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SOMMAIRE.

NOTICES.

All correspondence connected with the *C. M. Review* should be addressed to the Secretary, R.S.G., Kingston.

Communications intended for publications in the next issue of the *C. M. Review*, must reach the Editor not later than the 20th of the month.

NOTE.—Officers of the Militia are requested to kindly forward to the Editor, for insertion in the "Militia Item" column, any information respecting their own regiments which they think might be of interest to their brother officers.

List of useful scientific books for sale, published at the Royal School of Gunnery, Kingston, Ont.:—

	Cents.
Canadian Militia Field Artillery Manual, (by Lt.-Col. T. Bland Strange)	75
Retrospect of the late Franco-German War (same author)	50
Gr. Field Gun Drill, (extract from C.F.A.M.)	10
Rules for Competitive Practice for Artillery	15
Mortar Drill	15
Heavy Ordnance, (drill and exercises)	15

AVIS.

Conformément à la loi, toute personne qui reçoit un journal et qui ne le renvoie pas, se trouve abonnée de droit.

Les personnes qui auraient quelques communications à nous adresser sont priées de nous les envoyer avant le 20 de chaque mois.

Les personnes qui désirent entrer dans la Batterie "B" sont priées de se présenter au Commandant, (Kingston,) tous les jours de 10 heures à midi ou de lui envoyer leur demande avec leurs certificats de bonne conduite. Il faut aussi qu'elles sachent lire et écrire qu'elles jouissent d'une bonne santé, que leur hauteur ne soit pas moindre de 5 pieds 4 pouces, la mesure de la poitrine de 34 pouces. Enfin, nous les prévenons que les ouvriers charpentiers, menuisiers et forgerons ont une extra paie de 20 cents par jour.

La Batterie "B" informe le public militaire qu'elle tient à sa disposition les ouvrages de *drill* pour le *smooth bore*, le mortier, les canons rayés etc., ouvrages imprimés par les presses de l'Ecole Royale d'Artillerie sous la haute surveillance du commandant.

The Canadian Military Review,

FEBRUARY 1st. 1881.

Short Tactical Lessons for all arms at the Ontario Gunnery School.

"B" Battery, Royal School of Gunnery, Kingston.

No. 1.

Tactics from Latin *tango*, I touch, I hold.

Tactics is the art of handling troops in the field.

Strategy is the moving of troops on plans preconcerted in the office of the general in pursuance of his directions from his own government

Or Tactics, may be called the handling of troops in the field.

Strategy, the manœuvring of troops before being in contact with the enemy or the soldiering of the office or cabinet.

These two subjects touch each other sometimes, such as when the tactics of attack or defence are regulated with a view to cover the strategic line of retirement or base from which supplies and reinforcements are expected.

The *base* of operations is the place from which an army makes its start, and from whence it receives its supplies of food, ammunition and all things required for an army, recruits, &c.

In the case of attack the fighting tactics should be so regulated as to cut the enemy from his line of retreat towards his strategic base, without exposing your own.

Take the following example of the Franco-German war:—At Spicheren the Prussians threw their main artillery attack from Stering on the French left, and so cut them off from retreat towards or expected supports from Forbach, forcing them to retreat towards the right, away from Chalons and their supporting army, thus cutting their armies as under. (See Fig. 1.)

A Tactical Unit depends upon certain physical facts, which do not alter, and upon certain other physical circumstances that do alter. The things that do not alter are the size and strength of men. The power of one man's voice to make itself heard, and the power of one man to influence others in the field. The things that do alter; are the weapons used and the noise of modern war as compared with the comparatively silent slaughter of an ancient battle.

The size of a tactical unit depends then upon the greatest number of men that can be controlled by one man in the field having reference to the arms in use.

The Roman centurions command of 100 men or thereabouts, was the link of which the chains were formed that enslaved the world.

This number was determined as the greatest which one man could thoroughly permeate with his personal will or influence in peace time, so as to control them in war.

The men required to be such a distance apart when fighting as to use their weapons, (swords and javelins) effectively. The Greek Phalanax was a closer formation where men with spears stood touching each other in a wedge shaped column. The men in rear had longe spears. In the middle ages there were no regular armie and the size of a tactical unit depended upon certain feudi circumstances *i. e.*, the number of retainers following feudal chief or sub chief.

They were further divided into archers which corre pond somewhat to our rifle armed infantry, and mounte men at arms, (knights) wearing armour, for which the is no counterpart in modern battles, except, perhaps th charge of cavalry lancers.

When primitive fire arms and standing armies were fir introduced it was found that a thousand men or then abouts put shoulder to shoulder produced the best resu by firing volleys at the command of one man. This w the introduction of the battalion as the tactical unit f infantry, but when arms of precision and long range we introduced, troops could not be exposed in close formati without destruction.

Fighting in open order became a necessity, and it w found that the colonel of a battalion could no longer co mand his men in such an extended line. The mode captain—then like the centurion of old—became t leader of a tactical unit; but it was necessary to mainta some sort of control over these units, the command, ther fore, instead of being lateral has to be in depth, and it desirable that the companies and battalions support each other should be homogeneous and under one c trol. In a ten company battalion, therefore, the fo centre companies might be extended as the fighting li and the flank companies as supports and reserves, so th when the whole has to be pushed forward to the fighti line, the companies and sections composing them wo find themselves in their respective places, under their officers and sergeants, which would be all the more i portant if the reinforcements had been sent up by l companies or sections. Moreover, the tendency of att is to open out from the centre and avoid the crater of fi reinforcing from the flanks compresses the line for final rush, if the men have been taught to close to the ce as casualties occur, while it tends also to prevent its be outflanked, the supports coming up on the flanks.

