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ENGINEER ORGANIZATION OF A RIFLE
COMPANY'S DEFENSE AREA

by

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COUNTRY: USSR



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In the further engineer improvement of the defense, the positions of the rifle and machine gun squads as well as the positions of the reinforcing weapons are connected by trenches (frontally) and communication trenches (in the depth) and are supplemented by structures for observation, cover for the personnel and materiel, and obstacles.

In the case where the defensive position is occupied ahead of time out of direct contact with the enemy, its construction usually begins with the creation of trenches and communication trenches which are subsequently improved by all structures necessary for the conduct of battle.

Trenches and communication trenches were widely used from the very first days of the Great Patriotic War and, from the Kursk Battle, the use of trenches in combination with engineer obstacles became the primary means for consolidating the terrain in creating defensive positions. Trenches will have just as much significance in modern war, too.

Trenches and communication trenches will provide: a continuous firing position along the front on which rapid and covered maneuver of rifle podrazdeleniya and their means of armament may be accomplished; the uninterrupted supplying of the podrazdeleniya with ammunition, obstacle equipment, and other types of supplies; cover for the personnel and weapons against small arms, mortar, and artillery fire, aerial bombing strikes, and the fire and tracks of enemy tanks; a

considerable reduction in possible troop losses from the effects of nuclear weapons (in comparison with losses of troops disposed on open terrain); the covered evacuation of wounded and the rendering of medical assistance to those slightly wounded; convenience in personal communications between commanders and their podrazdeleniya in combat. Moreover, trenches and communication trenches further the camouflaging of the firing system of the troops combat formation.

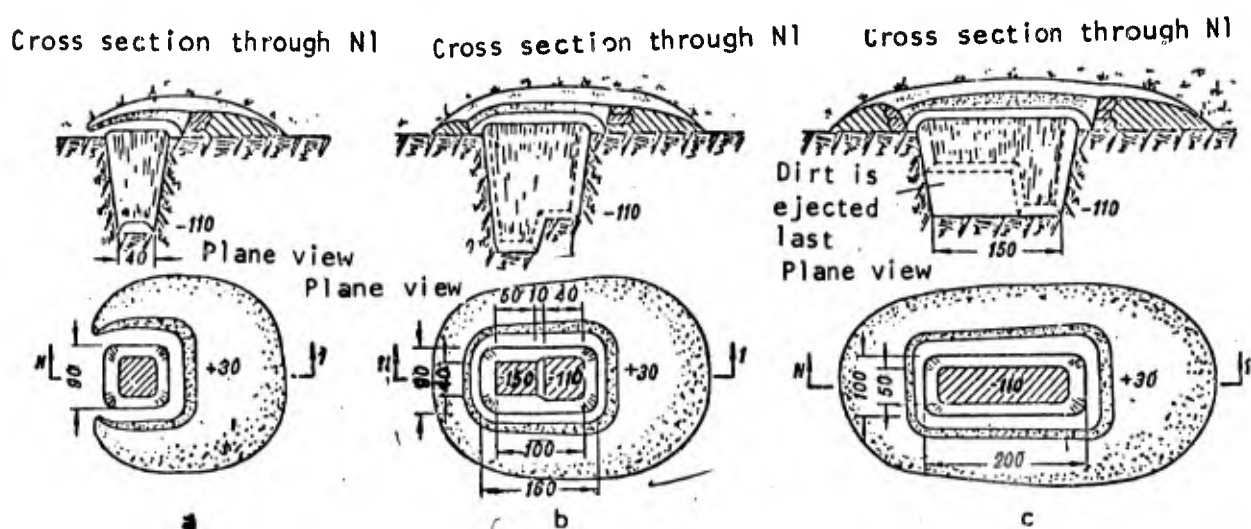


Figure 1. One-Man Foxhole for Firing From the Standing Position (Full Depth): a, Without firing step; b, With firing step; c, Elongated.

In the disposition of trenches on the ground, special attention is devoted to their plane outline. It should correspond to the terrain relief and the disposition of individual terrain objects (Figure 6). At the same time, the outline of the trenches should assure the possibility to conduct cross fire ahead of the entire defensive front and the flanking of dead spaces, natural obstacles, and sectors of obstacles which have been created by means of fire (Figure 7). For this purpose as well as for the best adaptation to the terrain and an increase in the protective properties, the trenches are given the shape of broken or curved lines in their plane outline (Figure 8).

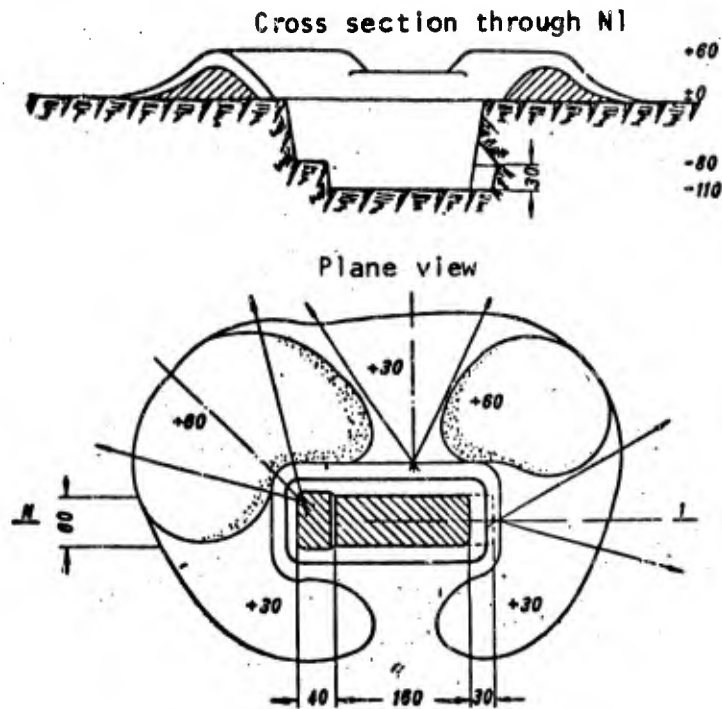


Figure 2. One-Man (Two-Men) Foxhole with Raised Parapet.

A company defense area usually includes two trenches: disposed in the first are the positions of two platoons, and in the second--of one platoon (Figure 9a). It is also possible to dispose the company in one trench when its combat formation is organized in one line or when two platoons are disposed in the trench and one is disposed in the communication trench (Figure 9b).

As a rule, antitank and antipersonnel obstacles are erected in front of the first trench.

The distance of one trench from another is determined by tactical concepts. The second trench should be far enough away from the first trench so that the machine gun podrazdeleniya or the artillery podrazdeleniye attached to the company are disposed in the second trench and have the capability of firing on the approaches to the first trench; so that the enemy who is conducting artillery fire on

the first trench cannot destroy the second trench simultaneously at the same elevation; and so that, in attacking with the purpose of seizing the first trench, the enemy cannot shift fire to the second trench without taking the risk of hitting his own attacking podrazdeleniya.

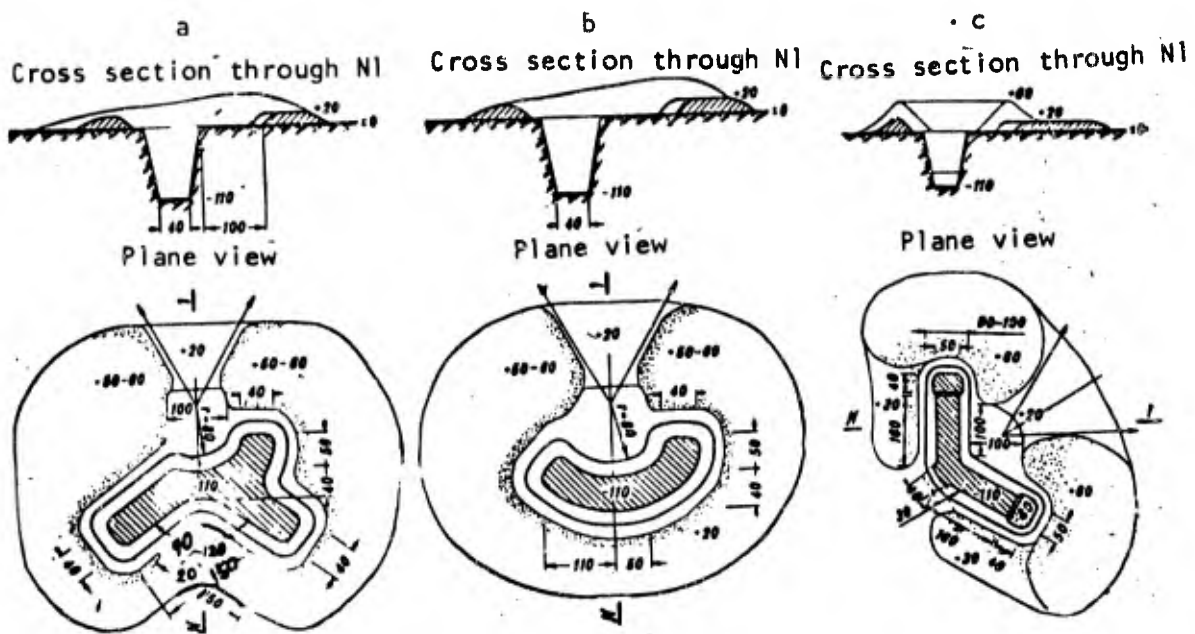
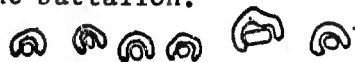


Figure 3. Variations in Pits for Light Machine Gun:
a, With rectangular emplacement; b, With semicircular
emplacement; c, With foxholes for firing and observation.

In accordance with these concepts as well as on the basis of the dimensions of the area defended by a company, the second trench is dug at a distance of 250-400 meters from the first trench and, when terrain permits, at 600 meters.

If a rifle company is defending in the first echelon and if its combat formations are disposed in two trenches, with complete engineer improvement, it is necessary to dig up to 3 km of trenches and 1.6 km of communication trenches. The number of trenches is determined from a calculation where the defensive front equals 1 km (the winding factor of the trenches is 1.3) and, for the self-defense of the mortar and artillery podrazdeleniya, at the firing positions it is necessary to dig additional trenches up to approximately 10% of the basic number.

The length of the communication trenches is determined on the basis that between the first and second trenches there will be one communication trench per platoon located in the first trench and that there will be one trench from the second trench to the rear per first echelon company in the battalion.



Digging in



Digging elongated one-man foxholes



Digging group foxholes



Further development of foxholes and preparing dugout




Improving a trench for a rifle squad




Digging connecting trenches to adjacent units and to the rear

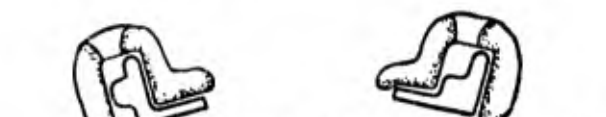
Figure 4. Sequence in the Development of a Position for a Rifle Squad.



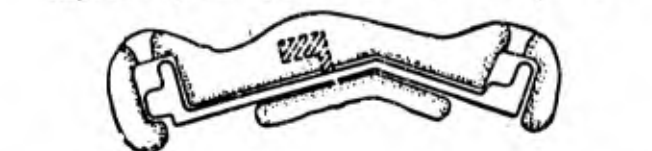
Digging in by section members



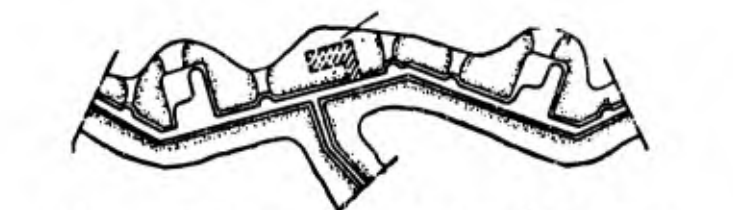
Digging a pit (slit trench)



Improving the pits for one machine gun



Building a dugout and connecting the pits



Digging connecting trenches to adjacent units,
preparing foxholes

Figure 5. Sequence in the Development of a Position for a Machine gun Section.

The combat, administrative, and sanitary improvement of the trenches will be different and will depend on the manning level of the podrazdeleniya which occupy them as well as on the availability of time and on local conditions. The primary requirement made on improving the trenches is the creation of the most favorable conditions for conducting fire against the enemy and for the maneuver of the podrazdeleniya as well as improving the protection of the defenders against enemy means of destruction.

First to be set up in the trench are foxholes for the riflemen and emplacements for machineguns and grenade launcher operators. These foxholes and areas are best made with a raised parapet. The foxhole is usually dug in such a way that it adjoins the trench

since this is most efficient (Figure 10). A soldier spends 0.5-1.0 hours on making an adjoining foxhole. However, sometimes, to improve firing, it is necessary to displace the rifleman's position to the front or rear of the trench line. In this case, an off-set foxhole is made (Figure 11) which is connected with the trench by a section of communication trench (usually does not exceed 3 meters). Foxholes for the conduct of frontal fire are disposed on the straight sectors of the trench, and for the conduct of oblique fire--at breaks in the trench or in specially made triangular projections (Figure 12). To protect the head of the rifleman, openings are made in the parapet and, with the availability of materials, covered firing openings are made (Figure 13). About 1 man per hour is spent on making the covered firing opening with a wooden frame, and when made from sandbags--0.5 man hours. The firing openings are made with the funnel-shaped opening toward the rifleman, toward the enemy, or with the funnel-shaped opening in both directions (Figure 14). For firing from the assault rifles, only firing openings with the funnel-shaped opening toward the enemy are made.

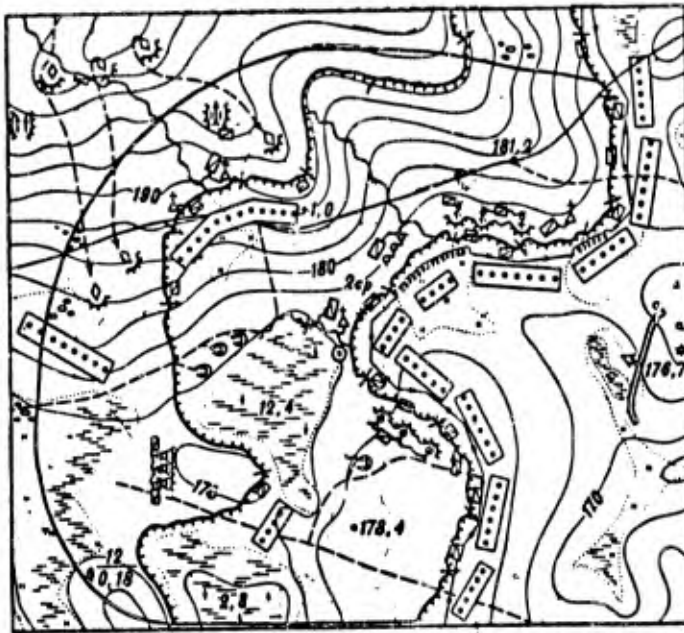


Figure 6. Diagram of the Engineer Improvement of a Rifle Company Defense Area (Variation).

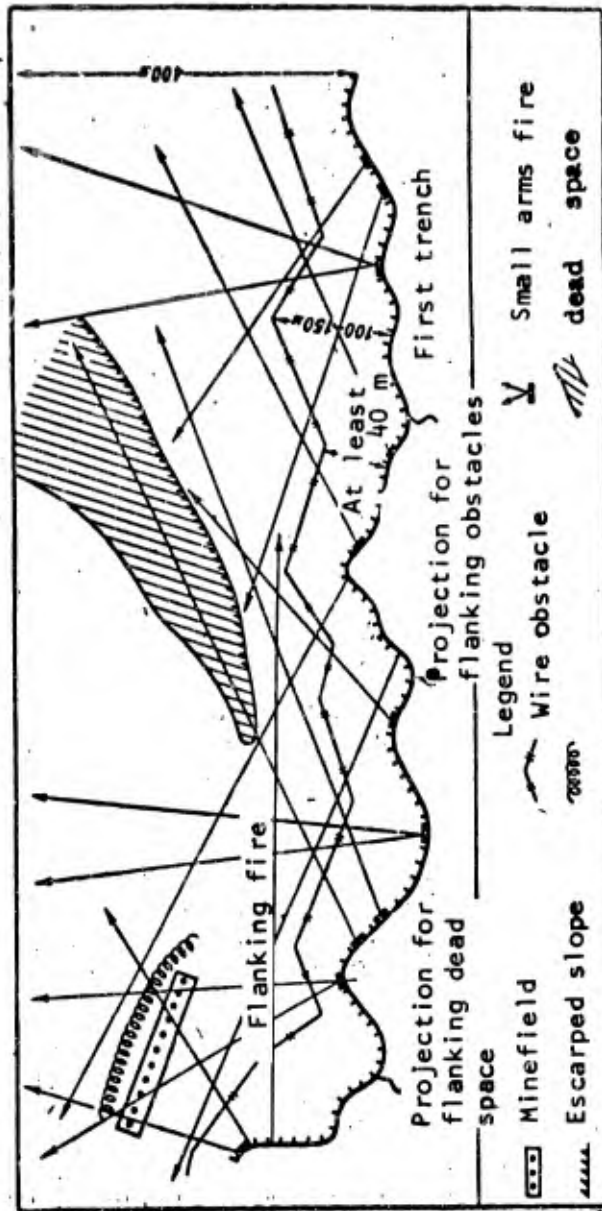


Figure 7. Outline of the First Trench of a Rifle Company Defense Area (Variation).

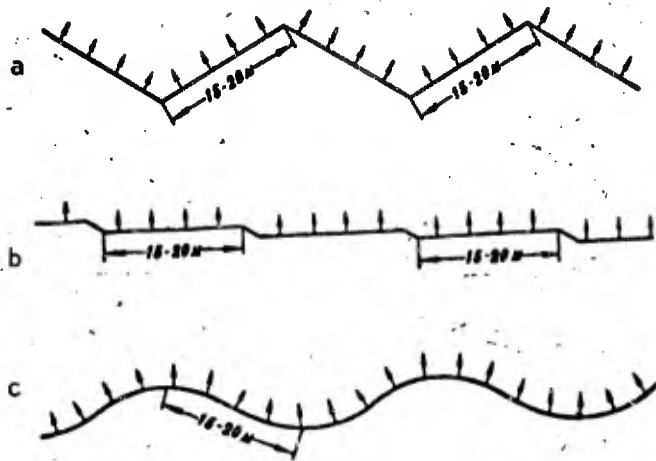


Figure 8. Plane View of Outline of a Trench:
a, Broken; b, Step-like; c, Curvilinear.

The emplacements for the machineguns are also made either adjacent to the trench or offset (Figure 15). It is convenient to make offset areas for the conduct of flanking fire in both directions (caponier type) or in one direction (semi-caponier type, Figure 16). About 1.5 hours are spent by two soldiers on making an adjoining emplacement.

With the availability of materials and time and in weak soil, the slopes of the ditch of foxholes, trenches, and communication trenches must be covered with a revetment of boards, poles, slabs, or panels of brush, wattle, or metal nets.

Boards, poles, and slabs are placed right up against each other or, to save material, thinned out (spaced one or two apart) against stakes which are driven along the slope every 75-100 cm from each other. The upper ends of the stakes are fastened by wire braces to anchor stakes which are driven into the ground at a distance of 2.5-3 meters from the edge of the slope (Figure 17). The space between the revetment material and the slope is tightly filled with dirt. From two to three man-hours are required to construct one running meter of such revetment. On 10 running meters of foxhole (trench), 500 running meters of poles with a diameter of 5-7 cm, 42 running meters of small logs with a diameter of 8-10 cm, and 120 running meters of 3-4 mm wire are expended. If a thinned out revetment is made with poles spaced one pole apart, the expenditure of poles is reduced approximately by half and if two poles apart--by two thirds. For revetments of the slopes using brush or

reeds, panels are made from them ahead of time (Figure 18); these panels are installed along the slope, their stakes are pounded into the ground, and the upper part is pressed compactly to the slope by a pressure pole using guys and anchor stakes.

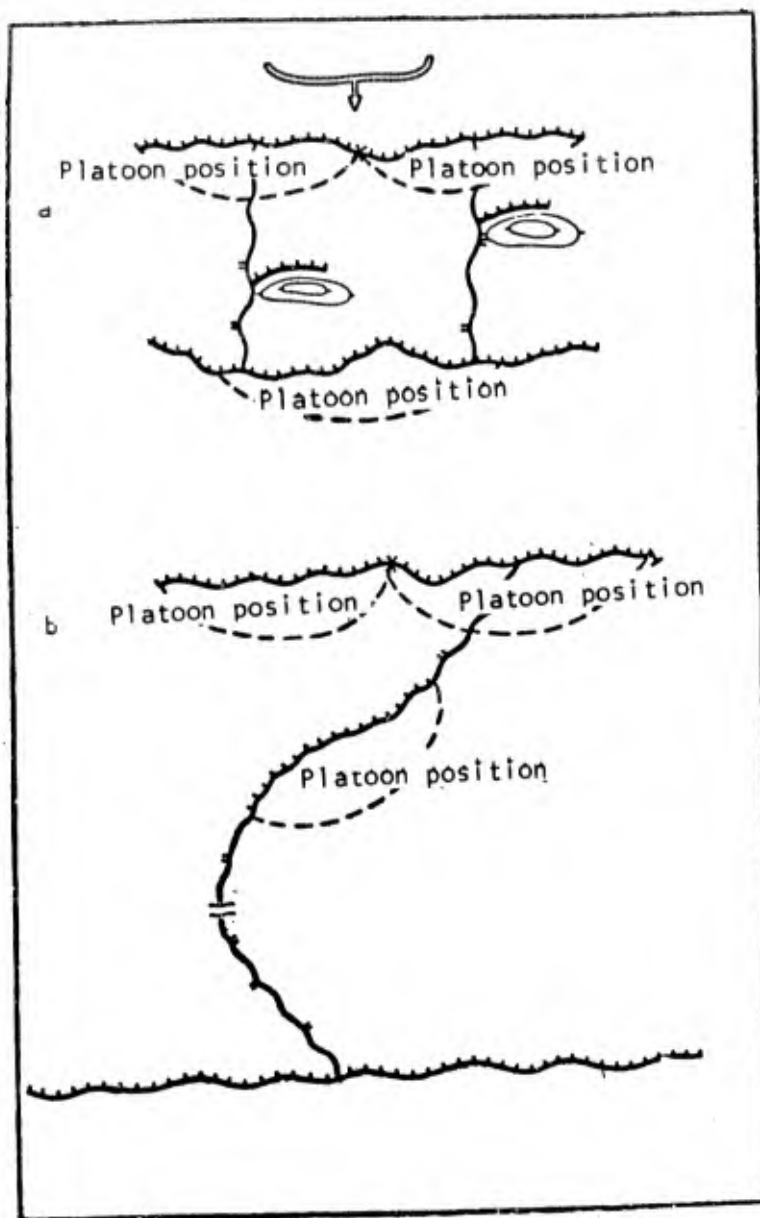
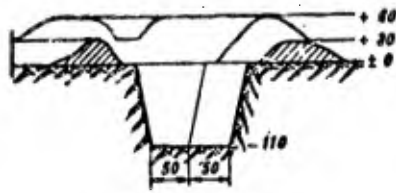


Figure 9. Variation in the Disposition of Rifle Platoon Positions in a Company Defense Area.

Cross section through N1



Plane view

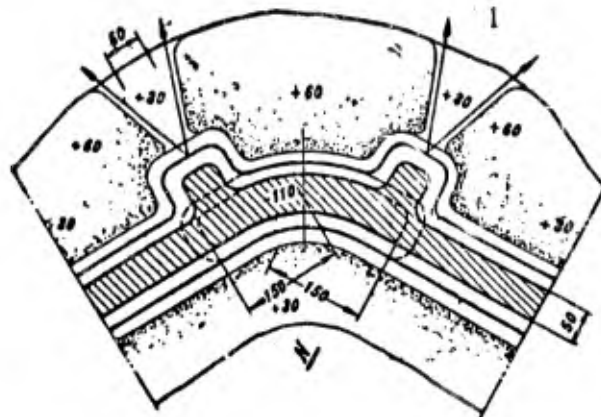
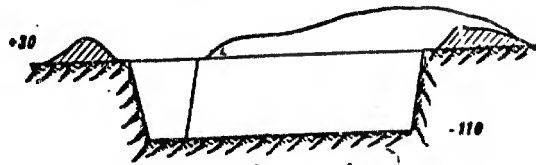


Figure 10. Adjoining Rifle pits.

Cross section through N1



Plane view

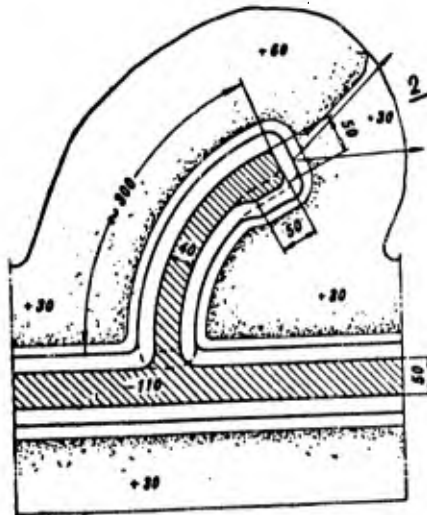


Figure 11. Offset Rifle pit.

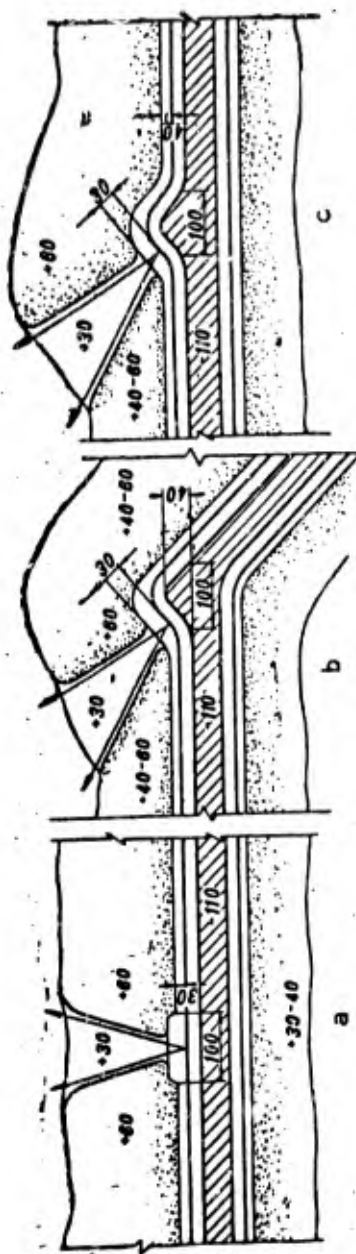


Figure 12. Disposition of Adjoining Rifle Pits: a, For the conduct of frontal fire; b and c, For the conduct of oblique fire.

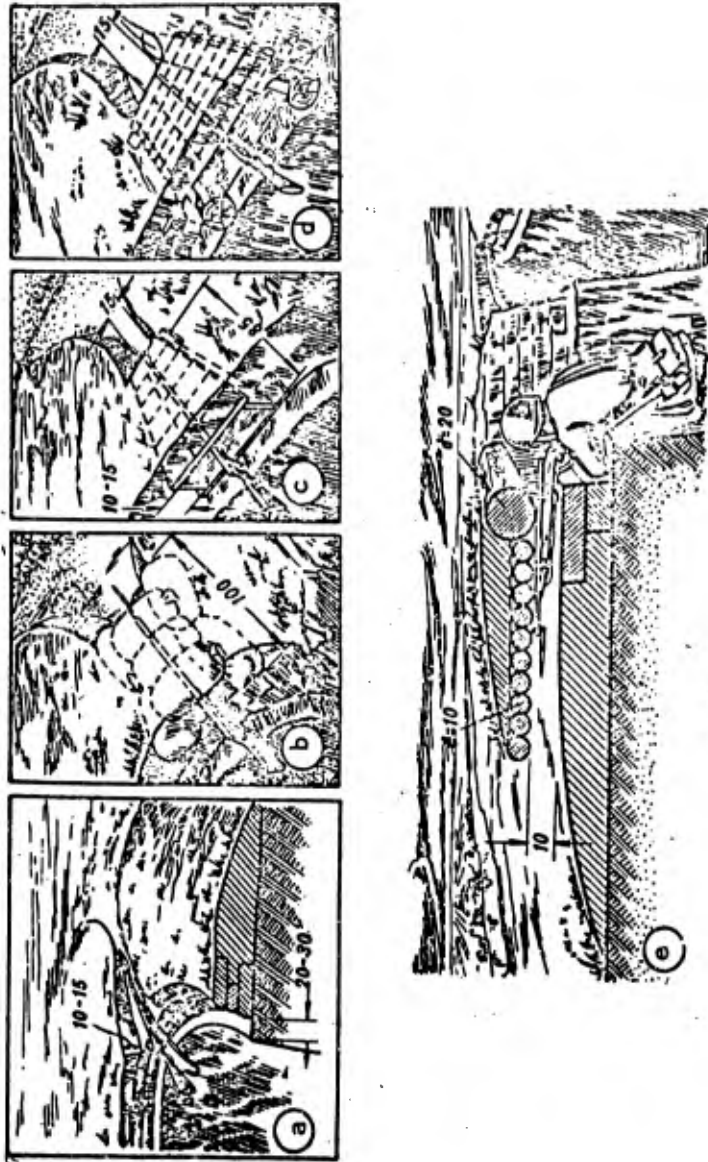


Figure 13. Firing Openings for the Conduct of Fire: a, Open embrasure; b, Covered firing opening of sandbags; c, Covered firing openings of boards; d, Firing opening of poles; e, Cross section of a firing opening of poles.

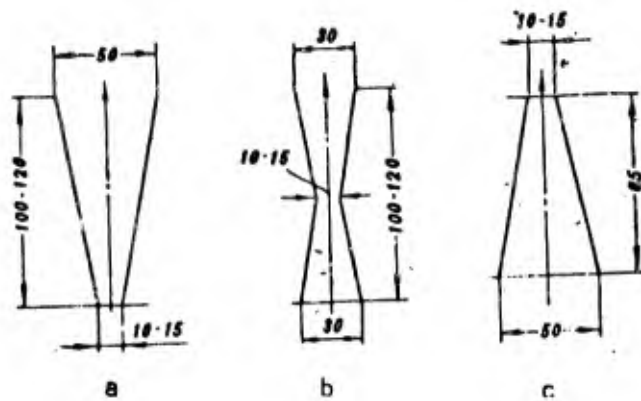


Figure 14. Types of Firing Openings: a, With funnel toward the enemy; b, With funnel in both directions; c, With funnel toward the riflemen.

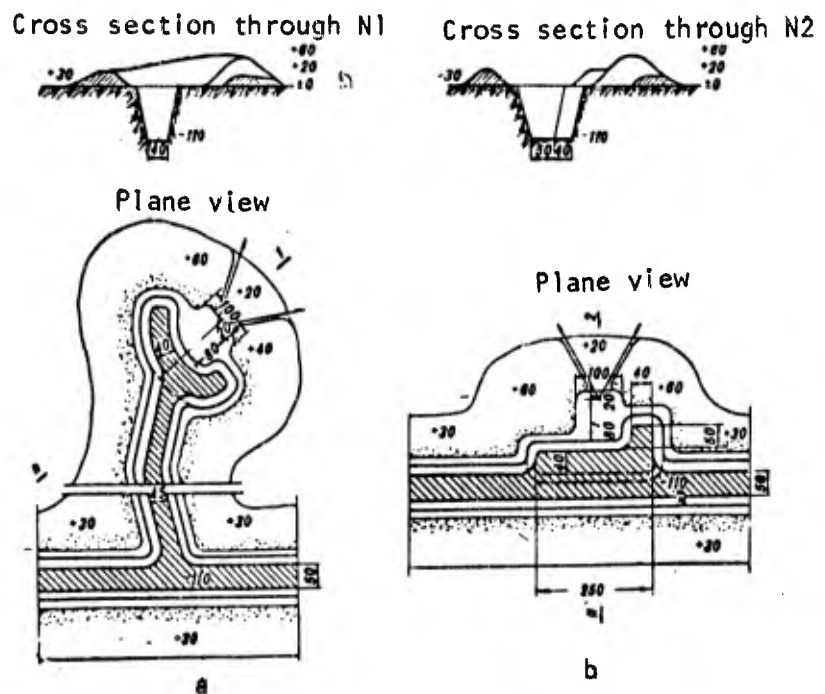


Figure 15. Emplacement for Machine guns: a, Offset; b, Adjoining the foxhole (trench).

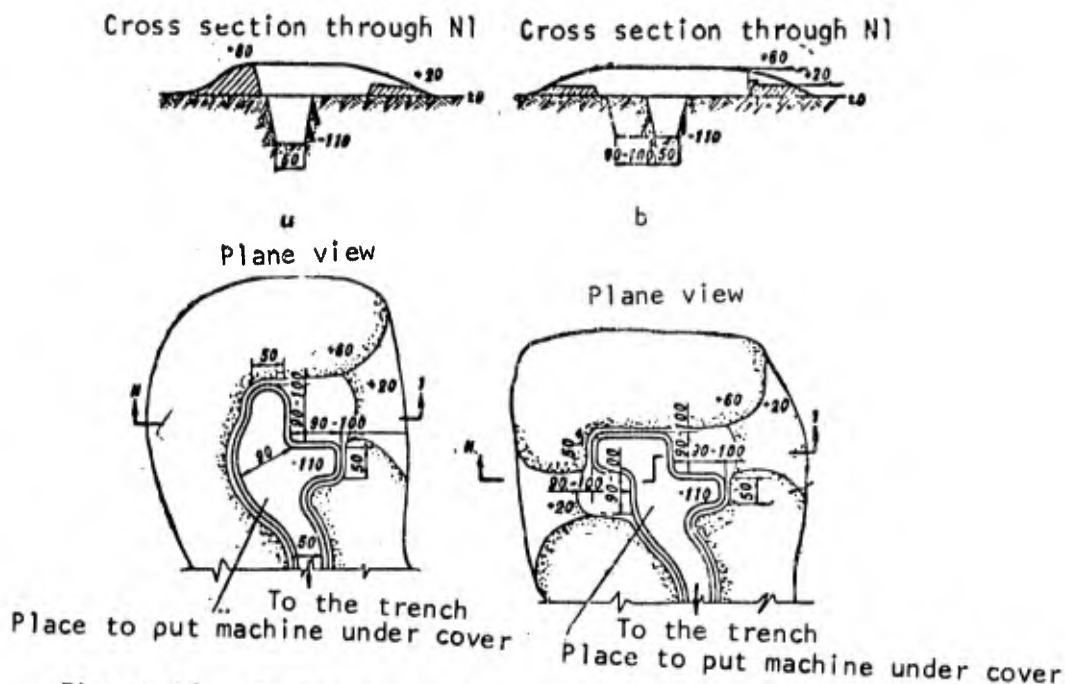


Figure 16. Emplacements for Machine guns: a, Semi-caponier type; b, Caponier type.

Since it is difficult to disperse in a narrow ditch, especially with stretchers for the wounded, cul-de-sacs and widenings about 3 meters long and up to 1.5 meters wide are made in the trenches (communication trenches) at certain intervals.

In order to assure rapid exit from the foxholes and trenches (communication trenches), they are equipped with ladders, bridging boards, ramps, and notches (Figure 19).

To store weapons, ammunition, and food, recesses are made in the forward slope of the trench, somewhat above its bottom, with walls of board or pole panels reinforced by field expedients. The dimensions of the recesses differ and depend on their purpose. Figure 20 shows a recess for administrative supplies. Ten man-hours are spent on its construction and 0.6 cubic meters of round timber are expended. A recess for ammunition is made with dimensions of 80 x 70 x 70 cm. In its construction, we are usually limited to the cover of small logs alone, leaving the walls and bottom without revetment.

In order to assure the combat use of the trenches and communication trenches, it is necessary to drain off ground and surface water. A lack of proper consideration of this in selecting the site for the disposition and in improving the trenches and communication trenches

on some sectors of defensive positions during the Great Patriotic War sometimes led to a situation where the troops were forced to abandon such sectors and expend a new effort to organize the defense in another place.

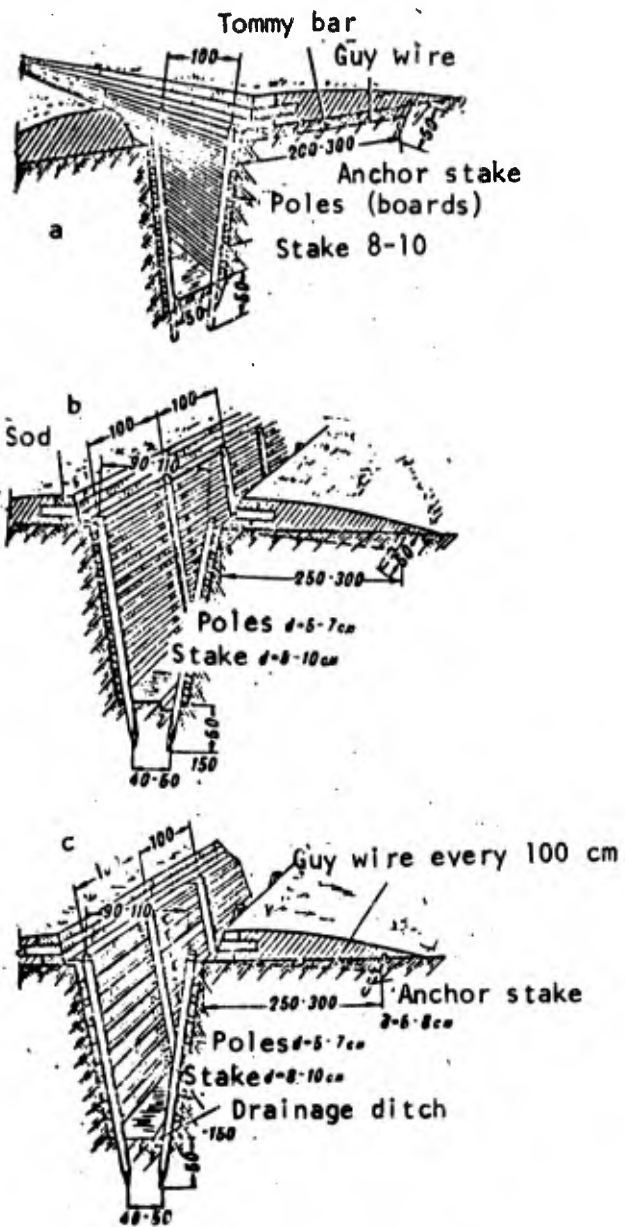


Figure 17. Revetment of Slopes with Poles: a, Continuous; b, Thinned every other pole; c, Thinned every two poles.

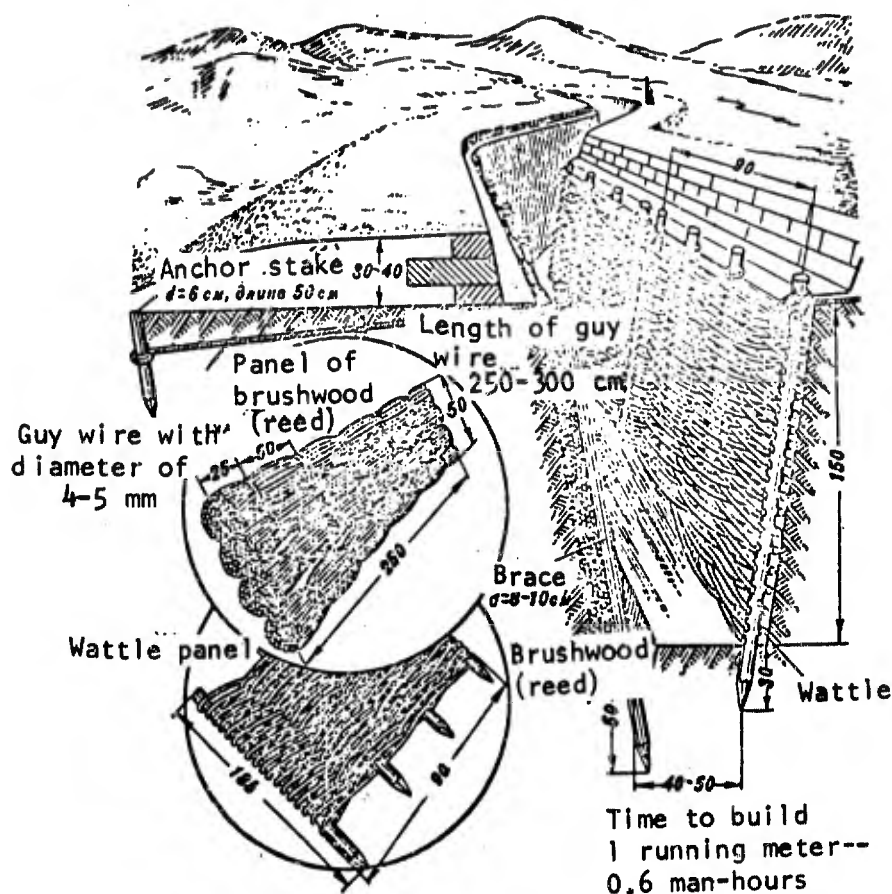
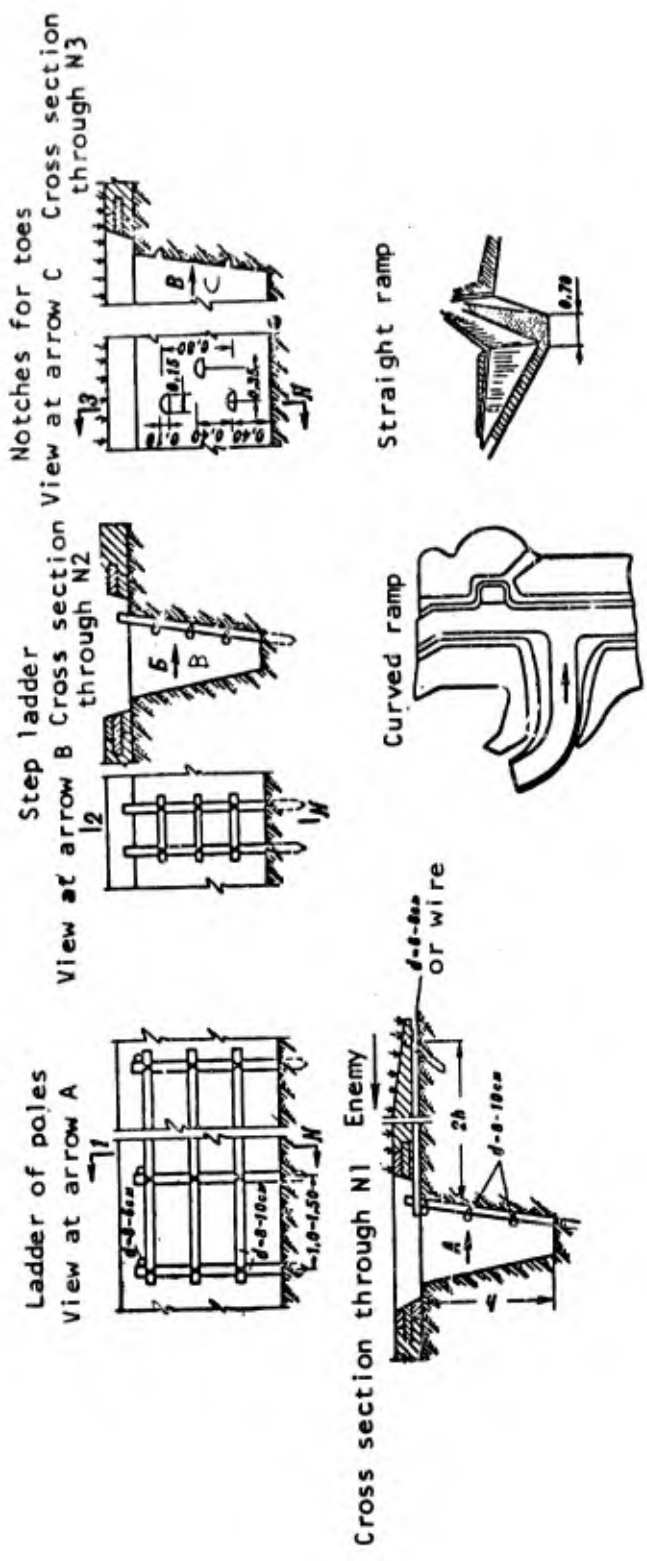


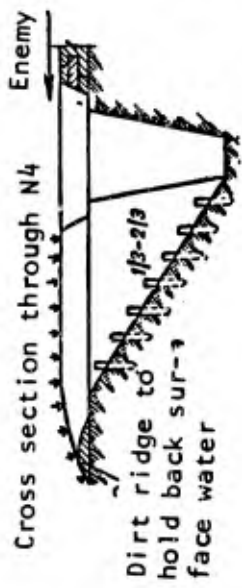
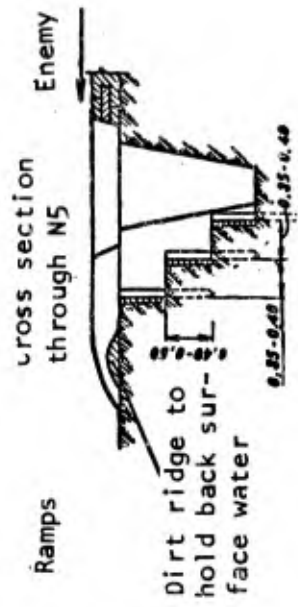
Figure 18. Revetment of Slopes with Panels of Brushwood (Reed) and Wattle.

With the location of trenches on the slopes of heights, an uphill run-off ditch is dug to intercept and drain off the water which flows from them along the trenches (Figure 21). The water from this ditch is drawn off to the lower terrain sectors or is passed across the trench through special wooden troughs. Three man-hours are required to dig 10 running meters of ditch.

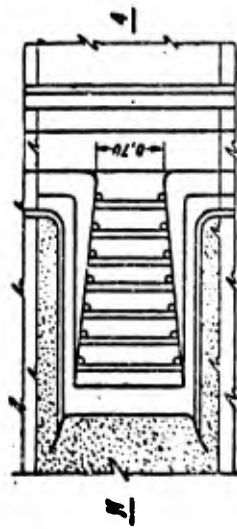
To drain off the water and dry out the trenches, drainage ditches are laid out along their bottom, the water from which is collected

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Plane view



Plane view

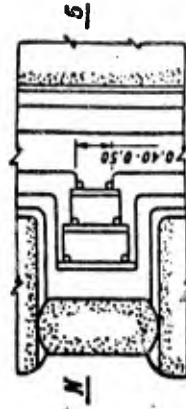


Figure 19. Arrangement of Exits From Foxholes, Trenches and Communication Trenches.

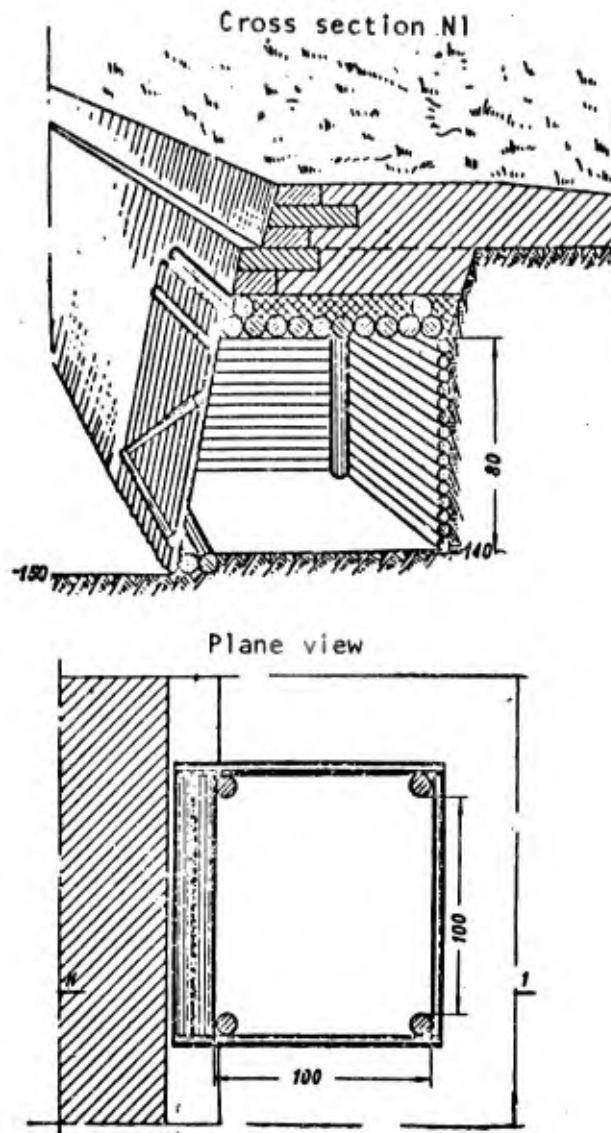


Figure 20. Recess for Administrative Supplies With Pole Revetment.



Figure 21. Uphill Drainage Ditch.

