THE

MADRAS GUNNER.

RULES AND INSTRUCTIONS

FOR THE

GUIDANCE

OF

Officers and Non-commissioned Officers

OF

Artillery,

IN THE FIELD, AND ON OTHER OCCASIONS,

RESPECTING THE

USE AND MANAGEMENT OF GUNS, &c.

UNDER THEIR CHARGE;

OR TO WHICH THEY MAY BE ATTACHED.

Particularly adapted to the Service in the East Indies.

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INTRODUCTION.

THE success of an army depends more on the ease and activity of its movements, than on its numbers; and this facility of movement can only be acquired and supported by the most minute attention to the discipline, and equipment, of the several parts of which it is composed.

The want of activity in the armies in India, has been generally attributed to the slow movements of the artillery; and doubtless, sometimes, with justice: but from the nature of the equipments, and the hitherto wretched bullocks with which the train of artillery on the coast has been drawn, neither indefatigable exertion, nor judgment in the officers, could entirely obviate the inconvenience; yet it must be in the recollection of many officers on this establishment, that the artillery department with the armies under Sir Eyre Coote, in the Carnatic, and

under Lord Cornwallis and General Harris, in the Mysore country, was, by careful attention to the general management of the guns and carriages, enabled to remove, in a considerable degree, these disadvantages.

Young officers, without experience, are apt to look on particular parts of their duty as trifling, being unable to judge of the consequences of little neglects, when permitted to exist any time; and, from the novelty of the situation, on taking the field, are, in many instances, at a loss how to act. The pride of an officer should stimulate him to an intimate knowledge of the most minute points of his profession, and a prompt and correct discharge of every duty, both as it affects himself, as also as an example to those under his command.—The compiler, in a long series of service, having had occasion to regret the want of some publication similar to "Adye's Pocket Gunner," and with a hope to remove inconveniences, and to establish uniformity in the duty of the corps of artillery, submits the following rules and memorandums for the guidance of officers, and non-commissioned officers of that corps.

Rules and Instructions, &c. &c.

IN THE FIELD.

On the general beating, or other signal for march, the artillerymen are to strike and pack up their tents as quick as possible, and with the greatest care. As soon as the tents are packed ready for loading, the horses or bullocks put to the guns, &c. the officers of divisions to parade their men in front of the guns, with shouldered arms, and open ranks.—Lascars to be paraded on the left of Europeans.

The Officers are then to Order;

Order Arms,
Sling Arms,
Rear Rank take close Order,
March,
——————— Face,
March.

The artillerymen fall in to their stations, and the Lascars to the drag-ropes, &c.—The officers then carefully prove every man to his station.

On the assembly beating, the officers order their parks or divisions to be drawn off in line, according to the order of march—first a gun, then its tumbril; then a tum-

bril followed by the gun; by which means every two guns will have their tumbrils between them, and ready at all times to form.—This is a general rule, but it sometimes may be necessary to direct a different order of march.

While the march beats, the officers of artillery may be mounted, but they are to have their swords drawn—the men to march in file in their respective divisions.—This to be observed on marching into a new encampment.—The artillerymen, and Lascars, are on no account to straggle from their guns on the march,—nor to leave them a moment, without permission of their officer or non-commissioned officer.

It should be particularly explained, and at all times understood, that no person is to strike or ill treat the drivers, but to assist them as much as possible.

On no account whatever is baggage, or lumber of the most trifling size, to be put on guns or tumbrils—should it at any time be necessary to allow a sick man to ride on a gun, till a dooley or other conveyance is procured, the officer of the division will sanction it.

Officers, or non-commissioned officers in charge, should be held responsible that their guns are at all times, on the march, *ready for immediate service*—(tumbrils and limbers

unlocked,) and for the quantity and state of their ammunition; on which account, when officers, or non-commissioned officers in charge, are removed from one brigade, or division, to another, the relieving officer becomes answerable: on all removals, officers receiving charge are to report to their commanding officers, that should the exigency of the case not allow an immediate examination, it may take place as soon after as possible.

Drag ropes to be at all times, on the march, in charge of a man (European or Lascar) to each, carried on the carriages; and officers will direct their being used in heavy ground, or ascending or descending heights; in such cases, a proportion of Lascars of the division to remain 'till the last carriage has passed the difficulty.

All casualties of a march, or expenditure of ammunition, to be immediately reported, through respective commanding officers, on coming to the ground, and all deficiencies or repairs to be immediately completed.

Artificers' carts to be divided on the march, and a proportion of artificers with each, who should be provided with drag ropes to assist in bad roads.

Spare bullocks to march on the open flank, paralleled to the divisions of guns, and never permitted to go from the line.

Bullocks to be regularly reported and mustered.

In event of carriages breaking down on the march, or any occurrence necessary to be communicated to the commandant of artillery, an officer to pass up the line of march to the next division of guns, and forward the report in like manner, to the commanding officer, should he be in front; but immediate steps to be taken to rectify the damage, by the artificers, spare carriages, or tumbri's.

It is proper that a confidential person, of the pay-master's department, with the keys of treasure tumbrils, march with the park, that, in the event of accident happening, treasure may be shifted to spare tumbrils.

In getting guns or tumbrils up a precipice, if heavy guns, and the ascent steep and long, guns should be unlimbered, and dragged trail foremost, the guns lowered on the transom so as to bring the weight forward,—two men with handspikes behind, one to each wheel, careful to keep clear outside the wheel, lest accident might happen to the drag ropes; but to guard against which, rollers should be attached to the wheels in such situations, (as those used with waggons in England,) such as recommended by Colonel Bell,—a number of which should be carried with every equipment of ordnance for the field, as they have been proved very serviceable in as-

cending steep ghauts.—The roller to be 8 inches diameter, and sufficiently long, say 18 inches, that a chain by which it is attached may clear the wheel when moving. The chain to be fixed in an eye bolt in the end of the roller or block, and to the hookwasher on the outside, and to the axle tree close to the friction-plate on the inside. Vide plate.

The ground on which parks, or divisions of ordnance are posted, and a moderate distance round, to be cleared, on coming to the ground, of long grass or bushwood, as the progress of fire in high wind is rapid, and in camp with native corps, fires frequently happen.

On coming to a new encampment, as soon as the guns, tumbrils, &c. are drawn up and carefully examined, and the artillerymen and Lascars paraded the rolls to be called, when the officers commanding divisions, or brigades, are to go along the line and receive reports.

The Officers are then to Order;

Order Arms,
Shoulder Arms,
Port Arms,
Right, Face,
Break.

The required guards to be mounted, and centinels posted.

General Instructions for an Artillery Guard over a Park.

The centinels posted about a park of artillery are not to suffer any person whatever, except those belonging to the train, and by authority, to go within the park line, or to fling any thing over or under it.

During the night, centinels are not to suffer any body to approach the line, and no centinel is to presume to go within the line day or night—they must on no account suffer any person to smoak near the park, or allow fire to be near it.

The serjeant or corporal must go round their centinels, during the night, every half hour, to see that every centinel is alert: and in the night no person is to be admitted into the park, unless the serjeant or corporal of the guard is with them; patroles to go as may be directed.

Great care must be taken, by non-commissioned officers of guards, or in charge of ordnance or stores, that the

tarpaulins of tumbrils or limbers are kept smooth, and close tied down, to prevent wet getting in or lodging thereon.

The serjeant of a new guard must be very particular in seeing that all the stores he is to take charge of are safe and complete; but the tumbrils and limber boxes, are not, on any account, to be opened by the serjeant of the guard, without a particular order from the officer commanding the park or division.

As the serjeant of the guard is held answerable for the safety of everything under his charge, it is necessary that he should be present when any working party is sent to the park, or any removals ordered by authority, all which he is particularly to report.

Officers in command of divisions are to be answerable that the men's arms are kept at all times in good order.

Uniformity of dress adds much to the appearance of a corps, and ever considered as a mark of its discipline and internal order: all the exactness of a garrison parade cannot be expected in camp, but cleanliness and soldier-like appearance must be insisted on, as indispensably necessary to the credit of the corps.

Artillery men should never appear out of their lines

without being dressed in a soldier-like manner, and with side arms.

Artillerymen are never to pass an officer of any corps, without paying him due respect, as directed in the standing orders of their corps.

When a man is reported to be drunk, the officer under whose command he is, should *see him*, and investigate carefully any complaint that may be alleged; if the officer considers it necessary to confine a man, a written crime should be sent with him, or as soon after as possible.

SICK.

Officers commanding divisions, or parks, should give the greatest attention to the sick, and see that they are properly attended to—The sick not in hospital, to be regularly taken to the surgeon at the hospital tent, and reported agreeably to the usual form of their corps.

When artillerymen are sent from camp, either on detachment, or to hospital, commanding officers of companies are to send certificates of what pay is due to each man, and of the period to which they are paid up.

An officer on duty at the park, is to visit the sick in hospital twice a day.

The surgeons will arrange, previous to the march, the means of conveyance, and will *see* that the spare doolies, and carriages, are distributed with the divisions of guns; by having a proportion of spare carriage with the rear division of guns, any man who may be taken ill on the march, where there is no sick conveyance, will be taken up,—a surgeon, or assistant surgeon, should march with the rear gun on this account, to be ready to afford assistance as it may be required.

Particular and interior arrangements for sick in hospital should be made by corps, as also for the march of such of the sick as it may not be necessary to send in doolies or carriages, yet are not able to march with guns; similar arrangements should be adopted for the native sick.

Directions for keeping Light Guns and Carriages in good Order, and for their Management.

The wheels should be taken off after a march, and axletrees carefully examined, as damages are sometimes not evident,—if any thing about the carriage is out of order, it is to be immediately repaired, and the axletrees greased.

Guns and carriages should be well washed, if practicable, particularly the cylinder of the gun, if it has been fired, and should, on such occasions, be laid under metal 'till perfectly dry.

If guns, &c. remain long upon the same ground, although only used for exercise, the wheels and axletrees, trail plates, &c. must be occasionally examined, and, in hot weather, the naves kept covered with sods, (or cow dung) to prevent the heat of the sun cracking them.—The elevation screws must be kept well oiled, and, in travelling, the screws to be let down.—Cap-squares to be always keyed down; and to prevent the key's shaking out, they should be opened after they are drove through the eye bolts.

Tarpaulins must be kept in good order by being fresh tarred occasionally.

When guns march, the shoulders of pintles, and the lower pintle plates, should be greased to prevent wearing by friction.

Limber boxes should be kept constantly complete with ammunition, and the requisite small stores—all expenditure of ammunition to be made from the tumbrils, as far as circumstances allow, or except in cases of emergency.

Spare spunges, wad-hooks, &c. to be carefully lashed to the limber and tumbril polls; the cheeks of the carriages to be perfectly unincumbered.

In mounting or dismounting guns, particular care to be taken that the cap squares are not strained, else the trunnions may be so closely embraced, as to prevent the elevation screw working freely.

When guns travel, the bottom of the elevation screw should be carefully capped in wax cloth, or flannel, to prevent the splash of dirty roads rusting or clogging the thread of the screw.

In packing ammunition in tumbrils or boxes, the greatest care should be taken to prevent the oakum being tight wrapped round either the shot, bottom of wood, or cartridge, but only loose surrounding each, so as that when a man takes hold of the shot with his right hand, he may slip off the oakum, gently drawing it through his left hand. Too much care cannot be taken to guard against accidents by friction; on which account, fixed ammunition must be packed in opposite directions, to prevent any two shot coming in contact.

The officer or non-commissioned officer in charge of guns should see that the spunges are properly coated, par-

ticularly that there is a good thickness of wool or thrum at the end, in order to clean out the cylinder.

That the punches are not too large for the vent, and that a hammer, spikes, and a punch, are attached to each gun, in the limber box; in order to have the punches always ready with a hammer, they should be tied together with strong twine, sufficiently long to allow of their being used in that state.

That, after exercise, a wad-hook is introduced to each gun to draw the wad, that the vents are examined and cleared;—for want of such precautions, two light six-pounders were useless at the battle of Minden; and a party of looty horse escaped, without injury, when plundering in the Carnatic, where they came unexpectedly, the guns having been used for drill, and the wads neglected to be drawn.

In all military exercise hurry should be avoided, but in the management of artillery more particularly—as a brave man may be so confused thereby as to prevent him from doing his duty with spirit and proper effect.

When guns are in the intervals of corps of infantry, the axle-trees should be in a line with the front rank, to prevent accidents from the battalion fire; after the guns

fire, they are to be brought up to their ground as above, that their explosion may not affect the troops.

When the enemy is forming behind a hill, round shot, or shells, should be thrown at a considerable angle, and small quantity of powder,—if advancing on level ground, round shot, in ricochet, may be thrown with happy effect, by grazing once or twice before it reaches the line, or column. It has often been observed, that steady soldiers have been more alarmed and confused by seeing shot hopping into their line, than by having a great number of their comrades killed by their sides without seeing it.

At 600 yards, round shot, fixt with the usual full quantity of powder, should be fired at one degree elevation, reducing elevation 'till 300 yards, when case shot will do much execution.

Round shot should never be fired, without pointing the guns carefully each time, and with attention to the elevation—but case shot, or quilted, may be fired as quick as the guns can be worked with safety in the intervals of corps, and which allows the officer or non-commissioned officer sufficient time to direct the gun, and to give a pretty good guess at the elevation. It is of the utmost consequence to fire so as to do execution—for shot firing over a line tends to give confidence to the enemy.

In time of action only, the pole horses, or bullocks, of each gun, should be kept with the limber, and other horses or bullocks should be kept in readiness to hook to the breast hooks,—chain traces, for brass 18-pounders, or iron 12-pounders, should be in two pieces, for the advantage of occasionally advancing the guns, by hooking on to the drag hooks or hook washers of each wheel.

At all times it must be the particular duty of the officers or non-commissioned officers, with guns attached to corps, to preserve their proper position, both in line and in advancing, and to see that their tumbrils are in their proper situation.

When guns are to cross a ditch, or go down a descent with bullocks, it will be necessary for drag ropes to be hooked to the drag washers, or breast hooks, to prevent a strain on the pintul, and to prevent accident to the pole bullocks, which, without such precautions, are frequently run over and injured.

In travelling, the screw is liable to be injured, unless either let down as low as the thread of the screw will allow, or by fixing a small chain and ring over the handles of the screw; in rough ground it is desirable that the screw be let down.

With parks of heavy guns, or carriages, the road from

the spot where the park encamps, leading to the high road on which the park is to move, should be reconnoitered the evening before the march, and the road prepared; much difficulty will thereby be avoided in drawing off in the dark.

Directions in quick-firing Field Pieces.

The man who spunges must give the word "fire," (except when the gun can be particularly pointed, in which case the man who points must give the word,) that he may fall back before the gun is fired, and keep his eyes fixed upon the muzzle, and not step out till he sees the explosion; when he spunges he must push the spunge close home to the breech, turning it twice to prevent any fire hanging; the spunge should be slightly wetted occasionally.

The man who loads must take care to keep the cartridge behind the wheel, 'till he sees the spunge drawn out.

The man who serves the vent, must on no account relinquish a firm and close pressure of the thumb, (as on that depends the safety of the man who loads) until the men who load and spunge are fallen back; when he

must be careful to prick the cartridge well, to fire with priming powder—if with pen-point tubes, the sloping part to be kept towards the muzzle of the gun, and the tube to be relieved a little after having entered the cartridge,—the tubes now in general use being cut square renders this unnecessary. The strictest caution to be observed, in order to guard against explosion of priming pouches, or tube boxes; the cartridges to be well pricked, and a necessary quantity of powder only to be used in priming, which is to be lightly dropped into the vent. He must likewise take care to stand clear, so that the wheel cannot run over him when the gun recoils. Should any tube stick, he must call to the man in front "don't load" "a tube stops the vent"—for want of such precaution many accidents have occurred.

The man who fires must hold the portfire well down, and when ordered to fire, lift it straight up to the vent, by raising his elbow, and not swinging it round.—He also must be careful to stand clear of the wheel.

The man who brings the cartridge from the ammunition pouch must keep it in his left side, as securely as possible, until he gives it to him who loads.

The man who carries the ammunition pouch, must be careful to keep it shut: spare portfires must not be carried in the ammunition pouches, but kept in hand.

When guns are fired with shot, the wheel drag-rope men must keep the wheel end of the drag-rope in their hands, fall back as the gun recoils, then hook and draw up the gun to its proper position, without this precaution, men are liable to be hurt by the recoil.

The steersman should recollect that a light six-pounder will recoil several feet upon level ground; they should therefore step sufficiently aside to avoid being entangled in the carriage. An active, careful tindal, or Lascar, who carries the water bucket, should have a portfire to replace them in use; as soon as he has so disposed of it, he is to fetch another; on no account should a lighted portfire be handed over the cheeks of the carriage; when circumstances allow, the wad-hook should be employed occasionally, as bottoms of cartridges sometimes remain after the gun is spunged.

The advantages derived from the equipment of artillerymen with fuzils, or light arms, on field service, has been so frequently evinced on occasions of emergency, and as such light arms do not interfere with the active performance of the duties of field guns, when slung, this equipment should never be given up.

INSTRUCTIONS

To be observed in the

PROOF OF CANNON,

As Established by the Military Board, Fort St. George, 1806.

1. All guns are to be searched for the purpose of ascertaining their actual state, which is to be expressed in the column of remarks, (and it is to be observed, that those guns only, whose state is doubtful, are to be submitted to proof, it being unnecessary to prove guns which are new, or perfectly free from defect, as well as those which have defects, that render them totally unserviceable.)

2. When guns are to be proved, the bore and vent to be perfectly cleared before the proof, by scaling the pieces with the usual quantity of powder.

3. The proof charge of powder for all *iron* guns, from eighteen-pounders upwards, to be 2-3ds the weight of the shot; charges for the lower calibers to be equal to the weight of the shot.

4. Brass guns, from eighteen-pounders upwards, to be proved with the charge of powder, 2-3ds the weight of the shot; heavy twelve-pounders with 7lbs. medium; twelve-pounders with 5lbs. and light twelve-pounders with 4lbs. of powder; light six-pounders to be proved with 3lbs. of powder.

5. The proof charge, beside the powder, to consist of two shot and three wads.

6. High junk wads to be used, one over the powder, and one over each of the shot.

7. All guns of the higher calibers, to twelve-pounders inclusive, to be fired twice; those of lower calibers to be fired three times.

8. The second round of the heavy pieces to be with one shot and two wads, and the last round of light pieces in like manner. The charge of powder is not to be varied.

9. No guns to be proved of lower caliber than six-

pounders; their bores are however to be searched and their state reported.

10. After the proof, a vertical and horizontal diameter of the bore at the muzzle are to be carefully measured with caliber compasses, and inserted in the report in inches and decimal parts.

11. The situations of holes or cavities, whether upwards, sideways, or in the bottom of the bore, are to be particularly remarked in the report, also their extent, depth, and distance from the muzzle.

12. The state of the vents is always to be remarked in the report; when so much blown as to render the pieces unserviceable, they shall not undergo the proof by powder, but the bores are to be carefully measured, searched, and their state reported.

13. The proof of cannon is always to take place between the hours of 7 and 10 in the morning.

14. The shot are always to be recovered, if possible, either by firing them into a butt of earth, or in a direction where they may be easily found.

N. B. The quantity of powder for the proof charges, has been calculated for powder that is exactly proof,

which it is considered to be, if 2lbs. of it will throw a 10-inch shell, weighing 96lbs. 1000 yds. from a 10-inch mortar elevated to 45 degrees; but if powder of a different strength be used, a proportionate alteration is to be made in the quantity of the charge; viz. powder proving 1,500 yds. is to be decreased 1-5th, and so of other powder.—A. N. B. at the foot of the proof report, is to mention the proof distance of the powder, which has been used.

Note. A piece of portfire, of length according to the number of guns to be proved together, to be fixed on the vent with clay, so as to allow the people employed sufficient time to get into a place of security.

No. 1. *(To face p. 24.)*

Form. *Report of a Proof of Cannon made at the Fort of* *by order of the Military Board.*

IRON GUNS.	Distinguishing Mark.	Number.	Length. Feet.	Length. Inches.	Weight. Cwt.	Weight. Qrs.	Weight. Lbs.	POWDER. Nature.	When made.	For Scaling. Lbs.	For Scaling. Ozs.	For Priming. Lbs.	For Priming. Ozs.	Charge. 1st. Lbs.	Charge. 1st. Ozs.	Charge. 2d. Lbs.	Charge. 2d. Ozs.	Charge. 3d. Lbs.	Charge. 3d. Ozs.	Total quantity used. 60 lb. Barls.	Total quantity used. Lbs.	Total quantity used. Ozs.	Round Shot. Charge 1st.	Round Shot. Charge 2d.	Round Shot. Charge 3d.	No. Total.	Height that the first Charge measured. Feet.	Height that the first Charge measured. Inches.	Height that the first Charge measured. Parts.	Vertical diameter of the bore at the muzzle. Inches.	Vertical diameter of the bore at the muzzle. Parts.	Horizontal diameter of the bore at the muzzle. Inches.	Horizontal diameter of the bore at the muzzle. Parts.	Remarks.	State of the Proof. Serviceable.	State of the Proof. Repairable.	State of the Proof. Unserviceable.
GUNS.																																					
Iron 24 pounder, heavy English.																																					
Do. .... Foreign.																																					
18 ... . English.																																					
Do ...... medium..........																																					
12 ....heavy..........																																					
Do. ... . light..........																																					
9. .... heavy..........																																					
Do. ... . Foreign.																																					
6. ....English.																																					
4........................																																					
Do. ... . Foreign.																																					
3.......... .... English.																																					
Do. .... light																																					
Brass 24...... ..heavy..........																																					
18............ light																																					
12........... medium																																					
Do........... .. light																																					
6...........................																																					
4............... long Foreign.																																					
3............... light English.																																					

No. 2.—(*To follow No. 1.*)

Form

Dimensions of Guns, Howitzers, &c. that require Carriages at

1805.

Species of Ordnance.	Rate of the Piece of Ordnance. English.	Rate of the Piece of Ordnance. Foreign.	Number.	Length. Of the Piece. F.	I.	Pts	From the centre of the Trunnion to the rear part of the Base Ring. F.	I.	Pts	From the Base Ring to the centre of the elevating screw-hole, taken in a line with the metal. I.	Pts.	Of the Trunnion. I.	Pts	Breadth between the outer extremities of the Trunnions, in inches. F.	I	Pts.	Diameter. Of the Base Ring. F.	I.	Pts	At the Trunnions. F.	I.	Pts.	Of the Trunnions. I.	Pts.	Weight of the metal. C.	Qrs.	Lbs.	Remarks.
Brass Gun.....	6 Pr.		1																								
Do. do.....		6 Pr.																									French.
Do. Howitzer.....	5½ Ins.																										
Iron Gun.....																											

