

**FM 17-45**

**WAR DEPARTMENT**

**ARMORED FORCE FIELD  
MANUAL**

**ARMORED ENGINEER BATTALION**

**November 13, 1942**

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### TABLE OF CONTENTS

	Paragraphs	Page
SECTION I. General .....	1-11	1
II. Training .....	12-18	10
III. Control, orders, liaison, and recon- naissance .....	23-25	32
IV. Marches .....	19-22	20
V. Security .....	26-31	39
VI. Offensive action .....	32-41	58
VII. Defensive action .....	42-46	72



# ARMORED FORCE FIELD MANUAL

## ARMORED ENGINEER BATTALION

### SECTION I

#### GENERAL

■ 1. PURPOSE.—This manual covers the tactics and technique of the armored engineer battalion. It supplements Basic and Engineer Field Manuals and Engineer Technical Manuals, and will be used in conjunction with them in training the armored engineer battalion and its component parts.

■ 2. MISSION.—*a.* The principal mission of the armored engineer battalion is to facilitate the rapid movement of the armored division of which it forms an organic part. It is trained and equipped to perform the following tasks for the division, but not all of them at any one time.

- (1) Reconnoiter and mark roads, trails, and other routes.
- (2) Reconnoiter bridges, defiles, obstacles, and areas.
- (3) Construct, improve, or reinforce fords, bridges, and culverts.
- (4) Construct and maintain floating bridges and ferries.
- (5) Transport infantry elements across streams with assault equipment.
- (6) Construct, defend, and remove obstacles.
- (7) Fight as infantry when required.
- (8) Execute demolitions.
- (9) Establish and operate water points.
- (10) Locate, and, if necessary, prepare advance landing fields.
- (11) Assist in the assault of fortifications.

*b.* For supply mission of the battalion see paragraph 9.

*c.* The armored division is characterized by great fire power and mobility. Armored engineers are trained to work rapidly, utilizing power tools and other time-saving expedients, to enable the tank elements to maintain the high degree of mobility without which they lose much of their effectiveness.

Elements of the battalion habitually provide their own local security. Where necessary they fight to accomplish their assigned task, but are not suitably armed for independent, sustained combat.

■ 3. ORGANIZATION.—The armored engineer battalion consists of a headquarters and headquarters company, four engineer companies, and a bridge company. Details of organization are shown in current Tables of Organization.

■ 4. EMPLOYMENT.—*a.* The armored division, with its large number of heavy vehicles operating at great speed, requires much engineer support for maximum battle effectiveness. The armored battalion is the only engineer organization designed to accompany the armored division in battle. It is highly trained, both technically and tactically, and is specially armed and equipped to enable it to furnish the prompt support demanded by the tank elements. Hence it must be used economically, and not dissipated on unimportant or unnecessary assignments. It should be supported closely by other engineer troops, who will take over bridge maintenance, ferry operation, and similar tasks, and release armored engineers to accompany and maintain mobility of the division.

*b.* On the march and under average terrain and road conditions, armored engineers are placed as shown in figure 1. The engineer element is placed well forward in each echelon so that necessary engineer work can be started with a minimum of delay.

*c.* In combat, armored engineers are employed in accordance with the tactical situation. By reason of its highly specialized training, missions involving combat should be assigned to the battalion only after carefully weighing the result to be obtained against the effect upon the mobility of the division.

■ 5. EQUIPMENT.—*a.* To facilitate its prompt employment on independent tasks, each squad of the engineer battalion carries in its armored personnel carrier certain carpenter, pioneer, and demolition equipment and limited quantities of engineer supplies and antitank mines. (See fig. 2.) Additional equipment and supplies are carried in platoon and

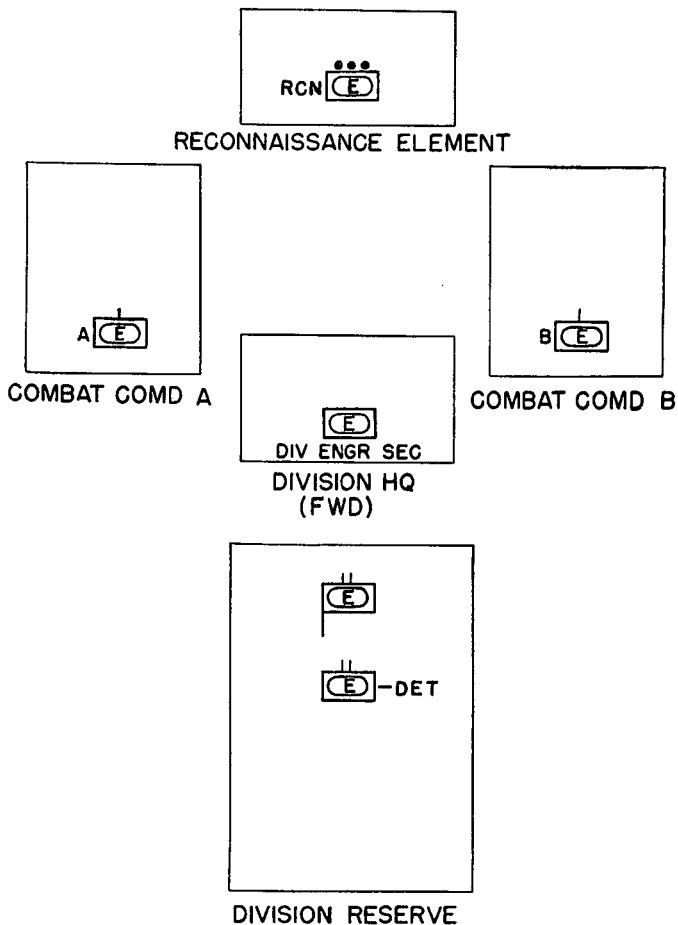


FIGURE 1.—Normal tactical disposition of engineer troops.

company transportation. Each engineer company has one trailed angledozer and one or more air compressors with power tools.

b. The bridge company carries sufficient equipment to construct 1,080 feet of floating bridge or 720 feet of trestle bridge. It may be broken down into units of 30 feet or multiples thereof for attachment to combat groups or march columns.

*Note A:*

Adz, carpenter's.  
Auger, ship ring.  
Hacksaw and blades.  
Chalk and crayons.  
Chisel, socket, 1-inch.  
2 files, saw, 8-inch.  
Level.  
Screw driver.  
Tape, metallic, 50 feet.

*Note B:*

Bar, gooseneck, 30-inch.  
3 hammers.  
3 hatchets.  
Line, chalk, 100-foot ball.  
Saw, cc, hand, 36-inch.  
3 saws, cc, hand, 26-inch.  
Wrench, monkey.  
3 pliers, side cutting.

*Note C:*

2 boxes, cap.  
Crimpers, cap.  
Drill, detonating cord.  
Galvanometer.  
Machine, blasting, 10-cap.  
Gage, tire pressure.

*Note D:*

2 cutters, wire.  
3 machetes.  
Oil, lard, pint can.  
Tape, tracing.  
3 axes.

*Note E:*

Bar, crow, 5-foot (carpenters' set).  
Auger, post hole.  
2 wedges.  
2 blocks, steel.  
Adz.  
2 hooks, brush.  
3 picks, railroad.  
4 shovels, short-handled.  
2 sledges.

*Note F:*

Cord, detonating.  
Explosive.  
Fuze and lighters.  
Reel, wire, 500 feet.  
Tape, friction.  
Twine and marline.  
30 bags, sand.  
Nails, bag, assorted sizes.  
2 nets, camouflage.  
5 ropes, drag, for 37-mm gun

■ **6. ARMAMENT.**—The armament of the armored engineer battalion is listed in current Tables of Organization. It is sufficient, if employed properly, for the defense of engineer working groups against small hostile mechanized or infantry parties. Because of the rapid tempo of armored operations, the attachment to small armored engineer groups of other troops (armored infantry) for their defense is neither practicable nor desirable. The engineers are organically equipped with a reasonable amount of armament for security and are trained in its use, both because of the resultant gain in tactical efficiency and because troops not so armed and trained

inevitably lack the offensive spirit necessary to carry on the required work under battle conditions.

■ 7. COMMUNICATION.—*a.* For communication, the armored engineer battalion is equipped with a limited number of radios and messengers.

*b.* For distribution of radios see current Tables of Basic Allowances. Radio nets are shown in figures 3 and 4.

NOTE.—The limited range of the SCR-510 radio set necessitates the relaying of messages from the engineer battalion reconnaissance platoon by the division reconnaissance battalion. Alternatively, a medium power radio station from the division signal company may be attached to the engineer reconnaissance platoon.

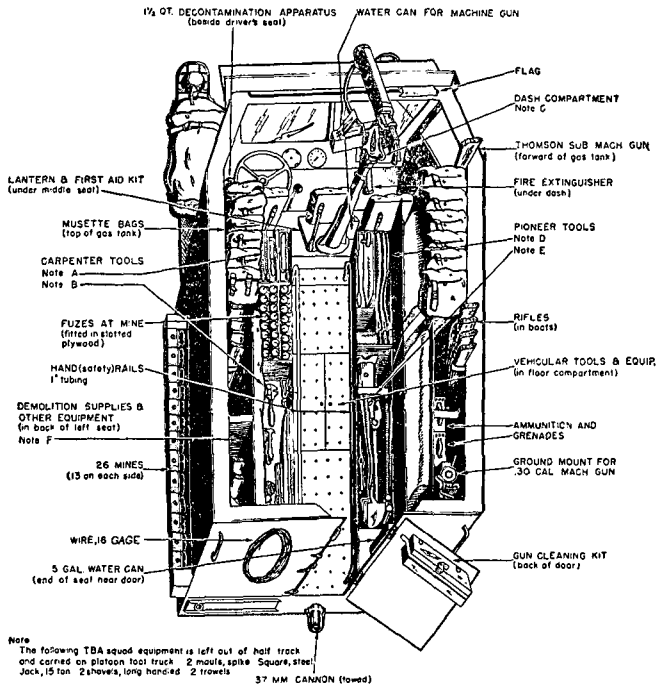


FIGURE 2.—Loading chart of personnel carrier, half-track M3, for engineer squad.

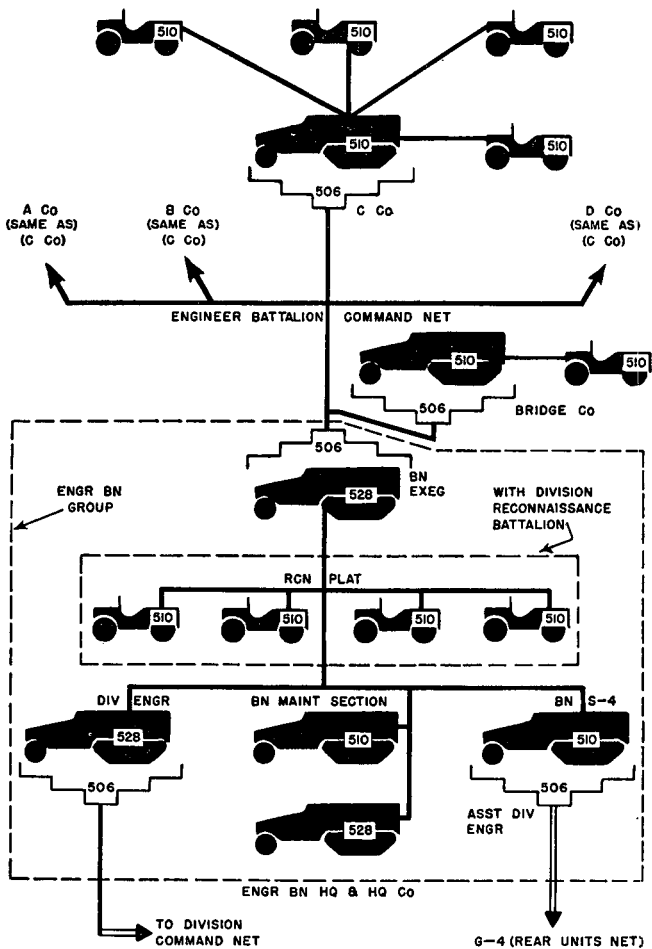


FIGURE 3.—Channels of radio communication.

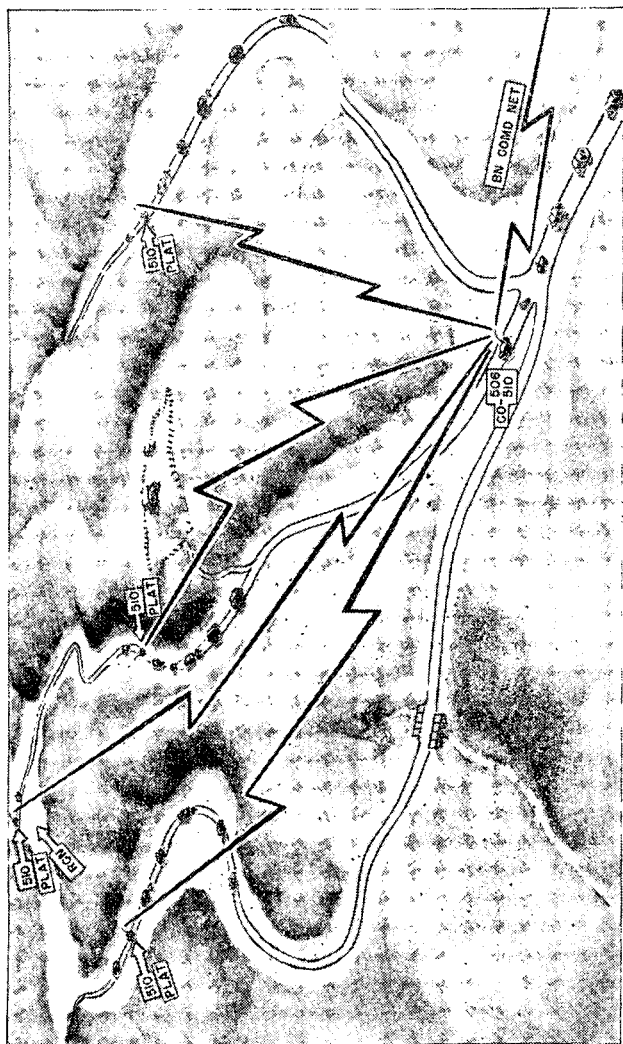


FIGURE 4.—Engineer company radio net.

■ 8. **ENGINEER ATTACHMENTS.**—Armored engineer units are attached to other units of the division as required by the situation. The division engineer must be prepared at all times to recommend to the division commander the strength and composition of these attachments. Hence, he must keep himself informed constantly as to the tactical situation, the terrain, road nets and their capacities, and the availability of engineer matériel and supplies. The commander of the unit to which an engineer element is attached may, in turn, attach parts thereof to his lower units. Due to the speed and dispersion of armored units in battle and the resultant difficulty of reinforcing them, initial engineer attachment should be relatively strong. Under average conditions an engineer company, reinforced with appropriate quantities of bridge equipment and prefabricated engineer supplies, is attached to each combat command.

■ 9. **SUPPLY.**—The division engineer is the engineer supply officer of the division. The S-4 of the armored engineer battalion, besides handling the normal supply of the battalion, also handles the engineer supply of the division. The principal engineer supplies for the division are water, maps, explosives, bridge materials, camouflage materials, and materials for field fortifications.

a. *Water.*—Water for the division is usually provided from local sources by using the organic water purification units with which each company except the bridge company is equipped. Water points are established as needed. All water is habitually filtered and chlorinated unless declared safe by the division surgeon. When local sources are inadequate, water is brought from the rear by nondivisional units.

b. *Maps.*—The division engineer section normally obtains maps from the engineer of the next higher unit and delivers them to G-2 for distribution.

c. *Explosives.*—Explosives are distributed at the engineer battalion train bivouac.

d. *Bridge materials.*—Heavy lumber and other materials for the construction or reinforcement of bridges may be procured locally, if available, or drawn from corps or army engineer dumps. Each platoon normally carries a small quantity for emergency work, and greater amounts when needed.



■ 10. DUTIES OF ENGINEERS.—*a. Division engineer.*—The commanding officer of the battalion is also the division engineer. The primary tactical staff duties of the division engineer are to—

(1) Advise the commanding general as to the strength and composition of engineer attachments, and as a staff officer supervise their execution of engineer duties.

(2) Prepare current and future plans for the use of that part of the engineer battalion not attached to combat commands or other units, and execute the plans as approved.

(3) Prepare engineer plans, tactical and technical, for the division as a whole, and supervise their execution when they are approved.

(4) Supervise the collection and dissemination of engineer reconnaissance data.

(5) Oversee engineer supply of the division. (See par. 9.)

(6) Furnish tactical and technical advice to the division commander on engineer matters, and assist him in preparation of training memoranda and demonstrations involving engineer training for other units of the division.

(7) Examine captured engineer material.

*b. Assistant division engineer.*—The assistant division engineer is the personal representative of the division engineer at the forward echelon of the division headquarters, and is liaison officer from the engineer battalion at division headquarters. He keeps a situation map showing the condition of routes and bridges, the location of existing natural and artificial barriers, possible defiles that can be blocked, fordability of streams, and other pertinent engineer information. He is prepared to present this information promptly to the division commander and staff. He also collects and forwards to the engineer battalion all information that may be of value to the battalion. The assistant division engineer works in close cooperation with G-2 on reconnaissance information and map procurement, with G-3 on plans of operation, and with G-4 on water and engineer supply.

■ 11. S-3 AIR.—To effect close and rapid coordination between the armored engineer battalion and the air support, an S-3 air officer is included in the armored engineer battalion Tables of Organization. This officer is trained in the tactics

and technique of air support aviation, in air observation, and in aerial photography. He is an assistant to the battalion S-3. The principal duties of the S-3 air are to—

*a.* Advise the division engineer and battalion staff on methods and desirability of using air facilities.

