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FM 5-20 D

WAR DEPARTMENT FIELD MANUAL

cl, 14 Jan 55

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CORPS OF ENGINEERS

CAMOUFLAGE OF

FIELD ARTILLERY

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WAR DEPARTMENT • FEBRUARY 1944

MANUALS IN THE FM 5-20 SERIES

- FM 5-20 Camouflage, Basic Principles
 - FM 5-20 A Camouflage of Individuals and Infantry Weapons
 - FM 5-20 B Camouflage of Vehicles
 - FM 5-20 C Camouflage of Bivouacs, Command Posts, Supply Points, and Medical Installations
 - FM 5-20 D Camouflage of Field Artillery
 - FM 5-20 E Camouflage of Aircraft on the Ground and Airdromes
 - FM 5-20 F Camouflage of Antiaircraft Artillery
 - FM 5-20 G Camouflage of Rear Areas and Fixed Fortifications
 - FM 5-20 H Camouflage Materials and Manufacturing Techniques
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WAR DEPARTMENT,

WASHINGTON 25, D. C., 9 February 1944.

FM 5-20D, Corps of Engineers Field Manual, Camouflage of Field Artillery, is published for the information and guidance of all concerned.

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BY ORDER OF THE SECRETARY OF WAR:

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(For explanation of distribution symbols see FM 21-6.)

C O N T E N T S

This manual supersedes paragraph 31, FM 5-20, 1 June 1940.

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THE WHY OF CAMOUFLAGE FOR FIELD ARTILLERY

The importance of concealment to field artillery cannot be overstressed. There are three reasons why the enemy will do everything he can to discover the location of field artillery. The first, and obvious one, is to reduce our fire power. He will attempt to do this by counter-battery fire and by aerial attack. The enemy's second reason for trying to locate field artillery is because, if he has accurate information about the location of our batteries, he may be able to bypass them. Finally, by locating our artillery, the enemy can learn much about our plans. Camouflage is not merely a way of hiding from the enemy while you are on the defensive. Camouflage can be a highly effective weapon of surprise. Skillfully used, it will enable you to come unobserved within range of the enemy to deliver a sudden knockout blow.

What the enemy looks for.—Aerial observers are trained to search for certain definite signs which indicate the presence of artillery. Because a battery has from two to six pieces, the principal sign is a group of from two to six objects, revealed by imperfectly camouflaged gun positions, blast marks, litter around pieces, or wheel tracks where weapons were brought under cover.

FIGURE 1.—A battery exposed, as this is, by poor position and ineffective camouflage is not likely to be in action very long.



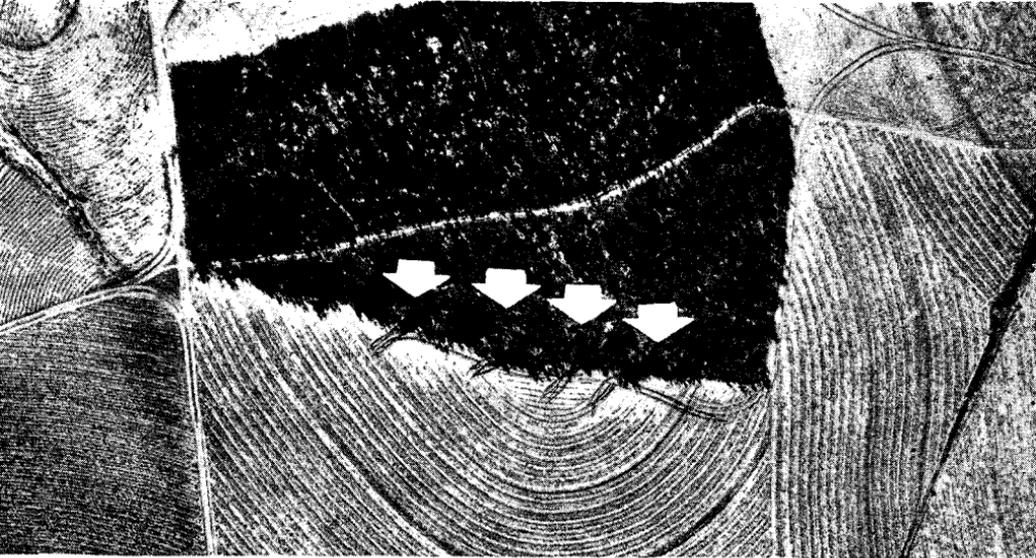


FIGURE 2.—Even though the battery is well concealed in woods, its location is no secret if careless tracks like these exist.

Other common signs are tracks made in bringing up ammunition, poorly maintained flat-tops which disclose the pieces, and cartridge cases. Even though weapons are hidden, such signs are indications of the presence of field artillery. Signs caused by activity around the battery position or the truck park—such as special trenches and spoil—may not, of themselves, indicate the nature of the position, but they do attract enemy attention, which may result in closer observation.

Choice of position.—All personnel should have a sense of the “air-view” and should learn to appreciate how the ground under their feet looks and photographs from the air. Information which will be of great value in the selection of battery positions can be obtained by studying air photographs of an area prior to occupying it.

A position enables the battery to perform its mission and should enable the battery to be concealed. Extensive reconnaissance may be necessary to satisfy these requirements.

Effect of situation on camouflage.—Camouflage measures will vary with each of the following:

1. Briefly occupied positions. There will be little opportunity to camouflage positions extensively which are expected to be occupied for a short time only. If it develops that the guns must remain longer, their locations should be changed.
2. Deployment for a co-ordinated attack. The location of each battery and of each piece should be carefully selected.
3. Defense. Extensive camouflage is developed in a defensive action. Utmost precautions must be taken to deceive the enemy as to the location of field-artillery installations.
4. Anti-tank mission. Special attention is given to camouflage against ground observation.

Concealment of ammunition.—Ammunition piles and pits in the battery dumps normally must be irregularly spaced, well dispersed, and varied in size. They are placed near or under brush, rock slides, road banks, and the like; around the base of large trees; or under low mounds of leaves. Fresh dirt from all excavations is concealed. In areas which contain straight lines, such as hedges or walls, ammunition can be stacked parallel and close to such features. Pits and piles are located so they can be reached by concealed routes. When foliage is scanty, it is especially important to avoid making new trails. Aerial photographs can pick up tracks through thin foliage and can also spot ammunition piles if not well concealed. For further details on camouflage of supply points see FM 5-20C, Camouflage of Bivouacs, Command Posts, Supply Points, and Medical Installations.

Truck park.—The truck park should be located in a well-concealed area several hundred yards from the battery position. For camouflage of truck parks see FM 5-20B, Camouflage of Vehicles.

Observation and command posts.—Observation posts should not be placed in the most obvious positions because the enemy will examine those areas minutely (fig. 5). The camouflage problem of observers is similar to that of front-line infantry, and all personal concealment measures should be taken (FM 5-20A). Command posts and fire-direction centers require especial care in concealment and in camouflage discipline because of their importance to operations and the large amount of traffic to them. Flat-tops, as low as possible to the ground to minimize detection by oblique observation, may be used to cover fire-direction crews, maps and equipment.

Radio vehicles are necessary around the command post and fire-direction center. They should be dispersed and concealed. In some places they may be dug in and covered with nets. In certain situations the only solution may be to disguise the vehicles to resemble general-purpose vehicles by adding bows, tops, and false hoods.

FIGURE 3. — Ammunition draped to resemble stacks of baled hay.

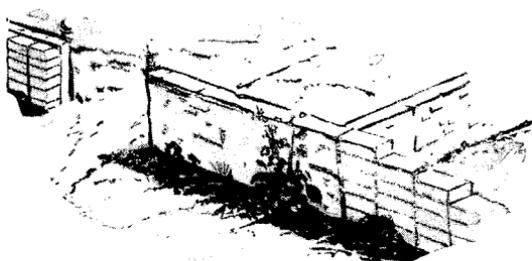


FIGURE 4.—Ammunition is concealed by stacking beside or in extension of a wall.

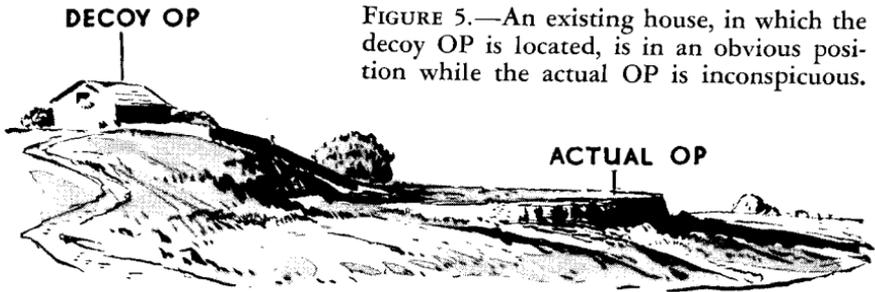


FIGURE 5.—An existing house, in which the decoy OP is located, is in an obvious position while the actual OP is inconspicuous.

Vehicles must not approach the command post except by existing roads, and then only when they can halt under good cover. Guards are posted to stop vehicles and cause the occupants to dismount; vehicles are then parked in concealed areas. Where the command post is reached over ground that shows tracks, the tracks must be carried past the command post to a logical termination some distance away.

Occupation of position.—In occupying a position, routes of approach must be carefully reconnoitered in advance. Guides direct the incoming battery to the previously selected turn-off and prevent unauthorized turn-offs. Vehicles which are not needed at the position itself are guided to the truck park. Prime movers and other vehicles which are needed are guided individually to their proper place. After the pieces are uncoupled, the prime movers are led by individual guides to the truck park.

Existing routes into and throughout the battery position are used whenever possible, even at the sacrifice of convenience.

Camouflage inspection.—As soon as the position is occupied, an immediate inspection—including aerial observation and photographs, when possible—is made to ascertain additional camouflage requirements.

FIGURE 6.—OP in a village roof from which a slate has been removed.





FIGURE 7.—Small trees bent and wired together over gun position.

CONCEALMENT WITHOUT THE

A position which is well located in relation to the surrounding terrain may often be concealed by using natural materials only. For principles of proper choice of position see FM 5-20, Camouflage, Basic Principles. Good concealment can usually be found among large trees. However, a battery must be located in woods so that slashings which will disclose the position are avoided. If it should become necessary to cut down trees to prepare a position, small standing trees may be bent and wired together to mask the exposed area (fig. 7).

Terrain with scattered trees and bushes presents a confusing pattern to the aerial observer. An irregularly dispersed battery can be hidden in such terrain by using cut brush to supplement natural concealment. This kind of terrain is often more desirable than thick woods because the line of fire is usually unobstructed.

In open country it is difficult to conceal battery installations completely from aerial observation without the use of artificial materials.

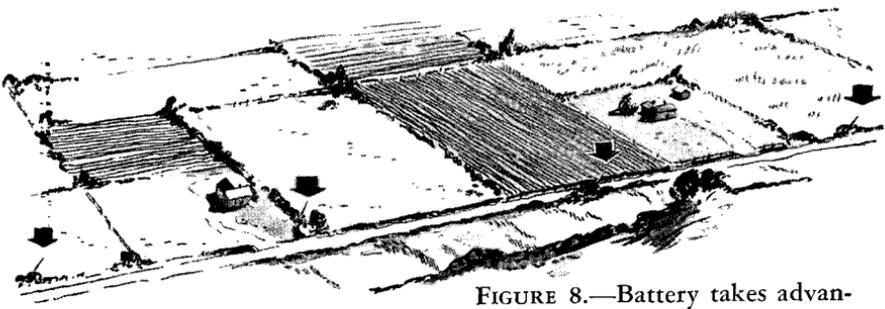


FIGURE 8.—Battery takes advantage of natural terrain features.

FIGURE 9.—Emplacement of piece makes it seem part of ruin, but flying stones may be dangerous.



AID OF ARTIFICIAL MATERIALS

Positions in hedge lines, brush patches, overgrown gullies, dry washes, and folds in the ground furnish partial concealment, however (fig. 8). Existing roads and paths should be used as far as possible.

Positions in towns or near groups of farm buildings offer good possibilities for concealment. There are existing streets or roads to conceal tracks. Debris, such as timbers and rags, furnishes camouflage materials. A few boards or laths leaned against the wheels of the piece and some rags draped over the muzzle are often all the concealment needed (fig. 10).

In fixed positions, revetments and other construction work should be made to conform in appearance to the particular building outlines and terrain forms which are present in the surroundings. For instance, if the position is on the site of a wrecked building, jagged rather than straight lines should predominate.

FIGURE 10.—Skillful use of boards and boxes "links" this piece to debris.



AIDS TO CONCEALMENT

Under Special Conditions

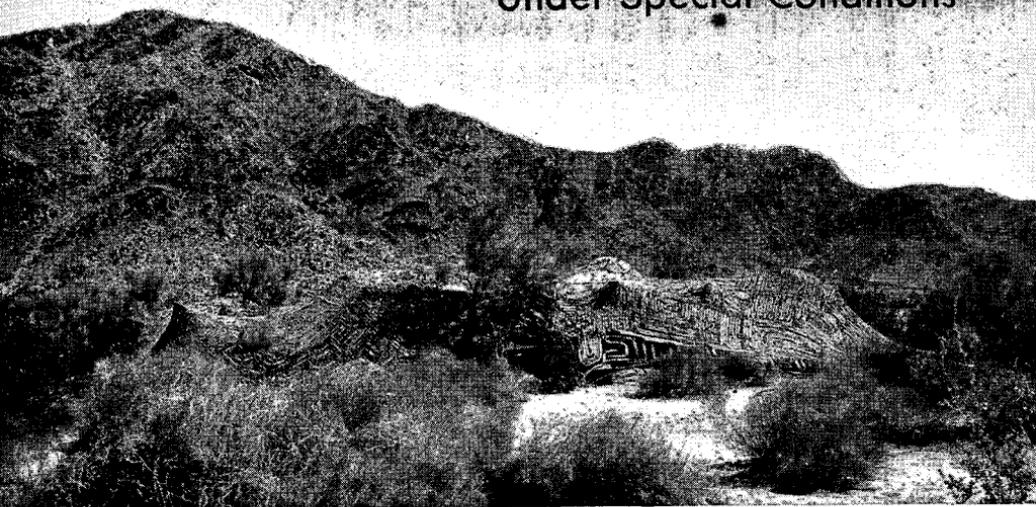


FIGURE 11.—155-mm howitzer concealed beneath draped garnished net. Quick-opening embrasure (see figs. 24 and 25) clears howitzer for firing instantly. Rear portion of howitzer remains covered at all times.

Close
FIGURE 12.—Embrasure of nets joined with quick-release device shown in figures 24 and 25.



In a desert or wherever vegetation is sparse, suitably colored drapes of either twine or shrimp net are a quick and effective means of concealment. They are particularly useful in concealing weapons in mobile situations.

Care should be taken to follow correct principles in their use. They must be large enough to conceal the space required to service the piece as well as the piece itself. Drapes must be propped up so that they do not touch the piece. The angle of slope to the ground should be no more than 15° from the horizontal. To conceal a position adequately, it is usually necessary to join several nets together.



FIGURE 13.—Gun in action. Except for embrasure, camouflage remains in place. Embrasures can be closed quickly after fire mission is complete, or, if piece is moved, drape can be removed quickly.



FIGURE 14.—British 25-pounder position located against an escarpment. Use was made of dummy stones in blending position with background.

An example is shown in figures 11 and 12. A 155-mm howitzer is concealed under the nets from net set No. 2 garnished to blend with the terrain. The embrasure is closed with a quick-release device (figs. 12, 24, and 25). The jointed nets are draped over the piece with the embrasure directly over the tube.

Four main props were used: one at each side of the shield to ensure headroom for the crew operating the howitzer, and one on each side of the tube. The latter two point outwards and fall when the embrasure is released for firing. Additional lower props were placed where necessary. Extension nets were added to the center net to keep the angle of slope to a minimum.

Drapes used in this way eliminate the shadows cast by flat-tops, which contrast strongly with the light background of desert terrain and which are certain to engage the interest of enemy aerial observers.

Full advantage is taken of terrain irregularities. The low mound formed by a properly garnished drape is hard to find from the air.

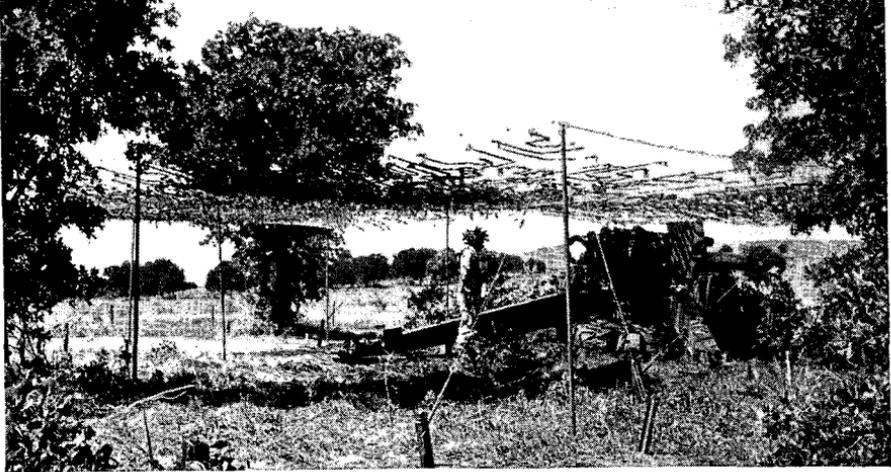


FIGURE 15.—Camouflage aided by proximity of overhead growth.

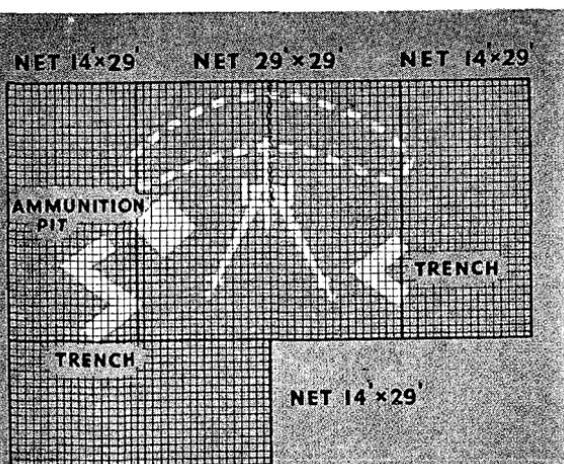
ARTILLERY NET SET No. 2

For Light and Medium Field Artillery

This net set (figs. 15 through 23) is organic equipment for concealment of light and medium field-artillery weapons in hasty, surface-type positions. Weapons concealed by this set include: 105-mm howitzer M2, 155-mm howitzer M1917A4 or M19188A3, 155-mm howitzer M1, and 4.5-inch gun M1.