N. B. The breadth between the extremities of the Trunnions may be correctly measured by Carpenters compasses.

Proof of ORDNANCE *for His Majesty's Service.*

All natures of ordnance undergo several kinds of proof, before they are received into his Majesty's service; viz. 1st. They are guaged as to their several dimensions, internal and external, as to the justness of the position of the bore, the chamber, the vent, the trunnions, &c.

2nd. They are fired with a regulated charge of powder and shot, and afterwards searched to discover irregularities, or holes produced by the firing.

3rd. By means of engines, an endeavour is made to force water through them; and,

4th. They are examined internally, by means of light reflected from a mirror.

Iron Guns.—The guns are first examined as to their proper dimensions, in which, in no case, more than 3-10ths of an inch variation is allowed; and in the diameter of

the bore only 1-30th from 42 to eighteen-pounders, and 1-40th from 12 to four-pounders; but in the position of the bore, ½ an inch out of the axis of a piece from a 42 to an eighteen-pounder, and 1-3d of an inch from a 12 to a four-pounder is allowed. They are then fired twice, with the charge in the following table, with one shot and two high junk wads; and examined with a searcher after each round.—In this examination, they must not have any hole or cavity in the bore of 2-10ths of an inch in depth, behind the first reinforce ring, or ¼ of an inch in depth before this ring.

Nature	Proof Charge.		Nature	Proof Charge.		Nature	Proof Charge.	
Pdrs.	lbs.	oz.	Pdrs.	lbs.	oz.	Pdrs.	lbs.	oz.
42	25	0	12	12	0	3	3	0
32	21	8	9	9	0	2	2	0
24	18	0	6	6	0	1½	1	8
18	15	0	4	4	0	1	1	0

Iron guns are sealed with 1-12th the weight of the shot.

Brass Guns.—From one-pounders to twelve-pounders, the diameter of the bore must not vary more than 1-40th of an inch, and in no dimensions more than 2-10ths.—The following are the established charges for their proof.—The heavy and medium guns, with a charge equal to the weight of the shot, except the medium twelve

pounder, which is proved with only 9lbs.—The light guns with half the weight of the shot. The brass ordnance have not, however, been proved of late with such heavy charges, but with the following:

Three pounders light, 3 times, with 1lb. each round.
Six-pounders light, 3 times, with 2lbs. each.
Twelve-pounders light, twice, with 4lbs. each.
Twelve-pounders medium, twice. with 5lbs. each.

Any hole ·15 of an inch deep upwards or sideways in the bore, or ·1 in the bottom, between the breech and first reinforce; or ·2 of an inch upwards or sideways, or ·15 in the bottom of the bore, before the first reinforce ring, will be sufficient to condemn them.

Brass Mortars and Howitzers.—The exterior dimensions are in no respect to deviate more than 1-10th of an inch, in an eight-inch howitzer, and 1-20th in the royals and coehorn mortars and howitzers.—The bores and chambers not to deviate from their true diameters or positions more than 1-40th of an inch.

The brass mortars and howitzers are fired twice with their chambers full of powder, and an iron shell.—The mortars on their own beds, at about 75° elevation; and the howitzers on their carriages, at about 12°. Iron mortars are proved on their iron beds, with a charge equal to the

full chamber, and an iron shot equal in diameter to the shell.

Royals, or coehorn mortars, having a hole ·1 of an inch in depth in the chamber, or ·15 in the chase, are ejected; royal howitzers the same.—Eight-inch howitzers having a hole ·15 of an inch in depth in the chamber, or ·2 in the chase, will be rejected.

Carronades.—The diameter and position of their bore and chamber must not deviate 1-20th of an inch.—They are proved with two rounds, with their chambers full of powder, and 1 shot and 1 wad.—A hole of 2-10ths of an inch in depth in the bore, or 1-10th in the chamber, condemns the piece.

Proof Charges.

68 Pdrs.	42	32	24	18	21
13 lbs.	9	8	6	4	3

All ordnance, after having undergone this proof, and the subsequent searching, are subject to the water proof: this is done by means of a forcing pump, having a pipe or hose fixed to the mouth of the piece: After two or

three efforts to force the water through any honeycombs, or flaws which may be in the bore, they are left to dry; and, generally, the next day examined by the reflected light from a mirror.—If the bore contains any small holes or flaws, which have not been discovered by the former proofs, they are very readily found by this: the water will continue to weep, or run from the holes, when the solid parts of the bore are perfectly dry.—Ordnance suspected of being bad are often subject to a more severe proof; that of firing 30 rounds quick, with the service charge and two shot; and in doubtful cases, where the purity of the metal is suspected, recourse has been had to chemical trials and analysis.—A quantity of clean filings taken from a part of an iron gun, free from rust, and dissolved in the dilute sulphuric acid, and the quantity of gas disengaged during the solution accurately ascertained; the plumbago which remains after solution is also separated by filtration, and carefully weighed.—Now it is well known that the purer the iron, the greater the quantity of inflammable gas obtained, and the less the proportion of plumbago which remains after the solution; from these two parts, therefore, a tolerable judgment may be formed of the quality of the metal.—When the plumbago exceeds 4¼ per cent. the iron will always be found deficient in strength; and there has been no instance of a gun bursting where the plumbago did not exceed 3 per cent. that is, where 100 grains of the metal did not leave more than 3 grains of plumbago.—The

colour of the plumbago is also to be attended to; when it is brown or reddish, it is an indication of hard metal, and when in quantities and mixed with coals, there can be no doubt but that the iron is too soft for cannon.

Proof of Iron Shells.—After the shells are guaged and examined, as to their dimensions and weight, they must be well scraped out, and the iron pin at the bottom of the inside must be driven down or broken off: they are then to be hammered all over, to knock off the scales, and discover flaws; and no hole, in the large shells, is allowed of more than $\frac{1}{8}$ of an inch deep.—An empty fuze is then driven into the fuze hole, and the shell is suspended in a tub of water, in such manner that the shell be covered by the water, but that it does not run into the fuze: in this situation, the nose of a pair of bellows is put in the fuze hole, and several strong puffs given with the bellows; and if no bubbles rise in the water, the shell is concluded to be serviceable.

Ordnance condemned as unserviceable for any of the foregoing reasons, are marked as follows: X D, or X S, or X W.—The first signifies that they are found to be faulty in their dimensions, by Desagulier's instrument; the second, by the searcher: and the third, by the water proof.

Directions for Embarking Ordnance and Carriages in Basket Boats.

The usual method of crossing rivers in this country is by *basket boats*.—They are formed of split bamboos, covered on the outside with half-tanned leather.—The form circular, and capable, according to their size, of carrying considerable weight.—On the basket boat of 15 feet diameter may be embarked, a brass eighteen-pounder, or 8-inch howitzer on its carriage, or a tumbril loaded with ammunition.

Considerable attention must be paid to the preservation of the boat, to prevent accident by cutting the leather.

In embarking guns or tumbrils the boat should be nearly filled with straw, brush wood, or some light, soft substance, and the guns or carriages should be embarked at a spot prepared, by making a temporary wharf, that the boat may float.—And by means of planks resting on a sleeper, placed close to the bank of the wharf, the gun runs on, till the wheels are above the sleeper, when the carriage, being raised by the trail, is to be gradually and gently lowered into the boat—the forepart of the planks serving as a platform to conduct it straight.—The sleeper should

be thick and secured firmly, on which the planks should be fixed at the required distance; the planks in the rear should be kept at the same distance by means of a cross piece of plank.

It is desirable that planks, and timber so fitted, be carried with every equipment of artillery, as difficulty often occurs in camp in procuring plank of sufficient size.

A model of a stage or platform for embarking guns, &c.* in basket boats, was submitted by Colonel Bell to the military board, and which, with an additional centre plank to support the trial of the carriage, would answer every purpose of a battery platform, and is nearly similar to the skeleton platforms now in use.

No. 3.—(*To face page* 32.)

Report of Inspection of Ammunition and Stores, with two Brass Eighteen Pounders, Field pieces, under the command of *the day of* 17

	Chains Traces		Round shot, fixed.	Grape, do. do.	Five-and-half-inch shells.	Cartridges, filled.	Do. priming powder.	Do. empty.	Portfires.	Fuzes, five and a half spare.	Tubes.	Match Skeins		Portfire stocks.	Claw hammers.	Pincers, pairs.	Punches.	Spikes Gun		Lintstocks.	Relievers.	Tube Boxes with Straps.	Padlocks with Keys.	Spunges with Heads.	Ladles with Worms.	Pouchers		Twine Skeins		Drag ropes, sets.	Tar and grease, half dupper.	Tompions with cellars.	Rope, two-inch fathoms.	Bitts, gun steel.	Iron primers.	Esses, iron.	Handspikes purchase.	Do. Traversing.	Buckets, leather.	Aprons lead.	Tarpaulins.		Yokes.		
	Gun	Tumbril.										Cotton.	Country.					Round.	Ragged.	Spring.						Priming.	Ammunition.	Europe.	Bengal.												Gun.	Tumbril. Limber.	Pole with collar.	Trace.	Pole spare.	Trace, do.
Gun and Limber.																																													
No. 1.																																													
2.																																													
Tumbril.																																													
No. 1.																																													
2.																																													
3.																																													
4.																																													
Total																																													
Wanting to complete																																													

No. 4.—(*To follow No. 3.*)

Report of Inspection of Ammunition and Stores with two Brass five and a half-inch Howitzers, under the command of *the day of* 17

	Chain Traces		Shells filled and fuzed.	Grape.	Cartridges filled.	Do. empty.	Mealed powder, lbs.	Portfires.	Tubes filled.	Fuzes drove.	Match Skeins			Spikes Gun		Rel evers.	Tube boxes.	Dredging boxes.	Padlocks with keys.	Rasps, fuze.	Drivers and setters.	Sponges.	Lintstocks.	Pouch-es.	Twine Skeins		Drag ropes, sets.	Tar and grease, half dupper.	Tompions with collars.	Rope, two inches fathoms.	Bits, gun steel.	Irons, priming.	Esses, iron.	Handspikes, purchasing.	Do. traversing.	Leather buckets.	Lead aprons.	Tarpau-lins.		Yokes.		
	Gun	Tumbril.									Cotton.	Country.	Quick.	Round.	Ragged.									Priming.	Ammunition.	Europe.	Bengal.											Gun.	Tumbril.	Limber.	Pole with collar.	Trace ditto.	Spare pole.	Do. trace.
Howitzer and Limber.																																									
No. 1.																																									
2.																																									
Tumbril.																																									
No. 1.																																									
2.																																									
3.																																									
4.																																									
Total																																									
Wanting to complete																																									

Proportion of Ammunition carried with Light Field Guns drawn by Horses.

	Twelve-Pounder.						Six-Pounder.				Three-Pounder.				Five-and-a half inch Howitzer.					
	Limber.			Tumbril.			Limber.		Tumbril.		Limber.		Tumbril.		Limber.			Tumbril.		
	Round.	Grape	Shells.	Round.	Grape	Shells	Round	Grape	Round.	Grape	Round.	Grape	Round.	Grape	Shells	Grape.	Canister.	Shells.	Grape.	Canister
One Gun	12	4	4	60	16	6	20	10	88	20	50	14	100	22	15	5	0	50	10	0

No. 5.—(*To follow No. 4.*)

Return of Light Field Artillery with the allotted proportion of Ammunition and Stores for Field Service.

	Number.	Carriages.	Tumbrils.	Shot fixed to bottoms. Round.	Shot fixed to bottoms. Grape.	Shells filled and fuzed.	Serge cartridges including ammunition	Tubes, filled.	Saluting cartridges.	Aprons, lead.	Bits, steel.	Boxes. Dredging.	Tube with straps.	Buckets, leather.	Collars, Bullock.	Drivers and setters.	Esses, iron.	Fuzes drove.	Hammers, claw.	Hand-spikes. Purchasing.	Traversing.	Irons, priming	Ladles with worms.	Lintstocks.	Locks pad with keys.	Match Skeins. Cotton.	Country.	Quick.	Pincers, pairs.	Portfires.	Pouches, ammunition.	Pouches, tube.	Rasp, fuze.	Relievers for spikes.	Ropes. Drag sets.	Two-inch fathoms.	Spikes, Gun. Ragged.	Round.	Spring.	Sponges with staves.	Stocks, portfire.	Tar and grease dupper.	Tarpaulins. Tumbril.	Limber.	Tompions with collars.	Traces, Chain. Gun and Howitzer.	Tumbrils.	Twine Skeins. Europe.	Country.	Yokes. Fixed Space Total Pole.	Trace.	Pole.	Trace.	Pole.	Trace.
Brass Guns, 18 pounders.	1	1	2	62	25		138	200	21	1	2		1	3	6		2		1	4	2	2	1	1	5	3¾	8		1	56	3	1		1	2	24	1	1	1	3	1	2	1	1	2	2	1	3	22	2	2	5	24
Ditto, 12 ditto	1	1	2	106	25		182	340	21	1	2		1	3	6		2		1	4	2	2	1	1	5	3¾	8		1	56	3	1		1	2	24	1	1	1	3	1	2	1	1	2	2	1	3	13	2	2	5	15
Ditto, 6 ditto	1	1	1	108	25		184	340	21	1	2		1	2	4		2		1	2	2	2	1	1	5	3¼	4		1	56	2	1		1	2	12	1	1	1	3	1	1	1	1	2	1	1	2	7	1	1	3	8
Ditto, 3 ditto	1	1	1	160	36		247	390	21	1	2		1	2	4		2		1	2	2	2	1	1	3	3¼	4		1	86	2	1		1	2	12	1	1	1	3	1	1	1	1	2	1	1	2	6	1	1	3	7
Howitzer, 8 inches.	1	1	2	31	25	31	107	190			2	1	1	3	6	1	4	43	1	2	2	2		1	5	3¾	8	1	1	56	3	1	1	1	2	24	1	1	1	3	1	1	1	1	2	2	1	3	17	2	2	5	19
Ditto, 5⅓ ditto	1	1	2	74	25	74	150	240			2	1	1	3	6	1	4	86	1	2	2	2		1	5	3¾	8	1	1	56	3	1	1	1	2	24	1	1	1	3	1	1	1	1	2	2	1	3	13	2	2	5	15
Ditto, 4½ ditto	1	1	1	76	25	76	152	240			2	1	1	2	4	1	2	88	1	2	2	2		1	3	3¼	4	1	1	56	2	1	1	1	2	12	1	1	1	3	1	1	1	1	2	2	1	2	6	1	1	3	7

The distance of a fort may be found by observing the time between seeing the flash of a gun, and hearing the report; for it has been found, by experiment, that sound moves at the rate of 1,142 feet in a second of time, therefore, by observing the time between seeing the flash, and hearing the report of the gun, the distance is easily found; thus—multiply 1,142 feet by the number of seconds counted between seeing the flash, and hearing the report; and divide by three, and you will have the distance in yards.

EXAMPLE.—The time between the flash and report of a gun was found to be six seconds. Required the distance.

1,142
6
6,852
2,284 Yards, is the distance required.

Distance may be ascertained by time of flight of shells, at 45 degrees elevation, or of shot from guns at different elevations, without instruments; the following methods will ascertain distances.

1. The breadth of a river, or other short distance, may be taken thus:—Take two pickets, of different lengths, drive the shortest into the ground, close to the edge of

the bank; measure some paces back from it, and drive in the other, till you find, by looking over the tops of both, that your sight cuts the opposite side. Then, pull up the first picket, measure the same distance from the second, in any direction, the most horizontal, and drive it as deep in the ground as before; consequently, if you look over them again, and observe where the line of sight falls, you will have the distance required.

II. The following simple method of ascertaining the breadth of a river, may be sufficiently correct for some cases:—Place yourself at the edge of one bank, and lower one corner of your hat, till you find the edge of it cuts the other bank; then steady your head, by placing your hand under your chin, and turn gently round to some level spot of ground, and observe where your eyes and the edge of the hat, again meet the ground: your distance from that point will be nearly the breadth of the river.

Battalion Guns.

As no fixed system has been established for battalion guns with corps to which they are attached—a remark that applies equally in England as in India—the observations on this point from the *pocket gunner* are here extracted.

"Of the Movements and Positions of Field Artillery.

"*Battalion Guns.*—The following are the usual positions taken by battalion guns, in the most essential manœuvres of the battalion to which they are attached; but the established regulations for the movements of the infantry, in the British service, take so little notice of the relative situations for the artillery attached to it, that there is no authority for a guide on the subject.—*In review*, both guns are to be placed, when in line, on the right of the regiment, unlimbered and prepared for action.—The guns 10 yards apart, and the left gun 10 yards from the right of the grenadiers.—Nos. 7 and 8 dress in line with the front rank of the regiment. The officer, at open order, will be in front of the interval between his guns, and in line with the officers of the regiment. When the regiment breaks into column, the guns will be limbered up and wheel by pairs to the left; the men form the line of march, and the officer marches round in front of the guns. In the review of a single battalion, it is usual, after marching round the second time, for one of the guns to go to the rear, and fall in at the rear of the column. Upon the regiment wheeling on the left into line,

the guns, if separated, will be unlimbered to the right, but if they are both upon the right, they must be wheeled to the right, and then unlimbered; and afterwards run up by hand, as thereby they do not interfere with the just formation of the line, by obstructing the view of the pivots.

"The usual method by which the guns take part in the firings while in line, is by two discharges from each piece, previous to the firing of the regiment, but this is usually regulated by the commanding officer, before the review.—Though the guns, when in line with a regiment in review, always remain in the intervals, in other situations of more consequence, every favorable spot which presents itself, from which the enemy can be more effectually annoyed, should be taken advantage of. In column, if advancing, the guns must be in front: if retreating, in the rear of the column. If in open column, of more than one battalion, the guns in the centre must be between the divisions, and when the column is closed, these guns must move to the outward flank of that division of the column which leads the regiment to which they are attached. In changing front, or in forming the line from column, should the guns be on that flank of the battalion on which the new line is to be formed, they will commence firing to cover the formation.

"In retiring by alternate wings, or divisions, the guns

must be always with that body nearest the enemy.—That is, they will not retire with the first half, but will remain in their position till the second half retires; and will then only retire to the flanks of the first half; and when it retires again, the guns will retire likewise, but only as far as the second half, and so on.

"When in hollow square, the guns will be placed at the weakest angles, and the limbers in the centre of the square. In passing a bridge, or defile, in front, the guns will be the first to pass; unless from any particular position they can more effectually enfilade the defile, and thereby better open the passage for the infantry.—But in retiring through a defile, the guns will remain to the last, to cover the retreat.

"*General Rule.*—With very few variations, the guns should attend, in all the movements of the battalion, that division of it to which they are particularly attached; and every attention should be paid in thus adapting the movements of the guns to those of the regiment, that they be not entangled with the divisions of the line, and never so placed as to obstruct the view of the pivots, and thereby the just formation of the line; but should always seek those positions, from which the enemy can be most annoyed, and the troops to which they are attached protected.

If at any time the battalion guns of several regiments should be united, and formed into brigades, their movements will then be the same as those for the artillery of the park.

For taking Seconds of Shells Flight.

The following table of length of pendulums to vibrate seconds at every fifth degree of latitude, taken from Hutton's mathematical dictionary, and inserted in the "*Pocket Gunner*" has been found to answer correctly.

Table of Pendulums to vibrate seconds.

Degrees of Latitude.	Length of Pendulum. Inches.	Degrees of Latitude	Length of Pendulum. Inches.	Degrees of Latitude.	Length of Pendulum. Inches	Degrees of Latitude.	Length of Pendulum. Inches.	Degrees of Latitude.	Length of Pendulum. Inches.
0	39,27	20	39,44	40	39,097	60	39, 158	80	39, 191
5	39,29	25	39,57	45	39, 111	65	39, 168	85	39, 195
10	39,32	30	39,70	50	39, 126	70	39, 177	90	39, 197
15	39,36	35	39,84	55	39, 142	75	39, 185		

The pendulum to be made of a musquet ball, having a conical hole through its centre, in which the silk is to pass, the knot tied at one end so as to lodge in the middle of the ball, from whence the required length is to be measured to the other end, which is to be fixed to the hook.—The pendulum to be let off at an angle between eight and twelve degrees.

Fuzes for Mortars, at 45° degrees elevation, &c.

The 13 and 10-inch fuzes of the same length, burn so nearly equal, that one common length serves both, and the 8-inch, royal and coehorn, answer with each other, therefore to find the length of fuze from one range, multiply the time of flight by 22 for the 13 and 10-inch—and by 24 for the other natures, which is the decimal part of an inch that a fuze should burn in each second of time, and the product will be the length required.—Notwithstanding the accuracy generally observed in laboratory work, fuzes sometimes are defective; much caution should be had in any branch of laboratory work, and particularly in fuzes.

Fuzes should be cut right across, that the explosion may be exact—but as in short distances, or in shells to be fired from guns, the required length of composition only of fuze would not allow of its being securely set, a mode proposed by lieutenant Morrison, of the Madras

artillery, and similar to that recently adopted by lieut. col. Shrapnell, of the royal artillery, for the spherical case shot shells, will be found perfectly secure for the shortest distances, allowing 1 or 1½ inch of fuze, and drilling out the composition to the required length.—This mode is necessary, as well to guard against accident in use, as to prevent fuzes of shells, intended for short distances with mortars, or for being thrown from guns becoming loose in travelling—Fuzes for mortars, when cut to the proper length, with a tenon saw, are to be pared with a paring knife, and rasped equally to fit the vent—Much attention is required in this point.

No. 6. *(To face p. 42.)*

Practice with a 5½ Inch Howitzer, at St. Thomas's Mount, Weight of Shell 16lbs. each Line being a Medium of three Rounds.

