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The Employment of Large Cavalry Masses, of Smokeless Powder, and of Movable Fortifications as Illustrated by the German Autumn manoeuvres of 1889

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Friday, June 13, 1890.

GENERAL SIR C. P. BEAUCHAMP WALKER, K.C.B., Vice-President, in the Chair.

THE EMPLOYMENT OF LARGE CAVALRY MASSES, OF SMOKELESS POWDER, AND OF MOVABLE FORTIFICATIONS AS ILLUSTRATED BY THE GERMAN AUTUMN MANŒUVRES OF 1889.

By GEORGE SAUNDERS, Esq. (Correspondent of the "Morning Post," Berlin).

IN September last year I had the privilege of witnessing the manœuvres of the VIIth and Xth German Army Corps in the neighbourhood of Springe, near Hanover. A very special interest attached to these manœuvres, as they formed the first occasion on which the new smokeless powder was employed on a large scale by the German Army. It happened, owing to the journalistic enterprise of the "Morning Post," and to an exceptional conjunction of circumstances, that I was the only correspondent of an English daily newspaper on the field. To this fact, and to the particular interest attaching to these manœuvres, was attributable the considerable attention which, I have since learned, the descriptions that appeared in the "Morning Post" excited at the time, though they were written by a layman in military matters, and by a layman of no great experience as an observer of such affairs.

I should have been the last to aspire to the honour of addressing an assembly like this on topics which form their own special province and which have only transiently occupied my pen as a journalist. But I could not refuse so flattering an honour when offered to me, unexpectedly, by your Secretary. I must, however, ask you to expect nothing more from me than such details as may have been found of interest in my telegrams on the manœuvres. I would ask you, in fact, only to regard me as a scout whom you may have captured in one of the villages about Springe, and from whose narrative your own military talents and experience may perhaps enable you to derive some scientific, or approximately scientific, idea of what took place at these manœuvres. As I understand that in actual warfare such information is not invariably rejected, I shall make no further apology for what I have to say. I should like to add, however, that if in any instance I pass outside the rôle of the captured scout, I shall only set up the further claim to act as a species of field telephone, and, unfortunately, not a very good one, and anything of tactical or

scientific value which I may report in this capacity comes from the authorities of our friends—I had almost said our allies—on the other side of the water. In this connection I would at once express my obligation to Major Scheibert, whose book on “Movable Fortifications” is a standard work in Germany, and who, both during and since the manœuvres, has been most kind and courteous in telling me anything which he considered could aid me in my task.

The manœuvres of last autumn began with cavalry operations on an extensive scale. The general idea of the first day's operations was that the Xth Army Corps (then commanded, by the way, by the present Imperial Chancellor, General von Caprivi) represented a Northern Army with its centre at Springe, the Emperor's headquarters. It was supposed to have lost touch with a Southern Army and to be trying to discover their whereabouts. This operation was conducted under the Emperor's personal command. To non-professional spectators, the first two days' manœuvres afforded the most brilliant of all military spectacles—a great display of cavalry; and the interest which they aroused was all the more intense that most German tacticians saw in the events of these two days what they believe will form the introduction to the great battles of the future, namely, a vast deployment of cavalry thrown forwards to reconnoitre and encountering the enemy's cavalry midway between the hostile positions.

The troops which the Emperor, commanding the attacking or Northern Force in person, deployed for the purpose of attack consisted of the whole cavalry division of the Xth Army Corps, a portion of their mounted field artillery (*service à cheval*), and a detachment of pioneers. The Southern Force actively engaged in the defence was made up of similar contributions from the VIIth Army Corps, with the addition of an infantry regiment, whose retreat the vast mass of the cavalry of the Southern Force covered.

About 7.30 on the morning of September 16th, the Emperor learned that his advance-guard had got touch of the enemy near the villages of Altenhagen and Münder, and he commanded his whole force to advance with the greatest speed. When the Emperor's forces (with which I was) approached the villages, they were received by the enemy's artillery, which, acting from a commanding position, succeeded in checking their advance; but the Emperor's artillery immediately returned the fire, and for nearly an hour an exclusively artillery battle raged. Meanwhile, a combined brigade of cuirassiers and uhlans, which the Emperor had sent out to reconnoitre on the right flank, rejoined the main body, and the enemy, observing this addition to our strength, withdrew from their position, strong as it was. And now followed the most remarkable portion of the manœuvres of the 16th September. It is difficult to say which movement was best executed, the orderly retreat of the Southern Army, leaving detachments of cavalry to observe our advance, and so perfectly covering their withdrawal that our artillery could not touch them during the whole operation, or, on the other hand, the masterly way in which our forces were manœuvred. Our artillery, protected by

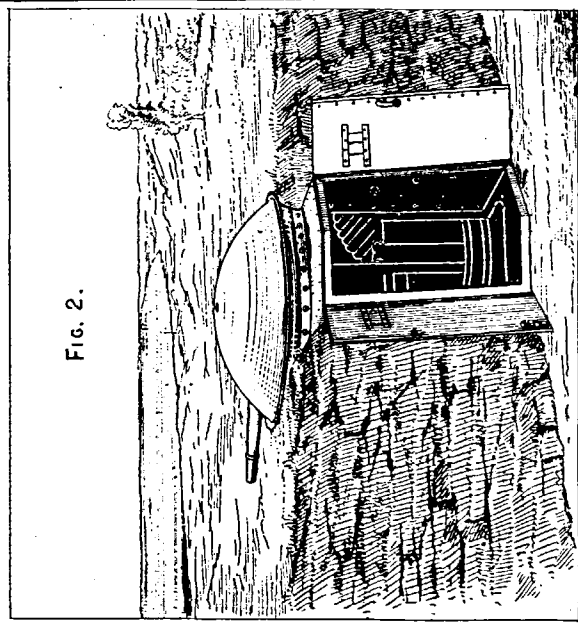


Fig. 2.

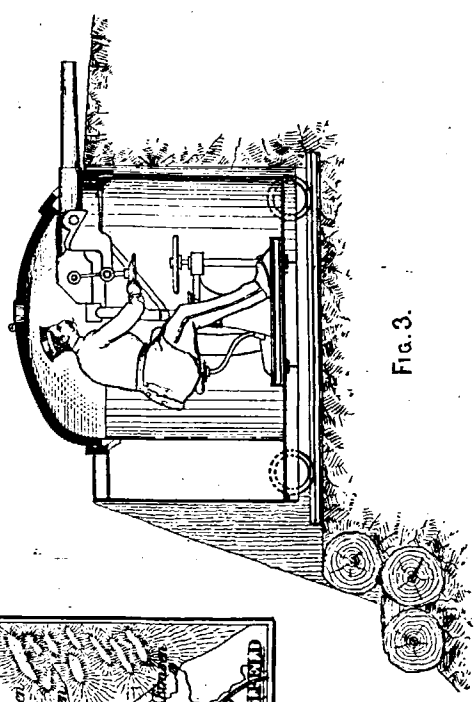


Fig. 3.

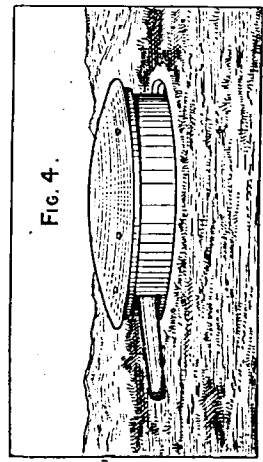


Fig. 4.

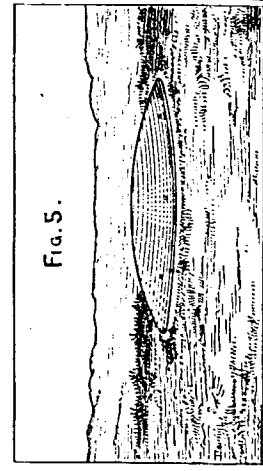


Fig. 5.

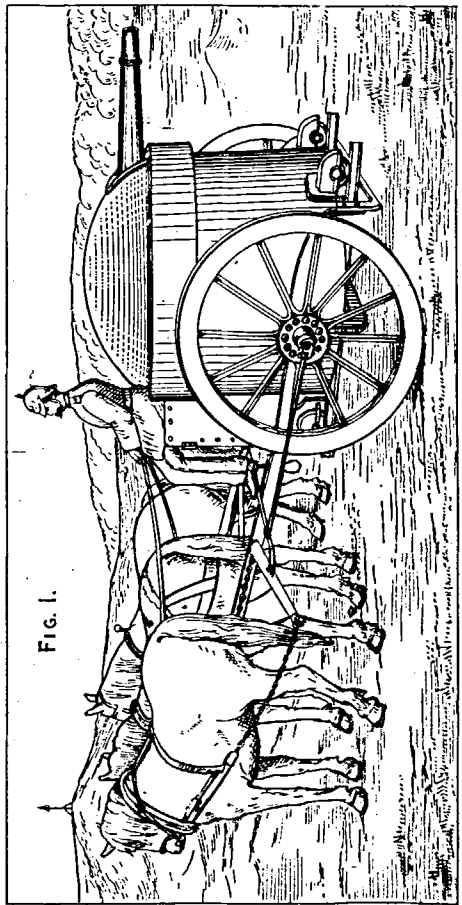


Fig. 1.

cavalry, was sent forward at a gallop, in order to take the first chance of directing their fire upon the retreat or upon new positions which the enemy might occupy. Indeed, no sooner was the enemy again visible on the heights of Boitzum than our guns came into action, driving them to their final withdrawal on Copenbrügge. Meanwhile our main force had defiled out of Altenhagen in admirable style, which the difficult nature of the hilly ground, and the trying defiles it contained, rendered all the more praiseworthy. Our task had been accomplished, we were again in touch with the enemy, and had ascertained the line of position he would evidently adopt in case of a general engagement, although no actual encounter, except between artillery, had taken place. The whole day's proceedings formed the liveliest representation of what might with probability be expected to occur during the earliest stages of the next European war.

