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CONTENTS

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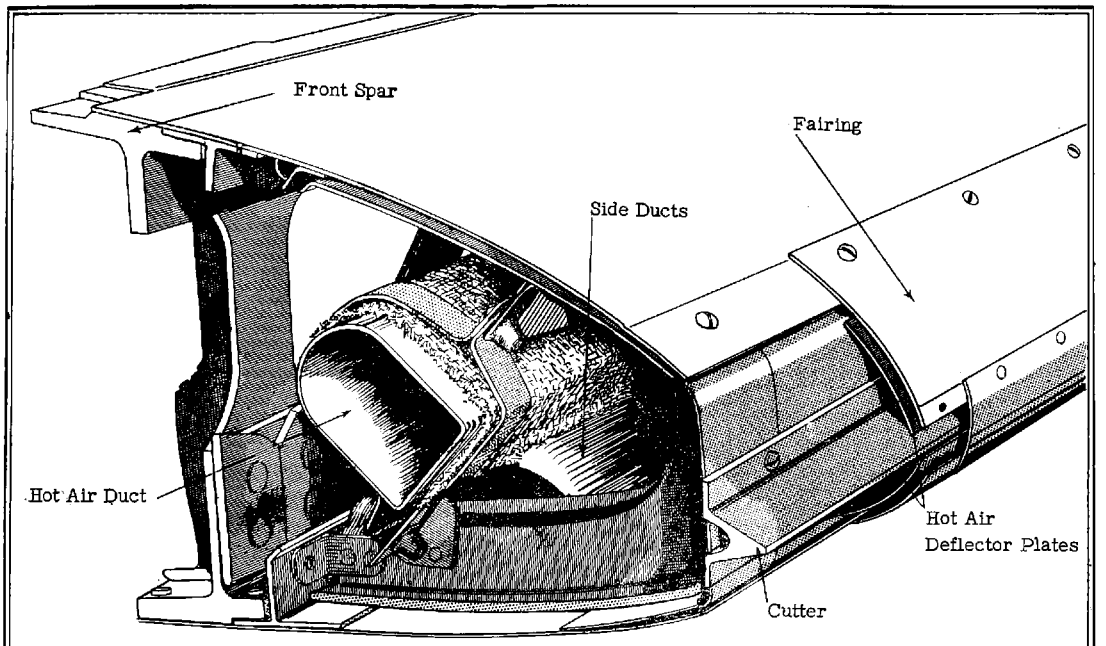
SECTION I

1. THE GERMAN CABLE CUTTER

Balloon barrages equipped with steel cables, which are used to protect industrial and military areas in the British Isles, and used to some extent in Egypt, present formidable obstacles to German fighters and bombers. These barrages are both fixed and mobile, and are capable of effective operation at considerable altitudes. In numerous instances, they have damaged the wings or fuselage to such an extent as to cause the enemy planes to crash or force-land on British territory. Avoidance of these barrages can be effected by flying over them, but this reduces the accuracy of level bombing. There are other means of avoiding balloon cables.

To cope with the situation, the Germans have developed knife-edge cutters called Kutonase which are fitted to the leading edge of the wings, and sometimes around the nose of the fuselage. They are made of steel, and the blade is suitably faired.



LEADING EDGE OF DORNIER WING, FITTED WITH KUTONASE

Three different types of Kutonase have been examined and tested. On the Ju-88 it was applied to a standard wing, the cutter having a hardened edge, covered with a thin sheet of duralumin forming the wing leading edge.

On the Dornier 217E, the wing in front of the spar had been specifically designed to take the cutter. The general design is similar to that on the Ju-88, but the cutter is of rolled steel instead of being fabricated, while the adverse effect of the fairing on the cutting is minimized by the insertion of a strip of thinner material along the fairing immediately over the cutting edge.

The Kutonase found on a Heinkel 111 was of an overshoe type, designed to be fitted to aircraft already in service, the complete unit being held in position by straps anchored to the front spar, and covered with doped fabric. In this case, the only material interposed between the cutter and the cable was doped fabric, but the advantage of this is probably decreased by the additional stiffness provided by the turned-in edges of the metal fairing. The cutter plate and mounting were similar to those on the Ju-88.

It is believed that the Kutonase on the Dornier 217E provides complete protection against heavy balloon cables at speeds over 200 mph but is effective against light barrage wire only at a considerably higher speed. Although the type used on the He-111 is just as efficient as that used on the Dornier 217E, the former plane is not so well protected on account of its lower maximum and cruising speeds. The Kutonase of the Ju-88 appears to provide little or no protection in normal flight, but might be effective at the speeds obtained after pulling out of a steep dive.

ANTIAIRCRAFT

2. 88-MM ANTIAIRCRAFT GUN ON RAILWAY MOUNTING

A photograph has been received of the German 88-mm antiaircraft gun on a railway mounting (see Tactical and Technical Trends, No. 17, p. 5 for a report on German railway antiaircraft protection). The four arms of the gun platform have been very considerably shortened and bolted to a railway car of the "Hungarian low-sided flat" type through a bed plate. The gun shield has been retained, and all other details of the gun and mounting appear the same as on the regular gun. A square platform on either side of the car can be let down from the vertical to the horizontal to give additional room for the gun crew. The photograph shows the gun being used for the engagement of a ground target, firing at right angles to the line of travel of the train, but there is little doubt that it can also be used in its antiaircraft role. Owing to the length of the barrel, the gun would, of course, have to be traversed to correspond with the line of travel when the train is in motion. This form of mounting allows a complete 360° traverse and freedom of elevation.

ANTITANK

3. GERMAN DEFENSIVE TACTICS IN RUSSIA

The following report contains German conclusions on certain phases of their defensive tactics as used in Russia.

* * *

a. Tanks should be kept in reserve. They should attack the flanks of enemy armored units as soon as the direction of the enemy attack is clear.

b. Defiladed antitank positions are highly desirable. Antitank guns should not open fire until approaching enemy tanks are at point-blank range. However, fire should be brought to bear under all circumstances, even though there appears to be little chance of success. The enemy tank will be slowed down, and will usually swing away. Antitank guns must be highly mobile so that they can be massed at any point where the enemy tanks are attacking. An allotment of half-track vehicles to antitank units is highly desirable to aid in obtaining cross-country mobility.

c. Concentrated artillery fire has a good harassing effect on enemy tanks.

d. Russian tank attacks are usually accompanied by infantry. German infantry which was passed by the tanks had great success against Russian infantry following the tanks. Therefore, all available means should be used to combat "tank shock." Experience has shown that German infantry when Russian tanks passed through them suffered only slight casualties when they were in "dug-in"

positions. For this reason it is essential that foxholes be dug deep, and at once, by every means available.

4. NEW GERMAN 75-MM ANTITANK GUN

With the increasing potential effectiveness of the tank, particularly in more powerful armament and greater armor thickness, there has of necessity been a corresponding development in antitank weapons. Perhaps the greatest threat to the tank is the antitank gun. Until recently the largest caliber German antitank gun (as differentiated from the AA/AT gun, or the tank gun) has been the 50-mm. It is now believed that the Germans have a 75-mm antitank gun, the 7.5-cm Pak 40. This is probably the long-barreled tank gun of the new Mark IV German tank, produced as a field piece. The importance of this development cannot be overestimated, since guns of the 50-mm class may thereby be rendered obsolescent. A further stage in the gun - vs. - armor battle may have been reached.

5. NEW AXIS SELF-PROPELLED GUNS

Owing to the battlefield mobility of tanks, as well as to other factors, the towed antitank gun is not always an adequate antitank weapon. To supplement the towed gun, self-propelled antitank guns have been developed and organized into special units: for example, the U.S. tank-destroyer organizations. For a considerable period of time the Germans have shown a tendency to mount a large number of guns on self-propelled mounts, the calibers varying from 20 mm to 150 mm. Recently the following new German equipment of this type was reported to exist:

German 37-mm AT gun on an armored personnel carrier;
Russian 76.2 -mm gun on German Mark II tank chassis;
Russian 76.2-mm gun on Czech light tank (38) chassis;
German 75-mm tank gun (40)* on German Mark II tank chassis;
German 75-mm tank gun (40)* on Czech light tank (38) chassis.

Of the above weapons, the first two are known to have been present in North Africa. Whether the last three have been issued to units is not known. The Germans are also reported to be developing 88-mm and 128-mm armored self-propelled guns.

The Italians are apparently still endeavoring to follow the Germans in the development of self-propelled weapons. It is reported that they now have a 90-mm self-propelled gun. While this gun is known to exist, it is not believed to have appeared yet in action. The Italian 75-mm self-propelled gun (see

*(See article number 4, this issue)

Tactical and Technical Trends, No. 6, p. 35) is reported to have proved not wholly successful, and it is thought that Italy does not possess sufficient resources to allow free improvisation on the German pattern.

ARMORED FORCE

6. RUSSIAN EMPLOYMENT OF TANKS

Soviet tactics, like German, are modern in character and show mastery of the entire gamut of weapons in modern war.

The following report deals with various items of information received from the Russian front, and is based mainly on articles which have appeared in the Russian Army newspaper "Red Star." No reference is made specifically to any particular phase of the Russian offensive.

The Russians declare that one of the main lessons of the campaign has been that armored forces alone can never achieve a decisive result; they must receive adequate support from other arms, and particularly from infantry, while they can never hope even to break the crust of a really strong position without the assistance of artillery or heavy bombing. The other arms are essential to deal with enemy artillery, antitank guns, and minefields. Moreover, even if tanks do penetrate a position, when unaccompanied by infantry they can be cut off and successfully dealt with, especially by night. The morale of seasoned troops remains entirely unaffected by the knowledge that isolated tanks are in their rear, for they realize that, provided the enemy infantry can be prevented from joining up with them, the tanks must either retire or be mopped up.

The Russians emphasize that armored vehicles must be concentrated to attack where they can be most effective. If they are supporting infantry they must be put under command of the unit supported, but the temptation to split them up into small groups with the object of helping the infantry forward all along the front must be avoided. Tanks should not be regarded solely as a means of direct attack to overcome strong resistance which is holding up the infantry , but should aim rather at breaking in where resistance is weaker, striking strongly defended localities only in the rear, and ultimately exploiting the "break-in" into a "break-through."

Tank forces in the attack must be accompanied by mobile field and antitank guns, which must be well forward to deal with surprise opposition. They will also be invaluable for repulsing enemy tank counterattack. Russian tank forces rely largely on air support, particularly by dive-bombers, to extend the range of artillery preparation, to harass enemy reserves, and to break up counterattacks.

7. NEW GERMAN TANKS

Several new types of German tanks have been reported to be in existence.

a. Mark I (C)

No details are known but it is probable that this is a redesigned Mark I intended for airborne or landing operations. The original Mark I tank weighed about 6 tons.

b. Mark II Special

The original Mark II tank (weight about 9 tons) has for some time been considered obsolescent as a combat tank. The new tank probably has thicker armor and a more powerful engine. One of the most important features is that it is reportedly armed with the long-barrelled 50-mm gun which is used in the new Mark III tanks. The result should be a comparatively light, fast tank with adequate striking power, probably suitable for use as a tank destroyer.

c. Mark VI

This is a heavy tank. No details other than the actual nomenclature are known, but it seems probable that this model is an entirely new departure in German tank design. It has been anticipated for some time that the Marks III and IV might be superseded by a new type incorporating the best features of each model and introducing features borrowed from British and possibly American designs. Having obtained a tank gun of first quality in the long-barrelled 75-mm tank gun (40), the weapon mounted in the new Mark IV tanks, it is probable that this weapon or an 88-mm weapon is the principal armament. The basic armor may be as thick as 80 or 100 mm, and spaced armor, at least in front, is probably incorporated. There may also be skirting armor. Face-hardened armor is probably used, and the speed is not expected to be under 25 mph.

