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SECTION I

1. ITALIAN CANTIERI Z 1007

Used as a bomber and reconnaissance plane, the Italian Cantieri Z 1007 has recently appeared in two different versions. Similar features include an all-wood cantilever construction of the mid-wing monoplane type, a length of 61 ft. 3 in., and a long nose. The wings have a sharp dihedral with a span of 81 ft. 10 in. and a gross area of 810 sq. ft. They are in three sections built upon two wooden box-spars with stressed plywood covering. The fuselage is semi-monocque of wood with stressed covering of poplar plywood. In one type the braced stabilizer is elliptical, with "V" cut-out and a wide single fin and rudder. The other type has an angular stabilizer with oval, out-rigged twin fins and rudders. The landing gear is retractable.

Both planes are powered by three 14-cylinder, radial Piaggio PXI RC-40 air-cooled engines, one in the nose of the fuselage and one on either side in the wings, giving a maximum speed at 15,000 feet of 280 mph, and a cruising speed of 235 mph. The range is approximately 400 miles with a full bomb load of 4,850 pounds. An improved model of this engine with 1,300 hp may be fitted and would increase the maximum speed to about 300 mph at 13,000 feet.

The armament consists of two 12.7-mm machine guns (one Isotta-Fraschini "Scotti" in the dorsal turret and one Isotta-Fraschini in the rear) and two lateral 7.7-mm Breda machine guns. The normal bomb capacity is 2,640 pounds, and the maximum load is 4,850 pounds.

The hand-operated turret is traversed by means of a wheel mounted at the lower end of an inverted control column. Operation of the wheel rotates the turret, while movement of the column gives elevation or depression. Elevation is from 0 degrees to approximately 70 degrees. A light metal rod mounted to project upwards though the perspex dome helps to balance the relative wind pressure on the gun barrel and gives the impression of two guns firing in opposite directions.

The shallow cupola, which projects above the top line of the fuselage, is of thick, transparent plastic material, and has a flat panel inserted for better sighting. There is no bullet-proof glass, but for the protection of the gunner there is a large curved sheet of armor plate (2 ft. 6 in. by 3 ft. 6 in.) 8 mm thick, which turns with the turret and protects the gunner's body. A smaller curved piece, 14 in. by 8 in., gives partial protection to his head. The gunner's seat is thought to consist of a single padded sling, hanging from the turret and rotating with it.

The lateral gunners' positions are protected by pieces of 5-mm armor plate on the side of the fuselage, and each lateral gun has three small pieces of 6-mm armor plating attached to the gun itself. The ventral gun position is also protected by 6 mm of armor.

Radio equipment of a new type incorporates an intercommunication amplifier A. 40 which replaces the speaking-tube system to which the Italians have adhered for so long, and is operated by the radio operator. In addition, provision is made for the latest fighter radio set (B.30) to be fitted, but no part of this equip-

ment has been actually installed.

Six self-sealing tanks are carried in each wing. The self-sealing system consists of covering the light-alloy metal tanks first with felt, then with two layers of black sponge rubber, and finally on the outside with yellow canvas. There is an unprotected oil tank behind each engine.

Apart from the gunners' armor already referred to, 5-mm armor is fitted in the roof over the front pilot and on the port side of the cockpit. The rear pilot is protected by a seat consisting of 6-mm plate and a piece of 5-mm plate over his head, as well as a bulkhead of 6-mm plate just aft of the lateral guns. This bulkhead does not fill the whole cross section of the fuselage but is of horseshoe shape.

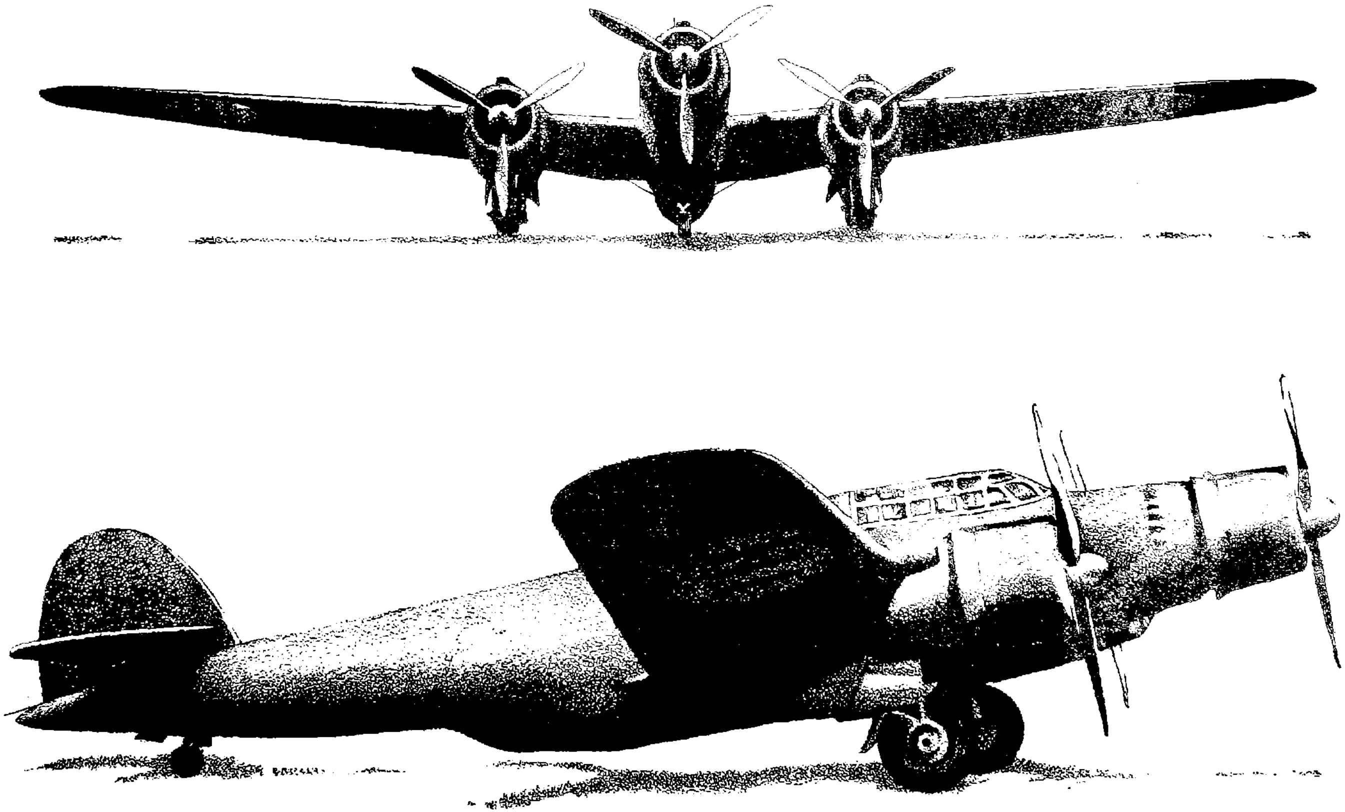
A recently-crashed Cantieri Z 1007 was found to have a Breda turret rotating by an electric motor. This motor was mounted behind the control panel to the right of the gun, which was on the left side of the turret and was fired hydraulically. Elevation and depression were effected by a hydraulic jack. The arcs of fire were probably 360 degrees in azimuth and 0 to 90 degrees in elevation. A San Giorgio reflector sight of a new type, smaller than the usual one, was fitted, and had its own speed-control mechanism. New-type exhausts were fitted similar to those on a Beaufighter, two pipes to each engine, and it is thought that they fitted on either side of each nacelle below the wings.

Internal racks for twenty 110- or 220-pound bombs were carried, apparently the electrical-release type. Stowage for three 110- or 220-pound bombs was found inside each wing, outboard of the engine nacelles, operated by rotating shaft control. All the bomb locks were the same type and could be operated either electrically or mechanically. It is thought that the wing racks were not in use, as no bomb steadiers had been fitted.

2. A NEW-TYPE JAPANESE MEDIUM BOMBER

A new Japanese twin-engine, medium bomber has been reported recently shot down in India. It is believed to be designated as Type 97 Mark II, manufactured by Mitsubishi, an improved version of the Type 97 twin-engine bomber, "Sally", re-engined and with improved armament, carrying a crew of seven.

The span of this new bomber, given as 74 ft. 10 in., is a little greater than the Type 97. The length of 48 feet is slightly less. It is a mid-wing monoplane with engines centrally slung, the nacelles being slightly longer under the wing to house the backward-retracting oleo-legs. It has a single fin and rudder. The main plane is of boxspar construction, with the trailing edge tapered more than the leading edge and with a small dihedral angle. It is of stressed skin metal construction, with the exception of the control surfaces, which are of the conventional metal



CANTIERI Z 1007

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frame construction, fabric-covered. There are split trailing edge flaps 14 ft. 4 in. long and 2 ft. 7 in. wide, starting at the fuselage with ailerons directly outboard of these in two sections and reaching almost to the wing tips. It has a perspex nose and a turret on top of the fuselage towards the tail.

Name plates on the engines state that they are the Mitsubishi Type 100, with 1,450 hp. This engine, apparently an improvement on the Kinsei engine in the Type 97, is a 14-cylinder, twin-row, air-cooled radial 52 inches in diameter, with a deep reduction-gear casing, and probably fitted with a two-speed supercharger, giving a superficial resemblance to the Wright Double Cyclone. The propellers are the three-blade metal type, with electrical pitch-changing mechanism operated by a motor on the forward end of the boss and enclosed in the spinner.

The armament in the new aircraft is reported to be considerably heavier than hitherto encountered in any Japanese bomber, although no armor is apparently provided.

A 7.7-mm Lewis-type machine gun is gimbal-mounted in the nose within an eccentric ring, in the same manner as in the He-111. Similar German influence is apparent in the design of the dorsal turret, which is like that of the Do-217E-2, except that the Japanese version is manually operated in both traverse and elevation. A Browning-type 12.7-mm machine gun is mounted on the inner side of a rotatable annular turret ring. For firing, the gunner stands at the side and aims by means of a reflector sight very similar to but smaller than the German "Revi." An emergency ring-and-bead sight is also fitted. Elevation and depression are effected by a hand crank, at the end of which is the firing button. Estimated maximum depression is 30° and elevation 80°, with an all-around traverse.

The lateral guns are two 7.7-mm Lewis-type machine guns. The one on the port side is mounted on a bracket and can be swung across an opening which also serves as a door to the fuselage. The starboard gun, in a cylindrical socket mounting in the middle of the bottom side, traverses a smaller aperture directly opposite.

The ventral gun, a 7.7-mm machine gun for rear use only, is fired through a hole formed by opening two doors in the bottom of the fuselage. Both doors have footsteps in the center, the forward half of each having a perspex window with two protection bars. There are two similar windows on each side of the fuselage, permitting a view to port and starboard. Forward of these are three perspex panels half-way up the fuselage side. A red push button on the starboard side of the fuselage floor near the gun is presumably connected up to some warning device (horn?) in the pilot's cockpit.

A 7.7-mm Vickers-type machine gun is mounted in the tail on a free-traversing bracket, the elevation and depression of which is controlled by another bracket attached to the forward end of the gun barrel. Both brackets are connected by link mechanisms to rods running down both sides of the fuselage. These, in turn, are coupled to a curved arm carrying a pistol grip which is operated by the gunner standing in the turret. Coupled in the linkage is a ring-and-bead sight,

which protrudes through two holes in the turret, and movement of the pistol grip controls the gun and the sight. The maximum movement appears to be 10 degrees in any direction, giving a cone of fire with a 20-degree angle. On the control arm are two "T" handles connected by Bowden cable to the cocking handle and to the stoppage clearing handle, respectively. The gun is fired by a trigger mechanism in the arm, connected by Bowden cable to the front sear on the gun.

The bomb bay in this new bomber, measuring approximately 15 ft. by 3 ft. and being 18 in. deep, is believed to carry a maximum load of 2,500 to 3,000 pounds. This load is an improvement on that of any known Japanese bomber. The bombs appear to be mounted alternately, nose-to-tail.

Five fuel and two oil tanks were traced. The oil tanks were in the leading edge, and the name plate gave a capacity of about 38 U.S. gals. Both of these latter tanks had self-sealing coverings which formed the actual outside skin of the wing. Two fuel tanks are situated in each wing root, and a third in the fuselage over the bomb bay. The total capacity is about 687 gals.

When carrying a load of 1,100 pounds, it is estimated that the airplane has a maximum speed of 285 mph at 13,000 feet, a service ceiling (with normal load) of 30,000 feet, and a cruising range of 950 miles. With 2,750 pounds of bombs the economical range is 1,300 miles.

ANTIAIRCRAFT

3. GERMAN ANTIAIRCRAFT CEILINGS

In order to assist in estimating the chances of being successfully engaged by antiaircraft fire when operating over enemy territory, three diagrams are here shown. They illustrate the ceilings of light and heavy antiaircraft guns and the zones of engagement of heavy antiaircraft guns.

a. Ceilings of Heavy AA Guns

The chance of being hit at the maximum ceiling (shown in figure 1 by broken-line trajectories), although it cannot be ruled out, is extremely small owing to the very long time of flight of the projectile and the fact that only one round can reach these heights while the plane is within range.

Prolonged engagements of a plane or formation are possible only at lower heights. The effective ceiling (shown in figure 1 by solid lines) for the 88-mm and 105-mm guns represents the maximum height at which a directly approaching aircraft flying at 300 mph can be engaged for 20 seconds with the last round fired at a quadrant elevation of 70 degrees. It will be seen that the resultant effective ceiling for the 88-mm gun, for example, is 26,250 feet. The accuracy of this basis of calculation is borne out by recently received evidence which suggests that the "88" does in fact have great difficulty in effectively engaging targets flying at about 26,000 feet.

