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SECTION I

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AIR

1. SOME FEATURES OF GERMAN AIR TACTICS

In a recent issue of the Red Star, the following article written by a Red Army Staff Officer, describes some features of German air tactics during the spring operations on the Eastern Front.

* * *

During the operations conducted this spring certain features of German air tactics stood out very clearly. Great air battles fought in the Kuban area and other regions of the front give many examples which characterize present tactics of the German Air Force.

In the first place let us note the use of very strong concentration of planes of all types for a blow on a chosen target. In order to achieve strong concentrations of planes at a given time on a target, the Germans, besides considerable regrouping of squadrons, use the following maneuver: groups of German bombardment planes based on airfields at a considerable distance from the chosen target take off according to a prearranged time schedule arriving over the target simultaneously, or within a very short time of each other. For example, during one raid in which several hundred bombers took part, the planes were over the target only 20 to 25 minutes. These planes flew from airfields widely scattered in depth and in front. Such a maneuver is often necessary as our [Russian] reconnaissance planes usually discover large concentrations near the front lines in time for our attack planes to disperse such concentrations. It is necessary to note that the maneuver described above is not always successful. Organizational difficulties, changes in weather conditions, and actions of opposing aviation often disrupt the plans of the German command. In one particular instance where five groups were to take part in a raid, only one reached its destination and was there dispersed by our air defense.

Combining both the concentration of planes on airfields near the front lines, and the air maneuver, Germans are often able to achieve strong concentrations of air power on a given target. This is done in the following manner: pursuit planes with limited gasoline capacity, and light bombers, are gathered on the airfields in the vicinity of the chosen target. For this purpose the Germans use squadrons trained for direct support of ground troops. The main force of bombardment planes follows a time schedule, taking off from widely scattered airfields.

The character of the German air attack depends on the air situation and the objective. If large numbers of fighter planes are available they arrive over the target ahead of the bombers. They endeavor to drive from the air the largest possible number of our fighter planes leaving the air over the target area uncontested to the bombers and their fighter protection. If sufficiently large numbers of fighter planes are not available, the bombers attack with almost no protection.

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In the massed attack of fighter planes that precedes the appearance of the bombers each group of fighter planes echelons vertically and in depth in such a way that it can fight independently of the others. Missions of these groups are varied. Some groups composed mainly of Me-109's and FW-190's engage fighter planes, employing horizontal and vertical maneuver. Often during the course of the battle Germans detach groups of four or six of the most experienced fighter pilots in order to intercept our reinforcements. Other groups somewhat smaller than the first endeavor to secure control of the air over the target.

The following example drawn from actual battle illustrates German methods of attacking our bomber formations. A group of "Lagg 3" fighters was protecting an echelon of "Ilushin 2" bombers which were operating over a battle field. In the vicinity of the target our planes were met by German fighters. After trying to separate our fighters from the bombers, German planes, for the most part, Messerschmitts, formed an "echelon in line ahead" on the right side of our bombers while the fighter escort was echeloned on the left side. This maneuver gave the German fighters certain advantages. It was difficult for our fighters to intercept the attack against the bombers without subjecting themselves to fire from succeeding enemy planes; each enemy plane was protected by the following one; and enemy planes could take turns firing against the same target.

Germans have also changed somewhat their bomber formations. Typical of the formations used recently is a group of 30 to 40 Heinkels or Junkers which fly either in a wide formation or in groups of 9 to 12 planes "in line ahead". On some occasions the number of bombers in group was increased from 60 to 80 planes. During daylight hours these attack in large groups, while at night they attack singly or in small groups.

Against our ground forces Germans use low-flying or diving attacks made with the improved Junkers-87 which they call Panzerjagdflyzeuge. It is now equipped with two automatic cannon, its speed is slightly increased (320 km/ph), and its range is increased. In combatting these attacks our "Ilushin 2" which has very strong armament is especially useful.

ANTIAIRCRAFT

2. GERMAN AERIAL DEFENSE WITH ALL WEAPONS

Reproduced below is a German memorandum on defense measures to be taken by ground forces against air attack. It is both comprehensive and concise. For previous reference to this subject, see Tactical and Technical Trends, No. 30, p. 6.

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(1) The activity of the enemy air force is directed against all resources of the German armed forces. It is, therefore, the duty of every single soldier and of all arms to combat enemy planes.

(2) The enemy plane can attack only when he can see you, your weapons, your vehicle or your tent. Avoid being "spotted" (sighted) from the air. The best protection against being seen is camouflage.

(3) Camouflage means adaptation to the forms and colors of the surroundings. Keep this in mind. Incomplete camouflage is better than none. However, an incorrect type of camouflage, such as the accentuation of color contrasts and the creation of noticeable shadows is worse than no camouflage at all. This will attract the attention of the enemy aviator.

Camouflage must be changed continually in accordance with the surroundings, background, weather, and even according to the time of the day. Efforts by each individual man increase the protection for all.

(4) On marches or at halts, in rest areas, while in readiness, attacking or defending, the leader must keep in mind to deploy the units, to disperse columns and marching groups, to keep proper distance between groups, as well as dispersal to the flanks. Gun emplacements of heavy weapons, preparations for combat of tanks, assault guns, and cars must be carried out near groves, in town-alleys or gardens, or near haystacks, or at least in surroundings which lend themselves for camouflage purposes.

(5) Execute marches and movements, even of smaller units, as much as possible at night. Avoid crowding. No halts at crossroads, squares or narrow places. Strictest black-out discipline. If flares are released by the enemy, cease marching, stop cars, don't move--hold draft and pack animals.

(6) Bombing attacks and attacks by other airplane weapons cannot be successful if you acquire cover against fragmentation for yourself, your weapon and your vehicle by digging. Remember: dig slit trenches when engaged in tactical situations, even at temporary halts or employments.

Never dig a slit trench beneath a motor vehicle (tanks excepted).

(7) On marches, the leader will order at least one man per platoon as an air guard; if troops are being transported on motorcars, at least one guard per truck.

(8) 20-mm AA self-propelled guns will always be ready for combat. Motorized troops must have the AA machine guns on trucks ready for combat. Keep sub-machine guns handy, distribute ammunition.

(9) On halts and in rest areas, designate a responsible superior for anti-aircraft defense. Keep anti-aircraft machine guns in readiness (in triangular formation).

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(10) Weapons must be camouflaged. Fire only if the object to be protected is attacked and if the airplane is within range of the weapons.

(11) If an air attack is imminent, cannoneers and machine gunners will not leave their posts.

(12) Cannoneers and gunners are not to be used as air sentinels.

(13) Each target must be combated with several types of weapons. Designate one gun or machine gun to be on the alert, in order to open fire at a moment's notice, and to concentrate fire on the target by platoon or machine-gun section.

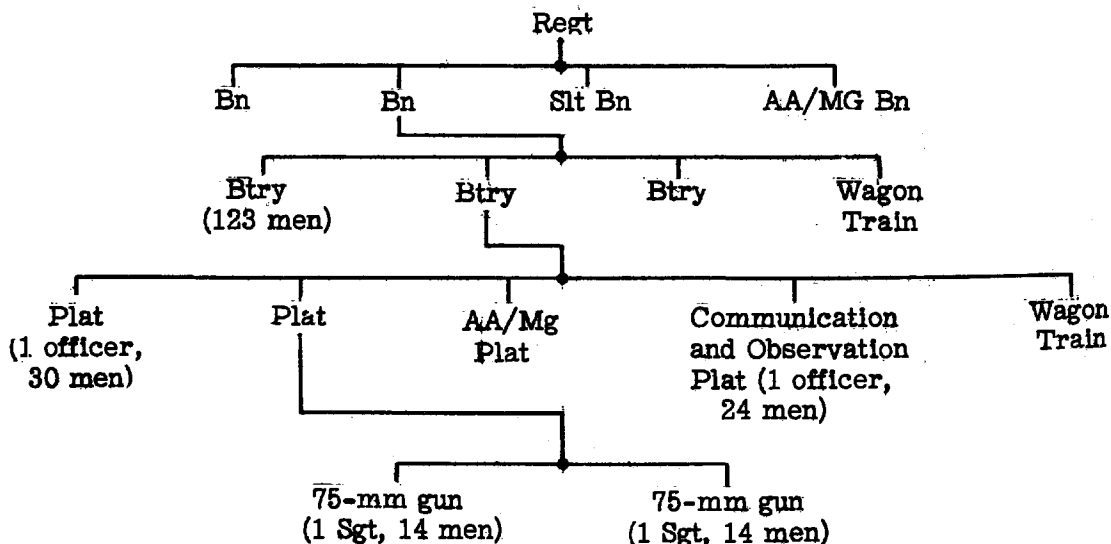
(14) Keep calm and don't get excited. To prevent damage by bombs or other airplane weapons and to efficiently repulse all attacks, act cautiously but quickly.

(15) There is no such thing as "air-terror".

3. ORGANIZATION OF JAPANESE AA REGIMENT

Recent evidence has thrown light on the organization of Japanese anti-aircraft units about which little was previously known.

The organization of an AA regiment is believed to be as follows:



A battalion therefore consists of 12 guns and a regiment of 24 guns plus a number of 20-mm AA/MGs. AA regiments are army troops, the battalion normally being the tactical unit.

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In the Southwest Pacific the Japanese appear to have frequently used two-gun positions with AA/MGs sited near the guns. In Burma, however, four-gun positions appear to have been more normal.

ANTITANK

4. TACTICS OF GERMAN ANTITANK ARTILLERY

The following summary from British sources gives some recent information on the German antitank tactics. It includes notes on the theory of this type of fighting and on actual experiences from battle areas.

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a. Antiaircraft Artillery in Antitank Role

A German artillery general writing in a newspaper article, stated that the AA artillery has long outgrown its original role. It has, indeed, still to undertake the AA protection of the forward positions and lines of communication, but these duties are carried out, as it were, on the side. Elements of AA artillery are now placed in the main line of resistance, and kept in a mobile condition. Their chief purpose is antitank defense, which they carry out by allowing the tanks to close to very short ranges. The first round should be, and often is, a direct hit on a vital spot. Furthermore, units of AA artillery may be also used as field artillery. They are placed in the field artillery area from 2,000 to 4,000 yards behind the main line of resistance, have their own OP's and perform all the normal artillery tasks.

b. Simultaneous Use of Various Calibers in AT Defense

Two papers, apparently from the German tank school, dealing with anti-tank tactics on the Russian front, state that 37-mm AT guns, although adequate against most Russian tanks, must be used in conjunction with 50-mm and, where possible, with 88-mm guns. AT guns should be concentrated in centers of resistance.

The papers also stress that long fields of fire are often a disadvantage; the ideal field of fire is that of the effective (not the maximum) range of the gun. Enfiladed positions, and positions on reverse slopes are becoming more important. Dummy positions are very important in making the heavy Russian tanks waste the small issue of ammunition carried. Mines in front of the guns are useful in view of the Russian habit of making small raids at night in tanks equipped with blinding headlights or searchlights.

At night always, and by day usually, a 37-mm AT gun with hollow-charge ammunition should be kept ready for action. Camouflage must be good, and fire

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held till the last moment, as more than one shot is scarcely ever possible.

c. Layout of Gun Positions

A British antitank regiment has supplied some interesting notes on the layout of the enemy antitank defenses in Africa.

(1) In general, gun pits appeared to be sited with no attempt at defilade; there were few instances of guns being in mutual support of each other. The 88-mm pits and the majority of pits for the 47-mm Italian guns were in the main line of resistance. There did not appear to be much depth in the layout of either of these types. The 20-mm Breda guns were in the rearward emplacements, thus giving a certain degree of depth to the position.

(2) Two 88-mm pits were examined, both well up in the main line of resistance--one was in fact sited in an opening in the foremost double-apron fence, about 50 yards in front of which was a low trip-wire. The gun was sited to fire straight to the front down a valley, to a distance of about 3,000 yards. Both AP and HE shells were found in this pit. The second pit was similar, but did not have as long a field of fire.

(3) Only two 47-mm pits were found in which there had been any attempt to get defilade from the front. None of these is considered to have been well-sited. In the majority of cases, pits were found (often in pairs about 50 yards apart) in the main line of resistance and sited to fire straight out over the wire, which was, on an average, 40 to 50 yards distant.

d. Company Tactics in Africa

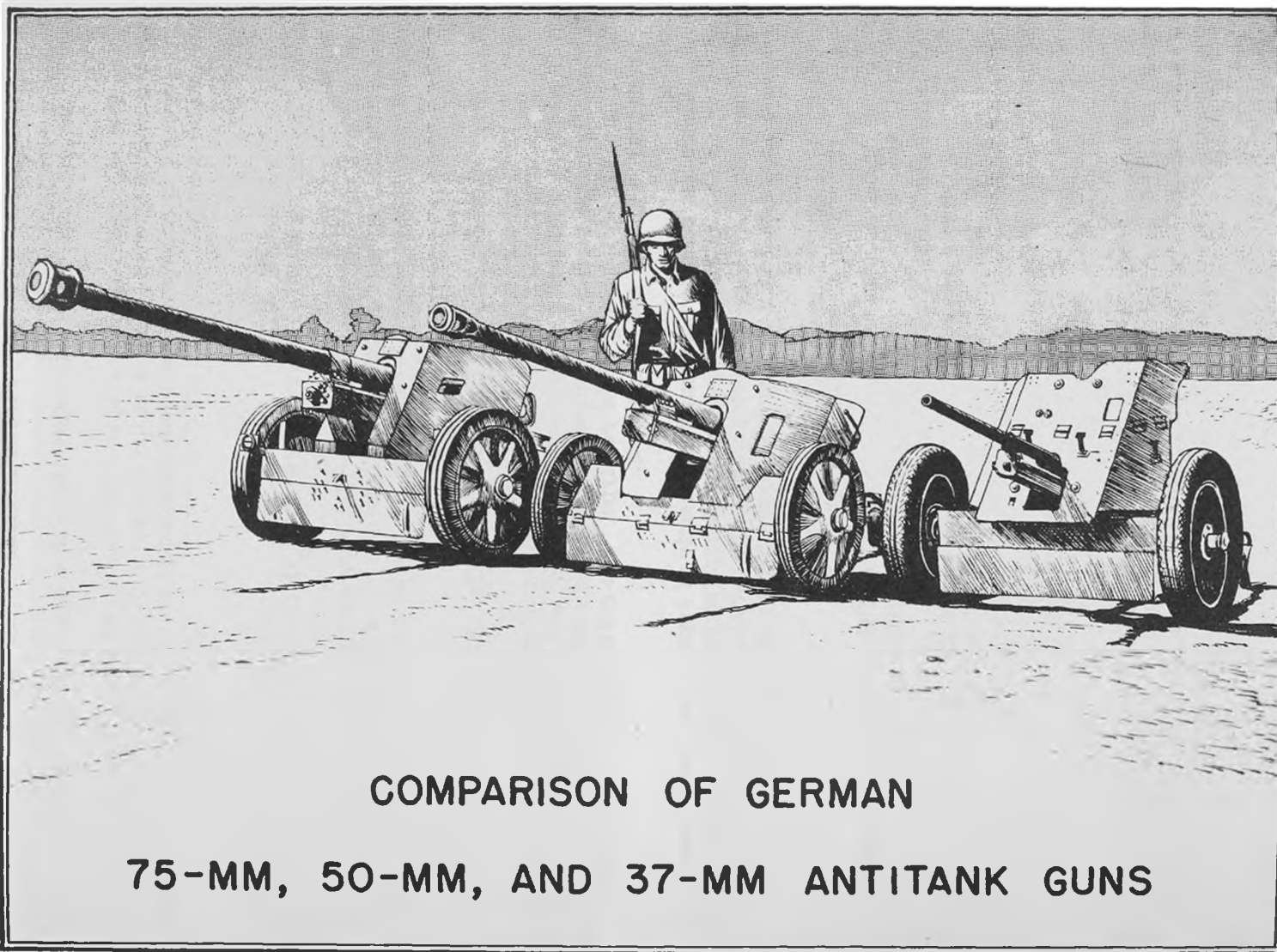
(1) Tactics in a Static Role

The German antitank company commander is given a sector to defend, which he sub-allots to platoon commanders. Each gun in a platoon is then given a definite sector within which the No. 1 of the gun has complete freedom of action. Fire was not controlled by the company commander. Rapid changes of position were possible only with the aid of tractors which were kept as near as possible to the gun positions. There were no drag-ropes on the guns and manhandling beyond a few yards was exhausting.

(2) Formation When Advancing

The company formation was for the three platoons to advance in line of platoons. Two guns in each platoon were forward, about 200 yards apart, and the third gun in support 200 yards behind, and equidistant between the forward guns. The distance varied, however, to suit the ground. When cooperating with, and protecting the flanks of tanks, a liaison officer was assigned to the tank unit by the antitank battalion.