Reports of a German heavy tank have been received over a considerable period of time. Apparently the most recent is the statement of a German captured in Tunisia. According to the prisoner, he belonged to an independent heavy tank battalion, which consisted of a headquarters company and two armored companies. Each armored company was equipped with nine 50-ton tanks. The tanks were armed with 88-mm guns and were capable of a speed of 50 kilometers (about 30 miles) an hour. Whether or not this is the Mark VI tank is not known.

8. ITALIAN PARACHUTE ARTILLERY EQUIPMENT

A number of prisoners of war from an Italian parachute artillery unit have revealed the following details of their equipment.

The type of parachute used is known as the "I.F." (Imbracatura Fanteria) which opens automatically. White parachutes are used for personnel. Jumps were made during training from heights varying between 800 and 400 feet. No jump is ever made from a lower level than 300 feet. One of the prisoners described a jump in which seven men had to leave the aircraft in 4 seconds. They were trained to launch themselves from the aircraft with arms and legs spread-eagled. The types of aircraft employed during training were the Caproni 133 (tri-motored transport type) and the Savoia-Marchetti 82 (tri-motored transport type).

Each man is stated to carry the following equipment: a haversack containing 40 hand grenades, a Beretta machine-carbine with 400 rounds of ammunition strapped to the right leg, and 3 days' iron rations and 1 quart of water. Mention was also made of revolvers and daggers, but the scale of issue was not stated.

The uniform appears to consist of an officer-type blue-gray tunic with lapels and large breast and side pockets, skiing-type trousers, and high black leather ankle-boots with toecaps and a rubber sole and heel in one piece. (This is not worn in North Africa.) The normal Italian steel helmet is worn, with a special lining and a neck protector. For protection when landing, gloves and knee pads are worn. An insignia consisting of a sword with a single wing is worn superimposed on the usual artillery collar patch, and a yellow parachute design is worn on the left upper arm.

Forty-seven-mm guns and ammunition are dropped in separate loads, by means of blue-colored parachutes, in special canvas sacks called Aero Rifornitori or Sacci Rifornitori. These sacks bear different markings which indicate their contents:

Gun barrel	Yellow flag
Ammunition	Red circle
Wheels and trail	Blue circle
Carriage	Black circle

The ammunition is packed in specially lined metal boxes containing either 4 or 8 rounds. The prisoners were uncertain as to the actual number, and were not able to say how many boxes were dropped in each sack.

9. JAPANESE FLAME-THROWER*

A Japanese portable flame-thrower, captured by American forces in Bataan, is described below. The weapon is of excellent design and construction, although considerably heavier than the corresponding A nerican type. The valve of the gun is awkward to operate. The mechanism for positive ignition is a distinct advantage. A desirable feature is that the flame-thrower operator can operate the valve of the pressure cylinder, but the Japanese method of doing this by means of a flexible shaft is considered undesirable as the shaft is heavy and easily kinked.

a. Pressure Tank

The pressure tank (capacity, 350 cubic inches) is 6 inches in diameter and has an over-all length (with valve) of 16 inches (see accompanying sketch). It has welded joints and is of light construction. To work properly it should have an initial pressure of 300 to 400 pounds per square inch. It is fitted with small couplings to secure it to the two fuel tanks. In the aperture at the top is fitted a handwheel-operated needle valve. Copper tubing connects the pressure tank to the left-hand fuel tank. The pressure tank is filled with compressed nitrogen.

b. Fuel Tanks

The two fuel tanks are of the same diameter as the pressure tank, but being taller have 25 percent greater capacity. The tanks are connected by two welded tubes, one near the top and the other near the bottom. These act as pressure and fuel channels and as joints. As mentioned above, the left-hand tank is joined to the pressure tank by copper tubing. This tubing is connected to a needle valve of which the operating handwheel is on a flexible shaft 1 foot long and coming over the shoulder of the operator. The right-hand tank is fitted on top with a 1-inch filling cap. About two-thirds of the way down its right side is the hose connection. An interior tube insures emptying the tanks. The lower connecting tube or channel allows the fuel in the left tank to empty out. The upper channel insures an equal pressure on both tanks regardless of the position of the tanks or the amount of fuel remaining in each.

c. Connecting Rubber Hose

The hose which connects the nozzle to the fuel tanks is made of 1 1/2-inch reinforced fabricated rubber tubing. It is 45 inches long and has brass fittings on both ends.

d. Fuel Nozzle and Ignition Mechanism

The fuel nozzle and ignition mechanism has an over-all length of 47 inches.

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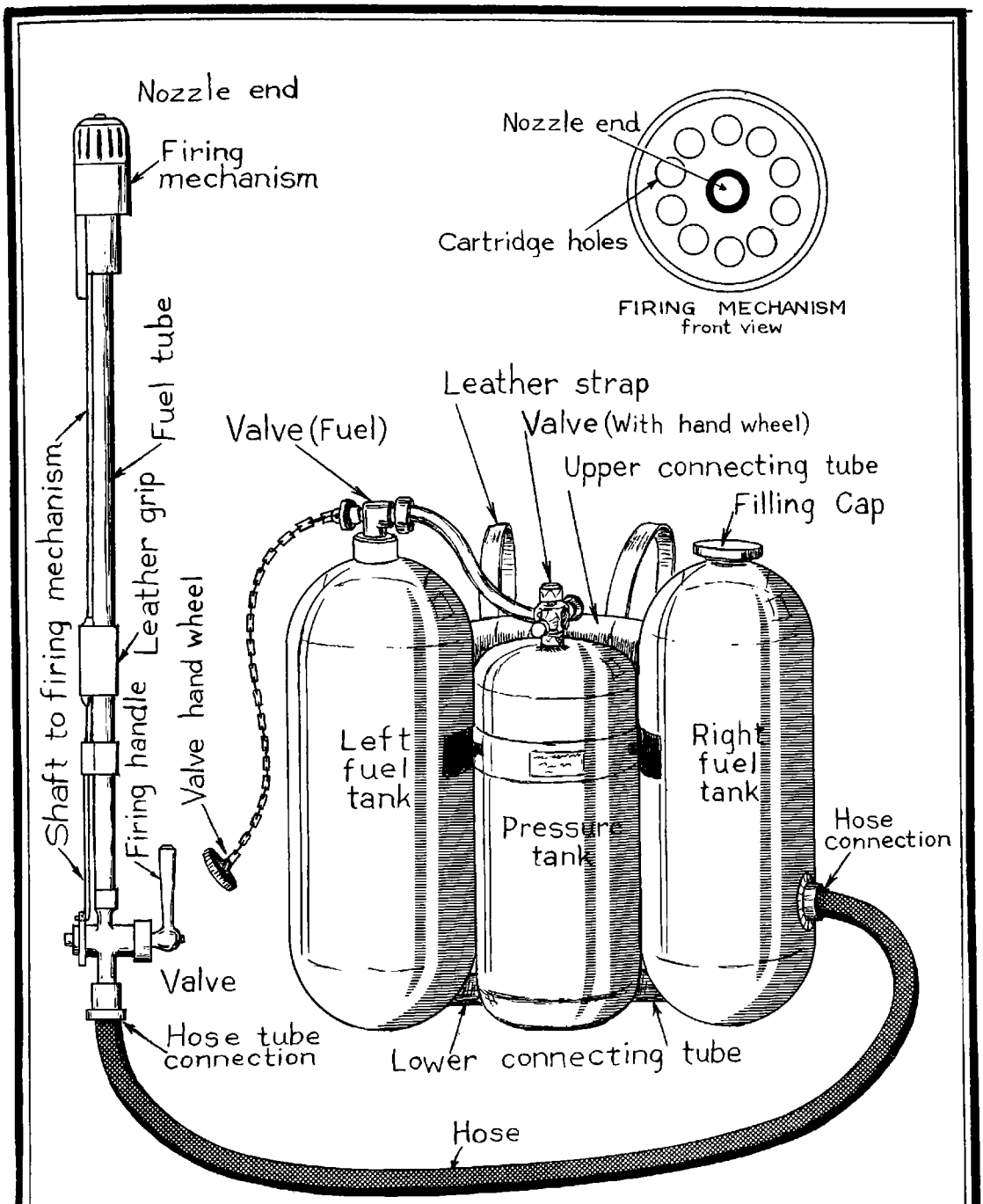
*Prepared in the office of the Chief of Chemical Warfare Service.



JAPANESE FLAME THROWER

At the hose end, the tube is 1 inch in diameter and tapers down at the nozzle end (where it passes through the ignition mechanism) to one-quarter of an inch. The ignition mechanism depends on the firing of a .43-caliber blank cartridge into the stream of fuel. The nozzle, fitted in a 2 1/2-inch by 5-inch cylinder, contains the firing mechanism. Within the perimeter of the cylinder are ten .43-caliber holes to hold the blank cartridges. The cylinder revolves on a cam operated on each stroke of the firing handle. The firing handle is on the handle end of the nozzle, and is connected to the firing mechanism by a metal shaft. When the firing handle is turned, it performs a two-fold function. It fires the blank cartridge under the firing pin, and at the same time closes off the fuel by shutting off the valve in the handle. This prevents the flame from reaching the tanks in case of a flare-back.

e. Operation

The leather straps which enable the apparatus to be strapped on the operator are fixed to the two connecting tubes of the fuel tanks. The tanks are filled with coal tar, thinned down with hydro-carbons, and then a filled pressure tank is attached. The operator opens the pressure-tank valve, thus putting pressure on the fuel-tank valve. The apparatus is strapped on with the fuel-tank valve handwheel and shaft carried over the left shoulder, and the hose and nozzle under the right arm. The operator releases the fuel by turning the handwheel of the fuel valve. The stream of fuel is played on the target, and then the firing handle is turned, firing one cartridge which ignites the fuel. It is estimated that the flame-thrower has a range of about 30 yards. It is capable of firing a continuous jet of fuel for 10 to 12 seconds.

ENGINEERS

10. MINEFIELDS IN NORTH AFRICA

The report which follows is the result of British experiences in one of the campaigns in Cyrenaica, as indicated in a British document. Minefields played an imporant part in this fighting.

a. In Consolidation

Until such time as antitank mines can be brought forward in bulk by night, the early consolidation of a newly captured position can be very greatly strengthened by the laying of a limited number of mines in order to restrict the probable avenues of enemy approach. An armored vehicle in engineer units is desirable for this purpose, though its design offers considerable difficulty, since it must resemble other armored vehicles in the vicinity and still have an adequate carrying capacity (two diametrically opposed characteristics).

b. Records

The campaign in question proved once again the paramount importance of minefield records, and it is clear that this problem received insufficient attention. Casualties were reported as resulting from the absence of records on the location of British antipersonnel mines, and the records kept of the numerous antitank minefields were often far from complete.

c. Marking of British Minefields

It should be noted that the majority of British casualties caused by British antitank and antipersonnel mines were due to carelessness with respect to the marking of the fields and notification of their presence. For this problem, no solution has been found either by the British or by the enemy, whose minefields are often marked by the wrecks of their own vehicles, and the vicinity by the graves of their own men. One difficulty was that there was no standard system of marking the minefields. One of a number of systems suggested was that in rear areas they should be marked with tin triangles painted black and hung on barbed wire, supported on either long or short stakes; it is essential that the stakes be placed firmly in the ground. In forward areas, a 2-inch white tape has been suggested, over-printed every yard with a black triangle and supported on short stakes; the tape would be issued with the mines from the advanced railhead,or packed in each box of mines at the base. The quantities of supplies involved would be considerable.

