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Friday, January 21, 1887.

LIEUTENANT-GENERAL SIR EDWARD B. HAMLEY, K.C.B.,
K.C.M.G., R.A., M.P., in the Chair.

SUGGESTIONS AS TO THE USE OF MACHINE-GUNS IN THE FIELD, IN COMBINATION WITH INFANTRY.

By Major A. D. ANDERSON, R.H.A.

(Read in the absence of Major Anderson by Major H. L. HIME, R.A.)

The CHAIRMAN: Gentlemen, I beg to introduce to you Major Hime, who is about to read a lecture on behalf of Major Anderson, who has been suddenly called to India, and has not had time to revise what he had written. I am sure that under those circumstances you will grant to Major Hime your indulgence.

STUDENTS of military history cannot fail to recognize the importance to the *morale* of an army, and its consequent bearing on the results of the campaign, of the possession of an improved class of weapon or adaptation of some advance in tactics; as instance the massing of guns by Napoleon I and the introduction of rifled cannon by Napoleon III; use of breech-loading rifles; an extended formation of attack, and the application of the enveloping or flank attack by the Germans; while, at the present moment, we find the larger European armies keenly alive to the necessity of arming their troops with repeating rifles, so as not to embark in the next campaign at a disadvantage; all, however, for the present appear to hold back from the machine-gun, probably owing to difficulties in the mechanism of the weapon, and doubts as to its use, but we cannot but feel convinced that just as certainly as the needle-gun gave to the Prussians a decided advantage in the campaign of 1866, so will an intelligent and bold use of machine-guns operate in favour of the nation that first utilizes them in a future campaign.

The inefficiencies or faults in the weapon itself may be considered to have been overcome, and the mechanism that is found suitable and efficient enough for the Navy for both defence and offence, and admitted by military authorities to qualify it to be considered a necessary portion of the armament of fortifications and defensive posts, is not likely to be far amiss, if only properly handled, were we to decide on using machine-guns in the field for offensive as well as defensive tactics. The terrific power developed by these weapons effectually silences all detractation from their value as implements of war, while military writers speak of them with respect, but remark that some solution as to their efficient use and adaptation to the field tactics of the present day is necessary.

General Brackenbury writes: "But their advocates have never yet put forth a complete scheme, showing how they are to accompany infantry in the field, acting on the offensive over all sorts of ground, and this must be done before they can be accepted for that purpose."

This I would urge is what we are now in a position to do: evolve a scheme for working them in the field.

Having overcome the difficulties of construction, ammunition and such like, and thoroughly convinced ourselves of their shooting powers, it would, indeed, argue weakness were we to stop short in finding the method of utilizing all we have got, and allow others to be in the field before us; and it is with the firmest conviction of the tremendous force lying to the hand of the army that first intelligently uses these weapons in the field, that we venture to add the following few suggestions to what has been already ably written on the subject. Whilst these weapons have been struggling through their stages of early existence, undergoing changes, alterations, and improvements, time has been given us to study and consider the innumerable ideas and suggestions that have been put forward as to their use in the field; advocates are forthcoming for forming machine-gun corps, or for attaching them to artillery, cavalry, or infantry, but the consensus of opinion has undoubtedly arrived at the sound view, viz., that they be attached to infantry, and fire the same ammunition.

It is not necessary here to discuss why they should not become part of the artillery or cavalry, or be formed into separate corps, though for exceptional purposes they might do any of these, but a little thought will lead to the conviction that machine-gun fire should be a multiple of infantry fire, and that as a rule it must be worked in the closest combination and connection with it.

The points to be decided towards carrying this into effect are—

(a.) The transport of the gun.

(b.) The number, allotment, and working of them.

(a.) *The Transport of the Gun.*—When we consider what is aimed at, viz., the closest connection between battalions and machine-guns, that the latter shall be able to go everywhere with the former, at the same pace, for the same or a greater distance, and without entailing extra labour on the men, we realize that the guns should not be on wheels, and that they must not be moved by manual labour, and this of itself suggests to us that they must be worked on tripods and carried on packs. A machine-gun with spare pieces, implements, &c., would form the load for a mule, while a second carried ammunition, and the whole would thus be capable of being taken up and down the steepest hills, over the roughest ground, through narrow lanes, and practically everywhere that a battalion of infantry could go, at the same pace, and without fear of being left behind.