Fire at the effective ceiling is apt to be only relatively accurate, although a number of reports have come in of accurate barrage fire at considerable heights. In these cases, however, formations had flown a constant course and height for unduly long periods, and this allowed ample time for the preparation of firing data. Aside from special situations of this kind, the most effective heights for fire by heavy guns on targets in sight are between 4,000 and 10,000 feet for individual

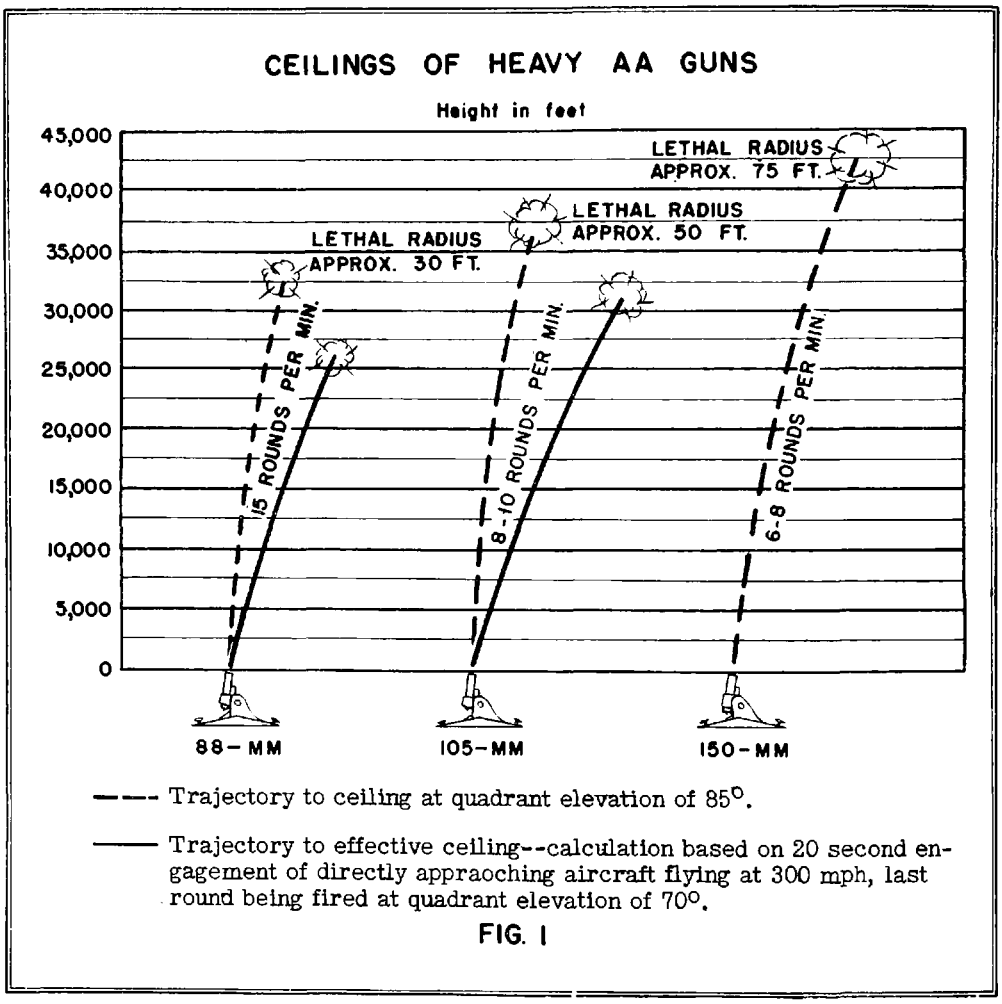


FIG. 1

aircraft, and between 4,000 and 14,000 feet against formations. For unseen targets, the most effective height is from 6,000 to 12,000 feet.

The lethal radii of burst noted in figure 1 are necessarily approximate. It should be remembered that the major effect of a burst is forward, so that danger from a close burst above an airplane is considerably less than from a burst in any other position.

b. Ceilings of Light AA Guns

Figure 2 is largely self-explanatory.* The sights used with light AA guns are chiefly of value for obtaining accurate opening fire. Subsequently, corrections are generally made by observation of tracer. This fact, together with the falling away of the trajectory above certain heights, mainly accounts for the distinction between heights to which accurate engagement is considered likely and heights at

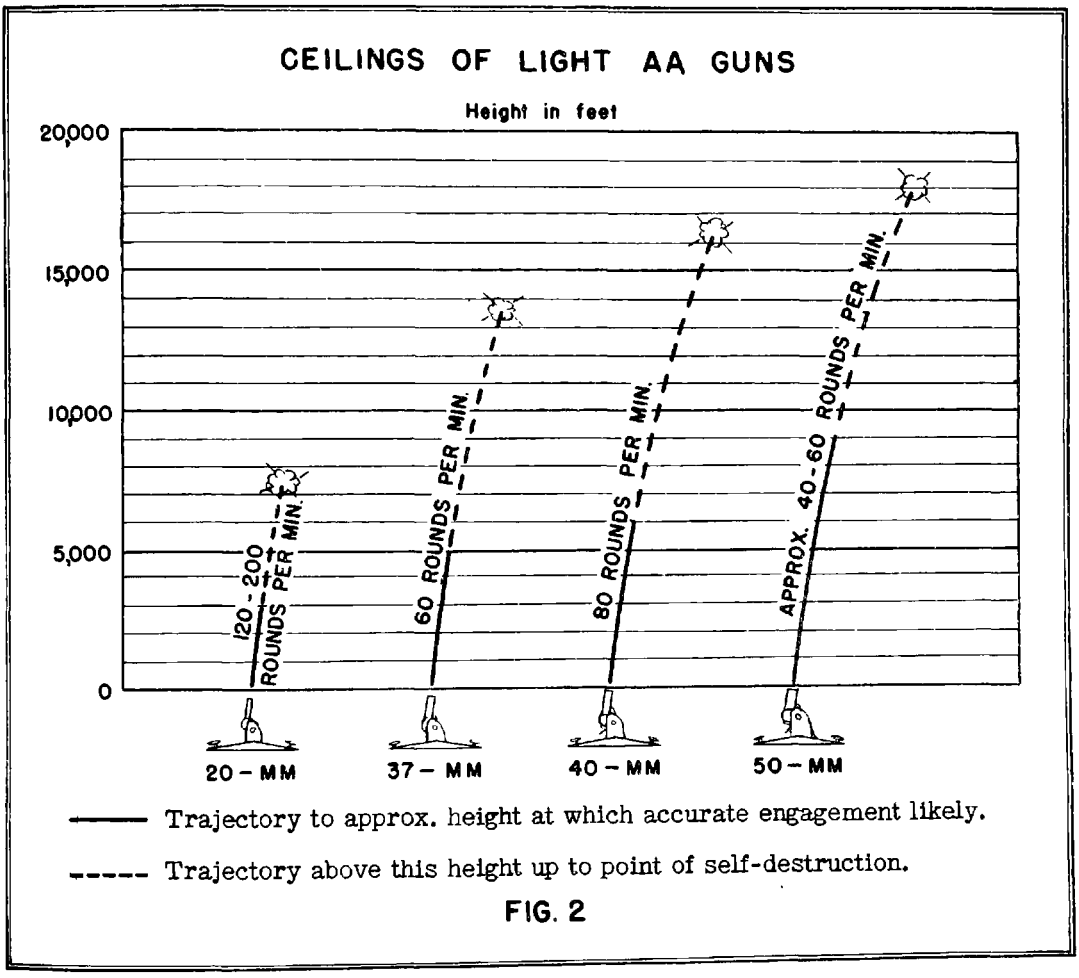


FIG. 2

which self-destruction takes place. It will be obvious that this distinction shown by the change from solid to dotted trajectories in figure 2 is very approximate.

*It should be noted that the rate of fire indicated in figure 2 for the 20-mm gun has reference to the single-barreled gun; the four-barreled 20-mm AA gun fires about 700 to 800 rounds per minute.

c. Zones of Engagement of 88- and 105-mm Guns

Figure 3 is a diagram designed as a guide for estimating how closely aircraft flying at various heights can approach a gun position without being engaged. This diagram shows the maximum ranges and dead zones of 88-mm (solid line) and 105-mm (broken line) antiaircraft guns from which can be read off maximum zones of engagement. These zones apply to directly approaching targets. For any other target course, zones of engagement will be smaller. The 150-mm gun (not

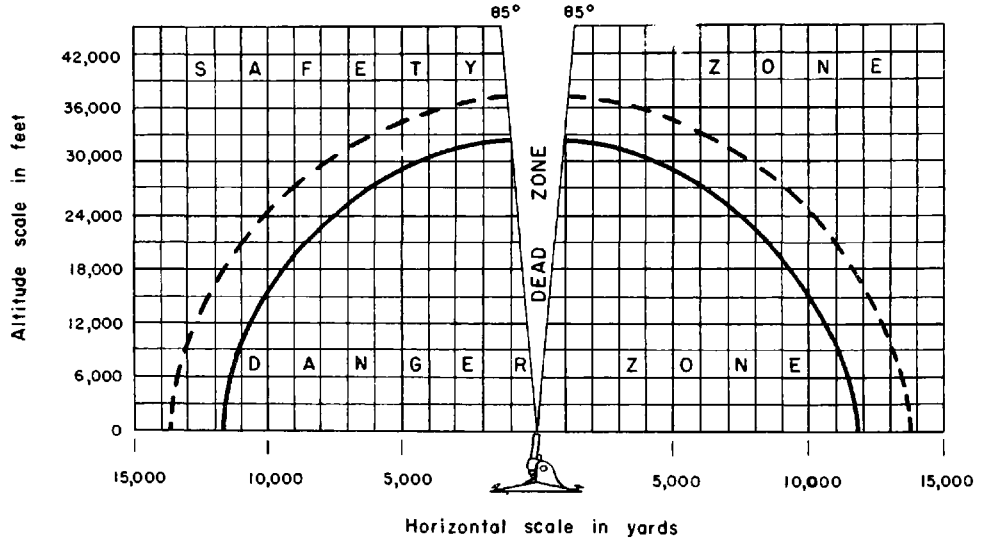


FIG. 3

included owing to insufficient data) is known to have better performance, and some additional allowance should therefore be made for this weapon.

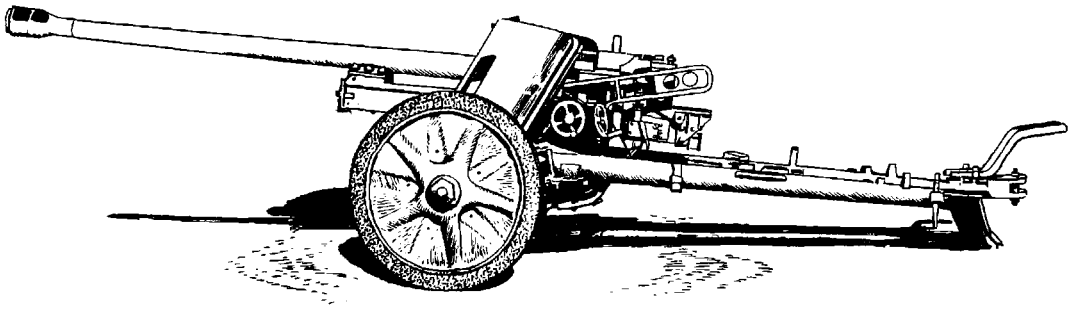
The 88-mm and 105-mm guns constitute the main German heavy antiaircraft equipment. The existence of a 150-mm AA gun is supported by only scanty evidence. The 128-mm AA gun is believed to be in use and to have a ceiling of from 35,000 to 40,000 feet.

4. GERMAN 75-MM ANTITANK GUN--7.5-CM PAK 40

Mention of this gun has already been made in Tactical and Technical Trends (No. 18, p. 4). It must not be confused with the 7.5-cm Pak 97/38 which is a German modification of the well-known French 75 (see Tactical and Technical Trends, No. 22, p. 6).

The 7.5-cm Pak 40 is very similar in appearance to the standard German 50-mm antitank gun, the 5-cm Pak 38. However, the following structural differences may be readily noted:

Item	5-cm Pak 38	7.5 cm-Pak 40
Shield	Curved. Flattened at outer edges	Angular. Flat frontal section with two flat side pieces set at an angle of approx. 45° to the plane of the frontal section
Muzzle brake	Narrow and elongated	Broad and longer
Sighting aperture	Rectangular	Square



5-CM PAK 38

The gun proper, i.e., exclusive of the carriage, is essentially the same weapon as the 7.5-cm Kw.K 40*, which is the principal armament of the new German medium tank, the PzKw 4. Two self-propelled versions of the 7.5-cm Kw. K 40 have also been reported, one mounted on the chassis of a PzKw 2, the other on the chassis of the PzKw 38 (t)**. The chief differences between the 75-mm antitank gun and tank gun are probably the substitution of mechanical firing and percussion primer for electric firing and primer; the chamber of the antitank gun is also probably considerably longer. The breechblock is the semi-automatic, horizontally sliding type.

*Kampfwagon Kanone--used by Germans to designate tank guns.
**A Czech light tank.

The piece is mounted on a split-trail carriage, with torsion springing; this springing is automatically cut out when the trails are opened. The wheels are of a light alloy and are fitted with solid rubber tires. An interesting feature is a detachable third wheel which can be fitted on near the trail spades, thereby permitting the gun to be man-handled more easily. The shield is of the spaced-armor type like the Pak 38; note also that a protective apron is provided.

Further details on this weapon are as follows:

Over-all length in travelling position	19 ft 2 in
Weight in action	3,350 lbs
Length of barrel	10 ft 6 in
Length of recoil	35.43 in
Elevation	22 degrees
Depression	5 degrees
Traverse	65 degrees

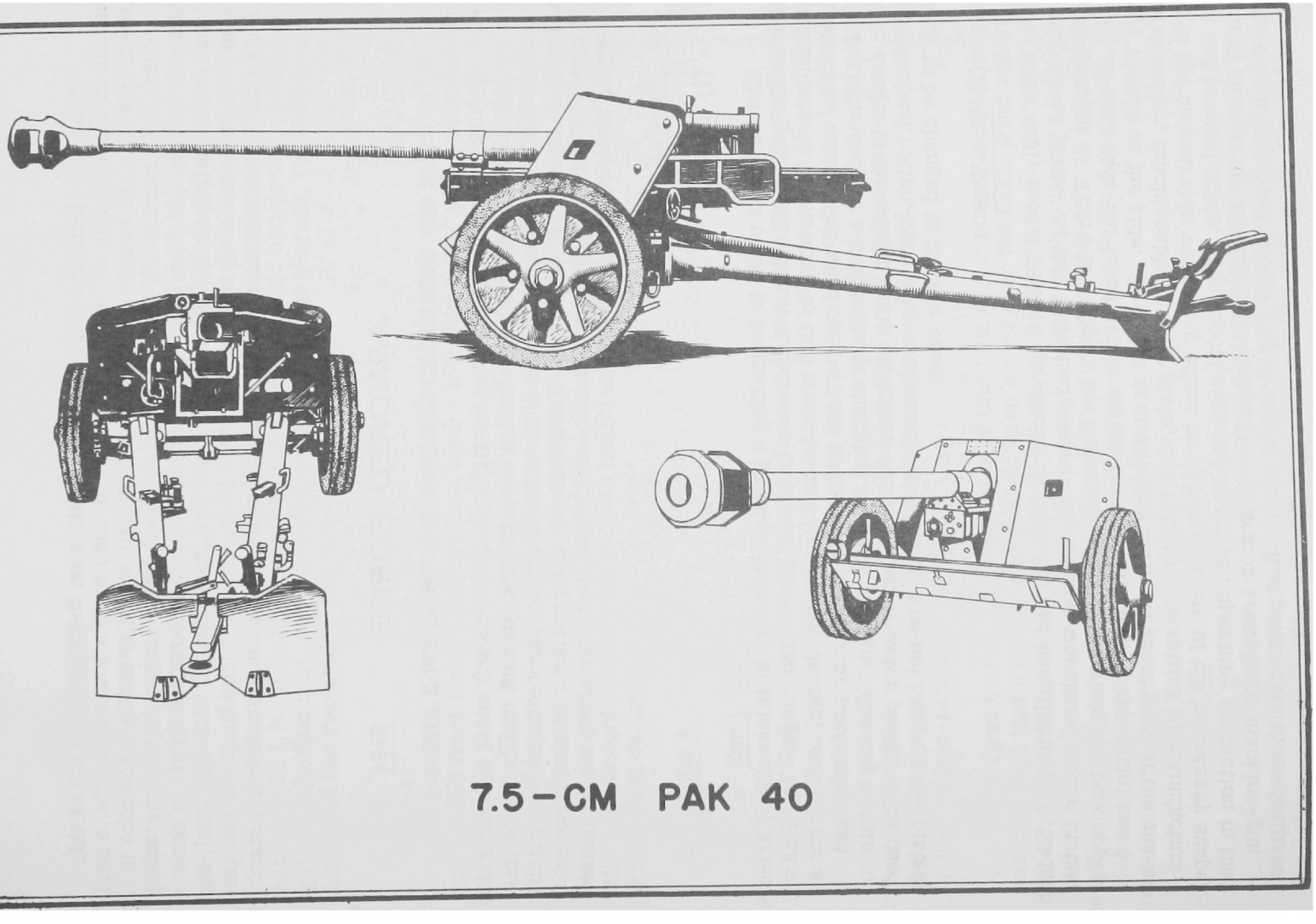
Four types of ammunition are used, namely HE, hollow charge, AP shot, and an armor-piercing tracer shell with a small explosive charge and an armor-piercing cap covered with a ballistic nose. Details on this latter type of ammunition (see sketch at left) are these:

Weight of complete round	27 lbs
Length of complete round	36.14 in
Weight of projectile	15 lbs
Weight of HE filling	3/4 oz
Weight of propellant	6 lb 3/4 oz
Muzzle velocity (estimated)	2,830 f/s

With this AP-HE ammunition it has been estimated that this gun can penetrate homogeneous armor as follows:

Range	Normal	30 degrees
500	5.20 in	4.43 in
1,000	4.72 in	4.02 in
1,500	4.27 in	3.62 in
2,000	3.82 in	3.23 in
2,500	3.43 in	2.87 in

The AP shot is the usual German steel casing enclosing a tungsten carbide core; it is fitted with tracer. The muzzle velocity with this ammunition is reported to be 3,250 feet per second.