In this set are prefabricated materials for erection of a main flat-top 29 feet square with a 14-foot slit embrasure in the center of one side, three extension flat-tops 14 by 29 feet, and necessary spare parts. A 12-pound sledge is included for driving stakes (fig. 17).

FIGURE 16.—One possible plan of net set and surface emplacement.



Components

- A Three extension frames.
- B One garnished main net.
- C Two carrying bags.
- D Main frame.
- E Three garnished extension nets.
- F Thirty stakes.
- G Thirty guy cables.
- H One 12-pound sledge.
- I Carrying bag straps.
- J Eighteen poles.

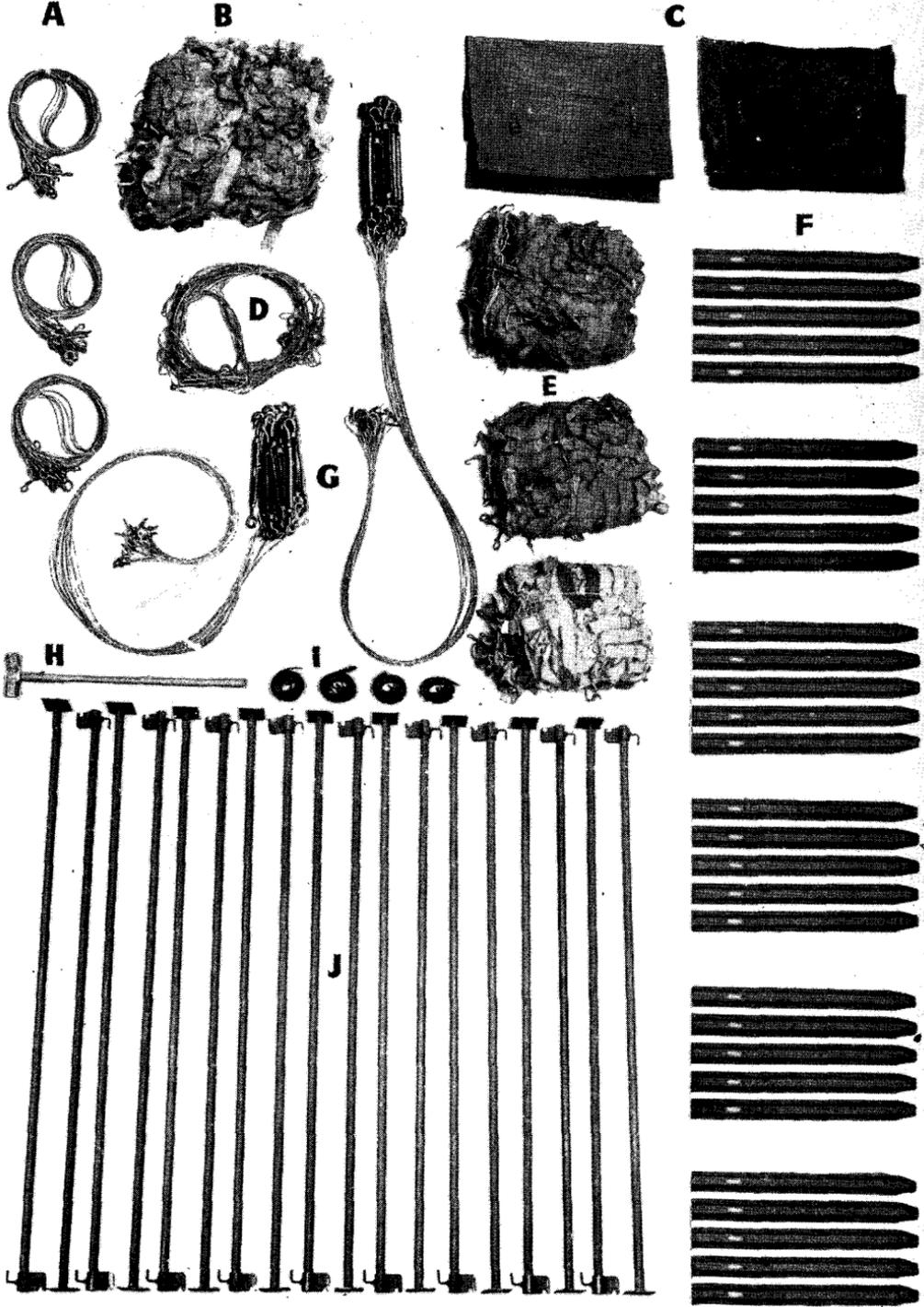
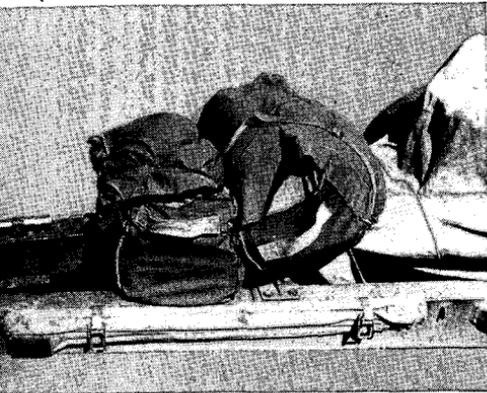


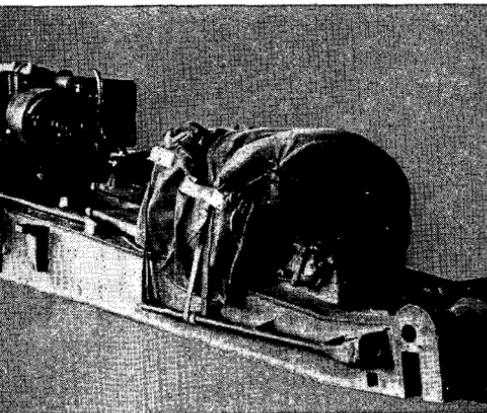
FIGURE 17.—Components of net set No. 2.



FIGURE 18 ①. — Poles, stakes, and sledges are carried under seats of prime mover. Nets, frames, and guys are carried in canvas bags attached to the trail of the piece.



②. — On 105-mm howitzer M2, bags are strapped around cradle traveling lock. Spreading trails allows bags to fall to ground.



③. — Bags attached to trail of 155-mm howitzer M1 or 4.5-inch gun M1. Straps loop around maneuvering handles, pass under bag handles, and fasten across tops of bags. Released by unbuckling.



④. — Bags attached to 155-mm howitzer M1817A4 or M1918A3. Straps cross on top and loop around side rods of loading barrow. These are released by removing fastening pins of loading barrow.

Rest.



FIGURE 19.—Portion of 155-mm howitzer battery showing effect of tying in flat-tops with existing scattered trees **A** and **C**. **B** shows conspicuousness of position in open terrain.

Choice of position.—Careful choice of position is the most important factor in successful concealment. A desirable position allows the field of fire necessary for the mission and possesses as much natural concealment as can be secured without compromising the mission. Access routes may be existing roads or, if necessary, new tracks located under overhead cover or along natural terrain lines; or, if exposed, extended past position to another logical termination.

The location of each piece should be chosen to gain maximum benefit from existing trees and bushes. Trees and bushes are particularly helpful in preventing detection of the position from low oblique observation, as shown in figure 19.

Erection of net set No. 2.—This net set is erected after the piece is placed in position. When attaching nets to the wire frame, care should be taken to have the embrasure opening in the net coincide with the embrasure release devices in the frame.

For erection procedure, see figure 20.

near

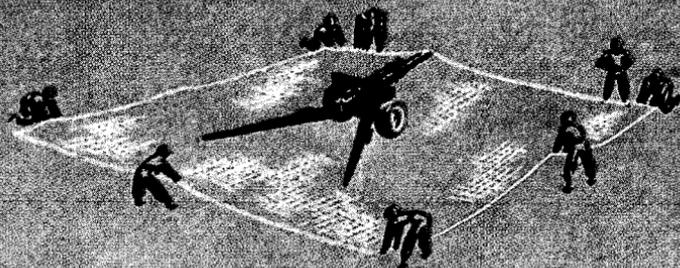
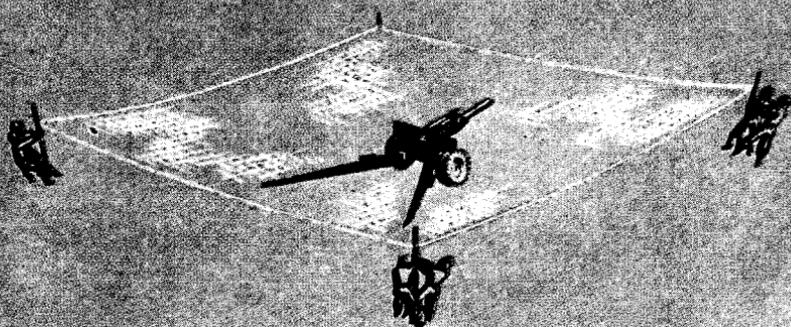
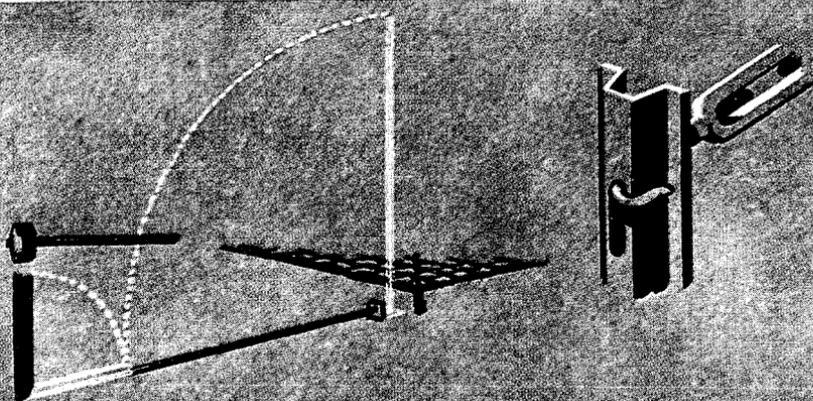


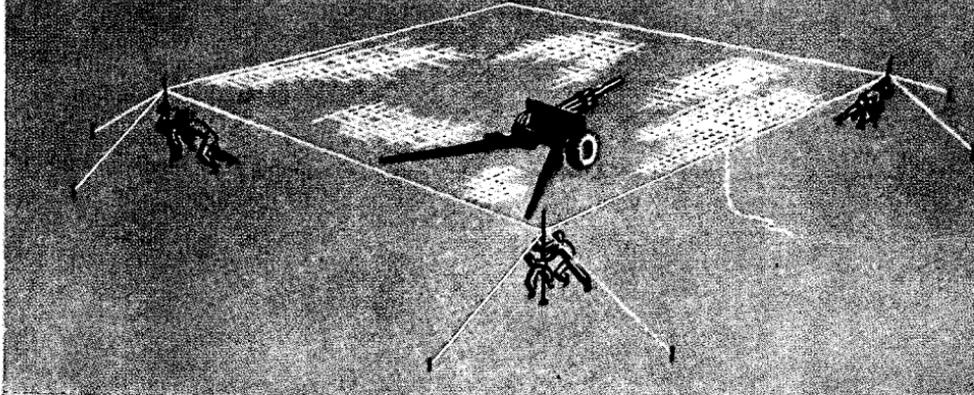
FIGURE 20 (a).—Main net (attached to frame) placed over piece with embrasure over tube.

(b).—Corners of net pulled out shoulder high while positions of corner poles are marked. Alternate procedure is to use a previously prepared knotted square of tracing tape.



(c).—Stakes are driven at a distance equal to the length of one pole and one stake from the marked corner position. Guy cables are hooked with turnbuckle through hole in stake.

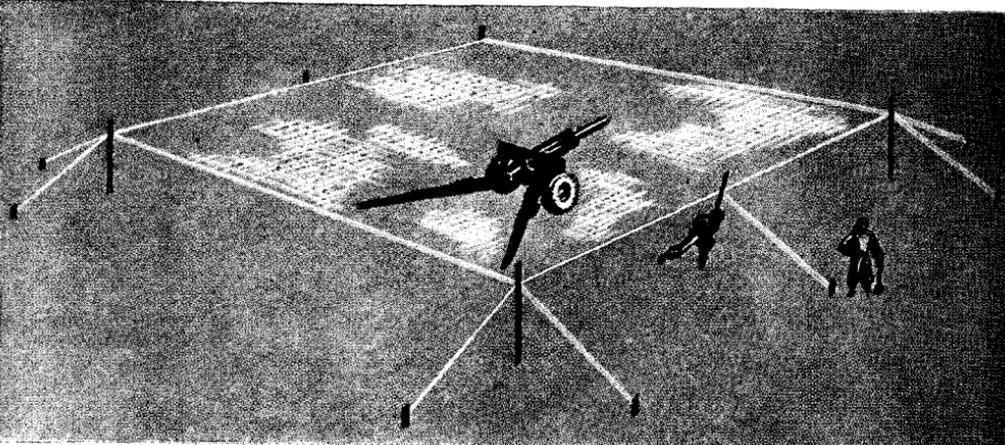




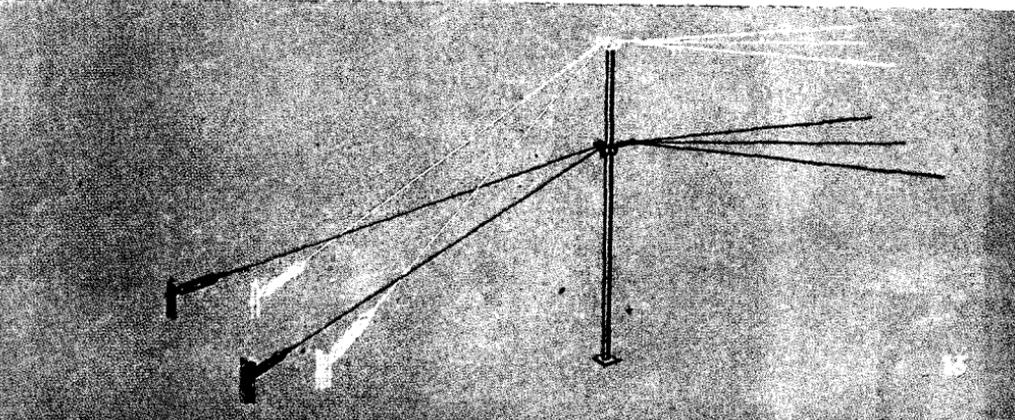
(d).—Toggles of guy cables are hooked through double-eye connector. Place connector in slot of bracket. Net is erected by pushing poles upright.

(e).—Locate fifth and sixth poles at center of sides parallel to embrasure and drive stakes in a similar manner. Tighten turnbuckles until net is flat.

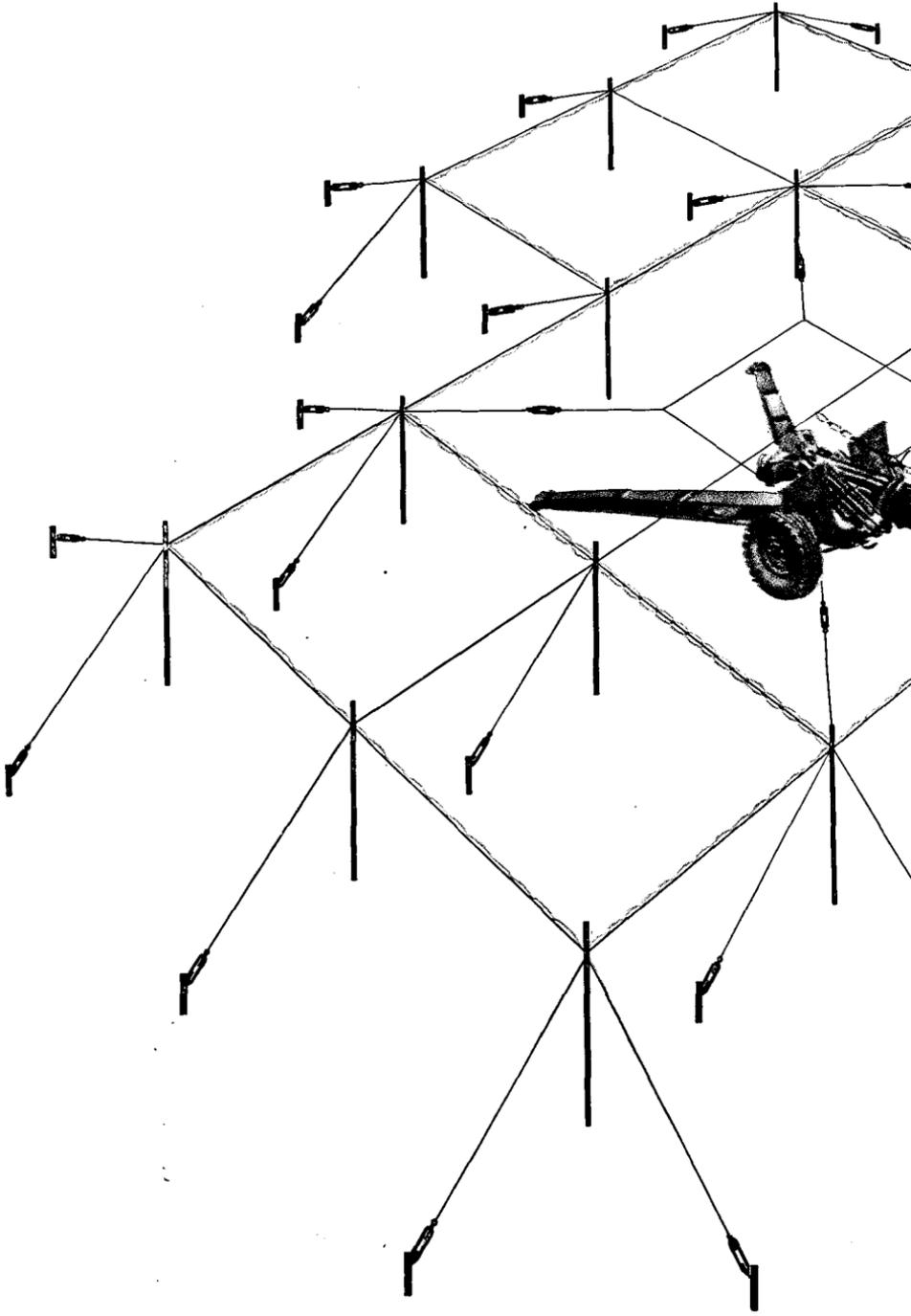
Rec.



