TACTICAL AND TECHNICAL TRENDS

No. 31
12 August 1943

Prepared for

ARMY GROUND, AIR, AND SERVICE FORCES

by

MILITARY INTELLIGENCE SERVICE,

WAR DEPARTMENT

CONTENTS

Readers are invited to comment on the use that they are making of this publication and to forward suggestions for future issues. Such correspondence may be addressed directly to the Dissemination Unit, Military Intelligence Service, War Department, Washington, D. C.

Other publications of the Military Intelligence Service include:

Special Series (published at least once a month);
Intelligence Bulletin (monthly);
Military Reports on the United Nations (monthly).

Requests for additional copies of all publications of the Military Intelligence Service should be forwarded through channels for approval.

* * *

Divisions and higher echelons may reproduce items from Tactical and Technical Trends provided the classification is maintained and the source is cited.

[redacted]

SECTION I

1. JUNKERS 52

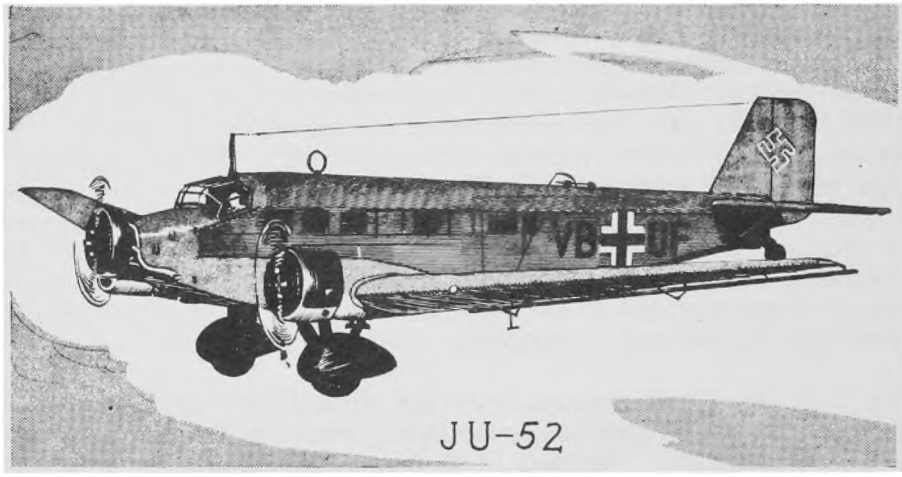
The Junkers 52 which first made its appearance as a commercial plane in 1931 was designed with a view to its ultimate conversion to a bomber. It was one of the most widely used types on German airlines and was also operated in Belgium, Holland, Austria, Denmark, Sweden, Norway, Finland, and several South American countries. Military versions of the Ju-52 equipped the bomber squadrons of the Luftwaffe in 1935 and remained as the standard heavy bomber in company with the Ju-86 until 1937. Ju-52's were used extensively in the early days of the Spanish Civil War and were also employed in the attack on Rotterdam. The bomber model was outdated by faster bombers at the outbreak of the war, and the aircraft was put into service as a troop and freight carrier and is still being produced for this purpose. Several guns have been added to transform it into an armed transport. The original passenger cabin is a bare storage compartment with broad entrance and exit hatches from which paratroopers can jump, and through which reserve supplies are dropped to the fighting troops. It has glider-towing fittings incorporated into the tail and is frequently used as a glider tug.

The Ju-52 is a three-engined low-wing monoplane with cantilever wings and semi-cantilever stabilizer, the latter being braced to the fuselage with a single strut on either side. The span is 95 feet 11 inches and the length 62 feet. It is of all-metal construction, with a deep rectangular fuselage, a fixed landing gear, and air-cooled radial engines, one in the nose, and the other two in nacelles in the wings outboard of the landing gear. A distinctive feature is the use of corrugated metal for wing and fuselage covering. The so-called Junkers "double-wing" is employed. The inner portions vary the camber; the outer portions act differentially as ailerons. There is a single fin and rudder. This plane may be equipped with floats for sea operations or skis for winter flying.

The engines consist of three B.M.W. 132 A or T air-cooled 9-cylinder radials, each developing 660 hp at sea level. The maximum speed of the Ju-52 is 170 mph at 4,500 feet; 165 mph at sea level. The cruising speed is 132 mph at sea level. The service ceiling is 16,000 feet with maximum load, 21,000 feet at finish. The normal range is 530 miles with a 5,000 pound load, or 790 miles with maximum fuel and a 4,000 pound load. The normal fuel load is 436 U.S. gallons, with a possible maximum of 645 U.S. gallons.

The armament varies, but the maximum so far found consists of four MG 15 7.92-mm machine guns. Reports have been received that 20-mm cannons are being used, but to date no aircraft with this armament have been found. The most usual combination on the freight version consists of one upper-rear MG 15 machine gun in a ring mounting, one lower-rear MG 15 machine gun in the retractable "dust bin", and two lateral machine guns firing out of the windows on each side aft of the wing. Occasionally, one of the machine guns has been found mounted as an upper-front gun, in a perspex dome over the second pilot's seat on the right-hand side of the cockpit.

The crew ordinarily consists of three, a pilot, a co-pilot, and a radio operator, the latter two manning the guns. When used as a troop transport, there is a fourth member who combines the duties of rear-gunner and checker of the parachutists and their equipment.



The official German maintenance handbook for the Ju-52 lists no fewer than 37 different uses and loadings, of which the following are examples:

1. Troop transport -- carries 15 to 20 fully-equipped men
2. Freight transport -- maximum pay-load, 5,260 lbs
3. Ambulance aircraft -- accomodation for 12 stretchers
4. Parachute troop carrier -- 12 fully-equipped men
5. Glider tug -- can normally tow one Go-242 with 23 men or 3 small gliders carrying 10 to 12 men each
6. Flying classroom -- especially for training in night flying.

Throughout the African campaign this aircraft has been extensively used for transporting troops, munitions and supplies of every kind from Italy and Sicily to Africa. During the height of the Tunisian campaign, from 50 to 150 per day were running a shuttle service across the Mediterranean, carrying on the return trip wounded men from Africa. Wherever possible, fighter escort is provided because the Ju-52 lacks speed, armor, and adequate armament. This accounts for the high attrition rate of this aircraft in all operations.

ANTIAIRCRAFT

2. JAPANESE ANTIAIRCRAFT GUN INSTALLATIONS

A study by the official U.S. Navy Pacific Photo-Interpretation Unit of aerial photographs of Japanese occupied areas in the Solomon Islands, reveals that the

plan of enemy medium and heavy antiaircraft battery positions usually follows one of three patterns: that of an arc, a triangle, or a rectangle. A typical battery position is shown in figure 1.

a. Ground Patterns

(1) Arc Pattern

The arc pattern includes 3 to 10 emplacements. The radius of the arc usually varies directly with the number of guns in the pattern. These batteries are frequently reinforced with a few scattered light AA positions. The CP of the arc battery is located back of the battery, approximately equidistant from the ends (see figure 2). Gun crew quarters and ammunition dumps can usually be

FIG. 1

observed at the edge of the clearings in which the batteries are installed. One noteworthy battery consists of a series of three arc patterns, the center one of the three being reversed in direction from the end two. This battery is located at Vila.

(2) Triangular Pattern

This is a three-gun installation in the shape of a triangle. The CP is usually located in the center of the position. It is similar to the arc and rectangular positions in all other respects (see figure 3).

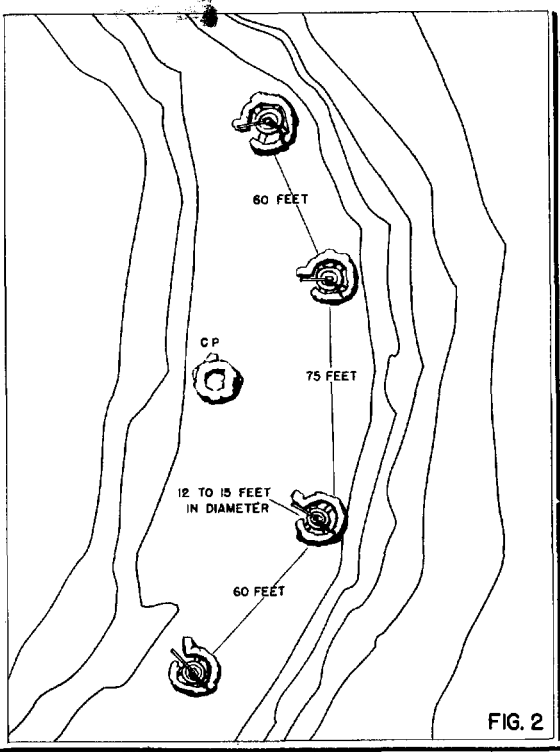


FIG. 2

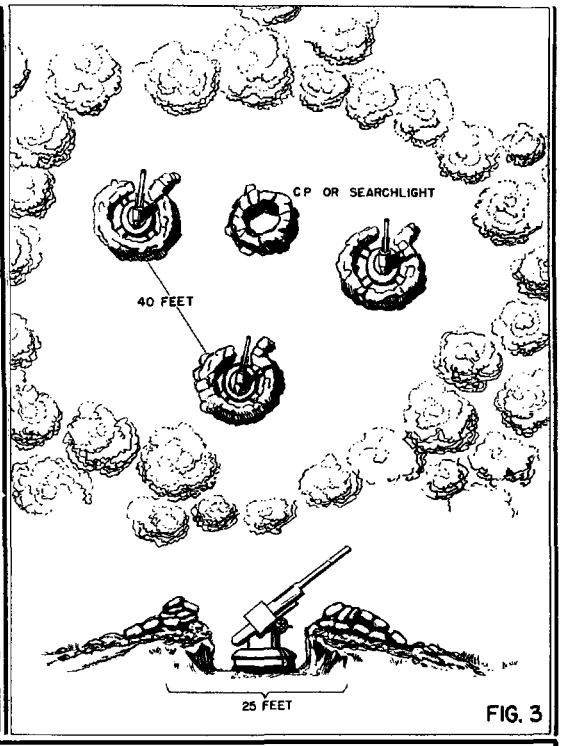


FIG. 3

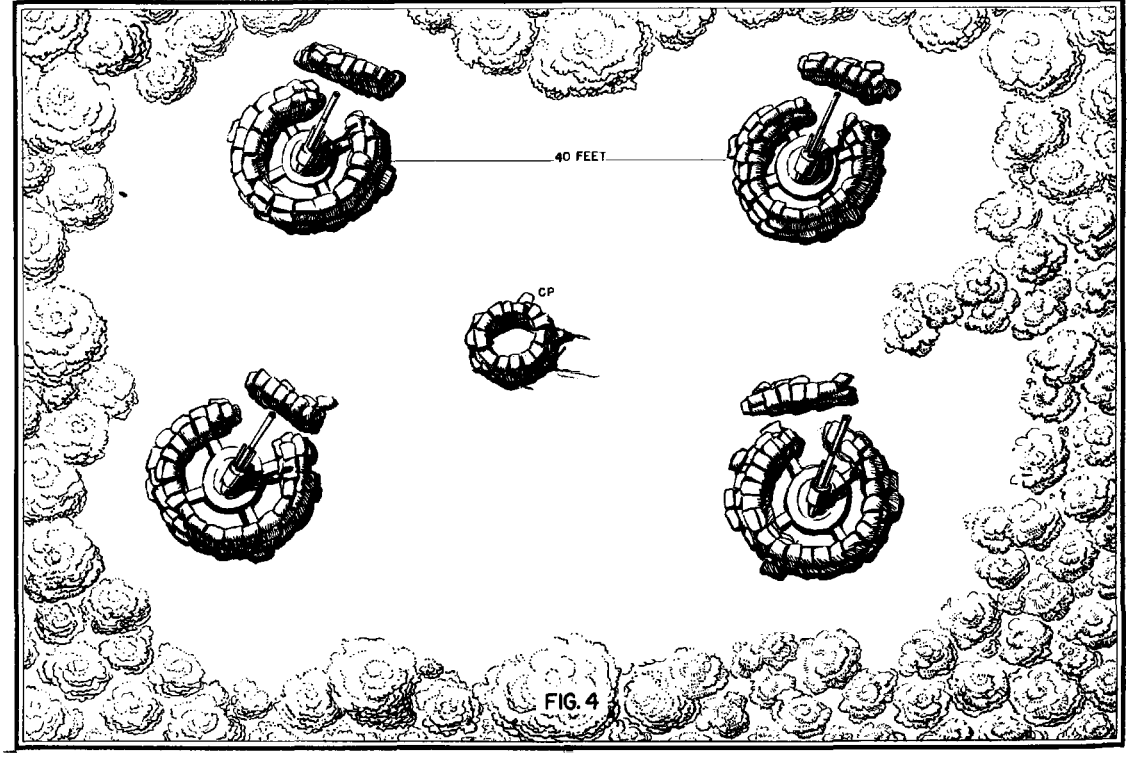


FIG. 4

(3) Rectangular Pattern

The rectangular position is a four-gun battery built in a roughly rectangular pattern. This pattern is more of a trapezoid but for purposes of classification, patterns of this type are classified as rectangular. This type of battery has a CP in the center of the position. Crew quarters, ammunition dumps, etc., are removed from the position as in the case of the arc pattern; if the position is in a clearing they are located at the edge of it (see figure 4).

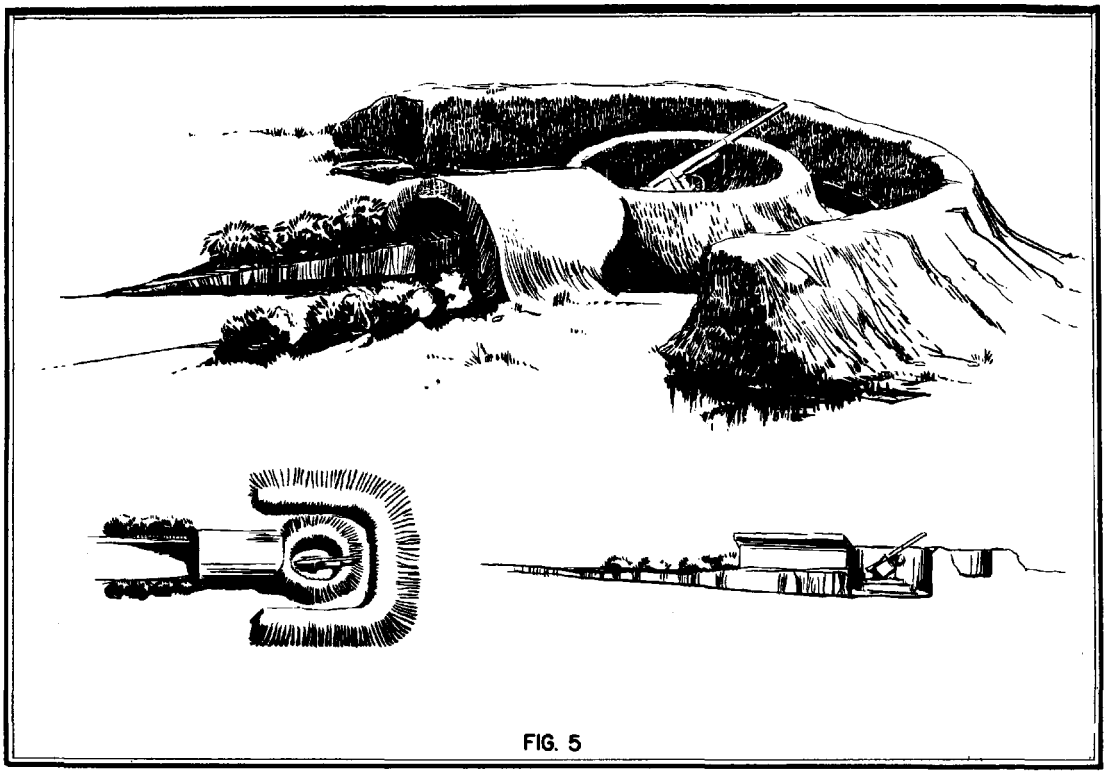


FIG. 5

b. Revetment Types

(1) Circular Revetment

The revetments that the Japs build are usually circular. In most instances they have no entrances. Some have been observed with a protected entrance, and a few with an unprotected gap. These revetments vary in size from 12 to 33 feet inside diameter. Most of them appear to be slightly countersunk. The revetment is probably built up of sandbags or some similar material (see figure 3).

