility desirable.

b. A flank guard when engaged fights a delaying or a defensive action; the artillery is employed in general as in the rear guard.

c. If the defense is based on successive occupation of key positions parallel to the line of march, protection of the artillery while changing positions falls primarily on troops of the other arms; however, the artillery commander should require a reconnaissance by artillery personnel to be made on the exposed flank of the line of march and should dispose the automatic rifles of the command so that they can be employed readily in both ground and air defense of the moving column.

SECTION IV

OFFENSIVE COMBAT

■ 163. GENERAL.—In the offensive, the usual forms of attack employed are penetration and envelopment. An attack usually consists of two principal elements; a main or decisive attack and a secondary or holding attack.

■ 164. ARTILLERY MISSIONS.—*a. General.*—The bulk of the artillery is employed in support of the main attack. However, provision is made for the mutual support of the artillery with both the main and holding attacks unless these attacks are beyond mutual supporting distance.

(1) In a penetration, the bulk of the artillery fire is placed in advance and on the flanks of the penetrating force.

(2) In an envelopment, the bulk of the artillery supports the main attack and definite assignments of artillery units

to support each attack are made. The location of the artillery should be such that, in the event the holding force is seriously threatened, the mass of the artillery will be able to support it. So far as practicable, the artillery is employed to assist in creating the impression that the holding attack is an attack in force.

(3) When the main and holding attacks are beyond mutual supporting distance, it is usually necessary to attach a part of the artillery and hold the remainder under centralized control. This attachment may be to the main attack force or to the holding attack force, depending upon whether the force commander remains with the holding attack or takes personal command of the main attack force.

b. Division artillery.—The targets engaged are those of immediate importance to the Infantry which the division artillery supports. In the absence of corps and army artillery, the division artillery includes in its missions those normally pertaining to the larger calibers.

(1) Appropriate missions for the division light artillery in direct support of the friendly Infantry are neutralization of the enemy Infantry and automatic weapons, and destruction of lightly constructed defenses. Prior to arrival of the heavier weapons, it executes the necessary counterbattery.

(2) Appropriate missions for the division medium artillery are neutralization of hostile Infantry, destruction of defensive works of moderate strength, concentrations beyond those of the light artillery, deepening a rolling barrage, neutralization of hostile observation, and interdiction and harassing fires. It may assist the corps in counterbattery.

c. Corps and army artillery.—The primary mission of corps artillery is counterbattery. Other missions include neutralization of command posts and enemy troop concentrations, interdiction of routes, and destruction of obstacles and defenses. In addition, corps artillery supplements the action of the division artillery by deepening and thickening its fire. Army artillery, when present, assists the corps artillery in counterbattery and takes over the more distant missions.

d. Phases of artillery fire.—On the offensive, artillery fires are divided into fires prior to the artillery preparation, the artillery preparation, and supporting fires during the attack. These three categories are primarily tactical. Actually, much of the artillery (especially Corps and Army Artillery) may continue on the same missions throughout the various phases of the attack.

(1) *Prior to the preparation.*—These fires comprise, as appropriate, support of advance guard actions and of development and deployment, support of preliminary combat to drive in enemy covering forces and to develop the enemy main position, harassing fire, long-range interdiction, attack of strongly fortified points of enemy reserve positions, gas missions, and counterbattery.

(2) *Preparation fire.*—See paragraph 132.

(3) *During the attack.*—(*a*) The bulk of supporting fire is in the form of concentrations. However, the use of rolling barrages over a portion of the front is not precluded, particularly in the zone of advance of the main attack.

(*b*) Counterbattery and long-range interdictions and destruction fires are continued.

(*c*) The fire is massed on the front of the main attack so as to facilitate the advance of assaulting troops and protect their flanks. It is important that hostile infantry supporting weapons, especially machine guns, are neutralized while the attacking Infantry is advancing to the assault, and that the enemy is prevented from occupying fire trenches or manning their weapons as the assault approaches its objectives. In areas beyond probable enemy machine-gun positions, fire is concentrated on enemy rear positions, observation posts, command posts, signal communication centers, and reserves.

(*d*) Supporting artillery fires should be planned (pars. 129 and 150) in advance to the extent that the Infantry can plan its scheme of maneuver and can estimate when and where supporting fires will be required. Schedule supporting fires must be susceptible of change to meet emergencies observed by the artillery or reported by liaison officers or the supported Infantry. Neutralization is maintained on a locality to be attacked until such time as the

Infantry is prepared to deliver its assault thereon. When practicable, the time at which the fire is to be lifted is arranged in advance; otherwise, it lifts on call from the Infantry made either directly or through the artillery liaison officers, or when the need therefor is observed by the artillery; when the fire is lifted by prearranged signal, such as a rocket from the Infantry, great care is necessary to avoid confusion.

e. Use of chemicals.—There are no restrictions on the use of nonpersistent gas except that it must be fired a sufficient time in advance of the arrival of the supported troops at the objective to permit their advance without gas masks. The use of persistent gas is restricted to certain portions of the ground which the supported troops will not occupy or over which it will not be necessary for them to pass. When persistent gas is used, precautions are taken that all units are informed of such fires.

■ 165. POSITIONS (par. 140).—Positions selected for the mass of artillery should be well forward so that continuous support can be rendered as long as practicable without displacement. Usually those units which are to remain longest in position (artillery of the GHQ reserve and artillery of reserve divisions) are placed in the most advanced locations.

■ 166. CONTROL.—*a. During preparation.*—Army and corps commanders will usually coordinate the action of all artillery participating in the preparation fire.

b. During attack.—Normally, the division artillery is held under control of the division commander in order that he may favorably influence the course of battle by concentrating artillery fire where and when desired.

c. During exploitation.—The attack may break up into a series of separate combats conducted by local infantry commanders whose mission is to push on to the area of the enemy artillery or deeper. When such conditions are foreseen, arrangements are made in advance for the employment of units of attached artillery and are effected as soon as centralized control becomes impracticable.

■ 167. EVENTUALITIES IN AN ATTACK.—*a. Halts in the advance.*—Troops halted for reorganization or other cause

must be protected by artillery fire. If the check is local in character and of relatively minor importance, the artillery originally assigned to support the unit will resume its supporting fires as the attacking unit resumes its advance; if the check is general in character or if, even though involving but a relatively small force, it is of major importance, an artillery preparation may be fired preliminary to resumption of the advance. If the check is of short duration, supporting fires should, so far as practicable, be a resumption or adaptation of the fires initially planned; if the check is of long duration and the situation justifies the disruption of the schedule fires initially planned, all or part of the artillery elements may be displaced if practicable during the halt and the plan of prearranged supporting fires rearranged accordingly; the advance may be preceded by a preparation.

b. Enemy counterattacks.—Based on early information, concentrations should be placed on the enemy troops as they assemble for a counterattack. In the event of a relatively unimportant local counterattack, the concentrations may be fired by the artillery designated to render normal support, supplemented by the fire of units which can be readily diverted from their normal missions without jeopardizing the general plan of attack. In the event of a general counterattack or of an important local counterattack, the fire of the division artillery should be supplemented by fire of the corps and the army artillery.

c. Relief in battle.—During the course of the relief of infantry units in battle, the artillery should be employed on defensive fire missions; zones designated for these fires are generally the same as the zones for supporting fire during the attack. Infantry and its supporting artillery ordinarily should not be relieved at the same time nor during the same night.

d. Pursuit.—Plans must provide for prompt forward displacement of the division artillery; for the attachment, as necessary, of artillery to units designated to pursue; for the redistribution of fire missions in order to permit this attachment; for timely and adequate ammunition supply; and for the employment of the corps and the army artillery to further the disorganization of the enemy forces by long-range fire.

■ 168. ATTACK IN A MEETING ENGAGEMENT.—*a.* A meeting engagement results from the contact of two hostile forces, neither of which is fully developed for battle.

b. As contact becomes imminent, the artillery of the advance guard operates as in paragraph 160. Other artillery increases its readiness for action. The artillery unit commanders move forward in the column, reconnaissance is intensified, and the units are subdivided for action.

c. When contact has been gained with strong enemy resistance, the column commander promptly orders into action such artillery units of the main body as may be needed to support the advance guard and cover development of the Infantry. The artillery not employed immediately is prepared for prompt entry into action as soon as the situation becomes clarified.

d. The division medium artillery is placed in position as soon as practicable for the execution of counterbattery missions and long-range fire on enemy columns.

e. Although initially the separate column commanders are permitted to employ their attached artillery as the local situation may require, the division commander through his artillery officer centralizes control of the artillery in his own hands at the earliest practicable moment. Unless otherwise specified, the artillery in the advance guard reverts to its normal command when field orders for the attack are received. When a major portion of the division artillery is used to reinforce the advance guard artillery, the latter should revert to normal command at once to permit proper coordination of fire.

f. Those artillery units committed to action during the early phases of the combat but not in positions suitable for the attack are moved prior to the attack.

g. In the absence of corps artillery, the division artillery executes counterbattery and distant interdiction.

h. By the time the Infantry has arrived on the line of departure, all the artillery should be in position prepared to support the Infantry in the attack.

i. Usually no preparation is fired because of the limited amount of ammunition available in such a moving situation.

j. Prearranged artillery supporting fires are usually limited to concentrations to cover the initial advance of the Infantry from its line of departure. They are supplemented or followed by fires as called for by liaison officers or by fires on targets of opportunity observed from artillery observation posts.

k. To assure continued support, the artillery commander, when the progress of the attack warrants, issues timely instructions for the forward displacement of artillery units.

■ 169. ATTACK OF AN ORGANIZED POSITION.—*a.* The degree to which a position may be organized is limited only by the time and facilities available to the defender. Organization may vary between that of a hastily occupied position characterized by lack of depth, hastily constructed defensive works, and incomplete provisions for command, supply, observation, and coordinated action of elements of the defensive force, and that of a strongly fortified defensive system on a stabilized front in which successive positions are prepared with defense areas or switch positions, or both, connecting the positions, and with complete provision made for the coordination of command, supply, observation, and fire support.

b. An attack against an organized position differs from that in a meeting engagement in that more time usually is available to study the enemy's position and dispositions, assign missions and objectives, prearrange supporting fires, organize command and observation posts, and perfect the systems of signal communication, liaison, and ammunition supply.

c. In general, the enemy will attempt to screen his main position and deceive the attacker as to his dispositions by the employment of covering forces and it may be necessary for the leading troops of the attacking force to execute a "reconnaissance in force" against critical points in the enemy's outpost zone. The object of this reconnaissance in force is to break through the hostile screen, drive in the defender's covering forces, and seize terrain which will permit the proper deployment of the command, especially of the artillery, and give an insight into the hostile battle position.

d. The bulk and sometimes all of the division artillery is employed to support the troops executing the reconnaissance

in force. Artillery not engaged reconnoiters the enemy position and its assigned position areas and prepares for entry into action; survey operations and other necessary measures to insure the maximum accuracy of fire are provided for; prearrangement of fire is planned to the extent that the supported Infantry can plan its operations; facilities of observation aviation and sound-and-flash units are exploited to the utmost to locate artillery targets, particularly enemy batteries; artillery not already in position moves to rendezvous or positions in readiness, from which it moves to attack positions under cover of darkness or smoke. A night occupation of position must be carefully prepared in order to preserve secrecy and avoid confusion. All preparatory measures should be completed during daylight hours, including the marking of positions and routes of approach, establishment of observation posts and signal communication, and preparation of fire.

e. When available, corps artillery is employed on counter-battery and to interfere with the strengthening of enemy positions and construction of new positions to which the enemy might retire. Until the situation has developed sufficiently, part of the corps artillery may be held in readiness.

f. In an attack on a stabilized front, the location and extent of the enemy's defensive positions are fully known and the attack opens with a coordinated assault.

g. The attack is usually preceded by a preparation.

h. (1) Supporting fires in the attack are in the form of concentrations or rolling barrages or both and are coordinated with machine-gun and mortar fires and with the operations of tanks. Plans should provide for the advancement of artillery fire according to a time schedule which may be modified when necessary to meet the needs of the assault troops.

