

line, and 39 in the second line. The infantry had now lost 385 men out of 400 in eight minutes. At 200 yards only one line was supposed to exist, additional men having come up from some other force. The battery fired cease—another gunner having been removed from each detachment. In one minute 51 men were disabled out of 156. The range was then reduced to 100 yards. Shrapnel were used, but put into the gun reversed, so that their percussion fuzes were next the cartridge. In one minute 113 men were disabled out of 156. Thus, at short ranges from 1000 yards to 100, the infantry never showing more than from 200 to 300 men in open order, and latterly much less. In ten minutes firing 579 men were killed or severely wounded, many of them struck over and over again at the same range. Taking into consideration the whole of the experiments I have put before you, is it too much to say that the fire of an English battery of the present (and we hope soon to outdo all this) begins to be effective at about 4000 yards, is very powerful at 2000 yards, and may be said to be annihilating to troops in any formation at 1000 yards and under. The ground must of course be supposed to be moderately open. The question then arises, what would the infantry have done against the guns? Well, gentlemen, we are not left entirely without knowledge on this point also. Last year (1875) certain experiments were conducted in India, among which not the least interesting were the attack of infantry against guns in shelter pits, and I will give you the results. But let us bear in mind that the infantry also had no enemy firing at them. On the 25th of February, forty men of the 48th Regt. were placed at 800 yards from two gun pits, containing imitation of guns and dummy gunners, all posted as serving their guns, whereas in reality the men would have been more than half the time under cover, to say nothing of the cover afforded by smoke. The infantry fired for five minutes. Result—three men hit in each gun pit. On the 13th March forty picked marksmen from the 76th and 107th Regiments fired for five minutes at two guns in pits. The men selected their own positions, about 750 yards from the guns. Result—five men hit in one pit, none in the other. On the 25th of June, forty men of the 45th Regiment fired at two guns in pits for five minutes. Range unknown, afterwards ascertained to be 770 yards. Result—one man hit in one pit, and none in the other. On the same day the experiment was repeated, the forty men being in skirmishing order. The range is not given in the official report, but I suppose it was the same as before—770 yards. Result—three men hit in one pit, two in the other. These results give us an average loss of two men per gun in five minutes, and show that the reduction of three men per gun made in the Okehampton experiments to represent the effect of fire from infantry advancing from 1000 yards to 600 in four minutes, was rather over than under estimated, especially as the first line would have lost three fourths of its strength. Remember that not more than a few men at a time can see the gunners if they have any cover. Here we have to face the great question of the comparative physical and moral power of infantry and artillery, and the moral effect produced upon one or the other arm by equal losses. Before attacking this subject, permit me to say that, in my humble opinion, the principal arm, the mainstay of an army, is, as it has been and must be long after our time, the infantry. It is the easiest trained, the cheapest to place in the field and keep there, the only arm which is equally powerful at

