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Lieut.-Colonel W. D. Croft C.M.G., D.S.O.^a

^a Scottish Rifles

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THE INFLUENCE OF TANKS UPON TACTICS.

By LIEUT.-COLONEL W. D. CROFT, C.M.G., D.S.O., Scottish Rifles.

On Wednesday, 7th December, 1921.

MAJOR-GENERAL W. H. ANDERSON, C.B., Commandant, Staff College, in the Chair.

THE CHAIRMAN: Ladies and Gentlemen, I hope that Colonel Croft does not require much introduction to the greater part of the audience. Colonel Croft made his reputation in France as Adjutant, as Battalion Commander and as Brigade Commander throughout all the fiercest fighting in that country from 1914 to 1918. At the end of the war, in 1919, he came to the Staff College as one of the hand-picked veterans for our first year's course; after leaving the Staff College he went to the Tank Corps, and he is at the present moment commanding the Tank Battalion at Aldershot, with which he went through the training of the Experimental Brigade last summer. To this great practical and theoretical experience he adds constant and constructive thought, as I know from personal experience, on tactical questions, especially those connected with mechanical warfare. These qualities, I know, will ensure for us a lecture full of interest for all soldiers who are anxious for guidance in the tactical problems of the future.

With that introduction, I will ask Colonel Croft to deliver his lecture.

LECTURE.

LADIES AND GENTLEMEN: I should like to point out that I have had no experience whatsoever in the field with tanks, and that I have never seen a tank in action. I am merely an infantryman, and the point of view that I shall put forward is that of an infantryman pure and simple. I am not a tank expert.

"Changes in tactics have always followed changes in weapons, but the intervals between such changes have been unduly long." The best illustration of Mahan's maxim is to be found in the effect upon tactics produced by the machine gun. Fifty years ago the machine gun was used, though rarely with effect, in the Franco-Prussian war, and it is only since the introduction of the tank that it has been allowed to effect even modified changes in forty-year old tactics.

In past wars, either one side or the other has entered upon hostilities with some defect in tactics, organisation or equipment, such lack of foresight having to be made good either during or immediately on the conclusion of the war. There has always been rather a tendency to

look back and take the latest efforts in war as a model, and build up on them. Now that so much store is set by the Staffs of armies, it will be part of their duty—and that not the least important part—to look ahead, to anticipate; for lack of foresight in the future will be the outward and visible sign of bad staff work in peace. Even now there is a tendency to base our tactics on what has been done in the last forty years. As a matter of fact, I think we as a race have every reason to be proud of ourselves as being the pioneers of new changes in tactics to suit new weapons. At Crecy our bowmen not only wrested the palm of battle supremacy from the armour-clad knight, which he had held undisputed for centuries and became the terror of Europe, but from Crecy dates the supremacy of infantry on the battlefield, a supremacy which they have held until now. In the Peninsular War Wellington's linear tactics enabled him to defeat the French time and again, and the French could never apply the correct answer. In a lesser degree, the skirmishing of the Light Division was a model for all time. In 1914 the Germans complained bitterly that every British soldier was armed with a machine gun, a high compliment to our pre-war training, and in 1916 we fathered the tank. I think, therefore, we have nothing very much to reproach ourselves with as regards changing our tactics to suit the changes in weapons, but that is no excuse for being stagnant.

With regard to the question of vulnerability, it has been estimated that 80 per cent. of infantry casualties in the Great War were caused by machine-gun fire and shell splinters. The tank is immune from both. With regard to gas, infantry obliged to move through a gas cloud suffered severely from the after effects, owing to their exertions, whereas the crew of a tank is carried through the gas cloud without the slightest exertion.

As regards the anti's, there are a great many people engaged at the present time on the subject of how to "do in" the light tank or the new tank. Outside witchcraft, there are two things that are supposed to deal with a tank effectively, the first being anti-tank guns and the second mines. The anti-tank gun was first used in the autumn of 1918. In September, 1918, the whole of the most powerful artillery which the world had ever seen was concentrated on knocking out the tanks, and yet over and over again the old slow "busses," at five miles an hour, extinguished the gun, often by getting round it and sometimes by direct approach. The tank won. Over and over again cases occurred not only of tanks walking round and out-manceuvring the guns, taking advantage of folds in the ground and so on, but actually walking up to the gun and treading it in. At the end of the war the tank was practically having a walk-over, but, of course, it had experienced very heavy casualties in the meantime. So had the infantry, but the tank won and came through. If you are shooting partridges, a covey of driven partridges comes over the guns at about thirty miles an hour. The average man has done well if he drops one bird in three shots—if he is lucky. Put a rifle in the hands of the man and how many would