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COMPARISON OF GERMAN
75-MM, 50-MM, AND 37-MM ANTITANK GUNS

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ARMORED

5. GERMAN PzKw 3

The accompanying photographs show four views of the German medium tank PzKw 3. Figures 2, 3 and 4 is the PzKw 3 with the long-barreled 50-mm gun. Figure 1 is essentially the same tank except that it is equipped with a short-barreled 50-mm gun.

6. GERMAN EIGHT-WHEELED ARMORED VEHICLES

The three main types of German eight-wheeled armored vehicles are shown in the accompanying sketches. These are all of pre-war design. The principal differences between the three types are outlined in the following report from British sources:

a. Eight-Wheeled Heavy-Armored Car Sd. Kfz. 231 (8 Rad)

This armored car called in German Schwerer Panzerspähwagen Sd. Kfz. 231 (8 Rad) has a 20-mm gun Kw.K 30* or Kw.K 38 and a 7.92-mm MG 34 mounted coaxially in the turret. The latter is capable of a 360° traverse. It is equipped with a radio, the aerial being of the rod type. The crew consists of four men - a commander, a gunner and two drivers.

There has been no confirmation recently of reports that the 37-mm Kw.K was to be mounted in this armored car instead of the 20-mm gun. Details of this car follow. (Except where otherwise stated, the particulars given below on the three models are based on the results of examination of a captured vehicle).

(1) Weight

Unloaded	16,588 lbs (German document)
In action	17,920 lbs (approx)
Axle loading	
1st axle	4,340 lbs
2nd axle	4,396 lbs
3rd axle	4,536 lbs
4th axle	4,368 lbs
	17,640 lbs

NOTE: A report on a captured vehicle estimates the weight loaded of this vehicle as 17,640 pounds, whereas a German document gives the weight in action as 18,256 pounds. It will be noted that the figures given here for axle loading, power/weight ratio, etc., are based on the estimate in the report.

*Kraftwagenkanone - tank gun or vehicle gun

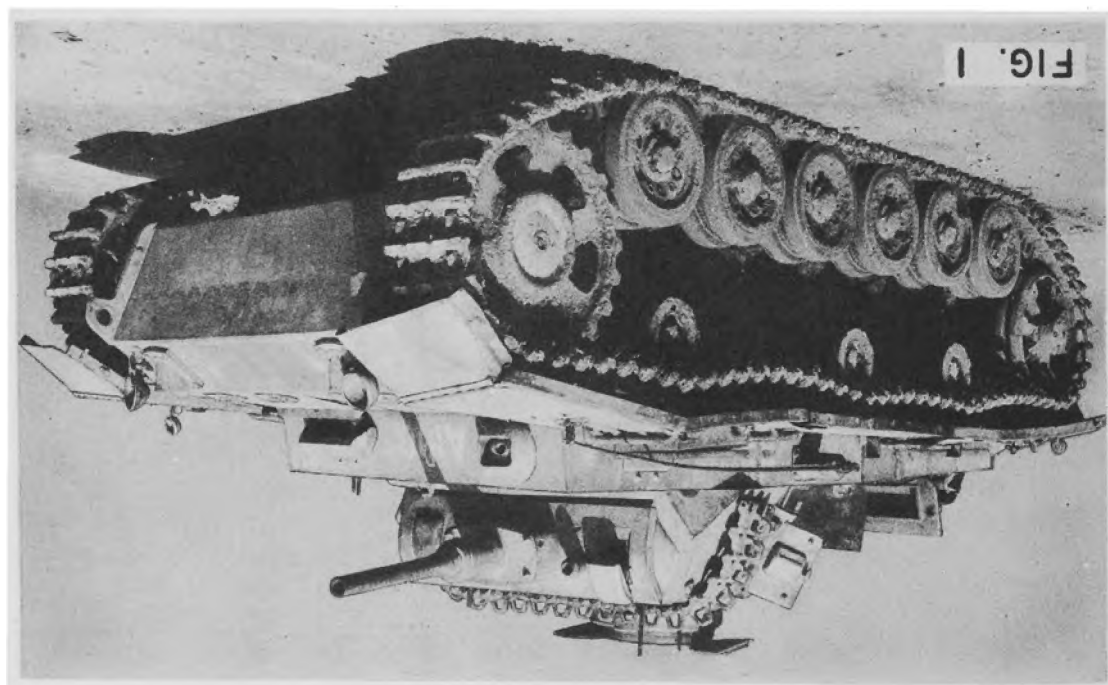


FIG. 1

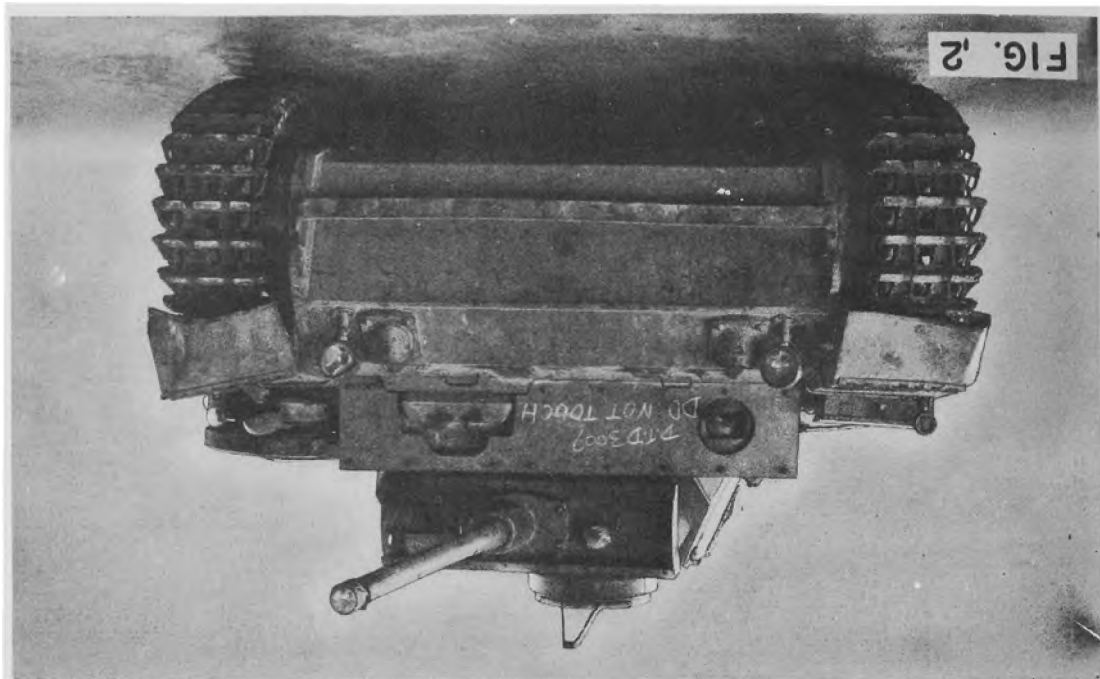


FIG. 2

PZ KW 3



Pz.Kw 3

(2) Armor

Welded construction. Brinell* hardness of plates 450 to 500. An extra V-shield .39 inch thick is mounted about two feet in front of the nose of the vehicle.

(a) Turret

<u>Plate</u>	<u>Thickness</u>	<u>Angle to Vertical</u>
Front (except gun mantlet)	8 mm (.31 in)	25°
Front (gun mantlet)	15 mm (.59 in)	25°
Sides	8 mm (.31 in)	28°
Rear	8 mm (.31 in)	30°
Top (front)	5 mm (.19 in)	78°
Top (rear)	5 mm (.19 in)	88°

(b) Hull

Front (upper)	8 mm + 10 mm (2 feet space) = 18 mm (.709 in)	45° (on front shield)
Front (lower)	8 mm + 10 mm (2 feet space) = 18 mm	30° (on front shield)
Sides (except engine compartment--upper)	8 mm (.31 in)	40°
Sides (except engine compartment--lower)	8 mm (.31 in)	37°
Sides (engine compartment)	10 mm (.39 in)	(see sides above)
Rear	10 mm (.39 in)	20°
Drivers plates (front and rear)	8 mm (.31 in)	28°
Top (glacis plate)	5 mm (.19 in)	71°
Top (rear deck and engine cover)	5 mm (.19 in)	83°

(3) Armament

One 20-mm Kw.K 30 or Kw.K 38; one 7.92-mm MG 34. Both are mounted coaxially in flat mantlet and both fired by pedals on gunner's foot rest.

Maximum elevation	11° 35'
Maximum arc of elevation	33°

One 9-mm sub-machine gun M.P(Maschinenpistole-machine pistol) 38 or M.P 40 is also carried as part of the equipment.

*See Tactical and Technical Trends No. 18, p. 34.

(4) Ammunition

20 mm	180 rounds (10 round magazines)
7.92 mm	2,100 rounds (150 round belts)
9 mm	192 rounds (32 round magazines)

(5) Sighting

Coaxial sighting telescope T.Z.F. 6 (Turmzielfernrohr)

(6) Turret Traverse

Manually operated 360°

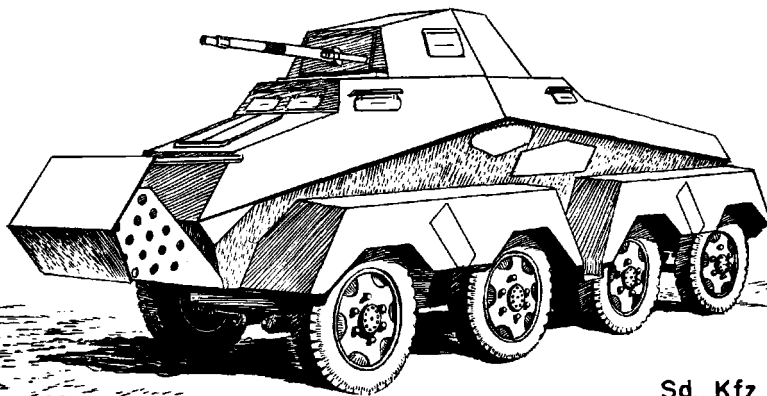
(7) Dimensions

Length	19 ft 1/2 in (21 feet including spaced shield in front)
Width	7 ft 3 in
Height	7 ft 10 in
Wheel track	5 ft 4 1/2 in (axle shafts horizontal)
Wheelbase (overall)	13 ft 5 1/2 in
Wheelbase (bogie)	4 ft 5 1/8 in
Bogie centers	9 ft 1/4 in
Belly clearance	12 in (to front differential casing)
Ground clearance	9 in (to front axle shield)

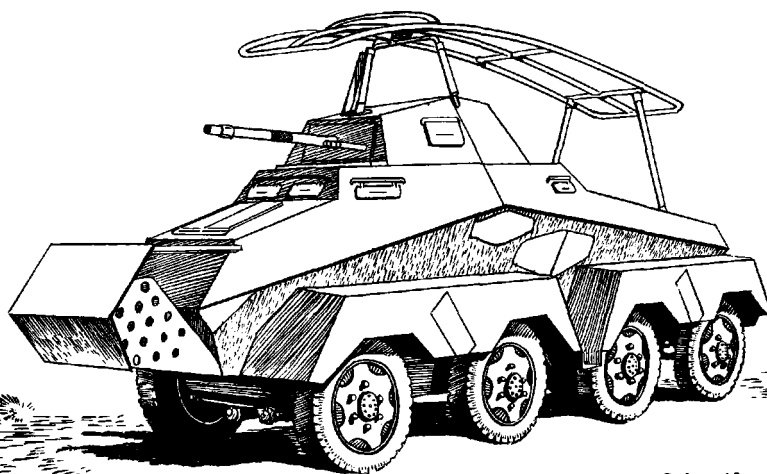
(8) Performance

Speed:	
Maximum	50 mph
Cruising	33 mph
Cross-country	19 mph
Acceleration (standing to 1/4 mile)	26.4 mph
Braking (dry, level concrete) at above speed	11.70 fss*(hand) 18.90 fss (foot)
Trench crossing	5 ft (estimated) at least
Step	1 ft 7 in (German document)
Fording	2 ft (limited by starter solenoid box).
Gradient (restarted successfully)	23°
Radius of action:	
Roads	165 miles
Cross-country	110 miles
Angle of overturn	30°
Tilting	11° 30'

*feet per second per second

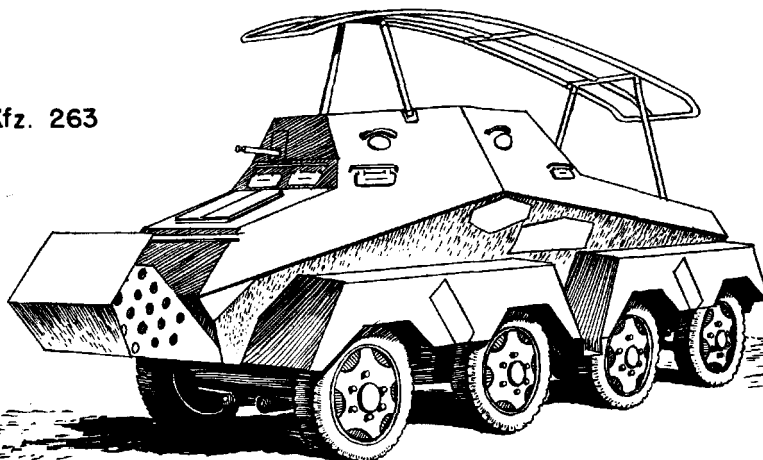


Sd. Kfz. 231



Sd. Kfz. 232

Sd. Kfz. 263



GERMAN 8-WHEELED ARMORED VEHICLES

(9) Engine

Maker	Bussing-NAG
Type	8-cylinder, 90° V-type, OHV, gasoline
Bore	107 mm
Stroke	110 mm
Capacity	2 gals
BHP*	155 at 3,000 rpm (makers rating)
Maximum torque	361 lb-ft at 1,500 rpm (estimated)
Firing order	1, 2, 7, 3, 4, 5, 6, 8
Compression ratio	5.5:1
Weight (dry)	1,344 lb
Weight per BHP	8.67 lb

(10) Power/Weight Ratio

BHP per ton	19.7 (see Note at 1, above)
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(11) Fuel Capacity

Main tank	24 gals
Auxiliary	6.5 gals

(12) Consumption

Roads	5.43 mpg
Cross-country	3.80 mpg

(13) Clutch

Type	2 plate, dry
Outside diameter	10.945 in

(14) Brakes

Type	Wedge-operated, two-shoe
Control	Rods and cables, no booster

(15) Steering

Type	Worm and nut
Maximum lock angle (wheel)	26 degrees
Turning circle diameter	37 ft 5 in
Number of turns of wheel, lock to lock	4 (front) 3 1/2 (rear)

*Brake Horse-Power

(16) Gearbox

Type	Constant mesh, helical gear
Ratios	6 forward, 6 reverse
Control	2 levers and 1 pedal at each end
Weight	390 lb (dry)

(17) Final Drives

Primary reduction	Helical spur gears, ratio 1.632:1
Secondary reduction	Spiral bevel gears, ratio 3.2:1
Overall ratio	5.222:1
Differentials (inter-axle) (inter-wheel)	De Lavaud roller free-wheel type Z. F. cam type

(18) Overall Ratios and Speeds

<u>Speed</u>	<u>Gear Ratios</u>	<u>Road speed (approx) mph at 3,000 rpm of engine</u>
6th	6.06:1	50
5th	8.93:1	33
4th	15.97:1	19
3rd	21.05:1	14
2nd	31.02:1	9
1st	55.46:1	5

(19) Suspension

Type	Semiindependent
Springs	Leaf, inverted, semielliptic
Ratio (sprung to unsprung weight)	5.743:1

(20) Tires

Type	Low-pressure, cord-reinforced
Size	8.26 x 18 in

(21) Intercommunication

Radio telephone, rod-type, aerial

(22) Vision

Commander's periscope
Vision openings with laminated glasses and armor flaps.

b. Eight-Wheeled Heavy-Armored Car (radio) Sd. Kfz. 232 (8 Rad)

This is the same as the Sd. Kfz. 231 as regards armament and traversing turret. The German name for it is Schwerer Panzerspähwagen (fu) Sd. Kfz. 232. The radio set, however, is provided with a large, horizontal, overhead aerial frame, which extends approximately the whole length of the vehicle and is curved down at each end. The aerial is mounted on a pivot above the turret at the front, and on two supports at the rear of the vehicle. The pivot mounting at the front permits the turret to traverse, but when the turret is traversed to the rear, there would appear to be a danger of shooting away the supports at low elevation, and the rear of the aerial at high elevation. The crew is four as in the Sd. Kfz. 231.

Specifications are the same as for the Sd. Kfz. 231, except in the following particulars:

(1) Weight

Unloaded	16,912 lbs
In action	18,704 lbs

(2) Ammunition Carried

20 mm and 9 mm	As for <u>Sd. Kfz. 231 (8 Rad)</u> ←
7.92 mm	1,500 rounds (150 round belts)

(3) Height

9 ft 6 in

c. Eight-Wheeled Armored Command Vehicle Sd. Kfz. 263 (8 Rad)

This vehicle, called in German Panzerfunkwagen Sd. Kfz. 263 (8 Rad), has a fixed turret slightly larger than the turrets of the armored cars, and carries a large overhead aerial frame of the same general type as that of the Sd. Kfz. 232.