Arrangement of drainage ditches

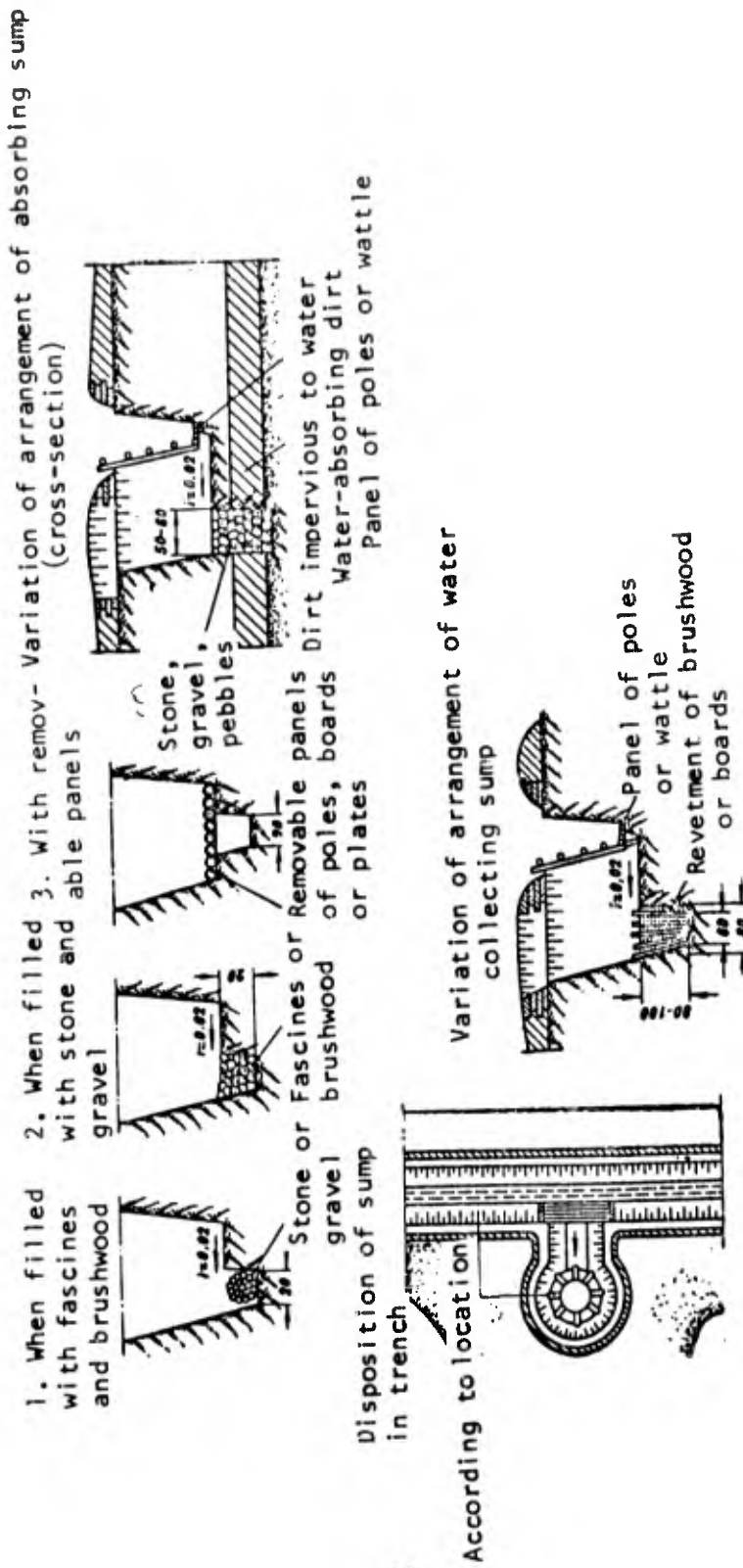


Figure 22. Arrangement of Sumps and Ditches to Dry Trenches.

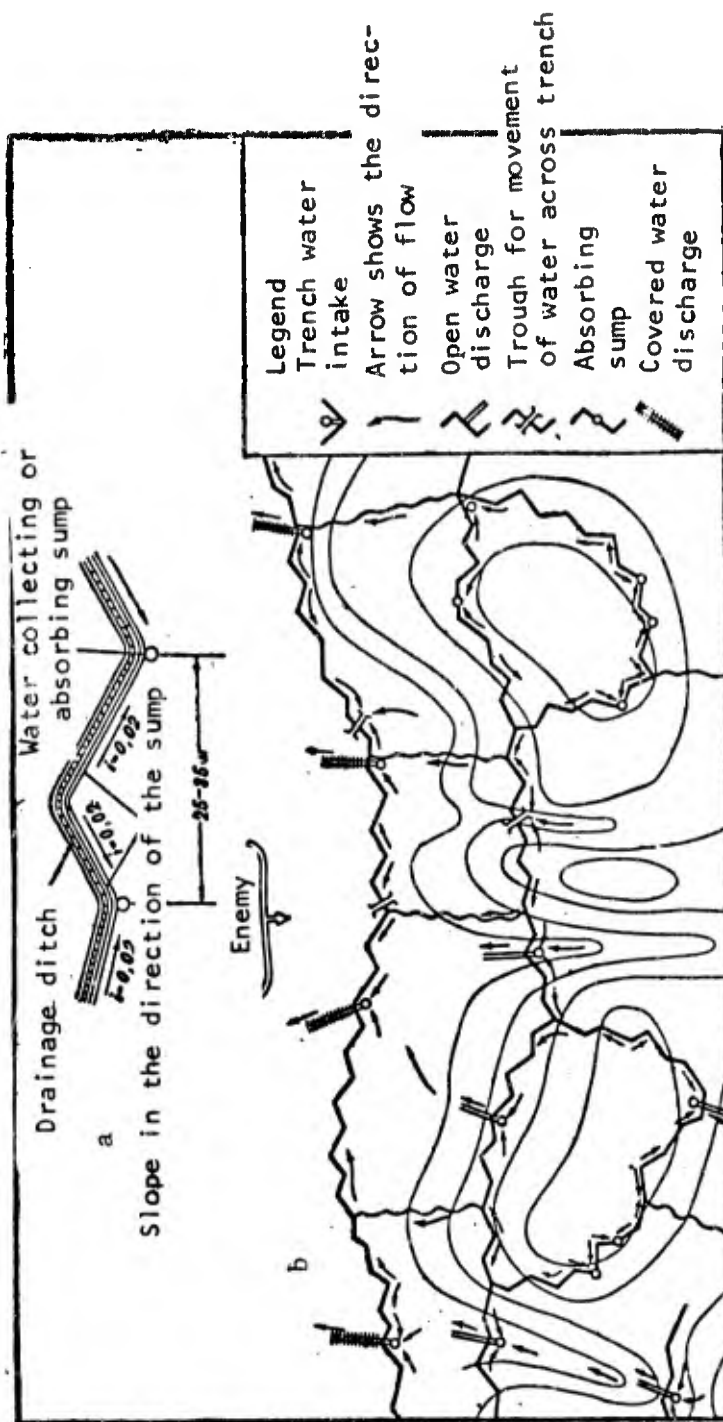


Figure 23. Principle Schematic of the Organization of Drainage From Trenches and Communications Trenches: a, On flat sectors; b, On broken terrain.

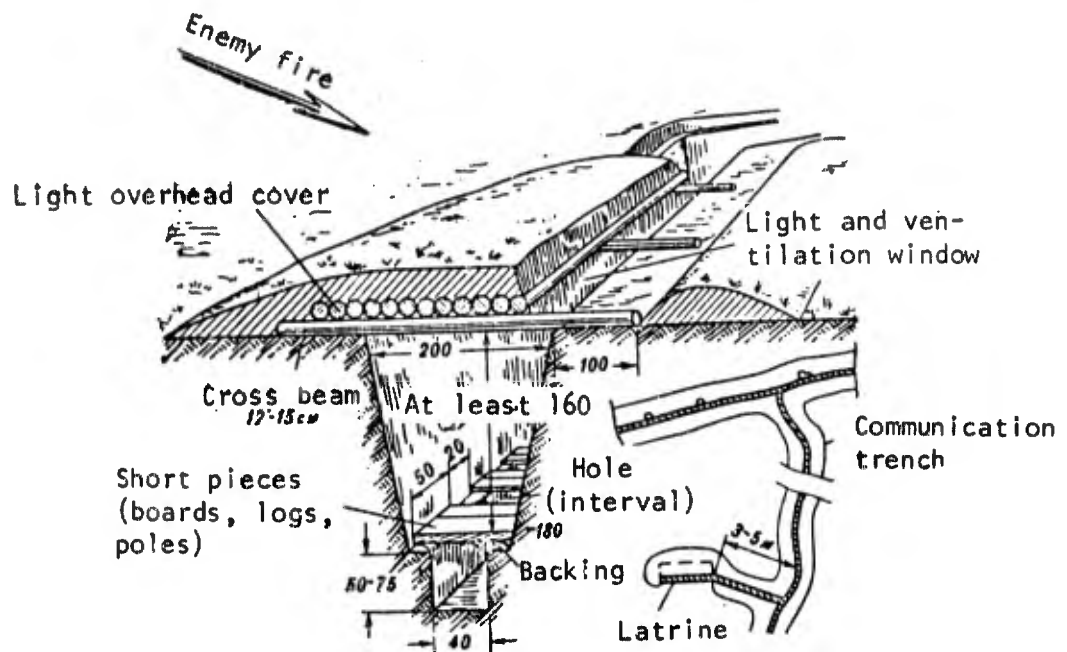


Figure 24. Latrine.

[Tr note--Text resumes on p. 36] covering--suspended traverses. The distance between them depends on the slope of the terrain. It can be considered that with a slope of up to 4° , there is no requirement to build traverses. With a terrain angle of 8° , for example, traverses must be constructed every 2-3 meters.

With the availability of time and materials, at the primary machine gun positions it is desirable to erect covered weapons emplacements. They may be timber dirt, stone dirt, reinforced concrete, armored, and others. Embrasures with hinged panels, armored flaps, etc. are installed for firing from these emplacements.

The most widespread type of covered emplacement, the construction of which may be performed by soldiers having the required special training, is the timber-dirt emplacement (DZOS) of log row construction (Figure 25).

The rows of logs of the emplacement frame are bound together from logs with a diameter of 16-18 cm. The finished frame (cribwork) is lowered into a ditch which has been dug in such a way that the distance

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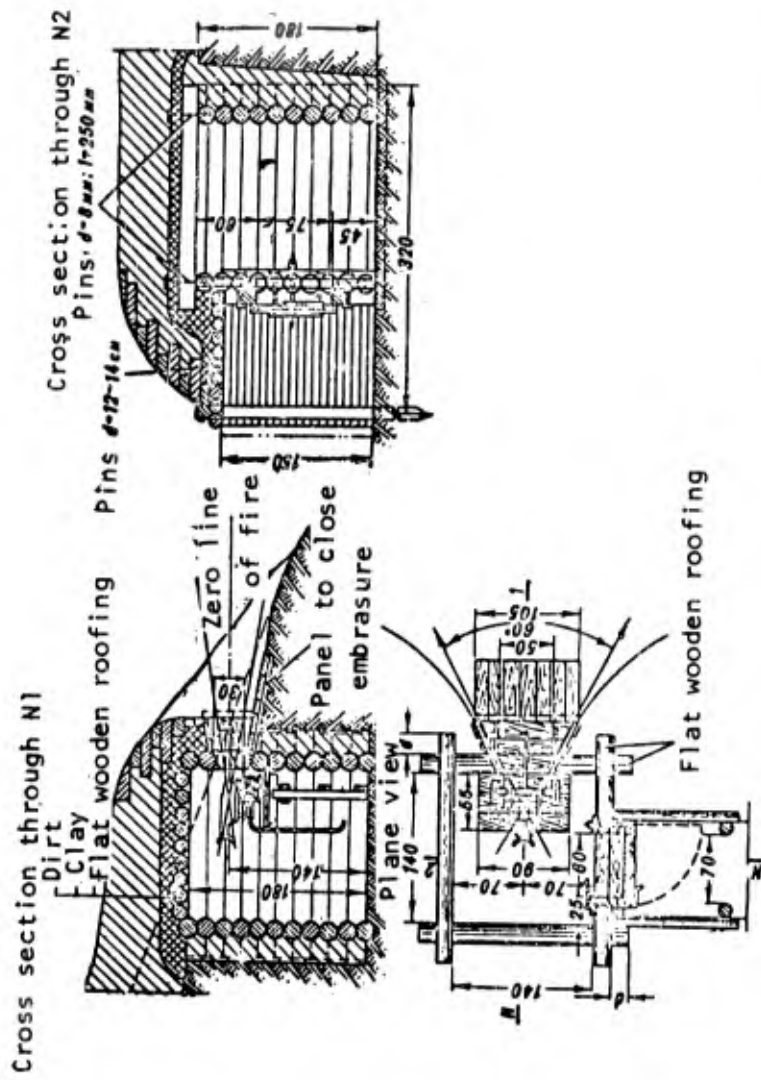


Figure 25. Earth and Timber Covered Machine gun Emplacement (DZ05) of Log Row Construction Located on a Slope.

Cross section through N1

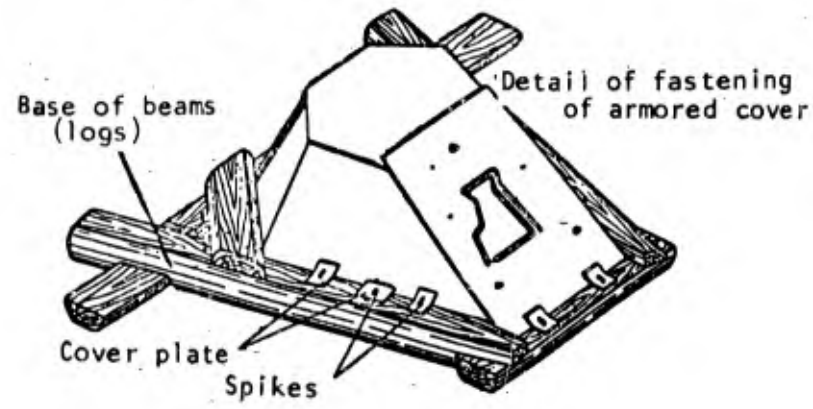
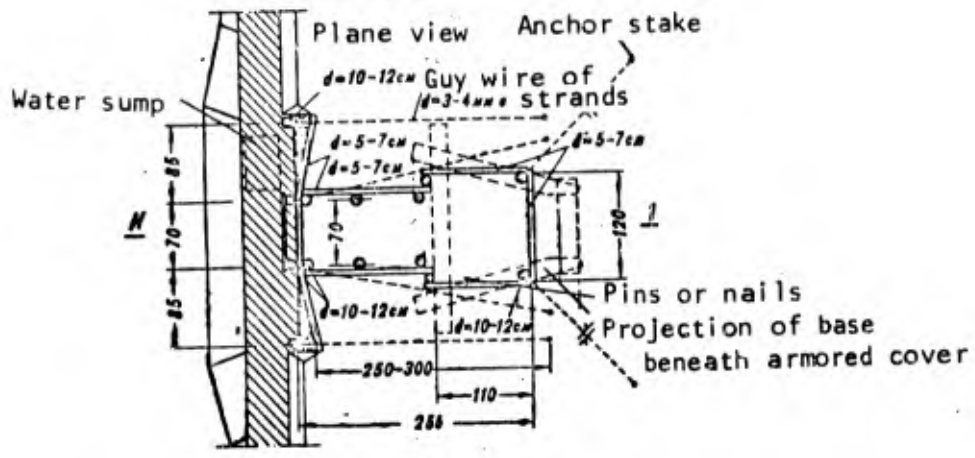
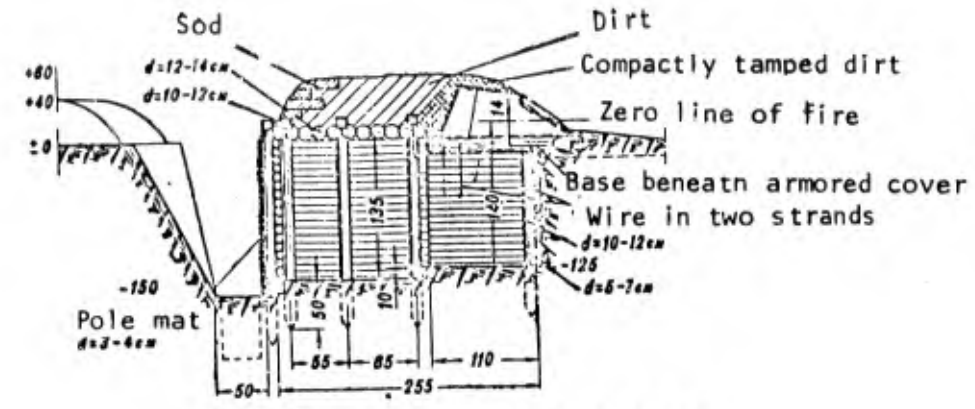


Figure 26. Covered Machine gun Emplacement with Armored Cover.

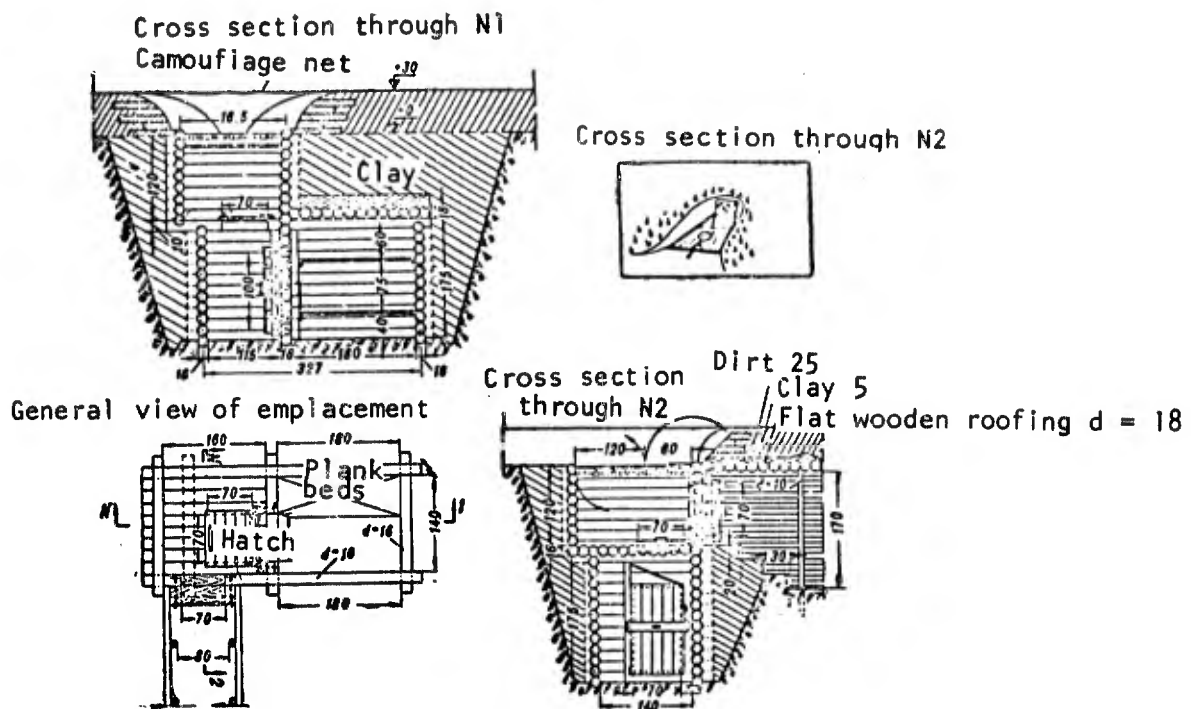


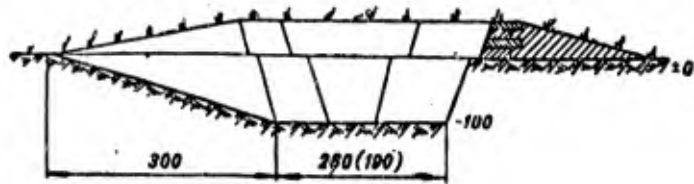
Figure 27. Disappearing Gun Emplacement (SOT).

In improving mortar pits it should be kept in mind that the best ground for setting up the base plate of the mortar is ground of medium compactness on which the plate provides insignificant settling, stability of the mortar is completely sufficient in firing, and the materiel wears out less. Therefore, light soil requires tamping and hard soil requires preliminary loosening with subsequent tamping. If the mortar is set up on untamped light soil, then after firing the baseplate moves backward and the mortar may fall. Sixty man-hours are spent on constructing a pit (without a dugout) and 1.6 cubic meters of round timber and 12 kg of metal articles are expended. The sequence in erecting a mortar pit is shown in Figure 28.

A rifle company which is defending on the main sector may be reinforced by up to 6-8 antitank

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Cross section through N1



Plane view

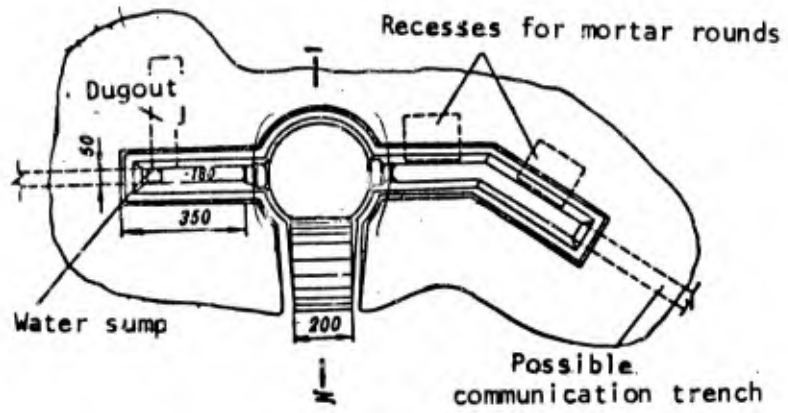
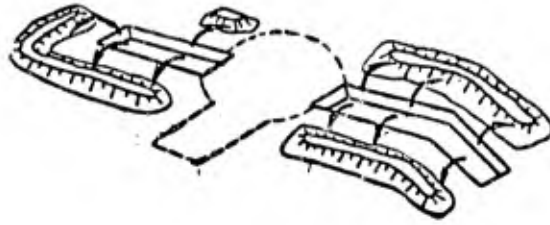
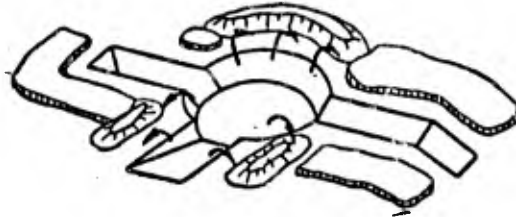


Figure 28. Pit for All-Around Firing for 120-mm (82-mm) Mortar.

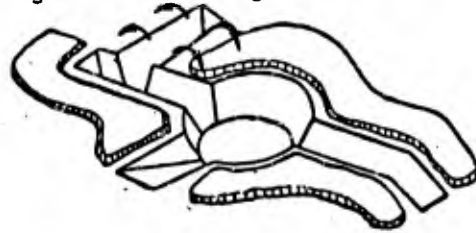
Erection procedure
Digging pits



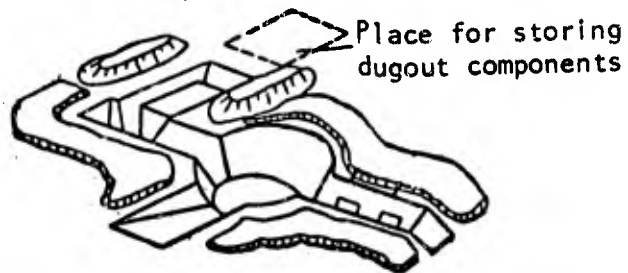
Digging emplacement and ramps

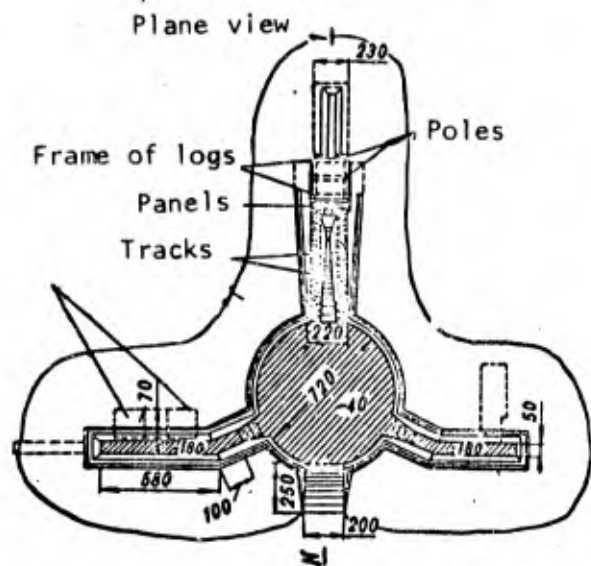
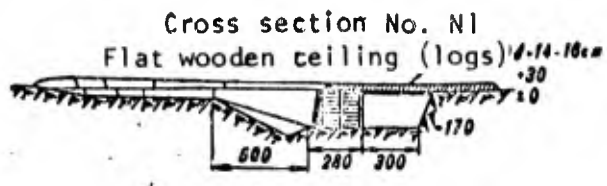


Digging ditch for dugout and layout of dugout



Layout of recesses





Order of construction

1. Digging cover for gun with bulldozer and pit manually

Working the ground manually

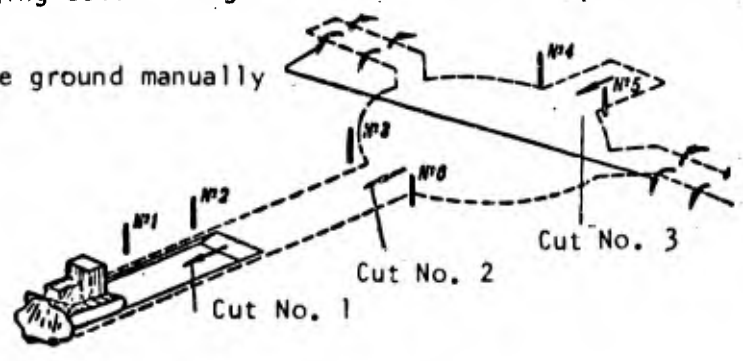
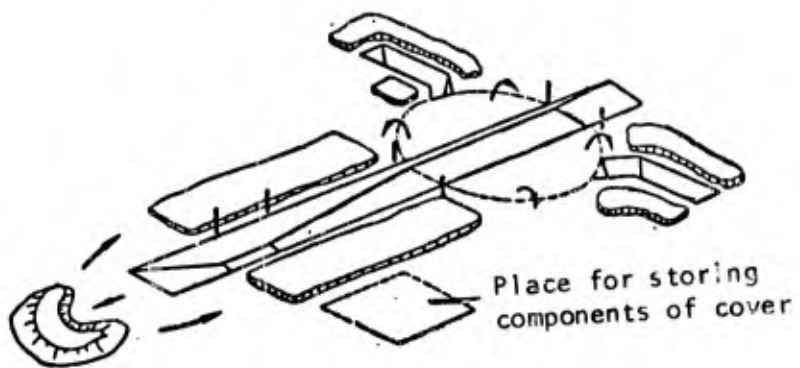
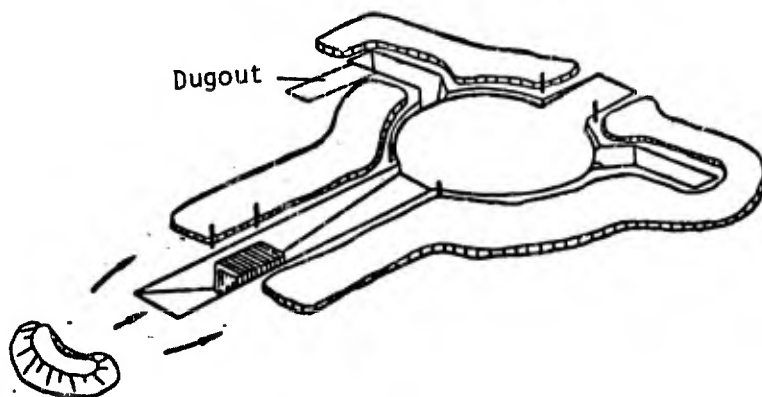


Figure 29. Pit With All-Around Firing for 57-mm and 85 (100)-mm Guns With Cover for the Gun.

2. Digging emplacement manually and forming the parapet using a bulldozer



3. Assembly of cover for gun and filling in



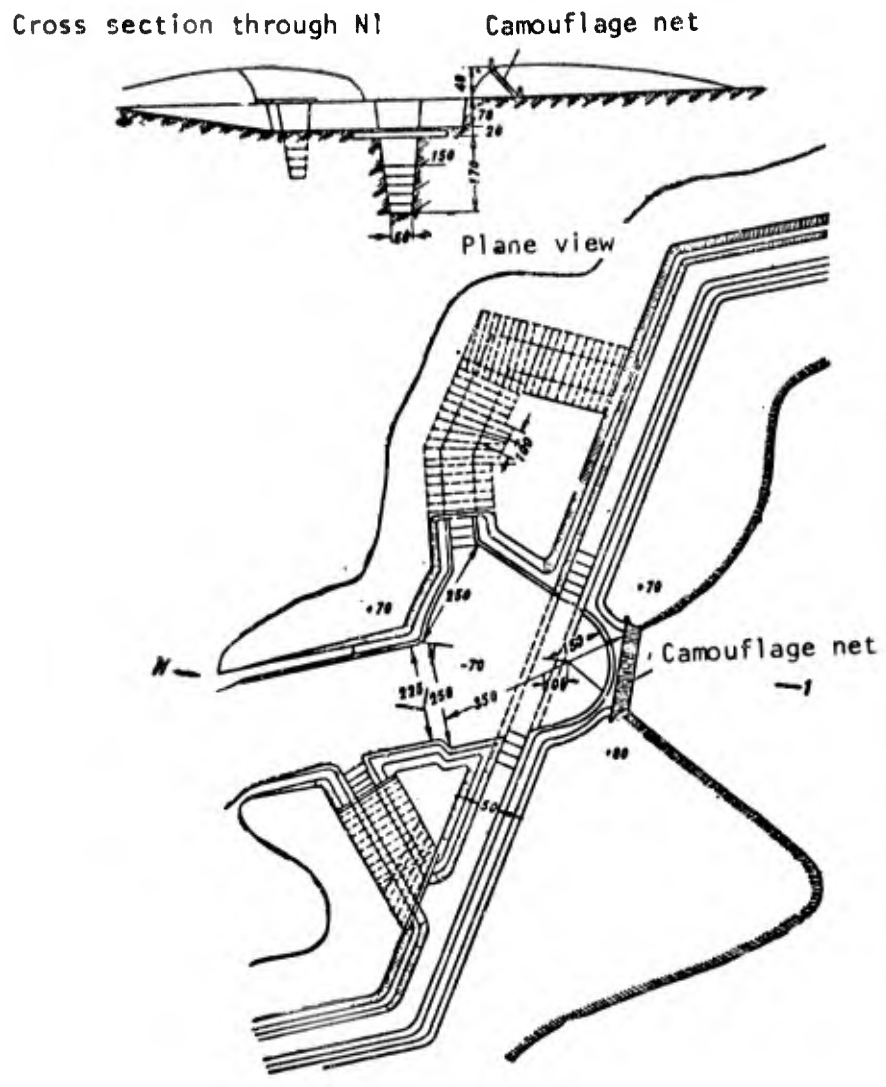


Figure 30. Pit For 85-mm Gun Adjoining a Trench (Variation).

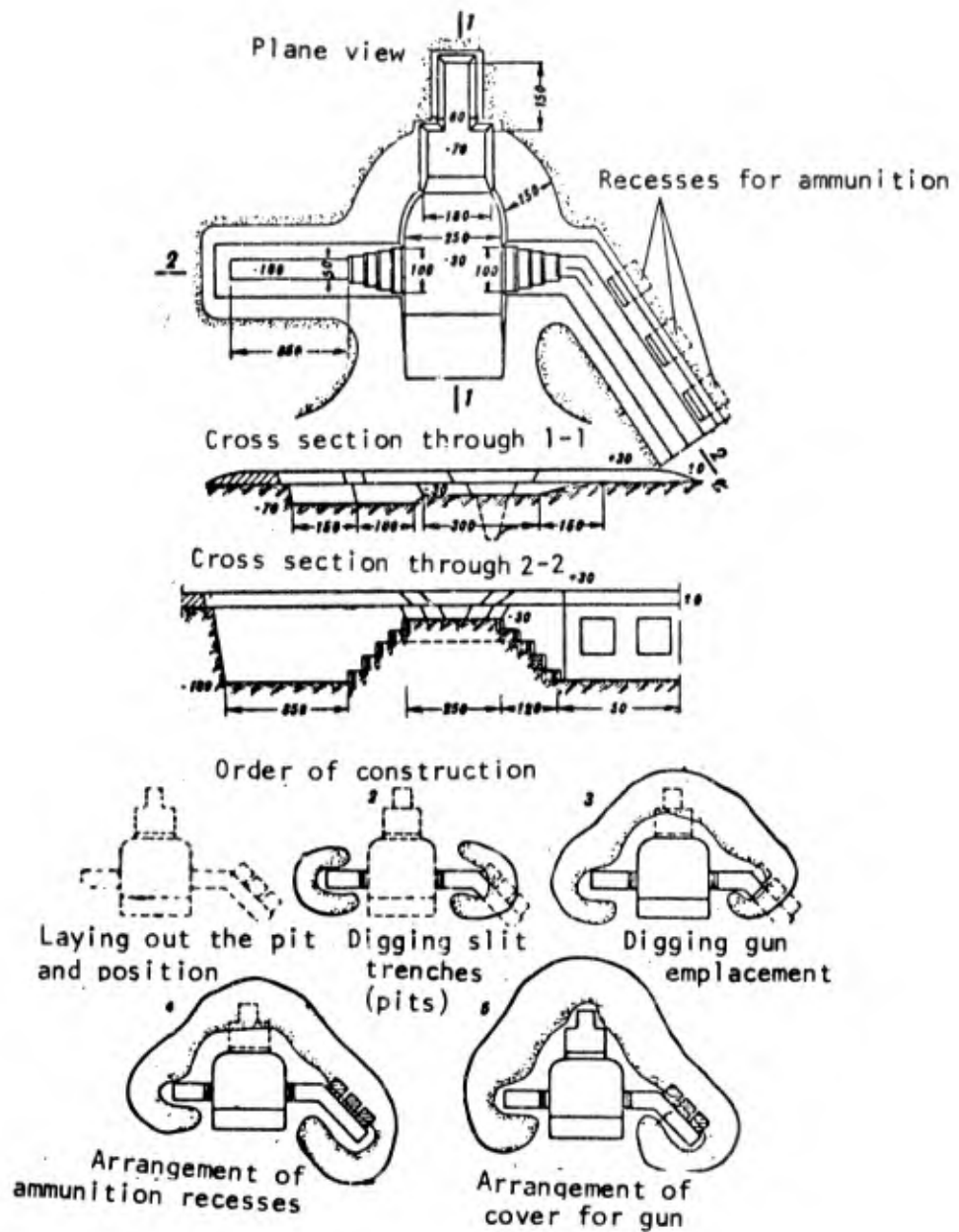


Figure 3! Pit for Recoilless Gun

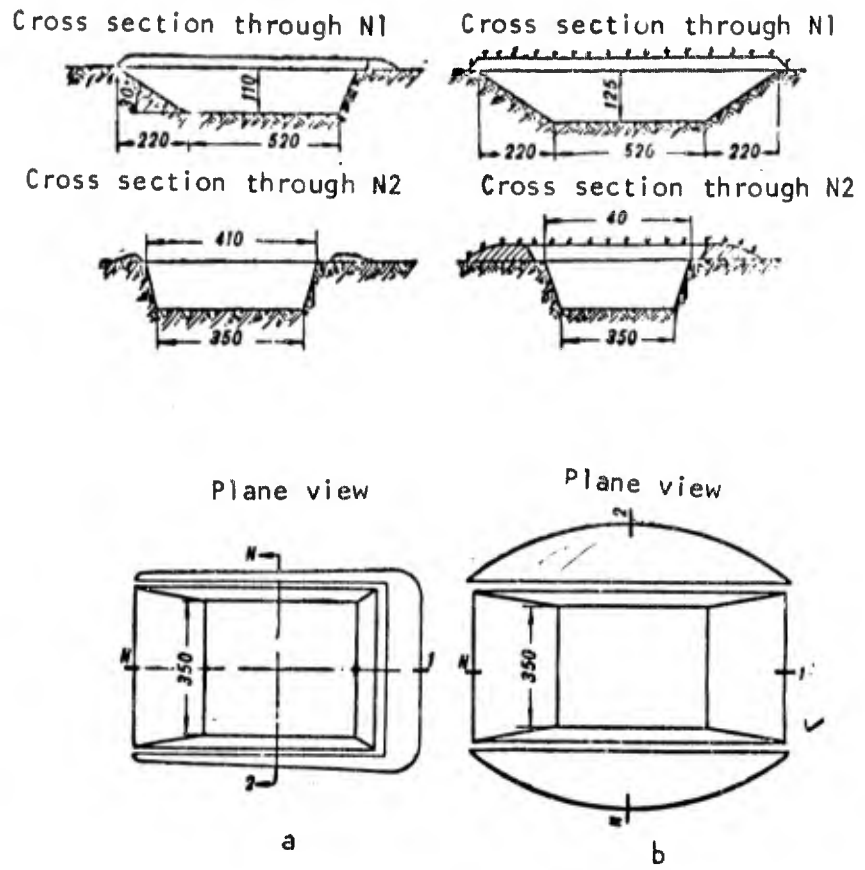
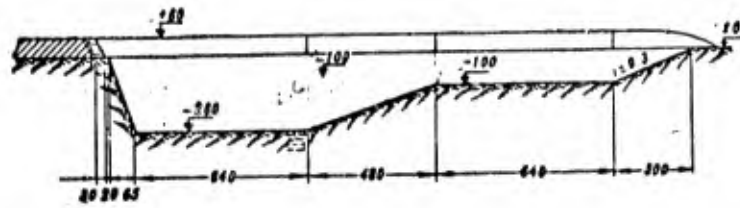


Figure 32. Pit for Tanks: a, With one ramp; b, With two ramps.

Cross section through N1



Cross section through N2

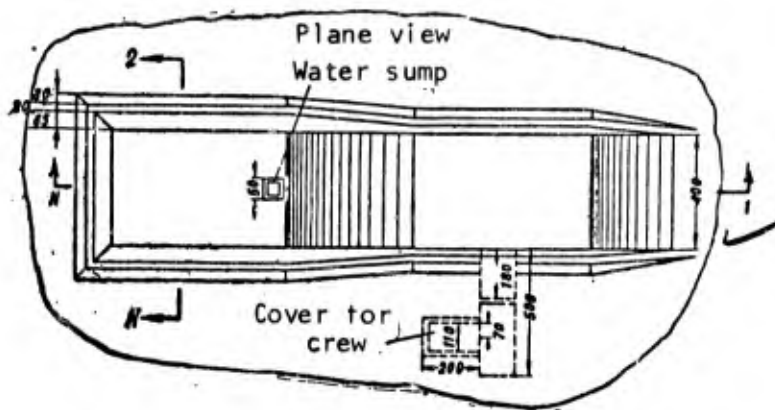
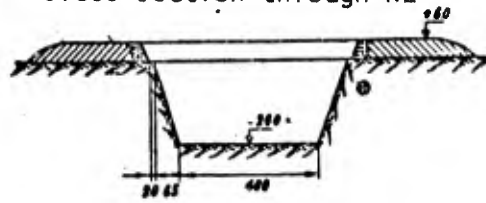


Figure 33. Pit for Tank with Cover.

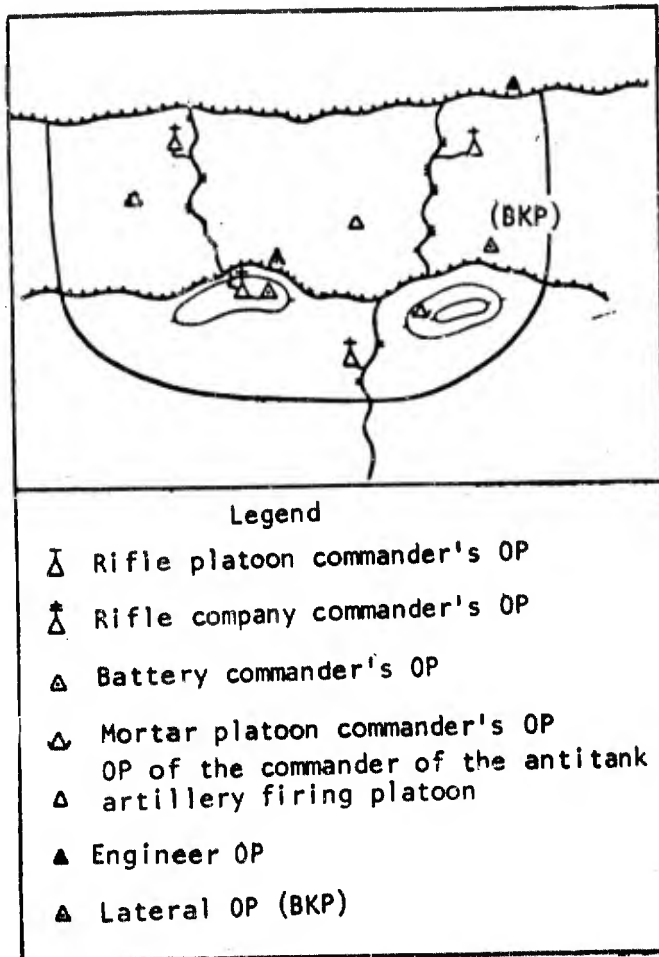


Figure 34. Diagram of Disposition of Observation Posts (OP) in a Rifle Company Defense Area (Variation).

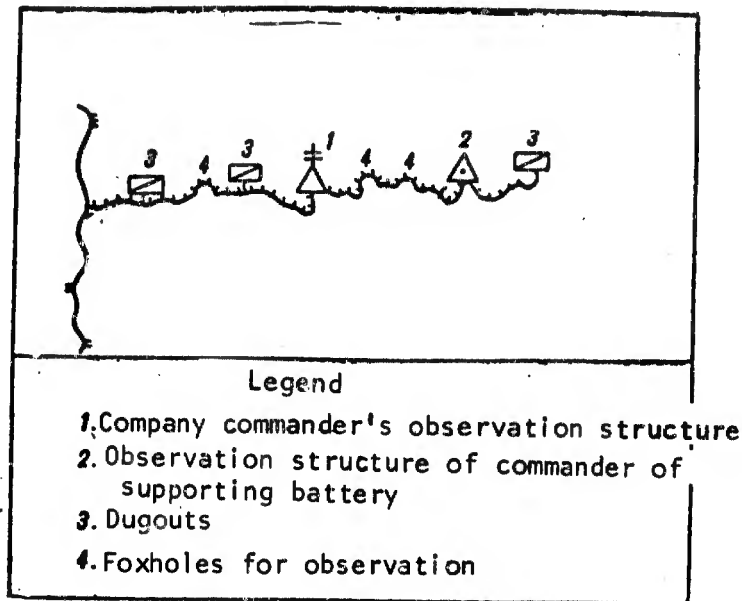


Figure 35. Principle Schematic of Location of Structures at OP of a Rifle Company Commander.

[Tr note--Text resumes on p. 51] i.e., almost six-fold less than when working manually (it is necessary to expend 170 man-hours manually).

In the last war, in the absence of means of mechanization for earth-moving work, sometimes it was necessary to detail podrazdeleniya of riflemen to help the tankers in order to accelerate the digging of pits for tanks. This assistance was especially necessary when the work on improvements was conducted close to the FEBA under conditions of direct contact with the enemy.

3. Structures for Observation

To assure uninterrupted observation and control of the podrazdeleniya in combat, special structures are erected in the defense area of a rifle company for observation. With the defense of a company on the first position, 8-10 primary observation posts will be established in its area (Figure 34). They are all dispersed frontally and in depth, being disposed in places which are most convenient for the conduct of observation in assigned sectors.

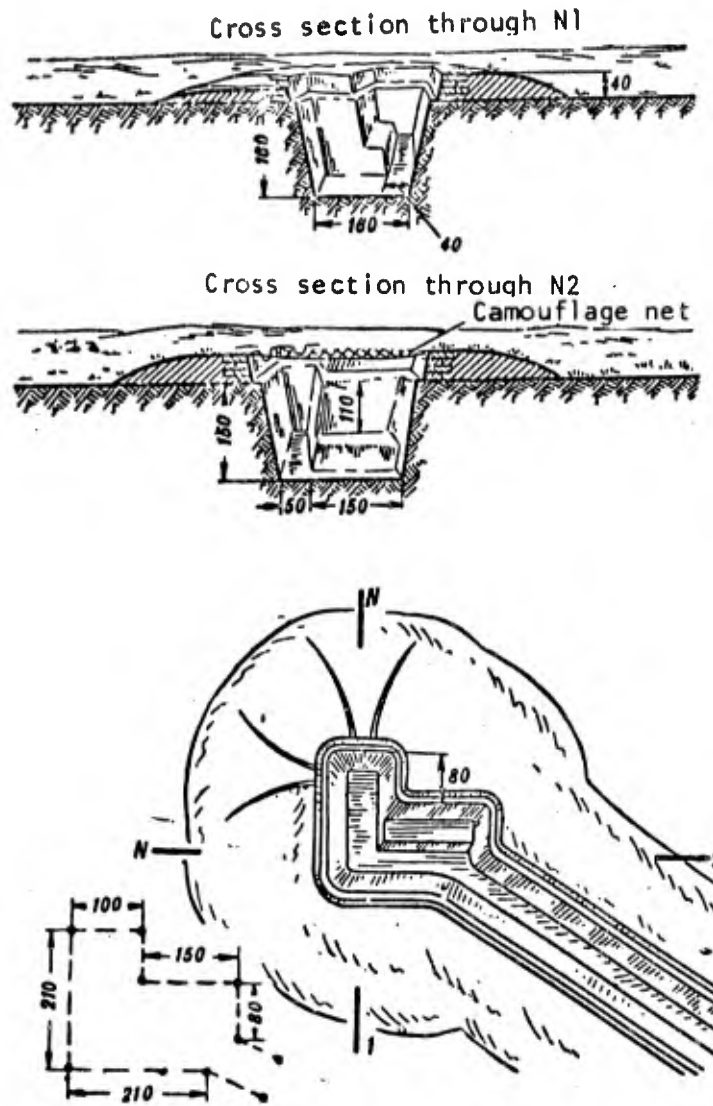


Figure 36. Open-Type Emplacement for Observation.

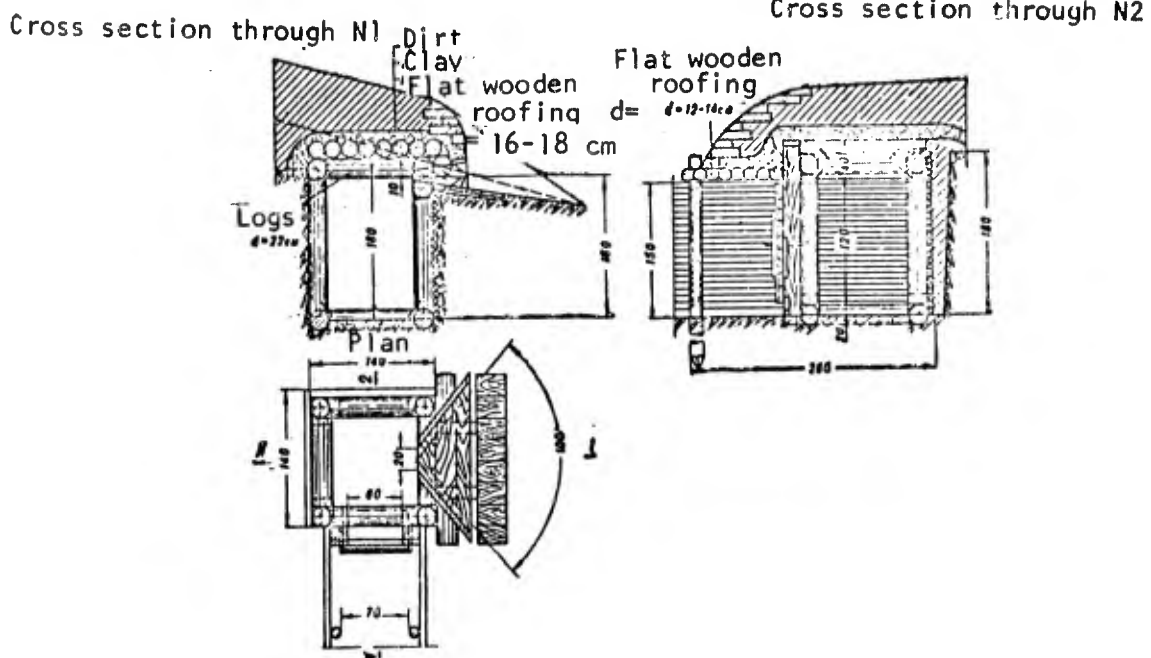


Figure 37. Timber and Dirt Structure with Viewing Slit for Observation.

The company commander's observation post is located on the terrain in such a way as to observe the platoon positions and approaches to them, follow the course of the company's battle, and see its combat formation completely. The place for the observation post is selected on high ground from which a good view of the required sector is provided within limits of 800-1000 meters. The conditions of the battle require that the company commander have two observation posts rather than one: a primary and an alternate. Erected at the company commander's observation post are: a structure for the company commander's observation, foxholes for messengers, dugout for the company commander and his deputy, dugout for the messengers and telephone operators, structure for observation and dugout for the commander of the supporting battery.

Figure 35 presents a principle schematic of the disposition of structures at the observation post of a commander of a rifle company. Usually, they are located 10-20 meters from each other.

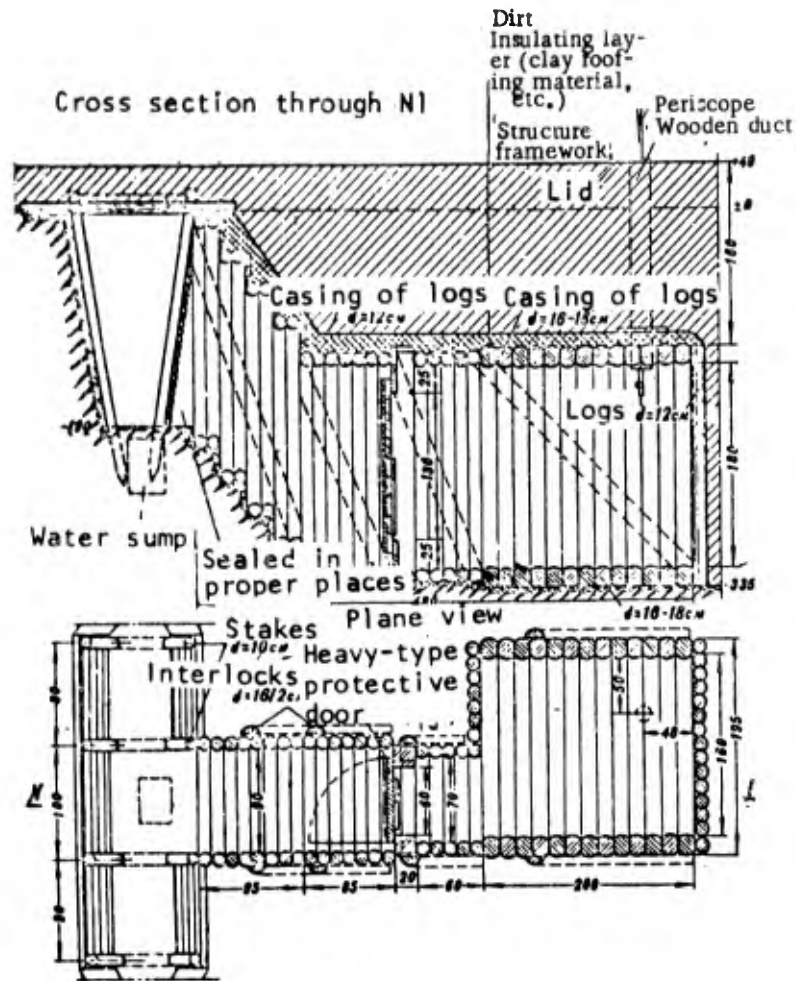


Figure 38. Structure for Observation Through a Periscope.