The Prussians were the first to return to the old Rom unit with satisfactory results, and it should be the c stant effort in peace time to keep the same small bo of men together in camp and barrack-rooms under same non-commissioned officers and officers; the s system being necessary for brigades and larger divisi Hence the value of localized armies, in brigades and d sions, which the British find it difficult to sustain on count of Indian service, but which the Canadian Mi authorities should be careful not to destroy.

No. 2.

ORDER OF MARCH.

The great operations of war such as decisive battles seiges are preceded and followed by minor operati such as marches and reconnaissance, which may b force to make an enemy show his position, and if op tunity offers change, into a real attack.

What are called minor operations of war are often equal in importance to what are considered important battles. Indeed neglects of little ordinary precautions sometimes lead to terrible disasters, such as that at Isandhlana. Every duty should be equal in the conscience of a soldier; he cannot judge what is important and what is trivial. Upon the vigilence of a solitary sentinel or vedette may depend the safety of an army.

Marches, therefore, should habitually be conducted with caution, and apparently useless formalities have to be carried out in time of peace, in order to teach the precautions that would be essential in war.

Marches are of two kinds. 1st. direct to the front; 2nd. flank marches.

For various reasons a flank march is a dangerous operation in the face of an enemy, and yet when an army is making a flank march it is dangerous for a smaller force to strike it in the middle of its length, as by simply facing in the new direction towards its assailant it becomes a deployed line. This was exemplified in Gen. Burrows' disastrous attack on Yakoob Khan's army at Maiwand. Trailing its length along, it was like a snake struck in the middle, both ends turned in and encircled the General's force.

If struck on the head of the line of march, it takes an army a long time to deploy, longer still if struck in rear. A snake held firmly by the tail can rarely injure its assailant. The same with an army.

The order of march is regulated with reference to readiness in forming the order of battle.

A *corps d'armé* may advance by one or more roads. This is generally advisable when roads are sufficiently near to maintain frequent communication.

The order of march may be divided into four parts:

1st. The *advanced cavalry*, generally about two days in advance of the main body, the distance depending upon the enemy and the character of the country. The cavalry flankers form part of the advance cavalry.

2nd. *Advanced guard.*

3rd. *Main body.*

4th. *Rear guards.*

The advanced cavalry are the *eyes, ears, feelers* or *fingers* and *screen* of an army. They advance in the form of an opened fan, or the extended fingers of the hand. The first advanced parties being only a non-com. officer and three men.

These parties are stretched across the front within sight of each other, and may be represented by the nails of the fingers, their supports by the knuckles and the massed cavalry reserve, by the back of the hand. (See Fig. 2).

The advanced parties should be selected from the best men, intelligent, daring, yet cautious. In an advance or retreat they should always keep touch of the enemy without allowing themselves to be compromised by the enemy's cavalry, with whom they would be in continual contact.

If the enemy retires they follow and harass him; if he advances overwhelmingly they retire slowly, remembering that as they fall back on their supports they become stronger, but that it is difficult to recover ground that has once been abandoned.

They keep up a continuous system of reports to their supports, who transmit them to the officer commanding the main body of cavalry. This system of reports is as if the advanced piquets or nails reported to the supports, or knuckles along the fingers, and these again report to the central support or hand.

Such reports should be written (even with pencil,) when possible, being particular about date, place, hour of the day or night, and corps of the sender. Writers of such reports should bear in mind the natural tendency to exaggeration, and be careful to state what comes under their own observation, and what is report or statement from civilians or natives of the country.

This system of reports carried by side patrols along lines converging to the main body of cavalry advance carry information as to the movements of the enemy, which is the *first* duty of advanced cavalry. The *second* is like unto it, to prevent an enemy from knowing what is done in your own army, or gaining information by penetrating between your advanced vedettes or piquets, so they would then cease to be the eyes, ears and screen of their comrades of the army.

To prevent this penetration by the enemy a system of cross patrols is carried on from one support to another across nails and the knuckles in order to intercept parties of the enemy and keep up communication. The *third* duty of the advanced cavalry is to slip between the enemy's vedettes, sentries, and even piqets and to find out what the enemy is doing. This requires a rare amount of caution, daring and cunning, combined with a good bump of locality in the individual. When he is an educated man, and can be furnished with a map of the enemy's country on a large scale, his service may be invaluable, as in the case of the young one-year sub-lieutenants of Uhlan Cavalry.

The flanks of the line of march are also protected by cavalry.

The best formation to afford such flank protection is a wedge echelon of small parties consisting of a non-commissioned officer and three men, the right flanking party extends from its left, and the left flanking party from its right, in such a manner that the leading party keeps sight of the main body, and each of the following sections of that in its front. They report to cavalry supports near the main body. (See Fig. 3).

The echelon movements allow, (in case of pressure from either flank,) of the parties wheeling outwards and presenting a front to an enemy while they fall back on their supports.

I have spoken of the duties of advanced cavalry as of the *eyes, ears and feelers* of an army, their lines of support and communication resembling the fingers of an extended hand. That hand can be closed if needs be to grasp an important position, such as a bridge or defile, and to enable it to be held, *Fire* has to be added to the *arme blanche* of the cavalry. Our cavalry at present have carbines, but they are not accurate enough for long ranges, nor do the men carry sufficient ammunition. Mounted riflemen are required, but in their absence the

advance cavalry is accompanied by a battery of light horsed artillery.

In Canada we have no horse artillery resembling the Royal, but with gunners mounted on the off horses and axletree seats as was the custom in the Indian horse artillery we could keep up with the cavalry.

There are numerous instances of parties of this kind, cavalry and artillery, striking and holding an enemy or important position until supplemented by infantry.

In the Canadian Manual for Field Artillery, you will find instances of the action of this combined force of cavalry and artillery, by the Prussians, notably at Vionville, Rezonville and Marsletours.