(f).—Sliding bracket can be adjusted to compensate for uneven ground, but stakes must then be located by measuring with guy cables.



rear



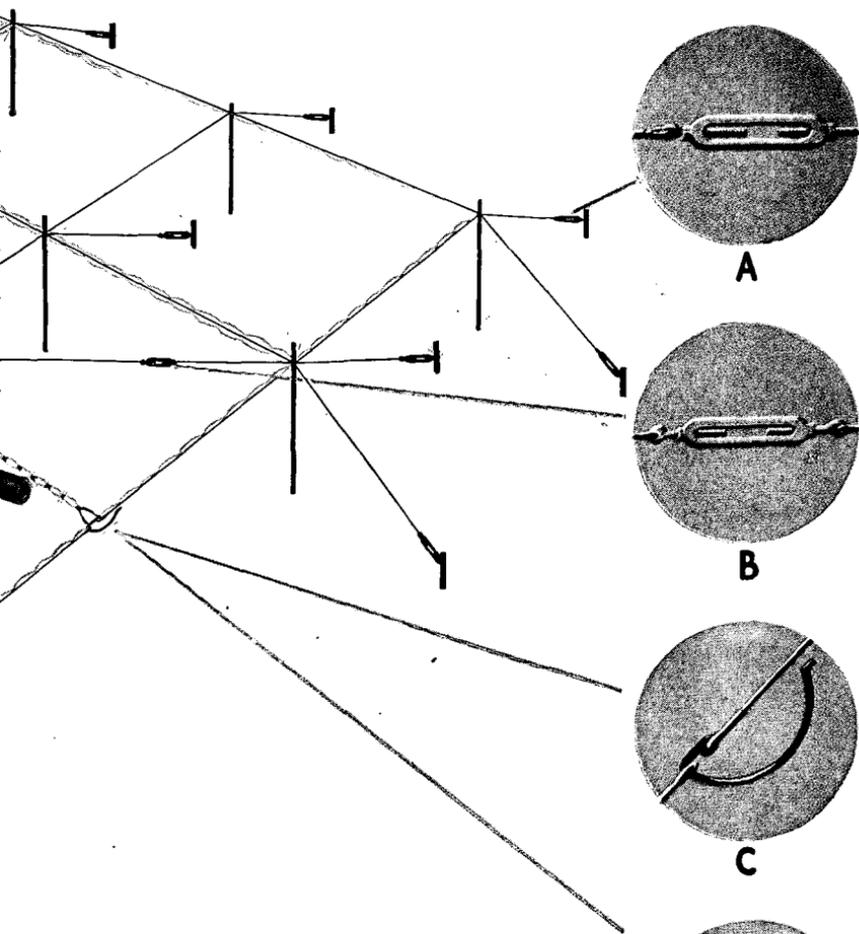


FIGURE 21.—Diagram of net set No. 2. Garnished nets have been omitted. One extension is located at either side of the main net and one extension at the rear in a position which will give the most effective coverage for the weapon. Nets should be left attached to frames at all times.

- A Turnbuckle for adjustment of guy cable.
- B Turnbuckle for adjustment of main frame.
- C Cable release closed.
- D Cable release open.

rise

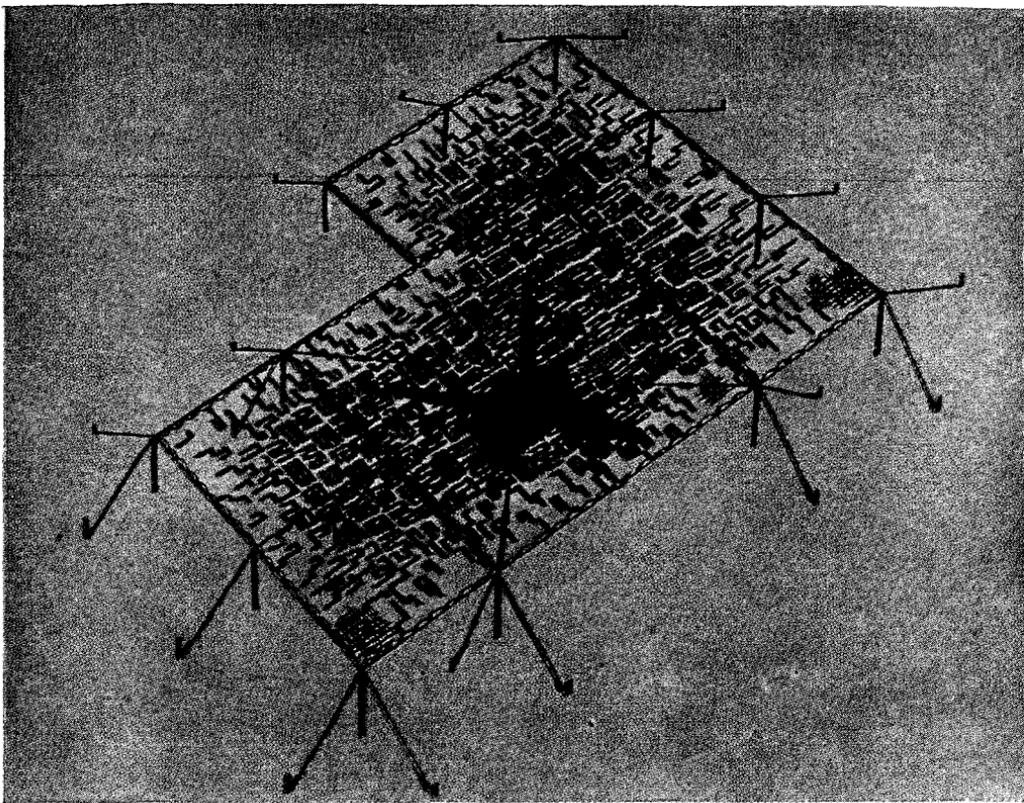


FIGURE 22.—All four nets are garnished as one unit. The thickly garnished edges of these extension nets are placed next to the main net, with the thinly garnished edges outside. Any gaps in the garnishing must be filled.

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Operation of embrasure.—To open the embrasure, the free end of the quick-release device in the net is first pulled. Then the outer cable release is tripped, and if necessary the inner release as well. This permits the net to drop down so that it will not interfere with elevating the tube and will not be damaged by muzzle blast. To close the embrasure, cable releases are engaged and closed, then the slit in the net is joined by the quick-release device (see figs. 24-29).

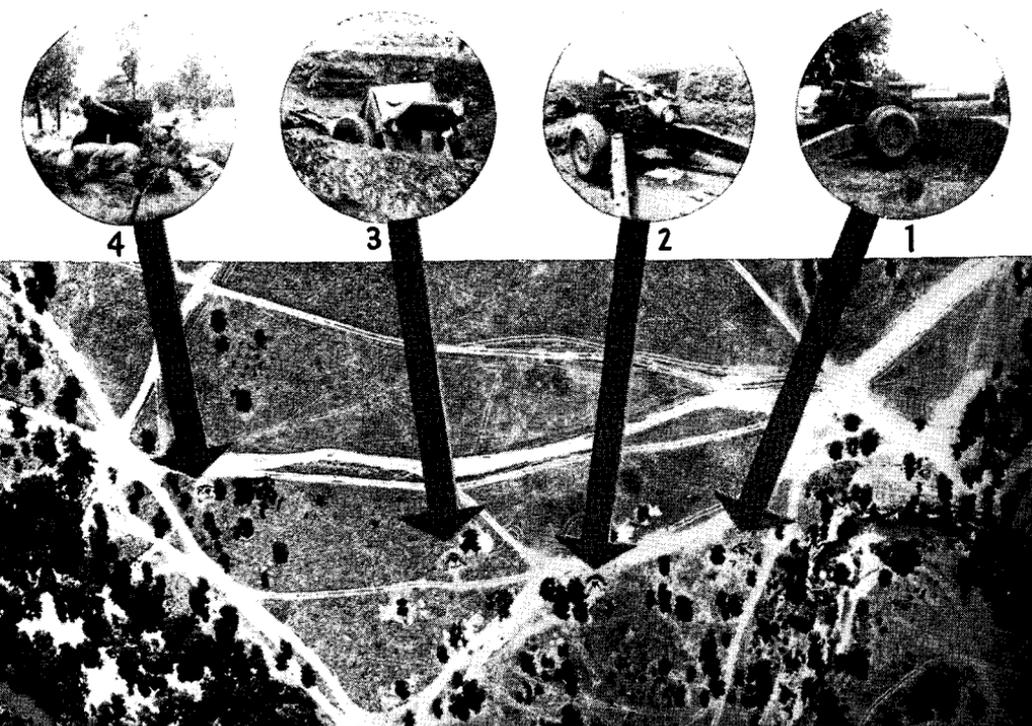


FIGURE 23 ①.—Uncamouflaged medium field-artillery pieces. Nos. 1 and 4 in surface positions. Nos. 2 and 3 in dug-in emplacements.

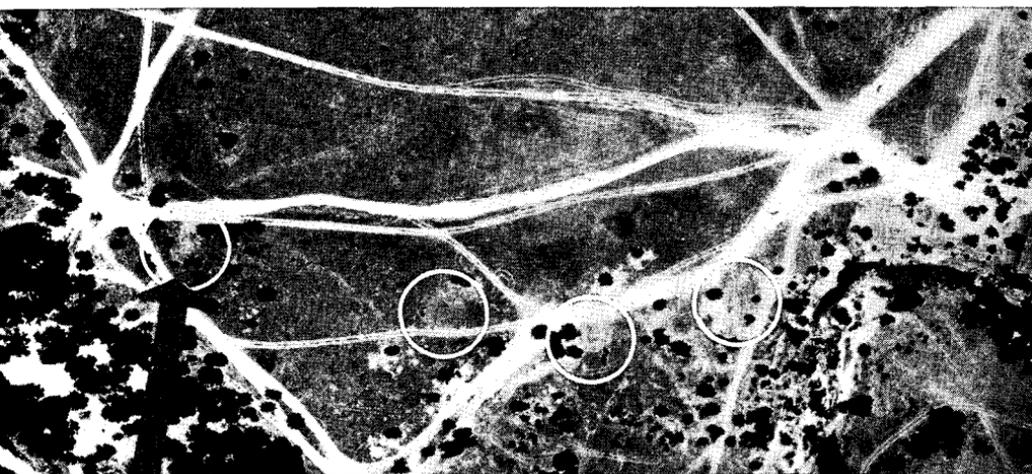


FIGURE 23 ②.—Same pieces under flat-tops. No. 1 well concealed. No. 2 shows spoil outside heavily garnished part of flat-top. Spoil and withered sod of No. 3 are conspicuous. No. 4 net, too thinly garnished, shows trampled area.



QUICK-RELEASE DEVICES

The hinge-and-pin device in figure 24 opens nets instantly and is the most efficient of the many quick-release devices tested and in use. It is standard equipment on net sets Nos. 2, 5, and 8 and is available for net sets issued prior to its development which have a ring-and-loop device (fig. 26). The hinge-and-pin device is used only to join nets. Cables forming supporting frame for nets are joined at the embrasure by a cable-release device (figs. 28 and 29). Figure 25 illustrates an expedient device made with .50-caliber machine-gun clips.

FIGURE 24 ① and ②.—Hinge and pin. A male and a female hinge, crimped to net edges at points opposite each other, are locked together by a pin. When cord which joins them is pulled, all devices open at same time. Details: A. Side elevation of hinges. B. Hinges joined and crimped to edges of nets. C. Distance between hinges. Few inches of slack in cord connecting pins permits device to be locked easily.

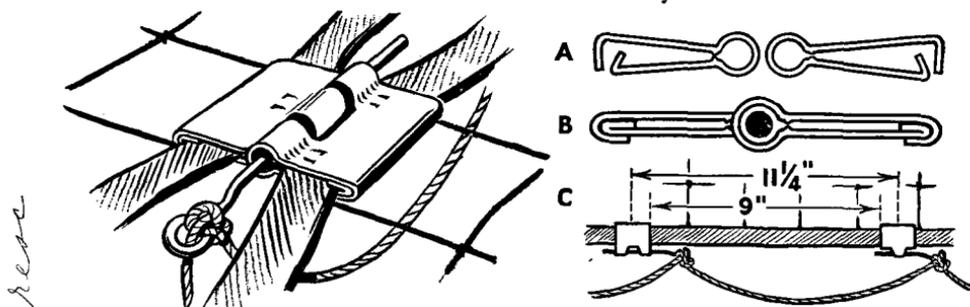


FIGURE 25.—Caliber .50 machine-gun clips, an excellent expedient. At each interlocking point a clip is fastened to each net in such a way that a 60d nail, joining them, passes through three rings. Cord is attached to nails as in figure 24.

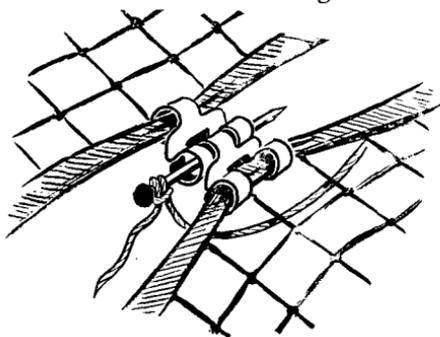


FIGURE 26.—Ring and loop, another expedient. It cannot open as quickly as either a hinge and pin or machine-gun clips, since it depends on progressive action.

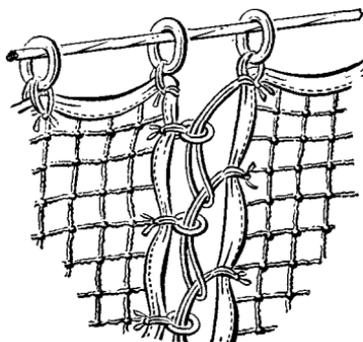




FIGURE 27.

CABLE-RELEASE DEVICES

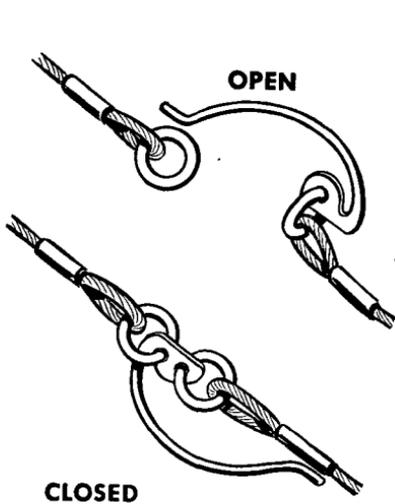


FIGURE 28 ① and ②. — Goose neck, formerly issued with net sets, replaced by cable release in figure 29. A useful expedient when new device is not available, it can be simply made by a blacksmith.

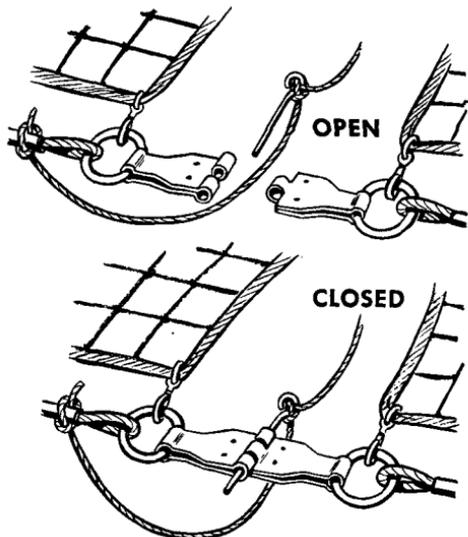


FIGURE 29 ① and ②.—New cable release for cable frames which support nets is opened by a pull cord and can be operated from a distance, a great advantage over the goose neck, tripped by hand.



FIGURE 30.—Net set No. 5 erected over a 155-mm gun, M1.

ARTILLERY NET SET No. 5

For 155-mm Gun and 8-inch Howitzer

read

Net set No. 5 is organic equipment for the concealment of 155-mm guns M1, M2, M3, and modified GPF, or 8-inch howitzers in surface emplacements such as shown in figure 30.

This net set (figs. 30 through 38) contains prefabricated materials for the erection of a flat-top approximately 60 feet square with a 30-foot embrasure. Component parts of the set are shown in figure 32.

As in all concealment, good choice of position is vital. In addition to providing the field of fire required for performance of the mission,

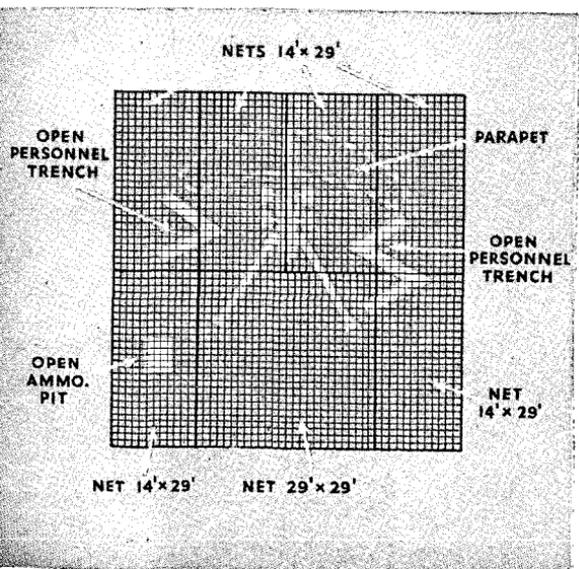


FIGURE 31. — Diagram of flat-top constructed with net set No. 5, showing position of flat-top in relation to piece and entrenchments.

