COMMENTARY

ON A

NEW DEVELOPMENT

IN

ARTILLERY

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In modern warfare, light artillery is faced with new problems, unknown in the last war. The purpose of this note is to offer a solution for some of these problems. It does not deal with conceptions of grand strategy but with simpler and more earthly questions such as digging in, camouflaging, traversing the gun, bringing ammunition and so forth. These are the tasks faced by the men in the field. Though less often discussed, they are no less important than strategical theories.

I—THE GUN HAS A DUAL ROLE OF FIELD ARTILLERY WORK AND ANTITANK ACTION

The primary role of the field gun is barrage, destruction, counter-battery. All these missions are nearly always accomplished by indirect firing from masked positions. To back an offensive the current practice, not very different from that of the last war, is to neutralize the enemy resistance by artillery fire, so as to allow infantry and armor to get close to enemy positions and storm them. In a defensive situation barrage by artillery fire will stop enemy infantry.

The use of the field gun against tanks by fire over open sight, at close range, is wholly recognized, too.

"Defense against attacks by armoured fighting vehicles must always be considered in the selection of gun positions and it must be borne in mind that the field artillery forms part *of the general antitank lay-out for the area in which it is located.** At halts and in bivouac it may be necessary to site a single gun for local protection. This ground defense must be coordinated throughout the unit, and later throughout the whole formation area. In the event of a breakthrough by the enemy, the gun position and the L. M. G. positions will form rallying points for the infantry. In the absence of other orders, these points will be defended to the last round."—"Current British Doctrines," War Office, *The Field Artillery Journal,* October, 1942.

"Basic means of disabling tanks and of repelling tank attacks is artillery fire at pointblank range. . . . Actual fighting experience showed that these guns were enveloped in a whole mass of artillery which without exception was drawn into active operations against enemy tanks. At present, *the principle that all artillery is antitank* artillery prevails unchallenged. . . . The tendency of German panzers to strike deep into the defenders' formations and encircle his units piecemeal necessitated organization of deep antitank defense to deprive enemy tanks of their maneuvering possibilities. The antitank defense center and antitank area have become the basis of antitank defense. The antitank defense center is built around the artillery formation which forms its backbone."—"The Development of Soviet Antitank Defense," by Lt. Col. I. I. Alexeyev, *The Field Artillery Journal,* November, 1942.

*Emphasis by this author, both here and in other quotations.—J. M. R.

In other words, whether wanted or not, field artillery is incorporated in the system of antitank defense. The batteries, to accomplish their normal mission by indirect firing, are emplaced a couple of miles behind the forward line. The defensive system is not made of a continuous line but of strong points echeloned in depth and able to fight back in all directions; hence, in such a system, artillery positions constitute, by force, centers of resistance around which the infantry digs in and to which it clings. In these strong points, infantry and artillery *help each other,* to their mutual advantage. The artillery deals the blow to the heavy enemy armor. The infantry strikes the riflemen. When the attack breaks out, enemy armor usually succeeds in passing between the first centers of resistance and in penetrating inside the defensive formation. A few minutes after the start of the offensive the centers of resistance, and therefore the field guns which they comprise, are engaged by enemy forces: it is sometimes said that, in cases like this, antitank guns can do the job and that field guns, when attacked by tanks, must be abandoned. This is merely *turning one's back on the problem.* Field guns can very well battle tanks and infantry at close quarters, provided the deficiencies of the mount are corrected; equipping field artillery batteries with antitank guns, which will be used only for close defense while the field gun will, by force, cease to be served, is like providing an automobile with two motors, one for the flat ground, the other one for the grades. Better use one motor with a shifting gear.

The field gun must be able to fire at its maximum range and *also* to face successfully a tank at 100 yards. It can do it if mounted on a well designed carriage.

Furthermore, the problem which we are considering now is the same for the antitank and the field guns. The only assets of the latter are its low silhouette and its high muzzle velocity. If its carriage had the other characteristic we outlined it would be far more efficient.

At least, the distinction between antitank gun and field gun tends to disappear. Caliber of antitank guns is ever increasing; already it is getting close to 75-mm. When a 75-mm. is not used in antitank work, it will be used in indirect firing for which it will be particularly successful due to its long range and accuracy.

II—THE MOUNT MUST BE HIGHLY MOBILE

The necessity of mobility needs hardly any development. An ever-increasing proportion of artillery is kept in reserve and rushed to the points when it is needed in order to stop a breakthrough or to back an attack. Therefore the gun must be able to travel at great speed.

It must also be able to pull out from its position and be in motion two seconds after the last shot. On the average gun mount the operations of unhooking and hooking up take a certain time, during which the gun and the gunners are vulnerable targets. Therefore, the gun should be able to fire *without* being unlimbered (see in picture how this is realized on a new type of gun mount). Such facility is particularly valuable when the gun shifts from position to position, a current practice in field artillery intended for disrupting enemy counterbattery. But its advantages are also felt when the gun falls into an ambush or is forced into action in the open.

This appears quite fully in the narrative of "Desert Encounter" (*Field Artillery Journal*) which also explains the necessity for protection and a 360° traverse.

