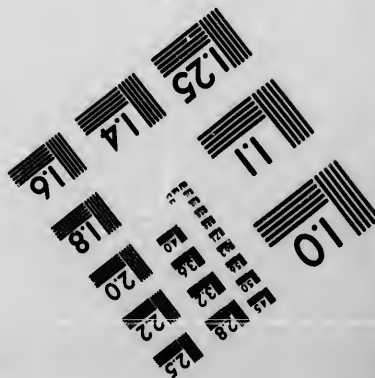
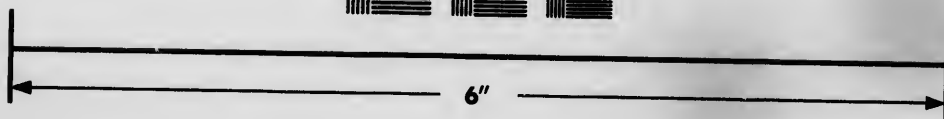
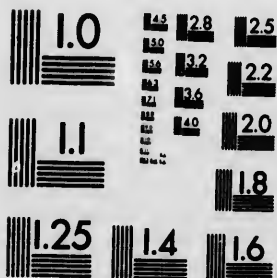


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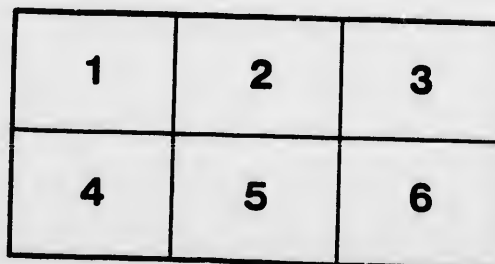
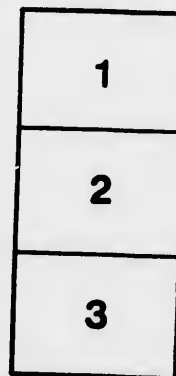
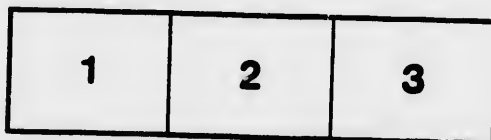
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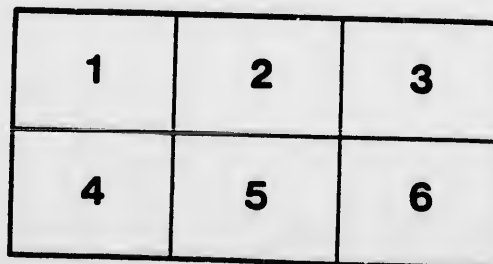
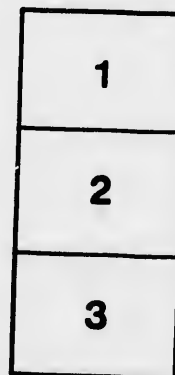
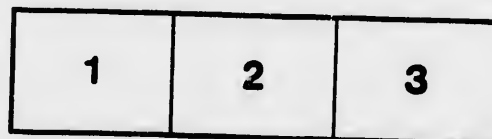
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London Field Battery

June 1884

C. V. Fairbank

London Field Battery

June 1884

page 159 Don. C.
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action 134 Sept. 1860

Entered Rm C 1st June 1876
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Commission 16 July
Action Nichta ~~30 Aug~~ 1880
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MANUAL
OF
FIELD ARTILLERY EXERCISES.



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GENERAL ORDER.

HEAD QUARTERS, OTTAWA,

January, 1884.

The Major General Commanding the Militia of the Dominion having approved of the Instructions contained in the "Manual of Field Artillery Exercises," desires that they may be strictly adhered to throughout the Dominion.

He also directs that every Officer of the Field Artillery shall provide himself with a Copy.

By order,

WALKER POWELL, Colonel,

Adjutant General of Militia.

THE FOLLOWING ABBREVIATIONS WILL BE FOUND IN THIS WORK:—

G. S. for General Service.

S. S. for Sea Service.

L. S. for Land Service.

M. L. for Muzzle-Loading.

B. L. for Breech-Loading.

S. B. for Smooth Bore.

M. L. O. for Muzzle-Loading Ordnance.

B. L. O. for Breech Loading Ordnance.

M. L. R. O. for Muzzle-Loading Rifled Ordnance.

B. L. R. O. for Breech-Loading Rifled Ordnance.

S. A. for Small Arm.

PREFACE TO FIRST EDITION.

It is desirable to have an uniform system of Artillery instruction throughout the Dominion, as closely as possible in accordance with that of the Royal Artillery, but the excellent text books of the latter distinguished service are more scientific, voluminous, and costly than is considered necessary for the militia artillery of Canada. They treat of varied drills and exercises, and described armaments, some of which are becoming obsolete, and others not yet introduced or likely to be supplied to Canada. The information required for a militia artilleryman is, therefore, diffused through many books and manuals difficult of ready reference, and confusing to a non-professional artillerist, whose time is limited, as his periods of instruction are short, and, of necessity, interrupted by civil occupations, such valuable and expensive works as the following being seldom within his reach.

Owen's Modern Artillery.

Treatise on Ammunition, Parts I. and II.

Text Book of Rifled Ordnance.

“ “ on Theory of Motion of Projectiles.

Cape's Mathematics.

Notes on Gunpowder.

Notes on Laboratory Department.

Notes on Gun Factory Department.

Notes on Carriage Department.

Griffith's Manual of Artillery.

Artillery Retrospect, 1870.

Handbook for Field Service.

Minor Tactics of Field Artillery.

Short Notes on Field Batteries.

Standing Orders of the Royal Artillery.

Manual of Artillery Exercises, in 8 parts.

Manual of Field Artillery, in 12 parts.

The latter has not been re-published since 1861, and is now out of print; there has been, in the interval, a revolution in the material and the application of Artillery.

The present object is to condense, as far as is consistent with simplicity. The above works are freely made use of, changes are as much as possible avoided, and nothing essentially at variance with the present practice of the Royal Artillery is introduced.

Land service artillery will be broadly considered as—

1st. Field.

2nd. Siege.

3rd. Garrison.

The distinctive character of the first is *mobility*, of the last *stability*, or tenacity in holding its ground.

Siege artillery holds an intermediate place between the two.

Artillery instruction will be divided into—

Technical.

Tactical.

Disciplinary.

Scientific.

The two last can only be slightly touched upon in a work like the present.

The Scientific instruction will, therefore, be limited at first, to a clear explanation of elementary gunnery, suitable to intelligent Non-commissioned officers, subsequently to be extended to Range finding and rough Surveying, as well as such elementary Fortification as is absolutely necessary for the requirements of an Artillery officer.

The Technical will include the gun and its ammunition, use, and rules for practice.

The Tactical will be comprised of drill :

1st. As a steadying training exercise for men and horses.

2nd. As training to surmount obstacles.

3rd. Artillery tactics proper : the movements, selection of position, and working of guns, before an enemy.

The Disciplinary portion will include the care and management of men and horses.

I have been assisted in various portions of this work by

Major Irwin, Capt. R. A. Asst. Inspector of Artillery and Commandant G. S. Kingston.

Capt. Prevost, Adj. G. S.

Capt. Holmes, Adj. G. S.

Master Gunner Donaldson, R.A.

Asst. Inst. of Gunnery Clifford, R. A.

“ “ “ Bernah, R. A.

Staff of
the Gunnery
Schools.

T. BLAND STRANGE, Major R. Art.

Lieut. Col. and Inspector of Artillery,
for the Dominion.

CITADEL,
QUEBEC, 1875.



PREFACE TO SECOND EDITION.

The First Edition of this text book having become exhausted, and its use having been found of much benefit to the Field Artillery of this Dominion, it has become necessary to issue a Second Edition. In preparing this Edition I have taken the opportunity to make a thorough and complete revision of the whole work, the necessity for so doing having arisen mainly from changes which have been introduced into the system of drill as practised by the Royal Artillery, and embodied in the Manual of Field Artillery Exercises for 1881, and in certain details of equipment, ammunition, etc., which required alteration and amendment.

For the purpose of rendering this work more generally suitable as a convenient manual of all practical Field Artillery exercises, those parts which illustrated by example the tactical employment of Artillery in recent campaigns, and which treated upon the scientific explanation of the general principles of gunnery have been omitted, as also the section on discipline. The former will, I trust, be eventually included in a Text book adapted for more advanced theoretical instruction suitable for both Garrison and Field Artillery. The latter has already been published as Standing Orders for the Regiment of Canadian Artillery, and extracts therefrom have been added to this work as an appendix.

general arrangement of the Royal Artillery Manual, has been taken as a general guide for the arrangement of the contents of this work, but whilst adhering as closely as possible to the Royal Artillery system of drill, the distinctive characteristics of drill without wagons have been generally adopted.

▲ Section on Brigade drill has been added for use in camps of instruction, and several minor additions, alterations and amendments have been made wherever it seemed advisable throughout the whole work.

DELACHEROIS T. IRWIN, *Lieut. Col.*,

Inspector of Artillery for the Dominion.

OTTAWA, January, 1884.

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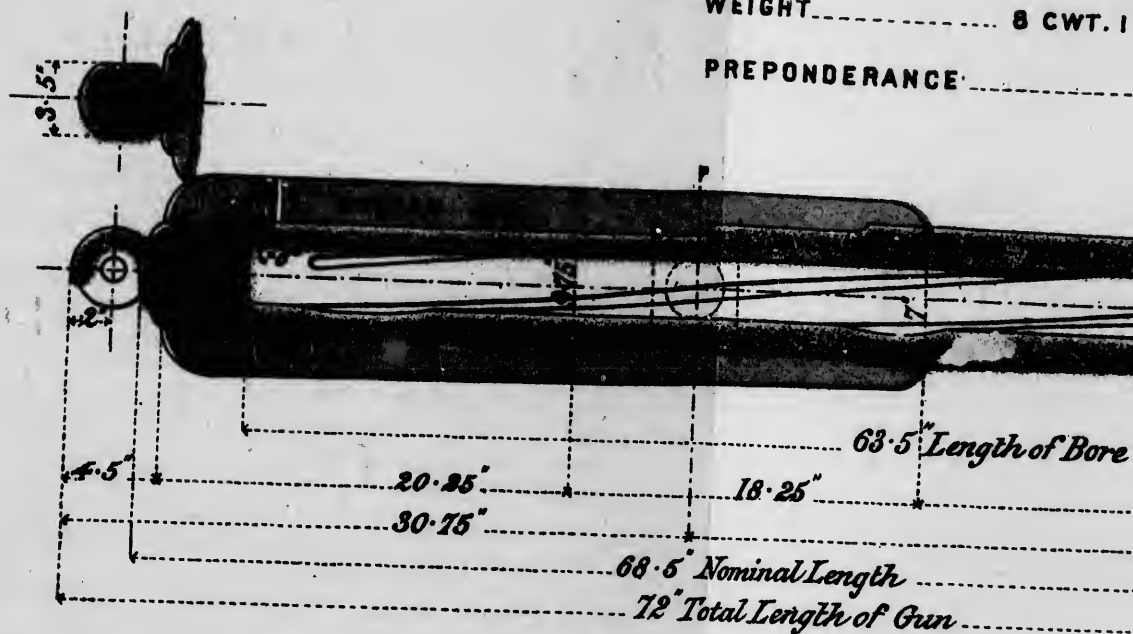
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ORDNANCE WROUGHT IRON RIFLED MUZZLE

WEIGHT..... 8 CWT. 1

PREPONDERANCE.....



Number of Grooves—3
Rifling an uniform twist of 1 turn in 30 calibres.



SECTION OF GROOVE
Full size.

RIFLED MUZZLE LOADING 9 Pr. 8 CWT. MARK I.

8 CWT. 1 PR. 4 LB.

RANGE 7 ..

$$3.3.71. \frac{74}{3} \\ 9766$$



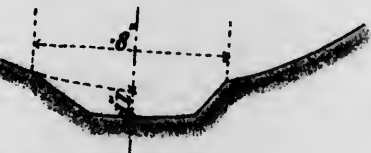
63.5" Length of Bore

25.5"

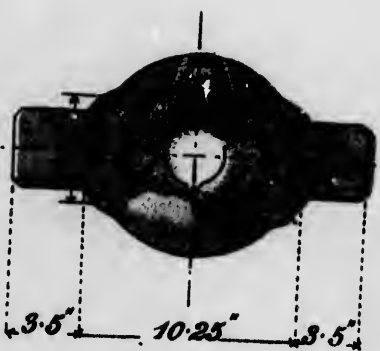
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41.25"

Length of Gun



SECTION OF GROOVE
Full size.



3.5"

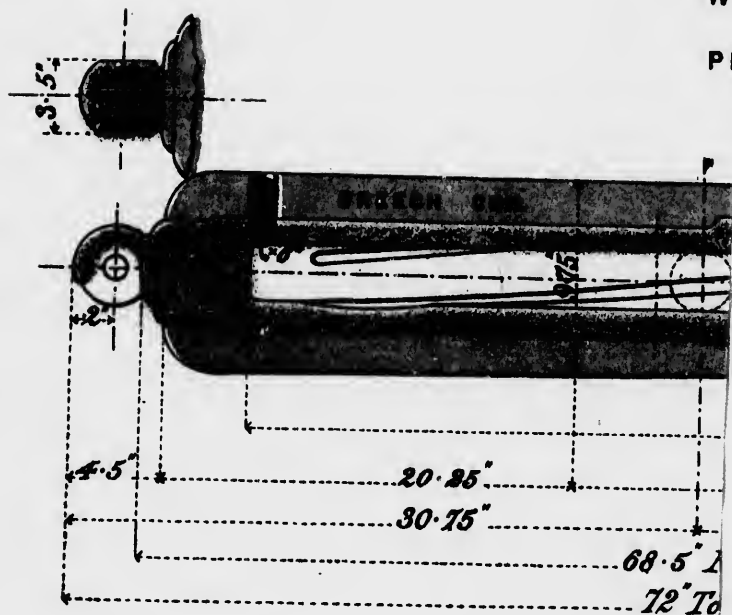
10.25"

3.5"

ORDNANCE WROUGHT

W

P



Number of Grooves—3
Rifling an uniform twist of 1 turn in 30 calibres.

Part I.

ARTILLERY MATERIAL.

SECTION 1.

The Gun.

Designation.—Ordnance, wrought Iron rifled, M.L. 9 Pr. 8 cwt.

Length,	nominal	—	—	5 feet 8.5 inches.
	total	—	—	6 feet.
	of bore	—	—	5 feet 3.5 inches.
	of rifling	—	—	4 feet 11.8 inches.
Preponderance	—	—	—	7 lbs.
Calibre	—	—	—	3 inches.
Nominal weight	—	—	—	8 cwt. 1 qr. 6 lbs.
Grooves	—	—	—	3. French modified.
Twist of rifling, uniform	—	—	—	1 in 30 calibres.
Initial Velocity	—	—	—	1,381 feet.

CONSTRUCTION.—The 9 Pr. Muzzle-loading rifle gun consists of two pieces—one shrunk over the other the “A tube” or “barrel,” and the “breech coil.”

The “A tube,” which extends the whole length of the gun, is formed from a cylinder, or ingot, of cast-steel, bored and turned to the proper dimensions, after being toughened in a “bath” of oil.

The “breech coil” is of wrought iron, and is composed of two pieces welded together, the part in rear of the trunnions being manufactured from bar-iron, which is coiled round a mandrill and welded, the fibre of the iron running round in the direction of the length of the bar, whilst the part from close behind the trunnions to the front, is forged solid, this latter piece, after being rough-turned and bored, is welded to the coil.

The "breech coil" takes the form of a jacket to the "barrel," the two pieces having been turned and bored to the proper dimensions, the "breech coil" is expanded by heat, and then lowered over the "barrel" which is placed in a vertical position to receive it, the coil, on being allowed to cool, contracts so as to grip the barrel, the two pieces, in a measure, thus becoming one.

SIGHTING.—The gun is sighted centrally with a tangent scale or hind sight, and a dispart or foresight.

The tangent scale consists of a rectangular steel bar, with a cross head also of steel, the bar is graduated in degrees, each degree being subdivided into twenty divisions, a division being equal to three minutes of elevation. The cross head is grooved on the top, and is fitted with a gun metal leaf, which can be moved either to the right or to the left, to compensate for accidental deflection, caused by wind, one wheel being higher than the other, etc., the front of the cross head is bevelled, and graduated right and left of the centre, in divisions reading three minutes each. The leaf is moved or clamped by means of a thumbscrew working in a slot in the back of the crosshead. The tangent scale works in a gun metal socket inserted in the breech of the gun at an angle of 1 deg. 30 mins. to the left, that being the angle which compensates for the derivation * of the projectile, caused by the rifling. The cross head is fixed on the bar with a corresponding dip to the right so as to be horizontal when the scale is in use. When the tangent scale is lowered to zero its apex is flush with the upper surface of the gun, this protects it from injury when not in use; when raised it is kept in position by a gun metal thumb screw.

The dispart sight is a small steel "leaf," screwed into the gun near the muzzle. The metal of the gun at this part is made the same thickness as at the breech, so as to form a "dispart patch," and give a line parallel to the axis of the gun. This sight, also, is protected from injury in mounting, dismounting, etc., by being fixed in a recess.

* The deviation caused by rifling is called derivation, that caused by wind and other circumstances, deflection.

TRUNNIONS.—The trunnions are 3.5 inches in length and diameter, and their axis coincident with that of the bore.

VENT.—A hardened copper cone vent is screwed in so as to strike the curve at the bottom of the bore, both to ensure that the whole of the unconsumed portion of the cartridge may be blown out, and also for the purpose of firing very reduced charges. The highest initial velocity would be given by striking the cartridge at a point four-tenths of its length from the base, but the strain on the gun would be proportionately greater.

SECTION 2.

Gun Carriage. Mark II.

The carriage is formed of two bracket sides of plate iron, connected together by two transoms of plate iron, three collar bolts, and a trail piece; an axletree bed with axletree and field wheels.

The brackets are parallel from the front to the position of the breech of the gun, from which point they converge to the point of the trail. The trail piece is continued into an eye, which is steeled to prevent wear by friction on the limber hook.

The axletree bed is of wrought iron, constituting with the axle a beam of box girder section.

The axletree is of wrought iron, and consists of the body and arms, the former being rectangular in section, the axletree arms, conical in form, and turned to fit a 10 inch "pipe box," are in direct prolongation of the body of the axletree, but have two inclinations, one slightly downwards, $\frac{1}{4}$ inch, termed "the hollow of the arm," which is given in order to compensate for the "dish" of the wheel, by bringing each spoke in turn, as it comes to the ground, nearly vertical; the other slightly forward, $\frac{1}{16}$ inch, termed the "lead of the arm," which keeps the wheel true on the conical arm, these two inclinations form what is called the "set of the arm." In the old pattern carriages the axletree bed is made of wood,

and is secured to the brackets by iron bands and screw bolts. There is an iron plate under the axletree bed, at each end, to prevent the lifting jack cutting the wood when the wheels are being removed for any purpose.

WHEELS.—The wheels are those known as the Madras pattern.

A wheel consists of the nave, the spokes, and the felloes ; the nave is the centre of the wheel ; it is made of gun metal in three pieces, viz., 2 flanges and a pipe box, the pipe box fits over the axletree arm, and revolves round it when the carriage is in motion, the flanges fit over the pipe box and keep the spokes, which are made of oak, in position round the pipebox, i.e., as radii of the circle of which the nave is the centre ; the flanges are secured by nutted bolts, one bolt between each spoke, the pipe box is prevented revolving in the flanges by a projecting feather which fits into a slot cut on the inner flange ; the spokes have a slight inclination outwards, about half an inch to the foot, this is called the "dish of the wheel," it is given in order to enable them to withstand the external thrust to which they are subjected in passing over rough ground, when one wheel is frequently higher than the other ; the greater distance between the wheels above also leaves more room for the load, and gives greater facility of approach to the parts near the axletree. The felloes are made of ash. The wheel is shod with a ring tire $2\frac{1}{2}$ inches broad and $\frac{3}{4}$ inch thick. A field service wheel is 5 feet high and weighs 2 cwt., 0 qrs., 6 lbs. The carriage has the following fittings, viz :—wrought iron cap squares secured by keys, metal sockets, with bolts to receive the trunnions of the elevating screw box, a staple with strap to secure the hand wheel of the elevating screw, a handspike ring, shoe, and pin, a sponge plate on right bracket, a plate beneath the trail and staples, with straps for securing a sponge on right bracket, a traversing handspike on left, and a spare sponge and handspike beneath ; a metal nut under the front transom with staple and strap to receive and secure a wadhook worm ; fittings for drag shoe and chain, small stores, &c., breast rings, trail handles, and a range plate.

The sponge stave and the traversing handspike are of ash unpainted: the sponge head of elm covered with fleecy hosiery, is fastened on one end of the sponge stave by marine glue and a copper band, and the rammer head, also of elm, bound with copper, on the other end by a wooden pin; in the centre of the rammer head an iron nut is fixed, into which the wadhook worm is screwed for use. The stave has a screw mark to shew when shell with service charge is rammed home 3 ft. 10½ inches from face of rammer.

AXLETREE BOXES.—Are rectangular in form, made of wood, strengthened with copper round the edge of the lid and hoop iron at the corners; they are secured to the top of the axletree bed, one on each side, between the brackets and wheels by nib-plates and stays of iron; in addition to carrying a few rounds of ammunition, etc., they serve as seats for two of the gun detachment, an iron guard, the upper part of which is covered with leather, is secured to the outside of the box, and protects the man from the wheel, whilst a leather strap secured at one end to the guard and at the other end to an iron bolt attached to the inner corner of the box acts as a support to his back, there is also an iron rest for the feet which, when not in use, slides into staples in the side of the box and is secured by a turnbuckle.

ELEVATING SCREW.—Designed by Sir J. Whitworth; it consists of a wrought iron screw working in a metal nut enclosed in an iron box, which oscillates from front to rear between the brackets. The nut is turned by a pinion, connected by a shaft with a small hand wheel outside the bracket.

SECTION 3.

Limber.

The limber consists of a framework, formed by 2 transverse and 3 longitudinal pieces of iron, an axletree, axletree bed and wheels the same as those described for the gun carriage, a platform board, foot board and 2 shafts.

The front transverse piece is called the "splinter bar," and

is connected by the longitudinal pieces, called "futchells," to the rear transverse piece, which is simply a piece of angle iron by means of which the whole framework is secured to the axletree bed; the extremities of the splinter bar projecting beyond the futchells are strengthened by iron stays attached to the axletree bed; it is provided underneath with 3 bands or shaft irons, and one V shaped iron to receive the shafts. The platform board is about 9 inches broad, it lies across the futchells in front of the axletree bed, and is provided with 3 box staples in rear to which the ammunition boxes are fastened. The ammunition boxes are of wood, 3 in number, 2 large ones about 21 inches square, for carrying projectiles and cartridges, and a narrow one between them to hold fuzes. The edges of the lids are bound with copper and the bodies are strengthened with corner pieces of iron. The two large boxes act as seats and, to protect the men from the wheels, are fitted on the outside with folding guard irons which double completely back for stowage in transport. When in use they are kept erect by small keys. The front of the boxes rest on the axletree bed, and the rear on 4 iron brackets; they are secured on the top of the limber, in front, by iron nib-plates which fit in the box staples already mentioned, and in rear by broad leather straps, which, after being passed through handles in rear of the boxes and staples on the axletree bed are buckled on the outside. The footboard lies across the futchells in front of the platform board.

The limber hook, to which the trail of the gun carriage is attached when limbered up, is secured to the rear of the axletree bed by 3 bolts; it is made of wrought iron, with steel bearings on the inside where the trail eye rests, to prevent it wearing away; the trail eye is prevented jumping off the hook when passing over rough ground by a bolt or key which is passed through a hole in the hook.

The fact of being able to unlimber the gun carriage has the following advantages:—

1st. The limber and horses can be removed from the recoil, dangerous proximity to the gun, and placed behind any cover which may be offered, as houses, irregularities of ground, etc.

2nd. The gun resting only on three points, viz., 2 wheels and the point of the trail, admits of the piece being more readily laid and gives more room to the numbers working it.

3rd. When limbered up the trail takes a proportion of the weight of the limber off the horses' backs, and the free attachment gives ample scope for manœuvring, diminishing the chances of upset from uneven ground, the absence of rigid connection allowing limber and gun axles to take various inclinations independently.

SHAFTS.—Are of ash, "near" and "off," the latter is the Brandling pattern, which consists of having the part between the splinter bar and the axletree arm entirely of iron; it consequently can be made much thinner than if of wood, thus allowing more space for the mud to work through when the carriage is moving over heavy ground.

For single draught the near shaft passes through the near splinter bar band, and fits into a stirrup iron which is suspended vertically underneath the left futchell. It is secured by an iron bolt which passes through the footboard, left futchell, and shaft, and is keyed underneath. The off shaft passes through the V shaped iron, and fits on the iron crutch in front of the axletree bed, which, during double draught, carries an iron washer, this washer being shifted to the axletree arm when the shafts are fitted for single draught.

For double draught the near shaft passes through the centre splinter bar band, the end fitting into a mortice in front of the axletree bed, and is secured by an iron bolt which passes through the platform board, centre futchell and shaft, and is keyed underneath.

The off shaft passes through the off splinter bar band, and the wheel iron at its extremity fits on the end of the axletree arm, acting at the same time as a washer.

Treble draught may be arranged by fixing the shafts as for single draught and using swingletrees, which are fastened to the trace loops at the extremities of the splinter bar.

SECTION 4.

Ammunition Wagon.

The ammunition wagon consists of a wagon body and limber, the latter being identical with that already described. The wagon consists of a perch, two sides, two platform plates, two footboards, three platform boards, an axletree bed, axletree, and wheels the same as in gun carriage: it is also fitted with a block for carrying a spare wheel.

The wagon is provided with four ammunition and two under boxes with a canvas cartouche for each of the first-named, and two grease tins for one of the latter, a drag shoe with chain and spare lashings.

SECTION 5.

Sleigh Carriages.

A gun with its ammunition can be arranged on sleighs. The sleigh consists of a platform placed on runners 16 inches high, the breadth of the runners being three feet. The summer carriages can be conveyed on the sleighs in case of emergency.

Three sleighs form one subdivision.

On No. 1 is mounted the gun (muzzle to the front), with its sidearms and a box on each side of the gun to hold ammunition, and which serve as seats.

No. 1 ammunition sleigh carries the front box of wagon body, and the gun limber boxes. No. 2, the rear box of the wagon body and the wagon limber boxes. The knapsacks are carried on the ammunition sleighs. Two horses are sufficient for each sleigh.

On the march, when the snow is deep and roads narrow, the spare horses should be in front or distributed between the subdivisions they are to assist.

In descending a hill, drive straight down, however steep. When a sleigh slews round, the horses should be thrown off to the side to which the sleigh inclines to slew; if not thus checked, horses must be pulled up.

Single Draught.—When this becomes necessary, the off horse remains in the shafts, which are shifted to centre of sleigh; long reins are buckled on and horses driven from sleigh; near horses have each a pair of leading traces hooked on, and are hooked on in front of shaft horses, drivers remain mounted. If a third horse is required, he is placed *between* the others, the leading rein being attached to crupper ring of leading horse.

Coming into action.—No. 5 unhooks the swingletree, places it on the back of the near horse; then steps in and takes hold of the shafts on the near side; 4 takes hold of the shafts on the off side, and the two numbers lift them off, laying them gently on the ground; 3, as soon as he comes up, places the hook of the swingletree in the crupper ring, hook upwards. No. 1 gives the word "Drive on" when all is ready. In coming into action to the front, or to the left, the gun horses move to the right and form in rear. In action right they move to the left and form in rear.

Part II.

AMMUNITION.

The various stores issued with the 9 Pr. M. L. R. gun, embraced under the term Ammunition, consist of the following :—

Projectiles,	{	Shells,	{	Common.
				Shrapnel.
				Shot, Case.
				Service flannel, 1½ lbs.
Cartridges,	{	Exercising Silk,		1 lb.
		Percussion,		Royal Laboratory.
Fuzes,	{	Time,	{	9 seconds M. L. O.
				5 " "
Tubes,		friction,		copper.
Primers,		Brass,		for Shrapnel shell.
Gunpowder.				
Portfires.				
Slow-match.				
Fuze-hole plugs.				
Wads,		papier machie.		

SECTION 1.

Common Shell. Designation—Shell, Rifled, Muzzle loading, Common, 9 Pr.

DESCRIPTION.—Is of cast-iron, having a cylindrical body and ogival * head, or point, the curve of the head being struck with a radius of 7.5 inches ; the shell is cast hollow,

* Ogive a pointed arch.

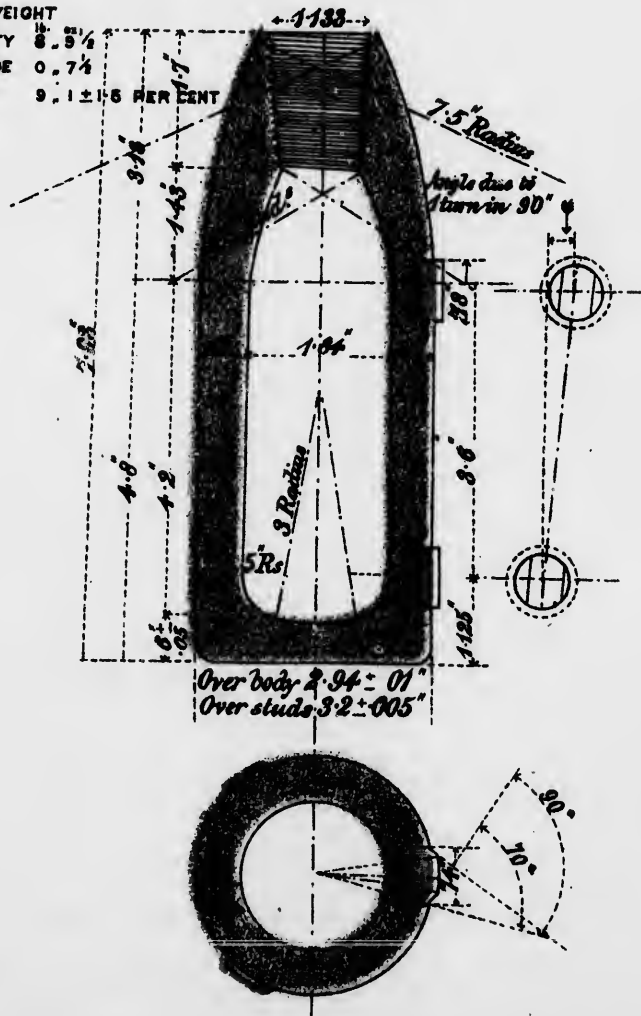
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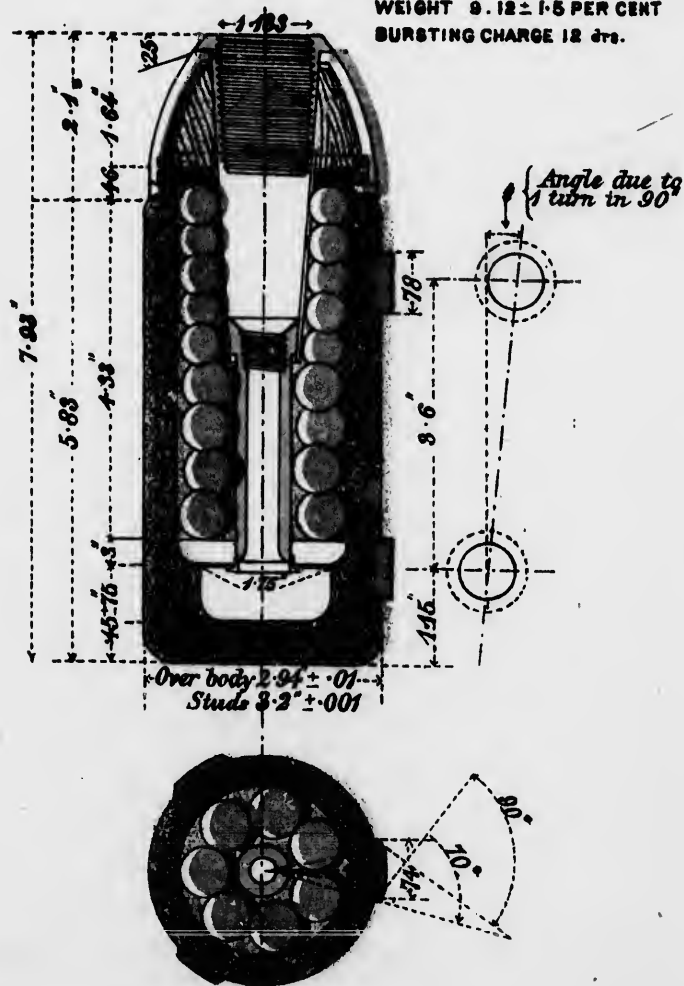
SHELL. R. M. L. COMMON, 9 Pr., IV.

MEAN WEIGHT	
SHELL EMPTY	8.94
BURSTING CHARGE	0.74
TOTAL	9.1 ± .5 PER CENT



SHELL R. M. L. BOXER SHRAPNEL, 9 Pr. VII.

16 oz.
WEIGHT 9.12 ± 1.5 PER CENT
BURSTING CHARGE 12 grs.



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and is lacquered internally with red lacquer to prevent premature explosion of bursting charge, by friction of rotation; it is provided with a conical opening in the point called the fuze-hole, through which the bursting charge (8 ounces Shell L. G. powder) is inserted, this hole is tapped to the General service * gauge for the reception of the Royal Laboratory percussion fuze, or a gun metal screw plug, (fuze-hole plug). The exterior of the shell is provided with three rows of zinc (copper in recent patterns) studs, two in a row, they are secured to the shell by expansion—countersunk holes being cut in the shell and the studs expanded by compression—the studs in each row are placed in the shell 3-6 inches apart, and at the angle due to the rifling, i.e., 1 turn in 30 calibres.

When issued filled the fuze-hole is secured by a papier machie wad which is driven into it, the fuze-hole plug being screwed in over the wad.

PAINTED.—Black except studs.

FUZES USED.—Percussion: Royal Laboratory. Time: 9 seconds M. L. O., or 5 seconds M. L. O., if specially required. The time fuze, however, is not generally useful with Common shell, it is more particularly applicable to Shrapnel.

USE.—With percussion fuzes, Common shell is most effective against troops holding ordinary buildings, log houses, stockades, etc., bursting just after penetration, † scattering fragments and debris among the defenders, and finally setting fire to the building; such fire quickly causes the withdrawal of troops. They can also be used with percussion fuzes against troops in mass, or sheltered in woods, when the shell fragments are more effective than Shrapnel balls, which are stopped by the branches. They are especially destructive when fired from a height at troops on com-

* Shells for Sea service had formerly larger fuze-holes than those for Land Service, but they are now assimilated, and the gauge common to both services is called the General Service Gauge.

† The time fuze, if bored long, will generally act on impact, being driven into the shell or split by coming in contact with ordinary masonry or logs, the newly turned earth of a parapet does not offer sufficient resistance.

paratively hard ground, as was the case from the hills round Sedan on the paved streets below.

Their exceptional use with time fuzes is for curved fire at troops behind earthworks, or rolling curves of ground, the shell being burst just over the crest, but this is delicate work requiring much Artillery skill, produced by considerable practice, combined with perfect material.

SECTION 2.

Shrapnel Shell. Designation,—Shell, Rifled, M. L.; Shrapnel-Boxer, 9 Pr.

DESCRIPTION.—The body is a hollow cast-iron cylinder, open at the top, but having a solid bottom; it is provided externally with studs the same as the Common shell; internally it is divided into two parts, the powder and bullet chambers.

The powder chamber, which is at the bottom of the shell, is smaller in diameter than the bullet chamber, and is formed by casting the wall of the shell at the bottom, thicker than the upper part, so as to form a cup, into which fits a tin cup for the reception of the bursting charge, (12 drs. service pistol powder). The tin cup is to prevent the accidental explosion of the shell on the shock of discharge (which might be caused by pieces of metal being knocked off the shoulder of the powder chamber). Over the tin cup and resting on the shoulder before mentioned, is a wrought iron disc, or "diaphragm," having a small hole in its centre, tapped to receive a brass pipe, which is screwed into it, and which forms the channel of communication between the fuze and the bursting charge; this pipe is also tapped internally at the top to receive a primer, which flashes the flame from the fuze to the powder chamber. The top of the pipe is enlarged so as to fit the inside of a tin socket which is soldered to it, and forms a cup for the bottom of the fuze, the top of the tin socket is flush with the top of the body.

The bullet chamber up to mark * IV, inclusive, is weak-

* The mark or numeral, is found on the side of the shell, near the base thus, ^{IV} R A L and the date of manufacture on one of the studs.

ened by 6 longitudinal grooves in the wall of the shell, called "lines of least resistance" (mark V is not weakened); it is lined with brown paper, † and filled to within a short distance from the top, with bullets made of lead and antimony, the interstices between them being filled with melted rosin. The bullets are covered with a kamptulicon ring, well kitted to prevent the rosin escaping into the interior of the shell.

The head of the shell is a thin skin of Bessemer iron, ogival in form, having a gun metal socket, or bouche, in the point, for the fuze-hole, (in patterns up to mark III, inclusive, the nose of the socket projected beyond the head unsupported, but in subsequent patterns it is stronger, and the part projecting beyond the iron forms a continuous curve with the head), which is soldered to the tin socket; the empty space in the head, between the iron skin and socket, is filled with wood, and the head is secured to the body, in the earlier patterns by plain rivets and solder, but in the later patterns screw rivets are substituted for plain rivets.

PAINTED.—Body black except studs, head red except socket.

FUZES USED.—Royal Laboratory percussion; 5 seconds M. L. O. time, and 9 seconds M. L. O. time for long ranges. The time fuzes are most properly used with Shrapnel, liberating the bullets before the impact of the shell.

USE.—Shrapnel is the principal projectile for field guns. They are under ordinary circumstances much more effective when used with time than with percussion fuzes; in the latter case the velocity of the bullets, and consequently their destructive effect, being diminished by the graze, &c.

They are used exclusively against the personnel of the enemy, and have an effective range up to 4,000 yds, but this cannot be attained with the 9 sec. fuze, which is only effective up to 2,900 yds.

The best position for the shell to burst depends upon the nature of, and extent of ground covered by, the object fired at, and the range—as a general rule the longer the range, the closer to the target should the shell be burst.

† To prevent the rosin which keeps the bullets compact adhering too firmly to the metal of the shell.

Shrapnel shell may be used in cases of emergency in lieu of case shot, the shell being placed head first in the bore and the fuze-hole plug removed.

SECTION 3.

Case Shot. Designation—Shot, rifled, M. L., Case, 9 pr.

DESCRIPTION.—The body, or outer case, until recently was made of XX single tin (it is now made of tinned iron), the sides being in three parts, soldered together longitudinally.

The base is strengthened by having a solid disc of zinc, laid in loose in the interior, and a ring of the same thickness riveted to the tin case on the outside.

The sides of the tin case are strengthened by being lined with three longitudinal segments of zinc, laid in loose, and forming an internal cylinder.

The top consists of a zinc disc, fitted to the case by turning over the fringed edge of the latter, to which it is soldered.

In Mark IV the ring, disc and segments are of iron instead of zinc.

The case contains about 110 bullets of an alloy of 3 lead to 1 antimony, the interstices being filled in with a mixture of equal parts of sand and clay, tightly rammed.

Above the bullets a wooden disc is inserted; in mark II, which was provided with an iron handle for lifting the shot, this made its full length the same as the other projectiles for the gun, but the handle being liable to be knocked off, permitting the sand and clay to escape, is removed in mark III. which is therefore about half an inch shorter.

PAINTED.—Black.

USE.—Against troops, or parties in boats. Its extreme useful range is about 350 yards.

SECTION 4.

Service Cartridge. Designation—Cartridge, flannel, service, R. M. L., 9 Pr., 1lb. 12ozs.

DESCRIPTION.—Is made of the best serge, all wool, in two pieces, the bottom being cut circular and the body rectangular;

SHOT R. M. L. CASE, 9 Pr., IV.

AVERAGE WEIGHT 9 lbs. 12 Ozs. 60 grs.

N^o 18 W.G. or .042





the body is formed by overlapping the edges one inch, and sewing them with three rows of stitches. The bottom is joined to the body by overlapping the edges three quarters of an inch and sewing them with two rows of stitches—fine worsted being used for sewing, the cartridge is then in the shape of a cylindrical bag. It is filled with $1\frac{1}{4}$ lbs. of Rifle L. G. powder, and "choked." This is done by gathering the mouth into plaits, and passing a needle threaded with three strands of coarse worsted through them, three turns are then taken around the neck thus formed, and the turns are prevented from slipping upwards by loops formed by stitching above and below them at intervals.

The cartridge is supported, or kept in shape, by bands of blue worsted braid, called "hoops" passed horizontally round it. They are kept in position by being passed in and out through the flannel bag at intervals, and, after drawing them tight, tying the ends—one end of the band being provided with a loop the knot is made by passing the plain end through the loop and making it fast with a half hitch.

MARKING.—They are marked on the outside in black, with the numeral or mark of the pattern, the nature and weight, thus:—

I.

9 Pr. R. M. L.

1lb. 12ozs.

Should rifle large grain powder not be available, large grain powder may be used for these cartridges, but all cartridges so filled must be stamped with the letters L. G., in red, one inch long. N.B.—The range is reduced by the use of L. G.

SECTION 5.

Exercising or Saluting Cartridge. Designation—Cartridge, silk cloth exercise, R. M. L., 9 Pr. 1lb.

This cartridge differs from the service cartridge in being made of silk, being sewn, choked, and hooped, with silk twist, and in containing only 1lb. of blank or exercising powder. It is marked similar to the service cartridge.

Silk, being more readily consumed than flannel, is used for these cartridges, on account of the small charge used, and from the fact that the cartridge is not as thoroughly consumed when there is no resistance offered to the escape of the heated gas, by the absence of a projectile.*

SECTION 6.

Royal Laboratory Percussion Fuze. Designation.—Fuze, percussion, R. L.

There are two patterns of this fuze in the service, marks I. and II., but as mark I. is to be used with field guns until the present supply is exhausted it will be necessary to describe it, and afterwards give the points of difference between it and mark II.

DESCRIPTION.—Mark I. consists of three principal parts—body, pellet, and guard.

The Body is cast with a solid head, and has a screwed in bottom, primed with a perforated pellet of mealed powder, and closed by a brass washer. It has a thread outside to fit the G. S. fuze-hole, and a square hole in the top for the G. S. key, by which it is screwed in. A steel point projects downwards from the top. To avoid liability of accident in transport, a safety pin passes through the body and guard, and is secured by a brass ring resting in a recess round the head; the ring has a tapelug, by which it can be raised when it is necessary to withdraw the pin after the shell has been placed in the muzzle of the gun. The hole left by the removal of the pin is closed to prevent premature explosion, from the flame of the discharge, by a lead pellet working in a cylindrical hole above; the inertia of the pellet causes it to cover the hole, either in ramming home or firing the shell.

The pellet of white metal (equal parts of lead and tin) has four projections or feathers outside, two rather higher than the others. It is driven with composition like a tube, but has a percussion cap at the top, the composition in which is protected by a thin brass disc which can be pierced if

* Service cartridges are now made of silk cloth, and will be issued when present supply of flannel cartridges is exhausted.

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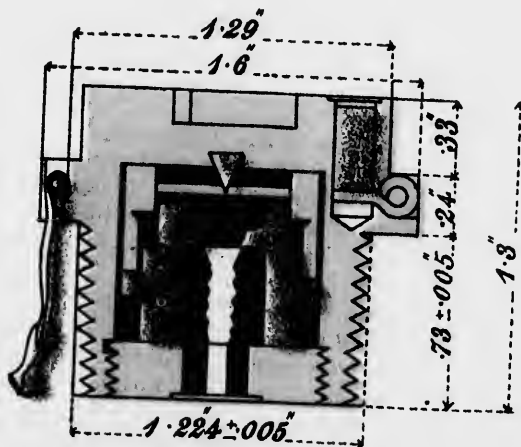
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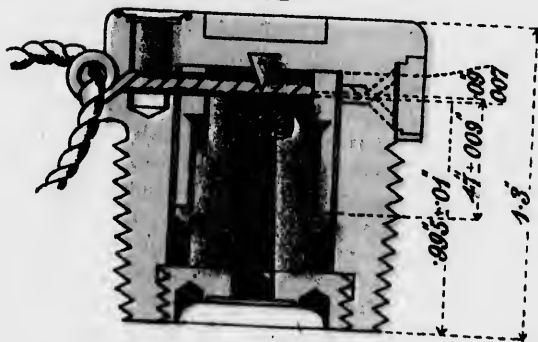
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FUZE PERCUSSION R. L.

I



II





driven on to the steel point above by a violent shock ; the cap has three holes at the bottom for the passage of the flame from it to the composition below.

The Guard, made of gun-metal, is supported in the upper part of the body on the feathers of the pellet, preventing any forward movement of the latter.

ACTION.—When the gun is fired the inertia of the guard sheers the feathers of the pellet, the guard then resting on the bottom of the fuze with its upper surface in a line with the top of the pellet. On the impact of the shell against an object, the pellet continues its forward motion, when the top of the fuze is suddenly stopped, the cap striking on the steel point is fired, the flame ignites the mealed powder in the pellet, and blowing out the washer of the fire-hole in the bottom of the fuze passes into and explodes the shell.

Mark II. differs from mark I. in the following particular :—

1st. The pellet and guard are smaller in diameter, to admit of greater thickness in the side of the fuze, and of a deeper screw thread at the bottom, thereby giving the base greater power to support the weight of the pellet and guard on the shock of discharge.

2nd. The pellet has only two feathers, and has no mealed powder pressed into it, and there is an increased quantity of detonating composition in the cap at the top of the pellet. The fuze is thus made quicker and more certain in its action.

3rd. The safety pin (of double twisted wire), passes through the head of the fuze, and is kept in its place by the two ends being opened out slightly so as to bind themselves in a conical cup. A thin disc of brass is then fitted in over the ends, and soldered over to keep the fuze watertight. The head of the safety pin is fitted with a loop of string, by which it is withdrawn. There is no brass ring or recess round the head of the fuze.

SECTION 7.

9 Seconds Fuze. Designation—Fuze, time, wood, Boxer, M. L.
9 seconds.

DESCRIPTION.—Consists of a beech wood frustrum of a cone, about 3·5 inches in length, having a composition bore, which is bored eccentrically from the top (or thickest part of the cone) to within a short distance of the bottom of the fuze. This bore is lined with a paper cylinder and driven with 1·8 inches of fuze composition, which consists of:—

		lbs.	ozs.
Saltpetre, ground,	- -	3	4
Sulphur, sublimed,	- -	1	0
Powder, pit-mealed,	- -	2	12

and above the fuze composition with ¼ inch of mealed powder.

Fuze composition burns when at rest at the rate of one inch in 5 seconds, and mealed powder at the rate of one inch in 2½ seconds, or half the time of a corresponding length of fuze composition.

The composition bore is closed by means of a gun-metal plug which is screwed into the head of the fuze. From the centre of this plug a copper pin projects downwards, to which two pieces of quick-match are secured, and the ends brought out through two holes and laid in a groove in the head of the fuze, the quick-match is protected by a band of tape secured to the head of the fuze by india-rubber cement; this band is not to be removed until the shell is placed in the gun.

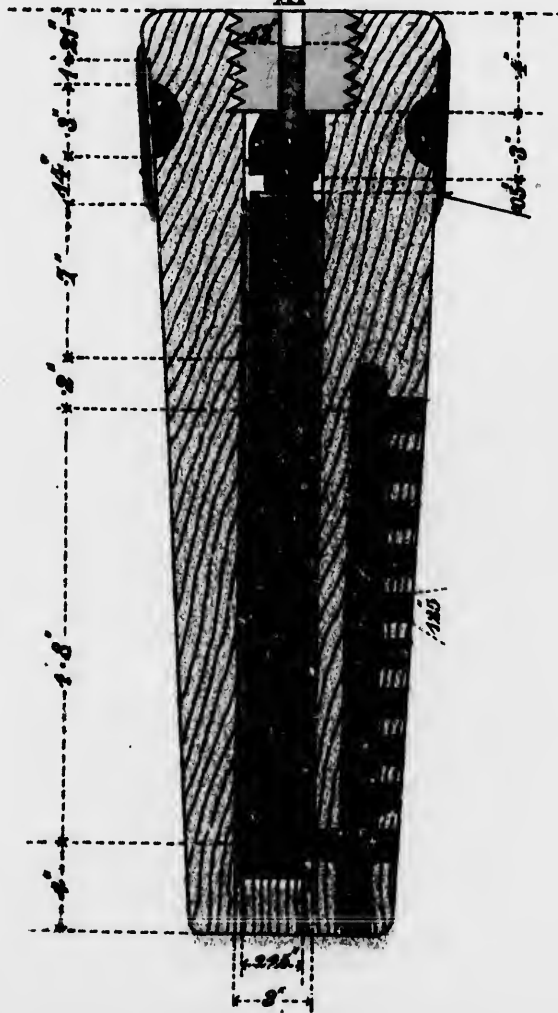
The paper lining in the composition bore prevents any space forming between the composition and the side of the fuze, * which might occur if the wood and composition were in contact, the wood being liable to shrink from change of temperature.

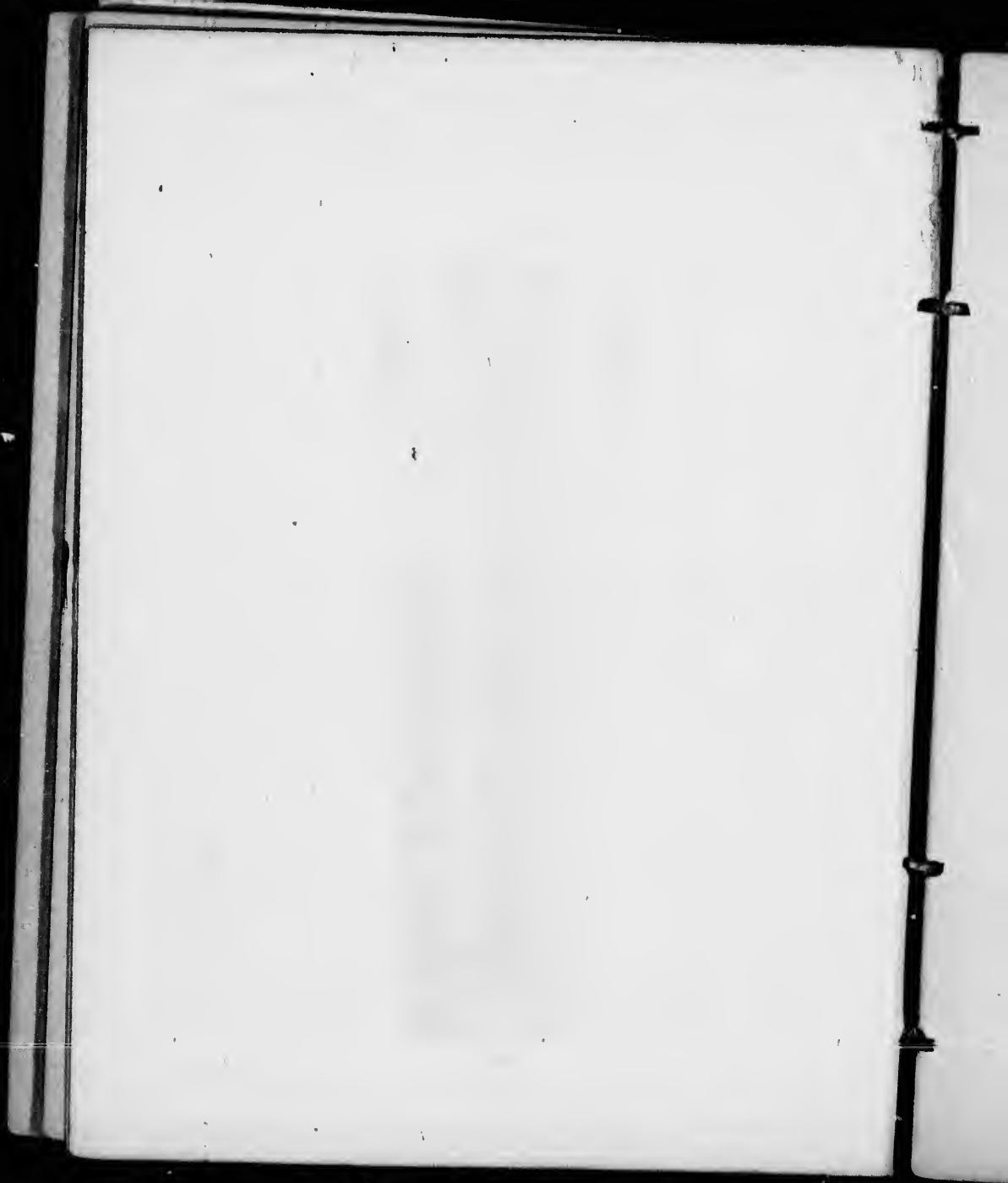
The gun-metal plug in the head of the fuze prevents the

* A space forming between the composition and the wood of the fuze would cause premature explosion of the shell and probable injury to the bore of the gun.

the fuze
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111





great pressure of the air to which the point of the shell is subjected (travelling point first), affecting the burning of the fuze, whilst the holes in the head, through which the quick-match is led, serve after ignition of the fuze, as escape holes for the gas generated by the burning composition, which, if not permitted to escape, would probably burst the fuze.