(2) Modification of Circular Revetment

At Vila a new type revetment has been observed. This consists of a ramp leading down into the opening of a covered shelter, probably for ammunition storage, which in turn opens directly into a circular gun revetment. Another revet-

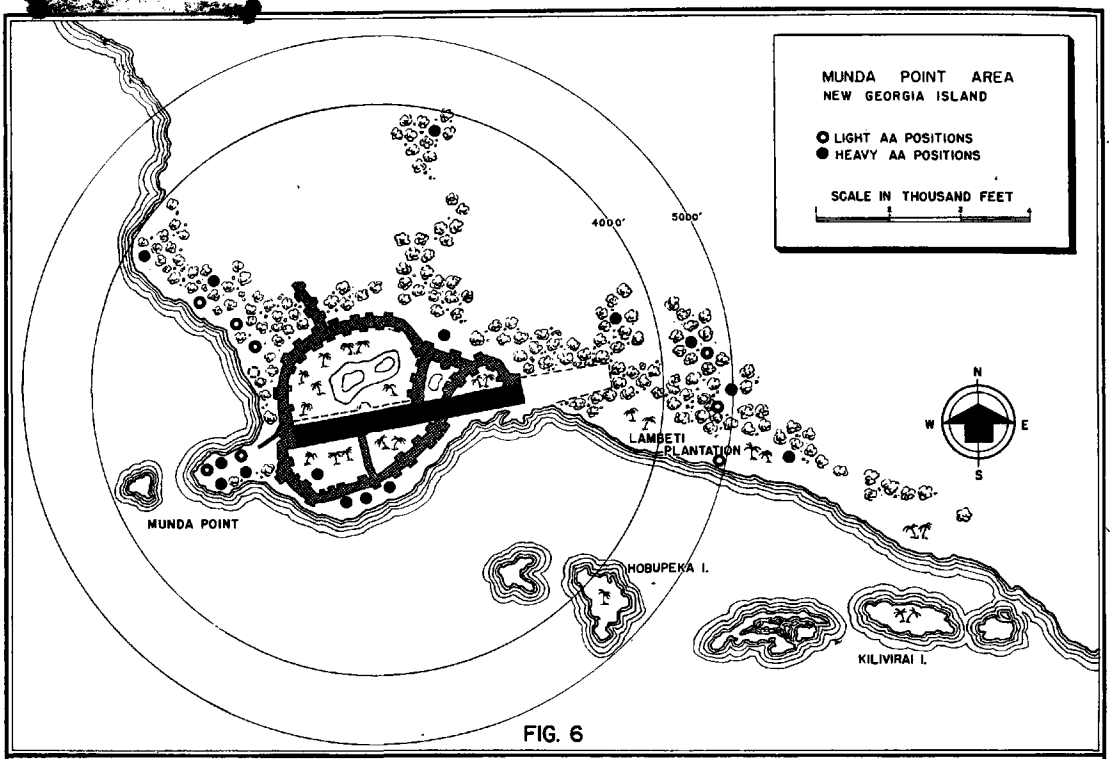

MUNDA POINT AREA
NEW GEORGIA ISLAND
LIGHT AA POSITIONS
HEAVY AA POSITIONS
SCALE IN THOUSAND FEET
4000'
5000'
N
W
E
S
LAMBETI PLANTATION
MUNDA POINT
HOBUPEKA I.
KILIVIRAI I.

FIG. 6

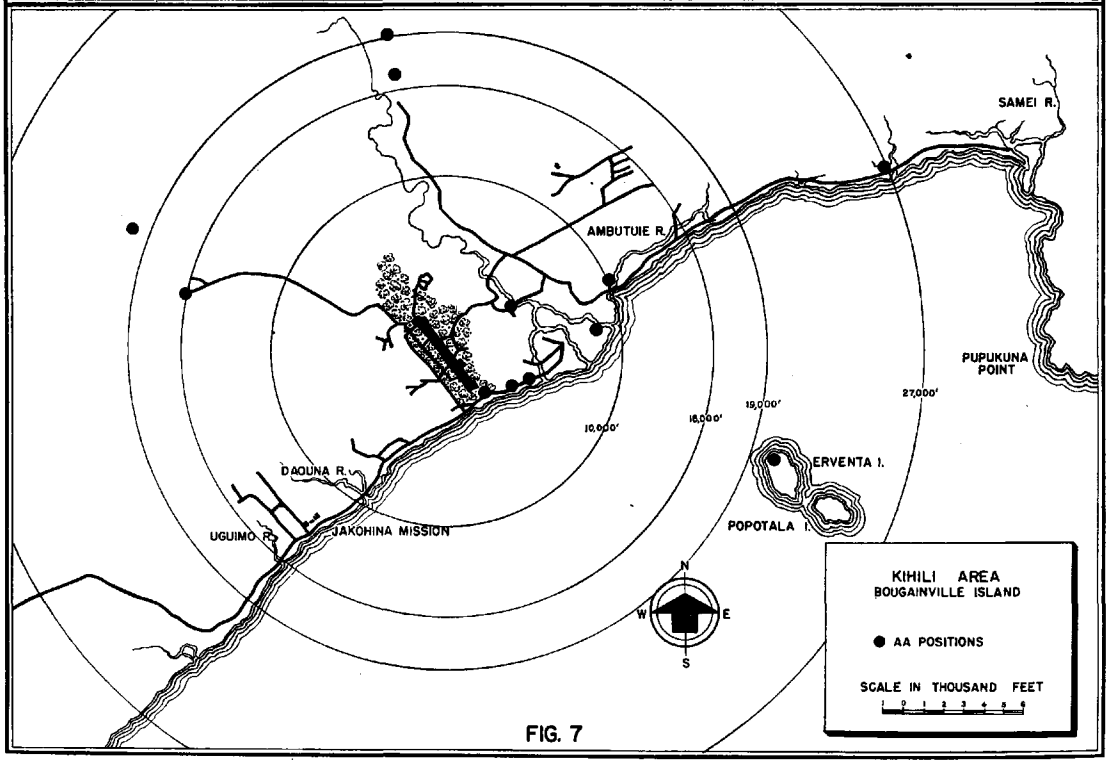

SAMEI R.
AMBUTUIE R.
PUPUKUNA POINT
10,000'
15,000'
19,000'
27,000'
DAOUNA R.
UGUIMO R.
JAKOHINA MISSION
ERVENTA I.
POPOTALA I.
N
W
E
S
KIHILI AREA
BOUGAINVILLE ISLAND
AA POSITIONS
SCALE IN THOUSAND FEET

FIG. 7

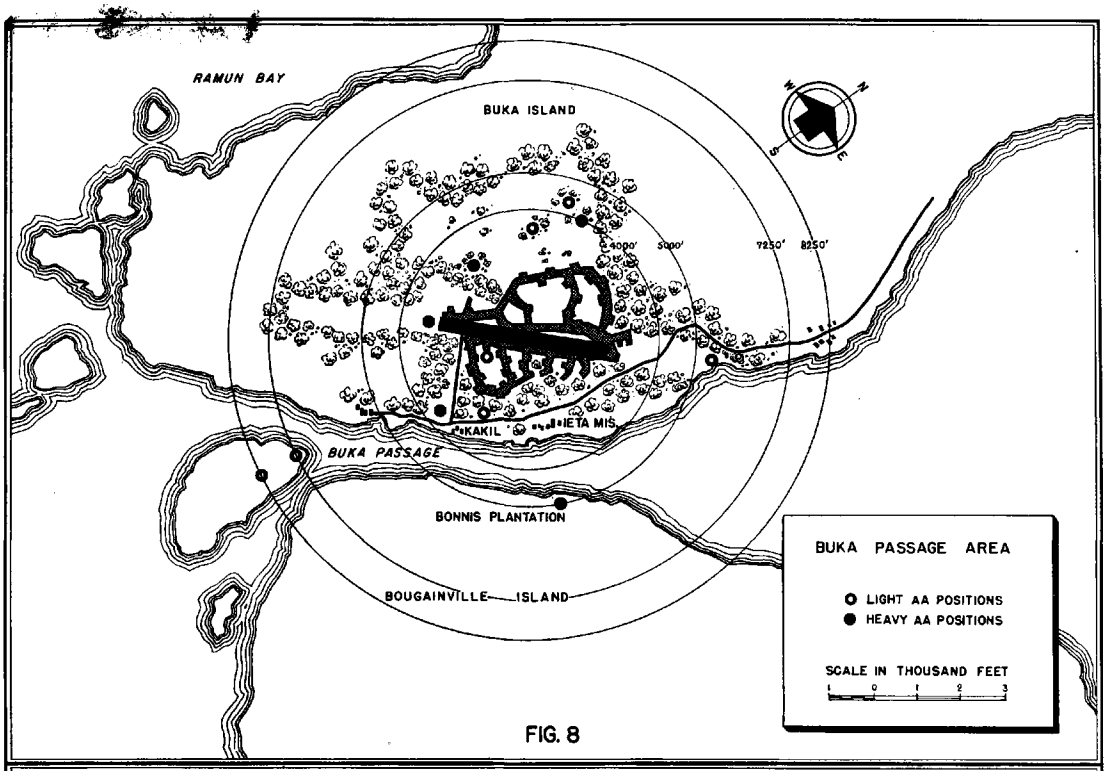

RAMUN BAY
BUKA ISLAND
4000'
5000'
7250'
8250'
KAKIL
IETA MIS
BUKA PASSAGE
BONNIS PLANTATION
BOUGAINVILLE ISLAND
BUKA PASSAGE AREA
LIGHT AA POSITIONS
HEAVY AA POSITIONS
SCALE IN THOUSAND FEET
1 0 1 2 3

FIG. 8

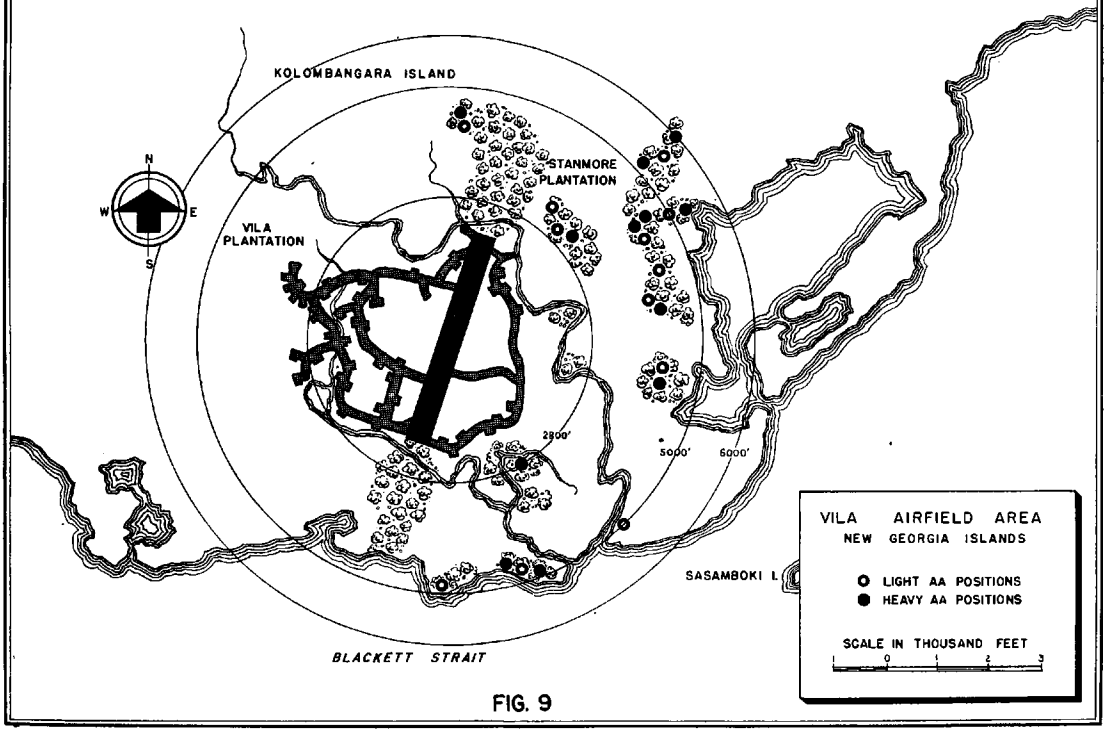

KOLOMBANGARA ISLAND
N
W
E
S
STANMORE PLANTATION
VILA PLANTATION
2800'
5000'
6000'
SASAMBOKI I
BLACKETT STRAIT
VILA AIRFIELD AREA
NEW GEORGIA ISLANDS
LIGHT AA POSITIONS
HEAVY AA POSITIONS
SCALE IN THOUSAND FEET
0 1 2 3

FIG. 9

ment is built around the first. Several of this type were observed in a battery (see figure 5).

(3) Spiral Revetments for MG or Light AA

At Munda a spiral sloped revetment was observed. The inside diameter was approximately 10 feet. The purpose of the spiral was to form a protected entrance. The spiraled wall continued about 3 feet beyond its beginning.

c. Location of Batteries

The location of batteries relative to a landing strip is highly variable. In most instances batteries have been built in natural clearings and elevations. This is illustrated by a comparison of figures 6 to 9.

ANTITANK

3. TACTICS OF RUSSIAN ANTITANK REGIMENTS

The following article from the "Red Star" shows the tactics employed by the Russians in combating enemy tank attacks, as well as the organization of a Russian antitank regiment.

* * *

There is no more powerful or deadly weapon in the struggle against tanks than the antitank gun, which can by its intensive and accurate fire frustrate the attack of great masses of tanks. This weapon is the basic means for the defense of troops, communications, and defensive objectives against tanks.

When the enemy, in organizing his attack concentrates his tanks on separate narrow sectors of the front, and uses them in masses as a battering ram, ruthless defense must be organized, and in the first place, antitank defense. Without powerful fighting units equipped for the purpose this would be difficult to achieve, and one such unit is the destroyer antitank artillery regiment. These regiments can operate independently, in the form of an army reserve, covering points of the front where there is a danger from tanks, or they can operate within the framework of an infantry division, supporting it at such points as may be necessary, and also operating with the supporting tank group.

In a sector where there is danger from enemy tank attack, the regiment can cover with its fire quite a large area, keeping a few batteries in a first echelon and a few in a second. Guns are usually sited so as to be mutually supporting. Each battery forms a separate antitank defense center mutually supporting, and within effective range of, the other batteries.

This makes it possible to increase the field of fire.

a. The Antitank Regiment in Action

The mission of the antitank regiment is to stop at nothing in its battle against tanks, even if it involves the sacrifice of a considerable part of its strength. The regiment will be carrying out its task even if it loses its guns, provided that it destroys and puts out of action a large number of enemy tanks, and provided that against the loss of the guns can be offset the time gained, the holding of territory, or the restoring of a position.

In any circumstances, guns will only open fire on tanks from a distance of 500 to 600 yards, and will do nothing before that to disclose their position. In order to attack the gun position, a tank, allowing for a speed of 12 miles per hour, will require two minutes. During this time, allowing for average conditions of fire, 12 to 14 shots can be fired. Let us suppose that the percentage of effective hits will be 20 to 25. This means that each gun will put out of action two to three tanks, before it is annihilated, assuming that the enemy continues to advance with complete disregard for losses. The whole regiment under such conditions can put out of action several dozen tanks in one attack, and moreover, only the batteries in the first echelon will suffer substantial losses.

Such is the destructive potentialities of the tank-destroying regiment, and they have not in any way been exaggerated. The correctness of these calculations has been borne out by actual combat. In addition there have been not a few cases where one gun has put out of action not two, but six, or eight or even more tanks. A few batteries have thus shattered a German attack.

b. How the Regiment is Organized in Defense

Let us examine the organization for defense within the regiment. The most usually adopted battle formation for the regiment is a diamond shape center of resistance, consisting of nests of resistance each of battery strength, with all-around defense within each battery. In the case of such a formation it is useful to keep one battery in reserve, because the possibility exists that the enemy tanks will go around the flanks of one of the batteries within the first echelon. The speed with which the reserve of fire power can be developed and brought into action is an important factor in success.