*b.* Prepare and expedite requests for air support, aerial photography, and air observation pertaining to engineer activities.

*c.* Inform the battalion of air action to be taken.

## SECTION II

### TRAINING

■ 12. GENERAL.—*a.* The fundamentals of training are prescribed in FM 100-5, FM 21-5 and FM 5-5. Special instructions are published in periodic training directives.

*b.* The complexity of organization of the armored engineer battalion, the comparatively large numbers of specialized tools and vehicles with which it is equipped, the number and variety of its weapons, and the many and varied methods of its employment, require well-planned and coordinated training and instruction of the highest type. Armored engineers must be capable of executing their assigned tasks under hostile fire, with maximum speed, with improvised means, if need be, and often without officer supervision. This demands the highest standards of individual and group training and discipline. Training must be thorough and continuous, and all available training time must be used to maximum advantage. A subject covered only hastily due to initial lack of training time must be reviewed and gone into thoroughly at the first opportunity. Practical application is stressed to the maximum; lectures, talks, and conferences are used only where necessary. Night training is emphasized.

■ 13. INDIVIDUAL.—Each armored engineer soldier receives basic training prescribed for all engineer privates during the first 2 months of his service, usually at an engineer replacement training center. After the soldier joins his battalion, this basic training is extended to include thorough instruction in the equipment and weapons peculiar to armored engineer

units. Special emphasis is given ferrying, hasty bridge and culvert repair and construction, demolitions, and the placing and removal of antitank and antipersonnel mines of all types. The importance of speed of operation is stressed throughout the program of training.

■ 14. SQUAD.—*a.* Under its regularly assigned squad leader and assistant squad leader, the armored engineer squad is given thorough training in the care, operation, and employment of its armored vehicles and its crew serviced weapons, and is practiced in the execution of engineer tasks and combat missions. This includes training both as part of the platoon and when the squad is functioning alone. Combat training is similar to that of the armored infantry squad. (See FM 17-40.) Engineer training stresses the proper organization and functioning of the squad in the rapid execution of such typical squad tasks as bridge and culvert reinforcement, mine field removal, demolition of bridges, destruction of hostile communication and supply installation, construction and operation of ferries, and construction and defense of temporary road blocks.

*b.* The importance of adequate security is emphasized continuously. Except under the unusual circumstance wherein no possibility exists of hostile ground or air attack, the squad always employs its four-man security group for its defense and to avoid being surprised. This consists of the corporal (second in command) and three well-trained privates, who act as observers and as operators of crew weapons sighted for the most effective defense of the squad. Where a threat of hostile mechanized attack exists, the security group usually places a few antitank mines across the most likely avenue of hostile mechanized approach, covering the hasty block so formed with antitank or machine-gun fire.

■ 15. PLATOON.—The engineer platoon comprises a platoon headquarters and three 12-man operating squads. It is the basic armored engineer work unit, although the individual squads are thoroughly trained in carrying out alone most of the tasks assigned to armored engineers.

*a. Combat.*—The combat training of the platoon is similar to that of the armored infantry platoon (FM 17-40). Al-

though the platoon is trained to fight as infantry, its combat duties will generally be combined with engineer operations.

*b. Engineer.*—The platoon is capable of executing independently any of the tasks normally assigned to engineers in the support of armored units. In its training special emphasis is placed on the proper coordination of the activities of its component squads with a view to securing maximum speed and efficiency. Advance planning on the part of the leaders becomes of increasing importance.

*c. Security.*—When the platoon is employed as a unit the three four-man squad security groups are habitually employed for defense of the platoon as a whole, and the activities are coordinated and supervised by the platoon sergeant as directed by the platoon leader. Whenever it is necessary to prevent surprise attacks and otherwise insure proper protection of the platoon, the four-man squads are augmented by other men detailed from the working groups.

■ 16. COMPANY.—*a. Engineer.*—The training of the engineer company consists of perfecting the teamwork of the three platoons and the company headquarters plus the training of the specialist personnel in company headquarters. The technical training of the company is best accomplished by employing it upon definite engineer tasks.

*b. Bridge.*—The basic technical and combat training of the bridge company is generally similar to that given to the engineer company. In addition, the bridge company personnel are thoroughly trained in the construction, maintenance, repair, loading, transporting, and unloading of the armored force bridge equipage.

*c. Headquarters.*—The commanding officer of headquarters company is responsible for the basic training of all men in his company, and for the specialist training of those men under his direct control. The training of the specialists under control of a battalion staff officer is the function of that staff officer.

■ 17. BATTALION TRAINING.—*a. General.*—The battalion staff is trained in coordinating the operations of lower units. This requires practice by the battalion commander in his command functions and training of the battalion staff sections in their staff duties.

b. *Schools.*—The battalion conducts schools to instruct officers and enlisted specialists in technical subjects. Use is made of division and branch schools when they are available, and of training films and similar aids, but greatest reliance is placed on practical application, particularly under field conditions.

■ 18. COMBINED TRAINING.—a. Armored engineers are almost always utilized as parts of larger combat groups. Their activities must, therefore, be coordinated carefully with those of tank, infantry, or other elements. Every engineer officer and noncommissioned officer must understand the general characteristics of the other troops with whom his command must function and when attached to another command, he must recommend to the commander thereof the most efficient method of utilizing the attached engineers.

b. The following fundamentals must always be kept in mind: Armored engineers, to accomplish their mission, must be well forward in combat groups. Typical assignments include the improving of stream crossings, such as reinforcement of bridges or culverts, construction of fords, the removal or aid in the removal of obstacles placed by the enemy, including mine fields; the surprise attack of weakly held enemy bridges and the prompt removal of emplaced explosives to prevent destruction by the enemy; demolitions of all sorts, including the destruction of bridges in a retrograde movement, the construction and defense of hasty road blocks for the protection of an exposed flank, and finally, assisting the attack as infantry. Casualties in engineer troops and equipment supporting leading tank elements will necessarily be high and their subsequent reinforcement and replacement difficult. Hence, the engineer reserve should be placed well forward in the column, and the equipment attachments should be of ample strength. Engineers should be employed on combat missions only when such employment is determined to be more urgent than engineering work.

c. The battalion commander must see to it that every opportunity is seized for the combined training of engineers with other troops. He will recommend details of such training to the division commander.

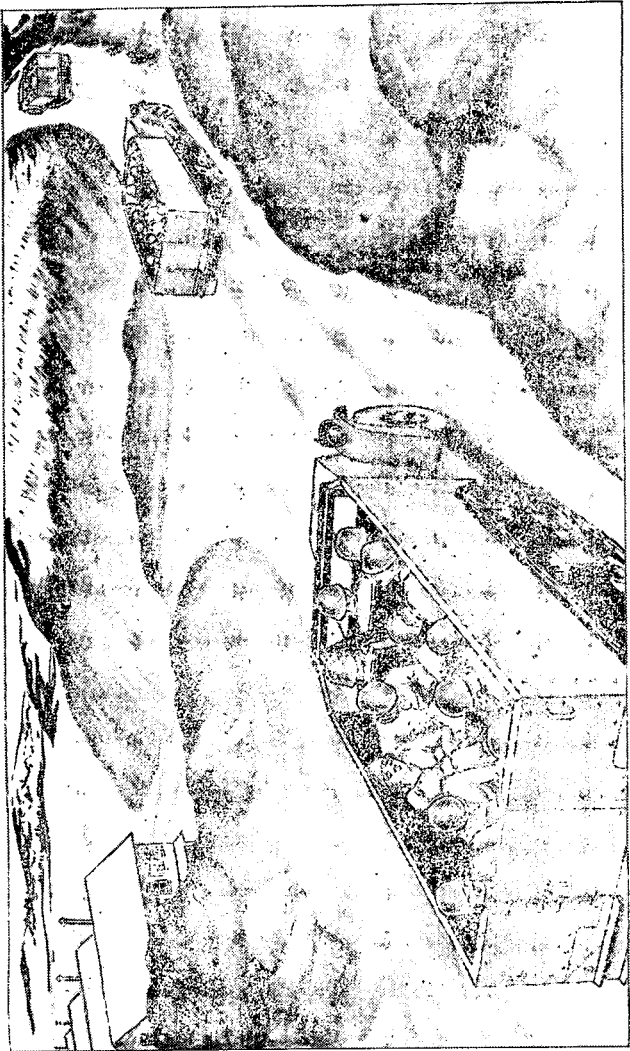


FIGURE 5.—Do not let the rest of the squad sleep while drivers are being trained.

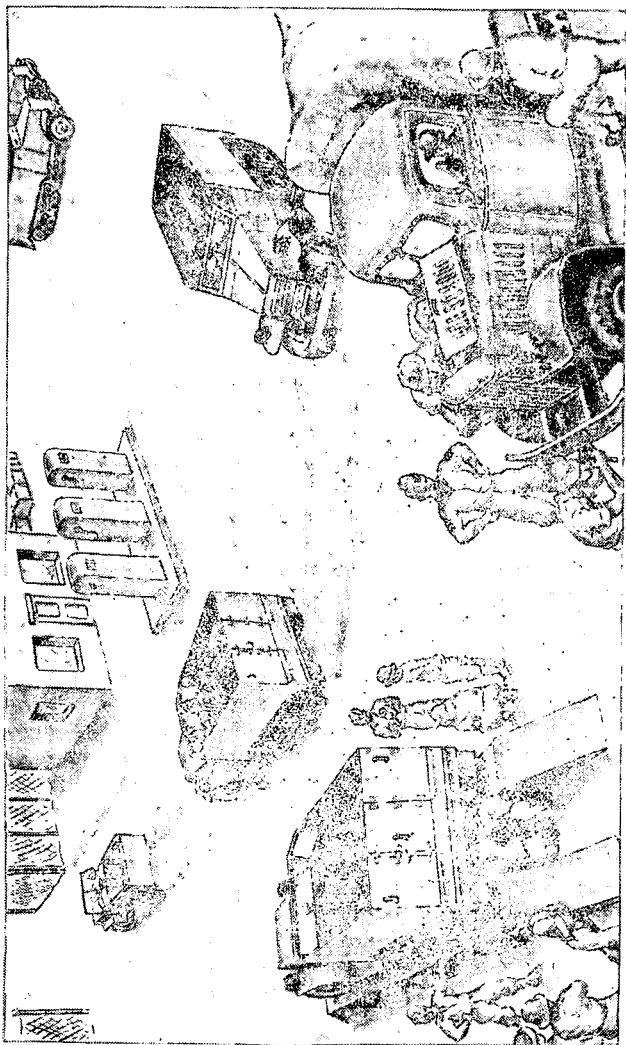


FIGURE 6.—Organize instruction so that all personnel participate.

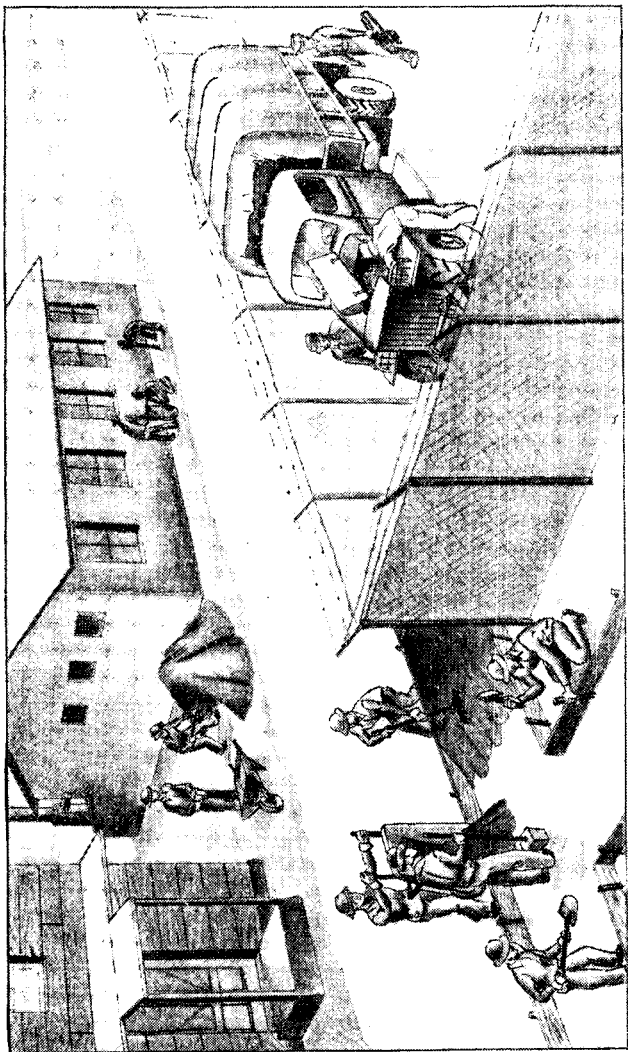


FIGURE 7.—Do not depend upon garrison duties to keep men in condition.



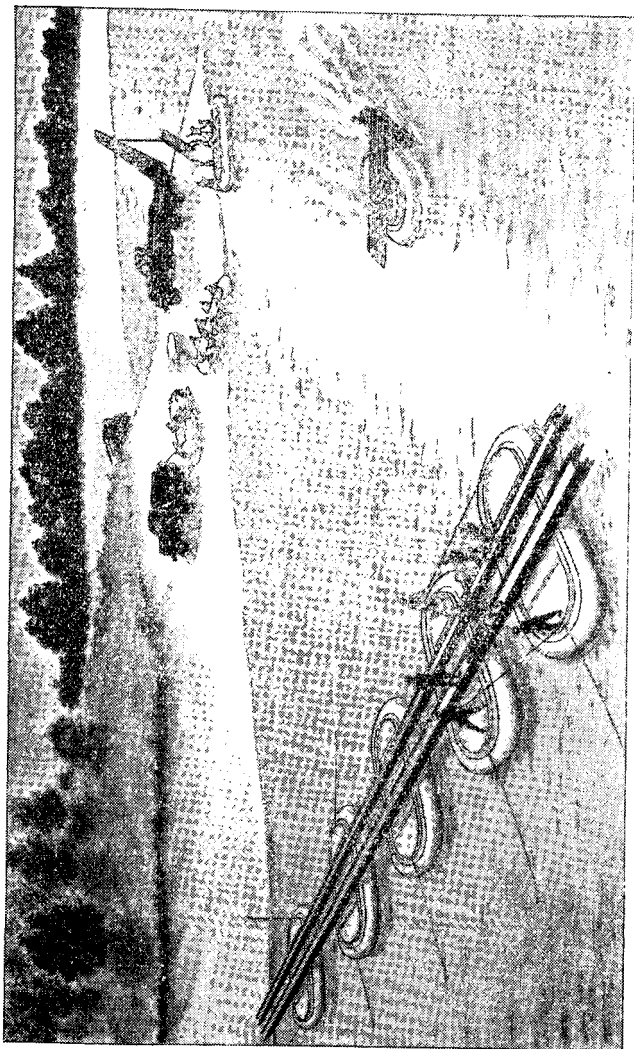


FIGURE 8.—Engineer training should be conducted under field conditions.



FIGURE 9.—Do not attempt to train *all* engineers to handle engineer specialists' work.



FIGURE 10.—Train specialists to handle special engineer work.

## SECTION III

## CONTROL, ORDERS, LIAISON, AND RECONNAISSANCE

■ 19. CONTROL.—*a.* The armored engineer battalion does not normally operate as a unit. However, the battalion commander keeps himself informed at all times of the tactical situation, maintains close communication with all engineer operations, and makes immediate recommendations for the necessary reinforcement or the release of attached engineer units.

*b.* Control is exercised through the use of radio, messengers, and personal visits. Periodic reports from outlying units are required by battalion headquarters.

■ 20. ORDERS.—*a.* Oral orders, frequently fragmentary, are customary. Warning orders are issued when possible. Sketches, overlays, and marked maps are used to simplify orders. Orders follow the outlines given in FM 101-5.

*b.* Orders must state a definite mission and are given in such form that they cannot be misunderstood.

*c.* The adoption of standing operating procedure reduces the amount of routine detail contained in orders. Standing operating procedure should not become voluminous and it should not be allowed to become so rigid that it interferes with the flexibility required of the armored engineer battalion, or prevent exercise of initiative.

■ 21. LIAISON.—*a.* The assistant to the division engineer is the engineer liaison officer at division headquarters. He collects and forwards all information which may be of value to the engineer battalion headquarters, to the engineer elements of the combat commands, and to the engineer reconnaissance platoon.

*b.* An attached engineer unit provides a liaison officer at the headquarters of the unit to which it is attached. His duties and responsibilities are similar to those of the assistant division engineer. For qualifications of liaison officers, see FM 101-5.

■ 22. RECONNAISSANCE.—*a. General.*—(1) The aggressive conduct of engineer reconnaissance, including the prompt

transmission of essential data to the next higher tactical headquarters and the next higher engineer echelon, is the continuing responsibility of all elements of the engineer battalion. The importance of this duty cannot be overemphasized. The engineer battalion is often widely dispersed, and unless battalion headquarters receives accurate reconnaissance reports, the battalion cannot function properly. See FM 5-5 for the general policies concerning engineer reconnaissance.

(2) The armored division moves with great rapidity. Positive mobile means of engineer reconnaissance are therefore essential. For this reason a reconnaissance platoon is incorporated in the headquarters company of the battalion.

*b. Reconnaissance platoon.*—(1) The reconnaissance platoon of headquarters company is the normal engineer attachment to the division reconnaissance battalion. It has the dual mission of assisting the reconnaissance battalion in engineering work, and of conducting engineer reconnaissance in the forward areas. It is organized into a platoon headquarters, three reconnaissance sections, and three engineer squads.

(2) The three engineer squads assist the movement of the reconnaissance battalion by the hasty repair of bridges, construction of fords, removal of obstacles, and operation of assault boats and small ferries. The reconnaissance platoon is reinforced when necessary by attachments from the engineer or bridge company. The squads are generally held under the control of the platoon leader.

