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ACHIEVEMENTS OF FIELD ARTILLERY.

BY

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PART VI.

The Russo-Turkish War, 1877–78.

Those who have followed us thus far will expect that after the Renaissance which we drew attention to during our last chapters, a further and more vigorous growth, culminating in even more splendid fruits than crowned the performances of artillery in 1870–71, would form the feature in the next campaign in Europe. Such anticipations might fairly have been indulged in, and an unchecked swelling of the tide of progress have been confidently awaited. It must be frankly confessed at once, however, that as regards artillery the experiences of the Russo-Turkish War are disappointing. To those, however, who care to examine in detail causes as well as effects, there is much to be learnt from that struggle as regards artillery which will explain what deficiencies were observable, and in showing where error lay will give hope and confidence to us for the future. Moreover, while it may be admitted that guns fell back for a time during the campaign as regards their relative importance to the other arms, we are still far from allowing that their failure was so complete or so general as it has sometimes been hastily assumed that it was.

In the next pages we shall have occasion to refer to more than one achievement of which the arm may justly boast, and that, too, in a campaign which is sometimes regarded as uniformly disastrous to it, and shall have to show that guns gained in importance rather than otherwise, even during experiences which on the whole were not favourable to their reputation.

It is not possible to speak of Plevna as an artillery achievement in the sense, that is to say, of an artillery success. Nevertheless at the prolonged engagement, extending over the 7th, 8th, 9th, 10th, and 11th of September, the Russian artillery played a part which was intended to be, and was so in one sense, predominant, and the failure of the final assault was no more to be laid at the door of the artillery than at that of any of the other arms. The general conduct of the whole operations, save only those undertaken by Skobeleff, was faulty in the extreme, unity of direction was lacking, the enemy's position was insufficiently reconnoitred, and was not clearly understood, while the efforts, neither of infantry nor artillery, were concentrated on the points which should have been recognised as decisive. Furthermore, the

attacks were delivered piecemeal, were allowed to be beaten in detail, and the vast preponderance of guns on the Russian side was not turned to account.

While, therefore, we are far from wishing to quote Plevna amongst artillery triumphs, we would dwell a moment on its incidents. We must not allow judgment to go by default, and we may be permitted, therefore, ere we proceed to recount more worthy feats, to pause and explain how it came about that after mighty preparations, what was intended to be a great artillery effort, failed to attain its object.

Before entering further on any discussion of the events of 1877–78, however, it will be well to glance at the numbers and armaments on either side.

The Russians invaded Turkey with some 180 battalions, 200 squadrons, and 800 guns, in all about 200,000 men, which would be reduced to some 180,000 effectives by the time the Danube was reached. The Turks at the outbreak of the war may be set down (according to Lieut. Greene[1]) as having an effective force of 360 battalions, 85 squadrons, and 450 guns variously distributed about their dominions in Europe. Of these a force of 165,000 men were available for operations in Bulgaria. Various reinforcements were, however, subsequently added to this total, and the Turkish force in the theatre of war in Europe until the collapse in January may be set down as about 215,000 men.

Turkey, therefore, will be seen to have been considerably deficient in cavalry, and to have had only about half as many guns as her opponent. In the quality of their armament her troops were, however, much superior to their foes. Their batteries were all equipped with steel breech-loaders (Krupp's) of 8 and 9 centimetres calibre, which in range, accuracy, and lightness were superior to the Russian field pieces. The great majority of the infantry were armed with the Peabody-Martini rifle, ·45 bore, which was probably as good as, or better than, any other military fire-arm of that time. Those who had not the Peabody were armed with our Snyder, a weapon at least as good as the Russian Krenk. On the other hand, the Turkish cavalry were armed with Winchester repeating carbines, which were inferior to the Berdan of the Russian horse. On the side of the Russians we find at first only bronze field guns, the muzzle velocity of which was but 1000 f.s., and, according to Lieut. Greene, it was with these only that the war was fought. Subsequently, however, some steel Krupp guns were introduced,[2] and the late General Brackenbury has told us that (notably at Aladja Dagh), with the newer equipment, and the lessons of experience, the Russian artillery practice improved considerably towards the close of the war. The greater part of the Russian infantry were armed with the Krenk rifle, but the Guard and cavalry had the Berdan. Shrapnel shell were made use of by both sides. The Turks used percussion fuzes, the Russians both time and percussion.

[1] "The Russian Army and its Campaigns in Turkey in 1877-78," by Lieut. F. V. Greene, U.S. Army.

[2] *See* "The War in Bulgaria," by Valentine Baker.

In Armenia the Turks used the same guns as in Bulgaria, but, according to Mr. C. B. Norman, late *Times* correspondent at the seat of war, the Russian field guns in Armenia were of the Krupp pattern, made of bronze, either 4 or 9-pounders, the Horse Artillery being armed with the lighter weapon, whilst infantry divisions were supplied with an equal number of each calibre.

The 4-pr. had a calibre of 8·69 cm, while that of the 9-pr. was 10·67 cm, so that it was really a siege piece. Three projectiles were fired by these guns, common shell, shrapnel, and the "round-headed" shell.[1] The weights in the case of the lighter gun being 9¾, 11¾, and 14 lbs. respectively, while in the larger one they weighed 27, 29, and 32 lbs.[2]

After the Russian defeats at Plevna on the 20th and 30th of July, when they fought against superior odds, the strength of the Turkish positions were fully recognised, and the third assault was delayed until considerable reinforcements appeared to render success certain. Especially was the force of artillery strengthened, and since it was recognised that previous failures had been largely due to an inadequate preparation for the assault by means of guns, it was determined to shatter the Turkish defences by a prolonged bombardment ere the infantry were again sent forward.

According to the account of Prince Kouropatkin, the Russo-Roumanian force which was got together at the beginning of September, for what was hoped would prove the final enterprise, numbered 82,000 bayonets, 11,000 sabres, with 444 guns, of which 20 were siege and 48 Horse Artillery guns, or, counting the artillery detachments, some 100,000 men and 20,000 horses.[3] This gives a proportion of guns to the total strength of 4·4 per 1000. A battalion of sappers was also added to the force.

The army under Osman Pasha on the 5th of September has been placed by the same authority at 49 battalions, 26 squadrons, and 60 guns, or about 35,000 men with 60 guns, while there is reason to believe that during the engagements Osman Pasha received reinforcements amounting to several thousand men. The proportion of artillery on the Turkish side was not more, therefore, than two guns per 1000 men, a circumstance which placed them at a great disadvantage.

Speaking generally, it may be assumed that at the third battle of Plevna, therefore, 40,000 Turks with 60 guns in a strongly entrenched position were opposed to 90,000 Russians and Roumanians, supported by an artillery numbering at least 400 pieces, of which 20 were 24-prs. of 6-inch calibre, and of the remainder, half were 9-prs. and half 4-prs. Besides which, there were 4 siege guns taken from the Turks at Nikopolis and 48 Horse Artillery guns.

How came it then that in a series of engagements extending over five days so vast a preponderance of guns to which the solution of the problem was entrusted failed to accomplish that complete success which had been looked for, or even such a measure of it as can be termed creditable ?

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[1] A sort of segment shell with a round solid shot in the top.

[2] "Armenia and the Campaign of 1877," by C. B. Norman.

[3] "Kritische Rückblicke auf den Russisch-Türkischen Krieg, 1877–78," nach aufsätzen von Kuropatkin bearbeitet, von Krahmer, Oberst und Kommandeur, etc., etc. Vol. I.

In the first place, it is to be noted that unity of command during the operations, a condition indispensable to military success, was lacking, and that this must almost certainly have been so, will be clear when it is mentioned that there were present on the scene, Prince Charles of Roumania, commanding the troops at Plevna; General Zotoff, his mentor, who may be regarded as their real head; the Commander-in-Chief, his Chief of the Staff, and finally the Emperor himself, with the Minister of War and a large suite. Those who are acquainted with the feelings held towards the Czar by the Russian troops, and the relations which existed between the other members of such a hierarchy of authorities, will appreciate the difficulties which were thus imposed on anything like an independent direction by any one individual, however high his position in the service.

The division of authority thus engendered affected the plan of battle, militated against concentrated efforts, caused decisive points to be overlooked, and in consequence an inevitable lack of cohesion supervened, not only as regards the general scheme of attack, but also affecting the manner in which the batteries were employed.

Finally the deficiencies of the Intelligence Staff caused a mistaken view of the strength and resources of the Turks to be taken.

It was admitted, when the plan of the third attack on Plevna was discussed, that the previous assaults had been insufficiently prepared by artillery, and therefore it was decided that not only were the Russian guns to fire on this occasion for hours, but days were to be given up to an annihilating bombardment, at which the services of siege guns were to be utilised.

The artillery were to gradually approach the works, and as they did so the infantry, which during the preliminary bombardment were simply to act as escorts to them, were to "draw near to the works under cover of the ground," and then break from their concealment to rush forward to their final assault. As matters turned out, however, both infantry and guns remained almost uniformly up to the moment the attack was launched on the 11th in the very same positions which they took on the 7th of September, and no gradual approach, far less an unobserved one, to the works was attempted at all. Moreover, it is the opinion of Prince Kouropatkin that to attain success, not only should the final assault have been prepared by artillery fire, but by that of infantry also, and that the advance of the bodies of troops should have been supported in like manner, not only by the guns, but by a heavy musketry fire too.

While the tactics adopted by the infantry were thus faulty, the manner in which the great preponderance of guns was wasted was no less unfortunate.

In order to clearly define what the *rôle* of the artillery was to be in the coming battle, General Zotoff had assembled a meeting of the principal artillery officers with the army at Poradim on the 2nd of September. At the council so formed he expressed his decided opinion that a continuous bombardment of the works, which should be persisted in until they and their garrisons showed evident signs of loss and destruction, ought to be carried out previous to any infantry attack.

To this it was objected that field guns could do but little injury to earthworks, and that neither the supply of ammunition nor the pieces themselves were equal to so heavy a call upon them. A counter proposition was then made that the redoubts should be swept by so heavy a fire as would destroy their armament, render them no longer a secure retreat for the reserves, and that by pouring a heavy fire on the approaches to them the advance of reinforcements should be rendered difficult. It was held by other members of this council that the destruction of the works should not be attempted, nor their continuous bombardment persevered in, but that the approaches alone should be cannonaded. The diversities of opinion thus exhibited were never really harmonised, and in the end no very definite plan at all was agreed upon, while the event proved that none of the anticipations put forward had any solid foundation.

As regards the ranges at which the guns were fought, the discussion thus set on foot proved for all practical purposes equally futile. It was admitted that one cause at least of previous failures had lain in the excessive distances at which batteries were kept from their objective, and it was said that the fault would not be repeated, yet the good resolutions agreed upon were forgotten on the field of battle, both by General and artillery leaders, and the batteries were held aloof as heretofore.

For a pernicious belief in the superiority of the Turkish guns had seized possession of men's minds, and, moreover, it had become an article of faith amongst Russian gunners that their arm could not face infantry fire. For fear, therefore, that the Turkish musketry might injure them, when the infantry went forward they declined to move from their secure and remote positions, and even when on the defensive, after the loss of a few men, batteries were seen to limber up and retire, leaving their infantry in the lurch at the very moment they most needed support and assistance.

Finally, a vital defect in the Russian direction of artillery fire is to be found in the ambiguity that was allowed to exist, even up to the most decisive moments, as to the objectives which were to be selected by the different batteries. It was supposed that the large bursting charges of the shells of the siege guns would indicate sufficiently to the others the direction in which they were to fire, and that, therefore, it was necessary for the higher leaders alone to superintend the fire of these. It has, however, long ago been recognised that concentration of fire is only to be obtained through concentration of guns thus brought under the personal guidance, by word of mouth if possible, of superior commanders. In the smoke and excitement of action it was utterly futile to hope that the bursting of shells, even of large size, could adequately replace such direction, and, moreover, a large percentage of the Russian shells never burst at all.

Since here we are rather apologising for a failure than recording a success, it is not proper to enter minutely into the manner in which the various batteries were placed, and we must, therefore, simply state the fact that unity of purpose was lacking in a marked degree in the fire direction of the Russian guns. On the 7th, 8th, and 9th of September

those who directed the Russian operations in general had themselves no clear views as to the solution of the tactical problem before them, and the blame must lie on their shoulders therefore, but on the 10th the points of attack had been decided on and announced, and therefore those in command of the artillery must from that time be held responsible for the fault. And even after the points of assault had been selected, batteries wasted their fire on works that were never attacked, and were never intended to be attacked. Others, in place of moving forward to the support of their comrades, watched them callously being mowed down from their comfortable positions in rear, and, if an individual battery leader forgot himself for a moment and moved forward, he was ordered back as soon as a man or two fell. Thus, for four long days the batteries remained in the very same places where they came into action on the first, and, finally, to make the ineptitude complete, almost all the 4-pr. guns, of which there were 180 on the field, were held in reserve, and never fired a shot at all. And these facts are stated, be it remembered, not on the authority of any detractor of Russian methods, but on that of Prince Kouropatkin, who was Skobeleff's Chief of the Staff during the war.

The examples of enterprise set in 1870 were already unheeded seven years later, and a marked superiority in guns which had been utilised so notably by the Germans was an encumbrance rather than otherwise to those who did not understand how to turn artillery to account.

What we have hitherto said has had reference rather to general tactics and the direction of the larger units of artillery than to the performances of the arm as regards shooting. At a time, however, when practice is attracting an unusual share of our attention, and the fire effect of batteries is jealously scrutinised, we may be pardoned if we pause to say a word on this part of the subject, and dwell a moment to let our readers hear the views put forward by Kouropatkin.

But first of all we will recall to our reader's recollection what we said in our first chapter as to moral effect, when we showed that, even if we gunners claim to produce more tangible results, we need feel no reproach when we are credited with such effect alone. Moral effect is indeed the chief factor in war, and is as worthy an object as a physical one. The two are inter-dependant, and projectiles are discharged, not alone to kill men or destroy material objects, but to make the idea gain possession of your enemy's mind that it is impossible for him to stay any longer where he is when you lay upon him. How a given number of guns can best be utilised depends largely upon the end in view, and circumstances in war vary so greatly that it is injudicious to lay down any hard and fast rules for their conduct. Great principles having a firm basis, both in theory and practice, there must and will ever be, but the circumstances of the moment must nevertheless be paramount, and the method varied according to the task in hand.

Now, on special occasions material destruction may be satisfactorily accomplished by means of a systematic, intermittent, and comparatively slow fire (and in siege warfare such a method is often the only one which can be employed). But in field warfare, speaking generally, the destruction of obstacles, the infliction of loss, or the demoralisation of

troops will most successfully be achieved by artillery fire when it is simultaneous, continuous, and rapid, rather than of long duration.

If there be lulls of quiet in the storm, opportunities for the repair of works, or reinforcements by reserves will be given. A converging will also be infinitely more effective than a frontal fire, and troops in entrenchments, secure from the foe immediately before them, may yet be made to suffer heavily if cannonaded from the flanks, or better still, from both front and flanks. The Russian gunners at Plevna, it must be noted, made no effort thus to attack the lines of Turkish entrenchments.

Further, we are in possession as yet of no statistics from which we can draw satisfactory conclusions as to the moment when the moral effect of artillery begins to assert itself. The actual number of hits, of course, is of importance, but not so much so as are the conditions under which those hits were obtained or, above all, the space of time during which they were brought about. It is perfectly conceivable that a given body of troops, after having sustained a loss of 50 per cent. of their strength, will continue to hold a certain position which, under other circumstances, they would not have defended after, but 10 per cent. of their numbers had been laid low. Troops do not retire because their ranks have grown too weak for the task in hand, nor, indeed, because of the actual losses at all; what makes them give way is the fear of the loss which they imagine they will sustain if they remain where they are, or push further forward in the attack. It is by means of a sort of instinctive calculation that is going on in the breasts of men in battle that one side or other suddenly comes to the conclusion that it can no longer hold its ground. And this unconscious calculation is apt to work out its conclusions most dangerously and most irresistibly when the losses on which it is of course mainly based occur in a short time. The shorter the period the more overpowering becomes the conviction. Thus it is that a battalion which has lost 200 men in a fight spread over ten hours may be expected to stand firm more confidently than one which has lost 50 men in five minutes. The sum of the physical strength of the latter body remains greater than that of the first, but the sum of its moral force is for a time less. If one seizes the timely moment and attacks that battalion a victory will be gained, but, if there is delay, the balance in your opponent's mind will again be restored, and the moral effect of the preparation for the assault, which was the object aimed at, will be lost.

Now, it is to be noted that these are not theories evolved by a professor at his writing-table or a lecturer at a blackboard, but conclusions based on the experiences of a soldier and verified by observation on the field of battle.

Further, it is no exaggeration to say that troops are capable of undergoing and undertaking more than the average General is inclined to give them credit for. Those with a genius for war make great demands on their men successfully, because they understand human nature, and it is in human nature to help them. Men will grow accustomed to almost any danger, provided that their nerves are given moments of rest to recover themselves, and that the strain does not

come on them, and does not increase, too suddenly.[1]

From these considerations it may be accepted that the action of artillery which strives to bring about the greatest possible demoralisation of troops must not only be overpowering as regards the number of guns, but must produce its effect rapidly.

We are told that on the 7th of September, when fire was opened by the Russian batteries with a view of destroying the Turkish works at Plevna and demoralising their defences, the whole of the "West Division," according to Kouropatkin, or "Right Wing," according to Greene, of the Russian army looked forward with absolute reliance to the effect of the artillery fire. The infantry listened with delight and confidence to the ceaseless thunder and the crash of bursting shells. The gunners, proud of the important part allotted to them, threw themselves into their work with unwonted energy. The general emulation, the vastness of the means employed, the masses of infantry standing ready to rush forward, were all circumstances which prompted the arm to efficiency, even at the cost of great self-sacrifice.

"Had we stormed on that day our batteries were ready at the first word of command to limber up and drive on nearer and nearer in to aid their infantry and support them. On that day we looked up to the gunners with the highest respect." The officers, we read, exposed themselves recklessly in their eagerness to observe their fire, the splendid detachments, kindled by the example of their officers, were ready to die round the guns of which they were so proud.

When day broke on the 8th it was clear that during the quiet of the previous night the Turks had repaired the ravages of the day before, and a leaden weight of disappointment sank on the hearts of the gunners.

But they buckled quickly to their work again.

The assault was confidently expected that day, but it passed as had done the previous one. Then the 9th went by, and then the 10th. Soon disappointment developed into disgust, and disgust led to reproaches. Every day showed more clearly that the guns were really effecting nothing, and finally the guns and ammunition began to be abused by the officers. It was no wonder that the men grew by degrees apathetic, and the belief gained ground that the assault would end in disaster.

And, indeed, the effect of the Russian artillery on the 9th and 10th was even less than on the 7th and 8th, the fire so far from increasing in violence, in the way it should have done, as the crisis approached, grew slacker[2] as the hours slipped by, until, at the end of the fourth day, many guns[3] had become disabled, the supply of ammunition began to run short, and, to crown the disaster, the weather became most unfavourable, and thick fog obstructed the view. It was then evident

[1] Sevastopol is a case in point, where the losses were so great that the detachments of some of the Russian guns had to be entirely renewed more than once in the course of the day.

[2] Prince Kouropatkin has closely examined the expenditure of ammunition, and has stated that it may be accepted as approximately true that up to the assault 30,000 projectiles were fired, and that each gun in position fired on an average 50 rounds on the 7th, 40 on the 8th, and 30 on the 9th and 10th.

[3] More than 60, according to Greene.

that the programme for the assault could never be carried out in its entirety, and it was decided to deliver it on the 11th.

It is for their conduct during the actual assault of their comrades that the Russian batteries have been most severely criticised, and Kouropatkin especially instances the case of the 4th, 5th, and 6th batteries of the 16th Brigade, which accompanied Skobeleff's attack on the green hills on the 8th, and which, when they began to feel the effect of the Turkish fire, limbered up and left their gallant brethren of the infantry in the lurch when their need was the sorest. According to the journal of the commander of the 5th Battery (which was the first to go) "the enemy's fire became so hot that the battery was compelled to limber up." After quoting the German writer, Thilo von Trotha, to the effect that "the battery which fires with devastating power from a given position for only one minute will have been of more service, even though it may then be destroyed, than ten which keep up an almost innocuous cannonade from positions far in rear, however well selected they may be." The Prince implores his gunner comrades to remember and lay to heart these words in future campaigns. In general, he says, where all arms have cordially co-operated with one another losses are comparatively evenly divided amongst them, and uniformity of loss is the best evidence of co-operation. But at Plevna they fell upon the infantry in an altogether disproportionate manner.

During the assault on the 11th the cavalry and artillery lost but 2 per cent. of their numbers; while, with the infantry, from 20 to 40 per cent. fell, and many units left as many as half their strength on the field. Under different leadership, in days to come, cavalry and artillery, it is to be hoped, may be counted upon to support their comrades in a tenfold better manner, even if in doing so they too may sometimes suffer to the extent of 50 per cent.[1]

The same 5th Battery, already referred to, seems rather plumed itself on its deeds of the 8th, and its journal records "that its losses show how well it performed its part."

Now, Prince Kouropatkin critically examines the return of losses, which were considered so heavy as to justify the retreat of the guns, and it appears that on the 8th of September the 4th, 5th, and 6th batteries of the 16th Brigade suffered as follows:—

	Men Killed.	Officers Wounded.	Men Wounded.
4th Battery	0	1	6
5th „	2	1	7
6th „	0	0	3
Total	2	2	16

That is to say, out of a total of 600 men 3 per cent. were *hors de combat*; or, of the 300 who formed gun detachments, 6 per cent. At the moment they limbered up they had not sustained their full loss either.

[1] The evidences of past campaigns and the deeds of some artillery detachments, even in 1877-78, notably at the Shipka Pass, where a loss of about 50 per cent. was met with stoical indifference, encourage him, he tells us, in his belief.

Compare this table with the returns of the regiment, Kaluga, whose advance the guns supported, and whose withdrawal they should have covered, which tell of 11 officers and 689 men, or 30 per cent. of the strength remaining after Lovtcha, and in some companies 60 per cent., killed and wounded.

Prince Kouropatkin says he knew these batteries well, and that their soldierlike behaviour on other occasions tempts him to regard their behaviour on the 8th as a momentary aberration of judgment.

A further examination of returns, somewhat imperfect however, shows that these batteries lost more than any others.

We need pursue a painful subject no further. The guns lost their opportunity and the confidence and respect of the other arms because, in the first instance, their *rôle* was not clearly defined by the General in chief command; because there was a lack of supervision and direction of fire on the part of their own senior officers; because many batteries were not eager to get to effective ranges; because they were afraid of musketry fire; because no steps were taken to protect artillery positions from that fire; because no effort was made to gradually occupy positions nearer to the Turks; because the flow of fire was not made to grow in volume as the supreme moment drew near, and, finally, because 186 pieces were never brought into action at all.

But why, it will be asked, have we devoted so much space to the discussion of episodes disgraceful rather than glorious for artillery? Why delay, "*infandum renovare dolorem*" all over again? Why not let the incidents of Plevna be forgotten in the brighter story of Aladja Dagh?

Briefly, then, because it must be admitted that, if guns are to be credited with anything like their true value, it is necessary to explain Plevna away, and because many of the critics of the campaign of 1877 have not hesitated to draw inferences most unfavourable to the future prospects of our arm from the experiences we have dealt with.

And yet nothing new of any value was demonstrated by them.

We might have prophesied before they occurred, with that confidence that springs from sure and certain knowledge, that, if tactics in general are faulty; that, if those who direct the operations do not know their business; that, if gunners are trained to be afraid of musketry, and hang back; and that if guns are weak and ammunition is defective, we need look for no triumphs for artillery. If the German batteries had feared the Chassepôt, or the Austrians the needle gun, as the Russians did the Peabody, might not Mars-la-Tour have been a French victory, and Königgratz a complete rout? And have we not all been told over and over again that the Prussian guns did nothing in 1866, and with better counsel did much in 1870?

Even in the beginning of the war of 1877, where the employment of artillery was understood, there were occasions, moreover, when its performances were by no means despicable, and towards its close, when experience had been gained, they were more than once brilliant.

Skobeleff, a leader with a genius for war, directed his batteries in a very different manner to what we have described, and his faith was so little shaken, even by what he saw at Plevna, that when he was sent

to Central Asia to take Geok Tepe, where others had failed, the one point on which he insisted was that he should have plenty of Field Artillery. His force for that campaign consisted of 7000 men and over 60 guns —about 9 per thousand—although he had a desert to march over, and the railway had not then been made.[1]

At Lovtcha (September the 3rd), when 22,000 Russians attacked 15,000 Turks in a well entrenched position, the artillery cannonade lasted from 5 a.m. to 2.30 p.m., and the assault which was then delivered by the infantry was completely successful. Skobeleff, who commanded the strong advanced guard that opened the attack, had the night before carefully prepared epaulments for his guns, and the instructions he drew up for the guidance of the troops in the impending operations display a clear conception of the duties and relative importance at various stages of the several arms.

"During the first part of the action which is imminent, the preponderating *rôle* belongs to the artillery. Battalion leaders will be instructed how it is intended to make the attack, and, at the same time, they will be enjoined to direct their advance in such a manner as not to interfere with the concentration of fire from the artillery. When the infantry move forward to the assault it will be supported to the fullest possible extent by the fire of the batteries. Great vigilance is absolutely necessary, and particular care is to be taken to accelerate fire should the enemy unmask any reserves, while, if the attacking body meet with any obstacle, it is to be poured in with the utmost possible vigour. When the range allows of it the entrenchments and troops of the enemy are to be fired on with shrapnel. The infantry must be careful to avoid confusion in the struggle, and distinguish between the forward movement and the assault. And never let it forget the sacred duty of aiding its comrades, no matter what sacrifice may be entailed in doing so. Let no cartridge be wasted. Remember how difficult the nature of the country renders the supply of ammunition. Again, let me impress on my infantry the necessity for order and silence during the fight. Do not cry "hurrah" till you are near the enemy and about to close on him with the bayonet.

I wish to remind all soldiers that while losses during a bold advance are at a minimum, a retreat, especially if it be a disorderly one, is invariably accompanied with much bloodshed."[2]

Skobeleff could not, however, be everywhere himself, and even at Lovtcha many of the errors which disfigured the Russian artillery tactics at Plevna were also to be found.

From the earlier months of the war, too, we may find here and there instances of artillery detachments doing good service, and Major-General Brackenbury, an artillery officer who had an unique experience in the observation of modern war, since he had been present at the chief events of 1866, 1870, and 1877–78, especially mentions a small affair during Gourko's passage of the Balkans, when 3000 Turks, entrenched before the village of Uflani, checked the advance of the

[1] *See* a lecture on "Field Artillery," by the late Major-General C. B. Brackenbury.

[2] Krahmer's "Russo-Turkish War." Vol. I., page 55.

Russian infantry. A rose garden put in a state of defence blocked the way, and the Russians were suffering considerable loss under the fire from it. A battery of Horse Artillery was sent round to a flank, and when it opened fire "the effect was instantaneous." I saw the Turkish defenders disappear as if by magic, and riding into the rose garden shortly afterwards found it strewn with dead bodies, bearing undeniable marks of having suffered from shell fire."[1]

Furthermore, we may note that the defences of Telisch capitulated on October the 28th after bombardment for three hours by 66 guns[2] (according to General Brackenbury, of the new pattern), without any infantry attack being delivered at all. The guns in this case were brought into action within 1500 yards of the Turkish defences and fired principally shrapnel.

Ardahan was captured chiefly through the effect of the fire of artillery, and although the bombardment did not commence till 3 p.m. on the 17th of May (1877), and although it had originally been intended to continue it during that evening and the following day, the fire of the guns was so destructive that Loris Melikoff determined to assault in spite of the lateness of the hour that very night, and by 9 o'clock accordingly the whole place was in Russian hands.

1000 prisoners, 92 guns (two of which were 8-inch, five 6-inch, and the majority of the rest 4-inch Krupp siege guns), and a vast quantity of ammunition and stores were captured. 1750 Turkish bodies were buried by the Russians, and their total loss was estimated at 3000. That is to say that about half the garrison were killed, wounded, or taken prisoners. "The losses of the Turks were occasioned almost wholly by the Russian artillery, which seems to have been admirably served."[3]

So far had the Russian artillery progressed since Plevna.

As an example, however, of artillery taking an unmistakeably prominent part on the open battle-field, we must turn to one of the latest battles of the war, that of Aladja Dagh, fought on the 15th of October, the first occasion when modern shrapnel has been employed on a large scale in field warfare proper, and one on which guns directed with skill and energy once more showed that where results are unsatisfactory the blame is less due to the inherent deficiences of the arm than to a want of knowledge and appreciation of its powers on the part of those who try to utilise it.

After several more or less successful engagements with the Russian force operating under the Grand Duke Michael against Kars during a period extending from the latter part of August to October, Moukhtar Pasha (whose successes had gained him the name of Ghazi) imagining, it is said, that the approach of winter would put a stop to further operations, abandoned the ground he held on the Great Yahni, Kizil Tepe, and Uch Tepe, and drew his army back to fortified positions at

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[1] *Vide* lecture on "Field Artillery."

[2] Greene says there were 72.

[3] *Vide* Greene's "History of the War."

Vizinkioi on Mount Avliar,[1] and the Aladja Dagh Mountain, leaving only a small advanced guard in front of his left flank at Little Yahni.

The Russians, however, had no idea of terminating the campaign on account of the cold, and were in fact maturing a scheme by which they eventually destroyed the whole of Moukhtar's army, and laid open the way for the capture of Kars. The plan of campaign they had in mind was that, while the main body of the army should demonstrate against the heights of Avliar and Aladja Dagh from the north, a detachment under General Lazareff should sweep round the Turkish right on a wide arc by the ruins of Ani until it gained the rear of the Turkish left at Orlok. The strength of the force told off to make this turning movement was 15,000 infantry, 22 squadrons, and 70 guns, while the reinforcements it picked up on its way further increased its total until it reached 20,000 infantry, 3000 cavalry, and 78 guns.

The remainder of the Russian troops were disposed in three detachments, that on the right, under Major-General Count Grabbe, consisted of 3 battalions, 15 squadrons, and 8 guns, and was close to, and a little south of Zaim.

The centre, under Lieutenant-General Heimann, numbered 24 battalions, 20,000 men, 8 squadrons, and 104 guns, and was between the Great Yahni and Hadji Veli.

The left wing, under Major-General Kouzminski, was composed of 8 battalions (6000 men), 24 squadrons, and 24 guns, and stood in front of Kizil Tepe.

Major-General Dehn led the reserve of 5000 infantry, 8 squadrons, and 40 guns, which was posted in front of Kulveran.

General Roop was placed in general command of the right, left, and reserve detachments.

The Turkish army which was opposed to these troops, including the garrison of Kars, only numbered about 36,000 infantry, a considerable force of cavalry of inferior quality, and some 150 guns.

Lazareff left the Russian head-quarter camp at Karajal on the night of the 9th of October, his march was conducted with great secrecy, almost altogether at night, and as he went along he unrolled a line of field telegraph behind, which eventually extended for 40 miles, and, wonderful to relate, being left undisturbed by the enemy, placed him in the closest communication with the Grand Duke, who was superintending the whole scheme of operations, and largely contributed to their success.

Heimann and Roop were to remain inactive till Lazareff was established at Bazardjilk, when Heimann was to assail Avliar and break the enemy's centre, while Roop attacked the Aladja Dagh and completed the circle which was to enclose the Turks.

On the 13th Moukhtar had been informed by spies as to Lazareff's movement, and had placed Reshid Pasha with 6000 men between Orlok and Bazardjilk to check his further progress.

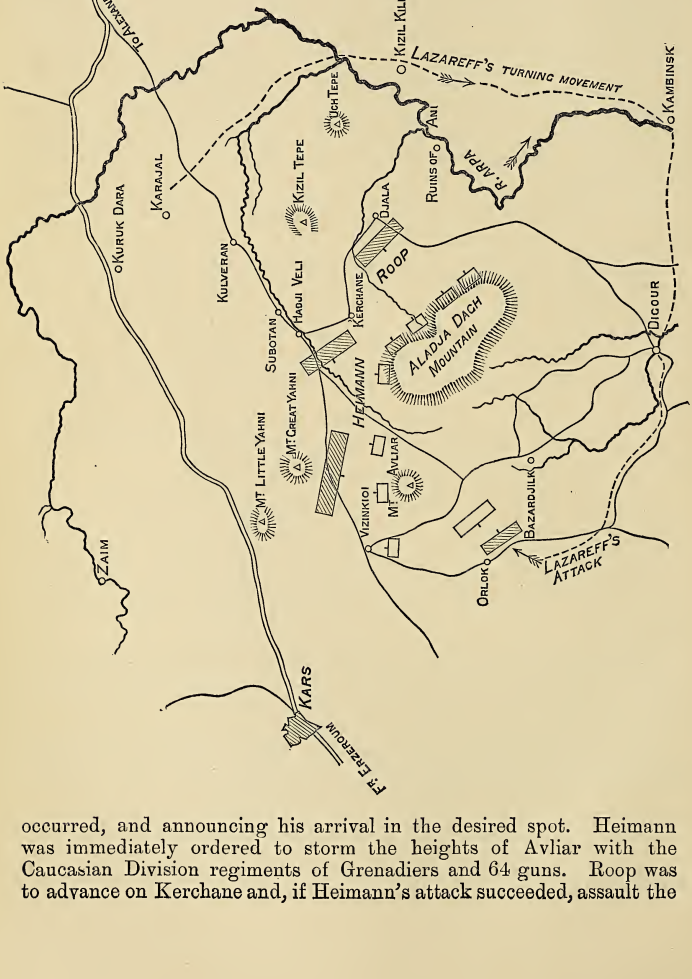
So weak a force was, however, easily brushed away by the Russians, who seized the positions it occupied with but trifling loss on the 14th,

[1] Called also the Acolias Hill (by the Russians), Evliatepisse (by the Turks), Awly-Yer, and Olya Tepe.

and were thus established completely in rear of the Turkish left, and between them and the reinforcements they were looking for from the direction of Erivan.

At 2.30 a.m. on the 15th the Grand Duke at Karajal received a telegraphic message from his Lieutenant telling him of the events that had

BATTLE OF ALADJA DAGH.—15th October, 1877.



occurred, and announcing his arrival in the desired spot. Heimann was immediately ordered to storm the heights of Avliar with the Caucasian Division regiments of Grenadiers and 64 guns. Roop was to advance on Kerchane and, if Heimann's attack succeeded, assault the

Aladja Dagh. Lazareff was to continue his advance towards Vizinkioi. One brigade of Heimann's command was moved forward from Great Yahni to cover the road from Vizinkioi to Avliar with its artillery, and frustrate any movement along it which the Turks might make.

The Grand Duke Michael and General Loris Melikoff arrived on the field near Hadji Veli between 5 and 6 a.m., and the battle opened about daylight. Heimann's 64 guns were gradually pushed forward until they were within 1500 yards of the Turkish works on the lower slopes of the Avliar Hill.

The Turks had but 6 guns to oppose them on this hill, and, therefore, too much should not be made of a feat accomplished with inordinate odds on one side; but, at the same time, it should be noted how different were the tactics adopted from those at Plevna, and credit must be given to the Russian gunners, whose fire appears from all accounts to have been extraordinarily effective. The Turks, as at Plevna, were strongly entrenched, and from the earthworks their rifle fire at a range of 1500 yards must have been biting in the extreme.

The Grenadiers lay down while the guns prepared the way for them, and so thoroughly was the work done that, when the assault was ordered about noon, the task which fell to their share was a comparatively easy one.

Lieutenant Greene says "they (the guns) did most terrible execution with shrapnel, which they planted on the lines of the Turkish trenches with great accuracy."

The Correspondent of the *Daily News* with the Russians writes thus:—

"This time the Russian gunners behaved well. They had placed their pieces at the reasonable distance of 1800 yards, and, laying aside the inefficient shells, concentrated a shrapnel shower on that part of the enemy's front which had been selected to be assailed by the storming battalions. Balls of white smoke, waving for a while in the calm air like balloons, indicated that the terrible messengers of death and destruction had burst at the proper point for sending fragments and bullets amongst the lines of the defenders.

I observed *how the musketry ceased after the bursting on a certain spot*, and only a few minutes afterwards it began again, when living men had replaced the dead and wounded."[1]

The correspondent with the Turks writes of the same incidents as seen from the other side:—

"At half-past seven o'clock the artillery opened fire on Evliatepessi" (Avliar in the other accounts) "the shells falling with an accuracy that contrasted strongly with previous artillery fire. The two heavy guns near Hadji Veli continued their terrible fire, each shell falling right in the middle of the redoubt on Evliatepessi, an isolated hill blocking the road between the two ravines, the shells rained incessantly."[2]

About noon the cannonade ceased, and the columns of attack began climbing the sides of the hill as rapidly as the rough ground permitted.

[1] "The War Correspondence of the *Daily News*, 1877," page 565.

[2] "The War Correspondence of the *Daily News*, 1877," page 579.

The Turks poured a hot musketry fire upon them but did not wait to cross bayonets with their assailants, and finally abandoned their artillery, ammunition, &c., on the crest of the hill, and fled in wild confusion to Vizinkioi. The whole position was in Russian hands by 1 o'clock, and by its occupation the entire of Moukhtar Pasha's army was cut in two. The portion of his army which retreated on Kars, whither Moukhtar himself fled after the capture of Avliar, was attacked by the troops under Lazareff, and was pursued by General Heimann.

General Roop, who had been waiting to see how Heimann's attack fared in front of the Turkish positions on the northern slopes of the Aladja Dagh, had confined himself all the morning to skirmishing and a vigorous cannonade from 24 guns. After the Avliar hill was taken, however, he perceived the Turks in front of him beginning to draw off some of their guns, and in order to prevent their escape he launched his columns to the attack, supported by 28 guns, at close ranges. As the Russians came on the right of their opponents gave way and fled towards Vizinkioi, and there was but little real resistance made to the assault at this part of the field.

But as the fugitives came down the western slopes of the mountain they were met by the troops of Lazareff, who had joined hands with Heimann round the west of the hill, and at the same moment Roop's right and Heimann's left put the remainder of the Turks to flight. The whole of Moukhtar's right was thus driven from its position and surrounded. As darkness closed in, nothing remained for the three Turkish divisions on the Aladja Dagh but to surrender, and accordingly they capitulated that night unconditionally.

The results of this victory, which is regarded as one of the most brilliant in the Russian annals, were the crushing defeat of Moukhtar Pasha's army 35,000 strong; 4000 or 5000 men belonging to it were killed and wounded in the battle, 7000 laid down their arms and were made prisoners, while from 1000 to 2000 were scattered in dispersed bands and disappeared. 35 guns, a vast quantity of small-arms, ammunition, and provisions were captured, and the fate of Kars was sealed.

The Russians lost some 56 officers and 1400 men killed and wounded.

There is a concensus of opinion as to the effect of the effect produced by Russian artillery.

"The greater part of the Turkish losses were caused by the admirable employment of the Russian artillery with shrapnel."[1]

General Brackenbury has put the proportion of Turkish losses at this battle due to artillery fire at 50 per cent. of their strength.

The Correspondent of the *Daily News* with the Turkish army describes a meeting he had with their commander the night of the battle, in these words :—

"Moukhtar Pasha turned to me abruptly and said—"What do you think of the enemy's artillery fire during the battle?" "Excellency," I said, I felt a little shy at giving my true opinion, "I think the Russian artillery fire was very good indeed." "Yes," said the Marshal, "that was the grand point where they beat us. It was the old story of France and Prussia."

[1] Lieutenant Greene's account.

Another correspondent, who rode over the Turkish position the night it was taken, thus describes what he saw :—

"The parapets and ditches of the Awly-Yer redoubt looked indeed very much like those of the Great Yagni twelve days before, after it had just been stormed. Rows of dead Turks, some horribly disfigured by shell fragments, were to be seen upon the earthworks and at the bottom of the ditches. Some were literally torn to pieces by the shrapnels. I think *most of them* were killed by the artillery, which indeed had done its duty this time." And in another passage he adds—

"I don't think that the Russians have sustained great losses by the assault, because in the first place the shrapnels had told terribly on the Turks, and had greatly diminished their number and demoralised them before the storming began. . . . . The inside of the redoubt, comprising the whole natural platform of the hill, was ploughed with shells and strewn with their fragments, and bullets flattened on the stones."

Finally, the Correspondent of *The Times* corroborates the other witnesses as follows :—

"The fight on the Olya Tepe for a time was conducted with equal gallantry; four battalions holding it behaved in a marked manner. Their losses, however, were most severe, for the Russian artillery, which now fired mostly timed fuzes, burst their shells on the summit of the conical hill with deadly accuracy."[1]

That the Russians had a great preponderance of artillery, both as regards numbers and weight of metal, at Aladja Dagh is true, but so had they at Plevna and yet accomplished but little, and to have done as much as they did in the battle we have just dealt with remains a great performance, considering that the guns were brought into action within from 1500 to 1800 yards of troops behind strong earthworks armed chiefly with a rifle but little, if at all, less effective as a military weapon than the most improved weapon of to-day.[2] Had the Russian gunners hung back out of reach of the bullets of their opponents their performances[3] would in all probability have been as small as they had been in the summer; as it was, they lost comparatively little, and did a great deal. Practice once more belied theory.

But ere the final issue of the campaign was declared, the Russian guns were to give one more example of what they could accomplish, by

[1] "Armenia and the Campaign of 1877," by C. B. Norman.

[2] The following account of what the bullet of the Peabody-Martini was capable of is interesting—one of the Correspondents of the *Daily News* writes from before Plevna :—"The penetration of the Peabody-Martini bullet is simply remarkable. At the distance of *2000 yards* from the Turkish lines I have dug them out of a foot of solid earth of a threshing floor. At the distance we now are from those who hold the rifles nothing short of a thick earthwork will stop them, for they skip merrily through the roofs of the houses, and through the mud fences and bury themselves deep in the earth." "*Daily News* War Correspondence," page 603.

[3] Speaking of the Russian artillery at the Aladja Dagh the official account says :—"It was worked on this day with a precision and activity which had not distinguished it on former occasions, and, as was remarked by an independent witness on the Russian side, instead of confining itself to a shell fire at impossible ranges—where neither accuracy nor effect could be expected, and where its fire was soon masked by the advance of its own troops moved forward this time in support of the infantry, and materially co-operated towards the general result of the day. It is also worthy of remark that, whereas the Turkish artillery fire was almost exclusively one of common shell with percussion fuzes, the Russian gunners recognised on this occasion the superiority of shrapnel fired with time fuzes, and used it in large quantities with great effect."

a performance so superior to any that the commencement of the war had displayed, that it has been hinted that officers better trained than those who held the Czar's commission were responsible for it.

After his rout at Aladja Dagh, Moukhtar Pasha effected a junction with the forces of Kurd Ismail Pasha, commanding the right wing of his army at Kuprikoi. This position was not, however, regarded as a sufficiently secure one, and the united forces retreated on Erzeroum, and finally took post on the heights of Deve Boyun, covering that city at a distance of six miles from it on the east. A strong position had there been prepared by the foresight of Moukhtar's Chief of the Staff, Faiza Pasha, and in it the army stood at bay confident in its almost impregnable strength.

General Heimann had been following fast on Moukhtar's heels ever since the momentous 15th of October, and on the 30th he arrived in front of his old antagonist and commenced reconnoitring his position. Before venturing upon an assault, however, he determined to await the arrival of the Erivan detachment of the Russian army under General Tergukassoff. This reinforcement reached him on the 2nd November, and preparations were accordingly made to attack the Turks on the 4th.

Greene places Heimann's force at 24,000 men, with 120 guns and 4 or 5 regiments of Cossacks, to oppose which, according to him, Moukhtar had 18,000 men and 60 pieces of artillery.[1]

The Turks were divided into three divisions. The right, under Faizi Pasha,[2] held the high ground above the village of Topalak. It had been strongly entrenched, and on it two or more redoubts had been placed.

The centre was also entrenched, posted on the flat-topped hill commanding the road, under the Commander-in-Chief himself, while the left, under Mehmed Pasha, was across the valley and rested on a height, also crowned by a redoubt, that commanded all the ground in the vicinity. Thus all the paths of the Russians towards Erzeroum were completely blocked.

The Turks never anticipated that a vantage ground naturally so strong and carefully fortified would be assailed in front, and regarded the valleys by which their flanks might be turned with special anxiety, and their position was, therefore, too extended for the force available.

Their foes, however, relying on the demoralised state of their enemies, and their weakness in artillery, which seemed inevitable after the losses at the Aladja Dagh, took the bold course of directly storming the position.

Early on the 4th, between 8 and 9 o'clock, the Turks saw their long dark lines slowly creeping forward, and for some time scarcely believed that the attack was really in progress. As it became apparent that they were really coming on, however, the Turkish gunners opened upon them at long range, and the Russian guns began to reply with results which brought back the remembrance of their recent achievements on the 15th.

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[1] The *Daily News* Correspondent says the Turks had only 15000 men.

[2] According to the *Daily News* Correspondent Ismail Pasha commanded the right.

"Shell after shell," says the *Daily News* Correspondent, "is planted in our midst with a precision which recalls the battle of Aladja." "I don't believe," said an old Moslem officer at my side, "that Russian officers direct those guns; they are English or they are Prussian." I

had seen the changed character of the artillery fire when the Russians drove us from before Kars backwards on the Soghanli Dagh. The Marshal himself, Moukhtar Pasha, called my attention to this extreme accuracy of fire, as he had done on a previous occasion when the Russians stormed Evliatepessi hill."[1]

But the Russians as they crept nearer opened suddenly out to either side, and endeavoured to turn both flanks of their opponent's position. All day long the musketry resounded in the glens and valleys, and, hard pressed though they were, the Turks stubbornly held their ground. In the afternoon the fire of the attack began to slacken, and at 3 o'clock, when the Russians were seen withdrawing to rally out of cannon shot, hope beat high in the bosoms of the defenders. But the Russian guns had not been idle while the flank attacks were being carried out, and by their fire 14 out of the 18 guns which were posted at the Turkish centre were dismounted or rendered useless.

The next incident in the drama forms one of the most remarkable incidents of the battle-field that have ever been chronicled, but has been passed by unmentioned in some accounts. Hozier and Norman, however, appear to regard it as the decisive event of the day, although both account for it differently. The former attributes the movement to good fortune and not to any happy inspiration, the latter seems to

[1] "*Daily News* War Correspondence," page 614.

think it was a deliberately planned ruse. Both describe it much as follows :—

While success seemed thus certain for the Turks a strong cavalry division was seen advancing up the road straight on the entrenchments. Moukhtar at once sent an infantry column, supported by two Horse batteries, down the road to drive off what he regarded as a rash reconnaissance. The eager Turks, snatching at the chance, poured out of their entrenchments, and rushed forward after the retreating horsemen till they were checked by some of the Dragoons on foot. The cavalry gave way little by little, and their pursuers, wild with success, went headlong after them. Suddenly from the hills that bordered the road heavy musketry broke out, and the Turks realised too late that they were hemmed in on either side and in rear. Cut off as they were, panic soon spread amongst them, and the contagion reached their brethren in the entrenchments behind.

The Russian batteries rallying to success spring eagerly onward and upward, a steep slope screens them as they draw near, and their artillery supports their efforts loyally with a fire which is described as "deadly."[1]

Strong reserves are steadily poured forward, and the attacking line fed from behind forces its way forward perseveringly. The spell in fact is broken; a sort of waver begins to show itself everywhere through the lines that guard the long hill, and, carried away by a gust of panic, the Turks finally give way and fly.

The rest of the story is soon told.

Although a gallant stand is made by Mehmed Pasha on the left till sunset, and the Turks hold out on the right also stubbornly, all that can be accomplished is to minimise defeat. Moukhtar is carried off in the rout of the centre, and the whole Turkish army retires in confusion to Erzeroum as night closes in.

Their entire camp, 400 prisoners, 43 guns and much ammunition are left in Russian hands, while 4000 men killed and wounded lie scattered on the mountain side.[2] The victors lost but 823 killed and wounded, amongst whom were 41 officers.[3]

Thus, in what was the final battle of the campaign in Armenia, guns once more played a leading part in the action, and nobly sustained the reputation they had made three weeks before.

While we are far from wishing to set up any fictitious claim for what the artillery on either side achieved during this, the latest, war on the continent, we yet believe that we have not been wide of the mark when we stated that the results as regards artillery were not to be taken *en bloc* as disappointing in the manner in which they have often been regarded. The engagements we have referred to show that the expectations of those who have watched artillery progress during the last ten years have every promise of being realised in the future.

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[1] *Daily News* Correspondent.

[2] This is according to Greene's and von Sarauv's account, but Norman says it may safely be assumed that the Turks lost 3000 prisoners and 42 guns, while between 2500 and 3000 men were either killed or wounded. "Armenia and the Campaign of 1877," page 400.

[3] "Der Russisch-Türkische Krieg, 1877-78," by von Sarauv.

We are quite prepared frankly to admit that the results attained from the arm were widely different from what they should have been, and that the confidence in it which prompted the Russians to bring 4 guns per battalion, or 6 to 8 per 1000 men, into the field was not justified by the results reaped. Yet after all, when we look below the surface, nothing was brought to light from the artillery experiences of 1877–78 except the fact that, with an antiquated equipment and false tactics, little need be expected from guns. It also became evident that common shell do little damage to earthworks, especially when the continuity of fire is not persevered with and intervals of silence allow the parapets to be repaired. It has been shown, however, that troops behind entrenchments are not outside the reach of shrapnel and time fuzes, and the experiences of the latter battles we have dealt with seem to encourage us in the belief that artillery, boldly and skilfully handled and equipped with those improvements which modern science has placed at its disposal, need not hesitate in the future as in the past to try conclusions with the other arms, and may even be enabled to accomplish relatively more than formerly. There appears at least no need to accept the gloomy conclusions which the early Russian failures spread about, and Aladja Dagh may fairly be quoted against Plevna.

(To be Continued).

DEFENCE OF A COAST FORTRESS.

BY

COLONEL J. B. RICHARDSON, R.A.

(Lecture delivered to Senior Officers' Class).

Coast defence generally is a very large question, very little understood, and one which would take up a great deal more time than the half hour available.

I propose, therefore, to take the matter up at a point where, in conformity with a larger scheme, it has been decided to place some particular port in a state of defence, either :—

(*a.*) To protect docks.
(*b.*) Or coaling stations.
(*c.*) Or to afford a secure base for naval operations.
(*d.*) Or shelter to merchant shipping.
(*e.*) Or all, or any of these combined.

Protection against mere raids.

Mere small attempts at military protection, against raids for the purpose of levying contributions, hardly come under the heading of Coast Fortresses, and would further demand much time.

Defence of sea front a question of £ s. d. Can be worked out beforehand.

The successful defence of a sea fortress against attack by ships is largely a question of money. It is capable of being worked out beforehand, and differs in this respect from field operations, that the locality is fixed, and consequently that the conditions of attack and defence vary little.

Depends less on fighting qualities than on preparation. Conditions of attack should be considered.

The defence of a sea fortress depends less on personal fighting qualities and more on preparation than, perhaps, any other form of warfare. Consequently the defence becomes very technical.

In fixing schemes of defence the nature and extent of probable attacks must first be taken into consideration.

To make preparations to defend a Coast Fortress against every possible form of attack by land and sea is to propose a greater expenditure than will probably ever be undertaken again.

Fortifications, expensive and generally obsolete.

There are people who pin their faith in fortifications; and no doubt fortifications give a sense of security to the uninitiated. It must always be remembered, however, that permanent fortifications are very expensive, slow in construction, nearly equally slow in removal, and that they are generally more or less obsolete before they are entirely completed.

Obsolete works a weakness.

Also that an obsolete permanent fortification is apt to prove an absolute weakness to defenders. There it is, and they do not like to abandon it; even when conscious that it is leading them into a false line of defence.

Improvised fortifications

The great success which has attended the use of improvised defences where serious land attack on a Coast Fortress has been undertaken should have prevented a free hand being given to would-be Todlebens, in the case of our existing fortresses. But it is never safe to pro-

phecy ; and possibly a repetition of defences of this class may be occasioned by panic, or by some pushing department at head-quarters, with money to spend.

Latest idea of fortress defences.

The latest (and apparently a very common sense) idea is that a Coast Fortress need only be kept prepared against what may be termed "Rush;" either by battle-ships, lighter craft, or by a naval landing force. More determined land attack being left to be met by a covering army, kept in hand in a more or less central position, and moved in sufficient force to any point when it is seen that an attack is going to be systematically pushed home.

Attack of sea fortress by fleets unlikely.

Now-a-days ships can carry but few rounds for their larger guns ; the newer ships carry from 80 to 90 rounds, and after these are expended the ship is more or less useless for fighting purposes until she has replenished, a somewhat lengthy and difficult operation at sea. Unless, then, a fleet has such command of the sea as to render it impossible that it can be navally attacked for a considerable period, it is unlikely that it will attack a sea fortress.

Bombardment likely to be of short duration.

It follows that a bombardment of a Coast Fortress, duly prepared, will probably be but of few hours duration at any one time, but that time is entirely at the discretion of the ships, and an ill-organised garrison may be worn out almost without firing a shot.

Landing parties likely to be small

Less crew than of old is accommodated on board a battle-ship ; while of that crew many are specialists who can ill be spared from the structure of the ship for landing purposes. Therefore any force landed for the purpose of rushing coast defences will be a small one. In our schemes of defence the probable extreme strength of such a landing party may be taken as not exceeding 2000 men.

What a hostile fleet would attempt, would be the damage and destruction of what the forts and mines are designed to guard, as opposed to the actual destruction of the forts. It is true that a complete destruction of the mines and forts would leave the dockyard, coaling station, &c., at its mercy ; but if only batteries and mines are intelligently placed their complete destruction is extremely improbable. The great value of ships as moving engines of attack, their vast cost, and the length of time it takes to replace them, renders it unlikely that they will ever be risked in the mere attempt to *capture* forts well prepared.

Coast Artillery will have well justified its existence if it ever induces a ship to engage.

Superiority of Coast Fortresses over ships.

Of late years the insistance of artillerymen that theirs should be the chief voice in the choice of positions for their batteries (though it has met with strenuous opposition), and the moral effect of submarine mines, has led, where high land exists, to a probably great superiority of Coast Fortress defences over battle-ships ; which are specially designed for the attack of their own kind, and, therefore, not for the attack of such fortresses, while it is improbable that vessels will be constructed for the mere attack of Coast Forts, as possibly each fortress has peculiarities which would demand modification in the attacking vessels.

The defence of fortresses which have no high land in their vicinity is a far harder nut to crack. Battle-ships are at their best when

attacking opponents more or less at the level of the sea, while Coast Batteries on low sites lose many advantages which high batteries possess.

It may, however, I think, be accepted that under existing conditions Coast Fortresses which are known to be reasonably ready will not be exposed to an artillery engagement other than at quite long range, partaking of the nature of a reconnaissance to ascertain their preparedness. If found in a really bad state of preparation, such as might be expected quite at the beginning of a war, ships which have no hostile fleet behind them may attempt the bombardment of Coast Fortresses to cover an attack on the dockyard, &c., which they guard. During such a bombardment they may attempt to ascertain the position of or to destroy mines and prepare the way for passing forts, or they may rush torpedo boats through to destroy shipping in the harbour, blow in dock-gates, &c.

Or, ships may ignore the Coast Fortress altogether and attempt to run through at great speed, merely firing to cover themselves with smoke, inflicting what damage they can, but only treating this as quite a secondary consideration. It is most improbable that if the close water is known to be mined, valuable war-ships will take this course.

Quite at the outbreak of war, knowing the prejudice against laying submarine mines, and the time taken in laying them, possibly very plucky fast cruisers may attempt rushes of this nature.

Fast torpedo boats will constantly attempt to rush the outer defences at night or in foggy weather, and the experience of our naval manœuvres shows that their is nothing so difficult to guard against. In all probability any of these attempts will be supplemented by landing or feints of landing, in order to confuse the fortress people and conceal the real object. Therefore good organisation is essential.

If the forts are faultily placed, a fleet may attempt the distant bombardment of the dockyard, &c., which the forts are intended to cover. It would take an immense amount of ammunition to do much real harm where the objective is not quite visible, but still it is possible ships might attempt mischief of this nature. They would have little chance of effecting anything, beyond frightening the population, unless they anchored.

The remedy is, of course, the placing of guns in proper positions, but if this has been neglected the movable armament, and especially howitzers, must attempt to annoy and draw the fire of the ships.

Means of Coast Fortress defence

The means available to render nugatory the attacks I have named are :—

(1.) Guns.
(2.) Moving torpedoes.
(3.) Electric lights.
(4.) Submarine mines.
(5.) Q.F. and machine guns and case guns.
(6.) Rifles.
(7.) More or less permanent defences.
(8.) Movable armament.

Guard boats. Many people think that guard-boats would be very effective at night. They may possibly be, under some conditions, but under most they would seriously impede the foregoing defences. So far no means have been devised for communication, with certainty and rapidity, with either guard boats or torpedo boats, and the result of sending out guard boats would be that enormously increased difficulty and responsibility would be entailed on those responsible for each of the other means of defence. The enemy's torpedo boats would slip in, or the friendly guard boats would be fired at. Everything that cannot make itself unmistakably known at night must be ruthlessly sunk. In these days of fast torpedo boats there is no time for consideration.

For the present I do not, therefore, include guard boats in the defences of a Coast Fortress.

Taking the means of defence of a Coast Fortress in the order named, we first come to guns.

Guns. Very many mistakes are made in the placing of these engines, and a vast expense is gone to, often quite unnecessarily, in the matter of emplacements. We see here, at Shoeburyness, the very heaviest guns, quite as an ordinary thing, sent down from the Arsenal at Woolwich on a Monday, fired on the Wednesday, and returned to Woolwich within the week. And we also see less heavy guns sanctioned and issued for Coast Fortresses, taking two years and upwards to fire, costing vast sums for elaborate emplacements, and being then pronounced by those most deeply interested to be in the wrong place.

Between these two extremes there should be a mean.

Guns intended to engage battle-ships should, whenever possible, be placed on high sites, that is to say, from 100 feet upwards. When at a good height no expensive disappearing system is necessary or even advisable. All such systems tend to slowness of fire, difficulty and uncertainty of working and vast expense, which would be better saved to be applied elsewhere in the multiplication of guns.

On heights less protection is needed, the guns cannot be so easily rushed by landing parties, their practice is better, their target is always larger, while they are difficult objects for a ship to hit.

Guns should be dispersed within reasonable limits. They should never be mounted singly, that is to say, one nature of gun should never be far from another of the same kind if only for the reason that if any accident happens to a single gun its ammunition is useless, and that it is far more expensive in proportion to work. But there are other objections to the single gun.

By dispersion it is not intended that each gun should be placed far from its fellow, but the groups, and perhaps the guns, should be at least so far apart that fire directed at one could by no possibility damage or interfere with the fire of another group.

Guns should be so placed as to have a reasonably large field of fire, because, with due care in ranging, their fire becomes more and more effective after the first few shots.

They should command all water which permits of the passage of ships.

When these conditions have been fulfilled their protection from an

enemy's fire, either by concealment or earth, iron, or other protection may be considered, but it must never be forgotten that war is not intended to be a safe game, and no portion of the attacking power of guns, on high sites at any rate, should be sacrificed to the mere safety of gunners.

Cartridges.

Magazines, however, should be made reasonably safe. They must, for rapidity of fire sake, be near the guns, and their destruction might mean the destruction of the gun too. It would probably be better to divide magazines, on high sites, into many cartridge stores, and make the line of least resistance of explosion take a direction away from the gun when possible. Cartridges, however, are more easily kept in a large magazine.

Shells are exceedingly difficult to explode, and are safe from all but direct hits.

A vast deal of nonsense has been talked about position-finding; of Commanding Officers sitting comfortably in cells, far away from batteries, and merely touching knobs, which discharge the guns with deadly effect. Human nature is still human nature, and I have an idea that men will fight best when they know that the eye of their Commanding Officer, who can recommend them for reward, is witnessing their deeds and work.

Locality of position-finders.

Therefore, I think that all means for directing the fire of guns should be as close to them as circumstances permit them to be used with good effect. The instruments, whatever they are, should be protected by concealment and by being placed just where fire, however reasonably inaccurate, directed at the guns will probably miss them, while there should be a sufficient multiplication of instruments to prevent fire becoming disorganised even if some are destroyed.

Communications.

Every single department throughout the fortress should possess the means of most rapid communication with every other part with which it has the remotest connection, and probably in no part of Coast Fortress defence is this more absolutely necessary than between the guns and everything connected with their service. The full value of the gun and its expensive mounting and ammunition will never be expended on the enemy without the very best possible communication between all its ramifications.

The best means of communication is still a perfectly open question. Order and range electric dials and telephones, visual dials, word of mouth and orderlies have alone, as far as I know, been tried. Personally, I consider all of them more or less unsatisfactory, but I by no means think that ingenuity is exhausted. In my opinion telegraphy is the best existing means.

Up to now the best practice, I am aware of, from forts, has been made from heavy guns, laid for line over sights, with extemporised communications from depression range-finders, with the working units visited occasionally by the Commanding Officer. Under any circumstances I feel sure that an organisation which will permit a commander to visit at his pleasure any portion of his command in action, will tend to produce better fighting and more severe punishment on the enemy than one which locks him up personally in a distant cell, though in

peace practice it may be different. The main thing is a really good Commanding Officer possessing a staff so trained that he can feel confidence that his instructions will be intelligently carried out, and that, wherever he is, he is in communication with that staff.

Quantity of guns.

The quantity of guns and ammunition for the defence of a Coast Fortress should not be stinted. It is not necessary or probable that a Coast Fortress should have all the latest patterns of guns, but a fort can carry ammunition to any extent, which a ship cannot.

Forts will never equal their opposing ships in novelty of armament. A fortress favourably situated for defence has such enormous advantages over ships that it can afford the difference if its guns are really well placed. A ship may be destroyed without piercing her armour.

Line of fire of guns.

The greatest forethought should be exercised to avoid mounting guns in positions where there is any chance of their fire destroying towns, villages, friendly forts, and shipping, if their projectiles miss opposing ships. The fire of such guns, from motives of humanity, would be *nil*, and artillerymen should not be placed in such a situation of responsibility.

Where a fortress is unfavourably situated for defence, more expenditure is needed. Guns, &c., must be kept up to date, and at least as powerful as ordinary battle-ships' guns. With much weaker guns a ship might be tempted to attack, and might do so with advantage.

Sorting of ammunition.

One of the most important aids to the good shooting of guns is good ammunition. Each cartridge for each gun and group of guns should be the same weight and of the same brand of powder. Shot and shell should be equally carefully sorted. Guns shoot very much alike when this is seen to properly.

Every gun, and its adjuncts, to be really effective must be occasionally tested by actual practice.

I have omitted all minute details. These become very technical, and are probably interesting only to specialists; but I return now to my earlier assertion, and I say that the great safety for Garrison Artillerymen against attack by *ships* consists not so much in their guns being protected nominally from all possible harm from an enemy's projectiles, as in having them properly placed in the first instance, or if that has not obtained, in moving them to the proper place; and then in keeping them always, unceasingly, in perfect condition for action in all respects, for then I feel sure that no costly battle-ship will attack them.

(2).—Moving Torpedoes.

Moving torpedoes.

These are practically projectiles and in some cases are merely a development of guns. I believe all artillerymen think they would probably be most effective if entrusted to people with their line of training.

Eas'ly counteracted.

Moving torpedoes, which work under water, can be counteracted in a variety of ways, though their presence, if known, would act as an obstacle to the quick movement of ships.

Dirigible torpedoes are, perhaps, among the most accurate, but the slowest and most easily warded off of any projectiles. They are the most useless in a fog, or with smoke blowing over, and they are very expensive projectiles.

Aërial torpedoes, such for instance as the Zalinski or Graydon, being closely allied to guns, cannot, so far as we know, be warded off. Their guns should be placed high up when possible. They have the advantage of not obscuring their fighting lights, and it matters little whether they strike or not, within limits; their target is a large one.

All these projectiles have a very low velocity compared with guns proper. They should not be used for the defence of mine-fields.

(3).—Electric Light.

Working guns automatically.

Though guns could, quite as easily as mines, be worked semi-automatically, that is to say, be made to strike with their projectiles any point, in the dark, touched by a ship, yet such a system would have all the disadvantages of the submarine mining system, inasmuch as it would be complicated, intricate, and therefore uncertain, while it would be dangerous to friendly shipping, and ships would disarrange the gear by accident.

No faith to be reposed in complex mechanism.

Personally, I have little faith in the efficiency in war of exceedingly complex mechanism, liable to fail if any one of its numerous ramifications get injured.

Still these complicated arrangements may be kept up as a last resource.

But it may, nevertheless, be most advisable to keep up such mechanism as a last resource, for use when simpler means fail owing to unusual conditions. The worst of complicated systems is that altogether too much faith is placed in them, and the necessary training for effectively working a simple but surer method is apt to be neglected.

If night could be turned into day the gun defence remains unassailable, but guns fail in darkness and fog without elaborate and intricate arrangements.

The electric light under favourable conditions enables guns and moving torpedoes to see their prey, but the light is, unfortunately, easily blinded by fog or smoke. Fog is, therefore, favourable for attack and bad for defence. Smoke can easily be got over by multiplying the lights and placing them, like the guns in dispersed stations, with a capability of concentration of beams.

Search and fighting lights.

There should be plenty of search and fighting lights, or the great power of gun defence will never be realised. At present gun defence is more or less thrown away for a large portion of every 24 hours.

Fixed beams are more favourable to an enemy than moving beams, and, I think, they would be easy to dodge. It is difficult to prevent discovery by a moving light steadily fixed and worked.

The fighting lights by which gun defence is made effective should be as much part and parcel of the gun defence as are position and range-finders. They are not so at present.

If *fighting* lights are placed on heights there is no reason they should not act as range-finders to the guns and they would less often be obscured. Search lights should be on low sites.

The more lights there are the more complete must be the control exercised over them by a Section Commander.

(4).—Submarine Mines.

Submarine mines are obstacles merely, they do not constitute an active attacking defence, and they depend for their existence on the

foregoing; guns, torpedoes, and electric lights, and on a particular armament kept up mainly for their special defence.

Their real value is that they are effective at times when the other means of defence are at their worst, viz., in fog. They are then as likely to strike friend as foe.

A most elaborate system has been devised to meet the many objections raised to the use of submarine mines in the close waters of Coast Fortresses. So elaborate that probably every other system of defence will either be paralysed, or will break down the system. While in fogs, just at the time when submarine mining defence should be most active, friendly ships will stand a very reasonable chance of destruction, for they will not know where to bring up.

In strong tidal waters submarine mines will be liable to destruction by an enemy without his exposing himself unduly.

In waters where there is little tide and where the guns are well pushed out, submarine mining will be at its best as regards defence. Neither aëriel nor water torpedo countermining will be easy.

No part of the defence needs to be kept so secret as submarine mines. These will be destructive only where their existence is not known, and they have more moral than active effect. All defence which is not possessed of the power of counter-attack is weak.

(5).—Quick-Firing and Machine Guns and Case Guns.

No part of the attack of a sea fortress is so difficult to meet as the repeated raids of torpedo boats at night.

The object of a Coast Fortress is to protect shipping, dockyards, &c., but heavy guns, torpedoes, and mines, are all unsuitable for engaging these rapid and small craft. It is true that the submarine miners say they would meet them with boat torpedoes but, like the fire of heavy guns inland, it is not probable that they would be permitted, to slaughter their friends.

At present the proper defence is said to be quick-firing and machine guns; and rapid-firing case guns have also been recommended by myself, though I do not think they are accepted. Naval people say that case will hardly penetrate a torpedo boat; our experimental experience rather differs from this dictum.

I cannot say I think the defence against torpedo boats (a form of attack I should most dread) is in a satisfactory stage. At any rate the position in which quick-firing and case guns are to be placed should receive the greatest consideration. It will never do to fire at random, in the dark, projectiles which ricochet an incredible distance where there is much chance of their going into towns or villages inland.

Quick-firing, and case guns should be capable of movement

Light quick-firing and machine guns and case guns should be movable, though used from positions previously prepared. Railway trucks are very suitable.

They should, if possible, and without much loss of speed, be in a manner automatically laid for elevation.

Special electric lights are needed for their service, but these may be comparatively weak. Probably some modification of the old parachute fireball or of rockets will be an assistance to quick-firing and case guns.

Owing to the great speed of torpedo boats there is no time for inquiry. The artillery must ruthlessly sink everything they see of the nature of a torpedo boat, unless previously warned that it is friendly. Therefore these guns must have rapid and good communication with a Section Commander. The warning must not be delayed.

Some good shelter for men working these guns must be provided. They must always be on the alert. An active attacker will endeavour by constant night alarms to wear out the garrison. After many false attacks a real torpedo attack will be pressed home. Therefore it is of vital importance to keep the men fresh and ready.

So rapid has to be the action of these guns that I believe their Group Commanders must be given a free hand.

Booms and obstructions calculated to delay torpedo attacks are good, and these should probably be laid out nightly by somebody connected with the quick-firing and case gun defence, or misunderstandings will ensue.

All quick-firing guns for fortress defence should use cordite.

(6).—Rifles.

Defence against raids by land.

The defence against landing raids, whether intended to be pushed home to the guns or merely as a diversion, is by far the best when entrusted to infantry. But in most of our sea fortresses regular infantry will be conspicuous by their absence, and the gunners will have to depend for their existence largely on irregular levies. I hold personally that garrison gunners should be taught to shoot accurately with small-arms up to, say, 200 yards. They could then stand a chance of repelling a close assault on their batteries, but much more than this is wanted.

Infantry outposts should observe all the immediate coast line of a fortress, and each outpost should be in telegraphic communication with the Section Commander, who must have a sufficient reserve to repel attack and the means, such as a tramway, of despatching it rapidly to any outpost threatened. Nevertheless, in fogs landing parties may slip through and up to the batteries, though probably not in great numbers.

By keeping a reserve well in hand a Section Commander will prevent his infantry becoming wearied and careless from repeated alarms. Good and intelligent as volunteer troops may be and are, they are never as amenable to discipline as regular troops, and would break down sooner under the stress of false attack. Panics are the bane of irregular troops.

It is most essential that when landing attack is in progress gunners should not be diverted from their guns. This is just the time when they may be called on to use them, and they must have confidence in their covering force.

(7).—More or Less Permanent Defences.

As protection against landing attack these would be erected from time to time, as occasion required, as an assistance to the infantry of the fortress, but I think it a mistake to put up expensive fortifications

in advance. They are sure to be either obsolete or well known to an enemy.

Batteries, however, should, where possible, be surrounded with a well-covered unclimbable fence, which would delay any attacking party which has slipped through infantry outposts, and would give gunners confidence. In peace time these fences would be useful to preserve guns and stores from intrusion.

On the land side there should be just sufficient fortification to delay an enemy landed in force until either help comes from a field army or until previously planned or improvised works can be got under construction.

(8).—Movable Armament.

The movable armament consists of all guns which have no permanent emplacement.

The lighter guns can be moved anywhere to assist infantry in repelling land attack, or to aid quick-firing and case guns in the prevention of torpedo or boat attack, but they are not very suitable for this, except when placed so that their fire covers an obstacle.

The movable armament would be of the greatest value in case of regular attack in force on the land side.

The howitzers might occasionally prove useful to prevent a ship anchoring in a comparatively undefended spot.

Conclusion.

I have run rapidly through the means afforded us for the defence of a Coast Fortress. It is a large subject, really needing more time. In that available I have not attempted to prove any of my statements or even to show how I have arrived at conclusions, but I have put nothing before you which I believe is not capable of demonstration from experience gained in our larger Coast Fortresses.

INSTRUCTIONS FOR THE CONVEYANCE OF TROOPS BY RAIL ON THE FIELD SERVICE SCALE.

FRAMED BY

THE QUARTER-MASTER-GENERAL IN INDIA.

COMMUNICATED BY

THE DEPUTY-ADJUTANT-GENERAL, R.A.

Extract of a Letter No. 120, dated 6th October, 1892, from the Deputy-Assistant-Quartermaster-General for Mobilisation to the Inspector-General of Artillery in India.

* * * * * *

(*a.*) A very large proportion of the covered goods wagons on Indian railways are now fitted for the conveyance of horses.

These wagons will each contain eight horses (not necessarily small ones), two native soldiers or followers, and the current day's forage.

It is consequently unlikely that high-sided trucks would be used for the conveyance of horses or that horses would ever be carried transversely.

(*b.*) Harness and saddlery is not carried in the same wagons as the horses, but is packed separately in goods wagons. It does not seem desirable to let the bridle remain on the horses.

(*c.*) The composition of trains for Artillery Batteries and Ammunition Columns, as well as the estimated capacity of railway stock of five feet six inches gauge, and instructions for loading artillery carriages are all given in the "Instructions for the Conveyance by Rail of Troops on the Field Service Scale."

* * * * * *

Composition of Trains.

The following tables show the composition of the trains required on a five feet six inch gauge line to convey corps units on the field service scale of baggage and transport (including 5 per cent. spare transport, but exclusive of camels [1] and camel drivers).

Troops railing to the base of operations on mobilisation will proceed on the field service establishment and on the scale of baggage and transport as laid down in preceding paragraph.

The marshalling of the trains as shown herein is intended only as a guide, but it should be adhered to as far as possible, as it has been found by experiment to be convenient. The composition of the trains, on the other hand, is *fixed*, and is not to be altered without absolute necessity. (*See* notes on page 34.)

[1] Does not apply to the regimental camels of Native Cavalry, which will accompany their corps.

ESTIMATED CAPACITY OF RAILWAY ROLLING STOCK 5′6″ GAUGE.

1st class carriage	8 British officers.
2nd " "	18 native officers, warrant officers, staff sergeants, clerks, or commissariat agents.
Composite carriage (1st and 2nd class) ...	4 British officers and 9 warrant officers, staff sergeants, or clerks.
3rd class " ... ... (*a*)	30 soldiers or native drivers (enlisted), or 50 followers.
" " bogie carriage ... ... (*b*)	60 soldiers or native drivers (enlisted), or 100 followers.
Horse-box (double)	6 chargers. 3 attendants.
" " (single)	3 chargers. 3 attendants.
Wagon (horse or cattle)	8 troop horses or ordnance mules and 2 followers with line gear, or 10 ponies or transport mules and 2 followers with line-gear.
Truck (cattle)	8 bullocks and 2 followers with line-gear, or 4 camels and 1 follower.
Truck (special)	1 elephant and 1 follower.
Wagon (covered goods), 10 tons	5 tons baggage or tentage, &c.
Open trucks for material not less than 18′ long.	3 pairs of wheels for artillery carriages. 3 tongas. 8 transport carts in pieces.
Powder van	5 tons.
Brakes	Saddlery and harness, or Baggage or tentage, about 2¼ tons.

NOTES.—When horse-boxes (double) are not available, 2 horse-boxes (single) must be given, provided the maximum number of 30 vehicles for a train is not exceeded.

In such a case, but not otherwise, a horse-wagon may be supplied in lieu.

(*a*) The actual accommodation is 6 soldiers or 10 followers per compartment: but as the number of compartments varies in different types of carriages, for the purposes of calculation a carriage with 5 compartments has been taken.

(*b*) The actual accommodation is painted on the end of each carriage. It has been assumed as double that of an ordinary 3rd class carriage for the purposes of calculation.

A bogie carriage may, therefore, be given in lieu of two ordinary 3rd class, unless troops and followers would be mixed thereby (*see* notes to tables of trains).

N.B.—If, owing to the actual capacity of the vehicles supplied being greater than the estimated capacity as above stated, or for any other reason, it is found that there are more vehicles on a train than are required, the extra vehicles should be cut off.

TABLE OF VEHICLES REQUIRED FOR TROOP TRAINS.

UNIT.	First class.	Composite, 1st and 2nd class.	Second class.	Third class.	Wagons, covered goods.	Wagons, open, low-sided.	Trucks (elephant).	Wagons (horse or cattle).	Horse-boxes (double).	Horse-boxes (single).	Brakes.	Total.
Horse Artillery Battery, Train No. 1...	—	1	—	3	2	4	—	12	1	—	2	25
" Trains Nos. 2 & 3	—	1	—	3	1	5	—	10	—	1	2	23
Field Battery, Train No. 1	—	1	1	3	2	6	—	11	1	—	2	27
" " No. 2	—	1	1	4	1	5	—	9	1	—	2	24
British Mountain Battery, Train No. 1	—	1	—	5	3	—	—	17	1	—	2	29
" " No. 2	—	1	—	5	2	—	—	17	—	1	2	28
Native " " No. 1	—	1	—	5	3	—	—	16	—	1	2	28
" " " No. 2	—	1	—	5	2	—	—	16	—	1	2	27
Heavy Battery, Train No. 1	—	1	—	1	4	—	18	—	—	—	2	26
" " Trains Nos. 2, 3, & 4	—	1	—	2	—	5	—	12	—	1	2	23

HORSE ARTILLERY BATTERY.

Train No. 1.		Train Nos. 2 and 3.	
1 brake.	Harness.	1 brake.	Harness.
1 wagon [1] (covered goods).	Reserve rations.	1 wagon (closed goods).	Stores, baggage, and tentage.
1 "	Stores, baggage, and tentage.	1 wagon (horse or cattle).	20 mules and 4 followers.
1 wagon (horse or cattle).	8 ponies, 2 mules, and 2 followers.	1 "	
1 "	20 mules and 4 followers.	1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	64 horses and 16 followers.
1 "		1 "	
1 "		1 "	
1 "	70 horses, 3 mules, and 18 followers.	1 "	
1 "		1 "	
1 "		1 wagon (open, low-sided).	9 mule-carts.
1 "		1 "	
1 "		1 "	Guns and carriages of a section and 4 followers.
1 wagon (open, low-sided).	9 mule-carts.	1 "	
1 "		1 "	
1 "	Guns and carriages of a section and 3 followers.	1 composite.	2 officers and 1 staff sergeant.
1 "		1 3rd class.	53 non-commissioned officers and men, 4 native drivers and 25 followers.
1 composite.	2 officers and 3 staff sergeants.	1 "	
1 3rd class.	55 non-commissioned officers and men, 4 native drivers and 27 followers.	1 "	
1 "		1 horse-box (single).	3 chargers and 3 syces.
1 "		1 brake.	Harness.
1 horse-box (double)	6 chargers and 3 syces.		
1 brake.	Harness.		
25		23	

One 3rd class bogie = two ordinary 3rd class carriages.

[1] Should be loaded beforehand.

FIELD BATTERY.

Train No. 1.[1]		Train No. 2.[1]	
1 brake.	Harness.	1 brake.	Harness.
1 wagon[2] (covered goods).	Reserve rations.	1 wagon (covered goods).	Stores, baggage, and tentage.
1 "	Stores, baggage, and tentage.	1 wagon (horse or cattle).	7 ponies and 2 followers.
1 wagon (horse or cattle).	9 mules, 1 pony, and 2 followers.	1 "	63 public horses and 16 followers (half battery).
1 "	80 public horses and 20 followers (half battery).	1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 "		1 wagon (open, low-sided).	Guns and carriages of a half battery, and 5 followers.
1 "		1 "	
1 "		1 "	
1 wagon (open, low-sided).	Guns and carriages of a half battery, and 6 followers.	1 "	
1 "		1 composite.	3 officers and 2 staff sergeants.
1 "		1 2nd class.	Hospital.
1 "		1 3rd class.	80 British non-commissioned officers and men and 5 native drivers.
1 "		1 "	
1 "		1 "	
1 composite.	3 officers and 3 staff sergeants.	1 "	
1 2nd class.	Hospital.		16 followers.
1 3rd class.	80 British non-commissioned officers and men and 6 native drivers.	1 horse-box (double).	5 chargers and 3 officers' syces.
1 "		1 brake.	Harness.
1 "			
1 horse-box (double).	6 chargers and 3 officers' syces.		
1 brake.	Harness.		
27		24	

One 3rd class bogie = two ordinary 3rd class carriages.

[1] Not more than one bogie 3rd class carriage to be attached to these trains, so as to avoid mixing troops and followers.

[2] Should be loaded beforehand.

BRITISH MOUNTAIN BATTERY.

Train No. 1.		Train No. 2.	
1 brake.	Pack saddles.	1 brake.	Pack saddles.
1 wagon[1] (covered goods).	Reserve forage and rations.	1 wagon (covered goods).	Baggage.
1 "	Baggage.	1 "	Guns and ammunition.
1 "	Guns and ammunition.	1 wagon (horse or cattle).	69 ordnance mules, 3 battery ponies, and 18 followers.
1 wagon (horse or cattle).	69 ordnance mules, 3 battery ponies, and 18 followers.	1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 "	80 baggage mules, 4 ponies, and 16 followers.	1 "	79 baggage mules, 2 ponies, and 16 followers.
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 composite.	3 officers and 3 staff sergeants.	1 composite.	3 officers and 2 staff sergeants.
1 3rd class.	135 British and native non-commissioned officers and men and 24 followers.	1 3rd class.	135 British and native non-commissioned officers and men and 26 followers.
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 horse-box (double).	5 chargers and 3 syces.	1 horse-box (single).	3 chargers and 3 followers.
1 brake.	Pack saddles.	1 brake.	Pack saddles.
29		28	

One 3rd class bogie = two ordinary 3rd class carriages.

[1] Should be loaded beforehand.

NATIVE MOUNTAIN BATTERY (2·5″ R.M.L.)

Train No. 1.		Train No. 2.	
1 brake.	Pack saddles.	1 brake.	Pack saddles.
1 wagon (covered goods).	Battery baggage.	1 wagon (covered goods).	Battery baggage.
1[1] "	Reserve forage and rations.	1 "	Guns and ammunition.
1 "	Guns and ammunition.	1 wagon (horse or cattle).	69 ordnance mules, 3 ponies and 18 followers.
1 wagon (horse or cattle).	69 ordnance mules, 3 ponies, and 18 followers.	1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	67 baggage mules, 3 ponies and 14 followers.
1 "		1 "	
1 "		1 "	
1 "	70 baggage mules and 14 followers.	1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 composite.	3 officers and 2 native officers.	1 composite.	2 officers and 2 native officers.
1 3rd class.	132 non-commissioned officers and men and 19 followers.	1 3rd class.	133 non-commissioned officers and men and 18 followers.
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 horse-box (single).	3 chargers and 3 syces.	1 horse-box (single).	3 chargers and 3 syces.
1 brake.	Pack saddles.	1 brake.	Pack saddles.
28		27	

One 3rd class bogie = two ordinary 3rd class carriages.

[1] Should be loaded beforehand.

NOTE.—For a Native Mountain Battery, armed with 7-pr. of 200 lbs., guns each train must be reduced by two wagons (horse or cattle) as it has 26 ordnance and 11 baggage mules less than a 2·5″ R.M.L. Battery. There will be no reduction in the 3rd class carriages required.

HEAVY BATTERY.

Train No. 1.		Trains Nos. 2, 3, and 4.	
1 brake.[1]	Baggage and commissariat equipment.	1 brake.	Baggage and tentage.
1 wagon[1] (covered goods).	Reserve forage and rations.	1 wagon (horse or cattle).	Bullocks, battery horses, mules, ponies, and 26 followers.
1[1] "		1 "	
1[1] "		1 "	
1 "	Elephant harness.	1 "	
1 elephant truck.	18 elephants and 18 mahouts.	1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 "		1 wagon (open, low-sided).	Carriages of a section and 5 followers.
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 "		1 "	
1 "		1 3rd class.	31 non-commissioned officers and men.
1 "		1 composite.	2 officers and hospital.
1 "		1 3rd class.	50 followers.
1 "		1 horse-box (single).	3 officers' horses and 3 syces.
1 composite.	1 officer and 3 staff sergeants.	1 brake.	Baggage and tentage.
1 3rd class.	18 assistant mahouts and 32 followers.		
1 brake.	Baggage.		
26		23	

One 3rd class bogie = two ordinary 3rd class carriages.

[1] Should be loaded beforehand.

A bogie 3rd class carriage should not be attached to trains Nos. 2, 3, and 4 in order to avoid mixing troops and followers.

Special instructions for entraining elephants will be issued separately.

AMMUNITION COLUMN.

3 UNITS.

Trains Nos. 1 and 2.

1 brake.	Harness.
1 wagon [1] (covered goods).	Reserve forage and rations, tentage, &c.
1 wagon (horse or cattle).	75 or 76 horses, 2 ponies, 2 mules, and 20 followers.
1 "	
1 "	
1 "	
1 "	
1 "	
1 "	
1 "	
1 "	
1 "	
1 wagon (open, low-sided).	Half the carriages, &c., of the column, and 7 followers.
1 "	
1 "	
1 "	
1 "	
1 "	
1 "	
1 composite.	1 or 2 officers and 2 staff sergeants.
1 3rd class.	44 and 45 British and native non-commissioned officers and men, and 14 or 15 followers.
1 "	
1 horse-box (single).	3 chargers and 3 followers.
1 brake.	Harness.
24	

One 3rd class bogie = two ordinary 3rd class carriages.

[1] Should be loaded beforehand.

Instructions for Entraining.

Time for loading troop trains.—The time that should be allowed for the loading of troop trains at original entraining stations is as follows:—

Troop train of British Infantry	1 hour.
" " " Native Infantry	
" " " " Cavalry...	
" " " All other units (not including elephant trains, for which special instructions will be issued)	1½ hours.

In the above limits has been considered the time that would be taken to bring each train ready marshalled to the platform after the departure of the preceding one. If necessary, arrangements must be made for the use of more than one platform, so as to make the above-mentioned times available for the loading of each train.

At intermediate rest-camp stations, where animals, camp equipage, and baggage will not be detrained, it is sufficient to allow 30 minutes for the entrainment of the troops and followers.

Railway arrangements required to reduce time of loading troop trains.—To enable troops to entrain within the limits of time named, the following arrangements must be made:—

(*a.*) In order to avoid delay in bringing up the trains to the troop platform, trains must be marshalled in sidings and brought up complete to the troop platform.

(*b.*) The railway must give facilities for the preliminary loading of the stores, &c., noted for such loading in the foregoing tables.

Arrangements by despatching officer for "preliminary loading."—The despatching officer at an entraining station will, therefore, arrange with the railway authorities for the reservation of a platform at which the stores in question can be loaded from 12 to 24 hours before the entrainment of the troops by fatigue parties detailed for the purpose.

The goods platform of a station will probably be the most suitable.

A siding is not suitable for the purpose unless a high platform is constructed.

It should be arranged that the vehicles of each troop train which are told off to be loaded beforehand ("preliminary loading section") are brought to the preliminary loading platform in the consecutive order of their troop trains from 12 to 24 hours before the departure of the latter.

Each of the above-mentioned "sections" will be marked by the despatching officer with the number of the troop train and the corps to which it belongs, and each vehicle will be marked with the nature of the stores for which it is intended.

The hour for loading each "section" will be arranged between the local military and railway staff, and orders will be issued by the former for the necessary fatigue parties. As soon as wagons are loaded, they will be locked.

It will be the duty of the despatching officer to see that these wagons are attached to the proper trains.

Special instructions to be drawn up by corps.

Officers commanding corps will carefully consider beforehand what arrangements are necessary for entraining in an orderly and expeditious manner both by night and day.

The regulations on the subject in the Queen's Regulations, Drill-Books, &c., require modifications and additions, as they are not in every case applicable to India, or to the entrainment of troops accompanied by followers, transport animals, and carts.

Officers commanding corps detailed for mobilisation are directed in Appendix I., Part A., of the various sections of the Field Service Equipment Tables, 1891, to draw up orders for the distribution and entrainment of their corps in the trains allotted to it.

This should at once be done on receipt of this pamphlet of instructions (the timings of the trains are not required to be known for the purpose), and the draft orders kept in the mobilisation box.

It is also laid down in the Field Service Equipment Tables quoted above that the orders for entrainment are to be practically tested as far as possible.

This is a matter for mutual arrangement between the local military and railway authorities.

Officers commanding corps can sometimes, by consulting the convenience of the railway authorities, get placed at their disposal, free of charge, for purposes of experiment, stock that is standing idle at the station.

In framing the above-mentioned orders, reference should be made to the instructions contained in Army Regulations, India, Volume X., Part II., paragraphs 273 to 325, which, however, applying as they do to ordinary relief movements only, should only be followed in so far as they do not clash with, and may be found applicable to mobilisation requirements.

As a further assistance, some of the orders issued by corps exercised in entraining and detraining on the Field Service Scale at Rawal Pindi in December, 1891, are now published (with some slight modifications) to bring to notice points that require attention. They are not, however, to be regarded as regulations, but corps should examine them and frame their own orders so as best to meet local conditions of platforms, &c.

The times taken to entrain and detrain at Rawal Pindi are also given for information.

ENTRAINING EXPERIMENTS.

Rawal Pindi, December, 1891.

One train load of	Corps.	Strength as given in the tables for	Time taken.			
			To Entrain.		To Detrain.	
	Day.		H.	M.	H.	M.
Field Battery, 12-pr. B.L.	50th Field Battery...	Train No. 1	0	49	0	47
British Mountain Battery, 2·5″ R.M.L. guns. ...	No. 9 Mountain Battery	Train No. 1	0	25	0	35
Heavy Battery	No. 22 Company, Eastern Division, Royal Artillery	1 Section complete with 6 elephants, 2 per truck, carriages were loaded by side loading	2	3	0	41
	Night.					
British Mountain Battery	No. 9 Mountain Battery	Train No. 1	0	46	0	43

Notes.—The units that entrained by night had previously been exercised by day.

The elephant trucks were not satisfactory, and different arrangements for entraining will be made after further experiment.

The platform was 3′ 9″ high 40 broad at top, and ramped in rear. 700 feet is about the length of a 30-vehicle train.

FIELD BATTERY.

Orders for Entraining.

(1.) The battery will be formed up on the platform in column of sub-divisions, guns next trucks. On the order to dismount, non-commissioned officers and gunners will place accoutrements and arms on platform on the outer flank of their sub-divisions. A sentry will be posted there over the arms and accoutrements.

Blankets will then be removed and placed by the accoutrements.

The horses will be unhooked, and will file away and halt opposite

horse-boxes. The drivers will then take off harness, pack it in harness wrappers, and label. They will be assisted by spare gunners, syces, and jemadars. Horses will be blanketted up with the saddle blankets and entrained under the Nos. 1 of sub-divisions. The former will superintend the entraining of the officers' horses.

During this time gun detachments under the covers of sub-divisions will entrain carriages on the trucks told off for them.

Magazines and buckets (which should be filled) will be placed in the trucks with the carriages. When the above duties are completed, sub-divisions will be marched off to put the harness in the brake-vans, and the tentage, baggage, and stores in the covered goods wagons. Cooking pots will be placed in the guard's-van or a vacant 3rd class compartment, if any.

Men will then put on accoutrements, take up personal kit, and fall in opposite their carriages.

All natives, except syces, will be marched at once on arrival at station under the tindal to the carriages told off for them, taking their kits with them.

Syces and jemadars will be put in horse-wagons after horses are entrained, and a lascar or other follower with a filled bucket placed in each of the open trucks.

BRITISH MOUNTAIN BATTERY.

Instructions for Entraining.

1. Distribution.—*The guns, ammunition boxes, pioneer pads, spare gun wheels,* and *axle boxes* will travel in the powder van (or closed goods wagons, if no powder van). The whole of the *ordnance saddles and harness* in the goods wagon next to the powder van.

The *baggage saddles* and *harness* in the front brake. *All riding saddles* (officers' and mounted mens') in the rear brake with *officers' baggage* and *office boxes.*

Kits and *tents* in the front goods wagon.

Line gear with the mules.

2. Preliminary.—The men will parade with great-coats rolled; towel and soap in haversacks.

Each transport driver will be provided with a ticket with strings attached, with his name on it—to attach to his paulin strap after he has packed his saddles—to assist the non-commissioned officer in giving out the saddles in detraining.

The quartermaster-sergeant, and one man per sub-division, will proceed to the station about an hour in advance of the battery, to inspect the trains, open the carriages and wagons, and mark each with chalk with the loads they are to contain.

The same men will be responsible that all carriages, &c., are closed after detraining.

The men will be told off in parties to perform certain duties before arrival at the station, as follows :—

3. Detail of Duties.—One officer to the guns and ammunition.

One officer to the ordnance mules.

The battery-sergeant-major to the baggage mules.
The quartermaster-sergeant to the baggage.
The sergeant farrier to the chargers and ponies.
One sergeant, and three men per sub-division to the guns and ammunition.
One sergeant, and four men per sub-division to the baggage.
One sergeant, and four men per sub-division to the ordnance mules.
Two men per sub-division to the baggage mules.
One non-commissioned officer to superintend the packing of the ordnance saddles.
One non-commissioned officer for the baggage saddles.
The European guard will put three sentries at intervals along the platform, and will travel in the carriage attached to the rear brake.

4. On Arrival.—On arrival at the station the battery will form up by half batteries according to the detailed strength for the two trains.
The half battery will form up on the platform as follows, facing the train :—

First and third lines and reserve ammunition in rear.
Second line in centre.
Baggage in front.

The gunners will be told off to their carriages and entrained by the officer on duty.
They will leave their great-coats, belts, and jackets in the carriages under the charge of one man per carriage, and will then fall in, in squads, as already told off.
The guns will come into action, ammunition boxes and other loads will be taken off, and the mules unsaddled as nearly as possible opposite the wagons which will contain them.
The saddles and harness will be packed in the paulins and strapped up, and will be carefully loaded by sub-divisions.
The second line mules will be unsaddled as soon as they arrive at the station, and the entraining will begin as early as possible.
As each second line driver gets his mules into the truck, he will take the line gear of the corresponding first line mule and one paulin to the first line driver.
The baggage will be unloaded at once opposite the goods wagon ; the mules unsaddled and entrained : after which the drivers will return, pack up their saddles by threes in the paulins, and place them in the front brake.
Two drivers will remain in each mule wagon with the mules, who will put on the line head collars and secure the mules' heads to the bar by the fore-foot shackles.
The officers' syces will travel in the horse-box with the chargers.
As soon as all are in, the wagons will be closed and secured, and the men will be entrained.

5. Detraining.—In detraining, the gunners will leave their great-coats, belt, &c., in the carriages until all the work is done.
The mules will be first saddled up, and the loads sorted out and placed

ready. The loading up will then be done by the same parties that unloaded them, assisted by the men who were originally told off to entrain the mules.

Instructions for Loading Artillery Carriages.

The despatching officer should see that trucks with sound floors are supplied for artillery carriages, especially for those of Heavy Batteries.

If possible, arrangements should be made for end loading the carriages of a Heavy Battery. If this is impossible, they should be loaded beforehand, as the labour in side loading is very heavy, and the operation is a lengthy one.

As end loading will in most cases not be possible, trucks with let down doors at least 5 feet 6 inches wide must be supplied for all artillery carriages. The trucks supplied should, if possible, be not less than 18 feet long. Trucks with let down ends are also convenient, as they can be let down so as to give more room for loading, and closed up again afterwards.

Artillery carriages must be loaded in the centre of the truck, so as not to throw more weight on one side than the other.

In the case of a Heavy Battery, care must also be taken to so arrange the load in the truck that all the springs of the latter are evenly compressed.

As during heavy troop traffic the supply of the more capacious types of open trucks cannot be counted upon, three pairs of wheels only have been allotted per truck, though in many trucks more than this number can be loaded with ease and safety.

The carriage should be firmly secured so as not to shift. With the 12-pr. equipment, care is to be taken that projecting parts are not rendered liable to injury by too close packing. Care is to be taken that no part of a gun or carriage projects beyond the buffer-cases of the trucks.

Batteries should be practised in loading their carriages (including the spare carriages) in dummy wagons with four and more pairs of wheels to the truck as well as three, so as to be prepared for possible contingencies.

Instructions for Loading Baggage.

Much time will be saved if carts conveying baggage to the train are brought up opposite the goods vans and formed up at close interval facing away from the train, so that the baggage can be unloaded easily close to the vans.

Corps which have to receive camel transport at the base will have to indent for local carriage to take their baggage to the entraining station.

At the detraining station transport will also be supplied to remove the baggage of such corps and reserve rations from the station to the camping ground.

Instructions for Taking Over and Marking Trains.

An officer will proceed to the station half-an-hour before the troops to take over the train and mark the carriages.

He will be accompanied by a party of eight or ten men to open the carriages, let down breast bars in horse wagons, &c., as all trains will, in a large troop movement, be handed over closed.

The despatching officer will also arrange with the railway authorities for the attendance, as each train comes in, of one of the railway staff with hammer and tools to open the doors of horse-wagons, &c., that are stiff.

At the detraining station a party of men must be told off to close the train before handing it over to the railway.

N.B.—Carriages are to be marked with chalk on the foot boards or on the floor just inside the open door and *not* on the panels or shutters.

Instructions for Placing Rifles and Carbines in the Arm Racks under the Flaps of Seats in 3rd Class Carriages.

Care is to be taken that rifles are placed the proper way in the arm racks. If they are lodged in the rack with the toe of the butt up, the trigger in the slot of the rack instead of behind it, or if the rifle is reversed in the rack, so that the muzzle is where the butt should be, the seat will not shut down properly, but will rest on the rifles and be liable to injure them.

RECENT DEVELOPMENT OF ARMOUR AND ITS ATTACK BY ORDNANCE.

BY

CAPTAIN C. ORDE BROWNE, LATE R.A.

THE object of the following papers is to continue the subject of "Armour and its Attack," which was dealt with in a series terminating in 1887, bringing it up to the present date.

The chief features of the development which has taken place in plates between the years 1887 and 1893 have been : first, the measure of success attained in giving a face so hard as to break up forged steel projectiles to the same extent as those of chilled iron broken on the earlier steel-faced plates[1] ; and secondly, increased toughness imparted to the mass of the plate chiefly by the use of nickel, though occasionally by the employment of steel of specially tough quality.

The effects of these two improvements may not always be clearly distinguished, but they are in their nature entirely different. The hard face enables the plate to defeat the shot by sudden check and rupture before the point enters sufficiently deep to obtain support from the surrounding metal. This without question occurs before a considerable part of the striking energy is delivered on the point of impact, for the fragments fly forward violently, though harmlessly, against the plate, and then, as it were, skate over its surface, still retaining enough energy to cut into any comparatively soft material[2] which they may encounter. This is clearly the most hopeful form of resistance. The really mischievous work impressed at the point of impact is limited to that delivered before fracture, so that it is conceivable that a projectile which might theoretically far outmatch the plate might be thus defeated. The improvement in toughness is more limited in its scope. These features will be dealt with in detail under the head of individual experiments. On the other hand, the manufacture of forged steel projectiles has been extended and considerable numbers have been made in this country : the chief development, however, in the way of projectiles has been in the construction of shells capable of carrying high explosives through a considerable thickness, even of steel and steel-faced armour. These are termed "armour-piercing common shell." They are made of steel and, as their name implies, they may be briefly described as a cross between armour-piercing and common steel shell. Although still in the experimental stage, at the end of 1892, they bid fair to influence the attack of armour considerably. They have about the same power of penetration as Palliser chilled iron shell.

[1] *See* Trials of Tresidder and Harvey plates, pp. 58, 60, and 64.

[2] *See* Trial of Ellis-Tresidder plate in August, 1892, given hereafter.

The guns have increased in power during the period dealt with, partly owing to the introduction of smokeless powder, which gives a higher muzzle velocity than brown or black powder fired in the same gun. Besides this, Q.F. guns are now being made of a length generally considered extravagant, amounting in some instances to 80 calibres, discharging projectiles with a muzzle velocity exceeding 3000 f.s. Such a velocity rapidly decreases, nevertheless at short ranges Q.F. guns may possess an increased energy and power of perforation that has a practical bearing on the lighter armour employed in gun shields, &c. This may become of greater importance owing to the fact that at very high velocities the perforation may probably be greater than would be calculated by any of the English formulæ. The truth is that formulæ for perforation of armour have been partly based on theory and partly empirically corrected on series of trials extending over a range of such velocities as could be attained at the time. Analysis shows that while English, French, and German formulæ give nearly the same results at about 1600 f.s., they gradually diverge as the velocity increases. No very serious discrepancy arises at such velocities as have been obtained with heavy guns, although even with these the differences at the muzzle are hardly such as ought to be; when, however, such velocities as 2500 feet are reached the formulæ give grossly divergent results, and at 3000 feet such as are a disgrace to science.[1] So that the experiments hereafter given on this question were urgently needed.

The experiments will be given with a little divergence from their historical sequence in order to group them better according to their character. Under any circumstances they are suited rather for reference than for reading in the ordinary sense of the word.

Gota steel plate.

On October 23rd, 1888,[2] a "through steel plate," made by Messrs. Schneider for the Swedish armour-clad coast service turret-ship, *Gota*, was tested. The plate was 6·5 feet × 6·86 feet × 9·56 inches. It weighed 12,676 lbs., or about 5·6 tons. It was attacked by chilled-iron 6-inch projectiles, each weighing 99·2 lbs., with a velocity of about 1835 f.s., having a calculated perforation of 11·4 inches of iron or 9·1 inches of steel. The plate was cracked through for fully half its length. The projectiles broke up with a penetration of about 3·6 inches. This trial is unimportant because chilled projectiles were employed.

M. Schneider on steel and compound plates.

In July, 1889,[3] Messrs. Schneider communicated to the "Engineer" paper accounts of trials of plates of his own, and of projectiles made by Krupp fired at Cammell's plates at Shoeburyness. In the latter trials the face of the plate had stripped off, exhibiting a total failure in the attachment, which was most damaging to the compound principle. The plate which Schneider instanced in comparison was one made by him for the *Nordenskjold*, and tested in 1880, anterior to the

[1] On September 20th, 1892, M. Canet fired a projectile from a 10^{cm} (3·9-inch) gun, with a muzzle velocity of 1026 metres (3366 feet). The perforation through wrought-iron would be, by the formulæ of De Marre, 20 inches, and by English formulæ under 14·5 inches.

[2] *See* "Engineer," February 1st, 1889, and "Brassey's Annual," 1888–89.

[3] *See* "Engineer," July 12th, 1889, and "Brassey's Annual," 1890.

Terrible plates. The plate in question was a most excellent one, measuring 4 feet × 4 feet × 9 inches, and weighing about 2·64 tons. It resisted the attack of three steel projectiles fired from a 16^{cm} (6·3-inch) gun, weighing 45 Kg. (99·2 lbs.), each with a striking velocity of 468^{m} (1535 f.s.), without allowing the points of the projectiles to come through and without cracking apparently. The theoretical perforation of the shot is 9·3 inches of iron or 7·4 inches of steel. It ought not, therefore, to perforate. Its energy is 1622 foot-tons or 614 foot-tons per ton of plate. The resistance to cracking was then very remarkable, but it is to be observed that while the Cammell plate is a singularly unfortunate specimen, perhaps the worst known, that selected by Schneider is probably the best he had to produce, and it is remarkable that, writing in 1889, he selected a plate of the date 1880.

In a letter he wrote to the "Engineer," M. Schneider said, "We admit that the hard steel of the compound plates breaks projectiles of medium quality more easily than the less hard solid steel plates, because the fire only acts on the exterior layer. The compound plate when well backed then, as is the case in the Cammell plate instanced—which is the perfection of the type—ought to have the superiority. This would be absolutely exhibited with ordinary cast-iron projectiles. But when this hard exterior layer is powerless to break the projectile immediately; when it allows of penetration, either because of its small thickness in relation to the calibre, or because of the quality of the projectile, the compound plate is necessarily inferior to the solid steel plate, which continues through its entire thickness to oppose penetration energetically. This is proved incontestably to any impartial person by the rounds on these plates—up to 10 or 12^{cm}—with chilled cast-iron projectiles of 16 and above, which will not break on these thin plates, and the blows with chrome projectiles of all calibres of the kind. Consequently the French Navy have adopted for proof trials of these projectiles, of solid steel plates exclusively."

M. Weyl on armour.

About this date M. Weyl[1] wrote on this question in the "Genie Civil." "Soon after these Spezia trials, occurred an incident which the manufacturers of compound metal sought to make the most of. Pressed by the Navy to increase the resistance and penetration" (or rather resistance to penetration) "of their plates, the Creusôt firm, in their search for the best, had gone too far in the direction of hard steel. At the opening of the manufacture of the *Terrible* plates a very hard steel had been employed, and as there had not been yet sufficient experience with this quality of metal it happened that the factory, as well as the naval control, allowed to be sent to Brest three plates which presented small cracks—'tapures.' The flaws appeared at Brest visible in the bottom of the bolt holes, without which nothing could have revealed their existence at the factory. Creusôt made then a slight retrograde step in the hardness of its steel, and simply exchanged the cracked plates, although they had been passed. Since that time no port has had to say that they have received cracked plates In fact, it was merely a simple accident in manufacture which was easily rectified

[1] *See* "Engineer," August 9th, 1889.

when it arose. The compound plate interest, nevertheless, seized at it, as was its right, and since this remote period whenever it presented itself abroad it took care to boast, on the one hand, of its qualities, and to relate, on the other hand, the story of the *Terrible* cracks. On the part of English makers this proceeding is legitimate : they seek orders, and employ all means to get them ; but what one cannot understand is the infatuation which puts French writers on the side of the foreigner in such things." The writer afterwards refers to the adoption of steel at the Terni works in Italy, and observes that Vickers produced a steel plate in the *Nettle* trials as good as the best compound.

It may be admitted that without question the French compound plate makers, as well as those in England, are interested in making the most of any failure in steel plates, but it is, indeed, difficult to believe that small cracks perceived only in the bottoms of the bolt-holes of three plates were the only foundation for the definite statements quoted in the earlier discussion of this question, namely, that out of about 90 plates made for the *Terrible*, 14 broke spontaneously at Creusôt, one at time of dispatch to the port of Brest, and three in the port. It may probably be that M. Weyl considers that the first 15 were a private affair concerning the makers only. It, however, can hardly be doubted that the retrograde action as to hardness spoken of had a cause beyond the discovery alluded to of slight cracks at the bottom of bolt-holes. The fact is that the results of the firing trials of the *Terrible* plates were such that the plates might well have been rejected.

M. Weyl[1] at the same time gave some valuable information on the action of high explosives against armoured ships. Speaking of the return to a greatly increased quantity of side armour for the new armoured cruiser, *Dupuy de Lôme*, of 6300 tons—French—which the Navy were driven to by the experiments against the *Belliqueuse*, he gives a valuable extract from a paper obviously written, he says, by an officer who had access to the official reports. This is too important to miss ; it is as follows :—"The rounds at the *Belliqueuse* were fired with guns of 14^{cm} and 16^{cm} (5·5 inches and 6·3 inches) model 1881, throwing shells of cast-iron of 30 kilos. and 45 kilos. (66 lbs. and 99 lbs.), containing only bursting charges of 2·8 kilos. and 4 kilos. (6·17 lbs. and 8·82 lbs.) of melinite. Here are the results obtained :—The bursting often took place after perforation, sometimes in the actual side. Fragments of from 10 grammes to 40 grammes, of which the number reached about 1500, and which are animated with enormous velocity, were projected in all directions, and even backwards, destroying all the *personnel* not under cover. The rest of the projectile was reduced to metallic powder, penetrating all surrounding objects. To these effects are to be added those of the explosion, which is local, but which has great energy. If it is produced while the projectile is passing through the side, holes of 1·3^{m} diameter (59 inches) are formed ; when occurring near the decks, they are destroyed by fracture of beams, bolts, and planks. It may also set fire to them, as was the case three times out of 12 rounds, on board the *Belliqueuse*. Lastly, the movement

French *Belliqueuse* trials.

[1] *See* "Engineer," August 9th, 1889.

effected by the mass of gas has such force that it destroys to great distances the weaker structural parts of the ship." The *Belliqueuse* thus treated is an old wooden iron-clad corvette, but offering as great a resistance as a great part of the French ships and cruisers.

Eng'ish *Resistance* trials.

The trials made at Portsmouth, against the old *Resistance* in 1889, naturally connect themselves with the above.[1] The precise results were kept in strict confidence; but enough is known to show that ships suffer terribly under the fire of shells charged with high explosives. In "Modern Naval Artillery,"[2] p. 78, it is stated that "various explosives were fired in 9·24-inch, 6-inch, and 4·7-inch shells," and that "none but those who had witnessed the trials could picture the wholesale destruction caused by these shells." Of the dummy men scarcely one in the vicinity of a bursting shell escaped; but one of the most remarkable features was the terrible "smoke and fumes after each explosion, which set fire to the ship and prevented anyone approaching the spot, in some cases for 20 minutes after the shell had burst."

Dutch Competitive trial of compound plates.

On November 7th and 9th, 1889, a competitive trial of compound plates was carried out at Helder, North Holland. Four firms competed, viz., St. Chamond, Marrel, Cammell, and Brown. The plates were 9 feet × 6 feet 11$\frac{1}{16}$ inches × 11$\frac{1}{2}$ inches (28^{cm}), and weighed about 12·4 tons each. They were attacked by a Krupp 28-ton gun of 28^{cm} (11·0 inches). The projectile was a Krupp forged steel shell, weighing 556 lbs. (252·2 kg.), striking velocity 1355 foot-tons (409·7^{m}), striking energy 7078·8 foot-tons, calculated perforation 14·52 inches of iron or 11·6 inches of steel, energy per ton of plate 570·8 foot-tons. Three rounds were to be fired at each plate. These plates were obviously overmatched. The St. Chamond and Marrel plates were perforated by each round, and broken up in two rounds. Cammell's plate bore three rounds. It was perforated in each case, but held together, though considerably cracked and parts of the face detached. Against Brown's plate the two first projectiles broke up, without perforating, leaving their points lodged and some cracks. The third round got through. It may be fairly argued that since the first two steel projectiles fired broke up against the Brown plate, while none did so in any other round, considerable success in hardening the face had already been achieved by Messrs. Brown.

Portsmouth *Nettle* plate trials.

In 1887 were instituted trials of plates on board the *Nettle* at Portsmouth. These were in a sense competitive, the principal firms competing being Cammell, Brown, and Vickers. The two first submitted chiefly compound or steel-faced armour, but also all steel. Messrs. Vickers' plates were all steel. Some effort was made to induce Messrs. Schneider to compete, but in vain. In ignorance of the correspondence which took place, it is impossible to say where the difficulty occurred, but the absence of Schneider, who at this time was the only experienced maker of all steel plates, was much to be regretted, although in the course of time opportunities arose of comparing his plates with those of English make.

The *Nettle* trials were confidential, but makers were eventually

[1] *See* "Brassey's Annual" for 1892, p. 309.

[2] This work was brought out to describe Elswick *matériel* in 1891.

allowed to exhibit their own plates, and photographs of them were shown in the Institution of Civil Engineers in the autumn of 1889, when Messrs. Cammell exhibited a compound and an "all steel" plate and Messrs. Vickers one of "all steel," which had been specially successful. The elements of this series of trials remained unaltered for years, being continued as reception tests. These were the following. The plates' dimensions are 8 feet × 6 feet × 10·5 inches; weight from 9 tons 7 cwt. to 9 tons 9 cwt. The attack was made by a 6-inch gun, firing three forged steel projectiles, supplied by Holtzer, and two chilled iron shot, the weight of each being 100 lbs. The striking velocity was 1976 feet, the energy 2708 foot-tons, and the calculated perforation 12·6 inches of wrought-iron, or 10 inches of steel or steel-faced armour. The shock per ton of plate was about 288 foot-tons. At this time, 1889, the points of the steel projectiles got far enough to tear open the backs of the best plates in small star cracks, but not to be themselves visible.[1] The chilled shot broke up with much less effect. On May 1st, 1890, Cammell submitted a plate against which the Holtzer projectiles began to break up.

Annapolis Competition 1890.

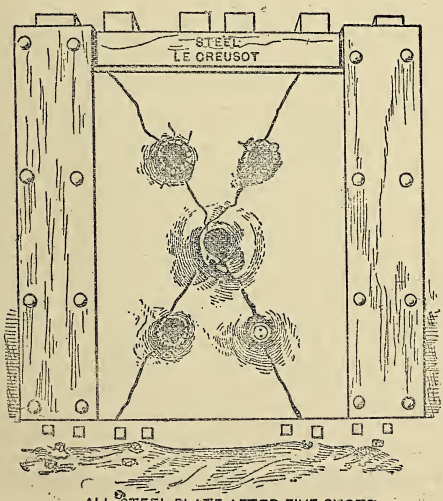
In the autumn of 1890, a competitive trial of plates took place at Annapolis, U.S., on September 18th and September 23rd. The plates were 8 feet × 6 feet × 10·5 inches, and weighed about 9·4 tons. Two were supplied by Schneider—one of steel, hammered and made on his usual system, and one differing in the fact that it contained 5 per cent. of nickel. One plate was submitted by Cammell, of the usual Wilson steel-faced make. On September 18th four Holtzer forged steel projectiles were fired at each plate from a 6-inch gun. Each shot weighed about 100 lbs. The striking velocity was 2075 f.s., giving a calculated perforation of 13·2 inches of iron or 10·6 inches of steel, and a total energy of 2986 foot-tons, and an energy per ton of plate of 318 foot-tons. These four rounds were fired towards the corners of the plates, as shown in the Figs. 1, 2, and 3, pp. 53, 54. On September 23rd, one round was fired from an 8-inch gun at the centre of each plate, with a forged steel projectile, which, being more than a match for the plates, perforated in each instance. The hardest plate would suffer the most from this round, as it would transmit more of the shock into the surrounding mass of plate before it let the shot through. Unless the velocity of the shot were taken after its passage, it would not be possible to tell how far the plate had resisted the shot. It may be seen in Fig. 5 that Schneider's nickel plate exhibits no fracture. The 8-inch projectile penetrated 10½ inches into the backing of this plate, but the 6-inch projectiles were all stopped with the points just seen at the back of the plate. The Schneider ordinary steel plate (Fig. 4) is broken across through the five shot holes in an X shaped crack. On the other hand, it stopped the projectiles with less penetration than either of the other plates. The Cammell-Wilson compound plate allowed of most easy penetration, the 8-inch shot passing entirely through three feet of backing into the mound behind. It had no

[1] Figures of these plates were given in "Brassey's Annual" of 1889. They possessed an interest then that was lost when they were surpassed by other plates in the results obtained under the same trial.

Fig. 1.

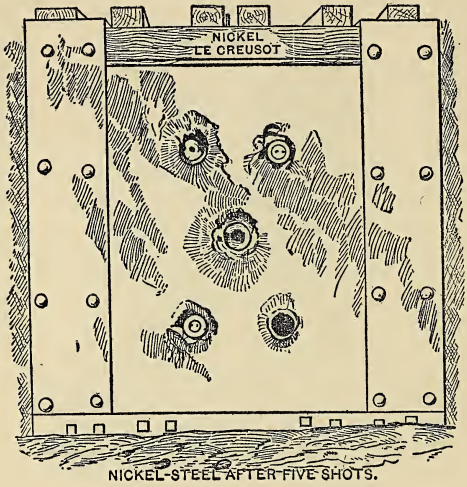
COMPOUND PLATE AFTER FIVE SHOTS.

Fig. 2.



ALL-STEEL PLATE AFTER FIVE SHOTS.

Fig. 3.



NICKEL-STEEL AFTER FIVE SHOTS.

through cracks, but its face broke away nearly all over (*see* Fig. 3). The general impression was that the Schneider nickel plate behaved best. On this occasion it may be seen that the Schneider plates scored a complete victory over their English compound rival.

Ochta Competition 1890.

On November 11th, 1890, a competitive trial took place at Ochta, near St. Petersburg, which closely resembled the American trial in its conditions. One compound plate was submitted by Messrs. Brown, on Ellis system; one "all steel" plate was sent by Schneider, which was found by subsequent analysis to contain 3 per cent. of nickel; and one plain all "steel plate" was sent by Messrs. Vickers. Each plate was 8 feet × 8 feet × 10 inches, weighing about 11·7 tons. Five forged steel projectiles were fired at each, two near the top corners, with about 1984 feet velocity, and a calculated perforation of 11·93 inches of iron and 9·54 inches of steel, a striking energy of 2414 foot-tons, or 206 foot-tons energy per ton of plate; and three near the bottom corners and centre, as shown in Figs. 4, 5 and 6, with about 2080 feet velocity, and 12·50 inches perforation through iron, or 10·00 inches through steel, a striking energy of 2682 foot-tons, or 229 foot-tons energy per ton of plate. This test was then a little less severe than that of Annapolis, but closely resembling it. The Figs. 4, 5, and 6,[1] show the faces of

[1] The author attended this trial and made the sketches as carefully as circumstances would allow.—*See* "Engineer," November 21st, 1890.

Fig. 4.—Brown 5.

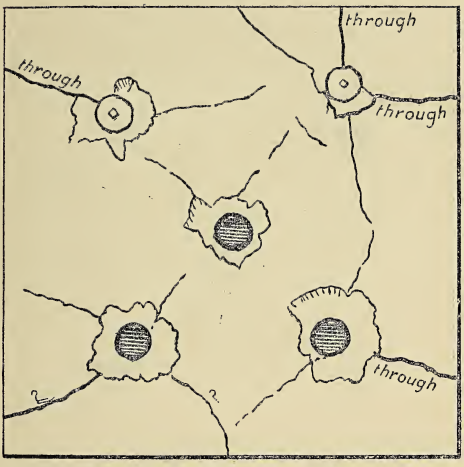
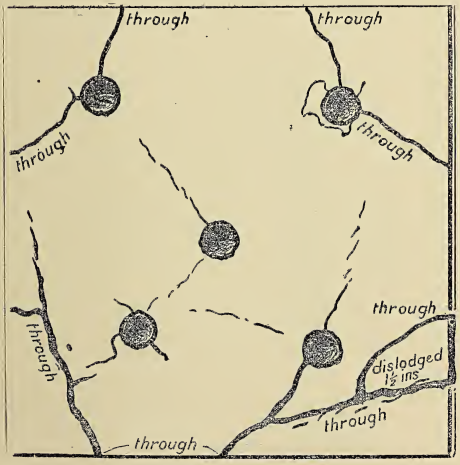


Fig. 5.—Schneider 5.



the plates at the conclusion of the trial. Fig. 7 shows the mounting

Fig. 6.—Vickers 5.

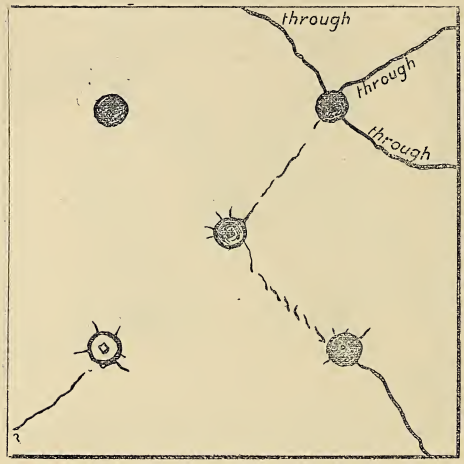
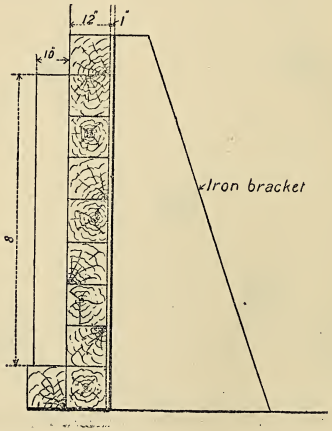


Fig. 7.



and supports. Here again the compound plate was beaten completely. The last three projectiles passed through plate and backing, and went on for a considerable distance, and this plate was badly fractured down one end. Its face, however, was not seriously broken away. The Schneider (nickel) steel plate was the hardest of the three tested and kept back the projectiles best, the points not showing through at the back, but it broke up to a considerable extent. Vickers' plate allowed the points of the projectiles just to come through, but it held together better than either of the others, and was probably judged by most to have behaved the best.[1] It may be seen that on this occasion the relative behaviour of the nickel steel and plain steel plates was reversed as compared with Annapolis; that is, in this case the nickel plate was the harder and the plain steel plate the tougher of the two. There was seen on the ground a compound plate made at Kolpino on Wilson's system, which had apparently behaved remarkably well, having resisted, by accounts given, a more severe attack than that of the competition, but it is impossible to judge of this without knowing the quality of the projectiles and other data accurately, and it would be quite unfair to mix it up with the trial, or to say more than the bare fact that a compound plate was seen which appeared to have borne a severe attack admirably.

Thin steel attacked by chilled iron shot.

On July, 1890, a trial of curved steel plates for conning towers of the Danish vessels, *Nordenskjold* and *Hekla*, took place, when plates 4·41 inches thick kept out 5·9-inch (15^{cm}) chilled-iron projectiles, 90·4 lbs. in weight. The projectiles broke up with only 3·98 inches penetration. The striking velocity was 1237 feet (377^{m}) implying a perforation of 6·4 inches of iron, or 5·2 inches of steel had they not broken up. This trial is to be noted as bearing on the attack of thin steel with comparatively large projectiles of chilled-iron, an important question for England, because we have large stores of these projectiles.

Compound plate attacked by chilled shot.

A trial of a similar kind, but much less severe, took place in February, 1891, on board the *Nettle* for the Argentine Republic[2]; when an 8-inch compound Cammell-Wilson plate was attacked by 6-inch chilled-iron shot, with a striking velocity of 1566 feet, and a calculated perforation of 9·8 inches of iron, or 7·8 inches of steel. The projectile broke up with but little effect, as might be expected.

Redemann-Tilford plate

Remarkable resistance was said to have been exhibited by a steel plate made on the Redemann-Tilford process in the Navy Yard at Washington, on December 10th, 1889. A 6-inch plate was said to have resisted a forged steel 6-inch projectile striking at 2103 feet velocity. The makers were anxious to obtain a trial by the English Government, which was accorded to them, but no plate was submitted, and on inquiry it appeared that the circumstances of the trial were misstated. The Redemann-Tilford process, however, was seriously

[1] The author prefers hardness in plates for ships, both as to immediate effect and as to probable repairs when the plates are removed.

[2] *See* "Brassey's Annual," 1891, and "Engineer," February 13th, 1891.

considered in this country by steel makers, but has produced nothing hitherto.[1]

Indian Head trials 1891.

Competitive armour-plate trials of great importance took place at Indian Head, U.S., in November, 1891.[2] The dimensions of the plates were the same as at Annapolis, namely, 8 feet × 6 feet × 10·5 inches. Six kinds were tested, which are given below in the order of merit in which the Board of Officers appointed to conduct the experiments unanimously placed them :—(1.) A high carbon nickel steel Harvey-Bethlehem plate. (2.) A high carbon nickel steel Bethlehem plate (un-Harveyed). (3.) A high carbon nickel steel plate of Carnegie, Phipps and Co. (4.) A low carbon nickel steel Harvey plate of Carnegie, Phipps and Co. (5.) A low carbon nickel steel plate of Carnegie, Phipps and Co. (6.) A low carbon steel Harvey-Bethlehem plate.

If the order of merit alone be considered, it will be seen that the only plate which contained no nickel was the worst in the trial, but curiously enough the Harvey process plates standing 1, 4 and 6 are rather below the average place. The best plate, however, which was a Harvey one, gave such good results that great expectations were entertained as to its future. This process may be said briefly to consist in the hardening of the face by carbonizing, and also by the application of jets of water. The makers resent the statement that this should be termed cementation. They claim that they impart great hardness to the surface, and that this hardness extends into the interior of the plate by graduation, which they claim is more thorough and sound treatment in theory than any attachment of a face plate of hard steel. The trial was the same as had been carried out at Annapolis in September, 1890,[3] that is to say four rounds were fired near the corners of the plate with 6-inch Holtzer forged steel projectiles, each weighing 100 lbs., with a striking velocity of 2075 feet, a perforation of 13·2 inches of iron, or 10·6 inches of steel, and a striking energy of 2086 foot-tons or 318 foot-tons per ton of plate supposing the plate to weigh 9·4 tons. Finally, an inch steel Firth Firminy[4] or Carpenter projectile, weighing 210 lbs., was fired at the centre with a striking velocity of 1850 feet, an energy of 4984 foot-tons, or 540 foot-tons per ton of plate, and a perforation of 14·7 inches of iron or 11·8 inches of steel. It may be sufficient to notice the behaviour of the best plate, that is the Harvey nickel high carbon Bethlehem one. Of this a print (Fig. 8), taken from a photograph by a process in which no hand work is performed, is given on p. 59.

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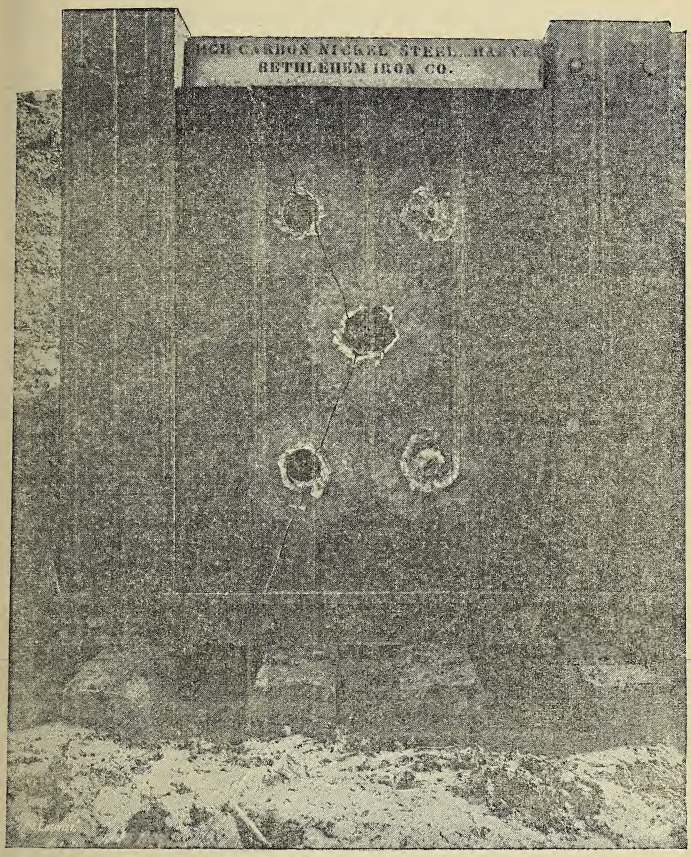
[1] The author, in discussing this question in "Brassey's Annual" for 1890, said, "The plate might thus be saved even from a blow, far outmatching it by breaking up the shot before enough energy was delivered to destroy it. In the Rodemann-Tilford process the front of the plate is said to be rendered hard in an extraordinary degree both by chemical and physical treatment. Whether by this or other means a plate face may in future be rendered so hard as to break up forged steel as at present made, further experiment must show."

[2] *See* "Engineer," November 20th and December 11th, 1891.

[3] *See* p. 52.

[4] This is the weight of the Firth Firminy projectile. The Carpenter weighed 250 lbs., and was fired with a velocity of 1700 feet.

FIG. 8.



It may be seen that the plate behaved very well indeed: on the apparent right-hand half the steel projectiles broke up, on the left they perforated, and the 8-inch projectile perforated and split the plate through the three perforated holes. Evidently one half of the plate was softer than the other. It is said that this is to be attributed to the fact that the plate was laid on its apparent left edge or side when it was hardened, and that water jets were applied at the upper part and the water ran down, acting with greatly diminished effect on the lower half. It is stated that Mr. Harvey, or his representative, objected

to this at the time. Taking it altogether, however, the result was better than any hitherto achieved, except some obtained with special plates which have now to be noticed. These so far rival them that it is difficult to judge between their respective merits.

[Ellis-Tresidder plates.

The plates in question were the result of a hardening process devised by Captain Tresidder, *late* R.E., who had joined the Atlas Works of Messrs. Brown. The process mainly consists in the application of jets of cold water distributed by means of pipes over the face of an Ellis plate. The jets being projected forcibly cause cold water to come in contact with the hot metal in a way which is impossible in plunging a hot plate into water, owing to the steam generated at the surface which prevents true contact. There are other features connected with Tresidder's process, such as a system of gauging to enable allowance to be made for contortion, which is necessary to cause the finished plate to be of the required form to fit the ship's side; the main point, however, is the application of cold water jets. During the year 1891 several trials were made of portions cut from the same rolled plate, some oil-hardened and some hardened on Tresidder's process.[1] The results yielded by the latter were excellent, forged steel projectiles of Hadfield's manufacture breaking up like chilled-iron shot, the white splashes radiating from the point of impact such as had hitherto been seen only with chilled shot.[2]

On October 3rd, took place, on board the *Nettle*, a trial very similar to the series at Shoeburyness, but which is to be preferred as an example seeing that it was made in conformity with the regular established *Nettle* conditions. The projectiles were three 6-inch shot of Holtzer's forged steel, weighing 100 lbs. each, and two of Palliser chilled-iron. The velocity was about 1976 f.s., the charge being 48 lbs. E X E powder. The energy was 2708 foot-tons, and calculated perforation 12·57 inches of iron or 10·1 inches of steel. The plate was 8 feet × 6 feet × 10·5 inches. Figs. 9, 10, and 11, pp. 61, 62, and 63, show the front and back and edge view of the plate after the trial. Rounds Nos. I. and IV., steel and chilled-iron respectively, produced less effect than II. and III., also steel and chilled-iron respectively, the lower half of the plate being apparently harder than the upper. All are completely broken up. A supporting structure would suffer very little from any yielding that has occurred in this plate.

It may be seen that the Tresidder plate was less severely tried than the Harvey plate last noticed. It also suffered less, so that no strict comparison can be made.

Cammell all steel plate, *Nettle*.

Messrs. Cammell submitted an all steel plate for trial at Portsmouth about this time, but while highly satisfied with the results they did not consider it superior to the compound plates.

Nickel steel plates, made at St. Chamond, also about this time gave good results as to toughness, but a plate 1·58 inches thick attacked by

[1] *See* "Engineer," November 6 h and November 13th, 1891.—In case of a slightly contorted plate concrete was run in between plate and backing to give support.

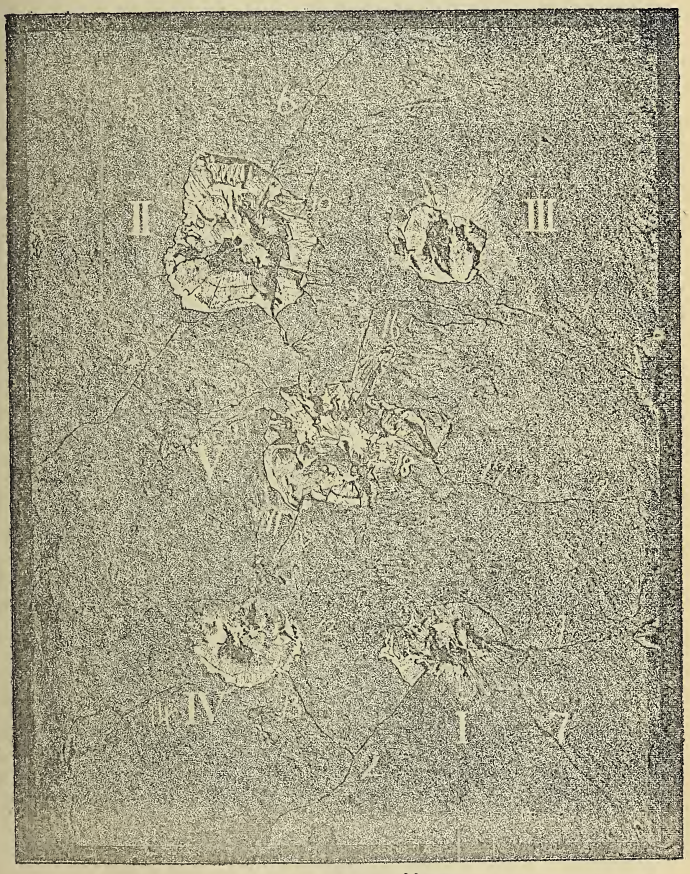
[2] An experienced naval officer actually assumed from the appearance of the plate that ch lled shot had been employed, and previous experience fully justified him in doing so. The author has acted on the same sign hitherto, which can no longer be depended on.

a 4·72 inch gun at a low velocity is under exceptional conditions, and admits of no comparison with the foregoing trials.

Schneider nickel plates at Gâvres.

Two Schneider nickel steel plates[1] had also been tested at Gâvres in July, 1891. The first was 8·26 feet × 4·99 feet × 10·43 inches (265^{mm}) thick. It was attacked by a 16^{cm} (6·3 inch) gun firing chrome steel projectiles, weighing 99·2 lbs. (45 kg.), each with a striking velo-

Fig. 9.

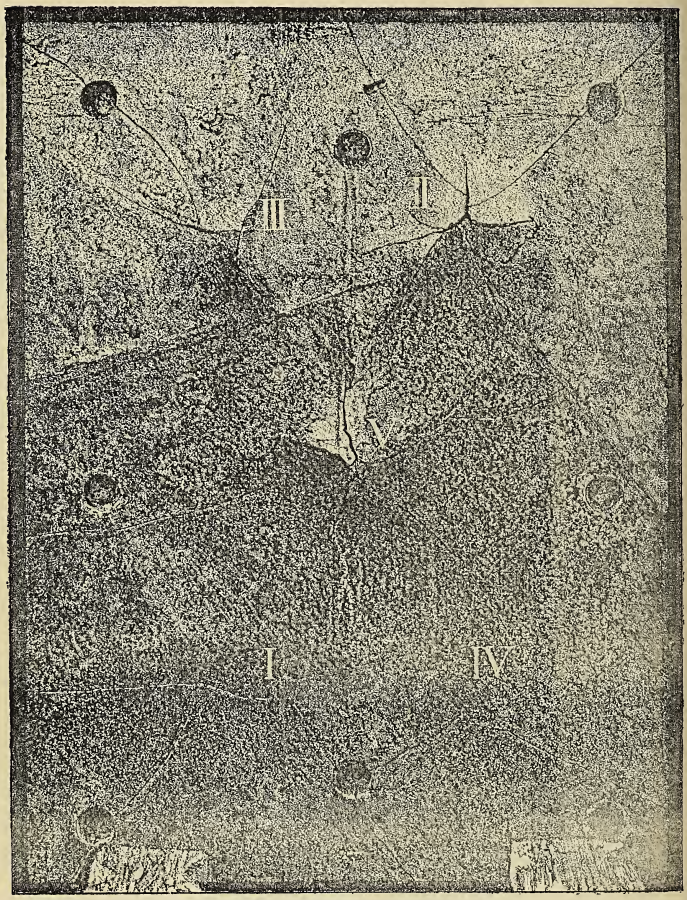


FRONT VIEW.

[1] *See* "Engineer," November 6th, 1891, taken from "Le Yacht," October 24th, 1891.

city of 2159 feet (658 metres) directed near the four corners and centre of the plate. Two projectiles perforated completely. One got its point through and rebounded. One lodged with its head through and one broke up. The calculated perforation is 13·4 inches of iron or 10·7 inches of steel. The energy of each shot was 3206 foot-tons or

Fig. 10.



Back View.

FIG. 11.

248·5 foot-tons per ton of plate, if it weighed as reported, 13,110 kg. or 12·9 tons, but this implies some mistake, as a steel plate of the dimensions given would weigh under eight tons; probably the width is wrongly stated. There was very little cracking. The plate, therefore, was very tough, but not very hard.

The second plate 8·25 feet × 8·27 feet × 9·84 inches was attacked by an old type gun of 9·4 inches (24^{cm}) calibre. Three chilled-iron projectiles were fired at it, each weighing 317·5 lbs., with a striking velocity of 1343 feet, and a calculated perforation of 11·8 inches of iron or 9·4 inches of steel. The plate was 9·84 inches thick so that complete perforation even with steel was hardly to be expected. The severity of the test was the tearing or wedging action. The striking energy was 3972 foot-tons or 330 foot-tons per ton of plate, supposing the latter to weigh, as reported, 12,395 kg. or 12·2 tons. The chilled projectiles naturally broke up, but they broke up the plate, which seems to imply that chilled projectiles which would sputter harmlessly against plates with a hard face, are formidable to comparatively soft though tough nickel steel. Against broken portions of this plate steel projectiles (two 24^{cm} and one 16^{cm} steel projectiles), afterwards rebounded.

Nickel deck plates.

As regards nickel steel, deck plates of this material have been made by Cammell and supplied to nearly all the vessels of the *Ramilles* class, and many trials have been made with nickel vertical steel plates in England. In spite of some marked success, certainty as to quality had not as yet been ensured.

Nickel steel plates in America 1892.

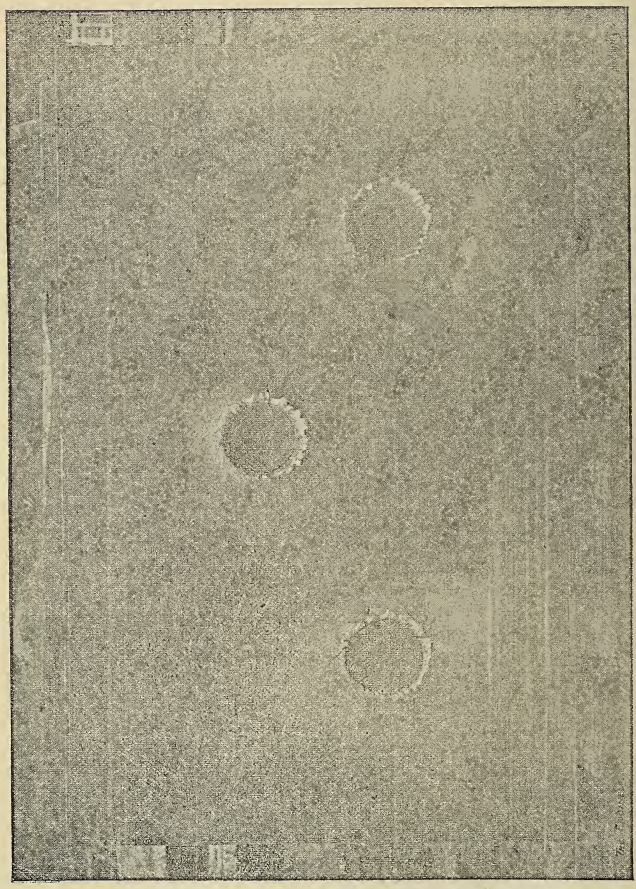
In May, 1892,[1] a nickel sample steel plate 10 feet × 6 feet × 14 inches (*see* Fig. 12), representing about 250 tons, for diagonal bulkheads of the U.S. battle-ships, *Massachusetts* and *Indiana*, was tested at Indian Head by a 10-inch gun firing three projectiles (presumably of forged steel), each weighing 500 lbs ; the striking velocity was 1400 feet, and the perforation, calculated on the English system, 15 inches of iron or 12 inches of steel; perforation, therefore, was not to be expected, and it appears that there was no appearance of the points at the back[2] and a total absence of cracking. The plate probably weighed about 15·4 tons. The striking energy of each round was 6795 foot-tons, or 441·7 foot-tons per ton of plate. The *Nettle* trials give only 300 foot-tons per ton of plate. It may be seen then that this plate bore the shock or

[1] *See* "Engineer" of July 15th, 1892.

[2] This means no doubt no appearance of star openings made by the points. The projectiles appear to have rebounded.

rending strain well, as seems to be the case with all good nickel plates. It would form a grand shield for inland fortification.

Fig. 12.



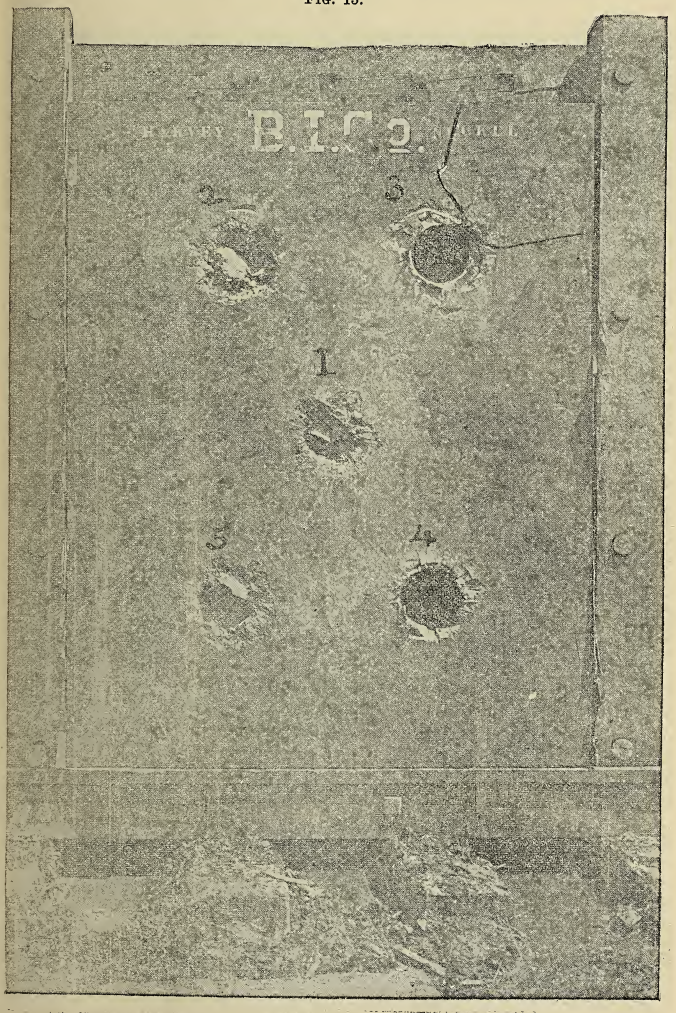
Harvey nickel plates 1892.

On July 23rd, 1892, a remarkable advance in the manufacture of armour by the Bethlehem Company was shown in the proof of two Harvey nickel steel plates. The first of these was tested at Indian Head[1] by the U.S. officers, not as in previous trials by four rounds

[1] *See* "Engineer," August 19th, 1892.

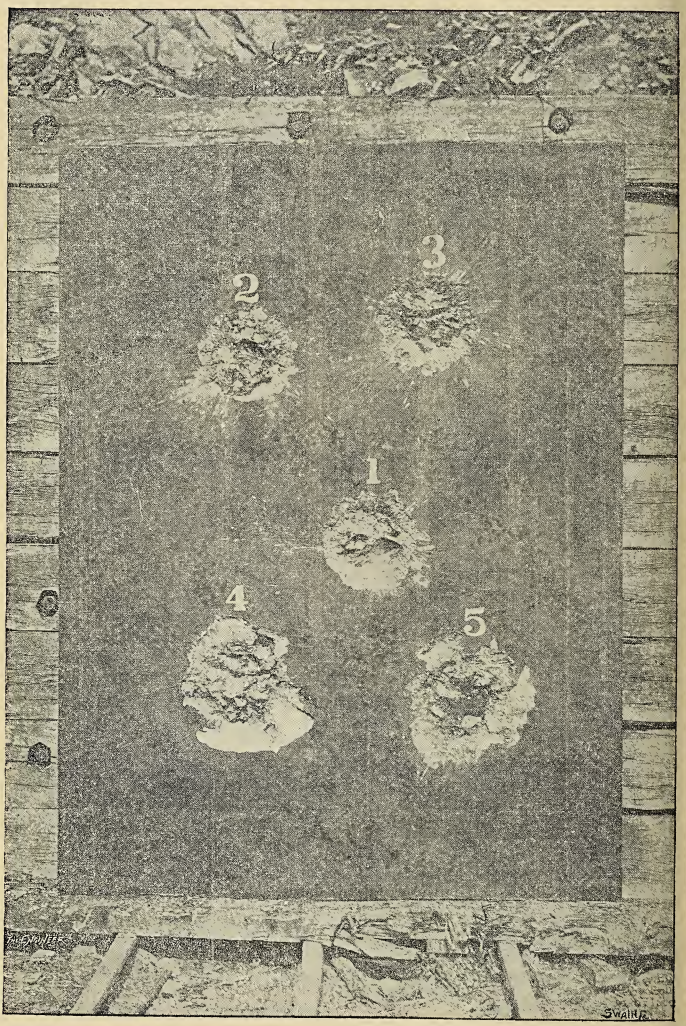
from the 6-inch gun and one from the 8-inch, but by five rounds from the 8-inch gun. The projectiles were Holtzer's forged steel, weight

FIG. 13.



250 lbs., striking velocity 1700 feet, total energy 5008 foot-tons, or 542·5 foot-tons per ton of plate, calculated perforation 14·6 inches of

Fig. 14.



iron or 11·7 inches of steel. The plate was of the usual dimensions, 8 feet × 6 feet × 10½ inches. The attack was, therefore, of such severity that nothing but greatly increased powers could enable the plate to bear it. How well it behaved may be seen in Fig. 13, p. 65. The points of the two projectiles striking on the apparent right penetrated to a distance of about 13 inches from the plate face, making star openings at the back and both rebounding entire. The other three projectiles broke up. It may be seen that a through crack connects shot hole "3" with the top and side, a corner of the plate being detached.

The second plate was tested at Bethlehem on July 30th.[1] The test appears to have been in all respects the same as that above-mentioned, except that apparently from the photograph the plate was wholly unsupported round its edge. The result is shown in Fig. 14, p. 66, which is a print of the photograph. Close observation will reveal a fine crack running from shot 3 to the top edge of the plate.[2] *The whole of the five Holtzer forged steel 8-inch projectiles* broke up, leaving their heads as shown. It is said that fine star cracks were in some cases beginning at the back, but in no case did any point come through. This result is then a magnificent success. The 8-inch projectiles were broken up by the Harvey face so completely that the white radiating splashes of metal are apparent, especially in rounds 2 and 3. That the plate held together in spite of the violent wedging strain of the five 8-inch shot heads thus driven almost through it, is to be attributed to the nickel.

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[1] *See* "Engineers" of August 19th, September 6th, and October 14th, 1892.

[2] The apparent crack across the left corner is only an imperfection in the print, being produced by the photograph card being broken in the post. The process of printing is done without hand work which renders it free fron suspicion of bias, but is liable to this class of fault.

(To be Continued).

SOLDIERING AND SPORT IN MASHONALAND.

BY

LIEUTENANT T. JONES, R.H.A.

Although the number of officers of the British Army who have served Her Majesty in different parts of South Africa, in times of both peace and war, is very large, it has fallen to the lot of but few of these to penetrate so far into the interior as the newly-occupied country of Mashonaland; for which reason it is hoped that a few notes by one who, joining the British South Africa Company's Police after some three years of service in the Cape Colony, Natal and Zululand, has found himself in a position to compare (from a military and amateur sportsman's point of view) the chief characteristics of this more northern territory with those of the better known parts of the country, may not be without interest. In order to give the reader a clear idea of the extent and situation of the territory occupied by the Chartered Company, it will be best, before proceeding to a description of the country, to say a few words as to its boundaries and the routes by which it can be reached. Mashonaland proper only forms a portion of the territory in question, which is a strip of country lying entirely inland, between Matabeleland on the west and the Portuguese sphere of influence on the east, bounded on the north by the River Zambesi, which is in Portuguese hands, and having for its southern boundaries the River Crocodile (the northern boundary of the Transvaal), and its tributary the Shashi, between which latter river and the Bechuanaland Protectorate is a narrow strip of country known as "the disputed territory," to which the two great chiefs, Khama of the Bechuanas and Tobengula of the Matabeles, both lay claim. From this it will be seen that when the Company first occupied the country they were literally surrounded by possible enemies, the Portuguese on the north and east, the powerful Matabeles on the west, and the Transvaal Boers on the south, whilst their only means of approaching the country was through "the disputed territory," which is considered by the Matabele as part of their own country. In less than six months after the expedition entered Mashonaland disputes arose on the east with the Portuguese, which ended, in May of last year, with a skirmish near Masse Kesse, in which a handful of the Chartered Company's Police with one 7-pr. put to flight the few hundred black soldiers led by Portuguese officers, who attempted to attack them in a strong position which they had taken up. This was followed by the evacuation of Masse Kesse by the Portuguese and its occupation by the Chartered Company, but after negotiations

between the English and Portuguese Governments it was restored to its former owners, and the Chartered Company's Police retired to their own fort at Umtali, some fifteen miles further to the west. Whilst this trouble with the Portuguese on their eastern boundary was going on the Chartered Company had to deal with a threatened invasion of their country by the Transvaal Boers, who collected together in large numbers on the south banks of the Crocodile with the avowed intention of entering Mashonaland, if necessary by force, and occupying it for farming purposes. To oppose this, strong posts garrisoned by the Chartered Company's forces, assisted by some of the Bechuanaland Border Police, were established at all the points on the river at which a crossing could be effected, and the banks were constantly patrolled from post to post. Eventually this trouble was settled without bloodshed, the leader of the Boer expedition being taken prisoner, and a large number of his followers agreeing to enter the country and accept land for farming purposes under the Chartered Company's rules. The third possible enemy of the Company, viz., the Matabeles, have as yet made no signs of hostile intentions, but how long they may remain thus peacefully inclined it is impossible to predict, and at any time some enterprising prospector in search of gold, having crossed the vaguely defined boundary, or some other cause having aroused the anger of the king or his warriors, the occupants of the country may find themselves plunged into a bloody war against a savage and merciless nation.

The principal centre of population and seat of Government in Mashonaland is Fort Salisbury, and the distance of this place from civilisation may be realised from the fact that it is, roughly, 1000 miles from the nearest railway, and 400 miles from the nearest port. It can be reached at present by two routes, one from the south and the other from the east. The first and as yet better known route is from Cape Town *viâ* Kimberley to Vryburg by rail (some 750 miles), and thence, in a northerly direction, along the road taken by Sir Charles Warren's expedition in 1885, through Bechuanaland to Macloutsie (some 550 miles), where a camp garrisoned by three troops of the Bechuanaland Border Police has been established; and from there a distance of about 50 miles across "the disputed territory" to Fort Tuli, the base of operations, and depôt of the Chartered Company's forces. Old campaigners in South Africa will know, or be easily able to calculate, that this journey, performed with ox-wagon transport, would take under the very best circumstances 30 days, or with mule wagons 20 days, exclusive of the two days and a half in the train; but they will also know that under ordinary circumstances oxen with loaded wagons would not perform the journey much under 50, nor mules under 30 days. As the pace at which troops can march through this country is regulated of necessity by the transport, it will be seen that in the event of an expedition being sent to Mashonaland by this route a very considerable time must elapse before any body of troops could be assembled, even at Fort Tuli, which is the most southerly point in the country. In the autumn of 1890, a troop of the 11th Hussars, escorting His Excellency the Governor of Cape Colony, marched from Vryburg along this road as far as Macloutsie and back, performing the distance with

mule wagons in remarkably quick time, but it must be remembered that, during a considerable part of every year, this road would be almost impassable for any large body of men, owing to scarcity of water, in obtaining which the Officer Commanding the troop of Hussars had considerable difficulty, even with so small a body of men.

The other route to Mashonaland is from Port Beira, which is a small Portuguese town on the east coast, about five days' voyage from Durban, having a very fair harbour in the mouth of the river Pungwe, which runs out at this point. This is much the shorter route of the two, but it has at present a serious drawback in the tsetse fly which infests a belt of country through which the road passes, and which destroys all transport animals brought within the region which it inhabits. This fly has always been dreaded by African explorers, but never until last year has its fearful power been fully realised by any but the very few who had witnessed its ravages. In the spring of last year a convoy of some 18 or 20 wagons and coaches, each drawn by a span of oxen, were landed at Port Beira, and attempted to make their way to Mashonaland. Of this convoy only one coach ever arrived, and the remainder of the wagons, etc., may be seen lying abandoned in the bush, whilst, if search be made, the skeletons of the animals, which fell victims to this terrible scourge, may be found lying about in the vicinity. For this reason the only means of transport available on a part of this route are native "bearers," each of whom can carry some fifty pounds weight, at an average speed of twenty miles a day; but this is an expensive, uncertain and inconvenient system of transport for any large body. Expensive because the bearers require high wages and have also to be fed, besides requiring other bearers to carry their food; uncertain, because they cannot always be obtained in sufficient numbers, and are, moreover, very apt to desert on the road; and inconvenient, because of the small loads into which all the stores to be conveyed have to be packed, as well as for other reasons which are sufficiently obvious without being detailed here. This route leads from Port Beira, up the Pungwe River by boat for 70 miles, to Mt. Pandas, thence with bearers, through "the fly country," about 100 miles, to Chermoy, from which place a wagon road leads to Umtali, the most easterly point of the Chartered Company's territory, another 100 miles or so. This route lies through Portuguese territory, but negotiations are now proceeding between the Chartered Company and the government of Portugal for the construction of a railway from Port Beira through the fly country, which, when it is completed, will give this route such enormous advantages over that from the Cape Colony, that the latter route will become almost, if not entirely, disused.

Thus the two most accessible points in the Chartered Company's territory are Fort Tuli on the south, which is about 600 miles from the nearest railway, and Umtali on the east, which is 270 from the nearest port. This latter distance is calculated by the present wagon road, but the railway will, no doubt, take a more direct line. A word more about the tsetse fly before concluding what there is to say about the approaches to the country: this fly inhabits clearly defined portions of the country, outside which it is never found, Mashonaland itself being

entirely free from it except in some little-known parts in the north-east and north-west. One or two curious facts about the fly are worth noting: its bites have no injurious effects upon human beings or wild animals; it never bites during the hours of darkness so that if an animal can be ridden through the fly country between sunset and sunrise, in one night, it will escape unhurt; the animals do not, as a rule, die immediately after being bitten, but on the contrary, they frequently live for two or three months, and in this way donkeys are often taken several journeys, backwards and forwards, through the fly country before they finally succumb. A "fly struck" animal will often live, and appear to be perfectly well, until he gets a wetting, when the bites will swell up into lumps under his skin, and death ensues. So much for the roads leading to Mashonaland; now a word as to those which have been made in the country itself. Of these there are two main ones, viz., one from Fort Tuli, in a north-easterly direction, to Fort Salisbury, and the other from Umtali, in a westerly direction to the same place. These are merely wagon-tracks, with passable fords, or "drifts," as they are called in South Africa, through the numerous rivers and "spruits" (streams). The difficulties of marching in this country are such as will be familiar to those who have read or had experience of marching in Zululand or Bechuanaland, viz., heavy sand, steep slopes, flooded rivers, etc., all of which occur in different parts of the road, but none of which are insuperable obstacles. The heavy ox-wagon, "double spanned" when necessary, travels slowly and laboriously through the sand and up the hills, and, given the necessary materials and labour, the rivers can be crossed when they are in flood by means of rafts, or "ponts" as they are usually called. Many soldiers and travellers will remember the Tugela and White Umfolosi rivers in Zululand, which, though not nearly so large or so rapid as the worst of the Mashonaland rivers, may yet be taken as examples of what has to be encountered, though in a worse degree, in this new country. To those who have seen rivers in flood in Asia or Africa it is not necessary to describe the surprising rapidity with which, in a few hours, an apparently trivial stream will become a surging torrent utterly unfordable, and to swim across which is a feat requiring considerable strength and determination.

The country occupied by the Chartered Company may be divided into two parts, viz., the low-lying wooded country or "bush veldt," and the high, open plateau or "high veldt," which forms the main and most valued portion of the territory, and which is, strictly speaking, Mashonaland, as the real Mashona tribes do not inhabit the low-lying portion of the country, but confine themselves to the elevated plateaus further inland.

Fort Tuli is in the low bush veldt, and from this place the main road to Salisbury lies, for the first 200 miles, through the same sort of country, and then leads up by a gradual ascent to the high open plateau of Mashonaland. This "bush veldt" is sparsely inhabited by a few scattered tribes called Makalakas, who acknowledge no paramount chief, but live in constant dread of having their homes pounced upon by marauding parties of the powerful and warlike Matabele, who in-

habit the country to the west, and who make periodical raids on the unfortunate Makalakas, killing the men, and carrying off their cattle and women, which latter they take back to Matabeleland loaded with the spoil, in the shape of corn, etc., which they have obtained. These Makalaka tribes have no power of combination for purposes of defence, and have become so accustomed to look upon the Matabele as their masters, that they seldom make any resistance, even when, as is frequently the case, they outnumber their opponents. They do, however, choose the tops of the small and rocky hills, which are found dotted about in the bush and known in the country as "kopjes," on which to build their huts, presumably with a view to defending themselves when attacked, but also no doubt for the reason that it is more healthy to live on the highest points of this country, in which malarial fever, of much the same type as that known in India as "jungle" fever, is terribly prevalent during the rainy season.

The habitations of this down-trodden race, built of sticks and grass, and perched on almost inaccessible ledges of rock, or half concealed in narrow clefts, present from a distance the appearance of nests belonging to some strange bird or monkey crowded together after the fashion of a rookery; and, indeed, the natives themselves peeping out of the small holes, by which they enter their huts, convey the idea more of frightened apes, than rational beings. The Makalakas have become accustomed to the presence of white men in their country, and bring their produce such as mealies, rice, sweet potatoes, and Kaffir corn, to the camps and to travellers on the road for sale. For the first 100 miles or so along the road from Tuli money is accepted in payment, but further north the natives are ignorant of its use, and demand beads, coloured calico, or blankets, in return for what they have to sell, as well as for their services, which are often requisitioned for herding cattle, carrying wood and water, etc. It has been said that in this part of the country malarial fever is very prevalent, and, indeed, it is so bad that during the rainy season the "bush veldt" is almost uninhabitable for white men, which makes the keeping up of any line of communications, or the establishing of any permanent posts, a matter of considerable difficulty. This difficulty is increased by the state of the roads, which become so soft and cut up by the traffic as to be almost impassable after a month or two of wet weather. One more drawback to this low lying part of the country must be mentioned viz., the "horse sickness." Those who have had anything to do with horses or mules in Natal and other parts of South Africa, will remember the almost invariably fatal result of an attack of this disease, for which, as yet, no remedy has been discovered, but whilst in Natal, or Zululand, it is considered a bad year if ten per cent of the animals in a regiment or battery succomb to it, in this low bush veldt of Mashonaland it is found almost impossible to save ten per cent from its ravages; and to make matters worse the animal is subject to the disease all the year round, whilst in Natal it is only during some four or five months at the beginning of each year, that it prevails. A horse which has had the horse sickness and got over it is known in South Africa as a "salted" horse, and although he is subject to periodical relapses, these seldom prove

fatal, provided he is given a complete rest, whilst he is suffering from them. For this reason "salted" horses and mules are in great demand, and a salted horse will often fetch from sixty to a hundred and fifty pounds, whilst, if unsalted, the value of the same horse would not be more than twenty or thirty. The difficulty then presents itself to the purchaser of distinguishing between a salted, and an unsalted animal, and as there is no way of ascertaining this by examination, a system of guarrantees is adopted, the seller signing an agreement (which the purchaser retains), to return the purchase money, in the event of the animal dying of horse sickness within a fixed period. This system leads to endless disputes, and is for obvious reasons unsatisfactory, but under the circumstances it appears to be the only method which can be adopted.

The high plateau of Mashonaland which is reached by the road from the south, some 200 miles from Tuli, differs in many respects from the low bush country just described. It is open grazing country, with only here and there patches of bush, and altogether much more healthy, it is not so pleasant to travel in as the bush veldt, owing to the scarcity of fuel (the dry dung of the cattle having frequently to be used in lieu of wood), and the difficulty of finding shade from the rays of the sun, or shelter from the cold winds, which constantly sweep these large open plains. It is, however, much safer for a body of troops, or convoy of wagons marching through this country, which is easily scoured in all directions by patrols, and affords few opportunities of concealment for hostile bodies of natives, wishing to surprise a column on the march.

The Mashona tribes which inhabit this plateau resemble in almost every particular the Makalakas described above, but they are as a rule more prosperous, having larger herds of cattle, which are almost invariably sleek and fat, bearing witness to the richness of the pasture, and the value of the country for grazing purposes. These tribes are also subject to periodical raids by their enemies the Matabele, and have no paramount chief under whom they can combine for defence. Indeed neither the Mashonas nor their neighbours the Makalakas, seem to have any stomach for fighting, and in the event of its being necessary to punish any of them for theft or other misconduct, the despatch of a small party of ten men to the village concerned being usually sufficient to overawe them; and as a rule they desert their abode, as soon as they get wind of the approach of such a party, taking their cattle with them, but leaving their huts and stores of grain for the commander of the patrol to burn, or dispose of as he thinks fit. This high veldt, although not nearly so unhealthy for men or horses as the bush veldt, is still by no means free from either the fever or the horse sickness, the latter disease, however, prevailing only during the wet season, from December to about May, in contradistinction to the bush veldt, where it attacks the animals in all seasons.

For purposes of defence, and for the preservation of law and order in Mashonaland, a semi-military force of some 600 mounted police organised in six troops, was originally raised by the Chartered Company, and this force armed with Martini-Henry rifles, and provided with a few

7-prs. and Machine guns, has done a vast amount of difficult and dangerous work, in the performance of which both officers and men have undergone hardships and overcome difficulties in a manner which would have done credit to many a "regular" regiment. But towards the end of 1891, the differences with the Portuguese and the Transvaal Boers having been satisfactorily settled, and the fears of an attack by the Matabele having somewhat subsided, the strength of the force was reduced to some 200 men who are distributed amongst the various centres of population. The telegraph line has been extended from Bechuanaland through Fort Tuli to Salisbury, but in the event of hostilities this line would be impossible to defend throughout its great length, and the heliograph, which as so many officers will remember, has proved so invaluable in Zululand and elsewhere, would no doubt be called into requisition, although the country is by no means so well suited for the establishing of lines of signal stations, as many other parts of South Africa. A line could be worked without much difficulty between Salisbury and Umtali, on what is known as the coast route, but on the other main road from Tuli to Salisbury, there are considerable obstacles in the way. For the first 200 miles from Tuli northwards, stations have been selected at convenient distances, but the unhealthiness of the district would render it difficult to keep signallers in them, at all events during the rainy season. From the edge of the high veldt to Fort Salisbury (another 200 miles) the country is so flat, that considerable difficulty is experienced in selecting stations without unduly multiplying their number, or placing them on hills so far distant from the main road as to make the supply of rations for the signallers and the garrisons necessary for their protection, a matter of considerable difficulty.

Enough has been said as to characteristics of the country, from a military point of view, to give a rough idea of some of the difficulties which would have to be encountered in the event of its being necessary to send troops into Mashonaland, and from what has been said it will be gathered that the only enemies which the occupants of the country now have to fear are the Matabeles, who are a branch of the ancient Zulu nation, and have inherited the fierce and warlike characteristics of their forefathers, from which it is judged that, if the time ever comes, when they find themselves engaged in war with the white man they will prove themselves foemen worthy of his steel.

This country of Mashonaland, till within the last two years, having been left undisturbed by the sound of rifle shot, except by the great African hunter, Mr. Selous, and a few other enterprising sportsmen, is teeming with game of all sorts, and the statement of an enthusiast, that every animal worth shooting except the Polar bear and the Bengal tiger could be found in the country, although not literally true, is not really so wide of the mark, for besides all the different kinds of buck, big and small, which inhabit Southern Africa, there are lions, elephants, buffalo, quagga, giraffe, leopards, wild pig, hyenas, hippopotami and rhinoceros, the last-named animal being, perhaps, the least often met with. Taking the game in the above-mentioned order, it is unnecessary to describe here the different kinds of buck, but a few remarks

on the usual methods of hunting them, and the most important points in which some of the principal ones differ from one another, may not be without interest. The South African hunter, when in quest of game of this sort, usually proceeds on horseback, frequently accompanied by one or two companions, but in default of these he seldom omits to take with him one or more natives, either mounted or on foot, more often the latter. He starts just as day is breaking, and rides at a foot's pace across the veldt, keeping a sharp look-out for game, and at the same time examining the ground carefully for spoor. On coming to a stream, or pool of water, he makes a careful inspection of the banks, and if he finds fresh spoor, he notes the direction in which the animals appear to have moved off, and then, if the wind is not blowing too much from behind him, he follows up the spoor as long as he is able to discern it, casting forward in the direction in which it is leading whenever the ground is so hard as not to show any marks. In this way he usually comes in sight of the game before long, and if the country is open, and his eyesight is good, he should catch sight of it at a considerable distance. If the bush is thick he frequently comes suddenly on his game, when he jumps off and takes a shot, if possible, before they begin to move, then up again on his horse, and after them as hard as he can gallop, endeavouring always to keep them in sight, which is sometimes very difficult to do, when the thickness of the growth impedes his progress and limits his field of vision. After a time the buck almost invariably pull up, and turn round to see what he is doing, but the well-trained shooting horse, having observed the game shortening their stride and preparing to halt, will have stopped dead, and his rider will be already dismounted with his rifle up to his shoulder, and before the buck have realised that he is so close the finest bull amongst them will have got a bullet, which, if properly placed, will bring him to book before he has gone very much farther, but, should he not be hit in a vital spot, he will start off again at speed, this time separating from the remainder of the herd. The hunter following as fast as possible, will, as soon as he stops again, dismount and put another bullet into him. When the buck is down, the experienced hunter loses no time in giving him the *coup de grace* with his knife, at the same time taking care to keep out of the way of his sharp pointed horns, for it is no uncommon thing for a buck, after falling and lying on the ground for some minutes, to get up and make off again into the thick bush, to die several miles away, whilst the careless hunter, thinking the hunt is over, and having left his horse perhaps a hundred yards away, and placed his unloaded rifle against a tree, is wiping his brow and leisurely getting ready his hunting knife. When the game is really killed, he is cut open, and as by this time the sun is getting hot, and the camp which was left at day-break is some considerable distance away, a fire is lighted by the "boys," who, following the spoor of their master's horse, have by this time arrived on the scene, and the liver or some other tit-bit is thrown on the ashes to grill, whilst the hunter smokes a pipe in the shade and the boys cut up the remainder of the meat into convenient pieces for carrying home. Then a rough breakfast having been made of grilled venison, washed

down by a draught of water, the horse, who has been "off-saddled" and allowed to graze, is loaded up with meat, and the boys carrying the remainder, the party makes the best of its way back to camp. In the open veldt where the game is seen at a distance, and before they are alarmed, the hunter will sometimes leave his horse and endeavour to get close to them by stalking, or in parts of the country where the game has not been much shot at, it is sometimes possible to ride quite close up to them, get a shot before they take fright, and then mounting again, gallop after them, and pursue the same tactics as before. There is one kind of buck called "sessibe," which are almost impossible to get close to by galloping, owing to their great speed and powers of endurance. They usually inhabit the open plains, and are only to be got at by careful stalking and a good shot at from 400 to 500 yards range, at which distance they will frequently stand and watch the hunter, allowing him time to take careful aim, but starting off again at once if he attempts to approach nearer.

Lions, although there are large numbers of them in the country, are not often met with in the daytime, and the best chance of getting a shot at one is by concealing oneself in the vicinity of a dead ox or other animal on a bright moonlight night, but they are very cautious animals, and usually choose dark nights for their marauding visits. A lion will sometimes kill an animal and leave the carcase half eaten at day-break, when he will invariably return the following night to finish his meal, so that in this way an opportunity is frequently given to his enemies of preparing a warm reception for him. Elephants are only met with in the northern part of the country, and are generally supposed to require a heavier bullet and larger charge than most other game, but the writer has seen one of these huge animals killed at a range of over a hundred yards with a single shot from a Martini-Henry rifle, which hit him just behind the shoulder. They are savage animals when wounded, or annoyed by firing, and unless hit in the right place will carry away any quantity of lead. In the Cape Colony, where there are still a few herds of elephants in the thick bush country near Port Elizabeth, they have been so much annoyed by hunting parties that they will frequently go for a white man in the most savage manner, even when he has no intention of molesting them, and in consequence they are much dreaded by the farmers in the neighbourhood, many of whom are not ashamed to confess that they are afraid to go out into the bush after sunset, when they know the elephants are about. When hunting them, one of the party always carries a box of matches with which he is ready to light the dry moss which grows on the bushes in great abundance, and several men have narrowly escaped with their lives by making use of this dodge, the fire, which spreads rapidly, having the effect of frightening the elephants, and causing them to turn back rather than charge through the flames.

Buffalo of the species known as Cape buffalo, which have the reputation of being the most dangerous animals in the country, are generally found in very large herds, but they are only met with in certain districts; generally in the parts of the country which are infested with the tsetse fly. They are not, as a rule, difficult to stalk, if proper

attention is paid to the direction of the wind, as they are very short-sighted, but if they "get your wind" they stampede, and woe betide the hunter if he should be in their way and cannot get up a friendly tree, for his rifle will be no use in such a case, with a herd of buffalo galloping in a mass he has little chance of escape. But more commonly the danger lies in following up a wounded animal, as he will frequently lie in ambush in a clump of bush and charge out on his pursuer when he least expects it.

Quagga and giraffe are very common in many parts of the country, especially the former, which are seldom shot, unless their meat is particularly wanted.

Leopards are not frequently seen in the daytime, and, as a rule, are only shot when they chance to cross the path of the hunter, though a wounded leopard is a dangerous animal, and will provide very fine sport for those who think the chief attraction is the danger. But, as a rule, inhabitants of that part of the world consider they have sufficient of that particular class of sport in defending themselves and their animals from the attacks of the lion at night, without putting themselves out much to look for it in the daytime.

Wild pig of the species known as "wart hog" are common throughout the country (being usually found in marshy ground), and are much sought after for the sake of their meat, pork being a pleasant change from the usual buck's meat. The tusks of these pigs, which curl upwards from the upper jaw, and in an old boar nearly meet over the snout, are much longer than those of the wild boar of India, which, moreover, grow from the lower jaw.

Hyenas make night hideous with their howling, but are useful as scavengers when the horse sickness or tsetse fly is carrying off the animals in a camp, the labour of burying the carcasses being saved by these animals, assisted by the "asvogels," who are always ready to devour any quantity of dead meat. On one occasion at Fort Victoria, groans being heard during the night, investigation was made, when it was found that they proceeded from a bullock which had fallen down outside the enclosure, and, being too weak to move, had been attacked by hyenas, his hind-quarters and entrails having been partially eaten, whilst he was still alive. After he had been put out of his misery with a bullet, the meat was poisoned with strychnine, and in the morning a hyena was found dead some 400 or 500 yards away. This instance is quoted to illustrate the difference between the habit of these cowardly beasts and that of the lion, who will invariably kill his game right out before proceeding to devour him.

The larger rivers of the country abound with hippopotami, commonly known in South Africa as "sea-cows." These huge animals are much valued by the Boer hunter for their hides and tusks, as well as the large quantity of fat obtained from them; this latter being an article in much demand in a country where the slaughter oxen, having usually been driven in a wagon until they were past work before being killed, are generally rather lean, not to say tough. Hippopotami usually remain in the water during the day, and come out on the banks after sunset to feed. They may be shot from the bank when they show

their heads above water, or on a moonlight night when they are on dry land, but the former is usually the method adopted, on account of the difficulty of getting a good shot in the semi-darkness, and the consequently increased danger of merely aggravating the animal by not hitting him in a vital spot, when they will frequently charge and make matters very unpleasant for their tormentor. When a sea-cow is shot in deep water the carcass sinks, and remains at the bottom for about 24 hours, after which it rises to the surface and can be dragged ashore. It might be supposed that the small boats and native canoes which are used for crossing or proceeding up and down these rivers would be in danger of being attacked by the sea-cow, but such is not the case, the huge beasts being constantly seen playing about within a few hundred yards of a boat without appearing to take any notice of it. But an instance did occur in the autumn of last year of a party of Englishmen, proceeding down the Zambesi in a canoe, being capsized by a sea-cow coming up from under the boat, but it was apparently unintentional on his part, as he made no sign of attacking the occupants of the boat when they were in the water, being probably quite as much afraid of them, as they were of him. Both the white men of the party, although they lost all their baggage, escaped with their lives, but one of the natives was dragged under by a crocodile, numbers of which animals infest these rivers.

Although all the game mentioned above are found in fair quantities in different parts of the British South Africa Company's territory, it is not necessary for the sportsman to go so far inland to obtain them, as he has only to land at Port Beira and proceed a few miles up the river Pungwe to find them in far greater numbers than he will in Mashonaland. The best time of year for shooting in this part of the world is from August to November, as the rainy season, lasting from December to March, is unhealthy, and after this the grass is too long until the latter end of July, when it has become dry enough to burn. In August, the old crop of grass having been consumed by fire, the young grass springs up in its place, and the game, attracted by this fresh pasture, are found in large herds, frequently grazing within a stone's throw of the main road. The abundance of game in this district may be judged by the fact that on one occasion it was the writer's fortunate experience to see, whilst standing in one spot, herds of no less than six different kinds of game grazing within a radius of a few hundred yards.

N.B.—The country has, doubtless, made considerable strides towards civilisation since this article was written.

SADDLERY.

BY

LIEUT.-COLONEL J. F. BROUGH, R.H.A.

From references which have been made to me, I think the following will prove useful to officers of Horse and Field Artillery whose batteries are taking blankets and V girth attachments into use.

(I.) "List of Changes in War Material, 6261," of 1st March, 1891, page 53, describes the blanket; whilst page 54 states how it should be folded. But, as the latter is not very explicit, the following rough diagrams will, perhaps, better explain the matter.

Fig. I. blanket laid down before being folded.

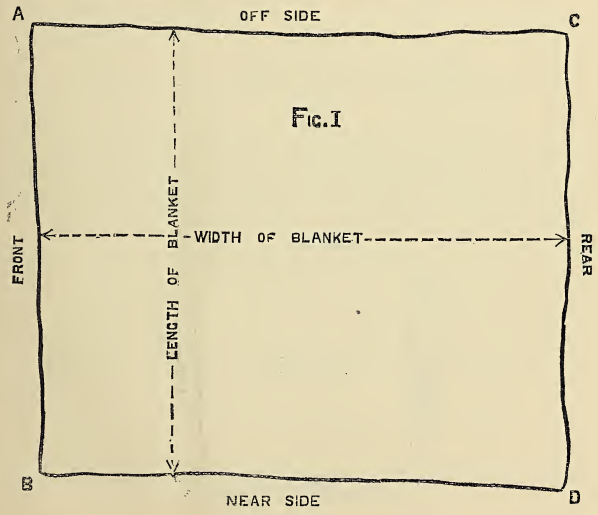


Fig. II. blanket folded in two, open side to *near* side.

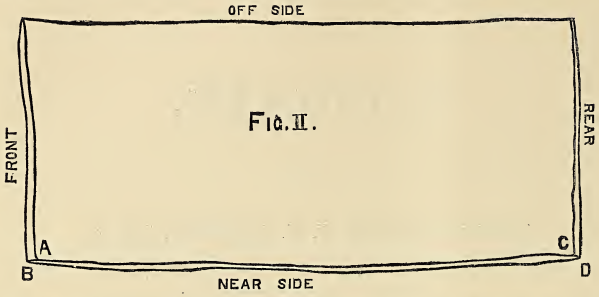


Fig. III. blanket showing front turned back (and *on top*), as directed on page 54 (line 3) above referred to.

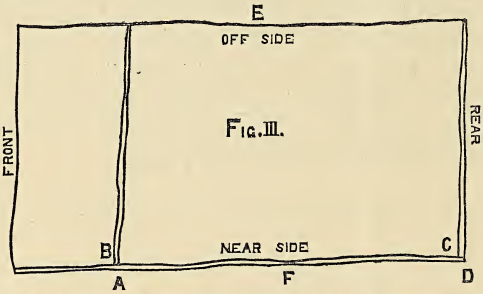
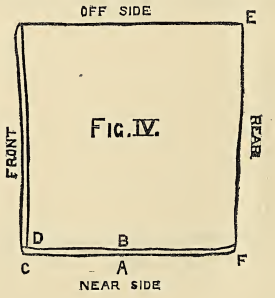


Fig. IV. blanket (as shown in Fig. III.) folded across its centre, E F, so as to bring the rear *over* the front. It then presents a flat surface on top, the turned back portion shown in Fig. III. being now hidden by what was in rear in that Fig. The Off side and the Rear side are now closed; whilst the Front and Near sides have open edges.



Page 53 referred to gives the dimensions of the new blanket; but there are several other descriptions of blanket still in use. I have not, therefore, drawn the above to any scale.

What has to be remembered is this:—Fig. I. A to B *must* be the length, and B to D the width. There are some square-shaped blankets in use: with them A to B and B to D would, of course, be alike. Moreover, with them, if they are 63 inches square, the turned back fold (Fig. III.) will come so far back that when the last fold is given (Fig. IV.) B A will be exactly under F.

Again, with blankets whose width exceeds 56 inches,[1] the turned back fold (Fig. III.) will, naturally, extend further back than 10 inches, which is the amount laid down on page 54 referred to.

(II.) Page 57 of the "List of Changes in War Material" in question shows a numnah. It is shaped alike in front and rear, and the straps shown on it serve to keep the blanket in its place on the *top* of the numnah; fastened, as these straps are, to the saddle in front and in rear.

"List of Changes in War Material, 6724," of 1st June, 1892, has introduced a still later pattern of numnah. But, in reality, it only differs from that depicted on page 57 referred to, in being three inches wider.

(III.) Particular attention is desirable to what is laid down on page 54 referred to: "Care is to be taken that the front edges of the blanket are kept in front of side bar."

It will be found too that, when the blanket is properly folded and secured in its place by the straps on the numnah, its rear side does not extend as far back as the ends of the rear fans of the side bars. This is a distinct advantage, as it prevents the ends of the side bars from pressing on the horse's loins.

It may interest officers to know that the general opinion, so far as I have been able to gather it, is favourable to the blanket in preference to pannels as bringing the rider closer to the horse's back.

(IV.) "List of Change in War Material, 6799," of 1st August, 1892, page 573, shows the V girth attachment. It will be seen that the strap marked B thereon is screwed on to the side bar at top, and stitched on to a dee below. It is thus all in one piece without holes, whilst the front strap has holes and a buckle. Now these holes are not intended as a means for tightening up the girth. They are the means whereby to fit the saddle, as it were, to differently-shaped horses.

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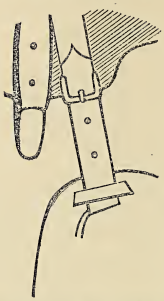
[1] Which is the width of the new blanket. (*See* page 53 "List of Changes in War Material, 6261.")

This Fig. shows the strap with the buckle in the top hole. And this



would, naturally, be the hole most likely to suit a round-barrelled horse, as by drawing the strap up any shorter this would only further tend to make the saddle shift *forward*. On the other hand, with a "herring-gutted" horse, it might prove necessary to have the buckle in the lowest hole, to prevent the saddle shifting *back*. This is the object of these holes, so far as I understand it.

(V.) Regarding splitting the girths into laces, *vide* last paragraph, page 572, "List of Changes in War Material, 6799;" if they are so split, it must be remembered that the unsplit six inches (*see* page 56, "List of Changes in War Material, 6261") should come, when the horse is girthed up, over the spot which answers to the breast-bone of a fowl. It will not do to drag it up on either side; for, if such be permitted, the advantage sought for by splitting into laces will be frustrated. A girth once split into laces, and should it prove too long for any horse, must be shortened at *both* ends; it will not do to take all the extra length off one end alone.

(VI.) There are two points which will require a certain amount of ingenuity to overcome.

Page 61, "List of Changes in War Material, 6261," shows the stirrup-iron with the buckle close to it. The spare end of the leather is apt to come out. How can this be avoided? The only remedy that suggests itself to me is to have as little spare end as possible: the longer the spare end, the more liable is it to work out.

Page 573, "List of Changes in War Material, 6799," shows the "sweat-flap." It is liable to work either backwards or forwards. How is this to be remedied? It has been suggested that a keeper on the "sweat-flap," through which one, or both, of the girth straps could pass, would keep it in its place.

WOOLWICH,
20th October, 1892.

RECENT DEVELOPMENT OF ARMOUR AND ITS ATTACK BY ORDNANCE.

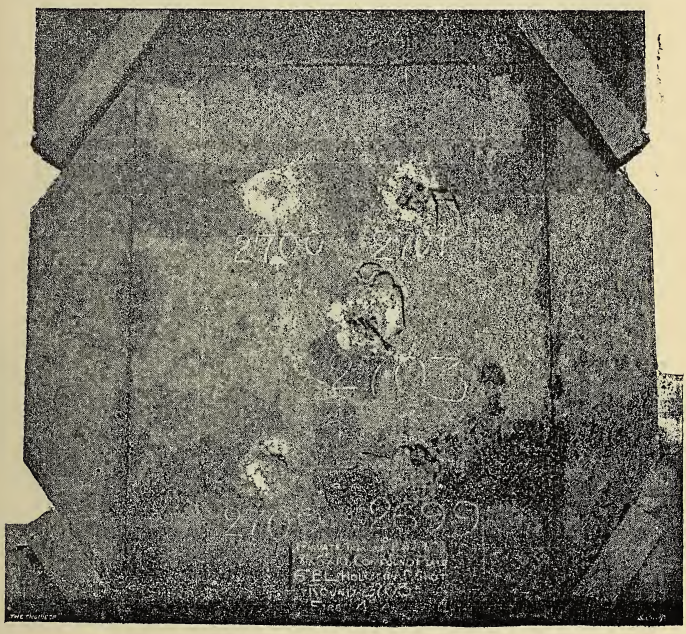
BY

CAPTAIN C. ORDE BROWNE, LATE R.A.

Ellis-Tresidder plate 1892.

On August 4th, 1892, at Shoeburyness, was tested an Ellis-Tresidder plate,[1] 8 feet × 6 feet × 10 inches, weighing about 8·56 tons. Five 6-inch Holtzer steel projectiles (weighing about 100·7 lbs. each) were fired at it, with a striking velocity of about 1950 f.s., total energy of each 2655 foot-tons, and energy per ton of plate 310 foot-tons, calculated perforation 12·4 inches of iron or 9·95 inches of steel. Figs. 15, 16, and 17, show the front, back, and edge view of this plate. It may be

FIG. 15.



[1] *See* "Engineer," September 16th, 1892.

seen that the whole five *Holtzer steel 6-inch projectiles* broke up, and apparently did not get their points through the steel face. There was a weak spot at the centre from a blister discovered by hammering to exist between layers of the wrought-iron. To ascertain the exact extent of this, a small hole had been drilled in the back and water forced in. Eventually it was judged not sufficiently serious to detract practically from the strength of the plate, a screw plug was inserted in the hole thus drilled. This, however, constituted a slightly weak spot, but even here on the removal of the screw plug after the trial no trace could be found of the shot point. The success of the trial was, therefore, most complete, and similar results were obtained soon afterwards both on board the *Nettle* and at Shoeburyness, the attack being made with Holtzer and Palliser projectiles.

Comparison must naturally be raised between the Harvey and Tresidder plates thus tried, but such a comparison is useful rather to bring out the different powers exhibited than to say that one plate is absolutely superior to the other. Briefly, it may be said that Harvey's

FIG. 16.

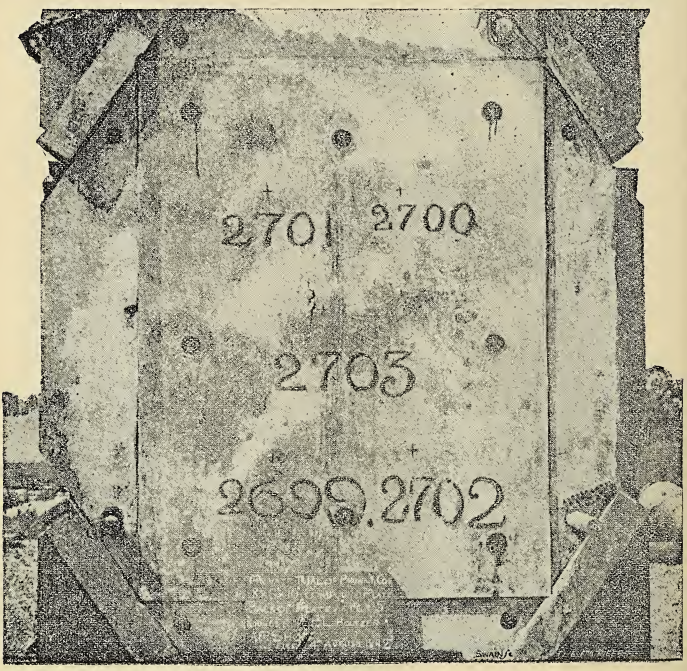
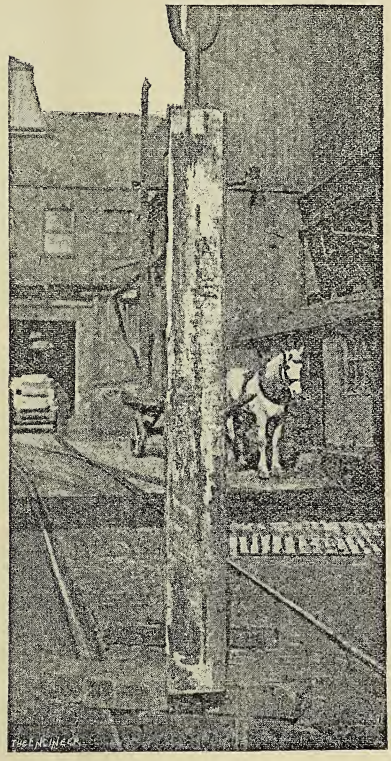


plate was much more severely tried, and in consequence that it suffered

much more than Tresidder's. The hard face of the latter performed

FIG. 17.



its work completely, breaking up the shot so abruptly that little rending strain could have been thrown on the plate. The plate, indeed, was well supported round its edge and at the back, but it cannot be supposed that such support was called much into play. Harvey's second plate also broke up every shot. It was apparently penetrated far deeper than Tresidder's, but the projectiles were 8-inch ones, and their energy much greater, and the test more severe than that of Tresidder's plate, even allowing for the difference in thickness. As above-said, the fracture of the projectiles was effected by the Harvey face, but not so quickly as to save the plate from a tremendous rending strain which it bore admirably, probably owing to its nickel. Tresidder might fairly plead that he had defeated the attack of 6-inch Holtzer projectiles more completely than the Harvey plate (*see* p. 59), which allowed the

points of two to come through the back, and that the change from 6-inch to 8-inch attack was made before the former had been altogether kept out, but when he goes on further and pleads that 8-inch projectiles would equally have broken up because they would not have delivered more work before fracture against his plate than the 6-inch, he must not expect his views to be accepted unless he can prove them. Hitherto the 8-inch attack has been crushing and formidable beyond all comparison with the 6-inch. It is due to nickel to call attention to the toughness exhibited by Schneider nickel steel plates at Annapolis and at Gâvre, as well as in the Harvey nickel trials, pp. 54, 61 63, 64, 65, 66.

Harvey plate, 1892.

On November 1st, 1892, a Harvey steel plate made by Messrs. Vickers, of Sheffield, was subjected to the usual trial on board the *Nettle*, at Portsmouth. Fig. 18, p. 89, shows the plate after it had borne the usual attack of three rounds with Holtzer forged steel and two with Palliser chilled-iron projectiles, delivered with a striking velocity of about 1976 f.s. The behaviour of the plate was admirable. Nos. 1, 2, and 5, penetrated more deeply and left more of their mass in the plate than the Palliser shot, making slight bulges at the back. The plate showed no sign of cracks compared with the Ellis-Tresidder plate. It may be seen that in the Harvey plate the steel shot heads show the core ends, and the mass being larger, it is clear that the projectiles penetrated deeper than in Tresidder's plate, but the metal appears to be more thoroughly proof against fracture, crack or blister, exhibiting in a high degree the same qualities that have been seen in nickel steel in former experiments.

Ochta competition 1892.

It might have been expected from the result of the above trials, that under the attack of 6-inch projectiles the Ellis-Tresidder plate would hold it own against Harvey. It might crack or show flaws in the metal, but it seemed probable that it would break up the shot even more abruptly than Harvey's plate. In a trial which took place at Ochta, near St. Petersburg, in November and December, 1892, however, the Ellis-Tresidder plate failed entirely from fundamental flaws in the metal; while Harvey's plate made by Vickers was more completely successful than ever. The details of this trial are reserved until the official photographs which Admiral Makaroff has kindly promised are received.

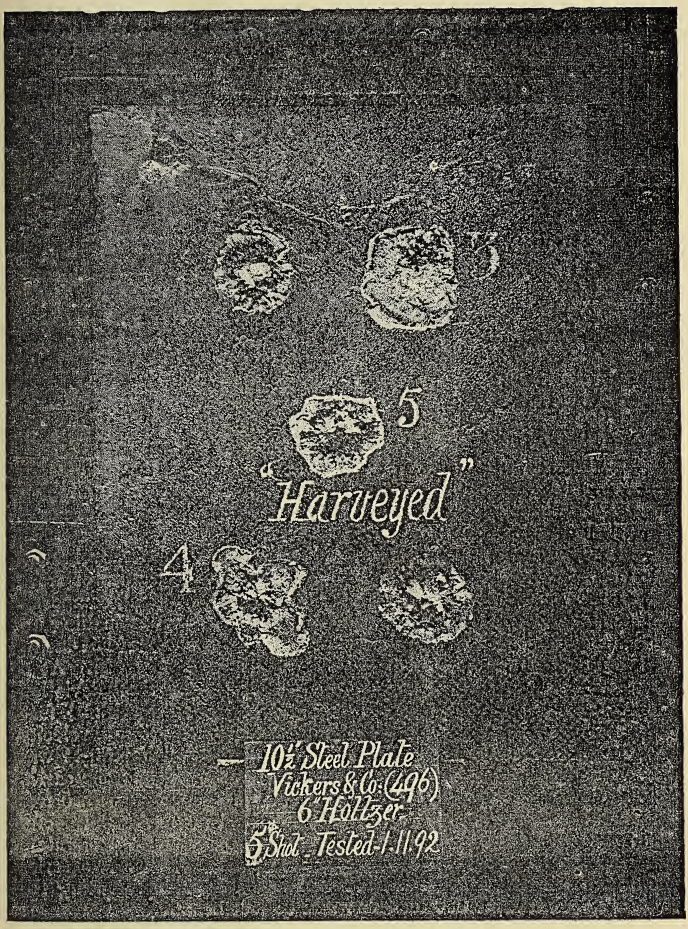
High Angle Fire and Attack of Decks.

Shoeburyness deck trials.

At Shoeburyness, on December 5th and 6th, 1887, (Min. No. 14,142), a target consisting of four contiguous steel plates 14 feet × 10 feet × 4½ inches laid horizontally, was attacked by Palliser studless shot, weighing about 354 lbs., fired from the 9-inch M.L. gun. At a range of 2917 yards, with a charge of 15¼ lbs. and an elevation of 47°, a projectile broke on impact, making an indent measuring 6½ inches × 7 inches × 2·9 deep.

On January 19th, 1888, at 2900 yards range, a similar projectile fired at 61° 15′, and an angle of descent of 78°, rebounded with its point broken off, having made an indent measuring 7¼ inches × 7¼ inches × 7¼ inches, the plate was bulged 3½ inches at the back, and a star opening was begun.

Fig. 18.



On September 14th, 1888, at 4000 yards range, elevation 69°, charge 30 lbs., a similar projectile struck and broke up into small pieces, making a disfigurement 11 inches × 6 inches, part of the shot being embedded. The plate was bulged to a height of one inch. The projectile was not thought to have struck truly point first.

Two questions are here involved : (1) the chance of striking ; (2) of perforating. It appears that scarcely 10 per cent. of hits were

made on a target of 560 square feet. This represents a very small portion of a ship's deck. The *Nile's* deck is about 22,080 square feet. As to perforation, a 4½-inch deck resisted the projectiles in such a way that no structure would have suffered seriously if protected by the above deck, and the second round mentioned above, which rebounded, appears from the indent to have struck as fairly as could be expected, and, as it was only broken at the point, it may be questioned if a forged steel projectile would have produced more effect under the same conditions.

Krupp's deck experiment, 1890.

Krupp followed up his early experiments on attack of ships' decks (*see* Meppen trials, 1879) by further firing with a 28^{cm} (11-inch) howitzer,[1] which at 45° elevation carried a projectile weighing 216 kg. (476·2 lbs.) a distance of 9864 metres, or over six miles. The time of flight was 47·6 seconds. The longitudinal deviation 119 metres (390·4 feet) and lateral, 49 metres (160·8 feet). Cast-iron shells broke up against 75^{mm} (3-inch) deck plates, bending them but slightly, but completely broke 50^{mm} (2-inch) plates. An armour-piercing steel shell 255 kg. (562 lbs.), with a velocity of 135 metres (442·9 feet), meant to imitate a falling projectile, shattered the 3-inch plate and remained intact. A chilled-iron shell of 230 kg. (507 lbs.), with 175 metres (574 feet) velocity, passed through a 3-inch plate at 60 degrees. Much in these last trials depends on the words "meant to imitate." A projectile fired point first at a plate, whether directly or obliquely, is in a very different position from one falling with its axis even slightly askew to its direction of motion. This is one main disturbing element in vertical attack.

In 1890,[2] Krupp fired a 28·55^{cm} (11·25-inch) howitzer, weighing 10·83 tons on a 45-ton bed with armour-piercing projectiles of from 512 to 936 lbs. weight, at a deck target 52 feet × 13 feet, composed of four steel plates rivetted together, the three upper ones making up a thickness of 76^{mm} (2·99 inches) and the lowest 13^{mm} (0·51-inch), total 3½ inches. This was backed with iron ribs and wood. At a range of 3870 yards (2·2 miles), the greatest longitudinal deviation was 95 feet, and lateral, 27 feet. One hit was obtained with 6¼ feet longitudinal and 19 inches lateral deviation. The striking velocity was 610 feet and angle of incidence 46½ degrees. The target was pierced and supports bent, and projectiles found 5 feet in the earth. At 63° elevation one hit was obtained at the same range with 5 feet longitudinal and 20 inches lateral deviation. The striking velocity was 751 feet and angle of incidence 66°. The projectile perforated, and was found uninjured 4 feet deep in the ground. Of two series (26 rounds in all) 20 would have struck a target representing the *Centaur's* deck, that is 360 feet long and 60 feet beam.

Japan deck trial 1891.

On March 19th and 20th, 1891, at Kwannonsaki[3] in Japan, a curved steel deck structure, 59 feet × 17·3 feet, was attacked by vertical fire. The deck consisted of three thicknesses of Creusot deck steel plates

[1] *See* article by C. G. L'Estrange in "Illustrated Naval and Military Magazine," also "Brassey's Annual," 1890.

[2] *See* "Engineer," October 31st, 1890, and "Brassey's Annual," 1891.

[3] *See* "Engineer," June 5th, 1891, "Brassey's Annual," 1892.

(nearly 3 inches in all) fixed on steel beams 4 feet apart. The range was 3773 yards (2·14 miles). The angle of elevation was 58° and of descent 61°. An 28^{cm} howitzer (11·02-inch) and 24^{cm} (9·45-inch) mortar were used. The latter piece attacked from a range of 3554 yards (2 miles), angle of elevation 60°, and descent 63°. About 7 per cent. of hits were made with the howitzer, and 5 per cent. with the mortar. The projectiles were of chilled-iron, weighing 478 and 269 lbs. respectively, and went clean through the target and buried themselves about 6 feet 6 inches in the ground.

Different kinds of deck attack.

Experiments have also been made by Canet in France and by Italy on vertical attack of decks, to say nothing of Shoeburyness,[1] which need not be here given.

These experiments on the perforation of decks have demonstrated that most steel decks could be perforated if struck with armour-piercing projectiles. The question is, could they be thus struck? Success appears to depend on the ship being anchored and on the projectile falling clear of all machinery and other massive material above the armoured deck. Common shells would act in the higher region of the ship with larger bursting charges, and might prove more destructive. The howitzer and bed used in Krupp's second trials weighed about 70 tons, and appears to be a more costly weapon than is generally devoted to vertical fire.

Decks may be attacked in two other ways, namely, by plunging and by curved fire. The former is seldom possible. A ship's deck is often constructed to resist the same projectile glancing on it at 10° that the side armour resists direct, consequently nothing is gained till the falling angle exceeds 10°. At 1000 yards range a command of over 500 feet would be required to give an angle of depression of 10°, and few guns are placed as high as this. At long ranges, however, especially with guns of old type, projectiles may have an angle of descent exceeding 10°. This becomes a kind of curved fire attack, and is no doubt the best one under some circumstances, although it is seldom that the armoured deck itself would be struck for reasons above given, and thus common shell would be the projectile generally used.

Use of High Explosives.

Graydon's dynamite shell.

In the summer of 1887,[2] a trial was made in America of the effect of a 7-inch Graydon steel shell, charged with 2·3 lbs. of dynamite, made up in small pellets, each enclosed in paper saturated in paraffin. The shell was lined with asbestos to prevent the conduction of heat and consequent premature explosion. The projectile weighed 122 lbs. Three rounds were fired at a half turret, with a 14-inch wall made up of two thicknesses of wrought-iron, and a 3-inch roof. The first shell was fired without a fuze. It burst, however, on impact with violence, lifting off the turret roof. The second and third rounds were fuzed and also burst. The general effects produced are shown in Figs. 19 and 20 herewith. The perforation in the first two rounds hardly ex-

[1] At Shoeburyness, plates, not made-up decks, were attacked.

[2] *See* "Engineer," February 22nd, 1889, given from U.S. "Information from Abroad."

FIG. 19.

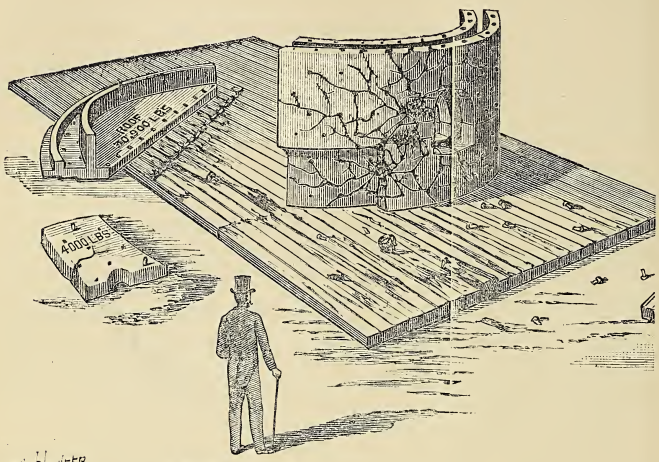
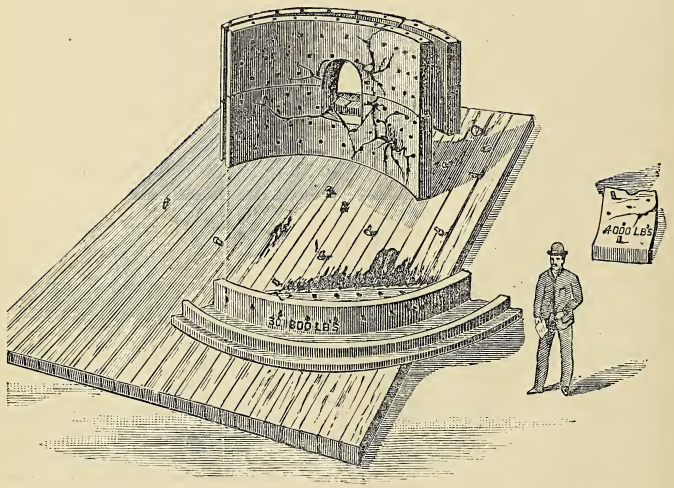


FIG. 20.



ceeded two inches. The third round struck an old indentation and perforated the front plate and bulged the inner one, and considerable cracking was produced by it.

The principal value of this trial is to give an idea of what effect a high explosive may produce on armour itself. The plates appear to have been old ones, but if any dependence can be placed on the cracks shown in the sketches, this class of attack might be valuable against inland forts, which, when made of wrought-iron too thick to be perforated by the guns brought against them, may resist the fire of projectiles fired without bursting charges for an indefinite time. The trial was not successful as to prevention of premature bursting.

High explosives in shells

Trials at Lydd, some years ago, showed that Gruson's ingenious device of filling shells with compounds, which compounds, which were only mixed and rendered explosive by rotation of the projectile in flight, could be carried out without danger to the gun. More recently it has been shown that compounds such as Roburite or Bellite could probably be fired with safety, and would probably burst a shell with great violence. Graydon brought forward a special compound also, as well as advocating the use of dynamite in shells (as noticed p. 91). Steel common shells have a capacity in proportion to their weight, which admits of a very large bursting charge.

French trials took place with regard to the great destructive power of Melinite.[1] It was concluded then that a combination of cupolas, combined with concrete in the form of a so-called artificial rock, as proposed by Mougin, might defy the attack of Melinite shells. Rolled iron was found far superior to steel for this class of work. An oscillating turret was proposed, but it is a question how far it has succeeded in actual practice.

The trials against the *Belliqueuse* and *Resistance* given on p. 50, are naturally connected with this subject.

Gun-cotton in shells. German trials.

In Germany shells charged with wet gun-cotton,[2] coated with an envelope formed by pouring in hot paraffin, were considered far superior to those filled with Melinite. So tremendous were the effects produced on earthworks that a revolution has been effected in the French and German frontier defences.[3] Both Von Sauer and Brialmont, opposed to each other in many questions, are here agreed that some form of movable armoured cupola might be used with advantage. Small forts at close intervals, with low command and protection by means of counter-guards with hard glacis, are recommended. Much bomb-proof accommodation would also be required.

Captain Fabre, in papers in the *Revue d'Artillerie*, expresses the opinion that coast batteries would suffer specially severely from ships' attack in future, and that the latter could shell them from 10,000 yards range. Many men's opinions have to stand over untested till actual war breaks out. This one appears, however, contrary to common sense if a fort is contemplated. Considering the very limited supply

[1] *See* "Engineer," November 29th, 1889.

[2] *See* "Engineer," August 7th, 1891.

[3] General Brialmont expressed a strong opinion on this question to the author in conversation.

of ammunition carried on board ship, most Coast Artillery officers would be delighted to see their enemy wasting precious ammunition in this way.

It may here be mentioned that Canet has made, for coast defence, guns of the extraordinary length of 80 calibres. On August 27th, 1892,[1] Canet fired a 10^{cm} (3·9-inch) gun, 80 calibres long, with a charge of 22·1 lbs. of brown prismatic powder, and a projectile weighing 13 kg. (28·7 lbs.) The muzzle velocity was 826 metres (2710 feet), and on September 20th, with the same projectile and a charge of 5·6 kg. (12·3 lbs.) of smokeless powder, the extraordinary muzzle velocity of 1026 metres (3366 feet) was obtained, and a muzzle energy of 2255 foot-tons, with a pressure of 19·55 tons. M. Canet holds that such guns are too long for ships to carry, and so far most officers would agree with him. He argues then that the fort by this means can obtain the power of attacking a ship at a range at which she could not reply. The value of this power practically depends on the chances of hitting at this range and the time a vessel would take traversing the zone in which she was unable to reply to the forts' fire.

Picric Acid. Several trials of the action of powder and high explosives were made with 6-inch projectiles. *Picric acid* in a Holtzer projectile, fired on February 27th, 1890 (Min. No. 22,308), broke up too early in penetration, and in too small fragments to be effective.

Lyddite. On July 17th, 1890 (Min. No. 23,759), a 6-inch Holtzer shot, filled with *stemmed Lyddite*, was fired at an Ellis compound plate, 4 feet × 4 feet × 9 inches, at a range of 150⅔ yards, and detonated in the act of perforation, bulging and separating the metal.

On July 24th, 1890, a similar projectile perforated and broke up.

On and shortly afterwards another charged with deadened Lyddite perforated and broke up.

On January 8th, 1891 (Min. No. 25,615), a 6-inch armour-piercing St. Chamond steel shot, containing 1 lb. of R.L.G. and 2½ oz. of R.F.G. powder, struck a compound plate, 4 feet × 4 feet × 9 inches, with a velocity of 1931 f.s., and an energy of 2585·7 foot-tons, and, breaking during perforation, carried all fragments through. On the same day a similar projectile acted in the same way.

In February, 1891, "Lyddite stemmed" was recommended by the Committee for use in armour-piercing projectiles, this form of Lyddite being considered more reliable as to keeping qualities than that which has been heated and run into the shell.

Steel Armour-Piercing Common Shell.

Experiments were made with projectiles thus designated which led the Ordnance Committee to report them as effective for the attack of armour up to one calibre thick. They contain about $\frac{2}{5}$ the bursting charge of common shell for the same gun.[2] They had been fired at various classes of targets, including a ½-inch wrought-iron plate, a 6-inch wrought-iron and 6-inch compound plates.

[1] *See* "Engineer," October 7th, 1892.

[2] Common shell (not armour-piercing) of cast-steel contain nearly 50 per cent. and those of forged steel over 100 per cent. more powder than cast-iron common shell.

At Shoeburyness, on January 27th (Min. No. 21,888) and 31st, 1890 (Min. No. 22,014), 6-inch B.L. projectiles ("pattern 6450"), weight 100 lbs. and 101¼ lbs. respectively, and containing $3\frac{3}{16}$ lbs. and 2 lbs. 15 oz. P. and 10 oz. R.F.G. powder, fired with a charge of 48 lbs. of powder, and striking at a range of 175 yards, with a velocity of about 1930 f.s., and energy of 2600 foot-tons, perforated a wrought-iron plate, 6 feet × 3 feet + 6 inches, backed with two feet of oak, bursting respectively 4 and 3 feet in rear of the backing.

On July 8th, 1890 (Min. No. 23,584), a 9-inch M.L. cast-steel shell ("pattern 6446") fired with a very low velocity, broke up against a 4½-inch steel plate, making an indent of 5½ inches from face, and a bulge at back 1·6-inch high.

On December 18th, 1890, and June 13th, 1891 (Min. Nos. 25,442 and 27,030), forged steel shell, fired from 9·2-inch B.L. gun, with striking velocities of 1979 and 1953 feet, passed through 9-inch compound armour, breaking up. This was considered unsatisfactory, as it is thought that shells of this class ought to pass unbroken through one calibre of steel or steel-faced armour in order to burst effectively behind it.

On July 16th, 1891 (Min. No. 27,452), several forged steel armour-piercing common shell were fired from the 6-inch gun at a Brown compound plate, 10 feet × 7 feet × 6 inches, with striking velocities from 1901 to 1944 f.s., the R.L. and Hadfield shells perforated unbroken when fired blind, when charged and plugged or charged and fuzed they perforated and burst behind the armour.

Angular Impact with A.P. Common Shell.

A series of trials were made to ascertain whether steel armour-piercing common shell and also Palliser shell would perforate steel or steel-faced armour at a considerable angle, carrying their fragments through in such a way as to be effective for service purposes.

In September, 1891 (Min. No. 28,284), a structure covered with a Brown steel plate, 10 feet × 7 feet × 4 inches, with 2½ inches of teak backing and two ⅜ inches of skin was attacked at 25° with the normal, or 75° with the plate face, by two forged steel common shell R.L. make (pattern 6450), and on September 29th (Min. No. 28,389), two more of these projectiles were fired, as well as two of Hadfield's make and one Palliser chilled-iron shell. These all passed through the plate, breaking up, but carrying their fragments through. Impact at 75°.

At Shoeburyness, on October 13th, 1891 (Min. No. 28,398), a forged steel armour-piercing common shell, R.L. (pattern 6450), and also a Hadfield one, were fired with a charge of 48 lbs., and striking velocity of 1944 to 1949 f.s. at the same structure, the angle of impact was 35° with the normal, or 55° with the plate face. Both shells broke up during passage. The R.L. shell passed wholly through the plate in fragments, and of the Hadfield part of the fragments passed through. 55°.

On November 13th, 1891 (Min. No. 38,825), a Palliser 6-inch projectile filled and fuzed and a cast steel armour-piercing common shell were fired at the same target with the same charge, and with striking velocities of 1932 and 1942 f.s., and energies of 2588 and 2615 foot-tons

respectively. Both projectiles passed through, bursting in their passage. Some Palliser fragments were left behind, but the whole of the steel shell fragments passed through the plate.

On December 8th, 1891 (Min. No. 29,048), a Hadfield 6-inch forged steel projectile, weighing 100 lbs. (No. 2669), and also a R.L. Palliser shot, were fired at the same plate at an angle of 45°, with a striking velocity of 1909 f.s. and an energy of 2502 foot-tons. Both projectiles made holes, broke and carried part of their fragments through the target.

45°.

The calculated perforation for the 6-inch projectile through steel at 75°, 55°, and 45°, are respectively 9·5, 8·1, and 7·0 inches, so that the plate was considerably out-matched. Had this not been the case, the projectile would probably have glanced off at 45°.

On March 3rd, 1892 (Min. No. 29974), two 5-inch B.L. Palliser shot were fired at the same target, weight of projectile 49½ lbs., with a striking velocity of about 1220 f.s., and an energy of about 517 foot-tons. One perforated at a weak place and broke up. The other was stopped and broke up.

Bursting action through thin steel.

On October 31st, 1891 (Min. No. 28,604), four 4·7-inch Q.F. cast-iron and steel armour-piercing common shells, filled and fuzed, were fired through a $\frac{3}{16}$-inch steel plate in order to test the position of the burst under these conditions. They actually burst in rear from 1 to 10 feet behind the plate.

Woodite.

A new material, called "Woodite," [1] (after its inventor, Mrs. Wood), was brought forward and highly commended at the April Meeting of the Institution of Naval Architects in 1889, both by Sir Nathaniel Barnaby and Sir Edward Reed. It takes two principal forms: (1) elastic Woodite; (2) buoyant Woodite.

Elastic Woodite consists mainly of India rubber, subject to special treatment. It is intended for use behind thin iron and steel built in in blocks. Eight inches of this material so applied closed up completely after perforation by Nordenfelt 6-pr. and 3-pr. gun projectiles, resisting the passage of water with a head of 40 feet. A thickness of four inches is recommended by the makers.

Buoyant Woodite consists principally of cork chemically treated. It is intended for raft purposes in ship construction, specially as a filling for cellular structures in which water can only enter to the extent to which woodite is bodily removed by shell, torpedo, or ram attack. It is said to be little liable to ignition, chemical action or decay, or to crumble when crushed or fractured, so as to interfere with the working of pumps and to admit into its texture only four per cent. of water in 24 hours.

Gruson's Shielded Mountings, 1890.

Gruson carried out a programme of experiments at Buckau and Tangerhütte, near Magdeburg,[2] in September, 1890, commencing on

[1] *See* "Engineer," May 10th, 1889, and "Brassey's Annual," 1888-89.

[2] Fully reported in the "Engineer" of October 3rd and October 10th, 1890, by the Author, who attended the trials. Given subsequently in "Lecture to School of Engineering, Chatham."

September 22nd (Monday).

The different classes of designs under trial may be grouped in more than one way, but are fairly included under the following heads:—(1.) Mountain and field quick-fire guns. (2.) Fortress guns on case-mate carriages. (3.) Fortress guns in shielded mountings. (4.) Naval guns. (5.) Turrets. These are taken in the order followed by Gruson in his printed list. The special use of a mountain or field quick-fire gun is to pour in a fire of extraordinary rapidity at any required moment; its relation to an ordinary field gun being in fact, the same as that of a magazine rifle to a single loader. This valuable power is obtained at the cost of the additional weight, inconvenience, and expense entailed by the use of fixed ammunition, in which projectile, charge, and detonator are held in a copper case, which can be thrust into the breech with great speed, and which itself acts as an obturator at the breech joint. The scope for this action is limited in the field by the power of stopping, or very nearly stopping, the recoil; for if it is necessary to run up and relay the gun, the quick-fire speed in entering the charge is of little use. Hence it naturally follows that in the field, where carriages with hydraulic buffers cannot conveniently be used, quick-fire guns will be of very limited size, their value depending on the efficient action of their brakes. It is well to be clear on this point, in order to avoid any false application to quick-fire guns of what would be sound reasoning in considering the value of field guns. Quick-fire, to be efficient, must not be interfered with by recoil, and it is obvious that even a moderate recoil repeated every few seconds must interfere most seriously with it. At a supreme moment, however—as in the case of a rush at the battery, when accuracy is not necessary—a small recoil may be disregarded. A very fair instance of this was seen in Tuesday's firing, September 23rd, at Tangerhütte, when a $5{\cdot}7^{cm}$ (2·24-inch) gun fired case at cavalry targets at 1800^{m}, discharging 11 rounds in 51 seconds. At the end of the 11 rounds the piece had run back $6\frac{1}{2}^{m}$; but the gunner firing had been able to keep close to the trail, and to see that the gun pointed fairly enough in the desired direction, so that the cavalry targets were well riddled, and more careful firing with shell on any special point might be carried out with a field piece with less recoil. This rapid discharge at a critical period is a function of sufficient importance to have secured the adoption of quick-fire guns; and, keeping this in view, there is a value in a maximum rate of speed such as may otherwise appear to be unnecessary and unpractical. No doubt such speed will seldom be called for, but when called for it will be at a moment when everything may depend on it. The same provision for rapid continuous fire is carried out in fortress and naval guns by recoil and automatic recovery of position between each round, or by absolute absorption of recoil on a rigid mounting, and to correspond to the critical moment of a sudden rush of an enemy on field guns may be taken, the case of assault of a fortress, or at sea of torpedo-boat attack. In the case of heavy shielded mountings and turrets, whether with quick-firing or ordinary guns, the main consideration is protection against heavy fire. In fortresses there exist points where in limited

space it is very desirable to place a piece which plays an important part, and on which a besiegers' fire will be concentrated. In such a case, a gun in a disappearing shielded mounting or turret may be of great value. The difficulty is mainly one of space, weight, and expense. A powerful gun means a long piece with strong recoil, and this being awkward to deal with, the tendency of guns on disappearing turrets and mountings is to be lighter than would be expected, and hence no doubt it is necessary to watch against the expenditure of means out of proportion to the power obtained. Thus there are places where, as an alternative, a gun might be fairly concealed, especially with smokeless powder, but in a regular siege, concealment soon comes to an end, continued practice discovers everything, and protection is then better than concealment. Here turrets and disappearing mountings have their field for action. A few definitions may be desirable to distinguish the classes of shields apart. In a *turret* the entire structure, walls and platform, as well as guns, generally revolves on trucks. In a *shielded mounting*, the shield or dome and gun revolve on a centre pivot. A *disappearing shielded mounting* only rises above the surrounding wall or glacis plate in coming into action, and after firing descends into the position of eclipse. In a *shielded emplacement*, the shield is a fixture, a mortar with a spherical body moves in a central hole in the shield, forming a ball joint on the top of a supporting pillar.

Lastly, special attention is invited to the *movable shielded mounting*, which consists of a gun in a sheet steel cylindrical structure with an armoured roof, which is placed on wheels, and can be brought into a gun pit, where it assumes an extremely strong position. Thus, in the defence of a fortress fresh ground might be taken and a gun placed in a spot which might greatly annoy besiegers and prove a valuable element in defence.

It may be noted that in all the trials smokeless powder was used, supplied by the United Rothweil Hamburg Company, from whom we in England obtained our first cocoa powder. The composition of the powder is a secret; it is almost wholly smokeless, and may be conjectured to resemble others which consist of gun-cotton in some form with a proportion of nitro-glycerine.

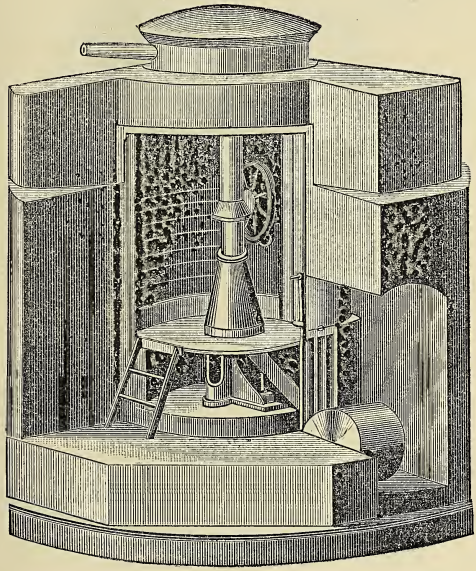
Passing by the trials of quick-fire guns, certain specimens of shielded designs may be noticed as included in the subjects of the lectures.

Disappearing shielded mounting.

The $5{\cdot}7^{cm}$ (2·24-inch) 25-calibre quick-fire gun in disappearing shielded mounting, shown in Fig. 21, was exhibited to show its working and powers. It is aimed and worked by one man, and another to assist and change round when required. He sits on a saddle so contrived as to set gear absolutely checking the recoil of the gun when turned down. In this position, he works the turret with his feet, and when the gun is run back, the hood with gun in it is raised or lowered very easily indeed, being well balanced by a counter-weight. Practice was made with ring shells against a line of 20 skirmishers with supports at 1300^{m} (1640 yards) range. Twenty rounds were fired—10 with slow and 10 with quick-fire; 277 hits were made on the skirmishers and 22 on the supports.

The whole structure of this mounting is balanced upon the pivot column, which moves up and down in the cone, and rests upon a lever, such as is shown in Fig. 21, whose counter-weight balances the

Fig. 21.

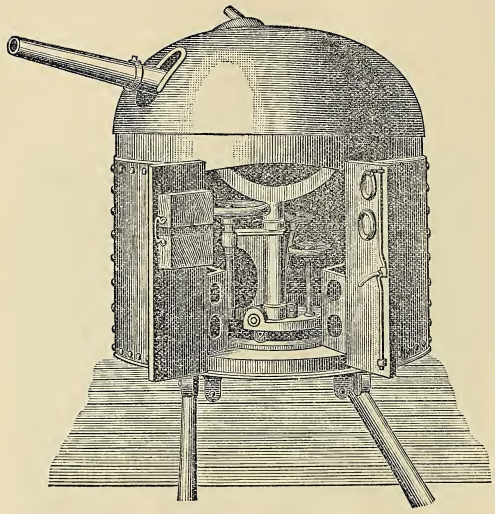


mounting. The gun rests with its trunnions in a frame, sliding backward and forward in guides. Bolts, which hold the gun from recoil, enter grooves in these guides, and are connected with a lever, on which the seat of the gunner pointing the gun is made fast. When the bolts are drawn back the seat is raised, and when pushed forward it is lowered. The effect of firing is to press the armoured ring against the glacis armour, after which it recovers its position again immediately, owing to the situation of its centre of gravity. The glacis ring is of chilled-iron, resting on sheet-iron plates and girders. In the position of eclipse, the flatness of the dome causes the top of the mounting to be very difficult to see or to strike with artillery fire, and the roof or dome resting on the glacis ring, the impact of projectiles can produce very little injury to mounting or armour.

Movable shielded mountings.

Fig. 22 is the movable shielded mounting for the 5·7 cm (2·24-inch)

Fig. 22.