he hit? Now put a gun in the hands of the anti-tank gunner, give him ideal conditions like Salisbury Plain (but in that case the tank must have ideal conditions, too, and, furthermore, remember the tanks will be coming at him at a maximum of twenty-five miles an hour). The tank is not going straight at the butt; it is zig-zagging and, unlike the partridge, the tank is hitting back. The gunner will be like the man with the rifle shooting partridges, a complete novice at the game, for he cannot possibly have such a target in peace. What are his chances of hitting the tank? In England, for instance, close country is normal, and it is exceptional to get a clear view for more than three hundred yards along the flat. A tank at maximum rates will get over that in less than half a minute. Furthermore, tanks in close country would probably work in pairs, that is to say, one tank would go forward covered by its mate in a good fire position, ready to shoot at the slightest flutter of the anti-tank gun.

With regard to the answer, the only answer to firearms was firearms. The German General Staff was answered, not by assassination, but by the formation of yet another General Staff. The answer to a machine gun was a machine gun firing from a tank, and the answer to a tank is another tank. It may be argued that, if the anti-tank gunner cannot hit the tank, neither can another tank. That is true; and it is quite possible that they may have to rub noses before they do hit each other, but they will hit each other eventually.

In the past, position warfare has been normal ever since the spade has played such an important part in shielding infantry. A war of movement, on the other hand, has been abnormal. Even as far back as the Peninsular War, Wellington sought shelter behind the lines of Torres Vedras, and if Masséna, when he confronted him, had possessed a supply service, he would have sat down, dug himself in, made a plan and dealt with Wellington once and for all. It was the soldierly thing to do. He could not do it, because his army lived on the country; the country was swept as bare as a board, and the army had to go back. Then Wellington hunted the rabble.

In the winter preceding the Wilderness campaign of 1863, the Federals and Confederates had finally come to grips across that vast continent. Both armies were entrenched—the Confederates, like the British in 1914-15 and again in 1917-18, were all in the line, and the Federals out training behind the line, which they held very lightly, just as the Germans did in 1917-18. The Wilderness campaign itself was a series of battles for inches, not acres; a war of attrition, where both the opposing infantries were so evenly matched that neither side could get a decision and the infantry on both sides eventually became exhausted. "Now we will rest the men and use a spade for their protection until a new vein can be struck," said Grant to one of his Generals at the end of severe but indecisive fighting. There are numerous other incidents that might be quoted. Plevna, the Russo-Japanese War, the Turks at Chatalja, and so on, are all instances of position warfare being normal

where two sides are at all evenly matched; and a war of movement, after the opening stages of the campaign, where the two forces are feeling for each other, only occurs when one side, having broken through, marches to ultimate victory or is checked again owing to the exhaustion of its infantry. Has the tank changed that? I maintain that it has, because, since the taking of the Gird trench in 1916, when 270 Germans surrendered to a single tank, the infantry have lost their supremacy on the battlefield. The queen of the battlefield is now a tank, which, like the queen at chess, can move pretty well when and where she likes.

I have to tread on rather delicate ground when I come to the subject of cavalry and tanks. I think it is safe to say that against machine guns a cavalryman is rather like a young rook in April. He cannot get cover like the infantry; he has to charge or go back. If he is up against a tank, he is even worse off than the infantry, or at least as badly off. If we go on with these forty-year old tactics of ours, the same system (mind you, I am not criticising the system, I am suggesting a change), it may well happen that, in the next war, we shall send out a Cavalry Division on an independent mission, and as, with the present system of tactics, we propose to put a battalion of tanks to an Infantry Division, we shall put a battalion of tanks to a Cavalry Division too. If we are confronted by a nation which has decided to cast the horse, that is to say, to go the whole hog and mechanise its army, it may well happen that that Cavalry Division will be confronted with a brigade of tanks. The cavalryman cannot fight these tanks any more than the infantry can, and he must retire gracefully through the tank battalion and watch the latter, backed by the horse artillery, take on the hostile tanks. The cavalry are, in fact, like the infantry, no longer mistress in their own house. The cavalryman has become a jackal to the tiger, the tank. In that minor rôle he is invaluable—the most rabid tank enthusiast will admit that. The cavalryman is almost essential to him in a minor rôle, but, in these days of bankruptcy, can we afford to have those two things side by side—horses and the men behind the horses and the tank or machinery and the man behind the machinery, and all that that implies? If we were rich there is no question what we would have, but unfortunately we are poor.