The simplest structures for observation may be a well camouflaged two-man foxhole which adjoins a trench or an open structure consisting of a foxhole for observation and a slit trench for the telephone operators (Figure 36). Ten man-hours are expended on building such a structure.

In preparing the terrain ahead of time, a covered structure for observation should always be erected for the company commander since it protects better against means of destruction and improves observation conditions.

In the Great Patriotic War, the most widespread structure for observation was a structure with observation slits of a frame or log construction (Figure 37). The vulnerable place with the action of a shockwave and one of the basic give-away signs of this structure are the observation slits. Therefore, measures should be adopted for the careful camouflage of the observation slits and, for the time of firing, they should be closed with thick panels although this also deprives the commander of the opportunity for conducting continuous observation. Another shortcoming of the structure is the fact that the observation slits permit observation only in a limited sector, within limits of 45-60° each. Despite these shortcomings, structures with observation slits will also find employment in modern war since they are simple in design, are constructed rather quickly (80-man hours with procurement of the parts), and require comparatively little material (round timber--3 cubic meters, lumber--0.4 cubic meters, and metal articles--28 kg).

Considerably better with respect to its protective characteristics and camouflage as well as to assuring observation are structures for observation through a periscope. Figure 38 shows such a structure which can also serve as cover for the company commander at the same time. Three hundred man-hours are spent on its construction and 6.2 cubic meters of round timber, 0.4 cubic meters of lumber, and 48 kg of metal articles are expended.

Structures for observation can be constructed with a lesser expenditure of time by using armored cover of the TNZ type. It also provides the opportunity for all-around observation, is not very noticeable, and has little probability of destruction in connection with its insignificant dimensions in a plane and for height.

One variation of a structure for observation with TNZ armored cover is shown in Figure 39. Usually, such a structure adjoins a trench and this assures better camouflage. However, even when constructed outside a trench, it is easily camouflaged under local objects which stand alone.

The armored cover is installed over a ditch on a wooden supporting frame and is fastened by four brackets. The supporting frame rests on the ground and is fastened to it by wooden anchor stakes or, using wire, to the revetment of the slopes.

With respect to the expenditure of time and materials on a structure with armored cover, almost as much time and materials are expended as on structures with the observation slits. Its construction requires 100 man-hours, 2.5 cubic meters of round timber, 0.25 cubic meters of lumber and 66 kg of metal articles (also considering the weight of the armored cover itself).

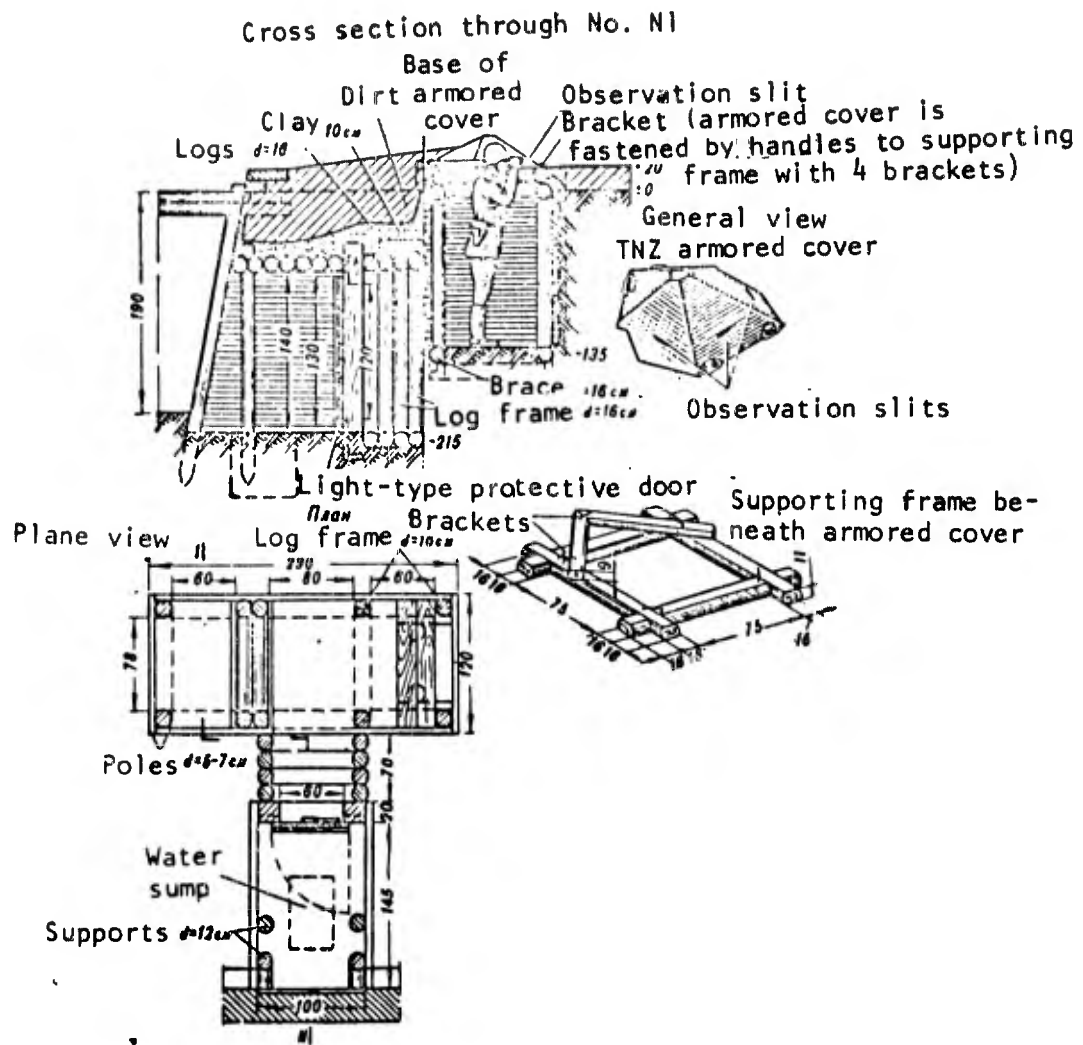


Figure 39. Structure for Observation From TNZ Armored Cover.

In individual cases when there is no possibility of obtaining a periscope or armored cover, a shaft can be constructed for observation (Figure 40). Such a structure is easily camouflaged but requires considerable labor and much lumber.

Used as cover at the company commander's observation post are structures of the normal type, the construction of which is described in the next section.

Since the enemy will first strive to determine the disposition of the observation posts at the position, the company commanders should adopt all measures to camouflage their observation posts and strictly see that the actions of the personnel who are servicing the observation posts do not give it away. The importance of careful camouflage of an observation post can be seen from the following example. In the area of Mosal'sk Station where, in January 1943, one of the rifle regiments of the Soviet Army was defending, the Germans tried unsuccessfully to reconnoiter the disposition of the expertly camouflaged structures of the battalion commander's observation post for a long time and then they began to conduct mortar fire on the presumed location of the observation post. In one day, the enemy fired 280 rounds and only 4 rounds fell where the observation post structures actually were. Even as a result of prolonged reconnaissance, the enemy could not exactly discover the observation post and destroy its structures with aimed fire since they were well camouflaged against the background of the terrain and the personnel of the observation post carefully observed camouflage measures.

The number of observation structures and the expenditure of forces and means of their construction in a company defense area may differ. Presented below is an approximate calculation of the volume of work and expenditure of materials for setting up an observation post in a company defense area.

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[Tr note--Text resumes on p. 62]

A covered section of a trench may be with a revetment of the slopes or without it. Such cover may be constructed most quickly by stretching over a ditch a canvas or shelter-half reinforced with pegs and buried with a 15-25 cm layer of dirt (Figure 41). The ditches can also be covered by poles, brushwood, or reed fascines or by elongated sandbags

(Figure 42). Expended on 10 running meters of cover are 2.5 cubic meters of small logs or 40 units of 25-30-cm fascines, or 30 units of elongated bags (not considering the revetment of the slopes). In all cases, it is necessary that the material for the covering extend beyond the edge of the ditch by at least 40-50 cm.

A covered trench sector protects the personnel against fragments, napalm, and thermal radiation.

In accordance with the experience of the Great Patriotic War, a slit trench is good protection against the fragments of aviation bombs and artillery shells. It represents a narrow ditch 1.6-1.8 meters long which is dug out from a foxhole, trench, or communication trench in the direction of the enemy (in a communication trench--perpendicular to the line of fire). The slit trench is dug with a capacity for at least a squad on the basis of 0.5-0.6 running meters per man. Where possible, slit trenches are covered by small logs or larger logs and are covered by a layer of dirt 40-50 cm thick (Figure 43). The entrance to such a slit trench is closed by an attached panel. Construction of the slit trench requires four cubic meters of round timbers and 3.5 kg of wire.

A covered slit trench may be constructed with an L-shaped outline and a vertical entrance. Such a slit trench protects the personnel in it against the effects of initial radiation and does not require a specially covered sector of communication trench. It is recommended that machine gun, artillery and mortar sections construct slit trenches with vertical entrances at their positions. The slit trench can be completely prepared, for example, by a gun section in only three days; in this, the sequence of its construction is such that four hours after occupying position a section will be able to dig it out to a depth of 1.1 meters and the radius of damage for personnel will be reduced 1.5-fold in this case. Deepening the slit trench to 2 meters and having constructed revetment for slopes with vertical brace supports, the radius of damage may be reduced up to two-fold, and this is achieved on the second day. Finally, after construction of the cover and the entrance hatch, the radius of damage will be reduced 3.5-fold. Construction of a slit trench with a vertical entrance will require 3.8 cubic meters of timber and 0.1 cubic meters of lumber. The volume of the dirt which is removed is 10 cubic meters. Ninety five man-hours are required to construct it manually.

For individual cover, recesses are made in the walls of the foxholes, trenches, or communication trenches which face the enemy. The recess represents a rectangular cavity of various dimensions (depending on the size of the soldier). Such a recess may hold one or

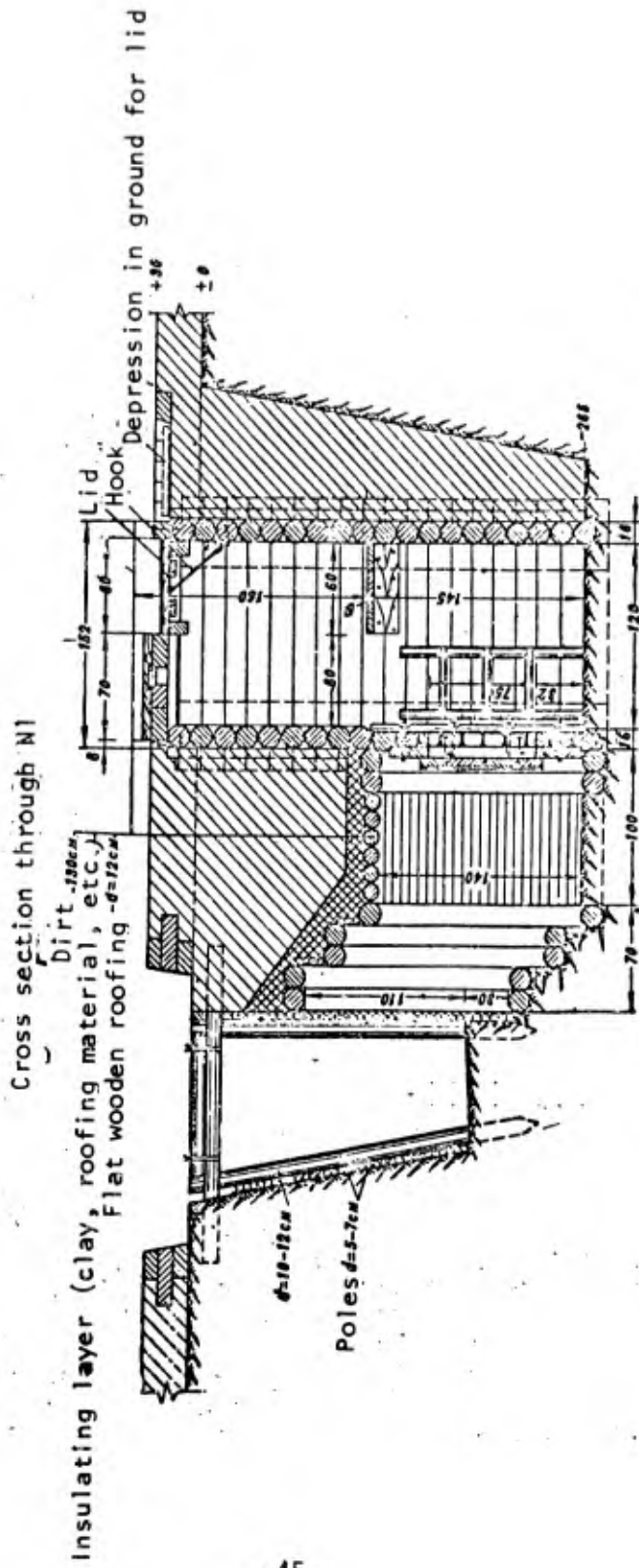


Figure 40. Shaft Type Observation Structure for Company Commander.

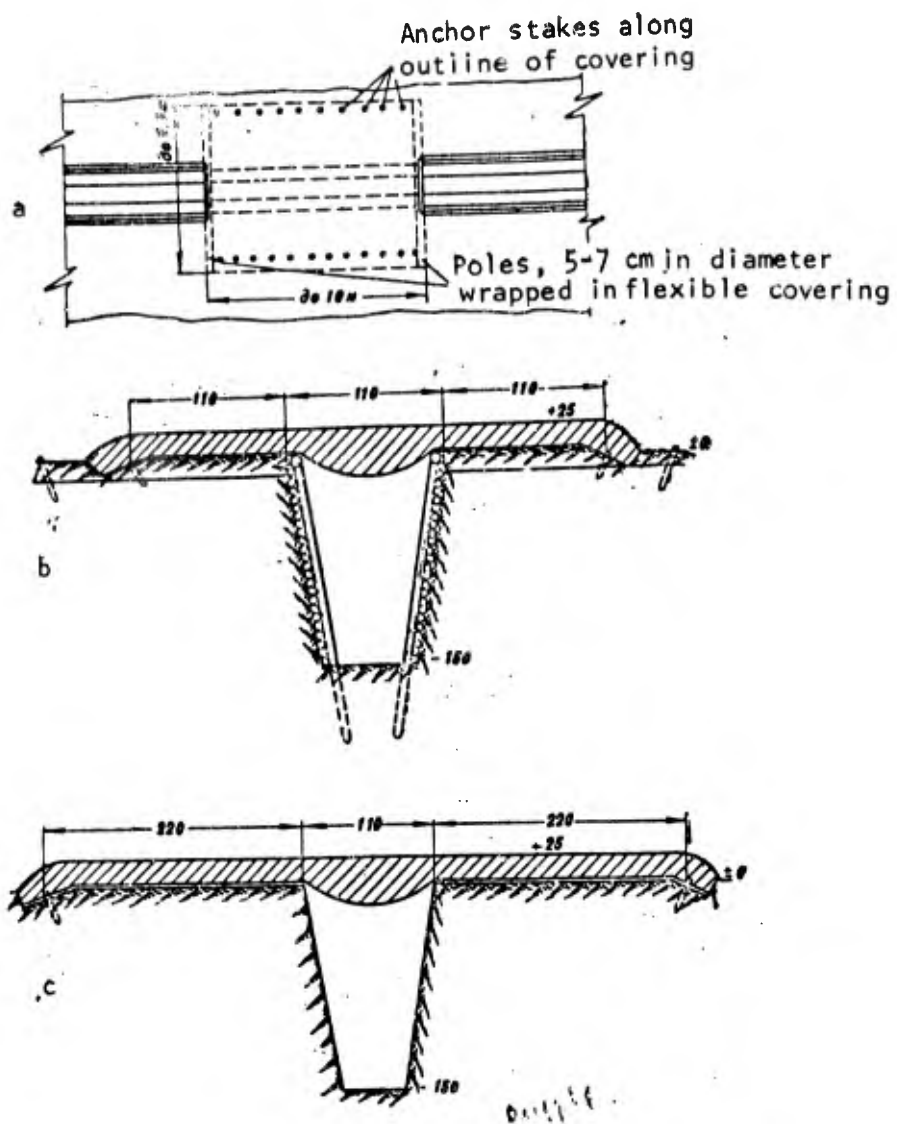


Figure 41. Trench Section Covered with Flexible Covering. a, Plane view of covering; b, Cross section of covering on covered section with revetted slopes; c, Same without revetted slopes.

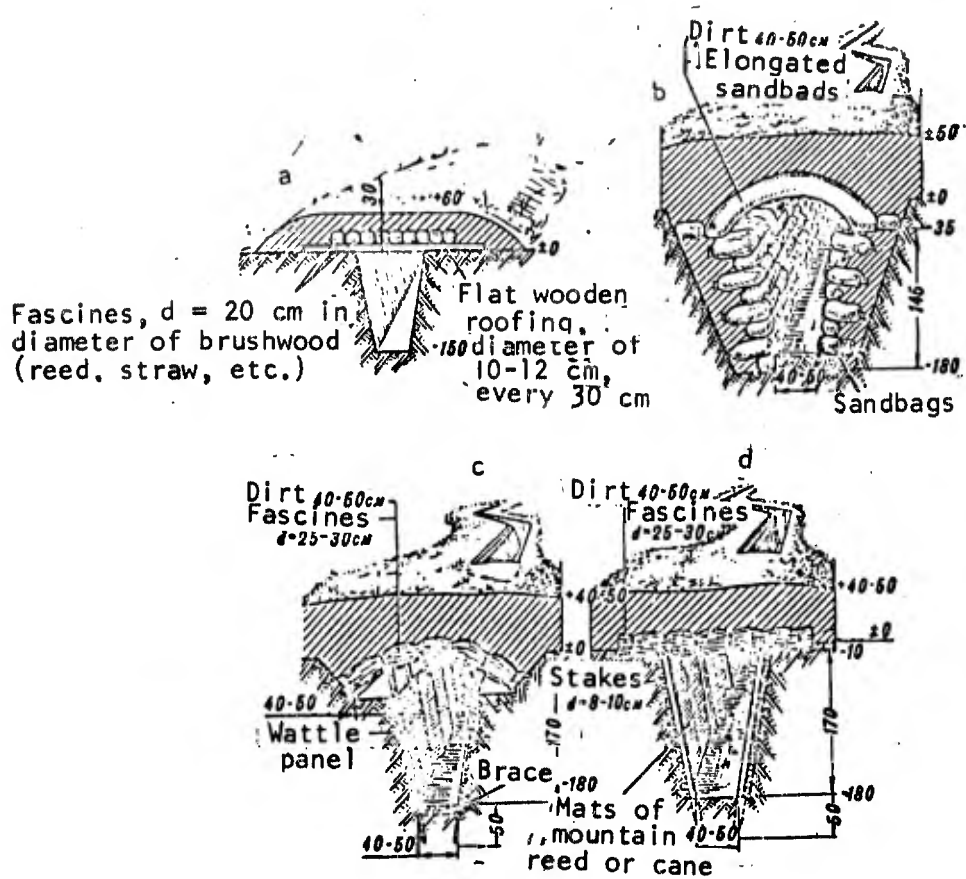


Figure 42. Types of Rigid Cover on Covered Trench Sections: a, Covering of poles and fascines; b, Arched covering of bags; c, Arched covering of fascines; d, Straight covering of fascines.

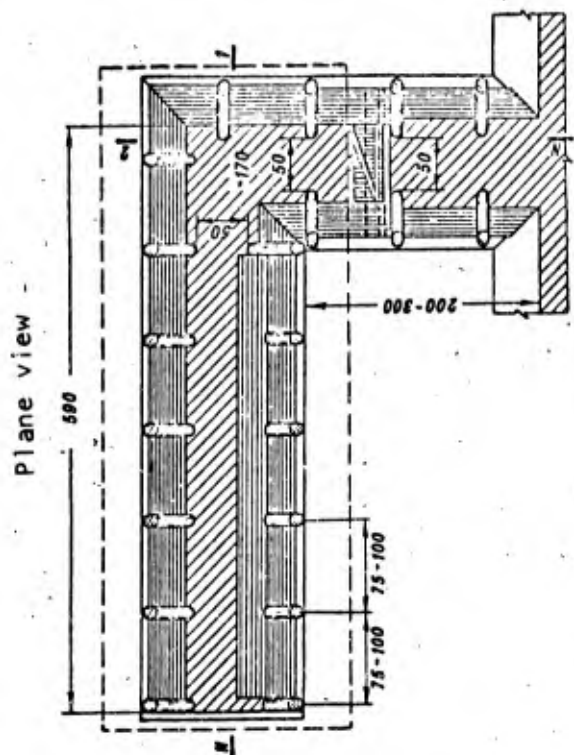
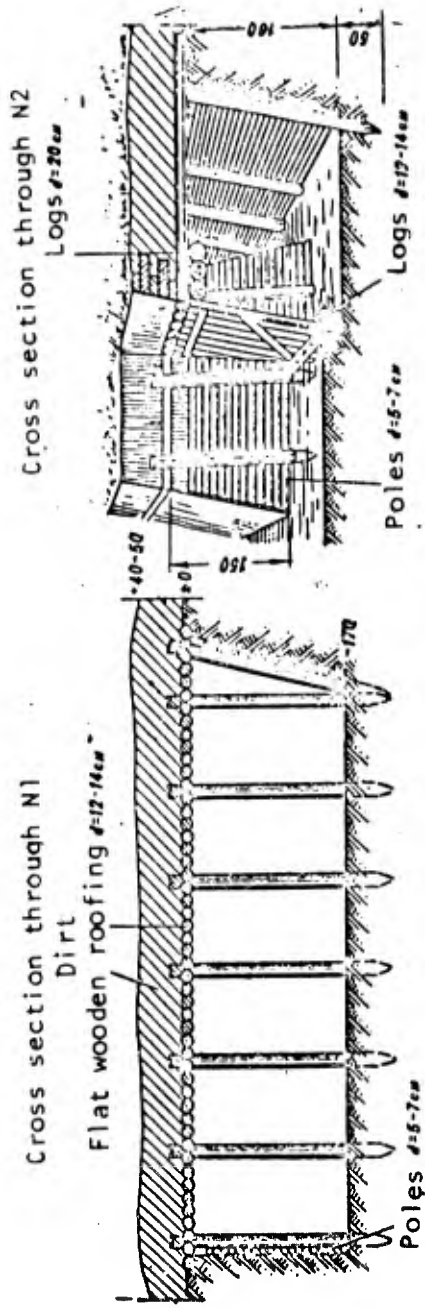


Figure 43. Covered Slit Trench.

two soldiers. Foxholes and other firing positions which are located at a considerable distance from dugouts and shelters must be equipped with recesses. If time permits and the corresponding material is available, it is desirable to revet the recesses with boards, poles, reed, or brushwood and to close the entrance with an attached panel. To construct the recess shown in Figure 44, 15 man-hours are expended and 0.4 cubic meters of round timber and 1.4 kg of nails are required.

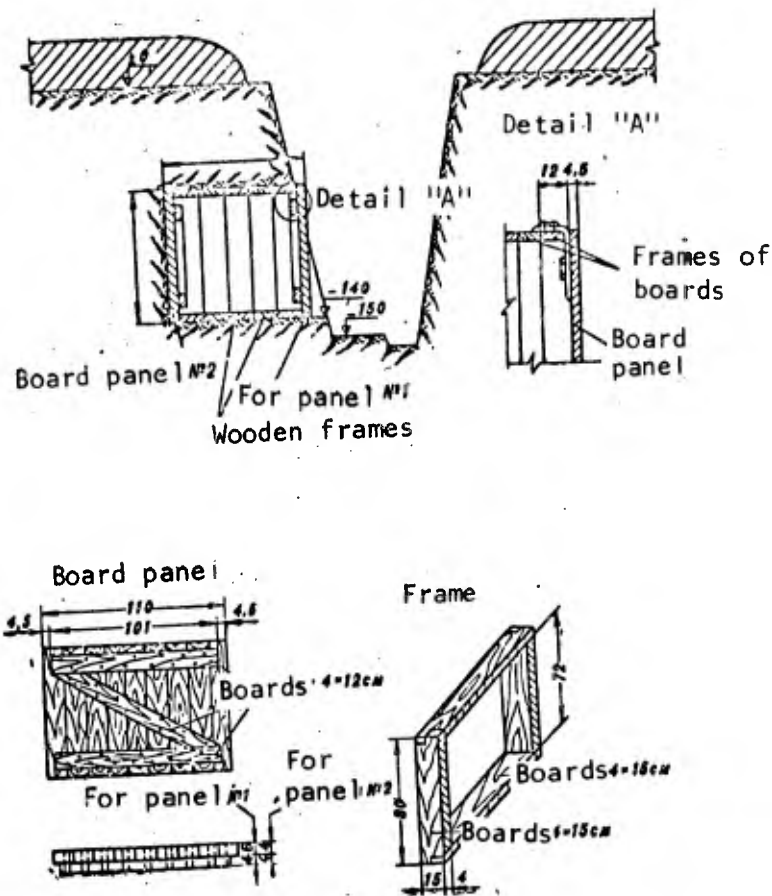


Figure 44. Recess for One Man.

On treeless terrain, under favorable conditions (for example, when the soil permits digging a trench with vertical walls and when the level of ground water is low), during the Great Patriotic War the rifle podrazdeleniya dug cover in the form of "foxholes" by the undercutting method. Such cover does not require revetment of the walls and is easily camouflaged since, when digging them, the upper layer of the soil is not exposed. One of the post war exercises, cover for riflemen was prepared by the undercutting method under the forward parapet of a trench. A squad dug out such cover in 11.5 hours. The passage of a tank, motor vehicle, and even the explosion of an HE charge over the protective arch did not cause deformation of the cover (see The Military Engineering Journal, No. 7, 1958).

A significant shortcoming of slit trenches, recesses, and covered sectors of trenches is that they are not adapted for people to rest. Dugouts and shelters are stronger and more convenient cover for the personnel.

Dugouts are usually constructed at the primary position of each rifle squad. They are also constructed for mortar and artillery sections or for tank crews. As the most complicated structures, shelters require special equipment and are erected on the basis of one per platoon.

Dugouts and shelters are constructed most often by the pit method, i.e., a pit is dug out in which the dugout case is installed and which is subsequently covered with dirt. The cases of the structure are made of round timber, prefabricated elements in the form of board or square beam casings, pole panels, sandbags, and other materials.

During the period of the Second World War, the most widespread type of bunkers and shelter was structures of braced construction with frames installed at a distance of 60-80 cm from each other. Elements of prop wall were placed behind the casings (small logs, poles, boards, slabs, brushwood fascines, etc.) which were the revetment for the walls of the pit.

Experience has shown that modern designs for cover should resist great lateral and vertical pressures, the amount of which may reach several tons per cubic meter.¹ Therefore, structures of continuous frame design will be more acceptable for modern conditions.

¹Sh. Zhirben, Anti-atomic Protection of the Population, Foreign Languages Publishing House, Moscow, 1957.

Figure 45 shows a bunker of log frames installed in a ditch right up against each other. Its construction requires the expenditure of 120 man-hours and 3.8 cubic meters of round timber, 0.3 cubic meters of lumber, and 35 kg of metal articles (nails, brackets, wire).

A shortcoming of such a bunker, just as of any structure which is assembled from frames, is the necessity for the compact adjoining of one frame to another which can be achieved only under conditions where all elements of the frame (the cross stringers and supports) have the same thickness. Consequently, one should either have beams of standard thickness for making the frames or each log should be edged on two edges to the required thickness. All this causes considerable difficulty, especially when performing engineer work with infantry forces.

Figure 46 presents a type of bunker of continuous frame construction which has been developed by officer

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[Tr note--Text resumes on p. 76] hermetically only with an actual threat of contamination of the air by toxic or radioactive substances.

In addition to simple cover and bunkers light shelters are constructed in the company defense area on the basis of one per platoon.

Shelters are equipped with filtration-ventilation units, thanks to which people may be in the shelters under conditions of contamination of the terrain and air with toxic or radioactive substances. In their strength, light shelters should withstand the shock wave of an air burst of a medium caliber atomic bomb at a distance of a hundred meters or more from burst ground zero. A sufficient layer of dirt should be poured over the framework of the shelter to reduce to the minimum the intensity of the effect of initial radiation. We recall that in order to reduce the effect of initial radiation two-fold, a layer of dirt 15 cm thick is needed, and to reduce it 100-fold-- 100 cm thick. A layer which reduces the dose of initial radiation dose by half is 10 cm for brick, 30 cm for wood and 7.5 cm for concrete.¹

¹M. Gvozdev and V. Yakovkin, Atomic Weapons and Anti-Atomic Protection, Moscow, 1956.

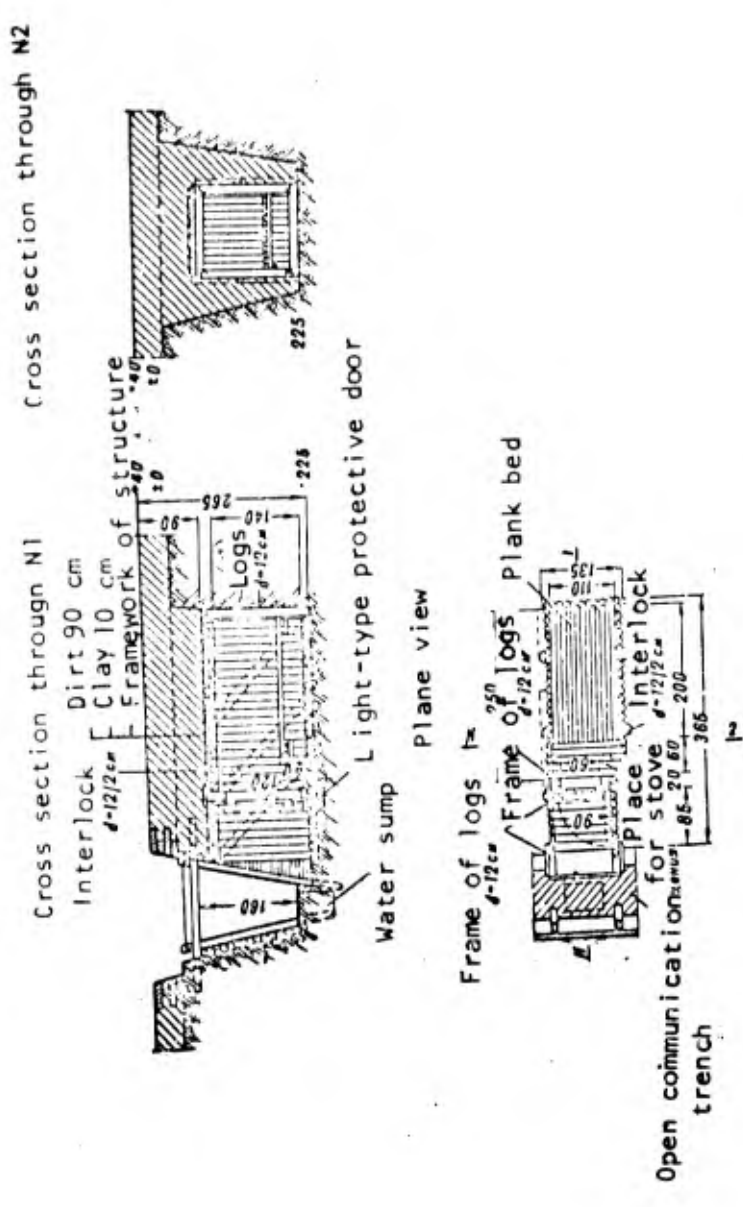
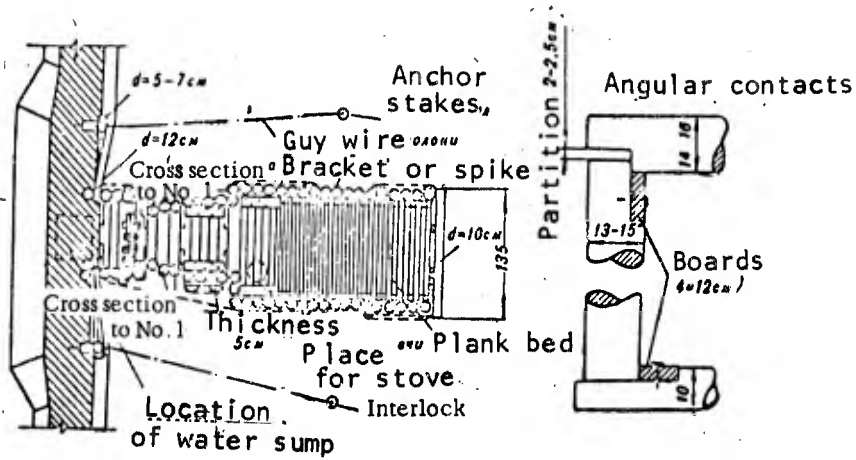
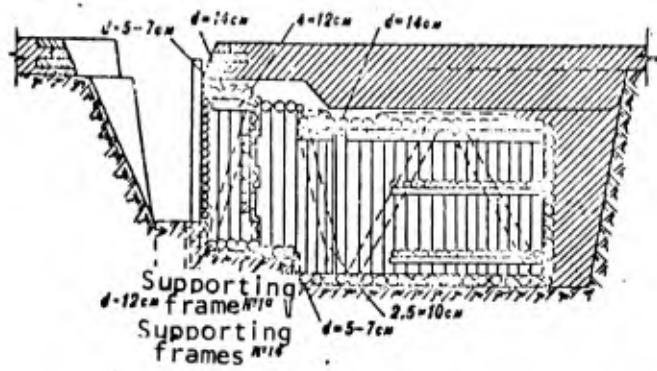


Figure 45. Dugout of Frames Emplaced Tightly Against Each Other.



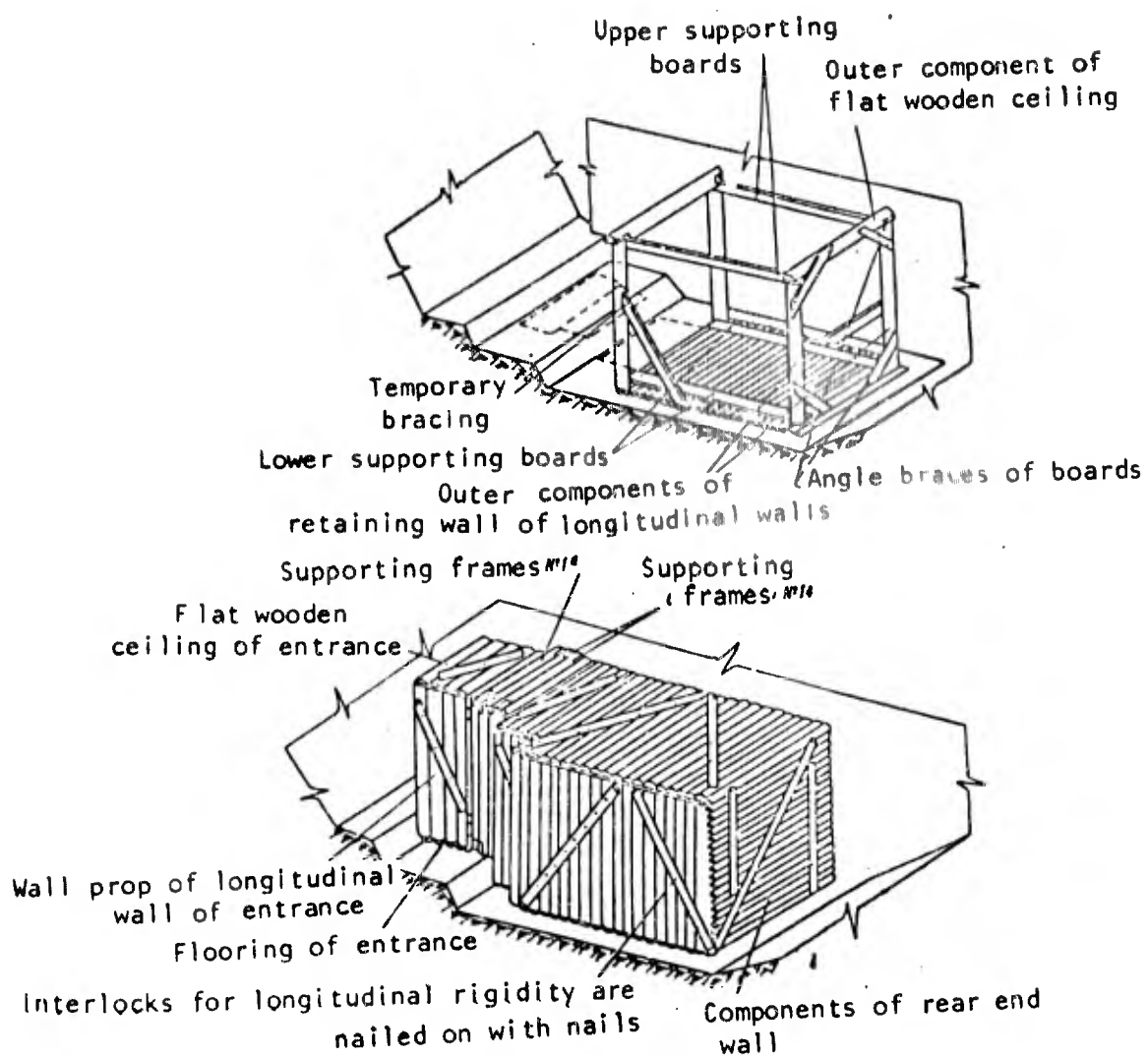


Figure 46. Dugout of Continuous Frame Construction.

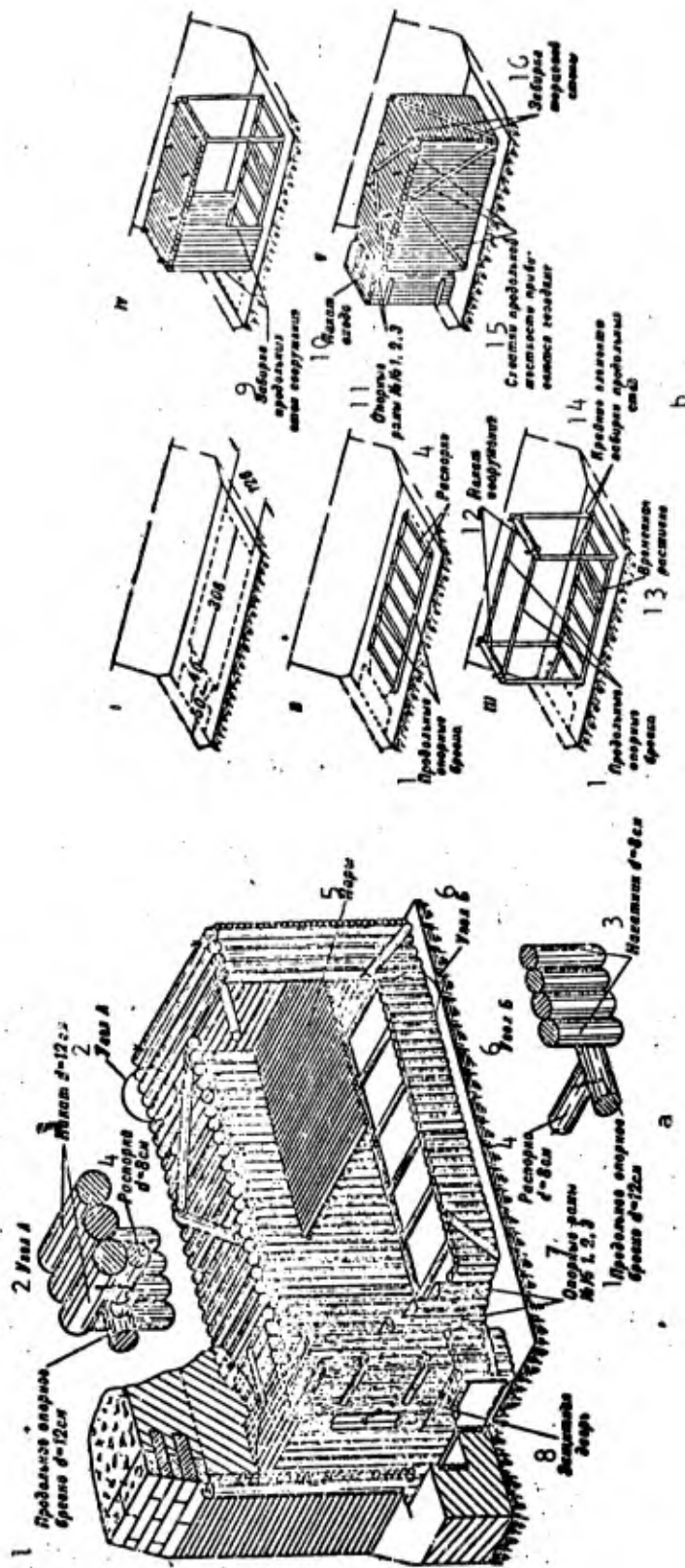
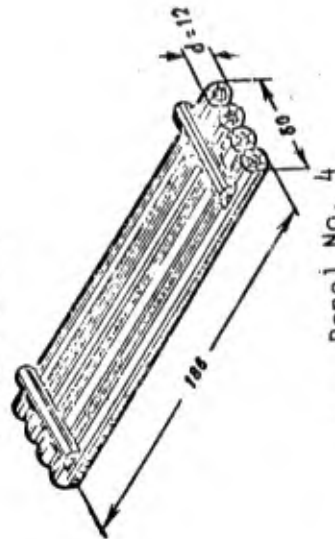
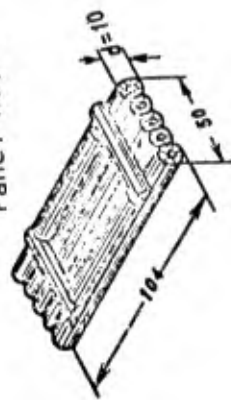


Figure 47. Dugout of Notchless Construction for Eight Men: a, General view; b, Sequence of assembly. Key: 1, Longitudinal supporting log; 2, Detail A; 3, Flat wooden roofing; 4, Brace; 5, Plank bed; 6, Detail B; 7, Supporting frames; 8, Protective door; 9, Wall prop of longitudinal wall of structure; 10, Flat wooden roofing of entrance; 11, Supporting frames; 12, Flat wooden roofing of structure; 13, Temporary bracing; 14, Outer components of retaining wall of longitudinal walls; 15, Interlocks for longitudinal rigidity nailed on with nails; 16, Wall prop of end wall.

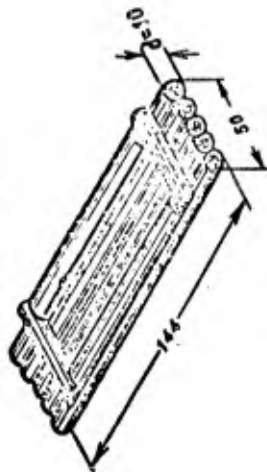
Panel No. 2



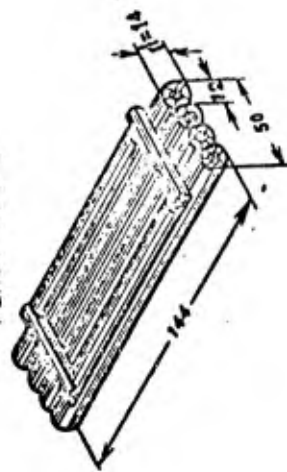
Panel No. 4



Panel No. 1



Panel No. 3



a

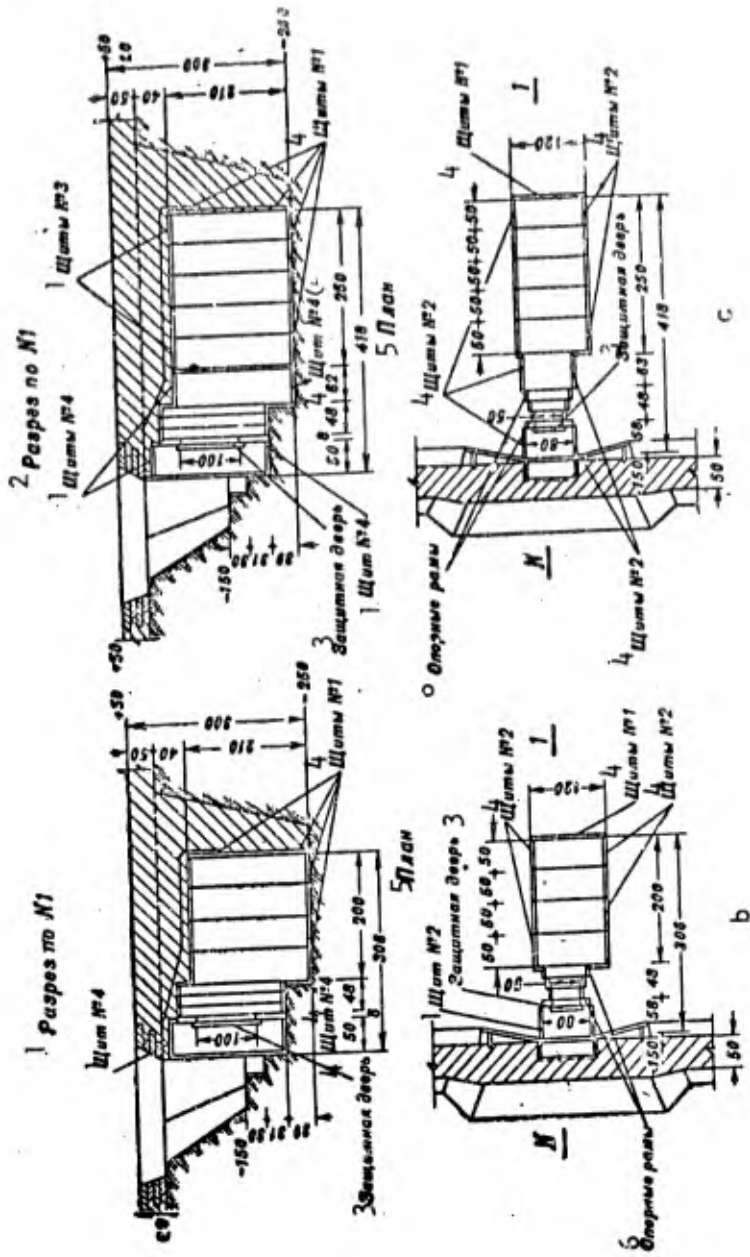


Figure 48. Dugouts of Standard Components: a, Standard panels; b, Dugout for four men; c, Dugout for eight men. Key: 1, Panel; 2, Cross section through N1; 3, Protective door; 4, Panels; 5, Plane view; 6, Supporting frames.

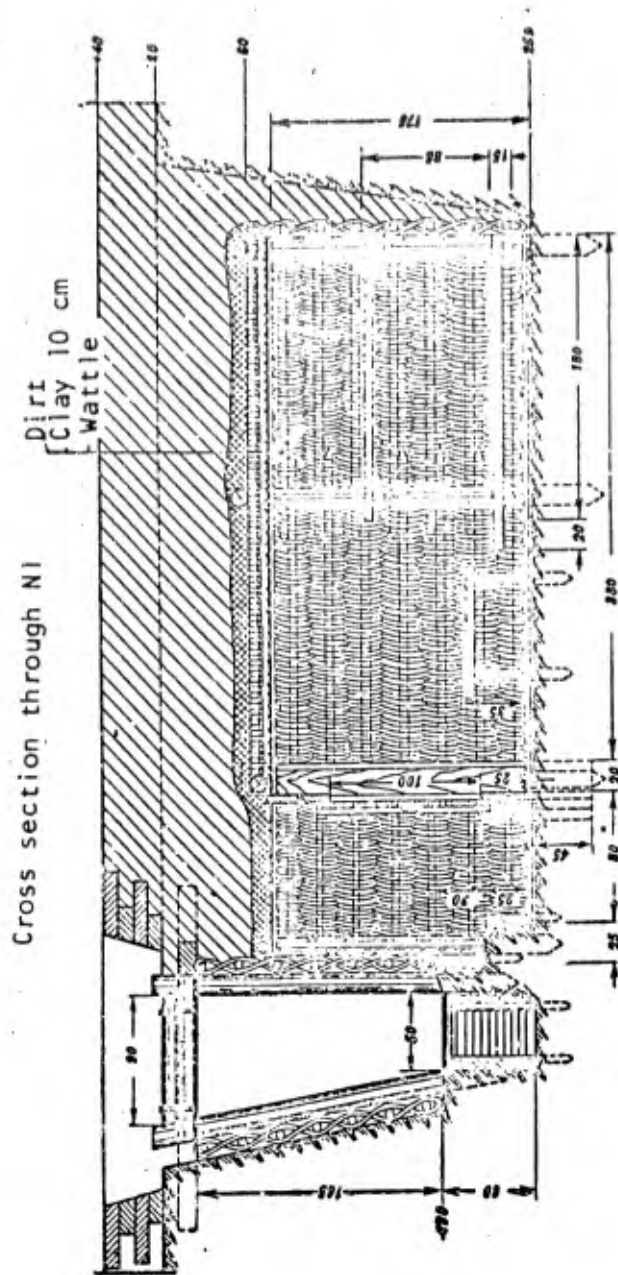


Figure 49. Dugout of brushwood and poles.