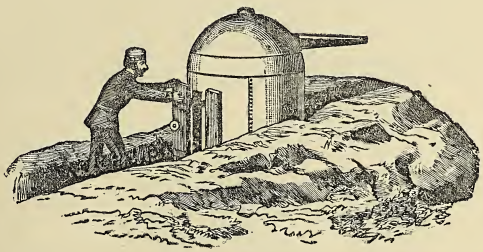


25-calibre quick-fire gun, weighing in all 2·85 tons, which was driven about the ground with three horses and a detachment of eight men, and put into position in a pit dug by the gun detachment (*see* Fig. 23.) The sheet-iron sides of the chamber are covered by the walls of the pit, and only the flat armoured dome-shaped roof is exposed to attack. In the case of a smaller mounting, that for the 3·7 cm gun, very little effect has been produced on one occasion by the impact of three 8·3 cm (3·3-inch) projectiles, slight indents only being made. The door and back of the mounting is of thicker metal than the sides and front, so as to resist a considerable blow from a piece of shell striking it at the opening left at the back of the pit, which, however, would not be a contingency likely to arise often. For firing permanently in one direction, the mounting is provided with a brake, and against skirmishers dispersion can be given by an arrangement limiting the rotation of the mounting to a certain angle. The ammunition is placed in tin boxes which stand on the floor of the chamber.

This 5·7 cm (2·24-inch) 25-calibre quick-fire gun, in movable shielded mounting, was drawn on wheels by three heavy horses abreast, the total weight of the load being 2900 kilos. (2·85 tons), exclusive of the driver. It was driven a short distance along the range, when the

word was given to halt and come into action with the horses still hooked in—action rear. The piece was then fired to one flank, the horses being still hooked in. The recoil consisted of a slight shock downwards on the end towards the horses, which was met as far as necessary by short thick legs which hung on hinges from the mounting. In six minutes 13 seconds the first round was fired, two men entering the cupola or mounting. The target represented 20 skirmishers, and supports in rear of each flank of 10 men each. The range was 1500^{m} (1640 yards); 172 hits were made on the skirmisher targets, 90 of them falling inside the bodies of the men traced on the targets. Fourteen hits were made on the supports. The detachment, consisting of one non-commissioned officer and eight men, were next ordered to take up a temporary protected position. Digging began at 11.3, a shallow pit was made by 11.12, and the wood for sleepers to carry the mounting rails was laid by 11.17, and secured by pickets. The gun was in its pit at 11.21½, and the first round was fired at 11.23½—that is 20½ minutes from the time the word was given to entrench. It may be seen in Fig. 23 that the pit was a shallow one, only affording partial

Fig. 23.



protection; also the ground was sand, and easily worked by spades without picks. This, however, is immaterial to the issue. It is apparent that this mounting is capable of being easily moved and put into a strong position in a very short time; and this, as noticed above, might make this mount very valuable in the general store of reserve pieces in a besieged place. The coming into action with the horses hooked-in may be regarded more as fun than serious purpose. The skirmishers and supports would spread and shoot down the horses and men outside the cupola, especially in the case of "action" to "right" or "left." Moreover, the piece could not advance, retire, or come into action at the rate required for a piece to work in the field.

A 3·7^{cm} (1·46-inch) 23-calibre quick-fire gun, in movable shielded mounting, was then limbered up and brought into a permanent position, consisting of a pit of full depth to cover it, lined with wood, and

afterwards taken out of it. This design is shown in Figs. 24 and 25

Fig. 24.

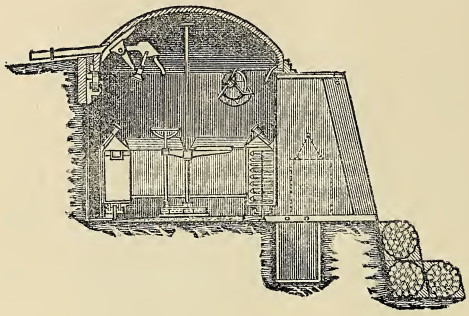
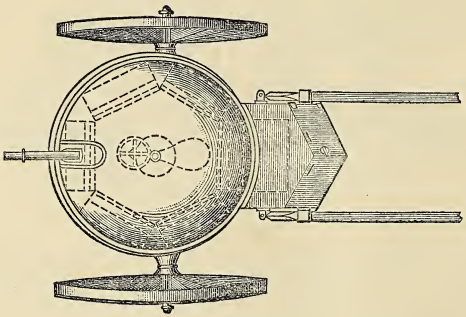


Fig. 25.

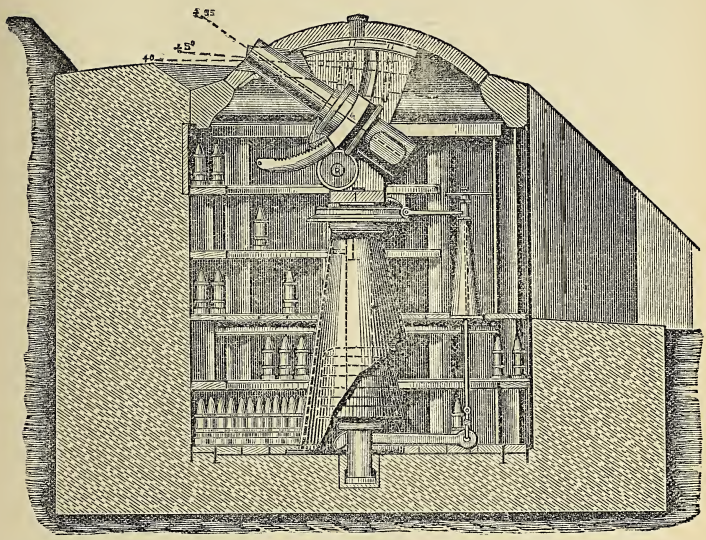


The hood of this mounting is the one which, as mentioned above, had been fired at with an 8·2 cm gun at 1500 m range and struck three times, slight indents only being made.

Rapid erection of shielded mounting.

Saturday's work (September 27th), began with an operation on which the value of the heavier shielded mountings greatly depends, namely, the erection of one of them in a pit made for it. The one selected was that for 12 cm (4·72-inch) howitzer of 13 calibres (*see* Fig. 26). The simplest mechanical means were purposely employed, con-

Fig. 26.



sisting of a travelling crane made by an erection of fir poles in the form of a sort of gyn, with four feet striding on to two trucks, which moved on parallel lines of rails. A differential pulley was suspended to lift the pieces of the mounting. The heaviest lift is 1900 kilogs. (1·87 tons), being the hood or cupola roof pieces, of which there are two, the hood being in this case made in two thicknesses. The entire weight of the mounting is 17,000 kilogs. (16·73 tons). Six men performed the entire work. They commenced at 9.42, and completed it by 11.30, having occupied 1 hour and 48 minutes.

The main questions in all these designs are the ease of working and the strength of mounting. The large turret for the two 15^{cm} guns, revolved once, when its momentum was overcome in 11 seconds, but generally slower, from 22 to 42 seconds. The 21^{cm} mounting, two revolutions in 20 seconds.

Gruson *matériel* generally.

The following remarks suggest themselves on the whole trial and exhibition of Gruson *matériel*. First as to the turrets and heavy shielded mountings. The mechanism is excellent. The ease with which the heavy shielded mountings are worked is only to be understood when it is borne in mind that they revolve on a central pillar, so that there is a great leverage against friction. Their behaviour under fire appears to be very good. There is a space between the edge of the hood, or cupola top, and the glacis plate or ring round it varying from about 1¼ inch in the large turret for the two 15^{cm} guns down

to about ¼ inch in small mountings. On firing, the hood is forced against the edge of the glacis ring, but there is little apparent violence or bad effect either on mounting or on the accuracy of the shooting. The 12^{cm} mounting was erected very easily, and certainly might be despatched and put up at night under favourable conditions at any desired spot previously prepared for it. Where any kind of rails existed, the operation would be specially simple. The element of resistance of the cupola roofs was not tried here, but it has been tested at Bucharest and elsewhere. Smokeless powder is held by some to have rendered it so easy to conceal the position of a gun, and to have detracted so far from the value of protection, as to make it questionable if the money needed for the latter is a good investment. This in a measure is true, but it is suggested that it does not apply to the case of systematic attack such as is employed in sieges, when all positions become known and attacked almost as accurately as if seen. The partial destruction of the sluice completely concealed in the ditch in Strasburg, by curved fire in 1870, may be taken as an instance of this occurring in actual war. Here, then, it is suggested that protection is of even more importance than concealment, and the cupolas and mountings exhibited at Tangerhütte certainly afford very complete protection, as well as being difficult to see, and it would take so enormous an expenditure of fire to destroy them, that probably they would remain serviceable until they should be captured. It has been objected that the man directing the fire in the shielded emplacements is boxed up too closely, and that in some of these a small "Admirable Crichton" would be needed to work with success, and that it is a mistake to endeavour to afford absolute security to any one. This objection is reasonable, but it would be perfectly easy to give the smaller hoods man-holes in the roof, so that if needed the man could raise his head and look out for an instant. They existed in the Bucharest cupola, and there is one in the turret for the pair of 15^{cm} guns. It has also been objected that nuts and bolts exist, which might be dislodged and form dangerous langridge. This applies chiefly to portable steel constructions, but the impression that this is characteristic of Gruson's designs appears to be a mistake. Even in the 12^{cm} shielded hood, which is made in two thicknesses, screwed together for the sake of portability, the bolts could not fly into the interior, seeing that they end in a decreased screw which hardly reaches to the interior surface of the inner cupola. Of course, this objection cannot be urged against chilled-iron shields whose special characteristic is the total absence of langridge. Details, such as position of bolts, ventilating holes and the like, might be varied at any time. It may be noticed that the report of discharge of the gun is surprisingly little heard inside a shielded mounting. In the practice made at targets at Tangerhütte, there was, in the judgment of some of those best qualified to speak, great room for improvement, and the same is true of some of the operations, such as getting a portable shielded mounting out of its counter-sunk position. No one, however, would go all the way to Magdeburg merely to see accurate target practice, which is only material so far as concerns the efficiency of the

guns. For example, if the oscillation or vibration of the guns fixed in the hoods had affected the practice, there would have been a valid cause of objection. This was not the case, and errors in setting fuzes or time lost in getting the exact range do not concern us. In conclusion the most remarkable design and features exhibited may be repeated :—(1.) Simplicity, efficiency, and speed of the quick-fire gear. (2.) The power of the quick-fire field guns when the recoil was checked. (3.) The nave brake employed. (4.) The power of heavier guns on naval mountings, where automatic recovery took the place of non-recoil. (5.) The behaviour of the movable shielded mountings dragged by horses, and got in and out of gun pits. (6.) The erection of the heavier shield and gun mounting in $1\frac{3}{4}$ hours. (7.) The behaviour of the heavier guns in the hoods or cupola tops, which were held on a centre pivot and rested loosely in their surrounding glacis or other rings.

Spezia Turrets and Krupp and Armstrong Heavy Guns.

The two turrets for the defence of Spezia harbour,[1] each mounting two Krupp 119-ton guns, were completed in 1891. The total running weight of each is 2050 tons. The armour is of Gruson's chilled-iron, proved in 1886, as before stated. The carriages and working gear was supplied by Elswick. A cupola turned a complete revolution in 1 minute 45 seconds, using a single engine out of the four provided for it. These turrets are by far the most powerful erections of their class yet made. It is stated that the 119-ton guns at Meppen have achieved on one occasion a muzzle energy of 57,950 foot-tons or 488 foot-tons per ton of gun. The Elswick 111 (or $110\frac{1}{2}$) ton gun has achieved 57,630 foot-tons, or 519 foot-tons per ton of gun. The charge at Spezia for the Krupp gun is 300 kg. (661 lbs.), the projectile weighs 920 kg. (2240 lbs.), the muzzle velocity is 1821 f.s., and the consequent energy 46,630 foot-tons. The service tables give for the Elswick 111-ton gun, a "full charge" of 960 lbs. S.B.ca. The projectile weighs 1800 lbs. The muzzle velocity is 2087 f.s., and energy 54,390 foot-tons. It appears then from the above that Krupp has on one occasion obtained greater energy than Armstrong, but it is difficult to say how far each gun is strained in the effort to obtain great energy. It may be questioned if the makers know it themselves. The service achievement at Spezia is modest compared with that of the Armstrong fired with the full charge, but the former may be intended for more habitual use than the latter. It may be briefly said that the 111 and 119-ton guns are of about the same power, the latter ought not to be stronger than the former, because the Krupp wedge system wastes a large mass of metal at the breech.

Perforation Trials at High Velocities to Test Formulæ.[2]

Most British and foreign formulæ give perforations which agree

[1] *See* "Brassey's Annual," 1891 and 1892.

[2] The author's attention was called to this subject when dealing with results calculated for very high velocities communicated to him by Canet, Krupp, and Armstrong. In consequence he has endeavoured to induce authorities, British and foreign, to investigate the question.

closely at about 1580 feet velocity. At lower velocities the English formulæ give greater perforation than the foreign, and at higher velocities the French formula of De Marre gives the highest result, that of Krupp comes next, and last the English, as shown in the table below calculated for the 6-inch 100 lb. projectile.

Formula.	Perforation through wrought-iron in inches. Striking at 1000 feet.	Striking at 1580 feet.	Striking at 2400 feet.
Fairbairn	5·92	9·88	15·26
Maitland	5·87	9·72	15·26
J. de Marre	5·01	10·13	19·25
Krupp	4·94	9·82	18·39

At higher velocities matters are still worse, the calculated perforation for the projectile, weighing 28·7 lbs., fired by Canet from a 10^{cm} (3·94-inch) gun, 80-calibres long, on September 20th, 1892, with a muzzle velocity of 3365 f.s., would be by De Marre 20·2 inches, and by the English formulæ less than 14·5 inches.

With a view to test the formulæ at high velocities, the Ordnance Committee, on July 20th, 1892, fired a 6-inch Holtzer forged steel projectile, with a striking velocity of 2378 f.s., at a target made up of two thicknesses of wrought-iron (12 inches + 5 inches), that is, 17 inches in all. By Fairbairn's formula this projectile should not perforate over 16 inches in two plates. By De Marre* it should pass clean

* The formulæ here employed are those communicated by Lieut. Perry, U.S. Artillery, viz. :—

$$\text{De Marre's} \quad \ldots \quad t^{0.65} = \frac{w^{\frac{1}{2}} v}{\log^{-1} 2{\cdot}9616\, D^{\frac{2}{4}}}$$

$$\text{Krupp's} \quad \ldots \quad t^{\frac{4}{3}} = \frac{w\, v^2}{\log^{-1} 5{\cdot}7776\, D^{\frac{5}{3}}}$$

Where t = thickness of wrought-iron perforated in inches.
w = weight of projectile in lbs.
v = striking velocity in feet.
D = diameter or calibre in inches.

through the plate, with a remaining velocity exceeding 1000 f.s. and by Krupp's about 890 f.s. On this occasion the shot actually perforated, and passed on for 1600 yards. Velocity screens had been erected behind the target. There was some uncertainty in the record owing to the flying off of a piece of iron from the target, but from screen and calculation as to graze, the remaining velocity appears to have been between 560 and 690 f.s.

Subsequently on November 15th, 1892, two rounds were fired from the 4·7-inch gun with 45-lb. shot, with a striking velocity of about 2217 f.s., both projectiles, however, broke up. They were not Holtzer's make, and there was some evidence that they were not flying truly; nevertheless, it appears that great excellence is required in projectiles striking even wrought-iron at a very high velocity, for their full calculated perforation to be realised.

(To be Continued).

ACHIEVEMENTS OF FIELD ARTILLERY.

BY

MAJOR E. S. MAY, R.A.

PART VII.

Recent Experiences and Conclusion.

Since the war which we last dealt with, Field Artillery has had no opportunity of distinguishing itself on anything like a large scale in Europe, and although there have been numerous wars abroad, some of which, such as that in Afghanistan and the Egyptian campaign of 1882, called large numbers on both sides into the field, the employment of guns, owing to one cause or another, has been such, that but little except on a small scale has been accomplished. Yet, as regards our own wars at least, it may be safely asserted that the discipline, bravery, and efficiency displayed by our batteries, under circumstances often more trying than any European soldiers have ever been called upon to face, has been equal to anything which the mighty conflicts we have been dealing with called forth.

If in these pages we were merely recounting a history of gallant feats, they might justly be studded with the names of individuals, and the deeds of small detachments of the arm would again and again have to be recorded. In every one of our small wars guns and gunners have merited substantial praise, occasionally individuals have even gained brilliant distinction, and it is no small satisfaction to the Royal Artillery that on at least two notable occasions,[1] when disaster such as we have rarely had to face fell on our arms, artillerymen, by their excellent discipline and staunch courage, were able to materially assist in averting complete ruin, and that the larger share of the few laurels that were borne home from those sad fields was admittedly theirs. Since, however, we are chronicling only achievements on such a scale as may instruct us with regard to the tactics of the arm in civilised and methodical warfare, and have regarded the subject as it is studied amongst continental soldiers, we can scarcely stay to examine performances affected under conditions which, viewed from this standpoint,

[1] The manner in which the Horse Artillery (E/B., now 58th Field Battery), under Captain (now Colonel) J. R. Slade behaved during the retreat from Maiwand, and the conduct of two guns of N/5 (now 2nd Battery 1st Depot Division) at Ingogo, are the instances referred to. With reference to this latter engagement there appears to be little doubt that but for the gallant stand made by the artillery, nobly assisted by some of the 60th Rifles, who, when the detachments had been much cut up, lent their aid to work the guns, the attack of the Boers would have been pressed home with the same vigour and success as it was subsequently at the Amajuba Mountain. Captain Greer, R.A., was killed about 1.30 o'clock, and then Lieutenent (now Major) C. S. B. Parsons, the only other officer with them, continued to fight the guns till dark, although severely wounded himself—the casualties amounted, in addition to those already specified amongst the officers, to 14 horses of 27, and 16 men out of 27.

are more or less abnormal. Difficulties of transport, the nature of the country, or the devoted fanaticism of a countless enemy have often compelled us to abandon all that the experience of Europe has taught us, and to fall back on formations and tactics primitive but effective. The exploits of a couple of mountain guns at the corner of a square, or field pieces in line with the infantry, like the battalion guns of a bygone period, have vindicated the training and pluck of our gunners and their officers on many a sandy waste, bleak hill side, or sun-scorched desert. But just as many gallant feats on a small scale have been omitted from our previous campaigns, so must these of more modern days, fresh as they are in our own memory, now be left. No breath of disparagement, however, hangs round such omission, but rather that of keen regret at being compelled to leave what we would most willingly have enlarged upon.

The Last Afghan War, 1879-1880.

Yet there was a battle fought in the Afghan campaign of 1880 which should have complete notice in these pages, and deserves mention even among the classic achievements of artillery. For, on the occasion we refer to, not only did the batteries engaged play a share in the fighting such as was distinctly and unmistakeably predominant, but they displayed qualities on the march, which led up to the fight, such as are unsurpassed in the records of any army, and, moreover, they faced odds such as none but English batteries have ever opposed successfully.

The battle of which, therefore, artillery has so much reason to be proud is that of Ahmed Kehl, about which in this country far too little has yet been heard. Yet the battle, and the trying march which preceded it, are especially remarkable and interesting to us, because in them a battery armed with every type of field piece was represented. The giant's share of the fighting fell, it is true, to Horse and Field Artillery, but the prompt intervention of a heavy battery was also invaluable at a most critical moment, while, although the Mountain Battery (11th)[1] with its 7-prs. was too far to the rear on the line of march to arrive in time to take part in the actual fighing at Ahmed Kehl, it showed its good qualities on many weary miles of road, and in the subsequent action on the 23rd of April did excellent service.

When at the end of March 1880, Sir Donald Stewart started to march to Cabul, it must be remembered that the inhabitants of the districts he passed through had not as yet felt the power of our arms, and were ready, therefore, to actively obstruct, and, by refusing supplies, render our progress as difficult as possible. Five days' rations were carried with the force, and while its path lay through the province of Kandahar no great difficulties were experienced. Once, however, that it was fairly beyond the pale, signs of trouble were soon apparent. A holy war had been preached along its path, and even those incapable or unwilling to bear arms might accomplish much against the invaders by merely abstaining from assisting them. Thus it was that the tillers of the soil disappeared as the hated column

[1] Now the 2nd Battery Eastern Division.

made its appearance. Villages were left deserted, the inhabitants either carried off, destroyed, or concealed the stores of grain they might have sold with advantage, and soon like a dark shadow another column, gathering in size as it proceeded, dogged the footsteps of our men, ever kept pace with them as they moved, and hung, a continual menace, on the flank.

Under such circumstances it will readily be understood how difficult and harassing a duty was that of obtaining supplies. At the end of a tiring march, on indifferent roads, with the enemy hovering within sight, weary men and jaded horses had again to turn out to hunt out and bring in forage and rations. The hiding places were by no means easy to discover, and the grain had frequently to be dug from beneath the floors of the houses where it had been buried. Where there were so many mouths, too, a wide area had to be covered to find enough for all. To obtain provender sufficient to supply the wants of a heavy battery at war strength under such conditions would alone have formed no easy task,[1] and in this instance the labours were added to by the presence round us of a horde of Hazaras, who crowded in upon the flanks, burning, destroying, and plundering the houses and property of the hated Afghans, and many a village was cleared of grain that would have been welcome to us by these unsatisfactory allies.

On the 18th of April, General Stewart encamped at Mushaki, two long marches south of Ghazni, and the enemy also pitched his camp a few miles away from ours. Information reached him that evening that the tribesmen would on the morrow make their stroke, and would most probably be found drawn up to bar our progress on some hills dominating the line of our advance six miles ahead. The chance we had been waiting for had come, and, warned in time, the force moved out cautiously at dawn the next day in the following order :—

General C. H. Palliser led the advanced guard, which was composed and moved as follows :—the 19th Bengal Lancers, "A" Battery, "B" Brigade, R.H.A.,[2] 19th Punjaub Infantry, the Head-quarter Staff accompanied by two escort companies, one of the 2nd 60th Rifles, and the other of the 25th Punjaub Infantry, while one troop of the 19th Bengal Lancers, two companies of Bengal Sappers and Miners brought up the rear.

Then followed the brigade commanded by Brigadier-General R. J. Hughes, which was formed of the 57th Foot, 2nd Ghoorkas, "G" Battery 4th Brigade, R.A.[3] with six 9-prs., 6th Battery 11th Brigade, R.A. armed with two 40-prs. and two 6·3-inch howitzers, and the 2nd Punjaub Cavalry.

In rear of these again moved the Field hospitals, baggage and other impedimenta, and, finally, Brigadier-General Barter's brigade, with which marched the Mountain Battery,[4] formed the tail of a column that extended for six long miles to the rear.

[1] An Indian heavy Field Battery's war establishment comprises 13 horses, 18 elephants, and 300 bullocks.

[2] Now "F" Battery, R.H.A.

[3] Now the 69th Field Battery.

[4] Commanded by Major Noel Harris, R.A.

About an hour after starting, when seven miles had been covered, the enemy were sighted in position some three miles away covering the hills on our left and on a col over which the road to the front led. The dense masses stretched round on the right also, so as to envelop our force as it moved forward.

General Stewart's dispositions were soon made. The Horse and Field Batteries were sent forward to take up a position opposite to where the roads crossed the hills, General Hughes's brigade being deflected to show a front towards the spur running parallel to the line of advance which was strongly occupied by the enemy. The cavalry and Horse Artillery being possessed of greater mobility than the other troops, outmarched their comrades while advancing into their positions. When, therefore, the Horse Artillery unlimbered the slower moving battalions were still so far behind them, that the two escort companies of the Head-quarter Staff were at first the only infantry within half-a-mile.

It was not anticipated that the enemy would at once assume the offensive in the manner he did, and, therefore, the artillery were ordered to get within 1500 yards, but not to open fire until the infantry had caught them up. Leisurely, therefore, did they bring their guns on to a tempting hillock, and, while the cavalry was moving to guard the rear of either flank, proceeded to set about finding the range in the orthodox fashion of the day. It was not at first realised that the enemy's line extended so much on our right flank as it did, and the chief danger was looked for naturally from the left, for we were in fact making a flank march in the presence of the enemy. Hardly, however, had the trails touched the ground when the inert mass on the hill tops became violently agitated, and with much shouting, tom-toms beating and banners waving, dense swarms of the foe, both horse and foot, came rolling down upon the head of our column. Both their flanks were thrown forward after the fashion of a Zulu impi, and our right was rapidly enveloped by the same crowded masses as our left. Taking ranges when the target was thus rushing onwards was of course futile, and, indeed, the difficulty was to shorten the lengths of the fuzes with sufficient rapidity. For a brief period the Horse Artillery had alone to stem the rush, then "G" Battery, 4th Brigade,[1] galloped into action alongside them. Twelve guns were thus opposed for some minutes to the charge pushed home with fanatical contempt of death of a force of Ghazis, which has been variously estimated at figures varying between 3000 and 5000 men.[2] Considering the difficulty so rapidly moving a target must have presented, both guns and rifles made excellent practice, and the evidence of officers engaged stoutly maintains that the artillery need never have shifted their ground had

[1] Under the command of Major Sir John Campbell, Bart.

[2] A letter, dated the 21st of April, 1880, from Lieutenant (now Major) P. F. Hamilton, R.A., who was with the two right guns of "A" Battery, "B" Brigade, thus describes this phase of the action:—"Although twelve field guns were making most excellent practice, and the two companies were laying many low before them, the advance was in no way checked, and I was laying a gun at a hundred yard's range at some Ghazis when our Major rode up and said, 'Why don't you limber up?' I then saw that the centre and left divisions had limbered up, and that there was no time to lose. We had just time to limber up and gallop to a hill 120 yards in rear; action rear again, and hard at it with case and shrapnel."

BATTLE OF AHMED KHEL.—19th April, 1880.

a. Position of two escort companies during charge of Ghazies.
b. 1st position of G/4.
c. 1st position of A/B.
d. 2nd " G/4.
e. " " A/B.
f. Position of Tillard's guns.
x y. False direction of charge of portion of 19th Bengal Lancers.

more case shot been available,[1] but, as it was, the wild swordsmen surged onward so fast that to burst shrapnel was impossible, and the few rounds of case were soon exhausted. In spite of the bold front they showed, therefore, the guns were ordered to fall back.

The late Colonel de Grey Warter of the Horse Artillery, who then as Major commanded "A" Battery, "B" Brigade, always maintained that his guns would never have been even momentarily lost had they never left their original position. To make an orderly retirement under such circumstances is even a higher test of discipline, however, than to remain doggedly in position, and the coolness and skill with which the short retreat was effected evoked admiration from all who saw it. [2]

It is to be noted also that it had never been intended to thrust the artillery so far forward, and that the eagerness of its commanding officer had caused him to exceed his instructions. Colonel Chapman,[3] R.A., the Chief of General Stewart's Staff, at once observed the faulty position the guns were in, and was endeavouring to get it rectified when the torrent burst upon them.

But the 59th Regiment of British infantry had to face to their left to withstand the onslaught of the Afghans before they reached the position where the guns were, and it was impossible to move them forward now to close the interval which was thus left open between the guns and the infantry. It was into this gap that the Ghazis first made their rush, and in order to meet it General Stewart's escort, consisting of one company of the 60th Rifles and one company of the 25th Punjaub Native Infantry, under Captain Davidson[4] of the 60th Rifles, with the intuition of self-sacrifice, threw themselves into the breach ahead of the Reserve, which was formed by the 19th Punjaub Native Infantry. It was through a mistaken order that the companies were thus utilised, but the moment was an extremely critical one, and their intervention was most opportune and effective. Yet, in spite of all their efforts, the rush of Ghazis penetrated so deeply into our line that they got within twenty yards of Sir Donald Stewart and his Staff, who actually drew their swords and prepared to defend themselves. The crisis, however, was of short duration, and the breech-loader in steady hands was too much even for the brave fanatics. Sharp volleys struck the charge of the Afghans in flank as they swept down on the guns, relieved the pressure, and enabled the two batteries to get away to the position some 120 yards further to the rear, where it was originally intended that they should have been placed.

While matters were thus progressing on the left and centre, the 2nd Punjaub Cavalry took care of the right, and by a series of charges, which for brilliancy were not surpassed during the war, covered the

[1] The official report of Colonel A. C. Johnson says:—"The attack of the enemy was so fierce and rapid, that within twenty minutes of the first gun both batteries had fired the whole of their case."

[2] General Stewart's despatch says—"The gallantry with which the batteries maintained their ground till the last moment, and the orderly manner in which the retreat was effected, reflected the greatest credit on officers and men."

[3] Now Major-General E. F. Chapman, C.B., head of the Intelligence Division at the War Office.

[4] Now Major Davidson, A.-D.-C. to H.R.H. the Commander-in-Chief.

retirement of the guns, and drove away the swarms who were endeavouring to envelop the right of our position.

Meanwhile on the left of the guns, where the 59th Regt., 2nd Sikhs, and 3rd Ghoorkas were moving up into position, the same determined onset had been made—two squadrons of 19th Bengal Lancers were moving into the place that had been assigned to them at a trot when the storm burst, and taken somewhat by surprise as they were, and the ground being uphill, the charge they delivered was indecisive.[1] In the *melée* which ensued the Ghazis got in amongst the cavalrymen, and the lance at close quarters was no match for the tulwar.

To make matters worse, one troop in the confusion lost its direction and rode wildly into the heart of our position behind our infantry. All was in the greatest confusion for a moment in consequence, the ammunition mules stampeded, while riderless horses rushing onwards came smashing into our reserve in rear of the Head-quarter Staff. The Ghazis on our left took advantage of the confusion and got completely behind our line at this end of it. Moreover an order had been sent to the 59th Regt. to throw back their right to check the rush of foemen that was pouring into the weakly held gap that lay between them and the guns. The words were misconstrued to mean the retirement of the whole regiment, and the exulting foemen, flushed with their success, were soon engaged also at this point in a hand-to-hand conflict with our men.

But the 3rd Ghoorkas on the left were thrown into company squares with cool promptitude by Colonel Lyster, V.C. The 2nd Sikhs, next to them, also behaved with splendid steadiness, and the 59th Regt., rallying once more, the persistent fire of these three regiments was too much in the end for their brave opponents.

The artillery, too, in their new position had not been idle, and the Afghans were literally mown down with the case and reversed shrapnel of the guns.[2] An officer present on that day wrote home at the time, "up to this, although we had made good practice, we had been obliged to retire, but, after taking up their new position, the two batteries soon cleared their front, and there was a ghastly pile of dead heaped on the ground we had just left."

While the action was thus being fought in front, the long baggage column, with its enormous collection of artillery bullocks and all the accompaniments of such a force as was engaged stretched far to the rear, was also menaced by another swarm of the ubiquitous enemy, who was gathering on a hillock to our left rear. The opportunity thus afforded our heavy battery, under Major F. A. Tillard,[3] was not allowed to slip, and a well directed shower of their powerful shells, aided by the fire of the baggage escort, soon dispersed and drove away these threatening hordes, and their contemplated raid was thus choked at its very outset.

[1] These two squadrons lost in this charge 3 officers and 17 men wounded, and 5 men killed.

[2] The official report of Colonel A. C. Johnson states:—"I cannot speak too highly of the steadiness and coolness of officers, non-commissioned officers and men of A/B. R.H.A and G/4 R.A., they worked their guns as if on parade, till they had turned the enemy with case shot within 25 yards of them."

[3] Now Major-General Tillard.

The battle affords a splendid example of what discipline and courage can effect even against overwhelming numbers. The enemy's strength was estimated at some 20,000, and to face it we had but 1300 rifles. The greatest credit is surely due to our gallant infantry, nor must the services of our cavalry either be overlooked. Nevertheless it is strictly true to say that the honours of the day rested with the guns, and that, had they not stemmed the first rush, as they did almost alone, our losses, even supposing that no worse result had ensued, must have been immensely heavier. As it was, it is not too much to say that no artillery has ever been called upon to repel a more determined charge upon them, a charge which no Europeans would probably ever have ventured to make at all, and which they certainly would never have delivered with the same ferocity and recklessness.

The effect of their fire, too, was something of which the Artillery may be proud. The estimate made at the time was that of the 1100 Afghans, actually counted on the ground, who were killed, 400 were slain by artillery fire. An officer of the Horse Artillery,[1] after the fighting was over, walked to where his guns had at first stood and counted on that spot alone 118 dead Ghazis palpably slain by artillery projectiles.[2]

The cavalry regiment which hurried on with reinforements from General Barter's brigade only arrived in time to take up the pursuit, for the fight was over in little more than an hour, but after our men had been called back the wild Hazaras persecuted their demoralised foes relentlessly. It says much for the discipline and physique of our battalions that, after such a trying experience, they should have marched as they did nine miles further that day with ease.

The effect of their victory was great and far reaching. The terror our guns produced was so abiding that the spirit of the enemy was broken, and Ghazni, for the bombardment of which the heavy guns had been brought, was abandoned without a struggle. Never before had the Afghans suffered so severely, and never had they received a sharper evidence of our superiority. Hardly a house between Kabul and Kandahar, but held a wounded man for weeks to come, and the villagers, cowed by our success, no longer dared to refuse to place their resources at our disposal. Ahmed Khel, in fact, paved the way for Lord Roberts's famous march later in the year, and but for its result, his force would scarcely have moved without molestation, or found the supplies along the road it did.

And now, among the barren hills of that wild region, there stands a shrine dedicated to the memory of 1100 "martyrs," who perished at our hands that day. It keeps a story of reckless bravery green in the hearts of a race, our foemen by creed and instinct, but to us it means something too, and surely every Englishman who should chance to visit that lonely spot will associate it with a no less splendid example of

[1] Lieutenant (now Major) P. F. Hamilton.

[2] The Field and Horse Artillery fired on an average 30 rounds per gun. Lieutenant Hamilton says—"All our case shot went, and we could have done with three times as many." Captain Corbett (now Lieut.-Colonel) R.H.A. was wounded, and so were three drivers, according to the same authority, but as a rule the enemy's bullents flew too high, possibly owing to the smoke of the rapid fire which hid the battery more or less.

courage on the other side, and will not fail to remember a battle on which all arms may justly look back with satisfaction, but of which our Field Artillery has especially reason to be proud.

On the subsequent more celebrated march no wheeled artillery accompanied the column, but for an excellent reason.[1] The co-operation of guns of powerful calibre from Kandahar could be reckoned upon in the decisive battle which, if it were fought at all, would take place in the neighbourhood of that fortress, and where mobility was a chief consideration, and bad roads militated against the use of wheels, the services of Field Artillery proper were rightly dispensed with. The value of the arm was scarcely likely to be overlooked in a force led by an artilleryman, who, moreover, was assisted by the same Chief of the Staff as had just accompanied Sir Donald Stewart, and whose high appreciation of the services of guns has just been quoted. But on that celebrated march, though no predominant share of the fighting fell to guns, yet was the Royal Artillery well represented by its Mountain Batteries, and the fact that the leader, who carried through one of the most successful of our military enterprises, and his principal Staff officer both belonged to their arm will ever invest the march to Kandahar and the subsequent battle with a special interest for artillerymen.

The Campaign in Egypt of 1882.

During the campaign of 1882 in Egypt, although as many as seven Field and two Horse Batteries, and one Mountain Battery were brought into action at Tel-el-Kebir (the largest number that had figured on our battle-fields since Gujrat, with the exception of the Alma, when we had about the same number), the brilliant and decisive nature of our assault rendered the force more or less independent of guns, and called for, and gave no opportunity, for heroic efforts on their part. The great triumph of the campaign was effected by means of a night march and a surprise, and under such circumstances the principal *rôle* fell naturally to infantry, and was amply filled by them.

At Tel-el-Kebir 42 field guns were formed up in line within musketry range of the intrenchments between our 1st and 2nd Divisions, and owing to the nature of the operations no attempt to prepare the way for the infantry assault in the orthodox manner was attempted. The

[1] Extract from lecture delivered by Lieut.-Colonel E. F. Chapman at the Royal United Service Institution on 9th March, 1881:—"It is beyond question, that whenever Afghans have been possessed of wheeled artillery during military operations, they have been so hampered by their guns as to be easily vulnerable, and in mountain warfare generally, a commander will gain less by the possession of guns, other than mountain guns, than he will lose by having his march restricted to regular roads. The important part, however, played during the battle of Ahmed Khel, in April last, by a battery of Horse Artillery, a light Field Battery, and a heavy Field Battery, when scores of fanatics were killed by case shot fired from the 9-prs., and when well-directed shell from the 40-prs. checked a turning movement undertaken by the enemy's horsemen, should not be forgotten. We may well be proud of the work our gunners did on that day, and acknowledge that the 1300 rifles which formed the fighting line of infantry could scarcely have withstood the charge of 3000 fanatic swordsmen, if they had not been supported by Field Artillery. The movement of Sir Donald Stewart's force, when he marched from Kandahar to Kabul, was, however, regulated by the pace of the heavy guns which accompanied it. Its first objective was Ghazni itself, and the possession of wheeled artillery was essential to its purpose. It would have been impossible for 40,000 of the enemy to have collected, and to have delivered an attack, such as was made at Ahmed Khel, against troops moving as rapidly as did those under Sir Frederick Roberts's command, the essential qualities of the force he led to Kandahar being mobility and striking power."

guns were relied upon to support either division should it meet with a check, and cover their rally for a second effort. The official account of the war states that the effect produced by our guns on the Egyptians throughout the campaign had been immense, and that it was expected that in the event of our meeting with a reverse our artillery fire would have been overpowering.

Had the divisions not carried the position with a rush, artillery, completely in the open under musketry fire from an intrenched foe flushed with the repulse of an infantry assault, must have been placed in so trying a situation that it says much for what our guns had done on previous occasions that it was in contemplation to assign it to them.[1] The infantry, however, fully answered the demands upon them, as it was tolerably certain that they would, and therefore the guns were never really called upon in the last action of the war.

The marked effect which artillery had produced on previous occasions having been referred to, it is right to notice the part played by a weak detachment of the arm in the very first fight which took place on the banks of the canal. It is on a very small scale, but the impression made by the guns was far-reaching, and the behaviour of those who handled them under trying circumstances formed one of the most brilliant episodes of the short struggle.

When the force which was intended to strike the decisive blow of the war landed at Ismailia, it was found that the water in the sweet water canal was rapidly falling, and that the enemy were endeavouring to cut off our supply. It therefore became desirable to push forward a small force rapidly to protect the canal from injury, and, as the spot at Magfar where injury could most readily be inflicted, lay but a few miles to our front, it was happily possible to start it off immediately.

On the 24th of August, therefore, a force consisting of three squadrons of Household Cavalry, two guns of "N" Battery, "A" Brigade,[2] R.H.A., a detachment of the 19th Hussars, and some Mounted Infantry were sent to join General Graham at Nefisha, and, with the 2nd Battalion York and Lancaster, and Royal Marine Artillery, moved out under him for Magfar.

The enemy's outposts at Magfar fell back before the advance of our cavalry towards Tel-el-Maskuta, a point on the canal where it was now ascertained that a second dam had been constructed, and that a strong force of his infantry was there in position.

Seeing an opportunity of striking a more telling blow than would be involved in merely destroying a dam, Sir Garnet Wolseley determined to push on and engage the enemy in an important action. A message was, therefore, sent to Ismailia to call forward the brigade of Guards and all the artillery and cavalry that were disembarked and ready to move.

Meanwhile a delaying action must be fought by what had become the advanced guard of the force behind.

General Graham's infantry were got into position, therefore, about 3200 yards from the enemy's position on the Tel-el-Maskuta dam, and

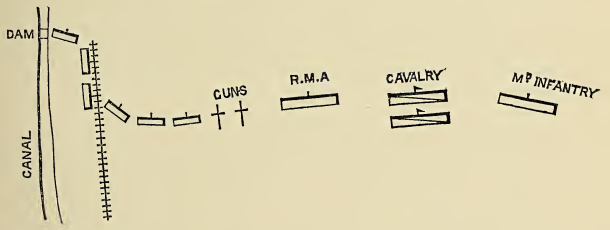
[1] "The Campaign in Egypt in 1882," by Colonel J. F. Maurice, p. 74.

[2] "N" Battery, "A" Brigade was reduced in February, 1884, and has never been re-formed.

a position was selected for the two Horse Artillery guns on the shoulder of a sand hill 600 yards from the canal, and between the infantry and the Marine artillerymen.

The cavalry and mounted infantry watched the enemy on some high ground on the right flank, and manœuvred to prevent his enveloping us there.

At 9 a.m. the Egyptians opened a distant but heavy musketry fire on the cavalry. They also extended their right beyond the canal, and advanced bodies of all three arms to within 2000 yards of our line in front of it. At 9.40 four guns began to fire on the hillock where our artillery stood, and a quarter-of-an-hour later two more were brought into action. The practice of these guns was good, but their fuzes did not act properly, and consequently their shrapnel was ineffective, while the soft and sandy nature of the soil also militated against the effect of their common shell and percussion fuzes. But for this our losses would in all probability have been severe.



Meanwhile Sir Garnet reserved the fire of our guns until the enemy should approach to a more decisive range.

About 10.30, however, as the fire of the six hostile guns was annoying our cavalry considerably, it was judged better to engage them with ours, especially as a trial shot (the range-finder had exaggerated the distance by more that 1000 yards) showed that they were within effective range. Two rounds of shrapnel caused some of the guns to be withdrawn further to the rear at once, but from thence the six guns turned their fire on our two.[1]

At 12 o'clock the enemy had brought reinforcements on the scene, which worked round our left, and a fresh battery from their right flank enfiladed and even took in reverse the position occupied by our infantry and artillery.

Two Gatlings and a party of sailors also now arrived, however, to our assistance, and our line was thrown back at right angles to engage the new enemy, whose fire was replied to by one machine gun and one of the Horse Artillery guns. A hillock supplied cover to our limbers and wagons, and the sandy soil again befriended us, or we must have suffered very severely.

The second Gatling was sent to the aid of the infantry on our left

[1] The first battery consisted of rifled bronze muzzle-loaders, the second were Krupps.

flank. The extreme heat of the day, and the labour entailed in running up guns between each round in the heavy sand, rendered the labours of the gunners very arduous, and several men succumbed, overpowered by the sun's rays. Yet the pluck and endurance of those who remained made up for paucity of numbers; the fire of our two guns never slackened, and its steady continuance was of most invaluable service to our force. The official account thus recognises the gallantry of the detachments :—

"The extreme heat of the day, to which one man after another succumbed, and the severe labour entailed upon the gunners in keeping up a constant fire against a very superior force of artillery in very favourable positions, were the greatest dangers to which the troops were exposed. For there could be little doubt that if our guns had been even for a time silenced, either because one of the shells which were constantly passing from both directions just over the heads of gunners, drivers, and horses, every now and then killing a horse or breaking a leg, had exploded in a wagon, or if the labour of pushing up the guns after each recoil through the heavy sand had so exhausted the men as to prevent their replying promptly to the Egyptian artillery, the enemy would have acquired a confidence which would have induced him to try his greatly superior numbers in a close attack, which we had barely sufficient numbers to meet."[1]

As time went by, however, the situation grew more favourable to us. At 1 o'clock the infantry from Nefisha made their appearance, and we possessed a substantial reserve. At about a quarter to three o'clock, however, two shells in succession had taken effect in our brave little battery, killing on the spot two men and several horses, and some Marine artillerymen were sent by General Willis to the aid of the division,[2] or section as it is now termed, which had been in action for five hours against six times its strength in guns. And it is to be recorded that when the gunners were faint and weary the drivers volunteered to take their turn at the wheels. Otherwise it would have been impossible for their comrades to have borne the strain as long as they did. As it was, not only did the drivers share their labours, but a well-arranged system for bringing water from the canal was adopted, and by pouring it over the heads of exhausted men, keeping as many as possible under the shade of the wagons, and only exposing to the sun those who were indispensable, the strength of the little band was husbanded. Such was the spirit which animated it that it was not willingly that the aid of the Marine artillerymen was accepted. These last, whose aid was indeed indispensable, bore their share of the labour with most cheerful alacrity for the remainder of the day.

For it was not until past 6 o'clock, when the Guards, after a most trying march, arrived, that the two 9-prs. were relieved by the remaining four guns of "N" Battery, "A" Brigade.

An hour earlier our cavalry had received a reinforcement of 350 sabres, and as his chances grew visibly less, the enemy's attacks became more hesitating, until they completely died away towards evening.

[1] "The Campaign of 1882 in Egypt," page 49.

[2] Lieutenant (now Major) S. C. Hickman was in command of these guns.

The first action of the campaign had ended successfully, and a great moral effect had been produced. No small share of the success was due to the steadfast behaviour of the artillerymen, who had waged an unequal struggle all day with a gallantry that made their feat one of the most celebrated features of the campaign.

The War between Servia and Bulgaria in 1885.

For our next illustration we must refer to a combat fought under widely different circumstances, and yet in one respect closely resembling, as far as the force engaged is concerned, the one we have dwelt on just now.

During the late Servian and Bulgarian War, at the battle of Slievnitza, an incident occurred which not only is interesting as an example on a small scale of exceptionally gallant behaviour on the part of a small force of artillery, but is invested with a special importance in our eyes, because it enables us to form some idea of the effect which shrapnel of modern type scientifically used is likely to produce.

Lieut.-Colonel D. D. T. O'Callaghan, R.A.,[1] has called attention to this example, the most valuable we have had in recent years of an artillery duel which, though but what would have been termed a very minor incident on one of the great battle-fields, in the absence of war experience with our improved weapons may justly claim our attention.

At Slievenitza we find the Bulgarians with an inadequate force defending a long line. The Servians, in place of assailing the weak flanks of their opponent's position, made repeated attacks on their opponent's centre where Prince Alexander had massed his best troops. These assaults were met with the greatest courage and stubbornness by the Bulgarian infantry, who were ably supported by their batteries, and were invariably repulsed. We are assured that the Bulgarian artillery was very admirably handled, and it is as a sort of sample of how well it bore itself that the incident we are about to describe has been quoted by Colonel O'Callaghan.

At one period of the action two Servian batteries (8 guns) opened fire on the left centre of their opponents at a range of about 1500 mètres, and Prince Alexander detached two guns under Captain Matthieff[2] to engage them. It will interest the officers of our Auxiliary Artillery to know that this officer was a reservist, and up to the outbreak of hostilities had been pursuing the even tenor of a barrister's profession.

His method of procedure is, however, worthy of the attention of the most experienced soldiers.

Selecting a position for his two guns which had just been occupied by some Bulgarian tirailleurs, he was able to ascertain the range with a near approach to accuracy. Then he led his two guns forward so as to derive all advantage which a fold in the ground could give them, and thus, partially protected, he unlimbered, and ran them by hand on

[1] *See* "An Artillery Duel," by Lieut.-Colonel D. D. T. O'Callaghan, R.A. No. 14, Vol. XVIII., "Proceedings," R.A. Institution.

[2] Colonel O'Callaghan walked over the field of battle with this gallant officer a few days after the fight and saw by the wheel-marks exactly where the guns had been brought into action, and the still recent evidences of the struggle.

to a flat-topped mound where he intended them to rest. The hostile guns meanwhile turned a rapid fire of common shells with percussion fuzes upon him.

The absence of reliable non-commissioned officers compelled him to adjust every fuze himself, and to this task he deliberately set himself, opening a methodical and careful fire of time shrapnel. His first shell was short; his second fell amongst a team in rear and did great execution; while his third burst about the correct distance short of the Servian batteries. With this length of fuze, therefore, he continued to fire, still adjusting each with his own hands, for six minutes; at the end of which brief period the Servian guns had had enough, and limbering up with great difficulty and with severe losses, both of men and horses, were taken out of action.

How trivial is the effect of the projectile which the Germans accomplished their achievements in 1870 compared with that which may be looked for from modern shrapnel is unmistakeably indicated by the story of this miniature artillery duel.

The ground (Colonel O'Callaghan, who examined it carefully, tells us) on which the Bulgarian guns were served was admirably suited for developing the full effect of percussion common shell. It was hard and gravelly, and here there was no chance of shells being "smothered," as those of the Egyptians were at Magfar. Eight guns were opposed to two, and only one man was available to do the most important part of the service of those two; naturally, therefore, many more projectiles were discharged by the larger number. In point of fact 27 grazes or small craters were counted round the wheel and trail marks of Captain Matthieff's guns; "yet," to quote that officer himself, "what did they kill?—a horse—he is there!" That was all that the concentrated efforts of eight guns firing the projectile that won Vionville for six minutes was equal to.

With reference to the effect of shrapnel, we may best give Colonel O'Callaghan's evidence in his own words:—"Riding over to the other side of the valley, across which this interesting duel had been fought, we had little difficulty in finding the position which had been occupied by the Servian guns. Rags, bandages, scattered pieces of uniforms and harness, all bore mute witness of the lawyer's skilful shooting, and showed that the eight guns had been beaten, and well beaten by the two, before they acknowledged that fact by limbering up.

A better comparison of the two natures of projectiles, time shrapnel and percussion common, could scarcely be made. Both were used under the most favourable conditions: that is to say, the shrapnel were used with nerve and consummate skill, while the common were favoured by ground that might be termed ideal."

Do we cherish but a vain hope, therefore, when we trust that, armed with the newer projectile, guns may look forward in the future to surpassing the achievements of 1870?

For two guns to put eight out of action under any circumstances is a splendid performance, but to do so in six minutes is so brilliant an one that any nation and any army might well be proud of it. When we remember that this feat was accomplished by guns which had

to move forward, unlimber, come into action, and obtain the range under the fire of opponents who had been some time in position and had guaged the distance accurately, we may well be astonished at the pluck and skill of the man who led them.[1]

And this feat, which we gladly insert amid achievements on a larger scale, was accomplished by a man without previous teaching beyond that of the schools.

The Chilian Civil War of 1891.

The incidents of another war of quite recent date, although the knowledge of modern tactics displayed by one side at least was deplorable, are not completely, however, without encouragement for artillerymen.

The records of the Chilian Civil War of 1891 will scarcely add much to our military knowledge. They are chiefly interesting because of the object lesson supplied by them with reference to the Mannlicher magazine rifle, and the risk of a vast amount of ammunition being wasted by men not thoroughly under control, was well illustrated.

There are two brilliant and successful charges of cavalry also to be noted, which will give encouragement for the future to admirers of the *arme blanche*.

The Constitutionalists further utilised the services of a battery of Krupp field guns of the modern pattern, and the effect of its fire is stated to have been most marked,[2] a most satisfactory result when it is considered how comparatively untrained were the gunners who formed its detachments.

The German artillery likewise take particular pride in pointing out that the man who was really responsible[3] for the success of the raw army which overthrew the tyrant Balmaceda, was Colonel Emilius Körner, who had been a German artillery officer, and was until 1885 Instructor in Artillery at the Artillery and Engineer School at Berlin, a position which he quitted to become Professor of Artillery, and subsequently Assistant Director of Military Education at Valparaiso.

Conclusion.

Having thus brought our brief narrative of the achievements of Field Artillery up to the present time, we may perhaps, ere we lay down the pen, be allowed a few observations in conclusion as to what the days to come may have in store for us. What lessons does the past enforce, and whither, if we read them rightly, are the signs of the future directing us? Will an arm which has been turned to such good account by the great soldiers in bygone years prove an incumbrance or a mighty weapon in the grasp of coming leaders, is a hail of musketry

[1] The Bulgarian guns were Krupps, of the 1878 model, firing a shell slightly heavier than that of our 12-pr. Colonel O'Callaghan says we may be assured that the armament of the Servians was similar.

[2] "Die Militärischen Ereignisse während des Chilenischen Bürger Krieges un Jahre, 1891." A pamphlet by Captain Schaumann of the German Army.

[3] It was not thought politically desirable that a national movement should be directed by a foreigner, and therefore Colonel Körner veiled his personality behind that of General Canto, and figured officially as a mere secretary to him.

to forestall the power and focus of shells, and is intensity of fire to supplant its concentration? Are guns to be dismissed to the dim horizon of the battle-field, or are they still to be played down as the trump cards in his hands by the General who can recognise the moment and its possibilities?

Let us take the main question first, for tactical considerations must ever take precedence of those which are merely technical. And it would seem, moreover, that the value of what artillery can be made to accomplish depends in the first place on the higher tactics of the battle-field, on the manner in which it is made to supplement and co-operate with the efforts of the other arms, and on its direction by a supreme leader handling it with perfect knowledge and confidence. Handling it, that is to say, with a full appreciation of its powers, with a bold liberal grasp, that adapts and bends materials to his purpose with the full decision that bespeaks the practised workman. The General must cease to regard artillery with that respect, akin almost to dislike, that distinguishes the superstitious awe with which the unknown or only partially understood is regarded by the unilluminated multitude. The tactics of artillery are invested with no scientific mysteries, and technical knowledge can be supplied by the experts who are to be found amongst its ranks. It is the Generals rather than the regimental officers, therefore, who require education if the most is to be got out of guns in the future. Frederick's blow at Rossbach, Senarmont's at Friedland, Napoleon's at Wagram, Lützen and Hanau; Blücher's at Bautzen, lead up to Longstreet's at Manassas, and Von Alvensleben's at Mars-la-Tour. The same spirit animates all these efforts, and the same impulse is given to the arm even though the age and the weapons stand separated by many decades and many scientific discoveries.

To descend to matters technical, it is to the shrapnel shell that modern gunners look to hold their place relatively to the other arms, and it is with no inflated rhetoric that they claim that the effect of modern artillery has been so greatly enhanced by its introduction that five times as great results may be hoped for from it than were attained by the German artillery in 1870.[1] The increased depth of the deadly zone, and the rapidity of fire which are rendered possible by modern improvements, have placed, according to a high modern authority,[2] a projectile in the hands of the gunner of to-day as effective at 3000 yards as was the old cannister at 500.

The same authority considers that modern artillery will, therefore, only thoroughly turn its powers to account if it accustoms itself to pick up the range quickly and accurately—even if it be obliged to keep at long ranges—and then pours in such a rapid fire as will annihilate its opponent. Artillery must act, as he, with a fine burst of enthusiasm, expresses it, "*par rafales*," that is to say, with the rapid and decisive

[1] According to Lieut.-Colonel Walford, R.A., the shells used by the Germans in 1870 gave about 30 or 40 splinters at the burst, while their present ring-shell gives 150 to 180 splinters, and their shrapnel discharges 262 bullets. The shrapnel, it is to be noted, has an excellent time fuze, which acts with regularity up to 3500 yards.

[2] *See* the opinion of Colonel Langlois, professeur à l'école Supérieure de Guerre, in his recent work "L'Artillerie de campagne en liaison avec les autres armes."

swoop of a cavalry charge, the crash of shells representing the rush of squadrons.

We are anxious to avoid introducing controversial matters into these pages, and we should be insincere did we disguise from our readers the fact that the suggestions just referred to touch upon debateable ground. Methods rather than principles have been, however, in dispute, and discussion in Germany has revealed something like a general acquiescence in the principles advocated. That is the point we wish here to accentuate, and it is only the broad tactical question we have in mind when we call attention to ideas which help to strengthen our contention that the most modern theories go to corroborate the practice of the past.

For here we may remark that the teachings of the past should have for us more significance than lies in the merely sentimental interest they frequently arouse, and that, if we consider them relatively and not absolutely, we may still derive benefit from their lessons.

The old smartness of drill and manœuvre which, until recent years, was invested with preponderating importance in the eyes of the majority of officers, had a very practical and useful basis. The cannonade which preceded the deployment of the columns, and searched the enemy's position, might be slow. It was never, and was never meant to be, decisive. When a decisive effect was called for, those leaders who understood how to turn guns to account massed them against the intended point of impact in the hostile array, and then a very rapid fire of grape was poured in at ranges within, often much within, 600 yards. To produce a decisive effect it was found that there should be no lull in the storm of missiles, no kind of hesitation, no opportunity for the other side to recover from its demoralising effect until the attacking infantry was upon them with the bayonet.

The rapidity of fire attained was also very much greater than is usually imagined. Decker tells us that each piece has been known to fire as many as five rounds per minute, and that an average of 2½, or 15 per battery of six guns was very usual.[1] That is how the guns at Wagram and Friedland produced their effect. Such a rapid fire was not of course of long duration, for its effect at short ranges was annihilating, but it was necessary to train a battery to be equal to it when the moment should demand, and at the supreme crisis it was essential.

[1] The extreme rate, it should be noted, was attained when guns were firing case, and it was not, therefore, necessary to run them up between the rounds. The continental rate of fire was probably greater than our own, for, according to my friend Colonel F. A. Whinyates, who has gone closely into the matter for me, the old S.B. R.H.A. 6-pr. of the Crimean epoch, which was identical (in some cases the very same guns were still in use!) with the weapon of the Peninsular days, would not usually fire more than three rounds of case per minute. The continental nations were formerly prepared to run more risk to procure celerity of fire than were we, even as now they are more prone to bring guns ready loaded into action, and carry fuzed shell in the limber, than we are, for the cartridge and projectile were attached together, as is the "fixed" ammunition of the quick-firing guns of to-day. Decker thus alludes to this practice:—"In the service of guns in the field it would be extremely inconvenient to load the cartridge and projectile separately, although this system has been adopted in the English artillery, and has the advantage of allowing powder and projectile to be kept apart in the caissons, by which accidents are often obviated. On the other hand, this method of loading delays the service of the guns, and in the tumult and heat of action there is a risk that the ball may be forgotten altogether." *"Traité Elementaire d'Artillerie."* p. 132 I believe the Sikhs were accustomed to carry their shot and cartridge in one bag, and were thus enabled to fire more quickly than did we in the campaigns of 1845 and subsequently.

In the case of cavalry actions, Horse Artillery, at the close quarters in vogue, had only a very few minutes to make their influence felt, and success attended those who could best turn the brief period to account.

It was not, therefore, through mere wantonness or love of theatrical display that "smartness" was cultivated in the old troops, nor is it open to us less fortunate in experience to deride methods that were the outcome of years of continuous active service, and which strove for and obtained efficiency solid and substantial.

Few will deny that mobility should still be the characteristic of Field Artillery, and there seems a probability that in the future the old rapidity of execution will also be asked for, although it will be linked with the necessity for greater accuracy, owing to the greater distances involved. We have in these pages already quoted the opinion of Prince Kouropatkin as to why the bombardment of Plevna failed, and we have insisted on the necessity of continuity in artillery fire at decisive moments. Kouropatkin in Russia is corroborated by Langlois in France, who, in his late work, argues that great rapidity of fire should be a leading characteristic of a capable modern artillery, because the effect of modern shrapnel will be so great that one side or other in the duel will quickly gain the upper hand. Moreover, he emphasises the necessity for continuity and rapidity of fire to clear the path for the assault, for the same reasons that made those characteristics necessary, if decisive effect were aimed at, in the days of grape and cannister.

And the necessity for rapidity of fire is recognised in Germany also. The distances will alter, but the same qualities will be demanded. For 500 paces substitute 2000, 3000, or whatever range the experiences of the next war will impose upon us. The vital point is that modern shrapnel fire may be made as destructive at the greater distances as ever was *mitraille* at the smaller, and the modern gunner, having got his range, must ply his fire with the same fierce energy as did his predecessor when he meant his blow to be a really paralyzing one.

And let the gunner bear in mind what has been said with reference to the number of hits not being decisive, but rather the rapidity with which these hits were obtained, when targets composed of flesh, brain, and nerves are in question.

As regards the system or methods by which good results are to be arrived at without rapidity being sacrificed, it is not convenient here to speak. Such a question bristles with controversial points which might be discussed at great length. Improvements in the construction of our ammunition are still to be looked for, and these, coupled with a judicious distribution of fire, not only as regards breadth but depth, may possibly obviate the necessity for such extreme nicety of ranging as is scarcely to be hoped for in the stress of action. The experts must here aid the tactician, however, and matters technical must be left in their hands.

But it is certain that, if a mass of guns is not to be wiped out by an opponent already in position ere it has time to assert itself, advantage must be taken of the conformation of the ground in leading guns into position, and their appearance must, if possible, be sudden and unexpected. Minor targets must be disregarded, and the whole strength unfolded, only when the moment is ripe.

A good artillery leader should therefore have that eye for country, and that power of taking in the situation at a glance which distinguishes a capable General. So far from destroying his initiative power, it is possible that modern developments may more than ever demand it of him, and the qualities of a Senarmont may again recognise their opportunity on future battle-fields. It is at least certain that it is now more than ever of vital importance that not only should Generals understand thoroughly how to handle guns, but that artillery officers should, in addition to their technical skill, possess such an intimate acquaintance with the working of the three arms, and so clear an appreciation of their relation to one another, that they should not hesitate to strike into the fight on their own initiative at the opportune moment. In other words, the artillery officer should possess the same qualities as the cavalry leader, and, recognising his opportunity, accept his responsibility with the same readiness as the latter is expected to do.[1]

Major von Rohne, Professor of Artillery at Berlin, has also contended that the first difficulty of the application of artillery in masses lies in the system of command. The tactical handling of a great mass of batteries is no easy matter, and requires much practice and experience. Yet, the lesson which underlies the story of artillery achievements seems to tells us that it is only when guns have been employed collectively, and that the efforts of all the batteries have been welded together and directed by one controlling grasp, that success, brilliant and complete, has been attained.[2]

To speak of great masses of guns, as viewed from the continental standpoint, may seem unnecessary in a publication intended almost wholly for British officers, but since we have dealt principally with foreign achievements, we must keep in view the interests and necessities of forces on a scale altogether disproportionate to our own. And while we are organised similarly to continental armies, and may again be called upon to operate on a large scale side by side with them, it may not be amiss to drop a word or two in passing with reference to English artillery alone.

In our service the battery is still regarded by the majority of officers as the unit, in whose leader are embraced all the functions, both of command and administration. The prerogative of the Major is still jealously guarded, and seniors, when they exercise their authority, are sometimes accused of interference. The Duke of Wellington, the high authority of whose name still broods over many of our military institutions, once said that artillery was necessarily a service of detach-

[1] It is noteworthy that Colonel Langlois demands that, in order that such an energetic spirit may animate every battery, an Inspector-General of Field Artillery should be appointed in France, who might give the same impulse to artillery in his country that General von Hindersin, with whom Prince Kraft's letters have made us acquainted, brought about in Germany.

[2] In allusion to the deficiencies of the French artillery in 1870, Rüston says:—"Intelligent artillery officers ascribe the inferiority of the French artillery also to the prevailing division of command. When the war broke out every one wanted to join in the campaign. The Minister of War gratified this desire; in order to give employment to the higher officers of artillery, he gave two Commandants, a first and second, not only to the artillery of every Army Corps, but also to that of every Division, so that it was often difficult to discover who was master and who was servant." "The War for the Rhine Frontier." Vol. III., page 301.

ments. So far as the necessities of our vast colonial Empire are concerned, the dictum may possibly be accepted as correct. But, if we are to possess an artillery capable of taking a full and effective share n a continental campaign, it would seem desirable to invest officers in the higher ranks with the complete responsibility which is attached to the office of command in every other portion of our service.

If men are to accept responsibility on active service, and assume the initiative on occasions, they must assert themselves in times of peace also, and the just exercise of their authority will no longer be regarded as interference, if it is recognised that they are measured by, and stand or fall with, the state of their commands.

The success of artillery has been chiefly dependant on the manner in which it has been led, and the importance and authority with which its superior officers have been invested in the eyes of the other arms—a system which encourages a man, who, as he nears the top, to relinquish rather than practice his habits of command, is not calculated to develop independance and decision on the battle-field, and there are not wanting indications that if manœuvring power were formerly one of the first qualifications of a commander, the same qualities that brought that power about will still be required, although they will not be evidenced in precisely the same manner as they formerly were.

There can be little doubt that position will be one of the main factors that will render the fire of artillery effective or otherwise in the future. A quick eye for country, a knowledge of the benefit the conformation of ground may be turned to, only to be acquired by habits of observation and practice in the field, and the ready obedience of those he leads, are essential to the leader who attempts to place his guns so as to derive the full benefit it is intended they should gain from his knowledge. Likewise he should be possessed of a sympathetic appreciation of the limitations and necessities of the other arms, and be capable of entering into and assisting the tactical problem in the solution of which he is to aid.

The side issue, however, presented by the consideration of this part of the subject as affecting our own service will not here be followed up. That there are difficulties other than those due to custom and prejudice in the way is admitted, but, nevertheless, when we are on the subject of the command of artillery, it is impossible wholly to disregard the state of things we see around us.

In conclusion a few words concerning our earlier pages seem called for.

We feel that it may be objected that some of these stories we have been busied with are but old world tales, pale shreds of ancient history, and valueless as lessons to guide us in the future. What are Nelson's and St. Vincent's tactics to the mastless ironclads of to-day, and what does Frederick's artillery teach modern batteries? Are the details of a scuffle in Servia or Chili seriously to engage the attention of those who have studied and taken advantage of the progress in science of the last twenty years with regard to the vast organisations of to-day? The reply we make is that in war the human element can never be disregarded, that the effect of the most perfect weapon in the world is

dependant on the nervous organisation of the flesh and blood that carries it, and that, moreover, the measure of the most accurate rifle is also the measure of the chance it has of missing the object at which it is directed by a soldier in the excitement of close combat. The recruit who points the new small-bore an inch above the head of the foe in front of him may kill some driver of the baggage train in rear, but will assuredly not disable anyone of the fighting line who are thronging down upon him.

That is why Kouropatkin said that his experience taught him that losses from the Turkish rifle fire were more severe at long than at close ranges. At the latter men lost their heads and let their rifles off wildly in the air, while, when the enemy was still distant, they aimed with deliberation.

Prudence is the child of experience, and if the first results of the next fight on a large scale compel guns to keep at the immense ranges some enthusiasts advocate, there will probably be little difficulty in persuading human nature to take care of itself. The teaching of history on the other hand distinctly tells us that danger lurks about a system which makes artillery think more of safety than execution, and it is encouraging to us to find that in the past the enterprise of the arm has grown greater with experience, and that the close of a campaign has found it more venturesome than it was at its commencement.[1]

With regard to the effect of artillery fire as evidenced by statistics, it seems right to say a few words as soon after the war of 1870, a good deal of misapprehension was abroad on the subject. The losses inflicted by the artillery in that campaign were frequently put down at 10 per cent. or even lower still. Now these estimates were based on the returns of killed and wounded made by the victors, those of the beaten army not having in many cases been preserved at all. It may be conceded that on the German side the losses through artillery fire only amounted to 5 per cent. But in the face of the examples we have quoted of the manner in which the German guns distinguished themselves, is there any cause for either shame or surprise in the admission? At Gravelotte something like one-third of the German losses took place in the Guard Corps which assaulted St. Privat, and the German batteries had so completely the upper hand of the French at this end of the line that the latter hardly dare show themselves at all, far less inflict loss on the assault. The same tale is told at the other extremity of the battle where the German infantry did not go forward until the enemy's guns had been more or less crushed. Even at Mars-la-Tour, where the French had a vastly greater number of guns available than the Germans, the latter had always the best of the artillery combat, and it was the Chassepôt and not field pieces that caused their severe losses, because the French batteries were continually compelled to shift their position by the overwhelming fire of those on the other side.

[1] The experiences of 1866 led the Germans to direct their batteries to endeavour to get to shorter ranges when taking the field in 1870. Lieut.-Colonel Fletcher, in his "History of the American War," says:—"The long range of their artillery was and has been on many occasions throughout the war, *especially at its commencement*, a disadvantage rather than a benefit to the Federal Army." . . . "much time and ammunition was wasted in firing into woods, and at imaginary bodies of the enemy."

If we turn to the French side, however, we find a loss of 25 per cent. from artillery fire admitted, and at Sedan it has been placed as high as 50 per cent. How inferior the projectiles made use of on both sides were to those with which batteries are now-a-days equipped we have already stated.

It is further also to be noted that one effect of artillery fire, and that too a most important one, is altogether lost sight of by those who measure its performances by hits or even by its demoralising effect on a foe in position. The effect we allude to is that of artillery fire upon troops under cover either in villages or behind intrenchments. In the former case it quickly drives them out into the open, for buildings exposed to such fire are shunned as mere shell traps, and allows the infantry to seize with perhaps but slight loss what they would have paid dearly for assaulting unsupported. In the latter the enemy are held cowering below their parapets, and thus the infantry of the attack are enabled to get within striking distance without being exposed to the long range fire of the rifle which would surely otherwise demand heavy sacrifice from them. And so greatly has the value of the co-operation of guns been recognised under these latter conditions that it is anticipated by more than one authority that the increased use of intrenchments, which future campaigns will in all probability display, will demand a more liberal supply of Field Artillery than ever, and will increase rather than diminish the relative importance of the arm.

Even at Plevna, faulty as were the tactics and disappointing the result as regards what artillery achieved, the Russian losses must have been far heavier but for their preponderance in the arm, and their opponents, though they may have crouched with comparative security under their head-cover, were yet held prisoners by the guns, and any efforts towards a counter-stroke were stifled by those field pieces, which, if they failed to produce more tangible results, were yet by no means ineffective in a manner less ostentatious but none the less real on that account.

Thus we are enabled to close our record of what has been done with bright presage of what the days to come may bring to us. We have kept clear, as far as possible, of statistics and percentages from the practice ground. According to them, too, modern shrapnel may be shown as destructive as the most enthusiastic gunner can desire. But the appeal to the battle-field is more convincing and more reliable. The great principles remain immutable, it is only as regards their application that we need to change, and the same causes underlie the victories of an Alexander, a Napoleon, or a Lee. It was Napoleon,[1] perhaps the greatest exponent of the art of war, who specially recognised the value of a powerful artillery, and showed the world how to turn it into account. The secret of his success lay in this chiefly, that he perceived

[1] "Napoleon's attack on the Austrian centre at Wagram was prepared by 100 guns. It was on the fire of this tremendous battery that Napoleon chiefly counted to do the work. He was himself an artillery officer, and he placed great reliance in all his battles on that arm of the service."—"The First Napoleon," by J. C. Ropes.

"In taking the field in 1813 Napoleon had an extraordinary amount of artillery with the army. Napoleon recognising the fact that the presence of a battery is a great moral support to raw infantry."—"The First Napoleon," by J. C. Ropes.

that the principle of being strongest at the decisive point at the opportune moment might be brought about by volume of fire, just as it might by weight of numbers. Therefore, at the crisis of the fight an irresistible cannonade was turned upon selected points of the line of his opponents, and the assaulting column followed so closely on the shock the blow of the projectiles caused that they were never allowed time to recover themselves. The Germans, realising the same truth, adopted its teaching, not only as the great master himself had done, but even went a step further and made guns the equivalent of infantry along the wide stretches, and during the prolonged stress of a long drawn struggle.[1]

A better equipped artillery than was theirs, better taught, and better led, (for we should profit by their experience), will surely not be content to do less? May we not even hope for more, and with tactics the same in principle, but adapted to the exigencies of the moment, with technical skill equal to what tactics ask, and with study and perseverance that will surely improve both, be once more equal to the occasion?

[1] Napoleon had, however, also set them an example at Wagram in this method of employing guns.

THE END.

OKEHAMPTON EXPERIENCES, 1892.

BY

CAPTAIN E. W. BLUNT, R.A.

(A Lecture delivered at the Royal Artillery Institution, September 21st, 1892).[1]

LIEUT.-COL. E. BAINBRIDGE, R.A., IN THE CHAIR.

CAPTAIN BLUNT—Gentlemen, a great compliment has been paid me in asking me to address you here this evening to say something about what has been going on at Okehampton this year. I am sorry for your sake, and perhaps for my own, that none of the other senior officers of the Staff were able to do it, and the duty has devolved upon me.

The practice of the past season at Okehampton has been conducted on somewhat different lines from that of last year. Perhaps the best way to lay it before you will be to state shortly the system followed and then to refer in detail to such points as seem specially to deserve notice.

The chief points of difference between the practice of this and of last year are two:—First, a progressive programme of practice was drawn up at the beginning of the season and, as far as possible, adhered to throughout. The object being that each battery should fire under the same conditions of time, range and target, whether it shot with the 1st Division in May or the 5th in September. If results are to be compared and accepted as a gauge of excellence, this is the only fair way of doing it. The hoped for uniformity has been only partially obtained. During the practice of the 3rd Division there was a difficulty about getting one of the ranges cleared. A Field Day, in combination with infantry from the Devonport Garrison, interfered with the 4th Division, one range being temporarily closed while field-works were being constructed. The 5th Division were allowed only 350 rounds, so their practice was curtailed, and moreover was much interrupted by a succession of wet days such as even Okehampton seldom gives. Nevertheless the conditions have been nearly the same for all batteries, and afford fair ground for comparisons to such as like to make them.

Many officers have expressed a wish that, for the batteries practising at Okehampton, three or four days of Service Practice should take the place of the present Competitive. This would go far to eliminate the

[1] The publication of this lecture has been delayed in order that it might not appear before the "Annual Report of the School of Gunnery on Horse and Field Artillery Practice at Home, 1892."

element of luck and to maintain the keenest interest throughout the practice, but would necessitate uniformity of range, position, and target for all batteries. It has been shown how many obstacles may arise to prevent the carrying out of a plan that at first glance appears so simple.

The second variation was giving a tactical scheme for each day's Service Practice, just as has always been done for Brigade Division Practice; but in this case a single battery represented the whole artillery force. The Battery Commander was thus, as far as possible, given a free hand, and selected his own positions, within certain limits, receiving only such orders as would on service be given to the Officer Commanding a Brigade Division. The aim being, of course, to give Battery Commanders the chance of reconnoitring and selecting positions.

How necessary such training is was shown by the frequency with which batteries were brought into positions, whence but a small portion of the target was visible over the guns.

System of Practice.

The course of practice was as follows:—The first week in camp was devoted to Elementary Practice, which Battery Commanders carried out on their own lines, though a few leading directions and suggestions were given by the Commandant to make the Elementary a better preparation for the Service Practice. Amongst other points it was recommended that time should always be taken and that very short ranges should be the exception. Series to obtain range and fuze were relegated altogether to Elementary Practice, and all the series of Service Practice were limited either in ammunition or in time. In other words, when the conditions of range and target pointed to deliberate shooting, a certain number of rounds, generally 24, were allowed for the series. In cases where speed was of more importance, the battery was allowed a certain time, varying from 8 mins. to 4 mins. in action.

Colonel Ward, in his report on practice at Gurgaon, says he considers the amount allotted to Elementary Practice excessive, and that 50 rounds should be sufficient to put a finish to the education of the drill ground. This is well worth consideration, and the tendency at Okehampton is certainly in the same direction. For though the number of rounds allowed has not been reduced, yet Elementary Practice is carried on under nearly as much supervision, and is subject to the same criticism as the Service Practice.

As has been stated above, a tactical scheme was given for each day's Service Practice, and targets were arranged to represent different stages of the fight. First, the enemy's artillery or bodies of his troops were fired on at a long range; next, his lines of advancing infantry came under fire, or his defensive position was shelled to prepare the way for our own infantry. Then, as their advance masked the fire of the guns, the battery advanced in support of the infantry and opened fire at a close and decisive range. This advance to short ranges of 1200

yards to 700 yards called forth a good deal of criticism from officers of other arms who visited the camp—"It is very well to advance against 100 dummies, but on service you would never get within 800 yards with infantry firing volleys at you." This was a common form of remark, due no doubt to the unavoidable absence from the practice ground of the troops in support of whom the guns were advanced. The possibility of getting to an even shorter range has been shown more than once, notably in 1870, when batteries came up into the fighting line hardly noticed by the enemy till they opened fire.

Now that there is some leaning to excessive deliberation in taking up positions, it is important to accustom batteries to the principle that they will on occasion be called on to fight at short ranges where rapidity will be obligatory.

The necessity for practice at short ranges was shown by the fact that fire at ranges of 1500 to 1200 was usually more effective than at ranges under 1000 yards.

Practice at artillery targets was usually limited at each series to 24 rounds. At infantry targets a time limit was given, varying from 8 mins. at the beginning of practice to 4 mins. in the later series. A four-gun battery was always allowed an extra minute to enable it to fire the same number of rounds as a six-gun battery. This was purely tentative, but seemed to answer fairly well. With regard to the method of coming into action, batteries always took up a preparatory position previous to opening fire at a long range, and on the conclusion of the series, the command "prepare to limber up for action" having been given, the Commanding Officer went ahead with his range-takers to reconnoitre, and the battery advanced with loaded guns to the second position. The Captain remained with the wagons and the senior Subaltern brought on the battery and, if conditions of ground, range, and target were suitable, halted under cover till called up by the Battery Commander. Perhaps it is not practical to employ range-takers at an infantry target, but they must have their share of the practice.

The third position was occupied as laid down for advanced positions, though, as the nature of the ground often rendered a long advance difficult, there was not always time for the Major to call out his Section Commanders and point out the target before the battery came on to the position.

One day was given up to practice at a moving target and to firing by auxiliary marks, both of which had also been practised during "Elementary." The results of shooting from under cover and laying by clinometer were usually good, and when once started the fire was as rapid as when the target was in view, but most batteries were slow in getting their pickets planted and opening fire. The general opinion seems to be that indirect laying will very rarely be resorted to, and most officers have a great objection to the idea of hiding behind cover to shoot, when by moving to the front the target would come into view. However, it is easy to imagine a case in which such an advance would be impossible, in the face of a much superior force of artillery, and if, from under cover of a friendly hill, it is possible to deliver an effective fire on the enemy's position and so assist our own infantry, then such

help is not to be despised—of course, there would be no finality in such a position, and the earliest opportunity would be taken to advance. But such occasions may arise, and we ought all to know how to make the best of them.

Moving Object.

Shooting at a moving object is at Okehampton unfortunately restricted to a range of about 900 yards, as there is so little ground on which a target can be worked. Accordingly the only drill practised was that laid down for defence against cavalry at 1000 yards and under. The battery was brought into action against a distant target, and during the practice the cavalry target was started by bugle sound and advanced obliquely on the battery at a rate of about 7½ miles an hour. During its journey of about 700 yards, which was done in rather under 2 minutes, it was found possible to fire about four rounds per gun, and this rate of fire would no doubt be improved on, but that the target has to be stopped just as it is within case range. On a dry day, when the bullets strike up a little dust and effect can be estimated, the fire certainly appears overwhelming. Lookers-on occasionally expressed some disappointment at the small number of hits on the target, which was a 3 ft. by 2 ft. screen mounted on an old sugar barrel. It was apparently forgotten that the target represented but a very small part of the front of an attacking squadron, and that the object of the practice was not so much to hit the target as to train the battery to deliver a rapid and effective fire over a constantly decreasing range.

Examinations.

The result of examinations in laying and in setting Scott's sights and fuzes, as also the greater uniformity in drill and fire discipline show some improvement on last year.

I propose now to touch on a few questions connected with the drill—not in the least with the intention of pointing out the faults of batteries, but merely to bring into notice points which during the season's practice have been remarked on and criticised.

Taking up Positions.

What may be called the deliberate method of taking up positions is taken exception to by many, and has always been the subject of much comment by officers of other arms attending the camp. It so happens that the only positions allowing a good view of the operations of Brigade Practice are unvariably higher than both batteries and targets, so that the number of men and horses who are the forerunners of a brigade coming into a long range position was exceptionally apparent, and it was sometimes forgotten that from the position of the target the same crowd would not be so visible. However, there was no doubt a leaning toward the deliberate method, even when conditions of range and target pointed to the need of more speedy action. To a great extent this may be attributed to anxiety to obtain good effects on the target, and to the unreal circumstances of the practice ground. The tendency

would soon correct itself on service, when so much more depends on time, and when the result of exposure would be more obvious.

In the recently published drill-book the key note of the instructions as to taking up a position is given on page 53, where it is stated that the deliberate method is to be employed "*if this can be done without attracting the attention of the enemy.*" In the occupation of an advanced position it would not always be either possible or desirable that Section Commanders should precede their batteries. At very close ranges, when the target is unmistakeable, it will not be necessary for them to move out in advance.

Exact Drill.

There is rather a disposition to neglect the traditions of the barrack-square and drill-ground, and to relax the rigidity of drill and discipline there inculcated. To some extent this is unavoidable and even necessary, but it must not be forgotten that nearly every regulation, besides being an aid to discipline, has for its object some advantage to be gained when training is put to the proof of war. If the guns of a battery do not come into action together the teams are so much the longer exposed to fire. Diminished intervals present to the enemy a more vulnerable target. A badly dressed line of guns obstructs the mutual view of Battery and Section Commanders, so necessary for the prompt and correct transmission of orders. There is little doubt that the best security for the steadiness of the soldier in action lies in a strictly enforced discipline.

Supply from Wagons.

Every opportunity was taken this year of practising batteries in the supply of ammunition. Wagons were taken out as often as possible, and batteries that had wagons lent to those that had not. The position laid down for wagons in action, viz., immediately covering their guns, is open to several objections. When the wagon comes up the leaders are in the way of the gun numbers, and if the gun immediately in front has to be fired, it not infrequently recoils on to the team and causes considerable delay in unhooking. Again, if auxiliary marks have to be placed in rear, as must be done if the battery has opened fire, the wagon is very much in the way. These objections disappear if the wagon be brought up covering the interval, and if the second line has to be brought up, there is plenty of room in a 19 yards' interval for two wagons side by side. The wagon drivers should always remain mounted, and the teams be unhooked by gunners if possible. Young or unsteady horses run back when the guns are fired, and a dismounted driver has little control over them.

Unhooking often occupied as much as two minutes. Some time would be saved if the breeching were a fixture on the shafts. This would require a somewhat shorter breeching and a single supporting strap, which would pass through the crupper and buckle on the off side, where it could be readily unfastened.

Spring hooks have also been suggested, but are open to the objection that they are difficult to unfasten in case of accident. Another idea is to substitute for the trace loop on the splinter-bar a hook with a drop

link. That is open to the same objection : you could not unhook it if the traces were taut.

Pole-draught has been on trial in "L" Battery and 57th Field, and has been favourably reported on. In most of the systems now under trial the draught is direct from swingle-trees hooked on to the splinter-bar. These can be quickly unhooked and slung on to a loop on the crupper, and the team is then free to walk away.

A similar method is applicable to shaft-draught, and even if the swingle-tree break, there remain the trace loops as at present.

Signals and Whistle.

Silent drill has been thoroughly adopted, and very few objections are now raised to it. The whistle is used much less, and only to call attention to important orders. A universal pattern of whistle would be an advantage now that its use is generally adopted.

Laying.

The 1st, 2nd, and 3rd Layers were distinguished by red, blue, and white bands worn on the left arm, and a different set was employed at each series of the day's practice. The chief causes of slow laying were a too great attention to line when firing shrapnel; and, when using Scott's sight, the difficulty of getting the object within the field of the glass. To obviate the latter, the layer should, as soon as his gun is in action, point out the target to his No. 2, who will then be able to align the gun at once. Some Battery Commanders consider that it would be advantageous to retain the services of the No. 1 of the sub-division as gun-captain, giving him the duties of No. 2 with the addition of command. This would ensure better supervision, leave No. 1 to bring his gun into action, and avoid the irritation sometimes felt by a sergeant who is not selected as a gun-layer, and accordingly has to be commanded in action by his junior. A drill has been proposed to test this principle, and is now being tried. But the sergeant, being of course one of the most intelligent and physically capable men of the battery, will probably continue to be a layer until it is ordered that the No. 1 of a sub-division is not to be selected.

Ranging.

Ranging was mostly carried out with percussion shrapnel, which answered well at short and medium ranges, up to about 2500 yards, unless the light was particularly unfavourable. About two-thirds of the ranges were found with percussion shrapnel. It was compulsory to use the small percussion fuze for ranging, and the same shell with time and percussion fuze appeared to range somewhat differently—at all events, it was suspected of doing so, and that is nearly as bad. The range-finders were more often than not within the short bracket limit, but were not always trusted. At anyrate, they were much nearer the right range than any unassisted estimate could be. The range-takers of the Horse Artillery Division had the mekometer, which was much preferred to the telemeter. It is quicker than the telemeter and just as accurate, and enables the range-takers to remain more under cover while at work. The most accurate range-takers of all were the range-

takers of "P" Battery, they really belonged to "J" I believe, and they used the mekometer.

During the process of ranging a battery the re-loading should be ordered by sections. The commander of the first section to fire may safely wait for the command "Prepare for Shrapnel" till the section next him has fired. This will avoid an unnecessary number of ranging rounds being expended.

Regulation of Fuze.

Length of fuze was generally found by working to graze. Scott's sights were seldom used for observation, either owing to Battery Commanders' dislike to throwing a section out of action, or to the difficulty of training a reliable observer. Moreover, their use is impossible when distribution begins after the first time shrapnel.

Deflection.

It is hard to understand the general unwillingness to give deflection boldly. With a strong cross wind it usually takes about four rounds to bring home to the commander the insufficiency of the deflection given. When it is considered that a round at all to leeward of the ranging point is almost useless, this reluctance to make a bold allowance in the first instance is unfortunate.

Passing Orders.

When an order had been given by the Battery Commander there was often some doubt as to how far it had reached. To remedy this, and to satisfy the Commander that his order had been heard and understood, Lieut.-Colonel Lockyer suggested that the receipt of every order be acknowledged by a salute, both when given in the first instance and again each time it is passed on.

Section Commanders.

A great deal of the effective service of the battery rests with the Section Commander, who should always endeavour to set an example of that alertness and instantaneous compliance with orders which is so characteristic of a good battery. It was never intended that the Section Commander should remain absolutely in one spot between his guns, although he should return there when not otherwise occupied, so that his Commander and every man of his section may know where to look for him. On the other hand, it is not right that the Section Commander should stand in easy postures while every man at the guns has to stand in his place at attention when not actually at work. It is not reasonable to expect smartness and strict attention from the men unless the officers show the way. The Section Commander must be held absolutely responsible that his guns are laid on the proper target. The alignment of the gun can be easily seen from the trail without interrupting the layer. During the season's practice guns were frequently laid on a wrong target, or on some rock, that in a bad light looked rather like the target. The position of Range Officer is, under such circumstances, one of some danger.

Rate of Fire.

The Commandant has, during practice this year, laid great stress on the necessity for increasing the rate of fire. There has certainly been a marked improvement in this respect, and if figures are to be trusted there has been no consequent falling off in accuracy. When the correct range and fuze have been obtained the rate of fire might be ordered by the Commander as "Ordinary" or "Regular Fire, at — seconds interval." Section Commanders would very soon get into the way of roughly estimating an interval of 10, 20 or 30 seconds.

The greatest rate of fire that can be maintained at a fairly easy target, on ordinary ground and with effective brakes, is probably about one round per gun per minute. During the past season this rate has very rarely been achieved. The chief obstacles to rapidity are excessive recoil and slow fuze setting. The former would tell far more seriously on service where long periods in action may be expected. At practice delay was chiefly consequent on the great amount of work thrown on No. 3. The drill-book says that after "Ordinary Fire" is ordered, fuzes will be set by No. 5. As a matter of fact this work always devolved on No. 3, since the number of shell brought up in the portable magazines was always sufficient to finish the series. It was instructive to note the variation in different batteries in the time from length of fuze being ordered to the firing of the next round. This interval varied from 30 seconds in a quick firing battery to 1 minute in a slow one.

Brigade Practice.

During the practice of each division two days were devoted to Brigade Service Practice, except in the case of the 5th Division, who only had one day, owing to lack of ammunition. The chief lessons afforded by the practice are that reconnoitring a position for three batteries is not the work of a moment, and that orders take some time to filter through to the gun detachments, and must therefore be issued in advance of the moment when their fulfilment is required. The full power of the weapon in the hands of the Brigade Commander can only be thoroughly developed if the fire of each battery is promptly available for any change of objective required. Last year the fire effect of the brigade was poor compared with that of single batteries. This year, on the contrary, the brigade practice shows relatively greater results than the battery service practice. It is hardly necessary to lay stress on the great advantage gained by batteries being commanded by a Lieut.-Colonel whose methods they know and to whom their capabilities are equally familiar. Almost as important is it that the Brigade Commander and his Adjutant should be mutually acquainted. It takes some little time to fall in with the ways of a new commander, and for a Lieut.-Colonel to discover how far he may rely on his new Adjutant, and the degree of minuteness required in the drafting of his orders.

The 4th Division took part in the combined field operations before referred to. The field-works against which fire was directed consisted of a breast-work of heavy timbers faced with earth, light shelter-

trenches and a solidly built stone redoubt, the wall of which was about 3 feet thick. Percussion shrapnel, fired against the breast-work, went through and burst on the inside, but, as might be expected, did no material damage to the parapet. The same projectiles, however, were used against the stone wall with great effect, and though the smoke prevented accurate shooting, the 8 or 10 shell that struck brought down a great deal of the wall and strewed the interior of the work with splinters of stone. The redoubt would have been quite untenable from the quantity of flying *débris*. It would have been interesting to note the relative effect of the long and short range infantry fire, but unfortunately it was not considered practicable to count hits till the close of the operations. The result showed the infantry hits to be about five per cent. of the rounds fired, and the artillery hits to be about three per shell.

Competitive Practice.

It was the universal opinion that, certainly as far as Okehampton was concerned, the conditions of the Competitive Practice were too difficult; and, had not the qualifying marks been reduced, no first or second, and only one third prize would have been obtained.

Until actually experienced, it is impossible to imagine the difficulty of making a row of dummies reasonably visible in the varying lights of the moorland. The fact that all the ranges run southward makes it harder, as the sun is so early in the day behind the targets. Probably the chief cause of the low scoring at Okehampton lies in the fact that, from the nature of the ground, the ricochet effect on the target is almost nil. Targets have generally to be placed on ground sloping towards the battery, and rock, heather and bog combine to check the course of every bullet as it reaches the ground. Experiments at Shoeburyness have proved that, of the effect on the target of shell burst 50 yards short, quite 50 per cent. is due to ricochet. When the distance of burst is increased, the proportion of direct hits is correspondingly lower.

To meet these difficulties it has been recommended that all three ranges be reduced by 500 yards. Another recommendation is that the long range target be of twice the front and half the depth. As it stands at present one lucky shell may cause as many casualties as the best series fired.

It is also proposed to invert the order in which the different targets are fired at, and to begin at the longest range. This is tactically more reasonable, and will save the useless expenditure of ammunition that now occurs when, the battery having fired its full number of rounds, some of the guns remain loaded. For, any shell thus loaded will serve for ranging on the next target.

The principle of marking for Fire Discipline is a difficult one, and a good many officers would like to see it done away with and credits awarded for time and effect only. On this subject I can not do better than quote Colonel Tyler's remark in the report on last year's practice. He there said "Fire Discipline may be defined as the element of work, while the number of hits must always be to some extent a matter of

luck, therefore the credits for Fire Discipline should be considerably increased."

The difficulty of securing for each practice camp the services of an umpire accustomed to Field Artillery work should not be great. But it must be remembered that comparison of awards for Fire Discipline only holds good for batteries of the same group. The system on which marks for Fire Discipline were awarded at Okehampton was as follows:—

The Commandant, as Chief Umpire, stood near the Battery Commander, while one of the Staff remained near the other flank, and both took notes during the practice. After the three series had been fired they met to decide whether the battery was first, second, or third class, considering its Fire Discipline, system and style, the capacity for command shown by the commander, and the general efficiency of all ranks of the battery. Taking a perfect battery as worth 100, marks were deducted for failures in any of the above respects, and from the figure of merit thus obtained, marks were deducted for any lapses in drill and discipline that may have been noticed during practice. The result was the Fire Discipline award. The marks for Fire Discipline were always awarded before the record of hits was known. The reason for that is obvious. If the record of hits comes in, and one battery is found to be one short of the qualifying number for a certain prize there might be a temptation to give them another mark for Fire Discipline.

Equipment.

There is not much that is new to be said about the equipment. The sights are still a source of trouble to many, and the wave of fashion seems for a time to have set against the Scott's Sight. Perhaps the necessity of training 18 layers militated against its use. Whatever the cause, most of the practice was done with the open sights, and of the four batteries who are at the top of the Okehampton competitive group, three never used Scott's sight at all in the competition, and the other used it in one series only.

There seems no reason why the deflection scale of the Scott's sight should not be graduated as on the tangent sight. The different reading is a frequent source of error.

When tangent sights have been long in use, there seems to be more difficulty in clamping them securely, and they are very apt to shift unless placed in the socket with care. That was particularly brought to notice in the case of Major Curling's battery. His guns have probably had more use than any other 12-prs. in the service ; and, although I think his men had been trained with as much care as men could be, he found that the sights did shift a good deal, and this was also found at the examination in laying. Some method of notching the graduations might perhaps be arranged which would ensure an accurate and secure setting.

Several methods of carrying the portable magazines have been suggested and tried. The Horse Artillery batteries had a platform fitted on the axletree, which answered very well. There is no doubt that as now carried they are a source of great discomfort and some danger to

the limber gunners. The footboard was never designed to accommodate two magazines, as well as three pairs of legs. Perhaps the most promising suggestion for a way to carry the magazines is that they should rest on a shelf in rear of each limber-box. The shelf would also be convenient for the service of ammunition. It may be objected that this would interfere with the carriage of the gunners' kits, but if the shelf, which has been fitted to some wagon-bodies and tried this year, is approved, the same objection will apply, and must be overcome.

Ammunition.

It seems probable that a new form of shrapnel will be introduced before long, and exhaustive experiments are being made to find the best pattern of shell. The common shell also appears doomed, and some form of ring or segment shell will perhaps replace it. (Hear, hear.)

The time and percussion fuze is excellent, and every gunner will be glad to hear that the difficulty of screwing up the nut without shifting the collar has been overcome by a very simple expedient, which promises to be successful. It is to be hoped that before long this will be our only fuze. (Hear.)

Cordite was used by the last division in camp, and was in every way satisfactory, that is as far as the powder was concerned; but the vent-sealing tube has not yet been brought to perfection.

Practice Reports.

The common view of the Practice Report is that it is a nuisance, though, perhaps, a necessary one. Yet, if made full use of, it may be of the greatest assistance in the detection and correction of faults in laying and fuze setting. Also, it brings home to the Battery Commander his own errors of observation and procedure. Every subaltern officer should, as soon as possible after the day's practice, examine the reports that he may see how his men are working, and confront the individual layer with the evidence of his mistakes. The battery practice book and the range report will provide all necessary information if the compiled report is not available. More than once the faulty adjustment of a Scott's sight, and, on one occasion, the use of a Mark I. sight with a Mark II. carriage, have been detected through the analysis of the Practice Report. But it would not be safe to rely on the Staff Officers to make such discoveries, nor can they be expected to follow the fortunes of each individual layer throughout the practice.

The method of analysis of the Practice Reports was very clearly laid down in the Institution papers of, I think, June, 1892, in a paper by Captain White.

Dress.

The dress for practice was always serge coats, except for Brigade Days, for which Field Day Order was adopted. The helmet is not a comfortable head-dress to work in, it interferes greatly with the layers, and is very inconvenient for officers, as it has be shifted to the back of

the head when using field glasses. Outside pockets for the serge coat would be a welcome addition. Knife, note-book, range card, and papers that will sometimes accumulate, get inconveniently mixed when hastily thrust into a small inside pocket.

Conclusion.

In reviewing the result of the year's practice I would say a few words in conclusion. The unquestionable zeal and interest shown by all ranks are a guarantee that improvement will be each year manifested. When the results are deduced from averages, such improvement must be gradual. But if a step onward is made each year, there is satisfactory proof that the foundation of the system is solid, that its design is good, and that the structure will be built of the best materials, put together without hurry, and selected by the light of experience and knowledge. (Cheers.)

NOTES ON RECENT EXPERIMENTS.

I have a few notes on recent experiments which the Ordnance Committee have kindly allowed me to mention here, because the Officers of the Regiment are very often in the dark as to what is going on; and I think they are, as a rule, very keen to know what efforts are being made to improve our *matériel*.

When the 12-pr. equipment was first proposed in 1881 it was intended to be a light equipment for Horse and light Field Batteries. On its introdution into the service the weight was found to be more than had been anticipated, and it was found to be too heavy for Horse Artillery. The only way to reduce the present equipment would be to carry less ammunition, which is undesirable. So it has been decided that a lighter equipment is to be introduced as soon as possible for Horse Artillery. The weight behind the teams to be as near as possible 30 cwt., the shell power and number of rounds carried in the limber being the same as with the present 12-pr. B.L. gun, with this object, no gunners will be carried on the limber.

An equipment has been on trial this summer at Okehampton which weighs just 32 cwt. behind the team. The gun fires the service shell with a muzzle velocity of 1550 f.s., the charge being only 12 oz. cordite, so that nearly 1 cwt. is saved on the 36 rounds.

Two kinds of brakes were tried with the carriage, one a ratchet round the inner flange of the wheel, acted upon by a pawl on the axle. The other being the double drag-shoe brake, which was, I believe, suggested ten years ago by the late Captain Frank Goold-Adams. The recoil with each kind of brake on ordinary ground was about 3 feet.

Both of these brakes were also tried by some of the Service Batteries. The axle brake did not last out the course of practice, and was not easily repairable. The drag-shoe brake was always efficient, and any injury to the shoes or guide-chains could be put to rights by battery artificers.

The limber for the new gun is made as light as possible, but is still in the experimental stage.

With regard to the 12-pr. service equipment a good many complaints have been made, chief of which is that the results of the fire are far less than they should be and not commensurate with the work done. This was brought prominently into notice last year, when the hits per shell were only 1·5. It must be remembered that this average included all ranging rounds, but still it cannot be denied that the effect is not what it should be.

The Ordnance Committee have gone into the subject and have been trying several designs of shell with the Horse Artillery gun, and with the service gun a shrapnel shell weighing about 15 lbs. This latter shell contains 252 bullets, a gain of 75 on the service shell. The bursting charge is in the base. (Hear.) The increased weight of the shell is counter-balanced by a saving of weight in the cartridge, since the charge of cordite required to give a 15-lb. shell a muzzle velocity of 1550 f.s. is only 1 lb. 0$\frac{3}{4}$ ozs. The recoil is practically the same as at present. The common shell has been constantly denounced as being useless, except for ranging, as it opens out without breaking up. Trials have been made this summer with a cast-iron ring shell, which is supposed to give sufficient burst for ranging purposes and, at the same time, to break up very completely and be useful as a man-killing projectile. The experiments with this shell are not yet concluded, as it is to be tried at Lydd on ground that is more favourable to shrapnel effect than that of Okehampton.

There are one or two weak points in the Mark II. carriage. (Hear.) The tyre brake is acknowledged to be bad and the proposed substitutes have been mentioned above.

The long elevating screw which was introduced to suit the traversing gear is slow and very liable to injury when travelling, as it projects so far below the trail. To obviate this a double screw, one working inside the other, has been tried. It works more rapidly, and only projects two inches below the trail when run down for travelling. This arrangement worked well, but the trial was hardly exhaustive. Two batteries had them this year.

Cordite.

The great difficulty that has attended the introduction of cordite is that of securing a suitable vent and friction tube. The rush of gas, if unchecked, is so violent that the ordinary steel vent gutters away and is unserviceable after a few rounds (varying from 10 to 30). Apparently the only way out of this difficulty lies in some form of vent-sealing tube. More than a dozen different forms have been tried, but as yet without very much success, and it has been found difficult so far to design anything that will be both effective as a vent-sealer, and at the same time not so clumsy as to affect the service of the gun.

Sights.

The modified form of Scott's sights having a drum marked in yards is a great improvement. It is also fitted with a clinometer level. The

"yard" graduation not only does away with the trouble of teaching gunners to read the vernier, but obviates the necessity for range tables.

A tangent sight with every hundred yards marked in figures was tried. Also, a new foresight with a single blade substituted for the cross-wires. Both were much liked by the batteries using them.

Case Shot Pockets.

Case shot pockets of two kinds—leather and steel—were fitted on the side of the trail, with the view that every gun may always have two rounds of case ready for an emergency.

Some 4 ft. 7 in. wheels were sent down to Okehampton for trial. Of course, from being lower they increase the stability of the carriage and decrease its weight by about 100 lbs. The difference in draught was not apparent, but theoretically it must exist.

These few notes, though not very full of detail, will give some idea of the efforts that are being made to respond to the wishes of the Regiment, and to show the direction in which improvement is being sought. (Cheers.)

DISCUSSION.

Colonel Bainbridge—Before any discussion takes place on the lecture to which we have been listening, I should be glad if Captain Blunt would tell us the result of this year's practice.

Captain Blunt—The average ranges for the last four years have been 2200, 2300, and 2200 again; there is not very much difference in that. The average time in action has been steadily diminishing. In 1889 it was 17 mins.; in 1890, 12 mins. 11 secs.; in 1891, 11 mins. 57 secs.; in 1892, 8 mins. 3 secs. The rate of fire has, on the other hand, been steadily increasing from 1·2, 1·7, to 2·15 and 2·6 rounds per minute. That, of course, includes all the ranging rounds, and it includes the fire at every sort of target. The rate of ordinary fire in rounds per minute was this year, for all the batteries, 4·01 rounds per minute. This is the first year, I think, that it has been taken. The six-gun batteries averaged 4·2 rounds per minute, and the four-gun batteries averaged 3·4 rounds per minute. They neither of them got up to the result of one round per gun per minute, which is what one aims at in ordinary fire. The Germans, I believe, in ordinary fire, fire about 7 rounds per minute in the battery—that is, of course, better than one round per gun. The hits per shell have steadily decreased. In 1889 they were 3·1; then they went to 2·08; then they went to 1·5; however, now we have got back to 2·3, something between 1889 and 1890. The casualties per shell in the same way have steadily diminished, the figures being ·831, ·806, ·697; but this year, whether by the arrangement of the targets or for whatever other reason, we have made a jump, and got to ·91 of a man killed for every shell fired. The targets, I think, have been rather bigger; I know the average size of each target this year is just about 60; that is to say, for each series fired there have been about 60 dummies put up to be shot at. The percentage of the target destroyed per minute has been steadily going up; it was 2·17 in 1889; 2·9 in 1890; 3·43 in 1891; and 3·65 in 1892.

Average Results of Battery Service and Competitive Practice.

Year.	Average range.	Time in action.	Rate of fire in rounds per min.	Rate of "Ordinary Fire," Rounds per min.	Hits per shell.	Casualties per shell.	Percentage of target destroyed per min.	Remarks.
	1	2	3	4	5	6	7	
1889	2231	17·0	1·2	—	3·1	·331	2·17	Ranging rounds are included in the calculation of columns 3, 5, and 6.
1890	2325	12·11	1·7	—	2·08	·806	2·98	
1891	2331	11·57	2·15	—	1·5	·697	3·43	
1892	2285	8·3	2·6*	4·01*	2·3	·91	3·65	

	Column 3.	Column 4.
*6-gun batteries	2·61	4·22
4-gun "	2·45	3·41

Those are all the results that I have here. When the annual report comes out I daresay you will get quite enough figures. (Cheers.)

Colonel Bainbridge—Would any officer like to make any remarks ?

Colonel Ollivant—There is one question that I should like to ask out of curiosity, and that is whether the lecturer ever noticed, in the practice of a brigade division, that any difficulty was found by the second battery coming into action in accepting the range from the first ? I happened to be the umpire this year at some practice which was carried out at Rawal Pindi by the Mountain Batteries, and I noticed that when one battery came into action, and was supported by two others afterwards, the officers commanding the last two batteries, although they were told by the Lieutenant-Colonel what the range was, insisted upon ranging again for themselves. I should like to know whether this independence on the part of battery commanding officers has been noticed at Okehampton, or whether it has been the habit to accept the range as given to them, and to commence the shrapnel fire at once.

Captain Blunt—I think, as a rule, it has been found necessary to verify, that is to say, to accept the range given as the starting point; but it does not seem to follow always that every battery must use the same. They may be slightly échelonned, or the part of the target told off to them may be at a slightly different range; and unless some sort of verification has been adopted, the practice, I think, has not, as a rule, been very good. It is hard to lay down any very precise decision about it, because in brigade practice it is impossible to have a range party, so that you cannot tell what the shell have been doing; but, judging from the battery end of the shooting, it appears that some amount of verification is necessary.

Colonel Spragge—Surely Colonel Ollivant does not mean that the Battery Commanders ignored the range passed to them for use by the Lieut.-Colonel—that would be tantamount to ignoring his orders.

Colonel Ollivant—I noticed that they did range, and my own opinion was that they ought to have accepted the range.

Colonel Spragge—There is one point that I should like to refer to, and that is the subject of Fire Discipline. I am one of those who think that Fire

Discipline should be entirely eliminated from the competition. (Hear, hear.) My ground for saying so is that I do not think thoroughly competent Fire Discipline judges can always be got. The position of a man who is called upon to judge the Fire Discipline of a battery appears to me to be an exceedingly difficult one; unless he is, like the beast in the Revelations, furnished with eyes before and behind, I do not see how he is to do it alone; and if you are to have two or three to help him, then it means having others to judge besides himself. So far as I myself saw, I cannot say that I was at all satisfied with the result of the judging of Fire Discipline, I will not say in what particular cases, but certainly in some that I have seen. I have no doubt that it was very ably done when we had, as last year, Colonel Tyler, and his able assistants to do it; but they are not always available, nor is it always even possible to have the same man judging entirely through a group of batteries. I cannot think it at all satisfactory that Fire Discipline should be judged in that way, and I consider that it would be very much better if the practice stood on its own merits, and the Fire Discipline were left to be settled by the Lieutenant-Colonel or some other competent judge, before the battery came on the field to practise.

Major Davidson—I quite agree with Colonel Spragge about the difficulty of judging, and I think it is most important that the judging should be uniform; but I must say that I entirely differ from Colonel Spragge as to the importance of Fire Discipline as part of the competition. As Colonel Tyler says, the actual firing, the results on the target, may be influenced almost entirely by luck, by weather, and other circumstances; but with anything like competent judging the Fire Discipline of a battery is a certainty, more or less. The state of training the men are in, the way they do their work, and everything else, is absolutely unmistakeable if the judging is anything like competent and uniform. It was proved last year, I think, that in the case of Major Curling's battery at any rate, they made comparatively poor effects on the target, although they got full marks for Fire Discipline; and I think that the marks for Fire Discipline, instead of being abolished, as Colonel Spragge suggests, ought to be increased, because the results on the target are fluctuating, and more or less a matter of luck, but the Fire Discipline is most important, and is absolutely independent of any luck.

As I am on my legs, there is one question that I should like to ask, and that is whether anything was noticed as to the results of Hammant's indicator? I believe one battery had it, and I happen to have used the Hammant indicator at Shoeburyness, and I think it is a most valuable instrument, and that it would be a grand thing if all 12-pr. batteries were furnished with it. The Hammant indicator makes the ranging process almost as quick again, and simplifies the whole thing; it almost entirely does away with individual errors, and I should be very much obliged if Captain Blunt would give us the experience as to Hammant's indicator at Okehampton.

There is one other point of the lecture that I should like to allude to, because I think it is of very great importance, and that is that "Some Battery Commanders consider that it would be advantageous to retain the services of the No. 1 of the sub-division as gun-captain." That is a most invaluable suggestion. At present the tendency is that the battery layers should not be Nos. 1 of subdivisions. In my own battery only one No. 1 is a layer: all the others are gunners or bombardiers. I think it would be an excellent thing if the No. 1 was always the supernumerary gun-captain giving general assistance and supervision. Less than five numbers would very soon be exhausted on service, and the laying become wild; and I think it is a humiliating position for the sergeant to be No. 3, as at present, and the suggestion that No. 1 should always be the gun-captain, although he is not a layer, is a very valuable one. (Cheers.)

Captain Blunt—With regard to the question of the Hammant indicator, I

think I am right in saying that it has not been popular at Okehampton. This has been a very dry year, and the ground has been rather hard. Last year, when it was very wet, and the ground was accordingly soft, it was found that if all six guns were laid, while the shooting was going on from No. 1 to No. 6 or *vice versa* the wheels sunk, and then what becomes of your Hammant indicator, unless you have got a stable platform? Another disadvantage (I do not know the cause of it, but it certainly happened with one battery this year) was that the elevating gear went wrong. It was in one of the batteries that had the double elevating screw, and the Hammant indicator was fitted to it; the elevating screw jammed, and when they took the indicator off it went right; I am not enough of a mechanic to explain the reason why.

Colonel Bainbridge—I should like to say a few words about the ammunition. In the first place, I think the method of calculating the effect per shell as carried out at Okehampton is a wrong one, because it is allowed that the common shell is not an effective shell for anything but ranging, and therefore the calculation of the percentage of hits per shell I think should only be made from the shrapnel fire, leaving out the common shell fire, otherwise I think it is very misleading.

With regard to the ammunition, one thing that I notice is that "The time and percussion fuze is excellent, and every gunner will be glad to hear that the difficulty of screwing up the nut without shifting the collar has been overcome by a very simple expedient"—that is, simply by putting a fixed washer between the screw and nut and the dome, so that when you screw your nut up you do not move your dome. The time ring is also made round so that it can be more easily moved without the hand touching the dome.

With regard to the new form of shrapnel, these are some results that were sent to me from Shoeburyness, which certainly look promising for the new shrapnel. The only land range they have there is 1500 yards. The service shell gave 90 hits; the Italian new pattern, being tried with a burster in the base, for the 12-pr. gave 136 hits; and the 15-pr., with the lower velocity, 149 hits. I have here another comparison with the burster 11 feet up. The service shell gave 85 hits; the Italian pattern, 99; and the 15-pr. gave 139. I think that looks rather promising for the new shell.

The only thing that I am disappointed in is that the lecturer did not give a little more credit to the tube used for cordite, with which, when I was at Okehampton, we certainly had no failure during the whole day, and there was not a single misfire; but, so far as I know, the objection to it is that it takes rather longer to put in and to hook in the lanyard.

We have carried out some experiments to-day with a tube which, instead of being pulled directly upwards, is pulled horizontally, and I think that will overcome that difficulty.

Captain Blunt—With reference to what you have said, Sir, about the hits per shell, I quite agree that it is not fair to include the common shell, but it is sometimes a little difficult to separate the ranging shrapnel and the common shell. Some Battery Commanders begin to range with common shell—two rounds, perhaps, of common shell—and then go on to shrapnel. Are you to eliminate all the ranging rounds, or are you to include in calculating the results the percussion shrapnel?

Colonel Bainbridge—I myself should only include the time shrapnel. But previously to this all the ranging has been done by common shell, and it has been calculated in the same way in previous years too.

I beg to propose a vote of thanks to the lecturer.—Carried by acclamation.

VOLUNTEER ADJUTANCIES.

BY

CAPTAIN G. OSBORN, R.A.

It is easy to find an excuse for this paper were it needed! The dearth of R.A. officers who are willing to take Volunteer Adjutancies appears to be due to the lack of information on the subject in the Regiment generally. This militates against the efficiency of our gallant Volunteer Artillery, and it becomes one's duty, after serving with the Volunteers, to do anything in one's power to increase the popularity of these appointments by relating one's experiences and promulgating them. I trust in this short paper to shew that there is, in a Volunteer Adjutancy, scope for work, ability and ambition sufficient to satisfy the most insatiate thirst, at any rate for five years.

The position of Adjutant, as regards his duties to the Colonel and the corps as a whole, is very different to that of an Adjutant of regular troops, being in many particulars more onerous. The greatest amount of tact is necessary in dealing with officers whom he knows to have less military knowledge than himself, yet to whom he must shew deference owing to their rank in the corps being higher than his own. He is bound to instruct them in whatever he finds them requiring instruction, he has not to deal with purely military men, but with men of every kind of civil occupation.

To many artillerymen the Volunteer officer is somewhat of an unknown quantity, but it may be taken as true, that in most corps the Volunteer officers are the natural leaders of men in the locality in which their corps is raised; either by reason of their rank and position or their wealth, and the fact of their employing a number of men, their athletic tastes, or their love of command and soldiering. Those who do not find themselves successful as Volunteer officers generally leave the service before they attain the highest ranks, as such men are disinclined to continue the expenditure of no small amount of time, work and money fruitlessly. Those who know the Volunteer officer best will be ready to grant, that, to find a more suitable body of men for regimental officers of our Volunteer army, would be impossible. The present dearth of officers is much to be regretted, as it naturally tends to keep some men in the commissioned ranks, who would gladly retire, having become inefficient from one cause or another.

Some officers openly confess, that, owing to the important civil positions they hold, they have not time or thought to give to learning up the intricacies of tactics or complicated drill, nor can they do much

more than attend camp for a week, once a year. But it must not be inferred that such officers are useless or inefficient. I have found some men who come under this heading who have proved most steadfast in carrying out duties, and in upholding discipline in camp, and more reliable for responsible work than many who could pass better examinations in military subjects, and know more of a soldier's life, but who lack business qualities. The truly busy man makes a really good volunteer, for he brings a well-balanced and clear mind to work at all he undertakes. At the same time it is very pleasant to have to deal with men who can and will devote some time to the study of military affairs. An Adjutant will himself learn a great deal by the mere effort of getting up the subjects and teaching them to others, and when men pass their examinations well, he is amply repaid for his trouble by the credit brought to the Regiment, and the satisfaction he feels at helping men to pull through.

It cannot be too strongly emphasized that the training of officers should be the first care of an Adjutant. It would appear that we Adjutants, as a class, have not taken this sufficiently to heart (I can at least own up to this deficiency on my own part). An artillery Lieutenant or Captain has not much experience of training officers, as he is generally himself young when he takes up the appointment, and it requires great experience, perseverance, knowledge and tact to become a good instructor of one's brother officers. However, upon the training of the officers depends the real worth of an Auxiliary Artillery Corps, and when this becomes more recognised there will be little fault to find with Volunteer Artillery.

The Adjutant is not only instructor to all ranks in the Corps to which he is attached, but chief adviser to the Colonel in all matters connected with the Corps. When new buildings are required he assists to design them, when new batteries are raised he assists to organise them; he must train the drivers and Nos. 1 in driving and riding, and generally superintend the conversion of Garrison Artillery into Field Artillery when batteries of position are required; he takes care that recruiting is sufficiently maintained and, in short, does everything in his power to render the Corps efficient, and to keep up its popularity in the neighbourhood. He is also a missionary of military habits and *technique*, and must strive, far more than in the Regular Army, to imbue his Corps with the spirit of the British Army. In the Regulars, good military customs and *esprit de corps* are deep rooted, and handed on in regiments without great effort on the officers' part; but, in the Volunteers, who have only existed thirty years, and have become consolidated still more recently, military knowledge and customs are little known, and must be imparted by the Adjutant and his staff by every means in their power. A modified form of the aural instruction now given to young soldiers in infantry regiments would be a great assistance. If this be well done all those who pass through the ranks of the corps will be more or less influenced for good; their discipline, loyalty, manliness and physique will be strengthened, they will gain some touch with the army, and, should emergency arise, those who have left will re-join gladly, and swell the ranks of our defenders when the need is greatest.

A medium sized corps consists of 645 of all ranks, one Lieut.-Colonel, 2 Majors, 8 Captains (in command of batteries), 8 Lieutenants and 4 2nd Lieutenants, a Veterinary Surgeon, Quarter-Master, Surgeon, Chaplain, Adjutant—28 officers in all. The Adjutant has three or more Sergeant-Majors or Sergeants, R.A., who, with him, make up the permanent staff. Each Garrison Battery consists of 1 Captain, 1 Lieutenant (perhaps one 2nd Lieutenant), 1 Sergt.-Major, 3 Sergeants, 4 Corporals, 2 Bombardiers, 2 Acting-Bombardiers, 2 Trumpeters and 64 Gunners.

Staff Sergeants are—1 Quarter-Master-Sergeant, 1 Armourer Sergeant, 1 Orderly-Room Sergeant and 1 Sergeant Trumpeter.

Thus there are some 40 Sergeants to form a Mess, if desirable. The N.-C.O.'s number in all over 100, who, if well trained, form the back-bone of the corps.

Each Battery of Position consists of 2 Garrison Batteries; Farrier-Sergeant, 2 Shoeing-Smiths, Collar-Maker and Wheeler are allowed. Latterly a separate establishment has been authorised.

There are ambulance men, signallers and cyclists in each battery (in some corps a cyclist section).

The Batteries of Position are provided by Government with 4 or 6 guns, either 16, 25, or 40-prs., with ammunition wagons for 200 rounds of service ammunition, harness for the gun teams, and an ammunition tent and proportion of spare stores, saddlery for Officers, Staff Sergeants, Nos. 1 and Trumpeter, swords for the N.-C.O.'s and Trumpeter, carbines and swords in proportion for the remainder. All equipment, water bottle, havresack, belts, mess-tins and pouch are provided privately by the corps. Camp equipment is provided by Government when required.

Garrison Batteries have 64-pr. and 40-pr. guns in the drill-sheds, on standing carriages, with all stores, also sets of repository stores for mounting and dismounting and transporting the same, and sufficient spare stores and lithographs and sections are allowed. All N.-C.O.'s and gunners have carbines and swords.

Signalling lamps and flags, and telescopes are generally provided privately by the corps, as also gymnastic and war game apparatus.

Clothing is provided privately by the corps, and is issued by the Quarter-Master Sergeant under orders of the Quarter-Master. Mounted N.-C.O.'s of the Battery of Position, and drivers and trumpeters wear breeches and boots and spurs for mounted duties. The red facing and cap-band and button never look smart, a brighter colour is required. The Adjutant endeavours, as much as he can, to get a fair standard of cut of trouser, shape of collar, and shape of forage cap. These are the most glaring eyesores in the uniform of many volunteers.

Head-quarters generally consist of a large drill-hall, gun sheds, where the guns are placed for drill, and drill and repository ground, staff office, Officers' rooms, Sergeants' Mess and canteen, gunners' reading room (well provided with newspapers and games), Quarter-Master's office, clothing store, artillery store, an armoury where carbines and swords are kept in racks. A few men of known good character are allowed to keep their carbines at home, for their convenience, when

often attending carbine matches and practices. A harness room is required for the harness and saddlery of Batteries of Position. A gymnasium is generally provided in the large drill-hall.

In superintending the training of the Brigade the Adjutant has a good many special duties to perform. He attends to all correspondence concerning discipline, training and practice, and the Government stores in charge of the corps, and keeps the account of the same under the Colonel's orders. He makes out the pay list of the staff, and pays himself and the R.A. N.-C.O.'s, and keeps a diary of all drills which he attends and the nature of instruction given, and the number of all ranks present (this diary is sent to the Officer Commanding Auxiliary Artillery quarterly). He has nothing to do with the corps finances. His most arduous duty, and that which takes up the most time and requires the most persevering energy, is the instruction of officers for examination in company drill, carbine drill, gun drill and repository drill, guard mounting; (in which officers must pass before their second annual inspection), and the instruction and examination (assisted by the officers) of the N.-C.O.'s and men for prizes, skill-at-arms, and the instruction and examination of all N.-C.O.'s and gunners before promotion to each rank. Since only a few men are able to be present on any given night, a great many nights must be devoted to this instruction of the young N.-C.O.'s, layers, limber gunners, &c., and in the instruction the Adjutant is greatly assisted by the staff and smartest N.-C.O.'s, but it is necessary that he should give his undivided attention to the examination of the N.-C.O.'s and gunners, even if he is assisted by the officers, as he must make use of this and every other available opportunity to learn what knowledge each N.-C.O. possesses and his general abilities, and whether their instruction has been sufficient. The examination must extend over a considerable period, to give men in all employments opportunity of attending on one night for examination. Of course some different questions must be asked on each night. The Sergeants should be well up in instructing squads in drill with the guns in use, ammunition, &c. But this will not be the case unless the Adjutant has taken great pains in superintending the instruction of men for promotion. It has been found that the higher the standard required in each rank, the more will the Volunteers try to attain to that standard, in fact they come up to hand grandly. A Sergeant should also be able to write fairly answers to questions concerning gun-carriages, ammunition and drill. It will generally be found in the Volunteers that men who have been advanced to the rank of Corporal or Sergeant are good layers—but to attain uniformity in laying requires the Adjutant to insist upon it in the examinations.

Before promotion to Corporal, Bombardiers will be examined, and must give promise of becoming good instructors and have proved themselves steady men, likely to win the respect of their comrades. Gunners who are smart men and efficient in their work on the guns, can lay well, and have a fair knowledge of ammunition and stores are promoted to Acting-Bombardier as vacancies occur. As many as 60 to 80 men will come up for examination each season for promotion and skill-at-arms, and when it is remembered that each has to be tested

separately in laying and practical work, and power of instruction, some idea of the Volunteer Adjutant's work, in this matter alone, can be formed.

Pot-hunting is greatly to be discredited in the Volunteers, but all Volunteers who do well are by no means pot-hunters. I remember one Sergeant, and from what follows I think every R.A. officer who reads of him will wish he had him in his own battery. He could not attend drill as often as some men, but in the examination for skill-at-arms, carried out as in R.A. R.O./90, he made full marks in giving practical instruction, he could drill a squad of recruits on the guns or in carbine drill, or setting up drill as well as a good R.A. Sergeant, with a good word of command; and some weeks afterwards, in practice camp, he scored full marks in good time, in the competition for the Colonel's cup, and won the prize. Needless to say, we brought him to the notice of the Inspecting Officer. By trade he was a foreman painter in a ship yard. He was a big made, swarthy man, who could sing a good song in grand style, quite a typical R.A. Sergt.-Major, but alas only a Volunteer. Unfortunately we, as a corps, could not claim the credit of training him, as he was Sergeant in another Volunteer Artillery corps, before coming to our neighbourhood and joining ours.

The Adjutant must also do all he can to make the drill and training of interest to men of varied callings and abilities; for men skilled in civil employments may be taught to turn their knowledge to great account for the good of the service. Thus, signallers are easily obtained from telegraph boys and men, and other postal and railway officials who join the corps and take a keen interest in army signalling; so much so that a good suggestion was made by one of them—to obtain old telegraph instruments from railway or post office officials and use them by attaching them to the spare wires (which always exist on the telegraph lines, for use in case of break downs) on the different telegraph lines in the district, and so communicate to different detachments and batteries near the same line. Flag and lamp signalling may be practised by day and night in the armoury grounds, or at long distances from steeples in town to the country, and cycling excursions with such objects, afford much relief to ordinary drill. Men, such as architects, surveyors, painters and clerks, can readily be taught to read an ordnance map or military sketch map, and to make military sketches of parts of the surrounding country. Those men who have much leisure and make military work their hobby, can be instructed in field fortification or reconnaissance work, or gunnery. Members who are workers in metals or jewellers will be greatly interested in making any instruments for range-finding, clinometers, dials, or anything for gunnery purposes which may be useful or experimental, or such as are not supplied by Government. I have seen good practice carried out with the aid of a clinometer and pointing rods, over a high bank, at a target 3000 yards away and invisible from the guns, the clinometer being made from my rough sketch and description, by a jeweller in the corps.

The Volunteer Batteries of Position are now harnessed with R.A.

harness, Staff Sergeant, Nos. 1, and drivers and officers are mounted, and in many cases are turned out in a serviceable and soldierly way, smart in every respect, and are no mean followers of the British Field Artillery. This perfection has not been arrived at without considerable difficulty.

The horses for draft were the first consideration, and these have been lent to some corps by private firms and public corporations, or hired privately by others, as circumstances differed in various localities. At first these horses were used in the guns with their ordinary cart harness, the drivers being on foot, each man leading his own horse, and himself dressed in a loose smock or serge. It was soon found, however, that locomotion under these circumstances was exceedingly difficult, and in thoroughfares where traffic was going on being even dangerous when passing other vehicles. The two lead horses, with their drivers walking on either side, formed a very large front; the Sergeant No. 1 was supposed to march in front of his team and direct them by signal and command; but he could not see all the drivers at once whatever position he took up, nor could the drivers see him or easily hear his voice; the lead drivers were not unanimous in the way they would pass obstacles, or even as to the particular spot which was best to make for. So that at last many corps began to buy R.A. harness at their own expense, and to mount the drivers as in the R.A., and thus somewhat forced the hands of the War Office, till at length permission was granted to mount officers, Nos. 1 and drivers as in the Field Artillery. Of course this could not be done at once; care had to be taken to find out what N.-C.O.'s and men were likely to make fair riders; these had to be trained, either by using hired horses in the armoury field every evening in the summer, and giving riding and driving lessons, or by sending men to a riding school. By both these methods thoroughly good men were found and trained, affording thereby much pleasant work to the Adjutant and his staff if he were lucky enough to possess a N.-C.O. who had served in the Horse or Field Artillery.

The whole of the mounted men of our corps soon learnt the sword exercise mounted, and the simpler battery movements; the emulation was pleasant to see. All the mounted N.-C.O.'s requested to be sent to the F.A. riding school, Newcastle, for a week, there to be perfected in their duties in stables, drill and riding; they sacrificed a week's pay to go, and lived in barracks, were very well received by the R.A. Sergeants' Mess, and obtained great credit for their smartness.

The number of members passing through the ranks is large, about 150 recruits joining, and 100 men or more leaving the corps every year. N.-C.O.'s do not leave as soon as some of the men—no man, however, is supposed to resign until he has been efficient at least three years. In our corps the recruits came in pretty thickly in the spring and early summer, very few joining at any other time of the year, probably this was due to advertisements chiefly, *i.e.*, most of the work of the year was done between March and June, and thus the Volunteers were brought prominently before the public only during these months. For a few days after each march out (which was always through part of

the town, and rendered most attractive by the excellent band of the corps) many recruits were enrolled. After the annual inspection, which took place in July, little drill was done in the corps. Endeavours were made to keep squads of 15 or more recruits together, and take them right through their drill, the Adjutant passing them, first in squad drill, then in carbine drill, gun-drill and repository.

There are some men in a Volunteer corps who are glad to attend nearly all the year round, and will learn anything in which they can obtain instruction, and for this reason the Volunteers are much better off than the Militia, for such men, living near their head-quarters, may be made thoroughly good and useful artillerymen, and will probably be made much more of as time goes on.

The men are fallen in in plain clothes to the number varying from 20 to 120, one N.-C.O. takes the recruits in squad drill, another takes the men to gun-drill, another a repository squad, or does a little company drill (if near the inspection), signallers will proceed to practise signalling, trumpeters are in a separate place practising. No one is allowed to remain in the reading-room or Sergeants' Mess unless they are thoroughly efficient and not required on parade.

The Adjutant superintends the drills, coaches officers for their examinations, examines men who are competing for skill-at-arms, or for Bombardier, Corporal or Sergeants' rank, or superintends the examination of layers. If officers are available, who will undertake to conduct examinations under the Adjutant's supervision, they gain greatly in knowledge of their work and of their men.

Recruits are sworn in between drills, or after they are finished.

As usual, part of the gun-drill consists of pure drill, the rest instruction in ammunition and gunnery. Some men may be taught how to aim by means of a Morris tube range, which may be fitted up in almost any armoury in such a manner as not to interfere with any other drill.

If the whole object of artillery is to "hit, hit, hit," as said by Prince Kraft, and since reiterated by many military men in every army in the world, surely an artillery officer may hail with delight the chance of obtaining an Adjutancy of Volunteer Artillery, for he will have the superintendence and direction of firing more ammunition than he would have in any other branch of the Royal Artillery. He is generally left to himself in the arrangement of the practices, and the object for which each series is carried out. He can range-find with plane tables, or any other means that can be obtained, and use dials and code signals, by which the commanding officer can work the guns from a distance. Drifting targets can be used, standing targets, sometimes towed targets. On the land range the Battery of Position can fire at every kind of entrenchment, dummy guns and men. There is, however, one difficulty in connection with practice. Every member of the corps must attend one practice during each year in order to be efficient, and this is not easily arranged. If the inspecting officer, at the annual inspection, wishes to see practice the matter is fairly easy, but even so, all men in the corps cannot go on the guns in one afternoon, nor would it be desirable to shew up the worst attenders before the inspecting officer in a body. Indeed most of the practice is carried out prior to

the inspection, and to this all the members have to be brought. There are several ways of accomplishing this. Full and due notice must be given to all the men, of the days and hours when practice will be carried on, and these days and hours must be arranged so as to suit the spare time of the different classes of men in the corps, and if towards the end of the practice, many men have still failed to appear, the N.-C.O.'s of the batteries should be given their addresses, so that they may look them up and caution them. Post cards also may be sent to each non-attender, and no stone be left unturned until all are brought up. One must hammer, hammer, hammer, till all are reached, perseverence will certainly be well repaid. And when Volunteer Artillerymen thoroughly understand how important it is to comply with this regulation, the difficulty will fade away and compliance become general. Volunteers are proverbial for good shooting, and I found the greatest keenness, amongst all ranks, to make good use of the ammunition allowed for gun practice; this keenness was certainly stimulated by the numbers of prizes given to the corps for competition, and by the popularity of the Shoeburyness meetings. One gun detachment from each battery was sent each year to Shoeburyness, and during the week of the National Artillery Association meeting, local papers, though far removed from Shoeburyness, were full of the doings of their Volunteer comrades there. Detailed results of the competitions were telegraphed each day, and humourous letters from different men in the camp were published. The enthusiasm of the population, when good prizes were won by their local corps, was astonishing to witness. It may not be known what interest our Volunteers took in the naval manœuvres of one or two years ago, when look-outs were kept all round our coasts, and many towns were bombarded with blank ammunition. For several nights the Volunteers patrolled the sands along the coast, and kept watch the whole night through; at last, when early in the morning, the iron-clads were heard booming far away, the signal guns were fired, those Volunteers who were at work threw down their tools in the workshops and rushed to the batteries, manning all the guns, firing blank ammunition at the most amazing rate and, as local history related, scared the enemy from our shores. Many of the men were only in their shirt sleeves and working clothes, and one, I believe, with one side only of his face shaven, not having had time to finish his toilet. There was no doubt about the corps being ready to do its best, and some of the foremen in the workshops who were ignorant of the cause of the stampede, were quite dumb-foundered at steady men losing their heads in such an extraordinary manner.

A few corps have arranged marches for their Batteries of Position, and now annually proceed to practice camp by route marches. Such corps greatly improve their efficiency, and gain valuable experience which nothing else could give them, not to speak of the healthy exercise and pleasure to all ranks.

If weather be favourable and the time arranged to suit the holiday season of the district, more than half the corps will attend camp for the inside of a week. The Adjutant who accompanies the corps into camp which has never been under canvas before has no sinecure; all

ranks being new to the work, the first regimental camp is a great undertaking. There is the difficulty of finding out how many men can get away from their ordinary employment and are willing to go into camp. This is done by appealing to the men on big parades, explaining to them, by printed circulars sent to each man, the nature of work, particulars of meals, the necessary kit, money allowance for extra messing or beer, the time men must stay in camp to obtain the Government grant for the corps, &c. A great amount of tact must be used, but in the end only approximate numbers will be known by the non-commissioned officers of the batteries, as many will be influenced by the weather on the day of leaving for camp. One of the first things a Regular officer will question is the kind and amount of baggage the men will bring with them, as they have no regular kit except their uniform and equipment. They are generally asked to bring a second pair of boots, a change of underclothing, towels, soap, brush and comb, and razor. This they can carry in their havresacks, but many men wish to bring more. I wondered what kind of parcel or box would be taken on first going to camp. The baggage had been ordered to be left in the railway station overnight, by each man taking more than his havresack would contain, so I went down late to see what it looked like and was surprised at the neatness of its appearance, as most of the baggage consisted of small tin boxes, which seemed very suitable. The box was, I believe, in most cases, the tin bonnet box of the family! In such ready and convenient ways do the Volunteers ever solve the minor difficulties of rapidly turning themselves into soldiers, and evidently they are well backed by the fair sex.

The Quarter-Master and Q.M.S., with some 15 men, proceed to the place of encampment, about four days before the rest of the corps, to receive the camp equipment, erect the camp, and complete the final arrangements.

When in camp, great strictness is required to get the men to turn out punctually to parade, and some men may not appear at all unless looked after; so that it is a good rule to oblige everyone to appear at each parade, some in fatigue dress if necessary, and to dismiss the employed men at once on their being reported all present.

The feeding is an important item, and it was found possible to give the men coffee and biscuit at 6 a.m.; breakfast, with ham or bacon or eggs, and bread and butter and tea at 8.15 a.m.; dinner at 1 p.m., and tea at 5, at the rate of 1s. 4d. a head (over 1 lb. of meat per diem was allowed per man). Sixpence a day was allowed for extra messing or beer. The men did credit to the fare, all looking fatter and stronger at the end of camp. Our Drum-Major, a veritable giant, not unknown at Shoeburyness, assured me that he increased 7 lbs. in weight in the week he was in camp. Men coming from very hard work, in iron-works and shipbuilding yards, and camping out with ice in the tents every night, as we had last year, must have abundance of good warm food and plenty of blankets at night, or the sickness would be serious; as it was only two of our men caught bad colds.

The amount of useful work which can be got through in the few days the camp lasts is very great, and officers, N.-C.O.'s and men confess they

learn more of their duties as soldiers in a week's encampment, than in all the time spent in the armoury and drill ground. The Adjutant, at a corps first encampment, must keep an eye on everything, and satisfy himself that all is going on in good order. He must teach those duties that are not understood, he must occasionally accompany the officer on duty by day and night, visit the guard, canteen, see that the cook's-mates understand their work, also the men on Quarter-Master's fatigues, he must insist upon cleanliness, both in the tents and outside, and he must arrange to have the canteen closed at the proper hours, and insist upon the orders being carried out. [1]

The drill and instruction, and gun practice in camp must be carried out by the officers and N.-C.O.'s of the corps, the Adjutant and permanent staff rarely giving any executive words of command; but when necessary the Adjutant must himself interfere to correct mistakes, or for the sake of safety when firing. He must make up the practice reports himself each evening, or see that they are most carefully compiled under his supervision; he must have diagrams made so that each layer can see for himself where his shots have fallen. These diagrams must be posted up where all can see them, with the list of the layers for the day, and the numbers of their shots. He must inform all ranks of any errors made during the day, so as to prevent their recurrence during the remainder of the practice.

In winter there is not much drill or military exercise going on, and this season is therefore chosen by the Volunteers to meet together in the evening at the head-quarters of different corps, for the purpose of hearing lectures on military subjects, or playing the war game and studying tactics. From small beginnings greater things have grown, and the Volunteer institutions that are springing up all over the country bear witness to the earnestness and industry of many of the Volunteer officers. War games played in the winter are of the greatest interest, they bring together many officers of different corps who would not otherwise meet, and cause a friendly comradeship to grow up in the service. The Manchester and Glasgow Tactical Societies, by their valuable publications and discussions, have become of great use to the authorities, and most important adjuncts of the Volunteer system. The development of such institutions throughout the country has a wide and healthy influence which is difficult to fully appreciate, and it is impossible to foretell the extent of their usefulness in the future.

In the neighbourhood in which I lived some half dozen Volunteer corps, comprising Artillery, Engineers and Infantry, were so situated that it was possible for officers to attend a war game at any one head-

[1] Every officer and N.-C.O. was given a copy of the small official book on "Duties in Camp," so that each could see for himself, when on duty, of what his daily work consisted. Camp standing orders were printed on large pieces of paper beforehand and posted on notice boards about the camp; likewise orders for the guard in the guard-room; for the canteen orderly in the canteen. Each battery was given a battery order book containing some usefel information for the battery orderlies, and in this book was kept a nominal roll of the battery present in camp, a duty roster, list for sick, prisoners, etc.; all orders were copied into it. Very few offences were committed, and for these confinement to camp, or stoppage of beer money or prize money were sufficient punishments. All flagrant misbehaviour entailed dismissal from camp or even from the corps, which were very heavy punishments for men always living in the locality, and therefore were very rarely resorted to.

quarters, and get back to their homes the same night. An Adjutant of one of the Infantry corps had lectured to his own officers and passed several in tactics, and, just before leaving to re-join his own regiment, obtained a war game for the corps; games were played between different corps, and then it struck some of the officers that a Volunteer Institution might be established, with simple rules and at the minimum of expense, by each corps getting their own war game, and each having a different set of maps. This was done. A game was played once each month at the different head-quarters in succession, only slight refreshment being provided, which could be taken by the players and onlookers during the game. Different officers were asked to make out the general ideas and act as umpires and players. This very inexpensive association was found to work admirably, and to the satisfaction of all, and greatly increased the knowledge of tactics of all the officers, making military history more interesting to some of them. Young fellows who were friends of the junior officers were allowed to attend, and some were persuaded to take commissions, partly by the interest aroused, in the first instance, by witnessing the war games.

Much more might be written of an Adjutant's experiences, but sufficient has been said to shew how varied and interesting is the lot of a Volunteer Adjutant.

A VISIT TO THE STOCKHOLM ARTILLERY MUSEUM.

BY

LIEUT.-COLONEL J. C. DALTON (H.P.), R.A.

During a visit to Stockholm, in July last, I was enabled to see the Artillery Museum, which is well worthy of a visit, and I propose to give a short account of it. The origin of the Museum appears to have been a collection of artillery models which was started somewhere about the year 1660. Later on, about the middle of the 18th Century, Field Marshal General Thomas Cunningham (died 1759) formed in Stockholm a model-room for artillery *matériel*, which now forms Group *B* of the present Museum. On May 4th, 1807, the King of Sweden extended the scope of this Museum, located it in the Artillery Park at Stockholm and placed it under the orders of the Officer Commanding the Artillery, who added to the collection an exhibition of ammunition and weapons. The years 1861 and 1864 saw the institution still further developed, and in 1877 Field Marshal Leijonhufvud, Chief of the Artillery, assisted by Lieutenant F. A. Spak, formed the existing collection into an Artillery Museum, and two years were spent in arranging it. The Museum is divided into 12 classes or groups, as follows :—

Group *A*.—Field and siege pieces, with their carriages, &c.
,, *B*. —Models of artillery *matériel* of Sweden and other countries (including fortifications).
,, *C*. —Artillery ammunition.
,, *D*.—Models of Swedish manufacture and proof specimens.
,, *E*. —Instruments for artillery purposes.
,, *F*. —Harness and appointments.
,, *G*.—Uniforms.
,, *H*.—Regimental trophies—Colours and musical instruments.
,, *I*. —Small-arms.
,, *K*.—*Armes blanches*.
,, *L*. —Small-arm ammunition.
,, *M*.—Manufacture of small-arms, and small-arm ammunition.

There is also a collection of books, manuscripts, records, &c., belonging to artillery science and history.

The Museum is arranged in a fine, well-situated and spacious building, of which the ground-floor is given up to the heavier part of the collection, viz., specimens of ordnance, limbers, carriages, &c., while upstairs are to be found examples of small-arms, ammunition, swords, uniforms, musical instruments, trophies, scientific instruments, small models, &c.,

&c. All are carefully arranged and well looked after. The fact of the specimens of old ordnance being under cover tends to preserve them. Artillerymen on duty patrol the rooms and see that nothing is interfered with. The Museum is only open to the public on Wednesdays for a few hours on payment of a fee of 1½d. Doubtless on other days it can be seen on application to the Commanding Officer, when probably a small fee or gratuity is expected. The collection of old and undoubtedly genuine pieces of ordnance seemed to me to be especially good. Some of them dated from the earliest periods after artillery had become generally employed, and it was very interesting to note the many specimens of ancient and elementary B.L. ordnance and revolving cannon, proving the truth of the saying that "there is no new thing under the sun." Many of the oldest pieces have been recovered from the sea, and are consequently somewhat corroded and destroyed, but, nevertheless, show plainly their original form and peculiarities. According to the places in which they have been found, so has it been possible to assign to them dates and with a fair probability of approximate accuracy.

In Group *A* there are six pieces dating from the 15th Century, of which the most ancient seems to be a bombard of the early part of that century, made of iron rods, bound together by iron hoops, and mounted on a carriage. This piece was found about the year 1700 in the harbour of Stralsund. Another, a "Mickhake," of wrought-iron, strengthened with iron hoops, and of about the same date, was found buried in the ground when opening out the street in the neighbourhood of the German Church in Stockholm in the year 1884. A similar piece was found in the old Castle at Kalmar in 1860.

There is a large collection of pieces of a later date, many of them very old and mounted on the carriages of the period, which are interesting; also a number of mortars, howitzers, shell guns, &c.

In Group *A* there are some English pieces, which include an 8-inch howitzer of 1806, made when the Earl of Mulgrave was Master-General, and bearing the name "H. King, 1806;" also a 10-inch howitzer bearing the initial "C" (Earl of Chatham). These were in the fortress of Karlsten; also a light 6-pr. R.H.A. gun, with a block-trail carriage of 1812, by "H. King." Several other countries are also represented.

In Group *B* there is a model of the famous depression carriage used with such success at the great Siege of Gibraltar, and invented by Lieutenant G. F. Koehler of the Royal Artillery (wrongly described in the catalogue as Lieutenant R.N.). Two original drawings by the inventor of this carriage are to be seen in the R.A. Institution, and a good biography of Lieutenant (afterwards Colonel) Koehler is to be found in "Kane's List." The remarkably adventurous and successful career of this officer dates from the invention of the carriage in question.

In Group *C* (ammunition), some of the oldest specimens—*i.e.*, stone shot—dating from the 15th Century, were found embedded in the walls of the famous old Castle of Kalmar.

The collection of uniforms in Group *G* is very complete as regards

Sweden. In artillery uniforms there is nothing older than 1794, but in the infantry some of the accoutrements date back some 300 years. The specimens are all arranged on dummy figures to represent soldiers of the period. There are very few foreign uniforms. England is represented solely by a R.H.A. gunner's full dress uniform of 1888, presented by a Swedish officer. This is not a creditable specimen of R.H.A. dress, and it has evidently been installed in the Museum by someone who did not thoroughly understand the uniform in question. The plume has been expanded at the top—apparently on purpose—to its fullest extent, so that a well-used shaving brush would be quite smart compared to it! I really think that if the Government or the R.A. Institution were to present (or exchange) a new set of R.A. uniforms, Horse, Field, and Garrison, it would be much appreciated, and we could send someone over to dress the lay figures properly!

Group *H* contains standards, trophies, &c., of which there are specimens belonging to the various Swedish regiments, the artillery included. The old standards are very large and heavy. Some bear inspiring mottoes, such as "*In Gottes namen*," "*Auf Gott hoffe ich*," "*Das Glück erfreue mich*," &c. An artillery standard of the time of Charles XII. bears, in addition to the Royal arms and monogram, various artillery emblems, such as guns, port-fires, partisans, lintstocks, &c. It was carried in a two-horse carriage at the head of the column on the line of march. This group also contains specimens of musical instruments, some of which are very curious.

Group *I* takes in small-arms amongst which there are some rare examples of wall pieces, matchlocks and flintlocks, pistols, &c., dating from the 15th Century, and the gradual advance in the manufacture of fire-arms is clearly indicated by the different examples dating from this early period to the present time. The English specimens are poor.

In Group *K* (*armes blanches*) there is a good collection of spears, halberds, pikes, officers' half-pikes, partisans, lintstocks, lances, &c. This group is sub-divided into : (*a*) arms with shafts (as above) ; (*b*) side-arms, including swords, rapiers, cutlasses, &c.

Group *L* contains specimens of all sorts of appliances for igniting the charge of small-arms, such as tinder, quick and slow match, priming, flint and steel, locks, percussion caps, &c.

Group *M* contains sights for small-arms, &c.

The Museum is, as I have said, a very interesting and well-arranged one, but it does not contain anything like the number of rare and curious articles which we could exhibit if our present scattered collections were brought together into one convenient building where they could be properly displayed and identified, with the help of a clear catalogue divided into classes and periods somewhat after the manner of the Swedish catalogue above described.

This system of collecting together isolated collections into one central institution has also been adopted with much success in Spain, where there is a splendid "Artillery Museum," which is a national institution entirely managed by artillery officers, there being a director and staff who are fully occupied in the supervision and working of the Museum. They see that it is properly supplied with all the latest specimens

of ordnance and models of scientific warlike appliances, trophies, military curiosities, &c. This Museum in some degree corresponds with our R.A. Institution, and is of great value to the Regiment and to the Spanish Army in general for purposes of study, besides being of much interest to the historian and student of military history.

To make such a Museum in this country it would be necessary to locate in one large central building in London or elsewhere the contents of the Rotunda at the R.M. Repository, and such portion of the Museum of the R.A. Institution as deals with military science and history. Also this might with advantage be supplemented by certain models, scientific curiosities, specimens of weapons, and ammunition from the Royal Arsenal.

By this means we should no doubt get together a highly interesting and valuable Museum which would hold its own with any similar continental institution.

But this is an easier matter to suggest than to carry out.

Many difficulties present themselves at once; first of all the *locale* of the newly-formed Museum; secondly, how a new house is to be provided.

I do not propose now to enter into the question of ways and means, but will merely remark *en passant* that even if an annexe to the R.M. Repository could be made which would house the military portion of the R.A. Institution Museum (leaving in the present building the ornithological, geological, numismatic, and other non-military collections), a great step would have been taken; and at all events many of the valuable and curious contents of the R.A. Institution, which are now rarely seen and known, would be on view and available for all who are interested to see and study.

Such a museum ought, as elsewhere, to be a regimental establishment and would, naturally, with us be a part and portion of the R.A. Institution.

I only offer the above as reflections which occurred to me after seeing the fine collections, such as I have alluded to, in Stockholm, Madrid, and other continental capitals.

The question of space in the present home of the R.A. Institution must be faced sooner or later, and there can be no doubt that if we could effect a concentration of our regimental treasures and house the collection properly we should benefit, not only ourselves as a Regiment, but the military and sight-seeing public as well.

RECENT DEVELOPMENT OF ARMOUR AND ITS ATTACK BY ORDNANCE.

BY

CAPTAIN C. ORDE BROWNE, LATE R.A.

A 6-inch gun at Elswick was lengthened for experimental purposes to 100 calibres, by screwing an additional piece on the muzzle. A trial took place on January 23rd, 1893. Fired with a projectile weighing 100 lbs., a velocity of 3231 f.s. was obtained, and with a 70-lb. projectile the enormous velocity of 3711 f.s. The highest record that has hitherto been recorded was that of the Canet 10^{cm} (3·9-in.) gun of 80 calibres length, which with a 13 kilos. (28·7 lb.) projectile achieved 3366 f.s. muzzle velocity. The Elswick result is a great advance, both in velocity and in being carried out on a much larger scale. The gun is intended for experimental purposes only; and there are questions which might be solved by it, which at the present time are important. As before pointed out, the foreign and British formulæ for perforation are widely divergent when a shot strikes with a velocity sensibly over 2000 f.s. With velocities approaching 3000 f.s. the differences in the perforations calculated by the different systems are, indeed, wild. In the case before us, the muzzle energy of the 70-lb. projectile with 3711 f.s. velocity is 6685 foot-tons, that of the 100-lb. shot with 3231 f.s. is 7238 foot-tons. It is really doing violence to the English systems of calculation to apply them to such a case, for reasons which need not here be discussed. Nevertheless, they are all we have in this country, and applied to this case, the perforation through wrought-iron is 19·7 inches. Krupp's formula gives 27·1 inches, and that of De Marre, used in France, 29·1 inches. Even a round or two with this gun at thick wrought-iron might teach much, and it must not be supposed that this is merely a theoretical question. Wrought-iron remains a fixed quality, while steel varies continually, so that our basis of calculation must be wrought-iron, to which we may apply an equation suited to any harder shield which may be in question.

Elswick High Velocity Trial.

The Portsmouth trial of a Vickers-Harvey 6-inch plate, to be noted presently, suggests the re-introduction of thin armour on a very large scale, seeing that comparatively thin plating will defeat the best 6-inch projectiles under service conditions. It may be that high velocity is of special importance in the attack of such armour, so as to enable a breaking shot to work mischief before it yields. This, however, is speculation.

A competitive trial of armour plates took place at Ochta, near St.

Petersburg, on November 23rd and December 13th, 1892, in which the following plates were tested :—

(1.) Cammell all steel hard.
(2.) Cammell all steel soft.
(3.) St. Chamond all steel.
(4.) Ellis-Tresidder compound.
(5.) Harvey nickel steel plate made by Vickers.

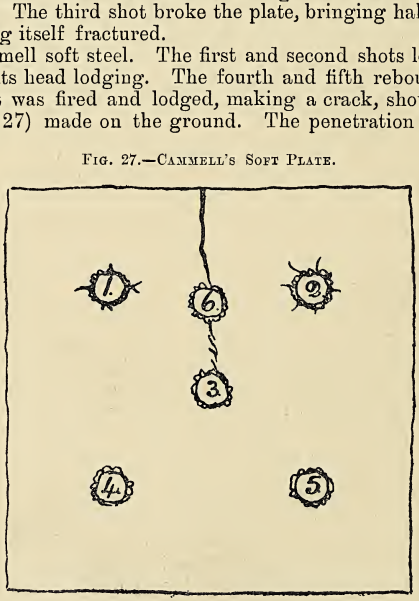
The plates each measured 8 feet × 8 feet × 10 inches, probably weighing about 11·5 tons.

The attack was made by 6-inch Holtzer forged steel projectiles, weighing about 90 lbs. (English) ; striking with a velocity of from 2177 to 2205 f.s., the mean being 2188, with a striking energy of 2975 foot-tons, and a perforation of 13·2 inches of iron or 10·5 inches of steel by the English formulæ, and 14·8 inches of iron or 11·8 inches of steel by Krupp's formula. The energy per ton of plate was 258·9 foot-tons. The results of the firing were as follows :—

(1.) Cammell hard steel. The first shot penetrated 13½ inches and rebounded intact. The second went through and carried off a corner of the plate. The third shot broke the plate, bringing half of it down, the shot being itself fractured.

(2.) Cammell soft steel. The first and second shots lodged. The third broke its head lodging. The fourth and fifth rebounded intact. A sixth shot was fired and lodged, making a crack, shown in rough sketch (Fig. 27) made on the ground. The penetration varied from

Fig. 27.—Cammell's Soft Plate.

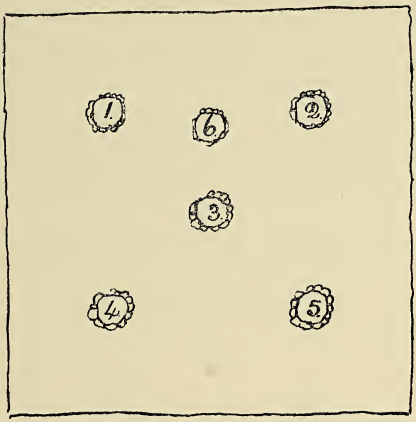


11½ to 21 inches.

(3.) St. Chamond steel. The first shot broke in two and rebounded. The second and third rebounded intact. The fourth and fifth broke,

the heads lodging and bodies rebounding. A sixth shot rebounded intact. The penetrations were from 11 to 12 inches. There were no cracks. (*See* sketch shown in Fig. 28.)

Fig. 28.—St. Chamond Plate.



(4.) Ellis-Tresidder steel-faced. Five projectiles only were fired, the plate exhibiting a flaw of a fundamental character, and cracking and fracturing at the first round. The first was very hard, all the projectiles being broken up small with penetrations of from 4 to 6 inches deep. Fig. 29 shows the plate after the fifth round. This part

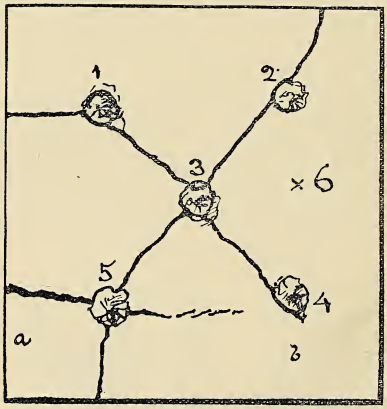
Fig. 29.—Ellis-Tresidder Plate.

of the programme was carried out on November 23rd. At this stage the St. Chamond plate had clearly behaved the best. The Cammell soft steel being placed second. The Tresidder face, however, had done its work well. It had broken up the projectiles completely and protected the backing, but the flaw in the plate had ruined it.

On December 13th, the Harvey nickel plate made by Vickers was tested. Four 6-inch Holtzer projectiles were completely broken on its face without making a single crack, with a penetration apparently of from 4 to 5 inches. So well did this plate behave, that it was judged to have shown itself the best after the fourth round, and the competition declared to be at an end. A 9-inch shot was then fired at it with a striking velocity of 1655 f.s., and an energy given as 7708 foot-tons, the projectile weighing about 406 lbs., which seems strange, the service weight being given as 275·6 lbs. 403 has since been given as the weight.

This round broke the plate across through the previous points of impact, as shown in Fig. 30. A sixth round was fired, a 9-inch pro-

Fig. 30.—Vickers-Harvey Plate.



jectile being again used, but with a striking velocity of 1889 f.s., and an energy of 9974 foot-tons or 867·4 foot-tons per ton of plate. This shot broke up, bringing down the entire target. Only one corner of the plate, however, was detached from the backing, and one bolt broken.

Nettle trial of small Vickers-Harvey plate

This was a grand victory for Vicker's-Harvey plate. With it must be mentioned a trial which took place at Portsmouth on board the *Nettle* on January 18th, 1893. The plate was only 6 inches thick. It was attacked by the 6-inch gun, firing 100 lb. Holtzer forged steel projectiles throughout. The first had a reduced charge, giving a striking velocity of 1507 f.s. The shot was pulverised without cracking or seriously injuring the plate. The second had a striking velocity of

1813 f.s. The shot was again broken up, but the plate was cracked. The third projectile struck with 1960 f.s. velocity, that is, it was fired with the full charge. The shot passed through the plate, lodging in the form of fragments in the backing. A fourth round was fired with 1815 f.s. striking velocity, when the shot again broke up without perforating and without making further cracks. No part of the plate fell from the backing.

This is a most remarkable trial, for it must be borne in mind that the resisting power of a plate is more nearly as the square of its thickness than as the first power, so that for a 6-inch plate to break up a projectile which until recently was a match for 10½-inch is a great triumph, and it may be seen from the account that any structure behind the backing would have been protected. Attention must be called to the fact that while the shot was broken up at 1815 f.s. velocity in such a way that a great part of its striking energy must have fallen harmlessly on the plate, it cannot be argued, that a shot is only capable of delivering a fixed quantity of energy before fracture, and that all energy over and above that is lost, for it appears that at 1960 f.s. velocity much more injury was done, apparently because more energy was delivered before the work of fracture was complete. Probably the fracture of the projectile occupies such a period of time that more work is done on the plate during the process by increasing the velocity, because, although the shot is the weakest element, there is not time to find the line of least resistance before the additional injury is done to the plate. It is perhaps the same action as causes fulminate not to follow the lines of least resistance taken by slower powder in bursting a shell.

Attack of Ships.

Shell attack.

The attack of armour-clad ships entails among other questions the choice of projectiles, in order to produce the best effect on the particular structure attacked. The highest authorities seem agreed that *failing any better achievement distinctly presented as within the power of attack, the best course is to fire common shells at the weaker portions of ships,* which in nearly all cases constitute a larger target than the thickly armoured parts. The fire should be directed on the central part of the ship where the crew and guns are placed, and *some Q.F. guns should be specially directed just in front of the funnels, where the conning tower is generally placed.* A ship may be crippled in its powers even by the lightest gun fire directed on the locality of the conning tower.[1] It is well to insist on this before discussing any other matter in even the most general way. Steel common shells now contain larger charges of powder than the older common shells of cast-iron. High explosives can be safely employed, and, lastly, the rate of fire has been increased so much by the introduction of Q.F. guns that a ship may suffer destruction from fire directed on her weaker parts to an extent that was formerly out of the question. On this account the term "shell attack" is substituted for "secondary *attack,*" which

[1] By confining the staff inside the conning tower, as pointed out by Lieutenant Honner, R.N., Assistant Secretary Ordnance Committee, and late of H.M.S. *Excellent.*

might be misleading. If the matter be dealt with in detail, however, it will be found that the line is not altogether clear between armoured and unarmoured parts. Thinner plates are used to protect gun positions and conning towers, and steel traverses and protective decks are largely employed in the later designs, and similarly the line is not so clearly drawn between armour-piercing and common shell as formerly. The *armour-piercing steel common shells*, whose trials have been briefly dealt with already, constitute an intermediate projectile whose scope of application is generally indicated by the fact that it will carry an explosive through ordinary steel or steel-faced armour one calibre thick.

Belt attack.

"Primary," or, as it is now called, "belt attack" may bring about the total ruin, or even immediate destruction of a ship by fundamental injury to her boilers, engines, magazines, or floating power, but such injuries are only possible when projectiles perforate the belt easily with spare energy left in them. The cellular system is now so general that it may be safely laid down that belt attack can only be attempted with advantage when an enemy's belt may be certainly and repeatedly perforated, and this will generally be confined to cases when she draws up opposite to a fort or, at all events, moves slowly.

Plates with hardened faces.

The complete defeat of the best forged steel projectiles by plates with faces hardened by Tresidder and Harvey's processes has introduced an element of uncertainty, and the great effect of excellence of material can scarcely be better illustrated than by the fact that the same Holtzer forged steel projectile which perforates 17 inches of wrought-iron without suffering deformation may be broken up almost like glass against the specially hardened steel face of a 10-inch or even a 6-inch plate.

It is beyond the scope of the purpose in hand to attempt to deal further with the question of common shell fire than to offer a few remarks for consideration.

Latterly the proportion of common shell issued to both ships and forts has been increased, as might be expected, for the reasons above-mentioned; it is, however, thought by some that heavier guns should have a larger proportion of armour-piercing projectiles than lighter ones.[1] It is seldom that a common shell can be driven into the vital parts of an armour-clad ship, so that unless the belt attack be given up armour-piercing shot must generally be used. Shell attack may very well be taken as the main work to be done under all circumstances by lighter guns, but hardly by really powerful armour-piercers. These latter may fire common shells at distant, or rapidly moving, or unrecognised ships when nothing further than "firing into the brown" can be attempted, but it appears reasonable that such guns should have the projectiles for which they may almost be said to be specially made in larger proportion than pieces, such as the 6-inch, which can seldom fire at armour with advantage.

The significance of the experiment of firing armour-piercing steel common and other common shells through very thin plates ($\frac{3}{8}$-inch

[1] Lieutenant Honner has urged this.

thick) should be insisted on as showing that fuzed shells of any kind can be made to burst from 1 to 10 feet behind the thinnest ship's side.

Rule as to limit of perforation of projectiles.

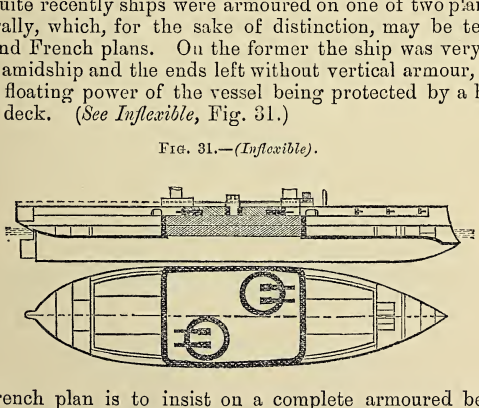
It may also be convenient to note the following rough guide as to the structural strength of projectiles and the limit to their possible perforation. Common cast-iron shells will perforate and carry fire through wrought-iron half a calibre thick. Armour-piercing steel common and Palliser shells will perforate and carry fire through ordinary steel or steel-faced armour one calibre thick. Forged steel projectiles easily get through wrought-iron armour up to two calibres thick, which is also about the present limit of the muzzle energy of many of the B.L. guns. As before said a Holtzer 6-inch shot has perforated 17 inches of iron easily, but 4·7-inch forged steel Laboratory and Projectile Company shot broke against 12 inches of wrought-iron. This last estimate, then, is given only to enable a general guide to be conveyed by the series. Common shell, half a calibre; "armour-piercing common," one calibre; and armour-piercing shot, two calibres. As to perforation achieved within the above limits, the old rule of thumb of one calibre perforation for each thousand feet velocity was good for projectiles whose $\frac{W}{D^3}$ approached 0·4 fired with velocities below 2000 f.s. If applied to projectiles, of which the $\frac{W}{D^3}$ is very large, as in the 10-inch and 13·5-inch B.L., where it reaches 0·5 or to velocities much exceeding 2000 f.s. a considerable error arises.

General plans of ships' structures.

Systematic instructions and information as to armoured ships can only be given in connection with Coast Defence. It may, however, be well to suggest a few principles to keep in view in dealing with foreign armoured ships in their latest forms. The figures for this purpose are taken from the paper read at the Institution of Naval Architects by Mr. White, the Director of Construction to the Admiralty in 1889.

Until quite recently ships were armoured on one of two plans, speaking generally, which, for the sake of distinction, may be termed the English and French plans. On the former the ship was very strongly protected amidship and the ends left without vertical armour, the lower parts and floating power of the vessel being protected by a horizontal armoured deck. (*See Inflexible*, Fig. 31.)

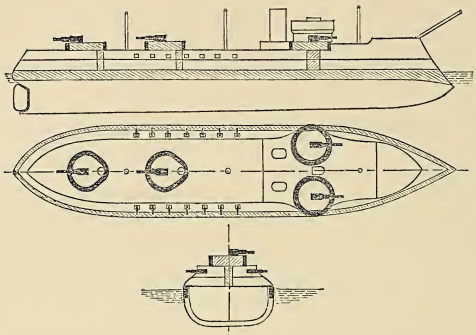
Fig. 31.—*(Inflexible).*



The French plan is to insist on a complete armoured belt at the water-line extending from stem to stern, as well as a horizontal

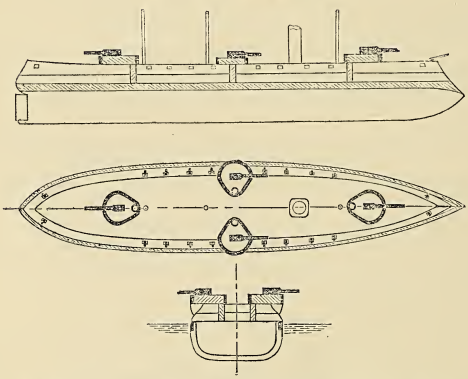
armoured deck. As will be seen, this necessitates weak places throughout the ship (*see Amiral Duperré*, Fig. 35, and *Magenta*, Fig.

Fig. 35.—*(Amiral Duperré)*.



36). On either system the design must be a compromise. The limit

Fig. 36.—*(Magenta)*.



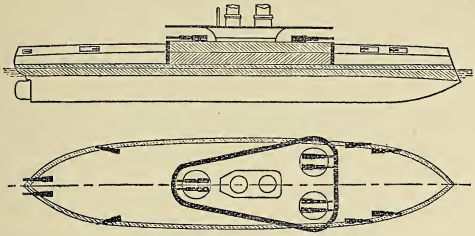
of weight of armour that can be carried involves some sacrifice of protection; the question is, what shape shall it take?[1]

The English view has been that near the ends the space between the sides narrows so much that there clearly comes a point when the heavy belt is protecting too little to compensate for what might be done with the same weight of armour elsewhere. The French have taken the opposite view, and their opinion has been supported by some high

[1] *See* paper read to Naval College, by Mr. Smith, of the Construction Department of the Admiralty. These two French ships have specially vulnerable places beneath their barbette batteries where a single common shell bursting might disable the gun.

The Russian *Sinope* (Fig. 40) has a complete belt, though she does not

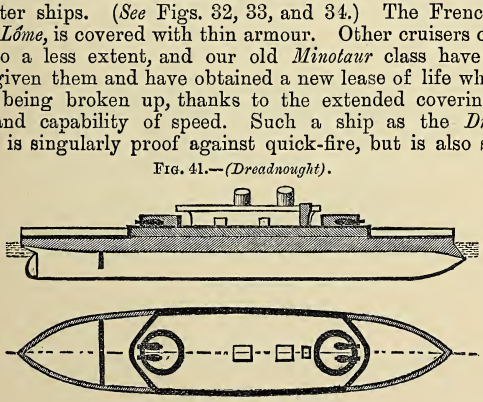
Fig. 40.—*(Sinope).*



in other respects resemble French ships.

The question of the belt is an old one. The above illustrations are intended to show what shape it has taken latterly; the matter that has principally affected later designs in armour is the introduction of quick-fire. Originally designed to meet the attack of torpedo boats, Q.F. guns have developed to such an extent that we now have a 6-inch Q.F. gun discharging 100-lb. projectiles, with a muzzle energy which is out of all comparison with anything that existed in the first days of armour. The 68-pr. shot, then delivering the hardest blow, had about 1200 foot-tons energy, and the 6-inch projectile has nearly 3000 already, and this will be considerably increased when cordite is used. At even a short range the latter has three times the energy of the former. The explosive powers, and much more the perforating powers, admit of no comparison. The quick-fire of a vessel is now for most purposes far more formidable than that of her heavy guns. Consequently unarmoured parts of a ship can be destroyed at a rate which has made an extension of thin armour necessary at any cost. The secondary Q.F. armaments and the extension of thin armour is a leading feature in the later ships. (*See* Figs. 32, 33, and 34.) The French cruiser, *Dupuy de Lôme,* is covered with thin armour. Other cruisers carry such armour to a less extent, and our old *Minotaur* class have had new engines given them and have obtained a new lease of life when on the point of being broken up, thanks to the extended covering of thin armour and capability of speed. Such a ship as the *Dreadnought* (Fig. 41) is singularly proof against quick-fire, but is also singularly

Fig. 41.—*(Dreadnought).*



deficient in artillery fire, having little to supplement her four primary guns in her two turrets.

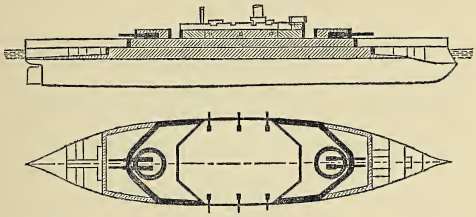
The terrible power of shell fire has developed another principle of defence, namely, the curved protective deck. In nearly all earlier designs the horizontal deck runs along the upper edge of the belt. It seemed only natural to employ it to protect as much of the hull and as great a reserve of buoyancy as possible.

For ships possessing no side armour, it would naturally be necessary for the steel deck to pass below the water-line at the ship's side, and a reserve of buoyancy would be secured by a rise towards the centre. The same structure, inconvenient as it is, is found in armour-clad ships, and protection is afforded by steel traverses, which limit the zone of destruction of a bursting shell. This suggests a question on which different opinions have been given by high naval authorities, namely, the measure of effect to be expected from shell fire. The total amount of explosive that can be delivered into a ship is advocated by some as the measure of injury. On this principle one 8-inch shell would be as good as two 6-inch, and for certain kinds of structural injury this may be true, but seeing that it is the upper parts and secondary batteries of ships that are generally open to shell attack, where langridge tells as well as abstract explosive power, and where the zone of both may be limited, it appears as if distribution would tell sufficiently to make two 6-inch shell produce considerably more effect than one 8-inch, indeed, under some conditions they might produce nearly the same effect as two of the larger shells.

(Conclusion.)

authorities in this country, notably by Sir Edward Reed. Latterly the designs on the two systems have approached each other more nearly than formerly. In England the *Trafalgar* class, finished in 1890 (*see* Fig. 32), and the *Royal Sovereign* and *Hood*, designed in 1889 and

FIG. 32.—*(Trafalgar)*.



completed in 1892 (*see* Figs. 34 and 33), show longer and longer belted

FIG. 34.—*(Royal Sovereign)*.

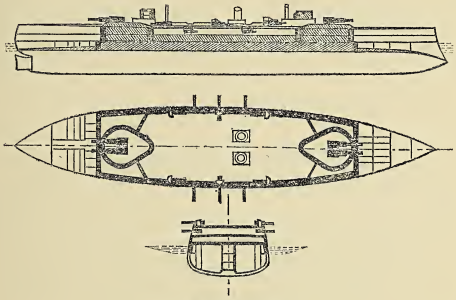
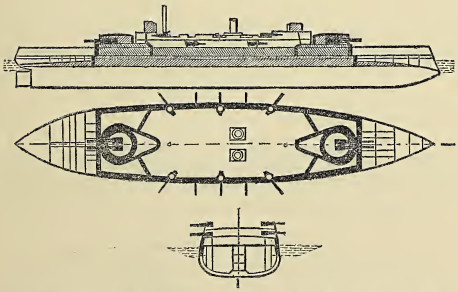


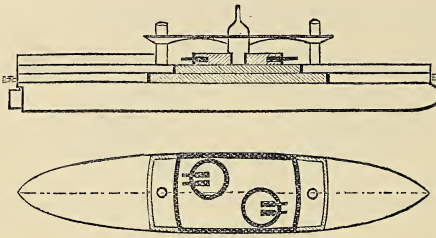
FIG. 33.—*(Hood)*.



portions, while the French *Bouvines*, launched in 1892, although maintaining the end to end belt, is a close copy of the English designs in

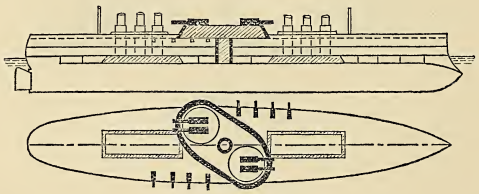
what is termed the redoubt principle (shown in Figs. 33 and 34), which have no weak place beneath the heavy gun positions such as is seen in Figs. 35 and 36. And the United States *Oregon* class, now building, very closely resembles our *Hood* and, indeed, our 1889 barbette class. Italy not only built ships on the English principle (*see Duilio*, Fig. 37),

Fig. 37.—*(Duilio)*.



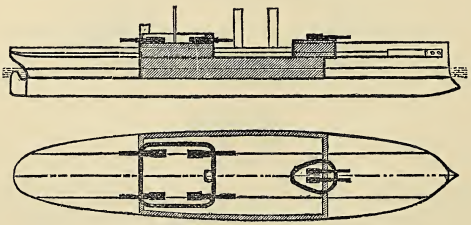
but carried it to extreme lengths never contemplated in England, abandoning all belt armour in the *Italia* and *Lepanto*, which are battle-ships intended to fight in line, as completely as we have done in cruisers (*see* Fig. 38). Russia, generally speaking, followed the French plan, and

Fig. 38.—*(Italia)*.



most Continental armour-clads have complete belts at the water-line, though exceptions occur, as in the German *Sachsen* class (*see* Fig. 39)

Fig. 39.—*(Sachsen)*.



MAKING OR BREAKING?

BY

LIEUT.-COLONEL D. D. T. O'CALLAGHAN, R.A.

What may be termed the *renaissance* of the Garrison Artillery has given rise to the publication of a mass of alarming and disquieting literature. The separation of the Regiment is practically accomplished, and the two great divisions will each train up their officers with the comforting conviction that they will stick to the trades for which they have served their apprenticeship.

With the young Field gunner the work is interesting and appetising. He learns, and is expected to know, more gunnery than heretofore, but then he has his horse and his spurs. If these last-named acquisitions occupy his attention during his adolescence more than his guns, who can blame him? Before many months have passed he will see that older, and considerably smarter officers than himself, devote much time and care to the actual shooting of the battery, and that quickness and accuracy in this respect receive as much commendation as do the most rapid and intricate evolutions performed at best pace on Woolwich Common.

The riding school sets him up, squares his shoulders, and improves his appearance; the gold lace on his uniform and the "reds" of his trousers pale from rain and dust, but an oil spot need never be found on either; and, best of all, from his very beginning he has a very fair amount of responsibility vested in him; he is in command of a section. Every man, woman, child, and horse in this little command is his own special care, and he vies with the other subalterns in the smartness and efficiency of his two guns on parade. His stable and his harness are his great pride, and his work, as he loves to call it, is more recreation than labour. It is true that parades and stables take up some of his time, but not to the extent of interfering with his cricket, rackets, and, when he can afford it, polo. Added to this, his chances of active service are at least as good as those of any other officer in the British service.

That his brother in the Garrison Artillery is less favoured, is evidenced by the fact of our having asked for more pay for him. That he fully deserves it, is evidenced by the fact of his having got it. This increased expenditure must, however, be justified in the eyes of the country. "You must pay the officers of the Garrison Artillery more highly," we say, "because they are more scientific than those in the other branch, and," we add under our breath, "if they are not, they have got to be." Science is the shibboleth of the Garrison Artillery, it is their *raison d'être*, it is the standard round which they must rally.

Now, the question is, are we making this goddess of science attractive to her votaries, or are we making her a sort of "Obi"—a terror to her novitiates, an unhallowed joy to her high priests?

When we commence the education of a retriever, we do not start by firing a gun in his face and giving him a thrashing; nor is there any reason to believe that the fact of subsequently giving him a larger feed than that apportioned to the other dogs would have any effect in preventing him from being gun-shy. With a young retriever we exercise the greatest care. His alarm at the sound of a gun is lessened by firing it first at some distance from him, and by degrees, he learns to connect the horrid noise with the fall of the bird which it is his great joy to bring, with loving care, to the hand of his master. Wild as a hawk he probably will be at first; but, if his master be wise, he will see in his wide-ranging, the promise of a hard-working untiring dog, who in good time will learn to husband his energy, power, and speed, to use these qualities to the best advantage and to show his superiority to the pottering brute who never would have the pluck to risk a thrashing. Nor, when he is following at heel, would his master, did he know dog language, dream of hurting his feelings by drawing invidious comparisons between him and the graceful setters flying over the heather, till, as they wind the birds, they become motionless, one dog backing the other, and showing the perfection of fire discipline that has been attained.

The birds are flushed and fired at, and now the retriever's turn has come. At a wave of his master's hand he bounds forward and, scientifically quartering his ground, picks up and brings back a dead bird. In following up the scent of a runner he shows the skill and perseverance innate in his breed, but brought to perfection by kind and careful training. Who shall say that the retriever is less useful than the setter? We hear every now and then of a retrieving pointer—we constantly see retrievers ruined by being used to find game and to "put out" rabbits, but are these jacks-of-all-trades ever really successful? Most men who take a pride in their dogs will answer this question with an emphatic negative.

The simile may be clumsy, but let us try and apply it. The free gallop of the setter, checked in a moment—the marvellous drill of his companion, who becomes motionless in the fraction of a second to back his comrade's point—may perhaps find a parallel in the traditional "Halt, Action Front!", the speedy and accurate movements of the mounted branch; while the keen, skilful, highly-trained retriever may be likened to the Garrison gunner biding his time, but, like his brother, reflecting the highest credit on his trainer. Both are necessary—each has his respective *rôle*; there are good and bad dogs of either breed, but to say that one is better than the other is illogical.

It is with the training of the young retriever, the Garrison gunner, that we are mainly concerned, let us see how this had best be accomplished.

The material, as it comes into our hands, may be described as heterogeneous, but it is practically divisible into two classes, the characteristics of which are tolerably well marked.

First, we have the lad of a mechanical turn of mind, who has, perhaps, refused the Engineers, to devote himself to the Garrison Artillery. He is, as a rule, an excellent and conscientious officer, and frequently surprises his comrades by his sterling soldierlike qualities. He may not have had, as a boy, opportunities of riding, and shrinks from joining a Field Battery with the amount of equine knowledge derived solely from the riding school. His horoscope may be cast with some degree of certainty. Zeal and creative genius will lead him to invent a fuze, and its non-adoption will furnish him with a grievance which will provide fuel for his combative faculties. He will then run a tilt against the authorities, and in so doing, will acquire a polished and incisive style of writing which will stand him in good stead hereafter. The subsequent transition is easy. Artillery College, Department of Director of Artillery, possibly manufacturing departments—where, if his former grievance be still unforgotten, he may be disposed to deal leniently with any efforts of his juniors, on which he may be called upon to sit in judgment. With the exception of the small matter of the fuze, this class of lad gives no trouble throughout his career. He has an aim and object from the first ; is more thoughtful and less apt to run riot than his comrades, by whom he is usually voted slow ; but give him a real difficulty to overcome—put him in what is familiarly termed a "tight place" and the grit in his composition will at once become apparent.

Next, we have the boy who, from not passing high enough in his examination, or from—well, anyhow, who is not likely to get into a Field Battery, has to cast his lot, against his will, with the Garrison Artillery. This lad wants skilful handling. He will be found to be easily led for good and evil, especially evil. The making or breaking of this lad is in his Major's hands and the responsibility is not one to be shirked. A considerable share of this responsibility may, moreover, be accepted by the Lieut.-Colonel. Without undue interference, he can exercise a parental and very beneficial influence over him. A complete contrast to his more studious comrade, the boy will resent the comparatively dull and uneventful life of the Garrison Artillery, the spurs of his more favoured brothers in the Field Artillery will be a constant thorn in his side, and he will supply the excitement for which he craves, by indulging in extravagances which his limited means should prohibit. Debt, with its concomitant miseries, will be the inevitable result, and he will go to India and stay there, a disappointed and needy man.

These may be set down as extreme cases, but they are by no means rare. There are, of course, shades of both, but the two classes are so distinct that a blend is barely possible. Now, I maintain that the initial treatment may be similar in both cases ; the bettering of the first and the saving of the second may be effected by the encouragement of "smartness," and by instilling a sense of responsibility.

It seems to me that we are prone to ignore the surroundings of a youngster who has just got his commission. He has emerged from the chrysalis into the butterfly state, and yet we ask him, (can anybody say with truth that we expect it ?), to take kindly to books and instruc-

tion, while he is first admiring his freshly donned colours and exulting in his emancipation from the weary work which has enabled him to achieve success. For the studious lad, a month of freedom and the congratulations of his admiring relatives may suffice ; such wild oats as his are quickly and scientifically sown and garnered, the "succession crops" being farmed with equal skill in his subsequent leisure moments. With the other, the conditions are widely different. Have his fling he will ; and it is well that his seniors should at times bethink them of their own youth, and remember that, by a merciful dispensation of Providence, old heads do not, as a rule, grow on young shoulders.

The panacea for boredom is novelty—fresh sensations and responsibility. Let the youngsters, therefore, be at once placed in charge of men, and hold them responsible for the smartness, efficiency, and well-being of their command. This, to which Major Saltmarshe ably draws attention in a paper in these "Proceedings" (August, 1892), is the secret of the success of the Field Artillery subaltern. As pointed out by him, the difficulties in the way of the Garrison subaltern having a definite section to command, are not insuperable, and every effort should be made to overcome them. It should be borne in mind that, when tempered with the sense of responsibility, parade work, pure and simple, carbine and marching drill, are *new* to the boy, and a spirit of emulation may be readily engendered, if praise be bestowed on the youngster whose men are the best set up, best drilled, and best conducted. The wayward, flighty boy may become a leader of men, but you must first give him the men to lead. After he has imbibed the love of soldiering and of man-leading—and not before—he should be delicately introduced to the more serious and (to him) the less interesting portion of his training.

And here I would refer to the first lines of my paper. Are we not by reason of our current scientific literature running the risk of making our young retrievers gun-shy ? Are such publications as the "Tactical Working of Coast Artillery" fit and proper books to put into the hands of youngsters ? Are they not strong meat for babes ? A spurious and unholy desire to read them might, perhaps, be inspired, were they labelled "For Field Officers Only," but this would soon wear off. It will be long before I forget the hunted look in the face of one very young officer to whom I gave one of these books to read, when he laid it silently on my table after a space of three days. "Did you understand it ?" "No, sir,"—and, I was fain to confess, no more did I. This is one result of enforced science, and I cannot think that it is wholly satisfactory. One of the best Majors, and most accomplished Field gunners of my acquaintance, confessed to me the other day, with bated breath, that he did not know the meaning of the expression "Gravimetric density," and I am afraid that I inferred from his tone that he didn't care ; but was he, for this crass ignorance, one whit the worse ? Why should he burden his brain with such technicalities ? For the specialist, the understanding of these things is a necessity and when that necessity arises, the knowledge can be readily acquired ; but let us avoid them in our current literature if we hope for its being read by anybody but rival authors, who scan it through

but to pick holes in it. Doubtless it is impossible to render books of instruction and dissertations on great guns attractive, but at present no attempt is made to do so. It is easy to cavil, and the question at once rises to the lips, "How are you to supply the place of these heavy and alarming treatises?" I submit that the remedy is easy. The bird tribe feed their young by partially masticating the grain or the worms which compose their usual diet, and administering it in this wholesome form to the callow brood, who could not digest it in its original state. I would make the Lieut.-Colonels play the *rôle* of the old birds. This may be a startling and revolutionary suggestion, and one which, if any attention at all be paid to it, is likely to call down upon my devoted head the wrath of a large and influential section of the regimental community. Be that as it may, my conviction is a strong one, and I propose to uphold it. Nobody, not even the Lieut.-Colonels themselves, will traverse the statement that these officers have more time on their hands than anybody else. They have not (or should not have) gained their exalted rank without having become efficient instructors in, and skilled translators of, the jargon of their trade; and, in their frequent leisure moments, it should give them but little trouble to compile notes for lectures in simple language, which should materially help the young birds to digest their necessary, but, in its crude form, unwholesome diet. "Attack Problems" are excellent things in their way, but, without sedulous and judicious preparation, they are apt to inspire the most abject terror and heartfelt loathing. Seen through the baleful light of our modern text-books, these "Attack Problems" appear to be refinements of cruelty; whereas, if administered in small doses and at not too frequent intervals, they may almost be made to lose the sickly flavour attaching to anything akin to an examination paper, and to breed a healthy spirit of emulation among their victims.

How does this same Attack Problem shape itself at first to the jaded, over-instructed youngster? His first feeling is one of bitter resentment, and he will read the thing through with fervid zeal begot of the hope to find some glaring error, some foolish and obvious *lapsus*, on the part of the paid tormentor who set it. Possibly, indeed very probably, his search may be moderately successful, but the feeble resulting joy is soon damped by the oppressive dulness and complication of the task. For him it has no semblance of reality; to him it is no vivid and smartly-written "skeleton" account of an attack on part of a fortress, of which his intimate knowledge will enable him to readily fill in the details; no set of conditions which his manipulative skill and orderly mind can marshal into the form of an interesting and connected narrative. No! to him it is a cruel and unnecessary scrutiny of a sadly muddled brain teeming with blurred impressions, in which "horizontal displacement," "curves of penetration," "dangerous zones," "ordinates," "abscissæ," and all the undigested lumps resulting from his last cram, jostle each other in hapless, hopeless disorder.

He must, perforce, try and write *something*; and then, in despair of remembering at what portions of which ship he should fire various projectiles at specified ranges, he interlards his feeble screed with such thund'rous, multisyllabic words of the cult, as he can remember (and

spell), in the hope that the presence of such expressions may soften the heart of the examiner and, in some measure, atone for the evident absence of their understanding. This, I take it, is no exaggerated description. Does it at all come up to our ideas of what may be gained by the solution of "Attack Problems?" Under these circumstances are not we most certainly making our young retrievers gun-shy?

In the Garrison Artillery every Lieut.-Colonel has a special section of a fortress under his command, and as Section C.R.A. he is bound to know every detail connected with the armament and with the defensive features of his section. In small commands the one Lieut.-Colonel has charge of the whole of the defences, but the same intimate knowledge should be a common factor in both cases, and it is this familiarity with possibilities of his command that should enable the Lieut.-Colonel to give object lessons to his officers, which should be of more real value to them than shelves full of text-books. During "personally conducted" strolls round the works, he can instil into their minds the means at his disposal for repelling a land or sea attack, he can point out to them the windings of a channel in what appears, to the uninitiated, a broad expanse of navigable water; by common sense teaching, he can convince them of the fact that Palliser shot may not be the best thing to fire at the steel-coated citadel of a modern ironclad, or time shrapnel at the funnel of a cruiser, when the rest of her is hull down. He can show them that the terrors of the penetration-table bogey may be considerably lessened by reducing them to a few obvious facts, and that, stripped of its awe-inspiring formulæ and labyrinthine diagrams, the displacement puzzle is capable of simple solution and ready application. These and many other means of alleviating the labours of his flock are at the disposal of the Lieut.-Colonel, who should further (I say this with some diffidence) prepare a series of lectures clothed in absolutely homely language, for delivery during seasons when weather interferes with out-door drill and instruction.

It will be noted that no suggestion is made that either the Majors or the Gunnery Instructor should take their share of this vicarious teaching. Both have their special fields of instruction, from which the "familiar scientific," may be usefully divorced. The Major's energy will naturally be devoted to parade work and to the smartness and efficiency of the officers under him. Even now that the Armament Major has relieved him of some of his responsibility, he still has a great deal of office work; and, although the responsibility for the youngsters' knowledge of interior economy, drill, &c., rests with him, he has not the amount of leisure which the Lieut.-Colonel has at his disposal, in which to prepare lectures and digest text-books. Where a Gunnery Instructor is kept, the time of that officer should be pretty well occupied in supervising the instruction of batteries taken off duty for their annual course, in examining layers and other specialists, and in assisting the younger officers to instruct the N.-C. officers and men of their sections.

It will naturally occur to Lieut.-Colonels to suggest the desirability of the Gunnery Instructor giving the lectures which, in my humble opinion, should be given by themselves; but the object aimed at

would not be attained. The Gunnery Instructor has a character to keep up, a reputation to sustain, and he is too young to dare to be deliberately simple and terse in his language. Little actual harm is done by his using the expressions "*vis inertiæ*" and "*momentum*," when, in nine cases out of ten, the word "weight" would have answered all purposes; but much good results when the older officer restricts his vocabulary to words of two, or at most three syllables, and apparently does not lose caste thereby.

It must be remembered that Garrison Artillery *only* is being treated of. The instruction of Field Batteries is on an absolutely different footing and for them no better system could, I think, be employed than that indicated by Major A. M. Murray, R.A., in the R.A.I. "Proceedings" of August, 1892, the Duncan Gold Medal Prize Essay for that year.

Thus far we have considered the training of the young Garrison gunner only in the matter of work—his play is almost of equal importance. The sober joys and methodical indiscretions of the nascent inventor need not concern us. It is with the "wide ranger" that we have to deal. Much trouble may be saved by an admission, at the outset, that although, at certain times and seasons, afternoon parades are more or less frequent, this is the exception—not the rule; and practically the Garrison Brigade subaltern is free and idle after lunch. This statement may be traversed, and theoretically he should have afternoon parades. In practice, it is not so. The nature of the work and the distance apart of the various batteries in a fortress, tend to long mornings; besides which, the afternoons are essentially fitted for fatigues, especially those for the Ordnance Store Department and Inspector of Warlike Stores.

In garrison towns at home there are clubs; in garrison towns abroad there are public-houses. These latter are also dignified by the name of club, but their *raison d'être* is a bar, and to these undesirable places our youngster will most certainly gravitate, unless counter attractions are provided. Cricket, football, rackets, golf, are all strong inducements to the boy who does not want to become a loafer, but there is no doubt whatever that the best lure from the loafing, sherry-and-bitters set, is the *horse*. In most foreign stations, a young officer, by practising a little self-denial, can manage to keep a pony, and without giving a fancy price for it, can play polo, ride paper chases, and amuse himself in a healthy and thoroughly satisfactory manner. Some of us, not blessed with an undue proportion of this world's riches, will preserve a vivid recollection of their first venture in this line after getting their commissions. How well we remember the hours spent in the stable superintending the grooming and feeding of that first purchase, the surreptitious visits at all hours of the day, with bits of sugar; the training of the brute for the gymkhana, and the first game of polo, when he stood over the ball in the midst of a scrimmage and a torrent of the most appalling language! Was it not a fact that this sorry beast contributed more to our good behaviour than all the excellent advice of our intensely serious but somewhat gloomy Major?

Now if, for the sake of argument, we suppose that this view be generally accepted, would it be thought dangerous and subversive were a suggestion put forward to help the impecunious garrison subaltern in the maintenance of a beast, to which the only drawback is a craving for food?

In the Garrison Artillery the little army of specialists is daily gathering strength. In addition to the Gunnery Instructor, there are officers in charge of range and position-finding and signalling, who do not draw forage for a horse. To argue gravely that holding one of these appointments constituted any real claim for forage allowance, would be absurd, and such a method of approach would be met by a prompt, and probably very curt, refusal. There is no question of right, it is simply one of expediency, and, in a minor degree, of expenditure. We most certainly wish to popularise the Garrison Artillery. Extra pay has not done very much towards doing so, and the struggle for Field or Mountain Artillery is as fierce as of yore. Forage is not very costly, and perhaps some reduction might be made in the case of horses which need not be passed as chargers. Three ponies, and in extreme cases four, can be kept going, with good, careful management, on the forage for two horses. There is no need for any special pleading. The extra cost would, I feel confident, be repaid a hundredfold, and the magic word "forage," would be an incentive to work, and to excel in some particular line, superior in power to many gold medals, and even to the sparsely sown commendations of Inspecting Officers. Such is the crude suggestion. It may possibly meet with a certain amount of ridicule, but, by some readers, it may be deemed worthy of thought. To the latter I commend it.

Those who trouble to criticise this little paper will perhaps accuse me of siding too much with the "wide ranger," to the detriment of the good boy. Well, to that I plead guilty; but who is not, in their heart of hearts, of my way of thinking? Which requires most assistance? Life presents comparatively few difficulties to the boy whom its temptations do not attract, but to the lad who inherits a taste for enjoyment, life is made up of pit-falls. Possibly it is their very frequency that makes us overlook the delinquencies of the one, while we are made uneasy, and are unjustly irritated by the methodical indiscretions of the other. The two natures demand widely different methods of management, and it is the power to appreciate this, that is so often lacking in Commanding Officers.

I have been tempted, I fear, to wander very frequently from the point, but my object in putting forward these heterodox views is to endeavour to impress on others, convictions that are very strong in my own mind. If we want a smart, zealous, active stamp of subaltern in the Garrison Artillery we must train him, and train him assiduously; but of all things, we must guard against making him "gun-shy!"

THE STRATEGICAL GEOGRAPHY OF EUROPE,

BY

T. M. MAGUIRE, Esq., LL.D.

(Inns of Court Rifle Volunteers).

(Notes of a Lecture delivered at the Royal Artillery Institution, Woolwich, Monday, November 28th, 1892.)

Colonel C. C. Trench, R.A., Director Artillery College, in the Chair.

This Lecture should be read with a Modern Atlas of Europe.

Colonel Trench and Gentlemen,

The historical portion of the subject which we are about to discuss, as far as the short time at our disposal will allow, would be in point of fact nothing less than the whole story of the fall of the Roman Empire, and then again the origin and development of modern European civilization since the fall of the mediæval system. The Mediterranean, the lines of the Danube and the Rhine, and their affluents, that portion of Italy which may be called Continental, and the great plain from the heart of the Russian Empire to the north of the Carpathians, and the Riesengeberge and Erzegiberge, and the Thuringian Wald to the German Ocean—here are the theatres over which generations after generations of the various races of Europe have wrestled for mastery; crowding on one's brain as one looks at the map are memories of the great makers of history and destroyers of thrones, all traversing the same war paths backwards and forwards from east to west and north to south—Romans and Carthaginians striving for the Mediterranean on the same principles which have led the English to plant the Union Jack at the pillars of Hercules, in Malta and in Cyprus, and the French to seize Corsica and to acknowledge in the 19th century the prescience of the Phœnicians by reviving their triumphs at the fortress of Biserta.[1] It was by almost the same routes that Hannibal, after his conquest of Spain, and Napoleon, two thousand years later, led their spoilers into the valley of the Po, and thence through the Italian Peninsula.

From the Middle Rhine the troops of Turenne and of Napoleon in turn advanced into the centre of Germany. The Elbe and the Oder saw the warlike daring of Gustavus Adolphus, of Frederick the Great, and of Napoleon. The hordes of Attila crossed the Rhine in his awful advance in the 5th century to Orleans and Chalons at the same passages as were traversed by the corps of Moltke in 1870. Cartha-

[1] See Appendix.

ginians, Romans, Goths, Moors, English and French have in turn experienced the difficulties which nature rather than art has interposed between Spaniards and their invaders. The writings of Cæsar and the exploits of Vercingetorix point out to modern Frenchmen the way to future victories. The immortal Corsican followed the very route by which the illustrious Marlborough, a century before, had carried the standard of St. George to the banks of the Isar and celebrated, in the words of the Kaiser Leopold the fame of his people in lands where the very name of England had hitherto been unknown. The Visigoths, Swedes, the Poles left their memorials in the territories between the Vistula and the Dnieper which saw the glory of Napoleon in 1807, at Friedland, and his doom in 1812. Many a barbaric chief and many a Roman legion operated between the Danube and the Po long before Suwarrow's Cossacks bathed their horses in the Ticino, or Napoleon's divisions marched from the Mincio across the Save and the Drave towards the capital of Austria. Around and past the great ramparts of the Carpathians the barbaric East surged for generations before rushing south over the Danube and carrying darkness and ruin into Greece, Italy, and Southern Germany, and to the walls of the capital of the Eastern Empire. These invaders trembled in turn before other Eastern heroes whose crescents were borne from Central Asia into the valley of the Euphrates and thence across the Hellespont into Constantinople itself, and thence to the regions of the Bulgarians and the Huns.

"There is nothing new under the sun," and we have listened during the last few days to the words of a powerful German soldier and statesman crying aloud to his countrymen to "Awake, arise, or be for ever fallen," for behind them and before them were gathering storms of war, more terrible than any recorded in the annals of their race. Eastward the Muscovites were hovering along the Vistula and the frontier of Galicia, and Westward the Gauls were arming themselves along the Meuse, the Moselle, and the Rhone. The fateful words of Von Caprivi expressed not only his own Fatherland's dangers, they caused a throbbing of the heart among the dwellers by the Temes, the Morava, and the Inn, and the astute Italians remembered the sack of Aqueleia and took counsel together amidst the ruins of the Forum.

As the signs of the times now appear, it would not be at all surprising if the people of Eastern Europe were to hurl themselves again upon Western Europe in our generation.

Broadly speaking there are three main lines of invasion from the East; first, by the North German plain; second, up the valley of the Danube as far as South Germany; and third, into Northern Italy from the valley of the Danube between Belgrade and Komorn. The first two tend to draw together and to converge on the Middle Rhine between Coblentz and Basle, and the third opens up the countries bordering on the Mediterranean. A glance at any map will show that Russia as a salient obtrudes itself, as it were, into Northern Germany and along the Northern frontiers of Bohemia and Hungary. Russia is within about 180 miles of Berlin, whereas the Germans are a long cry from Moscow and St. Petersburg. Moreover, East Prussia from the Vistula to the Niemen would be absolutely cut off from the rest of Germany by a Russian force moving North from Warsaw; so also a movement of Russians South-west from Warsaw into Moravia, and on Vienna, would compel the forces of Galicia and Hungary to form front to flank, if not isolate them from South Germany, but not, unless they were held by

another Russian force advancing from Roumania into Transylvania, from the resources of Carinthia, and, if the Triple Alliance was worth more than paper, from Italy. On the other hand, East Prussia is a formidable threat to the Russians in Poland. With strong fortresses in front of a Russian advance at Posen and on the Oder, and others of a formidable character at Königsberg, Dantzig, and Thorn, if the Germans, either alone or in conjunction with England, had the command of the sea they would be even worse than a sword of Damocles hanging over the line of the Muscovites at every step Westwards from Bresc-Litewski. But for the Russians to cut off the Germans East of the Vistula from the rest of Germany would be easier from a merely strategic point of view than for the Germans to cut off the Russians in Poland from the rest of their colossal Empire. From Thorn to Dantzig is a narrow base as compared with theirs. Alone it would appear as if Germany must bow before Russia if the latter were well organized. No fortresses, not even the line of the Oder, not the pools and lakes which abound between that river and Elbe could save them. It is true that all this land is inhospitable, uninviting, full of every kind of petty obstacle, and traversed by great rivers—all this is of no avail against the strength of armed myriads ; nothing except mighty mountains effectually closes the path of armies, and even these can be traversed at well-known defiles. How otherwise would the Macedonians have penetrated to the Indus and the Visigoths have overwhelmed the Iberian Peninsula, or the Cossacks have twice in this century occupied quarters at Adrianople ? On men and not on mountains or rivers or fortresses depends the fate of nations. Did not Napoleon in 1806-1807 traverse at his will the whole district from the Maine along the Saal across the Elbe, the Oder, the Vistula, the Pasarge, the Alle, the Pregel in spite of all bogs and morasses and forts. Why ? because he had the genius and the force wherewith to beat his enemies in the field. His glory waned and his genius was appalled amid the gloom and snows and solitudes and those horrors of the vast Scythian desert, more dread than even Dante's or Milton's imagination could body forth. Then in turn the victors followed him across the same rivers and further still across the Weser and Rhine, the Meuse, the Aisne and the Marne to Paris itself. Thus, then, if Germany is to be saved it will be by brains and courage, and not by topography or walls ; though at every march the invader must be prepared to reckon, and to cope, with these and to suffer tremendous losses as their consequence.

But if Austria joined Germany, the posture of affairs would be seriously affected. I trust you will take it that here we are not politicians, or taking sides in any way, we are merely looking at maps and remembering history. Were the Eastern Europeans to try to conquer the West, and Napoleon prophesied that they most assuredly would, they have to solve the difficulty of how to deal with the populations that are protected by the several branches of the Carpathians and of the mountains that encircle Bohemia. Here are natural fortresses on a gigantic scale with few possible entrances, dangerous to pass, and deadly to carry. A series of impracticable transverse obstacles complicated with all manner of rivers and morasses, most assuredly "dens and shades of death," that is if any attempt were made to push through them. Parallel obstacles and screens for the enemy of the very worst kind against attempts to pass North or South of them. To turn the tables by an invasion of Russia from Transylvania would not be much

use, but there would be a perpetual threat to the Russian line of communications. Suppose the Muscovite horde merely watched Germany in the North, and moved from the Pruth through Bulgaria and Servia on to the Raab towards Vienna, it would be threatened in its vital part, even supposing the Ottomans no longer had a place in Europe, by forces on the left from the Carnic and Noric Alps, and on the right from the Banat and Transylvania ; any reverse in the front would mean ruin. The resources of the Turks when they were the best soldiers in Europe, from the 14th to the 17th centuries, were again and again withered up in trying to get to Vienna ; it is true that a Russian under "the fell Suwarrow" penetrated from Poland into Italy and Switzerland in 1799, but then he had Austria for an ally, and but for this fact he would not have brought a single soldier back to Russia. Now let us suppose that Austria being an ally of Germany, the Russians passed the Oder and pressed on to Berlin and thence across the Elbe without taking Pryzmysl and Krakow and leaving Bohemia untouched, they would then have an Austrain army which, if France were neutral, could be reinforced by the Teutons South of the Maine, and also by the Italians either by way of the Inn or the Raab, parallel to their line of communication with their base ; with the consequence of such a position all students of Jomini and Hamley are conversant : in fact, as they went Westward they would drag at each remove a lengthening chain which might be cracked between the Bug and the Oder, and then their return to Russia would depend on the mercy of the Hun. How these mountains can be skilfully used as strategic screens was illustrated in Napoleon's campaign of 1813. He crossed the Elbe and marched on the Oder leaving the Erzegeberge and the Riesengeberge on his right, but the Austrians massed behind these ridges, and moving towards Dresden West of the Elbe, caused him at once to retrace his steps in order to save his communications with the Maine and Rhine. Thus in the territory between the Baltic and the Adriatic we see how the lines of operations are predetermined and influenced by the forces of nature.

To move westward :—from the fall of Feudalism till Sadowa—that is from the days of Bayard to Moltke, France and Austria were rivals, and other powers such as Savoy, Holland and the South German States alternately sided with one or the other and thus facilitated or retarded the plans of either. Prussia, now so pre-eminent, entirely through her military system, was not till the latter part of the 18th century a leading factor in European politics. Switzerland was neutral, of course, but the neutrality of this ancient republic was violated in the wars of the French Revolution by the friends of liberty. The position of Switzerland is very similar to that of Russian Poland, only that it is a mass of mountains and not a plain like the latter. It is also a salient and it juts into Southern Germany, touches the Tyrol, which belongs to Austria, and is bounded on the South by that portion of Italy which so long was part of the patrimony of the House of Austria. Austrian armies were along the Rhine and in the Black Forest from the Lake of Constance to Strasburg ; other Austrian armies were in Northern Italy from the Adda to Turin, and from Genoa to the Var ; in each case their base was Vienna. The French had violated the neutrality of Switzerland and had therefore command of the south of the Rhine from Constance to Basle, as well as of the passes leading from the valley of the Rhine into Northern Italy. The eagle eye of Napoleon at once took in the whole of this great topographical problem. He ordered Moreau

to cross the Rhine near Schaffhausen and threaten Ulm ; while the Austrians in South Germany were thus compelled to form front to flank, he made other French troops mount the St. Bernard and struggle through the passes of the Simplon and St. Gothard ; then he entered Milan, crossed the Po between Pavia and Cremona and—turning Westward—compelled the Austrians to fight with their face to their base on the field of Marengo. Nor was this the only time in modern annals that the violation of the Swiss Republic's territory was of the utmost strategical import. In 1814 the allies crossed the Rhine in German territory, from Wesel to Mannhein, but they also invaded France by the gap of Burgundy from Basle, and by the valley of the Rhone from Geneva. It is not surprising that the Swiss have come to the conclusion to bar the principal passes of their land for the future against the movements of Foreign armies, and formidable fortifications at St. Maurice[1] and Airola now stand in the way of both French and Italians.

In the wars of the last century, a considerable part of the left bank of the Rhine was in French hands, and after they overran Belgium and Holland in the wars of the Revolution, they could attack Germany as they pleased. They also overran Hanover, and in 1805 Napoleon's invasion was from the re-entering angle formed by the Maine from Wurtzburg to Mayence, and the Rhine from Mayence, up to Strasburg. The key of Southern Germany is the Danube from Ulm to Ratisbon. The Black Forest and the Suabian Jura render its upper basin not very fit for manœuvres ; while from Ratisbon to Passau, the left bank is closed by the Bohemian Mountains. Mack was in Ulm, the Russians were near the Traunn. The French Corps from Wurtzburg, Mayence, Mannheim, Spires, Karlsruhe, and Strasburg, marched on Ingolstadt, Neuburg and Donauwerth, then went to the Isar to prevent any of the allied troops coming to the relief of Ulm ; while others occupied the roads from Ulm by Nordlingen to Bohemia, by Rain and Augsburg to the Isar, and by Memmingen to the Tyrol, and thus compelled Mack to capitulate. Napoleon then marched into Vienna. But the possession of some Capitals is not decisive. The Austrians held out, and with the Russians, their allies, were beaten at Austerlitz. Now the strategical importance of South Germany in a campaign between France and Prussia became very obvious. It would have been impossible to Napoleon to have triumphed as he did, in 1806, if he had not previously secured, by making, the confederation of the Rhine, the aid of Bavaria, Baden, Wurtemburg, and Hesse. Then his legions formed up South of the Maine from Wurtzburg to Baireuth as the Prussians and Saxons went South-west across the Thuringian Wald ; he soon compelled them to form front to flank on the Saal, with their left on the Elbe ; he beat them at Jena and Auerstadt, and, seizing the passages of the Elbe between Magdeburg and Dresden, he was not only in Berlin before them, but captured the passages of the Oder at Stettin and Kustrin, and thus cut off Brandenburg from all help from Russia.

It is a singular fact that every war between France and Austria in Germany was accompanied by operations in the North of Italy. The road to Vienna and to France also was South as well as North of the Alps, and the valleys of the Adige and the Inn enabled the separated forces of the Germans to keep something like touch. In 1796, when Jourdan was on the Naab, and Moreau on the Leck, Bonaparte was on

[1] See Appendix.

the Mincio. In 1800, when Moreau was at Augsburg, Moncey was in the St. Gothard defiles, and Napoleon on the Po. In 1805, while Mack was in Bavaria, the Archduke Charles was in Lombardy. In 1809, while Napoleon was struggling against the Archduke at Aspern, Eugene was marching to his aid from the Adige. In 1866, when Prussia was attacking Austria in Bohemia, Victor Emanuel's forces were operating against them in the Italian Quadrilateral. Such historical records show that the Triple Alliance against France and Russia is a matter depending on most weighty topographical and strategical considerations, which cannot be ignored, rather than on the intrigues of diplomatists, or the caprices of Kings.

To turn to another branch of our subject. In 1870, the French had possession of the Vosges and the fortresses on the left bank of the Rhine from Huningen to the Lauter and also of Thionville and Metz. The Germans elected to concentrate on the Northern portion of the re-entering frontier formed by the Rhine as far as the Lauter, and thence to Sierck. The battles of Spicheren and Woerth compelled the French to fall back, some to Metz and others to Chalons. Of course, after their successes at Gravellotte and Sedan, there was nothing to prevent the invaders from investing Metz and Paris. After the investment of Paris, Gambetta's design was to raise the seige, and also fall on the German communications, and for this purpose, vast levies were organized South of the Loire and North of the Somme, and no small activity was displayed in the Cote d'Or. But all his plans, strategetically true enough, were foiled by the manner in which, after the fall of Strasburg, Von Werder protected the line of communications by his operations along the Doubs and Ognon and Soane, and above all by the skilful fashion in which, after the fall of Metz, Prince Frederick Charles, with one part of the investing forces, marched to the Loire and the Sarthe, and Von Manteuffel, with another part, held the lines of the Somme and the River Seine. But in truth, the French forgot the teachings of history, and the principles of strategy till too late. If Gambetta had on his strategic lines the armies that surrendered at Sedan and Metz, I venture to say that the capital of France would not soon have surrendered.—The writings of Napoleon show that Paris is not the strategic centre of France. It was Orleans, not Paris that saved France from the English in the 15th century. The lines of the Seine and Marne and their affluents are of course of great value by way of resistance to the invaders; but after all the great bulk of France is South of an arbitrary line drawn from Belfort to the Mouth of the Loire. See how fatal to the invader, moving from Metz and Strasburg Westward to Paris, would be a defence which would compel him to form front to flank to meet forces protected by the fortresses of Belfort and Besancon and Langres, and further protected by the Mountains of the Cote d'Or and by the Allier and the Loire, and with Lyons and the Rhone valley, and all the territory South of the Loire as a source of supply behind them. From Nevers to Besancon would be an excellent defensive-offensive line. The Map of France is now studded with great places of arms and with forts. It is to be feared that the French Engineers have with all these done much to compromise their nation. Field armies more than forts determine the fate of nations. Be this as it may and some excellent observations on the subject will be found in the appendix, it is a very clear that the results of the last war, from the point of view of military geography, have been most injurious to France. The outworks of France against Germany, having regard to the fact that

France is bounded in great part by other states, were the Rhine, the Vosges and the great places, admirably situated, of Metz and Strasburg. All these are now German, and prepared with extraordinary skill and lavish resources to resist a French offensive *a outrance*. So serious is the situation, that except through neutral territory, it is very hard for ingenious theorists to draw up any good scheme for a French assault on Germany, that offers a fair chance of success, especially as there is now small hope of detaching South Germans from the Fatherland. I have not time to dwell on these most interesting problems. They would take a lecture to themselves, but with your Secretary's permission, I propose to add Sironi's Views on some of them by way of an appendix[1]

Had we time, it would be well to show the great advantage of the command of the sea. The English all through the 18th century and in Napoleon's days with little trouble, and no serious danger to themselves, perplexed the French ; their fleets complicated the French plans and always rendered them insecure. Napoleon could not bring an army into Italy except over the Alps, simply because Lord Keith was cruising off Genoa. An English force at the head of the Adriatic would be a serious threat to a French army moving from the Adige to Vienna. In 1807 an English fleet and army in the Elbe would have imperilled the French forces that were concentrating on the Pasarge. At the height of his power, when Napoleon's corps had marched from the St. Cenis to the Semmering Pass, and from the Seine to the Niemen, and from the Danube to the Tagus, a small English force was quietly landed in Lusitania ; nor did it rest till it had mortally aggravated that Spanish ulcer which ruined him and had carried the standard of the descendant of the Plantagenets into the sunny lands by the Adour and the Garonne, which more than four centuries before had been governed by the Black Prince.

And now this short study of topography has brought us to our own lands " the greatest and the best in all the main" ; " those precious gems set in a silver sea," and as we look upon them on the map a certain glow of enthusiastic patriotism must pervade the souls of the dullest. Suppose among the other marvellous events of which the womb of our mighty mother is pregnant, an invasion of our Continent by the mighty Republic across the Atlantic could be conceived, the three bastions of Europe would be Scandinavia, the North-west of France and the North-west of Spain, and to these the United Kingdom would be the outwork. Thus these merely theoretical words of the modern Italian Sironi set forth the strategical might of our isles, as it also appeared in the days of Elizabeth to the English sage, whose mighty and subtle intellect saw through the veil of mystery that envelops the records of our past and the hopes for our future. Lord Bacon said that " he that commands the sea is at great liberty, and may take as much and as little of the war as he will ; whereas those that be strongest by land are many times nevertheless in great straits. Surely at this day with us of Europe, the vantage of strength at sea, which is one of this kingdom of Great Britain is great ; both because most of the kingdoms of Europe are not wholly inland, but girt with sea most part of their compass, and because the wealth of both Indies seems in great part but an accessory to the command of the sea." And so indeed it has been and it is. Colonel Maurice, a member of your own body, has pointed out not long ago how an English fleet could still, if our people so pleased, put the very strongest by land in very great straits indeed. For the rest

[1] In the Appendix Sironi's Views will be found in a French translation.

has not Lord Rosebery said recently that the British Empire is the very greatest influence for good on earth ? His words were welcome as water in the arid desert of the meaningless empty tirades, whereby the ignorant are gulled into forgetting their truest and highest interests. We cannot, and dare not be indifferent to the stupendous interests involved in the military topography of our neighbours of Western Europe. Everything that affects them must more or less affect us; but your proud motto *Ubique* reminds me of what a people we are, and of how distinguished an honour I receive in being allowed to address the Royal Regiment of Artillery. British Artillery—in this hall, your motto *Ubique* indicates truly that our empire is far grander than any that ever arose or fell in Europe, Western or Eastern, Roman or Gothic, Moslem or Christian, Gallic or Teuton, and that the responsibilities of its statesmen and soldiers are beyond compare. Radiating from these isles a long series of expeditions have given our race supremacy in every continent. Your guns command a route for our ships at the rock of Gibraltar, at Malta, in Cyprus, from which Richard I. led his Crusaders to the reconquest of Palestine. The English are now at the spot which "great Ammon's son" selected not only as the Capital of Egypt, but as a strategic point for the conquest of Asia, and thence your Empire reaches through the realms of the Moguls to utmost Cathay, while still further East it holds in fief the mightiest Isles of the Pacific, and its sway extends over the North of America, back again to the Atlantic. To keep this Empire intact is the duty of our generation even as its acquisition was the duty of our fathers. How to do this most efficiently history will teach us. The interest you display in studies, which guide and warn mankind, makes me confident that, if our Empire also points the moral and adorns the tale of the vanity of human wishes, the blame will not rest on your shoulders. You will have done your duty ; you will have striven to preserve it pure and mighty as our ocean itself, "icing the pole, and in the torrid clime, dark heaving, boundless, endless, and sublime."

CHAIRMAN : We give you our best thanks for having put so much interest into this subject which you have dealt with. I hope we may be fired ourselves with the same interest as you have brought into the subject.

MAJOR MAY : Some of us would like to hear from you whether there is any geographical explanation of how it is that Belgium has become the battlefield of Europe on so many occasions.

DR. MAGUIRE : It is very clear that Belgium is a very convenient road into France under some conditions, and of course the English would naturally, especially if in alliance with the Dutch, with Belgium itself, or with the North Germans, select it for a theatre of operations as in 1658, 1793, and 1815. If the Rhine from Strasburg to Coblentz and the Vosges and Moselle were very strongly occupied and fortified by the French, the Germans might try to turn these position by way of Belgium, or *vice versa*. Moreover the open character of Belgium makes it a convenient country for grand manœuvres. But clearly also Belgium is not the shortest cut to either Paris or Berlin, or Vienna, and armies adopting it could move on two sides of a triangle. My answer

to Major May must then include history as well as topography. The English selected the Netherlands as a base in the middle ages, because they had very close business relations with the Low Countries. From the 16th till the close of the 18th century the position of Belgium was very peculiar. The Low Countries passed into the possession of the House of Austria by the marriage of Maximilian with Mary of Burgundy; their son acquired also by marriage the Spanish dominions, and Belgium remained in Spanish hands. Holland having adopted the Reformed Religion separated from Spain in the time of our Elizabeth, and the war that led up to the separation was desperate in the extreme. But Spain remained ruler of Belgium, and as Spain and France were fighting throughout the 16th and 17th centuries, Belgium was constantly involved.

During the war of the Spanish Succession, Holland, England, and Austria were against France, and of course all strove for Belgium; hence Marlborough's great campaigns along the Dyle and the Scheldt. At the close of this war, Belgium passed to Austria, and of course as France was again fighting Austria, Holland and England in the 18th century, Belgium was once more a convenient theatre; at last, after the Revolution, France overwhelmed both Belgium and Holland, but only for a time. In 1815 they were made one nation, and were allied with England in the Waterloo campaign, but they separated, and each set up as an independent state, 1832-3. This is a rough answer, but my object is to show that Belgium's history would go far to explain how its territory has been the "Cockpit of Europe."

A vote of thanks to the Lecturer was put and carried unanimously.

APPENDIX.

The Command of the Sea.

The following extract from the great work by Capt. Mahan, United States Navy, shows how the command of even distant seas affects the chances of invasion.

Meanwhile that period of waiting from May, 1803, to August, 1805, when the tangled net of naval and military movements began to unravel, was a striking and wonderful pause in the world's history. On the heights above Boulogne, and along the narrow strip of beach from Etaples to Vimereux, were encamped 130,000 of the most brilliant soldiery of all time, the soldiers who had fought in Germany, Italy, and Egypt, soldiers who were yet to win, from Austria, Ulm and Austerlitz, and from Prussia, Auerstadt and Jena, to hold their own, though barely, at Eylau against the army of Russia, and to overthrow it also, a few months later, on the bloody field of Friedland. Growing daily more vigorous in the bracing sea air and the hardy life laid out for them, they could on fine days, as they practised the various manœuvres which were to perfect the vast host in embarking and disembarking with order and rapidity, see the white cliffs fringing the only country that to the last defied their arms. Far away, Cornwallis off Brest, Collingwood off Rochefort, Pellew off Ferrol, were battling the wild gales of the Bay of Biscay, in that tremendous and sustained vigilance which reached its utmost tension in the years preceding Trafalgar, concerning which Collingwood wrote that admirals need to be made of iron, but which was forced upon them by the unquestionable and imminent danger of the country. Farther distant still, severed apparently from all connexion with the busy scene at Boulogne, Nelson before Toulon was wearing away the last two years of his glorious but suffering life, fighting the fierce north-westers of the Gulf of Lyon and questioning, questioning continually with feverish anxiety, whether Napoleon's object was Egypt again or Great Britain really. They were dull, weary, eventless months, those months of watching and waiting of the big ships before the French arsenals. Purposeless they surely seemed to many, but they saved England. The world has never seen a more impressive demonstration of the influence of sea power upon its history. Those far distant, storm-beaten ships, upon which the Grand Army never looked, stood between it and the dominion of the world. Holding the interior positions they did, before—and therefore between—the chief dockyards and detachments of the French navy, the latter could unite only by a concurrence of successful evasions, of which the failure of anyone nullified the result. Linked together as the various British fleets were by chains of smaller vessels, chance alone could secure Bonaparte's great combination, which depended upon the covert concentration of several detachments upon a point practically within the enemy's lines. Thus, while bodily present before Brest, Rochefort, and Toulon, strategically the British squadrons lay in the Straits of Dover barring the way against the army of invasion.

Strategic Position of Biserta.

"The position of Carthage," writes the "Norddeutsche," "was without any doubt an incomparably more favourable one for maintaining command of the Mediterranean than that of Rome and its unimportant harbour of Ostia, and, indeed, it was owing to this favourable position, in conjunction with the statesmanship of its rulers and the activity and skill as seamen of its population, that the Punic capital was enabled to remain for so long the rival of Rome as mistress of those seas.

"Although not situated on the same site as old Carthage, the ruins of which lies some 8 miles off in a north-westerly direction in the neighbourhood of Cape Blanc, Biserta, the new base of the French Fleet in the Mediterranean, possesses a position for a war harbour so favoured by Nature that it not only vies with that of Carthage in every respect, but is superior in many points. A natural basin, over 2 German miles long and 1 broad, with a uniform depth of 40-ft., completely secure both from the force of the sea and from a hostile bombardment; the harbour of Biserta connected with the sea by a navigable canal 7·5 km. long will afford shelter to all the fleets of the world. This canal has been dredged out to allow the passage of ships drawing 30-ft. Two huge moles, each 1 km. long, are intended to protect the entrance into the canal. The Gulf of Biserta forms an advantageous approach to the harbour for a fleet, while the steep limestone cliffs of the surrounding coast render the fortification of the whole locality and the mouth of the harbour easy, as also of the town of Biserta, which is situated on the plateau. The position, in fact, possesses exceptional advantages for the establishment of a first-class naval station."

With regard to the strategic importance of this new French stronghold, Biserta appears to occupy a far more central position than Toulon, and in consequence of their propinquity it directly threatens the south and south-western coasts of Italy, Sicily, and Sardinia in the event of war between the two countries; in the second place, Biserta commands the great trade route from Gibraltar to the East, as well as of vessels proceeding to or coming from the Tyrrhenian Sea.

From Biserta it is easy to reach Sicily in 12 hours, Naples in 36 hours, and Maddalena in 24 hours, and a French squadron could reach in 36 hours any desired point on the coast of Sicily and most of the towns on the south-west coast of the peninsula and Sardinia.

If then the transformation of Biserta into a war harbour and station for the French Fleet affects most materially the military situation as far as the southern and south-western coasts of Italy are concerned, it is no less a matter of importance to England that the trade route through the Mediterranean should be commanded from such a base of operation so close as Biserta is.

The maritime position of Great Britain in the Mediterranean is threatened less by the fleets of her probable enemy than by the possibility afforded for the destruction of her trade and the interruption of the sea route to the East by ships issuing from secure harbours. Hostile squadrons will hardly be able to effect much against the strong fortresses of Malta and Gibraltar; but by attacks on the swarm of merchant ships which, even in war-time, would be passing between the Suez Canal and Gibraltar, cruisers issuing from Toulon, Algiers, and especially Biserta, would be able to inflict untold injury upon English

trade. For such an onslaught on English ships by the French cruisers, Biserta affords a perfectly unique base. Formerly the possession of Gibraltar and Malta, and still later the occupation of Alexandra and Egypt, enabled England to command the route from the Atlantic to Suez; but to-day Biserta rivals Gibraltar and Malta in this respect, and it may be confidently asserted that the completion of this newly-created stronghold in 1894, as is the intention of the French Government, will necessitate, on the part of England, a very considerable increase to her naval strength in the Mediterranean if she is to maintain her supremacy in that sea.

The "Neue Freie Press," on the 1st of September last, calls attention to the same subject: "For some time past," it says, "a wrathful feeling has shown itself in the Italian Press at the feverish haste with which the French are pushing on the completion of the fortifications and the harbour works at Biserta on the north coast of Tunis, which threaten alike the coasts of Sicily and Italy, Malta, and the English strategic route to India.—*Commander Gabbett, R.N.*

The Fortresses of France.