With regard to the infantry battalion, at the present time the infantry battalion is the most unwieldy contraption in the attack since the days of Gustavus Adolphus, but its hitting power on the defensive is far greater than ever before—32 Lewis guns with 225 men behind them, 8 machine guns with 100 men behind them, and 2 Stokes mortars with 20 men behind them. The hitting power has never been so enormous, when it is acting on the defensive. But in the attack it is unwieldy, and it is impossible to get anything like half the hitting value out of it. The origin of this enormous fire power is interesting. You will remember that in 1914 the Army on the defensive sent home the cry for machine guns, and that cry came home to an Army that was preparing for the offensive. When the new Armies came out, the infantry

had more fire-power than any pre-war battalion, though the numbers of Lewis guns were nothing like so many as at present. This great accession of fire-power was not a great success on the Somme, and it was put down to lack of training. But these weapons were increased until Battalion Commanders were called upon to deal with the present numbers, though in a slightly different organisation in so far as regarded the machine guns. As a Battalion Commander, I found it impossible to get real value out of these things in an attack, because of their unsuitability, though at the time I put it down to sheer incompetence. This unsuitability was never exposed, owing to the efficiency of the creeping barrage. I will endeavour to explain my difficulties. In the first place, I was forced to attack an enemy who knew his business sufficiently well not to make me a present of convenient tactical features such as are to be found at Aldershot, the home of the slogan "Fire and Movement." Consequently, if I used my machine guns, they must fire directly overhead without any advantage of command. Theoretically it is safe to do this, but in practice it is not. Anyhow, it was proved to our satisfaction that it was not safe, owing to the impossibility of entirely eliminating the human element in the excitement of battle. As regards the Lewis guns, the most advanced usually followed the first wave. Determined infantry when once launched are only stopped by one thing—machine-gun fire, which has often sent a battalion to ground. Picture to yourselves the position of the Lewis gunner. He, like the others, had dived into the nearest shell hole, and when he emerged in order to function he was, as often as not, under the necessity of cleaning his gun as best he could with a muddy hand to get it to function at all. In all probability the men carrying the drums were in another shell hole, and he found himself short of ammunition; when he was ready to open fire, he might run the risk of shooting into the backs of his comrades in front of him, or else he could not see his target. There was no question of his utility when once the position was taken, but I found that he was comparatively useless in helping to reach the objective. We were sometimes sent back behind the lines to schools in order to watch platoon demonstrations, but that did not touch our difficulties because the demonstrations were not practical. Platoons in real attacks do not perform little shows on their own; it was combined team work that we wanted to see, and eventually we saw it. The German gave us the best possible demonstration in 1918. As in most things which that excellent soldier did, he took the big view. He had found, like ourselves, that machine guns and automatic rifles were incomparable in defence; his problem was to get value from them in the attack. He milked his infantry dry of their best men and made his machine gunners a *corps d'élite*, the infantry being merely cannon fodder and line holders to come along and hold ground won. Then he made his machine gunners the spear-head of his army. He gambled on getting his machine guns through the trench system under cover of smoke and not until they were through the hostile infantry did

they function at all—to the flanks or in rear of their hostile infantry. The gamble came off in the south, but in the north, where the machine gunners were confronted with a more stabilised and strongly held system, they met with a costly failure. When confronted by our men they never had a chance; they were sent to ground like our Lewis gunners in the attack.

Had those machine gunners been inside a steel box there might have been a different end to the war. Put all these things in a steel box, and we get the machine gunner firing his gun as it was fired on the test bench. His spares are handy and clean to rectify failures; his ammunition is under his hand and clean; he has command, so that he can see his enemy. Fire and movement no longer applies to the unrealities of manoeuvres, but is a reality in war.

It has been my good fortune to command a company of tanks; it has been my ill fortune to break my heart trying to get some value out of this lump of unwieldiness in the attack. To me, therefore, the ideal battalion in the attack in this transition stage is 400 riflemen suitably equipped and suitably clad, and a company of tanks. It may be argued that machine guns will be wanted outside tanks for line holding. There is no reason why those machine guns should not be brought up afterwards in tractors and manned by some of the riflemen. But in the event of the counter-attack being delivered by tanks, we shall want our company of tanks to meet it.

The human factor, both in war and peace, must be considered. A tank crew is spared most of the horrors of the battlefield. They do not see or hear their stricken comrades; they do not see or hear the bursting shells, than which there is nothing more nerve-racking. They are under cover, and most of us remember how grateful we were to cower under a flimsy bit of corrugated iron and how loth we were to leave it during a bombardment; even a bell tent gave moral support. The crew are taken along just as they go about their daily work—until such time as they get a direct hit.