On the side of the fuze on which the wood is thickest, two small channels called "powder channels," are bored up from the bottom to within a short distance of the top, about half way between the composition bore and the side of the fuze, and filled with "pistol" powder, breaking into these channels are two rows of "side holes," ten in a row, drilled horizontally from the outside of the fuze, at a distance of $\cdot 2$ inch apart (from centre to centre, measured vertically), the holes in one row not being opposite to those in the other, but dividing the space, the rows thus indicating respectively the odd and even tenths of an inch from the zero point of the fuze. The holes, like the channels, are also filled with pistol powder, with the exception of the bottom hole of each row, which is bored completely through into the composition (to insure the ultimate action of the fuze should it have been improperly prepared), and filled with quick-match, which supports the powder in the channels. The powder channels below the side holes, and a groove connecting the channels at the bottom, are also filled with quick-match. The object of the groove is to cause the powder in both channels to explode at once, thereby causing a stronger flash, and the side holes and bottom of the fuze are covered with varnished paper. The first side hole is marked two, and is immediately at the top of the fuze composition, the $\cdot 4$ inch of mealed powder above the top side hole being in lieu of $\cdot 2$ inch of fuze composition. The time of burning being the same it gives a greater substance to resist the action of the borer when preparing the fuze to act at a short range, it not being so liable to crack or break away.

OBJECT OF THE POWDER CHANNELS:—The powder channels are necessary when the fuze is used with the Shrapnel shell to convey the flash downwards, the bursting charge

being at the bottom of the shell. They are also required with the common shell when fired at short ranges, the side hole being liable to be closed by coming in contact with the metal of the shell in the fuze hole.

TO PREPARE THE FUZE.—Insert the bit of the borer in the side hole corresponding to the required time of flight (a tenth of fuze being equal to half a second of time, approximately), and bore until the shoulder of the borer comes in contact with the side of the fuze, withdraw the borer, and fix the fuze in the fuze hole by screwing it in tightly with the hand; if necessary, it may be "set" home by a smart blow against a limber box, &c. When the shell is placed in the gun the tape strip is to be torn off the head of the fuze, and the priming loosened.

ACTION.—On the discharge of the gun, the quick-match round the head of the fuze is ignited by the flame from the charge, this passing into the interior of the fuze ignites the composition which burns uniformly down until it arrives opposite the bored side hole, when the flame passes out into the powder channels igniting the powder in them, which explodes instantaneously, the flame from which passing into the shell ignites the bursting charge.

This fuze is designated by the time it burns when in motion, whereas all other time fuzes, are designated by the time they burn when at rest.

APPROXIMATE RULE for finding length of fuze in tenths:—

For Common or Shrapnel shell.—Divide hundreds of yards in range by 2, and add—

Up to 1000,	1.
1000 to 2000,	2.
2000 to 3000,	3.

PAINTED.—It is painted black round the head and over one row of side-holes, and drab over the other row, the position and tenths of the fuze being marked and numbered.

ISSUED.—Five in a tin cylinder, the junction of lid and cylinder being secured by a tin strip soldered over it, there is a label on top of the cylinder indicating the nature and number of fuzes packed in it.

SECTION 8.

5 Seconds Fuze. Designation.—Fuze, time, wood, Boxer, M. L.,
5 seconds.

This fuze resembles the 9 second fuze, with the following exceptions:—

1st, It is driven with 2 inches of mealed powder instead of 1·8 inches of fuze composition and ¼ inch of mealed powder it, therefore, only burns 5 seconds when at rest.

2nd. The side-holes are marked in tenths and half-tenths, instead of tenths only, and the top side hole reads 1 instead of 2.

3rd. The parts painted black on the 9 seconds are painted red * on this fuze.

The top of the cylinder in which they are packed is also painted red.

APPROXIMATE RULE for finding length of fuze in tenths:—

Divide hundreds of yards in range by 2, and if over 1000 add 1.

SECTION 9.

15 Seconds Fuze. Mark I.

This fuze will gradually supersede the 9 and 5 sec. fuzes. It resembles them in internal dimensions, and in general principles of construction, it has, however, the composition channel in the centre driven with 2" of slow burning composition (1 inch in 7½ seconds). Above this is a .75" pellet of meal powder having a hole bored down its centre to a depth of .55". There are six powder channels connected at the bottom by quick match placed in an annular groove and pressed into the bottom of each channel. The bottom hole of one channel is bored through and threaded with quick-match. The paper scale gives intervals corresponding to half seconds and quarter seconds of time.

Painted, black and drab, paper scale white with yellow marks shewing side foles, and black lettering. Issue. Five in a tin cylinder.

* Fuzes driven with mealed powder are painted red, as also in this case, the head of the projectile with which it has to be used, viz., Shrapnel.

SECTION 10.

Copper Friction Tube. Designation.—Tubes, friction, copper, service, short.

DESCRIPTION.—The copper friction tube consists of three pieces,—the barrel, nib-piece and friction bar.

The barrel consists of a narrow strip of copper formed into a hollow cylinder, open at both ends, [its diameter being .2 of an inch], and having a small hole cut in the side near the top; it is driven from the bottom with meal powder damped with spirits of wine, after driving there is a small hole pierced up the centre of the composition with a fine wire, it is upon this hole that the peculiar action of the tube depends, as without it the meal powder would burn like a squib, and fail to ignite the cartridge instantaneously.

The nib-piece consists of a small piece of copper also formed into a cylinder, and secured by fine wire and solder to the barrel over the hole cut in the side.

The friction bar is a very narrow strip of copper roughened on both sides, and formed into an eye at one end, the other end is inserted in the nib-piece, detonating* composition being placed above and below it, the nib-piece pressed down on it with a pincers, and the eye turned slightly upwards; the top of the barrel is closed with shellac putty, and the bottom with a small disc of varnished paper to exclude moisture.

PAINTED.—Black.

ACTION.—When the friction bar is withdrawn by a steady pull, it ignites the detonating composition, this ignites the meal powder in the barrel, and the heated gas thus generated rushes down the vent and ignites the cartridge.

PACKING.—They were formally packed 100 in a zinc cylinder, having a band of shellaced calico pasted over the junction of lid and cylinder, they are now packed 25 in a tin cylinder, secured like those containing time fuzes.

There are other tubes which could be made in cases of emergency, but which are not considered service tubes, viz., the "Common Quill," and "Paper" or "Dutch."

* Friction tubes or any stores containing detonating composition must not be placed in a magazine under any pretence whatever

SECTION 11.

Common Quill Tube.

DESCRIPTION.—It consists of a goose quill about 3 inches long, the top being cut into 7 prongs, and a cup formed by woolding a strand of worsted above and below alternate prongs, the nib of the quill is then cut off and the tube driven with a pin headed drift, the cup is primed with mealed powder, damped with spirits of wine, gum arabic, and distilled water, made into a paste, it is then covered with fine paper, and a fine wire passed up the tube.

SECTION 12.

Paper or Dutch Tube.

DESCRIPTION.—The barrel consists of a strip of fine white paper, about $2\frac{1}{2}$ inches long, rolled into a cylinder of 2 inch diameter, and the edge secured by pasting; a cup is formed at the top of the barrel by a narrow strip of paper being rolled spirally upwards, the barrel is driven and pierced the same as the other tubes and the cup filled with priming paste which is built up above the cup like a pyramid, a cap of fine paper steeped in a solution of saltpetre is placed over the top and tied with silk under the head, and the fine wire passed up under the tube,—there is an objection to these tubes, the paper being liable to peel in the vent.

Both this and the common quill tube have to be fired with a port fire or slow-match.

SECTION 13.

Primer Brass, for Shrapnel Shell.

DESCRIPTION.—It consists of a hollow cylinder of brass 1.2 inches long, tapped externally for about half an inch from the top to screw into the brass pipe in the shrapnel shell, in the top of the primer is a conical cup shaped recess perforated with small holes communicating with the interior of the primer, which is filled with loose powder, the bottom is cloeds

by a thin annular disc covered with shaloon, the top of the primer is provided with two notches by means of which it is screwed into the shell—a screw driver being issued with the fuze implements for this purpose.

PACKED.—10 in a cylinder.

2 patterns have been issued, mark I is now obsolete.

SECTION 14.

Common Portfire. Designation.—Portfire, Common.

DESCRIPTION.—The common portfire consists of a hollow rolled paper cylinder about ten inches long, and a little less than three quarters of an inch in diameter, one end is closed by the paper being turned in, and the cylinder is driven with composition, consisting of

Saltpetre, ground	6 lbs.	0 ozs.
Sulphur, sublimed	2 "	0 "
Powder, mealed, cylinder,	1 "	4 "

provided at the open end with priming paste (mealed powder damped with methyated spirits), and a small hole is drilled into the composition to facilitate ignition.

PAINTED.—The case is painted a sort of flesh color.

It burns from 12 to fifteen minutes.

PACKED.—12 in a bundle tied with twine and having a paper cap secured over the primed ends.

USE.—To fire guns, fougasses, mines, etc., they should not be used however to fire guns at night, as a blazing portfire lights up a whole gun detachment for an enemy to fire at.

Blue, or Slow Portfire.

DESCRIPTION.—It consists of a solid roll of blue "sugar-loaf," porous brown, or blotting paper impregnated with a solution of 3 ozs. of saltpetre to 1 quart of distilled water, it burns from 2 to 3 hours. It takes its name from its color and rate of burning.

USE.—It may be used instead of slow-match or common portfire, for firing guns at night when it is not desirable to show a light.

They are not generally issued for service, but might be easily made in cases of emergency.

SECTION 15.

Quick-match. Designation, Match, Quick.

DESCRIPTION.—Is made of cotton wick in three sizes, 4, 6, and 10 threads, coated with

	4 threads.	6 threads	10 threads.
Cotton wick	1 lb. 10 ozs.	2 lbs. 2 ozs.	2 lbs 7 ozs.
Gum, Arabic	0 „ 8 ozs.	9 „ 9 „ 0 „ 10 „	0 „ 10 „
Powder, mealed, cylinder	20 „ 0 „ 20 „	4 „ 4 „ 24 „	0 „
Water, distilled	8 pts.	9 pts.	10 pts.

When not confined it burns at the rate of 1 yard in 13 seconds, when confined in a paper tube called a quick-match "leader" it explodes instantaneously.

SECTION 16.

Slow Match. Designation.—Match, slow.

DESCRIPTION.—Is made of Russian hemp, loosely twisted, or untwisted rope boiled in wood ashes and water, in the following proportions:—

Hemp, yarn	100 lbs.
Ashes, wood	1 bushel
Water	50 gallons.

It burns at the rate of 1 yd. in 8 hours.

USE.—To ignite the common quill, or paper tubes; in default of tubes, a piece of quick-match placed in the vent, or a little powder poured down it, and fired with slow-match will answer.

SECTION 17.

Fuze-Hole Plug. Designation.—Plug, metal, fuze-hole, G. S.

DESCRIPTION.—The fuze-hole plug is a solid piece of gun-metal, conical in form, and tapped from top to bottom, it is provided with a square hole in the top to receive the general service key, by means of which it is screwed in the shell.

SECTION 18.

Papier Mache Wads. Designation.—Wads, papier mache, fuze-hole, general service.

DESCRIPTION.—Is a ring of papier maché, about 1 inch in diameter, (the hole in the centre being about half an inch in diameter), having a disc of shalloon pasted on to one side.

It is placed in the shell with the side on which the shalloon is cemented downwards.

Is very easily forced into the shell when the wooden time fuze is about to be used and does not require to be removed when a metal percussion fuze is to be used.

They are to be placed in the fuze-holes of all shells that are carried, filled, and plugged, to prevent grains of powder working up from the jolting of the limber into the fuze-hole threads, which might cause explosion * in screwing in the fuze.

SECTION 19,

Gunpowder.

Gunpowder is an explosive propellant agent, consisting of an intimate mixture of saltpetre, sulphur, and charcoal, the proportion of the ingredients, as manufactured for the British service is as follows :

Saltpetre,	75 parts.
Sulphur,	10 “
Charcoal,	15 “

The action of gunpowder is due to the oxidation of the charcoal by the oxygen of the saltpetre (1 cubic inch of saltpetre contains as much oxygen as 3000 cubic inches of air), which generates a large volume of heated gas of great expansibility. This action in a mixture of saltpetre and charcoal alone is comparatively slow, sulphur is therefore added

* Loose powder escaping about the limber boxes, has been considered the cause of explosions of limbers when galloping into action over rough ground. Those who have witnessed such a calamity are impressed with a caution that appears unnecessary to the inexperienced.

to render it more rapid, which it effects on account of its igniting at a much lower temperature than either of the other two. The gradual conversion of gunpowder into gas is of great advantage when it is used as a charge for guns, the strain on the gun being gradual in consequence.

All gunpowder used in the service is made of precisely the same ingredients in the same proportions, though the temperature at which the charcoal is burnt varies somewhat in the different kinds of powder. Powder made from charcoal burnt rapidly at a high temperature, burns slower than powder made from charcoal burnt a longer time at a low temperature; this latter is much softer than the former, and has a more or less brown colour.

Subject to the above exception the difference in the behaviour of the various kinds of powder when fired depends entirely on their physical properties, the most important of which, as influencing the force exerted by fired powder are :—

1. The size and shape of the grain.
2. Density of the powder.
3. Hardness.
4. Amount of glazing.

1st. The larger the grain the longer each individual one will take to burn, but as the interstices between the grains increase with their size there is more space for the flame to pass between them and the whole charge will be more rapidly ignited. The pressure in the powder chamber will therefore be more uniform with a large grained powder—with a small grained powder a large volume of gas is generated at the point of ignition of the charge, this rushes violently through the interstices of the charge and between it and the base, and gives rise to intense local pressures.

2nd. The denser the grains of a powder, *i.e.*, the higher their specific gravity, the more slowly they will burn, the less the pressure they will exert in the bore of a gun and the less the velocity they will impart to the projectile.

3rd. Hardness is independent of density; its effect is to retard the ignition of the powder.

4th. The amount of glazing imparted to the grains will also retard the rate of ignition, but highly glazed powder wears better and is less liable to absorb moisture.

On the introduction of rifled guns, and owing to the increased work thrown on them by the increased weight of the projectiles, &c., it was considered advisable to use a powder which would burn more gradually, and strain the gun less than that then in use for S.B. guns. To attain this end the density and size of grain were increased, R. L. G. being introduced. This powder answered well for guns of small calibre; but when R.M.L. guns of 7 inch and upwards were introduced it was found advisable to use a slower burning powder than "R.L.G." Hence "*P*" powder of high density and of much larger grain was introduced. For similar reasons "*P₁*" has been introduced for still heavier guns, and the list of large grain powders is now supplemented by the introduction of prismatic powder.

For small arms, for the bursting charges of Shrapnel shell and for the powder channels of time fuzes, a rapidly burning and quick acting powder is required, and therefore a much smaller grain is used.

The size of gunpowder is determined by the sieve through which it is passed, the latter being distinguished according to the number of sub-divisions in a linear inch, thus an 8 mesh sieve would have 64 holes in a square inch.

The following are the classes into which *serviceable* powder is divided. The term "*service*" is applied only to powder used for firing projectiles.

SECTION 20.

Classification.

CLASS I.—*Service.*

All powder fit for filling cartridges to be used with projectiles either for cannon or small arms.

CLASS II.—*Blank.*

All powder which being slightly deteriorated is only fit for salutes and exercise.

CLASS III.—*Shell.*

Powder found too dusty and broken in grain for Class II. and only fit for filling shells.

SECTION 21.

Description.

The following list shows the purposes for which powders of the various descriptions in the service are used :

Prism Powder consists of regular right hexagonal prisms with flat ends, and a circular hole in the centre, each prism being about 1 inch in height and 36 inches in diameter. They are built up in regular layers to form a cartridge, approved for use with the 80 and 100 ton guns, charges from 338 to 450 lbs.

"*P*" or *Pebble Powder* and "*P₁*" are used with all guns above 64 pr. R.M.S. and 40 pr. R.B.L. Where no *P*. powder is available modified charges of R.L.G. will be used.

R.L.G.², grains 3 to 6 mesh, and

R.L.G.¹, grains 4 to 8 mesh, are used with all R.B.L. guns, and for R.M.L. guns from 9 pr to 40 prs. inclusive, and for all S.B. guns.

L.G., grains 8 to 16 mesh, is retained for S.B. mortars, and may be used in the absence of more suitable powder, for all S.B. guns, B.L. guns, and R.M.L. guns under 10-inches. It may be readily distinguished from R.L.G. by the absence of glaze, and the smaller size of the grains.

R.F.G. For rifled small arms, except Martini-Henry and pistols, for 7 pr. R.M.L. guns, and bursting charges shrapnel shells when the stock of F.G. is exhausted.

R.F.G.² For Martini-Henry rifle and carbine, and for gatling gun.

F.G. (16 to 36 mesh) for 7 pr R.M.L. guns, for all smooth bore small arms, and bursting charges of shrapnel shells.

Pistol, and *Adam's Pistol*, 44 to 72 mesh, for pistol cartridges and bursting charges shrapnel shell.

Mealed powder and *mealed pit powder* is ordinary powder reduced to dust, and is used for priming fuzes, &c., and for fuze composition.

Part III. INSTRUCTIONS RELATING TO EQUIPMENT.

SECTION 1.

Mode of packing Ammunition and Stores.

NEAR BOX.

1 half-round grease tin box,
3 lb., under.

1 pair drag ropes,
1 felling axe,
under footboard.

OFF BOX.

1 swingletree,
1 bill hook, under.

CENTRE BOX.

shovel. 3 shrapnel shells. 10 5-sec. wood time fuzes, under.	6 shrapnel shells. 18 filled cartridges in cartouche. 1 fuze pocket with one gimlet borer.	2 shrapnel shells. 4 common shells.
---	--	--

1 camp kettle, under.

8 percen fuzes.	16 percen fuzes.	16 percen fuzes.	20 9-secs. wood time fuzes.	100 friction tubes.	1 lanyard.
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1 pickaxe, under.

6 shrapnel shells.	3 shrapnel shells. 18 filled cartridges in cartouche.	2 shrapnel shells. 4 common shells.
--------------------	--	--

10 5-sec. wood time
fuzes, under.
3 shrapnel shells.
1 spade.

2 leather buckets, under.

On Lid.

1 gimlet borer.
1 key, iron, plug, G. S.

On Lid.

1 gimlet borer.
1 instructions, printed.

23 - Sh 40 percussion
8 - Com 15-15 ac
36 Cart 30-9 sec
100 tubes

38-8
8-C
76

On Lid.
1 gimlet borer.
1 instructions, printed.

1 key, iron, plug, G. S.

28 Sh 40 pncaseron
15-5 ac
30-9 ac
36 Cart 100 tubes

NEAR AXLETREE BOX.

1 linch pin.	1 tin box with car- tridges.	2 prickers. 1 water carriage brush.
1 drag washer.		
2 sponge cloths.		
2 case shot. ||		
1 tin box, with cartridge.	2 couplers. 2 spikes.	

On Lid.

1 fuze extractor.
† 1 tangent scale, 12°.

1 wadhook
worm, under.
1 tampeon,
with lanyard.

MARK I.

Weight about, Field $\frac{\text{cwts}}{36}$

1 short tangent scale,
spare.
1 long do

MARK II.

$\frac{\text{cwts.}}{35}$ $\frac{\text{qrs.}}{3}$ $\frac{\text{lb.}}{17}$

* With No. 1 gun. † When not in use in gun. || This box is fitted to carry 2 shells if required.
NOTE.—A little oakum may be used with advantage to prevent the movement of the time fuze cylinders in ammunition and centre boxes. An empty common shell for drill purposes should be carried in each gun limber. The powder from the shell will be wetted and destroyed. The packing of the gun and waggon limbers is made identical, to facilitate the supply of ammunition in action by replacing one by the other. The fuzes (time) are distributed so as to make a waggon, as far as possible, self-supporting in respect of fuzes.

THE

1 sponge
1 traversing
1 tube pocket, with strap.
1 spanner.
with cap.
handspike under.

TRAIL.

GUN.

1 pair pincers
1 traversing
1 brush
1 sponge
handspike.
piasaba, under.*
with cap, under.

OFF AXLETREE BOX.

Drag shoe, under.

1 tin box with car- tridge.	1 oil can.
2 case shot. ||	
2 keep pins for levating bolt.	
1 tin box, with cartridge.	

On Lid.

1 each
per divi-
sion

9 PR. WAGON.-LIMBER.

NEAR BOX.

1 half-round grease tin box,
3 lb., under.

OFF BOX.

1 swingletree.
1 bill hook, under.

CENTRE BOX.

6 shrapnel shells.	
3 shrapnel shells. 10 8-sec. wood time fuze, under.	18 filled cartridges in cartouche, 1 fuze pocket with one gimlet borer.
3 shrapnel shells. 5 8-sec. wood time fuze, under.	3 shrapnel shells.
2 shrapnel shells. 4 common shells.	

1 camp kettle, under.

On Lid.

1 gimlet borer.
1 key, iron, plug, G. S.

8 percen fuze.	3 shrapnel shells 10 8-sec. wood time fuze, under.	6 shrapnel shells.	1 spade.	
16 percen fuze.	14 filled cartridges in cartouche.	2 shrapnel shells. 4 common shells.		
16 percen fuze.				
20 8-sec. wood time fuze.				
100 friction tubes.				
1 lanyard.				
			pickaxe, under	

1 pickaxe, under.

2 leather buckets, under.

On Lid.

1 gimlet borer.
1 instructions, printed.

same ammunition as in gun limber

WAGON BODY.

On Lid.
 *1 clinometer.
 2 couples, trace.

Drag shoe, under.
 †1 spare wheel.
 1 picket rope.
 1 lifting jack.

On Lid.
 1 lanyard.
 1 water carriage brush under footboard.

1 hand saw, 1/4 in case, and 3 picket posts.
 1 portfire stick.

6 shrapnel shells.		
3 shrapnel shells 10 5-sec. wood time fuzes, under.	18 filled cartridges in cartouche.	3 shrapnel shells 10 9-sec. wood time fuzes, under.
2 shrapnel shells. 4 common shells.		

1 camp kettle, under.

4 reaping hooks.

1 camp kettle, under.

6 shrapnel shells. ‡ skein Hambro' line, under.		
3 shrapnel shells 2 sponge cloths, and 5 5-sec. wood time fuzes under.	18 filled cartridges in cartouche.	3 shrapnel shells 1 tube pocket, with strap under.
2 shrapnel and 4 common shells. ‡ skein Hambro line, under.		

28 lbs. grease in two tin magazine
boxes, under.

1 maul under.

Shafts, spare, under—near, with No. 1 or 4 waggon; off, with No. 2 or 5
waggon.

On Lid.
 1 drift, wood.
 2 portfires.
 1 holdall, with 2 needles and
 2 oz. worsted.
 1 funnel, leather
 1 knife.

6 shrapnel shells. 1-lb. slow match under.		
3 shrapnel shells 2 sponge cloths, under.	18 filled cartridges in cartouche.	3 shrapnel shells 1 drill tube, and 1 drill plug, with lanyard under.
2 shrapnel and 4 common shells. 1 linch pin, one drag washer. 1 skein of marline under.		

Box under containing 1 drill cart-
ridge. ‡

On Lid.
 2 portfires.
 1 portfire clipper.
 1 screw driver.
 1 pair scissors.

Weight, without tents, about 40 cwt. 1 qr. 21 lb.

*1 per battery. †1 per division.

3 picket posts.

5 sec

Cart. 72

sh 56

Com 16

9 4 30

same ammunition as in gun limber

SECTION 2.
Detail of Stores for a 9-pr. Rifled Muzzle-Loading Battery.
 PEACE ESTABLISHMENT.

STORES.	Each Gun & Limber	Each Am- munition Wagon.	Forge Wagon.	Total per Battery.	Remarks.
CAMP EQUIPMENT.					
Axes, felling, helved, 4½ lbs.	1	1	1	9	
Blankets, field service	4	6	1	40	
Buckets, leather, cavalry	2	2	2	18	
Hooks, handled { bill	1	1	1	9	
{ reaping	1	4	1	4	
Kettles, camp. Flanders	1	3	2	18	
Manis, wood, helved	1	1	1	4	
Posts, wood, picket, 2½ feet	1	1	1	18	
Ropes, picketing, 25 yards	1	6	1	4	
Tents, circular, complete	1	1	1	6	
	1	1	1	1	
	1	1	1	10	
TOOLS, INTRENCHING.					
Axes, pick, helved, 6½ lbs.	1	1	1	9	
Shovels, helved	1	1	1	9	
Spades, helved	1	1	1	9	
HARNES AND SADDLERY.					
Couples, trace	2	2	2	18	
TOOLS ARTIFICERS.					
Cases, leather, hand-saw	1	1	1	4	
Chests for tools, { smiths'	1	1	1	1	
{ wheelers'	1	1	1	1	

SECTION 2.—(Continued.)

STORES.		Each Gun & Limber.	Each Am- munition Wagon.	Forge Wagon.	Total per Battery.	Remarks.
Handspikes, traversing	(borers, hook with handles	2	1	..	8	One hook borer complete with bit carried in each fuze pocket.
	drifts, wood	2	1	..	12	
Implement,	drivers, screw, large	..	1	..	4	
fuze and shell	extractors, fuze	..	1	..	4	
	funnels, leather, common	1	..	..	4
	keys, iron, plug	..	1	..	4	
	bits, hook, borer,	..	1	..	4	
Jacks, lifting	keys, iron, plug	6	1	..	8	
Keys, spring lock	bits, hook, borer,	..	1	..	4	
Manyards, friction tube	..	1	1	1	48	
Match, slow	..	2	1	..	4	
Ordnance, rifled, muzzle-loading, with sights	complete	..	1	..	12	
Pins, steel, linch. spare	..	1	..	..	1
Plugs, metal, fuze-hole, G. S., drill, with lan- yard	..	1	1	1	4	
Pocketa, leather	{ fuze	..	1	..	4	
Portfires, common	{ tube	1	..	..	8
Prickers, priming steel	..	1	1	..	8	
Ropes { drag, light	..	2	4	..	4	
	{ lashing	1	1	..	8	
Scales, tangent, spare { 12° per division	..	1	..	1	1	
	{ 6°	..	..	..	2
Shafts, spare { on	..	..	1	..	2
	{ off	..	..	..	2
Shells, with { common	..	8	24	..	1	
plugs fitted { shrapnel with primers	..	28	84	..	112	

Reserve to be kept.

4 Cdr

24	∴	92	} Reserve to be kept.
84	∴	112	

4 Cde

Shot, case	15
Spanners, box, for aught	4
Spikes, gun, common	1
Sponges, with staves	2
Sticks, portfire	2
Straps, leather, tube pocket	1
Swing leathres,	1
Tampons, with lanyards	1
Tubes, friction { copper	100
{ dummy	100
Waggons { gun, ammunition, with shoe	r
{ forge, with anvil	r
{ store	r
Washers, iron, drag, spare	1
Wheels, travelling, spare 2nd class	1
Worms, wadbook	1

SECTION 3. Practice and Exercise Ammunition.

ARTICLES.	Number.	Remarks.
Cartridges, empty { flannel service 1½ lb. { silk cloth, exercise, 1 lb	-	
Fuzes { percussion, R. L. { time wood, 5 or 9 sec.	-	
Unpowder { blank on exercise { service { R. L. G. { F. G.	-	
(shell), L. G.	-	
Primers, shrapnel shell	-	
Shells, empty, { common { with plugs. { shrapnel	-	
Shot case	-	
Silk twist, ozs.	-	
Tubes, friction, copper	-	
Wads, papier mache, fuze-hole, G. S.	-	
Worsted, white—ozs	-	

SECTION 4.

Arms.

	Proportions.
Bayonets, sword, with scabbards.	
Carbines, B. L. rifled, complete with cleaning rods, jags and sight protectors.	Gunners and artificers, except farriers and shoeling smiths.
Implements, action	16 per Battery.
Springs, main	
Strikers	
Swords, cavalry, with scabbards	1 of each per battery.
	Brigade and battery staff-sergeants, sergeants, corporals, bombardiers, farriers, shoeling smiths, and trumpeters.

SECTION 5.

Accoutrements.

	Proportions.
Belts, { with front hook plates, carriages and billets.	One for each cavalry sword.
Waist { with plates, rank and file.	Gunners and drivers, and artificers, except farriers and shoeling smiths.
Bottles, water, with straps	All ranks.
Frogs, rank and file	1 for each sword bayonet.
Haversacks, canvas, white.	All ranks.
Knots, sword, buff, cavalry, sergeants and rank and file.	1 for every sword.
Pouches, leather, ammunition, rank and file.	1 for every carbine.
Slings, Carbine	" " "

SECTION 6.

Fitting Saddles, Bridles, Harness, &c.

"*Saddle*"—is to be placed in the middle of the horse's back, the front of it about the breadth of a hand behind the play of the shoulder, paying particular attention that the tree does not touch the horse's backbone.

"*Pannel*"—should be so stuffed as to have an equal pressure on the sides of the horse's back, taking care not to pinch the sides of the wither, or touch the horse's backbone, leaving room enough to admit of two fingers being introduced both in front and rear.

"*Numnah*"—to be fastened on saddle, or pad, with its straps tightly buckled round the flaps of pannels, care to be taken that the numnah does not rest on the horse's withers, but is well raised into the fork of the saddle over the withers by putting the arm, or a rolled horse rubber under it, which latter is withdrawn after the horse is girthed up.

"*Shoe Pockets*"—for non-commissioned officers and gunners.—Strap to be passed round cantle of saddle, point of buckle down, then passed through the holes in shoe pocket, which is to be buckled on, with nail pocket outside. For drivers, on flank straps of saddles or ring of pad.

"*Wallets*"—to be placed on pommel of saddle or pad, with hollow side of connecting piece to the front; the wallet strap to be passed to the rear through front keeper on the wallet till edge of buckle touches the keeper, the point of the strap then to be passed through rear staple, next through rear keeper on back of wallet, then through front staple, and finally through front keeper on back of wallet, and buckled point to rear.

"*Cripper*"—should admit the breadth of the hand between it and the horse's back, care being taken that none of the hair remains between it and the dock.

"*Girth*"—when buckled, to admit of a finger between it and the horse.

"Surcingle"—to lie flat over and not tighter than the girth.

"Head-collar"—to be so fitted that there should be room for two fingers between the horse's nose and nose-band, which should be the same distance below the cheek bone.

"Throat-lash" to admit the breadth of three fingers between it and the horse's jaw.

"Collar Chain"—is passed round the horse's neck from off to near side, and the T fastened through the diamond link on the chain.

"Driver's Collar Chains"—the T on the collar chain is passed through the lower ring of jowl piece from near to off side, through the ring at the other end of the chain, and then passed through the outer draught ring of hames (over side rein and under bearing rein of off horse), and buckle of buckling piece; the end of the chain is then passed under the inner wallet strap.

"Headrope"—non-commissioned officers and gunners: round neck of horse, the roll of extra rope to have four turns, and to be six inches from lower ring of jowl piece. Drivers: seven turns of rope, to commence six inches from lower ring of jowl piece, passing through outer draught ring of hames (over side rein and under bearing rein of off horse), through wither buckle from the top, lying over outer bar and tongue: is knotted inside at proper length, wither strap buckled over it.

"Head stall"—of all bridles to be of such a length that the mouth-piece of the bit may be one inch above the tushes of geldings, and two inches above the corner teeth of mares.

"Leading rein"—the short piece on near side should be carefully fitted, so that the bearing of the bit in the horse's mouth be even.

"Bearing-rein"—buckled to cheek of bit, and should not be tight.

"Side rein"—buckled to cheek of bit, below bearing rein.

"Curb chain"—to be flat and smooth under the jaw, sufficiently loose to admit of one finger when the cheeks of the bit are in a line with the head-stall.

"Bridle-rein"—to be of such length as to allow the upper part of the driver's left arm to hang straight from the shoulder, the lower part to be at right angles with the upper, and the rein full in hand when at attention on horse-back.

"Collar"—should be so fitted as to admit of the flat of the hand passing freely between it and the lower part of the horse's neck, and just room for the fingers to pass between it and the sides of the horse's neck.

"Hames"—should be bent at the bottom, so as to fit the lower part of the collar, and from about three inches below the draught-hooks, straight to nearly the top, where they should turn a little out. The breast-chain should be so hooked that the hame-strap, when buckled, will keep the draft-hook at a proper height.

"Wither-strap"—should not be tight, or otherwise it would pull the saddle forward, and tighten the crupper.

"Belly-band"—buckled so as to hang the breadth of a hand below the horse's belly when in draft.

"Bearing" and *"Hip-straps"*—should be fitted so as to keep the traces on the same line.

"Breeching"—to be ten or twelve inches below the upper part of the dock; and when the horses are hooked in, should have four inches' play from the collar to the breeching.

"Back-band"—to be of such a length that the points of the shafts are above the line of draft.

"Traces"—their length must in a great measure depend on the size of the horses and the nature of the ground; the distance should not be less than one yard from nose to croup.

The harness of each horse, must, to a certain extent, be fitted by guess, and corrected by observation when at work, in what way, is best judged by riding or walking at some little distance from a team, and observing whether the traces may be stretched direct to each horse's shoulder in succession without interference, while on the other hand no straps are very loose, except the wheel-horse's belly-band.

Dropping links and length of traces As to length, it will be found that the service traces are not too long for horses moving at a gallop, or moving over rough ground. It is therefore better never to cut lead traces short; two or three links may be dropped with small lead, or centre horses, but in the wheel trace not more than one or two links should be dropped, as it may be seen that the trace passes very low down on the wheel-horse, and it might therefore be lifted out of its proper line at his shoulder and so distress him if there were not sufficient links, for these links are the only means provided to enable the trace to take the line in which the horses naturally draw it.

There is no great harm in shortening wheel traces where it seems necessary, as is commonly the case.

It is generally thought workmanlike to see wheel-horses well back in the shafts: shortening the trace in this way gives, theoretically, a slight advantage, the shafts also are less likely to be broken, but for the same cause (viz., the decreased length of lever) the horse would have rather less power to keep the shafts steady over very rough ground. Sufficient room must be left behind the horses to allow of their being thrown right back in the breeching without their quarters running any risk of striking the splinter bar, as before stated.

BREAST HARNESS.

Breast Harness. Breast harness should be fitted to rest across that part of the horse's chest and shoulders which has least motion, that is high up, but at the same time not so high as to rub or interfere with his neck and throat.

A horse, especially with a man on his back (whose mere weight adds to the horse's power), can perform a good deal of powerful draught with breast harness, and it is, therefore, good for the purpose for which it is designed, viz., to enable a mounted man to hook in and assist a carriage when it is in difficulties. It fits any horse when properly adjusted, and it is light to carry when compared with collar harness.

The latter requires to fit the horse, but if it fits can hardly be put on wrong; while the breast harness may be said to fit any horse equally, but it can hardly be put on right. It is a great advantage when horses get collar-galled on the march to exchange them to breast harness, and *vice versa*, especially in the case of volunteer Artillery, whose collars cannot be altered to suit the inevitable change of a large proportion of horses that takes place at each training.

SECTION 7.

Instructions for Putting up Harness and Horse Appointments in the Harness-rooms.

Harness.

Nose-bags.—One on each peg, hung as far back as possible.
Heel Ropes and Picket Pegs.—Rolled ready for marching order and hung with nosebag of off set on peg as far back as possible. (Not used in Canada.)

Collar.—Hung on peg with hames buckled, point down.

Traces.—D on the hames-hook, the links to hang loose, other end hooked to hames-link.

Saddle or Pad.—Hung by crupper, surcingle buckled as when on the horse, ends of the hip straps passed through the hame-hooks.

Belly-band.—Buckled round traces and crupper; the traces hanging double, straight down inside the saddle or pad.

T-bits.—Rolled, as for marching order, and hung on the bearing-rein hook.

Bridle and Head Collar.—As if on the horse's head, reins loose hanging over the front part of the saddle or pad, curb over bit.

Head Rope and Collar Chain.—On head collar ring, ready for parade, end hanging down.

Breeching.—Over the collar.

Girth.—On saddle or pad, buckled as on horse.

Numnah.—Folded double, laid on the top of all.

Legging.—Hung to near hame-hook of riding set by top strap buckled; other straps unbuckled ready to be put on.

Whip.—Hung by hand loop to off hame-hook of hand set.

Non-commissioned Officers' Appointments.

Nosebag, Heel Rope and picket Peg.—(The two latter not issued).—Fastened together by a "tie," and hung on the peg, as far back as possible.

Traces.—The centre of breast-piece is placed on the saddle peg close up to the post or wall, trace to be laid at full length, two hooks at each end, then fold in three equal parts. One buckling piece to be round each end of trace when folded. The loin strap to be passed round the traces and buckled to loin strap buckles.

The loin strap to remain round the traces when hung up ; the curled hooks to be hooked into D's of breast harness, under the saddle.

Bridle and Head Collar.—Hung up complete, with head rope or chain as when on the horse's head, the bridoon in front of bit, twisted bit head piece over all, curb hooked over front of bits.

Saddle.—Is next put on the peg, surcingle and girth to be buckled as on the horse, crupper hanging down with end inside noseband the stirrups to hang at riding length inside noseband of head collar.

Numnah.—Folded double, laid on top of all.

DISPOSAL OF HARNESS IN CAMP.

It is always desirable to put harness in spare tents, if procurable.

Harness and saddlery to be laid down in rear of line of horses.

Traces.—To be laid on the ground doubled (lead traces twice doubled), with the whole of the links to the same side.

Legging.—Passed round links of traces, with centre of strap buckled.

Collars, with hames complete, crossways on traces, lining of collars downward, points of collars reversed.

Breechings doubled inside collars.

Pad complete on collars, with crupper thrown over top of pad.

Saddle complete, on top of pad, with crupper thrown over top of saddle, stirrup irons run up, leathers clear of ground.

Bridles hung on pommel of saddle, bits clear of ground.

Whip, hung on pommel of saddle, thong passed over head-piece of bridle.

T-bits, across seat of saddle, ready for use.

Numnahs reversed one over the other, inside face downward on top of the whole.

Nosebags on top of numnahs ready for use.

Non-commissioned Officers' Appointments.

Saddle complete on ground resting on pommel, stirrup irons and crupper looped on cantle.

Breast Harness.—Breast piece across horns of saddle.

Bridle.—Head-piece of bit hung on cantle over saddle seat, bridoon over bit.

Numnah covering seat of saddle, inside face next seat.

Nosebag on top of numnah ready for use.

SECTION 8.

Cleaning and Preservation of Harness.

When the harness is taken off the horses the iron work should be wiped dry, and an oiled rag passed over it to prevent rust ; * the mud and sweat should be sponged off, and the harness hung up for subsequent cleaning ; it should not be left hanging in stables where it may be knocked off the pegs and trampled on by the horses, nor should it be kept permanently in stables, where the steam from the horses, especially in winter, has an injurious effect ; the harness rooms should be dry with an even temperature. In the dry

* FOOT NOTE.—Coal oil is good for removing rust, but it should not be left for any length of time on iron work.

climate of Lower Canada, especially during winter, if exposed to stove heat, a good deal of oil is sometimes necessary to soften harness that has become too dry, but it darkens it and prevents it taking a polish for some time.

Leather is best preserved and cleaned with soft soap, but the following have frequently been employed :

Hard soap and beeswax, which gives a good polish, and is perhaps as good as anything.

White wax and turpentine, which gives a beautiful polish, but dries up and ruins the harness.

White of egg, which looks well in dry weather, but gets into a lather in wet.

Dubbing * should be applied warm, and allowed to soak into leather work which has become dry and hard, and sometimes brittle ; it has a remarkably good effect, the harness will not take a good polish after it, until the surface gets a little dry. Loose keepers should be stitched in their proper places.

To enable iron work to be kept really clean, it should be filed and burnished with chain burnishers, the collar chains shaken in a bag ; but there are more important duties than burnishing to be learnt by Militia in the short time allotted ; it is, therefore, sufficient to keep iron work oiled and free from rust ; the process of case hardening or blueing, might advantageously be resorted to.

RECIPT—As used by Quebec Squadron of Hussars :—

1 lb. Rosin.

1 " Bees-wax.

10 " Mutton suet.

The above to be melted separately and then mixed with ½ pint neatsfoot oil.

* A preparation rendering the harness both pliable and proof against rats, &c. It is put on with a brush after being heated to the necessary consistency ; more being applied to the inside than the outside of the leather.

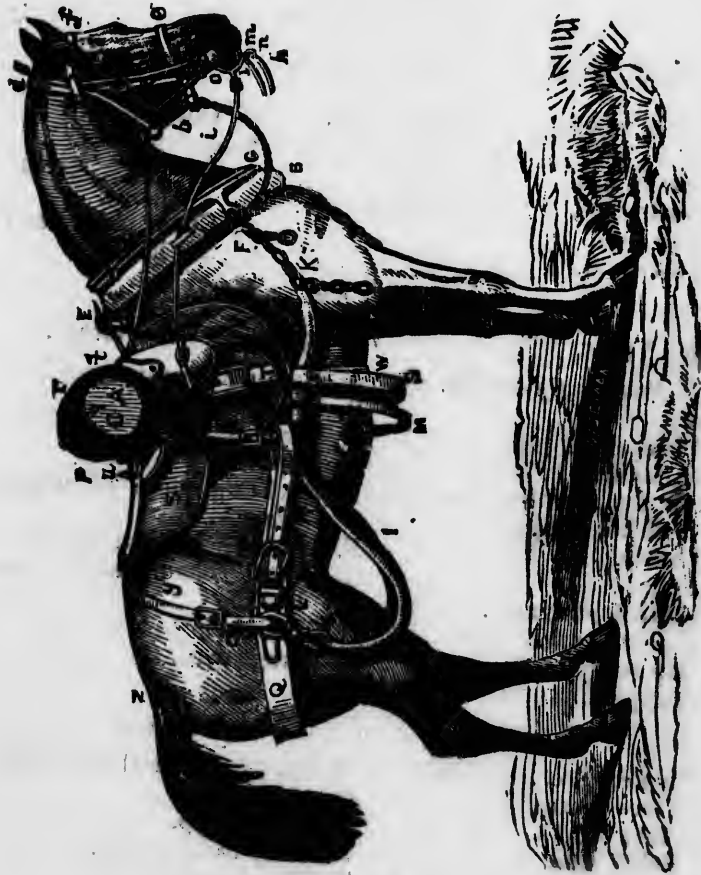


FIG. 1.—Shaft Horse—Marching Order.

Shaft horse marching order.

SECTION 9.

*Detail of equipment.**Head Collar.*

- a. Cheek pieces.
- b. Jowl piece.
- c. Throat lash.
- d. Head piece.
- e. Nose band.
- f. Brow band.

Harness Bridle.

- g. Bridle head.
- h. Bearing rein.
- i. Side rein.
- k. Leading rein.

Harness Bit.

- l. Cheeks.
- m. Bottom bar.
- n. Leading rein loops.
- o. Curb chain and hook.

*Driver's Kit.**g. Valise.**Pad or Off-Saddle.*

- p. Sheepskin.
- q. Numnah.
- t. Pommel, bearing hook, and wither straps.
- u. Cantle.
- v. Flaps.
- w. Girth & surcingle.
- x. Flank straps.
- y. Hip straps.
- z. Crupper.

r. Baggage or Valise straps.

- A. Staple of crupper.
- B. Harness collar.
- C. Hame strap.
- D. Hames.
- E. Buckling piece of wither strap.
- F. Shoulder bar and hook.
- G. Breast chain and hame hook.
- H. Wallets.
- J. Forage cord.

Traces.

- I. Pipe or case.
- K. Trace links.
- L. Trace hooks.
- M. Belly band.
- N. Buckling piece of flank strap.

Breeching.

- O. Buckling piece of hip strap.
- Q. Body piece.
- R. Shaft strap.
- S. Belly band or tug.
- T. Tug & back band.

N. B.—Water bottle and forage cord on active service.

SECTION 10.

HARNESSING.

First Method.

When the whole of the harness is not buckled together—
Buckle the girths to the tabs of the saddle on the off side.
The buckle end of the surcingle passed through the keeper
on the off side of the girth; a knot is tied on the girth
and surcingle to keep them clear of the ground.

The lead driver commences with the off horse. The horse
having been put on the short rack, at the word "*Harness*,"
clear the saddle (which has already had the numnah fitted to
it) from the other parts of the harness, support it on the
left arm, and with the cantle towards the elbow, place the
crupper over the seat of the saddle, holding the end in the right
hand which also assists to support the pommel of the saddle;
place the saddle on the horse's back from the off side, cast off the
knot of girth and surcingle, and place the crupper on the
horse's loins; move to the near quarter of the horse, gather
the hair of the tail in the right hand, and put on the crupper
with the left, clear the dock hair from the crupper, move
forward on the near side, lift the saddle clear of the horse's
back, move it forward towards the withers, and replace it
on the centre of the horse's back, buckle the girth and sur-
cingle, taking care that the surcingle be not tighter than the
girth. Unbuckle the top strap of the collar, place the collar
on the horse's neck, peak down, and buckle the top strap.
Fit the hames and reeve the strap, so that when buckled the
spare end shall fall to the inward side of the horse; turn the
collar at the smaller part of the neck with the mane.
Buckle the wither strap. Take the draught links of the off
trace in the right hand, the trace hook in the left, rest the
bight of the trace on the left arm below the elbow. Hook
the third link from the end to the shoulder hook and put in
the tie. Buckle the bearing and hip straps, pass the trace
hook up inside the hip-strap, and outside the bearing strap,
and hook it to the draught-link at the shoulder. Put on
the near trace in the same way, buckle the belly-band.

Turn the horse left about, and put on the bridle.

Place the centre of the riding horse's rein over the neck, the centre buckle towards the off side ; buckle the billets to the bit.

The bearing (or off horse's rein) is placed over the neck, the centre buckle to the near side ; the billets of the bearing rein are passed through, and buckled to the loops of the bit in line with the mouth-piece ; the throat-lash of the off horse is buckled outside the bearing-rein.

The curbs are then put on.

The billet of the side-rein is passed through and buckled to the same loop as the off end of and below bearing rein. The leading rein is buckled to the centre or lower loops of bit, as may best suit, the horse's mouth, short piece on near side.

Wheel driver commences at the off horse in the same manner as the lead driver, only that the hip-straps are not buckled to the traces. The breeching is to be put on before the traces, commencing at the off side. In putting on the traces, pass the bearing strap through the double of the shaft strap, to keep the latter in its place ; pass the end of the near side of near wheeler's breeching inside the surcingle, and hook it into the ring of the hames at the near shoulder, and secure the hook with a leather thong.

Second Method.

When the whole of the harness is buckled and fastened together.

At the word "*Harness*," turn the horse to the left about pass the left arm through the crupper, take hold of the collar with both hands (one on each side), put on the collar, turn it round on the off side, and the horse at the same time to the left about, place the saddle on the horse's back, straighten the girth and surcingle, put on the crupper, buckle the girth, surcingle, and belly-band, put on the bridle, hook on the curb, and buckle the throat-lash (if an off-horse), outside the bearing rein, and buckle the side rein.

SECTION II.

Equipment of Horses.

MARCHING ORDER.

N.B.—Articles of light picketing gear are y carried on War Service or in camp.

N. C. Officers' and Gunners' Horses.

Saddle and bridle complete, numnah, sheepskin (head rope, or), collar chain and log.

Near side of saddle.

Mess tin, nosebag, hoof picker, shoe case containing 1 hind shoe and nails.

Near Wallet.

Curry comb and brush, sponge, one boot, oil tin, and horse rubber.

Off side of saddle.

Water bottle, shoe case containing 1 fore shoe and nails.

Off Wallet.

Brush bag with 3 shoe brushes, blacking in case, one boot, stable bag.

*Valise (flap to rear when open).**Near end.*

1 pair drawers.
1 flannel shirt.
2 pairs socks.
2 shirts.
1 hair brush.

Centre.

Stable jacket or tunic (folded).
Plume case.

Off end.

1 pair of trousers rolled with Bible, boldall complete, button iron and brush, and brass ball inside.
1 towel, 1 cloth brush on top.



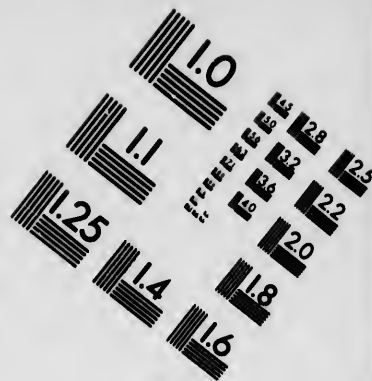
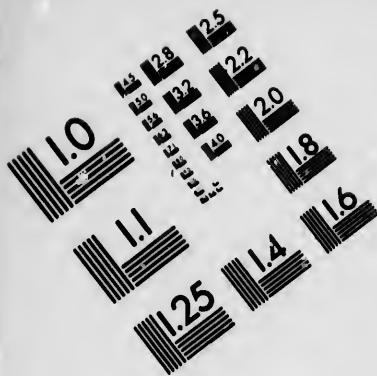
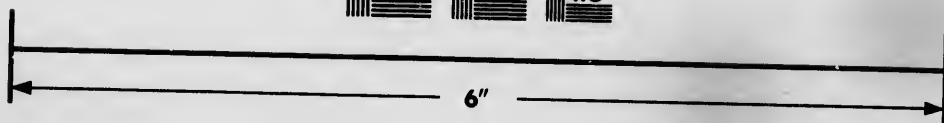
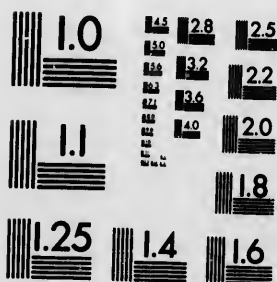


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One towel under sheepskin on top of corn bag, folded same length.

"*Cloak*"—rolled the length of sword blade and hilt, in front of wallets and fastened by the three straps.