Mule transport offers no difficulty in packing and unpacking the loads, and one of the men (probably three or four per piece) told off to attend to the gun, would lead and look after the animals.

(b.) *The Number, Allotment, and Working of them.*—Opinions here will probably differ; some may be found to advocate their retention

under the Commanding Officer, and entire control by him; but all tend to prove that here, as in many other cases, "Decentralization" is the sound theory; place them with the different companies to the extent of one apiece, to be managed and manned by them and worked as company commanders deem necessary, the battalion commander having, as in all other points, the power of utilizing them or directing their use as he deems requisite. We thus ensure all the companies in the regiment taking an interest in their own gun, and training men for work with it; it is ready to the hand of the Captain of the company, not requiring to be sent for, or applied for, in the numerous instances when a company detached or in want of assistance would be thankful for its support, and very valuable would be the aid it would afford in nine cases out of ten, if worked by properly instructed men, pushed forward, and, if necessary, used and exposed as freely and boldly as a section of the company; while at any moment the battalion, brigade, or divisional commander would be in a position to order the whole or a portion of them to mass on some suitable spot in support of an advance, an attack, or threatened point.

As regards the class of gun, Gardner, Gatling, Nordenfelt, or Hotchkiss, we would leave that to those who have best tried all and each of them, while probably three or four selected men per company would be found equal to working them and attending to the mules, the company Officers looking after and controlling their own piece; and should the eight per battalion be called for by the Commanding Officer, one of the Majors or a senior Officer should be placed in command, the supply of ammunition, beyond the one mule-load per gun, being as for the remainder of the battalion, but on an increased scale.

The advantages hoped for from the addition of machine-gun fire to that of the weapons now in use are—

(a.) A murderously powerful fire.

(b.) Relief to the infantry, in furnishing for them a powerful support, and one admitting of their withholding their fire till the last moment.

(c.) Increase of volume of fire.

As regards the first of these points, there can be no two opinions of the terrific power of the weapon if accurately laid and worked; while in respect of the second, machine-gun fire fills up a blot in our tactics, in that long-range fire may be carried out by them, allowing infantry to advance to the attack taking advantage of all cover and without firing, and enable them to achieve what military writers and past wars show us to be of the utmost importance, viz., the retention of infantry fire till the last moment. This it was that in the Peninsula formed the difference between our and the French infantry; they opening fire at 800 and 700 yards, we at 400 and 300 yards.

Similarly the 1870-71 war taught the Germans that though the French opened fire at 1,400 and 1,200 yards, their best policy was to withhold their fire till 700 and 600 yards; and in like manner the Afghan War taught many of our commanders that though damage

could be inflicted on the enemy at 1,200 and 1,000 yards, they spared their men and brought them fresher and better up to the attack by holding the fire until within 500 yards.

So it will always be; given equal conditions, the commander who spares his infantry and brings them without firing and fresh, close up to the enemy, before launching them forth for the attack, and then opens fire from every possible rifle, will fight under immeasurably more favourable conditions than one who commences firing at long ranges and continues it throughout the advance.

Long-range fire is at the same time a very necessary portion of a battle; your enemy cannot be permitted unmolested to concentrate the whole of his rifle fire on your advancing infantry, and to harass him and endeavour to keep his fire under, you must do one of three things—

I. Devote one half of your infantry to long-range rifle fire.

II. Open fire with your infantry at 1,200 or 1,000 yards and keep it up throughout the advance.

III. Use machine-guns for long-range firing: of these three the last if efficiently performed has all and everything to recommend it, for it admits of the whole of the infantry going forward complete in the formations most suited to the locality, without firing a shot, devoting their whole attention to rapid advances, and gaining cover until within say 500 yards of the enemy, when the fire from the defence would probably necessitate a commencement of fire from those advancing; not that this need follow as a matter of course, for it is certain that in the majority of instances some feature of the country will admit of a point even nearer than 500 yards being gained without firing, especially when we bear in mind the volume of machine-gun fire that can be brought in support. This in the case of a Division at the rate of eight pieces per battalion amounting to 56 machine-guns, which, discharging at the rate of even 100 shots per minute, yield a shower of lead that if directed on the infantry of the defence from any moderately protected spot, at 1,200 or 1,000 yards range with any pretence at accuracy, will far surpass in effect what could be obtained from three battalions, in the same position, if withdrawn from the attack for this purpose.