7.5-CM PAK 40

Comment: Detailed confirmed information on the effectiveness of this weapon is not available as yet. For its size it does have a low silhouette, a desirable feature for an antitank gun. While the muzzle velocity is high, the tube is of monobloc construction and the propellant charge is very large, so that the safety factor is open to question. The Germans have been doubling the length of the chambers in their tank and antitank weapons (e.g., the Russian 76.2-mm gun), and seem to have reached the conclusion that it is worthwhile since they are now producing this 75-mm antitank gun with the long chamber and shell case as a standard weapon.

ARMORED FORCE

5. INCREASED PROTECTION ON PZKW 3 AND 4

The history of the changes in the light medium PzKw 3 and 4 demonstrates how fortunate the Germans were in having a basic tank design that could be improved as battle experience indicated, for a basic design can be improved and still remain familiar to the users. Furthermore, the problems of maintenance and supply of parts are greatly reduced--and these problems are a major factor in keeping tanks ready for operational use.

a. The PzKw 3

(1) General

The Germans seem to be making a gradual increase in thickness of armorplate as the guns used against it increase in hitting power and range. The PzKw 3 medium tank is illustrative of this trend in tank armor and design, and affords a remarkable example of what can be done to improve the armor protection and fighting efficiency of a tank without changing its basic design. The key of this basic design is the welded main structure which allows heavier plates to be used when desired. Also, operating components of the tank are not hung on the plates likely to be changed to thicker ones.

(2) Pre-War

The early model PzKw 3 (produced in 1936-38) had basic armor of .59-inch homogeneous plate. At this time there were only 5 bogie wheels on a side instead of the present 6. There is a gap in the formation until 1939, when the tank appeared with 1.18-inch face-hardened armor on the turret and front. This model had 6 bogie wheels on the side. The side armor which forms a great part of the chassis was of softer, machineable-quality plate, due both to necessities of manufacture and to the undesirable weakening effect on hardened plate of the necessary suspension and bracket holes. The model also had improved aperture protection in the form of an external moving mantlet, additional armor around the machine-gun port, and an improved double-flap driver's visor. It appears that these features were added with the modification of but 2 plates on the tank.

(3) 1941 Changes

In 1941, as more powerful guns were being used against tanks, 1.20 inches of additional armor plate was bolted against the plates on the front of the superstructure and on the upper and lower nose-plates. The 1.18-in. basic plates were face-hardened to a Brinell hardness of 600 to 800 and 1.20-in additional plates were the same. About a year later, in January 1942, the tank appeared with a basic armor of 1.96 inches on the front and back, the side-armor thickness remaining unchanged at 1.20 inches. This armor was face-hardened and performed well against monobloc shot, but once the face-hardening was pierced, the shell fragments penetrated the remainder with ease.

(4) 1942

Therefore, in June 1942, a .79-inch additional plate was bolted on the gun mantlet and front superstructure as a means to defeat a shot with a piercing cap. Between this plate and the basic armor was an air gap or space, varying from 4 to 8 inches. The plate conformed roughly to the shape of the section covered. The spaced armor seems to have been a field expedient, resulting undoubtedly from the demonstrated fact that the spare section of track carried on the front of German tanks gave additional protection. This method of adding armor was officially recognized, as later models had brackets fitted for installing spaced armor when desirable.

b. PzKw 4

(1) Early Models

The PzKw 4, a slightly heavier tank than the 3, has passed through much the same line of development. Little is known about the models A, B, and C of this tank, but Model D was in use during the greater part of the period 1940-43. Specimens of armor cut from Model D have been examined. Of these, only the front plate of the hull appears to be face-hardened; this plate is carburized. All of the plates were high-quality, chromium-molybdenum steel, apparently made by the electric-furnace process.

The first increase in the armor of this tank was reported in 1941, when it was observed that additional plates had been bolted over the basic front and side armor. The additional plates on the front were 1.18 inches thick, making a total of 2.36 inches, and those on the sides were .79 inches thick, making a total of 1.57 inches. In its early stages, this addition was probably only an improvised measure for increasing the armor protection of existing PzKw 4 models in which the thickest armor was only 1.18 inches.

(2) Model E

In Model E, which had 1.96 inches of single-thickness nose plate, the fitting of additional armor on the front of the superstructure and on the sides of the fighting compartment was continued. Although the arrangement of the additional

side armor on this model appears to have been standardized, that on the front superstructure was by no means uniform.

Three PzKw 4 tanks have recently been examined. In each case, extra armor had been fitted to the vertical front plate carrying the hull machine gun and driver's visor. It had also been added to the sides of the fighting compartment both above and below the track level. The extra protection above the track level extended from the front vertical plate to the end of the engine-compartment bulkhead. It was thus 110 inches long and 15 inches deep. The pieces below the track level were shaped in such a way as to clear the suspension brackets. They were 90 inches long and 30 inches deep. All this extra side protection was .97 inch in thickness.

The vertical front plate was reinforced in three different ways. On one tank, two plates were used; one over the plate carrying the hull machine gun, this additional plate being cut away to suit the gun mounting, and the other plate over the driver's front plate, cut to shape to clear his visor. On the second tank, the arrangement around the hull gun was the same, but the extra protection around the driver's visor consisted of two rectangular plates, one on each side of the visor, there being no extra plate immediately above the visor. On the third tank, the only additional front armor was the plate around the hull machine gun. No additions had been made to the driver's front plate. In all cases, the extra frontal plating was 1.18 inches thick; the nose plate was unreinforced, but it was 1.97 inches thick, and the glacis plate was .97 inch thick. The final drive casings of PzKw 4 tanks of this period were also sometimes reinforced by .79-inch protecting rings. The additional plates on the front were face-hardened.

It is probable that the reinforced armor on the front superstructure of this model will compare closely with that on the corresponding parts of the PzKw 3 of 1941 and that the 1.96-inch nose plates will not differ substantially from those on the more recent PzKw 3's of June 1942, known as "Model J."

The reinforced (.79 inch plus .79 inch) side armor has, however, no counterpart in any PzKw 3 model. The additional plates are of homogeneous quality and have a Brinell hardness of about 370 on the front surface.

(3) Model F

Towards the end of 1941 the Germans introduced a PzKw 4, Model F, having 1.96-inch frontal armor (gun mantlet, front superstructure and hull nose-plates) and 1.18-inch side armor. In this and many other respects, the Model F conforms more closely than its predecessors to the corresponding model of the PzKw 3 (in this case PzKw 3 Model J). So far, the armor of the PzKw 4 Model F has not been examined to ascertain its chemical and ballistic properties, but there is a strong probability that these do not differ greatly from those of the PzKw 3, Model J.

(4) Model G

This model which mounts the long 75-mm gun, Kw.K 40, was first encoun-

tered in June 1942. It is reported from the Middle East that its armor is the same as that of Model F; namely 1.96 inches on the front, and 30 mm (1.18 inches) on the sides.

6. PROTECTION OF JAP TANKS AGAINST STICKY GRENADES

Two Japanese tanks captured in the Solomon Islands were coated all over with grease, apparently to prevent sticky grenades from adhering.

CHEMICAL WARFARE

7. GERMAN ANTIGAS EQUIPMENT FOR HORSES

The horse still plays an important part in the German Army. For example, there are over 4,000 horses in the German infantry division.

German antigas equipment for horses is reported to include the following:

(1) A gas mask with 2 canisters. The mask protects horses and mules against all gases affecting the respiratory organs. The life of the canisters is several hours, depending upon the concentration of the gas and the nature of the animal's work; the canisters can be readily changed;

(2) A pair of goggles to be worn with the gas mask to protect the eyes from spray;

(3) A set of hoof covers to protect the lower part of the leg on contaminated ground. The front-leg covers are shorter than the hind ones;

(4) A supply of decontamination material.

All of the above items are carried in a single special container.

ENGINEERS

8. CAMOUFLAGE

A recent British publication gives some excellent pointers on camouflage, including some principles of general application.

* * *

a. If an effective camouflage idea interferes with an administrative lay-out, change the administrative lay-out.

b. If a camouflage idea prevents the effective tactical use of a weapon or a position, modify the camouflage idea.

c. Remember that camouflage is something to be done before and not after. It should be preventive medicine and not plastic surgery.

d. Therefore, an advance party is worth its weight in gold in planning measures for concealment. In preparing to take up a position, here is the ideal order of events:

(1) Reconnoiter the site and decide how best you may use any existing pattern to assist concealment.

(2) Plan the paths by which you will reach those positions without leaving "pointers" for the enemy to follow.

(3) Plan how to reduce to a minimum the mess due to digging, building, etc., and how to hide whatever part is inevitable.

(4) Hide or disguise the shadows. Cover the shiny surfaces. Make color match the surroundings as well as you can; but remember that it is more important to have the correct texture than the correct color.

(5) See that your camouflage plan is understood and followed by all in the unit.

(6) Remember that unless you keep strict traffic control and maintain your camouflage properly, your position will soon become conspicuous again.

e. Remember that the lower the object, the smaller the shadow cast.

f. Remember that even if you are halted for only a very short time, it is worth while taking all possible measures for concealment. Once spotted by the enemy, even if you are not attacked, your game has been given away.

Even if it is only a matter of parking vehicles for a few hours, it is well worth while sending someone ahead who has studied the principles of concealment.

to view the ground you intend to use and to make a plan of how to use it to the best advantage.

If you can follow the principles outlined above, the positions you occupy will look less like ground taken over by the army. They will therefore look less important to the enemy, less worth while to photograph, or attack. Finally, remember that concealment is not hiding for the sake of hiding. It is hiding in order to attack the enemy with more deadly effect. That is the beginning and end of camouflage of armies in the field.

9. GERMAN WARNING DEVICES IN LIBYA

A United Nations patrol operating in Libya returned with the following information.

An enemy post was surrounded by triple concertina fence, upon which were booby traps that gave warning of the approach of the patrol. Few details are available but it appears that the explosions caused by these traps were not very large. It has been suggested that the traps may have consisted of German "egg" grenades with the screw caps removed and the igniter strings tied to the wire fence.

This type of booby trap had been found before, when a derelict vehicle had at least 20 such grenades tied to it.

For such a device to function satisfactorily, it would be essential for the body of the grenade to be secured firmly. The standard igniter for the grenade has a delay of about 4 to 5 seconds. The effect of the "egg" grenade is mainly blast.

10. GERMAN WOODEN ANTITANK MINES

Recent reports indicate that the Germans have placed orders in Norway for the production of wooden casings for antitank mines. One report states that these casings are of "fiber wood pulp" and adds that their object is to defeat present electro-magnetic methods of mine detection. A second, more detailed report states that the casings measure 8 x 8 x 2 inches and are made of 3/8-inch board impregnated on the inside. The filling is stated to be "trinol" (TNT), and the igniter, which is of the pressure type, is described as contained in a zinc casing, and inserted into a pressed TNT booster. The report states that on one occasion, owing to a shortage of TNT, the mines were filled with "donarite" (a commercial explosive of the dynamite class), but that this practice was abandoned as soon as supplies of TNT were received. It is further stated that the mines are specially intended for use in coast defenses.

Two types of wooden-box antitank mines have been encountered recently in North Africa. The first is a wooden box (Italian) 12 in. square and 6 in. deep, containing 25 blocks of TNT amounting to 11 pounds,* with 4 igniters of thin bakelite. Approximately 180 pounds of pressure on the wooden lid is needed to trip the igniter. The other kind of box is similar, but not so large, and has two aluminum igniters. One of the recent minefields had 222 wooden-box mines as against 75 Tellermines.

Comment: The Germans may be considering the adoption of non-metallic mine cases and the production of pilot models for trials is probably true. The use of such mine cases would reduce the detecting range of mine detectors.

11. ITALIAN ANTIPERSONNEL MINE

The following information on a new Italian antipersonnel mine has been obtained from the examination of captured specimens.

The mine proper consists of a thin sheet-metal case 1/16 inch thick (1), on the outside of which is wound the strip-metal loading (2).** This latter consists of 23-1/2 turns of mild steel strip, 0.21 inch in width and 0.15 inch thick. The mine cases and the reported production of pilot models for trials is probably true. The use of such mine cases would reduce the detecting range of mine detectors. of TNT weighing 100 grams (3.5 ounces). The over-all length (with striker cocked) is 17.6 inches.