The cavalry rear guard is the converse of the cavalry advance guard.

The cavalry advance guard also should carry discs of gun cotton with detonators, for destroying bridges railways, &c. These as a rule of course only destroyed in a retreat. A few entrenching tools and axes should also be distributed among Canadian cavalry.

Another very important function of the artillery with the advance cavalry is, that they are enabled to obtain information which the cavalry cannot do, viz. By opening fire in such a manner as to force the enemy to deploy his masses, often inducing him to unmask his whole artillery fire by replying to a fraction of yours, thus showing the position and number of his guns and batteries.

An advancing enemy met by artillery fire is apt to overestimate the force opposed to him, to deploy and proportionately delay his advance. There are instances where cavalry have held the enemy without the aid of artillery, by using caution and audacity, as in the case of the young volunteer in the Prussian army, who with a dozen troopers made prisoners five hundred French troops, also, the bogus investment of Thionville, by a few troopers and sappers with entrenching tools driving round the town in an omnibus, and producing all the desired effect of a regular investment.

(To be continued.)

Our Gunner Governor-General.

That the Governor-General of Canada holds a first class certificate from the Woolwich School for reserve artillery, and has long commanded the Argyle and Bute Volunteer Brigade of Artillery, is no slight advantage to the Militia Artillery of Canada, to the field batteries of which His Excellency offered for competition (through the Dominion Artillery Association,) last year, a cup and $100. A scale of credit was arranged so as to test not only the drill, discipline and artillery knowledge of the men, but also the fighting tactical science of the officers, who had to answer a series of selected questions on the subject, but also practically to place their batteries in fighting position wherever the ground permitted. The results these officers themselves feel to have been preeminently satisfactory in forcing attention to what is the end and aim of all military training, i. e., fighting tactics -too often lost sight of in Barrack yard drill. In a militia force whose time of training is of necessity so limited compared with what has to be learnt by such an arm as artillery, it is fortunate that instructional essentials should be selected by those who can be trusted from actual experience to know what should be learnt, and what may be left unlearnt. Hence the value of the Governor-General's prizes to the Artillery, and the form his practical knowledge and experience have led him to give to the competition for his prize.

Next year it is hoped that the long slumbering garrison artillery of Canada will be awakened by the practical form of reward put before them by their gunner Governor-General for genuine efficiency in the most *important* items. An artillery reward will not fall to a chance shot or be lost by an accidentally unserviceable fuze—over which the most skilled gunner can have no control—one difficulty that has hitherto stood in the path of the Dominion Artillery Association, and his efforts to assist it, *has* been the extraordinary and scarcely creditable absence of gun shifting material, *i. e.*, of lumber, in this land of lumber. The difficulty in getting the price of a few feet of square timber, and a few fathoms of rope for each battery competing, say, $20 per battery—surely the public spirit of the municipalities if not the country at large, might provide this important means of instruction for garrison artillery. But what have lumber and ropes to do with guns and gunners? ask the uninitiated; everything! To fight his gun is generally the last and least difficult duty of a garrison or siege gunner. To get his heavy gun into position into whatever temporary battery may have been constructed, *is a far more* difficult task, for which our rural Canadians from their habits of life are perhaps remarkably well fitted, if they only had the necessary military practice added to the every day experience in lumbering of so many among them.

GENERAL EFFICIENCY OF FIELD BATTERIES

In accordance with a resolution passed at the meeting of the Council of the Dominion Artillery Association, on the 4th March, 1880, by which it was resolved that the prize presented by His Excellency the Governor-General, be held this year by the officer commanding the most efficient field battery. The following scale of marks by which the efficiency of each field battery was tested is published for general information,

Marks were given by the Inspectors of Artillery at their annual inspection, as follows:—

Clothing and accoutrements	8
Guns, carriages and equipment	8
Horses	8
Harness and harnessing	12
Marching past—walk, trot, gallop	12
Standing gun drill and answers to questions on artillery, by N. C. officers	24
Field manœuvres	15
Selection of fighting positions and answers to questions from Field Artillery Manual on fighting tactics, (by officers)	24
Each officer or man with S. G. certificate, 1st to 4th	4 to 1
Each man with an efficiency badge (‡)	25
Sword drill with mounted officers and N. C. officers	5
Dismounting and disabled ordnance	8
Discipline (including camping details)	10

One-tenth (1-10th) total score at competitive practice

T. B. STRANGE, Lt.-Col., I. of A.,
President of Council, D.A.A.

D. A. A. Field Artillery Competition for Governor General's Cup and $100.

THE CREDITS AWARDED EACH BATTERY ARE SHOWN IN THE FOLLOWING TABLE.