On the 1st of January, 1882, France had 147 strong places, or independent forts, and 434 works, or detached batteries, that is 581 works of permanent fortification in all. In 1880 the French engineers estimated that the garrisons needful for all the fortresses of France would amount to at least 520,000 men, that is more than a fourth of the entire army of France as it then stood. The French engineers seem to think that the more works are constructed the more the security of the nation. Vauban, Napoleon, and Moltke held very different views. While not pretending to ignore the value of good fortresses, and being quite ready to provide them in reasonable abundance, their decided opinion was that the belligerent who is master in the field will either take, or evade, fortresses at his convenience. The best rampart for any country is a numerous, well disciplined, and well organized field army. The fewer the men who are shut up in forts the more powerful it will be. On the other hand fortresses are invaluable as delaying an enemy and giving time to a country to organize its resources.

Major Clarke on French Fortresses.

It is customary to speak somewhat slightingly of the performance of the French fortresses in the campaign of 1870-71. With a few exceptions they are commonly assumed to have fallen to brief bombardments by field guns, becoming thus available as illustrations of the power of rifled guns over fortifications, and indicating the necessity for armour in various forms together with other artifices dear to a certain class of mind. On the other hand, the fate of these fortresses has also been regarded as attesting the inefficacy of fortification generally, the uselessness of fortresses in face of the conditions of modern war.

Political considerations determined the fatal movement to Sedan, therefore fortresses exercise a baleful attraction over armies. Metz, a great frontier place of arms, was quite unprovided for a blockade, therefore fortresses are now easily thus reduced. But for the fortresses, however, the Germans would have swept France clear of all organized

bodies of troops within two months of the frontier battles. Had Paris and Metz possessed two months' more food supply the fortunes of the war might have been changed.

The French defences suffered from almost every conceivable disadvantage. Excluding the unfinished forts of Metz, the newest of the fortresses attacked, Paris, was thirty years old; the average age of the rest must have been more than 150 years. Though initially ill-found in all respects, and almost as completely unprepared for war as our own defences at home, few of these fortresses were improved or strengthened in the available time after the outbreak of hostilities. Not many things are more difficult than to direct a defence, and, with few exceptions, France had not the men for the work. To meet a siege train thoroughly reorganized after the Danish war and brought fully up to date the fortresses had no armaments worthy the name.

A number of men, even of disciplined troops, does not make a garrison, and in most cases the closely knit and carefully organized forces which a good defence requires were not available. Vitry, Toul, Laon, Schlettstadt, New Brisac, La Fère, Peronne, and Rocroy were garrisoned almost entirely by gardes mobiles, who at Vitry had not received their uniforms, and at Schlettstadt were engaged in looting their compatriots when the Germans entered; add to this that the fortresses were in almost every case mere lines enclosing towns in which the civil population were exposed to the full effect of bombardment, and it seems clear that prolonged defences could scarcely be expected.

Major G. S. Clarke on Fortification.

The siege operations of the 1870-1 campaign will repay a careful study by all who wish to base fortification on the experience of war, and not on the promptings of the inner consciousness, supported by diagrams. The main characteristics on the side of the attack were heavy bombardments, and an excessive reluctance to assault, even in cases where an early capture was extremely important and where the conditions were theoretically favourable. A single assault was attempted against the provisional works of Belfort and failed altogether. On the side of the defence the Artillery was, as usual in the case of permanent fortification, nearly impotent. The effects of the fire of the attack were uniformly small, except where the design of the works themselves was such as to ensure the maximum advantage to the enemy. Even on the towns, exposed as they were, the affects appear to have been moderate in many cases. In Paris, the total number of killed and wounded is given as 375, and the fires which broke out seem to have been easily extinguished.

Defence of Frontiers.

The defence of frontiers is a problem generally somewhat indeterminate. It is not so for those countries whose borders are covered by great and natural obstacles, and which present but few accessible points, and these admitting of defence by the art of the engineer. The problem here is simple, but in open countries it is more difficult. The Alps and the Pyrenees, and the lesser ranges of the Crapacks, of Riesengebirge, of Erzegebirge, of the Böhmerwald, of the Black Forest,

of the Vosges, and of the Jura, are not so formidable that they cannot be made more so by a good system of fortresses.

Of all these frontiers, that separating France and Piedmont was best covered. The valleys of the Stura and Suza, the passes of Argentine and Mont-Genèvre, and of Mont-Cenis—the only ones considered practicable,—were covered by masonry forts ; and in addition, works of considerable magnitude guarded the issues of the valleys in the plains of Piedmont. It was certainly no easy matter to surmount these difficulties.

These excellent artifical defences will not always prevent the passage of an army, because the small works which are found in the gorges may be carried, or the enemy, if he be bold, may find a passage over some other route hitherto deemed impracticable. The passage of the Alps by Francis I., Napoleon's passage of the Saint Bernard, and the Splugen expedition, prove that there is truth in the remark of Napoleon, *that an army can pass wherever a man can set his foot*, a maxim not strictly true, but characteristic of the man, and applied by him with great success.

Other countries are covered by large rivers, either as a first line or as a second. It is, however, remarkable that such lines, apparently so well calculated to separate nations without interfering with trade and communication, are generally not part of the real frontier. It cannot be said that the Danube divides Bessarabia from the Ottoman Empire as long as the Turks have a foothold in Moldavia. The Rhine was never the real frontier of France and Germany : for the French for long periods held points upon the right bank, while the Germans were in possession of Mayence, Luxembourg, and the *tetes de ponts* of Manheim and Wesel on the left bank.

If, however, the Danube, the Rhine, Rhone, Elbe, Oder, Vistula, Po, and Adige, be not exterior lines of the frontier, there is no reason why they should not be fortified as lines of permanent defence, wherever they permit the use of a system suitable for covering a front of operations.

An example of this kind is the Inn, which separates Bavaria from Austria : flanked on the south by the Tyrolese Alps, on the north by Bohemia and the Danube, its narrow front is covered by the three fortified places of Passan, Braunau, and Salzburg. Lloyd, with some poetic license, compares this frontier to two impregnable bastions whose curtain is formed of three fine forts and whose ditch is one of the most rapid of rivers. He has exaggerated these advantages, for his epithet of " impregnable " was decidedly disproved by the bloody events of 1800, 1805, and 1809.—" *The Art of War*," *Jomini, ch. iii., art. xxvi.*

Defensive System of France.

Si le sort des armes était, néanmoins, au début, contraire aux armées françaises, elles éprouveraient, avant tout, le besoin de se rallier après la défaite et de se renforcer pour réparer leurs pertes. Quelle serait, dans ce cas, la direction la plus avantageuse qu'elles devraient chercher à gagner dans leur retraite ?

Il y a, pour elles, cinq lignes de retraite possibles. Ce sont :

1° Sur Paris et Brest, directement à l'ouest ;

2° Sur Lille, vers le nord, pour rester sur le flanc de la ligne de communication de l'envahisseur ;

3° Sur Langres et Lyon, vers le sud, pour le même motif ;
4° Sur Nevers et Bayonne, vers le sud-ouest ;
5° Sur la ligne en équerre, Orléans—Nevers—Chagny.

Ad 1.—En battant en retraite directement vers Paris et l'ouest, les armées françaises s'exposent, surtout après une bataille perdue, à être débordées sur leur droite, c'est-à-dire au sud, par l'ennemi supérieur en forces et au moral, à être refoulées par lui vers le nord, coupées de la plus grande partie de la France et acculées à la mer ou à la frontière de Belgique (comme à Sedan, en 1870) ; car le centre géographique de la France est à Nevers, et non à Paris.

Si elles ne sont pas débordées par leur droite, elles ne peuvent néanmoins enlever à l'envahisseur l'avantage, en les poursuivant, de faire d'une pierre deux coups, c'est-à-dire de se rapprocher de plus en plus de son second objectif, Paris.

Ad 2.—En se retirant sur Lille, la grande armée française s'enfermerait elle-même dans un cul-de-sac et se priverait du gros des ressources du pays, qui lui sont cependant indispensables pour continuer la lutte. Il faut remarquer, en effet que, dès qu'une armée française s'est élevée plus au nord que Beauvais, elle est coupée de tout le reste de la France, quand l'envahisseur saisit le cours de la Seine entre Paris et Rouen.

Ad 3.—En rétrogradant au sud, vers Langres et Dijon, le défenseur s'expose, s'il est débordé sur sa gauche, c'est-à-dire vers l'ouest, par la vallée de la haute Seine ou celle de la Loire, à être acculé à la frontière suisse (comme il est arrivé à l'armée de l'Est, en 1871).

Ad 4 et 5.—En battant en retraite, au contraire, vers la ligne Orléans—Nevers—Chagny, les armées françaises couvrent la plus grande partie de la France et s'en assurent les ressources. Si la barrière de la Loire est fortifiée d'Orléans à Decize, l'envahisseur devra s'arrêter devant elle, soit pour la forcer, soit pour manœuvrer ; et, dès lors, les armées françaises gagneront du temps pour se refaire. Par Orléans, elles restent en communication, au moyen des chemins de fer, avec la Seine-Inférieure, la Normandie, la Bretagne, et peuvent tirer des approvisionnements de tous les ports de la Manche et de l'Océan compris entre l'embouchure de la Seine et celle de la Gironde. Par Nevers, elles restent en communication avec Nimes et Lyon, et peuvent tirer des approvisionnements du Midi et des ports de la Méditerranée. Par Chagny, elles ont accès directement sur les ports de la Provence et l'Algérie.

De la ligne Nevers—Chagny—Besançon, elles menacent constamment la ligne de communication principale de l'envahisseur. Les forêts du Nivernais et du Morvan peuvent masquer leurs mouvements latéraux. Elles ont à leur portée la fabrique d'armes de Saint-Etienne, la poudrerie de Vonges, et la grande usine du Creusot pour réfectionner leur matériel ou compléter leurs munitions.

De la ligne Orléans—Nevers, elles couvrent tout le centre de la France ; avantage fondamental, car l'ennemi a pour principe de ruiner de fond en comble les provinces qu'il occupe pour empêcher la lutte de continuer. Elles ont sous la main l'arsenal de Bourges ; elles peuvent puiser dans les manufactures d'armes de Châtellerault et de Tulle ; faire réfectionner ou compléter leur matériel par les usines de Guérigny, Nevers, Fourchambault, Montluçon et Commentry.

Derrière la base intérieure Orléans—Nevers—Chagny, les armées françaises ont à leur disposition les récoltes de la Beauce et de la Limagne, le bétail du Morvan et du Charolais, et la facilité de s'alimenter par les navires venus d'Amérique dans les ports de l'Atlantique (avoines et blés

des Etats-Unis, viandes de la Plata), ainsi que par les ports de la Méditerranée (blés de la Russie et de la Roumanie, fourrages pressés d'Algérie, productions de l'Espagne et du Midi).

Mais, si ces armées abandonnent d'emblée la ligne de la Loire, d'Orléans à Decize, elles perdent leur liaison avec le nord et le nord-ouest ; l'envahisseur devient maître dès lors des ressources de la moitié de la France. Donc, il est indispensable de fortifier par des têtes de pont la ligne Orléans—Decize, pour qu'elle limite longtemps les progrès de l'envahisseur et confère aux armées françaises la possibilité de reprendre l'offensive après s'être renforcées.

Il résulte de ces considérations que, dans une guerre défensive contre l'Allemagne, la base intérieure des armées françaises est marquée par la ligne en équerre Orléans—Nevers—Chagny. Il faut que cette base soit fortifiée par des points d'appui, pour que l'envahisseur ne puisse la dépasser d'emblée, même s'il est victorieux dans les premières batailles, et pour que les magasins d'armes, de munitions, de vivres, formés au début pour ravitailler les armées d'opérations dans l'Est, soient là à leur portée et en sûreté. Il faut aussi que de nombreux chemins de fer et des routes relient cette base intérieure (formée des stations-magasins) avec la frontière franco-allemande, sauf à échelonner des magasins de distribution intermédiaires et des manutentions.

Cette base en équerre est protégée à son aile gauche par le cours de la Loire, qui d'Orléans se retourne au sud-ouest ; à son aile droite, par Besançon. Si elle était fortifiée, elle permettrait de raser les fortifications de Paris et de Lyon, et dispenserait d'affecter à ces villes des garnisons immenses, qui seraient bien plus utiles sur le champ de bataille ; mais, si l'on croit devoir conserver les fortifications de Paris et de Lyon, il faut créer autour de Paris des têtes de pont à Corbeil, Lagny, Beaumont-sur-Oise et Meulan, pour que la garnison de Paris puisse être moins nombreuse et faire des sorties sur les flancs de l'investisseur ; autour de Lyon, des têtes de pont à Givors, Anthon (confluent de l'Ain) et Anse près de Trévoux ; on transformerait ainsi la position convexe et unique de la garnison en plusieurs secteurs concaves. Mais, nous le répétons, après avoir fortifié la barrière de la Loire, d'Orléans à Decize, il vaudra mieux raser les fortifications de Paris et de Lyon, qui exigent des armées entières pour garnison et empêchent d'avoir la supériorité numérique sur le champ de bataille ou de porter la guerre chez l'ennemi ; en outre, la populace de ces villes, se sentant en sûreté derrière des remparts, en profite pour aider l'étranger en faisant des émeutes, comme l'événement ne l'a que trop prouvé.

La région (Picardie, Artois et Flandre) située au nord de la ligne d'invasion allemande est riche, très peuplée, et peut tirer des ressources considérables de l'Angleterre et de la Belgique. Sa défense sera confiée à une armée secondaire, qui se couvrira du cours marécageux de la Scarpe et de la Sensée, en y élevant des ouvrages provisoires, à la place des villes fortifiées d'Arras, Douai et Valenciennes, qui exigeraient de grandes garnisons et qui seraient détruites en un jour par les obus-torpilles. Cette armée secondaire se basera sur les forteresses de Lille et de Dunkerque, et se reliera au reste de la France par les places de Péronne, La Fère et Laon. Par la place de Péronne, qu'il est essentiel d'entourer de forts détachés, elle sera maitresse du cours de la Somme ; par les places de La Fère et de Loan, elle pourra descendre dans le bassin

de la Seine, et agir sur la ligne de communication de l'envahisseur. Ce dernier sera donc forcé de détacher contre elle des forces au moins égales.—*General Pierron pp.* 250-252, *Edit.* 1889.

Position of St. Maurice.

C'est à Saint Maurice, en amont du lac de Genève, qu'on peut arrêter une invasion italienne qui aurait pénétré dans la vallée du Rhône supérieur, soit par le col de la Furka, soit par ceux de Nüfenen (Novena), de Gries, ou par la route du Simplon et les passages annexes, ou enfin par le chemin du grand Saint-Bernard et les cols voisins. L'importance de la position de Saint-Maurice a été reconnue par tous les militaires qui ont étudié la défense de la Suisse. Dans son rapport du 30 nivôse an IX, le général Léry, qui commandait le génie à l'armée française des Grisons, s'exprimait ainsi :

" Saint-Maurice offre encore, dans le Valais, une bonne position de retraite, où quatre mille hommes seraient pour ainsi dire inattaquables de front. On ne pourrait les forcer qu'en les tournant par les sentiers qui, de Sion ou de Saint-Pierre-de-Clages, vont gagner les sources de l'Avençon ; ces passages, toutefois, seraient faciles à défendre." (Un chemin muletier, remontant la vallée de la Lizerne, et passant par le pas de Cheville (altitude : 2,036 mètres), mène dans la vallée de l'Avençon, et en huit heures d'Ardon à Gryon, d'où une route carrossable conduit en deux heures et demie à Bex, sur les derrières de la position de Saint-Maurice).

La position de Saint-Maurice avait attiré également l'attention du général Chasseloup. Dans un memoire du 16 vendémiaire an XI (8 octobre 1802), après avoir discuté les advantages de la position de Sion, ce général s'exprime ainsi :

" Je sais bien que l'on me dira que Sion ne ferme pas le passage du grand Saint-Bernard ; mais Saint-Maurice est si près, il offre une position si magnifique à fortifier, que je me chargerais volontiers de faire de cette petite ville, avec ses hauteurs, une place qui, avec la vingtième partie de ce qu'a coûté Briançon, serait plus forte et surtout fermerait mieux la vallée du Rhône, que l'autre ne ferme la vallée de la Durance."

On ne'eleva cependant, durant le cours du premier Empire, aucune fortification à Saint-Maurice. Une négligence encore plus grave fut commise en juin 1815 : le défilé de Saint-Maurice ne fut pas occupé par les Français, et l'armée austro-sarde du feld-maréchal baron de Frimont put le franchir sans coup férir pour marcher sur le Jura, en effectuant, par son aile droite, sa jonction avec les troupes qui pénétraient en France par la Lorraine et l'Alsace. Les mémoires du temps montrent quel rôle eût pu jouer, en cette circonstance, la place de Saint-Maurice.

" L'avant-garde de l'armée autrichienne, sour les ordres du général Bogdan, écrit le comte de Villette-Chivron, sous-chef d'état-major du contingent piémontais, parut le 16 à Novare ; et le baron de Frimont y arriva le 18 au matin avec son quartier général. Il prit cette direction pour tromper l'ennemi, qui pouvait le retenir dans l'important défilé de Saint-Maurice en Valais, position que les Français paraissaient devoir occuper avant lui, comme en étant plus rapprochés.

"The occupation of the St. Simplon and of the great St. Bernard would only be a very temporary success for the Italians if a *coup de main* would not also place them in possession of the key of the Valais—St. Maurice."—*Capt. Marmier.*

The Franco-German Frontier.

La frontière franco-allemande a vers la France la forme d'une grande tenaille, dont l'angle rentrant se trouve au nœud d'où sortent la Meurthe et la Sarre, nœud derrière lequel est située la vaste place de Strasbourg.

La chaîne des Vosges méridionales en renforce le côté méridional; Metz et Thionville consolident le côté septentrional et précisément l'extrémité de l'aile droite de ce front stratégique.

L'extrémité gauche ne possède pas d'obstacles naturels ou artificiels qui puissent arrêter l'attaque, et elle est menacée par la place voisine de Belfort; mais les fortifications qu'on ne tardera pas à élever à Mulhouse ou à Altkirch, celles plus intérieures de Neu-Brisach, et principalement la situation éloignée de ce point d'accès, le cours du Rhin et le peu d'éloignement de la grande place de Strasbourg rendent moins sensible la faiblesse de l'extrême aile gauche.

Le reste de la ligne est au contraire extrêmement fort, et sa disposition est telle qu'elle rend très-dangereuse toute attaque française contre elle.

Enfin, dans la supposition d'une guerre entre Français et Allemands seulement, la rencontre des troupes ne pourrait avoir lieu que sur le front, de Porentruy aux confins luxembourgeois. Les territoires neutres de la Belgique, du Luxembourg et de la Suisse protégeraient les deux Etats belligérants, en empêchant tout mouvement tournant. En admettant que la France prenne l'initiative, bien que pour le moment cela soit peu admissible, ses attaques seraient nécessairement des attaques de front, car elle ne peut assaillir aucune des ailes avant d'avoir obtenu quelque grand succès.

En tenant compte des plus grands objectifs des deux pays, Paris et Berlin, la direction principale de l'attaque serait indiquée par la ligne qui passe par Coblentz ou Cologne, mais elle violerait la neutralité du territoire belge ou luxembourgeois et irait se heurter à la section du Rhin moyen, déjà très-forte, et qui devient plus forte tous les jours par suite de l'extension qu'on donne actuellement à la fortification des deux places précitées et à celle de Mayence.

L'attaque ne pouvant se développer dans cette direction, cherchera à s'en écarter le moins possible, car elle deviendrait d'autant plus excentrique par rapport à l'objectif principal qu'elle s'en éloignerait davantage.

La direction Paris-Manheim, correspondant à l'entrée de la vallée du Mein, paraît être ainsi la mieux indiquée.

Elle irait frapper le côté septentrional de la tenaille; mais, si elle se tournait contre Metz, elle rencontrerait immédiatement un obstacle formidable, susceptible de retenir longtemps une armée entière, et l'initiative ne tarderait certainement pas à passer du côté de l'Allemagne. Si elle tendait à tourner Metz et à pénétrer dans le Palatinat, elle s'exposerait aux attaques de flanc et de revers de la contre-offensive allemande qui déboucherait de Strasbourg et des Vosges méridionales, ou de Metz même et de Thionville, en même temps qu'elle devrait

affronter toutes les difficultés du terrain qui s'étend entre la Moselle, la Sarre et le Rhin, terrain très-coupé et qui possède de nombreuses positions dont la défense pourrait tirer un parti avantageux.

Si au contraire l'attaque visait l'angle de la tenaille, ou les Vosges méridionales, elle s'exposerait à être prise en flanc et enveloppée de la façon la plus compromettante par la contre-offensive allemande, en outre des difficultés que présente cette partie des Vosges devant laquelle elle serait certainement arrêtée. La contre-offensive dont nous venons de parler n'ayant rien à craindre du côté des Vosges, puisque celles-ci tombées, Strasbourg et le Rhin arrêteraient toujours certainement l'agression, et que, en supposant même que celle-ci passât sur la rive droite du fleuve, elle aurait devant elle la forêt Noire et serait toujours très-éloignée d'un grand objectif quelconque, la contre-offensive allemande, disons-nous, pourrait déboucher vigoureusement de l'aile droite et avec sa base, sans préoccupations d'aucune sorte sur ses propes communications avec Mayence, Coblentz et Cologne.

Si l'offensive française se développait plus au midi, elle découvrirait Paris et le cœur de son propre territoire, et deviendrait ainsi encore plus compromettante.

L'attaque simultanée de tout le front conduirait à un fractionnement des forces, tout à l'avantage de l'Allemagne, laquelle, assurée dans les puissantes positions qu'elle possède derrière la frontière, se renfermerait dans la défense passive, au moins sur une partie u front attaqué, et avancerait en masse sur l'autre, très-probablement vers l'extrémité de l'aile droite, c'est-à-dire du côté de Metz, cette place, par sa position avancée vers la capitale de la France et sur les flancs de la Lorraine et de la Champagne, paralyse d'une manière très-prononcée toute tentative offensive de la part de la France.

L'offensive française est aujourd'hui une question difficile à résoudre, et elle est d'autant plus grave, qu'en dehors des grandes difficultés qu'elle rencontrerait sur le premier front défensif, à cause de la conformation et de la constitution de la ligne des frontières, elle aurait encore à franchir la zone étendue de terrain située entre cette ligne et le Rhin ; puis elle rencontrerait cette barrière fluviale, dont l'art accroît encore tous les jours la grande solidité naturelle et artificielle des rives.

Le point sur lequel l'offensive française rencontrerait le moins de difficultés immédiates, et où elle serait même plutôt favorisée par un puissant appui, est Belfort. Mais si de ce point il n'est point difficile de pénétrer dans l'Alsace méridionale en arrivant ainsi derrière la section la plus forte des Vosges nous ne voyons pas quels pourraient être les résultats d'une semblable attaque.

D'abord, parce que nous nous demandons quel objectif pourrait se proposer l'offensive française débouchant de Belfort dans le cas de la neutralité de la Suisse ; ensuite, parce que l'armée allemande laisserait volontiers l'attaque se prononcer vers cet angle lointain de son territoire, en même temps qu'elle tenterait d'en retarder les progrès, et qu'elle se jetterait sur le cœur de la France en débouchant de Metz et de Thionville, soit par la ligne de la Moselle.

Autant la situation de la France est devenue désavantageuse par la perte de la Lorraine et de l'Alsace dans l'hypothèse de son offensive, autant est devenue avantageuse l'offensive allemande, en faisant abstraction de toutes considerations sur les forces respectives des deux Etats.

Aujourd'hui l'Allemange campe au cœur même de la France, et tandis qu'elle la domine sur le front et derrière des obstacles naturels et artificiels d'une grande valeur, elle a devant elle un terrain libre jusqu'à Paris, terrain sur lequel elle ne peut être arrêtée que par l'armée du défenseur.

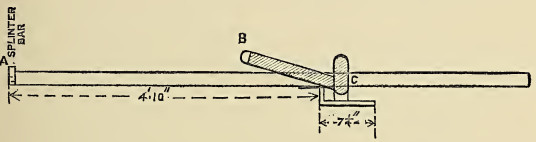
Une grande bataille gagnée peut de nouveau, et certainement avec de moindres difficultés que par le passé, porter sous Paris l'armée allemande, et compromettre encore une fois le sort de la France.—*From Colonel Sironi's Strategic Geography, translated into French by Captain Selmer, pp.* 622-625.

BREECHING FOR WAGON HORSES.

BY

LIEUTENANT J. A. HOBSON, R.A.

The breeching at present in use in the Regiment was devised before the present system of taking out wagon horses in action was introduced, and the process of buckling and unbuckling it not unfrequently causes delay, which would be undesirable in action, as drivers and horses would probably be under fire whilst hooking-in and unhooking. The following is a short description of a method, which has been tried in a Field Battery, R.A., of altering the breeching at present in use, so as to accelerate unhooking and hooking-in.



Three short straps, three or four inches long, are fastened, one to the off tug of the off-wheeler, and two to the near tug of the same horse. These straps are permanently fastened to the tugs, as shown at the point C. At the other end (B) is a dee. The near-side tug is not shown in the rough sketch, but the straps are fastened to it in a similar position, the only difference being that there are two of them; each with a dee at the other end.

The breeching of the two wheelers, instead of being buckled on to the dees on the shafts, is buckled on to the three dees at the end of these short straps at B. Two iron stops are fastened underneath the two shafts; the back of the stop being about 4 feet 10 inches from the splinter-bar; the bottom part of the stop itself being about 7¼ inches long and sufficiently deep to allow the tug to pass easily between it and the shaft.

When the strain comes on the breeching going down hill it pulls against the back of these stops, and not against the dees on the shafts as at present; but if the stops are placed as above, the pull will be in the same direction as with the ordinary breeching.

To unhook, it is not necessary to unbuckle any of the breeching of

either of the wheelers, but simply unhook the traces and they can walk out.

To hook-in is, of course, the converse, no buckling being required, but simply care being taken that the tugs are inserted *in* the stops. If the dimensions given above are kept roughly any horse, big or small, can be used, as by adjusting the breeching by means of the buckle the horse can be made to work at his proper distance from the splinter-bar, without there being any danger of the tugs getting in front of the stops and then working back over them.

It will be seen that when the horses trot away without the carriage the two wheelers are both fastened together at the near-side tug, but this does not bring them too near together so as to cause kicking, and is rather an advantage than otherwise.

Of course, with new breeching it would save leather if the breeching were buckled at the point B, instead of passing through the dee and then buckling on to itself; but the method I have described above is simply a means of adapting the present breeching.

The stops on the shafts have not been found to interfere in any way with the driver.

NOTES ON OPTICAL INSTRUMENTS.

BY

CAPTAIN D. G. PRINSEP, R.A.

Considering that optical instruments are now largely used in the service, a few remarks on their care and preservation are here jotted down as they have occurred to the writer. To enter into the most elementary principles of light would take more room than could be spared, and, therefore, for any elucidation of principles I must refer my readers to "Mathematical Instruments," by Heather (published by Crosby, Lockwood and Son), or to any other treatise on light. I include a few practical rules which are in use with Messrs. Cary, Opticians to the Navy, 181, Strand, W.C., who have afforded me the greatest assistance, and will be pleased to give any further information to those requiring it.

Optical instruments should always be kept in a dry place at about the same temperature as the air outside, and should NEVER be put away wet or damp in their cases, but brought in and cleaned as soon as possible and then replaced.

In taking a telescope to pieces to clean the lenses be very careful to replace each combination of lenses in the same order as when first taken out. It is best and safest to only clean one set at a time, leaving the others in their places until the first set is completely replaced.

A soft camel's hair brush is best for removing particles of dust from the glasses. They may then be rubbed very carefully and gently with an *old fine cambric* handkerchief (*silk* will scratch lenses in time). Anything employed for cleaning lenses should be kept in a box when not in use. A drop of spirits of wine is efficient for removing refractory stains.

If the lenses are discoloured from the action of the atmosphere, try washing them in potash dissolved in hot water, but usually repolishing is necessary.

If caused by the cement becoming discoloured from age; warm the glasses to separate them, then clean with a rag dipped in alcohol. Put a little Canada balsam on the surfaces to be united, work out the bubbles of air (if any) and warm, then allow to cool, and clean the edges with alcohol. All lenses have a small mark, either a scratch or pencil mark, on the circumference which should coincide with a similar mark on the lens to be united to it, and care must be taken that these marks do coincide or distortion will ensue.

Some lenses are not cemented together at all, but this varies with makers. The surfaces of the lenses are ground to different curves which fit together exactly, and the same surfaces must always be placed together. This can be ascertained by gently pressing one glass on

the other, when, if correct, they will stick together by cohesion when lifted gently.

The more convex side is generally placed outwards, *i.e.*, away from the eye and the concave or flint glass next, and in a triplet lens the less convex surface is usually nearer the eye.

Thus:—1. Crossed convex.
2. Double concave.
3. Convexo plane.
4. Concavo plane.
5. Concavo convex.

To ascertain which is the more convex side of a lens. "Surface" the lens by inclining it so that a reflection is obtained off the upper surface, then invert and compare the sizes of the reflections. The smaller the reflection the greater the convexity.

Diaphragms are adjusted thus:—

Push in the diaphragm with the largest opening until the eye, when placed in the focus of the object glass, can just take in the whole of the object glass and no more. Then place in the second until the opening in the first is a little more than free, and no reflection from the inside of the tube enters the eye.

The diaphragms in the eye-piece should be pushed up the tube until they are just in the focus of the lens in front of them nearest the eye.

If cross-wires are required they are always placed across the diaphragm nearest the eye lens; that is in the combined foci of the object glass and eye-piece.

To test a telescope for colour, etc. Direct it on to an object, such as a chimney pot against a bright background of sky, if there is colour about the edges the glass is not achromatic and should be rejected. Then direct it on to some bright spot against a dark background, such as a star at night, and adjust till it is clearly seen in the centre of the field of the telescope, then, without altering the focus, bring the spot to the extreme edges of the telescope, and if still clear and distinct the instrument is a good one.

To determine the power of a telescope.—Direct it on to a brick wall, about 30 yards off, and focus it, then compare the number of bricks seen through it by one eye with the number covering the same space with the other naked eye. Thus, if five bricks seen with the naked eye just cover one seen through the telescope, the power is five to one.

The power of an eye-piece may be considerably increased by unscrewing and removing the "field-lens," *i.e.*, that farthest from the eye, but the *centre of the field* only will be distinct.

Another way with an inverting eye-piece is to add the focal lengths of the *two lenses of the eye-piece,* divide by two, and divide the focal length of the *object glass* by this result.

e.g., 2 lenses focal lengths = ½ inch and 2½ inches.
„ object glass focal length = 21 inches.

Then $\frac{1}{2} + 2\frac{1}{2} = 3$; and $21 \div \frac{3}{2} = 14$ = magnifying power of glass.

To adjust for collimation error (*vide* "Hand-book of Depression Range-Finder" also). Focus the instrument on to some object exactly in the centre of the cross-wires. Then turn it round a half circle on its axis and note the amount the object moves away from the centre, correct by moving the cross-wires half-way towards the object with the inverting eye-piece (away from the object with the erecting eye-piece) by the capstan-headed screws at the side, taking care to take up as much one side as is given out on the other. Test again in other directions till the object remains in the centre in all cases.

This error can also be eliminated by slightly inclining the object glass, or by turning the lenses of the object glass round in relation to each other.

To fix cross-wires clean out and re-mark the old lines on the diaphragm, catch a spider of the small sort known as the money spider. Let him drop and, as he drops, catch the fresh web on a U-shaped piece of wire, winding it on with plenty of space between each return of the thread. Apply a drop of seed-lac lacquer or brown hard varnish to the marks on the diaphragm, and then lay across a single thread of the web from the U-shaped wire carefully and gently, and it will break off outside the diaphragm, the centre web remaining fixed. Repeat this for the other lines where necessary.

If two telescopes get broken, a sound one may be made from the object glass of one and the eye-piece of another. The focal length of the object glass must be found and the case arranged so that the draw tube will bring the eye-piece down to the focal point. The convex lenses of an object glass may, at a pinch, also be used to replace broken convex glasses in the eye-piece, but care must be taken to stop out or blacken all except a small portion of the centre of it, and the diaphragms and lenses may require re-adjusting.

In ordering a new lens to replace one broken, mention its nature (*see* Figs. at end), focal length, and diameter. If one of a doublet or triplet object lens the whole combination should be sent to the maker, as a portion of an object lens cannot be matched accurately.

The focal length of a lens or glass can be obtained by measuring the distance from itself to a point which will bring the rays of the sun or a candle to a focus. Combinations of lenses take their names from their form in combination. Thus a doublet formed of a crossed convex and a double concave, as shown here, would be termed a meniscus.

A good temporary draw tube can be made by laying a coating of paste or gum on a piece of fine paper and rolling it round a cylinder of the proper size, and this will take the screw threads of the lenses. A body could also be made in the same way to carry the object glass. but must be made strong enough and varnished over outside.

Terrestrial and astronomical telescopes differ only in their eye-pieces, the former being erecting the latter inverting (*see* Figs. at end). The eye-piece of the former is composed of four lenses, as shown in the figure. The 2nd and 3rd lenses are termed condensing lenses, and are necessary only to bring the image into an erect position, the 2nd

and eye lens forming a compound microscope through which the apparent image is viewed. There is much more loss of light in the erecting eye-piece, owing to there being more lenses, than is the case with an inverting eye-piece. The curves of the lenses vary slightly with different makers. The plate gives the most modern form.

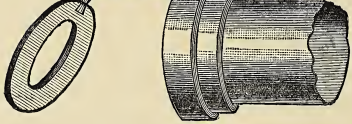
The double Galilean telescope or binocular field glass (its usual service form) consists of an object glass of shorter focus than in a telescope, and of a double concave lens as an eye-piece. In cleaning these glasses care must be taken to place the surfaces of the *same* concavity towards the eye in both tubes or distortion will ensue.

The binocular telescope simply consists of two erecting telescopes fitted parallel to each other, and with an adjustment to regulate the distance between the tubes so as to get a clear view with both eyes. Though very powerful, they are not to be recommended as their construction is very delicate, and if once knocked out of truth the eyes are strained by seeing two images, and they can only be repaired by an optician.

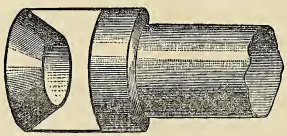
The same remarks apply to them as to single telescopes.

To light up cross-wires by night.—In the telescopes used with theodolites a ray of light is admitted through one of the trunnions which is bored for the purpose, and this ray is reflected by a small silver disc placed at an angle of 45° degrees with the optical axis of the instrument on to the cross-wires.

Another way is to fix an elliptic ring (with an ellipse bored through it for direct vision of the telescope) with a band to the outside of the



rim of the object glass of the telescope and to reflect the rays of a lamp up the tube by this means or the same may be applied in the shape of a cone silvered on the outside with its apex cut out and so reflecting the rays of any light at the side up the tube.



In the manufacture of lenses two different sorts of glass are used, viz., "crown" and "flint" glass. The latter is whiter and heavier than the former.

The *concave* glass of an object lens is of flint glass, and the smaller lenses of the eye-piece are commonly of crown glass.

The following recipes are useful for repairs :—

To clean brasswork.—Take a piece of woollen rag, scrape some rotten stone on to it and add a little oil. Rub the brass with this, then clean off with a linen rag and whiting, and finish with a clean rag.

Dead black for insides.—Take some lamp black (sold as vegetable black), add a *few drops* of gold size and a little turpentine, and mix well with a knife on a stone or other flat surface until it is the consistency of cream, and lay on cold with a camel-hair brush.

Dead black for outsides.—Take vegetable black and shellac lacquer and thoroughly mix with a flat camel-hair brush (which will also do for laying it on). Warm the work slightly and apply the mixture; or it may be laid on cold and then warm sufficiently to drive off the spirit and melt the shellac.

Note.—If the lacquer contains too much shellac and dries bright, add a little methylated spirits, but don't make the blacking too thin.

Lacquering.—Warm the work over a spirit lamp or gas flame (*not* a Bunsen burner), then, with a flat brush, lay on shellac lacquer made by dissolving shellac in methylated spirit, the work must be made sufficiently hot to evaporate the spirit and the water it contains, but not so hot as to make the shellac blister, about the heat that the hand can bear is enough.

Brazing and soldering.—Mix powdered borax and spelter or silver solder on the parts to be united and bring them to a red heat in a clear flame (silver solder melts at a less heat than spelter). If the article is small, a blow-pipe must be used.

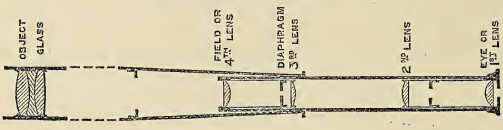
Soft soldering is done thus :—Wet the parts to be soldered with chloride of zinc or chloride of ammonia and place a small piece of soft solder on the joint. Heat with a blow-pipe or "copper bit" or soldering iron (which latter should be first heated but not red hot, and coated with solder and rosin). Then rub the parts with this iron and supply more solder as required.

The lining of tea chests makes a good soft solder.

Re-silvering sextant and range-finder mirrors.—Remove the old silvering with the ball of the thumb, scrape the chamfered edges of the glass to get rid of the old varnish. Rub the glass with a rag dipped in alcohol and clean with a silk handkerchief, wash leather, or linen rag. Then cut a piece of tin foil larger than the glass to be silvered, and place it on a flat stone or iron and rub it flat with a plug of cotton wool. Pour a little mercury on and gently rub until the whole surface is amalgamated. Then pour on more mercury and skim the surface till quite bright; then place a piece of clean paper on the edge of the quick-silver. Put the glass on this, and then with the finger gently glide the glass on to the foil. Place a weight of 2 or 3 lbs. on the glass and let it drain at an angle for about 12 hours (or never less than six hours). Cut away the superfluous foil and tap the stone to loosen the glass. Then with a knife pare the edges, clean and cover the silvering with a solution of seed-lac or hard brown varnish. Replace the mirror, taking care not to scratch the silvering.

In half silvering horizon glasses cut the top edge of the foil where required with a razor, dragging it away towards the unsilvered surface. This leaves a clean sharp edge.

Terrestrial, Erecting Telescope.



Astronomical, Inverting Telescope.

Binocular Glass ; 1 Tube.

Names of Lenses.

1. *Crossed Convex.*
2. *Double Convex.*
3. *Convex Meniscus.*
4. *Convexo Plane.*
5. *Convexo Concave.*
6. *Plano Convex.*
7. *Plano Concave.*
8. *Double Concave.*

THE VALUE OF A HIGH SITE FOR COAST ARTILLERY.

BY

MAJOR J. R. J. JOCELYN, R.A.

"On heights, less protection is needed, the guns cannot so easily be rushed by landing parties, their practice is better, their target is always larger, while they are difficult objects for a ship to hit.—"

COL. J. B. RICHARDSON, R.A.
R. A. I. Proceedings, Jan. '93.

The following notation will be used throughout the paper.

a = Height above sea-level of a given objective.

b = Length, measured in the plane of the trajectory, of the same objective.

e = Distance between the place where a certain shot, *fired from a level site*, strikes the water and the nearest point of the objective.

e' or E' = Distances, similarly measured, in the case of certain shots fired from a *high site.*

All these quantities are measured in the same units.

R = Range in yards to the nearest point of the objective.

h = Height in feet, above mean tide, of a given site.

l = Length in yards of 50 per cent. zone as given in the Range Table of any gun.

l' = Length in yards of same zone, when modified by influence of site.

m = ratio depending on the amount of quadrant elevation, necessary to change the range by 100 yards, in the case of a low and high site, respectively.

n = ratio of the longitudinal errors, which will just cause a certain objective to be missed, in the case of a low and high site, respectively.

q = Angle of Quadrant Elevation, due to h and R.

ω = Angle of descent, due to the trajectory, as given in the range tables.

β = Angle of depression due to h and R.

δ = Angle at which shot strikes, which angle, it is proposed to call the angle of arrival. Thus $\delta = \beta + \omega$.

Suffixes are used to connect certain of the above quantities with different values of h, thus δ_{100} would mean the angle of arrival when $h = 100$, m_{100} would mean that the ratio referred to a level site and one 100 feet high and so on. The gun is always supposed to be at O, and HH' is the mean tide level.

I. The Probable Rectangle.

The dimensions of the probable rectangle, as given in the Range Tables, have to be modified when the gun is raised above the level: the breadth zone is, of course, unaffected but the length zone must be reduced in the proportion of

$$\sin\omega : \sin(\omega+\beta).$$

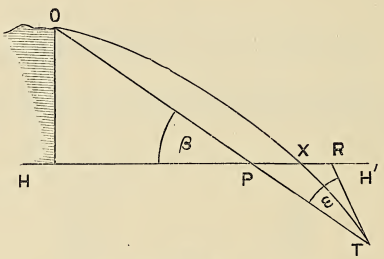


Fig. 1.

For let a gun at O, be fired at such a range that PT would represent the 50 per cent. length zone, on the level, the length zone due to the height, HO, will be given by PX.

That is, if

$$PT=l,\ PX=l'.$$

Now

$$PR=PT\frac{\sin\omega}{\sin(\omega+\beta)},$$

and

$$PX \text{ is} < PR.$$

so that

$$PX \text{ is} < PT\frac{\sin\omega}{\sin(\omega+\beta)},$$

but as a useful approximation we may write,

$$l'=l\frac{\sin\omega}{\sin(\omega+\beta)}.$$

Therefore the higher a gun is placed above the sea-level, the more accurate weapon it becomes.

If β be supposed constant, l' approaches a minimum as ω approaches 0°, therefore the flatter the trajectory of the gun, the more its accuracy is enhanced, while as ω increases, the nearer does the value of l' approach that of l, hence as the range increases, the effect of height tends to disappear.

When the effect of shooting is judged by the 'overs' and the 'unders,' as when practising at a Hong Kong Target, the accuracy of the practice should bear some relation to the value of l'. As comparisons of this sort may be of interest, Tables I., II., III. and IV. are annexed. Table I. gives the value of β for various ranges and heights, and the other three give the length of the 50 per cent. zones for three guns, that are much used at annual practice.

TABLE I. Value of the Angle of Depression (β).

Height of Site in Feet.

Range in yds.	25	50	75	100	125	150	175	200	225	250	275	300
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
100	4 16	9 28	14 75	18 26	21 48	26 27	30 41	33 19	36 35	39 48	42 32	45 0
250	1 54	3 48	5 42	7 36	9 28	11 18	13 9	14 55	16 52	18 26	20 8	21 48
500	57	1 54	2 51	3 48	4 45	5 42	6 40	7 36	8 51	9 27	10 23	11 18
750	38	1 18	1 54	2 33	3 10	3 49	4 28	5 5	5 46	6 20	6 58	7 36
1000	29	57	1 26	1 54	2 23	2 52	3 21	3 49	4 24	4 46	5 12	5 41
1500	19	38	57	1 17	1 35	1 55	2 13	2 32	2 52	3 10	3 35	3 48
2000	14	29	43	57	1 12	1 26	1 41	1 54	2 7	2 23	2 36	2 51
2500	11	23	35	46	57	1 9	1 20	1 32	1 44	1 55	2 7	2 17
3000	9	19	28	39	48	57	1 8	1 16	1 26	1 35	1 44	1 55
3500	8	17	25	33	41	49	57	1 5	1 13	1 22	1 30	1 38
4000	7	15	22	28	36	43	51	57	1 5	1 12	1 18	1 26
4500	6	13	19	26	32	38	45	51	57	1 4	1 10	1 16
5000	6	11	17	23	29	38	41	46	51	57	1 2	1 9

TABLE II. 9″ R. M. L. Gun.

Values of the 50 p.c. Length Zone.

Height of Site in Feet.

Range in yds.	0	25	50	75	100	125	150	175	200	225	250	275	300
1000	20	15·3	12·5	10·5	9	7·9	7·1	6·4	5·5	5·3	4·9	4·7	4·3
1500	21	18·6	16·4	15·3	13·9	12·9	12	11·2	10·6	9·9	9·4	8·8	8·4
2000	23	21·6	20·3	19·3	18·3	17·4	16·6	15·9	15·2	14·7	14	13·6	13
2500	24	23·1	22·3	21·5	20·9	20·2	19·6	19	18·4	17·9	17·4	16·9	16·6
3000	26	25·4	24·8	24·2	23·6	23·1	22·7	22·2	21·8	21·3	20·9	20·5	20·1
3500	27	26·5	26	25·6	25·3	24·9	24·5	24·2	23·8	23·5	23·1	22·7	22·5
4000	29	28·6	28·2	27·9	27·6	27·3	27	26·7	26·4	26·1	25·8	25·6	25·3
4500	30	29·7	29·3	29	28·7	28·4	28·1	27·9	27·7	27·5	27·2	27	26·8
5000	32	31·8	31·4	31·3	31	30·7	30·4	30	29·8	29·6	29·4	29·3	29·2

TABLE III. 12·5″ R. M. L. Gun. Mark I.

Value of the 50 p.c. Length Zone.

Height of Site in Feet.

Range in yds.	0	25	50	75	100	125	150	175	200	225	250	275	300
1000	19	14·5	11·5	9·9	8·6	7·5	6·7	6	5·5	5	4·7	4·4	4·1
1500	20	17·9	15·9	14·4	13·1	12·2	11·2	10·5	9·8	9·2	8·7	8·1	7·8
2000	20	18·7	17·5	16·5	15·4	14·8	14·1	13·4	12·8	12·3	11·8	11·4	11
2500	21	20·1	19·3	18·5	17·9	17·4	16·7	16	15·6	15	14·7	14·2	13·9
3000	21	20	19·8	19·4	18·8	18·4	18	17·5	17·1	16·8	16·4	16·1	15·7
3500	22	21·5	21·1	20·8	20·4	20·1	19·8	19·4	19·1	18·8	18·5	18·2	17·9
4000	23	22·6	22·3	22	21·8	21·5	21·2	20·9	20·7	20·4	20·1	19·9	19·7
4500	24	23·7	23·4	23·2	23	22·8	22·6	22·3	22·1	21·9	21·7	21·5	21·3
5000	25	24·8	24·6	24·4	24·2	24	23·9	23·6	23·4	23·3	23·1	22·9	22·7

TABLE IV. 12·5″ R. M. L. Gun. Mark II.

Value of the 50 p.c. Length Zone.

Height of Site in Feet.

Range in yds.	0	25	50	75	100	125	150	175	200	225	250	275	300
1000	22	17·5	12·5	10·2	8·7	7·5	6·6	5·9	5·4	4·8	4·5	4·2	3·9
1500	22	19	16·8	15	13·5	12·4	11·4	10·6	9·8	9·2	8·6	8	7·7
2000	22	20·3	18·9	17·7	16·7	15·6	14·8	14	13·4	12·8	12·2	11·7	11·2
2500	22	21	20	19·1	18·3	17·7	17	16·6	15·8	15·3	14·8	14·3	13·9
3000	23	22·2	21·6	21	20·3	19·8	19·3	18·7	18·3	17·8	17·4	17	16·7
3500	23	22·4	21·9	21·6	21	20·6	20·2	19·8	19·4	19·1	18·7	18·3	18·1
4000	24	23·6	23·2	22·8	22·5	22·1	21·8	21·4	21·2	20·8	20·6	20·3	20
4500	25	24·8	24·4	24·1	23·7	23·6	23·3	23	22·8	22·5	22·3	22	21·8
5000	26	25·6	25·4	25·2	24·9	24·7	24·5	24·2	24	23·8	23·6	23·5	23·2

II. The Virtual Target.

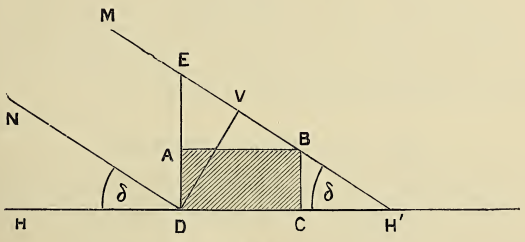


Fig. 2.

Let $ABCD$ be an objective, whose dimensions in the plane of the trajectory are $AD = BC = a$, and $AB = DC = b$, and let δ be the angle of arrival; then any shots between MH' and ND will hit $ABCD$.

Through D, draw DV at right angles to ND or MH', meeting the latter in V. Then DV is the *virtual target* presented by the objective, when δ is the angle of arrival.

Produce DA to meet MH' in E,

then

$$\begin{aligned} DV &= DE\cos\delta, \\ &= (a + b\tan\delta)\cos\delta, \\ &= a\cos\delta + b\sin\delta, \\ &= \sqrt{(a^2+b^2)}\left\{\frac{a}{\sqrt{(a^2+b^2)}}\cos\delta + \frac{b}{\sqrt{(a^2+b^2)}}\sin\delta\right\}. \end{aligned}$$

Let

$$\frac{a}{\sqrt{(a^2+b^2)}} = \sin\lambda,$$

then

$$\frac{b}{\sqrt{(a^2+b^2)}} = \cos\lambda,$$

and

$$DV = \sqrt{(a^2+b^2)}\sin(\lambda+\delta),$$

which is a maximum when

$$\lambda + \delta = 90°,$$

or when the ratio $\frac{b}{a}$ is such that λ and δ are complementary angles, in which case DV will coincide with DB.

DV may thus be considered as revolving round D, having, in the case of a *purely vertical target*, a maximum value DA, when $b = 0$; and, in the case of a *purely horizontal target*, a maximum value DC, when $a = 0$.

Now the ratio $\frac{b}{a}$ can never be less than 2, a value it might possibly have in the case of a torpedo boat, broadside on; its value will, in general, be very much greater: λ can, therefore, never be greater than $\tan^{-1}\frac{1}{2}$ or 27° say, hence in all practical cases, the higher the site, the larger the virtual target, for DV will become greater as δ increases up to about 60°, a value it can never well exceed.

III. The Effect of Mistakes.

That the gun thus becomes a more accurate weapon when placed upon a high site, is beyond question, but this will not be considered in the following investigation of the results of mistakes or faulty gear or material: in addition, lateral errors, from whatever cause, are generally trifling and, of course, are unaffected by site, so they need not here be taken account of. Longitudinal errors alone will be dealt with.

Longitudinal errors may be divided into two classes:

A. The gun may be fired at the wrong range.

B. The correct range may be known, but actually, or in effect, the wrong elevation may be given.

The causes of A are :—

Badly adjusted or faulty instrument; defective means for passing ranges; the slipping of a dial; in the absence of an instrument, wrong estimation of range; wrong corrections for tide and travel of objective; mistake in group difference or abnormal delay, on the part of Group Officer or detachment.

The causes of B are :—

Incorrect setting of tangent scale or index plate or wrong reading of clinometer; neglecting to lay on water line, when using tangent elevation; defects in elevating gear or racers; neglect of Fire Commander to compensate for weak powder or atmospheric conditions; irregularity in muzzle velocity owing to bad powder, wet sponging or bad ramming home.

IV. Mistakes with Quadrant Elevation.

A. When the wrong range is given to the guns.

Under these circumstances the error will be the same, whatever the height of site.

If it is an 'under' its effect will not be influenced by site: but if it is an 'over' a shot that would hit from the level, might be a miss from the high site, on account of the greater value of the angle of arrival.

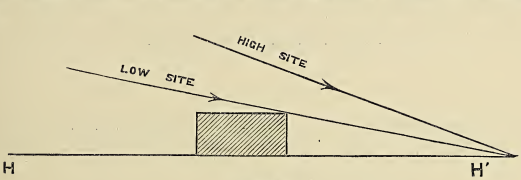


Fig. 3.

This defect, however, would be minimised if the objective approached to a horizontal target.

From this we deduce that quadrant elevation should not be used from a high site, unless an accurate range finder is installed, that group differences should be carefully evaluated, and that the fire commander's corrections for speed and direction are of more moment than on the level.

On the other hand the correction for tide is of more importance, the shorter the range and the lower the site.

B. When the gun is fired at the wrong elevation.

The causes classed under B all result in a mistake being made of a certain number of minutes of elevation. The question then is, which site is most affected by the same mistake.

In order to investigate this question, Table V. has been compiled, a specimen new and old type gun, being taken.

TABLE V.

Extract of Range Table of 9″ R. M. L., showing quadrant elevation for sites of 100′ and 200′, with corresponding angles of arrival.

Range in yards.	q_0	q		Difference in elevation per 100 yards.			m_{100}	m_{200}	ω	δ		Cot		
		100′	200′	$h=0$	$h=100'$	$h=200'$				$h=100'$	$h=200'$	ω	$\delta_{100'}$	$\delta_{200'}$
	° ′	° ′	″ ′	′	′	′			° ′	° ′	° ′			
1000	1 18	36·6 D	2 31 D	10	20·5	31	2·05	3·1	1 35	3 29	5 24	36	16·4	10·6
1100	1 28	16·1 D	2 D						1 46	3 30	5 14	32	16·3	10·9
2000	3 3	2 57	1 8·4	11	13·9	16·6	1·26	1·5	3 45	4 42	5 39	15	12·1	10·1
2100	3 14	2 19·6	1 25						4 1	4 55	5 50	14	11·6	9·7
4000	7 26	6 57·3	6 28	15	15·8	16·4	1·05	1·09	9 50	10 18	10 47	5·8	5·5	5·3
4100	7 41	7 13·1	6 45						10 11	10 39	11 6	5·6	5·4	5·1

Note. D stands for Depression.

Extract of Range Table of 10″ B. L., showing quadrant elevation for sites of 100′ and 200′, with corresponding angles of arrival.

Range in yards.	q_0	q		Difference in elevation per 100 yards.			m_{100}	m_{200}	ω	δ		Cot		
		100′	200′	$h=0$	$h=100'$	$h=200'$				$h=100'$	$h=200'$	ω	δ_{100}	δ_{200}
	° ′	° ′	° ′	′	′	′			° ′	° ′	° ′			
1000	41	1 13·6 D	3 8·2 D	4	14·5	25	3·62	6·25	43	2 37	4 32	80	21·8	12·6
1100	45	59·1 D	2 43·2 D						48	2 32	4 16	72	22·6	13·4
2000	1 27	29·7	27·6 D	4	6·7	9·8	1·7	2·45	1 33	2 30	3 27	37	22·9	16·5
2100	1 31	36·4	18·2 D						1 38	2 32	3 27	35	22·6	16·5
4000	3 12	2 43·3	2 14·7	6	6·8	7·4	1·13	1·23	4 23	4 51	5 20	13	11·7	10
4100	3 18	2 50·1	2 22·1						4 23	4 51	5 19	13	11·7	10

Note. D stands for Depression.

In the first column are three sets of ranges, each set consisting of two ranges, differing by 100 yards; in the next three columns, in each case, are the quadrant elevations due to these ranges, when the height of site is 0′, 100′ and 200′ respectively. The next three columns give the amount of alteration in elevation, due to a change in range of 100 yards, for each of the sites. The next two columns contain the values of m_{100} and m_{200}. The value of m_{100} is given in any case, by the ratio of the change in elevation due to 100 yards, on the level site, to the change in elevation, due to 100 yards, on the site 100′ high; m_{200} is a similar quantity concerning the site 200′ high, when compared with the level site.

Thus with the 9″ R.M.L., 10′ elevation on the level will alter the range from 1000 to 1100, whereas if the gun is 100′ high, it requires 20·5′ to effect the same result; hence $m_{100} = \frac{20{\cdot}5}{10}$ or 2·05. The other values of m_{100} and m_{200} are found on the same principle. The various angles of arrival and their cotangents are given in the remaining columns.

From an inspection of the table, it is apparent that the same mistake in elevation will cause a greater longitudinal error, in the case of a low site, than in the case of a high site; that this effect will be more apparent at a short range, than at a long range, and in the case of a new type gun than in that of an old: and further, that in the case of the high site and the old type gun, the angles of arrival are steeper.

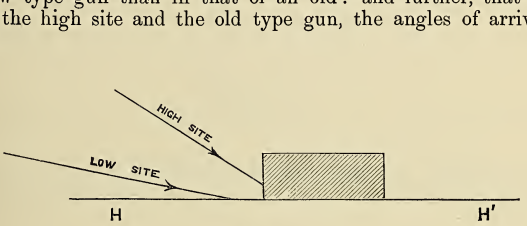


Fig. 4.

If the mistake then is such as would cause an 'under,' the high site has the advantage, which increases the shorter the range and the flatter the trajectory of the gun. (See fig. 4.)

If the mistake is such as would cause an 'over,' the compensating effect of the ratio of cot ω to cot δ must be taken into consideration.

The following method will give a criterion, sufficiently accurate for the estimation of the net result of the two conflicting causes.

Let e, e' be the 'overs' which would just cause an objective $ABCD$, to be missed from the level and the high site, respectively.

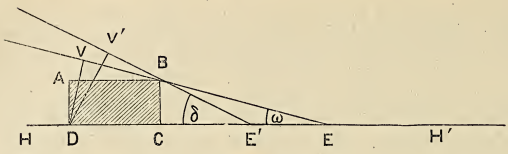


FIG. 5.

Then as e must be greater than e', let

$$e = ne' \text{ where } n \text{ is} > 1.$$

Let the virtual targets be DV and DV' as in fig. 5, then

$$DV = DE \sin \omega,$$

or

$$a \cos \omega + b \sin \omega = e \sin \omega; \qquad \text{(Art. II.)}$$

and

$$DV' = DE' \sin \delta,$$

or

$$a \cos \delta + b \sin \delta = e' \sin \delta; \qquad \text{(Art. II.)}$$

$$\therefore\ n(a \cot \delta + b) = a \cot \omega + b:$$

and

$$n = \frac{\cot \omega + \frac{b}{a}}{\cot \delta + \frac{b}{a}}.$$

By comparing n with the corresponding value of m, we can see whether it would require *a greater mistake* to cause e' than that which would cause e.

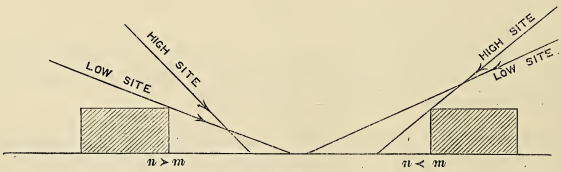


FIG. 6.

Thus if $n = m$, then the same mistake would have the same result in each case; if n is $> m$, then the same mistake would be more detrimental in the case of the high site, than in the case of the low; if n is $< m$ the reverse is the case.

TABLE VI.

Values of n when $\frac{b}{a} = 2$.

	9″ R. M. L.		10″ B. L.		
Range in yards.	Sites h=0′ h=100′	Sites h=0′ h=200′	Sites h=0′ h=100′	Sites h=0′ h=200′	
1000 to 1100	1·9	2·8	3·2	5·2	The mean value of the cotangents taken in each case.
2000 to 2100	1·19	1·3	1·53	2·05	
4000 to 4100	1·03	1.07	1·09	1·18	

In Table VI. some values of n are tabulated, on the assumption that the objective is of the kind most favourable to the low site, that is when the value of $\frac{b}{a}$ is as small as possible, viz. 2, and on comparing these values of n with simultaneous values of m in Table V. it will be seen that they are in all cases smaller.

In order to verify this method, let us assume that owing to some change in its ballistics, the value of m, in the case of the 10″ B.L., firing at about 4000 yards range, from a height of 100′, is 1·08, a quantity slightly smaller than that of n, which is 1·09; here, then, the low site would have the advantage, but if the ratio $\frac{b}{a}$ were increased, this advantage would disappear. The value of $\frac{b}{a}$, when both sites are on an equality, in the supposed case, can be found as follows:—

If x be this value,

then

$$\frac{13+x}{11{\cdot}7+x} = 1{\cdot}08,$$

$$13+x = 12{\cdot}64+1{\cdot}08x,$$

$$8x = 36 \text{ or } x = 4{\cdot}5.$$

To test this, let us take an objective, as in fig. 7, where a is represented by 1 and b by 2.

Fig. 7.

Let e and e', as before, be the 'overs' which would just cause the objective to be missed, from the low and high site, respectively; and let E' be the 'over' which would result from the same mistake, if made on the high site, as that which caused e on the low.

Then

$$e = 13 + 2 = 15,$$
$$e' = 11{\cdot}7 + 2 = 13{\cdot}7,$$

and

$$E' = \frac{e}{m_{100}} = \frac{15}{1{\cdot}08} = 13{\cdot}88.$$

Hence as E' is $> e'$, the same mistake is more disastrous on the site of 100′ than on the level, when $\frac{b}{a} = 2$.

Next let there be an objective, as in fig. 8, where a is represented by 1 and b by 4·5.

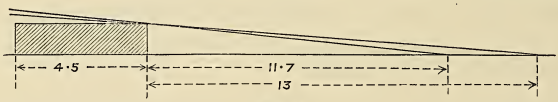


Fig. 8.

Here

$$e = 13 + 4{\cdot}5 = 17{\cdot}5,$$
$$e' = 11{\cdot}7 + 4{\cdot}5 = 16{\cdot}2,$$

and

$$E' = \frac{17{\cdot}5}{1{\cdot}08} - 16{\cdot}2.$$

Hence as E' is equal to e', the same mistake will have the same effect from either site, when $\frac{b}{a} = 4{\cdot}5$.

It is at once seen that as the ratio $\frac{b}{a}$ increases, the advantage of the high site will also increase; so that on the whole, mistakes of class B have less effect on the high site than on the level.

V. Mistakes with Tangent Elevation.

Tangent elevation does not alter with the height of the gun and the line of sight always passes through the object aimed at. It will therefore not be necessary to investigate the mistakes, classed as A and B, separately. We will therefore consider all mistakes, accidents etc. as causing a certain wrong elevation to be given to the gun.

First let the mistake be such as would cause an 'over.'

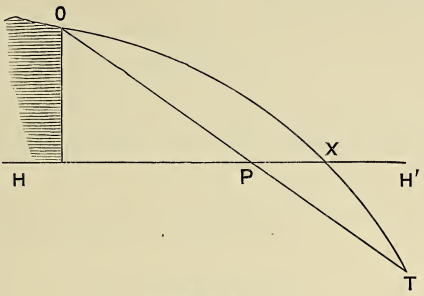


Fig. 9.

Suppose a gun placed at O and aimed at P, elevated in such a way that an error PT would result on the level; then the error from the high site would be PX, where

$$PX = PT \frac{\sin \omega}{\sin (\beta + \omega)}, \text{ approximately.}$$

From this we see that the flatter the trajectory, the less will be the longitudinal error from the high site.

The low site, however, reaps some advantage from the fact that ω is less than the angle of arrival at X, but this is more than compensated for, by the smallness of PX as compared with PT, as will be seen by considering the virtual targets.

In this investigation the angle of arrival at X will be taken as equal to $\beta + \omega$, though this is manifestly more than its true value, for the tangent to the trajectory, at the apex, is inclined at β to HH' and its inclination gradually increases to T', where it would have its maximum value $\beta + \omega$.

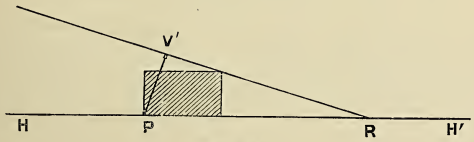


Fig. 10.

Let v be the height of the virtual target at any range, due to a level site, and let v' be that of the virtual target due to a site h' high, at the same range.

Let $PV' = v'$ and the angle $PRV' = (\omega + \beta)$, then a shot from the high site would have to have a longitudinal error equal to PR, if it just missed the objective; thus

$$PR = v' \operatorname{cosec} (\omega + \beta),$$
$$= a \cot \omega + \beta + b.$$

(Art. II.)

At the same time, let the trajectory in fig. 9 be such, that the error PT would cause the objective of fig. 10 to be just missed from the low site also; then

$$PT = v \operatorname{cosec} \omega,$$
$$= a \cot \omega + b,$$

(Art. II.)

$$\therefore \quad PX = \frac{\sin \omega}{\sin (\omega + \beta)} (a \cot \omega + b).$$

Now PX is $< PR$, if

$$\frac{\sin \omega}{\sin \omega + \beta}, \ (a \cot \omega + b) \text{ is} < a \cot (\omega + \beta) + b,$$

or if

$$a \cos \omega + b \sin \omega \text{ is} < a \cos (\omega + \beta) + b \sin (\omega + \beta),$$

or if

$$\sin (\omega + \lambda) \text{ is} < \sin (\omega + \beta + \lambda),$$

where λ has the same value as in Art. II.

Now in all practical cases we know this result must be true, as, of necessity, $(\omega + \beta + \lambda)$ must be less than $90°$, hence even in the most favourable circumstances as regards objective, the low site will always be at a disadvantage, which increases as the objective approaches a horizontal target.

In the case of 'unders' the advantage reaped by the high site is relatively even greater, for it benefits from the fact that PX is always less than PT, without being affected by the ratio $\cot \delta : \cot \omega$.

VI. The Advantage of the High Site.

We have seen that not only is the accuracy of the weapon increased, the higher the site upon which it is placed, but also the mistakes, accidents &c. that may occur in its working, have less effect on it, for the advantage that the low site possesses, under certain circumstances, *when using quadrant elevation*, may be neglected in the discussion, as quadrant elevation on the level is, as far as the trajectory is concerned, the same as tangent elevation, and the advantages of the high site when this means of elevation is used, are great and incontestable. In addition the mistakes classed as A *should not occur;* some of those under B are unpreventable, but as regards these, the high site is in a better position than the low, whatever kind of elevation is used.

In addition the high site possesses the three following most important advantages.

(1) More extended view; greater facilities for observation of the objective and observation of fire.

(2) Less liability for deck hits to glance.

(3) Greater immunity from hostile fire.

VII. The Case of Q.F. Guns.

All considerations combine to make it imperative to place Q.F. guns on a high site whenever it is possible.

TABLE VII.

3 Pr. Q.F. Hotchkiss Gun.

Range.	l	l'_{25}	l'_{250}	ω	δ_{25}	δ_{250}
				° ′	° ′	° ′
100	22	·58	·068	7	4 23	39 55
250	21·5	2·9	3·3	19	2 13	18 45
500	19	7·7	1·2	39	1 36	10 6
750	18	11	2·5	1 2	1 40	7 22
1000	16	11·8	3·7	1 28	1 57	6 14

We have seen that other things being equal the gun with the flatter trajectory is more benefited by the higher site. Q.F. guns as we know them to-day, have very flat trajectories, and future improvements will tend to make them flatter.

We have seen that when a range is unknown, an error in estimation is minimised by tangent elevation and a high site: the natural objective of the Q.F. gun, the torpedo boat, moves so quickly, and may appear so suddenly, that no method is known by which its quickly changing range can be measured and communicated.

We have seen that the more an objective approaches to a horizontal target, the greater is the advantage of the high site. The torpedo boat presents but a narrow ribbon of freeboard, that may often be almost buried in the trough of the waves.

We are told that shots that strike a deck at less than 10°, are almost sure to glance; the values of ω and δ in Table VII. show how site affects the trajectory of the Q.F. guns.

In the confusion of a night attack Q.F. guns on either side of a narrow channel might fire into each other, if means were not provided

to prevent their being raised to a dangerous elevation. This is easy if the sites are high, it is difficult when they are low.

Torpedo catchers of the "Rattlesnake" type often accompany a torpedo boat attack: they might possibly give a good account of a low site battery of Q.F. guns; they could not do them much harm if they were 100′ or more, above the sea.

In addition to this, all the other contingent advantages of the high site hold true with Q.F. guns almost to the same extent as with heavier ordnance.

VIII. The Trajectory of the Q.F. Guns.

If the trajectory in fig. 9 were correctly drawn and to scale, it would be possible, of course, to ascertain the difference between PT and PX by actual measurement: but from the flatness of the curve, it is not convenient to plot it, without exaggerating the ordinates. Trajectories plotted in this way can be utilized for measurements, by a construction for which I am indebted to Major P. A. MacMahon.

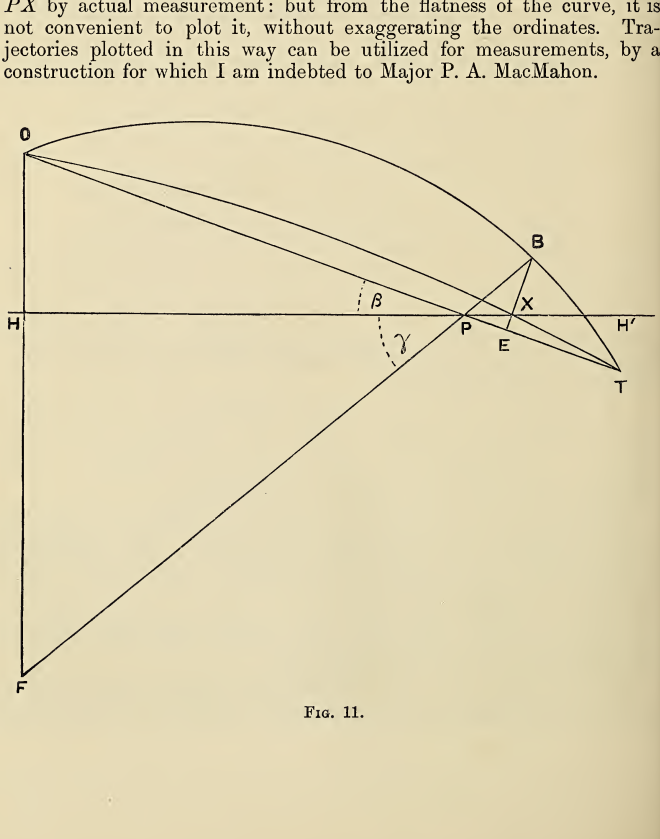


Fig. 11.

With the same notation as before, let OXT be the true and OBT the exaggerated trajectory, its ordinates being p times as great.

Through X draw the ordinate EXB, so that

$$BE = pXE.$$

Join BP and produce it to meet OH produced in F.

Let $HF = kOH$, and the angle HPF or $BPX = \gamma$.

Now, in any particular case, where R and h and consequently β are given, a knowledge of γ will enable us to find the position of X, and to evaluate the difference between PT and PX, from a plotting of the trajectories, such as is given in fig. 12.

Now

$$\tan\beta = \tan XPE = \frac{XE}{PE},$$

and

$$\tan(\beta+\gamma) = \tan BPE = \frac{BE}{PE},$$

$$\therefore \quad \tan(\beta+\gamma) = p\tan\beta.$$

Again

$$\tan\gamma = \frac{k \,.\, OH}{HP} = k\tan\beta,$$

and as

$$\frac{\tan\beta+\tan\gamma}{1-\tan\beta\tan\gamma} = \tan(\beta+\gamma),$$

$$\therefore \quad p\tan\beta = \frac{\tan\beta + k\tan\beta}{1-k\tan^2\beta},$$

$$\therefore \quad k = \frac{p-1}{1+p\tan^2\beta},$$

$$\therefore \quad \tan\gamma = \frac{p-1}{1+p\tan^2\beta}\tan\beta,$$

$$= \frac{p-1}{\cot\beta + p\tan\beta},$$

$$\therefore \quad \gamma = \cot^{-1}\frac{1}{p-1}\{\cot\beta + p\tan\beta\},$$

an expression from which its value can be easily found.

Suppose now P is the position of any point of aim, and it were required to determine where the shot would strike the water, if the range were wrongly estimated by any number of yards PT; let PB be drawn at the angle $(\beta+\gamma)$ due to the height and the range to meet

the exaggerated trajectory in B. Then X will be the point where a line drawn from P at the angle β, meets the perpendicular let fall from B on PT.

For practical purposes, in estimating an 'under,' we may consider PX the same, whether PT is under or over P.

TABLE VIII.

Values of γ. $p = 30$.

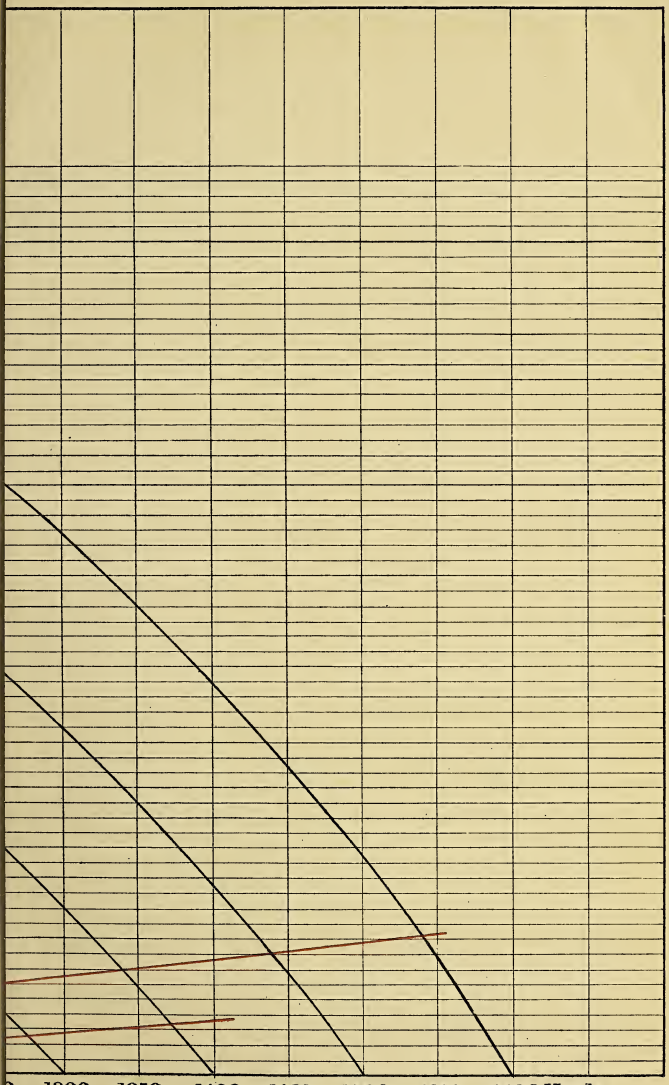
Height of Site.

Range.	25′	250′
	° ′	° ′
250	44 58	65 50
500	26 34	69 14
750	18 18	66 58
1000	14 2	63 26
1250	11 18	59 37
1500	8 47	55 51

In fig. 12 the trajectories* of the 3 Pr. Q.F. Gun (Hotchkiss) are plotted for every hundred yards up to 1600 yards, with ordinates exaggerated thirty times, and Table VIII. gives some values of γ, for two sites of 25′ and 250′ respectively.

Lines at angles β and $(\beta + \gamma)$ for a height of 250′, are drawn through several points, to show how small PX is, compared with PT. For example, if 750 yards be taken as the true range, from the two lines drawn through that point, viz. at 73° 18′ and 6° 20′, the value of PX can be found after the method of Fig. 11, on the supposition that the range is overestimated by 50, 150, 250, 350, 450, 550, 650, 750, 850 or 950 yards. In the first instance the 800 yards trajectory would be

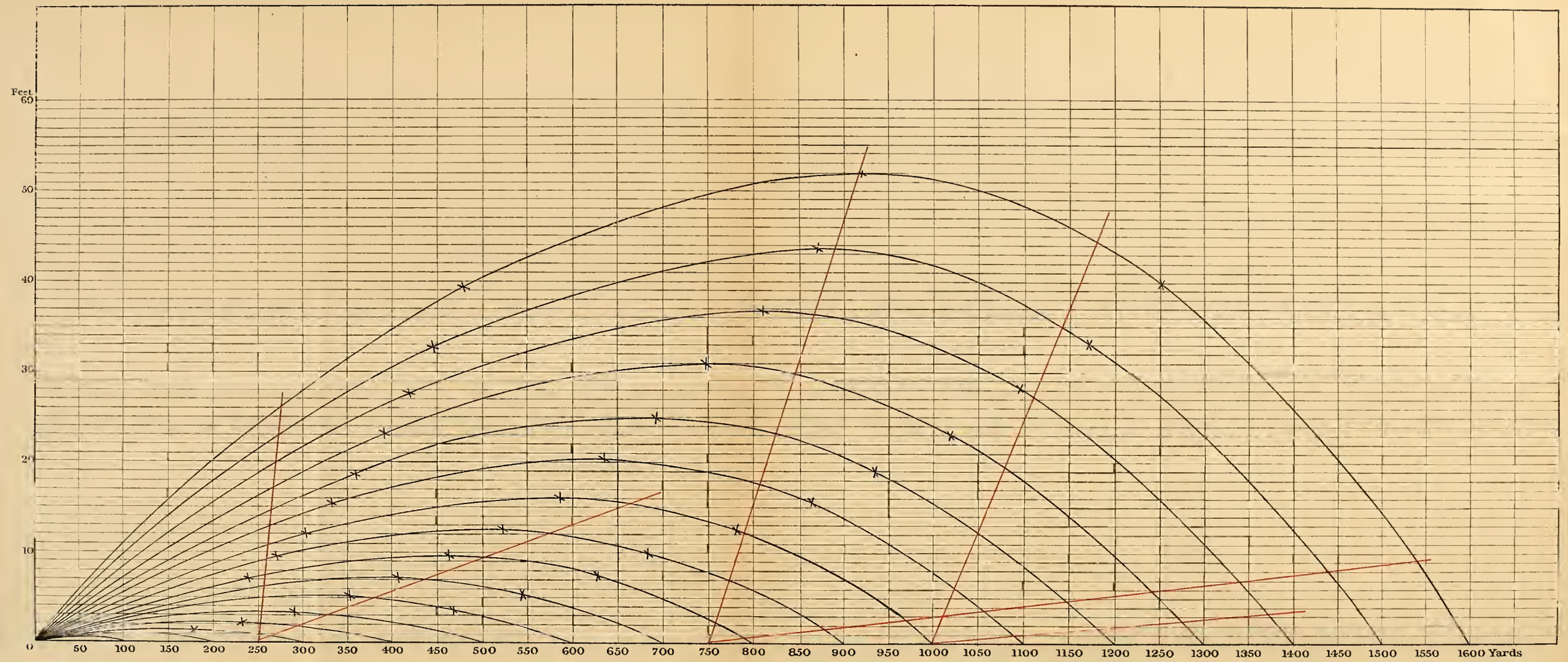
*These trajectories were plotted from the well-known formula $H = 16t\ (T - t)$; the points of quarter, half and three quarter time were found, and were taken as ·32, ·58 and ·78 of the range, respectively. It may be noticed that these sets of points, respectively lie on three ellipses, which pass through the muzzle, O, touch the horizontal through O at O, and have their major axes coincident with the perpendicular through O. It would thus be possible with very fair accuracy, to interpolate other trajectories, between those given in fig. 12.



Vincent Brooks Day & Son, lith. London.

TRAJECTORIES OF 3 Pr Q.F. HOTCHKISS GUN WITH ORDINATES EXAGGERATED 30 TIMES (P=30)

Fig. 12.



Vincent Brooks Day & Son, lith, London.

used, in the second the 900 yards and so on; it is easily seen that in these cases PX is much smaller than PT.

It will be noticed that at a short range it is almost impossible to miss; as shewn by the lines through 300.

It must be remembered that the heights given in fig. 12 are those above the line of sight, so that even if the guns were placed as low as considerations of tide would admit of, all ideas of "sweeping a channel" are quite delusive, when the objectives are such practically horizontal targets as modern torpedo boats.

THE EFFECT OF THE ROTATION OF THE EARTH ON THE MOTION OF PROJECTILES.

BY

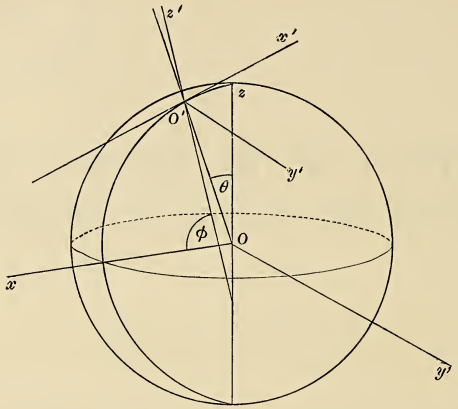
E. T. DIXON, (LATE R.A.).

TRINITY COLLEGE, CAMBRIDGE.

A MOMENT'S consideration will show that the rotation of the earth must have some effect on the flight of a projectile—that, in fact, the common theory of a parabolic path is only an approximation, even if the resistance of the air is neglected. If, for example, a gun were fired from the north pole, as soon as the shell left the muzzle it would cease to be affected by the rotation of the earth, and would therefore drift to the right as many minutes as the earth had rotated during the time of flight. It follows easily that at any other latitude there will be a similar drift, to the right in the northern hemisphere and to the left in the southern, the amount only being less, in the ratio of the sine of the latitude. This drift however would not concern practical artillerists, even if it were much larger than it is, for being constant for any given range, in any given latitude, it is naturally absorbed in the correction for drift due to rifling. But if the rotation of the earth produced any considerable effect depending upon the azimuth of the line of fire, it would be otherwise. It will be shown below that it does produce such an effect, of sufficient magnitude to be of theoretical interest, and which might even be made visible by careful experiments, though it is too minute compared with other sources of error to be worth taking into account in practice.

In the following dynamical discussion it will be assumed that the attraction of the earth on the projectile is constant in magnitude, and in direction with reference to the station from which the gun is fired, throughout the flight of the projectile. A consideration of the resulting equations will show that this approximation may be relied on to the order adopted for the deflection of the projectile, and also for its range, when the latter is not extreme.

To commence with we will take the centre of the earth as the origin of a system of rectangular axes, that of z being in the direction



of the north pole, that of x in the meridian plane of the station from which the gun is fired.

Let mf be the attraction of the earth on the projectile (m being its mass); which, be it observed, is not the same as the 'force of gravity' at the station; for the latter includes the effect of 'centrifugal force,' due to the rotation of the earth.

Let a, o, c be the coordinates of the station, u, v, w, the components of the initial velocity parallel to the axes, and θ the geocentric NP.D. of the station. Then the equations of motion of the projectile, ω being the angular velocity of the earth about the axis of z, are

$$\left.\begin{aligned} \ddot{x} - 2\omega\dot{y} - \omega^2 x &= -f\sin\theta \\ \ddot{y} + 2\omega\dot{x} - \omega^2 y &= 0 \\ \ddot{z} &= -f\cos\theta \end{aligned}\right\} \quad \begin{aligned} &\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1), \\ &\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(2), \\ &\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3). \end{aligned}$$

From (1)

$$\dddot{x} - 2\omega\ddot{y} - \omega^2\dot{x} = 0,$$

$\therefore$ (2)

$$\dddot{x} + 3\omega^2\dot{x} - 2\omega^3 y = 0.$$

From (2)

$$\ddot{y} + 2\omega\dot{x} - \omega^2\dot{y} = 0.$$

∴ (1)

$$\ddot{y} + 3\omega^2\dot{y} + 2\omega^3 x = 2\omega f \sin\theta,$$
$$\therefore \quad x^{\text{IV}} + 3\omega^2\ddot{x} \quad - 2\omega^3\dot{y} = 0,$$
$$x^{\text{VI}} + 3\omega^2 x^{\text{IV}} - 2\omega^3\dddot{y} = 0.$$

Whence

$$x^{\text{VI}} + 6\omega^2 x^{\text{IV}} + 9\omega^4\ddot{x} + 4\omega^6 x = 4\omega^4 f \sin\theta,$$

or

$$(D^2 + 4\omega^2)(D^2 + \omega^2)^2 x = 4\omega^4 f \sin\theta.$$

The solution of this equation is

$$x = A_1 \sin 2\omega t + A_2 \cos 2\omega t + A_3 \sin\omega t + A_4 \cos\omega t + A_5 t \sin\omega t + A_6 t \cos\omega t + \frac{f\sin\theta}{\omega^2} \quad \text{.............................(4).}$$

For determining the six arbitrary constants the initial conditions, substituted in equations (1) and (2), and their differentials, give the following equations

$$\left.\begin{aligned} 2\omega A_1 + \omega A_3 + A_6 &= u \\ 8\omega A_1 + \omega A_3 + 3A_6 &= 3u \\ 32\omega A_1 + \omega A_3 + 5A_6 &= 5u \end{aligned}\right\} \qquad \left.\begin{aligned} \omega A_2 + \omega A_4 \qquad &= \quad \omega\left(a - \frac{f}{\omega^2}\sin\theta\right) \\ 4\omega A_2 + \omega A_4 - 2A_5 &= -\ \omega\left(a - \frac{f}{\omega^2}\sin\theta\right) - 2v \\ 16\omega A_2 + \omega A_4 - 4A_5 &= -3\omega\left(a - \frac{f}{\omega^2}\sin\theta\right) - 4v \end{aligned}\right\}.$$

Hence

$$A_1 = A_2 = A_3 = 0,$$
$$A_4 = a - \frac{f}{\omega^2}\sin\theta;\ A_5 = \omega\left(a - \frac{f}{\omega^2}\sin\theta\right) + v;\ A_6 = u.$$

Also we have

$$y = \frac{\ddot{x} + 3\omega^2\dot{x}}{2\omega^3}.$$

Differentiating the value found for x and substituting, this reduces to

$$y = -A_4 \sin\omega t + A_5 t \cos\omega t - A_6 t \sin\omega t.$$

The equation (3) for z integrates by inspection, and so we have

$$\left.\begin{aligned} x &= \left(a - \frac{f}{\omega^2}\sin\theta\right)(\cos\omega t + \omega t \sin\omega t) + ut\cos\omega t + vt\sin\omega t + \frac{f\sin\theta}{\omega^2} \\ y &= -\left(a - \frac{f}{\omega^2}\sin\theta\right)(\sin\omega t - \omega t\cos\omega t) - ut\sin\omega t + vt\cos\omega t \\ z &= c + wt - \tfrac{1}{2}ft^2\cos\theta \end{aligned}\right\} \begin{aligned} &\text{.........(5),} \\ &\text{.........(6),} \\ &\text{.........(7).} \end{aligned}$$

We wish now to transform these equations to a set of axes with origin at the gun, z vertically upwards x to the north and y to the east. To find the vertical direction put u, v, and w, each equal to zero, and the components of the initial acceleration will be the components of g. Hence if ϕ be the latitude of the station (angle between the plumb line and the plane of the equator) we have

$$-g\cos\phi=\ddot{x}_0=-f\sin\theta+a\omega^2,$$

$$-g\sin\phi=\ddot{z}_0=-f\cos\theta,$$

and the direction cosines of the vertical upwards at the gun are proportional to $(f\sin\theta-a\omega^2)$; o; and $f\cos\theta$.

Hence, to rotate the axes to the required directions, we write $(-x\sin\phi+z\cos\phi)$ for x and $(x\cos\phi+z\sin\phi)$ for z, with similar transformations for u, w, and a, c. If at the same time we move the origin up to the gun the constant terms disappear, and we have

$$x=g\sin\phi\cos\phi\left\{\frac{\cos\omega t+\omega t\sin\omega t-1}{\omega^2}-\frac{t^2}{2}\right\}+ut\,(\cos^2\phi+\sin^2\phi\cos\omega t)$$
$$-vt\sin\phi\sin\omega t+wt\sin\phi\cos\phi\,(1-\cos\omega t) \quad \ldots\ldots\ldots(8),$$

$$y=g\cos\phi\left\{\frac{\sin\omega t-\omega t\cos\omega t}{\omega^2}\right\}+ut\sin\phi\sin\omega t+vt\cos\omega t$$
$$-wt\cos\phi\sin\omega t \quad \ldots\ldots\ldots(9),$$

$$z=-g\left\{\cos^2\phi\,\frac{\cos\omega t+\omega t\sin\omega t-1}{\omega^2}+\sin^2\phi\,\frac{t^2}{2}\right\}$$
$$+ut\sin\phi\cos\phi\,(1-\cos\omega t)+vt\cos\phi\sin\omega t+wt\,(\cos^2\phi\cos\omega t+\sin^2\phi) \quad \ldots\ldots(10).$$

The equations so far are exact, on the assumption that the attraction of the earth is constant in magnitude and relative direction. As however ω is very small compared with the other quantities in the equations, we may expand the circular functions, retaining only the first few terms. Keeping as far as ω^2 we have

$$x=ut-vt\sin\phi\,.\,\omega t-(ut\sin\phi-wt\cos\phi+\tfrac{1}{4}g\cos\phi t^2)\frac{\omega^2t^2}{2}\sin\phi \quad \ldots\ldots\ldots(11),$$

$$y=vt+(ut\sin\phi-wt\cos\phi+\tfrac{1}{3}g\cos\phi t^2)\,\omega t-vt\,.\,\frac{\omega^2t^2}{2} \quad \ldots\ldots\ldots(12),$$

$$z=wt-\tfrac{1}{2}gt^2+vt\cos\phi\,.\,\omega t+(ut\sin\phi-wt\cos\phi+\tfrac{1}{4}g\cos\phi t^2)\frac{\omega^2t^2}{2}\cos\phi \quad \ldots\ldots\ldots(13).$$

To determine the deflection produced in any given case, let V be the muzzle velocity, α the azimuth of the direction in which the gun is laid, α' that of the direction to the shot at a time t, β the angle of departure (elevation of gun plus jump) and δ the deflection of the shot to the right $(\alpha'-\alpha)$.

Then, neglecting ω^2 the above equations give

$$\tan\alpha' = \frac{y}{x} = \frac{vt + (ut\sin\phi - vt\cos\phi + \frac{1}{3}g\cos\phi t^2)\,\omega t}{ut - vt\sin\phi \,.\, \omega t},$$

$$= \frac{v}{u} + \left(\sin\phi - \frac{v}{u}\cos\phi + \tfrac{1}{3}\frac{gt}{u}\cos\phi\right)\omega t + \frac{v^2}{u^2}\sin\phi\omega t$$

But

$$\frac{v}{u} = \tan\alpha.$$

Hence, to the order adopted,

$$\tan\delta = \frac{\tan\alpha' - \tan\alpha}{1 + \tan\alpha'\tan\alpha} = \frac{\sin\phi\sec^2\alpha - \frac{w}{u}\cos\phi + \frac{1}{3}\frac{gt}{u}\cos\phi}{\sec^2\alpha}\,\omega t,$$

$$= \sin\phi\omega t - \cos^2\alpha\cos\phi\,\frac{\sqrt{u^2+v^2}}{u}\left(\frac{w}{\sqrt{u^2+v^2}} - \frac{gt}{3\sqrt{u^2+v^2}}\right)\omega t$$

$$= \sin\phi \,.\, \omega t - \cos\phi\cos\alpha\left(\tan\beta - \frac{gt}{3V\cos\beta}\right)\omega t.$$

The first term is the one we anticipated, depending only on the latitude and time of flight. But the second term involves the azimuth of the line of fire also, and would be of importance if it were large enough.

We may write δ for $\tan\delta$, and measuring δ and ω in minutes and minutes per second, $\omega = \frac{1}{4}$ and

$$\delta' = \frac{t}{4}\sin\phi - \frac{t}{4}\cos\phi\cos\alpha\left(\tan\beta - \frac{gt}{3V\cos\beta}\right) \quad \text{.....(14).}$$

For example, the 12 pr. B.L. field-gun with 8° elevation (no jump) and a muzzle velocity 1710 f.s., time of flight 11·8 sec.

$$\delta' = 2{\cdot}95\sin\phi - {\cdot}19\cos\phi\cos\alpha.$$

In England, say latitude 51°, this would give

$$\delta' = 2{\cdot}29 - {\cdot}12\cos\alpha,$$

that is a deflection of 2′·17 to the right when firing north and 2′·41 when firing south. The range of the gun with this elevation is 4000 yds, so that the shot would (on the average) fall about 5 inches to the left when firing north, and five to the right when firing south, if the sights were adjusted to the mean direction when firing east or west. Under the same circumstances at the equator the divergence

would be about $7\frac{1}{2}$ inches either way. As the width of the 50 per cent. rectangle at this range is over ten feet this divergence would not be noticeable.

The following table gives a few examples.

Gun.	M. V. f. s.	Elevation.	Range yds.	Time of flight sec.	Divergence.				Width 50% rect. feet.
					At Equator.		Lat. 51°.		
					min.	ft. in.	min.	ft. in.	
		° ′							
12 pr. B. L.	1710	8	4000	11·8	·19	0 $7\frac{1}{2}$	·12	0 5	10·14
,,	,,	15 24	6000	20·6	·75	3 9	·47	2 4	—
6 in. B. L.	1960	12 42	8000	14·1	·51	3 5	·39	2 7	7·2
,,	,,	18 10	10000	28·0	1·17	9 9	·74	6 2	39·0
*Howitzer	900 (?)	60 0	2000 (?)	20·0	6·28	10 6	3·95	6 7	—

The divergence here noted is that to the left when firing north, or to the right when firing south, if the sights are adjusted for east and west. It appears that the effect with the 6 inch gun ought to be noticeable at long ranges, on the average of a number of shots; for at the equator at 8000 yards it is very nearly half the 50 per cent. rectangle. In the case of the howitzer* defending a channel running north and south, if it were attacking the deck of a ship attempting to run the gauntlet, with high angle fire, it appears that the difference of deflection appropriate to the approaching and receding ship at 2000 yards would amount to as much as 12 minutes, equivalent to an error of 20 feet at that range, which might be enough to prevent the shell striking the ship at all.

The equations we have obtained also solve the problem of the deflection from the vertical of a stone dropped from a height, or projected vertically upwards. For the former we merely put zero for the initial velocities u, v, w, and equations (11—13) become

$$\left.\begin{aligned} x &= -\omega^2 . \tfrac{1}{3} g \sin\phi \cos\phi t^4 \\ y &= \omega . \tfrac{1}{3} g \cos\phi t^3 \\ z &= -\tfrac{1}{2} g t^2 - \omega^2 . \tfrac{1}{3} g \cos^2\phi t^4 \end{aligned}\right\} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (15).$$

Hence it appears that the principal deflection is to the east but that there is also a deflection to the south (in north latitudes) if we go to a higher order in ω. The easterly deflection for a fall of four seconds (about 250 feet) would be $\cdot 57 \cos\phi$ inches, or about a third of an inch in England. The southerly deflection would be less than a thousandth part of this. The easterly deflection has been experi-

* The details of the example about the Howitzer are not accurate.

mentally verified, by dropping shot down a mine in Germany, when it was found that they always fell a little to the east, though of course the amount of the deflection could not be accurately observed.

If a stone is projected vertically upwards the equations are

$$\left.\begin{aligned} x &= \frac{\omega^2 t^3}{2} \sin\phi \cos\phi \left(w - \frac{gt}{4}\right) \\ y &= -\omega t^2 \cos\phi \left(w - \frac{gt}{3}\right) \\ z &= t\left(w - \frac{gt}{2}\right) - \frac{\omega^2 t^3}{3} w \cos^2\phi \end{aligned}\right\} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(16),$$

from which it appears that the deflection is initially to the west and north. But if the stone continues to fall freely, after a time $2\,\frac{w}{g}$ (approximately) it returns to the level of the point of projection, after a time $3\,\frac{w}{g}$ it passes to the east of it, and after a time $4\,\frac{w}{g}$ to the south of it (in north latitudes, or *vice versa*).

DIARY OF LIEUTENANT INGILBY, R.A., IN THE PENINSULAR WAR.

CONTRIBUTED BY

MAJOR E. A. LAMBART, R.A.

Introductory Note.

THE following article is copied from the original diary, kept in the field by Lieut. Ingilby, now in the possession of Sir Henry Ingilby, Bt., of Ripley Castle, Yorkshire, who kindly allowed me to use it, together with another diary kept by the same officer in the Waterloo Campaign, for which I hope space will be found later in the "Proceedings."

Lieutenant William Bates Ingilby died comparatively recently as Sir William Ingilby, K.C.B., Colonel-Commandant R.A.

There are several incidents in the diary which seem to me of some interest, particularly the mention of "I" Troop, at Fuentes d'Onore. Perhaps someone, skilled in the records of the Regiment, can give the present designation of Lawson's and Gardiner's Brigades.[1]—*E.A.L.*

EXCHANGED with 2nd Lieutenant Forster into Captain Lawson's Company serving in the Army under Lord Wellington in the Peninsula. 1810.

Embarked at Woolwich, having been relieved from duty at the Tower, with a small detachment, in the *Columbus*, Transport No. 43. July 23rd.

Detachment, being reinforcements for the different Companies of Artillery in the Peninsula amounted to 84 men and 5 officers, under the command of Captain H. Lane, who had previously returned from the Army sick and was now proceeding to rejoin his Company there. Sailed down the Thames the evening of the same day. Were delayed several days in the Downs and off Spithead, in the whole some weeks, first waiting for convoy and afterwards for a fair wind.

After a good passage of 16 days we landed, September 15th, at Lisbon.

On the 19th we proceeded up the Tagus in boats to Villa Franca, and were met there by our servants with the baggage and animals, who had arrived by land.

Marched to the Convent of Na. Sa. La. de Meriana, and halted for the night; it was neither inhabited or furnished. Sept. 20th.

Rio Maior. " 21st.

Cavalria. " 22nd.

[1] Lawson's Company is now represented by No. 1 Battery, 2nd Depot Division, R.A., and Gardiner's Company by 17th Company Southern Division, R.A.—*A.J.A.*

1810. Sept. 23rd. Pombal, and on the 24th reached Coimbra. It is situated on the Mondego, and we found the reserve parks of ammunition and commissariat depôts of the Army here.

" 25th. Hearing from some wounded soldiers we met early in the morning the armies were in presence of each other, and that a battle was expected, leaving one officer to conduct the detachment, we pushed on that day and reached Malheada da Surda where I found my Company; it was attached to a Brigade of six 9-prs., the largest calibre of British Artillery in the Army, the other Brigades and the Troops of the Horse Artillery having but 6-prs.

I was introduced by Captain Lawson to Sir B. Spencer, who commanded the 1st Division of the Army.

Heard musketry as we approached the bivouac of the Army, and presently after met three wounded Hussars.

" 26th. The Brigade marched before daylight. It was a continual ascent until we reached the top of a very high ridge, and here we found the Army already formed in line.

Our guns were placed at the most commanding point of the position, near the walls of the Convent of Busaco, and gave us a most extensive view of the country, which appeared as an immense plain before us, for many leagues.

Columns of the French were opposite, upon the edge of the plain, but much lower, and the valley which ran between their columns and the foot of the ridge of Busaco, on which Lord Wellington had taken up his position, was deep and rugged, and difficult to pass from the steepness of both its sides.

At a considerable distance we could perceive other Corps of the French advancing, and, as they successively arrived in the evening, the advanced posts engaged.

We fired a few rounds with good effect; a sergeant of the Company was wounded in the head by a musket ball, but not dangerously.

The routes by which the French marched, as far as the eye could discern, by the villages on fire and still smoking. A finer situation could not be imagined to behold the first armies I had ever seen.

" 27th. The French advanced in three columns to force our position, but were defeated. We commanded their whole attack with the Artillery and caused them an immense loss in killed and wounded; 300 prisoners were taken, and amongst them was a General Officer. Firing was kept up until night, and recommenced next day from the Artillery and advanced posts of both Armies, but the French did not renew their attack seriously.

In the evening their columns seemed to be moving off to their right and at 10 o'clock at night we quitted our position and began to descend the hill of Busaco, our left being threatened to be turned. The road was bad, and passing through a wood, the excessive darkness of the night obliged us to use torches, and the heads of the columns of infantry were provided in the same manner. We had not proceeded far, when suddenly the drag chains of a gun gave way, and, the descent being very steep, the two wheel horses were not a match to keep the gun back, and the force of its weight was rapidly hurrying the whole

down the hill. They had already nearly rushed upon the gun preceding it, for, as a precaution, a considerable distance was allowed between each, when it swerved out of the track of the road and a limber wheel caught the stem of a small tree.

The sudden jerk threw all the leading horses down the declivity that was to the left, but contrary to apprehensions neither the drivers or horses in this instance suffered any serious injury whatever. We had eight horses in each gun—9-prs. Two others were a little while afterwards, at a difficult turn on coming out of the convent garden, upset, and, one rolling over, the wheel driver was so much hurt he died in the hospital from his bruises. Soon after daylight on the 29th we halted, and bivouacked near Aos Fornos.

1810.
Sept. 30th. We halted after a march in the morning near where the rear-guard with Captain Bull's Troop came up, and then proceeded again in the evening, and bivouacked near Condeira for the night.

Oct. 1st. Bivouacked at Redinha.

" 2nd. Boa Vista.

" 3rd. Passed through Legria and bivouacked near Cavalria. Here a soldier of the 50th Regiment, which then joined the Army newly from England, who had been detected more than once in plundering and on one occasion had actually presented his musket and threatened to shoot an officer of his regiment who discovered him (there being neither witness or assistance near at the time to form further evidence), was executed by the Provost-Marshal, by order of the Commander-in-Chief, on being again taken in the act of robbing. It was not deemed necessary in the hurry of the operations and retreat of the Army to wait the forms of a trial by a General Court-Martial; an immediate example was necessary to maintain discipline. The inhabitants of every town and village quitted their homes and preceded or accompanied the march of the troops, and they leaving much valuable property in many houses, the soldiers were tempted to quit their ranks in search of plunder. He was the first human being I had seen hanged. The inhabitants deserted their homes by order of their Government, though terror at the approach of the French Army might probably have been as effectual in causing their universal flight without the proclamation which was issued for this purpose.

" 4th. Rio Macoa.

" 5th. Withdrew our park from in front to the rear of the town.

" 6th. Passed through Alcoentre, and bivouacked at Quinta des Torres.

" 7th. Bivouacked near Aldea Galega.

" 8th. Passed through Sobral, and the Brigade cantoned in a small village between that place and a large permanent field redoubt (made on the top of a considerable height) afterwards called the Sobral Fort. The Army had now reached the first line of field works and redoubts constructed in defence of a position to cover Lisbon.

" 11th. The Brigade moved to Zebreira. Sir B. Spencer had the head-quarters of his Division in the village. We bivouacked on our post in the line, and masked the guns with field works. The whole of the French Army arrived and took up a position in bivouac occupying Sobral in great strength. A rough deep valley separated the outposts

in our front. The extreme right of our line rested upon the Tagus, and the left was at Torres Vedras. Every height was crowned with a permanent redoubt well mounted with guns, and the intermediate spaces between them along the whole front of the line was strengthened with entrenchments and abattis.

Two other lines of redoubts and entrenchments in succession rendered the position of the Army most formidable, and not to weaken the numbers of the regular troops of the Allied Army (which occupied the first line only) the two last were guarded and garrisoned by the Militia and armed Volunteers of the country. The French General frequently reconnoitred our position, but hesitated, and at length seemed unwilling to hazard an attack upon an Army thus strongly posted. The troops were under arms every morning an hour before dawn, and remained so until it was ascertained there was no appearance of an intention to attack, or any formation whatever amongst the troops of the enemy. At the end of the month I was directed to march and canton the reserve carriages of ammunition at Povoa de Galeaga, somewhat in rear, for the better foraging of the horses. In the night of the 14th of November the French retreated.

1810. Oct. 15th. At night I joined the Brigade at Sobral, and occupied the huts of the French. They had collected a number of wine butts and placed them in a line touching one another, and in each there was room sufficient for two officers to accommodate themselves.

" 19th. Alemquer. Cantoned with the 6th Division of Infantry. The French had taken a strong entrenched position in front of Santarem. Lord Wellington had his head-quarters at Cartans ; about mid-way between those two towns (which are three leagues asunder and upon high ground) there intervenes a flat or bottom on a level with the Tagus. At this season of the year its whole extent was laid under water, and rendered the position of the French accessible only by a straight and narrow raised causeway which crossed it, and was the great road from Lisbon. During our entire occupation of Alemquer I suffered from severe dysentry.

1811. Jan. 24th. The Brigade moved to Otta, and cantoned in the Quinta with some Artillery of the Portuguese under Major Arentchild.

Mar. 5th. In the night preceding the French Army evacuated Santarem, and abandoned their entrenched position. The Brigade marched with the 6th Division and bivouacked at Azambuja.

" 6th. Santarem.

" 7th. Goligao.

" 8th. Thomar.

" 9th. The Brigade received orders to follow a detached Corps, consisting of a regiment of cavalry and one brigade of infantry. We advanced by a road to the right of the main body. Was directed to proceed in advance with the cavalry to ascertain the practicability of the road for the guns. In the day overtook, and skirmished with, the rear-guard of the French left column in their retreat. The road farther in advance proved impracticable, and the guns halted at Cabacos.

" 10th. It turned out as we expected ; we had been directed to accompany the march of the right column by mistake, and returned to Thomar in

order to get upon the route of the main body of the Army. 1811.
Ceaerias. Mar. 11th.
Bivouacked near Pombal. " 12th.
Bivouacked at Condeina. " 13th.
The Army had overtaken the main body of the French yesterday at Redinha, and obliged them precipitately to continue their retreat with considerable loss in killed and prisoners, amongst the latter were nearly all their wounded.
We came up with the Army which engaged the French in front of " 14th.
Miranda de Corvo. They were dislodged from their position and again forced to continue their retreat. We fired a few rounds.
The Army attacked the French and drove them from their bivouac " 15th.
in front of Foz d'Aronce. We fired a few rounds. In these affairs we made many prisoners, and the Commander-in-Chief praised the conduct of the troops in orders, especially the Light Division, and called upon Commanding Officers to select a non-commissioned officer from each of its regiments to be recommended for commissions.
Bivouacked a league beyond Foz d'Aronce. " 17th.
The French were bivouacked on the right bank of the Alva, with a " 18th.
rear-guard advantageously posted to oppose the passage of the ford at the bridge Ponte de Murcella, which was entirely broken up and unfit to pass. Lord Wellington ordered a Corps to march in a direction to threaten the left of their bivouac, and the other Divisions, supported by the fire of the Artillery (and in which our guns shared), then advanced to the ford. A few shots were exchanged when, the Division appearing on their left flank, the French Army beat to arms, got into order of march and, making a precipitate retreat, abandoned their half-cooked dinners to those who had passed the river. The Brigade bivouacked.
The Staff Corps having made a bridge in the night capable of bear- " 19th.
ing infantry, the remainder of the Army passed the Alva, the guns fording, and bivouacked at Moita.
Galizis. " 21st.
Cantoned in the village of Maceira. Before the French had aban- " 23rd.
doned the positions of Sobral and Santarem they had suffered great privations, and their numbers had become much reduced. They now retraced their march, repulsed in their invasion, through a country exhausted of provisions and forage. The sick and dead were scattered on the roads and in their bivouacs, and the houses and hospitals in the villages and towns through which we pursued their columns were nearly all occupied, and some filled, with the dead and dying, the greatest part perishing from hunger and want. The horses in like manner died or became inefficient and were abandoned in great numbers, so that many of the tumbrils, with much other *matériel* of their Army was obliged to be burnt or destroyed on the spot or fell into our hands. Since the affair at Redinha some guns had been discovered and dug up. The French set fire to the towns and villages and put to death numbers of the inhabitants, without regard to age or sex, and in return the peasants, watching every opportunity, fell upon their stragglers and sick and massacred them instantly, if no British or regular troops were at hand to protect them.

1811.
Mar. 28th. Vinho.

" 29th. Cortico.

" 31st. Crossed the Mondego at a ford (having passed through Celerico), and marched upon Guarda, where we expected to have found the enemy, but they had hastily retreated.

April 2nd. Bivouacked at Val Mourisco.

" 3rd. The French took a good position on the right bank of the Coa at Sabugul. A Division of the Army was given time to march and ford the river higher up and attack their left. The remainder of the Army under cover of the fire of the Artillery advanced to force the bridge of Labuzal, and the fords in front of their position. We were engaged. The French position was forced, and they lost a great many in killed, wounded, and prisoners, and some guns were also captured. We continued the pursuit until dark, and then returned to bivouac upon the Coa close to Sabugal. Our loss was also very severe.

" 4th. Bivouacked at Soita.

" 5th. Aldea de Ponte.

" 9th. Nave d'Aver. During the advance of the Army I had partially recovered from a bowel complaint, but it here (while stationary) returned for several days very severely.

A part of the Army now blockaded and invested the fortress of Almeida on every side. The French were retired beyond the Aqueda, and had gone into cantonments. However, there was a rumour of their preparations to advance to the relief of the garrison of Almeida, and on the evening of May 2nd we had bivouacked with the infantry at Poco Velha, some of the French having already appeared on this side the Aqueda.

May 3rd. In the afternoon the village of Fuentes d'Onore, which is on the road from C. Rodrigo to Almeida, was briskly attacked by the French, and defended by the Brigade of Highlanders, supported by our guns. A small rivulet divides the village. After a sharp contest, each retained possession at night of that portion of it on their own side.

" 4th. Everything remained quiet ; nevertheless the shallow stream which separated the advanced posts was only a few paces across, and the troops of both Armies, by a silent consent, drank and filled their water canteens at opposite sides, but with their muskets loaded and leaning against the walls ready to be seized and fired at a moment.

The French, foiled in the attempt to carry the village of Fuentes d'Onore, were observed in the evening to be moving troops to their left, and to indicate an intention to advance by the road coming from Nave d'Aver.

" 5th. In the night we had heard distinctly the moving of artillery in the camp of the French, and Lord Wellington likewise brought a body of cavalry and the 7th Division of Infantry from his left, which occupied the strong ground on the bank of the rivulet from Fuentes d'Onore as far as Fort La Conceipcao (having Almeida a league in its rear, and facing the Aqueda at nearly the same distance), with these he strengthened and extended his right. At break of day the French appeared on the Nave d'Aver road, advanced a numerous cavalry, drove in the picquets, and attacked our right with great impetuosity.

Two guns of Major Ramsay's Horse Artillery were taken, but the cavalry charged, and they were recovered. The 7th Division, composed of Hanoverian Light Infantry, Brunswicken, and the Chasseurs Britanniques from the Mediterranean, and two British regiments, the 68th and 51st, received a furious charge, in squares, of the French cavalry and caused them great loss. Protected by the Light Infantry Companies of the Guards and of the Highland Brigade, we had advanced our guns with prolonges, and supported by a fire of grape and round shot the right, which gradually retired in admirable order. The French Dragoons fell upon these Light Infantry while dispersed, and before the Companies of the Guards could reform, sabred the greater number of them and made many of the rest prisoners.

The right wing of the Army now became thrown back with its extreme resting upon the Coa. This caused an angle in the position of our line at the point where it was intersected by the road from Nave d'Aver. The Guards and German Legion had this part of the line allotted to them, and one Brigade of 6-prs., and our lines, formed a battery (about 200 yards in their front, precisely at this angle) of twelve guns, and was supported on each side by the cavalry. The left seemed little disturbed. At the centre, the Highland Brigade obstinately maintained themselves in the village of Fuentes d'Onore, which was now considerably in front of the line. The French pushed forward a large battery of guns by the Nave d'Aver road to within 600 or 700 yards of us, protected and supported by their numerous cavalry. A furious cannonade then began, which was long maintained on both sides with the same spirit and vigour. Under cover of the fire of their battery the French in vain repeatedly attempted to debouch from the wood which masked their infantry. To whereever the head of a column appeared we turned our attention and diverted the whole fire of the guns, and, aided by the cavalry, succeeded in preventing their advance.

The Highlanders, though more than once driven for a few moments from their advantages by the accession of fresh troops brought forward by the French, finally prevailed, and obtained possession of the village of Fuentes d'Onore on both sides of the rivulet, and, as the efforts of the French to deploy their columns to attack our line at the angle, by the Nave d'Aver road, proved equally fruitless, they at length ceased the battle, which had lasted, from the commencement, seven or eight hours. (Extract from my letter, dated 8th May, 1811, "from the gun I had, out of 12 men and 8 horses, we lost 6 men and 3 horses; we have killed 1 sergeant, 1 corporal, 1 gunner, 2 drivers, and 9 horses; wounded 11 gunners and 2 drivers, amongst whom 5 amputations, and 13 horses, 2 of which are since dead.")

Of 54 gunners and 48 horses exposed in the field, the Brigade had in killed, 5 gunners, drivers, and non-commissioned officers; wounded, 11 gunners and 2 drivers, five amputations. Horses 25 killed and *hors de combat*; in the evening we withdrew the guns and bivouacked in rear of the infantry.

1811. May 6th. In the night the line threw up a breastwork and intrenched their position, and the French having threatened to capture or approach the

guns in the charges yesterday of cavalry, we dug rows of *trous de loups* in front of the sight of our battery. The videttes and sentinels were posted (and double at night), within pistol shot of each other, and the Artillery had exchanged grape shot on the 5th from the same batteries, where they continued to take their positions every morning before daybreak, and under these circumstances the Armies remained
1811. in presence of each other for several days.
May 9th. In the afternoon the French seemed preparing to retire, by withdrawing some of their troops from their front and other movements in their bivouac. The remainder were paraded in clean white trousers, as if being reviewed.

" 10th. A Spanish officer of Don Julian's Corps of Guerillas was killed from his own imprudence. An uncommonly thick fog obscured the morning and, as the sun dissipated it, this officer made his appearance between the lines of videttes brandishing his sabre and making most extravagant gestures. He was as near the French videttes as ours, and it was inconceivable what he meant, who, or what he could be. Lord Wellington mistook him for a French Dragoon, and instantly ordered a soldier of the Guards to fire, who, resting his musket on one of our gun wheels, fired, and, the ball passing through the person's head, he fell dead to the ground. I witnessed myself this singular shot, the distance was afterwards measured and found 80 yards. It was soon discovered he belonged to Don Julian's Corps of Guerillas, who presently came to bewail the fate of his officer.

As the morning cleared the French videttes gradually fell back upon the wood in their rear, and it was then discovered that, excepting this small rear-guard, their whole Army had effected its retreat in the night and passed the Aqueda. The cavalry pursued their rear-guard towards the Aqueda. We were now enabled to satisfy ourselves of the effect of the fire from our guns on the 5th. Where the French cavalry and artillery had been formed, 650 yards from our battery, their horses' carcases laid in whole ranks, and, the weather having been for several days extremely hot, the stench in the French bivouac was intolerable. They had taken off the hides from the most of their dead horses.

" 11th. Late yesterday evening several rockets were seen sent up from the neighbourhood of the Aqueda, and at midnight a loud explosion awoke the whole camp. It turned out the garrison in Almeida had employed themselves of late in mining the principal faces of the works, and the rockets being signals from the French General of his inability to raise the blockade, they charged the mines and having matches to fire the trains, they suddenly sallied from the fortress, to the amount of about 1200 men, and instantly began their endeavours to escape through the investing force and effect a junction with the French Army, which had advanced to the Aqueda at Puente de Ladron, near Barba del Puerco, to favour their purpose. One half succeeded in getting across the river, the remainder were either killed or wounded and taken prisoners by our troops.

Marshal Marmont succeeded Massena in the command of the French Army and was now directing all its operations. We took cantonments in the little village of Quenta de Bruta.

1811.

Moved into better cantonments at Freneida. May 13th.
Alfayates. June 2nd.
Bivouacked at Sota or Soita. " 6th.
Marched with a Corps under the orders of Sir B. Spencer. We passed the Coa at the bridge of Sabugal, and immediately took up a position on the left bank. " 7th.
The whole proceeded in the direction of the Alentejo, and the Brigade bivouacked near Meimoa. " 8th.
Bivouacked near Pedrogas. " 9th.
Escalhos (de Lima) or Cicalso de Cima. " 11th.
Passed through Castello Branco and bivouacked near Sarnados. " 12th.
Villa Velha on the right bank of the Tagus, bivouac. " 13th.
Occupied in passing the troops across the river in boats. Two guns only passed this evening. Lieutenant William Johnson of Captain Thomson's Brigade drowned in trying to ford. " 14th.
The remainder of the troops having passed, the Brigade marched and bivouacked at Niza. " 15th.
Portalegre. Here we found a good town, and very beautifully situated. The French had not advanced much beyond Badajos, or at least penetrated far into the Alentejo, so that this province had escaped the ruin and desolation which fell upon the towns and villages they occupied and passed through during their invasion and retreat on the north of the Tagus. We found excellent quarters and supplied ourselves with abundance of whatever we were in need. " 16th.
Bivouacked at Aronches. " 19th.
Bivouacked near St. Olaia. " 25th.
The camp broke up. Preceding the Brigade, halted, and slept at Assumar. July 22nd.
Arranged quarters and billets for the Brigade in Portalegre. " 23rd.
The Brigade cantoned in Portalegre. " 24th.
Alpalhao. " 31st.
Niza. Aug. 1st.
A bridge of boats had been laid across the Tagus at Villa Velha, where the Army repassed the Tagus and bivouacked (with the exception of Sir Rowland Hill's Corps, which remained in the Alentejo). In attempting to find a ford had nigh suffered Johnson's fate. " 2nd.
Sarnados. " 3rd.
Castello Branco. " 4th.
Escalhos de Cima. " 5th.
St. Miguel d'Arces. " 7th.
Pedraga. " 8th.
The Brigade cantoned in the village of Val de Lobo. " 9th.
Sabugal. " 28th.
Alfayates. " 29th.
Nave d'Aver. In September the French had collected a large force and prepared to approach with a convoy to provision C. Rodrigo. " 31st.
The French passed the Aqueda, and finding a part of our Army at Fuente de Guinaldo, which had been Lord Wellington's head-quarters, a severe affair took place, and the advanced-guard of the French was repulsed. A British regiment, the 5th, advanced and charged a Sept. 27th.

superior force of cavalry and defeated them. The attention of the Army was called to this gallant action by Lord Wellington. In the afternoon the Brigade marched with a Division of Infantry to Bis Muta, and, continuing our retreat entirely throughout the night, bivouacked on the 28th on the right bank of the Coa, near the village of Rendo.

1811.
Sept. 29th. Passed the Coa at a ford near the bivouac, and halted at Gata.

" 30th. Cantoned in the village of Baracal. While here was again attacked with severe bowel complaint, and became so extremely ill and reduced in strength that I frequently doubted of my chance of ever recovering, and was still suffering when at night, on the 23rd October, we marched, and halted in the morning of the 24th at Guarda. The horses had been ill-foraged of late and were weak. Guarda stands higher than any city in Portugal, which made the march both tedious and very laborious. It happened to be a severe frost in the night, and from mere exhaustion, in consequence of illness, I had great difficulty in sitting upon my horse and undergoing the fatigue of superintending the passing the guns up the mountain, but whether the extreme cold in my state, or the activity imposed upon me, or both enjoined to have a good effect upon my health, I recovered as it were at once, and next morning my bowel complaint had ceased.

Oct. 25th. Puchoso.

" 26th. The road leading to the bridge being impracticable we forded the Coa, and continuing our march, bivouacked at Bis Muta.

" 27th. Aldea Ribeira.

" 30th. San Pedro.

Dec. 1st. Cantoned at Val de Madeira.

" 21st. Moved into cantonments at Freiexed de Torrao, in order to better forage the horses.

1812.
Jan. 4th. Villa Turpim.

" 5th. Alemeda, in Spain.

" 8th. San Pedro, in Portugal. C. Rodrigo was invested and, ground being broken, the siege commenced.

" 9th. Cantoned in Castellejo de dos Casas.

" 10th. Passed the Aqueda by a temporary bridge made by the Engineers, and the Brigade co-operated in covering the operations against C. Rodrigo with a Division of Infantry.

" 11th. Being relieved by another Corps, the Brigade returned to its cantonments at Castellejo.

" 13th. C. Rodrigo and back to Castellejo.

" 17th. The company marched before daybreak into the batteries before C. Rodrigo, leaving our guns and horses at Castellejo.

" 18th. Castellejo.

" 19th. I marched with the howitzer to assist in the batteries before C. Rodrigo. After the necessary preparations, and two breaches being practicable, at a quarter before 8 o'clock in the evening the assault was began. There was a severe contest for about three-quarters-of-an-hour at the breaches, but the troops succeeding in forcing them, and the 3rd Division having scaled the walls at other points, the place fell and the garrison were made prisoners of war.

Generals Craufurd and McKinnon were both killed.

The repeated marches to and fro between Castellejo de dos Casas and C. Rodrigo, a distance of four leagues, rather fatigued the gunners, but did not prove injurious to them, and, though snow partially whitened the ground and every night while the siege lasted it was a keen frost, yet the Army acted with the greatest spirit, and the troops were never more healthy than during these frosty bivouacs.

1812.

The Brigade was ordered to take the route to the Alentejo. Having had no adequate remount since the great loss of our best horses at the battle of Fuentes d'Onore, and other casualties had likewise diminished our numbers, we were constrained to put into store at Almeida three of the spare ammunition wagons, a forge wagon, and wheel carriage, attached to the Brigade. Bivouacked at Aldea de Ponte. Feb. 12th.

Quadresieas or Guadrazias. Cantoned. " 13th.

Castelhiera. " 14th.

Coria. " 15th.

Capinha. " 16th.

Lardosa. " 17th.

Castello Branco. " 18th.

Sarnados. " 20th.

Gavico. " 21st.

Niza, passing the Tagus by a bridge of boats at Villa Velha. " 22nd.

Alpolhao. " 28th.

Portalegre. " 29th.

Assamar. Mar. 13th.

Bivouacked near Elvas under Fort La Lippe. The Brigade was included in a Corps composed of the 1st, 6th, and 7th Divisions of Infantry and two regiments of cavalry, under the orders of Sir Thomas Graham, destined to cover the siege of Badajos. " 14th.

The Corps passed the Guadiana at a ford two leagues below Badajos, and bivouacked at Valverde. " 16th.

Santa Martha. " 17th.

(The investment of Badajos was completed, ground broken, and the siege began).

The Corps bivouacked at Feria. " 18th.

Los Santos. " 19th.

Fuente del Maestre. Obtained a small escort of the 5th Dragoon Guards, and was directed to proceed to and reconnoitre the Castle of Segura de Leon, in which a little garrison of French were enclosed and blockaded by a band of Guerillas. As it was conjectured the French had a depot of arms and other stores here, the Guerillas were extremely anxious for the capture of the garrison, and had requested of the General to assist them with some artillery for the purpose of compelling a surrender. Slept at Valencia. " 21st.

Breakfasted with the Guerilla chiefs, who received me very courteously and accompanied me in my reconnaissance, and as we approached very near the citadel, and drew a smart fire upon the party, there was sufficient proof of the personal bravery of the leaders, and convinced me they only wanted means to enable them to cope with the French. " 25th.

The place was contemptible enough and had not a single gun mounted, but was sufficiently unassailable for these irregularly armed Guerillas. The band had a grotesque appearance, and consisting of both cavalry and infantry, and amounted to about 300 men. Many of the cavalry wore caps, and the infantry helmets, others had neither and were bare-headed. All had different arms, that is, hardly any two were armed alike. Some were deficient in fire-arms, and had but a pike, another was gallantly equipped with a brace of pistols in his girdle, a sabre at his side, a musket at his shoulder and a pike attached to his saddle, some had no saddles, others used ropes for bridles, but at least all were animated with a like spirit for plunder, hatred of the French, and unanimous cheers and vivas on our appearance in their camp. The garrison of the citadel awed the town of Legura de Leon, but a messenger was instantly dispatched summoning the Alcaldi to provide for our breakfast, which was promptly and liberally complied with. Uniforms they had none, with the exception of three or four, and in ascertaining if they had any means to attempt an escalade or take the place by a *coup de main*, I found the band, upon an average, had not more than three rounds each of cartridges. I returned to Fuente del Maestre the same night, and found the Corps had quitted their quarters suddenly and had marched in the direction of Llerena.

1812.
Mar. 26th. Joined the Brigade at Llerena. Sir Thomas Graham had endeavoured to surprise a Corps of the French at this place. They had, however, obtained timely information of his march, and gained the mountains without the loss of a man.

Intelligence arrived from Legura de Leon at the moment I proceeded to report to the General; as expected, at the appearance of a British officer to reconnoitre, the garrison apprehended being besieged and abandoned the citadel the same night.

" 27th. Maguilla.

" 31st. Ousagre.

April 1st. Los Santos.

" 2nd. Villaba.

" 4th. Santa Martha.

" 5th. Torre del Almendzel.

" 6th. By order of the Quarter-Master-General, I rode over and reconnoitred the field of battle of Albuera, on which Marshal Beresford had repulsed Soult's Army last year. It was expected the French would again endeavour to raise the siege of Badajos, and that another conflict might take place on the same ground. There were several trenches nearly filled with the white and bleached bones of the dead in that battle. The bodies had been thrown in and there left to decay without being covered up with the earth.

" 8th. The Corps bivouacked in position.

" 9th. The Brigade cantoned in Terre del Almendzal.

" 12th. Bivouacked near Albuera.

" 13th. Bivouacked near Badajos. The place was taken by assault on the night of the 7th.

The Light Division had been repulsed in repeated endeavours to force the breaches, and suffered severely.

The French Engineers had opposed such obstacles in the breaches and the garrison defended them so obstinately, it was found impossible to carry them except by a useless sacrifice of men. The 3rd Division, under Sir Thomas Picton, fortunately scaled the high walls of the citadel, but not without a terrible slaughter, and made the garrison prisoners, then bursting the gates they descended into the town and upon the ramparts. An assault on the side of the Guadiana succeeding also, by the gallantry of the 4th Division, the garrison at length surrendered prisoners of war.

The siege and capture cost the Army 6000 men killed and wounded, but impressed our own Army, the French Army, and all Spain, with a consciousness that the English troops, when properly commanded, are irresistible.

1812.

Bivouacked near Campo Maior. April 14th.
Fortos. " 15th.
Portalegre. " 16th.
Alpalhao. " 18th.
Niza. " 20th.
Passed the Tagus by the bridge of boats and bivouacked at Villa Velha. " 21st.
Castello Branco. " 22nd.
Losa. " 23rd.
Pedrogao. " 24th.
Mimoa. " 25th.
The troops were countermanded, and the Brigade bivouacked at Pedrogao. " 26th.
Losa. " 28th.
Castello Branco. " 29th.
Villa Velha. " 30th.
Repassed the Tagus and halted at Niza. May 1st.
Cantoned in Alpalhao. Captain Gardiner and his Company were appointed to receive over the guns and horses and drivers of the Brigade and Captain Lawson and his Company to be transferred to the 5th Division of Infantry. (The drivers remained, and having been promoted in April from Captain Lawson's Company, I obtained leave to remain attached to Captain Gardiner's Brigade). " 2nd.
Portalegre. " 20th.
Cantoned at La Codosera in Spain. A delay arose in the transfer of the Companies and Captain Gardiner did not assume command of the Brigade until this day. I was permitted to join Captain Gardiner's Company, and Captain Lawson proceeded to join the 5th Division with his officers and Company. " 21st.
Portalegre. " 30th.
Niza and bivouacked. " 31st.
Villa Velha. June 1st.
Castello Branco. " 2nd.
Lardosa. " 3rd.
Capinha. " 4th.
Castelheira. " 6th.
Sabergul. " 7th.
Aldea Ribeira. " 8th.

1812.
June 10th. Puebla d'Azarva in Spain. The Brigade became permanently attached to the 1st Division of Infantry, which consisted of the Guards, German Legion, two Highland Regiments, and the 24th Regiment.

" 11th. The Army advanced in two Corps and passed the Aqueda.

" 13th. Bivouacked at Zenebron.

" 14th. Tamames.

" 15th. Villa Alba de los Llanos.

" 16th. Matella. In the night of the 17th the French Army quitted Salamanca, and on the 18th we passed the Tormes above the town at the ford of La Martha and bivouacked on the right bank. The French had fortified a large convent and another smaller detached building, and left a garrison in each. The latter commanded the approach by the old Roman bridge over the Tormes leading into the town. They had also levelled all the houses and buildings near both forts and made a clear space of between 200 and 300 yards towards the town for the range of their cannon.

Towards the other side the forts were defended by the Tormes, which ran pretty close under the walls of both buildings. The forts were immediately invested, and in the night of the 18th we used the greatest exertions to construct two batteries, one to be directed against each fort. There was a great scarcity of tools and the ground excessively hard, but notwithstanding at sunrise we commenced the fire, but the shots from the forts shattered our incomplete and flimsy batteries, constructed out of the rubbish and ruins of the levelled houses; and the materials made use of, such as flock mattresses, &c., for want of sods in order to face the works and keep up the dry crumbling of the embrasures, caught fire from the muzzles of the howitzers and proved very inconvenient, and, which effectually contributed to aid the enemy's fire, rendered our battery, at least for the howitzers, nearly untenable. Notwithstanding, after a few hours we succeeded in battering down the side wall of the convent, which fell, accompanied by the cheers of the gunners, but it was useless, and failed to fill up the ditch, or offer any appearance of facilitating an assault. Captain Eligé was killed on the spot, and the gunners suffered severely. Kneeling and placing myself at an embrasure to watch the effects of a shot in order to ascertain how far we were correct in our fire, I gave the order without turning, "Fire" for the howitzer on my left hand, by mistake the non-commissioned officer fired the piece which was exactly behind me and close to my head, while looking through the embrasure. Completely stunned by the violence of the concussion I fell, of course, as if shot, but soon recovering no other mischief seemed done than by the fire singeing my hair and tarnishing the epaulet on my right shoulder and excepting that both my ears gushed out with blood instantly. Presently after the Commander-in-Chief came into the battery and addressing some questions to me, I found myself too completely deafened to hear a syllable.

" 20th. The French Army advanced with the intention to raise the siege. We moved forward and took up a position upon the heights of St. Christoval and Mourisca, a league in front of Salamanca, and left

sufficient troops to continue the blockade of the forts. The French made a feint upon our right and a few shots were fired and exchanged between the Artillery, but they declined the offer of battle and eventually retired.

1812.
The Army re-occupied our bivouacks in the neighbourhood of Salamanca, and operations were recommenced against the two forts. June 23rd.

In the morning the French appeared on the Alba de Tormes road, and threatened our right and rear. A Corps repassed the ford of La Martha to the left bank of the river, and took up a position on the heights in a direction to oppose them. The French retired in the afternoon, and at night we passed to the right bank and bivouacked as before. " 24th.

The forts were surrendered and the garrisons became prisoners of war. By a quick fire of red-hot shot the buildings were set on fire, and the magazines being full and not well secured the garrisons were compelled to submit. Inflammation, caused by the violent concussion upon the drums or tympanum of both my ears by the accident in the battery on the 19th, had for several days given me considerable pain, but was become very excruciating and deprived me entirely of rest. " 27th.

Bivouacked at Obeda. " 29th.

Annizal. " 30th.

Medina del Campo. Suppuration took place in my ears, and the discharge relieved the pain; my hearing was little impaired, and may perhaps always continue so slightly. July 1st.

Bivouacked at Villa Verde. " 12th.

Villa Neuva. " 14th.

The Army marched throughout the night and halted this morning at Nave del Bey. In the evening we returned to Villa Verde, remained under arms and bivouacked in the morning of the 17th at Cannical. " 16th.

The French manœuvred to gain some advantages and fell upon one of our Divisions (the 4th), but were repulsed, though not without loss. In the latter part of the afternoon the Army marched to Villiepa Villaescusa, but continuing our movements in the night came again to Cannical. " 18th.

Lord Wellington occupied a position near Villiessa with the French Army in our front. " 19th.

The Army was formed into the order of battle, which was declined by the French, who manœuvred upon our right. " 20th.

The French continued their movements which cansed the Armies to march in two parallel lines. Lord Wellington gradually refused, or fell back by his right, in order to preserve his communication with his rear from whence we drew all our supplies, and which was threatened by this movement of the French General. We repassed the Tormes and occupied a position at night upon the heights on the left bank under arms. The night was remarkably dark, with heavy rain, accompanied with tremendous thunder and lightning, and one loud explosion of thunder so frightened the horses of the cavalry that from Colonel Ponsonby's regiment 50 broke away from the men as they lay bivouacked with the reins in their hands, and caused considerable confusion. Our bridles were off for the horses to feed and they made a violent rush, but being yoked in the guns were easily stopped. " 21st.

1812.
July 22nd. The French still continued to threaten our right, and in consequence we made a lateral movement to the right and took up a position, having in front the two hills called the Arapiles, one of which we occupied and the other was seized by the French. The Light Division was on the left of one line, the 6th in the centre with the Arapiles immediately before it, and that in our possession was occupied by General Parke's Brigade of Portuguese. The 1st Division was not yet in line, but was on the right of the 6th and rather in reserve. The remainder of the Army made movements corresponding to the French, who, by extending their left, continued to threaten our right. The Hussars and Light Troops skirmished with the enemy's left, and the cannonade had began down the whole front of the line. About 3 o'clock in the afternoon the 1st Division at a brisk pace made a movement in close column to attack, but that being suddenly counter-ordered, the Division directly occupied the position of the 6th Division, which quitted its ground rapidly in open column, wheeled into line on the spot we had just left and advanced to attack the centre of the French line, which was weakened by the over-extending of its left.

General Pack at the same moment descended from his post, and, with his Portuguese, ascended to attack the Arapiles that was immediately in his front, and on which the French had got some artillery that swept our whole line. The Portuguese advanced to within musket shot of the crest of the hill, but were suddenly driven back and overwhelmed by the fire of the French, who had screened their force on the slope of the opposite side of the hill. These two Arapiles stood on the plain distinct from each other, quite isolated and without connection with any other heights whatever. I was advanced to sustain the defeated Portuguese with two pieces, a gun and howitzer. The 6th Division carried all before them, and, the Divisions on the right making a simultaneous advance, the whole left wing and centre of the French Army then giving way were thrown into confusion, which soon turned into a complete flight. The Light and 1st Divisions advanced to attack their right, but the retreat had become general and night put a stop to the pursuit. We bivouacked on the ground.

" 23rd. At daylight, in the morning, we began our march, but having received no orders in the night and without intelligence of the route the French had taken, the General was at first uncertain which road to pursue with his Division.

About 10 o'clock in the morning we came up with our most advanced troops, the Brigade of German Heavy Cavalry that had just executed a bold charge and obliged 150 infantry of the rear-guard of the French to lay down their arms. The cavalry had several officers and many of the dragoons killed, but acquired a great reputation. A squadron of Light Dragoons, followed by all the infantry, continued the pursuit. We kept pace with the dragoons, mounting the gunners on the gun-carriages, and, outstripping the infantry, came up with their rear-guard again. The French squadrons threatened to charge, the Commander-in-Chief dismounted, threw himself amongst our guns, and directed our fire personally. Had the French known the circumstance, it was not difficult to have captured him, but they stopped short at grape

shot distance, and in the meanwhile our infantry and more squadrons arrived. The French retired then with great rapidity, and the Light Division and cavalry followed them. In the battle yesterday and the affair this morning at La Lerna (Lurda) with the cavalry of the Foreign Legion, the French Army was computed to have lost more than 20,000 men prisoners, killed, and *hors de combat*, and above 20 cannon. We bivouacked on the ground.

1812.

Pena Verde. (Penarande). July 21th.

Fuentes de Ano. " 26th.

Arivolo. " 27th.

Puente de Runel, passed the Adoja. " 28th.

Passed the Eresena at Puente de Mediano and bivouacked at Mojados. " 29th.

Bivouacked on the left bank of the Duero at a ford opposite Asterniga. The French had evacuated Valladolid, and the road to the town. " 30th.

Aldea San Miguel. Aug. 1st.

Cojeces. (On the Cega). " 2nd.

Passed the Cega and bivouacked at Remondo. (On the Piron). " 6th.

Molino de Tremeroso. (On the Piron). " 7th.

Passed the Piron at Puente das Pinas and bivouacked at Los Huertos, or Taxyeros. " 8th.

Forded the Eresma and bivouacked at El Palacio de Rio Frio, within a few miles of Segovia, which layed to our right, and full in view. " 9th.

Bivouacked at Otero de Horreros. " 10th.

Passed the mountains of the Guadarama and bivouacked at the village of Guardarama. Rode to the Escorial. It was stripped and divested of every description of furniture and ornament. The bare walls alone of this immense palace remained and exhibited a melancholy appearance. Not a volume remained of an extensive and very valuable library, which the French had disposed of by public auction. " 11th.

The Portuguese cavalry of the advanced-guard gave way, and, retreating suddenly upon the squadrons of the German Brigade of Heavy Cavalry at Los Rosas, the French took them unawares; a great number were sabred and taken prisoners, together with three guns of Major McDonald's Troop of Horse Artillery under Captain Dynely. " 12th.

Captain Dynely subsequently escaped from the French camp and rejoined his Corps.

The Division passed the river Guadarama at the Puento de Retamar and bivouacked at Los Rosas. " 13th.

Madrid. Lord Wellington and the advanced troops entered on the 12th. The Divisions of Infantry were bivouacked on the skirts of the suburbs, but many of the officers had billets in the capital. We were quartered (the officers) in the house of a Juramentado or one who had taken the oath of allegiance to Joseph Bonaparte, he was a General, and had besides entered into the service of the French. " 14th.

The garrison in El Buen Retiro surrendered at noon.

The troops were already drawn up and the ladders prepared for a general assault, that would have taken place in the eyes of all Madrid. The garrison marched out prisoners of war; there were 2000 men.

The Portuguese troops on duty received them on the glacis as they marched out of the gate. A French soldier, who was drunk, as he came out of the gate, turned suddenly upon the sentinel, who was a Portuguese, and, accompanying his exclamation with a motion of both his hands which he held up, said aloud, "*Jamais se rendent Francais à telles sortes?*" with a comic expression in his countenance of contempt. His language not being understood by the soldier, and the officers paid no attention to it, he escaped any ill consequences from his rashness.

1812.
Aug. 18th. The infantry bivouacked at Puente de Retamar.

" 19th. El Escorial. We found sufficient room in the apartments and corridors to accommodate a Corps of 16,000 men.

" 28th. Revisited Madrid.

" 31st. Venda de S Rofael. The troops had broken up from El Escorial and marched in the direction of Arevalo.

Sept. 1st. Came up with the Brigade bivouacked at Adenero.

" 4th. Passed the Adaja, marched through Olmedo and bivouacked at Bocigas.

" 5th. Repassed the Adaja, marched through Olmedo and bivouacked near Hornillios.

" 6th. Passed the Erema and, crossing the Duero at the ford of Asterniga, bivouacked on the right bank of the river.

" 7th. The French having evacuated Valladolid, the troops advanced and bivouacked near the town.

" 10th. Forded the Piscurga and bivouacked at Trigueros.

" 11th. Bivouacked at Duenas.

" 12th. Passed the Carrion at the Puente de Villa Muriel and bivouacked.

" 13th. Repassed the Piscurga and bivouacked near Torquemada.

" 14th. Bivouacked near Puente de Quintona.

" 15th. Villa Drigo.

" 16th. Passed the Alencon at the bridge of Bunel and bivouacked.

" 17th. Bivouacked near Burgos.

" 18th. The troops completed the investment of the Citadel of Burgos. The troops destined to commence operations against the place forded the Alencon and bivouacked near Villa Tozo, a small village in which Lord Wellington had his head-quarters. The citadel was an old castle and had a garrison of more than 2000 men. It was enclosed within three distinct circumferences of works, and being situated upon a hill elevated above and commanding, within half a cannon shot, the whole town and the heights to the west of it, was exceedingly strong, and more especially so compared with our means of attack, which consisted of a train of three battering guns and the use that might be made of the Field Artillery attached to the Divisions. An unfinished horn work was assaulted and carried, and a Lieutenant and 40 men were made prisoners in it, but the troops were repulsed in an attack upon the outward line of works of the Citadel with considerable loss. Approaches were commenced from the gorge of the horn-work and, batteries being opened, the fire was kept up from the howitzers and guns of the Field Train and the three 18-pr. battering guns. Two breaches were made in the outward works of the place,

the troops assaulted and carried this line, and pushing on to the second were repulsed. The two breaches, however, were immediately connected by a work and we became completely established on this part of the outward line. The French had many guns on the top of the old castle, and the fort was besides in every respect well armed with heavy guns at the foot of its walls within the 3rd line, and their artillery was well served. A new battery was made and the three 24-prs. put into it to breach the 2nd line. As soon as it was discovered by the French the whole artillery of the fort fired, and it became a heap of ruins even before it was opened; two of the guns were destroyed by having their trunnions knocked off.

The Engineers boldly carried the sap commenced at that part of the 3rd line in our possession to within 6 feet of the 2nd line. Mines were made and charged. The field guns were placed in battery at different posts on the opposite side of the Citadel to that attacked, and by their fire annoyed and distracted the attention of the fort from the troops in the trenches, and things being finally arranged, a signal was given and the mines being sprung, the troops rushed forward to possess themselves of the breaches and to assault the works. For a while they were successful, but eventually were repulsed, leaving some of their dead on the parapet of the 3rd line, a proof of the courage of the troops who advanced at open day across a space swept by the grape and musketry of the garrison from behind their walls and entrenchments. This was the last serious effort made to possess ourselves of the fort by assault, and, as from the first the troops had seen the inadequacy of our means in artillery, the operations were not began, or carried on, with that same spirit as at C. Rodrigo or Badajos, which seemed to cause some discontent at the troops in the mind of the Commander-in-Chief. Also the weather became unfavourable, which added to weaken the strength of and disspirited the soldiers and brought with it great sickness amongst them. More than 200 men were killed and put *hors de combat* before this place.

1812.
Oct. 19th. In the evening the troops advanced, leaving a blockading force before the fort, and at night on the 20th met with and repulsed the advanced guard of the French at Rio Beno, or Quinta Nopalia.

" 21st. In the evening we began to retire, passed through Riobena and Villa Toro and, leaving Burgos to the left, continued to march the whole night and halted on the morning of the 22nd a short distance beyond Buniel. The same evening we continued our retreat and bivouacked at midnight near Celada del Camino.

" 23rd. Passed the Arlencon, and bivouacked near Torquemada.

The effects of privations during the siege, the wet weather and these forced marches caused some relaxation in the discipline of the Army. The soldiers in many instances broke into the wine cellars and, many drinking to excess, became incapable of proceeding and fell into the hands of the advanced-guard of the French.

" 24th. Passed the Carrion, destroyed the bridge, and bivouacked near Duenas. A picquet of Portuguese posted at the bridge sent to the Commanding Officer to obtain ropes to aid a deserter from the French to pass to our side of the river, the chasm in the bridge being com-

plete. The deserter perhaps got scared at the difficulties he saw there might prove in passing across either the chasm or river, which was filled to the banks with the heavy rains, or, on the other hand, he might have been put upon the affair in order to gain an opportunity of ascertaining the state of the bridge. At all events several of the picquet were on the edge of the chasm directing the man to take the rope and, putting it round his body, allow himself to be pulled across the river. The bridge might be forty paces in length and he retired from the opposite edge of the chasm seemingly with the intention to follow the directions we gave him, but when at the end of the bridge he suddenly lifted his piece and fired upon the party, and it was done so instantly no soldier of the picquet had time to return the fire before he had sheltered himself from harm. The road went off in an oblique direction to the right from the end of the bridge, and was raised above the plain in order to be on a tolerable level with the arch of the bridge and so to lead the road over a gentle ascent, the pretended deserter jumped off the road to the side which preserved him from being seen and the fire of the picquet, and he continued in safety. Mounted on a grey horse and amidst the soldiers on the bridge, it might be the man suddenly conceived I was an officer of rank, for the ball passed me very close, but happened to miss everyone. If he had repented his first intention to desert, perhaps he expected this vile attempt would recommend him to the mercy of his General.

1812.
Oct. 25th. We occupied the left bank of the Pisuerga and covered the bridge of the village of Calecon, which was already mined and charged to be destroyed. In the night the French attempted to force the passage of the bridge, but were repulsed, and left several dead within a few paces of the picquet which was stationed on the middle of it.

" 27th. The French army was encamped on the plain before us. They advanced a numerous battery of guns which began to play upon the bridge and village. The village of Calecon stands on the left bank of the Carrion, which rises into a height perpendicularly from the bridge, the road turned at right angles from the bridge being the only space between the river and the height. As our guns of the several Divisions were distributed to the different advantageous posts in the village, we commenced a furious and destructive fire upon the artillery of the French and forced them quickly to retire.

" 29th. The river becoming fordable and the enemy threatening our left by marching upon Valladolid, the bridge of Calecon was destroyed and, continuing our retreat, we passed the Puente del Duero and bivouacked on the left bank of the river.

" 30th. We marched along the left bank of the Duero (or Douro), and bivouacked in front of Tordesillas, which was in possession of the French, and the bridge also in their occupation. The nights became excessively cold, and the ground was covered every morning with a severe hoar frost. The position was an extensive plain gently rising from the Deuro, without shelter or a single tree, and fuel scarce, even for the purpose of cooking, and obtained only by the Commissariat purchasing some old houses, of which the beams and wood were served out in the usual regular proportions, to regiments and companies.

1812.

Bivouacked at St. Christoval. Nov. 7th.

Patiegua. " 8th.

Four guns of the Brigade remained at Villares, and I returned with two guns to St. Christoval. The Corps under Sir R. Hill from Estrencadura, and reinforced by the garrison of Cadiz, effected its junction with the Army of Lord Wellington. Marshal Soult, who had been forced to abandon the siege of Cadiz by our occupation of Madrid and operations in the north, likewise effected his junction with the French Army of the north which, under General Louhamhad, followed our route from Burgos. " 9th.

The army passed the Tormes at Salamanca, and on the morning of the 14th Lord Wellington offered battle in the neighbourhood of the two hills (Arrapiles) where we had fought and gained the battle in July. The French General declined the offer and fording the Tormes higher up, threatened our right and right rear. " 13th.

We quitted our position near Zjads and bivouacked at Frudes. The weather was cold and the rain fell very heavy, accompanied with strong winds. " 15th.

Bivouacked at Alduena de Bolida. It now rained in torrents, the roads became excessively heavy, and there being a scarcity in the supply of provisions, sickness and fatigue produced disorder amongst the troops and they committed a few excesses which incurred the censure of the Commander-in-Chief. " 16th.

The army retired through a wood by parallel roads in three columns. The right column happened to retire rather quicker, perhaps having the best road, and a patrole of the enemy's cavalry which followed it closely, perceiving a noise to its flank, wheeled to the right and traversing a part of the wood, intercepted itself between two divisions of the centre column and swept off General Sir Ed. Paget and some baggage. The army passed the ford of San Munos, but it happened the road farther on was choked up with baggage and the rest of the transport of the army, so that the Divisions became crowded together (without the possibility of filing off) on the left bank of the small river (which runs by San Munos) exactly where we had first forded, consequently the French came up in considerable force during the delay and commenced a destructive cannonade from the heights above the ford, and it was not till now that Sir Ed. Paget was missed and his fate known: there was some confusion, but at length Lord Wellington appeared, deploying the Light Division, advanced to the ford and drove back the enemy who had endeavoured to pass some troops across, this restored order and the army immediately recommenced its march, but not without having suffered a loss of 300 men by the cannonade. The army bivouacked and the French discontinued further pursuit. " 17th.

Bivouacked at C. Rodrigo. " 19th.

Under cover in the village of Alemeda. The bad weather, privations, fatigue and other casualties lost the army, from the beginning of its operations before Burgos, upwards of 5000 men. " 20th.

Junca in Portugal. " 23th.

Azinhal. " 29th.

Freiredas de Alvera. " 30th.

1812.
Dec. 1st. Baracal.

" 3rd. Trancoso.

" 7th. Cantoned at Pena Verde. Sick and much reduced, having been amidst all the unfavourable weather, and since we quitted Madrid, under a general order given out by the Commander-in-Chief, proceeded to join my company in England.

" 16th. Torrozello.

" 17th. Moita.

" 18th. Miranda de Corvo.

" 19th. Pombal.

" 20th. Legria.

" 21st. Rio Maior.

" 22nd. Villa Fornea.

" 23rd. Lisbon. General distribution of the Anglo-Portuguese army, 13th December:—

1st Division of Cavalry, Seixo and adjacent Portugal.
2nd Division of Infantry, Coria, &c., in Spain.
3rd " " Moimenta de Beira, &c., Portugal.
4th " " St. Jao, Cea, &c., Portugal.
5th " " Lamego, Portugal.
6th " " St. Jao, Cea, &c., Portugal.
7th " " Gouveia, &c., Portugal.

1813.
Jan. 2nd. Embarked at Lisbon on board the *Leda*, transport No. 313, and sailed on the 3rd.

" 16th. Landed at Portsmouth very ill. We had nothing but a gale of wind the whole way which increased my illness, and the pains in my body were insupportable. In London I consulted Dr. Pearson of Golden Square, who decided I had taken mercury, and in a dangerous manner, without any cause whatever, and prescribed only good food with port wine.

" 23rd. Ripley in Yorkshire. Weight, 11 st. 3 lbs. Weight in 1810, 14 st. 2 lbs.

April 12th. Joined Captain Triscott's Company at Battle in Sussex.

1814.
Mar. 30th. Joined "G" Troop of Horse Artillery at Woodbridge in Suffolk. Appointed 19th January.

W. B. Ingilby.

From Harrowgate through Leeds, Went Bridge, Doncaster, Bawtry, Gainsborough, Lincoln, Wragby, Horncastle to Harrington Hall; from thence through Spilsby, Boston, Spalding, Crowland, Thorney, by Whittlesea Mere to Chatteris, Ely, Bury St. Edmunds, Stow Market, Woodbridge.

Sent a man overnight with my two horses to Went Bridge, was driven over there next morning by my father, and then proceeded myself with my horses and man, he having saddle-bags.

BATTERY MESSING.

BY

LIEUT.-COLONEL J. C. GILLESPIE, R.A.

It is most desirable that there should be an established system of messing throughout the Regiment, and that changes of district, station or C.O. should not, as may be the case now, involve a revolution in the arrangements of a battery, and probably much dissatisfaction.

That there was a regular system once, and a very bad one too, that there is none now, and that there exist data enough to re-establish a new and better one, is the object of this paper.

For many years previous to 1888 the system of messing throughout the Regiment was as follows:—

A stoppage of 5½d. a day was made from each man, 1d. went for washing, 3d. for food and 1½d. for beer; I believe the latter was once 1d., but it had long been 1½d. A certain number of men did not care for beer at dinner, and their numbers increased largely in the latter years; to provide for their case, they were supplied, in lieu, with canteen tickets which could be exchanged for 1½d. worth of groceries; it was illogical, for if the man who drank beer was considered sufficiently well fed, there seemed to be no reason why the man who did not should have been compelled to eat more, and he should, unquestionably, have had his 1½d. back in money; this was evidently to some extent conceded, for no supervision was ever made over the spending of these tickets; often they went on tobacco.

The whole of the 3d. stopped for food was spent on the dinner except only tea, sugar and milk for breakfast and tea.

The tea cans were brought up to the rooms about 2.30 p.m., placed on the table or floor, and every man, when he came in, took a drink of the brown liquid, it could not be called tea; if he came in late he got none. This drink, with perhaps a bit of dry bread which had been cut in the morning and had lain exposed all day, was all that a man had for an afternoon or evening meal.

Great quantities of bones, fat, &c., were wasted and found their way to the refuse tub—this from ignorance of their value—but besides, much bread was thrown away (in the long-service days a very large amount), and the reason of this was the deplorable one that after some years of this system of feeding, a man's stomach became so deranged that he had no healthy appetite, and practically cared for little after dinner but beer; that this was one of the causes of the premature ageing of old soldiers, which was so marked in those days, I have little doubt.

Here and there an attempt was made at reformation; I can remember several such. In the R.H.A. Depôt at Woolwich, for example, for years there had been better arrangements, but, generally speaking, the feeling of officers and men was against any change, and the system remained as I have described till 1888.

In that year was published the now celebrated letter from Colonel Burnett, written from Mullingar, from which can be dated the commencement, at last, of a successful reform all over the army. With its publication orders were issued to Commanding Officers at once to overhaul their messing arrangements.

Experiments have been carried out now in many batteries from that time to this, and every detail in connection with the matter has been, somewhere or other, thoroughly gone into.

As at present there exists the greatest diversity with regard to amount of stoppage, hours of meals, unit of messing, and, in fact, on every single point, it may therefore be considered a good time to collect the information gained with a view to once more having a uniform system, this time based on better principles. I venture, therefore, to put forward the following propositions:—

Stoppage.—Although Colonel Burnett has proved conclusively that a stoppage of 3d. for food may be made sufficient, at any rate at Mullingar, I believe, in the R.A., it should not be less than 4d. or 4½d.; things are generally dearer at other places; the battery is a smaller unit; it has not the same Staff Quarter-Master, paid cook, &c.; the gunner's pay, too, is a little higher, and the men can afford the difference. All regiments are not, like Colonel Burnett's, raised from the thrifty, hard-headed race which inhabits the north-east of Ireland, and I know that he required an amount of supervision which, do what we liked, would never be given in most batteries. I feel sure the infantry generally would do well, too, to raise their stoppage above 3d., and this though I am aware of the success at Aldershot, in recent years, of similar arrangements.

Beer.—Beer should not be mixed up with the messing accounts at all. Many officers say they like the old English custom of the men having their beer at dinner; there is no need to change it, if thought desirable, provided the payment is put on a sound footing, and the only sound one possible is, that those who drink beer should pay for it extra.

I might add, however, that this system did not exist in either infantry or cavalry, and that, as a matter of fact, the gunner never did drink his beer at dinner, but always just before; the worst possible time the doctors would say.

Hours.—The hours for breakfast and tea should be as regular as that for dinner always has been. I should like to have the trumpet sounded for every meal.

I hear sometimes that the men have no time to sit down to a proper breakfast, but it is really organisation that is wanted, not time; a very few minutes suffices; breakfast should be just after morning stables.

I have often been told, in the same way, that the men don't care to stay in for their tea, but it is not true; they are not like Macfarlane's geese, who liked their play better than their meat; give the new

system a proper trial, and it will be found that the soldier has just the same views and appetite as every other working man under the sun who values his evening meal after the day's work is done, as much, or nearly as much as his dinner. If there is nothing provided for the men of course they wont stay, but if a comfortable meal is put down before them they will eat it fast enough.

Tea should be after evening stables, before gives too short an interval after dinner and too long an evening without food. The idea that a soldier's meals should be eked out by visits to the coffee bar should not be carried to excess, he should be properly fed in the barrack-room.

Unit.—The sub-division is the most expensive, as the smaller the unit the greater the proportionate waste. One big battery mess has the disadvantage that individual sub-divisions seem sometimes to think their interests may be neglected.

A system of section messes seems to work well.

Dripping Pan.—Any battery which works the dripping pan can easily provide dripping enough for its own cooking; this is all pure gain, for not only was the fat wasted, but its partial removal makes the stews and other dishes more palatable.

Stock Pot.—The complaint is made sometimes that the men don't care for soup. I believe this partly arises from its being made badly, partly also from the old prejudice in favour of spending all the money on the dinner; if this is done, of course the men have one good meal at the expense of the others, and don't want soup or anything else additional at dinner.

They will often like it in the evenings; in one battery I hear of giving it on the men's return to barracks, quite late, on the evening of the weekly half-holiday; different circumstances will suggest various plans. At all events, the stock pot, like the dripping pan is, to a great extent, a distinct gain.

Supplies for breakfast and tea.—Owing to long continued evil old custom, unless great attention is paid, it is hard to get the supplies for breakfast and tea really spent on these meals, and not just put down on paper and the whole thing left to chance; bread should be cut fresh for every meal, butter issued separately for breakfast and tea, and both these meals must be personally inspected if it is really intended to establish them properly.

Cooks.—The system of prizes for cooks does not seem much of a success, the difficulty of judging makes it rather a farce; but that the battery cooks should be paid extra there can be no manner of doubt.

The feeling of the Regiment has begun to change wonderfully in the last few years; Officers Commanding Batteries are now generally anxious to make any improvement; let me say to all such, whose batteries have not yet taken up the new principles, that they will be sure to meet with much opposition. The cooks, Nos. 1 and all N.-C. officers who have anything to do with the matter are almost all against reform. Any real improvement means more trouble to them. The old soldiers are against it because they don't know better, having never seen anything but the old vicious system.

"As the old cock crows so does the young," and the last joined

recruit follows suit, and commences to grumble. They will be told that the men wont eat this and can't do that, and dislike the other thing, but let them be quite assured that it is all nonsense, and that these reforms have now been thoroughly tried and proved to be sound; they will find that the difficulties will all vanish in time; they were insurmountable when I began first to agitate in this matter, nearly fifteen years ago, but they are not so now.

I will conclude by trying to refute an old standing objection constantly made that the whole thing is grandmotherly legislation and that it would be much better to teach the soldier to look after himself; it sounds plausible, but there is nothing in it. The question is not between individualism and organisation, the regulations absolutely forbid the former, but between bad organisation and good, and put thus there is no doubt which should carry the day.

If my opinions are stated too positively, it is only to save the perpetual qualifications "I think" and similar phases.

THE MINDEN BATTERIES R.A.

COMMUNICATED BY DIRECTION OF THE

DEPUTY-ADJUTANT-GENERAL, R.A.

THE operation of R.O. 85/1891 having brought to light the fact of four batteries and companies claiming to be survivors of the *three* companies of Royal Artillery engaged in the battle of Minden on 1st August, 1759, the D.A.G. gave directions for these claims to be investigated by a regimental court of enquiry, in view to determining to whom rightly belong the record of this distinguished artillery "War Service," with the following result:—

The original muster rolls and pay lists of the Royal Artillery for August 1759 show that the three companies at Hill Camp, Minden, on 1st August, were then designated:

1st Battalion, R.A.	"Captain Wm. Phillips's Company."	The 2nd Captain of which was Capt.-Lieut. Foy.
	"Captain Samuel Cleaveland's Company."	Commanded by Captain-Lieutenant Duncan Drummond Captain Cleaveland being "on command" elsewhere.
	"Captain Forbes Macbean's Company."	The 2nd Captain of which was Capt.-Lieutenant Griffiths Williams.

and subsequent rolls, pay lists, &c., and regimental orders show that these companies have undergone changes of designation as follow:—

(1) 1st August, 1759.	Captain Wm. Phillips's Company,	1st Battalion.		
12th July, 1763.	" " " "	3rd Battalion.		
Sept., 1764.	" E. Foy's "		3rd Battalion.	
" 1779.	" J. Woods's "			
1786.	" R. Dysart's "			
1795.	" W. H. Walker's "			
1798.	" Geo. Ramsay's "			
Jan., 1805.	" Chas. Younghusband's Company			
Dec., 1805.	" Wm. Millar's "			
Jan., 1806.	" Percy Drummond's "			
1814.	" Fred. Gordon's "			
1815.	" Chas. Egan's "			
1817.	" Cyprian Bridge's "			

Became 1st Jan., 1825, No. 4 Co., 3rd. Bn., R.A. { Still commanded by Captain C. Bridge.
Sept., 1858, „ „ „ (Captain Mortimer Adye's).
Re-organisation R.A. 1st April, 1859, No. 4 Battery, 3rd Bde., R.A. (Captain Mortimer Adye's.)
„ R.O. 14, April, 1877, "No. 3 Battery, 8th Bde." (Major Shakerley's.)
„ R.O. 28, March, 1882, No. 8 Battery, 1st Bde., Northern Division, R.A.
„ R.O. 89 of 1889, No. 6 Battery, Western Division, R.A.
„ R.O. 76 of 1891, No. 6 Company, Western Division, R.A., now commanded by Major A. H. Callwell, at Aden.

This Company is therefore entitled to be recorded as a "Minden" Company.

(2) "Captain Samuel Cleaveland's Company" has, in like manner, been traced, from 1st August, 1759 to *1st February, 1819*, on which latter date *this Company was broken up*, under the then designation of "Captain Hy. Light's Company, 1st Battalion, R.A."
(For a period, 1765 to 1780, this Company was commanded by Captain Forbes Macbean; but Captain Macbean was not one of its officers in the Minden year).

(3) The third "Minden" Company, viz., Captain Forbes Macbean's, has likewise been traced through the following changes of designation:
1st August, 1759, "Captain Forbes Macbean's Company," 1st Battalion
Became 1st July, 1762, "Captain Samuel Cleaveland's Company," } 1st Bn.
„ 1st June, 1763, "Captain C. Farrington's Company," } 1st Bn.
„ 1st June, 1771, "Captain T. Simpson's Company," } 1st Bn.
„ 1st July, 1827. "No. 2 Co., 1st Bn., R.A." (Captain J. C. Petley's).
Re-organisation R.A. 1st April, 1859, "No. 2 Battery, 1st Bde., R.A." (Capt. G. H. A. Forbes.)
„ 1871, "B Battery, 1st Bde., R.A." (Captain T. P. Carey.)
„ R.O. 14, April, 1877 (unchanged) 1st Bde., R.A. (Major C. E. S. Scott.)
„ R.O. 28, March, 1882 (unchanged) 1st Bde., R.A. (Major H. J. A. Shea.)
„ R.O. 89 of 1889, became "2nd Field Battery, R.A." and is now stationed at Lucknow, under command of Major F. M. Bannister.

This Battery is therefore a "Minden" Battery.

(4) Thus, of the three Companies engaged in the Battle of Minden, one was broken up in 1819, and the two survivors are:

No. 6 Company, Western Division, R.A.,
and
2nd Field Battery, R.A.

MODERN GUNPOWDER AND CORDITE.

(A Lecture delivered at the Royal Artillery Institution, January 23rd, 1893).[1]

BY

LIEUT.-COLONEL F. W. BARKER, R.A.

COLONEL C. TRENCH, R.A., IN THE CHAIR.

THE CHAIRMAN:—It is not necessary, gentlemen, to introduce the lecturer to you. I will call upon Colonel Barker at once to deliver the lecture which he has kindly prepared for us.

COLONEL TRENCH AND GENTLEMEN.—A most interesting lecture on explosives was delivered in this Hall, not many months ago, by a distinguished officer whose name is well known to us all, and whose services have been with the Royal Regiment of Artillery. The substances which he discussed in his lecture included, among many others, those whose manufacture and characteristics we are about to deal with this evening, namely, modern gunpowder and cordite. He, as Her Majesty's Chief Inspector of Explosives, treated (and, I submit, very properly treated) all the substances as explosives. I propose, however, to consider two of them, modern gunpowder and cordite, as propellants, and, as such, to discuss their manufacture, character and qualities, up to present date and recent experience.

It is hoped, therefore, that what I submit to you this afternoon may prove a not unsatisfactory sequel to the interesting lecture to which I have already referred.

Gunpowder.

Modern gunpowder, as distinguished from that in use up to a comparatively recent date, may be classified as a "reliable propellant," whose powers are under control, and from which almost identical results may be expected under relatively similar circumstances or conditions. The older gunpowder was a powerful explosive whose violence was only conjectured, and whose characteristics were a bar to all progress in scientific gunnery. There are black powders now in existence and

[1] Some of the diagrams, &c., connected with the Gunpowder portion of this lecture are taken from a paper read on "Modern Gunpowder as a Propellant," by the lecturer, in 1890, at R.U.S. Institution, and permission has been kindly granted to reproduce those required.

almost identical in appearance. With one class, the modern, the magnificent shooting of our prize rifle matches is obtained. The other, which represents the older gunpowder, is rejected as useless by civilised nations and, fortunately, (or unfortunately ?) relegated to the inhabitants of Darkest Africa and other simple folk who are easily satisfied with any compound containing a sufficiency of "villainous saltpetre." We can further emphasize the difference between old and modern gunpowders by comparing the manner in which pressures are developed by them ; and I submit a sufficiently characteristic example in the diagrams Fig. 1 and Fig. 2 now before us. Even after the

FIG. 1

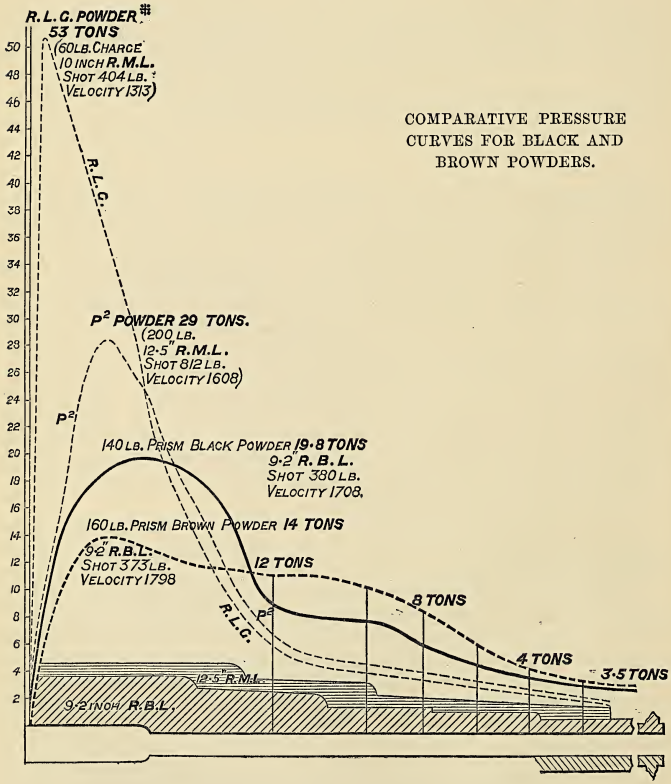
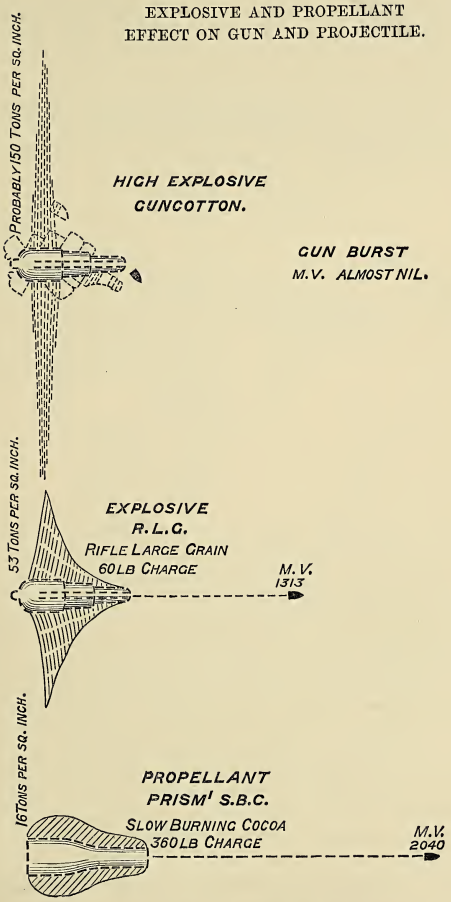


FIG. 2.

EXPLOSIVE AND PROPELLANT
EFFECT ON GUN AND PROJECTILE.



introduction of rifled guns we find a pressure recorded against R.L.G. powder of 53 tons; and only a few years ago, just before the manufacture of P^2 powder ceased, the pressures developed by it reached 29 tons, while the muzzle velocities in each case were comparatively low. On the other hand, the more recent gunpowders nearly fulfil the requirements of the artillerist, and give a high muzzle velocity with moderate and regular pressures properly distributed throughout the

bore of the gun, and further, these powders, by their uniformity of action, ensure similarity of results. The diagrams here indicate what the pressures are with the old explosive R.L.G. The dark area represents the rapid increment of pressure and the equally rapid decrease which takes place when the charge is ignited.

It may be well now to discuss the methods by which gunpowder has been developed into a "reliable propellant," and, as briefly as possible, to deal with the outlines of its manufacture. Let us note the new features in the table before us :—

TABLE A.—*Gunpowders.*

	Old. *Black.*		Modern. *Brown.*
KNO_3	75 saltpetre	79 saltpetre.	
S	10 sulphur	3 sulphur.	
C	15 charcoal (willow, alder, dogwood)	18 charcoal (straw)	carbon. hydrogen. oxygen.
		1·7 / 2·2 water	hydrogen. oxygen.
			Black.
		75 saltpetre.	
		10 sulphur.	
		15 charcoal	carbon. hydrogen. oxygen.
		1·0 / 1·3 water	hydrogen. oxygen.

Water is no longer looked upon as an unavoidable evil; its influence in reducing the pressure in the early stage of ignition, and the steam or gases produced from it hold a recognised position in the composition of the new propellant. These two vessels of water before you represent actually, the maximum quantity and the minimum quantity which should be present in each barrel containing 100 lbs. of service gunpowder. The larger quantity is 2·2 per cent, the maximum limit; and the smaller 1 per cent., the minimum limit for ordinary powders.

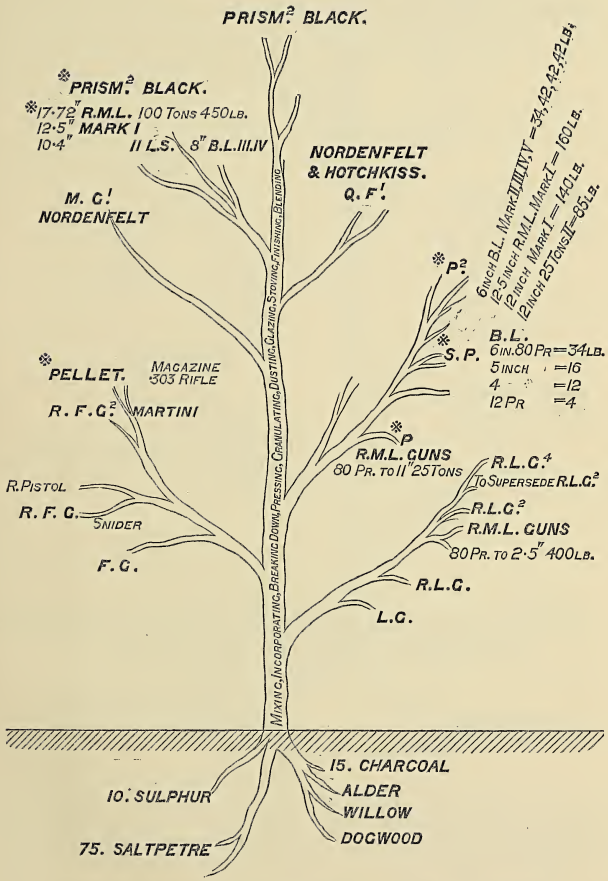
It is well to realise that the portion of the old maxim "keep your powder dry," must be considerably modified, and that, though modern gunpowder is designed to stand the ordinary changes of climate to which most of our war material is exposed, yet it may resent abnormal or artificial heating, or baking in magazines close to engine-rooms or boilers, as treatment unworthy of its dignity! I might say in passing, that the quantity of water shown in the table (Table A) is the normal amount which gunpowder retains under ordinary conditions; that is to say that it will not part with or absorb more than that quantity unless subjected to abnormal treatment. We may also observe that the charcoal has now fixed proportions of carbon, oxygen and hydrogen, which (when properly prepared) it should always contain. The old charcoal was merely burnt wood, and nobody knew anything about it. Now there is a careful analysis made of charcoal, and the proportions of carbon, oxygen and hydrogen are always adhered to.

As it is not proposed in this lecture to discuss the manufacture of gunpowder in detail, I shall only name the processes, each of which

has a considerable influence on the characteristics of the powder produced. They are exhibited along the stem of the tree diagrams, Figs. 3 and 4. In the roots the proportions of the different ingredients are

FIG. 3.

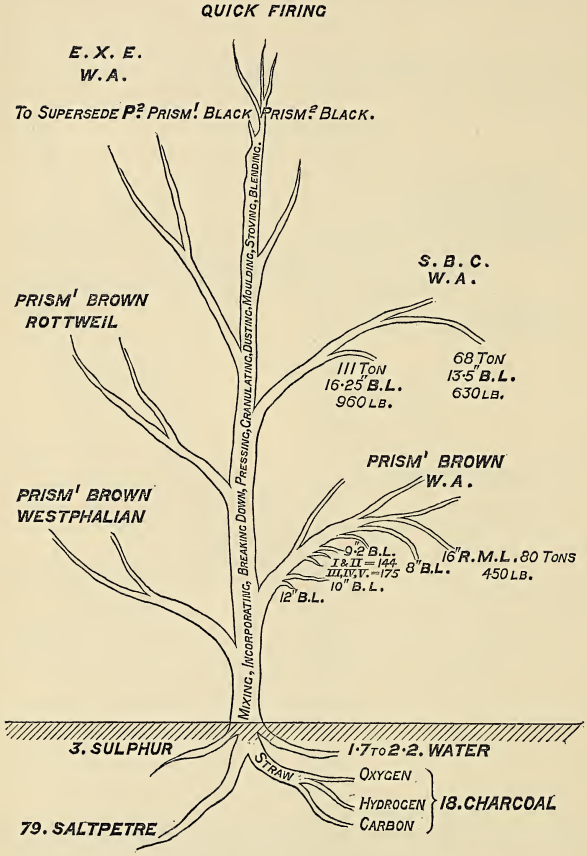
GUNPOWDER TREE.—*Black.*



* These charges are undergoing modification. *Vide* Brown Powder.

Fig. 4.

GUNPOWDER TREE.—*Brown.*



shewn, viz.: 3 of sulphur, 79 of saltpetre, 18 charcoal and water 1·7 and 2·2. The charcoal being composed of carbon, oxygen and hydrogen, straw being the material used for the new charcoal, and willow, dog-wood or alder for the other. Along the stem of the tree the different operations are shewn, and the sketch is intended to present in an easily remembered form, the outlines of manufacture of gunpowder, and the

guns with which it is used in the services.

The story of the unsuitability of the early powders to arms of precision is a question of the past, outside the limits of time at our disposal, and more recent experience has shown that even the best black powders in very heavy muzzle-loading guns were found to strain the inner steel tubes, and had a tendency to split them.

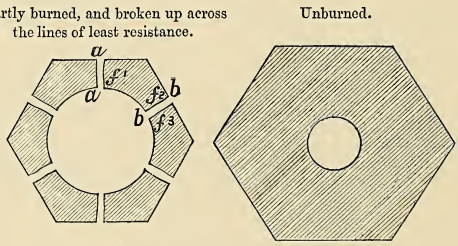
We are now in a position to consider the various steps which, within the last few years, have completely altered the character of gunpowder. If we look at the diagram to which I invite your attention, it will help us to form an idea of the manner in which gunpowder has been gradually developed from an uncontrolable and uncertain explosive, into a reliable propellant and servant.

TABLE B.

Progressive Steps towards obtaining Gunpowders suitable for Modern Rifled Guns.

System or method adopted.	Powder.	Result.
Change of size (Increase in).	R.L.G., introduced 1866 P. ,, 1871 P.[2] ,, 1876 R.L.G.[4] ,, 1887	Diminution in rate of burning. Reduction of shock or blow given by the powder on ignition.
Change of density (increase in).	Pebble. Prism[1] Black. Prism Brown. Prism S.B.C.	Reduction of rate of burning. Reduction of initial strain in the bore of the gun.
Change of form and moulding.	Disc. Pellet. Sphere. Cylinder. Hollow cylinder. Cube. Perforated prism.	Regularity of ballistics in units of powders manufactured under the same conditions. Final break-up along the lines of least resistance, giving additional surface of combustion and production of gas as the projectile travels along the bore.
Change of texture, granulating and moulding.	Masses or conglomerate lumps formed of compressed grain. Progressive or Fossano Prism,[1] black, 1881; ditto. brown, 1884; S.B.C, 1887; and E.X.E., 1887.	Regularity of density. ,, ,, pressures. ,, ,, velocities.
Change of composition.	Prism[1] brown. ,, S.B.C. ,, E.X.E. Water recognised as an ingredient.	Additional control over rate of burning pressures and velocities.
Blending.	P. and S.P. Prism[1] black. ,, brown. S.B.C. E.X.E.	Control over ballistics of lots or large batches. Regularity of results in batches, lots or charges of powder.

There are only two of the methods referred to in the table which our limited time will allow us to mention in detail. The first is change of form and moulding. It needs no explanation to demonstrate that a charge consisting of regularly shaped moulded powder of uniform size will give (other things being equal) more uniform results than could be obtained by an equal weight of irregular grains or lumps. But the modern shape, the perforated moulded prism, possesses further advantages over the other forms, which are worthy of consideration. If we take any of the old grain powders, or a mass or lump like P^2, we know that it burns from surface to centre. This being so, the surface of combustion decreases as the shot travels in the bore, or as the space behind the shot increases. That is to say, we find a reducing evolution of gas when you really most require an increasing one; and hence the speed or velocity of the projectile is not developed in the most satisfactory manner. On the other hand, if we now look at the perforated prism, we find that as the outside surface is diminished by combustion so the inside surface of the perforation is increased; thus we see a tendency to keep up a constant supply of speed producing gasses; and further, when the combustion reaches a certain point it is more than probable that the prisms break up across the lines of least resistance (they are marked in fig. *a*, *a*, *b*, *b*, and so on), thereby producing



twelve new surfaces f^1, f^2, f^3, &c., for combustion; fully developing the progressive character of the powder, and helping the projectile along as its speed is accelerated.

The second detail of the diagram to be brought to notice is "Blending," upon which chiefly the uniformity of character of the powder depends, and few who have not practically studied the subject, can realise how difficult it is to obtain this uniformity. For example, a day's production represents about a unit or lot of 100 barrels, equal to 10,000 lbs. of gunpowder. This large quantity must be absolutely uniform in itself. That is to say, every charge from it, fired from the same gun, under similar circumstances, should give identical results as to speed and pressure. This batch of powder is, however, made in many machines, on the out-turn of which the weather and temperature exert considerable influence, and besides this, the machines are tended and worked by different men, each of whom has what may be termed

CONDITIONS OF ACCEPTANCE FOR SERVICE POWDERS.—TABLE C.

Nature.	Velocity.		Pressure.			Charge.	Size of Grain. Prism or Cordite.	Density.		Moisture.		Weight of Projectile.	Fired at Proof in	Used on Service with	Remarks.
	Min.	Max.	Min.	Max.	Mean.			Min.	Max.	Min.	Max.				
R. Pistol.	680	...	...	...	...	18 Grs.	$\frac{1}{20}$ to $\frac{1}{30}$								
R.F.G.	1250	1290	...	...	...	70 "	$\frac{1}{12}$ " $\frac{1}{20}$	1·58	1·62	·9	1·2	480 Grains.	Snider Rifle.	Snider Rifle.	
R.F.G.[2]	1300	1340	...	...	...	85 "	$\frac{1}{12}$ " $\frac{1}{20}$	1·7	1·75	·9	1·2	480 "	M.H. Rifle.	M.H. 4″ Howitzer Jointed ·45 Machine Guns.	
M.G.[1]	1400	...	...	14·5	14·0	625	$\frac{1}{7}$ " $\frac{1}{11}$	1·75	...	1·0	1·3	3170 "	1″ Nordenfelt.	1″ Machine Guns.	
Q.F.[1]	1800 1820	1840 1860	...	11·5 13·5	14·0 13·0	$1\frac{15}{10}$ $1\frac{8}{10}$	$\frac{1}{2}$ " $\frac{3}{10}$	1·75	...	1·0	1·3	6 lbs. 3 "	6-pr. 3-pr. } Hotchkiss.	6-pr. and 3-pr. Q.F. Guns.	
R.L.G.	1385	1435	...	×	×	$1\frac{3}{4}$	$\frac{1}{4}$ " $\frac{1}{8}$	1·67	...	×	×	9 "	9-pr. R.M.L.	9-pr. R.M.L.	
R.L.G.[2]	1540	1590	...	16·5	16·0	$3\frac{2}{10}$	$\frac{1}{3}$ " $\frac{1}{6}$	1·65	...	1·0	1·3	13 "	13-pr. R.M.L.	M.L. 64, 40, 25, 16, 12, 13, 9, 2·5″, 12-pr. B.L. R.B.L. 7″, 40, 20, 12-prs., 8″, 6·6″, 6·3″ Howitzer.	
R.L.G.[3]	1380	1420	...	17·0	16·5	11	$\frac{1}{3}$ " $\frac{1}{2}$	1·65	...	1·0	1·3	$67\frac{1}{2}$ "	64-pr. R.M.L.	R.M.L. 64-pr., 40, 25, 16, 13, 2·5″, B.L. 4″.	
P.	1890	1930	...	16·5	16·0	34	$\frac{3}{8}$ " $\frac{3}{4}$	1·75	...	1·0	1·3	80 "	80-pr. and 6″ B.L.	R.M.L. 12″, 11″, 10″, 9″, 8″, 7, 6·6″, 80-pr., 64-pr. of 64 cwt. B.L. 6″, 80-pr., 5″ and 4″.	
S.P.	1690	1730	...	15·0	14·0	4	$\frac{3}{8}$ " $\frac{3}{4}$	1·75	...	1·0	1·3	$12\frac{1}{2}$ "	12-pr. B.L.	B.L. 20-pr. and 12-pr.	
P.[2]	1540	...	...	22·0	21·0	200	$1\frac{1}{2}$	1·75	...	1·0	1·3	812 "	12·5″ R.M.L.	R.M.L. 12·5″, B.L. 6″ Mark II., III., IV. and VI.	
							Height. Diam. Hole.								
Prism[1], Black	1530	1570	...	20·0	19·0	210	·98 1·38 0·4	1·76	...	1·0	1·3	812 "	12·5″ R.M.L.	R.M.L. 17·72″, 12·5″, 10·4″, B L. 8″ Mark III. and VII. 6″ Mark IV., V. and VI.	
E.X.E.	1940	1980	...	17·0	16·5	48	·076 " ·303	1·8	...	1·5	2·0	100 "	6″ B.L.	R.M.L. 12·5″, B.L. 6″ Mark II., III., IV. and VI.	
Prism[1], Brown	1960	2000	...	16·5	16·0	55	" " "	1·8	...	1·7	2·2	100 "	do.	R.M.L. 16″ 80-ton, B.L. 12″, 10″, 9·2″, 8″ Marks IV. and VI.	
do.	1980	2020	...	18·5	18·0	295	" " "	1·8	...	1·7	2·2	655 "	11″ do.	Do. do. do.	
S.B.C.	2010	2050	...	16·5	16·0	360	...	1·85	...	1·7	2·2	655 "	do.	B.L. 16·25″ and 13·5″.	
S.A. Pellet.	1830±40	...	...	19	18	70·5±3·5 Grs.	...	...	...	·9	1·3	215 "	·303 Magazine Rifle.	·303 Magazine Rifle.	
SMOKELESS.							CORDITE. Diameter. Length.								
Cordite S.A.	2000±40	...	...	16	15	$30\frac{1}{2}$	·0375″	1·56	...	...	·5	215 Grs.±3	·303 Magazine Rifle.	·303 Magazine Rifle.	
do. 5	1690	1730	13	15	14	1 lb. $0\frac{1}{2}$ oz.*	·05″ 11″	1·56	...	...	·5	$12\frac{1}{2}$ lbs.	12-pr. B.L.	12-pr. B.L.	*Provisional.
do. 7·5	...	...	...	...	...	..	...	1·56	...	...	·5	...	...		
do. 20	2120	2170	18·5	15	14	5·7*	·2″ 14″	1·56	...	...	·5	45 "	4·7″ Q.F.		
do. 30	2180	2220	11	14	13	15·8*	·3″ 14″	1·56	...	...	·5	100 "	6″ Q.F.		

* The larger sizes, ·4″, ·45″, and ·50″ are still in the experimental stage.

F. W. J. BARKER, Lieut.-Colonel, R.A.

.—TABLE C.

at Proof in	Used on Service with	Remarks.
der Rifle.	Snider Rifle.	
H. Rifle.	M.H. 4″ Howitzer Jointed ·45 Machine Guns.	
Nordenfelt.	1″ Machine Guns.	
} Hotchkiss.	6-pr. and 3-pr. Q.F. Guns.	
:. R.M.L.	9-pr. R.M.L.	
:. R.M.L.	{ M.L. 64, 40, 25, 16, 15, 13, 9, 2·5″, 12-pr. B.L. R.B.L. 7″, 40, 20, 12-prs., 8″, 6·6″, 6·3″ Howitzer. }	
r. R.M.L.	R.M.L. 64-pr., 40, 25, 16, 13, 2·5″, B.L. 4″.	
and 6″ B.L.	{ R.M.L. 12″, 11″, 10″, 9″, 8″, 7, 6·6″, 80-pr., 64-pr. of 64 cwt. B.L. 6″, 80-pr., 5″ and 4″. }	
-pr. B.L.	B.L. 20-pr. and 12-pr.	
″ R.M.L.	R.M.L. 12·5″, B.L. 6″ Mark II., III., IV. and VI.	
″ R·M.L.	{ R.M.L. 17·72″, 12·5″, 10·4″, B L. 8″ Mark III. and VII. 6″ Mark IV., V. and VI. }	
6″ B.L.	R.M.L. 12·5″, B.L. 6″ Mark II., III., IV. and VI.	
do.	{ R.M.L. 16″ 80-ton, B.L. 12″, 10″, 9·2″, 8″ Marks IV. and VI. }	
″ do.	Do. do. do.	
do.	B.L. 16·25″ and 13·5″.	
Magazine Rifle.	·303 Magazine Rifle.	
Magazine Rifle.	·303 Magazine Rifle.	
2-pr. B.L.	12-pr. B.L.	*Provisional.
...		
·7″ Q.F.		
6″ Q.F.		

tal stage.

F. W. J. BARKER, Lieut.-Colonel, R.A.

a personal error, which is enough in each process to make a serious difference in the portions of the batch or lot made by those working at the same time. The consequence of this would be that, if unadjusted, the lot of 10,000 lbs., as a whole, would prove most irregular in its characteristics and unreliable in its shooting. To overcome this a constant systematic method of intermixing the various batches from each process is adopted; and this (which is termed blending) being carried out on scientific principles, gives a uniformity to each unit of 10,000 lbs. which could not otherwise be obtained. We are thus provided with reliable and uniform batches or "lots" of the propellant under discussion.

Let us now examine the practical results which the development of modern powders has rendered possible. The table of conditions which must be fulfilled before these powders are accepted, sufficiently indicates what a very reliable propellant we have in modern gunpowder.

TABLE C.

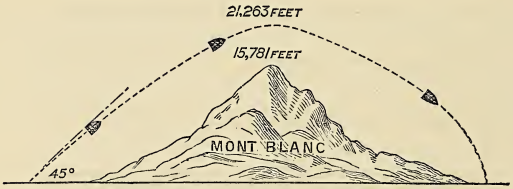
You see here velocities ranging to above 1300 miles an hour, and the difference admissible between the maximum and minimum velocities of of the rounds fired is only about 40 feet a second, or little more than the speed of a quick runner; while the mean deviation from the mean is generally 10 feet or less, which is under seven miles in a velocity of over 1300 miles per hour. Again, as to pressures in the bore of the gun, it can be seen how restricted and low they are. If we examine Table C. it can be seen how very regular the powders must be in their ballistics before they are admitted into the service, and if they do not fulfil those conditions the powders are rejected.

I further submit some results of the lecturer's firing with pebble powder at Waltham Abbey. It was only an average sample of service powder made in 1886 and kept in a waterside magazine and used as our "standard," for comparison with current manufacture. Here are the results of firing carried out during one month. On the second day of the month we fired the first round for the standard, and it gave 1690 feet in the 12-pounder breech-loader. Then we fired six experimental powders, testing the ordinary manufacture, and the last round fired with the same standard as the first, gave 1690 feet with 12 tons pressure. On the 10th of the same month, the first round gave 1690 feet; then we fired four experimental powders, or rather current manufacture powders, in between, and the last round with the same standard gave 1695 feet, that is to say 5 feet difference, and the pressure was 12·4 tons. On the 22nd of the month, the last round gave 1694 feet. I submit, that all of us who desire good results with our field guns might very well rest satisfied if we could always get that kind of shooting. But the first round on the last day's firing was rejected, because the velocity was rather high. It was 1716 feet, that is to say, 26 feet higher velocity than ought to have been obtained. The reason was this: that we fired a friction tube which exploded but did not ignite the charge. It struck down on the seam of the cartridge, broke up some of the pebbles into smaller grains. The new friction tube fired the charge, and the slightly increased velocity, 1716, was the result. You see, therefore, how

careful we must be, to have only one variable in experimental tests of this nature. Again, I may remind you that for all these experiments we have every shot weighed to the fraction of an ounce and the rotating bands gauged most carefully, to ensure that there is no other variable, when testing powder, than the powder itself.

There is still one other result which, although hardly within the scope of this lecture, ought not to pass without notice, as it shows, in an interesting manner, what modern guns with modern gunpowder are capable of doing. If we could imagine the highest mountain in Europe, Mount Blanc, placed between us and London, a shot which was fired not very long ago would have passed 5482 feet above its summit and lodged at the other side in London. This gives us some idea of what

FIG. 5.



SHOT 380 LB. RANGE 21,800 YARDS. OVER 12 MILES.
M. VELOCITY 2375 FT. OBTAINED IN 1888.

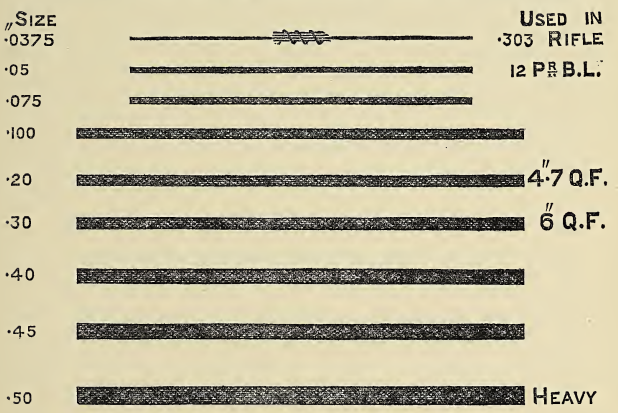
modern guns with modern gunpowder will accomplish. We cannot yet say what they will do when cordite comes to be used. I daresay this result suggests to some of us that we may possibly enable a projectile to leave the earth, as suggested in one of Jules Verne's stories, but practical gunnery has not yet approached to this. A velocity of between five and six miles a second would be required for the purpose, while about half-a-mile a second is our present maximum, possibly in the next few years we may do it, and attempt to disturb the equilibrium of the planetry system by sending messengers to the moon or elsewhere!

If the time at our disposal permitted, we could examine a long series of practical results which demonstrate that where properly handled and reasonably treated, modern gunpowder is a very reliable propellant. And further, until quite recently, when compared with any other, it might fairly claim to hold its own as a speed producer against all competitors. Quite recently, however, the high position which modern gunpowder has held, has been disputed by its youthful rival, cordite, and other smokeless powders whose characteristics we shall now discuss.

Cordite.

Cordite. { Nitro-Glycerine, 58. Gun-cotton, ... 37. Mineral Jelly, 5.

Comparative Table showing dimensions of Cordite at present used.



The thicker cordite, size 20 and upwards, is cut into lengths of 14 inches, and used in bundles of the required weight for the charge.

Cordite for Field guns is 11 inches long, and the S.A. rifle charge is made up of 60 strands, or threads of suitable length for the cartridge.

We have now examined the outlines of the methods employed in the manufacture of modern powders, and some of the processes which have been adopted to render them reliable propellants with the various guns in our service. The next step, or rather leap, in this manufacture to be considered, is the introduction of smokeless propellants. We are all aware how, for many years, this has been the ambition of the artillerist and the study of the chemist. It is hardly necessary to remind Officers of the Royal Artillery of the failures in this direction, which, for more than three decades, frustrated the efforts of those who tried to obtain a smokeless powder for rifled guns and small arms. Gun-cotton in every form, picric acid in various conditions, and many tri-nitro and di-nitro compounds were experimented with, confidently at first, then hopefully, and apparently finally abandoned in the face of what seemed to be insurmountable difficulties. At last, however, a sudden impetus was given to the whole question, about seven years ago, by recent discoveries in chemistry, and by the supreme importance which the introduction of quick-firing guns and magazine rifles gave to the production of a powder which would not, by its smoke, utterly neutralise the benefits to be obtained by rapidity of fire. Most of us

Cordite.

remember that many years ago smokeless powder was considered to be a possibility within reach, when the character of gun-cotton was first recognised, and it was thought that this substance might be utilised by being kept under control or "tamed" by some retarding agent. To the unscientific but practical man this seemed a matter not difficult to accomplish. On the one hand, we have a violent explosive of good gas producing powers and almost unlimited energy; on the other, an almost boundless range of dilutants, retarding agents, or "tamers," which, in greater or less quantities, should at any rate bring the violence of the explosion of gun-cotton to the same level as that of gunpowder. Here then, at first, was the problem to solve: To use with gun-cotton such a retarding agent as will "tame" the explosive, make it safe to handle, store and use, and at the same time leave it with sufficient energy for use in modern guns and rifles with certainty and regularity of propulsion. This problem, simple as it appears, baffled, for decades after gun-cotton was known, the energies and knowledge of the most scientific artillerists and chemists; and it is only within the last few years that any real approach to success has been made, and this success has been chiefly due to the use in the right direction of one of the properties which gun-cotton exhibits, namely its solubility in acetone.[1] The solubility of gun-cotton in acetone has been known for a considerable time; but how to utilise this property for artillery purposes has only recently been discovered, and is still the subject of careful investigation. Again, in January 1888, Messrs. Nobel & Co. registered a patent of the discovery that nitro-cellulose could be mixed with nitro-glycerine and that the two so combined, with or without the addition of a retarding agent, form a substance which can be relied upon for ballistic purposes. This, with other discoveries made about the same time, may be considered as practically the starting point for the most valuable of the smokeless powders, and those most largely used in the services, both in England and on the continent of Europe.

We shall now consider the composition and characteristics of the bases of smokeless powders which have been proposed or adopted. First on the list is gun-cotton. When we refer to the text-books we find that it is stated to be tri-nitro-cellulose, with the chemical composition and formula gun-cotton = $C_6 H_7 O_2 3 (NO_3)$.[2] I therefore propose to adopt this nomenclature which has been accepted up to within the last couple of years. The table now before us gives what may, for practical purposes, be considered the basis of the principal smokeless powders. Modifications of:—

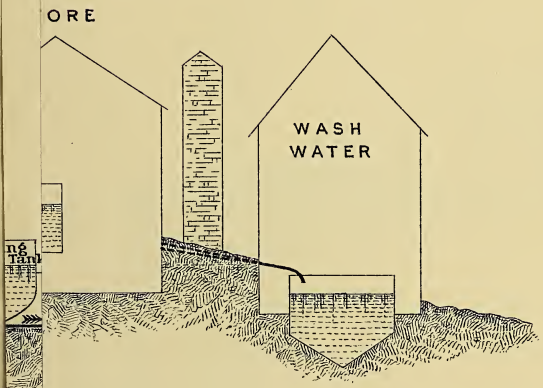
[1] Acetone, or "dimethyl-ketone," $CH_3 CO CH_3$, or "pyro-acetic spirit," is obtained among the products of distillation of wood, and may be prepared by distilling the acetate of lead calcium or barium.

The crude distillate is shaken with a saturated solution of hydrosodium sulphate, which combines with acetone to form a crystalline compound $(CH_3)_2 CO. HN_a SO_3$. This is freed from the mother liquor and distilled with sodium carbonate, when acetone distils over mixed with water, which is removed by fuzed calcium chloride.

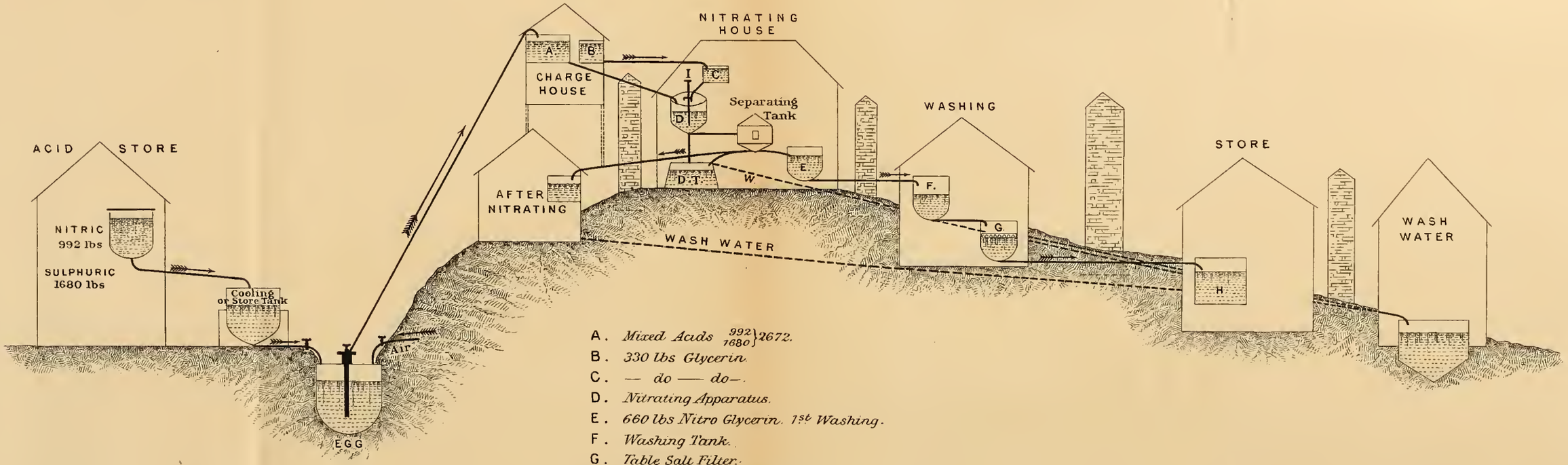
Acetone is a colorless fragrant liquid, Sp. gr. 0·81, and boiling at 56·3 C. = 133·3 Fahr.

It is inflammable, burning with a luminous flame. It mixes with water, alcohol and ether.—*Bloxam's Chemistry.*

[2] Some persons now hold the opinion that insoluable and soluable nitro-cellulose are the same substance under different "allotropic" conditions.


ORE
WASH
WATER

NITRO GLYCERIN FACTORY.



A. *Mixed Acids* $\frac{992}{1680}$ *2672.*
B. *330 lbs Glycerin.*
C. *— do — do—.*
D. *Nitrating Apparatus.*
E. *660 lbs Nitro Glycerin. 1st Washing.*
F. *Washing Tank.*
G. *Table Salt Filter.*
H. *Nitro Glycerin in Store Tank.*
I. Injector (with tap for checking the Inflow of Glycerin)
D.T. Drowning Tank.

Lt Barker R.A.

Vincent Brooks Day & Son lith.

1st. *Gun-cotton.*—Trinitro-cellulose, $C_6H_7O_23(NO_3)$, obtained by the action of nitric acid upon cotton, viz. :—

$$\underbrace{C_6H_7O_23(HO)}_{\text{Cotton or Cellulose.}} + \underbrace{3(HNO_3)}_{\text{Nitric acid.}} = \underbrace{C_6H_7O_23(NO_3)}_{\text{Gun-cotton.}} + \underbrace{3H_2O}_{\text{Water.}}$$

2nd. *Nitro-glycerin.*—$C_3H_53(NO_3)$ obtained by the action of nitric acid on glycerin.

3rd *Picric Acid.*—Trinitrophenole, $C_6H_33(NO_2)O$, formed by boiling "carbolic acid" or phenole with fuming nitric acid.

These may be taken as the parents of the majority of the smokeless powders which are deserving of consideration.

As most of us are acquainted with the manufacture of gun-cotton, and we need not follow up that of picric acid, I propose to only give a sketch of the processes of manufacture of nitro-glycerine now being made in tons weekly at Waltham Abbey. Nitro-Glycerin.

Before describing the processes I may as well tell you that it has been confidently stated, by a recent contributor to the daily press, that any tyro can make nitro-glycerine. This may possibly be the case; but if much nitro-glycerine be required, a large stock of tyros should be kept in hand to replace those who would undoubtedly be expended!

The manufacturing processes are exhibited on the diagram before you, and we may observe that in the preliminary operations the temperature must not be permitted to rise above a certain point, about 70·5° Fahr., and later on it must not be allowed to fall below a certain point, 50° Fahr. We have here the diagram (Pl. II) intended to show the construction and general arrangement of a nitro-glycerine factory. It is well to note that the various danger houses appear to be close together as shown in the diagram, whereas in reality they are hundreds of feet apart; and it would require paper of very inconvenient length to represent, in a satisfactory manner, the lateral extent of the various buildings.

The danger houses are separated not only by distance, but by heavy traverses, like walls of a fort, which isolate the buildings, and it is hoped that if an explosion took place, these traverses would confine the explosion to the exact locality where it occurs. The houses are lightly constructed of wood, and the traverses are very heavy solid masonry. The manufacture of nitro-glycerine is carried out as follows :—

The acids employed (nitric or sulphuric) are mixed, in a raised tank, in the acid store (Plate II) in the proportions of nitric acid 992 lbs., sulphuric acid 1680 lbs. The mixed acids are then allowed to run off into cooling or store tanks, where they remain until they lose the heat which has been generated by mixing.

The mixed acids, when ready for use, are passed into what is called the "egg." This is an iron vessel, egg-shaped at the bottom, and is an ingenious contrivance for dispensing with the use of pumps, the valves of which would be almost immediately destroyed by the corrosive action of the acids.

When the charge is ready to be transferred to the tank, A, in the charge house (*vide* Plate II), air is driven into the "egg" from an air engine, and the pressure of air on the surface of the acids forces them

up to the charge house through the pipe which connects the bottom of the acid charge in the "egg," with the tank A, in the charge house. The acids are then run by gravitation into the nitrating apparatus, a large cylindrical lead vessel, D, fitted internally with coils of lead pipes, through which a circulation of cold water can be kept up without letting any water mingle with the charge, and then the 330 lb. charge of glycerine is passed into a little tank, C, above the nitrating apparatus. The nitrating operation takes place as soon as the acids are in, and they are kept in a state of effervescence by air, which is pumped through perforated tubes at the bottom of the apparatus. The glycerine is allowed to pass through an injector, which can absolutely control the rate of supply of the glycerine to the acids. The temperature is most carefully observed and regulated during this process, and as any abnormal rise immediately indicates danger, an elaborate system of control is maintained. The maximum temperature permissible is 70° Fahr.

The uniformity of temperature throughout the charge, and also intimate mixture of the glycerine with the acids, is ensured by a constant inflow of air through perforated lead pipes in the apparatus. The air so injected keeps the charge in a constant state of effervescence.

The temperature of the charge is regulated, in the first instance, by the rate at which the glycerine is allowed to flow into the acids.

2nd.—By the cooling influence of the water passed through the lead coils.

3rd.—By injecting carbonic acid, which is kept, for emergencies, under pressure, in an iron cylinder close to the apparatus.

If the temperature still rises and gets out of control, the whole charge is immediately run off into the drowning tank (D.T. in Plate II), which contains about 10,000 gallons of cold water.

If the nitration proves satisfactory the operation is completed in about an hour, and the 330 lbs. of glycerine are converted into 660 lbs. of nitro-glycerine, mixed up in a sort of foaming liquid with the acid in the nitrating apparatus. It is then passed away to the separating tank where it is allowed to stand for about an hour. There is a little glass window in the separating tank, through which the layer of nitro-glycerine, a few inches thick, can be seen floating on the top of the acids like an oily liquid. When the separation is completed the acids are allowed to run off to the waste house or "After-nitrating house" as it is called, from the nitrating house, and the nitro-glycerine is run into the first washing apparatus and washed with a solution of soda in water, in a large tank which is also kept in a state of effervescence by injected air. Then from the first washing it goes on to the second washing in another house, passed on by pipes, and is there washed with hot water and soda for about four hours. The nitro-glycerine is now at the bottom of the tank. Water floats on nitro-glycerine and nitro-glycerine floats on acid, and the houses, tanks, &c., are so arranged as to levels, that gravitation can be used as much as possible, in all shifting or transfer operations, to avoid pumping, striking, or using violence with nitro-glycerine. Then the nitro-glycerine is filtered off through a bag of table salt, sodium chloride, and is passed on to the store tanks,

where it is kept in sufficient quantities for use in the manufacture of cordite. When finished, the nitro-glycerine is subjected to the "heat test," similarly to gun-cotton, and it should stand the test at 160° Fahr. for 15 minutes.

As cordite is composed of two "high explosives," gun-cotton and nitro-glycerine, the means adopted for converting them into a reliable propellant have now to be considered.

"High explosives" have all, more or less, the characteristics to which they owe their title. These are, great sensitiveness under certain conditions, and liability to violent explosiveness or detonation in their ordinary or "untamed" condition. This is exhibited in a graphic form in the diagram (Fig. 2).

One can well understand that none of these substances untamed are suitable for use with arms of precision. Under certain circumstances they might give fair shooting and satisfactory results; and under others their violence might be productive of the most serious consequences. A reliable retarding or "taming" agent was therefore absolutely necessary, and by using a solvent, such as acetone, and reducing gun-cotton to a plastic mass and then adding an inert or "slowing" substance, either a resin, grease, or other material, this violent explosive has been tamed down to any degree of rapidity of combustion required.

Gun-cotton has, however, one serious drawback, and that is that even with the highest degree of explosiveness which can be permitted for safety, it does not produce a satisfactory proportion of permanent gases during combustion, and the pressures developed are too high in comparison for the velocities obtained with the projectiles. We are therefore obliged to introduce some other ingredient which, while not producing smoke, will evolve the necessary gases for propulsion of the projectile, without increasing the rapidity of combustion or involving the risk of detonation. All manner of inert substances have been tried for this purpose with more or less success, but none as yet have been perfectly satisfactory. I may say, however, that a near approach to a gun-cotton smokeless powder was made at Waltham Abbey some years ago, when a grained powder was produced which, while smokeless, gave the best shooting obtained up to that time. Just at this period, however, the discoveries previously referred to were developed, namely, that an *active* agent could be used with gun-cotton, and nitro-glycerine combinations rapidly took the field.

The strange anomaly of two of the most violent explosives known, nitro-glycerine and gun-cotton, when combined in nearly equal proportions, producing a moderate explosive under control was, as I have already said, the starting point of a new era in smokeless powders. Nitro-glycerine is, as we know, about the most violent explosive yet discovered, gun-cotton is also noted in the list of "high explosives." Both when separate are very sensitive and easily detonated; but when combined they burn with great regularity.

I have now briefly mentioned the two great classes of smokeless powders; first gun-cotton and its kindred chemical compositions with a retarding agent, and, second, gun-cotton combined with nitro-glycerine

where nitro-glycerine takes the place of the retarding agent which was formerly used with gun-cotton. The first has not been so successful for the reasons already given, while the latter (gun-cotton with nitro-glycerine) gives most excellent ballistics but very high temperatures. The excessively high temperature which is produced by the use of nitro-glycerine has contributed towards the continuation of investigations on the Continent, as to the possibility of obtaining a gun-cotton or other smokeless powder; but hitherto we have not heard of any marked success.

I think that we are now in a position to discuss the manufacture of the smokeless powder, cordite, which promises so favourably, and which has been made so successfully in large quantities for over a year at Waltham Abbey.

Cordite is a smokeless propellant of the combined nitro-cellulose (or gun-cotton) and nitro-glycerine type. Its composition was determined by a Committee (The Explosives Committee) of most distinguished chemists, with Sir Frederick Abel as president. They decided that the proportion of the ingredients should be gun-cotton, 37 per cent.; nitro-glycerine, 58 per cent.; and mineral jelly, 5 per cent. The gun-cotton is first dried (in the form of 9 ounce primers) down to about 1 per cent. moisture. Then a portion (27¾ lbs.) is placed in a brass-lined box, and 43½ lbs. nitro-glycerine are carefully poured over it. These ingredients are then carefully mixed by hand and taken to the incorporating machines, and the whole is brought into a gelatinous condition by the addition of about 15$\frac{10}{16}$ lbs. of acetone, which is poured over the charge in the incorporating machine, and worked up into a kind of dough. 3¾ lbs. of "mineral jelly"[1] are afterwards added, and the material is incorporated or mixed for seven hours. When it has been sufficiently incorporated and is ready, the charge is taken to the press house where it is squeezed in a cylinder, one end of which has a small hole of the required size for the cordite, which is squirted through by means of a plunger or piston pressing on the other end of the cylinder. The cylinder is filled with composition and the plunger pushes or squirts the soft material in the form of cord or string of the thickness required. The sizes are ·0375 in., which is used for the rifle, up to ·5 in., which has been experimentally used with a heavy B.L. gun with satisfactory results. This string is wound on reels for the smaller, or cut into lengths for the larger natures. It is then placed in a stove and is dried, to get rid of the acetone at 100 degrees Fahr., from three to nine days, according to the thickness of the cordite. It is afterwards blended in the rifle cordite, by taking the production of ten presses which are on "one strand" reels and winding these on to one "ten strand" reel. Then the cordite on six "ten strand" reels is wound on to one drum, which make up a rope or cord of 60 strands, which in short lengths form the 30½ grain charge of the magazine rifle. The larger natures of cordite are blended on the same principles as gunpowder. Cordite has proved itself to be very safe to manufacture

[1] Mineral jelly (vaselin) is the liquid which distils over from petroleum at temperatures above 200 C. It is a hydrocarbon, richer in carbon than petroleum, and it boils about 278 C. Formula $C_{16}H_{34}$.

in its later stages, *i.e.*, *after* incorporation, and although we have had slight ignitions, I am glad to say that no explosion of any consequence has occurred.

Having now briefly sketched the outline of the manufacture of cordite, we will turn to what is doubtless the more interesting portion of the subject to practical gunners, namely, what are its shooting properties, its keeping qualities, and what is the effect of using it in the guns and small arms with which it is employed.

SHOOTING QUALITIES.

First, as to its shooting qualities, we can best judge of them by actual results obtained, and by comparison with our old friend black powder in the same weapon. These results, which are shown in the table before us, speak for themselves. I owe the latest results to the kindness of the Director-General, Dr. Anderson, and to our friends at Waltham Abbey. I have here sketched a comparative table (Table D)

TABLE D.—COMPARATIVE RESULTS.

Cordite and Black.

Nature.	Charge.	Velocity.	Pressure.
Magazine Rifle	70 grs.	1830±40	18
do.	**30 grs.**	**2000±40**	**15**
12-pr. B.L.	4 lbs.	1710±20	15
do.	**1 lb. 0½ ozs.**	**1710±20**	**15**
4·7 in. Q.F.	12 lbs.	1830±30	16 to 17·6
do.	**5 lbs. 7 ozs.**	**2145±25**	**15**
6 in. Q.F.	29 lbs. 12 ozs.	1890	15
do.	**14 lbs. 3 ozs.**	**2274**	**15·2**

showing the results obtained by black powder and smokeless powder. The black powder is in Roman type and the smokeless powder in black type, and I think that, without any further demonstration, we can see for ourselves the great advantages to be obtained if the smokeless powder always does what that table before us indicates. First we have 30 grains of the smokeless powder giving a 2000 feet velocity, as against 70 grains of the best of the modern black powders giving 1830 feet velocity, + or − 40. Then, in the field gun (which most of us here are interested in) one pound and half-an-ounce of smokeless powder (cordite) must give, as a condition of acceptance for service, 1710 feet + or − 20, as compared with 4 lbs. S.P. (selected pebble), which gives 1710 f.s. Then quick-firing gun, the 4·7-inch, gives, with 12 lbs. black

pebble, 1880 feet + or — 30, while with 5 lbs. 7 ozs. of smokeless powder it gives 2145 feet + or — 25. I think those results speak for themselves. Then again, in the 6-inch gun 29 lbs. 12 ozs. of black powder giving 1890 feet muzzle velocity with 15 tons pressure. The results in the table are based upon actual shooting, and the conditions of acceptance are framed upon practical experience, and these conditions must be complied with by all powders before they are allowed to pass into the service. It may here be interesting to quote some of the actual shooting within the last few months of our own experience, and for these, the latest results, I have again to thank our friends at Waltham Abbey and also the Director General, who has kindly permitted me to have them. With lot 8, size 5[1] (that is field gun size) in the 12-pr., 1 lb. 0½ oz. charge, from the actual results fired in July last we obtained 1732 feet as the muzzle velocity with 13·84 pressure. The results which were forwarded to me last month were 1726 feet velocity with the same lot, and 13·45 pressure. The temperature of the air when the firing took place in December being quite sufficient to account for the slightly lower results as compared with those obtained in July. It is easy to understand the favourable impression that results of this nature make upon those who watch them carefully. Then there are other difficulties which had to be contended with, and one was technically termed "sweating," which frequently causes strained relations between employers and employed (or unemployed?) Our "sweating," however, had nothing to do with workmen, but it was a curious propensity which some batches of cordite exhibited in exuding the nitro-glycerine on the surface. There are various causes which produce this exudation, one of which is water in the nitro-glycerine before incorporation; there are also several others which we need not enter into here, but I believe that the difficulty has been completely overcome, by arrangements during manufacture.

Climatic Trials.

Secondly, as to climatic trials or keeping qualities. Climatic trials have been carried out all over the world, and they have so far proved eminently satisfactory. The arctic cold of the winter in Canada with the temperature below zero, and the tropical heat of India have as yet failed to shake the stability of the composition, or abnormally injure its shooting properties. The Director General kindly wrote to me the other day and said that cordite returned from Canada has been analysed, and has been quite unchanged. I have myself had under my own observation 100 lbs. in an open case exposed, in an open porch, to all the vicissitudes of a Waltham winter—snow and rain—and also to an English summer—rain without the snow—and the results again showed that there was hardly any perceptible difference in shooting due to this severe test. If our old friend pebble or prismatic powder

[1] Size 5, lot 8, fired at Woolwich 7 July, 1892, in 12-pr. B.L. gun, charge 1 lb. 0½ oz.

M.V.	Mean.	Pressure.	Mean.
1734		13·3	
1731		14·2	
1733	1732	14·1	13·84
1733		13·8	
1728		13·8	

had half this ill-treatment one would have wished for a sea range, and a clear one, to fire over, and should certainly have protested against ordinary proof within twelve miles of London.

Thirdly, the effect on the weapon.[1] This may perhaps, and indeed is likely to prove the weakest point in the use of cordite under certain conditions. The small-arm magazine rifle undoubtedly suffers in the bore from the great heat evolved and the high velocity imparted to the projectile. On the other hand, we have at Waltham Abbey a 4·7 inch quick-firing gun which has fired, up to September last, over 40 rounds of black and 249 rounds of cordite, and yet the bore shows no abnormal erosion or scoring. We have also a 12-pr. B.L. constantly used, up to the same date, for firing pebble and cordite, and the bore is as smooth as could be expected.

In conclusion, we must all remember that, although smokeless powders have developed so rapidly, and have shown such great suitability for the guns with which they have been used, they are still in their infancy, and have not yet been subjected, on any large scale, to the stress of active operations in the field, engagements at sea, or lengthened storage in average magazines. So far as our experience goes, however, the results have been eminently satisfactory with our own smokeless powder, CORDITE.

DISCUSSION.

The Chairman—I may say that Colonel Barker will be very pleased to answer any questions that any gentleman may wish to put to him.

As regards the effect of temperature. Does not heating the cordite disturb its shooting qualities, and would you not expect abnormal results if it were fired hot? Say at 110° Fhr.

Colonel Barker—Heating cordite and firing it hot undoubtedly does disturb its shooting qualities, but as far as we can see not much more than gunpowder. I fear that we must always expect abnormal results with heated propellants—either gunpowder or cordite; and when fired hot the increase in pressures and velocities will depend upon the heat above the normal or average temperatures at which firing takes place.

Captain Orde Browne—Is it not true, as I think Captain Andrew Noble told me, that in some experiments in Spain they had a low velocity from their powder wherever they had been keeping it, and he recommended them to keep it in the sun, and they were astonished at the way the pressure went up?

Colonel Barker—That is so, I believe.

Captain Orde Browne—Would that be due to the temperature, or to the moisture that had been absorbed and got rid of; and would not cordite have a great advantage in that respect?

Colonel Barker—Cordite ought to have an advantage, because, if you subject gunpowder to a heating and cooling process, combined with the effect of

[1] Since writing the above, the lecturer has been informed that in the ·303 magazine rifle, this difficulty has been almost overcome by the use of a suitable wad. As regards the erosion in guns, *vide* the information given by D.G.O.F. in his remarks during the discussion.

moisture, it may get a little porous in its character, consequent on the absorbtion and ejection of water, while cordite has practically no moisure to part with.

Captain Orde Browne—Then, so far as you know, if you did the same thing to powder at a comparatively low temperature, which might have moisture in it, and then to cordite, and put them in the sun and fired them, the cordite would stand at least as well ?

Colonel Barker—I think so; our experience inclines us to believe that it would.

Captain Orde Browne—Then as regards the pressure, is it at all due to its being slower? May we suppose that there is a higher pressure forward in the gun, or is it entirely due to the absence of liquid and solid products of combustion?

Colonel Barker—There must be pressure somewhere to get up the velocity.

Captain Orde Browne—I thought the absolute pressure was reduced because there was no products of combustion except gasses—that there was not the same necessity for re-action: that the common powder was discharging the projectile in a quantity of liquid and solid combustion, and the cordite was discharging nothing but the projectile?

Colonel Barker—I think that is very probable.

Captain Orde Browne—Is not that the reason, that where you have no projectile in front you have a noise with black powder because you have liquid and solid products of combustion,[1] and you have no noise with cordite because you have nothing but the gas in front?

Colonel Barker—I do not think that; that is a complete explanation.

General Goodenough—The lecturer, Sir, is one and we are many; but I hope on some future day the subject may be again considered when we may have the pleasure of hearing him again lecture, because a temperature of 110° is a mere nothing, and I feel convinced that if in India you put a cartridge down on the ground it would rise to 110° in a very short time. I think that the subject is an interesting one to pursue, to see what would emanate and what the remedy would be.

There is a question that I want to ask, and that is this: We have heard that in France they have had great apprehensions as regards the keeping qualities of their high explosives, and we were told that they were prepared to renew the stock at at short notice, and so forth; and I should be glad if you could explain why it is that nothing of the sort appears to be requisite with us; and then, when you answer me, if you would kindly help this humble and ignorant individual by saying what acetone is and what mineral jelly is.

And I must just express the pleasure I have had in being at an interesting and valuable lecture of this kind, and how much I congratulate the Committee upon getting the lecturer to come here—all the more so on account of the great dearth that many of you have felt and suffered from of information on professional subjects in our professional papers, which has been felt by a great many people, and

[1] I was reluctant to open the question of recoil and pressures which depend upon so many variables, each of which require careful consideration and discussion. For instance, recoil with blank depends, as Captain Orde Browne states, partly upon "the products of combustion" and partly upon the *rate* of combustion and other variables. Recoil with a projectile introduces another set of variables, dependant on the weight of the projectile, resistance of rifling, rotating bands, &c., and also on the rate of combustion and manner in which the charge is ignited. It is doubtless very interesting and useful to follow up this question fully in the light of all the practical experience and published information now at our disposal, but I submit that the outside fringe of the question could only be touched in one afternoon's discussion, and that erroneous conclusions could therefore probably follow.—*F. W. J. B.*

which is difficult to overcome. But this is a means of overcoming it by lectures, by which I think we ought to be able to keep pace with the times.

Colonel Scott—I should like to say with regard to the keeping qualities that in India I saw cordite which was in the limbers at Meean Meer. They had the two limbers—the service limber and the experimental limber; the service limber was the ordinary limber, and the experimental limber was white colour with holes for ventilation; and they found in the experimental limber they had a temperature of about 122°, and in the service limber they went up to 132°. The boxes were opened and I saw them, and there was really no difference whatever in the cordite—there was just a mere faint odour of acetone. This cordite has now been sent down to Calcutta and Kirkee, and has been tried every month, and the results have been sent home to the Ordnance Committee, and they are most satisfactory so far. This is cordite that has been in boxes heated up to 122° and 132°. It was not fired at that temperature, but it was heated to that temperature, and the cordite did uot suffer in any way. I took that same cordite with me three years ago to Burmah and every place I went to, and I brought it back, and it is just as good as ever. The cordite from India has not been analyzed, but it is going to be very shortly; but I do not think anything is likely to be found deteriorated. However, the great point for gunners of course is whether this stuff will shoot in India, and so far it has been shown that it does shoot.