"*Cape*"—folded length of sword blade only placed on the top of cloak and fastened by two outside straps, points to the rear. The upper part of the cape should be pulled back rather behind the cloak and flattened down as much as possible.

"*Forage cap*"—in busby or helmet cover, under centre cloak strap.

"*Corn bag*"—folded one inch less than the length of valise, and laid on top of it under sheepskin and over valise straps.

"*Head rope*"—passed round horse's neck from off to near side, and put on as laid down at page 59.

"*Collar chain*"—put on as at page 59.

"*Log*"—on near wallet strap, so placed as to fit between cloak and wallet, and be secure when the cloak is removed.

"*Nose bag*"—rolled and carried on near shoe case, fastened to valise strap in front of keeper on valise. When corn is carried in the bag, the strap is twisted round top of bag, passed upwards through itself, and fastened to back arch of saddle.

"*Hoof picker*"—folded, is slung on strap outside near shoe case, point to rear.

"*Mess tin*"—is fastened to near valise strap in front of keeper on valise, tongue of buckle down, so that mess tin can be taken out without removing strap. Mess tin to be in rear of nose bag.

"*Pickering peg*"—on rear of valise, in line with seam, fastened by two outside straps only, point to off side.

"*Water bottle*"—under off end of valise in rear of heel rope, strap passing inside off valise strap and outside near valise strap in front of keepers on valise, bottom of bottle in line with bottom of shoe case.

"*Valise straps*"—points to front, buckles on top.

*Draught Horses.**The Riding Horse.*

Harnessed complete with numnah and head rope, or collar chain and log.

Near side of Saddle.

Mess tin.

Hoof picker.

Shoe case, containing 1
near hind shoe and
nails.

Near Wallet.

One boot.

Stable bag.

Cloth brush.

Off side of Saddle.

Spare ties.

Shoe case, containing 1 off
fore shoe and nails.

Off Wallet.

One boot.

One towel.

"Cloak"—rolled length of sword blade and hilt, in front of wallets.

"Cape"—rolled same length as cloak, and strapped in front of it by the three cloak straps, points to the rear.

"Forage cap"—in busby or helmet cover, under apron, secured by centre cloak strap.

"Hoof pickers"—as laid down for N.C. officers and gunners.

"Head rope"—as laid down at page 195.

"Collar chain"—put on as at page 195 a.

"Log"—on collar strap.

Strap of mess tin through ring or loop on saddle, tongue of buckle down, so that mess tin can be taken off without removing the strap. Fig. 2.

The Off Horse.

Harnessed complete with numnah and head rope, or collar chain and log.

Near side of Saddle or Pad.

Nose bag.
Shoe case, containing near hind shoe and nails.

Off side of Saddle or Pad.

Nose bag.
T-bits (rolled) fastened to off valise stamp in front of nose bag.
Shoe case, containing off fore shoe and nails.

Near Wallet.

Curry comb and brush,
sponge, harness brush.
Horse rubber and oil tin.

Off Wallet.

Curry comb and brush.
Three shoe brushes.
Blacking in case, and brush bag.

"*Valise*" on pad or saddle, points of straps to front buckles on top.

*Valise (flap to rear when open).**Near End.*

1 pair drawers.
1 flannel shirt.
2 pairs socks.
2 shirts.
1 hair brush.

Centre.

Stable jacket or
tunic folded.
Plume case.

Off End.

1 pair of trousers,
rolled, with Bible,
holdall complete,
button iron, and
brush and brass
ball inside.
1 towel, 1 cloth
brush on top.

When blankets and covers are carried the blanket is to be rolled round the valise, then the blanket cover, the whole covered with the sheepskin.

"*Corn bag*"—folded one inch less than the length of valise, and laid on top of it (or of blanket cover when used) and under sheepskin.

"*Nose bags*"—rolled and fastened to outer valise straps,

but when corn is carried in them the nose bag strap is to be twisted round top of bag, passed upwards through itself, and fastened to the ring or loop of saddle or pad.

"*Water bottle*"—carried on the back of the valise on the off horse, the point of the centre valise strap is brought up between the leather loops at the back of the water bottle and then buckled on the valise ; both ends of the water bottle strap are passed over the top of the valise, the point of the strap is passed through the lower leather loop and buckled to the other end.

"*Head rope*"—as laid down at page 59.

"*Collar chain*"—as for riding horse.

REVIEW ORDER.

N. C. Officers' and Gunners' Horses.

Saddles and bridles complete, numnahs.

Sheepskin, collar-chain.

Wallets unpacked.

Shoe cases with shoes and nails.

"*Cloaks*"—(only when specially ordered) rolled length of sword blade and hilt, strapped on top of wallets by the two outside cloak straps and wallet straps, and fastened with centre cloak strap.

"*Capes*"—rolled same length as cloaks, and strapped in front of them by the three cloak straps ; *when cloaks are not carried the capes* are folded length of sword blade and strapped on top of wallets by the two outside cloak straps and wallet straps.

Draught Horses.

Harness complete, with numnah, collar-chain.

Wallets unpacked.

Shoe cases with shoes and nails.

Cloaks and capes, the same as for N. C. officers' and gunners' horses. Fig. 3.

FIELD DAY ORDER.

Same as Review Order.

DRILL ORDER.

N. C. Officers' and Gunners' Horses.

Saddles and bridles complete, numnahs, collar-chains.
 Wallets unpacked.
 Shoe cases with shoes and nails.
 Capes (when ordered) the same as in Review Order.

Draught Horses.

Harness complete, with numnah, collar-chains.
 Wallets unpacked.
 Shoe cases with shoes and nails.
 Capes (when ordered) the same as in Review Order.

WATERING ORDER.

N. C. Officers' and Gunners' Horses.

Saddles complete (but without wallets or shoe cases), numnahs, head collars, and T-bits, or bridles if specially ordered.
 Breast harness not worn. Led horses without saddles or numnahs.

Draught Horses.

Saddles complete (but without wallets, shoe cases, flank or wither straps), numnahs, head collars, and T-bits, or harness bridles if specially ordered. Led horses without saddles or numnahs.

RIDING DRILL ORDER.

N. C. Officers' and Gunners' Horses.

Saddles complete (but without shoe cases).
 Numnahs, bit and bridoon, unless otherwise ordered.
 Wallets not worn with bridloons or snaffles.
 Collar chains not worn.

Draught Horses.

Saddles complete (but without shoe cases, flank or wither straps), numnahs. Snaffles or harness bridles as ordered.

Wallets not worn with snaffles.

Collar chains not worn.

When shoe cases are not worn the hoof picker will be carried in the breast of jacket, secured to third button from top.

Valise straps are never carried without valises.

Mounted orderlies and trumpeters in attendance on general officers, or colonels commanding, on parade turn out in the same order as the troops; but when the troops are in marching order they turn out in field day order, except on the line of march.

EQUIPMENT OF OFFICERS' HORSES.**MARCHING ORDER.**

Bridle complete, saddle complete, numnah (for Field Artillery only). Collar-chain and buckling piece. Lambskin cloak, and cape as for mounted N. C. officers and gunners, buckle of buckling piece of collar-chain to near side.

On active service and when encamped the head rope is worn instead of the collar-chain.

REVIEW ORDER.

Bridle complete, saddle complete. Collar-chain and buckling piece, lambskin, cape.

FIELD DAY ORDER.

Same as Review Order.

DRILL ORDER.

Bridle complete, saddle complete, collar-chain and buckling piece.

RIDING DRILL AND WATERING ORDER.

Same as Drill Order without collar-chain.



Fig. 2.—Near Leader—Marching Order.

Fig. 2.—Near Leader—Marching Order.



Fig. 3.—Near Wheeler—Review Order (with cape).



FIG. 4.—Gun Limber—Marching Order.

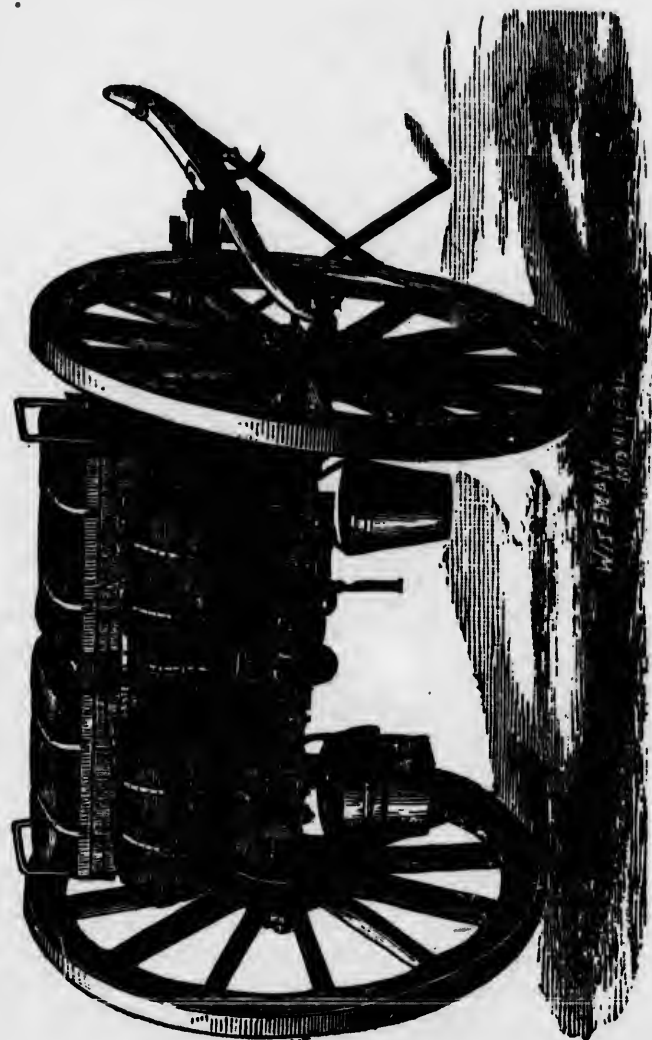


Fig. 5.—Gun Limber—Marching Order.

Part IV.

GENERAL INSTRUCTIONS FOR DRIVERS.

SECTION I.

Duties after a March.

1. After a march, when men arrive at the stables, or encamp, they are first to take off bridles, tie up the horses by the head collar and ropes, loosen girths, turn up cruppers and stirrups, pick out feet, wipe bits and stirrups. Then take head-collar off, turn the horse about, sponge nostrils and eyes, rub his head with a dry wisp, turn him about again, put on the head-collar, and give hay.

2. After an interval to refresh the men, the horses' feet are washed, saddles are taken off, horses are groomed, fed, watered, and bedded. The horse's blanket is used for his covering at night, with surcingle. Upon the vigor and exertion with which grooming is performed greatly depends the condition of the horse, especially under fatigue and exposure to weather. By hand-rubbing the legs and ears, not only until they are dry, but until the blood circulates freely, the health will be greatly preserved.

3. Immediately the saddles are removed, the men must be taught to examine the shoulders, withers and docks, and be most particular in reporting the least tenderness, heat, swelling, or galling. Non-commissioned officers are to pay strict attention to this, and see that the pads and collars are often beaten to prevent knots in the stuffing.

4. In grooming, wash dock ; begin at off hind-quarter, go towards the head, brush the dirt out, then brush with a straight arm, with circular motion, against as well as with the grain, until perfectly clean ; the hand not immediately in use to be kept on the horse, to prevent his closing on the groom. Curry comb is never to be used on the horse.

2. Filing in and out of Stables.

In filing into or turning out of stables the driver takes hold of the riding horse's bridle, close to the bit, with the left hand, whip in his legging, stock upwards. He takes hold of the leading-rein with the right hand, and throws the off horse to the rear of the riding one, keeping hold of both horses until formed on parade, or put back again into the stable.

3. Mounting with Harness Bridles.

At the word "*Prepare to Mount*,"—

First Motion.—Turn to the right, and place the right foot about six inches to the right; with the right hand place the middle of the riding-rein and the leading rein over the palm of the left hand. The hand is not to be passed through the loop of the leading rein.

Second Motion.—Take a lock of the mane in the right hand, in front of the collar, pass it up under the left thumb, and twice round it; then take hold of the stirrup leather, close to the iron, with the right hand; place the left foot in the stirrup, the right hand on the cantle, and the left knee against the saddle on the surcingle.

At the word "*Mount*,"—

First Motion.—Spring up, and stand erect in the stirrup.

Second Motion.—Carry the right leg quickly but steadily over the saddle, shifting the right hand from cantle to pomel.

Third Motion.—The left hand quits the mane, the bridle and leading-rein are both retained in the full of the hand, and are tightly held between forefinger and thumb, the hand being raised as high as the elbow, the back of the hand inclined upwards, the right hand takes the whip out of the legging, and holding stock and thong, rests on right thigh, back of the hand up, both elbows close to the side; the right foot is placed in the stirrup without the aid of hand or eyes.

4. *Sit at Ease.*

On the command, "*Sit at ease*," the left hand is dropped on the front part of the saddle, the right hand holding stock and thong of whip, remains resting on right thigh, back of the hand up. If the command "*Sit at ease*," is followed by "*Sit easy*," the drivers will be permitted to move their limbs, but must not lose their dressing. On the word "*Eyes Front*" being given to drivers sitting easy every driver will at once assume the position of "*Sit at ease*."

5. *Dismounting with Harness Bridle.*

At the word "*Prepare to Dismount*,"*—

First Motion.—Place the whip in the legging; the right foot quits the stirrup.

Second Motion.—With the right hand take a lock of the mane, in front of the collar, bring it through the left hand and twist it twice round the thumb; then place the right hand on the pommel, fingers to the right and thumb to the left.

At the word "*Dismount*."—

First Motion.—Supporting the body with the right hand and left foot, the right leg is brought gently (without touching the hind quarters or the saddle) to the near side, the right hand shifted to the cantle, body erect.

Second Motion.—The body is gently lowered until the right toe touches the ground.

Third Motion.—Resting on the right foot, the left stirrup is quitted, and the left foot placed in line with the horse's fore feet.

Fourth Motion.—Both hands quit their hold, the driver turns to the left, and brings his body square to the front; as he is turning, the right hand lays hold of the leading rein and the cheek of the riding horse's bridle holding up the horse's head as high as the shoulder.

* If this is ordered with Field Batteries, at close interval, the Nos. 1 and coverers must advance one horse's length in front of their subdivisions.

6. *Stand at Ease.*

The right arm (the right hand retaining the leading rein) is passed through the bridle rein, both hands brought together in front of the body, right foot drawn back six inches, and left knee bent.

"*Stand easy.*"—Drivers fasten their leading reins to their bridle reins, pass round to the off side of their horses, and cast off the bearing reins. Wheel drivers lower the props.

On the word "*Eyes front*" being given to drivers "*standing easy*," bearing reins will be hooked on, and props fastened up; leading reins unfastened from bridle reins, and the position of "*stand at ease*" resumed.

7. *Saluting when Mounted.*

A mounted N. C. officer, gunner, or driver riding singly, salutes by riding at "*attention*," the right hand extended behind the thigh, looking the officer in the face; with mounted parties, the N. C. officer in charge gives the word, "*Eyes right or left.*" Drivers with a pair of horses, whether hooked in or not, salute by passing their whips between collar and pad of off horses, looking the officer in the face, body erect, left elbow close, right arm extended to the right front, with the hand as low as the waist, back of the hand up, and inclined to the front, fingers closed on stock and thong. In trotting drivers do not salute, the right hand, holding stock and thong, rests on right thigh, back of the hand up. Drivers when halted do not salute.

8. *Hooking in.*

May be done by the gun detachments and the drivers or by either.

*First Method.**By the Detachments and Drivers.*

"*To hook in—prepare to dismount,*" "*Dismount.*"—"Hook in."

Before dismounting, the drivers take off their gloves and place them in the off wallet of their saddle.

The wheel driver stands to the shaft horse's head, passing his right arm through the rein of his riding horse ; 4 and 5 assist the wheel driver, 4 on near side, 5 on off side ; 5 raises as off shaft and guides point of it through the tug ; 4 acts in like manner with the near shaft, and gives the word "*Ready*" a signal for the drivers to back the shaft horse into his place ; 5 will then hook the off trace and buckle the breeching ; 4 buckles the breeching and hooks inside traces.

The wheel driver hooks near trace of riding horse.

3 assists centre driver, commencing with off trace and then turning inside and hooking inside traces ; the driver stands to his horses' heads and when off horse and off trace of riding horse are hooked in, hooks in near trace of riding horse.

2 assists lead driver in like manner.

6 and 7 assist wheel driver of wagon as 4 and 5 do at gun.

8 assists centre driver, and 9 lead driver of wagon as 2 and 3 do at gun.

In unhooking, the words will be, "*To unhook*" "*Prepare to dismount*," "*Dismount*," "*Unhook*,"—when each number and driver undoes what he had done in hooking in, commencing where he left off ; as soon as the leaders are unhooked they must be moved forward to enable the shaft horse to be led clear of the shafts.

The traces should always be hooked before breechings are buckled, and in unhooking the breechings must be first undone.

The backs of the trace hooks are always to be down, and the points of the ties are to be inwards on the trace, but outwards on the shoulder hooks.

Second Method.

By the Gun Detachments.

The drivers being mounted, at the word "*Hook in*," Nos. 2, 3, 4, and 5 go to the gun, 6, 7, 8, and 9 to the wagon.

horses. No. 4 takes hold of the shaft horse, close to the bit, with the left hand, right hand on the tug ; No. 5, standing on the off side, raises the shaft, and gives the words "*Ready*"; 4 then backs the horse, each number guiding the tugs upon the shafts, they then hook the traces and buckle the breeching ; 4 then hooks in the off trace of the near wheeler, buckles the breeching over the trace, and passing out by the rear, hooks in the near trace ; 3 hooks in the centre horses, commencing with the off trace, turning inside, and hooking each trace in succession ; 2 hooks in the lead horses in the same manner ; with only four horses, 3 can assist to hook in the near wheeler.

Nos. 6, 7, 8, and 9 hook in the wagon horses, exactly in the same manner that 2, 3, 4, and 5 hook in those of the gun.

Third Method.

By the Drivers.

The drivers being dismounted, at the word "*Hook in*" take off their gloves and place them in the off wallet of their saddle, turn to the right and tie their leading to the riding horse, by two half hitches ; the lead driver doubles round by the front to the off shaft ; the centre driver to the off side of his off horse ; the wheel driver stands in between his horses' heads, taking hold of the bearing rein with the left hand, close to the bit, the right hand on the tug. The lead driver raises the shafts, and gives the word "*Ready*," the wheel driver then backs the shaft horse, both drivers guiding the tugs upon the shafts ; then hook the traces, and buckle the breeching ; the wheel driver then hooks in the near wheeler, and the lead and centre drivers hook in their own horses as previously detailed for the detachment ; the lead driver stands in front, takes hold of the bit of each horse, stretches the traces, and places the horses square with the carriage, the whole of the drivers putting them well on their legs, and stand to their horses as before.

9. *Four Horses Abreast.*

When teams of 12 horses four abreast are used with double shafts, the drivers of the off pairs ride on the off horses and wear the leggings on their left legs ; the near breeching strap with hook is fastened on the off side of breeching of off riding wheel horse, near side of breeching fastened to D's on off shaft, with a strong strap with keeper (this strap should be about 2 feet long and 2 inches wide), the side reins of the horses driven from the off side are fastened on the near side of the pads ; the inside horses are coupled together by a side rein fastened to the head collars to prevent them from flying outwards.

10. *Driving Generally.*

The art of driving is a modification of that of riding. All the aids are founded on the same principle, so that it has happened that very little has been written or even distinctly laid down on the subject. The following may therefore be noticed :—

The movements of horses in draught are generally slower and steadier than those of a riding horse ; linked together as they are, and the team and carriage possessing considerable weight and momentum, it is not desirable to move any draught horse as suddenly and quickly as one in a detachment or in a rank of cavalry, nor is it easy for a horse to move with the eccentricity and suddenness sometimes exhibited by a well-bred horse in the ranks : hence, sitting in his saddle and retaining his place, especially in the centre or wheel, is comparatively easy to a man of slow parts. The quality of a man's driving is much less obviously perceptible than a man's riding, the legs are partly hidden and the position less conspicuous, while it requires careful watching to see if justice is done to the horses, and where battery horses have but little work to do one pair in the team might for a short time perform half the entire work without injuring their condition or destroying the general appearance of harmony in the work. Officers and Non-commissioned Officers are, for the most part,

in front of the teams, and unless they are vigilant may not observe how the work is done. Drivers are frequently instructed by those who have never driven themselves : in such cases it is not surprising that the instruction should mainly be in that part of their work which consists in riding, while that which is really more important and might tell much on service, viz: the management of their horses, is not brought up to a high standard.

The general guiding rules as to driving are not difficult.

The near horse is moved by the leg on the same principle, but not to the same extent, as a horse in the ranks.

The off-horse is brought in to the near one by laying or pressing the whip over him, touching the off-side just in front of the pad.

The whip with the side rein prevents him curving his neck round towards the driver. There is, generally, no difficulty in bearing the off-horse away by moving the hand and rein towards him. While a gunner is mounted on the off-horse its management is left to him, though the driver does not let go the leading rein, so as to be ready to control the pair when the gunner dismounts.

The management of the reins is peculiar ; the riding horse's rein should be shortened by means of the buckles sufficiently to enable the man to hold it single through his left hand.

The shorter branch of the leading rein should lead to the near cheek, and the longer to the off-cheek of the off-horse's bit. The buckle should be slipped to such a length that when the rein is in the driver's left hand, in its position in front of the centre of his body, it pulls evenly on the two sides of the off-horse's mouth.

Both horses are supposed to be turned to the right by turning the hand, thumb down, but it is more generally done by carrying the hand to the right, bearing the off-horse away by placing the whip hand on the rein ; this will hardly pull the off-horse's *right* rein, while the riding horse is thus moved by the pressure of the left rein against the left side of his neck.

Turning to the left is done by turning the hand, little finger down, or by carrying the left hand to the left and throwing the whip over the off horse's neck.

11. *Moving off from a Halt.*

At the word *March*, the drivers ease the reins, and close their legs to the riding horses, laying the stock of the whip, thong in hand, over the necks of the off horses, which will ensure their starting together ; this is of great importance, not only to prevent the breaking of the harness, but also the jibbing of the horses.

The spurs are for the riding horse, the whip for the off horse ; in using the whip it should be applied over the shoulder or neck, but never when the off horse is mounted, he must then be kept up to his work by the spurs of the mounted gunner.

Wheel and centre drivers must be careful that the horses in front of them are kept in proper draught, the lead driver being responsible for dressing.

To prevent loss of distance, on the command *March* every man should start his horses. Drivers should be specially cautioned not to wait until the carriage in front of them moves off.

The distance of at least four yards from the end of carriage in front to leaders' heads of team following must always be maintained.

In moving, generally, the lead driver is responsible for the dressing, but to enable him to keep it well, the pace should not be allowed to fluctuate or alter without word of command ; he is also responsible that he keeps his horses evenly to their work, but since he is answerable for the dressing his position is fixed, and it lies with the centre driver to see that the lead traces are well stretched ; the centre driver then sees to this, and that his horses are working evenly.

The wheel driver sees that the centre driver's traces are well stretched, and that his own horses are doing their share of work and working evenly ; indeed, the wheel driver is more responsible for the share of work falling on the horses in

the team than any other driver, he should be a sturdily built man, the centre and lead drivers may with advantage be light, while the lead driver requires to know his drill more perfectly than any. The pluck with which a team is driven depends on the lead drivers, and in some measure on the gunner on the off lead.—The mounted gunner should be tall, but light and active, rather long limbed, to mount easily.

12. *Halting or Pulling up.*

This must be done with judgment. When the pace is the walk, the carriage may be stopped at the word *Halt*, by the lead and centre drivers feeling the bits firmly but steadily, and closing their legs for an instant to keep the horses up to the collar. They also raise the whip hand as high as the head, the whip horizontally across the front, as a signal to the wheel driver; the wheel driver pulls up his riding horse, as directed for the lead driver, and with his whip hand takes hold of the leading rein, and inside of riding rein, both hands low, and by a steady firm feeling of both horses' bits, he sets them to the breeching: the moment he stops the carriage he must ease the reins, and put his horses to the collar, taking care that the leading traces are stretched. In pulling up from the trot the same aids must be applied, but the carriage must not be stopped too short. Officers should always give the word *walk* before the word *halt* when moving at a trot or gallop, even to come into action; no time is really lost by doing so, as men and horses are steadied, the rattle ceases, the word of command is distinctly heard, and the wheel horses are saved severe strains. The drivers should, therefore, never be allowed to pull up short from a trot or gallop, but always taught to expect a decrease of pace a few moments before halting or coming into action.

13. *Alteration of Pace.*

In all alterations from slow to quicker paces, the drivers use their legs and whips as directed in moving from the halt; jerking the horses should be carefully avoided.

14. *Taking ground.*

Taking ground, each carriage wheels, independently of the others, in a direction at right angles to the leading horse's heads.

It is done by turning the horses in succession as they come nearly up to the same spot of ground.

The lead and centre horses should be taken out of the collar as they turn the corner until the wheel horses and limber have turned it, otherwise they are apt to draw the outside trace over the horse's back, and also pinch the driver's leg by the horses pulling as it were round a corner.

To ensure the wheelers alone bringing the gun round the turn, it is usual to put them well into the collar and increase the pace a little coming up to the turn.

It will be found in all turns that it is nearly impossible to bring the limber over the exact ground on which the lead horses turned : it could only be done by a great exertion on the part of the wheel horses ; thus although they are generally put well into the collar, they bring the limber round a little short of the point where the lead horses turned. Hence in limbering up it is usual for the lead horses to jump well over the trail, the limber wheels either going over the trail-eye or close to it ; where this is not done the trail-eye is so far from the pintail when the limber has come round into its place that the latter has to be backed (which is dangerous) or the gun run up by the gunners. It is not, however, advisable to drive over the trail, as the loops and fittings are apt to be damaged.

Taking ground to the right, the lead driver works his horses round by feeling the inward rein of the riding horse, pressing with his left leg, and taking the leading rein in the right hand, to bear the off-horse off ; the gunner, when mounted, manages the off-horse. The centre and wheel drivers aid their horses round in the same manner, taking care to follow the lead. The wheel driver must keep the shaft horse from lying in the breeching.

Taking ground to the left.—The lead and centre drivers work their horses round by feeling the left rein and pressing

strongest with the right leg, keeping the whip stock, thong in hand, over the off horse's neck (except when mounted) until the turn is completed ; the wheel driver works round in the same manner, keeping the riding horse from lying back in the breeching.

15. *Reversing.*

Reversing, each carriage wheels about independently of the others.

Reversing to the left, drivers keep the whip stocks, thongs in hand, over the off-horses (except as before), circling round to the left, feeling with the left rein, and pressing with the right leg, watching the carriage, the wheel driver taking care to keep his riding horse from lying back in his breeching, otherwise the carriage is liable to be locked and upset.

Reversing to the right, the lead drivers circle their horses round, by feeling the right rein, and pressing with the left leg, taking hold of the leading rein with the right hand, and bearing off the off-horse (except as before), keeping their eyes on the carriage until the wheel is completed. The wheel driver goes about in the same manner, and must be very careful that the shaft horse is kept up from lying in the breeching.

In all formations the drivers must go well to the rear of the position on which the carriage is to stand, so as to be able to bring it up square.

16. *Inclining.*

Inclining, the carriages each turn in the direction ordered. Inclining is a movement by which a line, or any part of it, is carried on in a parallel direction at the same time that it is gaining ground to a flank.

17. *Wheeling and Shoulders Forward.*

All wheels of the battery, or its parts, from the halt are to be made on a flank ; during the wheel dressing is to the

wheeling flank, which regulates the pace at which the wheel is made, care being taken that the correct interval is preserved from the pivot.

When wheels are made on a fixed pivot, the pivot gun must move towards the rear, and wheel about to enable it to form up square. The other subdivisions come into line in succession.

Wheels are made on a movable pivot, except in wheeling from column into line or line into column, which can be done on a fixed pivot.

In wheels on the move the pace must be checked at the pivot and increased at the wheeling flank, so that it may be completed by every subdivision at the same moment, when the word *Forward* is given.

To wheel half or quarter right, or left, the word of command is *Half* or *Quarter—Right* or *Left*. If it is required to complete the wheel to the full quarter circle, after having wheeled "half right" or "half left" the word is *Right* or *Left*.

In throwing shoulders forward both flanks are kept in motion, the pivot describing part of a circle, and the outer flank and intermediate subdivisions, by a compound of inclining and wheeling, conforming to the pivot movements. To perform wheels on this principle the word is *Right* or *Left Shoulders*, followed by *Forward*, when the required degree of wheel has been attained.

When a battery in line or a division wheels about inwards the subdivisions pass each other bridle hand to bridle hand.

18. *Action.*

"*Action Front.*"—At the word "*Drive on,*" the gun drivers drive on one yard to clear the trail; the limbers and waggons reverse to the right, the former at the trot till in line with the guns, then move direct to the rear at the walk, "eyes left," and at the word of command or signal they again reverse to the right, "eyes right," and form in rear of the guns, the gun leaders ten yards in rear of the trail eye, the waggon leaders four yards from the limber.

"Action Rear."—At the word "*Drive on*," the limbers and waggons move on, incline to the left, reverse to the right, and form up as before.

"Action right."—At the word "*Drive on*," the gun drivers move forward one yard; the limbers and waggons then take ground to the left, and move to the rear, reverse to the left, and form up as before.

"Action Left."—The same as Action Right, except that the limbers and waggons take ground to the right, and reverse to the right.

19. *Limb ring up.*

"To the Front."—The gun drivers trot up, inclining to the right, keeping one yard clear in passing the gun; when clear of the gun-wheel they throw right shoulders forward, until the wheel of the limber is close to the trail eye, when the drivers pull up and square the limber, the lead drivers easing their traces, and passing their horses to the right until square, when they again stretch the traces; the wheel driver keeps his riding horse to the collar, taking care that the limber does not run back upon the gun. The wagon drivers trot up, halting four yards in rear of the gun.

"To the Rear."—The gun and wagon drivers trot up, inclining to the right, and when the limbers are close to the gun, the whole reverse to the left, the gun drivers holding in their horses until the wagons have reversed; they then complete the wheel, the lead drivers easing their traces, pass their horses to the left, to enable the wheel driver to wheel short round; the wheel driver, by holding in his riding, and keeping up his shaft horse, turns the limber, and keeps it from running back on the gun.

"To the Right."—The gun drivers trot up; the lead driver passing close to the trail turns to the right when the wheel driver is in line with it; the lead and centre drivers then ease their traces and pass their horses off to the right until square, when they again stretch their traces; the wheel driver, as soon as he is in line with the trail, turns to the right, and the limber is halted. The wagon drivers trot up, inclining

to the left ; at the proper interval from the guns, they take ground to the right, halting and dressing on their guns.

"To the Left."—The same as limbering up to the right, except that the gun drivers turn off to the left, and the wagon drivers move up inclining to the right.

In all limbering up, the drivers look over their shoulders, to see if the limber is properly placed, and correct it, if not ; in doing so they must not rein back.

Guns are invariably limbered up at the trot.

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Part V. EQUITATION.

INTRODUCTORY REMARKS.

A very large proportion of the horses used in the Canadian Militia are the property of the men, who for the most part know how to ride. It is therefore not necessary to detail the system of equitation laid down in the British army, nor does the short period of training allow its being carried out. But every field battery can have a proportion of its officers, non-commissioned officers and men, taught at the gunnery schools, and these can be employed in giving to their comrades the amount of instruction absolutely indispensable to the military horseman in order that being able to govern his horse by the aid of his legs and bridle hand, he may have the right hand at full liberty for the use of his weapons, and be capable on all occasions, whether acting singly or with the battery, of performing with ease his various duties.

When the drivers are mounted without guns for exercise or other purpose, they will be moved as cavalry, *i.e.*, form sections, half sections, files, right or left.

See definitions page .

1. *Open Manege.*

It is desirable occasionally that all artillery should be exercised in open manege, to prepare their horses for working steadily in the field, and to make the men trust only to the proper application of the aids.

These maneges may be formed in camp, by preparing certain portions of ground.

The length of each manege should be sixty yards, the breadth, twenty.

Where a larger size is required, and the ground will allow, an increase of five yards in breadth is to be made for every

ten in length ; one manege will thus contain two good circles or longes.

The corners of the maneges may be marked by large stones or stakes of sufficient height ; and the same attention must be paid to making the corners square, as in the riding school.

By increasing the number of these maneges, and placing them near each other, one or two instructors in each, any number of men and horses may be worked under the superintendence of the commanding officer or chief instructor.

It is recommended that those non-commissioned officers and men who have been formed at the riding establishments of the gunnery schools, and of whom a favorable report has been made, should be frequently employed in conducting riding drills, in order that they may keep up their knowledge of the system.

2. *Preparatory Instructions.*

When the recruits shall have been practised in the elementary exercises of marching, turning, &c., on foot, and shall have attained a knowledge of the usual military terms and commands, they will commence their lessons in riding.

They may be instructed in squads of 12 or 14, on steady horses with stripped saddles and bridoons.

Their lessons at first must be short, and at all times gentle. With patience and mild treatment on the part of the instructor, and with a proper explanation of the use and object of the different aids, they will make more progress than by harshness and severity.

Recruits are to be taught to saddle and bridle their horses properly, and also the proper manner of leading them.

3. *Saddling when not in Draught.*

Saddle, stirrup, girth, etc., as before described, page

Breast-plate.—The upper edge of the rosette, or leather, three fingers above the sharp breast-bone. The breadth of the hand between it and the flat of the shoulder.

Breast-harness should hang horizontally from the slings, about 3 inches above the point of the shoulder, and should

admit the breadth of the hand between it and the horse's breast.

4. *Bridling a Horse not in Draught.*

Head collar and curb as before, see page .

Bridoon is to touch the corners of the mouth, but low enough not to wrinkle them.

Bit is to be placed in the horse's mouth, so that the mouth-piece be one inch above the lower tusk, and two inches above the corner tooth, in mares.

5. *Leading the Horse.*

The reins of the bridoon being taken over the head, are to be held with the right hand, the forefinger between them near the rings of the bridoon; the spare end of the reins are then to be placed over the right hand.

When leading through a doorway, the man placing himself in front of his horse, and taking one rein in each hand, close to the rings of the bridoon, steps backwards; taking care that the horse's hips and appointments clear the posts of the door. When the horse is through, he places himself on the near side, as before.

In passing an officer the man will march at attention, and look towards him, keeping his horse's head as high as his own breast.

The squad having led their horses into the riding-school or manege, and formed in line, at open files, each man standing on the near side of his horse, toes in a line with the horse's forefeet, will receive the word.

Reins over.—The reins are brought over the horse's head, and placed upon his neck, the man taking hold of the bridoon rein near the ring of the bridoon.

Stand at Ease.—The right arm is passed through the bridoon rein, both hands brought together in front of the body, right foot drawn back six inches and left knee bent. When wearing swords, the left hand is placed on the hilt of the sword.

Attention.—The position of the man as at foot drill, but holding the left bridoon rein near the ring of the bridoon, with the right hand raised as high as the man's shoulder; toes in a line with the horse's fore-feet, left hand hanging down by the thigh. When with swords, the sword is brought perpendicular by the side, with the left hand extended downwards, fingers behind, and thumb in front of it; the shoe of the scabbard should be in front of the heel of the boot.

'In front of your Horses.—A full step forward with the right foot turning to the right-about, on the ball of it, taking the bridoon reins in each hand near the rings of the bit, raising the horse's head to the height of the man's shoulder, six inches from his breast, and making the horse stand even. In this position a man shows a horse to an Officer when halted. In leading horses for inspection the horses are to be turned to the right-about.

Dress.—When fronting the horses, dress to the left, if the right would be the flank dressed to when mounted, and *vice versa*.

Stand to your Horses.—A full step forward, with the right foot to the horse's near side, and turn left-about on the ball of it. Standing to the off side is only done when off side is mentioned, the man steps in with his left foot, and turns right-about, and in fronting again, he steps out with his left foot, turning left-about.

6. Mounting with Stirrups.

Prepare to Mount.—[In Four Motions.] *One.*—Turn to the right on the left heel, place the right foot opposite the stirrup, parallel to the side of the horse; heels six inches apart; take the bridoon rein equally divided in the left hand, and the bit reins in the right hand, placing the little finger of the left between them (the bridoon is to be taken in the same manner as the bit reins when used singly); place the left hand below the right on the neck of the horse, about twelve inches from the saddle.

Two.—The right hand draws the reins through the left, and shortens them, so that the left has a light and equal feel-

ing of both reins, in the horse's mouth ; the right hand remaining over the left.

Three.—The right hand throws the end of the reins to the off side, takes a lock of the mane, brings it through the left hand, and twists it round the left thumb ; the left hand closes firmly on the mane and reins, the right hand now quits the mane, and lays hold of the left stirrup leather, with the fingers to the rear.

Four.—The left foot is raised, and put into the stirrup, as far as the ball of it ; the right hand is placed on the cantle, and the left knee against the saddle, on the surcingle ; the left heel is to be drawn back, in order to avoid touching the horse's side with the toe.

Mount.—[In Three Motions.] *One.*—By a spring of the right foot from the instep, rise in the stirrup ; bring both heels together ; knees firm against the saddle ; heels drawn back a little, the body erect, and partly supported by the right hand.

Two.—The right hand moves from the cantle to the pommel, and supports the body while the right leg passes clear over the horse's quarters to the off side ; the right knee closes on the saddle, and the body comes gently into it.

Three.—The left hand quits the mane, and the right the pommel, the bridle hand takes its proper position ; the right hand drops by the thigh, without stiffness, the back of the hand outwards, fingers half closed.

The right foot takes the stirrup, without the help of hand or eye.

When the squad is to Dismount, the command is given—

Prepare to Dismount.—If in close order, the even numbers rein back one horse's length ; dress to the right ; the whole then proceed with the preparatory motions.

Prepare to Dismount.—[In Three Motions.] *One.*—The right hand takes the rein above the left ; the right foot quits

Two.—The right hand holding the rein, the left slides forward upon it, about twelve inches from the saddle, feeling the horse's mouth very lightly.

Three.—The right hand drops the end of the reins to the off side, takes a lock of the mane, brings it through the left hand, and twists it round the thumb, the fingers of the left hand closing firmly on the mane and reins; the right hand is then placed on the pommel; the body erect.

Dismount.—[In Four Motions.] *One.*—Supporting the body with the right hand and left foot, the right leg is brought gently (without touching either the horse's hind quarters or the saddle) to the near side; heels close; the right hand on the cantle, to preserve the balance of the body as in mounting.

Two.—The body is gently lowered, until the right toe touches the ground.

Three.—Resting on the right foot, the left stirrup is quitted and the left foot is placed in a line with the horse's fore-feet; the hands remain as in the former motion.

Four.—Both hands quit their hold; the man turns to the left on the left heel, and brings the body square to the front. During the turn, the right hand lays hold of the bridoon rein near the ring of the bit, and raises the horse's head as high as the man's shoulder.

7. To Mount on the Off Side.

Mounting and dismounting on the off side has to be practised by the gunners on the off horses. It is the converse of the above; gunners do not wear swords.

Officers and mounted N. C. Officers, when compelled to mount on the off side, throw the sword well behind the left leg after rising in the stirrup; when mounted, the sword to be brought to the near side.

8. To Dismount Off Side.

The converse of dismounting on near side when the sword is worn, it is to be passed behind the man's back to the off side.

9. Mounting and Dismounting without Stirrups.

This is sometimes necessary in coming into action, and with a restive horse, and is the safest plan for an active man.

Without Stirrups—Prepare to Mount.—Turn to the right, step six inches to the right, and close the left heel; the reins in the full of the left hand, on the pommel, the right hand on the cantle.

Mount.—Bend both knees, spring from the insteps, by which the body is raised to the centre of the saddle, rather leaning over it; by a second spring of the arms raise the body till the arms are straight.

Carry the leg over the horse, and fall lightly into the saddle, the right hand being carried from the cantle to the pommel.

Both hands then assume their proper position.

Without Stirrups—Prepare to Dismount.—Quit the stirrups if in use, both hands holding the reins, are placed with the fingers and thumbs extended on the pommel.

Dismount.—Raise the body out of the saddle by both arms, leaning forward, bring the right leg clear over the croup to the near side, and alight on the ground, the weight thrown on the toes.

The right hand lays hold of the bridoon rein as before.

The Recruits being mounted, and having been taught to take up the stirrups and to fasten them in front of the saddle over the horse's neck, by putting the off stirrup through the near stirrup leather, will be placed in the position without stirrups.

10. *Position Mounted—with Rein in each hand.*

The body balanced in the middle of the saddle; head erect and square to the front; shoulders well thrown back; chest advanced; small of the back slightly bent forward; upper part of the arms hanging straight down from the shoulder; elbows bent and lightly closed to the hips; little fingers on a level with the elbows; wrists rounded, throwing the knuckles to the front, and thumbs pointing inwards across the body; each hand holding a rein, between the third and fourth finger, the end thrown over the forefinger and the thumb closed on it, the hands about three inches from the body, and varying from four to six inches apart.

The thigh well stretched down from the hip ; the flat of the thigh to the saddle ; knees a little bent, legs hanging straight down from the knee and near the horse's sides ; heels well stretched down, the toes raised from the insteps, and as near the horse's sides as the heels.

A plummet line from the front point of the shoulder should fall 3 to 5 inches behind the heel.

This is the position halted, or at a walk ; at a trot the body must be inclined a little back, the whole figure pliant, and accompanying the movements of the horse.

The position with stirrups is the same as without, the heels well stretched down and lower than the toes. The foot kept in its place by the play of the ankle and instep, the stirrup being under the ball of the foot.

March.—In moving forward, the hands are to be eased by turning the little fingers towards the head of the horse ; when in motion the hands resume their position.

Halt.—A steady feeling of both reins, by bringing the little fingers towards the breast, nails turned upwards ; both legs closed for a moment, to keep the horse up to the hand ; hands eased as soon as halted.

Sit at Ease.—Drop both hands with the backs up on front part of saddle, fingers extended ; palms of hands on saddle ; reins retained between forefinger and thumb of each hand.

Make much of your horses.—If riding on the left rein, both reins are taken in that hand, and with right, pats of encouragement are given on the horse's neck ; if riding on the right rein, the left hand is used to caress the horse's neck.

If the command "*sit at ease*" is followed by the word "*sit easy*," the men may move their limbs, but must not lose their dressing.

On the word "*eyes front*" being given to men "*sitting easy*" they will at once assume the position of "*sit at ease*."

Attention.—The position described in the two first paragraphs must at once be resumed.

Rein Back.—A light feeling of both reins ; little fingers towards the breast, and pressure of both legs to raise the fore-hand, and keep the haunches under the horse ; ease the

reins after every step, and feel them again. This should seldom or never be practised on the circle.

To take the horse into the corners, the outward rein must be felt and the inward leg applied, still preserving the bend.

"Right or left Turn."—A double feeling of the inward rein, the outward retaining a steady feeling.

The horse kept up to the hand, by a pressure of both legs, the outward leg the strongest, to keep the haunches from being thrown out.

"Right or Left About."—A double feeling of the inward rein, and stronger pressure of the inward leg, supported by the outward leg and rein, the horse turning on his centre.

N.B.—By a turn about, the dressing is changed.

In turning to the right or right-about, the little finger of the right hand is to work towards the right shoulder; in turning left or left-about, the left little finger towards the left shoulder, upwards in both cases, to raise the fore-hand.*

In working to the right, the thumb of the inward (right) hand to be on a level with the little finger of the left; the inward rein one inch shorter, so as to let the rider see the horse's inward eye, and *vice versa*.

The squad halted by the wall or side of the manege, in file; *"Bend your Horses,"* play lightly with the inward rein. The bend should be from the poll of the neck. Bending and unbending should be gradual.

The motion of the inward hand in bending; or forming a horse's mouth, should be by turning the little finger towards

* A horse, thoroughly trained in a military manege, can be manoeuvred by a turn of the wrist and a pressure of the leg, but ninety-nine horsemen out of a hundred habitually move their horses by carrying their hand towards the side to which they wish to turn. The pressure of the reins against one side of the horse's neck will turn him from it, though most people think they turn their horses to the right by pulling the right rein, and *vice versa*, as in a riding school, when riding with a single rein in each hand. Few horses in Canada have a light mouth, from the fact that it is too cold to ride for pleasure in winter, they are therefore, driven in sleighs, and taught to bear on the bit in trotting fast; while in the country the driver commonly stands up, and leans the greater part of the weight on the bit. The proper aids have, however, been detailed for those who may have young horses to train as chargers.

the body, nails upwards, and resuming the position, alternately, by a movement of the wrist, not by easing and drawing back the hand by a motion of the elbow, which must be kept steady.

It must be well explained that lightness of hand consists in an almost imperceptible feeling and alternate easing of the bridle, according to the motion of the horse, by which the delicacy of the horse's mouth is preserved.

11. *Position of Bridle Hand, with the Bit.*

The upper part of the arm hanging straight down from the shoulder, the left elbow lightly touching the hip ; the lower part of the arm square to the upper ; little finger on a level with the elbow ; wrist rounded outward ; the back of the hand to the front, the thumb pointing across the body. The hand opposite the centre of the body, and three inches from it. The bridoon rein when working with the bit to be held in the full of the bridle hand, and apart from the bit reins. The top of the thumb firmly closed on the bit reins, which are divided by the little finger. The right hand drops by the thigh without stiffness, the back of the hand outwards, fingers half closed.

12. *Dressing.*

Dress.—The flank man, and the man next to him, being placed with their horses square, in line with the marker, with one yard between them, the remainder take up the dressing in succession from the flank to which the dressing is ordered, each keeping the same interval.

Bodies to be quite square to the front ; heads well up, and just turned enough to allow a glance of the eye towards the dressing point, so as to see only the surface of the face of the next file but one.

A correct position must be retained while dressing, whether halted, or moving ; and no attempt must be made to catch the dressing, by leaning forward, or back.

13. *Preparatory Sword Drill on Foot.*

The squad will be formed up at open files *standing at ease*,

the sword hanging by the sling, the palm of the left hand resting on the sword hilt, the right arm hanging by the side, the right foot drawn back six inches, the left knee bent.

Attention.—The sword to be brought upright by the side, the bottom of the scabbard resting on the ground, in front of the heel of the boot, the left arm extended, the hand round the scabbard, thumb in front, fingers in rear.

March.—Raise the sword smartly with the left hand at the first pace, without stooping or disturbing the position of the body, placing the forefinger below the lower ring of the scabbard, the thumb and remaining fingers round it, the hilt touching the back part of the arm.

Halt.—Lower the scabbard to the ground, as in the position of *attention*.

Draw Swords.—Raise the scabbard about six inches from the ground, with the forefinger under the top ring, the hilt slightly thrown forward, bringing the right arm at the same time smartly across the body to the sword knot, placing it on the wrist, and giving the hand a couple of turns inward to make it fast, and, as the handle is grasped, turn the hilt to the rear, and raise the hand the height of the elbow, the arm being close to the body; by a second motion draw the sword from the scabbard with an extended arm, the edge being to the rear, and sink the hand until the hilt is on a level with the chin, the blade perpendicular, the edge to the left, and elbow close to the body, which forms the position of *Recover Swords*; then by a third motion bring the swords smartly down until the hilt is on a line with the elbow, the arm close to the body, blade perpendicular, the edge slightly inclined to the left, which forms the position of *Carry Swords*; at the same time bring the scabbard to the side, in the same position as directed for *Attention*, before drawing swords.

Slope Swords.—Loosen the grasp of the handle, and let the back of the sword fall lightly on the shoulder.

Stand at Ease.—Keeping the sword at the *Slope*, resume in other respects the position of *Stand at Ease* before drawing swords, the right foot drawn back six inches, the left knee bent, the palm of the left hand resting on the top of the

scabbard. This position of standing at ease is always to be adopted on foot with swords drawn, both in the ranks and at open files.

Attention.—Come smartly to the position of *Slope Swords*, with the scabbard upright by the left side.

Carry Swords.—By a motion of the wrist and fingers, resume the grasp of the handle, so as to bring the blade upright, as before.

Return Swords.—Carry the hilt to the hollow of the left shoulder, the blade being kept perpendicular, and the back of the hand to the front, then, by a quick turn of the wrist, drop the point into the scabbard, and resume the first motion in *Draw Swords*; by a second motion let the sword fall smoothly from the hand, at the same time loosening the sword knot from the wrist; by a last motion come smartly to the position of *Attention*.

In marching with swords drawn, the scabbard is to be raised on the word *March*, and lowered to the ground on the word *Halt*, in the same manner as described for marching with swords not drawn.

The recruit having been perfectly instructed in drawing and returning his sword, will now be made acquainted with the strong and weak points of it; the *Fort* (strong) being the half of the blade near the hilt, the *Feeble* (weak), the half towards the point; indeed, a knowledge of these distinctions is very material, either in giving or guarding a cut; as much depends upon their proper application. From the hilt upwards, in opposing the blade of an adversary, the strength of the defence decreases in proportion, as the cut is received towards the point; and *vice versa*, it increases from the point downwards. The same grasp of the sword is to be retained throughout.

14. *The Sword when Mounted.*

Horses unaccustomed to the sword must be treated very gently and gradually familiarized with its use by the rider, who should never use it to strike his horse, nor use a riding whip, which will make a horse shy when the sword is raised,

mistaking it for a whip. The sword should be slung with the front sling so short that the hilt will hang close to the stripe on the left thigh—in this position the bridle arm below the elbow catches the sling and holds it down if the sword is stiff in drawing from the scabbard, the latter does not fly about if slung short and passed through the loop of the sabretache, as it will with a long sling. In returning the sword, if the edge is turned outwards, the blade comes across the mouth of the scabbard and steadies it to facilitate sheathing; while the forearm of the rider guides the back of the blade to the sheath, the handle is then turned in the right direction to allow the blade to drop home. It is dangerous to have the sword too loose in the sheath when mounted, as if jerked out in leaping, it falls on the hilt, which is heavy and presents the point to the horse's breast or belly, as he descends from the leap. The sabretache (which should contain a map of the country with roads marked) is worn with the front sling shorter than the rest. In walking the sword slings may be any convenient length. These seem small details, but few things make a man look more foolish than not being able to return his sword, and men are apt not to respect an officer who looks awkward on parade, no matter what his talents may be.

Draw Swords.—As before directed; except that the left hand holding the reins, does not quit its position to grasp the scabbard, which is prevented from rising (in the act of drawing), by the left elbow catching the front sling (as before described), the scabbard, after the sword is drawn, is left hanging by the sling.

Carry Swords.—The right elbow to touch the hip lightly; the wrist rounded so as to incline the edge slightly to the left; sword hand to rest on the thigh, the little finger in rear of the hilt.

Proving.—When proving the telling off with drawn swords at the slope, the sword hand is raised and extended straight to the front, the blade of the sword remaining on the shoulder with the edge up.

Slope Swords.—By bringing the lower part of the arms

square with the upper, and by bending the wrist upwards, and relaxing the 3rd and 4th fingers, the sword is allowed to fall back on the shoulder.

Sit at Ease.—The sword hand is lowered and allowed to rest on the off wallet, the bridle hand is dropped on the front part of the saddle.

Make much of your horses.—The blade of the sword near the fort is slipped between fore-finger and thumb of bridle hand, back of blade to the left, and so held with the reins, while the right hand is used to pat and caress the horse's neck.

Sit Easy.—If the command *Sit at Ease* is followed by the word *Sit Easy*, the sword blade will be lowered and placed between the fore-finger and thumb of the left hand, edge to the front, the right hand resting on the thigh, the men will then be permitted to move their limbs, but must not lose their dressing.