(2) Fire in the attack should be of sufficient depth to include all enemy installations imperiling the advance of the attacking troops. The density of artillery fire, particularly in support of the main attack, should be sufficient to overcome effective rifle and machine-gun fire on the immediate front of the advancing troops. The general density of supporting fire at greater depths is less than on the critical elements of the enemy's organization. The division medium

artillery is employed to give depth and volume to the fire of the division light artillery and to fire on enemy reserves and on objectives which cannot be neutralized by light artillery fire.

(3) When the enemy's main battle position has been penetrated and the enemy is disorganized and withdrawing to rearward positions, the attachment of some artillery to infantry assault units is often necessary to take care of unforeseen resistance. Arrangements usually are made in advance for such attachments.

(4) Artillery that is to revert to higher command, once its limit of range from initial positions is reached, is given orders as early as is practicable governing its subsequent movement and disposition.

(5) During the attack, corps and army artillery reinforce the division artillery fires and fire on targets beyond the range or power of the division artillery. The corps artillery, reinforced by the army artillery as necessary, fires counter-battery missions. Army artillery missions include fire on enemy troop concentrations and interdiction of lines of communication.

i. In a well-organized defensive system, the distance between the enemy's positions is usually such that the attacker's artillery must be moved forward in order to support the attack against the enemy's second position. Provisions for displacement are therefore included in the plan of attack (par. 146).

The displacement usually is made by echelon, the number of units to be moved at one time being governed by routes available and necessity of furnishing continuous support. The total number of units to be moved is limited by the ammunition that can be supplied to the forward positions. Normally, the heavy artillery continues to fire from its initial positions until the light and medium artillery have been displaced.

j. (1) Plans for the attack of an organized position should provide for heavy reinforcement of organic artillery in order to overcome the highly organized resistance to be encountered throughout the main battle position. The required artillery strength appropriate for the attack of positions with

varying degrees of organization are set forth in paragraph 191.

(2) Preliminary measures are initiated at an early date by the commanders of the artillery in position, both for their own units and for the reinforcing units, and include so far as practicable all the preparations necessary for the organic and reinforcing units in the attack.

(3) The artillery is organized for combat as provided in paragraph 137.

(4) Positions for the reinforcing artillery must be selected and all possible preparatory measures completed before it arrives. These preparatory measures are initiated by the organic artillery commanders and are completed by advance details of the reinforcing artillery.

(5) On arrival, reinforcing artillery is located in concealed areas out of range of hostile artillery fire. Reconnaissance and preparations for orderly movements into positions are made. Movements into position take place under cover of darkness and in accordance with a march table. In large attacks, several nights may be necessary for such movements. The order of movement is as follows: batteries which move directly into concealed firing positions, batteries which move into concealed positions in readiness from which they can be quickly moved into firing positions near by, and batteries which move directly into positions in the open. The latter are moved on the night preceding the attack.

k. Distribution of ammunition is planned in advance and begins before the reinforcing artillery moves into position. Sufficient ammunition is dumped in the vicinity of the firing positions for missions which are to be fired prior to displacement.

SECTION V

DEFENSIVE COMBAT

■ 170. GENERAL.—Defense of a position, whether it is hastily prepared or strongly fortified, is conducted in accordance with the same fundamentals. Details of execution, however, vary depending on whether or not the commander contemplates an early resumption of the offensive, the strength of the posi-

tion, means available for its defense, and action of the enemy.

171. EARLY RESUMPTION OF OFFENSIVE NOT CONTEMPLATED.—*a. General.*—(1) Development of the command in the preliminary stages of occupation of the defensive position is in general similar to that in the offensive. Troops are moved to assembly positions and then into positions to be occupied in the defense proper; sectors are assigned; operations of the elements of the command are coordinated; and the position is organized, fires are coordinated, and the systems of command, signal communication, observation liaison, and ammunition supply are developed as time permits. Exact information as to the trace of the main line of resistance is furnished to the artillery.

(2) Occupation of the defensive position by large units is whenever practicable covered by outposts (par. 159) located at sufficient distance from the main line of resistance to prevent the occupying forces from being taken under observed fire by hostile light artillery. The force commander decides whether the outposts are to retain their position after occupation of the main line of resistance has been completed. If the position of the outpost is not within effective range of the artillery supporting the defense of the main position, some light artillery is attached to the outpost.

(3) When the situation permits, mobile covering detachments with truck-drawn light artillery and when appropriate medium artillery attached, operate well in front and toward exposed flanks of the defensive position. By their fire, disposition, and movements they endeavor to deceive the enemy as to the defensive dispositions, lead him in a false direction, and cause him to deploy prematurely and on incorrect lines. Deploying on a broad front, they occupy successive positions on commanding ground and take advantage of every opportunity to open heavy surprise fire on formed bodies of hostile troops, without, however, allowing themselves to become closely engaged.

b. Artillery observation.—In selecting defensive positions, one of the primary factors is the availability of adequate ground observation for the artillery and the locating of the defensive lines to afford the maximum protection for this ob-

servation. Observation is organized to reduce invisible areas to a minimum and to provide for utilization of rearward observation posts in case of failure of observation posts located in the battle position.

c. Control of artillery.—The ability of artillery to mass its fire in critical areas or on important objectives is paramount; hence, centralized control is essential.

d. Time of opening fire.—Higher commanders determine the conditions under which artillery fire is to be opened during the hostile approach. In determining the time for opening fire, consideration is given to the fact that premature opening of fire by the mass of the artillery gives the enemy information relative to the location of the position and deployment of the artillery and that he may employ weak detachments for the purpose of inducing the defender to open fire and reveal his dispositions. Fire is not opened by the mass of the artillery until targets of sufficient importance are disclosed.

e. Artillery missions.—(1) *General.*—In general, the mission of the artillery is to prevent the enemy from launching a coordinated attack and to assist in stopping an attack should one be made. Normally, the general mission assigned initially to the artillery should indicate where the preponderance of support or the mass of fire is to be placed, or any priority to be given in preparing for support of different parts of the defensive position. Plans for delivery of defensive fires must be designed to provide concentrations of fire only on the critical zones or fronts; because sufficient artillery will rarely be available, even distribution of fire along the entire front would result in so little density as to be ineffective. In determining the detailed missions of the artillery, operations incident to a defense may be considered as divided into phases as follows: the period prior to and during the forming of the enemy for attack; the attack proper; and, in certain situations, the defender's counterattack.

(*a*) Missions appropriate to the first phase are interdiction of enemy routes of approach, harassing fire, support of covering detachments, fire on targets of opportunity, counterpreparation, and counterbattery.

(*b*) Missions appropriate to the phase covered by the attack proper are fire on attacking troops intended to break up the cohesion and momentum of the assault waves before they reach the main battle position, fire on troop assemblies, counterbattery, standing barrages, and interdiction.

(*c*) Relative to the third phase, artillery should be prepared at all times, following the launching of the enemy attack, to support counterattacks. As the time, place, and direction of counterattacks cannot be definitely foreseen, it is necessary that the artillery prepare plans to support such possible counterattacks as may have been designated by the division commander. In a counterattack by the division reserve, as much of the division artillery as practicable participates. Such a counterattack may be preceded by a preparation and may be reinforced by corps artillery and by artillery of adjacent divisions. Support in a local counterattack is provided for in conference between the local infantry commander and the commander of the supporting artillery. In such counterattacks, the local artillery commander should request such reinforcing fire as may be necessary. Normally, it is imperative that fire in support of counterattacks be observed continuously, liaison personnel being used as in the attack. Assignment of artillery to direct support of counterattacks and the artillery fires to be executed are planned in such detail as is practicable to insure maximum coordination of effort.

(2) *Division artillery.*—Fire of the division artillery must be coordinated with the fire of infantry weapons. Plans for supporting fires, particularly barrage fires in close defense of the position, must be prepared promptly. The division artillery participates in counterpreparation and takes under fire the most advanced elements of the assault waves; in addition, in certain situations, it assists the corps artillery in counterbattery fires for neutralization, and by fire in the corps artillery normal zone.

(3) *Corps and army artillery.*—When corps artillery is present, it will take over its primary mission of counterbattery and long range fire missions. During the critical stages of the defense, the corps artillery will reinforce and deepen the fires of the division artillery by firing on critical areas and on

hostile reserves. When army artillery is present, it normally will relieve the corps artillery of the more distant missions.

f. Prearrangement and coordination of artillery fires.—(1) When practicable, coordination of fires should be effected on the entire front, both laterally and in depth. This coordination involves measures to tie together artillery fires of adjacent units and artillery fires of the different echelons, such as division and corps, and corps and army. Even in rapidly moving situations, some coordination of artillery fire usually is practicable. Artillery commanders arrange with commanders of the supported troops the details of defensive fires of the artillery, coordinating them with those of the supported units. A general attack is met with a series of fires which seek to prevent the launching of a coordinated attack and to break up and destroy the enemy attack formations, should one be made. If the attack succeeds in penetrating the position, the artillery assists in limiting the penetration and in effecting ejection of the enemy, or if necessary, covers the withdrawal to rear positions, or delays pursuit.

(2) (*a*) Fires employed in the order of the usual priority of preparation are—

1. *For division artillery.*
   - First—Standing barrages for close defense of the main line of resistance.
   - Second—Defensive concentrations covering avenues of possible approach to the main line of resistance.
   - Third—Other defensive fires beyond the main line of resistance.
   - Fourth—Counterpreparation fires.
   - Fifth—Fires within the battle position to limit penetrations or envelopments.
   - Sixth—Fires in support of counterattacks.
   - Seventh—Fires covering a possible withdrawal.
2. *For corps and army artillery.*
   - First—Counterbattery, interdiction, and harassing fires.
   - Second—Fires to deepen and thicken the fires of the division artillery for close defense of the main line of resistance.