A column composed of four British 105s and two 37s suddenly meet several tanks in the desert:

"The enemy was approaching at about 900 yards per minute. * * *

"Major G ordered: 'ACTION FRONT!' * * *

"Then he mounted on a caisson * * * and opened with volleys at 2,000 yards. From discovery to first round had taken little more than two minutes. Every man there knew all too well that his own life and that of his comrades depended on the way the guns were served during the next few moments. They had dropped trails where they had halted, with the antitank weapons on the flanks. The distance to the low crest in front was about 700 yards, while on the *left flank* it closed in to *little more than 200 yards.* The prime movers withdrew some 150 yards to the rear and halted facing the front with motors running. Major G continued with 'gun fire' (volleys) until the German tanks broke defilade over the crest in his front.

"At the first volley the group of German tanks *had divided into three parties.* * * * The two flank groups swung away and the gun crews, if they saw them, paid little if any attention as they loaded and fired at the steel gray targets which *came on and on directly to their front.* With fuze caps left on and full charges, as fast as they could fire, those guns were served as every artilleryman hopes his will be in his hour of trial.

"Suddenly the 2-pounder antitank gun on the left front was demolished by a direct hit from a weapon of 75-mm. caliber and a withering blast of machine-gun fire *from the left flank.* The gun crew of Number Four instantly saw that they were about to be ridden down by a group of German tanks looming up just beyond the crest on *their left.* Fortunately the drivers of Numbers Three and Four prime movers had observed the approach of this new menace and were dashing up to the guns as fast as roaring motors would bring them. Miraculously the sections got away in the direction taken by the infantry, leaving tools, ammunition, and all manner of assorted gear and equipment scattered on the ground. The drivers of Numbers One and Two prime movers had realized the situation a few seconds later when they saw their mates start forward. They were just approaching their guns when both trucks were knocked out from the front and left hand simultaneously. *At the same time the tanks which had last been noticed going across the front towards the right were discovered to have swung in and were approaching the right rear of the position.* While Numbers One and Two prime movers were being wrecked by the covering fire of the German Tanks, the 2-pounder antitank gun on the right flank, which had first observed the menace on its right, made off following Numbers Three and Four.

"The crews of Numbers One and Two stuck to their guns, as tanks from three directions roared down upon them. *Neither flesh and blood nor guns could survive in such a rain of steel.* A last shot from Number One knocked out a medium tank just 75 yards to the front.

"Then there was sudden silence.

* * * "Largely as a result of this and similar actions, standing orders were issued in the Western Desert Front requiring field guns of 25-pounder and similar types to break off action and withdraw

whenever tanks came within 6,000 yards. Under no circumstances were they to allow tanks to approach closer than 4,000 yards unless there was thorough protection from mines or obstacles."—*The Field Artillery,* February 1942, pages 118-120.

III—THE THREE MEN WHO SERVE THE GUN MUST BE *PROTECTED FRONTALLY* AGAINST ARMOR PIERCING SMALL CALIBER PROJECTILES, *ALL AROUND* AGAINST SPLINTERS

One of the worst defects of the field gun for antitank action is its lack of protection.

"The British artillery, which had hurried from place to place all morning to meet the shifting attack, pulled out once more and raced to the rear to face the Germans. . . . At the same time the tanks' machine guns swept the brigade oblong with a blanket of fire which dwarfed even the machine gun fire of the Argonne in the last war. . . . The courage of the British in the face of this overwhelming attack was beyond praise. Their *exposed* gunners fought their pieces until they or their guns or both were destroyed. . . . British guns struck directly by German shells, fell useless on their sides in a cloud of dust. The crews of others were mowed down by machine gun fire. Toward the last the British artillery ammunition gave out and at the very end gun crews were firing star shells and smoke shells—anything to make noise. . . . The German machine gun fire was so intense and so low that the bullets seemed to weave a roof over our heads, and now and then one pinged into the side of the trench.—"Desert Tank Battle," by Harold Denny, *Field Artillery Journal,* October, 1942.

It is strange that shields 1/6 of an inch thick which were hardly satisfactory 40 years ago, although artillery seldom had to fight at close quarters and projectiles had low velocity, have almost not been modified. It is strange, too, that we are still content with a *protection limited* to the *front* of the gun, though shells explode at the *rear* and the *sides,* as well!

"Field Artillery which is encumbered with outmoded material and moss-covered ideas will be staring disaster in the face, when modern war blasts in the door. . . . In the campaign of France the

field guns were of remarkable effect against enemy tanks but most of the time at the *price of total sacrifice.*"—"Has Field Artillery Learned to Protect Itself?" *Field Artillery Journal,* Oct. 1942.

Now, one may say that things have taken a turn for the better and murderous incidents like this one could not happen again. Some people thought so—in 1942. This is what happened at the beginning of *'43.*

"On February 26, 1943, at Sidi Nsir in Northern Tunisia, the 155th Field Battery R. A. (95 Pounder) fought one of the finest battles in the long and glorious history of the Royal Regiment. At a cost of virtually complete extinction the battery did the work entrusted to it." * * *

"* * * Eight Messerschmitts swooped down on the guns and raked each in turn with machine gun and cannon fire, inflicting heavy casualties. This maneuver was repeated many times. Several vehicles on the road back to Hunt's Gap were wrecked and left burning, and the precious ammunition they carried had to be salvaged at imminent risk by the gunners. Bivouac shelters and dumps were in flames. Many men were wounded or killed." * * *

"By midday 30 German tanks, with self-propelled guns and infantry in support, had worked round both flanks and were within 600 yards. A little later the enemy opened small arms fire at close range." * * *

"The battery might have saved itself many losses had it concentrated throughout the fire of all its eight guns at a range of 1,200 to 2,000 yards, on the German tanks and artillery whose columns were cluttering the way up from Mateur. But its first duty was to protect the Hampshire companies by all means in its power, and it put first things first by concentrating in support of the infantry.