Eyes front.—On the words *Eyes front* being given to men *sitting easy*, every soldier will at once assume the position of *Sit at ease*.

Attention.—The position of slope swords is resumed by raising the sword blade, bringing the lower part of the arm square with the upper, the back of the sword on the shoulder. The bridle hand is raised to proper position.

When *Draw Swords* is ordered at the walk, the men remain at *Carry Swords* till ordered to *Slope*; when at the *Trot* or *Canter*, they come to *Slope* directly.

15. Rules for Markers.

When an officer or markers take up points for formation they draw swords; if marking for line, the hilt of the sword is to be held close to the right cheek, edge to the front; if for column the sword is to be at the *Recover*. On receiving the word *Steady* from the officer or sergeant-major dressing the points, they return swords.

In advancing in line, the directing officer extends his sword or sword arm to the front.

16. *Officers' Salute.*

The "*Carry Swords*," when on foot is to be the same as for Infantry. On the march when mounted (except when on the passing line in marching past) or when manœuvring, the sword is to be at the slope.

When the sword is at the "*Carry*," mounted (as in parade movements and on complimentary occasions), the position is with the hilt resting on the right thigh, the blade perpendicular, the wrist rounded so as to incline the edge slightly to the left, the grasp of the lower fingers slightly relaxed.

The salute on the march is to commence when at ten paces from the reviewing officer, taking the time from the officer on the right. The sword is then raised, by extending the arm to the right, and by a circular motion brought to the "*Recover*"; continuing the motion to the right shoulder, from whence the sword is lowered to the full extent of the arm, edge to the left, point about 10 inches from the ground. The time for completing the salute on foot is six paces of quick time. The same time is given for the salute when mounted, but the sword should then be held at the full extent of the arm, in a line with the knee, edge to the left, the thumb extended on the hilt. On the march, the above four motions, are slowly combined into one graceful movement. When at six paces beyond the saluting point the sword is brought to the *Recover* at one pace, and to the "*Carry*" on the following pace.

X 17. *Sword arm Signals.*

It may sometimes be advantageous to use the following signals, which can be made with the sword or arm :—

1. *March*.—Sword and arm extended horizontally in the direction intended.
2. *Right or Left take ground or incline*.—Sword and arm extended horizontally, hand in line with the shoulder, in the required direction.
3. *Right or left Wheel*.—Sword and arm extended, horizontally, then swept round a quarter circle in the required direction.

4. *Reverse*.—Sword and arm extended upwards, and circled round the head.

5. *Action*.—To indicate a position for action, or to be occupied, awaiting further orders :—arm and sword raised perpendicularly, and then lowered point to the ground ; body well bent down.

6. *Halt*.—Sword and arm perpendicularly raised over the head.

The officer making the above signals must face to the proper front of the force, and they should be made distinctly, holding the sword in the required position for several seconds, with the flat turned as most visible ; subaltern officers to repeat signals, except for action.

18. *Of Sights and Sounds.*

The horses must be gradually accustomed to the drawing and returning of swords, and firing, both mounted and dismounted.

The horse, being naturally afraid of these things, must not have his terror added to by harsh treatment. Patience, and gentleness being used, and the horse finding that these sights and sounds do him no injury, and are not accompanied by chastisement, he soon becomes familiarized with them, and sees and hears them without alarm. One minute's loss of temper, or violence, in the rider, may throw the horse back for a long time.

In all practices with arms, at first, suddenness of movement should be avoided, and everything be done smoothly and quietly. The morning and mid-day gun should be made the signal for a feed of corn to be followed by the trumpet sound ; the horses soon learn to like both.

Part VI.

TACTICAL.

Definitions—Standing Gun Drill—Manœuvres.

SECTION 1.

DEFINITIONS.

The tactics of Field Artillery cannot be separated from those of other arms, therefore an officer commanding a Field Battery must have a good knowledge of all arms.

A Rank.—Two or more soldiers placed side by side in line.

A File.—Two soldiers placed one behind the other in line.

Rank and File.—A term meaning strictly all men told off in the ranks, but generally used to denote corporals and privates.

Files.—This term is made use of to denote the strength of the frontage of a body of troops.

Fours.—Column of (infantry).—Four men abreast : 2 front and 2 rear rank men.

Fours.—Column of (cavalry).—Eight men abreast : 4 front and 4 rear rank men.

Fours.—Sections of (cavalry).—Four men abreast : front rank and rear rank alternately.

Half sections of (cavalry).—Two men abreast : front rank and rear rank alternately.

Section (infantry).—The $\frac{1}{4}$ th part of a company.

Subdivision (cavalry).—Half a division.

“(artillery).—One gun, with its detachment, horses and wagons complete.

Division (artillery).—Two subdivisions. The division bears the same relation to the battery, as the squadron to the regiment, the company to the battalion. The two guns of a division should never be separated.

“ (cavalry).—The $\frac{1}{4}$ th part of a squadron.

Company.—About 100 infantry soldiers, commanded by a captain.

Squadron.*—About 150 cavalry soldiers, commanded by a captain.

Troop.—An old and natural definition for a cavalry captain's command.

Battery.—Six guns (in Canada 4 guns with wagons, spare carriage, etc.) If a six gun battery has to be subdivided it ought to be subdivided into divisions, not half-batteries.

Battalion.—8 or 10 companies, (in the British Army) a regiment, sometimes with two battalions separately organized.

Regiment (infantry).—As above.

Brigade (artillery†).—Consists of two or more batteries. When more than three batteries are present, it is formed into brigade divisions, of two batteries each.

Brigade (cavalry).—3 Regiments.

Brigade (infantry).—3 Battalions.

Division of all arms.—2 Brigades of Infantry, 1 Battalion of Rifles, 1 Regiment of Cavalry, 3 Batteries of Field Artillery, 1 Infantry and Artillery Reserve Ammunition Column, 1 Company Royal Engineers, 1 Troop Military Police, Medical Department.

* A Squadron is supposed to consist of 2 troops with their respective captains, commanded by the senior. It is an unnatural cavalry unit.

† 6 or 7 batteries R. A., are formed into an administrative unit.

Army Corps.—3 Divisions. 1 Brigade of Cavalry, Corps Artillery, 5 Batteries (3 light, 2 heavy) in addition to Divisional Artillery. Army Corps Ammunition Reserve, in 3 Divisions. Corps Engineers:—1 Pontoon Troop, 1 Telegraph Troop, 1 Troop Military Police, Medical Department.

A Line.—Bodies of Troops placed side by side.

A Column.—Bodies of Troops placed behind each other. The term column or open column implies wheeling distance or such amount of space (between each body), as that the length, together with the breadth of the column, shall represent the frontage when wheeled into line.

Half Column.—A column closed up to half the distance laid down for column.

Quarter Column.—A column closed up with *six paces* distance clear between each body.

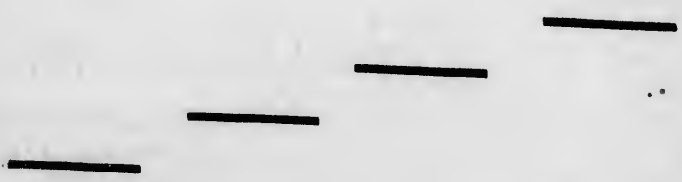
Column of Route (artillery).—A column formed with a front of only one carriage, and applies to line of march.

Double Column.—A formation of two columns.

A Line of Columns.—A line of two or more batteries, half-batteries, divisions, battalions or squadrons in quarter column.

Mass of Columns.—A column of two or more brigades, &c., in quarter column.

Direct Echelon.—Is when the line is broken into several parts, moving direct to the front or rear, in succession, thus:—



Oblique Echelon.—Is when the line is broken into several parts by wheels from line to column, less than the quarter

circle, so as to be oblique to the former front, and parallel with each other, thus :—



Alignment.—The line between two given points, or in prolongation of two points given as a base.

New Alignment.—The line on which the column is marching, after it has wheeled, or changed its direction.

Formation.—The act or method by which a body places itself in position.

Deployment.—The formation of line from column.

Flank.—The outer extremity of any body of men. Also the direction to either hand of a body moving.

Pivot.—The flank man or gun on which a body wheels.

Fixed Pivot.—When the pivot man or gun, during the wheel, turns upon the same ground.

Moveable Pivot.—When during the wheel the pivot man or gun describes a portion of a circle.

Pivot Flank.—In column of companies, batteries, half-batteries, &c., that flank on which the troops are working, and on which the officers commanding are posted.

Outer Flank.—The opposite flank to the pivot.

Point of Formation.—A fixed object or marker, on which a formation commences.

Base.—Two men placed at a distance apart, on which depends the proper frontage of a line, or covering of a column. "Alignment Base" is the term used in the former case ; "Covering Base" in the latter.

A "Base" Body.—Is that on which a formation is made, or, when in movement, that on which the dressing is thus—"Base Battery," "Base Division," or "Base Company." is

Fixed Base.—Standing base, on which the formation made.

Moving Base.—The base on which the dressing depends in movement.

Extent of Frontage.—The distance between the outer flank men of any formed body.

Depth.—Distance from front to rear.

Distances.—The space between bodies from front to rear.

Intervals.—The space between bodies from side to side.

A Horse's Length.—A term of measurement (8 feet).

Change of Front.—The throwing forward or back of either flank of a body on a fixed base.

Change of Position.—A line moving and re-forming altogether off its ground, to front or rear, either square to the former front, or with a flank thrown forward.

Close Order.—The ordinary distance between front and rear rank.

Order.—The increased distance taken by the rear rank on occasions of parade.

Dressing.—The act of correctly aligning on a base.

When the term "*Dress*" is used, it is the correction of an imperfect dressing; when "*Dress up*," it is for a rank to move up to and dress by another formed line.*

Covering.—The act of a body placing itself correctly in rear of another.

Oblique March.—Gaining ground to front and flank simultaneously.

Flank March.—Gaining ground to a flank only.

— **Taking Ground.**—Moving to a flank, each carriage or body of men, wheeling independently, at right angles to its previous position.

— **Wheeling or Shoulders forward.**—A body bringing forward a flank on a fixed or moveable pivot.

"*Right*" or "*Left*."—These terms are used to complete the wheel to the half or quarter circle, after having wheeled "*Half*" or "*Quarter*," "*Right*" or "*Left*."

Paces.—The denomination of different degrees of speed, also a measurement of distance.

* Guns can only dress up. If too far forward they must reverse and come up again.

Markers.—Non-commissioned Officers employed to give bases, and mark points.

Body of Direction.—Is the body on which the dressing or direction of the rest depends.

Alarm Post.—The place (previously indicated) where troops assemble when ordered to turn out suddenly.

Parade Movements.—The movements laid down for the inspection of a regiment or body of troops.

Parade Line.—The Line of original Formation, from which the Reviewing Officer is received and saluted.

Passing Line.—That opposite the Parade Line, the centre of which is the Reviewing Officer's Post.

Recruit, Squad, Arm and Sword Drills are found in Infantry or Cavalry manuals, and will not be dealt with in the present work.

INTERVALS.—1. Between files when formed in squadron, 6 inches from knee to knee.

2. Between the guns of a battery in line, full intervals, 6 horses 20 paces, 4 horses 15 paces.

3. Between squadrons in line. The breadth of a division, but never less than 12 paces.

4. Between cavalry regiments in line, or between cavalry and infantry in line, as for squadrons.

5. Between battalions in line, 80 paces.

6. Between batteries in line, or between artillery and other troops, 30 paces.

7. Between cavalry regiments in contiguous columns, as for squadrons.

8. Between battalions in contiguous columns, 12 or 30 paces, as ordered.

DEPTH OF TROOPS.—1. A regiment of cavalry, 2 ranks, in line at close order, 8 yards.

2. A battalion, 2 ranks, in line at close order, 2 yards.

3. A battery, in line at close order, with wagons, 34 yards. If without wagons, 15 yards.

4. A cavalry regiment, 4 squadrons, in quarter distance column, 56 yards.

5. A battalion, 10 companies, in quarter column, 65 yards.

EXTENT OF FRONT OF TROOPS.--1. The front of a squadron is equal to as many yards as it contains files.

2. The front of a battery in line, at full intervals, is calculated by multiplying 20 by one less than the number of its guns; *e. g.*, the front of a battery of 6 guns is 20×5 , or 100 yards.

2. The front of a company in paces is eight-tenths the number of files it contains.

MEMORANDA.--1. A regiment of cavalry in line, 4 squadrons of 150 men each, occupies a front of 350 yards.

2. Eighty-four guns (14 batteries) occupy about a mile.

3. Four batteries occupy about 500 yards.

4. The front of a battalion of 850 men in line is 300 yards.

5. A battalion of 850 men, in skirmishing order with 6 paces interval, covers about $1\frac{1}{4}$ mile.

6. A single company of 85 men, in skirmishing order with 6 paces interval, covers about 212 yards.

7. The following was the rule used by the Duke of Wellington in calculating the ground occupied by troops, and the time required to get them into position: "Every infantry soldier occupies 2 feet of front; therefore, as the men are in two ranks, every man may be said to occupy 1 foot; therefore 5000 men occupy a mile; and consequently it will require the same time that a man can march a mile to bring up the rear of a column of 5,000 men to the point from which the head started."

8. An infantry soldier carries 60 rounds of ammunition. At 2 shots a minute, this would be exhausted in half an hour.

9. A battery carries in the gun-limber 30 rounds of ammunition. At one shot a minute, this would be exhausted in half an hour.

A waggon contains 120 rounds of ammunition.

SECTION 2.

Drill.

GENERAL RULES.

I.

Instruction of the Recruit.—The instructors must be clear, firm, and concise in giving their directions. They must allow for the different capacities of the recruits, and be patient where endeavour and good-will are apparent.

2. Recruits should fully comprehend one part of their drill before they proceed to another. When first taught their positions, they should be properly placed by the instructor: when more advanced, they should not be touched, but taught to correct themselves when admonished. They should not be kept too long at any one part of their exercise. Marching without arms should be intermixed with the carbine instruction.

II.

Duration of Drills, &c.—Short and frequent drills are preferable to long lessons, which exhaust the attention both of the instructor and recruit. The recruits should be moved on progressively from squad to squad according to their merit, so that the quick, intelligent soldier may not be kept back by men of inferior capacity. To arrive at the first squad should be made an object of ambition to the young soldier.

III.

Mutual Instruction.—A system of mutual instruction will be practised amongst recruits; it gives the young soldier additional interest in his drill, and prepares him for the duties of a non-commissioned officer. Recruits should in turn, be called out to put their squad through the exercises which have been practised, and encouraged to correct any error they may observe. Lists of those who show talent for imparting instruction should be kept for reference.

IV.

Words of Command.—Every command must be loud, and distinctly pronounced, so as to be heard by all concerned ; for which reason it should be pitched half a tone higher than its wont.

2. Every command that consists of one word must be preceded by a caution : the caution, or cautionary part of a command, must be given slowly and distinctly ; the last or executive part, which, in general, should consist of only one word or syllable, must be given sharply and quickly : as

Battery—Halt : Half Right—Turn. A pause of slow time will invariably be made between the caution, or cautionary part of a command, and the executive word.

3. The words given in the *Extension Motions* and *Balance Step* must be given sharply, or slowly and smoothly, as the nature of the motion may require.

4. When the last word of a caution is the signal for any preparatory movement, it will be given as an executive word, and separated from the rest of the command by a pause of slow time ; thus, *Right—Form.* *Quick—March*, as though there were two separate commands, each with its caution and executive word.

5. When the men are in motion, executive words must be completed as they are commencing the pace which will bring them to the spot on which the command has to be executed. The cautionary part of the word must, therefore, be commenced accordingly.

6.—Officers and non-commissioned officers should frequently be practised in giving words of command. It will be found a good plan to practice several officers, or non-commissioned officers together, in giving words of command, first in succession, then simultaneously ; the time and pitch being first given by the instructor.

V.

In imparting instruction in Artillery drills, it should be borne in mind, that in every change of numbers, men have to learn different duties and to handle different implements from those they were previously engaged with ; the duties again vary with the several natures of ordnance, which are themselves divided into two classes : muzzle-loading and breech-loading. It is therefore impossible that such a variety of exercises can be well executed, unless the *object* of the various duties is comprehended.

Long explanations relative to the position of the body are to be avoided, the Drill Instructor should either place each man in the position he is to occupy in the performance of his duty, or himself show how the duty is to be performed.

Great patience and the utmost precision are necessary on the part of the Instructor. He should more especially endeavour to excite a spirited and active deportment in the squad ; and, above all, be particularly careful not to dwell too long on any one point in the drill. A portion, therefore, of each lesson should be devoted to theoretical instruction and to an explanation of the different parts of the guns, carriages and ammunition which are used, laying, preparing shells and fuzes, judging distances, and the use of the several projectiles at proper ranges. This instruction may be given at intervals during the time the ordinary drills are being learnt.

A thorough knowledge of the sights, and of the rules for applying corrections to rectify errors arising from difference of level of wheels, strong wind across or down the range, &c., is most essential, and also that the men should be constantly exercised in the same, so that in actual practice the proper corrections may be applied without hesitation. This subject is fully entered into at page 125.

On no account whatever should the Instructor allow the detachment to pretend to load or lay the gun. The essence of drill is that the Nos. should handle correctly the material belonging to the gun. To enable them to do this a dummy projectile cartridge and tube must be used every time the gun is loaded.

It is to be distinctly understood that no recruit is to go to practice until he has been well instructed in laying guns, in boring fuzes and in preparing shells.

In the service and exercise of the various descriptions of ordnance the same Nos., as far as possible, always perform the same duties.

The Instructor should ascertain that each No., is at his post by proving. This he does by calling out No. 1 "*Prove*," No. 2 "*Prove*," &c. The man called upon raises his right arm and extends it smartly to the front, hand open, thumb upwards, hand as high as the shoulder. When the next No. is called he drops his hand. The last No. lowers his hand at the word "*Down*."

On all occasions before giving a word of command, No. 1 should repeat the number of his gun.

At the sound or order "*Stand fast*," when a gun is loaded it will remain so, if in the act of being loaded, the loading will be finished and the gun not fired until the order to recommence firing is given.

Loading should be performed as rapidly as is consistent with the proper performance of all the duties, avoiding confusion.

The cartridge should be kept covered until the sponge is out of the bore.

The sponge, which should be fairly "high," should be kept well damped, as the loading is thereby facilitated.

If a shot jams in the bore, and cannot be got out by lowering the muzzle, the cartridge must be drowned and the charge blown out by the introduction of a small quantity of powder poured into the vent.

No gun is ever to be fired without the order of the No. 1.

When the order "*Cease Firing*" is given, the loaded guns are either to be discharged or unloaded, as the commanding officer may direct.

Whenever in the present regulations no special motions are prescribed for particular details of the drill, their performance must be left to the men themselves.

FIELD ARTILLERY FOOT PARADE.

It is not desirable to have two kinds of foot-drills in the Canadian Artillery, *i.e.*, Infantry for foot gunners, and Cavalry for dismounted drivers, as in the R. A., where men are enlisted for long periods of service ; therefore the Infantry formation by fours—which gives sufficient room for files wearing spurs—will alone be used to move Artillery on foot parades without guns.

SECTION 3.

N. C. Officers and Men Saluting.

Soldiers will be practised in saluting, first by Numbers then judging the Time ; being turned to the right for the right-hand salute, to the left for the left-hand salute.

Caution,—*Right-hand Salute, by Numbers.*

- | | | |
|------------|---|--|
| <i>One</i> | { | On the word <i>One</i> , bring the right hand smartly, but with a circular motion, to the head, palm to the front, point of the forefinger one inch above the right eye, thumb close to the forefinger ; elbow in line, and nearly square, with the shoulder ; at the same time, slightly turn the head to the left. |
| <i>Two</i> | { | On the word <i>Two</i> , let the arm fall to the side, and turn the head to the front. |

Caution,—*Right-hand Salute, judging the Time.*

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|---------------------------|---|---|
| <i>Right-hand Salute.</i> | { | On the word <i>Salute</i> , go through the two motions described in <i>One</i> and <i>Two</i> . |
|---------------------------|---|---|

Soldiers will be taught to salute with the left hand in like manner.

Soldiers, if standing still when an officer passes, will turn towards him, come to attention, and salute ; if sitting, they will rise, stand at attention and salute. When a soldier addresses an officer, he will salute, and halt two paces from

him. When walking, soldiers will salute an officer as they pass him, commencing their salute four paces before they come up to him; they should therefore be practised in marching, two or three together, round the drill ground, saluting points placed on either side of them, care being taken that they always salute with the hand furthest from the point saluted; when several men are together, the man nearest that point will give the time.

Soldiers will invariably salute anybody they know to be an officer, whether he is in uniform or not.

A soldier, with his sword undrawn, passing an officer, always salutes with his right hand.

Salute when Mounted.

1. When an Artilleryman mounted (but without arms) passes an officer, he should ride at *Attention*, casting his eyes towards him.

2. An Artilleryman with a sword drawn, if he passes an officer, should bring his sword to the *Carry*, casting his eyes towards him.

SECTION 4.

Instruction in Laying Ordnance.

EXPLANATION OF TERMS.

Before proceeding to instruct in laying, it will be necessary to explain everything connected with the sights and scales, also certain terms, such as axis of the gun, axis of the trunnions, line of fire, line of sight, trajectory, range, elevation, and depression, drift and lateral deviation, velocity, &c.

Should it be necessary to make use of such terms as parallel, right angles, horizontal, vertical, &c., they also must be explained.

The definitions in Gunnery are given at page

SIGHTS.

Field guns are sighted either with one muzzle and one tangent sight, or with two trunnion and two tangent sights.

The manner in which the sights are fitted to the gun should be pointed out.

Tangent sights are generally graduated with a degree scale on the front, a yard scale on the rear, and a fuze scale on one of the side faces. In some older patterns, tangent sights have only the degree scale (on the rear face): in such cases reference has to be made to the brass plate on the trail for the number of degrees of elevation corresponding to any given range. Some tangent sights, such as the 16-pr., have a slow motion screw at the head to give minutes of elevation; all are fitted with a sliding deflection leaf, capable of giving 30 minutes' deflection on either side.

TO ADJUST THE SCALE FOR ELEVATION.

The tangent sight is raised until the mark for the required number of yards is in line with the top of the socket in which the scale slides, and is then clamped.

TO ADJUST THE SCALE FOR DEFLECTION.

Deflection is given to the right or left of the zero point until the arrow points to the required number of minutes. The scale is then clamped. Deflection is always given on that side to which the shot is to be thrown.

As a practical rule each minute of deflection on the sight gives a difference of an inch in every 100 yards of range; thus, supposing that at a range of 2,400 yards a projectile has struck 12 feet to the right of the object it will be necessary to move the leaf 6 minutes to the left or give "six minutes left deflection" to correct the error, because 12 feet = 144 inches divided by 24 (the number of hundreds of yards in the range) gives 6.

TO LAY A GUN.

No. 1 having set his scale, lays with a full sight, *i.e.*, he brings the top of the notch, the apex of the fore sight, and the point aimed at, in line.

To ensure good laying, the following rules must be observed:—

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The eye not to be *less* than one foot in rear of the tangent scale notch, if possible more, and the distance between eye and notch not to be varied from round to round.

The head to be upright and the body in an easy position, supported, if possible, by holding on to, or resting on, the cascable.

The most conspicuous point in the object to be chosen to lay on.

The operation of laying to be completed as rapidly as possible, so as not to fatigue the eye.

The gun to be laid a little above the object, and then depressed on to it.

This ensures the breech being properly supported by the elevating gear, and guards against motion of the breech on the lanyard being pulled.

In laying a gun, avoid putting the back of the nail on the top of the sight, the hand to cover the eye, holding the tangent scale, or other peculiarity.

Much will depend on the Nos. who move the gun under direction of No. 1. With practice and intelligence they will readily understand when the gun is to be moved fast or slow, much or little. The word of command will be a guide to them. When loud they will work fast; when low, they will understand that the gun is nearly on the object, and must be moved gently.

Get a clear view of the object, and see that the gun is approximately in the line of fire before looking over the sights.

FIXED OBJECTS.

Lay on the point to be struck, as all allowances for wind, difference of level in trunnions, should be made on the scales, not by laying high or low, right or left.

When one wheel stands lower than the other, the gun will throw the shot towards the lowest side.

The rule for applying corrections in such a case is:—

Multiply the difference in level of the wheels in inches by the number of degrees of elevation for the range, for the

number of minutes' deflection to be given on the side of the higher wheel.

The wind has considerable effect in causing the shot to deviate to the right or left, and in increasing or reducing the range, especially at long ranges; by observing its strength and direction before commencing practice allowance can be approximately made for it at the first round.

The men should be practised, whenever practicable, in laying at such objects as troops (cavalry, artillery, and infantry), standing and in motion; houses, hedges, enclosures, batteries, entrenchments, &c., &c., as these are the targets likely to be met with on service.

MOVING OBJECTS.

No man ought to be allowed to fire at a moving object unless he has shown an aptitude for laying guns at a standing mark.

For beginners it will be convenient to move the object across the range in such a manner that the elevation may remain nearly the same; with skilled men the object can move obliquely across the range.

In firing at a moving object, four cases may occur, viz. :—

1. The object moving directly on the battery.
2. The object moving directly away from the battery.
3. The object moving across the front of the battery.
4. The object moving obliquely to the front of the battery.

The following points will have to be decided, viz. :—

- a. The direction of movements of the objects, with reference to the battery.
- b. The rate of movements of the objects.
- c. The ranges.
- d. The approximate time of flight of a projectile fired at the estimated range (a reference to the fuze scale will give this) in half seconds.

It is convenient to bear in mind that an object travelling at 4 miles an hour advances about 2 yards a second, 8 miles an hour, 4 yards a second, and so on; then, the time of flight

being known, it is easy to make the requisite allowance. The gun is laid sufficiently in front to allow of its being fired deliberately when the object arrives at the calculated distance from the line of sight.

Should the rate of progression of the object not exceed 6 miles an hour the requisite allowance may be made on the deflection scale, the rule being—Multiply the rate per hour the object is moving across the range by 5 for the number of minutes' deflection to give, at any range, on the side towards which it is moving. In this case the gun is fired as the object crosses the line of sight.

It must be remembered that, even on ordinarily level ground moving the trail may affect the elevation. No. 1, as soon as he has adjusted his scale, must place himself in prolongation of the line of sight, and step clear of the recoil as he gives the order "Fire."

It is found in practice that the principal errors are those of elevation, arising from the fact that on laying ahead, the gun is not truly on the line in which the object is moving. Errors in direction are principally due to variations caused by wind, the force of which should always be taken into consideration. It should be remembered that when firing at an object moving in the direction towards which the wind is blowing, less deflection is necessary than would be given by the rule above mentioned, and more if the wind is blowing in the opposite direction.

TO JUDGE DISTANCES.

As it is evident that the distance should be known in order to determine the required elevation and length of fuze, too much pains cannot be taken in instructing men to ascertain distances correctly.

In all positions there are many objects the ranges of which are known, men may therefore be constantly exercised in judging distances.

Range-finders have been generally introduced into the service; they should not be allowed to serve as an excuse for not teaching men to be quick at judging distances, but should

rather assist the instruction. Cases may arise where minutes may be of immense importance, and a readily guessed range of great use. Accident might also disarrange the instruments, and without knowledge much time and ammunition be wasted. Ground is most deceptive, and the apparent distance varies with light, &c., and very little can in reality be ascertained by a trial shot.

SECTION 5.

Standing Gun.— Drill with R. M. L. or S. B. Field Guns.

The detachment consists of 9 numbers (9, 13, and 16-prs.) and falls in two deep in rear of the gun, which is limbered up.

TO TELL OFF.

<u>Officer.</u>	|	<u>No. 1.</u>
<u>Tell off.</u>		

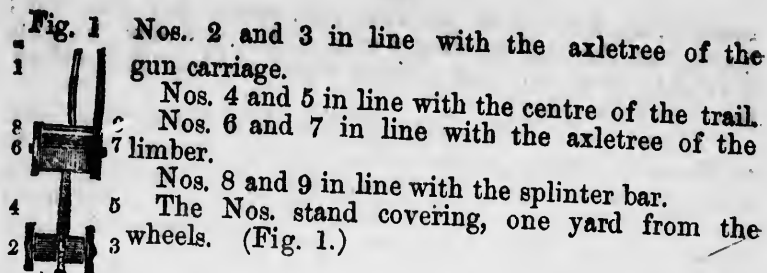
At "Tell off."—No. 1 (who is on the left of the detachment) takes a pace to his front, turns to his right, and numbers himself 1; the right-hand man of the rear rank numbers 2; the right-hand man front rank 3; the second man from the right of the rear rank 4; the man in his front 5; and so on; after the detachment is told off No. 1 falls in again on the left of the front rank.

No. 1 then straps on the fuze pocket on his right side, and 5 the tube pocket.

The front is that direction in which the gun is pointed when unlimbered, or to which, when limbered up, the horses' heads are turned.

POSITION OF DETACHMENT WHEN LIMBERED UP.
IN ORDER OF MARCH.

No. 1 in line with the point of the near shaft and two yards on the left of it.



IN. FRONT.

Two deep two yards in front of the shafts.

IN REAR.

Two deep two yards in rear of the muzzle of the gun.

RIGHT OR LEFT.

Two deep in line with the axletree of the gun carriage, one yard to the right or left of the wheel.

MOUNTED.

No. 1 on his horse; 2 and 3 on the gun axle seats; 4 and 5 on the limber; 7 on the off lead and 6 on off centre horse—8 between 4 and 5, when only 4 horses are in draught, No. 6 sits on limber box between 4 and 5.

The gun is never accompanied by its wagon under fire.

TO MOUNT.

Officer.

No. 1.

*Prepare to Mount.
 Mount.*

*Prepare to mount.
 Mount.*

"*Prepare to mount.*"—No. 1 runs to his horse, the other Nos. to their places, 2 and 3 to the gun axletree seats, 4, 5 and 8 to the gun limber, 6 and 7 to their horses, and 9 to the rear of the wagon body; the numbers that mount on the carriages seize the guard irons with their outward hands and place their

inward feet, 2 and 3 on the foot rest, which they pull out ; 4 and 5 on the trail handles, 6 or 8, as the case may be, puts his right foot on the spoke of the wheel, and his right hand on the top of the wheel

"*Mount.*"—The whole spring into their places (the Nos. on the gun limbers facing to the rear, but turning round to the front, lifting their feet close together, and throwing them over the guard-irons), and when seated lay hold of the hand strap with the inner hand, and guard-iron with the outer hand, and sit upright.

At the word "*March,*" the gunners seated on the ammunition-boxes and axletree-seats are to lay hold of the guard-irons with their outward hands, and when going over rough ground they should slightly raise themselves, so as to avoid being jolted.

"*Sit at Ease.*"—Drop the hand-straps, and sit well back, both hands remaining between the thighs.

TO DISMOUNT.

Officer.

No. 1.

Prepare to dismount.
Dismount.

Prepare to dismount.
Dismount.

"*Prepare to dismount.*" Nos. 2 and 3 drop the hand-straps, and place their inward hands on the gun and their feet in front of the foot rests ; Nos. 4 and 5, throwing their legs over the guard-irons, turn to the rear, the other Nos. stand up, keeping their outward hands on the guard-irons.

"*Dismount.*"—The whole jump off and form the order of march, but if for action, they go to their posts at the gun.

EXERCISE WITH DRAG ROPES.

When drag ropes are used Nos. 6 and 7 pass them towards 2 and 3, who hook them to the drag washers of the gun on their own side. The Nos. manning them on their own sides, No. 9, is in the shafts.

TO ADVANCE WITHOUT DRAG ROPES.

Nos. 2 and 3, between muzzle and wheel, push at the axletree boxes, 4 and 5 man the gun wheels, 6 and 7 the splinter bar, 8 and 9 assist at the points of the shafts.

CHANGE OF POSITION OF DETACHMENTS.

TO FORM THE ORDER OF MARCH FROM DETACHMENT FRONT.

Officer.No. 1.*Form the order of march.**Right turn, Double march.*

"*Right turn, Double March.*"—No. 1 turns with the detachment; 2 and 3 wheel to their right and open out. Each number halts when at his post; they turn to the front together, looking to No. 2, who turns about immediately he arrives at his station.

TO FORM THE ORDER OF MARCH FROM DETACHMENT REAR, RIGHT OR LEFT.

Officer.No. 1.*Form the order of march.**Left turn, Double march.*

When the detachments are in rear, or on the right, they proceed direct; but when on the left they countermarch to the left. No. 1 heads the rear rank. Each number halts when at his post.

TO CHANGE FROM FRONT TO REAR.

Officer.No. 1*Detachment rear.**Right turn Double march.**Rear turn.**Right turn, Half, Front.*

When the detachment is clear of the gun it turns to the rear; when in line with the position of "Detachment rear" it turns to the right, and when in rear of the muzzle it halts and fronts.

TO CHANGE FROM REAR TO FRONT.

Officer.*Detachment front.*No. 1.*Right turn, Double march.**Front turn.**Left turn, Halt, Front.*

When the detachment is clear of the gun it turns to its front, when in line with the position of "Detachment front" it turns to its left, and when in front of the leading horses it halts and fronts.

TO CHANGE FROM REAR TO RIGHT OR LEFT.

Officer.*Detachment, right (left).*No. 1.*Right (left) turn, Double march, Front turn, Halt.*

The detachment turns to its front when one yard clear of the gun wheel, and halts when in line with the axletree.

TO FORM DETACHMENT REAR FROM THE ORDER OF MARCH.

Officer.*Detachment rear.*No. 1.*Right about turn, Double march, Halt, Front.*

Nos. 2 and 3 close to the centre, and wheel to their left, marking time when opposite the off wheel and two yards from it, as soon as the detachment has closed up it is halted and turned to the front.

TO FORM DETACHMENT FRONT FROM THE ORDER OF MARCH.

Officer.*Detachment front.*No. 1*Double march,
Halt Front.*

No. 1 doubles out two yards in front of the near shaft, turns to his right, and gives the orders "*Double march.*" Nos. 8 and 9, followed by the other Nos., double out. As soon as 8 is clear of the shafts he inclines towards 9. When 8 and 9 arrive in line with No. 1 they wheel to their left and mark time. When the detachment is closed up, No. 1 gives, "*Halt Front,*" turning himself to the front at the same time.

TO CHANGE ROUNDS WHEN THE GUN IS LIMBERED UP.

The detachment being at the "order of March" in changing rounds,

No. 2 becomes No. 4.

" 4	"	" 6.
" 6	"	" 8.
" 8	"	" 1.
" 1	"	" 9.
" 9	"	" 7.
" 7	"	" 5.
" 5	"	" 3.
" 3	"	" 2.

TO UNLIMBER.

Officer.*Action, Front.**" (Right.)**" (Left.)**" (Rear.)*No. 1.*Action, Front.**" (Right.)**" (Left.)**" (Rear.)*

"Action Front."—No. 5 unkeys; Nos. 1, 4, and 5 lift the trail; 1 and 5 at the trail eye, 4 on the right of 1; 2 and 3 man the wheels. When the trail is clear No. 5 gives **"Limber—Drive on,"** the limber moves forward a yard, then reverses to the right, and the trail is carried round a half circle to the left, 1 and 4 shifting round the trail, as soon as the limber makes room, to avoid walking backwards. The numbers then place themselves as detailed for **"Action."** When the limber is sufficiently to the rear, it reverses to the right, and halts ten yards in rear of the trail eye covering the gun. The wagon reverses to the right, and when sufficiently to the rear reverses to the right again, and halts 4 yards in rear of, covering the limber.

"Action rear."—The gun is unlimbered by the same Nos. as in **"Action front,"** but the trail is not thrown round; the limber moves forward one yard, inclines to its left, and then reverses to its right, and halts ten yards from the trail eye covering the gun. The wagon inclines to the left, moves to the rear, and forms up four yards in rear of the limber.

"Action right."—Is the same as **"Action front,"** but the trail is carried round a quarter of a circle only, the limber drives on one yard, then takes ground to its left and reverses to its left. The wagon the same as the limber.

"Action left."—The trail is taken to the right, No. 5 shifting round the end as soon as the limber makes room.

The limber takes ground to its right and reverses to its right, the wagon the same as the limber.

In all unlimbering, except for **"Action left,"** 4 should shift round the trail as soon as it is unhooked, so as to avoid walking backwards—at **"Action left"** 5 must do so.

When there are no horses, 6, 7, 8, and 9 attend to the limber, No. 9 is between the shafts, 8 at the point of the near shaft, 7 at the point of the off shaft, and 6 in rear of the limber.

No. 1 is responsible for the correct dressing of his gun when it comes into action.

When a gun is limbered up the **"front"** is in the direction of the horses' heads, or points of the shafts; unlimbered, the **"front"** is in the direction of the muzzle of the gun.

POSITION AND GENERAL DUTIES.

No. 1 ships and unships the handspike, stands at the end of it, commands, bores and fixes fuzes when the shells are fuzed at the gun and hands them to 3, lays and lifts at the end of the handspike, in running up and back.

Nos. 2 and 3 stand outside and in line with the front of the wheels.

No. 2 sponges, rams home, and mans the right wheel.

No. 3 loads, uncaps, or removes safety pin from fuze when in the bore, serves ammunition from axletree boxes, and mans the left wheel.

Nos. 4 and 5 stand in line with the breech, outside the wheels.

No. 4 supplies 2 with sponge, replaces it on the trail, attends to vent, traverses at the end of the handspike, and mans the right wheel.

No. 5 makes ready, fires, and mans the left wheel.

No. 6 stands five yards in rear of the left wheel, supplies 3 with ammunition, hands shell to No. 1 when fuzed at the gun, lifts at the end of the handspike in running up or back when necessary.

No. 7 stands in rear of the off limber box, supplies cartridges and projectiles to 8, bores and fixes fuzes, when the shells are fuzed at the limber.

No. 8 stands in rear of the near limber box, supplies 6 with ammunition, and assists 7.

No. 9 attends to the ammunition wagon, and refills the gun limber from it when necessary. (Fig. 2.)



[GENERAL DUTIES WITH REDUCED NOS.

3 Nos.

No. 1 commands, attends to vent, lays, makes ready, and fires ; 2 sponges and rams home ; 3 loads and traverses.

4 Nos.

No. 1 commands, attends to vent, lays, makes ready, and fires ; 2 sponges, rams home, and traverses ; 3 loads and supplies himself with ammunition from 4 ; 4 stands in rear of the limber and supplies ammunition.

5 Nos.

No. 1 commands and lays ; 2 sponges and rams home, 3 loads and supplies himself with ammunition from 5 ; 4 attends to vent, traverses, makes ready and fires ; 5 stands in rear of the limber and supplies ammunition.

6 Nos.

No. 1 commands and lays ; 2 sponges and rams home ; 3 loads and supplies himself with ammunition from 6 ; 4 attends to vent and traverses ; 5 makes ready and fires ; 6 stands in rear of the limber and supplies ammunition.

After loading 3 gets another round from the No. at the limber and remains 5 yards in rear of the left wheel till the gun is fired.

7 Nos.

No. 7 supplies ammunition to 6. The other Nos. as before

ACTION.

*Officer.**Action.**No. 1.**Action.*

The gun being unlimbered at the word :—

"*Action.*"—No. 1 ships the handspike, satisfies himself that the gun and its fittings are in good working order, and that the bore and vent are clear.

No. 2 turns to his left, receives the sponge from 4, and remains facing the gun, with the sponge stave in his right hand, sloping at 45°. rammer head on the ground to the rear.

No. 3 turns to his right.

No. 4 turns to his left, steps in, unbuckles the sponge, and throws it over to 2, steps out again, and remains facing the gun.

No. 5 turns to his right, takes the lanyard out of his tube pocket, which is on his right side, and puts it under his belt.

No. 6 remains steady.

No. 7 prepares to issue ammunition.

No. 8 assists 7.

LOAD.

Officer.

Range—Yards.
With—Load.

*No. 1.**With—Load.*

"*Load.*"—No. 1 communicates the directions which he receives from the officer as to the nature of projectile to be

fired to 6 and 7, and when time fuzes are used, he either bores and fixes them himself, or instructs 7 to do so. He adjusts the scales of elevation and deflection, and, as soon as the gun is loaded, lays it as laid down at page 124. If the shell is fuzeed at the gun he receives it from 6, and hands it to 3.

No. 2 takes an oblique pace to the right with the right foot, then an oblique pace to the left with his left, then a side pace of thirty inches to his right; he then enters the sponge head into the bore, shifts his left hand back under to the right, straightens right knee, forces the sponge up the bore until his hands meet the face of the piece, shifts his hands to the rammer head, and forces the sponge hard home, bending over the left knee. He then gives the sponge two half turns by first lowering his wrist and then raising it, at the same time pressing the sponge against the bottom of the bore. He next draws the sponge out about half its length, at the same time straightening the left knee and bending over on his right; then again bending over the left knee, and shifting his hands to the centre of the stave he bends outwards, withdrawing the sponge, and with the left hand close to the head, turns the sponge, keeping the right hand fast, but turning the wrist, and throwing the sponge head upwards with the left hand, with which he seizes the stave at the rammer head. When No. 3 has put in a charge, uncapped the fuze, or removed the safety pin 2 introduces the rammer head, brings his hands to the sponge head, and forces the charge home in one motion, throwing in the weight of his body, both arms extended as far as possible so as to keep his body clear of the muzzle.* The charge is pressed home with one motion with as much force as possible. Directly the charge is home he springs the rammer by jerking it out with his right hand, and allowing the stave to slide through his hand; he then grasps it firmly in the middle with the right hand, and at the rammer head with the left, both knees straight, and steps back outside the wheel, first

* The mark on the rammer flush with the muzzle, denotes when the charge is home.

with his right foot, then with his left, and brings the right heel to the left ; he brings the sponge stave to the slope, and the left hand to the side in the first motion of stepping back, and remains facing the gun.

No. 3 slews his body to his right, and brings his hands together to receive the ammunition from 6, the cartridge in his right, the projectile in his left hand, backs of both hands down. As soon as the sponge is withdrawn he steps up to the muzzle, and puts in the ammunition, taking care that the choked end of the cartridge is next the projectile and that the seam does not come under the vent ; he then steps back to his former position. If firing shell he uncaps the fuze or removes the safety pin when the shell is in the bore. When shells are fuzed at the gun he receives them from No. 1.

No. 4 steps in, turns to his right, and places his left thumb on the vent, keeping his elbow raised, and his fingers on the left side of the gun, when 2 has sprung the rammer, places himself at once at the end of the handspike, and stands ready to traverse.

No. 5 prepares a tube.

No. 6 doubles back and gets a round of ammunition from 8, taking the projectile in his right and the cartridge in his left hand, back of both hands up, choke end of cartridge against base of projectile, the cartridge covered by the right arm carries them up and gives them to 3 ; he then returns to 8 for another round, and halts at his own station till the gun is fired. When shells are fuzed at the gun he hands them to No. 1, the cartridge to 3, and returns for ammunition.

No. 7 attends at the limber and issues ammunition. When firing shells to be fuzed at the gun, he loosens the plug ; if the shell is fuzed at the limber, he prepares and fixes the fuze. He should take care that the limber box is open as short a time as possible.

No. 8 assists 7 and issues ammunition to 6, which he gets from 7, holding the cartridge in his right, and the projectile in his left hand, backs of both hands down, choke end of cartridge against base of projectile.

TO LAY THE GUN.

Officer.

No. 1.
Trail (right).
 " *(left).*
Halt.

No. 1 looking over the sights, gives the necessary elevation with the elevating screw, and "*Trail right or left*" as required, then lowers the tangent scale.

No. 4 traverses with the handspike as directed.

If no order to fire should be given, No. 1 gives *Take post*, when the Nos. take post as detailed for "*Action.*"

TO MAKE READY AND FIRE.

Officer.*Fire one round.*No. 1.

No. *Ready.*
 No. *Fire.*
Run up or back
Halt.

At "*Fire one round,*" No. 1 gives the number of his gun and *Ready*, and steps clear of the wheel to that side where he can best observe the effect of his shot; 5 steps to the gun, and presses the tube into the vent with his right thumb; steps outside the wheel, shifts the lanyard to his right hand, and extends it looking to No. 1, keeping his hand level with the vent.

No. 4 resumes his position outside the wheel.

"*Fire.*"—No. 5 draws the lanyard strongly towards his body without a jerk, and replaces it under his belt.

In the event of a misfire, No. 5 will go round the front of the axletree on his own side, and from there put in another tube, keeping clear of the muzzle, resuming the position of *Ready*.

No. 4, after the gun has been fired, steps in and clears the vent.

As soon as the gun is fired, No. 1, if necessary, gives the

order "*Run up*," Nos. 2, 3, 4 and 5 man the wheels facing them, and turning them by means of the spokes, No. 1 lifting at the handspike, assisted by 6 if necessary, who places the projectile on the ground, and cartridge under his right arm. Should it be necessary to run the gun back, No. 1 gives "*Run back*," when the same numbers move the gun. At "*Halt*," each number returns to his place.

TO UNLOAD.

Officer.No. 1.Unload.

At drill as soon as the gun is fired No. 1 gives "*Unload*."

Nos. 2 and 3 man the wheels.

Nos. 1, 4, and 5 raise the trail until the drill ammunition falls out.

No. 9 takes back the ammunition to the limber.

When using a shell with lanyard, No. 3 hauls out the projectile and then mans the wheel.

TO CEASE FIRING.

Officer.No. 1.Cease firing.Cease firing.

"*Cease firing*."—No. 1 unships the handspike and buckles it on the trail, setting the scales at zero.

No. 2 throws the sponge over to 4, and turns to his right.

No. 3 turns to his left.

No. 4 receives the sponge from 2, putting the rammer head through the iron loop, buckles the stave on the trail, and resumes his position outside the wheel, turning to the front.

No. 5 turns to his left, and replaces the lanyard in the tube pocket.

No. 6 gives his ammunition to 8, and falls into his place.

No. 7 replaces ammunition ; if shells have been prepared

he removes the fuzes, screws in plugs, re-inserts the safety pin in the case of a percussion fuze, and replaces them in the boxes.

If any time fuzes have been bored they should be thrown away or destroyed, as also should any percussion fuzes the safety pins of which cannot be replaced.

No. 8 assists 7.

TO CHANGE ROUNDS IN ACTION.

Officer.

Change rounds.

No. 1.

Change rounds.

In changing rounds, No. 2 becomes 4, 4 9, 9 7, 7 8, 8 6, 6 1, 1 5, 5 3, 3 2.

TO LIMBER UP.

Officer.

Front, limber up.
(Right) "
(Left) "
(Rear) "

No. 1.

Front, limber up.
(Right) "
(Left) "
(Rear) "

Halt, limber up.

Limbering up may be done either to the front, rear, right or left.

"*Front, limber up.*"—No. 5 places himself at the trail eye, No. 1 on his right, 4 on the right of No. 1, they lift the end of the trail, carry it round a half circle to the left, and lower it gently to the ground. Nos. 2 and 3 man the wheels, if necessary assisted by 6 and 7. As soon as the trail is round, Nos. 2 and 3 get under cover between the muzzle and the wheels; 4 and 5 between the breech and wheels; 6 and 7 in front of 2 and 3; 1 in front of 4; the whole with their backs to the axletree. The limber comes up on the right of the gun, and when it is square, No. 1 gives "*Halt limber up,*" 4 and 5 lift the trail by the handles; 2, 3, 6, and 7 man the wheels. When the trail is on the hook, No. 5 keys, and the detachment forms the order of march.

"Rear limber up."—The Nos. perform the same duties, but the limber reverses to the left, as soon as it arrives at the trail, which is not thrown round.

"Right limber up."—No. 4 lifts at trail eye, No. 1 on his left, 5 on the left of 1; the trail is carried round a quarter of a circle and lowered to the ground, and the Nos. go under cover; when the limber is square they proceed as before.

"Left limber up."—The Nos. place themselves as for *front limber up*, and carry the trail a quarter circle to the left.*

SECTION 6.

Mounting and Dismounting Field Ordnance.

Guns of 9 cwt. can be mounted and dismounted by their own detachments; it facilitates the operation with heavier guns to have a few additional Nos.

When from the length of the gun the trail cannot be raised sufficiently high to bring the gun perpendicular, and so clear the trunnion holes, a hole must be dug to receive the muzzle

TO DISMOUNT GUN AND CARRIAGE.

Officer.

*Prepare to dismount gun
and carriage.
Dismount the gun.*

Dismount the carriage.

No. 1.

*Prepare to dismount gun.
Dismount the gun.
Lower the trail.
Run back.
Lower the gun.
Dismount the carriage.
Lift.*

"Prepare to dismount gun and carriage."—No. 1 removes or turns down and secures the elevating screw and removes tangent sights; 4 and 5 attach a drag rope to the cascable by an overhand knot in the centre, passing the ends to the front (with B. L. guns the knot is placed in front of the tapet ring, round the breech screw, and 3 removes the sponge

* The limber should never be backed, it is dangerous to the gun detachment, and the trail eye is liable to damage the limber boxes when backed on it.

bucket, placing it five yards to the left of the gun); 4 and 5 remove the sponges, drag shoe, and handspikes, 4 and 5 then go to the trail ready to lift; 2 and 3 remove the capsquares and man the wheels; 6 assists at the trail; No. 7 brings up a drag rope to 4; Nos. 1, 7, 8, and 9 place themselves in front of the gun and man the rope; Nos. 1 and 8 on the right, 7 and 9 on the left.

"Dismount the gun."—Nos. 4, 5, and 6 raise the trail; 2 and 3 man the wheels forward, until the gun is perpendicular.

When the muzzle touches the ground, Nos. 1, 7, 8, and 9 steady the gun on its muzzle, having hauled it out of the trunnion holes by the drag rope if necessary, and the carriage is run a few inches to the rear.

It is to be recollected, that after the gun is disengaged from the carriage the weight of the trail is much increased, and the men should be prepared for this.

"Lower the trail."—The trail is lowered; and at *"Run Back"* the carriage is run back by Nos. 2, 3, 4, 5, and 6.

"Lower the gun."—The drag rope is manned by all the Nos. on their own sides outside the ropes, and the gun is lowered by the Nos. walking forward with the drag rope. With B. L. guns No. 1 holds the lever to one side to prevent it being injured by the fall of a gun.

So soon as the gun is lowered, all the Nos. take post on their own sides, No. 1 facing the breech, and 2 and 3 being nearest to the muzzle.

"Dismount the carriage."—Nos. 2, 3, 4, and 5 lift the carriage, 2 and 3 in front with M.L. in rear with B. L., and 6, 8, 7, and 9 take off the wheels, 6 and 7 in front, 8 and 9 in rear, and at *"Lift,"* the carriage is lowered to the ground. No. 1 assists to lift the breast of the carriage.

Nos. 8 and 9 attend to the lynch pins and washers.

The limbers and waggons are dismounted in the same way, the boxes and shafts having been previously removed by the detachment.

When necessary the stanchions on the axle-tree boxes must be removed.

TO MOUNT GUN AND CARRIAGE.

Officer.*Mount gun and carriage.*No. 1.*Mount the carriage.**Lift.**Prepare to mount the gun**Lift.**Run the carriage up.**Raise the trail.**Lower the trail.*

The operation of mounting a carriage is the converse of the above, as also that of the gun, with the following exceptions:—

In mounting guns above 9 cwt., Nos. 2 and 3 place a handspike in the bore and lift, whilst 4 and 5 place a handspike under the gun behind the trunnions to be manned by 2, 3, 4, and 5; 6 and 7 then place the muzzle handspike under the breech to be manned by 6, 7, 8, and 9, the whole of the Nos. facing the muzzle. Additional Nos. man a drag rope placed on the cascable by 4 and 5, as in dismounting, a turn being taken round the handspike with either end of the rope, the running ends coming off below; the detachment lifts with the handspikes until it can more advantageously haul on the rope.