All-important in the utilization of machine-guns is that they be placed in the hands of intelligent men, who have been given sufficient opportunities of knowing and practising with their weapons, in order to derive full value from them and save reckless waste of ammunition. The three or more men proposed for each piece should therefore be largely composed of non-commissioned officers, the senior of whom should be a sergeant; beyond this no special provision seems necessary or desirable, and if introduced, would only lead to needless expense. Twenty-four men might be added to the strength of battalions or drawn from the present establishment for this purpose as considered desirable, and a very much larger number would of course be instructed for employment if required. As it is proposed that each machine-gun should become portion of a company, and in the majority of instances be at the disposal of the company Officers, no increase of

Officers is requisite, while if withdrawn by the Commanding Officer or higher authority for the purpose of being massed, a Field Officer or other competent Officer should be detached to command them and to return them to their companies on the completion of the duty.

If after trial it be found that more Officers are required with them, an increase of two subalterns per battalion should meet the case, attached to the two flank companies, with which they would remain until the machine-guns were ordered to mass, fall out with them and each undertake the charge of four, under the guidance of the Officer detailed to command them.

Regiments of infantry are not one Officer too strong for service, and could not afford to give them from present strength, should they be required. A little practice would require to be devoted to some simple system of manœuvring the mules, in order to guard against confusion when brought together in masses.

Probably sections of four guns (eight mules), worked much on the mountain battery drill principle, and only for movements of the simplest description, would be all that would be requisite, while during manœuvres they would join their own companies.

Let us now as an example imagine the case of two Divisions of all arms (A and B, *see* Plate) of equal strength, meeting on the march in ordinarily open country, and follow the course of attack of the one (A), whose infantry companies are strengthened by one machine-gun apiece, their opponents being without them, but to simplify matters consider that neither force uses any cavalry, as their presence is not requisite to prove or disprove the argument.

The Commander (A) having reconnoitred his enemy's advance resolves on attack, brings up his 18 guns to a knoll and opens on the opposing advanced guard, which falls back towards a ridge of hills it has just descended from, upon which its artillery having arrived are brought into action, range 2,000 yards, and an artillery duel from equal altitudes is commenced.

Commander A, owing to the fact that a succession of undulations leads towards the left of B's position, decides on advancing his infantry by the right of his guns, and leaving two companies on his extreme left as escort for the artillery, pushes the remainder forward towards B's left, having brought all the machine-guns under his own guidance. At 1,200 yards from B's position the reverse slope of a hill affording protection from possible fire from their opponent's artillery, a portion of the machine-guns (32) are halted with two companies in support and instructions to open fire on B's infantry just beginning to occupy the crest of the ridge and hedgerows below on the left of his position. The remaining six battalions make the best of their way forward, and now that the enemy's infantry fire begins to be felt, break into small columns or short lines and take every advantage of ground till they gain the shelter of a small hill facing the left front of B's position and about 400 yards from it; here a pause is made for rest and to complete the formation for the attack.

The remainder of the machine-guns, twenty-four in number, with

four companies in support, have at the same time been advanced to the extreme right, keeping out of range of infantry fire and occupying a favourable position behind a wall in the vicinity of a village about 100 yards from the enemy's extreme left, open fire on his infantry, and support with all vigour the attack about to be delivered by their own infantry.

The situation can now be described as an artillery duel at 2,000 yards' range, A's machine-guns, fifty-six in number, delivering a converging fire from two positions at 1,200 and 900 yards' distance, on B's infantry now formed on his left awaiting attack, A's infantry preparing to attack having suffered losses in their advance, but nothing in comparison to the damage that would be effected by the machine-gun fire, for B's movements cannot have been entirely under cover.

A's infantry when formed for attack should from this point deliver it in conformity with the present regulations, supports and reserves close up ready to merge in the fighting line almost at the start, and advancing by alternate rushes, open fire from the moment they expose themselves, throw all they can into the first line, and drive their onslaught home with determination.