(3) The three reconnaissance sections work for the division engineer. They depend on the reconnaissance battalion for protection and supply. In the absence of specific instructions they make technical reconnaissance of the most probable routes of advance of the principal division columns. They must be well forward to gain time for the close examination of bridges, but not ahead of the protection afforded by leading elements of the reconnaissance battalion. The platoon headquarters and the three operating squads, together with any additional engineer attachments, form a unit which is normally held under control of the reconnaissance battalion commander and used to give engineer support to the

battalion along the main axis of advance or on special missions.

(a) The platoon leader supervises operations of the platoon, recommends to the reconnaissance battalion commander a method of employing his engineer support, gives technical advice on obstacles, condition of bridges, and on

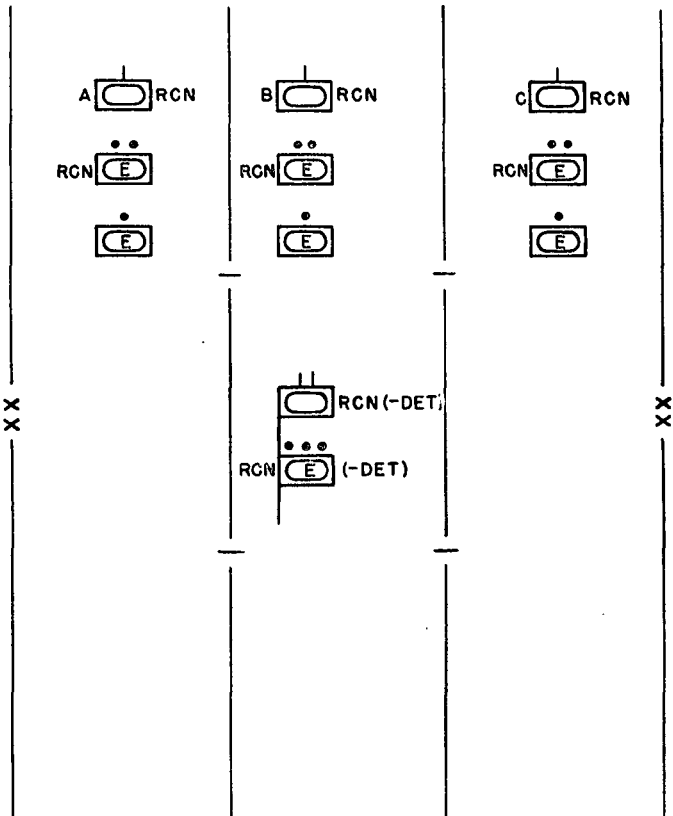


FIGURE 11.—Normal disposition of reconnaissance platoon when attached to the armored reconnaissance battalion.

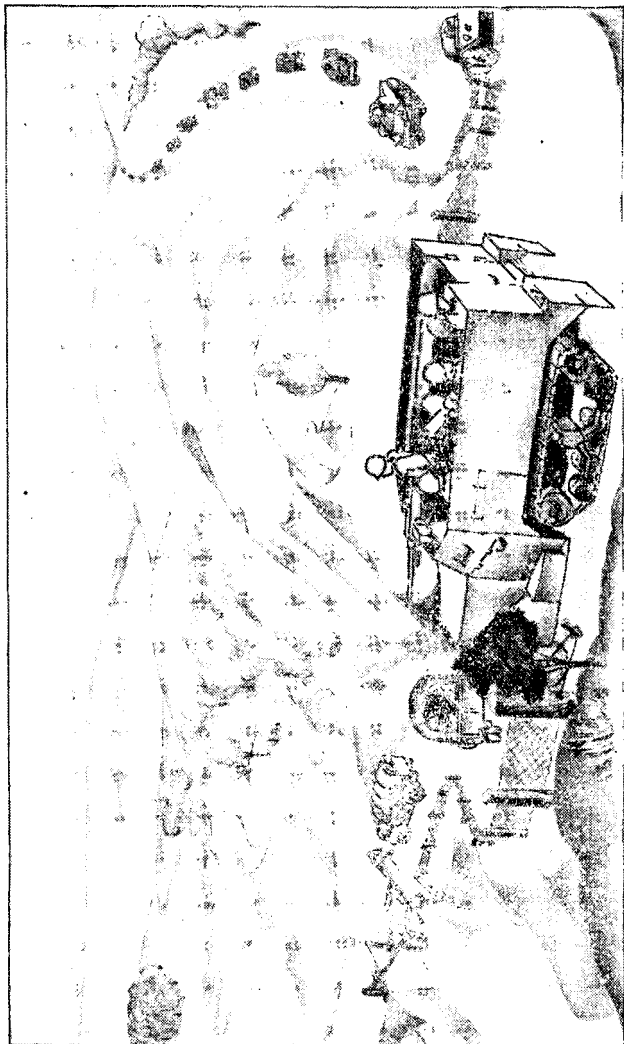


FIGURE 12.—Do not delay in reporting engineer reconnaissance information.



FIGURE 13.—Important engineer reconnaissance information must be reported immediately.



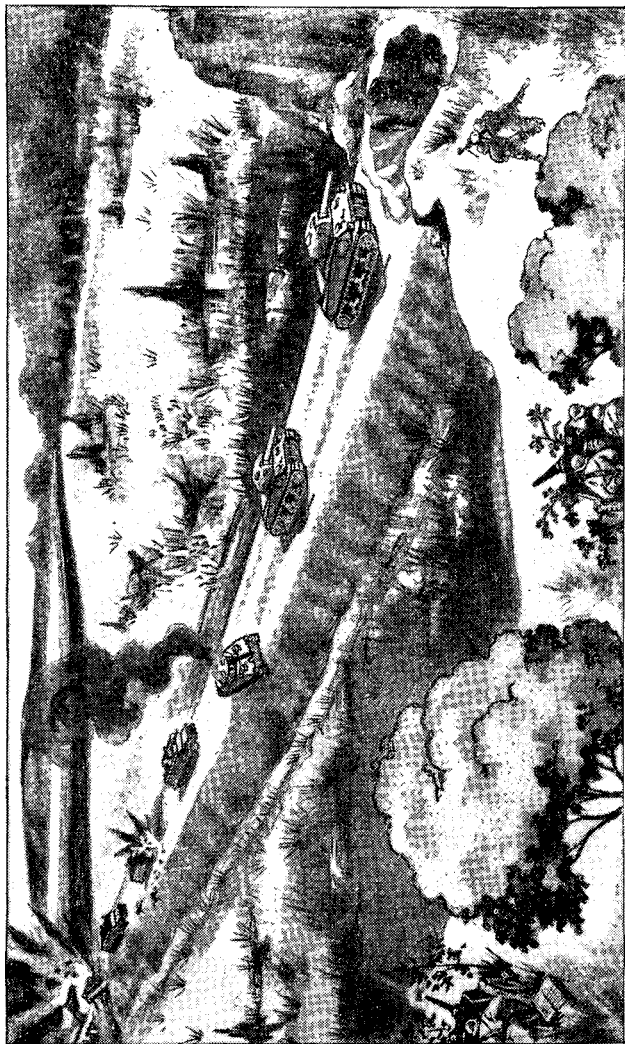


FIGURE 14.—Do not permit friendly troops to be held up by inadequate engineer reconnaissance.



FIGURE 1b.—Engineer reconnaissance personnel investigate bridges.

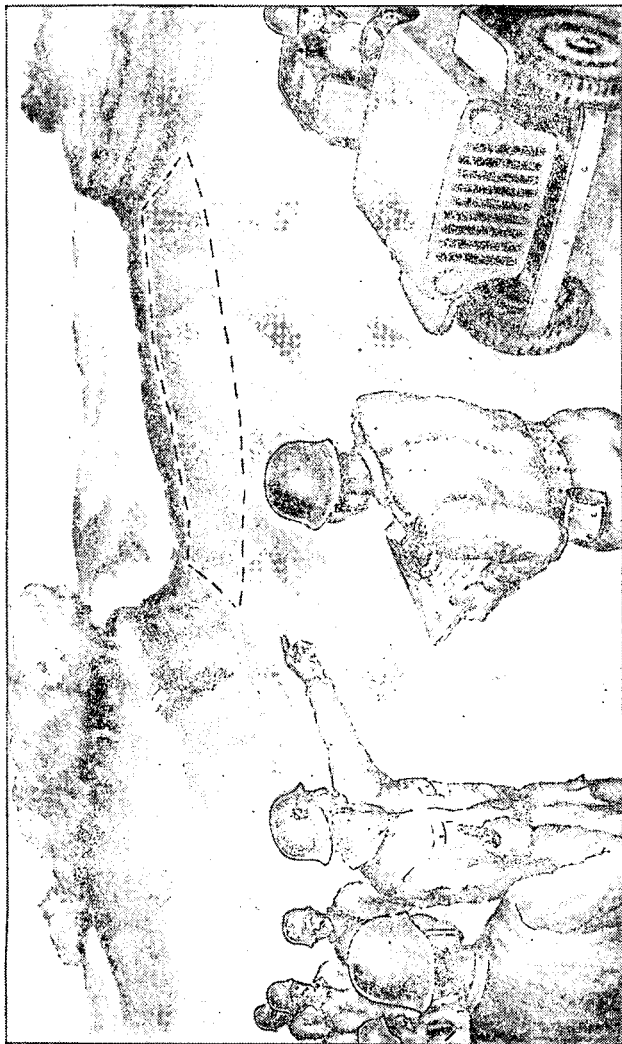


FIGURE 16.—Prisoners should be examined for knowledge of mine fields.

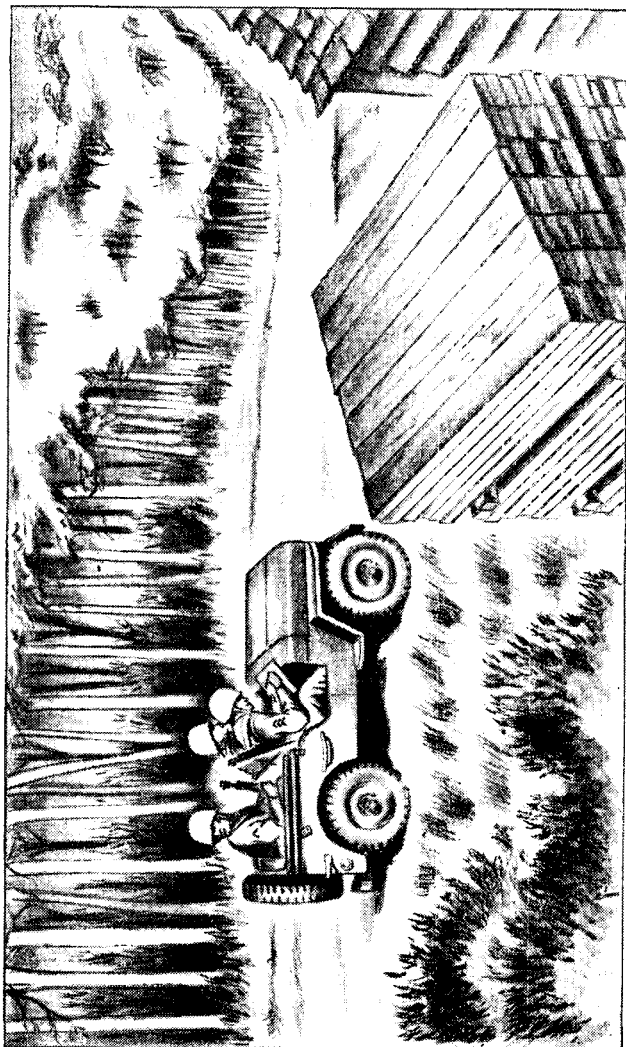


FIGURE 17.—Engineer reconnaissance should cover corduroy thicket, lumber, and other materials that may be used as expedients.

other engineer functions, and *makes certain that engineer reconnaissance reports are relayed promptly over the reconnaissance radio net, or by other means, to the division engineer.* (See par. 7.)

(b) The reconnaissance section leader employs his section to gather and transmit necessary engineer information. He must get his information back to his platoon leader without delay, either by radio or special messenger.

c. *Engineer company reconnaissance sections.*—The reconnaissance personnel of engineer companies attached to combat commands usually accompany the reconnaissance elements of the respective combat commands. Their method of operation is similar to that described above for the reconnaissance sections of the reconnaissance platoon. Information secured is transmitted by the most expeditious means to the parent engineer company. Information of use to the battalion or combat command is relayed promptly by the company commander.

d. *Reconnaissance reports.*—The following are routine subjects upon which information will be obtained and reported under varying conditions encountered:

(1) Location, character, extent and means of avoiding natural or artificial obstacles.

(2) Type, condition, load capacities, and traffic capabilities of routes and bridges.

(3) Continuing brief estimate of the terrain indicating such information as fordability of streams, commanding ground, areas suitable for tank action, defiles, and suitable bivouac areas.

(4) Location, type, suitability, and condition of landing fields.

(5) Location, type, quantity, and condition of supplies and resources; particularly construction materials, standing timber, water, fuel and lubricants, food, abandoned military stores, and transportation.

e. *Engineer situation map.*—The assistant to the division engineer at the forward echelon of division headquarters keeps an engineer situation map on which is plotted all pertinent engineer information.

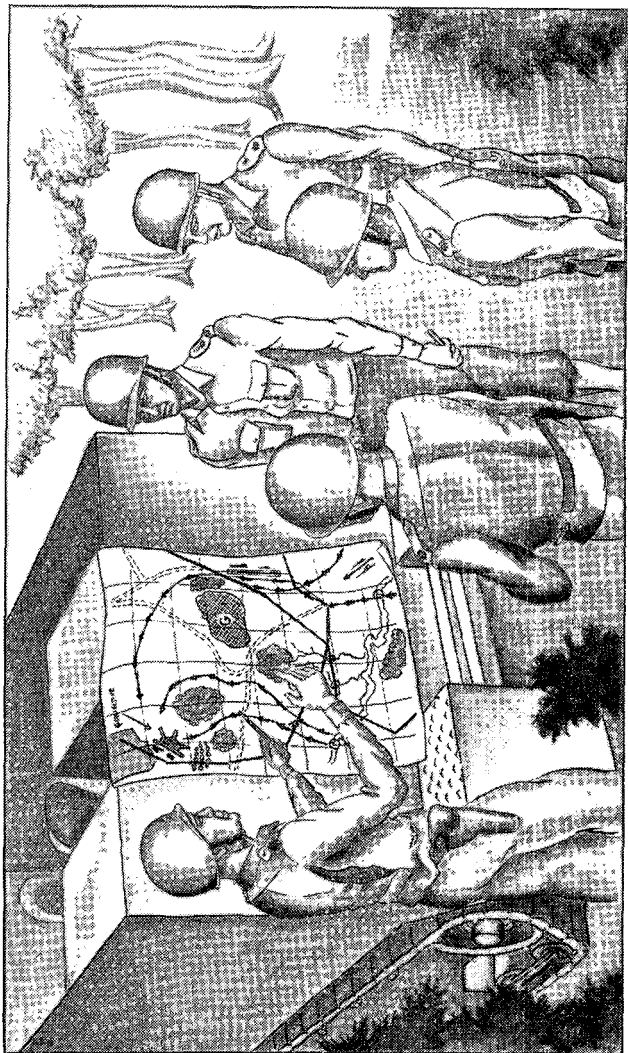


FIGURE 18.—Assistant division engineer always has a current engineer situation map.

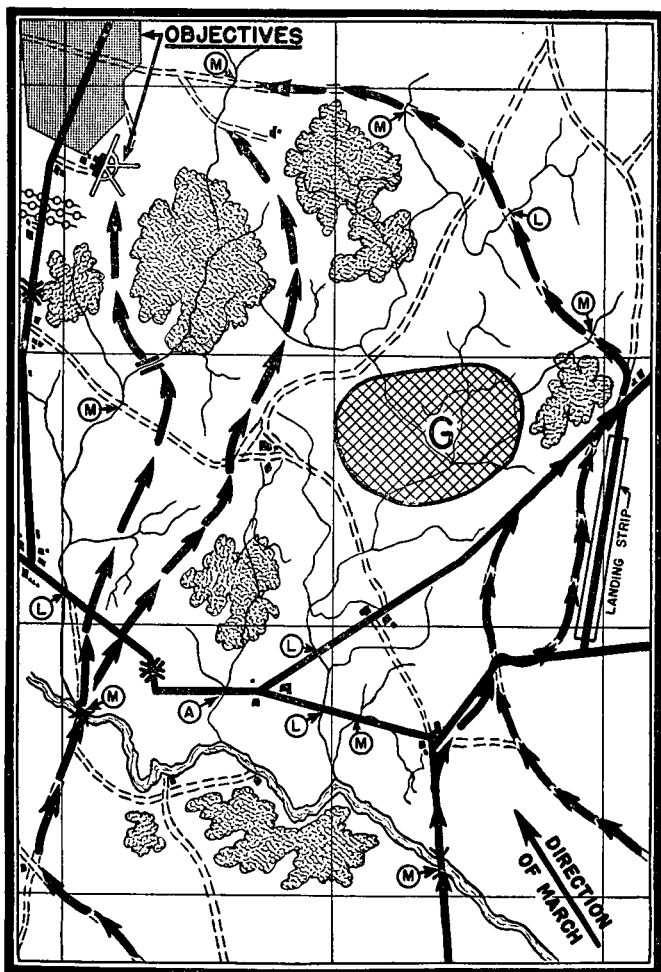


FIGURE 19.—Engineer situation map.

## SECTION IV

## MARCHES

■ 23. REFERENCES.—For the conduct of marches see FM 25-10 and FM 17-50.

■ 24. ENGINEER OPERATIONS.—*a.* When the armored division is on the march, the primary mission of the armored engineers is to insure its uninterrupted progress.