The decision as to whether minefields should be marked rests with the commander, who should realize that what denotes a minefield to friendly troops may also disclose its presence to the enemy.

d. Clearance of Enemy Minefields

In attacks on fortified enemy positions, mine detectors were used with success, through some difficulty was experienced in their operation in the noise of battle. In addition, they cannot, of course, be used under actual shell fire or aimed small-arms fire. There would appear to be a call for a type of detector with a visual indicator which can be operated from within a tank.

The best method of clearing minefields is still neutralization by hand under cover of darkness. Where mines have to be dealt with during daylight, the operation must be covered by smoke. On the enemy side of the main obstacle, when all surprise had been lost, a gelignite cordtex net was used for clearing lanes for the tank advance.

In one area, as a deliberate operation, 70,000 antitank and antipersonnel mines were cleared, and 100 miles of warning fence were erected; all this was done by 3 field companies in 25 days. Eighty percent of the mines cleared were laid by the enemy, and all had been subjected to shell fire and blast over a long period. Casualties during the 25 days were 16 killed and 13 wounded. This was

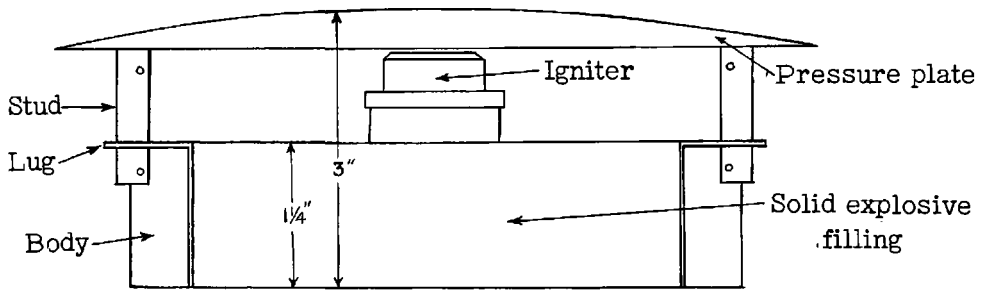
considered a very fine piece of work under the circumstances.

11. ITALIAN VARIABLE-PRESSURE MINE

a. General

The accompanying sketches show details of the Italian circular variable-pressure mine. This can be used as an antitank or antipersonnel mine. The following information has been obtained from an examination of a captured specimen.

The body of the mine consists of a circular steel container, 8 inches in diameter and 1 1/4 inches deep. The explosive filling, weighing 3 1/2 pounds, is similar in appearance to impure TNT and is wrapped in black waxed paper.

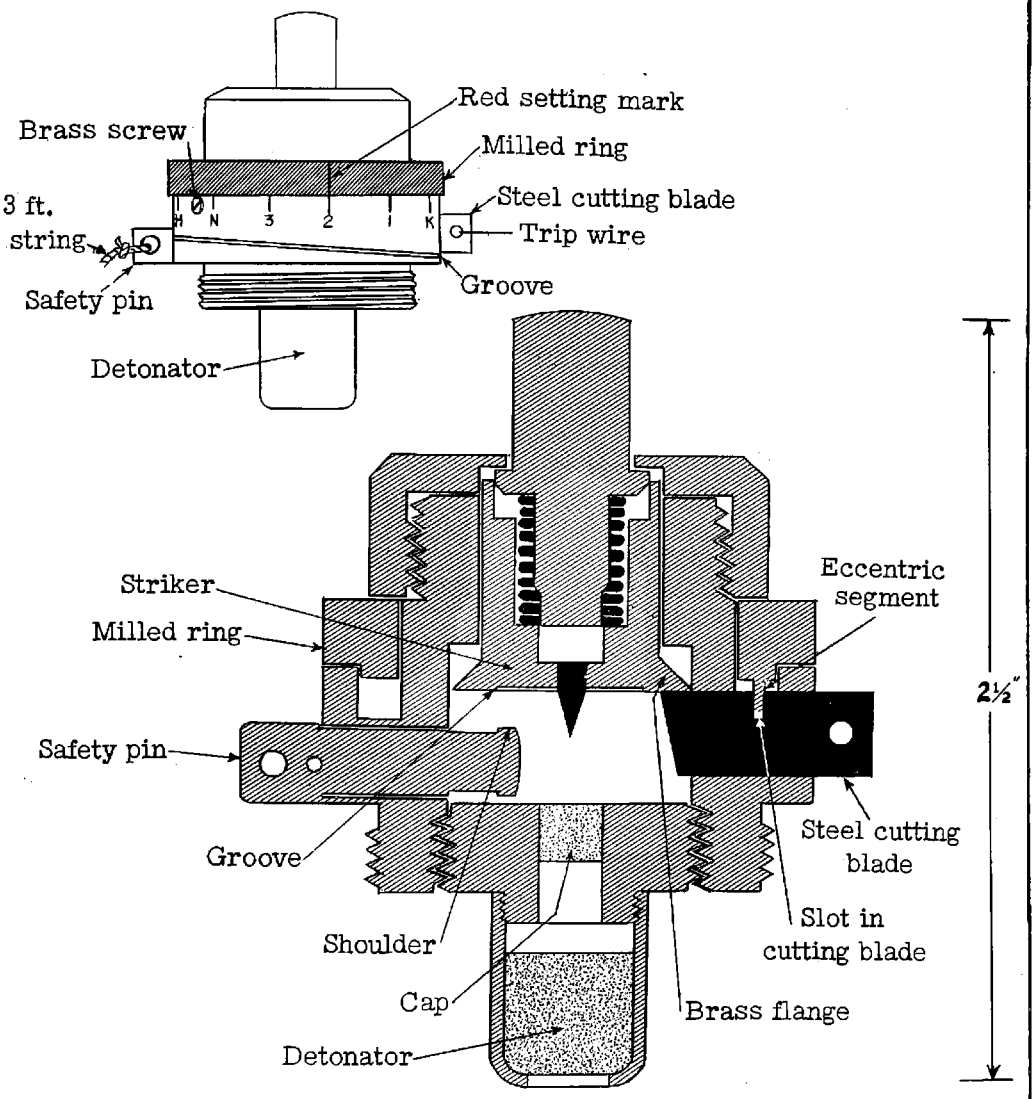


Into the top of the body screws the brass igniter, incorporating a spring-loaded striker which is retained by the hardened-steel cutting blade. A brass cylindrical safety pin, with 3 feet of cord or string attached to its outer end, is prevented from falling out, or being accidentally withdrawn, by a piece of twine passing through a hole in the safety pin and secured in a groove around the body of the igniter.

A steel pressure plate, 10 inches in diameter and slightly dome-shaped, rests on the top of the igniter and has three studs equally spaced on its circumference. These fit into the holes in three lugs welded to the outer edge of the mine body, and are secured by cotter pins passing through the lower of two holes, 1 inch apart, in each stud. The mine is painted black, and its total weight is 8 pounds. The over-all depth of the armed mine is 3 inches.

b. Functioning of Igniter

Pressure on the head of the igniter causes the steel cutting blade to cut through the brass flange on the base of the striker, which then moves under the influence of its compression spring to fire the cap situated above the



IGNITER — ITALIAN VARIABLE PRESSURE MINE

detonater. Since the flange takes the form of a truncated cone, the pressure required to operate the igniter may be varied by varying the depth of cut. This is effected by means of an eccentric segment on the underside of a milled ring. The segment projects into a slot in the cutting blade, and when the milled ring is rotated the cutting blade is inserted or withdrawn. A red setting mark on the outer edge of the milled ring indicates the setting of the igniter on the scale on the igniter body. This scale has the following significance:

K represents a firing pressure of 35 kilograms (77 lbs) (lowest setting)
1 represents a firing pressure of 100 kilograms (220 lbs)
2 represents a firing pressure of 200 kilograms (440 lbs)
3 represents a firing pressure of 300 kilograms (660 lbs)
N represents a firing pressure of 350 kilograms (770 lbs) (highest setting)

The rotation of the milled ring is limited in one direction by a stop, and in the other by a brass screw.

If the brass screw is removed and the setting mark set at "H," the eccentric segment is withdrawn from the slot in the cutting blade and, by attaching a wire through the hole in the cutting blade, the igniter can be made to function as a trip mechanism.

If the striker should be released prematurely while setting the igniter, a shoulder on the safety pin engaging in a groove in the base of the striker prevents the withdrawal of the safety pin.

c. To Disarm the Mine

(1) Look for a trip wire and if one exists cut it without exerting any pull on the cutting blade;
(2) Remove the pressure plate;
(3) Insert a pin of between 1/8 inch and 3/16 inch in the safety pin recess to a depth of not less than 5/8 inch;
(4) If the igniter has been set as a trip igniter, press home the cutting blade;
(5) Unscrew and remove the igniter from the mine;
(6) If the mine is required for further use repack it as described below.

d. To Arm the Mine

(1) To Arm as a Pressure Mine

(a) Remove the pressure plate.

(b) Set the igniter to the desired firing pressure by turning the milled ring until the red setting mark is opposite the required

graduation. Then screw the igniter into the mine and stretch out along the ground the safety pin withdrawal cord.

(c) Replace the pressure plate and insert cotter pins or wire through the bottom holes in the studs.

(d) After emplacing the mine, withdraw the safety pin.

(2) To Arm as a Trip Mine

(a) As above.

(b) Remove the brass screw and turn the milled ring until the red setting mark is opposite the graduation "H." Screw the igniter into the mine and stretch the safety pin withdrawal cord along the ground. Attach a trip wire through the hole in the cutting blade.

(c) As above.

(d) As above.

e. Method of Packing

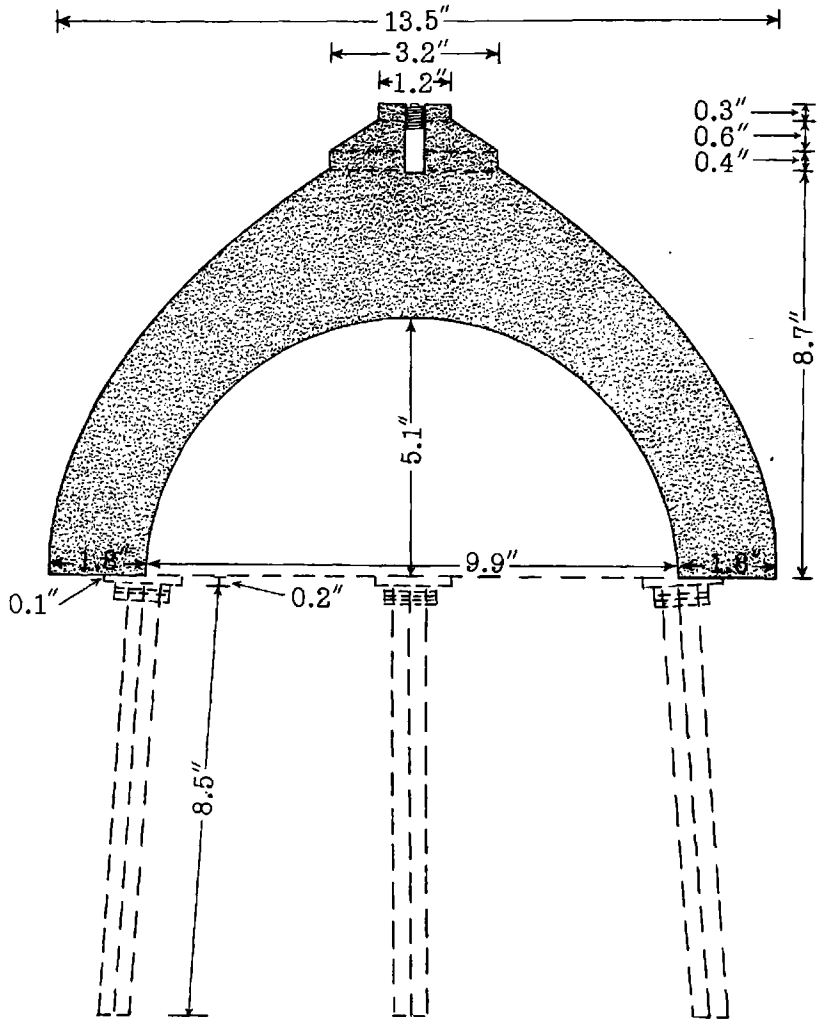
(1) As issued by the manufacturers, the igniter is replaced by a wooden plug which is screwed into the mine body. The pressure plate is then fitted on top, resting on the wooden plug and held in place by cotter pins or wire passed through the upper holes in the studs of the pressure plate. The igniters are carried separately in a steel container, 8 inches in diameter and 2 1/2 inches deep, partitioned radially to carry six igniters. Each container also holds three igniter tools.

