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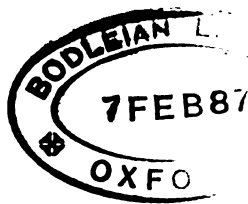
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P R E F A C E.

THE Secretary of State for War, in concurrence with the advice of His Royal Highness the Field Marshal Commanding in Chief, having directed that complete returns of the equipment of the army should be made by the officers of the Topographical and Statistical Depôt, and illustrated by drawings of every article authorized to be supplied to the army, the work was divided into seven parts, and intrusted to the following officers :—

Part I. Cavalry	-	Captain Petrie, 14th Regiment.
II. Royal Artillery	-	Major Miller, R.A., <i>77.0.</i>
III. Royal Engineers	-	Major Cooke, R.E.
IV. Military Train	-	Captain Petrie, 14th Regiment.
V. Infantry	-	Do.
VI. Commissariat	-	Do.
VII. Hospital Service	-	Do.

The compilation of the present part has been much impeded by the vast number of changes which have been made to the matériel of artillery in consequence of the introduction of rifled ordnance. The patterns of saddlery and harness have also been altered since that part of the work was first drawn up, and the personal equipment has likewise been modified or changed in many of its details since the original lists were completed.

The illustrations which are to accompany this part of the series of Army Equipments are still unfinished ; and as some length of time must elapse before they are ready for publication, it is thought desirable to issue the descriptive portion without waiting for their completion.

In the meantime all necessary corrections will be noted, in order that a revised and correct edition may be ready to accompany the plates.

It was originally intended to show the cost price of every article of matériel in the same manner as for other parts of the equipment, but certain objections being raised, whilst the work was in progress, to the introduction and communication of all those prices, it was determined that they should (for the present at least) be omitted.

(Signed) HENRY JAMES,
Colonel, Royal Engineers.

Topographical and Statistical Depôt,
6th April 1861.

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INTRODUCTORY REMARKS.

The term equipment is used in the following pages to express the Scope of the whole of the articles used in the Royal Artillery service. The object work. of the work is to show in what proportion they are supplied, and to give such information as to their dimensions, weight, materials, price, and pattern, as will be useful to persons connected with the service.

The work does not profess to describe the pattern or dimensions with sufficient accuracy to be a complete guide to the construction of any article, nor does it enter into the theories and principles by which the construction is regulated, but it occasionally contains remarks to explain why stores must be of a particular size or form to answer their intended purpose.

The information is intended to apply as accurately as possible to the latest approved patterns and regulations, but a few notes relative to the progressive changes in organization and equipment are embodied in the work. These additions have been made with a view to its being of some use in studying military history, and serving as a guide, however incomplete, to the state of artillery in earlier times, and the matériel in use at various dates.

As the equipment of artillery has never before been treated on this Arrangement. plan, it is necessary to explain that the subject is arranged under the following heads:—

ORGANIZATION, explaining the manner in which artillery is embodied and employed, so far as it is connected with the equipment.

PERSONAL EQUIPMENT, showing what *arms, ammunition, accoutrements, clothing, and necessaries* are in the possession of each officer, non-commissioned officer, and man.

HORSE EQUIPMENT, showing the articles which compose sets of riding appointments, of draught harness, stable necessaries, &c.

MATÉRIEL, showing the *carriages, ammunition, and stores* with which any piece of ordnance is equipped, according as it is used for *field, siege, or garrison* service. Under this head are included also the various wagons and carriages which accompany a field battery or siege train, tools and materials for the use of artificers, and all other kinds of artillery stores.

CAMP EQUIPAGE, MEDICAL EQUIPMENT, and MISCELLANEOUS, showing the proportion of camp equipage, medical stores, &c. included in the complete equipment of artillery, but not peculiar to that service.

The principle on which the details are arranged is to give, under each head, first, the articles necessary for the proper equipment of every individual *man, horse, piece of ordnance, or any other unit* which helps to compose a complete battery or train of artillery; next, a general list of all the articles in use, and the proportion in which they are required; and last, such tables as may be required for estimates or comparisons.

General remarks precede the lists in each division of the subject, and notes after each list contain such further information as is likely to be most useful.

In all long lists the names have been arranged in strictly alpha- Nomenclature. betical order for convenience of reference. They are frequently inserted more than once on account of the various ways of spelling or classify-

ing them. In store ledgers, for instance, pick-axe is always axe, pick, splinter-bar is bar, splinter, spoke shave, is shave, spoke; and the like: in artillery books and lists, sponge or spongy, quoin or coin, and many other words are used promiscuously; to avoid confusion in this respect such names are entered in the general lists, and frequently in the others, in both manners.

Value and weight.

The value and weight of each article are to be taken rather as comparative than as positive guides; the former varies from year to year according to contracts and price of materials, the latter not only varies in articles of the same description but (especially in large wooden carriages) changes in the same article after it is first made. Great latitude must be allowed to the variation of the real from the nominal weight in any single specimen.

Illustrations.

The column headed "Number of drawing" refers to a series of illustrations which will eventually be published in a separate volume, and will form part of the complete work. In the meantime reference may be made to the illustrations contained in other works on artillery, and to the lithographs in course of execution at the Royal Laboratory and the Royal Carriage Department.

Authorities.

The information contained in this work has been principally obtained from the following sources:—

The Deputy Adjutant General, Royal Artillery.

The Heads of the Manufacturing Departments in the Royal Arsenal.

The Principal Superintendent of Stores, Royal Arsenal.

Official Books of Instruction and Regulations for the Royal Artillery.

"Handbook for Field Service," by Colonel Lefroy, R.A., and other officers; printed at the Royal Artillery Institution and published by authority, 1862.

"Lectures on Artillery," by Major Owen, R.A., and Captain Dames, R.A., 1861.

"Notes on Matériel issued from the Royal Laboratory," by Captain Fraser, R.A., 1864.

"The Gunner, shewing the whole Practise of Artillerie: *written by* Robert Norton, one of his Maiesties *Gunners and Enginiers.*" 1628.

Animadversions of Warre, by Robert Ward, Gentleman & Commander, 1639.

"Principles of the Art Military (Third part), *composed by* Capitaine Henry Hexham;" second edition, 1643.

"The Artillery Officer's *Vade Mecum*, by S. P. Adyc, 1766." This volume is in manuscript, and belongs to the Royal Artillery Institution; the author was an officer of the regiment.

"Études sur l'Artillerie;" begun by the present Emperor Napoleon, and in course of completion by Colonel Favé.

Various other works are occasionally quoted.

The circulars to which reference is frequently made are those issued from the War Office to notify changes in Artillery Matériel and other stores.

ORGANIZATION OF ARTILLERY.

The organization of men employed in the management and care of artillery is necessarily adapted to the nature of their duties, and differs in some respects from that of infantry or cavalry. The infantry in a complete army is composed of so many battalions as will amount to the number of foot soldiers required, and regiments of cavalry are united with them to make up the proper proportion of mounted men, but in the case of artillery the number of men and horses is always governed by that of the *guns* to be employed. Principle of the organization.

The general proportion of field guns for an army of the present day is about three to every thousand men.* The proportion of heavy guns to be used in the attack or defence of a fortified place cannot be reduced to any concise rule, but in all cases the guns are worked by "batteries" or divisions of a few guns each, and the term battery is now extended to express the men, horses, and matériel of which one complete division is composed. It is also applied to the men, apart from the horses and matériel, instead of the term troop or company. Battery.

Hence the battery is, for tactical purposes, the *unit* of artillery,† but it is a unit of unequal value, its number of men and horses and its equipment of guns and wagons varying according to the service for which it is used. The principal difference is between the batteries of *field* and those of *garrison* or *siege* artillery.

FIELD ARTILLERY.

A battery of field artillery is composed of ordnance (mounted on field carriages) ammunition wagons, and certain additional carriages, together with men and horses in proportion to the establishment of matériel. The additional carriages convey tools and materials for executing repairs, books, stationery, and a proportion of forage or baggage, if necessary. They always include a forge wagon, store wagon, and store cart, and for active service a rocket carriage is generally added, but the details are liable to vary. The proportion of ammunition wagons is at least one per gun; it is increased on active service according to the calibre of the guns employed, as shown at pp. 20-27. The officers' horses in the field brigades are provided by Government, and remain the property of the public; officers of the horse brigades have to purchase chargers at their own expense. Battery of Field Artillery.

Batteries of artillery are also charged with the care and conveyance of such reserves of ammunition as are required to be within immediate reach of an army on the march. The present arrangement is that there should be three reserves, each including small arm as well as artillery ammunition. The first reserve consists of wagons added to the batteries when they are placed on a war establishment. The second reserve con- Ammunition reserves.

* It is proposed that a corps d'armée, consisting of about 12,000 men, should have, altogether, 48 guns; 12 guns to accompany each division of infantry (5,000 strong), 12 to be attached to the cavalry brigade, and 12 to be held in reserve. In the 17th century the proportion of guns was only one to a thousand men.

† For administrative purposes the entire regiment is divided into brigades, containing seven or eight batteries each, as may be seen in the "Army of Great Britain," by Capt. Petrie, Topog. Staff, p. 59. A complete brigade would never be sent into the field unless it happened to contain the right proportion of men for the ordnance employed. In any case a single battery of field or horse artillery is an unit as separate and complete as a regiment of cavalry or battalion of infantry.

sists of batteries organized for this particular service, without any pieces of ordnance whatever. The third is in charge of the store department.

Wagons with small-arm ammunition for the first reserve are added to batteries which are attached to divisions of the army, but not to batteries of position nor to those which belong to the artillery reserve of a complete corps d'armée.

Batteries of field artillery are equipped with ordnance of greater or less weight, according to the movements they are intended to execute. The pieces of ordnance suitable for the service are shown at p. 124.

Field battery. *Field batteries* act and manœuvre with infantry; as they are not required to move faster than a walk, except for short distances, the men to work the guns march on foot, but they can be mounted on the carriages, if necessary. They are now armed with six 12-pounder Armstrong guns. For details, see pp. 20, 22.

Horse artillery. *Batteries of Horse Artillery* act and manœuvre with cavalry, and, being required to move with equal rapidity, the gunners have to be mounted on horseback or conveyed by the gun carriages; for a comparison of the men and horses brought under fire, see p. 127. They are now armed with six 9-pounder Armstrong guns; details of their establishment are given in the tables.

Position artillery. *Batteries of position* do not manœuvre, but they follow the movements of the army, ready to take up such positions as may be desirable.

The pieces of ordnance are reduced to four in number, but are the heaviest that can be brought into the field. The 40-pounder Armstrong gun is now employed. Batteries of position are composed like field batteries, but have no rocket carriage; among the additional carriages there is a platform wagon. There are various stations throughout the country at which the matériel for these batteries is kept ready for use. In the event of their being required for service they would be moved by cattle obtained from the neighbouring farmers, and the guns would be worked by men of the garrison brigades, or by militia and volunteer artillery.

Mountain artillery. Batteries of artillery for service in mountainous countries are equipped with guns light enough to be carried by mules, and the carriages are constructed in such a manner that they may be conveyed in a similar way. 3-pounder guns, and 4½-inch howitzers have been hitherto used for this purpose.

Ammunition reserves. Reserves of ammunition consist of wagons for gun and small-arm ammunition, together with the usual additional carriages. Having no pieces of ordnance they do not require so many dismounted men. For the detail, see p. 29. Reserves of ammunition and mountain equipments are prepared for particular service only.

SIEGE OR GARRISON ARTILLERY.

Men. The batteries of siege or garrison artillery are for working the ordnance used in the attack or defence of fortified places. In the latter case the guns have not to be moved long distances, and in the former case they can be drawn with sufficient readiness by the military train or by cattle obtained for the occasion from the inhabitants; these batteries have therefore no horses, drivers, or field carriages permanently appropriated to them.

Their establishment, in peace or war, consists of 5 officers and 116 non-commissioned officers and men (see p. 30). This number would furnish three reliefs, of 10 men each, to three heavy guns, with a proportion of spare men for servants, camp duties, and casualties; in

garrisons there would probably be only three or four artillerymen to each gun, and the rest would be made up in the best available manner.