Colonel Barker—May I thank Colonel Scott for answering in so practical a manner a large and important portion of the question that has been put by General Goodenough; and might I suggest in addition that if the experiments are to be carried out, which I have no doubt will be made, that gunpowder should at the same time be subjected to the same firing conditions? I am quite sure that cordite will come out very satisfactorily under the trial.

General Goodenough—I should like to explain that at practice (and I am sure a great many gentlemen will confirm me) we always used to think that as you went on firing you generally got a longer range—that is to say, a higher velocity with the old black powder; and I always believed that that arose from the heating of the powder in the bore after the bore had been heated. If that was true, that the cordite would give a greater velocity when it was heated, I can only say that it is very likely to be heated, because, if you kept the gun loaded for a few moments after the firing was going on, the temperature in the bore would be very high and the pressure would be greatly increased. Black powder has often been subjected to that test and the increase has not been considerable; but if the increase is likely to be what Colonel Scott suggested just now, that ought to be considered. That point ought to be worked out. The point was not the keeping.

Colonel Barker—I meant merely the keeping. But with regard to the other point the experiments have not been concluded yet.

As regards General Goodenough's questions relative to the composition of acetone and also of mineral jelly—

Acetone is a colorless fragrant liquid Sp. gr. O. 81 and boiling at 56·3° C. Its chemical title is "Di-mithyl-ketone," and its formula CH_3, $COCH_3$. It is also called "pyro-acetic spirit" and is obtained among the products of distillation of wood.

Mineral jelly (vaselin) is the liquid which distils over from petroleum at a temperature above 200 C. It is a hydro-carbon richer in carbon than petroleum, and its formula C_{16} H_{34}. It boils at 278°.

Captain Abdy—There is a question, Sir, which has been sent to me by an officer who is unable to attend which, with your permission, I will now put on his behalf:—(1) Allowing that cordite supersedes gunpowder for cartridges of 12-pr. guns, what would the gain be in space saved in an ammunition box? (Naturally any space saved would be a gain, as likely to admit of more rounds being carried per box); and (2) will cordite, if used with the 12-pr., be likely to lessen the recoil sufficiently to enable the present gun-carriage to be lightened, or rather lighter in make? *i.e.*, will it do away with breaks, or reduce their weight, or that of any part of the gun-carriage?

Colonel Barker—The question, I understand, is by Colonel Brough. The first question is with regard to the capacity of limbers—what gain in space there is. That is very easily answered. There is not a great difference between the specific gravity, the density of cordite and gunpowder, so that you can see the space would be as 1 to 4. It is not quite so much for reasons which come in during the manufacture, such as the arrangement of the cartridge; but there would be an enormous saving of space if the present cartridge is finally adopted; and it is for those who manufacture the limbers and the limber-boxes and who have the arrangement of the cartridges to say whether the space will be gained.

With regard to the recoil,[1] it is a very difficult question and one that I should like to have had notice about; because it does not do to answer straight off a question that is put on the moment. One's inclination is to do so; but I think a lecturer is more discreet upon a large question of that kind if he waits until he can give something that is thoroughly authentic.

The Director-General—I am afraid I shall be travelling outside the subject of the paper in talking of the possible recoil of the new carriages, but there is no doubt, for the reason which has been already stated, I think by Captain Orde Browne, that as there is less to expel out of the gun, because there is nothing else in cordite, naturally the re-action is less and the recoil of the same velocity is less with cordite considerably than it is with black powder. And with regard to the capacity, we are hoping very shortly to produce an equipment for the Horse Artillery with a wire gun and pole draught and a limber to hold 42 rounds, which will be just 30 cwt. behind the team. That has not been attained yet anywhere. In that case there will be no brakes; there will be simply drag-shoes for stopping the recoil—that is found to be the simplest thing of all. And, by the way they are suspended, they do not require to be put under the wheels—they put themselves under the wheels and give no trouble whatever in working.

With repect to the effect of heat upon cordite, there is no doubt that cordite suffers from change of temperature more than black powder. Black powder on the other hand suffers a great deal more from change of moisture; but if the gravimetric density of cordite is not made too high, if it is kept below 50 cubic inches to the lb., the effect of temperature is not so great. But if the density is high, as in the 4·7-inch gun that Colonel Trench alluded to, and you take an extreme temperature of 110°, the pressure rises considerably. That raises the question whether we have got hold of the right size of cordite for the gun; just as with black powder, a great deal depends upon making the size of the explosive suitable for the nature of the gun. That matter, and many others connected with cordite, are still under discussion and experiment, and will no doubt be brought right. It is only this year that we have produced what may be called a service cordite—a cordite that does not vary in its quality; and the experiments now being carried on by the Ordnance Committee will show more and more what are the necessary precautions to be adopted in it. But the temperature is certainly one. And this has a very important bearing on the ship's magazines. For some reason, best

[1] *Vide* foot-note, p. 288.

known to themselves, the Navy put their magazines near their boilers to get them as hot as possible. That will not suit cordite at all—they will have either to shift their magazines, or to stick to black powder. But the change in velocity is very small—the reason being that the density is only 110 cubic inches to the lb. There is much more chamber room in the gun, and therefore the variation in pressure and velocity is not so great as it is when cordite is packed in a comparatively small space.

I may mention (to show what great things we may hope from cordite) that the new Naval 12-inch gun, 35 calibres long, will have an 850 lbs. projectile against the service projectile of 714 lbs.; it will have a muzzle velocity of 2400 feet at least (2500 I had hoped for) against the present velocity of 1800 feet, or something like that; and the breaching mechanism of this 12-inch gun will be only very little larger than the breaching mechanism of the 8-inch gun—the reason being that the charge of cordite is so small comparatively that the gun can be made much smaller; and the breach-screw will only be, if I remember rightly, 12½ inches diameter—that is just the size it is for the 8-inch gun. So you see that the direct advantage we shall get in a gun specially made for cordite will be that all the breaching mechanism will be lighter.

With regard to erosion we do not know much yet; but a 4·7-inch gun has fired over 1200 rounds and is still serviceable; whereas the same gun fired with a much lower muzzle velocity with black powder becomes unserviceable after 800 or 900 rounds. I think it extremely probable that, from the absence of any liquid or solid matter mixed up with the gasses produced by the explosion, our larger guns will suffer much less in proportion than the smaller ones; but that is of course a matter that has still to be proved by actual experiments.

The Chairman—I think there is nothing left for us to do but to thank Colonel Barker for his most interesting lecture.

THE BROME-WALTON FAMILY.

Mary Hickes ..... (Sister of Richard Hickes, Esq., J.P., lord of the Manor of Charfield, Gloucestershire).

married (1st) 1710

Joseph Walton (Merchant of Southwark, London). d. about 1714–15.

(2nd) 1717–8

Charles Brome, R.A. d. Capt. R.A., about 1763–4.

Buried in St. Nicholas Churchyard, Plumstead.

Joseph Walton, became *Joseph Brome* on his mother's re-marriage. b. 1712., d. 1796, aged 84, at Brome Hall, Shooters' Hill, Lieutenant-General, R.A., Colonel-Commandant, and Master-Gunner of England. m. (in Minorca) Jane Mercator, 1732, daughter of the King's Muster-Master.

Robert Brome, Lieutenant 37th Regiment, d. of wounds on the battlefield of Minden, 1 August, 1759.

Buried in St. Nicholas Churchyard, Plumstead.

Joseph Walton, Lieut.-Genl., R.A., Colonel-Commandant, Master-Gunner of England, d. 24 March, 1808; aged 74. m. The Dowager Lady Strachan.

Charles Mercator Brome Walton, Colonel 1st Life Guards, J.P., b. at Fontenoy, 11 April, 1745, d. 6 May, 1815, aged 70, at Charfield, m. Mary Ann, daughter of Robert Storey Walker of Westminster.

William Lovelace Walton, General Coldstream Guards, Colonel, 5th Regt. of Foot (Northd. Fusiliers). d. 11 Jan., 1815, aged 77, Onslow Square. m. Harriet, daughter of Peter Henry Lovell, of Cole Park, Wilts.

Joseph Strachan S. Walton, Lieutenant, 25th Light Dragoons, d. 1811 at Bangalore, E.I.

Charles Walton, Major, 4th Queen's Own Dragoons, d. 7 Nov., 1837, aged 57.

Fanny, now residing in the Queen's House, Tower of London, *Great Granddaughter of Lieut.-General Joseph Brome, R.A., Mr.-Gunner of England.*

Mary Rose, d. 14 Feb., 1885. m. Lt.-Genl. G. B. Milman, C.B., Major of the Tower of London, (son of Lt.-Genl. Milman).

Angelina Frances Milman (Only Child), residing in the Tower of London, Great Great Granddaughter of Lt.-Genl. Joseph Brome, R.A., Master-Gunner of England.

Ellys A. S. Bendyshe Walton, Capt. E. York Militia and J.P. d. 22 Feb., 1874; aged 53.

Bendyshe W. Ellys, d. 19 Oct., 1885; aged 30.

Norcliffe Walton, Capt. 94th Regt., formerly of 17th Regt. d. 1859.

Bendyshe Walton, Lieut.-General, C.I.E., formerly Major 53rd Regiment.

Francis Walton, Capt. Royal Engineers, d.

Chas. Bendyshe Walton. Indn. Civil Service.

Bendyshe, Indn. Civil Service.

Ellys William, Capt. R.E., Bengal.

Herbert, Lieutenant, Indn. Staff Corps.

Lewin Barlow, Lieutenant, Indn. Staff Corps.

Graham (2nd Lt.) 2nd Rl. Warrick, Ceylon.

Great Great Grandsons of Lieut.-General Joseph Brome, R.A., Master-Gunner of England.

NOTE.—The other members of the family, descended on female side, omitted (for want of space) notably the Rev. A. P. Cornwall of Chichester, great grandson of General Brome, nor can I introduce Dr. Wm. Wallford, of Brome-Walton Lodge, Brixton.—R.H.M.

.MILY.

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Francis Walton,
Capt. Royal Engineers,
d.

shе,
Service.

Ellys William,
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Herbert,
Lieutenant,
Indn. Staff Corps.

Lewin Barlow,
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Graham (2nd Lt.)
2nd Rl. Warrick,
Ceylon.

sons of Lieut.-General Joseph Brome, R.A., Master-Gunner of England.

the Rev. A. P. Cornwall of Chichester, great grandson of Lodge, Brixton.—R.H.M.

MEMOIRS
HISTORICAL AND BIOGRAPHICAL.

THE BROME FAMILY.

BY

MAJOR AND QUARTERMASTER R. H. MURDOCH, R.A.

(Assistant-Superintendent of Records).

Chapter I.

Individuals bulk largely on the horizon of Royal Artillery history; and their memoirs are of value in the ratio of the capacity of these to reflect light upon untrodden or obscured paths which lay open to former explorers of the history of the Regiment. Individuals, and groups or families, imperfectly and not known to the present generation of gunners, might justly claim precedence over the *Bromes* in the Royal Artillery Pantheon; and their contemporaries, the *Cleaveland* family (the founder of whom was the Herodotus of artillery history), and the *Toveys* (a race of fighting soldiers, the founder of whom was the true modern Shrapnel), run closely at their heels to the entrance to the Valhalla—for canonization by the Royal Artillery Institution Committee: but priority is now given to the *Brome* family for the following reasons:—

(1) They have been ignored, somewhat significantly, in "England's Artillerymen" (Browne), and in "The History of the Royal Artillery" (Duncan)—their founder being *fils du regiment*, and not having emerged out of the Public Schools or from the Royal Military Academy.

(2) They moved through a more extensive and varied artillery zone than any other family of the regiment, having joined hands continuously from the XVIIth well into the XIXth century; and they possessed "health, then wealth, then wit to guide them."[1]

The continuous regimental record of the Brome family extends from *anno* 1698 to 1830—a period of one hundred and thirty-two years; and although other members of this family attained to high distinctions in

[1] Carlyle's Review of Sir Walter Scott's "Life of Robert Baily, the Covenanter."

other arms and in the scientific world, interest will mainly centre in the founders of this family who were gunners.

The artillery Bromes were :—

Sire	Charles Brome, ...	1698 to 1760 = 62 years' service.[1]	
Stepson	Joseph Brome (Walton)	1721 to 1796 = 75 ,,	,,
Sons of Joseph ...	Joseph Walton ...	1753 to 1808 = 55 ,,	,,
	Thomas Walton ...	1768 to 1830 = 62 ,,	,,
Adopted son of Joseph	Joseph Brome (2nd)	1794 to 1825 = 31 ,,	,,

Charles joined the Artillery as a boy Matross—*i.e.*, apprentice gunner, in 1698,[2] to learn the "art and mysterie" of gunnery;[3] was enlisted as Matross on 2nd February, 1709; promoted (sworn) Gunner in 1718; and retired on full pay in November, 1760, as Captain commanding a company—having previously been the first Commandant of the Royal Artillery in Nova Scotia.

Joseph (1st), as the first drummer of the Royal Artillery in Minorca, 1721, died in 1796, a Lieutenant-General, Master-Gunner of St. James's Park and Whitehall (also lord of the Manor of Charfield);[4] having been *aide-de-camp* to three Commanders-in-Chief and Master-Generals of the Ordnance, thrice Commandant of Woolwich Garrison, and with a distinguished service reward of £182 *per annum*.

Joseph Walton entered the Royal Military Academy as Gentleman Cadet on 1st June, 1753, and died in 1808, a Lieut.-General, first Colonel-Commandant of the Invalid battalion, and Master-Gunner of Whitehall and St. James's Park.

Thomas Walton, from 1768 to 1830, served as an Officer of the Ordnance (civil department), and was distinguished for his artillery inventions and scientific attainments.

Joseph Brome (2nd) received a direct commission from the Crown, as Second Lieutenant of Artillery in August 1794; and died while in command of the Royal Artillery in Jamaica, as Lieut.-Colonel, in 1825.

Thus, each worthily represents a type of four out of the six former

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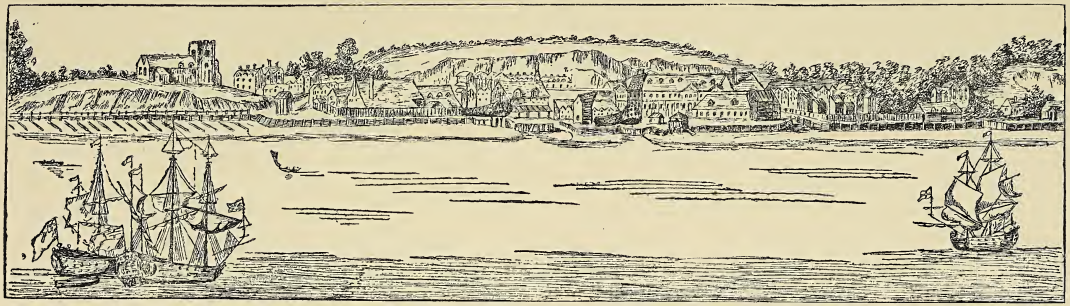
[1] *Sixty-three* years, according to Royal Warrant of 13th July, 1761; but this is reckoning to date of the Warrant.

[2] "Woolwich in 1698" is the subject of a fine engraving, plate 20 in Vol. VI. of "The Records of Woolwich" (Vincent), which is herein reproduced by kind permission of Mr. Vincent, Woolwich.

In 1698, each gun had its gunner, and each gunner was assisted by two matrosses, of whom one was a boy. . . "and their boies shall diligently watch upon their masters, and abide by them, to see what they have need of, or any thinge should lacke as in powder, stones, pellets, &c."—Grose's *Military Antiquities*, Vol. I., pp. 203, 226. Cleaveland MSS., p. 102 (Note 2).

[3] "Kane's List," p. 3 gives only the date of appointment to Matross in 1709.

[4] See also "Succession List of Master-Gunners of England, p. 27, in "Proceedings" R.A.I., Vol. XIX., Nos. 5 and 6.



modes of officering the Royal Artillery.[1] As, however, the pages of the "Proceedings" of the R.A. Institution are read far and wide outside of the regiment, it is necessary to remark that the careers of the two founders of the Brome family are types of the artillery of the past, and are impossible in the Royal Artillery of to-day.

The *Bromes* were of an ancient and honorable pre-Norman family, who "came over with the Flood," and the Aryan roots of the name B(ă)r—OM, signify "Sun's son" from *băr*, son, and *OM*, the sun or "fire principle"[2]—an appropriate name for the Boanergian "son of a gun," or gunner; but the immediate ancestors of this artillery family were Flemish skilled artificers settled in the Royal Dockyard at Woolwich and the *arthenal*[3] at Greenwich, where 2000 artificers were employed, among whom Peter the Great was at this time enrolled; and although the Woolwich branches have disappeared,[4] some families of the name are still residing in Greenwich and Deptford. The father of *Charles Brome* was probably employed in the gunpowder magazine and Royal Laboratory at Greenwich, which was then "the chiefest in Our Kingdom;"[5] and when Albrecht Borgard was, in 1698, commissioned to superintend the transfer of the Greenwich Laboratory to the Warren at Woolwich, the lad Charles Brome (then in his 16th year of age), in April 1698, became one of Borgard's "powder boys."[6] This service was reckoned as artillery service in the Royal Warrant of 13th July, 1761, which recites that "Whereas Charles Brome, Esquire, a "Captain in Our Royal Regiment of Artillery, hath served well sixty-"three years in Our said regiment. . . ."—evidently because of his having been sent on active service soon after enlistment; and, as for some years the record of his life is one with that of the great Master of Artillery (Borgard), he must have been attached to the personal service or staff of that distinguished Commander.

In 1698 (when Brome enlisted) there were not in the kingdom any

[1] The remaining modes were (5th) by graduating through the Royal Military Academy as N.C.O. Cadet; and (6th) by obtaining commissions for raising a certain number of recruits during war, or for passing a public competitive examination in scholastic subjects.

[2] "Origin of Language" (Kavannagh). "Science of Language" (Max Müller).

[3] *Arsenal*, derived from the Romaunt *Arthenal* or "naval citadel." Camden's "Britannica," published 1695, names Deptford, Woolwich, Chatham, Sheerness, as "the arthenals of the Royal "Navy in Kent." *See* also "Historical Notes on Royal Arsenal," p. 247, by Lieut. Grover, R.E.

[4] The last of the Bromes, whom I can trace, in Woolwich were John, brother of Charles, married at St. Mary's, Woolwich, in 1714; and his two children, Mary (born 12/10/1715), and George (born 25/1/1718), who were baptised at St. Mary's.

The Woolwich parish registers of 17th century are curious, and contain lists of Woolwichers (*a*) who were certified to have been buried in woollen (prior to general interment in coffins)—under Statute of Charles II., which was repealed in 1814. ("England in the 18th Century," Vol. III., pp. 504–6); and (*b*) who were sent to Westminster to be touched by the King for the "King's Evil."

[5] Board of Ordnance letter book, *anno* 1700. At this period 5000 barrels of gunpowder were magazined at the Greenwich Arsenal, from the fleet, *ibid.*—in replacement of the 5000 barrels removed in October 1694 to Gravesend and Tilbury, the estimate for a new Royal Laboratory, at Woolwich Warren, having been sanctioned only in 1694. Purfleet replaced Greenwich, in 1759, as the principal powder magazine of the kingdom, on complaint of the Greenwich inhabitants of the danger to their Town, only a quarter mile distant. *Records of Woolwich, Vol. VII., p. 220.*

[6] Henry Maudslay, the eminent Engineer, was also a "powder boy" at Woolwich, 1780.—*Records of Woolwich, Vol. V., p. 214.*

Barracks,[1] other than for the Guards, and these were some chapels, near the Tower, of disaffected nonconformists, seized by the Crown (*vide* B. of O. letter book), and in Forts:—soldiers were billeted; and were mustered, by the King's Muster Masters, at varying intervals, until monthly musters were established in 1715. Each Colonel had his own Standing Orders—no general regulations being in existence for discipline and exercise of the troops.[2] Borgard's orders are preserved at Woolwich.

In 1688, Matross *uniform* consisted of striped jacket and breeches, blue stockings, felt cap, neckcloth, shoes and buckles (*Cleaveland*, p. 110); but the artillery uniform, *temp.* Queen Anne, may be generally described as blue blouse, felt hat,[3] and pantaloons ("coates of blue, "with brass buttons, and lyned with orange bass, and hats with orange "silk galoome"); but each Commanding Officer "cloathed" his men much at his own caprice, deducting the cost out of pay due to the soldier, until 30th November, 1747, when the Duke of Montague, then Master-General, whose *bonhommie* was equalled only by his religious love of uniformity and order,[4] directed that the Royal Artillery be be clothed by Mr. Loudon of London, also annually, at average cost of £3 10s. per man—which order cancelled that of the Duke of Schomberg, quoted by Duncan in Vol. I., p. 59.

From 1698 to 1715 the *pay* of a (sworn) gunner was two shillings *per diem.*, and that of a matross and assistant one shilling and eightpence respectively; and there was no higher grade in the ranks than bombardier. The men were paid very irregularly, at intervals of two to six months; and Ordnance letter books show that officers were frequently settled with twelve months in arrear—cash being a rare commodity until after the Peace of Utrecht.

The personal *equipment* of a gunner comprised horn (for priming powder), priming iron, compasses, plummet and quadrant (for directing peeces), piece of chalk, tape or measured string, level (for testing mortar platform, &c.)[5]; and the matross carried dagger, Snaphance

[1] *Barracks* (never Barrack)—*i.e.* War- (Gr.) oikos, (Mars- (Gr.) oikos or War House)—*b* being in all languages interchangeable with *w*. Hence, the final *s*, in barracks, may not be left out (as in Johnson and Webster).—*Orig. of Lang.* (Kavanagh), Vol. I., p. 73.

[2] "Military and Martial Law" (Clode), p. 11. The earliest regimental Muster-Roll in the R.A. Record Office, at Woolwich, is for the year 1717.

[3] These *felt hats* (species of sou'-wester) were made by the Company of Felters, who were incorporated under Henry III., and who, down to the 18th century, continued to supply also the *felt wads* for guns. In 1747 the felt hats were called felt caps, and by the "Dress Regulations" of 22nd April, 1803, a *lacquered felt cap* was to be issued every two years.

An eye-witness at Agincourt states (*in rerum Britt. medii ævi scriptores, p. 193*) that when the army lay before Bouves, where was an immense quantity of grape wine in tubs, the English filled their *felt caps* with the wine (whereas the French had leather bottles for the purpose), which Henry V. forbade, saying that "most of them made bottles of their bellies without measure, which was not good for them." The folio quoted reads *bottles* instead of *felt caps;* but on a former occasion there was another account, in the Public Record Office (which I could not again find on recent visit), giving the *felt cap* version.—*R.H.M.*

[4] This Duke of Montague, since 1722 the first Grand Master of Speculative Freemasons, was at same time also the first Grand Master of Speculative Artillerists, in consolidating by Royal Charter, 1741, the Royal Military Academy, which had been founded, in 1719, as the school of theoretical instruction in Woolwich Warren. From 1741 artillery likewise emerged into a speculative science founded upon an operative art. *Ordnance Letter Book, Military. History R.M.A.* (1851 Ed.), p. 51. Grewenitz (*Traité*), p. 59. *History Freemasonry* (Gould), Vol. II., pp. 125, 126, 282.

[5] Müller's "Treatise on Artillery."
The Gunner's Glasse" (1646), by Master-Gunner Eldred, p. 76.
Papers respecting the Military Society (1772), p. 32.

musquett, and half-pike: the dagger (forerunner of the bayonet) was screwed into the muzzle of the musquett at close quarters (specimens are in the Tower)—for the bayonet proper was adopted in England between 1690 and 1715[1]—and the half-pike served also for musquett rest, when firing.

Disciplinary punishments during the same period were severe, and sometimes brutal—although the first Mutiny Act of William III. enacted that such must not involve loss of life or limb, save by sentence of court-martial;[2] the army, formerly the "King's Men" or Guards to the Sovereign,[3] being under that Act henceforth National.[4]

On 1st October, 1715, Gunner Robert Hughes petitioned the Board for pension because Captain Briscoe, at Gibraltar, had broken the gunner's arm and knocked out one eye:[5] the Board directed that Capt. Briscoe be court-martiall'd; but the Captain was not tried, and must have justified his philistinism. Minor offences were generally punished by the *lock-up* (with bread and water), or the *black hole* (with irons): but for non-capital crimes the *Wooden Horse* for infantry, and the *Picket* for cavalry and artillery were the favorite modes of enforcing court-martial sentences, until flogging by drummers came into vogue in Flanders, 1742. For offences affecting the character of the corps, *running the gantelope* was universally practised until 1742.[6] The "Wooden Horse" (one remained on the parade at Portsmouth about the year 1760) is described in the 1786 *Ed.* of Grose's "Military Antiquities" as having a ridged back, on which the infantry prisoner was mounted, with his hands tied behind him, and a musket tied to each leg (to prevent his falling off). In the "Picket," the cavalry or artillery prisoner, while standing on a low stool, had drawn up, to its utmost limit, and fastened by noose to a post (picket), that right hand which on enlistment he had voluntarily held up on attestation of his being a good and loyal soldier: the stool being removed, a stump of same height, with rounded blunt point remained, on which the bare heel of the sufferer rested in torture, generally for 15 minutes. In "running the gantelope," the corps or regiment, formed in varying depth, opened and faced inwards, each man being furnished with a

[1] In 1686 drill-book, called *dagger;* in that of 1690, *bayonet.* So that in latter year Colonels of Infantry may have procured private supply of the N.P. Bayonet Musquett. The drill-book of 1728 shows the bayonet fixed so as not to prevent loading and firing, after the manner of the French *bayonet à manche.* Grose (Vol. II., pp. 340-1). Grose is "at sea" in attributing the bayonet to French origin, and owned to having failed to discover the date of official adoption in England of the bayonet. (Vol. II., pp. 341-2). The first supply (20,000) of "Musquetts with Bayonets" was purchased in Holland by the Board of Ordnance, in 1715, to replace the Snaphance (dagger) musquetts—*vide* p. 18 of B. of O. "Significations," dated 6/12/1715; and other books record the names of the Holland firms, with the prices. Lieut.-Col. Hime ("Proceedings" R.A.I., Vol. VII., No. 3, p. 128) names 1693; but does not quote authority, and probably meant the introduction on the Continent.

[2] Clode, p. 49.

[3] Hence the term "Regiment," *i.e.* Regis-men or the King's men. On 30th August, 1642, Warrant of Earl of Essex directed the Surveyor of y^e^ Ordnance to "deliver to *my own Regiment* "120 musketts, &c." Yet Grose, writing in 1786 (Vol. I., p. 242), asserts. . . "Nor is this word (Regiment) one hundred years old; nor do I know of what language it is!"

[4] Military and Martial Law. (Clodo) pp. 7 and 8.

[5] B. of O. letter book, 1/10/1715, p. 12.

[6] Grose's "Military Antiquities," Vol. II., pp. 106 to 109.

switch or "cat," and the prisoner (naked to the waist) marched through the interval, preceded by a N.-C.O. with reversed halbert, each soldier giving a stroke: or, halberts were fixed triangularly and one transversely, to which the prisoner was secured, and the soldiers, in marching past from the right, each, with a "cat," delivered his stroke.

Only some 40 years prior to *Charles Brome's* enlistment, in 1698, had *bows and arrows* ceased to dispute with gunpowder arms,[1] and with the *leather guns* of Gustavus Adolphus[2] the Lord General "thundered with his ordnance;[3] while the *bayonet* has been shown to have replaced the *dagger*, in the Line 1690, and in the Artillery only in 1715;[4] and the *iron ramrod*, which was to work wonders for Frederick the Great, was not brought into use (in lieu of the wooden ramrod with bone button) for some 40 years afterwards[5]—although the *breech-loading* ordnance, of 1338, in England and France[6] had been "invented," in 1645, by Captain Peter Cannon of the artillery;[7] and, in 1681, Captain Leake (Master-Gunner of England) had "invented" the *red hot shot*, of Julius

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[1] In 1643, the Earl of Essex had raised companies of Roundhead archers. *Grose*, Vol. II., p. 273. The last occasion on which the Bow and Arrow were employed in the English army is thus narrated by the eye-witness, Gwynne, in his "Memoirs of the Great Civil Wars" (Ed. by Sir Walter Scott, 4to, 1822, p. 39):—"I, having the guard by the river side (Devizes, Wilts), and "standing by Sir Jacob Ashley, a bearded arrow stuck into the ground betwixt his legs. He "pluckt it out with both hands, exclaiming, 'You rogue, you missed your aim.'" The late General Sir Alexander Dickson added the following comment on this:—"This is perhaps the last "mention of the use of the Bow and Arrow, in England, in actual battle."

[2] One of these leather guns is in the Rotunda at Woolwich, No. 761.

[3] Cust's "Civil Wars:" and Gwynne (eye-witness), p. 42, describes the last use of leather guns thus:—"At Copredy Bridge, and thereabouts, we overtook Waller's army, which we engaged and "beat, took Weemes, General of their Artillery, prisoner, and withal took his leather guns, *which* "*proved very serviceable.*" (*Note.*—These small brass or copper and leather guns, seven in number, were mounted in barricadoes of wood, each of which stood on wheels, drawn by horses; and thus formed a species of moving battery of light or flying artillery. *Clarendon's History*, p. 522). And, on p. 55:—2nd battle of Newberry. . . . "Sir Richard Page needed no such orders—"for they came near to him as they moved by: nor could they come to charge Sir George Lyle "but thro' the enemy's fire—for Sir R. Page, with his leather guns, loaden with key shot, and his "400 musketters in the dry moate, played between the pailes upon the flanks of them." (*Note.*—Sir R. Page was advantageously posted in a castellated and moated mansion called "Stonehouse," which Cromwell's and Manchester's forces were compelled to pass in advancing to the attack).

[4] *Vide* Note 1 on page 297 hereof.

[5] "Frederick the Great" (Longman), p. 16—*ibid.* (Brackenbury), p. 44, in which latter Colonel C. B. Brackenbury, R.A., terms the rapidity and efficacy of loading a very "trifling development;" yet shows (p. 65) that the iron ramrod was a potent factor in the defeat of the Austrian cavalry at Mollwitz, and (p. 128) at Lobositz the Prussian cavalry, in their two desperate charges, were taught the lesson of the iron ramrod—viz., that unarmoured cavalry may not approach infantry when rapidly and efficaciously served. At this time Marshal Saxe ("Memoirs on the Art of War," page 45) "invented" body armour which was proof against pike, and musket ball that had not been "well rammed down." At Waterloo, even with the improved musket, ramrod and fixed cartridges, the French cavalry coolly "walked their horses round the British squares;" but these were cuirassiers, who were defended by their armour." Kelly's "Waterloo," p. 49.

Note.—During the Parliamentary Wars, Hazlerigg's "Lobster" Regiment were cuirassiers.

[6] "Ancient Cannon in Europe," pp. 291, 297, by Lieutenant (now General) H. Brackenbury, R.A.

[7] *Extract from the Royal Commission Report, dated 26th September, 1645*:—"Petition of "Captain Peter Cannon." "Petitioner was one of ye first employed to provide ye trayne of "Artillery for ye State: and to show his fidelity to ye cause of God maintained by Parliament, he "has spent much time and money in *inventing* iron and brass ordnance to be *loaded at ye britche*, "as others are at ye mouth. In this way they may be loaded and discharged much oftener than "others, and are more secure by sea and land, to the saving of gunners killed in loading and "spunging other ordnce at ye mouth. . . . ."

Note.—Specimens of early breech-loading cannon are at the Rotunda, at Woolwich. They were extensively employed by the Navy.

Cæsar, which were afterwards to be employed by Frederick the Great, in 1741, in Silesia with much effect.[1]

The subject of the artillery of the first half of the seventeenth century has been too ably handled in Vol. I. of the "History of the Royal Artillery" (Duncan), and in the brilliant essays on "The Mobility of Field Artillery" and on "The Field Artillery of the Great Rebellion" (Hime)[2] to justify much digression at present upon this topic; but quite a false impression will be carried away by the student of those professional treatises if he take the measure of the strength of the weakest developments to be a measure of the strength of artillery proper at that period.

"Mobility" concerns only *Field* Artillery, and Field Artillery is a factor quite distinct from *Siege* or *Garrison* Artillery: the mobility of Field Artillery was a "product of the inter-rivalry of arms."[3] How effectively *Siege* (or *Position*) artillery of England, from the days of Henry III. down to the 17th century, persistently maintained the superiority of Attack over the Defences of each succeeding age of fortification has been illustrated by the Royal Artillery "War Services" in the "Succession List of the Master-Gunners of England."[4] Colonel Hime had to admit that the "vice of the (field) guns of the seventeenth "century was not so much the fault of the guns as of the gunners,"[5] and that "the guns in themselves were not very far behind those in "use at the outbreak of the Peninsular War:"[6] while it is open to question whether the accuracy of practice in the 19th century, with the aid of range-finders and the perfection of gunpowder, much exceeds that of the sixteenth century, when, "if the gunner be not acquainted "with y^e^ Peece and Mark, to fayle at y^e^ first shotte is passable, and at "y^e^ second is pardonable, but to fayle of a fair shotte at y^e^ third time "is too much, and argues but little judgment and discretion in such "gunner."[7] Indeed, Grewenitz observes that in France, in 1671, artillery was considered as "an arm and a science, although looked "upon elsewhere as a mechanical art." *Traité*, p. 59.

The gunpowder (but with refined saltpetre) was of the same ingredients—saltpetre, sulphur, charcoal—as discovered in 1320 by the German monk, Schwartz, and in 1216 by the English monk, Bacon, from the ancient MSS. or parchment treatise of Mamus or Marcus

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[1] "Records of Woolwich" (Vincent), Vol. VII., p. 320. *de Bello Gal.* Lib. V. "Frederick the Great" (Brackenbury), p. 58.

[2] By Lieutenant (now Lieut.-Colonel, retired) H. W. L. Hime, R.A. "Proceedings," R.A.I., Vols. VI. and VII.

[3] "Proceedings" R.A.I., Vol. XIV., No. 3.

[4] "Proceedings," R.A.I., Vol. XIX., Nos. 5 and 6.

[5] "Proceedings," R.A.I., Vol. VI., p. 292. In "His Modern Artillery," p. 297, Colonel Owen adds ". . . in the time of the Tudors the calibres of guns were much the same as those of "cast S.B. ordance of the present day (1871)." "We have, now," (1772) writes Captain Jardine, "pieces 200 years old of better metal than that now used." *See Abstract of Papers relating to the Military Society, p.* 27.

[6] "Proceedings," R.A.I., Vol. VI., p. 284. Two splendid specimens of 42-prs., brought over from Ireland in 1547 by Henry VIII., are now in the Tower of London, and one in the Rotunda at Woolwich. Six 42-prs. were taken from the Spaniards at the capture of Minorca, 1708. Throughout all the Peninsular sieges no land service guns exceeded 24-prs.—*R.H.M.*

[7] Robert Norton's "The Gunner," *anno* 1628, p. 284.

Graecus;[1] which again was only a slightly improved proportion of the same ingredients in the "Greek Fire" (gunpowder) of the Ancients.[2]

In fact, the identity of the ingredients of the "Greek Fire" of Byzantium with the gunpowder of mediæval Europe, the Greek names given to the weapons by the uncultured Flemish artificers (involving profound philosophical and psychological significations), and the size, calibre (15 to 19 inches), and finish, of the great cannon of fourteenth century manufacture,[3] which could not have grown up, like a mushroom, in one night, confirm the *dictum* that in the 14th century "the Weapons of the Titans were placed in the hands of children."[4]

Greek Fire of Byzantium	Gunpowder of 1520.
Saltpetre, 4 ...	4
Sulphur 1½ ...	1
Charcoal 1 ...	1

(Palgrave) (Grose Vol. I., p. 398).

* * * * *

"Who, *by one proof and another*,
"*Learn't to know their powers*

* * * * *

"Of *Bombard*, *Gun*, according to its frame
"Or single *Cannon* this, or double name;
"Which split or shiver steel and stone outright,[5]
"And where the *Bullet* passes makes a road.

* * * * *

"Down to the *Sword*,[6] restore thy weapons bright
"Sad soldier to the forge, a useless load,
"And gun or *Carbine* on thy shoulder lay;
"Who, without these, I wot, shall touch no pay."
Count Ariosto *anno* 1516.

But *revenons a nos moutons*!

In 1702. *Charles Brome* served under Major Borgard[7] with the

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[1] "The Master-Gunners of England," ("Proceedings," R.A.I., Vol. XIV. No. 3), p. 13, Note 4. Neither Bacon nor Schwartz "invented" gunpowder: both Monks doubtless alike "discovered" the prescription from the Marcus or Mamus Graecus parchment. It is remarkable that the Freemasons also trace their Charters and knowledge of the mysteries of nature and science to the ancient parchments of "Mamus or Namus Graecus," who brought science into modern Europe, *anno* 1000, *vide* "History of Freemasonry," (Gould) Vol. I., pp. 97, 248., Vol. II. p. 248.

The French, who were artillery scientists, while the English were mere mechanicians also call *Marcus Graecus* their "first father," *vide* Le Blond's *Traité d'Artillerie*, p. 4 (translated in 1762, copy of which, in excellent condition, is in possession of Capt. W. Weston, 3rd Kent Artillery, Woolwich). Le Blond (p. 4) gives the title of the treatise of Marcus Graecus as *Liber ignium*.

[2] We are indebted to that prince of antiquarians, Sir Francis Palgrave, for this discovery, *vide* preface to his "Merchant and Friar." See also "Our Engines of War," by Col. H. J. White-Jervis, R.A., M.P., pp. 8, 9.

[3] "Proceedings," R.A.I., Vol. IV., No. 1.

[4] "The Master-Gunner of England," p. 11.

[5] The *Orlando Furioso*, of Count Ariosto, *anno* 1516, stanzas XXI. *et seq.*

[6] This forecast of the diminishing value of Cavalry (the sword) was prophetic, for since introduction of gunpowder arms, "the Cavalry have not won a battle, though they may have lost one." *Duke of Wellington*, *vide* "Proceedings" R.A.I., Vol. VI. No. 12, p. 436, Note 1.
Yet, by a singular anachorism, the *sword* is the sole survivor in modern armies of the weapons of the ancients.

[7] General Borgard attained the age of 92 years, and died at Woolwich on 7th February, 1751. He had lived to see Charles Brome a Captain commanding a company, and Charles Brome's son a Captain R.A. and A.D.C. to the Master-General of the Ordnance.

Sieges of
1702 Fort St. Catherine, Cadiz.
„ Fort Malaga.
„ Fort Duran, Vigo.
1705 Town and Castle of Valencia d'Alcantra.
1703 Ciudad Rodrigo.
„ Alcantra.
1708 Capture of Minorca.

artillery of the Bomb Vessels against Cadiz (Borgard's specialism being his skill in the new use of mortars,[1] many of which he designed, which skill is specified in the first British Warrant conferred upon him) in the Expedition under the Duke of Ormond and Admiral Rooke, during the war of the Spanish Succession: and until 1709 Brome's war services may be said to be a rehearsal of those so graphically described by Borgard himself in his Memoirs, pp. 93–4 of Vol. I. of Duncan's "History of the Royal Artillery," including the siege and capture of Minorca in 1708.

Minorca seems to have held an abiding fascination over *Charles Brome*—a foreign station, with delicious climate and environment, at which he was afterwards to spend a quarter of a century of his life, and with which the fortunes of himself, his son, and grandsons, were to be intimately associated. From the capture of Minorca, in September 1708, until 1st February, 1709, Borgard and Brome remained in the Island "regulating the artillery" and the vast armament of 250 pieces of ordnance determined on for its future establishment.[2] Major Borgard tells us that in February 1709 he proceeded from Minorca in command of the Artillery train against Villa Nuova, on the River Segra, Catalonia;[3] and on 2nd of the same month and year Charles Brome was promoted to the grade of Matross[4]—*vide* "Kane's (Artillery) List," p. 3, and Ordnance Letter Book *in loco*. Whether this promotion involved separation from Major Borgard, or whether Brome accompanied that distinguished commander throughout the eventful campaigns until the expedition into Scotland in 1715, it is impossible accurately to determine, as Artillery muster-rolls have been *regularly* preserved only since

Duncan, Vol. I., pp. 94-6.

[1] And why *Mortars?* Because the monk and chymist, Schwartz, discovered the force of gunpowder by the blowing up of his *Mortar and Pestal—(Traité d'Artillerie*, by Mons. Le Blond, (1742) p. 5. In pp. 132, 135 Cleaveland MSS. Mortars 13″ (first employed by Captain and Master-Gunner Silver) in Marlborough's campaign, 1693, were the "making of the modern Royal Artillery," and Borgard the Dane secured the services of the English expert, Silver, in the Spanish wars and capture of Minorca (referred to above). Mortars were first employed by the French in 1634 *(Traité d'Artillerie*, par Le Blond (1740) p. 37.

[2] "Hist. R A." Vol. I, p. 94. These were, in 1715, reduced to 200 pieces—42-prs. being the heaviest. (B.O. letter book, 1715).

[3] "Hist. R.A." Vol. I, p. 94.

[4] *Matross (derivation)* from ..... (Gr.) Matros, *i.e*, inspector, (Gr.) Metros ..... measurer, "Search y^e peece" "Guage y^e peece" are positions 3 and 13 in "Eldred's Drill Book," 1616.

Latin, *matrix*; as *crux*, *cruces*, became Anglicised into cross, crosses, so *matrix*, *matrices* (*i e*, bore of gun) became matross, matrosses.

Matross duties.—To assist the gunners in traversing, spunging, loading, and firing guns, &c. They carry fire-lock with bayonet since 1715 (prior to which a dagger and Snaphance musquett) and half-pike, and march as guard opposite the gunner, and guard the pioneers and waggons. Every peece hath its gunner, with his mate, and a man (boy) to serve them both, and helpe them charge, discharge, mount, wadde, clense, scoure, and coole y^e peece being overheated. The advanced guard to clear the road and put out of the way fire, or smokers of tobacco.—Cleaveland *MSS.*, pp. 102, 259.

Matross history.—Matrosses are first distinctly so named in the English Artillery Trayne of 1639 (Cleaveland p. 36), after the war with France, but were the "mates" or "servitour gunners" of *temp.* Hen. VIII., and the "villeins" of Hen. III., who assisted the "master gunner," but retained the official designation of "Matross" until 1783 (1798 in the Royal Irish Artillery), when the grade was abolished and the gunners proper were given the option of continuing to serve as "gunners" but on "matross" pay, or of transfer to the newly-formed Invalid (veteran) Battalion (of which a grandson of Chas. Brome became the first Colonel Commandant). So long as any of the original gunners remained these were called "First Gunners."

1717 (and rolls for the particular interval are not at present traceable); but the details of the Trains of this period embraced the full establishment of *Matrosses,* and Borgard took with him from Minorca to Catalonia, in 1709, twenty of this grade.[1]

In 1716, however, we find *Charles Brome* doing duty at Woolwich Warren as matross; and as this epoch was not only a crisis in his career, but also had in it an element of romance, we may dwell for a little while over the details of this interesting episode.

On 9th January, 1718, Brome was again promoted and "sworn in"[2] as *Gunner*;[3] at once left Woolwich for the Tower of London, and in March 1718 embarked for service with the Train of Artillery in Minorca, in charge of ordnance and stores: but prior to this he had married under somewhat romantic circumstances—not unusual at this period, as, about the same period, three other similar and well authenticated instances occurred (one to the grandfather of an artillery officer who now holds high rank, and one which would fill a three volume novel of the Zola type).

The tradition, common in the regiment fifty years since, was that "Charles Brome, being a splendid, handsome man, ruddy and of fair countenance, of pleasing address, and one who had seen much war service," Colonel Borgard kept him in charge of the guard at the Warren Gate, where, being always careful to entertain strangers, he chanced to entertain an angel unawares, as among the occasional visitors was a young widow, comely and wealthy, to whom "Corporal Brome" acted so gallantly that the lady fell in love with him and they were married "right off the reel"—just as Queen Christina of Spain

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[1] Cleaveland *MSS.*, p. 168.

[2] For the last 200 years and upwards the *substance* of the soldier's engagement with the Crown has seldom varied. The mode of administering the Oath of Allegiance, until *temp.* George II., was for the magistrate to recite the Code or Articles, and for the soldier to hold up his right hand, saying, "I hold all these Laws and Ordinances as sacred and good, and will conform, fulfil, and keep them to the uttermost of my power."—Clode's *Martial Law*, pp. 27, 29.

How similar to the Roman *Sacramentum* described by Tiberius, 54, when the recruit (tyro) passed by the Tribune, holding up his right hand, saying "*Idem in me?*"

An interesting and instructive essay might be written on "Origin and History of the Soldier's Attestation and Records." Up to April, 1859, the 1st Battalion Office, at Woolwich, held attestations since William III., but on breaking up of the Battalions, in 1859, some vandals destroyed large quantities of this "rubbish;" this I learned from one of the office clerks. The earliest attestation preserved to the R.A. Record Office is dated 1773.

[3] *Gunner.* The terminal root *er, ir* (the *ir* of *vir*), of Aryan and Sanscrit=Man. *(Origin of Language*, (Kavanagh), Vol. I., p. 422). *Gunner*, therefore, is literally the Gûné's Man. In the flogging days in the Navy, to be tied up to the gun (carriage) for such punishment was termed "kissing the gunner's daughter;" and "son of a gunne," for gunner "is as old as the hills." (*See* "Technological Dictionary," *in loco*).

Gun, from (Gr.) gûnee, gunaikos (cwēné, Anglo-Saxon), woman, female; and this from the Sanskrit *gânâka*, which, according to Max Muller, means "Chiefest," "Head over all," &c. (*Origin of Language* (Kavanagh), Vol. I., p. 422, Vol. II., p. 17). (Gr.) Gûnee (ge-on-é) has for its roots gee-earth, ON (sun, fire principle), ee (emanation), i.e. Promethean fire: but its prime is, of course, ON, comprised under the "fire" element, or Sun. In the 14th century the Scotch pronounced the word *gewnies* (*gynnys for crakys—vide* p. 6 of "Succession List of Master-Gunners of England"); and for same period Lieutenant (now Lieut.-General) Henry Brackenbury quotes Walsingham as referring to *gunnas suas, quas Galli canones vocant.* ("Proceedings," R.A.I., Vol. V., No. 1.) Anglice, *gonne.* The Scotch (who always excelled in the genius of classics), and the Continentals, invariably gave their cannon femine appelatives, to end of 16th century; and, on the Continent, *Sancta Barbara* is patron saint of the Gunners. One exception is to be found, in England, *anno* 1513, when the masculine appelative *John Evangelist* ("Succession List," p. 10) was applied by some one who was more devout than intelligent.

"exchanged eyes," at first sight, with Private Munoy, who mounted guard at the Palace; created him Duke, and married him "right off the reel." Whence come affinities? The writer has sifted regimental traditions by the score; but has found few in which ascertained facts so fully corroborate tradition. The laws of "election of affinities" and of "hereditary"[1] were certainly at work in the happy union of this couple—

"Who lived and loved in Minorca
"Through many a changeless year;"

and their sons and grandsons were likewise favorites with the ladies.[2] Certainly, Brome's handwriting in the regimental pay-lists of the period indicates that he was a man of intelligence and of character; up to 1751 we find, in Woolwich Garrison Orders, Colonel Belford directing that . . . "the Guard is to consist of 40 men, ten of whom to be "the handsomest fellows in each of the companies;"[3] and the "Records of Woolwich" (Vincent), of the period, abound in incidents of Royal and gala visits to the Warren—the Guards being warned to admit only "such as appear to be ladies and gentlemen."

Widow, Mary Walton (*née* Hicks) had one child (Joseph), who was born in 1712 and was therefore between 5 and 6 years of age at his mother's marriage to Charles Brome: and the children of this second marriage, born in Minorca, were Mary—who became Mrs. Lethard—and Robert Brome—who was given a direct commission, in September 1756, by King George II., as Lieutenant in 37th regiment, and who died of his wounds on the battle-field of Minden, 1st August, 1759, when the six British infantry regiments, unaided by cavalry, and at first without artillery, so gallantly sustained the shock of the three arms of France.[4] From documentary vouchers, in possession of descendants of the Brome-Walton family, and from other sources, the history of Widow, Mary Walton, has been traced as follows:—Our old friend Isaak Walton, of angling fame, a draper of Fleet Street, London, and Joseph Walton, a felter and hatter, of Southwark, London, were Freemen of the City of London. Isaak married the sister of Bishop Kerr, and died in 1683. Joseph married Mary, sister of Richard Hickes, Esquire, lord of the Manor of Charfield, and died about 1715, leaving the infant son, Joseph, who was born in 1712. As felter and hatter, at Southwark, Joseph Walton had supplied the Board of Ordnance with the felt wads for guns and felt caps for the artillery.[5] Richard Hickes was son of Richard Hickes, retired Manchester merchant, who had purchased or inherited the manor and advowson of Charfield, Gloucestershire—from Sir Wm. Throgmorton, who held the manor in 1608—and by his Will, dated 25th April, 1741 (copy of which

[1] Boston Lectures—"Marriage" (Joseph Cook's).

[2] Joseph Brome-Walton (son) married—there is reason to believe—Jane, daughter of Nicolas Mercator, Muster-Master, Minorca, while yet a Gunner.
Colonel Joseph Walton, R.A. (grandson) married the Dowager Lady Strachan.
General Wm. Lovelace Walton, of the Guards (grandson), married heiress of P. H. Lovell, Esq., of Colne Park, Wilts, and so on.

[3] "History of the Royal Artillery, Vol. I., p. 147.

[4] "Operation of the Allied Army, 1757-1762, by an Officer who served therein," p. 109.

[5] *Vide* foot note 3 on p. 296 hereof.

lies before me) Richard Hickes (2nd) bequeathed the reversion of his estates to the "son, Joseph, now in the Island of Minorca . . ." of his favorite sister, Mary Walton, the widow who had married Charles Brome of the Royal Artillery.[1] (Walford gives the rental at £2000 a-year).

For many years, however, the Brome's remained in Minorca in obscurity; and promotions out of the ranks averaged only one per annum, several of which were appropriated by the Borgard family and their connections. In 1720, two *drummers* were sanctioned for the Royal Artillery, by Royal Warrant of 11th June, 1720, for Minorca—who enjoyed the privilege of Royal Regiments of wearing red coats;[2] and the first drummer enlisted was Mary Walton's little boy, then aged 8, who, however, first appears in the regimental pay-list of 1721[3] as "Drummer Joseph Brome," and subsequently as "Gunner Joseph Brome *alias* Walton (1732–3 only), after twelve months furlough to England."

In an age when British Artillery was yet an operative art, when skill in the use of the recently revived mortars was sparsely diffused, and the processes of refining saltpetre and manufacture of gunpowder and cartridges had to be carried out at the station, the value of Gunner Charles Brome, fresh from Major Borgard's laboratory and arsenal in the Woolwich Warren, was appreciated in Minorca—where were still surviving many of the gallant veteran Trayne (the company was not relieved until 1749), whom under Master-Gunner and Captain Silver, with Charles Brome as one of its matrosses, Borgard had captured Minorca and its garrison of 1000 French and Spaniards, after a siege from 25th August to 19th September, 1708.[4] "Captain and Master-Gunner" Leonard Jackson, then commanding the Artillery in Minorca,[5] at once promoted Brome to Bombardier; and Brome was further promoted, with exceptional rapidity, to the newly created grade of Corporal in 1722, to the newly revived grade of Sergeant in 1737, and to Garrison Sergeant of Mahon in 1830, a position which he retained until, on the breaking out of war, he was commissioned, on 1st July, 1740, as "Lieutenant Fireworker," in the 58th year of his age and after 42 years of continuous service. That Brome was a man of extraordinary vigour is evidenced by his subsequent war services.

Of the two Mediterranean Garrisons—Gibraltar (captured 1704), and Minorca (captured 1708)—the former was ever held in secondary

[1] The present Right Hon. Sir Michael Hickes-Beach, M.P., is a member of this branch of the Hickes family.

[2] Red coats for R.A. drummers were abolished in 1851. *Vide* Colonel Miller's "Essays," p. 23.

[3] Some preceding pay-lists are noted, in the bound volume, as "Wanteing," owing, probably, to their having been impounded by the Law Courts, some years afterwards, when Joseph Brome inherited the estates of his uncle, Richard Hickes (2nd).

[4] The History of the R.A. in Minorca requires to be re-written. A whole chapter (XXVI.) is devoted to eloquent portrayal of the gallant defence of 1781–2 (when Charles Brome's grandson, Capt. Joseph Walton, commanded R.A.), for which the Governor, Sir George Murray, was court-martiall'd; but no account is given of the brilliant defence of 1756 (for which General Pakenham was given a Peerage); nor of its original capture in 1708 by Borgard's mortars and howitzers. Nor have we details of the re-captures in 1756 and 1782.

[5] As *Master-Gunner*, the Captain of the Company was responsible to the Lieut.-General and Board for armament, &c.; and as *Captain*, to the Master-General for *personnel* and discipline—hence the composite rank, which Captain Jackson was the last to hold. Captain Jackson is, of course, not in *Kane*.

regard by Colonel Borgard during the many years in which he virtually dominated all artillery interests, was given a smaller train and establishment, mounted lighter ordnance (32-prs. *versus* 42-prs.), and their relative annual cost in 1717 was Port Mahon £3756, Gibraltar £2898; and notwithstanding the heroic bravery of the Gibraltar garrison during the subsequent great siege of three years, the baneful licensing system may account for the broad line of demarcation between its system of artillery training and discipline and that of Minorca: only two of the Gibraltar early officers attained distinction, or were, during Borgard's *régime*, given opportunities of active service elsewhere (and in the latter half of the great siege the R.A. Commanding Officers were *ex* Minorquins). But over Minorca Borgard watched with parental care and affection; he had captured it; its command he entrusted, in 1725, to the ablest officer of the time—Captain Thomas Pattison,[1] and kept him there *nolens volens* until 1737—energetic, rigid disciplinarian, one who throughout his whole career ever asserted and conserved the functions and status of the artillery. To Minorca Borgard had sent off five of his nephews, each of whom he made to pass through the ranks, and for four of whom he procured commissions early in life,[2] and when war broke out in Europe, Minorca yielded (before General Borgard yielded up the helm) the officers who were to mould the destinies of the Royal Artillery in the Seven Years' War. In Minorca Royal Artillery Officers first successfully maintained their right to be considered as integral parts of the army, and to rank in Royal Commission with other officers of the army; and the Royal Engineers obtained their first company (of sappers and miners).

Like Calais to Queen Mary, Minorca must ever lie near the heart of every British Gunner and Engineer. Minorca was, in fact, the combined Woolwich and Aldershot, School of Gunnery and of Engineering, of the day; and to Captain Pattison and Sergt.-Major Charles Brome the deservedly high character of that garrison was certainly due.

I cannot close this chapter without recording my deep sense of obligation to the following:—

Marquis of Salisbury, for instructing H.M. Consul for the Balearic Islands to search ecclesiastical archives of marriages in Minorca; Lieut.-General Milman, for portraits of General Joseph Brome and sons; Rev. A. P. Cornwall and Dr. William Wallford for Brome-Walton family documents; Capt. H. D. Jones, *D.-A.-A.-G.*, Gibraltar, for searching local records.

[1] Pattison was with Borgard and Brome at the capture of Minorca, 1708, as "Gentleman of the Ordnance," and returned to Catalonia with Borgard in 1709 (*Cleaveland*, p. 169). Captain Pattison's nephew (James) married Mary, eldest daughter of General Borgard. *Vide England's Artillerymen*, p. 11 (foot note).

[2] *Kane* is still utterly unreliable as to origin of many of the artillery Officers in the early pages of that *Artillery List*, as proved by muster-rolls and pay-lists.

George Michelsen (pronounced Michaelsen), commissioned from the ranks, 1719.
Borgard Michelsen " " " " 1729.
William Sumpter, commissioned from the ranks 1731.
Withers Borgard " " " 1736. Died Captain R.A. in 1743; aged 29.
William Withers (came to grief).

(To be Continued).

A METHOD

OF

CONCENTRATING THE FIRE OF A GROUP OF GUNS LAID FOR DIRECTION BY GRADUATED ARCS.

BY

MAJOR A. C. HANSARD, R.A.

(Instructor in Gunnery).

It is well recognised that all the projectiles from a group of guns should strike a ship about the same spot, if possible; and it is obvious that, with any system where the guns are laid for direction by the graduated arcs (these arcs being oriented alike), the points of impact will be at the same distance apart as are the guns.

Probably with Position-Finding Groups some means will eventually be introduced to get over the difficulty, such as a separate training dial for each gun, but it must take a considerable time before all such groups are so supplied, and in the mean time the method here described has been tried and found to answer its purpose; and as it does not involve any alteration to existing fittings, and does not require any apparatus of an expensive nature, or beyond the capacity of any artificer to construct, it is hoped that others may be induced to try it.

The means to be provided consist of a diagram for the Group Officer, showing at a glance the number of minutes deflection to be given to concentrate the fire; and deflection bars, with movable pointers, to fit into the socket for the bolt at present supplied for reading the training.

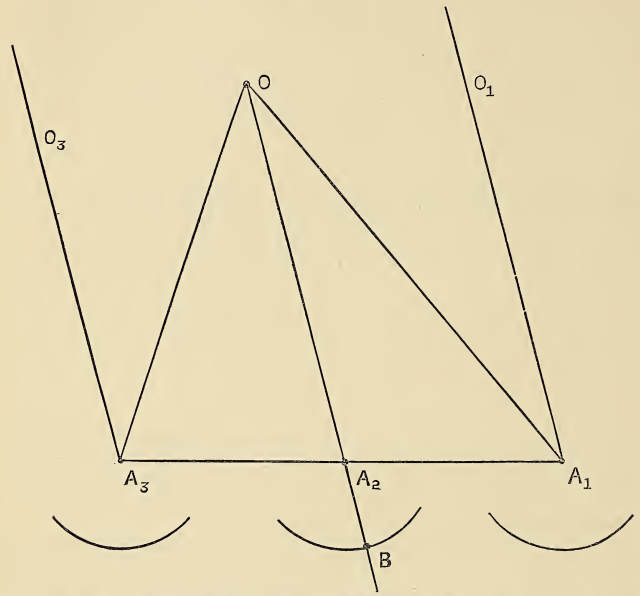
Before describing the mode of construction of the diagram it is necessary to investigate shortly the problem involved.

In Fig. 1, A_1 A_2 and A_3 are the positions of the pivots of three guns fought by one Position-Finder; O is the point it is desired to hit. The pivots are supposed to be in one line, and the distances between them equal.

If correctly laid the line of fire of A_2 will pass through O, but that of A_1 will pass through O_1 and that of A_3 through O_3. In order to bring the lines of fire of the outer guns through O, corrections equal

to the angles $O_1 A_1 O$, and $O_3 A_3 O$ must be made to the training of A_1 and A_3 respectively.

Fig. 1.



Since $A_1 O_1$, $A_2 O$, $A_3 O_3$ are parallel the angle $O A_1 O_1 = A_2 O A_1$ and $O A_3 O_3 = A_2 O A_3$

$$\text{now } \frac{\sin A_2 O A_1}{\sin A_1 A_2 O} = \frac{A_1 O}{A_2 A_1}$$

$$\therefore \sin A_2 O A_1 = \frac{A_1 O}{A_2 A_1} \sin A_1 A_2 O;$$

$$\text{similarly } \sin A_2 O A_3 = \frac{A_3 O}{A_2 A_3} \sin A_3 A_2 O.$$

Now $A_2 A_3 = A_2 A_1$, let this distance in yards be represented by d; $A_1 O = A_3 O = A_2 O$ very approximately, since they will always be large in proportion to d, let them be represented in yards by R;

$$\sin A_1 A_2 O = \sin A_3 A_2 O \text{ since } A_3 A_2 O = 180° - A_1 A_2 O;$$

and $$A_3 A_2 O = A_1 A_2 B.$$

Hence $$\sin O A_1 O_1 = \sin O A_3 O_3 = \frac{d}{R} \sin A_1 A_2 B.$$

Thus we find that the correction will be the same in amount for both

A_1 and A_3 (but opposite in direction) and, since the magnitude of small angles, such as are here in question, is approximately proportional to their sines, the correction will vary inversely as the range R, and directly as the distance d between the pivots and as the sine of the angle made by the line of fire of the centre gun with the line joining the pivots. For a given group d is of course a constant, so that the correction will vary inversely as the range and directly as the sine of the angle $A_1\ A_2\ B$ which depends on the training.

Let w represent the angle of correction, then

$$\sin w = \frac{d}{R} \sin A_1\ A_2\ B,$$

or

$$R = \frac{d}{\sin w} \sin A_1\ A_2\ B.$$

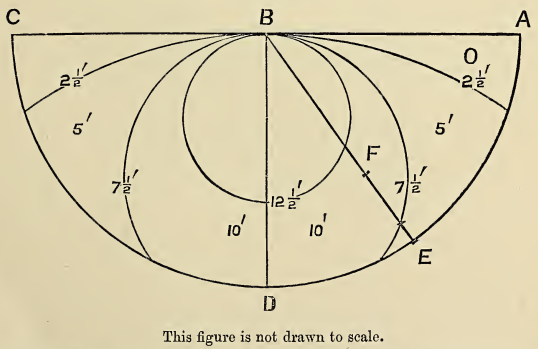
Now if we assign a definite value to w, $\frac{d}{\sin w}$ becomes a constant ($= K$ suppose). Then for any given value of $A_1\ A_2\ B$ we get the corresponding value of R at which w has the value assigned; that is we can find for every successive angle of training the corresponding range for which the correction will be equal to w.

The above equation when w has a fixed value becomes of the form

$$R = K \sin \theta$$

and this is a polar equation to a circle, the origin being on the circumference, and the initial line a tangent; $\frac{d}{\sin w} = K$ being the diameter of the circle, R the length of a line joining a point on the circumference to the origin, and the angle θ, the angle between that line and the initial line. This relation points out an easy way of showing the corrections.

FIG. 2.



This figure is not drawn to scale.

In Fig. 2, BD is at right angles to ABC. ADC is a semicircle with

centre B. A series of circles is described whose centres are all on BD and all touching ABC at B, and radii successively $= \frac{1}{2}.\frac{d}{\sin 2\frac{1}{2}'}, \frac{1}{2}.\frac{d}{\sin 7\frac{1}{2}'}$ &c., on any convenient scale of yards. From B draw the line BE, making an angle with ABC equal to the angle between the line of fire and the line of pivots, on BE set off BF to represent the range, on the same scale as was used to construct the circles. Then if F is on the circumference of the circle marked $12\frac{1}{2}$, the following relation holds

$$\mathrm{BF} = \frac{d}{\sin 12\frac{1}{2}'} \sin \mathrm{ABE}$$

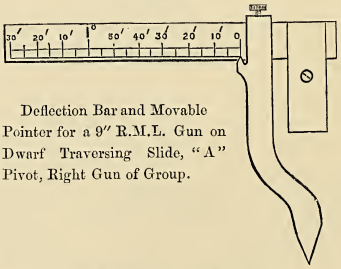
that is $12\frac{1}{2}$ minutes is the correction necessary for that range and angle. If F falls between the $7\frac{1}{2}$ and $12\frac{1}{2}$ circles it is sufficiently near to take 10 minutes as the correction required. If now we graduate CDEA in degrees (from left to right), and number the graduations, so that the reading at D corresponds to that on the gun arc when the line of fire is at right angles to the line of pivots, the reading at E will correspond to the training of the gun; and if, instead of drawing a line, we have a scale pivotted at B having a straight edge graduated in yards, we have all that is required for a practical diagram. All that has to be done, then, to make such a diagram, is to ascertain d in yards, and the reading of the pointer on the graduated arc when the line of fire is at right angles to the line of pivots; this can be done either from a plan, or by means of a sextant or compass. The diagram is then constructed as described.

Such a diagram for a group of guns, 10 yards apart, and having arcs graduated from 290° to 80° is shown at diagram A.

The diagram should be drawn out on paper, mounted on a board, and varnished; the scale may be of sheet metal with a paper scale, also varnished.

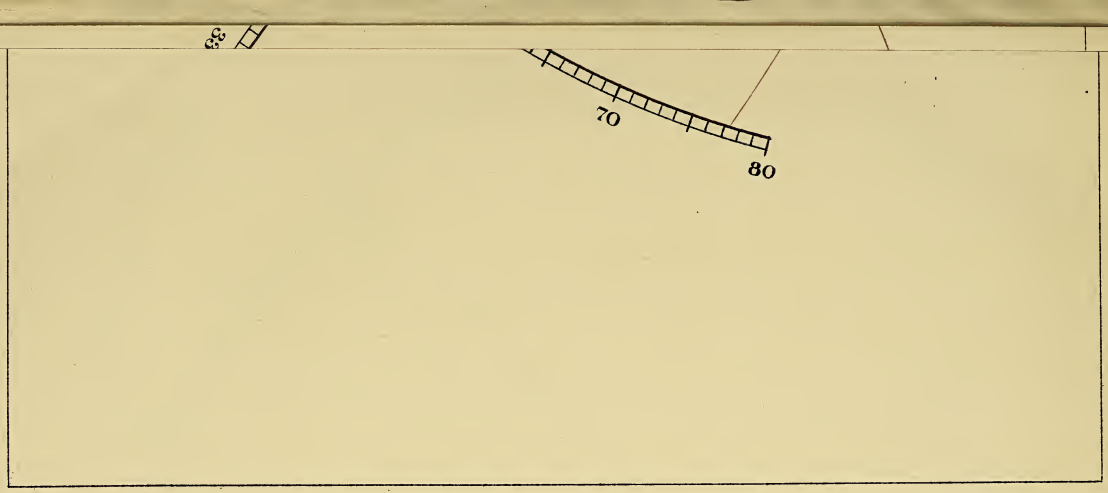
The deflection bar and movable pointer are of the form shown in diagram B; a short cylinder fits into the lower socket for the bolt

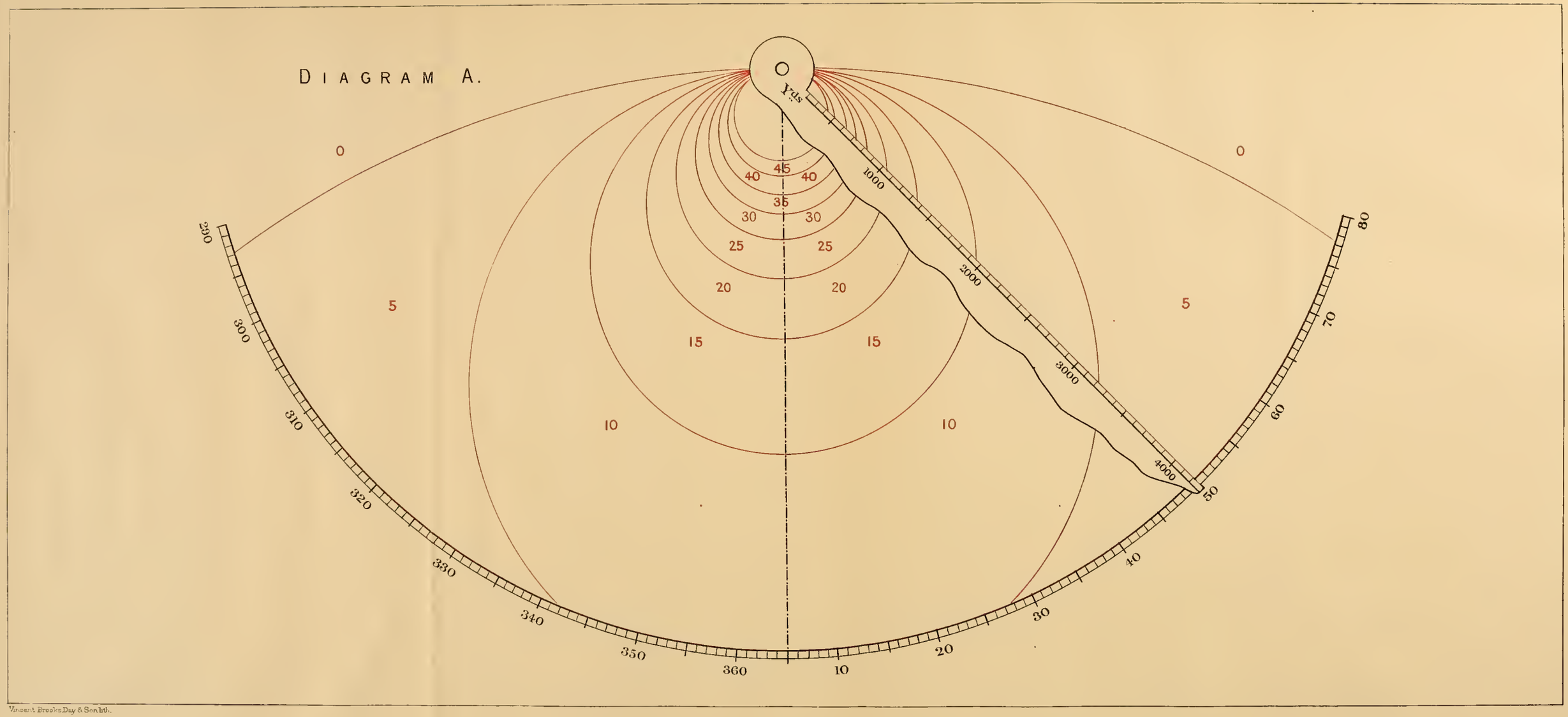
Diagram B.



Deflection Bar and Movable Pointer for a 9″ R.M.L. Gun on Dwarf Traversing Slide, "A" Pivot, Right Gun of Group.

pointer; a set-screw on its front fits into the slot in the socket, and prevents it from turning round; a bar is fixed at right angles to the cylinder and is graduated on its rear face in minutes; the size of these graduations depends on the radius of the arc, and can be ascertained by measuring the length of a degree of the arc. A pointer of the form


70
80



Vincent Brooks Day & Son lith.

shown has a socket sliding on the bar, and is clamped by a milled head screw at the top; the shape must be such that, when the arrow head points to zero, the point of the pointer must be under the centre of the socket.

The bar must point to the left for the right hand gun, and to the right for the left gun, as the correction has to be given outwards; thus they are not interchangeable, but the set screw on the front prevents the wrong bar being used.

The bars experimented with were made of hard wood with paper scales varnished; the face of the bar being recessed to prevent wearing away of the paper; metal would of course be better.

The pointer can be cut out of thick sheet metal and rivetted or soldered to a socket.

The method of giving the correction is as follows:—

The predicted range and training is read out by the dial number; for instance, "Range 2400 yards, 50 degrees training, Lay;" the Group Officer (or dial number) puts the scale of the diagram over this training on the arc, notes between which two of the circles the range lies, and gives out the correction marked there; "10 minutes deflection." The gun-layers set the arrows to that figure on the bars and train the guns till the pointer is over the training read out. Thus all the guns will be laid at the same training on the graduated arc, viz. at 50 degrees, but the lines of fire will in reality pass through 50° 10′ for No. 1, 50° for No. 2, and 49° 50′ for No. 3; and these lines will intersect at a range of 2400 yards.

Two cases which may occur require further consideration.

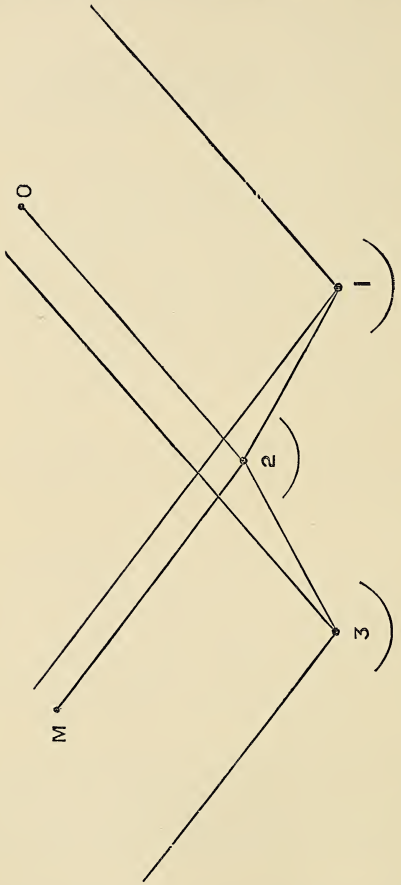
First, when a group consists of more than three guns; for instance, suppose there are four guns in a line at equal distances apart, the two outer guns will be three times as far from the centre of the group as the inner guns.

Now we found that the correction varied directly as d, that is as the distance from the centre; therefore, in the case supposed, the correction for the inner guns will be one-third that required for the outer guns. If we make the graduations on the deflection bars of the inner guns one-third as large as those on the bars of the outer guns, only one diagram and one order for deflection will be necessary. For instance, if the correction to be given by the diagram is 10 minutes, that deflection is ordered, all the gun-layers set their pointers to 10; but while at 1 and 4 guns 10 minutes are really given, at 2 and 3 guns only $3\frac{1}{3}$ minutes are actually put on.

This principle can be extended to include any case of guns which are not equi-distant from the centre of the group; one diagram will suffice for the whole group, provided the graduations on the deflection bars are made proportional to the distances of the guns from the centre; the diagram being made out, preferably, for the gun which is farthest from the centre.

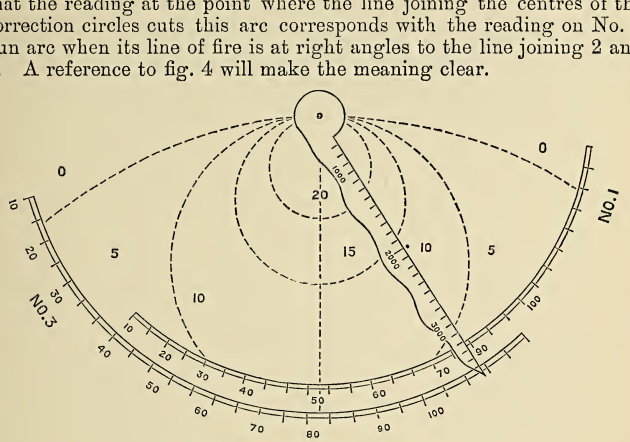
When guns are mounted on different pivots, the length of a degree on the arcs will not be the same; care must, of course, be taken to graduate the bars according to the length of the radius of the arc; also reducing proportionately, if necessary, for the above reasons.

The second variation is when a group consists of three guns which are not in one line. If the pivots are not greatly out of line, and especially when the arcs of fire are not greater than about 70°, no great error will be introduced by considering them as in line, taking d to be half the distance between the two outer guns. But if they are much



out of line, as in figure 3, it is obvious that if the object is at O, No. 1 gun requires a greater correction than No. 3; and *vice versâ* if the object is at M.

To meet this case draw out a diagram for No. 1 gun as before described, *d* being the distance of No. 2 from No. 1; then draw on the diagram a second arc outside the first, graduate it, and number it so that the reading at the point where the line joining the centres of the correction circles cuts this arc corresponds with the reading on No. 3 gun arc when its line of fire is at right angles to the line joining 2 and 3. A reference to fig. 4 will make the meaning clear.



This figure is not drawn to scale.

The Group Officer to ascertain the corrections lays the scale first over the training ordered, on the inner arc, notes the correction and gives it out to No. 1 gun; then swings the scale over to the same training on the outer arc, and gives the correction thus found to No. 3. If the distance of No. 3 from No. 2 is not the same as that of No. 1, the graduations on its deflection bar must be proportionately reduced as before described.

EXTRACTS FROM THE DIARY OF LIEUT. INGILBY, R.H.A., DURING THE WATERLOO CAMPAIGN.

COMMUNICATED BY

MAJOR E. A. LAMBART, R.A.

Introductory Note.

THE following extracts were copied by me from the original diary of Lieutenant Ingilby, now in possession of Sir Henry Ingilby, of Ripley Castle, Yorkshire, to whom I am indebted for the permission to do so.

According to the diary, Lieutenant Ingilby accompanied "G" Troop from Colchester to the Netherlands, and the earlier part of the diary is taken up in the notes of the voyage, and the country passed through *en route* to Brussels.

As will be seen, he joined "E" Troop before the fighting commenced.

Lieutenant Ingilby, afterwards Sir William Bates Ingilby, K.C.B., died a General in the army and Colonel-Commandant R.A., on the 6th August, 1879.—*E.A.L.*

Went for and brought a 9-pr. from Lieut.-Colonel Smith's troop at Erwetegen, which completed our troop to five 9-prs. and one heavy 5½-inch howitzer. Brussels. 1815. May 27th.

The whole of the Cavalry and Horse Artillery of the British Army, commanded by Lord Uxbridge, were reviewed by the Duke of Wellington, accompanied by Marshall Blucher and a vast number of other foreign officers, who expressed aloud, as they passed along the line, great admiration of the horses and their condition, and of the men and appointments—58 pieces of Horse Artillery and about 8000 Cavalry. " 29th.

Transferred to and joined Sir Robert Gardiner's troop (E) of Horse Artillery at Paemale. June 3rd.

. . . . . .

Rode into Brussels, dined at a *table d'hote*, having bought a pack saddle for my baggage mule which was to arrive the following day, and returned to the troop by 9 or 10 o'clock in the evening. " 15th.

We marched this morning before daylight, orders having arrived in the night to place ourselves on the great road between Ninove and Alost, the French Army we understood being in motion. My baggage was left to be brought on by some Commissariat waggons. A fresh order arrived directing us to proceed through Grammont to Enghien. Here we found the main force of the Cavalry, and we became permanently attached to Sir H. Vivian's Brigade of Hussars, the 18th and 10th and the 1st Germans, and one troop of 6-prs. We halted and " 16th.

bivouacked at dusk near Braine le Comte. There was heavy cannonading apparently at some leagues distance in our front, and some of the regiments of Cavalry still pushed forward—a drizzling rain came on. We had marched during the day between 50 and 60 miles with only one halt sufficiently long to feed with corn.

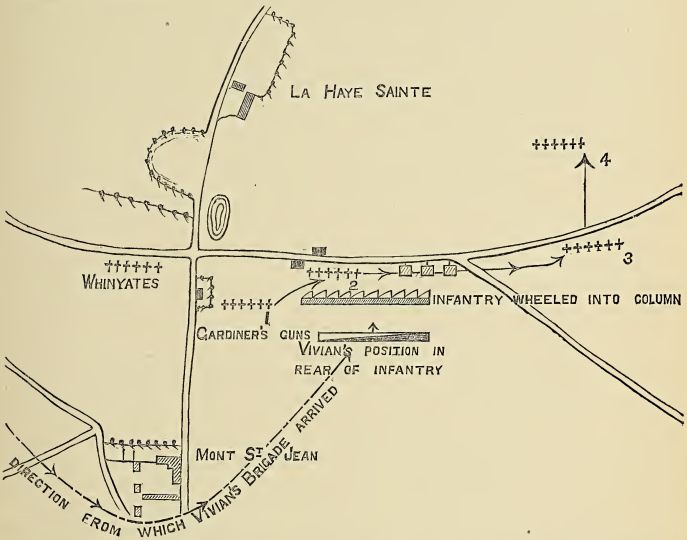
1815. June 17th. Marched before daylight and proceeded through Nivelles, meeting many wounded on carriages and some on foot, and arrived at Quatre Bras, where there had been a severe affair yesterday at the time we heard the cannonade. The Duke of Brunswick was killed, and though a great many dead had been buried, the ground was still strewed with the bodies of our Highlanders and the French Cuirassiers and their horses. The cavalry which had continued to push on last night, failed to arrive in sufficient time to be used, and there had been a deficiency of Artillery, but notwithstanding, the Infantry had repulsed the French and were masters of the position when we arrived this morning. The whole army gradually and successively arrived and the French appeared in tolerable force (but at a considerable distance) in our front. At about 12 o'clock I saw one of the Commander-in-Chief's *Aides-de-Camp* and heard him say to Sir R. Gardiner that the Prussians had been beaten with the loss of 12 cannon and a great many men, and that their army had retreated. In the afternoon our Infantry seemed to be moving off gradually, as I understood, to a position a few miles in our rear. The Cavalry formed in three lines, the Hussars facing towards the enemy, the Light Cavalry in the second line and the Heavy in the third line. Very suddenly it became extremely sultry with the sun obscured with a very black cloud. At this time a very thick cloud of dust shewed the march of cavalry which seemed to be approaching to reinforce the French from a direction in rear of their right, and at the same time there was a considerable bustle among those immediately in our front. It was known to many (and I had heard it from the same beforementioned A.-D.-C.) that Lord Uxbridge had the most positive orders to avoid an affair with his Cavalry, but such was not known to all, and as the French approached, the utmost silence prevailed along the whole of the lines, who evidently expected immediately to be engaged. The French advanced very boldly until their skirmishers, preceding the column, fired upon our line of videttes, which were ranged about 200 yards in front of our first line, which was flanked on the left by our troop and on the right by Lieut.-Colonel Smith's. They then pushed forward some artillery and immediately began to deploy; the first discharges from our artillery had scarcely been answered before the cloud which was hanging above us, burst with the loudest clap of thunder I ever heard, and the rain instantly commenced as it were in torrents, and at the moment the whole of the Cavalry received the order and commenced a rapid retreat. The scene was now completely changed. A few moments before, our three lines with sabres drawn, were watching with breathless interest the approach of the French Cavalry, all, excepting superior officers, having no doubt they were going to be in personal conflict, and now were retiring literally at a gallop in three separate columns by different roads. We followed the left column. We were pushed by a few light cavalry, and

on one occasion a squadron formed to repel some skirmishers who seemed inclined to make a dash at the rear of our troop of guns, but the very heavy rain caused the roads and ground to be so poached and cut up, that they soon ceased to follow us altogether after that demonstration, and I deliberately halted the rear gun of my division and had the wheel horse shod, under the protection of a few Dragoons, while the rest of the Brigade and the Troop were still galloping and trotting off in retreat. This enabled me to look about a little, and I then saw that the regiments to our right on the Pavé road were engaged. There was much charging and cheering, but I could not distinguish which had the best or worst of it. At dusk we came upon the Infantry who had already reached their bivouac and were in the positions assigned them. The Troop took up its quarters in the hamlet of Conconbert. On our right a cannonade was kept up till dark and I imagine the French continued their pursuit of the centre column until they felt our Infantry in position. We soon after heard the 7th Hussars had suffered severely in the charge on the Pave road and been brought out of difficulty by the Household troops. It continued to rain, but as in a hovel the the officers got into, we found plenty of potatoes and a barrel of beer, we did very well. The only inconvenience I suffered was from having lent my cloak to the Doctor who was ill and had none, by which I got so thoroughly soaked I could get nothing dried, having no change, and my feet began to swell so that I was afraid to take off my boots, fearing I might not be able to get them on again. All this made me so feverish that I could get no sleep and became so thirsty I could do nothing but suck the beer barrel with a straw to try and allay the parching of my mouth. I was, however, instructed to set off by times in the morning and find a practicable road from our bivouac, through the wood of Soignies, to Brussels, by which to conduct the brigade in case of a further retreat, which was to protect the left flank of the main body of the army on the great road through Waterloo to Brussels, the road I was to discover therefore was to be parallel to that road.

1815. June 18th. I left Conconbert, the bivouac of the troop, a little before dawn. The occasional cannonade which soon after began, became once or twice so strong that I thought a battle must have been begun. It still continued to rain and I was very uncomfortable in my feet, which were very painfully swollen. I had no map or a guide and I could only guess the position of the high road, and I knew as much of the direction in which Brussels laid, so that I had to try by riding along a great many different turns and roads. However, I at last succeeded in emerging out of the wood upon Brussels (just in front of me) and by a road that was practicable both for Artillery and Cavalry, by allowing the former before it should have become poached to precede the latter. On the Namur road I found about 400 or 500 Prussians parading and forming into column, they appeared to be of different regiments indiscriminately mixed and were *débris* of or runaways from the battle of Fleurus. I pointed to the direction in which our army lay, which an officer said it was their intention to join. I found the streets in Brussels, which I had seen only a few days before thronged with inhabitants and our troops, deserted excepting by the wounded

at the affair of yesterday and the day before who were straggling in, and others who had evidently slept on the steps exhausted and unable to go further in search of a hospital. I went straight to the Hotel d'Angleterre (having had no regular meal since the morning of the 16th) which I found still occupied and open, and a gentleman instantly offered me his breakfast which I accepted. He proved to be Admiral Sir Pulteney Malcolm, and was anxious to hear something of the Cavalry affair of yesterday (as Captain Elphinstone of the 7th Hussars was his relation) and what was expected. Learning his relative was wounded and that a battle was inevitable, he proposed going and I offered to conduct him to the army. He then endeavoured to procure a horse but as there was some delay, I accepted a cold chicken to bring to the troop and set off on my return journey by the road I had reconnoitred. On my way I perceived approaching from the opposite direction what I took to be a French *gensd'arme*, some of which I had accidentally seen in the campaigns in the Peninsula. I drew in my reins and felt if my sabre was all clear to draw. I thought it strange he should be there, still it was possible (it just crossed my thoughts) he had already retreated and that I might be in rear of the French instead of his being behind our army. The man, too, seemed to be under some such feelings as myself and threw his cloak aside, so that I began to think he reckoned, as well as myself, on a personal attack, and I considered with my little weapon, against his long sword, I might come badly off, so we neared each other quite cautiously, but to my relief, when within some ten or fifteen yards, he stopped and asked loudly where the Duke of Wellington's head-quarters were, which I told him, and we then passed on. I found, both coming and returning, numbers of the peasantry and inhabitants of the neighbouring villages thronging into the wood, carrying what valuables they could. I reached the troop on my return about half-past ten, and proceeded to Sir Hussey Vivian to make my report, having delivered my cold fowl to Gardiner and the rest of my brother officers. Sir W. Delancy was with Sir H. Vivian, delivering what I understood to be the Commander-in-Chief's instructions for the position of his Brigade and the objects he was to keep in view. Sir W. Delancy pointed to a direction to our left by which the Prussians would come, and that Sir H. Vivian was on no account to move his brigade from the position assigned to it until he had put himself into communication with the Prussians, and that they, the Prussians, had joined or reached his left. Sir W. Delancy shewed a dark spot on a hill, by a plantation, and said if they were troops, it was certainly a Prussian picquet. I made the remark that they certainly were troops. At about 11 o'clock Sir H. Vivian moved forward his whole brigade, here we remained in advance of the British position, and so much so that when the French advanced their columns previous to commencing the battle, at a very quick pace, we became first abreast of them, and they then passed our right flank, and we were in their rear and could distinctly see their immediate movements to advance to attack the troops in their front without regard to us. Our brigade then retrograded into line with the other troops, and became the extreme left of the Allied Army when deployed and

extended. The Prussian picquet still remained where Sir W. Delancy had first perceived it. Some Nassau light troops occupied the ridges in our front near Papelotte and some very little field pieces which they occasionally fired attracted now and then the fire of the French much heavier guns. The German Legion was on our right and appeared to extend to the Pavé road, and was on the face of a round hill called Mont St. Jean.



We could see, further on to our right, a considerable way along the front of our army. From the continual fall of wet since yesterday afternoon the ground had become very deep, and did not bear the guns well. It was about noon (when, as I have said, we were in advance of the British position with our Brigade) that the French column crowned the opposite heights, and they now again got into motion and, making a rapid and simultaneous push forward, both Infantry and Cavalry neared our whole line, and instantly the battle was commenced. The artillery of both armies maintained a terrible cannonade. At the centre and right the French brought into action a line of 70 or 80 guns. Supported by this battery a column of Infantry advanced with loud shouts of "*Vive l'Empereur*," and drove back one of our divisions from its position: they were then charged by our Cavalry and completely routed with great loss. The same Cavalry then advanced against a body of French Cavalry, which approached supported by another column of their Cavalry, to save or sustain their broken and retiring infantry. As the two lines of Cavalry neared each other the French rather hesitated or at least slackened their pace, the English increased

theirs. They met and the French were instantly overthrown, and the ground, which before had been clear, was covered with wrecks of the charge. Some of our Dragoons we could see individually or in small parties pushing on, and they had actually possession of the right of the large battery of French guns, while on the left their guns continued their fire. Sir H. Vivian was extremely anxious to do something with his brigade at this charge, but I knew he was restrained by his instructions which were, by no means to quit his position and expose the left flank of the army. As both Cavalries charged obliquely to the left and the French Cavalry was part of their right centre and extreme right, and did not move so fast as ours, it brought the charge nearly opposite the position of our brigade. Sir H. Vivian therefore took a couple of guns of the Troop and proceeded with them to assist General Ponsonby and his Cavalry; these guns were my division, but we became so completely within range of the enemy's numerous battery of superior calibre that one of the first shots directed against us blew up a limber, killed the Sergeant and passed through the shoulders of my charger exactly above my knees, and Sir H. Vivian immediately withdrew them, lest knowing his orders he might attract the attention of the Commander-in-Chief. The French, on seeing the limber blow up, gave some loud cheers, but that could not compensate for defeat with great loss of both attacks by the Infantry and Cavalry. General Ponsonby was killed and Colonel Ponsonby very badly wounded and left on the enemy's position. The French supporting column of Cavalry on seeing the overthrow of its leading column instantly put about and retired to its original ground on the extreme right of position—they were clothed in red. In these charges (excepting the great charge between the two large bodies of Cavalry) and repulse, the sight was perpetually interrupted by the smoke of the cannon and musketry and it was difficult at the distance to affix to each Corps or Regiment the part or share it took in them. Our Infantry that appeared driven back were Highlanders, and the Cavalry that immediately charged were the Scotch Greys. The great charge was made by heavy Cavalry supported by light. The battle appeared now to rage at every point, and though the day continued drizzling wet and the dulness of the atmosphere was increased along the line by the smoke of the musketry and cannon so as occasionally to render everything momentarily invisible or obscured, yet as the wind blew fresh and rolled it away, one could clearly distinguish other continual charges of Cavalry of both sides, and the alternate formations of the troops into squares and lines or masses. Twice or thrice a Prussian Officer appeared and announced the approach of their army, and at his request we actually cleared the road on which we were standing in order to have firm footing for our horses and guns, to make way for them. The Duke of Wellington, on the other hand, sent more than once to ascertain if they had arrived, or to enquire if they were in sight, but we could give no account whatever of them. The French were at length formed on a sort of plain or flat below and in front of the heights from which they had commenced their attack, but though nearer, had acquired no part of our position, and they were evidently greatly reduced in numbers, while at the same time

the ranks of our Infantry immediately on our right were thinned, as was apparent from the increased space caused by closing the files, between its left and our right. At about between four and five o'clock in the evening the Prussians did appear, and after some delay they formed and advanced briskly to attack the French right in front of Papelotte. We could see some columns and Artillery of the French immediately wheel to the right and repulse this attack, and these Prussians made no further progress or attempt to push on. At about half-past eight o'clock more of the Prussian Army appeared, and some of their Cavalry and Artillery taking up the ground we had maintained the whole day, Sir Hussey Vivian moved his brigade towards the right, crossed the Pavé road, and formed in line in rear of the Brunswick Infantry, who were in line, advancing firing—the smoke was so dense we could, for a time, see nothing immediately before us, while thus at the distance of about 15 paces supporting what proved to be at length, an attack from our side, and a total overthrow of the French. We could, however, perceive that the right of the French was engaged in, and opposed by, a heavy cannonade on their right rear, which could only be another body of the Prussians, although from the distance, and dusk, which at this time was commencing, we could discern nothing with the eye but the flashes and smoke of their cannon, and the sound even extended beyond where we could see, and it was evident the French were engaged in rear of the heights on which they showed their front to us.

About this time, while crossing the Pavé, Sir Robert Gardiner and Dyneley (Captain) both expressed their distrust of present appearances, they did not like them, and bearing in mind everything I had gathered from what Colonel Delancy said in my hearing to Sir H. Vivian, as to the time and occasion, when his Brigade would move and be brought to support the centre, I held and expressed a contrary opinion, that it was the Duke's turn and that he was now attacking their centre, his time for doing which evidently having depended upon the Prussians making their appearance in force on the right flank of the French.

A short while afterwards the Infantry in our front, which had continued steadily advancing and firing, halted and ceased firing, and we then perceived the French, both those immediately in our front and those on other parts of their positions, scampering off in full retreat. The Brunswickers broke into open column, and Sir H. Vivian passing through the intervals, the Cavalry pushed forward and were presently charging the fugitive masses in every direction, while we with the guns alternately unlimbered and advanced, bringing them to bear on every possible occasion till it was too dark to fire without danger to our own Cavalry, which continued to press upon the rear of the French, and turned their defeat into a complete rout and confused flight. We then halted to bivouac near what we called the Observatory, a wooden frame erection which was conspicuous in rear of the line of battle of the French in the morning. On being despatched to bring up our ammunition waggons which had been left behind at our advance, I passed in rear of the guns abandoned by the French, and met another

body of Prussian Cavalry apparently quite fresh, and proceeding as if to continue the pursuit. The ground and roads were strewed with the dead and wounded, the latter crawling towards the roads in the hopes of meeting more speedily with assistance, and it was with difficulty the waggons could be driven clear of the living and dead bodies along a part of the Quatre Bras road, where I saw many of both dead and wounded mangled by the wheels of, I suppose, the French Artillery in their retreat. In the early part of the day, when the battle was about commencing, a calf strayed in among the troop, which having been slaughtered for the men and officers (both were entirely without provisions) now served us all for a meal. Fires were made and we soon had a fried dish of veal, which satisfied our hunger, and I, for my part, had a good night's rest, after having been up very early and to Brussels, altogether a long and hard day.

1815. June 19th. Courcelles. We now began to learn and understand the extent of yesterday's victory and how hardly it had been gained, and the number of men and officers it had cost. My unlucky baggage which was left to follow the troop, on the morning of the 16th, with the commissariat stores, and the pack saddle I had bought on the evening before at Brussels, never came into my hands, were lost *in toto*, and my first charger having been killed, I was not likely to be much a gainer by the battle.

" 20th. Bouverines.

" 21st. A village about five miles to the left of Malplaquet.

" 22nd. St. Benin.

" 25th. A village three miles short of St. Quentin, heard Napoleon had addicated.

" 26th. Martignie. "*Le Journal de l'Empire*" announced the abdication of Napoleon, and General Lauriston was brought in by the advanced guard of the Brigade, asking to be conducted to the Commander-in-Chief.

" 27th. Through Nesle, Carapuis and Roye to Verpilliere. The inhabitants, their houses and villages, all appeared ugly and filthy in the extreme. The Prussians crossed our line of march to.day in advance of us, and shewed evident intention not to spare their enemies: they plunder without reserve, and in some instances, destroy—habits learned probably from associating, when in alliance, with the French themselves, and also in the spirit of retaliation.

" 29th. We passed through Mouchy and crossed the Oise at Pont St. Maxence. The bridge had been destroyed in the previous campaigns on the approach of the Allies, and was now repaired. Some Deputies from Paris were passed by the advanced guard to the Commander-in-Chief. We halted in Senlis.

" 30th. Passed through Louvres and bivouacked near Vanderland (?) in sight of the steeples of Paris, one of which has a handsome appearance at this distance—12 miles. La Fayette came out to the Commander of the Forces.

July 2nd. Bivouacked about one-and-a-half miles from St. Denis, and three from the heights of Montmartre, which we were given to understand the army would attack.

1815.
St. Denis given up to us. Some National Guards alone remained in July 4th.
it and looked very sulky.

We crossed the Seine this morning near Argenteuil by a bridge of " 7th.
boats, and the troop is cantoned at Pateaux and Pont de Neuilly. The Infantry bivouacked in the Bois de Boulogne, and Paris is surrendered to the Allied Army. Louis XVIII. entered his capital yesterday and so the war is ended.

Rode into Paris, passing by the Barriere de l'Etoile (unfinished) to " 13th.
the Place Louis XV. and the Palace of the Tuilleries.

. . . . . .

In order to be better foraged the troop had orders to be quartered August.
at Bresle, where we remained a considerable time. From Bresle we marched to Marseilles, Grandvilliers, and Poix and Hornois for different periods. From Hornois we changed our quarters to Oisement, Blangis and Neufchatel.

. . . . . .

From Neufchatel we returned to Blangis and moved to Abbeville, where I left the army to come to England to see my brother, who was expected to go with his Regiment, the 84th, to India.

. . . . . .

Joined the Army of Occupation at Bahaume in August, and returned May, 1816.
with it to England in November, 1818, and was reduced and appointed to a Company in the Mauritius.

Arrived at Glasgow on the Recruiting Service. Nov., 1822.

Appointed to a troop of Horse Artillery at Athlone in Ireland. Feb. 1825.

Joined " E " of Horse Artillery at Athlone. July 1825.

THE ARTILLERY OF THREE ARMIES.

COMMUNICATED BY

THE SECRETARY.

The attached table gives a comparison between the Army Corps of Great Britain, France, and Germany, both at the present time, and shortly after the last great European War of 1870-71. The two last named countries have been selected for comparison owing to their organisation having been more fully and carefully developed than is the case in other European countries.

From these tables it would appear that the British Army Corps is decidedly weak in artillery. Whereas in 1870 the typical French Army Corps had only 72 guns to 39 battalions, and Germany had 84 guns to 25 battalions; both France and Germany have now raised the number of their guns to 120, while France has also cut down her infantry battalions to 25, (which is the number that Germany has retained).

Great Britain, on the other hand, has increased the number of battalions from 21 to 25, but has reduced the number of her guns from 90 to 84. Whilst France and Germany now have 5 guns for every 1000 rifles, Great Britain has but 3·5 per 1000.

With regard to Horse Artillery it will be seen that each Army Corps has at the present time either two or three Horse Artillery batteries.

The question as to the proportion of cavalry in the Army Corps concerned has not been touched upon, since, in order to arrive at any fair conclusion, it would be necessary also in each case to consider the composition of the independent cavalry divisions.

Normal Army Corps after the last great European War.—1870-71.

	Infantry and Rifles.	Cavalry.	Artillery.
	No. of Battalions.	No. of Squadrons.	Guns.
Great Britain	21	24	90 (*a*)
France	39	16	72 (*b*)
Germany	25	8	90 (*c*)

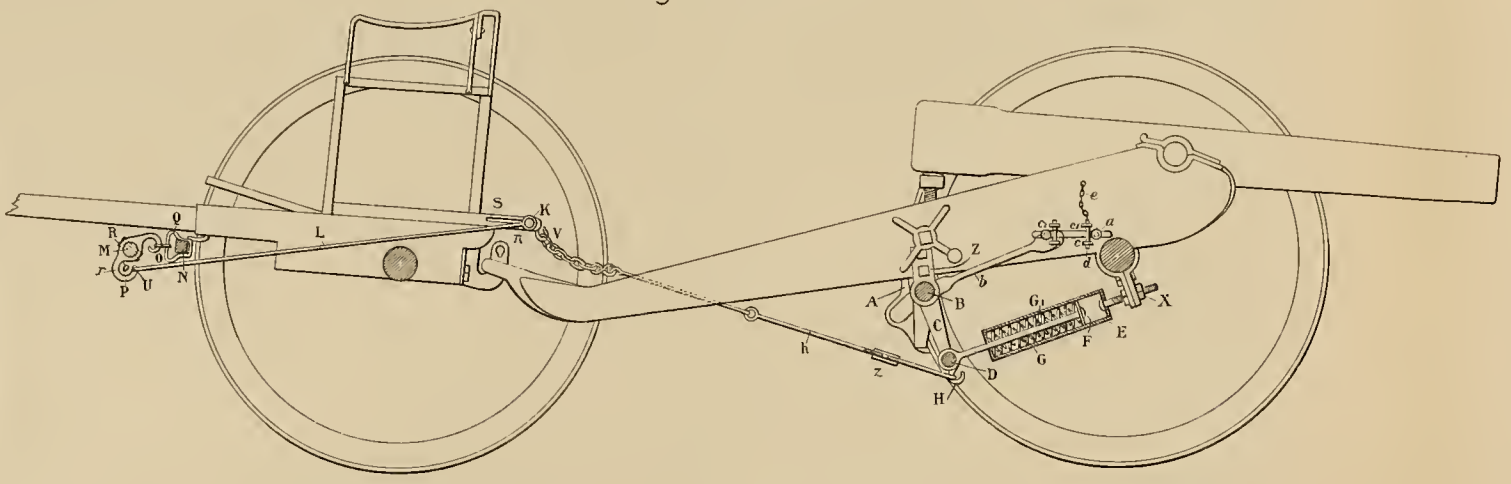
Normal Army Corps at Present Date.

	Infantry and Rifles.		Cavalry.		Artillery (exclusive of those sent to the Independent Cavalry Division).	No. of Guns per 1000 Rifles.
	No. of Battalions.	Strength in Rifles.	No. of Squadrons.	Strength in Sabres or Lances.	Guns.	
Great Britain ...	25	24,000	4	600	84 (*d*)	3·5
France	25	23,700	8	1160	120 (*e*)	5
Germany	25	24,000	8	1200	120 (*f*)	5

(*a*) Made up of 11 Field and 4 Horse Artillery Batteries.
(*b*) " " 10 " " 2 " " "
(*c*) " " 12 " " 3 " " "
(*d*) " " 11 " " 3 " " "
(*e*) " " 18 " " 2 " " "
(*f*) " " 18 " " 2 " " "

SCHLÄPFER AUTOMATIC BRAKE.

Fig. 1. Elevation.



Top view.

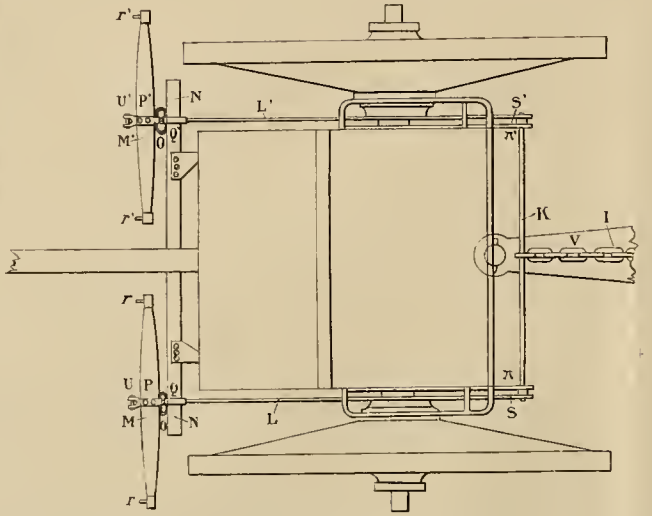
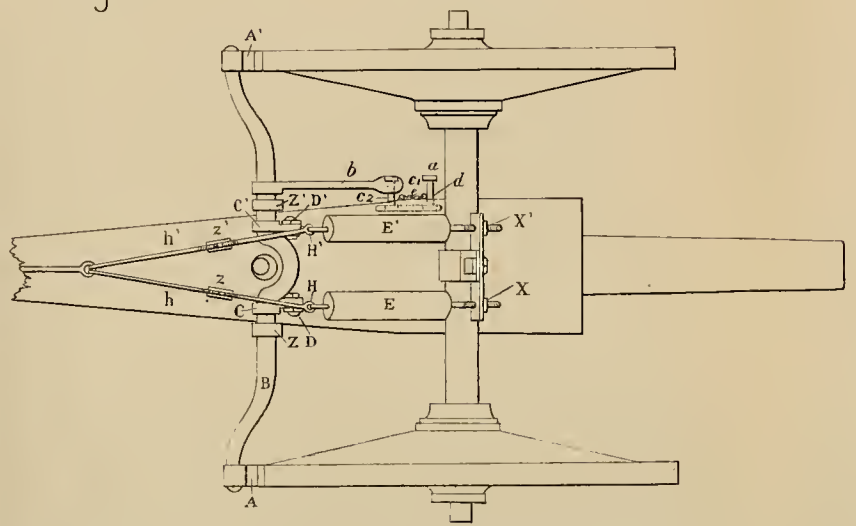
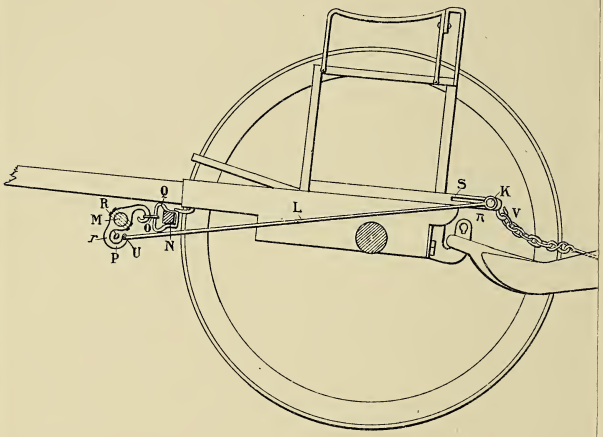


Fig. 2.

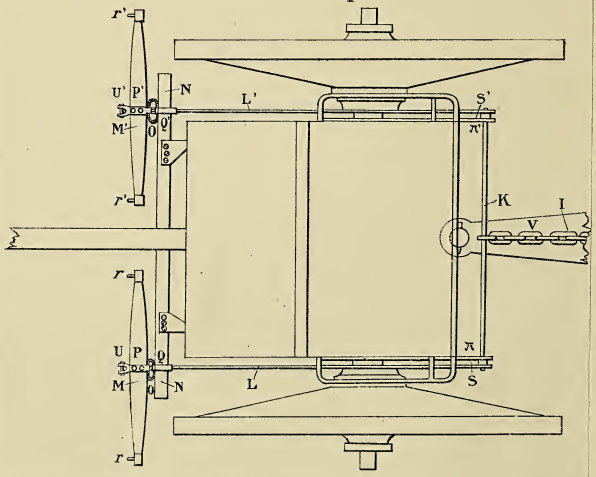
Bottom view.



AA'	*Battens.*
B	*Bar of the brake.*
CC'	*Levers.*
DD'	*Junction of the levers and pistons.*
EE'	*Spring boxes.*
F	*Piston.*
GG'	*Spiral springs.*
HH'	*Connecting rods.*
I	*Carbine attachment of chain.*
K	*Traction beam.*
LL'	*Traction bars.*
MM'	*Swingletrees.*
N	*Splinter bar.*
OO'	*Ring for attaching the hooks.*
P	*Swingletree hook.*
Q	*Iron loop on splinter bar.*
R	*Swingletree bolts.*
SS'	*Slides for traction rods.*
UU'	*Moveable joints between hooks and traction rods.*
V	*Connecting chain.*
XX'	*Bolts and screws for regulating position of springs.*
a	*Stop on the rod which controls the lever* b.
b	*Lever for unshipping the brake.*
$c_1 c_2$	*Loops for keep pin.*
d,e	*Keep pin and its chain.*
h,h'	*Connecting rods.*
r,r'	*Trace hooks.*
zz'	*Screw coupling boxes.*
ππ'	*Marks for adjustment.*



Top view.



ABSTRACT OF THE PROCEEDINGS

OF THE

FIFTY-SIXTH ANNUAL GENERAL MEETING

OF THE

ROYAL ARTILLERY INSTITUTION.

The Annual General Meeting was held on the 9th June, 1893, at the Lecture Room of the Institution of Civil Engineers, 25, Great George Street, Westminster.

Lieut.-General R. J. Hay, C.B., Director of Artillery, took the Chair.

Among others present were Lieut.-Generals E. F. Chapman, C.B., and Sir W. Stirling, K.C.B.; Major-Generals E. Markham, A. H. W. Williams, and W. L. Yonge; Colonels J. B. Richardson, C. Trench, W. S. Curzon, E. H. Holley, G. Burgmann, and A. Burton-Brown.

Chairman—Gentlemen, in the first instance I would like to explain to you how it is that I find myself in the Chair to-day. The reason is that Sir Robert Biddulph has had to go with His Royal Highness the Commander-in-Chief down to Hounslow and Kneller Hall to inspect there to-day, and I come next as senior.

I now invite the Secretary to read the Annual Report.

The Secretary read as follows:—

Annual Report.

During the past year there has been another large accession of members to the Institution, but the increase does not appear to be so considerable as it really is owing to the large number that have availed themselves of the New Rule, viz.: that members joining after the 1st October, in any year, do not become liable for an annual subscription until the 1st April following.

The fact that Cadets passing out of the R.M. Academy are not commissioned at once is found injurious to the Institution; the majority join as soon as gazetted, but some do not; in order to remedy this the Committee bring forward proposition No. 1, which, if passed, will allow a Cadet or Militia Officer to join the Institution as soon as he has passed the usual tests for a commission in the Regiment; the Com-

mittee, therefore, propose to allow them to join at once on payment of the annual subscription only, on condition that they pay the £1 entrance as soon as gazetted.

The other proposition brought forward by the Committee is one to enable them to extend the advantages of the Institution to men of science and learning in any way connected with the profession of arms, and they hope that the meeting will approve of it.

The system of Corresponding Members progresses favourably, and certain of those nominated under last year's New Rule have afforded the Committee valuable assistance.

R.A.I. Building. After various delays the Laboratory has been cleared out, the floors and walls of the room repaired and a floor covering of corticene laid down; this has enabled the Museum to be extended and the scheme of improvement to be fully carried out: the shelves of the library extension room are rapidly filling up with books from the smoking room, and from the library which has been hitherto much overcrowded. The space occupied by book-shelves in the smoking-room is now used to exhibit the collection of coloured prints of Royal Artillery dress and incidents which the Committee have been fortunate enough to acquire through the knowledge and good taste of certain members interested in the ancient history of the Regiment. The spaces vacated in the drawing room by the removal of various botanical and ornithological collections to what was the laboratory, are being used for hanging pictures painted by officers of the Regiment. The idea of forming this collection was mentioned last year, but the Committee hardly anticipated that it would have been so favourably received. Some 40 officers have promised to give works from their own pencil or brush, and 12 or 15 pictures have already been received; one distinguished family is represented by the works of three generations.

The increase to the Library during the past year has been very large; the Committee have bought every good work on Military Art or History that has been brought to their notice; among other works they are now subscribing to the history of National Biography.

Lectures. The question of lectures is a difficult one; in these days of many courses of instruction, increase of branches of the School of Gunnery and of various certificates of proficiency, there is a fear that lectures may be rather overdone. Bearing this in mind the Committee have been careful to restrict the lectures of the past season at the Royal Artillery Institution to a few given by those having a most intimate acquaintance with the locality or subject touched on. One lecture stands out prominently amongst those delivered at the Institution for years past, viz.: that of Prof. C. Boys, F.R.S., on "Photographing bullets in flight," and the Committee congratulate the members on the benefits to the science of ballistics that are likely to result from the delivery of this lecture. Six lectures in all were given during the winter season; Major Wingate, D.S.O., had unfortunately to cancel his engagement, but the proportion of about seven lectures for the twenty weeks of the winter season seems to the Committee most suitable.

Kane's List. The Committee regret that they have not been able to carry out their wish, expressed last year, to publish annually the Addenda and Corri-

genda of Kane's list. They find that the expense would be far greater than they had anticipated, and consider that it will be better to defer any further expenditure on Kane's list until the time comes to publish a new edition. Four new pages of names of young officers who have joined since 1891, have, however, been recently issued.

Before leaving this subject the Committee desire to testify their gratitude to General W. H. Askwith, Colonel Commandant, R.A., for the great help he has given them in making corrections. No error escapes his vigilance, and his labour of love in the cause of the Regiment is unceasing.

New Rules for Prize Essay Competition.

In order to facilitate the work of the judges of the Prize Essays this year the Committee have had all the essays type-written in triplicate, so that each judge has been provided with a typed copy. As the means of doing this accurately and of maintaining the necessary secrecy are somewhat cumbersome, the Committee intend to amend the Rules for Prize Essays as follows, viz. :—

The essays must be forwarded to the Secretary so as to reach him on or before the 1st of April.

Each essay must be type-written in triplicate. The essays must be strictly anonymous, but each to have a motto, and be accompanied by a sealed envelope with the motto written outside and the name of the writer inside; further, if the writer wishes to recover from the Committee part of the cost of type-writing his essay he should state this fact in the same sealed envelope and write outside it, above the motto, "to be opened."

All the envelopes thus marked will be opened by the Secretary after the result of the competition has been announced, and he will send the money for their type-writing expenses.

The Committee will allow a sum of £1 for type-writing each essay.

Loan Libraries.

During the last Practice season the Committee issued on loan to the Officers' Mess, Okehampton, a small library of books for the use of the large number of members of the Institution always in camp. During the present season they are making a similar issue to Lydd and the Camp Western Forts, Isle of Wight.

There are on the 31st March, 1893, 1791 Members of the Institution against 1753 last year. 94 Officers joined during the year against 127 last year, but another 52 are shown as joining on 1st April, 1893; whilst deaths and withdrawals amounted to 56.

The number of deaths was 18. Among them are to be noted the names of the following Officers :—

Lieut.-General C. S. Henry, C.B.; Major-General J. R. Anderson, C.B.; Major-General G. Shaw, C.B.; Major-General W. H. Noble; Colonel T. H. Lloyd; Colonel J. S. Rothwell; Major H. Crofton; Major C. S. Skipton; Major F. W. Campbell; Major G. Howard-Vyse; Captain G. L. W. Grierson and Lieut. J. A. Rich.

The accounts have again this year been audited by Messrs. Agar and Bates, Chartered Accountants.

Appendix A shows the Expenditure and Income.

Appendix B shows the financial condition of the Institution.

The General Credit shown in the Balance sheet is £3804, against £3577 last year. The Liabilities are £221.

"Duncan" Gold Medal, 1893.

The subject for the "Duncan" Gold Medal of the year was, "The Attack of a Coast Fortress."

Major-General H. Le G. Geary, C.B., Colonel J. B. Richardson, R.A., and Captain S. Eardley-Wilmot, R.N., kindly consented to act as judges.

15 Essays were submitted for competition, and the judges report that the essay bearing the motto "Celer" is worthy of the Gold Medal; that the essay bearing the motto "Le coût fait perdre le goût" is worthy of a Silver Medal and that the essay bearing the motto "Labor omnia vincit" deserves honourable mention.

The Secretary was requested to open the sealed envelopes, did so, and announced that Major F. B. Elmslie, R.A. is winner of the "Duncan" Gold Medal; Major R. F. Johnson, R.A. is winner of a Silver Medal; and that Lieut. C. Kenny, R.A. deserves honourable mention.

Rewards for Papers.

Lieut.-Colonels R. W. Rainsford-Hannay, S. C. Pratt, and J. K. Trotter, D.A.A.G., kindly consented to act as judges for the Rewards and recommend the writers of the following papers for the Rewards opposite their names:—

"Achievements of Field Artillery."	By Major E. S. May, R.A.	£10
"Field Artillery Fire."...	„ Captain W. L. White, R.A.	£5
"Artillery in Coast Defence." ...	„ Major A. C. Hansard R.A.	£5
"Armour and its Attack."	„ Captain C. Orde Browne (*late* R.A.)	£5
"The Sudan Past and Present." ...	„ Major F. R. Wingate, *D.S.O.*, R.A.	£5
"Applied Field Fortification." ...	„ Lieut.-Col. E. Clayton, R.A....	£3
"Soldiering and Sport in Mashonaland	„ Lieut. T. Jones, R.H.A.	£3
"Operations of the Irrawady Column."	„ Lieut. G. F. MacMunn, *D.S.O.*, R.A.	£3
"Okehampton Experiences." ...	„ Capt. E. W. Blunt, R.A.	£2
"The United States Military Academy."	„ Capt. A. C. T. Boileau, R.A....	£2
"Quick-firing Guns in Harbour Defence."	„ Lieut. A. S. Buckle, R.A....	£2
"Volunteer Adjutancies."	„ Capt. G. Osborn, R.A.	£2
"Making or Breaking."	„ Lieut.-Colonel D. D. T. O'Callaghan, R.A. ...	£2
For Various Translations.	„ Lieut.-Colonel F. E. B. Loraine, *late* R.A. ...	£1

The Sub-Committee do not consider that they can put together for purposes of comparison, contributions of such varied character, and suggest that the instructions to make a selection of the five best papers of the year might, in future, be altered.

There were no changes in the Committee last year, and it is now constituted as follows : Committee.

PATRON AND PRESIDENT :

Field Marshal H.R.H. the Duke of Cambridge, K.G.

VICE-PRESIDENTS :

The Director of Artillery.
The Deputy-Adjutant-General, R.A.
The General Officer Commanding Woolwich District.

MEMBERS :

The Assistant-Adjutant-General, R.A.
The Director, Artillery College.
The Assistant-Adjutant-General, Woolwich.
The Secretary, Ordnance Committee.

Colonel J. B. Richardson.
„ W. S. Curzon.
„ H. de S. Isaacson.
Lt.-Col. C. H. Spragge.
„ J. C. Dalton.
„ E. M. Baker.
Major A. W. Anstruther.
„ W. F. Cleeve.
Major H. C. Sclater.
„ E. S. May.
„ T. H. E. Acton.
Capt. J. M. Grierson.
„ H. J. DuCane.
„ A. Crawford.
Lieut. A. H. Lee.

Bankers :

Messrs. Cox & Co., and London and County Bank.

Solicitor :

E. W. Sampson, Esq., Woolwich.

TRUSTEES :

General Sir C. Dickson, V.C., G.C.B.
„ Sir H. A. Smyth, K.C.M.G.
Lieut.-General R. P. Radcliffe.

Secretary :—Capt. A. J. Abdy.

The Report as above having been adopted; the following propositions were brought before the Meeting and carried :—

(1.) To Rule I. to add after "£1 "—"Gentlemen who have qualified and are recommended for commissions in the Royal Artillery may forthwith become members on the same terms as Second Lieutenants."

(2.) In Rule II., after the words "Garrison and neighbourhood," to insert —"or such gentlemen connected with naval and military arts and sciences as they from time to time think fit."

Chairman.—Before I invite any gentlemen to make any remarks I think we may consider that this is a very satisfactory Report. There is one thing that I would suggest to the Committee : I think it would facilitate comparison very much if in the accounts the previous year's

accounts were entered in red ink. I think that would be an advantage, because I do not think any member ever carries about his copy of the previous year's report. It is a matter of congratulation, though not mentioned in the Report, that the sale of the "Proceedings" to the public has nearly doubled in the last year; that shows that they are much appreciated I think, and it is satisfactory in consequence.

One in my position cannot help remarking on the losses we have sustained. Every one of us must deplore the loss both to ourselves, the Regiment and to the R.A. Institution, of Generals Henry, Shaw and Noble.

Vote of thanks to General W. H. Askwith.

I think it would be a very good thing if we record a special vote of thanks to General W. H. Askwith, Colonel Commandant Royal Artillery, for the great trouble and interest he takes in matters connected with the Institution. It is rarely that an officer of his standing takes so deep an interest in such details, and I think he would appreciate it if we sent him a vote of thanks from this meeting.

Major-General W. L. Yonge.—I shall be very glad to propose a vote of thanks to General Askwith for the deep interest and great trouble he has taken in the Institution. I think when we do get a gentleman to do so it ought to be acknowledged.

Major-General A. H. W. Williams.—I shall be happy to second the motion.

The motion was carried unanimously.

Gifts of General Lynedoch Gardiner.

Chairman.—The next point to which I would call your attention is a present which has been received from General Lynedoch Gardiner, C.B., Colonel Commandant Royal Artillery, of sketches made by his father, Sir Robert Gardiner, G.C.B., K.C.H.; it consists, I believe, of scenes from the Peninsula, Sicily and Holland. There is some correspondence in regard to the gifts, which was received through Major-General A. H. W. Williams, and with your permission the Secretery will read it.

The Secretary read two letters from General Lynedoch Gardiner, C.B., Colonel-Commandant, R.A., describing the gifts and various interesting points connected with Sir Robert Gardiner's career.

(Note.—These letters will be published shortly in the R.A.I. "Proceedings.")

Chairman.—The Secretary tells me that it is proposed to have this correspondence printed and kept in the archives of the Institution, and if I might be allowed to say so, I think it would be a good thing if we got one of the best of those pictures framed and hung up, with some sort of inscription on it in reference to this table and those papers; for we all know—I am afraid I have great experience of that—that a paper gets into a drawer and never gets out of it again; it is forgotten altogether, and I think that would be a good means of remembering it. I do not know if any gentleman wishes to say anything on this subject.

Major-General A. H. W. Williams.—I think, Sir, your proposition is a most excellent one, and might be extended by having a plate put somewhere on the table where it might be seen informing future gener-

ations how the table came into the possession of the Royal Artillery Institution. And if you will allow me I should like to propose a vote of thanks to General Gardiner for his generosity in giving us this beautiful present—it is a most valuable present. The pictures and drawings I have gone through myself with General Gardiner, and I am sure that all the officers who see them will appreciate fully their value and intrinsic merit. And the table, as General Gardiner says in his letter, is quite a work of art of the most valuable period, at the time when furniture was made in a far better way than it is at present, it is one of the most beautiful specimens of that kind of furniture; and I think that a little plate let into the table, stating how it came into our possession, would be a valuable thing in future.

Lieut.-General Sir W. Stirling, K.C.B.—I should like very much to second that. Sir Robert Gardiner lived to a great age, and there never was an officer, I believe, who had the interest of the Corps more thoroughly at heart until the last days of his life.

The vote of thanks was put and carried unanimously.

Duncan Prize Essay, 1894.

Two subjects were then chosen for submission to H.R.H. the Commander-in-Chief, the one selected by him will be announced as that for the Duncan Gold Medal Prize Essay, 1894.

Report on state of R.A. Crimean graves.

The Chairman.—There is one more point that I would like to bring to the notice of the General Meeting which is that Captain Grierson, D.A.A.G., has lately been out in the Crimea and has visited the graves of the Artillerymen out there, and he has pointed out that for the small sum of £5, the headstones and so on could be put in very serviceable order, and in a condition to last for a good number of years.

The Committee of the Institution have therefore kindly consented to give that £5, provided that the General Meeting agree. Captain Abdy will read to you Captain Grierson's letter on the subject.

The Secretary read the same.

Major-General E. Markham.—I quite think, Sir, that as Captain Grierson has recently visited the place we ought to go by what he says. At the same time, I had a very interesting conversation the other day with Sir John McNeill, who is an Equerry to the Queen, and who has just come back from Sebastopol within the last fortnight. He visited the grave-yard, and as I understood from him, it was all in very good order, and certainly, since a few years ago, when the allowance was given of £200 a year for keeping it in order, he mentioned that Lieut. Murray[1] has exercised a great deal of care over it. Of course, a man of our own Corps going there and seeing the thing would go more minutely into the condition of the officers' gravestones, and would see what required to be done; therefore I quite support this motion. But I was rather amused at Sir John McNeill mentioning, and it is interesting to the Regiment, perhaps, to know that he remarked one particular tomb-stone with an inscription quite plain and it was "To the memory of the arm of Major-General George Henry;" he lost his arm in the trenches; it was taken off from the shoulder—it is buried there, and there is an inscription to it.

[1] Lieut. A. P. Murray, Gordon Highlanders, H.B.M. Vice Consul, Odessa.

The Meeting then approved of the expenditure of this £5.

Major-General A. H. W. Williams.—I think, Sir, we ought to pass a vote of thanks, after the letter of Captain Grierson, for his taking the trouble of searching out the tomb-stones and sending us the report.—(Applause.)

The Chairman.—I think that is everything, Gentlemen, as regards the Institution, unless any gentleman has any remarks to make.

General questions & vote of thanks to Inst. C.E.

A question raised by Captain T. E. Carte, R.A., as to the publication in the "Proceedings" of all lectures delivered at the Royal Artillery Institution was referred to the Committee, and the meeting concluded with a vote of thanks to the President and Council of the Institution of Civil Engineers for the kind loan of their Lecture Room.

STITUTION,

Income.

	£	s.	d.	£	s.	d.
ting	96	8	6			
s, &c.	293	17	3			
onery	0	3	6	429	16	4
ge and Parcels	31	5	6			
entry	8	1	7			
ce Fees—						
ceived £88 0 0	90	0	0			
tstanding 2 0 0				1551	9	6
ptions—						
ceived £1402 5 0	1461	9	6			
tstanding 59 4 6						
3240 13s. 11d. 2¾ per cent. Consols, less				86	18	0
ccount				1	14	7
				£2069	18	5

Assets.

Cr.

	£	s.	d.	£	s.	d.
kers, including £400 on Deposit Account				486	14	5
nt owing by Members on rent Accounts, included in ome	129	18	4			
nt owing by Members for rance fees and subscrip- s included in Income	93	14	6	223	12	10
ing paper	63	12	5			
s for sale	59	6	4	122	18	9
13s. 11d. 2¾ per cent. Consols				3192	8	2
				£4025	14	2

ed by the Committee, and the books of the Institution, ly Cash Book, and have found them in order. We

AGAR & BATES, Chartered Accountants.

APPENDIX A.

GENERAL ABSTRACT

OF THE

ACCOUNTS OF THE ROYAL ARTILLERY INSTITUTION,

From 1 April, 1892, to 31 March, 1893.

EXPENDITURE AND INCOME.

Expenditure.	£ s. d.	£ s. d.
Printing etc.: Wages—Compositors, &c.	123 17 2	
Printing Accounts	135 2 0	
Folding, Stitching, &c.	117 3 2	
Printing Materials	237 10 4	
Wood Engraving and Lithography	136 14 6	750 7 2
Classes		34 9 5
Lectures		27 10 2
Library and Books for sale		500 7 6
Museum		27 17 7
Observatory		10 0 5
Carpentry and Repairs: Wages	23 9 6	
Materials	30 17 5	54 6 11
Stationery		14 12 9
Postage and Parcels		77 6 3
Clerks and Orderlies: Wages	137 17 1	
Clothing	15 9 0	153 6 1
Subscriptions to Societies		2 2 0
Fire Insurance		39 0 0
Washing and Cleaning		27 9 5
Subscriptions refunded		13 5 0
Collecting Woolwich Bills, and Christmas Boxes		4 12 6
Medals, Honoraria and Rewards		103 6 0
Arrears of Subscriptions written off		3 3 0
		1843 2 2
Balance—Being surplus of income for the year ended 31st March, 1893		226 16 3
		£2069 18 5

Income.	£ s. d.	£ s. d.
Amounts charged to Members for: Printing	96 8 6	
Books, &c.	293 17 3	
Stationery	0 3 6	
Postage and Parcels	31 5 6	
Carpentry	8 1 7	429 16 4
Entrance fees and Subscriptions for 1892–93. Entrance Fees—Received £88 0 0		90 0 0
Outstanding 2 0 0		
Subscriptions—Received £1402 5 0		1461 9 6
Outstanding 59 4 6		1551 9 6
Dividends for a year on £3240 13s. 11d. 2¾ per cent. Consols, less Income Tax		86 18 0
Interest on Bank Deposit Account		1 14 7
		£2069 18 5

APPENDIX B.

BALANCE SHEET.—31st March, 1893.

Dr. Liabilities, &c.	£ s. d.	£ s. d.
To Sundry Creditors, viz.: Accounts for goods, Printing, &c., owing by the Institution and included in Expenditure for the year 1892-3	197 10 10	
Amount to Credit of Members on current Accounts	9 9 7	207 0 5
" Members' Subscriptions paid in advance		14 4 6
" Lefroy Portrait Fund—Amount at credit 31st March, 1892	1 4 0	
Less payments made	1 4 0	0 0 0
" Haggard Memorial Fund—Amount received to date	29 5 6	
Less payments made	29 5 6	0 0 0
		221 4 11
" Balance, being Surplus of Assets in this Balance Sheet at 31st March, 1893, viz.:		3804 9 3
Surplus at 31st March, 1892	3577 13 0	
Additional.—Surplus of Income for the Year ended 31st March, 1893, as per Expenditure and Income Account	226 16 3	
	£3804 9 3	

N.B.—This Surplus is in addition to the value of the contents of the Museum and Library, Instruments, Furniture, Fixtures, &c., belonging to the Institution, which the Committee have estimated at £11,000, and which are insured for that sum in the Sun Fire Office.

Assets.	£ s. d.	Cr. £ s. d.
By Cash in hand and at Bankers, including £100 on Deposit Account at interest		486 14 5
" Sundry Debtors, viz.: Amount owing by Members on current Accounts, included in Income	129 18 4	
Amount owing by Members for entrance fees and subscriptions included in Income	93 14 6	223 12 10
" Stocks on hand, viz.: Printing paper	63 12 5	
Books for sale	59 6 4	122 18 9
" Investments, viz.: £3240 13s. 11d. 2¾ per cent. Consols		3192 8 2
		£4025 14 2

£4025 14 2

AUDITORS' CERTIFICATE.

We have compared the foregoing Balance Sheet, and Expenditure and Income Account, with the Monthly Cash Accounts, audited by the Committee, and the books of the Institution, and certify the same to be correct. We have tested portions of the Cash and Lodger Accounts with the Vouchers and Daily Cash Book, and have found them in order. We have verified the Investment in Consols with the certificate received from the Bank of England.

AGAR & BATES, Chartered Accountants.

London, 1*st May*, 1893.

APPENDIX C.

Statement shewing Increase and Decrease of Members of the Institution during the year ending 31st March, 1893.

Ranks.	1st April, 1892.	Increase.			Total increase.	Decrease.				Total decrease.	Balance.		31st March, 1893.
		Promotions.	Retirements.	New Members.		Promotions.	Retirements.	Withdrawals.	Deaths.		Decrease.	Increase.	
EFFECTIVE LIST.													
Generals and Field Officers	474	29	—	2	31	—	32	6	8	46	15	—	459
Captains	426	45	—	5	50	29	6	2	2	39	—	11	437
Lieutenants... ...	553	—	—	81	81	45	1	6	5	57	—	24	577
Medical Officers ...	2	—	—	—	—	—	—	—	—	—	—	—	2
Veterinary Surgeons	1	—	—	—	—	—	—	—	—	—	—	—	1
Quarter-Masters ...	1	—	—	—	—	—	—	—	—	—	—	—	1
RETIRED LIST.													
Generals and Field Officers	167	—	32	—	32	—	—	16	3	19	—	13	180
Captains	72	—	6	—	6	—	—	1	—	1	—	5	77
Lieutenants... ...	18	—	1	—	1	—	—	2	—	2	1	—	17
Paymasters ...	2	—	—	—	—	—	—	—	—	—	—	—	2
Riding Master ...	1	—	—	—	—	—	—	—	—	—	—	—	1
Medical Officers ...	2	—	—	—	—	—	—	—	—	—	—	—	2
Chaplain	1	—	—	—	—	—	—	—	—	—	—	—	1
Honorary Members.	33	—	—	6	6	—	—	5	—	5	—	1	34
Totals ...	1753	74	39	94	207	74	39	38	18	169	16	54	1791

APPENDIX D.

Presentations to the Library.

Sixteenth Annual Report of Her Majesty's Inspectors of Explosives, 1891 ..... } Secretary of State for Home Department.

War Office Photographs, Nos. 7757, 7758 ... } Secretary of State for War.

Lithographs (Coloured) R.L., Nos. 191, 212, and 216. } Secretary of State for War.

Lithographs (Coloured) R.G.F., Nos. 146 and 148..... } Secretary of State for War.

Lithographs (Coloured) R.C.D., Nos. 189 and 201..... } Secretary of State for War.

Report of a Committee on a Military Map of the United Kingdom ..... } Secretary of State for War.

Experiments at Spandau on 2nd April, 1892, to illustrate the penetration of the 11mm and 8mm German Rifles	Secretary of State for War.
Extracts from the Annual Report of the President of the Ordnance Committee, 1891, six copies	
Instructions for Armourers, 1892	
Instructions in Regimental Transport Duties, 1892	
Employment by Railway Companies of Army Reserve Men and Discharged Soldiers	
Armed Strength of the German Empire, Vol. I.	
Armed Strength of the Russian Empire, Vol. I.	
Umpire Rules obtaining in Austria, France, Germany and Italy, for the Conduct of Peace Manœuvres, 1892	
Pay Warrant, 1892	Deputy-Adjutant-General, R.A.
Treatise on Ammunition, 1892	
Gradation List of the Bengal Artillery	
Instructions in Regimental Transport Duties, 1892	
Instructions for Practice of Horse, Field, Heavy, and Mountain Batteries, 1892	
Regulations for "Prizes for Skill-at-Arms," in India, 1892–3	
Instructions for Siege Artillery Practice, 1892	
Siege Artillery Instructions for Competitive Practice, 1892–3	
Instructions for Practice of Garrison Artillery over Sea Ranges, 1892	
Instructions for Siege Artillery Practice, 1893. 3 copies	
Volunteer Regulations, 1892	
Field Army Establishments: Home Defence, 1892	
Annual Report of the School of Gunnery on Horse and Field Artillery Practice at Home, 1892. 2 copies	
Annual Report on the Instruction carried on at the School of Musketry, Hythe, during 1891	
Approved Arrangements for Siege Practice at Lydd, 1893.	
Garrison Artillery Drill, Vol. I.	
Approved Arrangements for Coast Defence Instruction and Practice at the Western Forts, Isle of Wight, 1893.	
Instructions for Practice: Horse, Field and Mountain Artillery. 6 copies.	
Regulations for the Militia, 1893	
Equipment Regulations, Garrison Artillery Details. 2 copies.	
Hand-book of the Turkish Army, 1892.	Director of Military Intelligence.
Map of Anglo-French Boundary, near Sierra Leone	

General Map of the Pacific Islands, No. 834..	Director of Military Intelligence.
Map of Anglo-French Boundary near Sierra Leone, in 8 sheets, A to H, No. 902.	
Succession List to War Office Catalogue of Maps. 1st January, to 30th June, 1892 ...	
The Capture of Valparaiso, 1891	
Skeleton Map to Illustrate Operations in the Black Mountains	
Précis of Information concerning the Straits Settlements and the Native States of the Malay Peninsula.....	
Map of Egypt, Eastern Desert or Northern Etbai. 2 sheets. No. 864	
Hints on Reconnaissance Mapping for Explorers in Unsurveyed Countries	
Map of North Eastern Maroceo. No. 887 ...	
Map of Basutoland. No. 739	
Index Plan of the Ibea Railway Survey, Mombasa-Victoria Nyanza.....	
Map of the Surveyed portion of British Bechuanaland. 4 sheets. No. 950	
Map of the Territories Explored by the Boundary Commission on the West of the Gold Coast Colony. No. 944	
Accessions to War Office Library. No. 10, 1st January, 1893	
Particulars of Rifled Guns and Howitzers. 6 copies.....	Director of Artillery.
Tables enumerating the various natures of Gunpowder in the Service, and the Guns with which they are intended to be used. 2 copies.....	
Examination Papers for Auxiliary Artillery, May 1892	The Director-General of Military Education.
Report on the 13th Senior Class at the Artillery College.....	
Report on the Examination for admission to the Staff College, May 1892	
Fifth Report on the Education of Officers.....	
Report on the 13th Senior Class at the Artillery College	Director of Artillery College.
Annual Reports of the Board of Regents of the Smithsonian Institution for the years 1889 and 1890	The Council Smithsonian Institution.
Contributions to North American Ethnology. Vols. VI. and VII.	
Bibliography of the Algonquian Languages ...	
Annual Report of the Bureau of Ethnology, 1885–6	
Bibliography of the Athapascan Languages ...	
Smithsonian Contributions to Knowledge, Vol. XXVIII.	
Proceedings of the Institution of Civil Engineers. Vols. 108 to 111.....	The Council, Institution of Civil Engineers.
The Manufacture of Forged Steel Projectiles...	

Transactions of the East of Scotland Tactical Society, 1891–2 and 1892–3 ..... Discussion on "Some Needful Reforms"	The Council, East of Scotland Tactical Society.
Journal of the Iron and Steel Institute. Nos. I. and II., 1892 ..... The Iron and Steel Institute in America in 1890. Special Volume	The Council, Iron and Steel Institute.
Record of the Transactions of the Junior Engineering Society. Vol. II.	The Council, Junr. Engineering Society.
The Life of Francis Duncan, C.B., M.P., by Rev. H. B. Blogg, M.A.....	The Author.
Description of a Machine for Finding the Numerical Rules of Equations, and tracing a a variety of useful Curves, by F. Bashforth, B.A.	The Author.
Note on the Energy absorbed by Friction in the Bores of Rifled Guns, by Captain A. Noble, C.B., F.R.S. ..... Internal Ballistics, by Capt. A. Noble, C.B., F.R.S.	The Author.
Address to the Iron and Steel Institute, by the President, Sir F. A. Abel, K.C.B., &c.	The Author.
Applications of Elliptic Fonctions, by Prof. A. G. Greenhill, M.A., F.R.S.	The Author.
The Gunner's Pocket-Book, by Sergt.-Major A. C. Chew, R.A. 2nd edition.....	The Author.
Alloys of Iron and Chromium, by R. A. Hadfield. 2 copies	The Author.
Précis of the Arrangements connected with the Despatch of the Indian Contingent to Egypt, and of its operations in that Country in 1882, by Lieut. J. M. Grierson, R.A.	The Author.
Ten Years' Captivity in the Mahdi's Camp, 1882 to 1892, by Major F. R. Wingate, D.S.O., R.A.	The Author.
Preliminary Note on the Pressure Developed by some New Explosives, by Captain A. Noble, C.B., F.R.S.	The Author.
Millecinquecento Temi di Argomenti Svariatissimi, by Capitano Dionigi Romanetti ...	The Author.
Notes on Dynamics for the Senior Class of Artillery Officers, by Prof. A. G. Greenhill, M.A., F.R.S.	The Author.
Examination Papers, R.M. Academy, February 1892 and July 1892	The Governor, R.M. Academy.
Annual Report of the Chief of the Ordnance, United States Ordnance Department.....	Chief of the Ordnance.
Photograph of the Tomb of the late Major Norman Ramsay, R.H.A., at Inveresk, N.B.	Lieut.-Gen. J. R. Gibbon, C.B., *late* R.A.
Netherlands Artillery Atlas, plates 76 to 87, and 204 to 209	Netherlands Government.
Report of the Astronomer Royal, 1892..... Greenwich Magnetical and Meteorological Observations, 1890.....	The Astronomer Royal.

A Coloured Print of a Royal Artillery Field Battery in Action, 1853	Lieut. R. J. Macdonald, R.A.
Professional Papers of the Corps of Royal Engineers. Vols. XVII. and XVIII.	The Secretary, R.E. Institute.
Studies in Applied Tactics, by Karl Von Donat	Captain J. M. Grierson, R.A.
6 Photographs of some old Bronze Guns and Hand Mortars, found at Stettenbosch, S. Africa	Lieut.-Colonel R. A. Lanning, *late* R.A.
Norsk Marine Artillerie Matériel. Vol. VI.	Norwegian Government.
Water-Color Sketch of the Royal Artillery Band in 1833	Lieut.-Gen. E. A. Williams, C.B. R.A.
Water-Color Sketch of Fort Pendennis, near Falmouth	
Water-Color Portrait of the late General George James, as a Lieutenant R.A., dated 1827	General Sir J. M. Adye, G.C.B., R.A.
Military Vocabularies; English-Hindustani and English-Russian	T. M. Maguire, Esq., LL.D.
Information from Abroad, United States General Information Series, No. XI.	Chief Intelligence Officer, U.S. Navy.
Five South African Water-Color Sketches framed in Oak	Major G. E. Giles, *late* R.A.
First Report of the Bureau of Mines, 1891. Toronto, 1892	L. Homfray-Irving, Esq.
Der Nederlandsche Bezittingen in Oost-Indie, door J. W. Stemfoort, en J. J. Ten Siethoff	Lieut.-Colonel P. H. Hammond, R.A.
Water-Color Drawing of "Moul-Ali-Rock," Secunderabad, 1888	Capt. H. H. Hussey, R.A.
Canadian Military Institute Selected Papers, 1892–3	Secretary, C.M. Institute.
Pamphlet, "Warfare in Mountainous Countries." 2 copies	Major H. C. C. D. Simpson, R.A.
Water-Color Drawing of Nungee-Purbut, near Ghilgit, Himalayas; in gilt frame	General The Baron de Teissier, R.A.
Katalog ofver Artillerimuseum I Stockholm, af Fred A. Spak	Lieut.-Col. J. C. Dalton, R.A.
A Treatise on Artillery, dated 1780, by John Muller	H. T. Lyon, Esq.
Illustrated History of the 1st Battalion, The Black Watch (42nd Foot)	Colonel J. P. Groves.
Notice sur Quelques monnaies en Argent, Frappées a Omme Dirman (Soudan) par Yacoub Artin, Pacha	Major F. R. Wingate, D.S.O., R.A.
Handbook for the Hotchkiss 75^{mm} Rapid Firing Field Gun. 1893	Hotchkiss Ordnance Company.
Polished Mahogany Drawing Table	General H. L. Gardiner, C.B., R.A.
Portfolio containing original drawings by the late General Sir Robert Gardiner, and some engravings	
Water-Color Drawing of a "Corner in Nuremburg," by the late General Arthur Taylor, R.A., framed in gilt	

APPENDIX E.

Books, &c., Purchased.

A percus sur la Tactique de Demain; par le Commandant Coumés. Paris, 1892.

Allgemeine Lehre von der Truppenführung im Kriege. By Von J. Meckel.
Carnet de L'Officer de Marine. 1892.
Kritische Rückblicke auf den Russisen-Turkischen Krieg, 1877–78. 3 vols.
The Downfall (La Débâcle). By Emile Zola.
La Poudre sans Fumée, et les Poudres Anciennes. Par H. Ponteaux.
Batailles et Principaux Combats de la Guerre de Sept. ans. Paris, 1840.
Stratégie et Grande Tactique. Par le Général Pierron.
Note sur L'Emploi des Mortiers de 30^{cm} en Fonte. Par R. Degouy.
Introduction a la Theorie des Explosifs. Par M. E. Sarrau.
L'Artillerie de Campagne, et de Montagne, dans les Etat de L'Europe. Par J. Schubert.
Uniformenkunde Lose Blätter zur Geschichte der Entwickelung der Militärischen Tracht in Deutschland. By Von R. Knötel.
Les Nouvelles Défenses de la France, la Frontiere, 1870–1882–1892.
Traite Theorique et Pratique des Matiéres Explosives.
The Nearest Guard. By Major H. Brackenbury.
The Military Life and Character of H.R.H. William Augustus, Duke of Cumberland. By Neil Campbell-Maclachlan, M.A.
The Naval Annual. 1892.
The Electro-Magnet and Electro-Magnetic Mechanism. By S. P. Thompson.
Imperial Defence. By Sir C. Dilke and Spencer Wilkinson.
Lloyd's Register of British and Foreign Shipping, "War-ships of the World."
Text-book on Fortification. By Colonel G. Philips, R.E.
Treatise on Chemistry. Vol. II. Parts 1 and 2.
Guide to Promotion. By Lieut.-Colonel S. C. Pratt, late R.A.
Explosives and their Power. By C. N. Hake and W. Macnab.
An Inquiry into the Nature and Causes of the Wealth of Nations. By Adam Smith.
Frederick the Great. By Colonel C. B. Brackenbury, R.A.
Dynamo-Electric Machinery. By S. P. Thompson, D.Sc., &c. 4th edition.
Historical Records of the 32nd Cornwall L.I.
A Text-book on Steam and Steam Engines. By Professor Jameison.
Elementary Manual on Steam and the Steam Engine. By Professor Jameison.
Electricity, Magnetism and Acoustics. By Lardner and Foster.
Electricity for Public Schools and Colleges. By W. Larden, M.A.
The Influence of Sea Power upon the French Revolution and Empire. By Captain A. T. Mahan, U.S.N.
In a Conning Tower, or How I took H.M.S. *Majestic* into Action. By H. O. Arnold-Foster.
The Influence of Sea Power upon History. By Captain A. T. Mahan, U.S.N.
The Field Gun of the Future. By J. A. Longridge.
The Campaign of Waterloo. By J. C. Ropes.
The First Napoleon. By J. C. Ropes.
Royal Atlas of Modern Geography. Parts as issued.
Biologia Centrali-Americana, Zoology, and Archæology. Parts as issued.
Map of Europe.
Map of the Basins of the Rhine and Danube.
English Army Lists and Commission Registers, 1661–1714. By Charles Dalton, F.R.G.S.
Manual of Electric Search Lighting. By Major R. L. Hippesley, R.E.
Fortification for English Engineers. By Major J. F. Lewis, R.E.
Seventeen Coloured Prints and Sketches of Royal Horse, Field and Garrison Artillery.
Coloured Prints of Native Officer and Gunner, and Native Officer and Sepoy of the Nizam's Army.

Oil painting of an Artillery Incident. Period about 1800 (artist not known).
History of Kent.—Hundred of Blackheath.
History of Bayard, the Good Chevalier.
Memoirs of the Life of the Great Conde. 1807.
Pictorial History of Germany during the reign of Frederick the Great.
The History of the Rebellion and Civil Wars in England. 6 vols.
A letter to the Right Hon. the Lord B . . . . y, being an inquiry into the merit of his defence of Minorca.
A vindication of the Right Hon. Lord George Sackville, humbly inscribed to His Grace the Duke of Somerset.
Monograph of the Paradiseidæ, or Birds of Paradise, and Ptilonorhynchidæ, or Bower Birds. Parts as issued.

APPENDIX F.

Presentations to the Museum.

Regimental Cape, removed from the saddle of the late Major Stewart Smith, R.A., who was killed in action at the battle of Isandula, Zululand, 22nd January, 1879.	Major-General F. G. Ravenhill, R.A.
White Helmet, with brass ornaments complete, as worn by Officers, R.A., in India.	Major A. H. C. Phillpots, R.A.
Three Rifle Cartridges, headed respectively with silver, copper and ebony, used against Emin Pacha's troops of Equatoria by the Dervishes in the Sudan.	Major F. R. Wingate, D.S.O., R.A.
Silver Waterloo Medal, formerly belonging to Driver J. Singleton, R.H.A.	Major E. A. Lambart, R.A.
Cloth Tunic, as worn by Gentleman Cadets R.M. Academy prior to 1890.	Captain F. M. Lowe, R.A.
Cloth Overalls, as worn by Gentlemen Cadets R.M. Academy prior to 1890.	
Busby, with plume, &c., complete.	
Blue Cloth Helmet, with brass ornaments complete, as worn by Gentlemen Cadets R.M. Academy.	
A Shabracque, blue cloth, with gold lace border and ornaments complete, formerly the property of the late Colonel Pasley Dirom, Bengal Horse Artillery.	Captain A. Crawford, R.A.
A Parang, or British North Borneo Constable's sword, with hair of slain enemies attached, used at the storming of Galela Fort, 10th February, 1889; presented to Colonel A. C. Gleig, R.A., by Assistant-Commandt. Stewart, British North Borneo Constabulary.	Colonel A. C. Gleig, late R.A.

APPENDIX G.

List of Papers published in the "Proceedings" during the Year.

The Operations in Virgina, 1861-65. By T. M. Maguire, LL.D. (of the Inner Temple, Barrister-at-Law). A Lecture delivered at the R.A. Institution, Woolwich, 23rd November, 1891.

Field Artillery Fire. By Captain W. L. White, R.A. (School of Gunnery Shoeburyness.) Chapters V. to XI. (*Conclusion*).

Succession List of the Master-Gunners of England. By Major R. H. Murdoch, R.A. (Assistant-Superindent R.A. Records.) Part II. (*Conclusion*).

Quick-firing Guns in Harbour Defence. By Lieutenant A. S. Buckle, R.A.

Notes of Lectures on Artillery in Coast Defence. By Major A. C. Hansard, R.A. (Instructor in Gunnery.)

A Suggested Improvement in Mountain Artillery Transport. By Captain F. R. Maunsell, R.A.

Range Indicator Dial. By Lieutenant F. E. Freeth, R.A.

Narrative of the Crimean Services of "I" Troop, now "O" Battery, R.H.A. By Assistant-Surgeon R. Thornton. Contributed by Colonel F. A. Whinyates, *late* R.A.

Some Notes on Applied Field Fortification. By Lieut.-Colonel E. Clayton, R.A.

Experiences at Okehampton. Remarks on Captain White's Lecture. By Major C. R. W. Hervey, R.A.

Operations of the Irrawady Column, Upper Burmah. By Lieutenant G. F. MacMunn, R.A.

Notes on Egyptian Artillery. Contributed by the Secretary.

The Battle of the Velocities. By Captain H. A. Bethell, R.A.

Sir Henry Shere, Kt. By Charles Dalton, Esq., F.R.G.S.

Abstract of the Proceedings of the Fifty-Fifth Annual General Meeting of the Royal Artillery Institution.

Achievements of Field Artillery. By Major E. S. May, R.A.

Fire Discipline; Its necessity in a Battery of Horse or Field Artillery, and the best means of securing it. (Duncan Gold Medal Prize Essay, 1892). By Major A. M. Murray, R.A.

The Organisation of a Garrison Company. By Major P. Saltmarshe, R.A.

Fire Discipline; Its necessity in a Battery of Horse or Field Artillery and the best means of securing it. (Silver Medal Prize Essay, 1892). By Captain W. L. White, R.A.

Skill-at-Arms, By Lieut.-General Sir W. J. Williams, K.C.B., R.A.

Mountain Artillery Progress. By Major H. C. C. D. Simpson, R.A.

The United States Military Academy at West Point. By Captain A. C. T. Boileau, R.A.

"I" Troop (now "I" Battery), Royal Horse Artillery, at the Battle of Fuentes D'Onore. By Colonel F. A. Whinyates, *late* R.A.

Fire Discipline; Its necessity in a Battery of Horse or Field Artillery, and the best means of securing it. (Commended Essay, 1892). By Major W. L. Davidson, R.H.A.

Fire Discipline; Its necessity in a Battery of Horse or Field Artillery, and the best means of securing it. (Commended Essay, 1892). By Captain F. J. A. Trench, R.H.A.

Mounting Hydro-Pneumatic Disappearing Guns. By Captain L. C. M. Blacker, R.A.

The Sudan Past and Present. By Major F. R. Wingate, D.S.O., R.A.

Fire Discipline and Skill-at-Arms. By Major P. F. Hamilton, R.A.

An Infantry Officer's Ideas on Okehampton. Communicated by the Secretary.

A Note on the Gold Medal Prize Essay, 1892. By Lieut.-Colonel J. F. Brough, R.H.A. (With reply by Major A. M. Murray, R.A.)

Defence of a Coast Fortress. By Colonel J. B. Richardson, R.A. (*Lecture delivered to Senior Officers' Class.*)

Instructions for the Conveyance of Troops by Rail on the Field Service Scale. Framed by the Quarter-Master-General in India: Communicated by the Deputy-Adjutant-General, R.A.

Recent Development of Armour and its Attack by Ordnance. By Captain C. Orde Brown, *late* R.A.

Soldiering and Sport in Mashonaland. By Lieut. T. Jones, R.H.A.

Saddlery. By Lieut.-Colonel J. F. Brough, R.H.A.

Okehampton Experiences, 1892. By Captain E. W. Blunt, R.A. (*A Lecture delivered at the Royal Artillery Institution, 21st September, 1892.*)

Volunteer Adjutancies. By Captain G. Osborn, R.A.

A Visit to the Stockholm Artillery Museum. By Lieut.-Colonel J. C. Dalton (h.p.), R.A.

Making or Breaking. By Lieut.-Colonel D. D. T. O'Callaghan, R.A.

APPENDIX H.

Précis and Translations Published During the Year.

FRANCE. ...
- "Revue d'Artillerie." Registering Pressure-Gauge Applicable to Ordnance. By Lieut.-Col. F. E. B. Loraine, *late* R.A.
- "Revue d'Artillerie." The Field Gun of the Future. A critical examination of General Wille's recent work. By Gustave Moch, Capitaine d'Artillerie. *Précis* by Lieut.-Colonel F. E. B. Loraine, *late* R.A.
- "Revue Militaire de L'Etranger." April, 1892. The Last Campaign in Chili. By Lieut.-Colonel J. H. G. Browne, *late* R.A.

GERMANY.
- "Militär Wochenblatt." An Observation Ladder for Field Artillery. *Précis* by Major E. S. May, R.A.
- "Militär Wochenblatt." 29th June, 1892. Comparison of the the most important Regulations of Four Continental Powers as regards the Attack and Defence. By Col. Lonsdale Hale, *late* R.E.

RUSSIA.....
- "Invalid Russe." Cavalry Swimming. By Major E. A. Lambart, R.A.
- "Invalid Russe." Field Artillery of the Future. By Major E. A. Lambart, R.A.
- "Invalid Russe." No. 165. Defence of a Horse Artillery Battery against Cavalry. By Major E. A. Lambart, R.A.

New Experiments with Smokeless Powder. Report of Experiments at Herr Krupp's Factory. *Précis* by Major E. S. May, R.A.

APPENDIX I.

LIST

OF

FOREIGN MAGAZINES AND JOURNALS

TAKEN IN BY THE

R. A. INSTITUTION;

WITH THE NAMES OF OFFICERS WHO HAVE UNDERTAKEN TO SUPPLY PRÉCIS AND REVIEWS OF THEIR CONTENTS FROM TIME TO TIME.

COUNTRY.	NAME OF JOURNAL, &c.	TRANSLATOR.
France	Spectateur Militaire	Lt.-Col. F. E. B. Loraine, late R.A.
	Journal des Sciences Militaires.	Capt. J. F. Manifold.
	Revue d'Artillerie	Lt.-Col. F. E. B. Loraine, late R.A.
	Revue Militaire de l'Etranger.	Lt.-Col. J. H. G. Browne, late R.A., and Capt. E. J. Granet.
Spain	Revista Militar Española	Lt.-Col. J. C. Dalton.
	Memorial de Artilleria	" "
Germany	Neue Militärische Blätter	Capt. J. F. Manifold.
	Archiv für die Artillerie-und-Ingenieur-Officiere	Capt. R. M. B. F. Kelly.
	Militär-Wochenblatt	Major E. S. May.
Austria	Organ der Militär-Wissenschaftlichen Vereine	—
	Militärische Zeitschrift	—
	Mittheilungen, &c., des Artillerie- und Genie-Wesens	Capt. L. C. M. Blacker.
Italy	Giornali di Artigleria e Genio	Capt. H. de T. Phillips.
	Rivista " " "	Capt. R. M. B. F. Kelly.
Russia	Journal of Artillery	Major E. A. Lambart.
	Russki Invalid	" " "
Servia	Journal of Military Science, &c.	—
Sweden	Artilleri-Tidskrift	—

THE ATTACK OF A COAST FORTRESS.

BY

MAJOR F. B. ELMSLIE, R.A.

"CELER."

DUNCAN GOLD MEDAL PRIZE ESSAY, 1893.

At first glance the subject of the "Attack of a Coast Fortress" would appear to be almost purely a Naval one. But the subject of the Attack is so intimately connected, and interwoven, with that of the Defence, that the consideration of the former must greatly assist us in forming proper ideas as to the latter. This intimate connection with the subject of Defence, about which so much has been written and published—and notably the valuable and comprehensive article by Colonel J. B. Richardson, published in the "Proceedings" R.A. Institution for January last—makes it almost impossible not to travel again, to a certain extent, over ground already traversed by others. In writing on this subject there is no desire to pretend to naval knowledge, further than that which ought to be possessed by every officer who studies the question of Coast Defence, and the Attack is therefore considered chiefly from the point of view of the defenders. This would appear the more reasonable, as we gunners are little likely to have to take an active part in attacking—except on Land Fronts—foreign Coast Fortresses, while we may very likely be called upon to defend our own coasts against hostile attack.

It is very desirable to avoid, as far as possible, all purely speculative views, and to form our opinions on the substantial basis of history. It will consequently be necessary to describe, as shortly as possible, certain actual incidents, chiefly drawn from events of quite recent years.

Section I. On the Nature of Attack Which is Most Probable Under the Conditions of the Present Day.

It must be stated, as an axiom, that no attack will ever be undertaken without some definite object. A consideration of the most probable *objects* of an enemy will therefore give a key to the nature of attack which he may undertake.

"Naval Warfare," by Admiral Colomb.

It is shown conclusively, and proved from numerous historical examples, by Admiral Colomb, in his exhaustive work, "Naval Warfare," that before any attacks on sea-girt territory can be successful, or satisfactory, the Power making such attack must, at any rate temporarily, hold the command of the surrounding sea. This *command of the sea* will have to be established before the attack on territory can be undertaken, and maintained so long as the Land Forces are on foreign soil.

Now a modern ship can hardly be built and equipped during the continuance of a modern war. There is, therefore, no possibility of replacing casualties to ships by building others, and as the command of the sea must, *ceteris paribus*, depend upon the number of ships of war that each Power can maintain afloat, the value of each individual vessel is enhanced, far beyond its intrinsic value, great as this may be.[1] Under circumstances of a near equality in naval strength, the sudden destruction, or even total disablement, of two or three large ships might be a disastrous blow to the Power thus struck. It is not difficult to imagine combinations which might bring about this near equality.

From the foregoing considerations the following inferences may be safely drawn:—

(1.) Without waiting for pitched battles, or fleet actions on a large scale, *the destruction, or capture, of individual ships, as soon as possible, is the objective of the first importance to a Power attacking a maritime nation.*

(2.) The possibility of replacing lost or badly damaged ships during the time of war being so small, *both sides will hesitate, even more than formerly, before they risk their more valuable vessels in attempting to attack fixed defences.*

Coast Fortresses exist in a great measure for the purpose of acting as *points d'appui* for fleets. They generally contain, and are intended to protect, a dockyard, stores and coal, together with ships in various stages of preparedness for service, both men-of-war and colliers. Modern ships cannot keep the sea for months together, as could the old sailing ships of former days, and, in war time, they must have protected bases from which to operate, where they can take shelter, take refuge, refit, and replenish supplies. These bases are furnished by the Coast Fortresses.

It may be considered as a certainty that, in time of war, Coast Fortresses will constantly have under their protection valuable ships building, fitting out, repairing, or coaling. *These ships will be the primary objects of attack,* and their protection will be the primary duty for which the defenders of such fortresses will be held responsible.

A ship in port, in a state of comparative unpreparedness, is, in many ways, a more vulnerable object than a ship in full war trim on the high seas, and an additional reason for attacking ships in port is the profound

[1] Since the above was written, the following words, spoken in the House of Commons on the 7th of this month (March 1893) by Lord George Hamilton, the ex-First Lord of the Admiralty, show that the opinion of one whose judgment in these matters must be regarded with the highest respect, is quite in agreement with the view here expressed—"It must be recollected that, if we engaged in a really serious war, the command of the sea really rested with that Power which had the most battle-ships and the most fighting power."—*Standard*, March 8th, 1893.

political and moral effect which would be produced on a nation by the sudden destruction of their valuable ships in their very ports, and behind the shore defences.

The deliberate attack, on a large scale, of a Coast Fortress, with a view to its actual capture or destruction, not only requires, as shown by Admiral Colomb, a fully commanded sea, but is besides an operation of great magnitude, demanding all the resources of a great State, and demanding some time for preparation. The difficulties of our own Baltic fleet in 1854, and those of the French fleet in 1870 in effecting anything, even when they held the command of the sea, show how difficult it is for a sea force, alone, to seriously injure a nation through its shore defences. Even an attack with a view to the mere destruction of works is, so far as present experience goes, in many ways wasteful, the results hardly being commensurate with the expenditure, while the risk to big ships venturing into narrow hostile waters must be very great.

The bombardment of the works of Alexandria by our fleet in 1881 is a modern and most interesting example of how little really can be effected by a fine fleet, operating in a sea over which it has undisputed command, against indifferent works, on low sites, indifferently armed and manned, and unassisted by any auxiliary defence, such as torpedo boats or mines.

It is therefore quite unlikely that, at any rate at the commencement of a war, either side would feel itself in a position to attempt an attack on any fixed defences on a large scale. There remains then for consideration, attempts to bombard dockyards at long ranges, and attempts to destroy ships by other methods. The former partakes of the nature of a deliberate attack on works. The latter will be considered first.

In the American Civil War, in 1861, the Confederates were fitting out the schooner "Judah" in Pensacola Navy Yard to prey upon Federal commerce. The Confederates *believed her to be so safe that no naval force would attempt to cut her out.* The vessel lay alongside the wharf, to which she was secured by chains. She was manned and armed with three guns, and on shore two more guns (one of them a 10-inch) were mounted to command her decks and the wharf, while no less than 1000 troops were kept in and about the yard. "The Naval History of the Civil War," by Adl. Porter, U.S.N.

The Federal Commodore *considered the destruction of this vessel of so much importance as to warrant the risk of a failure and the loss of men.*

At 3 a.m. on September 14th, 1861, an expedition of 100 men in four boats was despatched from the Federal frigate "Colorado." The crew of the schooner were found at quarters and ready to repel boarders. *Two of the boats made for the shore,* and this party successfully spiked the two guns there mounted. The other two made for the schooner and, after a sharp fight, drove her crew ashore. *Finding it impossible to move the vessel* she was successfully set on fire. The boats made good their retreat. The schooner burnt to the waters edge, floated away, and sank. Subsidiary Attack.

The above incident took place little more than thirty years ago. It has been selected as comprising in small compass several most valuable lessons to be referred to hereafter.

Now the modern equivalent of a cutting-out expedition is *the torpedo attack*. Modern ships, unless actually under steam, are too heavy to remove, even if they could be successfully carried by boarding parties; and their construction is such that they are likely to be but little harmed by being set on fire. Their *destruction*, however, with as little risk as possible to the attackers, can be best and most speedily effected by means of *the torpedo*.

"Brassey's Naval Annual," 1892.

That this has already been realised by those nations who have had recent experiences of war can be fully proved. In the Civil War in Chili on the 27th January, 1891, the Government armed merchantman "Imperial" was lying in the harbour at Valparaiso, when an attempt to torpedo her (unsuccessful) was made by a picket boat belonging to the Congressional battle-ship "Blanco Encalada."

On the 23rd April, in the same year, the "Blanco Encalada" herself was lying in Caldera Bay, when she was *surprised*, about 4 a.m., by two Government torpedo gun-vessels, the "Condell" and "Lynch." These *acted in concert*. The "Condell" leading, steamed straight for the "Blanco," fired her bow torpedo (which missed), and then, turning sharp to the right, fired two in succession from her port side, one of which appears to have struck the "Blanco" near the bow. The "Condell" then steamed away. The "Blanco" kept her fire on the "Condell" as she fled, *without apparently noticing the approach of the "Lynch,"* which, following the "Condell," discharged two torpedoes, the second of which struck the "Blanco" amidships, sinking her in two minutes, with a loss of 11 officers and 171 men.

The destruction of a Turkish gun-boat in the Danube in 1878 by a Russian torpedo boat is another instance which will be recalled in this connection.

Such are the effects of the torpedo.

"Hostilities without Declaration of War," by Colonel Maurice, R.A., 1883.

In the early part of 1882 a Committee of the Board of Trade was considering the proposal to make a channel tunnel between England and France. The opinion of the War Office was sought as to what formalities, if any, were customary between opposing States at the outbreak of war. A somewhat startling result was arrived at by Colonel Maurice, R.A., then of the Intelligence Department, after a most careful compilation of all the cases in which hostilities have occurred between civilised powers, prior to a declaration or warning, between 1700 and 1870. The words of the Report presented to the Board of Trade Committee are worth quoting:—

Real danger of a sudden attack before fully prepared.

"The result of the investigations . . . . . is to show conclusively that there has not been . . . . any established usage whatever on the subject."

"Less than 10 instances have occurred during the above period, when 'Declarations of War' have been issued prior to hostilities: 107 cases are recorded of hostilities without declaration."

"In 41 of these cases the manifest motive (in several cases the actually avowed motive) has been to *secure advantage by the suddenness of the movement, and the consequent surprise of an unprepared enemy.*" (The italics are the writer's).

The argument can now be carried a step further.

In the British Naval Manœuvres of 1890, a hostile torpedo boat flotilla was established at the Island of Alderney, 100 miles from Plymouth. *It was determined to attack the British Fleet at Plymouth as soon as possible after receiving an intimation that hostilities had commenced.* "Brassey's Naval Annual," 1891.

Fearing that Alderney *might be watched* by British cruisers, *the flotilla shifted* to Guernsey (90 miles from Plymouth). The boats were divided into two divisions, according to their speeds: one division lay in Peter port, the other *in a convenient bay* at the south-east end of the island. Base with which base can be shifted. Harbour not necessary as a base.

Information that hostilities were to commence reached Guernsey at 6 p.m. on August 8th, 1890.

The boats immediately put to sea, each division travelling independently, *so that the faster division, at any rate, might strike a blow,* even should the speed of the others be insufficient to get them up in time.

By 2 a.m. that same night the faster division of boats rounded the east end of Plymouth Breakwater, and surprised the ships lying there. Doubtless several of them would have been sunk or disabled. Furthermore, the confusion caused by their attack *enabled the second division of boats to come up unobserved*—the parallelism between this incident and the real attack of the "Condell" and "Lynch" on the "Blanco Encalada," just described, is worth remarking—and rounding the western end of the Breakwater, to make a second effective attack. Speed with which distance can be traversed.

The Plymouth forts appear, on this occasion, to have taken no part in covering the ships. Possibly they had not been warned to take part in the operations. But they would have been hampered by the ships being in the way of their fire.

It is proper to remark that, up to this point, nothing has been quoted that has not *actually been accomplished,* while the power of all warlike appliances, and the speeds obtainable from boats, are still rapidly increasing. In the above operations the speed of the fastest division of boats never exceeded 19 knots. The new French torpedo boats have a displacement of 150 tons, and a sea speed of no less than 25 knots, while it was stated in the *Times* of 24th January last that one French boat had actually attained a speed of over 27 knots.

The number of torpedo boats belonging to France is 229, the greater number of which are of good size and speed.

This torpedo boat attack on Plymouth illustrates another great fact. *Modern speeds have narrowed the channel,* but so silently that it is doubtful whether, as a nation, we have yet realised the fact. If, by some great convulsion of Nature, the coast of France, with all its fortresses and ports, its bays, harbours, and inlets, still uninjured, had suddenly been thrust forward, until Cherbourg was visible from the Isle of Wight, and all the possible bases of action for French ships and boats stood visibly close to our shores, what a popular outcry there would have been, and what examinations into the preparedness of our defensive system—yet this change has virtually taken place.

The following table shows the distance *in hours* between certain English and French ports under modern conditions, for (A) the fastest torpedo flotilla capable of doing 24 knots, (B) an ordinary torpedo

flotilla at 17 knots, and (C) a fleet of battle-ships at an estimated speed of 12 knots. It is believed that these speeds would be endorsed by the Navy as approximately correct. The times are somewhat startling, when it is remembered that the class of vessels to which columns A and B refer could deliver thoroughly effective attacks without any delay, and without attracting any attention by preliminary preparations. The fitting out of a big ship or ships must be publicly known, and that knowledge can hardly be prevented from reaching the enemy, but the movements of a torpedo boat or two need attract no notice.

Torpedo expeditions can be despatched with secresy and suddenness.

Table of the approximate number of *hours* required to traverse the distances been certain English and French ports :—

Between	French Port.	and	English Port.	Distance in miles (approximate).	Distance in Hours. A. Fastest torpedo flotilla, speed 24 knots.	B. Ordinary torpedo flotilla, speed 17 knots.	C. Fleet of battle-ships, speed 12 knots.	Remarks.
			PORTS IN CHANNEL AND ATLANTIC.					
	Cherbourg and adjacent coasts. ...	...	Portsmouth	90	3¾	5½	7½	Fractions less than quarter hours neglected.
			Isle of Wight (nearest point)	65	2¾	3¾	5½	
			Alderney	30	1¼	2	2½	
			Guernsey	50	2	3	4¼	About 12 hours run is assumed as a limit to the radius of action of boats.
			Jersey	60	2½	3½	5	
			Plymouth	140	5⅝	8¼	11¾	
			Portland	80	3¼	5	6¾	
	Brest and adjacent coasts		Plymouth	160	6¾	9½	13¼	
			Falmouth	140	5¾	8¼	11¾	
			Queenstown	300	12½	—	25	
	Dieppe and coasts		Dover	80	3¼	5	6¾	
			Portsmouth	115	4¾	6¾	9½	
	Boulogne, Calais, Dunkirk, &c. ...		Dover	22	1	1½	2	
			Sheerness and Mouth of Thames	75	3¼	4½	6¼	
			PORTS IN MEDITERRANEAN.					
	Toulon, Marsailles, and adjacent coasts.			700	out of radius*		58¾	*Out of radius of direct action, but boats could, and probably would, be convoyed by ships, and might act effectively at Malta from some of these ports in 48 hours from the outbreak of hostilities.
	Sicilian Coast (nearest point).		Malta.	50	2	3	4¼	
	Sardinian Coast (nearest point).			350	out of radius.		29	
	Corsican Coast.			480	out of radius.		40	
	Biserta (Tunis).			280	11¾	—	23½	
	Toulon, &c.			780	out of radius.		65	
	Minorca.			580	〃	〃	48	
	Iviza.		Gibraltar.	420	〃	〃	35	
	Sardinia and Corsica.			800	〃	〃	66½	

That the change of conditions caused by these modern speeds has scarcely yet been thoroughly realised, is proved, not only by the surprise of the fleet at Plymouth,[1] but by the surprise of the "Blanco Encalada." There is no doubt that the Captain of the latter, having trustworthy information that the two Government ships were some 400 miles distant on the previous day, neglected precautions, which he would have taken had he realised that they were within striking distance.

Section II. On the General Principles which Govern the Attack.

(1.) *Good information* is absolutely necessary, before planning an attack, as to the names and numbers of the ships in each harbour, and where they are lying, their state of preparedness or otherwise. The strength, composition, and *morale* of the garrisons of the forts, the number, nature, positions, and mountings of the guns, and how fought, whether by P.F. or other systems. *The exact position of the P.F. cells for both guns and mine-fields—search-lights where placed*—position of Brennan torpedo station and how defended. Good charts of the channels and harbours, and pilots if possible. The general character of the defence contemplated, whether by guard-boats, mines, &c., &c.—if the latter, the exact position of the mine-fields and *where the shore ends of the cables are led ashore,* &c., &c. Most of this information is probably available to our possible enemies. The recent conviction of a N.-C.O. of the Royal Engineers for selling plans of a fortress to the French will be recollected in this connection. It may be remarked here, *en parenthèse,* that it is high time that our laws increased the punishment for such offences—the present maximum of 12 months' imprisonment is miserably inadequate.

(2.) *Speed and Secrecy* are essential, these were the secrets of Napoleon, and no words can express the importance of the former. In these days an hour or two more or less may be of inestimable value—even 30 years ago, the value of a few hours is strikingly illustrated by the case of the "Merrimac" and the "Monitor." In the American Civil War the Confederates were building the formidable armoured ram "Merrimac," while the Federals had on the stocks the turret craft "Monitor," the only vessel likely to be able to cope with the "Merrimac." A month before the "Monitor" was to be launched, the Confederates, *through their spies,* learned the exact condition of the vessel, and the day on which she would probably be put into the water, and, in consequence of this information, strained every nerve to complete the "Merrimac" first, doubling the number of workmen, and working both by day and by night. The result was that, on March 8th, 1862, the "Merrimac" attacked the Federal wooden fleet, sank the "Cumberland," burnt the "Congress," and had the fleet at her mercy, when at 8 p.m. that evening the "Monitor" appeared on the scene, and prevented the "Merrimac" from doing any more mischief. Those few

"Naval History of the Civil War," by Admiral Porter.

[1] It is fair to the Admiral of this fleet to state that he mentioned to his ships the *possibility* of torpedo boat attack, but expressed some doubt as to whether the rules of the manœuvres would admit of it. The ships were certainly caught in a faulty position and more or less unprepared.

hours' start, however, enabled the Confederates to destroy two valuable ships of the Federal fleet.

Speed caused the surprise and destruction of the "Blanco Encalada." *Speed* takes the defenders unawares—*acts* before the cumbrous paraphernalia of mines, booms, *et hoc genus omne*, can be got ready and in working order. *Speed* produces the highest moral effect—*bis dat qui cito dat* applies to blows as well as to gifts—in short, *speed* and *promptness* are more than ever before the keynotes of a successful attack.

(3.) *Directness of Object.*—For an attack to be successful, it must have a definite object, laid down beforehand, to be carried out, and *all side issues must be avoided.* This applies to subsidiary attacks, as well as to the chief ones. Every boat concerned must, as far as possible, have its particular mission. Any fighting should be left if possible to the covering boats, and *the real attack should never fire a shot* or even look aggressive, but steam *rapidly and silently* to its intended object.

"Memoirs of General Marbot."

It is related by General Marbot that, on one occasion, during the Russian wars, while serving as A.-D.-C. to a Marshal of France, it fell to his lot to have to convey an order to a French regiment, cut off from the remainder of the Army, and entirely surrounded by thousands of Cossacks. Two Orderly Officers had previously attempted to reach the regiment, but both had been slain. Marbot, however, had observed that both of these started with drawn swords, and thus invited attack. He, consequently, never attempted to draw his sword, but trusted entirely to his horse, and although recognised, and "hoorooshed" by the Cossacks, yet none really attacked him, and he actually passed unscathed through their midst, reached his goal, and delivered his message.

(4.) *Subsidiary Attacks.*—The attention of the defenders must be distracted and drawn from the real attack—by false attacks, possibly in several directions at once, and by real attacks subsidiary to the main one directed against local objects—these will include *landing parties* for the *destruction of P.F. cells,* Brennan torpedo stations, and the *shore ends of mine-field cables,* with the elaborate, complicated, and easily injured appurtenances belonging thereto. Feints, and real attempts, at creeping for cables, and countermining, will also be undertaken, generally in connection with other operations, but, above all, noise and smoke must be largely relied upon to cover operations of all kinds and distract the attention of the defenders. In the midst of all the above, and probably also in darkness and thick or rainy weather, the boats of the real attack, manned by picked and determined men, must steam rapidly and silently to their real objective.

(5.) Every endeavour must be made *to get mixed up with the defenders.* If this can be managed, both the gun and mine defence are paralysed and rendered impotent for the time, and an entrance to a defended harbour may be thus gained. To escape afterwards will be comparatively easy, as there is sure to be some uncertainty in the minds of the defenders as to whether boats *leaving* a harbour or channel may not be friends.

Another point in which the defence may be made to positively assist the attack is by drawing as much fire from the shore guns as possible, and using their smoke as a cover.

(6.) *No attack must ever be attempted by a single unsupported boat.* An interesting instance of this occurred during the war between Chili and Peru in April 1880. The Peruvian corvette "Union" was lying moored in the harbour of Callao. She was surrounded by a stout boom. A Chilian torpedo boat, fitted with spar torpedoes, was sent *to attack* the "Union," but on her way came into collision with a fishing boat, and one of her two spars was broken. Nevertheless the boat made for the "Union," and, finding her surrounded by the boom, exploded her other spar torpedo against the latter, destroying a portion of it, and opening a clear way to the ship. Having, however, no other torpedo available, *and no consort to take advantage of the opening thus made,* this boat had to retire, without effecting anything, at the moment when success was assured, had a consort been present. The success due to combined action is illustrated by the sinking of the "Blanco Encalada" previously quoted. "United States Naval Intelligence," War Series II., 1883.

The attack by torpedo boats should be exactly similar to an attack by cavalry. The boats should act in several successive lines, following one another in pairs, or threes if possible, and slightly echeloned. By this means P.F. predictions, if lost, as they probably will be, with reference to the boats for which they were intended, will be of no use for the following lines. This point will be referred to later. Even if the leading boats get destroyed or disabled, yet success may be attained by those following, while the knowledge of support, and *witnesses,* close behind, must nerve the leaders, as also the knowledge that in case of a breakdown assistance is at hand.

(7.) *Every advantage must be taken of meteorological conditions.*—Probably few of us landsmen fully realise the stupendous importance to both Attack and Defence of meterological conditions. The most obvious instance is the difference between daylight and darkness, but everyday incidents, such as fog, haze, rain, the state of the sea, the tides, *direction* and *force of wind,* and *state of the atmosphere with reference to the hanging of smoke, are* all factors of immense importance, and it is not saying too much to affirm that the success or failure of an enterprise may depend upon the use made of these natural conditions. For instance, during daylight, a good or bad light for aiming is chiefly dependant upon the position of the sun with reference to the various objects, and this is partially the case even when the sun itself is not visible. At Alexandria the low morning sun was full in the eyes of the gun-layers of the fleet, the batteries being in shadow, while the men in the latter viewed the ships brightly illuminated against a dull background. In a morning attack on say Plymouth, it would, therefore, be advantageous to select the western defences of the sound, which face more or less eastwards, for attack, rather than those on the other side.

The effect of *fog* is completely paralysing to the Defence, but an active attacker will utilise it specially to injure submarine defences. *Haze* and *mist* are modified fogs, and are far more troublesome to the Defence than to the Attack, on account of *their effect upon telescopes,* which form parts of certain instruments upon which the gun power of the Defence greatly depends. A very moderate haze, such as would afford little obstacle to navigation, has considerable effect upon tele-

scopes. In certain very moist states of the atmosphere, films form between the glasses of these instruments and give very great trouble. *Rain* is also prejudicial to the instruments and observations of the defenders, while the drift, and especially the "hang" of smoke, which latter varies greatly according to the barometer, are of extreme importance. Combinations of the above with one another, and with darkness, may render useless the best schemes of defence depending on the shore alone.

(8.) Every sort of *strategem* should be resorted to, and as it is hardly possible for a maritime nation like ours to absolutely block our ports to all vessels, there is some scope for ingenuity.

(9.) *The probable hour of Attack.*—This depends upon: (*a*) the object to be attained and (*b*) meteorological conditions. In the case of an attack upon works on a large scale, the hour chosen must almost of necessity be daybreak, for this alone allows of preparations being made under cover of darkness, and also affords probability of sufficient daylight in which to reap the fruits of the operations. But for torpedo boat attacks night-time offers many advantages, and the hour should be *a little before high water*, when this occurs within such hours as will enable the attacker to get away, after accomplishing his mission, before daylight. *The boats should reach their objective just about the time of high tide.* This will give them the best chance of clearing the electro-contact mines, many of which will be too deep in the water, at high tide, to be touched by a light draught boat. The largest French torpedo boats only draw 7 feet. The tide will also help them and increase their speed on both inward and outward journey. Another very possible hour for an attack is about 8 to 9 a.m., when the garrisons, after a night spent in constant watchfulness, will have, in all probability, relaxed their vigilance. A bold attacker might, at this hour, possibly catch the whole of the Defence unprepared.

Section III. On the Obstacles to be Overcome by the Attack, and how they must be surmounted.

It is desirable next to consider what obstacles will stand in the way of an attacker, what are the weak points of each, and how each should be dealt with.

In the first instance, the would-be attacker may find himself forestalled by a quicker and more enterprising enemy, and *blockaded in his own ports.*

On this head all present experience goes to show that it is very difficult, if not impossible, for a blockader to keep shut up even large ships. To keep torpedo boats from breaking out may be said to be an impossibility. These little craft are so dangerous to the ships of the blockading fleet that the tendency will be for the ships to keep as clear of them as possible, and *boats that wish merely to slip through the blockading line will probably meet with little real hindrance.*

Guard-Boats.—On reaching the vicinity of the port to be attacked, *guard-boats* and *picquet-boats* will probably be met with. How these should be dealt with is not for a landsman to say, but if the attack can draw on a running fight, and get thus mixed up with the defending

boats, all the gun and mine defence is paralysed, and the attack may be able to get through the defended water unscathed.

The following instance of a guard-boat action took place on May 25th, 1880, during the war between Chili and Peru. At Callao, two Chilian torpedo boats encountered a Peruvian launch which fled. One of the boats succeeded in exploding a torpedo under the launch's counter, the latter simultaneously exploding one under the torpedo boat's bow. The latter was sunk, and the launch, in a sinking condition, surrendered *to the other torpedo boat*—another instance, if one were needed, of the importance of boats acting in couples, or larger numbers. "United States Naval Intelligence," 1883.

Electric Lights.—Though not strictly obstacles, yet careful consideration must be given to the best manner of evading or baffling the beams of search-lights. *To be as inconspicuous as possible* is the first point, and it is worth noting that nothing shows up better in the beam of a light (or on a very hazy day) than a cloud of white steam or smoke, and some arrangement should be made, if possible, to enable boats to discharge their waste steam under water. *To obscure the water-way*, by shrouding it in a screen of smoke, will be the next desideratum, and here the guns of the Defence may greatly aid the Attack by pouring forth volumes of smoke, unless prevented by good organisation. *High speed* and an *erratic course* will assist to baffle the lights, and chief of all will be the method, referred to above, of *advancing in successive* lines, some of which, while attracting attention to themselves, will entirely divert it from others. Should the force available admit of it, an actual subsidiary attack, real or feigned, *on the lights themselves*, will be a sure way of engaging their attention while the channel is passed by the main attack.

Strategem, and creeping in under the shadow of the shore, or under the shadow of a passing ship or barge, will also be made every use of, and, of course, favourable atmospheric conditions will be of the greatest assistance.

The Gun Defence.—The weak points of the gun defence are its dependance upon good visual conditions, its slowness where large guns are concerned, the contracted arc of fire of guns mounted in closed works or behind shields, and the amount of smoke evolved. There is also the difficulty—not yet fully realised—of maintaining at all times, both of day and night, proper discipline, and instant vigilance in the garrisons, composed as they probably will be of reserve and auxiliary forces, and the want of high training consequent upon this composition—all the above points will militate against the effectiveness of the gun defences. Even where the P.F. system is relied on, a judicious choice of time and weather, a high speed, and an erratic course, will probably neutralise these instruments and the guns dependent upon them. Note that boats should never follow one another in the same course, otherwise if, as is highly probable, a prediction prepared for a leading boat be lost owing to her high speed, the following boat, if in the same track, might be made the recipient of the salvo.

Where the guns are known to be fought by P.F., in all probability a determined subsidiary attack by small landing parties, covered by gun fire, upon the P.F. cells will be attempted.

Where the guns are laid by sights, a high speed, and the dazzling of the gunners by the use of ships or boat search-lights, turned full into the battery, will be very effective in spoiling their aim and rendering their fire worthless. In addition, all the measures enumerated as suitable for evading electric lights are applicable to the problem of getting safely past the gun defence.

And the Attack may remember that even in daylight, with well trained men, a very slow moving target, and all conditions as favourable to the guns as possible, actual *hits* are not numerous. How much more difficult then will it be to destroy a scarcely visible enemy, appearing suddenly, at any hour of the night, and in any weather, moving at high speed, and in an erratic course, and probably disappearing long before the ranges can be taken and guns laid. A method of dealing with the problem of the application of heavy guns to such objects will be proposed immediately.

But a portion of the gun defence, far more formidable to torpedo boats and lightly armoured craft, is fire from *the lighter quick-firing guns*, such as the 6-pr. These guns should be liberally supplied to the defence *mounted on transporting mountings*. They can thus be utilised just where required, and the sites where they will be found need never be known beforehand to the attacker, who will thus be hindered in planning beforehand any special attack upon them. Of course the ammunition should be smokeless. The important point of the supply of quick-firing guns will be considered later.

The Submarine Defence—Mines.—Here we have the real "dark horse" of coast defence. In their earliest form they were used in the American Civil War, and on several occasions with effect. At the battle of Mobile, the Federal "Tecumseh" was sunk by a mine, as was also the "Cairo" in the Yazoo river on December 12th, 1862. In their present elaborate form, however, they are quite untried, for, unfortunately, they do not appear to have been used in any of the operations of recent years. But dangerous as they undoubtedly may be, they have many weak points. They are highly elaborate, take some time to lay correctly and effectively, and while constantly liable to injury, not only from tides, currents, and weather, but also from craft and shipping, are difficult to repair. Save in the case of purely mechanical mines, which would only be used in exceptional situations, their use involves great responsibility, and the risk of destroying friendly vessels by mistake, or accident, is considerable, and this must greatly paralyse their action, especially at night, and in thick weather. There are also great practical difficulties in keeping observers always at their posts, and vigilant and clear-headed. Furthermore, mine defence is more likely to be effective against large ships with considerable draught of water, than against the light draught torpedo boats. The French sea-going boats of 150 tons only draw 7 feet, and *at the top of the tide* and running fast, might very likely safely traverse a mine-field again and again.

Remembering all this, the main attack may traverse a mine-field by a rush, while, as in the case of lights, the attention of the defenders and observers is distracted by subsidiary attacks. The under-water

cables are almost sure to be protected by chains, &c., and will require some time to find and cut, but to a bold attacker the weakest point of the mine-field will very possibly be found *on shore*. The shore ends of cables are generally, for convenience, brought in close to a good landing place. Probably a determined attempt by a *small landing party* on the shore arrangements of the mines will be the best way of covering the passage. This subsidiary attack should try and damage the P.F. cells and test-rooms, and their valuable instruments and contents, by exploding hand charges in them.

In the attack of mines, as of other branches of the defence, an early and rapid attack, on a well laid plan, should have an excellent chance of being successful.

Brennan torpedoes may be met with, but an attack of the nature here considered can afford to disregard them. No Brennan is likely to catch a torpedo boat even if it were thought worth while to launch it against it.

Entanglements and obstructions will certainly be laid down by the defenders, and if placed, as they should be, where a heavy gun fire can be brought to bear, they may be very serious obstacles. But, at the same time, all important ports must have a fairway for the passage of friendly vessels, and of this fairway the attacking torpedo boats will probably be able to avail themselves.

Inner Guard-Boats.—An inner squadron of guard-boats may now be encountered. Many of these will probably be armed tugs, and other vessels of comparatively low speed. *Avoidance of encounter*, rather than attempting to fight them, must be the guiding principle in the mind of the Attacker. As before stated, the best thing for his purposes is to get well mixed up with the defenders.

Infantry and machine gun fire from the shore will become hotter as the harbour is approached, and the waters become narrower. It will, however, probably be wild and more or less ineffective, and will not of itself be a serious danger.

And finally, the ships, the real objective of the attack, will be found protected, possibly by their *boats*, and almost certainly by *booms, &c.* These booms should be destroyed by spar torpedoes—attempts at "jumping" them would appear to be very risky and wasteful of boats.

The ship's own defences of quick-firing guns, &c., fired, as many of them assuredly will be, at random, will probably do as much damage to friends as to foes. It has not yet been demonstrated what will be the effect *upon one another* of the promiscuous firing of several ships with modern armament during a night surprise. It will undoubtedly be very great.

Once close to his object, a bold attacker, well supported, should be able to inflict a decisive blow. Escape afterwards should be comparatively easy, owing to the uncertainty which must almost of necessity exist in the minds of the defenders, as to the identity of boats *leaving* their harbours.

It will appear from the foregoing that the obstacles presented by the Defence to a really prompt, well planned, and bold attack, are not nearly so insurmountable as might be thought at first glance. Further,

the Attack has immense advantages. It knows its own mind, chooses its own time, object, and atmospheric conditions, starts fresh to its work, employs its best and most dashing officers and men, and is a manageable force. On the other hand, the Defence is crippled by its very complexity, the extent of ground it covers (often such as makes rapid communications, or passing of men from point to point extremely difficult), the multiplicity of its details, and the colossal difficulty, apparently not yet properly realised in our country, of ensuring concerted action between the several sections of the Defence, some in the hands of the Navy, some in those of the Artillery, and some in those of the Engineers. Further, this concerted action cannot be rehearsed in time of peace, except at great cost, so the Defence may be said to be practically untrained at the outbreak of hostilities. Its officers and men, too, will be largely composed of auxiliary forces, certainly unable, at any rate at first, to compete, in these days of rapid movement and action, with the dash and speed of the Attack.

The Attackers, too, being presumably Naval men, besides being in training, have far more experience of practical work under varying meteorological conditions than the defenders—a knowledge which must give a still further advantage.

And also the *morale* and discipline of the garrisons and covering forces will inevitably be a source of trouble to the Defenders. Men, especially those only partially trained, cannot be always kept screwed up to a high pitch of vigilance and discipline. Crowded into confined works, the novelty will soon wear off. The nervous tension produced by constant anticipation of attack, especially if attack does not come, must be followed by relaxation. It will probably be found necessary to relieve the garrisons entirely every 12 or 24 hours.

If, therefore, the golden moment for attack, viz., the very commencement of hostilities, be, for any reason, not taken advantage of, it will be best for the attackers to *refrain* from mere attempts to harass the garrisons. Frequent attacks, especially if not pushed home, must be a positive advantage to the garrisons, as giving to the men excitement, interest, and occupation, and to the officers, practice, and opportunities of finding out their weak points. Far more harassing to the Defence will be the dead monotonous silence, the wearisome suspense, the feeling that an attack is always impending yet never coming, which must lower the spirits and energy of the garrisons. Fixed defences cannot take the offensive, or even compel the enemy to come and attack them, though they are themselves always open to attack. Their garrisons have thus a morally inferior position and will be dimly conscious of it. Finally, the tendency of most modern improvements has been in the all-important subject of *speed*, not only of movement, but also of fire, and it must be admitted that the Attack has benefited far more from these improvements than has the Defence.

The state of things obtaining at this moment, in the matter of the relations between the Defence and Attack of Coast Fortresses, bears a striking resemblance to the condition of the military nations of Europe, before the bursting upon them of the armies of the French Republic, and the inauguration of a new era in things military. We read in

History how the slow cumbrous methods of land warfare, traditional, and in vogue, up to the time of the French Revolution, were suddenly completely upset by the new style of warfare of the French armies whose *celerity of movement*, and consequent *rapid striking power*, gave them their enormous advantage over their slower, and less alert opponents. Somehow the state of Coast Defence in relation to the Attack at the present moment strongly recalls this position. The Defence compared with the Attack is wanting in *speed*. What then is to be done?

Section IV. On the Measures Required to Place the Defence on a Level with the Modern Attack.

It is hoped that a few suggestions on this point will not be considered out of place. The subject is of great importance to artillerymen, as a failure to cope successfully with the Attack, should a disaster unfortunately happen, would not only cast great discredit on the Defence generally, but a considerable portion of it would, rightly or wrongly, be thrown upon those manning the Forts.

1st.—First and foremost, then, it is necessary to mention the pressing need for greater *unity of command*. With us, at present, the responsibility for the Defence of Coast Fortresses is shared between the Naval and Military authorities. In Germany, on the contrary, this duel system has been abolished, and the Navy alone is responsible for the Coast Defences, and the same change appears to have been carried out by the French recently. There can be no doubt as to which system would work most smoothly in time of stress, and it is greatly to be hoped that it may be found possible to introduce it.

It is impossible to have written the foregoing without being impressed with the fact, which has probably also struck the reader, that the considerations bearing on the subject of this essay are chiefly of a naval character. This is of itself a strong argument in favour of entrusting the Defence to the Naval authorities.[1]

The proposed change would be one of great magnitude and need not be further discussed here.

For the present we must suppose that things remain as they are, and the problem is how, under present arrangements, is the greatest unity of command to be attained.

In the first place, then, it is necessary that an officer of *high rank* should be deputed by the Commander-in-Chief of a Coast Fortress to be in entire charge of all the sea defences. The Commander-in-Chief, himself, has multifarious duties constantly requiring his attention, and it is most necessary that the commander of the sea defences should be able to give his whole mind to his special department. He should be

[1] That this subject has been under the consideration of the late Admiralty, was stated by Lord George Hamilton in the speech of 7th inst., quoted above. He said:—

"But there was one point in our defence to which he desired to call particular attention, and that was the part the Army and Navy were to take in it. Every country, except our own, entrusted to the Navy and not to the Army, the defence of great Naval ports and stations. To entrust their defence to the Army was a wrong system. . . . . He was very anxious that, if the House wished it, nothing should be done by either the Admiralty or the War Office to impede a gradual transfer of the defence of Naval ports and stations from the Army to the Navy."—*Standard*, March 8th, 1893.

assisted by several Staff Officers, both Naval and Military, detailed, not as belonging to different arms of the service, but each as *in charge of a distinct section of the defences*, as will be explained immediately. The Commander-in-Chief of sea defences should also, if a soldier, be placed in direct, constant, and confidential communication with the Naval authorities. The Staff Officers should also be officers of rank, and would each be responsible that, not one particular arm, but the whole of the various branches of the services in their section, representing guns, mines, lights, pickets, guards, &c., &c., at all times worked thoroughly well together, and according to the broad scheme drawn up by the Officer Commanding the sea defences. Some such supervision is absolutely necessary to ensure combined action. Each Staff Officer should hold frequent conferences of the R.A., R.E., and Infantry officers of his section with the special view of encouraging *personal intercourse* amongst them, than which nothing is more effective in reducing friction, and promoting a clear understanding of each others needs.

(2.) *Good communications* between the different parts of the defence are of such vital importance that *no trouble or expense should be spared to render them thoroughly satisfactory*. Signalling by flags and lamps though useful in the field, where permanent appliances are impossible, is not sufficiently reliable, on account of its dependance on atmospheric conditions, and should only be used where obligatory, viz., in communications between the shore and guard-boats afloat, and on land in case of a breakdown of other systems.

Telephonic communication is not really satisfactory, being very liable to break down at critical moments owing to noise and excitement preventing the proper reception of messages—these frequently getting garbled in transmission, and causing mistakes which in time of war might lead to the gravest consequences.

Actual telegraphy, using the Morse alphabet, is far more reliable, and in the end takes no longer than telephony. To apply it everywhere would however require a larger number of trained men than are ever likely to be available.

Doubtless the most suitable system for Coast Defences and Forts would be the *Printing Telegraph*, printing off its messages automatically on a tape or sheet of paper. These instruments are in great use for business and club purposes, and are nothing new.[1] Their adoption for Coast Defences would greatly increase the speed and certainty of communications.

In answer to the usual objection, viz., the expense involved, it should be pointed out that good communications between the various parts of scattered defences are of vital importance on the broadest grounds, and their establishment in time of peace—for there will be no time for all this on the outbreak of war—should take precedence of all expenditure on local detail.

(3.) *Organisation*.—The area to be defended, and the approaches thereto must be mapped out into clearly defined zones—naval or boat

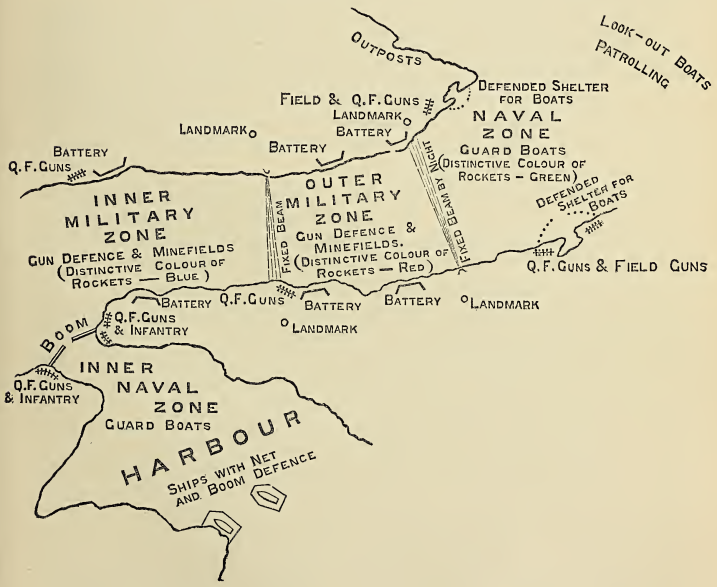
[1] Probably the best of these instruments is that known as the "Exchange Telegraph Company's Column Printing Telegraph." This is an excellent instrument, but the price is high.

defence zones, and military or gun and mine zones. The limits of these zones must be distinctly marked both by day and night. No boat is *under any circumstances whatever* to enter a military zone. No gun is *under any circumstances whatever* to be so trained that its projectiles will fall or ricochet into a naval zone. In the case of guns this must be provided for mechanically, by means of stops bolted down on the racers in the case of permanently mounted guns, and by placing large stones, timbers, banks of earth, &c., &c., beside the trails of any Q.F. or other guns which may be in temporary positions, so that by no carelessness or forgetfulness, in moments of excitement, could the guns be so trained as to be dangerous to friends. It will be the first duty of each Staff Officer to personally see that this is done, and to ascertain by actual trial that these stops are really in their correct positions and sufficient.

The above zones should be marked out by marks unmistakeable both by day and night. The attached plan of an imaginary defence is intended to illustrate what is meant. (Fig. 1.) It represents a

FIG. 1.

N.B.—Lights not indicated except those marking out zones.



channel leading to a dockyard. Here the outermost zone of all would of course be naval, and patrolled by guard-boats. These boats should thoroughly examine all merchant shipping approaching the port and would be responsible for the *regulation of the traffic*—a most important and necessary measure in time of war. This, however, is not the place to go into detail on this point. One (or more if possible) harbour of refuge, defended by mechanical mines, &c., &c., and supported by a special force on shore, should be provided for these boats within their own zone, whose limits landwards would be marked by buoys and landmarks by day, and possibly by a fixed beam by night.

(4.) *Information and Warnings.*—To give warning at night of the approach of attackers each boat should have a supply of rockets, and in each zone, whether Naval or Military, a rocket station, or stations, must be established, where they are under the control of the officer commanding the zone. These stations are *not* intended to repeat one another's signals, but to throw up rockets *only so long as an attacker is within their own zone.* No signal rocket must ever be fired except by the order of an officer. The rockets of each zone should be *of a distinctive colour*, so that it would be apparent to the whole defence which zone was signalling, and the inner defences would be thus kept progressively informed of the passage of the attacker, and would know approximately when he was nearing their zone.

Behind the outer naval zone will come a military zone, or zones, to be defended by guns, mines, and infantry. Inside of this again will be another naval zone where boats should lie to deal with any attacker who may have successfully run the gauntlet of outer defences. Should a boom exist, this might suitably mark the line between the zones, its seaward side being swept by fire from the shore, while behind it would lie the inner squadron of guard-boats ready to fall upon any one who might get by.

(5.) *Lighting the Approaches.*—The beams of electric lights alone should not be relied upon. At uncertain intervals parachute lights, or something similar, should be discharged, during the burning of which a *coup d'œil* could be taken of the whole area to be defended.

(6.) *The Gun and Mine Defence.*—It is the duty of the guns, in conjunction with the mines, to sink or destroy every floating thing which may enter their zone between sunset and sunrise. The guns must, moreover, so arrange that their smoke does not obscure the mine-field.

The present systems of gun defence require certain modifications. As already stated, heavy guns worked by P.F. and D.R.F. are too slow to be worked with effect against small, rapid, and erratic objects, especially at night, and under the distraction of subsidiary attacks—and heavy guns also produce great volumes of smoke. The Q.F. gun, firing smokeless powder, is the most dangerous enemy of the torpedo boat, and *a very large increase in our armament of these guns is an imperative necessity.* Rapidity must be met with rapidity, and it is not fair to those who will be blamed, should they fail to keep the enemy out, not to supply them with suitable weapons. These Q.F. guns should not all be placed in fixed positions, but some of them should be upon *transport-*

ing mountings, a few thus mounted being kept in every work ready to be run out to suitable points of vantage whenever required. Others, on fixed cone mountings (which are quicker and better for rapid fire than the transporting mountings), should be mounted *en barbette* (not behind walls or shields) in the works or in suitable situations.

No attempt should be made, with the bulk of the *heavy* guns, no matter how well provided with P.F. or D.R.F. installations, to follow, or aim at, these swift craft, though a few guns, here and there, with specially selected men, should be told off for this purpose. Promiscuous firing, if indulged in, will inevitably cover the channels and mine-fields with smoke, and do more real harm to the Defenders than to the Attackers. But these guns can nevertheless be utilised.

The power of *heavy shrapnel shell* is very great, and torpedo boats are ill adapted to resist it. The thickness of a French sea-going torpedo boat is only $\frac{3}{32}$-inch of steel, with an additional protecting plate $\frac{1}{8}$-inch thick over the conning towers, boiler spaces, and torpedo discharges. Without reckoning the large, heavy and irregular fragments of the bodies of such shells, which would probably be capable of going clean through such a boat at 600 to 800 yards from the point of burst of the shell, the bullets can penetrate such plates up to 300 yards from the point of burst.

Instead, therefore, of attempting with half trained garrisons, in the midst of darkness, confusion, and excitement, to carry out the elaborate and slow processes of range-finding, group differences, predictions, &c., &c., requiring large fort garrisons and staffs, and almost certain to fail under the circumstances enumerated, the Gordian knot should be boldly cut, and the gun defence reorganised as follows :—

(*a*.) The Q.F. guns must be greatly increased in numbers, and must deal with the torpedo boats by direct fire.

(*b*.) A few specially selected, well placed, medium, or heavy guns, with picked detachments and observers, should be detailed for the same duty.

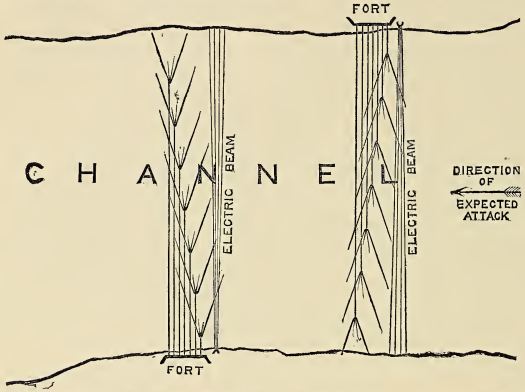
(*c*.) *Fire-swept Areas.*—All the rest of the heavy guns should be told off into groups, as large as possible,[1] and kept loaded with shrapnel shells and time fuzes and tubes in the vents. The guns of each group should be laid on parallel bearings but at different elevations, and the fuzes set to suit these elevations, the result being that, on their being fired, as a salvo, the whole of the water in front of that group would be swept by a storm of missiles. The idea is represented roughly by Fig. 2. A beam of light should be so placed as to be crossed, by the Attacker, a few moments before he reaches the fire-swept area, and the guns should be fired by the officer on look-out duty. Those guns which are laid for the higher elevations, and consequently have longer times of flight, should be those furthest from the direction of the Attack, as shown by the figure. The exact training

[1] Several tactical groups of guns may be combined into one for this purpose. This is specially applicable to old works where the guns are close together.

FIG. 2.

N.B.—The guns to be fired in salvoes as soon as the object crosses the beam. Shells to burst as shown.

Only the work on the lee-ward side is to be allowed to fire, the groups being considered as secondary to the main gun defence of Quick-Firing Guns.



and elevation of each gun must be plainly marked on their respective arcs. Spare shells, with fuzes fixed *and set*, would stand beside each gun. The moment a salvo has been fired, every gun would be instantly reloaded and relaid exactly as before. They will then be in readiness for the supporting boats, which will be in all probability following the first line.

Of course, more than one of these "fire-swept areas" must be prepared in each military zone. In cases where a channel is defended by works on both sides, it must be distinctly arranged that the *leeward side only* is to fire when the wind is across the channel. The Staff Officer in charge of the Section will give his orders on this point, from hour to hour, according to the wind.

As regards the proper moment to fire, moving beams can be utilised for this purpose, if a fixed beam is considered, for any reason, undesirable; the guns being fired electrically at the moment when this beam, which is following the object, reaches a certain bearing. This could, in fact, be made automatic by arranging the firing contacts on the training arc of the lamp, safety being ensured by a removeable firing plug in charge of the officer at the light, which would be inserted only when the light was actually following up an object.

By day the bearings should be on landmarks if possible, the bearings being also marked by buoys in the channel, some comparatively near to the observing station, in case haze or smoke obscured the more distant ones.

(7.) *Protection of Observing Stations, &c.*—These, as well as the shore ends of cables, are especially liable to attack by small landing parties, and must be protected by infantry pickets. The vigilance of these latter should be the constant care of the Staff Officer of the Section. The parties guarding a possible landing place should be provided with a machine gun. P.F. cells, no matter how far back they may lie, should never be without a guard.

(8.) *Position of Ships.*—Ships must never lie "under the guns of forts," but always far in rear of them. This was found practically by the Peruvians in the war with Chili.

Want of space has unfortunately prevented any reference to any form of attack, save the one which is most likely at the outbreak of hostilities. This, however, is the most important, as it is the one with which we shall first have to deal, for, as already pointed out, attacks on works on a large scale cannot take place until later. The interesting subject of the attacks to which our colonial and coaling stations are liable, has also to be left untouched.

Finally, the proposals, made above, are intended to meet the exigencies of the moment with the means existing, and to be practical rather than theoretical. The only point strongly pressing is *the provision of many more Q.F. guns, suitably mounted.* These are instantly necessary. Let us hope that the motto of this paper will be borne in mind by those responsible for the supply.

THE ATTACK OF A COAST FORTRESS.

BY

MAJOR R. F. JOHNSON, R.A.

"LE COÛT FAIT PERDRE LE GOÛT."

SILVER MEDAL PRIZE ESSAY, 1893.

INTRODUCTION.

A Coast Fortress can be defined as an area of land and sea defended with an artillery armament.

The attack of its land portion does not differ in its tactics from ordinary siege operations, and therefore only the attack of the works commanding its sea area will be discussed in detail in this paper.

"Purely naval attacks on fortresses have been few in number, and have only been successful when the ships possessed a decided superiority over the batteries, or at places where the garrison were decidedly inferior in skill and courage to the attacking crews."

"The old wooden line-of-battle ships were no match for the fortresses of their day, and there is no reason to suppose that modern ships of war, protected in a great measure as they are against projectiles, are more fitted than their predecessors for an attack on batteries on shore. No doubt ships have been successful against forts."

"Every modern improvement in guns and their ammunition tends to increase the superiority of shore defences over ships."

"On the whole it may be said that at the present day a purely naval attack on a properly designed fortress, garrisoned by the troops of a civilised Power, might be *magnifique* but under no conceivable circumstances could it be termed *la guerre*. Instances of naval success may be quoted in opposition to this view, but, as a rule, they occurred prior to the days of direct shell fire and accurate shooting."

"In combined naval and military operations against fortresses the co-operation of a fleet has often proved most valuable to the attack."

"Another legitimate use of ships is to force a passage defended by batteries. . . . . I know of no instance of ships having been prevented from passing batteries by artillery fire alone, unaided by natural or artificial obstructions."

The above extracts[1] illustrate the conclusions arrived at when the subject has been approached from the attacker's point of view, and so form a fitting introduction to a consideration of it from the defender's.

[1] Ships *versus* Forts; Jackson. R.E. Occasional Papers, 1889.

The value of a coin is often shown most clearly on the reverse.

Probably there are few naval officers who do not feel obliged to acknowledge the soundness of Admiral Selwyn's advice:[1] "I hope that naval officers will consider that a fort is a thing to be avoided."

In the past, however, there have been occasions obliging them to take the risks, and history is continually repeating itself. Even the very improbability may be an inducement to a bold commander, and it is the first duty of the Defence to investigate the probable action of the Attack in such a case, so that it may be anticipated and defeated.

More especially does it concern Garrison Artillery officers, on whom the responsibility of conducting the defence must chiefly rest.

For them unfortunately such an investigation is extremely difficult, because, although their business is to fight them, they have no facilities for making themselves practically acquainted with ships and their handling; being very seldom even afforded the chance of obtaining the slight knowledge to be derived from the co-operation of the Navy in sea-fortress manœuvres.

In fact one can only try to interpret history, carefully using the light given by those, who, by training or opportunity, are better qualified.

The reasons for an attack may be:—

1. To compel a weak or semi-civilised government to yield to demands made on it, through moral effect, *e.g.*, Lord Exmouth's attack on Algiers. The bombardment of Kagosima in 1863.
2. As a tactical manœuvre, either in support of army operations as at Fort Wagner, Roanoke Island, Grand Gulf, Fort Fisher, &c., in the American Civil War; or in the form of a demonstration for the purpose of inducing the defender's fleet to leave port to give battle as, it has been suggested,[2] might have been justification for a bombardment of Kolberg by the French in 1870.
3. To gain possession of the harbour or anchorage defended, which is required for subsequent operations, or whose loss will injure the enemy, *e.g.*, Port Royal and Alexandria.
4. To test the powers of specially built ships or floating batteries, of which the bombardment of Fort McAlister, Ogeechee River, is an example.
5. To reach for the purpose of capture, for use or destruction, the charge of the fortress, such as a water-way like the Mississippi; the enemy's ships, as at Mobile; or torpedo-boat depôts, as are to be found on the coast of Italy.
6. For strategical purposes, by drawing attention and troops from other points of the theatre of war, of which Dundonald's raids in the *Imperieuse* during the Napoleonic wars may serve as an example.

[1] Attack of Armour-clad Vessels by Artillery; Orde-Brown. R.U.S. Institution Journal. Vol. XXVI.

[2] Ships *versus* Forts; Jackson. R.E. Occasional Papers, 1889.

When the attack is made for any of the first four reasons it will be in the form of a bombardment, because the temporary or permanent destruction of the defensive power of the forts is essential. But in the other cases, if the object of the attack is not included in the gun-defended area of the fortress, bombardment will only be resorted to so far as it is necessary to prevent injury to the ships or boats forcing the defended passage.

In a bombardment the immediate aim is at all hazards to inflict injury on the Defence; in forcing a passage, to avoid injury to the Attack.

Bombardment.

Speaking of ships generally Admiral P. H. Colomb, R.N., has said[1] that "each presents three targets, (*a*) the 'vital' target, injury to which either sinks her, injures her engines, or damages her steering gear; (*b*) the 'effective' target, where her fighting power is contained, and where her men are; (*c*) the 'ineffective' target."

Among battle-ships may be classed those whose vital target and primary armament, as far as its service is involved, are protected by armour against the direct fire of the primary armament of their enemy; the secondary armament being also in a few cases somewhat protected against similar ordnance.

Among protected cruisers may be classed ships whose vital target is defended by either horizontal or vertical armour against the direct fire of secondary armament, including a few whose effective target is also to a certain extent protected.

All other ships have very slight, if any, protection, and for fighting purposes only differ from the old wooden ships in being less liable to be set on fire, but having less weight of metal in the broadside and forming better bursting screens for shells.

Torpedo boats have only offensive power against floating defences and dock gates, and their only defence is their speed and handiness.

Captain Jackson, R.N., writes:[2] "Ordinary sea-going ships of war are not, and never have been, intended by their designers to engage forts. They are built to fight other ships."

Rear-Admiral S. Long, R.N., said at the R.U.S. Institution[3] "If ships are pitted against guns on shore, unarmoured ships do not appear so favourably situated as in the days of wooden ships."

And Vice-Admiral Sir E. Fremantle, in the subsequent discussion, agreed "that the armament of our cruisers is such that the strength of a cruiser is only sufficient to fight its own equal, that she is not of much value against a fort."

The Director of Naval Construction has expressed the opinion[4] that "it is possible a ship may be put out of action without her armour

[1] Attack of Armour-clad Vessels by Artillery; Orde Browne. R.U.S. Institution Journal. Vol. XXVI.

[2] Ships *versus* Forts; Jackson. R.E. Occasional Papers, 1889.

[3] Probable Influence of Quick-Firing Guns on Naval Tactics and Construction; Long. R.U.S. Institution Journal. Vol. XXXVI.

[4] Probable Influence of Quick-Firing Guns on Naval Tactics and Construction; Long. R.U.S. Institution Journal. Vol. XXXVI.

being pierced;" and history supports the opinion. At Lissa[1] the Italian ship *Formidable* was not penetrated, but was so punished in her close action with the forts that she was unable to take part in the subsequent naval battle. At Charleston, on 7th April, 1863, five out of the seven especially built "monitors" were disabled, although neither their "vital" nor "effective" targets were penetrated, except in the case of the *Nahant*, which had her steering gear damaged.

Colonel Clarke, C.M.G., R.E., after discussing various types of ships, writes:[2] "The inevitable inference from the above analysis of naval development is, that the progress of gun-power, and the necessity for building ships to fight other ships, has resulted in types of vessels which become less and less qualified for engaging coast defences with any chance of success. . . . ."

"In engaging coast defences, however, this powerful weapon (the ram) disappears, and the task must be accomplished by the gun alone. It is for this reason that the exposure of the *personnel* of the modern ship becomes a factor of the first importance. The crews are, in this case, the real 'vitals' of the ship, and to inflict heavy loss upon them will suffice for all purposes."

It is clear that ships have little defensive power, but as long as Admiral Colomb's "vital target" remains intact they can choose their position, and can withdraw out of fire when they please.

Their offensive power lies entirely in the fire of their guns, and gun for gun in the same space will probably be greater than that of forts if the latter are placed like the ships (*i.e.*, on or near the water level), because the guns of the primary armament of ships are generally of a more advanced type and of a heavier nature than those in forts, while concentration and simultaneity of fire are easier. If the fort is penetrable, like the casemates of Fort Pharos, Alexandria, or untraversed, like Fort Walker, Port Royal, every hit will tell; and in some cases even if the fort is armoured beyond actual penetration it may be so damaged as to be silenced; for instance, it has been calculated that a shot from the 16-in. R.M.L. gun, striking the Dover turret at 2000 yards range, would have the energy required to lift the whole mass 16 feet, and it is scarcely conceivable that the turret would remain serviceable after such a blow.

But hits are not easily made from an unsteady platform, and even with accurate shooting, the offensive power of ships lessens considerably if the fort is constructed of earth, is well traversed, and amply provided with bomb-proof cover for its garrison, although it may be placed near the water level. Then, certainly, the garrison may be unable to carry on the combat continuously, but it will be impossible to render the fort quite unserviceable. Forts Wagner and Fisher, in the American Civil War are convincing examples of this.

When the forts are at altitudes over 100 feet, the ships' power to inflict injury or to drive the garrison from its guns dwindles to almost nothing, and disappears entirely if the works are properly constructed of earth and the guns are judiciously dispersed.

[1] Attack on Lissa, 1866; Lewis. R.E. Occasional Papers. Vol. IX.

[2] Fortification; Clarke, 1890.

Referring to the battle of Algiers, Captain Jackson writes:[1] "Here we have the old story which cannot too often be repeated:—Closely packed guns on low sites silenced by the fire of ships; dispersed guns on high sites holding out." And again, in connection with the naval attack on Sebastopol, 17th October, 1854, "Two little open batteries on a high site drove six ships out of action; while an open barbette battery on a low site was silenced, and the fire of a casemated battery much reduced, by three ships, assisted by others at long range." The two little batteries were the "Wasp" and "Telegraph," at heights of 130 feet and 100 feet, each only having five medium guns bearing on the ships.

Commander Mahan, U.S.N., remarks when commenting[2] on the attack of the river flotilla, on the Confederate position at Grand Gulf, on 29th April, 1863: "The limitation of the power of the vessels was very clearly shown here, as at Fort Donelson; the advantage given by commanding height could not be overcome. On a level, as at Fort Henry, or with slight advantage of command against them, as at Arkansas Post, the chances were, that they would, at close quarters, win by disabling or silencing the guns; but when it came to a question of elevation, the guns on shore were too much sheltered."

The same lesson was again repeated at Lissa.[3]

Colonel Clarke has well shown the difficulty of the task of the seaman-gunner.[4] "Thus with the service 10-inch R.M.L. gun, using the 70 lb. charge, a ship must be at 1750 yards distance to obtain a horizontal trajectory at the crest of a battery 300 feet high, while to obtain an angle of descent of 6 degrees she must move to 3350 yards. If the crest of the battery is 100 feet high the corresponding ranges are 1050 yards and 2950 yards. A common shell arriving at an emplacement with a horizontal trajectory can do little injury to the revetment wall. Striking only a few feet short of the crest, it will be deflected up, unless the burst is instantaneous, in which case (as proved at Eastbourne) the splinters all clear the emplacement. Practically therefore, to be really dangerous, the shell must burst *exactly at* the crest, which means hitting a target a few inches high, as well as securing an instantaneous burst."

Vertical fire, of which the Zalinski gun is a powerful development, especially at short ranges, is all in favour of the Defence.

Ships present a large horizontal target on which, except in a few cases, the whole "effective target" is exposed. Gun emplacements on land are very small targets, and in the worst placed and designed batteries can be given an impenetrable concrete roof. On land, the laying is done on a perfect platform, with the aid of range instruments, and with facilities for observation of fire. On the ships, the platform is unsteady, the obtaining of the range much more difficult, and observation must be of a most imperfect description.

Colonel Clarke says:[5] "For several reasons the result of the practice

[1] Ships *versus* Forts; Jackson. R.E. Occasional Papers, 1889.
[2] The Navy in the Civil War. 3 vols. Soley, Ammen, Mahan.
[3] Attack on Lissa, 1866; Lewis. R.E. Occasional Papers. Vol. IX.
[4] Fortification; Clarke. 1890.
[5] Fortification; Clarke. 1890.

carried out from H.M.S. *Hercules*, off Shoeburyness, in August 1886, was inconclusive. The fact nevertheless remains, that though the ship anchored in smooth water, such an excellent gun as the 8-inch 70 cwt. howitzer, was unable to plant a shell within 20 yards of a conspicuous target flag at only 1500 yards, and that two rounds fired with the same elevation and charge, on the same day, gave a difference in range of 370 yards." And again, "The original experiments made with a 9-inch polygrooved gun were remarkably successful, and proved that, thanks to the position-finder, it would be impossible for a ship to anchor at 8000 yards from such guns without receiving frequent deck hits of a dangerous nature."

It is true, if a large number of specially armed ships can be placed in perfectly smooth water, sheltered from the fire of the works attacked, and the latter are cramped and weakly constructed, the effect of *vertical* fire from the ships may be considerable. With these conditions 20 mortar schooners shelled Fort Jackson, below New Orleans, in 1862, and Colonel Higgins who commanded the fort has left on record :[1] "On the first night of the attack the citadel and all the buildings in rear of the fort were fired by bursting shell, and also the sandbag walls that had been thrown around the magazine doors." "I was obliged to confine my men to the casemates, or we should have lost the best part of the garrison." But this fire decidedly did not render the armament unserviceable, and the vessels owed their successful passage on the 24th April, to the crushing effect of their broadsides.

It is particularly worthy of note that the same mortar boats at a fair range effected nothing against the weak but dispersed Confederate batteries at Vicksburg, when Farragut passed them on the 28th June, 1862. They do not appear to have been of any use on the Atlantic coast, and Farragut had none with him at Mobile, though Fort Morgan would have been an ideal target.

Ships always have auxiliary armaments, forts frequently are without them. When this is so the ships will have a decided advantage, provided they can engage at sufficiently short ranges. The experience gained by the Inchkeith experiments, and at Alexandria, justify the following table of ranges as the greatest for effect:

Rifle Calibre	Machine	guns	1000 yards
1-inch „	„	„	1800 „
6-pr. Quick-firing	guns	...	2500 „
4·7-inch „	„	...	not much more.