1787.						1788.						1789					
Weight of Powder.			Elevation.	Time of Flight.	Length of Fuze.	First Graze.	Greatest Range.	Weight of Powder.			Elevation.	Time of Flight.	Length of Fuze.	First Graze.	Greatest Range.	Weight of Powder.			Elevation.	Time of Flight.	Length of Fuze.	First Graze.	Greatest Range.
Lb.	Oz.	Dr.	Degs.	Sec. Pts.	In. Pts.	Yards.	Yards.	Lb.	Oz.	Dr.	Degs.	Sec. Pts.	In. Pts.	Yards.	Yards.	Lb.	Oz.	Dr.	Degs.	Sec. Pts.	In. Pts.	Yards.	Yards.
0	12	0	4	2 ½		431 1-3	1430				3	2		350	1382 1-3	0	8	0	5	3		361	673 2-3
			5	3		546 1-3	1402				4	2½		424 2-3	1236				2	1½		127 1-3	854
			6	4	1 1	658	1390	0	12	0	6	4		643	1379				4	2½		268 1-3	897 1-3
			7	4 ½	1 1	874	1372				8	4		682	1405				6	3½		392 1-3	680
1	0	0	8	6	1 3	957	1698 1-3				10	5½		854	1286 2-3	0	10	0	10	4½		577 1-3	914 2-3
			9	6	1 5	969 2-3	1484				2	2		358 2-3	1545				12	5		685 1-3	994
			10	6	1 6	1001	1564 1-3				4	3		559 1-3	1531				2	2		282 2-3	1188
			6	4 ½	1 4	825 1-3	1759 1-3	0	14	0	6	4½		789	1588 2-3				4	2½		431 2-3	1177 2-3
			7	4	1 4	643 2-3	1423 2-3				8	5½		859 2-3	1381 2-3				6	4	2 4	598 2-3	1160 2-3
1	2	0	8	4	1 5	592 1-3	1522 2-3				10	7½		1062 2-3	1455	0	12	0	8	4	2 4	592	1299
			9	6	1 6	958 1-3	1416 1-3				2	2½	2 0	352 2-3	1449				10	5	2 4	723 1-3	1124 1-3
			10	6	2 0	917	1467				4	3	2 5	473 1-3	1476 1-3				12	6	2 4	795	1137 2-3
			6	4	3 0	687 2-3	1635 2-3	1	0	0	6	4	2 9	590 1-3	1471				2	2	2 0	305 2-3	1228 2-3
			7	4	3 1	694	1500 1-3				8	4	3 1	681 2-3	1282 2-3				4	3	2 1	366	1188 1-3
			8	4 ½	3 1	760 1-3	1525 2-3				10	7	3 3	1002 2-3	1353				6	3½	2 2	596 2-3	1278 1-3
1	8	0	9	6	3 2	975 1-3	1538 2-3				2	2	2 8	385 1-3	1526 2-3	0	14	0	8	3½	2 3	609 1-3	1137 2-3
			10	6	3 3	964 1-3	1265				4	3	2 8	524 2-3	1449				10	5½	2 4	729	1172 1-3
			11	6 ½	3 5	1008	1577 2-3	1	2	0	6	3	2 6	534	1408				12	6	2 5	924 1-3	1303 1-3
			12	6	3 5	951 2-3	1352				8	4½	2 5	772 2-3	1430 2-3						2 4	456	1320 2-3
											10	5½	3 3	877 2-3	1441 1-3	1	0	3	4	3½	2 4	588	1307
																			6	3½			

No. 9.—*(To follow No. 8)*

Richochet Practice with 4 2-5th Shells from Brass twelve-pounders at St. Thomas's Mount.— Weight of Shell 8lbs. each line being a Medium of three Pounds.

1787.						1788.						1789.					
Weight of Powder.	Elevation.	Time of Flight.	Length of Fuze.	First Graze.	Greatest Range.	Weight of Powder.	Elevation.	Time of Flight.	Length of Fuze.	First Graze.	Greatest Range.	Weight of Powder.	Elevation.	Time of Flight.	Length of Fuze.	First Graze.	Greatest Range.
Lb. Oz. Dr.	Degs.	Sec. Pts.	In. Pts.	Yards.	Yards.	Lb. Oz. Dr.	Degs.	Sec. Pts.	In. Pts.	Yards.	Yards.	Lb. Oz. Dr.	Degs.	Sec. Pts.	In. Pts.	Yards.	Yards.
	3	3 ⅓	1 70	569 1-3	1385		3	3 ⅓	1 25	584	1577 1-3		3	4 ⅓	1 40	888	1438 2-3
	4	3 ⅓	1 70	568 2-3	1484		4	3 ⅔	1 50	690	1383		4	4 ⅔	1 60	929	1375 2-3
0 12 0	5	3 ⅓	1 50	684 2-3	1452		5	4	1 75	761	1514		5	3	1 80	939 1-3	1559 2-3
	6	4	1 75	753	1395	0 12 0	6	4 ⅓	2 0	896 1-3	1641 1-3	1 0 0	6	5	2 0	1084 2-3	1498 2-3
	7	6 ⅓	2 0	1181	1816 2-3		7	6 ½	1 75	994	1408 1-3		5	5 ½	1 80	946 2-3	1473
	8	7	2 25	1246 1-3	1578 1-3		8	7	2 0	1095	1460		6	5	2 0	945 1-3	1375
	3	2 ⅓	1 50	464 2-3	1396		9	7 ⅓	2 25	1131 2-3	1384		7	6	2 20	1115 1-3	1452 2-3
	4	3 ⅓	1 75	677 1-3	1490 2-3		10	7 ⅓	2 50	1217 1-3	1585 2-3		8	6	2 40	1309	1767 1-3
0 14 0	5	5	2 0	1151 2-3	1790 1-3		3	4 ⅓	1 50	829 1-3	1573 1-2		3	3 ⅓	1 60	772 2-3	1462 1-3
	7	5	2 25	1006 1-3	1436 1-3		4	4 ½	1 75	851 2-3	1614 2-3		4	5 ⅓	1 80	874	1657 2-3
	8	5 ⅓	2 50	1063 2-3	1427		5	3 ½	2 0	681 2-3	1620 2-3		5	5 ⅔	1 90	1036 2-3	1459
	3	4 ½	1 75	836	1853	0 14 0	6	6 ⅓	2 25	1092 2-3	1669 1-3	1 2 0	6	5 ⅓	2 0	1014	1574
	4	5	2 0	1057	1843		7	6	2 0	973	1538 2-3		5	6	2 0	1065	1617
1 0 0	5	4	2 25	810	1503 2-3		8	7	2 25	1173 2-3	1556		6	6 ⅓	2 20	1122 2-3	1496
	6	5	2 50	999 2-3	1588 1-3		9	8 ⅓	2 25	1445 2-3	1742		7	8	2 40	1388	1759
	7	6	2 75	1046 2-3	1717 2-3		10	8	2 75	1426	1565 2-3		8	7 ⅓	2 60	1149 2-3	1524 1-3
	8	6	3 0	1044 2-3	1466 2-3		3	4	1 75	742 2-3	1253 1-3		3	3 ⅓	2 0	761	1467 2-3
	3	3 ⅓	2 0	699 1-3	1639		4	4 ⅓	2 0	920 2-3	1844 2-3		4	4	2 20	917 2-3	1553 1-3
	4	3 ⅓	2 25	635 1-3	1485 1-3	1 0 0	5	4 ⅓	2 25	913 2-3	1768 2-3	1 4 0	5	4 ⅓	2 40	996 1-3	1524
1 2 0	5	5 ⅓	2 50	1100	1563		6	4	2 50	841	1793 2-3		6	5	2 60	1123 2-3	1611 1-3
	6	6	2 75	1331	1792 1-3		7	6 ½	2 25	1126	1724 2-4		5	6	2 80	1396	1731

No. 10.—*(To follow No. 9.)*

Practice with a five-and-a-half-inch Mortar at St. Thomas's Mount at variable Elevations, weight of Shells 16lbs.—each line being a medium of three Rounds.

1787.							1788.							1789.						
Weight of Powder.			Elevation.	Time of Flight.	Length of Fuze.	First Graze.	Extreme Distance.	Weight of Powder,			Elevation.	Time of Flight.	Length of Fuze.	First Graze.	Extreme Distance.	Weight of Powder.			Elevation.	Time of Flight.	Length of Fuze.	First Graze.	Extreme Distance.
Lb.	Oz.	Dr.	Degs.	Sec. Pts.	In. Pts.	Yards.	Yards.	Lb.	Oz.	Dr.	Degs.	Sec. Pts.	In. Pts.	Yards.	Yards.	Lb.	Oz.	Dr.	Degs.	Sec. Pts.	In. Pts.	Yards.	Yards.
0	5	5	18	6½	3 6	629 1-3	835 1-3	0	5	0	16	4½	3 0	357	685	0	7	0	16	5 ½	3 0	612 2-3	663 2-3
0	5	8	20	7	3 3	670	996 1-3	0	5	0	18	5	3 5	416 1-3	695	0	7	0	18	6	2 8	574	737
0	5	8	22	6½	3 4	574 2-3	809 1-3	0	5	0	20	4½	3 6	352 2-3	701	0	7	0	20	6 ½	2 8	688 2-3	741 1-3
0	5	8	25	8	3 5	767	876 1-3	0	5	0	22	6	3 0	468 1-3	630 2-3	0	8	0	16	5 ½	2 5	697 2-3	807 1-3
0	5	12	18	7½	3 3	680 1-3	896	0	5	0	24	7	3 2	627 2-3	800	0	8	0	18	10	2 6	707 1-3	770 2-3
0	5	12	20	8	3 3	804 1-3	888 2-3	0	6	0	16	6	2 9	527	823 2-3	0	8	0	20	7	2 6	738 1-3	774 1-3
0	5	12	22	7½	3 3	696	810 2-3	0	6	0	18	6½	3 1	637	789 1-3	0	9	0	16	6 ½	2 3	717 2-3	878 2-3
0	5	12	25	9	3 3	844 1-3	964 2-3	0	6	0	20	7	3 2	612 2-3	718 2-3	0	9	0	18	7	2 6	827 2-3	901 2-3
0	6	0	17	6½	3 2	704 1-3	969 1-3	0	7	0	22	7½	3 4	717 1-3	790 1-3	0	9	0	20	10	2 8	957	1041 2-3
0	6	0	18	8	3 3	729 2-3	985	0	7	8	24	7½	3 3	696	776 2-3	0	9	0	22	4	2 9	949 2-3	1017
0	6	0	20	7½	3 3	722	931 2-3	0	5	0	16	4½	3 0	335 1-3	611 2-3								
0	6	0	22	8	3 4	760 2-3	900	0	7	0	18	7	3 1	573	740 1-3								
0	6	0	25	9	3 4	796 2-3	1063	0	7	0	16	6½	3 1	626	807 2-3								
0	5	4	25	8	3 4	763 2-3	821	0	8	0	16	6	3 5	551 2-3	878								
0	5	4	20	6	3 2	587 1-3	744 1-3	0	8	0	18	7½	3 2	829 2-3	909								
3	5	8	18	7	3 1	619 1-3	824 1-3	0	8	0	20	7	3 0	738	928								
								0	8	0	22	8	3 2	857 2-3	1061								

Ranges with a light 5½-Inch Howitzer. 1798. (From Pocket Gunner.)

Four Ounces.				Eight ounces.			Twelve ounces.			One Pound.		
Elevation.	Flight.	Range to first graze.	Extreme Range.	Flight.	Range to first graze.	Extreme Range.	Flight.	Range to first graze.	Extreme Range	Flight.	Range to first graze.	Extreme Range
deg. P. B.	sec.	yards.		sec.	yards.		sec.	Yards.		sec	Yards.	
1	1	66	From 400 to 600 yards.	1	96	From 700 to 1000 yards.	1½	140	From 1000 to 1350 yards.	1	159	From 1100 to 1400 yards.
2	1	85		1½	143		2	334		1½	325	
3	1½	100		1½	184		2	351		2	490	
4	1½	110		2	258		2½	506		3	668	
5	2	115		2½	307		3	500		4	728	
6	2	168		2½	376		3	509		5½	918	
7	2	194		3	408		3½	581		5	823	
8	2½	226		3½	529		5	872		6	975	
9	2½	282		4½	630		6½	975		7	1044	
10	2½	279		5	645		7	911		8	1049	
11	2½	260		5	642		7	1021		8	1104	
12	3	315		5½	797		7½	1177		8	1173	
				5½	715							

Ranges with a heavy 5½ Inch Howitzer. 1793.

(From Pocket Gunner.)

Elevation.	Two Pounds.			Three Pounds.		
	Flight.	First graze.	Extreme Range.	Flight.	First graze.	Extreme range.
degrs.	sec.	yards.	yards.	sec.	yards.	
1	2	453		3	479	
2	4	595		5	722	
3	4	666		5	921	
4	5	847	From	5	1000	From
5	5	957	1400	7	1325	1400
6	7	1178	to	8	1530	to
7	9	1449	1900	9	1577	2000
8	8	1355		9	1721	
9	8	1585		9	1801	
10	10	1853		9	1791	
11	9	1793		12	1013	
12	10	1666				

Rules for Calculating Piles of Shot.

Triangular Pile.

Rule.—Multiply the base by the base more 1, this product by the base more 2, and divide by 6.—Let the base be 20.

$$\frac{20+21+22}{6} \qquad 10+7+22=1540$$

Square Pile.

Rule.—Multiply the corner row by the corner row more 1, this product by twice the corner row more 1, and divide by 6. Let the side be 36.

$$\frac{36+37+73}{6}\text{—}6+37+73=16,206$$

Oblong Pile.

Rule.—From three times the length of the base more 1, substract the breadth; multiply the remainder by the product of the breadth more 1, and divide by 6.

Let the length be 50
Breadth. 20

then three times 50 more 1, and 20 substracted gives 131

$$\frac{131+20+21}{6}\text{—}131+10+7=9170$$ the number required.

Ranges, with five-and-a-half-inch Shells, from a 24-Pounder Iron Gun. Length of Gun nine feet and a half.—Weight 49 cwt. 26lbs.

Elevations.	Two Pounds.			Two lbs. 8oz.			Three Pounds.		
	Flight.	Range to		Flight.	Range to		Flight.	Range to	
		First Graze.	Extreme.		First Graze.	Extreme.		First Graze.	Extreme.
Degrees.	Sec.	Yards.	Yards.	Sec.	Yards.	Yards.	Sec.	Yards.	Yards.
1	1	213	1139	2 3-4	562	1456	1	277	1424
2	1 3-4	384	1267	1 1-2	442	1413	1 3-4	526	1464
3	2 3-4	565	1413	2 1-2	647	1553	2 1-4	740	1600
4	2 1-4	750	1479	3 3-4	896	1639	3 1-2	880	1679
5	3 3-4	836	1670	4	915	1510	5	1182	1733
6	4	896	1495	5	1140	1657	6 1-4	1384	1787
7	6 1-2	1180	1492	6	1205	1481	6 1-4	1410	1749
8	6 3-4	1305	1526	6 1-2	1259	1544	7	1520	1744
9	7 1-2	1329	1527	7	1341	1561	7 3-4	1722	1938
9½	6 3-4	1229	1453	...	...	...	8 1-2	1748	1881

Ranges, with four-and-two-fifth Shells, from a twelve-pounder Medium.

Elevations.	Eight Ounces.			Twelve Ounces.			One Pound, Eight Ounces		
	Flight.	First Graze.	Extreme Range.	Flight.	First Graze.	Extreme Range.	Flight.	First Graze.	Extreme Range.
Degrees.	Sec.	Yards.	Yards.	Sec.	Yards.	Yards.	Sec.	Yards.	Yards.
1	1 1-2	156						707	
2	2	293		2 1-2	350			758	From
3	2 1-2	363	From	3 1-2	355	From		849	1400
4	3 1-2	462	800	4	679	1100		1075	to
5	4	587	to	3 1-2	641	to		1150	1600
6	4	621	1200	5	941	1300		1300	
7	4 1-2	898		6	1020				
8	5	781							

Ranges, with a five-and-half-inch Brass Mortar, at fifteen degrees.

(From The Pocket Gunner.)

Charge.		Flight.	First Graze.	Rolled to.
Oz.	Dr.	Seconds.	Yards.	Yards.
2	8	3	209	303
3	0	3 1-2	256	330
3	8	4	375	443
4	0	4 1-2	457	501
4	8	5	530	600
5	0	5 1-2	561	627
5	8	6 1-2	667	715
6	0	7	709	780

Ricochet Practice, with Shot from an Iron twelve-pounder, at St. Thomas's Mount; each Line being a Medium of three Rounds.

1787.

Weight of Powder.			Elevation.	Time of Flight.	First Graze.	Greatest Range.
lb.	oz.	dr.	Degrees.	Sec. Pts.	Yards.	Yards.
1	0	0	3	2	264 2-3	1567
			4	3	543 1-3	1484
			5	3 1-2	556 1-3	1475 2 3
			6	4	716 1-3	1143 2-3
			7	4 1-2	870	1518
			8	5	956 2-3	1511 1-3
1	4	0	3	3	559	1850 2 3
			4	3 1-2	719 1-3	1741 1-3
			5	3 1-2	654 1-3	1540
			6	4 1-2	916 1-3	1645 1-3
1	8	0	3	3	500	1612
			4	5	987	1571
			5	6	1070	1832
			6	5	867	1101

General Observations and Directions for Mortar Practice.

Throwing shells from mortars with precision, depends on a variety of circumstances, and requires most particular attention.

1. The mortar should be guaged, to ascertain windage, and should fit exactly the bed.
2. The shells, having first been examined and proved, must be guaged.
3. Scale the Mortar.
4. Lay the range.
5. Take the centres at the muzzle and at the vent.
6. Lay the mortar for the object.
7. Elevate.
8. Load.
9. Correct the elevation and direction.
10. Uncap the fuze and dredge it lightly.

In loading, the powder must be set up in the chamber, and particular attention is necessary in weighing the powder; as considerable differences are found between scale weight and measure weight.

Before the shell is put in the mortar, wipe well the

shell's bottom with oakum—the plug or fuze to be placed exactly in the centre, the casting mark, (or asperity) to be upwards.

A careful steady person to take the seconds of the shell's flight, to be attended by a careful non-commissioned officer to look out.

The following orders directed to be observed at the practice at St. Thomas's Mount, 1806, as conveying more detailed instructions, is inserted.

Extract from cantonment orders, dated St. Thomas's Mount, 21st January, 1806.

The following orders to be observed at the ensuing practice.

The powder for practice will be all of that made in the same month, which will be proved by selection of individual barrels, as also, after being well mixed, reference to be made to the proof reports to regulate proportions, on a principle which will be communicated by the commanding officer, and left at the laboratory tent.

All the men off duty, Europeans and Golundauze, with the exception of the drill, with two companies of

Lascars, and the Lascar boys, to attend during days of practice, proportionally, in the range and battery. The attendance of all officers is expected immediately after day-light; those stationed to ordnance, by the superintending officers, to have each piece scaled as soon as they arrive at the ground; officers nominated to ordnance in the mortar range, to be present at the weighing of the powder: and when fuzes are used, they are to be cut and fixed under their own inspection.

A separate report to be delivered in daily by officers in charge of the mortar range and battery.

In order that every individual may have an opportunity of laying the different ordnance, officers and non-commissioned officers, in charge at each, are to pay attention that the inexperienced may receive every instruction in the management and pointing the piece; the names of persons who lay the different pieces to be inserted in the reports, but to be confined to one each day and that under the control of the superintending officer.

Particular attention is recommended in taking centres and elevations; and to ascertain their justness, the level and quadrant to be used after loading.

Officers and non-commissioned officers, in charge of ordnance, are to pay strict attention to the care of the instruments delivered to them, and to see that they are

returned to the ordnance officer previous to the parties marching to the barracks; should any damage or loss occur, the ordnance officer must report it on the spot to the superintending officer, otherwise such report will not be attended to.

A commissioned, and intelligent non-commissioned officer, with a proportion of men, to be appointed for the range reports daily; they will be prepared with forms of reports to fill up, accurately noting the graze of howitzer, shells, and shot in the mortar range; also the ranges and effect of fuzes.

The sash and gorget is dispensed with at practice, and the undress jacket and hat may be worn.

Subaltern officers are to produce their books of practice for the inspection of the commanding officer within one month from the last day of practice.

Directions to be observed in firing with Red Hot Shot.

1. Commissioned or non-commissioned officers, in charge of guns, are carefully to examine the cartridge bags, that they are sufficiently close in their texture as not to admit any powder working through; cartridges of strong flannel are best for this use.

2. The cartridges to be set home gently with the *rammer-head*; or, for greater security, with the spunge head, which will bring out any particles of powder; upon the cartridge a high dry junk wad, with one blow; on this a high-soaked wad, with two blows.

3. The hot shot, being cleared of dust or dirt, and guaged, brought on the carrier, is to be put in the gun, the man at the carrier end, furthest from the grate, letting go his handle as soon as the shot has entered the gun; that his fellow carrier may take it to the grate, or furnace, to be ready to bring fresh shot.

4. The gun being elevated one degree, will allow of the shot rolling home; a low-soaked junk wad to be set home over the shot.

The foregoing precautions being strictly attended to,

and which must be the duty of every officer and non-commissioned officer, in charge of guns, to cause being observed, the gun may be run up, pointed, and elevated, with as little danger as with cold shot.

Shot should be heated to the colour of a wafer-red; by being further heated they are liable to split on striking a hard substance,

Wads should be well soaked, and the water well squeezed out that a drop of water will not come from them.

Directions necessary to be observed in Batteries at a Siege.

Reliefs for the batteries usually take place in the evening, or dusk, with a view of preventing the besieged from annoying the parties on the march; it is, however, of much consequence that an officer, and one or two non-commissioned officers, for each battery, precede the relief, in order to see the precise situation of the posts and direction of the battery, and to receive particular charge of the battery implements and ammunition, the latter should on no account be taken on the report of the conductor, or ordnance officer, for such reports have often been found erroneous, and most unpleasant consequence might result from want of attention in this point.

Batteries are usually covered by infantry, and the sole business of the artillery is working the guns; on arriving at the battery, the details should take charge of the different ordnance and implements, a proportion of shot and wads guaged, and placed in the rear of each gun, the men for each ordnance proved to their stations, fuzes to be piled in a convenient safe spot, or against the merlons of the battery, so as to be easily come at; for it has sometimes occurred that the defence of a battery, on a night assault, has depended on the artillerymen.

An artilleryman of experience to be first selected as a *look-out* on the flank of the battery in order to instruct the young artillerymen how to execute that necessary duty; the look-out man, who gives notice of firing from the fort, (in order that the people in the battery may avoid exposure as much as possible,) should be relieved every half hour; and as the lives of those in the battery depend in a great measure on the attention to this duty, it should be impressed on the mind of every artilleryman, as a most essential duty, and post of trust.

In Europe, the expenditure of ammunition at a siege is from 60 to 80 rounds each gun per day. In this country, batteries usually fire from 100 to 150 rounds each gun, but on particular occasions of exigency, as at the siege of Seringapatam, each gun fired 200 rounds.