Each battery has its main and its alternate positions, for which all data are prepared; dummy positions are prepared if there is time. When a battery has to leave its main position for its alternate position, the former becomes the dummy position. Changing position must only take place during a lull in the fighting, and in all circumstances under cover of darkness. Before the battle positions are taken up, daylight reconnaissance is necessary. During this reconnaissance, the directions from which tank attacks are threatened are noted, battery control points and the tasks of each are fixed, and fire is coordinated. When the batteries take up their positions, the rearward elements of the regiment are moved back sufficiently far for them to be out of range of fire of

enemy tanks and artillery in an attack.

To ensure more effective and flexible control over the regiment, the commander has, in addition to his command post, an observation post in the area of the batteries of the second echelon (in the center of this defensive area, or on its flank). It is very important that it should be possible to observe from the OP the approach of tanks at every point within the regimental area. If this is not possible, the OP is chosen to cover the most vital parts of the defended area.

The regimental commander coordinates the fire of the batteries, ordering them to switch or concentrate their fire as the situation requires. He also determines the time and place for the reserve battery to come into action. If communications with the batteries break down, staff officers are immediately sent out to the batteries to ensure coordination.

c. The Reserve Battery

It is desirable to discuss in greater detail the employment of the reserve battery, since the question is one of importance. This battery can be employed in the following tasks: it can be brought into action at a point where the enemy has made a mass tank attack, in order to stiffen resistance; or on a flank which is open and where enemy tanks would get through to the rear; finally, to prevent further penetration at a point where the enemy tanks have driven a wedge into our lines. In all these cases, the time at which the reserve battery is deployed for action is of decisive importance; this is what determines both its position and the route by which it moves over to the required point.

The reserve battery can either be in the center of the defensive zone (the second echelon) as a whole, or can be split into its platoons and used nearer the flanks. The latter is possibly the better method. For example, if one of the flanks should become exposed, one platoon immediately goes into action, while the second can come up under cover of its fire. In case of a forward move, both platoons can converge simultaneously on the prearranged position.

If a battery (or platoon) is being moved any distance up to about 500 yards, it is best to move the guns by hand, since to bring up the prime movers will take nearly as long. Often, in order to conceal movement of guns, it is better to move them forward several times a short distance by hand, rather than to use the prime movers to move them a considerable distance in a single bound. Moving the reserve battery by prime movers is practicable when the time is available, when the distance to be moved exceeds 600 yards and when the movement is lateral. (A diversion rearwards is desirable in the interests of concealment).

4. A GERMAN ANTITANK MEASURE

A report from a British source states that in the North African campaign, the German tanks and antitank guns, after they had hit and immobilized enemy armored vehicles, continued to fire at them until they were either blown apart or were burning.

ARMORED

5. COOPERATION OF GERMAN INFANTRY AND TANKS

A tank exercise observed in Germany late in 1942 indicated that the Germans were developing a new type of combined tank and infantry tactics. These tactics have now been reported as standard German tactics on the Eastern front. A description of these tactics reported through a British source follows:

Five medium tanks are drawn up in line and immediately behind them two armored troop-carrying vehicles carrying nine men each, armed with automatic weapons. The center tank leads off, followed by the remaining four tanks moving in pairs; bringing up the rear are the two armored troop-carrying vehicles. The moment the leading tanks open fire the men in the troop-carriers dismount and advance at the double in extended order. Then four very large trucks come up, each carrying about 25 riflemen who dismount and advance in three "waves" behind the tanks.

6. JAPANESE LIGHT TANK

a. General

Three basic designs of Japanese tanks have been encountered in Southern Asia and the Southwest Pacific. The "tankette" is a lightly-armored machine-gun carrier of from 3 to 4.5 tons, which has had many models. The light tank, of from 7 to 9 tons, which mounts one 37-mm gun and two machine guns, has also appeared in several variations. The medium "cruiser" tank, mounting a 57-mm gun and either two or three machine guns, weighs from 14 to 16 tons. This latter model may also be encountered fitted with a 47-mm or other caliber gun in place of the 57-mm weapon. A larger tank, of from 25 to 28 tons, is known to exist but has not yet been met with in any theater of operation.

A report from Australia on a Japanese light tank, (see sketch) a variation of Model 2595, captured at Milne Bay draws attention to the following features not included in the "Handbook on Japanese Military Forces" published last September as TM 30-480.

(1) Exceedingly cramped fighting compartment;

(2) High quality of workmanship, material, and excellence of design generally;

(3) Solidly constructed Carden-Loyd type suspension with the weight of the vehicle supported by horizontal compression springs, protected by curved 4-mm (.16 in) armor plate;

(4) Adequate provision of exits for all personnel;

(5) Exceedingly fine workmanship on all transmission components, with extravagant use of self-aligning ball bearings;

(6) All gears are profile-ground, and mating surfaces of gear boxes and housings are hand-scraped for accuracy. Transmission gears are not case-hardened, but are heat-treated;

(7) Ball races are either of German manufacture or else have no name or type number imprinted on them;

(8) Combined rivetted and welded construction of hull, the whole being built around a channel- and angle-iron frame;

(9) Design generally very light, with extensive use of aluminum and light alloys;

(10) Lightly armored, the maximum thickness of armor being .47 inch even for the vertical plate at the rear;

(11) Insulation of the engine compartment against heat from outside sources and to prevent the heat from the engine penetrating to the fighting compartment;

(12) Woven asbestos paddings, separated from the inside surfaces of the tank by an air space, to prevent direct radiation from the hull to the crew in hot climates, and also to guard against injury to the crew when travelling over rough ground;

(13) Numerous vision slits at vital points, but unprotected by glass visor-blocks except directly in front of driver;

(14) Sturdy air-cooled Diesel engine;

(15) High power-weight ratio (approximately 25 HP per ton).

b. Comparison with the German PzKw 2

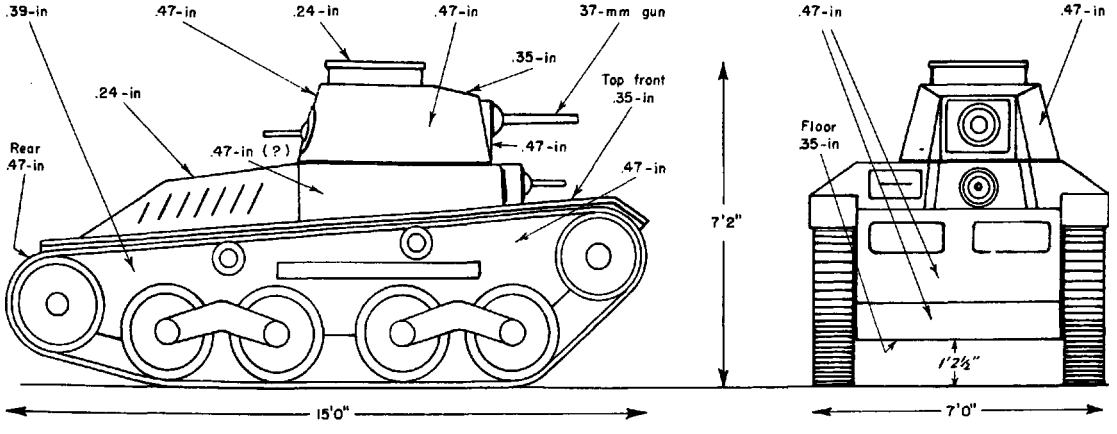
The Jap light tank and the PzKw 2 are of about the same vintage.

They compare as follows:

	Jap Lt Tk	PzKw 2
Dimensions		
Weight (in action)	8-9 tons	9-10 tons
Length	14 ft 4 1/2 in	15 ft 5 in
Width	6 ft 9 in	7 ft 3 in
Height	7 ft 0.5 in	6 ft 6 in
Clearance	15.5 in	13 in
Armor		
Front	.47 in	.79 in
Sides	.47 in to .39 in	.71 in
Rear	.47 in	.71 in
Turret	.47 in	.79 in
Top	.35 to .24 in	.59 in
Armament	1 37 mm 1 MG (in turret, right rear) 1 MG (in hull, forward)	1 20 mm 1 MG (coaxial, in turret)
Engine	6 cyl in line OHV Diesel, 240 HP at 2,000 rpm, air cooled, 5.12 in bore, 7.09 in stroke compr. ratio 15.05:1	Maybach, 6 cyl OHV gasoline, 140* HP, water cooled
Speed	28 mph	25 to 36
Fuel capacity	29 gal	44 gal
Drive	Front	Front

*Rated hp; the engine would probably develop considerably more actual power than the Japanese at about 1,800 rpm.

The German tank would appear to be the better of the two.



JAPANESE LIGHT TANK

c. Additional Details of the Japanese Tank

(1) Armor

The .47 inch armor is face-hardened; the .35 inch, is non-machineable homogeneous plate, only slighly softer than the .24 inch, which is homogeneous hardened. The recoil mechanism of the 37-mm gun is protected by a manganese steel casting, and the machine guns by hardened pressed steel sheaths.

(2) Ammunition Carried

For the 37-mm gun, 130 rounds are carried and for the machine guns, 2,340.

(3) Engine and Drive

On a fighting weight of 9 tons, power-weight ratio is 26.7 HP per ton. Fuel is carried in a main tank of 23 gallons with six in the reserve. The clutch is of the multi-disk type bolted to the fly-wheel, operating through a manual-control gear box with four speeds forward, one reverse. The steering is of the clutch-brake principle, with multi-disk clutches working external contracting type brake drums and operated by steering levers. The suspension is front drive sprocket, rear idler, with 4 bogie wheels in pairs on bell cranks, sprung by compression springs.

(4) Tracks

The tracks are full floating, of manganese steel, 10 inches wide. Ground contact is 7 feet 8 inches, giving a pressure of 9.9 pounds per sq inch.

(5) Intercommunication

The communication system is by radio.

Comment: The light armor and unprotected vision slits would seem to make this tank rather vulnerable, even to rifle and machine-gun fire. Japanese tanks are not manufactured on the assembly-line system; consequently, several variations of the original design will be encountered. Improvised mechanized units have been used by the Japanese in China repeatedly with considerable success. Such units, while probably without elaborated tables of organization and equipment, are organized on the basis of expediency and availability of materiel with the usual reconnaissance, ground-holding, shock, and supply components which characterize the mechanized brigades and divisions of foreign armies.

ARTILLERY

7. OBSERVATIONS ON GERMAN ARTILLERY TACTICS

A recently returned American officer reports that in North Africa the Germans frequently made a practice of firing a few salvoes from a battery; then, moving out, about the time the American forward observers had the position taped. Our own guns would plaster the observed position only to find that the enemy guns, apparently on self-propelled mounts, opened fire from some other point.

An extremely clever trick was reported to have been turned by a German tank unit upon which a British 25-pounder (88 mm) battery was attempting to adjust. After the first salvo hit at some distance from the tanks, a second was fired which apparently fell wide, and the third salvo went wider; the forward observer was frantic.

This is what had happened: the German tanks had timed the first salvo from the report to the instant of burst, which can be done with a low-velocity piece such as the 25-pounder, and fired a salvo from their own guns so that their own shells burst on the ground some distance away from the tanks at the same moment when the battery's shells struck. The forward observer was attempting to correct his own fire from German shell bursts.

The most dangerous German artillery fire was not from HE bursting on impact, but HE time fuze air bursts, and ricochet fire. In this latter type of shelling, the projectiles would strike the ground and ricochet upward, bursting over the heads of the troops.

A rather surprising percentage of the German shells were duds. Whether this was caused by defective fuzes, or for the reason that the projectiles were AP, used when the supply of HE had been exhausted, was not known.

CHEMICAL WARFARE

8. GERMAN WEAPON DECONTAMINANT

The following report is taken from information prepared by the Office of the Chief of Chemical Warfare. This weapon decontaminant called Waffenentgiftungsmittel is a small, semi-opaque, red brown, flat plastic flask 2 1/2 x 2 1/2 x 11/16 inches in size, having a screw top, attached by a cord to prevent loss.

Each German soldier carries one.

It contains about 56 grams of a yellow decontaminating liquid, having a strong odor of chlorine, and shown, by analysis, to contain methyl sulphon mono- or di-chloramide dissolved in tri (B-chloro-ethyl) phosphate. It is applied to all weapon parts with a rag or wadding and wiped off after a brief period. Tests show that it is an effective decontaminant. The solvent is also effective as a powder solvent for weapon barrels.

9. BRITISH DEMOLITION AND GAPPING OF GERMAN ANTITANK OBSTACLES

In the early phases of the present war the German successes were in no small part due to their offensive use of tanks and mechanized equipment. As they have gone on the defensive the Germans have paid equal attention to the development of antitank obstacles. The antitank ditch is one of the principal antitank obstacles, to which the Germans have devoted considerable study.

German-designed antitank ditches normally have vertical faces on both sides and not only on the side farthest from the approaching tank. Both faces must be broken down, but the face which the tank must climb up presents the greatest difficulty. The pick and shovel is likely to be the simplest and quickest method of breaking down a vertical face. The shovels should be specially prepared beforehand by bending the heads at right angles to the handle, so that the men can work on a face from inside the trench and pull it down towards them.

It will be necessary to use explosives where the soil is hard or the face is high. Various methods have been tried including the placing of charges against the vertical face or dug into the vertical face. Both of these methods have been unsuccessful as the resulting ramp has proved to be far too steep for the tank to climb. The only method that has been universally successful has been the placing of charges as shown in Fig. 1, though it has the disadvantage of exposing the men while placing the charge. In this method a minimum width of gap of 12 feet is

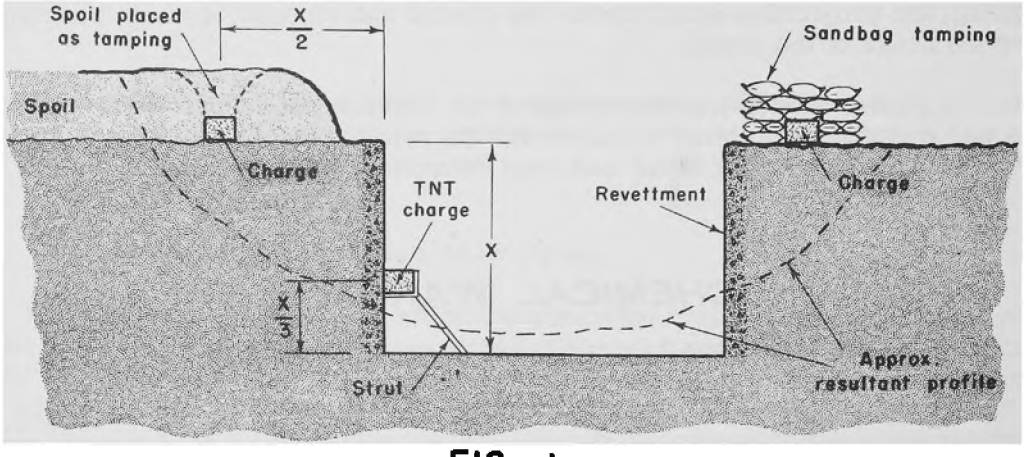


FIG. 1

required. The charge is placed on the original ground level, or dug in flush with the original ground level and tamped if time permits. Boxes containing 25 pounds of TNT, or equivalent explosive, are placed in a line across the gap desired. If the soil is not too compact, the charges can be placed 9 inches apart. If the soil is hard and compact the boxes containing the charges should be touching so as to increase the total charge. An alternative that has proved successful is the placing of double charges at the ends where the tank tracks will cross (see Fig. 2).

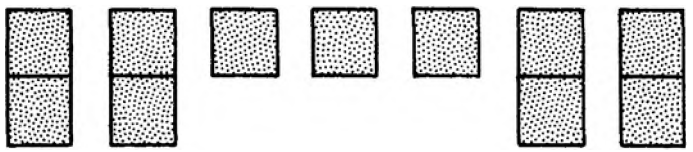


FIG. 2

The distance from the back of the charge to the edge of the trench should equal one-half of the depth of the face. If the trench is revetted with timber, the revettment must be cut. This is done by dropping the necessary cutting charges of TNT against the revettment in the form of an elongated pole charge. The charge will vary according to the type of revettment. It should be placed one-third of the way up the revettment from the bottom of the vertical face. (see Fig. 1).