Name of Battery.	Officer Commanding	Clothing and accoutrements.	Guns, Carriages & equipment.	Horses.	Harness & Harnessing.	Marching past—walk, trot & gallop.	Standing gun drill and answers to questions by Non-Commissioned Officers.	Field manœuvres.	Selection of fighting position, etc., and answers to tactical questions.	Each officer or man with S. G. certificate.	Each man with an efficiency badge.	Sword drill with mounted Officers and N. C. Officers.	Dismounting & disabled ordnance.	Discipline including camping details.	One-tenth total score at competitive practice.	Total.
	Maj. Macdonald, Commanding 1st. Bde.															
No. 2 (Ontario) Bty. 1st Prov. Brigade	Capt. D. McCrae	7	6	8	10	11	21	11	23	9	15.00	8	4	10	42.2	186.3
Quebec Field Battery	Capt. Crawford Lindsay	8	6	7	10	12	22	14	13	15	5.00	4	6	10	47.1	179.1
No. 1 (Wellington) Bty. 1st Prov. Bde.	Capt. Nicoll	7	6	6	10	11	23	12	20	15	2.75	4	5	10	43.2	174.95
Ottawa Field Battery	Capt Stewart	7	5	6	8	11	20	13	11	11	5.50	4	8	9	50.1	168.6
Toronto Field Battery	Major Gray	5	6	7	10	9	22	10	20	13	2.75	.	6	8	48.9	167.65
Kingston Field Battery	Capt. Wilmot	0	5	7	11	11	20	11	20	11			6	8	50.0	166
Welland Canal Field Battery	Major King	6	8	7	10	11	21	14	8	19	1.75		.	9	47.8	162.05
Woodstock Field Battery	Capt. Dibblee	4	4	8	8	7	19	10	18	24	5.75	8	:	10	41.9	157.65
Gananoque Field Battery	Major McKenzie	5	4	6	10	9	16	10	14	17	6.00	.	2	7	47.8	152.8
Durham Field Battery	" Graham	3	4	6	8	3	16	3		14	8.50	.	6	4	41.5	103

Our Militia.

(*To the Editor of the Witness.*)

Sir,—Judging by the signs of the times, it is just possible that our militia may be wanted before all the war clouds that hang over the Empire are dissipated. Just suppose that they were really wanted, how would it fare with them? Our men, as men, are as good as any that could be brought against them; but, in the matter of arms and outfit, they would be in about the same relative position as an Indian with a bow and arrow is to a white hunter with a rifle. Leaving out of the question for the moment the artillery, we find that the militia of Canada are armed with a rifle that belongs to the past generation. The Snider was, perhaps, the b... rifle in its day, but it is inferior to the Martini-Henry, which in its turn is eclipsed by the military rifles of other nations. Competent judges have said that the Snider is from 10 to 15 per cent. inferior to the Martini-Henry at any range up to 600 yards, and beyond that distance it is from 25 to 50 per cent. inferior. This handicaps our men rather seriously. It is not pleasant to enter into any contest with a strong probability of getting the worst of it, and *when it comes to defending one's house against odds*, one would naturally want to have these odds lessened as much as possible.

If any Fenian rabble should gather on our border during the present effervescence of the Hibernian mind, we should probably find them armed with the Remington or some kindred rifle, and, except at close quarters, our Sniders would be outmatched. To remedy this with the means at our disposal, our Government has in store here sufficient Martini-Henry rifles to equip one or more brigades. Let that be done now, at once. It will not cost much, if any money, and would have a good effect. It would strengthen and encourage our own men, and would tend to keep things quiet, by showing our misguided friends that we do not neglect precautionary measures.

Qui Vive.

Montreal, Dec. 28, 1880.

To the Editor of the Witness.

Sir,—Your correspondent "Qui Vive," in his letter on the militia, published in last Wednesday's *Witness*, is very much exercised over the inferiority of the Snid.r rifle to the Martini-Henry and other more modern rifles, and doubts the ability of our men to cope with the Fenian hordes which are distributed throughout the neighboring nation, in case they should take it into their heads to attempt an invasion of our country, as he surmises that they would probably be armed with the Remington or some kindred rifle.

Who ever heard of a band of scarecrow Fenians being armed with expensive modern rifles? The Skirmish Fund is far too profitable to its managers to be squandered in purchasing first-class rifles, when cheap second-hand ones would answer all the purposes of a demonstration equally well. *But, seriously, there* is not the slightest reason for anxiety on account of the inferiority of the Snider to the Martini-Henry as an arm of precision, as it is a very useful and serviceable weapon, and much less liable to injury from rough usage than most of the fancy modern rifles. To equip a few regiments with Martini-Henry rifles would do no good, and only stir up jealousies among the others, and to purchase a new armament for the whole militia would cost a good deal of money, and though the money allowed for militia purposes is altogether inadequate, I think that any increase could be much more profitably expended in other ways, which have been pointed out by Sir Selby Smythe, and to a few of which I desire briefly to refer.

In the first place we are very badly in want of schools for the proper training of infantry, cavalry and engineers. The Schools of Gunnery at Kingston and Quebec afford the desired facilities to the artillery, but the other arms of the service are totally neglected.

A very moderate increase in the Parliamentary grant would be sufficient to expand the establishment of these places, and convert them into brigade schools for the training of officers and non-commissioned officers of all arms, and the engineers who would be added to the garrisons would supply another much-needed want in keeping the valuable works at these points in proper repair.

Further, some inducement should be held out to officers, and non-commissioned officers to devote the necessary three months to qualifying for certificates at these schools and to continue in the force afterwards, and this could easily be done by giving an increased allowance, according to rank, to such officers as hold certificates from those schools, as, for instance, sergeants might get $25 a year; lieutenants, $40 ,

$60; majors, $80, and lieutenant-colonels, $100, which amounts would at least go part way toward meeting the expenses necessarily incurred in holding a commission. At present each officer, irrespective of rank, is allowed $1.00 per day for twelve days, and each non-commissioned officer and private fifty cents a day for the same period.

Another improvement could also be effected by doubling the pay of the men, as the loss of it through absence from drill would be more felt, and would give the officers more hold upon them I will just briefly ment'on a few other pressing wants without enlarging upon them: The expenditure of a few hundred dollars a year in fire-wood to keep the frost out of the splendid forts at Point Levis, a proper armament for these forts; a larger reserve stock of rifles, ammunition and clothing, the assembling of the militia in brigade camps during the period of annual drill; the gradual purchase or manufacture of a sufficient number of armour-piercing guns to properly defend our seaports, the formation of companies of marine militia; the formation at St. John, N.B., for the Maritime Provinces of a permanent battery of artillery, which could be trained in the use of torpedoes for harbor defence. Other desirable objects might easily be enumerated, but the above would suffice for some time to come. Before concluding this letter, I wish to protest against that most pusillanimous phrase, "Fenian Scare," as though a country possessing an organized militia, numbering over 40,000 men, was going to be thrown into a state of trepidation by a vague rumor of a possible raid by an insignificant Fenian rabble.