In peace we train our infantry now to be unnatural, to do things which they will never do in civil life. Forty years ago it was natural to do long, slow work on a pair of human legs, and to carry weights. Now everyone goes to work on a bicycle or 'bus, by train or tube—anything rather than walk. Legs are chiefly used for short, fast work—games. The British soldier is incomparable; he is so amenable to discipline that he marches long distances and carries a heavy load without anything more than a grouse or two. He is the most unimaginative person in the world, yet he does his best to exercise his limited imagination when training, but it bores him immensely. With a tank battalion it is quite the reverse. It was my lot to take over a tank company with just an average crowd of recruits. From the first it was obvious that the men meant business; you could not keep them away from the tank. The machines were as raw as the men, and working out of hours was normal, but they never thought of grousing. Last training season, those among

you who saw our men standing idle by a tank may possibly not have realised that those men had already done a day's work trying to get the tanks ready. They have far more work to do than infantry, and they undertake it willingly, because it is something definite and because they take a very big pride in their ship. The youth of the nation are, at the present moment, machinery-mad. The British soldier turned mechanic—what a combination! You must remember that I am not talking of specialists; they are exactly the same men as you get for the Army generally.

The question therefore arises: Are we to superimpose tanks on our forty-year old tactics, or are we to revise our tactics to suit the tank? Take the case of the Advance Guard to a force moving at the rate of $2\frac{1}{2}$ miles an hour, and doing 15 miles a day. It is admitted that some tanks must go with the Advance Guard; but, if there is only one battalion of tanks to a division, there will be few tanks to an Advance Guard. Where are they to go? They cannot go in front, as they are too few, and therefore too precious. If they follow along in rear of the main guard the pace will be highly injurious to the high-powered internal combustion engine; they must therefore take advantage of the shunting ground between the tail of the main guard and the head of the main body. They would have to move so as just to clear the head of the main body; on catching up with the tail of the main guard they would halt again, and so on. Occasions might arise when they could dodge the starting point and move off the road, but tanks, like others, do not like larking across country when hounds are not running! But, if they did so, their wireless telephone equipment would enable them to get all the news of the front from the front by means of the air, and so they might anticipate orders accordingly. The situation of the tanks with the main body is even more unenviable. They would have to go in front of the main body, and march with the ranks of the Advance Guard as a unit, or they would be forced to march right behind everything on the road and make progress in the same manner as the tanks of the Advance Guard. Now let us suppose that we, having made no drastic revision of our tactics, find ourselves at war with a nation which has abandoned the horse owing to supply difficulties, and has given up its trust in the human leg—which has, in fact, gone the whole hog and mechanised its army. It might happen that an ambush could be laid for the Noah's Ark; there would be no squealing or neighing, and the efficiency of the camouflage would be tested by its own air forces. At a given signal from the air, the hostile tanks are slipped; in half a minute they are into and over the Advance Guard. They might encounter some resistance from the few tanks, but Heaven prospers the big battalions, and in a few minutes they are into and over the main body before it has had time to think of deployment, and then they are at liberty to deal with the tanks of the main body at their leisure.

With regard to air control, much has been said recently about the

advisability of putting the tank commander in the air when tanks are operating independently. This would mean that the tank commander must have trained air sense and vision, be trained as an aerial machine gunner, be trained as a pilot (in order to drive in an emergency); in short, be a fully trained airman. Again, if his escort were driven off he might be called upon to fight for his life at a time when his tanks below were hanging on his words—divided control in its worst possible form! Again, visibility may be so bad as to prevent him seeing anything. It appears, then, that normally his best position would be on the ground, trusting to his airman to tell him all that he wants to know. He can hardly find time to become a trained airman and a tank commander as well.

The co-operation between the air and the tanks must be of the closest description. The greatest danger the tanks will have to fear in the future is from something which can outsail them and bomb them at leisure. An air escort will be essential, and this liability to bombing will control the size of the machines.

With regard to staff rides, it is outside the scope of this lecture to go into details concerning expense; that is a matter which can easily be worked out by the aid of cost accounting; but the most important part of revising tactics, that which is concerned with thinking things out to their logical conclusion, costs little or nothing. Staff rides conducted by those who are thoroughly grounded in our present system of tactics would undoubtedly throw important light on the necessity of changing tactics to suit the new and formidable weapon which has wrested the palm of battle supremacy from the infantry from the day on which an airman dropped the message to the effect that: "A tank is walking up the High Street of Flers with half the British Army cheering behind it."

DISCUSSION.