*b.* In order to minimize delay to the movement of the division, caused by obstructions on the route of march, engineer reconnaissance must be rapid and complete. Engineer units are placed as far forward as is practicable to reduce the time necessary to bring up repair parties.

*c.* Engineers must insure usable approach routes from the railheads or primary road nets, and from the bivouac areas to the assembly areas. From the assembly areas, routes may have to be prepared for the approach march.

■ 25. MARCH DISCIPLINE.—March discipline must be of the highest order. Due to the large number of vehicles in the armored engineer battalion, commanders and drivers are thoroughly trained in march discipline so that movements can be efficiently conducted.





FIGURE 20.—Do not delay movement by doing heavy work by hand if faster means are available.

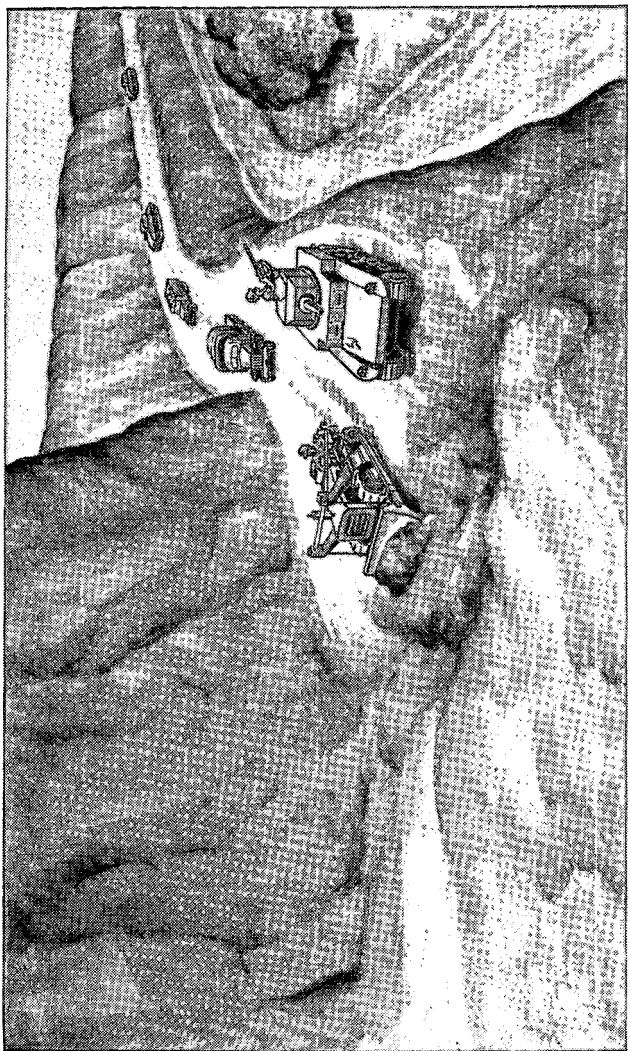


FIGURE 21.—Power equipment, if available, should be used to expedite movement of supported troops.  
*Post security detachment.*

NOTE.—In addition to security measures shown here, a security detachment has been sent forward to prevent harassing small-arms fire on the working party.



FIGURE 22.—Do not immobilize the engineer unit on a small maintenance job. Do not park vehicles in open when concealment is available. Do not post security detachment too close to work party.

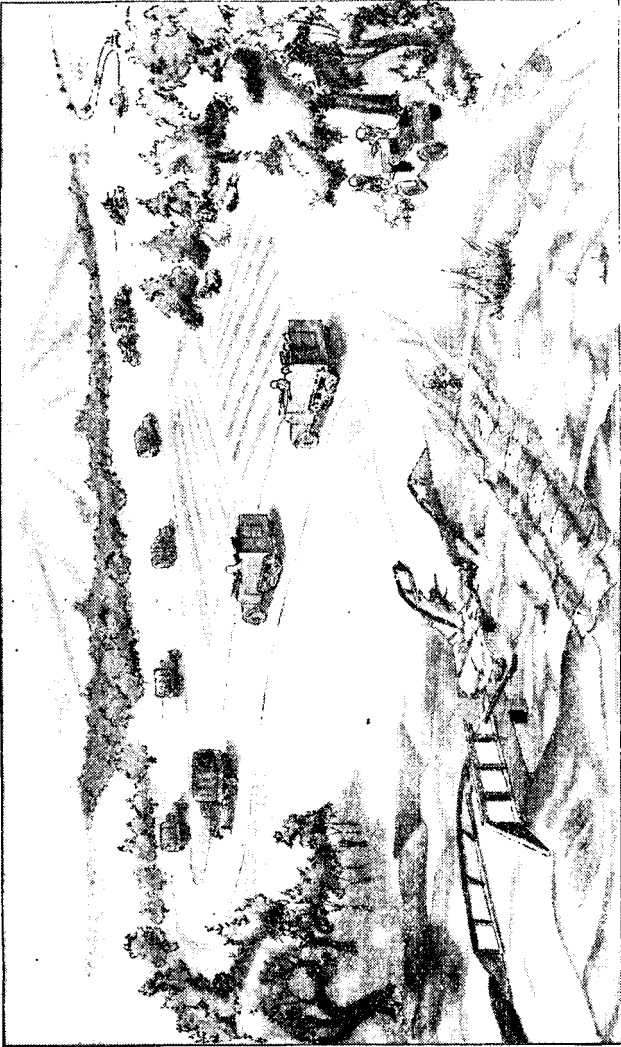


FIGURE 23.—Leave a small detail to maintain the crossing and send bulk of unit with the column.



FIGURE 24.—Do *not* place heavy engineer vehicles at the rear of a march unit and permit them to drop behind. Post guide at road junction where rear vehicles may go astray.

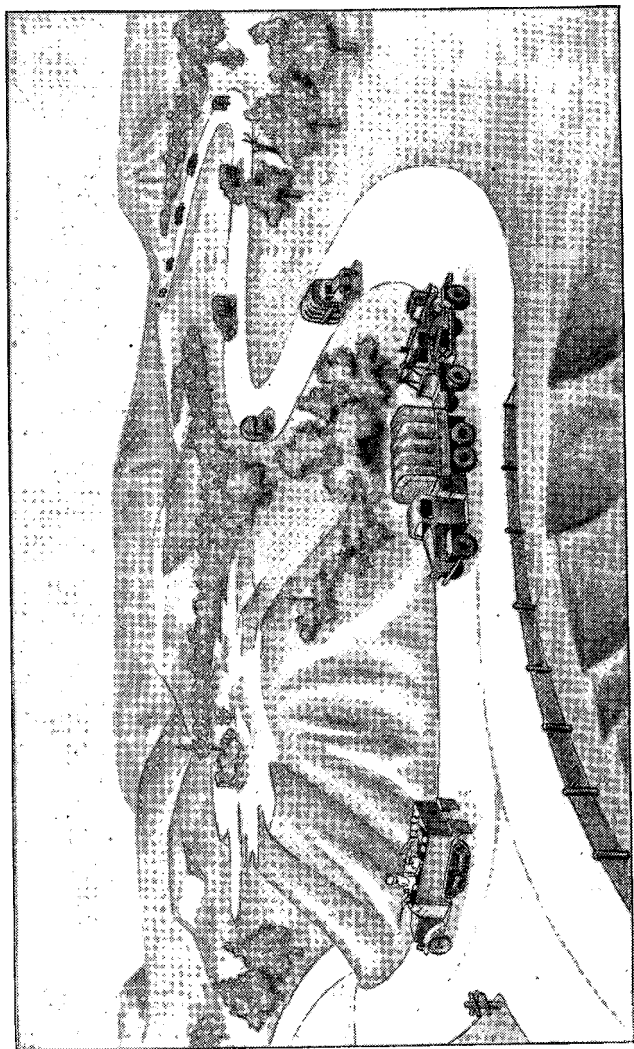


FIGURE 25.—Place slower vehicles in column where their progress can be observed and march rate adjusted accordingly. Post guide at points where rear vehicles may go astray.

## SECTION V

## SECURITY

■ 26. GENERAL.—*a.* The security provisions covered in FM 5-5 generally apply to armored engineer troops. FM 17-10 covers in detail the fundamentals of security for the armored division.

*b.* Security embraces all measures taken for protection against surprise, observation, and interference by the enemy. It includes special measures taken for protection against hostile aviation, mechanization, and chemical attacks.

*c.* Reports of battle-front observers have consistently emphasized the fact that in modern mechanized warfare every working group must provide its own protection or face annihilation by fast-moving hostile raiding parties or by paratroops. This is particularly true of armored engineer units, which must support leading armored elements operating in enemy-held territory and moving with such speed that attachment of other troops for the protection of engineer working parties is impractical. Hence armored engineer units must be trained to protect themselves against infantry, mechanized, and air attack. Normally four specially trained men of each squad, commanded by the assistant squad leader, are assigned to the defense of the squad. When operating together, the three squad security groups, commanded by the platoon sergeant, are disposed for coordinated defense of the platoon.

*d.* The division plan for general security usually includes some engineer devices and effort. These may vary from a few hasty obstacles and the hasty mining of bridges, to the connecting of natural barriers with a system in depth of deliberate and extensive artificial barriers including anti-tank mines, personnel mines, bridge and ford demolition, abatis, craters, and improvised obstacles, all properly concealed. Engineers cover all such devices by fire until relieved from that responsibility by higher authority. It is emphasized that during the time engineers are engaged in guarding these devices, their special engineering skills are not being utilized. It is, therefore, highly desirable that engineers be relieved by other troops as soon as practicable.

e. Each engineer unit from the highest to the lowest is responsible for its own local security. *Even the smallest work party must provide for this defense.*

■ 27. ON THE MARCH.—The extent to which an engineer unit on the march provides for its security depends upon the measures taken by other troops in the same column and upon the expectation of contact with the enemy. Engineers are not used as general security forces unless operating alone. An engineer unit operating alone, however, provides for its security on the march by forming advance, flank, and rear guards. (For security formations, see FM 17-32, FM 17-33, and FM 17-40.)

■ 28. AGAINST AIR ATTACK.—a. Engineer units protect themselves against air attack by the use of cover and concealment, night and cross-country marches, dispersion of vehicles, and suitable distances on roads.

b. An aircraft warning system must be organized to provide timely warning of the approach of hostile airplanes. Trained air sentinels are posted at all times to give warning of the approach of enemy aircraft. At the halt and in bivouac they are posted in positions of good observation and provided with adequate means of communication. One radio of the unit should be tuned to the air warning net or combat command net.

c. Slit trenches are dug at every halt of any appreciable length. This precaution should become a habit. Natural terrain features should be used to their fullest advantage.

d. Radio is normally silent on the march. It is silent in bivouac and must be silent for at least 1 hour before reaching bivouac.

e. On the march some weapons are directed to the front and left while others point to the right and rear. Be prepared to repel low-flying attack from direction of hills or woods.

■ 29. AT WORK.—a. The security of a working group may be provided by other troops. Infantry, artillery, aviation, and tank units may be assigned this mission. However, local security remains the direct responsibility of the engineer commander, who must either utilize his own troops for this



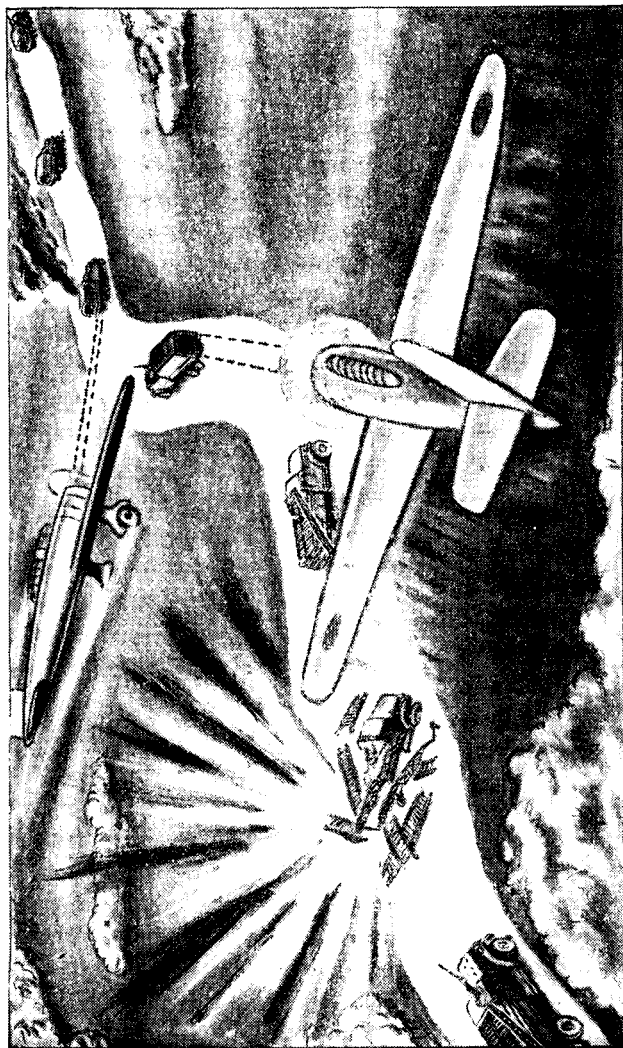


FIGURE 26.—Do not fail to provide air security for marching columns.

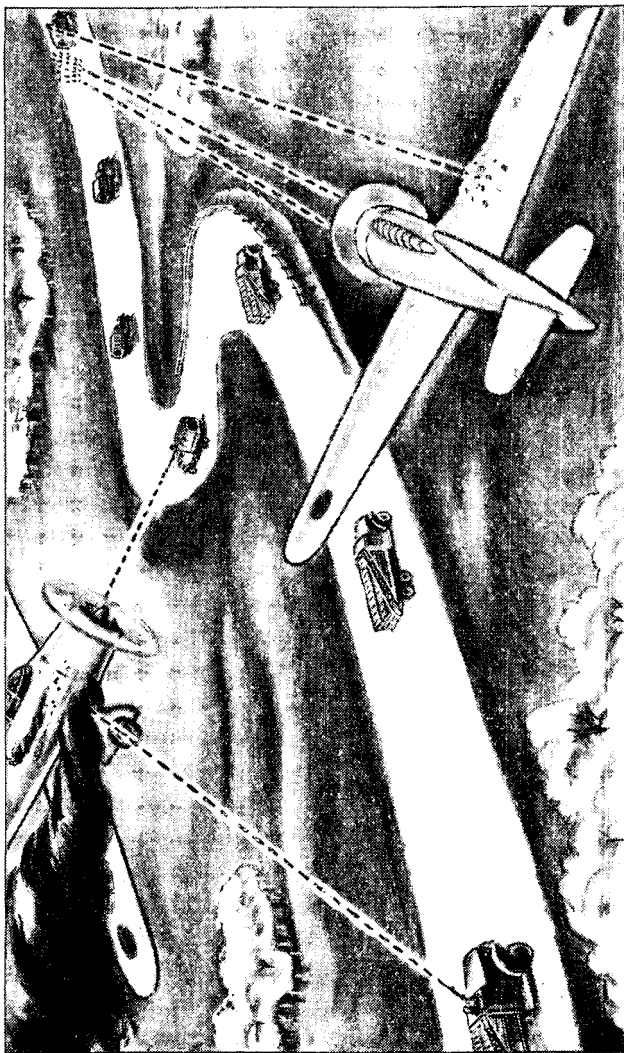


FIGURE 27. Be alert against air attack and fire with all suitable weapons.

purpose or satisfy himself that the local security measures being taken by other troops are fully adequate.

b. Each engineer commander must make a plan of action to be followed in case of enemy attack. This plan may provide for reinforcement of security elements from the working party or for the withdrawal of working groups under the protection of existing security elements as required by the situation. Troops engaged in work always keep their weapons nearby ready for instant use.

c. (1) Security against enemy ground action is provided by an outpost system. The location and nature of the outposts are determined by the anticipated enemy threat and by the location of working parties. The strength and composition of the outposts vary with the distance, mobility, and the aggressiveness of the enemy, the time of day, the terrain, the size of the command to be protected, the degree of resistance the outpost is expected to offer and any special duties assigned it. It is no stronger than is consistent with reasonable security.

(2) In all cases the security measures include the planned use of weapons mounted on vehicles and of towed weapons. Antitank mines are used for hasty road blocks. Antitank guns are of first importance in antimechanized security. Their employment is based on an initial minimum of guns in position to cover obstacles on routes of approach, with a maximum held in mobile reserve. Close-in protection must be provided by dismounted troops.

d. For security against chemicals see FM 21-40. For decontamination of vehicles see FM 17-59.

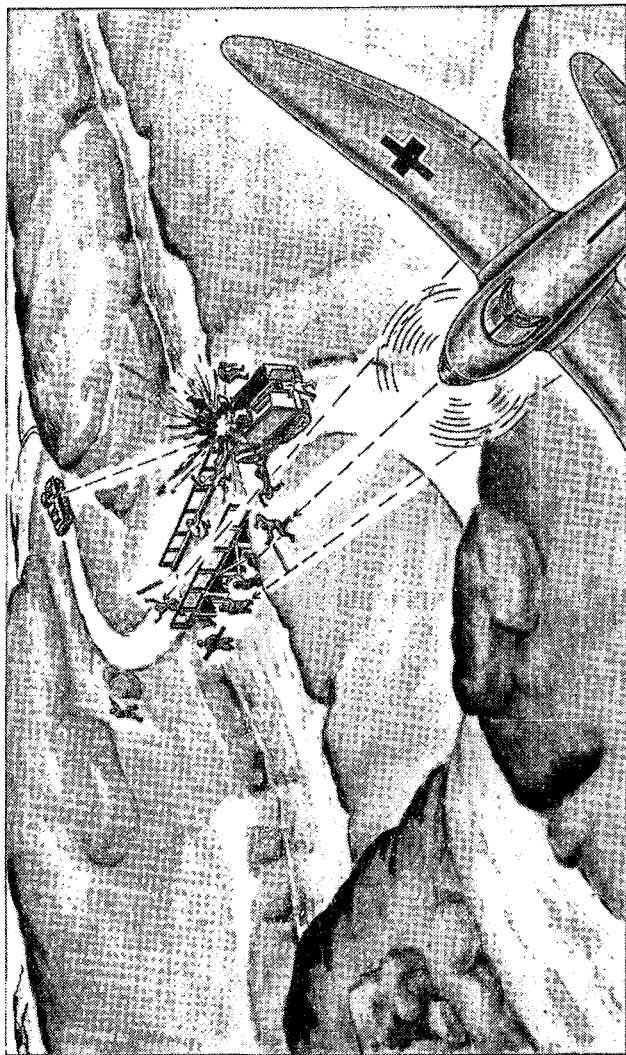


FIGURE 28.—Do not let a working party be surprised by sudden enemy attack.