If the forts have auxiliary armaments the advantage must rest with them because their guns will be better protected and better ranged, while the searching power of this class of guns, at the ranges admitting of correct observation of fire, is very small.

Such, broadly speaking, are the conditions of the combat to-day, but in the near future they will, in all probability, be modified in detail by "high explosives" carried in "armour-piercing" common shell, and by "Harvey" armour.

The effect of the introduction of the general use of shells, in the time

[1] Ships *versus* Forts; Jackson. R.E. Occasional Papers, 1889.

of wooden ships, is well-known, and probably the Defence will gain even a greater advantage from the use of high explosives.

The French trials against the old wooden iron-clad corvette *Belliqueuse* (offering, it is said, as much resistance as a great part of the modern French ships and cruisers), in which the heaviest shell used weighed 99 lbs. and contained only 8·82 lbs. of melinite, the effects are thus noted.[1] "The bursting often took place after perforation, sometimes in the actual side. Fragments from ½ oz. to 1½ oz., of which the number reached about 1500, and which were animated with enormous velocity, were projected in all directions, and even backwards, destroying all the *personnel* not under cover. The rest of the projectile was reduced to metallic powder, penetrating all surrounding objects. To these effects are to be added those of the explosion, which is local, but which has great energy. If it is produced while the projectile is passing through the side holes of 59 inches diameter are formed; when occurring near the decks they are destroyed by fracture of beams, bolts and planks. It may also set fire to them, as was the case three times out of 12 rounds, on board the *Belliqueuse*. Lastly, the movement effected by the mass of gas has such force that it destroys to great distances the weaker structural parts of the ship." One must not forget what a mass of electric wires, speaking tubes, &c., are used in the handling of a modern ship of war.

Again, in the trials against the *Resistance*, at Portsmouth, in 1889, which unfortunately have not been published, the destructive effects of high explosive shells after penetration are known to have been terrible, while one of the most remarkable features was the smoke and fumes after each explosion, which set fire to the ship and prevented anyone approaching the spot, in some cases for twenty minutes after the shell had burst.

On the other hand, while great effects are produced in ships, the whole experience gained at Lydd is said to[2] point to the fact that no increase of results can be obtained against earthworks.

The "armour-piercing" common shell are to have the same penetration as Palliser chilled-iron shot,[3] but against this advance it is said that the "Harvey" process of hardening so increases the resistance of armour, that it may lead before long to the re-introduction of broadside battle-ships, or at anyrate enable considerable protection to be given to the secondary armament, either of which changes will make much shorter ranges possible, and greatly improve the relative power of ships against many existing shore defences, though the invulnerability of properly placed forts will be as great as ever.

Whatever changes take place, however, in the relative power of ships and forts, the issue will still depend on the power of the guns to inflict injury on the *personnel* and material, the injury to the latter being of importance according to the degree it affects the former.

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[1] Recent Development of Armour and its Attack by Ordnance; Orde Browne. "Proceedings," R.A. Institution. Vol. XX.

[2] Fortification; Clarke. 1890.

[3] Recent Development of Armour and its Attack by Ordnance; Orde Browne. "Proceedings," R.A. Institution. Vol. XX.

Coast defence vessels with ramming power may render blockade difficult, but cannot well take much part during a bombardment, except as floating batteries, without masking the forts. An example was given at Cherbourg during the French Naval Manœuvres, 1892.[1]

Torpedo boats and other floating defences have the same drawback, and meeting them with their like will only form incidents of the battle.

Submarine mines and dirigible torpedoes will only be met with in channels and somewhat enclosed waters, or, if an attempt is made to employ them in the open they will only affect the question of range and anchoring. The case of Charleston, where submarine mines were used in front of the forts, is no exception, because the long bar gave the approach to the harbour all the characteristics of a channel.

It may be safely asserted that no serious bombardment of properly grouped, gun-ed, and garrisoned forts is possible without especially constructed vessels and much preparation, including the seizing of a suitable base of operations at no great distance. In the American War, for the attack of Charleston, the monitors had to be built, and Port Royal seized as a base. In the Crimean War the only effective action against forts was that of the specially built French ironclads, which reduced the casemated fort at Kinburn.[2]

Such a preparation involves complete command at sea. Without this condition the attack is limited in its nature by (1) Time; (2) Coal; (3) Ammunition; and is only likely to be undertaken by a small squadron.[3]

It is limited by time, because it is clear that the attack must be free from interruption, as was illustrated at Lissa, in 1866.[4]

It is limited by coal because the ships must be able to reach a depot, or colliers must be free to reach them.

It is limited by ammunition as its supply is what is carried, and sufficient must be kept for the naval action which is more or less certain. When Rooke took Gibraltar, which was only garrisoned by 150 men, he so far depleted his ships of ammunition that he actually risked the loss of the battle of Malaga which followed.[5] The Italian fleet would have been in far better a position to meet the Austrian at Lissa if it had not been engaged previously in a two days' bombardment of forts.[6]

Colonel J. B. Richardson, R.A., in a recent lecture[7] said:—"It may, however, I think, be accepted that under existing conditions Coast Fortresses, which are known to be reasonably ready, will not be exposed to an Artillery engagement other than at quite long range, partaking of the nature of a reconnaissance to ascertain their preparedness. If found in a really bad state of preparation, such as might be expected quite at the beginning of a war, ships, which have no hostile fleet behind them may attempt the bombardment of Coast Fortresses

1 French Naval Manœuvres, 1892; Garbet. R.U.S. Institution Journal. Vol. XXXVI.

2 Ships *versus* Forts; Jackson. R.E. Occasional Papers, 1889.

3 Naval Prize Essay, 1892; Craigie. R.U.S. Institution Journal. Vol. XXXVI.

4 Attack on Lissa, 1866; Lewis. R.E. Occasional Papers. Vol. IX.

5 Naval Prize Essay, 1892; Craigie. R.U.S. Institution Journal. Vol. XXXVI.

6 Attack on Lissa, 1866; Lewis. R.E. Occasional Papers. Vol. IX.

7 Defence of a Coast Fortress; Richardson. "Proceedings," R.A. Institution. Vol. XX.

to cover an attack on the dockyard, &c., which they guard. During such a bombardment they may attempt to ascertain the position of or destroy mines, and prepare the way for passing forts, or they may rush torpedo boats through to destroy shipping in harbour, blow in dock gates, &c."

Whether the attack is of the nature of a reconnaissance or a determined effort to destroy the defensive power of the fortress, and whether it is made by a small squadron or by an especially equipped fleet, the tactics pursued must in principle be the same, their application being modified to suit the circumstances.

It seems convenient to discuss the tactics under the following heads :

1. The ranges at which the bombardment will take place.
2. The manœuvring of the ships during the engagement.
3. The formation of the attacking force.
4. The most suitable time for an attack.

1. *The Ranges at which the Bombardment will take place.*

Admiral Sir A. Cooper-Key, G.C.B., has said :[1] "I hope no one will think that I am an advocate for timidly attacking forts by ships."

Colonel Lewis, R.E., writes :[2] "I have hardly ever heard a different opinion than that they (Naval Officers) would get as close as possible and pour in as heavy and rapid a fire as they could." And reviewing the lessons of Alexandria : "There is nothing in this action to disturb the opinion that ships attacking a properly built and manned fortress must fight at short ranges to obtain decisive results." And again, "It is only at short distances that the fire of a ship can be directed with sufficient precision to have any approach to certainty of striking the small area which is vulnerable in a barbette battery of the present day."

"The *Inflexible*[3] engaged Oom-el-Kabebe at a range of 3800 yards. Her practice is described on all hands as admirable. As the fort was only 80 feet above the sea, and was protected by a parapet 8 feet high, her shell struck with a descending angle, and had some searching power. As a result one S.B. Gun was disabled, and this gun was not in action, while the damage to the parapet could have been repaired in a short time. So much for the effect of slow fire from heavy guns at long range."

As before remarked, short ranges are necessary for the auxiliary armament to be of use.

At Sebastopol, on 17th October, 1854, the main body of the Allied Fleets engaged, at ranges of from 1600 to 3000 yards. Three guns dismounted and 35 casualties were the result in the Quarantine Fort, mounting 58 guns *en barbette*, after a bombardment of some hours. Four two-deckers and one frigate quickly silenced Fort Constantine, with casemates, at ranges of from 800 to 1500 yards.

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[1] Bombardment of the Forts of Alexandria ; Walford. R.U.S. Institution Journal. Vol. XXVII.

[2] Fortification for English Engineers ; Lewis.

[3] Ships *versus* Forts ; Jackson. R.E. Occasional Papers, 1889.

At Port Royal, 7th November, 1861, Fort Walker was silenced at ranges of from 600 to 800 yards.

At Charleston, 7th April, 1863, the monitors engaged at ranges of from 500 to 1000 yards.

At the shelling of Fort Wagner, preparatory to the land assault on 18th July, 1863, the fort maintained its fire from 12.30 to 4 p.m. while the range was 1200 yards, but was at once silenced when the ships moved in to 300 yards.

At Fort Fisher, in January, 1865, the ranges varied from 800 to 2400 yards.

It must be remembered that in examples from the American War the ironclads were impenetrable at the ranges, and that the broad-side ships had an overpowering superiority in mass of fire to the forts, which were all on low sites. When things were more equal it did not pay to get too close, as the river flotilla found at Fort Donelson, on 13th February, 1862, after its success at Fort Henry, eleven days before.

We may assume that the ranges will be as short as they can be without incurring too great injury to the effective target; and these ranges will probably be far less than might be supposed from formulæ for penetration, and the theoretical perfection of range-finding instruments. Annoyance and moral effect will generally be the aim, and long ranges will be used rather for the searching effect they give to the projectiles than for avoidance of injury to the ships.

The amount of injury it is allowable to incur depends on the distance from the fleet's base, whether the ship or ships can be spared for the necessary time of repair, and the prospects of a naval action to follow. More might have been attempted on the Atlantic coast in the American Civil War if it had not been necessary to maintain the blockade. At Lissa, the disablement of the *Formidable* contributed to the Italian defeat.

Colonel Lewis remarks[1] regarding Alexandria: "Long ranges were used probably because it was desired to keep the ships ready for subsequent action, and the possibility of silencing the guns at them, in consequence of the known bad quality of the gunners."

At Alexandria it may be questioned whether less injury would not have been received if the outside squadron had been taken early to shorter ranges, for the in-shore squadron had the fewer hits.

It can seldom, in a bombardment, be worth while to expose the ships to very great injury, because the results obtainable are too small.

At Fort McAlister,[2] 3rd March, 1862, 209 heavy shell were fired; 2 guns were dismounted and large craters cut in the parapets and traverses, "but still no injury was done that could not be readily repaired during the night." At Charleston,[3] on 7th April, 1863, 43 shot and 96 shell only produced 14 casualties although the works were struck 69 times. On this occasion 5 out of 7 monitors were disabled, and the iron ship *Keokuk* received 90 hits, of which 19 were penetrations on or below her water-line, which caused her to sink as soon as there

[1] Fortification for English Engineers; Lewis.

[2] The Navy in the Civil War. 3 Vols. Soley, Ammen, Mahan.

[3] The Navy in the Civil War. 3 vols. Soley, Ammen, Mahan.

was any sea on. On the 7th September, 1863, Fort Sumter[1] is said to have resembled a steep sandy island, not a fort; on the 8th, a landing party was repulsed. In December, 1864, the Federal fleet is said[2] to have thrown 15,000 projectiles into Fort Fisher, and on the 13th, 14th and 15th of January, 1865, 21,000, but an assault on the sea face was repulsed with loss on the last day. The fort appears to have had only 22 guns bearing on the ships, which had 405, and could bring at least 275 to bear at a time. At the French bombardment of Sfax "after a remarkably deliberate fire of 2002 projectiles delivered under peace conditions, the 'defensive power' of the place is reported to have been 'practically uninjured.'"[3] At Alexandria, Fort Mex, which has been described as a "pre-historic work," was attacked at short range by the in-shore squadron, assisted by the *Temeraire* outside the Corvette Pass. "In view of the tremendous fire to which Fort Mex was subjected, and the comparative short range at which all the ships except the *Temeraire* engaged it, it is impossible to believe the fact that not a single gun here was dismounted or disabled during the action proper. . . The 8-inch gun . . was bowled over by the *Penelope*, long after the fort had ceased firing, and from a distance stated to be about 300 yards." "So says Captain Goodrich in his official report on the action."[4]

No particular ranges can be assumed as probable for, independently of the hydro-graphic conditions of each locality, the permissible ranges for individual ships will vary according to circumstances. For instance, many battle-ships afford protection to their secondary armament by the armour protecting their primary armament when fighting end-on, and consequently if it is not necessary to use the former they can go in much closer than when they have to present their broadside to the fort.

2. *The Manœuvring of the Ships during the Engagement.*

The most important point under this head is whether the ships shall be anchored or kept in motion.

Captain Jackson, R.N., says:[5] "Without anchoring, experience has shown that the greater part of their fire is thrown away."

"The bombardment of the forts of Alexandria gave an excellent opportunity of comparing different methods of manœuvring ships when attacking batteries. The *Invincible* and *Penelope* remained at anchor during the whole engagement; the *Monarch* steamed backwards and forwards in a line parallel to the shore. The *Sultan*, *Alexandra* and *Superb*, at the beginning of the action, engaged under weigh, steering an elliptical course past the lighthouse batteries at a distance of 1500 yards. After passing the batteries twice in this manner they anchored, shifting their positions as requisite. This plan was also followed by the *Temeraire*. The *Inflexible* dropped a small buoy at a known range, and steamed up to it to deliver her fire. . . . . The plan of fighting a ship under weigh was evidently the worst of the many adopted. Sir W.

[1] The Navy in the Civil War. 3 vols. Soley, Ammen, Mahan.

[2] The Navy in the Civil War. 3 vols. Soley, Ammen, Mahan.

[3] Fortification; Clarke. 1890.

[4] Ships *versus* Forts; Jackson. R.E. Occasional Papers, 1889.

[5] Ships *versus* Forts; Jackson. R.E. Occasional Papers, 1889.

Hunt-Grubbe, who commanded the off-shore squadron, only tried the elliptical course in line ahead twice. He then anchored his squadron to get more accurate shooting."

Lieut.-Colonel Walford[1] was told that most of the hits on the off-shore squadron were received while in motion.

Colonel Clarke, R.E.,[2] "It is quite useless for ships to engage earth batteries by circling in front of them. They must either anchor or steam up to a buoy to fire, and the elliptical course, which theory has delighted in preserving, must be utterly given up where coast defences cease to proffer a target."

Lieut. R. Hyde Smith, R.N., referring to howitzers:[3] "Ships could not remain at anchor where such ordnance was mounted, and no distant bombardment could be effective without their being so."

Admiral Right Hon. Sir J. D. Hay:[4] "Captain Walford laid down rather hard-and-fast rules that for the future it would be better for ships, in all cases, to engage batteries at anchor. I should be very sorry to hear that made an invariable rule of naval tactics. It is quite true where you have not much sea-room, or where there is much motion, it would be the better plan to adopt; but where there is perfectly smooth water and you have plenty of sea-room, I think there may be occasions in which it would be better to attack with the fleet in motion than at anchor."

The *Monarch*, under weigh, at Alexandria, received no hit, while the *Penelope* was struck eight times and the *Invincible* eleven.

At Port Royal and the first attack on Charleston the ships were under weigh, but at the subsequent bombardments of Forts Wagner and Fisher they anchored.

Admiral Porter, U.S.N., has written regarding keeping the ships in motion:[5] "The plan has the advantage of bothering the enemy's gunners, as the ships are constantly changing their range; but it tends to lengthen out an engagement. At Hatteras, what should have been finished in six hours took twenty-four hours to accomplish." On which Captain Jackson remarks: "In these days, when the shore gunner has efficient range-finders while the sea gunner has none, which is the more likely to be bothered by change of range?"

Movement of the target or the gun generally renders the use of shrapnel with time fuzes almost impossible, which may be a disadvantage to the ships, but is not of much importance to the forts, because the upper works and unarmoured portions of the ships form excellent bursting screens, and shrapnel with percussion fuzes may be expected to be very effective.

From the Defence point of view there seems to be a decided advantage to be gained by the ships in moving, because (*a*) the "error of the day"

[1] Bombardment of the Forts of Alexandria; Walford. R.U.S. Institution Journal. Vol. XXVII.

[2] Fortification; Clarke. 1890.

[3] Naval Essay, 1892; Hyde Smith. R.U.S. Institution Journal. Vol. XXXVI.

[4] Bombardment of the Forts of Alexandria; Walford. R.U.S. Institution Journal. Vol. XXVII.

[5] Ships *versus* Forts; Jackson. R.E. Occasional Papers, 1889.

varies with range; (*b*) an alteration of speed varies the allowance for time of firing; (*c*) alterations of direction upsets "predictions" and often varies the deflection required; and (*d*) the necessity of frequently changing the assignment of targets to the forts or "groups" may very well produce confusion unless the officers of the Defence have had much more practice than is at all likely.

Steaming up to a buoy at a known range, though as far as the Defence is concerned it is much the same as anchoring, may be the better method for some ships. Captain Jackson says:[1] "In the absence of means of quickly ascertaining and communicating the range, any rapid movement on the part of the attacking ships is out of the question, or if carried out, must entail bad shooting and waste of ammunition. The numerous instances already given show that to maintain an effective fire a ship must be at anchor. The excellent practice made by the *Inflexible* at Alexandria may be quoted in opposition to this theory, but the peculiar armament of that ship must be taken into account. The *Inflexible* carried four 16-inch R.M.L. guns, and eight 20-pr. R.B.L. guns. The lighter guns were therefore wholly insignificant in comparison with the heavier. The ship carried no secondary armament, in the sense in which the term is now understood. The four heavy guns took some time to load, and their fire was naturally delivered in salvos, with considerable intervals. The policy of keeping the ship moving, and steaming to an ascertained position to fire, seems to have been the natural outcome of her armament. Such a plan would probably not have been followed had she had a secondary armament of 6-inch guns, such as is now usually carried by battle-ships."

Weighing the evidence, it seems probable that unless the Defence is known to be bad in material or *personnel*, a bombardment will be begun with the ships under weigh, and that if it appears possible to silence the forts, then to do that the ships will go in to short ranges and anchor.

Of course, when co-operating with a land force, as will usually be the case, there can be no particular object to be gained by silencing the guns on the sea faces. It will be sufficient to annoy the gunners on the land faces, who will be taken in flank or rear, or to sweep the ground outside the works in order to prevent sorties. Under these circumstances great accuracy of fire is not necessary, and it is unlikely the ships will either anchor or close to short range, unless they have an overwhelming superiority in mass of fire.

Another point in connection with the manœuvring of the ships under fire is the position individual ships should place themselves in with regard to the trajectories of the guns they are engaging.

Rear-Admiral S. Long, R.N., in a recent lecture[2] said: "In many cases of actions between single ships and of ships engaging forts there would be an advantage open to one opponent by maintaining the position as much as possible in which he presented an oblique target to his enemy, and this especially at the beginning of an action, when all

[1] Ships *versus* Forts; Jackson. R.E. Occasional Papers, 1889.

[2] Probable Influence of Quick-firing guns on Naval Tactics and Construction; Long. R.U.S. Institution Journal. Vol. XXXVI.

guns are intact and fire a maximum." He founded this theory on the increased resistance of armour if struck aslant.

Vice-Admiral Sir E. Fremantle agreed with him: "The position of 45 degrees . . . . was one which was especially favourable as enabling you to use all your guns on one broadside, whilst at the same time not being placed in a position normal to that of the enemy."

But Captain May, R.N., replied with much force: "Now-a-days that we have so much curved armour, turrets, barbettes, redoubts, and the much abused conning tower, I do not think the oblique direction is so important. If a shell comes in on the bow, 45 degrees from the keel, and bursts, the splinters will diverge another 45 degrees, and will rake the deck, going nearly fore and aft, whereas if the shell comes in directly abeam, you only get your angle 45 degrees, and probably only one gun on the fighting side injured. I think that is important, and we cannot afford to disregard it."

Tables might be given to show the increase of resistance given by the variation of the angle of impact, and it may be conceded that in some ships an oblique position of the keel may cause the emplacements of the primary armament to afford considerable protection to the secondary armament; but with a properly arranged and a properly fought fortress, the ships will be dealt with in succession and assailed with a converging fire, which will defeat such a manœuvre.

Under this head, too, may be included the nature of the fire.

Whether the fire of the fleet shall be concentrated on works in succession or spread depends on their arrangement. If the batteries can be approached in succession, Sir Howard Douglas' plan, as quoted by Captain Bridge, R.N.,[1] is obviously the best: "Isolated points of defence mutually protecting each other should be attacked in detail, and successively reduced, after which the fleet may arrive at and attack the main position." But if they do mutually protect each other, it is not clear how they can be approached in succession, and seeing how little material damage can be effected by ships' fire, it would appear that it must be generally advisable to, as far as possible, engage all guns bearing on the ships, in order to lessen the accuracy of their fire.

Under nearly all circumstances common shell appears to be the best projectile, but as exceptions may be noted—(*a*) The case of open works, when the range is known and facilities for observing the fire are good, in which shrapnel with time fuzes having some searching power may be better; (*b*) and perhaps, the chilled iron forts to be found[2] on the French, German, Russian, Danish, Spanish and Portuguese coasts, which might be best dealt with by salvos of armour-piercing shot. But even against armoured casemates common shell will generally have the best effect, because the burst affects the *personnel* morally, the observation of fire is easier, and guns may be put out of action by their mountings being jammed by *debris* or pieces of shell.

As a rule percussion fuzes to burst on graze are best, though if

[1] Naval Attack of a Fortress; Bridge. R.E. Occasional Papers, 1877.

[2] Attack of Armour-clad Vessels by Artillery; Orde Browne. R.U.S. Institution Journal. Vol. XXVI.

masonry has to be attacked a delay-action fuze, permitting of some penetration will enable a better result to be obtained from accurate hits.

Admiral Porter's orders at Fort Fisher were :[1] "Fire to dismount the guns and knock away the traverses." "All firing against earthworks, when the shell bursts in the air is thrown away. The object is to lodge the shell in the parapets and tear away the traverses in which the bomb-proofs are located. A shell now and then exploding over a gun *en barbette* may have good effect, but there is nothing like lodging a shell before it explodes."

Observation of fire may be assisted by sending out vessels for the purpose to a flank of the attack, as was done with three gunboats at Fort McAlister[2] or by the use of balloons, which the French have proved[3] practical.

3. *The Formation of the Attacking Force.*

Where it is possible it would seem that there is an advantage in ships, having end-on fire, approaching fortifications in line abreast, because it may to a certain extent prevent them being dealt with successively. The river gunboats on the Mississippi, acting together, survived many encounters with forts, but when the *Cincinnati* ventured to make a reconnaissance by herself at Vicksburg on 27th May, 1863, she was very quickly sunk.

Very often, however, if not in the majority of cases, hydro-graphic conditions will make such an advance very difficult or impossible.

Rear-Admiral Long (speaking, it is true, chiefly of purely naval combats), says :[4] "The formation in line ahead is that ordinarily used for navigation, especially in circumstances of difficulty, and when it is considered that the maintenance of any other formation involves the use of the compass, which is likely to be shot away in action; it seems probable that its advantages as regards facilities of maintenance will outweigh any disadvantages it may have from other points of view." And : "The distance apart at which ships of a squadron are to keep station affects the question of artillery support. Two cables (400 yards) appears to be accepted generally as the most suitable, and, considering the result of damage to communications or steering gear in action, no less distance is likely to be accepted on the open sea."

The concussion of the guns has been said to render the compass useless.

The intervals between ships may of course be affected by local conditions. Thus Sir G. Hornby has stated[5] that in the Dardanelles the water being very deep it is necessary to go close to the shore to anchor, and that consequently to bring a superior force of guns to bear on a

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[1] Ships *versus* Forts ; Jackson. R.E. Occasional Papers, 1889.

[2] The Navy in the Civil War. 3 vols. Soley, Ammen, Mahan.

[3] Balloons for Naval Purposes; Daniell. R.U.S. Institution Journal. Vol. XXXV.

[4] Probable Influence of Quick-firing guns on Naval Tactics and Construction; Long. R.U.S. Institution Journal. Vol. XXXVI.

[5] On Naval Tactics ; Dowell. R.U.S. Institution Journal. Vol. XXV.

fort from anchored ships, they would have to be very close together. His idea had been in such a case to put them one cable apart.

At Port Royal[1] the ships moved up in two columns; the main column at distances of a ship's length, with the flanking column of gun-boats at the same distance on the starboard (off-shore side).

At Charleston the monitors went into action in line ahead.

During the French Naval Manœuvres of 1892,[2] when Cherbourg was attacked, the fleet steamed past the breakwater in line ahead, sending out its torpedo boats to deal with those of the defence.

At Alexandria the off-shore squadron, before anchoring, moved on an elliptical course in line ahead, at intervals of about one cable, with a speed of about five knots.

At Sfax[3] the French had boats at a "few hundred yards," gun-vessels at about 2300 yards, and iron-clads at from 4300 to 7000 yards.

In several instances during the American Civil War the lighter vessels armed with long-range guns were employed outside those with heavier armament.

Something like the following plan seems probable :—

The ships intended to take an active part in the bombardment will be divided according to their vulnerability, and will steam up, at a moderate speed from one flank of the works, in columns of divisions in line ahead at intervals in each column of about 400 yards. The distances between the columns will depend to a great extent on the difference in vulnerability, but it will be sufficient to allow each column describing an elliptical course, until it is decided to close in and either anchor or steam on a buoyed course.

The fleet may be divided, in the first instance, into squadrons to deal with different parts of the fortress; one division of a squadron may anchor while the other keeps in motion, and the peculiarities of some ships may cause the commander to use them more or less independently.

Gun-vessels, and cruisers too weak to subject themselves to the fire of shore defences, will be employed on the flanks to observe the fire, or if opportunity offers to land small parties to surprise isolated batteries, which really appears the only possible method of silencing vertical fire batteries and guns mounted on the "disappearing" principle.

Torpedo boats will seek shelter on the off-shore side of the inner divisions, and be ready to deal with any attempts of craft of their own class.

If the Defence has controllable torpedoes, or batteries of Whiteheads like Germany and Italy, they will have to be avoided by motion or be dealt with by the torpedo boats if that is possible. Torpedo nets cannot be used under weigh, and in any case cannot be put out in action,[4] as if struck by shot or shell they would give dangerous splinters and fragments.

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[1] The Navy in the Civil War. 3 vols. Soley, Ammen, Mahan.

[2] French Naval Manœuvres, 1892; Garbet. R.U.S. Institution Journal. Vol. XXXVI.

[3] Fortification; Clarke. 1890.

[4] Submarine Mines; Clarke. "Proceedings," R.A. Institution. Vol. XVII.

4. *The Most Suitable Time for the Attack.*

There can be no doubt that, except for annoyance or attracting attention from an attempt to penetrate the water area of a fortress with torpedo boats, a bombardment at night is perfectly useless, and the expenditure of ammunition will always prevent one; though such a manœuvre is a pretty sight and will often form a part of peace exercises.

The earlier in the day a serious bombardment is commenced the better, because it will always take a considerable time to produce any effect, and if the garrison is worth anything, the task, if not finished, will have to be begun afresh next day. The ships will always be able to retire when they desire.

Tidal currents may affect the exact hour, as a strong one setting in towards the forts might carry a temporary disabled ship into a position she could not get out of. Besides some ships can fight better bow on and this would be difficult on the flow. At the attack on Grand Gulf, Mississippi, on 29th April, 1863, the gun boats actually ran past the batteries at very short ranges in order to gain the advantage of fighting with their heads up stream.[1]

Smooth weather is necessary for the ships' fire to have any accuracy, and is moreover desirable because, as the Director of Naval Construction has pointed out,[2] a ship rolling heavily may be struck below her armour.

A light breeze blowing landwards is favourable as long as ordinary powder is used, because the smoke will bother the fort gunners, and to some extent the ships will escape from the interference of each others' smoke.

Forcing a Passage.

This, as Captain Jackson has noted,[3] does not mean forcing the entrance of a harbour, the inner waters of which are under the fire of the defences, for in that case the ships would gain nothing; and the risk of their defeat and capture in their cramped position would make such an enterprise unjustifiable.

But, if there is undefended water beyond the defences as at Mobile Bay, the aim may well justify the risk, for it is pretty certain that no number of shore batteries will alone be able to prevent the ships passing.

It may be urged that no example, since the introduction of range and position-finders, quick-firing guns, electric lights, and means and methods of fire control, exists; but it is clear that the only way artillery can prevent a ship's passage is by injury to her engines or steering gear, and the chances of a ship escaping such injury are very great, and in most cases they may be made greater, or the effects of the injuries neutralised by proper arrangements.

The example of the *Keokuk* at Charleston shows how hard it is to sink or stop the weakest of ships. At Mobile the disabled *Oneida* was

[1] The Navy in the Civil War. 3 vols. Soley, Ammen, Mahan.

[2] Attack of Armour-clad Vessels by Artillery; Orde Browne. R.U.S. Institution Journal. Vol. XXVI.

[3] Ships *versus* Forts; Jackson. R.E. Occasional Papers, 1889.

carried past the fort by the gun-boat lashed alongside of her.

Such being the case it is clear that the conditions are very different to those governing the conduct of a bombardment, but the tactics to be pursued can be discussed under similar heads, with the addition of a fresh one, which requires to be taken first, viz.:

1. *The Dealing with Obstructions.*

Unless the attack has recent and reliable information, it will be necessary to closely reconnoitre a channel before making an attempt to force it, because even a slight check to the leading ship may cause great confusion, if not disaster. Of this there was a clear illustration at Mobile Bay, 5th August, 1864, where the stopping of the *Brooklyn* would have blocked the channel, and probably have put the fleet at the mercy of the Confederate ram *Tennessee*, but for the coolness and courage of Admiral Farragut, who took his ship, the *Hartford*, out of the column and over the submarine mines.

The reconnaissance will undoubtedly have to be carried out in boats under the cover of darkness, unless the forts are so obsolete and so badly manned that their fire can be completely silenced by a bombardment delivered from outside the channel; and even then if the channel be narrow musketry fire will make a daylight reconnaissance impossible.

Obstructions vary from simple entanglements like those at the entrance to Charleston north of Fort Sumter, to sunken ships, as at Sebastopol, or they may be submarine mines.

Some may be impassable or only removable with an outlay of considerable time, in which case the forts must be captured and the operation ceases to be one of simply forcing a passage.

Others it may be possible to get through, and in this class may be included submarine mines. This will be denied by some, and the examples of the *Patapasco*, the *Tecumseh*, and other ships sunk by mines in the American Civil War will be quoted, but all these cases were those of weakly built hulls without water-tight compartments, and their bottoms were actually blown in. With modern ships and mines, the effect *expected* is the disablement of the machinery by the shock, and not the actual sinking of the ship, but even this is doubtful when it is remembered that such weak constructions as the *Weehawken* at Charleston, and the *Montauk* at Fort McAlister, were actually lifted by the explosion of mines without injury. There appears to be no example of ships being injured by a simple shaking.

The British Navy has an elaborate system of counter-mining, but no other has,[1] and as such an operation undoubtedly requires much preparation, including the establishment of a base in the vicinity of the place attacked, it is unlikely to be undertaken.

Submarine mines are generally credited with exerting a great moral effect, even when the local conditions are most unfavourable to their use, but this will be worth nothing at all if a Farragut commands the attack.

[1] Submarine Mines; Clarke. "Proceedings," R.A. Institution. Vol. XVII.

2. *The Range at which the Ships will Engage.*

This will usually be decided by the conditions of navigation. But, if there is a choice, the nearer the ships can pass the forts the better, because the arcs of fire of the guns will be more quickly got through, and the ships will derive the full benefit of their secondary and auxiliary armaments, while the danger to the "vital target" is not great enough to outweigh these advantages.

3. *The Formation of the Passing Fleet.*

There appears to be only one formation for navigating a channel, viz.: that of line head.

Even at New Orleans, where forts on each side had to be engaged and were assigned to different divisions, the fleet was formed in a single column.

At Vicksburg, on 28th June, 1862, the gun-boats formed a separate column on the outside of, and covering the intervals of, the main one; but at Port Hudson, on 15th March, 1863, Farragut, with his previous experience, formed the two columns into one by lashing the gun-boats to the ships, which were slightly in echelon to facilitate end-on fire as the batteries were approached.

At Mobile, it is true, the monitors formed a separate column between the fort and the other ships, which were arranged as at Port Hudson, but it is certainly an open question whether it would not have been better to have had them at the head of the main column. They would have been in a better position to deal with the *Tennessee*, and the other ships would have had more room in the channel.

For the sake of mutual support the closest order admissible will generally be adopted. Rear-Admiral R. V. Hamilton, C.B., says:[1] "In attacking forts under weigh very close order must be kept." Farragut passing Vicksburg remarks: "If the ships had kept in close order in all probability they would have suffered less, as the fire of the whole fleet would have kept the enemy from his guns a longer space of time, and when at his guns his fire would have been more distracted."

The arrangement of lashing the smaller vessels on the outside of the larger ones greatly lessens the chance of the important ships being stopped, and leads one to ask if colliers and other comparatively cheap vessels could not be lashed on the fighting side, or both sides if required, to act as bursting screens for the projectiles of the defence?

Could not such ships be also used as "forlorn hopes" to clear the way through mine-fields at night? If built with water-tight compartments, or especially prepared, they would not sink before they had been moved out of the way of the following warships.

4. *The Manœuvring of the Ships During the Passage.*

Under this head there are two points, the speed and the nature of the fire.

As to speed, the highest compatible with the safe navigation of the channel and the co-operation of the ships seems to be the best, but the qualification is very necessary for the examples of the Mississippi and

[1] Naval Operations during the Civil War in the United States; Hamilton. R.U.S. Institution Journal. Vol. XXII.

Mobile Bay clearly show that the dangers from navigation and confusion in the squadron far exceed those from the action of the Defence.

It is worthy of note that at the Devonport Court-martial on the stranding of the *Howe* some officers expressed the opinion that large ships with twin screws can be more safely navigated in narrow waters at a speed of four or five knots than at a faster.

Uniformity of speed is to be expected, as any change is likely to produce confusion.

As to the nature of fire ; the immediate object being to avoid injury to the ships, and the best method of attaining it being to keep down the fire of the forts, the secondary armament, and the auxiliary if the ranges are suitable, will be used.

If the passage is made under cover of dusk or darkness and the fire of the forts is ineffective, it may often be better not to fire at all, because the smoke may increase the difficulties of navigation as was the case at Port Hudson ;[1] but in other cases the veil of smoke may be of great use in hiding the vessels.

5. *The Most Suitable Time for the Passage.*

Captain Jackson on this says,[2] "Admirals Farragut and Porter evidently considered that ships had a better chance of slipping past in the dark, and to obtain the immunity from the enemy's fire which obscurity afforded, were ready to encounter the risks to navigation, which are unavoidable in a night action. . . . . Yet the results of their action show that the passage of a narrow channel in the dark was a mistake. The case of a broad channel, which presents no difficulties of navigation, is different. . . . . Here, if a ship or squadron wished to force a passage, darkness or fog would be chosen. In clear daylight there would be a chance of passing without being hit. In even moderate mist, still more in darkness, there would be a certainty of passing without injury. Now on the other hand, consider a position like Vicksburg fortified according to modern ideas . . . No water battery would be found unless it were a dummy erected for the purpose of diverting the fire of the ships from more important objects. Along the shore would be placed numerous electric search-lights, which would brightly illuminate the passing ships, dazzle the eyes of their Captains, and at the same time render the guns on the heights above invisible. The search-lights on board the ships would only add to the confusion. Without exaggeration, it is not improbable that the search-lights, judiciously used, might alone prevent the passage of the ships, and that the latter would devote themselves, as a preliminary operation, to extinguishing the lights by machine gun fire. Under these circumstances would not an Admiral prefer daylight to darkness? Would it not be better to expose ships to the enemy's fire than to the risk of grounding under the batteries? Farragut's squadron in the battle of Mobile Bay, suffered little from the fire of Fort Morgan, though he passed it in daylight. . . . . However, looking

[1] The Navy in the Civil War. 3 vols. Soley, Ammen, Mahan.

[2] Ships *versus* Forts ; Jackson. R.E. Occasional Papers, 1889.

at the matter from the Artilleryman's point of view, no general rule can be laid down as to the probable time for an attempt of this nature. The passage of a clear channel, however strongly defended by batteries, may be effected at all times of day and night and in any sort of weather. Ships can only be stopped by obstructing a channel to such an extent as to delay them under fire."

In fog dirigible torpedoes cannot be used, and in darkness their effective use is uncertain, which sometimes may be of very great importance to the attack.

LANDINGS, TORPEDO-BOAT RAIDS, &c.

If the foregoing deductions concerning the attack and passing of forts by ships are correct, it is clear—the offensive powers of the ships being so small and their risks of disablement so large—that some form of land attack in co-operation will nearly always be made, if the capture of the forts is the object in view or is necessary to ensure success.

This form of attack remains much the same as when so often practised in the West Indies[1] and elsewhere in the last century, for, as Rear-Admiral P. H. Colomb[2] has pointed out, steam though it may shorten the passage of the boats from the ships to the shore, has not otherwise altered the conditions of the enterprise.

Although in some cases where the heavy broadsides of the ships were able to silence the weak shore batteries, landings were made close to the works, the lesson we received at Camaret Bay,[3] near Brest, as far back as 1694 holds good, and is strengthened by the relative power of ships and forts at the present day. A landing cannot take place in a defended area.

Sheltered landing places are necessary, for an open beach presents too many risks, because a very slight surf may make disembarkation impossible. The army was landed in the Crimea on an open beach, but the operation was one contrary to the teaching of experience, and itself illustrated the risks incurred.

When the attack is on a large scale, directly the land forces are in a position to act, the ships play a secondary *rôle*. They complete the investment and give such assistance with their guns as the circumstances admit.

Small parties may be landed either as a preparatory measure (Hatteras Inlet) or incidently during the attack (Alexandria), but in either case surprise is necessary for success, unless the troops of the Defence are very bad or have been thoroughly demoralised. A check to the attack generally means disaster. Louisburg, Cape Breton, in 1745, Petropaulowski in the Crimean War, Peiho River, in 1859, Fort Sumter, 8th September, 1863, and later the French abortive action at the mouth of the Tam Sui, are perhaps sufficient examples.

This necessity for surprise appears to limit such attempts to very small dimensions, and to render the often-suggested enterprises with

[1] Annual Registers.

[2] Military and Naval Operations; Colomb. Lecture 34, Aldershot Military Society, 1891.

[3] Military and Naval Operations; Colomb. Lecture 34, Aldershot Military Society, 1891.

landing parties about 2000 strong extremely improbable, if not impossible, because (*a*) few modern ships of war can carry troops; (*b*) none have men to spare from their crews, when they themselves are to be engaged; (*c*) the presence of transports will at once put the defence on the alert; (*d*) the landing of such a force will take a considerable time; (*e*) if such a force is landed, its relation to the ships is the same as if it was a large one, but as its self-contained power is smaller, its chances of getting away again are also much smaller, for embarkation is well-nigh impossible if the enemy cannot be kept out of range.

At Aboukir Bay,[1] in 1801, the marshalling of the boats conveying the first detachments numbering about 2000 men, took many hours, although the fleet and troops had had far more practice than is ever probable in future. At Lissa,[2] in 1866, the attempt to land 2200 men took many hours to prepare and was then abandoned before the Austrian fleet was signalled.

Torpedo boat raids to destroy shipping, dock gates, &c., are perhaps the most probable of all forms of attack, because the size and speed of the boats render injury to them improbable unless they are stopped by obstructions in narrow waters defended by quick-firing ordnance.

No exact form of attack can be predicted. It is not likely that more than one or two boats will be employed at a time. Their aim will be to reach their objective unobserved, and the method of effecting this must vary with local conditions.

There is one other form of attack which should be noticed, because bases of supply, such as Cardiff, where the object would be to destroy dock gates, and so impede shipments, are liable to it; viz., the use of high explosives conveyed in trading vessels. This will be prevented if all ships are compelled to anchor outside of the defences for examination, and each ship's agent at the port is made responsible for her.

In fog neither can torpedo boat raids be stopped, nor vessels carrying high explosives prevented reaching the vicinity of dock gates, without the defence has an efficient organisation of swift guard-boats.

CONCLUSION.

To sum up:—

In forcing a passage the risks include the possible loss of a ship or perhaps more. On the other hand it is almost certain that some of the ships will get past, though their injuries will be severe and the probability of receiving them will increase from year to year.

In a bombardment there is a risk of serious injury to all the ships engaged, but a small one of actual loss. There is, however, a certainty of an enormous expenditure of ammunition with no lasting result, unless the fortress is badly constructed *and badly manned.*

Command of the sea is necessary before any serious attack on a sea fortress can be undertaken, because time, free communication with the base, and the co-operation of land forces are requisite.

A naval force cannot alone capture or destroy land defences except in circumstances that should be exceptional.

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[1] Military and Naval Operations; Colomb. Lecture 34, Aldershot Military Society, 1891.

[2] Attack on Lissa, 1866; Lewis. R.E. Occasional Papers, Vol. IX.

The lessons for the defence:—

1. If the fortress' charge can be injured by distant bombardment a *few* heavy guns and a *few* heavy howitzers will be sufficient in advanced positions to keep the ships moving and so prevent accuracy of fire.
2. But it is best to concentrate the main defence on narrow waters, where navigation is difficult and ranges short.
3. A through channel, or the approach to the fortress' charge if it can be injured by torpedo boats, should be obstructed sufficiently to delay the passage of ships or boats; and the obstruction so defended that it may be safe from boat reconnaissance and attack.
4. Guard-boats are required for use in fog, when batteries are useless.
5. The material and the men should be prepared, remembering that simplicity of arrangement with the former, discipline *and localisation* with the latter, are the chief essentials.
6. Some officers, of Garrison Artillery or attached to it, should have sufficient naval training to understand the probable actions of the enemy.

If these lessons are acted on, Coast Defence will be doubly strong at half the expense; and the naval assaillants will more than ever feel that "*Le coût fait perdre le goût.*"

THE ATTACK OF A COAST FORTRESS.

BY

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"LABOR OMNIA VINCIT."

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PART I.

General Discussion of the Subject.

A Coast Fortress has been defined as "an area of land and sea provided at certain important points, or along tactically selected lines, with an artillery armament, partly fixed and partly movable;" its area being the amount of land and water covered by the fire of its guns.

An attack may be made on a coast fortress with any of the following objects:—

(1.) Conquest and occupation.
(2.) Destruction of forts, ships, stores, or other *matériel.*
(3.) Passage to some objective beyond.
(4.) Covering some other operation.
(5.) Moral effect.

The attack may be carried out by:—

(1.) A naval force.
(2.) Combined naval and military forces.

A naval attack might be made with any of the above objects, but it is unlikely that a serious combined attack will be attempted except with a view to conquest and occupation, though troops might be employed in connection with ships in cases (2) and (3).

Naval Attacks.

(*a.*) *With a view to conquest and occupation.*

These have been few in number, and only successful where the armament of the ships was decidedly superior to that of the fortress, or the ships' crews infinitely better than the garrisons both in skill and courage. The combat has always been an unequal one. Attacks, in the old days, were sometimes successful when the ships were able to get close in and bring half-a-dozen or so of their guns to bear on one of those of the fortress, and crush the latter by sheer superiority of

metal and rapidity of fire. As far as heavy guns are concerned, this case is obsolete, for modern ships carry but few guns, and well-designed modern fortresses consist of dispersed guns commanding large arcs. The ships, however, of the present day will be found much better armed than the fortress as regards quick-firing and machine guns, the former being in every way much more formidable than the old broadside guns.

Against a fortress, consisting of well-designed and dispersed barbettes, with good cover for the detachments, the effect of fire of a modern ship will, in some respects, actually diminish as she approaches, for the projectiles will have little angle of descent and searching power and the effect of shrapnel will be lessened.

Indirect fire can, of course, be attained to a certain extent by using reduced charges with modern low-trajectory guns. Howitzers would be the best weapon for the attack of fortresses, but useless for that purpose for which ships were designed—the attack of other ships—and even in calm weather difficult to use with accuracy. At Shoeburyness, in 1866, H.M.S. *Hercules*, anchored in smooth water, was unable at a range of 1500 yards with an 8-inch howitzer to plant a shell within 20 yards of a conspicuous target flag; two rounds fired with same elevation and charge giving a difference of 370 yards.

It is improbable that ordinary sea-going ironclads will be armed with howitzers, though special vessels might possibly be constructed for them.

Ships are heavily handicapped for the following reasons:—

(1.) They are not designed to fight fortresses, but to fight other ships.

(2.) Good shooting from a ship depends on the state of the sea, whereas the shore gun has a stable platform.

(3.) They cannot carry the enormous quantity of ammunition requisite to silence a modern fortress.

(4.) No satisfactory method of range-finding exists afloat, that on shore being perfect.

(5.) It is difficult to locate guns on shore, and many rounds, correctly laid, are thrown away.

(6.) The comparative targets of a single ship and a single gun (and if the shore guns be properly dispersed it is single guns at which the ships' fire must be directed) are enormously against the former.

Some of the best authorities hold that serious bombardment of a fortress is most unlikely to be attempted owing to the above disadvantages under which the ships labour. Still it must not be forgotten that fortresses have always been the masters of ships, and as this form of attack has been occasionally attempted, and even carried out successfully, in the past, so it may be again.

We, therefore, part of whose duties consist in defending coast fortresses, must not lull ourselves into a sense of false security by making up our minds that these fortresses will never be attacked. Serious bombardment, however, will never be attempted without an enormous superiority of guns on the part of the ships.

The attack by ships, assisted by naval landing parties, is less likely to be attempted in the future than in the past. Modern war-ships have few men to spare, and landing under fire is a most difficult manœuvre.

Serious naval attacks should never be attempted from a doubtfully commanded sea, unless either

(1.) The enemy's ships can be evaded by surprise and celerity,
or (2.) Sufficient naval force is available, in addition to the attacking force, to mask the enemy.

It may be noted that the introduction of steam has tended to make a doubtful command of the sea more doubtful, and an absolute command more secure.

(*b.*) *For the purpose of ravage and destruction.*

Naval attacks of this nature have been carried out in the past and may be expected in the future. The usual course adopted being that of long range bombardment.

The ships will be unwilling to risk themselves, and will probably keep under weigh, as well as at long range, though by so doing they cannot expect to do much destruction, and should the fire of the fortress not be very formidable they will find it worth their while to anchor.

Another form of ravaging attack, which is likely to be much attempted in the future, is that of sudden inroads into harbours by small craft and torpedo boats.

Light ravaging attacks may be made across a doubtfully commanded sea, where serious ones could not be thought of.

(*c.*) *For the purpose of passing in order to get to an objective beyond, i.e., forcing a channel.*

This is the most feasible form of attack by ships. It is necessary that there should be something for the fleet to do beyond, and that once past or through the fortress they should have matters fairly their own way.

We have many instances of this case in the past. That forts alone are powerless to stop ships running past is an axiom which has been proved over and over again, but forts in conjunction with obstacles are very difficult to cope with. Since the introduction of submarine mines, it is highly improbable that valuable ships will be ever risked, in the absence of proper appliances for clearing mine-fields, by trying to rush close waters, but at the commencement of a war, knowing the feeling against submarine mines and the difficulty of laying them, it is not impossible that swift small craft may attempt such rushes.

(*d.*) and (*e.*) *For the purpose of covering some other operation or producing moral effect.*

These two may be taken together, as the method employed will be the same in either case, *i.e.*, as in (*b.*), most likely long range bombardment under weigh.

Combined Naval and Military Attacks.

(*a.*) *With a view to conquest and occupation.*

This form of attack has been proved by history, and is universally acknowledged to be the only sure way of attacking a fortress. Troops are necessary to hold a place once taken, and, having troops, to attack directly by sea is to run useless risks. Failure on the part of the military attack does not weaken the naval force, whereas, if the naval force suffers and has to withdraw, the military force loses its base.

The part the navy plays is a secondary one. It conveys the troops across the sea, lands them, and then acts as their base, only actively co-operating in the attack when, in some special cases, it may be able to assist the army with its fire.

It is very important that the commanders of the two services should pull together, instances of failure in the past can often be traced to lack of unanimity between General and Admiral.

All possible interference by a relieving army must be taken into account, and provided for, if necessary, by a covering force. Fear of interruption being at an end, the siege on the land side can be pushed on by regular stages.

Since the besiegers intend to possess and make use of the port, harbour, or dockyard when captured, they will not, if they can possibly avoid it, destroy anything which they hope will become their property, and confine their assaults to the fortifications. In fact it has been said that an attempt to destroy any portion of the objective beyond the defences may be taken as a proof that the assailants have given up the expectation of capture and as a sign of the abandonment of the attack.

The design of modern war-ships has a good deal altered the question of transport. In the days of sailing and early steam ships most men-of-war had plenty of room for troops. Now there is no such room, and troops have to be carried in transports convoyed by men-of-war, a troublesome operation. But, on the other hand, the enormous accommodation of modern transports enables us to do with far fewer ships than formerly, though, of course, this means fewer boats and means of disembarkation.

Extensive combined operations should never be attempted without command of the sea, but, failing absolute command, they might be feasible if sufficient naval forces were available, in addition to the attacking force, to

(1.) Mask the enemy in his ports.
(2.) Cover the attacking force at the scene of operations.

Without command of the sea, a fortress, though taken, must ultimately fall unless it can get its supplies from the land, which will be unlikely in an enemy's country.

(*b.*) *For purposes of ravage and destruction or to force a channel.*

Troops have been used in the past, in conjunction with ships, for attacks with either of these objects, and may be so employed in the future, especially in the latter case, for the development of submarine mines may make the clearing of a channel such a difficult operation

that it may be advisable to land troops to take the batteries of the fortress in rear, and if possible silence them, before the ships attempt to clear their way through.

Foreign Powers have not adopted countermining, which points to the probability of their employing this method of attack.

To sum up, the various forms of attack which are likely to be attempted against a coast fortress are four in number, and as follows :—

(1.) Raiding attack by small craft.
(2.) Forcing a channel by ships.
(3.) Bombardment by ships.
(4.) Combined attack by sea and land forces.

PART II.

Historical.

Want of space debars us from describing as fully as we should wish the details of attacks which have occurred in the past, and we can merely notice the various causes which led to success or failure as they occurred, only going into detail in the more modern and important cases.

(I.) *Bombardment.* (*With a view to ravage and destruction*).—The principal instances we have of this form of attack are those of the French ports in 1694–5 and 1759, Algiers in 1806, Odessa and Sweaborg in 1854–5, and, lastly, Alexandria in 1882.

French ports. In the attacks on the French ports the ships expended enormous quantities of ammunition, keeping at long range. As a rule the town was set on fire, but the damage done was rarely equivalent to the expense incurred. They were carried out from a commanded sea.

Algiers. At Algiers the system of fortifications was so weak that by bringing the ships close in against the Mole a numerical advantage in guns of two to one could be attained. This was accordingly done, the ships engaging at even 50 yards. The action lasted seven hours, by which time "the sea defences, with great part of the town itself, were in ruins." Certain batteries, on high sites, were, however, intact. The ships expended all their ammunition, 49,000 rounds, and were somewhat damaged. Success was due to (1) careful planning of the attack; (2) inferiority of the garrison; (3) blunder on the part of the fortress in letting the ships take up their positions unmolested; (4) weakness of the fortifications; (5) command of the sea.

Odessa. The attack on Odessa was carried out by ships under weigh, first at fairly long ranges, and then closer as the fire of the fortress was subdued. The result was that "the batteries, docks, and port, barracks, and abundant supplies of ammunition and military stores were utterly destroyed."

Sweaborg. The bombardment of Sweaborg was one of the greatest ever undertaken. Special mortar-boats were used. The ships all kept at long range and in motion, the gun-boats circling, and the position of the mortar-boats being altered by hawsers ahead and astern. 10,000 projectiles were fired in 11 hours. The result was one great explosion and many fires, though the Russians denied that any damage was done

to the batteries or guns. The ships suffered little. Command of the sea was secured by an immense covering fleet.

Alexandria. The details of the attack on Alexandria, which had for its object "the destruction of the earthworks and dismantling of the batteries on the sea front," are too well known to need description. The following points may be noted :—

(1.) Superiority of fire of anchored ships over that of those under weigh.

(2.) Large amount of damage done to buildings, stores, &c., on shore.

(3.) Small amount of damage done to the batteries and their armament, proving that to obtain decisive results ships must come close in. Even low barbette batteries held their own against the ships.

(4.) The garrison was cowardly and easily demoralised.

(5.) Everything was in favour of the ships, the sea was calm, and there were no torpedoes, submarine mines, &c.

(6.) Owing to the long ranges (1000—4000 yards) only 11 out of 1650 common shell (7-inch and upwards) hit the parapet at the most effective place, *i.e.*, just short of crest.

Captain Goodrich, U.S.N., amongst other conclusions, draws the following :—

(1.) Recent high-powered guns are not adapted to bombarding earthworks.

(2.) Vessels are not yet, and never will be, able to fight on even terms with forts.

(II.) *Bombardment.* (*With a view to conquest and occupation*).—Of simple bombardments, unassisted by landing parties, we have few instances. The most notable are successful attacks on Chagres, 1740, and Acre in 1840; futile attacks on Charleston in 1776 and 1863, and La Guayra, 1743.

Chagres. After two days slow and deliberate bombardment by three battleships and some bomb vessels at moderate ranges, Chagres surrendered. The fall was due to (1) inferior garrison; (2) geographical position of fortress.

Acre. At Acre troops were ready to assist, but not required. Close ranges (6–700 yards) were adopted, and after three hours' bombardment the fortress ceased firing, and was evacuated during the night. The walls were high and not breached. The result was due to (1) the ships being allowed to take up their positions unmolested; (2) explosion of a magazine destroying two regiments.

La Guayra. At La Guayra landing parties were unable to get ashore owing to swell, and ships could not get close in. A distant bombardment followed with little result. Failure was due to (1) lack of sheltered landing place; (2) ships being unable to get close in.

Charleston was first attacked in 1740. A combined attack was intended, but the troops were cut off by the sea, and it took the form of simple bombardment. An attempt to bring the ships close in resulted in the grounding of several, one frigate being lost. After 10 hours' action the ships withdrew, terribly shattered, having made no sensible impression on the works. Failure was due to (1) collapse of the troops; (2) lack of an accurate chart. Charleston.

Eighty-seven years later Charleston was again attacked from the sea, the Federals thinking that with their new monitors and shell guns they had made a clean sweep of history. In two engagements with Fort McAlister (an earthwork mounting nine guns) the *Montauk* (a monitor) was struck 59 times, and only succeeded in disabling one gun in the fort. A month later three monitors attacked the same fort at a range of 1200 yards, and after eight hours' action the ships drew off, having inflicted but slight damage on the fort and being considerably damaged themselves. But the Navy Department still insisted on continuing this form of attack, and the Admiral attacked the fortress with seven monitors and one broadside ship. The ships mounted 32 guns against 67 on shore, but their guns were much more powerful. The squadron came up the Sound on a flood tide, the leading ship being hampered by a torpedo-catching structure fastened to its bows. The intended formation, line ahead 100 yards apart, was not kept with any precision. The orders were rather vague, Fort Sumter was selected as the principal objective. Anchoring does not appear to have been originally intended, but had to be adopted to avoid collisions. The ranges varied from 500 to 2000 yards. After three-quarters-of-an-hours' bombardment the ships drew off, five disabled and one in a sinking condition. One gun in the forts was disabled. Obstructions kept the ships from reaching their stations. The ships fired 139 shots, the fortress 2229. Failure was due to (1) insufficient armament on the ships to cope with the fortress; (2) obstructions, and the dread of them; (3) lack of preconceived plans.

(III.) *Forcing a Channel.*—We have several instances of this, especially during the American Civil War. Passages were forced successfully by Duckworth in the Dardanelles, 1809; at Obligado and San Lorenzo in 1845; at New Orleans, Vicksburg, and Mobile in 1862–3. Instances of failure are the Peiho River, 1859, Port Hudson, 1862. Obligado.

At Obligado conquest as well as passage was desired. Instead of making a combined attack at once, bombardment was resorted to by the ships, which suffered heavy loss. The passage was forced, and subsequently the forts were taken by landing parties without difficulty.

At San Lorenzo the moral effect of mortar fire from the opposite kept down the fire of the forts. A number of merchant ships convoyed by men-of-war got past with a loss of four, which ran ashore. San Lorenzo.

Conquest being desired, as well as passage, at New Orleans, six days were spent in mortar bombardment. Then a passage was cleared through the obstacles, and the ships went through by night, bombarding as they went. One corvette was rammed by an enemy's ship. New Orleans

At Vicksburg the forts were impregnable, and extended for three miles. The river doubles under the guns of the fortress. Farragut, Vicksburg.

after wasting two days in fruitless bombardment, ran past by night, with trifling loss. Later on he returned by daylight, and craft of all kinds forced the passage.

Mobile. At Mobile obstructions threw the whole line into confusion, and checked the ships under the guns of the fortress. The fleet suffered severely, and the attempt nearly ended in disaster.

Peiho River. At the mouth of the Peiho River, in 1859, the ships made the fatal mistake of first directing their attention to the forts instead of the obstructions. Landing was unsuccessfully attempted, and the attack ended in failure.

Port Hudson The failure of the attempt at Port Hudson was due to (1) darkness; (2) smoke; (3) intricacy of navigation; (4) rapidity of current.

(IV.) *Bombardment* (*assisted by naval landing parties*).—Gibraltar, in 1704, and Portobello, in 1739, are good instances of this.

Gibraltar. At Gibraltar 1800 marines blockaded the fortress on the land side, and the bombardment was followed up by storming parties. The fall of the fortress was due to the immense numerical superiority of the attacking force (10,000 to 150), and the cutting off of all supplies. Gibraltar has defied its foes from that day to this only because it has never been attacked by a power with command of the sea.

Portobello. Close alongside tactics were pursued with success at Portobello. Lack of troops necessitated the attack being made by the ships, which were brought in towing boats on their off-sides so that there might be no delay in landing the seamen once the fire of the forts was subdued. Success was due to (1) surprise and sudden assault; (2) inferiority of the garrison.

(V.) *Combined naval and military attacks.*—History gives us many instances of this form of attack, which was generally successful when properly carried out, failure being always due to obvious causes.

The chief cases of success are Louisburg in 1745; Belleisle, 1761; Charleston, 1780 and 1863; Banda Neira, 1810; Beyrout, 1840; Sevastopol, 1854; Kinburn, 1855; Fort Fisher, 1864; Sfax, 1881. Failures occurred at Carthagena, 1739; and Puerto Cabello, 1743.

Louisburg. Louisburg is an excellent example of successful combined attack. The garrison numbered 1200, the attacking troops 3850. The French fleet at Brest was masked by a superior British one. The troops were landed four miles from the fortress, covered by the fire of some of the smaller vessels. The fleet blockaded the entrance to the harbour, while the troops erected batteries on shore. After 47 days' siege, in which 9400 shell were fired by the besiegers, the fortress fell.

Belleisle. Belleisle, with a garrison of 2600, was attacked by 10,000 troops. The French fleet at Brest was masked. The troops were landed clear of the batteries, and at the second attempt established themselves on shore. After two months' siege the place surrendered.

Charleston. We have already seen that Charleston was twice unsuccessfully attacked by ships alone in 1776 and 1863. Following closely on each of these, combined attacks were successfully carried out in 1780 and 1863. In 1780 the fortress was much stronger than in 1776, and the attacking force consisted of 14 ships and 7550 troops. After some

delay, waiting for the French fleet to disperse, the expedition sailed. Troops, stores, and ships' guns were landed, and the heavy ships sent home. At the end of two months the shore batteries were completed, and the remaining ships ran up the Sound to create a diversion. The troops were not in sufficient force to completely invest the fortress on the land side, but reinforcements arrived, and this was done. The third parallel was completed three months after the start, and a few days after the fortress capitulated.

In 1863 the troops were landed on Folly Island, and erected batteries on the north side. The monitors co-operated on the flank of the shore batteries, and after four hours' bombardment the outworks were silenced. The troops then advanced on Fort Wagner, the monitors searching the ground in front and covering the advance. The ships engaged Wagner with little result; a night assault was then made by the troops, but repulsed. Next day more batteries were thrown up, and both these and the ships engaged Wagner. Batteries were also erected to play on Forts Johnstone and Sumter. The latter, taken in rear, scarcely replied, and in three days all the guns on the north-west face (which was not open to the ships' fire) were disabled. A month after the commencement of the attack the port was in the Confederates' hands, and Charleston was evacuated six months later owing to Sherman's operations in rear of the town.

Banda Neira

Banda Neira is a typical case of a successful landing. The defences consisted of 12 batteries (one with 52 guns) and 1500 men. The attacking force, three frigates, 120 troops, and two field guns. The landing took place at night; a tropical rain squall enabling it to be carried out just by one of the batteries, which was taken, without a shot, by a rush from the rear. The remaining works then gave in.

Beyrout.

Beyrout, twice bombarded without success, was evacuated in consequence of movements of troops in rear. Sidon was also taken by combined attack.

Sevastopol.

At Sevastopol the ships took little part in the attack, and their action cannot be said to have affected the issue in any way. They engaged the forts as "an assistance and diversion to a bombardment on the land side." The forts could not be approached closely, and the result of a bombardment, at anchor, of three hours, was three guns dismounted and 35 men killed. The ranges were 1600–3000 yards, and the Telegraph Battery (an earthwork 100 feet high) harassed the ships so much that they had to desist, the battery suffering no loss.

Kinburn.

Kinburn was taken by a combined attack, mortar boats and floating batteries being used.

Sfax.

The fall of Sfax was due to bombardment, followed up by troops. The ships fired 2002 projectiles, at ranges 1500–7000 yards, with little result.

Fort Fisher.

The attack on Fort Fisher is full of instruction. The futility of an explosion vessel having been proved, the ships bombarded, opposing about 500 guns to about 50 on shore. 2000 men were then landed on the beach five miles to the north, but on advancing the General pronounced the fort intact for defensive purposes and retired. The Naval Secretary then issued clear orders as to the conduct of the attack. A

three days' bombardment followed, the ships enfilading the land faces, coming in much nearer, and each being told off to certain guns. The result was that the guns on the land front were completely silenced. Meanwhile the troops were landing, with stores and artillery, their flank being protected by some of the ships, and on the fourth day the place was taken by assault on the land side. In all 50,000 projectiles were fired by the fleet, most of which were wasted on the sea face.

Carthagena. A combined attack was made on Carthagena (garrison 4000) by 51 ships and bomb vessels and 12,000 troops. The fortress was unapproachable on the sea side owing to three miles of shoal water. The troops were just landed on the island of Tierra Bomba; three weeks after the fleet was inside the harbour and most of the earthworks were silenced. The troops were then conveyed to the mainland. Then followed a collapse. Vernon erroneously imagined that there was not sufficient water to allow him to close on the town. General Wentworth spent some days in unaccountable inactivity. Each complained of the dilatoriness of the other. Sickness broke out among the troops, and after an unsuccessful assault, the attack was abandoned. The loss among the troops was 1800 men.

Failure was due to obvious causes: (1) friction and ill-feeling between General and Admiral; (2) faulty handling of both ships and troops; (3) sickness; (4) height of the defences.

Puerto Cabello. At Puerto Cabello a day was spent in silencing two batteries by ships' fire. Then a mixed force of troops were landed, but ran away on some guns being fired. A futile bombardment followed.

PART III.

Modern Improvements, their Nature, and their Influence on the Combat between the Ships and the Fortress.

(1.) *Ordnance.*—The introduction of rifling (which dates from 1850), of breech-loading, of accurate position and range-finders, of the disappearing system of mounting guns, and of various other improvements, has enormously increased the range, power, and accuracy of ordnance, as well as the safety of the detachments working the guns.

The result has been to increase the superiority of the fortress over the fleet, as, of course, the stable platform enables the fortress to take full advantage of all these improvements.

Enormous strides have been made since the days of the attack on Algiers, compare the 32-pr. of those days with the modern 6-inch B.L.:—

	Calibre.	Weight.	M.V.	Charge.	Weight of Projectile.	Effective range.
32-pr. S.B. ...	6·4″	3 tons.		10 lb.	36 lb.	
6″ B.L.	6″	5 ,,	1660 f.s.	34 ,,	100 ,,	8000 yds.

Of late years quick-firing guns have been greatly developed. Their chief characteristics are great speed of fire and ease of manipulation.

We possess four natures, 3-pr., 6-pr., 4·7-in., 6-in. The 4·7-in. fires a 45-lb. projectile which will penetrate 5·4-ins. of steel at 1000 yards.

This penetration will be increased when cordite is adopted. It is effective up to 2500 yards and can be fired at the rate of ten well-aimed rounds per minute. It is claimed for them that they will materially aid the attack, but the advantage of the ship only exists where the fortress is not similarly equipped. They are invaluable against torpedo boats and for rendering the unarmoured parts of ships untenable.

The introduction of machine guns is a distinct advantage to the defence, as an intense frontal fire can be suddenly developed by a few sentries without waiting for a complete manning of a work. With the Maxim gun 700 bullets per minute can be aimed and fired by one man, who need not show more than his head (which can be easily shielded), the feed being worked by another man completely under cover. They are effective up to 2000 yards.

At Alexandria the ranges were apparently too long, only seven hits on guns and carriages being the result of 16,000 rounds from the Nordenfelt. At Inchkeith 15,210 machine gun rounds were fired at dummies representing an exposed gun detachment, range 1000 yards. Result, 15 hits.

Machine gun fire from ships is useless against disappearing guns or batteries of any command, but of the greatest use against counter-attacks by torpedo boats.

Whilst on the subject of guns we must not omit to mention the Zalinski pneumatic gun, which, it has been contended, "will probably supersede all locomotive torpedoes at present designed, and may in many cases replace submarine mines with obvious advantage." The 15-in. gun can fire a projectile with a bursting charge of 600 lb. bursting gelatine. It is effective up to 2000 yards. There is no noise, flash, or smoke.

(2.) *The Submarine Mine.*—The practical employment of the submarine mine dates from the American Civil War of 1861–5. They were suggested at the beginning of the century and used to a small extent in the Crimean War, but they were not properly developed till the American War, when 21 vessels were sunk by them. The men and stores devoted to mining, in our service, have increased almost fourfold in the last ten years, and great progress has been made. There is no reason to suppose that Foreign Powers have not paid similar attention to the subject.

They may be divided into three categories :—

(1.) Observation mines, *i.e.*, those which are fired by electricity from the shore as the ship passes over. In thick weather they are, of course, useless. Being laid in deep water they do not impede navigation. They have been rejected by Germany and the United States.

(2.) Controlled electro-contact mines, those which depend for their action on contact with a vessel, but which can be rendered innocuous by disconnecting the battery on shore. They are easy to lay out, but are more likely to be disturbed by storm than observation mines owing to their being placed in shallower water. They are equally dangerous to friend and foe while the battery on shore is connected.

(3.) Uncontrolled or mechanical mines, those which explode when struck by friend or foe. These are, of course, very dangerous, and impossible to use in a channel where there is any friendly traffic. They are always ready, cheap, simple, and certain, but seldom used, except to block an enemy's port.

The general idea of submarine defence which will be met with will probably be modelled on the following:—

A main mine-field of observation and electro-contact mines with advanced guards and reserves of either or both, through the whole system a friendly channel defended entirely by observation mines.

Mines are, of course, a great adjunct to the defence, especially in the case of a channel.

(3.) *The Electric Light.*—This is a great adjunct to night operations. In the Crimean War a search-light on a small scale, produced by a Voltaic battery, was used; but this was a mere toy. The dynamo-electric machine, since introduced and perfected, with the Mangin reflector, throws a light by which, in clear weather, small objects can be clearly discerned at upwards of a mile (steam or smoke at a much greater distance), but in mist or fog the ray is useless.

The balance of advantage in employing the light is with the defence. The fact that the Suez Canal is now navigated by its means proves nothing as regards ordinary channels. The light is most efficient when external to the point sought to be protected, and this is more easily accomplished on shore, though special vessels should be employed to work the attack lights whilst the main fleet remains in darkness. Good practice can undoubtedly be made from shore batteries by employing the light in connection with the position-finder or depression range-finder, whilst fair practice can be made at a ship showing her light. Also a shore light thrown full on a ship renders navigation extremely difficult. On the other hand, ships' lights will be of great use to them in detecting counter torpedo-boat attacks. Attacking ships and boats should be coloured dull black.

(4.) *The Torpedo.*—Like mines, torpedoes first came prominently into notice during the American Civil War. Their introduction has tended to increase the superiority of the fortress. Some naval officers hold that they are quite as formidable to the attacking ships as the artillery fire of the fortress. They may be divided into two categories: (1) Those fired from the shore; (2) those fired from a ship. The former are incomputible with any except observation mines, and the range is limited. The latter have in connection with the boat an unlimited range, and counter torpedo-boat attacks are a great obstacle to the attack, especially in dusk, mist, or smoke. The fear of them would prevent ships from anchoring.

The best protection against torpedoes was at first thought to be in sub-dividing the ship into numerous small compartments, but this plan was soon seen to be futile. Then wire nets were suspended from long booms projecting from the ship's side, and these are at present in use. They, however, are a most cumbrous appendage and liable to foul the screw, moreover torpedoes are now made that will cut through any

net. It has been recently decided that the best protection consists in having special vessels of 800 tons armed with numerous light guns, and nets will probably be discarded in the immediate future.

PART IV.

Details of the Attack.—Naval Attack.

The general conditions of an attack on a coast fortress by a fleet are as follows :—

(1.) The ships will not have much choice as to point of attack.

(2.) The ships, provided they retain their mobility, can choose the moment for commencing and ceasing the attack.

(3.) The locality will be well known to the defence, and prepared with obstacles, &c.

(4.) Before making a decisive attack the ships will have to spend some time in clearing obstacles.

(5.) The clearing of these obstacles will point out to the defence the intended path of attack.

(6.) The obstacles will compel the ships to advance with caution.

(7.) The ships will have to economise their ammunition.

(8.) The fortress need not do so (unless invested on the land side).

(9.) The fortress can only repulse the attack, it cannot pursue or capture ships.

(10.) Once the fire of the fortress has been subdued, part of the fleet can hold it in check whilst the remaining ships carry out what is wanted.

(11.) The accuracy of fire of the fortress depends solely on *personnel* and *matériel*, whereas that of the fleet depends also on the state of the sea.

In Part II. we came to the conclusion that there are three forms of feasible naval attack, viz. :—(1) Ravaging attack by small craft for the purpose of cutting out ships, &c. ; (2) forcing a channel ; (3) bombardment. We will examine these in order.

(1.) *Ravaging attack by small craft.*—This form of attack will be best carried out by torpedo boats at night. The conditions for success are (1) darkness ; (2) careless defence. The electric light, machine and Q.F. guns are great obstacles. The boats, gear, and also the men's faces should be coloured dull black. Should guard-boats be found patrolling the harbour, fire from the shore need not be much feared as it would be equally dangerous to friend and foe.

(2.) *Forcing a Channel.*—In this case the aim of the ships will be to keep themselves as intact as possible and reserve their ammunition for the attack of some objective beyond the fortress. Hence they will try to get past as quickly as possible.

If the objective beyond consists of ships, small vessels will be nearly as effective for the attack as large ones and will have much more chance of getting through the channel successfully.

The attention of the attacking vessels must first be directed to the obstructions which are certain to be found in the channel, as it is these which will keep them under the fire of the fortress—the very thing they wish to avoid.

If the channel is in considerable use in peace time, possibly a sudden attack at the commencement of a war may find it to a great extent clear (at any rate of contact and mechanical mines). Observation mines may be laid and kept there without impeding navigation, but they are liable to get out of order. Anxiety to have a surprise must not result in want of caution. A few boats must be sent in to see what the channel is like and how it is obstructed.

The attacking forces are certain to be possessed of accurate charts of the locality and plans of the fortress, obtained in peace time, and should have a very good idea of what obstacles they may meet with.

The reconnoitring force, consisting probably of fast cruisers, torpedo-catchers, and torpedo boats must run in. Should they report clear the ships must go straight through.

If, however, there are obstructions a channel must be cleared through them. This will be best done by small craft, capable of easy navigation in intricate waters and manned by men well practised in working mines. These boats will have to go in by themselves, unsupported by the ships, which must be kept out of fire of the fortress till the channel is clear. Night will, of course, be the time for this operation, and if possible a foggy night, as fog obscures the electric light and upsets the shore gunnery. In clear weather Q.F. and machine guns on shore will make the task very difficult, if not impossible.

The work of clearing a channel through a mine-field consists of four operations:—(1) Sweeping; (2) slow creeping; (3) rapid creeping; (4) countermining.

(1.) Sweeping. This is a tedious operation, only to be carried out beyond the range of fire of the fortress, when the presence of mechanical mines is suspected.

If the water gets deep very quickly, it is probable that there will be no mines far from shore, and only electric ones closer in, so that sweeping may be dispensed with.

If, on the contrary, the water deepens gradually, mechanical mines may be found some way out to sea, and it must be adopted. The fleet should anchor outside the mines and beyond the range of the fortress guns and get their torpedo nets out. Then the procedure will be as follows:—The pulling boats will be prepared for sweeping. After nightfall the channel to be cleared will be buoyed out. Then, choosing a time other than that of low water, the boats proceed to sweep the channel in lengths, in pairs going in opposite directions to avoid dummy cables. On grappling a mine the boats anchor, and the mine is caught and fired.

Divisions of boats obliged to traverse unsearched ground should do so in line ahead, with tow-ropes not less than five fathoms long. When

time cannot be spared to sweep thoroughly, two gun-boats, protected by torpedo-catchers, can drag a chain along the bottom. When it is thought that electrical mines are being approached slow creeping must be commenced.

(2.) Slow creeping. The object of this operation is to pick up the enemy's cables, having first of all broken the continuity of the core and under-run the cable to see if it leads to a multiple cable with mines attached, and if so cut the multiple cable and render the mines useless. It should be carried out at night, and is only possible when not under heavy fire from the fortress.

(3.) Rapid creeping must be substituted for slow creeping when under heavy fire. The boats are towed by steam launches, and do not stop on hooking a cable.

(4.) Countermining. As soon as the channel has been well crept over the countermine launches should be ready to run the countermines. They will then run the first two lines of countermines, and fire them at once, and so on till the channel is cleared. If there is a boom a line of countermines can be run over which can be discharged by the leading ironclad ramming. This will destroy any boom.

Should the channel be cleared, the defence will immediately try to fill it up again, and possibly make it worse than before. Hence the operation of clearing should be so timed as to conclude just at daybreak, so that the ships may be able to see if the defenders attempt to lay more mines.

Now-a-days there is not the least use in ships trying to go through an intricate channel at night. In addition to the difficulty of clearing obstructions, electric lights turned on from the fortress would render steering extremely difficult, and the risk of going on shore would be great. Daybreak is the proper time.

It will probably be better for the ships to take in their nets, and trust to small craft (which should be plentiful) to protect them from torpedoes, as the nets would greatly hamper their speed.

Dredges might be used as protection against mines.

Line ahead will be the formation, there will not be room for any other.

It has been advocated by some naval authorities that an old ship should take the lead, but this expedient would be of no avail except against the obsolete mechanical mine. Also, an old ship would be more vulnerable to artillery fire, and, if sunk, would stop the whole line.

The ships' fire will be directed towards the *personnel* of the fortress and any position or range-finding cells the locality of which may be known, the object being to subdue or upset the fire as much as possible, not to destroy the forts, which would, of course, be impossible. Hence quick-firing and machine guns would be utilised as much as possible.

All available data, as regards the batteries, should be carefully studied, and each ship should know exactly at what points to direct its fire.

Should the wind be such that the smoke from the ships' guns might

interfere with their steering by obscuring the view, they had better not fire at all.

(3.) *Bombardment.*—We have seen in Part I. that the bombardment of a fortress by a fleet may be undertaken for any of the following purposes :—

(1.) Moral effect.

(2.) Creating a diversion and covering some other operation.

(3.) Destroying forts, ships, stores, &c.

(4.) Capturing the fortress.

In cases (1) and (2) the object will be not so much to subdue the fire of the fortress, or destroy any of the elements of defence, as to intimidate the garrison and inhabitants in the former, and in the latter to draw their attention away from some other operation (such as landing troops, destroying mines or obstructions, or an attempt to force a channel by other ships). It will not be worth while for the ships to commit themselves to a serious engagement, and risk being crippled, they will therefore engage :

(*a.*) At long range. (*b.*) Under weigh.

The range will be limited by the amount of elevation permitted to the guns by their mountings and ports. The shortest range at which the ships will be safe from direct fire can be calculated with accuracy, the thickness of their armour and the nature of the armament of the fortress being known. Locomotive torpedoes, mines, and the fire of machine and quick-firing guns will be avoided.

The object of keeping under weigh is not so much to offer a more difficult target to the guns, modern improvements in position and range-finding having made it just as easy for them to hit a moving as a standing object, but to facilitate avoiding counter torpedo-boat attacks, and to enable the ships to retire at once if much annoyed by the fire of the fortress. Being under weigh will not affect the ships' fire very much, as great accuracy will not be sought, and at long ranges it can never hope to be very effective.

Opinions differs widely as to the best formation to adopt. This will, of course, depend on circumstances, the nature of the fortress, &c., but as a general rule the best methods appear to be those of steaming to a buoy, anchored at known range, to fire, or for the ships to move in line ahead in an elliptical course. The fire should be well distributed and each ship know what to fire at.

In case (4) the object will be to subdue the fire of the forts and to capture them or some object which they defend. Hence the ships' fire must be effective and the attack direct and determined.

The conditions necessary for a successful attack of this kind appear to be as follows :—

(1.) Command of the sea.

(2.) Badly situated or constructed shore batteries.

(3.) Inferior garrison.

(4.) An armament afloat three or four times greater than that ashore.

(5.) A base close at hand.

(6.) Surprise and sudden assault.

This form of attack will be best carried out:

(*a.*) At close range. (*b.*) At anchor.

The range will depend on: (1) nature and position of batteries; (2) hydrography; (3) number of ships; (4) proficiency of garrison. The closer the range, probably the less room *there* will be for the ships, and the less guns can be brought to bear, also the less angle of descent will the ships' shell have. However, close range is a necessity to ensure good practice.

Anchoring is a necessity, as at close range there would not be room to manœuvre. Also, it has the following advantages:—

(1.) The range, bearing, and appearance of the target does not alter.

(2.) There is no fear of running against mines.

(3.) The ships can be placed much closer together.

(4.) The ships can, by means of springs on their cables, be warped in the most convenient angles for attacking.

The mines and obstacles will, of course, have to be considered and a channel cleared through them to allow the ships to move in. The operation will be similar to that in the case of forcing a channel, except that the ships can, if necessary, come in and support the small craft. It will be best done at night, so that at daybreak the ships can commence to bombard.

The station and objective of each ship must be settled beforehand. After the sweeping boats have cleared part of the channel, one of the ships can move up and anchor at the end of the clearance, and, if within range of the fortress, should have good bow fire. Then, as more of the channel is cleared, the ships can move up one by one, each anchoring in front of the last. After more of the channel has been cleared by creeping and countermining, the last ship can move up and anchor before the first, and so on; this saves the necessity of all the fleet weighing each time and moving up.

Should any of the defender's torpedo boats attack the ships in this position, they must trust to their nets, machine guns, and torpedo-catchers.

It is, of course, impossible to lay down fixed rules for the conduct of an attack, as these will vary with the circumstances of the case, the position of the fortress, strength and quality of the garrison, strength of the armament, &c. But the foregoing may be taken as a standard and altered to suit any particular case.

In case (3) the object will be to destroy the forts or that which they defend. Hence to effect anything the ships' fire must be accurate, and they should anchor if the fire of the fortress is not very formidable.

Long ranges will probably be adopted, as it will not be worth the ships' while to risk being crippled, for which reason they may also keep under weigh, so as to be able to retire at once if harassed by the fortress guns.

Combined Attack.

This is undoubtedly the only way to attack a strong coast fortress with a view to conquest and occupation, *i.e.* by a siege army on the land side, to which the ships act as a base, assisting by their fire where possible.

The question of command is the first which suggests itself. The divided command is unquestionably the best, the General over the land, the Admiral over the sea forces.

The duty of the Navy consists in :—

(1.) Transporting the army across the sea.

(2.) Landing the army.

(3.) Keeping the line of communications open.

(4.) Acting as the base of the army.

(5.) Assisting the army with its fire where possible.

(6.) Blockading the fortress on the sea side.

The duty of the Army consists in :—

(1.) Carrying out a regular siege of the fortress on the land side.

(2.) Blockading the fortress on the land side.

If these eight operations are successfully carried out, a fortress, however strong, must ultimately fall. We will examine them in order :—

(1.) *Transporting the army across the sea.*—The transport fleet must rendezvous at some home or friendly port under charge of a naval squadron sufficient for its protection, and by which it must be escorted to its destination. The fleet should sail under orders known only to the General and Admiral. If the fortress to be attacked is a long way off, the force should rendezvous, if possible, at some place within three days' sail.

(2.) *Landing the army.*—The time and place for landing must be settled by the General and Admiral. The navy must *not* compromise itself, nor go beyond certain limits, however much the army may wish it. Surf is the greatest impediment to a successful landing, and if the success of an attack depends on landing on an open beach, plenty of time must be allowed, as an impassable surf (which may possibly last a week) may be met with. Landing on an open beach is a very hazardous operation, as the weather may change in the middle. Cases will occur where it may be possible to land infantry, but not guns or stores.

If sufficient ships are present, and they can use their fire without danger to the landing troops, it may prove very useful. Should the landing have to be made under fire, the ships must take the batteries in hand, and keep them in hand even at some loss. Field-works they should deal with before the landing, and all cover should be so well searched as to make it impossible for the enemy to maintain himself

within striking distance of the landing place. This may necessitate the provision of vessels of light draught, the best of shelters for ships, and landing places for boats not always producing deep water close in shore. The immediate landing will be covered by quick-firing and machine guns in the boats.

If under fire the landing should be made on as broad a front as possible. Unless the landing be on wharves or jetties, the troops should never be embarked in steam launches, as they have small accommodation and cannot go where pulling boats can.

In selecting the landing place the following points must be considered and, if possible, attained:—

(1.) Avoidance of the fire of the fortress or earthworks.
(2.) Good anchorage for the ships.
(3.) Deep water close in shore.
(4.) Sheltered position.
(5.) Accessibility, to ensure free communication between ships and shore.
(6.) Broad stretch of beach.

Advantage should be taken of any natural features of the ground which may facilitate the landing parties defending themselves or the ships assisting them.

The landing should be carried out on the flood tide as follows:—

(1.) Troops to be embarked in pulling boats manned by their full complement of seamen.
(2.) These boats to be formed in columns of 5 or 6, connected by tow ropes.
(3.) Each column to be taken in tow by a steam launch, armed with a Q.F. or machine gun in the bow.
(4.) Columns to be so far apart that, when the boats are in line abreast, they can use their oars. 12 yards will be sufficient for each boat.
(5.) Flanks to be protected by special craft. Riflemen in the steam launches.
(6.) The approach to the shore to be rapid.
(7.) When the water begins to shallow the boats will be cast off, will form up right and left of the launches, and pull in to the shore.
(8.) The first division to consist of infantry, engineers, and, possibly, light artillery; also, naval artificers with material for erecting jetties, &c.
(9.) Boats, when emptied, to return at once for fresh cargoes.
(10.) Party landed not to advance too far, but to secure their position.

(3.) *Keeping the line of communications open.*—The object of this is for the renewal of supplies and reinforcements from depots at home. It means having absolute command of the sea, without which a combined attack on a large scale should never be attempted.

(4.) *Acting as the base of the army.*—This is the principal part played by the navy in the actual process of attack, *i.e.*, giving the army a base

to work from, from which it must draw the materials for attack, maintenance, &c., instead of (except in special cases) obtaining direct assistance. The essentials for this are:—

(1.) Free communication with depots at home.
(2.) „ „ „ the shore.
(3.) Sheltered anchorage.

(5.) *Assisting the army with its fire where possible.*—When the landing takes place some way from the fortress the ships can generally assist with their fire during the advance, guarding the sea flank if the advance is along the shore, and searching any cover near which the troops may have to go.

Some geographical features may exist which will enable the ships to assist the siege batteries by enfilading land faces.

Sudden bombardment by the ships may be of much use in diverting the attention of the garrison from an assault on the land side if this can be managed without risk to friend as well as foe.

(6.) *Blockading the fortress on the sea side.*—This is a very important duty, as, if it be efficiently carried out by land and sea, a fortress, however strong, must ultimately fall, owing to lack of supplies and reinforcements. If not carried out properly the result will be a protracted siege, probably lasting many weeks, and possibly resulting in failure.

(7.) *Carrying out a regular siege on the land side.*—Want of space prevents us from discussing this very important duty, about which many pages might be written. The operation would be identical with that of besieging any corresponding inland fortress and carried out in the regular manner by means of parallels, earthworks, &c.

The number of men required would depend on—

(1.) The strength of the garrison and extent of the fortress.
(2.) The strength of the enemy's land forces which are likely to be encountered.

Conclusion.

In conclusion we would point out that the limited space at our command has prevented us from dealing with the subject in any but a very general manner; in fact, we fear that we have already exceeded the allotted number of pages.

Note.—Amongst others, the following works have been studied by the writer of this Essay, who is under an obligation to the various authors:—

"Naval Warfare," ... ... By Admiral P. H. Colomb.
"Development of Navies," ... „ Capt. Eardley-Wilmot, R.N.
"Fortification," ... ... „ Major G. S. Clarke, C.M.G., R.E.
"Fortification," ... ... „ Major Lewis, R.E."

Also, papers and lectures from the "Journal of the R.U.S. Institution;" R.E. "Professional Papers;" "Proceedings," R.A. Institution; "Aldershot Military Society," &c.; by Admiral Colomb; Colonel Walford, R.A.; Captain May, R.N.; Captain Jackson, R.N.; Lieut. Sturdee, R.N., and others.

MEMOIRS
HISTORICAL AND BIOGRAPHICAL.

THE BROME-WALTON FAMILY.

BY

MAJOR AND QUARTERMASTER R. H. MURDOCH, R.A.

(Assistant-Superintendent of Records).

Chapter II. 1739-40—1758-9.

The period which we now approach was pregnant with issues of important and enduring consequences, not only to the Royal Artillery but to the Army at large, and worthily constitutes an epoch in military history.

(*a.*) The wars with Spain and of the Austrian Succession ushered in the Seven Years' War, which was the first act of the drama that was played out at Sadowa and Sèdan—a war which left England absolute mistress of the seas, founded her empire in India, and gave to her North America.[1]

(*b.*) It ushered in and bowed out the antiquated system of field tactics which had subordinated fighting to parade manœuvres, and taught the importance of reserves composed of *troupes d'élite*.[2]

(*c.*) It gave the first employment in battle to the "British bayonet" and to the "iron ramrod;" gave birth to the regiments of Highlanders and to mounted infantry[3]; and abolished body armour, the infantry soldier's sword, the shields of Highland regiments, the halberts and field staves of non-commissioned officers, and kettle-drum organisation.

(*d.*) It regimented the corps of Royal Artillery, and assigned to it permanent precedence over all dismounted arms; constituted artillery (since Fontenoy, 1745) an indispensable arm of warfare; gave birth to

[1] Russel's "Modern Europe," Vol. II. Longman's "Frederick the Great."

[2] "Annals of War," *anno* 1745, p. 65, by Sir Ed. Cust. The "Campaigns of the Seven Years' War, by an Officer who served with the British" (1764 Ed.)

[3] Hume's "England," p. 605.

the present system of officering the Royal Artillery; and established the artillery officer upon an equality with officers of the Army.

(*e.*) It gave mobility and permanence to modern field artillery, and "brigaded" field battery guns; abolished the 1½-pr. field gun (of Marlborough); introduced the 3-pr.—6-pr. field train (1740) and 3-pr. gallopers,[1] the short-lived but ever memorable 4-pr. bronze field equipment of 1744, which again gave place to the 6-pr. horsed "brigade" of 1745, and again to the 12-pr. medium and heavy field batteries of 1758—permanently horsed, with limbers and wagons complete—which first trotted into action at Minden (the Waterloo of the 18th Century).[2]

(*f.*) In it was also born the Royal Horse Artillery of Frederick the Great (1759), which England is credited with having copied some few years afterwards.

(*g.*) Between 1740—1759 the five complete companies of 40 officers 610 men constituting the corps of Royal Artillery had developed into the three battalions of 31 companies of 229 officers, 38 cadets, 2962 men.[3]

According to the fashionable orthodoxy of military Carlylean hero-worshippers, we should make the humiliating confession that all this series of developments in *arms* was the result, not of British initiative, but of our simian dexterity in imitating foreign masters, and that we were, in all these points, as dependent then as now upon German inspiration, in particular from Frederick the Great. There was a period (1582) when English *literature* likewise derived all its inspiration from continental sources, which drew, then, from the patriotic bosom of Richard Mulcaster, the prophetic challenge "Why raise not the English wits, if they will bend their wills either, to be in time as well sought to by foreign students for increase of their knowledge as our country is sought to at this time by foreign merchants for increase of their wealth?"[4] We who have lived to verify the prediction of the "genius who awakened the nation," ought to look forward to the day when English genius will also assert its pre-eminence in creative military arts and sciences. But may we not at once throw down the glove, and challenge the Germanophiles to disprove the assertion that, with exception, perhaps, of the creation of the technical term "Royal Horse Artillery," Germany *followed* in the wake of England in adoption of all other of the foregoing developments?

Depressing, however, is it to the searcher among original official *data* throughout this epoch to discover how imperfect, or absolutely untrue, are many of the received accounts of this period hitherto published and founded upon secondhand sources, traditions, and anecdotes—

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[1] In "Proceedings," R.A.I., Vol. VII., No. 3, p. 137, the dates of introduction of galloper guns are assigned to "some years after 1726, and in 1747;" but Lieut. Thos. James's "Book of Artillery" schedules galloping guns and carriages (6-pr., 3-pr., 1½-pr.), and howitzers, under Class K, "of my own projection, as approved by the Honble. Board of Ordnance on 5th June, 1725." This remarkable compilation, on vellum, was begun in March, 1722; the original work is among the "Dickson Papers," now in possession of General Sir Collingwood Dickson, V.C., G.C.B.

[2] Special authorities hereafter *in loco*.

[3] *Vide* R.A. Muster Rolls, 1740, and Record Books of Battalions.

[4] "Amenities of English Literature" (Disraeli), Vol. II., p. 20.

making the task of supplementing and correcting, on present occasion, peculiarly distasteful to the writer—apart from the necessity of his having occasionally (especially up to 1762) to diverge from the personal memoirs of the Brome family in order to cut an artillery road through the tangled jungle of impersonal history. We are all desirous of having the history of the Royal Artillery brought into line with modern times, and the "Proceedings" of the Royal Artillery Institution are now accumulating invaluable materials to this end; but how unwise to attempt to rear the building higher without reviewing and rectifying the basis and structure of the existing edifice?

Only with episodes of this eventful era, however, in which members of the *Brome family* were prominent actors are the present Memoirs directly concerned.

The declaration of war against Spain, 1740, by Britain ignited a train that was to fire central Europe, and found "England the Unready" true to her character, after the lassitude of a long era of peace. Minorca was expected to be the first object of attack by Spain, and Port Mahon (Minorca) was already strengthened by the presence of Commodore Haddock with a squadron of nine ships of the line[1]; and while infantry reinforcements were being got ready to augment the attenuated garrison of 2000 officers and men, a Royal Warrant, of 21st April, 1740, directed that the company of Royal Artillery be augmented to 100 men, with an addition of three officers, one of whom was Lieutenant-Fireworker *Charles Brome*,[2] upon whom was conferred the functions of local Adjutant to the Royal Artillery—his son, Bombardier *Joseph Brome*, being at the time Drill-Master. The armament of Port Mahon consisted of

Guns.	42-pr.	32-pr.	18-pr.	12-pr.	9-pr.	8-pr.	6-pr.	4-pr.	1½-pr.	Mortars.
148 Iron.....	8	24	18	12	41	8	26	11	—	4 Iron 13-in.
8 Brass	—	—	1	—	—	—	1	—	6	44 Brass { 8-in. 7-in. 5½-in. 4½-in. cohorns.

but, owing to the activity of the fleet, Spain did not at this time attack Minorca; and it was only on outbreak of the war of the Austrian Succession that *Charles Brome*—who had fought in so many sieges and battles under Borgard—was again to take the field, and *Joseph Brome* to undergo his baptism of fire and to be carried by the "boom" of war to become the foremost officer of the Royal Artillery.

In the effort to strengthen the artillery in other foreign garrisons, and in despatching to the West Indies, with the ill-fated expedition of 1741, "the most formidable train of artillery since the days of

[1] "Annals of War" (Cust), *anno* 1740.

[2] *Duties of Lieutenant-Fireworker.*—To exercise all under Fireworkers, and keep them at work in the Laboratory. To be ready to attend all expeditions, and give an account of the materials necessary. To teach all Fireworkers the art of making fireworks. To see that no materials are embezzled, nor any used by a learner, without permission, &c., &c.—*Vide* "Cleaveland MSS." pp. 77, 78; also "The Regimental Companion" (Adye), Vol. III., p. 284.

Marlborough,"[1] the Royal Artillery had well nigh exhausted its available supply of officers, men, and equipment. General Borgard was now very aged (88), and, though nominal Commandant at Woolwich, was no longer consulted by the War Office[2]; the Surveyor-General of Ordnance (Armstrong) was a confirmed invalid; the R.A. Lieut.-Colonel (Jonas Watson) and the senior Major of the Corps (Jonathan Lewis) had been despatched in command of the expedition to the Spanish West Indies—in which Colonel Watson was killed, in action on 26th March[3]—and Major Thomas Pattison, now become the Lieut.-Colonel, and virtual Commandant of the Corps (who had commanded in Minorca during so many years), was left at Woolwich with only four companies (one composed of recruits), and the field train of four 6-prs., twelve 3-prs., eight 1½-prs., and six Royal mortars (5½-in. and 4⅕-in.),[4] with which to prepare for the approaching war in Europe!

The Duke of Montagu, then Master-General of the Ordnance, and Lieut.-Colonel Pattison, were at this time, consequently, the pillars of the regimental Hercules—for the Lieut.-General of the Ordnance, Field Marshal Wade, was in Hanover, in command of the Anglo-Hanoverian forces.

In this emergency the Royal Military Academy was founded by the Duke of Montagu, under Royal Warrant of 30th April, 1741—not for the "instruction of young gentlemen," as erroneously stated in first para. of the "Records of the Royal (Military) Academy," and in the "Cleaveland MSS." p. 225—but, as judiciously pointed out by Colonel Duncan, *M.P.*, in the "History of the Royal Artillery" (Vol. I., p. 108), for all grades of the corps scheduled in the "Rules" appended to the Royal Warrant.[5] To provide, however, for immediate practical requirements in officers, Colonel Pattison's first steps were to recall to his right hand, from Minorca, Lieutenant *Charles Brome*, as his acting Adjutant, and to procure from the Master-General a commission as Lieutenant-Fireworker, for Bombardier *Joseph Brome* (1st February,

[1] "History of the Royal Artillery," Vol. I., p. 123.

[2] General Borgard was the last artillery officer who wore body armour, which is depicted in an excellent portrait in R.A. Institution. "Borgard was born in Norway, a subject of the King of Denmark, and came to England in a ship of his father's with a cargo of timber; but having a turn for military life he went upon the Continent (at 16 years of age), and was in most foreign services, particularly the Emperor's (*or Austrian*), and served against the Turks, and was in a prodigious number of battles and sieges before he came into the British service." *Old MSS. of Colonel Desaguliers.* His first commission was conferred by Royal Warrant dated 1693. He died on 7th February, 1751.

[3] "Cleaveland MSS." p. 226. "Colonel Watson was killed by a round shot, which glanced from a tree at some distance from the battery and struck him on the thigh."—*London Magazine*, 1744, pp. 76, 77.

[4] "History of the Royal Artillery," Vol. 1., p. 103.

[5] The first para. of the "Records of the Royal Military Academy" contains another error. The "practical school," founded (by Borgard) in 1719, admitted civilian cadets, not from a seminary at *Charlton*, but from Mr. Bracken's "great academy at *Greenwich*, cf which Paley was an Assistant-Master."—*Vide* "Memoirs of Wm. Paley, D.D.," by Meadley, 1818 Ed., p. 38.

By MSS. of Colonel Commandant Thos. Ord (commissioned in December, 1741), "the Royal Academy was established in 1741 as a school for the men in general, but in the year 1748 it was attended by the cadets only." The Royal (Military) Academy was *de facto* a regimental institution, to which civilians had *entrée*; but the regiment "despised its birthright," and consequently forfeited the attendant "blessings" (commissions, and staff employ): it would be beyond the scope of the present Memoirs to trace the processes by which the original character of the Royal Military Academy became diverted to the present limited usefulness of this Institution.

1742), in view to making him Adjutant of the Field Service Train about to be prepared for the Austrian Netherlands under Colonel Pattison's immediate command—a position which the Duke of Montagu conferred upon Lieutenant Joseph Brome, under Royal Warrant of 31st May, 1742.[1]

Here, again, both artillery and general histories fail us. With what armament did the Royal Artillery support the Expedition of 1742 to the Austrian Netherlands,[2] and fight the battle of Dettingen? The British *Artillery* in the battle of Dettingen are not mentioned in Russel's "Modern Europe" (Vol. II., pp. 394–6), Hume's "England" (pp. 599–60), Cust's "Annals of War," 1743 (pp. 32–34), nor in Browne's "England's Artillerymen" (p. 11); and in the "History of the Royal Artillery" (Vol. I., p. 125) the account is merely that "the Artillery share in this engagement was small; the chief points being the . . . obstinate bravery of the Infantry, and that the guns present with the R.A. in the battle were *3-prs.* twenty-four in number": while by "Cleaveland's MSS." (p. 228) "twenty-four *3-prs.* were embarked for Flanders on 18th June, 1742, arriving at Ghent on 30th *idem*."

Dettingen is celebrated in history as the last British battle commanded in person by the King (Geo. II.); to this day the British victory is commemorated by the lovers of Church music in the Dettingen *Te Deum* of Handel;[3] and one of the subjects of our Memoir, Lieutenant *Joseph Brome*, was Adjutant to the Royal Artillery in the field commanded by Colonel Thomas Pattison[4]: regimental *amour propre*, therefore, constrains us to call in the aid of original official records to do justice to the prominent services rendered by the Royal Artillery—apart from the higher consideration that in this battle we shall find the last unique specimen of ancient tactics, as well as the new method of employing field artillery, independent of battalion guns, a system which developed the brigading of field artillery in 1747 by the British,[5] and culminated in the glorious achievement of artillery at Minden in 1759.

By Royal Warrant, of 4th May, 1742, His Majesty approved of 30 pieces of brass ordnance, all *3-prs.*, viz., two for each of the 15 *bat-*

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[1] *Adjutant*, derived from *aide major*, an office created in the English army only in 1684 (for functions *see* Grose's "Military Antiquities" (Vol. I., p. 265). The successions, since 1688, of R.A. Adjutants with Field Service Trains can be culled from "Cleaveland MSS." Among the especially distinguished were:—(1694), Michael Richards and Wm. Bousfield; (1696), Albrecht Borgard; (1739), Wm. Belford; (1742), *Joseph Brome*; (1747), Forbes Macbean. The Adjutant, since 1688, has always been one of the "mounted" officers (Grose, Vol. I., p. 265), which is constantly ignored by our regimental historians.

[2] 16,000 British.
6000 Hessians } In British pay.
6000 Hanoverians }

[3] "Annals," 1743 (Cust), p. 35. Russel's "Modern Europe," Vol. II., p. 394. "God be praised, we have gained a great victory," is the opening para. of the despatches, by King Geo. II. from Dettingen.—*London Gazette*, No. 8236, of 1743.

[4] "History of the Royal Artillery," Vol. I., p. 124.

[5] The Germans adopted the "brigade" system only in 1760.—*Vide* Colonel Brackenbury's "Frederick the Great" (p. 236). In the R.A. Institution Captain Abdy, the Secretary, was good enough to show me an official Return (MSS.), signed by Captain Forbes Macbean, Adjutant R.A., of the Royal Artillery guns as "brigaded," dated September, 1747.

talions ordered to the Austrian Netherlands, consisting of :—

Lieut.-Colonel (Pattison)	1
Captain	1
Captain-Lieutenant	1
1st Lieutenant	1
2nd Lieutenant	1
Lieutenant-Fireworkers	3
Sergeants	6
Corporals	6
Bombardiers	6
Gunners	64
Matrosses	140
Pioneers	20
Drummers	4
Adjutant (Brome)	1
Quartermaster	1
Chaplain	1
Paymaster	2
Commissary of Horses and Wagons	1
Surgeons	2
Provost-Marshal	1
Commissary of Stores	1
Clerk ,, (Mercator)	1
Conductors ,, ...	9
Artificers	12

It is, therefore, correct to say that *3-prs.* were provided : but, obviously, such extensive *personnel* could not have been designed merely for 30 battalion guns, embarked in May, 1742 ; and this excited the surprise of the historian of the Royal Artillery (*see* "History of the Royal Artillery," Vol. I., p. 124). Recent search has unearthed a subsequent Warrant which solves the mystery. By Royal Warrant of 17th August, 1742, was further enacted that, in addition to the *battalion guns*, and detail aforesaid, a *Train of Artillery* consisting of "brass ordnance, howitzers, mortars, &c.," together with engineers and pontoon equipment be "immediately provided and transported thither, according to proportions fixed on 3rd *idem*"—pay being provided for additional *personnel* consisting of

Colonel and Comptroller[1]	1
Major	1
Captain	1
Lieutenants	2
Lieutenant-Fireworker	1
Bombardiers	3
Kettle Drummer	1
His Driver	1
Pontoon details	9
Clerk (Store Officer)	1
Conductors ,, ...	3
Artificers	3
Engineers	4

[1] Colonel Thomas Pattison (already in Flanders), in addition to his functions of commanding the Royal Artillery.

Thus, in addition to the Engineers, three complete Companies of Royal Artillery were employed in this expedition and were engaged in the battle of Dettingen, viz.:—

Captain Wm. Sumpter's Company (broken up in February, 1757).

„ Jas. Deal's Company (now the 5th Field Battery, R.A.)

„ Borgard Michelsen's Company (now 3 Company Western Division, R.A.)

The fact would appear to be that Colonel Pattison would not accept the only available Train as constituted in 1741—detailed on p. 414 hereof—but planned its re-constitution—leaving behind (to carry out his views) his Adjutant, Lieutenant *Joseph Brome*, who was *ad interim* attached to the personal staff of the Duke of Montagu, at Whitehall[1]—for the modifications of the Train consisted in rejecting the 1½-prs.[2] and adding ten heavy 6-prs. (brass) and four 8-in. howitzers,[3] with corresponding alterations in the "proportions;" and the Train arrived at Ghent in January, 1743, where the Commissary of Horse (Wm. Hawtayne) had already "hired contractor's horses" to draw the guns, wagons, &c. Thus, while the Royal English Artillery rejected the 1½-pr. and adopted the 6-pr., "the god whom the whole military world fell down and worshipped"[4] was bent on introducing the 1-pr. and ostracising the 6-pr.[5]—errors which Frederick the Great, retracted in 1759.

The Allies, under Field Marshal, the Earl of Stair (consisting of English, Hessians, Hanoverians, and Austrians—37,000, all told—of whom 26,000 fought at Dettingen), passed the Rhine on 14th May, 1743, and on 23rd arrived at Frankfurt, where the veteran Earl of Stair allowed himself to be out-manœuvred by de Noailles (with 50,000, of whom 30,000 fought at Dettingen), and was compelled to retreat, in order to effect a junction with reinforcements of 12,000 Hessians and Hanoverians, his magazines and supplies of provisions and forage being cut off, and the only route open to him being Aschaffenberg, with a bridge over the Maine, where he fixed his head-quarters. Affairs were in this critical condition—the Allies on half rations, the horses starving for want of forage, the whole Army cooped up in a narrow valley which, running between Mount Spessart and the Maine,

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[1] The R.A. regimental muster rolls and pay lists (July, 1742) show Lieutenant Joseph Brome as employed "in London;" and the first Flanders field roll returns him as "not yet come over." In this latter roll Colonel Pattison is described as "Lieut.-Colonel, Comptroller, and Commander-in-Chief" (Artillery).

[2] These 1½-prs. are stated to have been on the field at Fontenoy in 1745 ("History of the Royal Artillery," Vol. I., p. 127); but in the artillery details of Fontenoy, on p. 125, 1½-prs. do not appear. The statement is obviously an error. Colonel Pattison and his Adjutant (Joseph Brome) had had enough of 1½-prs. in Minorca; and there was no "authority" in England to thwart their rejection of this calibre. According to "Cleaveland MSS." (p. 235) the 1½-pr. disappeared in 1745; but these *MSS.* of this period are mere interpolations, by the revising editor, to replace the gap caused by loss of the original folios—as will be proved hereafter—*see* admission in foot note (1) of p. 228 of the *MSS.* The 1½-prs. were stored in Woolwich Warren, and such as were not melted down were, a few years afterwards, bored to 3-prs. by the brothers King, the Arsenal gunfounders.

[3] "Cleaveland MSS.," p. 235, "History of the Royal Artillery," Vol. I., p. 126 (the year should be 1742, not 1744: they arrived on 1st January, 1743.

[4] "Proceedings," R.A. Institution, Vol. VII., No. 3, p. 133.

[5] "Proceedings," R.A. Institution, Vol. VII., No. 7, pp. 460–1.

extends along that river from the town of Aschaffenberg to the large village of Dettingen—when Geo. II. arrived, from Hanover, on 19th June, with his second son, the Duke of Cumberland (then 22 years of age). The arrival of the King infused new spirit into the Army, and *à la guerre les trois quarts sont des affaires morales.* On 26th June, in the evening, the King gave orders that the Army be ready to march early next morning—in view to effect junction with Prince George of Hesse and the eight Hanoverian battalions, under General Druckleben (who had been ordered to halt at Hainau), and to secure provisions. The only available road, however, was between a mountain and a river, in the face of an active and superior enemy; and at such close quarters were the armies that the King had scarcely quitted Aschaffenberg when it was seized by the French. On 27th June was fought the battle of Dettingen, the Artillery services in which, as now collated from the *London Gazettes* of 1743,[1] have been ignored by all historians.

Battle of Dettingen.

At 4 a.m., 27th June, 1743, the Allies struck their tents and began to file off in two columns, the heavy artillery and the cavalry being in rear, where the King himself commanded, which, from ignorance of de Noailles's movements he considered the post of danger. The battalion guns marched on the right of their respective regiments.[2] Noailles at once altered his positions, and, by means of two bridges which he threw over the Maine, despatched 23,000 men under the Duc de Grammont to secure the defile of Dettingen, the infantry crossing bridges towards Selingenstadt, the cavalry fording the river higher up, and the artillery forming the *arrière garde.* Thus he was master of Aschaffenberg in rear of the English, and of Dettingen in their front: while the Allies were cooped up in a narrow plain, closed in by hills, woods, and morasses on the right; and on the left by the Maine, the steep bank on opposite side of which was planted with numerous cannon. The King, riding to the front and perceiving the Allied front to be chiefly threatened immediately drew up the army in order of battle in a rapid and masterly manner, under heavy fire at 200 paces from a French battery, which was soon answered by our artillery.

On the right of our army, at the entrance of the wood, the Hanoverians "erected" a battery, which flanked the enemy; another was erected by the English Royal Artillery on the left; and a third by the Austrians in the centre. "These did great service," but were from the first greatly over-matched in numbers and weight of metal by the enemy, whose fire could not be subdued.[3]

The French, under Grammont, having advanced into the plain of Dettingen from the formidable position originally assigned by Noailles,

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[1] *Whitehall Gazettes*, Nos. 8236, 8240, of 1743.

[2] Orders by Colonel Pattison, R.A.—"It has always been a custom for the artillery to take the right of all corps, and on all occasions." (Colonel Belford's Orders, *MSS.* in R.A. Institution, dated 14th November, 1755). The precedence of artillery over all dismounted corps was confirmed by the Duke of Montagu's Order dated W.O. 3rd April, 1746."

[3] The French had 4-prs. and 8-prs., as field guns.

were drawn up in two lines, supported by heavy field artillery and by cavalry. Their left extended towards the hill, and had behind them a little rivulet and the village of Dettingen. Their right was covered by the Maine and supported by a position battery of artillery erected near Maynfling, on the other side of the river.

At 8 o'clock a battery of French cannon at Hoechflat began to play upon the Hanoverian cavalry, but was soon silenced by the British artillery, "which was well served and did great execution." At 10 o'clock a general cannonade began, which lasted two hours: "the cannonade was the most severe ever known." While this artillery duel was going on, the British and Austrian cavalry led the attack upon the French, and being supported by infantry with battalion guns, gained a temporary advantage. The French horse now charged with great impetuosity, and broke the Allied cavalry; but both Ligonier's and Bland's dragoons gallantly checked the onslaught: the British infantry, however, now for the first time in war armed with the iron ramrod and the bayonet musquet,[1] could not be broken, and kept advancing with undaunted resolution—now firing, now pushing with the bayonet.[2] At 12 o'clock the whole Allied Army advanced, driving the French before them with dreadful slaughter and confusion into and across the Maine until 4 o'clock, when the pursuit ended from sheer fatigue; and the Allies, who had not yet breakfasted and had been under arms for twelve hours, and fighting since 8 a.m., were compelled to fall back upon their supplies. The French lost 4000 and the Allies 1500: the Royal Artillery loss in killed and wounded was 1 Officer, 1 Bombardier, 5 Gunners, 6 Matrosses.[3] Major Geo. Michelsen and Captain Withers Borgard (nephews of General Borgard) did not recover from the fatigues of this day, and died shortly afterwards—the former being replaced by Major Wm. Belford.

Only General officers are particularised in the despatches of the time, and therefore we look in vain for mention of the R.A. Colonel (Thos. Pattison), Major (Michelsen), or Adjutant (*Joseph Brome*); but it is significant that henceforth the Hanoverian Artillery were subordinated to the Royal English Artillery.

The victory of Dettingen resulted in the French re-crossing the Rhine—followed into France by the Allies, as far as Worms; and Hanover and Germany were now freed from the French. The order

[1] With the former snaphance or dagger-musquet the infantry could fire only once when approaching the enemy, and had then to screw on the dagger (which prevented re-loading) before charging. The N.P. bayonet musquet was adopted by the British only in 1715 (*vide* Chap. I.). In the former campaign in Flanders, under Marlborough, of three French regiments, whose bayonets were made to fix after the present fashion, one advanced with fixed bayonets against the 25th Regiment. Lieut.-Colonel Maxwell ordered his men to screw their bayonets (daggers) into the muzzles to receive the charge, but, to his great surprise, when the French came within a proper distance, they threw in a heavy fire, which for a moment staggered our people, who could not conceive it possible to fire with fixed bayonets.—"Military Antiquities" (Grose), Vol. II., p. 341. It was only in 1741 that the last of the British regiments and the R.A. received the N.P. bayonet musquet. The first trace of the O.P. musquet is in the "Remaine of small gunnes" in the Tower of London, *anno* 1600, viz.:—"Daggers with snaphawnses single, without cases," CXLIIII (144).

[2] "Annals of War" (Cust), *anno* 1743.

[3] *London Gazettes*, 8236 and 8240 of 1743. Sir E. Cust's account compares favourably with official despatches, except that, throughout, he ignores the artillery in this memorable battle.

of artillery march was the same as that detailed on pp. 125–6 of the "History of the Royal Artillery," Vol. I., with the same proportions of horses for the battalion and field guns, &c. The Colonel, Major and Adjutant were mounted. The Allies frittered away the time until negotiation of the Treaty of Worms, in September :[1] in October, George II. returned to Hanover, the Allies dispersed into winter quarters, the troops in British pay and the English wintering in Flanders ; and the R.A. remained inactive during the whole of 1744[2]—enjoying the society of their wives and children from England, and perfecting themselves in drill, discipline, "quick-firing, and building gun and mortar batteries."

In October, 1744, a fourth company R.A. was embarked for Flanders, in anticipation of resumption of hostilities in the coming spring, viz. :—Captain Mace's.[3] In January, 1745, Lieutenant and acting Adjutant, *Charles Brome* was promoted Captain-Lieutenant into a Flanders company ; but before embarking for the seat of war he was permitted a brief respite at Charfield with his wife's brother, Richard Hickes, *J.P.*, who died at the Manor House on 6th March, 1745, leaving the manor and freehold estates to his nephew, *Joseph* (*Walton*) *Brome* (now Adjutant in Flanders) subject to life interest, of his widow, Mrs. Richard Hickes.[4] On arrival in Flanders, on 4th April, 1745, Captain *Charles Brome* was posted to Captain Desagulier's Company—which, on account of having the 6-pr. equipment, had two Captain-Lieutenants, the other being Samuel Cleaveland (first father of the "Cleaveland MSS.," who subsequently became the Sir Alexander Dickson, of the 18th Century). Lieutenant Forbes Macbean was also posted to this Company, which was attached to the First Regiment of Foot Guards (Ligonier's) at Fontenoy, where the seven 6-prs. as battalion guns, won the admiration of the Army.

Battle of Fontenoy.

Louis XIV. having taken the field in 1745, in order to complete the conquest of Flanders, the battle of Fontenoy was fought on 11th April, 1745, between the French under Marshal Saxe and de Noailles—in behalf of Prussia—against the English, Hanoverians, and Austrians, under H.R.H. the Duke of Cumberland and Count Königsegg. Ample justice has been rendered by historians to the distinguished services of the Royal Artillery in this famous battle—particularly by Sir Ed. Cust, in his "Annals of War," 1745, to which the official despatches leave little to add. "The battle of Fontenoy gave the first example of that extensive employment of artillery in war, of which Frederick afterwards largely availed himself ; and the importance of reserves composed of *troupes d'élite* has been also recognised since this battle" (Cust, p. 65).

[1] Russel's "Modern Europe," Vol. II., p. 396.

[2] Cust, p. 36. R.A. Muster Rolls, 1744.

[3] This company was reduced in December, 1748, when under command of Captain T. Ord.

[4] *MSS.* in handwriting of General Chas. Mercator Brome Walton (of the Life Guards), son of Joseph Brome, R.A. Also, Will of Richard Hickes, dated 25th April, 1741. Joseph Brome's mother, Charles Brome's wife, sister of Richard Hickes, was living at this date, and is named as a beneficiary in the Will, but I cannot trace her further ; she probably died at Blackheath or Greenwich (where I have not searched), but certainly not at Charfield or at Woolwich. The family may now take up the search for the end of this romantic lady, whose marriage with Charles Brome was narrated in Chapter I.

Frederick the Great, in after years, in a discussion as to which was the greatest battle of modern times, declared "*C'etois sans contredit celle de Fontenoi, dont le general étoit à la mort lorsquelle se donna.*"[1]

The command in chief of the British and Hanoverian artilleries devolved upon Colonel Thomas Pattison, R.A. (aged 70), whose staff consisted of Lieut.-Colonel Deal, Major Wm. Belford, and Adjutant *Joseph Brome*. The killed and wounded of the Royal Artillery were 1 Officer, 1 Conductor, 3 Sergeants, 1 Corporal, 9 Gunners, 24 Matrosses[2]; and the *Gazette* adds that some cannon had to be left on the field "for want of horses, the contractor with the artillery having run off with them so early that they reached Brussels the same day."[3]

The wife of Lieutenant and Adjutant *Joseph Brome*, occupied a field tent at Fontenoy, during this battle in which her husband, her father-in-law (Captain *Charles Brome*), and her brother (Nicolas Mercator, the Store Officer), were engaged; and Mrs. Brome gave birth to a son, Charles Mercator Brome Walton,[4] on that eventful day.

Although the Duke of Cumberland led off his army in good order, the Allies could act only on the defensive for the remainder of the campaign, in covering Brussels and Antwerp—with minor engagements at Ghent and Ostend[5]—until the ascending fortunes, in Germany, of Frederick enabled him to dictate the Peace of Dresden, on 25th December, 1745. A large portion of the British cavalry and infantry (under Sir John Cope) had been withdrawn in the spring to Scotland, to assist General Hawley in repelling the threatened invasion of the Pretender, who landed in August, from France; and the Royal Artillery followed in December—too late to be engaged at Prestonpans (21st September, 1745), or Falkirk (17th January, 1746); but in time for Culloden (16th April, 1746), the great and last battle fought on British soil, in which the victory, which secured the throne to the reigning dynasty, was mainly due to the Royal Artillery from Flanders. The Ordnance records of this time show that the army from Flanders arrived in a pitiable condition, from disease (small-pox, scurvy, and ague), and deficiences of small-arms and artillery equipment[6]; but the suppression of the rebellion in Scotland is of such unique artillery interest, and the received regimental accounts are so imperfect and inaccurate that the events culminating in the battle of Culloden deserve special consideration, which must be deferred to our next chapter.

In closing this chapter I beg to place on record my thanks for the good offices of E. Salisbury, Esq., the Principal of the general search room of the Public Record Office, London.

[1] Cust's "Annals of War," 1750, p. 136.

[2] *Whitehall Gazette*, dated 11th May, 1745, and *London Magazine*, May, 1745, p. 234.

[3] *Whitehall Gazette*, 11th May, 1745, p. 2.

[4] Died 6th May, 1815, at Charfield, as General (Lieut.-Colonel 1st Life Guards).

[5] King's Warrants book 1711—1744, issues of arms to replace losses in these particular engagements.

[6] 1796 musquets, 1765 bayonets, 18 halberts, three drums, 323 swords, 200 pairs of pistols, and a new field artillery equipment were issued out of the Ordnance Stores to the cavalry, infantry, and artillery; while the City of London subscribed for supplies of bedding to the sick. (King's Warrants book 1711—1749; Ordnance "Specifications," *ibid*).

(*To be continued.*)

REMARKS ON

MAKING OR BREAKING.

BY

CAPTAIN W. H. CUMMINGS, R.A.

Lieut.-Colonel O'Callaghan's article in the March number of the R.A.I. "Proceedings" will have been read with interest by all, and agreed with, in the main, by those who wish to see the young Garrison Gunner, not only worthy of the extra pay he receives for being scientific, but also second to none in zeal and smartness and in proficiency at all games and sports.

No doubt the greatest responsibility rests with all senior officers, with whom young officers, especially on first joining are brought into contact, by precept, example and encouragement, to "make or break" them. No class is more amenable to good or bad influence, more easily led into good habits or the reverse. It has frequently occurred that officers of the Garrison Artillery have been compared (generally to their detriment) to their brother officers of Horse and Field Artillery; all comparisons are odious, and none more so than in this case; it is a practice very much to be deprecated, especially as there is really no comparison at all between any of the branches, each having in due proportion, as keen, as smart, and as sporting a lot of young officers as the other, and this fact cannot be too emphatically stated.

The question arises: How to mould the young Garrison Gunner into a good officer?

There are two aspects, which go together, but which must be viewed separately, in the making of a good officer; one, when in uniform or at his duty; the other, in plain clothes, or at his play.

To make them good soldiers it is unanimously acknowledged that they must be given responsibilities, the charge and command of men, the spirit of emulation and competition, in fact they should have command of a section and vie with their brother section commanders in everything concerning their own particular charge: there is nothing like friendly rivalry amongst brother subalterns to make them keen and zealous; each will try, not only to produce the smartest and best drilled squads, the cleanest barrack-room, the greatest number of specialists, but also the most cricketers for the company eleven, the best shots with the carbine, &c., &c.; all this is granted, but how

many are the difficulties in the Garrison Artillery? The perpetual cry "I have no officers, I have no men;" the number of courses (that bane of the Garrison Artillery); subalterns come and go so rapidly that a company C.O. gives it up in despair of even having an officer per half company, much less per section, and the changes become so frequent (at home at any rate) that identifying a section with a subaltern becomes impossible; then, again, the splitting up of companies to suit the barrack accommodation (so often scattered about in old casemates, buildings, huts of all sizes), the detachments, the employments, the fatigues, &c. Unless a company is struck off duty to undergo its annual course, a subaltern can never get hold of his men to teach or drill them, or even to know their names.

The first step then in obtaining keen and smart officers in the Garrison Artillery is by keeping them more permanently with their companies, giving them command of sections, and giving them men to drill with: the Horse and Field Artillery batteries get the majority of their men every day of the week, why cannot the Garrison Companies? The abolition of all courses away from their companies is very much to be desired, and relief from the majority of employments an absolute necessity. There is very much more variety of drill, more interesting work of all sorts, and many more opportunities for the exercise of "*nous*," and the display of zeal and ability in the Garrison Artillery than in any other branch of the service; manning of works and forts, siege and movable armaments, machine guns, shifts and repository work, foot drill, carbine practice, signalling, range-finding, &c., &c. In what other corps is there such endless variety? How can such service be called dull or monotonous? It is most disheartening for a company C.O. to be always foiled by want of officers and men.

To turn now to the other aspect, the social side.

How to prevent the young subaltern mis-spending his leisure time? Most Garrison Artillery stations are very sadly handicapped by having none of the attractions and means of recreation and amusement which the cadet had at the Academy and the boy had at School. An uncomfortable mess, without billiard room or racquet court, and very often no field for cricket or football, and outside every attraction to lead him into habits the opposite to manly or sporting. What is required is, firstly, a proper tone, encouragement, help and example from the seniors in mess (when there are any); secondly, a mess establishment as comfortable and attractive as possible; thirdly, a billiard room, racquet court and regimental games' fund including cricket, football, &c., for as certainly as none of these are forthcoming in barracks so certainly will they be sought for in the town accompanied, perhaps, by undesirable companions and other evils. Colonel O'Callaghan's description of the club abroad is perfectly true, such a club was the ruin of several and the curse of many, in a station where the writer was a few years ago.

As regards the danger of running the risk of making young officers "gun-shy" by current scientific literature, it is difficult to understand how such a treatise as "The Tactical Working of Coast Artillery" can appear unintelligible to those who have successfully passed through the

Royal Military Academy; of course no *mere reading* of such a book could make anyone proficient in, or even conversant with, its contents; without drill, practice and experience, such instructions must be more or less difficult to grasp, but each part or section learnt or studied concurrently with the aid of men and actual drill, surely is *not* above the intelligence of however young a subaltern. What is required to ensure a ready intelligence is the *desire* to learn on the part of the officer.

The *rôle* of Lieut.-Colonels in the instruction of young officers as stated in "Making or Breaking" would hardly be practicable under the present organisation: the responsibilities of the young officer's training cannot be shared (beneficially) between the Lieut.-Colonels and Majors; until Lieut.-Colonels are appointed to the command of two companies and remain in command of the same two companies all their Lieut.-Colonel's service, such a scheme as Lieut.-Colonel O'Callaghan suggests would not answer.

The "Attack Problem" may be a little overdone, but it is comparatively novel, and will soon adapt itself to the capabilities of those for whom set; it is undoubtedly the greatest improvement on the old Winter Sketch. At any rate it makes the young idea read, and when such a problem is given to a Captain and young subaltern to solve jointly, much good should result.

THE "LINING-PLANE" OF THE GERMAN FIELD ARTILLERY.

BY

CAPTAIN W. A. MACBEAN, R.A.

In the latest (1892) edition of the German Field Artillery Drill, increased importance appears to be attached to indirect fire, and for the first time its deliberate employment upon the battle-field finds sanction in the Regulations.

The paragraphs which bear most upon the subject are as follows, and are contained in the chapter upon "Battle."

274. "Direct fire is to be preferred to indirect fire; but the latter will have to be used when the ground or the tactical situation do not permit of direct fire."

So far, the wording of this paragraph is identical in the two editions of 1889 and 1892, but in the latter the following has been added:

"In some cases isolated batteries, covered from view and difficult of discovery by the enemy may, by the effect they produce in a specified direction, afford the means of gaining the superiority of fire."

The following is also new:

277. . . . . "Cover from the enemy's fire and from view may become a necessary preliminary condition for the superiority of our own fire effect."

In the 1892 edition mention is also made for the first time of an instrument termed the "Richtfläche," which is here translated as "lining-plane." According to the drill-book (para. 115) this instrument is to be employed for obtaining the line when the target cannot be seen over the sights, nor by standing on the gun-carriage, limber, etc., nor from rising ground in rear of the battery, and it has doubtless been specially adopted for use in such situations as are mentioned in the paragraphs quoted above.

The lining-plane consists of a brass base plate, steel sighting-arm, and clamping screw.

The base plate is semicircular in shape; its diameter has a fine edge and is planed quite true. The circumference is graduated in degrees; the graduation begins at 90° at both ends of the diameter and goes upwards on the right side (the diameter is placed to the front) to 100°, 110°, etc., and downwards on the left to 80°, 70°, etc.

The sighting-arm pivots on the centre of the diameter and is pro-

vided with a notch at one end and a pointer at the other. It can be adjusted in any position by means of the clamping screw.

Every gun carries a lining-plane in the trail-box. It is employed as follows:

The Battery Commander designates one of the guns and selects a lateral auxiliary mark, plainly visible to the whole battery and not too near. The gun named is trailed into the approximate line of fire and the position of the wheels marked. The lining-plane is then placed upon the plane surface on the top of the breech, with its diameter coinciding with the line cut on the gun at right angles to the axis of the bore. The gun-layer then directs the sighting arm on the auxiliary mark, clamps it, and reads off the number of degrees on the base-plate. This reading, say 40, is communicated to the Battery Commander, who then gives the command to the whole battery: LINING-PLANE—RIGHT, CHURCH STEEPLE, 40. The lining-planes of the remaining guns are then set to the graduation ordered, placed upon the guns and the trails are thrown round until the sights of the sighting-arm are directed on the auxiliary mark. After the first rounds the line is corrected if necessary by altering the graduation (by order of the Battery Commander) and shifting the trails until the sights of the lining-plane are again laid on the auxiliary mark, the instrument being so constructed that each degree gives a lateral deviation of $\frac{1}{50}$ of the range.

Elevation is given by quadrant.

When the line has been obtained, the battery ranged, and fire distributed, the lining-pickets are planted in rear of the guns, which are then lined on the pickets in the usual way.

VOLUNTEER ADJUTANCIES.

BY

LIEUTENANT F. E. FREETH, R.A.

In a paper published in the March "Proceedings," Captain G. Osborn states that there is a dearth of officers willing to undertake the duties of Volunteer Artillery Adjutants, and that the reason is that there is a lack of information on the subject. He then proceeds presumably to detail his experiences as a Volunteer Adjutant. Did he stop at this I should have nothing to say, and should simply look forward with interest to the host of applicants clamouring for the Adjutancy he so vividly describes, at the next vacancy. But he has made his paper a more general one, and I doubt if every Volunteer Adjutant will be found to agree with all he says. The subject is an interesting one, and I should like to be allowed, as a Volunteer Adjutant myself, to make a few remarks which are the result of my own observation.

I do not wish to say one word to discourage officers, and keen officers above all, from taking up these appointments; but if they do so on the strength of the expectations held out in the paper above referred to, there is much reason to fear that their hopes may be doomed to disappointment. There is another and perhaps a stronger reason why we should be careful to arrive at the exact facts of the case and not to present them in a too roseate form, and that is, that in order to encourage improvement it is first necessary to show that there is both room and necessity for it. There are certain conditions of so called "efficiency" laid down for the Volunteer, and I am afraid there is but too much inclination to regard these as the goal for which we aim instead of being as they are but a bare minimum. I shall, then, offer a few remarks on Captain Osborn's paper with a view of pointing out the material on which we have to work, with the view of rendering the Volunteer Artillery a real auxiliary in home defence which, I suppose, should be the aim of every Volunteer Adjutant.

Now, anyone who will take the trouble to look at the establishments of Volunteer Artillery[1] will find that there are a variety of Artillery Corps, some Garrison, some Position Artillery, and many with one or

[1] Special Army Orders, 14th July, 1892; Army List, October 1892, pp. 258-63.

two Position Batteries, and the remainder Garrison Companies. This at once constitutes a great difference between Corps, a difference which may be imagined from the analogy of the various branches of the Regular Artillery; but there is a still greater difference in the locality and local circumstances of Corps. Some Corps are all together in one place, some consist of a fair sized head-quarters, and have one or two outlying batteries, companies or detachments, and some consist of a number of such units having merely a nominal head-quarters.

I need not point out that where there are outlying companies the courses of instruction are much more difficult to carry out than would be the case where all are together; except during camp, or on some special occasion, it is in these cases difficult to get any number of Officers or N.-C.O.'s together. The Adjutant visits outlying detachments twelve times a year or less if there is a camp—and it must always be remembered that a Volunteer's time is not his own, that he cannot often, by reason of his civil employment, turn up to parade on any given day at a certain hour. Obviously in these cases an Adjutant's time is to a great extent taken up with ordinary drill and instruction, examinations of layers and for proficiency of sergeants, and the opportunities for progressive instruction are extremely limited. The 645 of all ranks, the 28 officers, especially considering the difference between establishment and actual numbers, the 40 sergeants and the 100 N.-C.O's. melt into small and distinct divisions—"the back-bone of the corps" is broken up. The Adjutant's whole time is spent in endeavouring to maintain uniformity.

I have heard many officers of the Garrison Artillery complain that their work of educating the men of their companies is interfered with by the numerous "employments" which take away their best men; the disadvantage is just that which the Adjutant of a split up Volunteer Corps suffers from, you cannot get a constructive course because you get fresh men every time.

Then let us take the office work, there is certainly plenty of it; in the matter of stores there are as many as in a moderate sub-district of an old-type armament, they may be much scattered and of great diversity, there is the pay and clothing of the Permanent Staff, and a general superintendence of the clothing and equipment and arms of the Volunteers, there is a heavy correspondence on matters of stores, discipline, recruiting, &c., as large a list of returns as you will find in most Regular offices, rolls, certificates, &c., and for all this what office staff have you? If your head-quarters consist of less than four companies you have one Sergt.-Instructor, who has also to look after the drill and equipment at the station.

I have little to say about the Position Batteries, they have the advantage of a settled equipment and, under the most favourable circumstances are capable of attaining a fair standard of relative efficiency. Their mobility is dependent, to a great extent, on the local facilities for obtaining suitable horses and drivers, and they accordingly vary very much in different Corps. Some Corps have R.A. harness, some have not, some mount Nos. 1, Staff Sergts. and drivers, some do not. There is as little to be said for the mixture of Position and Garrison branches,

in one Corps, as there would be for mixing up Field and Garrison Artillery in the Regulars. The men certainly pick up their gun-drill well, and can do their work really smartly, but as the majority of it is done in drill-sheds by gas-light, they are not capable of more than a limited training in the open, and often their work done before the Inspecting Officer, though creditable, is not their best, and nobody knows this better than the men themselves.

With Garrison Companies there is a difference, any officer who has served in the Garrison branch of the R.A. for the past seven years cannot but note the difference and the progress in *matériel* and appliances, and the consequent advance in the drill and interest which attaches to that branch of the service. It is perhaps not incorrect to say that the improvement in drill, &c., or if I may say so, in *personnel*, has followed that in *matériel*, and perhaps it has not quite caught it up—at least that appears to be the foremost argument for the introduction of specialists. Now all this is reversed in the Volunteer service, if you wish to advance in drill and in instruction you must advance beyond the *matériel* provided, for that practically remains of the old and obsolete type. This is the difficulty, your gun, mounting, and appliances remain the same, your Volunteer has satisfied himself, by a long experience of the practice range and of the competitions at Shoeburyness, that he could "hit, hit, hit," very well under the old system, and he does not altogether follow you in the advantage of depriving him of his individual merit in shooting, he rather adheres to the old method which gave him personal satisfaction and advantage. Now all the improvements in *matériel* which have rendered possible the combination of modern practice are beyond the reach of the average Volunteer. There are some Corps who can manage to go into a fortress, and it is within the reach of some to see, and to have demonstrated to them by actual vision the manner and substance of these modern improvements; but I think I am right in saying that these advantages are to the minority—distance and the conditions are prohibitive to most; your instruction then must be in advance of your appliances.

Some Corps may supplement the regular provision of the surrounding adjuncts of their obsolete practice guns by private expenditure, but this depends on the Corps, and cannot be laid down as a general rule.

I believe I am correct in saying that many Corps still carry out their practice from 64-pr. guns mounted on garrison standing carriages, a condition which alone confines the results to a narrow example of the modern drill. Also there is this disadvantage in practice in many Corps, that the men have to be brought from a distance to the practice battery (except in camp) and as their time is limited, and frequently further limited by train service, the practice has to be carried out under conditions of some difficulty; and as the regulations require every man to attend one, and give travelling allowance for only one practice during the year, the limits of possible instruction are soon reached. Anyone who has carried out practice over sea-ranges liable to be blocked knows well what these limitations impose.

I do not see much advantage, from a progressive point of view, in the National Artillery Association's competitions at Shoeburyness. An

effort appears to be now being made to bring the competitions more up to date; but so long as the best prizes are given for individual merit and the expenses of sending detachments is so great, I am afraid these competitions will remain of advantage to a few Corps only, and they stand in the way of establishing district competitions which might be more conducive to the real efficiency of Corps.

With Captain Osborn's remarks as to the primary necessity of training the officers I thoroughly agree; but I believe the only true groundwork of such training is to be got by instructing officers at first in classes by themselves, or with picked N.-C.O.'s if necessary. Such classes are not possible in many Volunteer Corps, and the consequence is, many officers' primary training is not thorough. I should like to see all Volunteer Officers go through the Woolwich course; but most of them are business men and cannot afford the time to go to such a distance for the length of time; but I believe much might be done by forming classes in the Militia and Volunteer districts of shorter duration and under a selected Adjutant, or if available a Gunnery Instructor and good Sergeant-Instructor; but, of course, the necessary instructional battery would be essential.

I cannot follow Captain Osborn through his eulogy of War Games, for I consider that if they are an advantage to the Volunteer Artillery Officer at all it can only be to the Position branch, though I think any institution which would encourage the knowledge of the theoretical application of drill and *matériel* to the necessities of war is a praiseworthy if not a necessary object.

I will add a few words as to my view of the prospects of an Artillery Officer who contemplates taking up one of these appointments. He will find plenty of work to do; he will have plenty of responsibility, for in most cases he will be more or less his own master; and he will find plenty of opportunity for applying a large share of tact and resource; he will have under his charge a sufficiently large amount of equipment and stores to satisfy any Commanding Officer; he will have plenty men to manage, and to manage by mutual good will. But do not let him expect great results, there will be little to show, however much he may do—the result no doubt is there, but it is not too apparent. His work will be very different from that with Regulars, and it will take him all his time to keep touch with what is going on in the Regular service. He is in the peculiar position of being the sole connecting link between the Regular and the Volunteer service; and he may find that position at times one of difficulty. I believe it is true that there is a lack of information on the subject of Volunteer work amongst Regulars, and I believe, with some very notable exceptions, that Regular Officers do not comprehend the nature of the work which goes on in Volunteer Corps, and I fear the result is, that the position of a Volunteer Adjutant is not appreciated as it should be. Work with Volunteers may or may not be a test of ability, it is certainly a bye-lane to ambition. The highest reward obtainable, as a rule—and doubtless it is theoretically a high one—is, the satisfaction of knowing you have done your best to fulfil a high duty. This satisfaction may, and probably will be, tempered by the feeling that you might have done better with more experience.

But I am afraid these are not the inducements likely to attract officers to these appointments, and I think the officer who is keen and ambitious professionally had better remain with the Regulars. I believe, in reality, the chief reasons which prevail with officers who contemplate this line of work are, home service and settlement for five years, and the illusion of extra pay. I say the illusion for, in Garrison Artillery, it is only to the subaltern that the extra pay comes; and the expenses are heavier, at anyrate to the unmarried officer, than with the Regulars; and with the Captain of Garrison Artillery the difference of pay only amounts to 5d. [1] a day, a consideration which applies also to Militia Adjutants.

If officers are to be attracted by professional prospects to these appointments it must be recognised that they are doing an onerous and responsible duty under trying circumstances in positions of much isolation, and I believe firmly that this is only to be done by further encouragment of Artillery Volunteers to advance professionally with the Regulars in the direction of training for the work which will inevitably fall to their share (and this applies with greatest force to the Garrison branch), in a national emergency.

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[1] Since the above was written a new Royal Warrant has appeared, adding 1s. per diem to the pay of Captains as Adjutants of Militia or Volunteer Artillery, this does not materially affect the comparison.—*F.E.F.*

THE SPANISH GUNFACTORY AND ARSENAL OF TRUBIA.

A REVIEW:

BY

LIEUT.-COLONEL J. C. DALTON, R.A.

In Vol. XIII., No. 6, p. 204 of the "Proceedings," I described a visit which I paid to the gunfactory at Trubia in 1884. Since that date this establishment has much developed, and Spain can now fully hold her own with other European countries, as regards the manufacture of guns and munitions of war.

Through the kindness of my friend Lieut.-Colonel Salvador Ordoñez of the Spanish Artillery, I have been favoured with a copy of a pamphlet written by himself entitled "La Fábrica de Trubia en 1892," which gives a brief historical notice of the factory from its foundation up to the present time, together with an explanatory plan of the works, and various tables showing the amount of money expended during the years 1879–91 on the establishment, the productions during the same years, the *matériel* produced for the Navy, the machinery set up in the works at different times, the *personnel* and machinery as at present existing, and the amount of work which can be turned out in any one year together with the cost of production.

I do not propose to do more than review briefly the information contained in the pamphlet referred to, which is very clear and concise and ably drawn up. The only exception I can take to the work is that except on the title page and as a signature at the end of the book, the name of Ordoñez never appears. This is due to the modesty of the talented author, for it must be well known both in Spain and to many outside that much of the recent development of the gunfactory at Trubia is due to the energy and scientific acquirements of Colonel Ordoñez who has invented and brought to perfection the coast defence guns and howitzers which bear his name, and which have been adopted into the Spanish service, some of which have already been described by me at various times in the pages of the "Proceedings."

In the brief introduction to his pamphlet Colonel Ordoñez claims for Trubia that at a moderate price it furnishes the State with all the most important Artillery *matériel* such as guns and their mountings, projectiles and the principal stores; and predicts further development and importance for their great industrial establishment, when its value to the state become still better known and appreciated. He remarks as an example of what has been done, that during the last 12 years, 1879-

91, the factory has triplicated its productive power and can now manufacture steel by the most approved methods.

The primitive factory at Trubia was founded in 1797, 11 kilomètres (about 7 miles) to the west of Oviedo and close to the river "Trubia." This situation was chosen in order to be safe from the French, and also because of the mineral wealth of the neighbourhood and the proximity of two rivers.

The factory as it was then started consisted of a small canal 6 feet wide, two furnaces which cast round shot, shell and bombs, and a few forges, all under the superintendence of a Colonel and Captain of Artillery, a Commissary, Paymaster and a few labourers, all of whom lived on the spot. The furnaces were closed in 1808 until 1844 when Trubia was merged with the Small-arms factory at Oviedo, and then only manufactured small-arms.

In 1844 the place was aroused from its lethargy on the appointment of a new director, Colonel Elorza, who had charge of the factory from 1844 to 1862. This officer possessed high scientific acquirements, had already studied metallurgy both in theory and practice in the University of Liége, and was endowed with great administrative capacity and a marvellous aptitude for work. He introduced trained and experienced men from abroad and with their help rapidly brought the place into a state of efficiency, and diffused a knowledge of the iron and mineral industry through Spain. In 1849 the factory turned out a 68-pr. gun (called the "11-foot gun") and continued to provide many smooth-bore guns for fortresses, coast defence and for the navy, and in August, 1860, produced a M.L.R. gun of 16^{cm} (6·3-in.) which successfully withstood 1365 rounds.

From 1863 to 1878 the change from S.B. to rifled ordnance gave plenty of employment in Trubia, and improved machinery had to be introduced to meet the new requirements for rifled heavy guns, iron plate carriages and heavy projectiles. But the small sum voted by the Cortes kept the establishment from developing to the extent it was fully capable of. In order to make the most of the sum allowed, the method followed was to keep adding new machinery and fresh workshops concurrently with the carrying out of the programme as to the output of guns, mountings and projectiles.

During the period 1879–91 the value of the war material produced and in course of manufacture was over £815,000, and machinery and workshops were added to the establishment to the value of some £845,000: the total output in the above-named period (costing £702,600) was 537 guns, of which 374 were for fortresses or coast defence, varying in weight from 4 to 50 tons; 15 siege pieces, 108 field guns and 40 naval guns; 964 mountings, of which 389 were with under carriages and platforms, 63 siege and 507 field carriages; 56,497 projectiles and a large number of various articles for artillery purposes such as limbers, wagons, gyns, cranes, sheers, brackets, axletrees, &c.

The war *matériel* in course of manufacture at the commencement of the financial year 1891–2 was valued at £112,000 and consisted of 65 guns and howitzers (45 being for coast defence), 166 mountings and 13,206 projectiles.

The above figures eloquently point to the advance made in Trubia during the last few years.

The factory is at the present moment capable of turning out annually 40 to 50 coast defence guns or howitzers of 15^{cm} to 30^{cm} (5·9 to 11·8-in.) calibre with their mountings and projectiles, with which for an annual subsidy of 2,300,000 pesetas (£92,000) the work of arming the extensive coast line of Spain can be proceeded with.

The author claims that when it is considered that in countries such as England, France and Germany large gunfactories are maintained by the State, and that in addition there are in these countries such powerful establishments for the production of war *matériel* as those of Armstrong, Schneider and Krupp, the advantages of having a place like Trubia must be recognised. By possessing such an establishment, Spain is no longer obliged to rely upon foreign industry, but gets good value for its money and can proceed with properly arming its coast line; a necessity which has become greater than ever now that navies are so steadily increasing in size; and, moreover, there is the great advantage that a numerous *personnel* are always being instructed who in their turn tend to raise the intellectual level of the country in their respective lines of employment.

The author sums up his remarks with the following conclusions :—

(1) The reform and development of the factory at Trubia dates from the time when *matériel* of war was constructed in a considerable quantity.

(2) During the last 12 years it has turned out the amount of war *matériel* above described simultaneously with the installation of workshops, furnaces, canals, railway lines, &c., and 213 machines (including hydraulic and electrical lighting &c.).

(3) The total *personnel* employed in the factory has been 1000 to 1200 men of whom 158 have issued from its school with special acquirements.

(4) The factory can now turn out annually 50 heavy pieces, with mountings and projectiles.

Chapter III. describes the factory as it exists at the present day, but space forbids my giving more than a very brief notice of what Colonel Ordoñez here tells us.

Trubia is situated on the river of the same name close to where it flows into the river Nalon, distant about 8¾ miles from Oviedo and 27½ from the neighbouring port of Gijon whence all the products of the factory are embarked. It covers an area of some 50 acres and has a railway line of the normal gauge, 3920 mètres (4286·3 yds.) long, which forms a branch of the main line from Leon to Oviedo and Gijon.

The motive power of the factory amounts to 800 H.P., of which 200 is derived from the river Trubia by means of a canal about 1120 yards long and 3¾ wide.

16 generators of the latest patterns, 13 steam engines, 3 turbines with horizontal axle and 3 powerful hydraulic wheels place in movement 257 working machines of different classes from the steel forging press of 1200 tons to the rifling machine for guns 12 mètres (39 ft.

4¾-in.) in length. The largest furnace is the Siemen's of 12 tons and the largest steam hammer weighs 6 tons, &c. &c.

For moving and transport there are 47 cranes (hydraulic, steam and hand), including 4 of 600 tons, and 3 locomotives.

On an average the works consume annually some 2500 tons of iron and 12,000 of coal, and produce from 900 to 1000 tons of war material valued at about 1s. 3d. per kilogramme (roughly 7½d. per lb.).

The executive staff consists of a Director, a Sub-Director, 3 Majors who are in charge of sections, and 5 Captains in charge of groups of workshops, besides the administrative and sanitation staff. The work of the different shops is entrusted to 2 Principal Foremen, 14 other Foremen and 17 assistants.

The rank and file of the remaining *personnel*, consist of 1064 workmen and messengers of whom 118 have come from the School of Apprentices during the last 12 years.

The factory is divided into three sections viz. :—

(1) The preparatory workshops for forging steel, casting guns and projectiles, &c., and the chemical laboratory.

(2) The construction of guns, mountings and projectiles so far as the mechanical and steam-hammer work is concerned.

(3) Models, carpentering, apprentices' workshop, repairs, Administration, lighting, &c.

The Sub-Director is charged with the drawing department whence all the plans are issued.

These sections are again sub-divided into groups of which the artillery workshop is the most important.

This consists of 2 large halls of total area of some 5000 square-yards. The numerous machines employed in this department include 2 turbine motors of 36 H.P. each, giving 310 revolutions per minute, made in Belfast on the Macadam principle; also Creusôt steam motors of 30 H.P. with 60 revolutions per minute. A press of 1000 atmospheres is from Tangy of Birmingham, and there are many other of the latest patterns of machines made by Armstrong, Whitworth, Tangy, Fairbairn, Appleby, Tweedell, Canet, Schneider and others, so that with the assistance of this admirable plant worked by intelligent and highly educated *personnel*, the factory at Trubia is fully able to deal with all kinds of ordnance. The usual system of construction is to turn out guns tubed and coiled (when the jacket is of cast-iron), or coiled with certain orders of coils when they are made entirely of steel such as the 32^{cm} (12·6-in.) and 28^{cm} (11-in.) guns of the ironclad *Pelayo*, and guns of small calibre.

Mountings for all calibres from 30·5^{cm} (12-in.) downwards, in addition to much iron and steel-plate work are made in the second group of shops which extend over some 2190 square-yards, with a park of about 3890 square-yards attached.

In the 12 years 1879–91 this department has turned out 964 mountings, of which 387 are for coast defence.

For the installation of machinery and transport generally, the works possess two locomotives, a travelling crane of 7 tons and an "Aveling Porter" to run on rails, which can draw 100 tons.

An important feature is the school for apprentices which has now 55 pupils, mostly sons of the employés in the factory, who undergo a four years' course of study in mathematics, mechanics, metallurgy, drawing machinery from nature, &c. They work as fitters in the shops. In the last 12 years 158 apprentices have passed through successfully.

The total Horse Power employed in the factory is 830.

The arrangements for the proof of guns require special mention. Firing is generally directed against the proof-butts or tunnel filled with sand to receive the projectiles, 164 feet deep. Platforms, railroad, and a Grüson 60-ton crane are employed for placing the ordnance in position; a 50-ton gun with its mounting can be brought from the workshops and placed in readiness for firing in 3 to 4 hours. Le Boulengé-Brequet chronographs are installed at a short distance off and communicate with the battery by a permanently laid telephone. Recoil is measured by the Sébert velocimeter.

When high-angle fire has to be employed the piece is transported to the Santa Catalina battery at Gijon (the neighbouring seaport).

In a *postscriptum* the author says that in consequence of some doubts on the part of the press he finds it necessary to make a few further explanations more especially as to the manufacture of steel at Trubia.

The factory has a Siemen's 12-ton furnace for fusing the metal and an hydraulic press of 1200 tons to forge it: there are also 20 vertical blast furnaces and a 6-ton steam hammer. The Siemen's process is found much more economical than the crucible method. For the heavy guns which are of cast-iron tubed with steel the tubes are now made in Trubia by the Siemen's furnace instead of being purchased abroad. But for heavy guns entirely of steel, the manufacture of which lies outside the limits of the Siemen's furnace, recourse must be had to foreign industries and the trade, as is generally done in other countries.

Unfortunately, in Spain there is as yet no firm capable of turning out steel tubes for heavy ordnance, nor as a rule, forged steel in large masses, hence she must have recourse to France and England in cases of necessity. Though the author does not think that the state should undertake the manufacture of steel on a large scale considering the smallness of the supply of war material, still he laments that in a town like Bilbao, for example, where minerals of superior quality, and iron rich in manganese and free from phosphorous and sulphur abound, which are well suited for obtaining steel from, a manufactory for this important industry has not as yet been established; consequently the Spanish government is forced to go outside their own country for tubes, armour-plates, shafts for screws of steamers and, generally speaking, for heavy guns.

Had Spain but such advantages, Trubia could turn out ordnance of any calibre, however large, in addition to being able to deal with the numerous problems which the manufacture of artillery entails, and which are so successfully solved by such renowned firms as Armstrong, Krupp, Canet, &c.

THE VALUE OF MOBILITY FOR FIELD ARTILLERY.

Précis of a Lecture delivered at Shoeburyness, May 2nd, 1893.[1]

BY

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THE VALUE OF MOBILITY ILLUSTRATED BY EXPERIENCES FROM THE BATTLE-FIELD.

COLONEL RICHARDSON AND GENTLEMEN,

To speak of the value of mobility, which is a qualification so vitally connected with tactical excellence, may appear superfluous when every week brings out a new manual of tactics, and every six months an examination paper. I believe, however, a few words on the subject will not be wholly redundant, because we live not only in an age much given to study, but distinguished for inventive genius also. Every impulse which science gives to manufacture improves the material means of destruction, and as fire-arms become more perfect, there is a tendency for men to dwell rather on what may be done with them when they are actually locked in combat, than on the manœuvres which bring about their judicious application. Musketry and gunnery being exact sciences, are, therefore, to the majority of minds more attractive than tactics, and there is sometimes a coldness where there should be sympathy between two schools of thought. The effect of fire can be measured on a target, while that of a charge or rapid march requires actual hostilities to give illustration of its value. We have target practice with us every day, but war experiences come but at wide intervals of time, or to some perhaps never, and so we lack object lessons to guide us in one direction.

It is a curious thing, however, that as cavalry the most mobile arm, lost in importance as musketry improved, and sacrificed also its dash to the improved art of shooting, it was in mobility that artillery made way under the new conditions. The matter came about in this way. Seeing the benefit which infantry derived from fire action, cavalry in

[1] This lecture was delivered extemporarily.

the 17th and 18th Centuries were tempted to discard the tactics on which they had hitherto relied, and which were their special characteristic, and sought aid also from powder and shot. Thus it was that The Great Frederick found his cavalry when he came to the throne halting to fire a volley ere they delivered their charge, and it required all the strength of character of a man exceptionally strong-willed to stamp the heresy out. But although Frederick appreciated, as every military genius has done before his time and since, the fact that mobility is essential to success in war, he found he could not dispense with fire effect even with his cavalry, and thus, curiously enough, it was that guns in Europe, in order to supplement the efforts of the horseman, became endowed as it were with a new life. From the new powers of movement that were given them a whole train of results, each foreshadowing some modern development of their tactics, was produced. Guns that could move could be combined together, could be brought rapidly forward to deal a decisive blow, or could be carried from one part of the field of battle to another. It was mobility in fact, rather than improved shooting powers, which first raised artillery from the position it once occupied as a mere appendage to the infantry, into the status and position of an arm capable (although it is not intended to and does not desire to use its powers) of independent action.

Artillery officers, remembering, perhaps, how much their arm had been indebted to mobility in the past, came 20 years ago to overestimate its importance, or rather to underrate that of fire. Then a re-action set in. We were taught that the whole duty of artillery was to hit, hit, hit. And now we have been reminded very forcibly that we must concentrate, concentrate, concentrate. With so much dogma flying about, I feel diffident in making any assertions, but I will venture to add as a corollary to both these postulates that guns must move also, otherwise they may find themselves in a position from which, perhaps, their hitting, if they survive long enough to find the range, may be of little avail, and their concentration will be that of an unwieldy mass. Accuracy without concentration is, in fact, of no value, concentration of fire means combination of batteries, and combination demands mobility. In other words, tactical considerations must form the foundations for technical excellence.

Napoleon, who destroyed his earlier opponents chiefly by the rapidity of his movements, in his later campaigns relied much on his artillery. He valued fire effect so greatly that some of his maxims in war might appear the utterances of an enthusiastic musketry or gunnery instructor of to-day. "Fire effect is everything, all the rest is nothing." "Victory will be his who understands how to bring a great mass of guns into action unexpectedly." Are not these almost the very precepts we hear round us in the mouths of many to-day ?

A combination of mobility and of fire was to be looked for from artillery. The most essential characteristics of Napoleon's tactics might, therefore, be found united in one arm, and, if we study what was his greatest artillery battle, we shall find a splendid illustration of how he turned to account the arm, all the powers of which he had done so much to develop. Nor need we hesitate to discuss the action

of batteries armed with weapons which are contemptible in the eyes of the gunners of to-day. While human nature exists the same fundamental principles must govern the course of all battles. What occurred at Wagram may very likely happen in the "next great war." Indeed, there was a battle fought in 1870 some incidents of which bear, it seems to me, in certain respects so close an analogy to the great struggle on the Marchfeld, that I propose to deal with them together here, and to let two engagements, separated by a gap of 60 years, measured by progress of time, and whole centuries as regards progress of science, stand together to corroborate one another, and bear witness to the necessity for an adequate mobility on the part of batteries. And in the phrase mobility I would include not only those qualifications which enable the guns and horses to travel fast, but the personal attributes of the commander who sets them in motion. Before, however, I compare these battles it is right that I should remind you that war does not mean a rapid succession of engagements. "Victory," as Frederick said, "lies in the legs," and there are many more days of marching than of fighting during a campaign.

Before ever a foe is seen quickness of movement in getting over long distances will be urgently required.

Rapid marches will have to be undertaken, not only for a mile or two, but for distances that it will take hours, or even days, to traverse. No doubt such great demands on the mobility of artillery can to some extent be avoided by assigning to it a very forward place on the line of march, and good arrangements here may render the necessity for a great strain of the powers of men and horses a matter no longer of very frequent occurrence. But such expedients will after all only partially meet the case. When one considers the great length of road that would be taken up by an Army Corps on the line of march, it will be seen that, even with the best arrangements compatible with prudence, the Corps Artillery must still be several miles behind the head of the advanced guard,[1] and must move up at a trot over these miles if they are to be in position within a reasonable time after they are sent for. An hour might be considered a reasonable time enough, but an hour, now that the intensity of musketry fire will become so much increased, will be a long time in the life of a battle. It will at any rate be extremely difficult to make up for what want of sufficient artillery for an hour's time may bring about. An impression will be made more quickly than in former days, while the value of a first success or a good beginning will be as important as ever. Here, therefore, we shall still require as much mobility as before, and we should be all the better off for a higher standard still. Nor can artillery with a due regard to safety be placed in a more forward position on the line of march than that already assigned to them by our regulations, nor will it be possible for forces in bivouac to bring their artillery masses nearer to the enemy than has hitherto been the custom, for as Prince Kraft has told us, in bivouacs, especially at night, artillery are defenceless and must be left in rear.

[1] According to the order of march laid down in "The Soldier's Pocket Book," the Corps Artillery would be about nine miles behind the scouts of the advanced-guard.

Whichever way we look at it we must be forced to the conclusion that long marches at a trot will have to be undertaken on certain occasions in any future campaign, and the experience of actual warfare will only bring the fact more clearly before us.

It scarcely seems necessary in the light of all that has been written on the subject, to bring forward examples to prove what sounds to students a truism. But facts apparently obvious are often lost sight of in practice, and it will do no one any harm to be reminded that the Corps Artillery of the German Guard marched nine miles on the road from Carignan to Villiers-Cernay at a gentle trot in one spell on that 1st of September which proved so great a triumph to the artillery of the victors. That long-continued trot helped to render complete the great girdle of batteries which encircled the French several hours earlier than it would otherwise have been, and the time gained was valuable in allowing a methodical reconnaissance, the selection of a good position, and that calmness in the occupying of it which goes far to promote an effective fire.

Neither let us forget von Dresky with the Corps Artillery of the 3rd Corps at Spicheren. He had marched his batteries 13 miles up and down hill in the early part of the day on that 6th of August, and, imagining his day's work was over, had settled down in his bivouac at Ottweiler for the night, when he was called upon at 3 o'clock to hurry to Saarbruck. In half-an-hour his horses were hooked in and he was on the road with 15 miles in front of him, over an undulating country. Those batteries had to hurry along so fast that they grudged even the time necessary to put on a drag-shoe. At 6.30 o'clock the Horse Artillery were on the battle-field, and were able to assist their friends. The effort was, however, somewhat beyond the powers of the Field Batteries, and when they appeared, at 8 o'clock, they were too late to be of service.

The performances of these same batteries during the campaign of 1870, led by the gallant von Dresky, might, indeed, serve to illustrate almost all the varied phases of an artillery fight, now, however, that we are dealing with mobility alone, we will only touch on one more of their achievements, that namely when at Beaune-la-Rolande, on the 28th November, they were ordered up to the assistance of the 10th Corps engaged on the north-east of Beaune.

Again, the superior mobility of the Horse Artillery enabled them to be on the scene of action when required, and they were able to render opportune aid, having accomplished a march of 31½ miles successfully, but, on the other hand, the Field Batteries, who could not get along so fast, failed as before to furnish timely assistance.

But it is not only for long and rapid marches such as these that mobility will always be essential to artillery. On the field of battle itself occasions will still occur when prompt assistance and support can alone be rendered by very rapid movement, and when, if artillery is to cordially co-operate and work with the other arms, it must be prepared to quickly respond to the call of its companions The inter-dependence of the three arms cannot be too often insisted upon. Artillery cannot cope single-handed with the enemy's skirmishers when established

within effective rifle range of the guns. For help in such situations they must look to an adequate force of riflemen on their own side, so posted as to prevent the creeping sharpshooter from attaining a dangerous proximity to them. All this is now universally recognised and understood. On the other hand, after the preparatory artillery action is over, and the infantry have moved forward, the artillery must also be ready to conform to their movements and advance more or less with them. We must now be prepared for more than long hours of collar work, since such an advance will often have to be very rapid and cannot always be confined to roads or paths. Rough or highly cultivated ground may have to be crossed, and the detachments, in the case of Field Batteries, will almost always have to be mounted on the carriages. Again, the configuration of the ground will very seldom allow of guns remaining in action behind advancing infantry, nor would such tactics be desirable, if its safety and staunchness are not to be compromised. For men have a nervous dread of shells flying over their heads from behind.

The guns, therefore, will have to keep pace with the tide of advance. But besides this general, and more or less deliberate, forward movement, occasions and opportunities may arise in future warfare as they have in the past, when artillery must be prepared to make short desperate rushes, and, forgetting their vulnerability and their long range, stand shoulder to shoulder with their brethren of the infantry. The war of 1870 shows us many such instances, and nothing in it was more conspicuous than the devotion with which the German Artillery again and again moved up right into the thick of musketry fire when urgent necessity existed for the sacrifice almost always involved. However perfect a weapon the modern rifle may become, if both sides are equally, or almost equally, well armed, the attack will come to a standstill at certain points as before, and then without the intervention of some new power it may be found impossible to push forward. There are also critical moments during all engagements at which not to be able to press on is tantamount to a repulse, when a check to an hitherto almost continuous advance may alter the whole aspect of affairs, or even herald the advent of defeat.

On such occasions it will be always necessary to bring artillery rapidly into action at decisive points to give support and confidence to a wavering infantry, or shake a stubborn foe. I need hardly remind you that it will also be necessary after a successful attack by the other arms to send artillery forward to secure the ground gained, to destroy obstacles to further progress, or harass the flying enemy.

And in the event of a disaster artillery must be no less alert to cover the retreat. It must, in fact, never forget that its chief value is as an auxiliary, and that it is with the infantry that it must stand or fall. Thus, on the 6th of August, 1870, at that same battle of Spicheren we find Colonel von Rex, commanding the 32nd Brigade, particularly begging for the support of artillery to give more decisive effect to the successes already gained on the Spicheren plateau by the infantry, who, half exhausted, were with difficulty clinging to the ground they had captured. In response to his cry for aid General von Bülow ordered up

the 3rd Light and 3rd Heavy Batteries of the 9th Brigade to the heights. The road by which these batteries endeavoured to advance was at all times a difficult one, but now ploughed up by shells, and narrowed by some cavalry who had preceded them and halted there, was almost impassable.

The leading gun of the Light Battery was alone able at first to reach the heights, and its anxiously waited for appearance was greeted we are told by a loud cheer from the well-nigh exhausted infantry. Soon after the rest of the Light Battery was got up, but only one division of the Heavy Battery was able to gain the spot they strove for. Although these eight guns lost nearly half their gunners, fighting as they were within 800 paces of a line of French skirmishers in shelter trenches, the effect of their shells compelled the enemy by degrees to abandon the field and the remaining four guns of the Heavy Battery were able to come into action also. The timely advance of these guns and the glorious struggle maintained by them had a most decisive effect, and had it not been for their opportune appearance the Rotherberg might have been lost to the Prussians. Few better examples of how lightness and activity may serve us at a pinch could, I think, be quoted. The Light Battery, it will have been noticed, was able to ascend a height at a critical moment which was impracticable to the heavier guns, and which it was of vital importance to occupy quickly with artillery. Not only, however, was the great necessity of mobility conspicuously displayed here, but the disadvantage of a field piece with much recoil in certain situations was also exemplified. We are told that the configuration of the ground, sloping as it did to the rear, brought about such an amount of recoil in the heavy guns as to interfere very seriously with their service. This fact, though only casually mentioned, is not without a certain bearing on the subject, and I feel I need not apologise to alluding to it here.

To return to incidents in the war of 1870—at the battle of Vionville—Mars-la-Tour, when the Prussian infantry had to evacuate the Trouville copses between 3 and 5 o'clock, their retreat was covered with much bravery by their artillery, who had a very difficult *rôle* to play, till they were reinforced at a critical moment by the 3rd Horse Artillery Battery of the 10th Corps, which had been temporarily withdrawn from another position, and which came up round the south of Vionville at a gallop and supported the other guns[1] already in action

From the battle of Gravelotte incidents of the same description might be freely culled. The splendid reckleseness or devotion, call it what you will, which sent Hasse's and Gnügge's batteries across the ravine opposite the French left, the gallant advance of von Prittwitz, and the 3rd Light Battery of the Guard Corps Artillery have furnished a theme for many a sympathetic writer. We need not multiply examples of this kind, and moreover they savour somewhat of a "Balaclava Charge" kind of tactics, and of magnificent courage, and soldier-like qualities, falsely utilised by deficient leadership.

It may possibly be that the same scenes may once more be re-enacted, in the future, for the very precision and intensity of modern

[1] The batteries of the 6th Infantry Division.

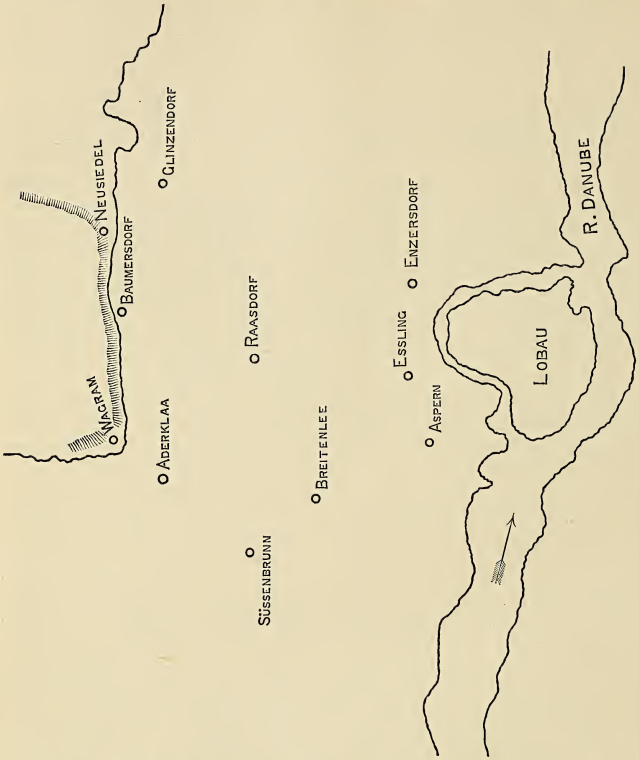
musketry may, one is almost tempted to say must, bring about a deadlock between the two lines of opposing riflemen. On such occasions the cry for artillery has invariably gone up in the past from infantry. He will be somewhat bold who will deny the possibility of its being heard again, and, if it is, then without the intervention of guns willing and able to move infantry will be prevented from making progress.

Such instances as I have just dealt with may, however, be regarded as the minor incidents of a fight, of a character, viewed relatively to the great places of the whole struggle, such as are borne by the personal acts of bravery performed by individuals in a *melée*. For great strokes conceived and carried out on a large scale, mobility, however, is even more essential. Guns may be combined for various objects during an engagement. To make or repel a flank attack, to fill a gap, in one's own or to force an entry into an opponent's line. A capable leader, who understands the arm, has a full control over it, and can rely on its rising to his expectations, has often in the history of war turned it on such occasions nobly to account. In the two battles we will now deal with we shall find mobility enabling it to equal the demands in every one of the eventualities I have alluded to.

Let us look at Wagram first, and as we do so I must presume that you are acquainted with the story of the campaign of 1809 up to the morning of the 6th of July, the day following that on which Napoleon had gained the left bank of the Danube with his whole army.

When the Archduke's attack on his right, in the early dawn of the 6th of July, took Napoleon by surprise, he had to hurry to support Davout with his guard and their artillery from Raasdorf, where they had bivouacked the previous evening, to Glinzendorf where the Austrian left was pressing on. The distance, as the crow flies, is some three and a half miles. There are no roads even now to compare with those we are accustomed to in England, and the fields on either side of the unmetalled tracks were then green with corn and cultivation. When I walked over the ground, two years ago, it was winter, and at every step one sank ankle deep into the soft alluvial soil of those level plains. But the crops must have made movement even more difficult in summer, and these batteries I speak of had to cover a lot of ground that day. For when the threatened inroad of the Austrians at Glinzendorf had been forced back, a new danger awaited Napoleon in his centre near Aderklaa. There, too, the Austrians were coming on with triumphant strides, and the same batteries that had stemmed their raid on the French right flank at one end of the battle, were now needed at the other to restore the fight, and fill the gap in their dangerously weakened centre. Napoleon, at the head of the cavalry and Horse Artillery, galloped himself to the new point of danger. The remaining batteries of his Guard, that is to say six Field, followed him with all the speed they could command, and their rapid flank march lay once again over the cultivated fields. I have often wondered how that wonderful change of position was made. The distance, as the crow flies, is some four miles and a half, and, as I have said, the ground traversed is a level highly cultivated plain. There had been a deluge of rain, too, on the night but one before, the ground must have been soft and soppy,

BATTLE OF WAGRAM.



and the long stalks of corn and herbage must have become entwined with the wheels of the carriages. To carry a mass of 60 guns such a distance at a crisis in the course of a battle seems to me a great performance, and it argues immense manœuvring power and skill both on the part of the batteries and of those that led them. When they gained the angle of the French line near Aderklaa they closed the breach the Austrians had made, and subsequently, after Davout had carried the heights above Neusiedel, and was driving the Austrian left before him, these same guns and 40 more were thrown into the fight under Lauriston to clear the way for Macdonald's celebrated column, and trotted out ahead to come to close quarters with the enemy. The deeds of the vast mass of artillery so formed are a leading illustration in all tactical works, and have become one of the common-places of military history. But the display of mobility made by them has been

hardly so much recognised, yet it seems to me a no less leading feature of their performance. Truly the incidents of Wagram succeed one another with the swiftness and variety of a kaleidoscope. While the French were winning at one end of the field they were at times being beaten at another, and the balance swayed for a long time in uncertainty ere the fortunes of the Austrians kicked the beam. Artillery was called upon more than once to throw its weight into the scales, and while its tremendous fire exemplified in Lauriston's huge battery won the day, its mobility was also indispensable to the victors.

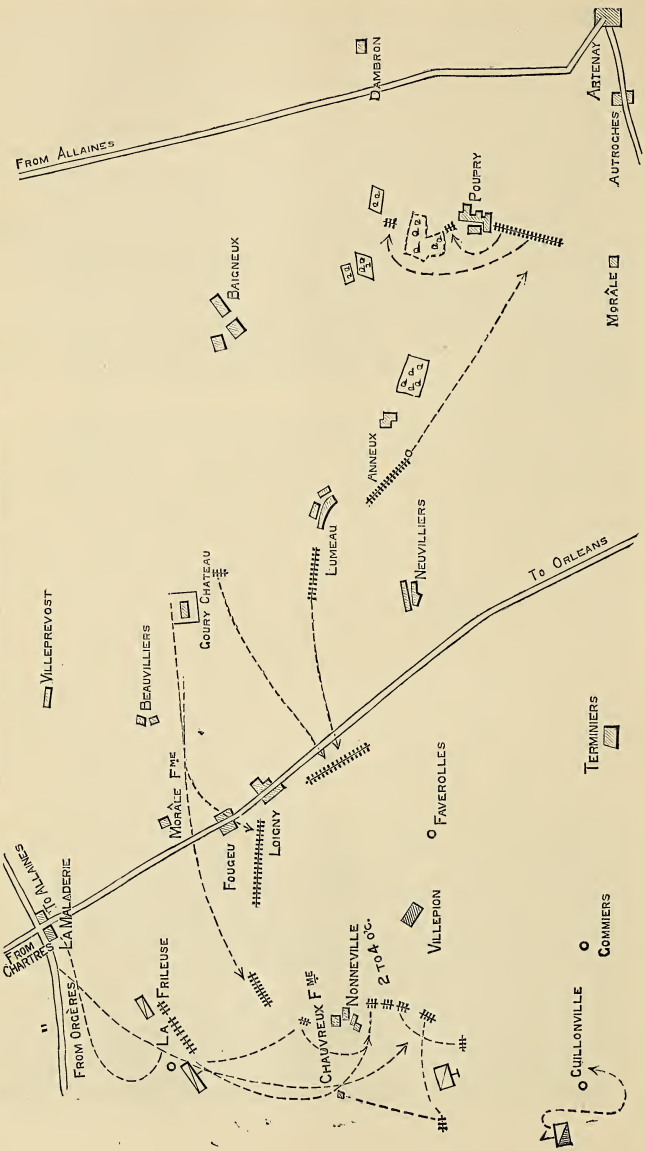
Now let us look at Loigny-Poupry, a great artillery fight of 60 years. later. There also we are bewildered by the numerous and changeful features of the fighting. There we see the mobility of artillery utilised both to make and repel a flank attack. There, too, it was the fire of artillery which went far to win the day for the Germans. In a word—the mobility and combined handling of certain batteries was displayed to such an advantage on the battle-field itself that of all the great fights of 1870 this one has called forth the special admiration of the German General Staff.

I will try and give you a brief summary of what occurred.

On the 2nd of December, 1870, Von der Tann, with the 1st Bavarian Corps, was facing south-west at La Maladerie. About 8 o'clock the French 16th Corps, advanced from Terminiers, Villepion, and Nonneville towards Loigny and Lumeau. Von der Tann had received orders to join hands with the German forces to the eastward, and to take up a position with his left resting on Chateau Goury. The 4th Cavalry Division he was told would cover his right, while the 17th Division was moving on Lumeau, and the 22nd on Baigneux to his assistance. But, as he accordingly took ground to his left, the French advance threatened his movement, and the 2nd Division was deployed in action about 9.30 o'clock between Beauvilliers farm and Chateau Goury. Six batteries here much distinguished themselves and formed a solid framework for their infantry, hard pressed by a superior foe, to rally on. Since we are especially considering the mobility displayed by guns on this day, we will not pause to describe the closely contested struggle which ensued. The French at first pressed on triumphantly. Then a brilliant counter-attack by the 3rd Bavarian Brigade achieved a temporary success, and forced their opponents in some disorder back as far as Loigny. But the whole French 16th Corps now advanced on the line Nonneville-Neuvilliers, and the brigade had to fall back with heavy loss. The batteries nobly stemmed the rush of the attack, and faced the hostile skirmishers while their comrades rallied behind them. They too, had, however, to give way also, and were compelled to fall back to a second position where they were reinforced by two batteries from the Reserve Artillery, and a chance was given to the infantry to rally and recover themselves.

Some little time previously, however, two Horse Artillery Batteries, with an escort of cavalry, from the 17th Division, had appeared to the south of Chateau Goury, and their fire, taking the enemy's advance as it did in flank, was of immense service in bringing it to a standstill.

Meanwhile the 4th Cavalry Division and the Bavarian Cuirassier


BATTLE OF LOIGNY-POUPRY.—2nd December, 1870.
FROM ALLAINES
DAMBRON
ARTENAY
AUTROCHES
POUPRY
MORÂLE
BAIGNEUX
ANNEUX
LUMEAU
NEUVILLIERS
TO ORLEANS
VILLEPREVOST
BEAUVILLIERS
COURY CHATEAU
MORÂLE F^ME
FOUGEU
LOIGNY
FAVEROLLES
TERMINIERS
FROM CHARTRES
TO ALLAINES
LA MALADERIE
FROM ORGÈRES
LA F^ME FRILEUSE
CHAUVREUX F^ME
NONNEVILLE
2 TO 4 O^C.
VILLEPION
COMMIERS
CUILLONVILLE

Brigade had commenced a turning movement against the French left. La Maladerie and Orgères were evacuated as they approached, and soon the two Horse Artillery Batteries and that belonging to the Bavarian Cuirassier Brigade were in action at La Frileuse. It will be as well to make one story of the performances of these batteries as it is on the mobility which they displayed in making this flank attack that we desire to dwell. At 2 o'clock, therefore, an even bolder attack was determined on by Prince Albrecht, who commanded them.

The 9th Cavalry Brigade (two Uhlan Regiments) and the 5th Cuirassier Regiment were to go forward on the line Gommiers-Terminiers to cut the enemy's line of retreat, while the Bavarian Cuirassier Brigade was to sweep round still further on the German right.

The 10th Cavalry Brigade (two regiments) were to be held in reserve.

The batteries to accompany the cavalry.

While the movement was in progress, however, French guns opened fire from Faverolle and Gommiers, and the Cavalry Division fell back to Chauveux Farm, one Horse Artillery Battery came into action on the north-west of Nonneville against a French battery on the north of Villepion, and two Bavarian Horse Artillery Batteries also hurried up across country at a rapid trot from where they had been in action at La Maladerie and supported it from the south-west of Nonneville. When the hostile guns had been silenced this battery again moved forward and unlimbered on the right of the Bavarian batteries. The three soon drove the French guns at Faverolles off the field, and then commenced to shell the village and the infantry posted there.

About 3 o'clock several regiments of French cavalry attempted to advance from the west of Guillonville, but as soon as they appeared the Horse Artillery Battery, which was waiting at Chauveux Farm trotted out to meet them, and its fire was so effective that the French horsemen turned and left the field. Its fellow battery also joined in the fight with the cavalry at a range of 1200 metres. A second attempt which the cavalry made to advance from the other side of the village was similarly foiled by the fire of these two batteries and we read that the French squadrons retreated so precipitately that the three Cuirassier regiments sent out from Chauveux Farm to attack them, could never catch them up.

Now the mobility displayed in these different movements by the German batteries is most praiseworthy. The performance of the Bavarian ones is especially remarkable, and they covered distances of 5000 metres (more than three miles) over the fields at a rapid pace, and showed the greatest quickness and readiness also in the various minor changes of position. From La Maladerie to Faverolles is more than four miles, and from Nonneville to La Frileuse two, distances being measured in each case as the crow flies.

The ground was fairly level, as is the plain of the Marchfeld. It should be noted, however, that there was a sharp frost, and that the surface of the fields was hard and favourable therefore to the guns. Yet the movements just described are, nevertheless, a remarkable display of mobility, and General Chanzy has admitted that the bold

flank attack was of the greatest effect, and that Admiral Jauréguiberry, who commanded the 1st French Division, was led to imagine by it that his left was about to be assailed by over-powering hostile forces.

We must leave the main battle now, and glance at another example of mobility on the part of batteries at the other end of the arena.

We have shown with what readiness the Horse Artillery guns of the 17th Division hurried forward to assail the other flank of the French. The remaining batteries followed their example no less satisfactorily, but I would pass over their achievements, since we have no space to devote to a detailed account of them, to call your attention to the action of those of the 22nd Division. This division had assembled on the morning of the battle on the east of Tivernon, and at 9 o'clock set out to march by Santilly on Baigneux.

When it arrived at Baigneux (about six miles as the crow flies) between 11 and 11.30 o'clock, its leader, General von Wittich, learnt news of the fighting before him and sent forward his six batteries some two miles further to attack the enemy who were assailing Lumeau. It is not my purpose here to enter into a minute description of how this mass of guns acted; of how its component parts prepared the way for and supported the attack of the infantry to which it was attached, or to tell in the words of the official narrative how it forced its way onward at "trot and gallop," and, finally, how it poured its concentrated fire at the "most effective ranges," from south-west of Anneux, into the flank of the French attack. Nor shall I ask you to consider the no less workmanlike manner in which the guns of the 17th Division were handled on the west of Lumeau. For what is more relevant to the special subject we are considering is another brilliant illustration of activity which the six Field Batteries of the 22nd Division were to give when news reached its commander that the 15th French Corps had advanced past Artenay on the road to Paris, and that its 3rd Division had fallen on the 3rd German Brigade of cavalry near Dambron and driven it back. The foe had then turned towards Poupry, perceiving the 22nd Division fighting as has been described.

Von Wittich promptly wheeled his division round on its left to face the new danger, and his Artillery Commander, Colonel von Bronikowski, personally led three Field Batteries, in line at full interval, at a trot across country to the south of Poupry where he brought them into action. The other three batteries followed no less rapidly in the same formation, and were soon unlimbered in line with the others on their right flank.

Thus these batteries, like those of the Guard at Wagram, were snatched out of one battle and hurried across country to interpose with most effective energy in another widely distant from the first, and, having just carried out a flank attack, now turned their energies to repel one. The exact distance traversed by these batteries in this last change of position is a little more than two miles. The stretch of ground covered does not strike one as enormous, nevertheless I think every artillery officer will admit that for Field Batteries, and two of them were Heavy Field Batteries, to advance in line at a trot across a a cultivated plain such as lay between Loigny and Poupry after all

they had done that day was a performance of which any artillery might feel proud.

And their labours were by no means over when they reached their latest position, for they had to sustain an obstinate struggle against seven French batteries and a superior force of infantry until darkness set in and the fight died out. Two of them had, however, again to utilise their mobility during this last fight, for one was called from the south of Poupry to the northern edge of the copses on the north of the village, and in doing so had to make a march of some two miles and a half, while another moved from the south to the immediate north of the village, and covered in two moves about a mile of ground.

Mobility is the most marked characteristic of the performances of the German batteries, but in respect to another point in their handling on this day they are also to be commended.

They were everywhere used in concentrated masses, and combined their fire on one target. Such a method of working batteries is now almost universally recognised as the only true one for artillery to adopt. Occasionally one hears a plausible suggestion put forward as to concentrating fire, but dispersing batteries. On paper the idea appears to have much to recommend it, but in practice it is found to be a fallacious one, because you cannot obtain unity of direction, in other words, concentration of fire, if it be adopted. For one man to direct the fire of five or six batteries, even if they be all formed up in line together, is an exceedingly difficult task, but if the mass be split up into several portions, the intervals between which are taken up by other troops, it is probably not an exaggeration to describe it as impossible.

And we should note also that not only is concentration one of the essentials to the successful action of artillery, but that the concentration of batteries should be accompanied also with their simultaneous and sudden appearance.

Now, where large masses of guns are concerned, to effect a great concentration of guns in the last stages of the fight either to force a way for the assaulting columns after the Napoleonic fashion, or for some other purpose, means that batteries may possibly have to be withdrawn rapidly from another part of the field, and brought into action again against the point selected for attack. Formerly a reserve of artillery was held in hand for this purpose, but now-a-days when guns are endowed with immense range they all may be utilised from the first, and to keep any idle would be a waste of opportunity. Concentration in a modern battle may, therefore, largely depend on mobility.

But a simultaneous and abrupt attack by artillery implies also great precision of movement, and precision means an unstrained effort. Batteries must, to use a sporting phrase, "go well within themselves," and respond readily to every call from him who guides them, turn to his hand as does the well-built vessel to her pilot, if they are to burst with any suddenness on the astonished foe. If it is by a great effort that batteries can reach a position they will either lose their chance by being too slow if they wait for one another, or will straggle up at intervals or even piecemeal by single guns, and in place of surprising their opponent may be themselves wiped out in detail.

When, therefore, the German General Staff hold up the mobility and concentration of their batteries at Loigny-Poupry to admiration, they remind us, though not intentionally, that these two features in the performance were complementary to one another, and that those six batteries of the 22nd Division could not have been rapidly and decisively carried out of one battle into another, had they not been held well in hand by a capable leader with a firm grasp of his command. Neither could the two Bavarian Horse Artillery Batteries have the brilliant march they did and have joined themselves on to the other three to form that mass of guns to the south of Nonneville, had they not been possessed of the other quality to which concentration in the other instance gave its opportunity.

So that we ought to remember that although artillery is the arm which acts by fire alone, to reach complete efficiency it must study something more than questions of gunnery although they must be always its first care. Position and the getting into position is a factor in success, the value of which it would be difficult to exaggerate. Combination, and that, too, in its widest term—combination of its various component parts, and combination with the other arms—must form a no less important subject of attention.

LETTERS

FROM

GENERAL H. LYNEDOCH GARDINER, C.B.,

Colonel Commandant Royal Artillery.

THESE letters, which were read to the Annual General Meeting, are now published as the Committee think that they contain much of general interest to the Regiment regarding both the presents given by General Lynedoch Gardiner and the circumstances attending the first gift of an Army Command to an Artillery Officer.

"109, Cromwell Road, S.W.,
15 April, 1893.

MY DEAR WILLIAMS,

I propose to offer my father's sketches which you saw yesterday to the Royal Artillery Institution.

He began sketching first when he was A.-D.-C. to General Fox (brother to Charles Fox the Cabinet Minister), in Sicily in 1806, and to Sir John Moore, in 1807. He came home with Sir John, but soon afterwards joined Sir Arthur Wellesley in the Peninsula, and was present at Roleia and Vimiera, and afterwards in Sir John Moore's retreat to Coruña, and there is one sketch, separate from the others, taken on that retreat, in which he acted as Brigade-Major to the Artillery force.

He returned with the Army, after the battle of Coruña, to England, and the same year went as Brigade-Major to the R.A. in the Walcheren Expedition, and there are several sketches in Holland. The next year he went out to the Peninsula again, and joined Lord Lynedoch at Cadiz, and was present, in command of a Field Battery (then called a 'Brigade'), at Barossa. He afterwards joined Lord Wellington's Army at the siege of Badajos, and from that time forward took part in most of the head-quarter actions, until he marched through Spain and France in command of a 'Troop' of R.H.A., and embarked for England in 1814. There are several sketches before he joined the R.H.A., but I do not think any afterwards. It was attached to the Hussar Brigade in the advance on France, and afterwards at Waterloo, to which it covered the retreat of the left wing of the Army from Quatre Bras, and had a desperate gallop for it. It is possible, however, that he may have made some sketches even in the latter part of the Penin-

sular War, as he often mentioned the loss of a tin case when disembarking from France with a good many drawings in it.

Below the sketches are some engravings which I found, these relating to his Court life; also a photograph of the Gardiner Battery at Gibraltar. He was selected for Equerry, on his return to England in 1816, to Prince Leopold (afterwards King of the Belgians) and Princess Charlotte, then heiress to the throne.

I propose later, when I have had time, to send some papers and letters relating to his campaigns, which can be placed in the small drawers at each end of the table. I have not found time to look over them thoroughly, but there are enough, I think, to be interesting to my brother officers.

The table itself is a beautiful specimen of cabinet work, I believe, made by Banting in 1816, when it was a present from my uncle Sir John Gardiner (for many years Deputy-Adjutant-General at the Horse Guards) to my father on his marriage; it puts up, and forms a large desk to show off drawings or engravings, and I hope will make itself useful in that way.

Will you kindly communicate my offer to the Commandant at Woolwich.

I am moving to a house which the Queen has placed at my disposal in Richmond Park, and the table would be available in the first week of next month for removal to the Institution if my offer be accepted.—

Yours sincerely,

LYNEDOCH GARDINER, General.

Major-General Williams,
Deputy-Adjutant-General."

"109, Cromwell Road, S.W.,
Wednesday, 19 April, 1893.

DEAR CAPTAIN ABDY,

I am afraid my friend General Williams has given you a too favourable account of my father's drawings.

They are merely sketches, and he was quite self-taught, but they are interesting from having been made while campaigning—they cannot be called 'pictures.'

I have a very pretty little water-colour drawing, framed by my old friend Arthur Taylor, which I could give you for your collection.—

Yours very truly,

LYNEDOCH GARDINER."

" 109, Cromwell Road, S.W.,
26 April, 1893.

DEAR CAPTAIN ABDY,

There are four very small side drawers, two at each end of the drawing table, and in these I have left what I found there belonging to

my father, and have besides added two books—one a well-bound edition of the book on 'The Holy Communion,' which he left to be printed after his death, and the other a bound volume of his pamphlets—the first of which is a memoir of his father-in-law,[1] who was certainly for some years (before the Peninsular War) the most distinguished Artillery Officer, and who continued, from a young man to a very old one, to be the Chief Staff Officer of the Corps. I remember him in my very young days, a most charming old gentleman, beloved by everybody; the next is a memoir of Sir Graham Moore, the Admiral, a most intimate friend of my father, being brother to Sir John Moore, whose A.-D.-C. my father was, and whom he loved and admired more than any other General he ever served under except 'the Duke,' and that was more admiration than personal affection. The other pamphlets are chiefly battling for the rights and efficiency of the Royal Artillery, and it was in consequence of some of these that Lord Grey selected him for Governor of Gibraltar, for it was in the gift of the Colonial Minister, though supposed to be with the concurrence of the Commander-in-Chief, who was then the Duke of Wellington.

The Queen and Prince Albert used at that time to visit Claremont, the property, for his life, of the Queen's uncle the King of the Belgians, and my father was living at Melbourne Lodge on the Claremont Estate, given to him by Prince Leopold and Princess Charlotte, when he joined them on their marriage in 1816.

One day the Queen and Prince Consort walked down from Claremont to Melbourne to tell my father that H.M. had just approved of his appointment as Governor of Gibraltar.

He could hardly believe his ears, for a General Officer's Command had never before been given to an Artillery Officer, but jealously kept by the Horse Guards, who thought that the R.A. and R.E. were sufficiently provided for by the Master-General of the Ordnance. However, having been told of his appointment on such good authority he went shortly afterwards to see the Duke of Wellington, thinking he knew all about it, but Lord Grey had taken care not to mention it until it had been approved by the Sovereign, and the Duke said: 'I'm very glad! but it's the first I've heard of it.'

My father's friend, Sir George Napier, the elder brother of Sir Charles and Sir William (all of them ardent admirers of Sir John Moore), was a leading candidate for the appointment, and he wrote my father such a handsome letter that I think I must send you that some day to go into one of the drawers, but I am now in the bustle of our move and cannot lay hands on it.—

Yours very truly,

LYNEDOCH GARDINER."

[1] Sir John Macleod, G.C.H., Director-General of Artillery.

ADJUNCTS OF DEFENCE.

BY

MAJOR SIR G. S. CLARKE, K.C.M.G., R.E.

The term "adjunct," however cacophonous, appears indispensable. Any secondary weapon, any scientific invention which, while in no sense necessary, may be distinctly beneficial, can only be thus labelled. Of such adjuncts there is an increasing number, varying in value. Each year brings forward new claimants for admission to the national armoury. Each such claimant is duly heralded by the Press, as needing only sufficient scope in order to "revolutionise" warfare. Yet warfare has never been revolutionised even by radical changes in primary weapons, such as the small-arm and the field gun. The adjunct cannot possibly alter the conditions of war by sea or land; but, in proportion to the increase of efficiency, simplicity, economy, or merely convenience practically attained, it will prove an aid in deciding military issues. By this test each new invention must be judged, and the examination should be conducted somewhat on the following lines:—

1. What can it actually accomplish; not in peace experiments, but under service conditions?
2. Does it lend itself to the requirements of the British Empire?
3. If so, under what local or other conditions?
4. Does the advantage justify the cost?

The first question is one for the inventor to answer by practical demonstration on lines laid down for him. As regards the third, it would be proper for the inventor to offer suggestions; but the second and fourth should be determined by those in authority, who would be more likely to form a right judgment uninfluenced by the inventor.

In a previous paper[1] it was sought to show how a useful adjunct of defence—the submarine mine—tended, by a process of unchecked scientific enthusiasm, to usurp a position extravagantly expensive in peace and probably dangerous in war. At the same time, it was endeavoured to arrive at certain principles which should guide the employment of mines in British waters.

Two other adjuncts of defence—the position-finder and the Brennan torpedo—may be similarly discussed, without revealing any of their secrets; but merely with a view to arrive at some limiting principles. The statement that every coast defence gun does not require a position-finder, nor any channel a Brennan installation, will be accepted without question. It follows that there must be limitations to the tactical

[1] "Proceedings" R.A. Institution, Nos. 11 and 12, Vol. XVII.

employment of either adjunct, and, in the interests of efficiency and economy, it must apparently be worth while to seek to arrive at these limitations.

The Position-Finder.

Accurate fire from permanently mounted guns at a stationary target depends on the exactitude and accuracy with which at least four separate conditions, independent of the gun itself, are, viz.:—

(*a.*) A line observed by eye.
(*b.*) An ascertained range.
(*c.*) Correction for drift.
(*d.*) Correction for wind.

(To the above may have to be added in some cases a correction for variability in powder).

Of these conditions, the first (*a*) can be met by (1) sighting pure and simple; (2) sighting for direction only; (3) a telescope with cross-hairs attached to the gun; (4) a telescope separate and at a distance from the gun. The second (*b*) can be fulfilled by suitable instruments, or (with loss of time and ammunition) by trial shots alone. The third (*c*) is a mere clerical matter; the fourth (*d*) is largely a question of unaided judgment, *i.e.*, of practical experience.

The relative importance of the fulfilment of these conditions in regard to accuracy of fire varies somewhat according to circumstances. Thus, in firing at a square target of small dimensions, the non-fulfilment of any single condition will ensure failure; (*a*), (*b*), and (*c*) may be exact, but a wrong estimate of wind correction will cause the shot to be thrown away. In this case, therefore, assuming equal care to be taken in performing each operation, the relative importance will depend upon the probability of the limit of permissible error being exceeded. In each operation, error up to a certain point will not vitiate the result. In which operation is that limit of error most likely to be exceeded—in the purely visual operation (*a*); in the determination of range (*b*); in the wind correction (*d*).

Assume that the length of target is great in proportion to its height, as in the case of a ship's broadside, then errors in direction become of less importance than those in elevation. In other words (*a*),[1] (*c*), and (*d*) become of relatively less account, and success turns merely on the fulfilment of (*b*).

If the target is moving, the question becomes complicated by the need for a further correction which affects ranges if the motion takes place along a line passing through the gun, and range and direction in varying degrees according to the obliquity of the path. Thus this correction usually involves two variables, and is practically a prediction of the position of the target at the moment when the projectile will reach it, such prediction being based on observations previously made.

What now are the special functions of the position-finding system, and how far does it tend to reduce the elements of error above pointed

[1] Except possibly when ordinary sights are used, and visual errors in elevation therefore become possible.

out? (1.) It reduces (*a*) to the comparatively simple operation of laying the cross-hairs of an easily manipulated telescope on a mark. By this one operation the range and the line of bearing are automatically transmitted to the emplacement, there to be translated from dials to pointers connected with the mounting. Thus, conditions (*a*) and (*b*) are both fulfilled, while corrections (*c*) and (*d*) remain to be applied, either by the operator or in the emplacement. (2.) Since the instrument enables the course of a vessel to be followed and plotted, the prediction involved in the supplementary correction can be made without difficulty unless the course of the target is specially erratic. (3.) The position of the observer being independent of that of the gun, the latter is able to carry on aimed fire over water not visible from its site. (4.) The operator is removed from danger, and is comparatively little liable to have his field of view obscured by smoke.

The instrument, when in adjustment, is theoretically perfect, and from its nature the probability of observation error is reduced to a minimum.[1] Assuming adjustment and electrical communication to be maintained, it is also practically perfect. Thus, once the principles are fully grasped, first thoughts naturally lead one to assume that an absolute solution of a difficult problem has been reached, and that a new method so accurate and simple as to demand general application has been provided.

Further consideration serves to modify this view materially. Assume, for example, that condition (*b*) can be otherwise fulfilled, or that accurate ranges can be otherwise obtained. Then clearly a portion of the advantages of the system disappear. To lay *for line* by sight is an easy operation, and two possible sources of error—the mis-reading of a dial, and the incorrect adjustment of a pointer to an arc are actually eliminated. The possible sources of error in elevation remain practically unaffected. Although prediction, in the sense above adopted, may not be equally inconvenient, the difference will not be marked. The instrument does not remove the more important sources of error, which still depend upon fallible private judgment. Thus, on purely theoretical grounds, it might be expected that when good range-finding can be carried out, no increased accuracy of practice can be attained by position-finding. Practical experience appears to bear out theory in this respect, and now that a good system of drill exists there is reason to believe that superiority both in speed and accuracy of fire can be claimed for the range-finder.

Abandoning theory and coming down to matters of infinitely greater importance in war—tactics and human nature—certain inevitable disadvantages attach to the new system. Under it the responsibility for accurate practice centres upon the observer in his cell. The gifted individuals to whom the grave responsibility of directing the fire of a heavy gun or group of guns may safely be entrusted, become the real commanders of the battery in regard to its war functions. They must be trained officers, possessed of iron nerve and wide experience. But, if this is admitted, a necessary limitation at once presents itself.

[1] This applies to a vertical base instrument only. In the case of a horizontal base apparatus other sources of error arise.

Material, apart from *personnel,* is expensive in peace and useless in war. How many trained and experienced officers can be spared for the multitudinous position-finding cells which would be required ? Even if it could be admitted that competent non-commissioned officers will be forthcoming, a powerful objection deeply rooted in unchanging human nature remains. The position of the Fort or Battery Commander is deprived of its first right. The work exists only for its fire effect. Failing that effect it is a mere futile excrescence marring a coast line. A commander deprived of all responsibility in regard to the one war function of his command is surely placed in a pitiable position, which only the most cogent reasons can justify. If, on the other hand, he is taken out of his command and placed in a position of some security on the top of an adjacent hill—the position selected in action by Osman Digna—the moral result will be deplorable. The position of the commander of a tactical unit, in action, is with his men, whose energies he must stimulate, whose dangers he must share.

Turning to the question of simplicity, the verdict depends upon tactical considerations. Some of the writing to which position-finding has given birth seems to show that simplicity in the actual working of coast defence has gone by the board. New titles have been freely mounted; involved systems of commuication have been demanded entailing a maze of telephone and telegraph wires, and presenting the fighting of a coast battery in a light calculated to appal the imagination. All this lends itself readily to diagrammatic illustration. Has it the smallest value in war ? It is remarkable that, at a period when the idea of interfering with tactical units, once engaged, is losing ground, the coast battery should be threatened with the loss of all independence. The chain of responsibility—General Officer Commanding, Section C.R.A., Battery Commander—is essential in peace where the object is preparation and the all-important element of time does not enter. It may be ruinous in war. The Battery Commander should know his work, his guns, his field of fire, as no one else can. His duty is clearly defined. Interference with his functions can only mean loss of time, with possible misunderstandings and confusion. His superior may be able to warn him to be on the alert, may reinforce him if his casualties are severe; but cannot hope to do more. Once engaged, he is, or ought to be, the best judge of the distribution of his fire. Unless this view, which has at least the sanction of experience, is correct, the complications threatened by position-finding must be regarded with grave distrust. Circumstances may justify them. In the rule, they are fraught with danger.

Of the many possible difficulties involved in the enormous electrical communications which any extended application of the system involves it is, perhaps, premature to speak. Those difficulties will not be adequately realised till such an application has been made and actually tried under service conditions.

The above considerations seems to lead to the following as the limiting condition to the use of this valuable adjunct. *Position-finding should never be employed where sights can be used, and when accurate range-finding within effective fighting distances is possible.* Ample scope remains for

the system. In the case of a battery intended for high-angle fire, or which is required for fire on water not visible from its site, the drawbacks disappear in face of the unique solution of a great difficulty. Similarly, casemates liable to be quickly obscured by smoke may be tranferred into effective gun positions. Thus limited, the system will rest on a solid foundation, defy all criticism, and secure itself against the violent re-action which its exaggerated employment would inevitably provoke.

The Brennan Torpedo.

Judged as a mechanical success, the Brennan torpedo stands unrivalled among all competitors. Other controlled torpedoes have certain commendable features. None have so far proved mechanically perfect. Local conditions may offer special difficulties in launching, but such difficulties can undoubtedly be overcome, and once overcome the actual working of a Brennan installation properly supervised may be relied upon. The percentage of faulty runs is infinitesimal. The steering is excellent, the immersion exact. The weapon, as a machine, is effective and complete. What functions can it, therefore, fairly claim?

(1.) A certain area of water, extending to a range of at least a mile but laterally limited, is open to the action of a dirigible torpedo under full control, and carrying a charge which would probably be fatal to any ship.

(2.) The torpedo itself has a speed even at the end of its run equalling or exceeding that of most battle-ships.

(3.) It is completely submerged and indestructible by fire.

(4.) Torpedo netting would not arrest its action.

(5.) The installation can, under favourable circumstances, be rendered secure from fire except at close quarters, and countermining operations, even if practicable, do not affect it.

(6.) The observer can be at a distance from the installation and can change his position.

(7.) Finally, with suitable arrangements, torpedoes can be successively launched from a single installation, at intervals not exceeding the mere duration of the run.

Certain conditions modifying the above statement may be alleged.

(1.) The manœuvring of the torpedo towards the conclusion of its run is slightly impeded, except when an elevated observing station is available, by the difficulty of ascertaining whether the torpedo has ranged up to or beyond the target. This difficulty would, however, be experienced only when dealing with a rapidly-manœuvring ship, and fuller experience may prove it to be less than might be anticipated.

(2.) Smoke intermittently obscuring the mast would render doubtful the accuracy of the practice at a moving target except at moderate distances.

(3.) Night practice against a manœuvring ship would probably be ineffective. At moderate range, however, employing the electric light,

a ship running a straight course across the front of the installation should be hit with certainty, provided that no smoke intervened to perplex the observer.

(4.) The cost of an installation is necessarily great, equalling that of a completely equipped battery of four or five 6-inch B.L. guns. The cost of maintenance will prove high and the *personnel* must be specialist and expensive.

Even when due reservations have been made, the torpedo must evidently be regarded as an extremely formidable weapon within the limits of its action. The question of its application is of a different kind. It is clearly unnecessary as a provision against unarmoured ships, with which the gun can effectually deal even at greater than Brennan ranges. It provides no defence against torpedo-boats—the principal danger to shipping in ports situated near an enemy's base. Its range is less than that at which a ship's fire is effective—far less, for example, than the range at which good practice was made by the *Inflexible* and *Téméraire* at Alexandria. For the defence of a sea front, it is quite unsuited. In many positions it would not range up to the water which an armoured ship would attempt to navigate.

These considerations appear to limit the justifiable employment of the Brennan torpedo to the defence of deep channels not exceeding about 1500 yards in breadth.

But a further limitation arises. Whither does the channel lead and what is the nature of the inner waters? If the channel open rapidly into broad and deep water which it is necessary to deny, if, in fact, it is a passage which can be rushed,[1] a Brennan installation is a suitable protection. In such a channel as that of the Thames, it would be obviously superfluous. To superimpose the Brennan upon an effective existing mine defence would clearly be unjustifiable. If a mine-field is real, that is to say intended for physical as well as moral effect, it will suffice; if not, it is a useless expense.

The Brennan torpedo, therefore, enters into competition with observation mines, over which in some cases it possesses undoubted advantages. In a deep channel with a strong current, for example, the mine is impossible. When the conditions are equally favourable to both weapons, the decision must turn upon relative economy which appear to be worth more careful consideration than has at present been forthcoming. At the same time, for the defence of a narrow deep channel opening into broad waters, and at a sufficient distance from a dockyard to render effective bombardment impossible,[2] the torpedo would probably be a more formidable defence than the gun. If, in such a case, the installation is rendered self-defensible, and supplemented by a few quick-firing guns as a protection against boat attack, there seems to

[1] Such cases are few in the British Empire. The Heads at Sydney and the Syemun Pass at Hong Kong may possibly be included in the category. The idea of a heavy ship "rushing" into such a harbour as Malta is obviously preposterous.

[2] By effective bombardment is meant fire capable of causing serious injury to national resources required for war. Such bombardments can under no circumstance be so undertaken unless certain immunity from naval intervention exists.
Even in the peculiar case of Foochow, the effect of bombardment proved to be strictly limited.

be no reason why it should not stand alone. It will not, however, obviate the necessity for providing some fire over interior waters, nor will it enable precautions against torpedo-boat attack to be dispensed with.

Broadly speaking, therefore, the torpedo must be regarded as a means of denying certain limited waters to armoured ships. The first question to be considered in any specific case is whether an enemy has anything to gain by placing armoured ships in such waters, or attempting to pass them at speed. This question is essentially naval, and lies wholly outside of the legitimate sphere of the technical expert. When it has been answered in the affirmative, a *primâ facie* case for a Brennan installation arises.

Fixed installations on shore have so far been dealt with. Such installations have the apparent disadvantage that their positions are certain to be accurately known in advance by an enemy. Where, however, the installation is properly sited and arranged, this disadvantage is of small account, since the torpedo can be freely used outside the zone of its vulnerability. By establishing it close behind a conspicuous building, which would be partially destroyed by a single projectile from the bow armament of an advancing vessel, all possibility of usefulness in war would be abandoned.

Assuming that a floating installation can be rendered as satisfactory as one on shore, the general conditions laid down remain practically unchanged. If the Brennan vessel is to be used at anchor, the advantage of the unexpected may be attained and the scope of action of the torpedo may be somewhat extended. If it is to be manœuvred against an enemy, it becomes a vessel of war with which we of the army have nothing whatever to do.

The two adjuncts above discussed are both capable of rendering valuable aid to the defence when employed with due regard to their limitations and to the outstanding requirements of British ports. Such aid is, however, in both cases, available only against purely naval attack, *i.e.*, attack by ships apart from operations on shore. This form of attack found little favour in the past wherever moderate coast defences, manned by trained gunners, existed. It is even less likely to be attempted in future now that ships are fewer, far more valuable, and, for the most part, relatively more vulnerable. Against an Algiers, an Acre, an Alexandria, it may unquestionably continue to play a part in war. Against the existing defences of British ports it is the least probable policy for an intelligent enemy to adopt. Such risk as they may run lie in other directions, and of such risks torpedo-boat attack at the outset of war is the greatest, although it applies to certain ports only. Here neither the position-finder nor the Brennan torpedo promises any assistance to the Empire.

Many of the principles which the writer ventured to urge as regards the employment of submarine mines have subsequently received official sanction. *Adsit omen.*

HORSES' SNOW SHOES.

BY

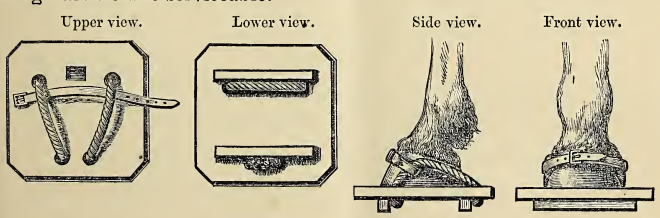
COLONEL C. J. DESHON, *D.-S.-O., late* R.A.

WINTERING in Norway during 1892–3 (one of the severest seasons experienced, according to the Aborigines, for the last 30 years) I was surprised to see that people managed to draw their wood and grass through the forest, the snow being everywhere about 4 feet deep, in many places 6 to 9 feet deep and soft.

I had proved that a man could not walk away from the main roads, on which the snow was packed by much traffic and snow ploughs, except on *ski* (Norsk snow shoes).

It should be stated that the Norsk petty farmers cut grass on the mountains and stack it, near where cut, until the snow allows them to use sleighs, there being no roads fit for wheels through the forest and over the marsh ground on the lower slopes of the hills up to these grass grounds. The sheds near their farms are only large enough to hold the grass cut near their farms, this they use first (and they keep as many cows and sheep as they can possibly feed shut up in sheds from October till May or June). The grass from the mountains has thus to be brought down over deep snow. To enable the ponies to move over the deep snow, they use snow shoes—which are made of plank or withes.

The wooden shoe is a piece of plank about 12″ × 12″ × 1″ with hole cut for front calk of horse shoe (the Norsk horse shoe is fitted with huge calks, one at toe and one at each heel), a grummet is so fixed on each side of foot place that when a strap passed under grummets and over front of hoof is buckled tight, the snow shoe is firmly fixed to the foot, yet not so firmly but that, if the pony falls, his struggles can liberate his feet—two small battens about 10″ × 1″ × 1″ are placed below each snow shoe to prevent slipping. The wicker shoe is a very rough article but serviceable.



I walked without ski behind a pony on snow shoes in snow $3\frac{1}{2}$ to $4\frac{1}{2}$ feet deep—the pony sank 2 to 3 inches; I sank about 30 inches, being as far as my length of leg would let me and was very quickly played out.

Would it not be feasible, were it necessary to have a war in winter, or over snow covered ground, to utilize Mountain Artillery, both men and mules on snow shoes of sorts? The mules in this work would have to be in draught, to reduce the weight on the shoes, the *only* sort of work for which, in my opinion, Mountain Battery Mules should ever be put in draught.

A PROPOSED METHOD OF FIRING AT MOVING OBJECTS AT MODERATE RANGES.

BY

CAPTAIN J. U. COATES, R.A.

Fire to go regularly through the battery, always recommencing where it last left off.

When using time shrapnel, never more than four guns to be actually loaded at the same time. The remainder to stand ready with fuze set and gun laid. This is necessary to avoid an undue amount of rounds acting on graze.

The following examples explain themselves.

1st Example using Time Shrapnel.

Infantry advancing 100 yards per minute.

A delay of 15 seconds is allowed for giving the change of range. Rapid fire is taken as one round in seven seconds, and ordinary, one round in 15 seconds.

Time available for fire at each range 1 minute 45 seconds, giving 15 rounds of rapid, or 7 rounds of ordinary fire.

Words of command.	Result.	Remarks.
"1800 yards, fuze 18, shot"...	+	Fuze 18 (or fuze set for percussion) is given to ensure burst on graze for ranging rounds.
"1600 „ „ „ "...	−	
"1600 „ fuze 7½, rapid fire"	−	These rounds being loaded with fuze 18 will act on graze.
	−	
	−	
	−	
	−	
	−[1]	
	−	
	−	
	+	
"Stand fast" (whistle)	+	

[1] If the bursts are too high to be well observed give "Stand fast," and reduce the range by 50 feet, leaving the fuze as before. This will not affect the distance of burst, but merely reduce its height.

At 2000 yards an alteration of 50 yards reduces its height by about 10 feet.
" 1500 " " " " " " 5 "
" 1000 " " " " " " 3 "

"1400 yards, fuze $6\frac{1}{4}$, rapid fire" — — These rounds being loaded with fuze $7\frac{1}{4}$ will act on graze.
—
—
—
—
—
—1
—
—
—
—
—
+
"Stand fast" (whistle) ..... +
"1200 yards, fuze $5\frac{1}{4}$, rapid fire" — — These rounds being loaded with fuze $6\frac{1}{4}$ will act on graze.
—
—
—
—
—
—
—1
—
—
—
+
"Stand fast" (whistle) ..... +
"1000 yards, fuze $4\frac{1}{4}$, rapid fire" — — These rounds being loaded with fuze $5\frac{1}{4}$ will act on graze.
—
—
—
—1
—
—
—
— The enemy being stopped, fire continues
— without a check until enemy retires.
—
—
—
—
—
—
—
—
"Stand fast" (whistle) ..... —

[1] If the bursts are too high to be well observed give "Stand fast," and reduce the range by 50 feet, leaving the fuze as before. This will not affect the distance of burst, but merely reduce its height.

At 2000 yards an alteration of 50 yards reduces its height by about 10 feet.
" 1500 " " " " " " 5 "
" 1000 " " " " " " 3 "

"Fire all loaded guns"	—	This command is unnecessary if next objective is at a shorter range.
	—	
	—	

Change target or follow the retreating enemy as follows :—

Words of command.	Result.	Remarks.
"1200 yards, fuze $5\frac{1}{4}$, shot" ...	+	
"shot" ...	—	
"Rapid fire"	—	
	—	
	—	
	—	
	—	
	—	
	—	
	—	
	—	
"Stand fast" (whistle)	—	
	—	
	—	
"Fire all loaded guns"	—	
	—	
	—	
"1400 yards, fuze $6\frac{1}{4}$, shot" ...	+	
"shot" ...	+	
"shot" ...	—	
"Rapid fire"	—	
	—	
	—	
	—	
	—	
	—	
	—	
	—	
	&c.	

In the above example, if time shrapnel be assumed to burst regularly 60 yards short of point of impact of unburst projectile, the first shrapnel on graze after each change of range would be 85 yards short, and the first time shrapnel 115 yards short.

If the shrapnel be assumed to burst 100 yards short of point of impact of unburst projectile, the first shrapnel on graze would be 45 yards short, the first time shrapnel remaining 115 yards short as before.

The infantry is assumed to advance steadily at 100 yards per minute, but in reality infantry would hardly maintain their maximum rate while under heavy fire. If the rate under fire is taken to be half the above there will be time for 33 rounds at each range, of which 28 will be effective shrapnel. If ordinary fire is used there would be time for 15 rounds.

The range is never changed until at least two rounds are +, as there is always the chance of the first being due to a fuze having been incorrectly set causing the shrapnel to burst on graze.

2nd Example using Time Shrapnel.

Cavalry at regulation gallop (not the charge), 15 miles an hour, 440 yards per minute, or 50 yards in seven seconds.

After allowing 15 seconds for giving change of range and fuze, the time available for fire is 55 seconds, giving eight rounds at each range.

Words of command.	Result.	Remarks.
"2000 yards, fuze 18, shot" ...	+	Fuze 18 is given to ensure bursts on graze for ranging rounds.
"1500 „ „ „ " ...	−	
"1500 „ fuze $6\frac{3}{4}$, rapid fire"	−	These rounds being loaded with fuze 18 will act on graze.
	−	
	−	
	−	
	−	
	+	
"Stand fast" (whistle)	+	
"1000 yards, fuze $4\frac{1}{4}$, rapid fire"	−	These rounds being loaded with fuze $6\frac{3}{4}$ will act on graze.
	−	
	−	
	−	
	−	
	−	
	+	
"Stand fast" (whistle)	+	
"500 yards, fuze 2, rapid fire" (This would be from cavalry magazine.)	−	These rounds being loaded with fuze $4\frac{1}{4}$ will act on graze.
	−	
	−	
	−	
	−	
	−	
	+	
"Stand fast" (whistle)	+	
"Case shot"		
"Rapid fire by sections"	&c.	

In this example, assuming that time shrapnel burst 100 yards short of point of impact of unburst projectile, the rounds acting on percussion will be 200, 150, and 100 yards short. The time rounds being 150, 100, and 50 yards short.

3rd Example using Percussion Shrapnel.

Cavalry at regulation gallop, 15 miles an hour, 400 yards in 55 seconds.

Time available for fire 40 seconds, or six rounds.

In this example all guns load again at once after firing.

Words of command.	Result.	Remarks.
"2000 yards, shot"	+	
"1600 „ „ "	−	
"Rapid fire"	−	Should the enemy be brought to a halt at any of these ranges fire of course continues without a check.
	−	
	−	
	+	
"Stand fast" (whistle)	+	

"1200 yards, rapid fire"	—
	—
	—
	—
	+
"Stand fast" (whistle)	+
"800 yards, rapid fire"	—
	—
	—
	—
	+
"Stand fast" (whistle)	+
"Cavalry magazine, rapid fire"	—
	—
	—
	—
	—
	&c.

In the above example four rounds fall short 200, 150, 100, and 50 yards.

If the time allowed for ordering a change of range could be diminished to 10 seconds and the rate of fire increased to one round in five seconds, which would be quite possible with percussion shrapnel (that is to say, each individual gun fires once in 30 seconds)[1] it would be possible to make alterations in range of 300 yards instead of 400 yards, In this case 30 seconds would be available for fire, and four rounds would fall 158, 111, 74, and 37 yards short.

By the proposed system words of command are reduced to a minimum, and from its simplicity the chance of a mistake or of the C.O. losing his head at a critical moment is much reduced. The conduct of fire can also be taken up by a new commander with a minimum of delay as compared with a more complicated method.

When the enemy is checked, fire continues automatically instead of ceasing, as is the case with any system involving a fixed number of rounds at each range.

The rounds + and on graze are a necessary evil, but the latter, at any rate in the first example would be burst fairly close up, and as an infantry target presents great depth the latter would not necessarily be lost.

If percussion fuze is used against cavalry it relieves the C.O. of all necessity for consulting a range card and enables him to devote his whole time to observation. There is also a far greater power of rapidly opening fire, following an enemy who retreats or changes direction, or changing the objective.

This system stands or falls as regards time shrapnel by the possibility of observing bursts as + or —. This ought always to be easy at short ranges against a broad object such as would be presented on service, and on which effect can be noticed in addition to observing

[1] It may be noted that with the ordinary method of firing at moving objects, if the ranging section fired at the above rate, *i.e.*, each individual gun taking 30 seconds, the enemy would cover 150 yards between each round.

the smoke of the burst (at 1400 yards a burst 60 yards short would be six feet high). This method would, however, be much facilitated by the addition to shrapnel of some substance giving a dense smoke on ignition, possibly in the head of a shrapnel with burster in the base, or in place of the resin used in fixing the bullets.

The above system is practically the same as the first method given in the Field Artillery drill-book of 1889, but so far as I know it has never been worked out in detail or tried at practice.

MEMOIRS

HISTORICAL AND BIOGRAPHICAL.

THE BROME-WALTON FAMILY.

BY

MAJOR AND QUARTERMASTER R. H. MURDOCH, R.A.

(Assistant-Superintendent of Records).

Chapter III.

Battle of Prestonpans.

Before withdrawal from Flanders of the four companies of Royal Artillery, the battle of Prestonpans had been fought (21st September, 1745), in which the English army was utterly routed by the clan regiments, without guns, under the Pretender, with the loss of all our field artillery.

At the outbreak of the Rebellion there was but one company (field train) of Royal Artillery on the Scottish establishment—with the forces commanded by Sir John Cope—armed with eight 4-prs., bronze (termed "brass"), on travelling carriages, and four 5½-inch Royal howitzers (formerly termed "hawbitzers"). This was Captain Archibald Cunningham's company, which now survives under designation of No. 1 Company Western Division R.A., at Bermuda, under command of Major Arthur Tracey.

The 4-pr. bronze gun—which was subsequently to win for the Royal Artillery unique renown at Culloden—had been designed and cast by Schalch, at Woolwich, in 1720[1]; and others in 1738 by Bowen, in London; yet, in June 1740, the field artillery train sent from Woolwich to Windsor (under Lieutenants Flight and Desaguliers) consisted of 3-prs. and 6-prs., as, owing to the excited controversy then raging on the

[1] No. 1 of this casting by Schalch, dated 1720, is now at Windsor Castle among the Royal trophy guns. The castings by Bowen are dated 1738–1742, one of which is in the Museum of Artillery at the Rotunda, Woolwich. The Chevalier de Johnstone, A.-D.-C. to the Pretender, says these were of sufficient calibre "to force houses and petty fortresses" ("Memoirs of the Scottish Rebellion," p. 113). The Chevalier's narratives tally with Ordnance records; but his modern Editor's *notes* are unreliable.

continent as to the merits of the 4-pr.,[1] the Board of Ordnance did not arm the Royal Artillery with this *field* weapon until 1744/5[2]—the 4-pr. *iron* guns, cast in 1715, having been supplied for *garrison* service, under Royal Warrant of 6th July, 1716.

Artillery writers concur in asserting that Captain Cunningham did not belong to the Royal Artillery (because his name is not in "Kane's List"); that the guns at Prestonpans were not served by Royal Artillery, but by "seamen hastily collected from the ships;" and that the guns were lost because the drivers ran away with the horses, led by Cunningham, who was dismissed with ignominy by court-martial.[3] Captain Cunningham was a Royal Artillery officer[4]; had fought at Dettingen, 1743[5]; commanded Royal Artillery at Prestonpans; and accompanied the army (when re-equipped) in subsequent operations: while the Royal Artillery pay lists show that only three "seamen" were attached to the Royal Artillery, and only at Falkirk.[6] The guns were lost at Prestonpans because the drivers ran away with the horses; but the drivers ran away with the horses because the guns were captured and the English army of 10,000 utterly routed[7] by 8000 undisciplined highlanders.[8] Let us confess the truth. The highlanders were invincible, and had not any "Cork Heel'anders" among them; they rushed our guns (Cust, p. 87); with their shields turned the bayonet; and the dragoons fled before the broadswords, leaving the guns behind them (Cust, p. 88). Nothing but guns could overpower these impetuous Highlanders, and, as we shall presently see, the 4-prs. served by ex-Flanders gunners did this dire duty effectually.

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[1] Lieut.-Colonel Hime, R.A., has briefly stated the nature of this controversy in "Proceedings," R.A.I., Vol. VII., No. 3, pp. 136–7. The French adopted the 4-pr. and 8-pr. field guns in 1726, and with these fought at Dettingen and Fontenoy. The English had adopted the 3-pr. and 6-pr. until 1744; Frederick employed 3-prs. and 12-prs. in 1741 ("Proceedings," R.A.I., Vol. VII., No. 7, p. 457). Colonel Hime shows (p. 461, *note*), that Napoleon I. suppressed the 4-pr. in the Italian campaign in favour of the 6-pr. In a MS. official return, among Sir Alexander Dickson's papers, dated 14th January, 1814, only two French 4-prs. are shown as captured in the depôt at Arrauntz. The English suppressed the 4-pr. in 1746–7.

[2] The 4-pr. *bronze* field train was peculiar to Scotland; and has never been employed in war by Royal Artillery elsewhere. It was "laid up" in Edinburgh Castle in November 1722 ("Cleaveland MSS," p. 202); but was not "fitted up" until by Captain Cunningham, January 1745 (R.A. "Pay List").

[3] "England's Artillerymen" (Browne), p. 13; "History of Royal Artillery" (Duncan), Vol. I., p. 128; "Mobility of Field Artillery" (Hime), "Proceedings," R.A.I., Vol. VII., No. 3, p. 143, note.

[4] Cadet-Gunner, November 1729; Lieutenant-Fireworker, March 1737; 2nd Lieutenant, 1st January, 1740; Captain-Lieutenant, 1st September, 1741; Captain, 1st January, 1744; Cashiered, May 1746—*vide* R.A. "Pay Lists" in R.A. Record Office. (His brothers, George and William, were Artillery and Engineer Officers).