B's infantry, to meet this, must expose themselves and offer a target to the machine-guns which would all this time keep up an incessant, and now that they will have found the range, a murderous fire.

This practically means that by the possession of fifty-six machine-guns A's infantry attack is stronger by a fire equivalent to that of at least three battalions, while the machine-guns themselves have nothing to really avoid beyond exposing themselves to artillery fire.

Should B hold part of his infantry and deliver a counter-attack from his right on A's guns, he runs the risk of being beaten in detail, and driven, by the attack on his left, off his line of communication; or should his artillery change their position or devote their attention to the machine-gun batteries or advancing infantry, they must be opposed at shorter range and energetically attacked by A's artillery, who, unopposed, would prove very formidable assailants; or again, should he resolve not to wait to be attacked, and move down the hill to oppose his assailants, he gives up the advantage accruing to him from his position, places his infantry on a par with his opponents, and enters on a tactical struggle with equal numbers, but weaker than his adversary by the fire of fifty-six machine-guns; the one course open to him would appear to be to withdraw behind the crest out of reach of his assailant's fire, but he thus leaves him free to, if possible, seize the crest of the position, and from thence open fire or occupy more advanced or commanding points from which a fresh attack could be delivered against him.

That the fire of a body of infantry would be immensely increased by the addition of one machine-gun per company does not admit of doubt, for by detaching three men to attend to the gun, the equivalent of the fire of at least fifty men is obtained, leaving out of the calculation the value to the battalion of being able to manœuvre up to a certain point without firing.

Machine-guns can as yet scarcely be said to have had a thoroughly impartial trial; from 50 to 100 picked shots are pitted against a machine-gun in the hands of men who have had it a few days or weeks, and who will certainly have fired very few shots from it; the result is, in the hurry, a jam occurs or the gun never gets on the target at all. The trial also should not be confined to the results from one gun, but from those of eight or, if possible, a larger number, so that if one or more miss the range and do not get on to their object, some of the others will; and the murderous nature of the fire is sufficiently well known to convince us that no formation of infantry could hold its ground, if exposed, under the fire of an accurately aimed machine-gun, the effect of which would be demoralizing; and we feel convinced that if justice be done to the weapon, the results must be very startling and convincing.

The correctness or otherwise of these proposals could with ease be tested by experiment on screens representing a battalion formed for defence upon which an attack should be delivered by a battalion advancing in every way under regulation conditions, opening fire from the first, and also an attack by the same body supported by eight machine-guns, who, occupying a position between 1,200 and 800 yards from the enemy, allowed their own infantry to approach to within 500 yards of the position, and then deliver its attack with combined machine-gun and rifle fire.

The result of the fire-trial cannot be doubted if the machine-guns be properly handed, while opportunities for their use by company commanders in detached positions, or working in any way independently, will occur in almost every phase of action; the one danger they have to avoid is artillery fire, and this, considering the mobility that would be attained by mule transport, and the fact that the weapons range up to 2,000 yards—thus offering a large selection of position—ought not to prove in any way an insurmountable difficulty; once in position and massed, machine-guns may be depended on to defend their front against all but artillery as certainly as would masses of guns; while if searched out, and suffering from artillery fire, their mobility is ample to admit of their being promptly moved over any country to a safer position.

It is with no dogmatic idea that this proposal will be found to be the best possible solution of the question, that these lines have been written, but in the hope that others may be led to consider and evolve schemes for the use of these weapons in the field, and with a firm conviction that the case is not being over-stated when we urge that "the nation which neglects to make use of machine-guns in the field will not only incur a heavy responsibility, but will undoubtedly suffer severely if opposed to them."

The CHAIRMAN: This being an unusually short lecture it is hoped that it will be followed by a large discussion. The subject is a most important one, and calls for careful consideration. I am sure that your valuable comments will be most welcome and serviceable.