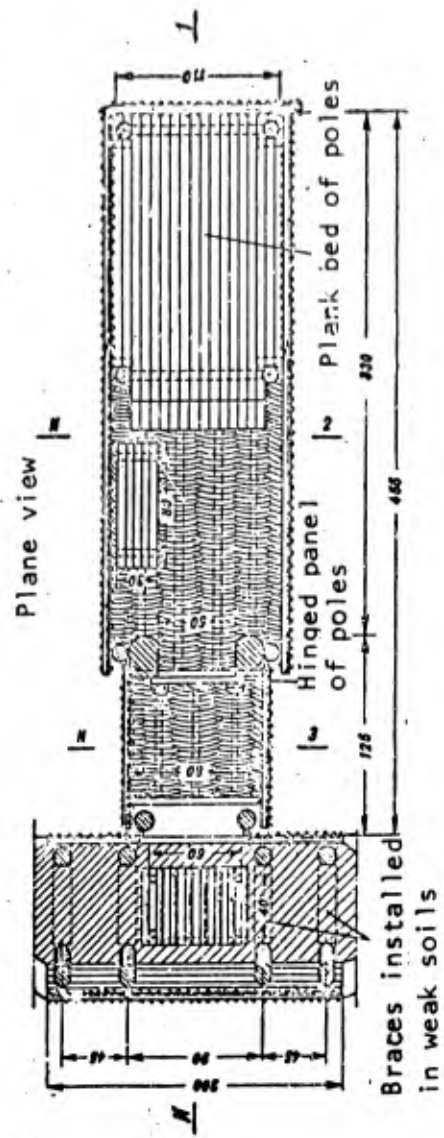


Figure 49. Dugout of Brushwood and Poles.

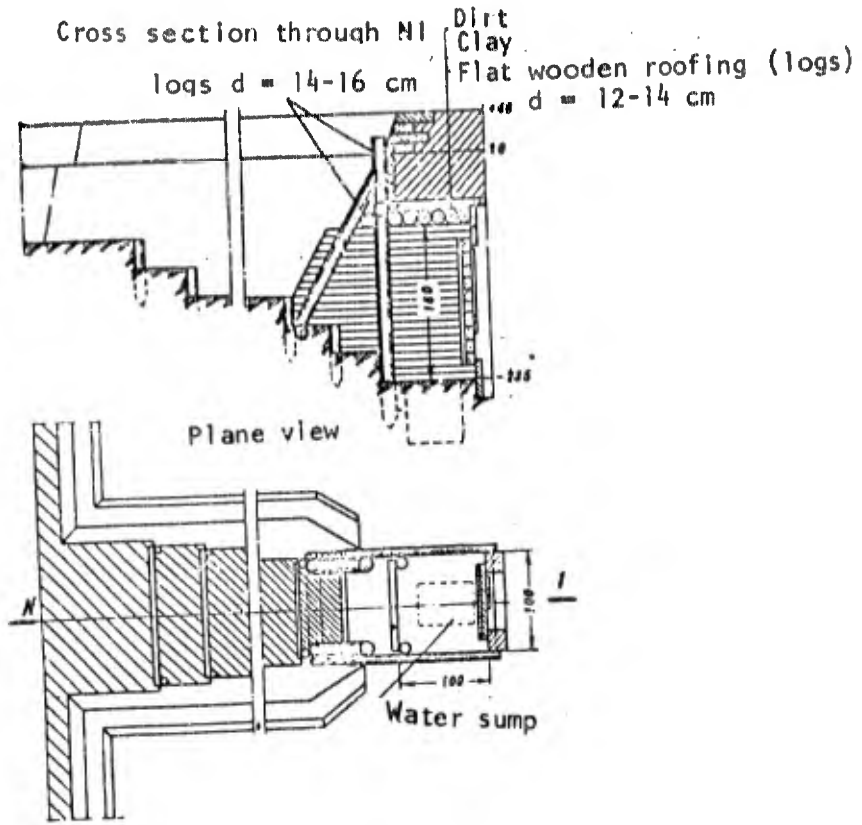


Figure 50. Variation of Entrance to Dugout Located in a Pit for a Tank.

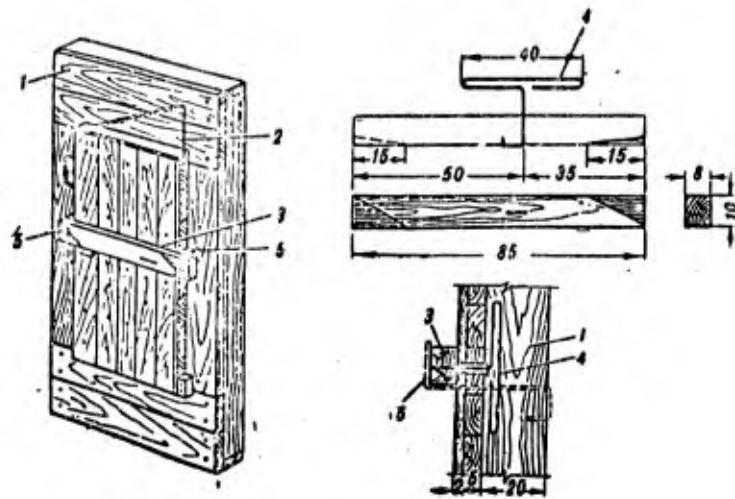


Figure 51. Protective Door for Cover.

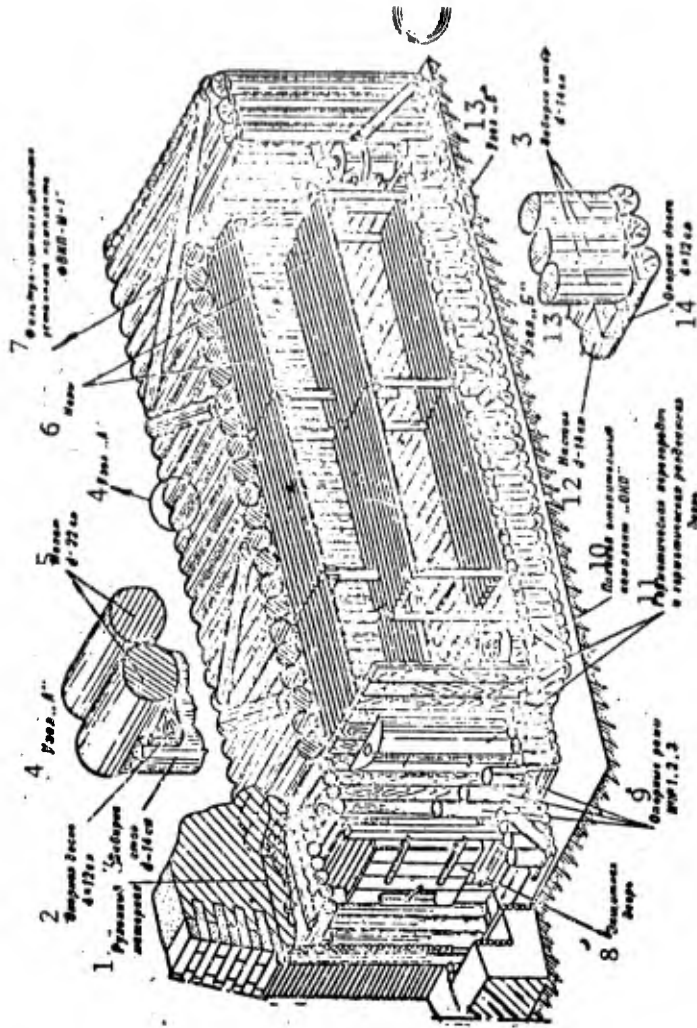


Figure 52. Light-Type Shelter of Continuous Frame Construction (General view). Key: 1, Roofing material; 2, Supporting material; 3, Wall prop; 4, Detail A; 5, Flat wooden roofing; 6, Plank bed; 7, Filtration-ventilation unit of FVKP-M-1 outfit; 8, Protective door; 9, Supporting frames; 10, OKP field heating unit; 11, Airtight partition and airtight extensible door; 12, Flooring; 13, Detail B; 14,

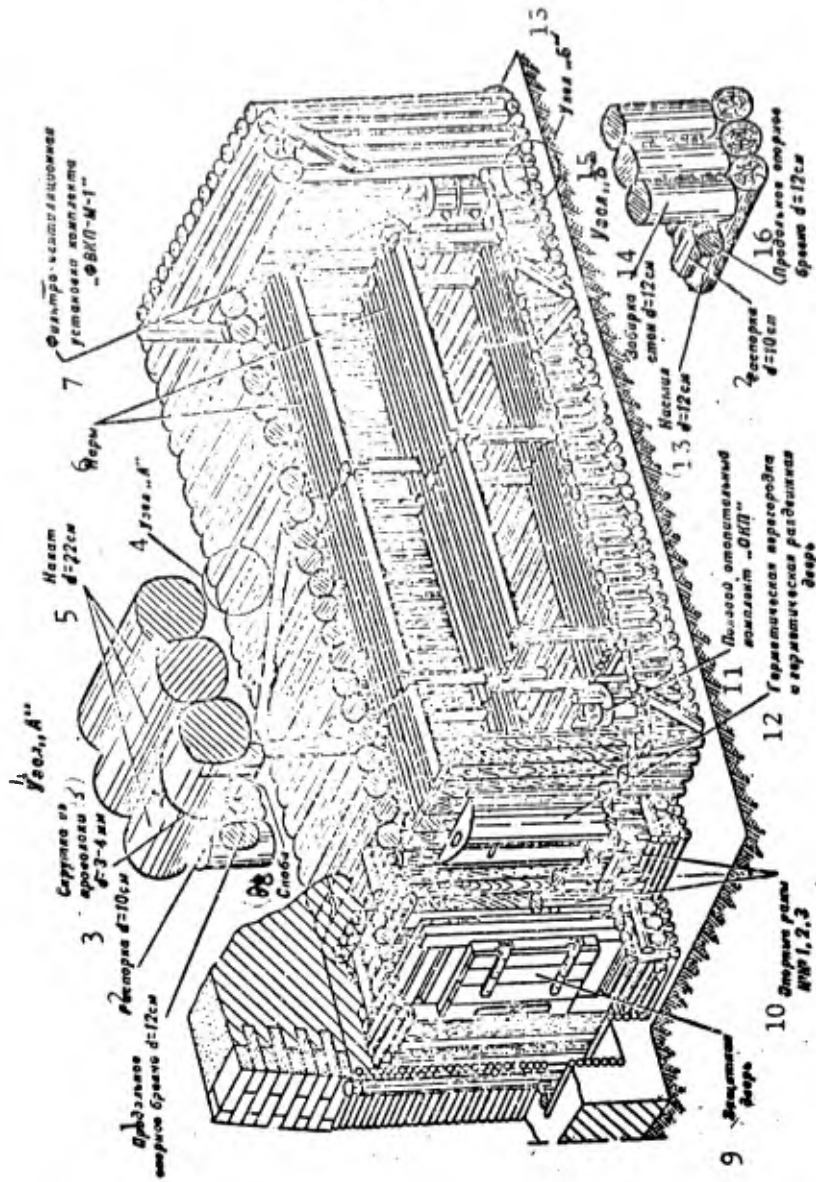


Figure 53. Light-Type Shelter of Notchless Construction (General view). Key: 1, Longitudinal supporting log; 2, Bracing; 3, Twist joint of wire; 4, Detail A; 5, Flat wooden roofing; 6, Plank bed; 7, Filtration-ventilation unit of FVKP-M-1 outfit; 8, Bracket; 9, Protective door; 10, Supporting frames; 11, OKP field heating unit; 12, Bracing; 13, Flooring; 14, Wall prop; 15, Unit B; 16, Longitudinal supporting log.

On the FEBA, shelters are usually built for 8-10 men, and in the depth of the defense--for 15-20 men.

Just as for dugouts, most rational for shelters are the continuous frame construction (Figure 52) and especially jointless construction (Figure 53). The construction of shelters of continuous frame and jointless construction, as well as the sequence of assembly of their frameworks do not differ fundamentally from the construction and sequence of the assembly of the frameworks of dugouts of the same construction. Approximately 27 man-days are expended on erecting a shelter with the expenditure of 0.5 cubic meters of lumber, 9 cubic meters of round timber and 35 kg of metal articles.

In the construction of dugouts and shelters, much time is spent on dirt-moving work. It is desirable to use excavators and bulldozers to speed it up. In 1957, at one of the exercises under the direction of officer P. A. Mulyar, a dugout (for 8 men) was made from pole panels by the forces of the riflemen. Of the overall number of 56 man-hours, 28 man-hours were spent on digging the pit, 4 man-hours on assembling the framework, 2 man-hours on assembling the entrance unit, 21 man-hours on burying and camouflage, and 1 man-hour on internal equipping. As can be seen from these data, about 80% of the time was spent on dirt moving work. Of course, the expenditure of labor on dirt moving work is sharply reduced with the use of dirt digging machines.

5. Obstacles

The experience of the Great Patriotic War has shown that obstacles in combination with natural barriers favor the creation of an especially strong and stable defense. Therefore, an attempt should be made to select those areas for defense which are covered by natural obstacles (canal, river, lake, muddy swamp, gully or ditch, steel slope of an elevation, embankment, etc.) However, it is not always possible to select such a position and, moreover, natural obstacles are difficult to negotiate only under certain conditions (for example, a gully will be an obstacle for tanks in the case where its width is 4 meters or more, a river if its width is at least 15 meters and depth 1.5 meters, etc.) In organizing the defense, it is usually necessary to supplement or reinforce natural barriers with artificially created obstacles. According to their use, obstacles may be antitank or anti-personnel, and according to the nature of effect on the enemy--explosive or non-explosive.

The most effective obstacles are explosives: they can be emplaced quickly, easily camouflages on any terrain, and are difficult to overcome. From the experience of the Great Patriotic War, it is known that antitank mines emplaced in front of the FEBA forced the enemy tanks either to cross the obstacles over passages made in the course of battle, which slowed up the rate of advance, or to bypass the obstacles, placing their sides under the antitank artillery fire of the defender.

Explosive obstacles are usually emplaced by sappers since special training and skills are required in handling mines and explosives. The commander of a rifle company which is occupying a defense area where the sappers are mining is required to cover the work of the sappers by fire from podrazdeleniya specially detailed for this time. To avoid the possibility of the sappers being fired on by friendly troops when emplacing the mines, the company commander informs the commanders of the platoons and the podrazdeleniya of reinforcing means concerning the place and time of the mining work. After completion of the mining, the company commander accepts the obstacles emplaced in front of the company defense area and within it and subsequently is responsible for their protection and defense. In this, special attention should be paid to guarding the passages in the obstacles which are sometimes left for the passage of friendly troops.

The podrazdeleniya of the company may be used to emplace non-explosive antitank obstacles in the form of antitank ditches, escarpments, counterescarpments, obstructions, barriers, barricades, posts, snow banks, and iced strips. This work is performed under direction of sapper officers or instructors. To increase the productivity of labor in making obstacles, power saws and other means of mechanization together with which the engineer troops are equipped, with their crews are sometimes detailed to help the infantry. How expedient this is can be seen from the following data: 35 man-days are required to make an obstruction of 100 running meters in a forest manually and, when using a power saw, only 3.5 man-days are needed, i.e., one tenth as much.

Non-explosive antipersonnel obstacles of barbed and smooth wire are erected simultaneously with the improvement of the firing positions by the forces of podrazdeleniya which are occupying the defense. These obstacles may be permanent (emplaced directly on the site) and movable (made in the rear and brought to the place for emplacement in individual segments).

Of the permanent wire obstacles, the employment of wire fences and wire entanglements have found wide employment among the troops.

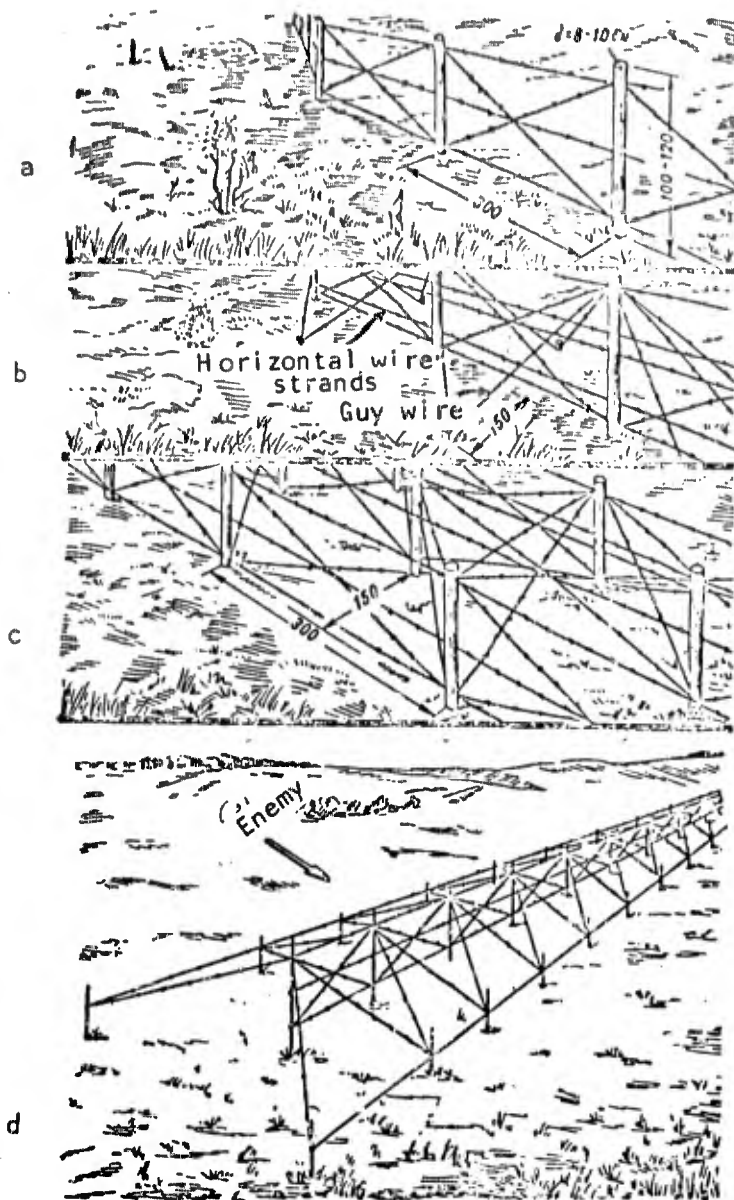


Figure 54. Wire Obstacles: a, Wire fence (5 strands of braiding); b, Reinforced wire fence; c, Wire net on wooden stakes in three rows; d, Wire net on metal stakes in one row with guide wires.

A wire fence is the simplest wire obstacle and consists of one row of stakes entwined with five strands of barbed wire (Figure 54a). Twenty man-hours are required for the construction of 100 running meters of fence as well as two coils of barbed wire, 34 stakes 175 cm long, and 4 kg of brackets to fasten the wire to the stakes. By adding two guide wires to each stake and connecting the guide wires on both sides of the fence with 2-3 horizontal wire strands, an obstacle which is more difficult to negotiate can be obtained with the same number of stakes--a reinforced wire fence; in this case for each 100 running meters of fence there is an additional requirement for 10 man-hours, 2-3 coils of barbed wire, and 70 stakes 70 cm long to fasten the guy wires (Figure 54b).

Wire entanglements are emplaced on wooden (Figure 54c) or metal (Figure 54d) stakes in 3-5 rows. The stakes are pounded in checker-board order at a distance of 3 meters from each other in each row and a distance of 1.5 meters between rows. The location of the strands of wire between the stakes as well as the order of entwining the stakes with the wire are shown in Figure 55.

The wooden stakes are pounded in the ground by mallets or manual rams (Figure 56), and the metal stakes are screwed into the ground; therefore, with their use the expenditure of time on building a wire entanglement is reduced 5-6-fold.

To entwine the stakes, a team of 3-4 soldiers is designated for each strand. First to be entwined is the first row of stakes closest to the enemy with five crews (according to the number of strands) working offset one behind the other. The first team fastens the wire at the bottom of the first stake, then stretches it to the top of the second stake, then to the bottom of the third, etc. The second team begins at the top of the first stake, then stretches the wire to the bottom of the second stake, then to the top of the third, etc. The remaining crews stretch the horizontal strands of wire--lower, middle and upper. The wire should be attached to the stakes with some slack since it is easier to cut and cross a tightly stretched strand.

The construction of 100 running meters of wire entanglement on wooden stakes in three rows requires 120 man-hours as well as 100 stakes 175 cm long, 10 coils of barbed wire, and 25 kg of brackets. The construction of the same section of entanglement on metal stakes requires 20 man-hours as well as 100 tall and 67 low stakes with the same amount of wire (the guy wires which go from the tall stakes in the outer rows are fastened with the low metal stakes).

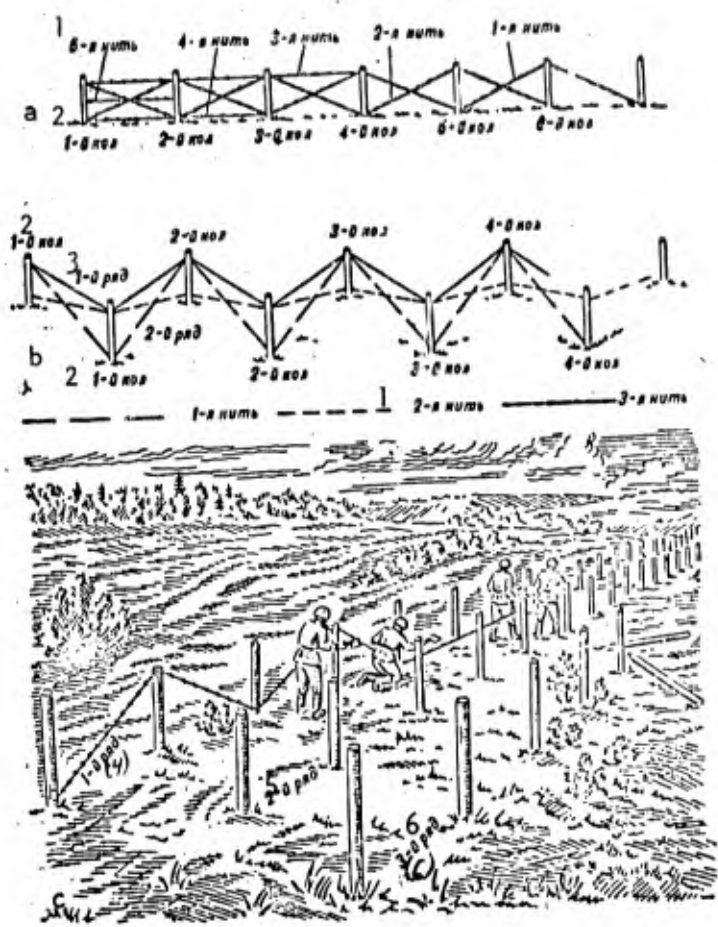


Figure 55. Construction of Wire Entanglement: a, Procedure for braiding first row of stakes; b, Procedure for braiding gap between rows of stakes (braiding of first row arbitrarily not shown); c, General view of work in attaching first strand of first row. Key: 1, Number of strand; 2, Number of stake; 3, Number of row; 4, 1st row; 5, 2nd row; 6, 3rd row.

With hasty consolidation of the terrain, when there is no time to construct the comparatively labor-consuming wire obstacles indicated above, the wire is used "in a scattered manner," unwinding 3-4 coils of wire along the ground in a strip of 4-6 meters. This obstacle can be used successfully in tall grass, among brush, in places covered with stones and boulders, and on forest cut-over areas.

Along with permanent antipersonnel wire obstacles, in consolidating positions movable wire obstacles are widely used.

Their merit consists first in the fact that they can be installed quickly and silently on any ground. With the hasty consolidation of the terrain, as well as in the immediate proximity of the enemy and under his fire rifle chasti successfully use such movable wire obstacles as wire spirals (Figure 57) and barely perceptible obstacles (MZP) to cover the FEBA.

The troops either obtain wire spirals in ready form or they make them on the spot. From 20 kg of barbs and 3 kg of smooth wire, two soldiers can make one spiral in two hours. In extended form, they represent a cylinder up to 10 meters long and 70-90 cm high.

The troops obtain the MZP in packages. In extended form, one package covers an area of 10 × 10 meters. In order to install the MZP on the ground, a team of eight men is required.

Knife rests and hedgehogs (Figure 58) are used by troops to emplace obstacles quickly on roads, ditches, and trenches as well as to close passages in the damaged sections of permanent obstacles. Experience shows that each rifle squad which is in the defense should have 3-4 hedgehogs or knife rests in order to close individual trench sectors with them in case of combat within the trenches or to use them to restore sectors of obstacles which have been destroyed by enemy fire. Required to make a knife rest are one pole 3.5 meters long, six stakes 1.5 meters long, and seven kg of barbed wire, and to make a hedgehog-- three stakes 1.5 meters long and 2.5 kg of barbed wire. Two soldiers make a knife rest in two hours and one soldier can make a hedgehog in one hour.

In installing portable wire obstacles, the individual elements of the obstacles should be carefully fastened to each other so as to make their removal as difficult as possible.

In order to increase the effectiveness of wire obstacles, especially under conditions of poor visibility, it is necessary to

install light and sound signals close to them which warn the defenders of the enemy's appearance at the obstacle. During the years of the Great Patriotic War, rifle companies which were in the defense set up various types of signaling devices; they suspended metal objects on the wire, they fastened rockets with pull-type fuses to the obstacles; they installed bells in the dugouts which gave a signal when wire strands in the obstacles were cut; they used trotyl charges and "booby traps" which explode when pulling a strand of wire in the obstacle, etc.

In erecting obstacles, it should be remembered that they become really effective if two basic requirements made of them are satisfied: first, approaches to the obstacles and the obstacles themselves should be under good observation and be fired upon by fire of all types, and second, the obstacles should be properly adapted to the terrain, hidden from observation and a surprise for the enemy. In order to create the best conditions for firing through the approaches, the obstacle belts are given a broken outline in the plane view and they are located no closer than 30-40 meters from the firing position and no further than 100-200 meters (Figure 59). The width of the obstacle belt depends on the availability of means and time. In order to make it difficult for the enemy not only to overcome the obstacles but also to reconnoiter them, it is better to make several narrow belts than one wide belt.

As an approximation for the preparation of requisitions for materials it can be considered that to cover the FEBA of a company defense area there is a requirement for 1.2 km of wire spirals or MZP packages; to cover the positions of podrazdeleniya disposed in the second trench--0.6 km of reinforced wire fence; to cover one of the flanks of the company--0.8 km of wire spiral, and to cover the artillery position--0.1 km of MZP. Thus, required altogether are up to 120 packages of MZP, up to 30 packages of barbed wire, and up to 80-160 units of spirals (in one or two rows). However, it should be said that such a quantity of wire obstacles can be obtained by a company only under exceptionally favorable supply conditions.

On receiving a limited quantity of wire to install wire obstacles, those sites should be selected where their employment will be most effective, for example, on an open flank.

In the last war wire obstacles, especially in front of the FEBA under conditions of direct contact with the enemy, were usually installed during the night. But, as is known, night hinders work and requires certain skills. A special feature of work on constructing obstacles at night is the seeming uncommonness of the surrounding situation, first of all because of poor visibility.

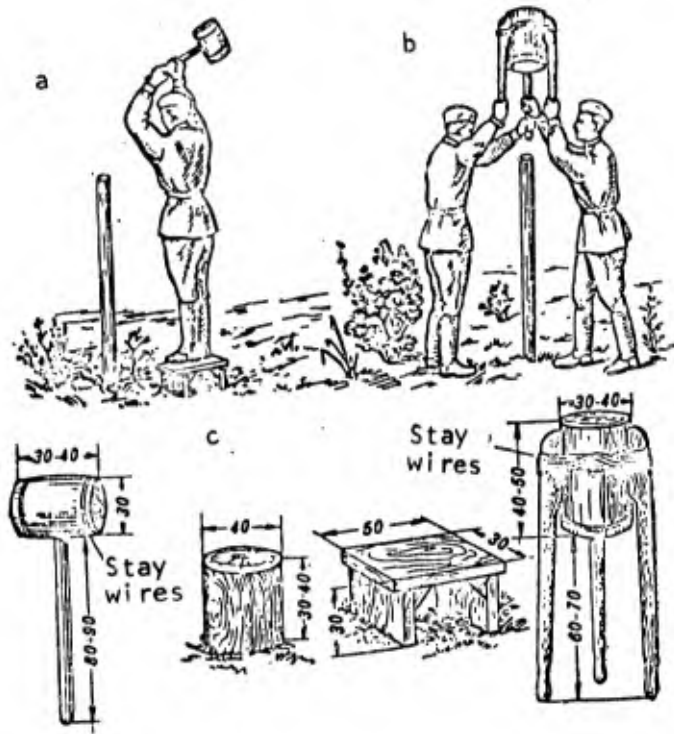


Figure 56. Pounding Wooden Stakes and Accessories for Their Pounding: a, Pounding with mallet; b, Pounding with manual ram; c, Accessories for pounding stakes.

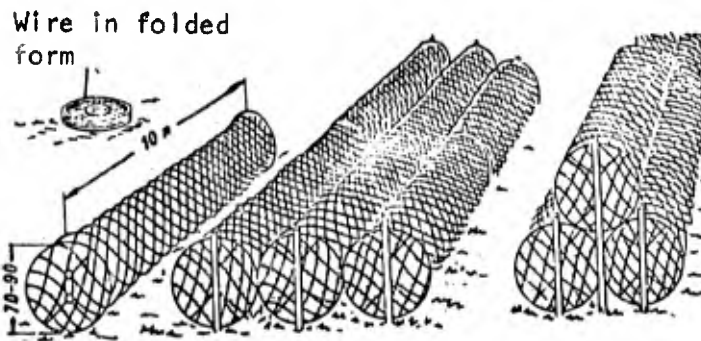


Figure 57. Obstacles of Wire Spirals.

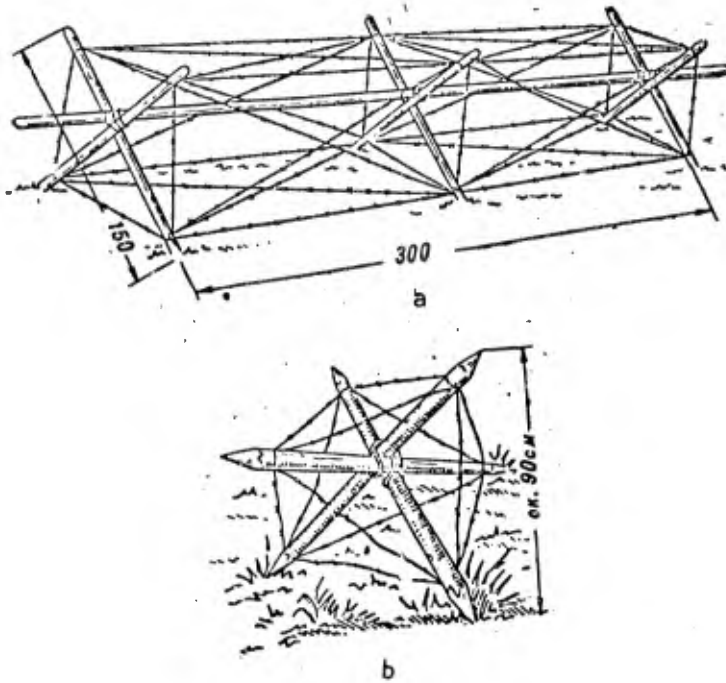


Figure 58. Portable Wire Obstacles: a, Knife rest; b, Hedgehog.

In 1955, in a rifle company of a motorized rifle regiment of the Moscow Military District, we observed a platoon exercise on constructing wire obstacles. The primary goal of the exercise was to teach the soldiers to build wire obstacles and to instill practical skills in setting them up on the ground with poor visibility.

The lessons were conducted on an improved company defense area. The "enemy" was 300 meters from our positions. In accordance with the tactical situation, a wire obstacle which had been constructed earlier in front of the FEBA of the company defense area had been "destroyed" by enemy fire and it was necessary to restore it. The platoon was assigned the mission to restore the destroyed sections of the obstacle during the night. A day prior to the start of the night lessons, the soldiers under the direction of an officer prepared the knife rests and wire spirals and they also prepared everything necessary to build a reinforced wire fence on metal stakes. It should be noted that considerably more time was spent on preparing portable obstacles than was envisioned by the regulation. And this is proper since drill is required for the accomplishment of the norms and the soldiers of the company did not have it.

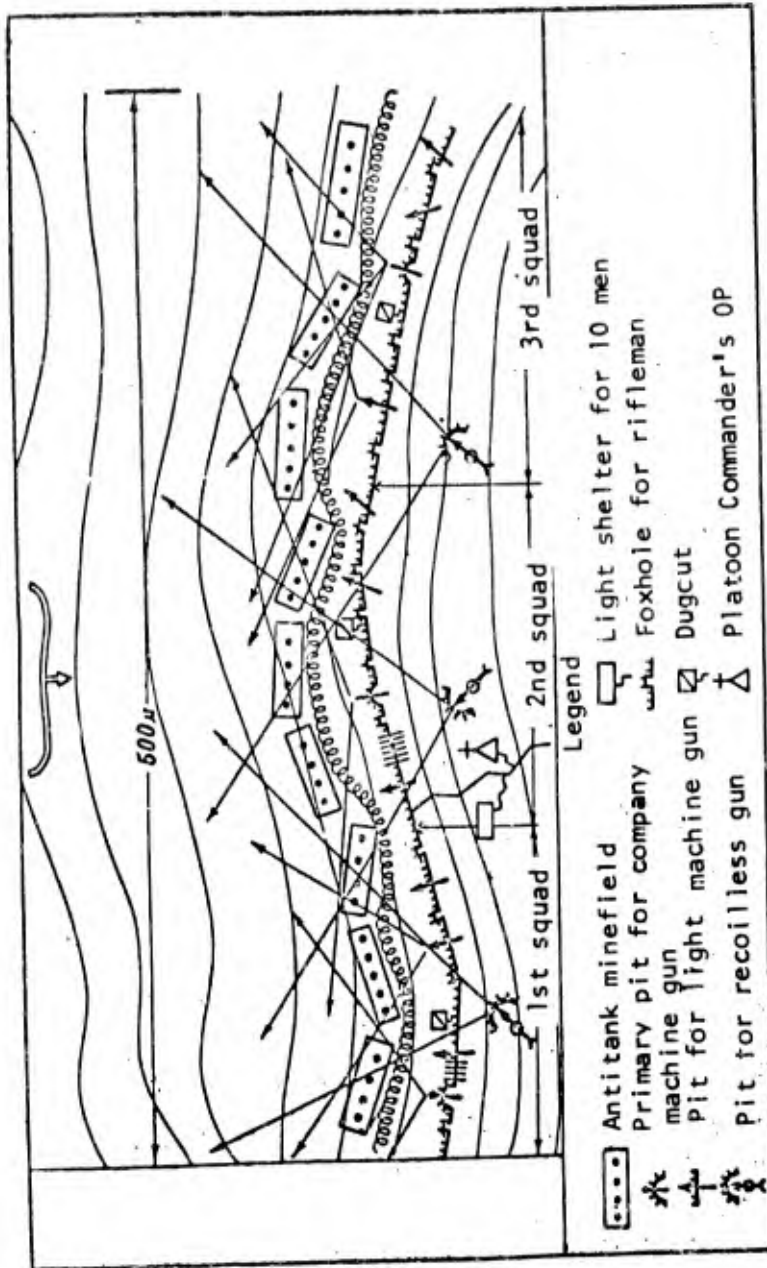


Figure 59. Disposition of Obstacles in Front of Platoon Position (Variation).

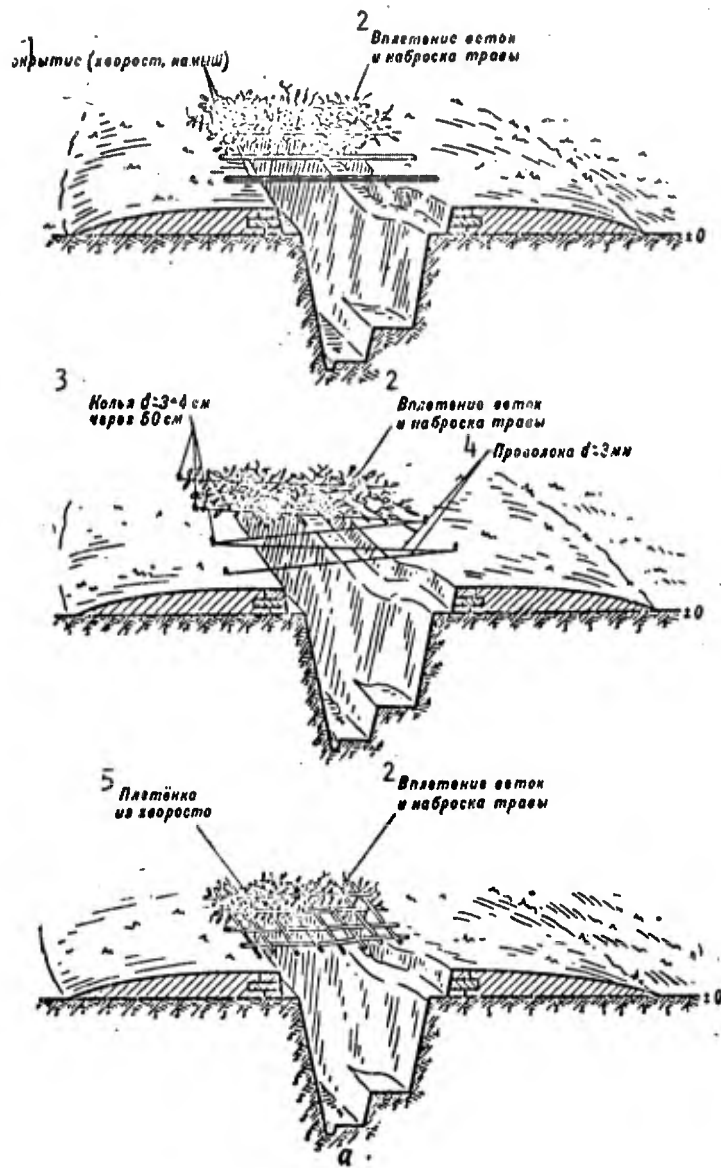


Figure 60. Camouflage of Foxholes, Trenches, and Communication Trenches with Field Expedients: a, Camouflage against plant background; b, Camouflage against a background devoid of vegetation. Key: 1, Overhead cover (brushwood, reed); 2, Interweaving of branches and scattering of grass; 3, Stakes, diameter = 3-4 cm every 50 cm; 4, Wire; 5, Braid of brushwood. (Continued next page)

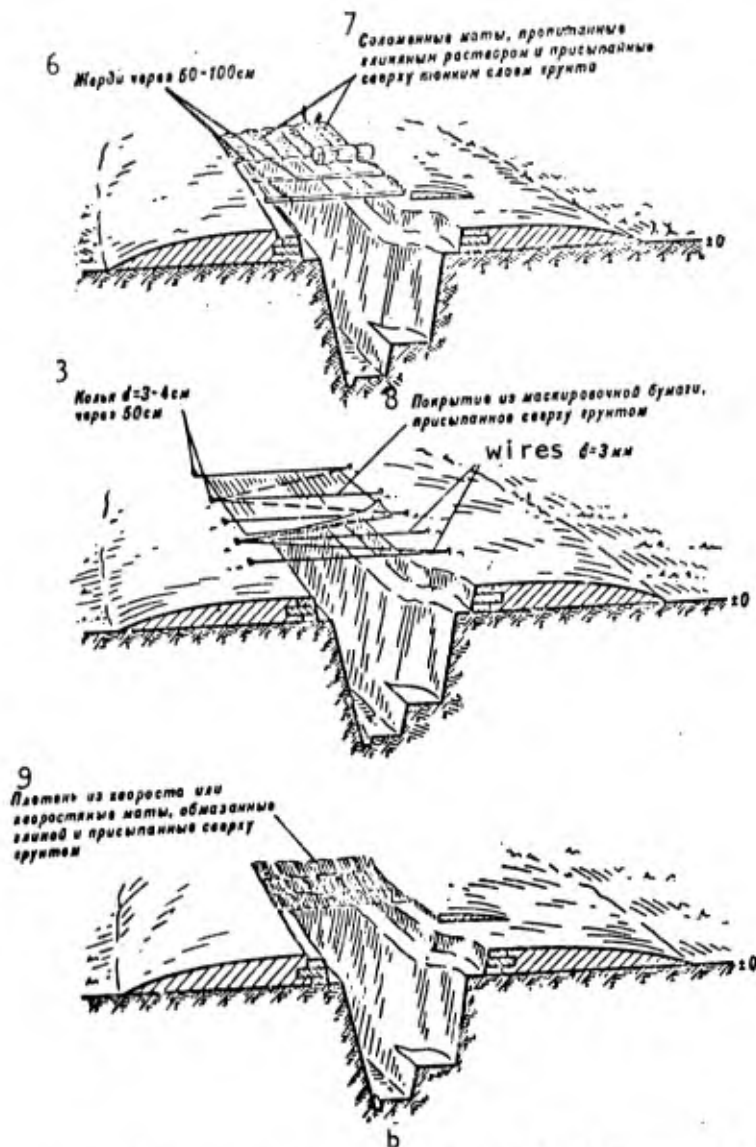


Figure 60. Key: 6, Poles every 50-100 cm; 7, Straw mats impregnated with clayey solution and with thin layer of dirt sprinkled on top; 8, Overhead cover of camouflage paper with dirt sprinkled on from above; 9, Wattle of brushwood or brushwood mats coated with clay and with dirt sprinkled on from above.

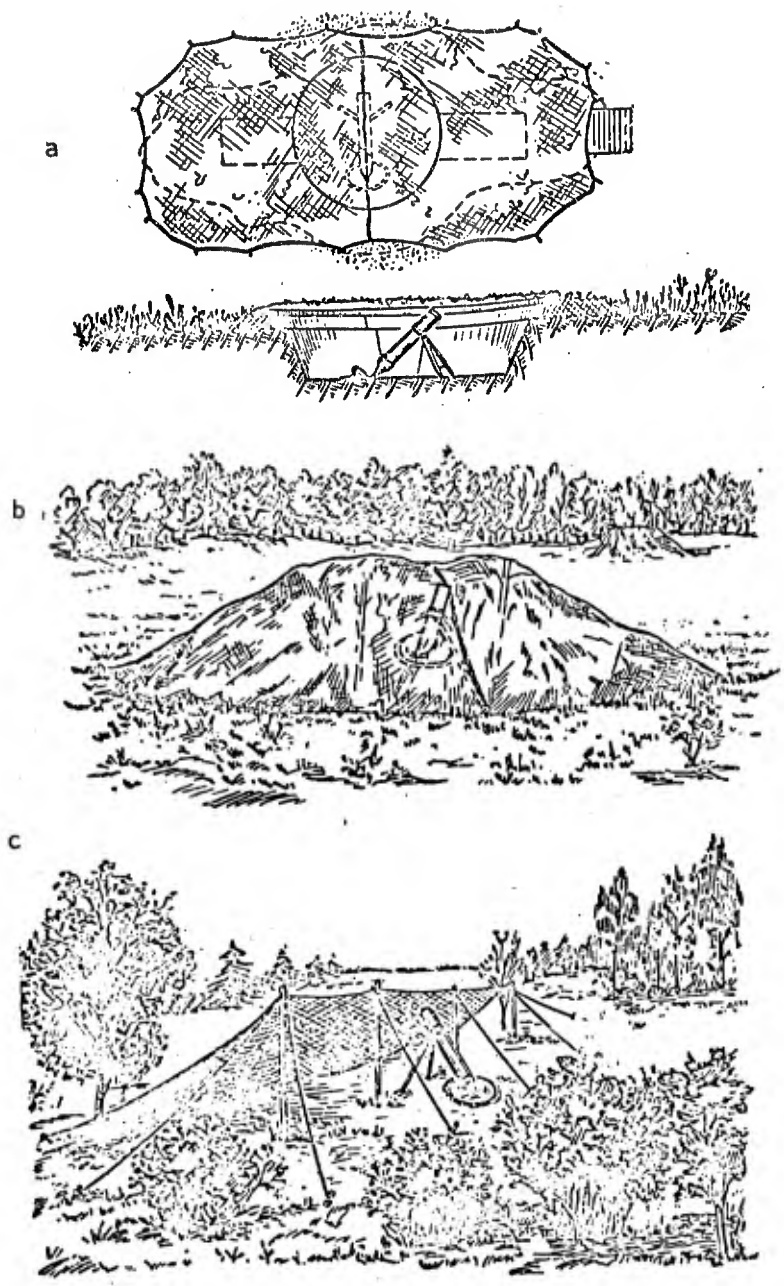


Figure 61. Camouflage of a Mortar Using an Organizational Camouflage Kit: a, Arrangement of flat cover over pit; b, Arrangement of convex cover; c, Arrangement of inclined net.

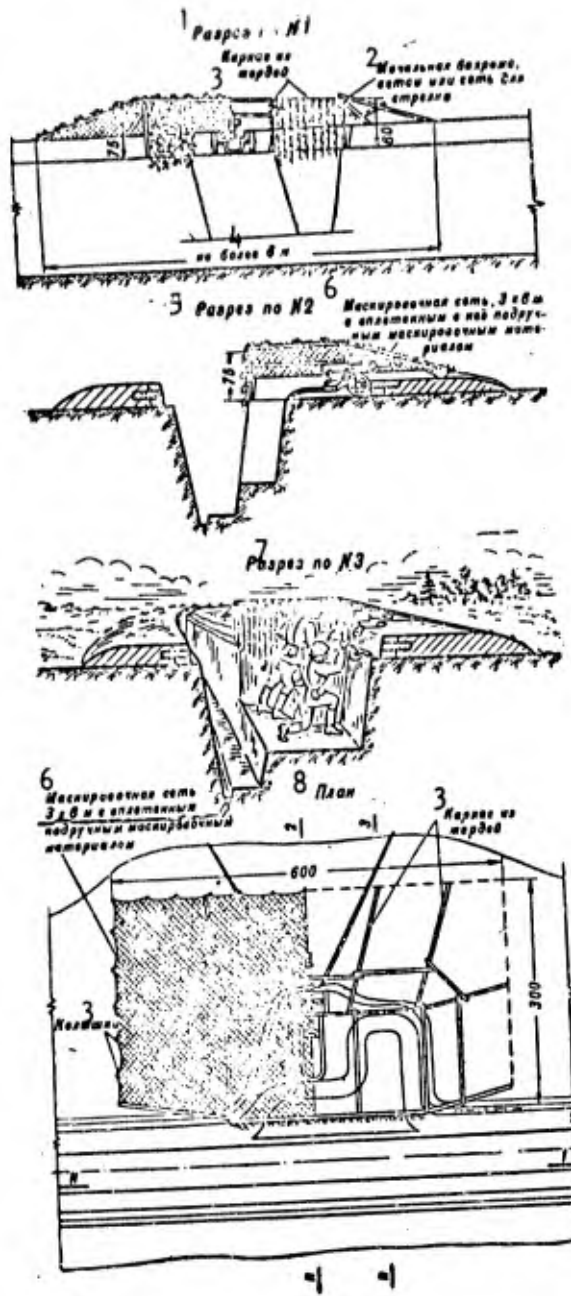


Figure 62. Arrangement of Convex Cover Over Machine Gun Emplacement. Key: 1, Cross section through N1; 2, Fiber fringe, branches or net for rifleman; 3, Pole frame; 4, No more than 6 meters; 5, Cross section through N2; 6, Camouflage net 3 x 6 meters with improvised camouflage materials interwoven on it; 7, Cross section through N3; 8, Plane view.

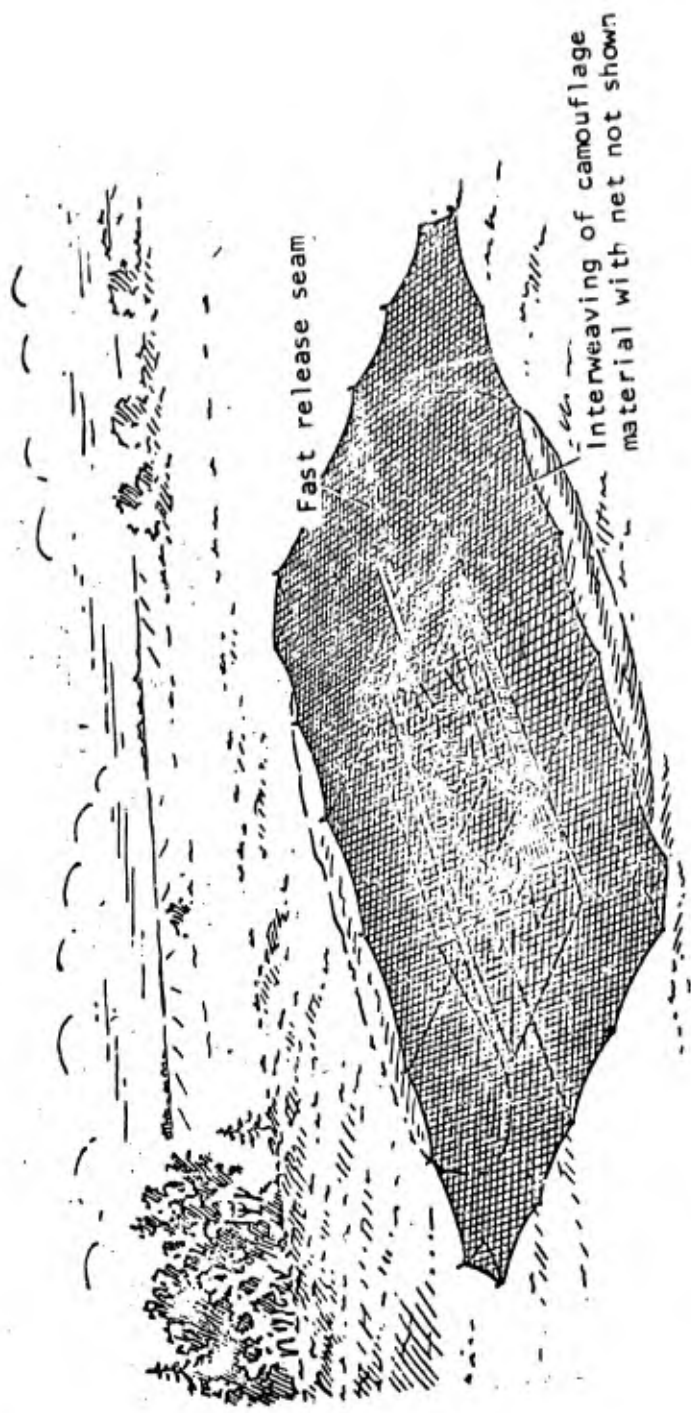


Figure 63. Camouflaging a Tank in a Pit.