(2) Slits in the pressure plate of the mine and slots on the side of the igniter container, which correspond exactly, lead to the belief that six mines and one igniter container are packed one on top of the other, with a strap or steel band passing through the slits and slots clamping all seven together.

Remarks: Mines so far encountered have been laid with their pressure plates flush with the ground. It is believed that in theory the mine should be buried to a depth of from 2 to 4 inches.

12. GERMAN HOLLOW DEMOLITION CHARGE

Specimens of a new type of demolition charge (see accompanying sketch) have been captured in the Middle East. It is designed to perforate steel cupolas in fortifications. While generally similar to the "bell" demolition charge described in Tactical and Technical Trends, No. 3, p. 22, an important difference is that this charge has three folding legs; these are provided to support the charge at a certain distance from the armor to be perforated. The weight of the charge is approximately 30 pounds.



German Hollow Demolition Charge.

It does not appear that these charges are normally carried by divisional engineers; they are probably held in reserve and issued for special tasks.

13. GERMAN TACTICS--RUSSIAN FRONT

The following report deals with the experiences of the German Army on the Eastern Front. The extracts are taken from two documents issued by The German War Office, one dated March 1, 1942, and the other August 1, 1942.

* * *

a. Attack

The special nature of the Russian Front, with its great area and few roads, has led to a tendency when on the march to cling too much to existing roads. The Russians have based their defensive system on these roads. The best attack is that made off the roads, using enveloping forces which must be made as strong as possible. Where possible, artillery should be allocated to these enveloping forces, but in most cases they will have to depend for their fire power on the heavy weapons of the infantry, especially the heavy mortars. Even weak enveloping forces may achieve decisive results by surprise attack, coordinated with the main frontal attack.

The fighting in the Kerch Peninsula has once more shown that deep slit trenches, and well-built earthworks, often render impossible the destruction of the enemy by artillery, infantry support weapons, and by bombing; these, as a rule, serve only to make the enemy keep his head down. Infantry in the attack must, therefore, approach as closely as possible behind the artillery barrage, and attack with all possible speed as soon as it is lifted.

The Russians have shown themselves very susceptible to a section or platoon assault in close formation, carried out with shouts and firing on the move.

Night attacks have been found to be of special importance on the Eastern Front, since it is the Russian practice to carry out moves at night, and these attacks prevent the enemy from carrying out his plan.

b. Coordination of the Various Arms

On the Russian Front our success in the coordination of the various arms has been due to the careful organization of the fire plan of all weapons down to those of even the smallest units. The infantry must learn not to rely exclusively on artillery fire, or the support of tanks or assault guns, but must use its own heavy weapons to the fullest extent.

The main task of the artillery is counterbattery missions, and all available forces will be concentrated against the enemy's artillery "schwerpunkt" (area in which enemy artillery is concentrated) without regard to corps or divisional boundaries.

Assault guns must never be used without the protection given by accompanying troops. They require infantry protection since, as they have no revolving turret and little protective armor, they are incapable of close defense.

c. Defense

Russian reconnaissance is pushed without regard to losses. Limited attacks for purposes of reconnaissance, are, as a rule, carried out mostly by a company, but may be made by a battalion. When the weak spots are thus found, the enemy maneuvers his main forces, which are usually masses of infantry supported by tanks. The attack is preceded by intensified mortar fire, and shelling by tanks at extreme ranges. If the leading tanks are shot up and the first attack beaten off, a pause of several hours often precedes the second attack.

The rule for defense in open country, when ammunition is plentiful, is to open fire at great ranges; when the country is not open and ammunition is scarce, it is more effective to let the enemy approach, and then strike him with sudden concentrated fire at long range.

Defense on a wide front is the rule on the Eastern Front, where only the most important points can be occupied. These are to be built up as strongpoints, and occupied with one or more platoons, with heavy weapons (heavy mortars, heavy machine guns, and antitank guns). All-around defense must be organized. When the strongpoints are far apart, greater patrol activities between them will be necessary.

d. Antitank Defense

Russian tanks seldom attack in large numbers. As a rule a few, sometimes even single, tanks precede the attacking infantry, which then follows in compact groups. In defense, therefore, the most important task of all arms is to separate the infantry from the tanks. The aim of infantry training in antitank defense must be to teach the young soldier that the effect of tanks against dug-in riflemen is extraordinarily limited. Fighting against tanks is, for the infantrymen, merely a matter of nerves.

The plan for antitank defense should ensure that 50-mm antitank guns are brought into position in good time, because of their lack of mobility; 37-mm antitank guns may be held on carts under cover, or near prepared positions, since these guns are more mobile.

e. March Discipline

The few and very bad roads in the east have necessarily had heavy

traffic, and a column moving on the roads is liable to become very extended. Therefore, troops following up require more time than usual, and it is necessary to put well to the front of the column considerable detachments of artillery and heavy weapons, and communications and engineer personnel. Similarly, to ensure the supply of a column, carefully calculated loads of ammunition, fuel, and lubricants must be included at intervals along the road.

f. Night Fighting

In night attacks all units must be given definite and limited objectives. Detailed and careful planning is the basis of success, and considerable previous reconnaissance is required. The results of this reconnaissance form the basis of the commander's plan, which must be known down to its smallest details by every junior commander.

A useful means of keeping direction at night is the preliminary setting of fire to haystacks or houses in enemy territory.

g. Mobile Troops

Fighting over wide, open areas and along roads has often made necessary the formation of mixed battle groups in which tanks have been included. As a consequence, the number of tanks decreased rapidly and the units from which they were detached lacked the necessary strength to carry out independent attacks. An armored division equipped with a tank regiment of three battalions and motorized infantry is capable of extensive tasks, provided its tanks are kept concentrated, and the motorized infantry is directed to cooperate closely.

In defense the most successful method of stopping a breakthrough of enemy mobile troops or tanks is the formation of mobile groups reinforced with antitank and close-support weapons; they should be disposed in depth throughout the sector, particularly in localities vulnerable to tanks. These counterattack groups are to be held ready to attack the flank or rear of any enemy force which may break through and to cut off the enemy rearward communications.

h. Miscellaneous

For all infantry weapons, in particular the machine gun, mortar, and antitank gun, a wide field of fire is not so important as emplacement to produce a heavy uninterrupted belt of fire to the immediate front.

On the Eastern Front, unnecessary losses have been caused by unmilitary behavior, both at headquarters and in units, in zones covered by enemy fire. Considerable casualties, which could have been avoided, have been caused by the disinclination of the German soldier to dig in quickly in the course of the battle, his carelessness behind the immediate front, and by inadequate battle reconnaissance of invisible areas.

14. BRITISH NOTES ON A CAMPAIGN IN CYRENAICA

The Middle East Theater has peculiar topographical and climatic conditions, and the conduct of military operations depends to a considerable extent on these important factors. Care must be observed in drawing general conclusions based on the tactics employed in one area, since the measures invoked may have local application only. The particular campaign treated here was in Cyrenaica as reported in a British document.

a. Consolidation of Position

Security against counterattack by enemy tanks will depend on the speed with which objectives can be consolidated. Consolidation is an operation in which all arms are concerned, and the proficiency required can be attained only by constant practice with a definite method to insure that it is carried out instinctively and without waste motion. There is no reason why a battle drill for consolidation should interfere in any way with selection of the best ground from a tactical point of view.

b. Deception

The study of this subject has, in the past, been neglected. Experience has shown that:

(1) Efficient deception measures may produce results out of all proportion to the effort in personnel and materiel expended on them.

(2) Staff officers must have a full knowledge of the potentialities of deception, and it must be considered in all operational planning.

(3) It cannot be effected on short notice; considerable preliminary organization and development are necessary.

(4) Large-scale deception normally involves a heavy call on administrative resources and equipment. Once it has been agreed that it is justified, full priority must be given to the scheme. Half measures are ineffective.

c. Penetration and Countermeasures

In certain operations there were occasions when strong forces, both enemy and British, penetrated to the extent of seriously threatening communications. When operating on wide fronts with dispersed forces this threat will always exist, and preparations must be made accordingly. Armored car patrols should be detailed to maintain contact both by day and night with any enemy columns which penetrate, and strong mobile reserves suitably located should be held for the protection of vital points.

15. SCOUTS AND OBSERVERS

The following report on scouts and observers is based on a lecture given by a British officer at the Commando school.

* * *

The object of scouting should be to obtain accurate and reliable information in all types of warfare, whether stationary or mobile, in all types of country, with or without the aid of maps, binoculars, and other such instruments, for the information of the commander which cannot be obtained in the normal way by other troops.

Scouts are specialists, and must reach a considerably higher standard of training in their specialty than do other troops. In addition, they must have a knowledge of the functions and organization of other arms, and must keep up with recent developments. Scouts must be keen, resourceful, and trustworthy, and must cultivate reasoning powers. Surprise and mobility are the greatest assets of scouts. It is the duty of every scout to learn all he can about his job and about the function of other arms, by constantly being observant and taking an intelligent interest in all he knows or sees around him.

The importance of gaining superior observation over the enemy cannot be overestimated. "No Man's Land," whether it be a hundred yards or a hundred miles broad, must be kept under continous observation, and regarded as a network through which no piece of information, however small, must be allowed to escape. For this reason, duties of scouts are the same although methods may be different.

A trained scout or observer, having acquired a knowledge of infantry soldiering, should be an expert in: observation and use of binoculars, map reading, writing of reports, use of compass, patrolling, concealment and use of cover, selection and construction of observation posts, use and care of weapons, and identification of the various arms. In addition, it is desirable that he should have a knowledge of field sketching, drawing plans, the study of air photography, and first-aid. He should also be able to ride a horse and a motorcycle, swim, cook, and sail a boat. A high standard of physical fitness is also required.

The various roles in which scouts are invaluable are:

(1) Patrols, observation in small detachments, sniping, and verbal reporting;

(2) Fieldcraft--if necessary to the extent of being able to pass through enemy lines;

(3) All scout personnel must attain a high degree of skill in movement by night over difficult country by use of stars and compass, and must be trained to carry out certain tasks under cover of darkness, and in silence;

(4) Construction of field defenses, and erection of obstacles;

(5) Demolition and sabotage.

For the above, scouts must not only be physically fit, but must have 100 percent self-confidence. There are more occasions in the role of a scout where a cool head, a clear eye, and a quick imagination win through, than in any other branch of military warfare.