[5] R.A. Muster-Roll, 1743; Flanders Roll, *ibid.*

[6] Pay list of Cunningham's company, 1st to 31st January, 1746:—"To Cash paid to 1 sergeant, 9 soldiers (infantry), and 3 sailors, that served as additional gunners at Falkirk, by order of General Hawley, £2 4s."

[7] "The Dragoons fled before the broadswords, leaving the guns behind them" ("Annals of War," 1746, p. 88). By Royal Warrants, 1746, five regiments alone had "broken and lost at Prestonpans and Falkirk" 1433 musquets and bayonets, 73 halberts, 45 drums, 268 pairs of pistols.

[8] Russell's "Modern Europe," Vol. II., p. 418.

Siege of Carlisle.

After loss of its guns at Prestonpans, Captain Cunningham's company was sent to London (Tower and Woolwich) for re-equipment;[1] rejoined the army at Newcastle[2]; and joined in the siege of Carlisle, on 29th December, 1745, whither General Hawley had brought also six 18-prs.—ship guns, from Newcastle, probably manned by the Navy[3]—much to the astonishment of the Scottish garrison, who thought that Cumberland had now not any artillery.[4] In Carlisle fort were recovered the Prestonpans guns and howitzers, which the Scotch, in retreating northwards, had left behind with the garrison of Carlisle (the 4-prs. alluded to in "Annals of War," p. 91), and also three of the six Swedish field pieces, with detachment of French gunners, disembarked at Montrose on 11th October[5]; and General Hawley (to whom the Duke of Cumberland had handed over the command) then marched in pursuit of the Scotch, whom he overtook at Falkirk, on 17th April, 1746.

Battle of Falkirk.

Artillery were not in action at Falkirk, on either side—the Scotch having left the seven Prestonpans 4-prs. and three Swedish field pieces in Carlisle; while Cunningham's new guns failed to come into action through getting stuck inextricably in a bog on the field.[6] The highlanders made short work of the English infantry and cavalry, under General Hawley, of whom 400 were killed: the whole battle did not last much above half-an-hour. The dragoons fled into the same bog where the artillery lay engulphed. It was at this crisis that Captain Cunningham appears to have given the order to forsake his guns (which again fell into the hands of the rebels), and headed the flight referred to in "Proceedings" R.A.I., Vol. VII., No. 3, p. 143, note 5, for which he was sent prisoner to Edinburgh, and cashiered, on 25th April, 1746, by sentence of General Court-Martial at Perth,[7] having

[1] A pontoon equipment, of 8 pontoons and spare carriages, proceeded also, under Lieutenant and Bridgemaster N. Marsh. (Voucher of 10th January, 1746, attached to R.A. pay list).

[2] By R.A. pay lists, endorsed "October to December, 1745," the route was *vid* Dunstable, Doncaster, Northampton, Newcastle. Clearly, no blame attached to Captain Cunningham at Prestonpans; and the story narrated by Cust (p. 87), and repeated by artillery writers, refers to Falkirk, subsequently.

The pay lists also contain charges for hire of wagons to convey the small-arms and gun detachments—to expedite the march.

[3] "The *ship guns* having been taken from Newcastle, General Wentworth requires 100 wall pieces in lieu." (Letter from the Duke of Newcastle, Whitehall, to the Master-General of y^e^ Ordnance, 17th February, 1745-6).

[4] "Annals of War," 1745, p. 94.

[5] *Ibid*, p. 94, "Memoirs of the Scottish Rebellion," by the Chevalier de Johnstone, 2nd edition p. 54.

[6] *Ibid*, p. 96: but the Chevalier de Johnstone's account (p. 128 of his Memoirs) is that the English were unable to avail themselves of their artillery during the action, and to carry it away with them in their flight, and "we found next day *ten* field pieces (*i.e.* the seven 4-prs. and three howitzers) half way up a hill, not having had time to be drawn up to the top."

[7] Several officers of the Royal army were likewise cashiered, and many soldiers sentenced to be shot. One of these execution parades, at Perth, gave occasion for the interesting foot note on p. 246 of "Cleaveland MSS.," relative to precedence of Royal Artillery with other Arms, which requires correction:—*For* 15th April, 1756, *read* 3rd April, 1746; *for* Major-General T. Pattison, *read* Major James Pattison. The Duke of Cumberland died in *1753*. The Major-General Brome was *Joseph Brome*, the Culloden Adjutant. "3rd April, 1746. Parole, Northampton:—It's the Duke of Montagu's orders that Colonel Belford write to Captain Pattison to acquaint General Bland it's H.R.H's. commands that the Artillery take the right of all Foot on all parades, and likewise of Dragoons when dismounted."

been "fetched from Edinburgh to Montrose by Sergeant Bristo and four men by ferry."[1] The command of the company was taken over, temporarily, by the Captain-Lieutenant, John Godwin, who re-equipped it (with its former 4-prs. and howitzers, re-captured at Carlisle in which were also many cavalry horses fully accoutred) and fought it at Culloden under Captain and Brevet-Major Borgard Michelsen.[2]

On arriving in the Thames from Flanders, in December 1745, the four companies Royal Artillery proceeded to Woolwich to take over the new equipment (4-pr.), and while the sick and disabled officers and men, and the head-quarters of three of the companies, were left at Woolwich—among the former being Colonel T. Pattison, Capt. *Charles Brome*, &c.—the fourth company, Captain Mace's, was quadrupled by sub-divisions from the others, and sent to the North with 16 field pieces as battalion guns,[3] which arrived by sea at Newcastle on 16th January, 1746—too late for Falkirk—and marched to Aberdeen to effect junction with the Duke of Cumberland (who had arrived to supersede General Hawley), with whom they marched and countermarched until the battle of Culloden, near Inverness.

Battle of Culloden.

The battle of Culloden was fought on 27th April, 1746 (16th April O.S.)—the last battle fought on British soil. It is not possible for any one who is unversed in the contemporary original records to realise how accurate are the descriptions given in Russell's "Modern Europe" (Vol. II., pp. 414 to 421), and in Hume (pp. 604–5), of the neurotic panic of England after the defeats of Prestonpans and Falkirk, relieved only by the impetuous courage of George II. and H.R.H. the Duke of Cumberland. Culloden was to decide whether the Dynasty should remain with the House of Hanover, or be wrested by the House of Stuart, and that decision was to be given, for a second time in domestic history, chiefly by the Royal Artillery.[4] "No victory was ever more complete, nor any more important in its consequences" (Russell, Vol. II., p. 421), except Minden and Waterloo. The Royal troops consisted of eight battalions of infantry (including the 1/34th regiment, now quartered at Woolwich as the Border Regiment, who were on the right of the second line), and three regiments of cavalry, in all about 8000, armed with the n.p. bayonet musquet, with iron

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[1] Voucher attached to pay list of Cunningham's company for quarter ended June 1746. The same voucher contains the following melancholy item:—"30th June. To attendance, nursing, and damage done ye bedding by Sergeant Ed. Bristo, deceased, during the time he lay ill of his wounds (received at Culloden), £2 6s. 0d."

[2] The Colonel John Godwin, who commanded R.A. during latter part of the great siege of Gibraltar. His portrait is in front west room of R.A. Institution. Ancestor of Colonel C. E. S. Scott, R.A.
R.A. Pay lists 1746.

[3] "England's Artillerymen," p. 13.

[4] Charles II. was restored by Colonel Monck, then Lieutenant-General of the Ordnance, with his gunners and the coldstreams. Colonel Monck was created Earl of Albermarle; but the office of Lieut.-General of the Ordnance has been allowed to lapse. The late General Sir Robert Gardiner, G.C.B., in his appeals to have the Royal Artillery represented as a *corps d'élite* among the Guards of the Sovereign, omitted these two important historical considerations. The Chevalier de Johnstone states that the victory at Culloden was almost entirely owing to the English artillery. ("Memoirs," p. 112).

ramrod. The Royal Artillery consisted of, on the right, the permanent field train, armed at this time with seven 4-prs., commanded by Brevet-Major Borgard Michelsen and Captain-Lieutenant John Godwin[1]; and the sixteen 4-pr. battalion guns, from Woolwich, of Captain Mace's composite company[2] with the eight battalions: the whole under command of Brevet-Colonel William Belford, with Lieutenant and Adjutant *Joseph Brome*, and Lieutenant and Quartermaster Charles Stanover as his Staff Officers.[3] These are the guns which at Culloden "were so exceedingly well plied that they made dreadful lanes through the clan regiments" ("Annals of War," Cust, p. 101); "served with so much skill and promptitude as to contribute not a little to the triumph of that memorable day" ("Military Antiquities," Grose, 1783 ed., Vol. II., p. 212); "the well served guns of the English, which overpowered the impetuous bravery of the highlanders" (Chambers's "Encyclopædia," article "Culloden"), "who were received upon the point of the bayonet, galled by an unexpected fire of musketry, and blown into the air by the artillery" ("Modern Europe," Russell, Vol. II., p. 420).

From the instances in R.A. pay lists of gun detachments "blown up on the march to Culloden," it would appear that at Culloden the artillery came into action with fixed ammunition—a practice common in Flanders and Germany during the Seven Years' war, when the rapidity of fire with field pieces exceeded that in the Crimea[4]; and, according to Lieutenant James's "Book of Artillery," 25th March, 1722, round shot and grape were employed[5]—as case shot cannot be traced in 1746, nor before the rise of the *Tovey* family R.A.

The rebels mustered about 8000, according to the account rendered by Monsieur Patullo, the Pretender's muster-master; and although these, with only 1½-prs. and o.p. snaphance or dagger muskets, scythes, &c., were opposed to like numbers of the finest troops in Europe, chiefly veterans from Dettingen and Fontenoy, Prestonpans and Falkirk might have been repeated at Culloden but for our superiority in artillery and a skilfully executed flank attack by Colonel Belford, R.A. and his Adjutant (Lieutenant Joseph Brome), who detached four guns from the right, broke down a walled enclosure, and getting upon the rear of the

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[1] *i.e.*, the Captain Cunningham's company of Prestonpans and Falkirk, whose second in command was Captain-Lieutenant John Godwin. This company is at present serving in Bermuda, under designation of No. 1 Company Western Division R.A., commanded by Major Arthur Tracey.

[2] This company was broken up in December 1748.

Sir Ed. Cust, in "Annals of War," p. 91, accounts specifically for only the 4-pr. equipment (then in possession of the rebels) of the permanent field train (Cunningham's, *i.e.*, Michelsen's, company) of 1745, and not that of 1746 (p. 101).

[3] R.A. pay lists, 1746.

[4] "Proceedings," R.A. Institution, Vol. XX., No. 2, p. 123, and foot note.

[5] Lieutenant James, R.A., was at Culloden. His widow died while Matron of the Royal Military Academy. His remarkable work, on vellum, is in possession of General Sir Collingwood Dickson, V.C., G.C.B.

Since penning the grape shot hypothesis, I find that this is specifically confirmed by the Chevalier de Johnstone on p. 190 of his "Memoirs."

The "History of the Royal Artillery," Vol. I., p. 129, is incorrect in stating that we had 3-prs. and 6-prs. in the field in Scotland. The author transcribed the statement from p. 304 of the 1833 edition of the "Waverly Anecdotes," in which Sir Walter Scott also asserts that we had 30 field pieces!

rebels "literally swept away, at once, whole ranks."[1] Neither the Chevalier de Johnstone, who at Culloden was attached as Captain to the rebel regiment of artillery, nor any other reliable historian, gives the number or calibre of the French field pieces with the Scotch; but voucher attached to R.A. pay lists, dated 2nd May, 1746, explains that at Newcastle, alone, there were then on charge "8 *one-and-a-half guns*, 16 basket carriages, 3 other travelling wagons, 29 tumbrils, 4 ammunition carts, 1 spare carriage with 1 spare wheel and axletree, 21 spare wheels and axletrees, and 300 prisoners, taken at the late action (Culloden) and surrendered themselves since": while the Ordnance Warrants book (1711—1749) describes the musquets captured from the rebels as "useless, on account of not being properly fitted with bayonets" (*i.e.*, the o.p. snaphance or dagger musquets[2]). The 3rd regiment ("The Buffs") took post at Culloden on the right of Mordaunt's division; and p. 179 of the History of this regiment states that "eighteen pieces of cannon, with all their utensils," were captured from the rebels.

Nearly 3000 fell on both sides in this sanguinary battle—equally distributed among the contending armies—the Royal Artillery losing in officers, non-commissioned officers and men, 10 killed, 23 wounded, 6 missing[3]; and commissions as officers were profusely bestowed by the King upon the non-commissioned officers of Royal Artillery for distinguished conduct in the field during the rebellion.

After the complete subjugation of Scotland, Perth became the army head-quarters of the northern division of the permanent Scottish establishment, including the original field train of artillery—the R.A. being left under command of Major James Pattison; and the Hessian infantry and cavalry (no Hessian artillery)—who had remained in garrison in Edinburgh, and did no fighting since arrival from Flanders—were at once re-embarked at Leith to rejoin the Allied army in the Netherlands; but H.R.H. the Duke of Cumberland withdrew to England, in May 1746, all the ex-Flanders Royal troops, including artillery—in view to resumption, in the spring, of active operations with the Allied army in the Netherlands—and encamped them temporarily at Windsor.

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Expedition Against Port L'Orient.

In the interval between suppression of the Scottish rebellion and resumption of the Austrian Succession war, active employment opened to Captain-Lieutenant *Charles Brome*, of Captain Mace's company, as "Captain Extraordinary," under Captain Chalmers, R.A., in the Expedition against Port L'Orient, Brittany, under Lieut.-General St.

[1] Chevalier de Johnstone. "Memoirs," p. 190. The scythemen attacked cavalry, by chopping the horse's nose, which made the poor brute instantly wheel about, exposing the rider to be mercilessly cut down.

[2] The siege train supplied to the Pretender's army, by France, consisted of two 18-prs., two 12-prs., two 6-prs. (heavy), but no mortars: these were employed at the siege of Stirling Castle. "Memoirs of the Rebellion," by Chevalier de Johnstone, pp. 119, 113. The Chevalier adds that field artillery, "instead of being useful (to the Scotch), was, on the contrary, a great embarrassment, by continually retarding our marches."

[3] *London Magazine*, 1746, p. 234.

Clair, which began and ended in September 1746, as one of a series of futile attacks upon the French coasts, in retaliation for the French harbouring of the Pretender.

A brief account of this expedition is given on pp. 15–6 of "England's Artillerymen"; but that author has gone too far in asserting that the incompetent Engineer, Mr. Thomas Armstrong, who was unhappily appointed "Commander-in-Chief of the Train of Artillery" commanded by Captain Chalmers, R.A., had "never been on any previous expedition"[1]: he meant rather "had not held any Rank." The following is memo. by General Sir Alexander Dickson, which properly explains the incident:—"The company detached on the expedition of 1746 was commanded by Captain Chalmers, R.A., one of the most able and accomplished officers of the regiment. He and the artillery train were put, by express orders of the Master-General, under command of Mr. Armstrong, the Chief Engineer, who had not at that time, nor ever had before or since, any Rank in the army—for the corps of military engineers had no military rank nor title till the year 1757."

Judged by the large and costly *personnel*, the ordnance and *matériel* must have been extensive: but the Royal Warrant of 7th May, 1746, approving of the "ordnance, mortars, and stores" (originally destined against Louisbourg), has merely a note "for the proportion, see rough estimate book;" and that book cannot now be traced.

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The period from resumption, in autumn 1746, of the Austrian Succession war until the close of that war by the Peace of *Aix la Chapelle*, in 1748,[2] was barren of international interest, notwithstanding the sanguinary battles of Val or Laffeldt and Rocroux, and the famous sieges of Bergen and of Maestricht—in which the Royal Artillery, while adding everywhere to its renown, suffered heavily in killed and wounded, and by dreadful hardships and diseases ("History of R.A.," Vol. I., pp. 131–134). The aged Colonel Thomas Pattison did not take the field, but delegated the command of the Royal Artillery with the Allied army to Colonel William Belford, whom he had imbued with a double portion of his spirit, and who took out with him, in July 1746, as Adjutant, Lieut. *Joseph Brome*, followed by Captains *Charles Brome*

[1] Royal Warrant, 3.6.1740—Mr. Thomas Armstrong to be "one of the engineers" of the Train commanded by Colonel Jonas Watson, R.A., for expedition to the Spanish West Indies.
" " 15.9.1741—Mr. Thomas Armstrong promoted "Chief Engineer" to attend the Train, *vice* Moore, deceased, in West Indies.
" " 13.4.1746—Mr. Thomas Armstrong to be "First Engineer and Commander-in-Chief of the Train," under Hon^ble^ Lieut.-General Jas. St. Clair.

[2] One of the mortars employed in firing the Royal Salute in London for the Peace of *Aix la Chapelle* is now in the Museum of Artillery at Woolwich. It has nine bores, chambered, calibre 7·25-in.; weight, 47 cwt. 3 qrs. 14 lbs. The others would appear to have done duty, unchanged, at the Gun House of St. James's Park for all Royal salutes, until the year 1881 (when a troop of Royal Horse Artillery was ordered from Woolwich to St. James's Park to fire the Royal Salute). These historical pieces (small Royal mortars and cohorns) were sent to Woolwich Arsenal a few years since—when the Gun House was about to be demolished—and are being enquired after. Lieut.-Colonel J. T. Ritchie, R.A., War Office, adds: "We fired the Royal salutes from the chamber pieces at St. James's Park until 1880, when H.R.H. decided that a troop of R.H.A. be quartered in London; and G/C Brigade came up accordingly, and fired the salutes in 1881."

and Samuel Cleaveland as "Captains Extraordinary"[1] in the spring of 1747.

The command-in-chief of the Anglo-Hanoverian-Austrian army was at first bestowed upon Prince Charles of Loraine, a professional soldier, but no match for the opposing genius of Marshal Saxe, who commanded the Franco-Prussian army: but H.R.H. the Duke of Cumberland succeeded to the chief command in July 1747.

The period is, however, possibly the most noteworthy in the history of development of the Royal Artillery.

Although in the Seven Years' war England changed sides from the Austrian to the Prussian alliance, it was fortunate for the R.A. to have been allied to the former during the wars of the Austrian Succession—as at that time Austria was the foremost artillery power in Europe[2]; and the successive equipments of our field artillery were consequently after the Austrian, and not upon the French nor Prussian systems.

Galloper guns, and, subsequently, the continental movement in favour of larger calibres, are generally credited to the genius of Frederick the Great and to the exigencies of the Seven Years' war; but let us reflect upon the facts of the English Board of Ordnance having, so early as March 1725, approved of Lieut. James's scheme of 6, 4, 3, and 1½-pr. gallopers[3]: the rejection in 1742, by Col. Thos. Pattison and Adjt. Joseph Brome, of the 1½-prs. of the Marlboro' era and substitution of 3-pr. battalion and 6-pr. position guns for the Flanders campaign (1742–5); the absolute adoption of the 4-pr. as the happy mean for field artillery in Scotland, 1745–6; and now, again, on resumption of the Austrian Succession war, in 1746–7, the re-organisation—in the hands of Col. Belford and his Adjutant, Joseph Brome—of the battalion gun system,[4] the introduction of limbers and limber-boxes, the brigading of field artillery,[5] and the organisation of a field artillery equipment which, in calibres and ammunition, will bear comparison with those in the Peninsular or Crimean campaigns.

We are willing to admit that the *guns* of the early days of artillery equalled any which we could produce in the Crimea—because the guns survive to bear witness of themselves; but the tone of the criticisms upon the *gunners* of those days, by moderns, perhaps savours a little too strongly of "the temple of the Lord, the temple of the Lord are We"—a prejudice which would be toned down somewhat by calm, dispassionate, study of original contemporary records of the periods. The history of artillery *matériel* is, in fact, one of successive cycles of larger progression and lesser retrogression: but that an immense stride forward has been made since the Crimea goes beyond question.

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[1] The term employed on p. 189 of the King's Warrants book, 1711–1749.

[2] "Proceedings," R.A. Institution, Vol. VII., No. 3, p. 141.

[3] Lieutenant James's "Book of Artillery," Schedule K, in possession of General Sir Collingwood Dickson, V.C., G.C.B.

[4] The original *MSS.* order, signed by Brigadier-General Belford, to officers R.A. appointed to the battalion guns is deposited in the R.A. Institution, No. 194.

[5] *MSS.* Official return of the R.A. as "brigaded" is dated 11th September, 1747, and is deposited in R.A. Institution. Copy of it is now subjoined, marked "B."

It would be both tedious and unprofitable to discuss the many variations of the train of artillery, pontoons, and stores, from embarkation under Royal Warrant of 8th July, 1746, until finally established under Royal Warrant of 22nd March, 1747/8—at which latter date the *personnel* and *matériel* were as subjoined:—

"Account of the Officers, Engineers, Ministers, Artificers, Ordnance and Habiliaments of War, of which the Train of Artillery consists." Royal Warrant 22nd March, 1747–8:—

A.—Order for marching R.A. Bois le Duc, April 12th, 1747. N.S.—in handwriting of Lieutenant and Adjutant Joseph Brome—is in R.A. institution. *MSS.* No. 184.

B.—Abstract of the officers and men of the R.A., as appointed to y^e^ respective *brigades of guns*; as also the proportions of ammunition in y^e^ waggons with them. 11th September, 1747.

Nature of Guns.	Number of guns.	Rounds of Ammunition. With round shott.	Q.F. round shott.	Grape shott.	Total.	Rounds of ditto for howitzers. Fixt shells.	Unfixd shells.	Grape shott.	Total.	Captains.	Lieutenants.	Sergeants.	Gunners.	Matrosses.	Total.
12-prs....	6	80	5	28	113	...	...	...	...	2	3	6	23	37	71
10 "	3	100	13	15	128	...	...	...	...	1	1	3	6	21	32
9 "	6	75	5	30	110	...	...	...	...	2	2	6	17	37	64
6 " ... ...long	8	85	5	39	129	...	...	...	...	2	4	8	16	48	78
6 " ... short	12	...	10	70	80	...	...	...	...	...	6	12	12	60	90
6 " ... Saxon	6	...	25	39	64	...	...	...	...	...	3	5	10	20	38
3 "	5	55	7	56	118	...	...	...	...	...	2	3	5	25	35
8-in. howitzers.	2	...	...	...	...	10	30	10	50	...	1	3	5	2	11
Royal mortars ...	6	...	...	...	...	20	20	...	40	...	...	...	...	..	...
Total	54	395	70	277	742	30	50	10	90	7	22	46	94	250	419

C.—Five companies of the Royal Artillery, each consisting of 115 officers and men, and 2 Captains Extraordinary, viz.:—

(1.) Brevet-Colonel Belford's—ex-Dettingen, Fontenoy, Culloden—now 5 Company Southern Division R.A., at Rawal Pindi.

(2.) Major Michelsen's—ex-Dettingen, Fontenoy, Culloden—now 3 Company Western Division R.A., at Halifax, Nova Scotia.

(3.) Capt. Williamson's—ex-Dettingen, Fontenoy, Culloden—now 5th Field Battery R.A., at Belgaum.

(4.) Capt. Ord's
(5.) Capt. Chalmers' } which were broken up in the Netherlands, Dec. 1748.

A brigade of 16 engineers, 1 draughtsman, and a company of miners of 42 men.

STAFF.

Lieut.-General of Ordnance (Duke of Montague)	1
Lieut.-Colonel and Comptroller (Belford)	1
Major (Michelsen)	1
Adjutant (J. Brome)	1
Quartermaster	1
Chaplain	1
Surgeon and Mate	2

MINISTERS.

Commissary of Stores	1
Clerks (of Stores, &c.)	8
Paymaster and Assistant	2
Commissary of Horse and Assistants	3
Conductors	13
Bridgemaster...	1
Pontoon N.-C.O's.	3
Provost Marshal and Assistant	2
Kettle Drummer and Driver	2

ARTIFICERS.

Artificers, various (detailed)	24

In addition to the following, fourteen 3-prs., bronze, had been embarked with battalions, in July 1746; but these were taken from charge of regiments, by Colonel Belford's re-organisation, for charge by Royal Artillery with the regiments.

Brass Ordnance.	Shott. Round.	Shott. Grape.	Shell.	Match.	Horses.	Waggons.	Carts. Ammunition.	Carts. Tumbrils.	Carts. Forge.	Pontoons.	Kettle Drum. Drums.	Kettle Drum. Chariot.
12-prs. ... ... 6 ...	250	47	...	21 cwt.	1680	270	20	2	2	With carriages, baulks, chesses, oars, anchors, cordage, &c. 45	1 pair. With banners, harness, &c.	1
9 " ... ... 6 ...	216	42	...									
6 " long 14 / short 44	260	200	...									
8-in. Howitzers ...	...	20	200									
5½-in. Mortars	...	...	400									
The guns with trail carriages, limbers, elevating screws, ladles, spunges, harness, and everything necessary.			Also 6000 Hand Grenades									

	Shott (tons)	Flints.	Musquets with Bayonets.	Fine paper for Small-arms.	Tools. Entrenching.	Tools. Artificers.	Spare. Gun carriages.	Spare. Mortar beds.	Spare. Limbers, &c.	Spare. Wheels.	Spare. Axletrees.
Musquet	67	244,630	1800	108 Rheams.	1700 various.	58 various.	8	1	34	30	30
Carbine	2	5657									
Pistol	1	20,570									

Deductions from the foregoing, too numerous for recapitulation now, will occur to every thoughtful artillerist.

War drifted to an end by the Treaty of *Aix la Chapelle*, 11th March, 1748; the R.A. were withdrawn to England in December, and took part in the national rejoicings, review by the King in Hyde Park, salutes and "fireworks of triomph" in the Green Park.[1] Large reductions of the army ensued; and two of the Flanders companies (Ord's and Chalmers') were broken up, detachments from these being sent to the North for distribution among the forts.

War services too numerous for quotation here.

Capt.-Lieutenant *Charles Brome* was rewarded, by G.O. 13th March, 1749–50, with the command of R.A. at Annapolis Royal; attained the rank of Captain on 8th March, 1751; and was then appointed as the first Commandant of the recently acquired Nova Scotia.

Dettingen, Fontenoy, Culloden, Val (Laffeldt), Rocroux, Bergen, Maestricht.

As reward for his long and distinguished services as an officer in the field, the Adjutancy of the Royal Artillery, without purchase,[2] was conferred upon Lieutenant *Joseph Brome* by the following G.O. 31st Dec., 1749:—"The Lieut.-General and principal officers of His Majesty's Ordnance having been pleased to appoint Lieutenant Joseph Brome as Adjutant to the Royal Regiment of Artillery, order that he be obeyed as such." His several promotions had been Lieutenant-Fireworker, 1st February, 1742; 2nd Lieutenant, 1st April, 1744; 1st Lieutenant, 2nd October, 1745. He was further promoted Captain-Lieutenant on 1st September, 1751, and on attaining the rank of Captain, 1st April, 1756, Capt. Joseph Brome resigned the Adjutancy (being succeeded by Lieutenant Forbes Macbean) in order to take over command of his company, at Woolwich; and in 1757 his aunt, Mrs. Hickes, the life tenant of Charfield, having died, he obtained absolute possession of the manor and freeholds of the Charfield estates.

* * * * * * *

Before dismissing the subject of the Royal Artillery in Flanders, it is necessary to open up two delicate topics—not only (*a*) to remove an unjust aspersion upon a certain class of R.A. officers that has obtained credence until now; but also (*b*) to clear the path of regimental history to future explorers.

On p. 236 of the "Cleaveland MSS." occurs the following item:—"The regiment of Artillery owes much to the memory of Col. Belford and Major Borgard Mitchelson (should be Michelsen) for their zeal and diligence and their influence during the campaigns of 1747/8, when they commanded in Flanders—for the corps then began to emerge from that state of oblivion and obscurity in which it had hitherto remained. It now began to bear a regular military appearance; great attention was paid to good order, strict discipline, and subordination—a change that was far from agreeable to the older officers, who, *being promoted from the ranks*, had grown up with erroneous notions and bad habits, inconsistent with any military system; but the junior officers, who of late had been promoted from the cadet company, being of a different stamp and better educated, and being now the majority, entered with great zeal and military spirit into the newly adopted alterations and improvements introduced by these two officers."

(*a*) There is not any single brick of the edifice of artillery history that has so often been made use of, in some half dozen separate

[1] For the ordnance employed for salutes *see* note 2 on page 481 hereof.

[2] By B.O. letter books of this period, the appointments of regimental Adjutant and Quartermaster were usually obtained by purchase—so much as £800 having been paid on one occasion. Each appointment had to be vacated on promotion to Captain.

regimental publications; and it has even been engrafted, with other errors, into the "Records of the Royal Military Academy" (p. 6): otherwise this squib fired from the hand of a young subaltern of less than two years' service—fresh from the walls of the new academy[1]—at the heroes of Dettingen, would be as unworthy of notice as it is directly contrary to the sentiments of both Colonels Belford and Cleaveland, expressed in semi-official letters to the Board of Ordnance. Col. Belford's letter is given in full on pp. 20–1 of "Essay on Early Artillery" by Colonel Miller, V.C., but no other writer has reproduced it. The source of the infelicitous passage is the anonymous *MSS.* Journal in R.A. library, No. 997, entitled "Memoirs of the Royal Regiment of Artillery from 1743," commonly quoted as the "Forbes Macbean MSS." The only officer of R.A. who was charged with disobedience or misconduct in Flanders had not graduated either from the ranks or from the academy, but had obtained a direct commission, *vide* "History of the Royal Artillery," Vol. I., p. 133), and "Kane's List."

(*b*) It is necessary, also, to invite attention to the fact that the whole of the folios of the so-called "Cleaveland MSS." from p. 228 (1742) to p. 242 (1754)—which include the objectionable passage—are *not* Colonel Cleaveland's notes, but mere interpolations, being literal transcripts from the before-mentioned Journal (innocently inserted, by the revising editor, to replace missing Cleaveland folios). The meagre admission, in foot note (1) of p. 228 of the "Cleaveland MSS." is insufficient to guard the ordinary reader from this misuse of Colonel Cleaveland's name; and the sources of regimental history cannot be guarded too jealously?[2]

The "Forbes Macbean Journal" purports to begin at 1743, while the fourth para. of its opening page proves that it was penned in 1783; it omits altogether Dettingen, Fontenoy, Scotch rebellion, battles and sieges of the campaigns in Flanders (1746–8), Minden (1759), &c.; stops short at 1779; is full of errors in matters of detail; and is not for one moment to be weighed in the balance with the "Cleaveland MSS."

(*c*) The professional rivalry of the "Practitioner" and "Theorist" officers of the period is tersely summed up as follows in original *MSS.* of a proposed treatise on fortification, in 1743, by General Sir William Green, *Bart.* (R.E.),[3] who had served through both campaigns in Flanders:—"The 'Practitioner' thinks that the 'Theorist' understands not the least thing, and that all his theory is nothing but a chimera which never can nor will be put in practice. On the contrary, the latter looks upon the former with the utmost disdain, as a set of stupid people and so obstinate withall as not to be convinced of their ignorance."

[1] Lieutenant Forbes Macbean entered the newly founded academy as cadet-matross in 1743, and obtained his commission only in 1745—*vide* "Kane's List."

[2] It is regrettable that the editing of the "Cleaveland MSS." has stopped short at 1757, unfortunately and unnecessarily.

[3] It is surprising that the extraordinary war services and scientific attainments of this very distinguished Engineer—from the opening of the Flanders campaign of 1742 to close of the great siege of Gibraltar (at which Sir William Green was Engineer-in-Chief)—do not appear to have been embodied in a Memoir. Lady Green's diary during the siege would complement many of the gaps in "Drinkwater's History." General Sir William Green was grandfather of Major-General O. H. A. Nicolls, present Commandant of Woolwich Garrison.

(To be continued.)

PRACTICAL HINTS ON THE SELECTION, TREATMENT AND TRAINING OF AUSTRALIAN REMOUNT HORSES IN INDIA.

BY

MAJOR J. HOTHAM, R.H.A.

As many of my brother officers are constantly coming out to India and taking over batteries horsed with Australian horses, perhaps a few hints as to the selection, management and training of Australians may be of use to them. I have therefore tried to put on paper my own experiences on these subjects.

The young Australian horse, for the first twelve months after his arrival in India, is a very delicate animal, and can easily be ruined both in constitution and temper.

Twenty years ago a very rough, coarse, under-bred lot of horses were imported for the Artillery, and on an average, five out of every twenty would be a buck-jumper, and give no end of trouble; now, on the contrary, few have this failing; the horses are far better bred than those in the home batteries, and although more spirited and not quite so steady in the ranks, or so easy to ride at first, are, if treated well from the beginning, the best, kindest and hardiest troopers in the world.

I have seen most European services, but I have never seen batteries horsed as are our Royal Horse Artillery Batteries in India.

Selection.

Although as a rule the Government Remount Agents at the depôts, who buy and select from the shippers, send off drafts to the different batteries to meet their demands, still it may often happen that a Major can manage (if he has the will) to go down to the depôt and look round for himself, he may also by chance be asked to assist the Remount Officer to select Artillery horses at one of the ports of disembarkation.

Now, it is but few men who have instinctively an eye for a horse, and though many a man may try to cultivate this gift, unless it be bred in him he will never thoroughly acquire it.

Again, it is very hard, even for good judges to tell at a glance, without long practice, what a young, raw, grass-fed, half-starved colt will grow into.

The most difficult of all horses to select are wheelers, especially for the Horse Artillery; you want blood, power, pace and stamina combined as far as possible. In selecting from a batch of raw four-year

olds that have been a month at sea, and are in many cases in wretched condition and much knocked about, you are very apt to overlook the real gun-wheelers and take animals, as such, that in twelve months will turn out too big and coarse for anything but Field Battery wagoners, and probably too heavy even for them, for the extent to which these horses will grow and thicken, even in six months, is almost incredible.

I have now, in the battery I command, some six or eight horses I selected three months ago, at the selection of which, for wheelers, the Remount Agent himself was rather astonished, and they have, in that short period, almost realised my expectations. You must therefore look for limbs, not bodies, good backs, short cannons, and breadth between the hips; if they are as thin as rails at the time, never mind if they have good heads and eyes, and clean, not hairy, legs. Height, from 15 hands 1½ inches to 15 hands 3 inches.

Gun-leaders and centre horses are easier to choose, but here again avoid very leggy ones with long shanks and pasterns. A pair of unfurnished five-year old wheelers will often make excellent centre horses for a season. I am, in my own battery at the present moment, working two pairs of young horses as centre horses on short days, and at driving drills, which next season will have developed into grand wheelers, having been broken already as such; and I have, this season, put two pairs in the wheel permanently that were running in the centre last year. In Field Batteries, I hold, there should be no such thing as what is commonly called a centre horse; a gun team should be composed of a pair of leaders and two pairs of wheelers, not hairy-legged, coarse brutes with pendulous lips and overhung eyes, but short-legged, active, clean-limbed horses of the coach horse stamp. I carried this out in the Field Battery I commanded for four years at home, and constantly interchanged my wheel and centre horses. At Okehampton, in 1891, the horses of my battery were by far the smallest horses in the camp, but I fancy they moved as fast as any, and I am sure they looked as well as any; they never knocked up, and after a march of 650 miles and three weeks in camp on Dartmoor, we marched into Newcastle with every horse in his proper place, never having left one on the way.

All detachment and riding horses should be capable of going in the guns, and be broken to do so; no horse should be selected that is not fit for that purpose. Ting-tang, leggy horses, with long cannons and pasterns, are to be eschewed, and in my opinion no riding or detachment horses should be above 15 hands 3 inches. They are easier horses for the gunners to get on and off, and stouter horses than the leggy ones.

Finally, in making your selection go for good limbs, backs and loins, never take a horse with a bad head if possible, or with long cannons and pasterns; you cannot of course get everything at the price, but above all go for blood.

Treatment.

The yearly batch of remounts will arrive about the beginning of the month of April; if you have not seen them before do not be dis-

gusted with them at first; after three or four days in the train at that time of year they will look their worst.

It must be borne in mind that these horses are arriving young, weak and unacclimatised, and their feeding and treatment at first must be very carefully supervised. If Government would make arrangements to keep all their remounts a full year at the depôts before sending them to regiments and batteries, it would, in the end, save enormously by so doing, for many a horse is ruined by having to be worked before he is acclimatised and fit to do so. Some few horses do get so kept, and at the Oossur depôt some years back, the young stock were nearly all there a year before being sent out, and benefitted greatly thereby, but, unfortunately, at the present time the horses are mostly issued some four or five months after their landing in the country.

On their first arrival, therefore, you cannot work them much, for they are too poor and weak, and you cannot feed them highly, especially on gram, or they will at once get bilious or be purged. The ration grain given in India is gram or coolthi (both of the vetch tribe, and very heating), this feeding is entirely new to Australian horses, and must at first be very sparingly given to them for the above reason. I recommend a diet of 3 lbs. of boiled barley, 3 lbs. of gram and 4 lbs. of bran for the first two or three months. This can be managed, for although the Government ration is gram and bran, or coolthi and bran, arrangements can be made privately with the contractor to change part of the gram for barley, it can be very cheaply boiled by using cow-dung and refuse litter as fuel, on low fire-places built on the ground.

Plenty of chaff should be mixed with every feed; to manage this every battery must supply itself with a private chaff-cutter as the Government does not provide them; eight or ten pounds of green food should be given daily to the young horses until the rains break, about the end of June; this can, as a rule, be procured from the Commissariat in exchange for dry grass, also in most stations there is a battery garden which, if properly worked, will supply a large quantity of green food at a very small outlay. At Mhow, I managed last year, between July and January, to cut some 120 lbs. a day of guinea grass, lucerne, Indian corn, carrots, &c., at an outlay of about four rupees a month extra wages to two syces, thirty rupees extra for labour, and say twenty rupees for seed, using a pair of battery bullocks to work the well. This year I could do still better, were I remaining on.

On first being put to work you may find that the legs of some of the young horses will become filled now and again, if so, throw them out of work for two or three days, put them on mashes, give them four ounces of Epsom salts for a day or two and they will probably come all right; should any, however, shew symptoms of fever, and their membranes become tinged with yellow, give at once 12 ounces of Epsom salts, followed by four to six ounces of linseed oil until the bowels act freely, put the patient in a box, feed him on green stuff and mashes till the fever leaves him and the membranes become pink again. When the bowels act well, a ball of 1½ drams of ipecac., twice a day and repeated for two or three days, will greatly assist to clear the membranes.

Bilious fever is a prevalent complaint in India among all horses; if not taken in time it pulls them down terribly, and must be guarded against by diet and healthy exercise and, in the case of young and immature horses, by keeping them out of the sun. When convalescent, chiretta tea is an excellent tonic. Chiretta is obtainable in every bazaar at a very small price, and an infusion easily made therefrom. Horses are most liable to this disease between the months of July and October, it being then the rainy season, and the atmosphere very sultry and oppressive. Many Australian horses, especially the darker colored ones, suffer also at this period of the year from an irritation of the skin akin to prickly heat, they break out in spots and become very itchy, especially about the tails and manes; some horses become thereby terribly disfigured. Almost every treatment has been tried for this disease by professional men and Officers Commanding regiments and batteries, but I do not think any have been entirely successful; people vary much in their ideas of its origin and of the best treatment for it.

It certainly affects horses worse in a damp climate than in a dry one. Personally, I am of opinion that it is a complaint easier to prevent than to cure; I have also noticed that the batteries that do the most work during the hot season suffer in a less extent from skin disease than those that do but little.

I recommend that such horses as are liable to this disease and have had it before (it generally recurs) be fed very sparingly on gram during the hot and rainy months (the bad cases I would feed entirely on bran and chaff); also that no lucerne grass be given them at that time of year, although other laxatives and green food such as carrots, guinea grass and Indian corn, being less heating, do no harm.

When a horse shows any symptoms of itchiness or spots, I should recommend its being well sweated, then groomed and washed down with a weak solution of phenyle, it would be well also to administer 4 ozs. of Epsom salts daily in its evening mash for three or four days. To horses that are known to be liable to this disease, I always give 4 ozs. of linseed oil twice a day for 10 days in each month during the trying season of the year; the latter treatment I find to be most beneficial.

Horses that rub their manes and tails badly must be tied up so that they cannot lie down or rub themselves against the posts and walls of the stable. Prussic acid, 1½ drs.; solution of potash, 8 ozs.; water, 12 ozs., will be found a good dressing for the irritated parts. I strongly deprecate the use of any greasy dressing myself, although there are many other excellent applications no doubt.

When the irritation has subsided, which in most cases it will do of itself when the cold weather commences, a little cocoa-nut oil rubbed on the bare places will encourage the growth of the hair wonderfully.

Stable Management.

The stable management here in India being so different to that at home, and requiring a much more minute supervision and constant care, it may be advisable to say a few words on the subject, as those who have no experience of Indian ways find themselves rather handicapped at first.

To begin with, the syce question is a difficult one : the wages of these men are very low, and in consequence you get a very inferior class, and more than half of them will rob you at every turn ; it, therefore, requires great watchfulness to ensure the horses getting the whole of their feeds, also, besides the syces, there are contractors and others who will try to make a living out of the rations of your horses.

In most batteries some old N.-C.O. or soldier is told off to look after the syces, the crushing and mixing of the food, and the lines in general. In many batteries he is also responsible for the feeding, and measures out the feed for each horse, but I do not advocate this latter custom ; it is entrusting too much to one man, especially when surrounded by temptations as he is sure to be.

A line-orderly there must be, a thoroughly reliable man, of good physique to stand the sun, and a man of some weight to keep the jemadars and syces at their work during the heat of the day when others are not about to see what goes on.

I do not advocate retaining one man too long in such a billet for the reasons I have mentioned above, and, although I have had under me many excellent orderlies, I have also had some who have done a good trade for themselves in selling the horses' rations.

In the battery I command the Orderly Officer weighs out the grain and grass at the gram-shed and stack-yard, the gram is then crushed and mixed with the bran for each feed, in a large vat, in bulk (the crushing machine is the private property of the battery, and a monthly allowance is drawn from Government for crushing grain). Each No. 1 draws in a tub his feeds at the commencement of each stable hour, and I hold them responsible for getting the correct amount. During the stable hour the Nos. 1 measure out their various feeds into iron pans, mix them with chaff, which they draw in a sack from the line orderly, who superintends the chopping of it, also the salt which they also draw daily, and place each feed behind the horse for which it is intended. The chaff-cutting machine is also private property, though no allowance is given for it by Government. I chaff 400 to 500 lbs. of hay a day. The tubs and pans are then taken back by syces to the line orderly's shed, who sees that they are all washed and cleaned in readiness for the next feed. The horses are fed before the men turn out of stables at morning and evening stable parade, and a European stable orderly is left in each sub-division under the orderly sergeant if the battery turns out before the horses finish their feeds, otherwise the grain would, in many cases, be robbed by the syces out of the horses' mangers. At mid-day feed the Orderly Officer and Nos. 1 attend, and see all their horses fed and watered ; on holidays, the Orderly Officer, the orderly sergeant, and the stable orderlies, attend at all stable hours to see these duties performed. The lines have to be most carefully watched by night and day to prevent the syces stealing the grass, especially during the hot weather, when there is a great demand for hay and litter among the cow-men.

The litter and refuse should be collected and put in a pit somewhere under the eye of the line orderly, and be removed daily by the contractor who purchases it. I make a fresh contract myself yearly for

the sale of litter; the price varies very much at different stations and according to the season of the year. I got here during the past year 21 rupees per month, which I spend on linseed oil and other extras.

The daily ration per horse is 10 lbs. of corn of sorts and 26 lbs. dry grass: green food can generally be obtained up to a certain extent at the rate of 2 lbs. of green for 1 lb. of dry grass; 1 oz. of salt per horse is also allowed.

In most parts of India the grain used is gram; in the Madras Presidency, coolthi takes the place of gram. Gram should be given crushed, and slightly damped. Coolthi requires boiling until quite soft, just enough water being added to be absorbed in the boiling. Bran can generally be drawn pound for pound in lieu of gram or coolthi by applying to the Commissariat Officer; if he be unable to do this, the contractor will generally manage it. In the hot weather it is advisable to give less grain and more bran.

In the battery I command, from April to July, the horses get about 5 lbs. of gram to 4 lbs. of bran, one pound of gram per horse per day being stored away for the cold season, when the work is heavy. (This I arrange with the contractor.) From November till March they get 7 lbs. of gram to 4 or 5 lbs. of bran—the gun horses about 8 lbs. of gram. Their daily ration is also supplemented during these months by 4 or 5 lbs. of lucerne and carrots, which are purchased out of the funds made by selling litter, etc., and provided by the battery garden.

A good division of the daily feeds is as follows:—About 1½ lbs. at 5 a.m. before going out, dividing the rest into three feeds, one at 10 a.m., another at 1 p.m., and another at 6 p.m., but different men have, of course, different ideas on this subject. I recommend that a board be hung up in the stable of each sub-division showing each horses' feed, with a column left blank for extras. Some horses may be on all bran, some on extra corn, some may be getting green grass, and some linseed oil. The C.O. selects the horses for these extras, the Section Officers see the order entered on the board opposite the horse's number, and the Nos. 1 carry it out.

Watering.

The watering of the horses requires a good deal of supervision; it is imperative that an officer attends every watering parade. Nearly all the kicks and treads occur at the water trough, when the syces are watering at mid-day and on holidays, if not well looked after.

I have found, from experience, that horses during the hot months will drink more water late in the evening than at any time during the day, and I always have them watered in the lines from buckets at 8 p.m. Most batteries do not water after evening stable hour, about 5 p.m., and the horses are not watered again till after parade in the morning, about 7.30 or 8 a.m. I maintain that this is a very wrong system. The ordinary water parades are daily about 7.30 to 8.30 after morning parade, 9.30 a.m. at stable hour, 12.30 mid-day, 5 p.m. evening stable hour, and 8 p.m.

During the hot weather I strongly recommend stopping the horses' fore feet with cow dung and clay. The fore feet become very hard

during the hot, dry season, and in many stations where the surrounding country is nearly all rock, constant cases of navicular disease and laminitis will occur; keeping the soles of the feet a little soft may lessen the concussion and jar, and in a small way check these diseases in some cases. A tub of stopping, ready mixed, might be kept at the end of each stable.

Training.

The remounts, on arrival from the depôts, should be put away on a line together, remote from the rest of the horses for the first month, on veterinary grounds. The rough-rider or some steady rank and file N.-C.O. can be put in charge of them, and a steady old soldier and good rider be told off to groom and ride each one of them. It is advisable to put them to work at once. Nothing is worse for young horses in every way than being led about by syces and doing no regular work; they get saucy and above themselves, and take double the time to break and train, or else they get bilious from want of exercise sufficient for digestive purposes. I recommend their being backed at once and being ridden for the first fortnight for about half-an-hour in the morning and half-an-hour in the evening; after that they may be ridden from one hour to one hour-and-a-half daily in the morning, taking care to get them back into the stables before the heat of the sun be great, and to work them very quietly.

It is a good plan to back them and start them at their work in a walled, circular *ménage* of about 25 to 30 yards in diameter, well littered all over, in case of falls; they should be led there by hand before being mounted, and there should always be three or four spare men to hold and lead the horses when first backed. The greatest care must be taken at first, for I know of no horse so easily spoilt and ruined as a young waler. A few days of rough handling or a blow or two, to resent which he bucks and puts his rider down once or twice (the ordinary soldier has not a very firm seat or light hand), and gets damned as a buck-jumping brute, men get nervous of him, and, from being constantly left in on every available opportunity, he goes from bad to worse, and gets a bad name which he may not really deserve. I should advocate that the C.O. attend at the riding schools every day for the first fortnight, for if he does so and the men see that he takes a personal interest in the young horses, they will soon learn to do the same. Though every C.O. may not, perhaps, have the time, and with many the breaking and training of young horses may not be, as with myself, a hobby; however, unless there be a thoroughly good rough-rider in the battery (I can count the good ones I have known in 22 years' service on the fingers of one hand) it is most essential that either the C.O. be there or some one of the officers who is really fond of horses and takes an interest in the work.

A broad strap, with a buckle, just long enough to strap the fore-leg up to the forearm, is an excellent and most useful appliance. A horse that is restive on mounting, and inclined to buck a bit at starting, is often quickly settled down and brought to order by two or three turns round the *ménage* on three legs; the strap can at any moment be quickly released by one of the spare men.

Never leave horses in the stable a day if it can be avoided; they soon become troublesome and go back very quickly. Allowances must, of course, be made for those that are poor in condition and weakly.

Having got your batch of young horses, with one or two exceptions, nicely through the school, say by the middle of May, able to go through a single ride, do their bending lessons and stand a sword, jump in hand, and lead and ride on either side, put them all into harness; after three days in the school in harness, take them out in the field and hook them in the guns for about 10 to 15 minutes daily for a fortnight, beginning at the off centre, and changing them to lead and wheel, ride and hand as required. They should be hooked in at first with a drag-rope attached to the off trace and a couple of men holding the drag-rope until they settle down; never on any account dismount your drivers whilst hooking in. At the end of 15 days they should all go fairly steadily, the horses selected for guns and wagons may then be posted, though the whole batch should go back to detachment drill for some time. Give them 10 days of this work, mixing them up with the old horses, teaching them to come into action, to act as horse-holders horses, to lead, and to be steady with the guns.

By the commencement of June they should all be in the ranks and go to regular battery drill, at least three times a week—no fast galloping, but real, steady work, to teach them their paces and places in the field. I am a very strong advocate for 20 minutes drill at standing manœuvres daily to train both men and horses, and also on short days and every day for young men and horses.

It is now the middle of June, and a batch of 25 remounts that joined the first week in April have been out daily in guns and detachments for the last fortnight, though the gun horses are only hooked in for a short period each day.

During the rainy season, from July till the end of September, it may be difficult in many stations to get on the drill ground, but a spare corner of hard ground can generally be found near at hand, where a good deal of detachment and driving drill can be carried on. During September and the first fortnight in October, the whole of the battery horses should be given plenty of long and steady work, at a pace of from five to six miles an hour, travelling from 15 to 18 miles a day. If this programme be carried out, after a fortnights' fast drill and manœuvring, at the commencement of the drill season, the young horses should be thoroughly broken, and the battery fit to go anywhere. I must, however, strongly impress on every C.O. the importance of sparing their young horses the first year, especially gun horses, and, if possible, of not using the latter in the guns on long days or on field days. Many a good young horse, especially in the Horse Artillery, has been ruined by so doing; let them do lots of short days, and driving drill in the guns, but if they have to go out on field days put them spare, or in the wagons, for the wagons move over a shorter distance and at a steadier pace than the guns.

Clipping.

It is the custom in India to clip the horses all over; this should be

commenced about the third week in October. It is a mistake to put it off too late, for the horses feel the loss of their coats less then, than later, also it takes some time to get them all finished.

I think it is a good plan to clip as they clip hunters at home, leaving the hair on the legs, shading away the hard lines with a lamp, and trimming the backs of the legs and heels where the hair is long.

Different batteries have different customs. It is a good plan though to tell off two good clippers per division, and to pay them so much to keep the horses of their divisions properly clipped and singed throughout the season. Every horse will want clipping and singeing twice—many three or four times. Begin with the horses whose coats are most forward; it is easy by handling the horse to tell if his coat is set.

In concluding these few pages, I wish to state that I am putting forward no fresh ideas, and that I am fully aware that a large percentage of the senior officers know as much about the subject as I do myself, but there are some I am sure, and among these many who are personal friends of my own, who, through good luck and better management, have not been obliged to soldier in India, at least so often and so long as I have, and these latter I know will be glad to avail themselves of some of the hints I have given above when obliged to come out with batteries to this country.

PENETRATION AND EFFECT OF PROJECTILES ON EARTH AND MASONRY.

BY

COLONEL J. B. RICHARDSON, R.A.

Earth as a defence.

Dealing only with land warfare, since the time when the term artillery first began to be used in connection with guns proper, continuous endeavours have been made to obtain protection from their projectiles. The ultimate result of these attempts has been, in all ages, the same, namely to prove that there is nothing so cheap and effective as a proper arrangement of earth.

Nothing has ever proved so effective as earth.

This, though patent to artillerymen, has not always been realised in its entirety by military engineers, especially in times of peace; and they have been led away into the erection of complicated and intricate structures, entailing the use of masonry and other more expensive materials, occupying less space, but involving a vastly increased expenditure, though nothing at any time has caused so great a waste of ammunition, or has so successfully resisted artillery attack for so long a period, as the universal, simple, easily handled, but space occupying material, earth.

Masonry defences exist.

Masonry defences, however, exist in profusion, and it is necessary to study their attack and the effect which projectiles produce on them.

Earth must be properly arranged.

It is not intended to imply that earth heaped up at random is the best possible defence. High mounds of earth presenting a steep slope to the attacking batteries are breached with the greatest ease, by guns throwing a long heavily charged shell, at a tolerably high velocity.

8-inch B.L. gun at 2000 yards range.

In 1887 the parapet of a 6-inch hydro-pneumatic gun emplacement was fired at by an 8-inch B.L. gun at 2000 yards range with a view to get hits near the crest. The emplacement was protected by 7 feet of concrete covered with 37 feet of earth, the exterior slope being about 45°. Two ranging shell struck the exterior slope and practically breached the earth right up to the masonry, making craters $17' \times 20' \times 6'\ 6''$ and $21' \times 20' \times 8'$ respectively. Had the exterior slope been considerably less these shell would have burrowed upwards and probably have made quite insignificant craters. It is difficult to obtain any effect from guns when a gentle slope is fired at.

Thrown up earth.

Thrown up earth is not only favourable to the penetration of projectiles (and, sometimes, if they contain a sufficiently powerful bursting charge, to their effect) but to the ease with which they may be made to strike, while newly thrown up works are easily seen, especially if very regular. Excavations in earth present by far the most difficult de-

Excavations

fences for artillery to deal with, for it is most difficult to tell either where they are or what damage is being done to them.

What the term 'earth' implies.

The general term "earth" includes an almost infinite variety of soils and conglomerates, some of which are not nearly as effective as others in their resistance to artillery, and the question is further complicated by the disposition, slope, &c. of each of these having a different bearing on the effect of projectiles; all this will have to be considered in siege warfare.

Masonry.

Masonry does not present so troublesome a problem. It varies of course in material, form, &c., but, whatever destroys the harder natures is almost sure to be effective against the softer.

Attack of both earth and masonry

In past times mere battering effect was chiefly sought, and this mainly because the fashion in fortification lay in the line of heaping up earth on the top of masonry or supporting earth by walls, instead of making it take a gentle slope; so that, to make a breach, all that was necessary was to break down the masonry, leaving the earth to tumble in. This was generally effected, up to quite a recent date, by cutting lines with projectiles on the face of the opposing escarp until, losing proper support, large blocks fell, followed by the earth they supported. Probably such a method needed a far greater aggregate weight of ammunition to effect a given task, though comparatively light projectiles were used, than would be needed to make a similar breach under far more difficult conditions now, though the modern projectiles each weigh six times as much as of old, and are fired from ten times the range. Against mere earth unsupported by masonry shot and shell of small size are useless.

Modern form of attack.

Whether earth or masonry is in question, the latest development of attack by artillery consists in so placing an aërial mine (for a shell is nothing else), that it shall act to the fullest advantage of which it is capable; and in using as large a mine as possible consistent with the mobility necessary for attack.

Increase of effect relatively to the weight of shell fired.

Simple as this sounds the difficulties which stand in the way are very numerous, and in practice, at present, in performing any given task of destruction, a very large proportion of shell power is wasted. In the case of attack, owing to the labour and difficulty of bringing to the front large weights of ammunition, it is of the utmost importance to diminish the proportion of waste to effective shell. The great aim of the artilleryman should be to obtain increased effect relatively to the weight of shell fired. For defence, where means of observation are not so good, plenty of ammunition is available, and small effect spread over a larger area may annoy an attacker and delay him, this maxim may not be of such paramount importance.

Waste in ranging.

Of course at the commencement of any given task some few rounds must be wasted in ranging but, that once effected, a large proportion of the shell fired should, with good guns, good ammunition, good appliances, and good officers and men, be effective.

Wasted shell.

Many shell are of course wholly wasted by not striking where required; these for the purposes of this lecture are left out of the question, which must deal chiefly with projectiles which strike the object aimed at; but in addition to the shell which fail to strike many which do

strike are more or less wasted by not doing all the work of which they are capable.

Comparison of fixed and fired shell.

The instances in actual practice in which shells fired from guns or howitzers produce as great a result as similar shells, buried in favourable positions, and fired by electricity or other means, so as to act as deliberately placed stationary mines, are extremely rare, though occasionally what appears to be an increased effect is obtained by a fired shell.

Causes of diminished effect.

There are several causes, some of which have not been generally recognised which tend to this result.

Powder charged shell.

Powder bursting charges, in shell fired from ordnance, set back from their own inertia, in many cases destroying the grain of the powder, and even at times crushing the charge into a solid mass, losing the air spacing most favourable to disruptive effect; so that, even supposing one of these shell to be burst in a position similar to a shell placed at leisure, in the place most favourable to effect, and then exploded, the fired shell is at great disadvantage, but not one fired shell in many may reach, and be burst in, this desired position for, as will presently be shown, the course of a shell in earth, &c. is not regular.

Difficulty of bursting shell at the right place.

Even supposing a shell to be dropped vertically into earth and its course through the earth to continue straight, the moment of explosion would be extremely difficult to arrange, yet there is only one point in its course through the earth where a maximum effect could be obtained.

Long fuzes.

Again, suppose it is attempted to obtain this maximum of effect by using a long delay fuze, to burst this shell after it has come to rest, then the exact nature and resistance of the earth would have to be known, an almost impossible matter for an attacker, for if the shell rests too deep its effect on earth is nil, and of course even on an experimental ground, with every fact available, it would be most difficult to prophesy the exact penetration.

High explosive shell.

High explosive filled shell are not so much affected by their contents being set back; in fact with some of the explosives which have been used, the setting back and breaking up of the contents of the shell has rendered them more violent and effective. If these are burst with fuzes with no delay, however, their action is often so quick that they make very small craters. They then become, in cases where they ricochet, very powerful man-killing projectiles, far more effective than shrapnel, as the body of the shell is broken into small pieces which are driven with great force and act in all directions; but shell which act as man-killing projectiles are never effective in earth.

Difficulties with high explosive shell.

There is of course an initial difficulty in firing shell filled with high explosives, for owing to the enormous rending power of these materials, if a shell bursts in the gun, the destruction of the gun is almost certain to follow. This has been entirely got over by the use of compressed air as in the Zalinski, Graydon, &c. guns; and there are some high explosives of very great power, which appear to be unaffected by the shock of discharge. As regards the attack of mere earth, however, and particularly of loose earth, high explosives can hardly be expected to produce the effect which it is possible to obtain with the slower and more sustained action of powder filled shells. The effect which is

most desired when shells are fired into earth is a great transporting effect; it is sought to throw the largest quantity of earth to the greatest distance. High explosives act too locally, they expend too large a proportion of their power, in making the grains of earth still smaller; in reducing them to impalpable powder; instead of throwing them to a distance. In the craters of high explosive shell in shingle at Lydd this is very strikingly exhibited, the craters being lined with fine white flint powder showing an immense amount of work done, yet but little shingle is thrown to any distance, though a portion is thrown violently enough.

High explosive shell v. casemates, &c.

High explosive shell, however, are most effective in earth when the earth is used as a protection to something underneath, such as masonry, and the object of the atttack is rather to destroy what the earth covers than to remove the earth itself. Here, if the high explosive shell can be fired so as to penetrate the earth and reach the masonry, the earth acts as efficient tamping, and the high explosive rends and destroys the masonry in a fashion with which powder filled shell cannot compete. Thus nothing is better for the attack of casemates, magazines, &c., protected by earth, than high explosives, nor is there the usual difficulty in getting them to burst in exactly the right place, all that is wanted is to get them as far through the earth covering as possible, and they may be equally as effectively burst at rest as when in passage through the earth.

Craters of high explosive shell.

Under very favourable circumstances shells filled with high explosives make very large craters; but more frequently their effect on earth defences, and especially the lighter forms of earth, is insignificant; while, so far, it has always been more difficult to burst them in the desired position than it is to burst powder filled shell.

Effect of shell in earth.

The effect of shell in earth, and especially in the looser and finer forms of earth, such as sand, shingle, &c., does not depend much on the velocity of impact. As long as the shell buries itself to a point where the mine which it contains has just sufficient power to completely blow away what is over it, it is most effective. If it exceeds that depth to any considerable extent its effect is what is called "smothered." There is a dull sound, the earth shakes, there is a slight upheaval and subsidence; if the shell is reasonably near the surface a little smoke oozes through; and with high explosives a flame is frequently seen; if deeper, it is difficult to distinguish a bursting shell from a blind, no effect at all is visible.

Smothered.

Effect of breaking up shell.

Now and then a shell breaks up before its contents are exploded, in which case there is always very little effect. A single large shell, burst at the proper place, may make an enormous crater and practically destroy the defences.

Difficulty with Fuzes.

Supposing a shell to strike just where required, and to take exactly the intended path, the difficulty of arranging a fuze so that it shall not burst too soon or too late, has been found extremely great at practice. Various delay action fuzes have been tried, some with long delay, with the intention of allowing the shell to reach the end of its path before being exploded. These have been mainly defeated by ricochet and the irregular path of projectiles in earth.

Course of shell in earth

The course of shells fired at moderate angles of elevation, so as to obtain accuracy of practice into earth is very variable and seemingly very difficult to reduce to any law. When travelling with great velocity they sometimes seem as if they disregarded the path which in theory is that of least resistance; as if time was not afforded to them to take it, and that as they slow down they endeavoured to revert to the line of least resistance in an exaggerated degree. Small objects which the head of the shell meets with, as it is coming to rest in its passage through earth, and which would offer no appreciable obstacle to the even path of the projectile in flight, tend to greatly influence its course, and that, apparently, directly in proportion to the exhaustion of its energy. Bullets from the high velocity magazine rifle, fired into sand here, have been found to alter their course on arriving at a sheet of paper, and sometimes to be deflected without penetrating this slight obstacle, though the paper would not have appreciably affected either the course or the velocity of the bullet in air. So, too, plugged shell of the far heavier 16-inch and 12·5-inch R.M.L. guns have been known to be largely deflected on meeting with a mere thin wooden partition, placed in the butt for convenience in holding the earth together when recovering the shell at proof, a partition which would be as nothing had the shell met with it in its flight through the air.

Magazine bullets.

Heavy shell deflected by thin wood.

Change of density deflects.

A little change in the nature or density of the material, therefore, is apt to make a great change in the course of a projectile in earth.

Ricochet.

Ricochet is fatal to effect; a shell striking earth seldom gets its contents exploded in time to make any thing of a crater if it commences to rise out of the ground on striking. If it does not explode in time it merely makes a narrow scoop, removing but little earth. If the charge does explode before the shell has completely risen, a pear-shaped crater, almost always of moderate dimensions, is formed.

Shape of head of shell.

The shape of the head of a shell has great influence on ricochet. Since the early days of the Whitworth rifled guns it has been known that flat-headed projectiles have a minimum tendency to ricochet, while the shape of head generally adopted as most favourable to the flight of a shell through air probably most favours the ricochet of a shell on striking a dense medium. Instances have lately occurred where shell, with very pointed heads, fired at an earth butt at a very high velocity, have actually come back over the gun from which they were fired; a ricochet backwards.

Shell ricocheting back.

Shells fired from the Zalinski gun, which have a sort of screw on the outside, long shell too, have wormed themselves through 40 feet of earth butt apparently in quite a straight line.

Long shell.

The length of the shell itself does not seem to have a very great bearing one way or another on its capability of holding a straight course through earth, but they are more likely to break up on striking.

Long delay fuzes.

The practical result of the employment of long delay action fuzes, such as five seconds delay, in shell fired at moderate angles of elevation is that a considerable proportion ricochet from, and burst in the air behind, the target works, while very few are in the desired position at the moment of explosion.

Instance of the evil effects of too long delay.

A remarkable instance of the evil attending the use of too long a delay in fuze action occurred at Lydd in 1888, when firing at a small field magazine with an 8-inch howitzer. After many ineffective rounds, largely due to ricochet, a shell, striking in exactly the right place, penetrated the overhead cover into the interior of the magazine, ricocheted from its floor, passed up a little flight of steps, grazing the edges of each, and went out through the small hatchway at the top, bursting in the air beyond. Such results lead to bad shooting and false conclusions, the place where the shell strike is not seen, but the explosion some way further on is seen. A slightly less delay would have blown up the magazine.

Long delay objectionable.

On the whole long delay action fuzes are objectionable, and shells, with but slight delay fuzes, give the best average results. Long delay no doubt occasionally shows to advantage in shells fired at very high angles of elevation, but even then there is a danger that the shell may plunge too deep before the fuze acts and be smothered.

Shells breaking up.

Shell from high velocity guns sometimes break up on striking earth, and especially sand, owing to the walls of the shell not receiving sufficient support.

Effect depends little on velocity of impact.

It has been already mentioned that the effect of shell in earth depends but little on the velocity of impact. It follows that heavy high velocity guns are not economical for earth attack, unless the slope opposed to them is very steep, while they are very seldom available for an attack on masonry, though very effective against it, as masonry is generally in fortifications defiladed from direct fire. Howitzers, by which term is meant light guns, throwing a large shell at a moderate velocity, have been found to be the best all-round weapons for the attack of both earth and masonry under the conditions presented by fairly modern fortifications, that is to say they produce generally a far larger effect with the expenditure of an equal weight of ammunition and labour. Howitzers have been supplemented in siege trains with guns of comparatively high velocity, probably because good man-killing effect is not obtained by howitzer shrapnel—but with the development of high explosive shell they will prove to be more effective all-round weapons for all purposes, men, even protected by earth, can be reached by these shell, whose effect, unlike shrapnel, does not depend on the velocity of their flight.

Increase of effect gained by large shell.

There is another consideration, not always thought of sufficiently, but which is very important in its bearing on the economical employment of shell fire in the destruction of *matériel*. Experience has shown that, no matter whether earth or masonry is attacked, an increase in the size of the projectile and consequently in the size of its bursting charge, is followed by an increase in the effect far greater than the proportional increase in weight. A shell containing 30 lbs. bursting charge, for instance, may easily perform a task which could not be accomplished by any reasonable number of shell containing 15 lbs., though the larger shell may not be double the weight of the smaller. The smaller shell may go nearly as deep into earth as the larger one and be smothered every time. Even suppose that neither shell are smothered, one shell succeeding another partly fills in the crater made

by the first shell, so that one shell falling in the right place and powerful enough to make the size of crater required does a given task more economically than two shell, the craters of which are collectively equal in area to that of the large shell.

Practical limit of size of shell.

There is, of course, a practical limit to the size of shell, leaving mobility out of account. Whether large or small shell are dealt with, before an effective hit can be obtained, howitzers have to be ranged for each task they are called on to perform by a process which must waste a certain number of shell, and probably about the same *number* of rounds would be required for each for this purpose. A small howitzer begins to become effective at a comparatively early economical period.

200-lb. shell.

Practically a shell weighing about 200 lbs. has so far been found to give the most economical results, and to be capable of being used with tolerable ease in siege work. If this is really the economical size no smaller shell should be employed for attack.

Nature of earth.

The quality of the earth has a very considerable influence on the effect of projectiles. The more closely the molecules of soil stick together the greater the effect obtained by shell. Damp earth, for instance, is easier to breach than dry. Clay, and especially moist tenacious clay, gives a maximum of effect. Enormous craters are formed by shell which explode at the right spot, and the soil is thrown in large lumps to a considerable distance, leaving a clean breach. Sand and shingle are the forms of earth most fatal to artillery effect. The former, however, does not offer nearly so effective a resistance to breaching when it is wet as when it is dry, the grains having then a tendency to adhere. Shingle is always difficult to blow away and wet does not seem to make much difference to it. The detached molecules of dry sand and shingle offer so little combined resistance that a bursting charge cannot blow them away far enough to make a good crater.

Loose iron gabions, &c.

Iron rails, and similar loose iron protection and gabions, used in conjunction with earth, often turn a shell aside and waste it, and may even break it up, but they have not been found of much advantage on the whole, for when a shell chances to get under or through them they tend to greatly enhance the effect of a bursting charge, which blows them and all over them high in the air. Large rails and pieces of iron become then almost as dangerous to defenders as the shell itself.

When masonry is the target high explosive shell should be most effective, their great rending power shaking and destroying the structure more than similar shell filled with gunpowder. Masonry is generally presented in the form of a vertical target, and the object of the attacker is to form a breach with a ramp to it. There is then no need for the greater distributive effect obtained by a slow explosive like gunpowder. All that is wanted is to tumble down the masonry, with what it supports, to form the ramp.

Covering masses.

Masonry escarps are generally protected by ditches with covering mounds of some sort; and their destruction is attempted either by high angle fire, with the intention of clearing the obstruction in front; by blowing away the covering mass and so obtaining a clear line of fire; or by a combination of the two.

Difficulty in obtaining effective hits.

It is most difficult to obtain a reasonable proportion of effective hits with high angle fire for the first form of attack. If the gun is placed fairly close to the work small charges must be used in the gun, and the shell is apt to strike with such feeble velocity that it fails to penetrate and does little more than roughen the surface of good masonry. Light shells are almost useless for, when firing at hard masonry where a given falling angle is common to a large and a small shell, the lesser may have so little momentum that it would hardly scratch the surface, where the big shell penetrates and utilises its bursting charge. Another reason for using the heaviest possible shell.

If, on the other hand, the gun is taken to a distance with a view to the use of a larger firing charge and an increased striking velocity, rather a larger proportion of shell are wasted by not striking at all.

Any task can be performed.

Any required task *can* be performed. It is a mere question of expenditure, but many practical artillerymen agree that, if very large howitzers are not available, and unless some great advantage is to be gained by breaching an escarp, it is better to leave it alone. A good masonry escarp wall, protected by a fine earth, sand, or shingle covering mass, would need an expenditure of ammunition which would, otherwise applied, effect the destruction of everything that the escarp protected.

Best way of attacking escarp.

If such a task is set, then by far the most effective plan is to shoot from a fairly long range, chosen with reference to the quality of the masonry attacked, so as to ensure each shell that strikes burying itself in the masonry and there exploding, when a few shell, striking fair, may do a great deal. Make the crest of the covering mass the mean point of impact; that is, see that during the firing, half the shells go over and half strike the mass, using such an elevation that shells that just go over will strike the masonry some little way down; while those that are short will not ricochet but will blow away the covering mass, gradually permitting a less angle of elevation to the guns until the defences are reduced to a dead level.

Large shell.

For such work none but the largest shell can be economical. A large remaining velocity is a necessity.

Casemates.

Another form of masonry is met with in defences, namely, casemates and overhead cover of various kinds. These, whether protected by earth or not, are best attacked by large shell filled with high explosives, fired at very high angles of elevation, and fitted with delayed fuzes. If such can be got down through the earth covering, on or into the masonry, or through the masonry into the casemate, the latter must be wrecked. A large mine of a high explosive properly tamped, as such a shell would be, is irresistible. Excavations, such as galleries, might be attacked in the same way, but it is difficult to see how their presence could be made known, except by the accident of a shell getting into them, when their *débris* blown into the air would tell a tale.

Tables of penetration.

I do not append any tables showing penetration into earth or masonry. Nothing practical appears to be deducible. Shells will sometimes, under favourable conditions, penetrate 40 feet of earth, but so much depends on the nature of the earth, and on varying circumstances that it is difficult to lay down any law. Each target that offers itself must be taken on its merits.

Craters.

As regards the craters made, a well-placed shell of about the size I have mentioned as being economical in use, viz., 200 lbs., may be expected to remove from 600 to 1000 cubic feet (or from 22 to 37 cubic yards) of soil of an average nature.

Estimate of size of shell.

It is necessary that I should state that the size of shell, viz., 200 lbs., which I have mentioned as about the smallest economical size for work, taking mobility, accuracy, and effect combined, is arrived at merely as the result of my own observation of facts, and differs from that laid down (somewhat hastily, as I believe) by others who mention a much lighter shell. This is not a question of the mere weight of ordnance to be transported to the front in siege warfare (which has most to do with the effect of projectiles on earth and masonry). Whatever be the gun, its weight is but small compared with the weight of ammunition which it will be required to fire and which must also be brought up to the fighting line. Further experiment, or better still, the experience of actual war is needed to settle how the attack of both earth and masonry can be accomplished with an expenditure of the smallest weight of ammunition, with the more modern and larger howitzers and shell.

Weight of guns not of account.

Information as to Defences valuable.

To further economise the number of rounds required for any given task it is necessary to learn something of the nature of defences attacked, or there will not be a reasonable chance of placing the mines contained in shell in the most favourable position for effect, and a further knowledge of what effect shell are really producing is of immense advantage. Ordinarily the attacker has to pick up this information how he can from the means of observation he has at his disposal. The effect of projectiles in both earth and masonry, studied from a distance, give him a good deal to go upon. It is frequently possible for a practised eye to tell the nature of the target work from the *débris* blown into the air. Earth can readily be distinguished from masonry, for instance, loam from clay or shingle, and concrete from brickwork, and that at ranges of some 3000 yards and more. If a plan of the defences attacked is available, it is frequently possible to estimate with considerable accuracy the part of the target work into which shell have fallen, a section of the work attacked will also aid.

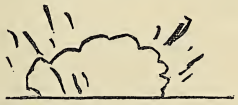
If a shell bursts low in a hollow the cloud of smoke takes an appreciable time to rise, while the *débris*, instead of being in the form of a

CONE.

Indicating Burst on Plane.

FRUSTRUM.

Indicating Burst in Hollow.



cone, as it would be if the shell burst actually in sight, appears more in the shape of a frustrum. When the shell strikes on level unmoved ground the flash is almost instantly seen. Frequently objects from which conclusions may be drawn are blown into the air, and are very distinguishable against the sky.

A series of successive apparent blinds would favour the conclusion that shell were being smothered. Water is most easily distinguished by the column thrown up.

Balloon observation.

Balloons are a great assistance in preventing waste of shell if their car contains a really practised observer; but the view obtained from a balloon is so entirely different to what the eye is accustomed to that, without much practice in observation, information received from this source is apt to cause waste. A balloon looks over all obstacles, and the observer in it is frequently unaware of their existence.

High ground in the neighbourhood may occasionally take the place of a balloon.

Instrumental observation.

Plane tables, theodolites, and very much rougher modes have been used with advantage to aid in ensuring the projectiles fired from howitzers falling in the right place, and it may be occasionally possible to get an observer, during darkness, hidden far to the front, in telephonic communication with the guns where he can actually see the attacked work.

Alteration in character of *débris*.

A practised eye soon detects whether the *débris* thrown up alters in character, and if the effect of shells signalled as correct is well noted, it is soon recognised that fire is falling off in accuracy.

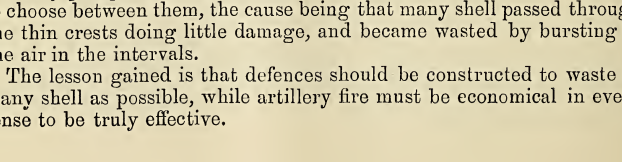
Where no means of giving an observer a more or less bird's-eye view, or of getting a pair of eyes well to the front exists, the destruction of well-concealed works becomes a difficult problem, and generally entails a vastly increased expenditure of ammunition.

Rate of breaching.

With well-organised fire, carefully checked by good observation, it has been shown that with an 8-inch R.M.L. howitzer, throwing a shell of 180 lbs. with a bursting charge of 25 lbs. of powder, it was reasonable to expect to form a breach through a thrown up earthwork, at reasonable ranges, at the rate of one foot in depth per round, including waste shell; the breach thus formed being a little less than the width of the crater made by the shell in the material.

Ripple parapets and screens.

In 1887 having no funds at my disposal for the erection of target works, I was driven to throw up shingle in the most economical way I could to waste fire, and it was an object that the work should be very easily repaired after fire. My target work consisted of a number of ditches with the earth extracted from them thrown up between them.



It was named by the men who constructed it the "Ripple" parapet, and though a small amount of earth was moved compared to the ordinary parapets, in a trial against a 30 feet solid work there was little to choose between them, the cause being that many shell passed through the thin crests doing little damage, and became wasted by bursting in the air in the intervals.

The lesson gained is that defences should be constructed to waste as many shell as possible, while artillery fire must be economical in every sense to be truly effective.

JOURNAL

OF

MAJOR GEORGE BROOKE, 1st BRIGADE BENGAL HORSE ARTILLERY.—1838.

BY

MAJOR-GENERAL F. W. STUBBS, *late* R.A.

INTRODUCTION.

The invasion of Afghanistan, with the view of placing Shah Shuja on the throne he had so often tried, but in vain, to recover, was the most insane idea that had ever emanated from the mind of a sober English statesman. Lord Auckland, a Whig of moderate views, not brilliant in ability, but conscientious, was the last man his friends would have thought likely, needlessly, to resort to the last argument. His council were unwilling participators in the manifesto of the 1st October, 1838: the Court of Directors at home were strongly opposed to the war. Whence then did it spring?

The Russian empire had been then, as it is now, extending itself in a way that excited the fears of British statesmen. By the treaty of Turko-Manchai, in February 1828, Russia secured the whole of the Caspian Sea and bound Persia to the will of the Tsar. When Muhamad Mirza became, in 1834, Shah of Persia, there seemed little chance that British influence would avail anything at Teheran.

Herat had always been a part of the Afghan kingdom under the late dynasty of Ahmad Shah's descendants. After Shah Shuja had been driven from the throne of Kabul it remained under his brother Mahmud, and on his death, in 1829, under Kamrán, Mahmud's son. Their Prime Minister, Yár Muhamad, perhaps the best known name in the history of Herat, excelled all the chiefs in Central Asia in cruelty and perfidy.

Kandahar likewise was independent of Dost Muhamad, now the Amír of Afghanistan. It was held by his half brothers, Kohan Dil, Sher Dil and Púr Dil Khans.

Both Herat and Kandahar are places of great strategic importance as far as India and Russia are concerned.

When Muhamad Shah, King of Persia, in November 1837, moved down to besiege Herat it was felt to be a distinct menace to the security of our frontier, in which the hand of Russia could plainly be seen. The Cabinet of Great Britain wrote urgent despatches to the Governor-General of India recommending him to adopt measures of defence, and it was plain that something ought to be done.

Lord Auckland had in the previous year sent Captain Burnes on a

commercial mission to Kabul, and, notwithstanding that Russia sent Vickovich immediately afterwards to try and secure the good-will of Dost Muhamad in her favour, the Governor-General might have cemented a stronger alliance with him than ever he could have hoped to do with Shah Shuja. For the former had by strength of character obtained a firmer hand over the uncertain tribal elements of which the Afghan kingdom was composed than Shah Zamán or his brother, Shah Shuja, had ever possessed.

But Lord Auckland was influenced too much by three men of undoubted talent—Mr. William MacNaghten, Mr. John Colvin, and Mr. Henry Torrens. To them we are mainly indebted for the Tripartite Treaty, the heads of which were set forth in the manifesto, dated Oct. 1st, 1838, a document which has caused many minds of less talent than its authors to marvel.

The Governor-General, the Maharaja Runjeet Singh, and Shah Shuja united to place the last-named back in the Bala Hissar at Kabul.

The territories of Runjeet Singh lay in the direct way to Kabul, and at one time it was hoped that he would not only furnish a contingent to assist, but permit the invading armies to march direct to Peshawur and thence to Kabul. But the wily old Lion would by no means consent to the invasion of his territories. Mr. Torrens, son of a distinguished Peninsular officer, and supposed to have inherited some knowledge of the art of war, acquiesced in the choice of the alternative route to cross the Indus in Upper Sind and thence move up to Kabul, through difficult passes, which it might have cost a campaign to force. Sir Henry Fane, the Commander-in-Chief, did not like the idea, but was to have commanded.

So a great interview between the Governor-General and Runjeet Singh was proposed. Runjeet, decrepit and broken down in health, though not in years, was always ready for an opportunity of reviewing our troops and judging himself of their efficiency. So the Ferozepore "tamásha"[1] was arranged and the "Army of the Indus" was assembled at Ferozepore.

But on the 8th of November, while the regiments and batteries were on their way up, another proclamation from the Governor-General told all India that cause for which the sword was being drawn no longer existed; the Shah of Persia had broken up his camp before Herat, which the gallantry of one man, Lieutenant Eldred Pottinger of the Bombay Artillery, held against him for ten months. There was no legitimate cause for war. "All that remained was usurpation and aggression," Kaye justly says.

However, the war was proceeded with, though the force employed was reduced from two divisions of infantry to one, from Bengal. Every one knows the sequel. After two years came unparalled disaster, a campaign to vindicate our honour, Shah Shuja murdered by a common Jazailchi, and Dost Muhamad restored to the country from which he had been unjustly driven.

To us now, half a century after, the fruits of an unholy war remain in an enormous debt and a distrust of our motives not yet eradicated from the minds of the Sirdars of Afghanistan.

[1] Show.

The following extract from the journal of the late General Sir Geo. Brooke, Bengal list, Royal Artillery, describing the interviews between Lord Auckland and the Maharaja Runjeet Singh at the commencement of the first Afghan war will be found interesting. It is published with the kind permission of the representatives of the writer, two ladies, in whose possession the journal is.

The peculiarity of the style is characteristic, partly of the individual, partly of his French education.

A few explanatory notes are added which may be found useful by some readers.—*F.W.S.*

September 23rd, 1838.—Arrived at Meerut, ordered to do duty with 2nd and 3rd Troops,[1] per G.O.

October 1st.—Heard of Pollock's appointment to Agra,[2] and that Faithful will keep the Regiment as Major-General.[3]

October 3rd.—Shakespear, J. Brind, and Lawrence[4] join Regiment. Latter our squadron.

October 4th.—Sir W. Cotton arrived. Mackinnon off to contingent. Barrett[5] appointed to us from Simla. Dunlop says . . . . that folks think the force will not cross the Indus, but all depends on the arrival of next mail from England, although Lord Auckland had heard from Lord Palmerston that his measures were approved of, and would be supported. . . . . 2nd Company 2nd Battalion ordered to Almorah. Hodgson has moved to frontier.[6] Civilians all alarmed, make things worse than in reality; but until November Goorkahs cannot act, and then our troops will be at hand.

October 27th.—Marched into Kurnal. *En passant* viewed by Sir Willoughby Cotton and General Duncan; both express much approbation at our appearance. Colonel Graham met us, he is much pleased.

November 2nd.—Camp full. Inspections in all directions. Rumours of Persians having withdrawn from Herat; of Dost Mahomed being willing to take pension; of the Scinds[7] protesting against our invading their territories, and Afghanistan disputing the passage of the Indus.

November 4th.—1st Troop 1st Brigade[8] warned to march with escort, and 4th Troop 3rd Brigade[9] to accompany Shah Shoojah.

November 13th.—Umballa.

November 20th.—Lordianah. Heard of Commander-in-Chief's resignation, and dawk being laid; probability of army breaking up at Ferozepore.[10]

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[1] Of the 2nd Brigade Horse Artillery.

[2] Major-General G. Pollock to command the Agra Division.

[3] The post of Commandant of the Bengal Artillery was not held by a Major-General. Faithful vacated the command in consequence in December.

[4] Afterwards Sir R. C. Shakespear, Sir James Brind, and Sir Henry Lawrence. The last posted to 3rd Troop, 2nd Brigade, Horse Artillery (Captain Alexander's).

[5] W. P. Barrett, Veterinary Surgeon, 2nd Brigade, Horse Artillery.

[6] Hostilities from the side of Nipal were apprehended, Hodgson was Political Officer there.

[7] The Sind Amirs whom we forced to pay us for invading their country.

[8] Captain T. Nicholl's

[9] Captain Timings'.

[10] The withdrawal of the Persian army removed the alleged *casus belli*.

November 23rd.—Tihara. Lawrence returned from Governor-General's camp. Still reported as certain that the Chief had resigned command . . . . . conditioning that Sir W. Cotton should command, and that General Churchill should get Sir W. Cotton's Division: no notice taken of conditions, and resignation accepted. Still not certain army not to break up.

November 24th.—Dhurum Kot. . . . . Found Broome[1] waiting our arrival, from whom we gather thus:—Native Infantry force to remain at Ferozepore: Buffs to remain; all artillery and rest of army to go on *viâ* Shikarpore: Scind chiefs insolent and hanging back: Runjeet forwarding all views, save that of acceding to the army passing through his territories.

Chief left Simla, and left there his resignation of the command of the Army of the Indus, coupling this with condition of Churchill commanding cavalry. The Governor-General indignant; has accepted resignation, not noticing conditions; says, however, if the cavalry demand a Divisional Commander that Colonel Arnold[2] or Colonel Thackwell[3] are the legitimate men for it. . . . . Government not sorry to be rid of a Chief refractory in Sir Henry Fane.

300 rat traps indented for by Commissariat on Captain Wade[4]; the greatness of the functionary wounded: "*Infra Dig.*" he called loudly and wide: the rat traps nevertheless, and the wags send him patterns of the Liverpool drop, the Manchester trap, &c., and the Governor-General, greatest wag of all, has ycleped him Baron Rat Trap, soubriquet he is likely to keep.

November 28th.—Near Ferozepore. Levée this morning by Lord Auckland at 11. At 10, heavy cannonading over the river, supposed to be a salute. . . . . Not an officer going to the Levée.[5] Lord Auckland sent to Graham for some shells for the two howitzers to be given to Runjeet Singh, and 48 were sent accordingly. Quœre, is this wise in Lord Auckland?

November 29th.—Moved off at daylight . . . . . reached our position in alignment of the camp a little after sunrise, and as soon as horses were fastened all hands rode to the Governor-General's camp, about three miles in front, to see the entry of Runjeet. Arrived there in plenty of time, found the escort troops drawn up as a street. Camel battery and a squadron of Lancers[6] in attendance from the army. The dust soon after rose in the distance towards the river, distant about two miles: in due time Runjeet's cortege showed ahead, and a stir made among the elephants in attendance at the Governor-General's camp.

A few single horsemen with proud bearing passed down the street, and eyed well the force: gradually the throng increased until the main body became visible through the dust. Mr. Torrens now came on an

[1] Lieutenant Arthur Broome, Artillery, *A.-D.-C.* to the Governor-General.

[2] 16th Lancers.

[3] Major-General now.

[4] Afterwards Sir Claude Wade, Political Agent on the Sikh frontier, and a very distinguished officer.

[5] They could hardly have done so, having come off a march, and being some distance from the Governor-General's camp.

[6] 16th Lancers.

elephant at utmost pace, passed down to Governor-General, Runjeet checking pace. Mr. Torrens returned to head of the street, and then, seeing all was right, flourished his cocked hat most studiedly theatrical in wave, evidently seeking to impress the importance of his act, when both great men cautiously advanced, so as to meet exactly at the head of the street. The throng was now great of Runjeet's attendants; those nearest him being formed of the Ghorchilahs,[1] horse and foot; the first in yellow silk, the latter in red of inferior kinkhab. Then, opening right and left, the great people met under bows and firing of salute from Camel Battery (and a very bad business they made of it). Lord Auckland stepped into Runjeet's howdah, embraced, and the double cortege moved on, great people taking their places, Commander-in-Chief on one side of the two heads, and Mr. Macnaghten on the other. Troops presented arms, bands played, and behind, the rush was terrific, of horsemen in particular. The centre line of elephants pressing on the troops, the Cavalry and Horse Artillery were driven back and order broken. Keeping my own, I followed the cortege down the street, and as Runjeet neared now and then the side I was on, had a very complete view of him and his son.[2] No picture I have seen is anything like him. The audience tent had a square before it railed off with khanauts, wherein officers were permitted to go, but only the immediate cortege of Runjeet. Not being in full dress, I did not attempt to go in. The crowd at the entrance was terrific. Horsemen all driven on each other from behind threatened to overwhelm and bear down the front; their matches all alight and the body-guard giving way across the entrance. In this state, fearing a row, I gave my horse, who had become very fidgetty, his head and will; he immediately sniffed, snorted, and with a grunt, as he kept a little room, lashed out twice, floored someone behind, bolted on, upset two more right and left, which worked way, and he found himself out through the flank of the body-guard in great style. I did not attempt to control him, but gave him way, and held on hard outside. I viewed quietly the less excited pelotons of inferior chiefs and men and rode home to breakfast.

The two howitzers were presented to Runjeet from the Park, 40 shells had been obtained. It would seem that, having found 9-pr. ammunition fitted, Lord Auckland had, at 4 p.m. preceding evening, sent for, and got all the shells of the 9-pr. Camel Battery[3]: the latter were, however, sent *loaded*, the former empty: all the shells had been laid out in front of the guns on the ground: as Runjeet went up to look at the guns he did not see the shells, tript, and fell on his face, fortunately, perhaps, at same moment the Commander-in-Chief tumbled also. Previously, men of Runjeet with lighted matches had been walking over and about the shells: at this time how little might have produced a tragedy! If a shell had gone off, every Seik blade would have been drawn, and every matchlock seized in hand, every looker on been

[1] Properly "Ghorcharras." Sikh Horse so called.

[2] Kharak Singh.

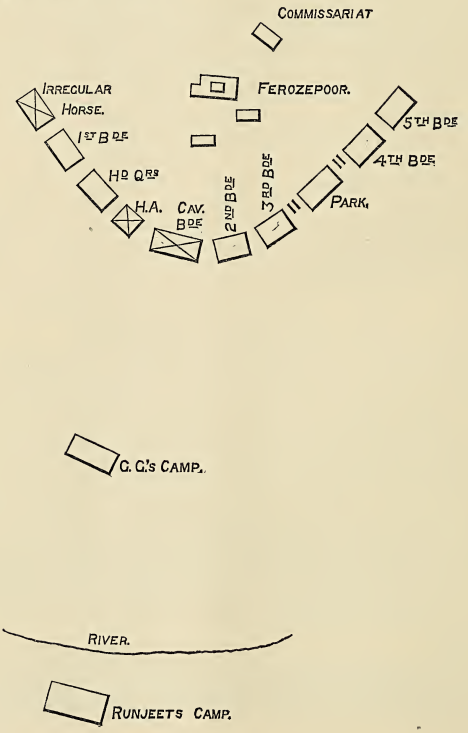
[3] G. B. is rather unintelligible, and appears to draw the long bow here; he means, however, that there were 40 empty shells with the two presentation howitzers (24-pounder, same as those in the Camel Battery) but no cartridges, which accounts for the demand for ammunition made on Captain A. Abbott, commanding the Camel Battery, whose shells had their bursting charge filled in, but who only sent a few.

massacred: the tent ropes of audience tent cut down as Runjeet was borne out and every soul in it cut to pieces; the camp fared no better; little except the head of the street re-formed from the onset in order: but the casualties in officers from the camp, lookers on, enormous, and the line would have been aroused to arms with barely any officers. Reflecting on this, the subsequent orders were judicious. The Queen's picture, the work of Miss Eden, was presented under a Royal Salute. Runjeet was indelicate in the endless presentation of his people to Lord Auckland.

About 10.30 the salute proclaimed Runjeet's return to his camp. The rumours of the day proclaimed a march through the Punjaub as certain, but from the Governor-General's camp we hear such was never even asked of Runjeet.

Orders issued for rehearsal of review on Friday. Visit of Governor-General to Runjeet proclaimed for the morrow; invitations down to Brigadiers and their staff inclusive.

The camp is thus formed:—



November 30th.—Ferozepore. This was the day fixed for the return visit of the Governor-General to Runjeet. At daybreak Dr. Ross of the Lancers called at my tent and offered an elephant seat. Accepted, dressed at a gallop, and off. I had no previous intention of going, disliking to mix with the crowd on their own dunghill after the specimen of yesterday on our side. Arrived at the bridge about 10 minutes before the Governor-General's cortege (which passed us in review): found a Staff Officer at the bridge head to stop all except those especially invited to form the suite of Governor-General or Commander-in-Chief. Loitered there, saw the cortege form and go up under a running fire salute from the camel jingal guns. After waiting awhile and debating what to do, and bewailing the want of wit in Ross not claiming to join his regiment as plea, we were near following the example of several others in going back, when an order arrived to pass over those waiting. On we went, passing the Marine Officer in his gig under pennant and ensign, and up the street of troops. Their lines were well dressed, tolerably uniform in dress, fine men, cavalry indifferently mounted. Two regiments wore a Calmuc helmet with tricolour pattern, and regular horse head-gear with brass studs.

The officers, horse and foot, in gaudy cavalry pattern jackets of red and gold, *à la* Hussar. Some few, blue and red, acorn embossed collar and cuff, and epaulettes. Some of the foot gold, some silver epaulettes on Hussar jackets: lower gear, nothing could be worse, no uniformity, no pattern. Jackets all hanging on the body, not fitting, no tidiness attempted. The head dress of the officers all silk, rags of colours flying in the wind in disorder. Mounted officers, bad cattle. Among them saw two Europeans. One, an American in an Artillery Commissary staff lace blue jacket, and sort of forage cap: untidy, dirty, and vulgar looking. The other, dressed in the rough nature as a horseman: very tidy, well mounted, clean, neat, and looking very smart and soldierlike. He evidently was incog., and wished to be so. Ford, the P.M. was in camp, but invisible; he commands a corps of cavalry, not in much repute for ability. A Mr. Fowle, brother of a lawyer in Calcutta, recognised by A. Abbott as a school-fellow, and [said] to have disappeared from his relatives, was recognised at the head of a regiment of cavalry; a gentlemanly man in manner and appearance, had a soldier's cut about him in dress and pattern; is very well informed. He was asked to dine at our Mess. Some of our officers went to visit him; his camp equipage is in our style: he seems to have laid out his course in the event of Runjeet Singh's death.

Reaching the head of the street we entered the red inclosure having khanautted gateways, the inside led about 60 yards up to the State tent, passing a small one where Runjeet is said to transact business and sit all day. Saw the State tent lined with shawl, and the great people sitting and exchanging presents under the Semiana. No difficulty made in our mixing with the suite, hence had a perfect view of persons. The Prime Minister, Dhiyan Singh,[1] stood behind his master in turban

[1] Dhián Singh was afterwards shot by one of the Sindinwala chiefs after the Maharaja Sher Singh had been murdered. His brother, Suchet Singh, met a like fate. The third brother, Guláb Singh, lived long afterwards as Maharaja of Kashmir.

and French cuirass, looking handsome in face and figure, the very chevalier of Seiks.

The chief adviser, styled "Faquir,"[1] stood there also. Floor carpeted with shawl carpets, the *coup d'œuil* was more curious than magnificent, under the mixture of dresses Asiatic, European and semi-demi both. The enclosure was full of the Guards or Ghorchilahs, dressed in silk and kinkhaub, armed at fancy. Saw the given howitzers there, and the golden charpoy,[2] an insignificant bijou.

Entered into confab with the Seiks, who there were exceedingly polite, far more than we were on our side to them. Their inquisitiveness great on the price of articles of uniform and pay received.

The interview closing fast, we returned ere the crowd began, and crossed over before the stir.

December 1st.—Troops paraded for rehearsal. Graham,[3] unwilling to take his place with the Commander-in-Chief, placed himself at the head of 3rd Troop in the centre of the line[4] and disposed of the Majors, one to each division. All went on well with the artillery. General Cotton, so fond of lording and wigging, caught it twice from the Commander-in-Chief very lightly. . . . After parade Sir W. Cotton came down upon Brigadiers. Marching past at the end was a beautiful sight. Graham with leading troop; Brooke with 3rd troop in centre; Pew with Camel Battery.[5]

December 3rd.—The army reviewed in the morning. The coming down upon the line of the Governor-General and Runjeet Singh was splendid: passing down the line, he noticed guns everywhere; well mounted and plainly dressed as before; few guards, and all orderly as such a mass could be. Saw the troops pass by, going out of the column, and returning to go by, then out again:[6] quite magnificent the show of the army. Buffs and European regiment[7] most distinguished.

[1] Aziz-ud-din, one of the ablest ministers of Runjeet, and later of Dhuleep Singh.

[2] Bed. Chár-pái = four feet.

[3] He was to have commanded the artillery with the Afghan Army as Brigadier.

[4] Of the horse artillery on the right of the cavalry: the foot artillery being on the right of the infantry.

[5] The artillery on parade and staff were:—

Colonel C. Graham, C.B., 1st Brigade, Horse Artillery.
Major P. L. Pew, 4th Battalion, Field Artillery.
" G. Brooke, 2nd Brigade, Horse Artillery.
Captain E. F. Day, Commissary of Ordnance.
Brevet-Capt. J. B. Backhouse, 1st Brigade, Horse Artillery, Brigade-Major.
2nd Troop, 2nd Brigade, Horse Artillery, Captain C. Grant.
3rd " " " " " " J. Alexander.
4th " 3rd " " " " H. Timings.
3rd Company, 2nd Battalion, No. 5 Horse Field Battery, Captain T. Sanders.
2nd " 6th " " 6 Camel " " " A. Abbott.
4th " 2nd " Reserve Company, Captain H. Garbett.

They would be thus on parade from the right—Horse Artillery right of Cavalry, Field Artillery right of Infantry.

[6] That is, after the Horse Artillery had passed the saluting point, he disengaged and took post with the Staff; rejoining his troop for the gallop past by the left.

[7] The Bengal European regiment; afterwards the 1st Bengal Fusiliers, and now the 1st Battalion Royal Munster Fusiliers. The word "dressed" refers to alignment—not uniform. This and the preceding note may perhaps be deemed superfluous. Regarding the Buffs, they were in full strength and healthy, while the 13th had been reduced by sickness. But the performance of the latter on service left nothing to be desired.

Native troops all good and beautifully dressed; no wonder the admiration was at a high figure.

December 4th.—Runjeet came in the evening to see the Park: very minute in looking at heavy guns and mortars;[1] asked the price of guns. One shell 8-inch, and one shell, shot and grape, for 24-pr. were got ready but not asked for: Lord Auckland and Commander-in-Chief attending. In the evening Miss Eden "At Home." Runjeet there. Generals and Brigadiers publicly asked. Graham was introduced to Runjeet, who asked Macnaghten who and what he was.[2] Mr. Macnaghten replied that he was a Burrah Sirdar, and commanded the artillery. "Will he shoot? If so I will order my head of artillery to shoot with him."[3] To this Graham replied that he could shoot very well in his younger days but his sight was now defective, but that, however, he had no objection. Shortly after that the Commander-in-Chief called for Graham and, telling him to order a 6-pr. in the morning to Runjeet's camp, desired that Major Pew, whom he understood to be a great shot, would attend. Graham, knowing Pew was only a sportsman shot, mentioned that Abbott was a good gun shot. "Order him too" was the reply. Accordingly they were so [ordered], and to bring a 9-pr. Camel Battery gun with ammunition. After Runjeet's departure the Governor-General gave his visitors a supper.

December 5th.—Accompanied Graham to Runjeet's review. Set out on a pad elephant, and sent on a charger. Arrived at the Ghat just five minutes before the Governor-General, who, as he passed, seeing us on foot, having alighted to take horse, he politely offered an elephant with a howdah. Graham was taken up by Broome, and I afterwards took up Captain Cotton. The cortege was duly met by deputation, and by Runjeet after passing the brigade, and all proceeded, joined by the Commander-in-Chief's cortege, to the field about 1½ miles beyond the camp. Passed a knot of Fakeers[4] who were insolent: body-guard following us, and a number of officers on horseback. After passing the camp, and entering upon the review ground, a body of mounted troops attempted to cut off the escort and horsemen, and with drawn swords rode on the body-guard, who, guarding off the weapons, walked steadily on with Dawkins[5] at head. Colonel Perse[6] was rougly treated, as also Mackenzie[7] of ours, who, losing his helmet, a shout of laughter was

[1] In little more than three weeks after this intelligence reached the British camp that the Maharaja had an attack of paralysis. He died at Lahore on the 27th of June following, at the age of 59, through debauchery and deep potations of Sikh whiskey made him look very much older. The one feature of his face which had not grown old was his single eye. Those who have tasted what Sikh whiskey used to be—and your host did not like to see it diluted—will not wonder at this.

[2] He was tall and erect, with a very soldierlike look about him.

[3] At his interview with Lord William Bentinck at Rupar, in October 1831, the Maharaja put up his umbrella, and Lieutenant George Campbell put a 6-pr. shot through it. This may have been the reason that the match on this occasion did not come off.

[4] These were of the class called Akáli; a fanatically insolent set. They wore sharp-edged iron quoits on a conically folded turban, and blue vestments.

[5] Captain Dawkins, commanding Governor-General's body-guard.

[6] Colonel Persse, 16th Lancers.

[7] Lieutenant Murray Mackenzie, 4th Troop, 3rd Brigade, Horse Artillery.

rudely raised. However, all pushed their way on, keeping close to the suite. My led horse and Graham's were cut off, and I could not, as I intended, ride down the line for a close view. The Governor-General, Runjeet, &c. proceeded, after a General Salute, to the right and passed down the line, which consisted of 4 regiments of Cavalry, two on each flank; then a battery of 2 Horse Artillery guns; 7 regiments of Infantry, with two batteries and two half batteries of 3 guns at intervals of brigades—total, 24 guns of Horse Artillery. The appearance of officers and men much as before. The Horse Artillery bad, rickety, and ill-proportioned carriages, all but 4, which evidently came from our arsenals. The men ragamuffinish. Harness bad, filthy, and no uniformity of trace. One Field Officer only, being the American before named. Guns of various calibres; 12-pr. heaviest. Very few spare horses. Horses the best on the ground. Two regiments of Infantry in reserve—total, 9 regiments of 8 companies and of 80 men each. Having regained the front, the manœuvring began. The General had no Staff; moved but little, and few words of command given: a bugle signal or two only given. Words that were given were so in French. This, however, was the only betrayal of the previous lesson being given. They step short, all in quick step and three ranks; all the drums and fifes collected into one band in rear of centre; beating whenever a movement was made to make the step, after the French fashion. The changes of front were well done, precisely, and in lines good. The Light Infantry coverings defective in want of unity of purpose. The artillery moving slow, but firing well. The charge of cavalry down the front a mere hand canter;[1] no line, bad in the extreme, and the artillery lagging under bad driving. Firings all good. The movements will be detailed in print, therefore notice them not. During the manœuvres I was placed next to the Commander-in-Chief on one side and Khurruck Sing on the other, and as the Commander-in-Chief addressed me at various times in question or remark upon the doings and appearance of the artillery, it gave a colour of import to my person, as Khurruck Sing was led to open a conversation with me, enquiries of rank, regiment, &c., and thence into remark on all going on, and interchange of compliments, which ended his expressing a wish I had been of the Governor-General's escort, and that he would then have seen me, as he hoped, very often during the tour.

* * * * * *

Dhian Sing sat in Runjeet's khawáss.[2] At close of the review the force marched past in Review Order. The shew of men good; officers bad, dirty, untidy to a degree, excluding all soldierlike appearance, and very awkward. The General having then come up was addressed by Lord Auckland and the Commander-in-Chief in praise, and the troops marched to camp. The double cortege moved back. Major Pew and

[1] The Sikh, and, indeed, Indian cavalry in general, did not depend upon the shock in their charges: the edge of the tulwar effected their purpose better.

[2] Back seat of the howdah.

Captain A. Abbott were with the gun near the flag-stand, but Runjeet shirked the trial. On returning, a camel tumbled down and produced another burst of derision. I envied not Pew and his fool's errand. At the camp Runjeet and Lord Auckland parted. Having passed the bridge of boats, Graham and I took to our own elephant and returned home. My gold trappings are already half worn out with all this rough usage.

[*December 10th and 15th.*—Detail of marches towards Sind of different parts of the army—after this the journal breaks off].

ROYAL TROPHY GUNS AT WINDSOR.

(REPORT BY MAJOR R. H. MURDOCH, ASSISTANT SUPERINTENDENT R.A. RECORDS.)

COMMUNICATED BY ORDER OF

THE DEPUTY-ADJUTANT-GENERAL, R.A.

AMONGST the trophy guns at Windsor Castle are several 4-prs. and 6-prs., of which nothing was known, locally, beyond the tradition of some of these having been connected with the army that fought at Culloden in 1746—a great part of the forces having been encamped on Thistle Lawn, near Virginia Water, on return of the army from Scotland under His Royal Highness the Duke of Cumberland. . . . .

The Deputy-Adjutant-General, R.A. therefore gave directions to have the Royal Artillery records searched; and the following particulars were collected by Major Murdoch.

"The guns at Windsor particularly described are—

Number.	Calibres.	Description.	By whom cast.	Dates of castings.
		4-prs.		
21	$3\frac{1}{4}$	Brass or Bronze (heavy) 12 cwt.	Schalch Bowen	1720, 1729, 1730, 1731, 1734, 1736, 1738, 1742, 1743, 1745, 1747, 1749, 1773.
		6-prs.		
16	$3\frac{3}{4}$	*Ibid.* (light) 6 cwt.... ...	King Kinman	1794, 1795, 1796, 1799, 1801.

All these guns are of bronze—formerly termed brass;[1] all are of English manufacture—Schalch, Bowen, King, and Kinman having been the Royal and licensed gunfounders of the periods.

N.B.—The subjoined foot notes were not in the official report:

"Royal Brass Foundry,
8th January, 1824.

SIR,—I beg leave to report that the proportion of tin to copper in brass ordnance formerly cast at this foundry was 10 lbs. of tin to 112 lbs. of copper; but about the year 1794 it was found necessary, to prevent the ordnance from bulging or dinting on proof, to make the metal a trifle harder by increasing the tin to 11 lbs. The quantity of tin was further augmented by the late founders, in 1805 and 1806, to $12\frac{1}{2}$ lbs., which proportion is still used, as near as possible, in casting the new pattern howitzers.—I am, &c.

(Signed) WILLIAM NORTH, Foreman."

The Inspector,
Royal Brass Foundry.

[1] Composition of "brass" i.e., "bronze" ordnance.

(Thus, there was not any brass in the so-called "Brass Ordnance." "Bronze" is a term of very recent application to such ordnance).

4-Pounders.

With regard to the 4-Prs.—apart from the statements, in London District, 5 | 327 and 57 | Windsor | 261.3 (by General H. Lynedoch Gardiner, C.B., and by the Master of the Queen's Household) as to some of these having been used at Culloden and left at Thistle Lawn, Windsor, in 1746, by H.R.H. the Duke of Cumberland on return with the Royal troops from Scotland—there can be little doubt that, with exception of the three of 1747, 1749, and 1773 castings, twenty-three of these 4-prs. were employed in the suppression of the rebellion in Scotland (1745–6), including the battle of Culloden on 16th April, 1746 (the great and last battle fought in Great Britain).

Examination of contemporary Royal warrants, Royal Artillery pay lists and muster-rolls, Board of Ordnance letter books, &c., &c., has led to the following information being obtained:

Battle of Prestonpans, 21 September, 1745.

At the landing of the Pretender there was only one field train (company) of Royal Artillery on the permanent establishment in Scotland, viz.:—

That commanded in the battle of Prestonpans, 21st Sept. 1745, by Captains Archibald Cunningham[1] and John Godwin; in the battle of Falkirk, 17th January 1746, by Captains Archibald Cunningham and John Godwin; in the battle of Culloden, 16th April 1746, by Captains Borgard Michelsen and John Godwin, which company now survives, under designation of "No. 1 Company Western Division, R.A.," stationed at Bermuda, under command of Major Arthur Tracey.

The armament of this company consisted of eight *4-prs.* ("brass," *i.e.* bronze) and four brass cohorns—the 4-pr. having replaced the $\frac{3}{6}$-pr. equipment in 1743–4.[2]

7 4-prs. Seven of these 4-prs. were in action at Prestonpans, on 21st September, 1745, and were captured by the rebels in consequence of the hired civilian drivers having run off with the horses during the battle on perceiving the Royal army to waver. These are the 4-prs. alluded to in Sir Edward Cust's "Annals of War," 1745, p. 91; and the rebels having subsequently left them in Carlisle Fort when retreating before the Duke of Cumberland's army (*see* Cust, p. 94), these guns were re-captured in January 1746 by the Royal Artillery under General Hawley.[3]

Battle of Falkirk, 17 January, 1746.

In the battle of Falkirk, artillery guns were not engaged on either

[1] For Captain Cunningham's history *see* "Proceedings" R.A.I., Vol. XX., No. 9, p. 476.

[2] The French adopted the 4-pr. field equipment in 1726, "Proceedings" R.A.I., Vol. VII., No. 3, pp. 136–7: and Napoleon I. suppressed it, in the Italian campaign, in favour of 6-prs.—*vide* "The Mobility of Field Artillery" (Hime) in "Proceedings" R.A.I., Vol. VII., No. 7, p. 461, note. The English adopted the 4-pr. in 1720 (gun No. 1 casting of that year is now one of the trophy guns at Windsor), and suppressed it in 1746: and although some 4-pr. castings were made subsequently, these were only for quick-firing experiments and to replace the *iron* 4-prs. in forts.

[3] The siege train of six 18-prs., referred to by Sir E. Cust ("Annals," p. 94), must have been ship guns. "The ship guns having been taken from Newcastle by General Hawley, General Wentworth requires 100 wall pieces in lieu."—Letter from the Duke of Newcastle, Whitehall, to the Master-General of the Ordnance, dated 17th February, 1745-6. It is certain that Captain Cunningham's field train had rejoined General Hawley at Carlisle by this time.

side—the rebels having left theirs in Carlisle Fort, as before mentioned, and not having at this date received the field guns recently sent over to them by France: while those of the Royal army (Captain Cunningham's company, which had re-equipped at the Tower and rejoined the army[1]) had stuck inextricably in a bog, and fell into the hands of the rebels.[2] These guns were, however, re-captured at the battle of Culloden. 8 4-prs.

Battle of Culloden, 16 April, 1746.

The Royal Artillery train sent to Flanders in 1742, and engaged in campaigns there under H.R.H. the Duke of Cumberland until 1745, consisted of thirty brass 3-prs.[3]; and in the winter of 1745 H.R.H. brought home from Flanders four companies to aid in suppression of the rebellion in Scotland. These four companies proceeded at once to Woolwich to take over the new equipment, and, while two companies were sent to the army camp at Finchley, from the four ex-Flanders companies, officers and men were despatched to Scotland with sixteen (4-prs.) battalion guns.[4] These are the guns which at Culloden "were so exceedingly well plied that they made dreadful lanes through the clan regiments"—("Annals of War," 1746, by Sir Edward Cust, p. 101)—"served with so much skill and promptitude as to contribute not a little to the triumph of that memorable day"—("Military Antiquities," 1783 edition, Vol. II., p. 212.[5]) 16 4-prs.

Permanent armament of the forts in Scotland.

The armament of the forts in Scotland in 1745–6 was that laid down in detail in the Royal Warrant of King George I., dated 6th July, 1716, and consisted wholly of *iron* ordnance, with exception of three brass cohorns in Fort William, Inverness; the 4-pr. field equipments were abolished in 1745–6 (the only occasion of their employment having been to quell the rebellion in Scotland); three of the companies from Flanders took back with them a 6-pr. equipment in 1747 on rejoining the Allied army (leaving the 4-pr. behind); and as after 1746 there has not been any instance of 4-prs. being employed in war (by the Royal Artillery), the *three* 4-prs. at Windsor, of post 1745 manufacture, cannot be trophy guns and must have formed part of the normal establishment of guns allowed for Windsor, which, by Royal Warrant of 6th July, 1716, amounted to 25 guns (calibres discretional).

4-pr. field train not revived after 1746.

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[1] By R.A. pay lists, endorsed "October to December 1745," the route was *viâ* Dunstable, Doncaster, Northampton, Newcastle. Clearly no blame attached to Cunningham at *Prestonpans*, in September; and the story narrated by Artillery writers refers to *Falkirk* subsequently.

[2] "Annals of War" (Cust), 1746, p. 96: but in his "Memoirs of the Scottish Rebellion," the Chevalier de Johnstone, who was with the Pretender, gives a different account of this (which is being dealt with in a separate paper).

[3] By Royal Warrant, 4th May, 1742, "His Majesty approves of 30 pieces of brass ordnance, all 3-prs., viz.:—two for each of the 15 battalions ordered to the Austrian Netherlands."

[4] *See* also "England's Artillerymen," p. 13. The R.A. pay lists, 1746, show that all these gun detachments, with ex-Flanders officers and staff, were welded into a composite company (Captain Mace's, which company was broken up in December 1748). Colonel Wm. Belford commanded the Royal Artillery at Culloden, with Lieut. Joseph Brome as Adjutant, and Lieut. Stanover as Quartermaster.

[5] "The well served guns of the English overpowered the impetuous bravery of the highlanders"—("Chambers's Encyclopædia," art. "Culloden")—"who were received upon the point of the bayonet, galled by an unexpected fire of musketry, and blown into the air by the artillery"—(Russell's "Modern Europe," Vol. II., p. 420).

Thus, the

7 4–prs. of Prestonpans, re-captured at Carlisle.
8 4–prs. of Falkirk, re-captured at Culloden.
16 4–prs. at Culloden, of the ex-Flanders companies R.A.

account for 31 4–prs.

From these deduct eight 4-prs. which remained in Scotland, as the original train, after return to England of the Royal army.[1]

Thus, twenty-three 4-prs., bronze guns, were available to be left at Windsor by H.R.H. the Duke of Cumberland on suppression of the rebellion.

Artillery Park for Windsor 1740.

The Board of Ordnance records and R.A. muster-rolls and pay lists also show that in 1740 a train of artillery was sent to Windsor from Woolwich, in June, under Lieutenants Flight and Desaguliers, to form an artillery park; but the guns were 6-prs.. and 3-prs, and the train returned to Woolwich in November 1740.

In 1746–7 the Board of Ordnance issued 2000 musquets with bayonets, swords, pistols, &c., to replace like numbers broken and lost at Culloden; but no guns lost by Royal Artillery in that battle.

Rides, &c., in Windsor Forest, 1786.

Also, in 1786, five regiments of infantry, namely, 23rd, 29th, 33rd, 38th and 43rd, had each a wing encamped in the forest of Windsor, and were supplied during six years from the Ordnance stores in the Tower of London with entrenching tools, &c.: during this period these working parties were "employed in completing the ridings, &c.," but guns were not sent during this period.

6-Pounders.

With regard to *6-prs.* of post 1794 manufacture (stated in 53 | Windsor | 261 to have been removed to Windsor about 1818), these may have been of Peninsular celebrity; but they could not have been at Waterloo, as no (R.A.) field guns under 9-prs. were engaged at Waterloo, except the 6-prs. of Capt. Joseph Brome's troop, R.H.A.,[2] which were employed at the close of the battle and in harassing the retreat of the French. The most careful search of the Board of Ordnance records has failed to discover any memo. of 6-prs. at Windsor."

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[1] One of these handsome 4-pr. bronze guns is in the Museum of Artillery at Woolwich—cast by Bowen, 1742; but the catalogue, No. 28, does not give its original history, and would appear to be slightly inaccurate in regard to length, calibre, and weight.

[2] Son of the Adjutant at Culloden.

TACTICAL PROBLEMS.

BY

CAPTAIN J. E. EDMONDS, R.E.

The examination in tactics for promotion consists, as a rule, almost entirely of map problems.

Except a small book by Karl von Donat, to which attention has been drawn in these papers, in which an examination question is worked out at length, in a manner, it is said, not approved of by the examiner who set it, there is no guide as far as I know as to how these problems should be dealt with. Moltke's "Tactical Exercises" deal with very large forces, and in many cases require actual reconnaissance of the ground.

It is, of course, easy to find many solutions to a given problem, but few of us, I take it, are heaven-born tacticians, and, when one has to answer in three hours, six questions, each of which, at the most reasonable computation, requires a quarter-of-an-hour's thought and study of the map, and three-quarters-of-an-hour's writing, it is of great assistance to know what other people, who are qualified by experience to judge, would do under the given conditions of the problem. I, therefore, venture to send a notice of a book which has recently appeared in France, by Commandant Devaurieux, Chief-of-Staff of the 2nd Infantry Division, called "*Cinquante problèmes tactiques discutés et traités sur la carte de Rettel.*" The problems include almost every ordinary operation, outposts under various conditions, marches when advancing, retreating, and crossing a flank, positions for battle, attack and defence of woods, localities, defiles, rivers, etc., night marches and surprises; minor operations, such as the attack and defence of a convoy of vehicles and prisoners, requisitions, protection of a railway and reconnaissances.

The force employed never exceeds a brigade of all arms:—six battalions, three batteries, two squadrons, and a section of engineers.

The map is, unfortunately, not quite satisfactory. It is the General Staff map, scale $\frac{1}{80000}$, hachured, with the heights of various points marked; no contoured map of France, except one on the small scale of $\frac{1}{1000000}$ with contours 100 metres apart, is available. The places are easy to find, as the map is divided into squares with letter and number, and these indicators are inserted in the text after the names.

The whole book is well worth translation. The translation of one problem is appended as best showing the method of the author, although others are worked out in more detail.

In each problem the situation and question are first stated, then follow reflections and the resolution taken, next the orders given, and finally, observations. The particular problem is selected as being almost identical with a question set at the last examination for promotion; whether the solution offered would be acceptable to the examiner hardly admits of doubt.

It should be noted that the two squadrons of cavalry are employed in the problems as follows:—One squadron (of discovery) for reconnoitring, half a squadron (of protection) for security, one troop with the advance or rear-guard, and the fourth troop as head-quarter escort and orderlies.

The book and map can be obtained through the Army and Navy Stores for 6s.

PROBLEM IX.

March of a single brigade of all arms retreating after a defeat.

Situation and Question.

An isolated brigade of all arms (six battalions, two squadrons, three field batteries, and a section of engineers) has been defeated to the south-east of Clermont, near the farm of Saint Acquaite. It retreats towards the north in the direction of Vervins.

Issue the orders for the movement.

Reflections and Resolution.

The first serious obstacle which can be opposed to the pursuit of the enemy, in retiring towards the north, is the river Serre.

The most direct road to Vervins passes through Pontsericourt. A retreat in this direction offers the advantage of being able to cross the Serre by two bridges, as the passages both at Pontsericourt and Saint Pierremont can be utilised.

Until the Serre is reached the rear-guard can take tactical advantage of the plateaux of the Farm Rougemont and of Montigny-le-Franc. (Montigny only on the map).

To prevent a hostile detachment anticipating the brigade on the heights of the right bank of the Serre, the bridges above and below the point of passage selected by the brigade must be blocked. Those on the east particularly must be watched.

In consequence the following orders are issued.

Orders Given.

(1.) General order.

Clermont, 29th June, 1891. 3 p.m.

The brigade will retreat on Vervins. The Serre will be reached, and crossed in two columns, one taking the Montigny-le-Franc—Pontsericourt road and the other the Rougemont—St. Pierremont road.

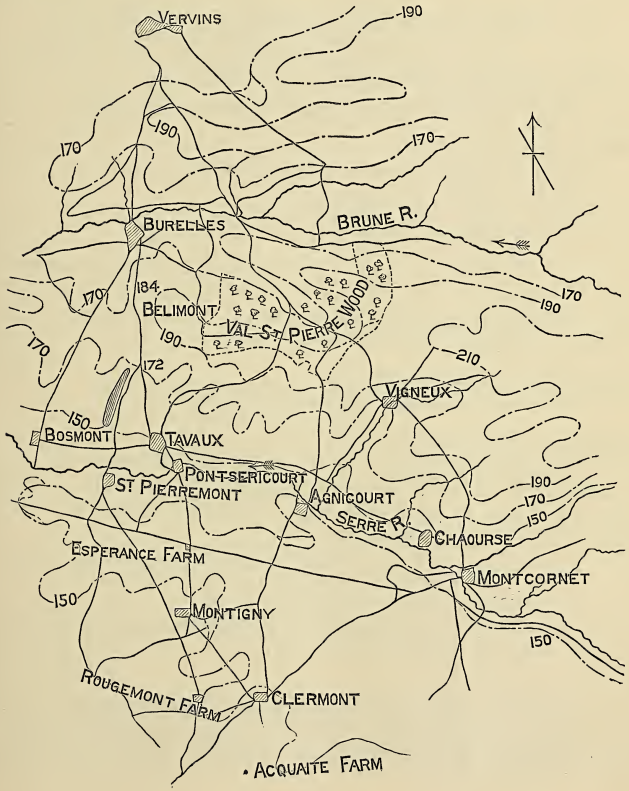
The two first battalions of "A" Regiment and two batteries of artillery will form the Eastern Column, the artillery marching between the battalions.

The 3rd battalion of "A" and the 1st battalion of "B" Regiment will form the Western Column.

The rear-guard, formed by the 2nd and 3rd battalions of "B" Regiment, the 3rd Battery, the Engineer Section, and quarter of a troop, will hold the enemy, occupying successively the crests near Clermont and Montigny, and eventually the heights on the banks of the Serre.

The reconnaissance squadron, after leaving a detachment to watch the enemy's right flank, will make for the bridge of Agnicourt, which is to be barricaded and, if necessary, destroyed. One troop will be sent to Vigneux to block the bridge on the Montcornet-Vervin road.

The outpost half squadron will place itself without delay on the west flank to guard and defend the bridge of Bosmont, which may be destroyed. The rear-guard must endeavour to maintain its position on the plateau north of Montigny until the last fractions of the main body are one kilometre clear of the foot of the heights on the right bank of the Serre.



When the two columns arrive on the plateau two kilometres north of Tavaux, the column which reaches the road junction first will continue its march followed by the other column.

The two batteries will halt, if necessary, in order to interpolate themselves between the last and last but one battalions of the single column thus formed.

In the absence of further orders the march will be continued in this formation *viâ* Burelles to Vervins.

The General will be at the head of the last battalion of the east column.

The baggage, which remained at Tavaux, and the ambulance, which is at Montigny, will precede the brigade. The wounded who cannot be moved will remain with two surgeons and some attendants at Clermont.

II.—Orders given by the Commander of the Rear-guard.

I.—Clermont, 29th June, 1891. 3.20 p.m.

To the 2nd battalion "B" Regiment and Engineers.

Hold the border of the wood south-east of Clermont.

To the battery.

Maintain your position to the west of Clermont.

To the 3rd battalion "B" Regiment.

Occupy Rougemont Farm.

II.—Montigny road. 4.15 p.m.

To the battery.

Leave your present position and take up a fresh one near the brickyards south-west of Montigny.

To the 2nd battalion and Engineers.

Cover and follow the retreat of the battery.

To the 3rd battalion.

Support the retreat of the artillery and infantry evacuating Clermont. When these troops are half a kilometre past you, retire in échelon and take up a position in line with them south-west of Montigny.

III.—Esperance Farm. 4.50 p.m.

To the 2nd battalion, Engineers, and battery.

Evacuate Montigny and take up a position near the Esperance Farm.

To the 3rd battalion.

You will again form the rear échelon at 500 metres from the troops leaving Montigny and, continuing retirement establish yourself about 1500 metres north-west of the Esperance Farm on the Montcornet-Marle high road.

IV.—Pontsericourt road. 6 p.m.

To the 2nd battalion, Engineers, and battery.

Evacuate the Esperance Farm, cross the Serre at Pontsericourt, pass through Tavaux, and take up a position two kilometres north of it (point 172) to defend the exits.

To the 3rd battalion.

Support the retirement of the troops evacuating Esperance Farm. When they have crossed the Serre, retire, crossing the Serre at St. Pierremont, and move up the road towards point marked 172 on map.

When you reach the plateau, line the eastern edge of the wood near the road, so that you can sweep with fire the ravine north of Tavaux.

OBSERVATIONS.

I.—When a body of troops retreats, especially after a defeat, it should seek to place a serious obstacle, such as a stream like the Serre, between it and the enemy as soon as possible. If this stream can be reached by two roads and be crossed by two bridges, so much the better; once crossed the retreat can be continued in a single column, the stream being sufficient to stop the immediate pursuit.

II.—Once united into a single column, the normal conditions of a retreat take effect, the two batteries marching between the last two battalions. This precaution is necessary in case the pursuit, again becoming active, should oblige the brigade to make head against the assailant, and to oppose him as rapidly as possible with all its artillery.

III.—During the retreat from Clermont to Vervins, the eastern flank runs most danger of being turned. And for the following reasons:—

(1.) The passage at Agnicourt is nearest to the enemy, that at Bosmont is half as far again.

(2.) From Agnicourt a hostile detachment could easily push forward to seize the heights commanding the right bank of the Serre, and take in flank the brigade debouching from the Tavaux Valley.

(3.) The enemy could further, thanks to the Val Saint Pierre Wood, gain the debouches west of the wood under cover, and, passing the Belimont Farm, menace the line of retreat on the Brune and Vervins.

For these reasons a whole squadron is used to guard the passages on the east, while half a squadron is sufficient to defend the bridge at Bosmont.

IV.—During the fight the enemy's cavalry might, instead of coming close to Clermont, move on Montcornet and, crossing the Serre there, push forward to seize the bridge at Vigneux. To be prepared for this eventuality a troop of the squadron at Agnicourt is sent there, a

more simple manœuvre than watching the Serre above Agnicourt. This last measure would necessitate a more excentric deployment with regard to the direction of the retreat, and would require a greater force, as four bridges would have to be watched in place of one—the two at Chaourse and the two at Montcornet.

V.—The expressions Eastern and Western Columns are employed in the order in place of the terms right and left, by design. Although frequently used, the latter only give rise to confusion when, as in the above problem of a retreating force, the troops face sometimes towards the enemy and sometimes towards the objective of the march, and have, so to speak, no proper right or left.

VI.—The issue of detailed orders ceases when the brigade again becomes a single column.

It would be easy to indicate fresh positions for the rear-guard. For example, one about two-and-a-half kilometres south of Burelles, between the point marked 184 and the Belimont Farm, which commands the principal exits from the Val Saint Pierre Wood. But it is unnecessary to develop indefinitely the already long series of detailed orders.

SELF-ADJUSTING FIRING LANYARD FOR FIELD ARTILLERY.

(WITH FUZE KEY ATTACHED.)

BY

LIEUT. C. B. SIMONDS, R.H.A.

Ever since the present system of ranging a battery, in which fire discipline (in its present sense) plays such an important part, was first adopted, improvements have been made yearly in the effect of fire and also in control of it. Those interested in the results obtained after each season's practice eagerly look forward to the official reports which are duly published, both at home and abroad. These official reports record, not only the results of the past season's practice, but also suggestions of improvements and requirements for the ensuing season.

After reading the "Annual Report on Horse and Field Artillery Practice at Home, 1892," from which the following paragraphs are taken :—

(1.) Page 37, para. 5 (Miscellaneous).

> "The service of the lanyard and tube is one for which it is difficult to suggest a less clumsy method, but some of the batteries tried a bandolier on the belt of the tube pocket to hold a few tubes, which could be filled and refilled during moments of leisure. The lanyard is hooked to a tube in the belt and a motion is saved. I think this slight change would increase the rate of service of the gun and should be tried."

(2.) also Page 32, paras. 7–8 (Fuze keys.)

> "These are constantly breaking, owing to the studs giving way when fuzes are being fixed. Some batteries had their fuze keys attached to the carriage instead of to the number who has to use them. This seemed a good plan. I think that a fuze key should be attached with a lanyard to the near side of each gun carriage, and to the back of each limber and wagon."

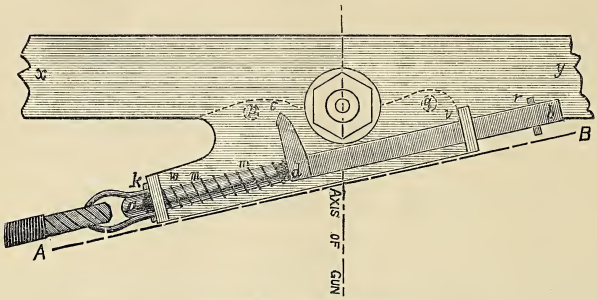
the writer considered a plan for facilitating the duties in the service of the gun as regards both setting the fuze and firing.

The self-adjusting firing lanyard, with fuze key attached, is a simple addition to the gun, and seems to admirably fulfil both these requirements.

It consists of a sliding bar *a b* (*See* diagrams) fitted with a cross-piece

PLAN (SHOWING POSITION OF VENT).

Scale $\frac{1}{2}$.



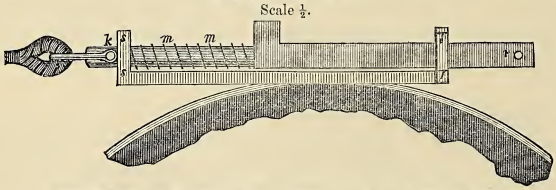
Nomenclature and Dimensions.

a b "Sliding-bar," length, 6″; thickness, ·3″; thickness, rounded portion, ·25″.
c d Cross-piece, length, ·9″; thickness, ·3″.
x y Fixing band (wrought-iron), breadth, 1·1″; thickness, ·1″.
w v Guide piece (wrought iron), thickness, 1·75″.

N.B.—The dotted lines *p q* show position of rivets where the Fixing band is joined (welded) to Guide piece.

ELEVATION ON *A B*.

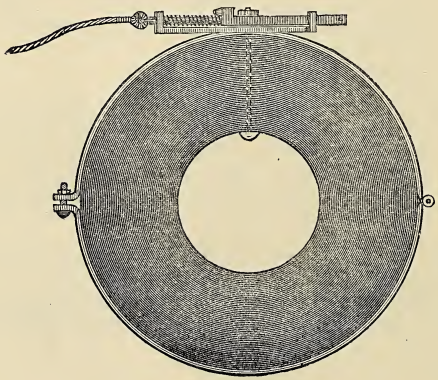
Scale $\frac{1}{2}$.



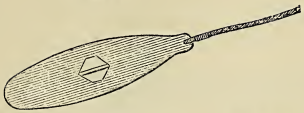
S S, *T T*, Guide for Sliding-bar; *r*, Stop rivet; *m m*, Spiral spring.

SECTION OF GUN (SHOWING IRON BAND WITH HINGE AND NUT ATTACHMENT).

Scale $\frac{1}{4}$.



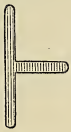
FUZE-KEY.
Scale ¼.



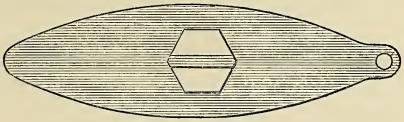
ELEVATION.
Scale ¼.

FUZE-KEY.
Scale ½.

Section.



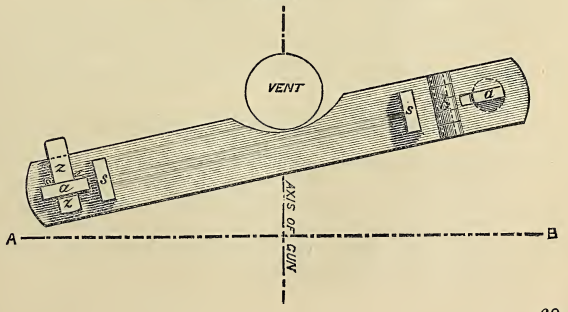
Plan.



c d, which is fitted to take the loop of the friction tube (a notch being cut in the cross-piece to hold the loop of the tube). The sliding bar *a b* is partly square in section and partly rounded, the rounded portion being so made to hold a spiral spring. The hole through which the bar slides in the guide T T is square, that in the guide S S is circular. There is a stop rivet *r*, which prevents the bar *a b* from being pulled too far, and straining the steel spiral spring. The spiral spring should be sufficiently strong to make the sliding bar return to its former position when the pull of the lanyard is released. The rivet *k*, which fixes the loop for the lanyard to the sliding bar, should be fitted so that it will only allow the sliding bar to spring sufficiently far back so that the cross-piece is in the proper position for fixing the loop of the tube.

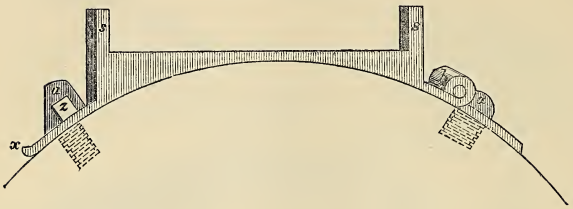
This method of adjustment, with an iron band round the gun, is clumsy, and the vent cannot be loosened or tightened while it is on; but this is only so fitted for the purpose of experiment (the surface of the gun is not injured in any way by this band fastening). The proposed method of fixing the lanyard to the gun, if the principle of the thing is approved, is shown below.

PROPOSED ATTACHMENT.
PLAN SHOWING GUIDE PIECE AND FIXING NUTS.
Scale ¼.



SECTIONAL ELEVATION ON *A B*.

Scale ½.



a, *a*, are steel nuts, screwed into the gun.
b, is a hinge.
s, *s*, are the guides for sliding bar.
z, is a fixing bolt held in by a split pin.
x, the end of guide piece, is slightly turned up, so as to allow a fuze key or pricker to be inserted under it to lift up the guide piece if necessary to take it off.

N.B.—The "sliding bar" is not shown in either of the above, so as to make them the more clear.

The nut at the hinge *b* is undercut thus on the outside, so as to admit of the guide piece fitting underneath. By this method of adjustment the whole thing can very rapidly be removed and replaced in the event of anything breaking.

For tightening the vent a spanner shaped thus would be better suited than the one now in use, as it would not be necessary to remove any portion of the Firing Lanyard.

The advantages of this instrument over the ordinary tube lanyard and tube pocket are :—

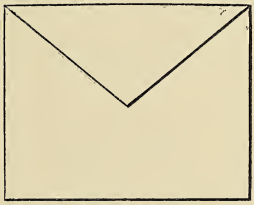
1. All appliances for firing are attached to the gun itself, so that in the event of No. 3 being disabled another man can fill his place and at once carry on his duties without having to supply himself with anything from the person of the disabled number.
2. Time saved in making ready to fire.
3. Insurance against miss-fire (the tube cannot be jerked out of the vent as the sliding bar can only move horizontally).
4. Freedom of action to No. 3, who is not overloaded with implements.
5. Convenient position of fuze key for setting fuze before loading.
6. Existing stores can be used (no special tube being required). The small fuze key attached to the end of the lanyard is only intended for fixing the fuze, it will not remove the fuze from the shell, but this would never be required to be done at the gun. (This small fuze key seems to be more handy for setting the fuze.)

This fuze key is also convenient to hold when pulling the lanyard to fire the gun. As soon as the tube has been fired the fuze key should be allowed to drop out of the hand, so that no strain comes on the lanyard when the gun recoils.

The lanyard is made short as possible, it should only be sufficiently long, when taut, to allow the fuze key to be just clear of the gun-wheel.

The friction tubes will be carried in a bandolier, attached with two straps to the left side of the top of the Mark II. carriage, and in the Mark I. carriage must be fixed to the left bracket, abreast of the vent.

The bandolier, to be made of leather, will hold 25 (one box of) friction tubes, and will have a pocket in which the fuze key will be placed when the gun is out of action. The bandolier will close like an envelope and fasten with a tie (the head of the tie, which is fixed to the body of the bandolier, to go through a hole in the flap of the envelope).



Of course, a fair trial will bring many suggestions of improvements to any new idea, and the writer does not pretend that this small addition to the already complicated mechanism of a field gun is by any means as yet perfect, but it has answered very well in "N" Battery during the short time it has been on trial, and there is no reason why it should break down as it can be made very strong.

SIEGE OF MINORCA, 1756.

BY

AN OFFICER WHO WAS PRESENT AT THE SIEGE.

INTRODUCTION.

This Journal of the Siege of Minorca in 1756 is given to the Regiment through the kindness of one deeply interested in its History and Records.

No other detailed account of this siege is known to exist, but a general story of it is given in Beatson's "Naval and Military Memoirs of Great Britain," and readers of this Journal are advised to study that work.

The name of the Author of the Journal is not given, but there is little doubt that he was an Artillery Officer. This Journal and that of the Siege of Belleisle are evidently by the same man; they are both in the same handwriting, identified as that of Lieutenant and Fire-worker Luke Forman[1]; as, however, he was not present at both sieges it is highly probable that he was the amanuensis of Benjamin Stehelin,[2] the only R.A. officer present at both, a man of good education and powers of observation.

The maps used to illustrate the Journal are taken from one of those presented to the R.A. Institution by the widow of Major-General Sir John May, K.C.B., K.C.H., R.A.; it is entitled, "A Map of the Isle of Minorca geometrically surveyed by the Royal Engineers while it remained in the possession of the French during the last War, and Digested by L. S. de la Rochette, M.DCCLXXX."

The manner in which Great Britain came into possession of Minorca is given by the Author in a short introduction to his Journal.

The events that led up to the siege of 1756 may be shortly described by the following extracts from Beatson:—

In October, 1748, the Treaty of Aix-la-Chapelle was concluded; by it the French naval power was so much reduced as to be no longer formidable. The French at once began to re-build, both at home and in Sweden, their fleet, and soon had a strong one afloat again.

Though, by the Treaty, peace existed in Europe, war continued between Great Britain and France, both in North America and the East Indies, and the consequent irritation between the two nations grew to such a pitch that early in 1756 it was evident that a declared state of war could not long be avoided. The French avowed their intention of invad-

[1] No. 158 in "Kane's List."

[2] No. 161 in "Kane's List."

ing Great Britain, and for this purpose concentrated troops, war-ships, and transports at Brest; these preparations were viewed with great alarm throughout England, and a large fleet was detained at home for the security of the nation. Meanwhile the French, almost unperceived, embarked some 16,000 to 18,000 men on board vessels at Toulon, sailed unmolested for Minorca early in April and proceeded with the siege of St. Philip's Castle, as set forth in the Journal.

As soon as news of this hostile invasion was received, Great Britain formally declared war against France on 18th May.

A SHORT ACCOUNT OF THE MANNER IN WHICH MINORCA FELL INTO THE HANDS OF THE ENGLISH.[1]

Upon the reduction of Sardinia, and the return of the Fleet to the Coast of Catalonia Major General Stanhope projected an expedition for the conquest of the Island of Minorca, then Garrisoned by the French and Spaniards for King Philip.

He accordingly procured the necessary orders for embarking a body of troops, amounting to two thousand six hundred Men, as it was given out; though in reality there were not more than two thousand; twelve hundred of which were British, including the Marines; Six hundred Portuguese, and the rest Spanish; these were put under his command, and arrived at the Island on the 14 of September, 1708.

They met with a great deal of difficulty in landing, and transporting the heavy Artillery in so rocky a Country, where there were but few Beasts of burthen, that they could come at; yet with continual labour they brought their whole train, consisting of 42 Guns, and 15 Mortars in twelve days time, to the ground where they intended to employ them.

In the mean time Fornelles Castle was briskly attacked by Capt Butter, in the Dunkirk; who got into the harbour two hours before the Centurion, Captain Fairborn, which was dispatched with him from the Fleet, and fired 36 Barrels of Powder against the Castle, which made a gallant defence; but the Garrison finding the Centurion was able to get in, and had begun a warm fire on them, thought proper to surrender themselves Prisoners of War, having had but one man killed and four wounded, whereas the Ships had eleven killed, and about sixty wounded.

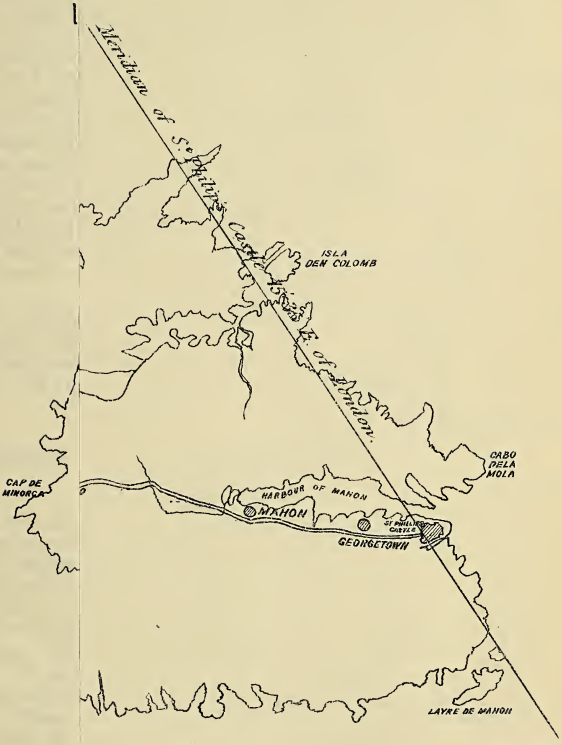
The Garrison consisted of about fifty men, and had twelve Guns mounted for its defence.

This success intimidated the Garrison of St. Philip's Castle and contributed a good deal to hasten its surrender to the confederates.

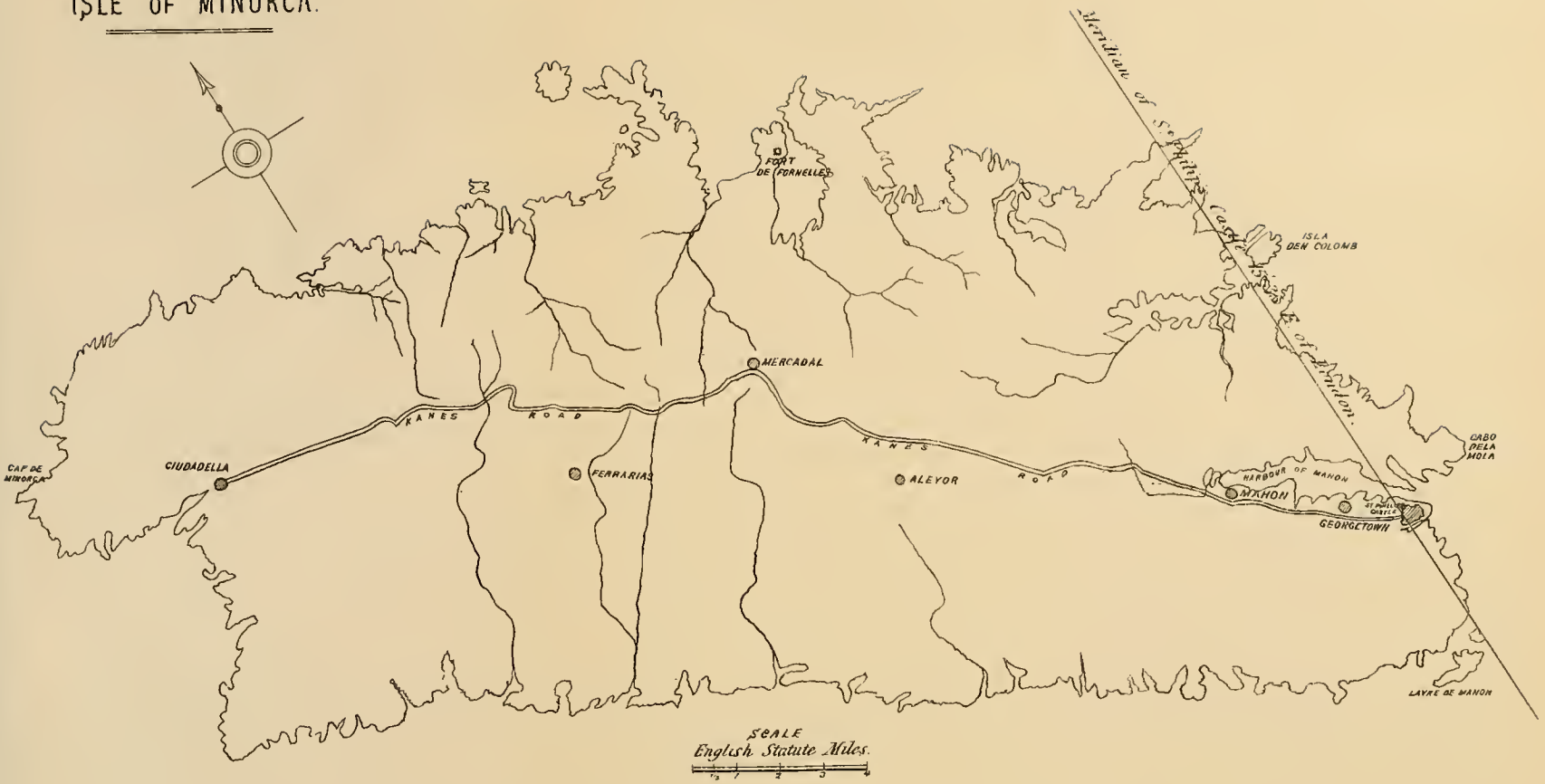
On the 28th at day break, the General opened a Battery of Nine Guns, against the two middlemost Towers, that defended a line the Enemy had lately made, and beat them down, making some breaches in the line wall itself, which consisted only of loose stones without mortar.

Brigadier Wade, being posted at some distance on the right with

[1] The spelling and capital letters are reproduced as in the original.


Meridian of St Philips Castle
ISLA DEN COLOMB
CAP DE MINORCA
HARBOUR OF MAHON
MAHON
ST PHILIPS CASTLE
GEORGETOWN
CABO DELA MOLA
LAYRE DE MAHON

ISLE OF MINORCA.



ISLE OF MINORCA

two Battalions; some of his Grenadiers entered the line without orders, which the Brigadier no sooner perceived, than he advanced with all the Men he could suddenly get together, to sustain them, and the General, hearing their fire, marched the ordinary Guard of the Battery up to that part of the line that was nearest, which put the Enemy into so great a consternation, that they immediately abandoned the two towers, which could not have been taken without Cannon, and retired precipately within the works of the Castle.

The Allies lodged themselves the same evening at the foot of the glacis of St. Philip's Castle; and traced out their main battery; but the next morning the Enemy beat a parley, and a treaty ensued, that ended in a Capitulation, which was signed at 5 o'clock in the afternoon, in consequence of which the General took possession of the place on the 30th, and found the Garrison to consist of one thousand Men under Arms, part of whom were to be transported into France, and the rest of them to Spain.

The loss of the confederates was inconsiderable, not exceeding forty men killed and wounded; among whom was the brave Capt Stanhope of the Milford.

A Detachment of foot was sent to Cuidadella which immediately surrendered; and here a Garrison of 100 men were made Prisoners of War.

In St. Philip's Castle were found 100 great Guns, and 3,000 barrels of Powder; with every thing necessary to sustain a Siege.

On the peace of Utrecht Minorca was yielded to us, and has ever since to the year 1756, remained quietly in our hands.

A JOURNAL OF THE SIEGE OF ST. PHILIP'S CASTLE IN THE ISLAND OF MINORCA, IN 1756.

1756. April 16th. Though the Garrison of Minorca had for several Months before been informed of the preparations the French were making at Toulon, and the adjacent Towns in the South of France, it was not till this night that all were fully convinced the Armament was intended against Minorca.

About 10 o'clock at night the Packet came in, the Captain of her, Mr Hope Junr brought the first certain account that the French Fleet were sailed, having been in company with them about a Day without being taken notice of.

The Officer of the Town Guard Lieut. Inglish, was sent for about 12 o'clock at night by Col Jefferys and desired to walk about the Streets and observe if any of the Inhabitants were moving; he returned and acquainted him upon his second visiting the Town that they had got notice of the account brought, for that the whole were stiring; he was told he might look upon this as an alarm and open his orders, which he did; and in pursuance thereof put his Guard under Arms, and sent to the Serjeant of the Quay Guard, and likewise to the Serjeant of St Stephens; who was to march out by St Stephens Cove, to open their orders; upon which these three Guards dividing them-

selves so as to form a Chain of Sentrys along the Line wall from St Stephens cove to the Quay, and in five Minuts were so posted, that neither man nor beast could escape their notice.

April 17th. The French Fleet appeared off Fornelles, consisting of 12 Sail of Men of War, and a vast number of Transports; and the Company of Col Rich's Regiment Quartered there marched for St. Philips; the Guards were augmented, the Town Guard to 60 Men, a Captain at Marlborough Fort, a Subaltern at the principal Barriers, a Subaltern at St Stephens, and a Subaltern at the Royal Battery; and every body prepared to go in to the Castle.

„ 18th. Early this morning the French Fleet appeared in sight of Ciudadela, on which the five Companies of Col Rich's with two Field Pieces marched for St Philips. In the afternoon the French began their Disembarkation at, and near to Ciudadela. Major Cunningham went out with a Party of Pioneers who with a party of Col Rich's commanded by Lieut Kennedy, endeavoured to destroy the Road; they were covered by a Captain's Command from Mahon, and returned to St. Philip's Castle at night.

„ 19th. A Field Officer's Party was left at Mahon, and Col Cornwallis's Regiment quartered there marched in to the Castle; as did also the Reg[t] quartered in the Town of St Philips.

„ 20th. A mine was sprung under the Friary hill at Mahon to destroy the Road; a Captain's command was sent to English Cove, and another to middle mount to cover the retreat of the Field Officer's party at Mahon; which marched in the Evening bringing with them 3 Spaniards taken in the Streets, the rest having fled and secured themselves.

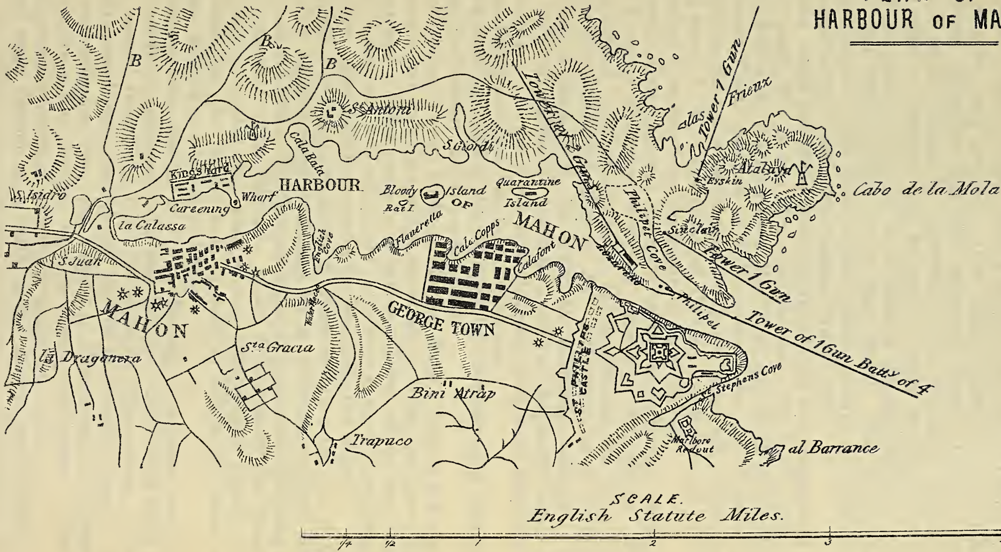
The French came this night to Alaor. Commodore Edgecombe in the Deptford, and Captain Lloyd in the Chesterfield sailed.

„ 21st. The Princess Louisa, Captain Noel, the Portland, Captain Baird, and the Dolphin with 30 men under the Command of Lieut O'Hara, sailed out of the harbour; Captain Scroop with the rest of the Dolphin's Crew were left behind to strengthen the Garrison as were likewise all the Marines under the command of Capt Mason and two Lieut[s], with a Detachment from Gibraltar that was on board the Deptford, commanded by Lieut Devoisrie; It is said that Capt Baird was very much for the men of War remaining to reinforce the Garrison, which had no other addition but what we have mentioned above, some Greeks and a very few Spaniards.

This day the Enemy appeared on this side Mahon. A part of the Garrison were employed in bringing in empty Wine Casks from the Town, and in destroying the Fascine Battery that was erected at the Quay; to defend the entrance of the harbour.

„ 22nd. General Blakeney sent out a Drummer to the Marshal Duke De Richelieu who commanded the French forces, to know the reason of his invading the Island in an Hostile manner (or to that effect). The fireship was sunk this day at the entrance of the Harbour. The Lieut Governor proposed to Captain Scroop, that the boom which was to have been laid across the harbour to obstruct its entrance, might be cut and brought away; but it was Capt Scroop's opinion it would be attended with too much difficulty, as it was so firmly secured with Anchors and Chains.

PLAN OF HARBOUR OF MAHON.



PLAN DE MARCH
DE HARBOUR

In the night the Enemy took the Prizes, that were left by the Men of War, up to Mahon.

The Marshal sent back the Drummer (who had been taken to his head Quarters at Alaor, where their Encampment then extended near a mile; in going and returning they blind folded him, at middle Mount; where they then had their advanced Guard; In his return before he came to Mahon, he observed several Pieces of Cannon in the road) with an answer; that he came to take possession of the Island, for the same reason that his Brittanick Majesty had taken possession of the French Ships (or to that effect). The Enemy had lighted up fires in a line from behind middle mount to Stanhope's Tower, and a pretty considerable distance further off. April 23rd.

The Town Guard continued in St Philip's, being now augmented to a Captain's party, The Enemy at a small distance. To day the French Fleet came before the Harbour from the West, and stood South East. „ 24th.

The French Fleet appeared at S. E. standing for the Harbour all the Batteries to the sea were manned to oppose them, but they tacked again and stood S. W. The principal Barrier and Sally port by the N. E. Ravelin, were this morning begun to be walled up. „ 25th.

The French Fleet appeared to the S. of the harbour and remained there till Evening, Cruising off and on; and then brought to. The Admiral detached 3 of his Squadron to the E. in Chace, the Wind W.; at night the French Fleet stood to the W. A Drummer of the Enemy's came in with a letter from the Duke De Richelieu relating to an Officer's Lady left behind at Ciudadela, and was dispatched again in about two hours. In the night several signal Guns were heard from the French Fleet, and false fires seen from them. „ 26th.

Alarmed about one o'clock this Morning by a report that a Ship was attempting the harbour, but it proved false. „ 27th.

The Castle brought to an Anchor under her Guns, a Ship of the Island from Genoua bound to Mahon, which was coming in to the harbour; The Enemy marched a large party to Stanhopes Tower, about noon they fired small Arms from a Window, and there were some shot exchanged on both sides. Their Fleet appeared in sight from the West.

The French Fleet stood from the S. West within a League of the harbour, then Tacked, stood south and lay to, till dark; our sea Batteries were all Manned. The Guards began to parade this Morning in the Subtereanean Communications. Boats with some of the Enemy in them, are frequently seen passing near Quarrantine Island. To day we heard that the Enemy were in want of Water, and were on that account obliged to move their Camp. „ 28th.

The Gunners were ordered to lay at the long storehouse near the sea, to be ready on any alarm from that Quarter; the French Fleet to the East, several Guns fired from the Enemy's Fleet at sea, in the night; and great lights through the Line of the French Camp. As we have no intelligence from the French or Minorquins, it is impossible to ascertain the strength of their Army, the extent of their Camp, or become acquainted with the progress they make. „ 29th.

We fired some Cannon at a party of the Enemy reconnoitring at Philipet, who retired immediately; the Prince of Wirtemburg was „ 30th.

one of them. The French Fleet appeared from the Southward, they consisted of 19 Sail, from whence it is conjectured they had taken some of our merchant Vessels. A few of the Enemy were seen in the Vineyards about three quarters of a mile from the Marlborough, who immediately made off on the firing some Wall pieces and small Arms.

May, 1st. A Drummer came in from the Enemy to the Governour, with a Letter, contents not known, and was sent back in an hour or two; supposed to be to demand a French Criminal which had been carried away by Captain Noel.

Mr Boyd went out with the Drummer, and took that opportunity to walk up to the ground where two Windmills had been pulled down, but could not discover any works begun on that side; nor does it appear that they have begun any Batteries, or brought up any Cannon as yet.

An alarm was purposely given to try the readiness of the Troops, when they all appeared at their posts; the piquet ordered to mount at sunset, to continue at their posts all night; and hold themselves in readiness till sunset next Day, till relieved by the New piquet. The French Fleet off the harbour.

Three Spanish Boats went off from the Western part of the Island, to the Enemy's Fleet; and continued amongst them till evening.

„ 2nd. General Blakeney sent a Drummer to the Marshall, the message not known. About Evening a large party of the Enemy's Pioneers and Spaniards marched round to Cape Mola. We fired from the Queen's Redoubt at a Ship coming out of a Creek, by Quarrentine Island, we imagined she had carried Stores to the N. E. side of the harbour, where from the number of people frequently seen there, it is conjectured that the French are carrying on some work; but Night coming on and the Vessel getting behind the Island, we were prevented from having any more than three shot at her.

The French Fleet in sight.

„ 3rd. We fired some Cannon Shot at the Enemy's Partys passing to and from Cape Mola, and threw some Shells which seemed to put them in great confusion. Mr Chissel was sent over to Cape Mola to make what discoveries he could, who brought us word the Enemy were at work where we judged them to be. A French Soldier came towards the principal Barrier, and by his gestures seemed inclined to desert; he was encouraged so to do, and some went over the Palissadoes to conduct him in, but he then turned back and made off, upon which the Sentrys were ordered to fire upon him, and he was killed. The Enemy's Fleet to leeward, a great distance off, Several Guns were fired from the Queen's Redoubt at a very considerable party of the Enemy who were marching along the Hills on the N. E. side of the harbour, many of them appeared to be Pioneers. A very strong party were seen this Morning at Cape Mola signal House, where they were relieving their Guard. A considerable body of the Enemy were collected on the neck of Land adjoining to Cape Mola, where, it being imagined that they were busied in forming some Battery, several Shots were fired at them, and some Shells thrown, one of which upon its bursting made them disperse, and quit the place.

We fired from the Queen's Redoubt at the Enemy's Parties passing the Neck of Land to Cape Mola. The Enemys Fleet in sight off the harbours mouth. May 4th.

The Duty being very hard upon the Subalterns, on application to Lieut Colonel Jefferys the Adjutants were ordered to mount their Guards; and for their further ease, one Sub: was taken from the Carolina, and one from Kane.

It having been found inconvenient to do Duty by the Long Roll; it was therefore changed; for in case of an alarm when the Regiments are out, Officers may be wanting to some, it is thought necessary to alter the method of mounting Guards, and their Duties, and to do them by Roster, by which means a more equal Number of Officers of each Regiment are off Duty.

We fired Cannon, and threw several Shells, to the other side of the harbour; the Enemy carrying on a work on Cape Mola. This day the Islanders ceased bringing Vegetables and other refreshments to the Garrison, it being forbid by the Enemy.

The French Fleet to the West. We fired shot and three Shells at the Enemy, who were bringing Fascines over the Top of the Hill at Cape Mola. This night Carcasses were thrown to Cape Mola, as we had been informed the besiegers had broke ground there, the third instant. „ 5th.

This morning we discovered a work the Enemy had carryed on, on the brow of the hill of Cape Mola; higher than, or above, the level of the top of the Castle; it appears like a Battery, and joins the old Wall near to the Sea: we also perceived another work of Fascines, we fired several Shot at these works. Last night two Men were sent out to reconnoitre, who went up the Line Wall, and through the Streets of St Philips, from Water Tower to Stanhope's Tower; but discovered nothing of the Enemy's proceedings. „ 6th.

We discovered for certain that the Enemy's work by the old Wall on Cape Mola, was a Battery of five Embrazures with sand bags in them, we fired at it continually from the East Counter Guard, as we did at the other work from Charles's Fort; we discontinued firing in afternoon, but gave them about 70 shot and some Shells in the Night. „ 7th.

Their Fleet off the Harbour every day. An 8 inch Mortar burst, and an 18 Pounder flawed so, as to be condemned; A Serjeant and a Private Soldier were sent out to reconnoitre, but they did not return any more. The masonry of our works gives way by the explosion of our own Guns. All works in the Garrison are now carried on during the Night.

At break of Day the Enemy opened two Batteries, one by the old Wall on Cape Mola, where they had 5 Guns of different natures, the highest of which seemed to be 26 Pounders, the other a Fascine Battery of 4 Mortars, their largest 13 Inch; from which they played very smart on the Castle, and Queen's Redoubt; it was returned from the top of the Castle, from most of the works on that side, and from two Guns at the Queens Redoubt; in about two hours their fire slackened, only one or two of their Guns playing, and those chiefly against the center of the Castle. „ 8th.

At night we fired both Cannon and Small Arms on a party of the Enemy heard at work by the burying Ground in the Town, they returned some small shot. A Shot of the Enemys fired one of our Guns, which went into the harbour. They dismounted a Gun on St Stephen's Battery, and one at S. W. Lunette.

Two Soldiers of Lord Effingham's Regiment were killed by one of our own Guns not being sufficiently Spunged; this day there was an order not to fire the same Gun above once an hour; there being many bad Guns, and the Embrazures slight.

May 9th. In the Evening a party of the Enemy approached towards the Glacis of Marlborough Fort, they were fired at with Small Arms, which they returned and retired behind the wall on the top of the Hill; keeping an irregular fire for near two hours; we sent them a few Shot from Carolina's lunette, the new Tenaille, and Hospital Battery; from the Marlborough several Cohorn Shells were directed up the Hill at them, some shells were also thrown to the Town near the old burying ground, where we heard the Enemy at work, as were some Carcasses to give light.

Some of the Enemy's fleet in sight.

„ 10th. We Cannonaded each other across the harbour, and the Enemy threw a great many Shells into our works from their Mortar Battery on Cape Mola; we likewise poured a great number of Cohorn shells into the Town to annoy the Enemies Workmen; It is apprehended that the Enemy are forming a Battery near where the two Windmills were destroyed.

This day an order was given that none of the Batteries should fire without orders from the Field Officer of the Day, but the inconveniency of this being discovered, the order was revoked; and the time for firing left to the direction of the Officers commanding the Guards. The Enemy's fleet in sight from the Westward.

„ 11th. In the night the Enemy lengthened their work by the burying place, and were also working by the water side near the House where Major Innes lived; we threw Shot and Shells to all parts of the Town to annoy them, and at night fired two vollies of our Mortars and Cannon.

A great noise of heavy wheel Carriages heard last night between Stanhope's Tower, and the Town. The Enemy's fleet in sight to the South East. Captain Flight was of opinion that by firing a Volley from all the Guns that bore on the Enemy's Gun Battery at Cape Mola, he could effectually silence it in a very short time; instead of which we only now and then fired a shot; and that, on account of the weakness of our own Works.

„ 12th. The Enemy having been discovered working near Major Innes's, two 32 Pounders were brought from the Royal Battery to Argyle's covered way, to fire at the wall behind which they were. We heard them very plainly at work near the burying place, towards which we fired; and threw many Shells the whole Night. About half an hour after Nine at Night they opened a Battery of five Mortars at Water Tower near Major Innes's, and in about an hour another of Three Mortars in the burying ground near Witham's five Court; from both these they played with great fury the whole night, throwing above 200

large shells; we returned them however many more, tho' less in size; ours being mostly Cohorns from the lunettes, to annoy their working parties. They dismounted a 32 Pounder on the Royal Battery, and an 18 P^dr on the top of the Castle. The Rattling of the Enemys Carriages was heard last night, about the same ground as the night before.

The Boom this night fell down as far as the ditch of the Anstruther. Four men had a very particular escape from a shell of the Enemy's, which run down a passage after them and burst in the corner thereof by a necessary house, cut in the Rock, but it did no other damage, than blowing two of them into it, tearing away the seats so as to leave no remains of them, and breaking three or four firelocks to pieces, as likewise the door, the men not being in the least hurt. One of the Gunners had his leg shot off, by a Cohorn Mortar which hung fire.

The Enemy seems to have extended their work, they Bombarded us all Day, which we returned, though chiefly in the night to the Town, where we fired some platoons of small Arms. One of the French Soldiers was wounded on the glacis, and fetched in; he was of Soissonnois's Reg^t, and in too much pain from his wounds to admit of many interrogations at that time; however the intelligence he did give, was that the French Army consisted of three Brigades, but that more was expected; that in a day or two the Beseigers would open two more Batteries, one of eight Guns near the spot of the Windmills, and one of three Guns in the lower end of the Town; that the Regiment he belongs to was ordered to the assistance of the Gunners; that he was one of a party of pioneers of three hundred men; that the working parties were covered by Grenadiers and Vollunteers, and that the Guards were of about fifty Men each. Our fire was so brisk, that we destroyed part of their Fascine work by the Windmills or burying ground. May 13th.

We were informed by two Minorquin Women who came to the Barrier, that the Serjeant and private man sent out last reconnoitring, had fallen into the hands of the French, and were prisoners at Mahon.

Upon a farther observation of the Enemys works, it was judged necessary to make a Battery in the place of Arms before the Bridge of the N. W. outward Ravelin.

We kept a very smart fire on the Enemy's works near the burying Ground, and greatly annoyed them; we heard from the prisoner taken yesterday, that a Battery was to be opened in the morning. „ 14th.

We found the Enemy's works not to be so far advanced as we expected, a Shell of the Enemy's fired five Guns upon the N. Counter Guard, which went off together by the Ammunition on the Battery taking fire; it hurt nobody, but did great damage to the Battery; we threw several Shot into the Town, and in the night cut some Embrazures more obliquely to bear on the Battery the Enemy were raising near the old burying ground. The Enemy threw very few shells this night; three Embrazures seen in the Enemy's work near the burying ground. „ 15th.

We fired briskly on the Enemy's work by the old burying ground; in the afternoon they beat a Parly, the Officer who came in from the General of the Day, brought an instrument which the Spaniards use to „ 16th.

catch the ink fish, which they pretended had been fired at them unlawfully: we could never find out that this had been done, and concluded it to be a trick to gain time; about two hours after the Officer was dismissed, we played our Batteries again with great fury, continuing the whole night, and directing all our fire against the Battery they were preparing to open by the old burying Ground. Some of the Enemy's Fleet in sight from the West.

This Day a shell of the Enemy's blew up a Barrel and ½ of Powder, and fired some shells on the Queen's Redoubt, but hurt nobody. They continue working in the hollow way by Water Tower, but it does not yet appear that they are opening any Embrazures.

May 17th. Early this morning the Enemy opened a Battery of 4 Guns by the old burying Ground, and another of 4 Howitzers by Stanhope's Tower; from which they fired with great fury, throwing in the Night upwards of 300 ricochet shells.

In the Morning Mr Boyd went to the French Commander in the trenches, with an answer to the remonstrance of the Day before. In the afternoon a French Officer came with a Letter for the Lieut Governour, but as he would not submit to be blindfolded he was not admitted into the works, but waited on the glacis till an answer was brought him; he insisted no Officer should be blindfolded, as Mr Boyd had not been in the morning; notwithstanding the custom of it was pleaded; and an instance given of Lord George Sackville who was treated that way when he went from the Duke of Cumberland to Marshal Saxe, during the late War in Flanders.

The French Fleet in sight off the harbour's mouth.

The Enemy threw up Traverses of Fascines, Earth, and Gabions, at the end of most of the Streets to cover their people passing and repassing.

„ 18th. About 2 o'clock in the Morning a shell from the Enemy set fire to some Powder at the N. W. inward Ravelin, which threw down a communication bridge, and a great part of the counterscarp into the main ditch, this covered and shut up a Subterranean apartment where two Familys were quartered; they were however all by timely assistance dug out and saved, except one woman who was suffocated.

At Day break a smoke was discovered at the same place, and it was found upon examination that the Match and Paper Cartridges were on fire; this alarmed the whole Garrison and everybody's assistance was called for; it was however by pulling out the stores soon extinguished though with the loss of six or seven men killed or wounded, by two shells from the Enemy which fell among the crowd, at that time very great; this accident has very much shattered the Ravelin, entirely ruined the gorge of it; and filled that part of the Main ditch with so much rubbish, as would greatly facilitate a descent into it.

In the afternoon the Besiegers discovered to us two Embrazures they had opened behind a wall to the right of the gabionade near Major Innes's House, but a constant fire of our 32 Prs being kept upon them from the Argyle covered way they were soon rendered useless.

(To be continued.)

A PROPOSAL FOR THE SUPPLY OF AMMUNITION IN THE FIELD.

BY

MAJOR R. WYNYARD, R.A.

In offering the following scheme for the consideration of my brother officers I am fully aware of the probability of there being many serious defects in it, and the possibility of some grave error which may render it quite impracticable. I am so convinced, however, of the necessity for a change in the present system of supply of ammunition that if my scheme should only succeed in furnishing some one with an idea which should lead to a more satisfactory and less dangerous system than the present, I should be well satisfied.

It is hardly possible for an artillery officer to bring his battery into action under the present system of ammunition supply without his being struck with a sense of the heavy loss which must be sustained by the *personnel* of his battery on the first occasion when it may have to encounter the fire of guns similar to those with which it is armed and equally well manned.

The first point which strikes even the ordinary looker-on—and how much more those vitally concerned—is the fact that close among the guns, and offering a target hardly less visible and of a far more dangerous nature than the guns themselves, are placed three large magazines, each about three times the size of a gun in action, and each surrounded by a crowd of men with exposed cartridges and shell in process of transference from the large magazines to smaller ones, which in their turn are to discharge their contents (though with considerably less risk) at the various guns.

The next point is the time taken, while the battery is in action and probably under fire, in unhooking the horses which have brought up these large magazines, in remounting and taking them under cover, and the reflection must occur to anyone—what will be the difficulty and delay when some of these men and horses are being killed and wounded (as must needs be) during the operation, and thereby adding to the confusion and hurry which accompany the coming into action of the best trained battery when under service conditions?

The third point, though this does not force itself upon our notice so much at field days or at practice, is the time and trouble involved in the replenishment of these magazines when replaced in turn by others, and required to be filled up from a third lot, of similar construction and similar disadvantages.

We may summarize these objections as follows:—

1. The danger to the gun detachments owing to (*a*) the increased target afforded to the enemy's fire (*b*) the size of the explosive placed in such a conspicuous position (*c*) the impossibility in ordinary positions of obtaining cover for the same within a reasonable distance of the guns.
2. The loss in men and horses, owing to the time necessarily taken in unhooking the wagons.
3. The time and labour involved in transferring (*a*) from the wagons to the portable magazines and again from these to the guns each individual shell, fuze and cartridge required for their service (*b*) from one set of wagons to another each of the above except the cartridges, which may be transferred in their cartouches.

The plan I suggest is roughly this:—

The substitution for the present system of packing ammunition both in limbers and wagon-bodies of a number of large portable magazines similar to (but larger than) those at present in use, to be inserted horizontally from the rear, and capable of being rapidly withdrawn and placed on the ground in rear of the guns, each complete with a certain number of shells, cartridges, fuzes and friction-tubes.

The advantages of such a system would be briefly these:—

1. Wagons need not be brought into the battery at all.
2. Limbers need only be detained a sufficient time to enable the numbers not required at the gun to remove the magazines, a matter of probably under a minute.
3. Cover could be obtained for the magazines in a very short space of time by a line of rapid shelter-trench in rear of each gun which would be very fair protection against shrapnel bullets, indeed it is possible that in some positions this cover might be thrown up without attracting observation while the battery was in the preparatory position and during the preliminary observation, range-taking, &c.
4. The replenishment of the gun-limbers from the wagon-bodies would be a matter of a couple of minutes, necessitating very few hands, and they would be ready in a few minutes (if required) with a fresh supply of magazines, even if they did not (as they probably would) take the place of the wagon-limbers, replenishing at leisure from the wagon-bodies, and setting the former free to supply the battery in their turn, this being done perhaps with wheel-horses only.

The difficulties of such a scheme, if approved in principle, would lie in matters of detail, and I will therefore sketch out the method of packing which appears at first sight the most feasible, though I have no doubt many possessed of greater technical knowledge will be able to improve upon it.

The present limber-box lends itself readily enough to the proposed

system, if the rear face of the box be made to open (probably downwards), instead of the top as at present. One or two incidental advantages would accrue as to the carrying of the gunners and their kits, while the lid could be fitted with small stores exactly as at present. The internal measurements of the box are 23″ long × 20″ wide × 15″ high, the second being that from front to rear. This second measurement happens to be almost exactly the length of a cartridge and its shell (11·5″ + 8·25″) placed in prolongation, so that if the box were divided—as looked at from the rear—into four portions by a horizontal and a vertical copper partition, so as to accommodate four of the proposed magazines, each of these would be capable of holding six cartridges and six shell, the diameter of each cartridge in its cover being 3½ inches, and of each shell (over driving band) a shade over 3 inches. To allow of fuzes and tubes being included *five* cartridges and *five* shell only would be carried in each, and a pocket provided in the vacant space, in which there would be ample room for the five time and percussion fuzes, box of friction tubes and the other necessaries of the limber-box.

This arrangement would give two more rounds in each limber-box than are at present carried, though the additional weight (66 lbs. in the limber and 132 in the wagon) would probably be somewhat reduced by the absence of wooden fittings. The addition of twelve rounds per sub-division would be a distinct gain for Field Artillery, the only branch that need be considered if the Horse Artillery are to be armed with a lighter gun.

Each of the proposed magazines would then carry:—

	lbs.	ozs.
5 shrapnel shell at 11lbs. 13ozs.	= 59	1
5 cartridges (in covers) at 4lbs. 4ozs.	= 21	4
1 box of friction tubes (say)	= —	10
5 time and percussion fuzes in boxes at 1lb. 0oz. 4drs.	= 5	1
Total	86	0

The present portable magazine, whose internal dimensions are $10\frac{7}{8}'' \times 6\frac{3}{4}'' \times 12''$, weighs empty 8lbs. 12ozs., and it is probable that the proposed one, whose dimensions would be $11\frac{1}{2}'' \times 6'' \times 20''$ would weigh about 13 lbs., giving a total weight when full of about 100 lbs.[1]

It must be remembered that the proposed magazines would not require to be "portable" in the same sense as the present ones, as instead of being a handy means of transporting ammunition from the wagons to the guns they would be the exclusive supply for the guns, and would be placed as close as possible to them, the rounds being taken from them with half the labour necessitated by the present system.

The most obvious objection to the above proposal is the necessity for one kind of shell only which the system involves. While admitting that this is practically a *sine quâ non*, it may be urged that it seems

[1] It is possible that galvanised iron would be a more suitable material than leather for the magazines, economising space, and probably weight, and permitting of side-hooks for the lids to fasten with, and countersunk handles for pulling out by.

almost certain that long before such a radical change in the method of carrying ammunition could be carried out shrapnel (or a shell of similar nature) will be our only projectile.

It is agreed on all hands that the only advantage to be gained from the use of common shell is its facility of observation in ranging under difficult conditions, while the disadvantages of having two kinds of shell are too obvious to be worth setting down.

This being the case it seems not too much to hope that some plan may be adopted whereby the smoke-giving property which is so important may be transferred from the shell to the fuze, and that instead of having for such a limited object two separate articles of manufacture, and two separate classes of shell cumbering our limber-boxes and confusing our calculations, we might have a certain number of time and percussion fuzes fitted with (instead of the elaborate time-arrangement) some smoke-giving composition which would answer the same purpose and solve our present shell difficulty.

As to case shot it now seems clear that short-fuzed shrapnel are much more effective, and the elimination of the former will probably take place before long.

In conclusion I may add that writing as I do from the wilds of Kashmir I have had no opportunities, since the above solution of the problem occurred to me, for inviting criticism upon it, and I may, therefore, perhaps ask the indulgence of my critics for not having seen and met objections that may occur to them.

NOTE ON INFANTRY TACTICS.

BY

LIEUT.-GENERAL SIR W. J. WILLIAMS, K.C.B.

Our Regulation formulates no system of attack; but gives principles and general rules. Until further orders shall be issued to the Army, a battalion, in drilling as against the enemy in battle, will be drilled as a battalion in First Line, according to the principles and general rules of Regulation, and perhaps in some degree according to the knowledge of battle of the commanding officer, such drill being subject to alteration by order at inspection, or on the battalion moving to another District, or on another General officer succeeding to the District command. Commanding officers will not drill, or will seldom drill, as in Second Line. There is no mention in Regulation of brigade column of battalions, nor of forming Lines. We can form column of battalions without saying to each commanding officer "bring your battalion here, and deploy it," and we can attack from brigade column of route without forming Lines to a halt; but it would be better to have the drill for battle formations. There is no drill for the conduct of Lines. A brigadier will say to the officer or officers commanding the First Line "there is your objective; try to envelop the position of the enemy, but do not exceed your proper frontage; do not exceed your depth of 800 yards; look out for flank attacks; advance to within 500 yards of the enemy, and take up a defensive position; now, go on;" and the officer or officers will extend something, and go on, each, if there shall be two, after the manner in which he shall have drilled his battalion. To the commanding officer of the Second Line the brigadier will say "let the First Line have half a mile distance; then follow in several lines; keep as far away as you can as long as you can, but you must be near at any crisis; you are to assault the position of the enemy, but do not pass on to assault until I shall have let you know where I shall mean the main attack to be." Or, if the officer commanding the attack should have made up his mind without feeling his way, he would point out the objective of the main attack, and the several lines would be placed opposite to the objective, before the advance of the Second Line. As the first two Lines together have more than a mile of depth, and as the Second Line advances in several lines, it is not clear what the half mile distance of the Third Line means; but the Third Line will be ordered to take up a defensive position. Such will be our orders for attack. In the Regulation and his orders, taken together, there ought to be enough to guide the conduct in the field of an officer of average ability. We can well imagine that an officer of average ability, who should have put his faith in Regulation, on receiving orders in battle

from an officer like himself, recognising the orders would wish that his text-book could have been less vague.

The field movements in the Regulation do not come into the tactics: when we pass on to tactics we leave all drill behind us. The movements seem to have been put there in deference to old officers; but with only scant comprehension of why they like drill. They like drill because they know that drill makes discipline and discipline makes strength in battle; and they like drill because they believe that practice of a movement at home conduces to its better execution in battle. For the latter reason old officers would like to see in Regulation the field movements which will be used in attack. Drill for proper field movements of the battalion and brigade, and a more correct drill language than is given us, are necessary to the proper conduct in the field of any body of troops larger than the tactical unit. Troop leading is more easily learned from drill than from the study of principles and general rules. Principles are for the few, and drill is for the many. General rules are bad teachers: they may be only expositions of the knowledge of those who know.

An officer under examination in tactics, being unable to answer a certain question, might yield to the temptation of saying he would act according to the circumstances of the case; and, if the insufficiency of that answer should seem to him to be too plain, he might add "according to the nature of the fire of the enemy, whether artillery or infantry fire, according to the strength of the enemy, and according to the nature of the ground." If he should make that sort of answer, he would bring in the nature of the ground: to cite the nature of the ground, without saying what would be done on this ground and what on that, is the surest sign of the mind not having been vexed by study of the question. The circumstances of cases will vary; but that is no reason for our not having a standard system of attack. It would be well for a commanding officer, who should not see anything better to do, to have a system and a drill to fall back upon; and an officer, who in battle shall be capable of seeing the best thing to do, will not be thwarted by that thing not being in Regulation. A standard system would not prevent thought: it would raise to its level, but not bring down to its level. But why should we want a different plan for different circumstances? We know how infantry and artillery are armed; and we know that our object is to get close to the enemy with a sufficient number of men in a fit state to charge. It would not be in the standard plan to move in column where any fire could fall upon the column; so there is no reason why the plan should vary with the kind of fire of the enemy. How would the plan vary with the nature of the ground? The plan would not vary: obstacles might impede, or forbid, advance by a certain line; neither a bank nor a made shelter-trench would alter the plan; if it should be necessary to attack an enemy having shelter for his firing line and cover for his supports, the attack would be followed by other Lines. How would the plan vary with the strength of the enemy? Only in the number of Lines: an enemy, known to be weak, might be attacked with less than three Lines; if the enemy should prove to be strong, and it should still be meant to

press the attack at that point, or if, the strength of the enemy being unknown, it should be determined to overcome all resistance at a selected point, the normal three Lines of attack would be supported by another Line or other Lines.

The Regulation objection to there being a standard system is that, as orders in battle cannot be carried out precisely, authority must be delegated. The statements as to battle are true; but the objection is not valid. An answer to the objection, so far as it relates to the different circumstances of cases, has been submitted. So far as reference is made to the failure of high command on account of the fire of the enemy, the objection seems to mean that, because the brigadier must lose control over his attack, and commanding officers must in their turn lose control over their captains, it is better to train company officers in the knowledge that, when they shall find themselves closely engaged with the enemy, they will have no orders to help them, nor conformed habit of one particular drill, but only their own talent, and what they may call to mind of knowledge gained by study of the principles and general rules of Regulation. In reply to the objection thus interpreted we submit that we can formulate a system of attack which, after the first advance of the firing line, shall work automatically; that it is better not to try to correct mistakes in battle by sending orders to the front; and that the brigadier for some time after the launch of the attack, and commanding officers for a longer time, could command by correcting distance and direction, if they should think it right to intervene. We submit, moreover, that the inevitable failure of high command under close fire ought not to prevent our planning how to proceed until the failure shall come. According to the scheme which would work automatically, the brigadier, having pointed out the objective and ordered the advance, would follow the rear battalion, if all his brigade should be in the attack: if he should have one battalion left he would stay with it. The command would pass from the brigadier to the commanders of Lines, and from Line commanders to company commanders, as the Lines should near the enemy. The firing line would be pushed forward by reinforcement and pressure of support until the line should charge, or until the whole attack should swarm on the firing line, and they should charge, or lie down and wait for support, or be driven back by a charge. It would not be difficult to formulate the scheme, and to frame the drill for it, provided that rear Lines should start at fair supporting distance—that is at a little less than half the distance given in Regulation—and that the depth of the First Line should never be more than 400 yards. In battle, the temptation to send an order to an officer advancing against the enemy ought to be resisted to the utmost. A firing line advancing under destructive fire is directed by its officers, or by its bravest men, or makes blind rushes when the impulse comes from within or by reinforcement; and orders can be sent only at peril of the bearer being shot, and with little chance of any attention being paid to the order should it be delivered; but, if a firing line should go off too much to a flank, and the Line next in support should not be too near, the true direction might be recovered by neglecting the one flank and sending reinforcements to the other.

Until the Line shall be near the enemy, the brigadier can order the First Line to advance more quickly, or a rear Line to close up; but it would be better not to send an order finding fault

Two real difficulties of our own making stand in the way of our formulating any system of attack. They are extending for safety, and dividing the battalion into eight companies. The evil of these difficulties does not end with their preventing our formulating an attack and having a drill in three Lines. So long as they shall prevent us, history will give us a right to believe that we should win in battle; but reason will conclude that the enemy ought to beat us. We could win only by fortune favouring us, or by the superior virtue of our troops more than making up for the disadvantages we put upon them.

The scheme of carrying extended order from skirmishing into battle assumes that there would be less loss in extended order, and that to advance in extended order under destructive fire is practicable. A condition is supposed to have varied so much as to call for a change in tactics; and a change is made. Waiving the argument that the conditions has not varied so much as we suppose, we submit that such a change as we are making cannot reasonably be made without satisfying the question—is it practicable? In judging, of that which has not yet been done in battle, whether it could be done or not—the question not being determinable by trial on the drill ground, but only by appreciation of the moral effect of the fire of the enemy—our guide must be experience. We must know what battle is, or trust to the judgment of those who know: as, perhaps, the truth has never been told except by one Russian writer, what battle is cannot be learned from books. It is impossible to believe that the officer who invented attack in extended order had ever advanced with infantry under fire which caused great loss; or that he had ever advanced under fire with infantry through broken ground, and then gone back by himself over the line of advance. Advance in extended order under destructive fire is not practicable. Assuming it to be practicable—that is to say, assuming that the moral effect of the fire of the enemy would not cause more men to fall out in extended order than with closed files—it is still probable that more men would be in front after an advance in line than after an advance in column of single ranks, or of lines, with extended files. In reality—that is to say, as all the things except one are, and as we believe the one thing, as yet untried, would be—a line of well disciplined soldiers, advancing under destructive fire to attack, becomes an irregular line, and moves on; and an attack in extended order made by the best disciplined soldiers in the world would waste, until the men who should be left would lie down and go no further. We can see any day on a drill ground that extended order takes up too much frontage, or gives too many lines; and that there is weakness everywhere, unless thin lines on the proper frontage are crowded one upon another to danger and confusion. Attack in extended order fails to pass the test of drill.

When Lines shall swarm together in the firing line, it will not so much matter how many companies there are in the battalion. Until then, at home and in the field, the improper division of the battalion

will badly effect its efficiency. When in battle the command shall pass from the commanding officer to the captains, it ought to pass to fewer captains and not to be wasted amongst too many. In order that command shall not be scattered, the company ought to be as large as possible; and in order that the command shall be felt by the company until the captain can command only the men nearest to him, the company ought not to be too large. The limits indicate companies twice the size of ours. In First Line, a battalion of eight companies cannot attack by companies: eight attacks and commanders in one battalion are impossible: we are obliged to begin with confusion of companies and want of proper command. In Second and Third Line, a battalion of four companies with company intervals would advance better than a battalion of eight companies with or without intervals. A battalion line of four companies with intervals would have the cohesion and elasticity of a line of squadrons. By company interval is here meant more than the two paces of Regulation.

By the Regulation, the Third Line has no part in the attack, but takes up a defensive position; the Frst Line attacks, but stops at 500 yards from the enemy, and takes up a defensive position; the Second Line, having come up from its half mile distance, carries on the attack, and assaults. It is not an attack in three lines, nor in two lines, but with two lines alternately—the Second Line not aiding the First Line, but reserving itself to pass on later to take up the attack; any reinforcements wanted by the First Line being brought across from another part of the field. There is no drill for this attack. For the Second Line, which plays the principal part, the only instructions are to take half a mile distance but to be near at any crisis, to form several lines and to assault—it is not stated what the lines are, nor how the assault is to be made. The vagueness of Regulation may lead to not knowing what to do, and not to the readiness to act for himself according to the circumstances of the case we look for in the officer who shall not have been taught a system. When we shall have departed from our old way of dividing the battalion, and have owned that, in taking up the scholastic idea of extending for safety, we erred, we shall be able to speak without circumlocution, and to state our attack in plain language. The attack will be in three equal lines; the distance of lines and the depth of the First Line, at the beginning, will be 400 yards; the First Line will attack by companies, each company giving its firing line and support; the Second and Third Lines will each advance in line with company intervals; all the rear will close upon the front; and the firing line will be reinforced and supported, not only by the rest of the First Line, but by the Second Line and the Third Line, until they shall charge. The statement of the system, the attack drill, and any tactical remarks which shall after deliberation be judged necessary, ought to be drawn up exclusively by officers who have drilled infantry and been with infantry in battle. Knowledge of drill and knowledge of battle are the guards against error.

GUERNSEY,
17th August, 1893.

SIEGE OF MINORCA, 1756.

BY

AN OFFICER WHO WAS PRESENT AT THE SIEGE.

(Continued from page 544).

In the Morning a Shell from the Enemy broke into one of the sub- May 19th.
terranean apartments near the well in the Center of the Castle, where it burst and killed five Sailors, and wounded two, who were asleep in their Beds. A Serjeant of the Artillery had his Leg shattered by a shell on the top of the Castle, of which he died. At Daybreak the Besiegers shewed six Embrazures in their work near the burying Ground, from this and their bomb Batteries they made a very brisk fire, having been pretty quiet during the night.

About one o'clock a Fleet of 17 Sail appeared from the West with English Colours; the Admiral carrying a Blue Flag at the Main Top Mast Head, and the rear Admiral a Red Flag at the Mizzen; the Garrison seemed Convinced they were our own Fleet, their Ships being much larger than those of the French which we had seen not long before, but their coming pretty near to us without sending in even a boat, where the communication was so safe and short, and their standing off again where there was not even the least appearance of Danger, brought us all (a very few indeed excepted) to conclude this Fleet to have nothing English about it. The Council of War about 7 o'clock at night sent Mr Boyd in a boat to this Fleet, whose behaviour in standing off, could not be accounted for; when he had got a little way from St Stephens Cove, a large party of the Enemy fired at him with Small Arms, he likewise sustained some Cannon Shot which did him no harm, and was pursued by two small Vessels, which missed him in the night, by the favour of which he returned, not being able to come up with this supposed English Fleet which stood off again; the Enemys Troops beat to Arms at the sight of the Fleet, and were all drawn out of their Camp, they did not fire till night, when they threw about 100 shells, their Carriages were heard in several parts of the Town. This night the Garrison were very alert, least the Enemy should upon this occasion make an attack.

Mr Boyd discovered that the Enemy were forming a very strong Battery upon the Coast; which he says must be designed to Command the usual Anchoring place called the moorings; and between six or eight hundred of the Enemy upon the Hills looking at the Fleet, which we afterwards understood were the Piquets of the Army, turned out to guard the Coast. The Enemy hoisted a red Flag at the signal house, and made fires or smoaks on different rising grounds.

The Enemy's works by Major Innes's were greatly demolished, and „ 20th.
the houses thereabouts battered down by four 32 Prs we kept continu-

ally playing on them from the covered way of Argyle. In the afternoon the Enemy's Battery by the old burying ground took fire, on which we plyed them very smartly with shells, Cannon shot and Musquetry; till it was extinguished, they returned us Small Arms from the Town to draw our fire from their battery, which was much torn and demolished; they opened a Battery at Stanhopes Tower, from which they fired several ricochet Shot; fewer shells than usual were thrown by them to day, and those came chiefly from Major Innes's and the Turks mount above Marlborough Fort.

The Fleet this morning is out of sight, but from the signal they were seen yesterday to make of descrying an Enemy, it is hoped they are in Chace of the French Fleet, as a Ship, supposed to be one of the French scouts, was discerned at the same time the signal was made. Several ships came in sight again from the Southward, with a very light breeze from the S. W. and were near three Leagues distant at sunset.

May 21st Two Deserters came in from the Enemy, one of the Royal Regiment, the other of the Royal Italians; one of them was drunk and would not own himself to be any more than a prisoner; the other informed us they had been lately reinforced, and were under Arms the day our Fleet appeared off; this night they threw many shells; their Fleet to the East.

These Deserters informed us that the Enemy are in search of our mines, but differ with regard to the spot where they are countermining; they likewise informed us, that there had been an engagement between the two Fleets, and that ours had been worsted; that the French Army now consists of near eighteen thousand. The Guards changed their hour of Mounting to three o'clock in the morning, in order that a greater number of Men, might be under Arms at the time when it is apprehended we are most liable to be attacked.

„ 22nd About sun set the Enemy fired a Feu de joye, and at the end of each fire gave us a general discharge from their Batteries of both Guns and Mortars; their small shot came into the works but did no harm; they threw very few shells at night. The Feu de joye was on account of the engagement between the French and English Fleets, the latter of which through the ill conduct of the Admiral was obliged to retreat and go back to Gibraltar; a very few of the English Ships were engaged, but they behaved extremely well.

The Enemy's fleet in sight all day close at the back of Cape Mola, most of them with their boats astern.

„ 23rd. The Enemy began to Bombard early in the Morning, fired smartly about daybreak, and continued the rest of the day as usual, they opened two more Embrazures at their Battery by the burying Ground to play on the Queen's Redoubt, this Battery has now six Embrazures. The Enemy's fleet in sight and very close in shore; the Enemy seen all this afternoon driving beasts into St Philips loaded with Fascines.

„ 24th. The Enemy fire very moderate to day; their fleet before the harbour. They Cannonaded the Queens Redoubt with two Guns from the Battery near the Burying ground.

„ 25th. The Enemy threw few shells in the Night, we fired a Carcass to their Battery, by the old burying ground, and gave them many shells;

about day break they fired both their Cannon and Mortars, but not with great violence; in the Evening their Fleet stood to the Northward behind Cape Mola.

The Enemy's Carriages heard between the Town Guard and burying ground, they are repairing and encreasing that Battery.

The Enemy threw a great many shells to day, most of which burst in the Castle square; their fleet behind Cape Mola; we imagine the Enemy are carrying on a Battery behind a mount commonly called Turk's Mount, a little above Marlborough fort towards the sea, by which we think they intend to oppose the entrance of any Ships into the harbour. They have added a great Quantity of Earth to their Battery near the burying Ground, they have five Guns at the burying Ground battery but fire very little from them, two of them bear upon the West face of the Queen's Redoubt and have impaired it greatly. May 26th.

The Enemy threw but few shells in the night; we fired as usual, particularly on the Town. The Enemy's fleet to the Eastward of Cape Mola. „ 27th.

For several days past the Enemy has given us very little annoyance, nor does it yet appear that they have made any great progress towards the acquisition of the place, or have proceeded with the vigour that might be apprehended from so formidable an Army, as we are informed they have invested the place with.

The Enemy fired little in the night, and we kept a smart fire as usual; their Fleet appeared off the harbour, and we counted 27 Sail, but no addition of Men of War; several of the Ships parted from the Fleet in the afternoon, and went to the Eastward; it is imagined these Vessels have brought them either more Troops, or Stores. The Lieut Governor had a dish of fish at his Table, killed by the explosion of a shell in the Water at St Stephen's Cove. „ 28th.

The Enemy were very quiet in the night, not firing at all and but little the whole day. In the morning their Fleet was so near the harbour, that several of their ships were in danger of being ashore near Turks Mount, it being almost calm, but they were towed off again. They fired several shot last night at a Vessel passing the Harbours mouth, which hoisted French Colours, but struck them upon their firing. They have now seven Mortars at their Battery by Major Innes's; about seven o'clock this Evening they fired upon us from a ricochet battery of three Guns, and two Mortars which lie concealed behind a rocky part, a little to the right of Turks Mount, most of their shot went clean over the Castle. It does not appear they have much repaired their Battery near the burying ground. „ 29th.

The Enemy threw very few shells last night, and fired in the morning Cannon from Turks Mount; we directed a Carcass and fire balls to their Battery, and gave them many shells and Cannon Shot; their smartest fire was in the morning, being pretty moderate the rest of the day; one of their shells set fire to half a barrel of Powder on Argyle fort, by which accident 40 Cohorn shells fired, and burst on the Battery, but hurt nobody. They fire very little from their Gun Battery by the burying Ground, four Embrazures of which are now filled up and the whole Battery very much damaged by our constant fire of Shot & Shells upon it. „ 30th.

May 31st. The Enemy fired little last night, but we heard a great many Carriages passing the back of the Town towards Stanhope's Tower; we made a smart fire upon all parts of the Town; theirs was moderate to day; some of our Shells, and a Carcass, being too near the Mortar, took fire on the top of the Castle, but nobody was hurt; their Fleet off the Harbour. The Genouese Vessell ordered to be fitted for sea.

It is discovered that the Enemy have collected a great Quantity of Earth, at the back of the fives Court near Stanhope's Tower.

June 1st The besiegers were heard to be very busy all night.

We still continually heard the Carriages in Town, and fired several Vollies of shells to annoy the Enemy, as likewise Carcasses to give light upon the Glacis; their fire in the Night was very moderate; in the morning we found they had carried on a work of Gabions from the fives Court to Stanhope's Tower, at which we fired the whole Day; they have filled up all the Embrazures excepting two of their battery near the burying Ground and those two they make no use of. Last night two Grenadiers of the Royal Welch Fuzileers deserted, and made their escape as is imagined by the Royal Battery.

We mounted 4 twelve pounders on the new Fascine Battery by the N. W. outward Ravelin.

Some of the Enemy's Fleet off the Harbour.

„ 2nd. We fired our Mortars last night upon the Enemy by signals given at the West lunette, directing when and where; a person being advanced for that purpose upon the Glacis, who by listening attentively could discover where the Enemy were at work.

We received from them a greater number of Shells than we had for several Days before, from their batteries in Town, near the burying Ground, Major Innes's, Turks Mount, and Cape Mola, they likewise fired very briskly from 3 o'clock in the afternoon till about 9 o'clock at night, and gave us some shot in the night from Turks Mount. We gave them a very warm fire all night.

The Enemy's fleet to the Eastward of Cape Mola. The Enemy very busy all night at work, notwithstanding our incessant fire upon them.

„ 3rd. The Enemy fired ricochet shot this morning from Stanhope's Tower, as likewise from their Howitzers near the same place, and played smartly with their shells from all sides, particularly in the afternoon; we gave them an equal return from our lunetts and inner works; they worked some time this morning near Stanhope's tower, but being interupted by our shells, thought proper to leave off. Their fleet off the Harbour. The Enemy very busy all night at their new work by Stanhope's tower, in spite of our constant fire.

„ 4th. The Enemy continued their work last night near Stanhope's tower, and it appears to be a battery they are constructing between that tower and the fives Court. They threw a great number of shells in the Day time, especially in the afternoon, but their fire was very moderate in the night, as was likewise ours.

The French fleet off the Harbour.

„ 5th. The Enemy opened a battery of 10 Guns between Stanhope's tower and the fives Court; from which they played with great fury, as they did from their other batteries the whole day; the heat of this fire was directed against the North Bastion of the Castle, the N. W. Curtain,

the W. Counter Guard, and the Queen's Redoubt; In the night they threw above 100 shells, several ricochet shot, and Howitzer Shells, by which they wounded some of the Picquet. We blew up some of their Ammunition at Stanhope's tower, by a shell from the West lunette; they have thrown several shells at a ship we had rigged ready for sailing in St Stephen's Cove, but to no effect. They renewed their fire from the Battery by the burying Ground with 6 Guns. Lieut Armstrong of Lord Effingham's much wounded on the top of the Castle from the New Battery; the Enemy's fire very smart to Day.

The Enemy began at Day break to Cannonade as smartly as yesterday, but did not continue it so long; they poured in among us a prodigious quantity of shells yesterday and to day, one of which set fire to some of our own shells on the West Counter guard, which burst without wounding anybody but the Sentry, who was hurt by the shell that occasioned the accident; a third of their shott from their new Battery have gone over the Castle into the sea. We have abated our fire, making use only of our Mortars against their new Battery; and reserving our Guns against their nearer approach. June 6th.

Their Fleet off the Harbour. The Besiegers discontinued cannonading all night, and were employed in repairing their works which had suffered in the Day; several parties of the Besiegers were seen from the Marlborough, in and about the place called the King's gardens, or Barranco.

The Enemy were pulling down houses all night in the town, we fired Small Arms at them the whole time from the covered way; in the morning they opened a Battery below Mr Boyd's of five Guns against Anstruther and Argyle Fort, in that part of the Town opposite the saliant Angle of the Queen's Redoubt, and bearing upon the Argyle and Anstruther fort; from which Battery they have already disabled two of the 32 Prs and one 9 Pr at the Anstruther; we plyed them well with shells, and prepared some other Batteries against them; They fired the whole day from Stanhope's Tower at the North Bastion, and Curtain of the Castle. „ 7th.

Our new Fascine Battery was opened this morning, but soon silenced by the fire of the Enemy's ten Gun Battery, and a shell shot burst upon it, which disabled the Gun there; several men killed and wounded upon this Battery, for about an hour in the night, the Enemy fired small Arms as fast as they could, but for what reason we could not guess. The works a good deal damaged by the Enemy's continual fire.

Their Fleet off the Harbour the whole Day. The Enemy are observed to be at work in a large Cornfield, near Quarrantine Island on the Philipet Shore. „ 8th.

This morning we fired upon the besiegers five Gun Battery with 3 thirty two Pounders from the Argyle, two 18 Prs from the Queen's Redoubt, and four Guns upon the top of the Castle; but two of the 32 Prs were soon silenced. We did this battery so much damage, that they could not fire from it the whole Day; several of our men killed and wounded, particularly four Sailors who were all wounded by a blind shell.

The Enemy began in the morning to batter as before, but by noon

we silenced four Guns of their last Battery; they continued firing from their other Batteries the whole Day, they threw but few shells in the first part of the night, but fired continually from the houses near their battery with Small Arms; which fire our Guards in the covered way returned very smartly. There was a frequent discharge of Small Arms after the Guards took their posts in the covered way for several hours, at some single soldiers who kept firing at the sentrys from Windows, and from Corners of Streets.

June 9th The Enemy began as usual in the Morning to batter the Castle, and other works, and to fire ricochet Shot from Stanhope's Tower. We discovered a Battery of eight Embrazures in a Corn field on the brow of the hill of Philipet; they poured us in, a great number of shells, both in the day and night. The battery on the covered way of Argyle is silenced, and the Enemy's fire from their five Gun Battery below Mr Boyd's, is so superior to ours that the Gunners cannot stand on the Battery.

„ 10th The Enemy opened a battery of 8 Guns in the Cornfield above Philipet, and fired at the North face of the Queens redoubt, and works adjacent; they likewise battered the Castle and Argyle fort from their other batteries; they have lately fired small Arms at the Embrazures of the out works, while the Gunners are loading. A shell blew up the Ammunition Chest, on the South Counter Guard, the explosion of which shook the Castle like a small Earthquake. Their Fleet off.

The five Gun Battery below Mr Boyd's was silent to day. This morning the three Guns on the S.W. inner Ravelin were again fired, after having been silent for some time, that the platforms might be repaired.

„ 11th The Enemy threw a great number of Shells and Howitzers last night; their Howitzers were mostly directed to the Queen's Redoubt, pitching between that and Kane's lunette, some by the West lunette towards the Castle; they battered as the day before and their fire was returned with equal spirit.

In the afternoon our fascine Battery was on fire, but was soon extinguished; the Enemy made a great fire upon us, while it was on fire. The French Fleet off the Harbour, saw 20 sail. The most constant of the Besiegers fire is from their ten, and from their six Gun Batteries; their five gun battery is exposed to a much superior fire from the Castle, the Queen's Redoubt and the three 32 Prs which are now mounted on the Anstruther that they are rendered almost incapable of firing from it.

The Anstruther and Argyle, Queen's Redoubt, Kane's lunette, West lunette, the outward and inward N. W. Ravelins, the W. Counter Guard, the N. W. Curtain with the N. and W. Bastions of the Castle, being at present the front of the attack are consequently the places that have suffered most by the Enemy's fire.

„ 12th The Enemy's fire and our return was as smart as the day before. Our new fascine battery set on fire twice, but extinguished without much loss. The Besiegers did not fire from their five Gun Battery after 9 o'clock this morning. They fire frequently from their Battery on the Philipet side during the night, but from no other; several men killed and wounded.

The Enemy's fire to day some what abated, and they threw but few shells the first part of the night, but played pretty briskly with their Howitzers. They fired some shot from the other side the water, and some ricochet from Stanhope's Tower. The French Fleet in sight to the West. June 13th.

A 13 Inch shell fell through the light hole into the Grand communication between the main ditch and Princes line, and burst in the midst of the Guards which paraded there, without hurting anybody; firing of Small Arms at each other all night.

The besiegers began to Cannonade very early this morning, and fired very briskly from all their Batteries, except the 5 Gun Battery, from whence however they fire a gun now and then.

A little before Day, a Deserter came in from the Enemy of the Regiment De Talaru, the only part of whose intelligence that can be credited, is, that two more Regiments were arrived from France since their last disembarkation. He says that near 2,500 of their Army are either killed or wounded; their fire not so violent as two Days ago; in the afternoon another Deserter was sent in from Marlborough Fort, who appeared to be out of his senses; our fire as warm as usual. „ 14th.

The Enemy's fire still less than usual, and few shells were thrown by them in the night; they however fired pretty smartly from their Howitzers, and threw pieces of shells out of their Mortars; we kept a very brisk fire on that part of the Town where they were heard at work, and where it is imagined they are constructing a Battery. „ 15th.

Lieut Armstrong died this morning of his wounds. One face of the West Bastion, and N. W. Curtain of the Castle, are so battered by the Enemy's six and ten Gun Batteries, that the Guns of them are drawn back, and the parapet thickened inwards; the same is likewise done to the N. W. face of the Queen's Redoubt, and the direction of two of the Embrazures altered, in order to bear on the Enemy's five Gun Battery.

The besiegers have removed three of their Mortars to the right of Stanhope's Tower, from whence they frequently throw shells to the Marlborough, which returns upon them a smart fire from two 9 Prs that bear upon them; and upon their ricochet Battery near Stanhope's Tower.

The Enemy fired Howitzers and ricochet shot, but threw not many shells in the Night; our return was as warm as usual. Lieut Francis of Cornwallis's Regiment had his arm broke by the Splinter of a shell, while on Guard at St Stephens, and had it cut off; and Lieut Young of the Fuzileers wounded in the Leg in the Castle square, while on Guard there. „ 16th.

The Enemy fire very little from their five Gun Battery, however they frequently work at it during the night; for several days past they have fired a great deal of *Mitraille*.

This morning the Enemy opened a battery of three Guns, at the same place where they had before shewn three Embrazures, that were destroyed by the heavy fire of the Argyle, namely a little to the right of their gabionade near Major Innes's. „ 17th.

The Enemy fire again so warmly from their five Gun Battery, that

the Gunners cannot stand upon the Argyle and Anstruther; firing of Small Arms from the Enemy all night; some fascines set on fire at the West lunette, at the extinguishing of which we had three or four men killed by the Enemy, who kept a constant fire on us from every part.

It having been found that the quantity of Wine and aquadent provided for the Troops, was insufficient to answer the present allowance of a pint per Day of the former to each Man; and two drams per Day of the latter, to the Men on Duty. The allowance of Wine was reduced to half a pint, a Man, and a Dram only to the Gunners while on the Battery.

The Enemy very busy pulling down houses in the Town, behind the little Parade, where it is supposed they will soon have a Battery.

In consideration of the scarcity of Officers, which was become Greater, by sickness and accidents, a Subaltern was taken from the Queen's redoubt. Within these last 24 Hours, we have had the misfortune to lose several Men by Small Arms.

June 18th. We manned the Guns on the N. E. Ravelin, and silenced the Enemy's 3 Gun Battery; they poured us in a great many shells and Howitzers in the night, which we returned as warmly. It appears that the besiegers during the night had carried on a single row of Gabions from the Left of their Gabionade, near their 3 Gun Battery, towards the water side.

„ 19th. We took away our Men from the N. E. Ravelin, and mounted four 32 Prs on Argyle's covered way, but the Enemy soon destroyed the Merlons of that work, and silenced the Guns; they gave us a great many Howitzers shells and ricochet shot in the night, for some time past they have fired small shot at the Embrazures, getting into Cellars and Houses were they are not easily seen, and firing through small holes at every one who shew their heads above the parapet.

The working party employed in repairing the Argyle and Anstruther. Yesterday the besiegers brought two Guns to fire upon the N. E. Ravelin; but to no effect.

„ 20th. The Enemy's fire from their Gun Batteries not so great as usual, they have been heard hard at work every night in the Town where we imagined they are about something of consequence; we have thrown them a great number of Shells in the night; and fired grape shot often on the Town to annoy them; they have given us few shells in the night, but fired smartly their Howitzers and ricochet shot.

The working party still employed at the Argyle and Anstruther. The besiegers for some days past have been straitened for want of Ammunition; it is imagined they are now landing a fresh supply; as several of their people are seen passing and repassing to the Cove on Cape Mola side with hand barrows.

Last night the Embrazures of the Argyle covered way were repaired, and this morning we fired about 12 or 14 Rounds from them; but were again obliged to desist from the same cause as the Day before.

„ 21st. We cannot discover what work the Enemy are carrying on in Town, but we see them frequently pass and repass as if they were carrying Earth; they have moved some Guns from their ten Gun Battery; at night they fired Howitzers and ricochet shot; their Batteries are frequently on fire. The works done at the Argyle and Anstruther, again

beat down, and the Battery silenced. Captain Hobby killed by a shell in the Castle.

The Enemy have not battered much this day or two, one of their Howitzer shells set fire to some of our 13 Inch shells on the N. West outward Ravelin, and 17 of them burst, but without hurting anybody; their fire and ours this night was as usual. June 22nd.

The Enemy worked hard last night, particularly behind the little parade in the Town; where it may very soon be expected that they will open a Battery. Our working parties employed again at the Argyle covered way, where the Embrazures are ordered to be masked, six Embrazures of the Enemy's ten Gun Battery are now masked.

The Enemy seem to be very busy in Town, and preparing Batteries; they threw more shells in the night than usual; several Men killed and wounded in the night. The French Fleet in sight. „ 23rd.

The besiegers are opening Embrazures in a work just in the front of the Tower by Major Innes's House.

All the 32 Pounders that were on the Royal Battery are demolished except four, three of which are mounted in the covered way of Argyle, and one only of them remains at the Royal Battery.

The Guns are loaded with Grape shot during the night, and run out to the Embrazures, but drawn in again in the Morning, and the Embrazures masked.

In the morning the Enemy began a very brisk and regular fire, which they continued all day from their Mortars and a prodigious number of shells were thrown into the works, particularly the Castle square; we very plainly saw three Batteries in the Town, with their Embrazures masked; which they opened about 12 o'clock, one by Water Tower of 4 Guns near Major Innes's, another opposite Kane's Fort, from whence they fired nine Guns successively, but the extent of their Battery and the number of its Embrazures does not yet appear; and the third near where Mr Baker lived; from these they fired with great fury the whole Day as well as from their Howitzer and ricochet Battery's; they Bombarded and Cannonaded so warmly, that we may conclude this Day's firing to be the Hottest we had yet sustained. Our works were extremely battered, and the Enemy kept a constant fire with their Small Arms at our outworks and Embrazures. We threw many shells, but fired little with Cannon, Our Merlons being greatly destroyed. Three small parties of the Enemy came upon the Glacis in the night within 30 or 40 paces of the Palisadoes; and exchanged some Shot with our Guards in the outward covered way, before the Queen's Redoubt, Argyle and Austruther. „ 24th.

The fire from the Enemy is now become so very heavy upon all the outworks in the front of the attack, that the Gunners are no longer able to stand to the few Guns still remaining; at least till the parapets and Merlons are repaired.

The Enemy kept a very hot fire the whole Day with their Cannon, Mortars and Small Arms on the outworks, and have so destroyed our Embrazures and Merlons, that we could play but very few Cannon against them; except the N. E. Ravelin, which bears upon the besiegers three and four Gun Batteries at the Water Tower by Major Innes's; but we plyed them pretty warmly with shells. „ 25th.

In the night they fired but little from their Mortars, but threw a vast number of Howitzer shells, and ricochet shot.

The Besiegers are heard drawing Carriages down from their ten Gun Battery into the Town. They have fired lately with smaller Cannon than formerly from that Battery, from whence it is imagined they have removed their heaviest Cannon from that, to the last made Battery in the Town.

June 26th. The Enemy kept a very warm fire this morning and so fast with their small Arms that they very soon silenced the Guns on the outer works, through the badness of the Embrazures and Merlons, which were almost destroyed.

We threw a great number of shells. For about two or three nights past, the Enemy have crept upon the Glacis near to the Pallisadoes, a few at a time; where they have exchanged some shot with the Guards in the covered way and then stole back again.

A Council of War was held this day at which all the Field Officers assisted, to concert as was said further means for the defence of the place, and was summoned to sit again to morrow. A breach having been made in the left face of the Anstruther, thought to be a practicable one.

The besiegers fired incessantly the whole night from all their different Batteries of Cannon, Mortars, and Howitzers, and chiefly directed their fire at the N. W. Curtain and W. Bastion of the Castle, and at the W. Counter Guard, N. E. Ravelin, and the Anstruther; all which are very much battered.

„ 27th. The Enemy fired a great many Howitzers and ricochet Shot, and continual firing of Small Arms on the outward covered way, and the lunettes; the same was returned from the Garrison, with now and then a Cannon from the W. lunette, and other batteries; though in general they are almost silenced, and about Day break fired extremely fast from their Mortars, which they continued to do the whole Day; their Gun Batteries played very warmly, and they kept a Constant fire with their Small Arms on the Embrazures of the outworks. Major Godfrey of Cornwallis's wounded in the Castle square by some stones thrown by the fall of a shell.

About 9 o'clock at night, the time our Guards marched into the covered way, they Cannonaded and Bombarded with great fury; which they continued to do for above an hour; between 10 and 11 after having ceased firing for about an hour, they made a general Assault from all the Saliant Angles of the Covered way with great intrepedity, as far as the S. W. lunette; the signal for which was 15 Guns fired on board their Fleet and four shells, two thrown from the Turks Mount, and two from the signal house into the sea, at the same time; and during most part of the night, a noise was heard in Town like the tinkling upon some Mortars. Our numbers not being sufficient to defend the outward covered way, the Guards agreeable to their Orders retired after having given them a few rounds, into the lunettes, &c. They attempted with boats armed and provided with scaling Ladders, to enter the harbour and St Stephen's Cove, in order to storm Charles Fort and St Stephen's Guard; and to second the attack of the Marl-

borough by attempting it at the Gorge, but they were repulsed; upon which those that had attacked Marlborough Fort retired likewise; they were also repulsed at the West, and Carolina's lunette; but not before they had cut down several ranges of Palisadoes, and nailed up some Guns on the new Batteries near that work; they entered the Queen's Redoubt by scaling and at the Gorge, where they took Colonel Jeffreys Prisoner; Lt Whitehead of Colonel Rich's Regiment was killed defending the breach at the Queen's Redoubt, which they mounted by the Ladders they had made use of to get into the Ditch. They possessed themselves of the Anstruther and Argyle upon the retreat of the Guards there, having landed a great many men in boats at the Royal Battery; We sprang a Mine at the Argyle with great success; for by it they lost the greatest part of two Companies of Grenadiers, and one of Volunteers, with their Officers, by their own confession. We threw a great many shells, as well as Carcasses to give light to our Troops. Our Guns were silent on most of the inner works, the Merlons and platforms being near totally destroyed; from the N. E. Ravelin, we fired grape pretty smartly upon them and with success, although it was dark. We sprang a Mine likewise at the Redoubt with some success.

The Council of War met again this day at 4 o'clock.

About Day break the Enemy beat a Parly to bury their dead, and draw off their wounded, which stopped our fire. At that time we could plainly see their Troops (excepting those in possession of the Anstruther, Argyle, and Queen's Redoubt) running away; their Officers using all their endeavours to make them advance, and our men made a furious fire upon them; during this parly they secured themselves, and augmented their numbers in the Queen's Redoubt and Argyle fort, as well as in the subterraneans, as far as the Kane; they lost about a thousand men in this attack, and a great many Officers. June 28th.

The parly continued this day, and at night both parties were allowed to work; which they did.

It must not be forgot that the sick and wounded men at Charles Fort, turned out for the defence of that place upon its being attacked, and some fired that had only the use of one Arm, during this cessation a Capitulation was proposed, and terms were sent to the Duke of Richelieu.

The Enemy advanced their Lodgments on the Argyle and Queen's Redoubt, and had now more men in the places they were in possession of, than we had in our whole inner works; they had also a Battery in Town completed with 12 Guns. „ 29th.

This Day till 12 o'clock we expected an answer to the Terms of Capitulation; when there was an extraordinary Council of War called, at which were present all the Captains off Duty; the Question being put whether they thought the fortifications and Troops were in a condition to stand a second assault, it was the opinion of almost the whole, that they were not; and that honourable Terms of Capitulation should be desired.

About 6 o'clock the Capitulation was signed by both sides, and about 7 the Enemy took possession of the barriers and outworks.

ARTICLES OF CAPITULATION proposed by his Excellency Lt General Blakeney for His Britannic Majesty's Garrison of St Philips Castle, and Island of Minorca.

ARTICLE 1st.

Asked.—	Reply.—
That all acts of hostility should cease till the Articles of Capitulation are agreed upon, and signed.	Granted.

ARTICLE 2nd.

Asked.—

That the Garrison upon their surrender, shall be allowed all the Honours of War (viz) to march out with shouldered Arms, Drums beating, Colours flying, twenty four rounds a Man, Matches lighted, four pieces of Cannon, two Mortars, with twenty rounds of Ammunition for each Piece; one Covered Waggon for the Garrison; not to be searched upon any account.

The Gallant and brave defence which the besieged have made, deserving all those marks of esteem and veneration which is due from every Military person to such actions, and the Marshall De Richelieu being desirous of shewing to his Excellency Lieut. General Blakeney, the regard which the defence he has made deserves, Grants to the Garrison all those military Honours which it can enjoy in the Circumstances of Marching out for an Embarkation, viz., shouldered Arms, Drums beating, Colours flying, twenty rounds each Man, and even Matches lighted; he consents also that Lt General Blakeney and his Garrison shall take with them all effects which may belong to them, and that may be contained in trunks; covered Waggons would be useless to them, there are none in the Island, therefore they are refused.

ARTICLE 3rd.

Asked.—

That the whole Garrison comprehending all his Britannic Majesty's subjects, Civil as well as Military, shall have all their baggage and effects secured to them, with Leave to move or dispose of it, as they shall think proper.

All the Garrison, Civil and Military, comprehending under the name of Civil, all Officers of Justice and Police, excepting Natives of the Island, shall have leave to take their effects & to dispose of them as has been said; but all lawful Debts of the Garrison due to the subjects of His most Christian Majesty, among whom the Minorquins are to be deemed, shall be paid.

ARTICLE 4th.

Asked.—

That the Garrison including Officers, Artificers, Soldiers, and other British subjects with their Families, that chuse to quit the Island, shall be provided with convenient transports and carried to Gibraltar by the shortest and most direct Navigation and landed in that Garrison so soon as they arrive, at the expence of the Crown of France, and that provisions shall be allowed them out of such as may be remaining in the Garrison at its surrender for the time they remain in the Island, and for their voyage by sea, in the same proportion as they now receive it, but if further supplies should be necessary, to be provided at the expence of the Crown of France.

Reply.—

Transports and Ships shall be provided, of those that are in the service of his most Christian Majesty, suitable to the Garrison, Military and Civil of St Philip's Castle, for them, and their families. These Ships shall carry them by the safest Navigation to Gibraltar with the least delay possible, and shall land them immediately. It is to be understood that after this landing, those Vessels are to be provided with sufficient passports, that they may not be molested in their return to the Ports of France, to which they are to go.

Hostages shall also be left for the security of those Ships and their Crews, who shall be restored to the first Neutral Ship that shall be sent for them. Subsistence also shall be allowed the Garrison, as well for their stay in the Island, as for a twelve Days voyage.

These Provisions shall be of those which are found in the Castle of St Philips, and be distributed in the usual manner, as to the English Garrison; and if a further supply is necessary it shall be given, paying for it, as shall be regulated by Commissarys on both sides.

ARTICLE 5th.

Asked.—

That proper Quarters be provided for the Troops of this Garrison, and a proper Hospital for the sick and wounded, during the time the Transports are getting ready, which time shall not exceed a Month from the signing of this; and such as may not then be in a condition to embark, shall be allowed to stay behind and be properly taken care of till they shall be able to be sent to Gibraltar, by another opportunity.

The Vessels being ready for transporting the Garrison, furnishing Quarters becomes needless; they shall march out and embark for Gibraltar without the least delay; and as to those who cannot embark immediately, they shall have liberty to remain in the Island, and they shall be supplied with every assistance necessary to carry them to Gibraltar, after they shall be in a condition to embark; and proper passports shall be left for a Ship to go and return. An Hospital Ship shall be allowed for the sick, and wounded, as shall be regulated by the respective Commissarys.

ARTICLE 6th.

Asked.—	Reply.—
That the Governour shall not be answerable for all Houses burned, and destroyed during the time of the siege.	Granted for the Houses burned and destroyed during the Siege; but certain papers of the Court of Admiralty, which have been carried into the Fort, shall be restored, as also the papers belonging to the Town house, which have been carried away by the receiver, and the papers belonging to certain French Merchants Ships relating to their Cargoes, which have been likewise detained.