On the 17th of September, cavalry operations were continued on a grander scale, for the Emperor led the combined cavalry divisions of the VIIth and Xth Army Corps against a skeleton cavalry force retreating eastwards from Copenbrügge. It was with the greatest difficulty that the spectators could follow the rapid advance of the Emperor's cavalry and the retreat of the skeleton force of the enemy, as the ground which was covered extended for 17 or 20 miles. Never in recent years have cavalry operations been conducted on so magnificent a scale.

The 18th of September was entirely a cavalry action; the burden of the battle fell upon the horse, not as on the previous day upon the artillery. It was a wild pursuit of cavalry by cavalry across an exceedingly difficult country.

The events of these two days were eminently significant as showing the belief of some of the best tacticians in Europe that a new era has dawned for cavalry, owing to the new cautious infantry tactics which forbid the near approach of hostile armies in view of the deadly destructiveness of repeating rifles and the treacherous fire where the smoke of the new powder is scarcely visible. Under these circumstances, the duty will more than ever fall upon the cavalry of skirmishing and reconnoitring, and this skirmishing, which was formerly merely the introduction to a battle, has now become a great battle in itself, involving a new development of cavalry tactics. It has continually happened at the dawn of new epochs in the art of modern war, such as have been inaugurated by inventions and improvements in weapons of precision, that numerous military critics have propounded afresh the theory that the importance of cavalry had become a thing of the past. At the outbreak of the American Civil War this theory was strongly urged, and the cavalry of the South, which subsequently achieved such brilliant results, was created from the most modest beginnings by General Stewart, probably without any adequate anticipation of the great development to which it was destined, and the eminent part which it was to play in the history of the war. With reference to this arm, there is probably no experience so instructive as that of the American Civil War, and there is cer-

tainly none that is more eagerly studied and appreciated in Germany. It is much to be regretted that there is no compendious and exhaustive history of that war which can be consulted by students of military tactics. But the story of Stewart's achievements serves to show what an advantage can be conferred upon forces which may be handicapped in other respects, if they possess a thoroughly disciplined and adequate body of cavalry, capable of acting both on the offensive and as a corps of observation. It has often been said that cavalry forms the eyes and feelers of an army, and cavalry alone can make it possible for those who are responsible for the conduct of military operations, to penetrate the intentions of the enemy and to choose both method and locality of attack, on the ground of adequate knowledge.

But it is eminently true that cavalry not only constitutes the organs of sight for an army, but that it is also the instrument by which the enemy can be rendered blind. A successful attack, on a large scale, by cavalry, breaks to pieces the network of observation which stretches in front of the position of the enemy in the shape of his outposts and patrols. A cavalry manoeuvre like that of the 17th and 18th September, at the last German manoeuvres, would have resulted in the outposts of the enemy being simply ridden down, and this operation is capable of being conducted with practical safety for the attacking force, which advances no further than is necessary to destroy the enemy's feelers, or to compel him to develop his position. If the first of these tasks be accomplished, the enemy is for the time being practically blinded; if the other be achieved, the veil which shrouds his position is broken through and the greatest advantage is secured in point of superior information in view of a general engagement.

So far as inferences were drawn from the autumn manoeuvres of 1889, they all tended to show that the practice of reconnaissance by cavalry in force will in future European warfare obtain much more extended application than in the past. All that can be done by small bodies of cavalry acting against such a network of advance posts as covers the defence of a modern army is to drive in a few outposts and frighten a few sentries. The reconnoitring parties will as often as not return very little the wiser for their expedition, and will have left the enemy without any serious injury to his own means of observation, or to the veil by which he covers his position and plans.

The attack *en masse*, on the other hand, constitutes in itself an operation of serious and, it may be, momentous importance, and it possesses the great advantage of being capable of execution without involving to the attacking party risks at all proportionate to the objects which may be secured in the event of success.

No sooner is a new poison discovered than chemists hasten to devise an antidote; and, similarly, the question arises by what means the attack of a reconnoitring expedition in force is to be counteracted. The answer seems to be unanimous in Germany that cavalry thus employed can best be met by cavalry, when either the enemy's movements will be anticipated by a similar operation on the part of the defending force, or his cavalry will be opposed by an equal body of horse which will frustrate the objects of the advance. This conclusion

formerly received practical application on a large scale on the eastern and western frontiers of Germany, where two independent divisions of cavalry used to be located in addition to the regular complement of the two army corps there quartered. These divisions were intended in case of war to watch and to counteract the similar division of French cavalry lying at Châlons under the command of General de Gallifet, and the masses of Russian cavalry on the eastern frontier. It is true that within the last six months, under the new scheme of German army organization, these cavalry divisions have been disbanded. But the reasons for this course, I am assured, lie in no change of view on the part of the authorities regarding the strategic advantages, or indeed one might say the necessity for the employment of cavalry on such a scale in the event of the outbreak of war, but depend rather upon questions connected with the administration of the army in time of peace and upon one important consideration of a different character, which, I believe, has not hitherto been publicly stated. The authorities, in fact, have the very strong conviction that the command of cavalry more than of any other arm involves gifts which depend upon the character and talents of an Officer more frequently even than upon his experience. I understand that there exists in authoritative quarters a strong desire to keep the hands of the administration free to appoint in time of war to the command of the independent cavalry divisions, which would then be immediately re-incorporated, soldiers who, irrespective of their age or experience, evince a particular talent for this branch of the service. Indeed, it is contemplated that the commands of these divisions shall not, even in time of war, partake of anything in the nature of a permanent tenure, but that it shall be understood to be open to the authorities to appoint for any given operation any Officer in whom they believe that they discern for the time being the most capable candidate for such a command. This policy, however, has not prevented the Emperor from appointing, the other day, to the command of the new Army Corps, which has its headquarters at Metz, the well-known Count Haezeler, who has the reputation of being the best cavalry Officer in the German Army. Before leaving this part of my subject, I may add that there is a manifest connection between the rôle which the German cavalry is expected to play in the next war and the policy of arming the whole of them with the lance. For cavalry encountering cavalry the lance will remain the decisive weapon of attack and defence. Great attention has been paid during the past year in Germany to the improvement of the lance itself, and I may mention incidentally that I recently had an opportunity of inspecting the hollow tube of steel, rolled by the Mannesmann process, which has been substituted for the wooden lance shaft. The steel lance is of wonderful lightness, and, of course, of very superior durability.

I must now pass on to the second subject of this paper, the employment of smokeless powder as illustrated by last autumn's German manœuvres. The three concluding days of the manœuvres constituted portions of a single great operation which would in itself be worthy of a special description. But I must confine myself, in

view of the limits of time assigned me, to the specific subjects announced, and I shall only indicate in the most general terms the strategic circumstances under which the trial of the smokeless powder on a large scale was effected.

The general idea which underlay the operations of the 19th, 20th, and 21st September may be stated as follows:—An army, represented by the VIIth Corps, was advancing from the west by way of Paderborn towards the river Weser. An Eastern Army desires to preserve the line of communication between Hanover and Brunswick, and the special idea is that the Xth Corps is defending the railway line between Hanover and Alfeld. Against it is advancing the VIIth Army Corps, with the object of preventing it from concentrating upon the village of Nordstemmen, and thus securing the railway.

The operations of the 19th developed on a great scale, and in a most interesting manner. From the eminence of Sonnenberg, where, during most of the day, the Emperor with Prince Albrecht and the Staff overlooked the battle, and which marked the position of the centre of the Xth Corps, one looked along a broad valley terminating some 7 miles off at Coppenbrügge, the headquarters of the VIIth Corps. The horizon on the left was bounded by the thickly wooded hills of Thüsterberg. On the right the plain was enclosed by the wooded slopes of Osterwald. Before one, as one looked westward along the valley, was stretched the wide plain dotted with the red-roofed villages of Benstorf, Oldendorf, and Hemmendorf, and on the edge of the forest slope on the right lay the village of Osterwald. I should have liked to have repeated the account which I gave at the time, of the interesting advance and repulse of the VIIth Army Corps on the 19th of September. Few things in modern warfare have been more admirable than the brilliant forced march, often as rapid as 8 kilometres per hour, with which the XIVth Infantry Division came up from Hameln to reinforce the XIIIth at Osterwald. This march reflects the greatest honour on General von Albedyll, commanding the VIIth Corps, and on the Officers and men of the XIVth Division. Our infantry (I speak now of the Xth Corps) were strongly entrenched behind the villages in front of the Sonnenberg, and they enjoyed excellent cover afforded by the hedges, ditches, and courses of brooks in and around the villages. Their fusillade and the action of our artillery, which was posted beside the Emperor on the Sonnenberg, were able entirely to check the enemy's advance. But the great event of the day was the persistent attempt of the enemy's cavalry to get in rear of our left flank through the gorge of the Marienhagen. Again and again the attack, which was supported by field artillery, was renewed, and it finally culminated in a magnificent cavalry engagement when the enemy's horse had actually emerged from the gorge, and was met by our cavalry in an encounter so close and excited that several of the opposing horses and riders rolled on the plain. Our charge had broken theirs; they turned tail and made again for Marienhagen gorge, our artillery harassing their retreat.

The result of the day's work was that the position of the Xth Corps remained impregnable, in spite of the extraordinary forced march of the VIIth. We bivouacked on a straight line between the slopes of Osterwald and the Thüsterberg, with the railway safe in our rear, though we were conscious that we should have to fight for it again on the morrow.

I may perhaps be allowed to digress, in order to mention the most interesting novelty of the day. This was the employment of dogs as despatch bearers. It was of immense importance to maintain unbroken and rapid communications between our force which was facing up the valley and that portion of the left wing which remained to watch the Marienhagen defile. Dogs were therefore taken forward with the main body, their masters remaining behind, to whom they returned, swift as arrows, as each was let loose with a despatch bound to his collar. These German despatch dogs are generally spaniels. Their management was intrusted to the chasseurs, who advanced in conveyances with our cavalry (another interesting novelty), supporting them where possible with a deadly fire.

The old smoky powder had been employed by both the attacking and defending force on the 19th September. During the heavy fusillade, and while our batteries were in action, the smoke from our repeating rifles and the artillery was dense, but a strong breeze cleared it away, and made rapid and continuous firing possible. We reflected that on the morrow, using smokeless powder, we should not be dependent on the favour of the wind.