"On every ground of military probability, the battle was almost over about 1530 hours. So at least the German command reasoned. What was meant to be the death blow was struck by a column of tanks which raced along the road in the heart of the battery position. 13 other tanks gave covering fire with guns and machine guns from hull down positions. A PzKw VI led the attack; this was holed three times in the turret by shells from No. 1 gun of 'F' troop." * * *

"* * * Hull down, the enemy tanks had a great advantage. Concentrating on one gun at a time they killed the detachments, smashed the guns, and set the remaining ammunition on fire.

"* * * At nightfall one 25-pounder and several Bren guns were still engaging at ranges of from 10 to 20 yards, German tanks which were lumbering through position, smothering the last resistance, swivelling round on their tracks and crushing in slit trenches.

"A few minutes earlier the last message had come over the wireless: 'Tanks are on us,' followed by the single 'V' tapped out in Morse.

"At the guns and in the command posts and observation posts when the battle began were 9 officers and 121 other ranks. Nine survivors came out, of whom two were wounded."—"155th Field Battery at Beja," *Field Artillery Journal,* September, 1943.

"Tank attack was probably more feared by artillerymen in France than any other type, and in Libya this seems even more pronounced." —"Dig for Your Lives" by Capt. Edward A. Raymond, F. A., *Field Artillery Journal,* January, 1943.

There is no better illustration of the problem than this: it is a fact that field guns must *battle tanks,* yet there is nothing that they *fear more than tanks.* The reason again is clearly apparent in the report of the clash between American and German forces in Tunisia (Kasserine Pass).

"What hit the Americans was the same machine employing the same tactics that shattered the French armies in the Spring of 1940. First, the dive bombers flashed down from the bright Tunisia skies in long screaming dives. The Americans took to their foxholes. Then tanks sped up in V formations with great 52- to 62-ton Mark VI's spearheading them. The result was explained in one terse sentence in a dispatch from Drew Middleton of the New York *Times:* 'Enemy tanks advanced under dive-bomber cover and the gunners were overrun before they had had time to fire more than a round.' "—*Newsweek,* March 1, 1943.

These men were mowed down without having the slightest chance. However high the muzzle velocity of the gun is, however hard is the steel of which the shells are made, however sharp are these shells, all is of no avail as long as the gunners who are charged

with pulling the trigger are killed or forced to duck into a trench. It has been forcibly pointed out in this report to the War Department, May, 1941:

"Ordinary guns cannot be set in conspicuous locations. Their crews will always look for some natural protection and cover, a mound, as a rule, behind which they will lie and *be forced to keep their heads down by the fire of machine guns.* While in this position their field of vision is very limited. Tanks take advantage of this to surprise, circle and isolate the guns one by one."

Indeed, it must be kept in mind that: whereas it is possible to serve a mortar *from within* a trench, and therefore with a reasonable amount of protection, and it is possible *to observe* the enemy from a foxhole through a periscope, and this quite safely, and whereas it is possible to carry ammunition by crouching in a trench without much risk, yet it is impossible to duck and at the same time serve a field gun!

In order to load the gun or to close the breech there are *three* gunners who cannot do otherwise than to *expose the upper part of the body,* especially since they cannot build an embrasure and at the same time traverse the gun at a great angle. When tanks surge, the gunners cannot dive into their slit trenches, they must stick to their guns.

What chance have these men in the hail of fire which sweeps the ground?

This is even worse when one realizes that for antitank action the field gun is sited in places from which it has a broad and deep field of fire in order to engage the tanks at a distance and avoid surprise.

"When a field gun takes up a position, it normally aims at having a clear view of *front and flanks of 1,000 to 1,500* yards, as a precaution against surprise attack. If that is not possible, it must be afforded protection by antitank guns or mines."—"Smashing the Panzers," by Maj. Gen. M. Rowan-Robinson, C.B., C.M.G., D.S.O., *Field Artillery Journal,* January, 1943.

In a report written immediately after the fall of France this kind of position was advocated in preference to the retreated spots with a *narrow* field of fire which was favored at that time.

"In order to fire over open sight at tanks, the gun should be sited in places where it has a broad field of fire (in traverse and range). This does not mean that the gun should be set on the summit of a hill and be in sight for ten miles around, but that, instead of being in a *retreated* spot with usually a very *narrow* field of fire, it be moved up to places where it has a *wide sweep*. For instance, instead of being put at the edge of a wood among the trees, it be set forward a few yards, at the corner of this wood and in front of the trees. Instead of being sited at the bottom of a valley it be sited on the slope of a hill. Only by doing so is one enabled to harass the tanks when they are still far off and to cover the same target with several guns."

But as a rule a gun cannot be set in a place from which it has a large field of fire without being itself exposed. If a gun covers at sight an area of one square mile, it can be subjected to a fire at sight also, from *any point* in this square mile.