The matériel employed in garrisons and sieges is described at pp. 236 and 266. The detail for a siege train of 105 pieces, arranged in the same form as for a field artillery battery, is given at p. 30.

REGIMENTAL STAFF.

On home service one colonel and four lieutenant-colonels do duty with each brigade, and there is a permanent staff of officers and non-commissioned officers, as shown at page 31. The staff remains at the head quarters of the brigade, but the lieutenant-colonels are sent to take command at out-stations, if there are two detached batteries serving in the same quarter or district. There are also certain regimental appointments which are held by officers who remain on the strength of the batteries. Among them are instructors of gunnery, firemasters, and orderly officers for artillery districts. Permanent staff.

On active service there are a lieutenant-colonel, an adjutant, and a quartermaster of artillery included in the staff of each infantry division or cavalry brigade. The officer commanding the whole artillery serving with an army, and such staff officers as his rank and the extent of his duties entitle him to have, are attached to head quarters. The proposed composition of the artillery staff to accompany a corps d'armée of 12,000 men is given at p. 31. Field artillery staff.

A siege train would have lieutenant-colonels in proportion to its strength, and if it contained several batteries there would be a colonel to command the whole. Siege train staff.

The number of horses for which staff officers are allowed to draw forage partly depends on whether they are employed at a home station, a foreign station, or with an army in the field, and is laid down in circular 847 (warrant of 8 January 1864). The officers are all mounted except the paymaster, quartermaster, and assistant surgeons of garrison brigades. All riding masters, and quartermasters of field brigades, are provided with troop horses ; the rest purchase their own horses. Horses.

RANKS AND DENOMINATIONS.

There are five ranks of officers in the Royal Artillery: colonels, lieutenant-colonels, captains, second captains, and lieutenants. The regimental staff officers for the various brigades consist, as in regiments of the line, of adjutants, paymasters, medical and veterinary officers, paymasters, and quartermasters ; the adjutants of brigades are generally second captains. Officers.

Of non-commissioned officers there are five ranks, viz. ; staff-serjeants of brigades (serjeant-major and quartermaster serjeant), staff-serjeants of batteries (serjeant-major and quartermaster serjeant), serjeants, corporals, and bombardiers. Non-commissioned officers.

Master gunners are warrant officers in the coast brigade ; this brigade is only employed at home. Master gunners.

The men are enlisted as gunners or drivers according to their size and previous employment, but they are available for both duties. Men.

Artificers are skilled workmen, principally employed at their respective trades, but instructed in artillery duties. They are enlisted as shoeing smiths, collarmakers, or wheelers. Collarmakers and wheelers rank as bombardiers, corporals, or serjeants, according to their length of service ; shoeing smiths, when promoted, become serjeant farriers, or serjeant armourers ; the latter are only required for Armstrong guns. Artificers.

Trumpeters. Trumpeters are enlisted when boys, there are two to each battery, and there is one trumpet-major to each brigade; rough riders and assistant gunnery instructors are merely non-commissioned officers specially instructed, and do not appear under those titles in muster-rolls or returns of strength.

TRANSPORT OF ARTILLERY.

On service. In the operations of a campaign, officers and men march on horseback or on foot according as they belong to the mounted or the dismounted branches of the service. In changing quarters, batteries of field artillery usually proceed by march route, but batteries of garrison artillery, or detachments of officers and men without horses and carriages are sent, if possible, by railway.

By railway. Railways may also be used in time of war for the conveyance of the horses and matériel. A complete field battery would be too great a load for one train, and would have to be forwarded in successive divisions. The distribution would depend on the carriages and trucks belonging to the line, and the number of trains would depend on the locomotive power of the engines employed. A complete field battery on a war establishment would require about four trains of 35 carriages each; further particulars relative to this point may be found in the R. A. Field Book, p. 258.

By sea. The space allowed on board transport ships is calculated by cubic feet and tons. It depends so much on the construction of the ship and other contingencies that no absolute rule can be followed. The cabin space allowed to an officer is 195 cubic feet, or 135 cubic feet if there are two officers in the same cabin. The berthing space for a man is 52 cubic feet; and the standing room for a horse is 126 cubic feet. Further space is required for hospitals, stores, provisions, forage, &c., according to circumstances, but practically the tonnage required averages from 2 to 2½ tons per man, and about 10 tons per horse.* The tonnage for the matériel of artillery is calculated by superficial measurement at the rate of 40 cubic feet to a ton, but if the gross weight of any separate article is more than the result obtained by its measurement, the larger amount is taken. (*See also p. 123.*)

Previous organization of Artillery.

Field train. The organization of field artillery in separate divisions of six guns was adopted for the English service in the course of the wars which followed the French revolution. Previous to that time the artillery to accompany an army was formed into a field train, organized in much the same manner as a siege train of the present day. The train was nominally divided into brigades of about 12 pieces each, but the guns were distributed among the infantry at the rate of two per battalion for the purpose of fighting or manœuvring. These pieces sometimes marched and encamped with the battalions to which they were attached, otherwise the train remained entire. Battering or siege pieces were separated from the battalion guns, but all were included in the "field train" department. The train was drawn by horses purchased or hired for the occasion, and the management of the horses was entrusted to "conductors," also temporarily employed. The staff of the train included the necessary artificers, but the duties of the artillerymen were confined to the service of the guns, and a company, 100 strong, was estimated as sufficient for a brigade of 12 pieces.

* Information from the Director of Transport Services.

This system being inapplicable to horse artillery, the troops in that branch of the service were organized in the present manner at their first establishment in 1793, but the battalion guns were retained until the recommencement of the war in 1802.* They were then formed into brigades of six pieces, horsed by the Driver corps.

The word brigade has borne so many meanings in connexion with artillery that it may be as well to recapitulate the various senses in which it has been used. In the last century it was applied to 12 guns of a field train, worked by artillerymen, but horsed and driven by any available means; during the Peninsular war and down to 1826 it was applied to divisions of six guns equipped for field service, and to any corresponding unit except troops of horse artillery. The Rocket troop (discontinued about 1847) was described as the Rocket brigade as long as it was kept up, and ammunition reserves were called brigades as late as the Crimean war. During the same period it represented in the case of horse artillery a unit of altogether different value, the entire body having been called the Royal Horse Brigade ever since its formation; in this sense it has been retained, and in 1859 its use was made universal by substituting it for battalion throughout the artillery service.

The term battery was originally applied to a few pieces of ordnance placed in a chosen position and furnished with some protection against the enemy's fire. In 1826 the term Field Battery was adopted from the Continent, to be used for such divisions of field guns as had been previously called brigades. In 1859 all troops and companies were ordered to be in future described as batteries.

During the 17th century the officers and men for the service of guns were appointed by warrant to accompany the trains temporarily equipped, and when the expedition was completed all those who were not required for duty in garrisons, or for some other train, were dismissed from pay and employment. For these artillerymen there was a certain organization by companies in 1693, and in 1698 a *regimental train*, consisting of four companies and a staff, was established for permanent service.†

Since that time the number of companies has varied at different dates.‡ The establishment has occasionally been reduced at the close of a war, but it has, on the whole, steadily progressed according as the importance of artillery has increased. In 1757 the number of companies having arrived at 24, the regiment was divided into two battalions: in 1790 there were 40 companies and four battalions. In 1792 a plan was considered, and adopted in the following year, for the establishment of horse artillery in a brigade consisting of eight troops, and all further augmentations took the form of additional battalions, companies, or troops, that the unity of the regiment might be preserved.

Ranks and Denominations at various periods.

Before the trains of artillery were embodied for permanent service each train was "wholly under the command of the Master, or General of the Ordnance, or in his absence under his Lieutenant or Brauc,"

* See "Observations on Fire Arms," by Col. Chesney, R.A., p. 128, &c. So late as 1799 there were only two 6-pounders with one ammunition wagon to an entire brigade of infantry; each piece was drawn by three horses in single draught, and conducted by a driver on foot with a wagoner's whip.

† R.A. Institution Proceedings, vol. ii., p. 138.

‡ The successive establishments may be seen in Kane's list of the Artillery.

(Norton, p. 121). The other officers consisted of master gunners, wagon masters, commissaries, and gentlemen, who were distinguished by the nature of their employment without bearing any military titles. Since the regimental organization was adopted the field officers of artillery have borne the same denominations as those of the line; the ranks of company officers have also been in conformity with those of the line, except that they have never included cornets or ensigns. In place of this rank, which would have been inappropriate to a regiment without colours, there was, until lately, a distinct grade of second lieutenant.

2nd Lieut.
Major.

The rank of major was discontinued in 1826, and that of second lieutenant in 1855; the rates of pay for those ranks being however retained for a corresponding number of lieutenant-colonels and subalterns. The second captains were originally captain-lieutenants, but there was always one to each company instead of only one for every colonel, as was the case in regiments of the line;* the name was changed in 1804. Besides the officers above mentioned, each company in the last century had one or more lieutenant-fireworkers, and earlier still there were gentlemen of the ordnance. The latter held an intermediate position between subalterns and non-commissioned officers, and corresponded to what were afterwards called cadets, being "gentlemen of quality, valiant, and capable of perferment;" similar appointments were held in infantry regiments. In 1743 and as late as 1770 all the officers carried fuzees when they paraded under arms.

Capt.-lieut.

Fireworker.
Gentlemen.

Bombardier.

Bombardiers were first embodied in 1686, the warrant for their appointment† stating that the king desired to make more extensive use of mortars, bombs, carcasses, &c., and that it was requisite to have "able persons well qualified and experienced in the practice of the said artillery." Petardiers (so called from the petards‡ then used in bursting gates or destroying palisades) are mentioned in the same warrant, and appear also in earlier lists, as far back as 1618, but this name fell soon afterwards into disuse, and that of Bombardier was diverted from its original signification § to express the rank of a non-commissioned officer.

Petardier.

Gunner.

The gunners were formerly divided into two classes, the inferior of which performed the less important duties connected with the service of a piece. In the early stages of gunnery, when there were only two trained artillerymen per gun,|| they consisted of a gunner and his mate, or matross, and when their number was increased the distinction of class was preserved. It continued to exist down to 1783, and during most of that time the difference of employment was indicated by their personal equipment; the gunners carried a field staff, which combined a linstock, for artillery purposes, with a spearhead for defence; they

Matross.

* The captain-lieutenant was in command of that company which was nominally held by the colonel of the regiment.

† Quoted in the R. A. Institution Proceedings, vol. ii., p. 131.

‡ The petard did not become obsolete until a comparatively recent date. There were petards of four sizes in use in 1813, and an article on the use of it was inserted in the Aide-memoire of 1852; (vol. 3. p. 114). Descriptions of it may also be found in most old works on Artillery. It was made of brass, cast in a bell-shape and fixed to a piece of plank about 29 inches square by 3½ inches thick.

§ The word "bombardiere" was used by the early Italian writers in a sense corresponding to artilleryman, the word bombarde being also applied to ordnance in general.

|| These two managed the loading and the laying; in the heavy part of the work they were assisted by soldiers or labourers; the cumbrousness of the matériel and slowness of the fire made any greater number of artillerymen unnecessary.

also wore swords. The matrosses were armed, first with half pikes and hangers, and afterwards with muskets and bayonets, like the infantry soldiers of the time. In 1748 both muskets and field staffs were exchanged for carbines and bayonets.*

Serjeants and corporals do not appear in the early lists of organization for trains of artillery, although they had long been embodied in other branches of the service; in a detail dated 1693 they are entered as "serjeants of the gunners," and "corporals of the matrosses," the bombardiers being included among the staff of the regiment. All the non-commissioned officers carried halberts and swords in 1743, and were first armed with carbines in 1754. Drums were originally used throughout the regiment, and were retained for garrison service until 1848. Fifes were introduced to accompany the drums about 1750. Drummers and trumpeters wore red coats (except in the horse artillery) until 1851.