The operations of September 20th, in regard to their results, may be summed up in a sentence. They afforded overwhelming proof that the so-called smokeless powder is a necessity of future warfare.

For practical purposes, the battle of the 20th may be regarded as having taken place along the slope of the Osterwald. Those who are familiar with the valley of the Thames at Oxford will form a good conception of the situation if they imagine the West Corps (the VIIth) advancing, and the East Corps (the Xth) retreating, along the slope which falls towards the village of South and North Hinksey. Down in the centre of the valley through which runs the river Snae raged an exclusively artillery battle. On the further side of the valley the cavalry had intermittent encounters, but the main fight was actually in the forest of Osterwald. On this day I followed the VIIth Corps in its first advance on the position of the Xth. The Emperor was in command of this corps, but he remained during the whole day with the artillery which waged constant battle over our heads with the artillery of the Xth Corps in front.

The advance through the forest slopes was the most exciting episode of mimic warfare I have witnessed. At 6 A.M. heavy rain fell, and a violent wind raged. At 7, when the patrols exchanged shots, heralding the battle, there was still a drizzle, increasing at times to a downpour of rain. Smoke from the red-roofed villages hung low along the valley. It was the very day for testing the merits of the smokeless powder.

The general idea of the operations was briefly to the effect that the right wing of the Xth Army Corps was to be driven back along the forest slope of Osterwald by the XIVth Infantry Division, while the XIIIth Infantry Division attacked the enemy's centre. If the attack succeeded, the right wing of the Xth Corps would have to fall back on the village of Mehle (corresponding to North Hincsey) and upon the village of Elze, still further along the valley of the Saale.

During the whole of the day I accompanied the advance of the XIVth Infantry Division. A little to the west of the village of Osterwald we came upon the enemy as we crept cautiously through the wood, and a rattling magazine fire was at once opened. Our corps (the VIIth) used smokeless powder. The enemy (the Xth Corps) used the old powder, and the results were most striking. The enemy appeared to be unable to determine our distance from them, while the heavy damp atmosphere made the smoke from their rifles lie along the glades of the forest like masses of blue violets. We were continually getting within 200 or 250 yards of them, always enjoying splendid cover, for the ground was so broken that Officers dismounted and had their horses led. Nay, more, we frequently on the edge of the forest took them in the flank, sending forward two or three companies at the double, and the enemy had to withdraw under a murderous fire from their front and left. They seemed utterly unable to guess where the fire came from, and, indeed, would have been next to annihilated before they had discovered our whereabouts.

After two hours' advance, driving the enemy before us in this fashion, we reached the edge of the forest, where it runs up the hill, leaving the plain at an obtuse angle. Here we found ourselves again on an open slope, which fell away before us down towards the village of Mehle, with its red roofs peeping through the lime trees. On the fringe of the wood our men lay down in splendid cover, and, regardless of the artillery fire directed against us from a distance of three miles, they punished the enemy terribly as he withdrew towards Elze, leaving Mehle low down on his right. I seized the opportunity of contrasting smokeless with smoky powder, and hurried forward towards Mehle, to a position immediately between the advancing and retreating infantry.

This was the aspect of the field. Upon the edge of the forest the advancing columns of the infantry of the VIIth Corps, or those lying on the ground, poured volley after volley on the retreating infantry of the Xth Corps. It required keen eyes to distinguish the faint brown puffs of smoke which came from the fire of a whole company. Strangely enough, it occasionally seemed as if one of the old cartridges had got in by mistake among the new ones, revealing its presence by a little trail of blue smoke.

And now, looking towards the retreating infantry of the Xth Corps as they stopped from time to time to return the enemy's fire, from each single rifle came a trail of blue smoke, and from each company as it volleyed, a cloud of dark blue smoke, which only a strong wind dispelled.

Away up, back on the rising ground above Osterwald, are the batteries of the VIIth Army Corps, booming as they shell the distant artillery of the Xth. Here, too, are faint light-brown clouds of smoke, more like dust beaten from carpets than anything else. In the opposite direction, on the high ground above Elze, and on the hillocks in the middle of the Saale valley, is artillery of the Xth Corps, using the old powder. Clouds of blue smoke, like that from burning gorse, shroud their position, and must undoubtedly diminish the rapidity of their fire as well as the accuracy of their aim. In fact, a whole battery of artillery using the new powder does not make half so much smoke as that made by a company of infantry with the old powder; and a whole company of infantry firing a volley with the new powder does not make half so much smoke as a single field-piece makes in firing with the old. Comparing battery with battery, the smoke from the artillery of the Xth Corps is like the smoke from a locomotive coaling up, while the smoke from the artillery of the VIIth Corps is like the faint steam mingled with brown coal-smoke when the locomotive is at full pressure and the furnace is glowing red.

Such was the evidence of the manœuvres of the 20th September. The Xth Corps, so stubborn in maintaining its position on the previous day, was totally at a disadvantage against the VIIth Corps, and had to fall back, with great loss, on Elze, though it had succeeded in maintaining the railway line between Hanover and Alfeld.

I ought not, perhaps, to omit to notice the masterly moves by which General von Caprivi, commanding the Xth Army Corps, though forced to fall back, as has been described, on the Hanover-Alfeld Railway, succeeded in preserving that line, to hold which, up to the noon of the 20th September, was the task allotted to him. Although the infantry of the VIIth Corps, as I have described, pressed forward to the edge of the forest above Mehle, General von Caprivi, by his artillery fire, managed to prevent them from coming further. In the meantime, under cover of his artillery, he made one division of his infantry face the border of the wood, while gradually withdrawing his main body along the uplands, so that had the enemy advanced beyond the shelter of the wood, he would have been taken on the left flank. From the uplands, finally, he concentrated so strongly on Elze that, when "cease firing" sounded at noon, it would have taken two hours' fighting to dislodge him.

The advantages of the employment of smokeless powder, as demonstrated by the manœuvre of the 20th of September, and confirmed by the experience of the following day, may be thus summed up:—

It exercised a most demoralizing and bewildering effect upon the troops exposed to infantry fire.

Further: (I.) The enemy experienced extraordinary difficulty in determining (a) the distance, (b) the direction, whence the fire came.

(II.) The smokeless powder gave the Army Corps which used it a greatly increased certainty of aim, arising from the absence of smoke from their own fire. This was especially asserted in the case of the artillery. It was freely stated that on this account the artillery was

able to fire twice as many rounds as in the same period of time with the old powder.

(III.) When the infantry was firing, brown smoke was faintly visible from the flanks; facing their fire, no smoke, or next to none, could be perceived.

(IV.) On the 20th and 21st September, artillery Officers were freely declaring that the new powder weighed half as much as the old, thus enabling double the quantity to be transported. These statements have been more than confirmed by experiments made only the other day at Magdeburg, when it was proved that, pound for pound, the new powder goes at least three times as far as the old.

(V.) These latest experiments further showed that the new powder does not half so readily cause the gun to heat as the old, and that it has the invaluable advantage of leaving the bore of the gun almost clean after several rounds of firing.

(VI.) The action of the powder in the tube of the gun, after ignition, may be described as being at first of an expansive character. In boating language it "gets the catch on" at the end, not at the beginning. It is only when the projectile reaches the mouth of the tube that the full expulsive power of the charge takes effect. The advantage of this quality may be tested with a common pea-shooter. By blowing into the tube moderately, till the pea reaches its mouth, and then giving a strong blast, the charge will carry farther and hit harder than if a strong puff is given at the beginning. So when the shell or shrapnel gets started within the tube the force of the explosion is not immediately exhausted. The projectile receives the final explosive push as it leaves the gun, and has no longer any friction to encounter from the bore.

Other qualities of the German smokeless powder which cannot exactly be classed as advantages, are (I), that, as an old General expressed on the field, "*Es stinkt ganz cannibalsch*"—it stinks abominably. (II.) It is said that the new powder, in exploding, puts a greater strain on the metal of the gun than the old. This statement, a stranger, as may be easily imagined, was afforded no opportunity of testing. But I observed that Herr Krupp, of Essen, was present during the whole of the manœuvres, closely observing the effect of the new powder on gun-metal. It was stated in many quarters that either new guns are about to be ordered or that the old bronze guns, which had been supplanted some years since, were to be reintroduced. At any rate, there is no bad record relating to the use of smokeless powder since the date of the last manœuvres. It will be interesting to see to what extent the smokeless powder will be employed in the approaching manœuvres at Flensburg, and whether the idea which occurred to me at the time, and which I mentioned in my despatches, will be realized in the employment of the new powder by the German ships-of-war whose participation will form so novel and interesting a feature in these operations. It would almost seem as if in naval warfare the smokeless powder were destined to achieve revolutionary results.

The German powder, by the way, is not, as was at first stated,

noiseless. The report, in fact, sometimes seemed louder, at least in the case of artillery, and was certainly sharper than when the old powder was used.

It was found at the French manœuvres of last year that the unsatisfactory results obtained from the employment of the French smokeless powder were chiefly owing to the want of a suitable blank cartridge. The new powder requires that the cartridge shall be provided with a suitable wad, else the expansion of the gases which are created immediately on ignition drives the greater part of the charge unexploded out of the gun. At the German manœuvres, the field-pieces which fired with smokeless powder are said for this reason to have had a bag of sand as a wad in front of the charge. This was possibly the cause of the resemblance of the artillery smoke to brown clouds of dust. The blank cartridges which were employed in the rifles had already been provided with a hollow wooden capsule having the outward shape of the conical bullet. Their original object was simply to give the blank cartridge the form required to make it fit into the magazine, which, of course, is constructed to suit ball-cartridge. These so-called German *Platz-patronen*, or bursting cartridges, are said not to penetrate a paper target at 17 yards, and may therefore be used with perfect safety for blank fire, while the French *fausse cartouche*, which is made of paper, is said to wound at 30 yards.