GENERAL LORD HORNE: General Anderson and Gentlemen, I came here this afternoon to listen and to learn, and it is only at my old staff officer's urgent request that I rise to open the discussion. I think the salient point of this very excellent lecture is the necessity for research. That has been my cry since the war ended, especially in connection with a subject kindred to tanks, that of machine guns. It is merely a platitude to say that we must all of us recognise that we are in the dark and that research is the first necessity. We must not cease to examine into the best means of employing the new weapons which we developed during the war. As regards the influence of tanks upon modern tactics, I was hoping that Colonel Croft would have been able to tell us a little more of what he thought should be the role to be adopted by the tanks. He has argued very excellently the possibilities of what might be accomplished and what might not be accomplished, but he, like myself, is still groping in the dark and unable to say what the best methods would be of accomplishing the results that we desire to attain. I pricked up my ears when I heard the closing sentence of the lecture, in which it was suggested that the man with the rifle has become an auxiliary to the tank. I shall want convincing before I yield to that claim, because I think that proposition has not been substantiated by the experience of the war and that the man with the

rifle still remains the unit on which we have to base the employment of the different arms. The lecturer gave as an illustration the tank which went up the street of Flers on the 15th September 1916. That was the first tank operation. I know that General Anderson will bear me out that in trying that experiment, we, of the XV Corps Headquarters, noticed a tendency on the part of tank officers to fight the battle by themselves. The most successful tank attack took place on the front of the 15th Corps, where three tanks got right through. On that occasion both the tank that went up the streets of Flers and the other two that went round got on well. I am sure if they had had a better idea of co-operation, if they had stopped and organised and carried the infantry with them, they would not be standing where they are now in front of the line at Geudecourt. They went on alone; they accomplished a splendid and most gallant work, but they were without support and there they remained. When we received that historical message—"A tank is walking up the streets of Flers followed by"—not "half the British Army cheering behind it"—I want to correct that, because the message was—"followed by a disorderly rabble"—I said: "I wish they would get themselves into some order, else they will very soon be back," and they would have been back but for the very energetic action of a Brigade Major.

Gentlemen, I will now urge someone who has had a more intimate acquaintance with the technicalities of the tank, and also some experience of its employment and the experiments in connection with its employment, to speak.

COLONEL J. F. C. FULLER, D.S.O.: Mr. Chairman, Ladies and Gentlemen, I had hoped that somebody not so intimately connected with tanks as myself would have got up and said a few words, but as nobody else has risen I will continue this discussion. I intend to speak on the question which Lord Horne has just spoken about, namely, the tactical side of this lecture. What changes are tanks going to effect in our future tactics? The problem is, I consider, a simple one if we bear in mind the factors which go to build up tactics. Suppose two men are going to fight, what have they got to do? They have to do three things; first, attempt to hit each other; secondly, prevent themselves from being hit; and thirdly, move; in other words, they must possess offensive power, protective power and mobility. These are the three key problems connected with tactics. Let us compare the tank with the infantryman, and especially the offensive power of the infantryman with that of the tank. The infantryman's offensive power is limited by his carrying power to a rifle and a hundred rounds. His direct protective power is nil. His moving power perhaps 15 miles a day under very good circumstances; under war conditions it is much more like 3 or 4 miles a day. Now take the tank; its offensive and protective powers are enormous when compared to those of infantry, and its moving power, even in 1916, was considerable. When these simple facts are accepted, there can be little doubt what tank tactics will be like. Let us visualise what will happen when tanks meet infantry, cavalry and guns. Let us ask ourselves these questions; What are the infantry going to do? What are cavalry going to do? What are guns going to do? When tank meets tank, what part can the infantry take in the tank battle? I do not know. If anybody can enlighten me as to this, I shall be only too delighted to hear the solution. What part will the cavalry play? They perhaps can scatter land mines about on the ground, but surely it is better to do this from the air or from a tank. What I think cavalry will do is they will save themselves; they will be the only arm which will save itself; they will gallop off the battlefield. What will the gunners do? They will knock out a certain number of tanks, but it must be remembered that the guns are in the open. If a gun is to be effective