While it was still light, the platoon commander together with the squad commanders moved out to the first trench of the company area and noted the place and type of obstacles as well as covered routes of approach to the site for their installation. At 22.30 hours, the platoon commander assigned to each squad a specific mission to set up the obstacles and the squad leaders assigned the mission to their subordinates. Then the squads were directed to the place where the obstacle means which had been prepared during daylight had been stored. A check of these means by the company commander showed that some of the components had not been properly prepared. The platoon spent about 30 minutes on correcting the defects which had been discovered. Then, on the signal of the platoon commander, the soldiers were sent out to construct a foot bridge across a swampy stream which flowed in front of the first trench. The foot bridge was needed to exclude the noise caused by the movement of people when fording a swampy place. As soon as the group leader reported the readiness of the bridge across the stream, one of the squads received the mission to lay out the logs of the obstacle. The layout was performed using luminous markers which were invisible from the "enemy" direction and visible from the friendly side at a distance of 30-50 meters. After laying out the logs, the rifle squads began to accomplish the assigned missions: some carried and installed the knife rests while others brought up long and short metal stakes, screwed them into the ground at certain intervals, and then braided the wire. In order to adhere to the assigned distance between the stakes the soldiers used a marking cord on which a mark was tied every three meters. The work went on without a hitch but the "enemy" was also active. He reacted to each negligence of the soldiers which caused noise: flares rose into the air, rattles made noise, and smoke puff charges were detonated. For example, it was sufficient to knock the metal stakes against each other accidentally for

Tr note--The next ten pages of foreign text not submitted for translation.

[Tr note--Text resumes on p. 111]

The effectiveness of camouflage measures depends to a considerable degree on the personnel's observation of camouflage requirements-- under all circumstances, to avoid everything which could be to the advantage of enemy reconnaissance. In a defensive position, each soldier and all personnel of the podrazdeleniye must adapt carefully to the terrain during movement and halts and skillfully camouflage the materiel against enemy ground and aerial observation. Being in the defense under conditions of direct contact with the enemy, it is necessary to avoid excessive movements, to keep to the shady sides of local objects, avoid movement across open places, in general to stop any movement where possible when enemy airplanes appear over the

defense area, to light no fires and not to smoke at night in open places, not to knock, not to give commands in a loud voice, to light campfires or stoke a stove only under cover and during hours established by the podrazdeleniye commander, adopting measures to reduce smoke (the openings of the smokestacks of dugouts and bunkers should be covered with branches to hold back sparks or special spark traps should be installed), etc.

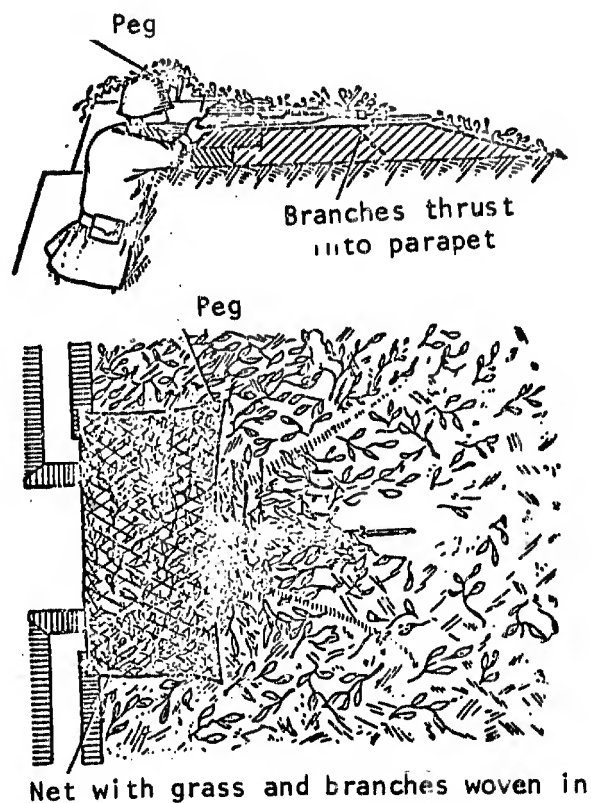


Figure 64. Camouflage of Firing Pit Adjoining a Trench.

Each soldier should know that single people can be seen during the day from an airplane with the unaided eye from 600 meters and people in foxholes--from 400-500 meters, a burning cigarette can be seen at night by a ground observer from a distance of up to 0.5 km, a burning match--up to 1.5 km, and the flash when firing a rifle--up to 1.5 km, and the flash of a flame when firing a single gun--up to 3-4 km. Therefore, one should not smoke in an improper place and should not fire for a long time from the same position, Inexperienced soldiers are puzzled why it is not permitted to light campfires at night even if the defensive positions are located in the depth of the defense. They forget that a campfire is visible at night from a distance of up to 6-8 km. At night, not only are shots and the noise from the movement of the tanks and motor vehicles easily heard, but also the noise of work in constructing defensive structures (the blows of the shovel, pick-mattocks, and a crowbar against the dirt can be heard at a distance of 0.5-1.0 km). Therefore, if it is necessary to conduct work in building defensive structures close to the enemy, the sound of work along the entire front should be created so that the enemy cannot determine from the sound the actual place where individual structures are being made. For camouflage, it is also necessary that the appearance and coloring of the terrain close to the structure should not be disrupted: do not trample and do not destroy vegetation, do not leave materials, ammunition boxes, food and food cans alongside the structure which has been built, do not spread out on the ground and do not hang clothes out to dry on the trees close to the position, etc.

During the Great Patriotic War, false actions and dummy structures were widely used for camouflage. They attracted the enemy's attention and thereby facilitated the camouflage of actual objects and actions.

The employment of dummy structures in camouflaging defensive positions may be of great value.

In order to distract enemy attention and fire from the actual disposition of weapons, it is recommended that the dummy positions be created in the company defense area at which mock-ups of the materiel are installed. The mock-ups of materiel are made from various materials. Figure 67 shows a mock-up of an antitank gun made of brushwood and poles. Ten man-hours are required to make it. Figure 68 shows a mock-up of a tank made of dirt in a pit. Its construction requires 30-40 man-hours. Dummy firing positions should be located no closer than 200-250 meters from the actual positions; to make the dummy positions appear active, it is either necessary to fire from them periodically with roving guns (machine guns) or to simulate it by detonating charges of high explosives.



Figure 65. Use of Trench Screens at Position of Rifle Podrazdeleniya.

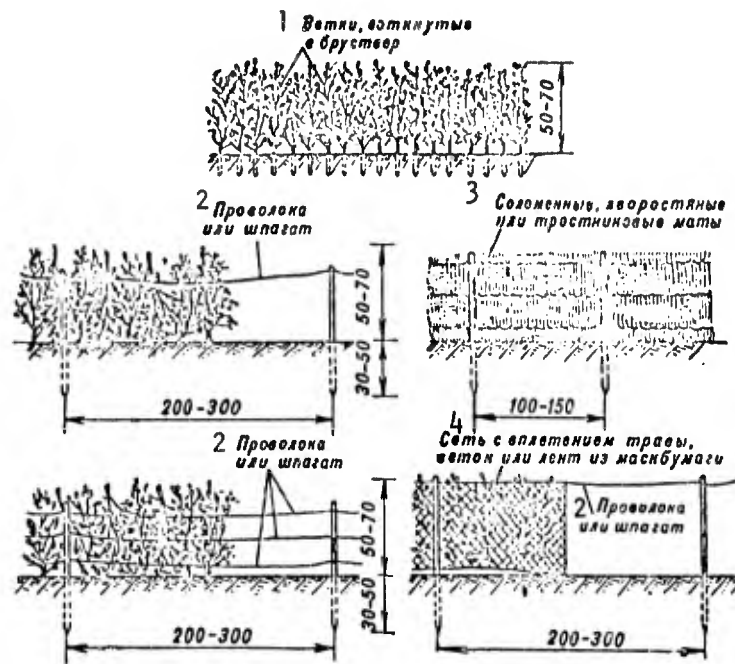


Figure 66. Variation of Arranging Trench Screens. Key: 1, Branches thrust into parapet; 2, Wire or binder twine; 3, Straw, brushwood or reed mats; 4, Net with interweaving of grass, branches or strips of camouflage paper.

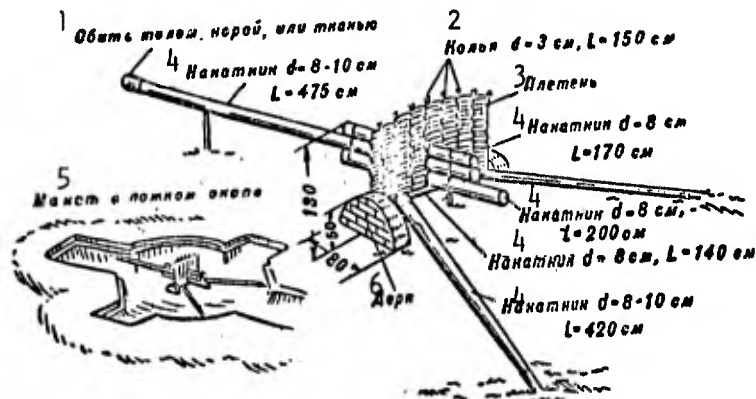


Figure 67. Mock-Up of Antitank Gun. Key: 1, Covered with tar paper, bark or cloth; 2, Stakes; 3, Wattle; 4, Small log; 5, Mock-up with dummy pit; 6, Sod.

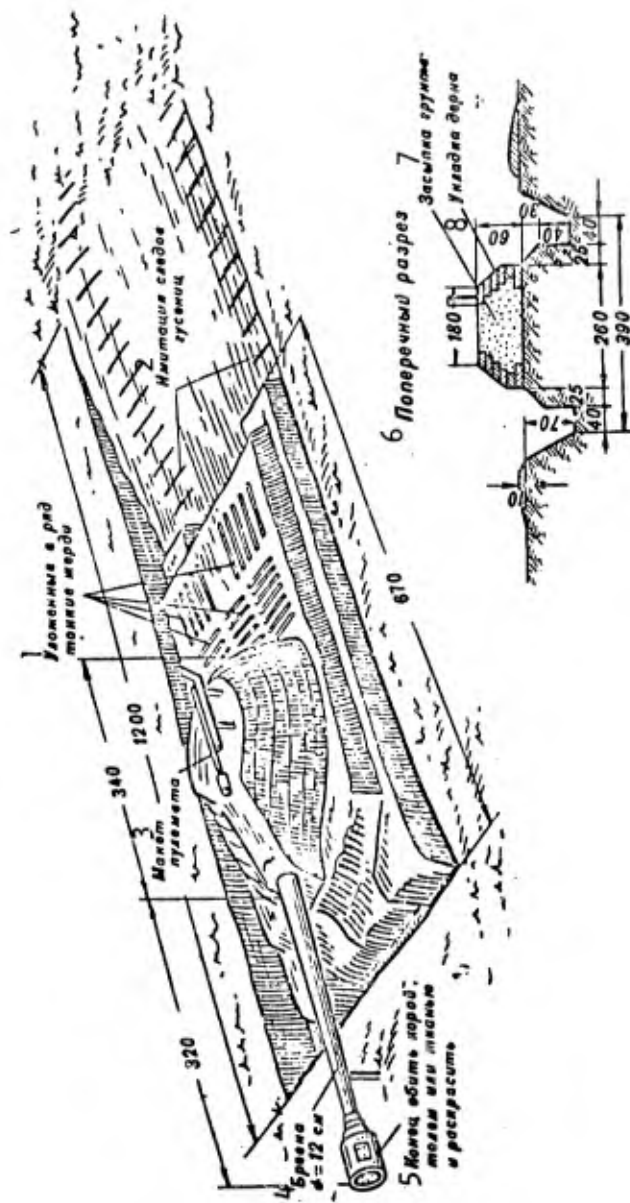


Figure 68. Mock-Up of Tank in Pit. Key: 1, Thin poles laid in a row; 2, Imitation of track traces; 3, Mock-up of machine gun; 4, log; 5, Cover end with bark, tar paper or cloth and paint; 6, Transverse cross section; 7, Covering with dirt; 8, Placement of sod.

Usually, the trails of tracks or wheels are laid out to the dummy positions, camouflaging them less carefully than the tracks which go to the main positions. Dummy positions must be slightly camouflaged otherwise the deception will be easily discovered.

If the position is equipped with trenches, it is not possible to hide it completely. The task of the camouflage will consist of confusing the enemy observers using dummy trenches and foxholes (along with the camouflage of the actual installations) and making it difficult for him to determine the actual system of fire.

Dummy trenches and foxholes are dug to a depth of 60 cm. They can be made even shallower but then, to create the appearance of depth in a ditch, on the bottom of them it is necessary to place out branches or grass or to paint the bottom with black soot or to burn straw or hay on the bottom.

In preparing for an attack, the enemy, in trying to destroy the main structures and trench sections by artillery, devotes great attention to the junctions of the trenches and communications trenches. Therefore, these junctions should be carefully camouflaged, building dummy junctions away from them (50-100 meters).

Along with dummy positions for machine guns, guns, and tanks, dummy wire obstacles, dummy antitank ditches, etc. can also be constructed.

On one sector of the front in the Great Patriotic War, dummy electrified obstacles were set up in front of the positions of the second echelon. These obstacles played a very important role. The enemy, having penetrated our defense and having reached the dummy obstacles, stopped, afraid of suffering casualties from the electric current, and he organized additional reconnaissance. This was exploited by our podrazdeleniya. The enemy's delay provided the opportunity to destroy him partially by fire and then to drive him out of our defense area.

The experience of the last war has shown that the skillful organization and conduct of camouflage measures and strict observation of camouflage requirements by the personnel is the guarantee of successful accomplishment of the assigned combat mission.

7. Supplying a Rifle Company with Water

Under defensive conditions, the personnel of a rifle company are supplied water in accordance with the norms which depend on the availability of water sources or means of obtaining water. It is customary

to consider ten liters as the daily norm for a man's consumption of water in areas which supply water. Under especially difficult conditions, when it is difficult to obtain water of good quality, the norm may be reduced to 2.5 liters per day (in a hot zone--up to 4.0 liters per day) but for a period of no more than three days. The daily requirement for replenishing motor vehicles consists of up to 8% of the capacity of the cooling system.

At the present time, it is necessary to consider another additional expenditure of water for the decontamination of equipment. To reduce the expenditure of water, decontamination should be conducted by wiping weapons with rags soaked in the decontamination solution.

In the practice of post war exercises, it has been observed that many commanders of rifle podrazdeleniya do not devote proper attention to the problem of water supply. This is explained by the fact that good quality water sources, as a rule, are completely sufficient in the exercise area. In the worst case, water is transported in organizational containers from the nearest water supply points. Actually, during combat actions, considerable efforts are sometimes required in order to supply people with good quality water. As a matter of fact, rivers, lakes and ponds, i.e., open bodies of water are undependable sources of water supply from the sanitary point of view. The water in them is not only turbid but it also contains microbes which can cause sickness. Moreover, the enemy may poison the water in such water sources.

During the Great Patriotic War, there were cases of poisoning of open reservoirs and wells which caused sickness among the soldiers who used the water from them without proper treatment.

Under modern conditions, open reservoirs may be subjected to radioactive contamination during nuclear bursts or the effect of initial radiation as well as from []* which fall out of the radioactive cloud. [] also possible is the landing in the reservoir [] and radioactive substances from rain and [] which arrive from contaminated sectors of the terrain and the contamination of reservoirs. All this is evidence of the considerable complication of the problems of water supply in modern combat; therefore, it should receive the most serious attention.

[] in a rifle company proven [] reconnaissance of water sources or water supply points. In this case containers which are available

*Tr note--[] indicate words missing from the translation due to illegible foreign text.

in the company--canteens, [] receptacles--are periodically filled with a quantity which satisfies the company's requirement. The situation may develop in such a way that the commander [] to solve the problem of the water supply of his podrazdeleniye independently. Therefore, commanders of rifle podrazdeleniya must know the simplest means for obtaining and treating drinking water. First of all, it should be remembered that the consumption of water for drinking and cooking food from any sources may be [] after investigating the water and concluding that it is [] which is done by the representatives of the medical []. Observation of this rule is especially important in using water from shallow shaft wells and open reservoirs. In the last war, the troops were permitted to use water from these sources only after it was boiled and chlorinated.

In some places, natural water emerges on the surface which may serve as a good source of [] under conditions of contamination of the terrain by radioactive substances. Ground water, as a rule, does not [] in view of the good capability of the ground to hold back radioactive particles. In general, it is considered that radioactive contamination of underground water is not very likely.

In the absence of springs, the necessity to dig pit wells may arise. A simple type of pit well no more than three meters deep is the so-called "kopanka" (Figure 69). It is dug in solid ground which does not require reinforcing the walls and has a round shape. To protect the walls of the "kopanka" from cave-in, a flooring of poles and boards is laid in which a hole is made which is tightly closed by a lid. From 25 to 30 man-hours are required to construct a "kopanka". Deeper wells as well as wells which are dug in medium and weak soils require revetment of the walls using logs, small logs, or boards. In order to exclude the possibility of radioactive substances getting into the water, it is necessary to cover the wells with tight lids of thick boards and to make drainage ditches at some distance from the wells. In addition, the dirt around the well should be well-packed with some slope so that the surface waters do not run into the well. It is best to place a layer of clay around the well and to pack it tightly. To avoid muddying the water, it is recommended that the bottom of the well be lined with well-washed large sand, gravel, or crushed stone.

Let us present an example of setting up a simple water supply point on a field exercise in 1954 (Far Eastern Military District). In the defense area of one of the rifle companies, it was decided to organize a battalion water supply point based on a well which was to

*Tr note-- [] indicate words missing from the translation due to illegible foreign text.

be dug. After terrain reconnaissance and determination of the location of the well, they began to dig a shaft with a cross section of 1.2×1.2 meters. Four riflemen and two sappers were detailed for the work. The water-bearing layer appeared only at a depth of nine meters. It was very difficult to dig the well, and it was often necessary to use a crowbar, wedges, and hammer while to excavate the dirt only a small shovel could be used. One man worked in the shaft and he was replaced every twenty minutes. The dirt was lifted by buckets from the ditch using a winch. As the well grew deeper, a log row crib was placed on the walls of the well. The difficulty in digging the well also consisted of the fact that the water began to soak through at a depth of three meters but the water-bearing layer which assured obtaining two cubic meters of water per hour was only at a depth of nine meters. A layer of gravel which had been washed ahead of time was placed on the bottom of the dug well as a filter. At first, the water was turbid but later it became light. At first the water was removed by buckets but later the regimental sappers installed a pump.

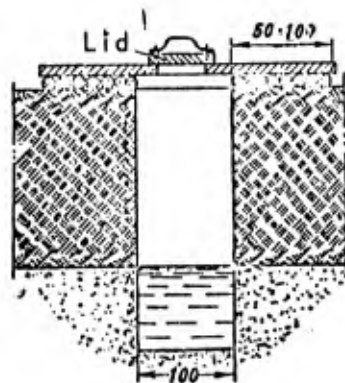


Figure 69. "Kopanka" Well Pit.

Under more difficult conditions, the work in constructing a water supply point is accomplished by podrazdeleniya of engineer troops.

The problem of water supply is not only obtaining water; it is still necessary to make the water suitable for consumption, i.e., to improve it. Improving the quality of water is not difficult and can be accomplished by the rifle company independently. Practice has shown that the disinfection of the water (destruction of the microbes) is attained by boiling it for ten minutes from the moment that boiling begins or by chlorination. The most widespread is disinfection of

the water by special tablets which are issued by the medical service. These chlorine tablets are dropped into the pots, bottles, buckets, and other containers with water. The water can be drunk 30 minutes after the start of chlorination since the microbes are dead by this time. In the winter, this time is increased to one hour. After chlorination, the water should have a slight taste of chlorine. If it does not have this taste, the number of tablets is increased until the taste appears. Water can also be chlorinated using calcium hypochlorite, adding 0.6 grams of lime for each one hundred liters of transparent water, and turbid river and dirty water (from ponds, lakes and irrigation ditches)--by using 2-4 grams. An hour after the addition of the calcium hypochlorite, the water can be drunk. In using shaft wells, the water should be chlorinated in the morning if it has been analyzed during the second half of the day, and early in the evening if the water was analyzed during the first half of the day.

The clarification of the water, i.e., the elimination of turbidity and coloring, is achieved by its settling in buckets, barrels, or authorized containers with the addition of 1-3 grams of aluminum oxide or potash alum to each bucket. As a result of the effect of these admixtures, flakes are formed in the water which, dropping to the bottom, take along the suspended particles which are in the water and which make the water turbid or colored. After approximately 30 minutes, the suspended particles settle on the bottom, after which the water can be used. Turbid water can also be made clear using home-made filters of field expedients which are made in clean water-tight barrels, cans, or boxes equipped with spigots. A layer of gravel (5-7 cm) is sprinkled on the bottom of the barrel and then a piece of clean cloth (like rough serge) is inserted and, a 30-40 cm layer of washed river sand is poured on top. Usually, the disinfection and clarification of the water are performed simultaneously.

At the level of a rifle company, some organizational means for purifying the water may also be used. They can include the general purpose portable filter (UNF-30) which clarifies, renders harmless, and disinfects the water, clearing the toxic substances and poisons from it (Figure 70). The productivity of the filter is 30 liters of water per hour.

It is sufficient to have five such figures to satisfy a company's requirements for water.

To purify the water, a company may also receive a cloth-carbon filter (TUF-200) the kit of which includes: a hand sprayer-pump, metal filter, four containers with a capacity of 100 liters each, two buckets,

a supply of carbon, calcium hypochlorite mixture and aluminum oxide. Figure 71 shows the kit for such a filter which has been set up to purify water. Using the TUF-200, it is also possible to decontaminate water contaminated with radioactive substances. In this case, two filter frames are taken instead of one and one of them is filled with carboferrogel, and the other with a cation exchanger.

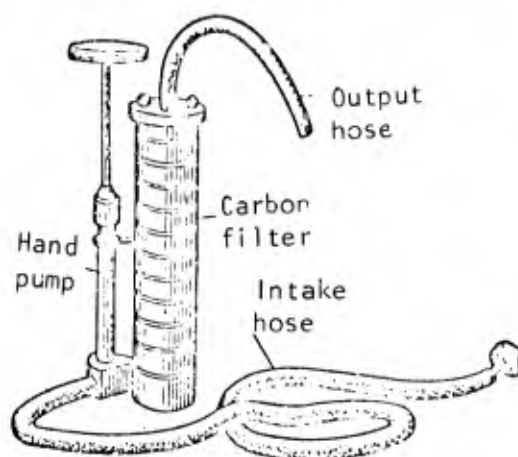


Figure 70. General Purpose Portable Filter (UNF-30).

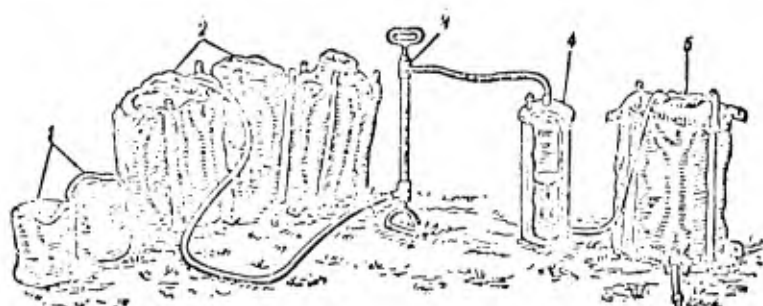


Figure 71. Cloth-Carbon Filter (TUF-200) Kit Set Up to Purify Water: 1, Bucket; 2, Three containers of 100 liters each for water being purified; 3, Pump; 4, Filter; 5, Container for 100 liters of pure water.

Under conditions of war, it is sometimes necessary to have some supply of water in each podrazdeleniye. Special attention is devoted to storing water in waterless areas and in mountains where water sources are located at a considerable distance. For convenience in storing and transporting water, local containers are used (barrels, tanks, cans, wineskins) and organizational containers of rubberized cloth (portable waterbags with a capacity of 12.5 liters, bags, a barrel with a capacity of 100 liters, and casks without props for 100 liters). There are also larger containers--up to 6000 liters. For greater safety in storing water under conditions of possible employment of atomic weapons, containers with water should be kept under cover or in special recesses which have been made in the slopes of foxholes and trenches.

CHAPTER II

ENGINEER IMPROVEMENT OF A RIFLE COMPANY DEFENSE AREA UNDER SPECIAL CONDITIONS

1. Special Features in Improving a Position when Defending a City

The defense of any populated place and especially a large populated place (city) has great significance because []* the populated place usually represents [] railroad and water main lines [], dirt roads, bridges and crossings, the retention of which assures freedom of maneuver for friendly troops and [] the actions of the enemy. In addition, populated places provide convenient quartering for the troops and create favorable conditions for the repair and restoration [] equipment.

The means of destruction which were employed in the past wars have comparatively limited effect against troops who have dug in a city.

For example, a single round from a rifle at a distance of 100 meters does not go through a brick wall with a thickness [], a machine gun burst--the wall of a brick building [] 50 cm, or reinforced concrete--15 cm; mortar [] cause damage only to those who are located outside [] a medium caliber artillery shell does not [] a reinforced concrete wall of a building with a thickness of 1.2 [] stone--with a thickness of 1.5 meters. If an explosive aviation [] of 50 kg explodes even three meters from a stone building and one weighing 250 kg [] from a stone building, its walls are not destroyed [] means in the form of incendiary bombs [] napalm cause fires primarily among [] structures of a city, etc. Thus, weapons [] of an atomic weapon, the basis of the defense of the city is made up of strong

*Tr. note [] indicate words missing from the translation due to illegible foreign text.

points which are made in especially strong reinforced concrete buildings which give their garrisons protection even at a short distance from burst ground zero of an atomic bomb.

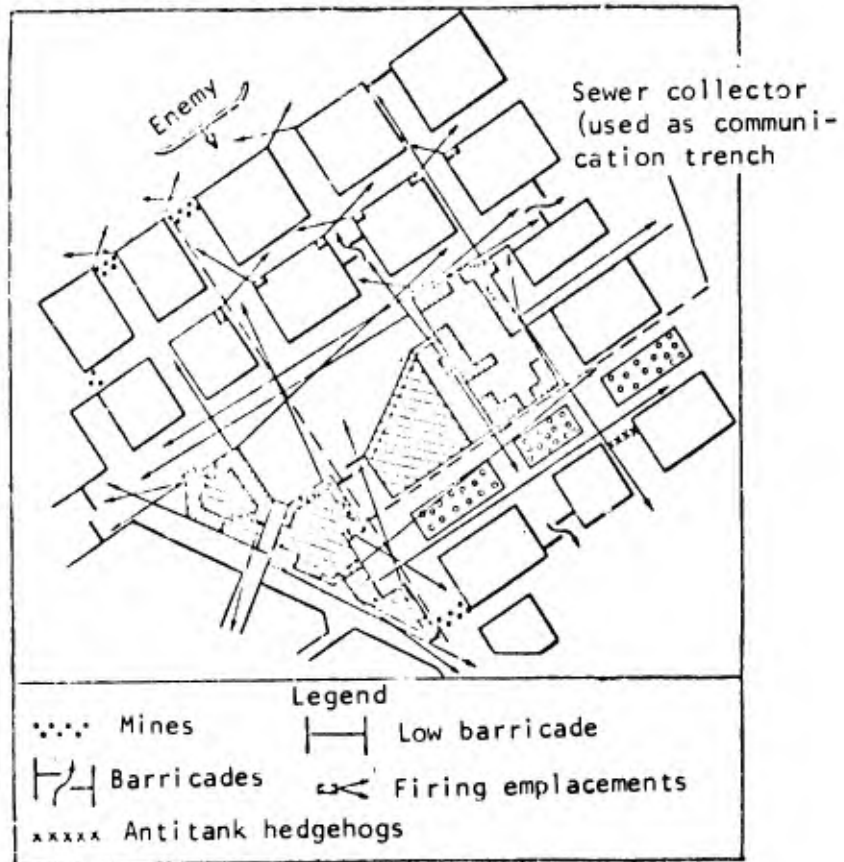


Figure 72. Diagram of Strong Points in the Defense of a City (Variation).

In organizing the defense of a strong point, the engineer improvement of the firing positions which are located outside the city structures do not differ in any significant way from the improvement of positions under normal conditions. It is a different matter in improving the firing positions in the structures. Here the construction of defensive structures has a completely different character and, in essence, is the adaptation of the building for defense (Figure 74). First of all, in buildings which are intended for the

location of weapons, the door and window openings through which the enemy may penetrate into the building or throw grenades on the defenders are sealed. For sealing the openings, use is made of sandbags and bricks (it is desirable to lay them on mortar). One can also nail up the openings from both sides with boards, filling the gaps between them with gravel, stone, sand, etc. If there is no time or corresponding construction materials for such sealing, it is necessary to block the openings or fasten material, sheets of roofing, metal netting, or other field expedients.

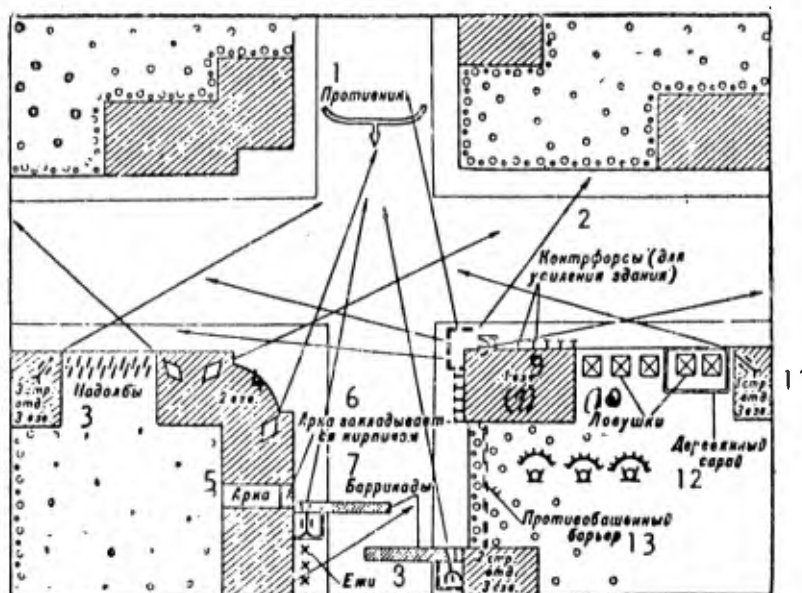


Figure 73. Diagram of a Strong Point of a Reinforced Rifle Company (Variation). Key: 1, Enemy; 2, Abutments (to reinforce building); 3, 3rd rifle squad, 3rd platoon; 4, 2nd platoon; 5, Arch; 6, Arch is piled with brick; 7, Barricades; 8, Hedge-hogs; 9, 1st platoon; 10, Traps; 11, 1st squad, 3rd platoon; 12, Wooden barn; 13, Anti-turret barrier.

Firing openings (embrasures) are left in the openings which have been sealed where it is most convenient to organize the defense and fire on the approaches. If necessary, new holes are knocked through for them, especially in the corners of a building, in the lower portions of the wall near the floor, etc. In using finished

openings, it is recommended that a hole for the firing opening (embrasure) be left in their upper corner and not in the bottom or in the middle, since fire which is opened from the upper corners of the openings will be more of a surprise for the enemy.

Material should be stored at door, window, or other openings which have been left as entrances to a building for their rapid sealing in case of necessity. In addition, the location of the firing openings (embrasures) in the building should assure the dependable firing through the approaches to the entrances. It is also necessary to assure the firing through all external walls of the building with enfilading fire in order to hinder enemy attempts to make breaches in them. Various projections of the buildings are used to organize enfilading fire: additions to buildings, porches, balconies, etc.

In improving buildings for the defense, the lower floors through which the enemy will first try to penetrate into the building should be consolidated especially carefully. It is necessary to make small holes in the ceilings between the floors (25 × 25 cm inside) through which, in case the enemy seizes the lower floor, hand grenades can be thrown on him. In addition, for protection against firing from below, sandbags are placed on the floor in those places where the riflemen or machine guns are located.

In case of their capture by the enemy, stairs are prepared for collapse and, instead of them, for communications between floors holes are knocked in the ceilings and are equipped with wooden or rope ladders.

Depending on the height at which the firing openings are made, the riflemen will fire through them from the standing position, from the kneeling position, or from the prone position. In case of necessity (when the firing opening is knocked through higher than 1.4 meters from the floor), supporting structures for the riflemen are made alongside the firing opening. Alongside the embrasures for the machine guns, just as in covered machine gun emplacements (see Chapter I, Section 2), tables are built and the embrasures are equipped with shields for closing.

Considering the danger of injury of the garrisons of the strong points by glass fragments, it is expedient to remove the glass ahead of time in buildings which have been occupied for the defense.

As a rule, a firing position for an antitank gun is made on the first floor (Figure 75). A breach is made in the rear wall of the building to roll the gun in and an entrance is made. A foundation

of logs and boards is placed beneath the wheels of the gun. Firing is conducted through an embrasure which is made in the wall of the building or through window or door openings which have been adapted for this purpose. The outer walls of the building which the gun emplacement adjoins are reinforced with a log crib work of log row construction, filling the gap between the crib work and the wall with stones or dirt. A roof is erected above the emplacement for the gun.

One should avoid building firing positions for recoilless guns in the building itself since the danger zone when firing from them reaches a length of 20 meters and a width of 12 meters (six meters in each direction from the axis of the gun).

Firing positions for mortars are also usually set up behind the building at a distance at least one and one half times greater than its height. Such a distance, which permits firing unhindered, protects the mortar and its crew from cave-in and injury by fragments when the building collapses. With a great density of structures, mortar positions can also be prepared inside the building--in the attic or in the rooms of the upper stories.

The location of weapons inside the buildings reduces the work for the engineer improvement of their positions and creates the best conditions for camouflage. However, the danger of the collapse of the buildings and the possibility that the weapons located in them may be put out of action require that a portion of the guns and machine guns be located outside the buildings. Often, this must also be done to assure firing through the streets and facades of the buildings which have been adapted for the defense with enfilading fire. Usually, with the location of weapons outside the buildings, their positions are set up under cover of stone walls, fences, enclosures (Figure 76) or in small street structures of the public utilities (Figures 77, 78).

Widely used for defense are sewer drains and manholes, which are found in large quantities on all streets of a city. A manhole is a unique disappearing firing point (SOT) since, in tilting the hatch of the manhole, the assault rifleman or machine gunner may suddenly bring down fire on the enemy and, if necessary, can also take cover suddenly and then, using the collector, move to another manhole as if to an alternate position. Such a method of fighting was widely used by our troops during the storming of Berlin and, in 1950, by the troops of the Korean Peoples Democratic Army in the battles in Seoul.

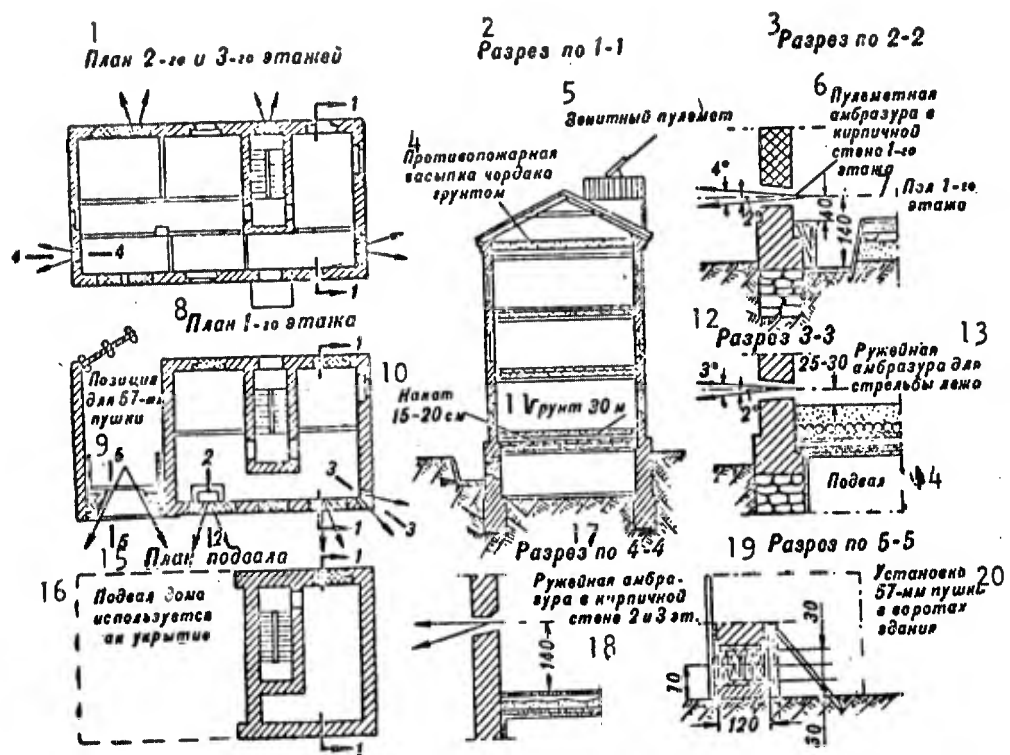


Figure 74. Variation of Adaptation of a Two-Story Building for Defense. Key: 1, Plan of 2nd and 3rd floors; 2, Cross section through 1-1; 3, Cross section through 2-2; 4, Pouring dirt in attic to prevent fire; 5, Antiaircraft machine gun; 6, Machine gun embrasure in brick wall of first floor; 7, Floor of first floor; 8, Plan of first floor; 9, Position for 57-mm gun; 10, Flat wooden ceiling; 11, Dirt; 12, Cross section through 3-3; 13, Rifle embrasure for firing prone; 14, Basement; 15, Basement plan; 16, Basement of house is used as cover; 17, Cross section through 4-4; 18, Rifle embrasure in brick wall of 2nd and 3rd floors; 19, Cross section through 5-5; 20, 57-mm gun emplacement in gate of building. (Continued on next page)

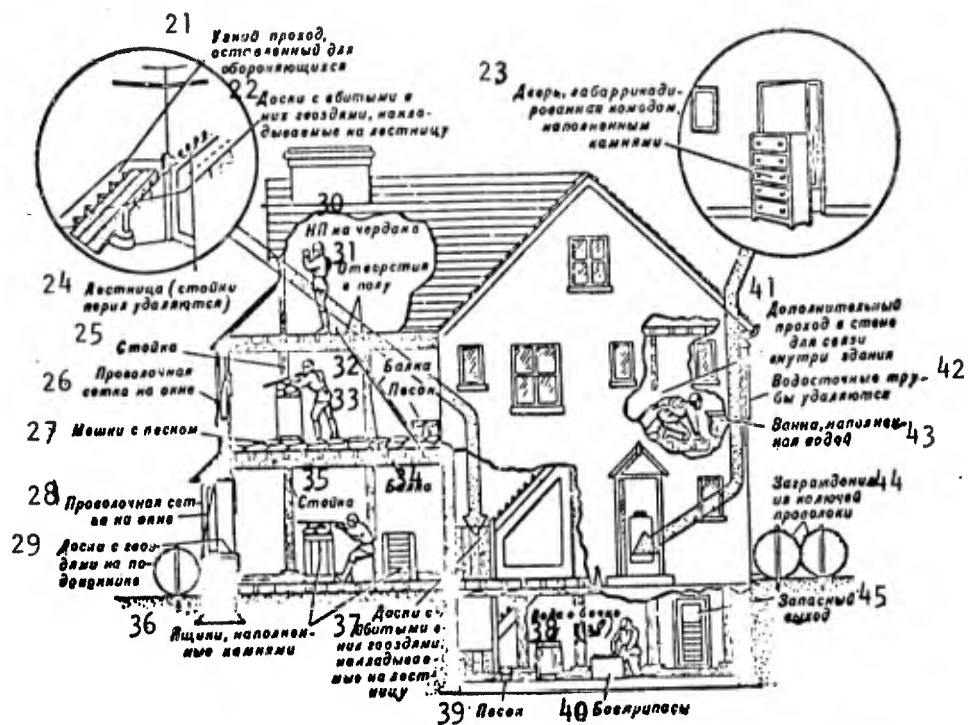


Figure 74 (Continued) 21, Narrow passage left for defenders; 22, Boards with nails knocked in them placed on stairs; 23, Door barricaded by dresser filled with stone; 24, Stairs (supports of handrailing removed); 25, Support; 26, Wire net in window; 27, Sandbags; 28, Wire net in window; 29, Boards with nails on window sill; 30, OP in attic; 31, Hole in floor; 32, Beam; 33, Sand; 34, Beam; 35, Support; 36, Box filled with stones; 37, Boards with nails knocked in them placed on stairs; 37, Water in barrel; 39, Sand; 40, Ammunition; 41, Additional passage in wall for communication within building; 42, Downspout removed; 43, Bathtub filled with water; 44, Barbed wire obstacle; 45, Alternate exit.

Cross section through N1

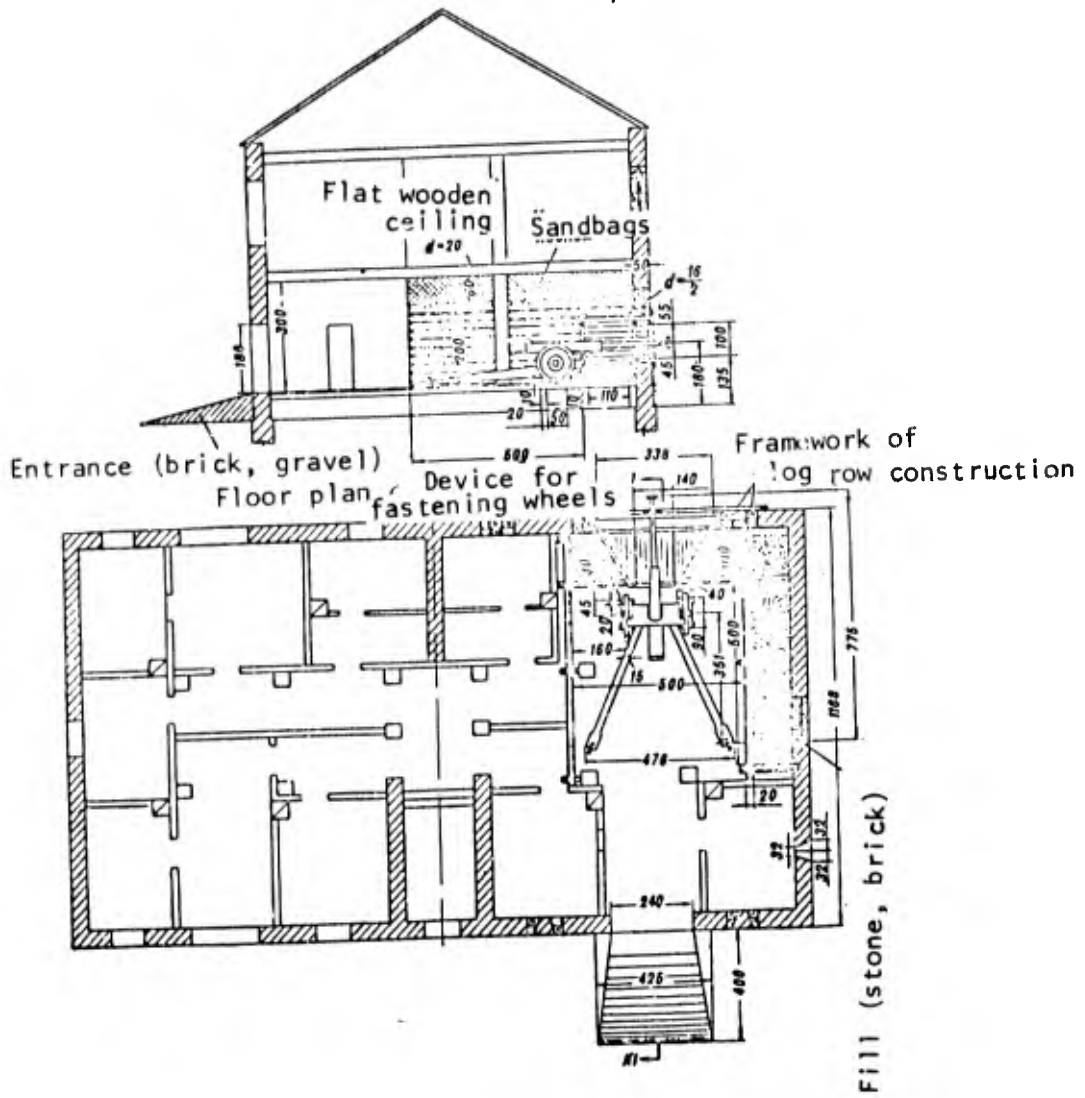


Figure 75. Building a Firing Position for an Antitank Gun in the First Floor of a Building.

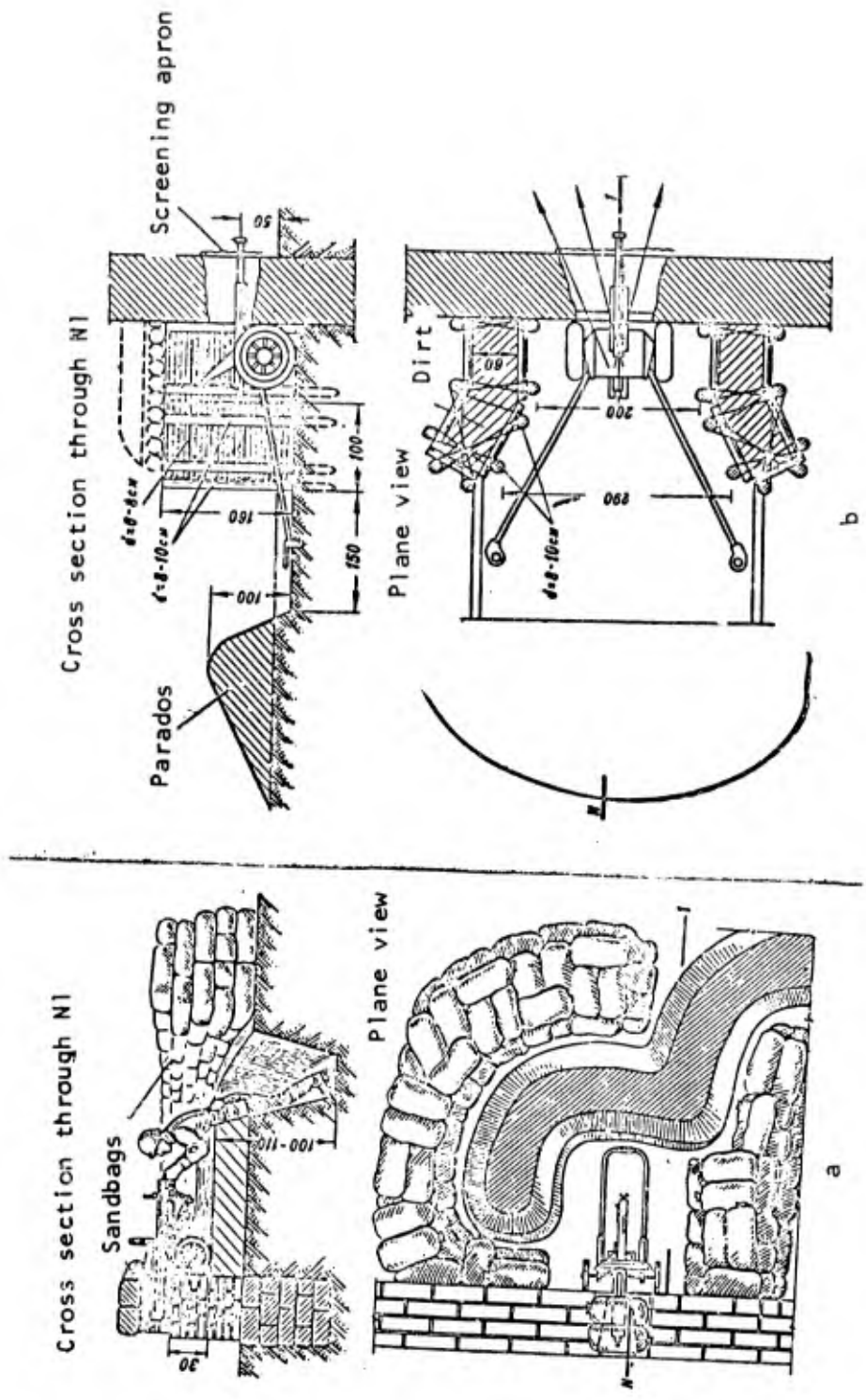


Figure 76. Adaptation of Stone Wall for Firing Position: a, Machinegun; b, Antitank gun.

Cross section through N1

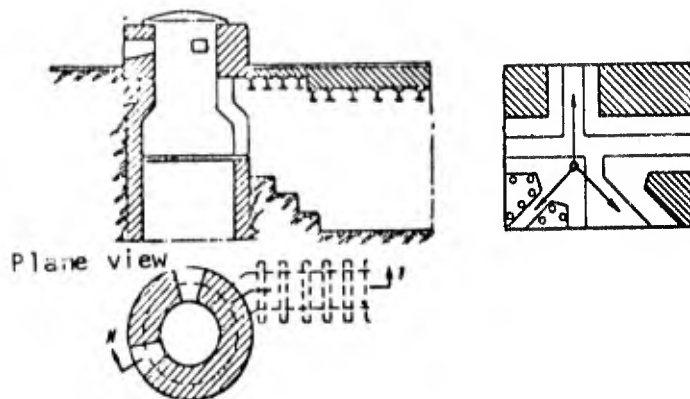


Figure 77. Adaptation of Transformer Booth for Two-Embrasure Firing Emplacement.

Structures for operation are built in the attics of buildings, in the rooms on the upper and lower floors (tiered observation), in fire towers, in the bell towers of churches and chapels, in plant smokestacks, etc. The construction of these structures or, more correctly, the adaptation of local objects and parts of the building for them, differs in each individual case. One should strive to create protection against the bullets and thermal radiation everywhere along with assuring observation (making observation slits). For example, in using bell towers, all openings on the platform of the bell tower where the observer will be located should be sealed by sandbags or board panels, leaving only observation slits in them. In using a factory smokestack, several holes should be knocked in it to assure all-around observation, and a ladder for the observer and a platform on which he will be located should be built inside the smokestack. From the attics of buildings, observation is conducted through attic windows or openings made in the roofing []* observer from fragments and bullets is erected [] cover from sandbags, board panels, [] doors and other field expedients.

Cover for people is set up in basements [] filtration-ventilation units are installed [] protective doors and other interior equipment in conformance with the purpose of the cover. The cover [] alternate exits which lead out to a distance [] which excludes the possibility of their being buried by fragments of the [].

* Tr. note--[] indicate words missing from the translation due to illegible foreign text.

Great attention should be devoted to clearing []*. For these purposes sometimes it is necessary [] to cut down trees, and at times to dismantle individual buildings, the material from which can be used to improve firing positions.