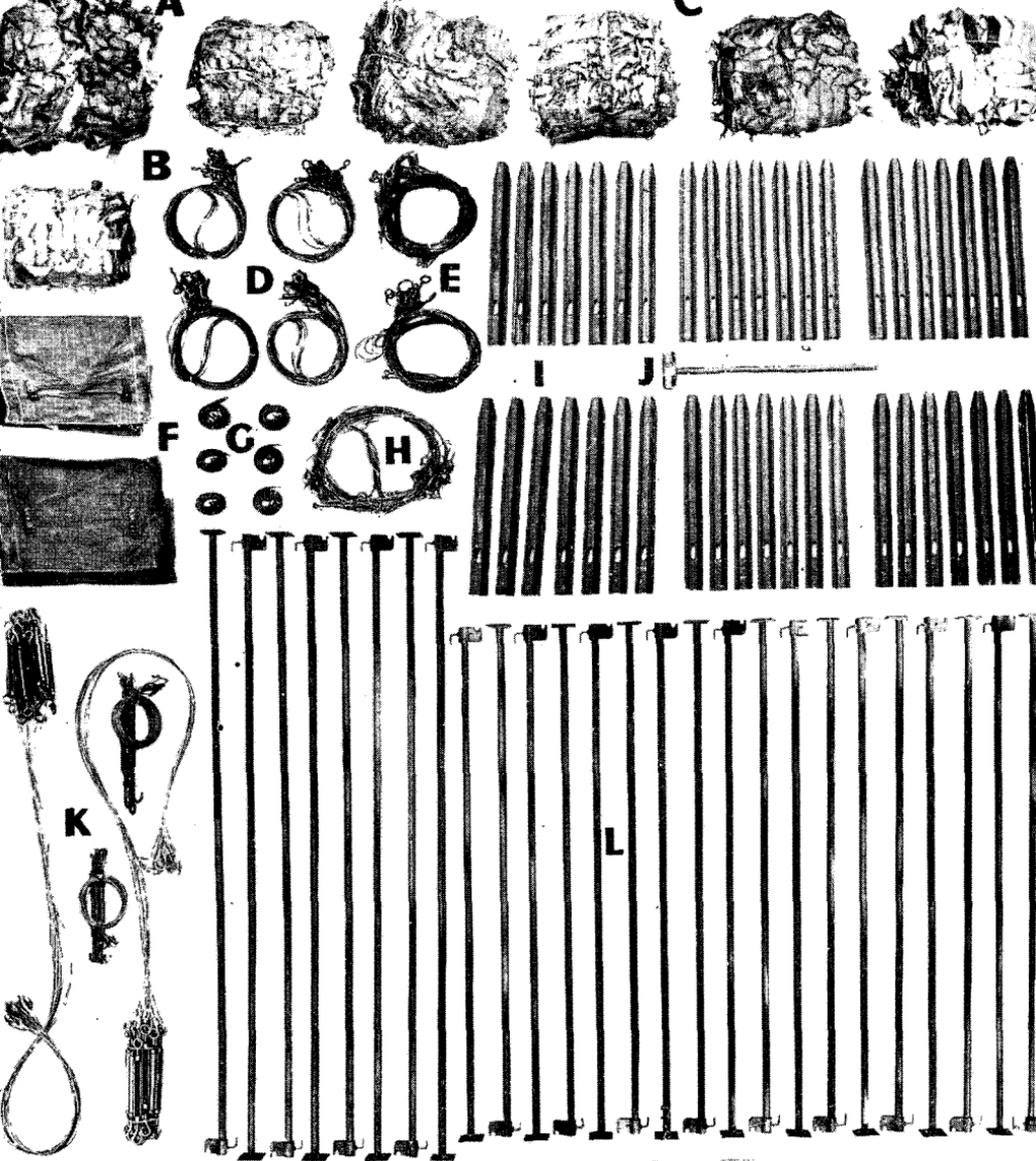


FIGURE 32.—Component parts of net set No. 5:

- | | | | |
|---|-----------------------------------|---|------------------------|
| A | Main net, 29 ft. sq. | G | Carrying-bag straps. |
| B | Two embrasure nets, 14 by 29 ft. | H | Main net frame. |
| C | Four extension nets, 14 by 29 ft. | I | Stakes. |
| D | Four extension net frames. | J | 12-pound sledge. |
| E | Two embrasure net frames. | K | Guy cables for frames. |
| F | Carrying bags. | L | Posts for frames. |

a desirable position affords some natural concealment as well as inconspicuous means of access. By tying-in with existing terrain features, such as bushes, trees, and broken ground, better concealment from low-altitude oblique observation is obtained (fig. 36).

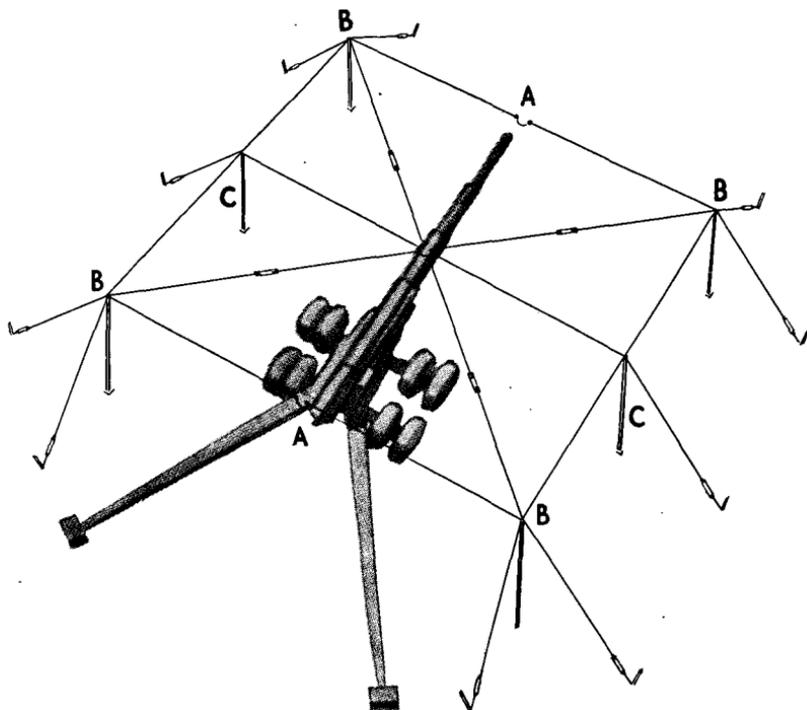
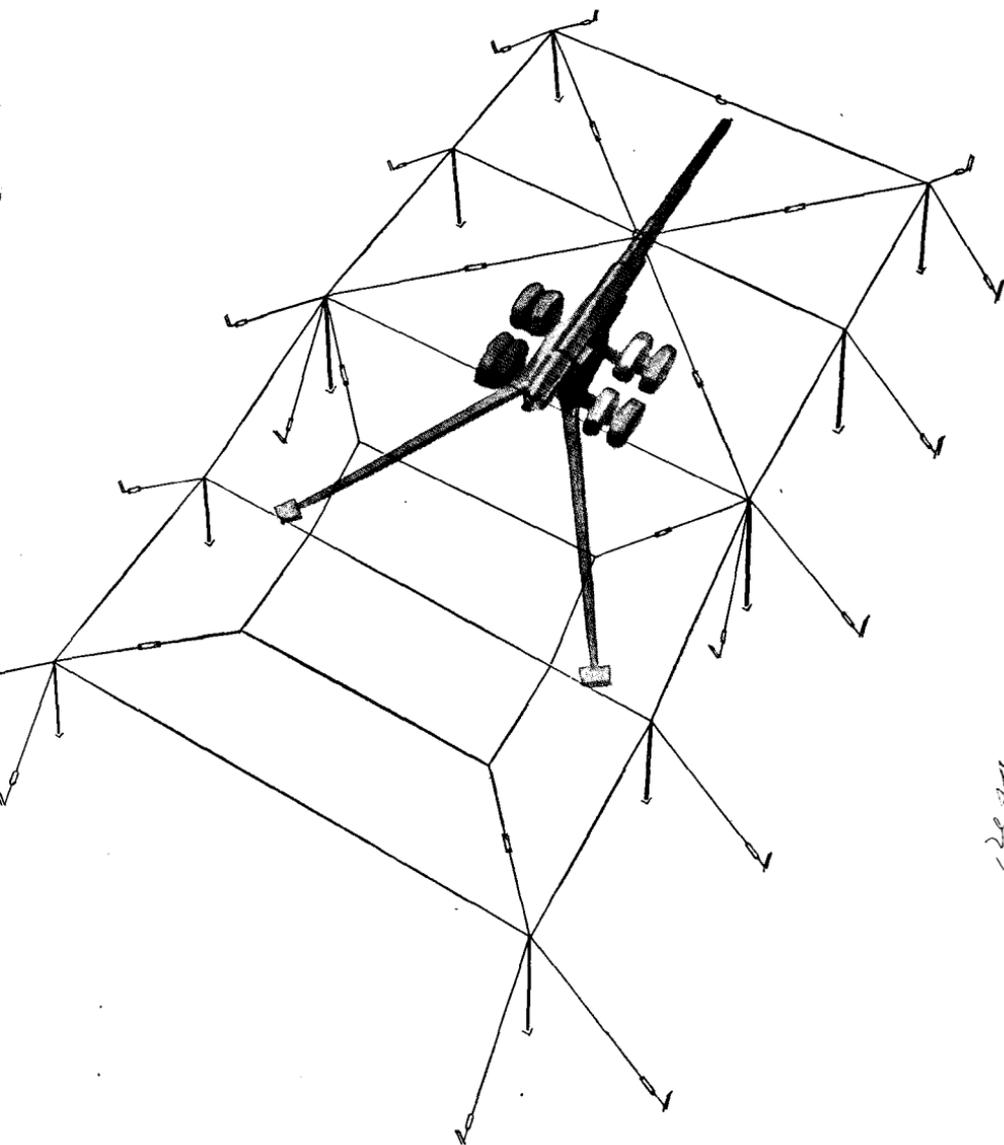


FIGURE 33.—Erection diagram of embrasure frame with garnished nets removed. In erection, the embrasure frame with net attached is first laid out and centered laterally over the tube, **A-A**. The embrasure is closed. Six $8\frac{1}{2}$ -ft. posts and ten long guys are used. Double-eye connectors are inserted in bracket slots on four corner posts at **B** and raised by two men at each corner. Points where the posts rest on the ground are marked. The net is lowered. Positions for the eight corner stakes are measured by laying a post and a stake end to end in prolongation of each side of the frame. Stakes are driven. Guys with turnbuckles fully extended are attached to frame and stakes and the flat-top is raised. Intermediate stakes and posts at **C** are located, guyed, and erected in the same manner. Turnbuckles are tightened until net is smooth and taut.

FIGURE 34.—Erection diagram of main frame. Main frame with net attached is erected over the trail and breech behind the embrasure flat-top. The two rear $8\frac{1}{2}$ -ft. posts of the embrasure flat-top are used as the front corner posts of the main flat-top. In order to allow for uneven ground, all posts have sliding brackets which may be adjusted as required.



120000

2622

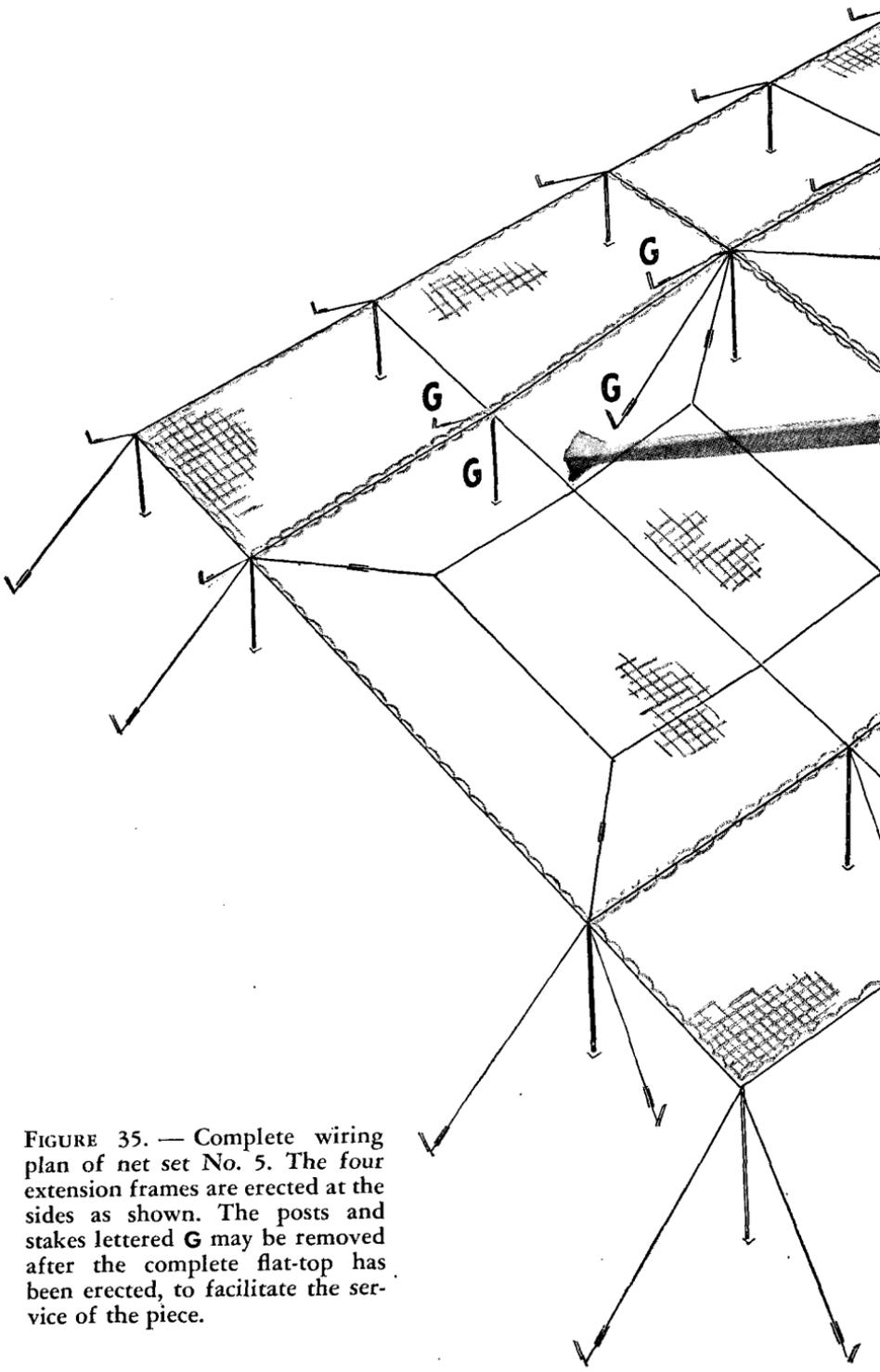


FIGURE 35. — Complete wiring plan of net set No. 5. The four extension frames are erected at the sides as shown. The posts and stakes lettered G may be removed after the complete flat-top has been erected, to facilitate the service of the piece.

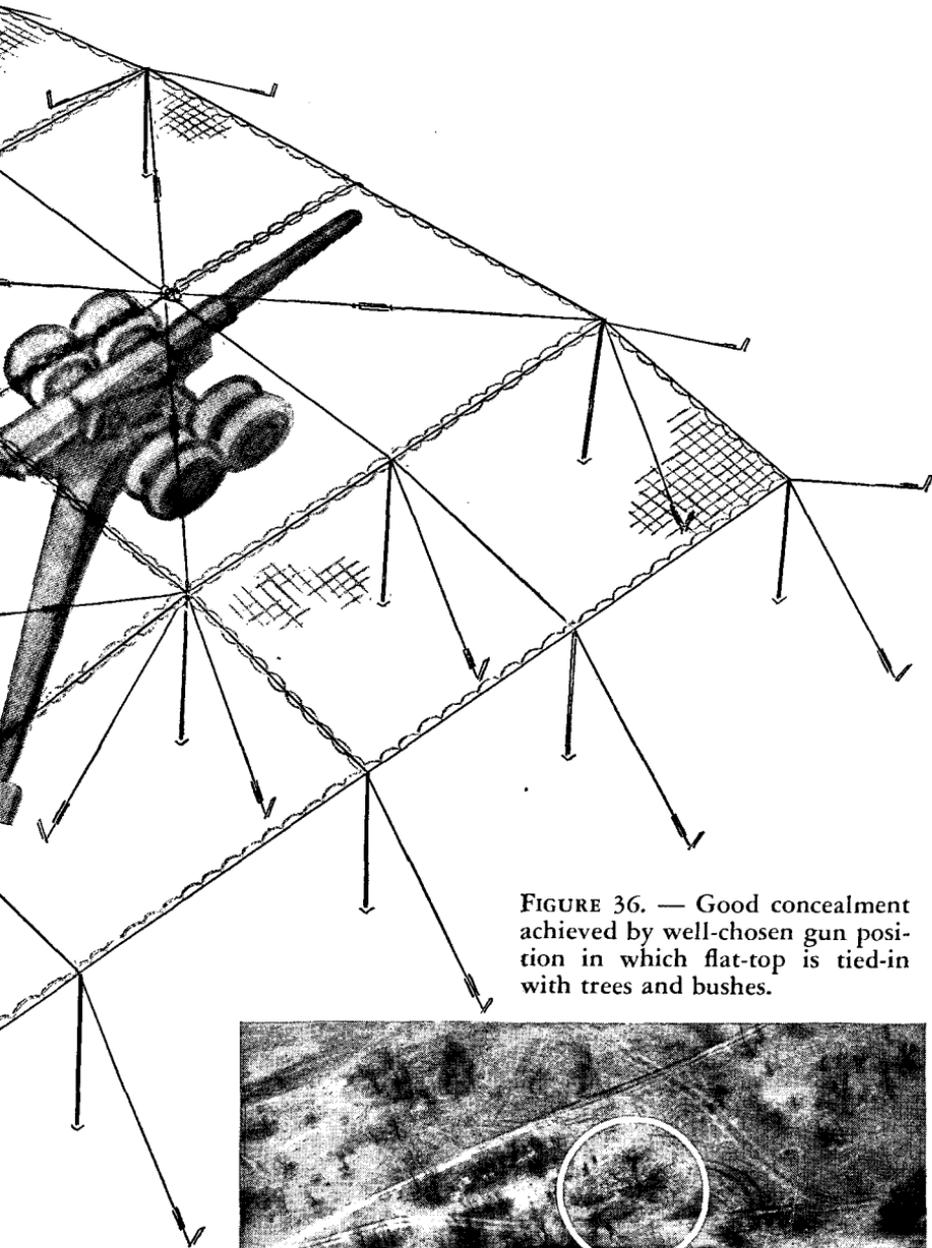


FIGURE 36. — Good concealment achieved by well-chosen gun position in which flat-top is tied-in with trees and bushes.