If the wall is revetted with concrete the sides as well as the bottom of the panel to be blown out will have to be cut with explosives (see Fig. 3). All these

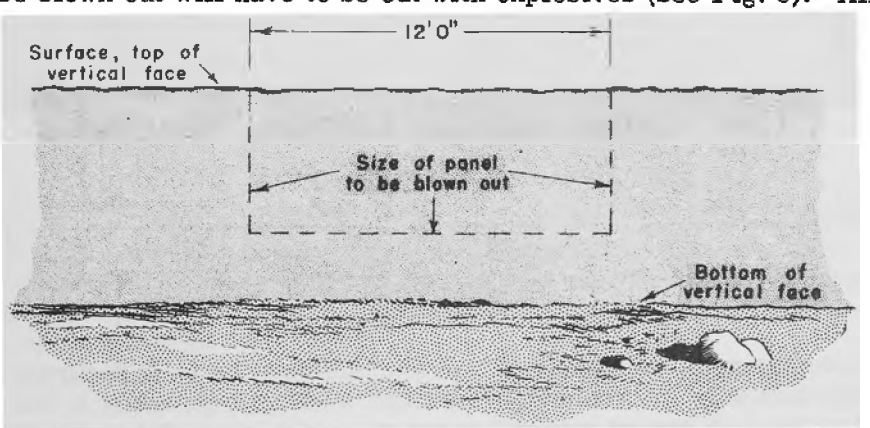


FIG. 3

charges must be made up beforehand on planks. There should be no economy of struts as close contact with the wall or revettment throughout the charge is important. Unless the thickness of the concrete revettment is accurately known, a larger charge than might appear necessary should be used in order to insure destruction. The charges should be laid end to end in order to get complete cutting action.

All charges must be detonated simultaneously including those on top of the trench, on both sides, and the revettment cutting charges. A detonating cap should be used in every 25-pound cratering charge of TNT and at suitable intervals

along the revettment cutting charges. The entire demolition setup is interconnected by means of primacord and leads are brought out to a central junction where detonation can be safely initiated. In order to be on the safe side, all primacord mains should be in duplicate. The junction box should be placed so that the detonating waves go forward along the primacord with no undue bends.

The explosion which breaks down the sides of the ditch leaves loose pulverized earth ramps on each face and loose earth in the bottom of the trench, which must be leveled off with pick and shovel. The spoil forming the ramps is likely to be very loose and soft, so that tanks will dig themselves in when climbing the ramp and get stuck. It is the rear of the tank's tracks which tend to dig in and belly the tank as it opens its throttle to climb out of the trench. To prevent this, brushwood fascines must be made ready to provide a good surface on the bottom of the ditch and resist the digging in by the rear end of the tank.

The fascines are laid crosswise and must be carefully made or they will tend to provide a track that will be too steeply cambered and the tank will slip off sideways. To prevent such sliding the fascines must be made wider at the ends, than in the middle by placing the brushwood, of which the fascines are made, with the thick ends outwards and the thinner parts towards the center (see Fig.

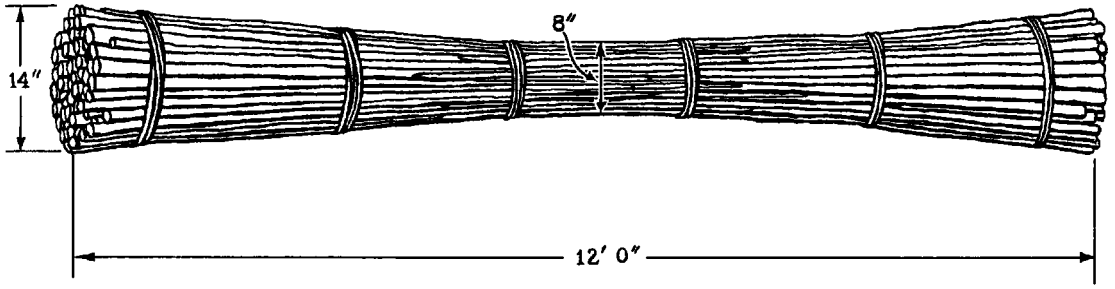


FIG. 4

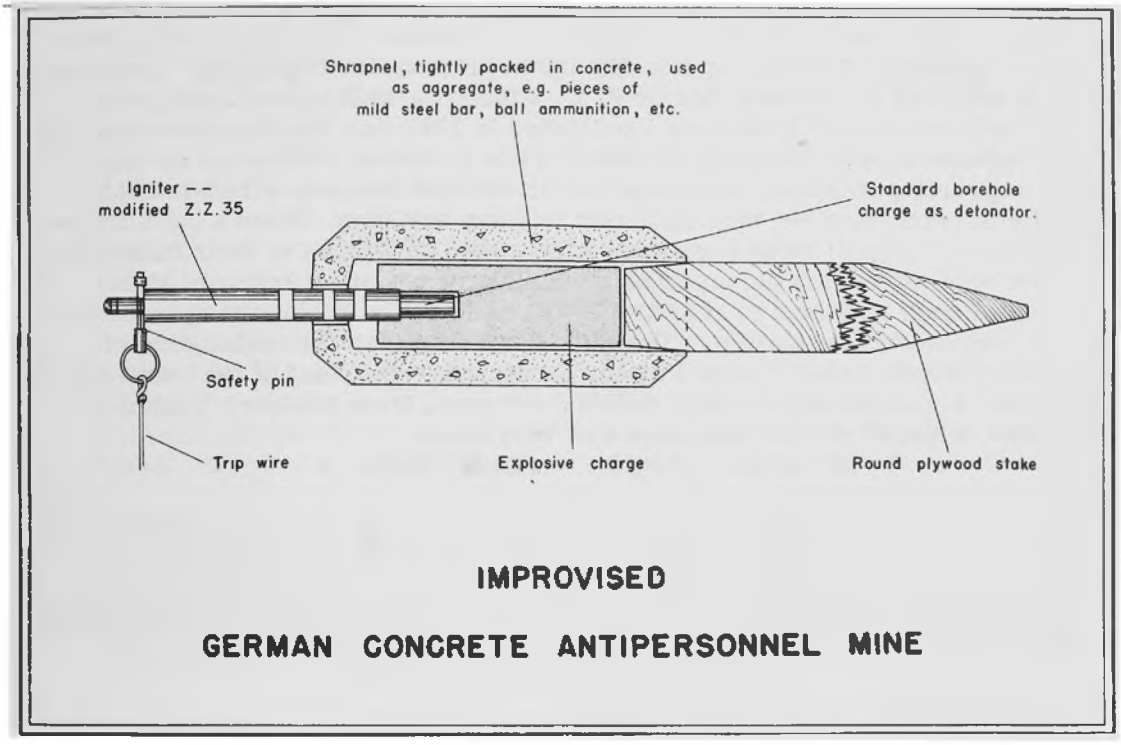
4). To insure strength, the center of the fascines must be very securely and tightly bound with wire. A reserve of fascines must be kept ready in the ditch to strengthen the tank gap as it shows signs of breaking up. It is essential that there be continuous maintenance of the gap while it is in use.

10. GERMAN IMPROVISED ANTIPERSONNEL MINE

A German improvised concrete antipersonnel mine is shown in the accompanying sketch.

It is used with a trip mechanism. One type of igniter which has been found with this mine is a modified type of the German pull-release igniter (Z and ZZ35)

having no hole in the top of the firing pin for attaching a trip wire. Instead the trip wire is attached to the release pin; when the release pin is pulled out by the trip wire, the firing pin is released and detonation takes place. The igniters (on which is stamped Nur Zugzunder - pull only) are packed in a standard ZZ 35 box



IMPROVISED

GERMAN CONCRETE ANTIPERSONNEL MINE

but with a label pasted on describing them as percussion igniters. The firing of the mine causes a belt of shrapnel (pieces approximately 3/8 x 1/4 inch) to be thrown out all around the mine. The concrete is reduced to dust. The effective radius is approximately 30 yards.

INFANTRY

11. CONSTRUCTION OF A GERMAN BATTALION DEFENSE AREA IN NORTH AFRICA

As stated in Tactical and Technical Trends, No. 27, p. 21, the German doctrine as applied to defense calls for the concentration of the available forces in a few, very strong islands of resistance. In contrast to the pre-1940 French "linear" practice of setting up the defense in platoon "strong-points" supported by field artillery in the rear, Major F. O. Miksche a well known Czech military writer, pointed out in "Blitzkrieg" published in 1942 that the Germans favor the use of defense areas containing at least a rifle company, reinforced by appropriate supporting weapons, organized for all-around defense, wired-in behind mine fields, and provided with their own infantry artillery. Even a battalion may be employed in one of these positions, which,when developed to their fullest extent, are self-sustaining defense areas, capable of resisting armored attack. An example of such an island of resistance will be found in the following translation of a German document entitled "Training Publication for the Installation of Battalion Defense Areas" issued by the Commander-in-Chief of the Panzer Army in Africa. A combat officer very recently returned from southern Tunisia reports that defenses of this type were met with there.

* * *

In order to strengthen the power of defense, the troops will organize defense areas which they can hold against attacks coming from any direction.

a. Dimensions

The normal battalion front in a defensive position may be from 3,500 to 4,000 yards; company defense areas (see figure 1) are some 700 yards wide by 300 in depth, and spaced about 500 yards apart.

b. Garrison of Company Positions

A battalion sector is divided into several company defense areas. In general, a rifle company with infantry heavy weapons attached occupies each of the four sub-defense areas. The unit command posts are also to be installed within these defense areas. Artillery is stationed behind the forward company defense areas on terrain protected by the rear company defense area of the battalion sector.

[Note: Whether this artillery is composed of the infantry guns, or attached field artillery is not clear but field artillery was found in such defense areas in Tunisia. Obviously, while the lay-out is such that infantry guns could cover the forward company positions, some field guns of greater range could be used, if available.]

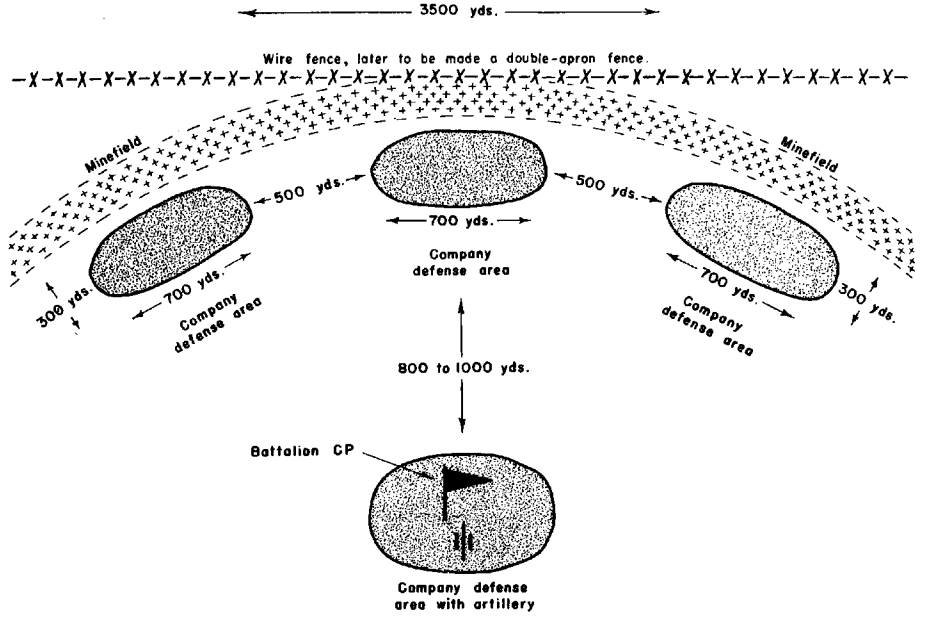


FIG. 1
BATTALION DEFENSE AREA

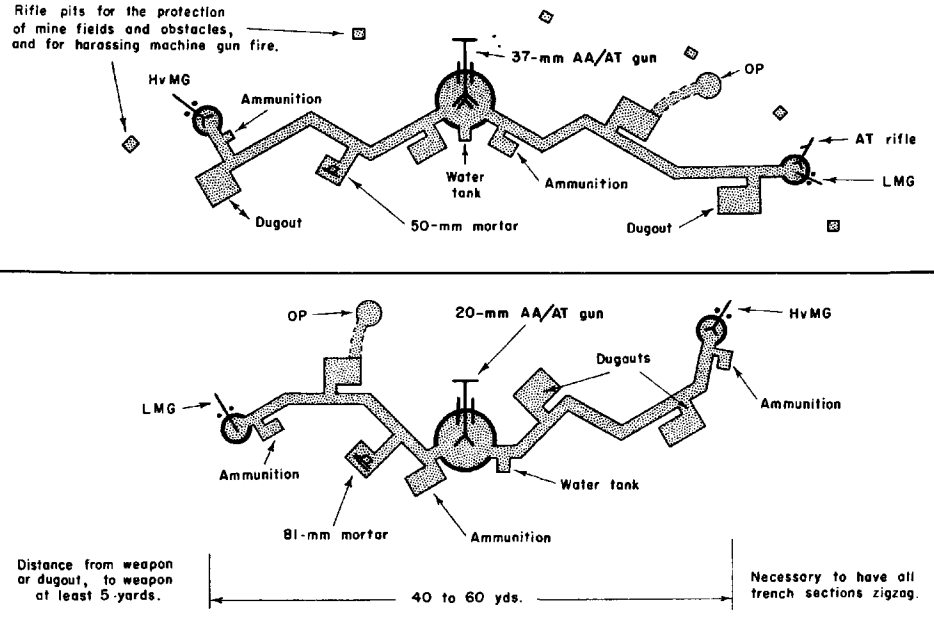


FIG. 2
TWO LAY-OUTS FOR A SQUAD POSITION, REINFORCED

c. Weapons

Weapons are distributed so as to give mutual supporting fire. Every company defense area is provided with infantry light and heavy weapons. Armor-piercing weapons, and antiaircraft guns are attached.

d. Defenses

The company defense area is to be fenced in with wire. However, platoon areas within such company areas are not to be inclosed by wire. [Note: Perhaps sufficient wire for both inside and outside entanglements was not available as wired-in platoon areas have been encountered.] The distance of the wire entanglements from the most forward weapons is about 50 to 100 yards.

To facilitate reconnaissance activity, narrow lanes through the wire entanglements are to be laid out on the enemy side. Wide lanes are permitted only on the flanks.

To defend the protective minefields, and wire entanglements, rifle pits, listening posts, observation posts, and weapon emplacements are installed. Dugouts are constructed for the garrison of the area.

Communication trenches are to be dug only between the firing positions or observation posts and nearby dugouts. Extensive communication trenches give the attacking enemy a chance to gain a foothold inside. In stony terrain the parapet is to be made of sandbags or stone, but trenches must first be dug deep enough into the ground (by blasting, if necessary) to prevent the position from showing above the surface.

As a matter of principle, no installations, as seen from the enemy side, must stand out above the surface of the grounds. Defended areas are not to be laid out on the crests of ridges but on the slopes [whether forward or reverse slopes, is not made clear]. Although the highest positions are normally the most desirable for observation and antiaircraft purposes, such installations must not be placed on forward slopes in view of the enemy, but somewhat further to the rear, masked by the crest.

Dummy positions (also for artillery and antiaircraft) are to be used for the purpose of diverting enemy artillery fire. Distance from the other positions must be great enough to protect the latter from the natural dispersion of artillery fire.

The sections of trenches inside a position must have frequent traverses or angles to reduce the splintering effect (see figure 2). Good camouflage is the best protection against enemy fire.

e. Transport

In rolling country, vehicles must be completely hidden from the view of the

enemy. In level country, this result is obtained by keeping the vehicles well to the rear of the combat positions, and by using camouflage with nets. These nets can be improvised with open mesh wire covered with any sort of brush or camel thorn.

* * *

Comment: Figure 1 indicates in diagramatic form the lay-out for a battalion defense area on more or less level ground. In actual practice, of course, natural defense positions would be entrenched. The front-line wire, naturally, would scarcely be laid out in a straight line. Both diagrams are based on German sketches, and are notable for their simplicity.

The three forward company defense areas are composed of several platoon strong-points subdivided into squad positions like the ones illustrated in figure 2. The large number of heavy and automatic weapons is worth noting. A squad area provided with an AA/AT gun, a mortar, a Hv MG, a LMG all well dug in and mutually supporting, flanked by similar squad areas and reinforced with the fire of infantry cannon from the support position, make a defensive position of great power, entirely aside from the garrison's rifle and grenade fire. Such a defense area could, if necessary, be supplied from the air if ground communications were cut off.