With guns under 9 cwt., Nos. 2, 3, 4, and 5 lift at a handspike under the gun, and No. 1 at the breech; 6, 7, 8, and 9 haul on the rope, placed as above, and when the gun is perpendicular Nos. 1, 7, 8, and 9 steady it.

TO REPLACE A DAMAGED WHEEL BY FULCRUM OR REDUCED NOS.*

Officer.

Right gun wheel disabled.
(Left) " "

No. 1.

Right gun wheel disabled.
(Left) " "
Scotch the sound wheel.
Raise the trail.
Lower the trail.
Change wheels.
Raise the trail.

"*Right gun wheel disabled.*"—No. 7 brings the spare swingle-tree (whimpltree) from the limber, hands it to No. 1 to use as a fulcrum, then doubles to the rear with 6, 7, and 8, to lift the spare wheel off the wagon perch, which must be unlimbered for the purpose; the centre or lead driver assists. As soon as the wheel is clear of the wagon, No. 7 runs it up to the gun, dish outwards, brings it opposite the damaged wheel and stands ready to assist in lifting it on, remaining in rear of the wheel.

"*Scotch the sound wheel.*"—Nos. 3 and 5 scotch the left wheel with trail handspikes or pieces of stone. If the ground is soft, 2 and 4 unhook the drag shoe, 2 places it under the end of the swingle-tree, which No. 1 places nearly perpendicular, the top leaning slightly to the rear as a fulcrum under the rear of the axle-tree bed, close to the damaged wheel.

"*Raise the trail.*"—Nos. 3, 4, and 5 raise the trail to enable No. 1, assisted by 2, to place the swingle-tree perpendicularly, as a fulcrum, with the end resting on the drag shoe, if the ground is soft.

"*Lower the trail.*"—The damaged wheel will be raised an inch or two from the ground. No. 1 removes linch pin and

* This shift can be done when the detachment is reduced to 4, as occurred at Inkerman, a shell breaking the top of a wheel and disabling nearly the whole detachment; the wheel was changed and the gun continued in action.

washer, and places himself in rear of damaged wheel to assist 6, who stands in front of it to lift it off. No. 2 stands in front of new wheel to assist 7 in putting it on.

"Change wheels."—The old wheel is taken off by 1 and 6, the latter runs it to the rear; 2 and 7 put on the new wheel; 1 replaces linch pin and washer; 7 and 8 help 6 to put the damaged wheel on the waggon perch, assisted by a driver as before.

"Raise the trail."—Nos. 3, 4, and 5 raise the trail. No. 1 releases the swingle-tree and lays it on the right of the trail, for 7 to take back to the limber after placing the wheel on the waggon perch. No. 2 replaces drag shoe, if used; 3 and 5 unscotch left wheel and replace handspikes, if used.

The Nos. then fall into their places.

The left wheel is changed in a similar manner, 2 and 4, 3 and 5 working on their respective sides, 2 and 4 scotching right wheel, &c.

If the wheel is so broken as to let down the axle-tree, or no swingle-tree is available, nor anything suitable for a fulcrum is at hand, the wheel can be shifted as follows:—

TO REPLACE A DAMAGED WHEEL.

Officer.

No. 1.

Right gun wheel disabled.
(Left) " "

Right gun wheel disabled.
(Left) " "
Lift.
Lower.

"Right gun wheel disabled."—No. 1 removes the linch pin and washer, and places himself in rear of the right wheel, ready to lift it off the axle-tree. No. 4 takes the handspike, and passes one end of it from rear to front under the axle-tree to 2 and 3, who man it on that side. No. 5 double mans it on the side of 4. The whole place themselves with their backs towards the gun.

Nos. 6, 7, and 8 double to the rear, and with 9 lift the spare wheel from off the perch of the wagon. As soon as the wheel is clear of the wagon, No. 7 runs it up to the gun dish outwards, and when it is opposite the right wheel he halts and changes from the rear to the front of it, ready to assist in lifting it on. No. 6, as soon as the wheel is off the wagon, doubles up and places himself in front of the disabled wheel, ready to assist No. 1 in lifting it off. Nos. 8 and 9 place themselves outside the left wheel.

"*Lift.*"—Nos. 2, 3, 4, and 5 lift at the handspike until the wheel is off the ground. Nos. 8 and 9 lay hold of the top of the left wheel, and use their weight and strength in bearing the right wheel from off the ground. Nos. 1 and 6 lift off the wheel, which is immediately run to the rear by 6, and No. 1 shifts to the rear of the new wheel. Nos. 1 and 7 lift the new wheel on to the axle-tree, and as soon as it is on, No. 1 gives "*Lower,*" 2, 3, 4, and 5 withdraw the handspike, which 4 replaces. No. 1 puts on the washer and linch pin, and 6, 7, 8, and 9 double to the rear and lift the disabled wheel on to the perch of the wagon.

The Nos. then fall into their proper places.

The left wheel, when disabled, is changed in a similar manner, except that the wheel is brought up on the left side of the gun instead of the right, and Nos. 3 and 5 next to axle-tree box.

The Nos. at the handspike must raise the end of the axle-tree sufficiently high to throw the weight on the other wheel, and the wheel must be lifted and not slid along the axle-tree.

With guns above 9 cwt. a drag rope brought up by No. 6 is made fast to the shoulder of the axle-tree of the disabled wheel by 2, and passed over the other wheel to four Nos. of another gun detachment.

A shaft brought up by No. 8 and placed by 4 is manned by 2, 3, 4, 5, 8, and 9.

As the wheels of a light battery are all of the same nature, when a gun wheel is disabled in action, the wheel from the limber may be substituted for it, and the disabled wheel, if

quite unserviceable, can be replaced as soon as another can be brought up. If the wheel be not quite unserviceable, it may be put on the limber till a convenient opportunity for exchanging it; and should it be necessary to move the carriage a short distance, the wheel may be locked with a drag chain, the sound part on the ground.

TO EXCHANGE THE GUN AND LIMBER WHEELS.

The preparations at the gun are the same as before. At the limber the horses are taken out; Nos. 2, 3, 4, and 5 come from the gun, and assist in lifting the limber; 6 and 7 take off the wheel, and the axle-tree is allowed to come gently to the ground.

Wagon wheels are removed in the same manner as those of the guns.

TO SHIFT SHAFTS FROM DOUBLE TO SINGLE DRAUGHT.

Officer.

*Shift the shafts from double
to single draught.*

No. 1.

*Shift the shafts from double
to single draught.*

No. 8 fetches the hammer. No. 7 places himself between the shafts, props up the off one and assists No. 8 to shift the near shaft into the left loop; he bolts it and props it.

No. 8 removes the linch pin from the off axle-tree arm and the linch pin and washer from the arm under the limber.

No. 7 in the meantime straps up the prop of the off shaft, and then assists No. 8 to shift it to the right centre loop and on the arm underneath, where No. 8 replaces the linch pin and also the linch pin and washer on the off axle-tree arm. No. 7 keys up the shaft and straps up the near prop. No. 8 returns the hammer and the Nos. resume their places.

Should No. 9 be with the gun he can assist by holding up the shafts.

TO SHIFT SHAFTS FROM SINGLE TO DOUBLE DRAUGHT.

This is the converse of the above.

TO PUT ON THE DRAG SHOE.

On a gun wheel, Nos. 2 and 4 or 3 and 5 unhook the shoe, and throw it as much as possible under the wheel; and 2 or 3 buckles the strap round a felloe.

A wagon wheel is locked in a similar manner by Nos. 8 and 9. To unlock the wheels, the strap is unbuckled, Nos. 4, 5, or 9, with a hammer, knock down the top keepers, the chain runs out, and the wheel passes over the shoe. This operation must take place just before arriving at the bottom of the descent. The shoe is picked up by No. 2, 3, or 9, and hung on the hook by the ring on the breast of the carriage or rear of the wagon.

SECTION 7.

To Move Disabled Ordnance.

GUN WITHOUT A WAGON ; CARRIAGE DISABLED.

Officer.

Carriage disabled.

No. 1.

Dismount the gun.

Sling the gun.

Dismount the carriage.

Prepare to lift the carriage.

Place the wheels and lash.

"Dismount the gun."—As before detailed.

"Sling the gun."—The horses must be taken out. The limber is run over the gun so that the breech may be towards the shafts and the trunnions under the limber hook. Nos. 2 and 3 put a handspike in the bore and raise it; 4 and 5 sling the gun with a drag rope, the returns are passed in rear of one trunnion and in front of the other, round the limber hook, and the end passed to the front to 6 and 7, who place a half hitch round the cascable (if a B. L. gun, round

the tappet-ring), then pass the end over the centre futchel in front of the footboard and make fast.

Nos. 2 and 3 bear down the muzzle when the end is passed to the front, until the breech is secured. Nos. 8 and 9 hold up the shafts.

"Dismount the carriage."—As before detailed; the cap-squares are replaced and keyed by Nos. 2 and 3, and guard-irons are removed by 2 and 3.

The carriage is then turned over by the whole of the Nos. with the trail towards the limber shaft.

"Prepare to lift the carriage."—Nos. 2 and 3 lift at the trail; 4 and 5 the cheeks close to the axle-tree; 6 and 7 the axle-tree arms; No. 1 steadies the shafts; 8 and 9 the breast.

The carriage is lifted trail first up the front of the limber until the trail is over the rear of the boxes; Nos. 2 and 3 then go behind the limber and all lift the carriage on the top.

No. 1 sees that the weight is properly balanced for draught.

"Place the wheels and lash."—Nos. 8 and 9 put on the linch pins and washers. The Nos. on each side place the wheels on the top of the carriage dish down.

Nos. 2 and 3 secure the trail to a handspike in the bore by the drag chain; 4 and 5 lash in rear to the box handles; 6, 7, 8 and 9 lash in front, 6 and 7 mounting on the footboard pass the breast chains (if there are any) over a felloe or spoke of each wheel; 8 and 9 hook a drag rope to the chain on their respective sides, and lash to the splinter bar. The side arms are strapped to the trail, one end resting on the limber boxes.

GUN WITH A WAGON; CARRIAGE DISABLED.

Officer.

Carriage disabled.

No. 1.

Dismount gun and carriage.

Prepare to lift.

Lift.

Place the wheels.

"Dismount gun and carriage and sling the gun."—As before stated.

The wagon and gun carriage are so placed that the rear of the waggon will be close to and in front of the trail.

The carriage is then turned upside down.

"Prepare to lift."—Nos. 2 and 3 place themselves at the trail ; 4 and 5 at the cheeks close to the axle-tree ; 6 and 7 at the axle-tree arms ; and 8 and 9 at the breast. At *"Lift,"* the carriage is lifted, and the trail rested on the footboard ; Nos. 2 and 3 then mount up and seize the trail handles, and at the next heave bring the trail on the rear box. Then lifting and moving forwards, they bring the trail eye near to the limber boxes, but not to touch them. In this position the trunnion plates might injure the lids of the boxes, but by placing a piece of wood three or four inches thick on the boxes it will raise the carriage clear.

Nos. 2 and 3 fix the trail to the perch of the wagon with the drag chain ; 6 and 7 lash to the futchels of the wagon.

"Place the wheels."—The Nos. on each side place the wheels on the top of the carriage dish down, and as far forward as possible, and they are lashed to the box handles by Nos. 2, 3, 4 and 5.

The spare wheel will have to be removed (if there is one on the perch), it can be carried with the others.

GUN AXLETREE ARM BROKEN.

Officer.

No. 1.

Gun axletree arm disabled.

Gun axletree arm disabled.

If it is required to retain a gun in action whose axletree is disabled, a stout spar, or, that not being procurable, a spare perch or a couple of shafts being available, either can be secured to the gun carriage. The drag-shoe being placed underneath to prevent the spar or shafts sinking, and to lessen the friction if required to move.

"Gun axletree arm disabled."—Nos. 2, 3, 4 and 5 take the spar (10 or 12 feet long) and pass it under the axletree bed, lashing it with drag-ropes to the ring on the breast of the carriage over the gun, or by lashing to the cheeks of the

carriage in front of the elevating screw. The remaining Nos. lifting the carriage on the side of the disabled axletree.

If it is necessary to move the gun any considerable distance, the mode given in page should be adopted.

GUN CARRIAGE, ONE WHEEL PARTIALLY DISABLED.

Suppose one or two of the felloes are disabled, the disabled felloes are turned up, and the drag-shoe placed as for going down hill.

Should there be no shoe, the wheel can be lashed to the trail to prevent it revolving.

Part VII.

INSTRUCTION OF THE BATTERY AND BRIGADE MOUNTED.

SECTION 1.

Intervals and Distances.

"*Intervals*" and "*distances*" are measured from Nos. 1 to Nos. 1, when limbered up, and from muzzle to muzzle when in action. Between files from knee to knee and nose to croup.

INTERVALS.

IN LINE.	Between files—	Six inches.		
"	Open files—	One yard.		
IN LINE.	Close interval.	Between	{	4 yards between
		Subdivisions		Nos. 1.
"	Half interval.	Between	{	9½ yards, with 6 horses.
		Subdivisions		7½ " 4 "
"	Full interval.	Ditto	{	19 " 6 "
"	"	"		15 " 4 "
		Between	{	A Subdivision interval
		Batteries		and a half, viz.
		and		28½ yards, with 6 horses.
		Brigades.	{	22½ " 4 "
"	Of Columns.	Ditto.		Ditto.

FRONTAGE.

The extent of Front of a Battery of Field Artillery is three subdivision intervals, plus the front of one subdivision, which in Field Batteries is three yards, an additional yard to be added for each extra file above this number.

With six horses, the extent of Front of a Battery of Field Artillery is 60 yards.

For every additional pair of horses in the gun teams 12 yards must be added to the frontage of each battery.

To find the frontage of a Brigade of Batteries, the number of yards is ascertained, by multiplying the frontage of a battery less that of a subdivision by the number in line, and adding a battery interval multiplied by one less than that number, and add the frontage of a subdivision; thus, for four batteries—

$$\text{Field Batteries, } 4 (60-3) + 28\frac{1}{2} (4-1) + 3 = 316\frac{1}{2} \text{ yards.}$$

DISTANCES.

Column of Subdivisions	{	19 yards with 6 horses.
“ “ Divisions	{	15 “ “ 4 “
“ “ Batteries and Brigades	{	38 “ “ 6 “
	{	30 “ “ 4 “
	{	85½ “ “ 6 “
	{	73½ “ “ 4 “

In column half an interval extra must be preserved between batteries.

Half column of batteries,	{	42½ yards with 6 horses.
Quarter “ “ “ or Divisions	{	36½ “ “ 4 “
	{	19 “ “ 6 “
	{	15 “ “ 4 “

“Column of Route”—generally includes wagons and spare carriages; the distance to be preserved in this case is 4 yards between the rear of one carriage and the lead horses of that immediately behind it.

DEPTHS.

The depth of a Column of Route of a Battery of Field Artillery without wagons is four subdivision intervals minus four yards; for every additional carriage with six horses 19 yards must be added, and for every horse by which the column is lengthened four yards.

In column of Route of a Brigade of Batteries, a distance of half a subdivision interval must be allowed between each battery, and calculated for accordingly.

PARADE INTERVAL.

Artillery is usually formed on the right or left of a line of troops, with an interval of $22\frac{1}{2}$, $28\frac{1}{2}$, or $32\frac{1}{2}$ yards according to the number of horses in the guns, whether four, six, or eight.

SECTION 2.

Parade.

TURNING OUT.

"*Boot and saddle*," is sounded half an hour before the "*Turn out*." The men must never turn out until the trumpet sounds for that purpose.

No man before turning out is to feed or clean his horse in his boots and spurs, a sufficient time will be allowed before he need begin to accoutre himself.

On the *Regimental call* being sounded the men of each subdivision will fall in on foot in front of their own stables, where they will be inspected by their Nos. 1, and the reports made to the sergeant-major. The mounted men of each subdivision will then be marched into stables ready to turn out when ordered, and the dismounted men marched to the Gun Park under the quarter-master-sergeant.

At the "*Turn out*" the subdivisions are formed up mounted in front of their stables, inspected by the Nos. 1, marched to the Gun Park by the subaltern officer on duty and hooked in. No. 1 puts on the fuze pocket, and No. 5 the tube pocket.

The officers will then inspect their divisions in the following manner:—" *Detachments rear* "—" *Draw Swords*," (open ranks); inspect every man, horse, and carriage, observing that each man has the whole of his appointments, that they are properly put on, and that the carriages are properly equipped, (then close

the ranks,) "*Return Swords*," and "*Sit easy*," and report to the subaltern on duty, who will then call the battery to "*Attention*" and tell it off.

TELLING OFF AND PROVING.

A Battery.

The Battery, limbered up, is told off by subdivisions and divisions, as follows :—

Number your subdivisions from the right. The Nos. 1 number the subdivisions. The battery is then told off.

1 and 2 *Right division.* 3 and 4 *Left.*

1 and 3 *Right subdivisions of Divisions.* 2 and 4 *Left.* 2 and 3 *Centre subdivisions.* (No. 2 is the subdivision of direction unless otherwise ordered.)

The battery is then proved by naming a subdivision, division or any individual number of the gun detachment. At the word "*Prove*," every man of the named subdivision raises the right arm as high as the shoulder, and extends it to the front, keeping it up until another part is ordered to prove. When the whole have proved, the word "*As you were*" is given, and the right arms are dropped. The word "*Sit easy*" is then given, and the report made to the commanding officer.

Should the original order of a battery in the field be changed either in line or column, it may be renumbered, in line from right to left, in column from front to rear. If this is not done it should cause no confusion ; all words of command apply to the then right or left, the right gun being always considered as No. 1. The muzzles of guns in action being the front, the horses' heads when limbered up.*

Spare carriages, when with the battery, form a third line in rear. Carriages covering their own subdivisions.

Officers must pay particular attention that all motions required of the soldiers are done with the same smartness as on the genera parade.

* In giving orders it is best for officers to speak of the leading, right, left or rear battery, division, subdivision or gun ; it prevents all chance of error and inversion is not of the slightest consequence to Artillery so handled.

A Brigade of Artillery.

The brigade having assembled in quarter column, the adjutant proceeds to tell it off by numbering the batteries from front to rear. He then names them No. 1 or Right Battery, No. 2 or Right Centre, No. 3 or Left Centre, No. 4 or Left Battery; the battery of direction and the two centre half batteries. The centre battery with an odd, and the right centre with an even number of batteries is the battery of direction in line, unless otherwise ordered. The brigade is then "proved" by naming any part of it previously numbered, in the same manner as laid down for a single battery.

When batteries in brigade lose their order the majors will renumber them, if ordered by the commanding officer, if not so renumbered the battery on the right (if in line, in front if in column) will be considered No. 1.

POSTS OF OFFICERS AND MOUNTED NON-COMMISSIONED
OFFICERS, &c.

Commanding Officer.

In line.—Three horses' lengths in front of the centre of line of officers commanding batteries.

Major.

In line, limbered up.—Three horses' lengths in front of the centre of the battery.

In column of batteries.—One horse's length in front, and three on pivot flank.

In column of subdivisions, or divisions.—Three horses' lengths on pivot flank of centre of battery.

The positions assigned to the major are those to be taken up when the formation is completed, while it is in progress his post is wherever he can best superintend and be heard by his battery.

Captain.

In line limbered up.—In the centre of the battery, in line with gun leaders.

Advance to order.—One horse's length in front.

In column of batteries.—As in line.

In column of subdivisions or route.—One horse's length on the outer flank of the centre of the battery.

In column of divisions.—Three horses' length from the centre on the outer flank.

In action.—He dresses the guns, assists the major in general superintendence.*

He dresses all points of formation, gives the word *Steady* when they have been correctly taken up and the formation complete.

Subalterns.

In line limbered up.—In the centre, between their subdivisions in line with the leaders of the guns.

Advance to order.—One horse's length in front.

When guns have to go to the rear of the alignment in order to obtain ground to form, the subalterns halt on the alignment.

In column of subdivisions or route.—One horse's length on the pivot flanks of the centre of their divisions.

In column of divisions.—In the centre, between their subdivisions in line with the leaders of the guns. In marching past, subaltern officers take order one horse's length in front of the centre of their divisions.

In close intervals.—A horse's length in front of centre of their divisions.

In action.—Superintending the guns of their divisions.

Adjutant.

In line, limbered up.—In centre of the brigade, in line with the leaders of the guns.

When there is an uneven number of batteries, one horse's

* When guns are merely manœuvring for parade purposes accuracy of dressing must be maintained, Nos. 1 looking to the gun of direction, and running up or back; but in taking up a fighting position a favorable emplacement is of great importance, the dressing of no consequence.

length from and on the off side of the officer in the centre of the centre division of the centre battery.

In advancing, in line one horse's length in front of the subdivision of direction.

In column.—Three horse's lengths on outer flank of leading battery in line with gun leaders.

In double column.—Three horses' lengths on outer flank of head of the column.

In echelon.—Three horses' lengths on the outward flank of leading battery.

Surgeon and Veterinary-Surgeon.

For inspection parade.—In line on the right flank, two horses' length from it in line with the lead horses' heads, in column, in rear. Non-combatant officers do not draw swords.

Brigade Sergeant-Major.

In line, limbered up.—In rear of the adjutant, in line with gun axles.

In column.—Covering the adjutant, in line with gun axles.

In advancing in line.—In line with the adjutant in front of the subdivision on his left.

Brigade Quartermaster Sergeant.

In line, limbered up.—In line with gun axles on left flank.

In column.—Covering quartermaster-sergeant of rear battery.

Battery Staff Sergeant.

In line, limbered up.—The sergeant-major one horse's length in rear of No. 1 subdivision. The quartermaster-sergeant the same in rear of No. 4 subdivision.

In column of batteries.—As in line.

In quarter column of batteries.—On the flanks of Nos. 1 and 4 subdivisions, in line with the gun axles.

In column of route, or column of subdivisions.—Sergeant-

major on the outer flank of the leading gun, in line with the leaders; the quartermaster-sergeant one horse's length in rear of the rear carriage.

In column of divisions.—The sergeant-major between the guns, in line with gun axles of the right, the quartermaster-sergeant between the guns of the left division, both sergeants covering the subaltern officers.

When the waggons are detached, the quartermaster sergeant is with the wagons. He keeps them as much as possible out of fire, and takes every advantage of ground and cover, but should never lose sight of his battery, and keep communication with it.

Artificers.

In line, limbered up.—The farrier, when mounted one horse's length in rear of No. 2 subdivision, and the shoeing smith in rear of No. 3 subdivision.

In column.—One horse's length on outer flank of No. 2 and 3 subdivisions, in line with gun axles.

The other artificers are told off in the gun detachments.

Trumpeters.

In line, limbered up.—One with commanding officer, the other one horse's length in rear of No. 3 subdivision.

In column.—One with the commanding officer, the other one horse's length on the outer flank of centre of the battery.

Nos. 1

Of Field Batteries are always mounted, except when in action, and during manœuvre remain on the left of the lead drivers of their subdivisions, who hold their horses in action, bring them up in limbering with 4 horses—with 6 horses this is done by the centre drivers.

Mounted Coverers

Of Field Batteries, on left of the leaders of the wagons.

Without waggons, covering the No. 1, and in line with the centre horse of the gun; they are then told off as gun numbers, in action the centre drivers hold their horses as the lead hold those of No. 1.*

COMMANDS AND SIGNALS.

All words of command should be given in a firm, loud, and explicit manner by the commanding officer, who should if possible be to windward of his command: they should be instantly repeated by the officers commanding batteries at brigade drill, and officers commanding divisions at battery drill, who then give their executive words of command. The Nos. 1 do not give words of command, except when subdivisions act independently, the executive words are then given by them. The bugle should be rarely used, except to order the pace, or when the battery is in motion, and never when acting with other troops. If there is a division without an officer, the senior No. 1 of that division commands it, and gives all divisional words of command, as well as the words for his own subdivision; he does not fall out, but remains on the left of his gun leaders.

The sword arm signals, as before described, should habitually be given with the word of command, which is often inaudible when the battery is on the move.

SECTION 3.

Rules for Markers.

GENERAL.

When the adjutant and markers take up points for formation they draw swords; if marking for line, the hilt of the sword is to be held close to the right cheek, edge to the

* In very heavy country and bad roads, Nos. 1 and coverers, and even a 3rd non-commissioned officer, may sometimes be hooked in with the breast harness, and form a team of 9 horses, 3 abreast, which is a very powerful system of draught when width of roads permit; when such draught is anticipated, as in a spring or autumn campaign, a short iron arm can be fastened on the near side of splinter bar, to which a swing-tree can be attached; in action the horses can be left in their places, the drivers holding the reins when the riders dismount.

front; if for column the sword is to be at the recover. On receiving the word *Steady* from the officer or sergeant-major dressing the points, they return swords. When the formation is complete and the word *Eyes Front* given, they fall in.

In taking up points for formation in line, markers face the new alignment, their horses' heads six inches from it.

In advancing in line, the adjutant and brigade sergeant-major raises their swords as high as the cheek, edge to the front.

For formations in column, the markers face in the same direction as the column, six inches from the pivot plank.

Markers as a rule do not take up points for action, should they be ordered to do so, the gun axles are to be dressed on them.

In forming up on parade with other troops both flanks of the front should be marked.

BATTERY.

The markers for a battery are the sergeant-major and quarter-master-sergeant, who are placed by the captain.* They mark for the points nearest to their position in the original formation.

In forming line or deploying from column, the marker of the base formed on places himself facing the No. 1 of the outer subdivision, the captain one horse's length on the outer flank facing the alignment. The other marker facing the No. 1 of the pivot subdivision.

In forming column, the marker nearest the pivot flank of the base places himself there, the captain one horse's length in front of and facing him; the other marker marks for the pivot flank of the division, which forms next in rear of the base.

* There are in the Canadian Artillery no divisional or subdivisional markers, who in the R. A. are mounted non-commissioned officers in charge of waggon teams. Where markers are particularly required for each subdivision, such as in forming for review with other troops, &c., the Nos. 1 can be ordered each to mark for his own gun, being dressed as before by the captains.



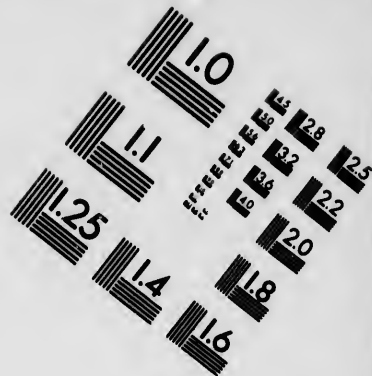
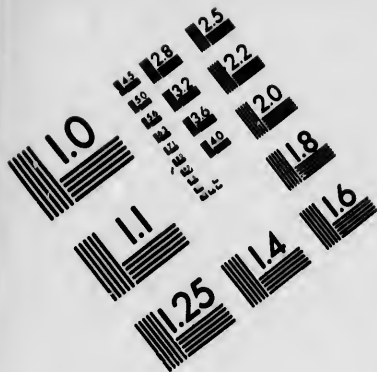
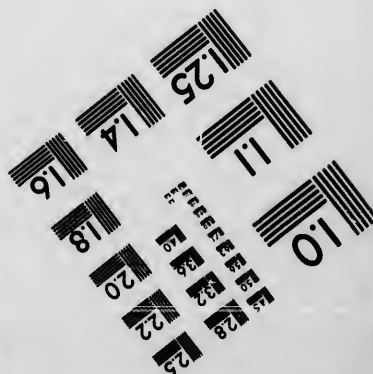
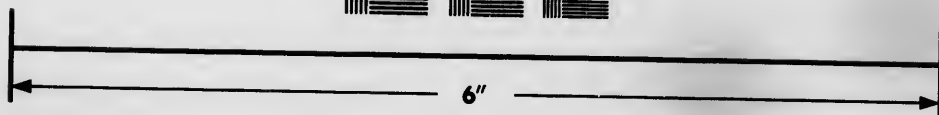
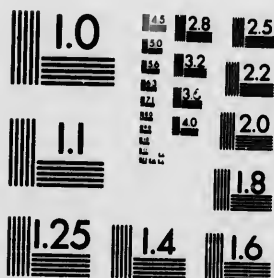


IMAGE EVALUATION TEST TARGET (MT-3)



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In changing front in line on a flank subdivision, if to the right, the sergeant-major marks for the right subdivision, the quarter-master-sergeant gives the other point. They are dressed by the junior subaltern, who is one horse's length on the left of the sergeant-major.

In changing front to the left, the converse is the case.

In changing front on a named subdivision, the marker nearest that subdivision marks for it, the other marker giving the other point, the junior subaltern one horse's length on the outer flank of the marker of the named subdivision dressing the points.

BRIGADE.

The markers employed in brigade movements are the brigade sergeant major, and the sergeant-major of each battery, who are placed and dressed by the adjutant. When the word "Marker" is used in the following movements it refers to the battery sergeant-major.

In forming line from column the base is given by the brigade sergeant-major and marker of the battery formed on, who place themselves opposite the Nos. 1 of the flank subdivisions of the base (the brigade sergeant-major opposite the left, the marker the right). The adjutant places himself on the outer flank of the base (unless he can dress a longer front from the pivot flank), corrects the direction of the base points, and dresses the markers, who mark for the subdivisions nearest the base, and should arrive at their places on the alignment, about 40 yards in advance of their batteries.

In forming column, the marker of the battery on which the formation is to be made places himself on the pivot flank, the other markers take their distances from him. The brigade sergeant-major faces the marker of the base battery, the adjutant places himself behind the brigade sergeant-major and corrects the covering.

In deployments the base is given by the brigade sergeant-major and marker of the battery formed on, who are placed at the head of the column by the adjutant. In other respects markers act as already laid down for formation of "Line from column."

In changing front the base is given by the marker of the battery formed on (who marks for the right subdivision), and the brigade sergeant-major (who marks for the left subdivision). The markers for the remainder mark for the subdivisions nearest the base. The adjutant superintends the dressing from the outer flank, unless he can dress a longer front from the pivot flank.

When a brigade in column enters a distant position, the adjutant marks the point of entry. When a column changes its direction, the adjutant marks the point where such change is made; if the changes are frequent, the brigade sergeant-major assists.

DRESSING.

The word "Dress" means to the hand to which the men are then looking; but when the dressing is to be to a different point, it will be expressed by the words "*Eyes Right*," "*Eyes Centre*," or "*Eyes Left*." When completed, the word "*Eyes Front*" is given, that heads may be turned square to the front.

In dressing, the horses stand straight to the front, and the men's bodies perfectly square, each casting his eye along the next man's face by turning his head in a very small degree towards the dressing hand.

A battery should always dress forward, and if too far advanced it must reverse, and come up to the alignment. When advancing in line, the No. 1 of the subdivision of direction will take up points on which to march, the Nos. 1 taking their intervals from and dressing by him. With unequal teams, viz., 6 and 4, the lead driver of the latter team dresses by the centre driver of the former.

After formation, when all is correct, the adjutant or junior subaltern, as the case may be, gives the word "*Steady*," and the commanding officer "*Eyes Front*," when the markers return to their proper places by the shortest route.

In movements in echelon, dressing is invariably by the flank advanced from or wheeled to, and the distance pre-

served from the preceding battery, division, &c. By attention to these two points the echelon when halted will be in a situation to come into action in any direction, or form line either parallel to the line it quitted or oblique to it.

In dressing in line at brigade drill, commanding officers face the centre of their batteries, with their horses' heads within six inches of the line. Each commanding officer gives the word "*Eyes Front*" as soon as his own battery is properly dressed, and the front of the next has arrived on the alignment; upon this word the commanding officer fronts and moves up to his post, three horses' length in front; the marker goes to the rear, and the men look to their front; but the base invariably remains posted until the whole brigade is formed, and the words "*Eyes Front*" given by the commandant. In resuming their posts commanding officers turn their horses right-about.

When the brigade is to be accurately dressed for purpose of parade, the caution is given "*By the battery of direction, dress;*" the brigade sergeant-major and marker of the battery of direction advance one horse's length in front of the flank subdivisions of the battery, and turn to the right-about, the commanding officer also turns to the right-about; the brigade sergeant-major and marker then raise their swords to give base, which is corrected by the adjutant; all markers then move out, and turning their horses to the right-about, take up their dressing from the base. On the word "*March,*" the subdivisions move steadily up with eyes to the centre. When the dressing is completed, the commanding officer gives the word *Eyes Front*; the whole resume their posts. A single battery is accurately dressed for parade purposes in a similar manner.

Dressing in line is by the subdivision or battery of direction.

In column or double column the left directs, unless otherwise ordered.

In successive formations of line each commanding officer gives the word *Eyes Front* as soon as his battery is properly dressed, and the next battery has arrived on the alignment; upon this word the marker falls in, but the base markers invariably remain posted until the line is formed, and *Eyes Front* given by the commandant.

For purposes of parade or review with other troops, the horses' heads are aligned with the contiguous infantry or cavalry, either in line or contiguous column. When it is required to come into action to fire a salute or any other parade purposes, the gun teams are advanced until the gun axles are aligned with the contiguous troops, the word being in this case. *Battery will advance for action, walk, march, halt, action front.* After firing a salute, they will rear limber up, retire, left reverse and come up square, dressing as before with horses heads on alignment of contiguous troops.

SECTION 4.

Manœuvres.

The first principle always to be remembered is that a battery has no fixed right or left, and only acknowledges the front to which the guns point when in action, or the horses face when limbered up.

Before commencing manœuvres, the commanding officer gives the order "*Off Gloves, Loop Swords.*" The gloves are placed on hook of sword belt, which is passed through both button-holes, the swords are then looped as follows: change reins from left to right hand, take hold of the scabbard at the top ring, pass the hilt from front to rear under both slings, point of the scabbard kept down; the sword is then hooked edge to the rear, the sword knot passed upwards under the waist belt behind the rear sling and drawn tight; reins are shifted from right to left hands. Officers, staff sergeants, and trumpeters do not loop swords.

The men on the carriages place their gloves in the pocket of the blankets underneath the straps.

The "*Trot*" is the pace of manœuvre, and should be regulated with reference to the slowest horse. It is, however, not advisable to start the trot from the halt without walking a few paces first. The word of command should therefore be, to commence all movements, "*Walk, March.*" When it is required either to *Trot* or *Gallop*, those sounds or commands will be given after *March*.

In all formations of either line or column, at any pace exceeding a walk, the word *Walk* is invariably to precede by a few seconds the words *Halt—Dress*.

If a formation is ordered when a battery is moving at the walk, that pace will be preserved by the "base" body, while the pace of each portion of the remainder will be increased or diminished as may be necessary, until the formation is completed; but if moving at the trot, and the formation is at the head of the column the pace of the "base" body will be diminished to the walk until the formation is completed, when the trot will be resumed.

Should a brigade or battery be moving when a formation is ordered, the "base" body will advance its own depth and halt; if forming line to the front from column, the rear of the column completes the formation by an oblique movement. If the caution "*On the Move*" is given the base body continues to move on at the original pace, while that of each portion of the remainder will be increased, or diminished, as may be necessary until the formation is completed; except when the formation is on the head of the column, when it will walk.

Artillery can be wheeled about on its own ground as far as frontage is concerned, but when acting with other troops, sufficient interval should be allowed on each flank to enable the subdivisions to wheel outwards if required. As a general rule when carriages reverse they do so to the left. For review or parade purposes it is more convenient for artillery to remain in the rear of any intended alignment until the other troops are finally formed, unless ordered to the front to cover the formation. In manœuvres they should always cover the formations, generally having to go to the flank or front to do so.

Although the admixture of guns of different batteries may be unavoidable on service, it is most desirable at drill that the battery as a unit should not be broken up. When it is not necessary the subalterns' divisional unit should never be broken up.

All formations of line from column, or column from line, are made at full intervals unless otherwise ordered, without

reference to whether the battery or brigade was at full or close intervals.

In all standing formations, either from line or column, the part next to that formed on makes two square movements, the next part inclines. In column, if the command "Form line" is given (and no flank named) the line is to be formed on the left of the head of the column.

When artillery is about to advance or retire through a line of infantry or cavalry, notice should be sent to the officer who commands it, that an opening may be ordered without confusion.

All officers should know the number of yards which the front of a battery or any of its component parts occupy, and be able, by the eye and the pace of their horses, rapidly to take up such distances.

In moving over rough ground it is desirable that the Nos. 1 should ride some distance in front of their subdivisions, in order to point out the best ground for the guns to pass over.

CARRYING GUN DETACHMENTS.

Gun detachments should be mounted under the following circumstances:

a. When rapid movements are intended.

b. When marching past at the trot, or galloping past.

When manœuvring No. 1 is mounted, two men will be carried on the axle-tree boxes, and three on the gun limber, and two on the off horses, as laid down. Even when wagons are horsed they should not accompany their guns, but should follow their movements at a distance of about a quarter of a mile, under the senior sergeant.

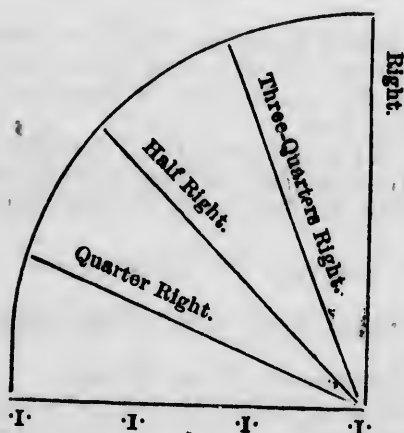
Gun detachments will be dismounted as often as circumstances will admit in order to ease the horses, but it should be equally borne in mind it is of great importance that the gunners working the guns should be brought into action as fresh as possible.

On ordinary marches, when action is not anticipated, the gunners should always march on foot.

LINE.

From line all formation of column will be in the rear of the named battery, or part of a battery, if the formation is on a central battery or part of a battery, those on the right will form immediately in rear of the base, and then those on the left.

CHANGE FRONT.



When a line is ordered to change front to a flank, by throwing a flank forward, such change is usually made on the flank subdivision, division or battery, which immediately changes front in the required direction and gives the base.

When a change of front is made by throwing a flank back, the base portion of battery changes front by wheeling up, the other batteries are reversed by subdivisions, conducted to a sufficient distance beyond the new alignment, again reversed, and move up into line.

A change of front may be made on any battery, the named battery changing front on its flank gun; or the change may be made on any gun of any battery.

A brigade or battery in line may advance or retire by subdivisions or divisions from the right or left of batteries, thereby becoming a column; moving to a flank in this formation it may pass obstacles or broken ground, without risk or disorder, or without material loss of distance in the general line.

ECHELON.

Direct echelon is formed by the successive march of batteries, divisions or subdivisions, to front or rear, and is particularly adapted to resist attacks in front or flank.

Oblique echelon is formed by wheeling batteries, or any part of them, less than a quarter-circle, so as to be oblique to the former front, and parallel to each other. It is used to gain ground to a flank while moving to the front. The distances and intervals should be carefully preserved.

CHANGE OF FRONT OR POSITION.

The changes of front in line are made by the echelon march of subdivisions, divisions or batteries, either to the front or rear, which are wheeled, half the angle ordered for the base, towards the new front, and are conducted to it by their inward flanks: on approaching their positions the wheel is completed and the line formed.

Changes of position from one distant situation to another are made either in line, by the direct echelon, by the oblique echelon of batteries or their parts, by battery columns or divisions or subdivisions. In changes of position by oblique echelon, the batteries or their parts wheel half the amount of the intended change, then move to the new position, where the base again wheels the required degree into the new alignment, and the formation is completed in the usual manner.

COLUMN.

In formation of line from column, the line may be formed on either or both flanks of the head of the column. In

column, if the command is "*Form Line*" the line is formed on the left of the head of the column. If it is intended to form the line on the right of the head of the column the command is "*On the Right, Form Line*." If the line is to be formed on both flanks, the portion which is to form on the right is that immediately in rear of the head of the column.

Deployments are similarly made from quarter columns and on the head of the column to either or both flanks.

Forming line from any position should be practised, for example, when the head of a column of divisions or subdivisions, has wheeled to the right, or left, to form line to the front or a flank before the rear divisions have entered the new direction. The word of command for the rear division depends on the position they may be in at the time the word to "*form line*" is given, and must be regulated accordingly.

Changes of direction in a quarter column must always be made on a movable pivot to enable the rear gradually to comply.

Distant positions, where circumstances will allow, are taken up by the march of the column, for this purpose the whole line wheels to the hand ordered, by batteries, half-batteries, or divisions, and moves off in a general column, which may also advance from the right, left or centre of the original line.

ACTION.

It is advisable at drill occasionally to take up fighting positions for instruction, the order being so given.

As a rule in coming into action, the range and projectile is named by the commanding officer, together with the flank from which the fire is to commence—generally from the leeward flank—an interval being allowed to elapse after firing the first gun, sufficient to observe the effect and alter the laying. This rule must be continued with the other guns.

Guns are brought as rapidly into action as possible, the inversion of the order in which they stand on parade, or the exact preservation of the interval or dressing, are matters of little importance when taking up a fighting position.

The nature of the ground governs the position of guns,

and every advantage should be taken of any cover which will protect the limbers from the enemy's fire without sending them too far to the rear.

The attention of officers in action should be principally directed to the effect of the fire of the gun, which should on these occasions be estimated on a selected object, the distance being judged or calculated, so that they may order any alteration required in the elevation or laying.

Previous to taking up a position the officer commanding the battery, or some one sent by him, should ride forward and select a suitable site for the battery to come into action.

A column expecting to be attacked on a flank will, of course, march with no greater front than subdivisions.

When a battery in line is ordered for action, the guns are not to be loaded until the word "*Load*" is given by the commanding officer, who will specify the nature of ammunition to be used. This must be loudly repeated by the officers, and instantly taken up by the Nos. 1, that no mistake may arise in the execution. The guns are not to be fired without orders.

No gun should be fired until the gun which formed next after it has been unlimbered, the limber reversed, and clear of the front.

When guns are in action and a change of front is ordered, the gun, or base named, on which the change is made, comes into action in the new direction at once; the other guns move at the word "*March*." When the ground admits, and the change of front is not a complete quarter-circle, the guns next the pivot gun are run up by hand.

When guns are formed in line for action, in succession, they are loaded and fired as soon as formed (unless directed to the contrary). They continue independent firing until "*Stand fast*" or "*Cease firing*" is ordered. If ordered to fire a certain number of rounds, the firing should commence from the right or left of batteries according to the wind; a regular and continued fire will thus be maintained.

The guns will remain in action until "*Cease Firing*" is given. Independent firing is never to be employed with blank ammunition.

On *Stand Fast* being ordered, guns then loaded are not to be fired off, but the detachments will await further orders.

On *Cease Firing* being ordered, all guns then loaded are to be fired off, and on no account is a gun ever to be limbered up when loaded.

Guns should be laid on some definite object, and it is only by concentration of fire that great results are obtained.

With the exception of case shot, the first few rounds at an unknown range must be trial shots, and should be fired slowly and carefully, even with blank, and the range at first should be habitually under-estimated, as it is more easy to correct the range when shot strike in front of the object fired at than beyond it. Independent fire should not be employed until the range is supposed to be thoroughly ascertained, and then only when a great effort is required. These ideas should be carried out habitually at drill, so as to accustom men to the requirements of war, and nothing should be practised in peace that would be impossible or disastrous in war.

When guns are in heavy ground they should be brought into action in the required direction by the word *Action Rear*, so as to save the gunners unnecessary labor; for a similar reason they should be limbered up to the rear.

To keep guns concealed as much as possible in such positions as the reverse side of slopes, &c., they should be halted, and the detachments dismounted under cover. Nos. 1, under instructions from their officers, advancing on foot, mark the exact position for their guns. When this has been done each gun should be moved to the spot indicated.

SECTION 5.

FIELD BATTERIES.

Inspection or Review.

FORMATION OF THE BATTERY FOR PARADE MOVEMENTS.

The battery is formed in line, limbered up, the detachments mounted.

The officers at order, viz., the subalterns one horse's length in front of the centre of their divisions, the captain in the centre, in line with the subalterns.

The major in the centre one horse's length in front of the captain.

The surgeon and veterinary surgeon two horses' lengths on the right of No. 1 subdivision, in line with the lead horses of the guns.

Trumpeters one horse's length on the right of the staff officers.

The sergeant-major one horse's length in rear of No. 1 subdivision; the quartermaster-sergeant in rear of No. 4; the farrier in rear of No. 2; the mounted shoeing smith in rear of No. 3 subdivisions; the spare horses between the subdivisions in line with the staff sergeants; the forge in rear of the sergeant-major, covering No. 1 waggon.

As the inspecting officer arrives about 40 yards from the commanding officer, he gives the word, "*General Salute*," "*Eyes Centre*," "*Draw Swords*,"* the time being taken from the commanding officer. Officers and mounted non-commissioned officers draw swords, the officers coming down, at the last motion, to the salute.

The band plays, or trumpets sound according to the rank of the inspecting officer, after which the officers recover and carry swords with the commanding officer.

* When parading with other troops swords may be drawn ready to join in the general salute.

Should the inspecting officer be under the rank of brigadier-general, he will be received with "*Eyes Centre, Draw Swords,*" the officers will not salute.

The commanding officer accompanies the inspecting officer while he makes his inspection.

As soon as the inspection has been made the commanding officer gives the word "*Slope Swords,*" Subalterns remain at order.

MARCHING PAST.

A Battery to march past in Line at Close Interval.

At the caution to "*march past,*" the captain marks the passing line by placing points as follows :

D ← 30 → C ← 40 → G ← 40 → B ← 12 ← E ← 30 → A

:	Passing line,	:
:	Parade line.	:

One of the gunners (the highest number) of No. 2 subdivision at point B, 40 yards on the right of the centre, facing the battery, and on a line about four yards in advance of that upon which the inspecting officer is supposed to place himself. The highest number of No. 3 subdivision places himself at C, 40 yards on the left of the centre, dressing by B, the captain posts himself at E, 12 yards beyond, until C is correctly dressed ; two gunners (the highest numbers) of No. 1 and 4 subdivisions move out to A and D, each outflanking the battery by about 30 yards, and dress by the points B and C. The captain proceeds to point A to superintend the covering.

The major gives the command "*The Battery will march past at close interval,*" "*Right take ground,*" "*Walk,*" "*March.*"

At the word "*March,*" the staff fall out, and do not again fall in with the battery, but must remain on the ground until the conclusion of the review ; the trumpeters take post for manœuvre.

When the head of the column arrives at the first wheeling point opposite A, the No. 1 of the leading subdivision gives the word "*Left Wheel*," and when the head of the column arrives at the point A the major gives the word "*Left take ground*," "*Close interval on 1*," upon which the rear subdivisions incline to their right after taking ground and move up to close interval at an increased pace, the subalterns taking post one horse's length in front of the centre of their divisions.

The major in the centre, one horse's length in front of the subalterns.

If there are only two subalterns, they march past in front of the centre of the flank divisions. Should there be only two officers with the battery, the second marches past in rear of the major.

The sergeant-major marches past in rear of No. 1, quartermaster-sergeant in rear of No. 4; the farrier in rear of No. 2, and the mounted shoeing smith in rear of No. 3 subdivision; the senior trumpeter one horse's length on the outer flank of, and dressing with lead horses of the guns (where he goes, on arrival of the battery at the point B); the other trumpeter in rear, in line with the staff-sergeants; the spare horses between the subdivisions of the divisions to which they belong, in line with the staff-sergeants, the captain one horse's length in rear of the sergeant-major; the forge in rear of the captain, covering No. 1 wagon.

At the point B the major gives the word "*Carry Swords*," "*Eyes Right*," upon which the drivers salute.

At 10 yards from the inspecting officer, the officers salute, subalterns taking the time from the major.

As soon as the major has passed the inspecting officer he places himself on his right and "carries" his sword; at 10 yards past the inspecting officer, the subalterns "recover" and "carry" their swords, taking the time from the officer on the right; when the rear of the battery has passed the inspecting officer the major rejoins his battery.

At the point C the word "*Slope Swords*" is given by the senior subaltern, upon which the drivers throw back their whips, and the senior trumpeter falls out to rejoin the major.

At the point D the major gives the word "*Left Wheel*,"

also at the fourth wheeling point, and the battery is moved round to the point B.

RANKING PAST.

By Single File.

The battery being halted four horses' lengths short of the point B, on the command, "*The Battery will rank past, by Single File,*" the captain, or, in his absence, the sergeant-major, places himself on the right flank of the battery, and turns to his left to superintend the ranking off; the Nos. 1 move out three horses' lengths in front of their guns, the coverers half a horse's length in rear of them.

When there are no coverers Nos. 1 move out one horse's length.

The trumpeters place themselves in single file in front of the No. 1 of No. 1 subdivision; the subalterns in front of the trumpeters, the major in front of the subalterns.

The distance from nose to croup is half a horse's length.

The major then gives the word "*Carry Swords,*" "*Eyes Right,*" "*Advance by single file from the Right,*" "*Walk,*" "*March.*" At the word "*March*" they move off, No. 1 of No. 1 subdivision followed by his coverer, the remainder turn to their right, move up to the passing line, turn to their left in succession, and cover from the front, each No. 1 followed by his coverer.

The guns move off from the right, then the wagons and spare carriages, in succession. Four yards is kept between each carriage on the passing line, all covering from the front. The drivers salute without any word of command at the point B.

The shoeing smith, farrier, quartermaster-sergeant, sergeant-major and captain, rank past in rear of the rear carriages.

The officers salute in succession when within 10 yards of the inspecting officer. The major after passing the inspecting officer places himself on his right, as before. At the point C the drivers throw back their whips. At D, the senior

subaltern gives the word "*Front Form*," the battery reforms (no carriage leaving the passing line until it arrives at the point C), and when formed, "*Slope Swords*."

The major gives the word "*Left Wheel*," also at the fourth wheeling point, and the battery is moved round to the point B. Spare horses do not rank past.

TROTTING PAST.

The major gives the word, "*The battery will trot past*," "*March*." At the point B "*Carry Swords*," "*Eyes right*." He falls out as before. At the point C, "*Slope Swords*," is given by the senior subaltern.

The battery is then re-formed opposite the saluting point at full interval. The major gives the word "*Wheel into Line*," "*Carry Swords*."

Spare horses and carriages do not trot past.

SWORD EXERCISE.

The sword exercise is usually performed after the battery has marched past and formed up on the original ground.

The major gives the command, "*Form for Sword Exercise*," upon which the subalterns move out four horses' lengths to the front and halt. The Nos 1 place themselves one horse's length in front of the off leaders of their guns; the sergeant-major one horse's length on the right of, and the quartermaster-sergeant one horse's length on the left of, and dressing with the Nos. 1 and coverers.

"*Close to the centre*." "*March*." At the word "*March*" the Nos. 1 of the right and left subdivisions close to the centre by wheeling inwards, those of the ~~central~~ subdivisions forming up, two horses' lengths in front of ~~the~~ subdivisions, the remainder form up in succession. The subalterns move with, and form up one horse's length in front of them.

The sergeant-major follows the No. 1 of 1 and ~~covers~~ him in line. The quartermaster-sergeant follows and covers the coverer of 4.

- Hash -

The captain dresses the line from the right flank, and gives the word "*Steady*," the major orders "*Eyes Front*;" the captain remains on the right of, facing the line.

The major then gives the command, "*From the right of divisions to the front file, March*." The subalterns place themselves in front of the Nos. 1 of their right subdivisions, and lead the files to the front, all dressing by the right, maintaining their proper intervals from that flank and covering from the front.

When there are no coverers, an interval of three yards must be taken up and maintained ~~from~~ the right of divisions, as the leading file of each divisions advances.

The sergeant-major becomes the rear file of the right, the quartermaster-sergeant of the left.