The provision of covered routes of maneuver and [] with the strong point and rear area is achieved by the thorough [] of these pads, the making of breaches [] necessity on individual sectors [] and communications trenches. Communication between floors of the building is organized through holes in the [] by ladders or ropes. These openings should be located one above the other through all floors [] in the lower floor the enemy will not be able to [] communications with all floors.

Houses which are occupied as strong points [] it is desirable to connect to each other [] knocked through from the basements of the houses or [] for this purpose lines of underground municipal [].

Our soldiers organized communications between [] of a strong point interestingly []. With strong machine gun fire [] the enemy [] street, as a result of which communications between houses practically stopped. The defenders of the strong point, having the opportunity to dig [] across the street, thought of a simple method. They took a sheet [] to its edges ropes, and, having placed food on the sheet, they pulled it across the street by means of [].

For tanks which are operating jointly with the [] companies, covert maneuver is assured by the making of [] in the walls of buildings and enclosures.

It is most convenient to make holes in the walls of buildings using explosives. A pole charge of 2.4 kg of TNT is required to knock through one running meter of wall two bricks thick, 3.8 kg of TNT for a wall two and a half bricks thick, and 5.4 kg of TNT for a wall three bricks thick. In order to make it difficult for the enemy to penetrate into a house, it is necessary to remove all objects which might help him in this. For example, lean-to ladders, boards, ropes, and other things should be collected inside the house and fire escapes which are joined tightly against the walls are either destroyed or taken under fire. For this purpose, all drain pipes and their fastening to the building are destroyed at the height of the windows on the second floor. All openings, including openings in smoke and ventilation pipes, should be closed so that the enemy cannot throw grenades inside the house through them.

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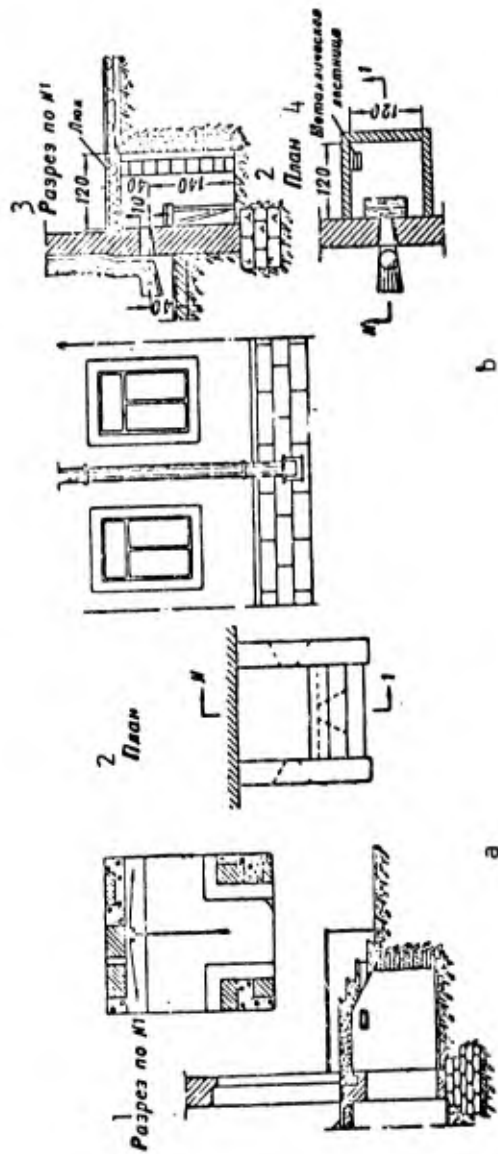


Figure 78. Variations of Camouflaged Disposition of Weapons Positions in City Structures: a, On the porch of a house; b, In the basement of a house with the outer opening of an embrasure in a downspout; c, In a fence and the guard booth of a plant. Key: 1, Cross section through M1; 2, Plane view; 3, Cross section through M1; 4, Metal stairs. (Continued next page)

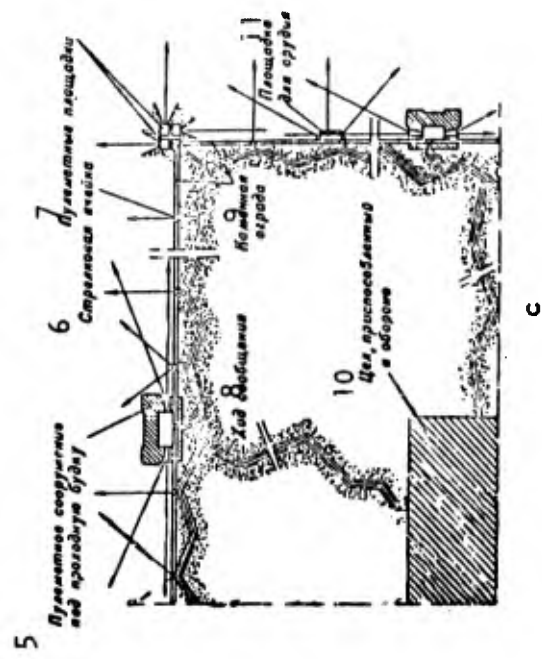


Figure 78 (Continued) 5, Machine gun emplacement in guard booth; 6, Rifle pit; 7, Machine gun emplacement; 8, Communication trench; 9, Stone fence; 10, Shop adapted for defense; 11, Emplacement for gun.

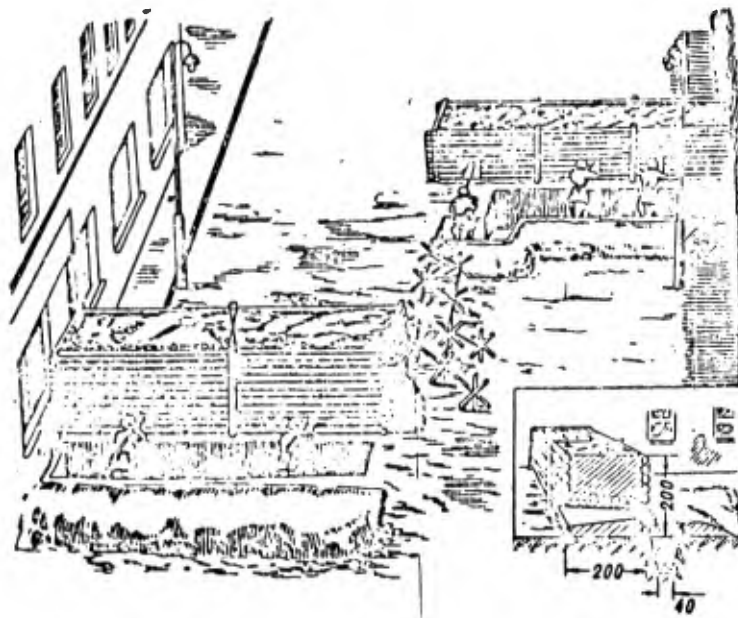


Figure 79. Variation of Arrangement of Combined Barricade of Timber-and-Dirt Walls and Metal Hedgehogs.

The camouflage of positions in the city, as has already been indicated, is facilitated by the variegated background which is created by the city buildings. In setting up firing positions in houses, special attention should be devoted to camouflaging the firing openings and embrasures, and in setting up observation posts--to the camouflaging of the observation slits. For this purpose, it is desirable to locate the slits, firing openings, and embrasures beneath the cornices of the buildings as well as in the shadow of various architectural decorations of the houses, and it is mandatory to cover their openings with camouflage panels. In order to make it difficult for the enemy to determine the location of firing positions from the sound of the shooting, it is desirable to fire from the depth of the premises where possible. Along with this, it is useful to place mock-ups of materiel and dummies of people in unoccupied window openings.

The street layout of a city creates favorable conditions for the construction of obstacles which hinder the enemy in utilizing city thoroughfares for the maneuver of personnel and combat equipment. The most characteristic types of obstacles for a city are barricades which found wide application in the defense of cities in the last war (Figure 79).

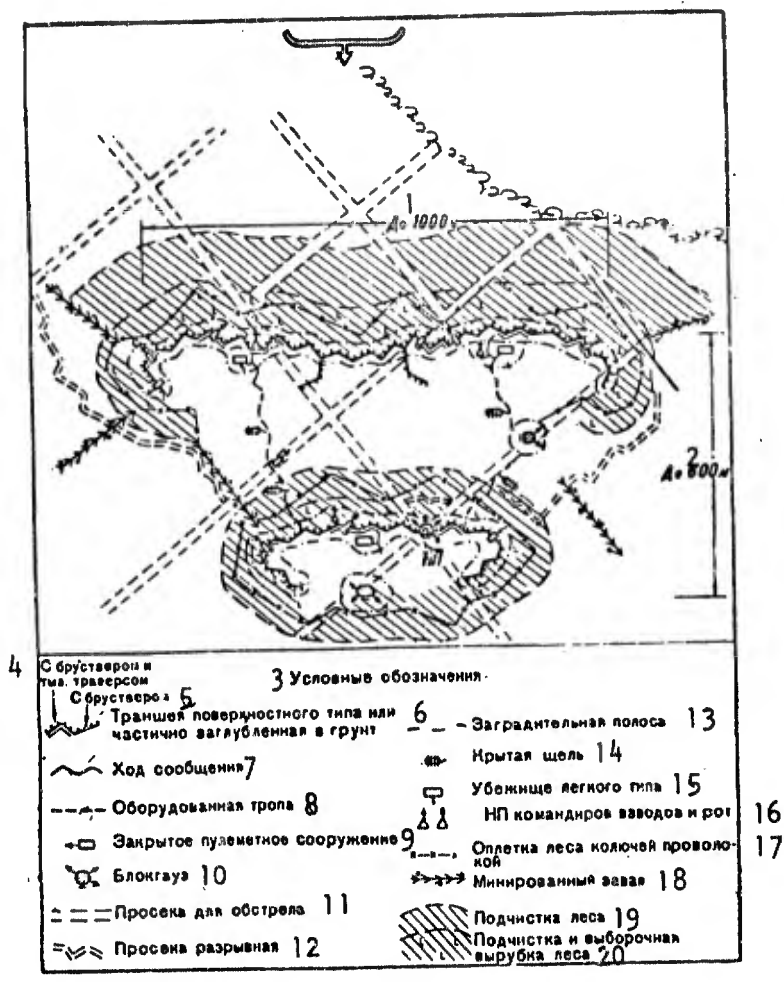


Figure 80. Diagram of Engineer Improvement of Company Defense Area in Forest. Key: 1, Up to 1000 meters; 2, Up to 600 meters; 3, Legend; 4, With parapet and parados; 5, With parapet; 6, Surface-type trench or trench dug in the ground; 7, Communication trench; 8, Improved path; 9, Covered machine gun emplacement; 10, Blockhouse; 11, Clearing for firing; 12, Explosive clearing; 13, Barrier strip; 14, Covered slit trench; 15, Light shelter; 16, OP's of company and platoon commanders; 17, Entwining of trees with barbed wire; 18, Mined obstruction; 19, Clearing forest; 20, Clearing and selective cutting of forest.

Antipersonnel obstacles which are usually set out 25-30 meters from the building (the distance for throwing a hand grenade) have great significance directly for the defense of a building which is occupied as a strong point.

Providing the troops with water in the defense of a city is one of the tasks of engineer support. In defending a city, under favorable conditions water supply points are set up primarily on the base of the existing water main. But in case a water main goes out of operation, temporary water supply points are organized and set up prior to its restoration using organizational means (see Chapter II, Section 7).

Under modern conditions, the significance of fire prevention methods has increased considerably; commanders of podrazdeleniya and chasti should maintain direct observation over the preparation of them.

Any building which is adaptable for defense must be given fire prevention support. For this, all unnecessary objects which may cause fire are removed from the building and from the courtyard. Wooden outbuildings are removed. Barrels with water are placed on each floor of the building and, even better, in each room. Sand or dirt is poured where they cannot be delivered. Manual fire extinguishers are collected from buildings which are not part of the system of the strong point or center of defense and are made ready ahead of time. All available containers are filled with water.

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[Tr note--Text resumes on p. 146] 2-3 man-hours (and for trenches with a rear parapet 4-6 man-hours), a rifle pit with head cover--6-10 man-hours and a covered machine gun emplacement--100-200 man-hours. When time is available, a dirt and timber embankment may be built in place of a parapet and consisting of log cribwork placed end to end and filled with dirt and then packed (Figure 82). To the front []* it is recommended that dirt be added so that the shockwave of an atomic burst which comes from the front [] structure and thereby its damage-causing effect is reduced. [] 17-20 man-hours for the construction of one running meter of such an embankment.

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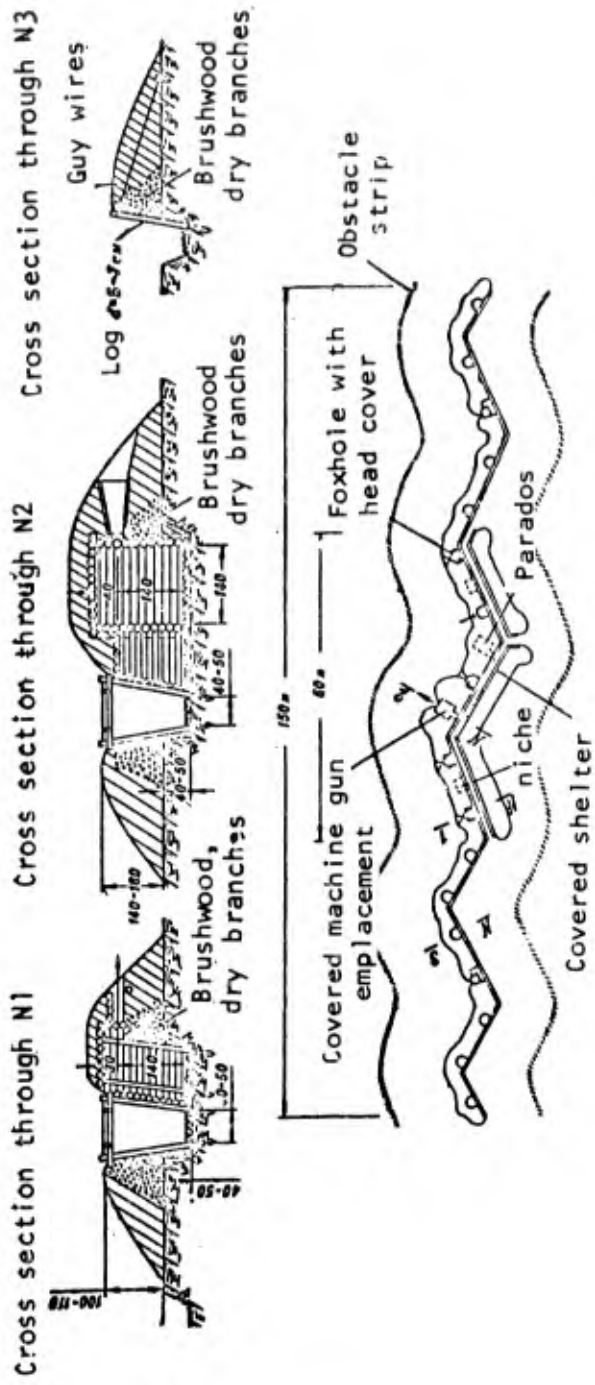


Figure 81. Engineer Improvement of a Rifle Squad Position in a Forest (Variation).

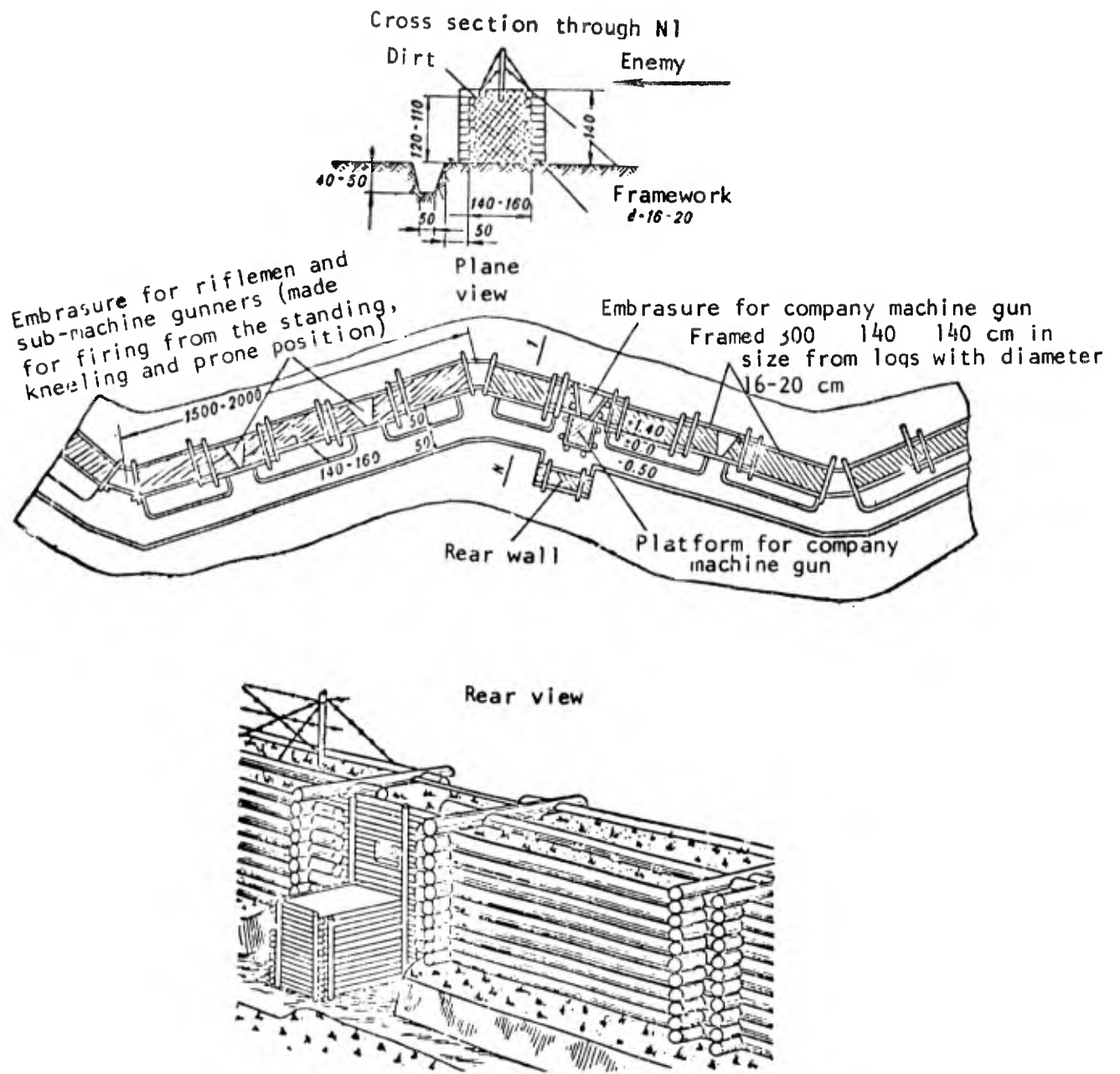


Figure 82. Setting Up a Rifle Position with a Timber-and-Dirt Embankment.

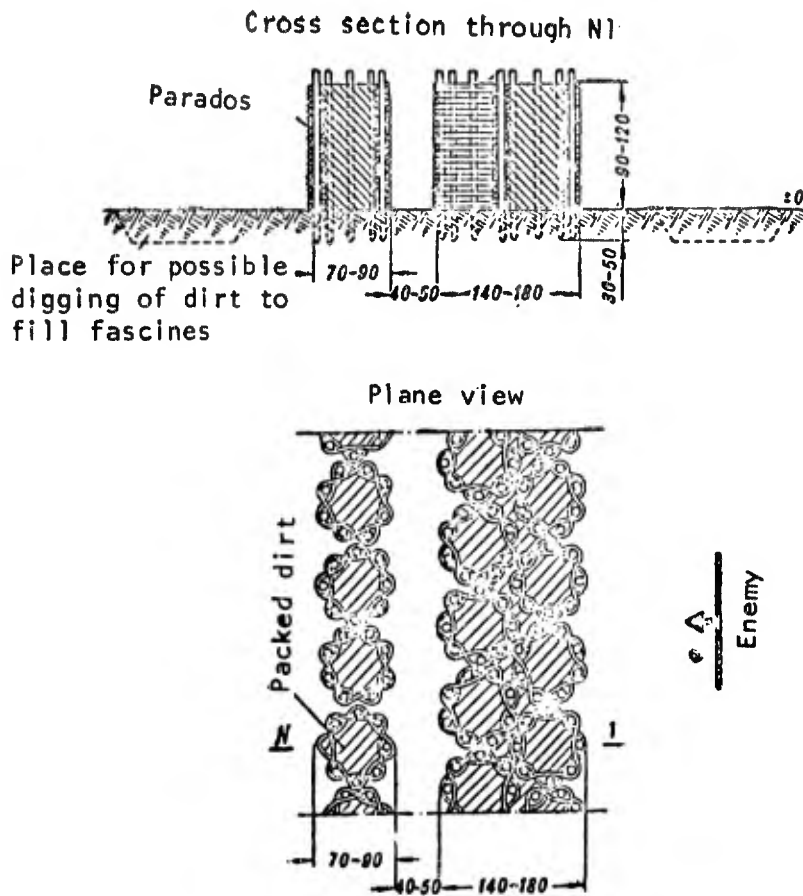


Figure 83. Making Trenches (Foxholes) of Fascines.

[]* type of structure, despite the great amount of work, found wide application in consolidating [] positions by our and the German-Fascist [] on the Northwestern and Volkhov fronts during the Great Patriotic War.

In the absence of timber of the required dimensions [] log cribwork, walls can be used of [] and fascines (Figure 83). The fascines are made with a height of [] and a diameter of up to 1 meter. Two rows of fascines filled with [] dirt assure the dependable [] of small arms fire. The fascines do not require additional strengthening and are easily replaced when destroyed. The construction of one running meter of trenches of fascines requires [].

*Tr. note--[] indicate words missing from the translation due to illegible foreign text.

In preparing trenches on positions of rifle []*, up to one-third of all firing pits are made [] at the primary positions for the company machine gun [] head cover above the emplacements or structures []. In order to reduce the volume of work and reduce [] above the surface of the earth, with a high level of [] water, covered machinegun emplacements are made [] for firing from the sitting or prone position.

[] of structures are made of single or double [] construction. Most often, double cribwork [] only in the wall in which there are embrasures [] entrance to the firing emplacements must [] parados which assures protection against [] bullets when firing on the structure from the direction of []. Figure 84 shows a covered machine gun emplacement for firing from the prone position with the front wall of double [] construction of such a structure requires [] man-hours.

Communication trenches are constructed only on open sectors [] which are easily observed from the direction of the [] as well as in the area of the location of dugouts and machine gun emplacements which assure the conduct of fire from the flank. Communication trenches are built just as []; the parados is made only opposite the [] structure or cover. On the remaining sectors, paths are made for the movement of personnel by clearing away bushes and stumps from the terrain and constructing vertical screens where observation from enemy ground observation posts is possible. Every 100-200 meters, slit trenches are dug to the side of the path for the cover of personnel against fragments when being fired upon by artillery or mortars.

For orientation when moving, a smooth wire is stretched alongside the path instead of handrails, and markers are set out.

Pits for artillery guns, mortars, tanks and other weapons attached to the company are constructed in accordance with the same principle as trenches: the basic part of their cover is the raised parapets. Figure 85 shows a pit for an antitank gun, on the construction of which about 300 man-hours are required.

In constructing pits for tanks, on the bottom of the depression (ditch) it is mandatory that a track of logs be laid so that the tank tracks have sufficient traction when leaving the pit. In preparing positions for mortars, trees and brush which hinder firing

* Tr. Note--[] indicate missing words from the translation due to illegible foreign text.

are cut down. A layer of brushwood 30-40 cm thick, sod, or sandbags are placed beneath the baseplate of the mortar.

In addition to regular types of structures, platforms and observation posts may be constructed in the trees for observation. The platforms are prepared in one tree or several trees which are located close to each other (Figure 86). So that the trees do not sway and thereby do not hinder observation, they are fastened by guy wires.

The basic types of obstacles in preparing a company defense in forest swamp terrain are, in addition to antitank and antipersonnel minefields, the braiding of trees with barbed wire, wire spirals, tree entanglements, blow down, booby traps, wooden barriers, and swamping.

The variety of terrain and background in the forest creates favorable conditions for the camouflage of all types of antipersonnel wire obstacles. A wire net on stakes and through the trees is well camouflaged in the brush and undergrowth and wire spiral-type obstacles which are not easily noticed become absolutely invisible even at a short distance.

In laying minefields on swampy sectors, it is necessary to protect the mines from contact with the water. Along with mines, wide employment may be found by pull-type booby traps tied to the trees.

Clearing away the field of view and fire is one of the important and extremely laborious types of work in organizing a defense in a forest. Usually the clearing is performed in the following manner (Figure 87). The clearing of the forest is performed to a distance of effective fire of the automatic weapons of a rifle company with consideration of terrain relief (as a practical matter in a strip up to 200 meters and only in individual cases up to 400 meters in front of the FEBA), i.e., the cutting out of the brush, undergrowth and stumps; the trimming of branches of trees to a height of up to 1.5-2 meters; and the clearing of the bushes, brushwood and deadwood from the emplacements.

On half the width of this strip, in addition to the clearing, the selective cutting of 25% of the trees on the average is performed to improve observation and fields of fire on the near approaches to the position. In the clearing process, primarily young trees are cut down with a diameter of the trunk of up to 15-25 cm; the cutting is performed unevenly: most of all near the FEBA (up to 30%, and then the further toward the enemy, the thinner (up to 20%). Five to six man-days are spent to clear one hectare of forest and, with selective cutting of the trees--up to 10 man-days.

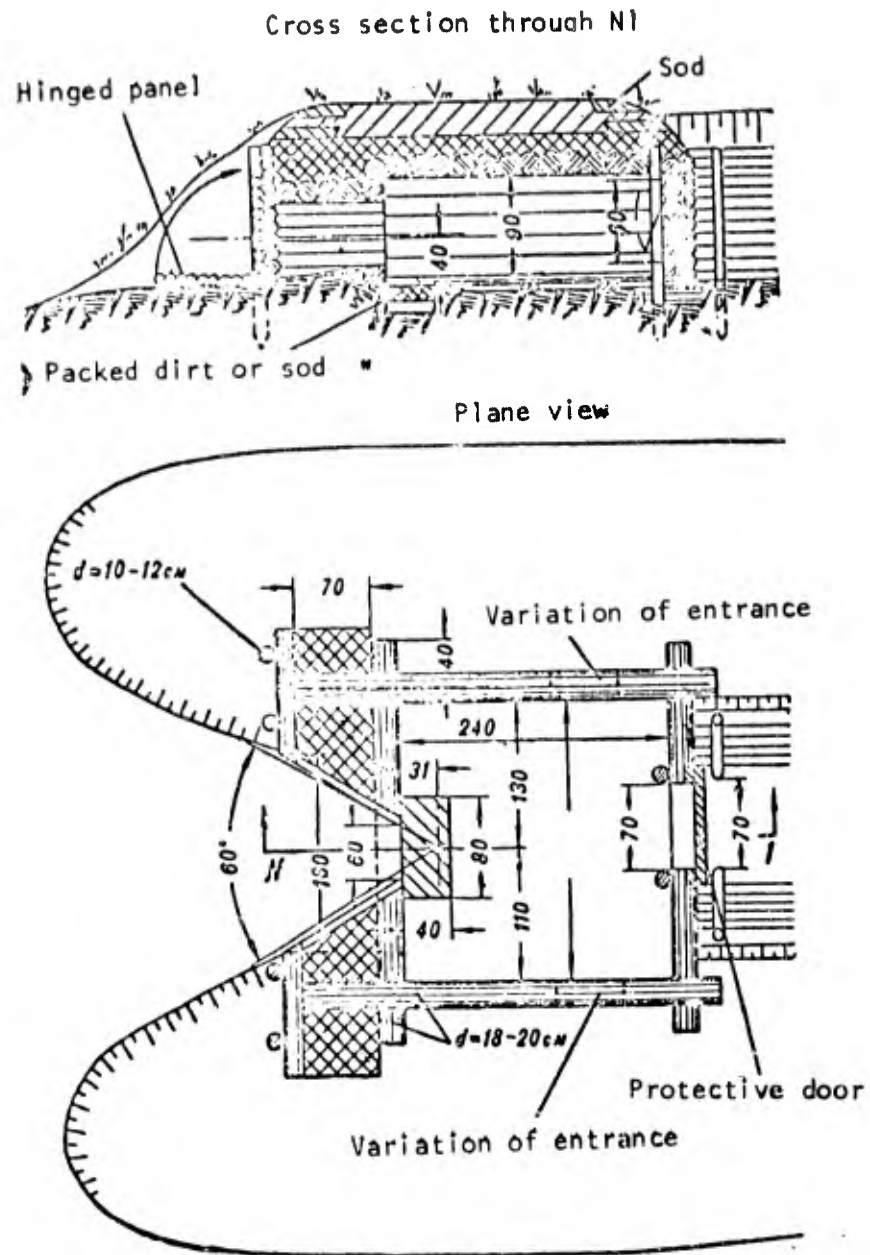


Figure 84. Covered Machine gun Emplacement for Firing Prone.

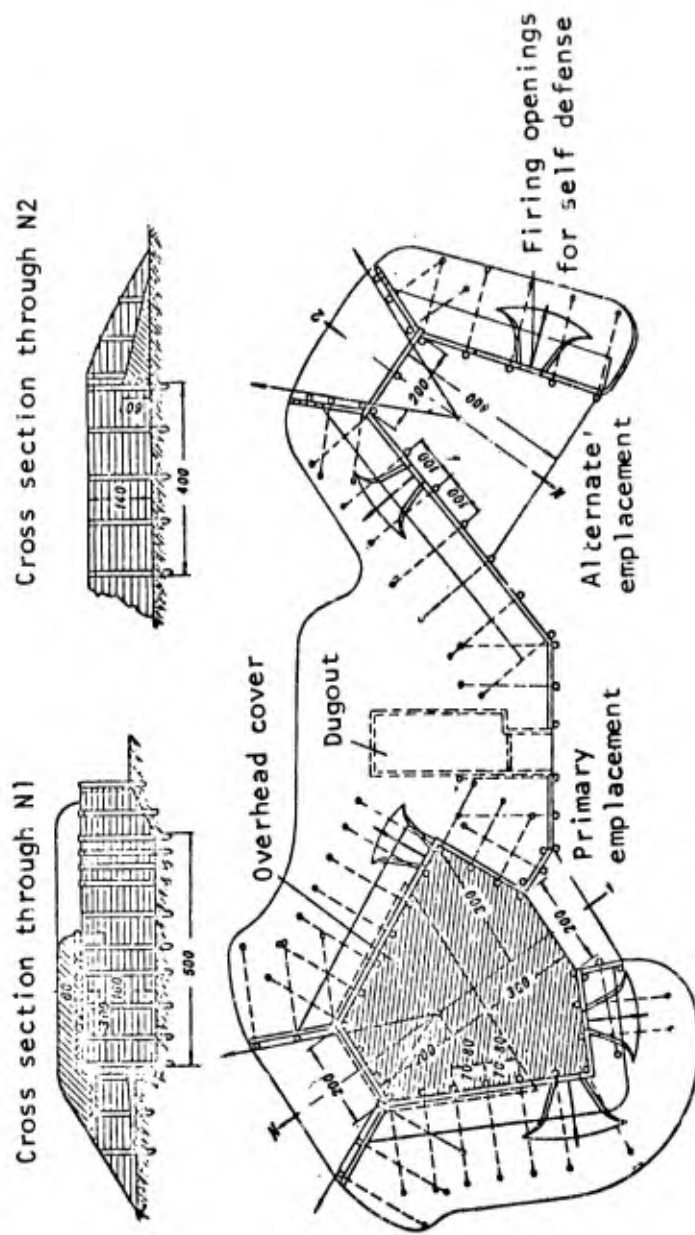


Figure 85. Pit for Antitank Gun in Swampy Wooded Terrain.



Figure 86. Platform for Observation in a Tree.

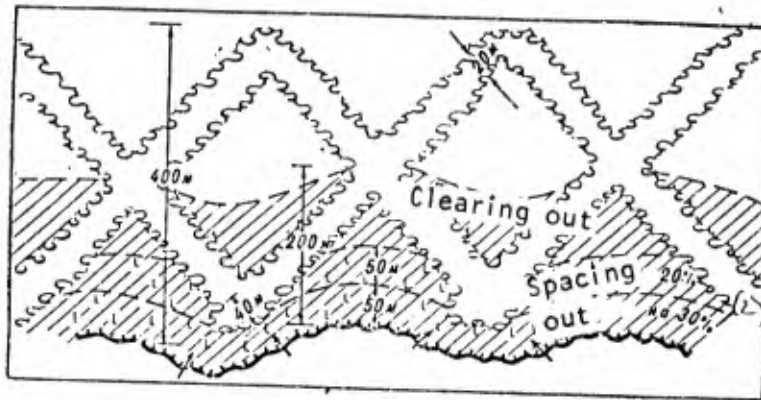


Figure 87. Diagram of the Clearing of a Forest in Front of the FEBA of a Company Defense Area (Variation).

To improve the conditions for the conduct of cross oblique flanking fire from machine guns in front of the FEBA, mutually intersecting clearings up to 40 meters wide are prepared in addition to the clearing and selective cutting or spacing of the forest, i.e., approximately one and one-half times greater than the height of the trees which are growing alongside so that the trees which are cut out by fire or uprooted by a burst cannot completely close the clearing.

So that the clearings are less noticeable and so as not to give the enemy the opportunity to determine the disposition of the firing positions from their outline in a plane view, it is recommended that a portion of the trees (primarily with a developed crown) be left uncut and that the clearing, in its preparation, be narrowed gradually from the FEBA toward the enemy.

In the depth of the company defense area--in front of the second trench and on the flanks--no clear opening is made and the clearing of the forest is performed in a strip up to 100 meters wide with selective cutting of trees within limits of 10-15%.

Under modern conditions, great significance is acquired by fighting forest fires and protecting the personnel against fire and destruction by thermal radiation in connection with the employment of atomic weapons as well as napalm and other incendiary means. Crown and ground fires may arise in a forest with a burst of an atomic bomb. Most probable are ground fires which spread with a speed of approximately 0.5 km per hour. To protect the personnel

from fire and injury by thermal radiation, it is sufficient to have overhead cover and head cover above the rifle pits and machine gun emplacements, light cover over slit trenches, and fire-prevention screens in covered structures.

To facilitate fighting forest fires, it is necessary to clear the dead wood, dry brushwood, stumps, and dead litter from the forest in the area of the disposition of firing positions. The collected dead wood is partially used to build the defensive structures and the remaining part is collected in piles and set on fire or buried by a small layer of dirt.

Barrier strips and fire breaks are made to prevent the spread of a fire which breaks out. The barrier strips represent a strip up to 2 meters wide from which all vegetation together with a small layer of plant soil has been removed. The construction of barrier strips is performed manually or using 200-gram charges of HE placed along the axis of the barrier strip at a distance of 1.5-2 meters from each other in holes 0.4-0.5 meters deep. About 5 working days are spent on making one running kilometer of barrier strip. The fire breaks are made with a width equal to the height of the trees--approximately 25-30 meters; all trees and brush are completely cut down in the clearing.

Available forest clearings, forest glades, and clearings which are made when clearing the forest for field of view and field of fire are used as fire breaks to reduce the volume of work.

A typical disposition of barrier strips and

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Underground sections which possess great resistance to dynamic loads create good conditions for protection against means of destruction. The thawed dirt which is removed is used for the construction of dome-shaped cover over foxholes and emplacements.

In a similar manner, the position of a platoon of the second echelon is prepared in the second trench which is also dug in the snow or in the ground. The platoon personnel are disposed even more compactly, being grouped close to the platoon shelter. However, for its entire length or at least on individual most important sectors, the trench should be supplied with a sufficient number of alternate pits and emplacements in order to assure platoon fire on threatened directions.

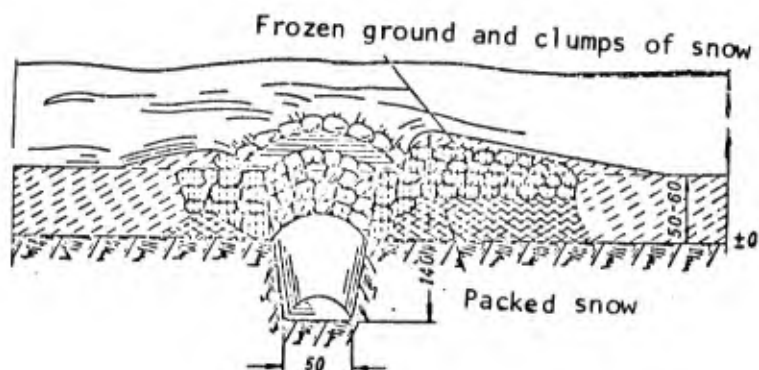


Figure 88. One-Man Foxhole Dug Partially in the Snow and Partially in the Ground.

Just what are the special features of constructing defensive structures under winter conditions?

In digging in, one man foxholes are made by throwing out the snow to the required depth. The parapet of the foxhole is made from packed snow. With a depth of snow of 50-60 cm, a foxhole for firing from the kneeling position is dug at once. A foxhole for firing from the standing position is dug in the snow and partially in the ground with the indicated thickness of snow cover. The dirt which is taken out in digging is used for the construction of the parapet which, upon completion of the work, is camouflaged with clean snow. Such a foxhole, shown in Figure 88, is dug by a rifleman in 3.5-4 hours. However, in view of the difficulty in working frozen ground, a one man foxhole for firing from the standing position is made most often by creating a higher parapet from packed snow. Subsequently, just as under summer conditions, a trench is dug for a rifle squad by connecting the one man foxholes with each other with a communication trench which has been dug out in the snow.

With availability of sufficient forces and time, it is always desirable to begin to dig the trenches and communication trenches immediately after digging in. Depending on the depth of the snow cover, the trenches are dug either completely in the snow (Figure 89) or partially in the snow and partially in the ground (Figure 90).

In deep snow which permits digging a trench to full depth in it or somewhat less (for movement bent over), first we clear away the snow to the planned mark of the bottom of the trench pit. Then we face the front and rear slopes of the trench with layers of clumps of snow, ice, or clumps of frozen ground, sprinkling them with

loose snow and with the subsequent leveling out and packing. If there is a reservoir near by, it is recommended that each row of clumps of snow and sprinkled snow be sprinkled with water during the construction of the trench. In loose snow and in the absence of clumps of frozen ground or ice, the slopes of a snow trench are made with a wooden lining (Figure 91).

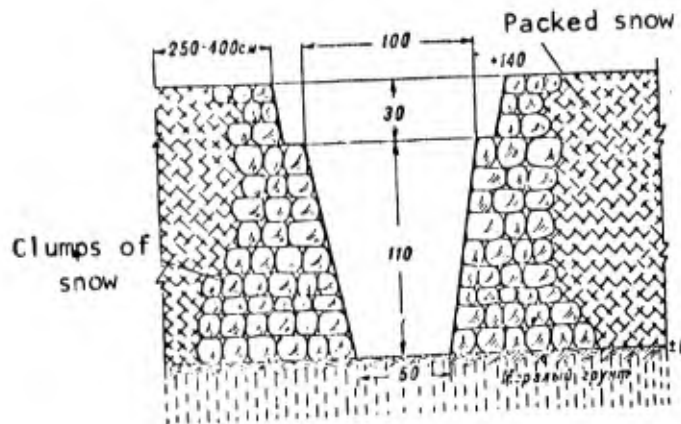


Figure 89. Making a Trench in the Snow.

The parapet of the trench is faced to a height of 30-40 cm. If the parapet is made from moist, tightly packed snow, its thickness is brought to 1.5-2.0 meters. With looser snow, the thickness of the parapet is increased to 3.5 meters.

The work in digging a trench in dirt outside the effect of aimed enemy fire can be organized in the following manner. First, the trench is laid out by placing stakes at the corners of the legs every 15-20 meters. Then, the snow is cleared away at the location of the future trench down to the frozen ground for a width of 4-5 meters, the trench is outlined, and the necessary depth for digging the frozen ground is determined (depending on the thickness of the snow cover). To work the frozen ground manually, the squad commander divides the people up in pairs. Each two soldiers are given one crowbar (or heavy pick mattock) and two shovels and a sector of trench 4-6 meters long is designated. Working in turn with the crowbar (pick mattock) and shovel, the soldiers first loosen up and throw out the frozen ground and then, by layer, they dig out the thawed ground with sapper shovels to the required depth. It is extremely important that work be conducted continuously on each section of the trench since, when halting, the thawed ground which is beneath the frozen crust freezes quickly and hinders the work.

For the same reason, it is expedient to place the dirt which has been dug out in the parapet immediately. After completion of digging the trench, the entire section is camouflaged by a layer of snow.

The productivity of labor of one soldier in digging out a trench in frozen ground manually is 2-2.5 running meters in 8 hours. Consequently, about 450 man-days are required to dig one kilometer of trench. Such an expenditure of labor

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[Tr note--Text resumes on p. 162] erected upon a layer of frozen ground are built by undercutting directly from the trench or from a pit up to 1.8 meters deep which has been especially dug.

For the rest of the personnel, the cover is equipped with removable plank beds which, when resting in the prone position, are placed in the passageway between the benches and the side wall, and when resting in the sitting position--on the bench. To warm the cover, organizational trench stoves are used or stoves which are made from improvised materials.

During the Great Patriotic War, on the Sivash beachhead (4th Ukrainian Front) in the winter of 1943/44, individual heated cover were widely used. It was constructed as follows: from the trench, under the layer of frozen ground a hole for one or two men was dug out and, under it, a cylindrical hole for the firebox with the emergency of the chimney on the outside. The entrance to the hole was curtained off by a shelter-half. With a minimum expenditure of fuel, such cover protected people sufficiently from the cold.

Figure 99 shows one of the possible variations of the construction of a structure for observation consisting of a dome and a section beneath the dome. The section beneath the dome is made in the dirt and consists of a ditch with a cylindrical shape and recesses for two men dug out beneath the layer of frozen ground in the front wall of the ditch. The dome represents a wire frame with holes for observation slits and is covered by several layers of frozen ground.

The structure is erected in the following order. On an area with a diameter of 3-4 meters from which the snow has been cleared a ditch is staked out and it is dug to the calculated depth. Then, the wire frame of the dome is placed above the ditch. All the cells of the frame are sealed with wet snow in such a way that a continuous

crust of dense snow is obtained. A layer of thawed dirt dug from the ditch is placed on the snow crust. If the dirt is extremely dry, it is easily moistened with water. The melted dirt is applied in layers of 8-10 cm each and is packed, in which respect the last layer is applied and packed after the freezing of the preceding layer. Wire rods fastened to the frame increase the strength of the dome, being its reinforcement. In the upper portion (in the keystone), the dome is made with a thickness of 30-50 cm and at the base--100 cm. Thanks to such dimensions, the bullets do not penetrate it. To make the observation slits in the wall of the dome, plugs of compact snow are emplaced which are removed after the dirt freezes.

After being made, the dome is frozen for 3-4 hours, then snow is sprinkled and it is camouflaged. For protection against the effects of a shockwave, the observation slits and entrance to the structure are covered by panels. About 4-5 man-days, 5 kg of wire, and an insignificant amount of lumber are expended on building an observation structure of such design.

Pits for antitank artillery are constructed with emplacements which are located either directly on the ground from which the snow has been cleared or (in deep snow) on an artificial base of logs, poles, or packed snow with interlayers of brushwood (Figure 100).

Because the amount of snow cover has no effect on the conduct of fire from mortars which, as a rule, are disposed on reverse slopes of hills or behind other natural masks, the emplacements for them are usually set up on the surface of the frozen ground, leaving 8-10 cm of snow (Figure 101). It has been proven by experience that frozen ground resists the dynamic effects much better than static effects; therefore, the emplacement beneath the baseplate of the mortar which is set up on frozen ground is extremely sturdy.

The building of obstacles has significant features under winter conditions. Mine obstacles which have been emplaced in the summer or fall lose their combat effectiveness under winter conditions (they freeze into the ground, are covered with a thick layer of snow); therefore, mines which are emplaced in the summer must be converted to a winter setting with the onset of winter.

This work is performed by the sappers.

In addition to mining, snowbanks, embankments, and icy slopes can be used successfully as antitank obstacles in the winter (Figure 102), and ice holes can be used on rivers and lakes.

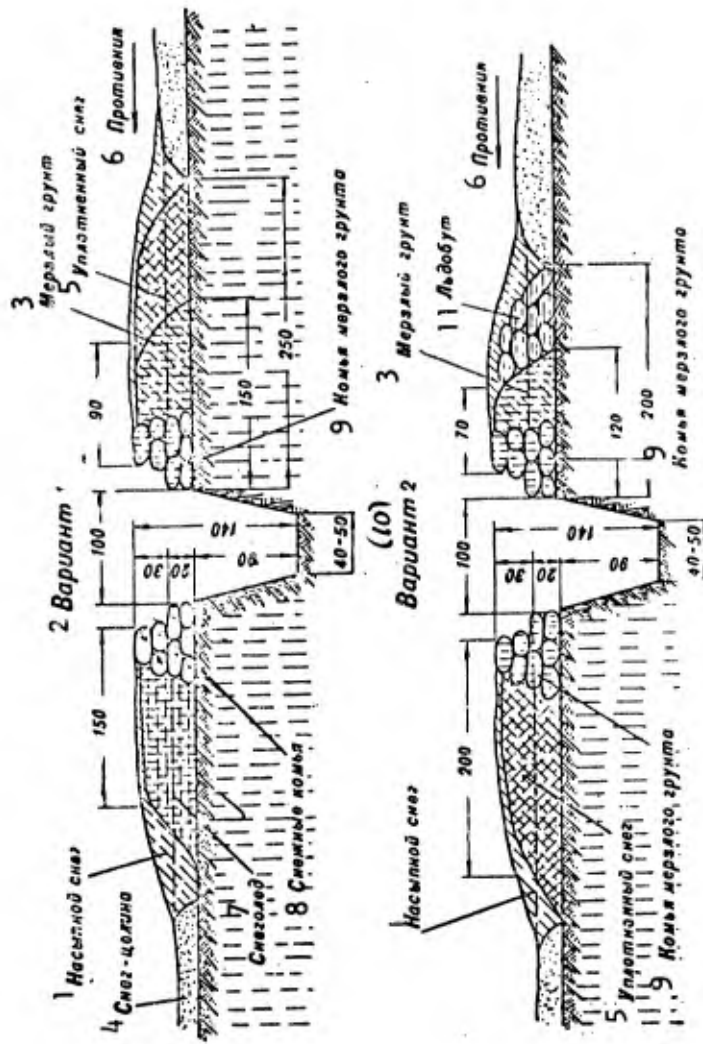


Figure 90. Variations in Making a Trench in Frozen Ground.
 Key: 1, Snow fill; 2, Variation 1; 3, Frozen ground; 4, Virgin snow;
 5, Packed snow; 6, Enemy; 7, Frozen snow; 8, Clumps of snow; 9,
 Clumps of frozen ground; 10, Variation 2; 11, Ice boom.

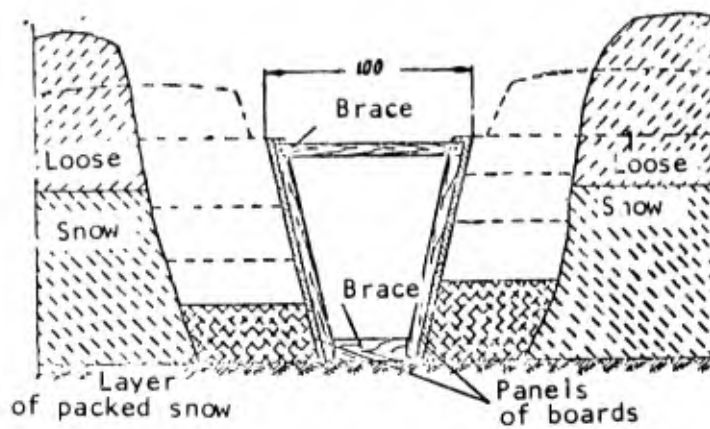


Figure 91. Use of Mold in Making a Trench in Loose Snow.

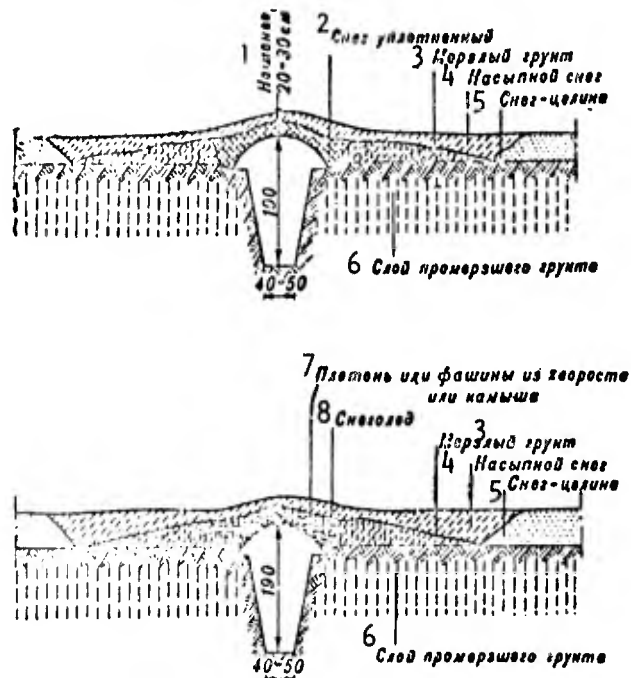


Figure 92. Variations in Making a Covered Trench for Protection Against Snow Drifts. Key: 1, At least 20-30 cm; 2, Packed snow; 3, Frozen ground; 4, Snow fill; 5, Virgin snow; 6, Layer of ground frozen through; 7, Wattle or fascines of brushwood or reed; 8, Frozen snow.

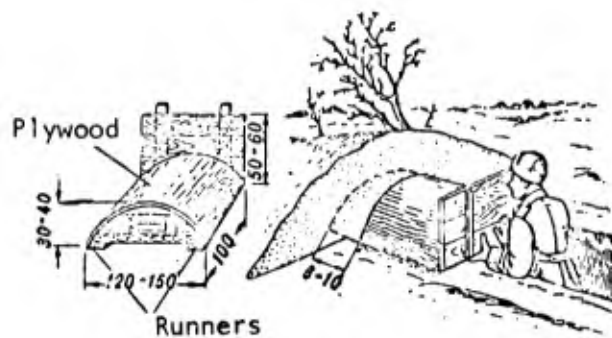


Figure 93. Movable Mold for Making a Snow Arch.