MEDICAL

16. SCHISTOSOMIASIS*

In some localities throughout the world (see map at end of book), bodies of fresh water such as lakes, rivers, streams, swamps, ponds, irrigation ditches, and flooded rice fields may harbor the larvae or cercariae (young forms) of various blood-worms or flukes. Human infestation with these flukes is known by the terms schistosomiasis or bilharziasis. The only type found in the Western Hemisphere (Caribbean Islands and South America) is the variety which produces intestinal lesions and dysentery and is known as intestinal bilharziasis. In certain regions of Africa these flukes produce a condition known as urinary bilharziasis, though the intestinal form also is present. Heavy areas of infection are found in Egypt and in some of the oases of the North African desert. In parts of the Far East, notably Japan and China, an intestinal variety is known as oriental bilharziasis. The geographical distribution of these diseases is shown on the map referred to above.

The cercariae or young forms of these flukes are harbored by certain species of fresh-water snails. When the parasites leave the snail host and are discharged into the water, the survival time of the cercariae is less than 48 hours unless another suitable victim is found. These cercariae may enter the body through the unbroken skin of swimmers, bathers, or persons wading in such waters, or through contaminated drinking water that has not been boiled or sufficiently treated with chlorine. If water for bathing is stored in a clean container and is free of snails, it will become entirely safe for use in 48 to 72 hours. This will not insure water satisfactory for drinking purposes.

One should be extremely cautious in wading, bathing, or swimming in fresh-water ponds, streams, lakes, or rivers which have not been examined and found to be safe by Army medical officers or others competent to judge. Salt-water bathing and swimming, except at beaches near the mouths of fresh-water streams or near city sewage outlets are safe and do not constitute health hazards.

*Prepared in the Office of the Surgeon General.

ORDNANCE

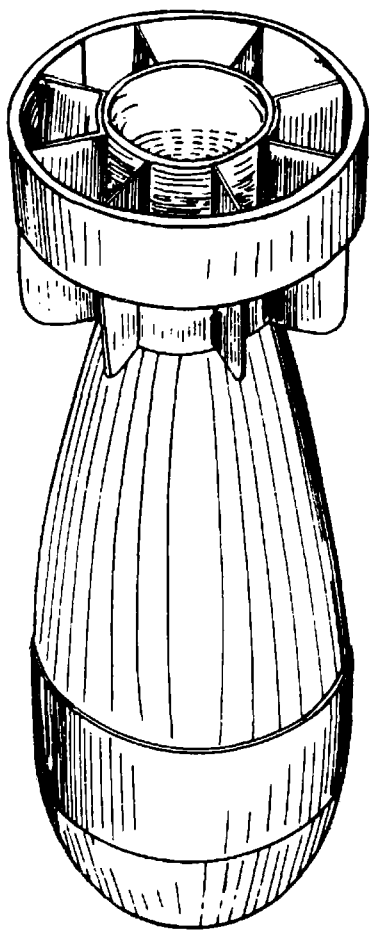
17. GERMAN ANTICONCRETE SHELL

While the fighting on the Russian Front has tended to consist chiefly of the fluid operations of open warfare, permanent and semipermanent fortifications have also played an important role. Faced with the necessity of reducing fixed defenses, the Germans are reported to have begun, comparatively recently, to produce a special design of shell to destroy concrete. So far as is known at present, reliance is placed on the unusual design of the nose of the shell and upon the build-up of the detonation. This shell, which carries the abbreviated nomen-

clature "Be," is reported to exist in 150-mm and 210-mm calibers. It is probable that there are other types for use with artillery weapons which would normally be expected to destroy fortifications.

18. NEW GERMAN ANTIPERSONNEL BOMB

A new type of antipersonnel bomb, weighing from 2 to 3 pounds when filled and complete with fuze, is reported to have been recovered in the Mediterranean area and is shown in the accompanying sketch. It is presumably German, since the bomb casing is very similar to the 50-mm mortar bomb.



The following details are available:

Length of body	4 1/4 in
Maximum diameter of body	2 in
Diameter of body at nose	1 3/8 in
Diameter of body at tail	1 in
Over-all length with fuze	6 3/4 in
Length of tail	1 1/4 in
Diameter of tail	2 in
Number of fins in tail	8
Nature of filling	TNT
Bomb and tail painted	yellow

The fuze is a one-piece aluminium fuze screwing into the nose and appears to be of the mechanical impact type.

19. AMMUNITION FOR GERMAN 100-MM CHEMICAL MORTAR

A recent report describes this as a single-barreled chemical or smoke mortar (Nebelwerfer), which in essential details is similar to the 81-mm mortar, though larger. The actual caliber of the weapon is 105 mm. An HE shell and two types of smoke shells are known to exist.

a. HE Bomb 10-cm Wurfgranate 37

This shell is conventional in appearance and design. Fitted with a nose percussion fuze, its internal arrangements are similar to those of the usual HE shell. Immediately below the fuze is a booster, which is contained in a steel holder screwed into the nose of the shell. A small smoke box is situated below the booster. The shell is gray-green in color.

The following are the main dimensions:

Weight of shell	16 lbs
Weight of bursting charge	3.75 lbs (TNT)
Length of shell	17 in (approx)
Diameter, across body	4 in (approx)
Diameter, across tail fins	4 in (approx)

b. Smoke Bombs 10-cm Wurfgranate 35

The existence of two types has been established from the examination of German documents. The internal arrangements appear to be similar to those for the standard types of German smoke shell.

Both types of shells are fitted with a nose fuze and both have a central tube containing a bursting charge of picric acid. It can be assumed that there will be a booster fitted underneath the fuze. One of the shells is reddish-brown in color and has "Nb" stencilled on the body, while the other is gray-green in color and has "Nb St" stencilled on the body.

c. Propelling Charges

The propelling charges consist of a primary charge and four auxiliary charges. The primary charge, which consists of 17 grams of ungraphited black powder, is contained in a blue-colored cartridge with a black primer color. Each auxiliary charge weighs 21 grams and is contained in a silk bag. These charges consist of a double-base propellant containing nitro-glycerine and having the following dimensions:

External diameter - 3.5 in (approx)
Internal diameter - 1.75 in (approx)
Thickness - 0.4 mm

The following system is used by the Germans to denote charges:

Charge 1 (Erste Ladung) - primary charge;

Charge 2 (Zweite Ladung) - primary charge plus 1 auxiliary;
Charge 3 (Dritte Ladung) - primary charge plus 2 auxiliaries;
Charge 4 (Vierte Ladung) - primary charge plus 3 auxiliaries;
Charge 5 (Fünfte Ladung) - primary charge plus 4 auxiliaries.

The shells are issued one to a container, and the total weight of shell and container is 20.75 pounds.

20. GERMAN ROCKET WEAPONS

There has been considerable speculation on German rocket weapons. While there is no doubt as to the existence of such weapons (it is thought that they have been used on the Russian Front), not a great deal is known as to how they are used or how effective they may be. The Germans have tried to surround this type of weapon with the maximum of secrecy and horror. However, according to the reported opinion of a senior Russian officer who had encountered them, the Russians apparently feel that they are not an effective weapon.

German rocket weapons have already been discussed in Tactical and Technical Trends. For purposes of convenience, brief mention is made below of all German rocket weapons so far reported.

There are two main types of rocket weapon, one of which is fired from a frame (see this publication No. 8, p. 28) and the other from a six-barrelled rocket projector (see this publication No. 10, p. 23 and No. 17, p. 38). The frame type reportedly exists in three models: a wooden frame, a steel frame, and a frame carried on the side of an armored personnel carrier. All are used to fire the same rocket projectile. There are also three models of the six-barrelled projector: 150-mm, 210-mm, and 280-mm. The 280-mm projector fires the same projectiles as those fired from the frames; it is reportedly six-barrelled, but this has not been confirmed.

The German nomenclature of these weapons is as follows:

Frame Type

Schweres Wurfgerät 40 (wooden)
Schweres Wurfgerät 41 (steel)
Schwerer Wurfrahmen 40 (on armored personnel carrier)

Projector Type

15-cm Nebelwerfer 41 (six barrels)
21-cm Nebelwerfer 42 (six barrels)
28/32-cm Nebelwerfer 41 (believed to be six barrels)

21. AXIS HOLLOW-CHARGE AMMUNITION

As previously reported in Tactical and Technical Trends (No. 4, p. 21) the Axis armies are using hollow-charge ammunition. This is armor-piercing ammunition with an explosive charge or filling and is designed to pierce armor at relatively low muzzle velocities. The Germans consider that it achieves reasonably good armor penetration with little loss of antipersonnel fragmentation.

The Germans are known to have at least 3 types of hollow-charge ammunition, all caliber 75-mm and designated as follows:

7.5-cm Pz. Gr. Patr. 38 KwK,
7.5-cm Gr. 38,
7.5-cm Jgr. 38.

The first type is used in both the short- and long-barrelled 75-mm tank guns; presumably this ammunition could be used in the new 75-mm antitank gun (7.5-cm Pak 40) discussed in this issue in article number 4. The second type is designed for the 75-mm light field gun 18, and the third type for the 75-mm infantry gun.

The Italians also are reported as having developed hollow-charge ammunition. They are known to have three types, 75/18, 75/27, and 100/17. The 75/18 is designed for the Italian 75/18 (caliber 75-mm, length of bore 18 calibers) gun - howitzer, the 75/ 27 for the standard 75-mm light field piece, and the 100/17 for the 100-mm mountain howitzer.

The 75/18 weapon exists in two models: model 34 and 35. Model 34 is a mountain gun; model 35, which has a more heavily constructed carriage, is used as a field piece and a self-propelled armored mount (see Tactical and Technical Trends, No. 6, p. 35).

22. DESTRUCTION OR SALVAGE OF ENEMY MUNITIONS

British experience in North Africa has shown that, before an advance is made, a plan must be drawn up for the salvage or destruction of enemy munitions. If destruction is decided upon, action should be completed as soon as possible after capture.

Engineer salvage units should be in possession of the following information before an advance is started:

(1) Types and calibers of munitions to be salvaged;
(2) Munitions to be destroyed;
(3) Munitions required for examination.

In spite of the absence of a complete plan in one of the North African

campaigns, it is learned that 4,000 tons of bombs were destroyed by engineering units during the course of a withdrawal. On one occasion 300 tons of high-explosive bombs, of which 50 percent were 110 pounders, 40 percent 550 pounders, and 10 percent 1,100 pounders, were collected in 1 day into 2 groups, each of 4 dumps, from various parts of an airdrome 1,000 yards in diameter, by 70 men using 8 trucks with tow-ropes. The demolition charges were laid in 3 1/2 hours, and firing took three-quarters of an hour.

23. DESTRUCTION OF ABANDONED VEHICLES

When motor vehicles must be abandoned, it is essential that they be rendered useless to the enemy. To this end the Germans recommend that the following steps (among others) be taken.

When the time is limited and the vehicle must be rendered useless quickly, the carburetor, distributor, and fuel pump should be destroyed. Hand grenades are effective for this purpose, especially when placed between the carburetor or distributor and the cylinder block. According to the Germans, a grenade placed in this position will crack the cylinder block. When there is sufficient time for more deliberate action, the distributor, generator, starter, and tires should be destroyed. Gasoline should then be poured over the vehicle and ignited. In the case of tracked vehicles, 3-kilogram (6.6-pound) charges should be placed between the driving sprocket and the front bogie wheel on each side of the vehicle, and exploded.

24. GERMAN SALVAGE OF CAPTURED MATERIAL

The importance of captured material in the German supply system is emphasized by Field Marshal Rommel in an army order issued to his troops. The order states that the shortage of raw materials and supplies in Africa makes it necessary to take every opportunity of seizing enemy equipment and supplies. Units may take with them only such amounts of captured material as will not impair their operational readiness; all other booty is dealt with by a special Salvage Section (Beuteberge-Abteilung) of Panzer Army Headquarters.