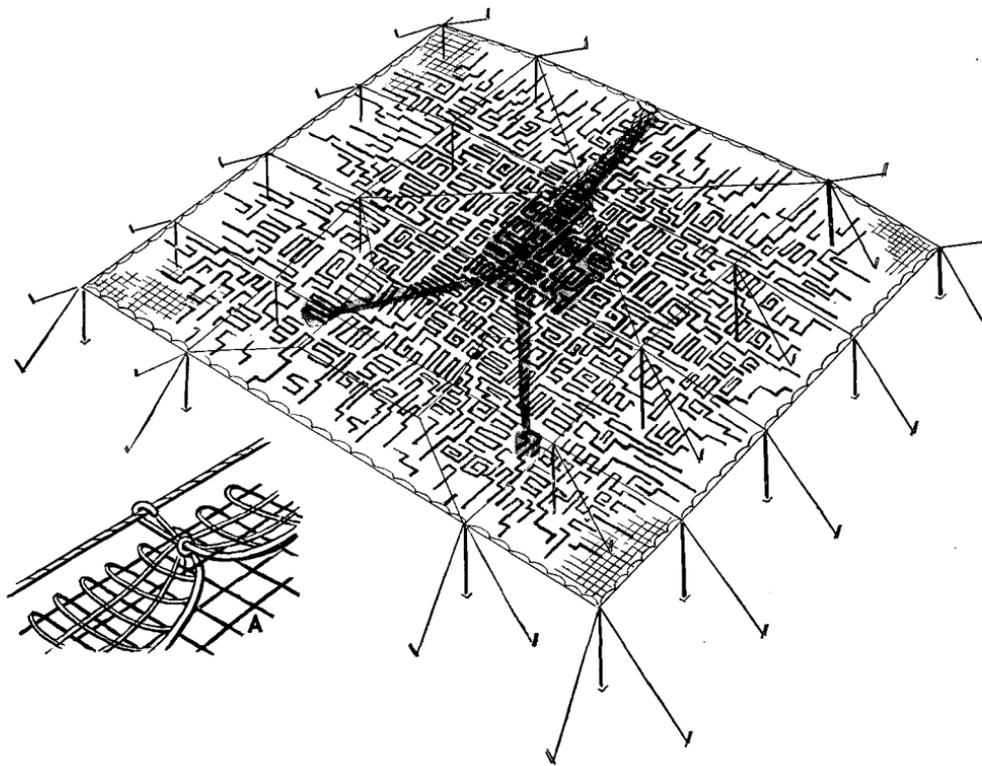


FIGURE 37.—Completed flat-top with seven garnished nets in place. Detail **A** shows method of taking up slack in nets.

The component nets of set No. 5 are garnished as a unit. When attaching nets to embrasure frame, make sure the thinly garnished ends are placed in the direction of fire. After being attached to the perimeter cables on three sides, by spring-tong fasteners, the nets are joined down the center with a quick-release device (figs. 24-29). All fasteners should face down. The extension nets, which are heavily garnished along one side, are placed with the thinned-out edges to the outside. If the nets are slack they may be tightened by inserting the snaps back under several meshes of the net and then resnapping them on the frame (**A** in fig. 37).

To clear for action, open the quick-release device, then trip the cable releases simultaneously.

In situations requiring a flat-top, net set No. 5 provides concealment for surface emplacements if a good position has been selected and camouflage discipline has been observed.



FIGURE 38 (a).—Scale, 1:3,000. An unconcealed 155-mm gun position as seen from the air. Inset shows a ground view of the same position.

(b).—Scale, 1:3,000. The same position seen from above after erection of flat-top constructed with net set No. 5. Inset shows side view of position with embrasure released and piece ready for action. While concealment cannot be obtained from enemy photographic observation at the low altitude of this photograph, it is effective against direct observation.



ARTILLERY NET SET No. 8

For 8-inch Gun and 240-mm Howitzer

Net set No. 8 is designed for the concealment of 240-mm howitzers and 8-inch guns in surface emplacements (fig. 39). This net set (figs. 39-48) contains prefabricated materials sufficient for the erection of a flat-top approximately 95 by 80 feet with a 36-foot embrasure. Component parts of the set are shown in figure 40.

As in all concealment, good choice of position is essential. In addition to the required field of fire, a desirable position affords some measure of natural concealment as well as means of access for vehicles and personnel between the firing position, the main road, and subsidiary elements of the position, such as latrines and observation posts. By merging the flat-top into bushes, trees, or broken ground, better concealment from low-altitude observation is obtained.

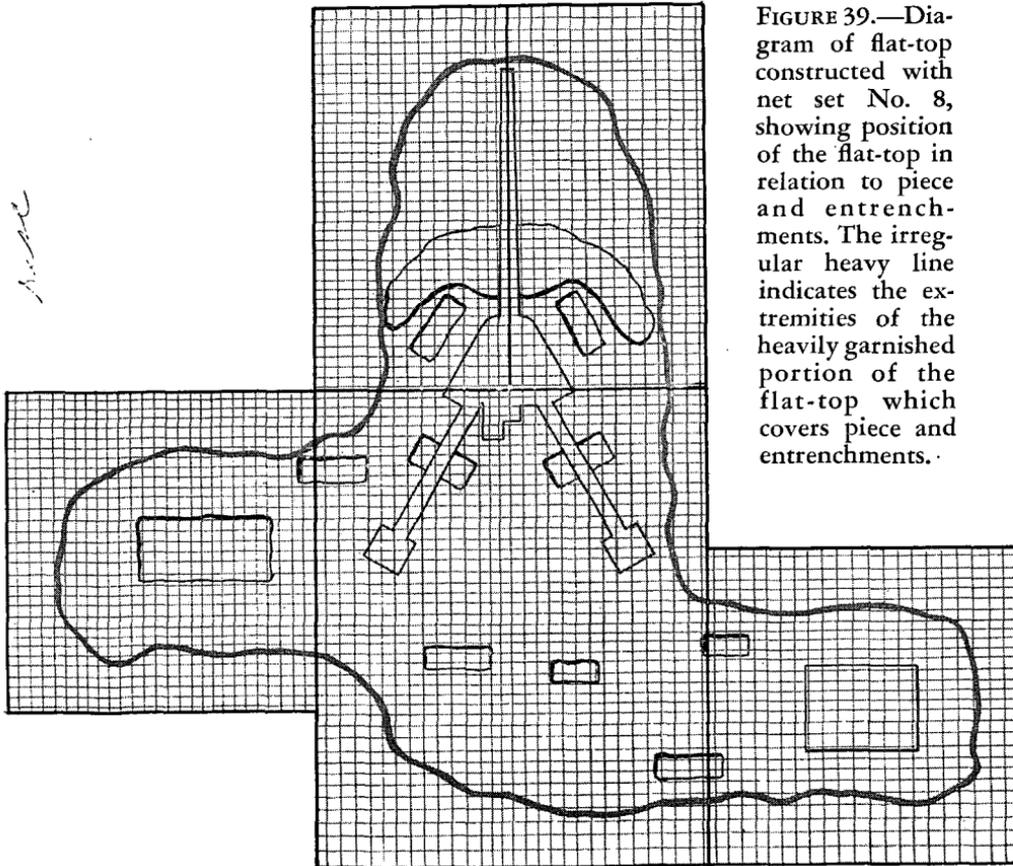


FIGURE 39.—Diagram of flat-top constructed with net set No. 8, showing position of the flat-top in relation to piece and entrenchments. The irregular heavy line indicates the extremities of the heavily garnished portion of the flat-top which covers piece and entrenchments.

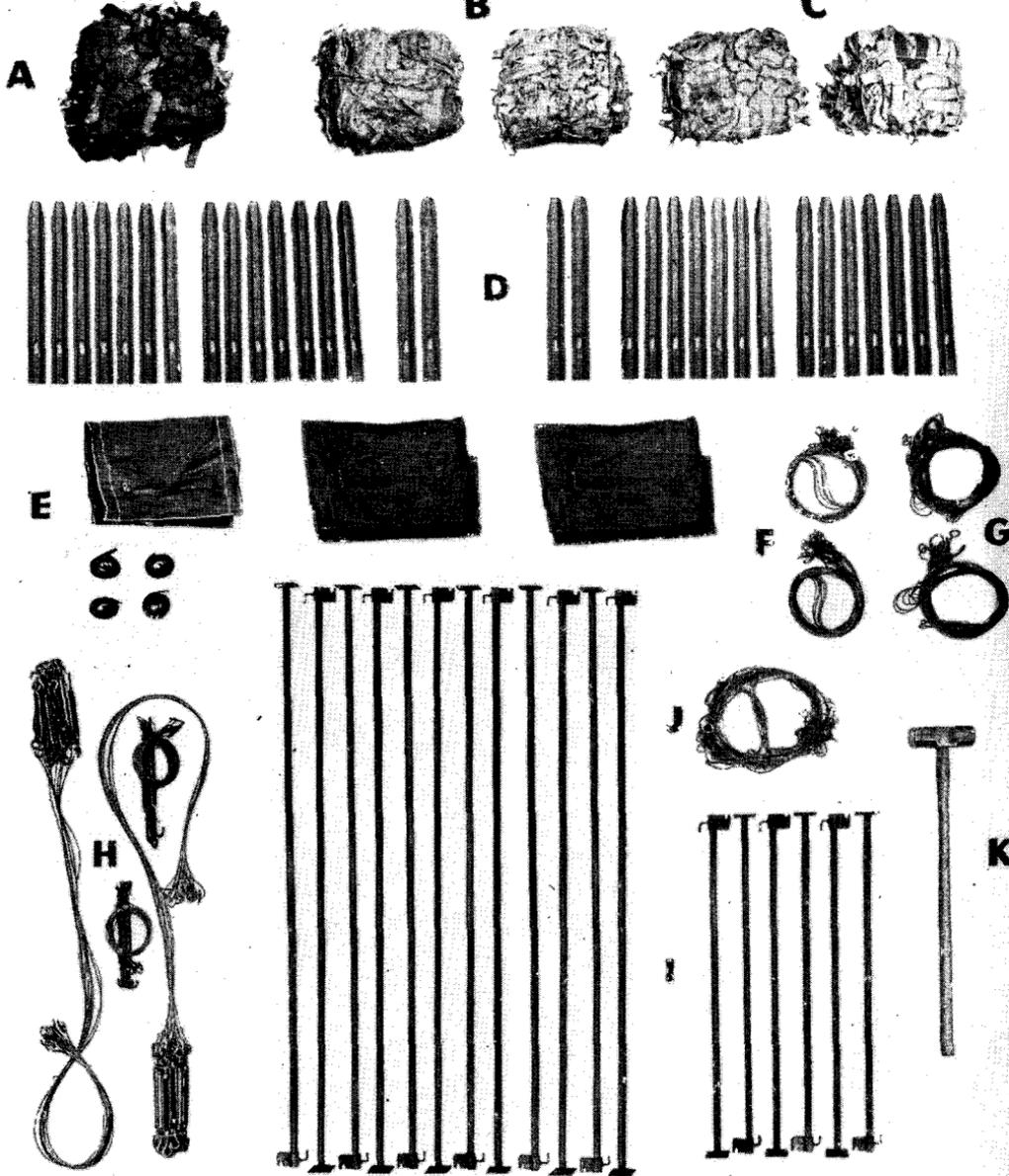
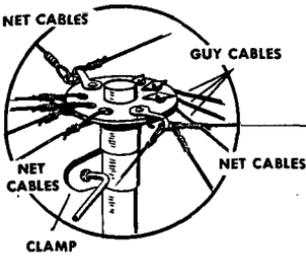


FIGURE 40.—Component parts of net set No. 8:

- | | |
|--|--|
| A Main net, 36 by 44 ft. | G Two side-extension net frames, 30 by 31 ft. |
| B Two embasure nets, 17 by 35 ft. | H Guy cables for frames (2 sizes). |
| C Two side-extension nets, 29 ft. sq. | I 18 posts for frames (2 sizes). |
| D 32 stakes. | J Main net frame, 37 by 46 ft. |
| E Three carrying bags and straps. | K 12-pound sledge. |
| F Two embasure net frames, 18 by 37 ft. | |

To erect the flat-top the five cable frames are laid out and centered over the emplaced piece, joined together, and hooked to the proper connectors (figs. 41 and 42). As part of this operation, the pins are inserted in the four embrasure-cable releases at **A** in figure 42. A detail of this release is illustrated in figure 29. The embrasure releases, after being connected, rest on the tube of the piece.

The next step is to fasten the five garnished nets to the cable frames by snap fasteners at the corners and by the spring-tong fasteners which are attached to the nets at other points. As the component nets of set No. 8 are garnished as a unit, gun crews must attach the nets to



↑
DIRECTION OF FIRE

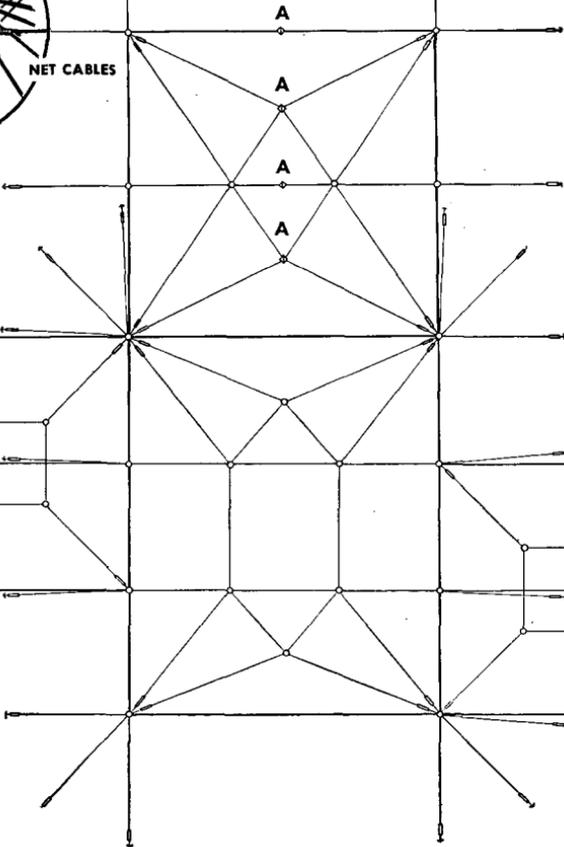
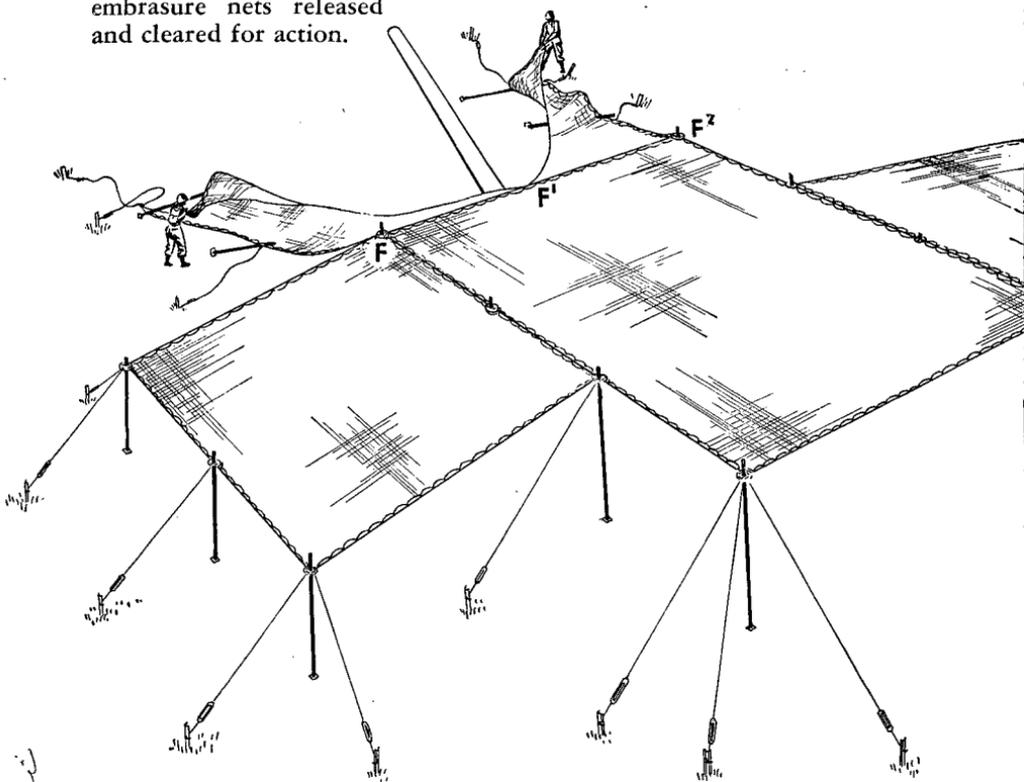


FIGURE 41.

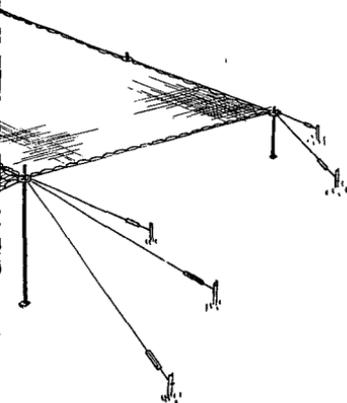
FIGURE 42.—Diagram of cable frames, guys, and embrasure cable releases.

FIGURE 46.—Diagram of completed flat-top with embrasure nets released and cleared for action.

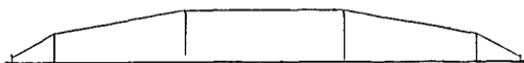


To erect a post, two men, working together, insert top of post in center hole of connector, tighten clamp at desired height, and then raise the post and hold it plumb. A third man stretches the guy cables with turnbuckles extended to full length to locate the positions of the stakes, which he then holds while the fourth man drives them. The hook in the turnbuckle is inserted in the slot in the stake and the guy is partially tightened. After all posts have been erected the turnbuckles are again tightened to remove any remaining slack from the cable frames.

To clear for action, pull the rip cord releasing the pins from the embrasure fastening device (figs. 24 and 25), and also, nearly simultaneously, release the embrasure cable fastenings (fig. 46). If necessary, the lacings joining the embrasure nets to the main net at **F-F¹**, **F¹-F²**, may also be opened, allowing nets to fall to ground.



①



②

FIGURE 47 ① and ②.—Section of flat-top as seen from the side and from the back.



FIGURE 48 ① and ②.—Net set No. 8 erected over a decoy 240-mm howitzer in a demonstration area as seen from the air at oblique and vertical angles.