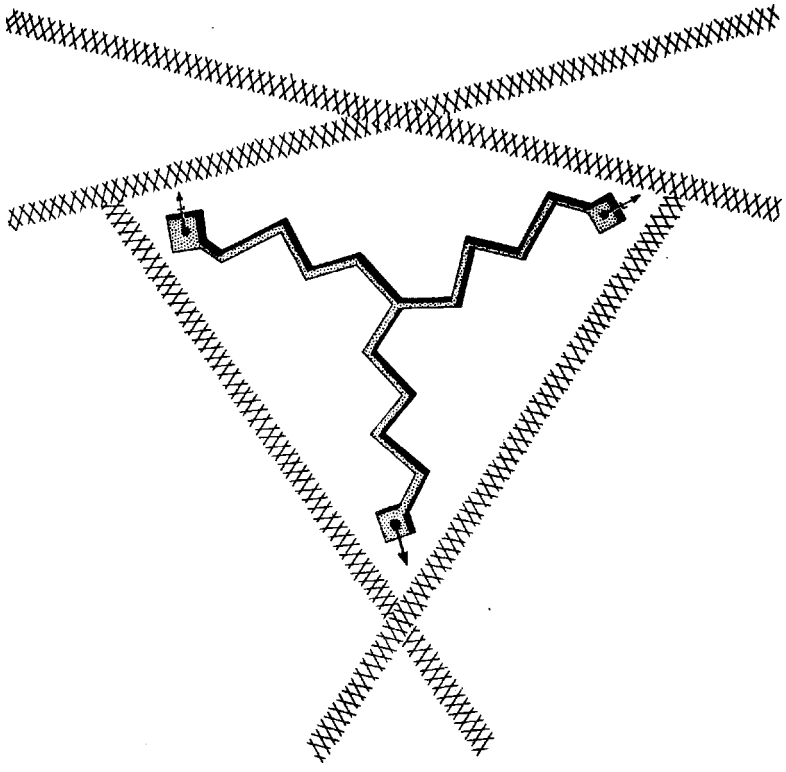
By necessity, the plan here outlined bears a superficial similarity to defensive layouts found in our own field manuals, but it should be noted that the method prescribed in the above document is based on the German theory of defense against the principal effort in a German armored attack. Such an attack combines overwhelming local superiority in men and equipment, the onset of tanks with motorized infantry and artillery following, combined with a fire from massed artillery, mortar and heavy weapons of the utmost possible violence, supported by dive-bombing. All is concentrated on a narrow front of perhaps 1,500 yards. The theory of defense assumes that the islands of resistance must allow the tanks to pass through since they can not prevent it, but do endeavor to stop by fire especially from the flank, the motorized infantry and artillery which follow behind. Cut off from their supporting infantry, the tanks are expected to be stopped by the rear elements of the defense and destroyed. A counterattack launched by the rear elements follows to eject any remaining enemy forces that retain a foothold in the defense system.

The extraordinarily wide frontage, 3,500 yards, is remarkable, as well as the wide spaces between the company defense areas - 500 yards. One commentator suggested that this defense would be far easier to pierce than our own more closely-knit system, but it must be remembered that the German plan here outlined is based on no theoretical study but upon the hardest possible school of African battle.

Another interesting feature is the concentration of heavy weapons entirely within the company defense areas.

A third feature is in the extensive use of minefields. Whether these minefields are laid by the garrison or by engineers is not made clear in the instructions, but as each German infantry company contains a group of men trained to lay and lift mines, it seems reasonable to suppose that the minefield in front of the battalion area was to be laid by the garrison. The absence of any indication of mines between the company defense areas is rather odd. It would seem logical to mine these avenues rather heavily. The failure to indicate such mining should, however, not necessarily preclude the possibility that mines might be found there. The system here illustrated would appear vulnerable to infantry attack. This, in fact, was the method used by Montgomery at Alamein, where, reversing the German practice, infantry and engineers equipped with mine detectors led the assault, behind a devastating artillery barrage. It is understood, however, that the British had a substantial superiority in both guns and tanks.

In southern Tunisia was found a rather unusual lay-out for a German platoon on the defensive. American officers report that inside the wired-in company



GERMAN PLATOON DEFENSE AREA

defense areas, were wired-in platoon defense areas, laid out in a more or less Y shape. The accompanying sketch is schematic, and not to any scale, but illustrates

the plan of such a position.

One branch of the Y, or the broad angle might be pointed forward, or occasionally, one branch ran over a crest with the other two limbs on the reverse slope. Automatic weapons were placed at the ends of the trenches; the trenches themselves were sometimes blasted out of the rock. Mutually supporting cross-fire, of course, was provided throughout the company area.

12. JAPANESE CONDUCT OF THE DEFENSE

When forced on the defensive the Japanese have striven to attain the element of surprise by means of silence and concealment; employed deceptive measures wherever possible; made extensive use of snipers; and attempted to disrupt the enemy advance by infiltration tactics. The following data on Japanese defensive tactics is taken from a recent British publication.

* * *

Unless attacked, Japanese troops occupying forward positions very seldom open fire, for fear of disclosing their location, even if the target offered is a good one. From the Japanese point of view, the defensive battle begins only when the assaulting troops are too close to be missed by their light and heavy machine guns. Carefully-concealed machine-gun positions then come to life when the assaulting troops are too close to the objective to receive support from their own artillery. If the assault is up hill the Japanese add showers of grenades.

Following normal practice the Japanese make the machine gun the principal weapon of defense. Automatic weapons are sited to fire along prepared lines, lanes being cut in the jungle if necessary. Heavy machine guns are sited well forward and are generally sub-allotted to platoon areas; they are often to be found on high ground or dug into the banks of "tanks," (water reservoirs); they are also sited to cover the main lines of approach; they are often placed singly, and frequently alternative positions are provided. An important point to remember is that during the defensive battle heavy machine guns sometimes fire along a line not more than ten yards from the forward edge of the Japanese main line of resistance, and assaulting troops, if unprotected by smoke or darkness, may therefore suffer heavy casualties just in front of the enemy position, particularly if they have become bunched in converging on the objective. Mortars and grenade dischargers come next in importance to the machine gun. Mortars of 3-inch or larger caliber may be allotted to rifle companies at the scale of one per company, but the weapon most frequently used by forward units is the 2-inch grenade discharger of which there are three in each platoon. This weapon throws a heavy grenade 700 yards. Once an attack is launched mortar and grenade discharger shelling is frequently

directed on areas which cannot be reached by flat trajectory weapons. Particular attention is paid to probable lines of approach and likely assembly areas.

Although the extent to which snipers are employed varies greatly with each front. there are certain places where snipers may be expected; namely, above small advanced positions, on the flanks of defense areas, covering lines of approach to Japanese positions, and covering paths in our own [British] area. Patrols, varying in strength, are very active at night and attempt to infiltrate between positions held by our troops - particularly those new to a sector.

The Japanese, so far, have made little use of artillery in defense. They tunnel into hill sides and build dugouts which afford adequate protection against all but a direct hit from a field gun. Well-built enemy earthworks often render his destruction by the normal supporting weapons impossible. Supporting fire shakes him and makes him keep his head down, but if the assault does not go in with all possible speed after the supporting fire has lifted, he is quick to seize the momentary advantage which slow troops may give him.

The Japanese launch immediate counterattacks against troops who have captured part of a position. These small local counterattacks may be made by only a dozen men led by an officer; they are preceded by a shower of grenades from grenade dischargers and the charge is made with automatic weapons. This immediate counterattack may be launched five to ten minutes after the position has been penetrated. A wild war cry, to which is sometimes added the shout "Charge!" in English, gives warning of what is impending.

Two examples of the Japanese conduct of the defense, are illustrative of most of the tactics commonly employed.

a. Example 1

In one case the Japanese placed a forward defense area on the hill illustrated in the accompanying sketch. All earthworks were carefully camouflaged and had it not been for sentries in our own forward positions, about 50 yards down the left slope of the hill, hearing the Japanese talk at night, it would not have been possible to say definitely that they were there.

Our reconnaissance parties, exposing themselves boldly on a ridge facing this position and 400 yards from it, were never fired upon, and many rounds of 3-inch mortar bombs were fired into it without producing any reaction.

The general line A-B was nearest to the point of observation. The position, however, continued on the right of A following the high ground which curved back slightly. It also receded behind B following the highest contour.

The position around A-B was probably held by a platoon as part of a company holding the main hill of which this feature was only a part.

The information available to the attacking troops, was that there were some enemy on the hill who had never been seen. They had been heard to talk at night and were believed to consist, at the very outside, of one platoon.

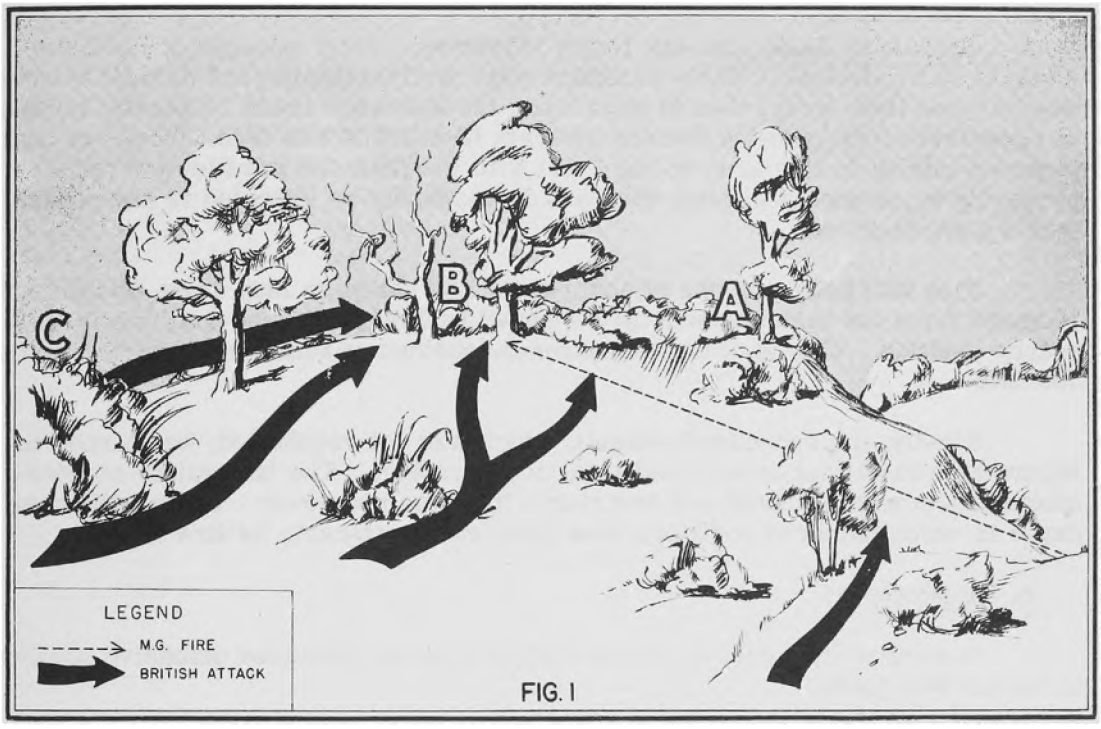


FIG. 1

After an intensive mortar bombardment one company launched an attack up both sides of the spur from C. The black arrows indicate approximately the line of advance of the main assaulting parties.

The leading assaulting troops made good progress until they were about 30 yards from the general line A-B; then a veritable hurricane of fire was let loose upon them. They were engaged by light machine-gun and grenade-discharger fire and began for the first time to suffer appreciable casualties. Shouting their war cries they continued to climb the hill, making use of such meager cover as the small bushes and folds in the ground offered. As the action grew in intensity camouflage began to slip off the parapet of what could now be identified as a continuous trench, part of which ran along the front A-B. When the leading troops were about ten yards from the parapet, they were subjected to accurate Japanese heavy machine-gun fire from a gun sited in another position. Although greatly weakened by casualties, they, the British continued to advance and, led by their company commander, hurled grenade after grenade into the Japanese position. They finally stormed and occupied the trench, killing or driving out all Japanese in that sector.

About ten minutes later there was a wild howl, as of jackals and hyenas; a shower of grenades from grenade dischargers fell among our troops, and with shouts of "Charge!" the Japanese counterattacked with automatic weapons, forcing our troops off the hill.

Comment: This company battle serves as a vivid example of Japanese methods in the defense. Their positions were well concealed and nothing tempted them to give them away; thus at zero hour, the attackers could be certain neither of the extent of the position nor the strength in which it was held. They had heard Japanese talking in this area at night and with the Japanese predilection for occupying commanding ground, they could reasonably be expected to have organized a position there.

Fire was held until the attackers were 30 yards or less away, and not until 10 yards from the parapet were they engaged by heavy machine-gun fire from a nearby position. This is a common Japanese method of achieving surprise in the defense.

Finally, the successful assault, which was not reinforced, was turned to failure by a small but determined local counterattack. The immediate counterattack is a common, though not invariable Japanese maneuver. There have been cases in which captured positions have been made untenable by fire alone.

b. Example 2

In another instance, an attack against a strong Japanese defensive position in Burma was made.

(1) Plan of British Attack

The plan of attack was divided into four phases:

Phase 1--At 0545 A Battalion to capture the eastern half of the Chaung River as far west as M16 (see accompanying sketch).

Phase 2--At 0645 B Battalion to capture the jungle area as far as line marked "A."

Phase 3--At 0710 C Battalion to extend their position on Twin Knobs to as far south as the line marked "B."

Phase 4--At 0850 B Battalion to exploit to line marked "C."

Artillery and heavy machine guns supported the attack with a barrage and concentrations.

(2) Japanese Position

The Chaung itself is a strong, natural obstacle, which the Japanese made

into an excellent defensive position, by building an intricate system of communicating weapon pits and defense areas, and at least one pillbox at S 5 (see accompanying sketch). All positions were mutually supporting.

The pillbox or bunker, which consisted of an outer covered weapon pit, and an inner chamber which is reported to have included both metal and concrete materials, was sufficiently well built to withstand no less than three direct hits from a 3.7-inch howitzer at point-blank range. It follows, therefore, that assaulting troops on and around the pillbox could be subjected to heavy mortar fire without any detrimental effects to the occupants.

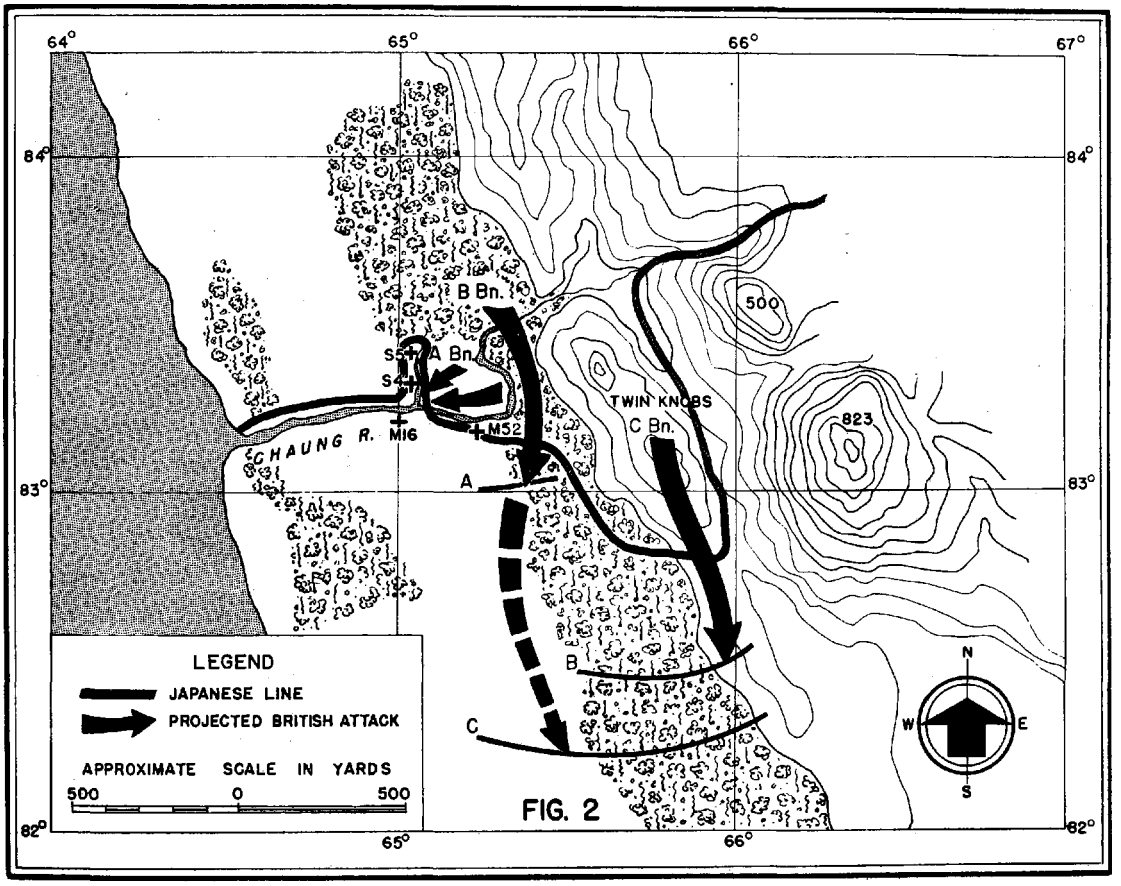


FIG. 2

All other works were dug well down and presumably provided with dugouts, for although approximately 124 tons of shell were fired into the Chaung area immediately prior to the attack, there was no indication that the enemy's fire power had been impaired.