At the siege of Galnah (one of Holkar's hill forts, 150 yards high) in the late Mahratta war, a breaching battery, without platforms, was opened at the distance of 200 yards from the base. It consisted of 4 iron 18-pounders, and 4 12-pounders, which, from the situation of the fortress, were elevated to 13 degrees, and fired in a day, the former 212 rounds, the latter 260 rounds. The trails of the carriages were sunk in the ground to admit of the elevation; but to prevent, as far as possible, injury to the carriages, in consequence, fascines were placed in the rear, which, by yielding to the recoil, prevented severe shock.

At the siege of Seringapatam 1799, the batteries opened as follows.

	Guns. Pounders.			Mortars. Inches.		
	24	18	12	8	5⅗	Distance
1st Battery, April 22d		8				780 yds.
2d ditto, 26th		4				380
3d Breaching 30th		6				400
4th ditto, May 2d	2	3		4	2	380
Total	2	21		4	2	

Carried by storm 4th May, 1799.

Dimensions of batteries vary according to situation, and the calculations of materials and workmen depending on peculiar soil, &c. &c. renders any fixed principle unnecessary.

The height of the parapet epaulment of a gun battery should be seven feet; distance between the centre of embrasures, 18 or 16 feet; when the ground will not allow, less will do. Embrasures lined with fascines are liable to take fire; if, therefore, cocoa-nut, or palmira, trees are to be procured, they make excellent lining for embrasures, not being liable to splinter; they must be securely picketted down.

Water tubs, constantly filled, should be kept ready at every battery.

In breaching, a line of direction and extent should be first marked out, as low down in the wall as the guns can be brought to bear; when the description of the breach is made visible, salvos have a happy effect.

Magazines.

Magazines, for the use of batteries, should not contain a greater quantity of powder than is necessary for immediate use; and much attention should be paid in the construction, particularly in a traverse. At the siege of Bangalore, a rocket fell into the magazine of the gun battery, and was instantly taken up by a sub-conductor and thrown to a considerable distance; this man, John Hoy, was noticed in general orders, and received a present from marquis Cornwallis, for spirited and cool conduct.

Statement of Battering Guns, Brass Guns, Howitzers, Mortars, Shot, Shells, and Gunpowder, for the Siege of Pondicherry, in 1778.

ARTICLES.			No.
Ordnance,	Iron Gun,	24-Pounders.....	9
Ditto,	ditto,	18.....	9
Ditto,	ditto,	12.....	10
Ditto,	Brass,	12.....	4
Ditto,	ditto,	6.....	12
Ditto,	ditto,	3.....	8
	Howitzer	8-inch	5
		5½.....	2
	Mortar	13.....	2
		10...	6
		8...	10
		5½	15
Shells, Iron,	Empty,	13-Inch	194
Ditto, ditto,	ditto,	10.....	1881
		8.....	8631
		5½.....	10,000
		4½	200
Shot, Iron,	Pound,	24	17,400
Ditto, ditto,	ditto,	18	17,200
		12	5602
		9	25
Gun-powder,	Europe,	60 lb. Barrels	370
Ditto,	Corned,	60.....	5915
Ditto,	Mealed, ...		1. 5

atement of Battering Guns, Mortars, Shot, Shells, and Gun-powder, for the Siege of Pondicherry, in 1793.

Ordnance,	Iron Gun,	24-Pounders.....	10
Ditto,	ditto,	18	7
		12	3
Ditto,	Brass	6	36
	Howitzers	8-Inch.....	4
	Mortars	13.....	2
		10.....	4
		8.....	4
Shells, Iron,	Empty,	13-inch	1000
Ditto, ditto,	ditto,	10	3200
		8	4800
Shot, Iron,	Round,	24-Pounders...	12,000
Ditto, ditto,	ditto,	18.....	12,000
Ditto, ditto,	ditto,	12.....	12,000
Ditto, ditto,	ditto,	6.....	2000
Gun-powder,	Corned,	60 lb. Barrels.	7800
Ditto,	Mealed,.....		30

Statement of Ordnance, in the Battering Train, for the Siege of Seringapatam, 1792.

	Guns.			Mortars.	
	Pdrs.			Ins.	
	24	18	12	5½	4½
With the Grand Army	4	20	4	4	4
Bombay Army	0	10	4	0	0
Total	4	30	8	4	4

The following Proportion of Ordnance and Ammunition, as a Battering Train, (exclusive of Field Magazine) was allotted for the Siege of Seringapatam, in 1799.

Iron Guns on Carriage and Limbers	24 Pounders	4
Ditto, ditto	18	30
Ditto, ditto	12	8
Brass Mortars on Beds	8 Inch	2
Ditto, do	5½	6
Spare Carriages	24 Pounders	2
Ditto	18	10
Ditto	12	3
Mortar Beds	8 Inch	1
Ditto	5½	2
Shot Iron, Round	24 Pounders	4800
Ditto, do	18	25,000
Ditto, do	12	9600
Shells, Empty	8 Inch	1000
Ditto	5½	3600
Shot, Grape	24 Pounders	80
Ditto	18	600
Ditto	12	160

Carcasses	8 Inch	40
Balls, fire drove	8	40
Ditto, do	5½	180
Cartridges, Cloth of different sizes		55,440
Gunpowder	60lb Barrells	5400
Mealed		40

No. 11.—(*To face p. 64.*)

Abstract of Ordnance, &c. &c. taken in Seringapatam, the 4th of May, 1799.

	Guns.																										
	42 Pounder.	36	32	30	26	24	20	18	16	14	12	10	9	8	7	6	5	4½	4	3½	3	2½	2	1½	1	¾	½
Brass Ordnance	1	...	1	...	...	2	...	5	6	1	22	...	6	6	9	51	3	2	46	27	39	82	26	14	15	...	9
Ditto { Unfinished in the Foundery }	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Iron Ordnance	...	1	2	1	11	19	5	27	10	9	51	8	75	28	10	36	12	...	37	...	24	16	22	...	53	5	1
Grand Total	1	1	3	1	11	21	5	32	16	10	73	8	81	34	19	87	15	2	83	27	63	98	48	14	68	5	13

	Mortars and Coehorns.															Howitzers.				Grand Total.
	15 Inch.	13	12	11	10	9	8	7	6	5¾	5½	4½	3½	3	2½	16 Inch.	12½	11½	8	
Brass Ordnance	...	3	3	...	1	...	2	...	6	2	5	19	2	1	16	1	7	2	1	444
Ditto { Unfinished in the Foundery }	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7
Iron Ordnance	2	1	1	1	4	1	1	1	...	...	...	...	...	...	...	...	...	...	...	478
Grand Total	2	4	4	1	5	1	3	1	6	2	5	19	2	1	16	1	7	2	1	929

Calculation, Total, of Round Iron Shot of different sizes.......424,400
Ditto, ditto, Gunpowder loose in different Magazines..........lbs..........520,000
Ditto, ditto, Firelocks, Carbines, &c.......... 67,000
N B. Guns mounted on the Works.......... 287

No. 12.—(*To follow No.* 11.)

Monthly Return of Ordnance and Military Stores, in charge of A. B. Commissary, &c. &c. of Stores, at shewing the Receipts, Issues, and Remains, for the month of 178—.

ARTICLES.	Remaining 30th April 179—.	Received.			Total.	Issued.			Remaining the 31st May.				Established Proportion.	
		Serviceable.	Repairable.	Unserviceable.		Serviceable.	Repairable.	Unserviceable.	Serviceable.	Repairable.	Unserviceable.	Total.	Surplus Total.	Wanting to Complete.
Anvils, Smiths.....No.....	3	1			4				2	1	1	4		1
Axes, Broad.	9	21			30	3			25	1	1	27		3
Felling.....	60	60	5	5	130	10			110	5	5	120		5
Barrels Powder, Empty.....	150	50	10	10	220	200				10	10	20		
Ammunition, Do.....	60	10	10	9	82	20			50	10	2	62		
Bags, Gunnery Ammunition.....	350			25	375	50			300		25	325	50	
Do. Saudge.	1450				1450	500			800	100	50	950		4100
Do. Do. small.....	6000				6000	1000			4000	106	894	5000		5894

N. B. Tools, of every description, in use with the Artificers of the Store Department, except those classed with Petty Stores, are to be kept on the Returns.

No. 13.—(To follow No. 12.)

Return of Garrison Artillery for the Defence of shewing the state of their Carriages and portion of Stores in readiness for immediate Service.

(Here enter day of Month and Year.)

		Carriages.		Mortar Beds.						Fuzes.		Fire Balls		Cloth Cartridges							Canvas Caps		Coins. Gun.		Coins. Mortars.											Match Skeins.							Spunges.			
	Number.	Serviceable.	Repairable.	Serviceable.	Repairable.	Shot, Iron Round.	Shot, Grape Quilted.	Shells.	Carcasses	Drove.	Empty	Drove	Empty.	Filled	Empty	Aprons, Canvas	Bits, Steel.	Boxes, Dredging.	Buckets, Leather.	Cant Hooks.	Mortar.	Spunge	Upper.	Under.	Upper.	Under.	Cylinders, Tin, Loading.	Drivers, and Setters, Sets.	Handspikes, Purchasing	Haversacks, Leather.	Irons, Priming.	Horns, Priming	Knives, Laboratory.	Ladles, with Worms.	Lins tocks, with Cocks.	Cotton	Country.	Quick.	Powder, Mealed Hhds.	Rasps, Fuze	Rope, Europe 3½ In. fath	Saws Fuze	Gun	Mortar.	Tompions.	Wads.
Iron Guns 18 Pdrs. upwards	1	1				600	20								662	1	2		1			4	1	1					6	1	2	1		1	1	[illegible]	4				18		4		1	700
Do. all Calibers below 18 Pdrs	1	1				800	20								882	1	2		1			4	1	1					4	1	2	1		1	1	1	4				18		4		1	1100
Mortars.. 13 Inches.. ,..........	1			1				200	10	2[illegible]								1		1	1	4			1	1	1	1	6				1				4	1	1	1		1		4		
Ditto, 10	1			1				300	10	33[illegible]		[illegible]						1		1	1	4			1	1	1	1	4				1				4	1	1¼	1		1		4		
Ditto, 8	1			1				300	[illegible]	33		10	5					1		1	1	4			1	1	1	1	4				1				4	1	1¼	1		1		4		
Ditto, 5½	1			1				500				[illegible]	[illegible]					[illegible]				2			1	1	1	1	4				1				4	1	5½	1		1		2	1	
Ditto, 4⅖	1			1				[illegible]										[illegible]				[illegible]			1	1	1	1	4				1				4	1	5½	1		1		2		

N. B. A Quadrant and Perpendicular to every two Mortars.

No. 14.—(*To follow No.* 13.)

Return of Heavy Field Artillery in the Garrison of *shewing the state of their Carriages, and proportion of Stores in readiness for immediate Service.* (*Here Day of Month and Year.*)

	Number.	Carriages with Limbers.	Beds for Mortars.	Shot. Round.	Shot. Grape.	Shells Empty.	Carcasses.	Drove. Fuzes.	Drove. Fire Balls.	Cartridge Cloth.	Aprons, Canvas.	Bits, Steel.	Boxes, Budging.	Buckets, Leather.	Cant Hooks, Pairs.	Canvas Caps. Mortars.	Canvas Caps. Spunge.	Coins. Gun. Upper.	Coins. Gun. Under.	Coins. Mortars. Upper.	Coins. Mortars. Under.	Collars, Bullocks.	Cylinders, Tin Loading.	Drivers and Setters, Sets.	Esses Iron.	Handspikes, Purchasing.	Haversacks, Leather.	Horns, Priming.	Irons, Priming.	Knives, Laboratory.	Ladles with Worms.	Linstocks with Cocks.	Match Skeins. Cotton.	Match Skeins. Country.	Match Skeins. Quick.	Powder mealed, lbs.	Rasps Fuze.	Rope, Europe Coils. $4\frac{1}{2}$ Inches.	Rope, Europe Coils. $2\frac{3}{4}$ ditto.	Rope, Europe Coils. 3 ditto.	Saws, Fuze.	Spunges. Gun.	Spunges. Mortar.	Tompions, with Collars.	Traces, Chain.	Wads.	Yokes. Fixed. Single.	Yokes. Fixed. Double.	Yokes. Spare. Single.	Yokes. Spare. Double.	Yokes. Total. Single.	Yokes. Total. Double.
Iron Guns 24 Pounder	1	1		1000	20					1100	1	1		2			4	1	1			2			2	6	2	1	1		1	1		4				½				4		1	1	200	1	29	1	4	2	33
18	1	1		1000	20					1100	1	1		2			4	1	1			2			2	6	2	1	1		1	1		4					½			4		1	1	200	1	24	1	3	2	27
12	1	1		1000	20					1100	1	1		2			4	1	1			2			2	6	2	1	1		1	1		4						½		4		1	1	200	1	14	1	2	2	16
Mortars.. 13 Inches	1		1			200	10	240					1	2	1	1	4			1	1		1	1		4				1		1	2	4	4	50	1	½			1		4									
10 & 8	1		1			300	10	330	10				1	2	1	1	4			1	1		1	1		4				1		1	2	4	4	50	1		½		1		4									
$5\frac{1}{2}$	1		1			500		550	20				1	2			4			1	1		1	1		4				1		1	2	4	4	50	1			¼	1		4									
4 2-5ths	1		1			500		550						2			4			1	1		1	1		4				1		1	2	4	4	50	1			¼	1		4									

N. B. For heavy Artillery, ordered on Field Service, the following articles are judged necessary: a Transport Carriage carries one 13-inch Mortar, and its Bed; a Mortar Cart carries one 10-inch, or two 8-inch Mortars, and their Beds; a small Cart, with four Bullocks, carries two $5\frac{1}{2}$ inch, or four $4\frac{1}{2}$ inch Mortars, with their Beds, a Quadrant, and Perpendicular to two Mortars.

No. 15.—(To follow No. 14.)

Dimensions of Guns, Howitzers, and Mortars, in the Garrison of *(Here enter day of*
the Month and Year) for which Carriges are required.

	LENGTH.								DIAMETER.													
	Of the Piece.			From centre of Trunnions to the Base Rings			Of the Trunnions.		Of the Base Ring.			At the Trunnions.			Of the Trunnions.		Weight of Metal.			REMARKS.		
	Feet.	Inches.	Pts.	Feet.	Inches.	Pts.	Inches.	Pts.	Feet.	Inches.	Pts.	Feet.	Inches.	Pts.	Inches.	Pts.	Cwt.	Qrs.	Lbs.			
Iron Guns, 24 Pounder.....	2	9	6	4			6	50	1	8	85	1	4	75	5	90	48	3	16			
Do..... 18	2	9		3	10	50	6	10	1	7	4	1	3	3	5	6	40	3	24			
Brass 12	1	5	50	2	2	80	3	90	1		15		9	40	3	55	8	2	2			
Do..... 6	4	4	6	2			3	10		9	33		8	90	3	63	5	1	6			
Howitzer...5½ Inch.....	4	2	2	65	1	40	3	85		10	25		10	55	3	51	4		11			
Do..... 4½	2	1	10	25		11	2	60		8	22		8	10	3		2		7			
Mortar..... 13	1	3	6				6	50				1	7	55	6	88	24	3	7			
Do.....10	2	5	50				6					1	3	20	6	60	10	3	4			
Do..... 8	1	1	10	40			4	45					11	30	5	10	4		24			

Breadth of the Rampart where the Guns are to be placed.. } Feet Inches

No. 16—(To follow No. 15.)*

Dimensions of Carriages for Guns and Howitzers, and Beds for Mortars, for which Ordnance have been indented for on the Arsenal of Fort St. George.

	Length						Width { Between the cheek, &c.						Diameter of the cap square.		
	Of the cheeks, or of the mortar beds.			From the centre of the cap square to middle of the centre transom.			At the cap square.			At the middle of the centre transom.					
	Feet	Inches.	Dec. parts	Feet	Inches.	Dec. parts	Feet.	Inches.	Dec. parts.	Feet.	Inches.	Dec. parts.	Inches.	Dec. parts.	
Garrison carriage, trail 24 pdrs.															
Ditto.....18															
Do.....12															
Do .....Truck 6															
Field carriage, light for guns. } 6															
Do..... 3															
Do. for Howitzer.....5 in.															
Ditto..... 4 2-5ths															
Mortar Bed 13															
Do..... 10															
Do.....8															
Do.....5½															

No. 16.—(To follow No. 16)*

Indent No. *on Fort St. George, for Ordnance and Military Stores for the Service of the Garrison of*
(Here enter day of the month and year.)

Names of Stores.	Stated proportion of Articles.	Remaining in the Magazine.	Wanting to complete and indented for.	Remarks.	Admitted by the military board and to be supplied.
Axes, broad-helved..... ..	10	4	6		
— Felling.....	20	15	5		
— Pick.....	200	90	110		

No. 17.—(*To follow No.* 16.)

Form of a Report, of a General Survey of Ordnance and Military Stores of a Magazine, &c.

Report of a Survey of Ordnance, and Military Stores, in the Fort of *Shewing Numbers and State.* (*Here enter the day of the Month and Year.*)

Articles.	On Return.				Found on Examination.				Surplus.	Deficient.	Rema
	Service-able.	Repair-able.	Unservice-able.	Total.	Service-able.	Repair-able.	Unservice-able.	Total.			
Axes, Broad	14		4	18	14		4	18			
Felling	18	3	4	25	18		6	24		1	The unserviceable were issued, 1 in use with the Battalion, or Major A. B.'s detachment.
Pick	27	1	2	30	27	2	3	32	2		Repairable, to be Repaired.
Hand	53	1	6	60	53		4	57		3	Ditto, ditto.
Buckets, Gun, Leather	24			24	20		4	24			Unserviceable, to be written of he Returns.
Belts, Bayonet, Country	100		4	104	100		4	104			Ditto, ditto
Cartridges, Musquet, Shotted	20 000		5,000	25,000	20,000	1,000	4,000	25,000			The Repairable require only to tied in Bundles, the unser-
Fuzil, ditto	1800	100	100	2,000	1,800		200	2,000			viceable were received from the attalion, or from different Corps in Garrison.
Carriages, Field, for Brass Guns, 6 Pds.	2	1	1	4	2	1	1	4			Repairable to be estimated unserviceable, to be written off
Garrison, Trail, 18	4		2	6	4	1	1	6			the Return, broken up, and the Iron brought to account,
Trucked, 9	3	1		4	3		1	4			upon Return. by weight.
Drivers, Brass, Coopers	1		1	2	1		1	2			Unserviceable to be written of the Return, and the Brass brought to account by weight.

N. B. If the Reports, of which Examples are given in the Column, for Remarks applicable to the Stores, cannot, conveniently, be entered in that column; information on the same principle, regarding the cause of the different Articles of Stores, not being found in a Serviceable condition, to be entered at the bottom of the Report, and reference thereto may be made in the Column of Remarks, by Roman Capital Letters, or otherwise.

Rates to be observed in making Stoppages from the European Artillery, for Arms and Accoutrements lost or damaged by their carelessness or neglect.

ARTILLERY.

	P.	F.	C.
Fuzil complete	5	2	40
Pouch and Belt	3	9	
Buff, Bayonet, Belt	2		
Ditto, Pouch, ditto	2		

No. 18.—(*To follow No.* 17.)

Table of Draught Bullocks, and Draught Horses, for Ordnance, Carriages, &c.

	No. of Each.	Draught Bullocks.			Draught Horses.		
		In the Yokes.	Spare.	Total	No. in the Traces.	Spare.	Total
Iron Guns.....24 Pdr.	1	60	10	70			
Ditto.....18.....	1	50	8	58			
Ditto.....12.....	1	40	7	47			
Brass.....18.....	1	30	5	35			
Ditto.....12.....Medium.	1	24	4	28			
Ditto.....12.....Light.	1	12	2	14			
Ditto .....6.....	1	8	2	10	4	1	5
Ditto .....3.....	1	6	1	7	3	1	4
Ditto Howitzers..... 8 Inch.	1	24	4	28			
Ditto ditto..... 5 1-2	1	12	2	14			
Ditto ditto..... 4 2-5	1	8	2	10			
Transporting Carriages	1	50	8	58			
Tumbrils, Ammunition	1	10	2	12	3	1	4
Ditto, Store	1	10	2	12			
Ditto, Treasure	1	10	2	12			
Laboratory Chest	1	8	2	10			
Carts, Artificers	1	10	2	12			
Ditto, Mortar	1	30	5	35			
Ditto, Platform, double	1	4	1	5			
Ditto, Common or single	1	2	0	2			

Carriage bullocks, in the proportion of one to 120lb. is eight, to be carried, and for every six bullocks, one spare.

The general order, dated 5th of February, 1800, in explanation of this table, directs that on all occasions the proportion of spare draught bullocks is to be calculated on the aggregate number of bullocks attached to the whole of the *ordnance, and ammunition tumbrils* in the field; and not upon the number attached to each gun, and tumbril separately.

Table for Mortars.

Greatest Range by	Nature of the Mortar.	Length of ditto.		Weight of ditto.		Weight of Shells filled.		Chamber contains Powder			Greatest Range.	Windage.
Yards	Inches.	Feet.	Inches	Cwt	Qrs.	lbs.	oz.	lb.	oz.	dr.	Yards.	Inches.
2050	13	3	8	25	0	200	0	9	1	8	2500	25
2900	10	2	9	11	0	96	0	4	0	0	8000	0
1800	8	2	2	4	0	48	0	2	0	10	1800	20
1400	Royal 5 1-2	1	4	1	1	16	0	1	0	0	1400	12
1000	Coehorn 4 1-2	1	11-2	0	3	8	0	0	8	0	900	0
								which is used for proof of Mortar.				

No. 19.—(*To face p. 66.*)

General Report of Mortar and Howitzer Practice.

Report of Practice, with the under-mentioned Ordnance, at St. Thomas's Mount.