ARTICLE 7th.

Asked.—	
When the Garrison quits the place, it shall not be permitted to decoy the Soldiers in order to make them desert from their Regiments, and the Officers shall have access to them at all times.	No Soldier shall be encouraged to desert, and the Officers shall have entire authority over them to the time of their embarkation.

ARTICLE 8th.

Asked.—	
That exact Discipline shall be kept up on both sides.	Granted.

ARTICLE 9th.

Asked.—	
That such inhabitants of the Island as have joined in the defence of the Garrison, shall be permitted to remain and enjoy their properties in the Island; unmolested.	His Excellency Lt General Blakeney and the Marshal De Richelieu, have it not in their power to prescribe limits, or extend the authority of the Kings their masters over their subjects, it would be restraining their power to oblige them to receive into their Dominions, persons, whom they would not think proper to be established there.

ARTICLE 10th.

Asked.—	
That all prisoners of War shall be delivered up, on both sides.	The Prisoners of War made during the Siege shall be restored; therefore the French upon returning those they have shall receive the two piquets which were taken in going to join the French Squadron, the Day Admiral Bing appeared before Mahon.

ARTICLE 11th.

Asked.— That Mr Cuningham acting as a Volunteer during the Siege, may be furnished with a proper pass, and allowed to go where his Officers may call him.

Reply.— Granted.

ARTICLE 12th.

On the preceding conditions, and Hostages being delivered on both sides for the faithful execution of them; His Excellency Lt General Blakeney consents to deliver up the place with all the Military Stores and Ammunition, Cannon and Mortars, &c., except what is reserved in the second article, to His most Christian Majesty; likewise to direct that all Mines and under Ground works, shall be shewn to His most Christian Majesty's Engineers.

(Sd) Wm. Blakeney.

28th June, 1756.

As soon as the above Articles shall have been signed, one of the gates of the Castle shall be delivered to the French, with the Marlborough and Charles's Fort, &c., after having sent Hostages on both sides, for the faithful performance of the above Articles; the boom which has been fixed in the Port, shall be taken away and the entrance shall be left free at the Disposition of the French, untill the entire marching out of the Garrison; and in the meantime the Commissarys on each side shall be employed on the part of His Excellency Lt General Blakeney in making a state of the effects in the Military and other Magazines, and on the part of His Excellency M. De Richelieu, in receiving them, in order to deliver to the English what is agreed upon.

Plans of the Gallerys, Mines, and other Subterranean works to be delivered up.

(Sd) M. De Richelieu.

DETAIL OF THE TROOPS IN THE GARRISON OF ST PHILIP'S, April 16th, 1756.

Regiments.	Capts.	Subs.	Sergts.	Corpls.	Drmrs.	Pvtes.
4th King's Own	6	12	27	29	7	623
23rd Royal Welch Fuzileers	4	13	26	26	7	627
24th Cornwallis's	7	13	25	27	6	624
34th Lord Effingham's	7	12	29	29	6	650
Royal Artillery	2	6	—	—	—	102
Marines	1	2	4	4	2	100
Detachment from Gibraltar...	—	1	2	3	1	40
Sailors	1	—	—	—	—	124
Greeks carrying Arms	1	1	—	—	—	59
Volunteers	—	—	—	—	—	8
Total	29	60	113	118	29	2956

Greeks. Jews. Spaniards. Women. Children.

A LIST OF THE OFFICERS OF THE GARRISON OF ST PHILIP'S IN THE ISLAND OF MINORCA, AS THEY DID DUTY BY THE LONG ROLL APRIL, 1756.

Lieut General Blakeney, Lieut Governour.
Lieut Colonel Jeffreys, Second in Command.
Lieut Colonel Rufane, Third in Command.

Lieut.-Colonel.

Lieut Colonel Thorne.

Majors.

Read, Hart, Godfrey, Pole, Captain Lynn acting as Major.

Captains.

1. Philips, Cornwallis's.
2. Wm Preston, C.
3. Sr H. Williams, Ld Effinghams.
4. Hardy, Rich's.
5. Mason, Marines.
6. Shirly, Ld E.
7. Flemming, Ld E.
8. Goring, C.
9. Dundass, Ld E.
10. Adey, R.W. Fuzileers.
11. Marley, R.W.F.
12. Darby, C.
13. Higginson, R.
14. Hoby, E.
15. Thomas, R.
16. Napier, R.W.F.
17. Dalling, R.
18. Goddard, C.
19. Robt Preston, C.
20. Partridge, R.
21. Allcock, Ld E.

Captain Lieutenants.

22. Rainey, R.W.F.
23. Cooke, R.
24. Edwards, C.
25. Widdens, Ld E.

Lieutenants and Ensigns.

1. Bostock, C. Lt.
2. Border, R. En.
3. Devoisrie, Guise's Lt.
4. Meyer, C. Lt.
5. Houghton, C. Lt.
6. Shaftoe, R.W.F 2nd Lt.
7. Boileau, C. Lt.
8. Blunt, R.W.F. 2nd Lt.
9. Martin, C. Lt.
10. Fielding, R.W.F. 2nd Lt.
11. Fox, R.W.F. Lt.
12. Sutton, C. En.
13. Vaughan, C. Lt.
14. Walsh, C. En.
15. Dalmahoy, R. Lt.
16. Thomson, C. En.
17. White, Ld E. Lt.
18. Dacre, R.W.F. 2nd Lt.
19. Wilkie, Ld E. Lt.
20. Ord, C. En.
21. Cowart, R. Lt.
22. Thorn, Ld E. En.
23. Lloyd, R.W.F. Lt.
24. Jenkins, R.W.F. 2nd Lt.
25. Kennedy, R. Lt.
26. Blizard, Ld E. En.
27. Dunn, R.W.F. Lt.
28. Legg, R. Lt.
29. Francis, C. Lt.
30. Charlton, R. Lt.
31. Young, R.W.F. Lt.
32. Long, Ld E. Lt.
33. Leslie, R.W.F. Lt.
34. Kennan, Ld E. Lt.
35. Roach, R. Lt.
36. Hamilton, Ld E. Lt.
37. Whitehead, R. Lt.
38. Atkinson, C. Lt.
39. Ogle, Ld E. Lt.
40. Poyer, Ld E. Lt.
41. Lind, Ld E. Lt.
42. Forster, R. Lt.
43. Shuter, Marines, 2nd Lt.
44. Johnson, Marines, 2nd Lt.

ENGINEERS.

Captain Bastide.
Major Cuningham.
Lieut. Archer.

ENGINEERS EXTRAORDINARY.

Bowen, Cornwallis's, Lieut.
Hewit, R.W. Fuzileers, Lieut.
Armstrong, Ld Effingham's, Lieut.
Wicket, Rich's, Ensign.

ADJUTANTS.

Doviell, Rich's, Lieut.
Bernard, R.W. Fuzileers, Lieut.
Hill, Cornwallis's, Lieut.
Exley, Ld Effingham's, Lieut.

The Adjutants did Duty in the Corps they belonged to, and the Serjeants Major acted as Adjutants.

Fort Major, Henry Innes.
Fort Adjutant, Ingram.

AIDS DE CAMP.

Lieut Campbell, Rich's, to General Blakeney.
Robert Boyd, Esq., to Lieut Col Jeffreys.

ROYAL ARTILLERY.

[1] Flight, ...		Captain.
[2] Gregory, ...		Captain Lieutenant.
[3] Webdell, ...	}	
[4] Charleton, ...	}	Lieutenants.
[5] Forman, ...	}	
[6] Day, ...	}	

Lieut Inglis [7] of the Royal Welch Fuzileers, doing Duty in the Artillery.
Lieut Stehelin of the Royal Artillery, appointed Lieutenant of Miners.

CAPTAIN FLIGHT'S DISPOSITION OF THE OFFICERS OF ARTILLERY ON ANY ALARM.

No. 1. Lieut Webdell.	Anstruther Fort.
	Covered way of Argyle.
	Argyle Fort.
	Queen's Redoubt.
No. 2. Lt Charleton.	Kane's Fort.
	Kane's covered way.
	West Lunette.
	Stone Battery on the Counter scarp of Ditch of Do.

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[1] No. 53 "Kane's List."
[2] " 84 " "
[3] " 115 " "
[4] " 137 " "
[5] ? Luke Forman, No. 158, or George Foreman, No. 169 in "Kane's List," being spelt each way in this Diary.
[6] No. 177 "Kane's List."
[7] ? William Inglis, No. 152 in "Kane's List," who had left the R.A. before 1751.

No. 3. Lt Foreman.	Carolina's.
	Fascine Battery on the saliant Angle of Do.
	3 Gun Stone Battery.
	South West Lunette.
	St Stephen's Battery.
	South Lunette.
	Hospital and Artillery Guard.
No. 4. Lt Inglish.	S.W. Inner Ravelin.
	S.W. Outward Ravelin.
	Covered way of Do.
	South Counter Guard.
	Covered way of Do.
No. 5. Lt Day.	N. Counter Guard.
	N.W. Outward Ravelin.
	N.W. Inward Ravelin.
	W. Counter Guard.

The Officer for the Piquet is to take No. 1 on any alarm; and the Officers the Batteries as numbered above, according to seniority from No. 1 downwards.

The Officers to visit the different Batteries they are alloted to, and in case of any attack, they are to go to that Battery they may think their presence may be most wanted.

Capt Gregory to be posted to the inward works, or wherever he may Judge most necessary for the service in the time of Action.

DETAIL OF THE GUARDS AT ST PHILIP'S, APRIL 28TH, 1756.

	Fd Officr	Capts.	Subs.	Serjts.	Corpls.	Drmrs.	Pvtes.
Field Officer of the Day ...	1	—	—	—	—	—	—
West Lunette	—	1	1	3	3	1	50
Kane	—	1	1	3	3	2	60
Queen's Redoubt	—	1	3	4	4	2	130
Anstruther	—	1	2	4	4	2	49
Marlborough	—	1	2	2	2	2	50
S.W. Lunette...	—	1	1	2	4	2	40
St Stephen's Cove...	—	—	1	2	2	1	40
Carolina	—	1	2	3	3	2	60
Charles's Fort	—	—	1	1	1	1	20
New Tenaille...	—	—	1	2	2	1	40
Castle	—	—	1	1	1	1	30
Cumberland	—	—	—	1	1	—	10
Hospital Battery	—	—	—	1	1	—	10
South Lunette	—	—	—	1	1	—	12
N.E. Ravelin...	—	—	—	1	1	—	10
Orderlys	—	—	—	3	—	—	3
Total	1	7	16	34	33	17	614
Piquet on	—	1	2	3	3	2	100
Piquet off	—	1	2	3	3	2	100
Total	—	2	4	6	6	4	200

The Company of Artillery with the seamen, and 300 Soldiers from the Regiments, in all 526 men, are appointed for the service of the Artillery.

DISPOSITION OF THE MEN UPON THE DIFFERENT BATTERIES.

	Artillery.				Total.
	N.C.Os.	Gunrs.	Regts.	Sailors.	
No. 1.					
Anstruther Fort	1	1	7	3	12
Argyle Fort	—	1	5	3	9
Covered way of Do.	—	1	5	3	9
Queen's Redoubt	1	4	16	8	29
No. 2.					
Kane's Lunette	1	1	6	3	11
Covered way of Do.	—	2	6	3	11
West Lunette	1	4	9	5	19
Stone Battery near Do.	—	2	5	3	10
					110
No. 3.					
Carolina's Lunette	1	3	10	5	19
Fascine Battery by Do.	—	2	5	2	9
3 Gun Stone Battery	—	1	4	2	7
S.W. Lunette	1	3	9	5	18
St Stephen's Battery	—	1	4	3	8
Covered way of St Stephens	1	1	4	2	8
South Lunette	—	1	3	2	6
Hospital Battery	1	3	8	5	17
New Battery by Artillery Guard	—	2	8	5	15
					107
No. 4.					
S.W. Inner Ravelin	1	3	8	4	16
S.W. Outward Ravelin	1	3	8	4	16
Covered way of Do.	—	1	3	2	6
South Counter Guard	1	5	9	5	20
Covered way of Do.	—	1	3	2	6
No. 5.					
N. Counter Guard	1	4	13	7	25
N.W. Outward Ravelin	1	4	15	10	30
N.W. Inner Ravelin	—	3	7	4	14
W. Counter Guard	1	8	16	16	41
					174
Top of the Castle	2	10	16	14	42
Marlborough Fort	1	2	8	6	17
					59
					450

Accidents that Happened During the Siege.

A Soldier of Lord Effingham's Regiment going up the staircase to the S. W. inner Ravelin, met a shell rolling down it, upon which he hastened back again, and got first to the bottom, the shell being close to his heels, but very fortunately as he turned into the Gallery the shell rolled out at the opposite door, where it burst.

June 3rd. A 13 Inch Shell from the Castle, was overtaken in the flight by a shot and beat to pieces in the air.

Several of the Enemy's shells fell into the harbour, where they always burst, and shook the works like a small Earthquake; they likewise sometimes killed fish, which were taken and eat.

A Sentry at Argyle Fort, had his Hat tore to pieces on his head, his firelock which he held in his hand beat to shivers, his Coat very much torn, but himself not hurt.

New Works.

A Stone Battery on the counterscarp of the ditch of the West Lunette.
A Fascine Battery on the Saliant Angle of the Carolina's Lunette.
A 3 Gun Stone Battery between Carolina's, and the South West Lunette.
A Tenaille Battery, at the Artillery Guard.

A LIST OF THE KILLED AND WOUNDED, &c., AT THE SIEGE OF MINORCA IN 1756.

Artillery and Additionals.	Killed.	Wounded.	Recovered of Wounds.	Taken Prisoner.	Total Wounded.
Company of Artillery	11	10	8	1	18
Sailors	10	33	—	—	33
Col. Rich's Regiment	4	6	11	—	17
R. W. Fuzileers	7	2	9	—	11
Col. Cornwallis's Regiment	3	8	10	—	18
Lord Effingham's	7	6	7	—	13
Artillery, &c., Total	42	65	45	1	110

FRENCH BATTERIES AT THE SIEGE OF ST. PHILIP'S CASTLE IN THE ISLAND OF MINORCA, IN 1756.

Batteries.	Guns.	Mortars.	Howitzers.	When Opened, 1756.	Works they bear on.	Distance from the Castle Square.	Commanders.
Turks Mount	3	3	—	May 20th to 28th	Castle. N.W. Outward	1000 yds.	Roquepine.
Stanhope's Tower	6	3	4	May 17th to 31st	Ravelin.	930 yds.	De Pelouse.
Burying Ground	6	4	—	May 12th to 19th	Castle. W. Lunette. Queens Redoubt	600 yds.	De Voisin. De Doley.
Water Tower	7	7	—	May 12th	Castle. E. Counter	700 yds.	De St Michel.
Cape Mola, or Signal House...	5	4	—	May 8th.	Guard.	1380 yds.	
Battery from Withams fives Court, to Stanhope's Tower	10	—	—	—	—	—	De LeBlanc.
From St Hugh Williams, to Mr Baker's Street	12	—	—	—	—	—	
Below Mr Boyds, where Potter the Cooper lived	5	—	—	—	—	—	St. André.
Corn Field by Philipet	8	—	—	—	—	—	De Louvicourt.
Total	62	21	4				

OCCASIONAL REMARKS ON THE SIEGE OF THE ISLAND OF MINORCA, IN 1756.

1756.
April 30th. The Garrison began to fire on the Enemy.

May 3rd. The Enemy broke ground on Cape Mola.

„ 8th. The Enemy began to fire from their Gun and Mortar Batteries on Cape Mola.

June 27th. Between the hours of 10 and 11 at night, the Enemy began to Storm the place with 10 Battalions, sustained by an equal number as a reserve, the attack continued till between three and four the next morning, when they beat a parley to bury their dead, and remained in possession of the Anstruther, Argyle, Royal Battery, and Queen's Redoubt, which they had taken during the assault; but were repulsed from the west and Carolina Lunettes.

„ 29th. The Articles of Capitulation were signed on both sides.

July 7th. The Garrison marched out with all the Honors of War, Drums beating, and Colours flying, and embarked on board 33 French Ships for Gibraltar.

„ 8th. Part of the Transports Sailed out of the Harbour, and kept off and on the Island the whole night, and part of the next day.

„ 9th. This afternoon the rest of the Transports came out of the harbour, and the whole stood on their course together for Gibraltar, with a fair wind.

„ 10th. We cleared the Island of Majorca.

„ 15th. We met at sea with Admiral Hawke's Squadron consisting of twenty three ships of the Line, steering for Minorca to reinforce that Garrison.

„ 30th. We anchored this afternoon in Gibraltar Bay, landed the 31st and were put on Garrison Duty the next day.

The French in the Siege of Minorca, fired 60,000 Shot and 20,000[1] shells.

Some Days before the French Stormed the works, they sent all the English Familys from Mahon to Ciudadela; their Camp was mostly in the Vineyards, their Troops very good and well Officered; they were supplied with great plenty of provisions of all kinds during the Siege; their principal Officers were quartered in the best Houses at Mahon, and made free use of the furniture of the inhabitants. After the departure of the English Garrison they made all of that Nation quit the Island, and seized upon their effects.

The French scaling Ladders were too short; they found great fault with our palisadoes, which not being each of them singly fixed into the ground were easily cut down, and rows of them laid down together, when they stormed the outer covered way.

Count Lannion was left Governour of Minorca, which trust he executed with great reputation, and was much esteemed and beloved, both by the Garrison and inhabitants.

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[1] In a table giving the number of rounds fired daily by each nature of gun in the Garrison, it is stated that the grand total of rounds fired by the English was as follows:—Shells, 27,630; carcasses and fire balls, 206; round shot, 32,734; grape shot, 940; double headed shot, 323; powder (lbs.), 353,639.

OCCASIONAL REMARKS, UNIVERSAL MAGAZINE, APRIL 1756.

Aix in Provence. The Troops began to go on board on the 4th April, 1756.

Besides the Men of War, the Fleet will consist of upwards of 300 Sail, sixty of which are Vessels of 300 or 500 Tons, having on board between 30 and 35,000 Men including Officers, Soldiers, and Sailors; 7 or 800 Women, 1,100 Oxen, 4,000 Sheep, 100 Horses, 100 Mules, a prodigious quantity of provisions of all kinds, meal, biscuit, water, hay, straw, Waggons, Cannon with their Carriages, Fascines, sand bags, shovels, &c.

For several weeks before the French landed in Minorca an embarge was laid on all shipping at that place.

The French Fleet put to sea from Toulon the 12th April.

Admiralty Office by a Letter from Capt Hervy.

That the Transports were 180, 90 of which are Tartans and Settees; that they have a Majorca Xebecque, which is said to serve as a pilot for the Craft.

ORDER OF BATTLE OF THE ARMY UNDER THE COMMAND OF THE DUKE DE RICHELIEU, AT THE SIEGE OF THE ISLAND OF MINORCA, IN 1756.

M le duc de Richelieu.

Lieut. Generals. 2. M le Marquis Dumesnil. 1. M de Maillebois.

M. de Camp. 2. M Monteynard. 5. P de Wertemberg. 3. Lanion. 4. P de Beauvauz. 1. Laval.

Brigadiers. 3. Roquepine. 1. La Sevu. 6. Monty. 2. Labliniere. 4. Talaru. 5. Viusinieu. 7. de Troisnel. 8. de Laqueville.

Brigadier Commanding the Artillery, M Diol.

Corps Roial d'Artillerie et de Genie.

Battalion d'Artillerie, Chabrier.

REGIMENTS.		BATTALIONS.	
Royal	...	2	
Medoc	...	2	
Bretagne	...	2	
Talaru	...	2	
Vermandois	...	2	
Rohan	...	2	
Rochefort	...	2	
Royal Italien	...	1	
Haynault	...	2	
Soissonnois	...	1	
Royal la Marine	...	2	
Cambise	...	2	
La Marche	...	1	
Royal Contois	...	2	
Briqueville	...	2	
Renet	...	2	Joined since their arrival.
Nice	...	2	

Each Battalion consisted of 12 Companies, and one of Grenadiers.

The Battalion Companies, 40 Men each, Grenadiers, 45.

In each Company 2 Serjeants, 3 Corporals, 3 Lance Corporals, and 1 Drummer.

Officers. 1 Captain, 1 first Lieut., and 1 second Lieutenant.

The Battalion of Artillery consisted of

4 Companies of Gunners, 70 Men each.	Commanded by M. Boniface, Brigadier and Chief Engineer.
3 Companies of Bombardiers, 70 Men each.	
3 Companies of Fireworkers, 70 Men each.	
1 Company of Miners, 60 Men.	
1 Company of Artificers, 40 Men.	

State of the French Fleet under M. De La Galissoniere, on the 20th May, 1756, when attacked by Admiral Byng.[1]

Ships.	Guns.	Commanders.
Le Foudroyant.	80	La Galissoniere, Lieut. General.
Le Redoubtable.	74	Glandeves, Chief d'Escadre.
Le Couronne.	74	La Clue, Chief d'Escadre,
Le Guevrier.	74	La Brosse.
Le Temeraire.	74	Beaumont.
Le Lyon.	64	St. Agnan.
L'Orphee.	64	Raimondis.
Le Content.	64	Sabran.
Le Triton.	64	Mercier.
Le Sage.	64	Durnen.
Le Fier.	50	d'Herville.
L'Hippopotame.	50	Rochemaure.
Frigates.		
La Rose.	40	Costebelle.
La Junon.	36	Beausfier.
La Gracieuse.	24	Marquiran.
La Topaze.	26	Carne.

State of the English Fleet under Admiral Byng, which on the 20th May, 1756, attacked that of M. De La Galissoniere, off the Island of Minorca.

Ships.	Guns.	Commanders.
Ramilies.	90	Admiral Byng. Capt. Gardner.
Culloden.	74	Ward.
Lancaster.	66	Edgecombe.
Buckingham.	70	Rear Admiral West. Capt. Everitt.
Trident.	64	Durell.
Intrepid.	70	Young.
Captain.	70	Catford.
Revenge.	70	Cornwall.
Kingston.	60	Parry.
Defiance.	60	Andrews (killed).
Deptford.	50	Amherst.
Princess Louisa.	60	Noel (wounded and died).
Portland.	50	Baird.
Chesterfield.	40	Lloyd.
Phoenix.	24	Hervey.
Dolphin.	20	— —
Experiment.	20	Gilchrist.
Fortune.	14	Maplesden.

[1] This was the engagement for the conduct of which Byng was tried and shot.

The following Five Ships Sailed from England the 17th May, 1756, to Reinforce the foregoing Squadron, Viz.:

Prince George.	...	90	...	—	—
Hampton Court.	...	70	...	—	—
Nassau.	...	70	...	—	—
Isis.	...	50	...	—	—
Another ship	...	70	...	—	—

And six Transports, with provisions and ammunition. In the engagement of the 20th May, Admiral Byng's Fleet had 43 killed, and 168 wounded. M. de la Galissoniere's had 38 killed, and 181 wounded.

QUESTIONS RELATIVE TO MINORCA. 1779.

Q.—What was the Garrison of Minorca in 1756.

A.—3,305 Men (Officers included). The Artillery, Sailors, Greeks, &c. are reckoned in that number.

The Artillery were made up, with 300 Men from the Infantry, and 124 Sailors, to 526 Men; and the Disposition of Men to serve the different Battery's, amounted to 450 Men.

Upwards of 200 Men mounted daily for the service of the Batteries.

There were 2 Captains, and 4 Lieutenants of Artillery; and 1 Officer of Infantry did Duty with the Artillery.

There were 3 Engineers, and 4 Officers of Infantry acted as Engineers.

One Officer of Artillery was appointed to the Mines, with about 40 Miners, taken from the Regiments.

Q.—What number of Men mounted.

A.—772 Men (Officers included) for the daily Guards, and 222 Men for the Piquet on and off.

Q.—What was the proportion of Duty the Garrison should have furnished to have supplied the service of the Place, viz.:—Citadel and outworks properly, and without fatigue.

A.—This is a Question not very easily answered, and many circumstances must be considered before this can be determined to any degree of certainty; It however may be presumed from the detail of the last Siege, that not less than one thousand men daily should be upon Duty for the necessary Guards, &c., and that to give three nights in bed, and allow for a reserve, Out post, Sickness, &c., Seven thousand Men could not be deemed too strong a Garrison to defend so extensive a fortification and outward covered way; but less than five thousand might I presume be considered rather as a weak Garrison; but this supposes the Garrison to be left entirely to its own defence, and the Enemy to have a Fleet to cover their operations.

Q.—What was the Tour of Duty, and what the Reserve upon the numbers employed for daily Service.

A.—The Garrison in 1756 had scarcely two nights in bed, and the weakness of the Troops at that Siege, would not admit of any Reserve.

Q.—What is a proper Garrison for the place.

A.—I do not pretend to be a competent Judge of this matter; which I think depends much on the plan of Defence, and Force and Attacks of the Enemy.

Q.—What is the number of the present Garrison.

A.—I am not at all acquainted with the present strength of the Garrison.

Q.—Is it practicable for an Enemy to carry the sap otherwise than above ground.

A.—The Ground on which the Enemy should make their approaches and erect their Batteries, being mostly hard rock, they can I believe make their approaches no otherwise than above ground.

Q.—If this be the only means; what are the materials to be got there first.

A.—I know of no other method of approach, than what is mentioned above; and the materials they would make use of, I apprehend would be Fascines, Earth from the Gardens (the mould of which is very fine and light), Gabions, Barrels, Sand Bags, &c.

Q.—If it is so difficult to carry on the sap otherwise, is it not then almost impossible for the Enemy to countermine the several Mines which defend the Angles and Faces of each work.

A.—From the nature of the soil as has been described above, which is mostly hard rock, it is scarcely practicable to countermine the Mines which defend the outworks and outward covered way. The French who brought a Company of Miners with them in 1756, attempted it, but after much fruitless labour, and no progress, gave over the attempt.

Q.—What is the number of Men requisite for a Defence of the Outworks upon each presumed Polygon of attack.

A.—This I think depends much upon present circumstances when the place is attacked, and on the plan of Attacks, and Force of the Enemy. It may be observed that the number of Men that mounted daily in the Outworks in 1756, were not adequate to the defence of such extensive outworks and covered way, when the French stormed it (who at that time attacked the whole extent of the Fortification to the sea, as well as land), and it was not safe to send Troops from the defence and Service of the Inner works and Covered way, to reinforce the Guards in the outworks, and the Men that landed in the Boats under Charles Fort where the Hospital was, were repulsed with the assistance of the sick and wounded Men, the weakness of the Garrison allowing but very small Guards on the line of Defence to the sea.

Q.—As the Mines seem to be the principal Defence of St Philip's, what number of Mines would be necessary.

A.—I think a Company of at least 100 Miners would be absolutely necessary for so large a number of Mines and such extensive underground works.

Q.—Can they be procured on the Island; have they a Miner there.

A.—I apprehend not, as to any Spanish Miners that may be there, I doubt whether they can be depended upon in time of Service; and if there are any among the Infantry, it would weaken the Garrison too much to take them away from the defence of the upper ground Works.

Q.—Would not short guns in the Subterraneans to defend them occasionally be of great consequence.

A.—There are six Cohorn Howitzers at Minorca, which I presume would be useful in defending the Subterranean Gallerys, either with Shells or Case Shot, if the Galleries will bear the explosion and shock; but I think that smoke balls would be very advantageous if fired in the Galleries. There are also Orgues fixed in all of them behind the Traverses, which make a very good Subterranean defence; all the Traverses in the Subterranean Galleries have ditches before them, and the passages of retreat round the Traverses are well secured by very strong and heavy falling doors.

The Officers' Quarters have also loop holes to fire Musquetry into the Galleries.

LOOSE THOUGHTS ON MINORCA.

As all the Guns at Minorca are Iron, and there may be probably Carron Guns among them, it would be very necessary to have them all examined by General Desagulier's Instrument.

If the Garrison of Minorca was of sufficient strength for that purpose, it would be of great advantage to have a Post at Fort Fornelles, as the harbour commanded by that Fort is the place where the Enemy's Transports must lie after the Troops are Disembarked, and being a very good harbour and directly opposite the French Coast, they will there keep up their communication with France, and receive there all their supplies of Men, Ammunition, &c.

A small Garrison there would also procrastinate the Siege, as they would probably take that Fort first before they make any attack upon St. Philip's.

Whether the Amusettis would not be useful in reconnoitring Partys and Sallys, or on the covered way when Stormed, or in the breaches.

THOUGHTS ON MINORCA.

Minorca if possible should be reinforced so as to make the strength 5000 men. The half Companies of Artillery should go, and the Corps of Artillery should be quite complete; there should be 200 Miners sent with a proper proportion of Officers for the Mines and Subterranean defence. Carcasses and Smoke Balls should be sent, and Captain Tovey's Shells to fire out of Guns on the fascine batteries of the Enemy.

Miners' tools, Carronades for Grape Shot in case of assaults and close attacks, and for the Flanks of Works and defence of the ditches.

LECTURES

FOR

N.-C.O. AND MEN OF FIELD ARTILLERY.

BY THE LATE

CAPTAIN G. L. W. GRIERSON, R.H.A.

THE following rough Notes of Lectures were found among the papers of the late Captain G. L. W. Grierson, R.H.A., being evidently compiled for his own use without a view to publication. His family have most kindly offered them to the Committee R.A. Institution, and they gladly avail themselves of the permission to publish for the general benefit of the Regiment to which he was so proud to belong.

READ Lord Roberts's Speech, at Gurgaon Camp of 1891. Points he laid stress on; examples of shrapnel fire effect he quoted. Read "An Artillery Duel," by Major O'Callaghan, R.A., in "Proceedings" R.A.I., and "Shrapnel Fire," by Major Clarke, R.E., in ditto. Shrapnel is the projectile we must know all about, it is the projectile to win battles with. 1st Lecture.

Common shell.—Useless for destroying earthworks or obstacles. On this point read extracts from "Clery," in his remarks on Russo-Turkish War; bombardment of Turkish works previous to assault at Plevna; also Major Savage's paper, "Fortification on the Battle-field," and Baker's "Preliminary Tactics" on this point. Diagrams of field-works showing how obstacles are protected from shell fire, and how the garrison is sheltered. 2nd Lecture.

Case shot.—Cone of dispersion and its area; most effective at 300 yards, when it covers a front of 42 yards. Read examples of effective use of case—Waterloo, Wörth, Salamanca.

Shrapnel Shell.—Trajectory up to point of burst identical with common; what occurs on burst; cone of dispersion; varies for different ranges; result of rotatory motion and forward motion of shell on balls; formation of cone; its pattern on ground; how balls are distributed.—*Vide* Baker's "Preliminary Tactics."

Danger zones of shrapnel at 1000, 2000, 3000, and 4000 yards.—Form of zones shows that fire cannot be too direct when object has depth, nor too oblique (or flanking) when object has frontage and little or no depth, *i.e.*, column and line. Effect of flanking fire on a line; effect of direct fire on a column. Percussion shrapnel; how ineffective; its effect on a broad target; on a deep target. Read remarks 3rd Lecture.

on ammunition used at Okehampton in "Report for 1891." Diagrams, drawings, &c.

4th Lecture. Effect of ground on fire.—In ranging; effect on cone of dispersion of ground sloping to and from the battery; effect of ground on ricochet; protection afforded by a small bank; Mercer's Battery at Waterloo; Clery; sweeping reverse slope with fire; effect of raising trajectory of ranging shell before shrapnel fire is opened; loss of bullets if this is not done. Read Colonel Scott's pamphlet; illustrate above remarks on blackboard, &c.; effect of flanking shrapnel on a field work and its effect when fire is frontal; when enfilade.

Requirements of a good position.—Clear view to front over range; cover for teams if to be had; level standings for guns, or slope so gentle that guns do not run back beyond recoil; guns not to be placed on impossible ridges and slopes at field days; false teaching; guns not to be placed on sky line on very high ground; lower slopes and spurs preferable; plunging fire when guns fire down from heights; Alma, Russian fire; Königgrätz good position, Lipa; presence of conspicuous objects to be avoided; stones in front; bog or marsh in front, in rear; slope in front, in rear; good line of advance; security of flanks; obstacles on flanks; no position ever combines all these advantages; make best use of ground as it is; if a disadvantage can be avoided do so, but first consideration *must* be view of fire and effect; *then*, secondly, cover. (Give local examples of good and bad positions.) Read Pratt, Baker, Clery, on this subject; also Hohenlohe and Von Schell.

5th Lecture. Introduction to Study of War.—Read Home, pages 2 and introduction; strategy and tactics; drill; discipline; difference between an army and a mob.—Home, Chap. I.; Baker, pages 3 and 4.

No rules for fighting; everything depends on ground and circumstances. Method of artillery fighting in the days of smooth-bores; necessity now-a-days for "fire discipline;" definition of term; how it arose; what it means; a battery should be a machine in the hands of C.O. Read Baker on "Fire Discipline," and his definition of it. Important for C.O. *only* to observe fire, and not the Nos. 1, &c., &c.; importance of every other person doing *exactly what* he is told, and not as he *thinks* should be done. Read White, on "Field Artillery Fire," Chap. I., "Fire Discipline."

6th Lecture. Composition of an English Brigade-Division and Army Corps.—Proportion of guns; cavalry and infantry; Corps Artillery and Divisional Artillery; number of rounds per gun in Divisional Artillery; position of artillery on the march; German Artillery in 1870 and 1866 contrasted on march; results. Read Hohenlohe. Advancing into position; formations; to pass obstacles; to move to a flank under fire. Hohenlohe. Method of bringing a battery and Brigade Division into action; reason for trying to open fire from first position so as to surprise enemy; artillery duel may last for hours; how fire discipline comes into play in coming into action; losses; loaded guns. Read White's Lectures, Chap. I. and II., and extracts from German "Reglement." Preparatory position; if not to be had battery must advance rapidly into position and rely on fire discipline; 8 or 10 minutes spent

in preparatory position not to be compared with disadvantages of going into action when not thus prepared; batteries may be engaged for hours; culpable neglect; the "gallop, halt, action front tactics" render it impossible to point out target and get the range; everything depends on success of artillery duel; when batteries debouch from a defile or narrow way, or have to come into action suddenly in rencontre, then there is reason; first gun out of debouch would be shown target; others form on it, and Nos. 1 and officers pick up target and range.

Great advantages to be derived from quietness at manœuvre; absence of excitement, or seeming excitement; not to interfere with smartness or dash; accidents in field; whole battery not to rush and help; the sub-division should suffice; the remainder go on; quietness in giving orders for manœuvre; in executing; peace the preparation for war; casualties in peace train for casualties in war. 7th Lecture.

Brief Sketch of Artillery Tactics.—Early wars of century; Napoleon's "battalion guns;" Peninsular War; Crimea; 1859, 1864, 1866, 1870. Remember artillery is an auxiliary to infantry, so is cavalry. Tactics of artillery have not changed, *distances* have altered; range at which formerly effective at outset of fight now impossible at the outset. Must get into action sooner than formerly, and remain in action longer; principle of massing guns not new; Eylau, Wagram, Borodino, Waterloo. Concentration of fire only obtained by massing guns; 1864, 1866, 1870 again. In 1866 artillery kept back in reserve; no such term now as "reserve artillery." How guns were used in 1870.

Characteristics of Three Arms.—Infantry fire and bayonet can go wherever a man can; effective on move, equally so for attack or defence quickly; cavalry, motion, never wait attack. Heavy cavalry charge, Balaclava; Russians defeated; cavalry eyes and ears of army; openings still left to cavalry; favourable ground; smoke. Tobitschau 1866, 18 guns captured; masses of cavalry in attack; Napoleon's wars; Frederick the Great. Modern German cavalry tactics.

Artillery powerless on move; surprise; ground; effective only at halt; movement to be quick; entails fresh range; move as seldom as possible in general engagement unless infantry tactics require; difficult to train; great effect of massed fire; ultimate success of battle depends on primary action of artillery; careful selection of first position. Read on these points Home, Clery, Hohenlohe, von Schell, von Hoenig.

Tactical handling of artillery in the attack.—Initiatory action; artillery duel; preparation for infantry attack; support of ditto; occupation of the position; pursuit. On defensive; artillery duel; infantry attack; counter attack; "Field Artillery Drill," Vol. II. Read Colonel Brackenbury's lecture "Use and Abuse of Field Artillery" (Aldershot, June, 1888.) Instances of pursuits, Waterloo; Königgrätz no pursuit; support of infantry, Gravelotte; effect of massed fire at Sedan, &c., &c. 8th Lecture.

Summary of duties of artillery, Hohenlohe. Formations in war, line and column; examples read from Hohenlohe of what actually occurred; no loss in flank march in column of route; artillery can always repel a frontal attack. Königgrätz, effect of enemy ranging to a position likely to be occupied by attacking guns; confidence that the 9th Lecture.

knowledge of skill in shooting gives the men. Sedan, importance of ammunition supply; importance of artillery being able to make long advances at trot; on roads; even pace; horses in wind; difficulty of observing fire; Gravelotte; Sedan; disturbing elements in war, &c., &c.

10th Lecture. Smokeless powder.—Its effect on the action of infantry, cavalry, and artillery in the attack; on the defensive.

Artillery gain by it; no smoke to obscure aim or enemy; guns can be closer and in tiers; difficult to make out a well-posted battery; element of uncertainty and *bewilderment*; weight; effect on gun; smell.

Read extracts from "Journal" of U.S. Institution, on "Smokeless Powder and German Manœuvres."

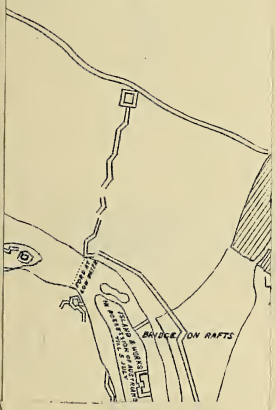
Remarks on Future Warfare.—Battles will be won only with great loss of life; cover training for infantry bad if carried too far. Germans recognise this; attack bound to cost life. Infantry must be trained to press on in lines fed from rear; reserves advancing in strict discipline; drums; colours; effect of drill and discipline. After 500 yards a decision one way or another. Artillery must share equally losses of infantry in attack.

Smokeless powder advantage to the traditional fighting of British infantry; concluding remarks. Lectures intended to show men how three arms are connected. Artillerymen should know something of fighting of infantry, the backbone of the army; the artillery being its right hand, cavalry (head) eyes. A battery must be able to move without impairing efficiency; must shoot well in action; fire discipline must do the rest.

Peace, the preparation for war; drill a means of discipline; discipline is obedience to will of superior; fire discipline obedience under fire. A battery in action is a machine, the C.O. by his will sets it in motion, stops it, makes it work quick, slow, moves it about. This can only be efficiently done by the works being in good order, and by each particular part of the works doing its share.

Karachi,
June—July, 1892.

SELING



THE ISLAND OF LOBAU,

SHOWING NAPOLEON'S ENTRENCHMENTS & ALSO THOSE OF THE AUSTRIANS BEFORE THE BATTLE OF WAGRAM IN THE YEAR 1809.

STADLAU

FROM VIENNA

TO BRUNN-LEE

TO ASPERN

TO ABERSLAA

ASPERN

TO ABERSLAA & WAGRAM

GRANARY

ESSELING

TO RAASDORF

TO MARCHF MEUGIEBEL

TO GLINZENDORF

TO LEOPOLDSDORF

TO HUTZENDORF

GROSS ENZERSDORF

MILL ISLAND TAKEN FROM AUSTRIANS ON 4th JULY

POWDER MAGAZINE

BRIDGE ON RAFTS

TWO GUNBOATS ARMED WITH HOWITZERS SKIFFS & BOATS

POWDER MAGAZINE

ROAD CONSTRUCTED BY NAPOLEON

JAGERS HOUSE

POWDER MAGAZINE

TO ORTH

HEAD QUARTERS OF THE EMPEROR

MAST USED AS A LOOKOUT

BRIDGE ON RAFTS

MITTER HAUSEN

DEPOT FOR STORES ETC.

PILES

BARRIER OF PILES

PILES

POWDER BRIDGE ON PILES

BRIDGE OF BOATS

PLACE WHERE THE BOATS WHICH FERRIED ACROSS THE LEADING TROOPS WERE ASSEMBLED

MUHLLEUTHEN

SCHWACHAT R.

KAISER EBERSDORF

1 2 3 MILES.

A VISIT TO ASPERN AND WAGRAM.

BEING AN ACCOUNT OF THE PASSAGE OF THE DANUBE BY NAPOLEON IN 1809.

BY

MAJOR E. S. MAY, R.A.

NATURAL obstacles, apparently insurmountable or impassable, have more than once in history failed to set a limit to the enterprises of genius. The mighty Rhine has repeatedly been crossed, the deep Danube and the lofty Alps have alike proved unreliable bulwarks, while even the sea, we proudly call inviolate, has failed in past ages to keep invasion from our shores. Yet such natural frontiers as broad rivers and mountain chains afford are those that most impress popular imagination, and are regarded with an almost superstitious reverence by the bulk of nations. Our confidence, from the time English history proper began, has happily been justified, but, since experience has proved that there is no obstacle which genius may not with good fortune surmount, and since in India we rely on high mountains, and, in the second line, on a vast river, the tale of how a General of more than average capacity was outwitted, and a mighty barrier passed with comparatively little sacrifice, should still interest us. When in Austria, two years ago, I spent several days in walking over the two great battle-fields which lie in the neighbourhood of the capital, and occupied my leisure hours in writing the following account of the great events of 1809, which the pressure of other work has prevented me from completely finishing until now.

An hour's journey in a steam tramway from Vienna brings one to a trim quiet little village straggling along one principal street composed of dainty white cottages with neat gardens in their front. At one end a small church with a taper spire stands across and closes the vista between the houses. A great stone lion in the churchyard, writhing with the pain of a sword thrust through his side, is the only object which strikes you as unusual. No monuments or obelisks, such as one sees at Gravelotte or Waterloo, are there. No ruins or loopholes or parapets remind you of war or victories. Yet it is at Aspern that we are, and the lion represents the power of the great Napoleon, who first was here taught to feel the keen mortification of defeat. The level plain, now brown with the freshly turned soil, stretching away to the north is the Marchfeld, where the House of Hapburg has more than once had to fight for its supremacy, and we are standing on a spot

which has witnessed more murderous slaughter than perhaps any other ground in Europe.

About a mile away, straight along the road in front of us, where the homesteads and low houses break the monotonous horizon, we may catch a glimpse of Essling. The spire to the left showing through the haze above the low buildings crouching under it is Breitenlee, the ragged trees to the south mark the Lobau and the course of the Danube, while the heights we may be able to dimly distinguish to the north-west are those of the Bisamberg. The haze and fog which usually hangs on such flat alluvial soil in the neighbourhood of a great river will scarcely allow us to distinguish the plateau of Wagram, which juts out into the plain away to our left front, nor will the trees between let us get a view of Enzersdorf, which is just beyond Essling, and lies before us somewhat to the right. Eighty-two years ago these names, now strange and unfamiliar, were in everybody's mouth. Anxious eyes from the steeples and towers of Vienna were straining to catch a glimpse of the neighbourhood about us, and tried to learn from the progress of the lines of smoke how the battle for their country's freedom fared. Yet at the present day comparatively few are familiar with these classic names. No memorials but that of the lion mark the scene of so much courage and devotion, and even the graves of the heroes of 1809 have disappeared. It is worth our while, nevertheless, to walk over the ground, and try and recall something of the battle commemorated as one of the most glorious in their annals by the Austrians by the name of Aspern, and as Essling recalling to the French one of the stoutest resistances their own or any other army ever offered to such an onset as they faced.

When the campaign of Eckmühl and the subsequent occupation of Vienna had given the world one more startling proof of what the genius of Napoleon could accomplish in spite of the opening blunders of Berthier, Europe waited spell-bound for the next news from the shores of the great river we are now beside. During the week which followed the capture of the capital, the conqueror occupied himself in reviewing his troops, distributing honours and rewards, and in making good the casualties his army had suffered in their recent actions. In spite of all that had been accomplished during the previous month, and the heavy losses which their victories had cost them, the troops immediately round him, that is to say, the corps of Massena and Lannes, the Imperial Guard, and the Cavalry under Bessieres, could still muster 80,000 strong on parade, and were in the best of spirits, firmer than ever in their confidence in the "little corporal," and looking forward to further triumphs under his leadership.

Eugene was hurrying from his vice-royalty to join his adopted father's force, and would bring 40,000 men with him, while the long line of communications, which stretched away to France behind the army, were secured by Davout at St. Pölten, and Bernadotte further still to the rear. Everybody felt that a man of Napoleon's energy with so formidable an engine of destruction at his command would not long remain quiescent, nor tamely allow its safety to be menaced by such a force as the enemy still retained intact. For, on the opposite

bank of the river, that on which we now stand, the Archduke Charles, who had been driven across at Ratisbon into Bohemia, still remained in command of an army numerically equal to that of the French, and, in spite of its misfortunes, in good heart, and animated by all the devoted courage patriotism and loyalty can inspire. Not only was such a force a menace in itself, but, while it held the field, it supplied a nucleus and rallying point for the Imperial resources to gather round against their country's invader, and, what was still more dangerous, its existance and any slight success it could obtain, might inspire the numerous States, now unwilling vassals of Napoleon's, to join cause against him, and raise the standard of revolt in his rear. Austria could not be looked upon as powerless while she wielded such a weapon, even though her capital were lost to her for the present, nor would even Eckmühl and the capture of Vienna sufficiently owerawe Europe, and humble his immediate adversary, unless followed by a more stunning blow. Napoleon felt that another victory was a political, even if not a military necessity, and his active mind was soon intent on casting about for some means of getting within striking distance of his only dangerous opponent on the other side of the broad river which lay between them.

The passage of such an obstacle in the presence of an enemy has always been looked upon as one of the most dangerous operations a General can undertake. To cross one so broad as that now in front of Napoleon under the fire of such a force as that of the Austrians would almost have been impracticable but for certain topographical circumstances peculiar to the neighbourhood of Vienna which considerably minimized the risk.

The Danube presented a far more formidable obstacle to the passage of an army above that city than it did in and immediately below it, where its swift, deep current, hitherto flowing but in one channel, widens out over the plain and is subdivided between islands into portions more manageable for bridging. Modern science has now embanked and modified the river's course, but even at the present day enough remains as it was to exemplify the problems Napoleon had to grapple with. At two points the facilities were obviously greater than elsewhere. At Nussdorf, opposite the city, which we left a little above us as we crossed the river to-day, an island close to the northern bank formerly divided the river into two channels of unequal width, the narrower being next the northern shore. But the quick eye of Napoleon was soon attracted by an even more favourable site for an enterprise such as he contemplated at a spot opposite Kaiser Ebersdorf, or Ebersdorf as it was then called. Here, formerly, the Danube was divided into no less than four different branches, the various islands offered concealment and space for the collection of boats and bridging material, while the large island of Lobau, two-and-a-half miles long, with its grassy pastures, and patches of wood, offered a singularly suitable site for the concentration and encampment of a large force. Moreover, the northern arm of the river here formed that re-entering bend which is so eagerly sought for by all commanders who would cross a stream in the presence of the enemy, and artillery on the Lobau could be easily placed so as to sweep the peninsula on which the leading troops would establish them-

selves. The banks of the Danube are here perfectly level, and the unbroken plain before us stretches away from the river till it meets the plateau of Wagram and the heights of the Bisamberg. The eye of the skilled General would not fail to notice also the two straggling villages we have come to see to-day, about a mile apart and perhaps the same distance from the river, which might be held by the portion of the troops already over while the remainder were effecting their passage behind.

Napoleon, after a careful study of the ground, determined to make preparations for forcing the passage at both these points at the same moment. It is difficult to judge of the facilities presented at Nussdorf now, because the island of Schwarze-Laken, formerly near the northern shore, has disappeared and conditions are therefore no longer as they were, but it is tolerably certain that the Emperor never really intended his preparations there as more than a feint. The collection of material and gravitation of troops towards the Lobau, independently of other considerations, seem clearly to point to this conclusion, but whatever his original intentions may have been, the force of circumstances soon made him determine to make his real effort from that island.

On May the 13th Lannes, to whom the operations at Nussdorf had been entrusted, had thrown two battalions into the island of Shwarze-Laken. This advanced guard was at once subjected to a heavy fire from the northern shore, and, assailed by Hiller with superior forces, was so roughly handled that it was compelled to capitulate ere succour could arrive from the more distant southern bank. Such a reverse, clearly showing as it did the difficulties inherent in the position of the island, determined Napoleon, even if his mind were not already made up, to confine his efforts here to deceiving the enemy, and to strain every nerve to quickly achieving the passage lower down, where Massena had been left in charge of the operations.

The Archduke Charles had neglected to occupy the Lobau in any strength, Massena had secretly collected a flotilla of boats and bridging material behind the island of Prater, then a wild tangle of forest, five days, during which Napoleon himself superintended the preparations with incessant vigilance, were enough to gather sufficient stores from the inexhaustible supply the captured arsenal of the Austrians placed at his disposal, the sixth saw the enterprise commenced, and the different parts of the structure were fitted together and floated down the little river Schwachat to the Danube.

In the midst of his preparations the Emperor heard that an Austrian corps had tried to cross the river at Linz and fall on his communications, while at Krems, too, his rear was threatened in a way which gave him considerable anxiety. A smaller man than he might easily have been frightened from his project by such menaces, but, so far from deterring, they more than ever urged him to swiftly carry out his plans, giving as they did clear evidence that the Archduke's forces were disunited, and in part at anyrate removed from the scene of action. He recognised at once where the decisive point really lay, and, as was his wont, disregarded the minor danger when his eyes were fixed on a great coup. In spite, therefore, of a rapid rise in the river caused

by the melting of the Alpine snows, the island of Lobau was seized and occupied during the night of the 19th, and a bridge tolerably substantially composed of boats and rafts established between it and the southern shore. By mid-day on the 20th everything was in readiness for further progress, a light bridge of pontoons was thrown across the narrow channel which separated the Lobau from the northern bank, and the leading troops of Massena's corps began to defile on to the vast plain of the Marchfeld.

Aspern and Essling were promptly taken possession of by the divisions of Boudet, Molitor, and Legrand, and placed in a state of defence. I have seen it stated that formerly these two villages were connected by a canal, but at present no trace of this is to be seen, and nothing larger than the ditches usually used to drain such level ground probably ever existed there. No doubt, however, the fields being flat and swampy were intersected by many such, and the road which connects the two villages, now traversed by the steam tramway, had a ditch on each side, and formed not only an excellent lateral communication, but provided some shelter to a defensive line.

The desperate struggles which centred round these villages must have pretty well destroyed the original shape and structure of their houses, and those which one sees to-day are, except in a few instances, scarcely the same that held the Frenchmen. Their general character, however, remains unaltered. All accounts show that they were composed (then as now) of low slate roofed cottages straggling along the road which runs between them, and that there was but one substantial building capable of prolonged resistance in each.

In Aspern the church and churchyard still stand out on the west flank as a bastion to the remainder, although the walls of the latter are not the same which afforded shelter in 1809.

In Essling we can see practically unaltered the three-storied granary jutting out to the north and flanking the fronts of the houses from which the Austrians never succeeded in driving their opponents. Its handsome doors of iron still show the Austrian bullet holes, and its solid walls and three tiers of windows still remain to exemplify what a strong redoubt it must have formed.

Impatient to bring about a catastrophe which should impress the world as much by its swiftness as its magnitude, Napoleon hurried his troops across with restless energy. All the afternoon and night of the 20th the stream of men kept ceaselessly flowing from the Lobau, and on the morning of the 21st 40,000 men were on the northern bank. No serious opposition was encountered from the enemy, nor indeed, except for a strong advanced force of cavalry which hovered about in front of the villages, did they give any evidence of their presence. While inactive, however, the Archduke had been by no means unobservant.

His force lay crouching on the Bisamberg ready to spring on the French when he judged that the opportune moment had arrived. The large building on that hill which he used as an observatory, and from which it is possible with glasses to observe the Lobau, still remains. From that look-out he had not failed to note Napoleon's preparations

and the movement down the Danube of Davout's corps. All the signs pointed to a grand effort to be made in front of Kaiser Ebersdorf, and he soon determined on a plan to entrap his enemy. A narrow roadway, such as the French possessed across the river, would only allow a very slow passage of troops, the least accident or check might block it for a considerable time, and the stability and even the very existence of the bridge, which formed their only line of communication and retreat, might be interfered with or even totally destroyed. The enterprise to which the headlong spirit of Napoleon had again committed his army was in truth a most hazardous one. The safety of, at anyrate, half his force miles away from France depended on the stability of a long crazy structure of timber and cordage swaying and groaning in the rush of a swollen river, while a powerful enemy in his front stood ready to crush the head of his attack ere the rear could come to its assistance. The Austrians, too, collected heavy barges and fire-ships above the Lobau, and while they determined to strike heavily at the French troops on their side of the river, hoped by floating these down the stream to destroy the bridge of boats to which they must look both for succour and retreat.

On the morning of the 21st of May, when it was seen that a large proportion of the French was across, while the remainder were still hurrying after them, many voices urged the Austrian commander to lose no time in making his spring. Although a General with vast knowledge of the theory of war, and one who has undoubted claims to the high reputation as a commander which he bears, the Archduke Charles seems hardly to have been gifted with that quick decision which has ever marked the successful leader of men. Especially when opposed to Napoleon, for whom he had an admiration which exercised an overawing effect upon him, he seems to have acted as if not completely sure of his purpose, or confident of his ability. On the 21st he was haunted by the same apprehension as to his right, that Wellington experienced at Waterloo, and delayed until the movement of his foes was well pronounced ere he began his advance about noon.

His force, which probably amounted to 80,000 men, but has been placed as high as 95,000 by some French authors, of whom 14,000 were excellent cavalry, with 288 guns, came sweeping over the Marchfeld in five broad columns.

As we look across the plain this March morning we see a vast monotonous stretch of ploughed land, soft and deep with rain and melting snow, but in the spring it was doubtless covered with rising crops, and movement would everywhere have been easy. The French force as time went on was fed by the stream of men hurrying forward from the rear, and by two o'clock in the afternoon may perhaps have numbered 50,000 men, without, however, as strong a force of artillery as the Austrians. Most French accounts place the total considerably lower, but, if the German auxiliaries be added in, their force can scarcely have been much below what I have stated. They were, however, at any computation so inferior as to be compelled to act on the defensive, and set to work to strengthen the two villages in every possible way, and to throw up what entrenchments time allowed round

them. Hiller's corps, which moved along the bank of the Danube on the Austrian right, and that of Bellegarde, which was next to it, assailed Aspern almost simultaneously. Hohenzollern's corps moved by Breitenlee to the left of these, the fourth column of advance commanded by Rosenberg advanced through Raasdorf on Essling, while the fifth under the same direction made a detour on Enzersdorf to turn the French right and co-operate in the attack on Essling. The cavalry massed together moved towards the open ground which stretches between the villages. To Massena, who had the divisions of Molitor and Legrand with him, was entrusted the defence of Aspern. Lannes held Essling with the Boudet division. The ground between was occupied by the remainder of Massena's corps, the Imperial Guard, the German auxiliaries, and the cavalry divisions of Nansouty, Espagne, and Lasalle, under Bessieres.

Massena had endeavoured to convert Aspern into a sort of citadel, and entrenched in it received the first shock of the Austrian advance. The church and cemetery, which we passed on the extreme west of the village as we entered it, had been particularly strengthened, and here the Marshal himself took up his position, and by his unsurpassed energy and courage infused a vigour into the defence which saved the French fortunes on that day. The first rush of the Austrian advanced guard found their opponents in far inferior numbers and hardly prepared for the assault, and they were driven out of a considerable portion of the houses at the first onset. The Molitor division, however, quickly rallied again and forced the Austrians back to the columns advancing in their rear. The three heavy masses of men advancing to their support soon however reinforced and reassured them, and converging on Aspern now threatened the French position with an imposing display of strength. Massena's men, however, lining the churchyard walls and the adjacent houses, poured such a heavy fire upon them as made up for any disparity in numbers there was between them. The disadvantages inherent in the column formation were here once more exemplified, the densely crowded masses were unable to turn their numbers to account, and were rent and torn by the storm of lead which burst on them from every wall and window. The church and cemetery, as we noticed, to some extent flanked the remainder of the village and entirely commanded the street down its centre, both sides therefore realised the importance of this part of the position, and fought for it with murderous zeal during the remainder of the day. The Austrian batteries were brought up to a short range and their grape shot rattled through the boughs of the trees which then grew round the church, and tore the little pointed steeple, which still remains, but though the Molitor division was at length driven from the village, in spite of a desperate resistance in every house and enclosure of its straggling length, columns of attack surged against this vantage point in vain. There Massena still held out, although assailed likewise by a heavy fire from the neighbourhood of Stadtlau, and calm and collected throughout this tremendous struggle he threatened the Austrian flank with the Marulaz cavalry, and drove them again from the village with the division of Legrand.

Meanwhile the gallant Lannes had been sustaining an uneven contest

with equal skill and bravery at the other extremity of the French line. Recognising that the force at his disposal was too small to hold so extended a line as would be involved if Enzersdorf as well as Essling were occupied, he evacuated the former village on the approach of the Austrian column which had been directed upon it, and prepared to defend Essling with the Boudet division.

This village is very similar in general character to that of Aspern, but about its centre, and projecting out beyond it so as to flank the whole of its front, there still stands a substantial three-storied granary which measures 120 by 60 feet, and is lighted by a considerable number of windows in each story. The basement is secured by heavy iron doors which still show the marks of the fire they received eighty-two years ago. It was round this substantial keep that the French resistance during this and the following day centred, and it was never captured by their opponents. The fourth Austrian column of attack stayed its advance until the fifth had completed its circuit round Enzersdorf, and the battle had therefore been raging for some hours round Aspern ere the assault from both front and flank was launched on Essling. When at length, however, the storm broke it encountered the same steady resistance it had met with earlier in the day, and bravely as the Austrian columns advanced, their compact masses were received with such a shower of musket balls and grape shot that they were driven off, and compelled to fall back with heavy loss.

Meanwhile the persistent attacks on Aspern in the early part of the evening had drawn the greater part of the French infantry to the defence of their left flank, and the interval between the two villages was occupied to a large extent by the Cuirassiers of Espagne and the light cavalry of Lasalle. The Austrian infantry, too, had been called away to where the struggle was fiercest, and their batteries, guarded by cavalry chiefly, had crept nearer and nearer, till their guns, many of which were of heavy calibre, were pouring most galling and destructive fire on the French defences. These circumstances and the level unbroken surface of the ground seemed to offer cavalry an opportunity for action, and Napoleon thought he saw the moment when he might by a sudden rush of horsemen seize the Austrian guns, and rout their weakened centre. Bessieres was ordered, therefore, to try and gain possession of them, and to the light cavalry of the Guard was allotted the enterprise. But the well served fire of grape at such a short range was too much for them, and they were withdrawn after several gallant efforts, while the formidable Cuirassiers of the same corps dashed forward in their place. But as these magnificent horsemen came on, the infantry behind the guns were thrown into squares, and when the mighty mass surged through the batteries they found themselves helpless between the solid blocks of men, who plied them on every side with a steady fire.

Much the same scene was now enacted as took place six years later at Waterloo. The infantry were enveloped by this great sea of horsemen, the reserve cavalry of Lichtenstein which was moving up to their support was driven back, but, isolated though they were, the Austrian squares stood as firm as in later years did ours, and the

splendid French cavalry rode round and round unable to effect an entrance anywhere or shake the stubborn front opposed to them. The muskets meanwhile ploughed their ranks with an incessant fire, and finally leaving half their numbers on the plain the squadrons were withdrawn shattered and crestfallen. Unbroken infantry had once more triumphantly shown that it need not fear even the best equipped and most valiant cavalry.

Inspirited by their success Hohenzollern's infantry at once pressed forward against the weakened French centre which was being forced back little by little into the promontory formed by the bend of the Danube between the villages.

As the Austrian advanced, a combined attack on Essling was made by Rosenberg's two columns, and the village was set on fire in several places by the shells which heralded the attack. The flanking fire from the granary and some of the buildings, however, arrested the tide of advance as it came abreast of the village, and all its energy and weight did not succeed in driving the heroic division under Lannes from its defences.

The attack from the direction of Stadtlau which would have struck the French in a most vulnerable point was, fortunately for them, not pushed home as it should have been, and a few companies of the Molitor division, taking advantage of the wooded and difficult nature of the ground, were able to keep the four Austrian battalions sent forward here in check.

But while the advance of the Austrians in the centre exposed their left to the flanking fire from Essling, it on the other hand also menaced the eastern side of Aspern, and soon that village was assailed on both sides by Hiller, and part of Bellegarde's corps under Vacquant.

A most murderous combat then took place and eventually a mighty shout, which was heard in the dusk high above the roar of battle all along the line, announced the capture of the village by the Austrians. Even then, however, Massena would not give up the struggle, but, calling Legrand's division to the aid of Molitor's, made a final attempt to regain his ground. The effort, however, was beyond his strength, and although he did recapture a few houses, the fall of night saw the churchyard and the bloody street in the grasp of the assailants.

In truth, when darkness put an end to the first day's carnage there must have been a feeling of chill disappointment throughout the French army. Aspern was lost to them, Essling was surrounded, their centre was shaken and showed signs of giving way, while the prestige which had surrounded all previous efforts of their Emperor had met with a distinct check. The enemy's guns were in positions which enabled their fire to search every part of their array. Their homes far away in France lay leagues and leagues behind them, while immediately in their rear rolled a broad swollen river imperfectly and inadequately bridged. Defeat meant destruction, and defeat seemed imminent. Napoleon, greatest in adversity, however, did not lose hope, but rather redoubled his efforts to ensure success. The Archduke, fortunately for him, suspended operations as the night closed in, and lost what might have been an opportunity for totally defeating his enemies. The rising waters of

the Danube, bearing swiftly down fire-ships and heavy barges, gave almost certain promise of the collapse of the French bridges. His country's oppressor lay in front of him badly shaken, with inferior numbers and in a most dangerous position, and, even if the attempts against the bridges were unsuccessful, prompt succour, such as could hardly be expected to reach him over the narrow causeway, alone could save him. Yet the Archduke, whose enterprise fell short of his knowledge of war, neglected to bring all his forces to bear on the decisive point, let the precious moments slip, and contented himself with the qualified measure of success which was already his.

During the night, in spite of the difficulties of the passage, the Infantry of the Guard, the corps of Lannes, and the troops of Oudinot were got across the river, and early the next day, in spite of all his losses, Napoleon had again 70,000 men in line and Davout with 30,000 more was just beginning to lead his men across. On the other side the Archduke moved his reserve from the Bisamberg to the village of Breitenlee, about a mile to the north of the field of battle. Some authorities even place the reinforcements which Napoleon received during the night at a higher figure than I have done, and estimate his available force on the following morning as high as 85,000 men. The fatal error in not following up his advantage committed by the Archduke becomes, however, sufficiently apparent when it is considered that but for the long bridge having become impassable for a time during the night, and the disastrous delay thus caused, a far more powerful force of artillery must have been at the Emperor's disposal, and the corps of Davout might have begun its passage several hours earlier than it did. Even as it was, the troops which closed up from the rear during the night must have brought his effective force to, at any-rate, the strength at which I have placed it.

Towards three o'clock in the morning the combat was renewed again on both sides. Massena supported by the fresh troops of Cara St. Cyr's division again assailed Hiller's and Bellegarde's regiments, which were in occupation of the greater portion of the village of Aspern. The cemetery and church were once more captured by the French at the point of the bayonet, and the Austrians were driven out to the positions held by them on the previous evening. At the other end of the line, however, in the early twilight they made a vigorous effort against Essling, and drove Lannes's troops before them out of the village, except those in the great granary who still were enabled to hold out. Both parties, however, speedily advanced to retrieve these important losses. On the east St. Hilaire pressed forward to the assistance of Lannes, and again expelled the Austrians, who in spite of the most determined efforts were never again able to establish themselves in this village.

At Aspern meanwhile the combat swayed back and forward with uncertain result. St. Cyr's men were speedily expelled from what were little more than bloody ruins by the Grenadiers of Klebeck, but reinforced by some battalions of the Imperial Guard in turn forced their assailants once more from the much contended-for cemetery and adjacent houses. Hiller, however, did not long allow them to retain

what they had captured. At the head of a strong column of attack he once more gained the vantage ground which the walls of the cemetery supplied, and, determining that they should no longer supply a rallying point to the defence, ordered his pioneers to level them and the parsonage house to the ground. Thus the most interesting part of the battle-field no longer exists as it originally did, and the little church alone remains to mark the scene of one of the most obstinate contests the records of war supply. The Austrians were never again expelled from Aspern, but on the other hand never were able to free the entire village from the French who to the last clung obstinately to some of the houses and enclosures.

It will have been noticed that the Austrian line, stretching as it did in a vast semicircle from the south of Aspern to the south of Enzersdorf, could not but be weak in certain portions, while, from the nature of their position, the fire of their powerful artillery converged with terrible effect from all sides on the French. Both these circumstances prompted Napoleon to make an offensive effort, and the fresh troops at his disposal gave him an opportunity for striking one of those decisive blows which were the special attribute of his genius. Accordingly when it became clear that the Austrians could make no effectual progress on his flanks, he prepared to pierce their line with that powerful effort against their centre which was a specially favourite manœuvre with him. To Lannes, who had given such magnificent evidence of capacity on the previous day, the movement was confided.

Issuing from between the villages at the head of a vast mass of men composed of the three divisions of Oudinot's corps, each division formed in mass of regimental close columns with some brigades of cavalry in rear, he advanced, in spite of the heavy loss his dense formation entailed, straight on Breitenlee where the Austrian reserves and the Archduke's head-quarters were placed. Napoleon directed that Davout's corps, which was soon expected to make its appearance, should support the forward movement by an advance on Essling, while Massena was enjoined to continue to hold his ground on the left. The old Guard was held in reserve, and the young Guard was to move towards Essling to attack Rosenberg's exposed flank. A tremendous cannonade from 200 pieces of artillery distracted the enemy's attention all along the front and prepared the way for the columns of attack. At 7 o'clock all the preparations were complete.

Lannes's inroad was at first attended with complete success. The Austrian artillery line, which had played such havoc, was broken, and the corps of Hohenzollern, which tried to bar the French progress, was forced back, fighting obstinately nevertheless, on the reserves at Breitenlee. Some of the French squadrons are said actually to have reached that village. In the midst of what appeared the Austrian extremity the Archduke vindicated his claim, not only to generalship but devoted courage. Seizing the standard of the regiment of Zach, an action which is perpetuated in the spirited statute to his memory in Vienna, he headed his reserves and called them forward against the rush of their assailants. The Austrian infantry, thrown into squares, again demonstrated the hopeless task, even the best cavalry are set

who are launched against such a formation. The scene of the previous day was once more re-enacted, the Cuirassiers in vain endeavoured to find an opening in their enemy's array, were again and again driven off with heavy losses, and the progress of the terrible column was arrested. In truth Lannes, in penetrating so far, had exposed the sides of his columns to a murderous cannonade from the hostile batteries to the right and left, while the Austrian squares also plied their unweildy masses with a fire to which the nature of the formation prevented any adequate reply. Once the triumphant onset of the column was stopped hope began to die away in the hearts of the French. They had been fighting hard for two hours. It was perceived that they were not properly supported, and ominous whispers were exchanged that a disaster had occurred in rear. The swollen river and the devices of the Archduke had indeed done their work. The long bridge to Kaiser Ebersdorf had snapt in twain and the greater part of Davout's corps was cut off and left behind on the southern bank of the Danube. The sinister rumours were soon confirmed by a message from Napoleon telling the Marshal to fall back on Essling. If he could no longer reckon on Davout's support, an advance of the centre, unsupported by a similar movement from Essling, would become an eccentric manœuvre in place of being but a portion of a comprehensive plan of attack. So far from any offensive movement, Napoleon would now be fortunate if he could sustain himself where he was, and secure a safe retreat across the river for his army.

Lannes fell back slowly before the troops he had just driven, suffering immense loss, because he had not enough confidence in the raw levies he commanded to order them to deploy. St. Hilaire was mortally wounded during this retreat, and the Austrian artillery, reforming their terrible line of batteries, poured a most destructive fire into the masses before them. Encouraged by the change of fortune in the centre, the Austrian columns renewed their attacks on Aspern and Essling with fresh vigour and rising hope, and these two posts were taken, retaken, and disputed inch by inch with a gallantry on either side it is impossible too highly to praise. Essling was five times in the Austrians' grasp, but the great granary ever remained inaccessible to them, and five times had they again to relinquish their hold. Nor did their utmost efforts in the centre produce more decisive results. The Archduke seeing a crowning victory almost in his grasp brought up his last reserves and hurled them on the more or less disordered mass of French crowding the narrow peninsula which led to the entrance to the Lobau. At the same moment Rosenberg's troops succeeeded in gaining possession of the greater part of Essling, and the Austrians tightened the girdle of fire which now enveloped the French on all sides. The brave Lannes, superior to all the other Marshals on the field of battle, had fallen mortally wounded, and the situation of the French army became most critical. But Bessieres's cavalry, in spite of all it had suffered, once more sacrificed itself to stem the tide of victory.

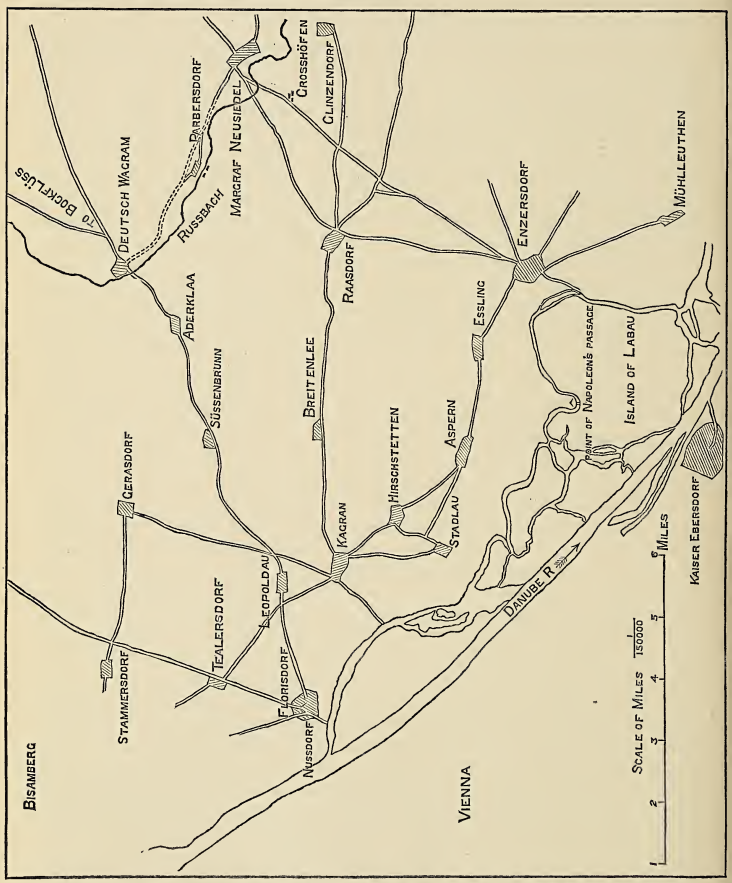
Massena and General Mouton were fortunately equal to the occasion. The former, whose services gained him the title of Prince of Essling, sometimes on foot, sometimes on horseback, seemed everywhere, and

whereever he was brought encouragement and opportune advice, while the latter, better perhaps remembered as the Count Lobau of Waterloo, placing himself at the head of the Fusiliers of the Guard charged the last Austrian reserves with the bayonet, and checked their onward rush. Napoleon himself retired to the Lobau and directed the position of certain batteries to cover the passage of the river, while he brought up some guns opposite Enzersdorf which enfiladed the Austrian attack on Essling and checked its progress materially.

The last charge of the French, though almost a despairing effort, was enough to check their foes, and the Archduke perceived too late that he had broken his strength and wasted precious moments in throwing his forces repeatedly against the strong bastions at the extremities of the French line, when he might have grasped victory by a resolute and sustained effort against their weak centre. It was not till one or two o'clock on the second day that he prepared to deliver the decisive blow that the French must have dreaded since the very beginning of the fight, and then his men were too disheartened and weary after thirty hours' battle to be able to persist in their efforts as they might have done earlier in the day. Shaken and weary the last rally of the French stalled them off, and little by little their ardour died away, and they contented themselves while daylight lingered with fiercely cannonading with most destructive effect the heavy masses of their foes, which were now crowded closely together round the bridge into the island. Both armies were in truth worn out and exhausted by the almost unexampled carnage. Many Generals and superior officers were dead or wounded on both sides—not less than 50,000 men had fallen in that narrow field—and the result, though unquestionably to be counted a victory for the Austrians, was by no means so decisive as it might have been. Their feelings of triumph were tempered by the terrible loss they had sustained, while on the French side the most gloomy forbodings filled every breast as the shattered battalions filed into the Lobau and lay down utterly wearied and worn out. Napoleon had only narrowly escaped sustaining a desperate calamity. His army which had previously carried all before it had been cut in two. Part of it was driven into an island short of ammunition and provisions, the bridge which formed its sole connection with the remaining portion was partly swept away, and in its front, only divided from it by a strip of water, not more than 20 or 30 yards across, lay a victorious army.

At the hurried council of war which was held close to the water's edge, his bravest Marshals, Massena, Oudinot, Bessieres, and Davout, pronounced the case hopeless, and advised a retreat to the right bank of the Danube. Napoleon's nerve, however, did not desert him. He pointed out that it was nearly impracticable to cross, since in boats alone could the passage be accomplished, the political effects of a retreat would be even more damaging to the French cause than the other no less serious results such a course would entail. He explained how it would be wisest to remain where they were and await the arrival of the reinforcements which were moving towards them from the Alps of Styria and the Tyrol, when, even if the enemy menaced their existing line of retreat, they would retire into Italy and soon regain their ascen-

dancy. "You Massena," he said, "will complete what you have so gloriously begun. You can alone restrain the Archduke, and prevent his advancing during the few days which are necessary towards establishing our communications." His fortitude, as well as the justice of his views, won his lieutenants round to his ideas, and they resolved to defend the Lobau to the last extremity.



In awarding praise and blame for the two days' fight, which had witnessed such a horrible massacre and no decisive result, one feels constrained to speak in limited terms, and with qualified approval.

The Austrians may well be proud that they dealt the first blow that at all vitally affected Napoleon's power. Yet, at the same time, one must admit that, had the bridge held out a little longer and the whole corps of Davout gained the northern shore, the battle must have ended in a very different way. The Archduke's attack was not pushed home on the first day as it might have been, nor was all the numerical preponderance he possessed thrown into the scale. Time was wasted in enveloping both the French wings, and the strongest portions of their position were assailed in place of the centre where there was no cover to cling to. His attack lacked concentration and his blow force. At the same time it should be remembered that had his brother, the Archduke John, co-operated, as he was ordered to do, with Kollowrath in his menace on the French rear at Lintz, a powerful diversion, which formed an essential portion of the Archduke's scheme, would have been effected, and the subsequent events which led to Wagram would probably never have taken place. But Napoleon cannot be absolved from the charge of rashness in undertaking an enterprise so brimful of peril as to thrust an army across a river relying only on the frail means of passage he possessed. Sudden floods, owing to the melting of the Alpine snows, are not uncommon, and are even to be expected in the Danube during the spring, and the misfortunes which occurred to the bridge should have been allowed for when the scheme of passage was drawn up. A General, in Napoleon's advantageous position especially, should have left nothing to chance, nor exposed a fraction of his force to an unequal contest, in which, even if it escaped destruction, it must incur immense loss, at a vast distance from its resources, and at a time when it would need all its strength for a subsequent battle. Genius would have been more fitly displayed in placing the army in a position from which it needed no genius to extricate it. As it was, if no one but Napoleon could have retrieved Aspern, scarcely anyone but Napoleon would have brought Aspern about, and his star shone brighter at Eckmühl, where he made amends for the errors of others than in the Lobau where he redeemed his own. That genius was necessary to restore matters and did do so, is alike his censure and his praise.

The place where Napoleon had determined to remain was by nature exactly intended for the site of an entrenched camp, the arm of the Danube which surrounds it on the north and east forming a natural wet ditch from 30 to 40 yards wide, and securing it against any sudden assault. Wide grassy lawns are interspersed plentifully with thickets and forest trees, and give the place the general appearance of a nobleman's park in England, a resemblance which is heightened by the herds of deer and plentiful game which one everywhere disturbs there now. The island is about $2\frac{1}{2}$ miles long by 2 miles broad, and provided ample space, therefore, for the encampment of even the vast numbers Napoleon ultimately assembled. The neighbourhood of Vienna ensured a supply of food and hospital comforts, while the Austrian Arsenal furnished an almost inexhaustible storehouse from which to draw guns, ammunition, and other war material. It is clear that the island was not so much overgrown 80 years ago as it is now, for many of the trees

at present stand rooted in the old parapets and embrasures which still remain, but all accounts show that there was an ample supply of wood nevertheless, and the other requisites of a good camping ground remain as they were.

Immediately after the council of war already referred to was over, the Emperor retired in a skiff across the river to Kaiser Ebersdorf, and I was told by a distinguished Austrian officer, with whom I had the pleasure of walking over the ground, that according to tradition he slept for thirty-six hours continuously when he laid down to rest, so exhausted was he by the strain the last two or three days had imposed upon him. Thus recruited he soon, however, set himself to work with renewed energies to render the place impregnable to the enemy and a convenient stepping stone for himself to the northern bank. Warned by his first failure he directed his whole genius towards making a certainty of his next attempt.

His first care was to restore the bridge, and throw up such earthworks round the one to the northern shore (which the Austrians did not try to wrest from his possession), and along the northern edge of the Lobau and adjacent islands, as would render any attempt at invasion on the Archduke's part hopeless. But he no longer thought of trusting to one frail bridge alone. He caused three, two of which were of the most solid description, to be constructed across the channel between the Lobau and the island in the main bed of the Danube, and two across the interval which separated that island from the southern shore. One of these latter was a bridge of boats; the other was built on piles. He likewise caused a sort of breakwater of piles to be driven into the bed of the river above these bridges whereever there was any danger of any fire-ships or other devices being floated down against them, and a regular system of guard-boats was established to patrol the water and ward off any attack the enemy might make down the river.

When at Vienna the old landlady with whom I lodged observing me to be deeply engrossed in military books and maps brought me a sketch of the Island of Lobau showing all the works and bridges, both of Napoleon and the Austrians, and offered to sell it to me. It was indeed full of interest, showing most minutely as it did the exact position of all the points of interest connected with the operations which I was studying. For the benefit of my readers I have reproduced it at the commencement of this article, and a study of it will better enable anyone to understand the situation than many pages of my efforts at description. The bed of the Danube is now very much altered from what it appears on the sketch. A high embankment along the Lobau has confined its waters, and they now flow in a single channel between that island and Kaiser Ebersdorf, as I have shown on the sketch.

It will be noticed that strong earthworks defended both extremities of these bridges. The Arsenal of Vienna contributed an immense number of guns for these *têtes du ponts*, and they soon became so formidable as to set attack at defiance. Such was the industry of all concerned that the bridges into the Lobau were completed in twenty days, but the energy of Napoleon did by no means rest contented when they were finished.

Along the whole length of the northern shore of the island strong batteries were thrown up. The adjacent islands were likewise similarly strengthened, as will be seen from the accompanying sketch, and soon the whole front opposite the Austrians bristled with heavy guns. The Arsenal of Vienna again was called on to supply them with cannon, and as many as 120 are said to have been in position on the northern edge of the island alone. Within a month all these works were completed and the Lobau may then be said to have become an impregnable entrenched camp, with ample and secure communications to the rear, teeming with armed men, and forming a magnificent base for further enterprises. But as the eye of Napoleon watched with satisfaction the fortress grow, he could not fail to note with anxiety the line of works stretching in a wide arc from Enzersdorf to Aspern, which the enemy were industriously building to deny his passage. The heavy losses of the recent battle had unmistakeably warned him of the sacrifices the stubborn courage of the Austrians would exact if he ventured to try and force his way directly to his front, nor was it in consonance with his genius to win by brute force what he might lightly snatch by stratagem. The immense earthworks, the magazines, the hospitals, the great road across the island, either actually remain now to view, or the positions where they stood are marked by obelisks. Their immense proportions, which filled the Austrians with dismay and now attract our admiration, were, however, never intended to do more than deceive the enemy and divert his attention from the direction from which the master-stroke was meant to fall. While the parapets were daily growing near the scene of the former crossing, and every effort seemed to be directed towards ensuring a passage there, swiftly and silently behind the leafy islands which would still hide such designs, no less eager hands were getting ready bridges destined for a very different point. The intention of Napoleon was, in fact, to only demonstrate in front of Aspern, but to really effect a passage opposite Mühlleuthen, and thus by one brilliant manœuvre render all the Austrians labours vain and nugatory. To thus surprise them it was necessary to throw his whole force across in a very short time, and therefore he determined to form so many bridges that the troops would move with the same freedom as though the river did not exist. The arm of the Danube below Enzersdorf is not more than 60 yards across, and when I saw it was so shallow as almost to seem fordable. But, in July 1809, the river was exceptionally high, and the current even in the side channels was rapid and strong. Napoleon prepared six bridges in all for this part, and took the most extraordinary pains to thoroughly rehearse all that was to be done, and to issue orders with such detailed accuracy that every man should know exactly where he was to go and what he had to do. An overpowering force of guns was also brought up ready to bear on Enzersdorf and prevent any attempt the Austrians might make from that side to interfere with the crossing. A vast fleet of ferry-boats and launches carrying artillery was also got together, and, in short, no stone was left unturned to ensure the success of the undertaking.

While Napoleon was thus giving a striking illustration of his

talents for organisation and mastery over details, he likewise showed such a grasp of strategical combinations as even his genius had never surpassed. The situation compelled him first to secure his communications with the Rhine, while at the same time he should endeavour to separate the Archduke Charles's force from that under his brother John which was at this time at Koermond, and the organisation rapidly gaining dangerous consistency known as the Hungarian insurrection. But since he would need every man he could possibly spare from these duties to throw into the scale on the decisive day, when he should decide to make his great effort from the Lobau, no larger force than was absolutely necessary could be detached from his immediate command.

Nice combination and an accurate calculation of time and space would enable forces apparently far distant to perform their share of the task in the outlying portions of the theatre of war and yet move in, without undue risk of leaving vital spots unguarded, in time to take their part at the place where the real issue would be decided. Davout was, therefore, directed to dislodge the Archduke Charles from Pressburg, which he had occupied, and so deny the passage of the Danube at this point to the Austrians. Thus he would guard the Emperor's immediate right.

Eugene, the Viceroy of Italy, was to manœuvre to gain the left flank of the Archduke John's army and thus place him between Davout and himself, a movement which would force him across the Danube at a point as far as possible from the main Austrian army at Essling. Marmont was called from Dalmatia, and MacDonald from Styria to support Eugene's movement, and eventually swell the muster-roll at the Lobau.

In the course of a short essay such as this, which does not aspire to give anything like a history of the campaign, it is not necessary to refer in detail to these various operations, admirably as they will be found to repay attention, and it will be sufficient, therefore, to say that they were carried out, if not always with perfect, at anyrate with sufficient, success on the part of those to whom they were entrusted. Archduke John, who throughout the war seems to have marred the best laid schemes of his brother by his wilfulness and want of intelligence (to attribute no worse motive), gave battle to Eugene, who had been meanwhile joined by MacDonald, at Raab at a singularly inopportune moment, and was signally defeated and driven across the Danube at Komorn.

Napoleon's right was now, therefore, covered by the line of the Raab, while the corps echeloned along the Danube rendered his left secure. There remained a certain danger that, while he threw his whole weight into the effort to cross at the Lobau, the Archduke Charles might slip away from his grasp, effect a passage at Pressburg, and assail his line of retreat. Strong earthworks were, therefore, thrown up, behind which a numerically weak force might conceal their numbers and obstruct the passage of a superior one round Engereau on the French side of the river opposite Pressburg, while a similar containing force deceived the Archduke John and occupied his attention before Komorn.

The corps of Davout and Eugene thus set free were advanced by forced marches to the Lobau, while Marmont, Bernadotte, Bessieres's Cavalry, and the Guard pressed forward to the same rendezvous.

On the 2nd of July the Emperor left Schönbrunn, where he had established his headquarters since the capture of Vienna, and rode to the Lobau, while on the afternoon of the same day the various reinforcements which he had set in motion began to make their appearance. Never had greater precision in such calculations been witnessed, and never had results better repaid accuracy and attention. From the afternoon of the 2nd till the evening of the 4th the ceaseless flow of armed men continued, every regiment found its particular position assigned to it, and its arrival provided for, and was soon instructed in the part it was to play in the well matured schemes which were soon to be unfolded to the world. That part of the stream which the Archduke Charles had imprudently left uncovered was simply to cease to exist as an obstacle, so much had the points of passage been multiplied, and the Emperor had so thoroughly laid his plans that he calculated that his whole vast force of nearly two hundred thousand men might be thrown across during the course of a short summer's night. Should his anticipations prove correct he would fight with nine chances out of ten in his favour, for while he held such a magnificent force closely and firmly in his grasp, the Austrian army lay loosely scattered and widely separated from the reinforcements which might reach them from Hungary. Largely reinforced since Aspern, the Archduke Charles had command of one hundred and forty thousand men, while the Archduke John was advancing towards him, though still ten leagues distant, at Pressburg, with thirty-six thousand more. But of these, the corps of the Prince of Reuss was watching the Danube opposite to and above Vienna, Kollowrath was at Hagenbrunn, the reserve of Grenadiers at Gerasdorf, Klenau at Essling and in the entrenchments opposite to the bridge south of Aspern. Nordman was at Enzersdorf and along the Danube lower down. Bellegarde, Hohenzollern, and Rosenberg were on the Wagram plateau. A glance at the map will enable anyone to realise how dangerously the line of resistance was therefore extended, while on the actual ground the flatness of the plain makes the distances appear even greater than they really are.

The Austrians, during the lull which followed Aspern, had been no less industrious than the French, and while the batteries were reared apace in the Lobau, earthworks sprung up rapidly too along the space between Aspern and Essling, while the northern side of the island was flanked by formidable works and entrenchments in front of and below Enzersdorf.

The better to conceal his designs and direct the enemy's attention to the original point of passage, Napoleon seized the mill island between Aspern and Essling on the 2nd of July, and commenced to connect it with the southern shore. Fully persuaded that a genuine effort was being made to cross here, the Austrians directed a furious cannonade on this spot, and the presence of Napoleon himself helped to lend importance to what seemed likely to develop into a serious engagement.

On the 3rd, the French seized the wood to the west of the point of passage before Aspern.

On the 4th, the corps of Marmont, Eugene, and Davout having advanced into the Lobau, all was felt to be in readiness, and that night was chosen for the great enterprise.

At 10 o'clock p.m. all was still silent on both banks. The French, however, were all on foot and ready, while their opponents were asleep. Rain began to fall in torrents, pitchy darkness cast an impenetrable veil around, and a heavy storm of wind drowned the slight noise the cautious preparations may have occasioned. Boats filled with light infantry were swiftly unfastened from the southern side of the Lobau, silently glided round into the narrow channel opposite Mühlleuthen, and landed the French soldiers on the left bank. These rapidly springing forward attacked the Austrian outposts, and the sound of their musketry gave the signal for which all were waiting. In a moment the whole length of the northern shore of the Lobau and of the opposite bank was lit by the fire of artillery, and an incessant rattle of musketry burst forth. Napoleon, as we have said, had mounted an immense number of guns, some of large calibre, the spoil of the Arsenal of Vienna, in his works, and from them he poured a tremendous fire on the Austrian lines in front of Aspern. At the same moment a false attack by the troops under Legrand, from the wood they had seized to the west of Aspern, kept the enemy's attention riveted on the bridge before him, and held Klenau's corps chained to their entrenchments. The batteries opposite Enzersdorf likewise pounded it with an incessant cannonade, and soon set fire to its shattered houses. In the midst of such a commotion, and under the pelting of a pitiless storm, the real designs of the Emperor were carried out, and the bridges, lying ready near at hand, swiftly swung across the narrow arm that separated his troops from their enemies. So well had all been arranged that in spite of the weather no hitch occurred. In a quarter-of-an-hour one bridge was in position, and the corps of Oudinot began to file across, three others, each opposite the place where the troops allotted to it were waiting in readiness to move, were also soon ready to be used, and by 3 o'clock in the morning as many as six were available. The obstacle had been annihilated, and, so far from being hampered by it, no army could anywhere have moved under more favourable circumstances, for in no place would six roads be found available leading directly from such an entrenched camp as they had occupied. The entrenchments opposite Enzersdorf were seized and turned against their former occupants, who were thus prevented by a heavy flanking fire from issuing from that village to interfere with the progress of the passage. Napoleon himself displayed the most wonderful energy and activity throughout the night, and moved from bridge to bridge to personally superintend the movement of every corps. The heavy fire unceasingly kept up at his former point of passage and Legrand's demonstration effectually deceived his opponents, and they did not for a moment doubt that a great effort to cross at the old place was being made.

When one visits the spot and sees the comparative narrowness of the channel, and the facilities the banks offer for a passage at any point along the Lobau to the east of the villages, one cannot understand how the Archduke, a man who had studied war closely, and an able General

measured by the ordinary standard, left such an opening for Napoleon, and allowed himself to be so completely outmanœuvred. I have had considerable discussion on the ground itself with officers of the Austrian army, and they themselves were the first to admit that they could not understand how such a blunder was made. It is easy to be wise after the event, and there may have been circumstances to be considered that are now left out of sight, but, however it was, the fact remains that Napoleon was let do unopposed the very thing which his character and antecedents might have led his opponents to expect he would attempt.

When day dawned the following morning the Austrians found nothing in their front at Aspern, but a dense mass of troops on the left bank of the Danube south of Enzersdorf. By 6 o'clock the level plain between that village and Mühlleuthen was simply covered by the vast array who were drawn up in almost contiguous columns opposite the bridges they had crossed over. These were now securely fixed, and the French army would no longer fight under the disadvantages they had experienced at Aspern, but possessed a secure line of retreat and a vast rallying place in their rear to receive them in the event of a disaster. Alison places their force at 150,000 infantry, 30,000 cavalry, and 600 guns, and these numbers may be accepted as probably about correct. The tempest cleared away, the sun shone out with the splendour of July, and the spirits of the French soldiers rose to the highest enthusiasm as they saw what the genius of the Emperor had accomplished. Massena easily drove the Austrians out of Enzersdorf, and then, as the whole of the immense army wheeled forward to the left round that village, the meaning of all that had been accomplished during the night was fully realised. The Austrian works and entrenchments erected with so much labour and patience to bar the French advance during the last six weeks were completely turned, and rendered untenable, while the difficult task of crossing a great river in the presence of a powerful foe had been accomplished almost without a struggle and with but little loss. The opportunity for engaging the French at a disadvantage had been let slip, and there was nothing the Austrians could now do but fall back on the strong positions behind them which extended in a vast semi-circle from Stadlau, their extreme right, to the centre at Wagram, and the left at Margraf Neusiedel. From the banks of the Danube the level plain of the Marchfeld stretches away in monotony, unbroken even by trees except where the little white villages spring abruptly from its surface to a low plateau extending from Wagram to Margraf Neusiedel, which is thrust out into the plain beneath like a sort of bastion from the heights further to the north. At its highest part, that opposite Margraf Neusiedel, it has a command over the ground in front of about thirty feet, but at Wagram its elevation is diminished to not more than half that amount. The top of the plateau is again perfectly level and well adapted for the movement of troops. Parallel to its front at a distance of a few hundred yards from it, flows a stream called the Russbach, which forms an obstacle impassable to artillery and cavalry, and if at all flooded, as it must have been on the 5th of July, 1809, a serious hindrance to the advance of infantry. Low pollarded willows mark its course, and it is spanned by bridges only at the villages

of Wagram, Baumersdorf (now called Pabersdorf), and Neusiedel. Its width varies from twenty to thirty feet, and, therefore, unless its length had been carefully reconnoitred, it would not appear to form an obstacle to the passage of mounted men. When reading accounts of the battle, which state that cavalry, who can usually ford a greater depth than infantry, could only pass it at the bridges, it was not quite understood why infantry could do so anywhere. The difficulty was easily explained, however, when I came to see the ground, for to prevent the swollen waters from flooding the level plain on either side in wet weather the banks had been steeply embanked. In some places the stream even flowed in several artificial channels thus protected, which foot soldiers might climb through easily enough, but which would prove impassable to guns and horses.

On the left of the Austrian position at the eastern angle of this plateau stands a strong stone two-storied building, with a high and massive round tower at one end, sometimes spoken of as a wind-mill, but which was once an old watch tower erected by some Warden of the Marches to check the inroads of hostile tribes ages ago.

About a hundred yards in front of this tower and on the plain immediately below lies Margraf Neusiedel, a small village of two-storied houses with slated roofs. Half way between it and Wagram we come upon Pabersdorf, known in all accounts of the battle as Baumersdorf, a little straggling village stretching along the various channels of the Russbach, and two or three hundred yards in front of the crest of the plateau. The Austrian left wing was, therefore, exceptionally strongly placed, but no natural features protected their line elsewhere, and the level and unbroken surface of the plain allowed an inroad to be made upon them at any point. From what I have said it will be evident that their front was unduly extended, and that to occupy so wide a sweep of country with the troops at their disposal must render the line of resistance weak throughout.

As the day went on the French advanced, spreading out in an arc concentric to the Austrian front, and their opponents fell slowly back before them, or advanced from their positions in rear on the Bisamberg to take up the ground they were now forced to fight upon. At 6 o'clock in the evening the French left was at Aspern, the centre at Raasdorf, and the right round Glinzendorf.

Napoleon having learnt that the Archduke John was still separated from his brother, and seeing that the extension of the Austrian line, placed their left beyond the reach of timely support from their right, determined to make a bold effort, notwithstanding the lateness of the hour, against their centre at Wagram. A sharp, swift blow delivered now might sever the Austrian army in two, and paralyse it from the outset.

The Austrians had at this time about sixty thousand men between Wagram and Neusiedel, under Hohenzollern, Bellegarde, and Rosenberg, while Napoleon had grouped in his centre a force greatly superior and numbering something like a hundred thousand men. In spite of the strength of the Austrian position his superiority, therefore, might enable him to gain the advantage, and he at once opened a heavy

cannonade all along the front of the plateau. Under cover of this fire Oudinot's corps was brought up and directed to attack Baumersdorf, while Eugene advanced on the east of Wagram, and Bernadotte with the Saxons supported him between Aderklaa and the other side of that village. Davout's corps on the right threatened the Austrian left at Neusiedel. The slightly elevated ground on which the Austrians were placed forms almost an ideal artillery position, and gave the fullest effect to the fire they poured on the French batteries and columns in their front. The Russbach, as I have explained, forms, and doubtless then formed, a far more serious obstacle than might have been expected, and detained the attack under fire at precisely the range most calulated to give effect to the artillery fire of that period. Oudinot found it impossible to make any way in the face of the obstinate resistance he encountered, and led his troops several times to the attack of Baumersdorf without success.

Near Wagram, what are often called "the heights"[1] in descriptions of this battle, have really diminished to a gentle rise, and the passage of the Russbach is by no means so difficult as lower down. Eugene, therefore, found his task less arduous, did succeed in forcing his way through the Austrian line, and, in spite of being unable to get his guns across the stream to support his infantry, he did drive the enemy's first line in some confusion from the crest of their position. But his advance occurring at the moment when Oudinot, who should have covered his right flank, was driven back, was exposed dangerously to a counter-stroke from the enemy, and the Archduke was not slow to seize the happy moment. Hohenzollern's cavalry was launched at Eugene's right, while Bellegarde's corps, which formed the second line, held them firmly back in front. The French at first checked, soon began to waver, and finally retreated with a haste that eventually became confusion down the slope they had so proudly mounted just before, and scrambled across the Russbach in a hurried rout. But the disaster did not end here. Bernadotte's troops, who had succeeded in partially occupying Wagram, and were advancing to the support of their comrades, mistook the fugitives for enemies, fired upon them, and then, borne down by the rush of friend and foe which was surging on them from the front, broke and fled panic-stricken to the rear. Meanwhile, the shades of night rapidly closing in, if they added to the French discomfiture, contributed not a little to their salvation. The growing darkness prevented the Archduke from following up his success, hid its true extent from him, and the Austrians were recalled to their previous positions, while the French lay down to rest on the fields round Raasdorf.

Both sides passed the night in preparation for the decisive battle which must be fought on the morrow, and in Vienna, only a few miles distant, the events of the next few hours must have been awaited with feverish anxiety. From the tower of the Stephan's Kirche in that city

[1] Similarly we read of "the heights" of St. Privat and Tronville to describe comparatively slight eminences on the fields of Gravelotte and Vionville. It seems as though a tendency towards inflation characterises the language of war. Squadrons are frequently "hurled," battalions are "overset," armies are "rolled up," bullets "hail," and lead in future is to be even "pumped." The enemy often fights for several hours with "desperate courage," yet succeeds in injuring but a very few.—*E.S.M.*

one can see that it would be possible to trace the progress of a battle on the plain of the Marchfeld, and we are told that the steeples of the Capital on the following day were crowded with anxious spectators of the combat which was to decide the destinies of their country. Never perhaps was a battle on such a scale, and on which such issues hung, fought in such an arena before such an audience. Something like three hundred and fifty thousand combatants, with from eight to twelve hundred guns, according to some accounts, were preparing to join issue in an amphitheatre almost, it might be thought, intended for such a contest of giants, and never has a fight exhibited so much incident, such swift interchange from defensive to offensive, or such activity as that displayed on both sides. The balance of fortune swung now in favour of one, now of another, while even in the moment of triumph the victors gave signal proof of how near they were to defeat.

Napoleon's force was drawn up on two sides of the triangle of Aspern, Wagram, and Neusiedel, and his greatest strength was collected in the northern angle. Finding the Austrian line so extended, and having had a proof of the strength of their position along the Russbach, he now determined to utilise the concentration of his forces in an attempt to break their centre, and at the same time cut off their left from any hope of reinforcement from the Archduke John, who might at any moment be expected to appear from Pressburg. In order, therefore, to prepare the great central blow, Massena was moved towards Aderklaa from Aspern during the night, and the division of Boudet was left alone to defend the neighbourhood of that village. The French strength was thus drawn completely to their centre and right, where Davout was placed, and the corps of Oudinot, Eugene, Bernadotte, and Marmont were assembled between him and the neighbourhood of Aderklaa. Round Raasdorf lay the Guard and reserve cavalry under Bessieres.

While Napoleon thus prepared to attack his adversary, the Archduke, emboldened by the brilliant success of the previous night, had decided to anticipate the impending blow, and fall upon the French instead of waiting for them. His brother should, it was calculated, have been near enough to co-operate by an attack on the French right, and with his help the Austrians would be about evenly matched as regards numbers with their opponents. Assisted by the reinforcements from Pressburg the left wing might crush the French right, while a powerful blow at their left might sever their communications with the Lobau. In the early dawn, therefore, the Austrians commenced a general forward movement.

Bellegarde advanced against Aderklaa, where the successes of the previous night had been gained, and Bernadotte's men fell back slowly before him and evacuated the village. Further to the south Klenau and Kollowrath, reinforcing Hiller and Lichtenstein, were pushed towards Breitenlee and Aspern and were soon threatening the French left flank in a very dangerous manner at a point where the withdrawal of Massena to the centre had left it comparatively unguarded.

On the extreme left of the vast arc which their line of battle formed, Rosenberg meanwhile advanced to the attack of Glinzendorf. The

noise of their cannon, momentarily growing louder as their attack made progress, rudely startled Napoleon from the carefully laid scheme he had spent the night in arranging. It had been intended by the Archduke that his right, where the preponderance of numbers was immensely in his favour, should commence the engagement, and that his left should not make their effort until later in the day, when it seemed a certainty that his brother would be upon the spot to co-operate with it. The immense distance over which his forces were scattered may possibly have been the cause of this arrangement miscarrying, for it is impossible to realise how difficult communication must have been over the wide level stretch between Wagram and the Danube until one has walked over the actual ground. Even now roads, as we know them in England, can hardly be said to exist, and after rain one sinks ankle deep into the soft ploughed land, or muddy cart tracks at every step. From whatever cause, however, it is certain that the Austrian attack on Glinzendorf was premature, and being unsupported died away in the manner in which such isolated enterprises always must. But at first they were successful enough to cause serious alarm to the Emperor. The Guard which was with him in front of Raasdorf, and which was to have been used to crown the success of his great central movement, was hurried by him to the threatened point, and the reserve cavalry and a powerful artillery were likewise brought up to stem the torrent.

But the danger was half averted ere they arrived. The Archduke, aware by this time that his brother was not near enough to co-operate with him, sent orders to put an end to the hasty movement of his lieutenant, and the Austrians were arrested just in front of Glinzendorf by an order to fall behind the Russbach to their original positions. The cup of triumph was thus rudely dashed from their lips by the hands of their own leader, and disappointed, and a good deal mauled by the French Cuirassiers and artillery during their retreat, they reluctantly retraced their steps. Scarcely had this menace died away on his right, however, when Napoleon's attention was called about 10 o'clock to what appeared the even more critical situation on his left and centre.

Massena, as has been said, had been ordered to move from left to right during the night so that he might take part in Napoleon's projected attack on the Austrian centre. Unaware of the heavy blow that was impending from the advance of the Austrian right, he zealously overstepped his exact instructions, pushed boldly on, and vigorously attacked Aderklaa. His leading division under St. Cyr carried the village with great gallantry, but, without waiting for support, it rushed rashly on and soon was brought to a stand-still by a heavy fire from Wagram and the high ground beyond the Russbach. The Austrian cavalry seized a moment of hesitation to charge the French in flank, and the division quickly became demoralised and fell back in confusion on Aderklaa. Then the Austrians, led by the Archduke himself, vigorously followed up their success, and not only drove their former assailants out of the village, but pursued them for some distance on the other side.

Napoleon, who had noticed from a distance what had occurred, perceiving that the opportunity for his contemplated attack was not yet ripe, quickly determined to alter his plan of action, and to try and turn

the Austrian left ere he again moved against them in the centre. He hurried Drouot forward with four Horse Artillery Batteries of the Guard to check the forward rush of the enemy, while the remaining six Field Batteries followed as fast as they could, and soon their sixty guns, together with forty more, were formed in a great battery across the breach in the French line, and kept the foe at bay by the heavy fire they brought to bear. The artillery paid dearly in men and horses for their brilliant "charge," as it has been called by Pelet, and Drouot, though he declined to leave the field, was himself wounded, but their splendid self-sacrifice was well repaid by the enemy's discomfiture, and the breathing time they thus afforded to their shaken infantry. The Guards who had only just completed their trying march across country towards Glinzendorf were countermarched across the whole length of the French right wing to the neighbourhood of Aderklaa. Massena was sent back to reinforce Boudet, and directed to try and check the bold dash at the French communications which the Austrian right wing was making. Finally, Davout was ordered to commence a wide turning movement against Neusiedel and the south-eastern angle of the Wagram plateau. The Emperor himself hurried to that spot in front of Aderklaa when the peril was for the moment most imminent, and together with Massena, who, although bruised and injured, displayed unrivalled courage and presence of mind, exerted himself with the greatest energy by both words and example to check the disorder into which the left of his centre had been thrown.

The situation of affairs on the extreme left of the French was meanwhile fraught with the greatest peril. The Austrians under Klenau and Kollowrath pressing on in superior numbers had easily driven Boudet's division from their positions, had captured Aspern and the entrenchments they themselves had evacuated on the previous day, and were even asserting their strength in Essling and beyond it towards Enzersdorf. Massena having rallied and reformed his corps pushed his way from Aderklaa to where he had been the day before to try and retrieve matters, but at first found himself unable to make any impression against the headlong rush of the confident enemy. Napoleon rode anxiously up and down the space in front of Aderklaa where at the moment his line was dangerously weak, Massena's troops having left ere the infantry of the Guard had time to accomplish their long flank march from Glinzendorf, while the great mass which MacDonald was to lead forward had not yet been assembled. The Austrian batteries pouring a heavy fire on this salient angle of the French position were engaged in a tremendous duel with Drouot's guns, and it needed the presence of the Emperor himself and the fine example of courage which he gave, to reassure the weak French force at this most important point. In the midst of the infernal din, surrounded by wavering troops, and a staff who muttered under their breath impatient at a delay they did not understand, his features retained their usual impassive appearance, but his watchful eye took in every feature of the situation, and his cool judgment waited till the moment was ripe for the stroke he had in contemplation, and was silently preparing to carry out.

As one looks from here across the level plain towards Neusiedel the

eye is arrested by a massive round tower which juts out abruptly from the monotony of the remaining scene. It was towards this tower that Napoleon's eyes now cast many a furtive glance. If Davout could carry out the movement which had been entrusted to him with success, the fate of the battle now hovering in the balance would be decided. The Austrian left would be turned and doubled back on their weak centre, which would be assailed with the accumulated force he held in hand for this purpose, and if driven in the whole of the left wing retreating before Davout would be taken in reverse. The success of the Austrian right would then be but an isolated advantage which could lead to nothing decisive. Indeed, if it continued to hold its advanced position while the centre and left were compelled to give way, it must be cut off and destroyed eventually in detail. As it advanced beyond Essling it must also become exposed to the fire of the powerful artillery which protected the French bridges, and would expose its flank and rear to Massena's advance. On the other hand, if Davout were unable to make progress on the right, as the day wore on he would become exposed to the danger of being assailed in rear by the Archduke John, whose tardy advance could not much longer be delayed, and the French, hemmed in between the two forces threatening their rear on either side, would have to fight for their very existence as an army. All hung, therefore, on Davout, and the troops in the fire-swept angle near Aderklaa must wait patiently for the development of his attack.

And well did the hero of Auerstadt fulfil his trust. Sending two of his divisions across the Russbach with ten thousand cavalry under Grouchy and Montbrun to turn the Austrian extreme left, he himself with the remainder of his force and supported by Oudinot, who held Hohenzollern in check in front of Baumersdorf, assailed the front at Neusiedel. After a desperate struggle, during which the place was several times captured and recaptured by either side, the Austrians were forced from its houses, and, although the tower on the edge of the plateau held out obstinately when the buildings below it had been evacuated, the French drove their opponents eventually from the edge of the plateau. The attack on the Austrian extreme left was meanwhile carried to an equally successful issue, and Rosenberg's corps was obliged to fall back and take up a position on the top of the plateau with its left thrown back at right angles to the Russbach and the remainder of the Austrian line. Oudinot rushing on when he saw Davout appear on the plateau penetrated into Baumersdorf after some severe fighting, and the Austrian commanders, seeing how hopelessly their troops were now placed, commenced to retreat slowly across the level plain behind them towards Bockflüss.

While these events had been taking place on the right, Napoleon with the centre was, as we have said, eagerly watching the signs of how the battle was going with Davout. During those anxious moments, between 12 and 1 o'clock, the situation of the two armies was indeed a most singular one. The Austrian line extended from Essling to Aderklaa, and on along the Russbach to Baumersdorf and Margraf Neusiedel, where it was being bent back by Davout at right angles to the

course of the stream. They were carrying all before them on their right, yet losing ground at the same moment on their left. The French, resting their left on the Danube near Enzersdorf, stood on a front generally parallel to that of their opponents, and were winning on the right while their left seemed hopelessly overpowered. The roar of the Austrian guns behind them round Aspern filled Napoleon's staff with dismay, and excited messengers galloped up from his rear with the most dispiriting intelligence. He paid no attention to the alarmist murmurs rising round him, but only broke his studied silence to ask now and then whether the smoke of Davout's guns appeared to progress east or west of the tower of Neusiedel. At length it palpably rolled beyond and to the west. The Emperor turned in his saddle and in a moment began delivering orders with the greatest animation. The battle was won. Massena was directed to make a strong effort against the Austrian right, which up to now had been let carry all before it.

The great line of artillery, which hitherto had thundered to cover the breach and ward off the enemy's attack, now redoubled its efforts in order to prepare the way for the advance of the infantry. The crisis so patiently and confidently waited for had at length arrived. The time was ripe for the carefully prepared blow against the Austrian centre, and the vast column which had been formed from Eugene's corps was placed under command of MacDonald and launched into the weakest part of the enemy's line. The Emperor himself directed its advance between Süssenbrunn and Aderklaa, and led the Guard both infantry and cavalry in rear to drive the victory home. The formation of this great column of attack was most peculiar, and exemplified the change, noticeable in a lesser degree in the formations in which their troops fought at Aspern, which the deterioration of the French raw material necessitated. The prolonged wars were leaving their mark on the country, it was no longer possible to pick and choose recruits, and sickness and bloodshed had thinned the ranks of the veterans. The army of Wagram was not the army of Austerlitz and Jena, and the Emperor feared to manœuvre soldiers he had lost confidence in with the freedom with which he formerly handled his regiments. Huge unwieldly masses, incapable of resistance if resolutely assailed, made their appearance on the battle-field, and the disaster of Waterloo was foreshadowed in the victory of Wagram. Eight battalions deployed in line, one in rear of the other, headed MacDonald's column, while six battalions in column on one side, and seven similarly arrayed on the other, formed its sides. This enormous mass of twenty-one battalions, comparatively incapable of any fire effect, was to break the Austrian line by sheer weight and the moral effect of numbers. A tremendous cannonade was used to demoralise the enemy, and replaced the musketry fire which the skirmishers preceding the light columns of earlier years used to rely on. As this overpowering mass moved forward the Austrians, shaken by the previous cannonade, gave way, but the close nature of the French formation made them pay dearly for their success, and men fell so fast that Macdonald was at length brought to a stand-still at Süssenbrunn. The Austrian line, which although driven back was by no means disintegrated, plied him on all sides with a hot fire which did tremendous

execution against such a target, and the fate of the battle was for a time again doubtful. But Davout's unmistakeable success on the plateau of Wagram paralysed the Austrian defence, and cut off as he was from his brother, the Archduke felt he could no longer hope for a victory. He therefore directed all his efforts to securing the retreat of his right, which was pushed dangerously far forward, and sent orders to withdraw it, while he endeavoured to check the French attack against his centre. All his available forces were directed, therefore, upon MacDonald, and the great column which was somewhat isolated suffered terribly at his hands. But the divisions of Durutte, Serras, Pachtod, and Wrede's Bavarians, with the young Guard under Reille behind them, were moved up to its support, while Nansouty's Cuirassiers and Walther's Dragoons on the left and right charged the Austrian masses and, though at a great sacrifice, relieved the column from the pressure it was struggling against. It was once more enabled to move forward, and the fate of the day was decided.

But though the French might justly claim the victory, they could show but few trophies of their success. The Austrians fell back everywhere unbroken, and leaving none of the traces that usually mark a retreat behind them. A few dismounted guns and 2000 prisoners, mostly wounded, were all that fell into the hands of their opponents, while they could also boast of 5000 prisoners captured by their right, and their powerful artillery still intact admirably covered their retreat. The French cavalry, either because their best leaders were *hors de combat* (Bessieres was wounded and Lasalle dead), or because they were exhausted by their previous efforts, did not respond to the call of the Emperor, hardly charged at all, and incurred his bitterest reproaches in consequence. In truth, the result was so indecisive that the Austrians could claim almost as much credit from the battle as the French, and the pedestal of the Archduke Charles's statue in Vienna to-day blazons Wagram and Aspern amongst the names of his other triumphs. The losses on both sides were about equal, and amounted in each case to about 25,000 men killed and wounded. I was much struck, both on this battle-field and that of Aspern, by the absence of any memorials or tombstones to mark the spot where so many must have been buried. The truth is, I believe, that the bones of those who fell have all been dug up and collected together, and certainly in the crypt of the church at Neusiedel a ghastly pile of skulls and bones is shown which is said to represent the remains of 40,000 men.

An incident which occurred in the evening when the battle was over serves to show how much the nerves, even of the victors, were shaken by all they had gone through, and suggests reflections as to what might have happened had the Archduke John behaved with the energy Blucher and the Crown Prince displayed under similar circumstances at Waterloo and Sadowa.

Between 3 and 4 o'clock, when his brother's army was already defeated, and when the chance of effective co-operation was gone, the head of his columns appeared in Davout's rear at Obersiebenbrunn, and some of his scouts are said to have penetrated as far as Wagram. The sudden apparition of even the advanced party of his force was

enough to throw the victors into something like a panic. The camp followers, baggage wagons, and other impedimenta that crowd the rear of an army, were in a few moments in an indescribable state of confusion, and a stream of fugitives for the bridges across the Danube soon covered the plain. Napoleon himself had to leave his tent and exert his authority to restore confidence. Such a mighty effect had the sight of a single squadron of the Archduke John's cavalry been able to produce, and that too when the force to which it belonged, so far from intending to attack the French rear, was itself about to retreat the way it had come! So sensitive is even a victorious force as to the safety of its communications, and so vast is the effect of a judicially aimed blow in war. This small incident well illustrates how much might have been accomplished had the pressure on the French right and rear been brought to bear earlier in the day, when their left and centre were likewise dangerously assailed, and shows also that the quality of the French troops was no longer what it was. The numbers were still there but the *moral* was perceptibly deteriorating, and the indecisive glories of Wagram were not enough to restore the prestige and confidence which had received so severe a shake at Aspern.

Those who have endeavoured to account for the few trophies which graced the conqueror's triumph in this great battle lay stress on the fact that Bessieres was wounded and Lasalle dead, and try to show that but for these fatalities the Austrian left would have been entirely cut off and destroyed. They likewise, in some cases, claim that Napoleon was visibly not himself throughout the second day, and point to the fact that he retired early in the evening to his tent as a proof of this. The real fact, however, seems to be that the Austrians were by no means demoralised, that their retreat was covered by a splendid force of artillery, and that they had given their opponents so much trouble that they themselves were wearied out, and had had enough of fighting. The success of the French attack in the centre was assured as early as two o'clock, and had it been that their troops were equal to further effort, it seems difficult to believe that the victory would not have been crowned in the decisive fashion Napoleon had taught his lieutenants to adopt on such occasions. The Emperor blamed his cavalry because his measure of success was not fuller, but it appears as though it would have been juster had he censured the stubborn courage of his foes. If the Austrians could claim no triumph at least they had the satisfaction of feeling that they had taught the world that it was possible to oppose Napoleon even with inferior forces without being utterly worsted, and they can boast to-day that they were the first to point the way to Leipzig and Waterloo. Had Napoleon never won but as he did at Wagram, Europe would never have trembled at his name.

SOME NOTES

ON

NAVAL GUN-DRILL AND PRACTICE.

BY

CAPTAIN P. E. GRAY, R.A.

THROUGH the courtesy of the officers of the *Cambridge*, Naval Gunnery Ship, I was allowed to witness drill and practice, on two days, off Plymouth, and by their kindness I was enabled to gather a certain amount of information as to the principles and science of gunnery as taught in the Navy.

The following notes are compiled in the hope that, as similar opportunities do not often occur, they may prove of some value to officers of the Regiment who are interested in Coast Defence.

Accustomed in the Garrison Artillery to crowded sea-ranges, and to constant and harrassing interruptions from fishing boats and shipping, the Royal Navy carry on their practice under, what are to us ideal service conditions. They steam to sea, drop their target and commence. If the range is foul they alter course until it is clear. An open horizon is all they ask for.

Their drill is expeditious to a very high degree, but it is loose, and to our ideas of rigid drill, rather too much in go-as-you-please style.

The practice which I saw carried on was quick and good, but the ranges were short, all under 2000 yards; the sea was calm, and the circumstances favourable to good shooting. The firing was from 6″ and 5″ B.L. and from Nordenfeldt machine guns on H.M.S. *Curlew*, and from 10″ R.M.L., 3-pr. Q.F., and machine guns on H.M.S. *Hecate* turret-ship. Half charges were used, which is, I believe, the rule for most naval practice.

The ranges were estimated and verified by trial shots from the Q.F. and machine guns.

The Navy invariably judge their own ranges, and verify by a gun of light calibre. Judging distance is a point in the instruction of their seamen-gunners on which they lay particular stress.

On the *Hecate* there is a 7-pr. R.M.L. gun mounted on the fore turret to act as a range-finder for the 10″ guns.

Range-finding instruments have been tried, but are found too slow, and inaccurate over 2000 yards, owing to the short base they are obliged to use. In the Austrian and American, but in no other foreign navies, range-finders are used.

The commands for drill appear to be simple and adequate: "Cast loose and load;" "At the target;" "Commence." The drill-book lays down that the objective shall always be indicated. The gun-captain then gives: "Right, quick" (or slow), "Left, quick" (or slow), "Stop!" "Raise," "Lower," "Well!"

In the orders for training right and left refer to the *muzzle*, in those for elevating, raise and lower refer to the *breech*; exactly the opposite to our custom.

The gun-captain fires the gun himself, from the rear, when his sights are on, and with the rising motion of the ship.

So far from objecting to a heavy rolling motion, the seamen-gunners prefer it. It saves elevating. They lay the gun horizontal, raise their sights, and wait for the upward roll.

Guns are invariably fired with the rising motion, except when the ship is rolling very heavily indeed, when the downward roll is taken advantage of to check the recoil.

The Naval carriages and slides, designed to save room as much as possible, always look very light and simple after many of our land mountings designed for emplacements where space is of no object.

The captain of gun stands, when firing the 5″ and 6″ B.L., only some four feet from the breech, and the gun recoils just short of him. The steep Vavasseur slides and powerful buffers check them very effectually. With the new 6″ Q.F. guns the recoil is only nine inches.

The underlying principle of Naval gun-drill is: "Carry on;" "Get the gun off;" "Hit the enemy, and lose no time in doing it again;" but its application appears rather opposed to our ideas of strict fire discipline and rigid drill. I heard the Instructor-in-Gunnery a Petty Officer, say: "Lend a hand, my lads, if you see a man struggling with a heavy job, why don't you lend a hand and help him?"

Their keenness, conspicuous throughout, if possible, increased when he said this. They literally "chucked" the 6″ shell into the bore, a couple of men behind the loading numbers giving "more power to their elbows," while the powderman, with his powder (the Navy never say cartridge) in a case like a long leather bucket, was handed along by all the higher numbers until he reached the gun, and held his case so that the charge could be rammed home, the rammer passing through the case and into the chamber. The instant it was home two pairs of hands swung round the breech-block and forced over the lever, if it worked stiffly they clapped on a tackle and heaved it round. The gun-captain had his gun trained and partially laid by the time the loading was completed.

Everything and everybody was made to move, and to move quickly. "It's no use playing with things, my lads," said the Gunnery Instructor. As an example of rapidity, I may mention that on board the *Curlew*, a course of seamen-gunners, qualifying for captains of guns, and competing among themselves for time and accuracy, fired 8 rounds each, in all 74 rounds, from the 6″ B.L. on Vavasseur mounting, using half charges. The total time taken to finish the practice was 56 minutes. Of course their range was always clear and everything worked satisfactorily. On looking over the other side sights in several

rounds, I thought the laying all too high until I found that their rule is to lay at the *top* of the flag, because the barrel itself is often invisible in a sea-way.

The front faces of tangent-scale deflection leaves being marked in knots instead of minutes, which were placed on the back of the leaf and used for wind correction only, appeared a useful arrangement, and if introduced for Coast Defence would assist a Fire Commander or Group Officer in correcting for speed, and simplify his calculations. In firing at a ship steaming in the opposite direction to their own, the sum of the combined speeds is put on the leaf, if at a ship steaming in the same direction, the difference.

The Navy have three methods of fighting their guns :—

1. *By Independent Fire*, when each No. 1 loads, aims, and fires his own gun; using his discretion and firing, when his sights are on, a given number of rounds or as ordered.
2. *Director Firing* for broadsides, when the objective is not visible, from smoke or other causes, from the gun-deck.
   The guns are trained to a stop on the racers, which is so placed that they converge at a point on the bow, beam or quarter, 800 yards from the ship, which elevation is given each gun by graduated scale.
   The officer at the director on the bridge, or in the conning tower, brings the guns into bearing by the helm, and fires his broadside electrically when the cross wires in his director telescope are on the objective.
3. *Broadside Firing* by directing gun, either electrically or using friction tubes.
   In this method the guns are trained on the objective, which is indicated, approximately, as bearing on the bow, beam, or quarter, and which can be seen over the sights. The directing gun estimates its range and passes it on to the others, who keep trained on the objective. As the No. 1 of directing gun sees his sights coming on he presses the firing key which fires the broadside, the other guns having connected up their electric tubes, which are in circuit with his firing battery.
   If friction tubes are used, the Officer of Quarters gives the word to fire when the No. 1 of directing gun lowers his hand, which he raises as a signal that his sights are coming on.

A gun is invariably loaded and run out under orders from its own gun-captain, unless expressly ordered to the contrary.

There appears to be no officer told off for duties similar to our Group Officer's.

The firing, ranging and service of the gun is left entirely in the hands of its gun-captain, who is a specially trained man, drawing extra pay, and permanently appointed to a particular gun, with a gun's crew under him but for that duty only. He is in no sense their administrative No. 1.

In broadside firing there is an Officer of Quarters whose duty is almost entirely disciplinary, so far as I could gather. He passes down orders received through voice-tubes from the conning tower, orders the nature of projectile and fuze, and gives the word to fire when friction tubes are used, but leaves all executive duties to the gun-captains.

In turret-ships there is an officer of each turret, but he does not interfere with the service of the guns. He repeats all commands, sees that the work goes on without confusion, and reports his turret as ready to fire; but the captain of turret, a seaman gunner or petty officer, orders the loading, laying and firing, except when the turret guns are being fought from the conning tower. In fact, the duties of officers in action, so far as working the guns is concerned, appear to be those of a Battery Officer on the gun floor, for discipline, but without fire direction; while the captains of guns exercise the duties of our Group Officer, gun-captain and layer, and also fire.

In the foregoing notes the terms gun-captain and No. 1 have been used as synonymous. The Naval drill-book, apparently, makes no distinction between them.

CLIPPING OF TROOP HORSES.

BY

MAJOR G. R. CHALLENOR, R.A.

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1. Why don't we clip our troop horses? This question is frequently asked, and the only answer to it, of course, is "because it is not sanctioned by Regulations." But why should it not be sanctioned? In India the practice for many years has been a recognised one, and Government supply the necessary blankets and clipping machines, and any officer who has ever served in that country will be able to testify to the universal benefit which it affords to both men and horses.

2. All officers of mounted corps are fully alive to the fact that an immense amount of time is spent in stables trying to get the thick, rough coats of horses dry after a long, wet march, or heavy field day, and how the men have to slave to get their work done, and the harness and appointments much to their detriment have to be left untouched until this work *has* been done.

3. During the last two winters I had the good fortune to be quartered at Aldershot, and, permission having been granted me, I clipped the horses of my battery all over, and provided them with blankets, the same plan being adopted by the Horse batteries there. With what success, it is needless to say. The result spoke for itself, and although the winters in severity were rather above the average, and there was much sickness about (principally influenza), throughout the whole time there were not two horses on the sick list from colds or other causes which could have been induced or brought on by clipping. But what a saving it was to the men! We would come in from a long morning's work, and go straight into stables until the mens' dinners were ready, by which time the grooming was generally completed, thus leaving the afternoon free for the cleaning of harness and appointments, while the other two batteries of the Brigade Division (the horses of which were not clipped), had to turn down again after dinner to finish their horses, many of which, at the conclusion of the evening stable hour, were still so wet that gun blankets had to be placed over them to prevent their getting chills.

I here append the orders which I issued for the winter These orders were published in the Battery Permanent Order Book, and copies placed in each stable and barrack-room so that all the men became thoroughly conversant with them :—

(*a.*) Horses are never to be kept standing about in the cold without their blankets.

(*b.*) On return from morning parades, and before the men quit the stables to change, the blankets will be thrown over the horses, and buckled in front, without removing saddles, and heels will be thoroughly dried.

(*c.*) All inspections, previous to parades, will be done in stables by officers and Nos. 1, and "turn out" will be sounded only in sufficient time to allow of "hooking in."

(*d.*) All horses proceeding on fatigues will invariably be accompanied by their blankets, which will always be thrown over them when standing still.

(*e.*) Each blanket will be marked with its horse's number, and the drivers will be responsible for their care and safety.

(*f.*) Blankets are on no account to be taken out to exercise.

4. Aldershot is as trying as most stations to horses, and if the system of clipping could be adopted there with success, why should it not be made universal throughout the United Kingdom? Battery Commanders say (and very properly too) that they cannot afford to provide blankets, and why should they be called upon to do so. Clipping might be sanctioned in orders, and blankets and clipping machines issued to regiments and batteries, and required to last a certain number of years, just as any other article of equipment, and I feel sure that in the long run it would be a benefit to the service in general, and certainly tend to make the mounted branches more popular for recruiting.

5. The adversaries to clipping say that it tends to make a horse's coat "come rough" in the summer, but I am bound to confess that my experience does not prove this, and, considering the average texture of the coat of a troop horse, I do not think that such a difference could be made, as to be used as an argument against it; while, on the other hand, the fact of clipping horses in the winter enables us to give them faster work and more of it, and to get them into, and keep them in, good hard condition, while those horses, which have been doing their work with their coats on, and have consequently had to be more or less "nursed," are quite "soft," and not nearly so fit to begin the hard work of the spring field days. If a horse be not clipped the fine dust and dirt which collect at the roots of the hair (and which it is impossible to remove, no matter how well he is groomed) tend to choke the pores of the skin, and to prevent the natural excretions from the body passing off freely. The rougher coated an animal is, the greater liability is there of this occurring, and consequently his health is bound to suffer, and with it his condition. I quote here the opinions of a well-known horse-master in the Regiment, Colonel Tyler,

late Commandant of Okehampton :—"If blankets were allowed, clipping the horses would be beneficial to them, saving to the men, and satisfactory to all concerned. Now that there are frequently manœuvres in the late autumn, when the coats of the horses are breaking and the horses weak, the effects of the hard work are seen throughout the winter, and if there happens to be a change of quarters in the spring, throughout the next year. When I commanded a battery I always noticed that a horse which lost condition after September, never recovered it until the spring was well over; what, then, would be the condition of horses leaving for active service in the early spring after trying autumn manœuvres! Horses which are clipped and clothed pick up condition in winter as readily as they do in summer, and are fit for work all the year round. I notice the horses which arrive at this Camp in the 1st division of batteries feel and show the effects of a march while their coats are in process of changing. If they were clipped in the winter this process would not try them nearly so much."

6. The present service blanket (issued when in Camp) is of very good material, and ought to last and be serviceable (if taken care of) for at least three years. The shape, however, is against it, and I would suggest that it be hollowed out in front, like the horse-rug of civil life, be supplied with a leather strap and buckle in front (to fasten across the chest), which, with the usual roller and pad, would be all that was necessary to keep it in its place, and prevent its shifting: the present twine fastenings are most faulty and unserviceable.

7. And now comes the question "Where are we to carry our extra blankets if ordered on service during the winter?" Well! such a contingency is so absolutely remote that it may be discarded as utterly improbable, and it is a difficulty that could be easily surmounted, and one that need not be touched on here. All we want and all we ask, is, "Allow us to clip our horses! give us the means of doing it, and supply us with blankets, and if we are ordered on service as a 1st Army Corps battery in the winter, we will find some means of carrying any extra blankets, should they be required," which in my humble opinion they would not.

In private life we clip our own horses, and even in these days the cab and 'bus horses get this indulgence, so why should we deny it to our troopers!

8. To sum up, then, the following are a few among the many advantages which can be claimed in favour of clipping :—

(*a.*) Increased facility for grooming and keeping the animal's coat clean, thus promoting health and condition.

(*b.*) Great saving in labour to men, and of exertion to the horse.

(*c.*) Power to move over longer distances and at a faster pace without distressing the horse unnecessarily.

(*d.*) Liability to catch colds and chills, throat and chest affections is decreased. (These diseases, as an after effect, often produce roaring).

(*e.*) Greater facility for conditioning the horse in the winter months, thus rendering him more capable of performing the hard work which the spring and summer field days entail.

(*f.*) Less damage to harness and appointments.

(*g.*) Tendency to galls and chafes is diminished.

(*h.*) Skin diseases not so likely to occur and easier of detection if they do.

(*i.*) It produces true action of the skin, helps the working of the liver, and prevents diseases of that organ.

9. In conclusion, I may add that the army in the last few years has made great improvements for the comforts of its men in more ways than one, why then should the animal that has to carry the soldier be left out in the cold, and why should we not endeavour to improve the condition and well-being of our troop horses!

Horses in these days may, and will be, called upon for greater exertions than formerly, and it is our duty to leave no stone unturned to bring them up to the greater pitch of excellence which these increased exertions will demand of them.

ARMY SCHOOLS.

BY

MAJOR A. M. MURRAY, R.A.

THE recently published Report[1] of the Director General of Military Education on Army Schools has doubtless received attention from every officer in the army. For us it has a special interest, not only from the fact that the author—Sir Robert Biddulph—is an officer of high rank in the Regiment, but because a better standard of education among the non-commissioned officers and men is every year becoming more and more a matter of imperative necessity. In order to keep pace with the fast developing improvements in *matériel*, and rapid changes in tactics, a good general education is essential as a foundation upon which to build subsequent technical training. This being so, the writer hopes the Committee of the Royal Artillery Institution will permit him to draw attention to one or two points in the Report while it is still fresh in the memory of all, and before its lessons pass out of mind.

The most striking fact brought to notice is the general falling off in the educational standard of the army during the past five years. Although this period has been one of increased activity in the Department of Military Education, and although many circulars have been addressed to Commanding Officers, emphasizing the importance of education, the results have none the less led to disappointment. On the 31st of December, 1888, the percentage of non-commissioned officers and men holding certificates (exclusive of 4th class) was 38·89 of the total strength of the army. On the 31st December, 1892, it had fallen to 36·51. It is true that in our own Regiment the percentage has risen from 39·72 to 41·84,[2] but ourselves and the Army Service Corps are the only branches of the army who have contributed to raise instead of lower the general average. In the Cavalry there has been a decline from 46·93 to 38·29, in the Foot Guards from 46·16 to 40·19, in the Royal Engineers from 65·12 to 62·76, in the Infantry of the

[1] Fifth Report on Army Schools, by the Director General of Military Education, 1893. Presented to both Houses of Parliament by command of Her Majesty.

[2] Chiefly due to the increase of 1st Class Certificates, owing to the possession of this certificate being required as a qualification for warrant rank.

Line from 35·11 to 32·76, and in the Ordnance Store Corps from 82·24 to 65·66.

A close study of the Report shows that this falling off is due to the decision made in 1887 to abolish compulsory school attendance for recruits, and substitute garrison schools for the existing regimental institutions. This step was taken mainly on the evidence of Mr. Knox, who was called as a witness before Lord Randolph Churchill's Committee on the Army and Navy Estimates, and in deference to a somewhat impatient cry which had been raised for economy in the military services. It was asserted that, owing to the progress of education in the country, recruits would join the army sufficiently instructed for all ordinary purposes, and it would therefore only be necessary to provide instructional machinery, for the purpose of the higher education of non-commissioned officers who wished to improve their knowledge and qualify for warrant rank. Regimental schools were closed, the staff of school-masters reduced, and large central garrison schools established in each military station.

At first there was some saving effected in the vote for Military Education, but owing to the necessity for strengthening the inspection branch, and other causes incidental to the new system, by which regimental control was abolished, this economy was not permanently maintained, and as the case now stands the vote for Army Schools for 1893–94 is £1013 higher than the corresponding vote for 1887–88.

While there has been no financial gain the cause of military education has undeniably suffered. In para. 2 of the Report Sir Robert Biddulph writes as follows :—

"The relative advantages and disadvantages of the garrison and regimental systems were fully set out in my last report, and the experience of the past four years has verified the opinions stated in that report. The measures necessary to be enforced on the introduction of the new system have been thoroughly supported by the General Officers concerned. The advantages have been made the most of and the disadvantages minimised as far as practicable, but the anticipation that under the garrison system schools would lose the great benefit resulting from the direct personal interest of Commanding Officers in them has been fully borne out. This defect undoubtedly exists, as there is a reluctance on the part of Commanding Officers to look much into the affairs of a school over which they have no definite authority. The frequent change of the officer under whose immediate control a school is placed tends to weaken responsibility for its management. . . It thus happens that Commanding Officers, in the many demands made upon their time have little opportunity of knowing much of the schools under them, or of the school-master upon whom they have to report."

After reading these words it is impossible not to feel that the garrison system has proved a failure. It has crushed regimental initiative. The large garrison schools do not supply the place of the regimental schools which were conducted under the direct control of the Commanding Officer. The classes are in many cases so large that it is difficult for the school-masters and their assistants to give the necessary indi-

vidual attention to all who come.[1] As a consequence the recruits grow disheartened. In obedience to the wish of their officers they begin by putting their names down for voluntary school attendance, and then one by one they fall off. It is within the recollection of the writer that many a promising recruit who joined the army with the best intention to improve himself has gradually relinquished his efforts to obtain his certificate from sheer want of sympathy, encouragement, and help.

The results of the Education Act of 1870, and subsequent Acts, are not so satisfactory as was expected. Boys who have passed the necessary standard are frequently removed from school by their parents at the age of ten, while not 3 per cent. of the sons of the working classes ever remain at school after 13.[2] Taken for hard work at this early age their minds lie fallow for seven or eight years until they enlist in the army. It is usually found that during this period they have forgotten most of what they learnt before leaving school. To show how lamentably low the standard of education still remains in the country Sir Robert Biddulph quotes the experience of a large employer of labour, who wished to obtain a number of labourers in connection with the construction of the Manchester Ship Canal. He states that he found only five out of every 20 men could read writing, and that in some cases the proportion was only one in 20, while out of a large number of candidates for employment he could not find 20 who could write a legible hand and do a simple sum in addition. "If," writes Sir Robert Biddulph, "this is a fair sample of the state of education in the country among the labouring classes it is not surprising that the state of education in the army is not better than it is, and the day when army schools for adults can be dispensed with seems to be as far off as ever.

Much can undoubtedly be done, as Sir Robert Biddulph points out, even under the present system by Commanding Officers to improve the education of their men;[3] but they work under difficulties which will increase each year. If it is true, as has been said, that "the Prussian school-master won the battle of Königgratz," primary education should surely be as much a part of regimental training as fire discipline and fire tactics. Are we wise to relegate it to a secondary place in our system of instruction? Ought not the compulsory attendance of every recruit at school to be insisted on till he has obtained a 3rd Class Certificate of Education?[4] The proposal to re-introduce com-

[1] The difficulty in getting efficient soldier assistants is very great under the present system. On this point Sir Robert Biddulph writes as follows:—"Formerly, when school-masters were attached to regiments, the regimental school-master had the ear of his Commanding Officer, and he was practically allowed to choose his own soldier assistants, and to retain their services. A man likely to make an efficient teacher was selected, and he was left in the school without removal for a considerable time. Now, however, especially in large stations, the school-master is not known to the Commanding Officer, and a soldier assistant is detailed to the school under orders from the District Office. A man is selected who is perhaps incompetent, and his instructions so inferior that soldiers are kept away from attending school as they feel they make no progress."—Report on Army Schools.

[2] In Germany the compulsory school age is from 6 to 14.

[3] The foundation of the winter school at Woolwich (for non-commissioned officers of the R.A. who wish to obtain 1st Class Certificates), which has been attended with such excellent results, is an instance in point.

[4] The examination for which consists in writing to dictation from a book of easy words arranged for children of nine years of age, and a paper in arithmetic, limited to the first four rules. It can hardly be said this is aiming too high.

pulsory attendance and revive regimental schools involves an increased charge on the Army Estimates, but we are already far behind both our French and German neighbours in the matter of military education, and unless we wish to get hopelessly in arrear we must be prepared to take energetic steps, cost what they may, to restore the balance.

Standing on the flank of a battery in action it is impossible not to notice the strong influence which education has on drill and training. It makes itself felt in the prompt and intelligent performance of the duties of each individual. In the old days of mechanical drill this was not so apparent, but under modern conditions when success depends on the ready appreciation of all ranks to carry out their superior's orders, when each individual has to think[1] as well as to obey, or rather has to think in order to obey, it cannot be doubted that there is an enormous initial advantage to a Commanding Officer who can work on minds previously prepared by a sound elementary education, in place of raw and neglected material. It is this thought which has prompted the writer to pen these few remarks, after reading Sir Robert Biddulph's Report, which is so full of practical interest and deserves exhaustive study.

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[1] "The conditions of modern warfare render it imperative that all ranks shall be taught to think and, subject to their general instruction and accepted principles, to act for themselves."—Infantry Drill-book, 1892. This general principle applies with equal force in the case of Artillery.

HORSE ARTILLERY GUNS AT WATERLOO.

BY

COLONEL F. A. WHINYATES, *late* R.H.A.,

AND

GENERAL H. LYNEDOCH GARDINER, C.B., EQUERRY TO THE QUEEN.

MAJOR MURDOCH has lately given us some very valuable and interesting papers, biographical and historical, connected with the Regiment and some of its former members. It is noticeable in these that he spares no pains to fully establish the truth and accuracy of what he states. I feel, therefore, that I need make no apology for pointing out that in his paper describing the trophy guns at Windsor (R.A.I. "Proceedings," October 1893), he has fallen in error concerning the number of 6-pr. guns used at the battle of Waterloo, and also with regard to the services of *Major*[1] Joseph Brome on that day.

The following form, prepared in April 1816 by direction of Lieut.-Colonel Sir John May, Assistant-Adjutant-General R.A., gives the troops and brigades with the army in 1815, and their armaments :—

[2]ORGANISATION OF THE BRITISH, KING'S GERMAN, AND HANOVERIAN ARTILLERY PREVIOUS TO THE BATTLES OF THE 16TH AND 18TH JUNE, 1815.

Colonel SIR GEORGE WOOD, Commanding Artillery. Lieut.-Col. SIR JOHN MAY, Asst.-Adjt.-Genl.
Capt. F. BAYNES, Brigade-Major. Lieut.-Col. SIR AUGUSTUS FRAZER, Commanding whole of R.H.A.
Lieut.-Col. SIR JULIUS HARTMANN, Commanding King's German and Hanoverian Artillery.

Field Officers.	Troops and Brigades.	Armament.	N.-C.O.'s and men.	To what attached.
Commanded by Lt.-Col. MacDonald, R.H.A.	Major Bull's	Heavy 5½-in. Howitzer.	175	Cavalry.
	Lt.-Col. Webber Smith's	Light 6-prs.	175	
	" Sir R. Gardiner's	"	175	
	Capt. Whinyates's	6 light 6-prs. and rockets.	175	
	" Mercer's	9-prs.	175	
	" Ramsay's	"	175	
Lt.-Col. Adye, R.A.	" Sandham's Royal British Artillery	"	200	1st Div. of Infantry.
	Major Kuhlman's Troop, King's German Horse Artillery	"	175	
Lt.-Col. Gold, R.A.	Capt. Bolton's Royal British Artillery	"	200	2nd Div. of Infantry.
	Major Simpher's Troop, King's German Horse Artillery	"	175	
Lt.-Col. Williamson, R.A.	Major Lloyd's Royal British Artillery	"	200	3rd Div. of Infantry.
	Capt. Cleeve's King's German Artillery	"	200	
Lt.-Col. Hawker, R.A.	Major Brome's Royal British Artillery	"	200	4th Div. of Infantry.
	Capt. de Rettberg's Hanoverian Artillery	"	200	
Major Heise, Han. Art.	Major Roger's Royal British Artillery	"	200	5th Div. of Infantry.
	Capt. Braun's Hanoverian Artillery	"	200	
	Major Unett's Royal British Artillery	"	200	6th Div. of Infantry.
Major Drummond.	Sir H. D. Ross's Troop, Royal British Horse Artillery	"	175	Reserves.
	Major Bean's Troop, Royal British Horse Artillery	6-prs.	175	
	Capt. Sinclair's Bde., Royal British Artillery	9-prs.	200	

[1] Captain Joseph Brome became a Major on the 4th June, 1813. *See* "Kane's List," p. 23.

[2] For corroboration of this Return, *see* Mercer's "Waterloo Campaign," Vol. I., p. 158. Also, Siborne's "Waterloo Letters," p. 188, *et seq.* Both give the armament of the troops, the latter of the brigades.

A memo.[1] accompanying the above says, "every troop and brigade was engaged on the 18th, except Major Brome's that was with the 4th Division at Hal,[2] and Major Smith's that did not arrive in time."

As there were, therefore, four 6-pr. troops at Waterloo, and each had as part of its equipment a 5½-inch howitzer,[3] it follows that there were twenty 6-prs. in action at the battle, and not five only.

The troop that joined in the pursuit with Sir Hussey Vivian's cavalry brigade, to which it had been attached all day, and which harassed the retreat of the enemy, was Lieut.-Colonel Sir Robert Gardiner's,[4] and not Major Brome's, who on the contrary commanded a 9-pr. brigade, Royal Artillery, and was eight miles away from the field of battle.

Thatched House Lodge,
Richmond Park,
12th October, 1893.

Dear Major Abdy,

I observe an erroneous statement at p. 522 of the October Number of the "Proceedings," viz.: "No (R.A.) field guns under 9-prs. were engaged at Waterloo, except the 6-prs. of Capt. Joseph Brome's Troop, R.H.A., which were employed at the close of the battle in harassing the retreat of the French."

Lieut.-Colonel Sir Robert Gardiner's Troop, "E" R.H.A., which had marched through Spain in the van of the Army attached to the Hussar Brigade in the last Peninsular campaign, ending with Orthes and Toulouse, and after marching through France embarked at Calais for England in 1814, was again attached to the same Brigade for the Waterloo campaign, and was certainly armed with 6-prs. at Waterloo.

I never heard my father mention Captain Brome's troop as having been so armed,[5] but I have heard him praise the foresight of the Duke of Wellington in having all the troops of Royal Horse Artillery armed with 9-prs. for Waterloo, except the two troops specially attached to cavalry on the extreme flanks of the Army, viz.: Webber Smith's "F" on the right and "E" on the left.

My father's troop was the last to leave the ground at Quartre Bras on the 17th June.

The infantry on the extreme left were suffered to retire unmolested covered by one of the Hussar Brigades to which "E" Troop was attached. In order to give the troops in their rear ample time to retire, the Brigade remained drawn up and the guns in action for a considerable time, expecting a charge from the cavalry in their front, but no movement was made until the guns limbered up and the Hussars turned

[1] For the full text of this memo. *see* R.A.I. "Proceedings," Vol. XVI., No. 12.

[2] *See* Duncan's "Royal Artillery History," Vol. II., p. 433 in support of this.

[3] *See* Adye's "Pocket Gunner," 1813, p. 3. Also, Mercer's "Waterloo Campaign," p. 158.

[4] *See* Siborne's "Waterloo Letters," p. 201.

[5] Captain Brome's name is new to me. It does not appear in the records of the Royal Horse Artillery, and it is probably meant for *Major Bean*, who did command a 6-pr. troop at Waterloo, and was killed there.

their backs, when an overwhelming force of cavalry was immediately flung at them, and it was one long gallop to the position at Waterloo. Their way lay through country roads deep in mud, and the enemy were sometimes even with the guns, and once, when passing through some narrow lanes bordered with hedges, ahead of them galloping in the fields on either side. The report went into Brussels that they were cut to pieces, and it was my father's opinion that if he had had 9-prs. he could not have got away from them. The horses were in splendid condition, far better than their pursuers, but only once during the retreat did he gain sufficiently on them to halt and open fire and off again at a gallop after firing a few shots. On arriving at the position at Waterloo nearly all the horses had lost shoes on the heavy ground, some of them all four shoes, and they had to sit up all the night shoeing.

After the action next day, being on the extreme left, the troop took part with the Prussians in the pursuit of the enemy until after dark.

In my young days in the Regiment I frequently dined with my father's old friends at Woolwich, Sir Alexander Dickson, Sir Hew Ross, Sir Thomas Downman, Sir Augustus Frazer, and many other Peninsula and Waterloo officers junior to them, Dyneley, Cator, &c., and have heard the gallop of "E" Troop quoted as an argument in favour of 6-prs. of 6 cwt. rather than 9-prs. of 13 cwt. for R.H.A. attached to cavalry. The opinion of these experienced H.A. officers was in favour of 6-prs. for acting with cavalry, but also to have some troops of Horse Artillery armed with 9-prs. with the head-quarters of an army in the field. Sir Hew Ross's "A" Troop acted chiefly with the Light Division in the Peninsula.

That comparison is, of course, now a thing of the past, but it was not so in the Crimean campaign nor in the Indian Mutiny, and in my very humble service I came to the same conclusion.

I commanded the same "E" Troop, under a different letter ("D"), 40 years after Waterloo, in 1855. It was then at Weedon armed with sixes, but was moved up to Woolwich and provided with nines, eight horses to the gun and ten mounted men to the detachment, being next for service, and it landed at Scutari with that armament, which continued after returning home through a season at Aldershot, often acting with cavalry, until it went to India in 1857.

It was armed with sixes when engaged in a flying column in Central India with the 17th Lancers and the 72nd on camels in pursuit of Tantia Topee. The advanced guard on two different occasions sent back word to me that it was no use for the guns to come on, as the ground was impracticable for artillery: once to cross a very deep and steep ravine with a stream at the bottom and a mere apology of a track, and once with the same sort of track where they thought the guns could not pass between the rocks. I had only one answer, viz.: that wherever cavalry could go Horse Artillery could follow, and we did so, without causing the slightest delay on both occasions.

If we had had nines there must have been some delay and difficulty.

Yours very truly,

LYNEDOCH GARDINER.

P.S.—Since writing the above I have referred to Colonel J. E. Michell's "Records of the Horse Brigade," in which the following passage occurs :—

"'E' and 'G' Troops, who were attached to cavalry covering the retreat from Quartre Bras, were seriously engaged. The former had been hard pressed by the enemy's cavalry," and Sir Robert Gardiner wrote: "fortunately we had not received the 9-prs., or we should have been cut to pieces."

'G' Troop was Sir Alexander Dickson's, commanded by Captain Mercer; 'A' and 'D,' Sir Hew Ross's with nines, and Major Bean's with sixes. 'E' and 'F,' Sir Robert Gardiner and Lieut.-Col. Webber Smith with sixes. 'G' and 'H,' Captain Mercer and Major Norman Ramsay with nines attached to the 1st Cavalry Division; Major Bull, 5½-inch howitzers; Captain Whinyates (2nd Rocket Troop) with 6-inch howitzers.

REPLY

BY

MAJOR R. H. MURDOCH, R.A.,

Assistant-Superintendent of Records.

By the courtesy of the Committee R.A. Institution I have been permitted to peruse, prior to their being sent to press, the interesting and valuable communications from two of the most eminent authorities upon Peninsular and Waterloo history; and am thankful for the opportunity of contributing a few lines of explanation, as well as for the lively interest evoked.

The inquiry referred to was instituted at the close of last year, and the Report embodied the results of searching Board of Ordnance records at the time available, in Chancery Lane and in the Artillery Record Office at Woolwich. Some additional data have since become available from Ordnance records received from London, &c., sufficient to set at rest the vexed question of R.H.A. guns engaged at Waterloo; and there is some prospect that in the Peninsular family papers of a distinguished General Officer solution may be found of the remaining problems: "What is the history of the 6-pr. Royal trophy guns; when and why were they selected for Windsor?"

The Report, on this point, may be summarised as follows :—

(*a.*) The *sixteen* 6-prs. may have been of Peninsular celebrity, but could not (all) have been engaged at Waterloo.

(*b.*) Because no R.A. field guns under 9-prs. were engaged at Waterloo, except the *6-prs. of one troop*, which were also employed, at the close of the battle, in harassing the retreat of the French.

(*c.*) That troop was *Captain Joseph Brome's.*

General Gardiner and Colonel Whinyates concur that the troop exceptionally distinguished was commanded by Brevet-Lieut.-Colonel Sir Robert Gardiner: and in this they are correct. The writer's statement that the troop in question was commanded by Capt. Brome[1] was, he regrets to say, erroneous; and he attributes the error to his

[1] Placed in position at Hal, by the Duke, to oppose advance of the French towards Brussels. ("History of the Royal Artillery," Vol. II., p. 433).

being at the time engrossed in the preparation of the "Brome Memoirs."

But Colonel Whinyates also asserts that *four* troops with 20 *6-prs.* were engaged at Waterloo, and adduces, in support, a tabular Return stated to have been compiled in 1816 by direction of Lieut.-Colonel Sir John May, *A.-A.-G.*[1] Now let us examine this return. It will afford a fair example of the circumspection required before accepting "authorities" in historical investigations, and will prove unreliable for the purpose adduced. It will be observed that this is a Return of R.H.A. armaments *previous* to the battle of Waterloo, not *on the 18th June.*

How frequent were the changes in R.H.A. armament "previous to the battle" may be gathered from contemporary journals:—*Mercer* writes (Vol. I., page 159), "We were ordered to send our light 6-prs. to Ghent to be replaced by heavy 6-prs.: in a few days the heavies were to be sent back and replaced by 9-prs., which we eventually kept." *Sir Augustus Frazer*—who commanded the whole of R.H.A.—writes (p. 159), on Saturday, 25th May, "I have promised Lord Uxbridge that the six troops shall be new armed and equipped on Monday;" and, again, on 31st May, "I cannot but smile at the changes back and forwards."

The Return is inaccurate with regard to armament *on the 18th June*, for it shows Bean's troop with 6-prs. Now, the D.-A.-G., R.A., on 15th May and 2nd June, wrote to Sir George A. Wood, "Ross's and Bean's troops will make up the eight demanded by the Duke; but have poor horses (Irish): Bean's takes 6-prs., but these can be changed at Ostend for 9-prs." Bean's troop arrived at Ostend on 10th June, and, accordingly, at once exchanged its 6-prs. for 9-prs. (*see* "History of the Royal Artillery," Vol. II., p. 418, and Mercer's *Journal*, Vol. I., p. 158).

We have, also, before us Sir John May's statement that Webber Smith's 6-pr. troop was not engaged on 18th June[2] at Waterloo, as it "did not arrive in time."

There remains only Capt. E. C. Whinyates's rocket and 6-pr. troop to be disposed of. This troop not being with the Hussar brigade of light cavalry, there was nothing available, at date of the Report, beyond the statement on p. 418, Vol. II. of the "History of the Royal Artillery," to prove that by 18th June it had not also exchanged its 6-prs. for 9-prs.—according to the declaration of Sir A. Frazer on 20th June (Frazer *Letters*, p. 551)—as Sir George Wood's despatch of 18th June did not enter upon the subject.

Among some volumes of Board of Ordnance Returns lately sent to the Record Office, there is one dated 1st July, 1815, showing this troop on that date with five 6-prs., I am happy to say.

Thus, it will now have been proved that only ten *light 6-prs.* were engaged at Waterloo.

There is reason to hope that before long the history of the 6-prs. at Windsor Castle will be brought to light; and we may rest assured that some of them will be found to have been of *Waterloo* and others of *Vittoria* celebrity.

[1] The original copy is not in R.A. Record Office in Sir John May's Official letter book.
[2] It had been assigned a position at Nivelles (*Frazer*, p. 557).

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NOTES

FROM

CORRESPONDING MEMBERS.

THE subject for the Duncan Gold Medal Prize Essay, 1893, is "The Attack of a Coast Fortress."

Attention is called to the Rules for Prize Essays printed at the end of the Rules R.A.I., and Officers are asked to be careful in posting their Essay intended for competition in time to reach the Secretary on or before the 1st of April.

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IN order to bring the already existing printed Records of the R. M. Academy up to date, it has been found that there will be a much larger amount of letter-press to be added than was at first anticipated. In consequence of this it has become necessary to raise the estimated price per copy from 12s. 6d. to 15s.

Any Officer who may wish for a copy is requested to send his name and address to the Secretary, R.M.A., Woolwich.

COPIES of examination papers in subjects (*c*), (*d*), and (*e*) are on sale at the R.A.I. The last sets comprise questions set in four examinations ending May, 1891. Price, Lieutenants (*c*), (*d*), and (*e*), 1s.; Captains, (*c*) and (*d*), 9d.

THE Committee will be glad to receive from any Member the name of such books as he may think desirable for purchase for the R.A.I. Library.

THE following works are now on sale at the R.A. Institution and will be forwarded post free at the prices noted after their titles below :—

Major-General Stubbs's "List of Officers of the Bengal Artillery," price 5s. 3d.

"Field Artillery Fire," by Captain W. L. White, R.A., price 1s. 2d.

"Notes of Lectures on Artillery in Coast Defence," by Major A. C. Hansard, R.A., price 1s. 2d.

"Ranging Note-Book," by Captain S. W. Lane, R.A., price 1s. 1d.

Instructions for Practice of Horse, Field, Heavy and Mountain Batteries in India, 1892.

THE following extracts are noteworthy in these Instructions just received from India :—

Scale of annual allowance of ammunition: a footnote states "An increase of shrapnel in substitution for common has been asked for."

"In elementary practice, which is for instruction and not for effect, common shell will be used both for ranging and, with time fuzes, to represent shrapnel; but at service practice, whenever shrapnel fire is to be opened, ranging will as far as possible be done with percussion shrapnel, unless the distance or difficulty of the target renders observation impossible. . . . ."

"There should be at least 18 qualified layers in a battery, and all should be given equal opportunities at practice."

"The object of practice of a Brigade Division is to perfect Officers Commanding Brigade Divisions in—

(i.) Choice of position and reconnoitring.

(ii.) Explanation of tactical idea.

(iii.) Indication, nature and extent of target; also the division of the target among their batteries and the change from one target to another of the whole or a portion of their commands.

(iv.) Bringing their commands into action.

(v.) The communication of orders.

(vi.) Economy, control of ammunition and rate of fire and making necessary arrangements for communication between the first and second line of wagons and the ammunition columns."

"In chosing his position, the Lieut.-Colonel should regulate his movements and those of his Adjutant so as not to attract the attention of the enemy. He should satisfy himself that none of the guns will be obscured by folds in the ground or other objects, and determine whether an echelon or a line formation should be adopted. While conducting this reconnaissance he should be careful to keep touch with his batteries, especially in close country."

"He should explain to the Battery Commanders as much of the tactical idea as will enable them to grasp the principles on which the action is to be fought, and on which the movements of the Brigade Division will depend. It is of the first importance that he should give an indication of the time he will probably be in action at each range or at each portion of the objective, and issue such orders as will ensure fire being so regulated that not only its greatest effect may be attained, but that no risk is incurred of its failing at the most critical moment."

"He should describe the targets and, if possible, indicate the system of fire tactics he proposes to adopt.

This must be practised in all cases before the batteries arrive at the practice camp."

"The practice of a Brigade Division will be:—

The batteries being assembled in rendezvous formation the Commanding Officer gallops on to reconnoitre, accompanied by his Adjutant, one trumpeter, one set of range-takers, and Battery Commanders, with one trumpeter each only. He points out the preparatory position, and his Adjutant rides back to show the batteries the way. He reconnoitres the enemy accompanied by trumpeter only, and selects the position; signals to range-takers and Battery Commanders to join him; points out target to the former and sets them to take the range; he then points out to the Battery Commanders—

(*a.*) Their objective (extent of target for each battery).

(*b.*) Their ground.

(*c.*) Whether echelon or line.

(*d.*) Approximate rate of fire.

They reconnoitre their own ground, each making for the windward flank of his battery.

The Commanding Officer communicates to them the range as given by the range-takers, and signals to the batteries to come up. As the battery approaches Sectional officers will gallop out about 200 yards in front and join the Battery Commander, who rapidly points out the target to them. They then make for their sections. The layers remain mounted with their sub-divisions."

ROYAL ARTILLERY BAND CONCERTS IN LONDON.

For the last four years the Band of the Royal Artillery has given four Concerts annually at St. James's Hall—two in the winter and two in the spring—which have been so cordially supported by officers of the Regiment as to more than pay their own way. The balance over and above expenses incurred for hire of Hall, etc (about £50 per concert) is divided among the bandsmen, the bandmaster alone excepted, Cavaliere Zavertal having hitherto declined to look upon these entertainments in any other light than that of a pleasant duty.

At the concert of the 18th November last, the number of names in the ballot (exclusive of late applicants) exceeded the number of reserve seats in the house, and an extra row of 32 seats was taken from the front of the area and added to the stalls. At the last concert (that held on the 2nd December) nearly the whole of the area, viz., 132 seats, was converted into stalls, and even so a number of late applicants could not be accommodated.

Friends of bandsmen, War Office clerks, and non-commissioned officers and men of the Regiment, are supplied with seats gratis, to the extent of 200 in the area and 200 in the gallery, and tickets for these parts of the house are in as great request and as much appreciated as those for any other.

The following table will serve to show how rapidly the popularity of these performances has increased since they were first inaugurated in May, 1889 :—

Date of Concert.	Number of subscribers.	Seats sold.	Representing. £	s.	d.	Remarks.
1889.						
1st May	216		48	12	0	Each subscriber charged 4/6 for five tickets.
8th May...	219		49	5	6	
1890.						
13th May	213	1096	82	4	0	Each ticket 1/6 to the limit of five per subscriber.
23rd May	220	1127	84	10	6	
21st November	235	1114	83	11	0	
5th December	236	1122	84	3	0	
1891.						
22nd April	246	1164	87	6	0	
29th April	249	1182	88	13	0	
21st November	257	1173	87	19	6	
5th December	252	1160	87	0	0	
1892.						
26th February	168	763	57	4	6	Notices of these concerts were issued in the leave season, and the former was held too early in the year.
20th April	229	1033	77	9	6	
18th November	270	1214	91	1	0	
2nd December	301	1340	100	10	0	

The band fund makes no profit out of the transaction, but when the proceeds have been unusually large it has been the custom to reserve a portion for the purchase of new and extra good instruments for solo players. Nothing, how-

ever, has so tended to increase the reputation of the band as these public exhibitions of its capabilities before crowded London audiences. Letters of congratulation and appreciation are constantly received by the Secretary from those who are evidently lovers of music and critics of the art in its highest sense; and it was recently represented to the Committee that the band should no longer hide its light under a private bushel, but should court public criticism, and invite professional attention to its performances, with a view to ascertaining whether, as was supposed, it could compete with other and better known string bands, and justly claim a place amongst the orchestras of the kingdom. The suggestion was adopted, and complimentary invitations in the name of the officers of the Regiment were issued to the leading journals of the daily and weekly press, with what success will be seen from the notices appended. They speak for themselves. But it may not be superfluous, or, let us hope, vainglorious to add that it is no small thing in the musical world to receive such praise as that conveyed in the terms used by *The Times*, *Musical Times*, and *Daily Telegraph* representatives.

The programmes for the two concerts were as follows :—

18TH NOVEMBER, 1892.

1. MARCH ... ... "Tannhäuser" ... ... *Wagner.*
2. SYMPHONY ... ... "Unfinished" ... ... *Schubert.*
   ALLEGRO MODERATO.—ANDANTE CON MOTO.
3. SUITE ... ... "L'Arlésienne" ... ... *Bizet.*
   1—PRELUDE. 2—MINUETTO. 3—ADAGIETTO. 4—CARILLON.
4. ... ... "In a Trance" ... ... *L. Zavertal.*
5. ... ... "Ungarische Rhapsodie" (No. 1 in F) ... ... *Liszt.*
6. INTERMEZZO ... ... "Cavalleria Rusticana" ... ... *Mascagni.*
7. OVERTURE ... ... "Mignon" ... ... *Thomas.*

2ND DECEMBER, 1892.

1. MARCH ... ... "Huldigungs" ... ... *Wagner.*
2. OVERTURE ... "A Midsummer Night's Dream" ... ... *Mendelssohn.*
3. SYMPHONY ... ... "No. 2" ... ... *Weber.*
   ALLEGRO CON FUOCO. ANDANTE. SCHERZO PRESTO. FINALE PRESTO.
4. ... ... Incidental Music to Shakespeare's "Henry VIII." ... *Sullivan.*
   1—ALLEGRO MODERATO. 2—ANDANTE CON MOTO (Song with Chorus).
   3—ALLEGRETTO GRAZIOSO (Graceful Dance). 4—ANDANTE MODERATO.
   (Water Music).
5. ... ... "Rigodon de Dardanus de Rameau" ... ... *Gavaert.*
6. TARANTELLE... ... "Die Fischerinnen von Procida" ... ... *Ruff.*
7. VORSPIEL ... ... "König Manfred" ... ... *Reinecke.*
8. OVERTURE ... ... "Tannhäuser" ... ... *Wagner.*

PRESS NOTICES.

DAILY TELEGRAPH.—November 21st.

On Friday afternoon, for the third time this year the officers of the Royal Artillery brought their famous orchestral band to St. James's Hall, and entertained their friends and their friends' friends with an admirable performance of varied music. These concerts, which, of course, are not public, have great merit. From an executive point of view their character is high, while it is the care of Cavaliere Zavertal, the conductor, to make the programmes worthy of an audience in which there must be many amateurs of refined taste. It is the rule to put a symphony in the first, or more classical, part of each selection; and, on reference to the immediate past, we find that during the last two years the band has played two movements from Rubinstein's "Ocean" symphony; Beethoven's No. 5 in C minor, and No. 4 in E flat; Schubert's in B minor; Raff's "Lenore," and Franchetti's in E minor—together with various overtures holding equally high rank among their kind. In a very distinct sense, therefore, the band of the "Royal Regiment" is one of the musical institutions of the metropolis, and some particulars as to its constitution may not be unacceptable.

The full strength of the organisation is 93 men and a certain number of boys, nearly all the members being the sons of soldiers, taken for six months on approbation at an early age, and taught two instruments, one wind and one string. While the strength of the band seems to be great, it is really small considering the size of the Regiment and the many duties it has to perform. Its regular engagement comprise a series of 19 weekly orchestral concerts during each winter and spring, four of which take place in St. James's Hall. During the summer months the band plays twice weekly on Woolwich Common; whenever called upon attends garrison balls and theatricals, cricket and polo matches, and sends a detachment to mounted parades. Besides all this, it visits various Royal Artillery stations to give concerts and performances as required, and sometimes is divided into three parts for duty at three simultaneous "functions." Three hours of every morning are given up to rehearsal, and once a week the orchestral band provides music for "guest night" at the Woolwich Mess. It is clear from these particulars that Cavaliere Zavertal and his men have not many hours of idleness; also that the strength of the band is by no means in excess of the demands upon it. No more active musical organisation exists in the Kingdom, nor, we venture to say, is there one more clearly entitled to the favourable consideration of the military authorities or of the public, to gratify whom it so largely labours.

The concert given on Friday afternoon was attended by a full house, and had in its programme a very interesting piece entitled "In a Trance," the work of the conductor. If anyone present went to St. James's Hall with an idea that allowance would have to be made for military musicians he must have been pleasantly surprised. The Royal Artillery orchestra has a right to be heard anywhere, and to play anything, on precisely the same conditions as any other band. It is qualified to take rank among the best, and entitled to be judged by the highest standard. This was proved again and again on Friday, especially by its performance of the more delicate selections, the rendering of "In a Trance," the Mascagni intermezzo, &c., being as refined and pure as even a fastidious taste could desire. In short, the concert gave nothing but pleasure, and reflected the utmost credit upon Cavaliere Zavertal and his accomplished subordinates. At the next performance (December 2nd) a symphony by Weber will be played, together with the overtures to "Tannhäuser" and "A Midsummer Night's Dream."

THE TIMES.—November 19th.

A decidedly successful concert was given in St. James's Hall yesterday afternoon by the splendid band of the Royal Artillery, under the clever bandmaster, Cavaliere L. Zavertal, who has brought the orchestra into a high state of proficiency. The way in which Schubert's "Unfinished" Symphony was played was quite surprising, since the delicate passages received as full justice as the more obvious and vigorous sections. Bizet's Suite from the music to Daudet's "L'Arlésienne" was the only other work of considerable length. The unisonous opening for strings was played with most remarkable precision and vigour, the lovely *adagietto* with much tenderness of expression, and the characteristic carillon with great effect. In Liszt's difficult "Rhapsody, No. 1 in F," the skill of various individual performers was displayed to advantage. The march in "Tannhäuser," the inevitable intermezzo from "Cavalleria," and the overture to "Mignon" were also given, as well as a graceful piece by the conductor, called "In a Trance."

MUSICAL TIMES.—December 1st.

On the 18th ult. a Concert (the third of the year) was given by this famous band, under the direction of Cavaliere Zavertal, at St. James's Hall. Though,

of course, not open to the public, the room was crowded—and, apparently, by appreciative listeners. They had certainly no reason to complain of the quality either of the music selected or of its performance. An interesting piece by the conductor, called "In a Trance," was played, to the manifest pleasure of the guests. It is, perhaps, necessary to say that this was one of the occasions on which this celebrated military band is *not* a military band, but transforms itself into an ordinary orchestra of "strings" and "wind." It numbers about a hundred performers, who, in a musical sense, are, like the army to which they belong, "ready to go anywhere and do anything," with perfect assurance of success. Indeed, the performances on this occasion reached a higher level than ever before, a fact which seems to indicate that further advance towards the ever-receding goal of perfection may be confidently anticipated. This admirable force has evidently adopted "Excelsior" for its motto. To descend to particulars—the playing showed an attention to detail and an amount of care and finish that might very well be regarded as a model for other musical organisations. Nothing slipshod, nothing rough or undisciplined was to be detected. Everything had been rehearsed till it was really *ready*. How seldom do such conditions obtain!

SUNDAY TIMES.—November 20th.

The Royal Artillery has reason to be proud of its band. We wonder how many regiments in the world can muster such a capable and well-trained body of orchestral players. Admiration for the ability of Cavaliere Zavertal and his men was aroused, not for the first time, on Friday afternoon at St. James's Hall, when they executed with refinement and intelligence such works as Schubert's "Unfinished" Symphony, Bizet's "Arlésienne" Suite (No. 1), and Liszt's first "Hungarian Rhapsody." In many respects the performance of these things could not have been improved upon. There was a large and demonstrative audience.

THE STANDARD.—November 19th.

For some years past the Royal Artillery Band has given afternoon concerts in the West End of London, greatly to the satisfaction of the many admirers of an excellent instrumental force. The first performance of the present season took place yesterday afternoon in the presence of a very large assemblage. The programme was well chosen, and, though sufficiently varied, appealed exclusively to amateurs of culture and intelligence. Schubert's ever-welcome "Unfinished" Symphony in B minor was rendered with refinement. The band is in a thorough state of efficiency, thanks to the careful training of its talented conductor, Cavaliere L. Zavertal.

THE QUEEN.—November 26th.

The Royal Artillery Band, which, including strings and wood-wind, numbers nearly a hundred performers, gave an excellent concert at St. James's Hall on Friday afternoon, and played before a very large audience a well-chosen selection of pieces, prominent among which ranked Schubert's "Unfinished" Symphony, which was given in really admirable style, its finished interpretation reflecting the highest credit on this very efficient body of instrumentalists. The intermezzo from "Cavalleria Rusticana" also found a place in the scheme, and met with the customary encore; the programme opened with the "Tannhäuser" overture, and included an interesting morceau "In a Trance," by Cavaliere L. Zavertal, the very able and efficient conductor of the band.

MORNING POST.—November 21st.

A concert was given on Friday afternoon at St. James's Hall by the Royal Artillery Band. The performance reflected great credit upon the conductor, Cavaliere Zavertal; and the programme was well chosen.

THE TIMES.—December 3rd.

The concert given yesterday afternoon in St. James's Hall by the band of the Royal Artillery was as attractive and as largely attended as that lately noticed. The opening pieces, Wagner's vigorous "Huldigungsmarsch" and the "Midsummer Night's Dream" overture, were in as strong contrast as could be wished, and each was played altogether admirably. The delicacy with which Mendelssohn's overture was given was again exhibited in an arrangement by Gevaert of the rigaudon from Rameau's "Dardanus," at the end of which a wonderful *diminuendo* was made in the violins. The symphony by Weber in C major, called "No. 2," was written, according to Grove's dictionary, before its companion in the same key; both are very early works, and only the ingenious scherzo and the very lively finale of the work played yesterday can be considered as worthy examples of the master's work. At the same time the fact that it was brought forward at all proves how earnest and artistic are the aims of the excellent conductor, Cavaliere L. Zavertal. A selection from Sullivan's "Henry VIII." music was given, including a rather vulgar arrangement of a song with chorus; Raff's tarantelle "Les Pêcheuses de Procida" was received with much favour, and the overtures to Reinecke's "König Manfred" and to "Tannhäuser" were also played as excellently as everything else in the programme.

THE STANDARD.—December 3rd.

There was a very large audience at the second concert given this season by the Royal Artillery Band, which took place yesterday afternoon, and the programme was admirably framed. The most interesting feature was Weber's "Second Symphony in C," which is rarely heard. It is a youthful effort, written in 1807, when the composer of "Der Freischütz" had scarcely attained his majority. According to his most sympathetic biographer, the late Sir Julian Benedict, "the whole composition seems written to order, and various beauties scattered everywhere suffer from interpolations and episodes which have no direct bearing on the principal subject, and are but too frequently stiff and awkward." The themes are, however, bright and Haydnesque, and there is some very pretty writing for the wood-wind in the symphony. Four sections of Sir Arthur Sullivan's incidental music to "Henry VIII.," were included in the scheme, and the whole were rendered with noteworthy care and accuracy under the direction of Cavaliere L. Zavertal.

THE QUEEN.—December 10th.

The Royal Artillery Band gave its second concert of the season last Friday afternoon in St. James's Hall before a large audience, again providing a varied and attractive programme, which included Weber's rarely heard "Symphony in C major," the second of the two symphonies written by the illustrious composer, each of which is in the same key, and both of which proceeded from his pen about the same period, viz., 1807, that is, just as he was attaining his majority. The work, which shows Weber as strongly under the influence of Haydn, is scored for a limited orchestra, and is interesting as a comparatively early effort; but, although it is certainly not devoid of merit, most people will agree with Weber's pupil and biographer, Sir Julius Benedict, that the symphony was a branch of musical art "that did not belong to Weber's sphere." The production was very creditably interpreted by the band, which had previously been heard in

Wagner's "Huldigung's" march, and in Mendelssohn's overture to "A Midsummer Night's Dream," and in the second part of the concert an excellent rendering was given of Sir Arthur Sullivan's incidental music to Shakespeare's "Henry VIII.," as well as of an arrangement by Gaevaert of the rigadoon from the opera "Dardanus," by Rameau, the contemporary of Bach and Handel, as well as of a tarantelle by Joachim Raff, the vorspiel to Reinecke's opera "King Manfred," and of the "Tannhäuser" overture, the several items being conducted with much discrimination by Cavaliere L. Zavertal.

BLACK AND WHITE.—December 10th.

There is a good deal of good music to be heard for money just now in London, but the vain public loves the music best that can be heard for love, and not money. Of this kind was the Royal Artillery Concert at the St. James's Hall of Friday last. A hundred artillerymen in uniform in the orchestra made a splendid show, and the music, all through, for "go" and precision, was hard to beat. The band have in Cavaliere Zavertal a conductor whom I should like to praise in proper technical language, but I will only repeat and adopt the over-heard remark of a young gunner, "He *does* pick 'em up."

THE ATHENEUM.—December 10th.

An interesting programme was offered at the second of the Royal Artillery Band's Concerts at St. James's Hall on Friday afternoon last week, one of the items being Weber's rarely heard "Symphony in C, No. 2." The two symphonies by the composer of "Der Freischütz" are early works, and he probably recognised that his gifts did not lie in this direction. The themes in the second symphony are bright and Haydnesque; but the development is poor and patchy. The rendering of the whole of the selections, under Cavaliere Zavertal, was highly commendable.

THE COUNTRY GENTLEMAN.—December 10th.

The concert given at St. James's Hall last Friday by the band of the Royal Artillery was an extremely good one, and the gunner officers must be congratulated on having such an excellent and efficient band. The band, which, under the direction of Cavaliere Zavertal, had been playing the night before at Welbeck, arrived in London in plenty of time to commence the concert at 3 o'clock. The audience were most enthusiastic, and a very enjoyable afternoon was passed.

DOVER.

A VERY successful performance took place in the Town Hall on 7th December, when "The Private Secretary" was represented. The Royal Artillery fully bore their share of the parts; Captain Stone acquitted himself with discretion and excellent taste as "Harry Marsland;" Captain Breakey, the "Hunting Squire," is entitled to praise for an excellent impersonation; Captain Moore-Lane played "The Tailor of Bond Street" in very clever and characteristic fashion; and among the minor characters were Messrs Parken and Hutchinson, who were equally of service to the piece. Mr. Clement Walter (Surgeon-Colonel of the Kent Artillery) took the character of the irate but good-hearted "Mr. Cattermole;" as a character sketch nothing in the play excelled in artistic quality this impersonation, which was particularly deserving of praise.

Recruiting appears to be very brisk in the Militia just now, two subalterns having joined for duty at the Depôt from the Kent Artillery, Lieutenants Hassell and Schlesinger, and several of the permanent staff have had to be called upon to assist as drill instructors. It seems a great pity the Garrison Artillery is so

unpopular, recruits preferring any other corps, or even Militia, to joining the Eastern Division; one wonders whether the fact of so many of the companies of this Division having been so many years at Gibraltar (some of them seven and over) has anything to do with it.

The Mess Committee are endeavouring to obtain a complete series of photographs or pictures of Officers Commanding Royal Artillery, Dover, since 1859 (the date of building this block of Officers' Quarters and Mess, and the separation of the R.A. and R.E. Mess). Any contribution will be most thankfully received.

INDIA.

On the night of the 21st September Lord Roberts was entertained to a farewell dinner at Bonsard's Hotel, Simla, by Royal Artillery officers.

General H. Brackenbury, C.B., presided, and fifty other officers were present from all parts of India. Telegrams expressive of regret at Lord Roberts's departure were received from all Artillery Messes in India.

Owing to an unfortunate error in transmission the speeches cannot now be given, but doubtless many have read them in the Service papers.

The dinner was a great success from first to last, and everything connected with it, attendance, speeches and applause, testify how deeply the Regiment in India feels the loss it suffers by Lord Roberts's departure.

OBITUARY.

Lieut.-Colonel T. H. Lloyd, whose death occurred at Upper Norwood, on 29th November, 1892, joined the Regiment as Lieutenant on 1st September, 1862; became Captain, 8th September, 1875; Major, 1st October, 1882; and Lieut.-Colonel, 6th February, 1891. He passed through the Staff College in 1878, and has held the following appointments, Brigade Major, R.A., Chatham District, from 1879 to 1884, Assistant-Quartermaster-General, District Staff Officer 1st Class, and Assistant-Adjutant-General for Bombay from 1886 to 1891. He retired on retired pay on 9th November, 1892.

Captain W. A. Watkins, who died at Waterford, on 9th December, 1892, was commissioned from the ranks as Lieutenant on 31st December, 1881, and became Captain, 24th May, 1889.

NOTES

FROM

CORRESPONDING MEMBERS.

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THE Committee will be glad to receive from any Member the name of such books as he may think desirable for purchase for the R.A.I. Library.

THE following works are now on sale at the R.A. Institution and will be forwarded post free at the prices noted after their titles below :—

Major-General Stubbs's "List of Officers of the Bengal Artillery," price 5s. 3d.

"Field Artillery Fire," by Captain W. L. White, R.A., price 1s. 2d.

"Notes of Lectures on Artillery in Coast Defence," by Major A. C. Hansard, R.A., price 1s. 2d.

"Ranging Note-Book," by Captain S. W. Lane, R.A., price 1s. 1d.

IF any officer has a copy of No. 2, Vol. XIX., R.A.I. "Proceedings," December, 1891, that he can spare, the Committee will be glad to give him the full price of 2s. 6d. for it, if he will send it, at once, to the Secretary R.A. Institution, Woolwich.

A MOST interesting lecture was given by Captain C. Orde Browne, *late* R.A., at the R.A. Institution, on Monday, the 12th December, 1892, on "The Story of Arms and Armour."

There was a very good attendance; the subject was illustrated by specimens from the collections at the Tower, Rotunda, and R.A. Institution Museums. Probably few of the audience knew previously of the beauty and value of the specimens shown from the Woolwich Collections. This lecture will not be published, but the shorthand writer's transcript of it, corrected and illustrated by Captain Orde Browne, will be sent on loan to any member who may wish to read it.

Two brasses have recently been erected side by side in St. George's (Garrison) Church, Woolwich, to the memory of Lieutenants J. Haggard and J. A. Rich, R.H.A. As the space available for memorials in this Church is becoming very small, the authorities in charge are only able to sanction the erection of small tablets. In consequence of this there is a surplus in each fund collected to supply these two memorials and this has been handed over to the R.A. Regimental Charities.

Many officers may have forgotten the fact that the Royal Horse Artillery is this year entering on its second century of existence, having been formed by Royal Warrant dated 8th January, 1793.

Among other proposed methods of celebrating the event is one to amalgamate the various troop dinners and for this year to have a Royal Horse Artillery Centenary Dinner.

The following proposition is put forward with a view to elicit further correspondence on the subject:—

"As the reliefs for Garrison Artillery stations are now so fixed that certain Divisions provide Companies to serve in certain stations, cannot some plan be devised by these Divisions so that at each Fort or station means of recreation suited to the station and for young men be provided?

Boats, cricket grounds, football grounds, gymnastic appliances which can be put up temporarily in barrack-rooms, libraries, and possibly small bands, are probably the most necessary.

A General Fund could be provided, doubtless, by subscriptions from:—(1) Officers of the Division on joining the Division; (2) by a small yearly subscription while in the Division; (3) Company Games' Funds; (4) yearly grants, with the sanction of the General Officer Commanding, from the Garrison Canteens.

On leaving a station a Board might be sanctioned to assess against the Company whether anything had not been properly cared for, and whether, taking into account depreciation from *fair* wear and tear, it was necessary to make a charge against the Company Funds on leaving.

There are many out-lying Forts and stations where recreation is very necessary and where, from the small number of men, it is almost impossible to provide them without aid."

The American publication, *Science*, published 25th November, 1892, contains an article by Major-General The Right Honourable Sir J. C. Cowell, K.C.B., on "The Date of the Last Glacial Epoch." This article shows the great value of the discoveries made by Major-General A. W. Drayson, *late* R.A., as described in his works entitled "30,000 Years of the Earth's Past History" and "Untrodden Ground in Astronomy and Geology." The article concludes with the following sentence:—

"Lastly, it is to be hoped that the discoverer of the second rotation may live to see the triumph which he has achieved universally admitted by all true lovers of science."

The Inter-Regimental R.A. *v.* R.E. Racket and Billiard Matches are fixed to be played this year at Woolwich, on Friday and Saturday, the 21st and 22nd April.

Any officer who may wish to represent the Regiment in either event is requested to communicate with the Honorary Secretary R.A. Games' Fund, Woolwich.

ROYAL ARTILLERY DINNER CLUB.

Rules.

Officers of the Royal Artillery on full or half-pay, can become annual subscribers at the rate of five shillings per annum, under the following conditions:—

(*a*) On joining the Regiment.

(*b*) If a Subaltern, by payment of five shillings for every year of service up to five years, which shall be the maximum number of years subscription chargeable to officers of that rank on joining.

(*c*) If a Captain, by payment of six years subscriptions.

(*d*) If a Major, by payment of seven years subscriptions.

(*e*) If a Lieut.-Colonel, by payment of eight years subscriptions.

EDINBURGH.

Having heard that the Cavalry Regiment here were trying a very novel and wholly radical experiment in stable management, which would, I fancy, make the hair of some of our old horse-masters stand on end, I went over to Piershill to see it.

The experiment consists in never removing the troop-horse's bed. The droppings are taken away as far as possible, but otherwise the litter is never touched, the fresh ration of straw being added daily. This system, I am told, is in vogue in the Austrian Cavalry, and has been tried with success by our own 12th Lancers. The chief advantage claimed is that the horse is encouraged to lie down during the day, which, of course, he cannot do under the usual *régime*, and also that he lies down more during the night; the result being an improvement in condition. All this being contrary to every precept of stable management which one has been taught and teaches, I was naturally curious to see it, so took the opportunity kindly given of going round stables with the Orderly Officer. Of course, it looks simply beastly. When I went round the fresh straw had not been put down, and each horse was standing on a little platform of dirty bedding about six inches high, from which, when trodden on, a certain amount of moisture exuded.

Most of the horses had scraped away a good deal of litter in the front part of the stall, and were standing with their hind-quarters somewhat raised.

The Piershill stables are old and low, yet I must confess I found very little smell when I went in, and none of that pungent odour of ammonia which one would expect. The horses were looking very well; and I was told that there was an improvement in their condition since the introduction of the system, about three or four months, though this I can give no opinion on, not having seen the animals before. As far as I could gather, the horses' feet do not suffer; I picked up one or two, and there was no sign of thrush in them.

I should think one great drawback must be the filthy state of the horse in the morning, and the time it must take to get a long-coated "hairy" decently clean. He must rise from his couch plastered over with muck like a cow, as I should fancy a good deal of the fresh straw, which is added at night, gets eaten.

There is probably not much chance of this practice becoming the rule of the

service, nor can one see any necessity for it, with us at least, during the winter months, during which the troop-horse has a comparatively easy time, and does not require to lie down during the day, as a hunter undoubtedly does. It is during these months, too, when we are short of men in stables, that the soldier requires consideration; and this plan certainly throws much extra labour on him.

Still, there are times, at Aldershot and elsewhere, when our horses are worked really hard, and it is important that every inducement should be given them to lie down during non-working hours to save themselves, and more especially their legs. Polo players particularly will recognise the truth of this. A pony that will only lie down all day on the off days is worth half as much again as a brute that won't. This experiment, therefore, will be of service, if it conclusively prove that a good bed may thus be obtained without any risk of injuring the horse's general health.

I sent this to the Officer Commanding, in case he might have any objection to its being published. He was good enough to add the following notes:

"The horses are supposed to stand level, and one of the greatest objects is warmth.

The bedding could be kept nearly dry by having a substratum of six inches of charcoal, which also acts as a disinfectant. During the summer dry months the bedding is, as a rule, dry and very fairly clean."

His Adjutant says:—

"I think that with a thick layer of charcoal, or even coal ashes (not too fine), under the straw, the liquid would be able to drain away, and there would be then a good deal to be said in its favour."

NATAL.

The R.A. Mess here, with quarters for four officers and their servants, is in a private house in Pietermaritzburg, about a quarter-of-a-mile from the camp; it has a very good flower-garden and kitchen-garden, the only grass lawn tennis court in the town, and stabling for seven horses; and the officers are in every way far better off than if a mess and quarters were provided for them in camp. The cavalry regiment now here is the 3rd Dragoon Guards who arrived from India about the middle of October, the 11th Hussars changing stations with them. The infantry regiment is the 84th (2nd York and Lancaster), and has a detachment of one foot company and half a mounted infantry company at Eshowe, the only detachment in the command. One mounted infantry company came into Maritzburg in October, the establishment at Eshowe being reduced to that extent; and as no extra barrack accommodation has been provided here all the troops in the camp are very closely packed in their huts. Hardly any expenditure on improvements in the camp has been sanctioned for some years, on the supposition that the Colony was going to adopt responsible government and that the troops would then be withdrawn, but the late elections have resulted in favour of the anti-responsibles, so now it is to be hoped that a little of the four million barrack vote will find its way out here, as it is badly wanted.

Major G. W. R. Fulton arrived in the station on the 23rd September to take over the command of the battery, Major Robertson having got his "jacket" and gone to India.

The annual battery sports came off on the 12th November, rain unfortunately kept a lot of people away who would otherwise have come, but made it much cooler

for the competitors, and the sports went off very well. The divisional tug-of-war was won by the left division, the open tug-of-war was easily won by the battery team, their only opponents being the 84th team. The open tent-pegging was won by Sergt. Connor, R.A., though there were five N.-C.O.'s of the Dragoons and two of the Natal Carabineers competing. The prizes were given away by Mrs. Fulton.

On the 17th November, a cup, competed for by tug-of-war teams representing England, Scotland, Ireland and Natal, was presented to the victorious English team. Out of this team of ten (which was coached by B.S.M. Humphreys, R.A.) eight men came from the battery, and nine of the Irish team were also gunners; the best pull was between these two teams.

Cricket has been going on since October, but the battery team is not very strong; so far it has won two matches, lost two and drawn one.

Polo has been rather slack since the departure of the 11th Hussars, as the 3rd Dragoon Guards have had a good deal of difficulty in getting ponies, the 11th having taken their best ones to India. When Captain Gonne returns from leave (at the end of April) the battery hopes to be able to put a team in the field, though they will be somewhat short of ponies.

The golf links are, unfortunately, only playable on for about three or four months in the year (June to September), as during the other months the grass is too long.

Quail shooting has been going on since the beginning of November, bags of 20 brace being often made by a couple of guns in a day, within five or six miles of Maritzburg. Guinea fowl and partridges can be shot on private grounds only. Buck can only be got in any number up in the Drakensburg, or in the Free State. Game is now closely preserved in Zululand, as a few years ago it was nearly becoming extinct. The nearest place for large game is up the Pungwe river, where buffalo, eland, quagga, and every kind of buck can be got in any quantity; there are plenty of lions there too, but though always heard at night, they are very difficult to find by day. Two officers of the 11th shot four last year, but others (of the 11th and 84th), who have recently been up the Pungwe, have not succeeded in shooting any. These trips are very expensive, and a man must have £200 at least to spare before undertaking them. In the Addo bush, near Port Elizabeth, there are a lot of elephants; they are very destructive, and the colonial authorities are only too glad to have them shot, but it is dangerous work as, if once a herd winds a man, they set to work to hunt him down. Captain Gonne, last year, was lucky in coming across two elephants by themselves, and getting them both with the expenditure of three cartridges.

In September, Lieuts. A. S. Miller and A. A. McHardy, R.A., went up to Zululand on three weeks' leave, going as far as the Tugela with an infantry company on its way to Eshowe. During this part of their expedition they got a certain amount of shooting, but on reaching Eshowe—where they were most hospitably put up by the 84th officers—they decided to push on *viâ* Ulundi to Rorke's Drift, and as they would not have much time to spare, they did not take guns with them. The trace of the fort at Eshowe is still visible. Ulundi was a two days' ride from Eshowe, a store forming the stopping place. One day was spent at Ulundi, and the battle-field visited; the spot where the square stood when charged by the Zulus is still distinctly marked out by the empty cartridge cases. The grave is just outside the square and is well looked after. Two days were taken in getting from Ulundi to the Nondwere Gold Fields (which do not appear to be very productive), whence the Prince Imperial's monument was visited; this is well kept and looked after. The next day's ride brought them past Isandhlwana to Rorke's Drift. The field of Isandhlwana is dotted over with heaps of stones marking the graves. The men were buried where they fell. A few of the graves are marked with crosses. The tent-pegs of the camp, cartridge

cases, buttons, pieces of shell (fired into the camp by the column on its return) can be picked up. At Rorke's Drift (still a Swedish Mission Station) a new church and store have been erected on the sites of those defended on the 22nd January, 1879, and the positions of the lines of defence formed by the mealie bags were pointed out. One day brought them to Dundee, whence the railway brought them back to Maritzburg. The whole distance ridden (on one horse each) was 350 miles, averaging 25 miles a day; the horses were in capital condition at the end of it.

OBITUARY.

Major-General W. B. Rice, Colonel retired list, met his death while skating on Loch Eylean, Inverness-shire, on 26th December, 1892. Deceased was born in 1837. He joined the Royal Artillery in 1858; became Captain, May, 1862; Major, July, 1872; Lieut.-Colonel, July, 1881; Colonel, in 1885; and retired as Major-General, September, 1886. He served in the Crimean Campaign from May to August, 1855, with the Siege Train at the siege of Sebastopol, and bombardments of 6th and 17th June (medal with clasp and Turkish medal).

Colonel J. C. Auchinleck, retired list, Royal Artillery, died at Langston, Havant, on the 28th December, 1892, aged 57 years. He joined the Army 10th August, 1856; became Captain, 10th October, 1867; Major, 1st January, 1876; Lieut.-Colonel, 2nd March, 1881; and Colonel, 2nd March, 1885. He served in the Indian Mutiny in 1857–59, and was present at the actions of Cawnpore, 5th and 6th December, 1857; the defeat of the Gwalior Contingent, the actions of Khodagunge, and the re-occupation of Futtehghur. Was also present at the affairs at Kunkur on 6th April, and at the attack and capture of Fort Sandee and pursuit of Feuze Shah (medal). Served with the Royal Artillery in the Afghan War of 1878–80, and was present at the engagement at Ali Kheyl (mentioned in despatches; brevet of Lieut.-Colonel and medal). Served in the Burmese Expedition in 1885–86 in command of the line of communications (mentioned in despatches; medal with clasp).

Major H. Crofton, whose death occurred suddenly at Shoeburyness, on 8th January, 1893, joined the Regiment as Lieutenant, 10th July, 1867; became Captain, 1st January, 1879, and Major, 1st October, 1884. He served in the Abyssinian Campaign, 1868 (medal).

DIARY OF FIXTURES.

FEBRUARY.

Day of the Mth.	Wk.	Regimental.	Cricket, &c.	Private.
1	W	... ...	... ...	... ...
2	Th	... ...	... ...	... ...
3	F	... ...	... ...	... ...
4	S	... ...	... ...	... ...
5	S	... ...	... ...	... ...
6	M	... ...	... ...	... ...
7	T	... ...	... ...	... ...
8	W	... ...	... ...	... ...
9	Th	... ...	... ...	... ...
10	F	... ...	... ...	... ...
11	S	... ...	... ...	... ...
12	S	... ...	... ...	... ...
13	M	... ...	.. ...	... ...
14	T	... ...	... ...	... ...
15	W	Ash Wednesday.	... ...	... ...
16	Th	... ...	... ...	... ...
17	F	... ...	... ...	... ...
18	S	... ...	... ...	... ...
19	S	... ...	... ...	... ...
20	M	... ...	... ...	... ...
21	T	... ...	... ...	... ...
22	W	R.A. Band Concert at 3 p.m.	... ...	... ...
23	Th	... ...	... ...	... ...
24	F	... ...	... ...	... ...
25	S	... ...	... ...	... ...
26	S	... ...	... ...	... ...
27	M	... ...	... ...	... ...
28	T	... ...	... ...	... ...

MARCH.

1	W	R.A. Band Concert at 3 p.m.	... ...	... ...
2	Th	... ...	... ...	... ...
3	F	... ...	... ...	... ...
4	S	... ...	... ...	... ...
5	S	... ...	... ...	... ...
6	M	... ...	... ...	... ...
7	T	... ...	... ...	... ...
8	W	R.A. Band Concert at 3 p.m.	... ...	... ...
9	Th	... ...	... ...	... ...
10	F	... ...	... ...	... ...
11	S	... ...	... ...	... ...
12	S	... ...	... ...	... ...
13	M	... ...	... ...	... ...
14	T	... ...	... ...	... ...
15	W	R.A. Band Concert at 9 p.m.	... ...	... ...
16	Th	... ...	... ...	... ...
17	F	... ...	... ...	... ...
18	S	... ...	... ...	... ...
19	S	... ...	... ...	... ...
20	M	... ...	Lincoln Races begin.	... ...
21	T	... ...	... ...	... ...

MARCH.—*Continued*

Day of the Mth	Wk.	Regimental.	Cricket, &c.	Private.
22	W	R.A. Band Concert at 3 p.m.	... ...	... ...
23	Th	... ...	Liverpool Races begin.	... ...
24	F	... ...	Grand National.	... ...
25	S	... ...	... ...	... ...
26	S	... ...	... ...	... ...
27	M	... ...	... ...	... ...
28	T	... ...	... ...	... ...
29	W	R.A. Band Concert at 9 p.m.	... ...	... ...
30	Th	... ...	... ...	... ...
31	F	Good Friday.	... ...	... ...

APRIL.

1	S	... ...	... ...	... ...
2	S	Easter Day.	... ...	... ...
3	M	Bank Holiday.	... ...	... ...
4	T	... ...	... ...	... ...
5	W	R.A. Band Concert at 3 p.m. Firemasters' Course begins.	Kempton Park Races begin.	... ...
6	Th	... ...	... ...	... ...
7	F	... ...	... ...	... ...
8	S	... ...	... ...	... ...
9	S	... ...	... ...	... ...
10	M	... ...	... ...	... ...
11	T	... ...	Epsom Spring Meeting begins	... ...
12	W	R.A. Band Concert at 3 p.m.	... ...	... ...
13	Th	... ...	Sandown Park Races begin.	... ...
14	F	... ...	... ...	... ...
15	S	Long Course leaves Woolwich	.. ...	... ...
16	S	... ...	... ...	... ...
17	M	... ...	... ...	... ...
18	T	... ...	Newmarket Craven Meeting begins.	... ...
19	W	R.A. Band Concert at 9 p.m.	... ...	... ...
20	Th	... ...	... ...	... ...
21	F	... ...	R.A. *v.* R.E. Racket and Billiard Matches, at Woolwich.	... ...
22	S	... ...	R.A. *v.* R.E. Racket and Billiard Matches, at Woolwich.	... ...
23	S	... ...	... ...	... ...
24	M	... ...	... ...	... ...
25	T	... ...	... ...	... ...
26	W	... ...	... ...	... ...
27	Th	... ...	... ...	... ...
28	F	... ...	... ...	... ...
29	S	... ...	... ...	... ...
30	S	... ...	... ...	... ...

PRÉCIS

AND

TRANSLATION.

"INVALID RUSSE."

No. 165.

DEFENCE OF A HORSE ARTILLERY BATTERY AGAINST CAVALRY.

TRANSLATED BY

MAJOR E. LAMBART, R.A.

The following scheme of self-defence against small bodies of cavalry has lately been practised in the Russian Guard Horse Artillery.

Every Horse Artillery gun has a detachment of nine men, of whom six are active numbers and three horse-holders. In moments of emergency (such as a cavalry attack) three numbers only are left with the gun, viz., a layer, a loading number, and a firing number. The other three numbers double to their horses, take them from the horse-holders, and mount. The horse-holders give the led horses on their right side to the lead centre and wheel-drivers respectively. This leaves six mounted men per gun free, or 36 in all; to these are added the six serrafile N.-C.O's., making 42. One of the battery officers previously told off takes command of the troop thus formed, which is placed on the threatened flank of the battery. When the enemy is within 30 to 40 paces of the battery the last round is fired, and the limbers move at a gallop and form at close interval to each other between the guns. The troop, formed as above, acts against the enemy attacking on the flank.

Note.—The above scheme will, I fear, be rather horrifying to those officers who hold with Prince Kraft that well-served guns can always drive away cavalry. Considering, however, that accidents do happen, and that a very few of the enemy's cavalry could "make hay" in a battery if they got there, it seems a pity that our drill-book does not contemplate any scheme of self-defence at close quarters.

NOTES

FROM

CORRESPONDING MEMBERS.

INDIA.

THE MURIDKI CAMP.

SPEECH BY LORD ROBERTS.

AFTER witnessing the manœuvres at the Muridki Camp, the Commander-in-Chief delivered an interesting address to the Royal Artillery. He said:—As this is the last opportunity I shall have of addressing the Royal Artillery at a practice camp in India, I should like to include in my remarks all branches of the Regiment. Commencing then with you, soldiers of the Royal Horse and Field Artillery, present or absent, I must tell you the satisfaction it has afforded me to note the general improvement in shooting, as shown by the figure of merit, which amounted to ·555 last season as against ·486 the previous year. This is due in part to your understanding the 12-pr. gun better, but also in a great measure to the admirable manner in which all ranks have worked. The Horse Artillery in particular have gone a long way up the list, and this year I am glad to find there is a still further improvement. This is especially gratifying to me after the warning I felt myself obliged to give when I last addressed you. I trust that this improvement will continue, and that in addition to being able to shoot with greater accuracy, you will strive to shorten the time now required to come into action. This is all important, for, as I have said before, the Artillery which soonest brings effective shrapnel fire to bear on its adversary will gain an advantage, the value of which it is impossible to over-estimate. Since last year we have been endeavouring to get rid of the common shell for the 12-pr. batteries, on the assumption that it is comparatively harmless against troops and quite useless as a portable mine for the destruction of earthworks, and that at all reasonable distances the burst of shrapnel can be observed with sufficient exactness to admit of ascertaining the range. The advantage of having but one projectile in a battery will be appreciated by all artillerymen, and, I believe, being able to fire throughout with shrapnel, will add considerably to the fighting efficiency of the Royal Regiment. The change will assuredly be introduced before long, but financial exigencies necessitate our continuing to use for the present a certain proportion of common shell. I hope, too, that we shall have in the near future a gun better fitted for Horse Artillery than the present 12-pr., which, splendid gun as it is, is too heavy for rapid movement. Its defects are being carefully inquired into by the authorities at home, who have informed me that they are very confident of being able to provide us with a gun which will be in all respects suited for Horse Artillery. Now, for the Garrison Artillery. Since I last addressed you in December, 1889, many of the measure I then considered desirable have been carried out. All the new breech-loading guns, heavy and medium, together with the quick-firers and machine guns, have been mounted at Aden and Bombay, as have the 6-inch and quick-firers at Kurrachee and Calcutta, while the heavy guns for the two last-named places have been received and are

about to be mounted. As I anticipated, a considerable difficulty was at first experienced in working this heavy ordnance, but the special knowledge, skill, and attention which modern armaments demand from those who would get full value from scientific appliances have not been wanting, and I am glad to think that the Garrison Artillery are proving themselves equal to the occasion. I wish I could announce that the same progress has been made in the supply of rifled guns and howitzers for Heavy Batteries and Siege Trains, but various reasons, into which I need not enter here, have prevented their issue. The chief difficulty has been in the manufacture of a suitable carriage. The home authorities, however, are sanguine of being able to overcome this difficulty, and I trust it will not be long before breech-loading ordnance is received. When the new guns, etc., come out, the Government of India have sanctioned their being kept at Roorkee with elephant and bullock transport complete, so that the Garrison Artillery will have an opportunity, not only of shooting with them, but what is almost equally necessary, of moving them about the country. With regard to shooting, I am glad to congratulate the Garrison Artillery on the fact that for my prize, open to all Batteries and Companies serving in Bengal, four Garrison Companies head the list, the average figure of merit of this branch of the Regiment this year being ·661 against ·527 last year. This is very satisfactory, and shows that the greater amount of leisure the Garrison Artillery have, as compared with Horse and Field Artillery, is judiciously spent in laying and practising gun-drill and handling ammunition. I earnestly hope that the Garrison Artillery will endeavour to accelerate the service of the guns, which I consider now to be the most important requirement; if it be true that during siege operations fire should be deliberate, it must be remembered that the contrary is the case in coast defence. During a naval attack on a port, the enemy's ships will advance at their utmost speed in order to try and run past the batteries. The only way, therefore, in which they can be stopped is by a combination of rapidity in serving the guns and accuracy of fire, which can only be attained by constant drill and practice; therefore, for Garrison as for all other branches of the Artillery, I must insist on what I have urged on former occasions, that it is necessary to quicken up the work of loading, laying, fixing of fuzes, and handling of ammunition and stores, if success is to be obtained in the very difficult task of repelling with heavy ordnance an enemy's attack on a port. The competitive practice on which the figure of merit has hitherto been calculated was mere shooting at a fixed single target by individual layers; most Batteries and Companies have now attained a sufficient proficiency to justify *fire discipline* being included in the competition, and prizes are being given for success in firing at dummies placed so as to represent service formations. A new scheme accordingly has been formulated for this year's practice, by which shooting prizes will be allotted to Batteries and Companies instead of to individuals, and in future Batteries and Companies will only compete against those armed with similar guns. A new and important feature is that Coast Defence Companies will fire with 6-inch breech-loading guns over sea ranges, and so gain very valuable experience in the management of these complicated pieces. Soldiers of the Royal Artillery, I have thought it might interest you to hear what I have to say as to how the several questions intimately connected with your armaments and efficiency are progressing. You may possibly remember my expressing a hope, when I addressed you last year, that some officer of the Regiment would undertake the task of compiling a history of artillery combats. My suggestion met with the response I anticipated, and the last few numbers of the "Proceedings" of the Royal Artillery Institution contain most interesting papers on the "Achievements of Field Artillery," by Major E. S. May. These papers are well worth reading, as they show what tremendous effect guns have had in wars of the past whenever they were properly served, even when only round shot and common shell were used; I have no sort of doubt that our Artillery will have a still

great effect in the future, considering the extraordinary improvement made in recent years both in guns and projectiles, and now that I have seen the way in which officers, non-commissioned officers and men have responded to the call I made upon them for a higher standard of shooting and fire discipline, the improvement in these respects during the seven years of my command in this country has been thoroughly satisfactory, and what is equally satisfactory is that it has not been made at the expense of the turn-out of guns or horses, or of the general smartness on parade and in quarters, for which the Royal Regiment of Artillery is so justly celebrated. This marked advance is mainly due to the exertions of Major-General Nairne, late Inspector-General of Artillery, whose unfailing tact and energy, and quite exceptional knowledge of all Artillery subjects enabled him to be of the greatest assistance to me. General Nairne has lately been succeeded by General Lewes who will, I am sure, continue the good work which his predecessor so ably began. Soldiers, farewell; it is not one of the least of my regrets on leaving India to have to say this word to my own famous Regiment. I shall always remember the willing and cheerful manner in which you all have worked under my command, and I am not likely to forget the splendid body of men I see before me for the last time. I am confident that, whatever duty you may be called upon to perform, or whatever enemy you may have to meet, I shall always hear that the Royal Artillery in India have upheld their high reputation and done honour to the Regiment to which we are all so proud of belonging.

DOVER.

The following changes in officers have occurred since last "Notes." Major N. Maxwell has assumed command of the 17th Siege Train Company, Captain H. H. Rich has joined from I.W.S. Mauritius, in place of Captain Douglas; Lieut. Parker has left for St. Lucia, and Lieut. James has joined the Depôt in his place. Captain Rickman has been struck off the strength on being placed on half-pay.

The Mess has been enriched lately by the presentation of engravings of two former Colonels-on-the-Staff, in response to an appeal of the Mess Secretary, who is trying to secure portraits of all former Officers Commanding R.A., since Colonel Burke-Cuppage's time, in 1861; these two are of General Gibbon, C.B., who commanded here from 1872 to 1877, presented by himself, and the other is of the late Colonel C. B. Brackenbury, who commanded here from 1886 to 1887, presented by General Brackenbury, C.B., Member of Council, Calcutta.

The Regimental paper of the 27th, "The Sprig of Shillelagh," has the following:—"A most enjoyable dance was given by the Gunners at the R.A. Mess, Castle, on January 13th. The arrangements were very good, the supper excellent, and a special word of praise must be given to the sitting-out places. Dancing took place in the Mess-room, which was decorated with flowers, and the Woolwich Band, perfect as to time and tune, as usual, was hidden at one end of the room by a screen of plants and greenery, which had a very pretty effect. The programme comprised no less than four *Pas de Quatres*, always a great feature in Dover ball-rooms. Dancing was kept up with great spirit till two o'clock, and the hosts are to be congratulated on a thoroughly successful evening."

THE ROYAL ARTILLERY MEETING, 1893,

WILL TAKE PLACE AT

ALDERSHOT

(By Permission of the Lieutenant-General Commanding the Division),

ON

SATURDAY, 8TH APRIL

(UNDER NATIONAL HUNT RULES.)

STEWARDS.

MAJOR-GENERAL A. H. KING, R.A.
LIEUT.-COLONEL R. H. WALLACE, R.A.
MAJOR F. W. J. EUSTACE, R.H.A.
MAJOR A. H. CARTER, R.A.
LIEUTENANT H. L. POWELL, R.H.A.

Clerk of the Course & Stakeholder ... LIEUT.-COLONEL S. H. TOOGOOD.
Clerk of the Scales and Judge ... ... MR. E. S. BROWN.
Starter ... ... MAJOR M. BOWERS (*5th Dragoon Guards*).
Handicapper ... ... MR. R. I'ANSON.

R.A. REGIMENTAL RACES.

The Royal Artillery Gold Cup value **100** sovs., with **50** sovs. to the winner, **20** sovs. to the second, and **10** sovs. to the third. For horses that have never won a Steeplechase value 90 sovs., the property of, and to be ridden by, Officers on full or half-pay of the Royal Artillery, and which have been regularly hunted during the past season by their nominators or by some other Officer qualified to enter. 12 st. each. The winner of any Steeplechase (Regimental races under 90 sovs. in value excepted) to carry 7 lb. extra; of two Steeplechases, or of one value 50 sovs, 14 lb. extra. Entrance 2 sovs., but free for starters except the winner. 3 miles.

The Welter Steeplechase of **50** sovs., with **10** sovs. to the second, and **5** sovs. to third. For horses (not thoroughbred), the property of, and to be ridden by, Officers on full or half-pay of the Royal Artillery, or Officers who have retired from the Regiment, which have been regularly hunted during the past season by their nominators or by some other Officer qualified to enter, and have never won a race of any description. 13 st. 7 lb. each. Entrance 1 sov., but starters free except the winner. 2½ miles.

The Light Weight Steeplechase of **50** sovs., with **10** sovs. to the second, and **5** sovs. to the third. For horses (not thoroughbred), the property of, and to be ridden by, Officers on full or half-pay of the Royal Artillery, which have been regularly hunted during the past season by their nominators or by some other Officer qualified to enter, and have never won a race of any description. 11 st. 7 lb. each. Entrance 1 sov., but starters free except the winner. 2½ miles.

Special Conditions for the above Three Races.

The Stewards reserve to themselves the right to refuse the entry of any horse that in their opinion, has not been regularly and fairly hunted.

Officers who have never won a contested Steeplechase or match (under National Hunt or Irish National Hunt Rules), other than a Regimental race, will be allowed 5 lb.

And Three Open Races.

ENTRIES to close to Messrs. WEATHERBY, Messrs. PRATT & Co., or Lieut.-Colonel TOOGOOD, Kings Worthy, Winchester, on TUESDAY, 21st March.

In all races except where specially mentioned, eight Entries to be made, or the race may be declared void.

The whole of the added money will be given for two starters, but one half for a walk over.

There are 50 good loose boxes at the Farnborough Commission stables, adjoining the QUEEN'S HOTEL, NORTH CAMP, FARNBOROUGH, *the charge for which will be* 5/- *per day, including hay and straw. Application should be made to* MR. F. SPICER. *Telegraphic Address* "SPURS," FARNBOROUGH, HANTS.

AT the Annual General Meeting of the R.A. Institution the Committee intend to propose the following additions to the Rules, viz. :—

To Rule I. to add after "£1 "—"Gentlemen who have qualified and are recommended for commissions in the Royal Artillery may forthwith become members on the same terms as Second Lieutenants."

In Rule II., after the words "Garrison and neighbourhood," to insert—"or such gentlemen connected with naval and military arts and sciences as they from time to time think fit."

OWING to unavoidable causes the dates of the R.A. *v.* R.E. Inter-Regimental Racket and Billiard Matches must be changed, and they will now probably be fixed for Friday and Saturday, the 14th and 15th April.

ROYAL ARTILLERY DINNER CLUB.

RULES.

OFFICERS of the Royal Artillery on full or half-pay, can become annual subscribers at the rate of five shillings per annum, under the following conditions :—

(*a*) On joining the Regiment.

(*b*) If a Subaltern, by payment of five shillings for every year of service up to five years, which shall be the maximum number of years subscription chargeable to officers of that rank on joining.

(*c*) If a Captain, by payment of six years subscriptions.

(*d*) If a Major, by payment of seven years subscriptions.

(*e*) If a Lieut.-Colonel, by payment of eight years subscriptions.

THE subject for the Duncan Gold Medal Prize Essay, 1893, is "The Attack of a Coast Fortress."

Attention is called to the Rules for Prize Essays printed at the end of the Rules R.A.I., and Officers are asked to be careful in posting their Essay intended for competition in time to reach the Secretary on or before the 1st of April.

Any member who wishes can receive, at the cost of stitching and binding, about 3s., a copy of the "Cleaveland Notes on the Early History of the Royal Regiment of Artillery. A.D. 1267—1757."

In order to bring the already existing printed Records of the R. M. Academy up to date, it has been found that there will be a much larger amount of letter-press to be added than was at first anticipated. In consequence of this it has become necessary to raise the estimated price per copy from 12s. 6d. to 15s.

Any Officer who may wish for a copy is requested to send his name and address to the Secretary, R.M.A., Woolwich.

Copies of examination papers in subjects (*c*), (*d*), and (*e*) are on sale at the R.A.I. The last sets comprise questions set in four examinations ending May, 1891. Price, Lieutenants (*c*), (*d*), and (*e*), 1s.; Captains, (*c*) and (*d*), 9d.

The Committee will be glad to receive from any Member the name of such books as he may think desirable for purchase for the R.A.I. Library.

The following works are now on sale at the R.A. Institution and will be forwarded post free at the prices noted after their titles below :—

Major-General Stubbs's "List of Officers of the Bengal Artillery," price 5s. 3d.

"Field Artillery Fire," by Captain W. L. White, R.A., price 1s. 2d.

"Notes of Lectures on Artillery in Coast Defence," by Major A. C. Hansard, R.A., price 1s. 2d.

"Ranging Note-Book," by Captain S. W. Lane, R.A., price 1s. 1d.

If any officer has a copy of No. 2, Vol. XIX., R.A.I. "Proceedings," December, 1891, that he can spare, the Committee will be glad to give him the full price of 2s. 6d. for it, if he will send it, at once, to the Secretary R.A. Institution, Woolwich.

R.A.I. "DUNCAN" PRIZE ESSAY, 1893.

The Secretary has received an essay bearing the motto :—

"Per mare per terram."

OBITUARY.

Major-General G. H. Vesey, retired list, Royal Artillery, died on the 29th January, aged 68 years. He served in the Crimean Campaign from March, 1855, including the siege and fall of Sebastopol (medal with clasp and Turkish medal.)

Major H. L. Mackenzie, late Royal (Bengal) Artillery, whose death occurred in December last, was commissioned as Lieutenant on 10th June, 1859; became Captain, 25th September, 1872; and retired with the honorary rank of Major, 30th April, 1880.

Major W. N. Perssé, late Royal Artillery, who died in London, on 11th February, 1893, joined the Regiment as Second Lieutenant on 28th February, 1855, became Lieutenant, 1st April, 1855; 1st Captain, 1st June, 1862; 2nd Captain, 2nd December, 1871, and Major, 11th November, 1874; was placed on temporary half-pay, February, 1875, and commuted, 7th May, 1877.

DIARY OF FIXTURES.

MARCH.

Day of the Mth.	Wk	Regimental.	Cricket, &c.	Private.
1	W	R.A. Band Concert at 3 p.m.		
2	Th			
3	F			
4	S			
5	S			
6	M			
7	T			
8	W	R.A. Band Concert at 3 p.m.		
9	Th			
10	F			
11	S			
12	S			
13	M			
14	T			
15	W	R.A. Band Concert at 9 p.m.		
16	Th			
17	F			
18	S			
19	S			
20	M		Lincoln Races begin.	
21	T			
22	W	R.A. Band Concert at 3 p.m.		
23	Th		Liverpool Races begin.	
24	F		Grand National.	
25	S			
26	S			
27	M			
28	T			
29	W	R.A. Band Concert at 9 p.m.		
30	Th			
31	F	Good Friday.		

APRIL.

1	S			
2	S	Easter Day.		
3	M	Bank Holiday.		
4	T			
5	W	R.A. Band Concert at 3 p.m. Firemasters' Course begins.	Kempton Park Races begin.	
6	Th			
7	F			
8	S		R.A. Races at Aldershot.	
9	S			
10	M			
11	T		Epsom Spring Meeting begins	
12	W	R.A. Band Concert at 3 p.m.		
13	Th		Sandown Park Races begin.	
14	F		R.A. *v.* R.E. Racket and Billiard Matches, at Woolwich.	
15	S	Long Course leaves Woolwich	R.A. *v.* R.E. Racket and Billiard Matches, at Woolwich.	

APRIL.—*Continued.*

Day of the Mth.	Wk.	Regimental.	Cricket, &c.	Private.
16	S	... ...	... ...	... ...
17	M	... ...	... ...	... ...
18	T	... ...	Newmarket Craven Meeting begins.	... ...
19	W	R.A. Band Concert at 9 p.m.	... ...	... ...
20	Th	... ...	... ...	... ...
21	F	R.A. Band Concert at St. James's Hall.	... ...	... ...
22	S	... ...	... ...	... ...
23	S	... ...	... ...	... ...
24	M	... ...	... ...	... ...
25	T	... ...	... ...	... ...
26	W	... ...	... ...	... ...
27	Th	... ...	... ...	... ...
28	F	R.A. Band Concert at St. James's Hall.	... ...	... ...
29	S	1st Div. R.H.A. (Aldershot) arrives at Shoeburyness, and 1st Div. Course Western Forts begins, and 1st Div. Course at Lydd begins.	... ...	... ...
30	S	... ...	... ...	... ...

MAY.

1	M	... ...	... ...	... ...
2	T	... ...	Newmarket 1st Spring Meeting begins.	... ...
3	W	... ...	R.A. Woolwich *v.* R.N. College, at Blackheath.	... ...
4	Th	... ...	... ...	... ...
5	F	... ...	... ...	... ...
6	S	... ...	R.A. Woolwich *v.* Royal Fusiliers.	... ...
7	S	... ...	... ...	... ...
8	M	... ...	... ...	... ...
9	T	... ...	... ...	... ...
10	W	... ...	R.A. Woolwich Officers *v.* N.C. Officers.	... ...
11	Th	1st Div. F.A. (Aldershot) arrives at Shoeburyness.	... ...	... ...
12	F	... ...	... ...	... ...
13	S	1st Div. F.A. (Ipswich) arrives at Okehampton.	R.A. Woolwich *v.* Shoebury, at Shoebury.	... ...
14	S	... ...	... ...	... ...
15	M	... ...	... ...	... ...
16	T	... ...	Newmarket 2nd Spring Meeting begins.	... ...
17	W	... ...	... ...	... ...
18	Th	... ...	... ...	... ...
19	F	... ...	... ...	... ...
20	S	1st Field Gunnery Course at Okehampton begins.	R.A. Woolwich *v.* Blackheath, at Woolwich.	... ...
21	S	Whit Sunday.	... ...	... ...
22	M	Bank Holiday.	R.A. Woolwich *v.* R.A. Portsmouth, at Woolwich.	... ...
23	T	... ...	... ...	... ...
24	W	2nd Div. Course Western Forts begins.	... ...	... ...
25	Th	2nd Div. F.A. (Weedon) arrives at Shoeburyness.	... ...	... ...
26	F	... ...	R.A. *v.* Aldershot Division, at Aldershot.	... ...
27	S	... ...	R.A. *v.* Aldershot Division, at Aldershot.	... ...
28	S	... ...	... ...	... ...
29	M	... ...	... ...	... ...
30	T	... ...	Epsom Summer Meeting begins.	... ...
31	W	... ...	The Derby.	... ...

JUNE.

Day of the Mth.	Wk.	Regimental.	Cricket, &c.	Private.
1	Th	... ...	... ...	... ...
2	F	... ...	The Oaks.	... ...
3	S	... ...	R.A. Woolwich *v.* R.A. Sheerness, at Woolwich.	... ...
4	**S**	... ...	... ...	... ...
5	M	... ...	... ...	... ...
6	T	... ...	... ...	... ...
7	W	2nd Div. F.A. (Aldershot) arrives at Okehampton.	R.A. *v.* Free Foresters, at Woolwich.	... ...
8	Th	... ...	R.A. *v.* Free Foresters, at Woolwich.	... ...
9	F	... ... **REGIMENTAL DINNER.**		... ...
10	S	Long Course joins at Lydd, and 2nd Div. Course at Lydd begins.	R.A. *v.* Shoebury, at Woolwich.	... ...
11	**S**	... ...	... ...	... ...
12	M	... ...	... ...	... ..
13	T	... ...	Ascot begins.	... ...
14	W	... ...	... ...	... ...
15	Th	... ...	... ...	... ...
16	F	... ...	R.A. *v.* R.E., at Woolwich.	... ...
17	S	2nd Div. R.H.A. (Woolwich) arrives at Shoeburyness.	R.A. *v.* R.E., at Woolwich.	... ...
18	**S**	... ...	... ...	... ...
19	M	3rd Div. Course Western Forts begins.	R.A. *v.* R.M.A., at R.M.A., Woolwich.	... ...
20	T	... ...	R.A. *v.* R.M.A., at R.M.A., Woolwich.	... ...
21	W	... ...	... ...	... ...
22	Th	... ...	... ...	... ...
23	F	... ...	R.A. *v.* Household Brigade, at Chelsea.	... ...
24	S	Long Course joins at Okehampton.	R.A. *v.* Household Brigade, at Chelsea.	... ...
25	**S**	... ...	... ...	... ...
26	M	... ...	... ...	... ...
27	T	... ...	... ...	... ...
28	W	... ...	R.A. *v.* Greenjackets, at Woolwich.	... ...
29	Th	... ...	R.A. *v.* Greenjackets, at Woolwich.	... ...
30	F	3rd Div. F.A. (Woolwich) arrives at Shoeburyness.	... ...	... ...

NOTES

FROM

CORRESPONDING MEMBERS.

EDINBURGH.

The letter from this Corresponding Member in February has elicited the following notes on similar Cavalry experiments in Austria and Italy, the former by Major E. S. May, R.A., the latter by Colonel C. E. S. Scott. R.A.

Major May says:—When in Vienna two years ago I was much interested in the system in vogue in the Austrian Cavalry, and it appeared to answer perfectly. On my first visit to a Cavalry barracks I was astonished to find the troop horses standing in beds of straw, in some cases almost up to their hocks, blanketed, and in the kind of luxury we are accustomed to see hunters enjoying in this country. On enquiry I was told that the ration of straw was slightly smaller than it is with us, and that the quantity of bedding was great, because little was ever removed. The bottom of a stall consisted of a layer, I think about 6 inches deep, of charcoal and sand, all the urine drained away through this, and there was no smell, and no sign of moisture or dirt. The Edinburgh correspondent speaks of "a little platform of dirty bedding . . . . from which, when trodden on, a certain amount of moisture exuded." I can assure him that the state of the case in Austria was very widely different from this. I unfortunately cannot lay my hand on the notes which I made at the time as to the exact quantity of straw allowed, or of the precise composition of the substratum of charcoal and sand beneath, but I remember that the ration was smaller than is ours, and that the comfort of the Austrian horses was immensely greater than what the "hairy" experiences here. The blankets were folded under the saddles, which were unstuffed, when the horse was ridden. The greatest care was taken to pick up every atom of dung from the straw as it fell, and the stablemen on duty were continually busy at this work. As the urine all drained away through the substratum, and the dung was all picked up, the horse lay on a dry, clean bed, and the blankets showed very little signs of dirt. I doubt whether in our service, until we persuade a different class to enlist, we can ever hope to arrive at the same state of things. The Austrian trooper is by nature and habits more frugal minded, methodical, and painstaking than is ours, and will carry out a system, such as I have described, more thoroughly and intelligently than most of the men we have to deal with, unless they are very closely supervised, are likely to do.