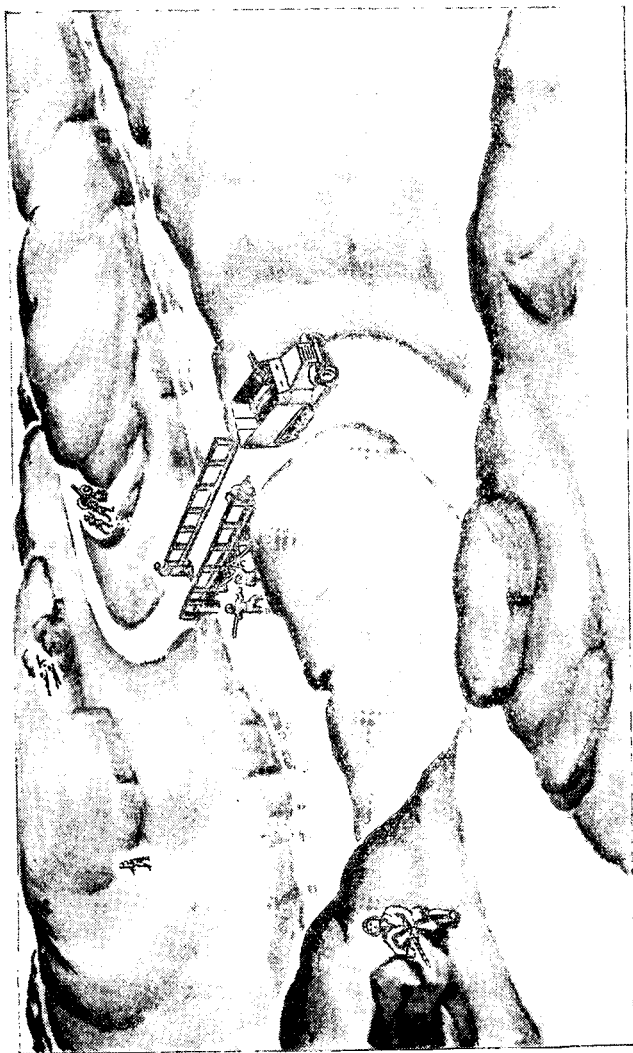


FIGURE 29.—Always provide all around local security for working parties.

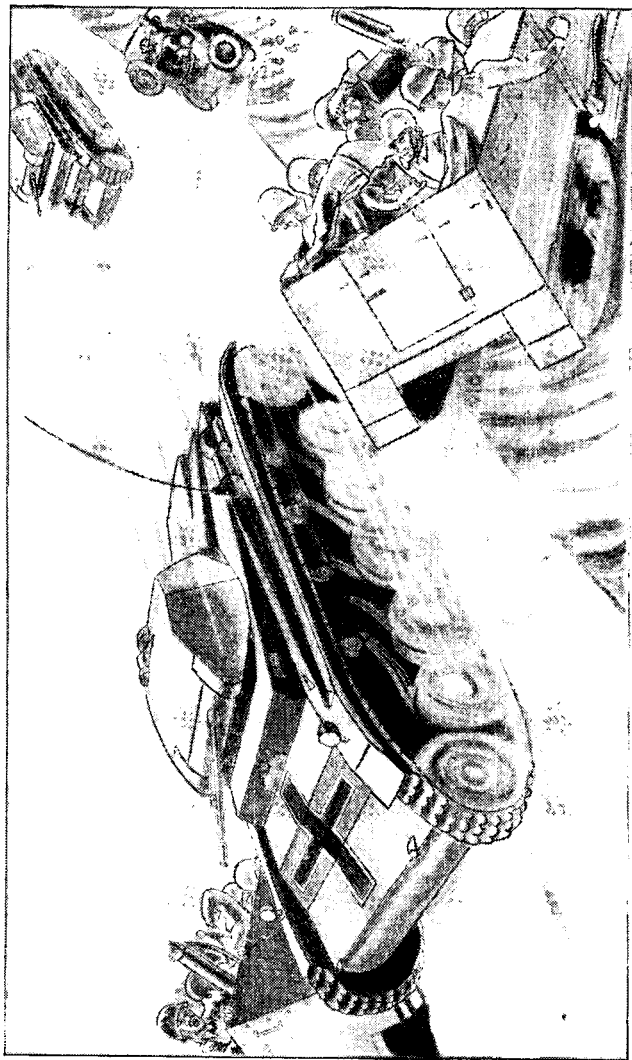


FIGURE 30.—Do not fail to provide security against enemy raids.

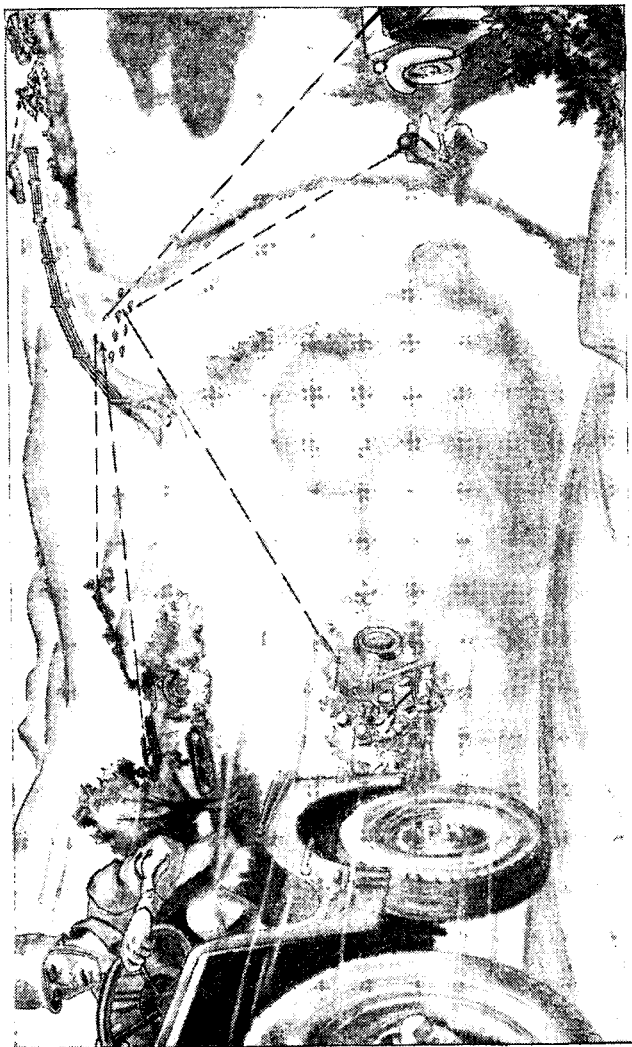


FIGURE 31.—Use antitank mines as a hasty obstacle to provide security from sudden attack.



FIGURE 32.—Use booby traps on obstacles, especially on those obstacles that are difficult to cover with fire.





FIGURE 33.—An undefended road block quickly becomes ineffective.



FIGURE 34.—Unless relieved by higher authority, engineer troops will defend barriers constructed by them. *Caution; No engineer skills are being used here.*

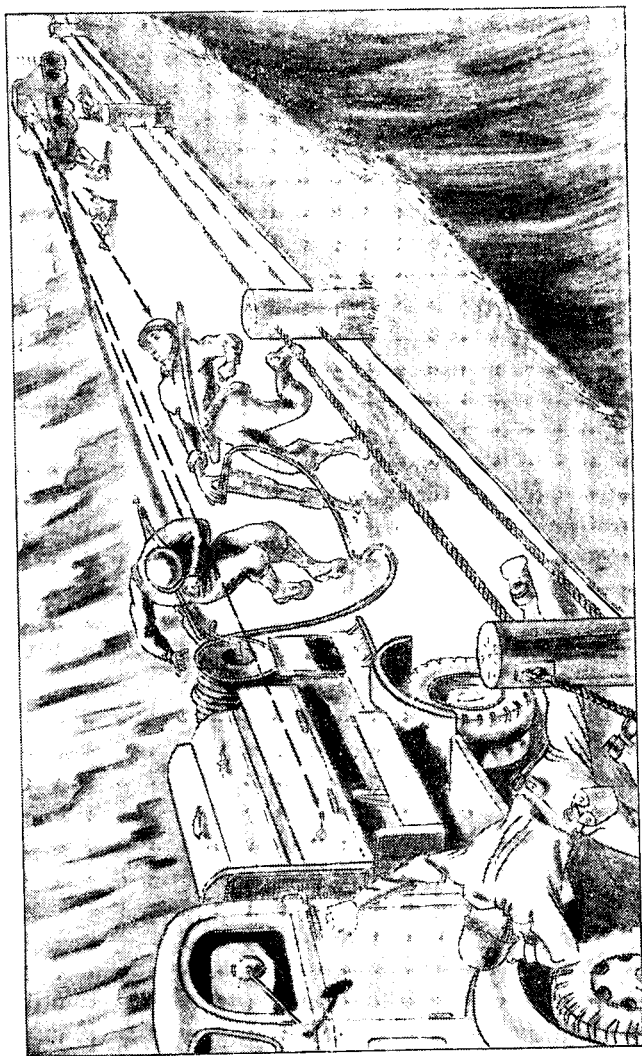


FIGURE 35.—Avoid the exposure of vulnerable engineer equipment to enemy fire.

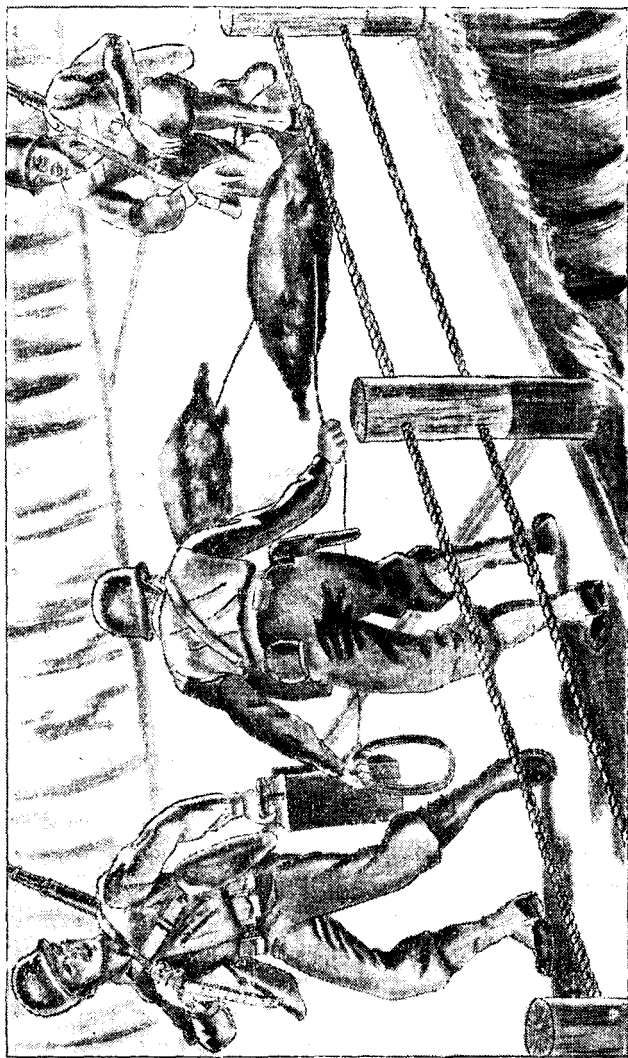


Figure 36.—When exposed to enemy raids, use time-saving expedients.

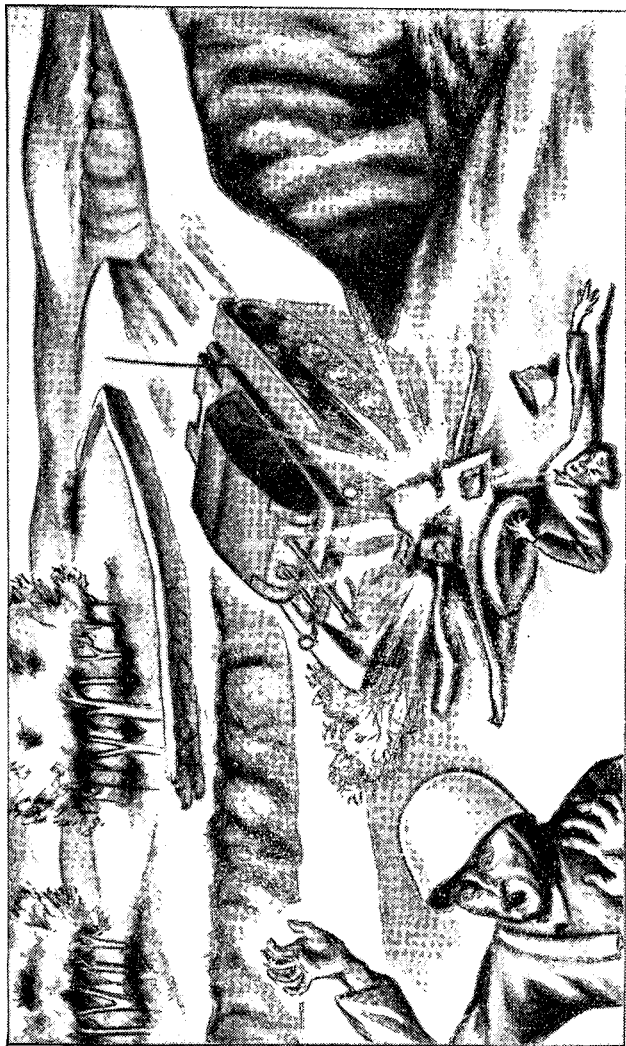


FIGURE 37.—Avoid locating antitank guns where they may be overrun by enemy tanks.



FIGURE 38.—When possible, locate antitank guns in tank-proof position. If such location is not available, camouflage and protect them with antitank mines.

- 30. COMPLETED WORK.—Where necessary for protection of a completed structure, the same general security measures

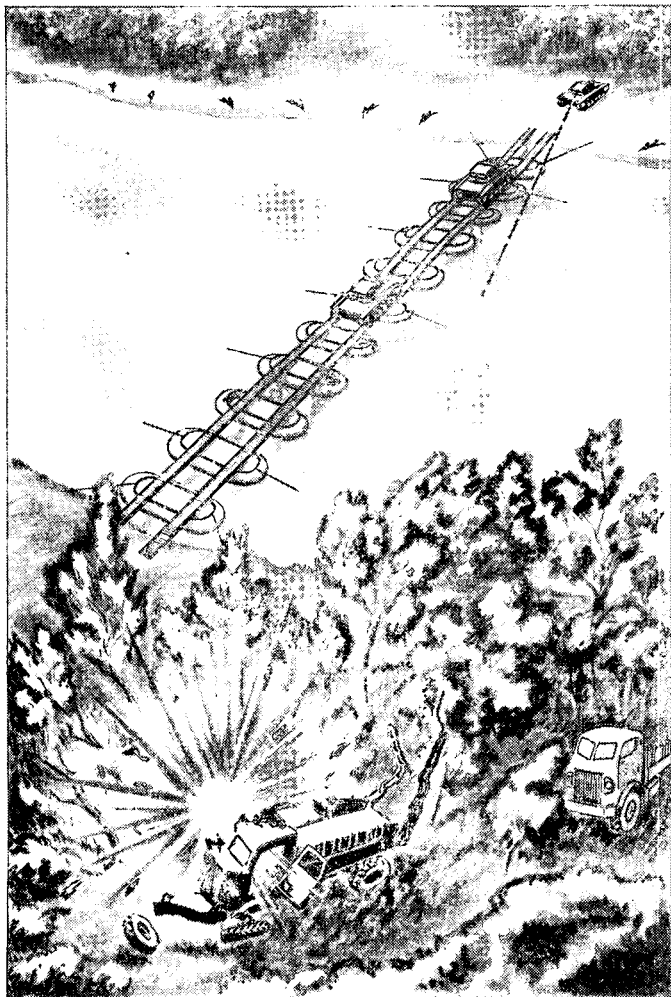


FIGURE 39.—Do not build a bridge without protecting it.

taken during progress of the work are continued after its completion.