Serjeant.
Corporal.

Drummer.

Horses and drivers were first permanently embodied in the regiment at the formation of the Horse Artillery in 1793, but the corps of Royal Artillery Drivers, which was raised in 1794 to furnish the horses and drivers for the rest of the field artillery, was constituted as a separate body and commanded by its own officers. The Driver corps was abolished in 1821, and since that time artillerymen have been enlisted to serve as gunners or drivers.

Driver corps.

Besides the men employed in the service and management of the ordnance, ammunition, and accompanying stores, the artillery attached to a field train formerly included a staff for more general purposes. It contained clerks or commissaries to take account of stores, pioneers for general service, "tin-boat men," for making military bridges, and artificers of various trades. Such of the artificers as were required for repairing harness and matériel were retained and enlisted for the service of the regiment when the field artillery was organized in separate batteries, but the bridge equipage and the workmen of other trades were eventually embodied in the corps of Royal Engineers. Commissaries and conductors were employed to superintend the issue of stores as late as the Crimean War, but those duties are now performed by the Military Store Department, who receive their orders from the Commander-in-Chief and not from the officer Commanding the Artillery.

Field train
staff.

* R. A. Institution Proceedings, vol. ii., pp. 134, 138; and Kane's List, appendix.

ARTILLERY.

FIELD ARTILLERY.

DETAIL OF A 12-POUNDER ARMSTRONG FIELD BATTERY.
PEACE ESTABLISHMENT.

Officers and Men.	Horses.	Matériel.
<i>Officers.</i>		
Captain - - - 1	Officers, 1 each - - 6	12-pounder Armstrong guns - 6
Second captain - - 1	Staff serjeants - - 2	
Lieutenants - - - 3	Mounted non-commis-	<i>Carriages.</i>
Assistant surgeon - - 1	sioned officers - - 6	Gun carriages - - - 6
— 6	Trumpeter - - - 1	Ammunition wagons - - 6
<i>Non-commissioned Officers and Men.</i>		
Serjeant-major - - 1	Farrier - - - 1	Forge wagon - - - 1
Quartermaster serjeant - 1	Shoeing smiths - - 1	Store wagon - - - 1
Serjeants - - - 7	Spare - - - 1	Store cart - - - 1
Corporals - - - 6	— 18	Total - - - 15
Bombardiers - - - 6	<i>Draught Horses.</i>	
Gunners - - - 80	6 guns, 6 each - - 36	<i>Ammunition.</i>
Drivers - - - 70	8 wagons, 4 each - - 32	732 rounds of gun ammunition.
Trumpeters - - - 2	1 cart - - - 2	<i>Stores.</i>
—173	Spare - - - 6	Each carriage is equipped with a
<i>Artificers.</i>		
Serjeant farrier ^a - - 1	Total - - - 94	fixed proportion of stores.
Serjeant armourer ^a - 1	<i>EQUIPMENT.</i>	
Shoeing smiths ^a - - 5	<i>Saddlery.</i>	
Collarmakers - - - 3	Officers, 6 sets.	<i>Tools.</i>
Wheelers - - - 2	Non-commissioned officers and	Collarmakers', sets - - 3
— 12	men, 12 sets.	Facing - - - 1
Total - - - 191	<i>Harness.</i>	
<i>EQUIPMENT.</i>		
As shown at pp. 45-59.	Lead, double sets, 21.	Farriers' and shoeing smiths' ^b 1
	Wheel, do. 17.	Smiths', (general service) - 1
	<i>Necessaries, &c.</i>	
		Special - - - 1
		Wheelers' and saddletree makers' 1
		<i>Materials for Repairs.</i>
		Iron work and spare parts of car-
		riages.
		Collarmakers' material.
		Farriers' do.
		Wheelers' do.
		Saddletree makers' do.

^a Also employed as carriage smiths.^b Provided by the farrier.

Medical stores, books, and stationery are required in addition to the matériel above detailed.

Articles of camp equipage (among which are 24 tents) are included in the proportion of stores.

The detail of men, horses, and carriages is liable to vary; this is taken from an official list, dated 8th March 1862.

FIELD ARTILLERY.

DETAIL OF A 12-POUNDER ARMSTRONG FIELD BATTERY.
WAR ESTABLISHMENT.*

Officers and Men.	Horses.	Matériel.
<i>Officers.</i>	<i>Riding Horses.</i>	<i>Ordnance.</i>
Captain - - - 1	Officers ^b - - - 9	12-pounder Armstrong guns - 6
Second captain - - 1	Staff serjeants - - 2	<i>Carriages.</i>
Lieutenants - - - 3	Mounted non-commissioned officers - 15	Gun carriages (1 spare) - 7
Quartermaster - - 1	Trumpeters - - - 2	12-pounder rocket carriage - 1
Assistant surgeon - 1	Farrier - - - 1	Ammunition wagons - 12
Veterinary surgeon - 1	Shoeing smiths - - 2	Small arm do. - - 6
— 8	Spare - - - 1	Forge wagon - - - 1
<i>Non-commissioned Officers and Men.</i>	<i>Draught Horses.</i>	Store wagon - - - 1
Serjeant-major - - 1	6 guns, 8 each - - 48	General service wagons - 2
Quartermaster serjeant - 1	1 rocket carriage - 8	Store cart - - - 1
Serjeants - - - 11	1 spare gun carriage - 6	Total - - - 31
Corporals - - - 9	20 wagons, 6 each - 120	<i>Ammunition.</i>
Bombardiers - - - 12	2 wagons (gen. ser.), each - 8	1,272 rounds of gun ammunition.
Gunners - - - 100	1 cart - - - 2	102,960 rounds for Enfield rifles.
Drivers - - - 120	Spare - - - 20	100 rockets.
Trumpeters - - - 2	—212	<i>Stores.</i>
—256	<i>Bât Horses.^b</i>	Each carriage is equipped with a fixed proportion of stores.
<i>Artificers.</i>	Officers, 1 each - - 8	<i>Tools.</i>
Serjeant farrier ^a - - 1	Total - - - 252	Collarmakers', sets - - 3
Serjeant armourer ^a - 1	<i>EQUIPMENT.</i>	Facing - - - 1
Shoeing smiths ^a - - 5	<i>Saddlery.</i>	Farrriers' and shoeing smiths' - 1
Collarmakers - - - 3	Officers, 7 sets. ^b	Smiths' (general service) - 1
Wheelers - - - 3	Non-commissioned officers and men, 23 sets.	Special - - - 1
— 13	<i>Harness.</i>	Wheelers' and saddletree makers' 1
Total - - - 277	Lead, double sets, 68.	<i>Materials for Repairs.</i>
<i>EQUIPMENT.</i>	Wheel, do. 34.	Iron work and spare parts of guns and carriages.
As shown at pp. 45-59.	<i>Necessaries, &c.</i>	Collarmakers' material.

* As given in the Appendix to the Report on the Composition of a Corps d'Armée, 1863.

^a Also employed as carriage smiths.

^b The veterinary surgeon provides two horses and saddlery at his own expense; all the bât horses are also private property.

Medical stores, books, and stationery are required besides the above-mentioned matériel. Articles of camp equipage (among which are 48 tents) are included in the proportion of stores.

ARTILLERY.

FIELD ARTILLERY.

DETAIL OF A RESERVE 12-POUNDER ARMSTRONG FIELD BATTERY.*

Officers and Men.	Horses.	Matériel.
<i>Officers.</i>	<i>Riding Horses.</i>	<i>Ordnance.</i>
Captain - - - 1	Officers ^b - - - 9	12-pounder Armstrong guns - 6
Second captain - - 1	Staff serjeants - - 2	
Lieutenants - - - 3	Mounted non-commissioned officers - - 12	<i>Carriages.</i>
Quartermaster - - 1	Trumpeters - - - 2	Gun carriages (1 spare) - 7
Assistant surgeon - 1	Farrier - - - 1	12-pounder rocket carriage - 1
Veterinary surgeon - 1	Shoing smiths - - 2	Ammunition wagons - - 12
— 8	Spare - - - 0	Forge wagon - - - 1
	— 28	Store wagon - - - 1
<i>Non-commissioned Officers and Men.</i>	<i>Draught Horses.</i>	General service wagons - 2
Serjeant-major - - 1	6 guns, 8 each - - 48	Store cart - - - 1
Quartermaster serjeant - 1	1 rocket carriage - - 8	Total - - - 25
Serjeants - - - 11	1 spare gun carriage - 6	=====
Corporals - - - 9	14 wagons, 6 each - 84	
Bombardiers - - - 12	2 wagons (gen. ser.), 4 each 8	<i>Ammunition.</i>
Gunners - - - 100	1 cart - - - 2	1,272 rounds of gun ammunition.
Drivers - - - 120	Spare - - - 18	100 rockets.
Trumpeters - - - 2	— 174	
— 256		<i>Stores, Tools, and Materials.</i>
<i>Artificers.</i>	<i>Bât Horses.^b</i>	As in the last list.
Serjeant farrier ^a - - 1	Officers, 1 each - - 8	
Serjeant armourer ^a - 1	Total - - - 210	=====
Shoing smiths ^a - - 5		
Collarmakers - - - 3	<i>EQUIPMENT.</i>	
Wheelers - - - 3	<i>Saddlery.</i>	
— 13	Officers, 7 sets. ^b	
Total - - - 277	Non-commissioned officers, 20 sets.	
=====		
<i>EQUIPMENT.</i>	<i>Harness.</i>	
As shown at pp. 45-59.	Lead, 56 double sets.	
	Wheel, 28 ditto.	
	<i>Necessaries, &c.</i>	

* From the Report of the Committee on the Composition of a Corps d'Armée, 1863.

^a Also employed as carriage smiths.

^b The veterinary surgeon provides two horses and saddlery at his own expense; all the bât horses are also private property.

This establishment differs from the one at p. 21 in having no small-arm ammunition wagons; there are consequently fewer horses required, but the non-commissioned officers and men are not reduced in number, in order that there may be a few spare men ready to supply casualties in the other batteries.

FIELD ARTILLERY.

DETAIL OF A 9-POUNDER FIELD BATTERY. WAR ESTABLISHMENT.*

Officers and Men.	Horses.	Matériel.
<i>Officers.</i>	<i>Riding Horses.</i>	<i>Ordnance.</i>
Captain - - - 1	Officers ^b - - - 9	9-pounder guns - - - 4
Second captain - - - 1	Staff serjeants - - - 2	24-pounder howitzers - - - 2
Lieutenants - - - 3	Mounted non-commissioned officers - 15	<i>Carriages.</i>
Quartermaster - - - 1	Trumpeters - - - 2	Gun carriages (1 spare) - - - 5
Assistant surgeon - - - 1	Farrier - - - 1	Howitzer do. - - - 2
Veterinary surgeon - - - 1	Shoeing smiths - - - 2	12-pounder rocket carriage - - - 1
— 8	Spare - - - 1	Gun ammunition wagons - - - 6
<i>Non-commissioned Officers and Men.</i>	<i>Draught Horses.</i>	Howitzer do. - - - 5
Serjeant-major - - - 1	6 guns and howitzers, 8 each - - - 48	Small arm do. - - - 6
Quartermaster serjeant - - - 1	1 rocket carriage - - - 8	Forge wagon - - - 1
Serjeants - - - 11	1 spare gun carriage - - - 6	Store wagon - - - 1
Corporals - - - 9	19 wagons, 6 each - - - 114	General service wagons - - - 2
Bombardiers - - - 12	2 wagons (gen. ser.), 4 each - 8	Store cart - - - 1
Gunners - - - 100	1 cart - - - 2	Total - - - 30
Drivers - - - 120	Spare - - - 18	<i>Ammunition.</i>
Trumpeters - - - 2	— 204	704 rounds of gun ammunition.
— 256	<i>Bât Horses.^b</i>	348 " howitzer do.
<i>Artificers.</i>	Officers, 1 each - - - 8	102,960 rounds for Enfield rifles.
Serjeant farrier ^a - - - 1	Total - - - 244	100 rockets.
Shoeing smiths ^a - - - 6	<i>EQUIPMENT.</i>	<i>Stores.</i>
Collarmakers - - - 3	<i>Saddlery.</i>	Each carriage is equipped with a fixed proportion of stores.
Wheelers - - - 3	Officers, 7 sets.	<i>Tools.</i>
— 13	Non-commissioned officers and men, 23 sets.	Collarmakers', sets - - - 3
Total - - - 277	<i>Harness.</i>	Farriers' and shoeing smiths' - 1
<i>EQUIPMENT.</i>	Lead, 66 double sets.	Smiths' (general service) - 1
As shown at pp. 45-59.	Wheel, 33 ditto.	Wheelers' and saddletree makers' 1
	<i>Necessaries, &c.</i>	<i>Materials for Repairs.</i>
		Iron work, and spare parts of carriages.
		Collarmakers' matériel.
		Farriers' do.
		Wheelers' do.
		Saddletree makers' do.