Third—Counterpreparation fires.
Fourth—Fires within the battle position to limit penetrations or envelopments.
Fifth—Fires in support of counterattacks.
Sixth—Fires covering a possible withdrawal.

(*b*) When appropriate, fires to support the action of covering forces should be given high priority.

(3) The degree of prearrangement and coordination of supporting fires by higher commanders depends upon the time available, ranging from a hastily prepared plan to an elaborate system of fires. Not all the above fires are used in each situation, nor are they necessarily fired simultaneously all along the front. General counterpreparations are fired when ordered by higher commanders (par. 133), local counterpreparations on the orders of the commanders concerned. Other fires are executed on request of the supported unit or on the initiative of subordinate artillery commanders when the necessity or advisability therefor is indicated by observation or report; they may be ordered by higher authority.

g. Positions.—Based upon a consideration of the missions, the artillery should normally be echeloned in depth in rear of the regimental reserve line. This echelonment may be by battalion within regiments or by battery within battalions. All batteries must be able to fire in close defense of the main line of resistance. From one-half to two-thirds of the light batteries should be able to fire in close support of the regimental reserve line. Some artillery should be emplaced well forward, generally just in rear of the regimental reserve line, in order to execute harassing and interdiction fires deep in the enemy zone. Part of the artillery will be required to support the outpost, either from its battle position or from temporary forward positions. Position areas of medium artillery seldom exceed in depth those of the light artillery and usually overlap those of the latter, in which case the light artillery is given priority in the choice of position. Heavy artillery, commensurate with its missions, is so located as to provide it the maximum protection. Artillery may be posted in temporary positions as roving artillery for the purpose of firing certain required

missions without disclosing the actual battery positions. When switch positions are prepared or contemplated, artillery positions for the support of the switch positions should be selected.

h. Reinforcing artillery.—When reinforcing artillery is to be provided, positions, communication, and other arrangements for its employment should be prepared by units already in position.

i. Preparation to support either flank.—The scheme of artillery employment must provide for the maximum flexibility. Careful planning is essential, to the end that the massing of artillery fire on and in front of any hostile threat can be effected promptly. Frequently no decision can be made in advance as to direction of the main enemy attack. The artillery, by advance selection of alternative observation to meet an attack from any direction, by laying essential wire lines thereto, and by reconnaissance for suitable alternative positions, prepares to render adequate support regardless of direction of the enemy main attack. Pending definite information regarding direction of the enemy main attack, particularly when wide envelopments or flanking attacks are probable, part of the light artillery may be held in general support or in readiness.

j. Defense against aircraft and ground troops.—(1) The defense against aircraft and ground troops by artillery in position is covered in part one.

(2) When a strong hostile mechanized attack is pending, a few mobile batteries are prepared for prompt movement to any part of the position where hostile tanks may succeed in penetrating the position. These batteries may be used to supplement the infantry antitank defense.

k. Use of chemicals.—Chemicals when authorized may usually be employed without restriction, except that care must be taken that the effect does not extend within the defender's position. Except for close-support fires, persistent gas will usually be very effective, particularly in counterbattery and interdiction. Smoke may be used in the defense during counterattacks and for neutralizing hostile artillery observation.

l. Defensive works.—In general, each combat arm is responsible for the execution of the work necessary to its own

defense. Artillery does not permit this work to interfere with the execution of its fire missions. Artillery defensive works are developed progressively as opportunity permits and are executed primarily to increase the power of the artillery to assist the supported troops. Accordingly, the greatest attention is given to developing and protecting the means of observation, command, and fire control. Protection for the firing batteries is obtained chiefly through provision for mobility in their employment, selection of alternative emplacements, defilade, camouflage, and adequate echelonment in width and depth. Protection for personnel is obtained as explained in part one, and in FM 6–130.

■ 172. EARLY RESUMPTION OF OFFENSIVE CONTEMPLATED.—*a.* A commander with an offensive mission may decide to assume the defensive because of temporary combat inferiority or in order to create a situation which will place the enemy at a tactical disadvantage and thus offer opportunity for a decisive counteroffensive. In both cases, an early resumption of the offensive is contemplated. By inducing the enemy to attack first, the commander hopes to fix and exhaust him and then, when the enemy is disorganized, to launch the counteroffensive. In such an operation, a large part of the infantry strength is held out of action initially, prepared to strike the offensive blow. The general mission of the artillery will indicate what part of the available artillery will be committed to the defensive phase of the action, as well as where the artillery must be prepared to mass its fire or what priority of support is desired during the defensive phase. In addition, if counteroffensive is to be assumed in a relatively short time, the artillery is instructed to make preparation for support of the counteroffensive.

b. Usually the defending force is given the minimum artillery support essential to accomplishment of its mission; the force making the counteroffensive is given the maximum support practicable.

c. If the counteroffensive is to be launched at or shortly after daylight, and time and space factors and the terrain (road net and absence of defiles) permit, artillery employed initially in support of the defensive phase will be able to displace under cover of darkness to new positions suitable for

support of the counteroffensive. Since counteroffensive is the decisive phase, the time required for such a displacement should be calculated with a considerable factor of safety, unless there is assurance that the enemy will not interfere with the movement.

d. Usually the exact location of the main and secondary attacks of the counteroffensive cannot be determined at the beginning of the defensive phase. Therefore, it is usually advisable to place an initial restriction on the employment of persistent chemicals. If the scheme of the counteroffensive has been definitely predetermined, persistent chemicals may be employed on any parts of the defensive front where no subsequent interference to the friendly attack will be possible.

SECTION VI

RETROGRADE MOVEMENTS

■ 173. GENERAL.—A retrograde movement is any movement of a command to the rear, or away from the enemy. Such a movement may be classified further as a withdrawal from action (night or daylight), a delaying action, or a retirement.

■ 174. EMPLOYMENT OF ARTILLERY.—In retrograde movements, the principal mission of the artillery is to delay the enemy advance and to assist the Infantry in disengaging from action. Just prior to disengagement, counterbattery becomes especially important. Close-in defensive fires usually are relatively unimportant. Truck-drawn light and medium artillery is best suited to support in retrograde movements, combining the required fire-power with high mobility. Positions are selected which afford the maximum ranges consistent with facility of withdrawal by covered routes. Maximum use is made of air observation.

■ 175. WITHDRAWALS.—A withdrawal from action is the operation of breaking off combat with a hostile force. It may constitute the initial phase of a retirement. It is habitually employed in the execution of a delaying action.

a. Night withdrawal.—In a night withdrawal, only weak outpost elements, formed from troops nearest the enemy, are left in immediate contact with the hostile force.

(1) The bulk of the artillery normally is withdrawn shortly after dark, moving, as the situation dictates, to assembly points where march columns are to be formed or to the support of a new position. The movement of this artillery may be made simultaneously where roads are ample or by echelon, with priority to the heavier calibers, where the road net is limited. It habitually precedes the Infantry of the main body in the retrograde movement.

(2) A part of the artillery remains in position to support the elements still in contact. Ordinarily, only so much artillery is left in position as is necessary to keep up the appearance of normal activity. Thus it is desirable that both light and medium weapons remain and that they be distributed across the entire front. This artillery takes over the more important fire missions on the entire front; usually it is not attached to the outpost elements, since ordinarily no single commander therefor is designated. This artillery usually withdraws simultaneously, preceding the Infantry of the outpost, at an hour set by the force commander.

b. Daylight withdrawal.—(1) As a daylight withdrawal is an emergency measure often forced upon a commander without much warning, the maneuver must usually be hastily planned. The actual form of the withdrawal may be forced upon the commander by hostile pressure. Local covering forces are designated by local infantry commanders to assist their firing lines to break off the engagement. A general covering force with an appropriate amount of attached artillery is designated by the force commander; the remaining artillery provides support of the main force while breaking off the action and furnishes close support of local covering forces.

(2) The amount of artillery attached to the general covering force is affected by the seriousness of the situation and by the support required by the main force. A battalion is desirable, since it is the smallest unit suitably organized for efficient fire direction and for withdrawal by echelon, thus providing continuous support.

(3) Employment of the artillery with the main force may vary from a favorable situation in which the mass may be withdrawn promptly under cover of the artillery attached

to the covering force, to critical situations requiring all the artillery to fight in the disengaging action furnishing continuous support by echelonment to the rear. Artillery in direct support remains in action to the last possible moment and does not hesitate to sacrifice itself if necessary. Whenever practicable, support of the main force is provided in the normal manner without attachment, though in critical situations it may be necessary to attach batteries to local covering forces.

■ 176. DELAYING ACTION.—*a.* A delaying action is an operation designed to prevent the uninterrupted advance of the enemy by holding for a limited time either a single position or successive positions. When the necessary amount of time has been gained on any position, the force withdraws from action.

b. Artillery is particularly valuable owing to the long-range delay provided by its weapons. Positions are sought well forward to effect this long-range action. Ordinarily, close support of the delaying position need not be provided for.

c. Defense of the position is begun by the artillery in general support which lays down interdiction fires on the routes of hostile approach and covers the withdrawal of the elements of the outpost. As the enemy develops his columns preliminary to deployment for attack, the artillery in direct support joins in the counterpreparation fires placed on the hostile assembly positions. From the beginning of the action, fire of the artillery is directed principally against hostile infantry and mechanized units.

d. When the delay is being executed in successive positions, the major part of the artillery usually is placed well forward behind the most advanced position occupied with the remainder in rear of the next position, thus insuring continuity of support during withdrawal from the advanced position. Movement of the artillery by echelon from support of the advanced position provides further for continuous support, particularly of intermediate covering positions, between the main delaying positions. Whenever practicable, most effective support is provided by holding the artillery under central control, which permits the massing of its fire at critical points. Decentralization may be necessary be-

cause of such contingencies as width of front, obstacles between major elements of the command, or rapidity or uncertainty of the action. Adequate observation aviation for adjustment of the long-range fires required in delaying action is essential.

■ 177. RETIREMENT.—*a.* A retirement is a retrograde movement by which a force seeks to gain freedom of action by moving to the rear and interposing a covering force between itself and the enemy. A retirement is initiated, whenever practicable, by a night withdrawal; thereafter the principles of employment of artillery with the covering force usually parallel those with rear guards and in delaying actions.

b. Disposition of the artillery with the main body depends upon its probable employment during the retirement. When roads are limited, the artillery is moved to the rear promptly. In certain situations, units may be placed in position at appropriate localities en route to cover the retirement. If the enemy is aggressive and the movement is made under pressure, the mass of the artillery may be required to remain near the tail of the main body to reinforce the fires of the artillery with the security detachment. When aggressive action by the enemy is not contemplated, the mass of the artillery may precede the main body, taking advantage of its mobility to relieve congestion. As the distance from the enemy increases, the small columns of the main body are consolidated into larger march columns constituted as combat teams.