However, the aerial in this case is supported by stays at the front and on top of the turret, and two at the rear of the vehicle. Two additional supports are sometimes fitted in the center. One MG 34 may be fitted, though no armament was fitted in one of these vehicles examined in the Middle East. The crew is five including two drivers.

Specifications are the same as for Sd. Kfz. 231 (8 Rad), except in the following particulars:

(1) Weight

Unloaded	16,576 lbs
In action	17,808 lbs

(2) Crew

Five

(3) Armament

One 7.92-mm MG 34 may be fitted

One 9-mm sub-machine gun, M.P 38 or M.P 40

(4) Ammunition

7.92 mm

1,000 rounds (100 round belts)

9 mm

192 rounds (32 round magazines)

(5) Height

9 ft 6 in

(6) Turret Traverse

Nil

(7) Radio aerial

Horizontal, overhead frame type.

d. Conclusion

In all three vehicles, the chassis is basically the same. The engines and chassis are usually, if not always, made by Büssing-NAG and the hulls and turrets by Deutsche-Werke of Kiel.

An extra V-shield .39 in thick is fitted about two feet in front of the hull to increase protection. The sides and bottom of the space between the shield and the front of the hull are closed by perforated plates so it can be used for stowage.

In addition to the above three main types, there has recently been introduced a new turretless type carrying a 75-mm (2.95 in) gun.

These vehicles are designed to travel in either direction at approximately the same speed. An interesting characteristic is that all eight wheels are used in steering.

Comment: Because of lack of axle rigidity, due to the semiindependent suspension system, the mobility of this vehicle is adversely affected when applying the power in mud, sand, snow or dust. Under these conditions the vehicle has a tendency to deflect.

ARTILLERY

7. ARTILLERY AND TANK COOPERATION--ENEMY METHODS

In the following article reproduced from the Soviet Red Star, a Russian major emphasizes the decisive importance of close and rapid cooperation between artillery and tanks in the attack. The methods outlined are, in effect, an application of the same principle of cooperation so often stressed by the Germans.

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Tanks are protected by armor, and are armed with guns and machine guns. In comparison with other services, tanks have many advantages in the way of maneuverability and striking power. Many military leaders placed all their hopes on armored forces, allowing only a secondary role to artillery. However, the experience gained in this war has shown that the role of artillery is not lessened by the presence of large numbers of tanks. On the contrary, it is increased. Tank attacks demand efficient cover by artillery fire. As a rule, tank attacks without the support of artillery come to a standstill.

Modern defense consists, above all, in antitank defense. The presence of various means of defense against armor, disposed along the front and in depth, well camouflaged, enables the defense to resist tank attacks in mass. To disclose and overcome all these means is not within the power of tank troops themselves.

Observation from tanks is difficult. Their range of fire is limited; accuracy of fire is comparatively poor. It is difficult to aim from a fast moving tank, which sinks into hollows and climbs obstacles. Forced halts even momentarily, increase the vulnerability of tanks. In such circumstances their advantages such as maneuverability, armament, striking power, cannot be fully utilized. Assistance is provided chiefly by the artillery.

The question arises of the efficient employment of artillery in support of the tanks. First, let us remember the varied nature of the tasks which the artillery can carry out. Artillery fire still possesses the greatest power and range. It can cover the movement of tanks to their assault positions, to their objectives and in the actual attack. It can put down concentrations after the attack, hold up enemy counter-attacks, and cover the evacuation of damaged tanks from the battlefield. The artillery prepares the breakthrough of massed formations of tanks, as well as assists in the movement of individual tanks. The methods employed are varied, depending on the size and characteristics of the task. Fire concentrations, changes in trajectory, lifting fires as the tanks move forward, displacing forward with the tank attack--all these may come into play.

The artillery missions must be planned for all aspects of the battle. The enemy will endeavor to forestall and break up our tank attack. For this purpose he will use long-range fire of two or three batteries, aimed at the route of approach of the tanks, at the areas of concentration and at assault positions. He will also use aircraft for this purpose. Therefore, the first task for our artillery

is to cover the approach of our tanks and their concentration by means of counter-battery fires and antiaircraft defense.

While silencing the enemy batteries it must be remembered that long-range fire originates from reserve positions, of which there will be several. These must be located beforehand, so as to be able to reply immediately to the enemy's opening fire. Enemy batteries will not fire accurately without observation. Consequently, during the period of artillery reconnaissance of the hostile defense position and later, the enemy's observation posts must be destroyed or rendered useless.

Counter-battery fire must also be used after the tanks have started to advance. The Germans meet attacking tanks with a barrage at a distance of 2 1/2 to 3 miles. Our artillery must then endeavor to intensify its fire against enemy batteries, force their gun personnel to take cover in trenches, and hinder the enemy's fire control.

The principal and most difficult task of the artillery is to disorganize the enemy's antitank defenses. Often our gunners open fire against the front line of defense, thinking that antitank guns and obstacles are situated there. Actually, the greater part of antitank obstacles are below the ground, camouflaged. Ammunition should be saved at the beginning of the battle for a more opportune moment for destroying hidden objectives.

As the tanks approach the forward edge of the enemy's defenses, the work of the artillery becomes more complicated. The requirements are speed and flexibility of fire control. The tanks will be meeting with obstacles. Enemy guns, situated in the immediate vicinity of the forward edge of their defense positions will open up. Our batteries will have to change over to firing on the forward edge of the hostile position and their fire must accompany but not damage our tanks.

The method of accompanying fire is the systematic concentration on certain targets. The effort to attain accuracy must not entail any delay. Often a complete barrage of bursts is most desirable, especially as the Germans have now abandoned their system of an interrupted line of defense. Intensive fire, opened without delay, even if inaccurate, will reduce the effectiveness of his antitank defense.

When attacking tanks are accompanied by artillery fire, the latter is provided by all the guns giving close support to the infantry, as well as by part of the long-range batteries. The latter's task is, chiefly, to isolate the attack objective throughout the depth of the enemy position, to neutralize the reserves thrown into the gap and to prevent counter attacks. Fire is controlled from command posts, well forward. Attention must be paid to signals and fire correction by forward observers in tanks equipped with radio.

Targets which appear after a barrage has been fired, or targets which have been hiding in shelters, or defended positions which are situated outside the areas taken under fire, must be dealt with by support weapons. Such support guns

accompanying the tanks must quickly destroy anything obstructing the tanks in their task.

After a thrust into their positions the Germans immediately organize a counter-attack with the help of reserves placed well to the rear. These counter-attacking groups consist chiefly of tanks. In one action, five of our tanks, accompanied by four guns, were counter-attacked by 18 enemy tanks. Our antitank weapons moved at a distance of 400 to 500 yards from our tanks. As the Germans devoted all their attention to our tanks, our guns opened fire on them. After firing 30 shells, two enemy tanks were on fire and four others damaged. The rest withdrew and our tanks successfully completed their task.

Recently, increasing attention has been paid to tank support artillery. Methods are being studied of the best cooperation with tanks. In this connection, the following is an example:

An infantry unit was ordered to capture an enemy position in a village. Tanks took part in the battle. A battery of 45-mm guns was detached to accompany the tanks. The guns were towed by the tanks by means of cables, and the crews, armed with automatic pistols, together with part of their ammunition were carried on the tanks. It looked like an artillery raid. Approaching the forward edge of the defense, and after taking the front line of trenches; the gunners shot up the Germans with their automatic rifles while defended positions were dealt with by the tank personnel. Later the tanks met with obstacles and the Germans started a counter-attack. Our gunners then unhitched their guns and firing over open sights, they drove back the enemy. This may not be a typical example, as these gunners were acting as infantry, but the fact that the guns were towed by tanks, and crews carried on the latter, is worthy of attention.

The usual method of moving guns behind tanks is for them to advance by their own traction, at distances of 200 to 300 yards from the tanks, in bounds from one position to the next. In this way the guns can cover the flanks of the tank units from counter-attacks and from flanking defense positions, which are the most dangerous of all for tanks.

ENGINEERS

8. NOTES ON CAMOUFLAGE

a. General

"Camouflage" as stated in Military Intelligence Service Information Bulletin No. 13, "is any and every means of hiding or disguising yourself from the enemy; misleading him as to your position, strength, and intention; confusing him so that he wastes his blows and falls into your ambush." A British source states, "not concealment, but invisibility is the object." These two quotations appear to cover the whole scope of camouflage. The following are some practical

notes on a phase of military activity which can not be too firmly impressed upon troops in the field. Not only our own lives, but the success of a vital operation may depend on the intelligent understanding of camouflage and also upon strict camouflage discipline.

b. German Instructions for Concealment of a New Main Defensive Zone

The following directive, issued by the commanding general of the 164th Light Division on the 19th of October, 1942, in Africa, is of interest as an illustration of the pains taken to conceal the shifting of the main defensive zone to the rear. (Aircraft observation had however disclosed the movement to the British before the order was issued.)

164 Light Africa-Division.

1a:

Div Hq., October 19, 1942

Subject:- Concealment of the New Main Defensive Zone

To: Regt. and Bn. Comdrs

The whole process of moving the main defense zone to the rear will only have served its purpose in the long run if we succeed in deceiving the English for as long as possible and in concealing the whole move from them. Otherwise the troops will have to suffer from enemy fire just as much in the present unfinished positions as they did before.

I therefore make regimental and battalion commanders personally responsible for doing everything in advance which will make the rearward move achieve its essential purpose.

To this end the following points must be observed:

- (1) Prevention of obvious movement in sectors under enemy observation.
- (2) Thorough camouflage and complete cessation of all movement on the appearance of enemy aircraft. Enemy fighters too have eyes and take photographs. In such cases every man will take full cover and will not come out and run around just to watch the performance in the air, as almost invariably happens at present.
- (3) Good reconnaissance and judicious layout of the supply routes, as far as possible running forward over dead ground to the various sectors.
- (4) Erection of notices "Caution," "Look out," "Enemy observation"; and if necessary, fencing off, or the posting of traffic guides.
- (5) Camouflage of Hqs. No bunching to attract attention.

(6) In contrast with the main defence zone, no complete cessation of hither-to normal movement in the new main line of resistance. Since the troops in front in the old positions are now numerically weaker they will have to give signs of greater activity.

(7) Extremely close watch by all infantry and artillery OPs. Nothing which the enemy is doing must escape notice. Is the enemy intensifying his reconnaissance activity in the next few days?

(8) Observation of enemy shelling. Is he firing onto the new main defence zone? Where? How many rounds?

Only if every man in the Division follows these instructions will the better situation of the main defense zone be made to result in greater security at all points with consequent benefit to the troops.

Sgd. Lungershausen

Another order from Hq xth Corps (German) to the Pavia Division reads as follows:

We must give the enemy the impression that new forces have arrived from the south, and that we intend to take the initiative there. The following measures should be taken:

(a) All motor transport and a few tank units should move about day and night in the forward area.

(b) Bring motor transport at present in forward bases right up to the line, and make dummy transport and tank positions, using blankets and other material.

NOTE: According to another source the tanks of one tank regiment were camouflaged as trucks by means of steel frames and canvas-painted sides, and were well forward. Stationary dummies made of cardboard were well behind.

c. Camouflage of an Allied Advance Headquarters

A scheme for the camouflage of an advance division headquarters on the African desert which appears to have been completely successful illustrates the use of simple materials, locally available. The headquarters was far forward-- within a mile of the front line, and consisted of a number of elephant iron* Quonset shelters dug in to ground level.

Positions were chosen behind small rises, some no more than 2 or 3 feet high. Digging was done at night and the construction of 8 to 10 dug-outs was carried on at one time. By day, the holes were covered with a fully garnished

*Huts made of a half-cylinder of massive, corrugated-steel sections.

net, consisting of about 30 percent of white rags, and the remainder of burlap. On each of these was sewn a patch of worn-out tentage large enough to completely shut out the shadow.

Part of the spoil was put into sandbags for office partitions, and part was carried away in bags to be laid out irregularly between low camel-thorn bushes where sand was sprinkled over them. [It is worth noting that, in this case, the freshly dug sand was not scattered out, since the difference of texture between the excavated material and the surface sand might have shown up on an air-photograph. The bagged sand resembled stones or sand hummocks].

d. Field Works

Block-houses of heavy reinforced concrete have been found, designed to resemble the typical local North African house with a courtyard in the center. Two loopholes for machine guns were pierced low down at each corner. An anti-tank emplacement was designed to resemble a native well complete with the up-rights and a pulley.

e. Tank Camouflage

Tanks have been observed in advanced areas camouflaged as trucks with steel frames and painted canvas sides, while dummy tanks made of cardboard were placed in the rear.

Groups of derelict smashed tanks have been used for covering 88-mm guns, toward which British tanks were lured by weak German tank patrols. Incidentally, tank pennants are reported to have provided excellent sighting points in the dusk for enemy gunners.

f. Minefields

A German minefield was recently camouflaged by tracks made with a spare wheel between the mines, and a British armored car was lured into it. A recent armored car patrol, which suffered a casualty on a mine reports that previous ground reconnaissance failed to locate this mine owing to the fact that the enemy had apparently made deep tracks with a spare wheel in order to conceal the presence of the mine.

Places where mines are laid may show signs of the earth having been disturbed, but owing to rain and sun, the sites may soon become sunbaked. In tracks through sand, loose pieces of scrub are placed on top of the mine as camouflage. These loose pieces of scrub may have booby traps attached to them. They are laid at very irregular spacing, but always either on or near a track. There are also dummy minefields completely wired in. These contain tins sunk into the ground with occasionally booby traps attached to them. The gaps between the dummy minefields are invariably sown with time mines.*

*A mine which has a setting that renders it inoperative after the time for which it is set has expired.

On the tar-macadam roads, the mines were well hidden by a thin layer of tarred gravel of the same texture as the road. The mines were first covered with a patch of asphalt, then loose sand or dust was scattered on top. The apparently careless half-concealment of dummy antitank mines is intended both to deceive the air camera and to induce the drivers of vehicles to drive over the carefully hidden genuine mines. In German minefields, the mines were so camouflaged that it was impossible to tell within 10 feet of where they lay--a fact confirmed by photographs on the spot.

From a recent German document, it is clear that air-photo interpreters take special note of army tracks or roads that twist and turn suddenly for no reason apparent in the nature of the ground. From such twists and turns the interpreters infer the probable existence of a minefield, and they warn their troops to avoid giving away the position of the minefield in such a manner. While there is nothing new in this ruse, it may provide a timely reminder that there is a simple, cheap and effective way of misleading the enemy as to the general plan of defense and the location of real minefields in the defended areas. Dummy tracks with these characteristic twists in association with lightly disturbed soil in plausible locations might be successful as decoys.

A British commentator complained that in the Western Desert, British minefields were not only identified by being surrounded by a barbed-wire fence, but even the location of individual mines was obvious, even by moonlight. He suggested that for each real mine placed at least two dummy mine-locations should be made by scratching up the surface of the ground.

g. German Training in Camouflage

Camouflage and concealment are given the greatest importance in all German military training. In defense, for example, it is even regarded as being preferable to use ground less favorable from a tactical point of view, if by so doing the intentions and organization of the defense become less apparent to the enemy than they would be in a more suitable defensive position.

Throughout training, special emphasis is laid on the individual aspect of concealment. It is stressed that the negligence of the individual rifleman may lead to the premature disclosure of his squad. Particular attention is therefore paid to squad training and dress.

During training, periods devoted to instruction in concealment and camouflage are usually spent teaching the use of natural materials, such as branches, rather than the use of artificial methods. An exercise has been observed in which the troops taking part were sent off individually to see how far they could go along a certain road before they were seen. The man who got the farthest was promised half a day off. Great stress was laid on realism in training. Even during an exercise, a squad leader was made to lead his squad through a ditch full of water if better concealment was obtained thereby.

h. Personal Concealment

The German steel helmet is camouflaged with leaves, grass, or whatever foliage is at hand. A rubber band is provided to hold these in position, as it is found, when a man is lying down on the ground, that his helmet reflects the light and is then the only part of him to be seen. Each soldier has a waterproof sheet, disruptively painted. Coloring of equipment and even of faces to blend in with the various types of background is encouraged.

Individual camouflage equipment which is much used by personnel of the Japanese Army consists of a body net and head net, either or both of which are used according to circumstances. The former consists of a net approximately 1 x 1 1/2 yards in size, made of a greenish-covered straw fiber cord or ordinary twine with a square mesh something under two inches in size. The head net is of a size which will allow it to fit snugly over a steel helmet or cap, and is of the same material, mesh, and color as the body net. In addition to those pieces of individual equipment, there is a net for the horses. Branches, leaves, grass, and other local vegetation are stuck into the nets.

i. German Attempts to Camouflage Cities

A huge structure was erected on the Charlottenburger Chaussee in Berlin, a broad avenue leading westward from the Tiergarten park into the heart of the area occupied by government offices, an ideal landmark for pilots. Along its entire length of 5 miles, wire netting covered with green cloth was installed. In an effort to lure British bombers away from Berlin, it is reported that the Germans have built a fake city to deceive the enemy pilots. Outside the city is a forest which has been cut through with lanes so that at night, from the air, it is apt to look like the Tiergarten. Fake roofs of cloth and paper are stretched between the trees and on the ground are low lights like those of a blacked-out city. Looking down at night, a flyer might think he was over the center of Berlin.