Month and Day.	Nature of Ordnance	By whom laid.	Nature of Powder.	Number of Firings	Weight of Shell	Weight of Powder.			Elevation.	Flight of the Shell.		Fuze.		From the Range. To the Right.		From the Range. To the Left		Grazes. First.		Grazes. Second.		Grazes. Third.		Real Distance.	Medium Distance	Flag at.	Remark
					lb	lb	oz	dr.	Deg.	Sec.	Pts.	In	Pts.	Yds.	Ft.	Yds.	Ft.	Yds.	Ft.	Yds.	Ft.	Yds.	Ft.	Yds.	Yds.	Yds.	
	13 In. Mortar	Lieut. A. B. Serjt. C. D. Gunn. E. F.	Europe	1 2 3	200	4	8		45	13 13 14	50	3	60	3		2								1007 1001 1104	1037	1100	Good Fuze. Line Shell, Good Fuze. Short Fuze.
	10 In. Mortar	Lt. F. W. S. L. Mats W. B Mr. C. D.	Bengal	1 2 3	96				45																		
	8 In. Mortar	Lt. F. W. W. H Serjt. J. B. Lieut. W. B.	Country.	1 2 3	48				45																		
	5¼ In. Mortar	Serjt. J W. Gunn. H I. Mats. J. K.	Europe	1 2 3	16				45																		
	8 In. Howit.	Lieut K I. Lieut J. H. Mr T. S	Europe	1 2 3	48				10									973 781 895	2	1143 972 1094		1165 1134 1190		1640 1490 1890	1506 2-3	1100	
	5½ In. Howit	Capt. A. T. Lieut J. K. Lt. F W. H W	Europe	1 2 3	6				10																		
	4⅘ In. Howit.	Col J K H. Lt.-Col W. S. Major G H.	Europe	1 2 3	8				10																		

No. 20.—(*To follow No. 19.*)

Table of Mortars.

Range.	13 Inch.			10 Inch.			8 Inch.			5½ Inch.			4½ Inch.			Flight.		Fuze.	
Yards.	lb.	oz.	dr	lb.	oz.	dr.	lb.	oz.	dr.	lb.	oz.	dr.	lb.	oz.	dr.	sec.	pts.	In.	pts.
100		7			5	8		4	12		2	4		1	8	4	37	1	9
150		10			7			5	8		2	7		1	11	5	28	1	32
200		13			8	8		6	4		2	10		1	14	6	20	1	55
250	1				10			7			2	13		2	1	6	80	1	70
300	1	3			11	7		7	12		3			2	4	7	50	1	88
350	1	6			12	14		8	8		3	4		2	7	8	12	2	3
400	1	9			14	5		9	4		3	8		2	10	8	60	2	15
450	1	12			15	12		10			3	12		2	13	9	12	2	28
500	1	14	8	1	1	3		10	12		4			3		9	68	2	42
550	2	1		1	2	10		11	8		4	4		3	3	10	12	2	53
600	2	3	8	1	4	1		12	4		4	8		3	6	10	60	2	65
650	2	6		1	5	8		13			4	12		3	9	11		2	75
700	2	8	8	1	6	15		13	12		5			3	12	11	40	2	85
750	2	10	10	1	8	6		14	8		5	4		3	15	11	84	2	96
800	2	12	12	1	9	13		15	4		5	9		4	2	12	20	3	5
850	2	14	14	1	11	4	1				5	13		4	5	12	64	3	16
900	3			1	12	11	1		12		6	1		4	8	13		3	25
950	3	2	2	1	14	2	1	1	18		6	7		4	11	13	32	3	33
1000	3	6		1	15	9	1	2	4		6	12		4	14	13	72	3	43
1050	3	8	8	2	1		1	3			7	1				14		3	50
1100	3	11		2	2	7	1	3	12		7	6				14	40	3	60
1150	3	13	8	2	3	4	1	4	8		7	11				14	70	3	68
1200	4			2	5	5	1	5	4		8					15		3	75
1250	4	2	8	2	6	12	1	6			8	4				15	28	3	82
1300	4	5		2	8	1	1	6	12		8	9				15	60	3	90
1350	4	7	8	2	9	8	1	7	8		8	13				15	85	3	96
1400	4	10		2	10	5	1	8	4		9					16	12	4	3
1450	4	12	8	2	12	6	1	9								16	48	4	12
1500	4	15		2	13	13	1	9	12							16	72	4	18
1550	5	1	8	2	15	4	1	10	10							17		4	25
1600	5	4		3		11	1	11	8							17	28	4	23
1650	5	6	8	3	2	2	1	12	11										
1700	5	9		3	3	9	1	13	10										
1750	5	11	8	3	5		1	14	12										

Smith's Military Dictionary.

SHELLS.	WEIGHT.
13 Inch	lbs. 205
10	94
8	42
5½ Royal	15
4 2-5 Coehorn	8

CHAMBERS CONTAIN.	SHELLS CONTAIN.
13 Inch	81lb.
10	5¼
8	2
5½	9 oz.
4 2-5	4½

SHELLS CONTAIN.	
	91b.
	3¾
	2¼
	14 oz.
	7

GREATEST RANGE OF SHELLS.

Shells.	Yards.
13 Inch	2500
10	3000
8	1800
5½	1500
4 2-5	900

No. 21.—(*To follow No.* 20.)

Table of Shells Ranges in Yards, at forty-five degrees Elevation, by which Fuzes may be cut to any Range required.

Seconds.	Yards.	Seconds.	Yards.	Seconds.	Yards.	Seconds.	Yards.	Seconds.	Yards.	Seconds	Yards.
5	134	9 1-4	450	13 1-2	977	17 3-4	1689	22	2595	26 1-4	3694
5 1-4	148	9 1-2	484	13 3 4	1017	18	1737	22 1-4	2654	26 1-2	3765
5 1-2	162	9 3-4	509	14	1050	18 1-4	1785	22 1-2	2714	26 3-4	3865
5 3-4	177	10	536	14 1-4	1088	18 1-2	1835	22 3-4	2775	27	3908
6	193	10 1-4	563	14 1 2	1127	18 3-4	1885	23	2836	27 1-4	3980
6 1-4	209	10 1-2	591	14 3 4	1166	19	1935	23 1-4	2896	27 1-2	4054
6 1-2	226	10 3-4	619	15	1206	19 1-4	1986	23 1-2	2961	27 3-4	4128
6 3-4	244	11	649	15 1 4	1246	19 1-2	2038	23 3-4	3024	28	4203
7	263	11 1-4	678	15 1-2	1288	19 3-4	2091	24	3088	28 1-4	4278
7 1-4	282	11 1-2	709	15 3-4	1329	20	2144	24 1-4	3153	28 1-2	4354
7 1-2	301	11 3-4	739	16	1372	20 1-4	2198	24 1-2	3218	28 3-4	4431
7 3-4	322	12	772	16 1-4	1416	20 1-2	2252	24 3-4	3284	29	4509
8	343	12 1-4	804	16 1-2	1419	2 3-4	2308	25	3350	29 1-4	4587
8 1-4	365	12 1 2	834	16 3-4	1504	21	2364	25 1-4	3418	29 1 2	4665
8 1-2	387	12 3-4	871	17	1549	21 1-4	2420	25 1-2	3486	29 3-4	4745
8 3-4	412	18	906	17 1-4	1595	21 1-2	2478	25 3 4	3555	30	4825
9	434	13 1-4	941	17 1-2	1642	21 3-4	2536	26	3624	30 1-4	4905

Remarks.

By this Table, if you know the distance, you likewise know how many seconds the shell was in the air; and by knowing the time you may know the distance, and may cut the fuzes accordingly, by burning one or two, and making use of a stop-watch with a second hand, or a pendulum that vibrates seconds.

Example 1. How many yards in twelve seconds will be the range at 45° elevation, viz. $12 \times 12\ 16\ \frac{1}{12} = 772$ yards, or $12 \times 12 \times 193\frac{30}{36} = 772$ yards as before.

The above example is done by the following rule.—Square the time of flight, and multiply that by 16 1-12, and the product divided by 3, the quotient gives the range in yards.

Example 2. The range of 45° being given to know the seconds, it was performed by the following rule.—Multiply the range by 3, and divide the product by 16 1-12, the square root of the quotient gives the number of seconds; or, to avoid fractions, multiply the range by 36, the twelve seconds contained in 3, and divide the product by 193, the 12 seconds contained in 16 1-12, the square root of the quotient gives the seconds.

$\sqrt{772 \times 3} = \sqrt{2316} = \sqrt{144} = 12$ Seconds,

or $772^2 \times 36 \div 193 = \sqrt{2316} \div 193 = \sqrt{144} = 12$ Seconds.

Range Report at Mortar Practice.

Range Report of the Ten-Inch Mortar at Practice. *March* 10, 1785.

Firings.	Shell from the Range.				Distance.		Remarks.
	To the Right		To the Left.				
No	Yards	Feet.	Yards	Feet	Yards	Feet.	
1	1	11-2	0	0	990	1	Good Fuze.
2	0	0	0	0	996	0	Line Shell, Fuze short.
3	0	0	5	0 1 2	940	0	Fuze long.

Range Report of Howitzers at Practice.

Firings.	First Graze from the Line.				Grazes.			Real Distance.	Remarks.
	Right.		Left.		First.	Second	Third.		
No.	Yards	Feet.	Yards	Feet.	Yards	Yards	Yards	Yards.	
1									
2									
3									

This Report is used where there are not a sufficient number of Non-Commissioned Officers to send with the Reports of the Grazes and Real Distance.

Table of Shells Ranges in Yards, at forty-five degrees Elevation, taken from a Medium of Five years Practice at St. Thomas's Mount.

	Seconds.	Yards.	Seconds.	Yards.	
	5 1-2	173	12	747	
	6	207	12 1 2	805	
	6 1 2	246	13	877	
	7	267	13 1 2	92[illegible]	
	7 1-2	314	14	998	
	8	349	14 1-2	1063	
	8 1-2	389	15	1156	
	9	414	15 1-2	1211	
	9 1-2	467	16	1252	
	10	528	16 1 2	1345	
	10 1-2	566	17	1423	
	11	629	17 1-2	1540	
	11 1 2	667			

No. 22.—(To face p. 70.)

General Report of Howitzer Practice.

Nature of Howitzers.	No. of Firings.	Weight of Shell	Weight of Powder.			Elevation.		Fuze.		Flight.		From the Range. Right.		From the Range. Left.		Grazes. 1st.	Grazes. 2nd.	Grazes. 3rd.	Medium distance first Graze.	Real distance of the Shell.	Medium Range.	Flag at	Remarks.
		lbs.	lb.	oz.	dr	0	1	In.	pts.	sec.	pts.	yds.	feet	yds.	feet	yds.	yds.	yds.	yards.	yards.	yards.	yds.	
8 Inch.	1	48	2	4		7		1	10	4	25	7	1			730	830	1124		1759		800	Good Fuze.
	2									4				15		690	794	794	706	1379	1709 2-3		Too long.
	3									5		8				698	896	1024		1990			Too short.
5 Inch.	1	16	1			7		1	10	4												800	Good Fuze.
	2									5													Too long.
	3									3	50												Too short.
4 2-5th Inch.	1	8				7		1	10													800	
	2																						
	3																						

N. B The Howitzers being seldom practised with alone, are generally included with the Mortars.

Rules for Guns, with Round Shot.

First. Scale the gun.

Second. Lay it for the bull's eye.

Third. Take the centres at the muzzle and breach.

Fourth. Finally, direct it to the object.

Fifth. Load; first, with cartridge, (or loose powder;) set it well up.

Process of Loading.

2nd. Put in the wad, ram home strong, twice.

3rd. Put in the shot.

4th. Put in a second wad, and ram home thrice.

Sixth. Take the elevation.

Seventh. Make the signals for firing.

Eighth. After the whole of the guns are discharged, while they are preparing for the next, the shot-holes must be covered with coarse tent cloth, pasted on with paste of wheat flour; this, however, is not always done, but the repair of the target is omitted until the day's

practice is over; the marks by chalk and charcoal answer full as well and take up less time.

N. B. To prevent mistakes and accidents, a few Lascars must be sent out to the distance of 2000 yards, to keep the range clear of travellers.

Ranges, with a Charge of two-thirds Shot's Weight.

Smith's Military Dictionary.

Pounders.	Length.		Range.			Remarks.
			Point Blank.	Utmost 45°	Utmost in miles.	
	Feet.	Inches.	Yards.	Yards.	Miles.	
42 Heavy.....	9	6	686	3861	2 1-8	
32 Heavy.....	9	6	697	3728	2 1-8	
24 Medium...	9	6	758	3876	2 1-8	
18 Heavy.....	9	0	705	4186	2 3-8	
12 Medium...	6	6	822	4089	2 5-6	
9 Heavy.....	9	0	794	3978	2 1-4	
6 Medium...	5	0	576	3899	2 1-8	
3 Medium...	4	6	576	3073	2 1-8	
1 Medium...	4	0	453	2467	2 1-8	

Form of Range Report, at Gun Practice.

Firings.	Shot went through the Target from the Bull's eye.												Shot grazed from the Target.			Remarks.
	To the Right.			To the Left.			Under.			Over.						
	Y.	F.	I.	Y.	F.	I.	Y.	F.	I.	Y.	F.	I.	Yds.	Feet.	Ins.	
1		1						2								
2					1	2					2	8				
3					2							9				
4		2	4				1	1								
5	2			1												
6	1	1	3							1	2	6				

No. 23.—(*To face p. 74.*)

General Report of Practice, with the under-mentionel Ordnance at the Mount.

Month and day.	Nature of Ordnance	Nature of Powder.	No. of Firings	Guns. Length.		Weight.			Weight of Powder.			Elevation.	Thro' the target from the bull's eye. Right.			Left.			Under.			Over.			Graze from the Target.			Remarks.
				F.	In.	C.	qr.	lb.	lb.	oz.	dr.	D. M	Y.	F.	In.	Y.	F.	In.	Y.	F.	In.	Y.	F.	In.	Y.	F.	In.	Yds.	
	18-Pounder Iron.	Bengal.	1	9		42	3	2	6			30			5				1	1					20			600	Out of the Target two yards from the right.
			2																									
			3													2	3			6								
			4										2	9			4					1	1					
			5																			1	1					
	18-Pounder Brass.		1	8	3	22	3	18	4	8		30															500	Missed the Target two yards to the left.
			2																									Ditto, one foot, ditto.
			3																									Ditto, two feet, ditto.
			4									32																
			5									35																One yard to right of the Target.
	12-Pounder Iron.		1	8	4	30	2	14	4			45															450	Missed the Target one yard.
			2																									
			3																									
			4																									
			5									25																Over the Butt.
	12-Pounder Brass.		1	5		8		7	3			15															400	
			2																									
			3									16																
			4									30																Over the Target in a line with the Bull's Eye.
			5																									
	6-Pounder Brass.		1	4	6	5		16	1	8		15															650	
			2									20																
			3																									Broke the frame in the centre to the right.
			4																									
			5																									

Powder to be used for Scaling and Starting Fuzes.

Ordnance.	Scaling.			Starting the Fuze.		
	Lb.	Oz.	Dr.	Lb.	Oz.	Dr.
Mortars and Howitzers 13		4			4	
Ditto, ditto..... 10		3			3	
Ditto, ditto..... 8		2	5		2	8
Ditto, ditto..... 4½		1	4		1	4
Ditto, ditto..... 4½		1			1	

Size of But and Target, &c.

	Feet.	Inches.	Pts.
But for Gun Practice.			
Front { Length Greatest	60		
Front { Least	53		
Height			
End. Breadth Greatest	24		
Least	17		
Target for Gun Practice			
Frame Square	12		
Side pieces Length	16		
Square		6	
Target Square	11	9	
Bull's Eye Diameter	1	2	
Ring's breadth			
(As the commanding officer may direct)			

Gunpowder.

The great difference in quality and strength of gunpowder, (to which the service in this country, in particular, is subjected,) renders it a desirable object to form, from actual practice, a table of proportions corresponding with the different strengths;—hitherto, calculations for mortars, guns, and small arms, have been on a table of one fixed range of proof; that of Madras being two pounds of powder, in a ten-inch brass mortar, to throw a shell, weight ninety-six pounds, at 45° elevation, 1000 yards.—Consequently, when powder, under that proof, is used, the proportion must be inadequate to the service required, and *vice versa*.

Similar observations, respecting English gunpowder, is made in the Pocket Gunner.

The manufacture of gunpowder at Madras, within a few years, under the superintendence of lieutenant Bishop, of the artillery, has considerably improved; and there is fair prospect of the Madras gunpowder being shortly brought to a standard of perfection hitherto unknown;—the average proof Madras powder, by the aforementioned rule, is 1450 yards.

Gunpowder should be turned every six months, and sifted and dried every second year; after which it should be proved agreeably to the regulations for proof.—That found under proof should be re-made at the expense of the superintendent, unless he can make it appear that the failure has not arisen from any neglect or inattention on his part.

GENERAL

TABLE OF MORTARS,

With Powder of different Strength,

BY MADRAS PROOF;

RANGE FROM 850, TO 1400 YARDS.

The following practice, with the exception of 1200 yards proof, was made from a 13-inch Mortar, too high, that of 1200 yards proof, with a mortar of the least possible windage, which will account for the considerable difference in range between the 13-inch Mortar, viz. with powder of 1200 yards proof 2. 10. 8. the difference in range was 257 yards. The other Mortars were all tolerably correct.

The above shews how fallacious calculations must be, if Mortars and Shells are not of correct dimensions.

Proof Range 850 Yards.

Yards.	Mortars.														
	13 In.			10 In.			8 In.			5½ In.			4⅕ In.		
	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.
400	2	6	4	1	5	8	0	14	4	0	6	3			
450	2	9	2	1	6	12	0	15	2	0	6	7			
500	2	12	4	1	8	0	0	15	14	0		11			
550	2	14	2	1	9	4	1	0	12	0		13			
600	3	1	4	1	10	6	1	1	10	0		6			
650	3	3	12	1	11	10	1	2	12	0	7	8			
700	3	6	0	1	12	10	1	3	12	0	7	12			
750	3	7	6	1	13	13	1	4	10	0	8	2			
800	3	9	8	1	14	14	1	5	6	0	8	6			
850	3	12	0	2	0	0	1	6	5	0	8	10			
900	3	14	0	2	1	4	1	7	6	0	8	14			
950	4	0	2	2	2	8	1	8	6	0	0	0			
1000	4	3	5	2	3	12	1	9	6	0	0	0			
1050	4	7	0	2	5	4	1	10	6	0	0	0			
1100	4	8	10	2	6	4	1	11	0	0	0	0			
1150	4	11	8	2	7	4	1	11	6	0	0	0			
1200	4	14	8	2	8	4	1	12	0	0	0	0			
1250															

Proof Range, 900 Yards.

Yards.	Mortars.														
	18 In.			10 In.			8 In.			5½ In.			4⅘ In.		
	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.
400	1	13	15	1	1	13	0	11	11	0	5	5			
450	2	0	11	1	2	14	0	12	7	0	5	9			
500	2	3	10	1	4	4	0	13	1	0	5	13			
550	2	6	13	1	5	7	0	14	0	0	6	1			
600	2	9	3	1	6	11	0	14	13	0	6	6			
650	2	11	3	1	7	15	0	15	11	0	6	8			
700	2	13	8	1	9	1	1	0	10	0	7	0			
750	2	15	13	1	10	4	1	1	11	0	7	2			
800	3	2	0	1	11	4	1	2	8½	0	7	7			
850	3	3	7	1	12	4	1	3	5	0	7	12			
900	3	6	0	1	13	2	1	4	2	0	8	0			
950	3	8	3	1	14	5	1	5	14	0	6	4			
1000	3	10	11	1	15	11	1	6	11	0	0	0			
1050	3	13	1	2	1	0	1	7	5	0	0	0			
1100	3	15	11	2	2	8	1	8	0	0	0	0			
1150	4	2	11	2	3	13	1	8	13	0	0	0			
1200	4	4	12	2	4	15	1	9	8	0	0	0			
1250	4	8	0	2	5	15	1	10	2	0	0	0			
1300	4	11	0	2	7	1	1	11	10	0	0	0			
1350															
1400															
1450															
1500															

Proof Range, 950 Yards.

Yards.	Mortars.														
	13 In.			10 In.			8 In.			5¾ In.			4⅕ In.		
	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.
400	1	11	14	1	0	6	0	10	6	0	5	0			
450	1	14	6	1	1	8	0	11	8	0	5	4			
500	2	1	0	1	3	0	0	11	14	0	5	7			
550	2	3	14	1	4	2	0	12	14	0	5	10			
600	2	6	8	1	5	6	0	13	12	0	6	1			
650	2	7	10	1	6	10	0	14	10	0	6	5			
700	2	9	2	1	7	12	0	15	10	0	6	10			
750	2	11	14	1	8	14	1	0	10	0	6	13			
800	2	14	0	1	9	14	1	1	4	0	7	2			
850	2	15	8	1	10	11	1	2	0	0	7	6			
900	3	2	8	1	11	6	1	3	12	0	7	12			
950	3	4	6	1	12	10	1	3	13	0	7	14			
1000	3	7	6	1	14	2	1	4	14	0	0	0			
1050	3	9	9	1	15	3	1	6	4	0	0	0			
1100	3	12	1	2	1	4	1	6	10	0	0	0			
1150	3	14	6	2	2	6	1		4	0	0	0			
1200	4	0	14	2	3	10	1	8	0	0	0	0			
1250	4	4	8	2	4	10	1	8	14	0	0	0			
1300	4	7	3	2	5	14	1	9	6	0	0	0			
1350															
1400															
1450															
1500															

Proof Range, 1000 Yards.

	Yards.	Mortars.															
		13 In.			10 In.			8 In.			5⅝ In.			4⅝ In.			
		Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	
	400	1	0	12	0	14	14	0	9	0	0	4	11	0	3	10	
	450	1	10	0	1	0	1	0	0	15	0	4	13	0	2	14	
	500	1	11	7	1	1	11	0	10	10	0	5	0	0	3	0	
	550	2	1	0	1	2	14	0	11	11	0	5	6	0	3	2	
	600	2	2	0	1	4	9	0	2	10	0	5	11	0	3	6	
	650	2	4	0	1	5	5	0	13	15	0	6	11	0	3	10	
	700	2	5	0	1	6	6	0	14	11	0	6	8	0	3	13	
	750	2	8	0	1	7	7	0	15	0	0	6	13	0	3	15	
	800	2	10	0	1	8	8	1	0	0	0	6	15	0	4	0	
	850	2	11	0	1	10	2	1	0	10	0	7	1	0	4	4	
	900	2	15	0	1	9	10	1	1	10	0	7	4	0	0	0	
	950	3	0	8	1	11	0	1	2	0	0	7	6	0	0	0	
	1000	3	4	0	1	12	8	1	3	8	0	0	0	0	0	0	
	1050	3	6	0	1	14	0	1	5	0	0	0	0	0	0	0	
	1100	3	8	8	2	0	0	1	6	0	0	0	0	0	0	0	
	1150	3	10	0	2	1	0	1	6	10	0	0	0	0	0	0	
	1200	3	12	0	2	2	4	1	6	8	0	0	0	0	0	0	
	1250	4	1	0	2	3	6	1	7	10	0	0	0	0	0	0	
	1300	4	4	0	2	4	12	1	8	0	0	0	0	0	0	0	
	1350					6	4	1	8	10	0	0	0	0	0	0	
	1400																
	1450																
	1500																

Proof Range, 1050 Yards.