■ 178. ARTILLERY WITH A CORPS.—*a.* A retirement of a corps is ordinarily made under protection of the rear guards of the divisions. Usually the corps artillery is employed only when a stand must be made.

b. During the initial phase of a withdrawal preceding a retirement, selected corps units, particularly the medium howitzers, may assist the divisions and participate in the deception regarding the appearance of the front. The need for counterbattery and other support, especially during a daylight withdrawal with the force under heavy pressure, may require continuous action of the corps howitzers by echelonment to the rear. As far as practicable and when not closely pressed, the corps units are moved promptly to clear the routes for division elements.

c. When retirement is made by stages, the corps artillery is usually employed to support each stage position; otherwise it is moved directly to positions to support the new defensive position.

d. During retirement, movement of the corps artillery is usually centralized under control of the corps artillery officer. If an uncertain situation exists on a division front or if corps and division units are intermingled in the original position prior to retirement, it may be advisable to attach appropriate corps artillery units to divisions.

e. In delaying action in successive positions, the corps artillery normally supports the main delaying positions. Delay by long-range fire from positions well forward is important. The distribution of corps artillery units in support of the several delaying positions conforms in general to the distribution of the troops of the command as a whole. The corps artillery usually is retained under centralized control.

SECTION VII

WITH CAVALRY

■ 179. GENERAL.—*a.* The fundamentals of employment of artillery with Infantry apply to artillery operating with Cavalry. The actual support of Cavalry after it has dismounted for action parallels the support of Infantry in similar operations. However, owing to the mobility of Cavalry when mounted and the consequent more rapid development of the phases of the engagement, artillery supporting Cavalry is more often required to occupy positions in a minimum of time, the positions are more often in the open, and the use of direct laying is often appropriate. The long, rapid marches made by Cavalry call for excellent care and conditioning of the teams on the part of horse artillery.

b. Generally, combat does not permit centralized control of the artillery by higher commanders that may be found in normal infantry combat. The artillery direct-support missions, instead of being decided upon by conference with the commander of the supported unit, are frequently decided upon by the artillery battalion or battery commander from what he sees on the battlefield.

c. Situations calling for the attachment of battalions or single batteries to cavalry units are quite common. When operating alone, the personnel of the battery detail should be augmented as may be necessary by battalion personnel.

■ 180. POSITIONS TO SUPPORT A MOUNTED ATTACK.—When a mounted attack is to be made, the position of the guns should be chosen with a view to obtaining the most effective fire on the enemy prior to the cavalry charge, and of covering with effective fire the area over which the charge is to be made. The position chosen should permit the fire to be delivered up to the moment of collision and should not hamper in any way the movement of friendly Cavalry. For this reason positions on one or both flanks from which fire may be delivered across the front of the element making the mounted attack are generally best. A position in rear of a mounted attack is generally faulty, as the advance of the friendly troops masks the fire of the guns too soon. In some cases, effective support can be given the mounted attack from positions covered by the pivot of maneuver. In other cases, when the enemy is strong in Cavalry, the most effective positions for support of a mounted attack may require special protection by the Cavalry, such as locating the Cavalry reserve near the position of the artillery or vice versa.

■ 181. ARTILLERY WITH CAVALRY RECONNAISSANCE DETACHMENTS.—Artillery, varying in strength from a section to a battery, may be attached to a reconnaissance detachment when the mission of the detachment warrants; in general, however, the mass of the artillery should be with the main body. To provide for artillery fire on enemy columns or other appropriate targets, artillery liaison officers or forward observers with facilities to communicate with the artillery by radio should accompany cavalry reconnaissance details.

■ 182. ARTILLERY WITH CAVALRY ON COUNTERRECONNAISSANCE.—Usually the bulk of the artillery is held in readiness prepared to move with the main body to resist hostile efforts to penetrate the screen.

■ 183. ARTILLERY WITH MECHANIZED CAVALRY.—The general method of employment of artillery with mechanized Cavalry is essentially the same as the method of employment of

artillery operating with horse Cavalry. The operations of mechanized Cavalry will normally be conducted with great rapidity and each operation will be of relatively short duration. The artillery supporting mechanized Cavalry will have little time for detailed reconnaissance and preliminary preparation of plans.

a. On the march.—On the march, the artillery marches near the head of the main body to facilitate its early entry into action. Reconnaissance detachments march with the forward elements of the advance guard. Artillery liaison officers or forward observers accompany the advanced scout car elements in order to provide means of bringing down artillery fire on enemy columns or other appropriate targets which may be encountered.

b. In the attack.—For an attack, the artillery is placed early in positions from which it can cover the development and support the attack. The positions should be as far forward as safety from direct fire of hostile small arms permits, and such that direct laying may readily be employed in the close support of the attack. The principal fire missions are fire on antitank weapons, counterbattery, and interdiction.

c. *In defense, delaying actions, and special operations.*—The artillery operating with mechanized Cavalry is employed similarly to that supporting horse Cavalry in such operations.

SECTION VIII

IN SPECIAL OPERATIONS

■ 184. GENERAL.—Special operations are those where the terrain, weather, or nature of the operation itself have such an influence as to necessitate special measures to meet the situations which may arise. Special operations include night operations, raids, river crossings, defense of a river line, landing operations, defense of a coast line, and mountain and jungle warfare. The discussion in this section is limited to land operations. Landing operations and the defense of a coast line involve the joint action of the Army and the Navy; they are governed by special regulations.

■ 185. NIGHT ATTACKS.—*a.* The artillery to support the attack must complete the necessary survey, locate its objectives, and arrange for liaison before dark. All plans and arrangements must be simple and well coordinated. Supporting fire consists mainly of concentrations fired on a time schedule or on prearranged signals.

b. The artillery should concentrate upon disrupting the system of final protective fires of enemy machine guns and upon counterbattery of the enemy batteries which are firing barrage and similar missions. In general, an artillery preparation is inadvisable; if fired, it should be short and violent. Fires are planned to box off the zone of attack and to protect the Infantry upon its arrival at the objectives or in case of a repulse.

■ 186. RAIDS.—Artillery support during a raid consists of neutralizing known and suspected hostile defense elements of the position to be raided and of isolating the area by means of a box barrage (par. 128c). The attacking troops are normally preceded by a rolling barrage, the artillery so employed being used later to interdict approaches to the area, to reinforce the fire isolating the area, or to neutralize enemy defense elements capable of rendering support to the raided position. Counterbattery fire should be employed as necessary during both the advance and withdrawal of attacking troops. In the withdrawal, a standing barrage may be employed and smoke may be used for screening.

■ 187. RIVER CROSSINGS.—*a.* During the first phase of a crossing, the artillery assists in driving all hostile forces across the river, such action being in the nature of an advance guard action; however, long-range artillery should be employed relatively early to counterbattery enemy artillery interdicting avenues of approach.

b. Selection of a place where the river makes a salient toward the attacking force enables the artillery to render more efficient support to the troops making the initial crossing. The artillery is placed in positions as close to the river line as practicable.

c. Greatest secrecy should be preserved in the preparations for a crossing, movements generally being made under cover

of darkness. When the element of surprise is not an essential factor, the commander of the force may require the artillery to fire a preparation during the operations preparatory to crossing. If the movement is to be a complete surprise, the opening of fire should be delayed until after the first waves have crossed.

d. Supporting fire of the artillery normally consists of concentrations during the initial stages of the landing on the hostile bank. These concentrations are placed on points from which the enemy can fire on or observe the crossing. A rolling barrage or more generally concentrations precede the advance to secure the bridgehead. Employment of artillery fire in the maintenance of the bridgehead is similar to its employment in a defensive position. The artillery in general support interdicts the movement of hostile reserves and protects the flanks of the bridgehead. As soon as the hostile artillery is located, the corps artillery neutralizes it.

e. Elements of the artillery may be ferried across relatively early to assist in extending the bridgehead; such units are usually attached to assault units. The mass of the artillery should be crossed on bridges, the crossing being by successive echelons as in a forward displacement during an attack. In certain situations, smoke may be used to advantage to cover the preparatory operations and the crossing. Artillery may be employed in feints to deceive the enemy as to the actual point of crossing.

f. As soon as the Infantry after crossing has captured suitable terrain for artillery observation, signal communication should be established between advanced observation posts and the firing batteries which have not crossed. Radio and visual signals should be used until wire communication is established.

■ 188. DEFENSE OF A RIVER LINE.—*a.* A river line may be employed as an obstacle in front of a defensive or delaying position or as an aid to counteroffensive action which seeks to strike the enemy while his forces are astride the river.

b. When the river line is employed as an obstacle in front of a defensive position, the main line of resistance is placed on or near the river bank. The artillery is employed as in the defense of a position (par. 171*g*), except that it will be

usual to emplace initially only a part of the artillery to cover the most likely crossing places, probable assembly positions and avenues of approach, and to hold the remainder in readiness to support the defense when the main crossing is discovered.

c. When the river line is to be held as a delaying position in a retrograde movement, the employment of the artillery is covered in paragraph 176.

d. (1) When the river line is employed as an aid to counteroffensive action to strike the enemy while his forces are astride the river, the river line is held by relatively weak infantry outpost detachments; the bulk of the Infantry is held in reserve prepared to strike the offensive blow as soon as the main hostile crossing is recognized. Some artillery is attached to the outpost detachments; the mass of the artillery is held in readiness, prepared to support the counteroffensive.

(2) The artillery attached to the advanced detachments is employed as in the support of an outpost (par. 159). Platoons or batteries are emplaced in concealed positions to cover the probable points of crossing and the approaches thereto; they remain silent until suitable targets present themselves and then open a surprise fire.

(3) Plans for entry into action of the remainder of the artillery are prepared in connection with the plans for the intervention of the main force. These plans usually cover two phases; support of the advanced detachments where a hostile crossing is being effected in order to delay the crossing of the hostile troops and prevent them from establishing a bridgehead, and support of the main force in its counterattack to eject the enemy or limit the extension of his bridgehead. In the first phase, the artillery occupies positions from which it can concentrate against the hostile points of crossing, particularly bridges under construction, and can cover the hostile approaches to the river. These positions are occupied as soon as definite information is available concerning the enemy's intentions. In the second phase, the artillery is employed as in the support of a counterattack. Since the mass of the hostile artillery will

still be on the far side of the river, the neutralization of hostile observation is especially important.

(4) Artillery observation posts covering the probable points of crossing must be established and organized in advance and included in the artillery communication net. A liaison detachment should be sent to the commander of each outpost sector.

■ 189. MOUNTAIN AND JUNGLE WARFARE.—*a.* Employment of artillery in mountain and jungle warfare corresponds to that in other types of operations, with the necessary modifications incident to the terrain. In this type of warfare, the principal difficulties in employment of artillery are—

(1) Compulsory decentralization of control, often necessitating the splitting up of batteries and the attachment of elements as accompanying artillery.