In their efforts to camouflage landmarks all over the city of Hamburg, the Nazis drained Binnen-Alster (a small lake near the harbor) and on it built imitation houses. Wooden bridges have been built on the Aussen-Alster Lake to simulate the well-known Lombards Bridge, which in turn, has been disguised to resemble the Jungfernstieg (a boulevard) complete even to a replica of the Alster Pavilion, Hamburg's most famous cafe.

Again, between Laufen an Neckar and Nordheim, it is reported that a large railway station, complete in every detail, was erected in a large field, about a mile and a half away from Laufen toward Nordheim. It was exceedingly realistic, and at night had dim, colored lights to represent signal boxes, signals, etc. Fires were lit to deceive the airmen after raids. It was ineffective, inasmuch as Laufen has suffered heavy air raids.

j. Decoy Town

The important Ploesti oil wells are situated on both sides of the Bucharest--

Ploesti Road, and 3 miles before reaching the last named town. The distance of the oil wells from the road is about 600 yards. In an attempt to confuse the enemy airmen as to the precise situation of the oil wells, the Roumanians are reported to have camouflaged them by erecting a new town nearby, constructed of wood and fitted with the necessary electric installations to make it appear moderately lighted at night. The dummy town was situated about 4 miles southeast of the Ploesti railway station and is of the same size as Ploesti itself.

INFANTRY

9. JAPANESE OFFENSIVE TACTICS

Japanese tactical doctrine has always stressed the superiority of the offensive. The following summary of recent Japanese offensive tactics together with the specific example indicated, are taken from a British publication.

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a. Envelopment

In the past envelopment in Japanese tactics has always been closely identified with attack. Attack by single or double flank envelopment is a favorite Japanese tactic. In fact, a study of Japanese offensive operations indicates that envelopment is sometimes used as if it were an end in itself. By placing bodies of troops across the enemy line of communications the Japanese attempt to compel their opponents either to attack them or withdraw, even when other types of attack would appear to promise better results.

Japanese strategy and major tactics in the offense against well-equipped forces offer the defender two alternatives--to attack the Japanese often on ground favorable to the defense, or to give up ground. In the first Burma campaign, from the time that the Japanese crossed the Salween River at Moulmein until the last action at Shwegyin on the Chindwin there are very few recorded instances of deliberate attacks. Rather was their superior mobility used to force us [the British] to attack troops who had succeeded in occupying a position behind us. The Japanese chose an area on the line of communication to hold which would cause us the maximum embarrassment and the focal point of the battle which ensued was often a road block. In fact, the Japanese fought defensively in country peculiarly suited to the defense. One big exception to this method during the first Burma campaign was an attack launched against one of our regiments at Kyaukse; here the Japanese suffered considerable losses and the attack failed completely.

b. Attack in Mobile Warfare

(1) Reconnaissance

Japanese attacks are preceded by careful reconnaissance in which various ruses are employed in order to discover the location and extent of enemy localities. Trees are shaken in order to draw fire, defending troops are addressed in their own language in the hope that they will respond, and small parties are used as bait for enemy fire. Finally, if cover permits, scouts may be left in observation for long periods close to the enemy main line of resistance.

(2) Methods of Attack

Attacks may take the form of single or double envelopment or frontal assaults. Zero hour is often any time from midnight to first light. Between 0300 and 0400 has recently (April 1943) been a common zero hour.

(a) The Enveloping or Flank Attack

Pressure is exerted frontally while the main effort is made around one or both flanks. Attacks of this nature often involve a double envelopment, a small flanking attack being made with an objective one to three thousand yards behind the enemy's main line of resistance, while a further turning movement is made some miles behind them. This double attack has sometimes been described as two thrusts--one made against regimental headquarters and the other against divisional headquarters.

(b) The Frontal Attack

While in Malaya and Burma we have chiefly experienced the attack by envelopment, the Americans report that in the Southwest Pacific area frontal attacks have often been made, particularly when an operation demanding more time might have given the defenders the opportunity to improve their positions.

Before a frontal attack, every effort is made by reconnaissance and ruses to locate a soft spot. Against this is directed the main effort of the attack, the object of which is to achieve a breakthrough.

Forward troops infiltrate, taking advantage of all available cover to creep forward. This is in the nature of a battle reconnaissance which goes to ground when held up by the defender's fire, but brings light machine-gun and mortar fire to bear on any positions it has discovered.

If the attack on the chosen sector does not succeed it is not uncommon for the main effort to be directed temporarily against another part of the front--the old axis of attack being reverted to later.

(3) Artillery

The artillery available for the support of a Japanese division in the attack in mobile operations has, by Western standards, so far been inadequate, and this weakness may account both for frontal attacks being launched without covering fire, and for the words "rash and costly" with which an American commentator describes them.

The field artillery so far met with in mobile warfare--and this was largely artillery from the infantry regimental gun company--was chiefly directed against our own gun positions. Such counter battery work in the Arakan has so far been inaccurate and therefore ineffective. Given sufficient data the Japs fire on large and small unit headquarters.

c. Attack Against a Fortified Position

The predominant considerations in an attack on a fortified position are surprise, preparation, and concentration. The Japanese ability to achieve surprise extends to all forms of warfare. Their preparations for an attack of this nature are extremely thorough and in the case of Hong Kong may be said to have extended over a number of years. Where possible, consular staffs, spies, and even officers and men in disguise have been employed in peacetime to make accurate and comprehensive surveys of fixed defenses and vital communications, while fifth columnists are employed for the same purpose in war. Besides the study of defenses and communications, preparation includes the accumulation of engineer equipment of suitable size to bridge probable demolitions, and the selection and training of special assault troops who have been chosen for their high intelligence.

They have been quick to profit by German methods and German experience and to realize that daring and highly-skilled assault troops will succeed where no amount of massed infantry will avail.

The operation frequently begins with heavy air attacks on airfields, anti-aircraft gun positions and headquarters. Later high-level and dive-bombing attacks are directed against fortifications.

A heavy preponderance of artillery is employed and mobile medium artillery (105 mm) firing armor-piercing shells is used against splinter-proof shelters.

The technique of the assault is ably described by an officer who was in the battle of Hong Kong:

"Numbers of assault troops would infiltrate through our lines under cover of darkness, and would hide in trees and bushes whence they would snipe our troops from the rear.

"The position to be attacked would be subjected to very heavy dive-bombing and artillery fire during the day.

"Assault troops in parties of ten would stalk the position, making such good use of ground and cover that they were rarely seen. The position, meanwhile, would be subjected to intense mortar fire, and fire from 50-caliber machine guns to penetrate the iron doors and windows of concrete shelters and pillboxes.

"When all parties of assault troops were in position in the dark, the mortar fire would suddenly increase. Then the parties of assault troops would make a coordinated assault on the position, throwing hand grenades and firing light machine guns, and at the same time receiving supporting fire from light automatic weapons and machine guns.

"If our troops took cover in their concrete shelters, the storm troops would surround the position, and approaching from the rear would drop hand grenades down the air vents of the shelters, killing the garrison; anyone trying to escape from a shelter, was picked off by someone waiting with a light machine gun to receive him."

d. Example of Offensive Tactics in the Arakan

Early in February 1943 the Japanese were on the defensive in the Arakan sector on the west coast of Burma roughly west of Mandalay. They had withdrawn from the line Buthedaung--Maungdaw, and were occupying positions along the general line Myohaung--Rathedaung--Donbaik (see figure 1). In the Kaladan Valley the opposing forces were not in contact with each other.

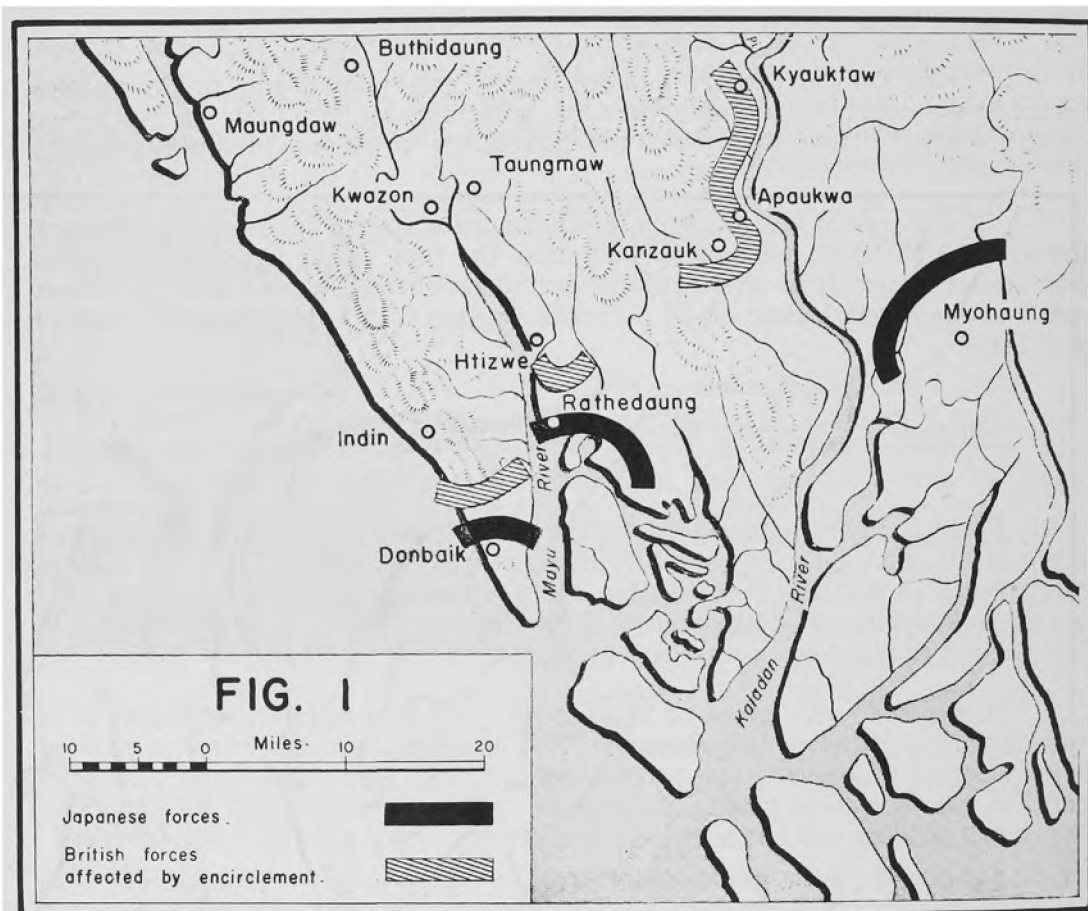
During the early hours of 21 February, a Japanese force estimated at between 200 and 300, advancing from the East, attacked our small post at Kaladan, the garrison of which withdrew to Paletwa (15 miles north of Kaladan). The enemy at once set about putting Kaladan in a state of defense with the apparent intention of holding any force which attempted to advance southwards down the valley.

During the second half of February a steady increase in the garrison at Myohaung was reported and towards the end of the month the Japanese who had previously been singularly inactive in the Rathedaung area began to infiltrate around our left flank by way of the foothills northeast of Rathedaung.

On 6 March enemy forces attacked our detachments in the Apaukwa--Kanzauk area. Our troops, an infantry battalion and some gunners, were forced to withdraw northwards up the Pi Valley, during the night of 8 and 9 March and the days following.

By now pressure was increasing on the left and right flanks of our force before Rathedaung and by the 12th, when considerable enemy forces from the Kaladan had begun to debouch from the hills into the Mayu River valley, heavy fighting developed east and southeast of Htizwe, the enemy being described by one

observer as "coming on in droves." One company of the 1st Punjab Regiment was attacked six times in four and a half hours but held its ground, inflicting heavy casualties upon the enemy.



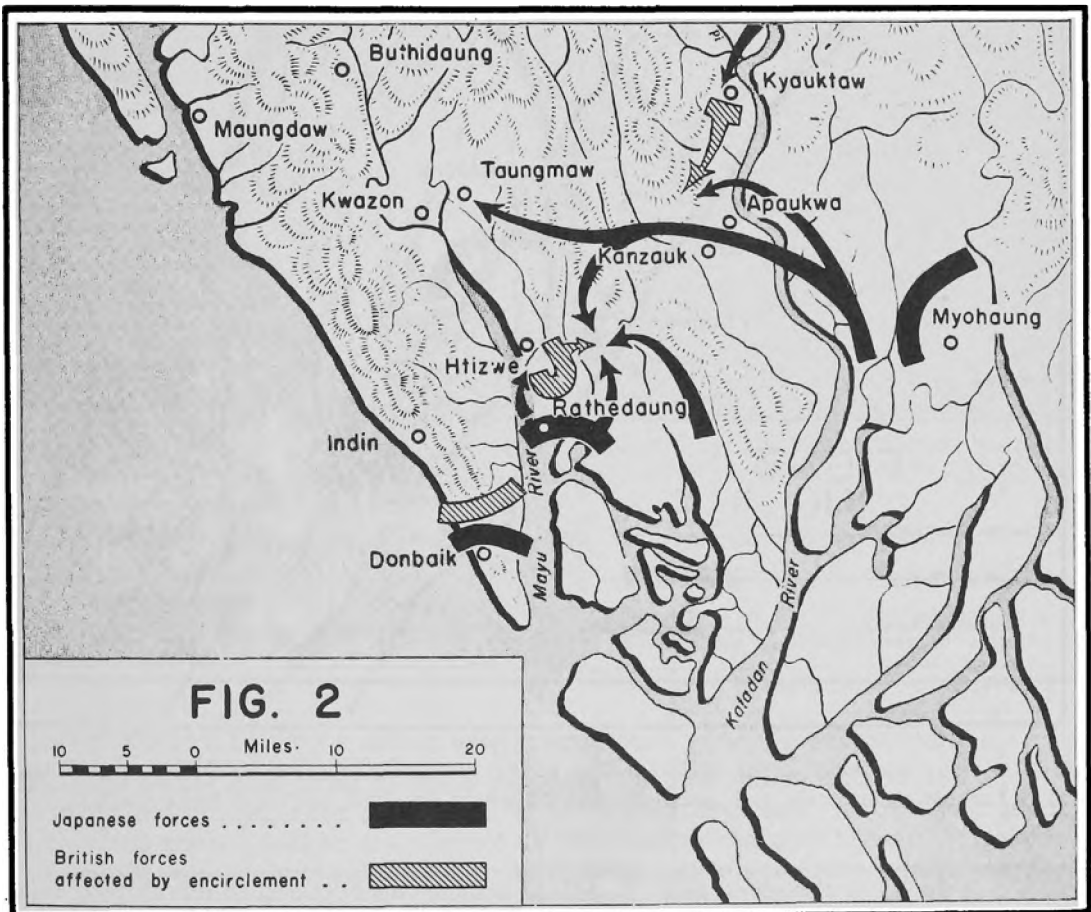
Before descending into the plain the Kaladan force was joined by a battalion from the Tawbya. The combined force fanned out on reaching the plain, not only cutting the line of communications of our force north of Rathedaung but also advancing up the east bank of the Mayu River towards Taungmaw (see figure 2).

On the night of March 16-17 our forces, no longer possessing a line of communications, broke contact with the enemy and withdrew northwards through a covering force.

The enemy opposite Taungmaw appeared to be in the nature of a holding force similar to that established at Kaladan. The main thrust was continued westward across the Mayu and by March 25 infiltration into the Mayu Range had already begun.