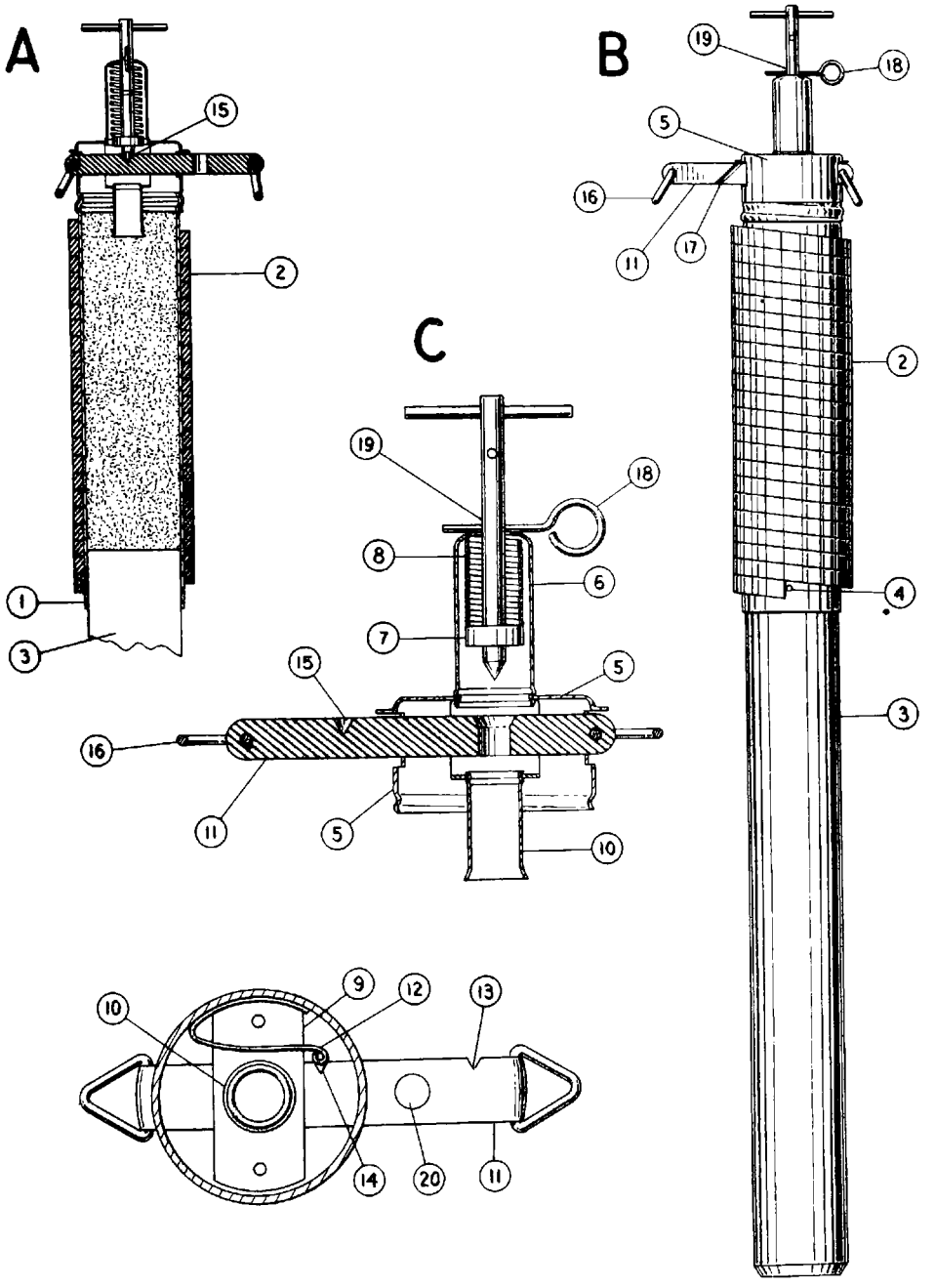
The mine is closed by the screw-on lid (5). Into a hole in the top of the lid is inserted the housing (6), which contains the striker (7) and the striker spring (8). Riveted to the under side of the lid is the stirrup-shaped holder (9), into the center of which is pressed the tube (10) which houses the detonator. Passing through the lid, through slots in the side, is the aluminum cap holder (11), which is located in the armed and unarmed positions by the spring (12). The coiled end of the spring engages in the groove (13) in the firing position, and in the groove (14) in the unarmed position. Uncocked, the striker rests in a seat (15).

The loops (16) at the ends of the cap holder enable the latter to be pulled into the firing position by remote control, and at the same time prevent the holder from being pulled out completely. The groove (17) is probably intended to weaken the holder, though its use is not apparent.

The mine is armed by pulling out the striker, against the action of the striker spring, from the position at A (see sketch) to the position shown at B, and inserting the safety pin (18) in the lower hole (19). The striker is then cocked. The cap is next inserted into the hole (20), and the trip wire connected up to the safety pin (18). Finally, the cap is pulled into the firing position shown at C, and the mine is then completely armed.

*There is reason to suppose that this weight may be even more--possibly 25 to 30 pounds.

**This is apparently grooved to assist in fragmentation.



ITALIAN ANTIPERSONNEL MINE

12. SOME NOTES ON GERMAN EXPERIENCES IN RUSSIA

The Germans have not failed to draw appropriate lessons from their campaign experiences in Russia. These have sometimes resulted in the re-emphasis of old doctrines; at other times, new or modified tactics have been adopted to meet particular features of warfare on the Eastern Front. Some of the combat lessons as stated in German documents are summarized below.

* * *

a. Attack

The practicing of attack tasks by individual companies, with heavy weapons and an allotment of engineers and assault guns, is very important. Instruction in close combat is to be extended. The importance of coordinating flat-trajectory and high-angle fire must be drilled into all officers, from section leaders up.

The success of attacks lies in using darkness and bad visibility to allow one's forces to approach the enemy and prepare for the breakthrough.

Attacks should not always be made at the same time of day, but, like the Russian practice, often at night, at dawn, in fog, or in snow storms.

Concentration of fire must be obtained by the allotment of heavy weapons to companies in the assault. The urge to speed up the attack must not lead to insufficient preparation.

When a position is taken at dusk, all-around defense must be effected (hedgehog fashion), and improvements made as soon as it is light.

b. Fire

The best riflemen should be equipped with automatic rifles with telescopic sights, so that they can be used as snipers with best effect. Rocket weapons are to be used when practicable, as they have a great effect against attacking forces and those which have dug themselves in. Heavy infantry-gun shells with delay fuzes often fail to explode on hard objects such as stony ground, stone walls, houses, ice, etc., as the fuzes break off. When this is noticed, an immediate change-over to instantaneous fuzes must be made.

c. Defense

The Russians are keen observers. All lights, smoke, etc., must be cut down to a minimum. At night, listening posts manned by two men must be set up and great stress laid on the importance of sentry duty. This must be practiced for long periods at night and in all weather.

d. Town and Street Fighting

When a village is attacked, the enemy must be held down frontally and attacked from the sides and rear. Strong assault units, armed with plenty of grenades, should take the individual houses and nests. Large built-up areas must be attacked systematically, section by section.

The defense of villages must combine aggressive reconnaissance of the front and flanks with the neutralization by fire of known assembly points. The Russians are adept at utilizing all available cover in order to approach villages from the flanks. They aim at taking up enveloping positions in order to launch an attack, often at night, for the systematic destruction of the village. If tanks are used, they engage house after house with their guns and force out the defenders.

e. Miscellaneous

(1) On repeated occasions, high casualties have been produced by bunching, and by failure to move forward by short bounds. (Over-fatigue and resultant indifference were given as reasons.)

(2) In order to lessen the number of abdominal and chest wounds, strict instruction must be given in short and skillful movement by bounds.

(3) It is most important that men dig in quickly and effectively to protect against surprise fire from mortars and rocket guns. Every soldier must be reminded that digging in and camouflage are his duty at all times. As soon as troops are within enemy artillery range, slit trenches should be prepared (without special orders).

(4) Personnel of first-line transport should be instructed in the building of cover for men, horses, and vehicles. All areas behind this front should be on the alert for raids.

13. GERMAN COMBAT INSTRUCTIONS

It is believed that the following combat instructions, a translation of German Panzer army headquarters' order, will be of general interest. The order has reference to recent operations in Tunisia. It is reproduced with only a few minor changes made with a view toward greater clarity for American readers.

* * *

a. Organization of Defensive Positions

Having increased to the full the bridgehead, this defensive position must be organized and strengthened until the arrival of the main force.

(1) Work will be done in the following order:

(a) Road blocks (with mines, according to circumstances)
(b) Siting of antitank guns and machine guns
(c) Assembly points for tanks
(d) Command posts
(e) Telephone communications

(2) Since engineering equipment and transport have not arrived, work must be done temporarily with improvised or rented material (no requisitioning).

b. Reconnaissance

War in Africa necessitates a far more extensive reconnaissance than in Europe. For this reason, reconnaissance patrols in certain cases are away for several days.

(1) First, the Axis forces must push out reconnaissance forces to a line 20 kilometers west of Kebili.*

(2) To achieve this, even by using Arabs, it is necessary to know to what nations and to which arms of the service the enemy forces behind this line belong--a line which is considered to be the advance line of the main body of their army.

(3) Use must be made of assault troops. Based on preliminary close reconnaissance, attacks must be carried out to cut off isolated enemy elements and capture transport (especially motor transport) and arms.

(4) Any plan of action for a unit larger than a company must first be communicated to Army Hq.

(5) Actions of a particular nature which aim at the capture of necessary avenues of approach, of high ground suitable for observation, etc., must be communicated in reasonable time so that the support of Army reserves may be given to units near the battle area.

c. Tactics

Every effort should be directed towards defense against much superior infantry, armored forces, and air attack which might threaten our present line.

(1) Every position must have an element (about one third of the whole strength) armed with numerous automatic weapons and ample ammunition, in order that centers of resistance may be formed, particularly on roads.

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*Kebili is roughly 225 miles south by west of Tunis and about 100 miles south of Kasserine Pass. A north-south line running through Kebile would be about 55 miles west of Tunis.

(2) In rear of the flanks, units must be held ready for counterattack along lateral roads that have been reconnoitered and along which night positions have been prepared. It is not a matter of seeking contact with the enemy's flank but of penetrating into his rear.

(3) Our artillery, still numerically weak, consists of infantry howitzers.* The artillery must organize positions and observation posts not only on one but on all the possible enemy lines of advance, and prepare or improve the quickest route (i.e., the shortest) which may link up these positions. Only extremely mobile artillery can, by its dispositions, fulfill its task.

(4) Besides emplaced antitank guns, unit commanders must have a mobile reserve of antitank weapons.

(5) Fire is nearly always opened at the wrong moment.

(a) Artillery must open fire at extreme range.

(b) Infantry and machine guns only fire at 300 meters. Enemy infantry carried in armored vehicles must be fired on first, thus separating the following infantry from their tanks.

(c) Assault tanks which move in front are not the concern of the infantry. They are neutralized by the antitank defense and by artillery. Enemy tanks which remain in the infantry area must be blinded and destroyed by groups specially trained as tank destroyers.

(d) Regimental antitank weapons must open fire at not more than 500 meters. If fire is opened earlier, it is a sign of fear, and above all it achieves no results. At the opportune moment an attack should be made on the flank; at the same time reconnaissance elements should be pushed forward within the enemy lines to oppose new enemy supporting forces, but the results of this action must not be waited for. The counterattack can be undertaken and be effective when the enemy is completely beaten and brought to a halt by fire. The troops engaged frontally likewise take part in the blow delivered against the enemy.

d. Messages and Information

(1) I forbid the use of the expression "strong enemy force."

(2) Either exact figures, or the extent of an attack (for example 100 meters) will be given, or the forces employed will be specified (For example: "one platoon at least"; "one company at most.")

(3) Care must be taken that all observations be communicated exactly and precisely to higher headquarters. The time, place, and circumstances in which such and such a thing has been observed or attacked by fire must be stated.

*Six 75-mm and two 150-mm infantry howitzers in each infantry regiment.

e. Comfort of Troops (Duties Incumbent on Unit Commanders)

(1) The most advanced posts must have hot soup.

(2) Now, during the rainy season, protection against dampness is extremely important; if necessary, Arab "burnous"* must be bought to prevent sentries getting wet.

(3) Carry a pair of socks in the trouser pockets, so that you can change after completing a tour of guard duty.

(4) Do not allow men who have a touch of temperature to become seriously ill; otherwise, they will be off your strength for several months. Send them in time to the field hospital, for 3 or 4 days.

(5) Everyone must wear continually a flannel body belt.

(6) In future, from sunset to sunrise the body should be fully covered.

f. Supplies

Supplies should be echeloned from the unloading point to units, so that local means of transport may be utilized, and gasoline be saved for operations.

g. Transport

Motor transport of all types must have their documents (e.g., for drivers, the dispatch ticket). General's vehicles are the exception to this rule. Motor transport will be requisitioned to give mobility to units. (Signed: Arnim)

14. JAPANESE USE OF NOISE AS A WEAPON

The following notes are quoted from an Australian publication, and concern Japanese tactics as designed to give their opponents the "jitters--the 'we are cut off" feeling."

* * *

When the operations of the present war are examined closely, especially those in Malaya, it is realized that defeats and retreats are brought about principally by the new weapon--"Noise." The more eerie the noise, the more effective--anything that can give troops the "jitters."

Noise is used to upset the morale. It aims at disrupting the psychological balance of the soldier and sometimes affects whole units.

*Woolen robe.

Aerial bombing causes few casualties, especially when troops are in shelters or slit trenches, but the effect on the troops is very great--much greater than artillery bombardment where the casualties are much heavier. In Malaya, troops which stood up well to artillery and mortar fire became extremely uneasy under aerial bombing. This was due mainly to the great smashing noise caused by the explosion of bombs. Usually the Japanese "blanketed" an area by dropping bombs from 20 or 30 or even more aircraft simultaneously. The noise was terrific and the effect on the troops in the area was very great psychologically, though not serious physically.

This psychological effect cannot be ignored. Many military leaders--usually those who have not experienced heavy aerial bombing--cannot understand why troops should be so seriously affected when the physical casualties are so light. The fact is that they are affected.

One noise-making device used on many occasions in Malaya by the Japanese was to fire bursts from a machine gun (or even two or three) behind the line all night long. This soon created in the receptive minds of the troops the "we are cut off" idea. Sometimes a few snipers who had infiltrated behind the lines fired shots throughout the night for the same purpose. They fired into space--no casualties from this firing were experienced, but the "casualties" on the morale side were heavy. Weak troops began to worry, and "look over their shoulders." They became unreliable, and when pressed from the front and flanks they were inclined to surrender, or more frequently to "escape." They usually escaped easily enough without loss through this phantom force behind them. The enemy, expecting this, was quick to take advantage of it, and thus another retreat was started. Usually it took days to collect these drifters or stragglers, and when they were collected and sent forward again they were less reliable than ever.

In Malaya and also in the Philippines, the Japanese used a time bomb fired behind our lines by a mortar or gun. On striking the ground, the bomb burst open and set off a fuze which fired intermittent explosives which sounded like a machine gun. This was called by our troops "a packet of crackers." This sounds childish, but it had a definite effect on many troops, especially those whose morale was below the average.

The Germans have an attachment to aerial bombs and shells, a device which makes a screaming noise as they fall through the air.

Any noise that may upset the nerves of their enemy has been adopted by both the Japanese and the Germans.

Our men must be taught to steel their nerves against uncanny and eerie noises. During their training, especially night training, all kinds of weird noises should be used to accustom them to this new weapon. They must be taught that noises hurt no one. They must learn to laugh at them.