What, then, are the factors which will be essential for its protection?

1. An adequate shield.
2. The ability to revolve quickly (all-out traverse), so that it can always face the tank attempting to circle it.
3. Small dimensions to permit easy digging in.

All the members of the crew must duck into fox holes except those who serve the gun. A 75 dug in and *without its tractor* has a silhouette which is only 1/15th as large as that of a medium tank. In the fight of the gun versus the tank at sight, the one which hits the target *first* wins. Every other condition being the same, (which is not the case on the conventional gun mount) the one with the largest dimension, i.e., the tank, is likely to be hit first and knocked out.

Such characteristics are all-important in a defensive situation. By enabling the gun to take position closer to the front line, they may prove valuable in the offensive, too.

An interesting example of such employment of artillery can be found in this recent report:

* * * "Between the battalion and Mining Town were two batteries of T-19s (105-mm. howitzers on half-tracks) and a platoon of engineers. On the forward slopes of the ridge were about 40 tank-destroyers and medium tanks." * * *

* * * "Sticking his head out of the slit trench, the lieutenant looked up the wadi past Mining Town and noticed three 88s, so cleverly concealed in some cactus scrub the night before that he had failed to see them all morning. They had been brought in there to fire against the tank-destroyers and medium tanks. This they proceeded to do, pointblank and to great effect. The M7 battalion, without observation, fired but was unable to stop them. The T-19 batteries could not bring fire to bear. Infantry mortars eventually knocked out one 88-mm. gun; the other two were withdrawn that night.

"The action was typically Nazi, in both its conception and its execution. It was daring, skillful, ruthless, and caused us heavy loss."—"Under Fire," by Maj. Edward A. Raymond, FA, *Field Artillery Journal,* December, 1943.

IV—THE PIT REQUIRED FOR THE GUN MUST BE SMALL

"To sum it up:

"We dig in when we stop. I do not care how many unused holes we leave behind, but I never want to lose a man for lack of a hole dug."—"Desert Victory," by Commander of the 1st South African Brigade, *Field Artillery Journal,* October, 1942.

It is a hard and deceptive job to dig in the average field gun. The pit must be large enough to allow the shifting of the trail. This means the removal of an enormous amount of earth and a lessening of protection.

The 25-pounder, for instance, on firing platform, requires a circular pit 29 feet in diameter; a pivotal gun of the same caliber with a 4-branch trail requires a pit of about the same area. This fact, though it is but seldom mentioned, has grave consequences:

a. The time for digging in is *long*. In mobile warfare one may usually expect to have 30 minutes to one hour before opening fire, sometimes less. The crew must be able to dig in the gun within

this short space of time. It can be done only if the area of the pit is not too large.

b. The second consequence is that the *protection* afforded by a large pit is *greatly diminished* especially against mortar fire. One pit five times larger than another is nearly five times as vulnerable.

c. There is nothing more easily *spotted by airplane* than a large circular pit surrounded by great heaps of stirred earth. Moreover, the fixed camouflage takes a long time to set up. Let us take the opportunity to point out that if the area to be concealed is small, the gun can be camouflaged by means of *clamps fitted on* the gun which can be extended all over the area and hold vertically a *few big* branches: stereoscopic survey of airplane photographs fails to reveal anything because the large branches give the necessary relief and ground observation is confused by the shade. This camouflage takes *two minutes* to set up and is far more efficient than a *fixed* net with scattered artificial leaves.

V—TRAVERSE—THE GUN MUST HAVE A 360° TRAVERSE AND BE EASILY AIMED AT A MOVING TARGET

"The battery commander bore in mind that all-round fire was the safest guarantee against surprise. . . . This unsuccessful attack cost the enemy 16 tanks, burned and battered. Had the battery remained in a concealed position, had its commander lost his head for an instant and failed to organize *all-round* fire and intrench himself in new positions in the forty minutes at his disposal, the enemy's losses would have been much slighter and perhaps the attack would have ended differently."—"Repulsing Tank Attack by Fire from Open Positions," by Ovady Savich, *Field Artillery Journal,* November, 1942.

"By 0730 hours the medium batteries were augmented by three field batteries firing from positions to the *north, east,* and *southeast.*

"The first heavy attack, approximately 60 tanks supported by motorized infantry and heavy mortars, came from the *east.* This force included a number of heavy tanks, the German Mark IV, which fire everything they have as they move—and they make quite a show as they come in.

"The attack was made in two waves on a front of about 1,000 yards, light tanks forward and the heavier ones in the second wave. It lasted exactly one hour, and failed to penetrate the perimeter in a number of places and suffered heavy losses. . . .

"A second and heavier attack was launched from *the north* at 1000 hours. The violence of this attack was such that I feared for about a half hour they would penetrate the perimeter. . . .

"The attack slowed down at 1030 hours, when the remaining tanks moved widely around to the *west,* still constantly under our artillery fire."—"Desert Victory" by Commander of the 1st South African Brigade, November, 1941, *Field Artillery Journal,* October, 1942.

Necessity for an all around traverse is *not confined* to antitank action, it is just as useful for common field artillery work on every battlefield, even in the jungle.