A guard is to be left over all dumps and stocks and Headquarters is to be informed of their location. The Salvage Section will make arrangements for the security and removal of all dumps and will provide technical personnel and transport. It is to be in direct communication with the forward troops, and will include a salvage platoon from Air Headquarters. Captured supplies are to be marked in light blue paint with the words "Tedesco," Italian for "German" and Erfasste Beute (captured booty). Strong disciplinary action is taken in the event of any misuse or destruction of salvage.

QUARTERMASTER

25. GERMAN RATIONS IN LIBYA

The following German food and water situation in Libya has been reported as a result of PW interrogations. The information showed that until July 1, 1942, no food or water difficulties had been experienced in the unit concerned, and after the fall of Tobruk canned fruit and vegetables had been added to the normal rations.

The battalion rations officer was responsible for the collection of rations (requisitioned every 3 days by companies) from the supply dumps, and for the delivery to companies. For distribution to companies there were four 3-ton trucks, never loaded to more than half capacity. Thus for 3 days' supplies, a 6-ton truck capacity per battalion was necessary. Bread was collected separately from the field bakery. Apart from the regular 3 days' supply, companies carried 6 days' and each man 1 days' iron rations. Rations included one hot meal each day, always prepared in the field kitchen, which is brought as far forward as possible.

Rations per man per day actually issued were:

Coffee	Bread	Water *
1/2 oz real coffee	1/2 lb at rest	About 5 pints at rest
1/4 oz substitute	1/3 lb in battle	About 3 pints in battle

*Drinking and cooking water, including water for tea and coffee .

SIGNAL CORPS

26. ITALIAN PARACHUTE SIGNAL FLARE

A specimen of an Italian parachute signal flare has been captured by the British in North Africa.

a. Description

The flare is contained in a cardboard tube (1) (see accompanying sketch) 0.19 inch thick, which, in the specimen examined, was colored bright red. The tube is provided with a corrugated cardboard grip (2), 3.9 inches long. Below this grip the tube is pinched in to fit into the groove in the wooden plug (3), and is secured by a wire (4). The open ends of the tube are sealed by paper, gummed over the ends at (5) and (6). The plug (3) has a central hole which contains a friction igniter (7), consisting of a match composition pellet attached to the end of a short length of cord and secured by a tack (8). The

free end of this cord string (9) is protected by the seal (5). A part of the cord (10) near the igniter pellet (7) is impregnated with phosphorus. At (11) is a short length of safety fuse which forms a 2-second delay and leads to the powder charge (12). Above this is the candle (13) and its parachute (14), which are secured in place by a felt washer (15) and a length of waste packing (16).

b. Method of Functioning

When the seal (5) is broken, and the free end of the string (9) pulled, the part of the cord at (10) is drawn through the hole in the plug (3), where friction between it and the pellet (7) ignites the latter, which fires the safety fuse (11). After 2 seconds delay, this ignites the powder charge (12) which expels the candle (13) and parachute (14).

c. Handling

If the ends of the tube are sealed, the flare has not functioned and is safe to handle. If the lower seal is broken, the cord should be secured within the end of the tube so that it cannot be pulled accidentally. The flare should be destroyed by burning.

GLOSSARY

27. BRITISH TERMS USED IN RELATION TO ARMOR

ANGLE OF IMPACT

This is the angle between the plate and the line of flight of the projectile on impact.

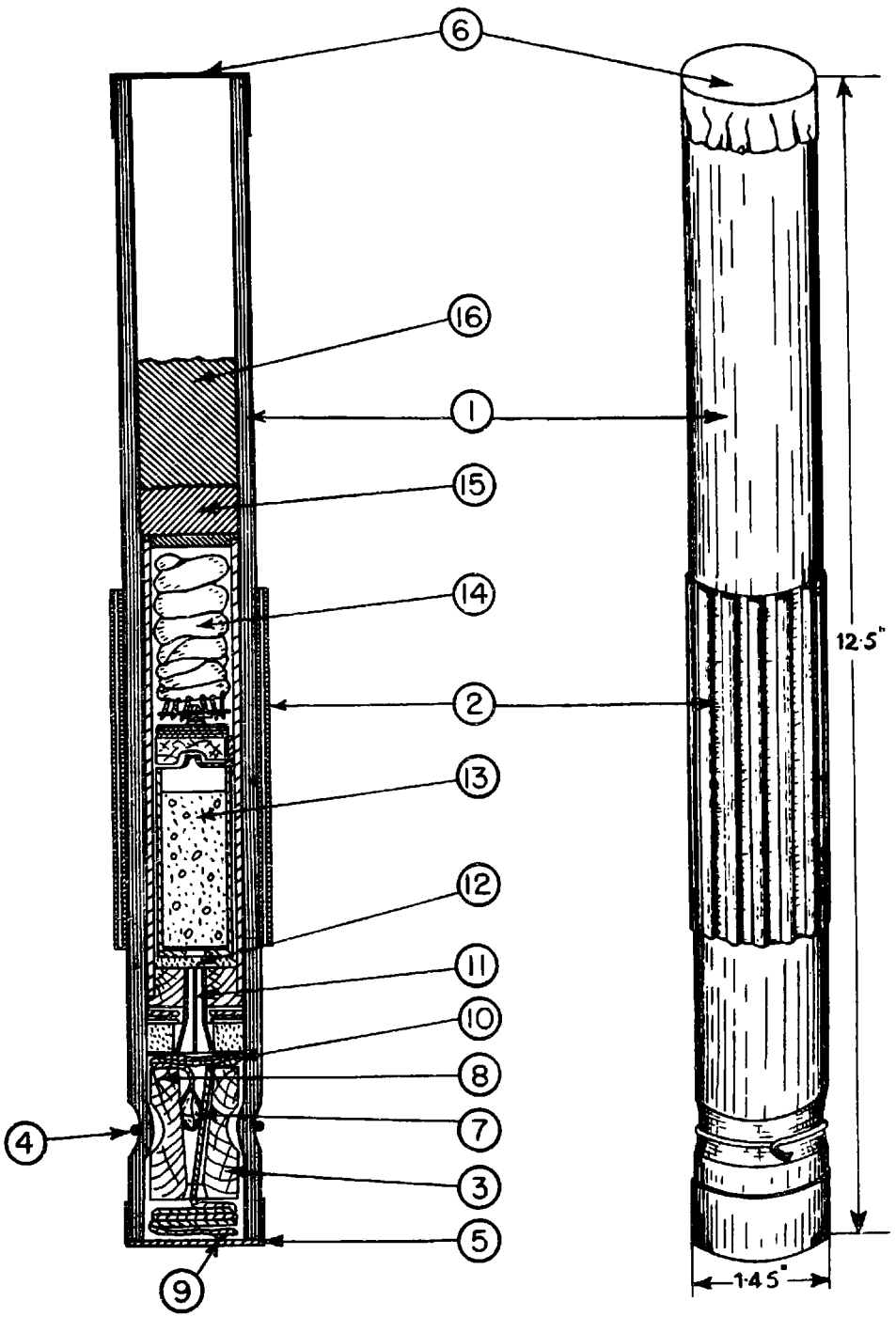
In the British and American Armies, this angle is measured from a line at normal (perpendicular) to the surface; some foreign countries, including Germany, measure it from the plane of the plate. Thus 30° British or U.S., equals 60° German.

At 10° to 15° angle of impact, the reduction in AP performance of a projectile is generally small compared with normal impact, but beyond about 20° the reduction is increasingly marked, and must be taken into account; 30° angle of impact is used for proof of all AP projectiles in Britain.

GERMAN AP 40 (Pzgr.40) (Sketch No. 3)

A special type of AP ammunition used with most German tank and antitank guns in addition to the more conventional types of AP projectile.

The AP 40 projectile consists of a mild steel body, a light alloy or plastic ballistic cap, and a cemented tungsten carbide core. The weight of this type of projectile is only about 50 percent to 65 percent that of the normal AP



ITALIAN PARACHUTE SIGNAL FLARE

shell. The muzzle velocity is high, but the velocity falls off rapidly with increasing range, so that increased penetration is obtained at short ranges only.

ARMOR-PIERCING CAP (Sketch No. 1)

A hard steel cap fitted to AP projectiles to assist in penetrating face-hardened armor.

A projectile so fitted is known as " APC." All modern German AP projectiles of 50 mm and over have a piercing cap; in calibers of 75 mm and over it is of blunt shape, making a ballistic cap necessary.

BALLISTIC CAP (Sketch No. 2)

A long and pointed cap fitted to a projectile to reduce the air resistance in flight. (Where both AP and ballistic caps are fitted, the projectile is designated APCBC).

In the case of normal AP projectiles, the presence of a ballistic cap, although in itself slightly impeding penetration, actually increases it at medium and long range due to the reduced deceleration caused by air resistance, and the consequent higher striking velocity.

BRINELL NUMBER see HARDNESS

CARBURIZING (also known as cementing or case hardening)

The process of increasing the carbon content of the surface of steel by heating the metal in contact with carbonaceous material.

This enables the surface to develop a much greater hardness than the interior when the carburized steel is heat-treated. In "gas carburizing," a gas rich in carbon is used instead of a solid material. See also CYANIDING.

CASE HARDENING (see CARBURIZING above)

CEMENTING (see CARBURIZING above)

CYANIDING (see CARBURIZING above)

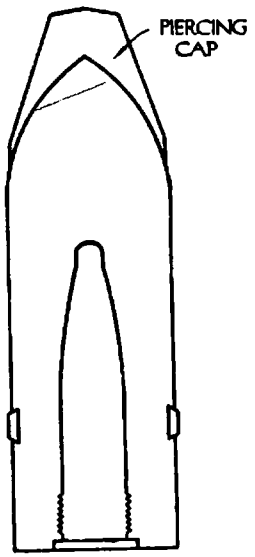
Another process of carburizing in which the metal is heated in a molten bath of sodium cyanide and other salts.

DISKING (see FLAKING and DISKING)

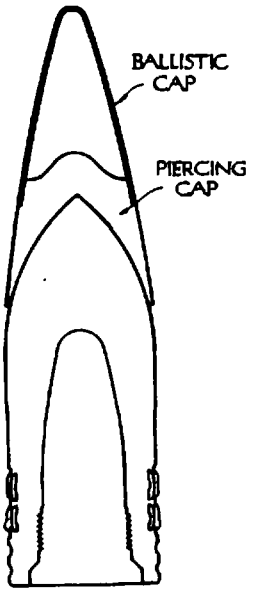
FACE-HARDENED ARMOR

Armor with a hard face, but tough base.

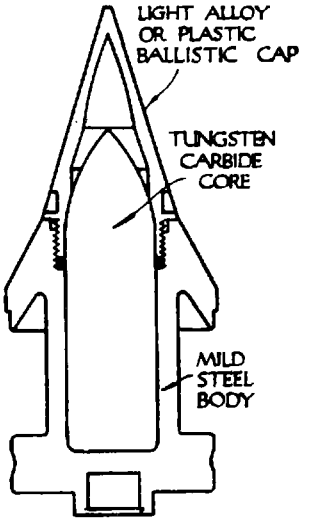
ARMOR PIERCING PROJECTILES



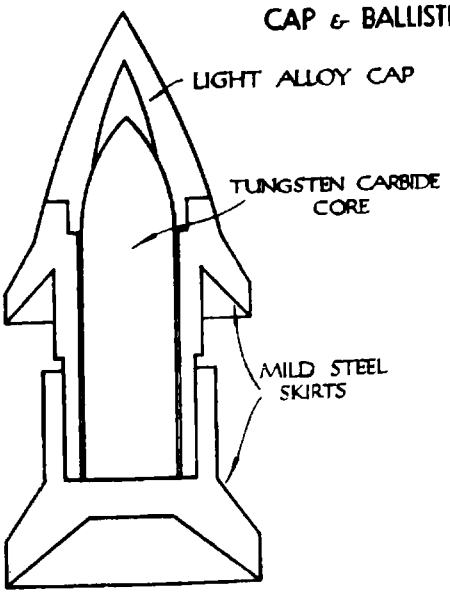
1. A.P. SHELL WITH PIERCING CAP.