At the same time, we should copy this successful trick from our enemy. The Japanese are very susceptible to howling noises. When the Australians

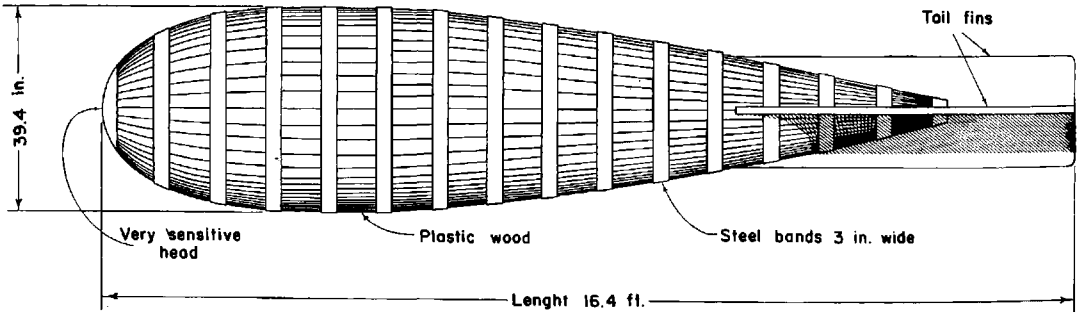
charged them with the bayonet, they went in with a terrifying yell. The Japanese could not stand it--they ran away screaming time after time. The yell terrified them as much as the sight of the cold steel.

We must invent and use every ingenious device that can terrify frightened men. Siren whistles should be used, of course with discretion. Even a soft tapping of wood or metal constantly all night long near their lines will worry them. Animal noises, even eerie lights, will have an effect. The ingenuity of cunning soldiers will soon devise sound effects that will upset the nerves of our enemy. They must be used with caution, otherwise they will become ridiculous--thus eliminating noise as a weapon.

ORDNANCE

15. PLASTIC-WOOD LIQUID-AIR BOMB

From an unofficial German source which may or may not be trustworthy, comes a description of a bomb built up out of staves and hooped like a barrel, with liquid air as a bursting charge.



The material was plastic wood consisting of seven or eight pressed layers with a total thickness of about 60 mm (2.37 in); the steel hoops were about 3 inches wide. In length, the bomb was about 5 meters (16.4 ft); in diameter, about a meter (39.4 in). The weight was not stated. In the dome-shaped head was a sensitive fuze and detonator. The explosive charge was stated to be liquid air.

16. ITALIAN 5-KILOGRAM TARGET-INDICATOR BOMB

The report on this particular type of bomb, known by the Italian name of bomba vento, gives the following dimensions:

Total weight	11.5 lbs (approx)
Over-all length (without fuze)	15.2 in
Over-all length (with fuze)	17.4 in

Length of body	8.9 in
Length of tail	9.2 in
Maximum diameter of body	5.2 in
Diameter of tail	7.0 in

The bomb is formed on a thin, sheet-metal cylinder (1) - see figure A - 6.7 inches in length and with a diameter of 3.1 inches. The lower end is closed by a thin steel disk (2) which has a central hole 0.9 inch in diameter. The fuze tube (3) is fitted over this hole and pressed into the disk (2). The four supports (4) for the vanes are spot-welded to the side of the cylinder. The short tube (5), 1 inch long and threaded at its outer end to receive the suspension lug (6), is also spot-welded to the cylinder (1). (For vertical suspension the lug in the fuze is used.) Four additional short tubes of small diameter are welded over four corresponding holes near the open end of the cylinder. One pair of these short tubes, which are 0.9 inch apart, lies symetrically between two vanes, and the other pair directly opposite between the other pair of vanes. They are intended as guides for the wire*(7) (see figure B). The bomb body (8) consists of hard concrete in which steel pellets are embedded. Two sets of spiral reinforcing are provided. Three turns of wire (approximately 16 standard wire gauge) are wound clear of the cylinder (1) near the open end. The wire passes through holes (9) in its vane-supports (4) and is welded at its end to the cylinder. Five turns of heavier reinforcing (about 8 standard wire gauge) are wound as shown at (10). This wire is welded to the cylinder (1) at one end and to the tube (3) at the other.

The vanes (11) are made of aluminum alloy and are riveted to the supports (14).

The cylinder contains the bomb filling, which may consist of a cardboard tube (12) filled with a smoke composition (13). The cylinder is closed by a cork plug (14, in figure B) held in position by the wire (7). The smoke composition is labelled Luce e Fumo Bianco, which indicates that a flash as well as a white smoke is emitted from the bomb.

An alternative filling which has been found consists of a 1-kilogram incendiary bomb (15, in figure C) with a black-powder charge (16) placed between it and the fuze when assembled in the vento bomb. When so employed, the incendiary bomb has the usual transit plug (21) drilled to take the flash from the charge (16).

An alternative tail has been recovered in which the cork plug (14) is not used to close the bomb, but instead a wooden plug of the shape shown at (16) figure D performs the double function of closing the bomb and supporting the vanes. These latter, shown at (17), are 8.7 by 2.6 in. and made of three-ply wood. They are inserted in slots in the plug (16) and are strengthened by a metal binding (18) and by four level strips (19) running the whole length of the vanes. There are four holes (20) passing through the plug located halfway between each pair of vanes. The plug (16) is attached to the bomb by four nails inserted through the concrete body. The fuze employed in this bomb is type S.

*I.e., to provide a passageway through the concrete body of the bomb for the wire.

From specimens examined it would appear that the concrete bombs, which are fitted with wooden tails, have no fuzing arrangement. In one case, there was no metal cylinder (1) or fuze tube (3). A single suspension lug was cast in the bomb at the nose. It is thought that these may be the Italian practice bomb, Bomba 5E.

It is learned from Italian sources that the vento (wind) bomb is designed to be used in conjunction with the 500-kilogram gas bomb(Bomba 500 0). The purpose of the bomb when dropped is to indicate the force and direction of the wind at ground level. The former is estimated from the angle the smoke makes with the ground, and the latter from the direction of the smoke trail.

During the day, the "smoke" filling is used, while as an alternative at night, the incendiary filling would be effective.

SIGNAL CORPS

17. AXIS SMOKE CODES AND SIGNALS

From a South African source comes a memorandum on Italian smoke signals for communication with aircraft, stated as applicable to Germans troops as well. The main advantages of smoke were given to be:

Safe and easy handling;
With good visibility it can be seen at 2,000 feet;
Produces dense concentrations for at least 30 seconds.

Five basic colors are used; orange, violet, red, green,and white. By using the 5 colors in various pair combinations, a total of 12 distinct and useful signals can be made. These are as follows:

a. Own Troops

Orange	Own troops are here
Orange and red	We are isolated - enemy is behind us
Orange and green	Continue your active support
Green	We are advancing - we are attacking - increase the radius of your action

b. Enemy Troops

Red	Enemy is attacking
Red and green	Enemy attacking our right flank
Red and white	Enemy attacking our left flank

Fig. "A"

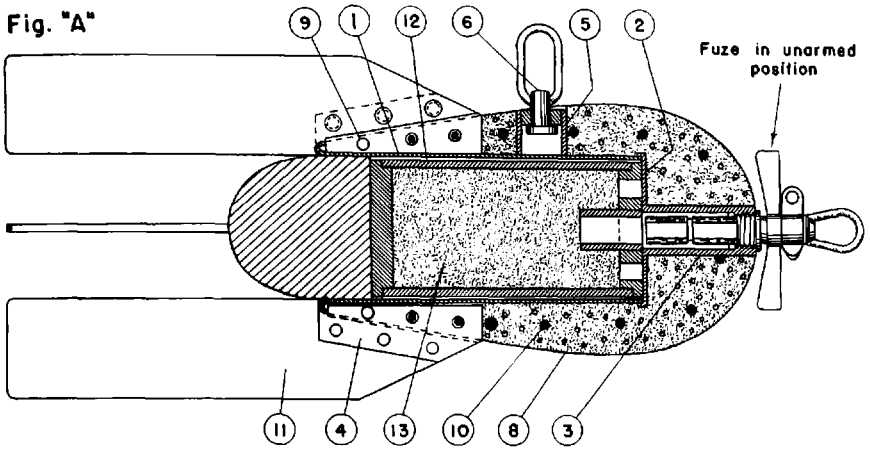
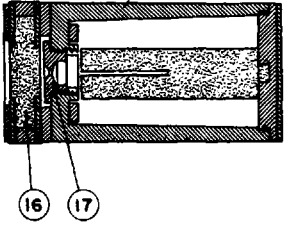


Fig. "C"



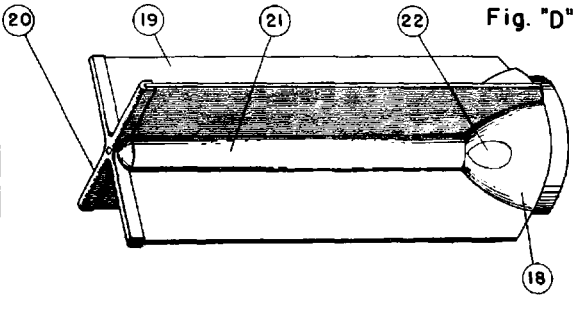
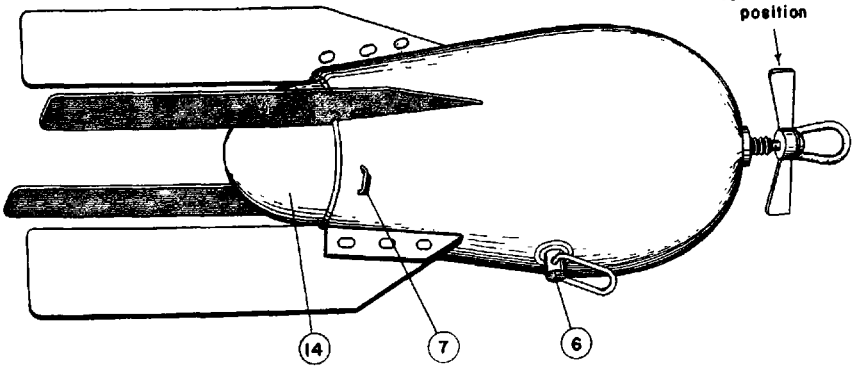


Fig. "D"

Fig. "B"



ITALIAN TARGET-INDICATOR BOMB

c. Tanks

Violet	Enemy tanks in front of us
Violet and red	Enemy tanks behind us
Violet and green	Enemy tanks on our right
Violet and white	Enemy tanks on our left
Violet and orange	Own tanks going into action

TRANSPORTATION

18. NOTES ON RUSSIAN AND JAPANESE ANIMAL-DRAWN TRANSPORT

With a high degree of motorization in many modern armies, particularly our own, it is easy to overlook the important part animal-drawn transport has played in World War II. In the German infantry division, horse-drawn vehicles are extensively used. A two-wheeled animal-drawn cart is standard equipment throughout the Japanese army. Finally, it is felt that if Russia had not possessed a large amount of animal-drawn military transport, their supply lines might have long ago broken down with the consequent defeat of her armies in the field; this is true not because of a lack of motor transport, but rather because ground conditions in Russia during much of the year make it essential that motor transport be extensively supplemented by animal transport.

The Soviets have clung tenaciously to the small, time-tested two-wheeled cart and a light four-wheeled wagon for transport, notwithstanding the great strides in motorization. These vehicles are not only used in the army, but also play a very important role in civilian transportation facilities.

There are definite reasons why Russians use a light vehicle instead of a heavy wagon. First, the Russian horse is of small stature, averaging less than 15 hands and, although he is a hardy and tough animal, he is unable to pull the load of the larger draft animal. (It is very unusual to see anywhere in the U.S.S.R. a large horse.) Secondly, inasmuch as so very little hard-surfaced, cobbled, or even improved roads exist in the U.S.S.R., transport is confined to natural dirt roads and even cross country; in certain conditions this make passage all but impossible. For military purposes in particular, cross-country operation is the rule, and in periods of thaw and rain, Russian mud is well-nigh impassable to any type of transport except a small wagon and cart or sled. When a Russian four-wheeled wagon becomes bogged down, a handful of soldiers can extricate it with very little trouble and keep the column moving. Thirdly, the Red Army finds a ready means of supplementing its organic transportation wherever it moves, since every community contains its complement of the standard cart, wagon, or sled which can be quickly commandeered for military purposes.

In the rear areas of the group of Russian armies which surrounded Stalingrad, American observers report the presence of the four-wheeled wagon, and of sleds of the same dimensions and capacities; these were the only means of supply

other than trucks. Where trucking was lacking for the supply during the encirclement of the Germans, thousands of four-wheeled wagons and sleds were recruited from the local inhabitants and elsewhere. The Russian general in command of operations in the Stalingrad area stated that movement from railhead to distributing point was a slow process requiring considerable valuable time, but by utilizing all types of transportation, including the two- and four-wheeled vehicles, he was fully supplied and on time.

The construction of the two-wheeled cart is very simple, and it is built to carry 450 to 500 pounds. It is fitted with shafts and drawn by one horse. It is 2 1/2 ft. deep and 4 ft. long. The four-wheeled wagon and the sled are about 2 feet longer and are drawn by one, two, three, or four horses in line.

It is noteworthy that nowhere is there evidence of the use of large heavy wagons of the escort type.

In winter dogs are used to draw light sleds. In the more northern regions even reindeer are used; they provide the cheapest and most economical means of transport, since they feed on the tundra (open, treeless plain).

In the Japanese Army a two-wheeled cart is standard equipment of the Transport Regiment, and is used throughout the armed forces. The cart is made of wood, and is strongly constructed but light in weight, so that it can be manhandled when necessary. It is fitted with shafts, drawn by one led horse, and carries about 450 to 500 pounds.

When used as an ammunition carrier, the standard load of the Japanese two-wheeled cart is 12 boxes of 540 rounds each of rifle ammunition, or 12 rounds each of 37-mm ammunition. The same cart is also converted into the standard two-wheeled ambulance. In each corner, steel posts are fitted, from which two stretchers are suspended on springs, one above the other. A waterproof canopy with side curtains is fitted. When stretchers are not in use, the cart can accommodate three persons sitting.

SECTION II

ENEMY SELF-PROPELLED GUNS--
A SUMMARY OF KNOWN EQUIPMENT

ENEMY SELF-PROPELLED GUNS -- A SUMMARY OF KNOWN EQUIPMENT

a. General

Self-propelled guns represent one of the technical advances made in ordnance during this war. The following account, from British sources, of German, Italian, and Japanese equipment shows the considerable interest which this development has aroused. Several descriptions and sketches of these guns have already been published in earlier issues of Tactical and Technical Trends.

With reference to German self-propelled guns the following general points are worthy of note:

There are no known German self-propelled heavy antiaircraft guns;

With regard to antitank guns, while there have been many local improvisations, the present German tendency is to provide self-propelled mounts for the heavier antitank weapons only;

In every case standard guns and standard chassis, whether semi- or full-tracked, are used;

All self-propelled guns are provided with AP and HE ammunition, and can thus effectively engage both "soft" and armored targets.

b. German AA/AT Guns

(1) 20-mm AA/AT Gun

Although primarily an antiaircraft gun, this piece can also be used against tanks. Mounted on a 1-ton half-track (see figure 1) with a gasoline engine, it usually tows a single-axle ammunition trailer. The armament is a long, thin-barreled, 20-mm, high-velocity gun. The weight in action is 4.5 tons; the length, 15 ft. 7 in., the width, 7 ft. 1 in. and the height, 6 ft. 7 in. On roads, the radius of action is about 137 miles; cross country, about 93. The crew is seven men.