The manœuvres of September 21st, which formed a further illustration of the use of smokeless powder, I shall chiefly regard in the light which they cast on the employment of MOVABLE FORTIFICATIONS.

On arriving at Elze at six o'clock on the morning of the 21st, I found that the Xth, or Hanoverian, Army Corps had bivouacked and taken up positions on the distant uplands to the right, about an hour's ride from Elze. Thither all hastened to gain the central point of the Emperor's position, who on this day commanded the Hanoverians. When we arrived on the scene we found that what had happened was this:—The Eastern Army was supposed, with the aid of the Hanover-Alfeld Railway, which the Xth Corps had succeeded on the previous day in saving, to have concentrated upon Nordstemmen, so that the task of the Hanoverians had been fulfilled, and they could now choose a more advantageous position. This they had done by swinging round like a door on its hinges back on the uplands into a position at right angles with that upon which they had fallen back on the previous day. In fact, to resume the comparison with the Thames Valley at Oxford, the Xth Corps had fallen back upon Cumnor village as their centre, and faced towards the Thames at Oxford, with their left wing bending somewhat round towards the Thames.

The first point to be noticed was the extraordinary strength of the position. Over the Osterwald heights, which the whole of our right faced, the enemy could not possibly pass. The defile at Wulfinghausen on our extreme right might be forced, but it was found impregnable since the 19th, when defended by our battalion of

Chasseurs. The only way in which the enemy could get at us was round by the plain between Mehle and Elze, which was reconnoitred by our cavalry in the early morning. They would then attack our centre at Sorsum (situated like Camnor) and our left, where our cavalry was massed, at Wülfigen.

Sorsum is a picturesque village at the foot of a conical hill covered with hazel shrubs. On a spur of the hill overlooking the village stands the church, a long narrow edifice with a high pepper-box tower, on the top of which a number of our Staff Officers were posted during the day with field-glasses, the better to observe the situation. On the slope rising behind the church the foreign Military Attachés were gathered. The Emperor and his Staff were on an eminence to the left. The village below was unoccupied by our troops, though the chalk marks on the doors showed that they had been quartered there on the previous night. The village was unoccupied because it lay too low to be of strategic value. The centre of our line was in front of the church, facing the opposite slope down which the enemy must advance. Here our entrenchments were strongest.

Never have I seen a position at once so strong by nature and so strongly fortified by art. Riding up to it in the morning, I first came upon lines of wire-fencing consisting of stakes four deep, with wire twisted across and along, absolutely impassable for cavalry, and for infantry most embarrassing. If the enemy's infantry ever reached the wire fences, they would stand an excellent chance of being annihilated while attempting to "warstle" through them. Next came our earthworks, line upon line of them. Behind them our infantry were nearly as safe as in their beds. On the heights behind, our artillery Officers were absolutely chuckling over the strength of our position, and foreseeing what havoc they would work among the enemy when he came down the opposite slope.

And now the battle opened, our outposts retiring from the opposite heights, soon followed by the advance column of the enemy. I shall not detail the events of the battle. The enemy's loss must have been terrible while coming down these slopes, and also in retreating up again as fast as they could, for they were exposed to our full artillery and infantry fire.

What I wish particularly to notice was the employment for the first time of the movable fortifications about which I wrote in the "Morning Post" in 1888, when Major Scheibert's treatise on the subject appeared. These fortifications are known in Germany as Schumann's armoured turrets, and are constructed in Gruson's works at Magdeburg. It is well known that heavy armoured turrets were constructed years ago in Gruson's works, and that they were adopted for the fortifications of almost all European countries; also that they gave excellent results in experiments conducted at Bucharest and at Spezzia, which excited European interest at the time. These armoured domes, however, were very expensive, and their weight was a great drawback. A new movement had arisen which was distinctly adverse to the high opinion formerly entertained of the

strategic value of great permanent fortifications, and which favoured the construction of improvised defences.

The exponents of these opinions directed attention to the tremendous military expenditure involved in great fortified places like Metz or Strasburg, and they pointed out the fatal attractions which such strongholds have possessed for great armies during recent wars. Even the brilliant achievement of the defence of Plevna is regarded by these critics as merely constituting a crowning proof of the superior excellence of improvised defences, and, on the other hand, as showing with what certainty the resort to the permanent shelter even of entrenchments leads to a disaster which might have been replaced by a series of brilliant movements, such as would have inflicted an equal loss on the enemy without the ultimate sacrifice of the army which inflicted it.

The late Lieutenant-Colonel Schumann, therefore, devoted his attention to the construction of an armoured turret, whose superior lightness might enable it to be transported by troops in the field. His object could only be achieved by sacrificing to a certain extent the power of the turret to resist the enemy's fire. He constructed two types of turrets armed respectively with guns of 1½-inch (3·7-cm.) and 2-inch (5·3-cm.) bore. These turrets are only proof against bullets and shell splinters, while they cannot resist the full impact of heavier projectiles. But since the small turrets cannot become direct targets for artillery without excessive waste of ammunition, they may be regarded as practically shell-proof.

The turrets, each of which contains a quick-firing gun, are placed in position in the infantry trenches, and strengthen the lines. They are transported on specially constructed carriages. For a quick-firing gun of 1½-inch (3·7-cm.) bore, the turret consists of a cylinder of 38 inches in diameter, which is protected by steel armour in the shape of a cupola or case, having a thickness of 1 inch (25 mm.) (see Plate). The quick-firing gun is capable of firing a maximum of 40 rounds a minute, and has no recoil. One man suffices for the service of the gun and for the management of the turret, which rests upon a revolving pivot. The gunner sits upon a saddle like that of a bicycle, while there is room in the back of the turret for a second man, who hands up the ammunition. The gunner can turn the tower on its pivot, and lower or raise the gun, so as to direct his aim.

156 metal cartridges can be stored on the floor of the interior cylinder.

The weight of the turret is—

		ton.	cwt.
	1,400 kilos.	1	7½
or	1,500 kilos.	1	9½

The weight of the carriage is

540 kilos.	0	10½
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The 1½-inch bore (3·7-cm.) fires shell and grape-shot containing 18 bullets. The initial velocity is 444 yards.

The range for shells is 2,734 yards.

The range for grape-shot is 328 yards.

The heavier form of field-turret containing the 2½-inch bore gun (5·3-cm.) has an interior cylinder of 77-inch diameter. The thickness of its armour is about 1½ inches.

The weight of this turret with gun is—

	tons.	cwt.
2,570 kilos.	2	10½
Carriage weighs 690 kilos. ..	13	

The gun fires grape-shot with 78 bullets and shrapnel containing 56. Range for shell about 3,500 yards, for grape-shot about 437 yards.

A more elaborate form of the armoured turret was devised by Schumann in order to afford greater protection for the gunners. By an arrangement of balances and weights the turret is made so that it can be raised and lowered from within. The external cylinder is sunk into the soil, and the roof, when the interior cylinder is lowered, is level with the ground. These turrets are much more heavily plated than those I previously described—the thickness of the armour being 4 inches (100 mm.). The weight of the turret is 12,500 kilos. or about 12 tons 6 cwt. The guns are the same as those already described, and have the same range.

Turrets are also made of a still heavier weight, and constructed to carry howitzers and mortars of 4½- and 8½-inch calibre, the weight of the turret of this last description being 80,000 kilos. or 78½ tons. These last turrets, of course, are not intended for transportation in the field, and are, indeed, constructed to rest inside a sunken cast-metal cylinder built into the ground. (See Figs. 4 and 5.)

For the purposes of improvised fortifications the lighter transportable turrets for 1½- and 2½-inch guns are of immediate practical moment (Figs. 1, 2, and 3). They can easily be stored in depôts and forwarded by rail. These turrets, mounted on their carriages, would certainly be able to traverse short distances on the field, where the roads are not too heavy. They may thus be expected to meet all the demands of purely temporary fortifications.

At the manoeuvres of last autumn the turrets were mostly sunk into the ground in the entrenchments. Eight turrets in all had been placed in position at regular intervals along the infantry lines. There was certainly, in view of the hilly nature of the ground on which the infantry of the Xth Army Corps was entrenched, considerable difficulty in transporting the turrets on their carriages. I observed about twenty soldiers with an auxiliary force of villagers dragging one of the turrets along a rough country road. Smokeless powder was employed in the guns, but it gave a bright flash at every discharge, so that the position of the turrets (though they were painted the colour of the soil) could be distinguished by the enemy. Their advocates, however, argue that even if artillery, after much trouble and waste of

ammunition, should have destroyed one, it would be a slight loss compared with the execution the turrets can inflict. The gunner in them has a sense of security which greatly adds to the deadliness of his aim. The guns are said to be particularly effective when firing solid shot against cavalry.

Against great permanent fortifications the besiegers now bring ordnance of tremendous weight, and the newest inventions of explosive projectiles are calculated to make the strongest forts tremble. The besiegers can also, by an energetic and well-directed attack, prevent the defenders from occupying or maintaining positions in the intervals in a line of forts. It is evident that the method of attacking fortifications has received a new and wide development, and has become a much more elaborate and interesting department of strategy than it was in the days of Sebastopol or even of Strasburg. In France as well as in Germany there exists a strong tendency to avoid in the future the error of staking too much upon the defensive strength of permanent fortifications; and there also exists a belief that more will be achieved by developments in the construction of improvised defences—a branch of strategy in the future of which the transportable armoured turrets may very probably play a prominent part.

I would ask permission to conclude this paper by giving a brief summary of the considerations which, it is anticipated, would predominate in facing the next great European campaign. This summary, I am enabled to state, is in general agreement with the views of the German General Staff.

Accuracy of aim and range of weapons of precision have marvelously increased since the last great war. Only the other day a few Austrian marksmen were able, in an incredibly short space of time, to annihilate the whole personnel of a battery (represented by dummies) at a distance of 1,400 yards. Artillery operates with shells from a distance quite out of the range of unassisted human vision, and with shrapnel up to a distance of 2,200 yards; in both cases with deadly precision. Shells filled with explosives wreck buildings and walls with unprecedented rapidity. The newest rifle works so quickly that the marksman is in a position to fire twenty unaimed and twelve aimed shots per minute. The penetrating force of the bullet from the small-bore is so great that it goes through the thickest tree trunks as well as earthworks of 18 inches thick, as if they were butter, and such cover no longer affords any protection for human life.