rest or in motion, the most easily concealed, the simplest in its armament and use. Only infantry can decide battles and secure the ground won. Whatever may be the increasing value of artillery, it can never supply the place of a single infantry soldier. But, on the other hand, the value of artillery has grown greatly of late years. If the guns are of no use when in motion, their long range renders the necessity of their moving much less, and their mobility shortens the period of weakness. To get the full benefit of that range we need two additions. The first is the range finder, which is at last adopted in the Service; the second is the telescopic sight, a specimen of which has been brought forward by Lieutenant Scott, of the Engineers, to whom we should all wish good speed in his endeavours to introduce it. The regularity of range noticed at Okehampton was secured by a very simple arrangement, which there is no need to publish to all the world, and we have reason to believe that the flatness of trajectory, and therefore the effect at all ranges, is in a fair way towards making another considerable step in advance. We may, therefore, take 4000 yards as a practicable range for field artillery. This means that a gun in action under favourable circumstances covers with its fire about seven square miles of country, and can change its object from one point to another more than four miles distant from the first by a simple movement of its trail. In other words, a column of the enemy on the right flank may be hit, and within a minute another column on the left flank, more than four miles distant from that at which it originally fired. Such opportunities are, of course, exceptional. No other kind of mobility can approach this. If the gun cannot fight in motion, there seems little need for them to do so. Since 300 or 400 yards' difference in range now matters little to artillery, the guns have a larger choice of positions than infantry in ordinary cases, so that they can generally find fair cover. Moreover, because they need not move much, they can make more use of artificial shelter. From such shelter they can act either offensively or defensively; whereas infantry must move out of its cover to attack, and cavalry can only attack by exposing itself completely. This quietude of artillery enables it to find the range of its mark accurately and fire steadily. The place where its shells burst can be seen, and the range corrected accordingly if necessary. No infantry soldier can tell whether his bullet has gone over or under the enemy, or struck the mark. The fire of infantry is the collective fire of individual men, and depends for its steadiness on the nerve of individuals. Hands will tremble and bullets go astray after a rapid movement even if the soldiers are not under fire. When to this is added the nervous excitement caused by the bursting of shells in front or in the ranks, and the sight of huge gaps made in the line or column, there cannot be much doubt that the average steadiness of nerve, and, therefore, the average firing must be very small compared with the steadiness of the same men on the practice ground during peace. The fire of artillery is not governed by the average steadiness, but by that of officers and sergeants, and less steadiness is required to lay a gun than to hold a rifle straight with its sight properly raised. How often, think you, would a man look to his sight when advancing under such fire as guns can now produce? Guns have no nerves to be shaken, and, the proper orders being given, aiming and firing is as much a matter of routine as marching. Forty shells bursting in a battery will not shake the accuracy of a single gun, if once

properly laid. I hope you noticed how in the battles before Metz the artillery held its ground sometimes when the infantry had to retire. You know the rule that the loss of one third is supposed to be about as much as infantry can bear without retiring. Some of the German batteries lost three fourths of their men, and yet held on and fought their guns. There was no difference in the men themselves. What was the reason? Simply this, that the guns did, as they always will if we let them, act as anchors to the gunners. Think how much trouble is necessary before a battery can retire. Somebody must take the initiative of giving the order, which must be repeated from mouth to mouth. Then the drivers have to perform a complicated movement, if indeed they are not under stress of difficulties because they have horses falling wounded in the midst of the teams. Next, the gunners must attach the gun to the limber—limber up, as we call it. Only then is the battery as well able to retire as infantry always is. Each gun is the rival of its companions in the battery. In peace its gunners have cherished it. They have, in good natured rivalry, struggled to make it first in beauty of polish and paint for itself and its carriage. They have striven to hide its defects and glorify its virtues. Gentlemen, they have called it *she*—need I say more? Well, then, this '*she*' is not easily deserted, and as a gunner has no other arms, he fights his gun to the last moment. Without her, he is disarmed and helpless; with her, no matter how many of his comrades are disabled, the power of fire is almost as great as ever. And *she* remains there as steady as a rock, always throwing defiance in the enemy's face. Surely it is not difficult to see why a battery should hold its ground, if we will only let it, if we don't teach the gunners to count the preservation of their guns as an end instead of a means. But the guns possess a quality which Nature has mercifully denied to female creatures generally—that of increasing their individual strength by combination. The effect of the guns is greatly increased by their employment in masses. Take, for instance, the cavalry experiment at Okehampton, the model of which is before you. The effect was produced by thirty six rounds of water shell in nine minutes. Meanwhile, after the first six shells the troops might have dispersed or galloped under cover. Had six batteries been there, the same or greater physical effect would have been produced in an instant of time, and the moral effect would have been overwhelming. A battery of 100 guns would, roughly speaking, occupy about a mile, and in former days a mile was a long range for guns. But now a line of two miles long might fire easily at some object, and the guns at one end could protect those at the other by flanking fire. Therefore every increase of range lends a new argument to the advocates of massing tactics. But I cannot find, either in reason or experience, any proof of a proposition which has lately been brought forward by an able writer on defensive tactics—namely, that the guns should be placed some 400 yards behind the infantry. If all the experience of the last war will not suffice to dispel the idea, neither will Napoleon's maxims, which, however, may come to our aid. He lays down the rule that artillery can defend its own front in these words:—"No infantry, however brave, can with impunity march 1000 or 1200 yards against a strong battery of artillery well placed and well served; before they could accomplish two thirds the distance, those men would be killed, wounded, or dispersed." And again:—"Artillery should always be placed in the most advantageous positions