"Having once determined that perimeter defense was necessary, the artillery was forced to make an effort, not previously foreseen, to cover with its fires any point in these defenses. This meant that the artillery as a whole had to be prepared to fire in any direction, the entire 360 degrees of the compass. Accordingly each battalion was assigned additional sectors and, after making their surveys, emplaced in alternate positions. This affected both the 75-mm. pack howitzers and the 105s, but particularly the latter, which were forced to emplace in a series of positions so as to cover north, south, east, and west. These positions were, for the most part, in the open flats north of the initial positions. The guns were well dug and slit trenches were provided for the personnel but they were, nevertheless, in a very exposed position from both bombing and shell fire." —"Marine Field Artillery on Guadalcanal" by Brig. Gen. P. A. Del Valle, U.S.M.C., *Field Artillery Journal,* October, 1943.

A broad angle of traverse is not sufficient by itself. It is also desirable that the *traversing be easy.* One man, the layer, should be able to swing his gun quickly at a broad angle by turning a handle crank. Then he will be able to adjust his fire rapidly and accurately on a moving target. How necessary this is, is strikingly shown by a German Captain in his report of a tank battle near Merdrop in May, 1940:

"As I turn the corner I see a French antitank gun staring at me in the face at a range of 70 meters. Two French soldiers jump behind the shield and the gun begins to move. Apparently they are *making the final corrections in laying.* Instantly I cut loose my gun and see four round black holes in the gun shield. A body falls over the left. Then I open my Machine Gun. . . ."

The average field gun, mounted on a firing platform in order to be traversed at a broad angle, needs the cooperation of two men. This is not easy on a field of maneuver and in battle it is still much more difficult.

VI—A LOW SILHOUETTE IS VERY DESIRABLE

The fight of tank versus gun is a *duel.* The one which finds its mark first wins. One of the adversaries, the tank, has in its favor mobility and armor, but it is still vulnerable because of its mechanism, its track, its gasoline tank and its large silhouette. A large silhouette is the drawback of a tank or, more generally, of any self-propelled machine.

For this reason, tanks, even on the attack, try to find hull down positions from which only their turrets stand out. A tank, like a boxer, fears a blow below the belt; when it can afford to, it digs in. This is a very current practice in the German and Russian armies and an important argument in favor of the thesis defended in these pages.

A tank is obviously not intended to be dug in, any more than an airplane is supposed to fight in a stationary position (although it could do it). A tank, dug in, loses its mobility, although every part of the tank is designed for the very purpose of mobility.

But the use of tanks in this fashion marks a trend. By digging in a tank, one seeks to have a gun of small dimensions, armored, revolving in all directions, easily aimed at a moving target, set low on the ground and easy to camouflage, with its vulnerable parts, mechanism and supply, well protected. These are exactly the characteristics which have been advocated in these pages.

VII—MANHANDLING

All those who have tramped in the mud, tugging the gun, know the importance of this problem. A gun must be hauled by hand. Distances to be covered are usually very short but they may prove sometimes insurmountable if the slope is too steep or the ground too heavy.

Tasks like these are greatly facilitated by new devices such as the new "artillery winch," which reduces the force necessary to pull the gun in a certain ratio.

These apparati are to the traction by hand what the gear box is to the automobile. An automobile without a gear box would stall on a moderately steep hill. *Because* of the gear box it climbs with the greatest of ease. The traction reducer gives the same advantage.

This is an important factor in the development of the armored guns which are somewhat heavier than conventional guns. Equipped with a traction reducer, an armored gun is easier to handle than a conventional, unarmored field gun of the same caliber.

II—COMMENTS ON SELF-PROPELLED MOUNT

In the foregoing we have examined the characteristics of a gun mount adapted to regular artillery field work and anti-tank action; we have shown that the specifications outlined can be easily deduced from actual reports.

All this pertains to ground gun mounts. Hence, a survey of self-propelled mounts would not be within the bounds of this note if it were not for the fact that some military experts discard "a principio" the ground gun carriage and fail to realize that each type has its own domain and that both types *complement* each other instead of *excluding* each other.

The subject deserves a certain amount of reflection, all the more so since popular fancy has taken to the self-propelled mount and sees in it a universal panacea, able to solve all problems which artillery faces in modern warfare.

It is a fact that, during the Libyan campaign, after the success obtained by the German 88-mm., the newspapers showed a picture of it with the caption, "This gun is superior to the British gun because it is self-propelled." Yet the picture showed clearly that the gun was not self-propelled but tractor towed; the gun was emplaced, the trail was split and the prime mover was off!

For others, a gun which is not self-propelled is a "defensive" weapon and, as such, is utterly obsolete. It seems hardly necessary to redress such nonsense. Strategical conceptions have nothing to do with the question of practical use of arms. These are entirely different matters. An artillery barrage is offensive when it clears the path of an infantry attacking; it is defensive when it protects infantry, repulsing an attack. A tank is an offensive weapon, but in action it must be protected by emplaced anti-tank guns. When Rommel in June 1942 destroyed a whole group of British tanks, his 88-mm. guns did not "charge," they were ambushed, on the

"defensive." However, who will deny that the success of this "defense" played an important part in the offensive which followed?

In order to get a clear idea of the question, we may consider one of the best known self-propelled guns—the first U. S. tank destroyer developed early in this war. This mount, fast and with almost no protection, is equipped with a hard hitting 75-mm. It marks the extreme application of the principle whcih consists of sacrificing protection to benefit speed, a principle much favored at the time of the blitz when speed and swiftness of action were considered the primary factors of success.