It is not, however, anticipated that the progress made in weapons of precision will result in an increased loss of life in future campaigns. The more primitive the weapons of warfare were, the greater, as history shows, was the sacrifice of the lives of the combatants. With the old muzzle-loader the combatants approached so close to each other that almost every shot told. Nowadays troops are never allowed to charge until it is believed that the enemy has been so demoralized that he may be safely approached at close quarters.

Thus the fortune of war is becoming more and more dependent on the *morale* of the opposed armies.

The increased precision and range of aim has also the effect of causing tactical advantage to be more decisive and to be more rapidly won or lost, as no commander would be willing, lightly, to incur the risk of exposing his troops to the well-aimed fire of the new magazine rifle, by a want of rapidity of decision, whether in ordering an advance or a retreat. Movements in the field will, therefore, be executed with increased rapidity, which will impart a new excitement and a greater liveliness of aspect to the battles of the future. On the other hand, it is not improbable that the same factors will produce a certain stagnation in the conduct of modern campaigns, owing to the cautious tactics which the deadliness of the new weapons of precision will enforce. The functions of great masses of cavalry, however, will become more important than ever. These will be the eye of a great army, as they will also be the veil which shrouds it from the enemy. The cavalry masses of the opposed armies will first encounter each other, and will put it to the issue which army has the keener eye and the closer veil. This development will lead to great cavalry battles initiating every great campaign and every important operation, where the nature of the ground permits.

The excellence of weapons of precision will, it is anticipated, redound pre-eminently to the advantage of troops acting on the defensive. It is, in fact, regarded as probable that the great battles of the future will more than ever have to be fought out on the wings, and that the success or failure of flanking movements will generally determine the issue of the combat.

Smokeless powder, in particular, will confer a preponderating advantage upon troops on the defensive, as the attacking force will have the greatest difficulty in discovering the position of lines and batteries which have the advantage of good cover, while bodies of men moving to the attack in the open will almost invariably fall victims to the deadliness of the defenders' aim. The task both of commanders and of cavalry patrols in endeavouring to discover the position of the enemy will be rendered much harder. Cover which protects troops from being seen will be as valuable as actual cover against fire has hitherto been. The choice of a position and the disposition of troops, so that the advantages of invisibility, as conferred by the smokeless powder, may be made the most of, will form the first care of the tactician.

In view of the great space which will be required for the movements of twelve to fourteen Army Corps on each side in a great campaign, it seems doubtful whether, either in the marshes of the eastern frontiers of Germany and Austria or on the hilly ground of the western frontier of France, scope will be found for the development of a battle which, under the conditions of modern warfare, involves an extension of front covering over thirty miles.

For the vast armies of to-day, the question of communications, and, above all, the importance of railways, will assume a fresh prominence, both in view of the commissariat and of rapid mobilization. More

than ever will the success or failure of the earliest operations of the campaign, which depend upon rapid mobilization, exercise a decisive effect upon the ultimate issue.

The speed and promptness of strategic operations which will be necessitated by the vast numbers of troops to be manœuvred, as well as by the considerations already indicated, will deprive great permanent fortifications of their former importance. They will only play an important part at points which cover difficult and unavoidable defiles, fords or bridges, embankments across marshes, &c. In all other cases the invaders will simply seek to avoid the strongholds and pass them. But even where the siege of such strongholds is undertaken, the besiegers will enjoy advantages through the employment of the new heavy ordnance and the new projectiles, out of all proportion to the progress which has been made in the art of fortification.

One important question which, more, perhaps, than any other, interests England, is the relation which the military security of a country bears to the number of troops which it can put into the field. The views which I believe to be entertained in Germany by those best capable of pronouncing an opinion on this score are distinctly in favour of the superiority of the army which is best disciplined, best equipped, best led, over a rival who, while stronger in numbers, is somewhat inferior in these regards. For the training of every single private acquires a high importance in view of the necessity that he should be familiar with the complicated mechanism of his weapons, and skilled in their employment. Good shooting has become indispensable. Ammunition must be carefully economized, and every shot made to tell. As General von Caprivi said the other day in the Imperial Diet, the whole physiognomy of Berlin has been altered in the last few years by the growing demands of drill and education upon the German private soldier. He is now hardly ever to be seen on week-days in the Berlin streets, and on Sundays he is no longer observed in the agreeable company which he used to affect, as he has no time during the week to strike up tender acquaintanceships. General von Caprivi added that when he entered the army it was considered sufficient for a private to fire some twenty rounds in the course of a year at an easy target, and the only question ever asked was: "Did the rifle kick badly?" Now the German private had to fire a minimum of 150 rounds, and his training had become most exacting and severe.

The demands of modern warfare are more than ever in the direction of requiring a superior *morale* in the individual soldier. The total absence of fear based upon calm reflection rather than upon temporary excitement, the coolness and self-command which have always given the great armies of history their advantage over their opponents, will more than ever stand the troops which possess them in good stead. They will facilitate that accuracy of aim, and that economy of resources which are the conditions of success with the new rifle and the extended range. The difference between the cool marksman and his excited neighbour is nowadays calculated with arithmetical accuracy.

There is probably no one who is familiar with the composition of the armies of Europe who will be prepared to deny that Great Britain possesses raw material capable of being very highly educated in the military virtues to which reference has just been made, and that she possesses this particular material to an extent equal if not greater than her Continental neighbours.

Similarly, the education of Officers in view of the conditions of modern warfare has become a matter of overwhelming importance. The Germans believe that the traditions of the last eighty years, and the present thoroughness and success with which this department of military efficiency is cultivated amongst them, give them an incontestable superiority over their neighbours on the Continent. But an Englishman—whose lot makes him a stranger within their gates—may claim with justifiable pride that the traditions of the British Army in respect of its Officers are in no wise in danger of being unworthily maintained, and that the testimony, based upon his last year's visit to Aldershot, of one of the foremost German soldiers of the younger generation, the Emperor William himself, has both in public and in private in his own country, as when he was in England, been heartily and unreservedly warm in its recognition of the soldierly attainments and the brilliant capabilities both of British Officers and men.

Major-General J. KEITH FRASER, C.M.G.: Sir, I think every one here, of all branches of the Service, feels that we owe a debt of gratitude to the lecturer for telling us so much as he has done on many topics. No branch of the Service can be more grateful to him than the one to which I belong, the cavalry. It is the first time I have ever heard anybody not connected with the Army speak in this room in the sense in which he has done. We can all remember that for very many years numerous Officers of the Army have spoken here in favour of increasing our cavalry, of the use of cavalry, and the future of cavalry. It is now a great many years ago since Colonel Valentine Baker stood and argued the point here with everyone. No result, as far as I know, has ever taken place. There has been no increase to our cavalry. We all remember the unfortunate state, owing to numbers, of our cavalry that went to the Crimea. Several here are present who saw it. It is to be hoped, now that one not connected with the Army has spoken, perhaps public attention will be drawn to the enormous disproportion there is between our cavalry and the other arms of the Service. If you look at Continental armies, you will find the cavalry is in large proportion; in our Army it is ridiculously small. I believe there is no country in the world, except Denmark, with so small a proportion of cavalry, and Denmark has no India to protect, no Egypt, no South Africa. In all parts of the world our cavalry are to be found. Talking of masses of cavalry, it is very interesting to hear of them, but unfortunately English cavalry soldiers can never see anything approaching to masses of cavalry. It is impossible at present, unless a great change comes over the country. The feeling of this great horse country seems to be always strangely against cavalry, and I believe nine people out of ten you meet with, unconnected with the Army, will tell you the days of cavalry are over. Well, they said the same, no doubt, before Brown Bess and powder were invented, and they will keep on saying the same; but each time cavalry goes out, it comes more to the front, I think. The lecturer spoke of the weapons of cavalry. I think the first weapon the cavalry soldier has is his horse, and no doubt our greatest difficulty is our horses. We have no reserve of horses. The reserve General Ravenhill has so admirably managed to obtain is hardly fit to be sent straight into the field with cavalry soldiers on their backs, and to send a cavalryman to fight against well trained horses and men in foreign armies, unless he rides himself a trained horse, is

really murder; for instance, to send a man out on outpost or reconnaissance on a horse that, perhaps, has never had a bit in his mouth. I think some went to Egypt that had never had bits in their mouths. I hope this lecture will do us great good. All those who have seen the German or Austrian cavalry manœuvres know how the great masses of cavalry are manœuvred, how they come up from, as it has been well described, "hull-down," and suddenly change the face of the whole battle. When the infantry is exhausted, even in mimic war, the sudden appearance of great masses of cavalry upsets the whole arrangement. So I think it would be in war. The lecturer spoke of the American War. There cannot be a better study than the American War, to see the admirable way in which the cavalry, not only on the Southern but the Northern side, were managed, really as cavalry, and not only as mounted infantry. They were used as cavalry; they dismounted when occasion required, as every cavalry ought to do, and I maintain cavalry ought to take care of itself. Every cavalryman ought to have his carbine, and be able to take care of himself, without asking the support of infantry. He is no use if he cannot take care of himself. I think it is rather an indignity to cavalry to think that they require mounted infantry to protect them. With reference to the use of dogs in war, it has happened to me to know the great use that is made of dogs in Bosnia and Herzegovina. There are quantities of dangerous people about in the countries near Montenegro, and the Austrian troops use these dogs as messengers. They are found most useful in sending messages from the rear of a column to the front, &c. Of course, naturally, the shepherd's dog is generally the most intelligent and the best, and the extraordinary journeys they will make across hills and places where horses, and even men, could not go, is quite wonderful. I have in my possession a return of the distances and of the extraordinary saving of time that has been effected by these dogs. As Colonel Schumann's fortifications have been alluded to, it has also been my lot to see a great deal of that system. Colonel Schumann was a friend of my own. He unfortunately died last year. He was certainly an extraordinary man. About three years ago I was staying with him in Roumania, and he made me a convert entirely to his system. In Roumania there are many hundreds of those guns prepared to send at any moment to parts where danger is threatened. They have several hundreds ready to send to the great line of defence between Focsani and Galatz, and if they are suitable to that country, I think they are still more suitable to England. They are very inexpensive. Earthworks can be run up very quickly by infantry, and if you have a mass of these guns ready to send at any moment to any threatened point, they make it really almost impregnable. They are very difficult to hit. In a potato field they are not visible: in strawberry beds you could not tell if they were there. They are very difficult to hit indeed for big shells, and even if they are hit, it is only one gun and two men gone if the whole thing is destroyed. I think they would be admirably adapted for some of our defensive positions.