General Lord CHELMSFORD, G.C.B.: I merely rise to give, as I have done on previous occasions, a lead to those who have perhaps come better prepared than

myself to speak on the subject. It is one that I take great interest in, and I think that we infantry Officers may congratulate ourselves that a paper of this sort emanates from an artillery Officer. When the question of machine-guns was first brought to the front, artillery Officers thought that they ought to have the weapon handed over to them, but I believe a better opinion has, after due consideration, come into their minds, and they feel that it is, as Major Anderson states, an infantry weapon, and should be an adjunct to an infantry battalion. With regard to the details, Major Anderson has evidently very carefully gone into the subject, but I do not think that we are as yet in a position to discuss that point. I shall be very glad, indeed, to see the trial made that Major Anderson recommends, because it is only by really testing the use of machine-guns in the way that he suggests that we can arrive at a conclusion as to whether they should be so used. My own impression is that their value would be greater in defence than offence, and although I do not for one moment deny that the advantage of machine-guns in covering an advance to an attack, which is of course the *crux* of all military manœuvres now-a-days, would be a very desirable one, I cannot help thinking that if machine-guns massed together open fire at 1,500 yards to support an advancing infantry, the artillery of the defence would knock them to pieces in a very short time. However, that is a point that I leave the artillery Officers here present to decide upon. Owing to the long range and accuracy of modern rifles the artillery are no longer able to give the same effective assistance to the defence as formerly, when the infantry used to look to them to open an effective fire of grape at the critical moment when the enemy's infantry were preparing for a rush upon the position. This can no longer be done by the artillery, but its place can well be taken by machine-guns. Seeing that their range is so deadly at that point where the attack would commence really to develop, namely, about 800 yards, I think that unless infantry are given these weapons to help them in the defence of a position they will be deprived of a very powerful ally. Whenever we take the field, we must necessarily, owing to our small numbers (if opposed to an European force), have to act on the defensive; I trust, therefore, our infantry may be furnished with these machine-guns in order to make up to some extent for want of numbers. I conclude by reiterating my sincere hope that the authorities will give our infantry the opportunity of showing that they are fit to be trusted with these weapons, and my firm conviction is that it would be a decided advantage to the Service generally that they should be entrusted with them.

Major HUME, R.A.: Mr. Chairman and gentlemen, I unwillingly rise to protest against the whole of Major Anderson's lecture, and to express my dissent from all that Lord Chelmsford has said. Major Anderson tells us that the great question is, who are to have the machine-guns, and he very truly observes that they have been claimed by the artillery, the infantry, and the cavalry. But he quite forgot to say that they have also been claimed by the Royal Engineers, in this theatre, on the ground that the Royal Engineers would do the machine-guns, as they do everything else, excellently well. But the fallacy of this argument is proved if you push it to the extreme; because it would lead to the utter absorption of all the Officers of the infantry, the artillery, and cavalry; and, in consequence, the British Army of the future would be "personally conducted" by the Royal Engineers. The question is who is to have the machine-guns. How that question arose it is difficult to understand. But the fact that it has arisen reminds one of a sentence in John Stuart Mill's book on Liberty, in which he says, "In this age the smooth surface of routine is as often ruffled by attempts to resuscitate past evils as to introduce new benefits." We all know that between the Thirty Years' War and the French Revolution the progress of field artillery was very much delayed by the system of battalion guns. This system of Major Anderson's is neither more nor less than the system of battalion guns revived with a new name. It was a bad system; it weakened the field artillery without strengthening the infantry, and it has been justly laid in the dust nearly a century ago. Yet this is precisely what Major Anderson wants to reintroduce; and I protest against it. The machine-gun is a piece of ordnance, and I think the French were very foolish to change the word "mitrailleuse" into "mitrailleuse." First we had the "mitrailleuse" of 1869; then it was called "mitrailleuse," and the man who worked it was called a "mitrailleuse." It is a piece of ordnance, and the man who works it is a gunner. If you insist on the

definition of "a piece of ordnance," I presume it is this:—A fire-arm that is too heavy to carry on one's shoulder; and gunners consequently are the proper people to work them. You contravene the great law of the division of labour if you try to convert an infantry man into a gunner; for these three or four men who are to work the machine-gun, what are they but gunners in disguise; gunners with red coats on them; but after all real gunners? The machine-gun, no doubt, is a most important element in modern war; but unless you are going to seriously diminish the great advantages that may accrue from their use, you must give them to the people who understand how to work them; and that is the gunners. I have nothing more to say.

The CHAIRMAN: Will you give us the benefit of your opinion, General Olpherts?