Here is the theory of employment of the T. D. as set forth in the *Field Artillery Journal* on the *eve* of the Tunisian campaign:

* * * "Tank Destroyer objectives should be *tanks,* moving objectives to be attacked with fire and movement."

"Against such objectives the Tank Destroyer Battalion may be employed to attack the head, the flanks, and the rear. It may hit the head, then the flank, and then the rear of an armored force. It may hit these points successively, engaging one while hitting another. Or it may attack all three simultaneously. The method to be chosen may depend upon the relative size of the units involved. A Tank Destroyer Battalion should be able to attack a tank company from three points at once, or perhaps a tank battalion in particularly favorable terrain. A Tank Destroyer Group should be able to handle similarly a tank battalion, or even, under favorable conditions, a tank regiment."

* * * "Tank Destroyers are not intended to fight a static battle, to slug it out with tanks. The Tank Destroyer Company is given great fire power and mobility. *Both* must be used. The fight must be kept moving, destroyers shifting from position to position and continuously attacking with fire. Tank Destroyers do not use shock action but they always attack with fire and movement."

* * * "To destroy tanks they must seek them out, act offensively, always attack, even when attached to larger units on the defensive."—"Employment of Tank Destroyer Units," by Lt. Col. G. S. Meloy, Jr., and Maj. Joseph Sill, Jr., *Field Artillery Journal,* February, 1943.

Some T. D. officers, particularly enthusiastic, were even seeing in it a "charging artillery" which would be enabled by its tremendous speed, not only to parry the blows of the enemy, but also to charge and overrun its foe. They forgot that even tanks, in spite of their heavy armor, seldom "charge" and that any machine without heavy protection has not a chance in charging on the battlefield. The self-propelled, unarmored T. D. is a very interesting solution, but a *limited* one. The combat by "hit and run" has restricted possibilities; a whole army cannot fight running. It is all right for the mechanized cavalry and its action is invaluable, but an army is not composed of cavalry alone. In order to fight, the host of the army must take position, it must stop and organize the terrain and this means that the army has to cling to points *temporarily* fixed. This is by no means in opposition to the fast war of movement. Occupation of position may last ten minutes or six months. But fundamentally the principle remains the same—the army settles somewhere.

The gun which is in charge of the defense of these places *temporarily* fixed will not move when the attack *is on*. Before or after the engagement it may have to move and for this reason it must have a great mobility but *during the engagement* it must stay where it is and this for two obvious reasons:

a) If it pulls out or is disengaged after having fired a few shots and while the attack is still progressing it leaves the place and its infantry *undefended*.

b) *During* the action any machine which is *not* heavily armoured will find it *extremely hazardous* to move in the open and in sight of enemy tanks and planes.

For the defense of the points *temporarily* fixed, the self-propelled, unarmored T. D. will be handicapped. To protect a strong point, a fortified village, a bridgehead, a center of reparation, a headquarters, the T. D. will be compelled to stay, for a while at least, where it has been set. Then, since all its protection rests in its extreme mobility, it will be hampered with the *same deficiencies* as the conventional field gun—*even more so* since its high silhouette and its unprotected reserve of gasoline and ammunition make it very vulnerable. This is even more evident if we recall that, as a field gun (the T. D. is part of field artillery) it has not only to

fire at tanks over open sight, but also to execute barrage at long range by *indirect* firing, and this type of action is just as important. In order to fire by *indirect laying* a gun must be stationed, for a time at least. This alternation, in quick succession, of fire of different kinds is an oft overlooked necessity. For 5 minutes the guns fire at tanks over open sight at 500 yards. The tanks break off the fight, the batteries then return to the fire at long range, called for by the infantry.

A gun cannot fire at long range at a target which as a rule it does not see, except by *indirect laying*. The fire is directed from an O.P. which is located sometimes close by, sometimes at quite a distance.

Everyone familiar with artillery problems knows that no such fire is possible if the gun continually moves around.

Therefore field artillery will be forced to proceed by *leaps and bounds*. These leaps may occur often and the intervals during which the guns are stationed may be very short, but one may safely assert that field guns will not be in a perpetual whirlwind.

These considerations, however, should not be understood as deprecating the T. D. whose possibilities remain very great for rearguard and foreguard action, counterattack, etc., in all of which its speed will prove very valuable. But this type of combat is typically cavalry action and just because one weapon may be successful in certain assignments, progress in other directions should not be forever forbidden.

Let us return to the defense against close attacks of these places *temporarily* fixed. On which principle is this defense to be based? The primary, the capital advantage of the outfit on the defensive is to be on its *own ground* and to be there *before* the adversary. How is this advantage put to practical use? By doing all that the attacker cannot do: digging in, camouflaging, picking out a favorable position, surveying the field of fire. These principles are not new. They are those which govern the employment of antitank guns. Why would they not be good for the field gun once its deficiencies have been corrected?

These advantages of the defensive position are so evident that the unprotected T. D. itself has been forced to adopt them. Here is what Col. Colbuck writes at the *close* of the Tunisian campaign:

"Tank Destroyers furnish commanders with a mass of mobile fire power with which to counter mechanized attacks. BUT—we must remember that T. D. vehicles are not armed like a tank and cannot 'shoot it out' with tanks in the open. . . ."