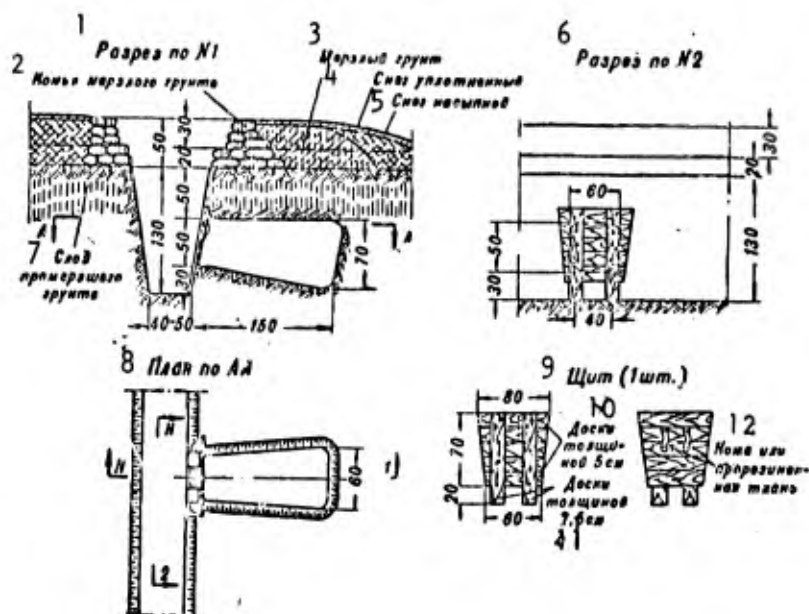


Figure 94. One-Man Hole Above a Layer of Frozen Ground. Key: 1, Cross section through N1; 2, Clumps of frozen ground; 3, Frozen ground; 4, Packed snow; 5, Snow fill; 6, Cross section through N2; 7, Layer of frozen ground; 8, Plane view through A-A; 9, Panel (one piece); 10, Boards 5 cm thick; 11, Boards 2.5 cm thick; 12, Leather or rubberized cloth.

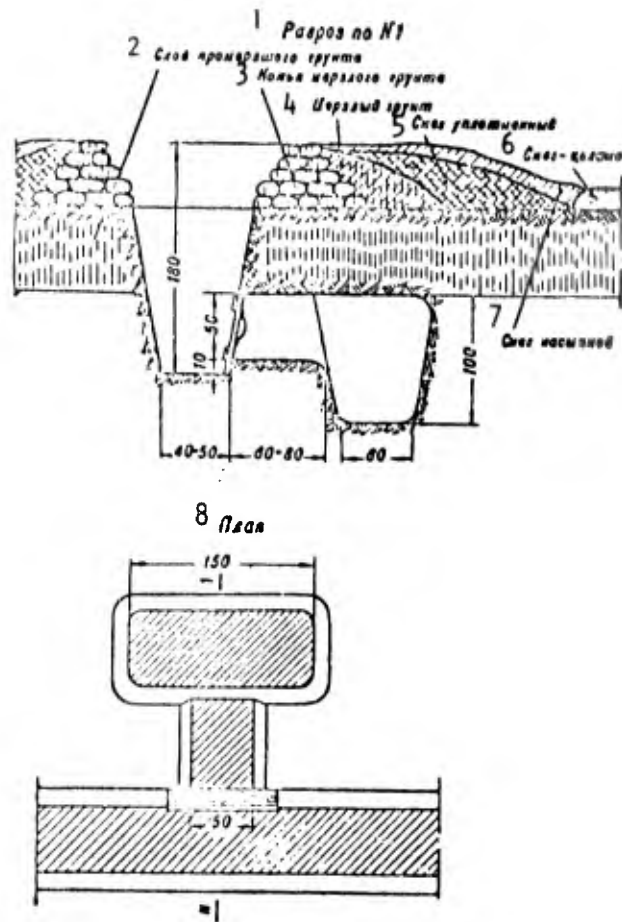


Figure 95. Recess for 1-2 Men Beneath a Layer of Frozen Ground. Key: 1, Cross section through N1; 2, Layer of ground frozen through; 3, Clumps of frozen ground; 4, Frozen ground; 5, Packed snow; 6, Virgin snow; 7, Snow fill; 8, Plane view.

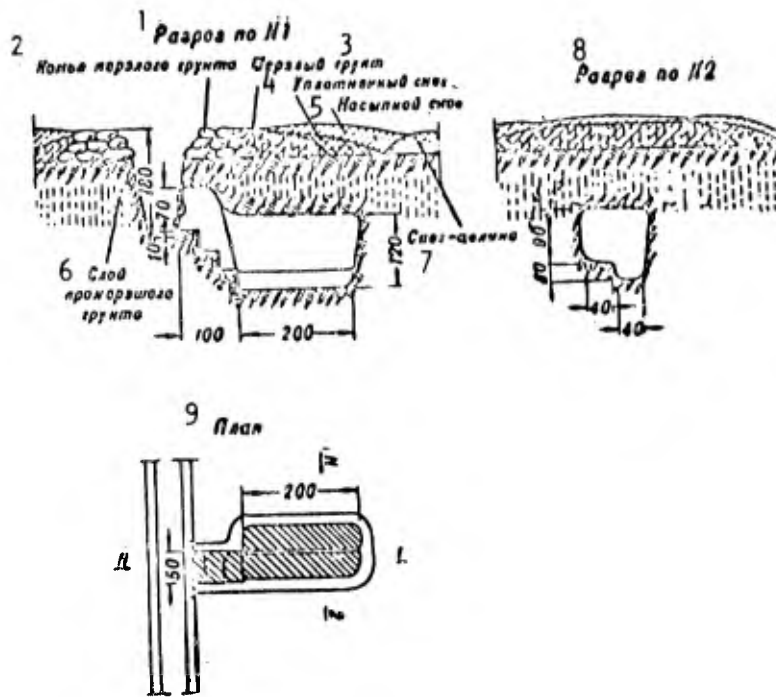


Figure 96. Slit Trench for 3-4 Men Beneath a Layer of Frozen Ground. Key: 1, Cross section through N1; 2, Clumps of frozen ground; 3, Frozen ground; 4, Packed snow; 5, Snow fill; 6, Layer of ground frozen through; 7, Virgin snow; 8, Cross section through N2; 9, Plane view.

The special types of wire obstacles which are used in the winter in place of wire nets on tall stakes are shown in Figure 103.

The mantle of snow complicates the camouflaging of positions considerably since on a monotonous white background any artificially created spot is sharply noticeable. Therefore, in winter one should carefully see that places where the snow is contaminated (for example, the blast areas at guns) or sectors of ground which have been exposed in the work process are always sprinkled with clean snow. For these same reasons, the movement of people over virgin snow should be categorically forbidden. Special attention should be devoted to the struggle against giving the position away which is connected with the heating of cover. The stoves should be stoked at a certain time in accordance with the orders of the company (platoon) commander when, because of visibility conditions, the enemy will not be able to see the smoke or flame which is coming out of the chimney. It is also extremely desirable to use those types of fuel which give less smoke.

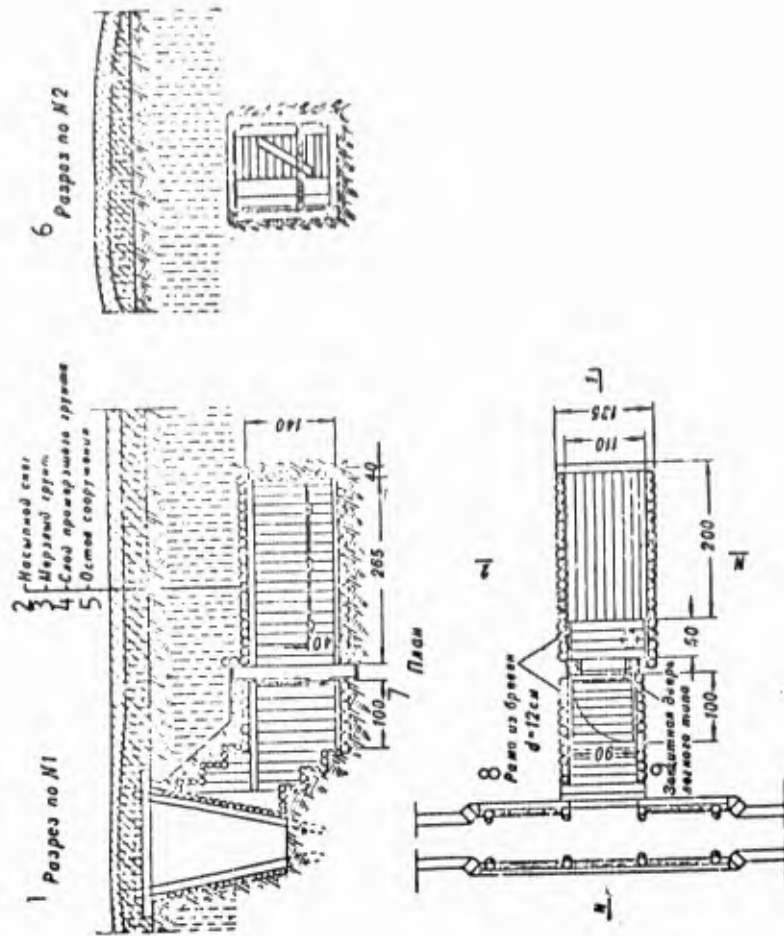


Figure 97. Dugout for 4-5 Men Beneath a Layer of Frozen Ground.
 Key: 1, Cross section through N1; 2, Snow fill; 3, Frozen ground;
 4, Layer of ground frozen through; 5, Framework of structure;
 6, Cross section through N2; 7, Plane view; 8, Frame of logs;
 9, Light protective door.

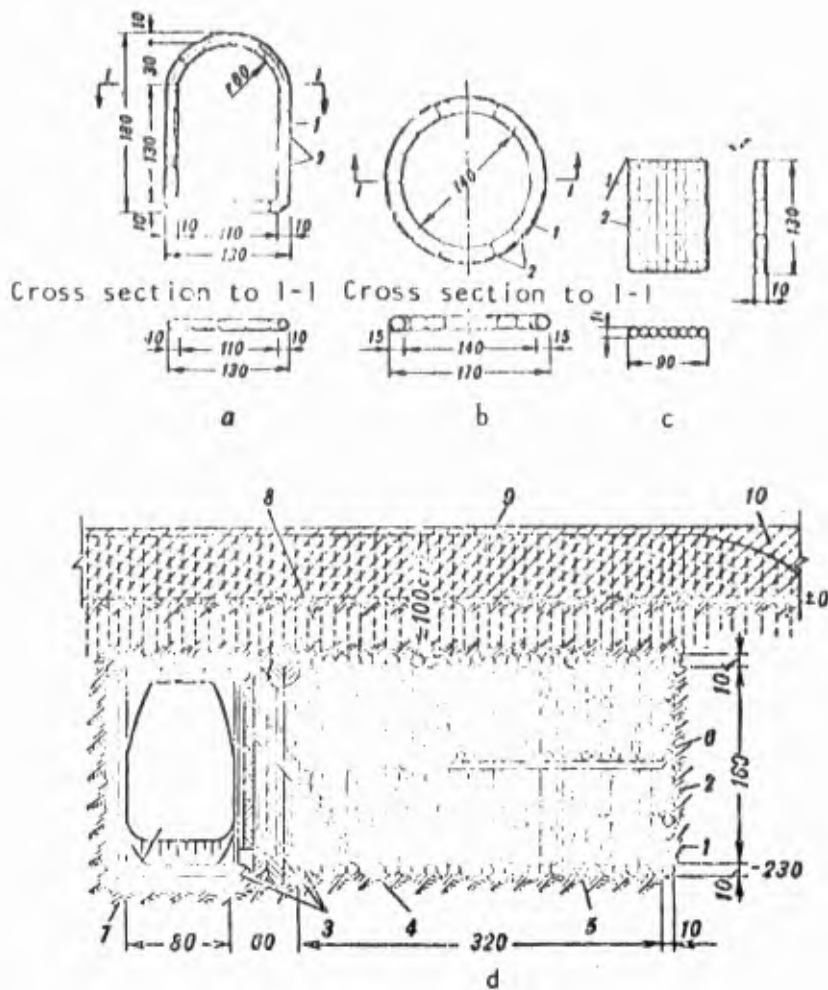


Figure 98. Design of Dugout of Fascine Frames Under Winter Conditions: a, fascine Frame; 1, Brushwood; 2, Binding; b, Fascine ring with round wall cross section; 1, Brushwood; 2, Binding; c, Fascine panel; 1, Brushwood; 2, Binding; d, Cross section of a dugout of fascine frames; 1, Fascine frames with round wall cross section; 2, Fascine panels; 3, Frames of logs with diameters of 16-18 cm; 4, Protective door; 5, Poles tied to the fascine frames; 6, Plank bed of pole mat (removable); 7, Communication trench beneath layer of frozen ground; 8, Layer of ground frozen through; 9, Frozen fill dirt; 10, Snow fill.

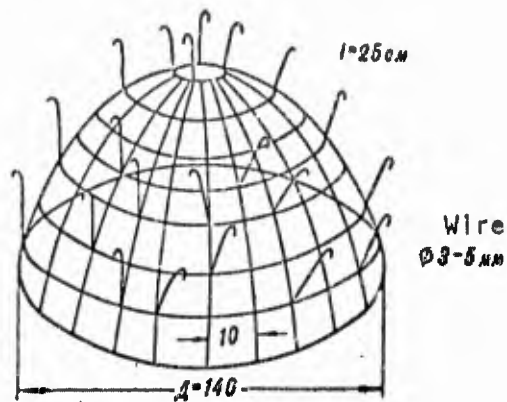
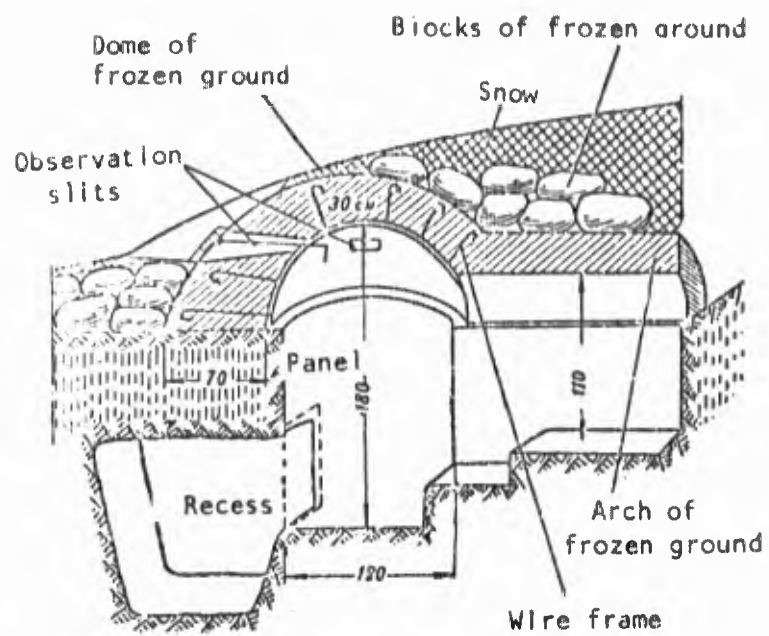


Figure 99. Covered Structure for Observation Which is Erected Under Winter Conditions.

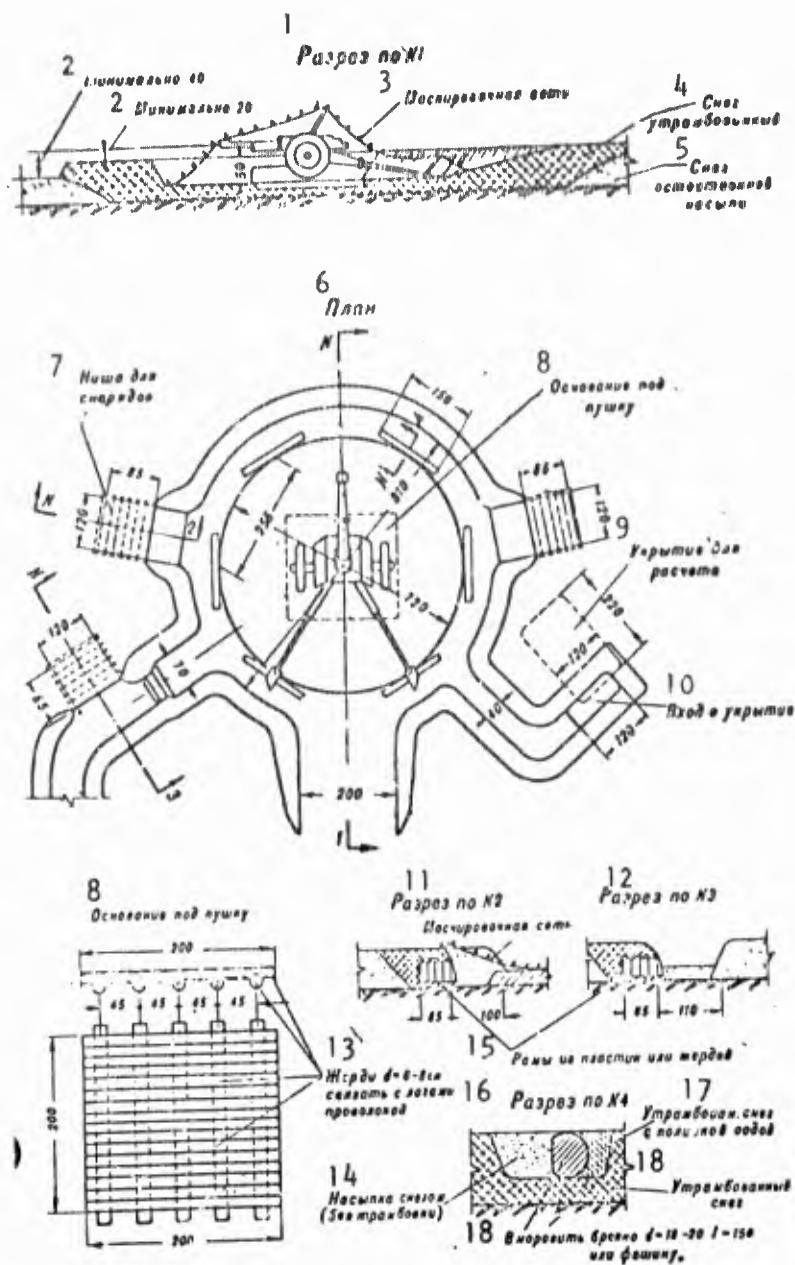


Figure 100. Construction of a Pit with All-Around Field of Fire for 57-mm Gun with Snow Cover More Than 30 cm. Key: 1, Cross section through N1; 2, Minimum; 3, Camouflage net; 4, Packed snow; 5, Common fill snow; 6, Plane view; 7, Recess for shells; 8, Base beneath gun; 9, Cover for crew; 10, Entrance to cover; 11, Cross section through N2; 12, Cross section through N3; 13, Poles with diameter of 6-8 cm; tie to sleepers with wire; 14, Snow fill (without packing); 15, Frame of plates or poles; 16, Cross section through N4; 17, Packed snow on which water is poured; 18, Freeze in log with diameter of 18-20 and length 150 or fascine.

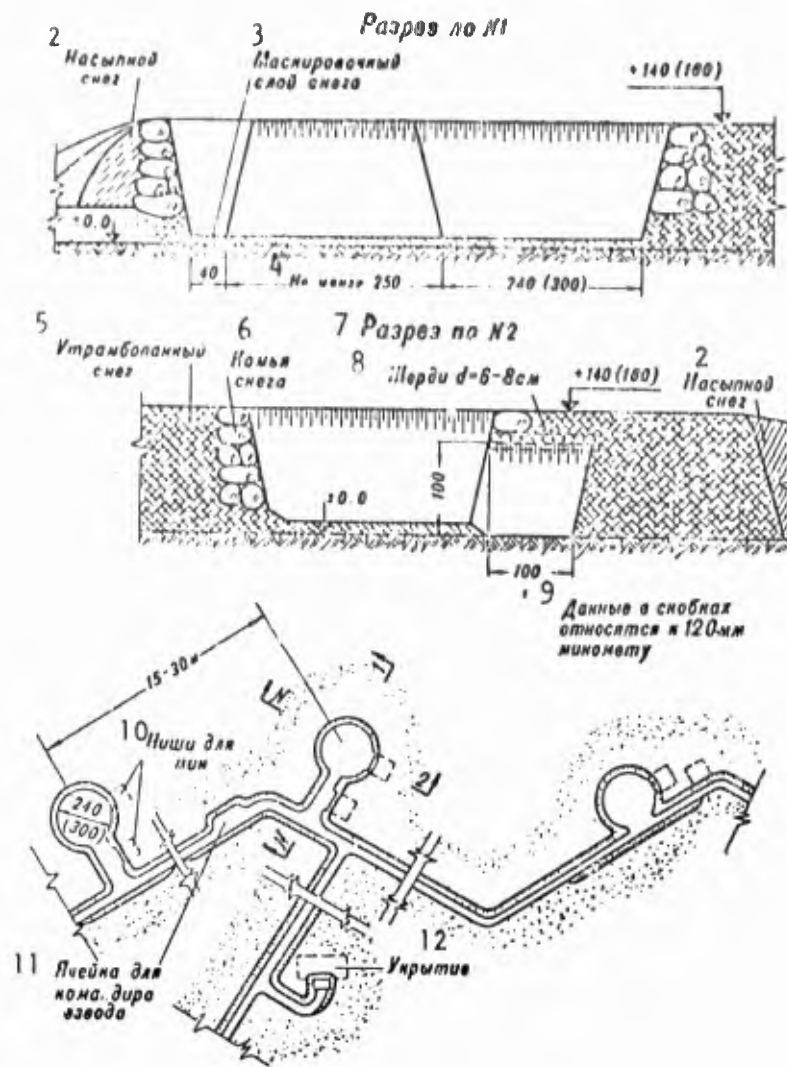


Figure 101. Firing Position for 82-mm and 120-mm Mortars Under Winter Conditions (Variation). Key: 1, Cross section through N1; 2, Snow fill; 3, Camouflage layer of snow; 4, At least; 5, Packed snow; 6, Snow clumps; 7, Cross section through N2; 8, Poles; 9, Data in brackets pertain to 120-mm mortar; 10, Recesses for mortar rounds; 11, Foxhole for platoon commander; 12, Cover.

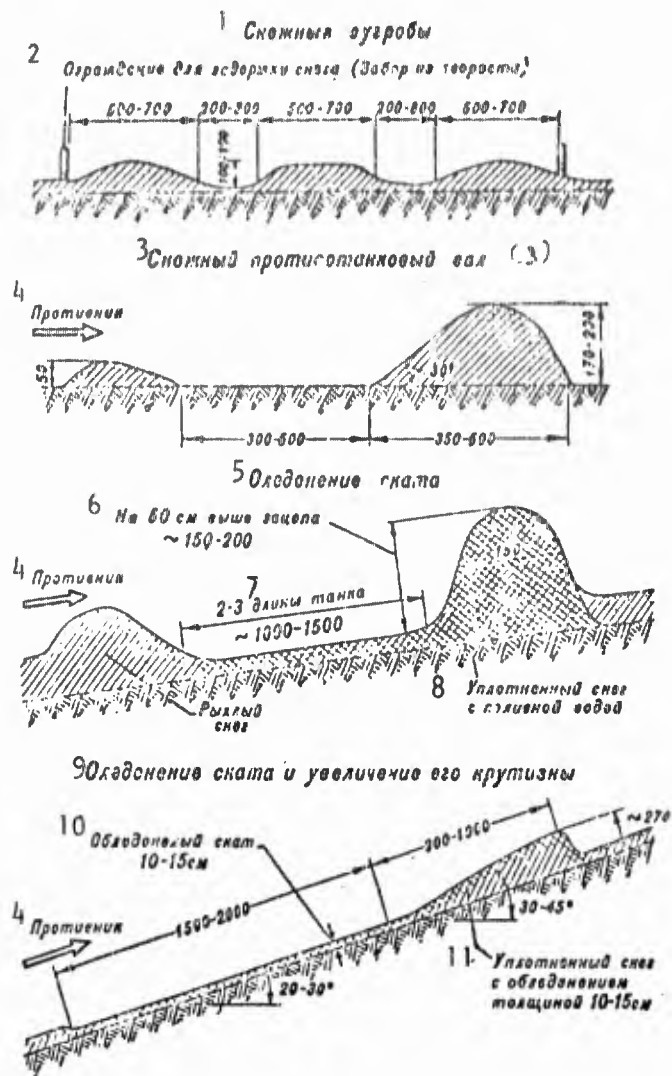


Figure 102. Antitank Obstacle Made in Winter. Key: 1, Snow banks; 2, Barrier to hold back snow (fence of brushwood); 3, Snow antitank embankment; 4, Enemy; 5, Icing the slope; 6, 50 cm higher than the checking device; 7, 2-3 tank lengths; 8, Packed snow with water poured on; 9, Icing the slope and increasing its steepness; 10, Slope iced; 11, Packed snow with icing 10-15 cm thick.

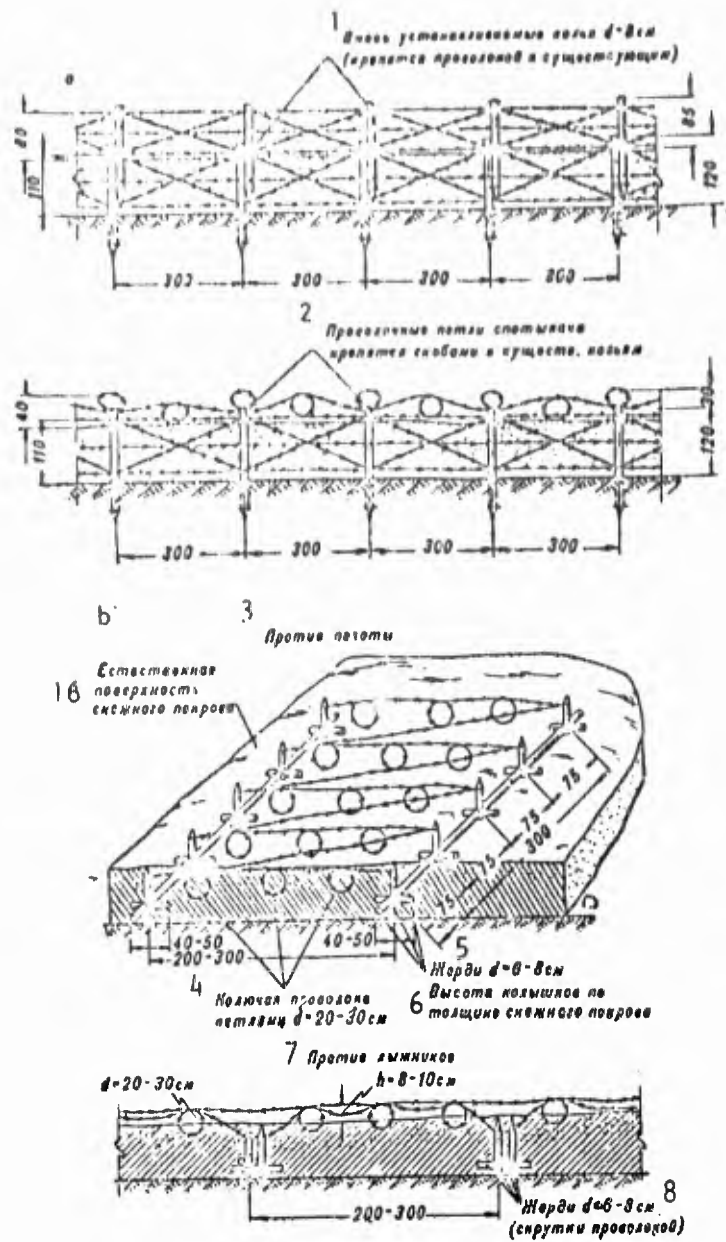


Figure 103. Antipersonnel Wire Obstacles Set Up in Winter: a, Variations in increasing the wire net; b, Obstacles against infantry and skiers; c, "Trippers" using poles and "horses"; d, Knife rest. Key: 1, Newly installed stakes (fastened by wire to existing stakes); 2, Wire loops of tripper fastened by brackets to existing stakes; 3, Against infantry; 4, Barbed wire in loops; 5, Poles; 6, Height of stakes according to thickness of snow cover; 7, Against skiers; 8, Poles (joints with wire) (Continued next page).

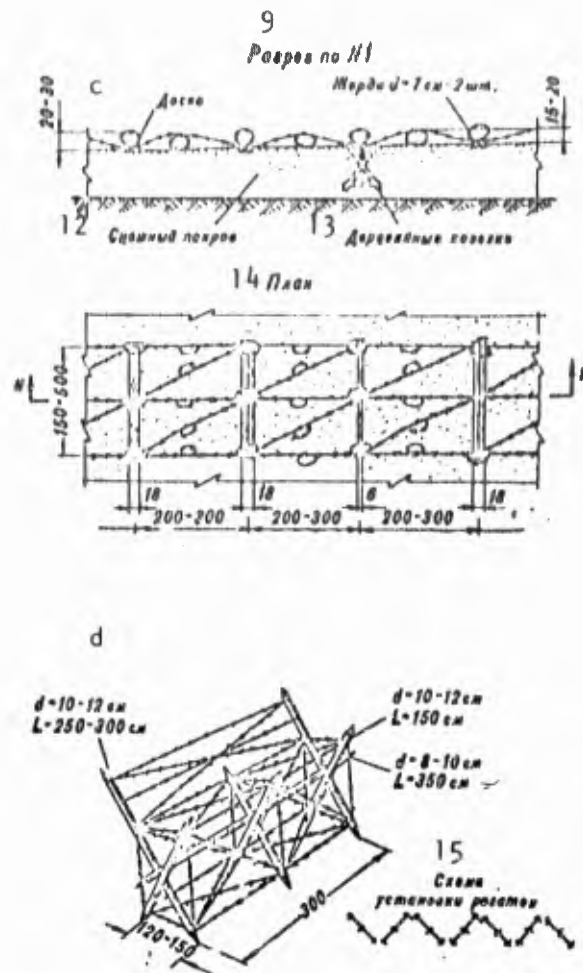


Figure 103 (Continued). 9, Cross section through N1; 10, Board; 11, Poles; 12, Snow cover; 13, Wooden horse; 14, Plane view; 15, Diagram of setting of knife rests; 16, Natural surface of snow cover.

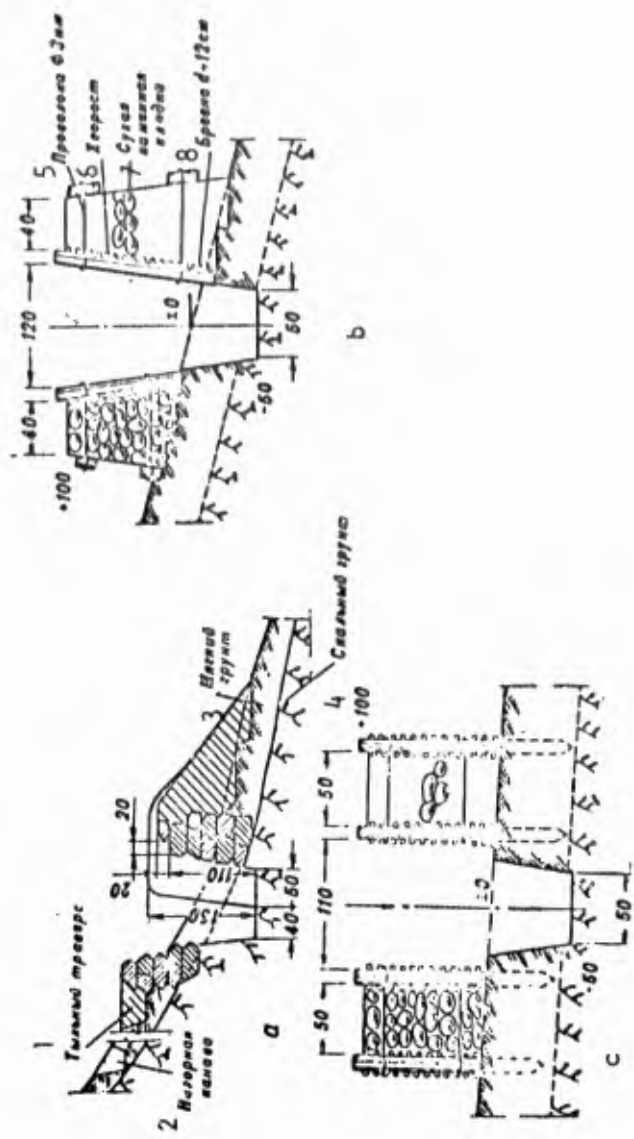


Figure 104. Variations in Making Pits in Rocky Ground; a, From dry masonry; b, With brushwood revetment of inner wall; c, From double wattle with gap filled with stones. Key: 1, Parados; 2, Uphill ditch; 3, Soft ground; 4, Rocky ground; 5, Wire; 6, Brusnwood; 7, Dry masonry; 8, Log.

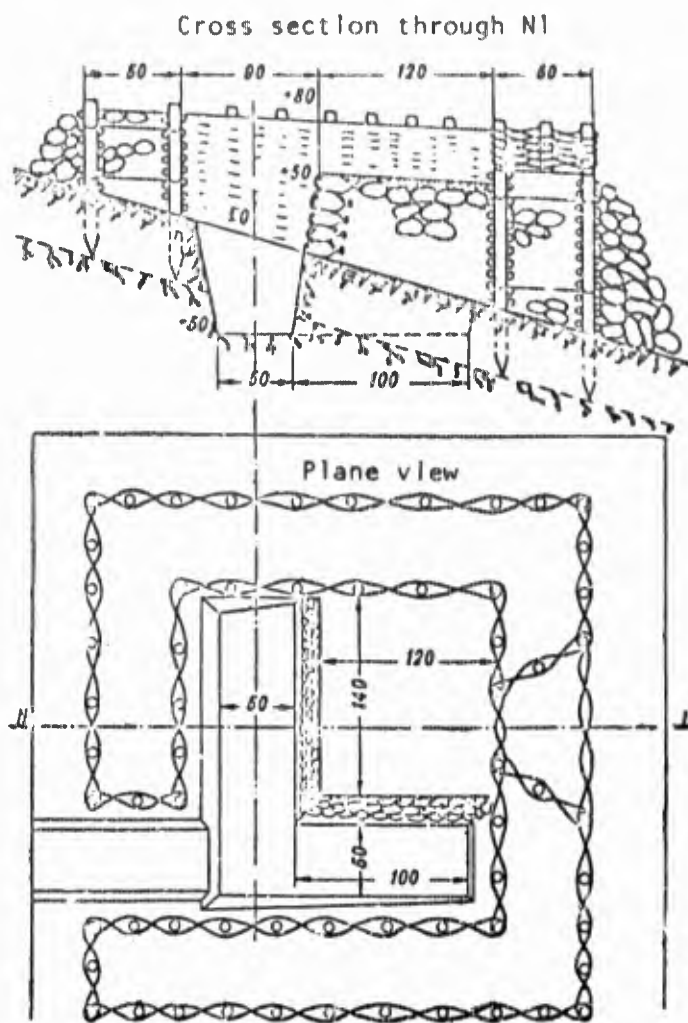


Figure 105. Open Machine gun Emplacement in Rocky Ground.

Winter may find the troops in positions which were set up under summer conditions or in the fall. In anticipation of this, even before the snow falls and the frosts set in, the company commander determines those firing emplacements which may turn out to be unsuitable for use after the snow falls and he prepares either alternate structures or new structures to replace them, the embrasures and observation slits of which are made with consideration of the anticipated snow mantle. This is how it was, for example, in 1942 near Moscow when our troops, having dug in on positions in the fall, were to conduct an entire series of measures with the onset of winter to reequip the defensive structures and make them applicable for winter conditions. The troops had to make steps for firing in the trenches and foxholes since the snow which had fallen changed the height of the parapet and the foxholes and machine gun emplacements which had been made earlier became unsuitable for the conduct of fire. The machine gun sections, often with the assistance of the sappers, were forced to change the height of the embrasures in covered emplacements, etc. On individual sectors of the Volkhovsk and Western Fronts, cases were common where, because of the deep snow cover, previously erected covered machine gun emplacements could not be used for their designated purpose. The troops were forced to prepare new emplacements and pits for the machine guns with consideration of the layer of snow which had fallen and to convert the old emplacements into heated cover.

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[Tr note--Text resumes on p. 184] was observed here 10-15 years ago, in general the river channel is considered dry. This example is evidence that the selection of positions in the mountains requires special attention, and not only a careful study of the terrain but also the collection of information on it from the local residents so as not to be caught unaware by any unexpected developments.

Mountain relief has an effect not only on the disposition of firing positions but also on the forms and dimensions of defensive structures. For example, when disposed on steep slopes even in soils which permit working with pioneer tools, the protective height of the foxhole is achieved primarily by laying out the parapet with minimum deepening in the ground so as to avoid the appearance of dead space which cannot be fired upon in front of the foxhole. As the steepness of the slope increases, the interior slope of the parapet is made more gently sloping so that the rifleman can fire from a semi-prone position. Communication trenches are made primarily for crawling and, more rarely, for moving when bent over. The dimensions of parts

of foxholes and trenches change depending on the steepness of the slopes. The chest height of a foxhole when disposed on slopes which face the enemy is reduced, and on slopes which face the rear-- is increased.

Figure 104 presents variations in the construction of a foxhole on rocky ground on the slope of a mountain, and Figure 105 shows the construction of an open machine gun emplacement.

On the average, it is necessary to expend 4-6 man-hours to make one running meter of trench in the mountains. The making of an emplacement for the machine gun which is shown in Figure 105 requires the expenditure of 20 man-hours.

Solid rocky ground permits making the slopes of dirt depressions almost vertical, without revetment, when making foxholes and trenches. In loose ground, when the making of revetments is necessary (for example, at the foothill of a mountain, in the floodplain of a mountain river, etc.) They are made of stones which are brought no closer than 20-30 cm from the base of the parapet to avoid injuring the people by fragments of stone. Under these same conditions, it is desirable to cover individual sections of foxholes and trenches and to make head cover and other light overhead cover above the firing pits and emplacements.

For example, on mountain positions of troops of the Korean Peoples Democratic Republic and the Chinese volunteers in the war in Korea, covered trench sectors 10-15 meters long were constructed every 10-25 running meters of trench and cover was created for the personnel not only against stone fragments, bullets and shells, but also against napalm which was widely used by the interventionists.

Especially important significance in the mountains is acquired by the drainage of surface waters which, during downpours, carry along large stones which present a considerable threat for the personnel and equipment which are located in foxholes or trenches. In addition, currents of water may carry along particles of dirt with a high concentration of contamination by residual radiation. The drainage of the water is performed in the normal method (see Section 7, Chapter I) on the basis of a thorough study of the terrain's relief.

The availability of a sufficient quantity of construction materials on site and the necessity to create dependable protection against injury by shell fragments and fragments of stone caused the employment of covered firing emplacements on broad scales during the Great Patriotic War with engineer improvements of the defense in the mountains. For example, in the course of battles in passes of the Main Caucasus Range, 900 covered machine gun and artillery emplacements were constructed. Many of them were also constructed on the Georgia Military Road.

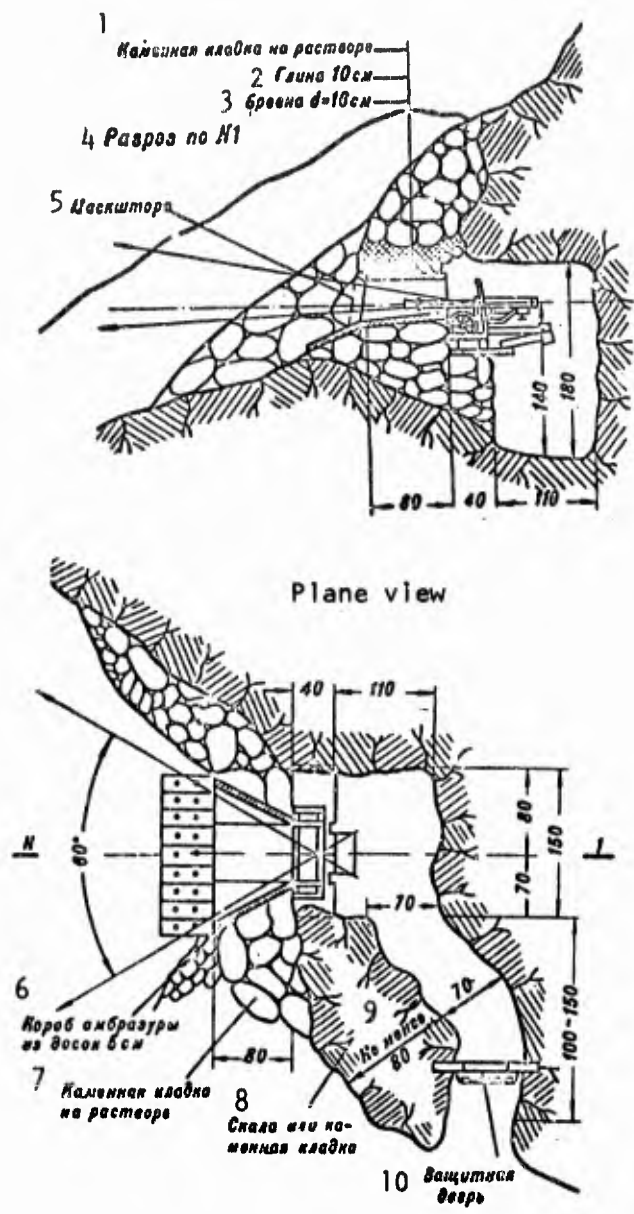


Figure 106. Adaptation of Depression in Rock for a Covered Machine gun Emplacement. Key: 1, Masonry using mortar; 2, Clay; 3, Logs; 4, Cross section through N1; 5, Camouflage blind; 6, Embrasure box of 5 cm boards; 7, Masonry using mortar; 8, Rock or masonry; 9, At least; 10, Protective door.

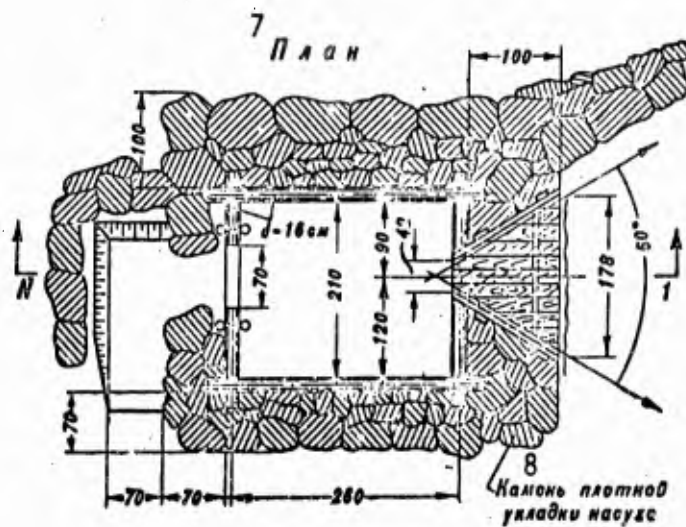
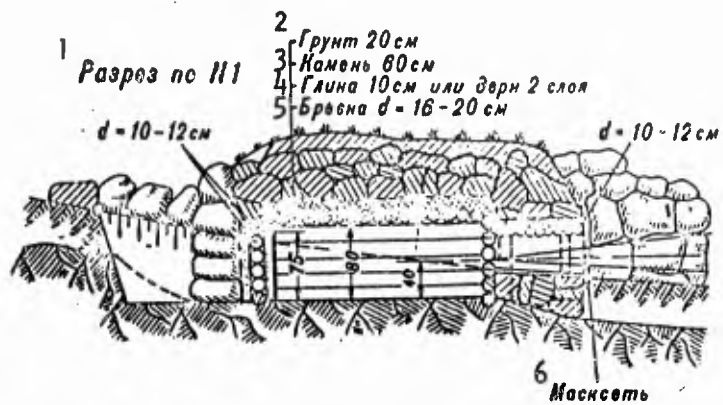


Figure 107. Covered Machine gun Emplacement for Prone Firing. Key: 1, Cross section through N1; 2, Dirt; 3, Stone; 4, Clay 10 cm or 2 layers of sod; 5, Logs; 6, Camouflage net; 7, Plane view; 8, Stone laid compactly and dry.

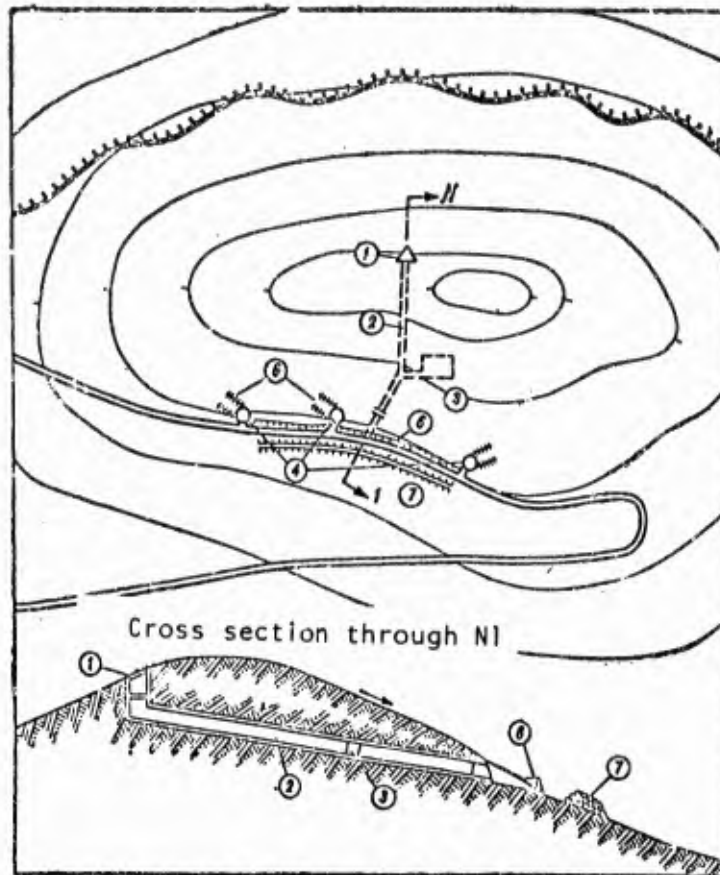


Figure 108. Diagram of Improvement of Mortar Platoon Firing Position (Variation with Underground Portion): 1, Observation structure; 2, Communication tunnel; 3, Underground cover; 4, Open emplacements for mortar; 5, Cover for mortar; 6, Steepness of slope of connecting trench; 7, Parados.

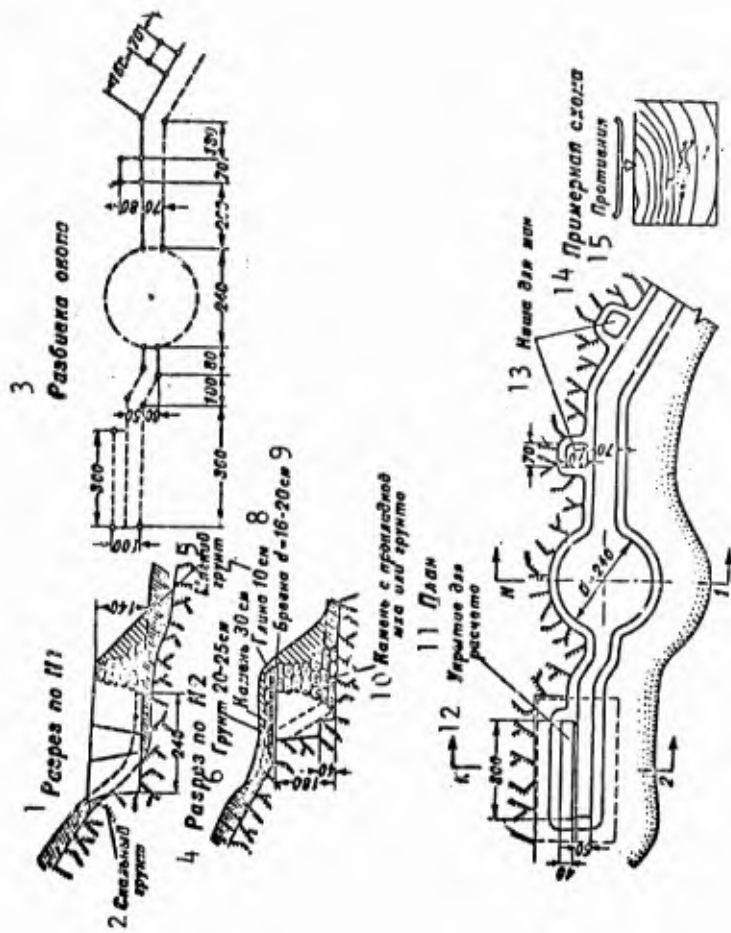


Figure 109. Arrangement of Mortar Pit in Rocky Ground on Reverse Slope. Key: 1, Cross section through N1; 2, Rocky soil; 3, Layout of pit; 4, Cross section through N2; 5, Soft ground; 6, Dirt; 7, Stone; 8, Clay; 9, Logs; 10, Stone with padding of moss or dirt; 11, Plane view; 12, Cover for crew; 13, Recesses for mortar rounds; 14, Typical layout; 15, Enemy.

Mountain relief furthers the construction of underground works in improving positions. Figure 108 shows one of the possible variations of constructing a firing position for a mortar platoon. The open mortar emplacements are disposed on the reverse slope and the observation structure is constructed using an underground tunnel on the forward slope. Cover for the personnel is set up in the tunnel. However, such improvement of the position is possible only under conditions of a prolonged defense. The most widespread emplacement for mortars is a pit which is usually located on the reverse slope (Figure 109).

Under mountain conditions, it is comparatively difficult to find a position for artillery close to a road; therefore, it often is necessary to expend considerable efforts to roll the guns into position. For this, various blocks and winches are used with the help of which the guns are lifted onto elevations using ropes. The engineer improvement of artillery firing positions in mountain terrain is extremely varied. If it is possible to dig into the ground without the expenditure of special efforts, a regular pit is dug (see Section 2, Chapter I). Otherwise, the gun is located on a cleared area and a parapet on which a layer of dirt is poured from above is erected for the cover of the section. Where possible, caves or depressions in the rock which are easily adaptable for a covered artillery emplacement, are used (Figure 110).