(2) Scarcity of positions and adequate observation and difficulty of locating suitable routes, necessitating more extensive reconnaissance.

b. In forces operating in such terrain, it is desirable that a portion of the artillery consist of pack units for operating off the main route; other artillery, so far as practicable, should be capable of high-angle fire.

SECTION IX

ESTIMATE OF ARTILLERY REQUIREMENTS

■ 190. RESPONSIBILITY.—The task of estimating the amount of artillery needed to insure adequate support is a responsibility of the artillery officer of the army, independent corps, or independent division. In the case of the army or independent corps, the lower echelons of command ordinarily will be called upon to prepare detailed studies of the requirements for their respective zones of action and the final estimate of the army or corps artillery officer will be based on a consideration of these studies and the plans of the army or corps as a whole.

■ 191. FACTORS TO BE CONSIDERED.—*a.* The desirable amounts and types of artillery for any operation are determined primarily by the fire missions contemplated. The basic factors

to be considered are the number, types, and ranges of the objectives to be attacked, character of fire to be employed, and time available for the delivery of the fire. These factors frequently cannot be determined with accuracy. In estimating them, it is necessary to consider the character of the terrain; strength and disposition of the enemy; amount of counterbattery and distant interdiction to be undertaken; and in the offensive, front and depth of the main and holding attacks and extent to which combat aviation and tanks are to be employed. A sufficient number of positions must be available for emplacing the batteries without overcrowding or excessive dispersion in depth; the number of roads available and the road space alloted for the movement of artillery and ammunition must be adequate for the completion of the movement in the time allowed.

b. For a defensive action and for the initial stage of an attack in a situation in which sufficient information of the enemy position is available, the requirements can be determined with considerable accuracy by listing the barrages, concentrations, interdictions, and other known fires required. Estimates for later phases can be based only on the most probable eventualities. However, requirements for the initial phase of an attack usually are the most severe.

c. For an offensive operation, a study of experience data determined from past operations of a similar nature will furnish the basis for a rough estimate of the artillery requirements.

(1) For an attack against an organized position, the best available data, based on experience, are contained in the following table:

Requirement	Batteries per 1,000 yards of front			
	Light	Medium or heavy	Total	RR or other long range artillery
Maximum	18	18	36	1.5
Normal	14	13	27	1
Minimum	10	10	20	

The maximum allotment is for a situation in which the enemy is on the alert, expecting an attack, and is thoroughly organized, supplied, and equipped. The normal requirement is for a situation in which the enemy is more or less surprised, has not been reinforced, and is only fairly well organized, supplied, and equipped. The minimum allotment is for a situation in which the enemy falls back during the preliminaries of an attack, occupies a poorly organized position, or is expected to fall back on account of pressure elsewhere; it usually is applied to the front of the holding attack.

(2) In open warfare, owing to the rapidly changing situation and lack of detailed information, many of the basic factors cannot be determined accurately. The following figures may be used as a guide in lieu of data based on actual experience:

Allotment	Batteries per 1,000 yards of front			
	Light	Medium or heavy	Total	Long range artillery
Main attack	5	4	9	½
Holding attack	3	3	6	

CHAPTER 6

PLANS AND ORDERS

■ 192. GENERAL.—Combat orders are also covered in FM 101–5. Regardless of the size of the force, the basic decision regarding employment of the artillery rests with the force commander and his plan will include instructions for the artillery. These instructions will often be limited to a broad general mission, indicating only the area in which the artillery will be prepared to mass its fire or the front to be given the preponderance of artillery support. It is customary for the force commander, before announcing his plan, to avail himself of his artillery officer's opinion relative to employment of the artillery.

■ 193. DIRECTIVE.—Using as a basis the plan of the force commander, the artillery officer adds necessary basic decisions to prepare a tentative plan for employment of the artillery. He issues this plan to his staff in the form of a directive.

■ 194. RECOMMENDATIONS FOR EMPLOYMENT OF FIELD ARTILLERY.—Using the directive of the artillery officer as a guide, the artillery staff prepares the detailed recommendations for employment of the Field Artillery. These detailed recommendations are submitted to the force commander or his chief staff officer for approval. When approved, they form the artillery subparagraph of the force commander's field order and are the basis for the detailed plan for the employment of the artillery and the artillery field order for the operation.

■ 195. FIELD ARTILLERY PLANS.—*a. Detailed plan.*—The Field Artillery has no independent role in battle; the plan for its employment is built entirely with the idea of assisting to the utmost the scheme of maneuver of the force commander. This artillery plan, with large commands, may be complete and detailed and will be published in a written field order or an artillery annex. With small commands or in rapidly changing situations, the artillery plan will normally be brief,

omitting many details found in a complete field order or annex, and may be issued orally. In either case, the sequence of steps in arriving at the detailed plan for employment of the Field Artillery with the force is essentially the same, varying in details with the size of the command and the tactical situation. This sequence may be summarized as follows:

(1) Consultation by the force commander with the artillery officer.

(2) Announcement by the force commander of his plan, including his general instructions for employment of the Field Artillery to further same.

(3) Estimation of the artillery situation and formulation of the tentative plan for employing the artillery, consisting of the artillery instructions of the force commander supplemented by such basic artillery decisions as are necessary.

(4) Issuance of the tentative plan of the artillery officer to his staff in the form of a directive.

(5) Preparation by the artillery staff of the recommendations for employment of the Field Artillery, usually in such form that they can be used in operation orders.

(6) Approval by the force commander or his representative of the recommendations described in (5) above.

(7) Preparation by the artillery staff of the detailed plan for employment of the Field Artillery.

(8) Publication of the detailed plan in the form of a field order or field artillery annex.

b. Plans of subordinate artillery commanders.—A commander of a subordinate artillery unit receives his mission from the next higher commander. This mission is the basis of his plan. However, the details of his plan will be largely influenced by the plan of the supported-unit (infantry, cavalry, or other artillery) commander. Consultation with the latter is essential before the subordinate commander can perfect his plan. The sequence of steps taken by a subordinate artillery commander in arriving at his detailed plan may be summarized as follows:

(1) Consideration of his mission as assigned by his immediate superior.

(2) Consultation with the supported-unit commander, to obtain from the latter his scheme of maneuver and the artillery fires desired.

(3) Estimation of the artillery situation and formulation of his plan, based on his mission and the desires of the supported-unit commander. In formulating details of the plan, the commander receives such assistance from his staff as he deems necessary.

(4) Publication of the detailed plan in the form of a field order.

c. Progressive issuance of orders.—The inference should not be drawn that the procedure outlined in *a* and *b* above must be completed before any orders are issued. On the contrary, as soon as parts of the plan are formulated and coordinated, *the necessary fragmentary orders based on them should be issued without delay.*

■ 196. ORDERS AND ANNEXES.—*a. Artillery field orders.*—(1) Forms and check lists for artillery field orders are given in FM 6–130 and FM 101–5.

(2) Field artillery combat orders follow the five-paragraph form for field orders and may be oral, dictated, or written. Written orders are issued by brigades and regiments when the tactical situation is such that it is practicable to publish an order and get it to the troops in time for their action; otherwise, dictated or oral orders are issued. Battalion and battery orders are almost always oral. Often, because of lack of time, artillery field orders are issued in fragmentary form; this is usually the case with battalion orders and frequently with regimental orders. When written fragmentary orders are issued, each order should be given an appropriate heading indicating its main purpose, such as reconnaissance, fire missions, displacements. The sequence should follow that of a field order, and in units larger than the battalion, the fragmentary orders may be combined later into a complete written field order. In preparing artillery field orders, use is made of explanatory maps, tracings, charts, and tables, which are referred to in the order and appended thereto as annexes.

(3) The army (corps) artillery officer rarely issues an artillery field order. Normally the artillery annex to the army (corps) field order is sufficient for the purposes of the commanders of the major units of the army (corps) artillery, provided they receive a copy of the army (corps) field order.

The annex alone is not sufficient, since the commanders of the major units must have the information contained in paragraphs 1, 2, 3, and sometimes 4 and 5, of the army (corps) order.

(4) The field order of the division artillery is based on the division commander's plan of employment of his artillery as expressed in the division field order and includes such instructions as are necessary to insure coordination between units of the division artillery and also between the division artillery and that of the corps and army, based upon the artillery annex to the corps order.

(5) Regimental field orders are based on the mission assigned by the next higher commander. The commander of a regiment in direct support, prior to issuing his order, consults with the commander of the unit which the regiment supports. Paragraph 4 contains items concerning supply, evacuation, and circulation essential for the information of battalion commanders.

(6) Battalion field orders seldom are issued to all the battery commanders and staff officers at the same time. The battalion usually is the only organization to announce a reference point at the beginning of an oral order (for orienting purposes) or in paragraph 2 of a written order. Instructions covering the fire direction plan (FM 6–40) are included in paragraph 3. Paragraph 4 contains appropriate data concerning the ammunition train, ammunition supply, aid station, and other appropriate administrative matters. The battalion axis of signal communication is generally given only to the communication officer, and no battery axes of signal communication are given.

(7) Battery field orders are usually given in fragmentary form to the individuals concerned.

(8) Warning orders are of particular importance to artillery units, since the efficiency of artillery movements and fire depends on timely preparation.

b. Artillery subparagraph of division (corps, army) field order.—This subparagraph includes basic decisions regarding employment of the artillery sufficient for the artillery commander to formulate his detailed plans and for other major commanders to understand what support they may expect

from the artillery. The artillery officer in his capacity as staff officer usually recommends the content of the artillery subparagraph. Whether or not the artillery subparagraph should be amplified by an artillery annex to the field order depends upon the complexity of the plan and the degree of centralized control of artillery fires. For a form for the artillery subparagraph, see FM 6–130.

c. Artillery annexes.—Forms for artillery annexes are given in FM 6–130. An artillery annex to the field order of a command is an amplification of the artillery subparagraph of the field order. The artillery annex is issued whenever, by reason of the amount of detail relative to the employment of the artillery, the field order of a command would be unduly expanded by including these details in the artillery subparagraph. The written annex follows in general the field order form, except that when the artillery commander's field order is taken in its entirety to form the artillery annex, the field order form is modified by omitting subject matter which would be a duplication of matter contained in the field order to which the annex is attached. The artillery annex is given a caption as follows:

ANNEX ——— TO FO ———, ——— DIVISION (CORPS) (ARMY) FIELD ARTILLERY

Many of the details of an annex are set forth in maps, charts, tables, or tracings, which are attached as annexes to the annex and are numbered serially. Each shows by legend the particular purpose for which intended; for example, *Annex 1—Artillery Preparation* or *Annex 2—Accompanying Fires*. An annex may consist exclusively of maps, charts, tables, or overlays.