General OLPHERTS: Really I have no opinion to offer. I never offer an opinion unless I think it is of any value.

Colonel FARDLEY WILMOT: I might ask the artillery this question, whether, seeing that the machine-gun has a range of 2,000 yards, and artillery has a range of from 6,000 to 8,000 yards, would it not hamper the artillery, if the machine-guns were attached to them? Another thing I should like to say with regard to the lecture is this. It seems to me very doubtful if a battery of machine-guns could protect its own front. A line of skirmishers would soon capture a battery of machine-guns if it were not protected by a large body of infantry. Their power of traversing is very slight; they can pour out a stream of bullets in one direction only, and a body of infantry circling round could easily take them at a disadvantage. I have seen the machine-gun at Aldershot worked in the open, and I think a company would have had no difficulty in putting it out of action and capturing it directly.

Sir WILLIAM OLPHERTS, *U.C.*, *K.C.B.*: Sir Edward Hamley, when you kindly suggested that I should say a few words a minute ago I was quite unprepared to do so. It was by a mere accident that I heard of this lecture, and I have come down here to learn, not intending to say anything myself. But with regard to the question as to which arm of the Service should have the machine-gun, I only wish to say as an old artillery Officer that I do not think that is a point that ought to trouble us in the least. I think we should all be one in these matters. In the Mutiny I was very short-handed at starting with my battery, and at the end of it a great portion of that battery was composed of men of the cavalry and infantry. They had all their different uniforms in my battery. There was a man of the Highlanders in the highland costume and men of the Military Train and other regiments in it, and really I was as much indebted to the infantry as to anyone else, and if it had not been for them I could not have worked my battery. I am, therefore, perfectly convinced that if the infantry take charge of these machine-guns they will do them justice, just as I believe the artillery would as far as they have got the means of doing so. But we ought not to separate one arm of the Service too much from the other, and I would rather see them more linked together, and if the machine-guns will help to do this, by all means let it be used in any way you like.

Colonel BAYLIS: As a Volunteer Officer I hope you will not consider it presumption on my part if I offer a few remarks. Major Anderson rather assumes that the machine-gun will be so useful in the field to support infantry that it ought, if practicable, to be adopted, and he quotes the words of General Brackenbury, who says, "But their advocates have never yet put forth a complete scheme *showing how* they are to accompany infantry in the field acting on the offensive over all sorts of ground, and this must be done before they can be accepted for that purpose." I think we may say that Major Anderson has assumed that these machine-guns would be useful if you could have the transport for them, and you will find that he puts forward the mode in which he recommends the transport. I think we are indebted to Major Anderson for suggesting a mode in which those guns might be conveyed. He alludes to the different kinds of machine-guns, and then he says they might be conveyed by means of mules, the transport not to be by manual labour but by the assistance of packs. If that is a new suggestion I am not aware of it, as I have always understood that mountain batteries were carried on mules in that way. I suppose they have no wheels, but whether they carry wheels on mules or not I do not know, but what I understand from Major Anderson is that in the case

of these machine-guns, wheels are to be dispensed with altogether. If the machine be portable it may be useful. There are times when, as has been observed, the skirmishers would very soon destroy the efficiency of the machine-guns, but there may be positions in which these guns, if they did not take too many men to serve them, would be extremely useful for attack. They might be extremely useful in defence also, because they might be placed in a position where they could check a pursuit in the case of a retrograde movement. I understand that Major Anderson suggests that these guns would be useful adjuncts as they would require the same ammunition as the infantry, so that there would not be two sorts of ammunition; and the ammunition carried for these guns would be available for the purposes of the infantry with their rifles. That seems a very important consideration, because one knows what the waste of ammunition is from the great evil of distance and impetuous firing; the tendency of the introduction of repeating rifles will be to bring men into action at long ranges instead of leaving them to reserve, as much as possible, their fire for shorter ranges. I think machine-guns might be useful, or if not wanted, the same ammunition would be available for the infantry when they have not the means of carrying sufficient ammunition for their rifles. I do not know whether I have been rather intruding in making these remarks, but at the same time it occurred to me that the mode of transport suggested by the lecturer might make machine-guns extremely useful in combination with infantry.