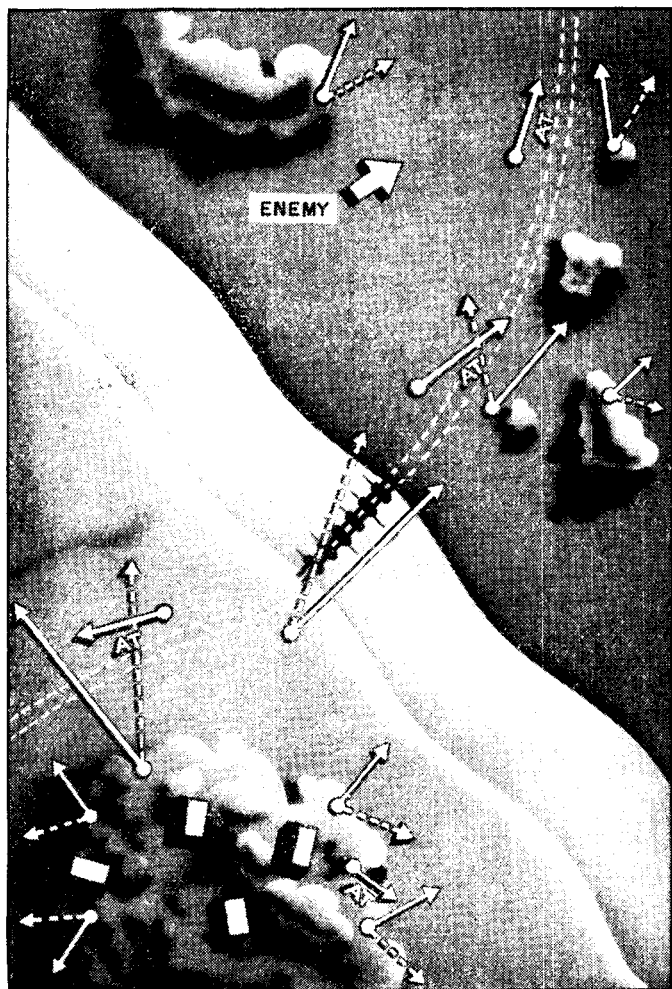


FIGURE 40.—A bridge worth building is worth defending.



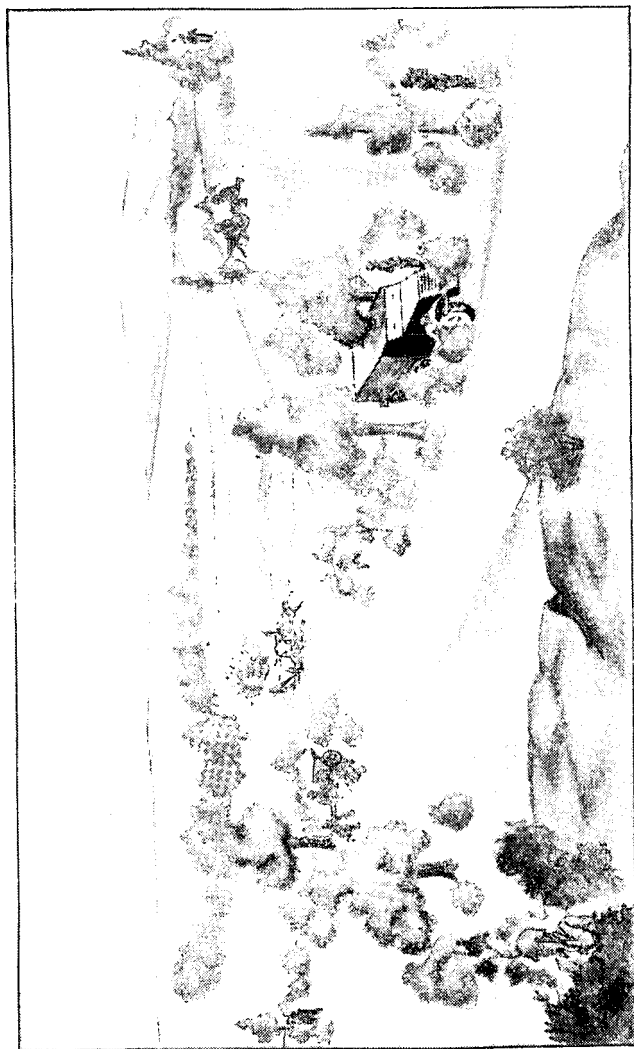


FIGURE 41.—Provide for defense for all obstacles.

■ 31. CHECK LISTS FOR SECURITY PLAN.—While not applicable to every situation the following points are of value as a check for any particular security plan:

- a. Provide for all around security.
- b. Do not unnecessarily deplete the command by large security detachments.
- c. Security parties must have rapid means of communication with their headquarters. Full use is made of motorcycles,  $\frac{1}{4}$ -ton trucks, and visual signals.
- d. Each security detachment covering a possible route of mechanized or armored approach must be equipped with at least one antitank mine for each 2 feet of antitank mine obstacle to be created.
- e. Obstacles are covered by rifle, machine-gun, and anti-tank gun fire.

## SECTION VI

### OFFENSIVE ACTION

■ 32. GENERAL.—Offensive action by armored units is covered generally in FM 100-5, FM 17-10, and FM 17-100.

a. The primary mission of engineers in offensive action is to insure the unobstructed movement of tank elements, particularly those in contact with the enemy. They build and reinforce bridges, remove mine fields, make paths through antitank obstacles, and passages over or through antitank trenches and craters.

b. Although some engineer work can be foreseen, much unanticipated engineer work will arise during battle. Leaders of engineer units from the smallest to the largest must be prepared to accept responsibility, determine what is necessary, and execute needed engineer operations without specific instructions from higher authority. *Time* is the most important factor in such operations.

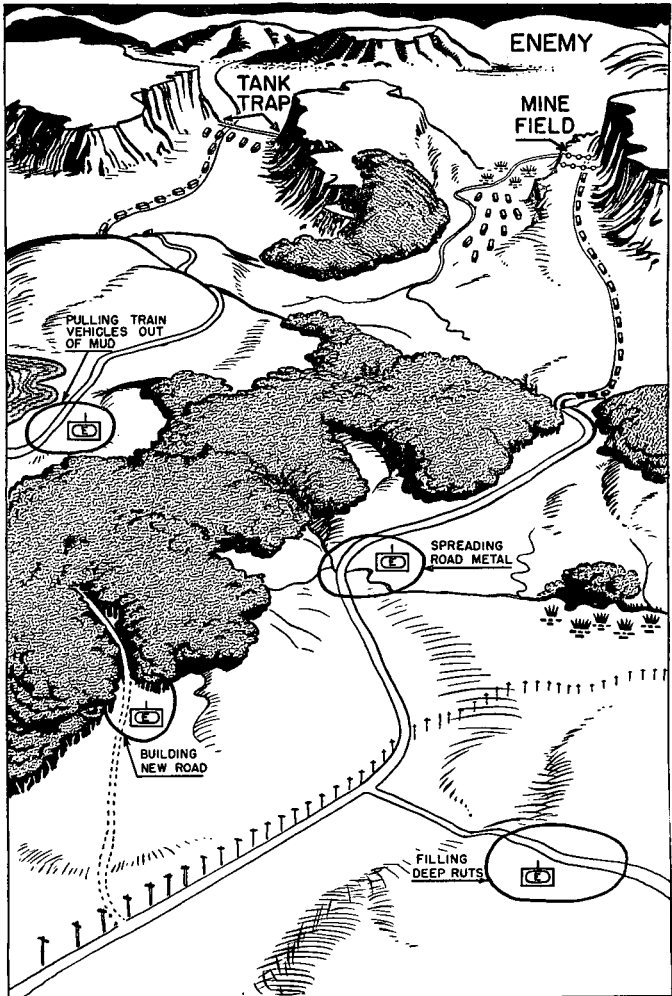


FIGURE 42.—Simple road maintenance that requires little technical skill should not consume the time of highly specialized armored engineers.

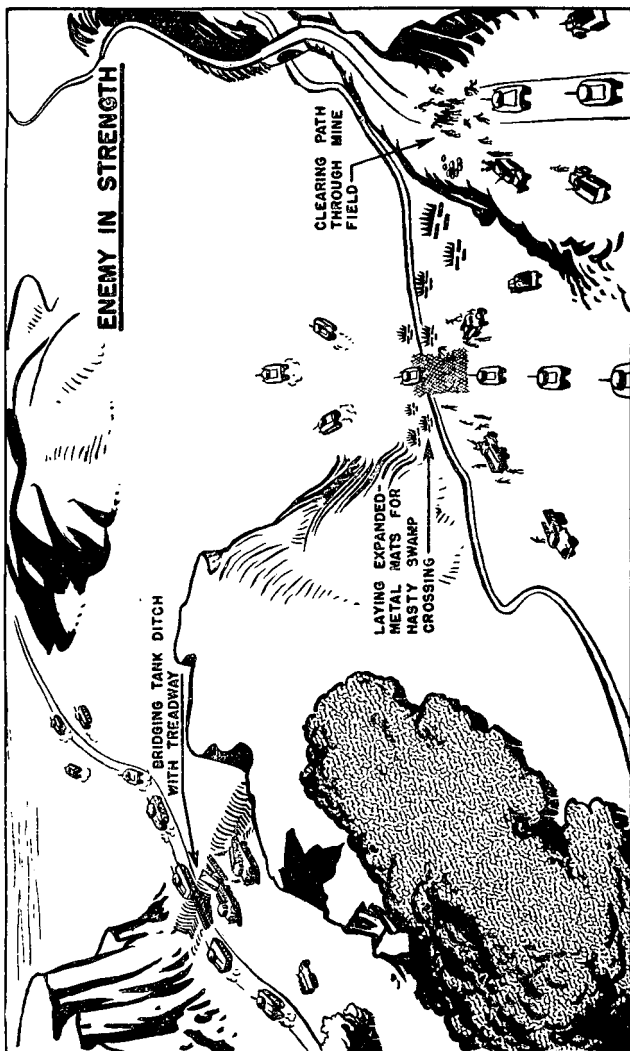


FIGURE 43.—The primary mission of facilitating the forward movement of armored units will usually require the entire strength of the engineer battalion.

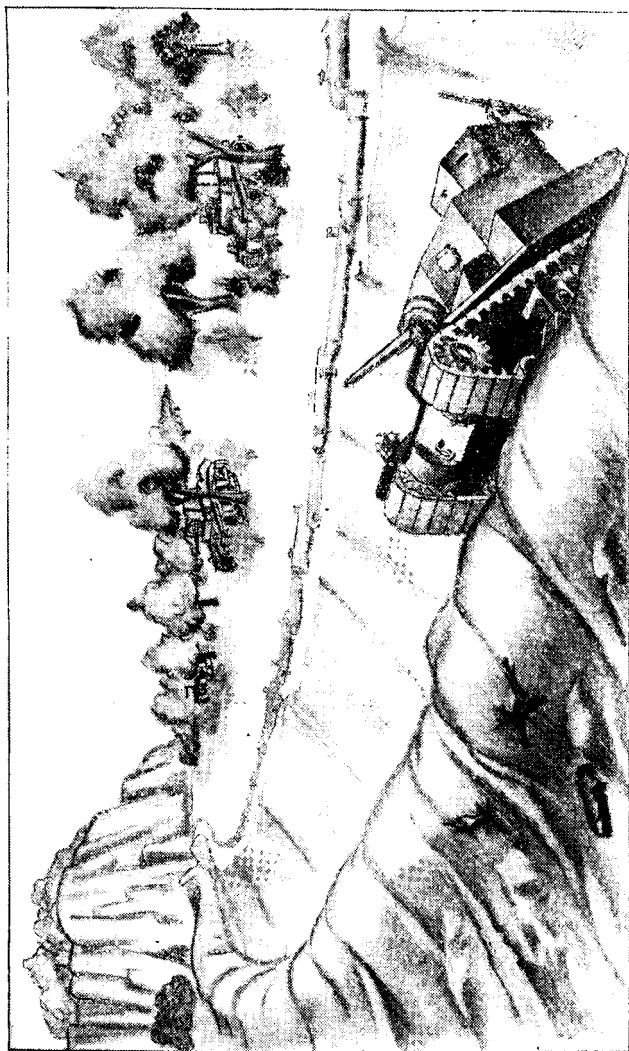


FIGURE 44.—Do not let obstacles hold up the movement of combat units.



FIGURE 45.—Obstacles must be quickly removed, bypassed, or surmounted.

■ 33. ARMORED TACTICS.—FM 17-100 indicates suggested groupings and methods of attack for the armored division. Irrespective of the size or composition of the unit an engineer estimate must be available for use by each group commander for each situation. The senior engineer officer makes this estimate.

■ 34. ACTION IN A MEETING ENGAGEMENT.—Aggressive and rapid engineer reconnaissance must be accomplished, followed by a quick engineer estimate of the situation. Continuous engineer battle reconnaissance must be executed. The principal engineer effort is directed toward expediting the probable envelopment by our own forces of either or both enemy flanks. All engineer antitank guns must be ready for instant action against hostile mechanization.

■ 35. ATTACK FROM ASSEMBLY AREA.—*a.* To assist the movement of the division into the assembly area, engineers—

(1) Remove obstacles on approach roads.

(2) Improve fords, strengthen, repair, or construct bridges, and install and operate ferries.

(3) Provide up-to-date map information secured through engineer reconnaissance, study of air photographs, or from other sources.

(4) Provide flank security by use of demolitions and obstructions on flanks and to the rear.

*b.* In the assembly area, engineers—

(1) Operate water points.

(2) Reconnoiter tank routes for the attack, prepare complete plans for required work, and carry out such work in advance of the attack where this procedure will not disclose our plans to the enemy.

(3) Assemble engineer supplies and equipment needed to support the contemplated operation.

(4) Furnish technical advice and supplies for the camouflage of vehicles of other units.

*c.* Engineers in the approach march—

(1) Prepare tank routes to the line of departure.

(2) Facilitate the advance beyond the line of departure by providing and installing special means for vehicles to cross

streams, canals, marshes, gullies, trenches, antitank ditches, and similar obstacles.

(3) Clear and work lanes through mine fields.

*d.* Engineers are available to insure the timely removal of obstacles and mines. During these operations they must be protected by tank, artillery, and infantry fire.

■ 36. ATTACK AGAINST A FORTIFIED POSITION.—*a.* Armored units are seldom used to attack a fortified position. Usually hostile positions such as fortifications on commanding ground, cities or dense forests are bypassed. If it is necessary to attack such a position, specially organized assault units, including engineers, massed artillery support, and bombardment aviation are used.

*b.* A procedure in the reduction of fortified position may be as follows:

(1) Engineers preceded by tanks advance to the front and flanks of the position as far as the protective bands of natural and artificial barriers.

(2) Engineers and infantry covered by fire of tanks, artillery and combat aviation, if available, clear lanes through barriers and then again follow the tanks.

(3) Tanks and flat trajectory, high muzzle velocity anti-tank and antiaircraft artillery weapons close in and, firing from defilade, cover the final assault of the engineers and infantry.

(4) Engineers using explosives, flame throwers, and other weapons destroy gun emplacements and breach walls.

■ 37. MOPPING UP OPERATIONS.—An important mission which may fall to engineer assault detachments is the capture and clearing of street barricades and the mopping up of resistance in buildings. The technique involved is similar to that used in the reduction of fortifications. Houses are usually attacked and reduced by using explosives. Barricades are outflanked by assault parties which advance from house to house.

■ 38. PURSUIT (see also FM 17-10).—*a.* Armored units must pursue to the limit of their abilities even into the night. No halts are made, even temporarily, for reason other than depletion of fuel and ammunition supplies or enemy action.



Tanks lead the engineers and infantry with the artillery in close support. Heavily defended areas are avoided whenever possible.

b. About twice the usual number of engineer troops is allotted a combat command assigned to pursuit mission. The engineer work, consisting of the seizure of bridges before they are destroyed, hasty reduction and removal of barriers, and bridging of streams, is pushed to the maximum ability of the assigned engineers. Engineer supplies, particularly hasty bridging equipment, are kept well forward in the advancing columns.

c. In the envelopment of retreating hostile troops, two primary functions of the engineers are—

(1) Expediting the movement of the tank units by hasty removal of barriers and the bridging of streams.

(2) Retarding and isolating enemy units by placing hasty obstacles in front of their retreating columns.

d. Engineer troops may be transported in tanks to accomplish these missions. They must be quick to recognize and exploit opportunities. Control must be decentralized to subordinate engineer unit commanders.

■ 39. ATTACK OF A STREAM LINE.—*a. General.*—The subject of river crossings is covered generally in FM 100-5.

(1) In the attack of a stream line full advantage is taken of the mobility of the armored units and of engineer expedients. On occasion, a detour to use an existing bridge may be made more quickly than a demolished bridge can be repaired or replaced. To maintain the tempo of attack, an improvisation which gets a tank column across a minor stream in a few minutes is preferable to a more permanent structure requiring an hour or more for construction.

(2) With advanced echelons, a bridge is never built initially when a ford is sufficient. Speed of movement is never sacrificed for perfection or even safety in a structure.

(3) So far as possible, standard bridge equipage consisting of lumber, expanded metal mats, treadways and treadway supports (both fixed and floating) should always be available for use with leading echelons. However, when time permits, maximum use is made of local material so as to conserve standard equipage for more critical occasions.

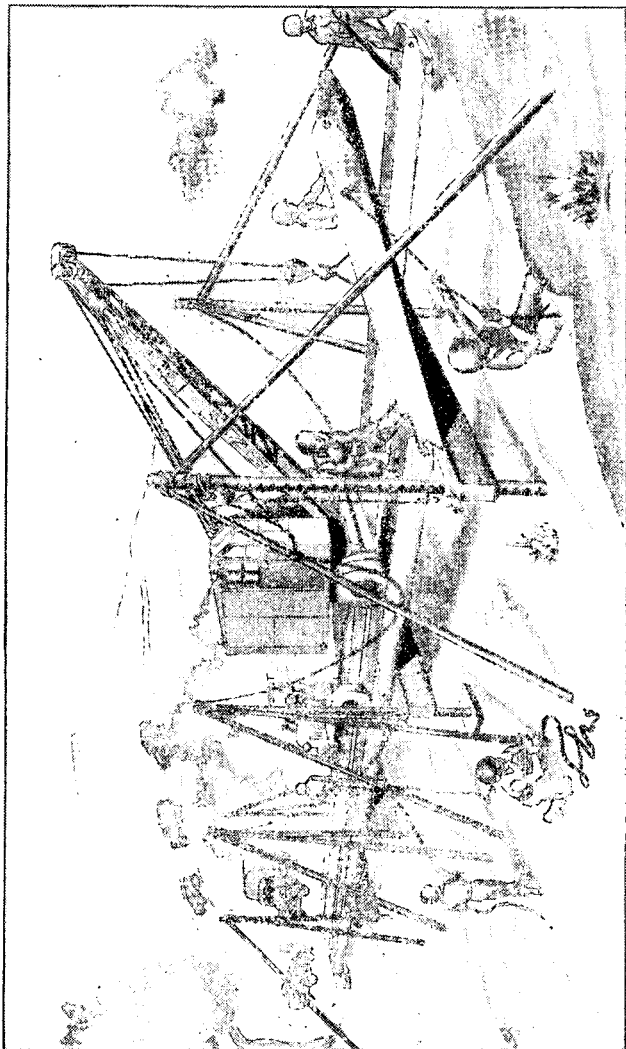


FIGURE 46.—Do not waste valuable time building unnecessary bridges.