Yards.	Mortars.														
	13 In.			10 In.			8 In.			5½ In.			4⅕ In.		
	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.
400	1	8	15	0	14	6½	0	8	12½	0	4	7½	0	2	8
450	1	11	8	0	15	10	0	9	10½	0	4	11	0	2	11
500	1	13	9	1	1	2	0	10	7	0	4	14½	0	2	13
550	2	0	2	1	2	5	0	11	4	0	5	2½	0	2	0
600	2	2	3	1	3	7½	0	12	2½	0	5	7	0	3	3
650	2	3	6	1	4	8½	0	13	2⅝	0	5	10	0	3	6½
700	2	4	8	1	5	9½	0	14	1	0	5	13	0	3	9½
750	2	7	6	1	6	9½	0	14	13	0	6	3	0	3	12
800	2	9	7	1	7	10	0	15	5½	0	6	7½	0	3	14
850	2	11	2	1	8	4½	0	15	14½	0	6	12	0	0	0
900	2	14	7	1	8	14½	1	0	13	0	6	15	0	0	0
950	3	0	0	1	10	8	1	1	9	0	7	4	0	0	0
1000	3	3	7	1	11	8	1	2	8	0	0	0	0	0	0
1050	3	5	8	1	12	14	1	3	13½	0	0	0	0	0	0
1100	3	8	1	1	14	12	1	4	3	0	0	0	0	0	0
1150	3	9	11	1	15	13	1	4	11	0	0	0	0	0	0
1200	3	12	7	2	1	0	1	5	8	0	0	0	0	0	0
1250	4	0	6	2	2	2½	1	6	8½	0	0	0	0	0	0
1300	0	0	0	2	3	9	1	7	1	0	0	0	0	0	0

Proof Range, 1100 Yards.

Yards.	Mortars.														
	13 In.			10 In.			8 In.			5½ In.			4⅕ In.		
	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.
400	1	8	2	0	13	15	0	8	9	0	4	3	0	2	4
450	1	10	6	0	15	3	0	9	6	0	4	7	0	2	8
500	1	12	13	1	0	9	0	10	2	0	4	11	0	2	10
550	1	15	4	1	1	12	0	10	13	0	4	15	0	2	13
600	2	1	6	1	2	13	0	11	11	0	5	3	0	3	0
650	2	2	12	1	3	12	0	12	10	0	5	6	0	3	3
700	2	4	0	1	4	13	0	13	7	0	5	11	0	3	6
750	2	6	12	1	5	11½	0	14	1	0	5	15	0	3	9
800	2	8	9	1	6	12	0	14	10	0	6	3	0	3	11
850	2	10	11	1	7	7	0	15	3	0	6	7	0	0	0
900	2	13	14	1	8	3	1	0	0	0	6	10	0	0	0
950	2	15	9	1	9	6	1	0	9	0	6	15	0	0	0
1000	3	2	15	1	10	8	1	1	8	0	0	0	0	0	0
1050	3	5	0	1	11	12	1	2	9	0	0	0	0	0	0
1100	3	7	9	1	13	8	1	3	1	0	0	0	0	0	0
1150	3	9	8	1	14	10	1	3	10	0	0	0	0	0	0
1200	3	12	1	1	15	12	1	4	8	0	0	0	0	0	0
1250	3	15	12	2	0	15	1	5	7	0	0	0	0	0	0
1300				2	2	6	1	6	2	0	0	0	0	0	0

Proof Range, 4150 Yards.

Yards.	Mortars.														
	13 In.			10 In.			In.			5½ In.			4½ In.		
	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.
400	1	7	5	0	13	7½	0	8	5½	0	3	15½	0	2	0
450	1	9	9	0	14	12	0	9	2½	0	4	3½	0	2	4
500	1	11	15	1	0	0	0	9	11	0	4	7½	0	2	7
550	1	14	6	1	1	3	0	10	6	0	4	11½	0	2	10
600	2	0	9	1	2	2½	0	11	9½	0	4	15	0	2	13
650	2	2	2	1	2	15½	0	12	1½	0	5	2	0	2	15½
700	2	3	8	1	4	½	0	12	13	0	5	7	0	3	2½
750	2	6	2	1	4	14½	0	13	5	0	5	11	0	3	6
800	2	8	0	1	5	14	0	13	15½	0	5	14½	0	3	8
850	2	10	4	1	6	9½	0	14	7½	0	6	2	0	0	0
900	2	13	5	1	7	7½	0	15	3	0	6	5	0	0	0
950	2	15	11	1	8	9	0	15	9	0	6	10	0	0	0
1000	3	2	6	1	9	8	1	0	8	0	0	0	0	0	0
1050	3	4	8	1	10	10	1	1	4½	0	0	0	0	0	0
1100	3	7	1	1	12	4	1	1	15	0	0	0	0	0	0
1150	3	9	11	1	13	7	1	2	9	0	0	0	0	0	0
1200	3	11	11	1	14	8	1	3	8	0	0	0	0	0	0
1250	3	15	2	1	15	11½	1	4	5½	0	0	0	0	0	0
1300	0	0	0	2	1	3	1	5	8	0	0	0	0	0	0

Proof Range, 1200 Yards.

Yards.	Mortars.														
	13 In.			10 In.			8 In.			5½ In.			4½ In.		
	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.
400	1	4	8	0	13	0	0	8	[illegible]	0	3	12	0	1	15
450	1	6	8	0	14	6	[illegible]	9	0	0	4	0	0	2	2½
500	1	8	0	0	15	8	0	9	8	0	4	4	0	2	4
550	1	10	8	1	0	9	0	9	14	0	4	8	0	2	7
600	1	12	0	1	1	8	0	10	12	0	4	12	0	2	9
650	1	13	8	1	2	10	0	11	8	0	4	15	0	2	12
700	1	15	8	1	3	4	0	12	2	0	5	3	0	2	15
750	2	1	8	1	4	4	0	13	10	0	5	7	0	3	2
800	2	2	8	1	5	0	0	13	2	0	5	0	0	3	5
850	2	4	8	1	5	12	0	13	12	0	5	3	0	0	0
900	2	7	6	1	6	12	0	14	6	0	6	0	0	0	0
950	2	9	0	1	7	12	0	14	10	0	6	4	0	0	0
1000	2	11	0	1	8	8	0	15	8	0	[illegible]	7	0	0	0
1050	2	12	8	1	9	8	1	0	6	0	0	0	0	0	0
1100	2	14	8	1	11	0	1	0	12	0	0	0	0	0	0
1150	3	0	0	1	12	4	1	1	8	0	0	0	0	0	0
1200	3	2	0	1	13	4	1	2	8	0	0	0	0	0	0
1250	3	4	0	1	14	8	1	3	4	0	0	0	0	[illegible]	0
1300	3	6	8	2	0	0	1	4	4	0	0	0	0	0	0
1350															
1400															

Proof Range, 1250 Yards.

Yards.	Mortars.														
	13 In.			10 In.			8 In.			5½ In.			4⅕ In.		
	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.
400	1	3	8	0	12	9	0	7	10½	0	3	7½	0	1	14
450	1	7	15	0	13	15	0	8	8	0	3	12	0	2	0
500	1	10	3	0	14	6	0	9	0	0	3	15	0	2	1½
550	1	12	10	0	15	1	0	9	6½	0	4	2	0	2	4
600	1	14	15	1	0	6	0	10	3	0	4	6	0	2	6
650	2	0	12	1	1	8	0	10	14	0	4	9	0	2	9
700	2	2	8	1	2	4	0	11	9	0	4	13	0	2	12
750	2	4	14	1	3	5	0	12	3	0	5	1	0	2	14½
800	2	6	12	1	4	3	0	12	10	0	5	3½	0	3	1
850	2	9	13	1	5	1	0	12	13	0	5	6½	0	0	0
900	2	11	15	1	6	3	0	13	14	0	5	10	0	0	0
950	2	14	8	1	7	5	0	14	3	0	5	14½	0	0	0
1000	3	1	4	1	6	0	0	13	[illegible]	0	6	1½	0	0	0
1050	3	3	10	1	8	15	0	15	9	0	0	0	0	0	0
1100	3	6	5	1	10	6	1	0	4½	0	0	0	0	0	0
1150	3	8	7	1	11	8	1	1	[illegible]	0	0	0	0	0	0
1200	3	11	1	1	12	7	1	2	[illegible]	0	0	0	0	0	0
1250	3	13	14	1	13	11	1	2	11½	0	0	0	0	0	0
1300	0	0	0	1	15	2	1	3	12½	0	0	0	0	0	0
1350															
1400															

Proof Range, 1300 Yards.

Yards.	Mortars.														
	13 In.			10 In.			8 In.			5½ In.			4⅕ In.		
	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.
400	1	4	11	0	11	4	0	7	8	0	3	2	0	1	11
450	1	7	2	0	12	4	0	8	0	0	3	8	0	1	13
500	1	9	5	0	13	4	0	8	8	0	3	10	0	1	15
550	1	11	12	0	14	5	0	8	15	0	3	12	0	2	1
600	1	14	0	0	15	4	0	9	10	0	4	0	0	2	3
650	2	0	1	1	0	6	0	10	4	0	4	3	0	2	6
700	2	2	0	1	1	4	0	11	0	0	4	7	0	2	9
750	2	4	4	1	2	6	0	11	10	0	4	11	0	2	11
800	2	6	2	1	3	6	0	12	2	0	4	13	0	2	13
850	2	9	6	1	4	6	0	12	8	0	5	0	0	0	0
900	2	11	4	1	5	10	0	13	6	0	5	4	0	0	0
950	2	13	15	1	6	10	0	13	12	0	5	9	0	0	0
1000	3	0	11	1	7	8	0	14	9	0	5	12	0	0	0
1050	3	3	8	1			0	15	2	0	0	0	0	0	0
1100	3	5	15	1	9			15	13	0	0	0	0	0	0
1150	3	8	2	1	10	12	1	0	9	0	0	0	0	0	0
1200	3	10	12	1	11	10	1	1	9	0	0	0	0	0	0
1250	3	13	4	1	12	14	1	2	3	0	0	0	0	0	0
1300	0	0	0	1	14	0	1	3	7	0	0	0	0	0	0
1350															
1400															

Proof Range, 1350 Yards.

Yards.	Mortars.														
	13 In.			10 In.			8 In.			5½ In.			4⅘ In.		
	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.
400	1	8	13	0	10	6	0	6	11⅗	0	2	13⅗	0	1	8
450	1	6	5	0	11	9	0	7	8	0	3	4	0	1	10
500	1	8	7	0	12	2	0	8	0	0	3	6	0	1	13
550	1	10	14	0	13	3	0	8	7½	0	3	8	0	1	14
600	1	13	8	0	14	2	0	9	1	0	3	10	0	2	0
650	1	15	7	0	15	4	0	9	10	0	3	13	0	2	3
700	2	1	8	1	0	4	0	10	7	0	4	1	0	2	6
750	2	3	10	1	1	7	0	11	2	0	4	5	0	2	7½
800	2	5	8	1	2	9	0	11	10	0	4	6½	0	2	9
850	2	8	15	1	3	11	0	12	3	0	4	9⅘	0	0	0
900	2	10	9	1	5	1	0	12	14	0	4	14	0	0	0
950	2	13	9	1	6	1	0	13	6	0	5	3⅘	0	0	0
1000	3	0	2	1	7	0	0	14	15	0	5	6½	0	0	0
1050	3	2	12	1	7	12	0	14	9	0	0	0	0	0	0
1100	3	5	9	1	9	2	0	15	5⅘	0	0	0	0	0	0
1150	3	7	15	1	10	0	1	0	1⅘	0	0	0	0	0	0
1200	3	10	7	1	10	13	1	1	1⅘	0	0	0	0	0	0
1250	3	12	10	1	12	1	1	1	10½	0	0	0	0	0	0
1300	0	0	0	1	13	2	1	2	⅕	0	0	0	0	0	0
1350															
1400															

Proof Range, 1400 Yards.

Yards.	Mortars.														
	13 in.			10 In.			8 in.			5⅘ In.			4⅘ In.		
	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.	Lbs.	Oz.	Drs.
400	1	8	0	0	9	7	0	6	4	0	2	6	0	1	5
450	1	5	8	0	10	0	0	7	0	0	2	9	0	1	7
500	1	7	8	0	10	13	0	7	8	0	2	15	0	1	9
550	1	10	0	0	12	0	0	8	0	0	3	1	0	1	11
600	1	12	8	0	13	0	0	8	8	0	3	5	0	1	14
650	1	15	0	0	14	2	0	9	0	0	3	8	0	2	0
700	2	1	0	0	15	6	0	9	14	0	3	10	0	2	2
750	2	3	0	1	0	7	0	10	10	0	3	14	0	2	4
800	2	5	4	1	1	12	0	11	2	0	4	0	0	2	6
850	2	8	0	1	3	0	0	11	14	0	4	3	0	2	8
900	2	10	8	1	4	4	0	12	6	0	4	8	0	2	10
950	2	13	0	1	5	8	0	12	14	0	4	14	0	0	0
1000	2	15	8	1	6	8	0	13	10	0	5	1	0	0	0
1050	3	2	4	1	7	4	0	14	4	0	0	0	0	0	0
1100	3	5	0	1	8	6	0	14	14	0	0	0	0	0	0
1150	3	7	8	1	9	4	0	15	10	0	0	0	0	0	0
1200	3	10	0	1	10	0	1	0	10	0	0	0	0	0	0
1250	3	12	0	1	11	6	1	1	2	0	0	0	0	0	0
1300	0	0	0	1	12	8	1	1	14	0	0	0	0	0	0
1350	0	0	0	1	13	8	1	2	10	0	0	0	0	0	0
1400	0	0	0	1	14	6	0	0	0	0	0	0	0	0	0
1450	0	0	0	1	15	1	0	0	0	0	0	0	0	0	0
1500	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0

It is completely established by every day's practice with artillery, that, with every possible care and precaution, measuring the force of gunpowder with *certainty* is impracticable;—for there is no certainty of producing the same effect, with a similar quantity of powder fired from the same ordnance, and with the exact same weight of shot or shells, and loaded as far as in the power of man in the same manner.—Complete accuracy, therefore, is not attainable, much less so, from a difference in ordnance; no two mortars (procurable in this country) being precisely the same; therefore, although the *tables* will be found generally exact, having been formed from actual practice, yet, a trifling difference will occur, perhaps, with other mortars, and where the same means of approaching accuracy is not to be found, as at the presidency.

Table of Shells Ranges, in yards, at 45° elevation, taken from mediums of three years practice. St. Thomas's Mount.

Yards.	Pendulum.	
	36 3-10 Inches.	39 1-28 Inches.
	Sec. pts.	Sec. pts.
400	8 40	9 5
450	9 5	9 30
500	9 40	9 50
550	10 0	10 25
600	10 45	11 5
650	11 10	11 30
700	11 20	12 5
750	11 49	12 35
800	12 10	13 5
850	12 30	13 30
900	12 40	13 50
950	13 30	14 10
1000	14 0	14 30
1050	14 20	14 40
1100	14 55	15 15
1150	15 25	15 35
1200	15 30	15 50
1250	15 40	16 25
1300	16 0	16 30
1350	16 20	16 55
1400	16 45	17 10
1450	17 0	17 20
1500	17 30	17 45

Tubes.

Tubes are of much consequence, but complaints of them have been so general as almost to supersede their use; although tubes, if properly prepared, possess decisive advantages over priming powder, particularly in dispatch, cleanliness, and safety.

Metallic tubes are objectionable, but if not allowed to remain long filled, will answer very well.—No tube, for even the heaviest ordnance, should be longer than 4 inches, if filled with a paste made of good powder and pure spirits of wine: when filled, a wire should be run through their centre, well dried, and put up for use.—Although it is desirable to have tubes fresh filled, which can be done at all times, yet these will be good for a considerable time, and their powers completely preserved;—an advantage of these tubes is reducing all to one denomination, thereby simplifying this article of artillery store.

Several trials have been made with tubes of the above composition, and a report, under date the 17th of March, 1806, establishes their preference:—tubes of 3 inches and 2o prs. in length, fired an iron 18-pounder, and the tubes appear calculated for any caliber.

To clear a Gun when a bit or tube is broke in the vent.

Draw the charge, sprinkle a little powder loose with a ladle from the breach to the muzzle,—drive in a light tompion, with a small score or groove, and blow the powder off.

If a shot sticks half-way,—if you fire the gun it probably splits, and you cannot draw it; in which case, the powder should be completely damped, and, while soaking, the gun should be primed with fine powder, getting as much down the vent as possible,—then fire it off.

The following quantity of Provisions is furnished daily to each European Soldier, Madras Establishment, in Camp, as Batta.

When it happens that any article cannot be supplied, the several articles deficient are to be made good to the soldier at the rates affixed.

Daily Allowance.	Payment in lieu. F.	C.
One and one-half pound of beef, or one-eighth of a sheep	1	0
One-half measure of Rice	1	0
Two drams, each dram one-fortieth of a gallon	1	0
Five billets of fire-wood	0	20
One-sixteenth measure of Salt	0	10
Amount of Payment in lieu of provisions	3	30

Working Parties.

When at a siege European soldiers are employed in making, or repairing, works, they are to be paid for every twelve hours, day or night, as follows:

	Fs.	Cash.
Serjeants, each.....	11	0
Corporals, ditto.....	7	40
Privates and Drummers.....	5	40

Dangerous and extraordinary service paid for at the discretion of the commander in chief.

Sepoys, when employed, working in trenches or batteries, or on any working parties in the field, are paid as follows: for every day or night of 12 hours, (which is reckoned a tour of work) subject, however, as well as Europeans to stoppages for neglect of duty, or loss, or embezzlement of tools.

Working money to Native Corps.

	F.	Cash.
Serjeants, each.....	11	0
Subahdars, ditto.....	11	0
Jemidars, do.....	5	40
Havildars, or Naiks, each.....	4	0
Privates, and all other descriptions, each.....	3	0

Pioneers, or occasional Lascars, are not paid extra for working during the day, unless the commanding officer on duty, or chief engineer, certifies they deserve it by particular, hard, or dangerous, duty.

All working parties employed on service in the field, in situations of danger from an enemy, receive the same allowances as are usually paid to working parties during the period of a siege.

Spherical Case Shot.

(Colonel Shrapnell.)

Mode of examining the different natures of Lieutenant-Colonel Shrapnell's Shells in the Royal Laboratory.

1st. The shells are to be well examined with a pick-hammer of a proper weight, to the diameter of each nature, to find they are not damaged by sand holes or other flaws.

2d. They are to be well scraped inside with proper scrapers that will get under the dip of the fuze hole, so that all the bore, sand, or gravel, may be cleaned out, which is to be done by rolling and shaking the shell with the fuze hole downwards. It may be taken out of large shells with a proper ladle that will go into the fuze hole.

3d. They are to be proved with a strong bellows and water as usual; the shot being placed under in a tub or bucket, introduce the nose of the bellows into the fuze, and by blowing them the water will bubble if the shell be porous.

4th. They are to be examined, by the new pattern caliber instruments, round the side and at the bottom, to ascertain their thickness and concentricity.

5th. They are to be examined by a circular gauge, and appropriated to the respective ordnance they are found to answer. If any are too high by ·03 of an inch, or too low by ·03 of an inch, they are to be rejected.

6th. When each shell is ascertained to be perfectly dry inside, it is to be placed with its fuze-hole up, and the nose of a strong bellows (forming an angle downwards) being introduced into it, a few blasts being given will blow the remaining particles and dust out of the shell.

7th. The shells are to be classed, by their fuze holes, into different numbers, viz. 1, 2, 3, and 4; those of an equal size to be packed in boxes by themselves.

8th. A file is to be used occasionally to try if the metal is soft, instead of breaking the shell.

9th. Each shell to be sounded, by striking them gently, as the ringing tone will be lost, should there be an imperceptible crack in it.

N. B. In the examination of spherical case shot shells, the thick side of the shell need not be taken into consideration, but the thinest part only; for when the thinnest part is too thin by the rule given, the thickest part must be too thick, which needs no examination to discover.

Supposing an eighteen-pounder shell ought to be ·5 inches thick in every part, substract the non-concentricity allowed of ·083 from it, and there remains ·417 inches for the thinnest part of an eighteen-pounder shell which can be received.

Natures.	Diameter of Shells.		Thickness of Metal.			Fuze holes.		
	Exterior.	Interior.	Ordered.	Error.	Thinnest.	Diameter at the Top.	Diameter at the Bottom.	Depth.
8 In. or 68 Pdrs.	7.85	6.28	·785	·131	·654	1.22	1.1	1.9
42 Prs. and 36 Prs.	6.7	5.36	·67	·111	·559	1.22	1.1	1.6
32 Pdrs.	6.105	4.884	·61	·101	·509	1.22	1.1	1.5
24 Pdrs.	5.5	4.4	·55	·091	·459	·89	·77	1.1
18 Pdrs.	5.0	4.0	·5	·083	·417	·89	·77	1.1
12 Pdrs.	4.4	3.52	·44	·073	·367	·89	·77	1.0
9 Pdrs.	4.05	3.24	·405	·067	·338	·89	·77	1.0
6 Pdrs.	3.55	2.84	·355	·059	·296	·89	·77	1.0
3 Pdrs.	2.83	2.264	·283	·047	·236	·89	·77	·9

After the shells are thus examined, and found serviceable, they are filled with leaden balls. After each shell becomes half full, a piece of hard wood may be applied into the fuze hole to pack them tight, then put in a few balls, and the stick alternately, until the shell becomes perfectly well filled, and choaked below the fuze hole; none of the balls to remain in the fuze hole.—The stick to be of strong, hard wood from twelve to fifteen inches long, as the diameter of the shell may require, and turned in the form of a skewer nearly to fill the fuze hole.

Bottoms may be attached to shells with a piece of thin canvas like a grape-shot bag, sewed at the side, and a drawing string at each end;—draw the one at bottom, then turn the bag and make a grummet of one strand of old rope; put it into the bag, and shell after it; draw the other string short of the fuze hole and tie it; then take a hitch on the bag between the shell and grummet, which being tied, and the bag and shell painted, make a good bottom.—Collars of wood are now glued to shells.