SUPPLEMENTARY CAMOUFLAGE FOR DUG-IN POSITIONS

The total thickly garnished area of flat-tops and extensions must be large enough to conceal all signs of activity. In the net sets, this area is large enough to provide concealment for well-chosen surface emplacements, but it is insufficient to cover the limits of spoil and activity around dug-in emplacements. Therefore, net sets over dug-in emplacements require supplementary camouflage—natural materials, additional extensions, garlands, or chicken wire garnished with steel wool or cloth. See figures 49 through 57.

The thinned-out edges of flat-tops do not provide concealment; they are essential, however, because they enable a flat-top to blend with its surroundings. When flat-tops are composed of several nets

FIGURE 49.—Diagram of dug-in position covered by net set. White dotted line indicates outside limit of spoil. Black double line indicates outside edge of *thickly* garnished area of nets. The area between white dotted line and black double line is not concealed.

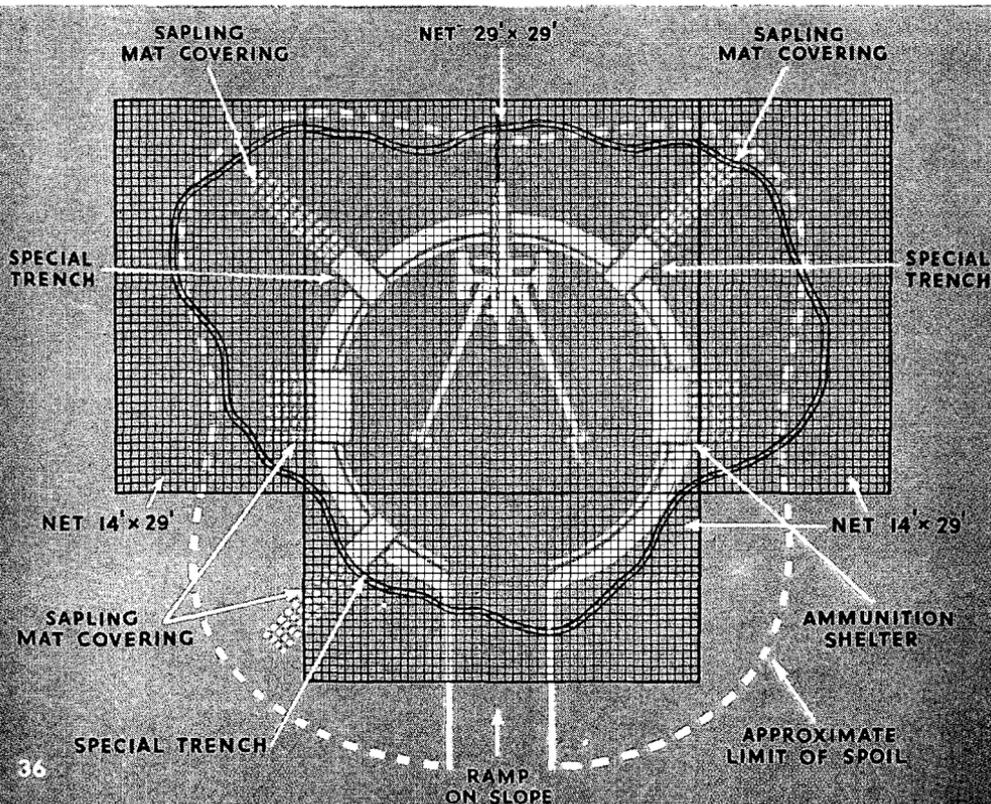




FIGURE 50.—Areas between nets *must* be garnished with additional burlap strips or textured patches.



FIGURE 51.—Prefabricated garlands can be used to tie-in a camouflaged installation with nearby natural foliage, or to thicken overhead cover, or to cover spoil and paths. However, light-colored surfaces must be darkened by toning down or texturing before they can be effectively concealed with garlands or garnishing.

joined together, the areas where they adjoin must be garnished in the same density as the thickly garnished areas of the nets. Further supplementary camouflage is necessary to break up or cover spoil and trampled areas under the thinned-out edges of flat-tops, exposed blast marks, and paths leading to the installation. Whenever possible, use natural local materials for supplementary camouflage. When suitable camouflage materials are not available, necessary supplementary camouflage material is obtained from Class IV engineer stock.

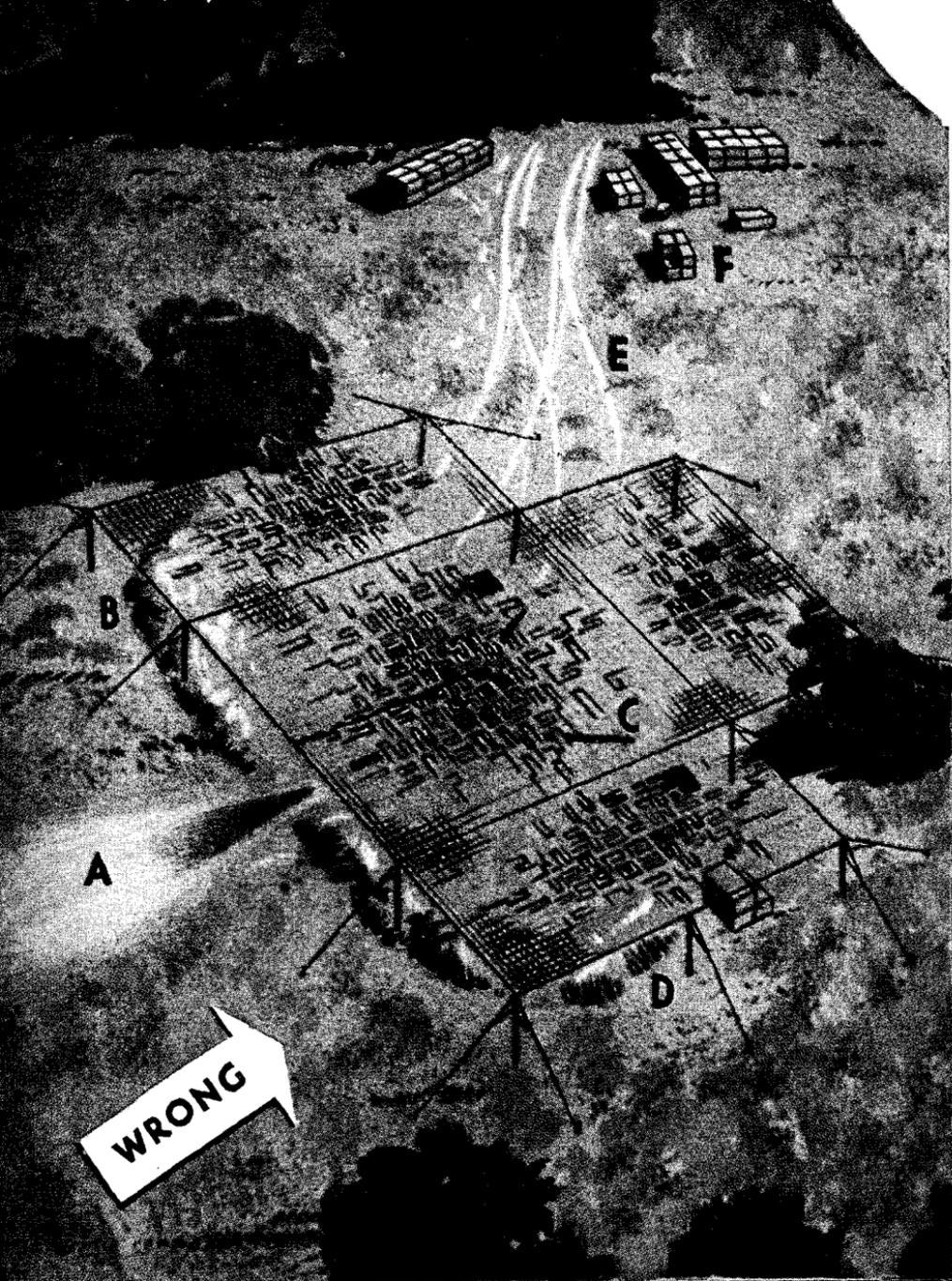


FIGURE 52 ①.—Position revealed by spoil, blast mark, tracks, and obvious activity. A. Blast mark shows as a light, fan-shaped area. B. Spoil under thinly garnished area reflects light through net. C. Lack of garnish where extension nets meet. Trails of piece show through net. D. Spoil and ammunition cases are not concealed. E. Paths from ammunition supply. F. Insufficient cover for supply.

red

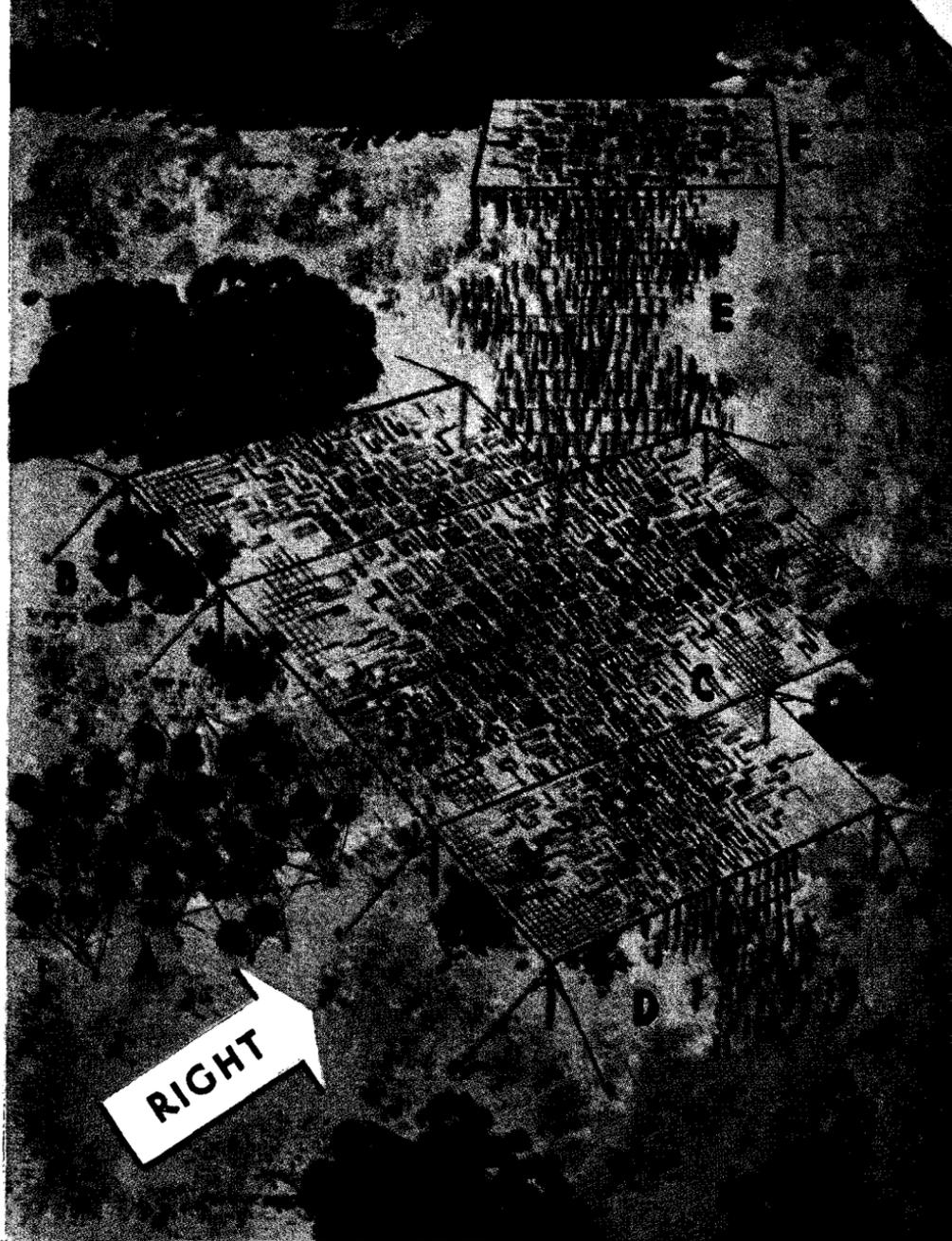


FIGURE 52 ②.—Dug-in position with supplementary camouflage. **A.** Irregular network of wire garnished with natural materials covers blast mark. Foliage changed after firing. **B.** Spoil darkened and textured with natural materials. **C.** Areas between nets garnished with 2-in. burlap strips. **D.** Net set tied in to existing foliage with garlands. **E.** Trampled areas concealed with garlands. **F.** Additional flat-top over supplies.



FIGURE 53.—This photograph illustrates a dug-in 155-mm gun position at which flat-top does not cover all the spoil. Supplementary camouflage is necessary to conceal such a position. Flat-top is extended around edges, either with additional nets or with garlands.



FIGURE 54.—Blast mark made from firing 105-mm howitzer. Such blast marks must be concealed as follows: (1) drive 2½-ft. stakes in ground over an area greater than blast mark area; (2) either criss-cross smooth-strand wire over area and support it on stakes, or support chicken wire on stakes; (3) place natural materials, such as brush, in wire. Material is replaced after the piece fires each mission.

FIGURE 55.—During firing. Note debris and activity of crew during firing. These cannot be prevented, but they can be concealed. In this picture, garnishing in net over debris and activity is too thin. Garnishing must be maintained on center areas of flat-tops approximately as thick as that shown on the net directly over the piece.



FIGURE 56.— Empty containers in this photograph are stacked under edge of net. They might shine through the net and attract attention. These and empty shell cases must be carried away from position and hidden under natural cover or disposed of in such a way that they do not attract attention.

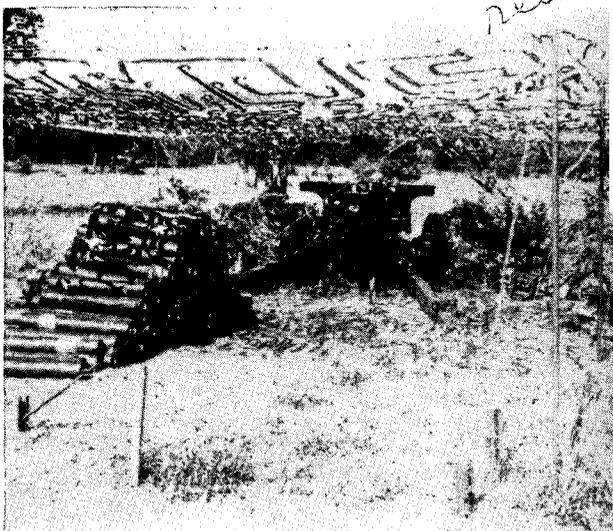


FIGURE 57.—Battery ammunition supply point camouflaged with 18- by 18-ft. chicken-wire flat-top garnished with natural materials. Photograph taken in winter. In summer, natural materials are changed as often as they begin to wilt. Supplementary camouflage of this kind is necessary at positions where there is not sufficient natural cover to conceal ammunition supply points, as in this case.



CAMOUFLAGE FOR .50-CALIBER MACHINE GUN

Camouflage for .50-caliber anti-aircraft machine guns for protection of field-artillery batteries must depend, for the most part, on good choice of position, extensive use of natural materials, and improvised artificial structures made in the field. For designs for more elaborate emplacements, see FM 5-20F, *Camouflage of Antiaircraft Artillery*.

A dug-in position, part of a deliberate position occupied by a heavy anti-aircraft machine gun, is illustrated in figure 58. The parapet has been completely sodded. A small tree is stuck in the ground beside the machine gun in the emplacement. The tree can be lifted out of its socket and thrown clear of the emplacement quickly. This solution is effective against both ground and air observation.

A quick solution to the problem of concealing an anti-aircraft machine gun and emplacement, using a 15- by 15-foot net, is illustrated in figure 59. To go into action, the crew trips a wire-holding device on the inside of the net. Note that the parapet is sodded and covered with leaves in winter. The net opens readily, as illustrated in figure 59 (2). In a second the jaws separate and the igloo falls in two pieces to the ground.

To construct the igloo, a 15- by 15-foot twine net is cut in two pieces. The new edges of the net are reinforced with rope. Two bows are made of 2-inch saplings fastened to stakes in the ground (fig. 60). The net halves are tied to the bows and the free ends are staked to the ground on the outside edge of the emplacement. The net is garnished with cloth materials in colors appropriate to the surroundings.

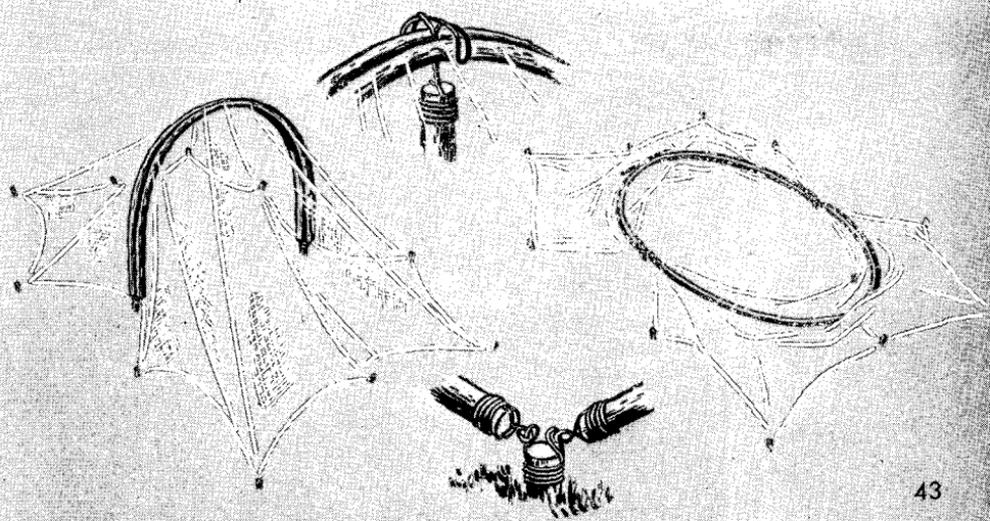
FIGURE 58.





FIGURE 59 ① and ②.—Antiaircraft machine-gun emplacement with quick-opening igloo, for use in terrain with natural foliage.

FIGURE 60.