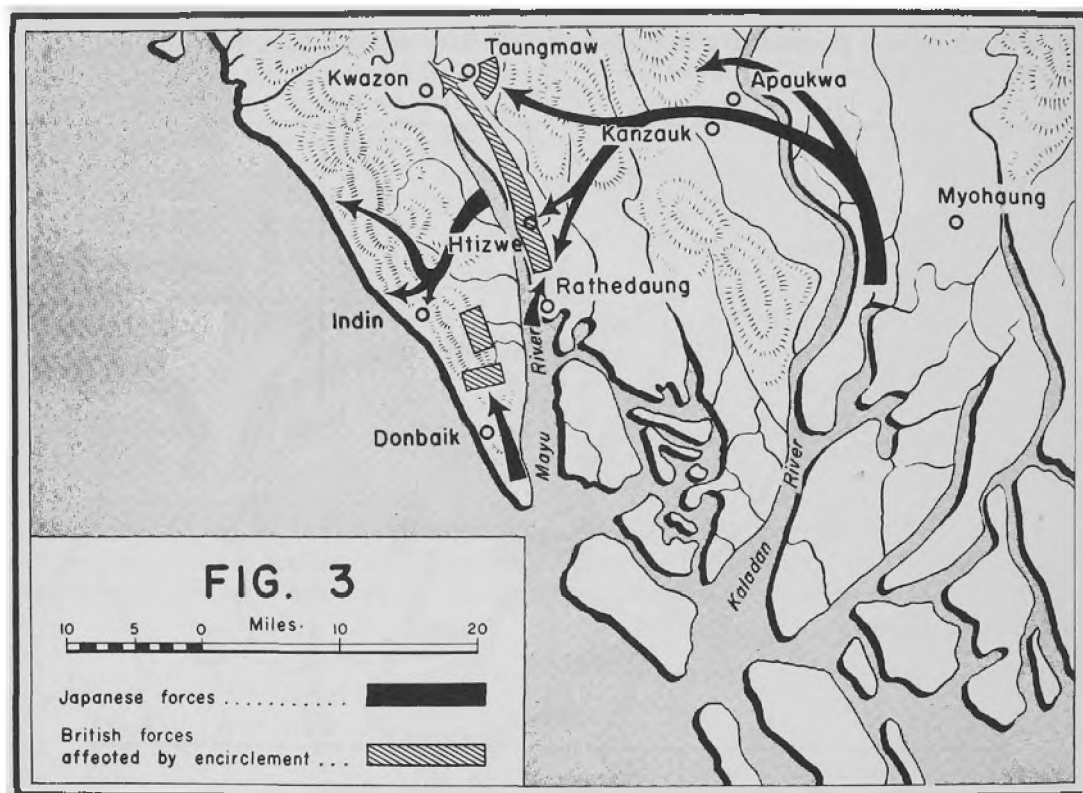
At midnight on the 2d and 3d April a party of Japanese suddenly attacked and overwhelmed a standing patrol on a bridge northeast of Indin; they were unable to establish a successful road block but the threat to our communications here and further north was such, that we were forced to withdraw our forces northwards up the coast (see figure 3).

From Kanzauk, where this enveloping movement began, to Indin where it reached the coast, is, as the crow flies, a distance of 25 miles, but this actual distance gives little indication of the difficulties which faced the enveloping troops



Except for small paths running east and west through the hill areas all lines of communication run north and south, and until such time as British forces in the Rathedaung area were forced to withdraw, the enemy depended to a large extent for supply on what they carried with them. Later, supply was based on the Mayu River valley but here also it was not too easy, for the British air force and Burmese gunboats continued to patrol the river. As the forces involved in the operation increased, so did the problem of supply.

The operation was typical of Japanese offensive tactics: although the maneuver gradually extended right across our front--or rather rear--few direct attacks took place after the battle around Htizwe. A part of the enveloping force occupied a position around Indin and waited to be attacked, while other elements continued infiltration northwards through the hills.



At Rathedaung a double envelopment was made, a small force occupying a position near the east bank of the Mayu river about 3,000 yards behind our main line of resistance while the main thrust came in against our left rear, east of Htizwe.

As we have observed before, actual attacks as opposed to enveloping movements were made with great determination but they lacked preparation and careful coordination. As a result they were very costly and it is estimated that by the time they reached Indin battalions averaged only 450 strong. (The battalions used in this operation contained only 3 companies and had a full strength of about 750).

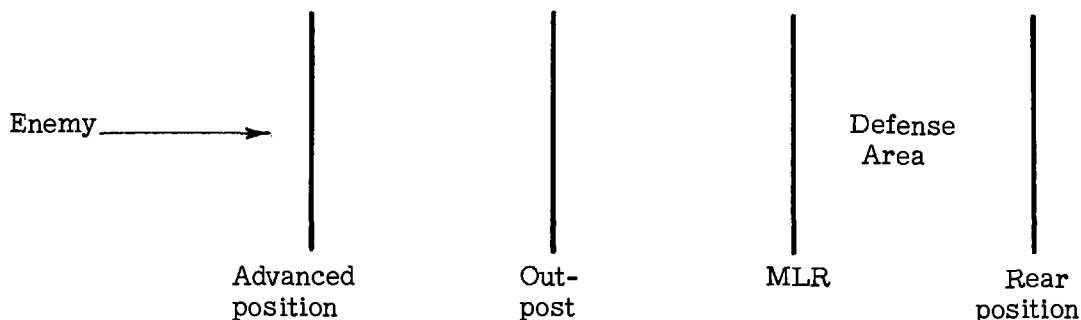
In conclusion it remains only to be said that once again the Japanese had, where possible, avoided attack as a means of achieving their object using their superior mobility to occupy a position on our line of communications where we should be compelled to attack them or withdraw.

10. ROMMEL'S DEFENSES OF STABILIZED POSITION AT EL ALAMEIN

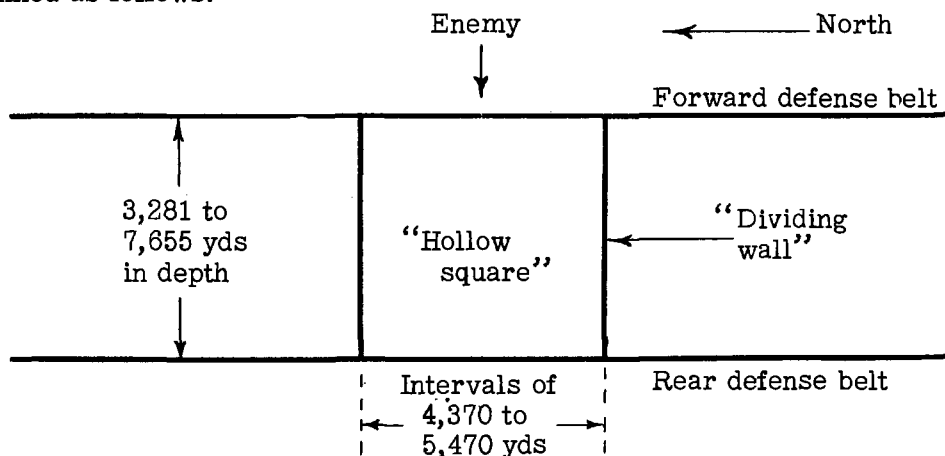
A well-organized defense capable of quickly and effectively reverting to the attack, with cunning and deception concealing movements and dispositions, can sometimes offset numerical superiority.

Due to the great length of front and shortage of troops at El Alamein, Rommel modified the traditional German system of defense in depth to a defensive square pattern as revealed in a recent report from Allied sources. Use of such a system is a possibility in fortifying the Mediterranean coast line.

(1) The usual German defense in depth may be diagrammed as follows:



(2) At El Alamein, Rommel used two main defensive belts (forward and rear) from 3,281 to 7,655 yards in depth connected by dividing belts at intervals of 4,370 to 5,470 yards, thus forming a series of hollow areas, which may be diagrammed as follows:



(3) The "hollow squares" formed by such a defensive pattern are characterized as follows:

(a) Designed on topographical basis with artillery placed so as to cover entire area:

- (b) Act as traps for troops who succeed in penetrating forward defenses;
- (c) Permit enfilade fire from either or both of "dividing walls" and rear position;
- (d) Artillery disposed for defensive fire throughout front with particular concentration on the "hollow squares,"
- (e) Minefields give additional protection in these "hollows", which were called "devils gardens" by Rommel.

(4) The forward defense belt, thinly manned, was protected by minefields and listening posts. These were for prevention of surprise and deception rather than defense.

(5) Main advantages of such a defense are:

- (a) Permits covering of wide front with a minimum number of men;
- (b) Protects troops from hostile artillery fire which is usually concentrated on forward defense belt.

ORDNANCE

11. GERMAN ANTICONCRETE SHELLS--150- AND 210-MM CALIBERS

Reference was made in Tactical and Technical Trends, No. 18, p. 23, to the special German design of shells for the destruction of concrete. These designs are thought to be initiated recently.

In the description which follows details are given about the weight and filling of the 150- (5.9 in) and 210-mm (8.3 in) calibers of this shell. The accompanying sketch shows the method of filling in each case.

Both shells have a base fuzed piercing shell, the smaller shell fired by the 150-mm medium howitzer (15-cm s.F.H. 18*), and the larger by the 210-mm heavy (21-cm Mörser 18). A steel exploder container is fitted to these shells with a ballistic cap welded to the shell.

a. Shell Filling for 150-MM

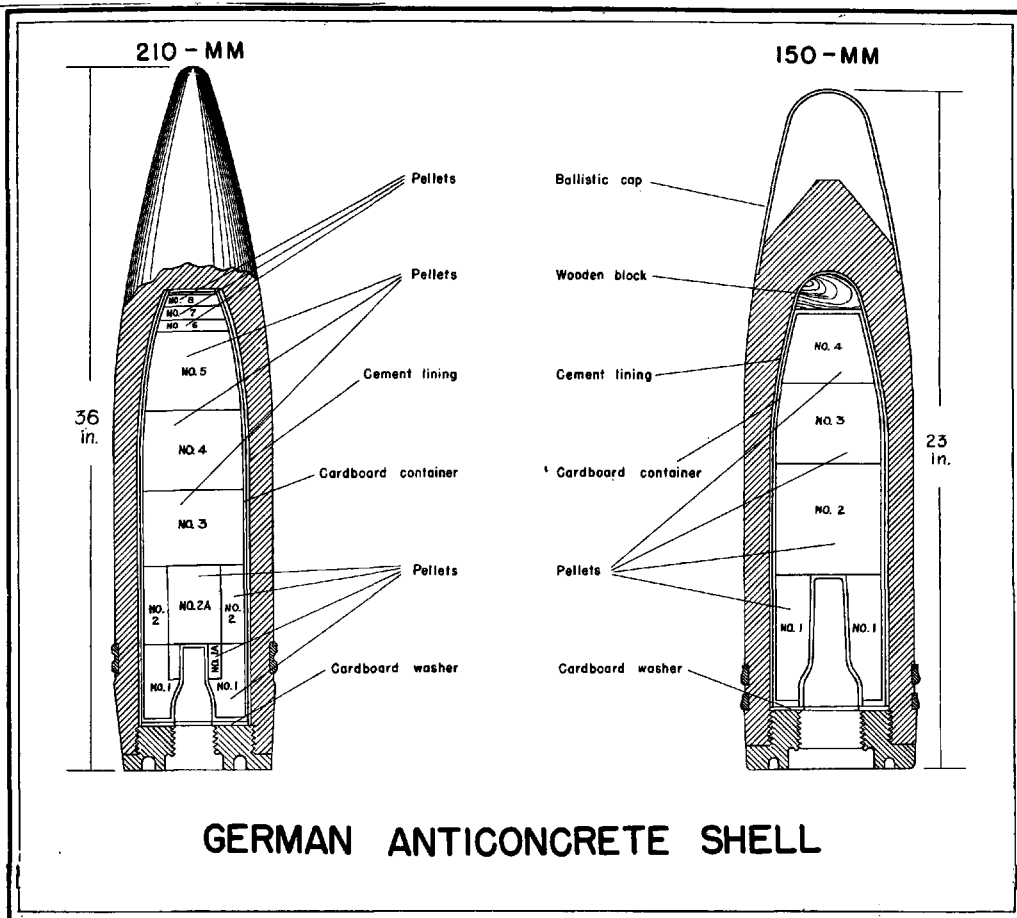
Four pressed pellets comprise the shell filling. These are placed in a container with a wooden block at the nose. The complete charge is held in position in the shell by a cement lining. The filling consists of TNT around and in front of the exploder container, and of waxed TNT towards the nose. The gaine exploder container is of the C/98 type filled with picric acid.

b. Shell Filling for 210-MM

Ten pressed pellets comprise the shell filling. They are placed in a card-

*schwere Feldhaubitze--medium field howitzer.

board container which is held in position by a cement lining. The shell filling is interesting in that it has 3 flat disk pellets at the nose. The front one is pressed potassium chloride, and the two immediately to the rear are a mixture of TNT,



GERMAN ANTICONCRETE SHELL

wax, and potassium chloride. They are apparently intended to provide a deadened HE filling in the nose of the shell. Another feature of interest is that the straight TNT portion of the filling, which picks up a detonative impulse from the exploder, is completely surrounded by waxed TNT.

Additional details for each shell follow:

150-MM

Weight (filled).....	95 lb 5 oz
Weight (empty).....	83 lb 8 oz
No. of pellets	4 (total weight 7 lb 2 oz)
Weight of Pellets,	
No. 1	2 lb 2 oz (TNT)
2	2 lb 6 1/2 oz (TNT)
3	1 lb 10 1/2 oz (TNT/wax 95/5)
4	15 oz (TNT/wax 90/10)

210-MM

Weight (filled)	267 lb 12 oz	
Weight (empty)	237 lb 3 oz	
No. of pellets	10 (total weight 25 lb 8 3/4 oz)	
Weight of Pellets,		
No. 1	4 lb 2 oz (TNT/wax 94/6)	
1a	8 oz (TNT)	
2	4 lb 3/4 oz (TNT/wax 90/10)	
2a	1 lb 5 1/2 oz (TNT)	
No. 3.	5 lb 2 oz (TNT/wax 90/10)	6 6 oz (TNT 60.5, wax 5.4 potassium chloride 34.1)
4.	5 lb 4 1/2 oz (TNT/wax 91/9)	7 5 oz (TNT 44.1, wax 5.6 potassium chloride 50.3)
5.	4 lb 2 oz (TNT/wax 91/9)	8 5 oz (potassium chloride)

12. COMPARISON OF GERMAN MACHINE GUNS

The following comparison and photographs of the German machine-gun model 34, 34 (modified), 34S, 34/41 and 42 are based on data received from the Aberdeen Proving Grounds.

The MG 34 is a familiar weapon, and model 42 has already been described in Tactical and Technical Trends no. 20, p. 28 and no. 31, p. 37. This report is of interest because of its comparison of the variations of model 34 and the excellence of the detail of the illustrations.

*

*

*

a. MG 34 Modified

The MG 34 (modified) is used principally in armored vehicle hull mounts and differs from the MG 34 in the following:

- (1) Heavier barrel jacket adapted to fit in ball type hull mounts
- (2) Absence of antiaircraft sight bracket
- (3) Simplified and easily operated firing pin nut lock
- (4) Bipod clamps for attaching bipod for emergency use.

This model can be mounted on the antiaircraft and heavy ground mounts.

b. MG 34S and 34/41

The MG 34S and MG 34/41, are identical in appearance except for the perforated operating handle of the MG 34/41 (see figure 2) but are named in this report separately only because a definite effort was made to make them as distinct models. The reason for this is unknown. One description will suffice for both weapons. They differ from the MG 34 in the following:

- (1) Provision for full automatic fire only instead of full or semiautomatic fire;
- (2) Simplified trigger group with extensive use of stampings;
- (3) Barrel 3 1/2 shorter with enlarged muzzle end to accelerate recoil;
- (4) Simplified bolt and bolt-locking sleeve eliminating many machining operations;
- (5) Elimination of firing pin lock nut and substitution of a simple, easily operated, plunger type, catch recessed in the bolt carrier;
- (6) Larger and stronger ejector assembly located in the left receiver wall;
- (7) Larger and stronger buffer group;
- (8) Heavier recoil spring constructed of two lengths of woven wire;
- (9) Addition of a cocking lever catch to secure cocking lever in the forward position;
- (10) Modified feed mechanism providing a more secure trip on the cartridge.

Both models can be used on the antiaircraft mount and although they appear to have been designed for mounting on the heavy ground mount, the clamp, fitting over the rear end of the barrel jacket cannot be secured when the gun is in place. A different trigger actuator is also required. The MG 34 and the models described above may be mounted flexibly in tank hulls.

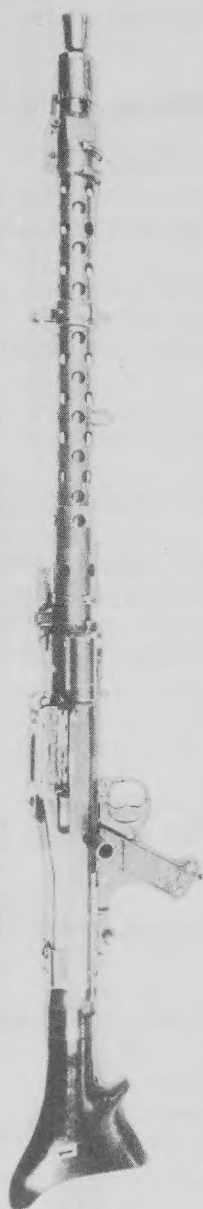
c. MG 42

The MG 42 is a new design but has the same tactical employment. A few of the outstanding characteristics will be listed here. The MG 42 differs from the MG 43 basically in the following:

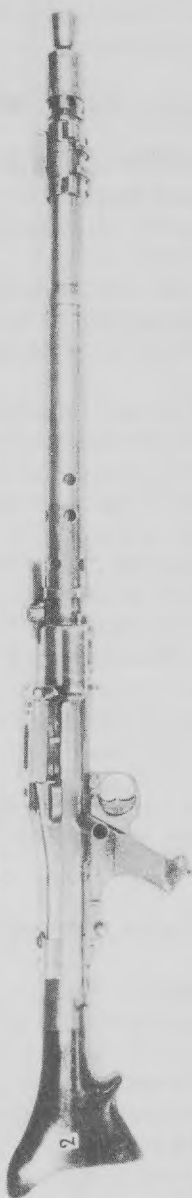
- (1) Extensive use of stampings in receiver, barrel jacket, cover assembly, and trigger group;
- (2) Provision for full automatic fire only;
- (3) Simplified bolt assembly allowing rollers to lock bolt to locking sleeve and eliminating locking lugs. The bolt carrier is a forging;
- (4) Simplified buffer mechanism with a very heavy spring;
- (5) A new and simplified quick change barrel is provided;
- (6) A more flexible feed mechanism is provided making for smoother operation.