Lieutenant-Colonel T. S. WALKER: I should like to ask one question about the manœuvres. I happened to be there the whole time, and should be very glad if the lecturer could give us some enlightenment as to what occurred on the last day. We all admire the German soldiers immensely—no one could help doing so—but yet they are far from immaculate, and I witnessed some proceedings along with other English and French Officers on the last day, of which I should be glad to have an explanation. An attack was made by one corps against another in an entrenched position, commanded by the Emperor; the supreme attack was made against the left flank of the defenders; everything proceeded in the stereotyped manner up to the point where we all expected the final rush to be made. The assailants were to the defenders as about two to one. Quick firing had already commenced, and we momentarily expected the final effort, when, to the surprise, I may say the bewilderment, of the onlookers, all of a sudden the defenders, contrary to the dictates of tactics, stood up, sprung over the crest of the parapet, and formed in line. Not a shot was fired: they were there for a few seconds, and then they advanced against the attackers (who were firing at them all this time), about 30 yards in line, when it seemed to dawn on them that it was necessary to fire also, and they went down on their knees and began firing. Some one came up to the Commanding Officer of the attacking force, and evidently they had to withdraw,

and they were as surprised as we were that they had to do so, because everything betokened a success, as far as our ignorant vision could make out. They also retired in the same way, without firing a shot, without alternative battalions or companies halting, firing, and retreating, at the double; they retired just like a flock of sheep. I think, perhaps, if the lecturer was there, he might throw some light upon it. It suddenly dawned on one of the Commanding Officers of a battalion that it was necessary to fire on the defenders—now the assailants; he did so, but he was left in the lurch; the others did not help him, but left him alone; he was assailed by cavalry and was annihilated in the spirit. Now, I admire the Germans immensely—seeing them on parade they are admirable—but if that had occurred at Aldershot, you reporting gentlemen would have had it next day in all the papers. The German reporters are not allowed to utter a syllable as to what takes place, so that it does not appear in their papers, fortunately, or, perhaps, unfortunately, for them; consequently, I have never been able to find out why this occurred, who was at fault, and why all the principles of tactics, so far as I can grasp them, were not followed. Perhaps you can tell me.¹

General Sir CHARLES SHUTE: I do not think I can pay our excellent lecturer a greater compliment than by saying that he has left us no opportunities for debate. He has placed before us a number of unquestionable and valuable truisms, and truisms that I wish we could impress upon the public of this country in general. The fact is, that we are governed by a democracy, and it is absolutely necessary that they should know the real value of cavalry and horse artillery, in order to induce them to pay for a very expensive force being in an efficient and thoroughly good condition, and this is best impressed on them by a civilian like Mr. Saunders lecturing on the subject. The fact should be impressed on the public that our cavalry is now in skeleton, and yet that, if they could not take the field as to strength, in due proportion to the force to which they should be the eyes and screen, and always miles in advance, they would in civilized warfare be almost valueless. It would be utterly impossible that they should be the eye of a General Officer, nor could they cover his operations, because the cavalry of every other country would proportionately so much outnumber them that it would be utterly impossible for ours to keep the field. We know well that cavalry is entirely an offensive force, and cannot act on the defensive, and that if they are very much outnumbered, and their quality is not so sufficiently superior to the enemy's as to compensate for want of numbers, that they are certain to be obliged to give up their forward position to the enemy; our own Generals would be thus blinded, whilst their every movement would be known to their opponents. But besides the more ignorant of the tax-paying public, the cavalry and horse artillery have but very doubtful friends in the many Officers who have risen to high positions on the Staff through experience (never having commanded regiments or batteries) of savage warfare, which may, I fear, prove as inferior a school for ours as Algeria did for French Officers. In our little wars that we have now been so accustomed to for many years, there has been no opportunity given us for opposing, or for employing

¹ On leaving the lecture hall the other day, Captain Adie, who witnessed the foregoing apparent incongruities in tactics, informed me that the German official interpretation of the subject-matter was, that the attackers had been so completely crushed by the overwhelming artillery fire of the defenders, that they were completely *hors de combat*. This verdict, however, I challenge, as the attackers at the decisive point of the battlefield had such a preponderating force, both of artillery and infantry—in cavalry only were they much weaker. Moreover, even if the assumption that they were crushed be maintained, why should they have been allowed to advance close up to the position? They ought to have been previously retired, and most emphatically the defenders should not have sacrificed the advantages of cover, they, in consonance with the first leading principles of tactics, should have followed the retreating army by fire only; but on this occasion the assailants had not retired, and yet for some distance, they were advanced against in line, and without a shot being fired. A most unrealistic picture was drawn of a modern battle.—T. S. WALKER.

cavalry and horse artillery, and all practical knowledge of their value seems lost to us. We are opposed to an enemy that has hardly got a pair of trousers to wear; certainly much less dragoons or horse batteries. I agree with my friend General Keith Fraser, that we are sadly behind the times in these matters, and it is only by gentlemen—more particularly by civilians like the lecturer—impressing these truths on the British public, that there is any chance of our improving our present position. One word with regard to the cavalry Reserve. We are all, or most of us, practical soldiers here, and we know perfectly well that the cavalry Reserve must be almost valueless if they are never called out. We know quite well that a dragoon that has not seen a horse for eighteen months is not worth a rap, and would not be for at least six or more months. Therefore, in point of fact, it is absolutely necessary that our cavalry and horse artillery should be kept in a more efficient and stronger state than we are inclined to do at present. The Germans, acknowledging this truth, always keep up their cavalry regiments to within a few sabres of their war establishment. There is really nothing the lecturer has said with which anyone can possibly differ, and I will only, therefore, again repeat that I think his remarks, as regards the cavalry, are most valuable for the British public.

Major WALKER SMITH, R.A.: I have risen, Sir, more than anything else to ask the lecturer if he will kindly give us information on one little point with reference to the question of smokeless powder. The question is one which had previously struck me as demanding more specific information than we now possess, viz., what would be the influence of smokeless powder on the attack operations of an ordinary battle. In the forest slopes fought over in the earlier of the two great actions described by the lecturer, we hardly find features normal to the ordinary battlefield or field-day. The ground appears to have been thickly covered with woods and undergrowth, and both forces were the whole time kept more or less "upon the run." I can certainly imagine that upon ground so conditioned the superior qualities of smokeless powder would stand out in very strong relief. Whether it would do so in the normal attack over a perfectly open and even glacia, like the St. Privat slopes, is to my mind the problem now requiring solution. We all know in the discussion of battle tactics what tremendous importance is attached to bringing up the supports and reserves, the second line, and so on, tolerably well screened by *their own smoke*. We know something too of the advantage conferred on company leaders even by the little smoke of ordinary field-days in leading their men to the attack. Now, by the adoption of smokeless powder all this is swept away. It is open to question whether the formal attack over the fire-swept glacia may not be more fairly regarded as the normal type of present day collision, than the running combat in the instance dealt with by the lecturer, and it would be interesting to know his opinion as to the effect of smokeless powder on the tactics of the attack in the (probably) more numerous cases that I refer to. There is one other point of some importance, to which I would ask permission for one moment to advert. The last speaker, General Shute, told us that the lecturer's paper was so pertinent and sound as to leave us no room for criticism. I think I must make a slight exception to that. Admirable and most interesting as the lecture undoubtedly was, I did rather regret, for one, the little burst of optimism with which it closed. I know the leading journals on both sides of politics are unfortunately in the habit in this country of giving their correspondents a brief to "write up" the British Army and the British system in every possible way; and I believe that this custom has exercised a most deleterious influence upon the Service. Possibly however, after all, I am not so much at divergence on this point with the lecturer. He speaks of the admirable "raw material" that we have in the Service, both of Officers and men, and there we are beyond doubt thoroughly in accord with him. The question is—Is it anything more than raw material; or, is it not the fact that the material from the German and Continental point of view is exceedingly raw indeed? Let me give you one single illustration, mentioned by the lecturer himself, namely, the taken from an important topic mentioned by the lecturer himself, namely, the capacity of the German soldier for enduring immense fatigue, working day and night, both in peace and war, in barracks and in field operations. My own observation of the work done by German soldiers entirely confirms his view. Whether our own men are capable of similar uncomplaining endurance, is a question which

may or may not be answered in the affirmative. I maintain, however, that you do *not* find that the average British soldier of any one arm of the Service is worked, either for athletic or instructive purposes, to anything like the same extent in our own country. There is a query I have often heard started in the course of conversation at Aldershot and elsewhere, and notably during the discussions arising out of the field days of the last summer—Why do we not exact more hours' labour from the soldier, in order, on these days, when an adequate training is the one paramount essential, to teach him his work? The answer you get from two Officers out of three is this: that in our Service the troops are enlisted on the voluntary system, that it is impossible to exact more from the men than is now the case, that they will not stand severer work, and that even now they have been known to cringe mutinous tendencies after a very ordinary degree of good marching. I only tell you what has been remarked to me, without in the least endorsing it. Heaven forbid that it should be true! I do trust we have not in our Service fallen quite so low as that, but I wish to quote this as an illustration of the deplorable results which may be traced not remotely to the language of over-optimism which in this theatre and in the press we are always adopting about our own Service and our own arrangements, while we turn a blind eye to some of our most serious defects.