(1) *Division.*—In the division, an artillery annex is appropriate where the scheme of artillery fires has been highly organized and control is centralized. When an artillery annex is used, the division artillery commander's field order is usually taken in its entirety, the annex caption being added thereto. After authentication by the division G–3, the annex is attached to the division field order. The division artillery commander's field order is issued as an

annex to the division field order when it is necessary to give the other troops more complete information of the artillery than can be included in the artillery subparagraph of the division field order without making it unduly voluminous.

(2) *Corps and army.*—Usually the corps and the army issue artillery annexes. The artillery annex to the corps (army) field order is prepared by the corps (army) artillery officer; it publishes to subordinate commanders the corps (army) commander's orders for the employment of all the artillery with the unit. The artillery annex to the corps field order may contain certain instructions for the division artillery, and similarly the artillery annex to the army field order may contain certain instructions for the employment of both corps and division artillery. Such instructions are confined to the assignment of specific fire missions of importance from the corps (army) viewpoint, or to general instructions as to the methods of employment necessary for the coordination of all artillery units to be employed. In an annex, appropriate subheads, such as *Division artillery, Corps artillery,* and *Army artillery,* in the sequence given, are used. The annex is signed by the chief of staff in the name of the commander and authenticated by the corps (army) G–3.

PART FOUR

LOGISTICS

(This part deals primarily with those details of logistics which have particular application to the Feld Artillery. The entire subject is covered in FM 100–10, FM 101–5, and FM 101–10.)

CHAPTER 1

SUPPLY OTHER THAN AMMUNITION IN ARTILLERY UNITS

■ 197. TABLES OF SUPPLY AND EQUIPMENT.—Supply publications of the various services list the component parts, spare parts, and accessories pertaining to the weapons and transportation listed in Tables of Organization and Tables of Basic Allowances.

a. Tables of Basic Allowances.—These tables prescribe in detail the authorized allowances of organizational and individual equipment with the exception of equipment required for temporary use for special purposes; component parts, spare parts, accessories, and expendable items listed in publications of supply services; recruit clothing and equipment and Alaskan clothing prescribed in AR 600–750 and AR 615–40.

b. Tables of Organization.—These tables prescribe in tabular form the organic structure of units, including subdivisions and personnel with qualifications thereof. They also show for purposes of information the authorized allowances, as prescribed in Tables of Basic Allowances, of weapons, transportation, and principal items of equipment pertaining to the unit.

■ 198. TRAINS.—The maintenance sections of all batteries carry water, small spare parts, and the unconsumed portion of the ration. The ammunition train of each battalion transports extra ammunition for all guns in the battalion.

■ 199. ARTILLERY OFFICERS WITH SUPPLY FUNCTIONS.—*a. Brigade, regiment, and battalion S–4's.*—See chapter 2, part three.

b. Battery.—In the routine of battery supply, the battery commander is assisted by the supply sergeant, mess sergeant, and stable or motor sergeant. (See par. 203.)

■ 200. BRIGADE.—*a. Brigade or division artillery.*—(1) *General.*—With the exception of ammunition supply, the supply activities of the staff of the division artillery commander are confined to insuring that the tactical efficiency of units does not suffer through lack of supplies. The division artillery commander keeps himself informed as to the supply status of his regiments and other units and takes appropriate steps to remedy any supply situation causing difficulties. The administrative plans of the force commander are included in his administrative order which is furnished the division artillery commander; copies are furnished each regiment and to other units as appropriate. The division may deal with the division artillery as an entity in the matter of trains, train bivouacs, and the issue of rations and forage.

(2) *Brigade headquarters and headquarters battery.*—Supplies for this battery are obtained from the division by the battery commander in the same manner as regiments procure their supplies. On the march, those elements of this battery corresponding to a maintenance section may follow the battery or may be directed to join a battalion ammunition train of one of the regiments; in bivouac, it usually is located near the brigade command post.

b. Brigade (corps and army).—(1) *Corps artillery brigade.*—The supply system in the corps artillery brigade is similar to that in the division artillery, except that requests for supplies go to appropriate corps supply officers and supplies are furnished by appropriate corps trains.

(2) *Army artillery.*—Army artillery units are supplied in a manner similar to that of the corps artillery brigade, except that requests for supplies go to appropriate army supply officers and supplies are furnished by army supply establishments.

c. GHQ reserve artillery.—GHQ reserve artillery is supplied in the same manner as the organic artillery of the unit to which attached.

■ 201. REGIMENT.—*a. Fundamentals of supply.*—(1) For all supplies (except ammunition when the artillery is organized

as a brigade), the regiment deals directly with the division (corps or army).

(2) The regiment is the supply unit for its components, including attached units; it is the last of the major links in the chain of supply other than ammunition.

(3) Supply is based on the need of the troops; routine supplies are furnished without requisition, other supplies on any intelligible form of request.

b. Supply and maintenance platoon.—Each regimental headquarters battery has a supply and maintenance platoon. This platoon contains the personnel necessary to assist the regimental supply officer in the exercise of his supply duties. It also contains personnel and equipment to perform the necessary regimental motor maintenance functions. When a battalion is detached from the regiment, a suitable proportion of the supply and maintenance platoon will accompany it to perform the supply and maintenance functions.

c. Administrative plans and orders.—The plans prepared by S–4 depend upon the operation plan of the regiment and the administrative plans of higher authority. S–4 keeps informed as to the operation plan of the regiment through contact with the commander and other staff officers; and as to administrative plans of higher authorities through their administrative orders and instructions. Administrative orders contain information relative to distribution of rations and forage; supply points for ammunition, gasoline and oil, water, and the various essential supplies as appropriate; collecting and hospital stations for men and collecting stations for animals; instructions regarding burial, salvage, captured material, and prisoners of war; circulation and control of traffic; instructions for quartering parties; and locations of the rear echelon and the forward echelon of the headquarters issuing the order. Regiments do not publish administrative orders. Such items as may concern the several subordinate units of the regiment are included in paragraph 4 of the regimental field order. The necessary information and instructions to be given by S–4 of the regiment usually are communicated orally or by short written messages to the officers concerned.

d. Procurement and delivery of supplies.—(1) Rations and forage for the regiment are based on the consolidated strength report of the regiment made up by S–1 and transmitted to the division adjutant (corps, army). Each battery submits to regimental headquarters a daily strength report (morning report) of men and animals. This report may be sent by telephone. When supplies other than rations and forage (except ammunition, gasoline and oil, and medical supplies) are needed, the unit commander sends a request for them to the regimental S–4 who consolidates the requisitions of the several units and transmits the consolidated requisition to the appropriate division (corps or army) supply officer.

(2) Rations and forage supplies may be distributed at the railheads to regimental transportation (railhead distribution) or may be distributed to regimental areas by cargo vehicles under supervision of the quartermaster (unit distribution). Other classes of supplies may be distributed by cargo vehicles under supervision of the responsible supply officer, may be delivered at the railhead, or may be made available at depots.

■ 202. BATTALION.—*a. General.*—Unless the battalion is detached from the regiment, it has no supply functions other than ammunition supply, except to insure that the tactical efficiency of the batteries does not suffer through lack of supplies. The battalion commander keeps himself informed as to the supply status of the units of his command, taking appropriate steps to correct deficiencies. When the battalion is detached from the regiment, it takes over the supply functions of the regiment with respect to the components of the battalion; it is accompanied by personnel from the regimental supply and maintenance platoon as prescribed in Tables of Organization.

b. Rations, forage, gasoline, and oil.—The status of the rations carried on a kitchen depends on the number of meals which have been served; that is, on the time of day and when the last rations were delivered to the kitchen. The same is true for the grain ration for each animal; likewise, the amount of gasoline and oil varies between deliv-

eries. The C or D type field ration carried by individuals is to be used only in an emergency.

■ 203. MAINTENANCE SECTION OF BATTERY.—The maintenance section is the supply and maintenance agency of the battery.

a. Duties of personnel.—The following are the principal duties of members of the maintenance section who have supply and allied functions:

(1) *Mess sergeant.*—The mess sergeant, under supervision of the lieutenant in charge, is responsible for drawing and preparing the daily ration, for good order and police of the kitchen and mess area, for discipline and training of the cooks, and for care and maintenance of property connected with his activities. He is assisted by the cooks and by such kitchen police as are made available.

(2) *Stable sergeant (animal-drawn units).*—The stable sergeant, under supervision of the lieutenant in charge, is responsible for the care of all public animals assigned to the battery. He is responsible for care and issue of all forage in the battery, for care of sick animals, for good order and police of the stables and picket lines, and for care and maintenance of the property connected with his activities. He supervises the work of the horseshoers and the saddler. He is assisted by the stable orderly and such stable police as are made available.

(3) *Motor sergeant (motorized units).*—The motor sergeant, under the supervision of the motor officer, and assisted by his motor mechanics, is responsible for the care and maintenance of motor equipment of the battery.

(4) *Supply sergeant.*—The supply sergeant, under supervision of the lieutenant in charge, is responsible for the general care of all Government property issued to the battery until it has been issued by him. In addition, he keeps the supply records of the battery and initiates requests for new supplies. He supervises the work of the chief mechanic and general mechanics in repairing and maintaining the matériel of the battery.

b. Disposition.—(1) *On the march.*—In truck-drawn batteries, the maintenance section habitually accompanies the battery. In horse-drawn batteries, that part of the section

transported by motor accompanies the battalion ammunition train.

(2) *When combat becomes imminent.*—In truck-drawn batteries, maintenance sections (less mechanics' trucks) may be directed to join the battalion ammunition train, may be assembled at some convenient point, usually under an officer designated by the battalion commander, or may remain with the batteries. In horse-drawn batteries, the motorized portions of the maintenance sections may remain with the battalion ammunition train or may be assembled as the battalion commander directs.

(3) *When battery positions are occupied.*—Battery maintenance sections (less elements needed with the batteries) may be retained under battalion control in a battalion rear echelon, to which may be sent the limbers (motors) of the gun batteries. If the situation permits, the battalion commander may release to their batteries these maintenance sections.

c. Positions.—In action, the maintenance section should be located in a concealed position as near the battery as the situation permits, in order to facilitate control, carrying out of motor maintenance, and prompt feeding of men and animals. The position should not be so near to that of the battery as to subject the section to fire directed at the firing battery or to indicate to the enemy the location of a firing battery. The element of the battalion headquarters battery charged with maintenance and supply duties bivouacs near the command post. The maintenance section of a battalion ammunition train bivouacs with the train.