FIGURE 47.—Utilize quick bridge expedients where possible.

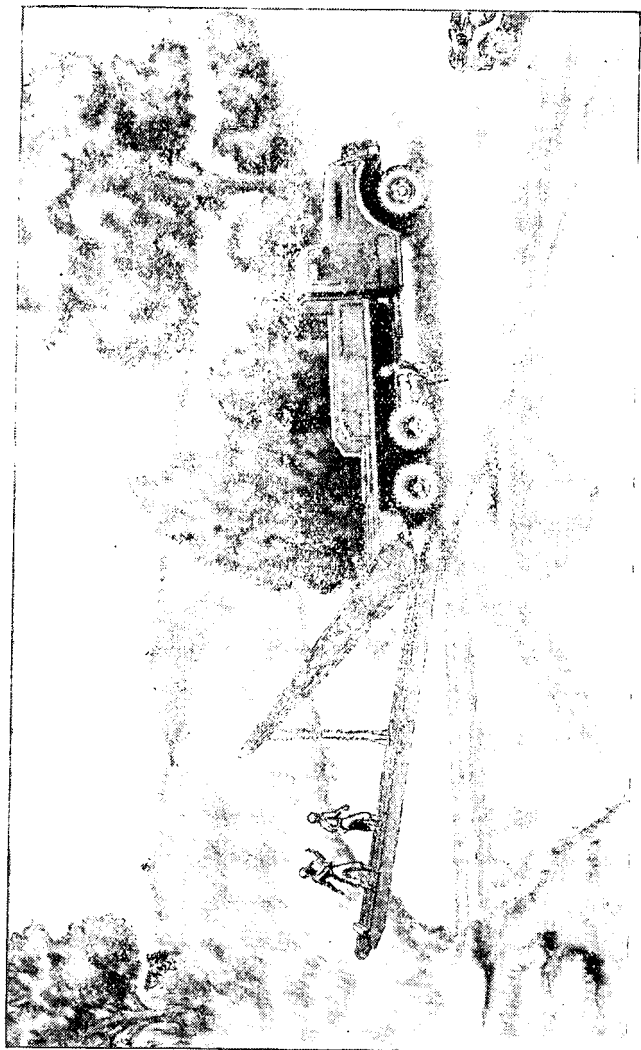


FIGURE 48.—Treadways may be placed to bridge a small stream quickly.

(4) In river crossings, the engineers are responsible for operations from the time the crossing troops are met by the engineers at the assembly areas until they are landed on the far shore.

*b. Hasty crossings.*—In an exploitation or pursuit, attacking forces may come upon a stream line before the defender has had time to exploit its possibilities as a barrier. Engineers with advance guard or pursuing detachments remove partially placed demolitions, and utilize the fastest means available to provide crossings over demolished or partially demolished structures.

*c. Weakly held crossings.*—(1) Where crossings over unfordable streams are weakly held, the division reconnaissance personnel, including elements of the engineer reconnaissance platoon carrying reconnaissance boats, approach as close to the stream as possible. Under cover of their own machine-gun, antitank, mortar and assault gun fire, these troops inflate the boats, rush them to the water, and paddle across. The crossing is made on as broad a front and with as much speed as possible. After the enemy shore is reached, troops seek initially to seize terrain which will prevent direct fire of small arms on the crossing point. Often smoke is used to screen the crossing.

(2) Immediately behind the initial wave, additional troops, mortars, and antitank guns are crossed in assault boats and rubber ponton floats. Meanwhile, the treadway bridge is brought up, heavier ferries placed in operation, and finally the floating treadway bridge constructed. Throughout the whole operation, all ferries and ferry rafts are operated to maximum capacity, pouring strength into the bridgehead.

*d. Forced crossing.*—(1) The armored division is not particularly adapted for use in forcing a major crossing against an alert enemy. An attempt to force a crossing with an armored division amounts to immobilization of the major part of an arm and therefore the division loses its greatest weapon, mobility.

(2) When the armored division forces a crossing alone the procedure is generally as described in FM 5-5 and TM 5-270. Engineer reconnaissance elements, maps, and air photographs supply general engineer information. Special



FIGURE 49.—Do not delay assault crossing by firing from boats.

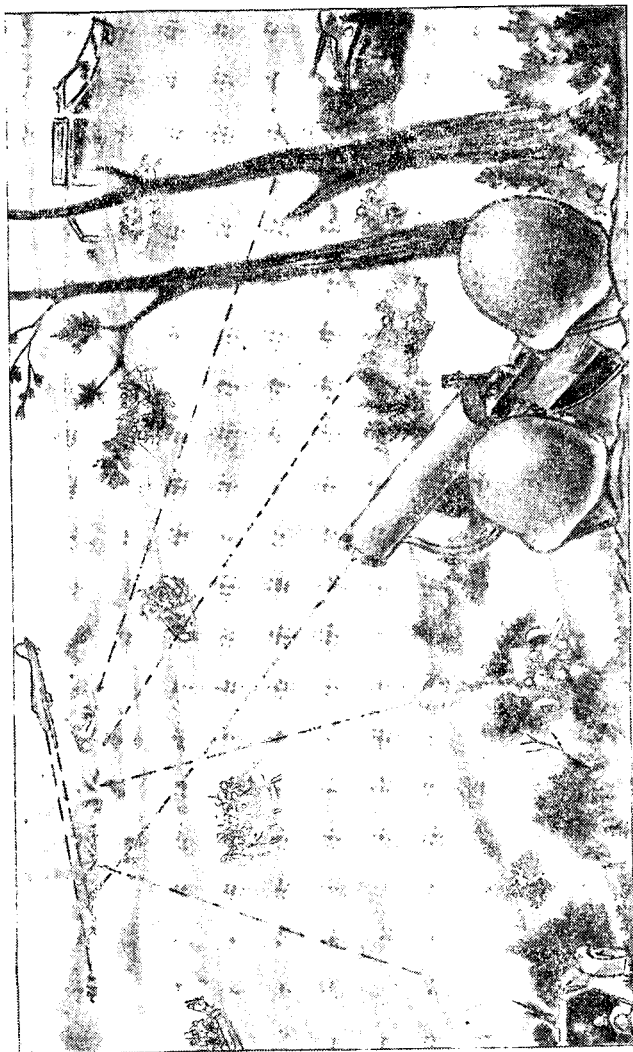


FIGURE 50.—Concentrate on getting troops across in a short time. Supporting units must furnish fire support.

bridge reconnaissance data are secured through personal inspections by the division engineer and his staff and by the reconnaissance elements of the engineer battalion. The crossing is usually accomplished under the direct supervision of the division engineer.

■ 40. **TEMPORARY LANDING FIELD CONSTRUCTION.**—On occasion, armored engineers may be used to construct temporary landing fields in forward areas to facilitate aviation support for the armored division, although this is ordinarily the work of troops of higher echelons. Such work is limited principally to the conversion of sections of main highways to runways, and the provision of means of bypassing vehicular traffic. The specific tasks include—

- a. Location of suitable sites.
- b. Procurement of necessary construction materials and equipment.
- c. Limited and rapid work on existing road surfaces and shoulders of the roadway.
- d. Construction of bypasses for vehicles.
- e. Removal of natural and artificial air traffic obstacles.
- f. Camouflage of airplanes, field installations, and possibly runways.
- g. Maintenance of facilities provided.

■ 41. **BRIDGE COMPANY IN COMBAT.**—The use of the bridge company as riflemen in offensive combat is rare. Their principal combat mission is to protect operations and equipment of the unit when at work and to provide security when in movement or in bivouac.

## SECTION VII

### DEFENSIVE ACTION

■ 42. **GENERAL.**—a. The principal functions of armored engineers in the defensive, including withdrawal and delaying actions, conform to those prescribed for offensive action. Other duties of engineers in defensive action include—

- (1) Clearing and repairing routes for tank counterattack.
- (2) Securing routes of withdrawal and supply by construction of road blocks, mine fields, and other obstacles.



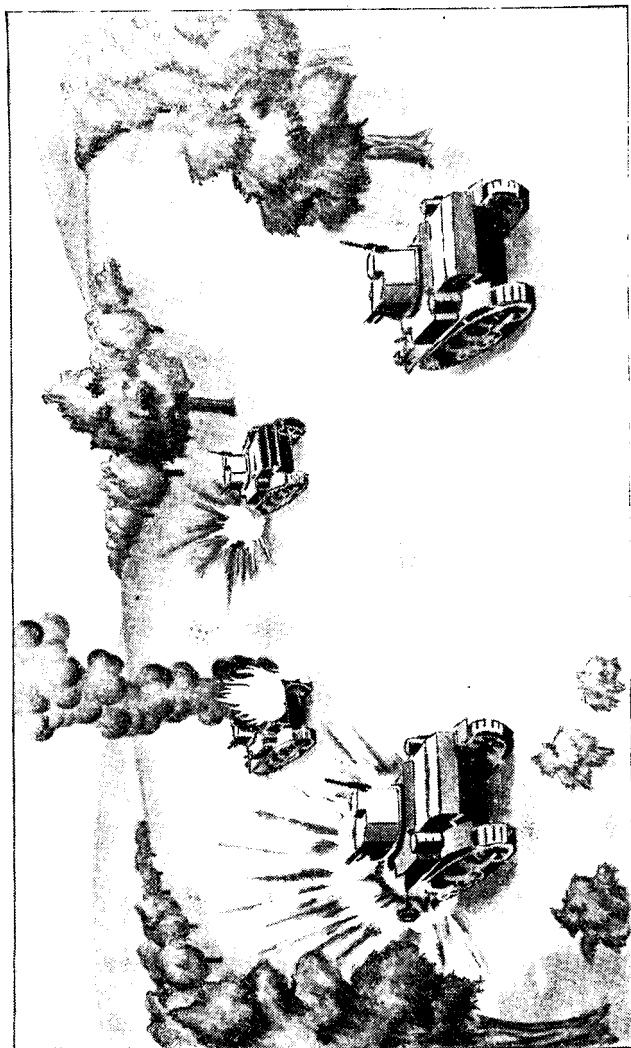


FIGURE 51.—Do not permit friendly tanks to run into your own antitank mines.

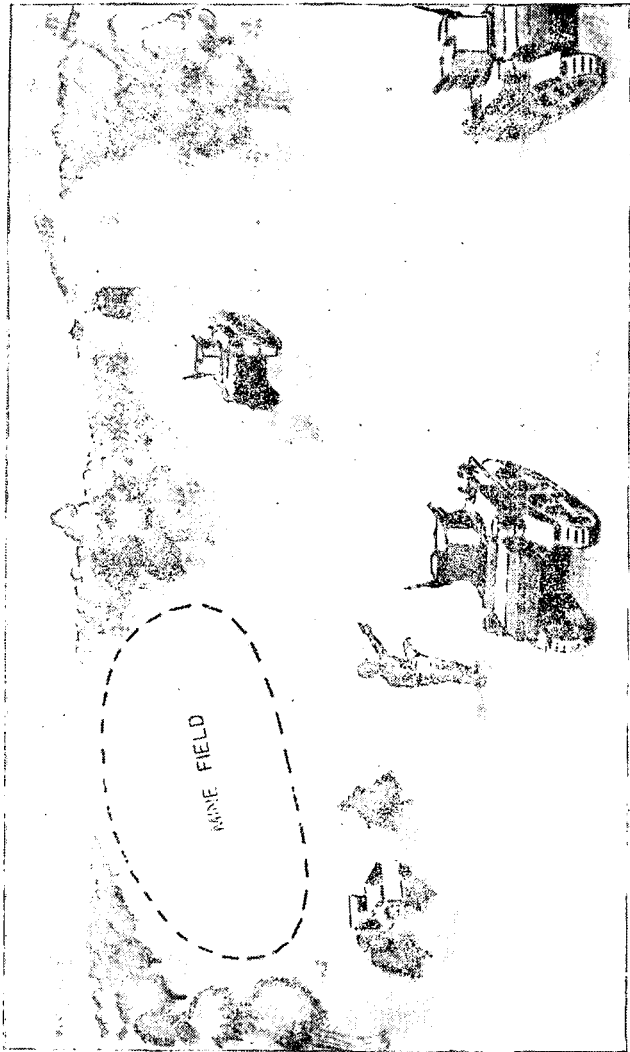


FIGURE 52.—Engineers should provide guides and maps to assure passage through mined areas.

(3) Guiding friendly troops through prepared obstacles.

b. All fords and bridges are prepared for destruction. Those not to be used by withdrawing reconnaissance and delaying elements are destroyed. Others are prepared for destruction and defended by fire of automatic weapons, anti-tank guns, and tank destroyers if available. A prepared demolition is never left unguarded. An engineer officer or noncommissioned officer is stationed at each bridge or ford prepared to destroy it instantly if otherwise it would fall into hostile hands.

c. Engineer platoons or squads will lay antitank mines across approach roads at the most suitable bridge or defile and defend the temporary block thus formed with their organic weapons.

■ 43. ACTION IN A WITHDRAWAL.—a. Armored engineers form part of the rear guard, their chief mission being to impede the enemy by demolitions and obstacles. The rear guard usually moves by bounds by echelons. Demolitions may be prepared and guarded by elements of the leading echelon, and the demolition actually executed by echelons following in the rear.

b. Engineer troops working on the flanks near the head of the retiring column perform such demolitions on either flank as are necessary to protect the column from attacks by enemy armored or motorized units.

c. In withdrawals and delaying actions, the division engineer should prepare for the approval of the commanding general a plan of demolitions. Although the plan is directed by the division engineer, the actual execution must be decentralized.

■ 44. DELAYING ACTION.—a. Against an unarmored enemy, our own delaying forces usually consists of infantry supported by engineers, tanks, and artillery.

b. Against an armored force, our delaying forces comprise tanks supported by engineers, artillery, and tank destroyer units. Engineers and infantry support the tank destroyer unit in the protection of flanks.

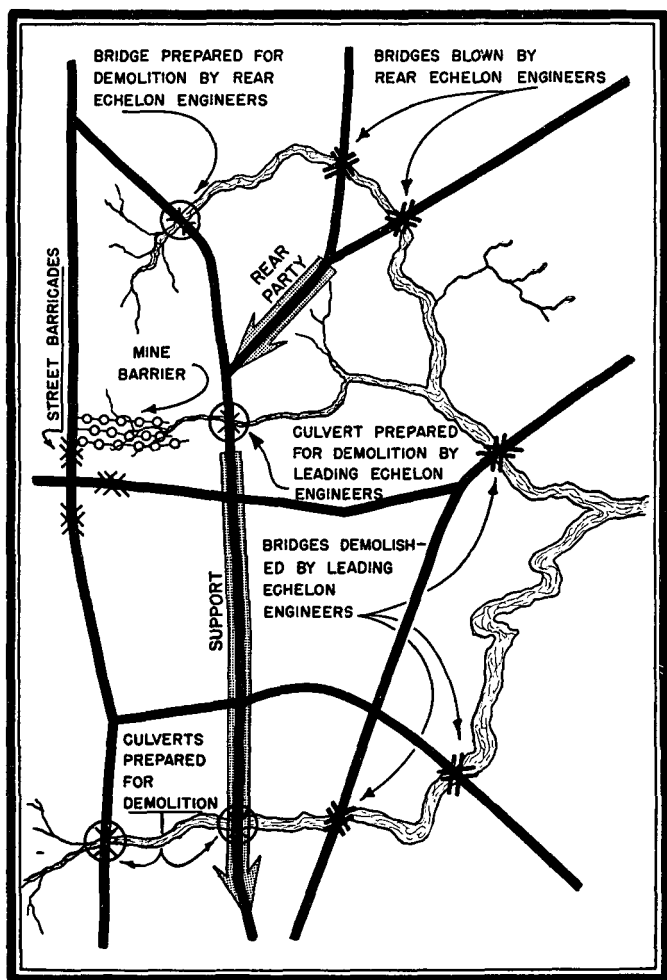


FIGURE 53.—Armored engineer action in the rear guard.

■ 45. DEFENSIVE ACTION DURING OFFENSIVE.—Extensive engineer defensive work on the flanks may become of supreme importance when the armored division is nearing its objective in a deep offensive drive. Although the major effort of the engineers is intended to facilitate the movement of the spearhead of the attack, the entire personnel of the armored engineer battalion must be prepared on short notice to assist in protection of the column's flank and rear.

■ 46. DEFENSE OF RIVER LINE.—*a.* In the defense of a river line, a large part of the armored units is held in mobile reserve, or reserves, prepared to strike at any point or points of hostile crossing. Reconnaissance is conducted as long as possible on the enemy side. Patrols are used to detect hostile crossings.

*b.* Engineers mine all bridges, dams, and fords and demolish all not needed for contemplated immediate operation. Engineers and infantry prepare barriers on the near bank and, if time is available, organize the occupied area into barrier zones for defense in depth. Engineers insure good routes for our reserves to possible hostile crossing points and patrol the stream for enemy activity.