Method of fixing Fuzes into Shells of Colonel Shrapnell's Construction.

After the shells are filled with leaden balls, and bottoms attached to them, the bursting powder is to be poured into the fuze hole through a funnel, shaking the shell in order to receive it; no powder is to remain in the fuze hole,—then, having a quick match cut into strands of six inches, a shell having an eight-inch fuze hole, is to have two strands put on the top of the balls in order to ensure its bursting; and a five and a half-inch fuze-hole one strand.

If the range requires an inch or more of fuze, the fuze is sawn straight across at the length wanted,—For shorter ranges, when an inch is not required, the fuze is to be sawn across at an inch, and bored through the side of the composition with a fuze-augur,* at the length wanted,* and a deep groove made from the bore to the bottom, or sawn end with the saw, fixing a half strand of quick match into the hole and groove, in order to convey the fire quickly into the shell; the fuze then is to

be wrapped round with tarred oakum or flax, and driven with light blows into the shell. Care must be taken that the hole in the fuze is below the surface of the shell, and that no cavity remains between the shell and the fuze, lest the bursting powder be lighted by the explosion of the charge, and burst the shell in the gun.—Or the composition may be bored out of the fuze from the bottom, and to the length wanted, with an instrument attached to a scale for that purpose, and driven as above.

If the fuze hole of the shell be screwed or tapped, the fuze may be screwed into the shell with a pair of copper pincers.

When long fuzes are required for shells to be fired from mortars at high angles, they are to be fixed as follows:—Viz. empty a few balls out of the shell, then take a piece of hard, turned wood, four inches longer than the diameter of the shell, put it into a narrow bag of flannel of the same length, put the stick and bag into the fuze hole, and turn up the shell and shake it, letting its weight bear on the stick, which will immediately get to the bottom; turn the shell, and draw out the stick, leaving the bag behind, which is to be nearly filled with bursting powder, through a funnel; the remaining part to be poured beside the bag, among the balls.

The fuze being cut to its proper length, leaving one side longer than the other with a slope, may be driven to the bottom of the shell, if required, as the powder will give way through the bag.

Fuzes need not be cut to a greater exactness than one half-tenth of an inch, and should be calculated to burst the shell short of the object in the following proportions, viz. about one-fourth of a second short or one half-tenth of an inch of fuze, for ranges less than 400 yards; about one half-second of time short, or one-tenth of fuze, for ranges between 400 and 800 yards; one second of time short, or two-tenths of fuze, for all ranges from 800 yards to a mile or beyond it.

N. B. It is advisable to cut off the wooden ends from all fuzes, that in case the shell is fired as a round shot it may afterwards burst.

Observations upon firing Spherical Case Shot; a method of extending and directing the fire of Leaden Balls to any distance within the Range of Cannon.

To give spherical case shot a proper velocity, it ought never to be fired with a less charge of powder, from brass guns and carronades, than one-twelfth weight of the shot.—In iron guns one-eighth the weight of the shot may be used on account of the increase of wind-age.

The heavy five-and-half-inch howitzer of ten cwt. is a piece of ordnance most strongly recommended, as adapted for this kind of fire, with a charge of two-pounds of powder, as well as all carronades: but the chamber of the light five-and-a-half-inch howitzer contains too small a charge to make any considerable range; it is not, therefore, well calculated for spherical case shot, except the chamber held eight ounces more powder.

From mortars, this kind of fire makes a very perpendicular shower of case shot, better calculated to drive an

enemy from entrenchments, than any fire carried on with artillery.

From guns and carronades the advantages of spherical shot will be found equally great from a three-pounder to a sixty-eight-pounder; and its comparative destruction, or effect, exactly in proportion to the weight of each shell when filled with balls.—Carabine balls are preferred, as they go entirely through a deal target of two inches thick, those shot which graze excepted.

To find the length of fuze for brass guns, carronades, and howitzers, having either the range or elevation given.

The range being given to find the length of fuze.

Rule.—Multiply the range in yards by two, and divide by three, and the quotient gives the length of fuze in decimals of an inch.

EXAMPLE.

What length of fuze is proper for a range of 700 yards.

700
2

3)1400

466 the length of fuze.

Having the angle of elevation given, required the length of fuze.

Allow as many tenths of an inch of fuze composition as there are half degrees in the elevation of the piece, rejecting the first half degree.

EXAMPLE.

Suppose the gun was elevated eight degrees, or sixteen half-degrees, reject one half degree, and there remains fifteen half degrees, to which correspond fifteen-tenths of fuze, or one-and-one-half-inch.

Rule for the light five-and-half-inch Howitzer.

Reject the first 100 yards of range being so near to point blank range, for the ignition of the fuze; after which, allow one tenth of fuze composition, and one degree of elevation, for every 100 yards of range.

EXAMPLE.

Suppose the range 600 yards.

100

600 gives 5 deg. and 5 seconds

Rule for Iron Guns, with one-eighth weight of the Shot, for the Charge of the Powder.

Allow a second of time for each degree of elevation, and find the corresponding length of fuze, diminishing the same according to the rule given,

EXAMPLE.

Two degrees gives two seconds of time, which, diminishing as above, leaves of inch for the length of fuze.

The following method of procuring the elevation will annoy the enemy, during the time it is ascertained.—Fire at the enemy with a round shot, using the same cartridge of powder allotted for the shell, and when the shot reaches them at first graze, the same elevation will nearly answer for the shell, the weight of the shot being little more than the weight of the shell.

Powder for Charge and Bursting Shells.

Nature of Ordnance.		Charge.		Bursting.	
		Lbs.	Oz.	Lbs.	Oz.
Iron Guns.	42 Pounders	5	0	7	8
	36	5	0	7	8
	32	4	0	7	0
	24	3	0	6	0
	18	2	4	5	0
	12	1	8	4	8
	9	1	2	3	8
	6	0	12	2	8
Brass Guns.	12 Pounders	1	0	4	8
	9	0	14	3	8
	6	0	12	2	8
	3	0	8	1	8
Carronades.	68	5	0	15	0
	42	3	8	7	8
	32	3	0	7	0
	24	2	0	6	0
	18	1	8	5	0
	12	1	0	4	8
Howitzers.	8 Inch.	3	0	15	0
	5½ do. heavy.	2	0	6	0
	5½ do light.	1	0	6	0

Table for firing Spherical Case Shot.

	Elevation.	Fuze Inches.	Range Yards.
Brass Guns, Carronades, and heavy Howitzers.	2	·3	450
	2½	·4	600
	3	·5	750
	3½	·6	900
	4	·7	1050
	4½	·8	1200
	5	·9	1350
Light 5½ Inch Howitzer.	1	·1	200
	2	·2	300
	3	·3	400
	4	·4	500
	5	·5	600
	6	·6	700
	7	·7	800
	8	·8	900
	9	·9	10.0
Battery Guns.	½	·1½	300
	1	·2	400
	1½	·2¾	500
	2	·3½	600
	2½	·4⅜	700
	3	·5⅓	800
	3½	·6⅛	900
	4	·7½	1000
	4½	·8⅝	1100
	5	·9⅞	1200
	5½	1 1	1300
	6	1 3	1400
	6½	1 2	1450
	7	1 3	1500
	7½	1 3	1550
	8	1 3	1600

Practice with Spherical Case Shot, at Woolwich, 1804.

Nature of Ordnance.	350 Yards.		500 Yards.		600 Yards.	
	Elevation.	Fuze.	Elevation.	Fuze.	Elevation.	Fuse.
Heavy, 5½ Inch.	1	·1½	1¾	·2½	2¾	·4
Light, do	2¼	·2½	3¼	·3½	5	·5
Do. 12 Pounder.	1½	·1½	2½	·3¼	2¼	·5
Do. 6 Pounder.	¾	·1¼	1¼	·2	2½	·4
8 Inch Howitzer.	0	0	0	0	4	·5
68 Pdr. Carronade.	0	0	0	0	2	·4
24 Pdr. do	0	0	0	0	2½	·4
12 Pdr. do.	0	0	0	0	2¾	·4

Practice continued.

Nature of Orduance.	Flight Seconds.	Elevation.	Fuze Inches.	Range Yards.
24 Pdrs. Iron Gun.	1½	¼	·1¾	400
	2½	½	·3¾	650
	3½	¾	·5½	850
	5	1	9	1150
	6	1¼	1 1	1370
	7	1½	1 3	1570
	7½	1¾	1 4	1670
	8	2	1 5	1770
12 Pdrs. Iron Gun.	1½	¼	·1¼	400
	2½	½	·4	650
	5	1¼	·9	1140
	6	1½	1 1	1360
	6½	1¾	1 2	1470
	7	2	1 3	1540
	7½	2¼	1 4	1670

Comparative Windage.

Nature of Ordnance.	Diameter of			Windage of.	
	Bore.	Shot	Shell.	Shot.	Shell
68 Pdr. Carronade.	8,05	7,93	7,85	·12	·2
8 Inch Howitzer.	8,	7,93	7,85	·07	.15
42 Pdr. Gun.	7,018	6,684	6,7	·334	·318
42 Pdr. Carronade.	6,84	6684	6,7	·156	·14
35 Pdr. Carronade.	6, 9	6684	6,7	·216	·2
32 Do. do.	6,41	6,105	6,105	·305	·305
32 Do. Carronade.	6,25	6,105	6,105	·145	·14
24 Do. Gun.	5,823	5,547	5,5	·276	·32
24 Do. Carronade.	5,68	5,547	5,5	·138	·18
5½ Inch Howitzer.	5,62	5,547	5,5	·073	·1
Royal Mortar.	5,62	5,547	5,5	·073	·12
18 Pdr. Gun	5,292	5,04	5,	·252	·29
18 Do. Carronade.	5,16	5,04	5,	·12	·16
12 Do. Gun.	4,623	4,03	4,4	·22	·22
12 Do. Carronade.	4,52	4,03	4,4	·117	.1
4 2-5 Inch Howit.	4,52	4,03	4 4	·117	·12
9 Pdr. Gun	4, 2	4,	4,05	·2	·1
6 Do. Do.	3,668	3,198	3,55	·17	·181
3 Do. Do.	2,913	2,775	2,83	·138	·0 3

Spherical Case Shot. 1804

Nature.	Shells.						
	Diameter.	Thickness	Weight.				Carbine Balls in each
			Empty.		Filled.		
	Inch.	Inch.	Lbs.	Oz	Lbs.	Oz	No.
8 Inch.	7,08	·7	33	3	61	1	563
32 pdr.	6,16	·6	14	6	28	5	286
24 Ditto.	5,55	·5	10	10	20	14	208
18 Ditto	5,03	·4	6	15	15	0	165
12 Ditto.	4, 4	·4	5	7	9	14	96
9 Ditto.	4,04	35	3	19	7	8	76
6 Ditto.	3,55	·3	2	8	4	14	50
3 Ditto.	2,84	·25	1	7	2	8	22

Method of making Fuzes of Colonel Shrapnel's Construction.

The fuzes, after being turned so as to fit the fuze holes, are bored, and a deep thread grooved inside, to hold the composition firm; and, instead of being turned with cups, they are hollowed conical, and roughed with a tool that cuts under, the better to receive the priming.—After they are driven, with fuze composition, one-and-one-half-inch, they are sawn across the top, about one-fifth of an inch down, so as not to touch the composition, and divided into five equal parts, of two-tenths of an inch each; after which a bit of quick match is placed across, and drawn tight in the same grooves; they are then primed, with mealed powder and spirits of wine, capped, and packed for service.

Explanation of the Effects, and Advantages, that may be derived by firing Spherical Case Shot.

1st. The whole charge takes effect on the enemy at any distance; by the present mode of firing, the greatest part of the charge disperses, as soon as it leaves the muzzle of the gun, and cannot be directed.

2d. Grape, or case, shot may be fired with an effect equally close and collected, to any distance within the range of the piece; and the artillery need not advance within musquet shot of the enemy, to make use of this kind of fire with its full effect, and are not so subject to have their guns charged either by cavalry or infantry.

3d. It requires less precition and exactness to point a piece of ordnance, charged with spherical case shot, than with a round shot, because case shot is a wide and dispersed fire; the difficulty in elevation is therefore less.

4th. Its comparative destruction with that of a round shot will be, generally, as the number of shot within the

shells to one; that is to say, a three-pounder, twenty-two to one in its favor; a six-pounder, fifty to one, &c. &c. in which calculation I have not enumerated any effect from the splinters of the shell.

5th. Small balls cannot be projected to very considerable distances, unless enclosed in heavy spherical cases, which, from their form and weight, are not much influenced by the resistance of the air, or diverted from their direction.

6th. The explosion of the shell makes no change in the direction of the shot within it; they consequently complete the shells tract or curve, which I have sometimes observed to be 400 yards.

7th. From the unevenness of the ground, such as hillocks, banks, fallow-fields, &c. all shot which graze most commonly lodge; whereas, by using this shell the whole charge will be carried over those irregularities, and reach the object with its full contents of balls.

N. B. Firing these kind of shells from guns is managed with more facility than the ordinary howitzer practice, both as to the length of fuze, as well as the elevation required, and may be carried on in the field, precisely the same as firing round shot.

No. 24.—(*To face p.* 120.)

Report of an Experiment made at St. Thomas's Mount, by Order of Colonel Robert Bell, Commandant of Artillery, with Spherical Case Shot, fired against two Curtains, each 120 feet in length, by 6 in height—placed at 700 and 750 yards distance from the Guns.

Month and Day.	Number of Firings.	Ordnance.	Guns. Weight. Cwt.	Guns. Weight. Qrs.	Guns. Weight. Lbs.	Guns. Length. Yds.	Guns. Length. Ft.	Guns. Length. Ins.	Weight of. Shell filled. Lbs.	Shell filled. Ozs.	Shell filled. Drs.	Each charge. Lbs.	Each charge. Ozs.	Each charge. Drs.	Elevation. Deg.	Elevation. Mts.	Elevation. In.	Fuze. Pts.	Fuze. Sec.	Fuze. Pts.	Flight. Lbs.	In the Shell. Bursting powder. Ozs.	In the Shell. Bursting powder. Drs.	In the Shell. No of Carbine leaden Balls.	No. of Balls through each Curtain. 1st.	No. of Balls through each Curtain. 2nd.	No. of Balls through Total.	Guns distance from the curtain. 1st. Yds.	Guns distance from the curtain. 2nd. Yds.	Remarks.
Wednesday, 4th February, 1807.	1	Iron heavy 12 Pdr.	34	1	..	2	2	6	10	12	...	1	..	...	2	30	...	450	8	..	...	4	8	85	24	53	77	700	750	Burst in the flight at about 700 yards.
	1	Brass light 12 Pdr.	8	1	14	1	2	1	10	12	...	1	...	...	3	...	...	500	5	..	...	4	8	85						Burst in the flight at about 650 yards
	1	Do. do. 6 Pdr.	6	...	11	1	2	...	5	6	...	...	12	...	3	...	...	500	...	..	...	2	8	34						English fuze did not burn through; shell taken up entire.
	2	Iron heavy 12 Pdr.	34	1	...	2	2	6	10	12	...	1	8	...	2	...	...	450	4	..	...	4	8	85	34	43	77	700	750	Grazed at about 650 yds. and instantly burst.
	2	Brass light 12 Pdr.	8	1	14	1	2	1	10	9	...	1	...	...	3	...	...	500	3	30	...	4	8	85						Burst in the flight at about 650 yds.
	2	Do. do. 6 Pdr.	6	...	11	1	2	...	5	6	...	...	12	...	3	...	...	500	3	..	...	2	8	34						Burst in the flight at about 750 yds.

Note. From the foregoing Experiments the effect was perfect, the leaden balls appearing to have an impulsive motion after the bursting of the Shell, many balls impelled straight forward 100 yards, several pieces of the Shell spread to the right and left to the distance of 200 yards, from the point of Explosion. A round of three guns being fired, the separate effect of each gun could not be recorded; each line, therefore, records the effect of each round with two guns, the 6 pounder having failed in effect.

No. 25.—(*To follow No. 24.*)

Report of an Experiment made at St. Thomas's Mount, by order of Colonel Robert Bell, Commandant of Artillery, with Spherical Case Shot, fired against two Curtains, each one hundred and twenty feet in length, by six in height, placed at seven hundred and seven hundred and fifty yards distance from the Guns

Month and Day.	Number of Firings.	Ordnance.	Guns. Weight. Cwt.	qrs	lb.	Guns. Length. Yds	Ft.	In	Weight of. Shell filled. lbs.	oz.	dr	Each Charge. lbs.	oz.	dr	Elevation. Deg	Min.	Fuze. In.	Flight. Pts.	Sec	Pts.	In the Shell. Bursting Powder. lbs	oz.	dr	No. of carbine leaden Balls.	Number of balls through each Curtain. 1st.	2d.	Guns distance from the Curtain. Yds. 1st.	Yds. 2d.	Remarks.
Friday February 20, 1807.	1	Iron heavy 12 Pounder.	34	1		2	6		10	12		1	8		2			450	3			4	8	85	37	28	700	750	Shell burst at twenty-eight yards from the first curtain, as was evident from the ground being prinkled by the explosion, at about three yards high; one ball went through the bamboo flag-staff, which is twenty-five yards in the rear of the second curtain.
	2	Ditto.....							10	12		1	8		2			450	3			4	8	85	53	32	700	750	Shell burst about fifteen yards from the first curtain, at about three yards height from the ground.
	1	Brass light 12 Pounder.	8	1	14	1	2	1	10	12		1			3			500	2	45		4	8	85	1	7	700	750	Shell burst considerably above the height of the curtain, at about ten yards in front.
	2	Ditto.....							10	12		1			3			500	3			4	8	85	17	9	700	750	Shell grazed forty yards from the first curtain, and burst in the after-flight.

Bottoms for Fixing Ammunition.

A mode has been adopted, in England, of fixing ammunition for field guns, by canvas bags, instead of wooden bottoms with tin straps.—This led to a comparison of expense at Madras;—and a suggestion, by captain Beauman, of a mode of fixing ammunition to wooden bottoms *without straps*, by a composition of country glue 8, rosin 2, which requires a much smaller proportion of wood than the former bottoms, fixed by straps, and has been found sufficiently secure to admit of travelling on the worst possible ground; indeed, the bottoms adhere to the shot for a considerable distance in the flight from the gun.

The expense, *in India*, is not greater than canvas bags for bottoms, and to which there are many objections; shot properly high cannot be introduced into the cylinder with canvas bags, whereas the new bottoms do not come near to the centre of the shot.—The expense of the new bottoms, which have been adopted at this presidency, is not one-half the expense of the bottoms fixed by straps hitherto in use.

Extract from General Regulations, for the Forces serving on the Establishment of Fort St. George.

The artillery never do duty but in corps; the officers, however, are not to be exempted from a participation in the general duties of the garrison, or camp, in which they may be serving, (guards and piquets excepted, which they take with their own corps only.) But, as there is in some situations a very extensive superintendence, and always more or less responsibility attached to the officers of this corps, who are entrusted with detached commands, it is ordered that, (though the officer commanding the artillery is, at all times, to be included in the general, or garrison, roster) in instances where such commanding officer makes it appear to the commanding general, that he has peculiar professional occupations which will demand his attention, and which would be interrupted by the performance of garrison duties, he shall be exempted from such duties at the discretion of the commanding general.

Detachments of artillery allotted to ordnance attached to corps of cavalry and infantry, are to be under the orders of the officer commanding such corps; but, as the general charge of the ordnance of a line, as well as of the officers and men of the artillery corps, is vested in the senior artillery officer with an army, he has authority, not only to call together for parade, exercise, punishment, or other regimental duty, the detachments allotted to ordnance attached to cavalry and infantry corps; but likewise to direct such exchanges, or removals, in those detachments, without diminishing their strength, as the interior arrangement of the artillery may render necessary; and officers in command of detachments of artillery, serving with corps, will consequently report to the commandants of those corps, all orders they receive to the above-mentioned effect, to prevent delay in their execution.

Directions for performing the Gun Exercise, and stationing the Men.

It being necessary to have one certain and precise method of stationing Europeans and Lascars to field guns, as well as of performing the several motions of the gun exercise, in order that the discipline of the battalions may be always uniform and exact, the following disposition has been made by the commandant of artillery, with a view to ensure the accomplishment of that important object, and to provide in the best manner for the security of the men:—In this disposition a non-commissioned officer and seven Europeans are allowed to each gun, two of whom are posted at the inner extremity of the drag-ropes to facilitate the different movements that may be ordered.—The station of the officer, or non-commissioned officer, commanding each gun, on field or exercising days, is to be on the right or left, according to the wing in which his gun is stationed; one pace before the drag-rope, and the same distance from the wheel facing to the front. (In firing, the officers move to the rear.) In action, or when firing shot, he is to

post himself in the rear, so as to be ready, at all times, for pointing his gun, and to observe the manner in which every man belonging to it performs his duty.—The Europeans are numbered from 1 to 7, and, for the sake of brevity, the gun supposed to be already loaded.

No. 1. Loads. His station is on the left of the gun, between it and the left wheel; his right foot to be advanced directly to the front, as far as not to cause his body to sink, the head turned to the right; and eyes directed to the muzzle of the gun; hands placed open, with the fingers close, and extended on his thighs, and the body square to the front.

No. 2. Spunges and Rams the Cartridge. His station is on the right of the gun, between it and the right wheel; the left foot advanced directly to the front so far as not to cause the body to sink, the spunge staff placed against the hollow of the right shoulder, running close down that side and thigh, held by the right hand as low down as the arm will permit without constraint; the fingers extended along the front, and the thumb with a little obliquity, so as to encompass a part of the staff along the rear; the left arm, from the point of the elbow across the breast, with the thumb between the spunge staff and the hollow of the right shoulder, the fore finger opposite the thumb and against the front part of the staff, the remaining fingers close, extended, and parallel to the

fore finger; the elbow to be horizontal to the hand, which in this position will be open with the palm downwards; the body to be square to the front, and so far on the right of the gun that, was the left arm brought down in the above position, the point of the elbow would just clear the swelling of the muzzle; the head to be turned a little to the left, and eyes directed to the muzzle of the gun to ensure his not stepping out until he sees the explosion.

N. B. No. 1 is to stand as far on the left of the gun as is directed for No. 2 on the right.

No. 3 is posted at the inner end of the right drag-rope, immediately on the right of the right wheel, for the purpose of taking the rope off the drag-hook, when necessary to retreat, and for replacing it there when occasion may again require; he can also give a signal for the Lascars to advance, by either moving forward with his body, or a motion of his hand; the rope to be held in both hands; the right gripping it fast with the palm downwards, and the left with the palm upwards; the body square to the front, and eyes turned to the left in order to observe the instructions given to the men who work the guns, and the signals made by the officer or non-commissioned officer for relieving, advancing, and retreating.