CHAPTER 2

ARTILLERY AMMUNITION SUPPLY

■ 204. GENERAL.—The general fundamentals of supply are applicable to ammunition supply. The following additional points are especially applicable:

a. Resupply of ammunition should be by established credits.

b. The routine daily ammunition reports (FM 6–130), combined with estimates based on plans for future operations, form the basis on which ammunition is supplied.

c. Ammunition must be delivered to the firing batteries in complete rounds (projectile and fuze, powder charge, and primer); the amounts delivered should be sufficient to permit the batteries to fire until their first displacement and then to move fully loaded. Care must be exercised to avoid delivering excessive amounts of ammunition to battery positions, resulting in a surplus, which in the event of a displacement would have to be abandoned or rehandled.

d. Ammunition resupply should be so arranged that all ammunition vehicles, when displacing, will have their normal loads intact.

e. Every attempt must be made by commanders to avoid abandoning ammunition when their units change position.

f. Continual care must be exercised to protect ammunition from the action of the weather. (FM 6–40 and FM 6–120.)

■ 205. ARTILLERY OFFICERS.—A primary duty of all artillery officers and artillery commanders is close supervision of ammunition supply and expenditure. This supervision includes preparation of estimates of ammunition requirements, allocation of available ammunition, preparation of ammunition reports, and preparation of appropriate parts of administrative orders. Shipment of artillery ammunition to supply points, in quantities in accordance with the prepared estimates of requirements, is handled by the supply services; normally the supply forward of ammunition depots and railheads is the duty of the artillery itself, assistance when necessary being furnished by higher echelons. Considerations of

procurement and transportation require that expenditure be controlled; this control is a responsibility of army, corps, and division artillery officers who must weigh proposed expenditures against expected results when preparing their ammunition plans for any particular operation.

■ 206. MUNITIONS OFFICERS (ch. 2, pt. three).—Munitions officers are employed upon staff duties pertaining to ammunition supply as directed by their commanding officers. Specific duties vary, depending upon the responsibility of the commander concerned. The following duties apply in general to all munitions officers:

a. Receiving and consolidating ammunition reports and preparing reports with respect thereto; forwarding the latter to the next higher authority in the chain of ammunition supply.

b. Keeping their commanders informed of the amounts, kinds, and calibers of ammunition on hand by organization; and of the condition and suitability thereof.

c. Submitting recommendations regarding plans for the drawing and delivery of ammunition, location and operation of trains, traffic circulation, location of dumps and distributing points if used, and amounts and kinds of ammunition at distributing points, dumps, and battery positions.

d. Preparing for approval pertinent parts of orders and other instructions regarding ammunition supply.

■ 207. TRAIN COMMANDERS.—Commanders of all units charged with the transport of ammunition are responsible to their respective commanding officers for the efficiency of ammunition transport; for drawing and delivery of ammunition in the prescribed amounts, calibers, kinds, component parts, and lots; and for concealment and camouflage of their ammunition dumps, distributing points, loads, and bivouacs.

■ 208. CHAIN OF AMMUNITION SUPPLY.—Ammunition allotted to an army, usually by establishing a credit in communications zone depots, is used to stock army ammunition depots (or railheads). The army commander, on recommendation of the army artillery officer allocates this ammunition to the army artillery and to each corps and separate division. Similarly, the corps commander reallocates the corps allowance

to the corps artillery and to each division. Likewise, in the division artillery the ammunition may be reallocated to regiments to cover a particular operation or period of time. In each case, the subordinate unit is informed of the supply points at which the various types of ammunition are available and the hours during which it may be drawn.

■ 209. SUPPLY ESTABLISHMENTS.—For further details regarding ammunition supply installations, see Ordnance Technical Manuals.

a. Ammunition supply point.—This is a generic term applied to ammunition depots, railheads, and distributing points. Ammunition supply points are designated by combining the name of the establishing unit with the type of installation; for example, "First Army Ammunition Depot No. 1", "1st Division Ammunition Railhead", "2d Division Ammunition Distributing Point." The unit ordnance service is responsible for the organization and operation of ammunition supply points of divisions and larger units.

(1) *Ammunition depot and railhead.*—An ammunition depot is an organized locality for the reception, classification, storage, and issue of ammunition. The unit ordnance service is charged with the organization and operation of ammunition depots of the unit. An ammunition railhead is a location on a rail line where ammunition is received by rail and issued to unit trains direct from cars or from the ground adjacent to the rail line with a minimum of unloading and sorting prior to issue. Ammunition railheads are ordnance service installations. Desirable characteristics of a site for an ammunition depot or railhead are—

(*a*) On or adjacent to a railway with a sufficient siding capacity to accommodate the number of railway cars it may be necessary to bring in at one time. A siding capacity for at least one train of 33 cars is usually the minimum.

(*b*) Beyond the range of hostile artillery fire. This may not be practicable in the event the enemy has long range railway artillery.

(*c*) On the best available road net with good motor roads leading into the division areas.

(*d*) Adequate traffic circulation facilities.

(*e*) Separated from other installations by at least 500 yards and from medical installations by 1,000 yards.

(*f*) Within an area protected from mechanized attacks.

(2) *Ammunition distributing point.*—A unit supply installation in advance of depots and railheads where ammunition is issued to subordinate units. An ammunition distributing point should be—

(*a*) Readily accessible to the trains of the artillery it serves.

(*b*) Off main traffic routes where practicable, and on good motor roads from the rear. It should have a turn-around and should connect with other roads leading to battery positions.

(*c*) Concealed from hostile air and ground observation.

(*d*) Beyond the range of hostile medium artillery.

(*e*) Located with sufficient space available so that operation at the distributing point will not block traffic.

b. Ammunition dump.—An ammunition dump is a temporary stockage of ammunition on the ground within the area of a unit. The commander of a unit establishing a dump is responsible for the ammunition stored in the dump. The dump is designated by the name of the establishing unit; for example, "Battery A Ammunition Dump," "1st Battalion, 1st F. A. Ammunition Dump." An ammunition dump becomes a supply point when designated as a distributing point by the unit commander. When ammunition dumps are established the following safety precautions are followed:

(1) The size of stacks should be such as to confine loss from deterioration or detonation to a relatively small amount. Stacks should be located 10 or more yards apart and should contain not more than one hundred rounds of 75-mm ammunition, fifty 155-mm projectiles, or twenty-five 240-mm (or corresponding caliber) projectiles. Peacetime standards should be followed as nearly as possible.

(2) Every possible use should be made of natural cover (the prescribed method of stacking ammunition is sufficiently flexible to permit utilization of all possible natural cover).

(3) All stacks not naturally covered must be camouflaged. The following will assist materially in concealing the installation:

(*a*) Irregular shape of stacks.

(*b*) Irregular spacing of stacks.
(*c*) Use of existing roads only.
(*d*) Utilization of existing inconspicuous structures.
(*e*) Avoidance of conspicuous land marks.

■ 210. SUPPLY METHODS.—Ammunition is hauled from ammunition depots or railheads by one of the three following methods:

a. Artillery ammunition vehicles haul all the ammunition required from depots and railheads to batteries.

b. Vehicles are attached to artillery units to assist in hauling ammunition.

c. Ammunition distributing points are established by a higher echelon.

■ 211. SUPPLY PLANNING.—In preparing ammunition supply plans for division artillery or for a brigade of artillery for a contemplated operation, S–4 must estimate the ammunition required, make a request for the required credits, obtain necessary transportation for transporting it and, in conjunction with regimental and battalion S–4's, make plans for the delivery to battery positions.

a. The *ammunition estimate* must be made in consultation with S–3. The best available experience tables of ammunition expenditures should be used as a guide. The primary factors which affect the estimate are the type and estimated duration of the engagement and the number of guns and howitzers to be engaged.

b. The *request for allocation* of the required ammunition should show the number of rounds for each caliber and type of ammunition required, the period for which the ammunition is expected to suffice, and the time it should be made available. The request is forwarded through channels prescribed by the force commander or according to staff practice in the particular unit.

c. The *ammunition haulage plan* provides for the transportation of ammunition from the supply point to batteries.

(1) In making a haulage plan the following items must be covered:

(*a*) Location and time of opening of the supply point.
(*b*) Time length of the haul.

(*c*) Amount of ammunition to be delivered.

(*d*) Transportation available.

(*e*) Time available.

(2) It is generally most convenient to reduce requirements to truck loads or battalion ammunition train loads, depending on the transportation available, and then to determine the number of trips required. Such considerations may reveal the necessity for requesting additional transportation. The detailed haulage plan is evolved after a careful study of all these factors.

■ 212. SMALL-ARMS AMMUNITION.—The relatively small amount of small-arms ammunition required by field artillery units is obtained by arrangement with the ordnance officer of the unit to which the artillery pertains.

CHAPTER 3

EVACUATION AND HOSPITALIZATION, REPLACEMENT, MAINTENANCE, AND SALVAGE

■ 213. EVACUATION AND HOSPITALIZATION (FM 101–10).—*a.* The medical service of a division comprises—

(1) Division surgeon's office.

(2) Division medical unit.

(3) Medical detachments with units.

b. The medical detachment of a field artillery regiment is organized for division into sections for duty at regimental headquarters and with each battalion. The battalion sections may be subdivided into groups for duty at battalion aid stations, with batteries, and as litter bearers. In an animal-drawn organization, the medical detachment includes a veterinary section for treatment and evacuation of animals.

(1) On the march, a section of the medical detachment marches at the rear of each battalion. The regimental surgeon accompanies the regimental staff. The veterinary personnel (horse-drawn regiments) marches at the rear of the animal elements. The remainder of the medical detachment usually marches at the rear of the regiment. The transportation carrying the medical combat equipment usually marches with the battalion ammunition trains. March casualties are collected by ambulances with the troop units, by march collecting stations established by the division medical unit, or by a combination of the two methods.

(2) A battery aid squad from the battalion section accompanies each battery into action. The remainder of each battalion section establishes a battalion aid station.

(3) The veterinary aid station for a horse-drawn regiment is established by the veterinary section at or near the point where the animals of the regiment are assembled.

c. Evacuation from unit aid stations is the responsibility of medical troops.

■ 214. REPLACEMENT.—*a.* Personnel to replace losses or to bring a unit to its prescribed strength are obtained from the

zone of the interior, from convalescents in the theater of operations, and from officers made available by reclassification or other cause. Requisitions for replacements are prepared by the S–1 sections of regiments and higher units and are forwarded through the normal channels. Replacement echelons include division replacement battalions, army replacement battalions, and advance and base replacement depots. Replacements are forwarded to organizations by the most convenient means available; they should arrive fully clothed and equipped. As a rule, replacements are not furnished during a major engagement.

b. Animal replacements are furnished by the Quartermaster Corps through remount depots (army or base). Requisitions for animal replacements are prepared by regimental and separate unit supply officers and forwarded through normal channels.

■ 215. MAINTENANCE.—*a. Ordnance matériel.*—Repairs to ordnance matériel of the corps and division artillery which cannot be made by artillery units are made by the corps ordnance units. Inspection of ordnance matériel is an important function of ordnance personnel in combat.

b. Motor transportation.—Maintenance and repairs of field artillery motor transportation (except special vehicles such as tractors issued and maintained by the Ordnance Department) are the responsibility of motor maintenance and repair personnel of the Field Artillery and of the Motor Transport Service, Quartermaster Corps. The scope of maintenance and repairs assigned to each is prescribed in FM 25–10.