Bipod, antiaircraft and heavy ground mount are provided but these mounts are not interchangeable with those used with the MG 34.

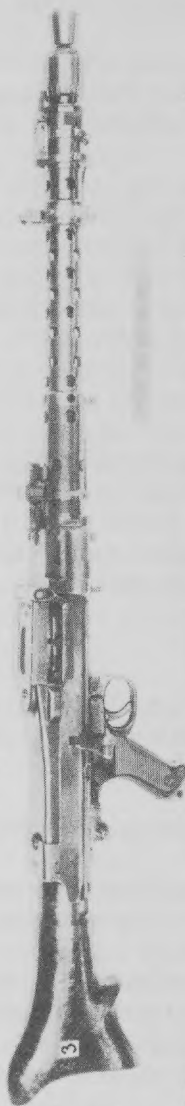
COMPARISON OF GERMAN MACHINE GUNS



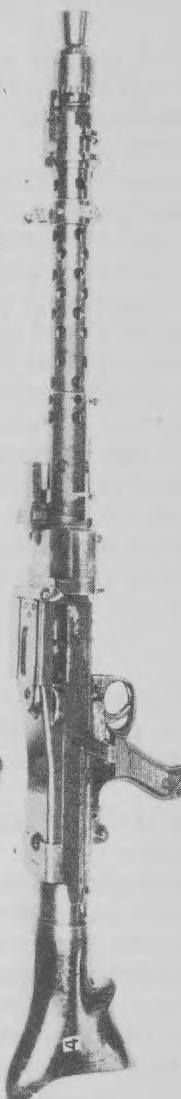
MG-34



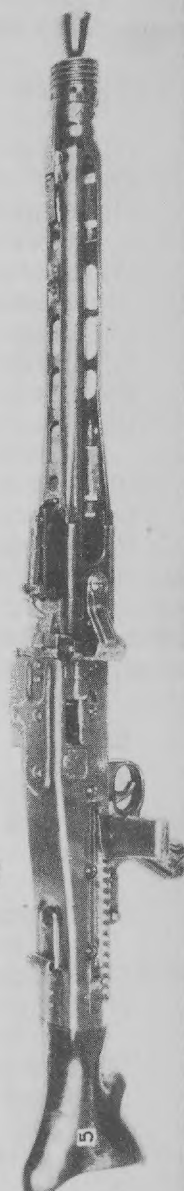
MG-34
(modified)



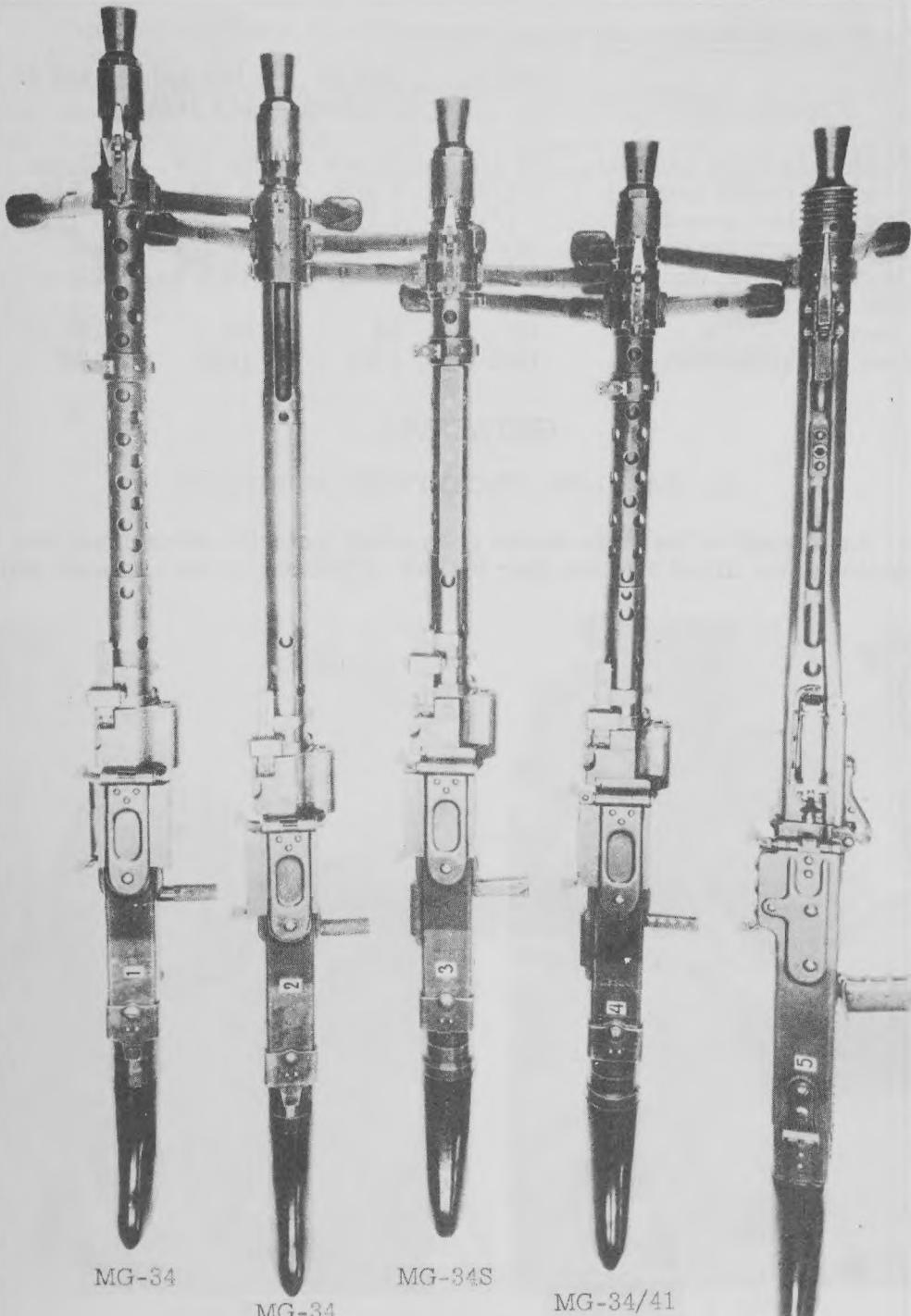
MG-34S



MG-34/41



MG-42



MG-34

MG-34
(modified)

MG-34S

MG-34/41

MG-42

d. Tables of Weights and Measurements:

Characteristic	MG 34	MG 34 (Modified)	MG 34S MG 34/41	MG 42
Weight w/o bipod (pounds)	24 1/2	26 3/4	24 1/4	23 1/4
Weight of barrel (pounds)	4 3/8	4 3/8	3 3/4	3 7/8
Weight of bolt (pounds)	1 1/16	1 1/16	1 5/16	1 1/16
Overall length (inches)	48	48	44 1/4	48
Length of barrel (inches)	23 1/2	23 1/2	19 3/4	21
Free length of recoil spring (inches)	18	18	22	15 1/2
Year of manufacture	1941	1942	1942	1942

GENERAL

13. HANDLING OF CAPTURED MUNITIONS

As a result of the large stocks of captured material which came into possession of the Allied Nations after the fall of Tunisia, it has happened that the



FIG. 1



FIG. 2

lack of adequate storage or shelter facilities has made the proper care of some of this material somewhat indifferently carried out.



Captured munitions in particular should be carefully handled if accidents are to be avoided. For example, when stored for shipment or other purposes, they must not be exposed to excessive heat nor direct sunlight, as in figure 1. In this connection it has been reported that German Tellermines when so exposed in storage have burst open as the result of expansion caused by excessive heat; when this occurs the explosive fillers of the mines are exposed, thereby creating a dangerous hazard (see figure 2).

If proper precautions are not taken accidental explosions will occur; in fact a recent case has been reported where a number of German mines exploded during shipment.

[REDACTED]

SECTION II

GERMAN SMOKE TACTICS FOR SUPPORT OF COMBAT TROOPS

"The fire power of modern automatic weapons is so great that it is almost impossible for infantry to advance across open terrain without prohibitive losses, unless the advance is preceded by an intense artillery preparation, or is screened with smoke. It will usually be desirable to use a combination of methods; artillery, mortar fire and flame throwers to disrupt the enemy plan of fire, and smoke to screen the friendly operations.

"The use of smoke to screen infantry operations came into extensive use during the First World War. Its value is now so well recognized that no attack of importance can be undertaken without first considering the possibilities for its employment."*

The significance of this quotation is highlighted by the fact that the Germans have made extensive and effective use of smoke for support of ground combat operations and may be expected to continue to do so. For this reason, German tactics in the use of smoke is important. These tactics are set forth in a chapter of a German handbook written by General Friedrich von Cochenhausen and entitled "Tactical Handbook for the Troop Commander". While this is not an official German military manual, it is thought to be authoritative in that it is known to have been extensively used as late as 1942 by German army personnel, especially officer candidates and junior officers, and there is no reason to suppose that it is not similarly used today. Although the translation is extracted from the 1940 edition of this handbook, it is nevertheless believed to embody current German thought on the subjects treated.

Before going further, a brief description of the organization of German "smoke troops" (Nebeltruppen) should be given. In this connection it must first be pointed out that, as far as is known, the German army does not have a chemical warfare service as such. However, it is believed that these smoke troops are general chemical warfare troops, who are trained for both smoke and gas operations, and in the event of chemical warfare breaking out, the offensive role will be borne primarily by them. Specifically with reference to the use of smoke, it should be borne in mind that when smoke is required in limited areas it is produced generally by smoke-producing ammunition fired by the combat units' organic weapons, such as artillery and mortars; in operations involving the use of smoke in large quantities the specially trained and equipped smoke troops are used.

The German smoke troops are a separate arm of the service, under an "Inspectorate of Smoke Troops and Gas Defense", which is concerned with the offensive use of gas, and gas defense. Smoke units are organized in general on artillery lines, in regiments, battalions, and batteries. The smoke regiment consists of a headquarters company, a signal platoon and three smoke battalions. The battalion contains a headquarters platoon, a signal platoon and three batteries. Each battery consists of two platoons, each with three 105-mm (4.14 in) mortars. The total armament of the normal regiment is thus 54 smoke mortars. Batteries

*Quoted from "Chemical Warfare Intelligence Bulletin No. 15", dated 1 June 1943 and published by the office of the Chief of Chemical Warfare.

of 8 mortars are known, thus a regiment may have as many as 72 mortars.

Great importance is attached by the Germans to the primary role of the smoke troops, which are GHQ units and normally allotted to corps as required, for purely smoke purposes. In any large scale operation smoke will be fired by smoke and artillery troops, under the control of an artillery commander.

The basic weapon, as noted above is the 105-mm mortar.

The following smoke units have been reported:

- (1) Eight smoke regiments, including one SS regiment, in the GHQ pool.
- (2) Three heavy smoke regiments equipped with rocket weapons.
- (3) Ten independent smoke battalions.
- (4) Two experimental smoke regiments.
- (5) A mountain smoke battalion.

A number of these units have been reported destroyed at Stalingrad. Three smoke batteries have also been reported in North Africa.

It is now known that the Grossdeutschland Division and probably 20 divisions formed since December 1941, include an organic smoke battery.

It is well to point out here that the Germans distinguish between the blinding screen and the area screen, a distinction not specifically made by General von Cochenhausen. The blinding screen is laid to blind hostile observation. The area screen is laid over an extensive area and fighting is carried out within the screen under conditions similar to a natural thick fog. For details on the tactics involved in the use of an area screen see Tactical and Technical Trends, No. 18, p. 39.

The translation from General von Cochenhausen's handbook follows

* * *

EMPLOYMENT OF SMOKE (ARTIFICIAL FOG) IN COOPERATION WITH COMBAT TROOPS

a. Purpose and Characteristics of Smoke (Artificial Fog)

Smoke is used to conceal friendly troops and installations; to blind or deceive the enemy or to hinder the effect of his fire. Smoke is also used to cover the enemy. Or, in case it is desired to cut out hostile observation, it may be used to cover friendly troops. It is preferable to smoke the enemy if the smoke mission in the given situation can be accomplished with the available material. The enemy's fire effect is decreased if the smoke covers his riflemen and observation posts

rather than his targets. To smoke friendly troops will restrict their action and draw the enemy's attention toward them.

Although slightly irritating, smoke is harmless. Being practically the same color as natural fog, it is distinguished by its greater density and sharper outline, as well as its sudden rise and disappearance. Its density and extension depend upon weather and terrain.

Favorable conditions for the employment of smoke are: a steady moderate wind; humid atmosphere; clouded sky; falling temperature; early morning or late evening hours; bare, even terrain.

Unfavorable conditions for the employment of smoke are: a calm, very weak or very strong gusty wind, constantly changing its direction; dry atmosphere; sunshine; heat; hilly or covered terrain.

b. Smoke Materiel

(1) Smoke Shell

Smoke may be produced by special ammunition for artillery and mortars, as well as ammunition for similar special weapons of foreign countries (for example, the American 107-mm gas mortar, having a 2,250-meter range*). Smoke shell is most applicable for use against hostile troops and it is least dependent upon the weather. For the relation between the point of impact and the target with respect to different wind directions, see figure 1. A smoke cloud which is to blind the enemy should be built up as rapidly as possible and maintained with moderate fire.

Ordinary mortars and special gas mortars normally consume less ammunition than guns of equal caliber. For example, the American gas mortar requires a maximum of only four rounds per minute to build up and maintain a smoke cloud 200 meters wide.

(2) Smoke Sprayers and Smoke Releasing Apparatus

Devices which squirt out a smoke-producing fluid may be used to establish a smoke curtain (see figure 2) or a smoke cloud (see figure 3).

The types of sprayers most commonly used are the small sprayer carried on the back of the individual soldier, and the large sprayer which is moved into position on a hand cart. The small sprayers produce smoke for a period lasting about 10 minutes, and the large ones, for periods lasting from 30 to 40 minutes. The small sprayers can be used by troops while they are in movement, or in position. These sprayers are suitable for rapid use within the combat area of infantry troops. The installation of the large sprayers in the foremost parts of the combat zone is

*This and other references to U.S. materiel are part of the original German document.

time consuming, and possible only when the terrain is hidden from hostile observation.

Italy and Russia possess vehicles which release smoke during periods lasting from 60 to 70 minutes. These vehicles are used generally while in motion

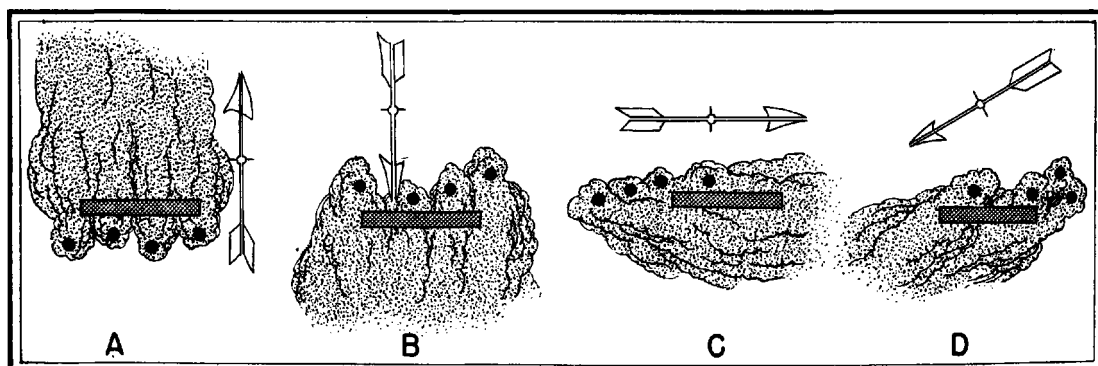
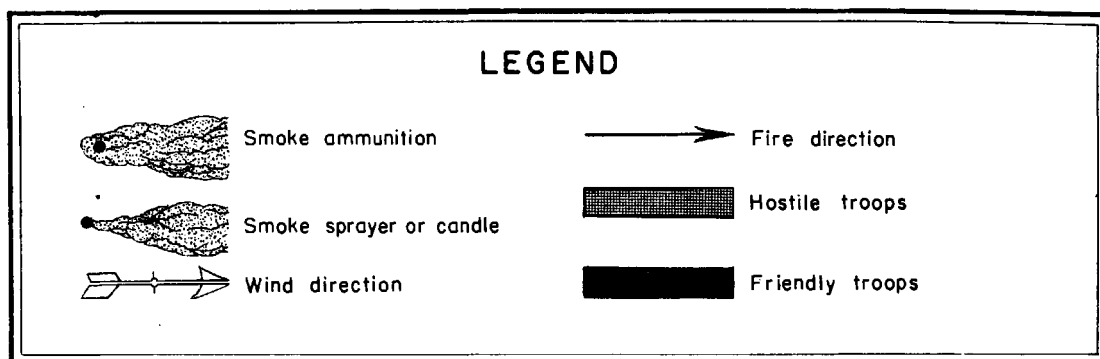


FIG. 1

to conceal the movements of large units of mixed forces or to conceal motorized troops.