in a tank battle it must get inside a tank. In 1916, when Colonel Swinton gave us the tank and saved the British Army, even then, as Colonel Croft has told us, the tank accomplished something, and the fact that it was able to accomplish something, considering it was an untested machine, was one of the most remarkable episodes not only in military history but in the history of engineering. I will examine now what occurred at a later period in the war at Cambrai, in 1917, and again at Amiens, in 1918. In 1916 on the first day of the battle of the Somme 40,000 British soldiers were killed and wounded. At Cambrai, in 1917, we suffered 6,000 casualties. At Amiens, in 1918, there were 40 officer casualties and 937 casualties amongst other ranks, a total of less than 1,000. These facts are tactically so conclusive that I cannot imagine how anybody can doubt that a man moved in a machine protected by armour, a man supplied with large quantities of ammunition, can possibly be inferior to the man who has to fight on his feet. As an infantryman, I am certain that the infantryman's future place is in a tank. I believe that the cavalryman's place is in a tank but of a different type, and that the artilleryman's place is in a tank, again of a different type. Consider the gunner of to-day: he has to fire from behind an infantry screen. If he is sent out on his own he has to be provided with an escort. Why? Because he cannot protect himself locally. Put him in a steel box and he obtains local protection. In connection with this lecture there are two other points which simultaneously arise, protection of infantry from the air and protection from gas. Let us visualise a Divisional column such as seen in 1914, marching along a road in a war of a few years hence. Let us watch it attacked by 20 or 30 low flying armoured aeroplanes, equipped with 20 machine guns apiece, what will happen? The answer is to be found in the last number of the "Army Quarterly" which contains an interesting account of what happened to one of the Austrian Armies when attacked by aeroplanes during its retirement in Italy. The writer says that, having gone over the ground after the battle, he came to the conclusion that warfare of this nature should be prohibited, it was too horrible. How will the infantryman protect himself against low flying aeroplanes? A tank can; an infantryman cannot. In the future how will the infantryman protect himself against unknown gases? I do not know, unless he wears a diver's suit with yards of piping trailing behind him. But he can protect himself in a tank, and though not the tank of to-day, the idea is perfectly feasible. There is only one thing more I want to mention, because I think it will clear up a misconception as regards the tank. The tank is not a weapon; it is the means of moving weapons. The tank offers to the infantryman a comfortable means of movement; it does away with slogging along the road on foot; and very much the same applies to the cavalryman and the gunner. In my opinion, as in civil life the lorry has all but replaced the horse as a means of movement, so in armies will the horses be replaced by the tank. If we go outside into Whitehall and count the number of horse vehicles and motor vehicles we shall find many petrol-driven vehicles but very few horse vehicles, and from the point of view of military movement I am convinced that in the future much the same thing will happen.

CAPTAIN F. E. HOTBLACK: There is only one point I should like to make on a question which has not been clearly explained, namely, the enormous difference in tanks between 1916 and 1918. One very often meets people who base their opinion of the tank on 1916. To my mind, you cannot say too much of the failures of 1916, as far as the tanks were concerned, and the failures also, except in a very few cases, in 1917. It is not until you come to the Mark V tank at the end of 1918—the tank which is now obsolete—that the history of the efficient

tank begins. The tank was then just beginning to be a real weapon, or to be a real method of transportation, whichever you like to call it. The tanks did not come into their own in any sense until the Battle of Amiens on 8th August 1918. The curious part about that battle, from the point of view of the people now in England, was that it was so very largely fought by troops which had not been hammered during the recent German offensive—that is to say, by Canadians and Australians, and it is for that reason, very largely, that a tremendous number of English officers do not quite realise what a great change had taken place in the tank since those very gallant, but very often unavailing, efforts in 1916. It was not a question of starting off twenty tanks, as it often was at the third Battle of Ypres, and being quite satisfied if two out of twenty got there. Instead of, as at Cambrai, getting large numbers knocked out by one gun the position was very much changed. I know personally of a great many cases in battle where the tank, with its increased speed—(it was only five miles an hour then)—“did down” the gun. There was also the very amazing case of the armoured cars, which slipped through and got among the German transport, and which, on their way to divisional headquarters, were beckoned and shown which way to go by the German policemen on point duty. They arrived, you may remember, actually at divisional headquarters. That is not a fairy tale, because the German G.H.Q. report of the battle, dated 15th August, I think, referred to the fact. It mentioned that tanks and armoured cars had got through to the divisional headquarters and the batteries before any defence could be made.

I quote that because I think the tendency very often is to fix on some incident of 1916 and base opinions on the tank as it existed then. Obviously, a great change was made between 1916 and 1918, so that it is not wrong to expect that even greater improvements will be made in the future.

LIEUT.-COLONEL W. E. CLARK: I should not like the mounted troops which I feel I represent to go by default in a discussion of this kind. I have read books on the subject of tanks; I have read American reports as to them; but never until this afternoon have I heard or read what I have thought right away through is the correct definition, the one just given by Colonel Fuller. I could shake him warmly by the hand and say delightedly that at last I have heard the truth stated, which is that we have got mechanical transport for every weapon in the field. A haze has been hanging about everything that has been written and everything that has been argued up to date as to whether the tank is a weapon or really represents mechanical transport. They are two utterly different things. I saw the tank in 1916 in its first attack at close quarters on the Somme; I saw the tank at Cambrai and I saw the tank on the 8th August 1918. In 1916 the tank was in its infancy but it certainly got across the wire and obstacles. In 1917 it pushed through the wire and got clean away, and it did very much better than most of us anticipated it would do. There the mounted troops had difficulties. The cavalry could not get close up, but I do not think that this failure gave any light on the question of tanks *v.* cavalry. In August 1918, there is not the least doubt to my mind, that had the tanks worked with the cavalry or the cavalry worked with the tanks, whichever way you choose to put it, great things could have been achieved. As it was, the pursuit miserably fizzled out to nothing. I was close enough to know what occurred in the two disconnected attacks. There was great gallantry and dash displayed on the part of junior officers of the Tank Corps and certainly on the part of one officer in command of a cavalry regiment; but if the attacks had been combined the results would have been far greater. We have not yet got a satisfactory artillery in tank form. There are many