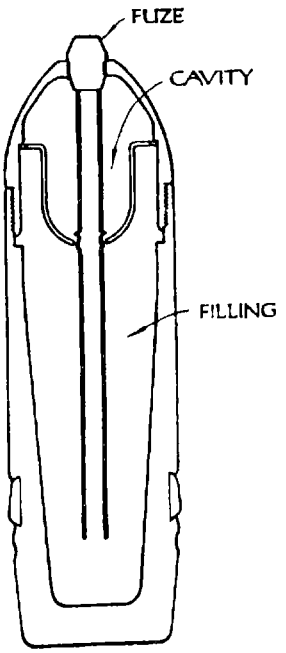
2. A.P. SHELL WITH PIERCING CAP & BALLISTIC CAP



3. A.P. 40 SHOT



4. GERLICH TYPE PROJECTILE



5. HOLLOW CHARGE SHELL

This armor is usually made by carburizing one surface of the plate so that this surface becomes much harder than the body of the plate when the plate is heat-treated. Face-hardened armor may also be produced by flame-hardening.

FLAKING OR DISKING

Terms used to describe the type of plate failure which is accompanied by an approximately circular piece, of much greater diameter than the projectile, coming off the back of the plate. It occurs when the plate has insufficient shearing strength in a direction parallel to its surface. Flaking or disking is dangerous in single-skin armor.

FLAKE-HARDENING

A face-hardening process which consists in using an oxyacetylene flame to heat the surface layer of metal above the critical temperature, and then quenching rapidly by a spray of water falling behind the flame.

GUERLICH PRINCIPLE (Diagram No. 4)

This principle involves the use of a tapered-bore barrel and a skirted projectile, the skirts of which are squeezed down as the projectile travels through the bore. A high-muzzle velocity is obtained by the use of a light projectile with a large effective base area at the commencement of shot travel. It is a means of obtaining a high armor-piercing performance without necessitating a heavy weapon. Owing to the relatively light weight of the projectile, this performance is obtained at short ranges only. The thickness of armor penetrated is considerable in relation to the weight of the gun. The hole made is, of course, small. Barrel wear is high.

German antitank guns so far known to be working on this principle are the 28-mm tapering to 20-mm (see Tactical and Technical Trends, No. 5, p 14), and the 42-mm tapering to 28-mm (see Tactical and Technical Trends, No. 7, p 3). The projectiles for those two guns have a tungsten carbide core.

HARDNESS

The hardness of a material is its resistance to deformation.

Various systems are employed for measuring hardness, including the Brinell, Vickers Diamond, and Rockwell systems. The Brinell number of a given specimen is derived from the diameter of the impression obtained by pressing a steel ball on to the surface of the material.

HOLLOW-CHARGE SHELL (Diagram No. 5)

A type of shell with a shaped cavity in the forward end of the HE filling.

The effect on impact is to concentrate a jet of blast in a forward direction. The underlying principle is to pierce armor by blast perforation, instead of the projectile forcing its way bodily through the armor by its weight and striking velocity. The penetrative power of hollow-charge AP projectiles is therefore independent of the striking velocity. Their use in low-velocity weapons, such as howitzers or infantry guns gives these weapons an improved performance against tanks, within the limits of their accuracy.

HOMOGENEOUS ARMOR

Armor which has approximately the same composition and hardness throughout its thickness.

HOMOGENEOUS HARD ARMOR (HOMO HARD)

A homogeneous armor of a hardness too great to be conveniently machined by ordinary commercial methods; i. e., of a Brinell harness greater than 400, usually 440 to 480.

IMMUNITY THICKNESS

The thickness of plate specified as providing protection against a given attack. When the plate is up to the average in quality, this figure is usually the thickness that will so withstand the specified attack that the bulge caused at the back of the plate is uncracked.

IZOD NUMBER (see TOUGHNESS)

MACHINABLE QUALITY ARMOR (MQ)

A homogeneous armor sufficiently soft to be machined by ordinary commercial methods; i. e., of a Brinell hardness less than 400.

PANZERGRANATE (Pzgr)

The German generic term for all types of AP projectiles, whether shot or shell, capped or uncapped.

PETALING

This is said to occur when metal displaced on perforation forms a ring of petals round the hole in the plate. With thin plates, petals are formed on the back only. With thick plates, they may form on the front as well. Petaling is the most desirable type of back damage on penetrated plate, since with perfect petaling, none of the armor is projected into the vehicle, as is the case when the penetration of the plate is accompanied by flaking or plugging. There are, however, intermediate conditions under which the petals formed on the back during penetration do not remain attached to the plate.

PLUGGING

A plug is said to be formed when the pressure of the head of the projectile causes the separation by pure shear of an approximately cylindrical plug of the plate metal. Next to petaling, it is the least undesirable form of failure, since less metal is projected into the tank than with flaking.

SHELL

A projectile having a cavity which may be filled with HE, smoke, or chemicals, and generally fitted with a fuze.

SHOT

A solid projectile.

SPACED ARMOR

When two or more plates are used with a space between them, the arrangement is known as "spaced armor."

There is little data on the effectiveness of spaced armor. It has been stated that the space should be greater than "the length of the projectile plus one inch." The shot may then be tipped while passing through the outer plate and turned in the space, thus striking the rear plate sideways and being stopped by it. This effect is likely to be more pronounced at oblique attack, for at normal the shot may sometimes keep straight and so penetrate the rear plate. A smaller gap may, however, be effective if the projectile shatters during its passage through the outer plate, as would appear to be the case with projectiles having tungsten carbide cores, or if the outer plate is face-hardened.

TOUGHNESS

The toughness of a material is its capacity to absorb energy before fracturing. It is commonly measured by the Izod Impact Test in which a notched bar test piece of the material is held in a vice and then broken by a heavy pendulum. The Izod value is the energy in foot pounds required to break the test piece and is calculated from the continued movement of the pendulum before commencing to swing back.

Toughness and hardness are largely opposing properties, the relation of which has to be balanced if a satisfactory ballistic performance is to be obtained.

SECTION II

GERMAN ATTACK UNDER COVER OF AREA SMOKE SCREEN

GERMAN ATTACK UNDER COVER OF AREA SMOKE SCREEN

The following translation of portions of a German manual gives some guiding principles for carrying out attacks in which area smoke screening is employed as an integral part of an operation. The term "area screen" is employed to mean the use of smoke to cover an extensive area so as to produce conditions resembling those effected by a thick natural mist. (See Tactical and Technical Trends, No. 6, p. 16, for certain details about the tactical use of smoke by the Germans.)

* * *

a. General

Artificial smoke - used for area screening - is an important aid to an attack against an enemy prepared for defense on a stable front, in field works, or behind water obstacles.

The employment of area screening depends on the plans of the superior commander, the strength of the front to be attacked, the topography, and the weather conditions. In an attack on a wide front, the screening may be limited to a particular locality.

It creates a zone of decreased visibility in which and into which observation, and hence observed fire, is rendered either difficult or impossible except at the closest ranges. It therefore favors close combat. Given this chance, the attacking troops close with the enemy. Some units utilize gaps in the enemy's fire, disorganized by the smoke, to achieve a breakthrough; at the same time other units attack and neutralize those enemy islands of resistance that might hold up the breakthrough. In this way the attacker pushes his way through the entire depth of the hostile battle position.

The attack under the cover of smoke, with a constantly changing visibility, demands initiative and resolution from the leaders of the smallest units and even from the individual soliders.

If the defender, ready in expectation of an attack, is blanketed by smoke, the resulting impossibility or difficulty of observation causes a material reduction in the effectiveness of his weapons. Hence, as long as the screen lasts, the defender's morale is subject to an ever-increasing strain.

Owing to the impossibility of maintaining observation in a battle waged in smoke, the superior commander of the defense will only be able to influence to a slight extent the course of the action. In an attack on a wide front this will seriously affect the commitment of enemy reserves. Without observation the planned defensive fire cannot be brought to bear with flexibility nor be maintained indefinitely. Organized control of fire will be quickly undermined. Gaps will inevitably appear in the curtain of fire. This will be the case particularly on a defensive front where the fire plan is based on enfilading cross-fire.

The attacking units must have available equipment which will enable them to maintain their direction in smoke, and they must be well trained in its use.

In order to reach assembly positions the use of smoke screens may be necessary. Area screening, however, should be reserved for the attack on the hostile battle position so as to enhance its effect by achieving surprise in its employment. Anything which will give the defender any indication, during the period of preparation, of the intended use of area screening must be avoided. The length of time consumed between reaching assembly positions and the beginning of the attack in the main battle zone is mainly determined by the scope of essential preparations, reconnaissance, the assembly of the attacking units and their ammunition, and the enemy counterattacks. In the case of limited local actions this will occupy at least one night. In the case of an attack on a wide front against a defensive position with permanent defenses, it may stretch over a period of several days.

The main objective of the attack lies in the enemy's artillery position.

As a general rule, area screening will not be employed beyond the rear edge of the hostile battle position. It may be advisable to blind the enemy reserve positions (i.e., by a smoke screen in the ordinary sense, which aims to curtain observation from one area into another rather than to reduce visibility within an area as does the area screen), and also in certain circumstances, the antitank defense on the far side of the battle position, as protection for the attackers as they emerge from the cover of the area screen.

If the hostile battle position is of great depth and strength, it may be necessary to decide upon intermediate objectives. Such a procedure makes it possible to coordinate the laying of the area screen with the progress of the attack. Only features of the ground easily distinguished in the smoke, i.e., roads running at right angles to the line of advance, intersecting streams, etc., are suitable as intermediate objectives.

The area screening is put down in zones 200 to 300 yards deep across the line of attack. The smoke will extend to adjoining areas by drift. Its rate of advance will be governed by the difficulties anticipated in the respective zones from the fighting and from the nature of the terrain. Two hundred yards every 15 minutes can be taken as a guide. A completely flexible control of the smoke screen - to suit the advance of the infantry - is not practicable. Once the screen has been set in motion to cover the ground to a particular objective, it must adhere to the time table laid down. The only possible change of the time table is at the point when the advance is resumed from one intermediate objective to the next.

In order to deceive the enemy, the screen must always extend over the flanks of the area of attack.

The area screen can only be put down by smoke units and artillery working together under the sole command of the artillery commander.

The area screen can be supplemented by the smoke equipment of the attacking units, such as smoke hand grenades, smoke candles (adapted for throwing), and smoke shells fired by the light and heavy infantry guns. For this purpose, it is essential that the attacking units be abundantly equipped, especially with smoke candles.

Rear areas of the battle zone which afford the enemy observation of the battle zone, but are outside the area screen, must also be blinded when the attack commences. Such additional tasks increase the number of smoke batteries and the munitions necessary, as does also a high wind.

Even though area screening is employed, the artillery must still carry out its chief task, namely to prepare the way across the battle zone for the attacking units and to give them the necessary fire support. The area screen supplements, but does not replace, HE bombardment with its destructive effect. The artillery must therefore be prepared to meet the unusual conditions. Since observation of the effect of artillery fire on individual targets is interrupted during the employment of the screen, the destructive artillery bombardment preceding the area screening acquires increased importance. The mixture of HE and smoke bombardment in the area screen makes it difficult for the infantry to orient itself and closely follow up the smoke.