The captain superintends the dressing; when sufficiently advanced the major orders "*Halt, Dress*." When the covering and dressing is complete he orders "*Eyes Front*;" the captain falls in two horses' lengths in rear of the centre.

The sword exercise is then performed, on the conclusion of which the major orders "*Front Form*," "*March*," "*Carry Swords*," "*Eyes centre*," "*Return Swords*," "*Take Post on your subdivisions*," "*Outwards Wheel*," "*March*." At the word "*March*" the sergeant-major and quartermaster-sergeant move towards the flanks of the battery, the Nos. 1 wheel together outwards in succession and follow them; the subaltern move with their divisions, all wheel up and halt opposite their proper position; they then move to the battery, dressing by the centre; the Nos. 1 halt at their guns; all come about together by signal from the captain, or, in his absence, the sergeant-major.

SECTION 6.

Formation of the Brigade for Parade Movements.

BRIGADE.

The Brigade is formed in line, the officers at order, as detailed for a single battery.

The commanding officer in the centre two horses' lengths in front of the lieut.-colonels.

The lieut.-colonels in the centre of their commands, two horses' lengths in front of majors of batteries.

The adjutant having dressed the line of captains and subalterns, places himself two horses' lengths on their right.

The brigade sergeant-major places himself in line with the lead horses of the guns, covering the adjutant.

The brigade quartermaster-serjeant one horse's length from, and in line with the gun axle on the left flank.

The brigade staff officers one horse's length on the right of the brigade serjeant-major.

All the trumpeters one horse's length on the right of the brigade staff officers.

When two batteries are inspected, they will be under the command of a lieutenant-colonel or the senior officer present.

When a brigade consists of more than three batteries, it should be told off in brigade divisions, and a lieut-colonel or other officer appointed to command each brigade division.

After the salute has been given, the officers commanding brigades, or brigade divisions, will post themselves on that flank of their commands to which the inspecting officer repairs, where they will receive him and accompany him to the extent of their commands, after which they will resume their original posts.

MARCHING PAST.

At the caution to "*March Past*," the adjutant marks the passing line in the same manner as laid down for a battery, the points being given by farriers and quartermaster-serjeants.

The commanding officer gives the word "*The brigade will march past in half column* (or column) of Batteries*," "*Close Interval*," "*Batteries Right Wheel*," "*Close Interval*," "*Walk*," "*March*."

The staff officers fall out, and the trumpeters rejoin their respective batteries. The trumpeter accompanying the commanding officer marches past half a horse's length to the

* Always at inspections and reviews unless otherwise ordered.

right or left rear of him, according to the flank the marching past is from.

If the brigade is to march past at half column distance, the majors of the rear batteries will give the word "*Trot*," and when they have gained their proper distance "*Walk*."

When the head of the column arrives at the first wheeling point opposite A it wheels to the left, and when within wheeling distance of the passing line it again wheels to the left, the other batteries following in succession.

If the brigade is to march past at full or half intervals, by divisions or half batteries, the batteries will take ground to the right, as detailed for a single battery.

In marching past the lieutenant colonels or officers commanding brigade divisions are two horses' lengths in front of the majors commanding the leading battery of their brigade divisions.

At "Reviews" and Field Days," the senior officers commanding the parade, and brigades, fall out after saluting, and place themselves on the right of the reviewing officer; lieutenant-colonels and majors remain with their brigade divisions and batteries.

At "Inspections," lieutenant-colonels and majors fall out and place themselves on the right of the inspecting officer.

The adjutant marches past two horses' length in rear of the right subdivision of the rear battery. The brigade sergeant-major in rear of the left subdivision dressing by the adjutant, the brigade quartermaster-sergeant and riding master, if not required by the commanding officer, will march past in rear of the centre in line with adjutant and brigade sergeant-major, dividing the interval, the brigade quartermaster-sergeant next the sergeant-major.

TROTting PAST.

The commanding officer gives the word "*The Brigade will trot past in Column of Batteries*," "*March*." Each battery trots past as detailed for a single battery.

The adjutant, the riding master, the brigade sergeant-major and the brigade quartermaster-sergeant as at the walk.

On arriving on the original ground the brigade is wheeled into line previous to commencing manœuvres.
Swords to be carried on wheeling into line.

SECTION 7.

Movements of a Battery.

FROM LINE.

The following instructions are for a battery of four guns, six horses in each carriage, without wagons:

1. FROM LINE TO COME INTO ACTION.

Commanding Officer.

Officers.

Nos 1.

*Action Front.**Action front.**Dismount*

At the word *Action Front*, given by the commanding officer and repeated by the officers, the Nos. 1 order their detachments to *Dismount*, when the No. 1 and gunners spring off the horses and carriages, the centre drivers of the guns lead the Nos. 1 horses to the rear; as soon as the trail is clear of the limber hook the Nos. 5 give the word *Limber Drive on*, and the limbers reverse as laid down in the instructions for drivers, and proceed to the rear, dressing by the left, the staff sergeants go to the rear with the limbers; the sergeant major, when they are sufficiently to the rear, gives the command or signal *Right Reverse* to the whole, and halts them by command or signal when 10 paces from the trails of the guns.

When it is necessary for officers to dismount, their horses will be held by the lead drivers of Nos. 1, 2 and 3 on their near side.

For drill purposes the guns are dressed by the captain on the gun of direction.

2. FROM LINE TO ADVANCE.

Commanding Officer.

Officers.

Nos. 1.

*Battery will advance—
Walk, March.*

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When advancing in line, the No. 1 of the subdivision of direction will take up points on which to march, extending his sword arm to the front, that he may be known to the other Nos. 1 who take their intervals from, and dressing by him; when the advance is continuous he may be directed to drop his sword arm.

3. FROM LINE TO RETIRE.

Commanding Officer.	Officers.	Nos. 1.
_____	_____	_____
<i>Left Reverse Walk, March</i>		
<i>—Forward</i>		

Officers and staff-sergeants turn about on their own ground. Nos. 1 turn about with their subdivisions.

The subaltern officers remain between their guns.

4. FROM LINE TO TAKE GROUND TO A FLANK.

Commanding officer.	Officers.	Nos. 1.
_____	_____	_____
<i>Right (or left) take ground</i>		
<i>Walk, March.</i>		

At the word *March* each carriage wheels—officers and staff-sergeants shift to their places in column of subdivisions.

5. FROM LINE TO INCLINE.

Commanding Officer.	Officers.	Nos. 1.
_____	_____	_____
<i>Right (or left) Incline—</i>		
<i>Walk, March.</i>		

At the word *March*, No. 1 subdivision must be careful to make the incline correctly: the lead driver of No. 2 dresses on the axletree of No. 1 gun, 15 paces distant; the lead driver of 3 dresses on the axletree of 2 gun, and so on.

Left Incline is done on the same principle.

To resume the original direction the word is "*Forward.*"

6. FROM LINE TO DIMINISH (OR INCREASE) INTERVALS ON THE MOVE.

Commanding Officer.	Officers.	Nos. 1.
(To diminish :) <i>Half (or close) Interval</i> on—No.		<i>Right (or Left) Incline</i>
(To increase :) <i>Half (or Full) Interval</i> on—No.		<i>Trot-Forward-Walk</i> (except No. 1 of the named subdivision)

The commanding officer names the subdivision on which the formation is to be made.

Should it be required to form diminished intervals from the halt, the named subdivision stands fast, the remaining subdivisions reverse to the left, and form up at the interval ordered.

7. FROM LINE TO ADVANCE IN COLUMN OF SUBDIVISIONS FROM A FLANK.

Commanding Officer	Officers.	No. 1.
<i>Advance in Column</i> <i>of subdivisions from</i> <i>the right—Walk,</i> <i>March.</i>	<i>Left Division—</i> <i>Right take</i> <i>ground.</i>	<i>Of 1—Advance.</i> <i>Of 2—Right take ground</i> <i>—Left take ground.</i> <i>Of 3 and 4 in succession</i> <i>Left take ground—For-</i> <i>ward.</i>

No. 1 advances, the remainder take ground to the right, and to the left when in rear of No. 1.

8. FROM LINE TO ADVANCE IN COLUMN OF DIVISIONS FROM A FLANK.

<u>Commanding Officer.</u>	<u>Officers.</u>	<u>No. 1.</u>
<i>Advance in Column of Divisions—from the Right—Walk, March.</i>	Of Right Division Advance Of Left Division— Right take Ground— Left take Ground.	

At the word *March* the right division advances, and the left division takes ground to the right; and when it arrives in rear of the right division, takes ground to the front.

9. FROM LINE TO ADVANCE IN ECHELON OF SUBDIVISIONS FROM A FLANK.

<u>Commanding Officer.</u>	<u>Officer.</u>	<u>Nos. 1</u>
<i>Advance in Echelon of Subdivisions from the Right—Walk, March.</i>		(In succession)— Advance— Walk, March.

At the word "*March*," No. 1 subdivision advances; the other subdivisions in succession, at subdivision distance.

A battery in echelon of subdivisions, if required to change its front when in action, does so at the words "*Action Right* or (*Left*)," by throwing the trails round, and bringing the guns into the new direction; the limbers forming in rear of their guns.

A battery may advance in echelon of divisions from a flank in the same manner, the officers giving the word of command to their divisions which advance at division distance.

10. FROM LINE TO RETIRE IN COLUMN OF DIVISIONS FROM A FLANK.

The battery is reversed to the left by the commanding

officer, and at once advanced from the flank named in column of divisions without further orders from the commanding officer.

11. FROM LINE TO RETIRE BY ALTERNATE DIVISIONS IN ACTION FROM A FLANK.

When a battery in line, in action, is ordered to retire from a flank by alternate divisions, the limbers come up and reverse as for limbering up to the rear, the named division limbers up at once and retires on its marker, who will have taken up any distance that may be ordered in rear of its inward flank; the other division remains in action, the limbers six yards from the trails, ready to limber up, and retire as soon as the named division is halted for action.

The senior officer of each division gives the word of command.

When the command "*Form line*" is given, line is formed on the rear division, the limbers of which at once take their usual position in action.

If the division to retire is not specified, the left retires.

Note.—At field days when ammunition is to be used, the limber boxes are not to be opened, but two or three cartridges are to be temporarily placed in one of the axle-tree boxes for use, when the limbers are in such close proximity to the guns.

12. FROM LINE TO CHANGE FRONT TO THE REAR.

Commanding Officer.	Officers.	Nos. 1.
(The battery will counter-march — Walk — March.		No. 1. Advance— Right Shoulders, Halt. No. 2. Right Shoulders. Halt. No. 3. Left Shoulders. Halt. No. 4. Advance—Left Shoulders, Halt.

The sergeant-major places himself in rear of No. 2 subdivision, the quartermaster-sergeant in rear of No. 3. The captain dresses the markers from the sergeant-major.

At the word "*March*" Nos. 1 and 4 advance four yards, and wheel inwards—2 and 3 also wheel inwards, the whole pass each other by subdivisions, bridle hand to bridle hand, and again wheel up into their places in line.

13. FROM LINE TO CHANGE FRONT TO THE REAR WHEN AT DIMINISHED INTERVALS.

Commanding Officer.	Officers.	Nos. 1.
<i>The battery will countermarch—March—Divisions. Inwards about Wheel.</i>	Of Right Division— <i>Left about Wheel—Forward—Halt.</i> Of Left Division— <i>Halt—Right about Wheel—March—Forward—Halt.</i>	—

At the word "*March*," the battery advances two horses' lengths, the left division halts, the right moves forward, and as soon as it is sufficiently advanced to enable the left division to wheel, the whole wheel about inwards, and incline to the centre, the right division coming up at an increased pace.

The markers as in the preceding movement.

When this done "*on the move*," at the trot, the left division walks; if at the walk, the right division trots, and the movement is carried out as above, the original pace being resumed at the completion of the movement.

A battery at diminished intervals may also change front to the rear on the centre, and open out to full intervals in wheeling; the word of command is,—

"*The Battery will countermarch, Full Interval on No.—. March, Left Division Halt. Divisions Inwards about Wheel.*"—"Forward."

The right division moves forward as in the former case, and, in wheeling, the subdivisions open out to full interval from the one named.

14. FROM LINE TO REVERSE A BATTERY WHEN AT HALF INTERVALS.

Commanding Officer.	Officers.	Nos. 1
<i>Battery will reverse— March. Left Reverse.</i>	—	Of 1 and 3,— Advance—Front Form—Halt. Of 2, and 4—Halt.

When this is done on the move, the left subdivisions walk, and the right trot ; when clear, the whole reverse.

15. IN LINE LIMBERED UP TO CHANGE FRONT ON A FLANK SUBDIVISION.

Commanding Officer.	Officers.	No. 1.
<i>Change front to the Left— Walk—March.</i>	Of Right Division—advance Subdivisions half left.	Of 1 and 2—Half Left — Left— Halt— Of 3—Advance— Left take ground— Halt— Of 4—Right take ground — Right Reverse— Halt.

The marker of the left subdivision marks with his horse's head close to the head of his No. 1's horse, the others for their respective subdivisions. When there are no markers, the sergeant-major marks for No. 1, quartermaster-sergeant for No. 4 ; being dressed by the captain.

As a general rule reverses are inwards in these formations, as there may not be room to an outward flank.

At the word *March*, the left subdivisions *Right take ground*, *Right reverse*, and moves up to its marker ; the others advance, wheel half left, and left towards the formation, and halt when in line.

*Lt. Reserve
wait till the
company dis-*

Q.M.S.

16. IN LINE LIMBERED UP TO CHANGE FRONT RIGHT BACK.

Commanding Officer.	Officers.	No. 1.
<i>Change front Right, Back—Walk—March.</i>	<i>Of Right Division—Left Reverse—Subdivisions Half Right—Forward.</i>	<i>Of 1 and 2—Right—Left Reverse—Halt. Of 3—Left Reverse—Right take ground—Left Reverse—Halt. Of 4 Left take ground Left reverse—Halt.</i>

17. IN LINE LIMBERED UP TO CHANGE FRONT LEFT BACK.

Commanding Officer.	Officers.	No. 1.
<i>Change Front Left Back—Walk—March.</i>	<i>Left Division—Right Reverse. Subdivisions — Half Left—Forward.</i>	<i>Of 1—Right take ground—Right Reverse—Halt. Of 2—Right Reverse—Left take ground—Left Reverse. Of 3 and 4—Left—Left Reverse—Halt.</i>

18. IN LINE LIMBERED UP TO CHANGE FRONT ON A CENTRAL SUBDIVISION.

Commanding Officer.	Officers.	No. 1.
<i>Change Front to the Left on No. 3—Walk—March.</i>		<i>Of 1—Half Left—Left Forward—Halt Of 2 — advance—Left take ground—Halt. Of 3— advance Right take ground—Right Reverse—Halt. Of 4—Right Reverse—Left take ground—Right Reverse—Halt.</i>

In changing front on a central subdivision, the longest flank should be thrown forward if possible—thus change of front to the right should be made on No. 2, to the left on No. 3.

These manœuvres can be executed on the same principle by divisions.

A battery can also change front on a moveable pivot by a simple wheel.

19. FROM LINE TO CHANGE FRONT WHEN IN ACTION.

The commanding officer orders the named gun to be brought into action in the new direction, the guns next to it are brought into their position either by hand or limbering up, according to the nature of the ground.

The guns next to those run up by hand should be limbered up, but the detachments not mounted.

A battery may change its front "half right" or "half left," on the same principle. The commanding officer's word would be "*Change Front*," "*Half Right*," On No.—

These manœuvres can be executed on the same principle by divisions and half batteries.

20. IN LINE LIMBERED UP TO CHANGE FRONT FOR ACTION.

Commanding Officer.	Officers.	No. 1.
<i>Change Front Right</i>	<i>Of Right Division</i>	<i>Of 4—Action Right.</i>
<i>Back for Action.—</i>	<i>—Left Reverse—</i>	<i>Of 3—Left Reverse—</i>
<i>March.</i>	<i>Subdivisions—</i>	<i>Right take ground—</i>
	<i>Half Right—For-</i>	<i>Halt—Action rear.</i>
	<i>ward.</i>	<i>Of 2 and 1—Right—</i>
		<i>Halt—Action rear.</i>

At the caution the left subdivision comes into action in the new direction ; at the word *March*, the others proceed as in No. 16, and come into action to the rear, when their gun axle-trees are on the alignment.

Change front right or left back, quarter left back, three quarters half, can be done on the same principle.

21. FROM LINE—A BATTERY IN ECHELON OF DIVISIONS TO CHANGE ITS FRONT WHEN IN ACTION.

Commanding Officer.	Officers.	No. 1.
<i>Change Front to the Left on the Left, Guns of Divisions—March.</i>		Of 2 and 4— <i>Action Left.</i> Of 1 and 3— <i>Run up.</i>

At the caution the pivot guns are turned into the new direction, and at the word *March*, the others, if the ground will permit, are run into position by hand.

The guns will not be limbered up if they can be run into position by hand.

Retirements in echelon are done on the same principle as the advance.

22. FROM LINE TO CHANGE POSITION TO A FLANK.

Commanding Officer.	Officers.	No. 1.
<i>Change Position by the Oblique Echelon of Divisions to the Right — Walk — March— Form Line.</i>	<i>Half Right--For- ward—Right— Forward—Halt.</i>	

At the word *March* the divisions wheel half right, and advance until the word *Form Line* is given.

The commanding officer gives the words *Form Line* when the echelon has arrived at 20 paces from the intended position.

The markers, i.e., sergeant-major and quartermaster-sergeant, under the 3rd subaltern, move out at the words *Form Line*, or before, if directed, and mark the line at right angles to the original position, or at such place and angle as may be ordered, allowing 30 paces for the right division to wheel up square. The officer of the right division gives the word *Right* to his division, and halts it on the alignment.

The other division receives the word *Right* as soon as its right is uncovered from the division in front, and come up in succession into line.

It must be borne in mind that subdivisinal markers do not go out for formations for action. The captain and two staff-sergeants perform this duty on service, with sextant, or such range-finder as might be supplied; if there is no instrument, they assist the commanding officer to the best of their judgment to ascertain the distance of the enemy.

23. FROM LINE TO CHANGE POSITION BY THROWING BACK A FLANK.

Commanding Officer.	Officers.	Nos. 1.
<i>Change Position Right</i>	<i>Half Right—Forward — Right—</i>	
<i>Back by the Oblique</i>	<i>Forward — Left</i>	
<i>Echelon of Divisions—</i>	<i>Reverse—Halt.</i>	
<i>Left Reverse — Walk—</i>		
<i>March—Form Line.</i>		

The battery having reversed, the movement is performed as in changing position to the right, except that each division, after completing the wheel at the word "*Right*," passes the new alignment, and when sufficiently to the rear reverses to the left.

Note.—Changes of position may be made half right or left in the same manner, the divisions forming oblique echelon by wheeling quarter right or left. To complete the wheel in forming line the word is "*Right* or *Left*."

24. IN LINE TO FORM COLUMN OF DIVISIONS IN REAR OF A FLANK.

Commanding Officer.	Officers.	No. 1.
<i>Column of Divisions in</i>	<i>Of Left Division—</i>	
<i>Rear of the Right—</i>	<i>Right — Reverse—</i>	
<i>Walk—March.</i>	<i>Left take ground—</i>	
	<i>Left take ground—</i>	
	<i>Halt.</i>	

At the word *March*, the division that moves reverse to the right, and dress by the left; the left division, when sufficiently to the rear, takes ground towards the column (viz., to the left); the officer, when he sees the leaders of his rear subdivision on the line of markers, gives the words *Left take Ground*, and halts his division when in position.

In all formations, officers should be careful to give the word *eyes right*, *left* or *centre*, to their divisions, according to the position of the base.

This movement can be done to the front or to either flank on the same principle, if required.

25. FROM LINE TO BREAK INTO COLUMN OF DIVISIONS TO A FLANK.

Commanding Officer.	Officers.	o s. 1.
<i>Column of Divisions to the Forward.</i>		
<i>Right— Divisions Right</i>		
<i>Wheel—Walk—March.</i>		

At the word "*March*," the divisions wheel to the right, and pass along the original alignment.

If, for convenience of ground or other reasons, it is desired to form a column of divisions maintaining the pivot, the manœuvre may be performed as follows :

Commanding Officer.	Officers.	Nos. 1.
<i>Breaking into Column of Divisions to the Right—Walk March.</i>	<i>Of Right and Left Divisions--Change Front Right Back.</i>	<i>Of 1, 3,—Left Reverse—Forward—Right take ground—Left Reverse Halt. Of 2, 4—Advance—Left take Ground—Left reverse--Halt.</i>

The base for the covering of the column is given by the sergeant-major who marks for No. 2 subdivision, and the quartermaster sergeant who marks for No. 4.

This movement would generally be employed in breaking into column from line with other troops, under special circumstances.

MOVEMENTS FROM COLUMN.

26. FROM COLUMN OF ROUTE TO FORM COLUMN OF DIVISIONS.

Commanding Officer.	Officers.	No. 1.
<i>Form Divisions—Walk—March.</i>		Of 2.— <i>Left take ground—Right take ground—Halt—Dress.</i> Of 4.— <i>Left take ground—Right take ground—Halt—Dress.</i>

Nos. 2 and 4 take ground to the left and then to the front. If the command is *On the Right Form Divisions*, the subdivisions form on the right.

If this is done on the move the rear subdivisions will incline, and at an increased pace form divisions.

27. FROM COLUMN OF DIVISIONS TO ADVANCE IN COLUMN OF ROUTE.

Commanding Officer.	Officers.	No. 1.
<i>Column of Route from the Right—Walk—March.</i>		Of 1 and 3—(in succession)— <i>Advance.</i> Of 2 and 4—(in succession)— <i>Right take ground—Left take ground.</i>

If this is done on the move, No. 1 advances at an increased pace, and is followed by the others in succession, inclining.

28. FROM COLUMN OF DIVISIONS TO WHEEL INTO LINE.

This is a simple wheel by divisions on a moving pivot, the word of command being *By Divisions Right or Left Wheel up*; but when done at a *Halt* on a fixed pivot so as to form on a fixed alignment, it is as follows:

Commanding Officer.	Officers.	No. 1.
<i>Right (or Left) Wheel into Line—Walk—March.</i>	Of Right and Left Divisions— <i>Change Front to the Right (or Left).</i>	Of 1 and 3— <i>Left take ground—Left reverse—Halt.</i> Of 2 and 4— <i>Right take ground—Halt.</i>

At the caution, the officers commanding divisions move to their position on and facing the alignment; at the word *Eyes Front* they turn to the right about and fall in between their subdivisions.

The markers mark for the flank subdivisions in the new line, the captain dressing them from the outer flank of the sergeant-major.

At the word *March*, the outer subdivisions wheel up into their places. In order to do this correctly, the drivers must break away to the rear of the intended line, so as to come up square. The pivot subdivisions wheel to the right, and when sufficiently to the rear wheel about and come up to their positions.

This may be done to the left in the same manner.

29. FROM COLUMN OF DIVISIONS TO FORM LINE ON THE LEADING DIVISION.

Commanding Officer.	Officers.	No. 1.
<i>Left or Right of the Front Form Line—Walk—March.</i>	Of Left Division— <i>Left take ground—Right take ground—Halt—Dress.</i>	

At the caution, the markers take up the alignment.

At the word *March*, rear division takes ground to the left.

The officer of the left division, as soon as his rear subdivision is opposite its position, gives the word *Right take ground*, and *Halt, Dress*, as his division comes up into line.

If *On the Move*, the left division inclines towards the intended line, and come up at an increased pace.

Line may be formed to the right in the same manner.

When for *Action*, the leading division comes into action at the word *March*. The rear division proceeds as before, and come into action when in position, dressing on the axles of the guns already in action.

30. FROM COLUMN OF DIVISIONS OR SUBDIVISIONS LINE RIGHT OR LEFT ON THE LEADING DIVISION OR SUBDIVISIONS FOR ACTION.

Commanding Officer.

Line right on the leading division for Action.

Officers.

No. 1

Right Division—
Right Wheel—
Halt — Action
front.

Left Division—
Forward—Trot—
Right Wheel—
Walk — Halt —
Action front.

The officer commanding leading division wheels his division to the right or left at once, and when square, halts and comes into action front at once. Officer of rear division advances at the trot, then wheels to his right or left, and when in line with right division, halts and action front; if this is done by subdivisions the leading subdivision wheels to its right at once and advances its depth, then halts and action front, the rear subdivisions come up at a trot in succession and halt, action front opening fire in succession.

31. RETIRING IN COLUMN OF DIVISIONS TO FORM LINE ON THE LEADING DIVISION FOR ACTION REAR.

Commanding Officer.	Officers.	No. 1.
<i>On the Right of the Leading Division, Form Line for Action Rear—March.</i>	Of Leading Division —Halt—Action Rear Of Right Division— Right take ground— Left take ground— Halt—Action Rear.	

32. CHANGING THE ORDER OF A COLUMN.

Should it be necessary to change the order of a column, the rear subdivision or division inclines to the right or left, as ordered, and when clear of the column moves to the front, followed by the rest in succession.

The word of command is *Rear subdivision or division to the front*, or it may be *Rear division to the front through the intervals*, the rear subdivisions incline inwards, opening out when clear in front.

33. TO COUNTERMARCH A COLUMN OF DIVISIONS.

Commanding Officer.	Officers.	No. 1.
<i>Divisions will Counter- march--Walk--March.</i>	<i>Subdivisions In- wards--About Wheel Forward—Halt.</i>	Of 1 and 3--Ad- vance—Right Shoulders. Of 2 and 4--Left Shoulders.

The base is given as for column.

At the word *March*, the divisions wheel about inwards by subdivisions, and halt.

Officers turn right about and halt their divisions.

On the Move.—The divisions wheel about inwards by subdivisions, bridle hand to bridle hand, and move forward without halting.

SECTION 8.

MOVEMENTS OF A BRIGADE.

MOVEMENTS FROM LINE.

1. FROM LINE TO ADVANCE IN COLUMN OF BATTERIES FROM A FLANK.

Commanding Officer.

*Advance in Column of Batteries
from the Right—March.*

Majors.

*Of Right Battery—Advance.
Of Centre and Left Batteries—
Right Take Ground—Left
Take Ground—Forward.*

At the caution, the major of the right battery shifts to his place in the column about to be formed. The majors of the centre and left batteries remain opposite the centre of their batteries until they are directly in rear of the major of the right battery, when they halt, allow their batteries to pass them, and as their rear subdivisions come in rear of the pivot flank of the column, give the word "*Left Take Ground.*"

If the advance is ordered with diminished intervals, the right battery advances, closing on the pivot subdivision. The centre and left batteries wheel to the right at the diminished interval, and wheel to the left as they arrive in rear of the pivot flank of the right battery.

The words of command are :

Commanding Officer.

*Advance in Column of Batteries
from the Right—Half (or
Close) Interval—March*

Majors.

*Of Right Battery—Advance—
Half (or Close) Interval on 4.
Of Centre and Left Batteries—
Right Wheel—Half (or Close)
Interval—Forward—Left
Wheel—Forward.*

If the advance be made from the centre battery, the latter advances at the word "*March*," the right battery takes ground to the left and again to the right when in rear of the leading battery.

The major of the left battery gives the word "*March*," when the movement of the right battery gives room for it to take ground to the right; when in rear of the head of the column it takes ground to the left.

To retire in column of batteries, the brigade is reversed and advanced from the named flank, or centre.

2. FROM LINE TO ADVANCE IN ECHELON OF BATTERIES FROM A FLANK.

Commanding Officer.	Majors.
<i>Advance in Echelon of Batteries</i>	<i>Advance— (in succession)—</i>
<i>from The Right—March.</i>	<i>March.</i>

The batteries advance in echelon at wheeling distances from the front.

The majors are on the right flank of their batteries, if advancing from the right; on the left flank, if advancing from the left.

Retiring in echelon is on the same principle.

3. FROM LINE TO RETIRE BY ALTERNATE BATTERIES OR DIVISIONS.

Commanding Officer.	Majors.
<i>Retire by Alternate Batteries—</i>	<i>Left Reverse.</i>
<i>March.</i>	

The even numbered batteries retire first; or the word may be given, "*Retire by alternate Divisions*," in which case the left division of each battery will retire first.

If the line is in action, and the command is given "*Retire by alternate Batteries*," the major of the centre battery gives the word "*Rear Limber up*."

The limbers of the other batteries come up, and reverse as laid down in manœuvres of a single battery.

At the word "*March*," the centre battery retires to any distance that may be ordered, and comes into "action," its position being given by its marker, on its left flank under the superintendence of the adjutant.

As soon as the centre battery has halted and come into action, the flank batteries will limber up and retire a like distance beyond the centre battery, markers marking for the inwards flanks under the superintendence of the adjutant from the centre.

When the command "*Form Line*" is given, the line is formed on the rear battery or batteries, the limbers of which take their usual positions in action.

4. FROM LINE TO CHANGE FRONT TO A FLANK.

Commanding Officer.

Majors.

*Change Front to the Right—
March.*

*Of Right Battery.-- Change
Front to the Right.
Of Centre and Left Batteries.--
Half Right--Forward--Right--
Forward--Halt.*

Changing front is made on the flank battery unless otherwise ordered.

The base is given by the right battery.

To "change front half (or quarter) right" is done on the same principle.

5. FROM LINE TO CHANGE FRONT, RIGHT BACK.

Commanding Officer.

*Change Front Right Back
—March.*

Majors.

*Of Left Battery—Change Front—
to the Right.**Of Centre Battery—Left Reverse—
Right Wheel—Forward—Left Re-
verse—Halt.**Of Right Battery—Left Reverse—
Half Right—Forward—Right—
Forward—Left Reverse—Halt.*

The base is given by the left battery, which changes front to the right.

6. FROM LINE TO CHANGE FRONT ON A CENTRAL BATTERY

Commanding Officer.

*Change Front to the Left
on the Centre Battery—
March.*

Majors.

*Of Centre Battery—Change
Front to the Left.**Of Right Battery—Half Left—
Forward—Left—Forward—Halt.**Of Left Battery—Right Reverse—
Left Wheel—Forward—Right
Reverse—Halt.*

The base is given by the centre battery.

The left battery, in order to preserve its interval from the centre battery, must incline to the left after wheeling.

7. FROM LINE TO CHANGE FRONT TO THE REAR.

This movement is performed by each battery counter-marching. The base is given by the centre battery, the brigade sergeant-major in rear of No. 1 subdivision, the marker in rear of No. 4.

8. FROM LINE TO CHANGE POSITION BY ECHELON OF BATTERIES.

Commanding Officer.

Majors.

<i>Change Position to the Right by the Oblique Echelon of Batteries —March—Form Line.</i>	<i>Half Right—Forward—Right— Forward Halt.</i>
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At the word "March," each battery wheels half-right.

At the word "Form Line," the leading battery immediately completes the wheel to the right, advances its own depth, halts, and gives the base; each battery completes the wheel to the right when opposite its marker.

In like manner the line may change position in any required direction, such as "To the Left," "Half right," "Half Left," "Right back," &c.; the batteries always wheeling into oblique echelon half the amount of the intended change, and the other half as they severally approach the new alignment.

Change of position may also be made by the oblique echelon of half batteries, in the same manner.

9. FROM LINE TO CHANGE POSITION BY DIVISIONS FROM A FLANK.

Commanding Officer.

Majors.

<i>Change Position to the Right by Divisions from the Right of Bat- teries—March—Form Line.</i>	<i>Of each Battery—Advance in Column of Divisions from the Right—Leading Division Half Right—(In succession)—Front Form.</i>
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The commanding officer points out to the major of the right battery the point where the right of the line is to rest.

The interval of the heads of batteries to be preserved from the right battery. Each battery, as it approaches the line, receives the word "Leading Division Right,"—"Front Form," from its major.

The base is given by the right battery.

10. FROM LINE TO FORM COLUMN.

Commanding Officer.

Majors.

*Column of Batteries in rear of the Right—March.*Of Centre Battery — *Right Reverse—Forward—Left Take Ground—Left Take Ground—Forward—Halt.*Of Left Battery—*Right Reverse—Forward—Left Incline—Left Incline—Left Take Ground—Forward—Halt.*

At the word "*March*," the major of the right battery shifts to his place in column of batteries. The majors of the centre and left batteries remain in rear of their batteries as they go to the rear, halt when opposite their markers, and allow their batteries to go sufficiently to the rear to permit of their coming up square in column.

The left battery inclines to the left when the centre battery takes ground to the left, and inclines again when sufficiently to the rear.

If the column is to be formed on the centre battery, the right forms in rear of it, and the left in rear of the right.

If the brigade is composed of more than three batteries (two or more brigade divisions), and the column is to be formed on a central battery, the batteries on the right of it form immediately in rear of it, then those on the left; the brigade division of which the named battery forms part being first formed on the same principle.

A quarter column is formed in the same manner, with the exception that the left battery moves into column by two square movements.

11. FROM LINE TO MOVE TO A FLANK ALONG THE REAR.

Commanding Officer.

Majors.

Column of Batteries from the Right along the Rear—March.(In succession) from the Right
—*Left Take Ground—Leading subdivision—Left Wheel—Right Take Ground.*

At the word "*March*," the right battery takes ground to the left, and the leading subdivision wheels immediately to the left. As soon as the rear subdivision (No. 1) has passed to the rear of the remaining batteries, the battery takes ground to the right.

As soon as the right battery has arrived in rear of the centre of the centre battery, the major of that battery gives the word "*March*," and the battery proceeds as detailed for the right battery. It is followed in a similar manner by the left battery.

Majors remain on the inner flank of their batteries till clear of the line; they then shift to the left.

A brigade in action may prolong the line to either flank, by the flank march of subdivisions along the rear, suppose to the left from the right; on the word "*Prolong the line to the left from the right*," the right battery limbers up to the rear, moves along the rear in column of subdivisions from the right, and each subdivision wheels up to the right in succession, and comes into "*Action front*."

MOVEMENTS FROM COLUMN.

12. FROM COLUMN TO WHEEL INTO LINE.

Commanding Officer.

Majors.

Left Wheel into Line—March.

Left Wheel into Line.

At the caution, the majors place themselves facing the alignment, where the centre of their batteries will rest.

The base is given by the leading battery.

At the word "*March*" each battery wheels into line to the left; the majors give the word "*Eyes Front*," when their batteries are dressed.

Wheeling into line without halting is a most necessary practice; the word of command is the same as from a halt.

At the completion of the wheel the majors give the word "*Forward*," and the line advances at the former pace. The dressing is by the battery of direction.

13. FROM COLUMN TO FORM LINE ON THE LEADING BATTERY.

Commanding Officer.

Form Line—March.

Majors.

Of Centre Battery—*Left Take Ground—Right Take Ground—Forward—Halt.*Of Rear Battery—*Left Inclines—Forward—Right Inclines—Forward—Halt.*

The base is given by the leading battery.

At the word "*March*" the centre battery takes ground to the left, the major halts opposite his marker, allows his battery to pass until the rear subdivision comes up to him, when he gives the word "*Right take Ground,*" and halts his battery on the marker.

The rear battery inclines to the left at the word "*March,*" and when opposite its marker it inclines to the right, and halts in line.

If this is done "on the move," the centre battery will proceed as laid down for the rear battery.

Line may be formed on the "*Right of the leading battery*" in a similar manner.

14. TO COUNTERMARCH A COLUMN OF BATTERIES.

Commanding Officer.

The Batteries will Countermarch—March.

Majors.

The Battery will Countermarch.

The base is given by the rear battery, the marker of which places himself in rear of No. 1 subdivision of the rear battery.

If the batteries are at close interval the right divisions of each battery move forward until sufficiently in advance of the left divisions to allow the latter to wheel about inwards, and at the word of command from the majors, all the divisions wheel about inwards (the right at an increased pace), and are halted on their markers by their respective majors.

MOVEMENTS FROM QUARTER COLUMN.

15. FROM QUARTER COLUMN TO DEPLOY TO A FLANK.

Commanding Officer.

Deploy to the Left—March.

Majors.

Of Centre and Rear Batteries
 —Left Take Ground—Right
 Take Ground—Forward—Halt.

The base is given by the leading battery.

16. FROM QUARTER COLUMN TO DEPLOY TO BOTH FLANKS.

Commanding Officer.

Deploy Outwards—March.

Majors.

Of Centre Battery—Right take
 Ground—Left take Ground—
 Forward—Halt.
 Of Rear Battery — Left take
 Ground—Right take Ground—
 Forward—Halt.

The base is given by the leading battery.

Should the brigade consist of more than three batteries, the commanding officer will name the number of batteries to form on the right, thus, "*Deploy Outwards---Two Batteries to the Right.*"

17. FROM QUARTER COLUMN TO OPEN OUT TO COLUMN.

Commanding Officer.

*Open to Column from the
 Rear Battery—March.*

Majors.

Of Centre and Leading Batteries—Advance—Halt.

The markers take their distance from the rear battery. The adjutant corrects the covering from the front.

It may sometimes be necessary to open out from the leading or centre batteries, in which case the batteries in rear of the named one (which stands fast) reverse, proceed towards

the rear, and again reverse when they have got their distances ; those in front of the named battery advance.

If it is intended that the brigade should advance after opening out, the word will be "*Advance in Column*," upon which the leading battery advances at the word "*March*," and is followed in succession by the others, when the battery in front of them has gained its distance.

18. FROM QUARTER COLUMN TO FORM LINE TO A FLANK.

Commanding Officer.

Majors.

*Line to the Left on the Rear
Battery—March.*

Of Leading Battery—*Advance*
--*Left Wheel—Forward—Halt.*
Of Centre Battery—*Advance--*
Halt—Left Wheel—March—
Forward—Halt.
Of Rear Battery—*Left Wheel*
--*March—Forward—Halt.*

On the word "*March*," the leading and centre batteries advance, and as soon as they have got their proper distance, wheel in succession, to the left at the command from their respective majors, who remain on the left of their batteries until halted.

The rear battery wheels up, advances its own depth, and gives the base.

Line can be formed on the leading battery on the same principle.

19. FROM QUARTER COLUMN TO CHANGE FRONT TO A FLANK.

Commanding Officer.

Majors.

*Column will Change Front to
the Right—March.*

Of Leading Battery—*Advance*
from the Left in Column of
Subdivisions — Right take
Ground—Forward—Halt.
Of Centre and Rear Batteries—
Left take Ground—Leading Sub-
division—Right Wheel—Right
take Ground—Forward—Halt.

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A FLANK.

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—March—

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A FLANK.

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Column of
Right take
l—Halt.
Batteries—
leading Sub-
heel—Right
ward—Halt.

The base for the covering is given by the leading battery on the prolongation of the outer flank of the column, at a distance equal to its front.

At the word "*March*" the leading battery advances from the left in column of subdivisions, and when the major finds his leading subdivision nearly opposite the marker, he gives the word "*Right take Ground*," halting his battery when it arrives at its marker, the rear subdivision throws its right shoulders forward, before it reaches the point where the preceding subdivisions have wheeled to the right, at which it reverses to the right.

The remaining batteries take ground to the left, leading subdivisions wheel to the right, and when covering the leading battery take ground to the right, and halt on their markers.

If the change of front is to the left the base for the covering is given on the left of the leading battery.

20. FROM QUARTER COLUMN TO REVERSE THE FRONT.

Commanding Officer.

Majors.

*Column will Reverse its Front by Div-
isions Wheeling About Inwards—
March—Divisions--Inwards About
Wheel—Halt.*

Right Division--Advance.

The base for the covering is given by the leading battery at the rear of the column, on the outer flank.

The whole of the right divisions advance, until that of the rear battery is clear of the left division of the leading battery sufficiently to allow the latter to wheel inwards, when at the word "*Inwards About Wheel*" from the commanding officer, the head of each column of divisions wheels about inwards, the right at an increased pace; the whole are halted by the commanding officer, when the leading battery reaches its marker.

The majors lead round with their left divisions.
This can be done at reduced intervals.

21. A QUARTER COLUMN OF BATTERIES TAKING GROUND TO A FLANK TO DEPLOY ON THE REAR BATTERY.

Commanding Officer.

Deploy on the Rear Battery.

Majors.

Of Rear Battery—*Halt--Left
Take Ground--March--Halt.*
Of Centre Battery--*Halt--Left
Take Ground--March--Halt.*
Of Leading Battery—*Leading
Subdivision Right Incline--
Left Incline — Forward —
Left Take Ground--Halt.*

The base is given by the rear battery.

If this is done with other troops, the adjutant and marker of the base battery should fall out, and follow the flank march of the column, ready to give the base and points immediately the brigade arrives at where its left will rest. The majors of the centre and rear batteries should also remain in rear.

The rear battery halts at the word to deploy, until its left flank is clear, it then takes ground to the left, and moves up to the alignment.

This is a special parade movement, to be used when it is desired to preserve the original telling off.

Part VIII.

MISCELLANEOUS.

SECTION 1.

ACCIDENTS IN THE FIELD.

Space does not permit of dealing exhaustively with this subject; a few examples of accidents in the field may be found instructive.

The most common casualty in draught is to have a horse down. A leader can generally get up again easily unless his leg is over the trace, and even then he can sometimes do so. The best way to put this last matter right, when the horse is on his legs, is to slacken the trace as much as may be, pat and talk quietly to the horse and hold his head well up, while his trace is unhooked and replaced in its proper position.

But when any horse is down and does not at once rise, it is better to sit on his head and hold him firmly down till the harness is sufficiently undone to clear him. In the case of the shaft horse, both traces and breeching must be undone. If the horse is lying on the trace, so that it cannot be unhooked unbuckle the hame strap, open the hames, and so release the traces; it may be necessary to move the wheel an inch or two forward, and after unhooking run the carriage back so as to leave him lying clear on the ground with nothing to prevent his rising. It is rather difficult to keep the shafts from digging into him as they pass over him; they should be held up from the side towards which his back is turned to avoid his kicking.

If a gun wheel breaks and lets down the gun it will be found that the gun and carriage require a very heavy lift to

raise them sufficiently to change the broken for a new wheel. The team of the gun may be employed to do it without unhooking by simply unlimbering and fastening the prolong to the pintail and round the axle tree bed of the broken wheel.

A gun or carriage may be capsized right over on to its wheels. The best way to repair this form of disaster would be to keep the wheel horses down, unhook them, run the carriage clear, get them up, unlimber the gun, reverse the limber by raising the shafts and the gun if not too long by raising the trail. A hole may be dug if necessary to let the muzzle enter it, especially if the gun is not completely capsized.

Disabled carriages are treated under the heads, mounting and dismounting field ordnance, &c., page 143 and consecutive pages. If a shaft is broken, the gun may be driven currie, that is, the remaining shaft must be put on the near side and a handspike lashed to it by means of a drag rope, at such a length as to support the shaft in about the usual position, when the handspike rests across the saddle and pad of the wheelers; the driver then sits on the limber between the gunners, and drives his horses with reins made up of Hambro' line.

In passing obstacles, unless time is of vital importance, the gunners should be dismounted, as it is less dangerous and lightens the weight.

The men on the gun axle seats are very rarely injured except by carelessly putting a leg or arm between the spokes. If thrown off their feet are close to the ground, they are simply left behind without danger of being run over, except in a column of route. The danger to limber gunners is greater; they should be careful to hold on to the hand straps and in passing rough ground to hold also the hand rail on the box, rising slightly from their seats and resting part of the weight on the feet, so as to take the jolts on the natural springs of the arms and legs instead of on the vertebral column.

ACCIDENTS TO MOUNTED MEN.

The accidents that may occur to mounted men are frequent, but simple in character, the great danger is that the carriage's

in rear may pass over a man on the ground and kill him; this, however, rarely happens, as the drivers generally have time to move clear. Horses seldom strike a man on the ground with their feet very severely.

A common cause of men riding against each other is from their not looking in front of them.

It may be observed that there is comparatively little danger of a battery, at full interval, riding into a body of men, as they have room to wheel by subdivisions up to the last moment.

Perhaps the most fatal class of accidents to mounted men is from horses rearing and falling back on them, this may occur from a young horse taking fright at firing; if opportunity is given, laying a hand or sword on the horse's head may prevent a horse from rearing. In any case the rider must not hold on to the curb rein, but if necessary take a lock of the mane in his hand and ease the reins in so doing.

A young horse taking fright and "bolting" or backing against a gun is dangerous; serious accidents have occasionally occurred of this kind.

A riding horse kicking over the trace of a gun has been thrown down; the remedy is to keep him down, slack the traces and unhook.

OBSTACLES.

The gunners should always dismount in passing serious obstacles. When time is an object, a ditch may be passed in line at full intervals; otherwise, in column of route when the leading guns will break down the obstacle or diminish the steepness of the banks of a ditch or ravine. If there is time, a few minutes use of the intrenching tools carried on the limber will render most places passable. As a rule the team should be brought up quietly and the horses given their heads. It is sometimes necessary, but dangerous, to go at speed.

The gun may be unlimbered and the prolong used.

For a short stiff pull up hill, the weight of the men on the off horses is an advantage.

In short, in most places, where there is space for the axletrees, field guns can be brought by resolute men—and even at speed Artillery have passed obstacles from which their Cavalry escorts have turned back.

SECTION 2.

Passage of Rivers.

When embarking field guns in boats a few simple precautions have to be taken, such as not allowing the gangways, or embarking skids for guns to rest on the gangway, nor the bottom of the boat on the ground. If the boat is wide enough guns can best be run aboard on (with the boat end on) long skids with flanges on the inside to keep the wheels from running off.

When a river is too deep to be forded without wetting the ammunition boxes they should be taken over in boats or on rafts easily constructed in a wooded country like Canada; cask rafts are available with every force carrying the necessities of life, such as pork, flour, not to mention beer, spirits and coal oil casks, or a couple of canoes connected with a platform of timber will carry the gun itself.* The horses may be made to swim over as described. When the banks of a river are wooded the limber boxes may be slung over on the battery picket ropes long-spliced together, using the prolong ring as a runner and the rope as the sling. Or the picket rope may be used as a cable in ferrying, the current almost unaided will send a raft across.

Slot bridges are easily constructed by Canadian axemen. All existing bridges should be examined or enquired about, on

* FOOT NOTE.—A 9 pr M. L. R. field gun, with carriage, limber, ammunition, &c., complete, weight 35 cwt., say 3,500 lbs., Canadian measure. The flotation of a cask raft is easily ascertained by remembering that roughly a gallon of water weighs 10 lbs, or a cubic foot of water 60 lbs. If you are using then say the ordinary small casks of 30 gallons the flotation per cask would be 300 lbs. To leave a margin so as not to submerge casks and allow for weight of superstructure: use, say 15 casks, made into a raft supported by 3 rows of casks of 5 each. Leave the bung-holes up so as to pump. The whole raft is lashed, no nails are used, and has been found strong enough to allow the gun to be fired from it, the recoil being absorbed by the movement of the raft backward.

an unknown route. They can be easily strengthened with timber. In selecting a point to force the passage of a river a re-entering angle is chosen. In this case the bank on your own side is generally higher than the opposite, which is formed by the detritus of the stream in making the bend.

The re-entering angle also enables the opposite side to be swept by a cross fire.

A ford is generally formed from one salient to another by the drift of sand, &c., in rivers that wind.

In crossing guns a tolerably hard bottom is of the first importance.

Swampy ground has to be filled up with brushwood and corduroy road, but can generally be avoided by a detour.

MODE OF SWIMMING A HORSE.

Occasions may occur on service where men may be obliged to swim their horses; the rider should unbuckle the snaffle rein, which generally has a buckle at the centre, and cut the bit rein or unbuckle it from the bit and take it off, to prevent the chance of the horse getting his foot through; the head collar chain or rope should also be taken off and put in wallet, the stirrups taken up and crossed, nothing being left to entangle the horse. If the bit rein is not taken off the rider should leave it perfectly slack and scarcely feel the snaffle, taking a lock of the mane, together with the end of both reins, in his left hand. Any attempt to guide the horse had better be done by the slightest touch possible of the snaffle rein, or by splashing water on the side of the horses' nose from which you wish him to turn; but, as a rule, the current will carry a horse down in spite of himself or his rider; "C'est le premier pas qui coute"—get the first horse over and the others will follow. The rider should lean his chest as much over the horse's withers as he can, throwing his weight forward and holding the mane to prevent the rush of the water carrying him backwards. If the horse appears distressed, a man who cannot swim may with safety hold the mane, and throw himself flat on the water, thereby relieving

ing the horse from his weight. When the horse comes into his depth he may again get back to his saddle, or he may catch hold of the tail and allow the horse to pull him out if the water is deep near the bank and the man cannot swim.

Horses in draught should of course be unhooked, and all the harness except the head stall or snaffle bridle taken off. The harness can generally be carried in boats or rafts with the guns, the horses swimming--they will sometimes follow the raft if the driver sits on it holding the head collar rope.

SECTION 3.

Encamping.

When a battery is on the march, its equipment of tents will be carried on the ammunition wagons, and when encamped the distribution will be as follows, viz :

Officer Commanding, 1 tent.

Right Division 1 tent for officers, 4 for men.

Left Division, 1 tent for officers, 4 for men.

Guard, 1 tent ; staff sergeants, 1 tent.

In standing or brigade camps, 2 additional tents will generally be provided for the men, and 1 spare for harness.

A Battery of Artillery will usually encamp at full interval, as shewn in Fig., but when the ground will not admit of this formation the Battery may be encamped in column of subdivisions Fig. 1, and this method is generally recommended for a temporary camp, whenever it is possible to do so. The picket lines should be fastened to the wheels of the different carriages, as this is the quickest and safest way of securing the horses.

In pitching tents, the Nos. 1 will be aligned by the captain at ten paces interval, six men will be told off to bring up and pitch tents, one file as pole men, one as packers, one as peg-men. A peg will be driven between the heels of each No. 1. the pole man will then take his place, and when the signal is given the tents will be raised together, the four red runners being each held by a man, No. 1 seeing that the door points the proper way and that the fly is fastened.

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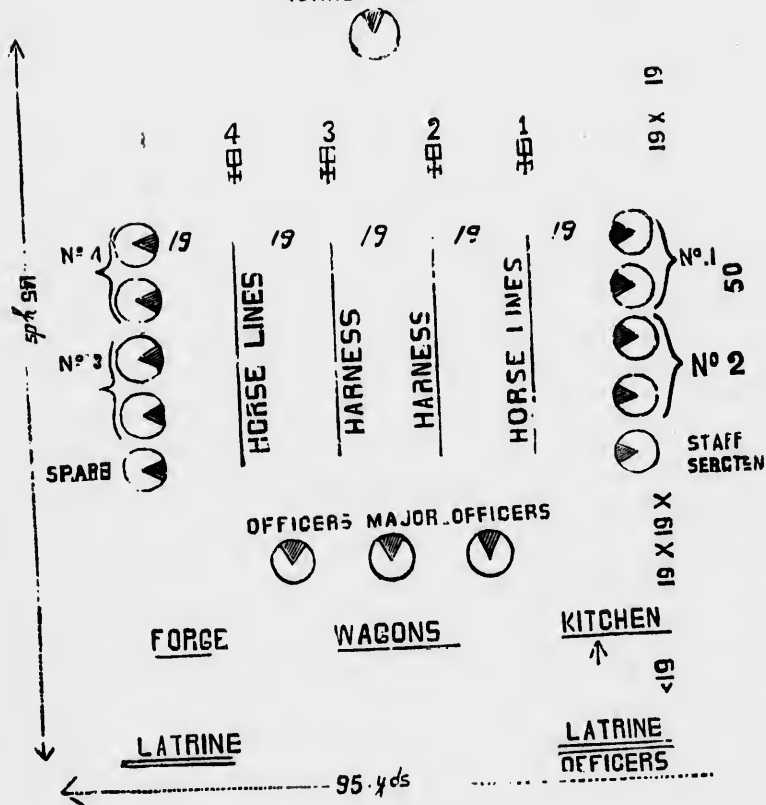
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CAMP OF A FIELD BATTERY.