Captain J. M. GRIERSON, R.A.: Having had the advantage of going through the manœuvres last year from the beginning to the end, and also the pleasure of meeting our lecturer there, I should like to be allowed to say one or two words. First; as to smokeless powder. I entirely agree with what he has said, and I only wish to mention the enormous latitude it gives to field artillery in their choice of positions. In the attack of the VIIIth Army Corps on the second day of the final manœuvres, their guns were placed in three lines in rear of one another, firing over one another. That would have been absolutely impossible with the old powder. In a country where positions are cramped, the use of smokeless powder gives an enormous advantage. With regard to the turrets, I think that is a point on which military opinion in Germany is very diversified. I do not think the Germans approve generally of them. They think them artificial, heavy, and complicated. They may be of use in defensive positions previously prepared, but they probably never will be where they are wanted, and they certainly are no good for offence. Last year, one point that struck me more than anything else was the excellence of the Umpire Staff. In our manœuvres we detail regimental Officers as umpires. The Germans detail their very best Officers for the work, i.e., those of the Great General Staff in Berlin. Wherever the troops got near one another or otherwise the situation required a decision to be given, there was an umpire on the spot. There was no putting troops out of action, piling arms, and lying down, thus introducing a state of things which looks only ridiculous. The troops went back when they were repulsed, the fight surged backwards and forwards, and the resemblance of the whole thing to real war was enormously increased thereby. That can only be done if umpires are men who have received the training which the General Staff in Germany have, and which any General Staff ought to have. The final impression left on my mind by the manœuvres was that the introduction of this smokeless powder and the probable use of cavalry in masses are entirely in favour of the British Army. Our cavalry have always shown a decided preference for cold steel, and I think smokeless powder gives an enormous advantage to the offensive defence, which is the traditional style of fighting of the British infantry.

Captain MIDDLETON: With reference to the use of dogs as messengers on the battlefield, I should like the lecturer to tell us how the dogs were conveyed along with the troops, because I think, if they followed the troops over a rough country, hedges, and ditches, and so on, they would have rather a bad time of it. Did they follow across country, or did the conveyance taking them keep to the main roads? Another point is as to the effect of firing with smokeless powder, and as to the difficulty of determining the distance and direction of the position of your enemy who is using such powder. I should like to ask, Were there any range-finders about? There must be a certain amount of report, and that would give some idea as to where the guns were, and a few trial shots, either from the artillery or from our rifles, considering that the rifle fire extends to 3,400 yards, would make the enemy show themselves

somehow or other. Major Smith referred to the length of time that men are drilled now. I think the British raw material is not worse than the German, but the age of the German raw material is slightly over that of the British. The German raw material is taken at a certain age (twenty years), and I am afraid a good many of our recruits are only sixteen years old.

General Sir JAMES HILL-JOHNS, V.C., K.C.B.: I do not wish to make any observations upon the lecture, because I lost half of it through coming in late, and I consider the rest of it was very much to the point, and will be most useful in bringing the subject to the notice of the public. What I wish to do is to ask about the movable fortifications; how are they worked? I suppose they go with the attacking force as well as with the defence. Now, you cannot find trenches when you are advancing, and if they are used in the advance, is the outer part of the machine made of steel? Is it bullet-proof, or are you obliged to make trenches for them? And again, I should like to know what the range of vision is of the man who is inside. As far as I can judge from the drawing, he can see out of only a very small hole, and by the lie of the ground may not be able to see more than 100 yards or so. Has this weapon a lateral range of fire of any extent? As far as I can see from the diagrams, the cost of working a very heavy machine like this movable fortification, drawn by one or two horses, would not be repaid by the amount of fire which as a rule would be obtained from it. Of course, in a defensive position, if you can choose your spot to place these batteries, I can understand them as being most useful: but if you have to take them up in a hurry, and use them when you are advancing or retiring, the ground will probably be found unsuited to them, and therefore, as far as I can see, I do not think they would be of sufficient value to the Army to repay the State to have them, except in defensive works.

Lieutenant-Colonel E. GUNTER: I should like to add my testimony to the very great interest with which we have listened to this admirable lecture. I only want to say one word with reference to what the last speaker referred to, namely, the portable turrets. Notwithstanding the enthusiastic way in which the lecturer has spoken of them, and which has been confirmed by General Keith Fraser, who had personal experience of them, I do hope that we shall never adopt anything like them. I think the use of such improvised iron fortifications, either in the attack or defence, would be something like going back to the old days of plate armour and iron helmets, and visors, and all that. I think if fortifications on a large scale chain the troops who are to defend them, so in a smaller way would these improvised temporary smaller fortifications hamper them. I think true value in defence, as well as in attack, will consist in increased mobility and activity, therefore, any such improvised fortifications, however well they may work in theory, must be detrimental in practice.

Colonel BAYLIS, Q.C.: Will you excuse me for making a few observations. I may say we are all exceedingly pleased that a civilian should have contributed so much interest to this theatre; and civilians, according to many most distinguished Officers who have spoken here, have done much good for the Services by their contributions to the lectures of the R.U.S. Institution, and expressing their opinions freely in the discussions. I agree very thoroughly with what has been said by one or two General Officers, that it is not only from the Services themselves that these suggested improvements will arise, but from getting public opinion to bear upon the subject, by papers and discussions here; and when a civilian comes forward and gives his valuable assistance to this end, as Mr. Saunders has done, we are very grateful to him. As an old Volunteer Officer, I can say myself that I believe the Volunteer Force has done a great deal of good in bringing military matters, of which, as civilians only, they were ignorant, more before the public, and making the public feel that they ought to do more for, and appreciate better, the services of the Army and Navy and of the general services. One question, with reference to smokeless powder, has occurred to me; we, no doubt, when out shooting partridges and pheasants, are very glad to have our smokeless powder, and so have a second shot with the other barrel; but then we must remember they cannot shoot back at us. Is not smoke a great protection in the face of an enemy? It has its disadvantages no doubt. By the use of smokeless

powder you may be able to see your enemy, but you will remember you are seen by him also, and I have understood that if you can approach your enemy in a fog, or smoke, it is a very great assistance to an advance against a defending force. I was told by Lieutenant Harwood, R.A., who was one of the Officers who, at Inkerman, directed the two guns against the smaller guns (12-pounders) of the Russians. He said, "When those two larger guns were brought up at Inkerman, we could not see the enemy, through the smoke and the fog. What did I do? I could only fire at the flashes of the enemy's guns;" showing the advantage of obscurity to the enemy in making an attack. I think we have heard of instances in which it has even been found very useful for ships to create smoke in order to pass unobserved under the batteries of the enemy. I, therefore, cannot think that smokeless powder will always have the advantage.¹

Colonel R. S. LIDDELL (late 10th Hussars): With reference to what has been said by Sir Charles Shute, I should like to ask the lecturer one question. He spoke of the daily increased estimation in which cavalry is held in Germany, and in the other Continental nations, and of the large number that has been added in the last few years, that ever since the war of 1866 there has been a continual increase of the German cavalry. I should like to ask him whether the numbers of the cavalry are in any way built up by the cavalry Reserve in Germany, because in this country I know people think that, although we are very weak in cavalry, still it is all right as long as we have the cavalry Reserve. When I was in Germany a few years ago, I was told that the cavalry soldiers, after three or four years' service in the ranks, were sent into the Reserve, but never were those cavalry soldiers permitted to come back to the cavalry; they were employed in the transport or in some other way, but they are never permitted to come back to the cavalry. If that is the case, it seems that we are rather risking matters if we are always to depend upon our cavalry Reserve.

Mr. SAUNDERS: I am very grateful for the extremely kind reception which my paper, being a paper by a civilian, has received. I feared it might be rather an infliction upon an institution like this, but I hope I have been able to say something of interest if not of value. I feel in replying especially that I labour under disadvantages which some of the speakers have said would very probably attach to an attacking force using smokeless powder,—that is to say, as a civilian, I am advancing in the open against a smokeless fusillade which is sure to puzzle, and which might very well annihilate, me. I am also very grateful to General Keith Fraser for adding so much that I did not know. It happened, to my very great satisfaction, that he bore out some things which I said about the movable fortifications. It was extremely gratifying to me to find this, as of course my information was necessarily somewhat of an incomplete character. With regard to what Colonel Walker said, I remember I think having the pleasure of talking to him on the field, but I am not quite sure that I remember seeing him at the precise position whence I witnessed the operations to which he referred.

He asked with regard to the ———— may the defending force got out of their trenches and stood up and advanced in such a fashion as to expose themselves to a murderous fire from the other side, and also why the other side did not, under these circumstances, attack them. I suppose that if this had actually occurred it would very likely have been said by the observers on the field that it was because the Emperor was himself commanding the defending force, and that success was intended for his forces. But that really was not the case: there is no doubt, I think, that battle was fought fairly out, and I think, so far as I can reply as a non-professional man to that question, the real fact was that our position was so tremendously strong (I was with the Xth Corps on this occasion), and especially the fire of our artillery was so very effective, that really those troops with which I suppose Colonel Walker to have been coming over the hill, were all smashed up before they got near us. When our men left their trenches, in fact, Colonel Walker's side was already decimated. There was one battalion of the enemy's chasseurs, I remember, which came up in the most plucky manner; they

¹ Hence the idea of Colonel Crease's smoke balls, lately tried.—Ed.

certainly fired their last cartridge; they came round the corner till they got close to our lines, they came close up to us, and the Umpire ordered them to cease firing till he could decide whether they were annihilated,—and he finally decided that, though probably they would have been absolutely annihilated, yet such a movement in the case of a forlorn hope might really do some good and might have weakened our positions, and therefore be allowed them to march off the field with the honours of war. But I think it must probably have been further on the left flank where the particular instance occurred to which Colonel Walker referred, so that I am unfortunately not able to give him full information, not having witnessed it. My own impression is, if it did occur, it was because our artillery and these turrets too must have done a very large amount of execution before the enemy came near us. Then with regard to what was said about the advantage of smokeless powder to troops on the offensive. I admit that it would be a very serious matter indeed for troops coming up over open ground and encountering a smokeless fire. In summing up at the end of my paper, and expressing not my own views by any means, not expressing views on my own authority, but expressing what I believe is considered in Germany to be likely to occur, I said that smokeless powder was expected to confer preponderating advantage upon troops who occupied entrenched positions, and that for the attacking troops under the circumstances which were assumed by the speakers it would be a very serious matter indeed, and very difficult for them to do anything at all. There is no doubt smoke is in some circumstances a great protection for troops attacking. General Sir James Hills-Johnes said that the circumstances in which I described the battle of Osterwald were abnormal; that it took place in a forest, and therefore there was considerable difficulty in judging this battle by ordinary standards. That was perfectly true, and I said so at the beginning of that description, both from the fact that the battle took place on the edge of the forest, and from the fact that it was extremely misty and rainy weather, so that the smoke lay along the whole forest, and obscured the line very much more than would have been the case under other circumstances. It was certainly a particular kind of day, but it was also in that sense rather a test day. The day and the ground were very much to the disadvantage of the old powder: but, on the other hand, the circumstances were admirably calculated to test the smokelessness of the new powder and its consequent advantages. It was shown clearly on this particular day that the new powder had absolutely no smoke, because, although the atmosphere was so damp and heavy, there was none to be seen. Coming back upon what I said about the excellence of the British troops at the end, that was perhaps a little piece of patriotic effusion on my own part which I think you will allow me—

The CHAIRMAN: Do not retract it.