Sprayers may release smoke effectively, irrespective of the direction and speed of the wind. Unarmored and armored vehicles equipped with sprayers may release smoke effectively even in a calm atmosphere, providing the vehicles are moving at high speeds. However, if the wind is blowing away from the enemy, such a method should not be used to smoke friendly front line troops. Nevertheless, this method is applicable for smoking the enemy only for short distances (seldom more than 800 to 1,000 meters), if there is a steady following wind blowing toward the enemy.

(3) Smoke Hand and Rifle Grenades

These have a limited effect both as to time and space.

(4) Smoke Candles and Smouldering Material

These develop smoke which resembles fog. The material most commonly used includes small candles that are thrown, or placed, a few paces apart on the

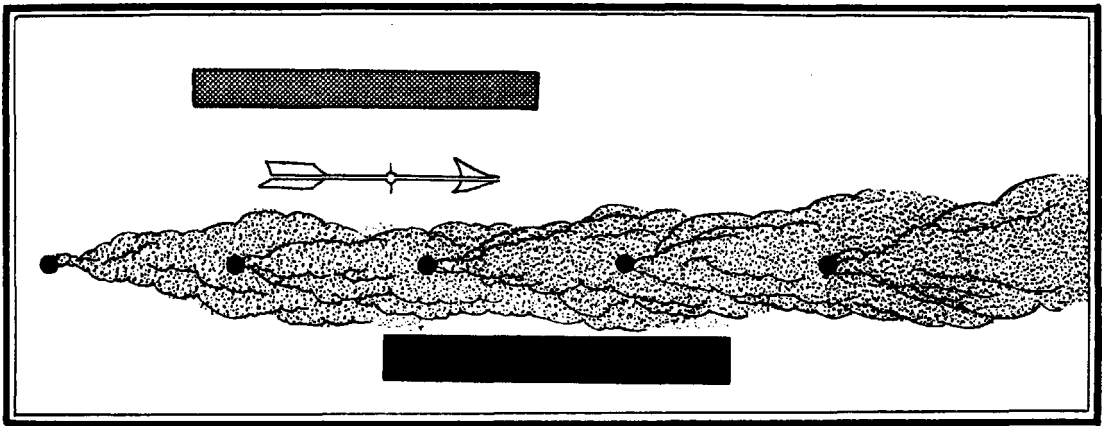


FIG. 2

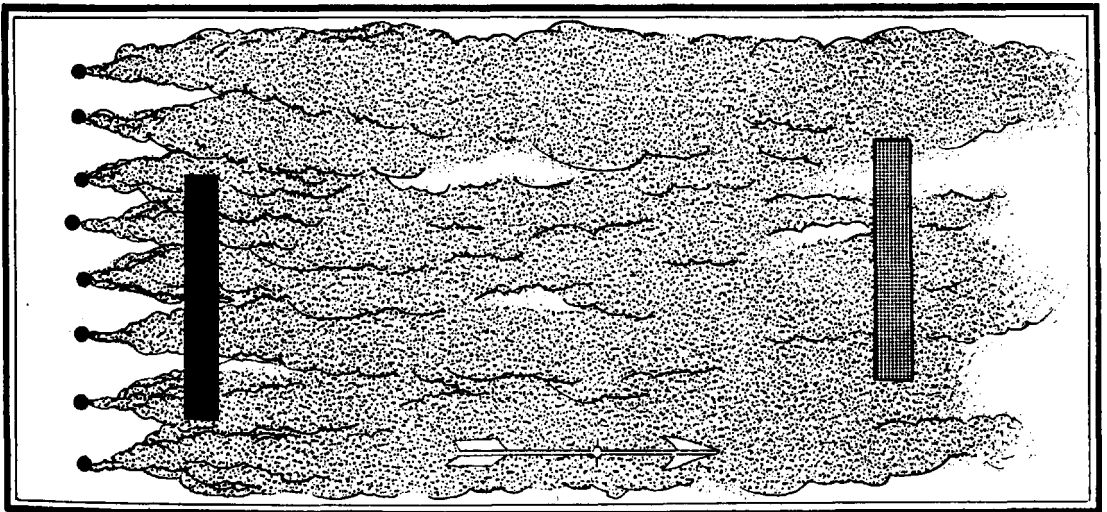


FIG. 3

ground. They produce smoke for periods lasting about two minutes, and they are used mostly in such small-scale smoke operations as in combat in the interior of the hostile position. The French infantry is equipped with a smoke candle which

weighs 15 kilograms (33 pounds) and burns about 10 minutes. These candles are used also in large-scale smoke operations.

(5) Airplane Smoke Material

Airplanes may drop smoke bombs to cover or screen the enemy for a short time in limited areas.

Airplanes may also be equipped with smoke sprayers, which, depending upon the type and size of the apparatus, can either lay a flat smoke screen about 300 meters wide and several kilometers long, or establish a vertical curtain about 200 meters high. Planes so equipped may be used to produce smoke in aerial combat, or they may release smoke to blind anti-aircraft weapons or deprive the enemy of ground observation over friendly troops. Due to the rapidity with which they can be laid, and great extent but short duration, such smoke screens are suitable, principally to conceal the movement of cavalry and motorized units. According to the American opinion, these screens are unsuitable for concealing infantry. However, according to the Swedish viewpoint, they are practical even for concealing infantry, providing there is a slowly moving wind and a damp atmosphere.

c. Issuance of Orders for the Employment of Smoke

The influence of weather conditions and the usually short duration of the smoke effect, require rapid and determined action in the employment of smoke. The following disadvantages should be taken into consideration in making decisions to use it: restriction of observation; interference with neighboring troops and with the operations of weapons. Troops, especially artillery, that will be effected by the smoke should be informed of its contemplated use.

Independent employment is permitted only in case the effect of the smoke is limited to the area of the command using it. In other cases, the use of smoke is regulated by the common higher commander. The commander can withhold from his subordinate units the permission to use smoke. Only armored vehicles may use smoke without restriction for self-protection.

For large-scale smoke operations, army and corps commanders allot to their subordinate units, smoke troops with projectors or sprayers, the required ammunition for artillery and mortars, as well as airplanes equipped with smoke-producing apparatus. In general, the division commander regulates the use of smoke and coordinates its effect with the fire and movement of his subordinate units. Pertinent proposals in this respect are made by the smoke troop commander. The combat order should prescribe what the smoke is to conceal and for what purpose it is to be used. When used against hostile observation, the direction and duration of the screen should also be stated. To insure close cooperation, smoke troops usually are attached to the units that are to be protected.

d. Use of Smoke in Large-Scale Operations

(1) Attack

Smoke conceals the movements made in preparation for attack and it facilitates surprise. Smoke reduces losses and its use is especially valuable in

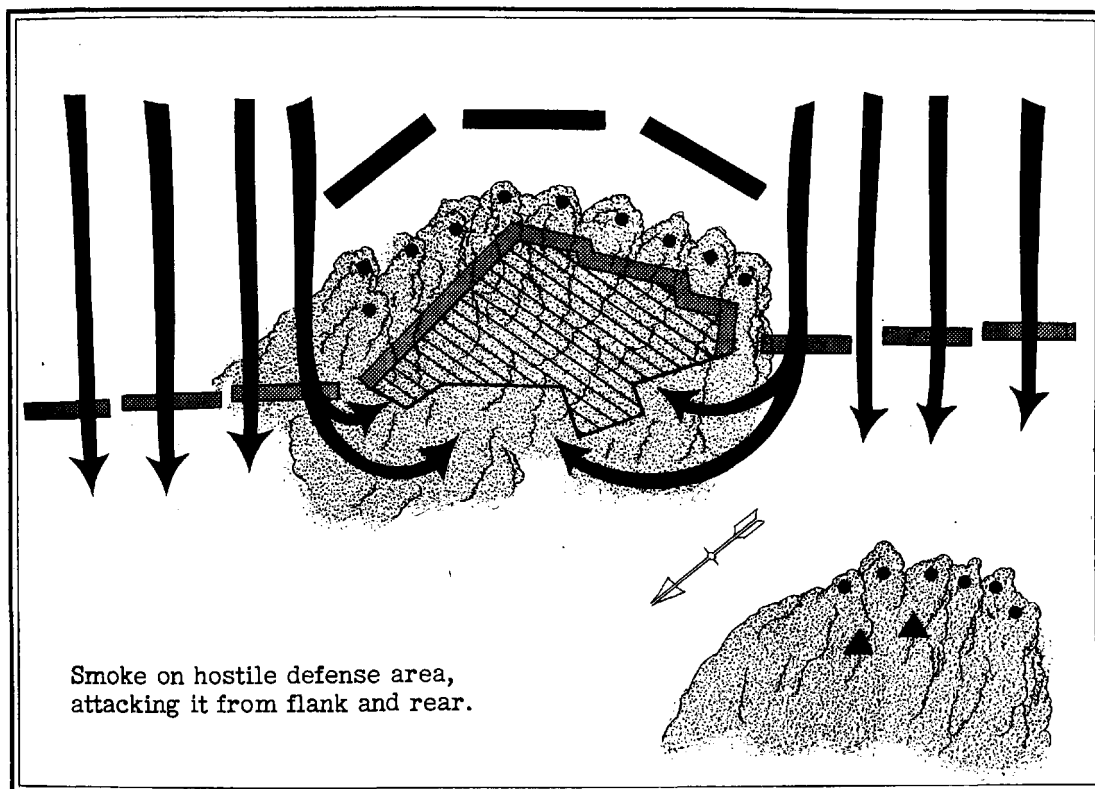
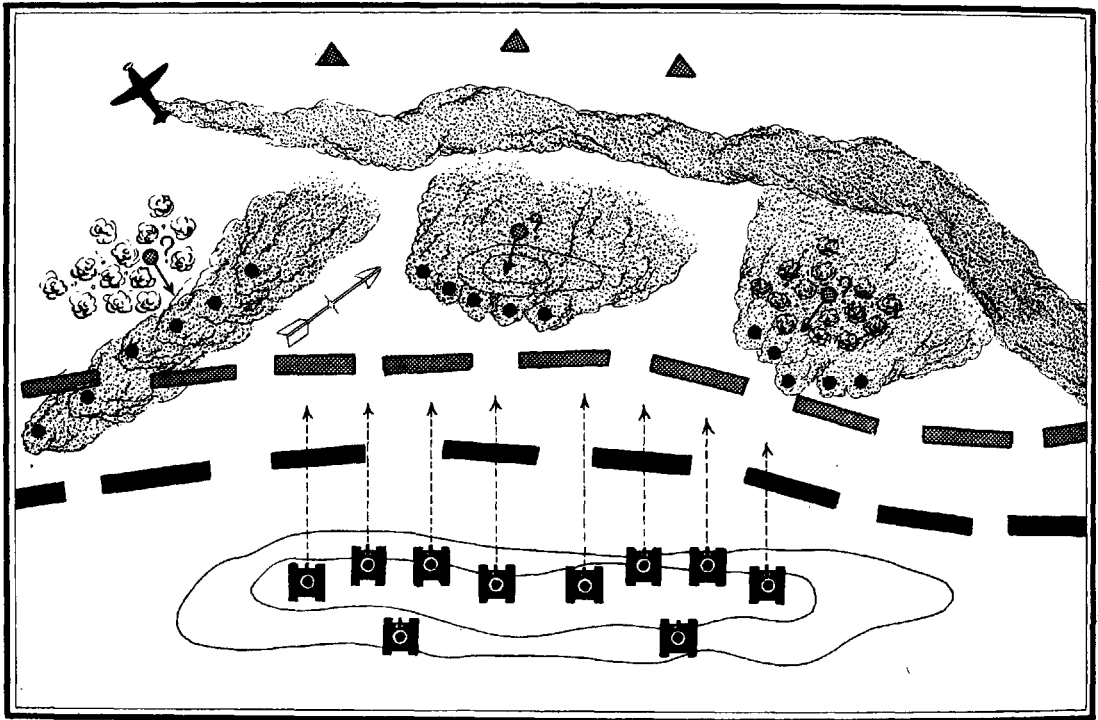


FIG. 4

crossing open terrain, and during the initial crossing of a river in the face of the enemy. Unobservable hostile positions, suspected observation posts, and defensive weapons such as concealed machine guns, can be prevented from operating efficiently by the use of smoke. Smoke troops so employed reduce the required fire power and facilitate the establishment of the artillery main effort. According to American opinion, attacking troops concealed by smoke may even forego fire protection.

Smoke serves to support the attack in the zone of the main effort, to veil weakness in adjacent zones, to disguise gaps in the line in front of thinned-out positions. Most frequently, however, the attacker uses fire from smoke-producing

ammunition to blind the enemy; smoke sprayers are seldom used for this purpose, and then only as a temporary expedient when the wind is blowing toward the enemy. Sprayers are mainly used to screen friendly attacking troops in order to conceal their approach, their position of readiness, the filling-in of the foremost lines, and similar movements. For illustrative examples see figures 4, 5, and 6.



Hostile OPs and suspected defense weapons smoked during a tank attack.

FIG. 5

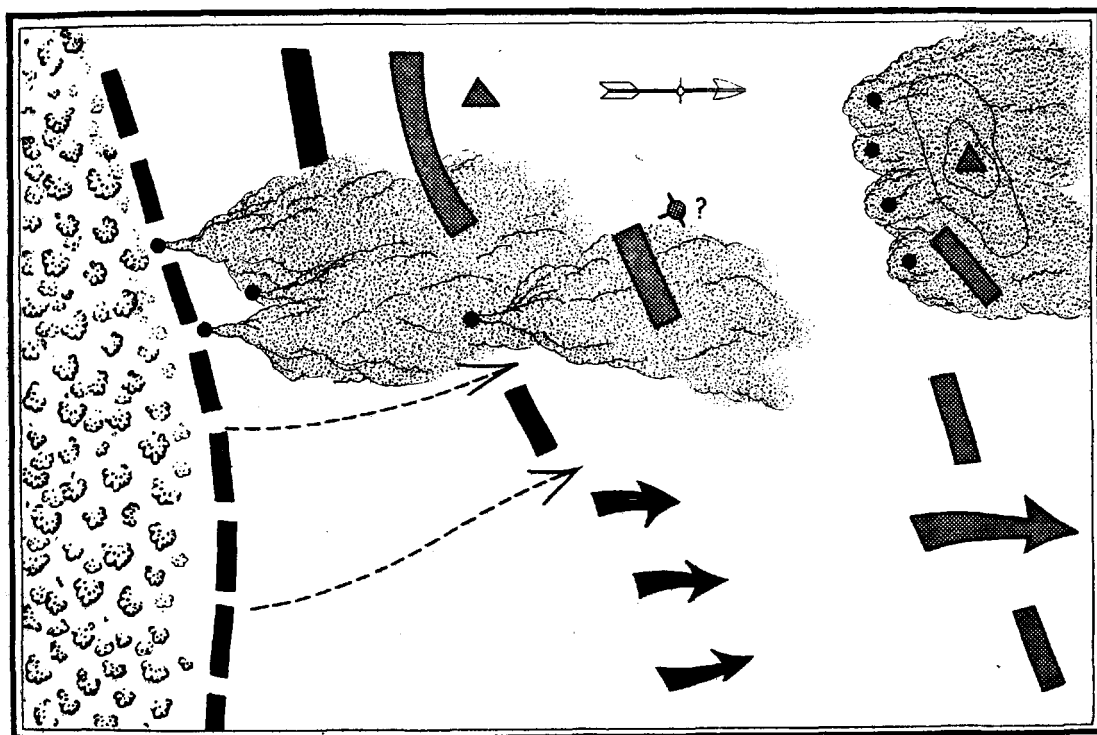
(2) Defense

In defense, the use of smoke in front of artillery observation posts is seldom advisable, because such use blinds their observation, thereby weakening the fire.

The defender's use of smoke on critical parts of his own position in case of a hostile tank attack is recommended only by the French. Such use is regarded by other countries as disadvantageous.

Fire from smoke-producing ammunition is a suitable expedient for blinding hostile observation positions. The defender should make prior preparations, if he intends to use smoke in the forward parts of his combat zone, in order to conceal working parties or other movements from hostile observation. Smoke also furnishes protection for such operations against surprise advances by the enemy. Smoke may be used in the rear of the defender's artillery observation posts, except when the wind is blowing in the direction of the observation post itself.