technical things connected with artillery which have to be considered, but there is one thing I am perfectly certain of, and that is that a small travelling gun on a big conveyance is not going to knock out mobile artillery which is mobile. You must remember that guns lost their mobility in the war about November 1914; they, properly speaking, never moved again on either side. That fact is almost completely forgotten. As far as I am concerned, I am of the opinion—and I believe other officers in my regiment, to whom I have spoken on the subject, think the same—that mechanical transport, as compared with a new trench weapon which wants to fight on its own, is the solution of the problem troubling us all.

LIEUT.-COLONEL W. D. CROFT, C.M.G., D.S.O., in reply said: Lord Horne criticised my failure to go into details of what the tactics of the tanks were going to be. I think one could lecture for several afternoons without a break on that subject and then not really begin it. It is rather difficult to visualise the future tactics of modern tanks, because the type that we shall probably have in the near future is not quite completed yet; the experiments are not finished, so that naturally we have not had a chance of trying the tank out practically. Also there is the question of expense to be borne in mind. Things will go very slowly for the next few years, but thinking costs nothing. We can all do a tremendous lot of thinking about tank tactics in the future. We can exercise our imagination on staff rides. People who are thoroughly *au fait* with the present system of tactics and no one else should exercise their imaginations, and I think the result would be very satisfactory. This is part of the winter training of the Second Division at Aldershot, and I look forward to it as far and away the most interesting thing in that sort of line that it has ever been my good fortune to take part in. Colonel Fuller mentioned the question of mines. My time was so limited that I had to cut out any remarks that I wished to make about mines. Some people imagine that you can put down a mine here and a mine there and that the tank will go to it like hounds to poison. I have had to put down mines and it took me many weeks and much labour and many mines to lay even a moderately sized minefield. Now even in the last war, in which we were buzzing off about 12,000 tons of ammunition a day—I do not know how many truck loads that works out at—all the ammunition was earmarked. In the next war it will not be possible to have quite such a big affair and the truckloads will be still more limited. Which will get priority on the truckload—shells or mines? As regards bombing, Colonel Fuller mentioned that bombing and machine gunning from the air might be a very serious business in the future. I think that bombers are rather going to control the size of our machines. The bigger the tank the easier the target. I think it is better to have them fast and handy than to have them the size that some people talk about—tank battleships. I cannot see it for many reasons.

THE CHAIRMAN (Major-General W. H. Anderson, C.B.): Ladies and Gentlemen, We are very much indebted to Colonel Croft for his lecture. If I may say so to him, as an old friend, I think perhaps the point that has come out most clearly has been the one that has been brought forward by Colonel Fuller. We have now got down to what is, I think, the bedrock of our difficulties as regards tanks. We do not know what we mean when we use the word "tank." We do not know whether we mean a tank as a weapon, which is the way we have generally looked at it, or whether we mean it as a means of transport or whether we mean a combination of the two—a weapon and at the same time a means of transport for weapons and for men. That point, I think, has been cleared up,

and that means we have made a very great advance, because in our future thought we shall be able carefully to differentiate what we mean when we speak either for or against the tank.

That brings me to another point--that many of us are ranging ourselves either for or against the tank, which seems to me to be a very great mistake, because the tank has undoubtedly come to help the army, and if any part of the army takes up an antagonistic view to the tank, while the other takes up a purely partisan view, instead of obtaining progress, only bickering will result.

That brings me to the further point--that we have to consider all these questions from two main points of view, that of the present and that of the future. The practical man, leading troops, will of course want to know how to employ the tanks that he sees actually on the ground at the moment. The higher leaders and the Staff, who are thinking of the future, want to consider the tank not only from that point of view but from the equally important aspect of what we shall get in the future. We are rather apt to confuse those two different points of view. Generally, I think we can say that the advance of the tank will be governed more or less by the same conditions as have occurred in the case of the Navy, namely, the contest between guns as against armour and speed.

If we look into the far future, it seems to me quite easy to visualise the possibility of the gradual increase and improvement of armoured aeroplanes until they in fact become flying tanks, capable of landing in their own length and of transporting guns, gas or men to selected positions. But that aspect is, I think, too far away for most of us to realise at the present moment. What I think we have to bear in mind is that we must advance by evolution and not by revolution, and that at any particular moment of peace any particular weapon such as the tank must be in a great many stages, according to the thought which is directed to it by various people.