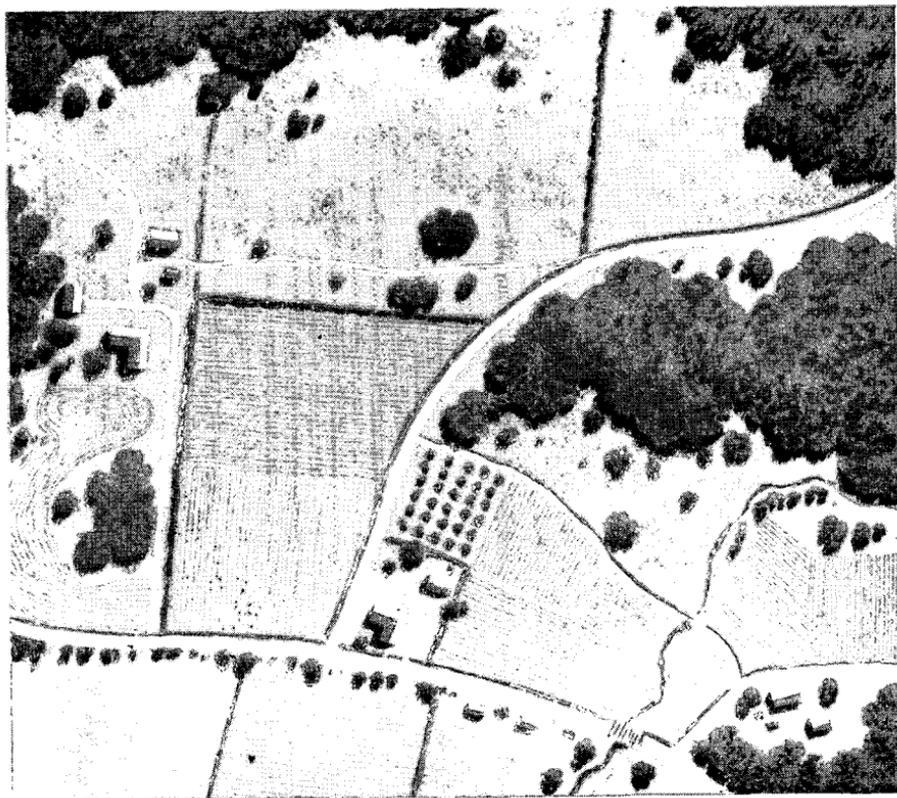
CAMOUFLAGE DISCIPLINE

For Field Artillerymen

Once concealment has been obtained, it can be preserved only by good camouflage discipline. Every man in the unit should be taught what terrain and installations look like from the air, and what signs give information to the enemy. Without this knowledge, good camouflage discipline is impossible. See FM 5-20A and TM 5-267, Supplement 2, page 21, *Camouflage Discipline*.

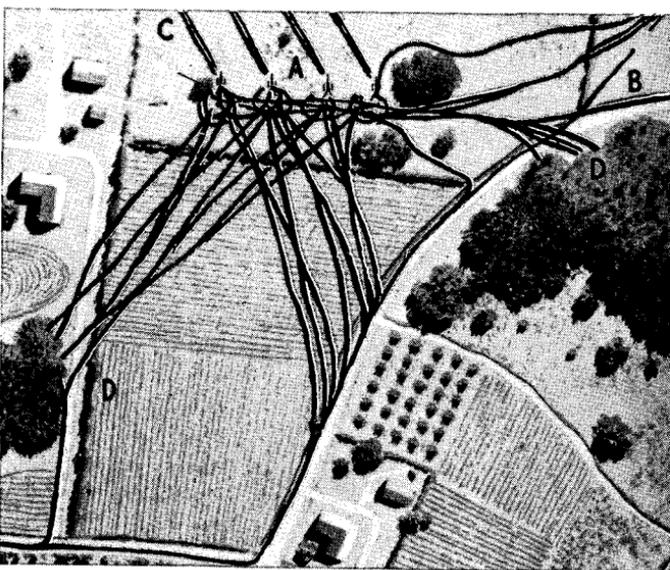
Camouflage discipline for field-artillery units seeks to control six major factors: tracks, spoil, debris, blast marks, neglected camouflage materials, and carelessness.

FIGURE 61 ①.—Terrain that might be occupied by a battery of light or medium artillery.



②. — This is existing track pattern for terrain illustrated in fig. 61 ①. The battery commander must plan to use it in a way that will create few, if any, changes in its appearance. Unavoidable changes either must be of an apparently innocent nature or concealed.

③. — WRONG. Battery has occupied a position in this terrain and made new tracks to gun positions A, OP B, aiming posts C, ammunition supply points D.



④. — RIGHT. Telltale signs have been avoided by following existing track pattern and making inconspicuous changes. Gun positions have been reached by an existing track A. Guns were man-handled to final position, and grass over which wheels passed was brushed up. Existing terrain lines and tracks B, C, and D are used to reach OP, aiming posts, and ammunition supply points. Guides are posted to prevent drivers shortcutting corners, widening existing tracks, or turning around in open spaces. Tracks to latrines and battery bivouacs must be planned for concealment.





FIGURE 62 ①. — Same terrain shown in previous pages has been occupied by a battery with perfect track discipline, *but they have not taken care of spoil properly.* Spoil shows through flat-tops and discloses position A. Also, gun squads failed to remove blast marks B.



②.—The spoil should be covered with tree or bush branches placed in a natural growing position. Branches lying flat do not add as much texture.

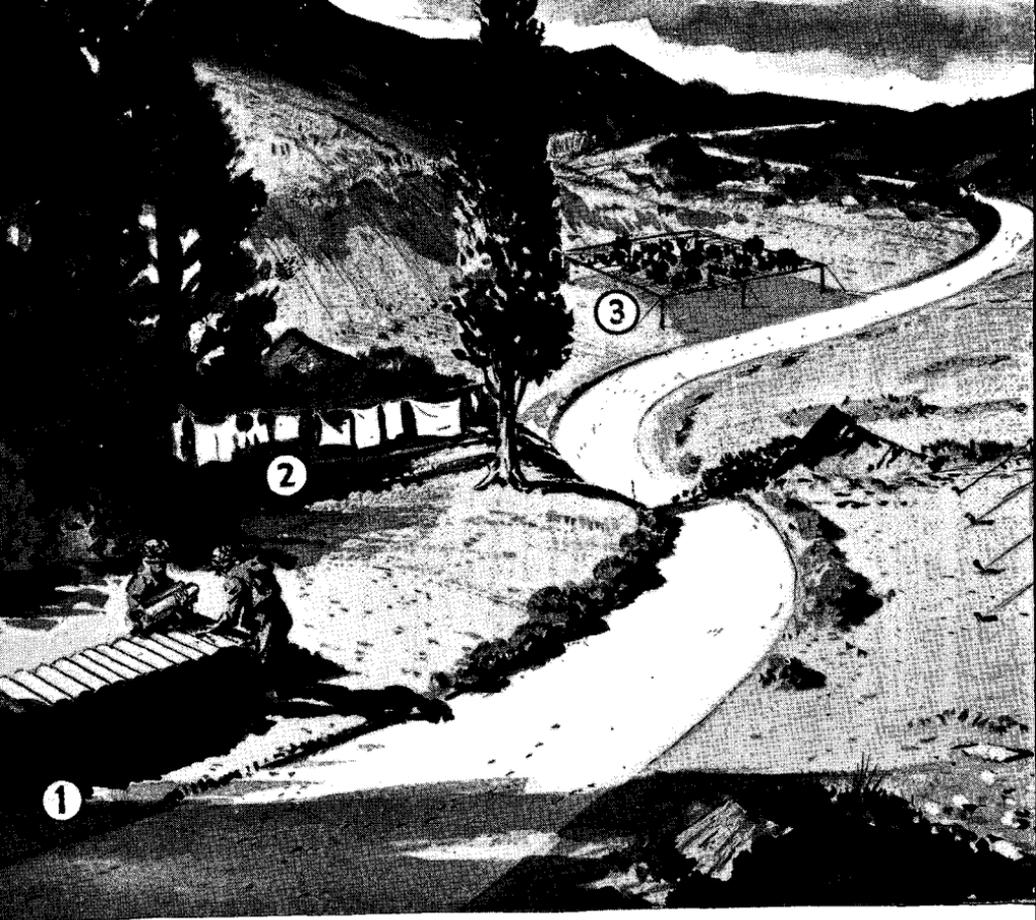




FIGURE 62 ④.—Blast marks can be concealed. One method of camouflaging blast marks is to cover area with network of wire supported on $2\frac{1}{2}$ -ft. stakes. This network is used to support branches and other suitable foliage in natural position over blast mark area. The network should be irregular in outline and cover a larger area than the blast mark.

Training.—Camouflage discipline is the personal responsibility of every man in a battery. The necessary degree of discipline can be attained only by constant training. The principles of camouflage discipline must be stressed through all tactical training. If this is done, good camouflage discipline will become so habitual that it will be observed at all times, even under the stress of combat fatigue. Experience has proved that camouflage discipline cannot be taught successfully after the combat zone has been reached. By that time improper habits have been developed too strongly to be corrected.

③.—Spoil not used to make parapets must be carried away and hidden under bushes or trees, thrown in streams, or scattered on nearby roads of same color as spoil.



OTHER SIGNS OF ACTIVITY. Five errors are illustrated above. Small pictures show how to correct them.

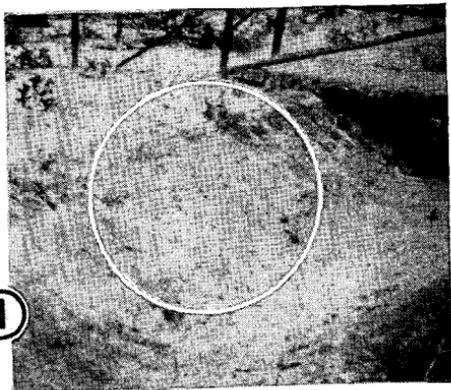
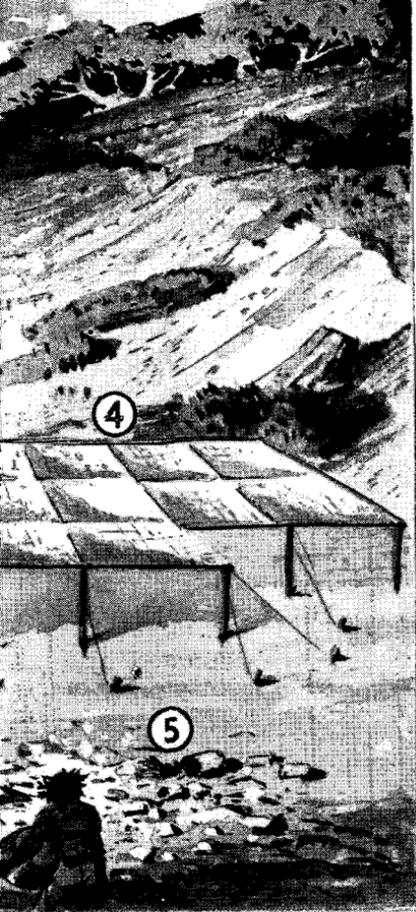


FIGURE 63 ①.—Shell cases and containers must be kept under cover. They can also be placed in ditches and covered with earth or weeds.



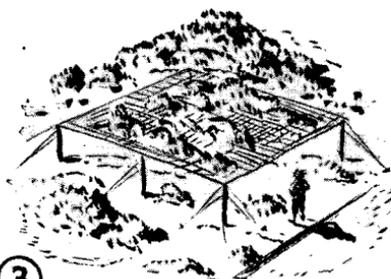
④.—Flat-tops must be kept flat and taut to prevent easily identified wire pattern from showing through. At night, when dew is expected, or during rain, twine nets must be slacked. When drying, nets must be tightened to keep flat and taut.

②



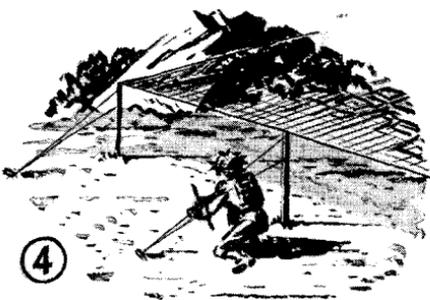
②.—Is clothing dried where it will not be exposed to enemy observation? If natural cover is not available, dry laundry in buildings or away from position.

③



③.—Natural materials must be replaced as soon as they show signs of withering. Foliage must be cut and disposed of where it will not attract attention. A decoy position is a solution to the disposal problem.

④



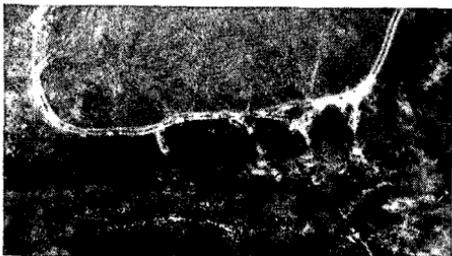
⑤



⑤.— Empty tin cans are buried or dumped. They may be used effectively as signs of activity at decoy positions.



FIGURE 64 ①.—An artillery position can be simulated perfectly without the use of dummy guns or equipment. This decoy consists of blast marks, tracks, and debris.



②.—Aerial photograph of a decoy artillery position.

DECOY POSITIONS

The decision when and how decoys shall be used with field artillery is made by the force commander. Decoys are a part of operational camouflage. See FM 5-20, Camouflage, Basic Principles.

Except when we are trying to mislead the enemy as to our strength and intentions, true positions must be concealed before decoys are set in place because a decoy is effective only when there is no evidence of the object to which it is related.

The decoy position should be located to one flank of the firing battery to avoid possible hits on the latter during enemy adjustment on the decoy. The exact distance between the two positions depends upon the local situation. The maximum distance should be small enough to confuse the enemy in his attempts to correlate sound- and flash-ranging data with results of his visual observation.

The principal intentional "mistakes" to make in preparing a decoy position are those which would be typical at an actual position improperly concealed—evidence of blast marks, foot and vehicle tracks, regular spacing of pieces, debris, foxholes and special trenches, spoil, communication wire dug in across roads, and shell cases.

However, *the simulation must not be overdone*. The decoy position must be discovered through relatively slight clues. A decoy position is convincing if a few tracks are allowed to show just outside the position, if light paths appear to lead to aiming posts, if a few cans are tossed into the open near a woods where a kitchen might logically operate. Another effective ruse is to arrange piles of brush in a regular pattern to simulate piles of ammunition.

One loaded truck can be used to make realistic tracks suggesting the movement of artillery equipment into position. A few men with picks and shovels can scratch up the dirt in the shape of characteristic blast marks.

An evacuated position can become an effective decoy position, particularly if some old flat-tops remain on the site. For the decoy to be completely effective, some signs of activity must be maintained. New tracks and paths should be made from time to time. Blast marks should be emphasized and new ones added. The decoy's effectiveness should be verified by aerial observation and photography.

Deception may be increased at decoy position by using explosives, such as dynamite, TNT, and flash powder, to add flashes and noise to the position. Explosions are co-ordinated with firing from the real positions, thus confusing the enemy as to the location of the real positions.

AN AERIAL STUDY OF FIELD ARTILLERY CAMOUFLAGE

The following series of four aerial photographs shows first an area before occupation by field artillery, then the area occupied but with insufficient camouflage applied, followed by two views of the positions completely camouflaged. The sketch, figure 65 (c), shows location of guns and equipment.

Field artillery troops should make certain that when they reach combat zones they will know how to move into position after dark and complete camouflage during the night so the area will appear unchanged by the next morning.



FIGURE 65 (a). — Scale, 1:8,500. Area before batteries of 105-mm and two sections of 155-mm howitzers occupy it.

(b). — Scale, 1:8,500. Same area with batteries and servicing installations emplaced. No machine guns shown. Location of equipment is indicated in sketch, (c).





(c). — Overlay showing location of installations in howitzer batteries.

1. 105-mm howitzer.
2. 105-mm howitzer.
3. 105-mm howitzer.
4. 105-mm howitzer.
5. 155-mm howitzer.
6. 155-mm howitzer.
7. Kitchen area.
8. Canvas fly over fire to disperse smoke.
9. Five ammunition pits.
10. Telephone central.
11. Battery executive post.



(d). — Scale, 1:8,500. Battery positions after camouflage.

(e). — Scale, 1:14,500. Battery positions after camouflage.





FIGURE 66.—Scene showing how branches can be stuck in snow in front of howitzer and howitzer squad. Notice shelter tent is painted white to blend with snow-covered terrain.

75-mm PACK HOWITZER

Choice of position.—Especially suited to mountain and jungle operations, the 75-mm pack howitzer depends mainly on natural cover for concealment.

Good positions in mountainous terrain are found among rocks and in brush. Personnel and ammunition make use of nearby cover. Shadows of trees and brush aid concealment. Advantage is taken of folds in the terrain. Routes to and from positions should wind through timber, brush, and rocks. Separate entrance and exit routes should be planned so that a turn-around does not ring the position.

Aids to concealment.—When piece is under natural cover and not firing, it should be draped with a net (fig. 67). In jungle terrain, nets should be garnished dark green to resemble the terrain. In mountains, the standard summer and fall patterns are usually effective. See FM 5-20, Camouflage, Basic Principles. Paint nets pure white in snow. The drape normally issued for the 75-mm pack howitzer is 22 by 22 feet. Branches and debris may be scattered over the net to assist in blending the installation with its surroundings (fig. 69 ②).

A hammock is an aid to concealment where overhead cover is sparse (fig. 68). When in a stabilized position where there is no natural cover, use the net to erect a flat-top (fig. 69).



FIGURE 67.—When howitzer is not in operation, issued net is used as a drape to cover howitzer and prevent enemy observation.

FIGURE 68. — In sparse natural cover, net may be used as a hammock between trees to prevent aerial observation.