* From the Report of the Committee on the Composition of a Corps d'Armée, 1863.

^a Also employed as carriage smiths.

^b The veterinary surgeon provides two horses and saddlery at his own expense ; all the bât horses are also private property.

Medical stores, books, and stationery are required besides the matériel.

Articles of camp equipage (among which are 68 tents) are included in the proportion of stores.

ARTILLERY.

FIELD ARTILLERY.

DETAIL OF A RESERVE 9-POUNDER FIELD BATTERY.*

Officers and Men.	Horses.	Matériel.
<i>Officers.</i>	<i>Riding Horses.</i>	<i>Ordnance.</i>
Captain - - - 1	Officers ^b - - - 9	9-pounder guns - - 4
Second captain - - 1	Staff serjeants - - 2	24-pounder howitzers - - 2
Lieutenants - - - 3	Mounted non-commissioned officers - - 12	<i>Carriages.</i>
Quartermaster - - 1	Trumpeters - - - 2	Gun carriages (1 spare) - 5
Assistant surgeon - 1	Farrier - - - 1	Howitzer do. - 2
Veterinary surgeon - 1	Shoeing smiths - - 2	12-pounder rocket carriage - 1
— 8	Spare - - - 0	Gun ammunition wagons - 6
<i>Non-commissioned Officers and Men.</i>	— 28	Howitzer do. - 5
Serjeant-major - - 1	<i>Draught Horses.</i>	Forge wagon - - 1
Quartermaster serjeant - 1	6 guns and howitzers, 8 each - - - 48	Store wagon - - 1
Serjeants - - - 11	1 rocket carriage - 8	General service wagons - 2
Corporals - - - 9	1 spare gun carriage - 6	Store cart - - - 1
Bombardiers - - - 12	13 wagons, 6 each - 78	Total - - 24
Gunners - - - 100	2 wagons (gen. ser.), 4 each - - - 8	<i>Ammunition.</i>
Drivers - - - 120	1 cart - - - 2	704 rounds of gun ammunition.
Trumpeters - - - 2	Spare - - - 18	348 " howitzer do.
— 256	— 168	100 rockets.
<i>Artificers.</i>	<i>Bât Horses.^b</i>	<i>Stores, Tools, and Materials.</i>
Serjeant farrier ^a - - 1	Officers, 1 each - - 8	As in the previous list.
Shoeing smiths ^a - - 6	Total - - 204	
Collarmakers - - - 3	<i>EQUIPMENT.</i>	
Wheelers - - - 3	<i>Saddlery.</i>	
— 13	Officers, 7 sets. ^b	
Total - - 277	Non-commissioned officers, 20 sets.	
<i>EQUIPMENT.</i>	<i>Harness.</i>	
As shown at pp. 45-59.	Lead, 54 double sets.	
	Wheel, 27 ditto.	
	<i>Necessaries, &c.</i>	

* From the Report of the Committee on the Composition of a Corps d'Armée, 1863.

^a Also employed as carriage smiths.

^b The veterinary surgeon provides two horses and saddlery at his own expense; all the bât horses are also private property.

This establishment differs from the one at p. 23 in having no small-arm ammunition wagons; there are consequently fewer horses, but the non-commissioned officers and men are not reduced in number, in order that there may be a few spare men ready to replace casualties in the other batteries.

HORSE ARTILLERY.

**DETAIL OF A 9-POUNDER (ARMSTRONG) BATTERY.
PEACE ESTABLISHMENT.**

Officers and Men.	Horses.	Matériel.
<i>Officers.</i>	<i>Riding Horses.^b</i>	<i>Ordnance.</i>
Captain - - - 1	First captain - - 3	9-pounder Armstrong guns - 6
Second captain - - 1	Other officers, 2 each - 10	<i>Carriages.</i>
Lieutenants - - 3	Staff sergeants - - 2	Gun carriages - - -
Assistant surgeon - - 1	Mounted non-commissioned officers and gunners - - 48	Ammunition wagons - - 6
— 6	Trumpeters - - 2	Forge wagon - - 1
<i>Non-commissioned Officers and Men</i>	Farrier - - 1	Store wagon - - 1
Serjeant-major - - 1	Shoeing smiths - - 3	Store cart - - 1
Quartermaster serjeant - 1	— 69	Total - - 15
Serjeants - - 7	<i>Draught Horses.</i>	<i>Ammunition.</i>
Corporals - - 6	6 guns, 6 each - - 36	720 rounds of gun ammunition.
Bombardiers - - 6	8 wagons, 4 each - 32	<i>Stores.</i>
Gunners - - 80	1 cart - - 2	Each carriage is equipped with a fixed proportion of stores.
Drivers - - 70	Spare - - 8	<i>Tools.</i>
Trumpeters - - 1*	— 78	Collarmakers' sets - - 3
— 172	Total - - 147	Facing - - 1
<i>Artificers.</i>	EQUIPMENT.	Farriers' and shoeing smiths' ^c 1
Serjeant farrier ^a - - 1	<i>Saddlery.</i>	Smiths' (general service) - 1
Serjeant armourer ^a - 1	Officers. ^b	Special - - 1
Shoeing smiths ^a - - 5	Non-commissioned officers and men, 56 sets.	Wheelers' and saddletree makers' 1
Collarmakers - - 3	<i>Harness.</i>	<i>Materials for Repairs.</i>
Wheelers - - 3	Lead, 22 double sets.	Iron work, and spare parts of guns and carriages.
— 13	Wheel, 17 ditto.	Collarmakers' material.
Total - - 191	<i>Necessaries, &c.</i>	Farriers' do.
EQUIPMENT.		Wheelers' do.
As shown at pp. 39-44.		Saddletree makers' do.

* There are two trumpeters employed, but one is mustered as a driver.

^a Also employed as carriage smiths.

^b The officers' horses and saddlery are provided at their own expense.

^c Provided by the farrier.

The numbers of men, horses, and field carriages are liable to vary ; the above are taken from an official list dated 8th March 1862.

Medical stores, books, and stationery are required in addition to the above matériel.

Articles of camp equipage (among which are 24 tents) are included in the proportion of stores.

ARTILLERY.

HORSE ARTILLERY.

DETAIL OF A 9-POUNDER (ARMSTRONG) BATTERY.
WAR ESTABLISHMENT.*

Officers and Men.	Horses.	Matériel.
<i>Officers.</i>	<i>Riding Horses.^c</i>	<i>Ordnance.</i>
Captain - - - 1	First captain - - 3	9-pounder Armstrong guns - 6
Second captain - - 1	Other officers, 2 each - 14	
Lieutenants - - - 3	Staff serjeants - - 2	<i>Carriages.</i>
Quartermaster - - 1	Non-commissioned officers	Gun carriages (1 spare) - 7
Assistant surgeon - 1	and gunners - - 48	12-pounder rocket carriage - 1
Veterinary surgeon - 1	Trumpeters - - - 2	Gun ammunition wagons - 11
— 8	Farrier - - - 1	Small arm do. - - 1
<i>Non-commissioned Officers and Men.</i>	Shoeing smiths - - 3	Forge wagon - - - 1
	Spare - - - 6	Store wagon - - - 1
	— 79	General service wagons - 2
Serjeant-major - - 1	<i>Draught Horses.</i>	Store cart - - - 1
Quartermaster serjeant - 1	6 guns, 6 each - - 36	Total - - - 25
Serjeants - - - 9	1 rocket carriage - - 8	
Corporals - - - 6	15 wagons, 6 each - 90	<i>Ammunition.</i>
Bombardiers - - - 9	2 wagons (gen. ser.), 4	1,170 rounds of gun ammunition.
Gunners - - - 80	each - - - 8	100 rockets.
Drivers - - - 100	1 cart - - - 2	Small-arm ammunition according to the natures in use by the cavalry.
Trumpeters ^a - - - 1	Spare - - - 18	
—207	—162	<i>Stores, Tools, and Materials.</i>
<i>Artificers.</i>	<i>Bât Horses.^c</i>	As in the last list.
Serjeant farrier ^b - - 1	Officers, 1 each - - 8	
Serjeant armourer ^b - 1	Total - - - 249	
Shoeing smiths ^b - - 5		
Collarmakers - - - 3	<i>EQUIPMENT.</i>	
Wheelers - - - 3	<i>Saddlery.</i>	
— 13	Officers. ^c	
Total - - - 228	Non-commissioned officers and men, 60 sets.	
<i>EQUIPMENT.</i>	<i>Harness.</i>	
As shown at pp. 39-44.	Lead, 49 double sets.	
	Wheel, 27 double sets.	
	<i>Necessaries, &c.</i>	

* As given in the Report of the Committee on the Composition of a Corps d'Armée, 1863.

^a There are two trumpeters employed, but one is mustered as a driver.

^b Also employed as carriage smiths.

^c The officers provide their own riding horses, bât horses, and saddlery.

Medical stores, books, and stationery are required in addition to the matériel.

Articles of camp equipage (among which are 44 tents) are included in the proportion of stores.

HORSE ARTILLERY.

DETAIL OF A 6-POUNDER BATTERY. WAR ESTABLISHMENT.*

Officers and Men.	Horses.	Matériel.
<i>Officers.</i>	<i>Riding Horses.^c</i>	<i>Ordnance.</i>
Captain - - - 1	First captain - - 3	6-pounder guns - - 4
Second captain - - 1	Other officers, 2 each - 14	12-pounder howitzers - - 2
Lieutenants - - 3	Staff serjeants - - 2	
Quartermaster - - 1	Non-commissioned officers	<i>Carriages.</i>
Assistant surgeon - - 1	and gunners - - 48	Gun carriages (1 spare) - 5
Veterinary surgeon - - 1	Trumpeters - - 2	Howitzer do. - 2
— 8	Farrier - - 1	12-pounder rocket carriage - 1
	Shoeing smiths - - 3	Gun ammunition wagons - 5
	Spare - - 6	Howitzer do. - 4
	— 79	Small arm do. - 1
<i>Non-commissioned Officers and Men.</i>	<i>Draught Horses.</i>	Forge wagon - - 1
Serjeant major - - 1	6 guns and howitzers,	Store wagon - - 1
Quartermaster serjeant - 1	6 each - - 36	General service wagons - 2
Serjeants - - 9	1 rocket carriage - - 8	Store cart - - 1
Corporals - - 6	1 spare gun carriage - 6	Total - - 23
Bombardiers - - 9	12 wagons, 6 each - 72	
Gunners - - 80	2 wagons (gen. ser.), 4	<i>Ammunition.</i>
Drivers - - 100	each - - 8	924 rounds of gun ammunition.
Trumpeters ^a - - 1	1 cart - - 2	472 " howitzer do.
—207	Spare - - 18	100 rockets.
	—150	Small-arm ammunition according to the natures in use by the cavalry.
<i>Artificers.</i>	<i>Bât Horses.^c</i>	<i>Stores.</i>
Serjeant farrier ^b - - 1	Officers, 1 each - - 8	Each carriage is equipped with a fixed proportion of stores.
Shoeing smiths ^b - - 6	Total - - 237	
Collarmakers - - 3		<i>Tools.</i>
Wheelers - - 3		Collarmakers' sets - - 3
— 13		Farriers' and shoeing' smiths 1
Total $\frac{1}{2}$		Smiths' (general service) - 1
228		Wheelers' and saddletree makers' 1
	EQUIPMENT.	
	<i>Saddlery</i>	
	Officers. ^c	
	Non-commissioned officers and men, 60 sets.	
	<i>Harness.</i>	
	Lead, 45 double sets.	
	Wheel, 25 double sets.	
	<i>Necessaries, &c.</i>	
		<i>Materials for Repairs.</i>
		Iron work and spare parts of carriages.
		Collarmakers' materials.
		Farriers' do.
		Wheelers' do.
		Saddletree makers' do.