Colonel Scott says :—Observing amongst the "Notes" for February last some remarks by a Member at Edinburgh on the system of allowing stable bedding to remain for a time without being removed, and as I have had some personal experience on the subject, I beg to submit a few observations :—

1.—When I was 2nd Captain of the Riding Troop (1865-7) under Captain A. M. Calvert we tried the experiment. Captain Calvert had, I think, heard that the Cavalry of some foreign army had adopted the plan with success. He therefore obtained permission to give it a trial.

One stable in the West Rear Range was used, and the experiment was continued for some six weeks with considerable success, except when the day arrived for removing the litter, and then the stench was frightful—the men could only remain in the stable for about 10 or 15 minutes at a time, as the exhalations from the pent up ammonia affected their eyes.

About a week from the commencement of the trial a good soft bed was established which continually increased in thickness till at the end of the time it must have been over a foot in depth. The stableman was enjoined to remove the droppings as they fell, in baskets which were provided for the purpose. Of course, at night this could not be done, but no difficulty was experienced in keeping a clean bed. At "litter down" the day's ration of clean straw was shaken down on top of the permanent bed, and the horses got up in the morning quite as clean as when littered down in the usual way.

As regards eating their litter, I think under *any* system it is a mistake to put the clean straw too much to the front.

When a Battery C.O. my orders were to keep the clean straw well to the rear, out of reach of the horse. There is no object in putting it far forward, as horses almost always lie down far back (as far in fact as the collar chain allows).

2.—When at Verona, two or three winters ago, I obtained permission to visit the Horse Artillery and Cavalry stables there and found the system of not removing the litter in force. The stables were quite sweet, and the officers assured me they always kept so, and their experience quite agreed with mine of 1866, viz.: No loss of condition, but on the contrary, from the horse having an ample and soft bed, and no bad effects on the feet. However, when the day arrived for removing the permanent bed they said the stench was intolerable.

I now find that the plan had then been but a short time on trial, experiments are indeed still being made, as I found on visiting the Artillery stables here a few days ago, and the "Veterinary Regulations" give most elaborate instructions on the subject, a précis of which I enclose.

3.—When visiting the stables at Rome I found that one of the six batteries of the 13th Regiment of Field Artillery quartered here was experimenting with a thickish layer of charcoal as a foundation. This seemed very successful, the straw remained drier, and the officers said all the stale was absorbed by this means, and the task of removal rendered far less unpleasant.

There is no fixed time for removing the "permanent bed." It is left to Battery C.O's. to decide, and they told me that it was usually removed every 10 or 12 weeks.

The bed was from 4 to 4½ yards from front to rear, so that when a horse reined back to the full length of his rope he might find straw to lie upon. It seems they put down clean straw at odd times when fonnd necessary, not at stable hour only.

I asked with regard to para. 2 of the Regulations* whether they didn't find that the horses' rest at night was disturbed by the stableman walking about with a lantern and removing the dung. The officers said they were so short of men just now (only 6 or 7 per battery available for stables) that they had been obliged to disregard this order lately, but that they quite agreed with me that it was far better to leave the horses alone at night, and that at present the two stablemen per battery simply slept in the stables at night.

The stables were very large and lofty—horses only on one side, as in the stables on the north side of R.H.A. Square at Aldershot.

Para. 2.—*It is the special duty of the stablemen to remove the manure as it falls, either by day or by night, and for this purpose the stablemen should be provided with bull's-eye lanterns, and should use a basket constructed in such a way as to be easily managed. They should be careful not to carry away any straw.

The horses in the Italian Army do not require bails. In the whole of the six batteries I only saw one horse isolated. In one of the batteries I noticed that the beds were poor—the floor showing here and there. On asking how this was, they told me the time for removing the "permanent bed" was at hand, and that for about a week they had been saving up their clean straw to make a good bed on starting afresh.

The ration of straw in the Italian Army is 3·2 kilos = about $7\frac{1}{16}$ lbs. English. The horses are supposed to eat a portion of this, but it is not cut up into "chaff" as with us. The hay ration in quarters is 3·5 kilos = about $7\frac{3}{4}$ lbs. English.

Although I think the system very suitable in Italy, I cannot say I consider it so for our own service (in England), where the stables are, as a rule, far less lofty, and with stalls on both sides of a stable. Greater depth than is usually available in English troop stables is also necessary.

4.—The officers were most kind in showing me everything I wished to see. The harness and appointments are of the "rough and ready" type, no panels to the saddles, the horse blankets being folded up and placed underneath.

The harness in the Mobilisation Stores was all quite new and seemed of very good quality—all black except the saddles. Wheel horses wear collars, the centre and lead use breast harness. The centre horses also wear breechings, so as to be available as wheelers.

The Mobilisation Stores contained everything necessary for bringing the whole Army Corps (Artillery, Cavalry, Infantry, Train, &c.) on to a war footing.

In the barrack-rooms I noticed that every man had his own metal washing basin. These they take down to the stables, and the men are not allowed to return to their rooms until they have washed themselves thoroughly—a plan worthy of adoption by us.

HALIFAX, N.S.

On 20th January the R.A. and R.E. gave an Evening Tobogganing party on the Citadel Hill, instead of on the more usual, but less private site on Collin's Hill. The slide was lit up by a line of torches fixed in the snow, and near the foot was a huge bonfire, close to which the mess establishment dispensed refreshments, including the ever popular hot mulled claret, punch, etc. A great novelty in the entertainment was an ingenious contrivance to save the sliders the labour of dragging their toboggans up the hill; a holdfast was driven in at the top and bottom of the hill to each of which an 8-inch block was secured, through these an endless $2\frac{1}{2}$-inch rope was reeved, a harnessed horse was hooked-in to the rope and went up and down the hill, the toboggans also being hitched to the rope and thus getting pulled up. The system worked well except in one or two cases when some toboggans were nearly "solid drawn" through the block at the top in consequence of their owners paying less attention to them than to their fair partners whom they were escorting up the hill.

On 1st February the R.A. and R.E. gave a sleigh drive round by Dutch Village and the Point Pleasant Park. It was a great success, the night being a bright moonlight one with no wind. Between 30 and 40 sleighs paraded and on the termination of the drive 80 persons sat down to supper in the mess.

Major Brady, Capt. Boileau and Lieut. Elliot have been travelling on short leave in Upper Canada, in couples part of the time, and at other times in "half couples." Collectively and individually they visited Quebec, Montreal, Ottawa, Toronto, Kingston, Hamilton and Niagara.

At Kingston the Royal Military College was seen over and also the School of Instruction of the Permanent Canadian Artillery in the *Tête de Pont* Barracks.*

* Where the hospitality of Colonel Cotton and his officers was enjoyed.

One of our officers was fortunate enough to see a parade of the "A" Battery with their guns on sleighs. They turned out very smartly in marching order under the command of Major Drury, the red busby bags and mufflers giving a dash of colour to the otherwise sombre appearance produced by the black fur caps and dark cloaks against the snowy background. Four guns were paraded, each drawn by four horses, the gunners being mounted on the limber and axle-tree boxes. There were no wagons. The guns are 9-prs. R.M.L., and were mounted on converted patterns of the old Woolwich sleigh, an invention of Major Drury's own, and a great improvement. One sleigh is used for each gun and carriage and one for each limber, the two being connected by the pintail and trail-eye and the whole forming a perfect specimen of what is known in this country as a "bob sleigh." To load the sleighs the gun and limber wheels are removed and their axle-tree arms rested in trunnions, the shafts remain in their proper place. To come into action they unlimber just as with wheels. The disadvantages of the old pattern Woolwich sleigh were that the gun had to be dismounted to be placed on it, the carriage and limber were left behind, and to come into action the horses had to be unhooked, and when in draught the wheelers were racked going over uneven ground by the unnatural angle of the draught (about 35°), and by being too close to the sleigh. With Major Drury's system, if there were a spare sleigh or two following the battery with the wheels loaded on them, the whole battery could be converted from "runners" to "wheels" in a few minutes. On this occasion the "A" Battery went for its drill on the River St. Lawrence, which at that point is a couple of miles broad, and was frozen 2 feet thick with ice over which was about 6 inches of snow. The battery manœuvred at a walk, trot and gallop, unlimbered and fired up the river with live shell, both common and shrapnel properly fuzed, and this with the thermometer at 5° above zero and a wind like a razor, thereby showing that the Canadian artilleryman is made of pretty good stuff.

On 3rd February, Captain Boileau gave a lecture at Montreal, by request of Lieut.-Colonel Cole of the Montreal Garrison Artillery. The subject was "The functions of Modern Garrison Artillery and its training." The lecture was delivered in the Craig-street Drill Shed, in the Montreal Garrison Artillery Armoury, which was tastefully decorated. Major-General Herbert, C.B., Grenadier Guards, Commanding the Militia in Canada, was in the chair, a strong contingent was there from each of the Montreal Militia Regiments, as well as the Garrison Artillery and the Field Battery, and the Press was represented. A *verbatim* report of the lecture was published in the *Canadian Military Gazette*, with a portrait of the lecturer!

On 14th February, Lieut.-Colonel Arthur Hill, C.R.E., was married to Miss Clarkson in St. Luke's Cathedral, Halifax, and on the previous night he was entertained at dinner in the R.A. and R.E. Mess. The wedding was a uniform one. The three bridesmaids were handed out by Major Brady, R.A. (bestman), Lieut. Enthoven, R.E., and Lieut. Elliot, R.A., the remainder of the officers—R.A. on one side of the aisle and R.E. on the other—drew their swords, on the termination of the ceremony, and formed an "arch of steel" for the procession to pass under. The bridegroom was presented with a silver punch bowl as the joint gift of the officers of both the Regiment and the Corps. The whole function was quite a R.A. and R.E. one, and tended to show the good feeling that exists between the two services at this station, and the popularity of Colonel Hill with both.

RAWAL PINDI.

"B" Battery, R.H.A., on Wednesday, 1st February, celebrated the 100th Anniversary of the formation of the Battery.

The General Officer Commanding granted the Battery a holiday; unfortunately, owing to the bad weather, it was necessary to postpone the sports which were fixed for the afternoon, but it was fine enough to allow the Battery to be photographed in Review Order.

At 6 p.m. "Dinner up" was sounded, and after dinner there was a Smoking Concert.

At 9.30 p.m. the Staff-Sergeants and Sergeants gave a Ball in the Sergeants' Mess; at supper Major J. A. Coxhead, commanding "B" Battery, R.H.A., asked all present to join in drinking long life, health, prosperity and many happy returns of the day to "B" Battery, Royal Horse Artillery. In the very happy speech with which he introduced this toast he was able to say he had received many congratulatory telegrams that day, and among them the following from H.E. Lord Roberts, Commander-in-Chief:—"My heartiest congratulations to 'B' Battery, Royal Horse Artillery, on completing the 100th year of its life: may the coming century add to its glory."

To commemorate the anniversary, a piece of plate is being purchased for the Officers' Mess, and any Officer who formerly served in the Battery and who may by accident not have received the circular on this subject is invited to send his subscription to the "B" Battery, R.H.A. Centenary Fund, at Messrs. Cox & Co., 16 Charing Cross.

WOOLWICH.

The R.A. Drag Point-to-Point Races were held on 17th March, near Eltham. The course laid out was nearly four miles; starting in Mr. Godson's field on Shooters' Hill, it ran parallel to the Eltham road till opposite Well Hall Farm, it then turned to the right, crossed the new railway and ran towards Lee; after crossing the brook twice a flag was turned, and the course ran straight back, crossing the Eltham road at Well Hall, and finished in a long meadow occupied by Messrs. Low.

The day, though fine, was very cold; the attendance was good, and the shelter of the Mess tent was much appreciated by the ladies, who came not knowing how bitter was the wind. The enclosure was not, as on the last two occasions, on the top of the Cemetery Hill, but was in a field at the back of the farm buildings close to the winning flag.

Everyone was much pleased at Captain Simpson winning the Garrison Cup, as he had once before come in first in this race and lost by going the wrong side of the winning flag, and run second for it another year.

The only Cup for which there was an exciting finish was the Heavy-Weight, and the result of it was in doubt from the time the first two entered the last field until the winning flag was passed, a distance of over 500 yards; such a finish is rarely seen at a point-to-point meeting.

First race, the Garrison Cup, presented by General A. H. W. Williams:—

Captain G. G. Simpson's Shopette	Owner 1
Captain H. Montgomery-Campbell's Wellesley	Owner 2
Mr. J. C. Wray's Conamur	Owner 0
Mr. W. A. Boulnois's Edith	Owner 0
Major E. C. F. Holland's Chop and Change	Owner 0
Mr. W. C. Staveley's Bacchus	Owner 0

Shopette won easily, Wellesley second.

2nd Race—Light-Weight Cup :—

Major E. C. F. Holland's WILLOUGHBY ..... OWNER 1
Captain E. J. Phipps-Hornby's L'ENFANT PRODIGUE. OWNER 2
Mr. D. R. Coates's BOB ..... Owner 0
Captain C. E. Lawrie's NORAH ..... Owner 0

Willoughby won, with L'Enfant Prodigue second.

3rd Race—The Heavy-Weight Cup :—

Mr. F. A. G. Y. Elton's PAUL ..... OWNER 1
Mr. J. F. N. Birch's THE PRIEST ..... OWNER 2
Mr. F. W. Heath's CAMELOT ..... Owner 0
Mr. A. M. de L. Cowper-Smith's PARKER ..... Owner 0
Mr. G. T. Forestier-Walker's FAIRY ..... Owner 0
Captain A. B. Denne's TIPPLER ..... Mr. W. A. Boulnois 0
Mr. C. Battiscombe's RUFUS ..... Owner 0
Mr. G. H. A. White's MAUD ..... Owner 0

Paul won, with The Priest a good second.

GOLF.

THE annual competition for the "Barron Cigarette Box" and the "Rifle Brigade Cup" took place on Wednesday, 22nd March, a lovely day; with the following results :—

	Gross Tl.	Hndcp.	Nett Tl.
Lieut. A. M. Cayley, R.A.	110	22	88*
Vet.-Capt. F. Raymond	123	35	88‡
Lieut. C. C. Van-Straubenzee, R.A. ...	109	18	91‡
Capt. E. J. Phipps-Hornby, R.H.A. ...	108	15	93
Lieut. T. G. Tulloch, R.A.	100	6	94 } †
Capt. H. Montgomery-Campbell, A.-D.-C.	100	6	94 }
Capt. F. H. Crampton, R.A.	120	22	98
Lieut. T. L. Coxhead, D.-S.-O., R.A. ...	114	12	102
Capt. W. St. P. Bunbury, R.A.	115	12	103
Capt. F. F. Minchin, R.A.	113	10	103
Vet.-Major B. L. Glover	139	35	104
Capt. H. L. Jenkinson, R.A.	123	18	105
Capt. J. T. Johnston, R.A.	135	28	107

Major F. A. Curteis, W. Foord-Kelcey, Esq., and Vet.-Capt. J. Burton made no returns.

*Wins the "Barron Cigarette Box." †Tied for the Rifle Brigade Cup (to be played off). ‡Divide Sweepstakes.

THE R.A. *v.* R.E. Racket and Billiard Matches are fixed to be played at Woolwich, on Monday and Tuesday, the 24th and 25th April.

The matches will probably be played as follows :—

Four-handed Rackets at ... 3 p.m., 24th.
Four-handed Billiards ,, ... 4.30 p.m., 24th.
Single Billiards ... ,, ... 10.0 p.m., 24th.
Single Rackets ... ,, ... 10.30 a.m., 25th.

Officers wishing to witness the matches are requested to give as early notice of their intention as possible to the Hon. Secretary, R.A. Games' Fund, in order that arrangements may be made for rooms and dinner.

At the Annual General Meeting of the R.A. Institution the Committee intend to propose the following additions to the Rules, viz. :—

To Rule I. to add after "£1 "—"Gentlemen who have qualified and are recommended for commissions in the Royal Artillery may forthwith become members on the same terms as Second Lieutenants."

In Rule II., after the words "Garrison and neighbourhood," to insert—"or such gentlemen connected with naval and military arts and sciences as they from time to time think fit."

Any member who wishes can receive, at the cost of stitching and binding, about 3s., a copy of the "Cleaveland Notes on the Early History of the Royal Regiment of Artillery. A.D. 1267—1757."

In order to bring the already existing printed Records of the R. M. Academy up to date, it has been found that there will be a much larger amount of letter-press to be added than was at first anticipated. In consequence of this it has become necessary to raise the estimated price per copy from 12s. 6d. to 15s.

Any Officer who may wish for a copy is requested to send his name and address to the Secretary, R.M.A., Woolwich.

Copies of examination papers in subjects (*c*), (*d*), and (*e*) are on sale at the R.A.I. The last sets comprise questions set in four examinations ending May, 1891. Price, Lieutenants (*c*), (*d*), and (*e*), 1s.; Captains, (*c*) and (*d*), 9d.

The Committee hope to publish a fresh series, comprising those papers set from November 1891 to May 1893.

The Committee will be glad to receive from any Member the name of such books as he may think desirable for purchase for the R.A.I. Library.

The following works are now on sale at the R.A. Institution and will be forwarded post free at the prices noted after their titles below :—

Major-General Stubbs's "List of Officers of the Bengal Artillery," price 5s. 3d.

"Field Artillery Fire," by Captain W. L. White, R.A., price 1s. 2d.

"Notes of Lectures on Artillery in Coast Defence," by Major A. C. Hansard, R.A., price 1s. 2d.

"Ranging Note-Book," by Captain S. W. Lane, R.A., price 1s. 1d.

ROYAL ARTILLERY DINNER CLUB.

The Regimental Dinner will take place on Friday, 9th June, 1893.

Rules.

Officer of the Royal Artillery on full or half-pay, can become annual subscribers at the rate of five shillings per annum, under the following conditions :—

(*a*) On joining the Regiment.

(*b*) If a Subaltern, by payment of five shillings for every year of service up to five years, which shall be the maximum number of years subscription chargeable to officers of that rank on joining.

(*c*) If a Captain, by payment of six years subscriptions.

(*d*) If a Major, by payment of seven years subscriptions.

(*e*) If a Lieut.-Colonel, by payment of eight years subscriptions.

The number of Subscribers is now—

125 on Active List.
142 on Retired List.

The cost of the Dinner this year will be—

Subscribers	£0	16	0
Non-Subscribers	1	15	0

LORD ROBERTS has accepted an invitation to dine at the Regimental Dinner as a Guest, and H.R.H. the Duke of Connaught has been asked to meet him, and has also accepted.

R.A.I. "DUNCAN" PRIZE ESSAY, 1893.

The Secretary has received in addition to the one mentioned in March "Proceedings," Essays bearing the mottoes :—

"Le coût fait perdre le goût."
"Forewarned is forearmed."
"Whosoever commands the sea commands the world itself."
"Experientia docet."
"A hundred cities crown the isle and the broad fields, etc."

and one bearing the motto—

"No man can enter a strong man's house, &c."

which is not accompanied by a sealed envelope.

OBITUARY.

COLONEL J. S. Rothwell, R.A., whose death occurred at Camberly, on 13th March, 1893, joined the Regiment as Lieutenant, 1st July, 1861; became Captain, 10th October, 1874; Major, 1st July, 1881; Lieut.-Colonel, 30th November, 1886, and Colonel, 30th November, 1890. He passed through the Staff College in 1878, at which establishment he was Professor of Staff Duties at the time of his death.

MAJOR C. S. Skipton, R.A. joined the Regiment as Lieutenant on 6th January, 1872, became Captain 30th July, 1881, and Major 17th August, 1888. He died at Mooltan, E.I., on 15th March, 1893.

THE death is announced at Edinburgh, on 23rd March, 1893, of Major-General J. R. Anderson, C.B. (retired R.A.). The deceased officer joined the Regiment on 18th December, 1840, as Second Lieutenant; became Lieutenant, 23rd November, 1841; Second Captain, 30th June, 1848; Captain, 24th February, 1854; Bt.-Major, 12th December, 1854; Lieut.-Colonel, 20th July, 1858; Colonel, 9th July, 1864; and retired with the honorary rank of Major-General, 15th March, 1871. He served during the operations on the Yiang-tse-Kiang, in China, in 1842, including the storm and capture of Chin Kiang Foo; also the demonstration before Nankin (medal). Served in the Eastern Campaign of 1854 and up to July, 1855, including the affairs of Bulganac and M'Kenzie's Farm, battle of Alma, capture of Balaclava and siege of Sebastopol (medal with three clasps, C.B., 5th Class of the Medjidie, and Turkish medal). Served in India in 1857–58, and was at the action of Pandora, where a portion of his troop acted as cavalry; commanded the Artillery of Grant's Division at the capture of Meangunge, also at the siege and capture of Lucknow (four times mentioned in despatches, brevet of Lieut.-Colonel, medal with clasp).

DIARY OF FIXTURES.

APRIL.

Day of the Mth.	Wk.	Regimental.	Cricket, &c.	Private.
1	S	... ...	... ...	... ...
2	**S**	Easter Day.	... ...	... ...
3	M	Bank Holiday.	... ...	... ...
4	T	... ...	... ...	... ...
5	W	R.A. Band Concert at 3 p.m. Firemasters' Course begins.	Kempton Park Races begin.	... ...
6	Th	... ...	... ...	... ...
7	F	... ...	... ...	... ...
8	S	... ...	R.A. Races at Aldershot.	... ...
9	**S**	... ...	... ...	... ...
10	M	... ...	... ...	... ...
11	T	... ...	Epsom Spring Meeting begins	... ...
12	W	R.A. Band Concert at 3 p.m.	... ...	... ...
13	Th	... ...	Sandown Park Races begin.	... ...
14	F	... ...	... ...	... ...
15	S	Long Course leaves Woolwich	... ...	... ...
16	**S**	... ...	... ...	... ...
17	M	... ...	... ...	... ...
18	T	... ...	Newmarket Craven Meeting begins.	... ...
19	W	R.A. Band Concert at 9 p.m.	... ...	... ...
20	Th	... ...	... ...	... ...
21	F	R.A. Band Concert at St. James's Hall.	... ...	... ...
22	S	... ...	... ...	... ...
23	**S**	... ...	... ...	... ...
24	M	... ...	R.A. *v.* R.E. Racket and Billiard Matches, at Woolwich.	... ...
25	T	... ...	R.A. *v.* R.E. Racket and Billiard Matches, at Woolwich.	... ...
26	W	... ...	... ...	... ...
27	Th	... ...	... ...	... ...
28	F	R.A. Band Concert at St. James's Hall.	... ...	... ...
29	S	1st Div. R.H.A. (Aldershot) arrives at Shoeburyness, and 1st Div. Course Western Forts begins, and 1st Div. Course at Lydd begins.	... ...	... ...
30	**S**	... ...	... ...	... ...

MAY.

1	M	... ...	... ...	... ...
2	T	... ...	Newmarket 1st Spring Meeting begins.	... ...
3	W	... ...	R.A. Woolwich *v.* R.N. College, at Blackheath.	... ...
4	Th	... ...	... ...	... ...
5	F	... ...	... ...	... ...
6	S	... ...	R.A. Woolwich *v.* Royal Fusiliers.	... ...
7	**S**	... ...	... ...	... ...

MAY.—*Continued.*

Day of the Mth.	Wk.	Regimental.	Cricket, &c.	Private.
8	M	Position-Finding Class joins the Artillery College.	... ...	... ...
9	T	... ...	... ...	... ...
10	W	... ...	R.A. Woolwich Officers *v.* N.C. Officers.	... ...
11	Th	1st Div. F.A. (Aldershot) arrives at Shoeburyness.	... ...	... ...
12	F	... ...	... ...	... ...
13	S	1st Div. F.A. (Ipswich) arrives at Okehampton.	R.A. Woolwich *v.* Shoebury, at Shoebury.	... ...
14	**S**	... ...	... ...	... ...
15	M	... ...	.. ...	... ...
16	T	... ...	Newmarket 2nd Spring Meeting begins.	... ...
17	W	... ...	... ...	... ...
18	Th	... ...	... ...	... ...
19	F	... ...	... ...	... ...
20	S	1st Field Gunnery Course at Okehampton begins.	R.A. Woolwich *v.* Blackheath, at Woolwich.	... ...
21	**S**	Whit Sunday.	... ...	... ...
22	M	Bank Holiday.	R.A. Woolwich *v.* R.A. Portsmouth, at Woolwich.	... ...
23	T	... ...	... ...	... ...
24	W	2nd Div. Course Western Forts begins.	... ...	... ...
25	Th	2nd Div. F.A. (Weedon) arrives at Shoeburyness.	... ...	... ...
26	F	... ...	R.A. *v.* Aldershot Division, at Aldershot.	... ...
27	S	... ...	R.A. *v.* Aldershot Division, at Aldershot.	... ...
28	**S**	... ...	... ...	... ...
29	M	... ...	... ...	... ...
30	T	... ...	Epsom Summer Meeting begins.	... ...
31	W	... ...	The Derby.	... ...

JUNE.

1	Th	... ...	... ...	... ...
2	F	... ...	The Oaks.	... ...
3	S	... ...	R.A. Woolwich *v.* R.A. Sheerness, at Woolwich.	... ...
4	**S**	... ...	... ...	... ...
5	M	... ...	... ...	... ...
6	T	... ...	... ...	... ...
7	W	2nd Div. F.A. (Aldershot) arrives at Okehampton.	R.A. *v.* Free Foresters, at Woolwich.	... ...
8	Th	... ...	R.A. *v.* Free Foresters, at Woolwich.	... ...
9	F	...	**REGIMENTAL DINNER.**	... ...
10	S	Long Course joins at Lydd, and 2nd Div. Course at Lydd begins.	R.A. *v.* Shoebury, at Woolwich.	... ...
11	**S**	... ...	... ...	... ...
12	M	... ...	... ...	... ...
13	T	... ...	Ascot begins.	... ...
14	W	... ...	... ...	... ...
15	Th	... ...	... ...	... ...
16	F	... ...	R.A. *v.* R.E., at Woolwich.	... ...
17	S	2nd Div. R.H.A. (Woolwich) arrives at Shoeburyness.	R.A. *v.* R.E., at Woolwich.	... ...
18	**S**	... ...	... ...	... ...
19	M	3rd Div. Course Western Forts begins.	R.A. *v.* R.M.A., at R.M.A., Woolwich.	... ...
20	T	... ...	R.A. *v.* R.M.A., at R.M.A., Woolwich.	... ...
21	W	... ...	... ...	... ...
22	Th	... ...	... ...	... ...

JUNE.—*Continued.*

Day of the Mth.	Wk.	Regimental.	Cricket, &c.	Private.
23	F	... ...	R.A. *v.* Household Brigade, at Chelsea.	... ...
24	S	Long Course joins at Okehampton.	R.A. *v.* Household Brigade, at Chelsea.	... ...
25	S	... ...	... ...	... ...
26	M	... ...	... ...	... ...
27	T	... ...	... ...	... ...
28	W	... ...	R.A. *v.* Greenjackets, at Woolwich.	... ...
29	Th	... ...	R.A. *v.* Greenjackets, at Woolwich.	... ...
30	F	3rd Div. F.A. (Woolwich) arrives at Shoeburyness.	... ...	

JULY.

1	S	... ...	... ...	... ...
2	S	... ...	... ...	... ...
3	M	3rd Div. F.A. (Colchester) arrives at Okehampton.	Oxford *v.* Cambridge.	... ...
4	T	... ...	Oxford *v.* Cambridge.	... ...
5	W	... ...	Oxford *v.* Cambridge.	... ...
6	Th	... ...	R.A. *v.* Oxford Authentics, at Woolwich.	... ...
7	F	... ...	R.A. *v.* Oxford Authentics, at Woolwich.	... ...
8	S	2nd Field Gunnery Course at Okehampton begins.	R.A., Woolwich, *v.* Blackheath, at Blackheath.	... ...
9	S	... ...	... ...	... ...
10	M	... ...	R.A. *v.* Harlequins, at Woolwich.	... ...
11	T	... ...	R.A. *v.* Harlequins, at Woolwich.	... ...
12	W	4th Div. Course at Western Forts begins.	... ...	... ...
13	Th	... ...	... ...	... ...
14	F	... ...	Eton *v.* Harrow begins, and R.A. *v.*, R.E. at Chatham.	... ...
15	S	... ...	R.A. *v.* R.E., at Chatham.	... ...
16	S	... ...	... ...	... ...
17	M	... ...	... ...	... ...
18	T	... ...	... ...	... ...
19	W	... ...	R.A. *v.* Eton Ramblers, at Woolwich.	... ...
20	Th	... ...	R.A. *v.* Eton Ramblers, at Woolwich.	... ...
21	F	... ...	... ...	... ...
22	S	3rd Div. Course at Lydd begins.	... ...	... ...
23	S	... ...	... ...	... ...
24	M	... ...	... ...	... ...
25	T	... ...	Goodwood begins.	... ...
26	W	... ...	... ...	... ...
27	Th	... ...	... ...	... ...
28	F	4th Div. F.A. (Shorncliffe) arrives at Okehampton.	... ...	... ...
29	S	Position-Finding Class proceed to Isle of Wight.	R.A., Woolwich, *v.* R.A., Aldershot, at Woolwich.	... ...
30	S	... ...	... ...	... ...
31	M	... ...	R.A. *v.* B.B., at Woolwich.	... ...

PRÉCIS

AND

TRANSLATION.

"REVUE MILITAIRE DE L'ETRANGER."

JULY, 1892.

"THE MILITARY AND NAVAL POWER OF THE UNITED STATES."

TRANSLATED BY

LIEUT.-COLONEL J. H. G. BROWNE, LATE R.A.

In a session of the American Senate, on the 14th February, 1891, one of the members, Mr. Gibson, urged the necessity of placing the organisation of the military forces of the United States on such a footing as would enable the country to make its influence felt outside, and to intervene in general foreign politics. After having expressed the opinion that in order to take up this attitude they must be prepared to assume the offensive whenever the honour of the country demanded it, Mr. Gibson added that, as soon as the Government declared war they would have the whole country at their back, without distinction of political parties. In the further course of his speech he described the American nation as an "ambitious and aggressive people," called attention to the national excitement at the time of the English Extradition Treaty in 1889, and concluded by reiterating his assertion, that if either political party, republican or democrat, declared war, the people would fly to arms at the sound of the first cannon-shot.

As no protest was raised against Mr. Gibson's theories it may be assumed that the desire to make the United States a great military power is a reality; a fact which had already been demonstrated by other circumstances.

The President's message, at the opening of the 51st Congress in 1889, plainly indicated the intention of the Government to take in hand the re-organisation of the military and naval forces. He recommended the strengthening of the fleet, both in men and *matériel*, the establishment of a naval reserve and of a complete system of coast defence, the augmentation of the artillery, &c.; while the Secretary of the Marine Department talked openly of taking the offensive, and made an immediate demand for eight armour-plated cruisers.

At the same time, the proposals made by General Schofield, Commander-in-Chief of the Federal Army, in his report addressed, in 1889, to the Secretary for War, indicated new ideas with regard to the organisation and instruction of the land forces. Until the last few years, the Federal Army had been engaged in

securing the tranquility of the colonies in the far west. Consequently it had been split up into a number of small groups, and its organisation and instruction corresponded to the needs of this special service. But the pacification of the country being now considered as assured, it seemed reasonable to adapt the organisation of the army to the condition of defence against foreign attacks; and with this object in view, General Schofield, in his report, recommended that the infantry regiments should be divided into three battalions of four companies each, that the artillery units should be modified, with a view to adapting this arm to garrison service; that promotion should go on independently in each branch of the army; that examinations should be instituted for officers, and that the pay of non-commissioned officers should be raised, in order to encourage recruiting. The General also recommended an immediate augmentation of 5000 men in the infantry whose strength was 25,000, and an increase of the number of regiments of artillery from five to seven. The total strength of the last arm would have been raised to 84 batteries, viz.: 12 field batteries for general service, and 72 garrison batteries for coast defence. These calculations appear to have been made solely with reference to the defence of the sea coast. It was not considered necessary to erect any fortifications on the Canadian frontier.

General Schofield's propositions were not all agreed to by Congress; but by the end of 1891, thanks to the forethought of the Commander-in-Chief of the Army, seconded by the good-will of the Secretary for War, the organisation of the Federal Army had already undergone numerous and important modifications. By an order of 1890, regimental promotion was substituted for promotion on a general list. In 1891 the system of commands was altered, which enabled General Schofield to push on the reforms which he advocated. With a view to the concentration of the army upon certain points determined by strategical considerations, he withdrew the garrisons from about forty small posts, and formed these hitherto independent units into battalions. He also modified the organisation of the artillery regiments, so as to form a nucleus for the defence of the fortified places. Improvements were also introduced into the system of recruiting, into military law, &c., and new regulations for infantry exercises were published. At the same time the militia were put on as good a footing as possible. With regard to *matériel*, a Special Commission assembled at Springfield to try all the modern patterns of rifles and all the smokeless powders which could be procured. The adoption of a small-bore repeating rifle may be considered as near at hand. The artillery was given a complete armament, consisting of a light gun of 3·2″ calibre, a heavy gun of 3·6″, and a mortar of 3·6″ for field artillery; and of a 5″ gun and a 7″ howitzer for garrison artillery. At the end of 1891 the armament stood as follows:—

3·2″ guns	125	with carriages.
3·6″ „	24	„
3·6″ mortars...	16	„
5″ guns	10	„
7″ howitzers...	10	(carriage under trial).

All these pieces are steel breech-loaders, and their ballistic properties are of the highest character. Nothing is wanting except smokeless powder, which is being carefully sought for.

In accordance with the above measures for improving their military position, the Americans began, in 1890, to organise their coast defence. A plan had been drawn up in 1886, which laid down the principles upon which the system of defence should be based, arranged under several heads.

The different points which a hostile fleet might attack are classed as follows, in order of importance:—

1. The great centres of population and production.
2. The navigation by long sea.
3. The coasting service.

It is assumed that the war fleet will give battle, protect navigation on the high seas, and destroy the enemy's commerce. The coast defence must meet the other needs. For this purpose fixed defences will be required, such as mines and works of fortification; and also movable defences, such as floating batteries and torpedoes. With regard to armament, that of the artillery will consist of steel rifled pieces, comprising 12-inch mortars for plunging fire, 8, 10, 12, 14 and 16-inch guns for direct fire, quick-firing guns and mitrailleuses. Preponderance will be given to plunging fire; the total number of mortars provided being equal to that of all the guns of different calibres put together. The armament of a fortress will always consist of a number of mortars equal to or greater than that of all the other pieces put together, the mortars being from 50 to 75 per cent. and the heavy armour-plated guns from 10 to 20 per cent. of the whole. The remaining pieces would be placed *en barbette*, or mounted separately upon "Eclipse" carriages or upon elevators.

The general plan of defence includes the protection from bombardment of important points by the above-mentioned means, the creation of fortified harbours of refuge, and the organisation of an interior system of maritime communication, which could be utilised during hostilities. It is recommended that 27 places should be fortified, viz.: 18 on the coast of the Atlantic, 3 on that of the Pacific, 5 on the Gulf of Mexico and 1 on the frontier of Canada. The armament proposed comprises about 1300 pieces of ordnance, 150 torpedoes and 6000 mines. The whole expense is estimated at 126,377,800 dollars (about £26,000,000). This plan of defence, although it has not yet been submitted for sanction by the Legislature, has already been carried out to some extent.

By the "Rivers and Harbors Act" of 1890, the number of national ports of refuge was to be raised as soon as possible to six. In accordance also with a Commission which sat in 1890, the "Rivers and Harbors Act" authorised the execution of certain works with a view to the completion of a "second coast line" or "inland water route," which was already partially in existence. The same Act provided for the formation of a ship canal between Buffalo, Chicago and Duluth, so as to furnish a sheltered line of communication throughout the chain of the great lakes, after the manner of the Welland Canal constructed by the English on the southern frontier of Canada. Steps were also taken to counterbalance the influence of England in the neighbourhood of Paget Sound. With this in view, money was voted to improve the water communication in that region generally, and especially to make a canal between Paget Sound and the Lakes Union and Samamish, a position recommended for the establishment of a naval station intended to counteract the English station of Esquimalt.

Although these different improvements belong especially to the question of naval defence, they are important with regard to operations both by land and sea.

In the marine department still greater strides have been made since the appointment of the present Secretary, Mr. Tracy, who demanded the organisation of a fleet of 100 vessels, including 20 ships of the line, 60 cruisers and 20 coastguard ships, and who formed a Commission (the "Board of Naval Policy"), composed

NOTES

FROM

CORRESPONDING MEMBERS.

ALDERSHOT.

ROYAL ARTILLERY RACES.

Stewards: Major-General A. H. King, R.A.; Lieut.-Colonel R. H. Wallace, R.A.; Major F. W. J. Eustace, R.H.A.; Major A. H. Carter, R.A.; Lieut. H. L. Powell, R.H.A. Clerk of the Course and Stakeholder: Lieut.-Colonel S. H. Toogood. Starter: Major M. Bowers (5th Dragoon Guards). Handicapper, Clerk of the Scales, and Judge: Mr. R. I'Anson.

SATURDAY, 8TH APRIL.

For the third year in succession the races have been favoured with lovely weather. Details:—

2.10.—THE ROYAL ARTILLERY GOLD CUP, value 100 sovs., with 50 sovs. to the winner, 20 sovs. to the second, and 10 sovs. to the third; 12 st. each; winners extra. Three miles.

Mr. H. L. Powell's ch g ECLIPSE, aged, 11st. 9lb....CAPT. A. KING 1
Major W. N. Lloyd's b g WEDLOCK, aged, 11st. 9lb...MR. C. O. HEAD 2
Capt. F. C. Johnson's COTSWOLD, aged, 12st. 2lb. .....OWNER 3
Mr. W. A. M. Thompson's SCHOTTISCHE, aged, 11st. 9lb. ...Owner 0
Capt. Dawkins's PILGRIM, aged, 11st. 9lb.....Owner 0
Mr. G. C. Fordyce-Buchan's KATHLEEN, aged, 11st. 9lb.....Owner 0
Mr. E. J. R. Peel's CANDYTUFT, aged, 12st. 2lb. .....Owner 0
Capt. H. G. Ricardo's PLAYBOY, 6 yrs. 11st. 9lb. Mr. W. F. O'Conner 0
Mr. J. C. Kirk's K.C., aged, 11 st. 9 lb. .....Capt. S. Lawless 0

Betting: 7 to 4 against Pilgrim, 7 to 2 against Eclipse, 6 to 1 each against K.C. and Coltswold, and 10 to 1 against any other. Eclipse, followed by Wedlock and Pilgrim, showed the way for a mile, when Pilgrim fell, and Eclipse went on with the lead until the last hurdles, where he was challanged by Wedlock. The latter could never reach the leader, who practically made all the running, and won by two lengths; a bad third. Candytuft was fourth. Schottische fell at the first fence.

3.30.—THE ROYAL ARTILLERY WELTER STEEPLE-CHASE of 50 sovs., with 10 sovs. to the second, and 5 sovs. to the third; 13 st. 7 lb. each with allowances. Two miles and-a-half.

Mr. H. L. Powell's b g COOK, aged, 13 st. 2 lb. ...CAPT. A. KING. 1
Mr. De Prée's BONAVENTURE, aged, 13 st. 7 lb. .....MR. F. ALLEN 2
Major W. H. Darby's PRINCE ARTHUR, 6 yrs., 13 st. 7 lb. CAPT. BARRY 3
Mr. A. Cowper-Smith's PARKER, 6 yrs., 13 st. 2 lb. .....OWNER 4
Capt. H. G. Ricardo's MEXICO, aged, 13 st. 2 lb. Mr. S. W. Blacker 0
Capt. F. A. Elton's PAUL, aged, 13st. 2 lb., (car. 13 st. 6lb. Owner 0
Capt. A. B. Denne's TIPPLER, aged, 13 st. 2 lb. Mr. W. A. Boulnois. 0

Betting: 2 to 1 against Cook, 4 to 1 against Prince Arthur, 5 to 1 against Bonaventure, and 10 to 1 against any other. Parker, Bonaventure, and Cook ran in the order named for half the distance, when Cook took the lead, but was closely pressed by Bonaventure up the straight. The favourite, however, had the best of a good finish, and won by a head; a bad third. Parker was fourth, and Paul last.

4.50.—THE ROYAL ARTILLERY LIGHT-WEIGHT STEEPLE-CHASE of 49 sovs., with 10 sovs. to the second, and 5 sovs. to the third; 11 st. 7 lb. each. Two miles and-a-half.

Mr. S. W. Blacker's br m ENNISCORTHY, 6 yrs. 11 st. 7 lb.
Mr. C. O. HEAD 1
Major W. H. Darby's br g PRINCE ARTHUR, 6 yrs. 11 st. 7 lb.
CAPT. A. KING 2
Capt. H. G. Ricardo's b g PLAYBOY, 6 yrs. 11 st. 7 lb.
MR. W. F. O'CONNER 3
Mr. S. W. Blacker's KATHLEEN, aged, 11 st. 7 lb. .....Owner 0
Mr. G. C. Fordyce-Buchan's JORROCKS, 5 yrs, 11 st. 7 lb. ...Owner 0
Capt. F. C. Johnson's LONGTAIL, aged, 11 st. 7 lb. .....Owner 0
Capt. Morley Knight's MOONLIGHT, aged, 11 st. 7 lb. Capt. Lawless 0

Betting: 3 to 1 each against Playboy and Jorrocks, 4 to 1 against Prince Arthur, 8 to 1 against Enniscorthy, and 10 to 1 against any other.

Prince Arthur, attended by Playboy and Enniscorthy, held the command until the last water, where the latter took the lead, and drawing away as they entered the straight Enniscorthy won by six lengths from Prine Arthur, who was four lengths in front of Playboy. Kathleen was fourth and Moonlight last. Jorrocks refused.

There were also three open races, each of which brought out four or five runners.

EDINBURGH.

MAJOR A. H. C. PHILLPOTTS, R.A., writes:—

As none of the correspondents on the subject of bedding down cavalry horses say anything regarding Germany, I may mention that when visiting the large Military Riding Establishment at Hanover, about three years ago, which I did by the courtesy of General von Krozick who commanded the school, I noticed that all the horses—about 200—used for the instruction of officers and non-commissioned officers, stood on "*matress beds*" as they call them. The bedding simply being allowed to remain for a month or so under the horses without being removed, fresh straw being periodically added. The stables were remarkably clean, sweet and neat, and the frogs of the horses, several of whose feet I picked up, were in perfect order.

The stablemen, who evidently had plenty to do keeping the stables in order, were neatly dressed in clean stable dress with a cotton blouse on.

No men were to be seen in the dirty, nondescript rags so familiar in the British troop and battery stables. The saddlery not in use was hung up clean and neat, on pegs behind the horses.

The daily allowance of straw was rather less than with us, and I understood that this method of bedding down the horses was neither new nor experimental.

HALIFAX, N.S.

THE past month has been one of departures and farewells. Captain Farmar, R.A., headed the exodus by going home in the mail steamer of 18th March, to join the Inspection Staff at Woolwich, to which he has been appointed from No. 3 Company, Western Division, Halifax.

A big farewell dinner, of forty covers, was given, on 22nd March, in the R.A. and R.E. Mess to Major-General Ryan, R.A., and to Lieut.-Colonel Rolph and the Officers of the 1st Battalion Leicestershire Regiment, which was a very special and festive occasion. Major-General Ryan had just vacated the command of the R.A. in British North America, and left next day for Ireland *viâ* New York. He is the first Colonel-on-the-Staff who has been removed from this station on promotion to Major-General, and so, in addition to the single gun which is always fired here after dinner on the departure of any member of the Mess for good, a salute of 11 guns (models, but noisy) was fired from the Mess verandah by Lieut. Macgowan and the Assistant Instructor-in-Gunnery. The departure of the Leicestershire Regiment for the West Indies in a day or two made the occasion a still more notable one, especially as the relations between the R.A. and R.E. and that Regiment during its two years at Halifax have been, and are, of the most cordial and friendly description; arrangements were made by the hosts to seat every officer in the Regiment who could manage to be present instead of the conventional six or eight. The toasts of the evening were "Major-General Ryan" and "Colonel Rolph and the Officers 1st Leicestershire Regiment," but others followed, and speeches were made by Colonel Hill, R.E., Major-General Ryan, Colonel Rolph, Majors Maycock, Bor, Reader and Brady, and Capt. Boileau, who has known the 17th for 15 years.

On 23rd March the hired transport *Jelunga* arrived from Bermuda with the 1st Battalion King's Regiment for Halifax on board. She is one of the "British India Steam Navigation" line, and is a fine, large, comfortable vessel with a speed of 15 knots.

On March 25th, Major Crookenden, R.A., returned from leave in England, and assumed temporary command of the R.A. in British North America. He is now the senior Major in the Regiment.

It is stated on private authority that Colonel Isaacson has been named to succeed Major-General Ryan as Colonel-on-the-Staff, but he has not joined yet, nor even been gazetted.

On 1st April, Major Waldron, R.A., D.A.A.G., sailed for England in the mail steamer *Sardinian*, in command of a large party of time expired men, invalids and details of various regiments to hand over at Liverpool. On the termination of the duty he will take short leave of absence at home.

On April 4th a farewell dinner was given in the R.A. and R.E. Mess to Lieut.-Colonel Arthur Hill, who is removed from C.R.E. at this station, on completion of five years, and whose departure is much regretted by officers of all ranks of both corps. On April 7th, a large afternoon "at home" was given in the Mess, in honour of Mrs. Hill, and next day "the happy couple" sailed for England in the mail steamer *Labrador*.

ROME.

A CORRESPONDENT writes:—Being in Rome on the King's Birthday (14th March) I availed myself of the opportunity of observing how reviews on such occasions are conducted in Italy. An officer of the artillery, who had been permitted to show Lord Denbigh and myself over the barracks, stables, etc., a short

time before, kindly obtained leave from the Colonel of his regiment (the 13th of Field Artillery) to give me a window in the Artillery Barracks from which to witness the parade. It was held in the "Castro Pretorio," where the cavalry and artillery of the garrison of Rome are quartered. The available space for forming up was as near as possible 220 × 220 yards, or somewhat larger than the R.H.A. Square at Aldershot, and into this space the whole garrison (some 6000 men) was packed. The infantry was drawn up in four lines of company[1] quarter columns.

Battalion in Company Column.

Each regiment is composed of three battalions, and each battalion has four companies of four sections. On the right of each regiment were (1) the pioneers; (2) the bugle band; (3) the band. The cavalry and artillery regiments composed the 5th line—in rear. The 13th Regiment of Field Artillery had six (four-gun) batteries on parade. I went purposely very early (8.30 a.m.) so as to see the regiments arrive, and although the hour fixed for the King's arrival was 10 o'clock, I found that one or two battalions had already marched in. By about 9 o'clock the parade was formed and at 10.15 the King arrived, accompanied by the proverbial "brilliant and distinguished staff." I counted 202, but believe there were a few more! On the arrival of the King a Royal Salute was given, the whole of the troops saluting in the usual way, the bands continuing to play, and the officers and men remaining at the salute for some minutes. The King then rode down the front of each line, inspecting very closely. This took about 20 minutes. He was not (as with us) preceded by a portion of the Staff, but led the way himself. There was no "*feu-de-joie*" or "three cheers." On completion of the inspection the King rode off with his Staff and took up his position in the "Piazza Independencia," just outside the barrack gates. The troops defiled there en route to their respective barracks, the infantry leading, followed by the cavalry and artillery, as is the universal practice in Italy. This is certainly a good plan, as the ground is preserved in better order for those on foot. It was very hot whilst the troops were standing on parade, but only one man fell out—though the men were in an "order" more approaching our "Marching Order" than anything else. In Italy the infantry seem to carry the knapsack[2] in all orders—even recruits wear them at drill as soon as they have got over the "goose step" and other elementary work. I thought the men looked very young (they join at 20), but was immensely surprised to hear afterwards from Colonel Slade (our Military Attaché) that, on an average, each battalion of infantry had 100 men in the ranks (out of the peace establishment of 400) who had only joined on the 1st of March (a fortnight before!) This was certainly a wonderful achievement, and speaks volumes for the barrack-square system. The Field Artillery drivers also had nearly all joined so late as the 1st December, 1892. It seems the conscripts know some time beforehand what regiment or corps they have to join on a certain date, and do all they can to smarten themselves up in anticipation. They all take opportunities to go to their Regimental District Head-quarters (there are some 80 of such in Italy) some time before and get measured for their uniforms, etc. It is, therefore, possible to despatch them to join their regiments the day after they report themselves at the Regimental District Head-quarters.

Except for the regiments of "Alpini," there is no territorial system in Italy. Each regiment contains men from the several Regimental (or Recruiting) Districts.

[1] The formation is called company column, but I have described it as quarter column, there being only six paces between the front rank of one company and front rank of the next.

[2] The hairy French pattern.

The system of having all the recruits to join on one day, of course, much facilitates instruction. On the occasion in question I had an exceptional opportunity of observing the Field Artillery, as the Regiment formed a quarter column of batteries exactly in front of my window, and from that formation moved off in a column of route to the barrack gate. The horses were fairly even but all of a light stamp, the wheel horses more especially so to our eyes. Only the pole horses wear collars, the others "breast harness." "Hand horses" have no pads or saddles, except the off leader, on which a gunner is mounted. The harness is black, as ours was up to 1854. The lead and centre horses have very long traces, those of the latter being attached to the same swingle-trees as the wheelers, whilst the leaders are hooked in (as our centre horses are), viz., to the wheelers. These long traces are kept in their places by passing through several loops on the harness of the pair of horses in rear. All men are "gunners and drivers," as was the case with us until 1854 or 1855. The oldest soldiers are usually employed to drive. All the men wear trowsers and heel spurs (straight).

Officers only (of Field Artillery) wear knee boots, breeches, and hunting spurs.

In the Cavalry and Horse Artillery, the N.-C.O's. and men wear a black leather sort of gaiters (cut to resemble high boots), ankle boots and heel spurs, they are well made and look very like knee boots, and have some advantages over these, especially when on active service, in camp, or on the march.

The Field Artillery have no carbines.

Mounted N.C.O.'s and men (including drivers) of Field Artillery carry revolvers and 18 rounds of ammunition. In Horse Artillery all carry revolvers and 36 rounds of ammunition.

Horse and Field Artillery carry their shells fuzed; percussion detonators to insert when loading are carried seperately. The fuze is a time and percussion, and burns 14 seconds. In the Field Artillery there are five men mounted on the gun carriage, viz.: three on the limber and two on the axle-tree seats. The limber is a fixture and has a back-board, and opens to the rear. The men on the limber wear their swords, these with the heel spurs must be much in their way. Each gun carriage carries four rounds of case, viz.: two on the trail and two under the limber box (one on each side of pole). Spare wheels are carried horizontally under the wagon bodies.

Cavalry, Horse Artillery and mounted men of Field Artillery (including drivers) carry their kits in two sheep-skin saddle-bags falling on each side of horse's flank. The wheel and centre drivers' off horses seem to have an easy time, having nothing to carry but very light harness.

I began, intending to write only a short account of the review, but thinking my brother officers might be interested in matters relating to the artillery here I have, I fear, been induced to make this note too long.

I hear the system of gun practice in Italy is very good, and if I can pick up any useful information on the subject before I leave shall hope to submit it in another letter.

At the Annual General Meeting of the R.A. Institution the Committee intend to propose the following additions to the Rules, viz.:—

To Rule I. to add after "£1"—"Gentlemen who have qualified and are recommended for commissions in the Royal Artillery may forthwith become members on the same terms as Second Lieutenants."

In Rule II., after the words "Garrison and neighbourhood," to insert—"or such gentlemen connected with naval and military arts and sciences as they from time to time think fit."

Any member who wishes can receive, at the cost of stitching and binding, about

3s., a copy of the "Cleaveland Notes on the Early History of the Royal Regiment of Artillery. A.D. 1267—1757."

In order to bring the already existing printed Records of the R. M. Academy up to date, it has been found that there will be a much larger amount of letter-press to be added than was at first anticipated. In consequence of this it has become necessary to raise the estimated price per copy from 12s. 6d. to 15s.

Any Officer who may wish for a copy is requested to send his name and address to the Secretary, R.M.A., Woolwich.

The Committee will be glad to receive from any Member the name of such books as he may think desirable for purchase for the R.A.I. Library.

The following works are now on sale at the R.A. Institution and will be forwarded post free at the prices noted after their titles below :—

Major-General Stubbs's "List of Officers of the Bengal Artillery," price 5s. 3d.

"Field Artillery Fire," by Captain W. L. White, R.A., price 1s. 2d.

"Notes of Lectures on Artillery in Coast Defence," by Major A. C. Hansard, R.A., price 1s. 2d.

"Ranging Note-Book," by Captain S. W. Lane, R.A., price 1s. 1d.

"Achievements of Field Artillery," by Major E. S. May, R.A., bound, price 2s. 6d.

R.A. CHARITIES.

The Hon. Secretary R.A. Charities, Woolwich, will be much obliged if those who have copies to spare will send him the Annual Reports of the R.A. Charities for the years 1880, 1881, and 1886.

ROYAL ARTILLERY DINNER CLUB.

The Regimental Dinner will take place on Friday, 9th June, 1893.

Rules.

Officer of the Royal Artillery on full or half-pay, can become annual subscribers at the rate of five shillings per annum, under the following conditions :—

(*a*) On joining the Regiment.

(*b*) If a Subaltern, by payment of five shillings for every year of service up to five years, which shall be the maximum number of years subscription chargeable to officers of that rank on joining.

(*c*) If a Captain, by payment of six years subscriptions.

(*d*) If a Major, by payment of seven years subscriptions.

(*e*) If a Lieut.-Colonel, by payment of eight years subscriptions.

The number of Subscribers is now—

125 on Active List.
142 on Retired List.

The cost of the Dinner this year will be—

Subscribers	£0	16	0
Non-Subscribers	1	15	0

Lord Roberts has accepted an invitation to dine at the Regimental Dinner as a Guest, and H.R.H. the Duke of Connaught has been asked to meet him, and has also accepted.

R.A. *v.* R.E. RACKET AND BILLIARD MATCHES.

The results of the R.A. *v.* R.E. Racket and Billiard Matches are as follows :—

R.A. won the double rackets by 4 games to 1.
R.E. won the four-handed billiard match.
R.A. won the single billiard match.
R.E. won the single rackets by 3 games to 2.

The representatives were—

	R.A.	R.E.
Rackets double.....	Captain Cooper-Key Captain Quinton	Captain Hamilton. Lieut. Blair.
„ single	Captain Cooper-Key	Captain Hamilton.
Billiards, four-handed	Major Curteis Captain Pollock	Major Dorward, *D.S.O.* Lieut. H. B. Jones.
„ single	Major Curteis	Major Dorward, *D.S.O.*

R.A.I. "DUNCAN" PRIZE ESSAY, 1893.

The Secretary has received in addition to those mentioned in April "Proceedings," Essays bearing the mottoes :—

"Tam arte quam marte."
"A fronte pracipitium, a tergo lupus."
"Delenda est Carthago."
"Disjecta membra."
"Tekel."
"Labor omnia vincit."
"Vae victis."

OBITUARY.

Colonel F. E. Lewes, retired list, Royal (late Bengal) Artillery, died suddenly at Morrell's Hotel, London, on the 26th March, 1893, aged 55 years. He joined the Army June 8th, 1855; became Captain, January 24th, 1865; Major, Sept. 21st, 1872; Lieut.-Colonel, January 17th, 1880; and Colonel, May 1st, 1880. He was present at the mutiny of the 51st Bengal Native Infantry at Peshawur on August 28th, 1857, and served in the Peshawur Division under Sir Sydney Cotton during the Indian Mutiny (medal); served against the Mahsood Wuzeerees in the Expedition under Brigadier-General Sir Neville Chamberlain in April and May, 1860, with the Peshawur Mountain Battery (medal with clasp); commanded two Mountain guns at the surprise of the Berzotee Village of Gara on February 25th, in the Kohat Expedition of 1869, under Colonel Keyes (mentioned in despatches and specially thanked by the Governor-General in Council).

Major-General C. W. Elgee, c.b. (retired), whose death occurred at Eastbourne on 2nd April, 1893, joined the Regiment as 2nd Lieutenant, 6th August,

1846; became Lieutenant, 1st January, 1847; 2nd Captain, 17th February, 1854; Captain, 17th November, 1857; Major, 1st January, 1868; Lieutenant-Colonel, 20th December, 1869; Colonel, 20th December, 1874; and retired with rank of Major-General, 1st October, 1882. He served in the China War of 1857, Capture of Canton (medal with clasp, brevet of Major); South African War, 1878—Kaffir Campaign (mentioned in despatches, medal with clasp; C.B.)

Mr. J. Bramley, of Drayton Hall, Uxbridge, who died there on 16th April, was buried at St. Margarets, Lee, on 20th April. The coffin was borne from the residence of Mr. John Penn to the Church by a detachment of the Riding Troop, R.A., from Woolwich, Mr. Bramley having served in the Royal Artillery. Among those who paid the last tribute of respect to the memory of the deceased were General Erskine, Major-General A. H. W. Williams, Deputy-Adjt.-Gen. R.A., Captain Webber, R.N., and Dr. W. H. Russell.

DIARY OF FIXTURES.

MAY.

Day of the Mth.	Wk	Regimental.	Cricket, &c.	Private.
1	M	... ...	... ...	... ...
2	T	... ...	Newmarket 1st Spring Meeting begins.	... ...
3	W	... ...	R.A. Woolwich *v.* R.N. College, at Blackheath.	... ...
4	Th	... ...	... ...	... ...
5	F	... ...	... ...	... ...
6	S	... ...	R.A. Woolwich *v.* Royal Fusiliers.	... ...
7	S	... ...	... ...	... ...
8	M	Position-Finding Class joins the Artillery College.	... ...	... ...
9	T	... ..	... ...	... ...
10	W	... ...	R.A. Woolwich Officers *v.* N.C. Officers.	... ...
11	Th	... ...	... ...	... ...
12	F	1st Div. F.A. (Weedon) arrives at Shoeburyness.	... ...	... ...
13	S	1st Div. F.A. (Ipswich) arrives at Okehampton.	R.A. Woolwich *v.* Shoebury, at Shoebury.	... ...
14	S	... ...	... ...	... ...
15	M	... ...	... ...	... ...
16	T	... ...	Newmarket 2nd Spring Meeting begins.	... ...
17	W	... ...	... ...	... ...
18	Th	... ...	.. ...	... ...
19	F	... ...	... ...	... ...
20	S	1st Field Gunnery Course at Okehampton begins. 1st Div. R.H.A. (Aldershot) arrives at Shoeburyness.	R.A. Woolwich *v.* Blackheath, at Woolwich.	... ...
21	S	Whit Sunday.	... ...	... ...
22	M	Bank Holiday.	R.A. Woolwich *v.* R.A. Portsmouth, at Woolwich.	... ...
23	T	... ...	... ...	... ...
24	W	Queen's Birthday Celebration 2nd Div. Course Western Forts begins.	... ...	... ...
25	Th	... ...	... ...	... ...
26	F	... ...	R.A. *v.* Aldershot Division, at Aldershot.	... ...
27	S	... ...	R.A. *v.* Aldershot Division, at Aldershot.	... ...
28	S	... ...	... ...	... ...
29	M	... ...	... ...	... ...
30	T	... ...	Epsom Summer Meeting begins.	... ...
31	W	2nd Div. F.A. (Aldershot) arrives at Shoeburyness.	The Derby.	... ...

JUNE.

Day of the Mth.	Wk.	Regimental.	Cricket, &c.	Private.
1	Th	... ...	... ...	... ...
2	F	... ...	The Oaks.	... ...
3	S	... ...	R.A. Woolwich *v.* R.A. Sheerness, at Woolwich.	... ...
4	S	... ...	... ...	... ...
5	M	... ...	... ...	... ...
6	T	... ...	... ...	... ...
7	W	2nd Div. F.A. (Aldershot) arrives at Okehampton.	R.A. *v.* Free Foresters, at Woolwich.	... ...
8	Th	... ...	R.A. *v.* Free Foresters, at Woolwich.	... ...
9	F	... ... REGIMENTAL DINNER.		... ...
10	S	Long Course joins at Lydd, and 2nd Div. Course at Lydd begins.	R.A. *v.* Shoebury, at Woolwich.	... ...
11	S	... ...	... ...	... ...
12	M	... ...	... ...	... ..
13	T	... ...	Ascot begins.	... ...
14	W	... ...	... ...	... ...
15	Th	... ...	... ...	... ...
16	F	... ...	R.A. *v.* R.E., at Woolwich.	... ...
17	S	2nd Div. R.H.A. (Woolwich) arrives at Shoeburyness.	R.A. *v.* R.E., at Woolwich.	... ...
18	S	... ...	... ...	... ...
19	M	3rd Div. Course Western Forts begins.	R.A. *v.* R.M.A., at R.M.A., Woolwich.	... ...
20	T	... ...	R.A. *v.* R.M.A., at R.M.A., Woolwich.	... ...
21	W	... ...	... ...	... ...
22	Th	... ...	... ...	... ...
23	F	... ...	R.A. *v.* Household Brigade, at Chelsea.	... ...
24	S	Long Course joins at Okehampton.	R.A. *v.* Household Brigade, at Chelsea.	... ...
25	S	... ...	... ...	... ...
26	M	... ...	... ...	... ...
27	T	... ...	... ...	... ...
28	W	... ...	R.A. *v.* Greenjackets, at Woolwich.	... ...
29	Th	... ...	R.A. *v.* Greenjackets, at Woolwich.	... ...
30	F	3rd Div. F.A. (Woolwich) arrives at Shoeburyness.	... ...	

JULY.

1	S	... ...	... ...	... ...
2	S	... ...	... ...	... ...
3	M	3rd Div. F.A. (Colchester) arrives at Okehampton.	Oxford *v.* Cambridge.	... ...
4	T	... ...	Oxford *v.* Cambridge.	... ...
5	W	... ...	Oxford *v.* Cambridge.	... ...
6	Th	... ...	R.A. *v.* Oxford Authentics, at Woolwich.	... ...
7	F	... ...	R.A. *v.* Oxford Authentics, at Woolwich.	... ...
8	S	2nd Field Gunnery Course at Okehampton begins.	R.A., Woolwich, *v.* Blackheath, at Blackheath.	... ...
9	S	... ...	... ...	... ...
10	M	... ...	R.A. *v.* Harlequins, at Woolwich.	... ...
11	T	... ...	R.A. *v.* Harlequins, at Woolwich.	... ...
12	W	4th Div. Course at Western Forts begins.	... ...	... ...
			... ...	... ...
13	Th	... ...	... ...	... ...
14	F	... ...	Eton *v.* Harrow begins, and R.A. *v.*, R.E. at Chatham.	... ...
15	S	... ...	R.A. *v.* R.E., at Chatham.	... ...

JULY.—*Continued.*

Day of the Mth.	Wk.	Regimental.	Cricket, &c.	Private.
16	S	... ...	... ...	... ...
17	M	... ...	... ...	... ...
18	T	... ...	... ...	... ...
19	W	... ...	R.A. *v.* Eton Ramblers, at Woolwich.	... ...
20	Th	... ...	R.A. *v.* Eton Ramblers, at Woolwich.	... ...
21	F	... ...	... ...	... ...
22	S	3rd Div. Course at Lydd begins.	... ...	... ...
23	S	... ...	... ...	... ...
24	M	... ...	... ...	... ...
25	T	... ...	Goodwood begins.	... ...
26	W	... ...	... ...	... ...
27	Th	... ...	... ...	... ...
28	F	4th Div. F.A. (Shorncliffe) arrives at Okehampton.	... ...	... ...
29	S	Position-Finding Class proceed to Isle of Wight.	R.A., Woolwich, *v.* R.A., Aldershot, at Woolwich.	... ...
30	S	... ..	... ...	... ...
31	M	... ...	R.A. *v.* B.B., at Woolwich.	... ...

AUGUST.

1	T	... ...	R.A. *v.* B.B., at Woolwich.	... ...
2	W	... ...	... ...	... ...
3	Th	... ...	... ...	... ...
4	F	... ...	R.A. *v.* Mote Park, at Maidstone.	... ...
5	S	5th Div. Course at Western Forts begins.	R.A. *v.* Mote Park, at Maidstone.	... ...
6	S	... ...	... ...	... ...
7	M	... ...	... ...	... ...
8	T	... ...	... ...	... ...
9	W	... ...	R.A. *v.* I.Z., at Woolwich.	... ...
10	Th	... ...	R.A. *v.* I.Z., at Woolwich.	... ...
11	F	... ...	... ...	... ...
12	S	... ...	R.A. Officers *v.* N.-C.O's. at Woolwich.	... ...
13	S	... ...	... ...	... ...
14	M	... ...	... ...	... ...
15	T	... ...	... ...	... ...
16	W	... ...	... ...	... ...
17	Th	... ...	... ...	... ...
18	F	... ...	... ...	... ...
19	S	... ...	... ...	... ...
20	S	... ...	... ...	... ...
21	M	... ...	... ...	... ...
22	T	5th Div. F.A. arrives at Okehampton.	... ...	... ...
23	W	... ...	... ...	... ...
24	Th	... ...	... ...	... ...
25	F	... ...	... ...	... ...
26	S	... ...	... ...	... ...
27	S	... ...	... ...	... ...
28	M	... ...	... ...	... ...
29	T	... ...	... ...	... ...
30	W	... ...	R.A. Woolwich *v.* Charlton Park, at Woolwich.	... ...
31	Th	... ...	... ...	... ...

PRÉCIS

AND

TRANSLATION.

"REVUE D'ARTILLERIE."

SCHLÄPFER AUTOMATIC BRAKE.

BY

LIEUT. D'ARTILLERIE SCHWOB.

TRANSLATED BY

LIEUT.-COLONEL F. E. B. LORAINE, *late* R.A.

MANY gun carriages have been supplied with automatic brakes, where the action of the latter has been effected by the discharge of the gun. The brakes of which we are about to speak act automatically, not only during practice, but also on the march.

In a system which was tried at Frauenfeld in Switzerland, the skidding of the wheels was produced by the action of the horses when holding back the carriage. But to the effort required to hold the carriage before the brake could act was added the effort required to actuate the brake, and it was found that horses were frequently thrown on their knees on even moderately rough ground. This system was therefore abandonned. In a more recent plan skidding is on the wheels whenever the horses are not pulling. This plan is therefore automatic in the descent of hills. Similarly the gun in action is always skidded without any previous manipulation. There is a special arrangement for unskidding when the gun has to be run up in action.

The plan embodying these advantages, which we are about to describe, is due to Mr. Schläpfer, a mechanical engineer of Lausanne, who has applied it to a bronze 6 cm Krupp gun employed for the instruction of the cadets of the Canton of Vaud. In July, 1892, the brake was shown at the General Assembly of Swiss Officers, presided over by Colonel Turettini, and the latter praised it unreservedly. The author of this article has examined the brake in Mr. Schläpfer's workshop and has seen it applied to all sorts of carriages. He declares that, though a few improvements in detail are still desirable, yet the brake has acted with good effect under all circumstances, both in gun-practice and on the march.

During practice, with a charge of 10½ ozs., and a projectile of 8 lbs., the recoil was 31 inches. The recoil of the same piece was 13 feet when the brake was unshipped.

DESCRIPTION AND ACTION.

Two battens, AA′, are carried by a curved bar B, which can revolve in the two collars, Z, Z′, fixed to the carriage. When the bar revolves each batten also

revolves round a certain point, at the intersection of the plan of the wheel with the line joining the centres of the collars, Z, Z′. This centre of rotation being other than that of the wheel, we readily see that in turning the rod B one way or the other we make the battens either approach or recede from the wheels. The construction is such, that if we turn the bar like the hands of a watch for an observer placed on the left side of the gun limbered up, and looking across the gun-wheels the battens recede. We shall call that a turn to the *right*, and the reverse movement a turn to the *left*.

(*a*) Suppose we turn the bar to the *left*, or in other words apply the brake. When the gun recoils, as the brake is not yet strongly applied, the wheels can turn. But as the battens adhere to the wheels they are carried with them, so that the bar B turns to the *left*, and the battens are thereby more and more strongly applied to the wheels, so long as these continue to move. When the friction between the battens and the wheels is in excess of the friction between the wheels and the ground, then of course the wheels slip, but do not roll. The bar B has a curve such, that the line, which joins the centre of the wheel to the point round which the batten turns, makes an angle of about 135° with the line joining this point to the centre of the batten when in contact with the wheel. Experience has shewn this to be the most favourable construction for ensuring the combined action of the wheel and the batten. The battens are attached to the bar B by joints revolving round a horizontal axis to secure their perfect adjustment throughout to the tires of the wheels.

(*b*) We now turn the bar to the *right*: the battens at once recede and the wheels are free to turn.

Let us then see how these two movements are effected automatically.

The arrangement is as follows: The trace hooks r, r' are fixed, not to the splinter-bar, but to the swingle-trees M, M′. At the middle of each swingle-tree is fixed a double hook P, of which one end is attached to the splinter-bar by means of an iron loop Q and a ring O, while the other end is hinged by means of the bolt U to the end of the traction rod L. The rear extremeties of the two traction rods are connected by the beam K. The beam K, by means of the chain V, the connecting rods h, h', and the levers C, C′, actuates the bar B of the brake. (The two slides S, S′, are provided on each side of the limber for the beam K to move on). When the beam moves forward by the advance of the team the bar B is made to turn to the *right*, *i.e.*, as we remember, to remove the battens from contact with the wheels.

The spiral springs G, G′, acting by means of the pistons F, F′, actuate the levers C, C′, so as to apply the brake. The springs are not designed to serve in themselves as brake springs, but simply to give strength and cohesion to the general design. The spring boxes E, E′, are attached to the carriage by means of bolts and screws X, X′, which can be tightened or released at will, within a margin of 6 inches. On the other hand, a force of 80 lbs. will only move the springs $\frac{6}{10}$ of an inch. The alteration of the position of the spring boxes, rendered necessary by the wearing away of the soles of the two brakes or by whatever cause, renders necessary a special adjustment of the traction machinery of the system. That adjustment is effected by means of the screw coupling-boxes z, z', which are turned in either sense until the beam K is at the marks π, π', of the slides S, S′, the team being at the halt. On coming into action, while one number unkeys the limber hook, the other number disconnects the chain V at the point I where there is a carbine hook attachment. When in action, as already mentioned, the brake is automatically applied. However, the lever b, when released, allows the curved bar B to drop and turn to the right, unshipping the brake and allowing the carriage to be run up by hand. The lever b is controlled by the rod a running in a groove, and with a swelling at one end. The rod a is

fixed by the keep-pin d, and the loops c, c' for the active position, and c^2 for the passive position of the brake.

In order to determine experimentally the force required:

1. to unship the brake;
2. to keep it unshipped;

the loops A were replaced by dynamometers, and the maximum force indicated was about 55 lbs., while a force of only 9 lbs. was found sufficient to release the brake.

These results can be easily explained. Their solution is no other than that of the problem: to find at every moment, the value of the power P of given direction, in equilibrium with a resistance R, of given magnitude and direction, and knowing the course followed by the point, at which the power P and the resistance R are applied. The direction of the harness traces may be taken as the given direction. It may be considered invariable when the horses are about to start the carriage.

The resistance R, being the measure of the force of the spiral springs (80 lbs.), is exerted at the point U, where the traction rod is attached to the swingle-tree hook. The power of the horses, acting at the trace hooks, is applied at a point obviously at the same distance from the splinter-bar as the preceding force. We may therefore regard as equal the two arcs of circle which these two points describe round the splinter-bar when the swingle-tree is turned by the power of the horses. (We might, on the other hand, take account of the difference between the radii r, r', of these circles. The courses traced by the two points will be in the proportion of r to r', since the angles of turning round the splinter-bar are equal. In the equation below the quantities P and R should be replaced by the values Pr, Rr', proportional to the respective work performed. The radii r, r', can be directly measured).

Similarly, with regard to the traction rods, we may consider their direction known and constant, and disregard, owing to their length, the slight displacement of the jointed end at the swingle-tree hook.

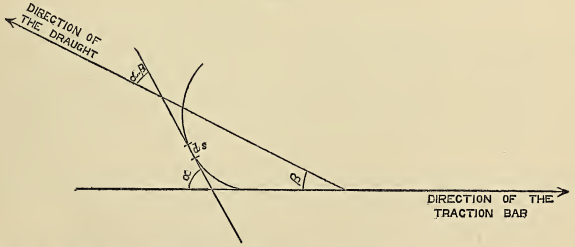
The conditions are therefore those of the case propounded:—

P known in direction;
R known in direction and magnitude;

the direction of both forces being constant.

Let then β be the constant angle which the traces make with the prolongation of the traction bars. Let us consider an element ds of the arc described by the point U where we suppose P and R to be applied. Let α be the angle which this element makes with the prolongation of the traction bar.

Fig. 1.



Then the equation of equilibrium gives:

$$R\ ds \cos.\ \alpha = P\ ds \cos.\ (\alpha - \beta)$$

$$\text{if } \alpha = \frac{\beta}{2}, \text{ then } P = R\left(\text{for cos.}\left(-\frac{\beta}{2}\right) = \cos.\ \frac{\beta}{2}\right)$$

$$\text{when } \alpha \text{ is } > \frac{\beta}{2}, \text{ then } P < R.$$

We may now write the equation as follows :—

$$P = \frac{R}{\cos.\ \beta + \sin.\ \beta \tan.\ \alpha}$$

When the swingle-tree hook turns upward the angle α increases also tan. α for all angles between 0° and 90°, consequently P diminishes. P disappears when $\alpha = 90°$ and tan $\alpha = \infty$, that is to say that P varies from R to zero when α increases from $\frac{\beta}{2}$ to 90°.

In practice α is at first manifestly about zero, that is to say, the hook is perpendicular, or thereabouts, to the traction bars when the brake is applied, the hook being vertical, and the bars practically horizontal. In this position the formula gives :

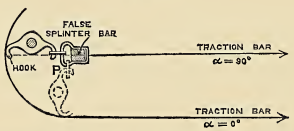
$$R\ ds = P\ ds \cos.\ \beta$$

whence $P > R$

The dynamometer however gave 55 lbs. as the maximum value of P, whereas the force of R is about 80 lbs. This discrepancy is accounted for by the fact that the chain V is not taut when the brake is on. There is a certain amount of play at both of its points of attachment to the beam and the connecting rods respectively. The horses therefore turn the hooks upwards in a slight degree before the springs of the brake act. When the springs act α is $> \frac{\beta}{2}$ and then $P < R$.

If α becomes equal to 90° P, as we have said, disappears, for we have, in fact, the position given in the annexed figure where the brake is disarmed and has really ceased to be automatic. Theory and practice therefore both shew the necessity of preventing the swingle-tree hook ever assuming a horizontal position.

Fig. 2.



Inasmuch however as the traction bars lie underneath the splinter-bar, the "*dead angle*" cannot be reached. The slighter the dimensions given to these parts the more nearly will the "*dead angle*" be reached, though not attained, and the smaller the effort of the team to keep the brake disarmed. When the team comes to a halt the springs may be relied on to overcome the inertia of the system and apply the brake.

It has been found that, thanks to the springs, the shocks proceeding from the irregularities of the ground acting on the carriage are not transmitted in their entirety to the team, and the experiments of M. Marey have proved that this elasticity effects an economy of 25 per cent. in horse power.

The reader will remember that when the brake is applied the swingle-tree hook tends to fall to a vertical position. This produces a certain movement of the

traces in a downward and backward direction. On the other hand the pole, in the descent of hills, has the opposite effect on the breast harness, and moves it in an upward and forward direction. Consequently the brake has the happy tendency of correcting the latter movement and of giving more fixity to the harness.

It must be finally noted that the conditions of draught are improved by the use of this brake in the following particulars:

(*a*) By the introduction of swingle-trees.

(*b*) By the interposition of an elastic medium between the team and the weight.

(*c*) By the steadiness and comparative fixity of the harness in the descent of hills.

N.B.—No detail has been furnished of the weight of the system.

NOTES

FROM

CORRESPONDING MEMBERS.

DOVER.

Captain J. P. DuCane and 2nd Lieut. W. P. L. Davies have joined No. 2 Company, and Captain J. D. Anderson has joined No. 17 Siege Train Company. 2nd Lieut. W. E. Manley has proceeded in charge of the usual summer detachment to Newhaven Fort.

An excellent portrait of the Duke of Cambridge has recently been presented by H.R.H. to the R.A. Mess, and Major-General Hoste, C.B., who commanded the R.A., South-Eastern District, from 1877–81, has kindly presented a framed photograph of himself as an addition to the collection of portraits of Colonel's-on-the-Staff. To make this collection complete since the appointment of the first Staff Colonel R.A., South-Eastern District, in 1861, only four are required, those of Colonel Burke Cuppage, 1861–64; Colonel Ormsby, 1864–66; Colonel Elwin, 1866–68; and Colonel Eaton, 1868–72. The Mess Committee would be very grateful for any assistance in obtaining any or all of these four portraits.

The R.A. Officers, Dover, turned out in great force to assist in welcoming Lord Roberts on his arrival at Dover on 6th May; the top of the Admiralty Pier was crowded, while below were the Mayor and Corporation, Major-General Lord William Seymour and the Head-quarter Staff, a great number of Officers of the Garrison, and several from Shorncliffe, Canterbury and Walmer. The R.A. formed an avenue through which Lord Roberts passed, accompanied by Lady Roberts, the Mayor and Lady Crundall, Lieut. Furse, R.A., A.D.C., &c., &c. A procession of carriages conveyed the party to the Town Hall, where an address was presented to Lord Roberts, and luncheon served. The gallant General looked extremely well and was evidently pleased with his reception.

HALIFAX, N.S.

Colonel H. de S. Isaacson has been appointed Colonel-on-the-Staff to command the R.A. in British North America, vice Major-General Ryan promoted, but has not yet joined.

Lieut.-Colonel Saunders has rejoined from four months' leave of absence in England and assumed temporary command of the R.A.

The new C.R.E., Colonel E. P. Leach, V.C., C.B., has arrived from England.

On 12th April Major D. C. Carter, R.A., arrived here, on his way to Bermuda, in charge of a draft, and was duly forwarded by first steamer, having been looked after during his stay by two old friends, to whom his appearance in the Western Hemisphere was a great treat.

Two German men-of-war, the "Kaiserin Augusta" and "Seeadler," put into Halifax for a couple of days to coal on their way to the New York celebration.

The Newfoundland Division of the British North American Fleet has arrived at Halifax on its way to the Fisheries. It consists of the "Cleopatra,"

"Buzzard," and "Pelican," under the command of their new Commodore, Captain Hon. A. G. Curzon-Howe, C.B. The "Buzzard" is commanded by Commander Hay, whose two brothers in the Regiment are well known.

Lieutenant-General Montgomery Moore has been appointed to succeed General Sir John Ross, G.C.B., in the command of the troops in Canada. Sir John and his daughter, Miss Ross, sail for England on 27th May. On the 3rd idem they gave a most enjoyable dance—the last unfortunately which will be given at "Bellevue" under Sir John's *regime*.

The salmon fishing in Nova Scotia has been unusually late this year in opening, owing to the exceptionally severe winter which has just been experienced. Mr. Macgowan, R.A., killed a 15 lb. salmon in Indian River on April 11th, and Major Brady, R.A., killed a 9-pounder in the same river on 19th April.

On 5th May Mr. Macgowan caught 68 trout, aggregating 53 lbs., in two hours, at Mud Lake.

On 9th May a dinner was given, in the R.A., R.E. Mess, to the Hon. Mr. Fielding, Premier of Nova Scotia, at which Commander Hay, R.N., the Attorney-General (Mr. Longley), and other guests were present.

WOOLWICH.

R.A. LIBRARY.

The Committee R.A. Mess, Woolwich, are endeavouring to form as complete an album as possible of all Officers now serving, who have reached the rank of Lieut.-Colonel, and also of all Officers who have left the Regiment.

They have now 590 photographs, and are very anxious to increase the number, so will be grateful to any retired Officer or Officer of or above the rank of Lieut.-Colonel who, not having already sent his photograph, will be so kind as to do so.

Should any Member of the Institution have in his possession photographs of deceased Officers the Committee would be very grateful if he would allow them to form part of the Library collection.

CRICKET.

The Cricket season has opened very well for the R.A. Woolwich team which, this year, is stronger than it has been for a long time; of the six matches played five have been won.

This year matches have been arranged against the Royal Artillery at Portsmouth, Sheerness and Aldershot, besides the two annual matches against Shoebury. The match R.A. Woolwich *v.* R.A. Portsmouth, was played on Whit Monday, both sides consisting of officers only. Portsmouth were without Quinton and P. D. Hamilton, so Woolwich won rather easily.

The most consistent run getters have been Major Curteis, Captain Adair, Lieuts. Perkins and Van Straubenzee while Captain Crampton and Lieut. Staveley are most welcome additions to the bowling talent.

At the Conversazione of the Royal Society on the evening of the 10th May, 1893, Major H. C. L. Holden, R.A. exhibited the following electrical apparatus:—

1. Apparatus for indicating and recording the electrical pressure and current on alternating systems of supply.
2. Instrument for rapidly ascertaining the E.N.F. and internal resistance of a galvanic coil.
3. Self-recoiling pyrometer working with Le Chatelier's thermo-couple.

R.A. CHARITIES.

The Hon. Secretary R.A. Charities, Woolwich, will be much obliged if those who have copies to spare will send him the Annual Reports of the R.A. Charities for the years 1880, 1881, and 1886.

R.A.I. "DUNCAN" PRIZE ESSAY, 1893.

The Secretary has received in addition to those mentioned in May "Proceedings," Essays bearing the mottoes :—

"Celer."

"'Tis not in mortals to command success, &c.": but the latter arrived too late to be included in the competition.

OBITUARY.

Deputy-Inspector-General H. Briscoe, M.D., who died at Dover on 9th May, 1893, joined the Regiment as Assistant Surgeon on 27th August, 1841; became Surgeon, 13th April, 1855; Surgeon Major 27th August, 1861; and was placed on half-pay with the rank of Hon. Deputy-Inspector-General 20th October, 1869.

Lieut.-Colonel J. D. Shakespear, whose death occurred on 7th May, 1893, was commissioned as Second Lieutenant 18th June, 1842; became Lieutenant, 9th September, 1843; Second Captain, 6th March, 1850; Captain, 16th December, 1854; Brevet Major, 12th December, 1854; and Lieut.-Colonel, 24th August, 1861. He Served in the Crimean War, and was present at the affairs of Bulganac and M'Kenzie's Farm, the battles of Alma, Balaclava (horse shot), and Inkerman, and the siege of Sebastopol (medal with four clasps, Turkish medal, Brevet of Major and 5th class of the Medjidie). He retired on half-pay 19th June, 1863, and commuted 6th August, 1872.

INTER-REGIMENTAL

RACQUET AND BILLIARD MATCHES.

R.A. *v.* R.E.

Played at Woolwich, April 24th and 25th, 1893.

DOUBLE RACQUETS.

PLAYED AT 3 P.M., 24TH.

R.A.		R.E.
CAPTAIN COOPER-KEY.		CAPTAIN HAMILTON.
LIEUT. & CAPTAIN QUINTON.	*v.*	LIEUT. BLAIR.

Rubber of 7 Games.

1st Game.	*2nd Game.*	*3rd Game.*	*4th Game.*	*5th Game.*
R.A. 15.	R.A. 15.	R.A. 9.	R.A. 18.	R.A. 15.
R.E. 9.	R.E. 8.	R.E. 15.	R.E. 13.	R.E. 2.

SINGLE RACQUETS.

PLAYED AT 10.30 A.M., 25TH.

R.A.		R.E.
CAPTAIN COOPER-KEY.	*v.*	CAPTAIN HAMILTON.

Rubber of 5 Games.

1st Game.	*2nd Game.*	*3rd Game.*	*4th Game.*	*5th Game.*
R.A. 5.	R.A. 15.	R.A. 15.	R.A. 12.	R.A. 6.
R.E. 15.	R.E. 12.	R.E. 13.	R.E. 15.	R.E. 15.

DOUBLE BILLIARDS.

PLAYED AT R.A. INSTITUTION, AT 4.30 P.M., 24TH.

R.A.		R.E.
MAJOR CURTEIS.		MAJOR DORWARD, D.S.O.
CAPTAIN POLLOCK.	*v.*	LIEUT. JONES.
104.		79.
183.		125.
200.		173.
	204 all.	
231.		257.
		300.

Jones running out with an unfinished break of 43.

SINGLE BILLIARDS.

PLAYED AT R.A. INSTITUTION AT 9.45 P.M., 24TH.

R.A.		R.E.
MAJOR CURTEIS 500.	*v.*	MAJOR DORWARD, D.S.O. 303.

Principal Breaks.

34, 33, 27, 23 (unfinished), 23, 19, 18, 18, 16, 15. — 29, 17, 16, 15.

Major Curteis led throughout.

R.A. & R.E. Annual Racquet and Billiard Matches.

The results of the Racquet and Billiard Matches up to and including the present year are shewn below :—

1873.

Racquets.			*Billiards.*		
Double. R.A. 1.		R.E. 4.	*Double.* R.A. 500.		R.E. 497.
Lieut. W. E. Denison.		Lieut. L. K. Scott.	Lieut.-Col. Drayson.		Capt. Seton.
" W. L. Davidson.		" S. M. Maycock.	Major Maitland.		" Mant.
Single. R.A. 2.		R.E. 3.	*Single.* R.A. 500.		R.E. 361.
Lieut. W. L. Davidson.		Lieut. S. M. Maycock.	Major Maitland.		Capt. Mant.

1874.

Racquets.			*Billiards.*		
Double. R.A. 4.		R.E. 1.	*Double.* R.A. 500.		R.E. 492.
Major Newman.		Lieut. L. K. Scott.	Major Maitland.		Capt. Warburton.
Lieut. Crookenden.		" Tower.	Lieut. Anstruther.		" Seton.
Single. R.A. 0.		R.E. 3.	*Single.* R.A. 370.		R.E. 500.
Lieut. Crookenden.		Lieut. Tower.	Major Maitland.		Capt. Warburton.

1875.

Racquets.			*Billiards.*		
Double. R.A. 0.		R.E. 4.	*Double.* R.A. 500.		R.E. 494.
Capt. Anderson.		Lieut. Tower.	Capt. Hazlerigg.		Major Warburton.
Lieut. Crookenden.		" *Hon.* M. G. Talbot.	Lieut. Anstruther.		Capt. Skinner.
Single. R.A. 0.		R.E. 3.	*Single.* R.A. 286.		R.E. 500.
Capt. Anderson.		Lieut. Tower.	Lieut. Anstruther.		Major Warburton.

1876.

Racquets.			*Billiards.*		
Double. R.A. 3.		R.E. 4.	*Double.* R.A. 500.		R.E. 451.
Major Murdoch.		Lieut. Penrose.	Capt. Hutchinson.		Major Warburton.
Lieut. Anstruther.		" Onslow.	Lieut. Anstruther.		Capt. Skinner.
Single. R.A. 1.		R.E. 3.	*Single.* R.A. 479.		R.E. 500.
Major Murdoch.		Lieut. Penrose.	Lieut. Anstruther.		Major Warburton.

1879.

Racquets.			*Billiards.*		
Double. R.A. 4.		R.E. 0.	*Double.* R.A. 500.		R.E. 430.
Capt. Griffiths.		Capt. L. K. Scott.	Major Hutchinson.		Major Seton.
Lieut. D. C. Carter.		Lieut. W. A. Cairnes.	Capt. Anstruther.		Capt. Glancy.
Single. R.A. 3.		R.E. 1.	*Single.* R.A. 500.		R.E. 421.
Lieut. D. C. Carter.		Lieut. W. A. Cairnes.	Capt. Anstruther.		Capt. Glancy.

1880.

Racquets.

Double.	R.A.	4.	R.E.	0.
Lieut. King.			Lieut. R. S. Hedley.	
" Cooper-Key.			" W. A. Cairnes.	
Single.	R.A.	0.	R.E.	3.
Lieut. D. C. Carter.			Lieut. W. A. Cairnes.	

Billiards.

Double.	R.A.	500.	R.E.	430.
Major Hutchinson.			Major Manderson.	
Capt. Anstruther.			Capt. Glancy.	
Single.	R.A.	458.	R.E.	500.
Capt. Anstruther.			Major Manderson.	

1881.

Racquets.

Double.	R.A.	4.	R.E.	0.
Lieut. King.			Lieut. S. M. Maycock.	
" Cooper-Key.			" W. A. Cairnes.	
Single.	R.A.	3.	R.E.	1.
Lieut. Cooper-Key.			Lieut. W. A. Cairnes.	

Billiards.

Double.	R.A.	500.	R.E.	392.
Major Hutchinson.			Capt. Glancy.	
Capt. Anstruther.			" Broadfoot.	
Single.	R.A.	500.	R.E.	468.
Capt. Anstruther.			Major Mant.	

1882.

Racquets.

Double.	R.A.	4.	R.E.	2.
Lieut. C. D. King.			Lieut. Tower.	
" Cooper-Key.			" Friend.	
Single.	R.A.	3.	R.E.	1.
Lieut. Cooper-Key.			Lieut. Tower.	

Billiards.

Double.	R.A.	300.	R.E.	252.
Col. Maitland.			Major Seton.	
Lieut. Bruen.			Major Glancy.	
Single.	R.A.	500.	R.E.	437.
Col. Maitland.			Major Seton.	

1883.

Racquets.

Double.	R.A.	1.	R.E.	4.
Lieut. C. D. King.			Lieut. Tower.	
" Cooper-Key.			" Friend.	
Single.	R.A.	1.	R.E.	3.
Lieut. C. D. King.			Lieut. Tower.	

Billiards.

Double.	R.A.	267.	R.E.	300.
Col. Maitland.			Lieut. Bor.	
Capt. Anstruther.			Lieut. Dumbleton.	
Single.	R.A.	500.	R.E.	297.
Capt. Anstruther.			Lieut. Dumbleton.	

1884.

Racquets.

Double.	R.A.	3.	R.E.	4.
Lieut. Cooper-key.			Lieut. Tower.	
" C. D. King.			" Friend.	
Single.	R.A.	2.	R.E.	3.
Lieut. Cooper-Key.			Lieut. Tower.	

Billiards.

Double.	R.A.	277.	R.E.	300.
Lieut.-Col. Hazlerigg.			Lieut. Dumbleton.	
Capt. Anstruther.			Capt. Digby.	
Single.	R.A.	500.	R.E.	398.
Capt. Anstruther.			Lieut. Dumbleton.	

1885.

Racquets.

Double.	R.A.	4.	R.E.	2.
Lieut. Cooper-Key.			Capt. Friend.	
" C. D. King.			Lieut. Hamilton.	
Single.	R.A.	3.	R.E.	1.
Lieut. Cooper-Key.			Capt. Friend.	

Billiards.

Double.	R.A.	300.	R.E.	274.
Major Anstruther.			Capt. Digby.	
Capt. MacMahon.			" Baddeley.	
Single.	R.A.	500.	R.E.	248.
Major Anstruther.			Capt. Digby.	

1890.

Racquets.

Double.	R.A.	1.	R.E.	4.
Captain Cooper-Key.			Lieut. Hedley.	
Lieut. Simonds.			" Sheppard.	
Single.	R.A.	0.	R.E.	3.
Captain Cooper-Key.			Lieut. Hedley.	

Billiards.

Double.	R.A.	235.	R.E.	300.
Major Anstruther.			Captain Digby.	
Lieut. Lachlan.			" Dumbleton.	
Single.	R.A.	500.	R.E.	489.
Major Anstruther.			Captain Dumbleton.	

1891.

Racquets.

Double. R.A. 2. R.E. 4.
Captain Cooper-Key. Captain Hedley.
2nd Lieut. Galloway. 2nd Lieut. Sheppard.
Single. R.A. 3. R.E. 2.
Captain Cooper-Key. Captain Hedley.

Billiards.

Double. R.A. 300. R.E. 250.
Major Anstruther. Colonel Glancy.
Lieut. Pollock. Capt. Hedley.
Single. R.A. 444. R.E. 500.
Major Anstruther. Colonel Glancy.

1892.

Racquets.

Double. R.A. 4. R.E. 0.
Captain Cooper-Key. Captain Hamilton.
Lieut. & Capt. Quinton. Lieut. Blair.
Single. R.A. 3. R.E. 0.
Captain Cooper-Key. Captain Hamilton.

Billiards.

Double. R.A. 300. R.E. 291.
Captain Curteis. Colonel Glancy.
Captain Pollock. Captain Roberts.
Single. R.A. 500. R.E. 469.
Captain Pollock. Colonel Glancy.

1893.

Racquets.

Double. R.A. 4. R.E. 1.
Captain Cooper-Key. Captain Hamilton.
Lieut. & Capt. Quinton. Lieut. Blair.
Single. R.A. 2. R.E. 3.
Captain Cooper-Key. Captain Hamilton.

Billiards.

Double. R.A. 231. R.E. 300.
Major Curteis. Major Dorward, D.S.O.
Captain Pollock. Lieut. Jones.
Single. R.A. 500. R.E. 303.
Major Curteis. Major Dorward, D.S.O.

DIARY OF FIXTURES.

JUNE.

Day of the Mth.	Wk.	Regimental.	Cricket, &c.	Private.
1	Th	... ...	... ...	... ...
2	F	... ...	The Oaks.	... ...
3	S	... ...	R.A. Woolwich *v.* R.A. Sheerness, at Woolwich.	... ...
4	S	... ...	... ...	... ...
5	M	... ...	... ...	... ...
6	T	... ...	... ...	... ...
7	W	2nd Div. F.A. (Aldershot) arrives at Okehampton.	R.A. *v.* Free Foresters, at Woolwich.	... ...
8	Th	... ...	R.A. *v.* Free Foresters, at Woolwich.	... ...
9	F	... ... REGIMENTAL DINNER.		... ...
10	S	Long Course joins at Lydd, and 2nd Div. Course at Lydd begins.	R.A. *v.* Shoebury, at Woolwich.	... ...
11	S	... ...	... ...	... ...
12	M	... ...	... ...	... ..
13	T	... ...	Ascot begins.	... ...
14	W	... ...	... ...	... ...
15	Th	... ...	... ...	... ...
16	F	... ...	R.A. *v.* R.E., at Woolwich.	... ...
17	S	2nd Div. R.H.A. (Woolwich) arrives at Shoeburyness.	R.A. *v.* R.E., at Woolwich.	... ...
18	S	... ...	... ...	... ...
19	M	3rd Div. Course Western Forts begins.	R.A. *v.* R.M.A., at R.M.A., Woolwich.	... ...
20	T	... ...	R.A. *v.* R.M.A., at R.M.A., Woolwich.	... ...
21	W	... ...	... ...	... ...
22	Th	... ...	... ...	... ...
23	F	... ...	R.A. *v.* Household Brigade, at Chelsea.	... ...
24	S	Long Course joins at Okehampton.	R.A. *v.* Household Brigade, at Chelsea.	... ...
25	S	... ...	... ...	... ...
26	M	... ...	... ...	... ...
27	T	... ...	... ...	... ...
28	W	... ...	R.A. *v.* Greenjackets, at Woolwich.	... ...
29	Th	... ...	R.A. *v.* Greenjackets, at Woolwich.	... ...
30	F	3rd Div. F.A. (Woolwich) arrives at Shoeburyness.	... ...	

JULY.

1	S	... ...	... ...	... ...
2	S	... ...	... ...	... ...
3	M	3rd Div. F.A. (Colchester) arrives at Okehampton.	Oxford *v.* Cambridge.	... ...
4	T	... ...	Oxford *v.* Cambridge.	... ...
5	W	... ...	Oxford *v.* Cambridge.	... ...
6	Th	... ...	R.A. *v.* Oxford Authentics, at Woolwich.	... ...
7	F	... ...	R.A. *v.* Oxford Authentics, at Woolwich.	... ...
8	S	2nd Field Gunnery Course at Okehampton begins.	R.A., Woolwich, *v.* Blackheath, at Blackheath.	... ...
9	S	... ...	... ...	... ...
10	M	... ...	R.A *v.* Harlequins, at Woolwich.	... ...

JULY.—*Continued.*

Day of the Mth.	Wk	Regimental.	Cricket, &c.	Private.
11	T	... ...	R.A. *v.* Harlequins, at Woolwich.	... ...
12	W	4th Div. Course at Western Forts begins.	... ...	... ...
13	Th	... ...	... ...	... ...
14	F	... ...	Eton *v.* Harrow begins, and R.A. *v.*, R.E. at Chatham.	... ...
15	S	... ...	R.A. *v.* R.E., at Chatham.	... ...
16	S	... ...	... ...	... ...
17	M	... ...	... ...	... ...
18	T	... ...	... ...	... ...
19	W	... ...	R.A. *v.* Eton Ramblers, at Woolwich.	... ...
20	Th	... ...	R.A. *v.* Eton Ramblers, at Woolwich.	... ...
21	F	... ...	... ...	... ...
22	S	3rd Div. Course at Lydd begins.	... ...	... ...
23	S	... ...	... ...	... ...
24	M	... ...	... ...	... ...
25	T	... ...	Goodwood begins.	... ...
26	W	... ...	... ...	... ...
27	Th	... ...	... ...	... ...
28	F	4th Div. F.A. (Shorncliffe) arrives at Okehampton.	... ...	... ...
29	S	Position-Finding Class proceed to Isle of Wight.	R.A., Woolwich, *v.* R.A., Aldershot, at Woolwich.	... ...
30	S	... ..	... ...	... ...
31	M	... ...	R.A. *v.* B.B., at Woolwich.	... ...

AUGUST.

1	T	... ...	R.A. *v.* B.B., at Woolwich.	... ...
2	W	... ...	... ...	... ...
3	Th	... ...	... ...	... ...
4	F	... ...	R.A. *v.* Mote Park, at Maidstone.	... ...
5	S	5th Div. Course at Western Forts begins.	R.A. *v.* Mote Park, at Maidstone.	... ...
6	S	... ...	... ...	... ...
7	M	... ...	... ...	... ...
8	T	... ...	... ...	... ...
9	W	... ...	R.A. *v.* I.Z., at Woolwich.	... ...
10	Th	... ...	R.A. *v.* I.Z., at Woolwich.	... ...
11	F	... ...	... ...	... ...
12	S	... ...	R.A. Officers *v.* N.-C.O's. at Woolwich.	... ...
13	S	... ...	... ...	... ...
14	M	... ...	... ...	... ...
15	T	... ...	... ...	... ...
16	W	... ...	... ...	... ...
17	Th	... ...	... ...	... ...
18	F	... ...	... ...	... ...
19	S	... ...	... ...	... ...
20	S	... ...	... ...	... ...
21	M	... ...	... ...	... ...
22	T	5th Div. F.A. arrives at Okehampton.	... ...	... ...
23	W	... ...	... ...	... ...
24	Th	... ...	... ...	... ...
25	F	... ...	... ...	... ...
26	S	... ...	... ...	... ...
27	S	... ...	... ...	... ...
28	M	... ...	... ...	... ...
29	T	... ...	... ...	... ...
30	W	... ...	R.A. Woolwich *v.* Charlton Park, at Woolwich.	... ...
31	Th	... ...	... ...	... ...

NOTES

FROM

CORRESPONDING MEMBERS.

ADEN.

This is a great place for the enthusiastic Garrison Artillery officer. The well-laid plans, charts, carriages, and racers of men and mountings—Mountain, Field, Siege, Garrison and Coast Defence, 3-pr. to 30 ton—H.P. broadside, end-on, vertical, horizontal, and inclined, perched 1000 feet above, or sunk 10 feet below, sea level, "gang aft agley," owing to the trying climate, so that the artillery officer gains considerable experience here in repair and care of *matériel.*

Luckily there are lots of us. Although it is the middle of the leave season and the height of the hot weather, two (single) companies have four officers each, and the third would be complete if two officers had not been invalided and one sent to a course. The R.A. Staff is complete. Fourteen we should muster if we were now bidden to give *bon voyage* to a new Commander-in-Chief—of Madras for example. The last occasion when this pleasant duty fell to our lot was when "Bobs, God bless him," bid us a kind farewell.

Armament and working pay are, alas! still *in nubibus* of Elysium, and soft promises pay for no passages by P. and O., nor would have done so before these were raised and the rupee lowered. However, we are having a very cool season. The monsoon has broken early.

A local oar of vast body, mind and generosity, has presented a double outrigger to the boating club.

The new Golf Club-house is rising proudly from its foundations. Lieutenant Lethbridge holds the record for these links with 46. He performed a notable feat the other day by walking and swimming round the peninsula before breakfast. He only swam where he *knew* the cliff was unclimbable, even by him, and where he *hoped* there were not many sharks. He breakfasted at 7 p.m. and, like the Boojum, dined on the following day.

The new barracks are occupied, and now all our men, except twelve, live on a hill of their own.

Major Anderson, Commandant Poona Horse, died here on passage and was buried with military honours. All the officers of the Italian man-of-war in harbour attended the funeral; a kindly compliment, which shews how well we stand with them.

The Mess has been refurnished, and, as the officers of a wing of the South Wales Borderers live with us, we have a very pleasant party.

CORK.

The South of Ireland Military Tournament took place in the Agricultural Grounds on Saturday and Monday, the 3rd and 5th of June, and the R.A. quartered in the Cork District came off very well. In the final tug-of-war 28 Company Southern Division R.A. beat 17 Company of the same division, the other teams entered being from the Royal Navy, the Royal Marines, and the Royal Irish Constabulary (2). The line battalions constituted a separate class. In the Heads and Posts, Sergeants Price and Kirkbride took 2nd and 3rd prizes. Tent-pegging, with lance, Sergeant Parker 2nd prize. Tent-pegging, with sword.—1st, Ser-

geant Price; 2nd, Sergeant Parker. V.C. Competition.—1st, Sergeant Mullins. All these N.-C.Os. belonged to the 67th Field Battery stationed at Fermoy.

Officers—Sword *v.* Sword.—Lieut. Stirling, 67th Field Battery, *v.* Riding-Master Waile, 10th Hussars. After very even fighting Stirling was disqualified for, by mischance, touching his opponent's horse on the head.

Jumping Competition by Sections over Post and Rails, Hurdle, Water Jump, and Stone Wall.—In this the teams from 67th Field Battery and the 10th Hussars jumped beautifully, and no decision could be arrived at till after two extra runs, when the R.A. were beaten by one point. Not a bad performance for one Field Battery against two Cavalry Regiments, viz., 10th and 13th Hussars.

On their march from Cahir to Cork and back the squadron of the 10th Hussars were put up for the night by the R.A. at Fermoy.

The Cork Harbour division of the R.A. have opened their cricket season well, having beaten the Navy and Haulbowline (twice), the 85th King's Light Infantry and the Youghal Cricket Club, thus keeping up their reputation of last year, when they won every match they played, beating the Cork County twice, and all the regiments in the Cork District. Lieutenant Galloway (a *quondam* representative of the R.A. at rackets) is the chief run-getter, while able aid in bowling and safe fielding from Major A. Griffiths help the team to win their matches. Lieut. Phillipps is captain, and Company-Sergeant-Major Brown, late of the Ordnance Artificers, is a great addition to it.

Cork Harbour, as many readers may know, is the R.A. official and euphemistic term for Spike Island, once the rocky and island home of convicts, and we have, on account of this rock, to play on matting. During the last three years Spike Island has been made the R.A. Head-quarter Mess, and both companies of Garrison Artillery, together with a company of Engineers and two companies of the Infantry regiment from Kinsale, are quartered here; the outer forts, Carlisle and Camden, being now garrisoned by Infantry and Engineers, keep the R.A. together at Spike.

DOVER.

No. 17 Siege Train Company has proceeded to Lydd for its six weeks' annual course, returning to Dover about 20th July.

Captain J. P. DuCane has gone to Newhaven in command of the half company there.

The Kent Artillery have dispersed after their month's training. They were located in Fort Burgoyne, and many were the mutual hospitalities interchanged between them and the Castle; the officers very kindly sent their band to play on Guest Night at the R.A. Mess, which was very much appreciated.

On June 3rd a very interesting and close golf match was played over the links of the Cinque Ports Golf Club at Deal between teams of the R.M.L.I. at Walmer and R.A. Dover, with the following result:—

Royal Marines.	Holes.	Royal Artillery.	Holes.
Major Hungerford	2	Captain F. W. S. Stanton	0
" Wilkinson	1	Colonel Lloyd	0
Mr. Curteis	1	Major Maxwell	0
" Ward	0	Captain Cummings	1
	4		1

No. 2 Company carried out its practice (competitive) at Newhaven this year, securing a 3rd class; this is praiseworthy, when they were firing at a "record" target, on which direct hits alone count, and with guns fitted with the clumsy capstan-headed elevating gear, and with no sighting steps and posts.

HALIFAX, N.S.

Major Brady went fishing the second week in May near Bridgewater and killed two salmon.

On 17th May a farewell dinner was given in the R.A. and R.E. Mess to Miss Ross, the party consisting of 12 ladies and 24 gentlemen. Lt.-Col. Saunders proposed Miss Ross' health, and, in doing so, alluded to the fact of her being the grand-daughter of that distinguished Royal Artilleryman, Field Marshal Sir Hew Ross. Mr. Godfrey White, A.-D.-C. returned thanks for the toast. Special menu cards of an appropriate and artistic character were designed by Mr. Enthoven, R.E. The band of the 8th King's Regiment (kindly lent for the occasion) played during dinner.

On 23rd May another farewell dinner was given in the Mess to General Sir John Ross, G.C.B., and his personal staff—Major H. Fergusson, A.-D.-C. (Rifle Brigade), and Mr. Godfrey White, A.-D.-C. (Grenadier Guards). Unfortunately the General himself was unable to be present, as he was suffering from gout, but his health was drunk all the same and the fact communicated to him by telephone to Major Waldron's house, where he was staying prior to his departure.

On 24th May the usual Queen's Birthday parade was held in the Citadel, the troops manning the ramparts and firing the *feu-de-joie* round them. It was an occasion of unusual interest, as it was Sir John Ross' last parade, after 47 years in Her Majesty's service. At the conclusion he ordered the troops to be formed into three sides of a square and addressed a few words of farewell to them. Next day he took his departure to England on the expiration of his five years as G.O.C. troops in Canada; the departure was by rail to Quebec. All the officers in the Garrison were at the station in full dress. Miss Ross was overwhelmed with bouquets of flowers. The King's Regiment formed a guard of honour and band at the station, and the R.A. and R.E. furnished two guards of honour, each 50 strong, at the Head-quarter Office. The R.A. fired a salute of 15 guns from the Citadel Hill as the train left the station.

Captain Fasson, R.A., joined on 20th May on promotion from Field Artillery Depot at Woolwich.

The incandescent light, which has been in use for some time in the Officers' Mess, has now been installed in certain parts of the Citadel, viz., the Sergeants' Mess, Canteen, Coffee Shop, Recreation-room, and two Billiard Rooms. It is a great success, and makes the casemates, always so dull and gloomy, cheery and even brilliant. It is cheap, each light costing only $6 per annum, they are of 16 candle power each, and the current is 50 volts.

Polo has begun again with the month of June, and no difficulty is found in getting four a-side; the players from the R.A. being Major Brady, Captains Alexander and Duffus, and Lieutenant Arthy.

ROYAL ARTILLERY DINNER CLUB.

There were present at R.A. Dinner on 9th June, 1893—

65 Generals.
33 Colonels.
41 Lieut.-Colonels.
42 Majors.
37 Captains.
19 Lieutenants.

In consequence of the large space occupied by the Annual Report and Three Essays it is necessary, this month, to leave out Cricket Matches and Diary of Fixtures, besides various other Notes.

OBITUARY.

Captain A. M. Archdall, who died at Newent, Gloucester, on 27th February last, joined the Royal Artillery as 2nd Lieutenant, 19th December, 1844; became Lieutenant, 1st April, 1846; Captain, 31st December, 1852, and retired on half-pay, 12th August, 1855.

Captain J. R. K. L. Heyland, whose death is announced from Murree, E.I., died there on 12th May, 1893. He joined the Regiment as Lieutenant on 2nd February, 1876, and became Captain, 1st January, 1885. He served in the Afghan War of 1880 (medal).

Major J. Thomson, was commissioned from the ranks as Lieutenant (Coast Brigade), 4th November, 1859; became Captain, 31st July, 1870; and retired with the honorary rank of Major, 10th March, 1875. He died at Wandsworth on 23rd May, 1893.

Captain P. M. Syme, who died at Ashford, Kent, on 12th June, 1893, joined the late Bengal Artillery as Second Lieut. on 14th June, 1845; became Lieutenant, 21st June, 1850; Second Captain, 27th August, 1857; First Captain, 20th February, 1863; and retired on half-pay, 1st July, 1864.

Captain C. G. Johnson, who died at South Norwood, on 12th June, 1893, joined the Regiment as Second Lieutenant 8th April, 1853; became Lieutenant, 24th February, 1854; Second Captain, 1st April, 1860; and Captain, 30th September, 1868. He retired with an annuity, 11th November, 1871.

Second Lieutenant C. D. Workman died at Malta, on 13th June, 1893. He was commissioned as Second Lieutenant on 13th February, 1891.

Second Lieutenant E. St. J. Brownlow, whose death occurred at Fort Govindghar, Amritsar, on 15th June, 1893, joined the Regiment as Second Lieutenant on 24th July, 1891.

General Sir E. B. Johnson, G.C.B., C.I.E., whose death occurred in London on 18th June, 1893, was commissioned in the late Bengal Artillery as 2nd Lieut., 10th June, 1842; became Lieutenant, 3rd July, 1845; Captain, 25th June, 1857; Brevet-Major, 5th July, 1857; Brevet-Lieut.-Colonel, 19th January, 1858; Brevet-Colonel, 19th January, 1863; Major-General, 6th March, 1868; Lieut.-General, 1st October, 1877; General, 1st October, 1887, and Colonel-Commandant, 20th December, 1890. He served in the Sutlej Campaign, 1845–6, and was present at the Battles of Ferozeshah and Sobraon (medal with clasp); the Punjaub Campaign, 1848–9; passage of the Chenab at Ramnuggur; battles of Chillianwallah and Goojerat, and subsequent pursuit of Sikhs and Afghans. (Despatches, *London Gazette*, 19th April, 1849, medal with two clasps; brevet of Major); Indian Mutiny, 1857–8; actions of the Hindun (slightly wounded), battle of Budleekeserai; siege and capture of Delhi; siege and capture of Lucknow. (Despatches, *London Gazette*, 15th December, 1857, and 25th May, 1858, medal with two clasps, brevet of Lieut.-Colonel; C.B.) He held various staff appointments, both in India and at home, the principal ones being: Adjutant-General in India; Member of Council, both in India and at the India Office, while, from December 1884 to December 1886, he was Director-General of Military Education.

NOTES

FROM

CORRESPONDING MEMBERS.

GOLD MEDAL PRIZE ESSAY, 1894.

The Subject approved for the "Duncan" Gold Medal Prize Essay, 1894, is as follows:—

"What is the best Tactical Organisation and System of Training massed Batteries of Horse and Field Artillery?"

The Committee wish to draw the attention of intending competitors to the Rules for the Prize Essays which have been recently amended, and which now read:—

The Annual Gold Medal, when awarded, to be accompanied by an *honorarium* of £20; the Silver Medal by an *honorarium* of £10.

The candidates must be Officers of the Regiment who are members of the R.A. Institution.

Officers are requested to confine their Essays to about 16 printed pages of the "Proceedings;" other things being equal brevity will count towards success.

The Essays must be forwarded to the Secretary so as to reach him on or before the 1st of April.

Each Essay must be type-written in triplicate. The Essays must be strictly anonymous, but each to have a motto, and be accompanied by a sealed envelope with the motto written outside and the name of the writer inside; further, if the writer wishes to recover from the Committee part of the cost of type-writing his Essay he should state this fact in the same sealed envelope and write outside it, above the motto, "to be opened."

All the envelopes thus marked will be opened by the Secretary after the result of the competition has been announced, and he will send the writers the money for their type-writing expenses.

The Committee will allow a sum of £1 for type-writing each Essay.

The Essays will be submitted for decision to three Judges chosen by the Committee.

The Judges are empowered to recommend:—

1. That two Medals, one Gold and one Silver, be awarded, or
2. That only one Medal, Gold or Silver, according to the merit of the Essay, be awarded, or
3. That no Medal be awarded.

The names of the successful candidates will be announced at the Annual Meeting, and Medallists will be distinguished as such in all Lists, &c., issued from the Institution; and in the event of a University man gaining a Medal, a report of his success will be made to the University of which he may be a member.

The successful Essays will be printed and circulated to members by the Institution.

In the Annual Report, 1892–93, p. 333, No. 7, Vol. XX., R.A.I. "Proceedings," the inscription mentioned by Major-General E. Markham should read

"Under this stone
lies the
Right Arm
of
Lt.-Colonel C. S. Henry,
R.H.A.
17th August, 1855."

In the recent Cambridge Mathematical Tripos Mr. E. T. Dixon was placed 17th Wrangler. He only resigned his subaltern's jacket in D/A., R.H.A., in May, 1888. His high place on the list is the more praiseworthy as he is at a disadvantage in the matter of age compared to the mass of competitors.

A correspondent gives this rough rule:—

When carrying out practice over sea ranges, the following has been found a handy method of improvising a safety triangle to determine whether ships, &c., are within an angle of $7\frac{1}{2}°$ with a line from the battery to the target, and if it is consequently unsafe to fire. Close the first three fingers of the right hand, hold the thumb and little finger upright, separated by the clenched fingers, and extend the arm at full length. Align first the top of the thumb, then the top of the little finger with the target, and any object seen inside the little finger on the left of the target, or inside the thumb on the right of the target is within $7\frac{1}{2}°$, and in the dangerous zone. This will be found approximately correct for most people, as the distance from the eye to the top of the fingers, arm at full length, is eight times the distance between the top of the thumb and the little finger, and tangent $7\frac{1}{2}°$ is $\frac{1}{8}$ nearly.

It should be tested by finding with the D.R.F., using the Vernier, two objects $7\frac{1}{2}°$ apart, and aligning on them. The proper position of the fingers can then be readily seen.

"The Army Book for the British Empire," published by authority, will make its appearance at an early date. The book will, to a large extent, be descriptive of the system on which the army has been built up since 1872, in which year, it will be remembered, Mr. Cardwell, who was then Minister, introduced such radical but necessary changes.

It is being edited by Lieut.-General W. H. Goodenough, C.B., and Lieut.-Colonel J. C. Dalton, who have obtained the co-operation of various contributors, all experts in the special subjects they treat of.

The book will be in four parts:—

I. The army system,
II. The components of the army,
III. The army in India and the Colonies,
IV. The army in war,

and will be illustrated with two portraits and with maps.

REGIMENTAL COLOURS.

THERE have lately been various complaints as to the miscellaneous wearing of the R.A. colours by civilians, and queries as to how this can be stopped; unfortunately the colours were never registered, so no check can be put on their sale to the public. Fashions change, and just now zig-zags are in favour, so we suffer; at other times the colours of the Guards and I Zingari have pleased the public. Like the members of these Clubs we must wait patiently until the fashion changes and we are left in undisputed possession of our own colours.

A large majority of the Regiment voted a few years ago in favour of retention of the colours unchanged, and since then officers have adopted them for constant wear, so that they are never likely to be mistaken in military or general society.

There is, however, another question that has been raised, and this is the desirability of ornamenting the dress of Indian native servants with the regimental colours; it is doubtful if any one feels an increased pride in the Regiment when passed by a low-caste syce or four rickshaw men decked out in blue with the red zig-zag. Those who have given their servants this very distinctive dress probably forgot that the colours were designed to be worn by officers only, except in the case of N.-C.O's. or men joining their officers to represent the Regiment at cricket or other sports.

The following Results are extracted from General Orders by His Excellency The Commander-in-Chief in India.

Adjutant-General's Office, Simla, 7th April, 1893.

THE result of the competitive shooting of Batteries and Companies of Royal Artillery in India for prizes for Skill-at-Arms, 1892-93, is as follows:—

The conditions were—

GROUPS I. AND II.

Targets—1st Position.—Three columns of infantry standing dummies, each 30 strong, in fours, advancing directly on the Battery and 25 yards apart, depth 15 yards.

2nd Position.—A line of infantry, standing dummies, in three groups, 25 yards apart, each group consisting of 15 dummies at 1 yard interval.

Ranges.—Unknown at two positions, but within the following limits:—

	1st position.	2nd position.
Group I.	2200 and 2600	1800 and 2200.
Group II.	2000 and 2400	1600 and 2000.

Ammunition.—A total of 24 rounds at each position.

Procedure.—The battery, drawn up 5 miles from the targets, the position of which is unknown, advance $2\frac{1}{2}$ to 3 miles, halt and prepare for action, then advance to first position approximately pointed out, and come into action.

After replenishing ammunition, repairing targets, &c., advance at a trot to the second position pointed out as before, and proceed as at first position.

Points—Hits.—One for each lodge or through (strikes not counted).

Fire Discipline.—Points allowed from a maximum of 100.

GROUP IV.

Targets.—Two stationary targets anchored at different ranges—one about 1600 and the other about 2400 yards.

Ammunition.—24 rounds 6-inch B.L. common shell, plugged.

Procedure.—Each company to parade four gun detachments, and man two 6-inch B.L. guns in one group, the second two detachments acting as a relief to the first two.

Twelve rounds, *i.e.*, six rounds from each gun, to be fired by first two detachments at the further target; to be then relieved by second two detachments, who will fire 12 rounds at the nearer target.

Points.—For rapidity of fire; 30 if competition is concluded in 36 minutes. Four to be added or deducted for each minute under or over, but not more than 50 to be allotted.

For accuracy, shots falling within a rectangle 80 yards long by 10 wide to score as hits; outside no score. Total points for 24 hits, 175.

For *fire discipline* from a maximum of 75.

GROUP V.

Targets.—6 feet by 6 feet, with bull's-eye marked with a radius of 2 feet—one at about 1500 and the other about 2000 yards; rectangles 70 yards by 6, and 85 yards by 6 respectively.

Ammunition.—40 rounds of 40-pr. R.M.L. common shell, plugged.

Procedure.—Each company to parade four gun detachments with at least twelve qualified layers. In Heavy Batteries the four guns to be manned together and fired in succession, 20 rounds being fired at the first position and 20 at the second. In Garrison Companies, if two guns are available, both to be manned together, the detachments being relieved after 20 rounds; if only one gun is available, the detachment to be relieved after every 10 rounds. In either case 20 rounds to be fired at each range.

Points.—Hits: Direct hit 10. Each shot in outer rectangles, 4 to 7; in inner, 7 to 10.

For *fire discipline* up to a maximum of 100.

The result shows an improvement in Horse, Field and Mountain Artillery, in most points brought to notice in previous years; the laying has increased in accuracy, while in fire discipline and handling of ammunition, and consequently in time, there is a decided advance. Steady drill and careful training, in which a general improvement has now taken place, should ensure guns being uniformly and accurately laid, and fuzes exactly set, and the chief difficulty still remaining lies in correct observation of fire by the Battery Commander, upon whom now mainly depends the success of the shooting.

The Royal Horse Artillery Batteries have generally shot well, and it is also gratifying to His Excellency the Commander-in-Chief to find that the superiority of the 12-pr. B.L. is so marked as a comparison of the scores, of both Horse and Field, in the two groups, shows.

GROUP I.—12-pr. B.L. Guns.

Results of Competition for Battery Prizes, Skill-at-arms, 1892-93.

Battery.	Name of Battery Commander.	Hits. First position.	Hits. Second position.	Hits. Total.	Fire discipline.	Grand Total.	Time in Action. First position.	Time in Action. Second position.	Practice ground.	Remarks.
54th Field	Major Farmer ...	698	337	1,035	90	1,125	6′ 35″	6′ 5″	Saugor Camp.	*Disqualified.*—Having fired 49 rounds instead of 48, one extra in place of a premature.
"C" R.H.A. ...	Major Rochfort ...	809	221	1,030	95	1,125	10′ 0″	8 55″	Gurgaon Camp.	*1st Battery Prize, and prize given by His Excellency General Lord Roberts, Commander-in-Chief in India.* (Total hits per minute in action 54·44).
"T" R.H.A. ...	Major Long... ...	478	415	893	95	988	9′ 1″	7′ 41″	Gurgaon Camp.	*1st Battery Prize.* (Total hits per minute in action 53·47).
71st Field	Major Kuper ...	651	229	880	95	975	9′ 55″	8′ 50″	Gurgaon Camp.	*2nd Battery Prize.*
44th "	Major Wynyard ...	433	284	717	85	802	8′ 39″	6′ 55″	Saugor Camp.	*2nd Battery Prize.*
51st "	Major Brunker ...	547	148	695	95	790	9′ 12″	9′ 8″	Cawnpore Camp.	*3rd Battepy Prize.*
19th "	Major Maberley	578	99	677	98	775	8′ 6″	6′ 30″	Vishranathpur Camp.	*3rd Battery Prize.*

GROUP II.—9-Pr. R.M.L. Guns.

34th Field	Major Bell-Irving	244	127	371	100	471	9′ 0″	8′ 0″	Shuirajpur Camp.	*1st Battery Prize, and prize given by His Excellency Sir James Dormer, Commander-in-Chief, Madras.*
33rd "	Capt. Hutchinson	178	141	319	95	414	7′ 0″	6′ 45″	Camp Yamjal.	*1st Battery Prize.*
42nd "	Major Dewar ...	158	126	284	95	379	9′ 27″	10′ 0″	Camp Velechi.	*2nd Battery Prize.*
27th "	Major Pengree ...	213	53	266	100	366	5′ 22″	7′ 0″	Kirkee.	*2nd Battery Prize.* This Battery won the prize given by the Inpector-General of Artillery in 1890-1.
"M" R.H.A.	Major Leach ...	153	113	266	98	364	7′ 32″	7′ 33″	Camp Yamjal.	*3rd Battery Prize.*

GROUP IV.—6-in. B.L. Guns.

Results of Competition for Company Prizes, Skill-at-arms, 1892-93.

Company.	Name of Company Commander.	Accuracy. Hits.	Accuracy. Marks.	Rapidity.	Fire Discipline.	Grand Total.	Time in action. Minutes.	Time in action. Seconds.	Station.	Remarks.
No. 14 Eastern Division... ...	Capt. R. Morris...	22	160·4	50	63	273·4	27	35	Bombay	*1st Company Prize, and prize given by His Excellency Sir George Greaves, Commander-in-Chief, Bombay.* This Company won the prize given by His Excellency the Commander-in-Chief, Bombay, in 1891-2.
No. 18 Southern Division... ...	Capt. F. A. Randolph	21	153·125	50	67·5	270·625	18	0	Rangoon	*2nd Company Prize.*
No. 21 Eastern Division... ...	Major J. M. Simpson	20	145·8	50	60	255·8	27	56	Bombay	*3rd Company Prize.*

GROUP V.—40-pr. R.M.L. Guns.

Company.	Name of Company Commander.	Hits. First position.	Hits. Second position.	Hits. Total.	Fire Discipline.	Grand Total.	Time in action. First position.	Time in action. Second position.	Practice Ground.	Remarks.
No. 1 Eastern Division... ...	Major Hewitt ...	134	143	277	95	372	33′ 0″	33′ 0″	Ferozepur	*1st Company Prize and prize given by the Hon'ble Lt.-Genl. H. Brackenbury, C.B., Military Member of Council.*
No. 13 (Heavy Battery) Western Division.	Major Western ...	149	104	253	90	343	11′ 54″	[16′ 0′	Camp Yamjal.	*2nd Company Prize.* This battery won the prizes given by His Excellency the Commander-in-Chief, Bombay, in 1889-90, and 1890-91.
No. 9 Southern Division... ...	Captain Preston ...	97	125	222	100	322	24′ 41″	105′ 26″	Palavaran	*3rd Company Prize.* This company won the prize given by His Excellency the Commander-in-Chief, Madras, in 1891-2.
No. 11 Southern Division... ...	Major Ryan	65	125	190	85	275	33′ 0″	26′ 30″	Delhi Fort	*3rd Company Prize.*

GLASGOW.

On Monday evening, the 19th June, in commemoration of the Battle of Waterloo, the N.-C.O.'s of the 7th Field Battery, now quartered at Maryhill Barracks, gave their Annual Quadrille Party in the Gymnasium there; several of the officers of the Battery and of the 2nd "Black Watch" were present.

On the 6th July, to celebrate the Duke of York's wedding, a grand military display was given on Glasgow Green, a review of the Regulars and Volunteers being held at 11 a.m., and a military tournament taking place on the green in the afternoon. The latter was arranged for the Lord Provost, Magistrates and Town Council of Glasgow, who spared no expense or trouble in trying to make the tournament a success; a grand stand and enclosure to hold 10,000 people was specially erected, and it is estimated that upwards of 50,000 spectators were present. The Battery gave two displays, one of Artillery driving through pegs (trotting and galloping), and the other of Artillery in action, both of which were much appreciated. Major Woods and Captain Guise were on the committee of the tournament, and were the chief judges in most of the events; a handsome gold medal to commemorate the tournament was awarded to each by the Corporation of Glasgow.

The Battery is under orders to proceed from Glasgow to Barry Links (5 days' march) on the 25th July for Annual Practice, returning to Glasgow on the 18th August.

HALIFAX, N.S.

Lieut.-General Montgomery Moore, the new G.O.C. Troops in Canada, has arrived at Halifax. He has brought out as his Military Secretary Major Apsley Smith, R.A.; a popular appointment irrespective of the satisfaction of seeing a Gunner in an Army Staff billet.

Captain F. M. Lowe, R.A., and Mrs. Lowe arrived with a draft per s.s. *Assyrian* on 17th June. Captain Lowe is to be Instructor-in-Gunnery. This is the first time there has been an Instructor-in-Gunnery at Halifax for twenty years, the last one being Captain Darwall, who went home with the 3rd Brigade in 1873.

The officers' problems in Coast Defence, which were executed by R.A. Captains and Subalterns during the winter months, having been set and criticised by Captain Boileau, have now been returned by the Admiral with further criticisms by the Gunnery and Torpedo Lieutenants of H.M.S. *Blake*. The problems relating to the defence of mine-fields were also criticised by the R.E. officer in charge of submarine mines. The ships selected all belonged to the new United States Navy. The officers who were required to solve the problems entered into the spirit of the thing and worked them out fully and carefully; the four best have been sent to the Horse Guards, but they all go to form an interesting collection which may be of use in considering schemes of local defence.

Major Crookenden has been promoted Lieutenant-Colonel, and "selected" for the command of the R.A. at Aden. He is to be succeeded as Armament-Major at Halifax by Major J. O. Hodgson, who has previously served seven years in this garrison.

Two French men-of-war have been in port, the *Naïde* and the *Magon*, both are wooden cruisers, the former is the flag-ship of Admiral Sallandrouze de Lamornaix, commanding the "*Division Navale volante et d'instruction*," the latter belongs to the "*Division Legère de l'Atlantique*."

Lieutenant-Colonel Saunders and Officers R.A. and R.E. dined on board the *Magon*. After dinner Colonel Saunders returned thanks for the British Army in

French, and Colonel Crookenden highly delighted the French officers by singing French Canadian songs to them.

Major Brady has been on a week's leave to Tangier River, 60 miles east of Halifax, and found it, like most rivers in Nova Scotia, much over-netted. Nevertheless he hooked six salmon, killing four and losing two. The largest was 13 lbs. One fish was on for one and a quarter hours.

No. 3 Company Western (Major Brady's) has bought a whaler which has been named the *Valkyrie*. Her dimensions are: length over all, 34 feet; length on water-line, 27 feet; beam, 8 feet 9 inches. She is schooner rigged with brown sails, and is a very trim looking craft. She was built for the Chicago Exhibition by a man at Tancook, N.S., who subsequently was unable to send her there on account of the expense. Lieuts. Marsh and Arthy sailed her round from Tancook Island to Halifax Harbour, a distance of 50 miles, and had rather a hard time of it, as they were becalmed off Sambro Island, and ran short of water. The trip took 36 hours, including a night in Pennant Harbour. On Saturday, 8th July, the *Valkyrie* won the Hesslein Cup, in the Royal Nova Scotia Yacht Squadron Races, Lieut. Marsh being skipper and the other hands all R.A. Officers.

On 21st June, the Annual Horse and Pony Races were held. The only R.A. Officer riding was Captain C. H. Alexander, who rode a winning mount on one of his own ponies, "Galfred."

The news of the disaster to H.M.S. *Victoria* was received at Halifax through the public Press, on Friday, 23rd June, the day after it occurred. An officer was sent on board the French flag-ship next morning to ask that the Officers R.A. and R.E. might be excused from dining on board as arranged, and almost simultaneously the French Admiral sent his A.-D.-C. to the R.A. Park to express his sympathy, and request that he and his officers might be allowed to cancel their engagement to dine at the R.A. and R.E. Mess.

The Royal Wedding-day, on 6th July, was not observed at Halifax, except by the Navy and Military dressing ships and signal station, and firing salutes. Lieut. Macgowan, who was very intimate with the Duke of York when he was out here in command of the *Thrush*, sent H.R.H. a cablegram of congratulation, and next morning received the reply: "Our warmest thanks—George."

WOOLWICH.

This year the gaieties of the season seem to have been crowded into the month of July.

Owing to the disastrous loss of H.M.S. *Victoria*, the June ball was postponed until 7th July. It was then most successfully brought off and, judging from the attendance, is as popular as ever; had there been a few more dancing men the demands on those who did dance would, perhaps, have been a little lighter.

On Tuesday, 4th July, General Lord Roberts was entertained at dinner at the R.A. Mess.

About 125 officers were present, and the seating capacity of the Mess was tested to its limit.

The enthusiasm evoked by the toast of his health could hardly be restrained when, in his reply, Lord Roberts referred in kindly terms one by one to the various Royal Artillerymen who had served with or under him in India.

Besides the toast of the evening, the healths of Sir W. Stirling and Sir A. Noble were drunk on their receiving the honour of Knight Commandership of the Bath in the last *Birthday Gazette*: in replying, Sir W. Stirling alluded very gracefully to the love and confidence in Lord Roberts felt by all ranks of his Battery, F/A Royal Horse Artillery, when serving in Afghanistan.

After hearing some songs Lord Roberts left the Mess amidst the cheers of officers crowded on the stairs and in the hall.

The Garrison Sports, usually held in August, took place on July 11th, 13th, and 14th, and again this year the mounted sports were contested in Charlton Park on the space adjoining the Polo Ground, instead of on the upper part of the Common; this spot is far more pleasant than the old ground at the top of the Common.

On Monday, July 17th, Sir W. and Lady Stirling gave a garden party at the Governor's House, R.M. Academy; luckily the weather, though threatening, held up, and the party was enjoyed by a great number of guests from London, as well as Woolwich and neighbourhood.

The officers of "J" Battery, R.H.A., entertained the N.-C.O's. and men of the battery at supper in the R.A. Theatre on 18th July, to celebrate their second record at Shoeburyness, and the retention of the gold cross guns for another year. Afterwards the Battery gave a variety entertainment to which were bidden the General Commanding and the officers and ladies of the Regiment.

To say that it was a success would be to damn it with faint praise, while to attempt to select one part of the programme as better than another would be impossible. The programme given below shows that well-known and popular members both of the professional and amateur stage gave their valuable services, and the way that they were appreciated both by the "Gods" and entire house, must have been most gratifying to the originator of the idea.

Major Davidson's song, "As Long as the World Goes Round," was full of topical allusions and warmly received, and after it "Auld Lang Syne" and "God Save the Queen" were sung in full chorus.

"J" BATTERY, R.H.A.

R.A. THEATRE,
18th July, 1893.

PROGRAMME.

MARCH.....“Faust”..... R.A. BAND.

“BREAKING THE ICE.”

An Original Comedietta, in One Act, by *Charles Thomas.*
Miss Marston.....MRS. MANSELL.
Captain Selby.....CAPTAIN MANSELL, R.A.

VALSE.....“Mia Cara”.....R.A. BAND.
SONG.....“Miss Julia”.....LT.-COL. BARRINGTON-FOOTE, R.A.
SONG.....“The Boys of the Old Brigade”.....SERGT. POOL, R.H.A.
MUSICAL SKETCH.....MR. C. P. LITTLE.

ENTITLED, “A VILLAGE ENTERTAINMENT,” by *F. Anstey.*

COMIC SONG.....MR. CLAUD NUGENT.
SONG.....“The nasty way he said it”...CAPT. H. J. DUCANE, R.H.A.
RECITATION.....“The Two Thumpers” LT.-COL. BARRINGTON-FOOTE, R.A.
SONG.....“As Long as the World Goes Round”...MAJOR DAVIDSON, R.H.A.

“AULD LANG SYNE.” “GOD SAVE THE QUEEN.”

OBITUARY.

Lieutenant St. L. L. N. Nott, whose death occurred at Agra, on 23rd June, joined the Regiment as Second Lieutenant, 27th July, 1888, and became Lieutenant, July, 1891.

Colonel W. Ward, late Royal (Bombay) Artillery, died at Weston-super-Mare, on 3rd July. He served in the Egyptian Campaign of 1882, and was present at the battle of Tel-el-Kebir. (Despatches, *London Gazette*, 2nd November, 1882. Medal, with clasp, bronze star, brevet of Lieutenant-Colonel, 3rd Class of Medjidie.

Major-General C. D. Chalmers (retired), died in London, on 20th July, 1893. He served during the Indian Mutiny, 1857–8, and was present at the action of Kalee Nuddee, affair of Ramgunge, siege and capture of Lucknow, actions of Bareilly, Shahjehanpore, and Mohumdee. Medal, with clasp.

CRICKET, 1893.

ROYAL ARTILLERY *v.* ALDERSHOT DIVISION.

PLAYED AT ALDERSHOT, 26TH AND 27TH MAY.

ROYAL ARTILLERY.

1st Innings.		*2nd Innings.*	
E. J. R. Peel, b O'Donnell	4	b O'Donnell	9
C. C. Van-Straubenzee, c MacTier, b Halliday	4	b Shekleton	28
Major W. N. LLoyd, c Ridley, b O'Donnell	9	b Wynyard	56
Capt. P. H. M. Dorehill, b MacTier	34	c Taylor, b Shekleton	21
Major F. A. Curteis, b O'Donnell	16	not out	136
A. E. J. Perkins, b O'Donnell	0	c Ridley, b MacTier	7
W. Strong, b O'Donnell	29	c O'Donnell, b Wynyard	5
T. M. Usborne, l b w, b O'Donnell	35	b Halliday	54
W. C. Staveley, l b w, b Wynyard	5	not out	11
Capt. F. H. Crampton, b O'Donnell	0		
E. G. Waymouth, not out	11		
Extras	11	Extras	28
Total	158	Total (for 7 wickets)	355

ALDERSHOT DIVISION.

1st Innings.		*2nd Innings.*	
Capt. H. B. Trevor, c Curteis, b Crampton	13	not out	45
F. P. Taylor, b Waymouth	3		
Capt. E. G. Wynyard, c Perkins, b Dorehill	134		
" P. C. W. Trevor, c Curteis, b Waymouth	0		
R. C. Saville, c and b Waymouth	3	st Usborne, b Waymouth	7
Capt. H. C. MacTier, b Dorehill	25	not out	52
" A. B. Ridley, c Perkins, b Dorehill	11		
" O'Donnell, b Dorehill	8		
" Shekleton, c Usborne, b Dorehill	10		
" Clowes, b Crampton	1		
Sergt. Halliday, not out	7		
Extras	4	Extras	6
Total	219	Total (for 1 wicket)	110

ROYAL ARTILLERY *v.* FREE FORESTERS.

PLAYED AT WOOLWICH, 7TH AND 8TH JUNE.

FREE FORESTERS.

1st Innings.		*2nd Innings.*	
J. S. Russell, c Curteis, b Elton	27	b Dorehill	4
G. F. Vernon, b Dorehill	58	b Crampton	43
Major Friend, c and b Elton	7	c Usborne, b Elton	27
" Hardy, b Elton	15	b Elton	4
J. A. Gibbs, c Crampton, b Elton	0	c and b Dorehill	2
A. J. Thornton, c and b Dorehill	1	not out	18
Capt. Banbury, b Dorehill	0	b Elton	7
" Willes, st Usborne, b Elton	37	l b w, b Elton	1
H. E. Chapman, b Elton	4	b Crampton	0
Major North, not out	14	b Crampton	2
Capt. Bunbury, b Elton	7	absent	0
Extras	11	Extras	5
Total	182	Total	113

ROYAL ARTILLERY.

1st Innings.		*2nd Innings.*	
Capt. J. P. DuCane, b Gibbs	68	c North, b Friend	1
C. C. Van-Straubenzee, c Vernon, b Thornton	18	not out	58
Capt. P. H. Dorehill, l b w, b Thornton	9	ht wkt, b Gibbs	21
Major F. A. Curteis, l b w, b Thornton	7	b Thornton	5
E. J. R. Peel, not out	17	b Friend	2
T. M. Usborne, b Thornton	19	not out	34
A. E. J. Perkins, b Thornton	0		
Capt. A. J. Abdy, b Thornton	0		
" F. H. Crampton, b Friend	19		
F. A. G. Y. Elton, b Gibbs	2		
E. G. Waymouth, b Thornton	1		
Extras	4	Extras	11
Total	164	Total (for 4 wickets)	132

ROYAL ARTILLERY *v.* ROYAL ENGINEERS.

PLAYED AT WOOLWICH, 16TH AND 17TH JUNE.

ROYAL ARTILLERY.

1st Innings.		*2nd Innings.*	
Capt. J. P. DuCane, b Guggisberg	7	c Rawson, b Bayfield	7
" H. R. Adair, st Rawson, b Bayfield	47	c Friend, b Guggisberg	8
" F. W. D. Quinton, run out	2	c and b Bayfield	4
" P. H. M. Dorehill, c Bayfield, b Guggisberg	16	b Woodroffe	36
Major F. A. Curteis, b Bayfield	0	not out	96
T. M. Usborne, b Bayfield	10	b Bayfield	10
R. S. Hamilton, c Woodroffe, b Bayfield	6	b Bayfield	0
A. E. J. Perkins, b Bayfield	0	b Bayfield	34
C. C. Van-Straubenzee, b Bayfield	2	c Friend, b Guggisberg	6
Capt. F. H. Crampton, c Bigge, b Guggisberg	16	l b w, b Woodroffe	26
H. C. Moorhouse, not out	12	c Guggisberg, b Bigge	20
Extras	18	Extras	22
Total	136	Total	269

ROYAL ENGINEERS.

1st Innings.		*2nd Innings.*	
Major Friend, c and b Hamilton	45	c Perkins, b Dorehill	33
T. A. H. Bigge, c DuCane, b Moorhouse	19	c Straubenzee, b Perkins	35
Capt. Hamilton, c Quinton, b Hamilton	22	not out	33
E. M. Blair, b Moorhouse	41	not out	65
Major Young, b Hamilton	0		
Corpl. Bayfield, b Hamilton	0		
Capt. Rice, c and b Adair	1		
A. J. Woodroffe, b Hamilton	0		
F. G. Guggisberg, b Crampton	53		
C. N. North, c Dorehill, b Moorhouse	9		
Major Rawson, not out	8		
Extras	15	Extras	29
Total	213	Total (for 2 wickets)	193

ROYAL ARTILLERY *v.* ROYAL MILITARY ACADEMY.

PLAYED AT WOOLWICH, 19TH AND 20TH JUNE.

ROYAL MILITARY ACADEMY.

1st Innings.		*2nd Innings.*	
R. A. Birley, c Usborne, b Adair	42	b Barnes	117
C. Wigram, b Holloway	24	c Campbell, b Barnes	58
M. O. C. Tandy, c Perkins, b Adair	12	c Perkins, b Crampton	1
W. L. Foster, b Hamilton	4	c and b Hamilton	0
P. Blount, c Hamilton, b Adair	2	c Campbell, b Barnes	2
C. C. Barnes, c Holloway, b Hamilton	13	c and b Barnes	0
P. de B. Radcliffe, b Crampton	5	c and b Barnes	3
E. L. Wheeler, b Crampton	3	b Perkins	15
L. K. Stanborough, c Crampton, b Moorhouse	7	b Hamilton	9
C. G. Meyrick, b Crampton	16	c Barnes, b Moorhouse	4
C. B. Symonds, not out	6	not out	2
Extras	6	Extras	27
Total	138	Total	238

ROYAL ARTILLERY.

1st Innings.		*2nd Innings.*	
Capt. J. P. DuCane, b Wigram	0	b Stanborough	7
" H. R. Adair, not out	83	c Wigram, b Stanborough	5
C. C. Van-Straubenzee, b Stanborough	0	not out	71
A. E. J. Perkins, c Sandy, b Stanborough	5	not out	93
R. S. Hamilton, c and b Wigram	10		
Capt. F. H. Crampton, c Symonds, b Birley	22	b Wigram	0
H. C. Moorhouse, c Barnes, b Wigram	4		
T. M. Usborne, c Radcliffe, b Wigram	0	b Wigram	7
W. O. Holloway, b Wigram	2		
H. M. Barnes, run out	26	c Radcliffe, b Wigram	1
H. M. Campbell, c Radcliffe, b Wigram	13		
Extras	3	Extras	25
Total	168	Total (for 5 wickets)	210

ROYAL ARTILLERY *v.* HOUSEHOLD BRIGADE.

PLAYED AT CHELSEA, 23RD AND 24TH JUNE.

HOUSEHOLD BRIGADE.

1st Innings.		*2nd Innings.*	
B. V. Wentworth, c Crampton, b Barnes	64	st Usborne, b Barnes	22
H. W. Studd, c sub., b Barnes	25	b Barnes	12
W. S. Gosling, run out	21	c and b Barnes	8
Capt. C. P. Kindersley, b Crampton	0	b Crampton	9
Lord Newtown-Butler, c Bannatine-Allason, b Barnes	6	b Barnes	0
Sergt. Cumner, b Barnes	11	b Crampton	49
S. Earle, not out	52	run out	9
J. H. R. Bailey, c Perkins, b Crampton	51	b Crampton	3
H. H. Amory, run out	15	c Perkins, b Barnes	13
Sergt. Dudson, b Barnes	5	c and b Crampton	6
Corpl. Robinson, b Barnes	11	not out	3
Extras	25	Extras	1
Total	286	Total	135

ROYAL ARTILLERY.

1st Innings.		*2nd Innings.*	
Capt. J. P. DuCane, b Gosling	45	c Dudson, b Studd	0
C. C. Van-Straubenzee, b Wentworth	1	c Butler, b Gosling	13
Capt. P. H. M. Dorehill, l b w, b Studd	19	c Earle, b Studd	38
Major F. A. Curteis, c and b Gosling	42	c and b Cumner	35
A. E. J. Perkins, c Butler, b Studd	0	b Cumner	27
C. Prescott-Decie, b Studd	4	run out	35
T. M. Usborne, b Wentworth	27	c Gosling, b Studd	5
Major R. Bannatine-Allason, b Gosling	10	c Studd, b Cumner	3
Capt. F. H. Crampton, c Wentworth, b Studd	25	b Amory	16
H. M. Barnes, not out	19	l b w, b Wentworth	0
Major A. S. Pratt, run out	6	not out	4
Extras	19	Extras	7
Total	217	Total	183

ROYAL ARTILLERY *v.* GREEN JACKETS.

PLAYED AT WOOLWICH, 28TH AND 29TH JUNE.

ROYAL ARTILLERY.

Capt. H. R. Adair, c Bathurst, b Grainger	74
C. C. Van-Straubenzee, b Grainger	2
V. R. Hine-Haycock, b Grainger	4
Major F. A. Curteis, c Grainger, b Clowes	24
A. E. J. Perkins, b Nash	12
T. M. Usborne, c Bathurst, b Grainger	9
W. C. Staveley, b Grainger	0
Capt. F. H. Crampton, b Grainger	0
Major W. L. Davidson, c Elore, b Lord Bingham	135
Capt. E. J. Phipps-Hornby, b Bathurst	13
H. C. Moorhouse, not out	23
Extras	25
Total	321

GREEN JACKETS.

1st Innings.		*2nd Innings.*	
Capt. Boultbee, c Usborne, b Crampton	40	b Adair	9
Corpl. Webb, c Crampton, b Moorhouse	1	b Adair	0
H. R. Blore, b Crampton	45	c Adair, b Crampton	19
Lord Bingham, b Crampton	5	l b w, b Crampton	23
H. G. Majendie, c Crampton, b Adair	21	c sub., b Adair	0
Sergt. Grainger, b Crampton	11	c Curteis, b Adair	0
Capt. Phipps-Hornby, b Crampton	12	b Adair	0
Capt. Clowes, c Usborne, b Adair	1	b Adair	3
Colonel Bathurst, c Perkins, b Crampton	5	b Crampton	3
Private Nash, not out	2	not out	13
W. H. W. Steward, c Curteis, b Adair	0	b Adair	1
Extras	13	Extras	14
Total	156	Total	90

ROYAL ARTILLERY *v.* OXFORD AUTHENTICS.

PLAYED AT WOOLWICH, 6TH AND 7TH JULY.

OXFORD AUTHENTICS.

1st Innings.		*2nd Innings.*	
F. A. G. Leveson-Gower, b Prescott-Decie	15	c Straubenzee, b Barnes	10
B. N. Bosworth-Smith, st Usborne, b Barnes	23	c Curteis, b Barnes	5
R. T. Jones, c and b Prescott-Decie	7	b Elton	17
H. Philipson, b Prescott-Decie	2	c Straubenzee, b Crampton	54
W. S. Case, c Usborne, b Barnes	4	c Usborne, b Barnes	33
A. J. Boger, c Usborne, b Prescott-Decie	1	b Crampton	23
F. G. H. Clayton, c Elton, b Barnes	0	b Barnes	7
P. Colville-Smith, b Elton	22	b Elton	12
W. E. T. Bolitho, st Usborne, b Holloway	46	b Elton	22
E. Lane-Fox, not out	12	b Barnes	0
J. Roberts, b Holloway	0	not out	16
Extras	23	Extras	17
Total	155	Total	216

ROYAL ARTILLERY.

1st Innings.		*2nd Innings.*	
Capt. J. P. DuCane, c Colville-Smith, b Lane-Fox	0	b Clayton	1
C. C. Van-Straubenzee, b Clayton	23	c Lane-Fox, b Boger	105
Major F. A. Curteis, b Lane-Fox	4	c Bolitho, b Case	42
A. E. J. Perkins, b Clayton	28	c sub., b Boger	57
C. Prescott-Decie, c Bolitho, b Jones	0	not out	31
Major W. L. Davidson, b Clayton	6	not out	3
T. M. Usborne, b Clayton	6	c Jones, b Boger	0
W. O. Holloway, b Clayton	11		
Capt. F. H. Crampton, l b w, b Clayton	9		
H. M. Barnes, not out	6		
F. A. G. Y. Elton, b Clayton	4		
Extras	14	Extras	24
Total	111	Total (for 5 wickets)	263

ROYAL ARTILLERY *v.* OXFORD HARLEQUINS.

PLAYED AT WOOLWICH, 10TH AND 11TH JULY.

ROYAL ARTILLERY.

1st Innings.		*2st Innings.*	
Capt. H. R. Adair, c Robertson-Walker, b Webbe	1	b Wilson	2
C. C. Van-Straubenzee, b Robertson-Walker	6	b Webbe	29
Capt. C. D. King, c Robertson-Walker, b Pearson	31	b Wilson	6
Major F. A. Curteis, b Robertson-Walker	10	c Wilson, b Robertson-Walker	11
A. E. J. Perkins, l b w, b Robertson-Walker	5	c Pearson, b Webbe	1
Major W. L. Davidson, b Robertson-Walker	0	run out	7
W. O. Holloway, c Robertson-Walker, b Webbe	20	l b w, b Robertson-Walker	35
T. M. Usborne, c Burge, b Pearson	13	c Pearson, b Webbe	5
Capt. F. H. Crampton, c Wilson, b Pearson	0	c Wilson, b Webbe	0
H. M. Barnes, not out	3	b Webbe	7
E. G. Waymouth, run out	1	not out	4
Extras	10	Extras	10
Total	100	Total	117

OXFORD HARLEQUINS.

1st Innings.		*2nd Innings.*	
J. G. Walker, run out	0	c Adair, b Waymouth	1
A. J. Webbe, c Usborne, b Adair	41	b Crampton	7
G. L. Wilson, c Van-Straubenzee, b Crampton	13	b Crampton	0
W. D. Llewelyn, c Davidson, b Waymouth	16	b Waymouth	20
J. Robertson-Walker, c Holloway, b Waymouth	10	b Waymouth	0
H. M. Burge, b Adair	6	b Holloway	14
J. A. Gibbs, b Waymouth	1	not out	4
J. Eyre, c and b Adair	3	not out	4
C. A. Field, c Curteis, b Barnes	9		
R. B. Pearson, not out	23	c Crampton, b Adair	28
R. P. Lewis, c Crampton, b Barnes	0		
Extras	15	Extras	3
Total	137	Total (for 7 wickets)	81

ROYAL ARTILLERY *v.* ROYAL ENGINEERS.

PLAYED AT CHATHAM, 14TH AND 15TH JULY.

ROYAL ENGINEERS.

Corpl. Bayfield, c Curteis, b Barnes	12
T. A. H. Bigge, b Barnes	41
Capt. W. C. Hedley, c Perkins, b Adair	56
E. M. Blair, c Prescott-Decie, b Barnes	58
Capt. Hamilton, l b w, b Dorehill	10
" Rice, c Prescott-Decie, b Dorchill	6
W. Robertson, c Adair, b Prescott-Decie	68
A. J. Woodroffe, b Dorehill	0
Major Young, not out	21
G. C. Hall, c Van-Straubenzee, b Adair	0
Major Rawson, b Prescott-Decie	2
Extras	4
Total	278

ROYAL ARTILLERY.

1st Innings.		*2nd Innings.*	
Capt. H. R. Adair, c Blair, b Bayfield	0	c Bayfield, b Hedley	37
C. C. Van-Straubenzee, c Bigge, b Hedley	8	b Bayfield	6
Capt. F. W. D. Quinton, c Robertson, b Hedley	13	c Bigge, b Bayfield	42
" P. H. M. Dorehill, b Bayfield	1	b Bayfield	0
Major F. A. Curteis, b Hedley	0	b Hedley	3
A. E. J. Perkins, b Hedley	2	c Blair, b Hedley	3
W. Strong, c Bigge, b Bayfield	31	c Blair, b Bayfield	4
C. Prescott-Decie, b Hedley	0	b Bayfield	3
T. M. Usborne, b Hedley	0	c Rawson, b Hedley	1
H. M. Barnes, not out	4	b Bayfield	0
Capt. F. H. Crampton, c Bayfield, b Hedley	1	not out	11
Extras	7	Extras	11
Total	67	Total	121

DIARY OF FIXTURES.

AUGUST.

Day of the Mth.	Wk.	Regimental.	Cricket, &c.	Private.
1	T	... ...	R.A. *v.* B.B., at Woolwich.	... ...
2	W	... ...	... ...	... ...
3	Th	... ...	... ...	... ...
4	F	... ...	R.A. *v.* Mote Park, at Maidstone.	... ...
5	S	5th Div. Course at Western Forts begins.	R.A. *v.* Mote Park, at Maidstone.	... ...
6	S	... ...	... ...	... ...
7	M	... ...	... ...	... ...
8	T	... ...	... ...	... ...
9	W	... ...	R.A. *v.* I.Z., at Woolwich.	... ...
10	Th	... ...	R.A. *v.* I.Z., at Woolwich.	... ...
11	F	... ...	... ...	... ...
12	S	... ...	R.A. Officers *v.* N.-C.O's. at Woolwich.	... ...
13	S	... ...	... ...	... ...
14	M	... ...	... ...	... ...
15	T	... ...	... ...	... ...
16	W	... ...	... ...	... ...
17	Th	... ...	... ...	... ...
18	F	... ...	... ...	... ...
19	S	... ...	... ...	... ...
20	S	... ...	... ...	... ...
21	M	... ...	... ...	... ...
22	T	5th Div. F.A. arrives at Okehampton.	... ...	... ...
23	W	... ...	... ...	... ...
24	Th	... ...	... ...	... ...
25	F	... ...	... ...	... ...
26	S	... ...	... ...	... ...
27	S	... ...	... ...	... ...
28	M	... ...	... ...	... ...
29	T	... ...	... ...	... ...
30	W	... ...	R.A. Woolwich *v.* Charlton Park, at Woolwich.	... ...
31	Th	... ...	... ...	... ...

SEPTEMBER.

1	F	... ...	... ...	... ...
2	S	6th Div. Course at Western Forts begins.	... ...	... ...
3	S	... ...	... ...	... ...
4	M	... ...	... ...	... ...
5	T	... ...	Doncaster Races begin.	... ...
6	W	... ...	The Leger.	... ...
7	Th	... ...	... ...	... ...
8	F	... ...	... ...	... ...
9	S	... ...	... ...	... ...
10	S	... ...	... ...	... ...
11	M	Special Class joins the Artillery College.	... ...	... ...
12	T	... ...	... ...	... ...
13	W	... ...	... ...	... ...
14	Th	... ...	... ...	... ...
15	F	... ...	... ...	... ...
16	S	... ...	... ...	... ...
17	S	... ...	... ...	... ...
18	M	... ...	... ...	... ...
19	T	... ...	... ...	... ...
20	W	... ...	... ...	... ...
21	Th	... ...	... ...	... ...
22	F	... ...	... ...	... ...
23	S	... ...	... ...	... ...
24	S	... ...	... ...	... ...
25	M	... ...	... ...	... ...
26	T	... ...	... ...	... ...
27	W	... ...	... ...	... ...
28	Th	... ...	... ...	... ...
29	F	... ...	... ...	... ...
30	S	... ...	... ...	... ...

NOTES
FROM
CORRESPONDING MEMBERS.

THE subject for the Duncan Gold Medal Prize Essay, 1894, is—

"What is the best tactical organisation and system of training mass batteries of Horse and Field Artillery?"

THE following works are now on sale at the R.A. Institution and will be forwarded post free at the prices noted after their titles below:—

Major-General Stubbs's "List of Officers of the Bengal Artillery," price 5s. 3d.

"Field Artillery Fire," by Captain W. L. White, R.A., price 1s. 2d.

"Notes of Lectures on Artillery in Coast Defence," by Major A. C. Hansard, R.A., price 1s. 2d.

"Ranging Note-Book," by Captain S. W. Lane, R.A., price 1s. 1d.

"Achievements of Field Artillery," by Major E. S. May, R.A., bound, price 2s. 6d.

The two Numbers of "Nature" containing Professor C. V. Boys's Lecture on "Photography of Flying Bullets," fully illustrated, price 8d.

Examination questions in (*c*), (*d*), and (*e*) set in the four examinations ending May 1893:—

Captains (*c*) and (*d*) ... price 1s. 1d.
Lieutenants (*c*) (*d*) and (*e*) price 1s. 1d.

BOOKS RECOMMENDED FOR THE STAFF COLLEGE AND PROMOTION EXAMINATIONS.

BY

LIEUT.-COLONEL EDEN BAKER, R.A.

[*Always follow the Syllabus in the Queen's Regulations closely.*]

MILITARY LAW.

LIEUTENANTS.—Army Annual Act, 1893.
Military Law, by Lieut.-Col. Pratt. 7th edition. 1892.
Army Act. Part II.
Reserve Forces Act, 1882.

CAPTAINS, IN ADDITION TO THE ABOVE:—
Army Act. Parts III., IV., V.
Militia Act, 1882.

Vide Army Order 103. June 1893.

FIELD FORTIFICATION.

Instruction in Military Engineering. Part I., Field Defences 1892 (*omit* fougasses and large inundations.

Manual of Elementary Field Engineering (*omit* Sections 12 to 15, 18, 20).
Defence and Attack of Positions, by Colonel Schaw. 3rd edition. *Read* chapters 5, 7, 8 and 9.

PERMANENT FORTIFICATION.—*Staff College only.*

Text-book of Fortification for use at R.M.A., Woolwich, 1878. Part I., pages 132 to 191; Part II., pages 1 to 108 and 138 to 145.

MILITARY TOPOGRAPHY.

Text-book of Military Topography, 1888 (*omit* Sections 13 to 24 and 26 to 28).
Short Notes on Tactics and Reconnaissance, 1887, by Major J. R. J. Jocelyn, R.A. *Read* pages 65 to 81 and 84 to 94.

TACTICS.

Infantry Drill, 1893. *Read* the tactical part on pages xxiv, xxvi, 11, 50, 51, 87, 90, 94 to 192, 244 to 249.
Short Notes on Tactics and Reconnaissance, 1887, by Major Jocelyn, R.A. *Read* pages 7 to 62, but note that Infantry formations have been altered by Infantry Drill 1893 and Artillery Intervals and Distances by Field Artillery Drill, 1889. For Lieutenants Promotion Examination *read* only up to heading 15.
Minor Tactics by Colonel Clery. 6th edition. *Read* Chapter IX., X. and XX.
Preliminary Tactics, by Major Eden Baker. 1892. *Read* Ammunition Supply (the Battery Supply System has been altered), Time and Space (note that the following pages have been altered:—last line page 45, nearly all page 46, top half of page 48, and on page 49 lines 6 to 16 and 29 and 30), and Marches.

ARTILLERY.—*Lieutenants R.A. for Promotion Examination.*

Text-book of Gunnery, by Major Mackinlay. Chapters I., II., XII. XIV., XVII.
Treatise on the Manufacture of Guns, 1886. (New edition now in press).
Treatise on Military Carriages, 1888.
Treatise on Ammunition, 1892.
Handbook of Artillery *Matériel*, by Major Morgan, 1892.
Field Artillery Drill, Vol. II., 1889. (New edition now in press).
Manual of Garrison Artillery, Vol. I., 1892.
Handbook for Field Service, Vol. I, Field Artillery. *Omit* Parts I; IV; VII, 1 and 3; VIII, 2 and 3; IX, 2 and 3; X; XI, 2, 7 and 10.
Regulations for Magazines, Ammunition Stores, Laboratories, &c., 1887.
Manual of Field Range-finding, 1890. } Alternative.
Hand-book for the Depression Range-finder, 1892. }
Preliminary Tactics, by Major Eden Baker, 1892. *Read* pages 171 to 174, 178, 179, and Chapters V. and IX.

STAFF COLLEGE ENTRANCE EXAMINATION, MAY, 1894.
MILITARY HISTORY.

Vide Army Order 138, August 1893.

Officers going up for the Staff College Examination are recommended to read all Magazine Articles, Lectures, &c., that refer to Field Subjects.

Artillery College, Woolwich,
1st September, 1893.

DOVER.

Captain J. McC. Maxwell has joined No. 2 Company; 2nd Lieutenant B. R. Brewin has relieved 2nd Lieutenant W. E. Manley at Newhaven, the latter rejoining head-quarters. No. 17 Siege Train Company has returned from Lydd, leaving 2nd Lieutenant Boyd and 50 men there. Lieutenant Schlesinger, Kent Artillery, has joined the Depôt *vice* Lieutenant Hassell relieved.

A handsomely-mounted and framed photograph of General Sir Burke Cuppage, K.C.B., first Colonel on the Staff R.A. at Dover, has been presented to the Mess by Lieut.-Colonel Spencer Gardiner. Sir Burke Cuppage commanded the R.A. South-Eastern District from 1861–64, and his name will always be associated in Dover with the restoration of the ancient (probably most ancient in England) Church of St. Mary-within-the-Castle.

Lieut.-General G. G. Pearse, C.B., Colonel-Commandant Royal Horse Artillery, has very kindly presented the Mess with a photograph of Major-General Gerrard Potter Eaton, who commanded the R.A. South-Eastern District from 1868–72, of whom General Pearse writes, "a very good officer—of a very good family."

The Mess Committee are more than ever anxious to obtain portraits of Major-Generals Ormsby and Elwin, to complete the list.

The R.A. Cricket Club Dover has not been successful up to date, they appear to be very good in the field and in the bowling, but are decidedly weak with the willow.

The R.A. helped to line the streets on the occasion of H.R.H. the Prince of Wales's visit to Dover to lay the memorial stone of the New East Pier on 20th July, and Colonel Lloyd and two officers R.A. received invitations to the luncheon in the Town Hall.

The officers R.A. endeavoured to induce the Marquis of Dufferin and Ava to name a day and dine with them, in his capacity as Constable of Dover Castle, when he was at home, but unfortunately he could not manage it, every afternoon and night he had engagements in London.

OBITUARY.

General Sir E. B. Hamley, K.C.B., K.C.M.G., Colonel-Commandant, whose death occurred in London, on 12th August, 1893, joined the Regiment as 2nd Lieutenant, 11th January, 1843; became Lieutenant, 5th September, 1843; 2nd Captain, 14th May, 1850; Captain, 16th December, 1854; Brevet Major, 12th December, 1854; Brevet-Lieut.-Colonel, 2nd November, 1855; Brevet-Colonel, 2nd November, 1863; Major-General, 17th May, 1869; Lieut.-General, 10th May, 1882; General, 30th July, 1890; and Colonel-Commandant, 7th December, 1886. He served throughout the Crimean Campaign of 1854–55, was present at the affairs of Bulganac and M'Kenzie's Farm, battles of Alma (horse shot), Balaclava, Inkerman (horse killed), siege and fall of Sebastopol. (Despatches, *London Gazette*, 12th November and 2nd December, 1854, 26th January, and 2nd November, 1855, medal with four clasps, Brevets of Major and Lieut.-Colonel, Knight of the Legion of Honour, 2nd Class of Medjidie, Sardinian and Turkish medals, and C.B.) Egyptian Expedition, 1882, commanded 2nd Division, and was present at the battle of Tel-el-Kebir. (Despatches, *London Gazette*, 6th October and 2nd November, 1882. Thanked by Houses of Parliament, medal with clasp, bronze star, 2nd Class Osmanieh, K.C.B.) He was Commandant Staff College from 1st July, 1870, to 31st December, 1877, and was a Member of the Council of Military Education from 1st April, 1866, to 31st March, 1870.

The death is announced of Major-General J. G. Balmain, retired, Royal (Madras) Artillery. He retired on full pay, 31st December, 1870.

Major-General C. D. Chalmers (retired), who died in London, on 20th July, 1893, was commissioned as Lieutenant, 1st October, 1855; became 2nd Captain, 9th February, 1865; Captain, 5th July, 1872; Major, 11th March, 1874; Lieut.-Colonel, 1st July, 1881; Colonel, 1st July, 1885; and retired with honorary rank of Major-General, 1st October, 1887. He served during the Indian Mutiny, 1857–8, and was present at the action of Kalee Nuddee, affair of Ramgunge, siege and capture of Lucknow, actions of Bareilly, Shahjehanpore, and Mohumdee (medal, with clasp).

Colonel W. Ward, retired, Royal (Bombay) Artillery, died at Weston-super-Mare, on 3rd July, 1893. Colonel Ward served in the Egyptian Expedition, 1882, and was present at the battle of Tel-el-Kebir. (Despatches, *London Gazette*, 2nd November, 1882, medal with clasp, bronze star, Brevet of Lieut.-Colonel, 3rd Class of the Medjidie.)

CRICKET, 1893.

ROYAL ARTILLERY *v.* ETON RAMBLERS.

PLAYED AT WOOLWICH, 19TH AND 20TH JULY.

ETON RAMBLERS.

W. D. Llewellyn, c Perkins, b Butler	43
W. C. Bridgeman, c Phipps-Hornby, b Cochrane	24
J. A. Gibbs, b Cochrane	0
C. Leveson-Gower, b Butler	0
H. Foljambe, b Cochrane	9
C. Heseltine, c Curteis, b Cochrane	2
J. Pelham, b Cochrane	0
G. A. Foljambe, b Butler	3
H. Kinloch, b Cochrane	0
G. S. Foljambe, not out	6
J. H. Walker, b Cochrane	0
Extras	11
Total	101

ROYAL ARTILLERY.

C. C. Van-Straubenzee, not out	32
Major F. A. Curteis, c Gibbs, b Heseltine	1
Sergeant Cochrane, b G. A. Foljambe	10
A. E. J. Perkins, c Pelham, b Heseltine	0
Capt. E. J. Phipps-Hornby, not out	0
W. G. Thompson, b Heseltine	7
T. M. Usborne, c G. A. Foljambe, b Pelham	0
Capt. F. H. Crampton, b G. A. Foljambe	0
W. C. Staveley, F. A. G. Y. Elton, Gunner Butler	Did not bat.
Extras	7
Total (for 6 wickets)	57

ROYAL ARTILLERY *v.* BAND OF BROTHERS.

PLAYED AT WOOLWICH, 31ST JULY AND 1ST AUGUST.

BAND OF BROTHERS.

1st Innings.		*2nd Innings.*	
R. J. H. Arbuthnot, c Wigram, b Cochrane	11	l b w, b Butler	18
R. H. D'Aeth, b Prescott-Decie	0	run out	4
E. Fisher, run out	26	b Crampton	19
Major L. B. Friend, c Straubenzee, b Butler	6	c Prescott-Decie, b Wigram	14
F. T. Welman, c Butler, b Cochrane	19	b Crampton	5
S. S. Williams, c Dorehill, b Cochrane	4	c and b Crampton	34
Major A. J. Abdy, c and b Dorehill	28	b Butler	0
C. Streatfield, b Butler	10	c Prescott-Decie, b Crampton	0
E. Berens, c Curteis, b Crampton	4	b Butler	9
R. Berens, not out	44	b Butler	1
F. S. Cornwallis, b Dorehill	0	not out	1
Extras	11	Extras	11
Total	163	Total	116

ROYAL ARTILLERY.

1st Innings.		*2nd Innings.*	
C. C. Van-Straubenzee, b Fisher	36	not out	5
C. Wigram, c Streatfield, b D'Aeth	78		
Major Curteis, b Fisher	56		
C. Prescott-Decie, c and b Williams	2	not out	0
Capt. P. H. M. Dorehill, l b w, b Fisher	30		
Sergeant Cochrane, b Williams	4		
H. D. White-Thomson, b Williams	0	b Fisher	11
A. E. J. Perkins, c and b Fisher	4	b Fisher	0
T. M. Usborne, b Fisher	2	b Williams	4
Capt. F. H. Crampton, not out	3	c Streatfield, b Williams	13
Gunner Butler, c and b Fisher	0		
Extras	24	Extras	9
Total	239	Total (for 4 wickets)	41

ROYAL ARTILLERY *v.* MOTE PARK.

PLAYED AT MOTE PARK, 4TH AND 5TH AUGUST.

MOTE PARK.

1st Innings.		*2nd Innings.*	
F. M. Atkins, c Usborne, b Butler	58	c Usborne, b Cochrane	17
F. G. Stenning, b Butler	5	c Usborne, b Butler	11
Major L. Spens, run out	2	b Butler	32
A. J. Thornton, c Adair, b Crampton	1	b Butler	12
Hickmott, c and b Butler	15	b Adair	45
K. McAlpine, b Butler	0	b Adair	22
J. S. Hardy, c Usborne, b Cochrane	6	b Butler	7
F. E. Hughes, b Butler	0	b Butler	9
H. A. Hughes, c Adair, b Dorehill	24	not out	6
H. Prentis, b Butler	1	b Butler	1
H. Waghorn, not out	23	c Cairnes, b Cochrane	1
Extras	21	Extras	6
Total	156	Total	169

ROYAL ARTILLERY.

1st Innings.		*2nd Innings.*	
C. C. Van-Straubenzee, b Prentis	0	b Waghorn	29
Capt. H. R. Adair, c Atkins, b McAlpine	59	b Waghorn	18
J. W. F. Lamont, c Hickmott, b Prentis	0	c and b Thornton	2
Major F. A. Curteis, c Hickmott, b Atkins	8	b Waghorn	0
Capt. P. H. M. Dorehill, c Stenning, b Atkins	6	b Waghorn	11
J. E. Cairnes, c Atkins, b Waghorn	81	b Waghorn	12
Sergeant Cochrane, run out	31	c Stenning, b Thornton	7
F. B. D. Broadrick, c Hickmott, b Thornton	10	b Waghorn	1
Capt. F. H. Crampton, c McAlpine, b Waghorn	0	c Atkins, b Thornton	0
T. M. Usborne, b Waghorn	2	not out	17
Gunner Butler, not out	0	c Thornton, b Waghorn	2
Extras	5	Extras	5
Total	202	Total	104

ROYAL ARTILLERY *v.* I ZINGARI.

PLAYED AT WOOLWICH, 9TH AUGUST.

ROYAL ARTILLERY.

1st Innings.		*2nd Innings.*	
Capt. J. P. DuCane, b E. C. Mordaunt	5	b Miller	3
C. C. Van-Straubenzee, c Miller, b E. C. Mordaunt	7	c Clarke, b E. C. Mordaunt	9
Major F. A. Curteis, c Bannatine-Allason, b E. C. Mordaunt	5	b E. C. Mordaunt	7
Capt. H. R. Adair, not out	14	b E. C. Mordaunt	0
J. E. Cairnes, b E. C. Mordaunt	0	c Mitchell, b Miller	11
H. D. White-Thomson, c E. C. Mordaunt, b Miller	1	b E. C. Mordaunt	10
A. E. J. Perkins, b E. C. Mordaunt	0	b Miller	2
C. Prescott-Decie, c and b E. C. Mordaunt	0	b E. C. Mordaunt	0
Capt. F. H. Crampton, b E. C. Mordaunt	1	b E. C. Mordaunt	0
Gunner Butler, b E. C. Mordaunt	0	b E. C. Mordaunt	0
E. G. Waymouth, b Miller	5	not out	6
F. A. G. Y. Elton, c Cattley, b Miller	1	c Bannatine-Allason, b Miller	3
Extras	4	Extras	3
Total	43	Total	54

I Zingari.

A. G. G. Asher, c Waymouth, b Butler	13
F. A. Soames, b Waymouth	4
G. J. Mordaunt, b Butler	9
S. W. Cattley, run out	11
G. F. Vernon, c Waymouth, b Butler	6
C. C. Clarke, b Butler	8
H. F. de Paravicini, b Prescott-Deeie	11
E. C. Mordaunt, c DuCane, b Prescott-Deeie	0
Major R. Bannatine-Allason, b Waymouth	20
G. A. Miller, b Waymouth	10
Major W. L. Davidson, not out	2
R. Mitchell, b Crampton	3
Extras	8
Total	105

R.A. (WOOLWICH) *v.* N.-C. OFFICERS.

Played at Woolwich, 12th August.

N.-C. Officers.

1st Innings.		*2nd Innings.*	
School-Master Watts, c sub., b Broadrick	4	run out	0
Sergeant Cochrane, st Hornby, b Davidson	25	b Elton	8
Warrant Officer Singer, c Curtis, b Stanton	12	c Straubenzee, b Adair	1
Bombardier George, c Curtis, b Stanton	10	run out	35
Sergeant-Instructor-Gunnery Cooper, b Stanton	1	c Davidson, b Adair	4
Warrant Officer Williams, b Adair	4	b Stanton	15
Bombardier Chapman, b Stanton	0	not out	11
Quartermaster-Sergeant Toole, st Hornby, b Staveley	41	b Adair	0
Bombardier Robinson, b Adair	13	b Adair	3
Sergeant Seville, b Adair	3	c Broadrick, b Straubenzee	0
School-Master Atkinson, not out	0	c Straubenzee, b Adair	0
Extras	9	Extras	3
Total	122	Total	80

Officers.

1st Innings.		*2nd Innings.*	
Major H. A. D. Curtis, b Robinson	6		
Capt. H. R. Adair, b Robinson	8	not out	15
C. C. Van-Straubenzee, c Robinson, b Cochrane	27	c and b Atkinson	11
Major W. L. Davidson, b Atkinson	26	b Atkinson	19
F. H. G. Stanton, b Chapman	3		
Capt. E. J. Phipps-Hornby, run out	6		
W. C. Staveley, b George	8	b Atkinson	6
A. M. Cowper-Smith, b Robinson	7		
F. B. D. Broadrick, c Williams, b Robinson	6		
F. A. G. Y. Elton, b George	0		
C. E. D. Budworth, not out	1		
Extras	8	Extras	4
Total	106	Total (for 3 wickets)	55

PRÉCIS
AND
TRANSLATION.

"REVUE MILITAIRE DE L'ETRANGER."

JANUARY, 1893.

TACTICAL OBSERVATIONS.

BY

GENERAL DRAGOMIROV.

PRÉCIS BY

LIEUT.-COLONEL J. H. G. BROWNE, LATE R.A.

THE *Invalide Russe* published some time ago a summary of the observations made by General Dragomirov upon the exercises and manœuvres carried out by the troops under his command. The General's reputation, and the influence which he has acquired in the Russian army, render these observations especially valuable. He is the author of a "Manual for the Preparation of Troops for Battle," in which he strongly advocates a gradually progressive system of tactical instruction, grouping the different units together by twos, threes, and so on, without skipping any intermediate combination. He considers that manœuvres executed with the three arms combined can only be really useful when preceded by exercises in detail of this description, in order to make sure that every unit is competent to play its own part.

With this object in view he would, previously to the manœuvres, practise, actually upon real ground, the attacks of cavalry against infantry and artillery, the tactics of marches, &c., &c. After this movements of the three arms combined should be practised, first without any tactical hypothesis, and then against a marked or skeleton enemy. But, according to General Dragomirov, the preparation of troops for war is very insufficient if it stops short at ordinary tactical instruction. It should aim at *true* military education: that is to say, the development in the individuals of each unit, in the units of the same arm, even in the different arms, of that spirit of devotion and self-sacrifice which the necessities of war imperatively demand; a spirit which he calls the "*camaradie de combat.*" This moral preparation is indispensable to ensure success in war. "Just as a sensible man does not hesitate to sacrifice one of his limbs to save his life, so a well-trained soldier should not hesitate to sacrifice himself for the unit or for the

army to which he belongs. He should love his company more than himself, his battalion more than his company, his regiment more than his battalion." The object of peace manœuvres should be to render these theoretical principles instinctive in the soldier. With this object in view certain special exercises would be introduced in order to accustom the soldier to face death without flinching, such as artillery firing over the heads of infantry. General Dragomirov, indeed, would go so far as to make a recruit stand in the open between two targets whilst a good marksman fired three or four shots at each target in succession at 50 yards range!

But at the same time the soldier must be practically convinced that his comrades are animated with the same spirit of devotion. His motto should be "Don't think of yourself, your comrades will think of you." The theoretical knowledge and practical ability of the officers should be employed in directing the troops in such a manner as to enable this "*camaradie de combat*" to be exercised under the most favourable conditions. This is the great object of tactics.

It may be said then, that, in General Dragomirov's opinion, combined exercises should aim at the following results :—

(1.) To put in evidence the tactical principles which ought to guide the employment of troops.

(2.) To develop the manœuvring power of the troops and the tactical "*coup d'œil*" of the officers.

(3.) To impress in a practical manner upon the troops the reciprocal obligations imposed upon them by the "*camaradie de combat*," and to place them, in a rational and progressive manner, in situations analogous to those which may be presented upon the field of battle.

Having thus indicated General Dragomirov's special ideas, we will briefly notice his remarks upon the exercises practised by his troops, especially those which relate to artillery.

Exercises with Ammunition against a Marked Enemy.

Strength of the Detachment : One Regiment of Infantry and one Battery with four guns.

The General finds fault with the infantry for not covering the battery when it advanced to take up a position. He says that this would never have occurred in an exercise specially intended to test their knowledge when acting in conjunction with artillery, and is like forgetting one's letters when learning to read. It is a great mistake to keep one's knowledge locked up in compartments, as it were. Although it is necessary that complicated questions should be studied in detail, all this preliminary work must be blended into a single whole, otherwise there will be no military training in the true and complete sense of the word.

After finding fault with some details of the infantry advance, he says that the artillery remained too far behind (about a mile). This shows too much caution. Effective fire should not be the only object of the artillery. They should impress upon the minds of the enemy the conviction that nothing will prevent them from gaining ground. To object that changes of position expose the guns too much, only shows ignorance of war. Our own losses are seen, but those of the enemy cannot be estimated. Guns must not be nursed when thousands of lives are at stake. Moreover, infantry are much more confident and cheerful when their guns are near at hand, and confidence is a most important element in war.

The General also finds fault with the Infantry Commander for distributing his reserves too much along the whole line, instead of bringing them up in force upon the decisive point, and he blames the reserves themselves for halting to fire

as soon as they came up in line with the others, instead of pushing on to the front. He considers that the final rush was begun much too far from the targets (600 paces, instead of 200 to 300), and that the men would have arrived on the ground out of breath and exhausted. This advance was also made in extended order, instead of being made in groups formed on the sectional leaders, as is laid down in the Russian infantry regulations.

Special Exercises of Cavalry in Conjunction with Horse Artillery.

With regard to the cavalry attack, the General says that it should always be prepared beforehand, unless it partakes of the nature of a surprise. Under any circumstances accidents of ground should be utilised, so as to approach as near as possible under cover. In attacking infantry the charge should be made in line in close order, but this line should be preceded by some scouts in extended order, intended to draw the enemy's fire. As a rule, cavalry should try to take the enemy in flank, but they should not shrink from a frontal attack when circumstances require it.

In an exercise of a cavalry corps of two divisions operating against a marked enemy, the General finds fault with the Commander for not reconnoitring the enemy's position with sufficient exactness; the result of which was that his force was deployed on a line by no means parallel to that of the enemy. He impresses upon cavalry officers the importance of giving a good direction to the attack, of "aiming well" so to speak, and says that an error of direction in launching forwards a troop of cavalry, which ought to fall upon the enemy with a speed comparable to that of a bullet, may result in the gravest consequences to all concerned.

In an action of cavalry against cavalry, the Horse Artillery has no time to change position. They should advance boldly with a support of one or two squadrons, come into action as near the enemy as possible, and open fire at once, not upon the hostile artillery, but upon the cavalry. All the guns should be deployed together, and a separation of batteries should be avoided.

Artillery positions should be always reconnoitred beforehand. This would avoid the spectacle sometimes seen of guns being brought into action in a bad position, and then limbered up again directly in order to find a better.

The General notices that one of the batteries, when charged by cavalry, counter-charged *with its limbers*, the detachments remaining with the guns and preparing to defend themselves. The General commends this. He says that in war we should defend ourselves in every possible way, and that it is better to bring up the limbers to the defence of the battery when in danger than to leave them in rear to be used by the enemy to bring off the guns if the charge is successful.

Note.—This appears to be a new idea. Norman Ramsay's troop charged at the battle of Fuentes d'Onoro, but the guns were limbered up, and the mounted detachments protected the drivers and horses.—*J.H.G.B.*

Tactical Instruction of an Army Corps.—Manœuvres of one Division Against Another.

The General finds fault with the infantry for not abandoning their column formations as soon as they came within the zone of effective fire, and with the cavalry for separating too far from the infantry. He deprecates the tendency of the latter arm to play an independent part on a distant field of action, more especially when they are weak in numbers. The should act in unison with the infantry and charge with or immediately after them, otherwise they will probably be repulsed. On the other hand, the sudden apparition of the cavalry, when the infantry attack is fully developed, may have great influence upon the *moral* of the troops attacked.

The General criticises the defending force for making their counter-attack with their local reserves only, the general reserves not coming up until the position was carried. He approves of an attack made upon this general reserve by a regiment of Cossacks, and says that, although the regiment might have suffered heavily, it acted in accordance with the principles of the "*camaradie de combat*" in supporting its infantry at the critical period of the struggle by delaying the advance of the reserves. He finds fault with the front line of the attack for lying down to fire, and says that the great principle to instil upon the soldier is not to try and get cover for himself, but to take up the most advantageous position for firing. The utilisation of cover thus understood, becomes a consequence of tactical principle, not its object. Reserves should not be hurried up with unnecessary rapidity, but the men should be kept as fresh as possible for the final assault.

Speaking of an "enveloping attack," the General remarks that this is easier talked about than carried out. The enemy will not go to sleep. He will manœuvre, and, speaking generally, it may be said that under these conditions an "enveloping" attack will become a frontal action as far as concerns the troops actually engaged in it.

We will now give a summary of the tactical ideas upon which General Dragomirov specially insists.

(1.) Success in war requires before everything the most perfect union and cohesion between every fraction of the army. The different arms, the different units in each arm, the individuals in each unit, should co-operate, actively and incessantly, towards the common object. In time of peace then, the soldiers' training should aim at inculcating the notion of duty, and of giving them the experience necessary for them to fulfil instinctively upon the field of battle the obligations imposed upon them by the "*camaradie de combat*," placing them always, at the same time, under the best possible conditions in a tactical point of view.

(2.) In order to gain a victory, it is not necessary to be absolutely stronger than the enemy, but only to be stronger than him on the point or in the zone of the decisive attack at the moment when that attack is made. The tactical skill of the Commander must, therefore, be directed towards ensuring a convergence of efforts upon this point or in this zone. The same principle must be borne in mind, if occasion requires, by the subordinate officers. In all cases the leading idea with regard to the employment of troops is not to distribute them evenly along the line to be attacked, but by utilisation of ground to economise the forces necessary to produce the maximum effect upon the decisive points.

(3.) The concentration of infantry and artillery fire upon the point of attack is insufficient to produce decisive results. If the enemy is to be obliged to retreat, the attack must be pushed to extremities, that is to say, the bayonet must be called into play or, to speak more accurately, ground must be gained with such decision and continuity as to force the enemy to the conclusion that it will be impossible for them to resist the progress of the attack. When this point is reached, the assailants will have broken the equilibrium of moral forces, and the battle will be gained.

(4.) The choice of the point and of the moment of attack belongs to the Commander. For instance, an endeavour may be made to turn one of the enemy's flanks. But, whatever may be the point selected, the troops charged with the execution of the attack should be properly placed, and set in motion in the right direction. They should have nothing to do but to march straight to the front, and as rapidly as possible, upon the point named. The dispositions adopted should, therefore, allow of a constant advance from front to rear, *i.e.*,

they should include a series of échelons intended to ensure the continuance of the movement.

(5.) The decisive attack is not only the most important part of the battle, but it is the one which demands in the highest degree the co-operation of the three arms. If it is true, that in order to charge the enemy with the bayonet the infantry must cross the dangerous zones which lie between without allowing themselves to be checked by the severe losses which they sustain, it is equally clear that the cavalry and artillery must confront the same dangers in order to support the principal arm and make the decisive attack successful.

The cavalry must then be ready to intervene even during the actual execution of the attack, not to speak of the active part, which has always been assigned to them, of delaying the arrival of the enemy's reserves, or of following up a success or covering a retreat after the actual assault.

The artillery must never consider that they have done their duty simply by preparing the way for the attack, and by continuing to fire at long ranges, but must take their part in the common dangers. Some of the batteries should accompany the attack in order to keep up the *moral* of the other troops, and to show that the forward march is general, and cannot be arrested by the enemy.

NOTE.—General Dragomirov seems to ignore the great loss in *horses* which must ensue whenever mounted corps are brought under close infantry fire, and which may render such corps absolutely ineffective.—*J.H.G.B.*

NOTES

FROM

CORRESPONDING MEMBERS.

THE subject for the Duncan Gold Medal Prize Essay, 1894, is—

"What is the best tactical organisation and system of training mass batteries of Horse and Field Artillery?"

THE Committee have determined to send out monthly with the "Proceedings" a sheet containing Advertisements of Articles or Property for Sale, Houses to Let, and Wants generally of Members of the R.A. Institution. The rate charged will, at first, be 1s. for four lines or under, and 3d. for every additional line. No advertisement will be printed for any but a Member, and it is hoped that Members will not send advertisements of property or wants other than their own.

THE following works are now on sale at the R.A. Institution and will be forwarded post free at the prices noted after their titles below:—

Major-General Stubbs's "List of Officers of the Bengal Artillery," price 5s. 3d.

"Field Artillery Fire," by Captain W. L. White, R.A., price 1s. 2d.

"Notes of Lectures on Artillery in Coast Defence," by Major A. C. Hansard, R.A., price 1s. 2d.

"Ranging Note-Book," by Captain S. W. Lane, R.A., price 1s. 1d.

"Achievements of Field Artillery," by Major E. S. May, R.A., bound, price 2s. 6d.

The two Numbers of "Nature" containing Professor C. V. Boys's Lecture on "Photography of Flying Bullets," fully illustrated, price 8d.

Examination questions in (*c*), (*d*), and (*e*) set in the four examinations ending May 1893:—

Captains (*c*) and (*d*) ... price 1s. 1d.
Lieutenants (*c*) (*d*) and (*e*) price 1s. 1d.

A CORRESPONDENT writes:—

"It has so often been stated that no "wheeled artillery" accompanied Sir Frederick (now Lord) Roberts on his famous march, and this has lately been reiterated by Major May, in his interesting book "Achievements of Field Artillery," that I feel induced to mention the following facts.

It is true no field guns started from Kabul for Kandahar, but at Khelat-i-Ghilzai (six marches from Kandahar) the Right Section of C/2 R.A. (Major P. H. Greig's, now the 75th Field Battery), under Lieutenant H. F. Mercer, joined the Column, and marched with it to Kandahar, taking part in the battle of the 1st September. This detachment received the bronze star, commemorative of the march. This section did not, I believe, in any way delay the Column, though the roads were bad.

I think, therefore, the Field Artillery may fairly claim that they took part in this, one of the great military achievements of the Nineteenth Century."

DOVER.

Colonel Lloyd and Officers R.A. were "At Home" on Tuesday, 29th August, to which over 300 invitations were issued, and many availed themselves of a lovely afternoon to visit the Castle. Refreshments were served in the Mess Room, and a portion of the R.A. (string) Band played outside, where it was much appreciated. On the following day the Officers R.A. again entertained a large number of friends in their enclosure at the North Fall Meadow to witness the Annual Regimental Athletic Sports, the weather was delightful and the scene, gay with bunting, marquees, and crowds of people, very picturesque. The usual events were varied by the burning of the Dover Golf Club hut, through the overheating of the stove chimney; the hut was very soon totally destroyed. All the competitions were entered into with much zest, and a greasy pole in the centre caused much merriment throughout the afternoon. At the conclusion of the sports Mrs. Lloyd distributed the prizes, and the vociferous cheers given for both Colonel and Mrs. Lloyd vouched for the success of the afternoon. A word of praise must be given to Lieutenant Vereker, upon whom the burden of the arrangements fell.

Colonel Lloyd won the monthly medal in July at Deal on the links of the Cinque Ports Golf Club, and in August his name appears fourth out of some fifty competitors.

The R.A. Dover very much regret the departure of Surgeon-Captain Stanistreet, ordered to India, who has been living with them at the Castle for the past two years, and hope that some R.A. Mess in India may be fortunate enough to get him to live in it.

Practice from the two 80-ton guns at the Pier turret took place in August with satisfactory results. These guns have had several years rest while the turret was being strengthened. The comments in the daily papers about the projectiles weighing nearly a ton thrown enormous distances across the Channel, and fired by means of a range-finder from the Castle, were amusing.

Major Darby has joined and assumed command of the Depôt vice Major McClintock retired from the service.

HALIFAX, N.S.

The Italian flagship "Etna" was in port from 14th to 23rd July, having come on to Halifax after the New York celebration. She is the first Italian man-of-war that has been here for 30 years, the last one being the "San Giovanni." The Admiral and officers of the "Etna" dined at the R.A. and R.E. Mess, and the compliment was returned on board ship. The "Etna" after leaving here proceeded to Montreal, where an unfortunate contretemps occurred, owing to her salute not being answered, and the Italian Admiral declining to accept as a reason "that Montreal is not a saluting station."

The R.A. Games' Fund has made itself popular in Halifax by giving £25 towards the R.A. boat here.

Colonel Isaacson and Major Hodgson joined for duty on 29th July, and Capt. Lushington on 26th August.

On 7th August Major Brady's Company (No. 3 Western) fired its Competitive Practice from the 9-inch R.M.L. guns at York Redoubt at a towed target.

The Dominion Artillery Association held its annual camp at Point Pleasant from 8th to 16th August. Militia Artillery detachments competed from Halifax, Quebec, Montreal, New Brunswick, Prince Edward's Island, and other places. The guns fired from were 64-pr. R.M.L., but the detachments took the opportunity while here of learning heavy gun drill, in which they were instructed by

Captain Lowe, Instructor-in-Gunnery, and four N.-C.O. of the Royal Artillery.

On 20th August woodcock shooting began. Lieut. Macgowan shot 29 brace in six days in stormy weather.

Captain Duffas, R.A. has been elected Polo Secretary vice Major Maycock, R.E. ordered home.

A picture gallery is being formed in the office of the Colonel-on-the-Staff here. Portraits have been already obtained and hung of General Francklyn, General Gibbon, Major-General Ryan, and Colonel Peter Hill. The Adjutant R.A., British North America, would be very glad to hear further from ex-Colonels who have commanded the R.A. in British North America, or from their relatives and friends.

Captain Boileau is getting up a meeting at the Chicago Exhibition between the officers of the Halifax, Hong Kong, and Bermuda garrisons. The probable date will be some time towards the end of October. The enterprise is under the patronage of Lieut.-General Montgomery Moore, Commanding the Troops in Canada. A Mess will be formed in one of the principal hotels at Chicago. The Hong Kong officers will have the greatest distance to travel—9678 miles—but as a set off against this the Canadian Pacific Railway Company, which has a splendid line of steamers running between Hong Kong and Vancouver, has kindly undertaken to make special arrangements for their transit. Captain Boileau would be glad to hear from any officers at home or abroad who are likely to be in America on leave or duty about that time (October).

OBITUARY.

General Sir F. A. Campbell, K.C.B., Colonel Commandant, whose death occurred at Guildford, on 15th September, joined the Regiment as 2nd Lieutenant, 13th December, 1836; became Lieutenant, 10th August, 1839; 2nd Captain, 14th October, 1846; Captain, 5th June, 1852; Lieut.-Colonel, 15th September, 1857; Colonel, 15th September, 1862; Major-General, 28th October, 1868; Lieut.-General, 8th November, 1880; Colonel Commandant, 27th July, 1883; and General, 5th July, 1886. He was a Member of the Ordnance Select Committee from February, 1860, to 30th September, 1863; Superintendent Royal Gun Factories from 1st October, 1863, to 30th July, 1875; and Director of Artillery and Stores from 1st August, 1875, to 31st January, 1883.

Colonel F. C. H. Clarke, C.M.G., late Royal (Bombay) Artillery, died at Brighton, on 27th July. He was commissioned as Lieutenant, 9th December, 1859; became Captain, 1871; Major, 1878; Lieut.-Colonel, 1885; and Colonel, 1889. He was Assistant Commissioner for the Delimitation of the Bulgarian Frontier, 1878; British Commissioner for Demarcation of Turkey in Asia, 1879, with the local rank of Lieut.-Colonel; D.-A.-Q.-M.-G. at Horse Guards, 1872–80; served during the Transvaal Campaign, 1881, as A.-Q.-M.-G. Lines of Communication; and was Professor of Military Administration and Law at the Staff College, 1882–84. In 1884 he was appointed Surveyor-General of Ceylon, which appointment he held at the time of his death. Colonel Clarke was also well known by his translation of the official edition of the "Franco-German War," and was the author of a text-book entitled, "Lectures on Staff Duties," written for use at the Staff College.

By the death of Lieut.-General J. R. Gibbon, C.B., at Charlton, on the 23rd August, the R.A. Institution, and the Regiment generally, lose one devoted to their best interests; any appeal for help to a Regimental cause received from

him a prompt and generous answer, and more than once he has given to the Institution or Regimental Messes presents of great historical value. Brought up from his boyhood in the Regiment he could give most interesting accounts of men and customs in the Royal Artillery during the last 60 years. He was commissioned as 2nd Lieutenant, 18th December, 1840; became Lieutenant, 23rd November, 1841; 2nd Captain, 30th June, 1848; Captain, 17th February, 1854; Brevet-Major, 20th July, 1858; Lieut.-Colonel, 21st July, 1860; Colonel, 21st July, 1865; Major-General, 18th March, 1870; and retired with the honorary rank of Lieut.-General, 1st May, 1880. He served in the Crimean War, and commanded the Artillery of the 4th Division during the siege and fall of Sebastopol (medal with clasp, and Turkish medal). In 1857–8 he served in India, and was in command of the Artillery of Brigadier-General Walpole's Division at the siege and capture of Lucknow, where he specially distinguished himself. He was wounded at the action of Simree, when in command of the Artillery of Sir Hope Grant's column. He was five times mentioned in despatches, and granted a distinguished service pension, with brevet of Major, medal with clasp.

Lieut.-Colonel R. W. Kaye, R.H.A., died at Sea, on board P. and O. steamer, *Peshawur*, on the 18th August. He joined the Royal (Bengal) Artillery as Lieutenant, 9th December, 1859; became Captain, 11th December, 1872; Major, 26th May, 1880; and Lieut.-Colonel, 1st January, 1889. He served during the Jowaki Expedition, 1877–8, and the Afghan War, 1878–80, including the capture of Ali Musjid, and action on the Gara Heights near Kam Dakka (mentioned in despatches, medal and clasp).

Lieut.-Colonel T. E. Kennion, retired list, Royal (Bengal) Artillery, died at Clifton, on the 1st September. He joined the Bengal Artillery, 11th June, 1842; became Captain, 6th July, 1857; Major, 19th January, 1858; Lieut.-Colonel, 29th March, 1865; and retired upon half-pay, 2nd October, 1867. Colonel Kennion served in the Sutlej Campaign, and was present at the battles of Moodkee, Ferozeshah, and Sobraon, where his horse was killed under him. In 1846 he had charge of the Lahore field magazine. On the Mutiny breaking out he was placed in command of two Horse Artillery guns, and appointed Quartermaster of the Artillery of General Nicholson's Column, but volunteered for service before Delhi, where he was twice wounded; he was mentioned in despatches and received the brevet of Major.

Captain W. Richey (retired), who died at Lee, on 9th September, was commissioned from the ranks as Quartermaster, on 1st April, 1875; and became Hon. Captain, 1st April, 1885. He served in Corfu during 1854–55, and during the China War of 1860, and was present at the capture of Sinho, Tangku, Taku Forts, and surrender of Pekin (medal with two clasps). Captain Richey retired from the service on his appointment to the office of City Marshal on 13th November, 1889, which appointment he held at the time of his death.

The notice inserted in the September Obituary R.A.I. "Proceedings" should have read as follows:—"Lieut.-Colonel W. Ward, retired list, Madras Artillery, died at Weston-super-Mare, on 3rd July." This officer must have retired before the amalgamation of the lists, as no trace of him can be found in the Regimental records.

Many apologies are offered to Colonel W. Ward, Royal (Bombay) Artillery, for the inconvenience he must have suffered from the previous notice.

CRICKET, 1893.

R.A. (WOOLWICH) *v.* CHARLTON PARK.

PLAYED AT WOOLWICH, 30TH AUGUST.

ROYAL ARTILLERY.

Capt. E. J. Phipps-Hornby, c Lawrence, b Ogilvy	3
" H. R. Adair, b Ogilvy	2
W. C. Staveley, c Lawrence, b Taylor	31
C. C. Van-Straubenzee, b McAlister	80
Major W. L. Davidson, b Taylor	3
C. E. D. Budworth, b Keats	19
F. B. D. Broadrick, b Keats	2
Major A. J. Abdy, not out	1
W. G. Thompson, b Keats	0
Gunner Butler, b Keats	2
F. W. Heath, c Lovey, b McAlister	1
Extras	10
Total	154

CHARLTON PARK.

E. F. Taylor, b Butler	4
E. J. Ward, b Adair	11
S. Castle, c Hornby, b Butler	14
Capt. McCanlis, c Hornby, b Butler	23
H. C. Ogilvy, c Hornby, b Adair	0
S. R. Sargent, b Adair	7
W. Martin, c and b Butler	35
A. Lovey, b Van-Straubenzee	15
Rev. W. M. McAlister, c Davidson, b Adair	9
W. J. C. Keats, not out	0
H. E. Lawrence, not out	0
Extras	8
Total	126

NOTES

FROM

CORRESPONDING MEMBERS.

The subject for the Duncan Gold Medal Prize Essay, 1894, is—

"What is the best tactical organisation and system of training massed batteries of Horse and Field Artillery?"

The following works are now on sale at the R.A. Institution and will be forwarded post free at the prices noted after their titles below:—

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Examination questions in (*c*), (*d*), and (*e*) set in the four examinations ending May 1893:—

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Tables of Four-Figure Logarithms, pocket edition, mounted on linen, price 3d.

Lithographic plates of Field Artillery Harness stripped and laid down for inspection, price for pair (lead and wheel), 1d.

Captain W. H. Williams, R.A., has kindly consented to deliver a lecture on "Travels in East Africa and Uganda," at the R.A. Institution.

The date is not absolutely fixed, but will most probably be Thursday, the 30th November, at 5 p.m. The usual notices will be duly circulated.

During the last month the Committee have received from the D.-A.-G., R.A., a trophy of arms and implements left by

Miss Mary Augusta Gordon

to the Officers of the Royal Regiment of Artillery, as a small token of her gratitude for their kind sympathy towards her late brother,

General C. G. Gordon, C.B., R.E.

Memorial Brasses have been placed to the memory of Captain G. L. W. Grierson, R.H.A., as under :—

One 24″ × 12″ (maximum size allowed) in the Garrison Church, Woolwich. One 40″ × 18″ in the South Aisle of Glasgow Cathedral.

The sum collected from Officers R.A. with whom he had served amounted to £39 8s. 3d.

This covers exactly the cost of the brasses.

DOVER.

Since last "Notes" another portrait has been added to the collection, in the R.A. Mess, of Colonels-on-the-Staff, that of Colonel Elton, C.B., who vacated the command in June, 1892, presented by himself, a most excellent likeness in Jacolitte's permanent process, and handsomely framed. The Mess Committee also record with pleasure the gift of a silver tankard from Surgeon-Captain Stanistreet on leaving for India, and the receipt on loan from Captain H. Rouse, R.A., of a very fine Sambhur head and horns.

The R.A. Dover played a return match against the R.M.L.I. over the Cinque Ports Golf Club links at Deal, on 7th October, with the following result :—

R.M.L.I.	Holes.		R.A.	Holes.
Major Hungerford	0	*v.*	Colonel Lloyd	1
Lieut. Curteis	0	*v.*	Major Maxwell	1
" Ward	1	*v.*	Capt. Cummings	0
Capt. Pym...	0	*v.*	" Stanton	6
" Trotman	3	*v.*	Lieut. Owen	0
Total	4		Total	8

The R.M.L.I. having won the previous match, the conqueror is to be played off shortly.

No. 17 (Major Maxwell's) Siege Train Company has a very strong football team, and are having a try for the Kent Challenge Cup. They won their first tie on 7th October against the Army Service Corps, Shorncliffe.

Newhaven Fort is to be occupied, contrary to previous custom, by the half Company of No. 2 (Major Fraser's) Company during the winter, owing to the Drop Redoubt being full up with the Depôt men.

INDIA.

The Instructions for Practice of Horse, Field, Heavy and Mountain Batteries in India, 1893–94, have just been received.

A noticeable feature in them is the change in annual allowances of ammunition, as follow :—

Horse and Field Batteries.

Scale A.

1892—Common, 276.	Shrapnel, 222.	Case, 12.			Total, 510.
1893— „ 130.	„ 368.	„ 12.	Star 12-pr. 12.	„	522.

Scale B.

1892—Common, 128.	Shrapnel, 70.	Case, 12.	Total, 210.
1893— „ 50.	„ 148.	„ 12.	„ 210.

Other noteworthy headings are :—

Rapid System of Ranging for Royal Horse Artillery.

A rapid system of ranging being necessary for Royal Horse Artillery acting with cavalry, when the time allowed for action will frequently be restricted to four or five minutes, the following plan is to be practised :—

Case I.—The Battery gallops into action with a flank section loaded with percussion shrapnel : the first gun is fired at the estimated range, and the second with about 150 yards more or less elevation, to form a bracket. The other two sections have meantime prepared for shrapnel with time fuze, and, a bracket being obtained, the centre section is fired at *the mean*, the third section corrects fuze if necessary. Range and fuze being now assumed to be found with fair accuracy (both should be taken rather short as the target is probably advancing), rapid fire from a flank is ordered.

If a very rapid fire effect is required, an alternative plan may be adopted in

Case II.—The Battery gallops into action with all guns loaded with percussion shrapnel, and the flank (or first) section opens at the estimated range. The second section stand ready with 150 yards difference, as ordered, to obtain a bracket : the third section fires at *the mean* to verify. Each section prepares for time shrapnel as soon as fired, and the Battery Commander will be almost sure to have got the range sufficiently accurately to be able to order range and fuze. The service of ammunition must be from limbers and magazines : the wagons would accompany the squadron carts, and be ready to fill up after every engagement.

Notes on points observed during the Practice of 1892-93.

(i.) Slow and irregular laying, with too much attention to direction on a broad target ; and want of care in selecting layers. The remedy is only to be found by constant and almost daily practice, and frequent examinations such as are held at practice camps.

(ii.) Irregular fuze setting. The only remedy is in constant practice as for (i).

(iii.) Indecision in applying corrections of elevation and fuze, and bad management of fuzes.

On these points constant practice at drill on the part of the Battery Commander in making the necessary corrections is essential, as also a strict adherence to the rules laid down for management of fuzes.

(iv.) Delay caused by *excessive* use of signals.

The signals to be used are laid down in Appendix C, *and others are not to be introduced*, or confusion is likely to ensue. Greater quietness is induced if all information be given to the Section Officers when they are first called up and by them communicated to gun layers ; the first round may then be got off with hardly a word being heard.

(v.) The use of the whistle is recommended, *never as a substitute for verbal orders*, but *to call attention to them*. It should be sparingly used, so that when it is heard, the men may know that some important order is about to be issued.

A short chirrup is followed by " Keep to —— yards," or " Keep to —— fuze." A long blast is followed by an order such as a sudden change of target.

(vi.) Auxiliary marks were not used as often as they might have been with advantage. Maintenance of fire in action must often depend on the employment of auxiliary aiming points either in front or rear of the Battery. At practice, therefore, whenever from distance, state of the atmosphere, smoke, &c., the target is indistinct and difficult to lay on, the guns should, as a rule, only be laid on it once, auxiliary marks being selected for future use. This more especially when Batteries are not provided with the telescopic sight.

In any great action where many guns are engaged, the enormous volume of smoke will render the use of auxiliary marks imperative. The following is the shortest method ensuring the continuation of fire against a target that has become lost to sight.

When the Battery commences its ranging, tell off the windward gun to take the angle of sight of the target, *i.e.*, angle between the line of sight and the horizontal. This is done by laying the gun point blank on the object and measuring the angle at which it stands by clinometer, of which each gun is now provided with one. The ranging having been completed, the Battery Commander may wish to pass from tangent to clinometer elevation on account of the target having become indistinct. All he has to do is to order the tangent elevation, *plus* or *minus* the angle of sight, according as the target is above or below the Battery to be given by clinometer. As far as line of fire is concerned, if the target be a long continuous one, such as a line of infantry, it is quite sufficient to run the gun up into the same wheel tracks; if the target is an agglomeration of smaller points, such as a line of guns, then auxiliary points *for line only* must be established, elevation being given by clinometer.

(vii.) Tendency on the part of Battery Commander to move about in the Battery. *His place in action is on the windward flank*, and it is important that his subordinates should know where to look for him.

(viii.) Delay frequently occurred when a Battery was ordered to limber up before advancing to a fresh position by there being so many shell fuzed that they could not be packed away in the limbers at once, and it was necessary to wait till the fuzes were removed and plugs replaced. There should never be more shell fuzed than can be packed into the portable magazine available. The Battery is then ready to limber up at any moment and take up a fresh position.

OBITUARY.

Lieut.-Colonel William Whateley, whose death occurred at Stoke Damerel, on 18th September, 1893, joined the Regiment as Lieutenant, 1st April, 1863; became Captain, 1st January, 1876; Major, 9th December, 1882; and retired with the honorary rank of Lieut.-Colonel, on 3rd July, 1886. Lieut.-Colonel Whateley served in the Soudan Expedition, 1885–6, and was present at the action of Giniss. (Despatches, *London Gazette*, 9th February, 1886; medal and bronze star).

Major C. R. Wynne, died at Delgany, County Wicklow, on 11th October, 1893. He joined the Regiment as 2nd Lieutenant, on 20th December, 1832; became Lieutenant, 5th June, 1834; 2nd Captain, 15th April, 1844; Captain, 1st November, 1848; and retired on full pay, 22nd March, 1853. He was granted the honorary rank of Major, 28th November, 1854.

Major W. B. Young, whose death is announced as having occurred at Ascreavie, Forfarshire, N.B, was commissioned as 2nd Lieutenant, 6th August, 1828; became Lieutenant, 1st October, 1830; 2nd Captain, 23rd November, 1841; Captain, 23rd May, 1846; and retired on full pay, 6th August, 1850. He was granted the honorary rank of Major, 28th November, 1854.

CRICKET, 1893.

The following are the results and averages for the Royal Artillery Cricket Club, 1893.

Matches played, 13. Won, 5. Lost, 6. Drawn, 2.

Batting Averages

Names.	No. of Innings.	Runs.	Most in an Innings.	Times not out.	Average.
Major W. L. Davidson	5	151	135	1	37·75
Captain H. R. Adair	13	318	83*	2	31·8
Major F. A. Curteis	21	505	136*	2	26·57
J. E. Cairnes...	4	104	81	—	26
C. C. Van-Straubenzee	24	498	105	2	22·63
H. C. Moorhouse	4	59	23*	1	19·66
Captain P. H. Dorehill	13	242	38	—	18·61
W. Strong	4	69	31	—	17·25
W. O. Holloway	4	68	35	—	17
A. E. J. Perkins	21	280	93*	—	13·33
T. M. Usborne	22	260	54	2	13
F. W. D. Quinton	4	51	32	—	12·75
Captain J. P. DuCane...	12	144	68	—	12
H. M. Barnes	9	64	26	3	10·66
E. J. R. Peel	4	32	17	1	10·66
C. Prescott-Decie	10	75	35	2	9·37
E. G. Waymouth...	6	28	11	3	9·33
W. C. Staveley	4	27	11*	1	9
Captain F. H. Crampton	21	150	26	2	7·89
H. D. White-Thomson	4	22	11	—	5·5
F. A. G. Y. Elton...	4	10	4	—	2·5

And fourteen others who played fewer than four innings each.

* Signifies not out.

Bowling.

Captain F. H. Crampton bowled in 11 matches taking 37 wickets.
" H. R. Adair ... " " 6 " " 22 "
" P. H. Dorehill... " " 5 " " 15 "
Lieut. H. M. Barnes ... " " 5 " " 28 "
Gunner Butler ... ... " " 4 " " 25 "
Lieut. C. Prescott-Decie " " 4 " " 9 "

And seven others bowled in fewer than four matches.

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IT will probably interest many to learn that the re-numbering of recruits has commenced this autumn; the old series of numbers closed with 99,999, and a recruit in the R.H.A. is the proud bearer of the new No. 1.

ATTENTION is called to the recent publication by the Intelligence Division, W.O., of the "Drill Regulations of the German Field Artillery," translated from the German by Capt. W. A. Macbean, R.A.

It is a work that affords an opportunity to officers of the Regiment of studying the lines upon which Field Artillerymen in Germany are working. The book can be purchased through this Institution, price 1s. 6d.

DURING the past month the Records of the Royal Military Academy have been published by F. J. Cattermole, Artillery Place, Woolwich. The price of issue has been raised to one guinea, but all subscribers who sent in their names for a copy under the previously advertised conditions receive it at 15s.

CORK.

The Cork Harbour Division of the Royal Artillery had on the whole a successful season at cricket this year, only losing two matches, viz., against Cork County and the Oxfordshire Light Infantry, and winning both the home and the out matches against the Shropshire Light Infantry, the York and Lancaster Regiment, and the Youghal Cricket Club. 2nd Lieut. Hine-Haycock came back in time to help bowl many wickets, and with 2nd Lieut. Holbrook divides the bowling honours. Major Griffiths and Lieutenant Galloway head the batting averages.

At football no success can be recorded. The team entered for the Army Cup, being beaten in the first round by the South Lancashire Regiment by two goals to nothing, though it is only fair to the R.A. to say that they were somewhat handicapped by having to leave Spike at 4 a.m., travel up to Birr, a six hours' railway journey, and then play off the Cup Tie. 2nd Lieut. Wyatt is captain of the team.

Changes there have been many. Captain Butler the Staff Adjutant, on account of his health, went to India with the 29th Field Battery from Clonmel, and Capt. Gay took his place. The other officers who went with it were Major Burton, Lieutenants Reed and Gillman. This battery held a high record for shooting, having been a first class battery three years in succession, and in one year obtained the highest marks of any battery at home. Glenbeigh was their practice camp. The 11th Field Battery have taken their place and arrived at Clonmel in October.

The 8th Field Battery went to Hilsea in the summer, and Major Burton's battery, the 25th, came over from Plymouth and relieved it at Limerick.

At Fort Westmoreland, Major Hodgson has left for Halifax, and Major Daniell has come, the latter on promotion from the Depôt at Yarmouth. The Instructor-in-Gunnery, Lieut. C. Phillips has gone on six months' sick leave in a sailing vessel to Australia. Lieutenant Dykes has become an I.P.F., and is still busy seeking for his P.F. instruments.

The 17th Company Southern Division, R.A., one half of which came here in 1889 and the other half on the reorganisation in 1891, but both from the Portsmouth District, have gone back there and are quartered at Fort Grange, Gosport, thus showing the advantages of belonging to the Southern Division, in only having two districts to serve in, viz. the Southern and Cork, when quartered at home. Major Griffiths, who was the "oldest inhabitant" of Spike, went with it, and yields that honour to the District Adjutant, Lieut. Bateman. No. 10 Company of the same Division have arrived to take their place; actually a Garrison Company with all its officers present.

The golf links at Fort Westmoreland are in good order, but, needless to say, are sacred to the male sex, those who wish for "fairer" company can play at the Rushbrooke Golf Links, which are on Queenstown Island, or can go further afield to the Glanmire Links near Cork.

At lawn tennis, which is still a popular pastime in Ireland, Lieuts. Galloway, Puxley, and Wyatt won many "pots" during the last summer.

An old friend of the Regiment is now quartered in Cork, viz., Major Spens of the 85th, but there is no racquet court there for him to show his prowess in; however, he comes to Spike sometimes to take the R.A. on at golf, and makes a good fight of it on strange links with the crack R.A. man, Galloway.

DOVER.

Lieut. Desborough has joined No. 17 (Major Maxwell's) Company.

The deciding match at golf between teams of R.M.L.I. Walmer and R.A.

Dover was played at Deal, on 14th October, resulting in a win for the R.A. by 17 holes. The individual matches were as follows :—

R.M.L.I.	Holes.		R.A.	Holes.
Major Hungerford	3	*v.*	Colonel Lloyd	0
Capt. Trotman	0	*v.*	Major Darby	1
" Pym	0	*v.*	Capt. Stanton	11
Lieut. Curteis	0	*v.*	Major Maxwell	2
" Ward...	0	*v.*	Capt. Cummings	6
Total	3		Total	20

The Mess Committee would most thankfully receive any books (standard works, books of reference, novels worth binding, &c.) to assist in forming a library, the want of which is much felt by officers living in the Castle.

MALTA.

Some time ago it was proposed that the R.A. officers who were then, and had lately, been quartered in Malta should in some way express their appreciation of the great courtesy shown by the officers Royal Malta Artillery in sending their band to attend the funerals of officers and men of the Royal Artillery, and to play at the R.A. and R.E. Mess at large mess dinners, and at other entertainments.

A meeting was held, with Major-General Nicholson's consent, at which it was determined to ask for subscriptions among all R.A. officers who were then, and had been within five years, quartered in Malta, so that a fund might be raised to purchase something suitable to present to the Royal Malta Artillery as an expression of thanks.

This appeal was very liberally responded to, and at a meeting held last spring it was found that sufficient funds had been raised to purchase a silver cornet for the band; and as it was considered that nothing more appropriate could be got, it was determined that the presentation should take that form. Cavaliere Zavertal was written to, and most kindly undertook to see that the instrument was a thoroughly good and suitable one, and in due course the cornet arrived, and it was determined to present it at a dinner to which all the officers of the Royal Malta Artillery were asked.

Accordingly on the evening of the 9th (the Prince of Wales's Birthday) Major-General Nicholson presented the cornet to Colonel Speranza, commanding the Royal Malta Artillery, as representing the Regiment, in a very appropriate speech, in which he commented on the good feeling and sense of comradeship which has been steadily growing up between the two Regiments, and explained the reasons which had led the officers R.A. to hope that the officers Royal Malta Artillery would do them the honour to accept this small token of good feeling on their part.

Colonel Speranza, in accepting the gift on behalf of the Royal Malta Artillery, expressed his conviction that both the officers and men of that Regiment most warmly appreciated the sentiments which had actuated the officers R.A. in making it, and he was sure that the cornet would ever remain an heirloom in the regiment as a remembrance of good feeling in the past, and as a pledge of good comradeship in the future.

It has not been possible to acquaint those subscribers not present in the island with what had been determined on from time to time, or to acknowledge their subscriptions by separate receipts, but it is hoped that this notice will satisfy them that their subscriptions have been duly applied to the object for which they were given in a way that will meet their approval.

PORTSMOUTH.

SHORTLY before relinquishing command of the Southern District, General H.R.H. the Duke of Connaught issued a circular letter on the subject of a systematic arrangement of future memorials in the Royal Garrison Church, Portsmouth; the work proposed to be carried out is described in the architect's words, as follow :—

> "It is proposed to arcade the south aisle wall from the western porch door to the existing break in the string-course near the single lancet window, and reaching from within 3 feet 6 inches of the floor to the string under the aisle windows.
>
> "This arcade would be formed in the wall to a depth of nine inches, and be constructed of Caen stone, the single shaft dividing the bays into lancets being of Purbeck marble. In the back and head of each lancet, slabs of alabaster would be let flush with a margin of freestone of a warm brown colour, to harmonise with the slabs, which would be inscribed in gilded letters.
>
> "By coupling the lancets under an enclosing arch the series would be less monotonous than if composed of single lancets, and the alternation of the single dividing column with the groups of triple stone columns would further diversify the composition agreeably.
>
> "The general treatment is common to most of our English mediæval Chapter Houses attached to the great Cathedrals.
>
> "Provision for 78 memorials would be secured, and this could hereafter be doubled by using the north aisle in the same way."

With reference to the foregoing, it is proposed that the Royal Artillery should purchase one arcade bay or arch, at a cost of £40, or thereabouts.

The names to be inscribed thereon should be limited to those officers of Royal Artillery who have died whilst serving in the Portsmouth Garrison.

The names to be inscribed thereon should be selected by the D.-A.-G., R.A., Director of Artillery, and C.R.A., Southern District.

A sketch of the proposed Memorial Arcade can be lent to anyone applying to the Secretary, R.A. Institution, Woolwich.

If carried out the following would be among the names to be inscribed :—

Major-General G. Gambier, C.B.
Colonel E. Wodehouse, C.B.
Major C. C. Young.
,, N. S. K. Bayly.
,, F. B. Knox.

Donations will be received by Grant and Maddison's Union Banking Company, High Street, Portsmouth, or by the Treasurer, Major G. Barker, R.E., 9, Western Parade, Southsea; in sending donations officers should notify their wish for the money to be devoted to the Royal Artillery Arch.

OBITUARY.

Major-General Sir Christopher Charles Teesdale, c.b., k.c.m.g., V.C. (retired list), Royal Artillery, Master of the Ceremonies to Her Majesty, died on the 1st November, at Bognor, Sussex. He was born in 1833. He entered the Royal Artillery in 1851; became Captain and Brevet-Major, 1858; Major, 1872; Lieut.-Colonel, 1876; Colonel, 1877; and Major-General, 1887; retiring in 1892. He was an A.D.C. to Her Majesty from 1877 to 1887, and Equerry to the Prince of Wales from 1858 to 1890, since which time he had been Extra Equerry. In 1890 he was appointed Master of the Ceremonies to Her Majesty. Sir Christopher served as aide-de-camp to Major-General Sir W. F. Williams during the blockade of Kars, and at the battle on the heights above the town on 29th September, 1855, he successfully held the redoubt called Yusek Tabia for over seven hours under very heavy fire, and was mentioned in despatches. During the fighting he received a severe contusion from a grape shot in the leg. The rank of Lieut.-Colonel and the Third Class of the Medjidie were conferred on him by the Sultan in recognition of his gallantry. In a letter from the Foreign Office of March, 1855, the Government conveyed their sense of approval of his efforts in averting from the garrison of Kars the horrors that they suffered from famine in the preceding winter. In virtue of his rank of Lieut.-Colonel in the Turkish service he received the Order of Companion of the Bath and that of the Fourth Class of the Legion of Honour. Subsequently he was awarded the Victoria Cross for gallant conduct during the Russian War, in having, while acting as aide-de-camp to Sir W. F. Williams at Kars, volunteered to take command of the force, engaged in the most advanced part of the works, the key to the position, against the attack of the Russians. By throwing himself into the midst of the enemy, who had penetrated into the redoubt, he encouraged the garrison to make an attack so vigorous as to drive the Russians out and prevent its capture. He also, during the hottest part of the action, when the enemy's fire had driven the artillerymen from their guns, by his intrepid example induced them to return; and, having led the final charge which completed the victory of the day, he at great personal risk saved from the fury of the Turks a considerable number of the disabled among the enemy who were left wounded outside the works—an action witnessed and acknowledged gratefully before the Russian Staff by General Mouravieff.

Captain C. W. Gordon (retired), whose death occurred at New York, on 14th October, 1893, joined the Regiment as Lieutenant on 25th January, 1877; became Captain, 9th September, 1885; and retired on 16th February, 1889.

Captain C. H. A. Hervey, died in London, on 12th November, 1893. He was commissioned as Lieutenant, 26th July, 1881; and became Captain, 18th November, 1889.

Captain J. A. L. Campbell (retired), died from a wound received in action in Matabeleland, on or about 16th October, 1893. He joined the Regiment as Lieutenant on 2nd February, 1876; became Captain, 10th January, 1885; and retired on a gratuity 4th April, 1888.