■ 216. SALVAGE.—*a.* The prompt salvage of abandoned or partially worn-out material and the exploitation of captured material make available considerable quantities of supplies for issue to troops.

b. Much salvage material originates in the forward combat areas. Regimental commanders are responsible for the collection of salvage in their areas and for its delivery to designated collecting points. Salvage operations, however, must not be permitted to interfere with combat and normal supply operations.

c. Because of the difficulties of artillery ammunition supply, it is imperative that there is prompt salvage of ammunition from all abandoned positions and supply installations. When an artillery unit moves and finds it impossible to move some of its ammunition, the unit's munitions officer reports the exact amount and location thereof to the munitions officer of the next higher echelon. The latter then takes the necessary steps to salvage it.

d. The S–1 section of each staff supervises the preparation of reports covering captured material, and the S–4 section coordinates and supervises the disposal thereof. Captured material which cannot be used locally is turned over to the salvage service or reported to G–4 for disposition.

CHAPTER 4

MARCHES

■ 217. GENERAL.—*a.* Marches by the artillery in the presence of the enemy are discussed in part three. In such marches, the force commander issues instructions for the march, to which the artillery conforms.

b. In marches not in the presence of the enemy, tactical considerations are of secondary importance. In such cases, because of the varying degrees of mobility in his command, the force commander will usually issue general instructions only, covering time, destination, available routes, and such restrictions as are necessary to prevent interference between larger units. The artillery commander must then make additional decisions and detailed arrangements. The logistics of marches are covered in FM 25–10 and FM 101–10.

c. The conduct of marches is discussed in FM 6–5.

■ 218. MARCHING HEAVY ARTILLERY.—The marching of heavy artillery necessitates certain modifications of the general considerations of marches. The principal modification is due to the wide tread and great weight of the 155-mm. gun. Its width is so great that two-way traffic is impracticable on a road of ordinary width while these guns are being moved over it. To insure its uninterrupted progress, a serial containing these guns should be assigned to one-way roads or roads with wide metalled surfaces. Strong bridges are necessary.

CHAPTER 5

MOVEMENTS BY RAIL AND WATER

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SECTION I

RAIL

■ 219. GENERAL.—Administrative details of troop movements by rail are covered in appropriate Army Regulations. The logistics of rail movements are discussed in FM 101–10.

■ 220. MOVEMENT OF ARTILLERY.—In view of its high mobility on highways, the movement of truck-drawn artillery by rail will be exceptional in the theater of operations. For movements not in excess of 100 miles, it is generally expedient to move all artillery by marching. For movements between 100 miles and 1,000 miles, it is usually expedient to move animal-drawn (and tractor) artillery by rail and truck-drawn artillery by marching. Tactical and strategical considerations may reduce this limit (1,000 miles) in certain situations.

■ 221. TRAIN LOADING.—In the theater of operations, artillery when moved by rail is usually transported by standard-type trains. Nonstandard-type trains may be employed outside the theater of operations and are generally used in time of peace.

■ 222. RAIL MOVEMENT ORDERS.—The headquarters ordering a rail movement should issue the necessary warning orders and field orders. The details of such orders are given in FM 101–5 and FM 101–10.

■ 223. ORDER OF ENTRAINING.—In some cases, it will be necessary for troops to fight immediately upon arrival and tactical considerations will govern the order of entrainment of units; in other cases, the troops will merely be changing areas and considerations of supply and administration will be para-

mount. The order of entraining is based upon the order in which it is desired to have units arrive in the detraining area. It is desirable that part of the headquarters of battalions and higher units moving by rail be transported in one of the first trains of the unit to arrive in the detraining area. Part of the headquarters should remain in the old area until the last of its unit leaves.

■ 224. TRANSPORTATION GROUPINGS.—*a.* In general, complete units are sent from the same entraining points; this applies especially to administrative units, such as regiments. It facilitates loading, unloading, and assembly of organizations in the new area, and avoids divided responsibility with respect to order and police at entraining and detraining points. However, the movement of any unit requiring more than one train can be expedited by assigning it more than one entraining point. The tactical unity of battalions should be maintained, and unless unavoidable, movements of a battalion should not be split between days.

b. The basic units for rail transportation of the division artillery are the gun or howitzer battery and the regimental headquarters battery. Unit train accommodations in excess of a battery's requirements are filled by detachments from other division artillery units and medical troops; such detachments should be adequate for the handling of the impedimenta and animals accompanying them. This rule also applies to subdivisions of a gun or howitzer battery detached by reason of being in excess of train accommodations for the battery.

c. Entrainment should be such as will expedite detrainment and tactical employment. To this end, for example, a piece and its caisson, a reel and cart, etc., should be grouped on the same flat car; the animals of a section should be together; and personnel should be grouped by sections.

■ 225. ORGANIZATION AND PROCEDURE.—*a. Organization.*—Commanding officers of transportation groupings submit to their superiors for appropriate action the plans for entrainment and detrainment. Plans vary with the variation in loading facilities, number of entraining points, types of matériel, tractive power, and railway cars. The plan outlined

in the table below exemplifies an entrainment organization appropriate for horse-drawn artillery. With obvious modifications, the plan is suitable for entraining motor-drawn artillery.

Organization for entraining one third of a battalion of horse-drawn artillery

BATTERY COMMANDER

	Group I (vehicles)	Group II (animals)
In charge	1 officer	1 officer.
Assistants	Chief mechanic	Stable sergeant.
Property security	Detachment of the guard	Detachment of the guard.
Loading detail	Carpenter; detail of enlisted personnel not mounted.	Horseshoers; stable orderlies; mounted enlisted personnel; teamsters.
	Group III (baggage)	**Group IV (personnel)**
In charge	1 officer	1 officer.
Assistants	Supply and mess sergeants	First sergeant.
Property security	Detachment of the guard	Guard (less detachments).
Loading detail	Cooks; saddler; other mechanics; detail of other enlisted men not mounted; personnel released from groups I and II.	Battery clerks; personnel not required by other groups; personnel released from group III.

b. Procedure.—The organization shown in the table in *a* above should function in the following manner:

(1) Railway cars are inspected by the battery commander and the group leaders sufficiently in advance of arrival of the command so that cars found unsuitable may be made ready for use before the hour of entraining.

(2) The unit and detachments from other organizations that are to travel in the same train are inspected and, when found to be ready to entrain, are marched, group III detached, to the vehicle cars. Group III is dispatched to the entraining point independently where preparation of

the kitchen car and loading of rations, forage, and baggage are methodically and promptly accomplished.

(3) Overcoats, raincoats, canteens, saddle bags (grain bags inside), saddle pockets, haversacks, musette bags, side arms, and special individual equipment are taken into personnel cars by individuals. Blanket rolls, bedding rolls, and carriage accessories are loaded with other baggage. If troops are transported in box cars, they retain their blanket rolls. Harness, saddlery, watering buckets, and feed bags are loaded in the forage car. Until required for loading, the foregoing articles are piled on the ground and left under guard.

(4) At the vehicle cars, nonmounted men pack unsecured accessories in paulins, remove personal equipment, and pass watering buckets to drivers. Vehicles are spotted at the loading ramps by teams as called for, teams being unhitched and moved to the harness car in turn. Vehicles are loaded and securely chocked in place by personnel of group I. Its task completed, this personnel, carrying its equipment and carriage accessories, is reported to the group III officer, who causes it to load its blanket rolls and carriage accessories, and then releases it with its individual equipment to the group IV officer.

(5) Mounted men remove their equipment from the saddles and pack the harness and saddlery in sacks at the forage car. The mounted men, leaving these articles and the watering buckets in piles, lead their animals by team or section to the horse cars. The group II officer releases the personnel of his group, after loading the animals, to group III for the loading of saddlery, harness, watering buckets, feed bags, forage, and other impedimenta; it is then released, with individual equipment, to group IV.

(6) The group III officer releases cargo vehicles to group I for loading after the discharge of their last cargo including accessories and teamsters' blanket rolls.

(7) The group IV officer segregates personnel in detachments, each equal in number to the accommodations of the assigned car; each detachment consists of as many whole sections as practicable, under the command of the senior

chief of section. Detachments are loaded simultaneously shortly before the train departs.

■ 226. DETAILS OF LOADING.—Details of loading animals and matériel are covered in FM 25–5 and FM 25–10.

■ 227. DETRAINING.—Personnel vacates cars; horse equipment, bedding rolls, and accessories are unloaded; animals are detrained in the reverse order of loading; teams are harnessed and mounted equipment adjusted; teams are then moved to the vehicle cars. Vehicles are unchocked and unloaded in the reverse order of loading and teams hitched. As cargo vehicles are hitched, they are moved to group III cars and loaded. A place of assembly is selected near detraining points but at such distance away as will obviate congestion. Each vehicle and artillery carriage is moved to the assembly point as soon as loaded and equipped. When the command is detrained and assembled, report is made to proper authority.

SECTION II

WATER

■ 228. REGULATIONS GOVERNING.—Army Regulations prescribe the rules governing embarkation, preliminary preparations, routine duties on board ship, debarkation, and the secrecy to be observed with respect to oversea movements.

■ 229. EMBARKATION.—Field Artillery will be embarked so as to expedite its tactical employment when such is expected upon debarkation. The battalion ordinarily constitutes the embarkation unit; in any event a gun or howitzer battery will be accompanied on the same transport by its impedimenta and by animals when feasible. Pieces, ammunition, ammunition vehicles, supplies, and prime-movers will be stowed on board in the reverse order of debarkation, thus conforming to the sequence of tactical requirements. When tactical deployment upon debarkation is not contemplated, embarkation may be such as will assure economical ship loading; to this end, personnel is not necessarily accompanied by its animals or impedimenta.

■ 230. MOTORIZED ARTILLERY.—Motorized artillery, as compared with horse-drawn artillery, is more suitable for unit loading, more economical in space, and more readily put ashore.

■ 231. ANIMALS.—Depending upon available facilities, animals may be embarked by being led up gangplanks or by being hoisted aboard. Animals may be similarly debarked or they may be required to swim ashore; as many as practicable should be led, while swimming, by personnel in small boats.

■ 232. DEBARKATION.—In landings on hostile shores, the debarkation of artillery impedimenta and animals on the beach is the function of field artillery personnel; operation of all ship appliances, including small boats and launches, is the duty of ship personnel.

■ 233. CARGO SPACE.—To aid in preparing reports as to cargo space required, the rule that a cubic foot of cargo is equivalent to 0.025 of a ship-ton should be applied; for example, allowing 300 cubic feet for an animal of average size, the application of the rule indicates that 7½ ship-tons are required per animal.

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