SUBALTERN.

Montreal, Jan. 1st, 1881.

[It is said there are only 1,000 (?) stand of Martinis in Canada, and out of these the R.M.C. Cadets are armed. In the event of emergency, the arming of city regiments in Montreal would probably lead to inadequate supply of ammunition, or to mistakes in issue between Snider and Martini. Besides, has the Henry Martini mechanical arrangement been sufficiently tested in the severe climate of Lower Canada? The Halifax garrison are trained soldiers who don't do small arm practice in winter.—Ed. C. M R.]

Krupp's Meppen Experiments of 1879.

The purpose of this paper is to take a short review of the most characteristic features of the Krupp *matériel* experimented on at Meppen last summer, calling attention chiefly to the best results, and comparing them with corresponding ones obtained in this country, with a view to promote the discussion of those matters in which it may appear that we have most to learn.

The principal feature in the Meppen programme was the trial of Krupp's 40cm (15 75-in) breech-loading gun, weighing about 70 tons 17 cwt, known commonly as the 71-ton gun. The trial was specially important for three reasons. 1st, it is the first breech-loader whose power approaches that of the 100 and 80-ton guns made in this country; 2nd, it is a steel gun; its proportions are based on results obtained during the last few years.

All these questions are interesting, and deserving of so much attention that it would be difficult here to deal fairly with all. For the purpose in hand, however, it is not necessary to discuss the question of the respective *metals* of the guns, because it can easily be shown that there was nothing in these experiments that bears upon this point beyond the negative fact that the steel guns in no respect exhibited any fault. We may safely say that our Woolwich guns would have done equally well, as far as the material is concerned, for the pressures in Krupp's guns were by no means excessive. The 71 ton gun for example, was not subjected to as high a pressure as our own 80 ton gun has borne. A test which tries neither gun obviously furnishes us with no means of comparison, and hence the Meppen trials in no way furnish data for the discussion of the relative merits of wrought-iron and steel guns, but bear entirely on the two other questions, namely that of breech loading and proportions—the *former* as concerns ease in working, and the latter power and good shooting.

The 71 ton gun was mounted as for coast defence, on a traversing platform, and a carriage nearly of the English pattern in all respects.

The gun was easily worked by a detachment of 15 men. Ten rounds, with chilled projectiles, were first fired; the time occupied by the last five rounds was 24 minutes. The breech-piece moved easily A good deal of oil was used on it. The breech-loading certainly saved the men much labor, not only in the actual ramming home, but also in bringing up the projectiles, since it was not necessary for them to cross any of the racers or the Cunningham chain The charge was made up in four cartridges, each containing 110 lbs of prismatic powder. The least satisfactory part of the service of the gun was the difficulty experienced in the ignition of the charge and in remedying miss-fires. The vent was in the axis of the piece, and a disc of calico was torn off the bottom of the cartridge last entered, to expose the powder to the flash of the tube The latter was of a bad pattern, short and weak No stress is to be laid on this, as the remedy is obvious. A primer or a stronger tube would rectify this fault. A rather more serious difficulty was apparent when a miss-fire had occurred. The position of the vent was such that it was unusually dangerous to approach it while there remained any likelihood of the gun firing. A gunner may insert a tube in a vent in the top surface of a gun with comparative safety, but to thrust his hand into a cavity in the breech, and in such a position tamper with a doubtful tube and charge, would indeed be dangerous. On active service the risk, no doubt, would be run, and it is possible if the man stood on the step of the carriage and reach round so that the gun in any unexpected recoil should carry him with it rather than run over him, that he might escape without injury. Nevertheless, while this modifies the objection, it remains sufficient to make it imperative to construct some implement to enable a tube to be removed and another entered with safety, even should a miss-fire be a much rarer occurrence than it was at Meppen last summer. The flash from the vent has been spoken of. This is an objection which belongs to all axial-vented guns In Krupp's guns, there was but little flash at Meppen, owing to an arrangement by which a loose platinum ball in the vent is driven up out of the way by the flash of the tube, but pressed back so as to close the vent by the rush of gas from the charge. An Italian officer stated that this ball is not serviceable, but becomes worn and of little use after a time Under any circumstances this difficulty is one connected with axial vents rather than breech-loading.

A more important question is the the shooting of the gun as regards power and accuracy. The chilled projectiles had 0·078 in windage, which is about the same as that in Woolwich projectiles, namely, 0 08-in. over a copper rim. The common shell subsequently fired, however, had the unpratical windage of about 0·02-in. over an i. n body.