No. 4 serves the Vent.—This station is on the right, and to the rear of the right wheel in a line with the centre transom, facing almost to the front; his eyes directed to the vent, and occasionally to the man who sponges; the right foot to the front, and to be clear of the wheel and the recoil; the left foot so near the cheek of the carriage, that he can easily reach any part of the breech or vent-field with either hand; the toe pointing to the left, and both heels in a line; the centre of the lower part of the left hand to be placed behind the vent, the fingers brought round to the left to guard against sparks from the portfire, nearly meeting the thick part of the thumb: by this means the tube is encompassed by the left hand, the right hand hanging down and close to the thigh.

No. 5 Traverses.—His station is in the rear of the traversing handspike, which is to be held in both hands; the left hand in front of the right, the body square to the front, and the heels close; and as this man may occasionally point the gun to the object, when not found necessary to alter the elevation, he should be taught to look along the gun while in this position, on which account, in action, where the men seldom change stations, it is recommended that a gunner fills this post, in which he may be particularly useful in the above-mentioned case, or when the officer or non-commissioned officer's attention may be taken off, by some more necessary part of the duty than that of laying every gun that is to be fired.

No. 6 *Fires.*—His station is on the left, and to the rear of the left wheel facing to the right; the left foot to be clear of the wheel so as to avoid all danger from the recoil; the right foot in the rear of the left, both heels in a line; the toe pointed towards the rear, which will cause the body to incline a little in that direction; the portfire in the right hand, held to the rear in a line with the right toe, and the arm extended at full length.

No. 7 is stationed at the inner end of the left drag-rope, and immediately on the outside of the left wheel; the body square to the front, and eyes turned to the right, for the same purpose as No. 3, with the right drag-rope, with this difference, that when the gun is working he passes the cartridge to the man who loads; the manner of doing it will be hereafter described.—The word of command "Fire" being given by the officer or non-commissioned officer, the following motions are performed:

No 6. *Two Motions.*—1st. Place the right heel in the hollow of the left foot, and fire the gun by touching the composition of the tube nearly in a horizontal direction; the portfire is to be lifted straight up to the vent, and on no account swing round. 2d. Fall back to the original position.

No. 5. *Two Motions.*—1st. At the word fire spring briskly to the left, clear of the wheel, bringing the right

foot close to the left, and facing to the front as before. He must recollect that a light 6 pounder will recoil several feet on level ground, and therefore step sufficiently to the left to be quite clear of the carriage. 2d. As soon as the gun is loaded, and when the man at the spunge falls back, he is to resume his former position by springing to the right.

No. 4. *Five Motions.* 1st. At the word fire, take the left hand from behind the vent, and the same time step back with the left foot, swinging round on the ball of the right toe, and placing it in the rear of the right, the body leaning well back, and facing to the left, but rather turned to the rear. 2d. As soon as the gun has fired, bring the left foot up to the original position near the cheek of the carriage, and make a motion to take the empty or fired tube out of the vent, should it have remained there, in which case he must call out to the man who spunges, by saying "don't load,"—"a tube sticks in the vent." For want of this precaution many men have lost their arms in quick firing; the tube is then to be taken out by placing the fore and middle fingers under the cap, the palm of the hand upwards, and by springing it out suddenly, which clears the vent. 3d. Sweep off, with the right hand, the fire that may have remained on the breech, or vent field. 4th. Place the thumb of the left hand on the vent, pressing it close as possible, but not so as to make the hand tremble or shake; raise the elbow nearly perpendicular,

the fingers resting on the breech moulding; open the tube box at the same time with the right hand, seize a tube and between the fore and middle fingers, the thumb resting on the cap of the tube.

N. B. The man who serves the vent must not take his thumb off, until the man who spunges is safely fallen back; and not to put the tube in 'till the gun is pointed.

5th The gun being loaded, and the men who spunge and load having fallen back to their original positions, take the left thumb off the vent, and place the centre of the lower part of that hand behind it, as in the original position, enter the tube in the vent (the sloping or cut part to the front) then quit the right hand and place it on the thigh, and bring the fingers of the left hand round to the thick part of the thumb, as in the original position. When any tubes fail, it will be advisable to prick the cartridges with a pricker before the tube is inserted into the vent.

No. 3 Stands Fast.—

No. 2. Eight Motions.—1st. The gun being fired, which is to be ascertained only by seeing the explosion, step out with the right foot to the front, inclining a little more to the right than is customary in marching or walking,

swinging the body a full pace to the left, by raising the left heel, and pressing on the ball of the foot; the toe pointed directly to the rear, the right heel, at the same time, turned outwards, which will bring the toe pointed to the left; the rammer end of the spunge staff is raised with the right hand, and the spunge carried down with the left, to a horizontal position, running the left hand, at the same time, up to the spunge head, which is brought down by the right of the gun, close to the muzzle mouldings, until it comes under the lower part of the muzzle. 2.—Raise and introduce the spunge into the mouth of the gun, quitting the left hand, and with the right sending it with great force against the end of the cylinder, or bottom of the bore, bending, at the same time, the left knee, and the body inclining in an exact direction the same way, but upon no account leaning forward, which would throw it before the face of the gun.

N. B. The above position brings the body parallel to the line of the gun, and the feet at right angles to each other; so that, drawn together, the right toe would be brought close to the left heel, and, consequently, when asunder in this position, the right heel is nearly the length of the foot behind the left. 3.—Turn the spunge briskly from you, with the right hand, a half round of the cylinder, keeping it well pressed

against the bottom of the bore;—was the hand now opened the palm would be upwards.

N. B. In cases where the man at the sponge, in quick firing, suspects that fire may be hanging, which one turn of the sponge has not entirely extinguished, he may turn a second time, and to be so far the judge of his own security. He must also wet his sponge occasionally in the bucket, as thereby the danger of fire remaining in the gun will be entirely avoided. 4th. Quit the right hand, and bring it round close, and almost imperceptibly, to the upper part of the sponge staff, seize it, and draw it suddenly out of the bore, meeting the centre of the staff with the left hand, the fingers placed under, and the thumb on the top thereof, the palm upwards. 5th. Reverse the sponge staff, by swinging the rammer head with a sudden jirk of the right hand (which then quits it) towards the ground, and round to your left, or towards the rear; this will raise the sponge, and, at the same time, bring it down to the point; the left hand yielding naturally to this movement, the palm becomes downwards, and the staff is supported by it alone; the thumb being under, and the fingers on the top, the sponge end having come round to your right, or to the front, falls into the right hand, which is held open to receive it, when the left hand is immediately run along the staff, as near to the rammer head as it can, without constraining

the body, directing, and introducing, the rammer-head into the mouth of the gun, with the fingers extended; then quitting, it is placed on the sponge staff, near to, and in front of the right hand, with the palm downwards; the sponge sunk a little below the horizontal line, and the right arm extended to prevent the rammer from going any length into the gun, until it is necessary to send it home, when it has the full force of this extension. 6th.—Send home the cartridge, by the force of the right arm, which is to be kept stiff, after the first spring from the elbow is made; the left hand continuing close to the right, and retaining a slight hold of the sponge staff, to guide the rammer, and to assist the right hand, until nearly before the cartridge reaches the bottom, where it quits, and is thrown in a line with, and horizontal to, the left shoulder, but upon no account farther back, as the right shoulder, and breast, would come in front of the gun, in proportion as the left is carried beyond this line; the left knee is to bend, and the body to follow in that direction, the right knee kept straight;—and here it is necessary to observe, that too much attention cannot be paid in keeping the feet in the exact position described in the 1st and 2d motions, and the remark that follows, which is upon such principles that as it gives the man sufficient power over the sponge staff, so it protects the body effectually from suffering in case the gun should unluckly go off at this crisis. By running home the cartridge with a stiff arm, it requires very little assistance from the body, which con-

sequently is not moved from the direction it was placed in; after having stepped out to spunge as described in motion the 1st and 2d, and in which it faces the left; the bending of the left knee to the rear causes the body to follow, and by that means the right arm preserves its full force, and the keeping of the right knee stiff, also secures the body from bending forward, or any part of it coming before the mouth of the gun. If the above rules are observed, there is not a possibility of a man losing his life; for, in the event of an accident happening, the only part that could suffer would be the right hand, and there have been instances where even that was not the case. 7th. The instant the cartridge is sent home, spring the rammer out of the gun by a sudden jirk of the right arm, letting the staff slide through the left hand, and following it at the same time to the front to the full extent of the arm, until it is stopped by the rammer-head coming against the lower part of the hand, the left hand coming gradually round to the front, in proportion as the above motion is done, and concludes it by being placed on the rammer-head with the palm downwards, and both arms at full length, the sponge-staff sloping regularly from the rammer-head towards the ground. 8th. Swing the body round a full face to the right, raising the left heel, and turning on the ball of that toe, bringing the right foot in the rear of the left, at the same time the sponge to the recover, by drawing it suddenly towards the body with the right hand, assisted by the left, when it is quitted by the latter, which now meets it

near the centre, as directed in the first rule, and throws it against the hollow of the right shoulder, the elbow and arm perfectly quare, as in the original position.

No. 1.—*Three Motions,* 1st.—As soon as the gun has fired, the left foot is to be advanced directly to the front; swing the body round a full face to the right, by raising the right heel, and turning on the ball of that toe, which will then point directly to the rear; turning the left heel outwards, that toe points to the right; receive the cartridge from No. 7, with the shot in the left hand, and the bag in the right, and put it secure under the coat, on the right hip. 2d.—When the gun is sponged, and, during the time that No. 2 is reversing the sponge, bring the cartridge from under the coat, insert it into the muzzle of the gun with both hands, then quit it, and place the hands on the thighs. 3d.—Fall back to the original position at the time that No. 2 does, by raising the right heel, and swinging the body round on the ball of that toe a full pace to the left, drawing, at the same time, the left foot in the rear of the right.

No. 7.—*Two Motions.* 1st.—When the gun has fired make a face to the left, receive a cartridge from the Lascar appointed to hand it, the shot in the right hand, the bag in the left, and place it under the coat on the left hip. 2d.—Face to the right, and give the cartridge-shot end foremost to No. 1.

The word of command, "shift," being given, No. 1 relieves No. 2, who relieves No. 3, who relieves No. 4, and so on in succession to No. 7, who takes up No. 1.'s original position, and becomes the man who loads.

When the man at the sponge is relieved, or offener if there appear occasion, a wad-hook is to be introduced into the gun, to draw out any bottoms of cartridges that may remain in the cylinder.

N. B. As it would both lose time and be inconvenient for No. 2 to go round the extremity of the right drag-rope to relieve No. 3, the latter is to take the rope off the hook, and deliver it to the former, who will pass himself through, and, having faced to the front, fix the rope again on the hook. In like manner, No. 7 is to take the rope off the drag-hook, and, having passed to the front, delivers it to the lascar next to him, at the rope, who is immediately to fix it again ready for No. 6; and No. 7 falls into his station for loading.

It is to be observed, as a general rule, that men holding the right drag-rope, are to have the palm of the left hand upwards, and the right downwards; and those of the left drag-rope the right upwards, and the left downwards, at all times when advancing; but when the ropes are hooked to the trail for retreating, the

hands are naturally changed so that the palm of the hand next the inner extremity of the ropes, as having most power, shall always be upwards.

When only a non-commissioned officer or gunner, and four artillerymen, are allowed to each gun, the Lascar at the inner extremity of the left drag-rope, must hand the cartridge to the man who loads, and perform the same duty as is directed for the European No. 7,—And the non-commissioned officer, or gunner, is both to steer and point the gun. By this arrangement the European No. 1 Loads, No. 2 Spunges, No. 3 Serves the Vent and No. 4 Fires, consequently the drag-ropes are manned only by Lascars. —Cartridges to be brought up by Lascars.

When the gun is fired with shot, the wheel drag-ropemen must unhook and fall back as the gun recoils, keeping the drag-ropes in their hands ready to hook, and draw the gun up to its former position the instant the recoil ceases; without this precaution the drag-rope-men may be drawn back, and hurt by the recoil, particularly when the gun is heated by long firing.

The word of command for the slow or regular firings to be given by the officer commanding each gun in a loud sharp tone of voice, advancing for that purpose one pace to the front, facing inwards towards the gun, and the heels close and square; at all other times, the word fire is to be given

by the man who spunges. Care must be taken that the men at the outer extremity of the drag-ropes always touch when the guns are in line, and that the proper distances in wheeling, advancing, or retreating, are constantly preserved, also that the drag-rope-men are fallen back and dressed before the firing commences.

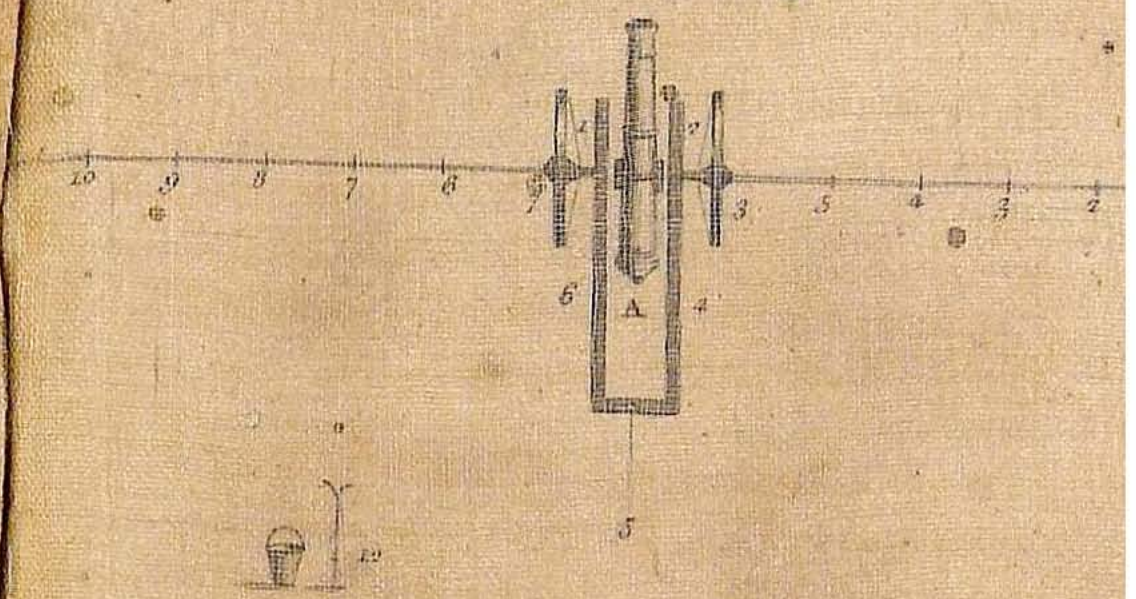
When the exercise is over, the non-commissioned officer, stationed to every gun, must with his own hand draw out the exercising wads.

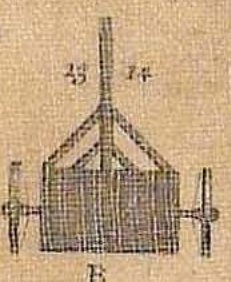
After a field day with powder, the gun as well as the carriage must be well washed, particularly the cylinder of the gun, in which case it must be laid under metal until perfectly dry.

Although the brisk performance of the several motions of the gun exercise must be insisted on, yet no man is to be hurried, or prevented from using the means for his own security, when spunging as before directed. The most perfect coolness and recollection must be inculcated on all occasions, as the want of these qualities cannot fail of producing the most fatal and disgraceful consequences.

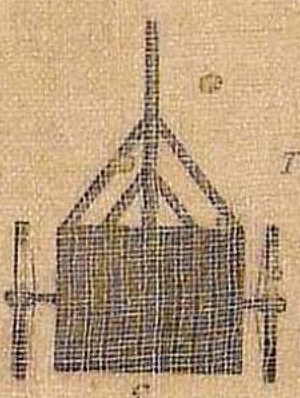
THE END.

Position for Action.



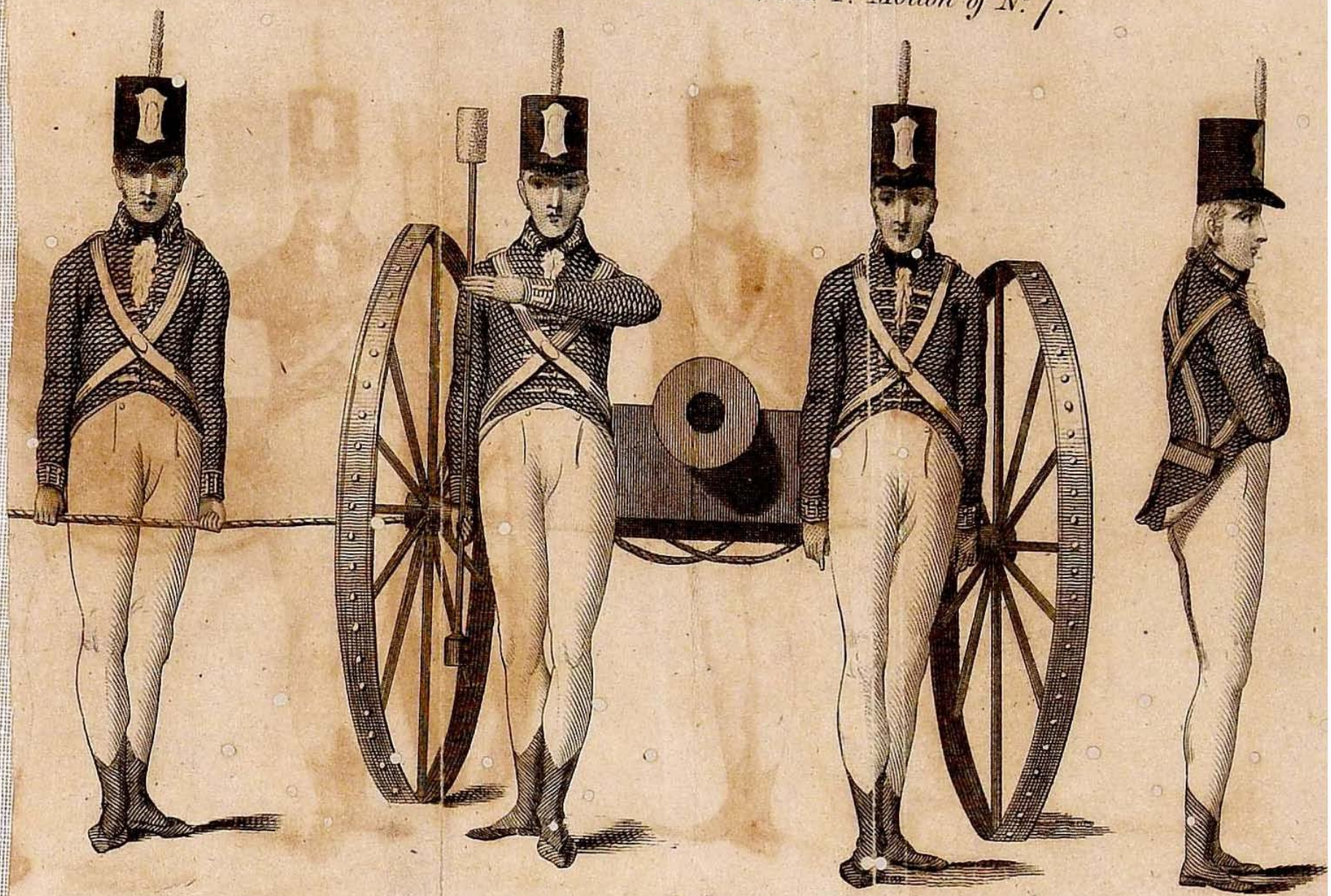


A. Gun
B Limber
C Handril



The Europeans are numbered in red & the Lascars in black Ink.

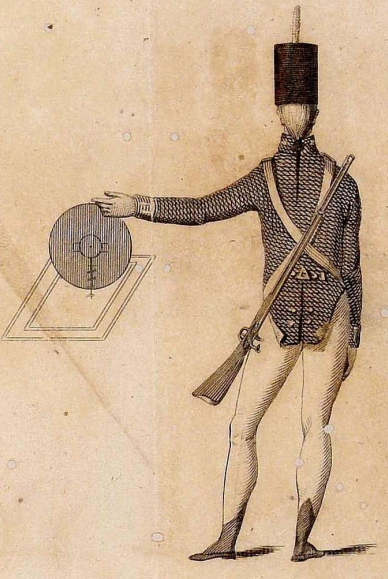
First Positions of N.os 1, 2 and 3, and 1.st Motion of N.o 7.



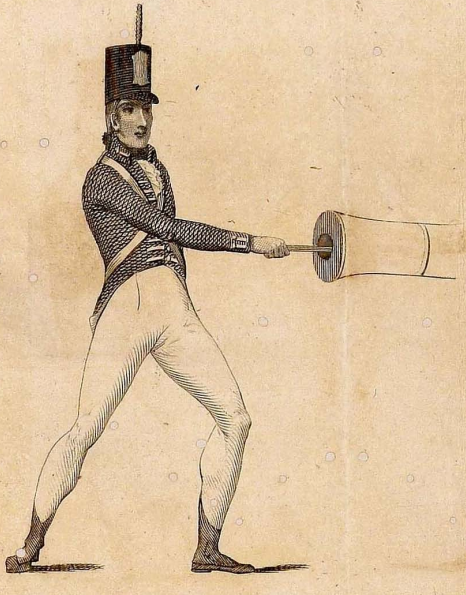
For printed directions to these Plates, see p. 124. to 138.

1st Position of No. 6. Plate III.

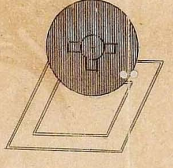
1st Position of No. 4, at the Vent. Plate II.

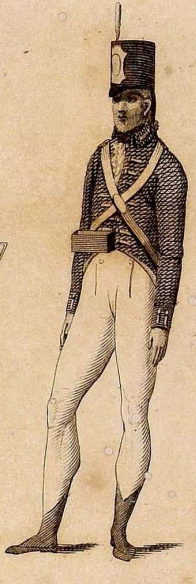


sition of N.º 2. Spunging. 2.d Motion, Plate V.



Position of N.º 4. 1.st Motion. Plate IV.





Position of N.º 2. Ramming home the Cartridge. 6.th Motion.

Plate VI

Neele sc. Strand.

Position of N.º 2. after Springing out the Rammer. 7.th Motion. *Plate VII*