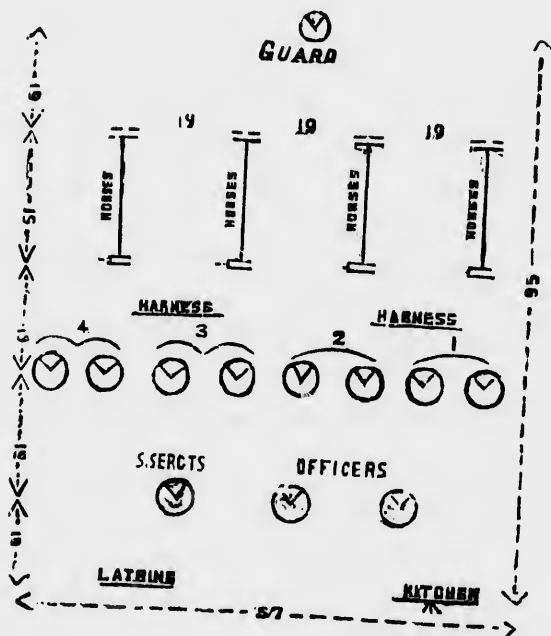
FULL INTERVAL.

GUARD TENT



CAMP OF A FIELD BATTERY.

COLUMN OF SUBDIVISIONS.



The forage is to be kept in the centre of the lines between the two central tents.

The horses will be unsaddled when the backs are cool, and the saddles placed near each horse and raised, if possible, off the ground. The bits will be taken off, the headstalls left on. So soon as the camp is pitched, the horses, when cool, may be taken to water, and on their return fed. If the horses are not used to being picketed, it is advisable that they should be picketed as they stand in the stables and not as they stand on parade. It may also be desirable to leave the bridoon reins on while feeding, so that if a horse gets alarmed and struggles there may be some command over him. In order to give the horses confidence, the men should be kept as much as possible among them; and, if the weather be fine, all cleaning of accoutrements should be done close to them. If, however, horses are used to being picketed, in a little time they stand as quietly as in a stable, and these precautions need not be taken. Kickers and vicious horses should at all times be picketed at a distance from others.

The greatest order and regularity should be observed in all operations connected with encampments, to perform which expeditiously and regularly, especially in adverse circumstances of weather, etc., requires close adherence to the system laid down. *Vide* regulations for encampments.

Part IX.

EMPLOYMENT OF ARTILLERY IN THE FIELD.

SECTION 1.

Organization.

The Artillery of an Army Corps is divided into :—

1. Divisional Artillery.
2. Corps Artillery.

The Divisional Artillery forms, like the brigade of Infantry, an integral portion of each division.

The Corps Artillery is a distinct body, and can be used as such, or to reinforce the Divisional Artillery according to circumstances.

SECTION 2.

RESPONSIBILITY OF DIFFERENT RANKS OF OFFICERS.

In order that no question may arise as to the responsibility of officers of different ranks in action, the following general rules will be observed :—

The Brigadier-General will be responsible that the Lieut.-Colonels or other officers in command of more than one battery in the field are acquainted with the position of the Corps ammunition columns, the probable position of the Corps staff, and every other necessary information which does not come strictly under the government of general officers commanding divisions. He will also be responsible, under the orders of the General Officer in command of the Corps, for the tactical use of the whole of the Artillery not at the time under the command of general officers commanding Divisions.

Whenever Corps and Divisional Artillery are massed he will take immediate command of the mass, assigning to each section the portion of the objective at which it is to fire, and the commanding officer of each section will divide the portion so assigned amongst the batteries under his command.

Any order given by him to the Artillery is to be considered as coming from the general commanding the Corps.

Lieut-Colonels or other officers of less rank being in command of a section of Artillery, will be responsible for the tactical handling of the batteries under their command, including the general choice of positions and the part of the objective to be fired at. When their batteries are massed, they will assign the position to be taken up by the wagons and spare horses, and direct the replacement of casualties.

Officers commanding batteries will be responsible for the range and nature of projectiles used, as well as for the actual movements of their batteries. In action they should separate themselves from the smoke of the guns, and watch carefully the result of the fire, correcting errors from time to time. They will note down the object, the apparent effect of the fire, and the changes made in projectiles, range, and direction; the movements of their batteries, the hour at which movements and opening or ceasing fire occur, together with any useful remarks. The books in which these notes are made should be preserved for future reference. They will also be responsible when acting singly that the wagons are within reach, and that the guns in action are kept duly supplied with everything needful for their efficient working.

The other officers of the batteries (one of whom should, as a rule, be with the wagons) will be responsible for the discipline and steadiness of the non-commissioned officers and men, for the exact obedience to instructions, for the laying and working of the guns, and for keeping the commanding officer informed of the requirements of the battery as to ammunition, men and horses.

SECTION 3.

GENERAL PRACTICAL RULES.

The following simple practical rules may be of assistance to battery commanders and others whom it may concern:—
1st. *If you cannot march you will never fight.* A few galled, lame or broken-down horses among your teams, mean the disgrace of abandoning a gun or ammunition wagon. In this case

prevention is the only remedy which a steam-power commander cannot ensure, unless in time of peace he has forged a chain of responsibility, every link of which bears a share of steady strain, from the subalterns commanding divisions, the sergeants in charge of subdivisions, down to the individual driver.

2nd. *Regularly trained Artillery collar-makers, shoeing smiths and wheelers are very important personages, and should be well supplied with tools and materials. Otherwise misfitting harness, that would produce many galls, would seem to be inevitable with Volunteer batteries turned out suddenly.*

3rd. *Your limber gunners must be able to lay their hands on every article in the limber-boxes, 2 and 3 greasing wheels, screwing-up bolts, &c.*

4th. *As you generally have to commence the fight, never lose an opportunity of getting permission, or your guns near the head of the column of march, except in a wooded or close country. Under all circumstances, in addition to your eclaireurs in your front, have a couple of intelligent mounted markers, non-commissioned officers, well in advance, to seek out passages over ditches, swampy ground, &c.*

5th. *Procure maps even when familiar with the country,—they are necessary for directing others,—and habitually use them, folded the size of your sabretache.*

6. *Note carefully every cross-road or lane, as a means of breaking away to a flank, from which you will best be able to assist your infantry deployment by partially enfilading the enemy's line.*

7. *Avoid the converse of the above, that is, getting jammed up behind the leading battalions of infantry, whose deployment will probably be checked unless you cover it, while the rear battalions press up and crowd round you, restricting your action.*

8. *Keep an eye on your neighboring infantry, with a view to mutual support in case of a rush by the enemy. Escort-duty of guns is distasteful, unless there is a strong feeling of camaraderie for the artillery. Infantry are unable to keep up, and, losing sight, perhaps, of both the guns and their own*

battalion, wander off, disgusted. Cavalry are little use against a resolute fire of skirmishers. The proper escort for guns would be the coming cavalry!—the long-talked-of mounted riflemen; and their place, the exposed flank of the battery, dismounted and under cover when practicable. If they formed part of the establishment of the battery, they would be doubly valuable, filling casualties at the guns, or getting them out of difficulties with breast harness, which they should carry on their riding horses.

9. *Leave your ammunition wagons under charge of the Quarter master Sergeant or an officer if available, to follow at a distance, taking advantage of accidents of ground, and replacing expended ammunition by sending up wagon-limbers to be exchanged for the empty gun limber, which, when refilled, can again come up. It might be advisable to do away with wagons and have only an increased number of limbers, for facility of movement, &c.*

10. *In advancing into action, the commander rides several hundred yards in front, to select a position and avoid a cul-de-sac; he is accompanied by his trumpeter and a mounted marker from each division to assist as range-finders, carrying a pocket-sextant and a measured piece of fishing-line on a reel, to take a base on Colonel Drayson's plan. The battery is brought up, silently, by the sword-arm-signals of the commander, who will endeavor to bring up guns without being seen by the enemy, unlimbering in rear of a slope to avoid the teams appearing on the sky-line, and running the guns up by hand when practicable.*

11. *The points for consideration of a position are, in order of importance:*

(a) *Efficacy of fire;*

(b) *Cover for the pieces and limbers, if possible, the reverse of a gentle slope permitting guns to be withdrawn till the muzzles only can be seen; best fulfil this condition, or 20 minutes with the entrenching-tools will give cover if no hedge or bank is available; a screen of bushes or a Canadian rail-fence with a little earth thrown up gives confidence:*

- (c) *Position of the other troops, your own, and the enemy ;*
- (d) *Facility of advance ;*
- (e) *Facility of retirement ;*

These conditions are seldom united in an equal degree. The commander must, at once, decide which is the most important to secure the object of the engagement and which to give up as least essential. No position can be called a good one that does not fulfil the first condition.

12. *Avoid unmasking the position by opening fire until a worthy object is within range, which should not be above 2,500 yards, the limit of field-glasses by which the results of fire can be ascertained.*

13. *Open fire deliberately from the leeward gun, firing a little short of the estimated range, increasing and correcting the elevation of the remaining guns, firing more rapidly as the range is ascertained or the foe comes to close quarters ; but never waste ammunition, which encourages an enemy, unsteadies your men, and is difficult to replace. "If ordered to fire (uselessly, in your own judgment), obey ; but fire as slowly as possible."* Opening fire at too long ranges is the vice of all arms and all armies ; restrained fire raises the confidence of those who practice it, and none can do so more steadily than the English, while it depresses those who have to advance on a comparatively silent foe.

14. *"Guns should bear on that arm of the enemy's force which threatens most—as a rule, the enemy's infantry and cavalry, rather than their artillery."* When you do fire on an opposing battery, not in self-defence, but to save your own infantry being shaken before a contemplated assault by the enemy, let it be understood in your own battery that you concentrate on their centre gun (common shell and percussion fuzes) ; and, when silenced, turn attention to that on its right, then left, and so on.

15. *Guns being useless while limbered up, and a change of position necessitating a fresh estimate of range, the number of changes of position in action should be a minimum and the pace a maximum, provided it is steady.*

16. *The subaltern's command of two guns should never be separated ; they are battle comrades, and form as complete a*

unit as an infantry company. They are often detached from the battery for advanced guards or *quasi* outposts. It is not good for a gun to be alone; alternate fire is essential.

17. *Having a favorable position, keep it* until the enemy retires beyond 2,500 yards or your own troops mask your fire; in either case advance to within 800 yards of the enemy, and press his retreat. Should he advance, say within 800 yards and that there are no special orders or reasons for holding the position it may be advisable to retire to about 2000, if the ground offers a second favorable position. 800 yards, or thereabouts, being the effective limit of infantry fire, is the commencement of perfect artillery efficiency. *It may be necessary to sacrifice guns and gunners to save a broken infantry.* Always deliberate before retiring, unless specially ordered, and bear in mind that the last few rounds at close quarters often turn the tide of battle, and bring you honor, or, at least, a sense of having done your duty to the uttermost.

18. *Reasons for advance to short range.*—Several reasons are given by Major Hoffbauer, of the German Artillery, why guns should advance to short ranges:—*Moral effect.* This cannot be over-estimated. Advancing infantry derives new inspiration when the guns pass close by in eager advance, and their opening fire is heard; while the artillery is impelled by anxiety to support its comrades of the infantry. With what a welcome are the gunners received at such moments, and the ring of the British infantry battle cheer does not die in the memory of those who have heard it.

"The advantage of being near at hand, to support the attack if checked, or to prepare the way for renewed efforts.

"The great advantage of close connection with the infantry, so that the artillery can co-operate at the right moment, which is always difficult when the positions are too far to the rear.

"The decreased liability of being masked by advancing infantry. Moreover, the guns are far more likely to be able to co-operate up to the last moment before the actual assault without hazard to the other troops. For at the decisive moment, smoke, unfavorable or misty weather, the sun shining in the eyes, dust flying about, approach of evening, and similar causes, very frequently render it impossible for artillery,

posted far in rear, to distinguish friend from foe, and consequently it may, perhaps, cease fire at a critical moment, just when the enemy is bringing up fresh batteries, and hurls intact masses of infantry against the shaken assailants.

19. After a section of the ground has been stormed, the artillery is launched forward in large masses to secure its position, to pursue the enemy with its fire, and to prepare further attacks. It must not wait for higher authority, but take the initiative, and act in the spirit of the Commander-in-Chief's intentions. *To avoid delay the Artillery Commanders ride to the front during the last rush*, as soon as the advancing infantry masks the fire of the guns against the principal object of attack, to watch the progress of the fight and observe where their batteries can be employed with greatest advantage.

Artillery officers must, above all things, remember that the defeat of the enemy, not the preservation of their batteries in good condition, should be the object of their first attention.

Artillery should never waste time in parade movements in the field. Each battery should be directed on its intended position, and move to it by the quickest route.

SECTION 4.

Outposts.

The chief duties of outposts are—

1st. To prevent the enemy from attacking the main body of a force when at rest, for a sufficient length of time to enable it to form up for action on its chosen ground.

2nd. To obtain information as to the number and disposition of the enemy, so far as can be done without patrolling or reconnoitring to a long distance.

3rd. To prevent the enemy from obtaining the like information with regard to our own army.

In order to carry out the first duty, the enemy must be prevented from occupying with his Artillery any position within good range of the camp or bivouac. Whatever be the force detailed for the outposts the commanding officer of

the Artillery will consult with the officer commanding the outposts as to the disposition of the guns during the day. At night they will, as a rule, be with the reserve of the outposts.

Artillery officers must bear in mind that outposts are not intended to make a prolonged resistance, unless specially ordered to do so. The guns must not be so committed to a struggle that they are unable to retire in safety. Otherwise the commander of the main body would either suffer unexpected loss of Artillery, or to be forced to support the guns and fight on other ground than that selected by him.

On the other hand, the fire of the guns from advanced positions by day may sometimes oblige the enemy to bring up his Artillery to force a passage, thus fulfilling the second duty by gaining information of his strength and intentions, and the third duty, by deceiving him as to the real position of the outposts line. Guns so pushed forward must invariably be withdrawn before their safety can be compromised.

The officer commanding Artillery on outpost duty will, after placing his guns in the position first selected by him, proceed to make a study of the ground in the neighborhood, if there is sufficient light for the purpose, and if there is not he will do so as soon as possible. He must be acquainted with the supposed direction of the enemy, and will take care to ascertain—

1st. The distance of important points within range.

2nd. The different lines of retreat on his main body.

3rd. The present position, line of retreat, and line of resistance of the outposts of which he forms a part.

If the Artillery occupies an advanced position it must be furnished with an escort, generally of Cavalry, which will throw out vedettes, or patrol the country in front and flanks according to the nature of the ground. The commanding officer of Artillery must make sure that he fully understands the signals which will be made by the vedettes, and, should be in constant communication with the officer commanding the escort. He should also communicate with the outposts in rear by means of connecting posts. The guns should be thoroughly concealed, and gun-pits should be prepared for

their occupation when they have to come into action. The guns may be unlimbered, but the horses must not be unhooked. Fires must not be lighted, if the enemy is known to be near at hand, and never close to the position of the guns.

GENERAL RULES FOR THE OFFICER COMMANDING THE ARTILLERY OF OUTPOSTS.

1st. Every precaution is to be adopted against surprise from the enemy.

2nd. The guns must be so placed as to command the probable direction of the enemy's march, whether those guns be with the reserve or in advanced positions.

3rd. Every item of information is to be noted down. The notes must be handed to the relieving officer. Any information of the enemy's movements, and any fact of sufficient importance should be noted and sent to the officer commanding the outposts. Copies of all notes should be kept.

4th. The commanding officer of Artillery should never be without a distinct plan of what he should do in case of an attack, and his subordinate officers should be informed of his intentions. His plans should be devised on the principle of delaying the enemy and making him show his force, without compromising the retreat of the outpost line, including his own guns.

SECTION 5.

Escorts for Artillery.

Although instances have occurred in modern war, of Artillery, when alone, beating off attacks made upon it by the other arms, such instances are only to be considered as exceptional, and, as a rule, Artillery cannot be expected to provide for its own security when separated from other troops.

Artillery, when in the neighborhood of other troops, should have no need of a special escort. The officer commanding the nearest troops will be responsible for guarding the front of the Artillery from the enemy's skirmishers, and its flanks

from sudden attack. If such dispositions are not made, the commanding officer of Artillery may demand a detachment for the purpose, which will then become an escort and act under his orders.

If a force of Artillery is ordered to a distance from the general body of troops, it will either form part of a mixed force so ordered, in which case the rules given in the preceding paragraph will be applicable; or it will itself constitute the chief part of that force, when the superior officer who gives the order will also detail an escort for the guns if necessary. In case of emergency, the officer commanding the detachment of Artillery may demand an appropriate escort from the nearest troops. The officer commanding the escort should be junior in rank to the officer commanding the Artillery, and act under his orders. If on any occasion he happens to be senior, he must remember that, as commanding an escort, he should act in subordination to the wishes of the officer commanding the Artillery.

For marches, and generally in open country, Cavalry will be the appropriate escort. If the Artillery is to occupy a position in action for a long time, especially in a close country, the escort may be of Infantry; but in that case it, should be relinquished or exchanged for one of Cavalry, as soon as the Artillery is ordered to take up a new position unless the movement is to a very short distance.

On the march, part of the escort will always be in front and part in rear of the guns. The comparative strength of these portions will be governed by the same considerations as those which apply to advance and rear guards. The flanks should be guarded by patrols. Exact distances cannot be laid down, as they will vary with particular cases; but the general rule is, that there should be no possibility of an attack from the enemy's Cavalry or Infantry before the guns can have time to move off out of range, or to come into action according to circumstances. The chief duty of the escort is to prevent surprise, and the guns should never move to a position which has not been reconnoitred by the escort, patrols from which should push forward at a gallop and search woods, and cover, in the neighborhood of the position.

SECTION 6.

Marches.

ADVANCED GUARDS.

On the march, advanced guards are organized to precede the main columns in order to clear the road of minor forces of the enemy, to restore communications, to obtain information, and, generally, to prevent the march of the main column from being delayed.

If Artillery is attached to an advanced guard, it will be placed near, but not at the head of the reserve of the advanced guard. As the main body is within a known distance and coming up, the Artillery is sure of support within a known time, and its commanding officer, who should be informed before hand whether the advanced guard is to bring on an action or not, may, in the former case, act with boldness and energy; but, in the latter case, the Artillery must be handled with caution, so as not to commit the other troops of the advanced guard to an attack which was not intended.

When Artillery is in action, the escort will act on the principle of outposts. Vedettes or sentries will be posted, or movable scouts sent out to watch both front and flanks of the guns, while a reserve at least equal to the force detached as vedettes, &c., will be held in hand, under cover, if possible, near the guns; but, as a general rule, not either directly in front or in rear of them. The general tactical knowledge of the commanding officer of Artillery and escort must guide them in each particular case. The duty of the escort is:—

- 1st. To guard against surprise.
- 2nd. To defend the guns if attacked.

REAR GUARDS.

Artillery will seldom be attached to a rear-guard unless the whole force is retiring before an enemy, in which case the rear guard becomes an advanced guard reversed; with the difference that the main body is moving away from, instead of advancing towards it. The Artillery will, therefore, avoid

committing itself to close action with the enemy. Its duty will be to retire from one position to another, and force the enemy, by its fire, to lose time by deploying. There is no position in which a thorough knowledge of tactics, a clear head and a quick eye are more necessary to the commanding officer of Artillery than when on duty with a rear-guard. He should make sure that he understands the intentions of the officer commanding the rear-guard, and must then act on his own responsibility. The enemy will almost always endeavor to outflank the rear guard; and the Artillery, if detached to right or left, should invariably be accompanied by a strong escort of Cavalry.

MAIN BODY.

The main body of a corps on the march will consist of Divisions, which may march on one or on more than one road. The Divisional Artillery will, as a rule, march near the head of the main body of its division. The Corps Artillery, if possible, on a separate road, guarded by a strong escort. This road should be between those on which the Divisions are marching. Part of the escort will be thrown well forward as an advanced guard, and its patrols must be in frequent communication with those of the divisions on either flank.

The Commander of the Corps Artillery must be thoroughly informed as to the intentions of the general commanding the Corps. He will be ready at any moment to push forward the whole or part of his guns to support an advanced guard if an action is contemplated, or to occupy a position determined upon beforehand. All such movements should be made with rapidity and preceded by Cavalry, who will send information whether the advance may be continued without undue risk.

Artillery (as well as other troops) must never fill the road from side to side. Space must always be left on one side for the passage of carriages, staff, &c. But, if the width of the road will admit, guns about to descend steep hills which necessitate momentary halts may draw up alongside each

other, so as to avoid a check to the column. Nothing fatigues horses or troops more than such checks, which are multiplied and rendered more fatiguing in proportion to the length of the column.

ORDERS FOR THE MARCH.

1. There is no time when a battery requires so much attention and vigilance on the part of the Officers, Non-Commissioned Officers and Men, as on a march.

2. Immediately a battery receives the order to march, the Subaltern Officers will furnish the officer commanding the battery with a distribution return of their respective divisions, detailing the men and horses to march as well as the dismounted and sick men. The Surgeon will send in a return of men unable to march.

3. On the night previous to marching, the Quarter Master Sergeant will have the whole of the barracks, stables, or camp lines, &c., cleaned and placed in good order, so as to expedite their being given over the following morning, which will be done in the presence of an officer of the battery.

4. Every battery when not marching with other troops should have an advance and rear guard.

5. The head of the columns should be occasionally changed, a different sub-division leading, this tends much to relieve horses. A uniform pace should be observed by the leading division.

6. The battery should be halted shortly after marching, and again every 4 or 5 miles, when the men should be dismounted, horses, harness, &c., examined.

7. Gunners and Drivers must report the slightest appearance of a gall or chafing by any part of the harness.

8. Officers commanding divisions will not quit them until men and horses are accommodated on the line of march; they will see that the men do not lounge in the saddles, this habit being the cause of many sore backs.

9. Should the march be long, a feed of oats may be carried in the nose bags.

10. Farriers to carry spare shoes and nails in their holsters.

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11. When a man has cleaned his horse, harness and appointments, he must clean himself.

12. The Orderly Officer will receive the reports at every stable hour and at tattoo from the Sergeant Major, and will visit the guard after tattoo.

13. On passing through or arriving at a military station, a report should be made to the Commanding Officer.

14. On the arrival of a battery where there is no camp ground or barracks, the Commanding Officer, previous to dismissing the parade, will inform the officers at what time the Nos. 1 are to attend at head-quarters to accompany the Commanding Officer round the different billets of their sub-division; this is usually about two hours after arrival.

15. On arriving at the stables, bridles, cruppers, and kits are to be taken off, girths slackened, mouthe washed out only, feet washed, eyes and nostrils spunged, and then fed. Saddles not to be removed, or the horses watered until the arrival of an officer, who will examine carefully their backs, shoulders, &c. He will also ascertain whether the forage supplied is of good quality. Should the horses be too much crowded, he will get the billets exchanged or some of the horses removed to other stables.

SECTION 7.

Field Artillery Entrenchments.

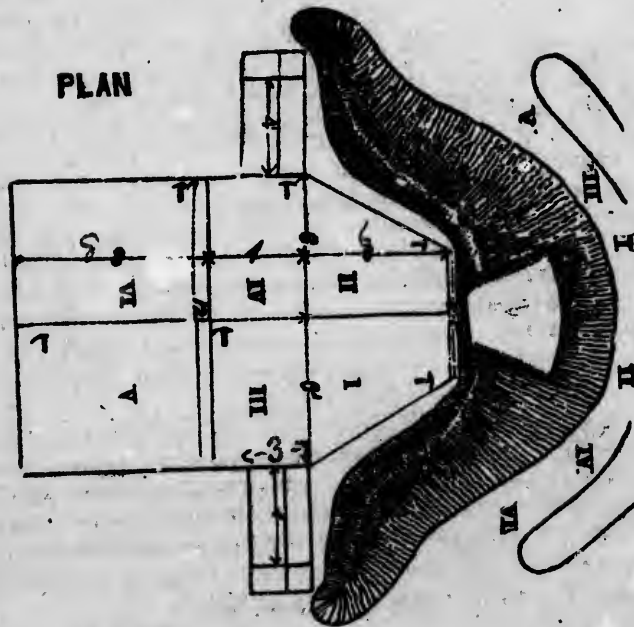
Artillery should always avail themselves of natural features, but occasionally it may be necessary to make gun and limber trenches. A gun trench of the dimensions shown in the subjoined plan can be made by a gun detachment in an hour.

Table of Dimensions.

	Ft.	In.
Breadth of narrow end.....	5	6
" broad end.....	12	0
Length of pit.....	10	0
" ramp.....	8	0
" side-pits.....	4	0

Breadth of do. at top.....	3 0
“ “ “ bottom.....	2 0
Breadth of steps inside pits.....	1 0
Depth “ “ “.....	1 6
Breadth of Berm.....from 1 foot to	2 0
Depth of gun-pit.....	2 0
Height of parapet.....	3 0
Slope of ramp, $\frac{1}{4}$.	

PLAN



SECTION



This work should be commenced where the pick-axes are marked on the plan, the seventh man being employed in shovelling and ramming on the parapet. The addition of two or three men would enable the parapet to be made thicker by earth obtained from a small ditch in front. Two more men might be employed in forming the embrasure, revetting the parapet and ramming. If twenty men were employed the workmen might be relieved occasionally, and the side trenches for ammunition or the gun detachments might be lengthened. Isolated gun pits would form a conspicuous mark; shelter trenches should therefore be made to the right and left. If necessary, limber pits, somewhat in the shape of charger pits, for a limber and a pair of horses each, might be constructed. They should be of the following dimensions:—

Limber Pits.

	Ft.	In.
Length.....	12	0
Width at top.....	7	0
“ bottom.....	5	6
Depth.....	3	0
Ramps at each end, $\frac{1}{4}$ or $\frac{1}{2}$.		

If necessary similar pits, but with a berm of 2 feet for the horses' heads, could be provided for the other horses.

The above gun pits may be advantageously connected by prolonging the side trenches, which, if time permits, may be made a foot deeper and covered with an extemporised roof of timber and sods, brushwood, &c., thus forming a convenient receptacle for a few rounds of ammunition.

BARBETTE FIELD GUN SHELTER ON NATURAL TERREPLEIN.

When gun pits are dug in soft soil the wheels and trail are apt to sink with continuous firing, and in wet weather or in certain localities it would be difficult to arrange for efficient drainage. Under these conditions it would be advisable to leave a platform for the gun on the natural level,

cover being obtained by digging a narrow ditch in front and wide trenches between the guns, the earth so obtained being formed into a parapet in front of the guns. This parapet may advantageously be revetted and strengthened by fence rails.

Intervals should always be left for the free advance of the guns.

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Part X.

GUNNERY.

SECTION 1.

Definition of Gunnery Terms.

Calibre.—The diameter of the bore. In rifled guns it is measured across the lands.

Axis of the Piece.—An imaginary line passing down the centre of the bore.

Axis of the Trunnions.—An imaginary line passing through the centre of the trunnions at right angles to the axis of the piece.

Windage.—The difference between the diameter of the bore and that of the projectile.

Trajectory.—The curve described by the projectile in passing from the muzzle of the piece to the first point of impact.

Range.—The distance from the muzzle of the piece to the intersection of the trajectory with the line of sight.

Line of Sight.—An imaginary line passing through the sights of the piece and the point aimed at.

Line of Fire.—An imaginary line joining the muzzle of the gun and the object fired at. This term would be used instead of the preceding one if firing from behind cover, or in any other case when the sights of the gun are not used.

Plane of Sight.—The vertical plane passing through the line of sight.

Angle of Sight.—The angle which the line of sight makes with the horizontal plane.

Angle of Elevation.—The angle which the line of sight makes with the axis of the piece.

Quadrant Angle.—The angle which the axis of the piece, when laid, makes with the horizontal plane. It is termed *quadrant elevation* or *depression* according as the piece is laid above or below the horizontal plane.

Line of Departure.—The direction in which the projectile is moving on leaving the piece ; in other words, a tangent to the trajectory at the muzzle.

Plane of Departure.—The vertical plane passing through the line of departure.

Angle of Departure.—The angle between the line of departure and the horizontal plane. The excess of the angle of departure above the quadrant angle is commonly called the *jump*.*

Angle of Projection.—The angle between the line of departure and the line of sight.

Angle of Descent.—The angle which a tangent to the trajectory at the first point of impact makes with the horizontal plane.

Lateral Deviation. The perpendicular distance of the point of impact of the projectile right or left of the plane of sight.

Drift.—The constant deflection of a projectile from the plane of departure due to the rotation imparted by the rifling of the piece. It is sometimes termed *derivation*.

Point Blank.—A gun is laid point blank when the line of sight is parallel to its axis. Point blank range is the range due to the jump of the gun.

Muzzle Velocity.—The velocity in feet per second with which a projectile leaves the piece from which it is fired.

Remaining Velocity.—The velocity of a projectile at any given point of its trajectory.

Striking Velocity.—The velocity of a projectile at the point of impact.

Terminal Velocity.—The maximum velocity which it is possible for a given projectile to acquire by falling through the air.

* When a gun is fired the whole system has a tendency to revolve in a vertical plane round the point of the trail. This lifting in front gives rise to the "jump."

DEFINITION OF ARTILLERY FIRE.

The following are the natures of artillery fire :

WITH REFERENCE TO THE VERTICAL PLANE.

Direct Fire.—Fire from guns with service charges at all angles of elevation not exceeding 15° .

Indirect or Curved Fire.—Fire from guns with reduced charges and from howitzers and mortars at all angles of elevation not exceeding 15° .

High Angle Fire.—Fire from guns, howitzers, and mortars at all angles of elevation exceeding 15° .

WITH REFERENCE TO THE HORIZONTAL PLANE.

Frontal Fire.—The line of fire perpendicular to the front of the object fired at.

Oblique Fire.—The line of fire inclined to the front of the object fired at.

Enfilade Fire.—The line of fire parallel (or nearly so) to the front of the object fired at.

Reverse Fire.—When the rear instead of the front of the object is fired at.

The term "direct" being already used as above in reference to the vertical plane, "front" or "frontal," is therefore to be used instead of "direct," in reference to the horizontal plane, and the old term "vertical" is to be included in that of "high angle fire."

Oblique, cross, reverse and enfilade fire then become varieties of either "direct or curved" fires, or of both according to the position of the guns relatively to the object, just in the same manner as "front" or "frontal," may be "curved" or "direct." Ricochet fire becomes a variety of "curved fire" with S. B. guns, which are placed in the prolongation, or nearly so, of a line of troops or works, the charge being reduced and the elevation not exceeding 15° . It is used to dismount guns covered by parapets and traverses, &c., or against troops similarly protected, the projectile just clearing a parapet, for instance, and rebounding along the adjacent face of the work.

"Ricochet" is not suitable to rifled guns, the bounds or ricochets of their projectiles being too irregular to be reliable. It has been superseded by curved fire with percussion fuze, the projectile just clearing the parapet or traverses, and exploding on impact behind them. Curved fire may be "front" or "frontal," as has been already mentioned. It is so when the guns from which it is obtained are placed perpendicularly to a line of troops, face of works, or other object, and the projectile fired so that it will just clear an intervening parapet or other covering mass and strike the object—breaching fortresses is performed in this manner.

"Curved" or "direct" fire, with rifled guns, may be used for enfilading; its application depends upon the nature of the object and its position relative to the firing batteries.

Enfilade curved fire will be used if the guns are intended to dismount ordnance along a face of works protected by traverses, or create casualties among defenders. The siege of Duppel is a good illustration of the effectiveness of this mode of using curved fire. The Prussians enfiladed the face of the works, dismounting ordnance and creating casualties, silencing the batteries, and in a comparatively short time rendering their capture easy.

Enfilade direct fire will be used if it is intended to enfilade a line of troops in the open, or any object not screened by an intervening cover. The parallelogram of error in "curved" or "direct" *enfilade* fire is always more advantageous than in "curved" or "direct" *front* or *frontal* fire, unless the object in the latter case has great depth.

SECTION 2.

The Gun.

The principal questions to be decided in the construction of Ordnance are the following:—

1. The best material for ordnance.
2. The best system of rifling.
3. Muzzle or breech-loading.
4. The proportion of weight to calibre.

MATERIAL FOR ORDNANCE.

Long experience has taught us that the metals available for the manufacture of guns are practically limited to cast iron, wrought iron, steel, and bronze.

Cast iron has great hardness, but comparatively little tenacity.

Wrought iron is comparatively soft, but possesses great tenacity and ductility.

Steel has the good qualities of both the preceding, without their defects, but it is considered uncertain in its strength by our authorities.

Bronze is soft but tough and tenacious.

In our service the plan now adopted for the construction of rifled guns is to shrink coils of wrought iron over a tube of steel. The hard metal thus forms the bore, and the softer wrought iron not only gives support to the steel but prevents the gun bursting explosively in case the tube is fractured.

The 7-pr. mountain gun is the only one which is entirely made of steel.

RIFLING.

The object of rifling a gun is—

1. To increase its accuracy.
2. To increase its range.
3. To enable us to fire a shell of the same weight as that of the smooth-bore gun from a much lighter gun, or a heavier shell from a gun of the same weight.

1. *Accuracy.* A shot from a smooth bore leaves the gun rotating round an axis dependent on the position of the centre of gravity or the portion of the bore last touched. This rotation is uncertain in its direction, and the deviation due to it cannot therefore be corrected. In a rifled gun the grooves impart a definite rotation to the projectile, which gives it a constant deviation or drift which can be corrected, the accuracy of the gun being consequently increased.

2. For projectiles of the same weight, the resistance of the air increases as the square of the diameter. An elongated

projectile, which is kept point first during flight by the rotation imparted to it by the rifling, will therefore range farther than a spherical one of the same weight. For instance, if two 12-lb. shot start with a velocity of 1,600 feet, the spherical one (4.45 inches in diameter) will have a remaining velocity of 753 feet at 1,000 yards, whereas the elongated shot (3 inches in diameter) will have a remaining velocity of 1,166 feet at the same range.

3. Our present 9-pr. R.M.L. gun of 8 cwt. carries 40 rounds, and weighs 35 cwt. when equipped for service, and is a more efficient weapon in every way than the 9-pr. S.B. gun of 13½ cwt., which only carried 32 rounds, and weighed, equipped for service, 40 cwt.

The various systems of rifling which have been, or are now, in use, may be classed as follows :

1. Breech-loaders, with projectiles having soft metal coating or rings larger in diameter than the calibre of the gun, and forced into the grooves on the discharge of the gun.

Examples. The service Armstrong B.L., and German system.

2. Breech or muzzle-loaders, with hard projectiles depending for their rotation on mechanical fit.

Examples. The Whitworth and Lancaster systems.

3. Muzzle or breech-loaders, with projectiles having a sabot attached to their base which is expanded into the grooves on the discharge of the gun.

Examples. The service 6.3-inch howitzer, the new Armstrong B.L. guns, and the 13-pr. R.M.L. gun.

4. Muzzle-loaders, with projectiles having studs or ribs to fit the grooves.

Example. Our present R.M.L. guns.

1. The first of the above systems centres the projectile the most perfectly, i.e., it leaves the bore with its axis stable. The twist of the grooves can therefore be less than in the other systems, and the strain, both on gun and projectile, be proportionately reduced. The Armstrong system, however from the shape of the grooves and the thickness of the lead coating on the projectiles, gives considerable pressures. Lead coated projectiles are liable to damage in transport and to

deterioration in store; they foul the bore, necessitating the use of a lubricant, and the lead coating, unless chemically attached, is liable to become detached from the projectile in flight. Projectiles fitted with copper rotating driving rings have not these disadvantages.

2. The second system throws an excessive strain on both gun and projectile. If the projectile does not fit the bore accurately it makes indifferent practice, if it does, "jams" may occur in loading.

3. The third system promises to give many of the advantages of the breech loader, such as centering the shell and consequent accuracy, to the muzzle-loading gun. The grooves being numerous and shallow, and the projectile an easy fit in the bore, there is comparatively little strain on the gun. The sabots (or rotating gas checks) can be carried separate from the shells, thus reducing the chance of injury in transport to a minimum. The following practice gives a direct comparison of the 3rd and 4th systems. It was carried out at Shoeburyness with two 6.3-inch howitzers, one rifled with 5 plain grooves, uniform twist 1 in 16 calibres, shell with studs; the other with 20 shallow grooves, twist 1 in 100 to 1 in 35 calibres, shell with a copper cup-shaped sabot or gas check attached to its base.

		Mean Range. Yards.	Mean error in Range. Yards.	Mean error in Direction Yards
Charge 4 lbs. Elevation 15°	{ 5-grooved howitzer polygrove "	2,871 3,164	40.8 18.6	3.28 1.32
Charge 2 lbs. Elevation 35°	{ 5-grooved polygrove "	2,159 2,801	29.2 11.0	7.6 1.52

4. The fourth system includes all the R.M.L. except the 13-pr. guns in our service. Its defects are that the gun is weakened by the deep grooves cut into it, and the projectile being imperfectly centred does not shoot well unless the twist of the grooves is greater than would otherwise be necessary. The bore of the gun is liable to deterioration after a number of rounds by the rush of gas over the shot.

Amongst the various modifications of No. 4 system of rifling in our service are :

1. The French, applied to the 7-pr.
2. The modified French, 9-pr. and 16-pr.

To recapitulate:

There is less strain on a gun: the greater the number of grooves, the shallower they are and the less rapid their twist, and the more easily the projectile is started.

The twist must be sharper: the longer the projectile, the less perfectly it is centred, the lower its muzzle velocity, the shorter the gun, and the longer the range at which it is intended to be used.

The more numerous the grooves the shallower they may be.

MUZZLE OR BREECH-LOADING.

Muzzle-loading guns have been adopted in our service on account of their greater simplicity, a quality which is held to outweigh the advantages claimed for the breech-loaders, namely greater cover for the gun detachments and greater accuracy.

PROPORTION OF WEIGHT TO CALIBRE.

Two incompatible qualities are required from guns—the maximum of effect and the minimum of weight.

The first involves the use of heavy shells with large bursting charges and high velocities. To obtain the velocity, large charges of powder must be used. The weight of the gun, carriage, &c., must therefore be proportionately great.

The second quality, which is of especial importance in field and siege artillery, is opposed to the use of heavy charges with heavy shells. If a heavy charge is used, the shell must be light and *vice versa*.

Hence the necessity for different calibres, and the three natures of ordnance, viz. :—Guns, howitzers, and mortars.

SECTION 3.

The Projectile.

FORCES ACTING ON A PROJECTILE IN THE BORE OF A GUN.

These may be briefly summed up as follows :

a. *The Force of Projection of the Powder-Gas.*

The forward velocity, or velocity of translation, attained by a projectile at the muzzle of a gun, is due to the sum of the pressures of the powder-gas during its passage through the bore. The more gradually this velocity is imparted to the projectile the less will be the strain upon it. The object sought after in recent experiments is to distribute, as far as possible, the pressure over the whole length of the bore, and to obtain the maximum work from a given charge of powder without undue strain on either gun or projectile. A theoretically perfect result would be obtained if the last atom of powder were converted into gas as the projectile was leaving the muzzle.

b. *The Rotation imparted to the Projectile by the Grooves.*

There is less strain on a projectile the greater the number of the grooves, the less their twist, and the more gradually the rotation is imparted.

The force required to produce a given rotation being definite, the greater number of grooves the less will be the strain exerted by each individual one on the driving surfaces of the projectile.

It is the first blow of the powder-gas that exerts a destructive effect on the projectile, the more easily therefore the latter can be started, the less the strain on it. Hence the advantage of the increasing over the uniform twist. There is, however, a slight loss of velocity with the increasing twist, due apparently to two causes—the friction between the edges of the grooves and driving surfaces of the projectile is greater, the pressure between them being distributed more uniformly

throughout the bore, although the maximum pressure is much less; the facility with which the projectile can move, leads to less powder being burned before it starts, and the total pressure in the bore is therefore somewhat less.

If a projectile is not perfectly centred in the bore it is liable in its passage through it to be driven violently from side to side of the bore. It is thus unduly strained, and its axis becomes unstable.

2. FORCES ACTING ON A PROJECTILE DURING FLIGHT.

The chief forces acting on a projectile during its flight are:

- a. The force of projection.
- b. The force of gravity.
- c. The resistance of the air.

If a projectile were acted on by the force of projection alone, it would (by the first law of motion) proceed in a straight line and pass over equal spaces in equal times. The force of gravity, however, causes the projectile to fall with a constantly accelerating velocity, so that, were it moving in vacuo, it would describe a curve instead of a straight line. This curve is a parabola.

But the resistance of the air, which, according to Professor Bashforth's experiments, varies approximately as the cube of the velocity,* the square of the diameter and inversely as the weight, further varies the form and renders the calculation of the elements of the trajectory a complicated mathematical problem. Most practical questions can, however, be comparatively easily worked out by means of Professor Bashforth's tables.

It is evident that (the resistance of the air varying as $\frac{d^3}{W}$) if two projectiles are of equal diameter and start with the same muzzle velocity, the heavier will lose its velocity

* For velocities between 1,100 and 1,400 f.s., for higher velocities the resistance varies nearly as the square of the velocity, and for lower velocities at a higher power than the cube.

more slowly and range the further. Or if the two projectiles are of the same weight, but of different diameters, the one with the small diameter will have the advantage.

This is well shown in the following range table, which gives a comparison between the shooting of a 12-pr. S.B. and a 12-pr. R.M.L. gun.

Gun.	Muzzle Velocity.	Range and Elevation.				
		1°	3°	5°	7°	9°
12-pr. S.B....	1,769	700	1,200	1,600	1,950	2,250
12-pr. R.M.L.	1,700	1,200	2,143	2,917	3,672	4,350

The remaining velocity of the two projectiles at 2,000 yards would be :

12-pr. S. B.	-	-	506 F.S.
12-pr. R.M.L.	-	-	977 F.S.

The momentum of the elongated projectile is thus nearly double that of the spherical one at 2,000 yards, though it started at a slightly lower velocity.

If the weight of the elongated projectile were reduced from 12 to 9 lbs., its diameter and muzzle velocity remaining the same, its remaining velocity at 2,000 yards would be 890 F. S., thus showing the disadvantage of reducing the weight of the projectile.

The weight of a rifled projectile can be increased :

1. By an increase of its length.
2. By an increase of its density.

The length of a shell is limited by the strength of its walls.

The pressure of the powder-gas is directed on the base of the shell. If the pressure therefore is high, and the shell long, there will be a tendency in the walls to "set up," and premature explosions may occur.

If a shot and a shell of the same calibre were both of the same length, the shot, from its greater weight, would keep

up its velocity the longer. In practice, however, shells are made of greater length than shot, to compensate for their smaller density.

The density of a shot may be increased by making it of heavier material. A case shot, therefore, filled with iron balls would be a less powerful projectile than one of similar weight filled with lead balls.

The resistance of the air also varies according to the shape of the head of the projectile, a flat head meeting with most resistance, and an ogival head (the form adopted in our service) the least.

Of other causes which affect the flight of rifled projectiles, the following may be noticed :

d. The rotation due to rifling.

e. The rotation of the earth.

d. A projectile fired from a rifled gun has a permanent deflection or "drift" in the direction of its rotation. This is chiefly due to the fall of the projectile by gravity, causing the air to be more dense underneath it than at the sides and top, and thus forming a cushion on which it rolls.

The guns in our service have a right-handed twist ; the projectiles therefore drift to the right, the amount of drift depending on the speed of rotation. Any cause, therefore, which diminishes the speed of rotation (such as unsuitable form of head, instability of axis, &c.) will also diminish the drift.

In service guns the drift is corrected by the insertion of the tangent scale at an angle to the left instead of vertically.

e. The rotation of the earth affects the deflection of projectiles to a certain extent. The question has been investigated mathematically, and it is found that in the northern hemisphere the deflection is always to the right, in whatever direction the gun may be fired.

VARIABLE FORCES ACTING ON A PROJECTILE.

All the above forces and causes of deviation will already have been ascertained, and their effects noted and allowed for, before a gun is issued for service ; they will not, therefore, come

under the cognizance of the practical gunner. There are, however, other causes of deviation, which must be observed and corrected to ensure accurate shooting.

The following are the principal ones :—

f. Variability of the charge, due to—

1. Incorrect weighing.
2. Variation in strength of the powder.
3. State of the atmosphere, especially as regards moisture.

g. Variability of space occupied by the cartridge in the bore.

h. Difference of level of wheels.

i. Force and direction of wind.

f. The only way to correct variations in the strength of powder, which are sometimes very great, is carefully to mix the powder before the cartridges are made up. This is not a very difficult matter with the small charges used in field guns and howitzers, and the better practice that will be obtained amply compensates for the time and trouble involved in the operation; extreme care in weighing out the charges (especially for howitzers) cannot be too strictly enforced.

A long continuance of wet weather will cause the cartridges (unless stored in magazines) to absorb a certain amount of moisture, which will cause a reduction in muzzle velocity, and consequently in range. The contrary effect will take place in dry weather, especially in hot climates. As, however, from this cause all the cartridges in the limber boxes would be nearly equally affected, it is an easy matter to make the necessary correction by giving more or less elevation to the gun.

g. If the shell is not rammed home exactly to the same spot each round, the shooting will be injuriously affected. The greater the space occupied by the cartridge the less will be the range.

h. If the gun wheels (or trunnions) are not level when the gun is fired, the shell will deflect towards the lowest side. It is difficult to ascertain any small difference of level by the eye. Guns on travelling carriages will, however, probably

be fitted with a "deflector," a small pendulum hanging to the axletree, by means of which the difference of level can be read off. The rule for correction is to multiply the number of inches difference of level by the number of degrees of elevation at which the gun is to be fired for the number of minutes deflection necessary.

In practice, if great accuracy is required, it will be found better to level the wheels approximately, if they are much out, than to lay off the target.

3. Wind has considerable effect on the deviation. According to its direction it may increase or reduce the range, or deflect the projectiles right or left. If gusty, and of great force, it is impossible to make any correction for it, and the shooting will be bad, especially at long ranges or with low charges.

If, however, the wind is fairly constant in direction and force the necessary corrections can be made on the tangent or deflection scale. No formula can be given for this correction, as the force of the wind must be judged, no instrument for this purpose being available. A little practice, will, however, enable a No. 1 of ordinary intelligence to obtain a very close approximation to the proper correction, and the second round would be corrected by the result of the first.

SECTION 4.

Effect of Projectiles.

A. COMMON SHELL.

• Common shells may be used :—

1. To destroy the "personnel" and "matériel" of the enemy.
 2. To destroy earthworks, buildings, &c.
1. In the first case the shell depends for its effect on the striking force of the splinters into which it bursts. A high velocity and a considerable number of good-sized splinters are the principal requirements for this nature of fire.
- To obtain the maximum effect from common shells

against troops in the open, they should be burst close up to, or if the troops are in column or other deep formation, on the head of the column. Against troops behind cover (field entrenchments, &c.) the crest of the parapet or other covering obstacle should be the point aimed at. Against guns, limbers, &c., the shells should not be made to burst short, but an endeavor be made to obtain direct hits.

Percussion fuzes should be used in all but exceptional cases, such as when the ground in front of the enemy is very soft, and prevents the fuzes from acting or smothers the bursts, or if the troops fired at are in such a position that the splinters of shells burst or graze pass over their heads.

2. When employed for the destruction of earthworks, magazines, buildings, &c., the common shell depends for its effect on its striking velocity (and consequent penetration) combined with the explosive force of its bursting charge.

a. 1. In breaching a parapet by direct fire the upper part of it should be the point aimed at, and the point of impact then gradually be lowered so as to cut down the parapet from the top. It has been found that shells bursting low down in a parapet do but little damage; they throw up a certain amount of earth, which is apt to fall back again into its original place.

R.L. percussion fuzes should be used for this nature of fire whenever practicable. R.L. fuzes act on graze, shells bursting on the parapet (and to a certain extent those bursting short) would therefore be effective against the men and material behind it.

B. SHRAPNEL SHELL.

Shrapnel shells are used exclusively against the personnel of the enemy. They depend for their effect on the striking velocity of the balls and splinters disengaged from the shells on bursting. The higher the velocity the more effective the shell, because, not only is the angle of descent for a given range less, and the space covered by the balls therefore greater, but the penetrative power of the balls is also increased. The bursting charge of a shrapnel shell should not be

more than sufficient to open it, or the balls will be dispersed to too great an extent. The cone of dispersion of our field shrapnel has been found to be about 8° at medium ranges. That is to say, a front of 14 yards would be covered by a shell bursting 100 yards short, and so on in proportion.

Time fuzees are nearly exclusively used with shrapnel; as with percussion fuzees, not only is the velocity of the shell reduced by the graze, but as it rises from the graze before bursting, the balls are thrown upwards and reach the ground with a greatly reduced velocity.

The principal circumstances that limit the effective range of shrapnel are—

1. The penetrative power of the balls.
2. The time of burning of the fuze.
3. The angle of descent of the shells on bursting.

1. We may take it for granted that a ball which will perforate or lodge in a 2-inch deal target would kill or disable a man.

We will assume 500 feet per second to be the lowest effective striking velocity of shrapnel bullets. The remaining velocity of the 9-pr. shrapnel at 4,000 yards is 626 f. s., and that the 16-pr. at 5,000 yards is 617 f. s. As far then, as the penetrative power of the balls is concerned, the shells will be effective at these ranges when burst within 100 yards of the objects, if filled with 1-oz. balls, or within 75 yards of it if filled with $\frac{1}{2}$ -oz. balls. The heavier the shell the longer it will retain its velocity.

2. The limit of the 9-sec. fuze in the 16-pr. is 3,100 yards, and in the 9-pr. 2,900 yards. With a 15-sec. fuze, the effective range of shrapnel from these guns is increased to 4,200 and 3,800 yards respectively.

3. The angle of descent has considerable influence on the effect of shrapnel. If it is great, the lower part of the cone strikes the ground at such an obtuse angle that ricochet is prevented, and the upper part of the cone covers but little ground before the graze of the balls. At 2,000 yards the angle of descent of the 16-pr. shell is 6° , and that of the 9-pr. $6^{\circ} 37'$, the lower part of the cone would therefore reach the ground at 10° and $10^{\circ} 37'$ respectively, and the

velocity of the balls would be greatly reduced after ricochet. As the range and angle of descent increase, the retarding force of the graze also increases, till at 4,000 yards the angle of descent of the lower part of the cone would be about 20° , and the balls would hardly ricochet at all.

It is thus evident that, with our present field guns, an effective shrapnel fire is not to be expected at ranges beyond 4,000 yards. Long before this limit is reached, it becomes more and more difficult to make really good practice, because the longer the range, the closer to the target should the shells be burst, whilst at the same time the difficulty of observation increases. The fuzes also cannot be adjusted within sufficiently close limits.

The following tables are extracted from some reports on shrapnel practice.

Table I shows how much more difficult is the use of percussion as compared with time shrapnel as far as mere accuracy of shooting is concerned.

Table II gives the best distances and heights above plane to burst time shrapnel.

TABLE I.

Percussion shrapnel.					Time shrapnel.				
Ranges	Burst short.				Ranges	Burst short.			
	Effective.	Good.	Bad.			Effective.	Good.	Bad.	
yds.					yds.				
1,000	from 20 to 100	40	over 170		1,000	from 10 to 150	100	over 250	
1,300	" 20 to 70	25	" 145		1,300	" 10 to 120	80	" 220	
1,600	" 15 to 50	20	" 100		1,600	" 10 to 110	80	" 190	
2,000	" 10 to 25	12	" 50		2,000	" 10 to 100	80	" 170	
2,300	" 5 to 15	10	" 30		2,300	" 10 to 90	60	" 150	
2,600	" 5 to 12	5	" 20		2,600	" 10 to 85	60	" 135	
3,000	" 5 to 10	7	" 15		3,000	" 10 to 80	60	" 120	

TABLE II.