The diagrams, Nos. 1 and 2, show a remarkable degree of accuracy, chiefly in the vertical direction, which argues well for the regularity of the charge, which has been attributed to the prismatic powder employed But while the regularity of the powder is a necessary element in such a result, I cannot see how it *alone* explains it. The effect of variation in powder doubtless would be seen in the deviation of the shot in the vertical direction only, but it appears to me that bad shooting from the faults in the bore of the piece would be seen in irregularity both in the vertical and horizontal direction. If the vertical deviation is very small, then it argues not only that the powder was regular but that the bore also carried true to within the limit exhibited, and a cause for the error in the the horizontal direction must be sought elsewhere. With regard to the powder, it stands to reason that a charge composed of a fixed number of prisms of uniform size and density gives promise of greater uniformity being attainable than when pebbles are employed; and there seems no reason to doubt that whatever difficulties were at first experienced this has been achieved. Surely if two attempts were made to obtain regularity in powder—one by employing prisms, each uniform in size and shape, and if possible pressed uniformly, and another by means of pebbles of an accidental shape from uniformly pressed-powder cakes—the former, though it may be difficult, offers promise of ultimate success in the higher degree. As to the windage, stress can hardly be laid on the great reduction in the case of the common shell; the two kinds of projectiles made pretty nearly equally good practice. Lastly, *as to the proportions of the bore and chamber.* The most striking feature is the length of the bore. Figs. 2, 3, and 4 show the relative lengths of the best heavy guns at present in existence, by which it appears that the bore of the 71-ton gun is only 20 inches shorter than that of the 100-ton gun, and 55 ins. longer longer that of the 80-ton gun. The chamber in length is 60·6 ins., that of the 100-ton gun being 59·7, and of the 80-ton gun 58·0. The calibre of the 71-ton gun is 15 75 against 16 in the 80, and 17·72 in the 100-ton gun. Consequently, the bore of the 71-ton gun is 21.8 calibres long against 18 in the 80, and 20·5 in the 100-ton gun. The diameter of the chamber of the 71-ton gun is 17·32 ins., that of the 80 and 100-ton guns being 18 0 and 19 7 ins respectively, that is to say, it is 1 57 ins. greater than that of bore as compared with 2·0 ins. increase in the 80, and 1.98 ins. in the 100-ton gun.

Speaking generally, the bore of Krupp's gun is relatively rather longer, and the chamber less enlarged than in the 100-ton gun, while in the 80-ton gun the bore is actually the shortest, and the enlargement of the chamber actually the greatest of the three

It should be understood that our own investigations have led to the adoption of far greater length of bore than is exhibited in any of these three guns I am informed that a breech-loading gun of 40 tons, 26 calibres long, is in course of construction. I am speaking, therefore, of the 71-ton gun which was made last, simply as having actually *embodied in it* a further stage of progress than the 80-ton gun. The first gun with an enlarged chamber, that I know of, was a field gun fired by Sir J. Whitworth, at Southport, in October, 1872.

On the proportions of bore and chamber mainly depend the power of the guns. To be able to make a comparison between them, discrimination is necessary. It would not be right to take equal or proportionate *charges* as the basis of the comparison, because the principle on which a long gun is advocated is that any greater result can thus be got from a gun with a given strain on it, but at the expense of some waste of powder.

It is clear, then, that looking to the endurance of the gun rather than the expenditure of powder, the basis of comparison should be *proportionate pressures* it would scarcely be right to say equal pressures, because the thicker gun can fairly be expected to bear a greater strain than the thinner one. Now, the best results obtained from these three guns are as follows:—

The 80-*ton* gun at Woolwich with a proof-charge of 451 lb. giving a pressure of 21·5 tons, discharged a projectile weighing 1,728 lbs., with a velocity of 1,598 f.s.—having 32,08 ft. tons stored-up work, or 638·77 ft. tons per inch circumference—equivalent to a penetration of a 32 3/4-in. plate of wrought iron. The 71-ton gun at Meppen is reported, on one occasion, with a charge of 485·1 lbs., giving a pressure on the gun of 20·02 tons, to have discharged a projectile weighing 1,715 lbs., with a velocity of 1,703 f.s.,—having, therefore, 34,483 ft tons stored-up work, or 697·02 ft. tons per in. circumference—equivalent to the penetration of a plate 33·6 ins. thick.

During the public trials in August, the 71-ton gun was not tested so severely, and it is therefore right to class the above in the same category as the Woolwich proof-round above mentioned. In August the average weight of the chilled projectiles was 1,712·8 lbs.

harging charge was 452 lbs., the initial velocity was 1,618 ft., the ed-up work 32,211 ft. tons—the work per inch circumference ft. tons, equivalent to a penetration of 32.12 ins. The pressure in the bore was 19·65 tons.

highest result obtained with the 100-ton gun of 17·72 ins. calibre hitherto, has recently been furnished me by Captain Noble, as follows: charge, 573 lbs.; projectile, probably about 2,000 lbs.; velocity, 1,751·5 ft.; stored-up work, about 41,290 ft. tons, or 742·07 tons per inch circumference, equivalent to a penetration of 31·8 ins. of armour. The pressure on the bore was 17·6 tons.

It is quite clear, from the above, that the 71-ton gun is a much better weapon than the 80-ton gun, inasmuch as it beats it in every respect. It fires a heavier projectile with a higher velocity, which therefore more energy or stored-up work, and an inch and a more penetration, and all this is done with less pressure on the bore of the gun. The reason is that it is a better proportioned gun, its main advantage being its greater length. The 100-ton gun compares much more favorably with Krupp's gun, but, nevertheless would do so better if its length were greater. The main difference in the guns depends on the difference in the length. Comparing these three guns together, I must remind that the 100 and 80 ton guns are productions of an earlier date than the 71-ton gun, and the latter *ought* therefore be better proportioned. I am not speaking, then, of any superiority in knowledge shown by Krupp; on the other hand, I am anxious to do justice to the labors of General Younghusband and Captain Noble in making investigations on this question, which the artillery world generally has turned to good account. Speaking, then, not of the knowledge but of the fulfilment of it in new guns, the question naturally arises, how is it that our Government should be now completing and issuing guns so inferior in power to Krupp's 71-ton gun, which achieved the results we speak of half a year ago? The answer is, the guns are designed for the "Inflexible," and that, being muzzle-loaders, the vessels had to be made with portions of the corresponding to the length of the gun to make provision for loading. All this was determined five or six years ago. Since that time *our own investigations* have shown us the desirability of increasing the length; but the gun being a muzzle loader it is impossible to do so. For the ship in question, a muzzle loader is limited to its length by inflexible conditions; and all that can be done is by enlarging the chamber, to utilize to the fullest the disproportionate thickness of metal. Circumstances have, in this instance, then, combined so as to bring out the disadvantage of a muzzle-loader in a peculiar way; for we find ourselves, in the case of the "Inflexible," issuing new guns of obsolete proportion for a new ship. Apart from this trying instance, however, it is clear that every increase in length is in favor of the breech-loader, because the labor and inconvenience of muzzle-loading increase in an increasing ratio; and, in the case of turret ships and in some guns in casemates and cupolas, muzzle-loading long guns becomes eventually almost impossible.