* As given in the Report of the Committee on the Composition of a Corps d'Armée, 1863.

^a There are two trumpeters employed, but one is mustered as a driver.

^b Also employed as carriage smiths.

^c Officers provide their own riding horses, bât horses, and saddlery.

Medical stores, books, and stationery are required in addition to the matériel above detailed. Articles of camp equipage (among which are 36 tents) are included in the proportion of stores.

ARTILLERY.

HEAVY FIELD ARTILLERY.

DETAIL OF AN 18-POUNDER BATTERY OF POSITION.
WAR ESTABLISHMENT.

NOTE.—The equipment of batteries of position for service in the field depends entirely on the circumstances of their employment. The following equipment is given as a specimen of what it was in the Crimean war. (Artillery Field Book, p. 45.)

Officers and Men.	Horses.	Matériel.
<i>Officers.</i>	<i>Riding Horses.</i>	<i>Ordnance.</i>
Captain - - - 1	Officers, 1 each - - 6	18-pounder guns - - 4
Second captain - - 1	Staff serjeants - - 2	
Lieutenants - - - 3	Mounted non-commissioned officers - - 8	<i>Carriages.</i>
Assistant surgeon - - 1	Trumpeters - - - 2	Gun carriages (1 spare) - 5
— 6	Farrrier - - - 1	Ammunition wagons - 12
<i>Non-commissioned Officers and Men.</i>	Shoing smith - - 1	Platform wagon - - 1
Serjeant-major - - 1	Spare - - - 2	Forge wagon - - 1
Quartermaster serjeant - 1	— 22	Store wagons - - 2
Serjeants - - - 7	<i>Draught Horses.</i>	General service wagons - 2
Corporals - - - 5	4 guns, 12 each - - 48	Store cart - - - 1
Bombardiers - - - 6	Spare gun carriage - 8	Medicine cart - - - 1
Gunners } - - - 205	Platform wagon - - 8	Water carts - - - 3
Drivers } - - - 2	15 wagons, 6 each - 90	Total - - 28
Trumpeters - - - 2	2 wagons (gen. ser.), 4 each - - 8	
—227	5 carts, 2 each - - 10	<i>Ammunition.</i>
<i>Artificers.</i>	Spare - - - 20	816 rounds.
Serjeant farrrier ^a - - 1	—192	<i>Stores.</i>
Shoing smiths ^a - - 6	<i>Bât Horses.^b</i>	Each carriage is equipped with a fixed proportion of stores.
Collarmakers - - - 3	Officers, 1 each - - 6	
Wheelers - - - 2	Total - - 220	<i>Machine.</i>
— 12		1 triangle gyn complete.
Total - - - 245		<i>Tools.</i>
<i>EQUIPMENT.</i>	<i>EQUIPMENT.</i>	Collarmakers', sets - - 3
As shown at pp. 45-59.	<i>Saddlery.</i>	Farrriers' and shoing smiths' 1
	Officers, 6 sets.	Smiths' (carriage) - - 1
	Non-commissioned officers, 15 sets.	Wheelers' - - - 1
	<i>Harness.</i>	<i>Materials for Repairs.</i>
	Lead, 55 double sets.	Iron work and spare parts of carriages.
	Wheel, 37 ditto.	Collarmakers' materials.
	<i>Necessaries, &c.</i>	Farrriers' do.
		Wheelers' do.

^a Also employed as carriage smiths.^b Not provided by the public.

Medical stores, books, and stationery are required besides the above-mentioned matériel.

AMMUNITION RESERVE.

DETAIL OF A BATTERY EQUIPPED TO CONVEY THE SECOND RESERVE OF AMMUNITION.*

Officers and Men.	Horses.	Matériel.
<i>Officers.</i>	<i>Riding Horses.</i>	<i>Carriages.</i>
Captain - - - 1	Officers ^c - - - 7	Gun ammunition wagons ^b - 12
Second captain - - - 1	Staff serjeants - - - 2	Small arm do. - 12
Lieutenants - - - 2	Mounted non-commissioned officers - - - 8	Spare gun carriages - 2
Quartermaster - - - 1	Trumpeters - - - 2	Forge wagon - - - 1
Assistant surgeon - - - 1	Farrier - - - 1	Store wagon - - - 1
Veterinary surgeon - - - 1	Shoeing smiths - - - 1	General service wagons - 2
— 6	Spare - - - 1	Store cart - - - 1
<i>Non-commissioned Officers and Men.</i>	— 22	Total - - - 31
Serjeant-major - - - 1	<i>Draught Horses.</i>	<i>Ammunition.</i>
Quartermaster serjeant - 1	24 ammunition wagons, 6 each - - - 144	The number of rounds will vary according to the nature of the ammunition.
Serjeants - - - 8	2 spare gun carriages - 12	
Corporals - - - 6	2 wagons, 6 each - 12	
Bombardiers - - - 6	2 wagons (gen. ser.), 4 each - - - 8	<i>Stores, Tools, and Materials.</i>
Gunners - - - 40	1 cart - - - 2	Supplied in the usual proportion.
Drivers - - - 110	Spare - - - 18	
Trumpeters - - - 2	—196	
—174	<i>Bât Horses.^c</i>	
<i>Artificers.</i>	Officers, 1 each - - - 6	
Serjeant farrier ^a - - - 1	Total - - - 224	
Shoeing smiths ^a - - - 6		
Collarmakers - - - 3	EQUIPMENT.	
Wheelers - - - 3	<i>Saddlery.</i>	
— 13	Officers, 5 sets. ^c	
Total - 193	Non-commissioned officers, 15 sets.	
EQUIPMENT.	<i>Harness.</i>	
As shown at pp. 45-59.	Lead, 61 double sets.	
	Wheel, 34 ditto.	
	<i>Necessaries, &c.</i>	

* As given in the Appendix to the Report on the Composition of a Corps d'Armée, 1863.

^a Also employed as carriage smiths.

^b For Armstrong or smooth-bored ordnance, in proportion to the number of batteries armed with such pieces.

^c The veterinary surgeon provides two horses and saddlery at his own expense; all the bât horses are also private property.

Medical stores, books, and stationery are required as for other batteries.

Tents and other articles of camp equipage are included in the proportion of stores.

ARTILLERY.

SIEGE OR GARRISON ARTILLERY.

DETAIL OF A BATTERY.

Officers and Men.	Remarks.
<i>Officers.</i>	
Captain - - - - - 1	There are no <i>horses</i> or <i>matériel</i> permanently attached to a siege or garrison battery. Conveyance has to be provided for the officers' baggage, a part of the men's kits, and the books, stationery, &c. of the battery.
Second captain - - - - - 1	
Lieutenants - - - - - 3— 5	
<i>Non-commissioned Officers and Men.</i>	The establishment is not increased for active service.
Serjeant-major - - - - - 1	The officers are all dismounted unless they happen to hold brevet rank.
Serjeants - - - - - 5	
Corporals - - - - - 4	
Bombardiers - - - - - 4	
Gunners - - - - - 100	
Trumpeters - - - - - 2—116	
Total - - - - - 121	
	For equipment, <i>see</i> pp. 45-59.

DETAIL FOR A SIEGE TRAIN.

Matériel.	Matériel.
<i>Ordnance.</i>	<i>Carts.</i>
24-pr. iron guns - - - - - 45	Hand carts - - - - - 20
8-inch iron shell guns - - - - - 30	Trench carts - - - - - 20
10-inch iron mortars - - - - - 15	Store carts - - - - - 4
5½-inch brass mortars, with beds - - - - - 15	— 44
Total number of pieces - - - - - 105	Total number of wheeled carriages - 275
	<i>Machines for mounting Ordnance.</i>
<i>Ammunition.</i>	Triangle gys - - - - - 10
500 rounds for each piece.	Crab capstans (ten) and various stores.
<i>Travelling Carriages for Ordnance.</i>	<i>Platforms.</i>
24-pr. gun carriages - - - - - 51	For guns - - - - - 75
8-inch gun carriages - - - - - 36	For mortars - - - - - 15
10-inch mortar carriages - - - - - 17	
— 104	<i>Stores for the Service of Ordnance.</i>
<i>Transport Carriages for Ordnance.</i>	In the proportion shown at pp. 248, 254, and in the total numbers given at p. 264.
Platform wagons - - - - - 35	<i>Stores for unloading Transports.</i>
Sling wagons - - - - - 6	One set, as detailed at p. 265.
Drug carriages { large - - - - - 8	<i>Tools.</i>
{ small - - - - - 8	Carpenters' - - - - - sets 6
— 57	Collarmakers' - - - - - " 12
<i>Wagons for Ammunition and Stores.</i>	Jobbing smiths' - - - - - " 6
Forge wagons - - - - - 8	Shoering smiths' - - - - - " 6
General service wagons - - - - - 52	Wheelers' - - - - - " 6
Store wagons - - - - - 10	For reventing ordnance - - - - - " 1
— 70	<i>Materials.</i>
	Spare parts of carriages, &c.

A train thus composed is held in readiness for any immediate requirement; the arrangements for its care and transport in the field are given at p. 238. The entire train would require 26 batteries of artillery for its service, but any portion of it might be used separately.

Camp equipage and medical stores for the men would be issued in the proportions shown at pp. 426, 428. The usual books and stationery would also be required.

ARTILLERY STAFF.

REGIMENTAL STAFF OF A BRIGADE.

	Horse Brigade.	Field Brigade.	Siege or Garrison Brigade.	Remarks.
<i>Officers.</i>				
Colonel commandant - - -	1	1	1	For horses, see p. 15.
Colonels - - - - -	2	2	2	Not employed on regimental duties.
Lieutenant-colonels - - -	4	4	4	Only one present for duty.
Adjutant - - - - -	1	1	1	2nd captain.
Paymaster - - - - -	1	1	1	
Quartermaster - - - - -	1	1	1	
Surgeon - - - - -	1	1	1	
Assistant surgeons - - -	*	*	4	
Veterinary surgeons - - -	*	†	0	
Riding master - - - - -	1	1	0	
<i>Non-commissioned Officers.</i>				
Serjeant-major - - - - -	1	1	1	
Quartermaster serjeant - -	1	1	1	
Armourer serjeant - - - -	0	0	1	
Orderly-room clerk (serjeant)	1	1	1	
Paymaster serjeant - - - -	1	1	1	
Hospital serjeant - - - - -	1	1	1	
Trumpet major - - - - -	1	1	1	

* 1 with each battery.

† 1 for two batteries.

STAFF FOR ARTILLERY IN THE FIELD.*

Officers.	Men.			Horses.†				Store Carts.
	Civil Servants.	Clerks.	Drivers.	Riding.	Bât.	Pack.	Draught.	
<i>At Head Quarters.</i>								
Major-general commanding -	6	—	—	4	4	—	—	—
Assistant adjutant-general -	2	3	} 1 {	3	2	} †	2	1
Assistant quartermaster-general	2	3		3	2			
Aide-de-camp - - - - -	2	—	—	3	2	—	—	—
<i>With each Division of Infantry and the Artillery Reserve.</i>								
Lieutenant-colonel, R.A. -	3	1	—	3	2	—	—	—
Adjutant - - - - -	1	—	—	2	1	1	—	—
Quartermaster - - - - -	1	—	—	1	1	1	—	—
<i>With each Brigade of Cavalry.</i>								
Lieutenant-colonel, R.H.A. -	4	1	—	4	2	—	—	—
Adjutant - - - - -	2	—	—	3	1	1	—	—
Quartermaster - - - - -	2	—	—	2	1	1	—	—

* Agreeably to the proposed detail contained in the Report on the Composition for a Corps d'Armée.