In mountains, it usually is easy to find a position for flanking with artillery fire the approaches to the strong point and obstacles and other elements of the division. Figure 111 shows a variation in the construction of a pit for a 57-mm gun which is intended for the conduct of flanking fire.

The digging in of tanks in mountains presents great difficulties. Therefore, the tankers first use natural cover in the form of caves and various depressions and they dispose the tanks in the shadow of steep slopes. In those cases where it is necessary to create tank positions on open terrain, it is necessary to select a layer of dirt []* and to [] the insufficient height of the cover with stones. This is how, for example, positions were improved on one of the exercises in Armenia in 1957. The layer of dirt in the exercise area did not exceed 50-70 cm and next came a layer of volcanic rock (basalt, tuff). Even the use of high explosives to dig in the tanks is made difficult. To improve the position, the tankers removed the layer of dirt and, using the tank cables, they dragged up large boulders to the edges of the area which had been cleaned since there were many of them about, forming a pit parapet from them.

* Tr. note--[] indicate words missing from translation due to illegible foreign text.

In the mountains, it is very difficult to organize observation of the terrain which lies ahead. Observation posts on a []* sector of observation which are located on elevations have the shortcoming that poorly seen from them and sometimes not seen at all are small depressions and other small folds in the terrain which are also primarily approaches to the defensive position. Therefore, the construction of observation posts with a narrow sector of view is more preferable. They are necessary for the timely discovery of individual enemy groups and his reconnaissance [] observation post in front of the defense area, especially its simple emplacements.

Figure 112 shows a diagram of a typical [] of the observation post of the commander of a rifle company which is made in two variations: without an underground part (A) and with an underground part (B). Where there is a sufficient quantity of stone and digging in the ground is difficult, the emplacement for observation is made from large boulders (Figure 113). In this, it should be considered that such a structure is stable with respect to the shockwave of an atomic burst.

In the mountains, cover for the personnel plays an important role since it protects the personnel not only against means of destruction but also against sudden changes in weather which are characteristic of mountain terrain. The difference between temperatures during the day and at night in mountains is extremely significant and precipitation, especially in the fall and spring, is extremely abundant.

In constructing shelters, use is first made of natural cover: caves, narrow crevices, washouts, etc.

The adaptation of caves for cover usually does not require a large expenditure of time and materials and is limited to installing internal improvements (plank bed, benches, filtration-ventilation unit, field heating unit, etc.) and the construction of a protective door. In using crevices, in addition, it is necessary to make a covering of logs and stone.

Mountain regions also abound with artificial works in the form of sections of tunnels on roads, mining works, stone quarries, etc. Such types of works may also be quickly adapted for shelters.

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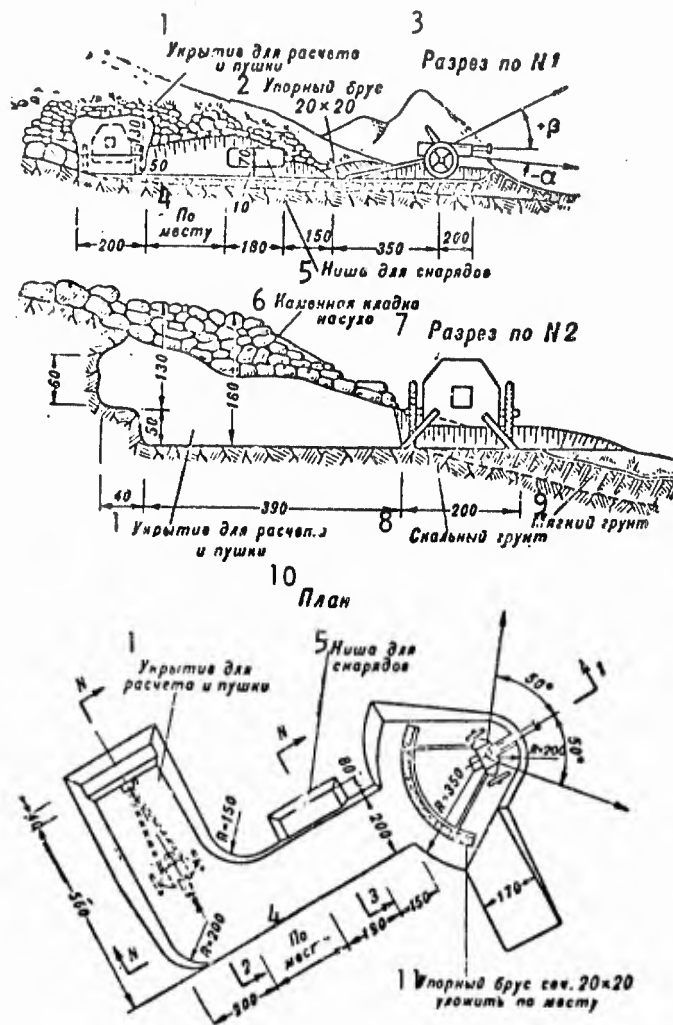


Figure 111. Pit for 57-mm Gun for the Conduct of Flanking Fire. Key: 1, Cover for the crew and gun; 2, Supporting beam; 3, Cross section through N1; 4, Depending on site; 5, Recess for shells; 6, Dry masonry; 7, Cross section through N2; 8, Rocky soil; 9, Soft soil; 10, Plane view; 11, Supporting beam 20 x 20 cross section to be laid in accordance with site.

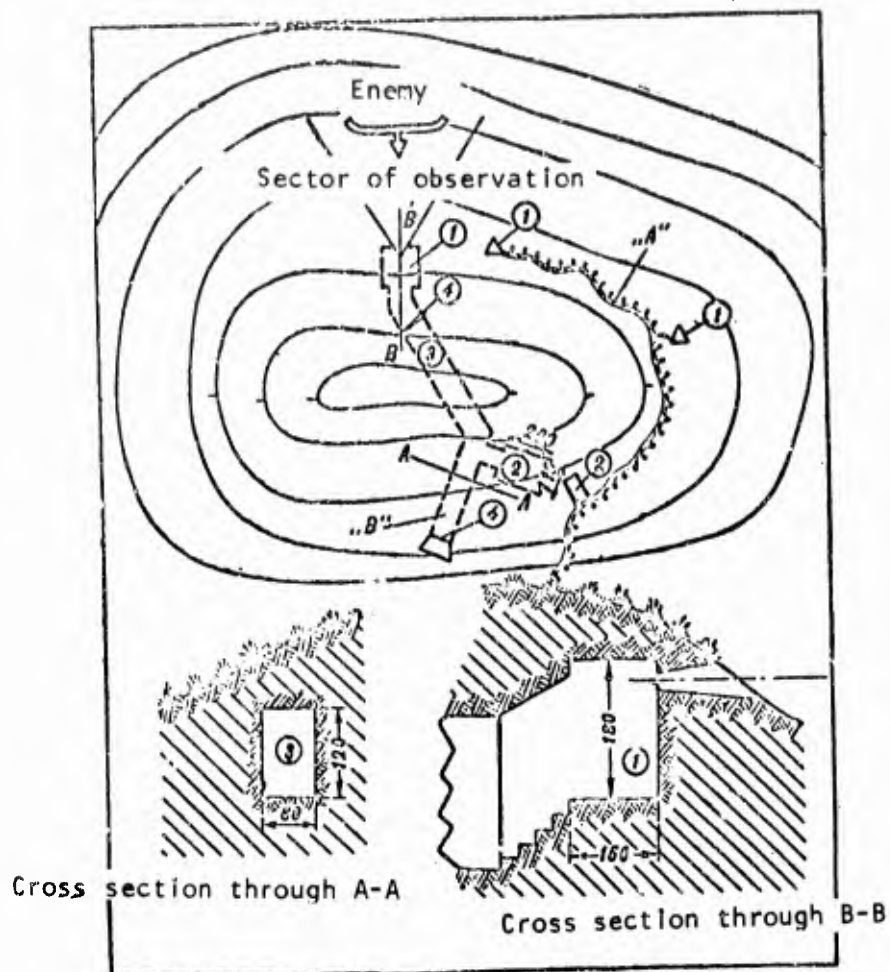


Figure 112. Diagram of Improved Observation Post of a Rifle Company Commander: a, Open disposition variation; b, Variation with underground part; 1, Observation structure; 2, Cover; 3, Tunnel; 4, Protective door.



Figure 113. Structure for Observation of Large Stones and Boulders.

In the absence of ready cover, it is prepared either by the pit (Figure 114) or underground (Figure 115) method.

The hard ground of mountain terrain, although it hinders the digging of pits or underground works, considerably simplifies the construction of cover and creates dependable protection against means of destruction. To reduce dirt and rock work as well as to increase the degree of protection, it is advantageous to erect the cover adjoining the steep sectors of reverse slopes.

Of obstacles in mountain terrain, the most widespread use has been received by antipersonnel obstacles since the enemy infantry may filter through everywhere regardless of the steepness of the slopes of the hills while the accessibility of mountain regions for tanks is extremely limited.

Of the antipersonnel obstacles, in addition to wire entanglements, knife rests, hedgehogs, and "scattered" wire, in the mountains use is widely made of such obstacles as entwining tree trunks with wire, stone fields, and fougasse made with rock and explosive.

For the construction of wire entanglements it is desirable to have metal stakes which are considerably easier to install in the hard ground than are wooden stakes. For the same reasons, in the mountains barbed wire will often be used "scattered" especially in combination with stone fields. During the combat operations of our troops in the Polar region in the course of the last war, knife rests set up in []* and fastened with stones were successfully employed.

*Tr. note--[] indicates words missing from translation due to illegible foreign text.

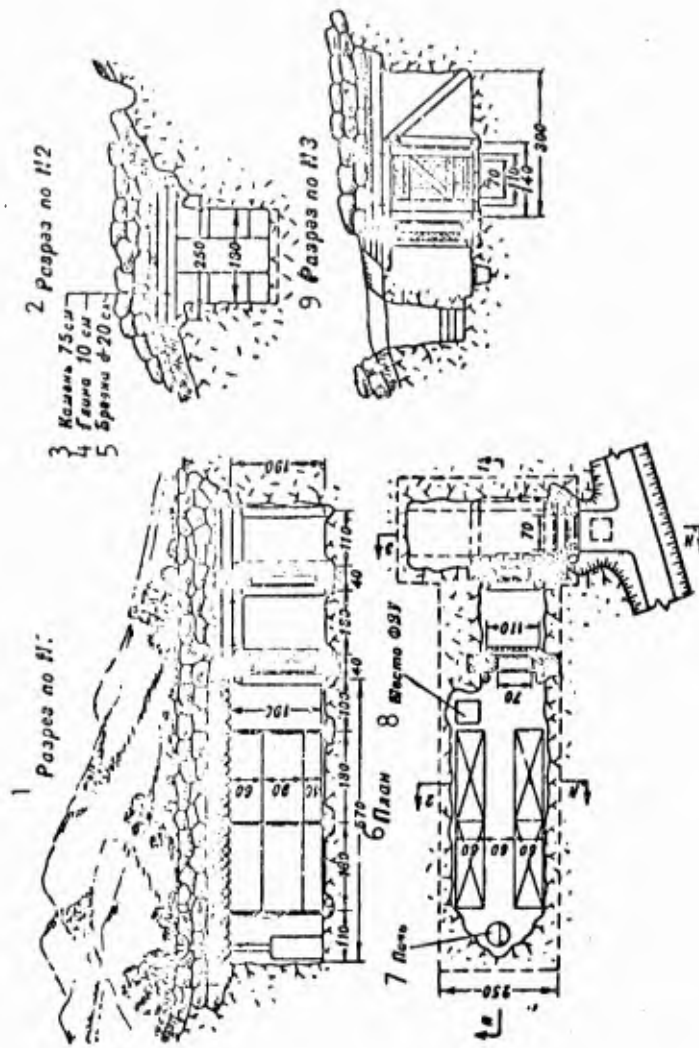


Figure 114. Ditch-Type Shelter in Mountains. Key: 1, Cross section through N1; 2, Cross section through N2; 3, Stone; 4, Log; 5, Clay; 6, Plane view; 7, Stove; 8, Locations of filtration-ventilation unit; 9, Cross section through N3.

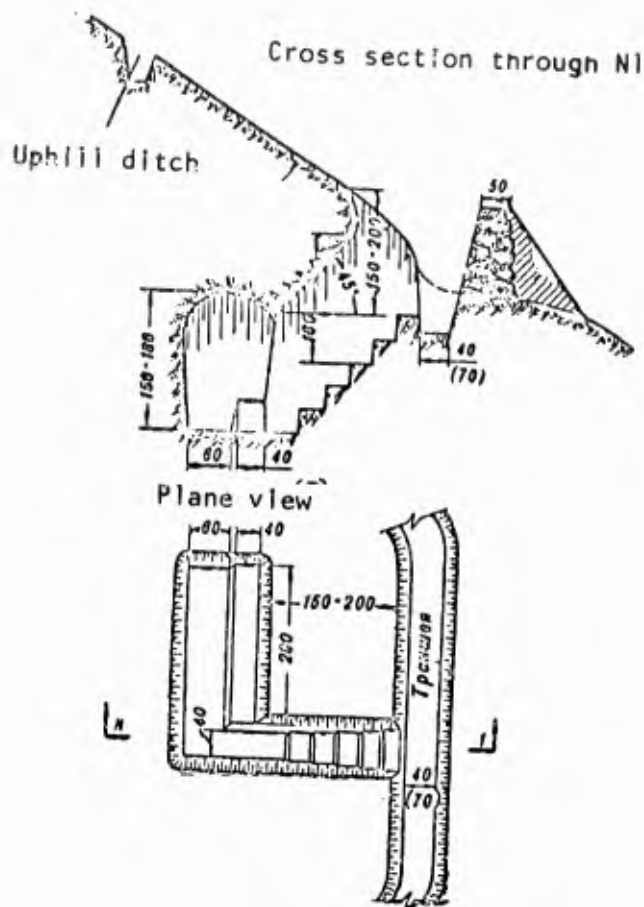


Figure 115. Underground Cover in Hard Ground.

Wide application in mountains is found by stone fougasse. Being simple in construction, they inflict moral damage as well as physical damage on the enemy. They are located in places of the probable advance of the enemy singly or in groups at a distance of 10-15 meters from each other. With the proper construction of stone fougasse, in the explosion the stones fly approximately up to 300 meters in front and 50-60 meters to the side. If the fougasse is made on a slope, then falling with the burst, the stones carry along a great number of other stones which rain down on the enemy and inflict considerable losses on his personnel. Of the antitank obstacles, the most characteristic of mountain terrain are stone obstacles, stone barriers, and combined obstructions of trees and stone which are alternated with mined obstacles.

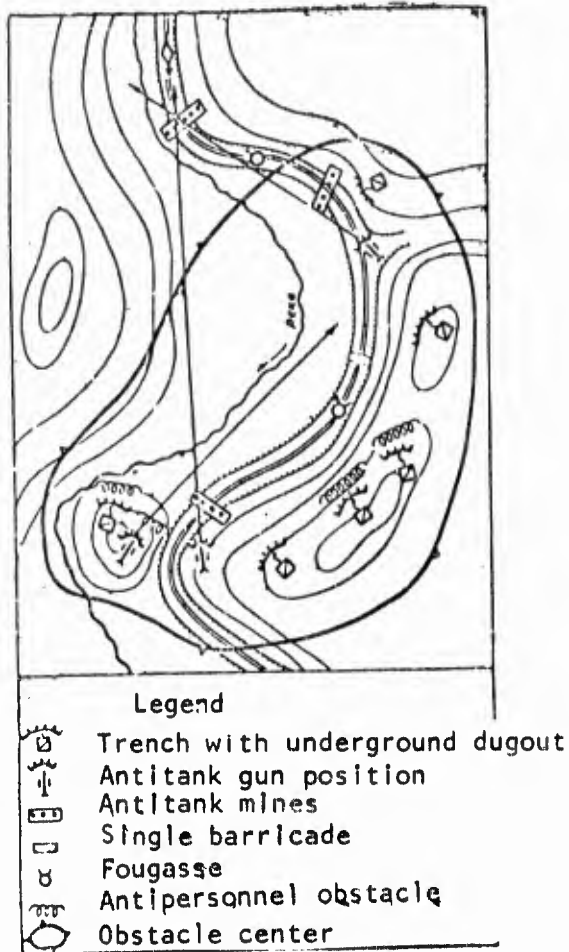


Figure 116. Center of Obstacles on a Road in Mountains.

Antitank obstacles are employed most often on roads which lead out toward defensive positions. Here, effective results are provided by the combination of obstacles and demolitions (the crumbling of the roadbed, construction of craters, etc.) Both the demolitions as well as obstacles are constructed on steep slopes and turns in the road and, first of all, in those places where by-passes are difficult.

Figure 116 shows the covering of a section of mountain road by obstacles supported by artillery and machine gun fire.

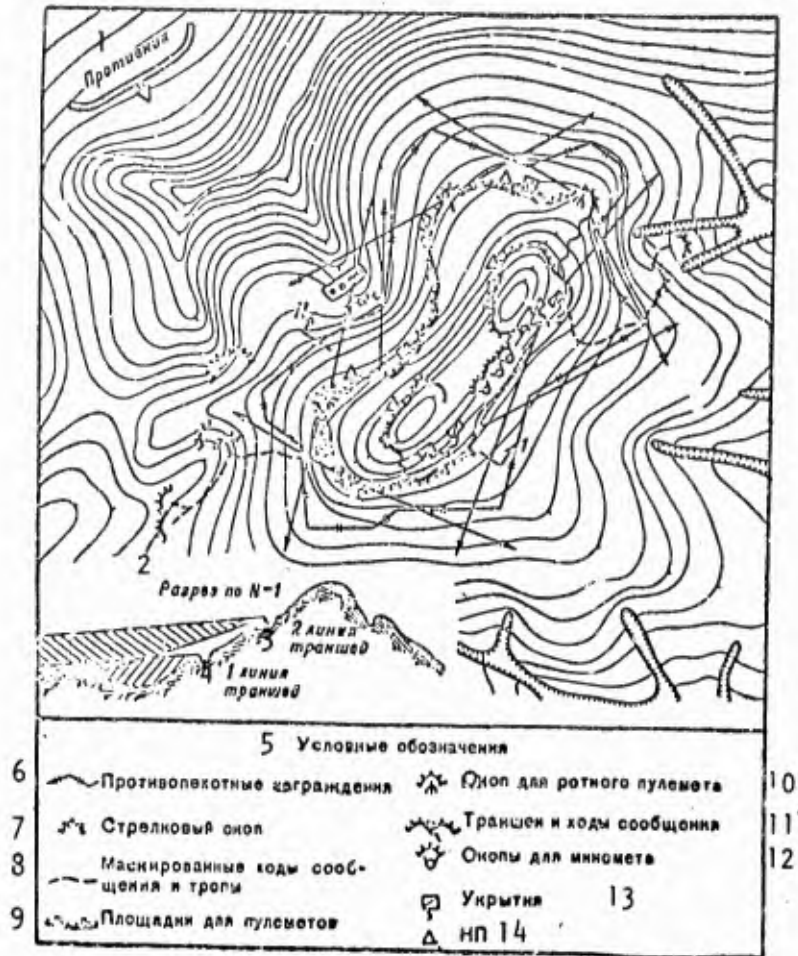


Figure 117. Diagram of Engineer Improvement of a Company Defense Area in the Mountains (Variation). Key: 1, Enemy; 2, Cross section through N1; 3, 2nd line of trenches; 4, 1st line of trenches; 5, Legend; 6, Antipersonnel obstacles; 7, Foxhole; 8, Camouflaged communication trenches and paths; 9, Machine gun emplacements; 10, Pit for company machine gun; 11, Trenches and communication trenches; 12, Mortar pits; 13, Cover; 14, Observation post.

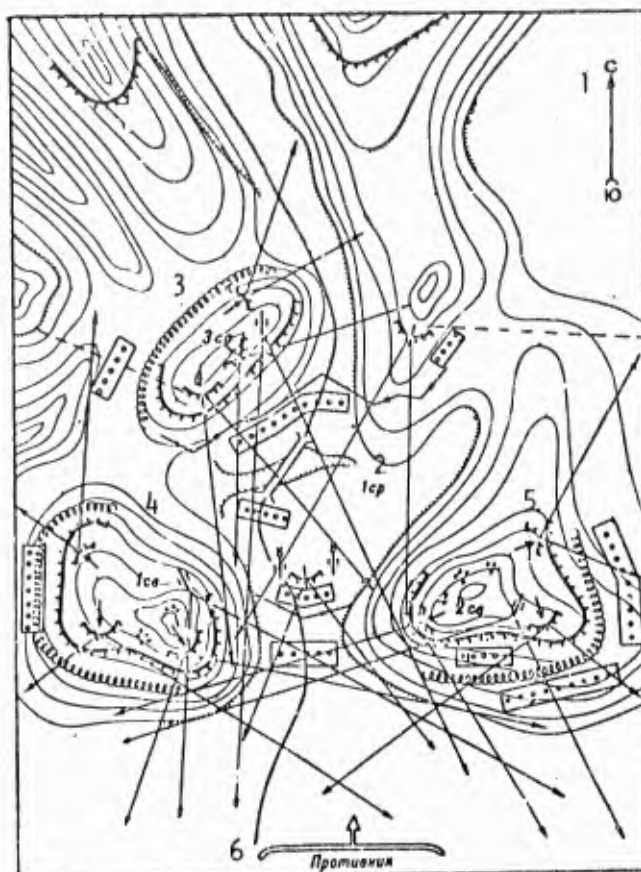


Figure 118. Diagram of Engineer Improvement of a Rifle Company Defense Area in the Defense of a Pass (Variation).
 Key: 1, N-S arrow; 2, 1st rifle company; 3, 3rd rifle platoon; 4, 1st rifle platoon; 5, 2nd rifle platoon; 6, Enemy.

We present an example from the experience of improving terrain in mountains during the period of the Great Patriotic War. In assuming the defense, one of the rifle companies occupied a defense area on a hill with a reading of from 800 to 1725 meters and covered with spruce and beech. After reconnaissance and organizing []* the company began to improve the defense area. Engineer work was accomplished under difficult conditions. The ground was clayey and stoney and could be worked only with crowbars and pick mattocks, and a large number of roots required the use of axes. There were no high explosives, and therefore it was possible to count only on pioneer tools. Since the steepness of the slope of the terrain

*Tr. Note--[] indicate words missing from translation due to illegible foreign text.

on which the company was disposed exceeded 10°, it was decided not to fill in a parados and to be limited only to a parapet. After digging the trenches, it became necessary torevet the rear slope since the rain which had occurred knocked down individual sections of the slopes in some trenches. When the trenches had already been dug, in some places ground water began to seep through and additional measures were required to draw it off. With the []* of the revetment of the rear wall of the trenches, the platoon commanders checked the quality of work, as especially the strength of the guy wires which were driven in 3 meters from the brow of the trench ditch. Sectors of observation and fire were cleared away in front of each trench in such a way that the cutting did not give away the position. The clearing of sectors of observation and fire in the company defense area permitted the company to fire not only through the terrain in front of the FEBA, but also on the slopes of the adjacent height. Instead of communication trenches dug in the ground, paths were laid out which ran through nearest brush, gullies, and on to the gully slopes of the hill being defended. On the most elevated positions of the platoon positions, covered timber-and-dirt structures were constructed for machine guns designated to fire on the distant approaches to the company FEBA. The company conducted engineer work for 15 days. The enemy's fire effect only partially affected the course of the work. After 15 days of defense, the enemy initiated active operations. The company was subjected to intensified enemy attacks five times, but the enemy attacks were beaten back by the organized fire of all organizational weapons and weapons attached to the company, and he did not succeed in penetrating the company defense area. The well-prepared defense area of this company subsequently served as a departure position for the launching of an attack by our troops.

In engineer improvement of the terrain in mountains, sometimes one must encounter difficulties which cannot always be anticipated. In particular, combating water in building cover sometimes acquires extremely serious significance. The following instance took place, for example, in the Carpathian mountains at the Russkiy, Veretskiy, and other mountain passes in September and October of 1944. The weather was rainy. Digging in on a position which had been seized from the enemy, our troops began to construct cover of the normal type. The presence of a forest permitted building overhead cover of logs and poles. But the dirt which was thrown over the overhead cover soaked through quickly and the water seeped into the cover. Clay, which usually serves as a dependable means of insulation, was not available in this area. Then they began to place shelter-halves,

*Tr. Note--[] indicate words missing from translation due to illegible foreign text.

canvas, or regular oilcloth on the flat wooden roofing. They covered the floor of the cover with branches and pine needles. During the two weeks' stay at these passes, our troops were forced to fight against surface water, removing it from sumps, or draining it off through uphill ditches which were made close to the cover.

The variety of mountain relief affects the disposition of the troop combat formations and the nature of the engineer improvement of a company defense area. Shown as examples in Figures 117 and 118 are variations of plans for the engineer improvement of a company defense area in the mountains.

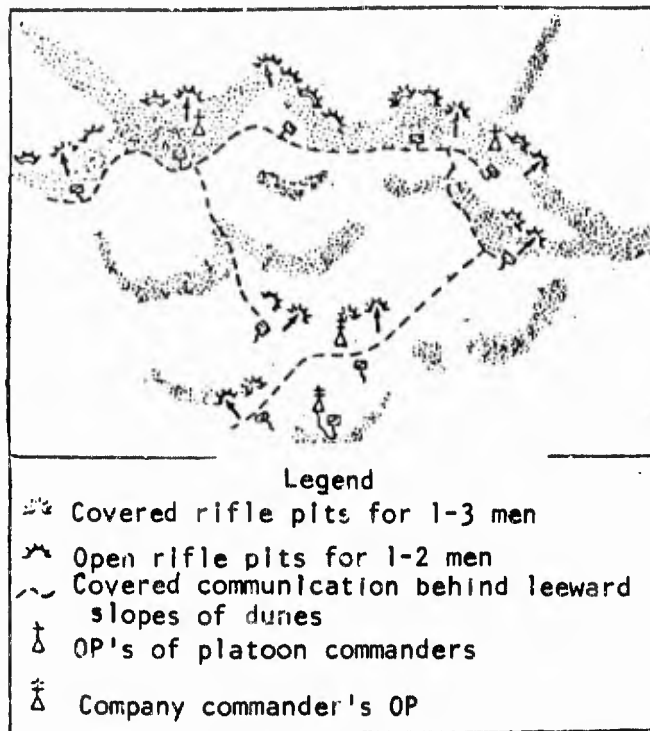


Figure 119. Diagram of Engineer improvement of a Company Defense Area in Dune Sands.

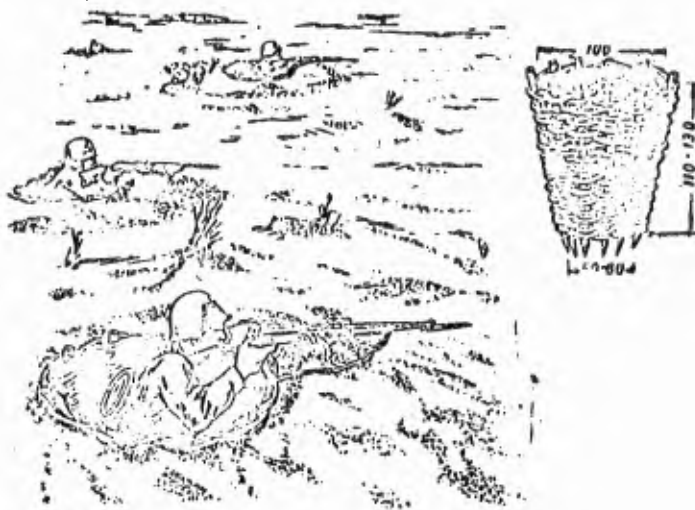


Figure 120. Wall Revetment of One-Man Foxhole in Dune Sands.

When skillfully used, mountain terrain presents great possibilities for the creation of positions which are inaccessible but which have good engineer improvement. It creates the most favorable conditions for the employment of underground defensive structures in the defense which can successfully withstand the destructive effect of modern means of destruction. However, even with preparation for the defense ahead of time, to assure constant combat readiness of the position

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A considerable threat for the defense is created by the movement of sands, as a result of which the field of view and fire from the emplacement may be closed quickly and unexpectedly. Therefore, it is necessary to adopt measures which limit the movement of the sand. One can recommend the fastening of the surface of dry sand with branches, clumps of grass and thorns, or what is more dependable, by installing low fences on the upwind side which limit the movement of the sand toward the emplacement. With the wind direction from the direction of the enemy, a fence which is made of branches and small bushes may simultaneously serve as a screening fence.

It is mandatory to revet the slopes of defensive structures in dune sands. The revetment can be made of brushwood. For example,

in reinforcing slopes of one-man foxholes, fascines with a conical shape are made of the brushwood which then are lowered into the hole which has been dug (Figure 120). However, brushwood may not always appear at the place where the position is being established: in the deserts, most often there will be no improvised materials at all. Therefore, it is necessary to count primarily on materials which are brought up. Of them, for desert conditions the most convenient and highly transportable materials are paper sandbags which are filled with sand on the spot. There are three types of them: straight, elongated, and curvilinear; they are used not only to construct the revetments of slopes successfully but also to line the frameworks of covered defensive structures.

Figure 121 shows variations in constructing the revetments of slopes of foxholes using straight sandbags. From 38 to 60 bags are expended per meter of foxhole and 6.5-8 man-hours are expended. By combining straight and curvilinear or straight and elongated sandbags, covered sections of foxholes can be constructed (Figure 122). For one sector four meters long, there is a requirement for 182 straight and 29 curvilinear sandbags or 198 straight and 15 elongated sandbags with an expenditure of 44 man-hours.

Straight sandbags can also be used to cover the slopes of machine gun emplacements which are adjacent to trenches (Figure 123) or which are offset (Figure 124). To improve an emplacement which is adjacent to a trench, approximately 100 straight bags and 15.5 man-hours are required.

Figure 125 shows the construction of a curved machine gun emplacement of sandbags with the expenditure of a minimum amount of wood (only to shape the embrasures and to construct the entry hatch) and Figure 126 shows a structure for observation from an open area.

In desert terrain where there is no natural cover, the troops have a special need for dugouts and shelters. The use of sandbags for their construction expands considerably the possibilities of providing the positions with a sufficient quantity of dependable cover for the personnel. This can be seen, for example, from the fact that 270 straight and 43 curvilinear bags are required to construct one dugout and only 0.16 cubic meters of lumber are needed to construct the protective door. The total weight of the materials which go into one dugout is a little more than 200 kg and, thus, one vehicle can transport simultaneously the material which supports the construction of 15 dugouts.

Sandbag emplacements are erected comparatively quickly (for example, 75 man-hours are expended to construct a bunker) and only a little training of the soldiers in filling and laying the sandbag is required.

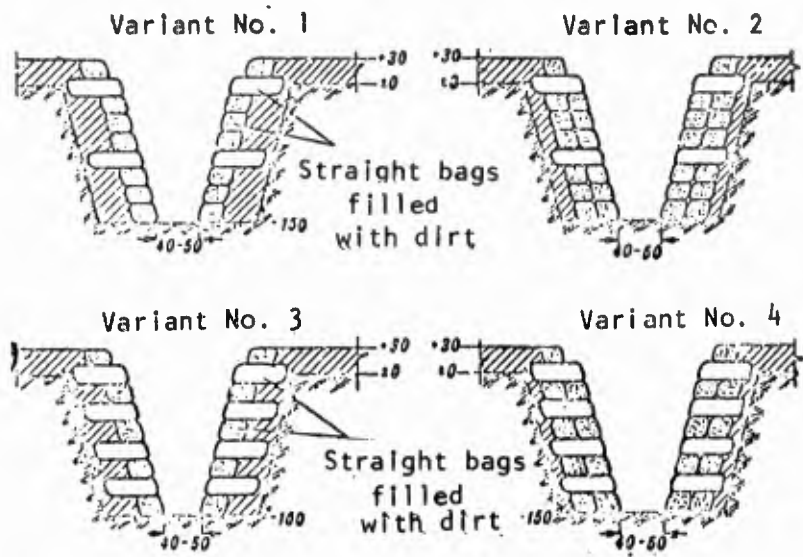


Figure 121. Revetment of Slopes of Trenches With Sandbags.

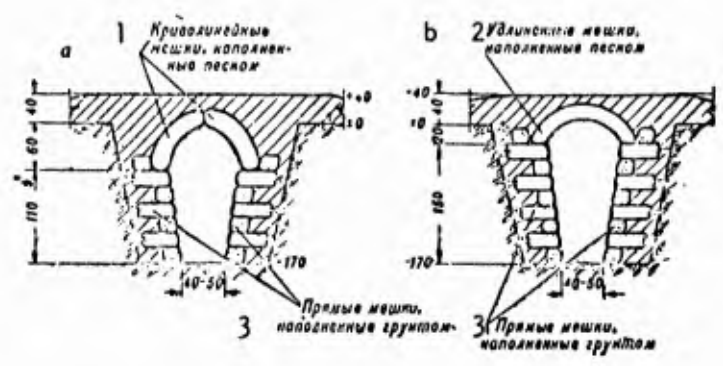


Figure 122. Arrangement of Covered Sections of Trenches with Sandbags: a, With curvilinear bags; b, With elongated bags. Key: 1, Curvilinear bags filled with sand; 2, Elongated bags filled with sand; 3, Straight bags filled with dirt.

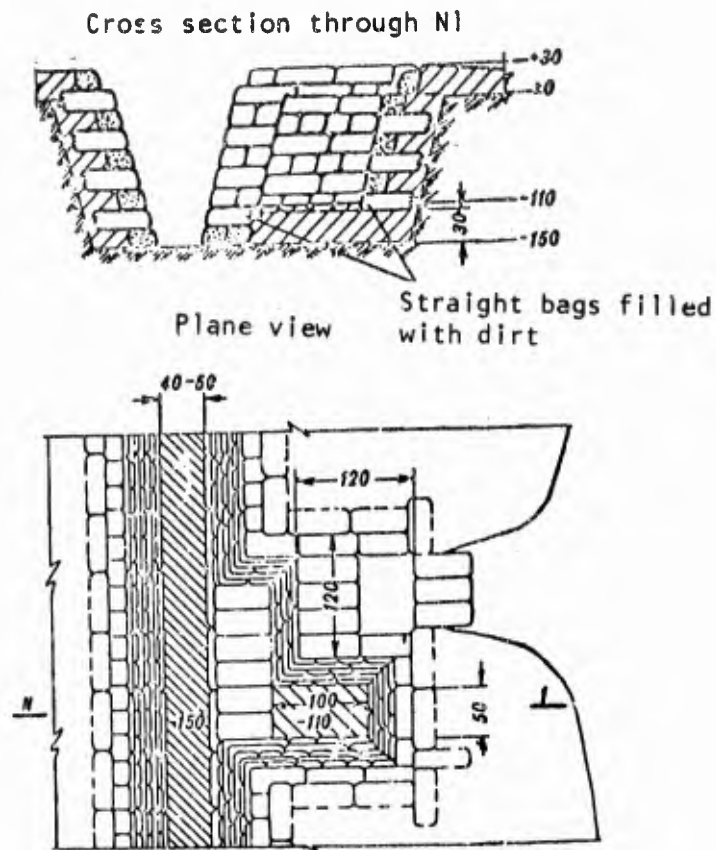


Figure 123. Machine gun Emplacement Adjoining a Trench with Sandbag Revetment.

Using as an example the construction of a sandbag bunker, let us follow the sequence and technique of erecting a structure from them.

The bags are filled with sand simultaneously with the digging of the pit.

The filling of straight sandbags, from which the walls of the structure are lined, is performed using a templet which is made of 4-6 stakes 110-120 cm long and driven in the ground around the perimeter of the bag being filled. A metal or wooden ring is inserted in the mouth of the bag. The bag is placed in the templet which supports it in a vertical position which is most convenient for filling with sand. After the bag is filled, the ring is removed, the mouth is tied with wire, and the bag is removed from the templet. The use of the templet almost doubles the speed of filling the bags.

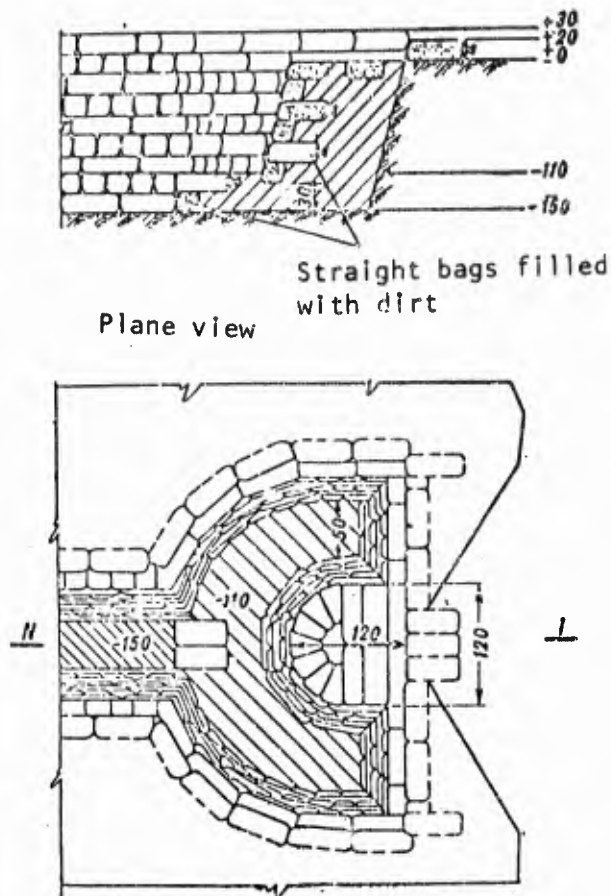


Figure 124. Offset Machine gun Emplacement with Sandbag Revetment.

Before making the walls with the bags, the protective door is installed in the pit, fastening it temporarily in a vertical position using braces or guy wires.

In the side walls, the straight bags are laid in alternating rows: one row with a stretcher, the next row with a header, and with the mandatory bonding of the seams. After the laying of each row of bags, the interval between them and the slope of the pit is filled tightly with dirt to improve the air sealing of the dugout. This work should be conducted especially carefully on sectors which are directly adjacent to the protective door. At the place where the protective door (or airtight partition) is installed, two layers of roofing material are emplaced between the bags. After laying each row of bags, the compactness of their fitting to the frame of the protective door is checked. All chinks around the outline of the frame are thoroughly sealed with remnants of torn bags, fiber packing, rags, etc.

The end walls and the shaft entrance to the structure are made from elongated or curvilinear bags.

The surface of the last row of bags, which serves as the support for the arched roof, is evened out by the pouring of dirt, after which supporting bags which absorb the forces of the thrust of the arch are laid. The construction

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[Tr note--Text resumes on p. 216]. the ditch. Two soldiers support the filled bag in the lower portion and place its upper end in the direction of the ditch. The third soldier of the team stands on the []* opposite the keystone of the arch, takes the free end of the bag, bends the bag, and places it flush against the other bag which is placed at this time with the opposite [] side of the pit. After installing the bags, before covering the framework of the structure, it is necessary to seal with improvised materials all openings and cracks between the bags which form the arch of the structure. The covering of the framework should be performed from two sides of the pit so that no uneven loading of the covering with dirt is created.

One of the variations of constructing a dugout of sandbags is shown in Figure 127. Required to build such a dugout are 127 straight sandbags, 43 curvilinear bags, and a protective door. The bunker is erected in [] man-hours.

The internal equipment of the dugout (shelter) is performed in the normal manner. When installing the filtration-ventilation unit, 2 [] bags of the arch of the roof are pressed down and the air vent is passed through the hole which is formed.

Such are the designs of structures made with sandbags and the methods for erecting them.

It can be considered approximately that a rifle company, having approximately 10,000 sandbags, can set up a company defense area in 8-9 days in dune sands with its own forces.

In setting up a company defense area in ridge and other fastened sands, the employment of trenches is possible since in this case the slopes of the trenches, foxholes, and other open structures may be left without revetment and, in this manner, the volume of work is

*Tr. note--[] indicate words missing from translation due to illegible foreign text.

reduced considerably. However, here just as in the dune sands, the accumulation of sand in the ditches of the structures is possible but this process occurs less intensively and primarily due to the sand which is removed in digging the structures. Therefore, it is comparatively easy to protect open structures against drifts by fastening their parapets, paradoses, and other []* with cut branches and clumps of vegetation.

Covered defensive structures are built just as in dune sands, primarily of sandbags. With the presence of brush and reeds, they can also be constructed of fascine frames made from these materials (Figure 128). Fascines of tamarisk or haloxylon are made with a diameter of 25 cm, of cane--25-30 cm, and of reeds--30 cm.

Under conditions of clay soils on playas (clay desert), the engineer improvement of a company defense area will be hindered to a considerable degree because of the great compactness of the ground which does not permit digging trenches and foxholes without preliminary loosening. The use of earth digging machines under these conditions does not provide the required effect either. Digging 1 km of trench 110 cm deep manually requires 300-350 man-days instead of the 100 man-days under normal conditions. Therefore, continuous trenches cannot be employed here as in dune sands; positions will consist of individual foxholes.

The layer of playa clays lays to a depth of 70-150 cm. Sand is located beneath it. Such a soil structure favors the construction of underground structures beneath a layer of very compact dry cemented clays.

The design of structures presented in this section, the basis of which is provided by sandbags, may be successfully employed in steppe terrain which has almost the same special features as do deserts.

6. Special Features of Establishing Positions in the Defense of a Water Obstacle

The development of crossing means and the improvement of methods for the passage of tanks along the bottom of rivers has not deprived a water obstacle of importance as a barrier which is difficult for attacking troops to overcome.

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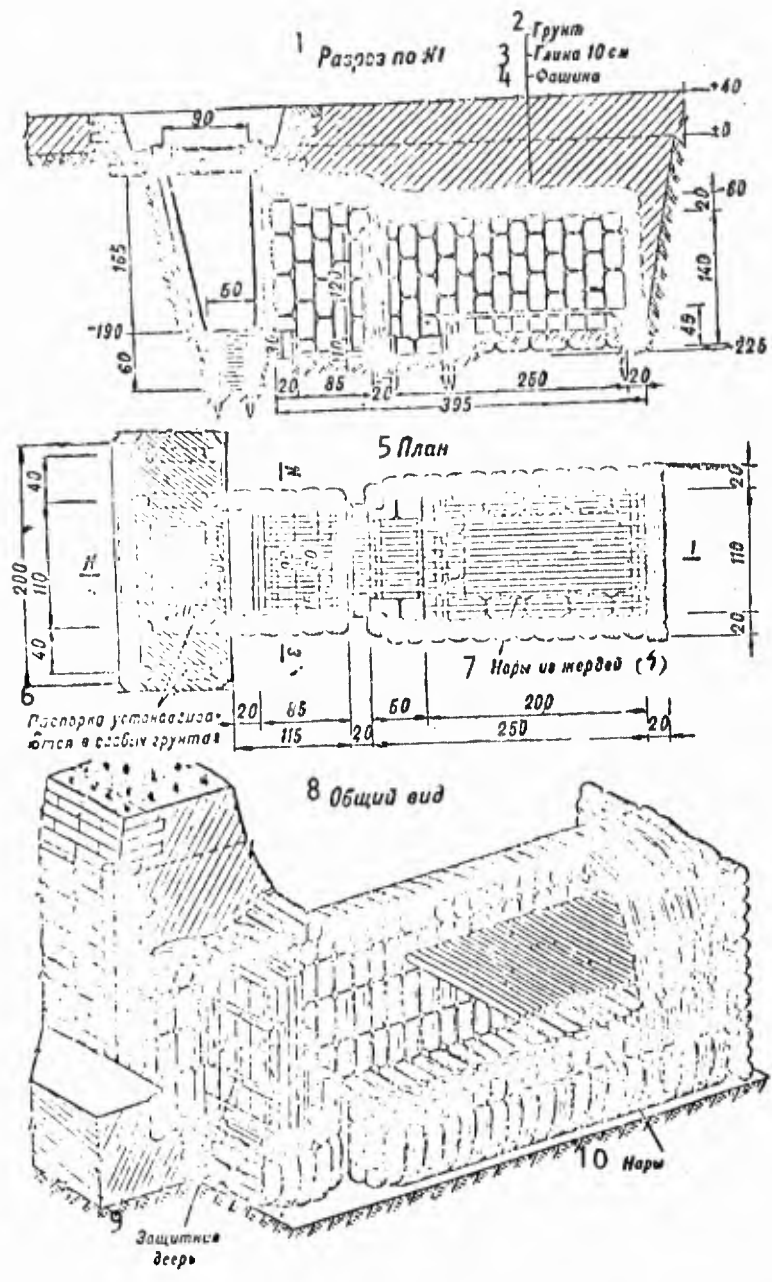


Figure 128. Dugout with Framework of Fascine Frames.
 Key: 1, Cross section through N1; 2, Dirt; 3, Clay; 4, Fascine; 5, Plane view; 6, Bracing installed in weak soils; 7, Plank bed of poles; 8, General view; 9, Protective door; 10, Plank bed.

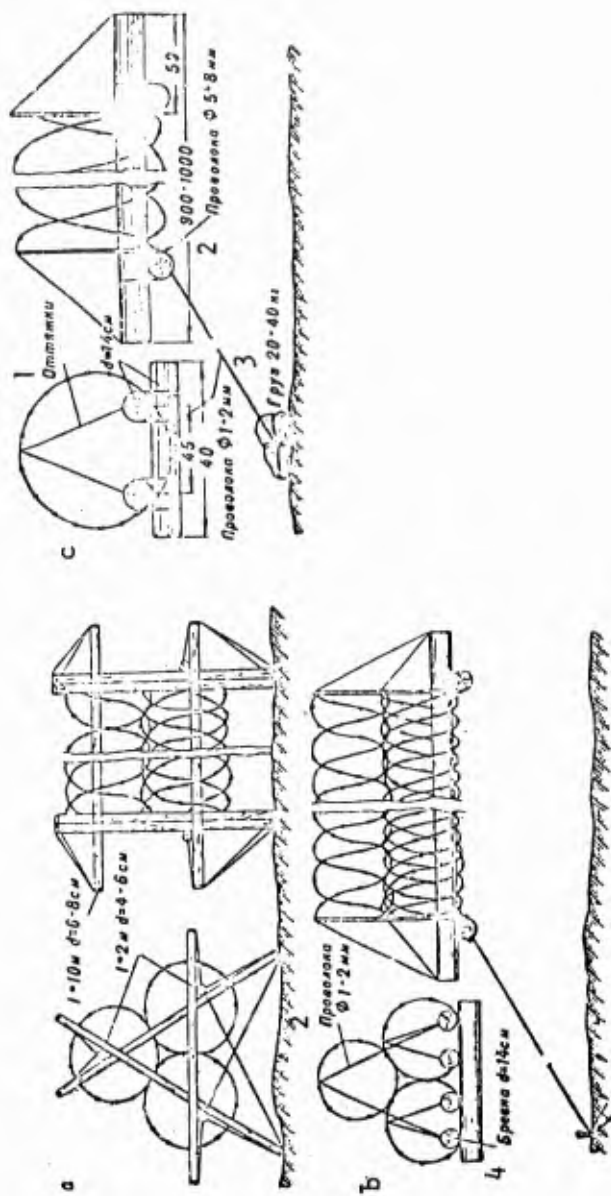


Figure 129. Underwater Wire Obstacles: a, Movable spiral placed on the bottom; b, Floating one-row spiral; c, Floating three-row spiral. Key: 1, Guy wire; 2, Wire; 3, Weight; 4, Logs.

The properties of a water obstacle as a barrier depend on its width and depth, speed of current, compactness of dirt on the bottom, character of banks and floodplain, fluctuations in the water level, etc. The time of year and weather conditions have a great effect on the surmountability of the water obstacle. For example, during the flood period even small rivers which flow in broad floodplains are converted to mighty water obstacles while, in a hot summer, they are easily forded. A severe winter, binding the surface of the water with ice, practically deprives rivers, lakes, and other bodies of water of importance as obstacles for troops.

Using rivers as natural obstacles, the defender usually organizes his defense along the friendly bank of the river.

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In the defense of a river, it is necessary to destroy or prepare for demolition all crossings as well as local and improvised crossing means which the enemy may use in case he launches an attack. In addition, it is expedient to burn or collect and cross over to the friendly bank all wooden structures located on the opposite bank so as not to give the enemy the opportunity to use them as improvised materials for forcing the river.

APPENDIX 4

MEANS FOR MECHANIZATION OF ENGINEER WORK

Mechanization Means	Brief Characteristics
KG-65 and ETR-152 rotary trench excavator	Used to dig trenches and communication trenches up to 1.5 meters deep, up to 1.1 meters wide across the top, up to 0.6 meters wide across the bottom, height of parapet 0.4 meters; productivity is 200 running meters of full depth trench per hour.
PLT-60 plow trencher	Used to dig trenches and communication trenches up to 0.6 meters deep, 0.9 meters wide across the top, 0.5 meters across the bottom, and height of parapet 0.3 meters; productivity when working with S-80 tractor is about 1.5 km/hr.
E-255 single-scoop excavator	Used to dig ditches and pits and with crane equipment, for loading-unloading and assembly work. Digs ditches up to a depth of 2.8 meters and slit trenches to a depth of 4 meters; productivity in weak soils (with scoop with a capacity of 0.25 cm) is 45-50 cm/hr, in medium soils--30 cm/hr, and in hard soils--25 cm/hr.
D-157 and D-271 bulldozers	Used to dig ditches for shelters, pits and cover for combat and transport equipment; productivity in weak and medium soils up to 80 cm/hr.
MP-180 power saw	Used to fell trees. In felling trees with a diameter of 25-35 cm; productivity in 10 hours is up to 200 pieces or 75 cm.

APPENDIX 5

CALCULATION OF VOLUME OF WORK IN THE ENGINEER IMPROVEMENT OF A
COMPANY DEFENSE AREA (APPROXIMATE)

Ordinal No.	Type of Structure	Unit of Measurement	Quantity	Required Forces, Man-Days	
				Per Unit	Altogether
1	Platoon positions	Pieces	3	182	556
2	Vertical trench screens	km	1.3	25	32.5
3	Structure for observation post of commander of machine gun platoon and company commander	Pieces	1	2.0	2.0

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14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
dugouts trenches weapons emplacements obstacles						