The Chaung is overlooked from the east by two commanding positions, Hills 823 and 500. These are both steep and densely wooded. Although no weapons were

pin-pointed on these hills, mortars, heavy machine guns and at least two 75-mm mountain guns undoubtedly fired from there. These weapons could thus put down defensive fire anywhere in the area, by day, by night, or through smoke.

Unlike other Japanese defensive positions, weapon pits and fox holes near the Chaung were clearly visible from the air and in many cases could be seen from OP's. This does not mean that any movement, or guns were visible, but it was possible to determine where earthworks had been dug. However, in the jungle and on the hills 823 and 500 positions were so well concealed that with the exception of the two strong points which held up B and C Battalions, they remained undiscovered to the end of the battle.

(3) Course of the Battle

A Battalion commenced their advance without appreciable opposition, but soon the company attacking the Chaung from the north experienced the now familiar Japanese tactics of withholding their fire until the last moment, and it was not until they were crossing low, loose strands of wire, about 15 yards from bunkers at S 4 and S 5 (see sketch) that intense fire was brought to bear on them. These two bunkers were attacked repeatedly, but without success; our troops could find no opening through which to throw grenades and while on and about these bunkers they were subjected to mortar fire to which the bunkers themselves were immune. The other two companies were more fortunate, and although they were subjected to showers of grenades from grenade dischargers and hand grenades while advancing down the Chaung, succeeded in taking their objective, which included M 16. A proportion of these troops advanced up the small Chaung and cleared it as far as S 4 where they in their turn were held up. As the light improved, and as presumably the Japanese realized the situation, showers of projectiles from all weapons were fired into and around the Chaung, and heavy machine guns opened up from the flanks.

Meanwhile Phase 2 began and B Battalion advanced only to be held up by what was described as a defense area similar to S 5 (M 52 on the sketch). B Battalion was unable to reduce this position and was subsequently withdrawn.

Phase 3 commenced according to plan, but C Battalion almost immediately suffered the same experience as B Battalion, in that they ran into a cunningly concealed heavy machine gun position just beyond the line of departure. This position was so well hidden, that it escaped notice when the area was reconnoitered prior to the attack. This position also held out.

Comment: The attack failed through no lack of courage; the dash and daring of the attackers has been aptly described as an epic of collective gallantry. Why then did the defense succeed? There are important reasons:

Following his normal practice the Japanese held his fire until the assaulting troops were almost upon him; only then did his machine gun nests come to life--machine gun nests about whose strength or existence we knew little or nothing. To quote from a British defense pamphlet "the main task of medium [U.S. heavy]

machine guns. . .will be to take toll of enemy unarmored troops. . ." and no heavy machine gun is better sited to fulfill this role than one in an undetected nest with a big enough covering of earth, timber, and perhaps steel and concrete, to withstand the preliminary bombardment. In fact, by continually improving their positions and by careful attention to camouflage, the enemy had achieved surprise in the defense.

Strong positions which could withstand the fire of our artillery could also withstand the fire of Japanese mortars which gave additional protection to their garrisons.

The first and chief problem then, which the Japanese defensive position presents, is the problem which has faced every modern army for more than 25 years--it is the detection and neutralization of the machine gun firing from a well-built nest.

It will be noticed that no counterattack was launched in this battle, elements which had penetrated the position being dealt with by intensive mortar and grenade-discharger fire alone. This practice of bringing down defensive fire on one's own positions is likely to be a common feature of Japanese defensive tactics. In fact either by immediate fire or immediate counterattack the Japanese will attempt to make an overrun position untenable.

* * *

American Observers' Notes

Officers just back from the New Guinea and Munda fronts describe a Japanese defense system containing rather unusual features.

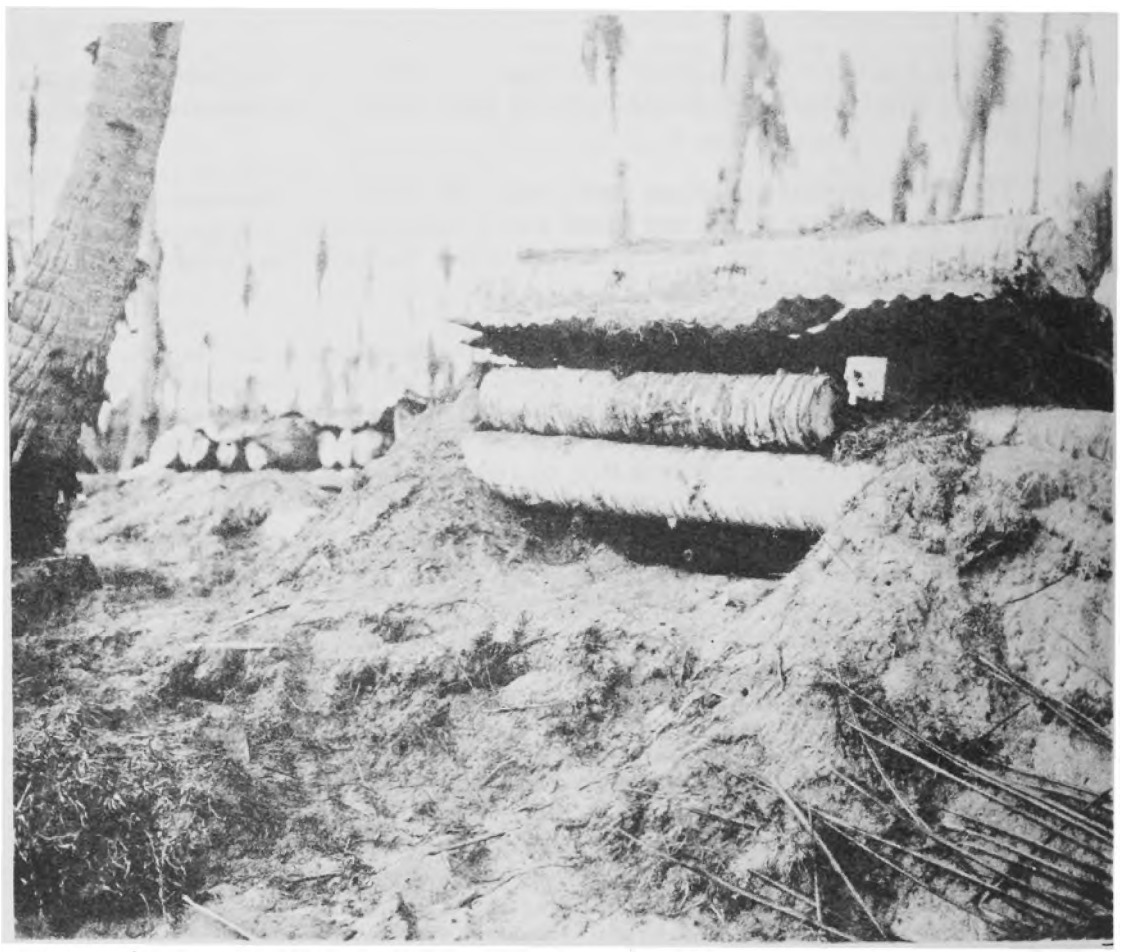
The area to be covered is fortified with bunkers set as closely as five yards apart with a second line of bunkers covering the gaps and a third line behind the second. The bunkers themselves are made of three layers of springy palm logs covered with earth and skillfully camouflaged. So strong are they that one officer reported he had seen British 25-pounder shells and our own 81-mm mortar projectiles "bounce off them." A 105-mm howitzer shell, however, would penetrate (see accompanying photographs for typical bunkers.)

Behind the lines of bunkers the Japanese sited mortars.

The armament of individual bunkers was apt to be an automatic weapon, which the Japs operated until killed.

Instead of fire-lanes, passages about 2 feet square were cut through the brush or grass, down which the Japanese would fire. Such rabbit-runs were practically impossible to detect until the garrison of the bunker opened fire.

Frequently, bunkers would be protected on each side by rifle pits, connected to the bunker by a shallow crawl trench. Access to the bunker was by holes so small an average American could not wiggle through. "The Japs," stated the observer, "burrowed like gophers."



Another favorite defense was to dig in among the roots of a banyan tree--a large tree that stands up above the ground on a mass of stilt-like legs.

Canister fired by a 37-mm gun proved effective against such a defense. Its balls tore through the jungle growth for 150 yards, delivering a cone of fire about 30 yards wide at 100 yards range, sufficient to hit both the bunkers and its protecting riflemen with the same charge.

The bunkers shown in the accompanying photographs, were part of a Japanese defensive position in New Guinea. It is reported that they were thoroughly "worked over" with artillery before their capture, which may account for the lack of camouflage. The timber in this case is probably cocoanut logs. Else-

where a type of palmetto is used. Both woods are springy and therefore tend to absorb the shock on contact of a shell. In the first photograph note how close the bunker in the background is to the one in the foreground. It was this type of Japanese field fortification that has caused U.S. troops such difficulty in the Munda area.

MEDICAL

13. IMMERSION FOOT

General

"Immersion foot" is an ailment, normally rare, which results from having the feet wet, as in a lifeboat, for days on end. It is aggravated by cold, and since the freezing point of sea-water is lower than that of human blood, the feet and lower legs of persons in lifeboats and on life rafts are apt to exhibit symptoms of freezing if kept wet for hours and days with ice cold sea water.

Torpedo victims are often huddled together with little chance for movement; immersion foot is the result. Technical experiment has also demonstrated that vitamin deficiency plays a great part in lowering the patients' resistance. It was discovered that immersion foot could occur in warm southern waters as well as in the North Atlantic.

With no or improper first-aid or medical treatment, amputation is frequently necessary, and intense suffering almost inevitable. However, with proper precautions, first-aid and correct hospital treatment, much of this pain and injury can be avoided. Three medical officers of the Canadian Royal Navy, Surgeon Commander D. R. Webster, Surgeon Lt. F. M. Woolhouse and Surgeon Lt. J. L. Johnston have developed such methods, described in the April 1943 issue of the Royal Canadian Navy Monthly Review, from which this article is extracted.

Symptoms

Victims of immersion foot report that they felt no pain after the first cold in their feet and legs. However, as their feet grew colder, and the circulation slowed down, the tissues were damaged, and as time went on, the skin became waxy-white in color, and insensitive to pain or temperature. Their extremities were practically dead with no more than a spark of life to be nurtured back to health through a gradual rise in temperature. Under such conditions, infection develops easily in the injured tissues and gangrene would be an almost certain result.

Dangers of Improper First Aid

Sympathetic rescuers have massaged these pitifully swollen feet and covered them with blankets and hot water bottles. Soon began, "intense, intermittent, stabbing, shooting pains, which started in the ankle joint and radiated to the tips of the toes with a generalized tingling sensation." Some victims of such misdirected treatment developed gangrene, which sometimes resulted in amputation. This happened to the survivors of one internationally known ship which was sunk in European waters. Of those picked up by trawlers, almost all had to have their feet amputated.

Precautions

It is most important to keep the feet dry and warm and to exercise the legs and feet--two things next to impossible in a crowded life boat or a raft. The first thing to be done, if possible, is to cover the legs and feet with a thick coating of grease as do long distance swimmers. Constricting clothing and shoes must be removed--they are useless in keeping the feet warm in the water anyway.

Correct First Aid

The first-aid rules are simple. The patient is to be kept dry and warm except for his feet. Any wounds, cuts or sores are to be dusted lightly with sulphanilimide powder. The legs are wrapped in some clean, soft material and laid on pillows.

Treatment

Doctors Webster, Woolhouse and Johnston used as their basic theory, "treat cold with cold." The affected areas were slowly brought back to normal temperature over a period of weeks. At first when it became necessary to devise a treatment in line with this theory, the patient's legs were placed, elevated, covered with a sterile towel, and packed with ice bags. Later, instead of ice, a cold blast from a fan was used, and at another time, the patient's feet were left exposed in a cold room while his body was warmly covered. Finally, a refrigerator was developed, with two openings for the legs, like a prisoner's stocks.

So effective was this treatment in relieving pain in one case when the cooling system failed, a patient fled to a window and promptly put his feet out to cool in the winter air.

There are some "must nots" which are most important:

No rubbing or massage;
No heat of any kind near the affected parts;
The patient must not stand or walk and his legs and feet must be gently handled;
The legs and feet must not be washed or soaked;
No lotions or antiseptics except sulphanilimide may be applied.

Results

At an eastern Canadian port, of 150 cases so treated, only seven amputations were necessary.

Men who were cured had to learn to walk all over again, and had an unusual and awkward gait until they regained the use of their limbs. Severe cold, too, would bring aches and pains to their feet.

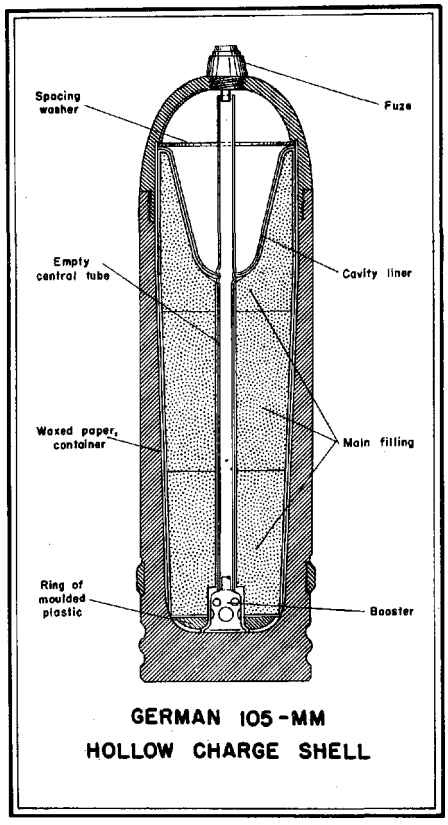
ORDNANCE

14. GERMAN 105-MM HOLLOW-CHARGE SHELL

The use of hollow-charge ammunition by the Axis armies was referred to in Tactical and Technical Trends, No. 18, p. 27.

The following description and accompanying sketch will serve to bring out some details covering the German 105-mm (4.13 in) hollow-charge shell called the 10-cm Gr 39. This ammunition is used in the German 105-mm gun howitzer.

a. General



GERMAN 105-MM HOLLOW CHARGE SHELL

Weight, filled, unfuzed	25 lb 7 1/8 oz
Weight, filled, fuzed	25 lb 9 oz
Weight, bursting charge	3 lb 14 5/8 oz
Penetration (estimated)	
Homogeneous armor	3.15 in at 30°
Homogeneous armor	3.74 in at normal
Color	Olive green, red band above rotating band.