Major HIME: I think the last speaker quite forgot two most important points. The first is, that mules are mortal; and the second, that Major Anderson will permit no wheels. If the mules are shot, and you want to move your machine-guns, it is for others to tell you how they are to be moved.

A MEMBER: I think the worst thing that would happen in that case would be that the guns would be put out of action; instead of having a battery of seven guns you would have only six.

Colonel RICHARDSON, R.A.: It seems to me that, to a certain extent, this is all a question of economy. I doubt very much whether there are any infantry Officers here who would prefer to have twenty of their infantry men replaced by or of these machine-guns, or think that they would thereby do much more execution. You try to make two or three infantry do the work of twenty or thirty. It may be that the nation cannot afford a proper supply of infantry, then we shall have to take to machine-guns, but it seems to me that with all this mule transport, the expense would soon be greater than would be the supply of an equivalent number of infantry, and there can be very little doubt that mules might be very much better employed in bringing up ammunition for these infantry. If the infantry Officers seriously prefer the machine-gun to the breech-loader then I think it is time for them to adopt the machine-gun. As an artillery Officer I am sure they are quite welcome to them as far as I am concerned. I hold that machine-guns are merely a cheap substitute for more expensive artillery; for field guns are more effective than machine-guns at all ranges. No doubt that in the defence of flanks, or when they can be kept out of the way of fire, to a certain extent the machine-gun will economize infantry, so that it is simply a question of economy, but history shows that it is dangerous to attempt to substitute machines for the proved value of the infantry man.

Colonel MARKHAM, R.A.: Mr. Chairman and gentlemen, I think we may assume from what has fallen from several speakers that what Lord Chelmsford has stated about this lecture is not quite in accordance with the views that they entertain as to machine-guns being an infantry arm. I think it quite a matter of opinion myself, although I am an artillery Officer. The question is really as to the transport of the gun. I think Major Anderson's idea was that the machine-gun should always travel with the infantry in the attack, but I can hardly believe that when infantry come to close quarters, the machine-gun will accompany them; it will have to be left somewhere, it can hardly go under a hot fire when the infantry come to close quarters because the mules are but mortal and will become ineffective. I think myself if the machine-gun is to be used, and there is no doubt it is a most useful arm, it should be upon wheels; if it is upon wheels, I believe it should be in batteries. The organization of the batteries is another affair. I think a number of machine-guns should be placed as a battery which would be under the General Officer commanding the

division, and when an attack was ordered by the infantry, no doubt the machine-guns would be ordered to move to a certain position, and they would get to those positions far more quickly on wheels than on mules. Then with regard to their being in the field without supports and fought by themselves, I can hardly think that. Every battery has to be supported in the field, and I cannot conceive that a battery of machine-guns would be left unsupported by itself any more than a battery of field guns. It is merely a matter of transport. If they are on wheels, they become I think an artillery arm; if they are on mules, they become an infantry arm. But I do not think that is the point. The great question is, if the machine-gun is brought into the field, how it is to be tactically used, and I really think we are able to do it best upon wheels.