† Riding and bât horses are private property; pack horses and draught horses are furnished by Government.

‡ Either 1 pack horse each, or 1 store cart between them.

PERSONAL EQUIPMENT.

The Royal Regiment of Artillery is divided for administrative purposes into several brigades, whose personal equipment varies in many of its details. A list to show its comparative cost for every rank is given at page 60, the detailed lists from which that is compiled are given at pages 39 to 59, and a general list of all the articles comprised under this head will be found at page 61.

DISTINCTIONS OF BRIGADES, RANKS, AND EMPLOYMENTS.

Distinctions of
brigades.

The horse brigades, or Royal Horse Artillery, are armed and equipped as light cavalry, and their uniform resembles that of a hussar regiment; field and garrison brigades wear a tunic instead of a jacket, their busby has no cap line, and they wear the plume on the left side instead of the top. The brigade to which they belong is shown by a number on the shoulder strap. Drivers and any other non-commissioned officers and men who are employed on mounted duties in the field brigades have leather bootings at the bottom of their trowsers, like the horse artillery, and wear spurs.

The arms and accoutrements are supplied to brigades according to the requirements of the service for which they are employed. The horse brigades have a sword.* A sword is worn likewise by mounted non-commissioned officers of field brigades, but the general arm for field and garrison brigades is the sword bayonet; a carbine accompanies the sword bayonet, but it is only occasionally carried.

The whole of the officers wear a light cavalry sword; those of the horse brigade are distinguished in full dress by wearing a laced jacket, a busby with the plume at the top, and a gold cap line: in undress by a black sword belt. Mounted officers of all brigades have black leather bootings, spurs, and sabretasches.†

Distinctions of
rank.
Officers.

The distinctions of rank in the Royal Regiment of Artillery correspond with those of the Royal Engineers and of light cavalry regiments, and are as follow:—

Lieutenants have an Austrian knot of gold cord on each sleeve, and a crown on each side of the collar.

Captains have the same knot ornamented with gold braid, and a star in addition to the crown.

Field officers, brevet or regimental, have on each sleeve a chevron of gold lace ornamented with small braid, and there is lace round the bottom (as well as the top) of the collar. The precise rank is shown by the badge on each side of the collar; majors having a star, lieutenant-colonels a crown, and colonels a star and crown.

On the stable jacket and frock coat the collar badges are worn by field officers only; the sleeve ornament of the frock coat is in black cord or black lace.

Staff.

Colonels on the staff, and those in command of field or garrison brigades, wear a cocked hat and feather in place of the busby and plume.

Officers on the general staff of the artillery are equipped like other staff officers, except that they wear the dress appointments of the regiment, and the coat is blue, with scarlet collar and cuffs.

* Until recently the drivers of the Horse Artillery had no arms.

† The use of the sabretasche, formerly restricted to the horse artillery and the adjutants in other brigades, was extended to all mounted officers in 1863.

For adjutants there is no distinction, except that those of garrison *Regimental* brigades are equipped as mounted officers. Medical officers wear a *Staff* black shoulder belt with a small case of instruments; veterinary surgeons also have a case of instruments, but the belt is white.

In the field and garrison brigades the regimental staff, adjutants excepted, wear cocked hats, and the feather in the hat is varied as follows:—For medical officers, it is black; for veterinary surgeons, it is red; for quartermasters, it is white; and for paymasters, it is omitted altogether. In the horse brigades the plume of the busby is varied in the same way; medical officers and veterinary surgeons also have black instead of gold cap lines.

The Austrian knot is worn universally by the non-commissioned *Non-commissioned officers and men.* officers and men: it is in gold cord for those who rank as serjeants, and in yellow worsted for the inferior ranks. It is worn by gunners and drivers without any other ornament, except the good-conduct badges to which they may be entitled.* Non-commissioned officers, artificers, trumpeters, and rough riders are distinguished by gold chevrons and badges, which are worn on both arms in full dress and on the right arm only in undress, thus,—

Non-commissioned officers.	}	Bombardiers - one gold chevron	}	between the elbow and shoulder.
		Corporals - - two ditto		
Serjeants - - three ditto, with a field gun over them				
Non-commissioned officers.	}	Battery staff serjeants, four chevrons, with a field gun, on the lower part of the sleeve.		
		Brigade staff serjeants in undress are distinguished from battery staff serjeants by having the chevrons and gun on both sleeves; those in the field and garrison brigades also have sword and pouch belts of white enamelled leather, like those of the officers.		
Artificers, &c.	}	Armourers, a hammer crossed with a pair of pincers.	}	Badges of employment.
		Assistant gunnery instructors, two guns crossed.		
		Collarmakers, a portsmouth bit and curb.		
		Farriers and shoeing smiths, a horse shoe.		
		Rough riders, a spur.		
		Trumpeters, two trumpets crossed.		
		Trumpet major, the same, with a sprig interposed between them.		
Wheelers, a wheel.				

The busby and tunic were adopted instead of the shako and coatee with epaulettes in 1854-5, at the same time the horse artillery jacket underwent some alteration, and the present undress uniform was introduced for both branches of the service.

ARMS, AMMUNITION, AND ACCOUTREMENTS.

The arms included in the personal equipment of the Royal Artillery Arms are,—

Sword, of light cavalry pattern; its length is 3 ft. 4½ in. (handle 5¼ in., blade 2 ft. 11 in.), its weight 4 lbs. 11 oz. (sword 2 lbs. 7 oz., scabbard 2 lbs. 4 oz.)

Sword bayonet, to be used with the carbine or separately; it weighs 1 lb. 10½ oz., and is furnished with a steel scabbard weighing 12½ oz., its length of blade is 1 ft. 10¼ in.

* These badges are plain chevrons on the lower part of the right sleeve. They are discontinued when the wearer reaches the rank of serjeant.

Carbine, pattern of 1853; the same bore, grooves, and twist as the Enfield musket; bore $\cdot 577$ inch in diameter, rifled in 3 grooves, with a spiral of 1 turn in 78 ins., length of barrel 2 ft., total length 3 ft. $3\frac{1}{4}$ in., weight 6 lbs. 2 oz. A later pattern, approved 30th December 1861, differs from the above in having five grooves, a spiral of one turn in 48 inches, and a back sight graduated up to 600 yards. (Circular 639, par. 434.) A *snap cap*, with chain and eyelet, a *stopper* for the muzzle, and a *wrench* with ball-drawer are provided with each carbine and classed under the head of arms. The wrench as issued to serjeants has a cramp; for rank and file it has none.

Ammunition.—The ball cartridge, in white paper, contains 2 drs. of Enfield rifle powder, and a ball weighing 530 grains ($1\frac{1}{2}$ oz.) The blank cartridge in purple paper, contains $3\frac{1}{2}$ drs. of powder. The percussion caps are of the usual pattern.

The *sword* is worn by all officers, by non-commissioned officers and men of the horse brigades, by the brigade staff serjeants of the other brigades, and by the mounted men of field batteries, drivers excepted.

The *sword bayonet* is worn by the drivers and dismounted non-commissioned officers and men of field brigades, and by all the non-commissioned officers and men (except brigade staff serjeants) of siege and garrison brigades.

The *carbine* is carried by all non-commissioned officers and men (except brigade staff serjeants) of siege or garrison brigades; a certain number of carbines is also issued to batteries of field and horse artillery, but these are attached to the limbers during a march, and are not carried by the men themselves. A few spare nipples are in charge of the serjeants. Twenty rounds of ball cartridge and thirty percussion caps are issued for each carbine, and an allowance is made for practice and exercise on the scale given at p. 122.

A chest constructed to hold 20 artillery carbines with sword bayonets was approved 1st April 1863; it measures, outside, 44" \times 21" \times 17 $\frac{1}{4}$ ", and weighs 91 lbs.

Accoutrements. The following belts, &c. are in use with these arms:—

For the *sword*,—

Sword belt, in two patterns, white enamelled leather with gilt plate for brigade staff serjeants (field and garrison only), and buff with brass snake hook plates for all other ranks. The belt complete includes two *carriages* and two *billets* or buckling pieces.

Sword knot, buff, in two patterns, for staff serjeants and other ranks.

For the *sword bayonet*,—

Waist belt, buff, with *frog* and *plate*; the plate is gilding metal for serjeants and brass for the rank and file.

For the *carbine*,—

Sling, buff, attached to the carbine.

Pouch, of black leather, with a gun ornament in gilding metal for serjeants and in brass for rank and file.

Pouch belt, buff.

Cap pocket or *pouch*, buff, worn on the pouch belt. (Cavalry pattern adopted 29/3/62.)

The following articles are also included in the term accoutrements:—
Trumpets, and *bugles*, with strings, for trumpeters.

Spurs and hoof pickers, for mounted non-commissioned officers and men. The spurs have been of the cavalry pattern since 1861 ; the picker has a turnscrew combined with it for fixing the spurs to the boots.

Canteens (wooden) and *havresacks*, for all ranks.*

The pouch and belt are worn by officers as well as by men armed with carbines. The dress pouch and belt are of blue morocco leather embroidered with gold. The undress pouch is of black patent leather, with a gilt device, and is intended to contain a small telescope, pencil, scale, and compasses. This pouch is worn with the dress belt by the horse artillery and with a white belt by other officers. Brigade staff serjeants (those of the horse artillery excepted) wear a pouch and belt of the undress pattern. The sabretasches worn by mounted officers may also be classed with accoutrements.

Small arms and accoutrements sent to an army in the field are in cases marked with a red ball.

A list of the cost prices of all arms and accoutrements, including the separate parts which can be obtained for repairs, may be seen in War Office Circular No. 756, 1st May 1862.

CLOTHING AND NECESSARIES.

The clothing supplied to serjeants is superior in quality to that of the rank and file, and in some instances there is a higher quality for the use of staff serjeants. Artificers receive the clothing for rank and file until they are entitled to rank as serjeants. Qualities.

The *busby* is of the same pattern for the horse artillery as for the other brigades, but the plume is worn on the top by the former, and on the left side by the latter. Serjeants have a gilt instead of a brass ornament. *Cap lines* (worn in the horse brigades) are of yellow worsted with gold runners and acorns for serjeants, and entirely of yellow worsted for inferior ranks.

Dress jackets for the horse artillery are of three qualities ; for staff serjeants, for serjeants, and for rank and file.

Undress jackets, tunics, trowsers, and overalls are of three qualities ; for staff serjeants, serjeants, and rank and file.

Forage caps are of two qualities ; for serjeants or staff serjeants, and for rank and file.

Cloaks and great coats are of two sorts, viz., cavalry pattern cloaks for the horse brigades and mounted men of field brigades ; and great coats for dismounted non-commissioned officers and men in field and garrison brigades. There is but one quality of each sort. The cloak has a cape which can be detached and worn separately. †

Boots and other articles of clothing or necessities are of one quality for all non-commissioned officers and men. The set of necessities for mounted men differs, however, from that of dismounted men ; the former is issued to the horse brigades, and the latter (generally) to the other brigades, but the drivers and other mounted men in field batteries are provided with the mounted kit. A complete list of each set is given at pages 57 and 59.

* These articles were formerly issued with camp equipage only, but are now in ordinary use.

† The cavalry pattern cloaks were adopted in 1863 in place of the horse artillery pattern cloaks previously worn by mounted men, and of the special great coats issued for the use of drivers.

Cloaks for mounted non-commissioned officers and gunners are expected to last 10 years, and the great coats of dismounted non-commissioned officers and men, 4 years. The permission lately given (24th January 1862) to wear them off duty does not affect these periods. At the end of the prescribed time they are examined by a board of officers, and condemned if found to be unserviceable. Requisitions for new ones are made through the Deputy Adjutant-general R.A.