There are two versions of the gun itself, namely the 20-mm Flak 30 and the 20-mm Flak 38. The gun, mounted in front, may or may not be shielded. It fires 20-mm, .260-pound, high-explosive shells at a high muzzle velocity of 2,950 f/s, the .327-pound AP shell at 2,625 f/s, and the .223-pound AP 40 shot at 3,270 f/s. The firing rate is 120 rpm. The horizontal range is 5,320 yards. The mountgives an all-around traverse and an elevation varying from minus 12 degrees to plus 90. At 400 yards, the AP shell will pierce .98 inch of homogenous armor at an impact angle of 30 degrees, and 1.50 inches at normal. At 400 yards' range, the AP 40 shot will pierce 1.46 inches at 30 degrees, and 1.69 inches at normal.

(2) 20-mm Four-Barreled AA/AT Gun

This is a Vierling (quadruple) gun on an 8-ton half-track (see Tactical and Technical Trends, No. 4, p. 4) 22 ft. 6 in. long by 7 ft. 11 in. wide and

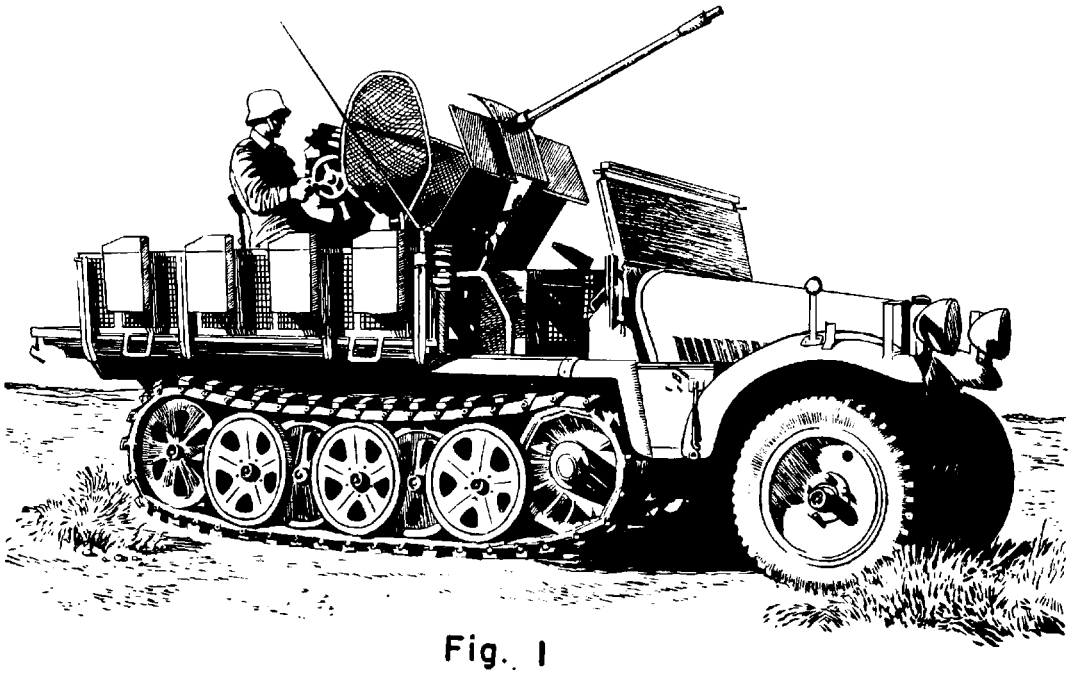


Fig. 1

10 ft. 10 in. high, weighing, ready for action, 11.5 tons. The gasoline engine develops 140 brake horse power, giving a radius of action on the road of 155 miles, and about 62 cross country. The crew is probably eight. The armament is a quadruple 20-mm Flak 38, with an all-around traverse and an elevation stated as from "minus 10 to plus 100" (apparently 10 degrees past vertical--which seems odd, but may be useful when firing at planes passing directly overhead). The range, penetration, and ammunition are substantially the same as for the Flak 30 and 38 previously noted.

(3) 37-mm AA/AT Gun

While like the 20-mm primarily an antiaircraft gun, this 37-mm gun can be used for horizontal fire. It may be identified by the long, slender barrel with a conical muzzle brake (see figure 2), and it usually tows an ammunition trailer. The mount is a 5-ton, half-tracked vehicle, with a 130-HP gasoline motor giving a 156-mile radius on the road, and about 62 miles cross country (which seems rather small). The length and breadth are 20 ft. 7 in. by 7 ft. 6 in.; the height is 9 ft. 2 in. The crew is eight men.

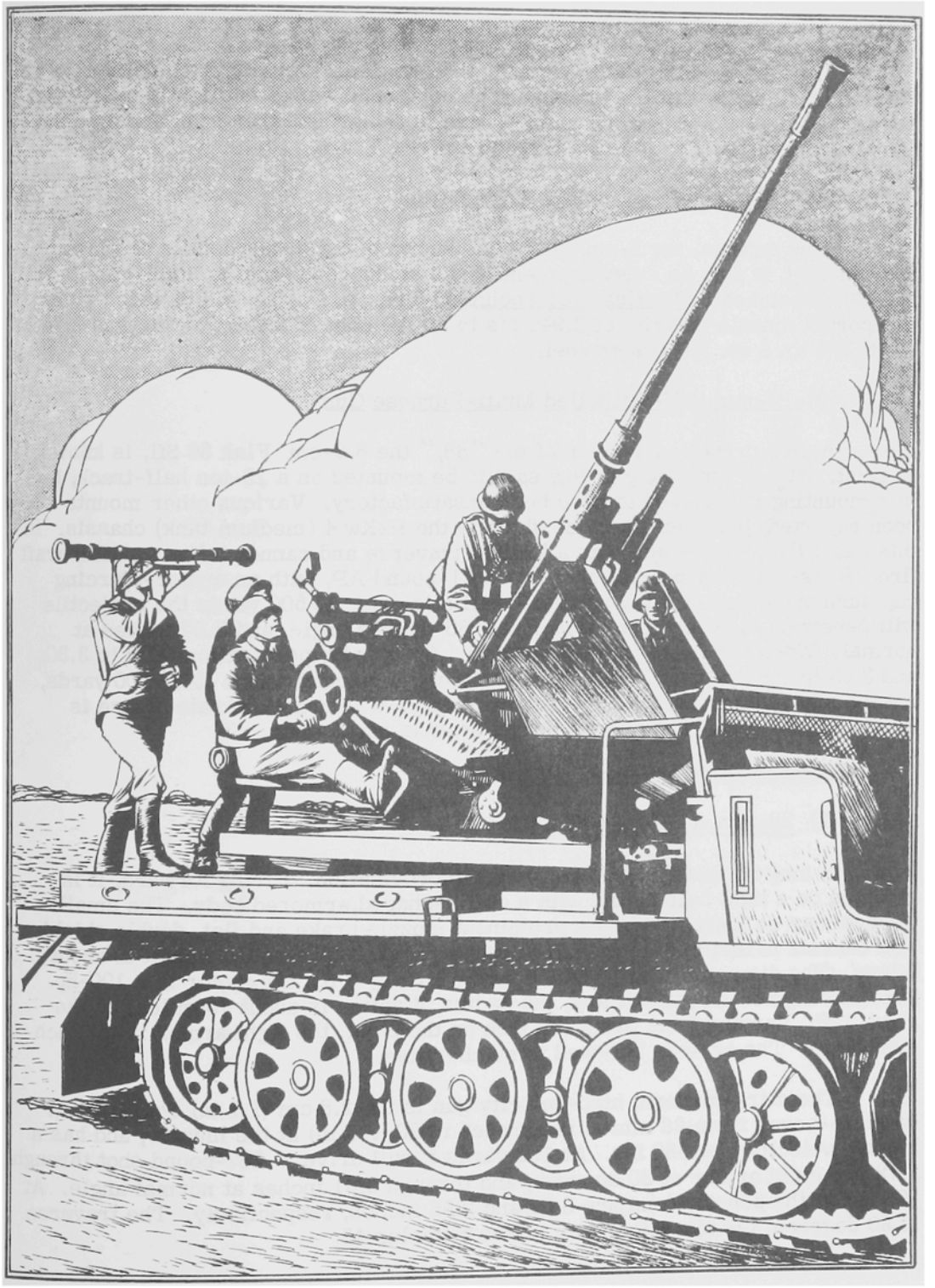


FIG. 2

Like the 20-mm, the 37-mm Flak 36 is a high-velocity gun, delivering an HE shell at 2,690 f/s at the muzzle. The horizontal range is slightly over 7,000 yards, and the rate of fire, 60 rpm. There is all-around traverse, and an elevation of from minus 5 to plus 85 degrees.

(4) 50-mm Self-Propelled AA/AT Gun

This weapon, the 5-cm Flak 41, is known to exist, but details are lacking. Presumably, it may be a development of the standard 50-mm antitank gun (5-cm Pak 38) described in Tactical and Technical Trends, No. 15, p. 38, which gives a reported muzzle velocity of 3,940 f/s to an AP shot of 2.025 pounds, and 2,740 f/s to a 4 lb. 9 oz. AP tracer shell.

(5) 88-mm Self-Propelled Multi-Purpose Gun

A self-propelled version of the "88," the 8.8-cm Flak 36 Sfl, is known to exist. At one time the gun was said to be mounted on a 12-ton half-track, but this mounting is believed to have been unsatisfactory. Various other mounts have been reported, the most likely of which is the PzKw 4 (medium tank) chassis. In this case, the gun probably has a limited traverse and cannot deliver antiaircraft fire. It fires a 20-pound HE shell, or a 21-pound AP, with an armor-piercing cap surmounted by a "wind splitter" ballistic cap. At 500 yards the projectile will penetrate 4.33 inches of armor at a 30-degree angle, and 5.07 inches at normal. When the range is lengthened to 1,000 yards, penetration falls to 3.30 and 3.93 inches, respectively. The maximum horizontal range is 16,200 yards, but the sight is graduated to 10,340 yards only. The practical rate of fire is from 15 to 20 rpm. The number in the crew is not stated.

c. German Self-Propelled Antitank Guns

(1) 28-mm AT Gun, Model 41

It may be that this gun is a local improvisation. Firing forward, it is mounted on a light half-track, with a coffin-shaped, armored body. The small weapon may be identified by its prominent muzzle brake and flat, double shield. The chassis is that of a 1-ton half-tracked vehicle. The battle weight is about 6 tons. The dimensions are 15 ft. 6 in. by 6 ft. by 7 ft.; the motor is a 100-hp gasoline engine. Cross country, the radius of action is about 75 miles; on the road, 120. Varying from about .39 inch on the front, the light armor is .32 inch elsewhere. The crew is believed to number five.

The ultra-modern, high-velocity gun is the 2.8-cm (1.1 in) Pz.B. 41. It is choke-bored from 28 mm at the breech to 20 (.79 in) at the muzzle, and has a muzzle velocity of 4,580 f/s. At 100 yards it will drive a .287-pound shot through 2.72 inches of armor at 30 degrees, and through 3.31 inches at normal angle. At 400 yards the penetrations are 2.09 and 2.56 inches, respectively. The traverse is 90 degrees, the elevation from minus 5 to plus 45.

(2) 37-mm AT Gun

Like the 28-mm, this gun may be a local improvisation. The obsolete 37-mm antitank gun, with or without a shield. fires towards the front and is mounted on a 3-ton armored half-track; weight in action is 8.4 tons (see figure 3). The dimensions are: length 18 ft. 8 in., width 6 ft. 10 in., height

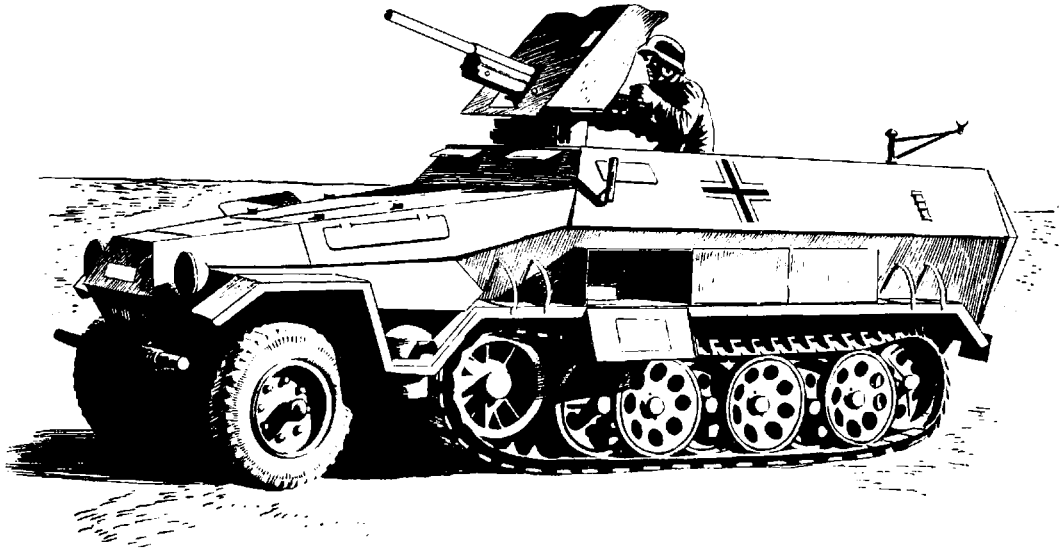


FIG. 3

about 7 ft. 6 in. The gasoline motor develops 100 hp. On the road, the radius is 187 miles, and 81 across country. In front, the armor is from .39 inch to .59 inch in thickness, and on the sides, .32 inch. The crew numbers three.

This gun has a muzzle velocity of 2,500 f/s for the 1.68-pound AP shell and 3,380 (estimated) for the .786-pound AP 40. The HE weighs 1.38 pounds. At 200 yards, the AP shell will penetrate 1.65 inches at 30 degrees and 2.20 inches at normal angle; at 600 yards, 1.34 and 1.81 inches, respectively. The AP 40 at 100 yards pierces 2.68 inches at 30 degrees and 3.11 inches, normal; but with the light AP 40 shot, at 400 yards, the penetration falls to 1.93 and 2.28 inches. The effective range is 600 yards. The maximum traverse is 60 degrees, and the elevation varies from minus 8 to plus 25 degrees.

(3) 47-mm AT Gun

This piece of equipment is the Czech antitank gun mounted in a three-sided shield on the turretless chassis of the PzKw 1 Model B tank. It may be recognized by the five bogie wheels (of which the rear four are partially obscured by a girder), a front sprocket, a rear idler, and four return rollers. The gun-

shield is open at the back and top. The gun is fitted with a muzzle brake, and the recuperator is above the barrel. The weight is 7.5 tons; the dimensions 13 ft. 7 in., 6 ft. 7 in., and 7 ft. A 100-hp gasoline engine will drive the vehicle on a radius of action of 70 miles cross country and 90 on the road. The crew is three.