It seems to me that we have something like seven stages to consider. First of all there is the farthest ahead, which embraces the scientific aspect and the scientific possibilities of any weapon such as this. Secondly, coming somewhat behind that, we get the experimental designs, which are ahead of production but which are still behind the scientific aspect, and which are really the designs of the future. Thirdly, coming a little behind that, we have the thought of experts and enthusiasts, which is far ahead of the thought in the nation or in the army in regard to any particular weapon. Those experts and enthusiasts will always be pressing for advance from the weapons which they have at their hand towards the experimental designs which are farther ahead. Fourthly, some little way behind that, we get forward thought in the army which is backing up the expert and the enthusiast, but which is generally somewhat behind them. Fifthly, behind that again, we shall always, I think, find the higher military authorities, who, by reason of the many other claims upon their attention, cannot be enthusiasts on any particular subject, accepting, or possibly rejecting, the forward thought in the army. In any case, by reason of the many other and conflicting claims which they have to consider, they will act as a brake on that thought. Sixthly, behind the views of the military authorities come the views of the financial authorities and the question of the amount of money that is available for military expenditure. That will act as a brake on the military authorities, because the amount of money available is far behind the desires of the enthusiasts and of the forward thought section in the army. Seventhly, the actual army, the fighting soldier, does not even see that. He only sees that part of the provision which is allowed for by the financial authorities which has actually reached the fighting troops, and that must be far behind the scientific thought on the subject, far behind Colonel

Fuller's, far behind those who are in the van of thought as regards any weapon. Even then, with those weapons that do reach the army, we have got to train not only the enthusiasts but the whole bulk of the Staff, commanders and troops in the army, in order that they may understand the actual weapon which has reached their hands. The state of training of the army, therefore, will very likely be lagging a little and sometimes much behind the actual potentialities of the weapon which is in their hands, which, in itself, is far behind the thought of the scientist and enthusiast, and even of the military authorities who are trying to push the matter on. We must, therefore, even in the most favourable circumstances, always start a campaign a long way behind the scientific possibilities of our new weapons.

Now, are the circumstances likely to be favourable to us, as soldiers, in the course of the next few years? Looking at the immediate future, there are many things which are against us. First of all, there is undoubtedly the present financial stringency, which is such that the nation will not spend money now on new weapons or on any improvements, on a large scale, of the weapons we possess. In the second place, we have to bear in mind the imminent reduction in naval armaments as a result of the Washington Conference. That does not give us, from the point of view of the soldier, much hope of the nation starting another competition in fresh forms of armament such as the armoured tank and the gun, similar to the one which we have seen running its course since the introduction of ironclads forty or fifty years ago. Then we are up against another brake, namely, that war against a civilised enemy is unlikely for some few years to come, and any campaigns which we may have to conduct will be against either uncivilised or partly civilised nations, and against such an enemy the weapons which we have in our hands will probably be sufficient to provide success, and will therefore probably turn the nation from the necessity of looking farther ahead for the provision of weapons which may be well within the bounds of possibility of design and the production of which is only a question of time.

All those factors are against progress being made, and that, I think, makes it all the more necessary to look ahead of the practical aspect of the moment and to consider the time when, in the future, British soldiers may have to use their weapons against a civilised enemy. We must always remember, so far as the tank is concerned, that we have always been more or less in the position of the Southerners with the Merrimac in York River against the wooden ships of the Union in 1862. Although we have seen the British tanks victorious, we have never yet seen a real contest of tank versus tank; therefore the fighting experts are drawing on faulty experience, because so far we have not seen the tank against its own best enemy, the tank itself.

I should like, in conclusion, to say one or two words, from the point of view of training, on what I have seen at Aldershot, and also the purely theoretical training given at the Staff College. There is undoubtedly a tendency to look at the tank as a great asset on one side, as against an enemy without them on the other side. The outstanding lesson of the tank at Aldershot last year was undoubtedly the helplessness of infantry without tanks of their own, or anti-tank weapons of their own, when faced by tanks. It is not possible to ask infantry without tanks to face tanks. What we have always to consider however is the question of tank versus tank.

I now ask you, ladies and gentlemen, to pass a very hearty vote of thanks to Colonel Croft for giving us a lecture which has not only been full of thought and interest but which has provoked a discussion of very great value.

The resolution of thanks was then put and carried by acclamation.

AIR COMMODORE BROOKE-POPHAM: Ladies and Gentlemen, It affords me much pleasure to propose a hearty vote of thanks to General Anderson for taking the chair this afternoon. We owe him our gratitude not only for his persuasive art, which he has so successfully used in inducing unwilling speakers to come forward, but also for giving us a very admirable summary of the discussion and his own thoughts on the matter.

The resolution of thanks was carried by acclamation, and the meeting terminated.