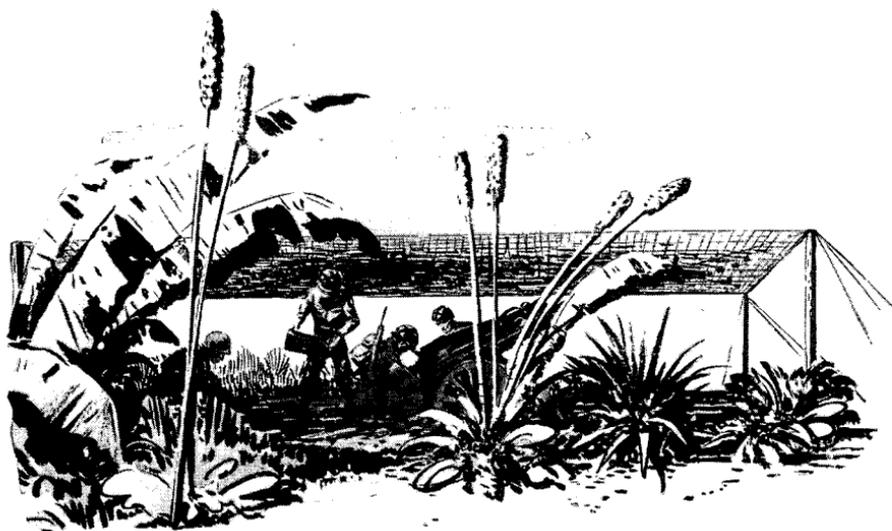


FIGURE 69.—When there is no natural cover, net may be used for flat-top to cover position. See FM 5-20, Camouflage, Basic Principles, for erection procedure of small flat-tops.



FIGURE 70 ①.—In snow-covered terrain, paint the net and garnishing white and use as a drape when the howitzer is not firing.



②.—In mottled terrain, stick branches and small bushes in the net to make the camouflage of a position more effective.

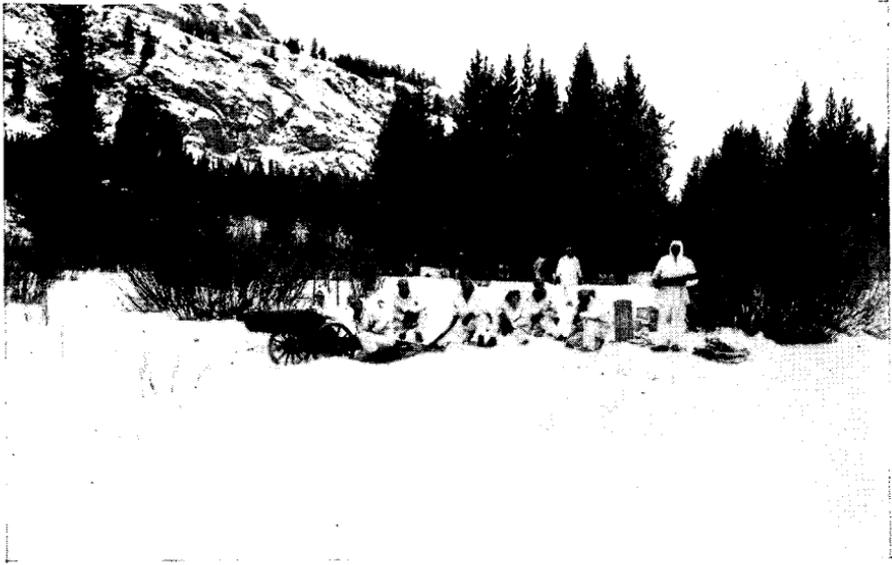


FIGURE 71.—A poorly chosen position in the open, although natural cover is nearby. Tracks and debris would be conspicuous from the air even though blast marks have been covered with snow.

Camouflage discipline.—All the rules and techniques of camouflage discipline must be applied to operations with 75-mm pack howitzers.

Keep activity around emplacement at a minimum before, during, and after firing.

Remain hidden except when actually firing.

Keep ammunition piles dispersed under cover.

When operating in snow-covered terrain, hide blast marks by throwing snow over them (fig. 71).

Pack animals.—One of the most difficult problems is to conceal pack animals and signs of their presence. They are conspicuous in open snow (fig. 72). They may not be noticed, however, if they are dispersed on a broken terrain pattern (fig. 73).

Do not allow tracks made by pack animals to point out troop positions. Take routes along the wind-blown side of a slope, along shady side of tree rows, or across a mottled ground pattern. If it is necessary to remain in the open, keep the animals in a single track.

Be sure tracks continue past loading points and battery position.

Distribute animals by sections, instead of having them all on one picket line (fig. 75). When they are in small groups under overhead cover, wherever it is available, or in brush, the size and identity of the group are difficult to discover.



FIGURE 72.—A conspicuous line of pack animals in snow terrain.



FIGURE 73.—Tree shadows behind battery position are a good place to unload mountain howitzer from pack animals.



FIGURE 74.—Pack animals dispersed in snow terrain are not conspicuous.



FIGURE 75.—Pack mules being dispersed in the picket line and concealed under cover of trees away from the battery position.

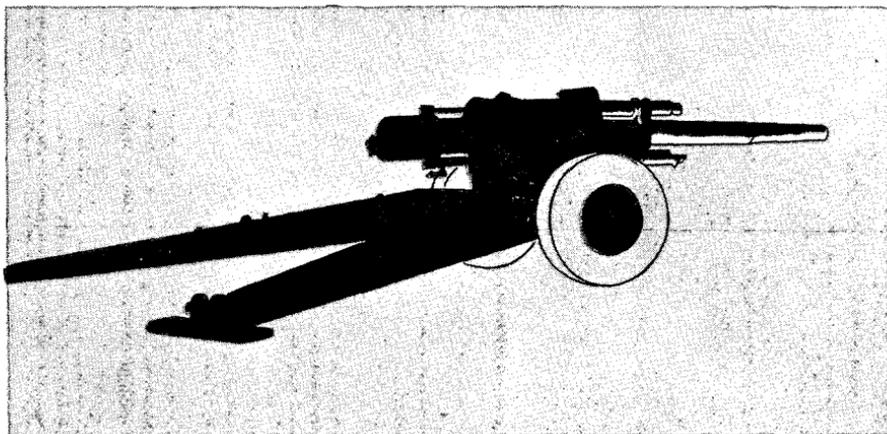


FIGURE 76.—4.5-inch gun painted with three-color pattern suitable for average temperate and jungle terrain. The three colors are olive drab, field drab, and black. In this case, white was used for countershading.

CAMOUFLAGE PAINTING

For Field Artillery

Field artillery pieces to which painted camouflage patterns have been applied are difficult for the enemy to distinguish at close ranges. Camouflage paint can be expected to do no more than that; it does not give complete concealment to the piece, its emplacement, its crew, or the activities resulting from service of the piece.

When the decision is made to apply painted patterns, the accompanying illustrations should be consulted as a guide. Patterns are designed for use in different types of average terrain. Colors in each pattern should be chosen to match the dominant colors of the particular combat zone in which the piece will operate.

In working out camouflage patterns, the following points should be borne in mind:

1. Background determines the colors to use.
2. Under surfaces should be lighter than upper surfaces.
3. Patterns should be large and bold.
4. Patterns should cut across the main straight lines of the piece.
5. Patterns should be continued across adjacent surfaces—as horizontal to vertical.
6. Colors used should contrast strongly.
7. Black should be used sparingly, except in terrain which contains many deep shadows.

For a detailed discussion of these principles see FM 5-20, Camouflage, Basic Principles and TM 5-267, Supplement 2, Camouflage.

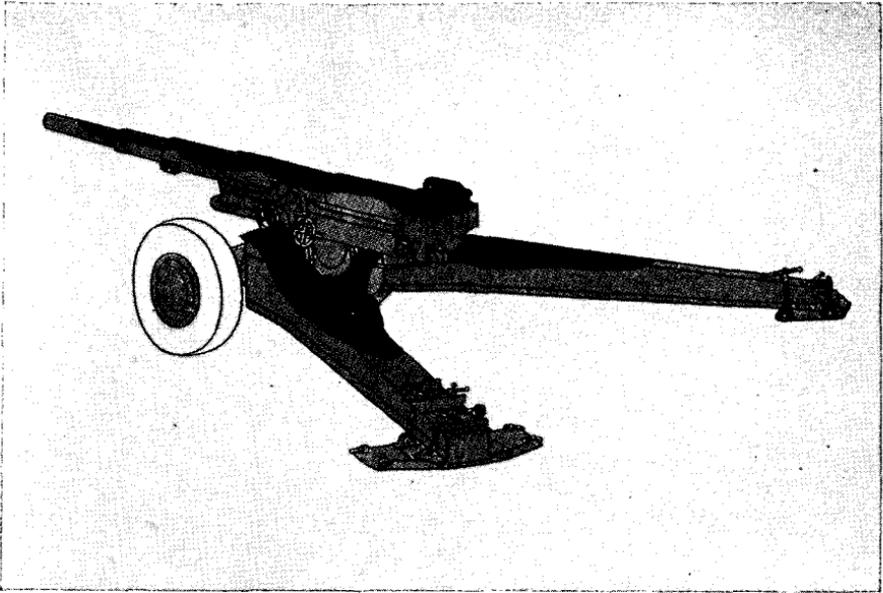


FIGURE 77.—155-mm gun painted with earth yellow and olive drab. Pattern is suitable for light desert backgrounds. In reddish desert backgrounds, the earth yellow should be changed to earth red.

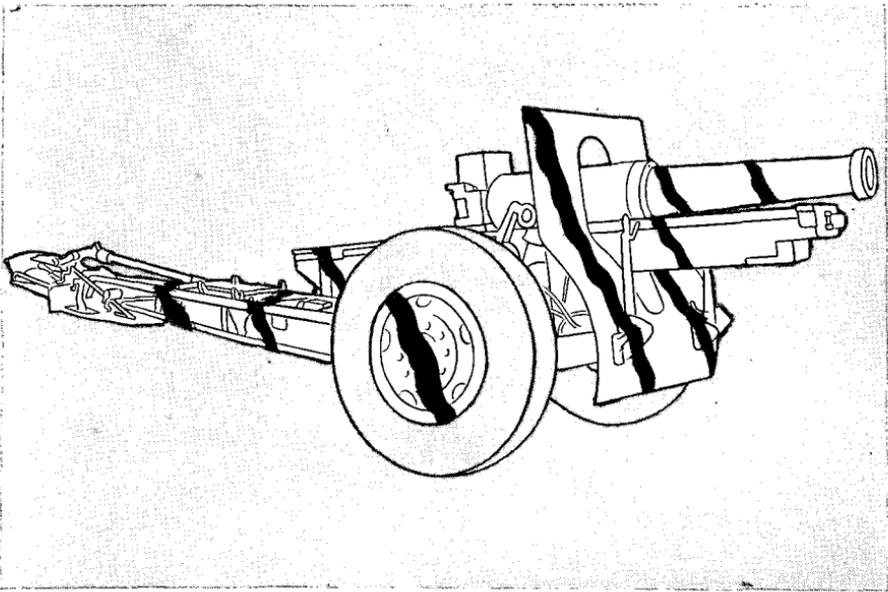


FIGURE 78.—155-mm howitzer is painted white for snow terrain with wooded areas. About 15% of the piece is left olive drab. Where there are no woods to break up the snow, piece is painted solid white.

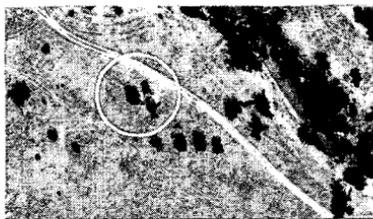
CONCEALMENT OF FIELD ARTILLERY OBSERVATION PLANES

Use natural cover to conceal observation planes. If there are no woods in which to park them, they should be located among existing bushes and trees and draped with issue shrimp nets. Complete concealment can be gained with these materials (fig. 79).

The characteristic shape of aircraft, the difference in texture between the smooth surfaces of the plane and the surrounding terrain, and shine from the cockpit glass are the main points that must be considered. Natural lines in the terrain can be a great help to concealment when a plane is parked within or alongside them. Wise use of the terrain often results in losing the characteristic shape of the plane. Texture differences can be eliminated only by covering the plane with natural materials or a net. To get rid of shine, cover glass with natural materials, burlap, blankets, coats, or even mud.



FIGURE 79 ①. — Observation plane parked between two small trees and draped with a shrimp net. Net is propped up on poles above the wings and fuselage; its sides are pulled out and staked.



②.—Scale 1:6,000. An aerial view of installation above. Plane follows an existing track to taxi to this position.

FIGURE 80. — This small plane will fit easily under natural cover or under and near small bushes and trees. It may be draped with a shrimp net if further concealment is needed.



FIGURE 81. — Plane parked along a hedge line and covered with natural materials. The air view below shows that although plane is not completely concealed, it is almost lost in a natural line in the terrain and is likely to be overlooked. For complete concealment in this case, both the net and natural materials should be used.

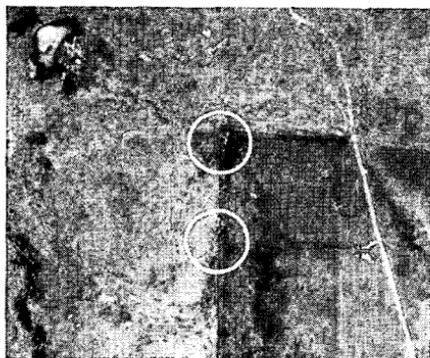
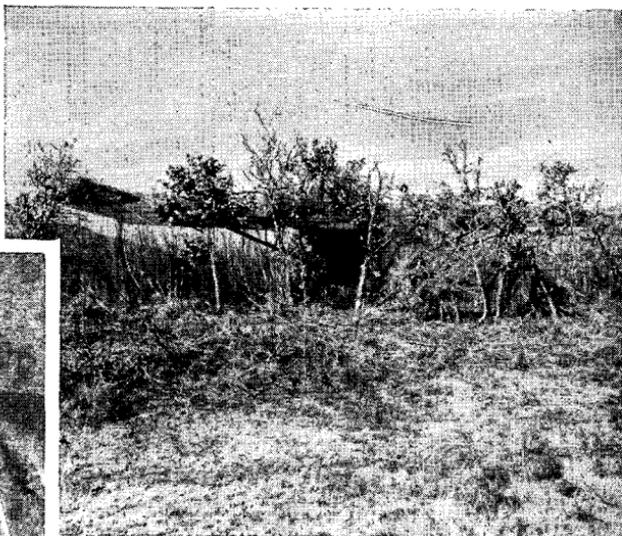


FIGURE 82. — Parked within the same natural line in the terrain as the plane above, this plane is draped with the issue net. In the air view above, the identity of the plane is completely hidden. An enemy photograph interpreter would find it difficult to get helpful information.

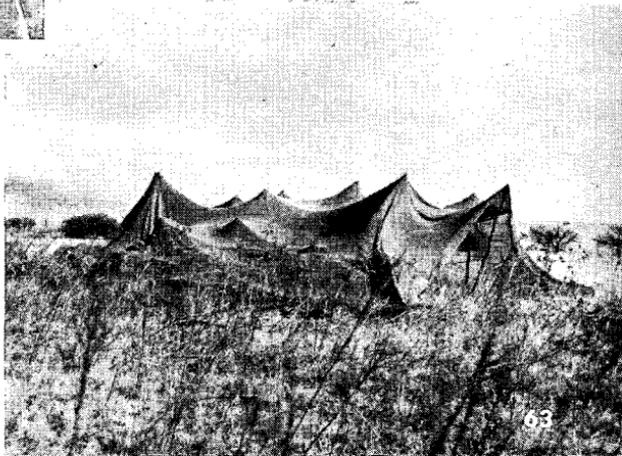


FIGURE 83.



FOR CAMOUFLAGE OF FIELD ARTILLERY

Camouflage benefits are directly proportionate to the amount of mental and physical labor expended. The relative importance of the elements necessary to successful camouflage are: first, proper choice of position; second, careful camouflage discipline; third, proper erection of camouflage; and fourth, use of most suitable camouflage materials available. Figure 85 shows one solution for a battery layout. It should be studied in relation to the check list below.

PIECES

1. Can the pieces accomplish the mission?
2. Have pieces been placed to take advantage of both natural cover and terrain pattern?
3. Can the sections operate in the position chosen without noticeably disturbing the surroundings?
4. If natural cover is thin, can you bend the trees overhead and tie them together?
5. If nets have been erected because of insufficient natural cover, does their garnishing blend with the surroundings? Are they kept tight and flat during daytime?
6. Are any of the paths and roads to the position in the open? Have you extended them to a destination away from position?
7. Have you used natural materials to tone down emplacements and spoil so they cannot be seen through the overhead cover?
8. Is there a ring of tracks and tramlings around each piece to make the position conspicuous to the aerial observer? If so, have you covered them?
9. Have empty shell cases and litter accumulated around position?
10. Have you covered blast marks in front of the pieces?
11. Have paths and tracks within the position been wired in to prevent them from widening?
12. Is all camouflage carefully maintained?

AMMUNITION DUMP

1. Has reserve ammunition been placed to take advantage of both natural cover and terrain pattern? Can it be reached without making new tracks or otherwise changing the terrain?
2. Have existing roads and paths to ammunition been wired in to prevent changes in appearance of terrain?

AIMING POSTS

1. Do paths to aiming posts follow natural lines in the terrain?

ANTI-AIRCRAFT MACHINE GUNS

1. Have machine guns been emplaced to accomplish their mission?
2. Have machine guns been placed to take advantage of terrain pattern and access roads?
3. Has spoil from emplacements been toned down?
4. Have emplacements been covered with nets?
5. Do garnished nets blend with surroundings?
6. Are nets kept tight and flat during daytime?
7. Has trampling around emplacements been avoided? If not, have signs of it been covered?

TRUCK PARK

1. Is vehicle park far enough away from battery?
2. Have correct procedures for concealing vehicles and bivouacs been followed? They are discussed in FM 5-20B, Camouflage of Vehicles; and FM 5-20C, Camouflage of Bivouacs, Command Posts, Supply Points, and Medical Installations.

OBSERVATION POSTS

1. In locating OP, have unusual landscape features been avoided?
2. Do tracks to the OP follow natural lines in the terrain?
3. If OP is dug in and no natural cover exists, has it been covered with either a net or natural materials?

SWITCHING CENTRAL

1. Has it been located to take full advantage of natural cover?
2. Do wire lines follow natural lines in the terrain?

COMMAND POSTS AND FIRE-DIRECTION CENTERS

1. If natural cover is sparse, have vehicles been draped? Have dug-outs and personnel shelters been covered?
2. Have turn-offs from existing roads been covered with hammocks or trees tied together? Have turn-offs been wired in to prevent changes in appearance of terrain?
3. Have wire crews taken advantage of both natural cover and terrain pattern when bringing wires to the command post?
4. Have guards been posted to keep vehicles circulating and to prevent them from bunching together near the command post?
5. If natural cover is sparse, have nets been used to cover fire-direction crews, maps, and equipment?

OBSERVATION PLANES

1. Are planes under natural cover? If there is no natural cover, have they been draped or covered with natural materials?