Such uses serve to conceal the shifting of strength (such as the movement of reserves, changes in artillery positions), but it will fulfill its purpose only if it completely excludes all ground and air observation. In a delaying action, smoke facilitates disengagement from the enemy.



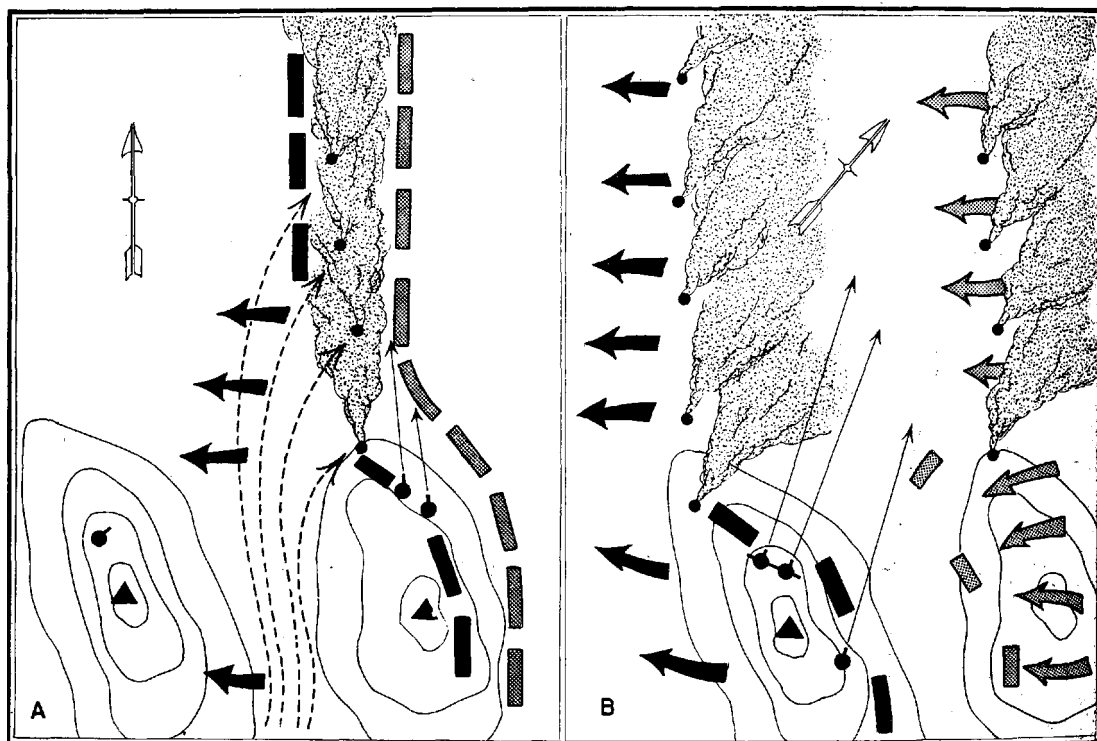
Smoke protecting an attacking flank.

FIG. 6

(3) In Breaking Contact During Combat

For this purpose smoke is of valuable assistance. It facilitates disengagement from the enemy by day, because it is a substitute for insufficient terrain

cover. Whenever possible, the enemy should be blinded by smoke-producing ammunition. Generally, the withdrawing troops can also be covered by sprayed smoke, in many cases even if the wind is blowing in the direction of the withdrawal. However, in general, the timely employment of smoke sprayers is possible only in case of previously planned preparations for vacating a position. Possibly, the smoke apparatus may fall into the enemy's hands. The advancing enemy should be held up by observed or planned fire as soon as the smoking or rearward movement begins, in order to prevent him from using the defender's smoke to maintain pressure on the withdrawing troops (see figures 7 and 8).



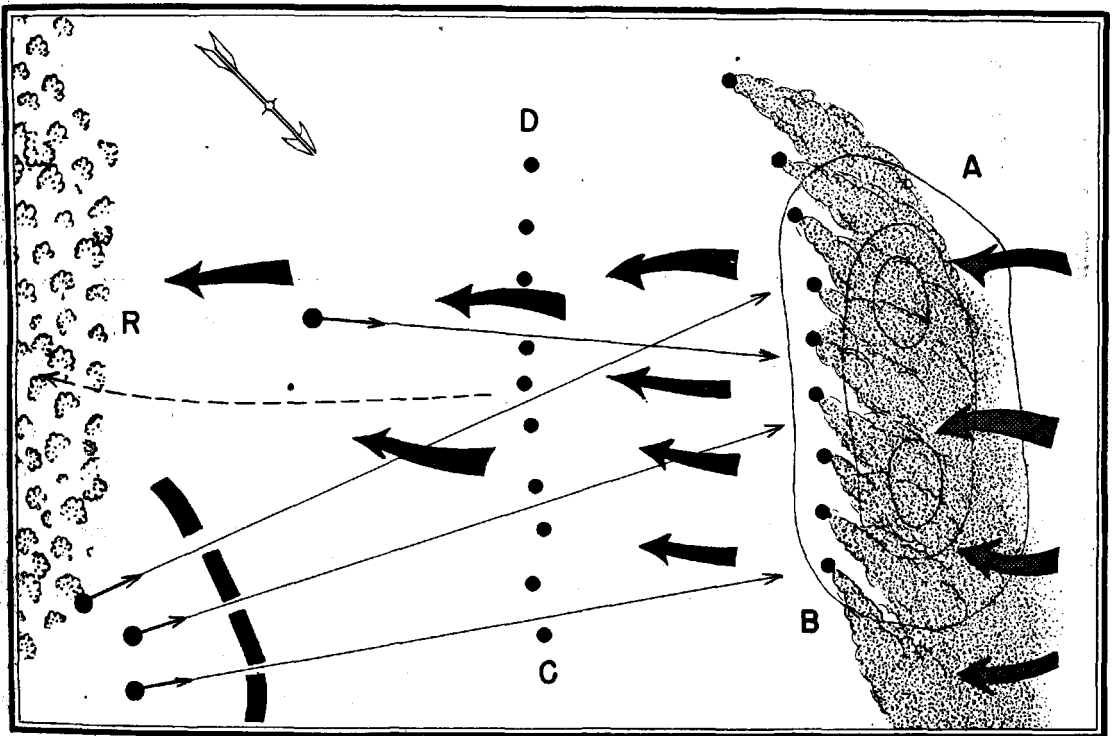
Use of smoke to facilitate a withdrawal. Several smoke screens established successively. A - Initial phase, B - Continuation.

FIG. 7

(4) The Blocking Out of Air Observation

This requires a great expenditure of smoke ammunition. Therefore the exclusion of air observation by smoke is possible only for short periods of time. The establishment of a complete smoke cover that cannot be seen through from above can be accomplished only under especially favorable weather and terrain conditions.

Combat bridge construction and large ferries cannot be concealed from the air by smoke for long periods of time. Likewise, troop movements can be concealed only during short marches, for example, troops moving from a dispersed or camouflaged formation into natural cover. Smoke makes low-level air attacks more difficult. Where such attacks are to be expected, it is recommended by the Italians as a preventive measure to smoke troop formations, for example, when the troops are emerging from a defile. According to American opinion, large installations cannot be defended against aerial bombing attacks by the normal service smoke materiel.

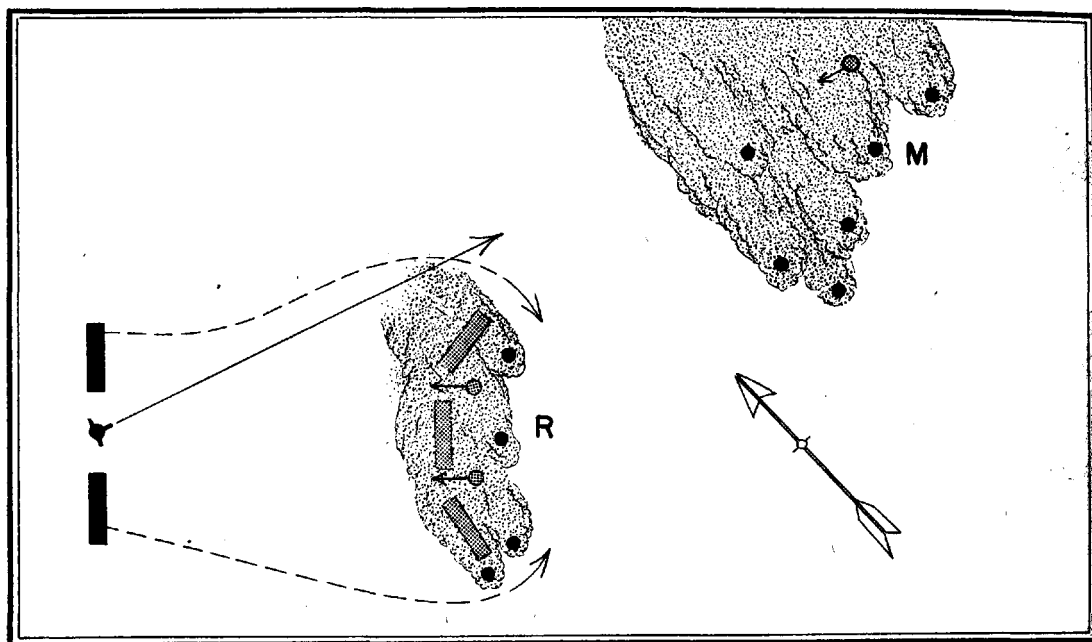


Rear guard, concealed by released smoke, withdrawing from the heights A-B. Smoke is prepared to be released on line C-D. R is the rearward or assembly position.

FIG. 8

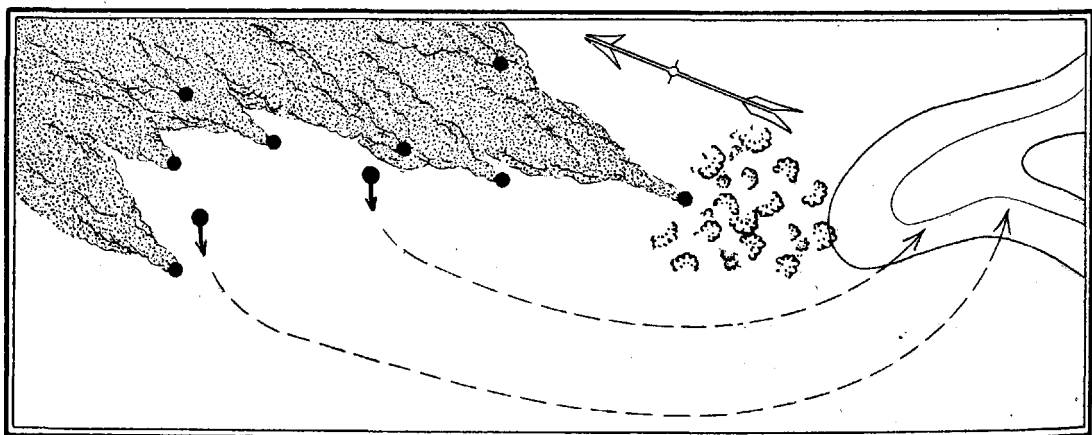
(5) Deceptive Use of Smoke

Smoke may be used deceptively to divert hostile attention and fire from decisive positions. For example, in river crossings it may be used at many places to deceive the enemy as to the location of the contemplated crossing point. The dimension of the deceptive smoke cloud must be such as to make it appear to serve an important purpose in the combat situation.



Use of smoke in an attack against a machine-gun nest. Mortar smoke shells used against M. Rifle smoke grenades used against R.

FIG. 9

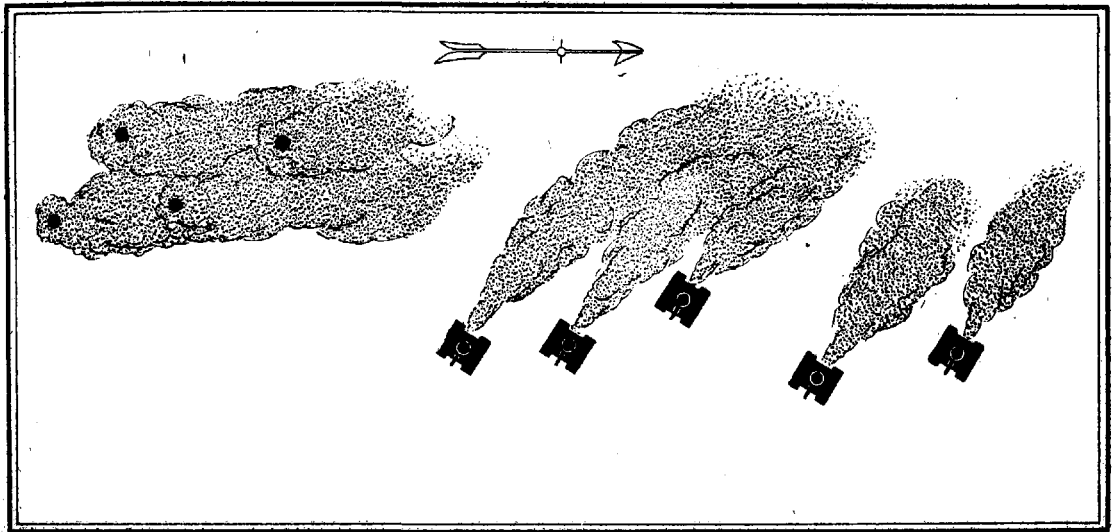


Machine-gun section under hostile fire changes position while screened by smoke from smoke candles.

FIG. 10

e. Use of Smoke in Small-Scale Operations (Limited Areas)

In such situations, smoke operations should be carried out with the combat troops' organic facilities, such as smoke candles, smoke hand and rifle grenades, artillery and mortar smoke shells, as well as smoke sprayers on armored vehicles (see figures 9, 10 and 11).



Tanks withdrawing while screened by their own smoke. The flank vehicles are screened by smoke produced by an artillery battery.

FIG. 11

f. Combat in Smoke

Smoke hinders the defense more than the attack.

Troops moving cross country in smoke maintain their direction by compass. In order to keep troops in hand it is at times practical to move them by bounds. In smoke, troops should advance silently and attack resolutely. The decision is secured in close combat. Upon contact with the enemy, attack him immediately with the bayonet, hand grenades, and loud yells.

In defense, the direction of fire should be definitely established and a plan of fire should be prepared in advance, thereby guaranteeing effective fire even in case of a surprise attack supported with smoke. Upon the appearance of smoke, do not fire until it is established that the enemy is actually attacking. On threatened positions, keep detachments close at hand for counterthrusts with bayonets. Counterattacks generally should be launched just after the disappearance of the smoke.

When encountering hostile smoke put on gas masks and keep them on until it is definitely determined that the smoke is not mixed with other chemical agents.

Front line troops should open fire individually against hostile smoke only if it is directly in front of their own position. The enemy may display smoke to divert fire from his own important positions. Combined fire will be ordered by higher authority. Friendly air reconnaissance should determine definitely what the hostile smoke conceals.

*

*

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COMMENTS

(1) It is interesting to note the German conception of American, Swedish, and Italian opinion on smoke employment. This and similar German texts indicate a detailed study of American experiments and conclusions concerning the use of smoke.

(2) In order to disperse the hostile fire that it attracts, smoke should cover a maximum area, if it is to be placed on terrain in which friendly troops are operating. However, the possible hindrance to friendly artillery observation, friendly fire, and troop movements, should always be taken into consideration in decisions to use smoke. Even if handicapped by smoke artillery can continue to execute its previously prepared fires, but it cannot recognize or fire effectively upon new targets. In view of the above considerations, the Germans have not emphasized the development of smoke-spraying vehicles for use in support of front line units. They prefer to use weapons firing smoke-producing ammunition instead.

(3) The Germans believe that it is generally unnecessary for the defender to leave his cover and move within the view of an attacking enemy. Therefore, the use of smoke by the defense against an attack is usually undesirable, since the strength of the defense depends mainly on the effectiveness of aimed and observed fires.

(4) It must be assumed that the purpose of smoke during a daylight withdrawal will be immediately recognized by the enemy who will increase his efforts to push after the retiring troops. Smoke alone will not hold the enemy away. Therefore, in such situations German artillery and other heavy weapons supporting a withdrawal, will increase their fires against favorable targets, previously selected and registered upon. These weapons will also be prepared to place aimed and observed fire upon the advancing enemy as he emerges from the smoke.

(5) It is noted that in this and other texts, as well as in accounts of combat experiences, the Germans frequently use smoke as follows: to conceal movements of armored and foot troops, especially from the flanks; to deceive the

enemy, by judiciously placing it at seemingly logical and important points; to reduce the ammunition expenditures required to neutralize hostile weapons, especially those in threatening positions that afford good natural concealment and at the same time cannot be efficiently combatted by armored vehicles, infantry weapons, or artillery.

(6) Whether the use of smoke brings the intended results, depends upon the ability of the commanders concerned to achieve a clever cooperation between the effect of the smoke, and the fire and movement of the combat troops.