All articles of personal equipment are inspected weekly by the battery officers to insure their being kept up to the proper establishment and in good condition.

A camp blanket and waterproof cover are supplied to each man for service in the field.

Clothing and necessaries sent to an army in the field are in packages marked with a black heart.

CONVEYANCE.

Those articles of the personal equipment which are not actually in wear are carried thus,—

Officers.—Each officer of artillery on service in the field has to provide a packhorse and saddle for his baggage. Mounted officers have also a valise to hold part of their effects. The weight of an officer's baggage in the field should not exceed 2 cwt.; at home it is according to his rank, viz., field officers 27 cwt., captains 18 cwt., subalterns 9 cwt. On board ship a certain cubical space is allowed according to rank, viz., field officers 135 cubical feet, captains 90 cubical feet, subalterns 60 cubical feet.

Non-commissioned officers and men, are allowed $\frac{1}{2}$ cwt. each (56 lbs.) of baggage at home, and $2\frac{1}{2}$ cubical feet on board ship. Some of their necessaries are packed in regimental bags, for which conveyance has to be provided; the rest (see pages 58-9) are contained in the valises or knapsacks, which are carried either by the men themselves, or by the horses and field carriages of the battery.

The dress ordered to be worn on various occasions is as follows:— Dress.

OFFICERS.

Full dress	Marching order, church parade, and courts-martial	Busby (or cocked hat) and plume; tunic (or dress jacket), undress trowsers; sword, undress sword belt and sabretasche, undress pouch and belt; steel spurs.
		At Court, reviews, and in evening dress
Undress	On parade and all duties	Forage cap, stable jacket, undress trowsers; sword and belts, &c., as for marching order.
	At mess	Stable jacket, waistcoat, dress trowsers, dress spurs.

The spurs and sabretasche do not apply to dismounted officers.

The frock coat may be worn as a morning dress, off parade, instead of the stable jacket; the pouch belt is not worn off parade except by officers on duty; the sword belt is worn under the jacket and over the

ARTILLERY.

frock coat or tunic ; trowser straps are to be worn on all occasions except in marching order on foot. A wooden canteen and canvas havresack, like those of the men, are worn on active service only.

NON-COMMISSIONED OFFICERS AND MEN.

Horse brigade, and mounted non-commissioned officers and men of field brigades.

Full dress	}	Marching order	{ Busby and plume, dress jacket or tunic, overalls, sword, sword belts, havresack, gloves, and spurs. Men armed with carbines have also a pouch and belt ; drivers of field brigades have a sword bayonet and waist belt instead of the cavalry sword and belt.
		Review order, church parade, and courts-martial	{ The same, except the havresack.
Undress	{	Forage cap, stable jacket, overalls, sword (with the above exceptions), sword belt, gloves, and spurs.	

Dismounted non-commissioned officers and men of field and garrison brigades.

Full dress	}	Marching order	{ Busby and plume, tunic, trowsers, leggings ; carbine (garrison brigades only), sword bayonet, waist belt, pouch and belt (for men armed with carbines), canteen, havresack, and gloves.
		Review order	{ The same, but without canteen or havresack.
		Church parade, and courts-martial	{ The same as marching order, but without the carbine, pouch belt, canteen, or havresack.
Undress	{	Forage cap, stable jacket, gloves, and such arms and accoutrements as may be ordered.	

Non-commissioned officers and men of garrison brigades carry their knapsacks, with kits complete, in marching order only.

PERSONAL EQUIPMENT.

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HORSE BRIGADES. OFFICERS.

Description.	Cost.	Weight.	Remarks.
OFFICER.			
<i>Arms.</i>			
Sword (and scabbard) - - -	£ 3 10 0	lbs. 3 2	
<i>Accoutrements.</i>			
Belt, pouch, dress, gold lace -	3 0 0	} 9 11	Worn also with the undress pouch. Used on active service only. Ditto.
Belts, sword { dress, gold lace -	3 10 0		
{ *undress, black -	2 0 0		
Canteen, wooden, with strap -	0 2 6		
Havresack - - - - -	0 1 0		
Knot, sword, gold line - - -	0 15 6		
Pouch { dress, gold embroidered -	4 10 0		
{ undress, black patent leather -	1 0 0		
Sabretasche { dress, embroidered -	11 0 0		
{ undress, black - - -	2 0 0		
<i>Uniform.</i>			
*Busby, with plume and ring - -	10 0 0	} 24 3	Paymasters have no plume.
*Cap line, gold - - - - -	3 0 0		
Cap, forage - - - - -	1 15 0		
Cloak - - - - -	6 10 0		
Frock coat - - - - -	6 10 0		
Gloves - - - - - pair	0 6 6		
Jackets - { *dress - - - - -	16 16 0		
{ stable - - - - -	5 10 0		
Spurs - { dress, brass - - - pair	0 10 6		
{ undress, steel - - - "	0 10 0		
Stock, black silk - - - - -	0 2 6		
Trowsers { dress, gold stripe - pair	4 10 0		
{ undress, booted - - - "	3 10 0		
Waistcoat - - - - -	1 15 0		
Total - - - - -	92 14 6	37 0	Approved 27th July 1863.

NOTES.

This list applies to battery officers, and, with the differences noted at p. 33, to the regimental staff. The cost and weight are to be taken only as an approximate guide.

The articles marked thus * are peculiar to the horse brigade; the rest are also worn by officers of the other brigades.

All additional things necessary for an officer's outfit are provided at his own discretion.

The amount of baggage is restricted to 2 cwt. on active service, and at home to the quantities described at page 37.

The distinctions of rank are described at page 32. The dress jackets worn by captains and field officers cost, in consequence of those distinctions, about 2*l.* and 3*l.* more than those of lieutenants; there is also a difference in the prices of the stable jackets and frock coats.

The dress to be worn on various occasions is given at page 37. Officers of horse artillery (riding masters excepted) have to provide and keep up at their own expense their horses, saddlery and stable necessaries, as shown under the head of "Horse Equipment."

PERSONAL EQUIPMENT.

41

NON-COMMISSIONED OFFICERS AND MEN.

Description.	Cost.	Weight.	Remarks.
STAFF SERJEANT.			
<i>Arms.</i>			
Sword (with scabbard) - - -	£ 0 19 0	lbs. 4 11 oz.	
<i>Accoutrements.</i>			
Belt, sword, buff, complete - - -	0 4 3	} 4 10	Including billets, &c. Issued every three years. Issued every five years.
Canteen, wooden, with strap - - -	0 2 6		
Havresack - - - - -	0 1 0		
Knot, sword - - - - -	0 1 0		
Picker, hoof, with turnscrew - - -	0 0 4½		
Spurs, steel - - - - pair	0 1 9		
<i>Clothing.</i>			
Boots, Wellington - - - pair	0 15 0	} 25 8	Issued every four years. To last 10 years.
„ ankle - - - - -	0 10 0		
Busby, with plume, ring, and cap line	0 16 0		
Cloak and cape - - - - -	3 2 6		
Gloves - - - - - pair	0 2 0		
Jacket, dress - - - - -	5 12 6		
Overalls, booted - - - pair	1 19 6		
Trowsers - - - - -	1 8 6		Without bootings, 1l. 14s. 6d.
<i>Necessaries.</i>			
Articles shown at page 57 - - -	3 12 5¾	} 20 2	Mounted kit.
Cap, forage - - - - -	0 11 9		
Jacket, undress - - - - -	2 7 0		
Total - - - - -	22 7 1	54 15	
SERJEANT.			
<i>Arms.</i>			
Sword (with scabbard) - - -	0 19 0	4 11	
<i>Accoutrements.</i>			
Belt, sword, buff, complete - - -	0 4 3	} 4 10	The belt to last 9 years ; the billets and carriages 6 years. To last 12 years. „ 2 „ „ 9 „ Issued every three years. Issued every five years.
Canteen, wooden, with strap - - -	0 2 6		
Havresack - - - - -	0 1 0		
Knot, sword, buff - - - - -	0 1 0		
Picker, hoof, with turnscrew - - -	0 0 4½		
Spurs - - - - - pair	0 1 9		
<i>Clothing.</i>			
Boots, Wellington - - - pair	0 15 0	} 25 7	Issued every four years. To last 10 years.
„ ankle - - - - -	0 10 0		
Busby, with plume, ring, and cap line	0 16 0		
Cloak and cape - - - - -	3 2 6		
Gloves - - - - - pair	0 2 0		
Jacket, dress - - - - -	4 12 6		
Overalls, booted - - - pair	1 6 0		
Trowsers - - - - -	0 17 6		Without bootings, 1l. 1s.
<i>Necessaries.</i>			
Articles shown at page 57 - - -	3 12 5¾	} 20 2-	Mounted kit.
Cap, forage - - - - -	0 11 9		
Jacket, undress - - - - -	1 13 0		
Total - - - - -	19 5 7	54 14	

NON-COMMISSIONED OFFICERS AND MEN.

Description.	Cost.	Weight.	Remarks.
GUNNER—cont.			
<i>Necessaries.</i>			
Articles detailed at page 57 - - -	£ 3 12 5½	} 22 0	Mounted kit.
Cap, forage - - - - -	0 1 10¼		
Jacket, undress - - - - -	0 14 0		
Total - - - - -	<u>13 12 8</u>	<u>57 4</u>	
DRIVER.			
<i>Arms.</i>			
Sword (with scabbard) - - -	0 19 0	4 11	
<i>Accoutrements.*</i>			
As detailed for serjeant - - -	0 10 10	4 10	
<i>Clothing.</i>			
As for gunner - - - - -	7 14 6	25 15	
<i>Necessaries.</i>			
As for gunner - - - - -	4 8 4	22 10	
Total - - - - -	<u>13 12 8</u>	<u>57 4</u>	
TRUMPETER.*			
<i>Arms.</i>			
Sword (with scabbard) - - -	0 19 0	4 11	
<i>Accoutrements.</i>			
As detailed for serjeant - - -	0 10 10	} 8 0	
Bugle, with string - - - - -	1 3 0		
Trumpet, with string - - - - -	0 14 6		
<i>Clothing.</i>			
As for gunner - - - - -	7 14 6	} 25 15	Two trumpets, crossed.
Badges, pair of, for dress jacket - -	0 0 11		
<i>Necessaries.</i>			
As for gunner - - - - -	4 8 4	} 22 0	
Badge for undress jacket - - - - -	0 0 6		
Total - - - - -	<u>15 11 7</u>	<u>60 10</u>	

* The driver's legging and whip are issued with the harness.

* One of the drivers in each battery of horse artillery is equipped and employed as a trumpeter.

HORSE BRIGADES. ARTIFICERS.

Description.	Cost.	Weight.	Remarks.
FARRIER.			
<i>Arms and Accoutrements, as before</i> -	£ 1 9 10	9 5	} 45 9 The badge is a horseshoe.
<i>Clothing and Necessaries, as serjeant</i>	17 15 9		
<i>Badges, extra</i> - - -	0 1 10		
Total - - -	<u>19 7 5</u>	<u>54 14</u>	
ARMOURER.			
<i>Arms and Accoutrements, as before</i> -	£ 1 9 10	9 5	} 45 9 A hammer crossed with a pair of pincers.
<i>Clothing and Necessaries, as serjeant</i>	17 15 9		
<i>Badges, extra</i> - - -	0 3 0		
Total - - -	<u>19 8 7</u>	<u>54 14</u>	
SHOEING SMITH.			
<i>Arms and Accoutrements, as before</i> -	£ 1 9 10	9 5	} 47 15 The same badge as for farriers.
<i>Clothing and Necessaries</i> - - -	12 2 10		
<i>Badges, extra</i> - - -	0 1 10		
Total - - -	<u>13 14 6</u>	<u>57 4</u>	
COLLAR MAKER.*			
<i>Arms and Accoutrements, as before</i> -	£ 1 9 10	9 5	} 47 15 A portmouth bit and curb.
<i>Clothing and Necessaries</i> - - -	12 7 7		
<i>Badges, extra</i> - - -	0 2 0		
Total - - -	<u>13 19 5</u>	<u>57 4</u>	
WHEELER.*			
<i>Arms and Accoutrements, as before</i> -	£ 1 9 10	9 5	} 47 15 A wheel
<i>Clothing and Necessaries</i> - - -	12 7 7		
<i>Badges, extra</i> - - -	0 2 10		
Total - - -	<u>14 0 3</u>	<u>57 4</u>	

* Collarmakers and wheelers receive the clothing of serjeants, or of rank and file, according to their length of service. In all cases they wear the same chevrons as the non-commissioned officers with whom they rank, in addition to the distinctive badges of their employment. In the above list the clothing and necessaries of a corporal are given for comparison.