Mr. SAUNDERS: All I want to say is that I like to indulge those feelings when I am in Berlin, so that I hope nobody here will grudge me them. But what my opinion is perfectly true. I think if you enquire I said about the Emperor's review, I was much impressed at Aldershot, further into that matter you will find he was very much impressed with a swing and he has said so again and again, because he never saw troops go by with a swing like ours; his own troops have a smart parade step, but they have not the swing and life our troops had in going past him. He was very much impressed with our cavalry too, I believe. I think you will find if you inquire further that that was the case. I only thought I would mention the fact (and it is a fact) to indulge my own feelings in the matter, not to damage the British Army in any way, by my humble praise, which you can afford to disregard. I am sorry that I am not able directly to answer Colonel Liddell's question. I have known a good number of Reserve cavalry Officers in Germany. I do not know about the men, or whether they are afterwards good for active service. I suppose Colonel Liddell meant to say that they deteriorate so much after leaving the army that it is of no use ever to call them out again.

Colonel LIDDELL: I meant that the rule is in the German Army that they do not take them back as cavalry soldiers; they put them on another list altogether. They use them for drivers, not for cavalry soldiers.

Mr. SAUNDERS: I am unable to answer that question myself, but I am grateful to our Chairman, who has undertaken to answer it for me. With regard to

smoke being a protection, I do not know, I am sure, whether the want of it would invariably preclude an advance across a glacis. I have seen such an attack as has been spoken of: it was only a very small sham fight. In that case the attacking troops did come right over the open with smokeless powder; but certainly they formed splendid targets; there is no doubt they were much more easily seen than if they had had the protection of smoke. I have been talking more of defensive positions in my paper, and, as I said in the summary, I did not speak on my own authority. I imagine that at the beginning of the next war the important thing will be to secure tactical positions, and to keep them; and therefore securing these positions will be very much more important than ever. I also said that cavalry will be very much more important in reconnoitring and finding out what positions the enemy is going to take up. The idea I have tried to convey is that it will only be at the very last stage of a battle that troops will ever venture into the open, when they have the new powder against them, even although they are firing the new powder themselves. With reference to the armoured turrets, I do not think I spoke quite so enthusiastically of them as Colonel Gunter indicated. I left the point undecided whether they were easily movable or not; but I think that a much more favourable description of them than mine was given by General Keith Fraser, and I must say that all my sources of information in Germany entirely confirm his views with regard to them. At the same time, I mentioned, I think, in the paper, that I certainly saw difficulties occur in transporting them. The ground was extremely difficult and hilly, and they were somewhat slowly transported; I should also like to know whether the turrets which General Keith Fraser referred to were smaller than those I saw. I do not think one horse, the strongest draught-horse, could have drawn one of the turrets I saw.

General KEITH FRASER: Those that I saw were drawn by two small country horses, but the turrets were not used as though in the field, at the manoeuvres of which I spoke; they were only used for putting into earthworks thrown up rapidly, sending them down the morning or evening before taking up positions, not moving about the field. Therefore I never saw any difficulty in moving them, because there was always plenty of time to take them, shift them off the cart, and take away the horse. They were not used with field artillery.

Mr. SAUNDERS: I think they were used very much in the same way at these manoeuvres. These entrenchments were put up in a single night, the wires I described and everything else; and the turrets were wheeled into position beforehand. The position was very carefully chosen. The men worked all night. As one gentleman said in speaking of the German soldier, he goes through a tremendous amount of work, and these men must have worked the whole night, and in drenching rain, in getting these positions into shape. With regard to the difficulty of transporting turrets for great distances, they would be transported by railway, and they can, of course, only be brought very effectively into position where there is some time to arrange the position beforehand. They cannot be carried over the battlefield, hither and thither, and then not go forward with the advance.

They were not so used in this case. They did not go forward with the advance or anything like that, but they strengthened the initial position of the Xth Corps. That is about all they did.

General Sir JAMES HILLS-JOHNS: With reference to range of vision, my difficulty was how they could be used in the attacking force.

Mr. SAUNDERS: They were not used in the attacking force at all on this occasion. I do not know that they could be. They might have been wheeled up to the top of a height opposite our positions, and have done something from there, but they would have been certainly lost in the retreat which the Vth Corps had to make on that day, which became very precipitate. It was a regular scramble at the end of the battle. With regard to the conveyances the dogs were brought in, to the best of my recollection, we simply pressed into the service a lot of country carts and vehicles of that sort. The ground in the valley was not all broken up with hedges and ditches. In the place where the cavalry advanced there were fairly good roads, and the carts got over the fields all right. They certainly did that on that occasion. I do not know whether they could always be employed in this way.

The CHAIRMAN (Sir Beuchamp Walker): I do not think that, at this late hour

of the afternoon; you require much from me. I promised Mr. Saunders I would answer Colonel Liddell, not that I have anything to answer, because I entirely agree with him. If Colonel Russell, my successor at Berlin, were here, he would tell us what is the case at present. As well as I recollect, Colonel Liddell is quite right—the Reserve men are not put into the cavalry again, and there is really no necessity for it. At the time I served with the German Army the regiments of cavalry consisted of five squadrons. Four squadrons took the field, the fifth squadron remained at home, and was the next day raised to a strength of 200 men and horses, and was a Reserve for the regiment in the field. I was much amused by Mr. Saunders's description of the character given to the smokeless powder by the German General, because it was one of the points which I was most anxious to have brought out. At the time of the German manœuvres of last year I was, as usual, living with my daughter in Germany. The gardener at our house was called up to the very Xth Corps with which Mr. Saunders made such interesting experience, and when he came back, we naturally asked him, "What sort of a time have you had?" Oh, he had had a very hard time; very little to eat, and oh, that smokeless powder, it stank so that one could hardly stay in the ranks. I am sorry there is nobody here to-day who will tell us anything about the smokeless powder that we are introducing, and that the French and Austrians are introducing. I do not know whether General Keith Fraser can tell us anything about it.

General KEITH FRASER: It is all the same powder; it has the advantage of not smelling at all.

The CHAIRMAN: Certainly, from what I heard last year in Germany, the stench of this powder was something quite overpowering, and quite sufficient to be very hurtful. The last thing we hear about it is that camphor is being largely introduced into it, so there was a question the other day of the possible disappearance of camphor from the *materia medica*. There is one point no one has touched on. When I was asked to take the chair at this lecture, the point of most interest that crossed my mind was the question of the employment of large masses of cavalry. In 1866 the Prussians sent a cavalry Corps into the field. That was composed of two full Divisions of cavalry, and so little satisfied were they with the result attained by that cavalry Corps, that in the war of 1870–71 they had no tactical unit larger than the Division. I was really in hopes some other of my brother soldiers would have got up and discussed the question as to how large a mass of cavalry can with advantage be employed under one command. I quite agree with Mr. Saunders in what he told us he believed would be the result in Germany in the next war, of men being really laid hands on—I won't say whatever their rank, but certainly not by seniority—to take command of cavalry in the field, because it is about the most important duty the soldier has to perform, and the one that requires the sharpest fellow, hard rider, keen, cool head, and sharp eyes. In 1870–71 the Germans largely employed their cavalry in the very way indicated by Mr. Saunders. With the Army to which I refer, the Crown Prince's (late Emperor's Army), there were two Divisions constantly in the front, or on the flank, and it was from them that his Staff attained their knowledge of the French dispositions. In fact, the flank march, which ended in the Battle of Sedan, was entirely in consequence of the force of cavalry pushed forward, which got to Châlons and found out that Marshal MacMahon's Army had taken the march, and had so given an opportunity of his flank being fallen upon. Cavalry, therefore, were used in that way very largely indeed, and in other ways also. I know my old friends, the Brunswick Hussars, made a march which, without data before me, I should not like exactly to define, for the purpose of cutting a railway at a junction. I think they marched 35 miles, cut the railway, marched back again, and did it all within 36 hours. So much has been said by others that I have nothing really left to say, except to ask you to tender to Mr. Saunders our very warm thanks of acknowledgment for the most interesting lecture he has given us. It is very modest of him to say that he is a layman and civilian, and that it seems a very difficult matter. All I can say, I only wish he belonged to us. He showed a very marked appreciation of what he saw, and he has described it in simple, modest terms. We have not heard anything "of not getting anything to eat and nothing to drink." I think we are extremely indebted to him. There is another gentleman to whom I should like our thanks

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to be given, and that is to Mr. Moore, the editor of the "Morning Post," and who has in the kindest manner assisted in our getting Mr. Saunders to come over to give this lecture. I think I may assume, from the applause with which you greeted my last words, that I am fully justified in thanking Mr. Saunders most cordially for the great pleasure and instruction he has given to us this afternoon.