An interesting point in the design of this shell is the shape of the cavity in the nose, which differs from that of the 75-mm hollow-charge shell (see Tactical and Technical Trends, No. 19, p. 27). In the latter case the cavity is cylindrical for the greater part of its length, being rounded off at the rear. In this case the cavity is conical except at the extreme rear, which, too, is rounded.

b. Method of Filling

The charge is supported on a ring of moulded plastic material fitting the base of the shell cavity. The charge, together with the plastic ring, central tube and cavity liner fits into a waxed paper container. It is probable that the charge is loaded into a hot shell lined with a bituminous composition to keep the filling firm.

c. Bursting Charge

The bursting charge consists of three pellets of cyclotol (TNT) wax, hot pressed, details of which are:

	Weight	Density	Composition		
			Cyclotol	TNT	Montan Wax
Nose	561 gm (19 oz 12.5 dr)	1.56	57.7%	39.6%	2.7%
Middle	720 gm (25 oz 6.25 dr)	1.58	57.1%	39.8%	3.1%
Base	490 gm (17 oz 4.5 dr)	1.58	55.5%	41.7%	2.8%

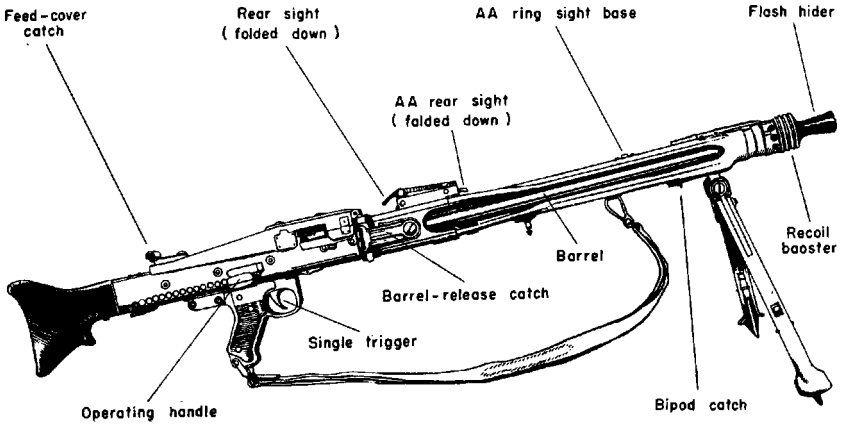
Note: It is probable that fuze AZ 38 and booster Zdlg 40 are fitted. These are shown in the accompanying sketch.

15. GUDOL POWDERS

Frequently within recent months technical descriptions of German ordnance contained the word "Gudol" or "Gudol-type powder". A description of this flashless propellant has recently become available. Its chief constituents are triglycoldinitrate, nitro-cellulose and nitroguanidine in equal parts. Nitroguanidine made by nitrating guanidine, which is a urea compound made from calcium cyanamide, releases large quantities of ammonia when discharged as a propellant. While the ammonia lowers the gas temperature below the flash-point, when used in large quantities as artillery ammunition, it produces enough ammonia gas to unfavorably affect the gun crews, particularly on a still day.

16. MORE DETAILS OF THE GERMAN MG 42

While an account of the new model 42 dual-purpose machine gun was published in Tactical and Technical Trends, No. 20, p. 28, further details of this light and fast-shooting weapon are now available. The locking mechanism is novel to those familiar with machine guns other than the Russian Degtyarev. The present standard dual purpose machine gun of the German Army is the MG 34; the latest known type of German machine gun to have been captured is the MG 42. It seems evident that this weapon is designed to replace the MG 34 although the actual extent of replacement is not known. (For additional details on these weapons see "German Infantry Weapons", Military Intelligence Service, Special Series No. 14 dated May 25, 1943.)



German M.G. 42

Weight with bipod	23 3/4 lbs
Length overall	48 in
Length of barrel	21 3/4 in
Weight of barrel	3 lb 14 1/4 oz
Cyclic rate of fire	1,100-1,350 rpm
Mounting	bipod or tripod
Caliber	7.92 mm (.311 in)

There is no provision for single shots.

a. Comparison with MG 34

By comparison with the MG 34, several interesting new features are noted:

(1) Locking System

In place of the Solothurn rotating bolt-head of the MG 34, the locking of the bolt to the breech of the barrel is achieved by a wedge, which forces outward, and into suitable recesses in an extension of the breech of the barrel, two rollers on the head of the bolt. As the principle is not familiar to many, at least in its application to ordnance, a simplified diagram illustrative of its action is shown in figures 1 and 2, and a detailed sketch of its application to the M 42 machine gun is shown in figure 3.

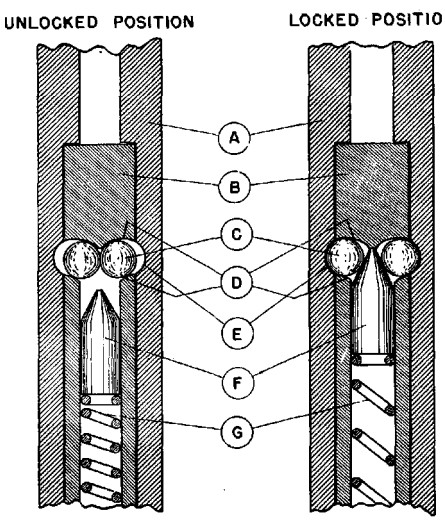


FIG. 1 FIG. 2

(a) Explanation of the Principle

It is desired to lock interior tube B (figure 1) securely, but temporarily, to exterior tube A. This locking is accomplished by means of circular (or in some cases spherical) bodies C, which are forced outward through holes E in tube B, into recesses in tube A by means of wedge F, actuated by spring G. When the spherical bodies C are in the position shown in figure 1, inner tube B is free to move within exterior tube A, but when spherical bodies C are thrust outward through the apertures in tube B and engage in the recesses in tube A, the two tubes, A and B are firmly locked together (see figure 2).

(b) Application in Model 42 MG

This principle is applied in the Model 42 machine gun as follows (see figure 3). On firing barrel A and barrel extension B recoil to the rear until rollers C are cammed inward by fixed cams D unlocking bolt head E and retracting firing pin F. The bolt carrier G and bolt-head continue to the rear guided by fixed guides H while barrel and barrel extension return to battery. On the return of the bolt, the impact of the roller with the camming surfaces I, the "spherical bodies" of figure 1 and 2 on the barrel extension carry the rollers from their seats, and, together with surfaces J on the bolt head, force the rollers outward locking the bolt head to the barrel extension. The initial outward motion of the rollers also frees the firing pin holder K which is driven forward by spring pressure insuring complete locking (by wedging rollers outward) before the firing pin can strike the primer. To extract the bolt-head from the barrel extension, the rollers must be pressed back with the thumb and finger inserted into grooves in the receiver.

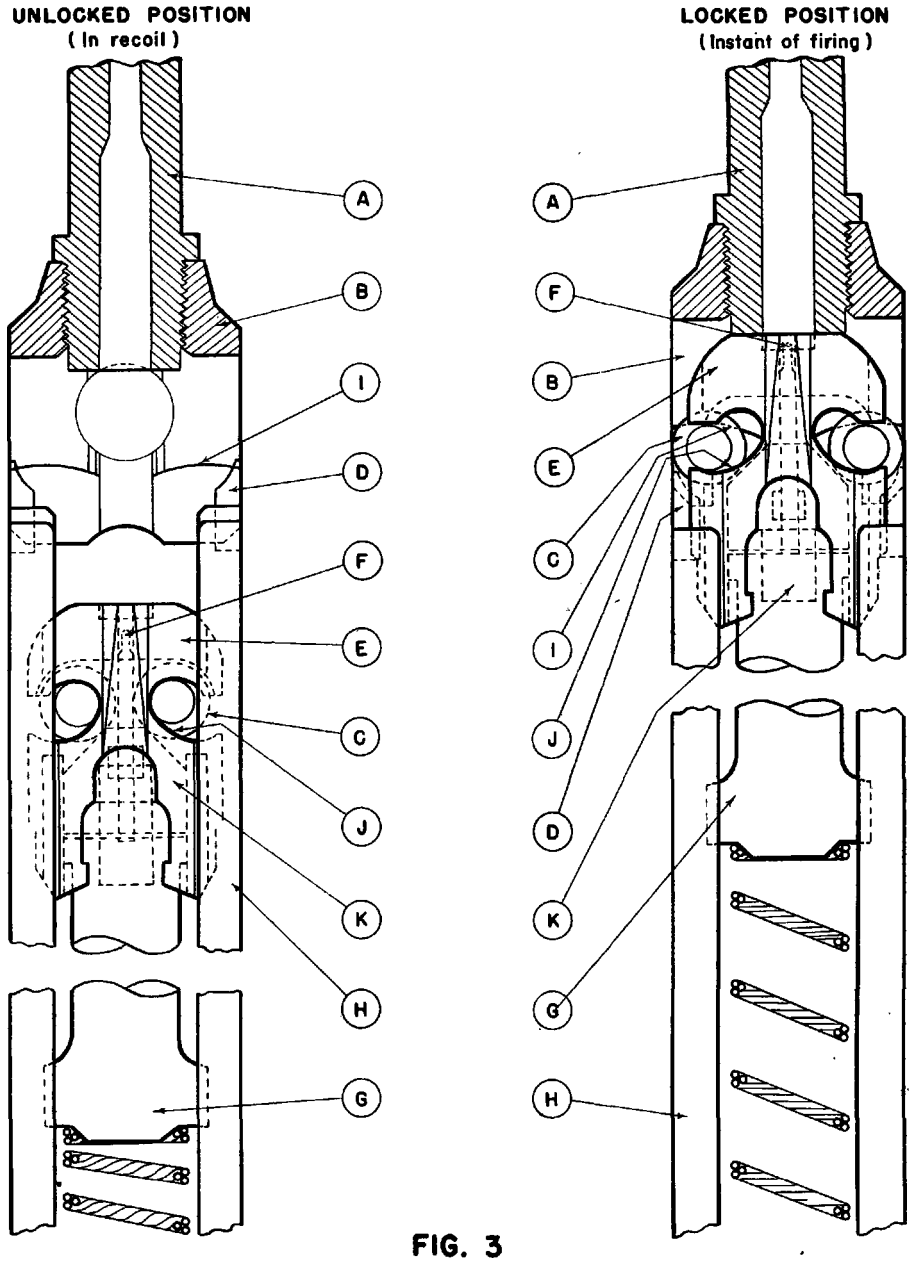


FIG. 3

BREECH BOLT, GERMAN MODEL 42 MG

The bolt-head can then be pulled out.

By this system, the gun attains a rate of fire of 1,100 to 1,350 rpm which would appear to be unnecessarily high for a ground gun, though of obvious value for AA fire; the cyclic rate of fire of the MG 34 is from 800 to 900 rpm. Preliminary trials show, however, that this high rate of fire has not been obtained without a certain decrease in accuracy compared with the MG 34.

b. Barrel Changing

The frequent barrel changing necessitated by the high rate of fire is met by the introduction of a rapid and efficient barrel-changing device. A barrel-change lever is hinged in the right side of the barrel casing, and can be swung outward bringing with it the barrel, which lies in a metal loop attached to the inside of the change lever. The barrel can then be slid out to the rear.

c. Unusual Feed Mechanism

Feed is by continuous metal belt through a feed block. As in the MG 34, operation is by a feed arm housed in the feed cover. In the MG 42, however, two feed pawls are linked to the front end of the arm by an intermediate link, in such a way that when one is feeding, the other is riding over the next round in the belt. The effect of this is that feed is in two steps instead of one step as in the MG 34, and is therefore much smoother.

d. Construction

The extensive use of pressing, rivetting and spot-welding in the construction (there are very few machined parts) gives the gun a less-finished appearance than is usual in German weapons. Considerable effort has been made to lighten the gun without the loss of strength - for example by making holes in the operating handle. There is no reason for assuming, however, that its life and performance are not up to the usual German standard.

17. PREMATURES IN GERMAN 20-MM FOUR-BARRELED AA GUN

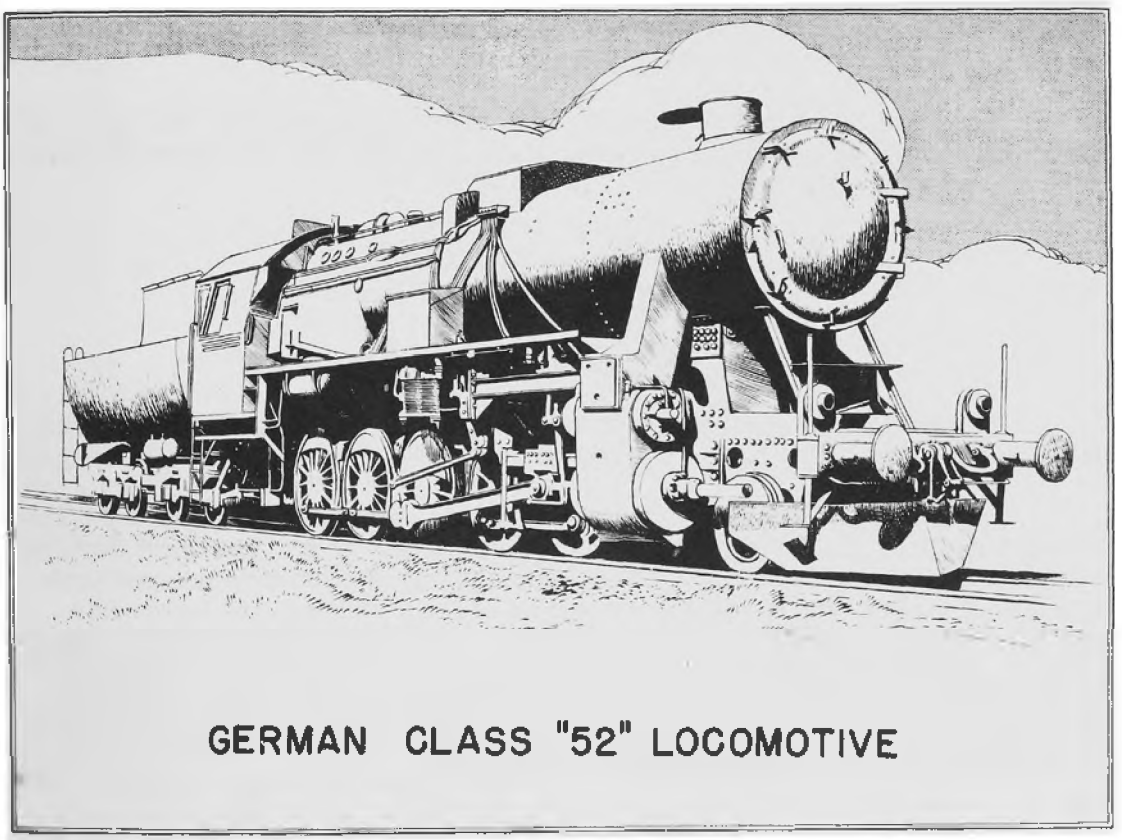
A communication from a German battery commander that fell into Allied hands complains of frequent premature explosions of the shells in the gun barrels before the closing of the breech. In the case cited, the premature had ignited about ten rounds in the magazine, which in turn set off the magazine of an adjoining gun. Two men were killed, four badly injured.

The writer suggested substituting for the over-sensitive ammunition, made between 1938 and 1942 with fuze AZ 5045, the armor-piercing Panzergranate 41. This ammunition may also be loaded with the 20-mm AP tracer self-destroying shell. As the complaint about the 20-mm four barreled AA gun applies with equal force to the single-barreled 20-mm Flak 38, appropriate precautions would appear advisable in handling any captured weapons of these types.

18. NOTES ON GERMAN ROLLING STOCK

It has been stated that the Nazis have accorded number-1 priority to transportation even to the extent of taking precedence over airplanes. Germany is vitally dependent on the smooth functioning of her transportation system. If this vital system which connects Nazi factories with their sources of supply and with their battle fronts, is put out of operation or seriously damaged, their whole war effort must obviously be retarded.

Some interesting developments affecting the transportation set-up, tending to reduce the consumption of construction materials and other valuable economies, have been recently reported in connection with the German locomotive and freight car situations.



GERMAN CLASS "52" LOCOMOTIVE

As was indicated in Tactical and Technical Trends, No. 24, p. 40, it was thought probable that the construction of the class "42" locomotive is to be started in 1944. This new type is said to be a refinement of type "52" (see sketch), has greater tractive power and is designed to meet the requirements of heavy freight traffic.