The CHAIRMAN: I am sorry the discussion has not been more ample, because there is no subject, I think, which can be more properly discussed in this room than the present one, for war is every day becoming more and more dependent on the inventions of science. And how to turn these to advantage is important to all nations, but more especially, I think, to ourselves, and for this reason, that while we cannot pretend to compete in numbers of men with the formidable armies of the Continental Powers, yet on the other hand we are credited with being able to afford to buy expensive equipments in greater degree than they can, and therefore whenever it is possible to substitute material means for men, it would appear to be so far a distinct advantage to us. If, therefore, machine-guns can be made to take the place efficiently of certain proportions of men, why that is a matter upon which a British Government may congratulate itself. Now this is by no means the first time that this subject has been discussed in this Institution, but I think that hitherto the view has been taken that the machine-gun should be used on the side of the defence, and it is perfectly evident that if a force in position can be aided by a number of these machines, which would sweep the avenues of approach to the position, it so far possesses a very great advantage. But now we have the fresh proposal to enlist it on the side of the attack. Well here again I think it is indisputable that provided two forces, otherwise equal, are face to face, and the one that attacks can succeed in bringing up a line of machine-guns at such a distance as to bear effectively upon the enemy's position, an immense advantage will be gained in thus covering the otherwise very difficult attack of the infantry. Well I think that it was hardly necessary perhaps to enforce this view with argument; I think we are all ready to admit that in the case I have imagined, that of having brought the guns efficiently to bear, they must be of the greatest advantage to the force which possesses them. Major Anderson enforced his argument by an illustration which you see on the map behind me. Now I cannot help thinking that if Major Anderson had had a little more time to think the matter over, he would have strengthened his case very much, for I can hardly admit that that illustration is a correct view of what might happen. For example, I do not know what the commander of the force attacked would be about to allow the other to manœuvre at its will and pleasure around him, and to bring on to his flank that line of machine-guns which is enfilading it. I should suppose that he also would exercise his power of manœuvring, and it is obvious that he would take the ordinary precaution of keeping a battery in reserve, and that that battery might very properly have been made to enfilade the wall behind which the assailant's machine-guns are supposed to be, in which case they never would have got there at all. It would be more satisfactory that some problem connected with machine-guns should be worked out on the Kriegspiel. It would be a novel and interesting use to make of the game, and I think we might get some better result from it than the illustration we have before us. There is one important point I should like to touch upon. Major Anderson proposes to attach a machine-gun to every company. It is to be carried on a mule, and that mule is to be accompanied by another with the first supply of ammunition: that would be sixteen mules per battalion which must be always up with the battalion. This is all he says, so far as being explicit as to transport, but he tells us the one mule-load must hereafter, in the course of the action, be supplemented, like the infantry, by more ammunition, only in an increased degree. Now the whole question turns very much upon the increased degree of supply of ammunition. I do not know whether any exact calculation has been made on this subject, but I find it stated in a lecture given here by Lord Charles

Beresford that a Nordenfolt 10-barrelled machine-gun can fire a thousand rounds in a minute, and he also says—I do not know whether it is his own opinion or whether he is quoting another—that the proper supply of ammunition to each gun in the field should be 10,000 rounds. Now we must remember that the whole value of the machine-gun consists in its being able to pour an immense volume of bullets over a given space in a given time. A great number of these bullets will fail to hit, but then a great number will reach their mark. In proportion as you diminish the supply you diminish the value of the machine-gun. If you say I will only permit it to fire so many rounds in the minute, in that degree you impair it as a weapon. Supposing this estimate to be correct of firing a thousand rounds in a minute, the whole 10,000 rounds might be fired away in ten minutes. In the same lecture, a mule was supposed to carry 600 rounds of ammunition in cases, but I find in an estimate for a foreign army that quantity is very much increased. We will suppose that the mule could carry 1,000 rounds. You will see you must then have eleven mules following every company, eighty-eight mules for the battalion, and a very large increase of transport for the division. How far this might be practicable is a very important element of the question, and until we have that thoroughly sifted, we have not got the means of determining any point I may say connected with the matter; we cannot say how many guns would be capable of following a battalion into action. That therefore is a matter that I hope will engage attention in future discussions on this subject, namely, the proportion of transport that will be required to follow a battalion if they are entrusted with guns to this extent. Now I do not feel myself the same jealousy at entrusting them to the infantry which has been expressed by Major Hime, and for this reason, that we must remember that the machine-gun after all is only taking the place of the infantry arm, that is, merely so many rifle barrels discharging rifle ammunition, and therefore the control of them may properly, I think, be entrusted to an infantry commander. But this is a question which should rather follow upon the conclusions we might come to after a fuller discussion of the matter, in which these elements which I have endeavoured to indicate would be considered. At any rate I dare say we are all agreed in this, that the weapon is one of great value; that it would be of much advantage to the side which should succeed in bringing it on to the field of battle; and that if one army possessed it another which should enter the field against that army would find it necessary, in order to fight on equal terms, to provide itself in the same way. As then I believe many foreign armies are already beginning to equip themselves with machine-guns, it seems almost inevitable that we should in some early future war see them brought into the field. Whatever our opinion may be, I am sure you will agree with me that we are very much indebted to Major Anderson for starting this discussion upon a subject of this importance, and that we are obliged to Major Hime for having been so good as to read the lecture, and that we hope he will convey the thanks of this meeting to Major Anderson for having taken the trouble to put his ideas into form and to present them to us.