Armored units can be and should be used in the attack; in the screened zone they must maintain the closest coordination with the attacking infantry. Their employment will be limited to the use of individual armored vehicles attached to attack groups for crushing nests of resistance.

b. The Attack

The following points relate to an attack on a wide front against a front provided with fixed works. They are also to be used in an attack against an enemy entrenched in field defenses or behind water obstacles.

The selection of suitable points of attack, and the time table on which the movement of the area screen depends, can only be based on careful preliminary planning. The attacking units themselves must have as clear a picture as possible of the particular ground and the defensive dispositions in their zone of attack; this is necessary in order to permit them to stage the attack in detail and to make proper use of their direction instruments, as well as to be able to reorient themselves, under the difficulties which arise when fighting in smoke.

An attack embodying the use of smoke should commence when the infantry is within assaulting distance. For this purpose, the ground leading up to the battle zone must be already occupied and cleared of obstacles and minefields, so that no lengthy delay will occur during the approach and the occupation of assault positions.

The attacking units are brought into position the night before the attack. In order to avoid undue exposure to enemy artillery fire, they may be assembled for the attack in rearward positions, providing the approach to the battle zone is adequately patrolled. Pathways and roads in the approach zone must be so marked that an unimpeded approach is assured even when smoke is present. The attacking units come up to the line of departure in open order, to lessen the effect of the enemy barrage. The early morning hours are the most favorable for the commencement of the attack.

The approach of the attacking units can be preceded by a fairly long area-screening bombardment - even intermittently - on the forward approaches of the battle zone, in order to give the enemy no clue as to H-hour; this will also cause him to disclose his defensive barrage and artillery positions. A mixture of smoke and HE fire can be maintained until the infantry attack approaches the region of the area screening.

The attacking force can make systematic use of area screening in a degree proportionate to the thoroughness with which the artillery has destroyed defensive works, obstacles, and mine fields, and cleared out the pockets of enemy resistance in the hostile outpost position prior to the launching of the attack. The HE bombardment should be put into operation early and to a large extent be maintained with intensity, if the troops have been drawn up into final assembly positions, in order that during this period, when they are more defenseless than the defender, they should not be exposed to increased enemy artillery fire. While the attacking units are deploying into attack position, the artillery should put down harassing fire on the hostile outpost position. The neutralization of enemy artillery becomes a factor of particular importance at this point. At the commencement of the attack under cover of the area screening, all artillery unengaged and not firing smoke opens up on counterbattery tasks so as to assist the assaulting troops to cross the zone of the enemy barrage. The enemy artillery should be kept neutralized throughout the further course of the attack. Part of the artillery should continue to engage such of the enemy positions in the hostile outpost zone as have not been covered by smoke.

When the infantry is nearing the rear edge of the battle zone, the artillery takes up the task of rendering the necessary fire support to the spear-head of the attack as it comes into view out of the smoke, either because of the thinning out of the area screen or because they have left its cover prematurely. At this point, HE bombardment must neutralize enemy forces debouching on to the far side of the battle zone and must hinder the bringing up of enemy reinforcements. For this purpose, provision should be made for rapidly moving forward a number of batteries.

Artillery forward observers with field telephones accompany the most advanced elements of the attacking infantry, with artillery liaison officers at infantry battalion headquarters. During the advance in the smoke, they signal to the observation sections at a pre-arranged time by means of "vertical light signals," to indicate the progress of the attack.

The commitment of the assaulting troops is done by individual assault groups at points where the defenses, obstacles, and terrain offer favorable conditions for a thrust through the hostile battle position.

During the battle, the assault groups must rely upon their own resources. Their strength should be such as to ensure that they will be able to fight across the battle zone over the whole of their allotted sector, and to reach the far side as units strong enough to continue active fighting. It is most important for the attack that full advantage be taken of the enemy's lack of observation. The thrust through the battle zone is based on the assumption that the defensive works will also be subjected to attack at the same time. In an attack on a battle position of considerable depth, the assaulting units are organized in groups which carry out the breakthrough, and into those which are intended simultaneously to attack the centers of resistance.

The division commander designates the objectives to the infantry commanders. He assigns the artillery its missions and, subject to orders from higher echelons, arranges the direction and timing of the area screen. He informs the infantry commanders of the plans of the artillery and smoke units, and puts under their command the necessary engineer units, and, if required, antiaircraft guns and armored vehicles. He must make every effort to see that the attack, after the hostile battle position has been broken through, is carried into the enemy artillery position without delay. He relieves the assault infantry of the responsibility of finishing off the defensive positions remaining unattacked between the assault groups.

The commander of the infantry regiment gives the assault battalions their battle orders and organizes their coordination. To this end, he indicates the direction of attack and the objectives. He attaches to the battalions, to enable them to carry out their missions, such further weapons as are necessary--antitank guns, infantry guns, direction indicators, and special weapons. His further influence on the progress of the fighting is exercised by the prompt use of his reserves at the points where the attack can best be pressed forward. After the breakthrough, he quickly reforms those elements of the regiment which have become scattered during the attack, so that they may again be used as a united whole.

The battalion commander splits his battalion in accordance with their missions. The troops assigned to carry out the thrust across the hostile outpost position must be prepared to overrun rapidly,or crush,the enemy troops occupying this zone. They should therefore be reinforced with heavy machine guns, reserve assault units, and, if the occasion requires it, heavy mortars and light infantry guns as well. The battalion commander tells them where to go and assigns guides to operate with them. Those forces which are sent out against the defensive works need, above all, engineer units with their specialized offensive equipment, individual armored vehicles, and weapons for the engagement of pillboxes. The battalion commander goes forward himself with the troops assigned to the main effort, i.e., the breakthrough, and is responsible for seeing that they succeed quickly in reaching the far side of the battle zone. There, he reor-

ganizes his companies to continue the attack.

Besides the coordination of individual armored vehicles during the attack against enemy field works, armored units, after the battle zone has been successfully crossed, should continue the attack by breaking into the enemy artillery positions; the enemy reserves also should be attacked in order to facilitate the reorganization of friendly infantry for further attack.

By clearing away obstacles and minefields, the engineers make it possible to push forward almost up to the enemy front lines, the line of departure for the final breakthrough. During an attack in smoke, engineer units are attached to the individual assault groups for special purposes, chiefly for the demolition of the stronger field works. Their strength is determined by tasks to be performed.

As the area overrun increases, it is important to clear paths quickly across the battle zone and to mark those on which reinforcements can be brought up in order to exploit fully the success of the attack.

During the attack through the smoke-covered battle zone, it is unlikely that there will be any danger from enemy tanks, and yet the rapid organization of an adequately strong antitank defense in the newly acquired line is necessary when the smoke cover is left behind, especially after the objective of the attack has been gained. Since the antitank guns needed by the assault groups for the engagement of loopholed defenses are, for this purpose, drawn from the companies of the infantry regiments, division antitank units are given the mission of screening as quickly as possible, against enemy tank attack, the infantry which has broken through the battle zone.

The lack of observation in the smoke-covered area makes necessary the extensive use of radio, even for lateral communication. When the far edge of the battle zone is reached, communications with the artillery must be established by all means available. The increased requirement for means of communication makes it clear that additional signal units should be provided.

The cooperation of the air force is desirable: at the commencement of the assault, dive-bombing attacks are made against enemy battery positions, and during the development of the attack, against the assembly and movement of enemy reserves. Reconnaissance aircraft are to be employed to observe the battle zone and the density of the smoke screen, and to reconnoiter the unscreened enemy rear area.

Reserves are to be held ready in such a position that the attack can be continued as far as possible without interruption until the objective of the attack - the enemy artillery positions - has been taken. After the objective has been reached by the assaulting units, larger units held ready for immediate use, especially armored divisions, are thrown in to develop the success already achieved into a full-scale breakthrough.

During an attack against an entrenched enemy position (without permanent fortifications), area screening is particularly effective in upsetting enemy defensive fire, since as a general rule it is not based on a rigid machine-gun fire plan. On the other hand, the attacker will have less information about the hostile dispositions and the effective zone of the enemy's fire than if he were attacking a permanent front. Under these circumstances, there will not usually be a grouping together of assault troops into special units.

In the case of an enemy defending behind a water obstacle, area screening is used as a general rule only where there is little or no current and the width of the stream is small. The peculiarities of smoke formation over an expanse of water (because of differences in temperature, etc.) must then be taken into consideration. The bringing up of ferrying equipment is carried out under protection of the smoke, which in the most densely smoked area should prevent observed fire or aerial observation of the crossing. The first wave should ferry over those attacking groups which will deal with the most forward positions commanding the water. The time table for the smoke barrage will consider the fact that the troops ferried across must assemble on the enemy bank before the thrust into the hostile battle position. If the strength of the current and width of the stream preclude the employment of smoke for the actual crossing, it may be practicable to employ area screening for the subsequent prosecution of the attack.

c. Direction Indicators for Attacking Units

Apart from the watch compass, the following are available for attacking units:-

(1) A radio beam--a transmitter and several receivers working in conjunction with it. The transmitter is set up at the line of departure, and lays a radio beam about 20 meters wide through the smoke in the direction of the objective. By using the receiver, one can check at any time whether he is on the radio beam, i.e., in the line of the attack, or has deviated to a flank. This equipment is mainly intended for the leading units of the forces carrying out the attack. Transmitter, receiver, and service personnel will be provided by a special communications unit. For such employment they are attached to the attacking unit.

(2) Direction shells which scatter colored powders (red, yellow, blue) are issued as special ammunition to the infantry gun companies. These rounds are fired before the commencement of the attack at intervals of about 50 yards along the path of the attack, which is thus marked by colored patches.

(3) Direction tapes about 300 yards long, one end of which is attached to a rocket fired in the desired direction. Direction can then be maintained by following the tape along the ground to its far end, from which point another tape-trailing rocket can be fired, and so on. This system is recommended chiefly for marking the direction of advance of the attack groups to the most advanced positions.

(4) The gyro-compass serves as a refinement of the watch compass. It is not deflected by metals (e.g., tank turrets), and can be set for the direction of attack.

(5) Direction tapes in various colors serve to mark paths taken by staffs or units through the smoke. They facilitate report traffic, the maintenance of contact, and the forward movement of units subsequently committed. Markings on the direction tapes give the troops an indication as to how far they have penetrated into the smoke from their starting point.

The employment of direction indicators, the allocation of the individual colors, and the necessary instructions to attacking units, must be clearly laid down in orders.

d. Influence of Weather, Wind, and Terrain

Every smoke operation is fundamentally influenced by weather, wind, and terrain.

(1) Weather

The weather is considered favorable when there is an overcast, little light, and cool temperature; hence, in general, the early morning and evening hours. It is unfavorable under conditions of intense solar radiation, intense heat, frost, and snow.

(2) Wind

Up to a velocity of 8 mph, wind conditions can be considered as favorable for area screening. Where the velocity exceeds 12 mph, the smoke will be thinned; when it is over 16 mph, a continuous smoke effect can no longer be achieved even with the highest expenditure of ammunition. The stronger the wind, the more the smoke will be held down to the ground, and the lower will be the height of the screen.

(3) Terrain

Ammunition expenditure is lower in hollows, woods, bushy country, and thick undergrowth. The necessary ammunition expenditure increases in hilly or bare country. Pronounced ridges and hollows can only be screened with dense smoke under especially favorable conditions. For these reasons the breadth of the target sector allotted to a battery with a given ammunition expenditure must be adjusted according to the topography of the sector.

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