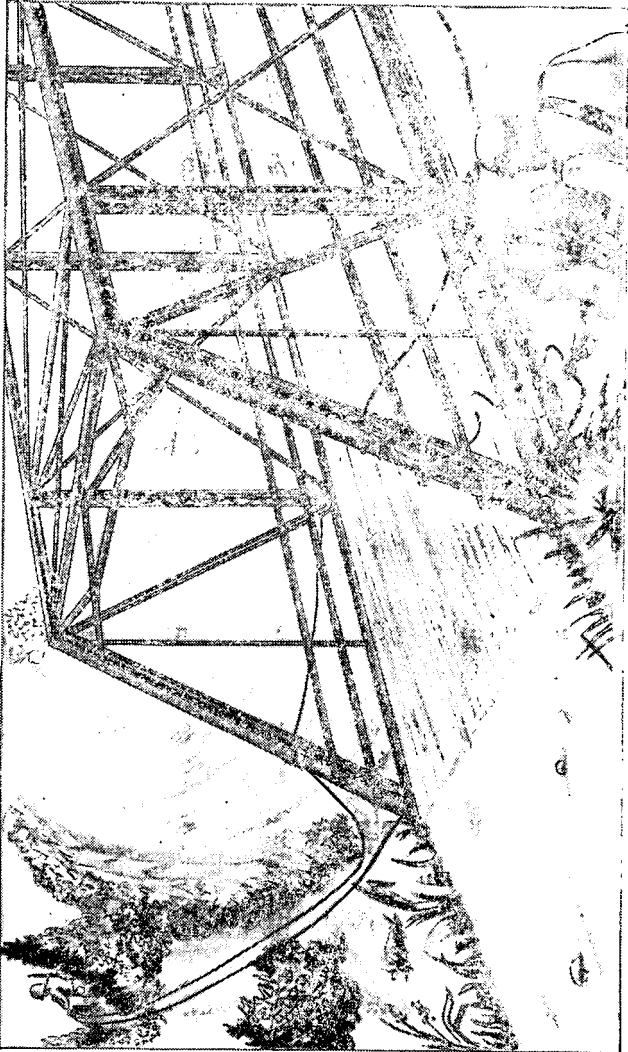


FIGURE 54.—Do not let the enemy approach prepared demolitions unobserved.

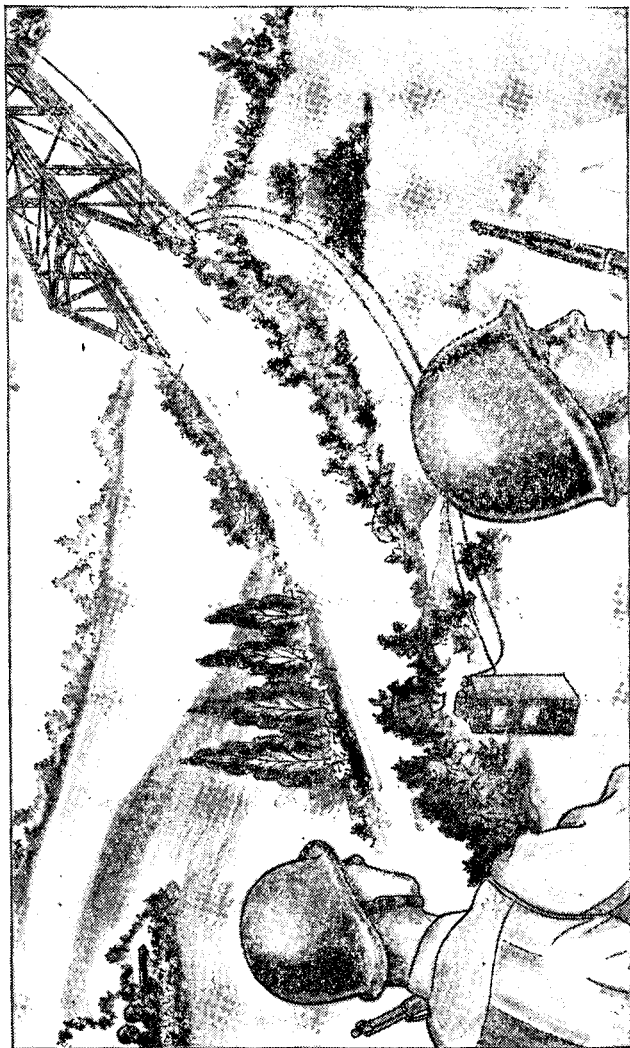


FIGURE 55.—Place guards where they can protect lead wires to detonator.

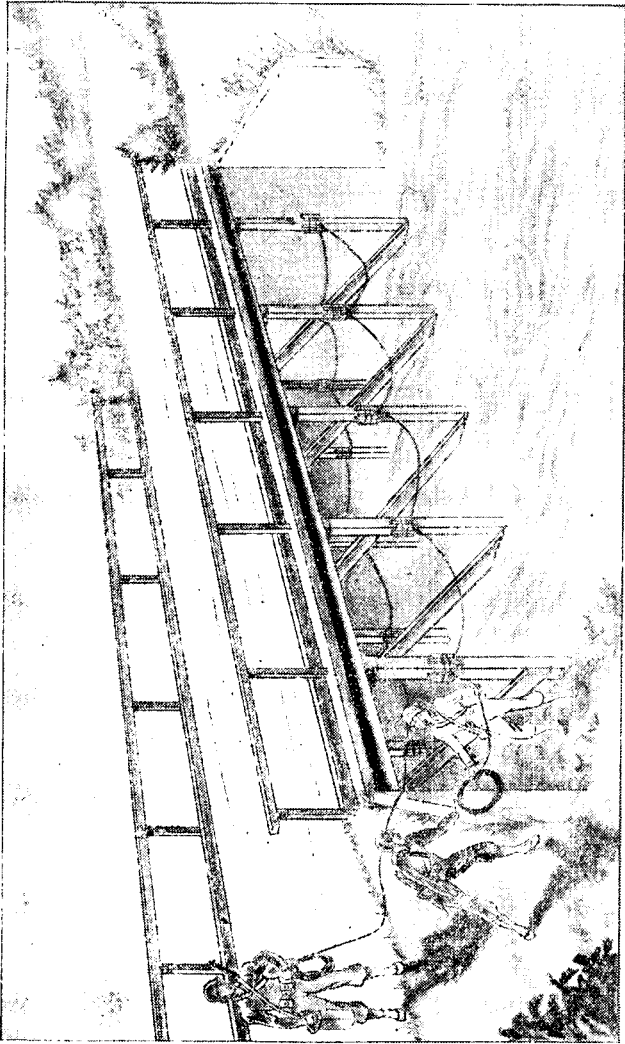


FIGURE 56.—Do not waste valuable explosives.



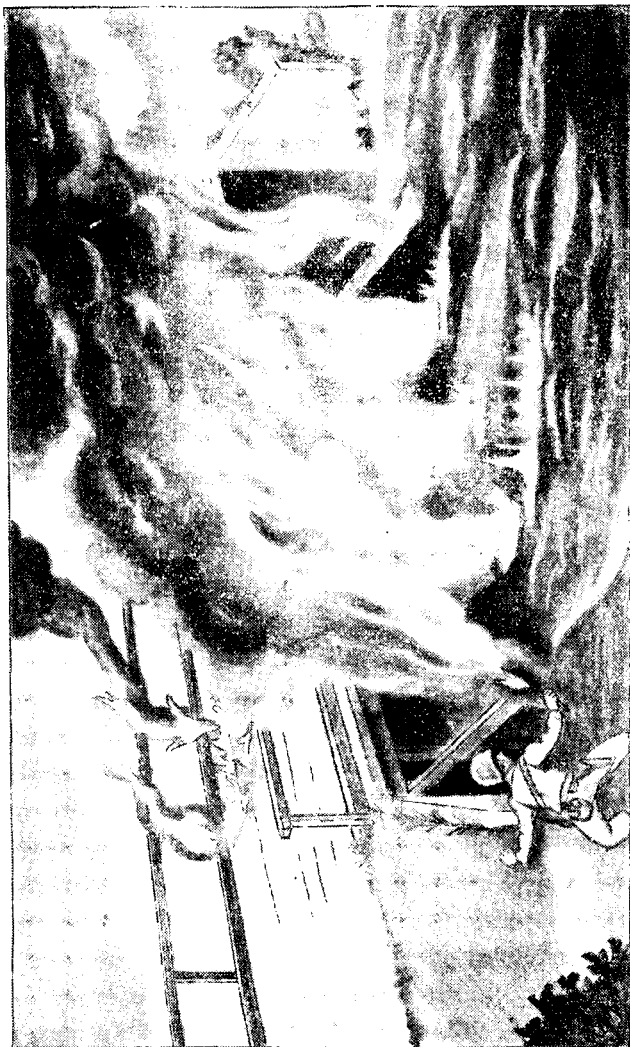


FIGURE 57.—Economize on explosives; use expedients when practicable.



FIGURE 58.—Do not waste explosives by overdemolishing a bridge.



FIGURE 59.—Demolition should be of such extent that it will take the enemy longer to repair the bridge than to construct a new temporary bridge or ford.

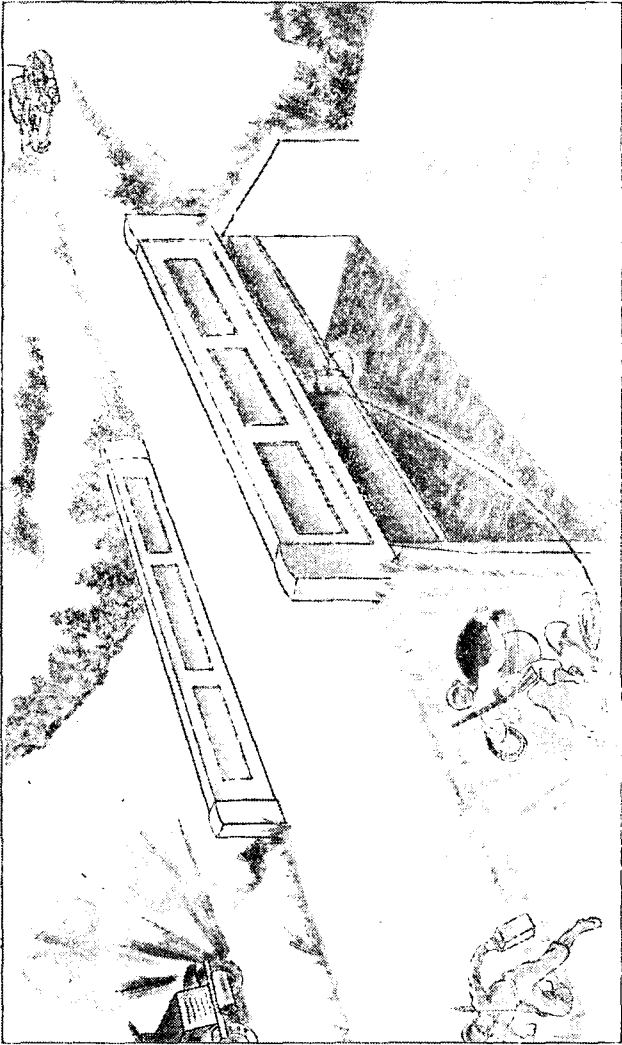


FIGURE 60.—Do not use slow methods if pressed for time.



FIGURE 61.—Use quick methods when there is little time.

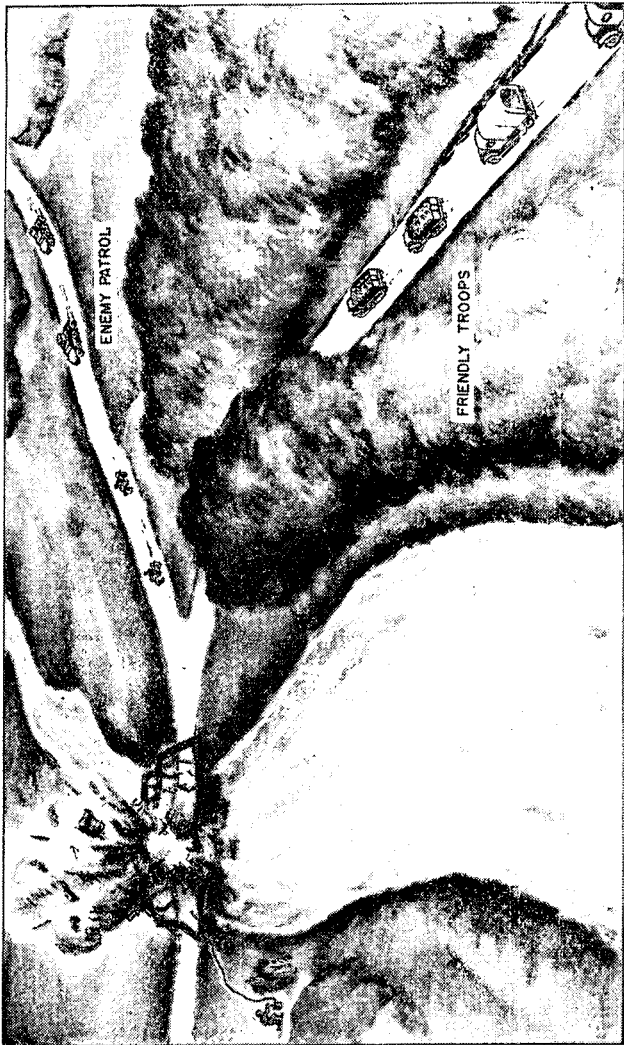


FIGURE 62.—Do not cut off friendly troops by demolishing a bridge too soon.

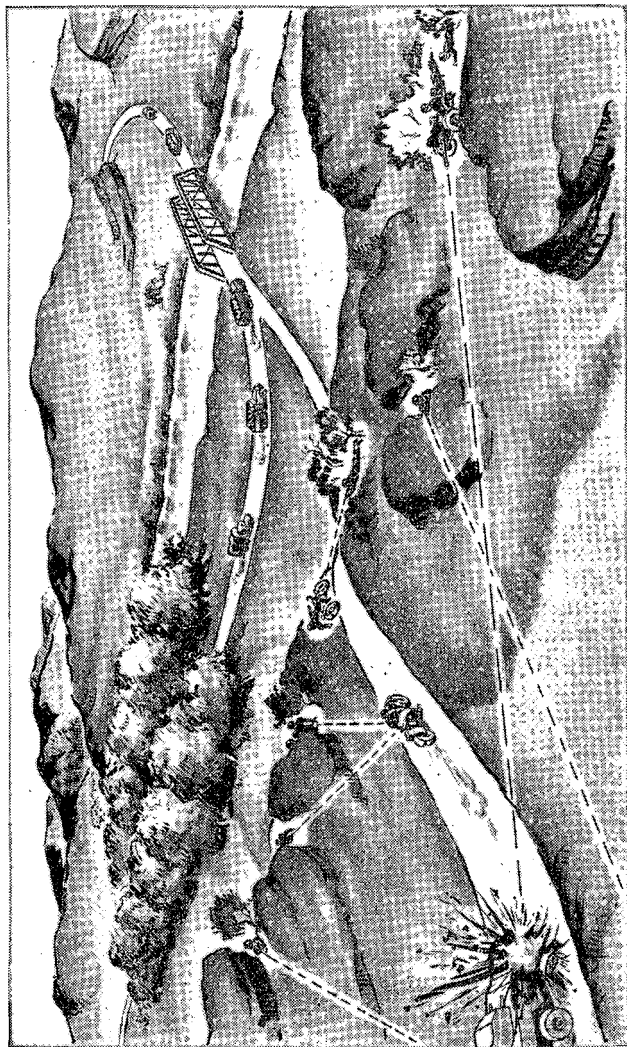


FIGURE 63.—Repel small enemy patrols and hold prepared bridges for friendly use as long as possible.





## INDEX

	Paragraph	Page
Allotment.....	4, 8	2, 8
Armament.....	6	4
Attachment.....	8	8
Attack:		
Against fortified position.....	36	64
From assembly area.....	35	63
Of stream line.....	39	65
Bridge:		
Company in combat.....	41	72
Data.....	10	9
Equipment.....	5	2
Maintenance.....	4	2
Materials.....	9	8
Bridging streams.....	39	65
Communication.....	7	5
Control.....	19	20
Defense of river line.....	46	77
Defensive action.....	42	72
Defensive action during offense.....	45	77
Delaying action.....	44	75
Division engineer:		
Duties.....	8, 10	8, 9
Assistant.....	10	9
Duties of engineer battalion.....	2	1
Employment.....	4	2
Engineer, division.....	8, 10	8, 9
Engineer supply.....	9	8
Equipment.....	5	2
Explosives, supply of.....	9	8
Ferrying.....	4	2
Landing fields.....	40	72
Liaison.....	21	20
Map:		
Supply.....	9	8
Situation.....	22	20
Marches:		
Discipline.....	25	32
Employment on.....	4, 24	2, 32
Meeting engagement.....	34	63
Mission.....	2	1

## INDEX

	Paragraph	Page
<b>Offensive action:</b>		
Attack against fortified position.....	36	64
Attack from assembly area.....	35	63
Attack of stream line.....	39	65
General.....	32	58
Landing fields in.....	40	72
Meeting engagement.....	34	63
Mopping up.....	37	64
Pursuit.....	38	64
Organization.....	3	2
Pursuit.....	38	64
Radio.....	7	5
Reconnaissance.....	10, 22	9, 20
Reports.....	22	20
Security.....	2, 15, 26-31	1, 11, 39
Situation map.....	22	20
S-3 air.....	11	9
Supply.....	9	8
<b>Training:</b>		
Battalion.....	17	12
Combined.....	18	13
Company.....	16	12
General.....	12	10
Individual.....	13	10
Platoon.....	15	11
Squad.....	14	11
Water supply.....	9	8
Withdrawal.....	43	75