The Skoda gun has a 30-degree traverse with an elevation of from minus 8 degrees to plus 12. The AP tracer shell, 3.68 pounds, has a velocity of 2,540 f/s, penetrating at 300 yards 2.32 inches of armor at 30 degrees, and 2.99 inches at normal angle. At 1,000 yards the respective penetrations are 1.85 and 2.44 inches. An HE shell of 5.07 pounds and and AP 40 shot of 1.81 pounds are used. The effective range is not stated, but is apparently 1,000 yards. About 74 rounds are carried.

(4) 50-mm AT Gun

The only evidence of this equipment is a photograph, which showed a long-barreled gun in a fixed, square turret on an armored half-tracked vehicle of unconventional design. There is a large muzzle brake at the end of the gun, which is believed to be the standard 50-mm Pak 38.

(5) 75-mm AT Gun, on a PzKw 38(t) Chassis

This equipment consists of the 75-mm (2.95-in) antitank gun (Pak 40) mounted on the turretless chassis of the light Czech PzKw 38(t). The suspension consists of four large Christie-type bogie wheels, two return rollers (mounted above the space between bogie wheels 1 and 2, and 2 and 3, respectively), a front sprocket, and a rear idler. In action, the weight is 10 tons. The dimensions are 15 ft. 3 in. by 7 ft. by 7 ft. 2 in. A 125-hp gasoline motor gives a radius of 143 miles on the road, 103 cross country. A plate of .98-inch armor with, possibly, an additional plate of the same thickness riveted on, protects the front. The sides are 1.18 inches toward the front, and .59 inch toward the rear of the sides and the back of the hull. The crew is probably four.

The gun is a 75-mm antitank piece, thought to have a performance similar to the 75-mm long-barreled tank gun mounted in the latest PzKw 4's. This latter gun has the moderate velocity of 2,400 f/s, giving a penetration (presumably with a 15-pound, capped AP projectile) of 3.5 inches at 500 yards at a 30-degree angle, and 4.25 inches at normal. At 2,000 yards, the shell pierces 2.44 and 3.03 inches. There is an AP 40 shot supplied for this gun, and a 12.5-pound HE shell.

(6) 75-mm AT Gun on a PzKw 2 Chassis

This 10-ton assembly may be recognized by the long-barreled gun with the muzzle brake, as in the previous description, but the PzKw 2 chassis has either five or six large bogie wheels. Its length is 15 ft. 2 in., width, 7 ft. 4 in., and height 10 ft. 6 in. With a 140-hp gasoline engine, the radius on the road is 118 miles, and cross country 78 miles. In front, the armor varies from .59 inch to 1.79 inch, with .59 inch on the back and sides. The crew is probably four. The gun is the same one described in the previous paragraph.

(7) 76.2-mm (3-in) AT Gun on a 5-Ton Half-Track

Possibly another local improvisation, this piece of equipment consists of a Russian 76.2-mm gun mounted on the chassis of a 5-ton half-track in a high, square, box-like riveted structure of .20-inch armor, open at the top (see figure 4). The gun may be employed both in field artillery and antitank roles.

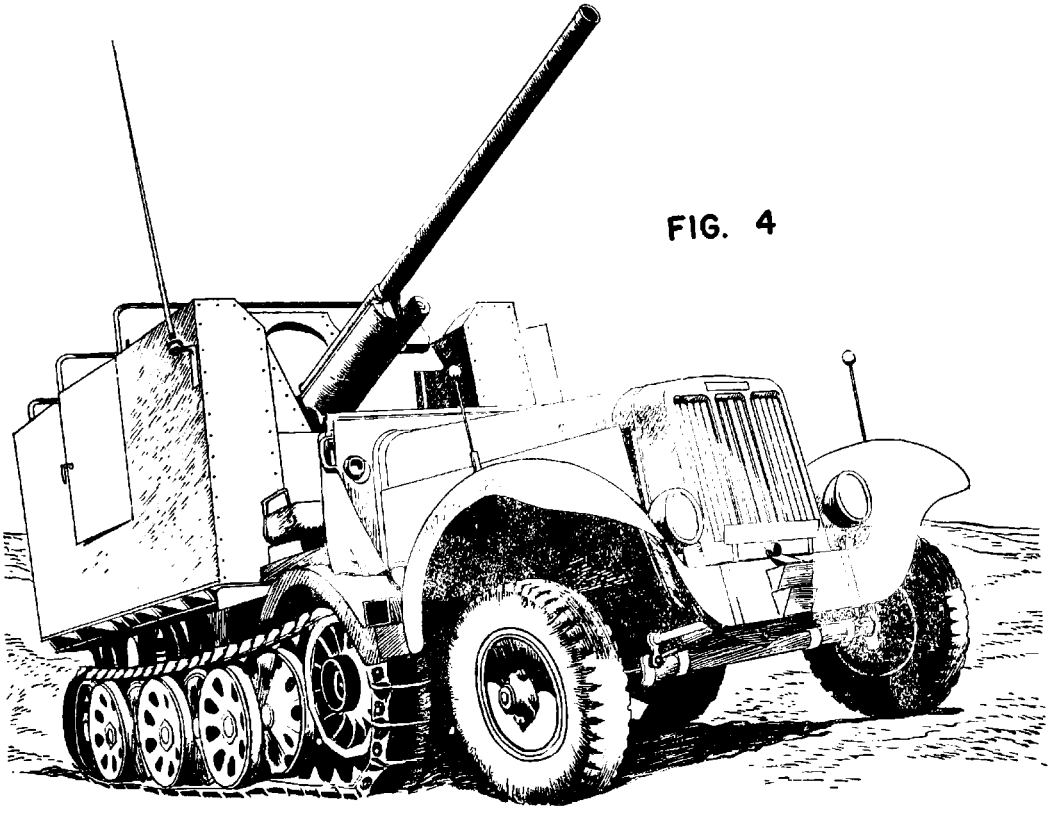


FIG. 4

The weight is about 10 tons. The mount is 19 ft. 9 in. long, 7 ft. 3 in. wide, and 10 ft. high. The motor is a 130-hp gasoline engine, giving the weapon a radius of action of 160 miles on roads and 70 across country, carrying a crew of probably six.

The 76.2-mm Russian field gun Model 36 (7.62-cm Pak 36 (r)) with a long, thin barrel throws a 14.8-pound capped armor-piercing shell at the relatively low velocity of 2,200 f/s, a 14-pound HE at 2,340 f/s, and an AP 40 shot of 9.25 pounds weight at 2,800 f/s. The range is not stated, but the firing charts include ranges up to 2,000 yards, at which range it is claimed that the AP shell will drive through 2.08 inches of armor with a 30-degree slope, and 2.52 inches, vertical. At 500

yards, the penetration is reported to be 3.11 and 3.70 inches, respectively. The awkward-appearing mount gives an unexpectedly large traverse of 60 degrees, with an elevation varying from minus 5 to plus 45 degrees. (The gun mount is capable of giving 75 degrees of elevation, but the shield fouls the front tarpaulin rail at 45 degrees.) Sixty-four rounds are carried, approximately half HE and half AP.

(8) 76.2-mm Gun on Tank Chassis

This is the 76.2-mm Russian gun just discussed, mounted on the light Czech PzKw 38(t) chassis with 4 bogies as described in Tactical and Technical Trends, No. 21, p. 6 (see figure 5); it is also mounted on the PzKw 2 chassis

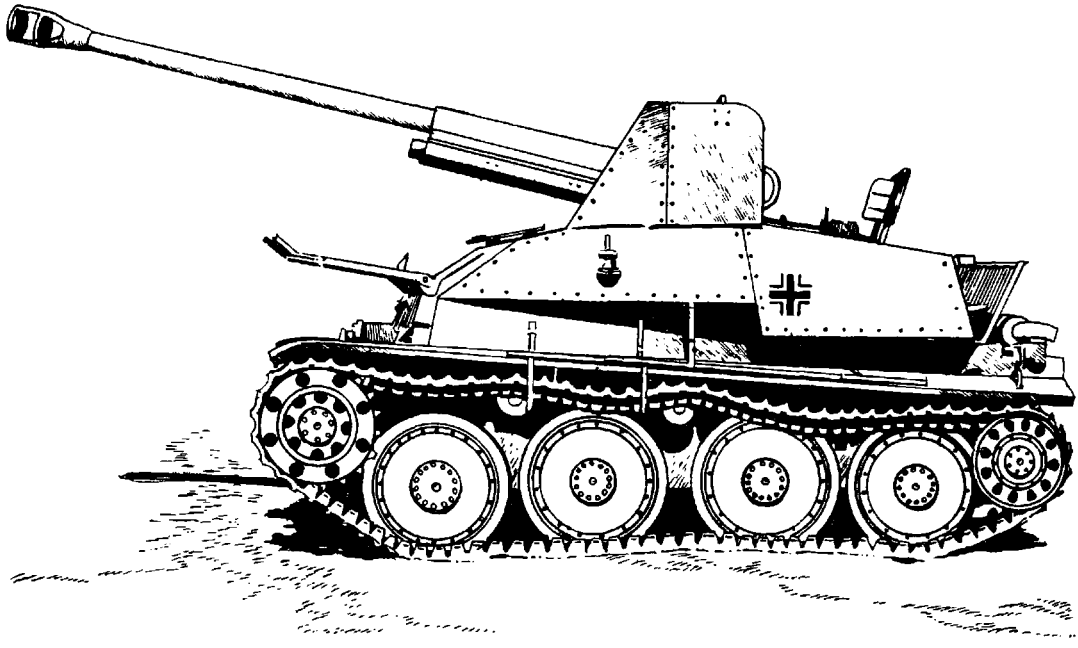


FIG. 5

which has 5 bogie wheels. Both chassis are rather light for so large a gun. It seems unlikely that either the traverse or elevation on these tank chassis is as great as on the 5-ton half-track.

d. German Self-Propelled Assault Guns

(1) 75-mm Assault Gun

A low silhouette, a well-armored body, and a short gun firing forward characterize this assault gun. (See Tactical and Technical Trends, No. 7, p. 9.)

The mount is the chassis of the PzKw 3. The suspension consists of six small bogies on each side with three return rollers, a front sprocket, and a rear idler. The vehicle with its weapon is heavy - nearly 20 tons. It is 17 ft. 9 in. long and 9 ft. 7 in. wide, but only 6 ft. 5 in. high. A radius of 102 miles by road and 59 cross country is attained with a 300-hp gasoline motor. The crew is four. Probably, this model is no longer in production.

With its casemate mount, the short-barreled 75-mm gun has a traverse of only 20 degrees, and an elevation varying from minus 5 to plus 20. For HE shell, the gun is sighted to 6,550 yards; for AP, only 1,640. At 500 yards, the penetration is 1.81 inches in 30-degree sloping armor, and 2.16 inches in vertical; at 1,200, it drops to 1.57 and 1.89 inches. The HE shell weighs 12.6 pounds; the AP shell, with cap and ballistic cap, 14.81. There is an AP hollow charge of unstated weight, as well as a 13.56-pound smoke shell. In the bins of the carrier, 44 rounds are carried, and about 40 more may be stacked on the floor. A dozen stick grenades (potato mashers) may also be carried clipped on a rack.

(2) 75-mm Medium-Length Assault Gun

This machine is essentially similar to the foregoing, except that a gun 30 calibers long mounted in a large box-like casing has replaced the stubby piece in the earlier model.

(3) 75-mm Long Assault Gun

The third assault gun model is a long-barreled "75" with a prominent muzzle brake. It, too, is mounted on the PzKw 3 chassis (see figure 6). The

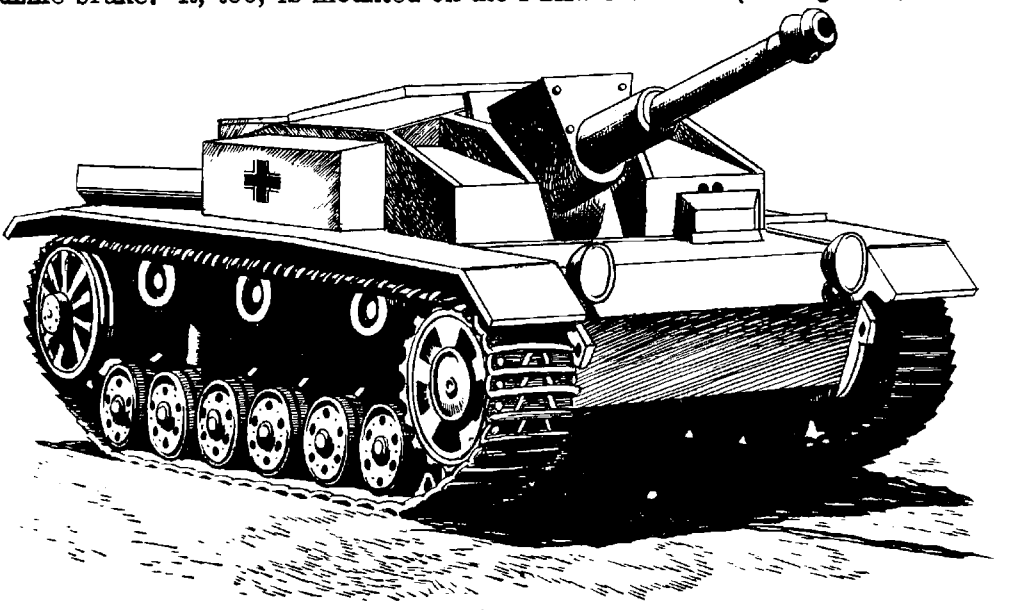


Fig. 6

velocity has been increased to 2,400 f/s, with a resulting increased penetration

at 500 yards of 3.5 inches of sloping armor and 4.25 inches of vertical; at 2,000, the penetration is still formidable--2.44 and 3.03 inches. It is thought that this gun is primarily a tank-destroyer weapon.

(4) 75-mm Gun Mounted on a 3-Ton Half-Track

Probably another local improvisation, this weapon is mounted on an armored half-track. The mounting is the same as that used for the 37-mm anti-tank gun, the details of which are given in c (2) above. (If the 76.2 Russian gun is a little heavy for a PzKw 2 mount, a 3-ton half-track would seem extremely light for a 75-mm piece.)

(5) 150-mm Infantry Howitzer on PzKw 1 Chassis

Probably retaining its original wheels and trail, this medium howitzer is mounted on the semiobsolete PzKw 1-B chassis. This chassis has five bogies (of which the rear four are partially obscured by a girder), four return rollers, a front sprocket, and a rear idler. Above the chassis floor is a high, three-sided gun shield, open on the top and back. The weight is about 9 tons. In length, it is 13 ft. 7 in.; in width, 6 ft. 7 in.; and the height is 11 ft. A radius of 95 miles on the road and 70 miles cross country is given by a 100-hp gasoline engine. Front and sides are protected by .59-inch armor, and back by .28 inches, and the gun shield is thought to be only about .39 inch. Four men make up the crew.