At the conclusion of the paper the President invited discussion.

Major-General S. E. Gordon, C.B., R.A., said: It appears to me that breech-loading is, in a manner, forced upon us by circumstances; we have reached the extreme power of muzzle-loading guns simply because we are unable further to increase their length. We have made them as long as they can be for use on board ships and in casemates. Guns of greater power are demanded, but we cannot arrive at greater power without greater length, and we all know that naval guns are limited in length by the space available for recoil. The bore of this gun of Krupp's is calibres in length, while our 38-ton gun is, I think, 18 calibres, and that of the 80-ton gun is about the same. There is no doubt that the power of the Krupp 71-ton gun is greater than the 80-ton at present, but if we could put on a few more feet at the muzzle of the latter, we could realize a far greater energy. Well, in order to increase the length of the gun, you must introduce a breech-loading arrangement. As to the question of the weakness of breech-loaders, we must remember that the gun which burst on board the German training ship was an old gun, and that it was the gun itself which gave way, and *not the breech-loading arrangement*. Therefore, that occurrence affords no argument against breech-loading, although it may be an argument against making guns of steel. In 1868 the Ordnance Sein Committee very strongly recommended a trial of breech-loading guns, but there were said to be very good reasons why the recommendation was not followed. We have got a great number of short guns, very good of their kind beyond doubt, but nevertheless unequal to longer B. L. guns which might have been produced of the same weight.

Militia General Orders.

Province of Ontario.

Sarnia Battery of Garrison Artillery.

To be Captain:

1st Lieutenant Charles S. Ellis, G. S., vice Joshua Fourth Adams, who is hereby permitted to retire retaining rank.

Province of Nova Scotia.

Yarmouth Battery of Garrison Artillery.

Erratum.—Adverting to No. 4 as General Orders (21) November, 1880, for "Thomas F. Jolley" read "Thomas R. Jolly" as the name of the Officer promoted to command of the Battery.

CERTIFICATES GRANTED.

Royal Schools of Gunnery.

Province of Ontario.

Cavalry.

Third Class "Short Course" Certificates.

Sergeant T. A. R. Peel, 1st Regiment.
do George Sheppard, Princess Louise Dragoon Guards.
do Sterling LeRoy, 4th Provisional Regiment.

Fourth Class "Short Course" Certificates.

Sergeant Henry M. Ryan, 1st Regiment.

Gunnery.

First Class "Long Course" Certificates.

Lieutenant R. W. Rutherford, 66th Battalion.
2nd Lieutenant G. F. Cole, N.B., Brig. Garr. Artillery,

Third Class "Short Course" Certificates.

Corporal E. A. Day, Ottawa Field Battery.
Acting Bombardier Chas. Simpson, "B" Battery.
Gunner Richard Lake, do

Fourth Class "Short Course" Certificates.

Sergeant J. Bernie, Collingwood Batt. Garr. Artillery.
do Evan Ladow, Trenton do
do William Watts, do do
Gunner H. A. Wright, Kingston Field Battery.
do John Fournier, "B" Battery.
do Michael Ryan, do
do Thos. Callaghan, do
do George Hastie, do
do George Mercer, do
do William Woods, do

Province of Quebec.

Gunnery.

Second Class "Short Course" Certificates.

2nd Lieut. H. M. Campbell, 8th Regt. Cavalry, N.B.
2nd Lieut. J. D. Roche, No. 3 Battery, Quebec, G.A.

Fourth Class "Short Course" Certificates.

Bombardier T. Nevison, Shefford Field Battery.
Gunner J. O. Alix, jr., do
do E. Bailey, do
do J. H. Doyle, Richmond Field Battery.

Progress of Heavy Artillery.

The progress of heavy artillery in its developments and manufacture has now reached a very interesting stage. We have all maintained that the system of building up guns by placing the hard steel tubes inside soft iron coils was contrary to the rules of science, especially when the outside casing was subjected to a severe tensile strain necessary to compress the steel tube. We say necessary, for though the steel tube is no doubt very strong, it will not stretch under sudden strains, but will snap or split; hence the severe tensile strain on the casing is necessary to prevent the tube stretching to its snapping or splitting point. Steel will stretch considerably under a gradual strain, but snaps under a sudden strain. We pointed to the various explosions which had taken place, such as the two Thunderer guns which broke up like carrots, one on board ship and the other at Woolwich, also to the 100-ton gun on board

the Duilio, and to the Krupp 9½ inch guns, one of which burst at the Dardanelles and the other two respectively at Rustchuk and on board the German Gunnery ship Renown. The gun at Rustchuk was a disastrous explosion, a number of officers and men having been killed or wounded, and the gun on board the Renown made havoc with the crew of that ship. We warned the Government of the day that the true system of making large guns was to place the tubes or barrels loose inside their casings, on the plan so successfully originated and carried out by Sir W. Palliser, and that to succeed in this operation the barrels should be made of soft and ductile coiled wrought iron, which all know to be so excellent for sporting guns. The gun casings used by Sir W. Palliser have hitherto been of cast iron, as the casings can be easily made of that material, but it is known that he does not oppose steel casings, but would gladly adopt them if they could be successfully cast, though still adhering to his system of the loose, tough coiled barrel. Our warnings would appear to have had some effect, as judging from an article in an evening contemporary, a great gun manufacturing firm is abandoning its lines, and a complete change of front is taking place, and it has been announced that a new plan has been hit upon other than that of soft coils shrunk over hard steel tubes.