"The T. D. Battalion must be ready to move instantly into the selected positions occupying them *before* hostile tanks actually reach the scene. . . . Concealment is paramount. Remember, silhouettes are not low and skins are thin. Hull-down positions are therefore essential. It may often be necessary to dig in the vehicles. We can profit from British experience in the Libyan desert where this was practically S. O. P. All positions must be thus prepared, including those which are selected for only possible later use; when vehicles are going into actual action to meet the thrust there is no time for digging which should have been completed long before. The same is true of alternate and supplementary positions."

"T. D.s, like conventional artillery, are most vulnerable when on the road. It is, thus, doubly necessary to cling tenaciously to initial positions just as long as effective fire can be delivered from them."—"T. D. Fundamentals," *Field Artillery Journal,* June, 1943.

But there is another advantage, another possibility which a weapon which is "at home" has and of which, obviously, a weapon on the attack is deprived. This advantage is the possibility of removing from the place of combat all that is vulnerable and cumbersome such as gasoline tanks, motors, supply of ammunition, etc. This enables one to leave at the exposed spot a weapon with small overall dimensions, easy to dig in and to conceal, and which can be provided with a thick shield proportionate to modern projectiles without reaching an excessive weight. But this splitting in combat of the gun and the motive power can only be done if the gun is towed or portee, not if it is self-propelled.

If we consider the problem in a more general way we see three factors in a modern gun:

First factor—*Fire power* (gun).

Second factor—*Motive power* (motor, tracks, supply of fuel and ammunition).

Third factor—*Protection* (armor).

On a conventional field gun the third factor is almost non-existent; on a tank destroyer the first and second factors are combined on the same vehicle. The third factor is practically absent. On the armored gun the first and third are combined, the second factor is apart. On a tank the three factors are combined on the same vehicle. There we put our finger on the reason why the tank is a complicated machine and a headache for the designer. Since the gun is on the *same vehicle* as the motive power and all that goes with it, gasoline tanks, tracks, etc., *all* of them must be protected. If one increases the thickness of the armor, then the weight increases. In order to keep the same mobility, the motive power must be boosted. Then the size of the machine becomes inadequate and must be modified. This calls for a heavier weight of armor. Hence tanks, like ships, tend to become heavier and heavier. This is why they are equipped with airplane engines, having a greater power for a given weight. This is why the engineering of a tank is nothing but a succession of compromises in which some parts have to be sacrificed for the benefit of others. This is why also, in spite of their apparent ruggedness, they are delicate machines requiring great care. But it *cannot be otherwise.* The three requirements concerning fire power, protection and motive power must be *combined on the same vehicle* because the machine is an *offensive* weapon which goes *inside* enemy lines; it must be self-sufficient, and must *carry with it* all that it needs on any kind of ground.

On the other hand, any self-propelled machine which is designed to meet tanks in open field needs armor. Then it will inevitably become a kind of tank. A glance at the most recent tank destroyers is a proof tht all armored self-propelled guns belong to the same family. Distinctions between armored self-propelled guns and tanks are indeed subtle. They lie in tactical employment which are not the same for both kinds, but fundamentally there is no real difference in design. Both are vehicles which *combine* armor, fire power and motive power.

"Besides new PzKw VI ('Tiger') tanks, the Germans this year are using an armored self-propelled gun called 'Ferdinand.' Tiger, a 60-ton machine with thick front armor and heavy armament, was to be used as a battering-ram to clear the way for other vehicles, while itself remaining invulnerable to artillery fire. The same task was also assigned to Ferdinand, which weighs 70 tons, has even stronger armament, and which outwardly is scarcely distinguishable

from a tank. In fact, in early phases of the fighting many Soviet commanders mistook Ferdinand for Tiger. Ferdinand, however, is a relatively low-speed vehicle, armed in an unwieldy fashion with a single gun mounted on a non-revolving turret. Although resembling a tank and acting in conjunction with them, it actually is a new type of self-propelled artillery."—"Artillery vs. Tiger and Ferdinand," by Lt. Col. L. Vysokoostrovsky, *Field Artillery Journal*, November, 1943.

On the contrary, a gun which *does not invade* enemy lines and is not expected to roam the field in the open is not subjected to the same requirements as the tank. Then it can be tractor-towed and it becomes possible to combine speed, armor and fire power much more easily. How, in that case, is this combination of speed and armor possible? If one wants high speed, then one can spare only *limited weight* for the armor, 3,000 pounds, for instance. On a gun *without* its tractor these 3,000 pounds can make a very thick armor. In combat the gun by itself will be very efficiently protected. In transit, the whole machine, tractor and gun, will be light enough to travel at a good speed. The combination of speed and armor is thus realized. But this is obtained because all that is vulnerable is *moved away* from the place of combat and only the very minimum is left "in the ring" and thus can be equipped with a shield which, although thick, is not excessive in weight. But if with the same amount of steel one wants to cover an entire vehicle with its motor, and its gasoline tank, the armor will be too thin to afford any real protection in a fight *versus a tank at close range.*

Even though one may be unfamiliar with engineering problems, one easily realizes the economy in weight and simplification in design brought out by the application of this conception. For instance, the whole armored 25-pounder, equipped with a 2″- thick shield, is not heavier than the mere transmission of the self-propelled gun of the same caliber. It is hauled by a tractor equipped with an automobile engine, at the same speed as that of the self-propelled gun equipped with an airplane motor.