The piece is the normal 150-mm heavy infantry howitzer (15-cm s.I.G.33) with a muzzle velocity of 790 f/s and a range of 5,125 yards. The recuperator is underneath, and extends almost to the end of, the short barrel. On the field mounting, the traverse is 11 degrees, and the elevation from 0 to 73 degrees. Ammunition weights are 83.6 pounds for the HE shell, and 84.7 for the smoke.

(6) 150-mm Infantry Howitzer on PzKw 2 Chassis

A close-support piece of great power has been made by mounting a 150-mm howitzer low behind a three-sided shield on what is possibly a redesigned PzKw 2 chassis. (See Tactical and Technical Trends, No. 22, p. 13, and No. 13, p. 6.) In place of the usual five large bogie wheels, there are six (see figure 7), suggesting that the normal PzKw 2 chassis has been lengthened, or a new chassis designed. There are four return rollers, a front sprocket, and a rear idler. The weight is about 11 tons. The length is about 18 ft.; the width is 7 ft. 4 in., and the height has been kept down to 5 ft. 6 in.--a remarkably low silhouette. A 140-hp motor gives a radius of action of 118 miles on the road and 78 miles across country. The frontal armor consists of two plates, .59 and .79 inch thick. Sides, back, and shield have .59 inch, and the superstructure .39 inch. The crew is probably four. As in the previously described weapon, the gun is a short heavy infantry howitzer, with the recuperator almost as long as the barrel.

e. German Self-Propelled Medium Artillery

(1) 105-mm Gun

Nothing is known of the mount except that it is armored. The gun is thought to be the standard 10-cm K 18 of which the following are some of the particulars: muzzle velocity 2,660 f/s; maximum effective antitank range, 2,060 yards; penetration with 34.6-pound armor-piercing shell at 500 yards, 30 degrees slope, 5.49 inches, and vertical, 6.46 inches; penetrations at 2,000 yards, 4.39 and 5.22 inches. A capped, AP shell and a 33.5-pound HE shell are reported.

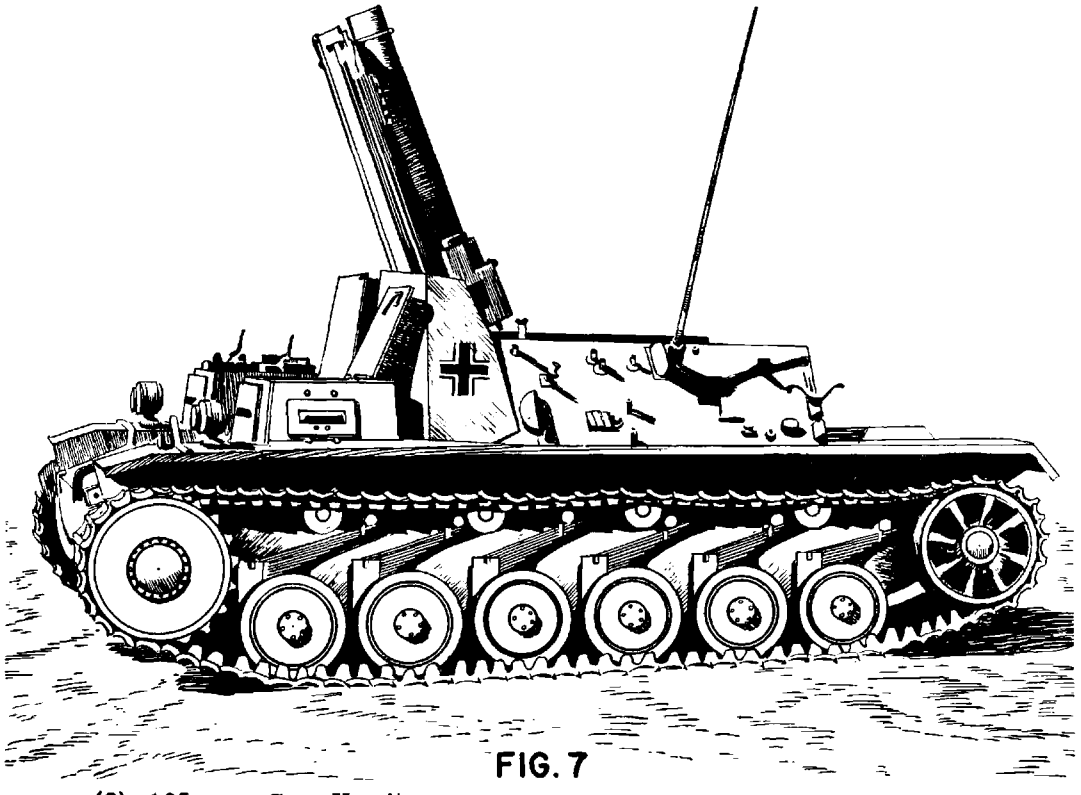


FIG. 7

(2) 105-mm Gun-Howitzer

Nothing is known of the mount, but the gun performances are believed to be as follows: muzzle velocity (super-charge), 1,540 f/s; range, 11,640 yards. Shell weights vary between 31.25 pounds for the AP tracer to 35.9 pounds for the hollow-charge.

(3) 128-mm Gun

Both this gun and the 105 were probably produced to deal with the heaviest Russian tanks. No details are available as to the gun or the mount.

(4) 150-mm Howitzer on French 38L Mount

Attention is called to the account in Tactical and Technical Trends, No. 12, p. 15 of this 150-mm howitzer mounted on the 6-bogie chassis of the French tracteur blindé 38L (see figure 8). The hull is divided into 3 compartments: the

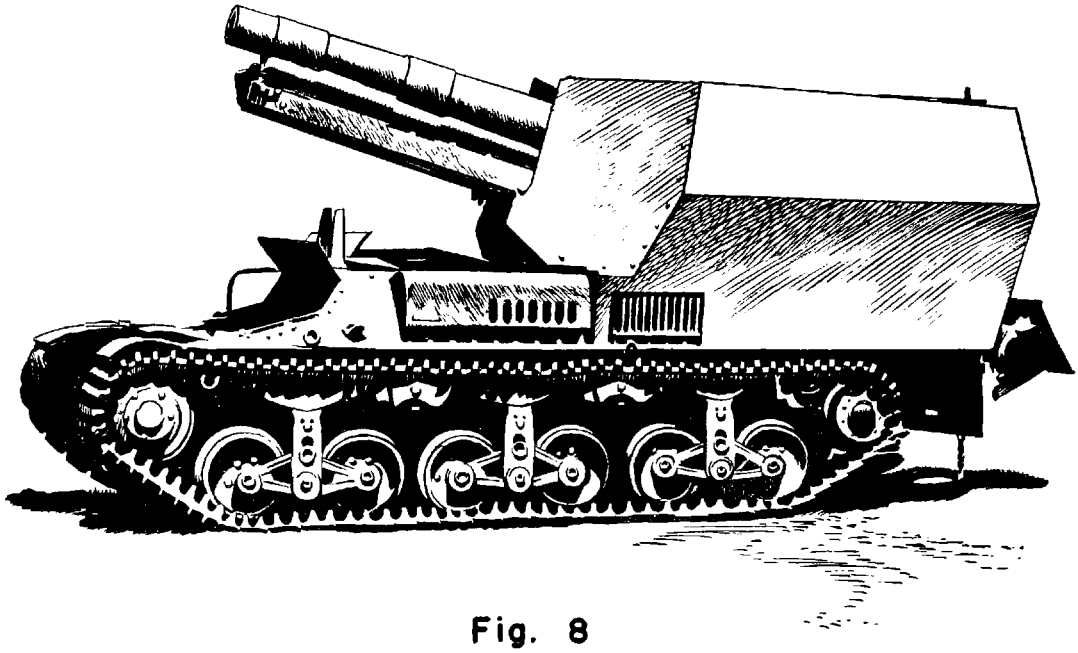


Fig. 8

driving compartment in the front, the engine in the center, and a deep, well-protected cockpit for the gun crew in the rear. The assembly is light (7 1/2 tons). It is 14 ft. long and 5 ft. 2 in. wide, with a 70-hp engine giving a speed of 22 mph. The radius of action is not stated. Armor protection is from .37 to .47 inch in front,.35 inch on sides and rear, and .24 inch on the superstructure. The fixed gun housing, mounted in the floor of the chassis, is of rather thin plate. Traverse is limited to about 4 degrees, and a rear spade is provided to take up recoil stresses. The crew is four.

While the 150-mm assault guns, previously described, are 150-mm infantry howitzers firing an 86-pound shell, this medium howitzer has a longer barrel, which gives a muzzle velocity of 1,250 f/s instead of 790 to a shell of 92.4 pounds weight. The range is 9,300 yards as against 5,125. HE shells, and anticoncrete and smoke shells, are provided. It is notable that in this case a self-propelled gun firing a 92-pound shell to so great a range has been developed on a weight limit of 7.5 tons.

f. Italian Self-Propelled Guns

(1) 75/18 Gun-Howitzer

This seemingly effective, self-propelled equipment is the chassis of the M13, mounting a 75/18 gun-howitzer (see figure 9). The turret and part of the

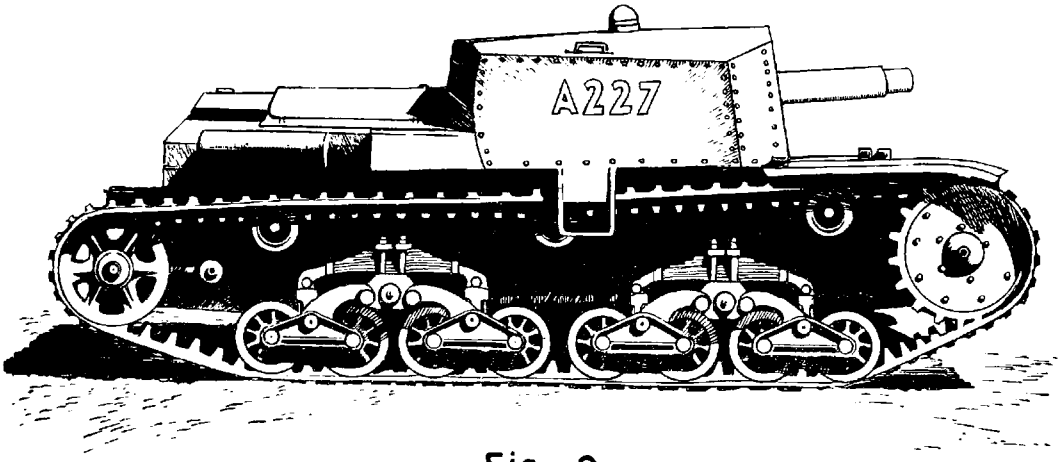


Fig. 9

superstructure of the tank are removed, and a new vertical front plate is fitted, as well as new side plates without the hull entrance-doors. The fighting compartment is roofed with .39-inch plate. Ready for action, the gun weighs about 11 tons. It is 16 ft. 2 in. long, 7 ft. 3 in. wide, and only 5 ft. 10 in. high, presenting a rather squat appearance. The unusual engine is a 105-hp Gasolio, burning a a mixture of gasoline and fuel oil. On the roads, the radius is about 120 miles. The cross-country radius is not stated. The armor is substantial: 1.69 inches on the gun mantlet, and two plates, 1.46 and .91 inches, forming the front vertical plate. Sides and tail plates are .98 inch. The crew is three.

The gun has a traverse of 45 degrees and an elevation of from 15 degrees minus to 25 degrees plus. It is an 18 caliber weapon with a maximum range of 8,350 yards. The ammunition consists of 13.9-pound HE shell, 14.1-pound AP, and a 14.5-pound shrapnel. Storage for only 29 rounds is provided, but many more will certainly be carried.

(2) The 75/27 Gun, Truck Mounted

It has been reported that there is in service a somewhat clumsy self-propelled mount comprising a 75/27 gun on the back of an unarmored "S.P.A." truck. The standard small shield is retained and a second small shield mounted in front of it; the trail legs are shortened and clamped to the chassis. The gun fires forward over the hood of the truck.

The gun is rather better than the 75/18, with a muzzle velocity of 1,675 f/s. The elevation is from minus 15 to plus 65 degrees; the traverse is practically 60 degrees. In addition to the HE, shrapnel, and AP shell already noted, the gun fires a 13.79-pound streamlined HE, a 15.9-pound case-shot* and a hollow-charge shell.

(3) 75/27 Antiaircraft Gun, Truck-Mounted

This is an obsolete 75/27 Krupp antiaircraft gun mounted on a Ceirano 50 C.M.A. 53-hp truck, or a Fiat 18 BL 40-hp truck. Both are four wheeled. The Ceirano truck has a radius of 150 miles on the road; the Fiat, 112. The gun has a muzzle velocity of only 1,675 f/s, with a horizontal range of 6,600 yards and vertical range of 15,200 feet. The elevation is 70 degrees, the traverse 160. A 14.5-pound, time-fuzed, HE shell is fired.

(4) 90/53 AA/AT Gun, Truck-Mounted

This is a 90/53 AA/AT gun mounted on a four-wheeled 60-hp Lancia Ro truck. It is probable that the gun can be used only against ground targets. The radius of action is about 150 miles.

A muzzle velocity of 2,756 f/s gives the 22.2-pound HE shell a range of 19,100 yards. The practical rate of fire is from 15 to 20 rpm. The elevation is from slightly below horizontal to 85 degrees, and the traverse, 360. An AP shell of unknown weight is reported to penetrate 4.41 inches of plate on a 30-degree slope at 500 yards, and 5.63 inches of plate at the vertical. At 2,000 yards, the respective penetrations are 3.15 and 4.13 inches.

(5) 90/53 AA/AT Gun on a Tank Chassis

It has been reported that the 90/53 gun is now found on a mount of entirely new design in the center of what appears to be a tank chassis, firing forward, with a 40-degree traverse. The muzzle is said to slightly overhang the front of the chassis. The chassis itself is stated to be identical with that of the earlier M 13/40 medium tank as regards suspension, armor, and appearance, but the engine is more powerful. In order to fire the gun, the tracks, apparently, have to be locked by the steering levers. Only a limited number of rounds can be carried. The crew is probably six. Whether the chassis is used for the 90/53 self-propelled gun only, or is that of an M15 tank, is at present obscure.

g. Japanese Self-Propelled Artillery

Information regarding Japanese self-propelled guns is entirely too indefinite to warrant any statement. However in October 1941, the British reported a Japanese self-propelled gun, of which but one has been seen, perhaps an experimental model. It is supposed to be a weapon of about 100-mm caliber mounted in the

*Similar to shrapnel, for close range.

chassis of a medium tank. The piece is said to be long, and to have no shield. The gun may be the 105-mm howitzer, Model "91" (1931), of which the following is known: muzzle velocity 1,790 f/s; maximum range, either 11,500 or 14,200 yards; maximum elevation and traverse (both), 45 degrees. The ammuntion is a 35-pound HE shell.

CORRECTIONS

ORDNANCE

No. 23, p. 25: In a report on the Italian 8-mm Breda medium machine gun, model 37, it was here stated that the German 7.92-mm ammunition could be used in this weapon. This statement is incorrect.