We welcome the change, whatever it may be, it is a distinct proof that our objections and criticisms have been correct, and if further sign were wanted we point to Woolwich, whence it is announced that a radical change is likely to take place in artillery manufacture. Through all these changes and seeming perplexity, it is refreshing to observe the steady progress of Sir Wm. Palliser. He does not abandon any portion of his system, but holds on his way to the sure goal of ultimate adoption. The firing of his guns doubly loaded has produced a deep and permanent impression in the minds of all thoughtful and unprejudiced artillerists, not only throughout the service generally, but also in official quarters. Experiments now in progress at Shoeburyness would seem to indicate that the Palliser guns in Her Majesty's service are to be more heavily loaded in future. The charge of 4½-ton Palliser gun, which previously was 10lbs. of R. L. G. powder and an 80lb. projectile, has lately been increased to 25lbs. of pebble powder and a projectile of 100lb. The importance of this progress in power may be estimated when the enormous number of these guns on service in England, India, and the colonies is considered. It so happens that Sir John Adye, the present surveyor-general of the ordnance, was one of those who originally recommended the adoption in large numbers of these guns into the service about 12 years ago, and the consideration that no one accident has occurred during all this time out of the thousands of Palliser guns which are in our service, and which are constantly being fired all over the world, taken in conjunction with the great and successful development of the system in the United States, will no doubt exercise a considerable influence in his mind as to the direction which experiments with rifled guns of the largest calibre ought to take. An 11-inch Palliser gun has just been completed in America, and four 12-inch 40-ton breech-loading guns are to be manufactured at once. These will have soft coiled wrought-iron barrels loose in their castings, so that the latter will be quite free from the initial tension caused by being shrunk on. This is the key to Sir William's success, for by a scientific application of different metals in his guns, the strain on firing is felt through the whole structure, while it is limited to the tension solely due to to the pressure of the powder charge, and hence he is enabled to fire his guns doubly loaded. Alluding to their heavy breech-loading guns now on order, an American military contemporary observes, "once under weigh it will be perfectly feasible to make a large number to supply our forts, and experience shows that that in range and penetration we shall be fully equal—if not superior—to any arms that can be brought together against us. Both British and Italian officers admit (after spending millions) that they may be compelled to adopt the American system." The Thunderer disaster has been the cause of a new and most effective way of testing guns. A Woolwich ton gun tested in this manner has been blown into hundre fragments. Sir William Palliser asserts with confidence a 38-ton gun constructed on his principle would with double loading as well as the 7-inch did, and that the sub tion of a coiled barrel for the steel tube in the Woolwich would bring these guns into harmony with his principle would enable them to stand the test of double loading. maintains that unless a gun will stand this test it is unfit retained in the service. We unhesitatingly maintain tha truth of opinions based upon practical experience, ought, i interest of the service, to be at once tested in a gun o heaviest calibre.—*London Morning Post, Dec.* 28, 1880.

THE GREAT BREECH-LOADER.

Yesterday the 43-ton breech-loading gun was fir the proof-butts of the Royal Arsenal, Woolwich, i presence of General Sir Evelyn Wood, V.C., and Wood, Colonel Eardley Maitland, R.A., Superintende the Royal Gun Factories, and others. The most rem able peculiarity of the gun, as seen from a little dist is its extreme length, which gives it a shape much d ent from that of the ordinary guns of the service. A of similar weight, constructed on the principles w have hitherto prevailed, would measure probably more than 20 ft. in length, while this one is 7ft. 8i yond that measurement. The bore has a diameter in., and is 26ft. long, forming a capacity which, wit enlarged chamber, will enable it to employ profitabl combustion of large charges of mild powders. Scie research into the action of fired gunpowder has, in ating the bore, rendered muzzle-loading difficult, an cause, combined with the introduction of chamberin the necessities of the navy for guns which can be ha in limited space, has brought about breech-loadi heavy ordnance. The breech piece is a solid cylin screw, about 18 inches long and the same diameter bore, and is worked with great simplicity. At the to load, a gunner turned a handle, releasing the which was drawn out, received by a carrier and away to the right, where it was held by a simple The projectile was then pushed in until it was stopp a choke in front of the chamber, and this was follow the cartridge. The former weighed 714lb, and the which consisted of perforated prisms 1in. across, w 250lb., which is some 50lb. short of the contem maximum. A plate, bearing four crusher-gauges cording pressure, was then inserted, and the breech was brought back and screwed home in a few se It is obvious that a screw 18 in. long, and bearing number of threads, would require an equal num turns to fix it into its seat, but, by cutting away h quantity of the screw and the screw-nut in the gun, intervals are created, along which a fraction of r enables the block to escape, or fixes it firmly in its The great weight of the gun has necessitated gear this purpose, and a simple contrivance sets in m toothed segment which locks or unlocks the breec block being run in and out by a quick-threaded similar to the slide-rest of an ordinary lathe. Th ing of the breech, or obturation, as it is called, is by an expanding steel cap on the face of the breech which effectually prevents the escape of gas to th These and other particulars having been explained visitors, a tube was inserted in the axial vent, gun being fired, gracefully recoiled up its railed pl the shock of discharge being largely absorbed by draulic buffers. Captain Morley, R.A., the proof reported the velocity of the shot to be 1,718 feet cond, which, for a small charge, was fair.—*Londo Telegraph.*