The same informed technical source responsible for the information mentioned in the foregoing paragraph, states that the dead weight of the railway

freight cars now manufactured in Germany has been reduced from pre-war levels by 25 per cent in the case of baggage cars, 34 for refrigeration cars, 29 for flat cars, 38 for box cars. However, the average carrying capacity for all types increased by 10 per cent.

The use of these new cars will provide the following chief advantages: saving of time and labor in manufacture, saving in construction materials, and enabling locomotives to pull additional cars.

The number of types of steam locomotives was reduced by the end of 1942 from 119 to 12. This included locomotives for military and privately operated railways (mostly small gauge), and in the case of electric locomotives, from 11 to 2, and from 97 to 5 for internal combustion locomotives.

The manufacture of additional types is continued in former locomotive works in Poland, Czechoslovakia and Hungary.

The chief types manufactured in 1942 were freight models "50" and "52" (see Tactical and Technical Trends, No. 24, p. 34) with "52" scheduled for almost exclusive production in 1943.

GENERAL

19. DECEPTION USED BY GERMAN PW'S

It has been reported that German prisoners of war about to be captured, in some cases have resorted to a trick which enables them to keep their weapons.

Just prior to the time they are captured, the aluminum canteen is emptied of water and then slit from the base of the bottle to the neck. The short German automatic pistol is placed inside the canteen. The sides are then pressed down together again over the weapon, thus keeping it from rattling, and the canvas canteen cover is then drawn over the canteen. The weight of the pistol is approximately equal to a canteen filled with water. In a great many cases, when this method is resorted to, the prisoner is able to carry the weapon into an internment camp, where it might be used for an attempted escape, or in any other similar situation which may be detrimental to his captors.

SECTION II

OPERATIONS OF AXIS MOUNTAIN TROOPS

OPERATIONS OF AXIS MOUNTAIN TROOPS

Before the war comes to a close, squads of American troops may well be roping across Alpine glaciers, groping for hand-holds up Balkan rock pinnacles, or dodging ice falls on the bleak crags of Norway. A description of how Axis mountain troops operate, taken from German sources except where elsewhere noted, would therefore appear timely.

It must be remembered that many of the European mountains are, as a rule, higher, rockier, more jagged, and desolate than those with which most Americans are familiar. Like the Canadian Selkirks, the Alps culminate in such tremendous snow-capped peaks as Mont Blanc or the Matterhorn, rising from ice fields and glaciers, storm-swept and dangerous, with deep-cut, stony valleys between. Rockfalls and avalanches are the ordinary risks of the Alpine mountaineer.

Eastward in the Tyrol the peaks are lower, and in the Balkans they are not high enough to wear snow in summer. Only two Balkan summits rise over 9,000 feet. However, the jagged Tyrolese and Balkan crags and pinnacles spring from jumbled masses of huge mountains, especially in Albania. They are extremely rugged, often forest covered, and riven by terrific gorges. Passes are few, and like the men of that land, rough and hard.

The forbidding Norwegian ranges, many lying north of the parallel of Nome, Alaska, or Labrador, are chilled by gales that roar across the ice floes straight down from the Pole. While not more than a thousand feet loftier than our Great Smokies or White Mountains, these wild peaks, with their low snow-line, great ice fields that come almost down to salt water, and sub-arctic weather, make them similar in many respects to the Alps. A peculiarity of the Norwegian mountain terrain consists of innumerable long, narrow lakes.

In visualizing operations in such highlands, one basic factor must always be borne in mind--the slowness of all military movement due to terrain, cold, and exhaustion, and the difficulty of command and supply.

What follows is based on German sources, except as otherwise noted.

* * *

a. Marching

A time allowance of one hour per 1,000 feet of climb and 1,600 feet of descent must be made in addition to that called for by the map distance. Because of the limited number of trails and the slowing-down of both men and animals due to fatigue, troops should be marched in smaller units than is customary on lowland

terrain. The maximum practical formation, is a company, reinforced by a battery, with a platoon of engineers pushed well forward to help clear the trail. [It may be noted here that our own Field Service Regulations suggest a reinforced battalion, which may be more practicable here than in Europe.]

This division into small self-sustaining units minimizes the risk of ambush, and each column can fight independently. To prevent small bodies of snipers from holding up the advance, single guns are placed near the head of the column. Both stationary flank guards and mobile patrols should be thrown out to secure high positions to the flanks. These elements rejoin the column as it passes. Where the climbing is particularly stiff, the infantry mingles with the artillery and pack train to help when necessary. Pack artillery moves at a walking pace. Rest-halts of three or four hours to permit the unloading of both men and animals are required every six hours. Short rests without removing packs are of little use. [Our regulations suggest regular short rests as well, which would appear to be absolutely necessary.]

b. Command

Warfare among the peaks is a severe test of the skill and leadership of the junior officers, as the operations of these small groups call for a high standard of training and discipline. Communications between forces scattered over many square miles of forest, rock or ice is difficult to maintain, and command problems are far more complex than in the lowlands.

c. Supplies

While transport aircraft may sometimes be used, one- or two-ton trucks, horses and mules, aerial cableways, pack animals, and manpower may all be required. A man will pack from 45 to 75 pounds; horses and mules not over 200 pounds.* Man-packing cuts heavily into the effectiveness of a fighting unit, because of fatigue and the employment of men needed for other purposes. (In the landing on Attu, a caterpillar tractor hitched to a pulley made fast to a "dead man" at the top of a cliff was used to haul up supplies.) Care should be taken to see that supplies are packed at the base in containers suitable for such transport. Normally, supply columns are organized into valley and mountain columns, the former carrying supplies for two days, the latter for one or two days.

d. Weapons

Naturally greater reliance is placed on lighter weapons than in ordinary combat. Light machine guns, and an extensive use of mortars tend to replace heavy machine guns and light artillery. Antitank and heavy machine guns are usually sited to cover road blocks. The effectiveness of artillery fire from valleys depends on carefully selected observation posts in communication with single guns. How difficult it is for artillery to operate in mountainous country cannot be overemphasized.

*U.S. Army load--no German figures given in source material.

The Germans have several types of mountain guns. One is the 75-mm infantry howitzer (7.5-cm l. I.G. 18--leichtes Infanteriegeschutz--light infantry gun) without the shield. It is only 10 calibers long, horsedrawn, and capable of being broken down into six loads of 165 pounds, maximum, each, for pack transport. With a 12 degree traverse, it has an elevation of from minus 10 degrees to plus 73. The projectile is a 12-pound high explosive shell with a percussion or time fuze, the latter in British opinion much more effective against rocks, where the instantaneous fuze is of little value. Five different charges are used with the following ballistic performance:

Charge	Muzzle Velocity (f/s)	Max. Range (yds)
1	310	930
2	368	1,260
3	440	1,750
4	565	2,680
5	730	3,880

This is probably the type of weapon most likely to be encountered.

A heavier gun, perhaps obsolescent, is the 75-mm mountain gun (7.5-cm Geb. K. 15--Gebirgskannone--mountain cannon). This 15.4-caliber gun weighs 1,380 pounds. The elevation varies from minus 9 degrees to plus 50 and the traverse is only 7 degrees. It is slightly more powerful than the weapon just described. The ballistics of the four charges with a 12-pound HE shell, with or without tracer, are:

Charge	Muzzle Velocity (f/s)	Max. Range (yds)
1	770	4,280
2	865	4,990
3	1,000	5,890
4	1,270	7,250

The gun breaks down into seven pack-loads, of which the heaviest, 330 pounds, would appear too heavy for packing by horse or mule.

Another gun is the 75-mm mountain gun (7.5 cm Geb. G 36). Why it is called a "gun" ("G". is abbreviation for "Geschutz" meaning "gun") when the other is called a "cannon" is not obvious. The Germans, like ourselves, use the terms interchangeably. No details of the piece are available, but is reported to fire the same projectile (not "ammunition") as the airborne gun (7.5-cm LG 40) described in Tactical and Technical Trends No. 26, p. 15. That weapon is a 320-pound recoilless, rifled, breechloader, throwing a 12.56-pound HE shell or a 10.05-pound hollow-charge shell, with a velocity reported to be 1,197 f/s and a range of 7,410 yards. Such a gun might, due to its lightness, be used as a mountain gun. It also can be broken down into separate parts.

There is a report of a 105-mm mountain howitzer (10.5-cm Geb. H. 40) but no details are yet available.

In the weapons list, grenades are not mentioned - perhaps they are taken for granted. In the East African mountain campaign in Eritrea during 1940-41, the Italians used a very light hand grenade, which the British report, produced "devastating effect". The resourceful British countered them with corrugated iron shields, and fabricated slings and catapults which threw them back at the Italians "with considerable accuracy" at ranges up to 100 yards.

Recently, a German publication suggested a mountain tank capable of taking gradients up to 45 degrees, narrow enough to travel mountain trails and of such a construction as to make possible sharp turns. The engine would have to be capable of functioning at 12,000 feet. Nothing definite is known concerning such a tank.

e. Training

In general, German mountain units initially receive the same basic training as infantry, with specialized training afterward. Battalion officers must be trained army mountaineering guides and each year pass tests. All guides must be adept at map reading and familiar with the use of the altimeter, be able to judge the weather and recognize mountain dangers. They must be capable of reaching difficult observation posts. As sound travels farther in the mountains than across flat country, great emphasis is placed on movement without noise. Troops are trained to be most economical in their expenditure of ammunition. As troops may be away from their organizations for days at a time, a high standard of discipline and hardness is required.

f. Notes on Reconnaissance, Communication and Engineers

Aside from its usual functions, mountain reconnaissance calls for the marking of trails where pack transport must be used, where the path should be improved, where the path is under enemy observation, and where troops will have to be responsible for their own transport.

"In the valleys, motorcyclists may be used for communication; on the heights, wire laying is most difficult and radio is the primary means of communication." The above abridged quotation fails to mention the fact that among the peaks are many dead areas where radio, especially short range, is unreliable, and wire or visual signals must supplement the radio. Jamming is possible and was experienced in the Attu operation. Heliograph, blinker, rockets and smoke all appear practicable. In their East African warfare, the British made extensive use of visual signals, with a curious development--the sewing of colored patches on the backs of assault troops' uniforms, so that they may be identified at long range and not fired upon by their own supports.

Engineers must understand the bridging of torrents, the making of mule trails, and the construction of aerial cableways. The British in Africa report such other activities as road maintenance, mine laying and lifting, demolitions,

reconnaissance, water supply, and when not otherwise usefully occupied, fighting. In Europe, protection against snow and the clearing of snowed-in roads and trails would be part of the engineers' work as well as the construction of defensive positions by blasting. In the more static phase of mountain warfare during World War I, a great deal of tunneling and underground warfare was waged on the Italian front, involving some blasts of the most gigantic proportions. An article on this subject appeared in Tactical and Technical Trends, No. 29, p. 39.

g. Tactics

(1) Attack

The early possession of commanding heights is essential for the security of forces moving in the valleys. The main attack, generally, will have to follow the valleys, as they alone give freedom of movement to a strong force and its supply trains. In attacking uphill with artillery support, there is danger of rock slides caused by the shells of the covering fire. Downhill attack is easier for assault troops, but presents tactical and ballistic problems for artillery.

Ordinary artillery was found by the British in Eritrea to be of little value, but pack-howitzers with a very high trajectory, and medium howitzers, if they can be gotten up, were most effective. It is to be presumed that the Germans will make full use of this experience.

(2) Defense

In defense it is better to have only the foremost defense areas on, or in front of, the crest, and to have the heavy weapons on the rear slope. This the British found to be the Italian method, augmented by machine-gun and mortar fire. The ancient, effective defense common to all primitive warfare, of rolling or blasting down rocks on attackers is not mentioned by either British or German sources used here, but the advantage of well-placed mines to start rock-slides is too obvious to be over-looked. In retreat, every single avenue of pursuit must, if possible, be blocked or mined, forcing the pursuers to storm high crags in the face of delaying fire. Demolition operations to blast roads or cover them with avalanches are particularly effective.

The British report frequent use of road-blocks covered by fire, and the use of intense defensive mortar- and machine-gun fire by the Italians, together with very wasteful fire at night that gave away their positions. British troops that had attained their objective were subjected to violent fire and counterattack. In their withdrawal through the mountains toward Keren in Eritrea, the Italians made full use of demolition tactics to delay pursuit.

On Attu, where the terrain was mountainous, the Japs used fog as cover and followed the edge of it up the mountain side. However, among the high peaks, according to experienced mountaineers, fog is apt to be unreliable cover.

h. Combat in Extreme Cold

The following German memoranda appear to be of unusual practical value:

(1) Marching

(a) Weapons must be covered.
(b) It is emphasized that clothing must not be too warm.
(c) Plenty of towing ropes should be loaded on the trucks.
(d) Advance guards should be strong, with heavy weapons and artillery well forward.
(e) Antitank weapons are distributed along the column.
(f) Ski and sleigh-borne troops are deployed to guard the flanks.
(g) Horse-drawn sleighs and handsleds are valuable for the transport of weapons and supplies.

(2) Halts

As opposed to normal mountain practice, halts must be short when the temperature is low.

Here occurs a rather unusual direction, worth quoting in full. "Motor vehicles must be parked radiator to radiator, snow removed from under the vehicles and some sort of foundation placed under the wheels." Presumably, during a lengthy halt, the trucks are pulled off the road, into deeper snow, which obviously must be dug away from the wheel tracks to prevent possible stalling. Probably, they are parked in woods or under cover, or camouflaged. Placed radiator to radiator, a tarpaulin could be thrown over the hoods and the engines kept warm. The foundation under the wheels would give starting traction. A suggestion as to camouflaging wheel tracks with fresh snow might have been in order.

(3) Restrictions to Movement

At zero temperatures the use of tanks and motorized equipment is limited. Tractors can negotiate snow slightly over a foot deep, but motorcycles are useless at six or seven inches. Snow is a tank obstacle when higher than the ground clearance of the tank. Gas consumption at very low temperatures is calculated to be five times normal. "Snow over 16 inches is not passable for pack animals." It is to be doubted if Custer, Miles, or some of the other generals of the Indian Wars would accept this limitation; but the reason, perhaps, may be that in the Alpine variety of mountains, 16 inches of snow or over on the level will drift and block the trails until it is impractical to attempt pack train transport.

Here it should be noted, that during the Norwegian campaign in April and May of 1940, the Germans drove motorized spearheads, including tanks and motorcycles, eastward from the Osterdal (valley) north of Oslo toward Hjerkinn and Inset through high passes, over narrow, sharply twisting roads where the snow lay from

six to ten feet deep. How it was done has not come to our knowledge, but neither the Norwegians, who certainly knew the country, nor the British, had considered it a possibility. The results would indicate that such snow-fighting equipment as bulldozers, rotary ploughs, and similar machinery were included in the German materiel.

(4) Weapons

Ranges are usually under-estimated in clear weather and over-estimated in fog. At low temperatures, weapons at first fire short. When visibility is bad, ammunition consumption rises.

(5) Reconnaissance, Communication, and Engineers

Among the extra tasks of reconnaissance caused by cold are, information as to the depth of snow, load capacity of iced streams, and danger of avalanches.

Scouts must remember that the enemy will use tracks in the snow to lead patrols into ambush.

Signs on stakes well above the snow or the marking of rocks or trees and the setting up of flags on poles are necessary to mark roads.

Line construction takes longer in extreme cold, and the cold and damp lower the efficiency of electrical equipment.

Engineers must understand the bridging of iced surfaces, bridge protection and maintenance against ice, and the blasting of the frozen surface of marshes.

(6) Tactics

(a) Attack

Assembly areas, in view of the difficulty of movement, must be farther forward than normal. Deployment must often be delayed till contact with the enemy is made. As a rule, limited objectives only are possible, but combined frontal and flank attacks will be made where possible. Commanding positions, which assume added value in cold weather, must be seized early in the action. To prevent surprise, or deal with surprise attacks, heavy weapons must be decentralized. In attack, ski troops are valuable.

(b) Defense

It must be remembered that obstacles take much longer to build in the cold. To make the enemy deploy early, strong outposts are required. The usefulness of snow as a protection against fire is often over estimated but ice fortifications and ice concrete can be employed as described in Tactical and Technical Trends, No. 22, p. 20.

CORRECTIONS

Index

No. 30, p. 46: In the section Antitank, opposite the reference to the "75-mm Antitank Gun," reported in issue No. 22, the page number should read 6 instead of 66.