16-pr.				9-pr.				
Burst short.	Range.	Angle of descent.		Height	Burst short.	Angle of descent.		Height.
yds.	yds.	°	'	ft.	yds.	°	'	ft.
100	1,000	2	20	12.0	80	2	29	10.4
80	1,200	3	0	12.6	60	3	10	9.9
"	1,400	3	40	15.8	"	3	54	12.2
"	1,600	4	25	18.5	"	4	43	14.8
"	1,800	5	12	21.9	"	5	33	17.9
"	2,000	6	0	25.0	"	6	27	21.0
60	2,200	6	57	21.6	"	7	39	16.0
"	2,400	7	47	24.5	40	8	46	18.5
"	2,600	8	45	27.7	"	9	54	20.9
"	2,800	9	45	30.8	"	11	10	23.6
"	3,000	10	46	34.2	"	12	34	26.5
50	3,200	11	47	37.8	30	13	53	22.2
"	3,400	12	46	42.0	"	15	22	24.6
"	3,600	13	51	46.7	"	17	6	27.6
"	3,800	14	52	50.7	"	18	50	30.7

C. CASE SHOT.

Case shot from field and siege guns is used at close ranges against troops. It may be considered effective from 300 to 400 yards, according to the nature of the ground. Hard even ground is most favorable for it.

SECTION 5.

Artillery Fire.

FIELD ARTILLERY.

The projectiles of Field Artillery are common shells, shrapnel, and case shot, its targets, the enemy's troops, guns, &c., either in the open or more or less covered, and also field-works, entrenchments, and buildings. The two first would, as a rule, be attacked by shrapnel, the three last by

common shell fire. As, however, but little effect can be produced on earthworks by common shells from field guns, they would generally be employed more with a view to disturb the troops covered by the earthworks than for the destruction of the earthworks themselves.

A. Shrapnel Shell.

Shrapnel is *par excellence* the field artillery projectile. The chief points that require attention in order to obtain the best results with it may be briefly stated as follows:—

a. The service of the gun must be correctly performed. This involves a careful instruction of the gun detachment, especially in the following points:—

1. Laying.
2. Loading, more particularly the uniform ramming home of the charge.

3. Boring of fuzes.

b. The elevation for the range (measured or estimated) must be correctly ascertained. This will seldom agree exactly with that given in the range table, as some of the disturbing causes mentioned in page 247 generally come into play.

The necessary deflection must also be given to correct difference of level of wheels, wind, &c.

c. The length of fuze must be ascertained. It will always be shorter than that given in the range table for the range, because:

1. The length of the fuze there given is for a burst at the target instead of from 50 to 100 yards short of it.
2. The time of burning of a fuze increases with its age. Fuzes that have been stored in hot climates sometimes burn irregularly, giving premature and blind shells.
3. The time of burning increases as the barometric pressure diminishes. Every diminution of pressure by one inch (equivalent to 1,000 feet in height) increases the time of burning of a fuze by $\frac{1}{35}$. The fuze tables are based upon practice at Shoeburyness, approximately the sea level, but batteries will often come into action at more than 1,000 feet

Height.

ft.
10.4
9.9
12.2
14.8
17.9
21.0
18.0
18.5
20.9
23.6
26.5
22.2
24.6
27.6
30.7

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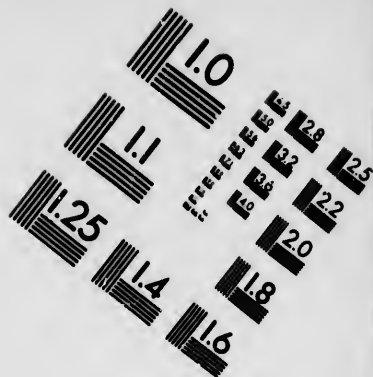
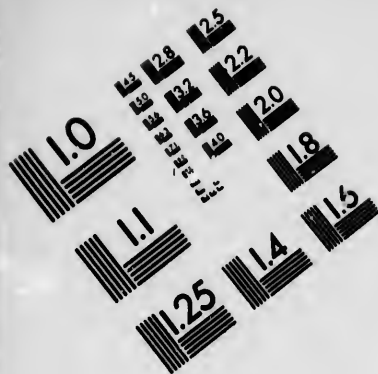
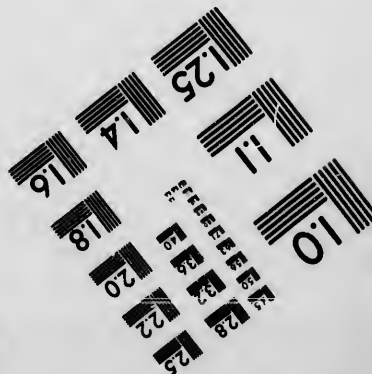
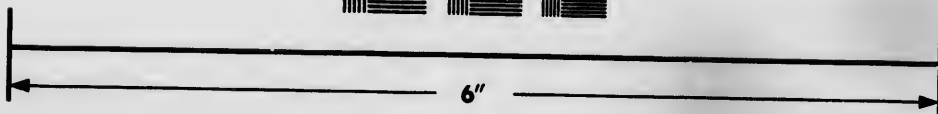
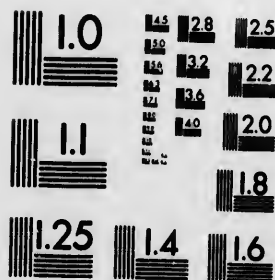


IMAGE EVALUATION TEST TARGET (MT-3)



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above this level, and a sensible increase in the time of burning of the fuzes will then occur.

a. The result of each round must be carefully observed. It will hardly ever be possible to estimate the actual distance of the burst of a shell from the target. The only point there can be any certainty about, is whether a round burst short of, or beyond the target, and even this cannot always be done, unless the bursts are comparatively low.

The first rounds fired on coming into action should, as a rule, be fired slowly and deliberately, and corrections made as follows, two rounds at least being always fired with the same elevation and fuze :—

a. If the shells are observed to burst short, increase the length of fuze by a graduation at a time, till a shell is observed to burst over ; then reduce the length of fuze by one graduation.

If the shell bursts over, reduce the length of fuze by a graduation at a time until one bursts short ; then go on with this length of fuze.

b. If the shells burst so high as to render it difficult to decide whether they are bursting short or over, reduce the elevation, and then proceed as in *a.*

c. If a shell grazes short of the target before bursting increase the elevation, and proceed as in *a.*

By this method we may be certain of getting the elevation and length of fuze as nearly as possible correctly.

Example :—

9-pr. Gun at 2,200 Yards.

Number of round.	Length of fuze.	Observed position of burst
1	13	
2	"	over (+)
3	12	" "
4	"	short (—)
		" "

The distance between the bursts of the fuzes bored at 12 and 13, should be about 145 yards. The two first rounds both being over, shows that their mean burst must have been some little distance in rear of the target, and 12 fuze would therefore probably bring the burst within the effective limit of the shrapnel at this range (90 yards). If, however, the mean burst of the two first rounds happened to have been close in rear of the target, that from 12 fuze consequently about 140 yards in front of it, and therefore beyond the effective limit, this length of fuze must nevertheless be retained, as the Boxer 9-sec. fuze does not admit of finer adjustment.

It is important to bear in mind that, on the burst of a shrapnel shell, the medial line of the cone of dispersion falls below the trajectory, the shell would have followed had it not burst, hence, to secure the greatest effect, slight additional elevation to that due to the range should be given. The amount of additional elevation requisite will increase with the distance of burst from the object fired at. The more distant the object the closer up should the shrapnel be burst

B. COMMON SHELL.

It is advisable, when circumstances permit, to ascertain the correct elevation by a fire of common shell with percussion fuzes. The bursts of the common shell are more easily observed than those of the shrapnel, and less ammunition and time will therefore be expended in the process. The following (based upon the system laid down in the German practice regulations) will be found a quick method of ascertaining the correct elevation:—

Begin with the elevation (yard scale) for the estimated or measured range. If the shell falls short (or over) increase (or reduce) the elevation by 100 yards at a time, till a shell falls over (or under). Then reduce (or increase) the last elevation by 50 yards, and fire a few rounds. If another correction is required, increase or reduce the elevation by 25 yards.

If half the number of rounds fired, with any given elevation, fall short, it shows that the mean point of impact of the series is at the foot of the target.

C. FIRING AT MOVING OBJECTS.

When a battery has taken up a position, it is always advisable to ascertain the ranges of any conspicuous natural objects in its front, in order to be able to open an effective fire on any of the enemy's troops as soon as they pass close to these objects. If this is not possible, and there is no means of ascertaining the range of the moving target, except by firing then:—

1. If the target is moving towards the battery, keep up a slow fire with an elevation less than that necessary for the original range of the target until a round is observed to hit or to be over. Then a rapid fire for about half-a-dozen rounds (or a salvo)! Then reduce the elevation by 200 yards and proceed as before, and so on.

2. If the target is moving away from the battery, begin as before, but with more elevation than necessary until there is a round short, or a hit, then rapid fire, then increase the elevation by 200 yards, and so on.

3. If the target is moving across the front of the battery, lay on the head of the column, or other body of troops, with the elevation for the range.

Selection of Men for Instruction in Laying.—In every battery a certain number of men will be found who, from possessing superior intelligence and good sight, are specially fitted for instruction in laying, and every opportunity should be taken to exercise them in this most important subject, bearing in mind that it is not sufficient merely to be able to lay correctly, but that the prompt and intelligent application of requisite corrections, under all possible circumstances that may arise, is of equal importance. This is only thoroughly attainable by constant practice.

Nos. 1 should, if possible, observe the effect of every round themselves.

The graduations on the tangent scale are only approximations.

The elevation requisite for a given range, or length of fuze to open a shell at a given point, will be liable to variation

from one or more of the causes previously detailed, and allowance should be made accordingly.

At gun practice it is unadvisable to alter the elevation after each round unless the error is considerable, short or over, but the result of several rounds should govern these alterations, as there is a certain parallelogram of error due to each gun.

The ranges corresponding to the angles and minutes of the tangent scales are determined by experiment, a range curve being constructed representing the mean range of a gun fired with its service charge at certain elevations. It is with the aid of this range curve that range tables are made.

To make use of range tables when at practice the distance of the object aimed at must be known, as it is according to its greater or less distance that elevation is given when firing.

SECTION 6.

Range Finding.

The distance of an object may be ascertained by judging, which is very uncertain for the long ranges of artillery, and also by means of instruments. Practice will enable you to estimate distances pretty accurately up to 600 or 700 yards, but when firing at objects over that range instruments should be used. A pocket sextant is the most portable and useful instrument for that purpose, and the ranges are found with it by means of tables, either of natural tangents with right-angled triangles or in oblique-angled triangles, the principle of which is, by the proportion as one side is to the sine of its opposite angle, so is any other side to the sine of its opposite angle.

The following tables of natural tangents is given as an example of the application of the above principle to right angled triangles. The known side, as a base, being 100 yards in length, or when long ranges are required, 200 yards, the result being of course doubled :—

NATURAL TANGENTS TO A BASE OF 100.

D'g. m.	R'ge.	D'g. m.	R'ge.	D'g. m.	R'ge.	D'g. m.	R'ge.	D'g. m.	R'ge.
		81. 0	630	83. 48	920	85. 38	1285		
		6	38	52	80	36	99		
		12	46	56	40	39	1814		
		16	53	84. 0	51	42	30		
		24	61	3	59	45	45		
		30	69	6	67	48	61		
		36	77	9	76	51	77	86. 50	1807
77. 36	451	42	85	12	84	54	95	52	26
45	60	48	94	15	93	57	1412	54	46
78. 0	70	54	702	18	1001	86. 0	30	56	66
15	80	82. 0	11	21	10	2	42	58	87
30	91	6	20	24	20	4	54	87. 0	1908
45	502	12	30	27	29	6	66	2	29
79. 0	14	18	39	30	38	8	79	4	51
10	22	24	49	33	48	10	92	6	74
20	31	30	59	36	58	12	1505	8	97
30	39	36	70	39	68	14	19	10	2020
40	48	42	80	42	78	16	32	12	44
50	57	48	91	45	88	18	46	14	69
80. 0	67	54	802	48	98	20	60	16	94
10	77	83. 0	14	51	1109	22	74	18	2120
20	87	4	22	54	20	24	89	20	47
30	97	8	30	57	31	26	1604	22	74
40	608	12	38	85. 0	43	28	19	24	2202
50	19	16	47	3	54	30	35	26	31
		20	55	6	66	32	50	28	60
		24	64	9	78	34	66	30	91
		28	73	12	90	36	83		
		32	82	15	1203	38	99		
		36	91	18	16	40	1717		
		40	901	21	29	42	34		
		44	10	24	43	44	52		
				27	56	46	70		
				30	70	48	88		

TO MEASURE DISTANCES USING TABLES.

X.



If two sextants are used it will facilitate the operation. Suppose A. X. to be the distance required, and A. B. the base, which must be carefully measured.

Two men place themselves one at each end of base, the man at A. having set the index of his sextant at 90° moves himself back or forward (a pace or so only is generally required) or the man at B. is made to move until he is reflected im-

mediately above the object X., the line A. B. will then be at right angles to A. X. The man at B. having set the index of his sextant at zero looks at A. through the clear glass, and moves the index screw until the object A. is reflected immediately above the man at A., the index arm will then indicate the number of degrees and minutes in the angle A. B. X. On reference to the tables opposite the angle thus obtained, will be found the distance A. X.

Example.—Suppose the base used to have been 100 yards, and the angle A. B. X. to have been 84 deg. 17 min., the distance A. X. would be 1000 yards.

ONE SEXTANT WITHOUT TABLES.

If one sextant only is used, it is set at 90° at A. A fishing reel measured in yards is stuck in the ground at A. by a spike screwed into the butt of a fishing rod or other pole to which the reel is fastened, the pole serving to mark the end of the base. The line is run 100 yds. or any convenient length by an assistant at right angles to A. X. The man at A. with sextant corrects the man at B., getting him reflected over X. Sticks his sword or a lance in the ground at A. if no staff has been provided for the fishing reel, walks to B. and takes the angle when X. is reflected over B. Then without tables, distance A. B. in feet $\times 1150$ divided by angle at X. in minutes = range in yds.

N.B.—Angle X = 90° —angle B.

g.m	R'go
00	1807
02	26
04	46
06	66
08	87
10	1908
12	29
14	51
16	74
18	97
20	2020
22	44
24	69
26	94
28	2120
30	47
32	74
34	2202
36	31
38	60
40	91

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SECTION 7.

Range Tables.

RANGE TABLE FOR RIFLED FIELD GUNS.

6 por. Armstrong, B. L. R.

DISTANCE OF OBJECT.	ELEVATION.	TIME OF FLIGHT.	LENGTH OF FUZE.	
Yds.	Deg.m.	sec.	inches.	E. time.
200	9	.58	.27	Length of bore 4' 5". Total length, 8' 0-1". Calibre, 2-5". Weight, 3 cwt. Charge, 12 ozs. No. of grooves, 32. Twist of rifling, 1 turn in 30 calibres. E time fuze (only issued for sea service), burns at the rate of 1" in 2 18 seconds. The time of flight can be obtained approximately by dividing the number of hundreds of yards range by 3; and the length of fuze (E time) by dividing the number of hundreds of yards range by 6.
300	20	.86	.40	
400	34	1.22	.56	
500	55	1.56	.76	
600	1 15	1.92	.92	
700	1 35	2.30	1.06	
800	1 55	2.65	1.21	
900	2 16	3.00	1.38	
1000	2 37	3.36	1.54	
1100	3	3.73	1.71	
1200	3 22	4.10	1.90	<i>Rough Rule for Elevation.</i> 500 yards, 55'. 500 to 1000 yards add 20' for each hundred yards. 1000 to 1500 yds., add 22' for each 100 yds 1500 to 2000 " " 25' " "
1300	3 44	4.47	2.05	
1400	4 6	4.83	2.21	
1500	4 29	5.20	2.39	
1600	4 53	5.60	2.57	
1700	5 19	6.00	2.75	
1800	5 45	6.40	2.94	
1900	6 10	6.78	3.11	
2000	6 35	7.20	3.30	
2100	7	7.60	3.49	
2200	7 26	8.02	3.67	Example by above rule :— 500 yards, 55'. 1000 yards, 55' + 100' = 2° 35'. 1500 yards, 2° 25' + 1° 55' = 4° 25'. 2000 yards, 4° 25' + 2° 5' = 6° 30'.
2300	7 52	8.46	3.84	
2400	8 18	8.90	4.08	
2500	8 41	9.32		
2600	9 6	9.80		
2700	9 33	10.30		
2800	9 59	10.78		
2900	10 26	11.28		
3000	10 53	11.80		

RANGE TABLES.—(Continued.)
7 Por. M. L. R. Field and Mountain Guns, (Bronze.)
 Charge, 10 oz. Weight, 224 lbs.

RANGE.	ELEVATION.	TIME.
Yards.	Deg. min.	seconds.
200	0 55	1.1
300	1 24	1.6
400	1 55	2.1
500	2 27	2.6
600	3 1	3.2
700	3 36	3.7
800	4 13	4.2
900	4 51	4.7
1000	5 32	5.3
1100	6 14	5.8
1200	6 58	6.3
1300	7 46	6.8
1400	8 32	7.4
1500	9 22	7.9
1600	10 14	8.4
1700	11 8	9.0
1800	12 5	9.7
1900	13 4	10.3
2000	14 5	11.0
2200	16 15	12.3
2400	18 35	13.6
2600	21 6	14.8

RANGE TABLE.

9-pr. M. L. R., 8 cwt. :

Projectile, Shrapnel Shell, 9 lb. 13 oz., charge 1¼ lb.*

Mean Elevation due to each 100 Yards of Range.

Table showing the distance at which shell will burst.

Distance of Object.	Elevation. °		Time of Flight.	Tenths of fuze.	Range in Yards.
yards.	degs.	mins.	seconds.		
100	0	0	0.25		
200	0	6	0.50	1	200
300	0	14	0.80	1.5	300
400	0	26	1.05	2	400
500	0	39	1.35	2.5	500
600	0	52	1.70	3	600
700	1	5	1.95	3.5	700
800	1	18	2.25	4	800
900	1	31	2.55	4.5	900
1,000	1	44	2.85	5	1,000
1,100	1	57	3.20	6	1,100
1,200	2	12	3.55	6.5	1,200
1,300	2	28	3.85	7	1,300
1,400	2	45	4.15	7.5	1,400
1,500	3	2	4.45	8	1,500
1,600	3	20	4.75	8.5	1,600
1,700	3	38	5.10	9	1,700
1,800	3	58	5.45	10	1,800
1,900	4	18	5.80	11	1,900
2,000	4	40	6.15	12	2,000
2,100	5	2	6.50	13	2,100
2,200	5	24	6.90	14	2,200
2,300	5	47	7.30	15	2,300
2,400	6	10	7.70	16	2,400
2,500	6	34	8.10	17	2,500
2,600	6	59	8.50	18	2,600
2,700	7	25	8.90	19	2,700
2,800	7	52	9.30	20	2,800
2,900	8	20	9.80		2,900
3,000	8	48	10.30		3,000
3,100	9	18	10.80		3,100
3,200	9	49	11.40		
3,300	10	21	12.00		
3,400	10	53	12.70		
3,500	11	27	13.45		

* Common shell being lighter than shrapnel ranges about 100 yards farther with the same elevation. Thus at 2,000 yards the elevation for common shell will be 4° 18'.

The elevation and length of time fuze corresponding to various distances are given by graduations on the range-plate and tangent bar.

These graduations, however, have only an approximate value, as the data upon which they are based were obtained by experiments carried out at Shoeburyness under certain conditions of weather, powder, fuze, &c. ; and a change in atmospheric conditions, strength of powder, or age of fuze would probably necessitate a corresponding change in elevation to be given, and length to be bored.

The graduations, therefore, must be looked upon merely as a guide, and the officer superintending practice must always use his discretion in making such changes from the given elevations and lengths of fuze as he may consider necessary.

distance
will burst.

Yards.

200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
2400
2500
2600
2700
2800
2900
3000
3100
3200
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8600
8700
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9200
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9400
9500
9600
9700
9800
9900
10000

yards
on for

S. B.

BRONZE GUNS AND HOWITZERS.

Nature.	Charge.	Weight.	Elevations and times of flight.					
			PB.	$\frac{1}{2}^{\circ}$	1°	$1\frac{1}{2}^{\circ}$	2°	$2\frac{1}{2}^{\circ}$
	lb. oz.	cwt. qr.						
6-pr.	1 8	6 0	336	468	643	763	926	1019
			8"	1.4"	2"	2.4"	2.9"	3.4"
9-pr.	2 8	13 0	311	490	688	806	955	1052
			6"	1.4"	2"	2.4"	2.8"	3.5"
12-pr. } How.	1 4	6 0	199	309	404	527	625	721
			7"	1.4"	1.6"	1.9"	2.1"	2.7"
24-pr.	2 8	13 0	273	393	515	661	785	873
			8"	1.2"	1.7"	2.2"	2.7"	3.3

Nature.	Charge.	Weight.	Elevations and times of flight.				
			3°	$3\frac{1}{2}^{\circ}$	4°	5°	6°
	lb. oz.	cwt. qr.					
6-pr.	1 8	6 0	1070	1202	1280	1450	1600
			4"	4.4"	4.6"	5.5"	6.6"
9-pr.	2 8	13 0	1148	1293	1475	1541	1784
			4.2"	4.5"	5.2"	6"	7"
12-pr. } How.	1 4	6 0	776	881	1022	1126	1293
			3.5"	3.8"	4.3"	5"	6"
24-pr.	2 8	13 0	941	1111	1208	1381	1485
			3.7"	4.2"	4.6"	5.6"	6"

RANGE TABLES.—(Continued.)
18 Por. Garrison S. B. Gun.—38 or 42 Cwts.
Charge, 6 lbs.

flight.

	2½°
0	1019
9"	3.4"
5	1052
8"	3.5"
5	721
1"	2.7"
5	873
7"	3.3

flight.

	6°
0	1600
50	6.6"
5"	1784
41	7"
.	1293
26	6"
.	1485
81	6"
6"	

RANGE.	SHOT AND SHRAPNEL SHELL.		COMMON SHELL.	
	ELEVATION.	FUZE.	ELEVATION.	FUZE.
Yards.	Deg.	Inches.	Deg.	Inches.
300	P. B.		P. B.	.2
400	1		1	.2
500	1½		1½	.3
600	2		2	.3
700	2½		2½	.4
800	3	.2	3	.5
900	3½	.3	3½	.6
1000	4	.4	4	.7
1100	4½	.5	4½	.8
1200	5	.6	5	.9
1300	5½	.7	5½	1.0
1400	6	.8	6	1.1
1500	6½	.9	6½	1.2
1600	7	1.0	7	1.3
1700	7½	1.1		1.5
1800	8	1.2		1.7
1900	8½	1.3		1.9
2000	9	1.4		2.0
2100	9½	1.5		
2200	10	1.6		
2300		1.7		
2400		1.8		
2500		1.9		
2600		2.0		

RANGE TABLES.—(Continued.)

40 Por. B. L. Gun.—Charge, 5 lbs.—Projectile, Common Shell.

Mean Elevation due to each 100 yards of Range.

DISTANCE OF OBJECT.	ELEVATION.	TIME OF FLIGHT.	LENGTHS OF FUZE.	DISTANCE OF OBJECT.	ELEVATION.	TIME OF FLIGHT.	LENGTHS OF FUZE.
Yds.	deg. m.	sec.	inches.	Yds.	deg. m.	sec.	inches.
100	10	.85	.05	2100	5 27	6.60	1.35
200	21	.65	.10	2200	5 45	7.00	1.40
300	33	.95	.15	2300	6 4	7.35	1.45
400	45	1.25	.20	2400	6 24	7.70	1.55
500	58	1.55	.25	2500	6 44	8.05	1.60
600	1 12	1.85	.35	2600	7 5	8.45	1.70
700	1 27	2.15	.40	2700	7 27	8.80	1.75
800	1 42	2.45	.50	2800	7 49	9.20	1.85
900	1 57	2.75	.55	2900	8 12	9.60	1.90
1000	2 13	3.05	.60	3000	8 35	10.00	2.00
1100	2 29	3.35	.65	3100	8 58	10.40	2.10
1200	2 46	3.70	.75	3200	9 22	10.80	2.20
1300	3 3	4.00	.80	3300	9 46	11.25	2.25
1400	3 21	4.30	.85	3400	10 10	11.65	2.30
1500	3 39	4.65	.95	3500	10 35	12.05	2.40
1600	3 57	4.95	1.00	3600	11	12.45	2.50
1700	4 15	5.30	1.05	3700	11 25	12.90	2.60
1800	4 33	5.60	1.10	3800	11 50	13.35	2.70
1900	4 51	5.95	1.20	3900	12 16	13.80	2.75
2000	5 9	6.30	1.25	4000	12 42	14.25	2.85

Shell.

LENGTHS OF FUZE.

inches.

1.35
1.40
1.45
1.55
1.60
1.70
1.75
1.85
1.90
2.00
2.10
2.20
2.25
2.30
2.40
2.50
2.60
2.70
2.75
2.85

APPENDIX.

DISCIPLINE.

With a view to insure uniformity, as far as possible, in the interior economy of all Field Batteries of Artillery, the following notes on the above subject, together with extracts from the "Standing Orders" for the Regiment of Canadian Artillery are appended :

1. *Commanding Officer.*

The expression "commanding officer" as used in the sections of the Army Act, 1881, relating to "*Courts-Martial*," to the "*Execution of Sentence*," and to the "Power of Commanding Officer," and in the provision consequent thereon, and in these rules, means, in relation to any person, the officer whose duty it is under the provisions of Her Majesty's Regulations, or, in the absence of any such provisions, under the custom of the service, to deal with a charge against that person of having committed an offence, that is, to dispose of it on his own authority or refer it to a superior authority. Q. R. sec. vi., para. 12, note.

2. *Summary Punishment.*

A commanding officer in dealing summarily with a case, may award a private soldier the following punishments, subject to the soldier's right of trial by court-martial, instead of submitting to the award :—

(a.) Imprisonment, with or without hard labor, not exceeding seven days.

In the case of absence without leave exceeding seven days

the imprisonment may be extended to the same number of days as the days of absence, not exceeding twenty-one days in the whole.

(b.) In the case of drunkenness a fine not exceeding ten shillings, according to scale. The award, when prescribed by the scale, is compulsory.

(c.) In the case of absence without leave, not exceeding five days, deprivation of pay for every day of absence.

Note.—If the absence exceeds five days the commanding officer will make no award, as, in such case, all ordinary pay for every day of absence is, under the provisions of the Royal warrant, forfeited without award.

(d.) Any deduction from ordinary pay allowed by sec. 138, sub-sec. 4 or 6, Army Act, 1881, to be made by a commanding officer.

A commanding officer may also award the following minor punishments :—

(e.) *Confinement to barracks* for any period not exceeding twenty-eight days, which carries with it punishment drill to the extent of fourteen days, the taking of all duties in regular turn, attending parades, and being further liable to be employed on duties of fatigue, at the discretion of the commanding officer. Every award of confinement to barracks for fourteen days, and under, is to carry with it punishment drill, which in the mounted service, is to be "kit drill" and in the infantry "marching order."

(f.) *Extra guards or piquets*; but these are never to be ordered as a punishment except for minor offences or irregularities when on, or parading for, these duties.

Any of the above punishments may be awarded severally or conjointly, subject to the following provisions :—

1. When imprisonment exceeding seven days is awarded for absence without leave, a minor punishment must not be given in addition to the imprisonment in respect of the offence of absence.

2. Any award of imprisonment, up to seven days, inclusive, will be in hours; exceeding seven days in days.

3. When an award includes imprisonment and a minor

punishment, the latter will take effect at the termination of the imprisonment awarded.

4. A single award of punishment, including imprisonment and confinement to barracks, will not exceed twenty-eight days.

5. A soldier undergoing imprisonment or confinement to barracks may, for a fresh offence, be awarded further punishment of imprisonment, or a minor punishment, or both, to commence as above specified, provided that no soldier shall be imprisoned by summary award for more than seven consecutive days (except for absence without leave) and that the whole extent of consecutive punishment, including imprisonment and confinement to barracks, shall not exceed fifty-six days in the aggregate.

6. Defaulters are not to be required to undergo any portion of their punishment drill or confinement to barracks which may have lapsed by reason of their being in hospital or employed on duty. Vide Q. R. sec vi., para. 42.

Attention is also directed to sec. 43 as to how punishment drill is to be carried out.

3. Non-commissioned officers, including acting non-commissioned officers, are not to be subjected to summary or minor punishments, but they may be reprimanded, or severely reprimanded, by the commanding officer. When an offence committed by a non-commissioned officer is of such a nature as to require admonition only, it should not be entered against him in the defaulters book. Acting and lance non-commissioned officers may be ordered by a commanding officer to revert to their permanent grade, but are not liable to a summary or minor punishment in addition.

A private soldier may be admonished, but is not to be reprimanded. Vide Q. R., sec. vi., para. 44.

4. The attention of commanding officers and others is also directed to paras. 45 to 59, Q. R. sec. vi. with reference to the administration of discipline, and also to the provisions of the Militia Act. secs. 75 to 90, and R. and O. 1883, paras. 1041 to 1049.

It will be generally found that, except when corps are called out for continuous service, exceeding the ordinary

period of annual drill, the provisions of the Militia Act, respecting offences and penalties will be found, in addition to such minor punishments as are above prescribed, most suitable for application in the case of ordinary offences.

OFFICERS COMMANDING BATTERIES.

5. The officer commanding the Battery is responsible for its internal management and conduct in every particular ; he is to see that all duties are carried on with energy and zeal ; that all orders and regulations are adhered to in every respect ; and that all returns are made out according to form, and sent to the Orderly Room in proper time.

He is responsible that his men are at all times complete in regimental necessaries, strictly according to pattern, and that they have no article of clothing which is not so.

He is to inspect the whole of the men's kits and accoutrements once a month, and is responsible that his subalterns do so once a week. He is himself to superintend the fitting of all clothing.

He is responsible for the payment of the non-commissioned officers and men of the Battery ; is in person to settle all bills connected with the messes, and is to pay monthly all other claims of tradesmen and shopkeepers on the Battery.

He is personally accountable for the arms, ammunition, accoutrements, clothing and stores belonging to the Battery. It is his duty to keep at all times a correct roll of his Battery, and to see that his subaltern officers have correct rolls of their divisions. See also R. & O. 1883, paras. 209 to 214.

SUBALTERN OFFICERS.

6. Subaltern Officers are required to have an accurate knowledge of the Battery to which they belong, and from them is expected a close attention to their district, stable and other duties.

They will be required to possess such a competent knowledge of all drills and duties, mounted and dismounted, as will enable them to act as instructors, and they will also be

required to assist in the course of instruction by giving lectures on ammunition, gunnery and artillery, &c.

They are responsible for everything connected with their divisions, and are to send in a weekly report to the officer commanding the Battery. *Vide* Form A.

A Subaltern is to be detailed for duty, daily or weekly, as orderly officer, during which period he will not leave camp or barracks without leave from the officer commanding.

He will perform the daily routine of duties as specified in Form B, and send in his report at office hour, on the day following.

The Orderly Officer will inspect the rations of bread, meat and forage daily at the hour of issue, and if they are found of bad or inferior quality, he will at once notify the Quartermaster who will cause a Board to assemble. If the rations are condemned by the Board the Quartermaster will take the necessary steps to purchase a fresh supply. The proceedings of the Board will be forwarded for the information of the officer commanding as soon as possible after the sitting.

Subaltern Officers wishing to exchange duties are to forward a memorandum to that effect, signed by both officers, to the officer commanding, or, in his absence, to the Adjutant, and duties are not to be exchanged without the sanction of either of those officers.

All Subaltern Officers will attend the morning drills of their Batteries, and the orderly officer those of the afternoon as well.

OFFICERS IN GENERAL.

7. All officers are to consider exactness of time at parades and posts of assembly as one of the first principles of military duty, and are earnestly enjoined, by strict adherence to all orders, to set an example of good order and military discipline to every soldier under their command.

They are to make themselves acquainted with the Militia Regulations, Army Act, Queen's Regulations, and all General, Garrison, and Artillery standing orders, of which latter they are to have a copy in their possession. Ignorance of orders will never be admitted as an excuse.

They are always to treat non-commissioned officers with kindness, not reprimanding them in the presence of the men when it can be avoided, and although no misconduct or neglect should be overlooked, they are required to be very cautious in placing them under arrest.

They will make themselves acquainted with the names of every man in the Battery to which they belong, and endeavor to acquire a knowledge of his disposition and character. When they reprimand a soldier, they will on no account use violent or irritating language, and in no case whatever allow him to make an answer on parade.

Officers signing documents are to put their regimental rank immediately after their name; and if they have brevet rank, it is to follow the regimental rank, the name of their Corps should also be added in their own handwriting.

Officers are to be most attentive to their stable duties. They will see that the horses are properly cleaned, the stables ventilated, and the horse appointments arranged according to order.

In the like manner, in visiting the men's rooms or tents, they will see that the beds or blankets are folded, arms arranged, and clothing disposed according to order.

Officers in command are to take care that Divine Service is regularly performed for the troops under their command, and all officers are required to attend Divine Service at the place of public worship to which the soldiers of the denomination to which they belong are marched. Officers will wear uniform (Field day order) at morning service; soldiers are to wear their side arms.

All applications for leave of absence must be made in writing through the officer commanding the Battery, and the intended address of the applicant while absent must always be stated.

On joining the Corps, either from leave of absence or detachment, officers are immediately to report their arrival.

Officers may employ gunners or drivers as servants, the practice being sanctioned as an indulgence. Application for a servant must be made to the Officer commanding.

Officers are required to furnish themselves with the latest editions of the undermentioned books, viz. :—

"The Queen's Regulations and Orders for the Army."

"Regulations and Orders for the Militia."

"Manual for Field Artillery, Canada."

"Manual of Artillery Exercises, 2 vols." (Garrison, only.)

"Field Exercise and Evolutions of Infantry."

"Rifle Exercise and Musketry Instruction."

"The Artillerists' Manual (Griffith's), or the Handbook for Field Service."

SERGEANT MAJOR.

8. He must be an example of activity and soldier-like conduct. He must exact prompt obedience to his orders, and instantly correct any want of energy or exertion which he may observe. He should make himself acquainted with every man's name, character, temper, and abilities. He must be very diligent in informing himself of every part of his duty, strictly correct in the execution of it, and by his manly, soldier-like conduct, zealous activity, and a due regard to the feelings and comfort of those under him, set an example to the rest of the non-commissioned officers. He will bring any irregularity among the non-commissioned officers, whether at the Sergeant's Mess or otherwise, at once to the notice of the Adjutant.

He is to keep a roster for the duties of all non-commissioned officers, detail all duties, give out the daily orders to the Battery orderlies as soon after they are published as possible, and he must exact from the non-commissioned officers performing this important duty the same degree of attention as when on parade.

He is to visit the regimental guard room frequently, and see that it is kept clean, and that the written orders for the guard are perfectly legible. He is to furnish a list of all prisoners confined to the prisoners' room, main guard or police station, to the Adjutant daily.

He is to parade all guards, escorts and orderlies, and ascertain that they understand their orders,—particularly the rate.

at which mounted orderlies are to go and return. He is to specify this on the envelope of the despatch, and is to inspect the orderlies and their horses on their return, when he receives the answer or acknowledgment of the message.

All passes for non-commissioned officers and men are to be signed on the back by the Battery Sergeant Majors, previous to being submitted to the officers commanding Batteries.

They will attend at the Orderly Room when prisoners are disposed of, and enter in their Squad Book the amount of punishment awarded in each case.

QUARTERMASTER SERGEANT.

9. All Battery stores are in his charge, and he should see that every article in store is in the best possible state.

The kits of recruits should be properly marked in the Battery Store, and issued to them in presence of the Quartermaster Sergeant, who is responsible that every article is properly marked before delivery.

He is to attend his officers at all inspections of necessaries, arms, barrack rooms, harness, &c.

He is to attend at the delivery of bread and meat, and forage, and see that they are good and of full weight.

He is responsible that the arms, accoutrements, and clothing of any man deserting, going into hospital, or becoming non-effective by death or other casualty, are immediately enumerated and taken into store. He is also to take into store the necessaries of men in prison. Kits belonging to men, who go on duty involving an absence of more than one night, are to be given into store before the men quit the barracks.

He is to collect reports after every field-day, before the Battery is dismissed, to ascertain what may have been lost or broken.

He is to make frequent inspections of the barrack rooms, tents, stables, utensils, &c., and report all deficiencies, in order that the charges may fall upon the person through whose neglect or carelessness the damage has been caused, and not become a general charge against the Battery. He is to be

assisted by the Nos. 1 of Subdivisions, and non-commissioned officers in rooms and stables.

He is to keep an exact account of the distribution of the barrack bedding, so that, in the event of any loss, it cannot come as a general charge against the Battery.

ORDERLIES.

10. Garrison Orderlies are always to parade in Field Day order.

Mounted Orderlies and Trumpeters in attendance on General Officers on parade turn out in the same order as that in which the troops parade, except when the troops are in marching order. In this case—on ordinary Field Days—Orderlies turn out in Field Day order, and only carry the complete equipment of marching order when the articles are required for actual use—as on line of march, &c.

The credit of the corps is affected by the conduct of Non-Commissioned Officers or men on mounted orderly duty; therefore no irregularity in any Orderly, however trifling, will ever be overlooked.

When an Orderly is required to "turn out," whether by night or day, he must do so with the greatest smartness, and is, unless otherwise ordered, to proceed at once to the Sergeant Major, who will give him his orders.

A Mounted Orderly is on no account to stop on the road, neither is he to carry any other than the message or letter committed to his charge, which he is to deliver to the person to whom it is sent, or to some trustworthy person deputed to receive it. (*Vide also* Queen's Regulations, Sect. VII., Paragraphs 189-190.)

NON-COMMISSIONED OFFICERS AND MEN.

11. From Non-Commissioned Officers is expected the strictest attention to all their duties, the greatest sobriety and regularity of conduct, and care as to dress and appearance. They must insist on strict and prompt compliance with their orders, but at the same time use their authority with discretion and

never allow themselves to be influenced by prejudice or ill-will towards any individual. Non-Commissioned Officers must never make use of abusive or improper language to the men, and must use special tact in dealing with young soldiers. They are to give their orders plainly and decidedly, in as few words as possible, and they are never to suffer a reply when on parade or other duty, nor when off duty to be intimate or associate with the men.

Non-Commissioned officers having occasion to confine Soldiers are to give in a written crime to the Non-Commissioned officer of the Guard, signed by themselves, and to report the circumstances to the Sergeant Major.

Whenever a non-commissioned officer is placed under arrest for drunkenness, the officer or non-commissioned officer confining him will immediately send for the two senior non-commissioned officers of the Battery to which the prisoner belongs, and the Sergeant Major also, should he be in barracks; and these are to appear as evidences. In the case of a Gunner or Driver so confined, the Battery Sergeant Major and orderly non-commissioned officer of the Battery are, when possible, to be sent for, or, in their absence, the two senior non-commissioned officers of the sub-division to which the prisoner belongs, and they likewise are to appear as evidences.

Non-commissioned officers are never to allow themselves to be treated by, or to be seen drinking, or familiarly associating with the men, and will be subject to be punished for wilful disobedience of orders, if found so doing.

Men obtaining passes are to be inspected by the Battery orderlies, who are responsible that they are properly dressed.

Non-commissioned officers and men are forbidden to carry heavy walking sticks. There will be no objection to their walking out with light sticks or canes.

Every sergeant in the Field Artillery is to have in his possession a copy of the Manual of Field Artillery Exercises, and in Garrison Artillery a copy of the Manual of Artillery Exercises and Field Evolution for Infantry. All non-commissioned officers are recommended to provide themselves

with a copy of the Artillerists' Manual by Major Griffiths, or the Hand-Book for Field Service.

Seniority alone can never give a non-commissioned officer right to promotion. When a non-commissioned officer is discovered to have become careless, negligent, or indifferent in the discharge of his duty, whatever his rank and service may be, he can never expect preferment.

No party is to be sent out on duty except in charge of a non-commissioned officer; and no fatigue party is to be sent beyond the precincts of a garrison without the express permission of the officer commanding.

No non-commissioned officer of any rank is on any account to appear in plain clothes, except by permission of the Commanding Officer, and this permission is never to be given to those under the rank of Sergeant, unless under very exceptional circumstances.

No non-commissioned officer, or soldier present with his Corps, is to address his officers in writing.

No man is to reply to an officer or non-commissioned officer when found fault with on duty or in the ranks.

Any non-commissioned officer or man must immediately report any illness either of himself (or of his horse) to the No. 1 of his subdivision; if this is neglected he will be liable to punishment. A similar report is to be made of any damage or loss to his appointments. No man on the sick report is to quit the barracks or camp, or to enter the canteen.

Any man having real cause for complaint should appeal through the Officer commanding his Battery; and without meaning to encourage trifling complaints, of which all good soldiers should be ashamed, it is to be clearly understood that all real grievances will be redressed. The yearly inspection is not the period at which claims are in ordinary cases to be brought forward for adjustment (*Vide* Queen's Regulations, sect. v., par. 46.)

A soldier without his cap, or who is carrying anything that prevents him from saluting properly will, if standing still,

come to "attention" as the officer passes; if walking, will turn his head slightly towards the officer in passing him.

The first duty of a soldier is to *obey orders*.

If he think himself aggrieved in any way, or that he has received an unjust order, he should obey the order, and afterwards represent his case to his officer, when the matter will be investigated.

If a soldier has a complaint to make, either as regards his pay, messing, or on any subject, he should make it when the officer on duty visits the barracks at dinner time. It is for this purpose that the men are asked if there are any complaints.

Should a soldier wish to see an officer on any subject, he should ask to do so through the Sergeant Major, or a non-commissioned officer.

If soldiers make frivolous or unnecessary complaints they are liable to be punished.

No soldier is to leave Camp or Garrison unless he has been granted a *pass* for that purpose, and which he must have in his possession, otherwise he is liable to be made a prisoner for absence without leave.

All soldiers going on pass must be properly dressed. Gloves are to be worn and not rolled up in a bundle and carried in the hand.

No soldier should be more than five miles from his quarters without a *pass*.

Soldiers are not allowed to smoke in the streets.

No soldier is allowed to lend any article of his regimental clothing, &c., to another, nor sell or exchange any of his kit without permission.

No soldier is allowed to alter, or have altered, any part of his regimental clothing, except with the sanction of the Commanding Officer.

NOS. 1. OR NON-COMMISSIONED OFFICERS IN CHARGE OF SUB-DIVISIONS.

Nos. 1 of sub-divisions are immediately responsible to their own divisional officers, that the arms, accoutrements, appointments, men's necessaries, and everything under their charge, are complete and in the best possible order.

They must make themselves acquainted with the character and abilities of their non-commissioned officers and men, take every opportunity of instructing the younger non-commissioned officers in their various duties, and be most particular that they on no account associate or drink with the men, as such conduct tends to weaken their authority and renders it almost impossible for them to conduct their duties in a proper manner.

They are to make themselves fully competent to instruct the men in the duties of artillerymen, and make them familiar with tables of practice, so that they may be able to lay their guns with the greatest precision for all distances, and in the shortest possible time.

They must pay the greatest attention to the state of the guns, carriages, saddlery, ammunition, horses, shoeing and everything connected with their sub-divisions. They must see that the Shoeing Smiths inspect the horses' feet every morning at stable hour, as this will prevent the frequent inconvenience arising from horses casting shoes on the march and at drill. The stable utensils are under their charge, and they must be careful to notice any deficiency or injury to them, ascertaining, if possible, the individual to blame.

The young non-commissioned officers and recruits must be instructed in the manner of taking to pieces and putting together every part of their appointments.

Saddles, harness, bridles, and other appointments are to be hung up in a uniform manner.

The appointments are to be taken to pieces once a week, and laid out for the inspection of the officers in charge of divisions. The ammunition and small stores (weather per-

mitting) must be taken out of the boxes once a week, and thoroughly inspected, care being taken that each box contains the proper articles assigned to it. Any article found to be damaged is to be at once reported with a view to immediate repair.

When squad parade sounds, each No. 1 will parade his men in front of his sub-division stables, and inspect them most minutely; he will then march them into stables, and file every man to his horse or horses, go round, inspect every horse, see that they are all properly girthed up, and that the surcingles are not tighter than the girths (neglect of this point producing lumps and galls, and throwing horses out of work for a time) and point out everything that may be wrong, and have it altered on the spot. He will then file out and mount his men, and see that the stirrups and drivers' reins are of a proper length. He is also responsible that the saddles, pads, &c., are fitted as laid down in Field Artillery Exercises.

When marched to the Gun Park the Nos. 1 will be most particular in seeing that the horses are properly hooked in, the main points to be attended to being that the traces are not twisted and hooked in of unequal length (the hand horse if anything the longest), that the breechings have no more play than four inches between them and the collars, and are from 10 to 12 inches below the upper part of the dock, that the ties are properly fastened, and that each driver has a spare set on the off ring of his saddle.

In marching to the drill ground, or in route marching, the Nos. 1 need not remain in one place, but should constantly observe that the line of draught is straight, the drivers sitting up and paying every attention to their horses, and they should correct anything they may not have seen when inspecting their sub-divisions in the park.

When halted they must see that the drivers examine their horses' feet, shoulders, girths, saddles, &c., and report that all are correct or otherwise; and they will themselves report to the Officer in charge of the Division.

On coming in from drill, or marching order, or from the line of march, as soon as the horses are filed into stables and

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fastened up, the men will be allowed ten minutes to change their clothes, at the expiration of which time each No. 1 will parade the whole of his sub-division off duty, and march them into stables, where they will remain, and on no account quit the stables without leave until the "turn out" sounds.

They are most careful to inspect and pass at stable hours every horse under their charge, and report accordingly.

They must not only be vigilant themselves, but impress upon all non-commissioned officers and men under them the necessity of reporting at once any horse which may appear dull or the least off his feed.

Sick or lame horses under treatment in stables must be pointed out to the Stable Orderly, so that he may see that the orders of the Veterinary Surgeon or Farrier are carried into effect.

They are to see that the wheels of their carriages are properly greased, and are always fit for service.

(13.)

ORDERS FOR STABLE PICKET.

The stable picket will mount at "turn out" of stables, the men who are to form it having been allowed to leave stables a quarter of an hour before turn out to dress themselves. Previously to being marched off they are to be inspected by the Subaltern Officer on duty.

They must remain constantly on their post, and not go into the stables without a light, which must be in a lantern. Should a horse get loose, they must call the non-commissioned officer of the picket.

The picket will be dismissed at morning stable hour by the Non-Commissioned Officer in charge.

STABLE DUTIES.

Nothing is more important than the horses being in good condition, and at all times fit for immediate service; the stable duties will therefore require the greatest attention

to the quality, quantity and distribution of the forage, as well as the vigor and exertion with which the grooming is performed ; these are subjects that require from every officer and non-commissioned officer the strictest attention.

Great care must be taken that the horses are properly watered, without which they cannot possibly be kept in good condition. Every horse should be allowed as much as he will drink, excepting when brought in heated or over fatigued, at which time they should be sparingly watered ; but at the next stable hour they should not be stinted. Non-commissioned officers must look carefully after young soldiers in this matter.

The following routine will be gone through daily at stables : On the trumpet sounding for morning stables, the men will fall in by squads, the roll called, then march to stables, litter up, and sweep down, commence grooming off side, then near side, "heads about," clean eyes, nostrils, &c., sweep down, clean headstall ; feed with corn when trumpet sounds.

On the trumpet sounding for mid-day stables the men go immediately to their horses, the non-commissioned officers go round their squads to ascertain whether all are present, pick out and wash horses' feet, &c., "heads about," "collar up," groom body and legs, feed with hay (no man to leave off grooming till permitted by the non-commissioned officer to do so), sweep down ; feed with corn when trumpet sounds.

At evening stables water and feed with hay, dress, &c., then litter down, feed with oats and hand-rub legs (principally hind ones) for quarter of an hour, litter down for the night.

Horses not present at the appointed stable or feeding hours, are not to have a double feed of oats, if there be time to divide it, before they are bedded up for the night.

When men come in with their horses, and they have not had their meals, they may be permitted to quit the stables for half an hour, leaving their horses harnessed until they return ; they are first to take off the bridles, put on collars, throw up cruppers, wisp their head and legs, pick and wash their feet, and feed with hay. On their return to the stables the horses are to be watered, and fed with oats,

and the harness taken off, and horses and harness thoroughly cleaned.

A couple of hands-full of chopped straw and hay to be given mixed with each feed of corn.

No man is to take a horse outside the stable to groom him, unless ordered by an officer to do so.

On no pretence is a horse to be struck in the stable, or quickly turned round in the stall.

Smoking at stables is strictly prohibited.

12. The saddles and bridles, harness, and other appointments, are to be cleaned daily and hung up in a uniform manner.

The stable utensils are to be carefully arranged in the most convenient places, pitch-forks especially are not to be left in places where they are liable to injure horses. The wheelbarrows are always to be emptied before the men are dismissed from stables.

Non-Commissioned Officers in charge of stables are to be most particular in observing that the horses are all let down from the rack before quitting stables.

One stableman is always to be in the stables. The cook of his room will bring him his meals. In case of any accident he is to pass the word for assistance to the nearest bar-rack room.

(14..)

PARADES.

The following orders for trumpet parade calls are laid down :

1. For all mounted parades, except riding drill and watering order, the trumpet is to sound "Boot and Saddle" 60 minutes before the hour of parade; 15 minutes afterwards "Squad Parade," and 30 minutes after "Boot and Saddle" the "Turn Out."

2. The sound "Boot and Saddle" does not imply that the horses are not to be harnessed and saddled until that sound; it is meant more as a warning to all hands that it is half an

hour to turn out and a quarter of an hour to squad parade, harnessing and saddling must always depend on circumstances, and special orders must always be given concerning it. Horses should never be harnessed before it is absolutely necessary.

3. Subaltern Officers "turn out" when the trumpet sounds "Turn Out" for the men, half an hour before the time named for parade, and immediately begin their inspections, at the same time the Nos. 1 are inspecting; if they do not do this the battery can never be properly inspected, and ready at the hour named.

4. For foot parade, batteries will fall in for "Squad Parade" 30 minutes before the hour named, "Fall in" to sound directly after the Nos. 1 have inspected their sub-divisions, and the battery to be told off in divisions, ready for divisional officers' inspection, 15 minutes before the hour mentioned.

A

SUBALTERN OFFICER'S WEEKLY REPORT.

From	To	Battery	Station	Artillery
Commanding			Date	Artillery
				Artillery

SIR,—I have the honor to Report that during the past week I inspected the arms, accoutrements and regimental necessaries of the non-commissioned officers and men of the Division (or half Battery) of the Battery under your command and found them clean, complete and in good order, with the exceptions mentioned in the Nos. Reports.

The deficiencies reported last week have been made good. I have examined, and herewith forward the mess-books of the Division (or half Battery).

I have the honor to be,

Sir,

Your obedient servant,

B

DAILY REPORT.

BATTERY.

Bread and
Meat.

SIR,—I have the honor to report :

1. That as officer on duty on the

I attended at the issue of bread and meat, and forage and found them of weight and of quality.

Meals.

2. I visited the barrack rooms, or tents at and found everything regular ;

The men were all present, and complaints.

Hospital.

I signed the

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Your obedient servant,

To the officer commanding,
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