One may be surprised at the emphasis given to speed and mobility of towed artillery since it is often believed that mobility is the main asset of the self-propelled machine and one on which it cannot be challenged. As a matter of fact, mobility is a broad term and deserves close examination: For cross-country performance the self-

propelled gun usually has the advantage. But it must then be pointed out that mediocre cross-country performance of towed artillery is too often due to the fact that we use, as prime movers, machines which are obviously *ill adapted* to this work, such as four-wheeled trucks with deficient flotation and traction. Such a truck, even without a gun in tow, may often get stuck in the mud although then by itself it is *nothing but a self-propelled machine.* A prime mover such as the new U. S. whole full-track tractor can pull a 3-ton gun nearly everywhere a tank can go. However, the fact remains that a self-propelled gun will always cross ditches and climb up steep grades with greater ease than a towed machine and will be able to fire from places where a ground mount will be hampered. These characteristics will prove very valuable in certain kinds of missions and by themselves they are more than sufficient to justify the S. P. mount for artillery of armored divisions.

For strategical moves on long distances along roads or already opened paths a towed gun rolling on wheels is usually superior. For the prime mover an excellent solution combining tactical and strategical mobility is attained by the half track, U. S., or better a 6 x 6 splinter proof tractor, the rear wheels of which can be fitted with tracks when need be. Such removable tracks are vulnerable and can be used only because this machine is not expected to confront fire in the open.

In mountainous country or in cut-up terrain where small bridges must be crossed the towed gun has a distinct advantage. An armored gun of 88-mm. weighs 4 tons. A gun of the same caliber splinter-proofed and self-propelled weighs around 25 tons. The former can be hoisted by man or by horse to places the latter will never be able to reach. It will pass on *many bridges* which will *never hold* a 25-ton machine. It is well known tht for mobility it is often sought to break the load in as many parts as possible so that each one may be carried more easily. The mountain pack artillery gun is divided into seven separate loads. The towed gun with its tractor has, to a lesser degree, the same facility. It can be broken in two, the gun and the motive power, which is impossible on a self-propelled machine. And finally, when the motor or the tracks of the tractor break down, or *when it catches fire*—unfortunately a *most frequent* cause of disability on a gasoline engine driven machine—*the towed gun can be kept in action* and pulled by any other available means of propulsion.

A study of mobility, to be complete, requires that the rapidity of action be considered. . . . On this point the fundamental inferiority of the *conventional* gun mount resides.

Before being removed from its position the gun must wait for the tractor to come. Limbering up takes a certain time during which the gun cannot fire and the gunners are exposed. This indisputably is a grave handicap avoided by a self-propelled machine. And not only by the self-propelled machine, *it is also avoided by the towed armored gun equipped with a specially designed limber.* Attention of the reader has already been called to this point and some of the requirements for an armored gun-carriage were to be able to fire without having to be unlimbered and put in traveling position immediately after the last shot and without any gunner having to step out. This is realized by a simple device. Certain new types of gun mounts fire without being unhitched. They are put in traveling position automatically when the tractor starts. If the gun has to fold up at a moment's notice, the tractor will be kept limbered up to the gun during the fire. Two seconds after the last shot it will be on the road. Such a situation may occur when the gun is employed in rear guard action, for delaying enemy advance, or is exposed to a wide awake counterbattery and may have to shift quickly to an alternate position. But as a rule one may expect to be able to unlimber. If the gun has to fold up, it will move between actions and with the bulk of the army break off the fight and retreat *during the night.* An army is a gigantic and complicated body which is most vulnerable when it is in movement and which must try to avoid being taken under fire while it is displacing. This is true for an infantry battalion, true for a battery of towed artillery and true, also, for the self-propelled, unprotected gun as was well pointed out in the previously quoted article of Col. Colbuck. Therefore these outfits will move *between* action and between action only. In action whenever it is possible the tractor will be moved off and concealed in a nearby place. The machine gun on the tractor is available also for antiaircraft protection unless the tractor is being used for supplying the position with ammunition.

"There is generally concealment near at hand, in which the tractor could be hidden.

"But can a tractor be set close to a gun and not be endangered by the fight? Yes, because tanks have *one primary mission,* which is

to crack the actual resistance they discover. *They do not mop up* and do not bother to seek out such things as hidden tractors. In fact, they avoid any places off at the side which can harbor unpleasant surprises. They will avoid them even more carefully if at the same time they run the risk of receiving a deadly blow from a gun in the vicinity. Let us not forget that the fight of a gun versus a tank, by its peculiar character, is *extremely localized: A small area around the gun is under a heavy fire but, a few yards away one escapes it.*" —"It Must Be Armored," by J. Riboud, *Field Artillery Journal,* November, 1941.

"Most people agree to trucks fairly close to gun positions, with machine gun mounts used as AA protection. Dispersion is more valuable than camouflage, although the latter is important."—*Field Artillery Journal,* September, 1943.

It is even easier to keep our modern tractors very close to the firing position as they are slightly armored.