The tools for the use of artificers are included in the matériel and stores of the battery to which they are attached. Farriers' churns are issued with the saddlery.

FIELD AND GARRISON BRIGADES. OFFICERS.

Description.	Cost.	Weight.	Remarks.
MOUNTED OFFICER.			
<i>Arms.</i>			
Sword (and scabbard) - - -	£ 3 10 0	lbs. 3 2	
<i>Accoutrements.</i>			
Belts, pouch { dress, gold lace - - -	3 0 0	} 9 15	Used on active service only. Ditto.
{ *undress, white - - -	1 2 0		
Belts, sword { dress, gold lace - - -	3 10 0		
{ *undress, white - - -	2 0 0		
Canteen, wooden, with strap - - -	0 2 6		
Havresack - - - - -	0 1 0		
Knot, sword, gold line - - - - -	0 15 6		
Pouch { dress, gold embroidered - - -	4 10 0		
{ *undress, black patent leather - - -	1 0 0		
Sabretasche { dress, embroidered - - -	11 0 0		
{ undress, (white slings) - - -	2 0 0		
<i>Uniform.</i>			
*Busby, with plume and ring - - -	7 17 6	} 22 12	Approved 27th July 1863.
Cap, forage - - - - -	1 15 0		
Cloak - - - - -	6 10 0		
Frock coat - - - - -	6 10 0		
Gloves - - - - - pair	0 6 6		
Jacket, stable - - - - -	5 10 0		
Spurs { dress, brass - - - pair	0 10 6		
{ undress, steel - - - "	0 10 0		
Stock, black silk - - - - -	0 2 6		
Trowsers { dress, gold stripe - pair	4 10 0		
{ undress, booted - - - "	3 10 0		
*Tunic - - - - -	7 10 0		
Waistcoat - - - - -	1 15 0		
Total - - - - -	79 8 0	35 13	

NOTES.

This list applies to mounted battery officers, and, with the differences noted at p. 33, to the regimental staff of field brigades. The articles, except what are marked thus *, are the same as are worn by officers of the horse brigades.

Dismounted officers do not wear spurs or sabretasches, and their trowsers are not booted.

All additional articles necessary for an officer's outfit are provided at his own discretion.

The amount of baggage is restricted to 2 cwt. on active service, and on home or colonial service to the quantities detailed at p. 37.

The distinctions of rank are described at page 32; the tunics worn by captains and field officers cost in consequence about 2*l.* and 3*l.* more than those of lieutenants; there is also a difference in the prices of the stable jackets and frock coats.

The saddlery and horse appointments of mounted officers are given at page 68; the officers of field batteries, and the riding-masters and quartermasters of field brigades are furnished with them by Government; all other mounted officers have to purchase them.

The dress to be worn on various occasions is given at p. 37. Officers serving in North America during the winter months are directed to wear the following winter clothing (see R.A. Cir. Mem. 15/3/62):—A frock coat with black fur on the collar, breast, and cuffs; a black fur cap with ear flaps; gauntlets of the same material; and a pair of Canadian boots over the trowsers and reaching to the knee. Mounted officers have hunting spurs. The coat is worn as an overcoat, with a scarlet scarf outside, and the sword belt underneath.

FIELD AND GARRISON BRIGADES.

Description.	Cost.	Weight.	Remarks.
DISMOUNTED OFFICER.			
<i>Arms.</i>			
Sword (and scabbard) - - -	£ 3 10 0	lbs. 3 2	The same patterns as for mounted officers.
<i>Accoutrements.</i>			
Belts, pouch { dress, gold lace - - -	3 0 0	} 6 8	Worn on active service only. Ditto.
{ undress, white - - -	1 2 0		
Belts, sword { dress, gold lace - - -	3 10 0		
{ undress, white - - -	2 0 0		
Canteen, wooden, with strap - - -	0 2 6		
Havresack - - - - -	0 1 0		
Knot, sword, gold line - - -	0 15 6		
Pouch { dress, gold, embroidered - - -	4 10 0		
{ undress, black patent leather - - -	1 0 0		
<i>Uniform.</i>			
Busby, with plume and ring ^a - - -	7 17 6	} 21 7	
Cap, forage - - - - -	1 15 0		
Cloak - - - - -	6 10 0		
Frock coat - - - - -	6 10 0		
Gloves - - - - -	0 6 6		
Jacket, stable - - - - -	5 10 0		
Stock, black silk - - - - -	0 2 6		
Trowsers { dress, gold stripe - - -	4 10 0		
{ undress - - - - -	2 10 0		
Tunic - - - - -	7 10 0		
Waistcoat - - - - -	1 15 0		
Total - - - - -	64 7 6	31 1	

^a A cocked hat is worn by paymasters and quartermasters; the latter have a drooping white feather, the former have none.

NOTES.

This list applies to the battery officers, the paymasters, and the quartermasters of garrison brigades. The rest of the regimental staff are mounted.

Brevet field officers always wear the distinctions of their rank, and are equipped as mounted officers, but do not wear booted trowsers and spurs on foot parades.

For distinctions of rank, see page 32; for full dress and undress, page 37; for baggage allowed, see page 37; and for the winter clothing in Canada refer to last page.

OFFICERS.

Description.	Cost.	Weight.	Remarks.
MEDICAL OFFICER.			
	£ s. d.	lbs. oz.	
<i>Arms.</i>			
Sword (and scabbard) - - -	3 10 0	3 2	
<i>Accoutrements.</i>			
*Belt, shoulder, black, with case of instruments * - - -	3 0 0	} 8 0	Worn on active service only. Ditto.
Belts, sword { dress, gold lace - - -	3 10 0		
{ undress, white - - -	2 0 0		
Canteen, wooden, with strap - - -	0 2 6		
Haversack - - - - -	0 1 0		
Knot, sword, gold line - - -	0 15 6		
†Sabretasche { dress, embroidered - - -	11 0 0		
{ undress, black - - -	2 0 0		
<i>Uniform.</i>			
*Cocked hat, with black feather - - -	4 17 6	} 22 10	
Cap, forage - - - - -	1 15 0		
Cloak - - - - -	6 10 0		
Frock coat - - - - -	6 10 0		
Gloves - - - - - pairs	0 6 6		
Jacket, stable - - - - -	5 10 0		
†Spurs { dress, brass - - - pairs	0 10 6		
{ undress, steel - - - "	0 10 0		
Stock, black silk - - - - -	0 2 6		
Trowsers { dress, gold stripe - pairs	4 10 0		
{ undress, bootied† - - - "	3 10 0		
Tunic - - - - -	7 10 0		
Waistcoat - - - - -	1 15 0		
Total - - - - -	69 16 0	33 12	

* The price and weight do not include instruments, for which there is no regulation.

NOTES.

* The articles marked thus * distinguish the medical officers from the rest of the regimental staff; for veterinary surgeons the shoulder-belt is white and the feather is red.

† Assistant surgeons doing duty in the garrison brigades are not mounted, and therefore do not wear sabretasches, spurs, or bootied trowsers.

The amount of baggage allowed to medical officers and veterinary surgeons is governed by the regulations at page 37.

Medical and veterinary officers wear the same distinctions of dress as those with whom they rank, viz. :-

- Assistant surgeon - - - { at first as lieutenant.
- Surgeon - - - - - { after six year's full-pay service, as captain.
- Surgeon-major - - - - - as major.
- Veterinary surgeon - - - - - as lieutenant-colonel.
- Do. do. 1st class - - - - - as lieutenant.
- Staff veterinary surgeon - - - - - as captain.
- Do. do. - - - - - as major.

The distinctions of rank are described at page 32, and the dress to be worn on various occasions at page 37.

ARTILLERY.

FIELD BRIGADES.*

Description.	Cost.	Weight.	Remarks.
STAFF SERJEANT.			
<i>Arms.</i>			
Sword (with scabbard) - - -	0 19 0	4 11	Brigade staff serjeants only. ^a Light cavalry pattern.
<i>Accoutrements.</i>			
Belts { sword, white enamelled leather	0 9 9	} 5 1	
pouch, do. do.	0 3 6		
Canteen, wooden, with strap - -	0 2 6		
Havresack - - - - -	0 1 0		
Knot, sword - - - - -	0 1 3		
Picker, hoof, with turnscrew - -	0 0 4½		
Pouch, black enamelled leather	0 9 0		
Spurs, steel - - - - -	0 1 9		
<i>Clothing.</i>			
Boots, Wellington - - - pair	0 15 0	} 25 1	Issued every 4 years. To last 10 years.
" " " " " " " " " "	0 10 0		
Busby, with plume and ring - -	0 12 0		
Cloak and cape - - - - -	3 2 6		
Gloves - - - - - pair	0 2 0		
Overalls, booted - - - - -	1 19 6		
Trowsers - - - - -	1 8 6		
Tunic - - - - -	3 10 0		
<i>Necessaries.</i>			
Articles detailed at page 57 - -	3 12 5½	} 20 2	Without bootings, 1l. 14s. 6d. Mounted kit. Distinction of rank on each sleeve.
Cap, forage - - - - -	0 11 9		
Jacket, undress - - - - -	2 7 0		
Total - - - - -	20 18 10	54 15	
SERJEANT.			
<i>Arms.</i>			
Sword (with scabbard) - - -	0 19 0	4 11	The same as above.
<i>Accoutrements.</i>			
Belt, sword, buff, complete - -	0 4 3	} 4 10	The same as are used in the Horse Artillery and with the same periods of duration. See p. 41.
Canteen, wooden, with strap - -	0 2 6		
Havresack - - - - -	0 1 0		
Knot, sword, buff - - - - -	0 1 0		
Picker, hoof, with turnscrew - -	0 0 4½		
Spurs - - - - - pair	0 1 9		
<i>Clothing.</i>			
Boots, Wellington - - - pair	0 15 0	} 25 2	Issued every four years. To last 10 years.
" " " " " " " " " "	0 10 0		
Busby, with plume and ring - -	0 12 0		
Cloak and cape - - - - -	3 2 6		
Gloves - - - - - pair	0 2 0		
Overalls, booted - - - - -	1 6 0		
Trowsers - - - - -	0 17 6		
Tunic - - - - -	2 5 6		

* Battery staff serjeants are equipped like serjeants, except that their rank is shown as mentioned at p. 33.

* There are about 20 non-commissioned officers and men in each field battery (besides drivers) equipped as mounted men; in this number the serjeant-major, quartermaster-jeant, farrier, two of the shoeing smiths, and both trumpeters are always included; the remainder are selected according to circumstances.

MOUNTED NON-COMMISSIONED OFFICERS AND MEN.

Description.	Cost.	Weight.	Remarks.
SERGEANT—cont.			
<i>Necessaries.</i>			
Articles shown at page 57 - - -	3 12 5 $\frac{3}{4}$	} 19 15	Mounted kit.
Cap, forage - - - - -	0 11 9		
Jacket - - - - -	1 2 0		
Total - - - - -	<u>16 6 7</u>	<u>54 6</u>	
CORPORAL.			
<i>Arms.</i>			
Sword (with scabbard) - - -	0 19 0	4 11	
<i>Accoutrements.</i>			
As detailed for serjeant - - -	0 10 10	4 10	
<i>Clothing.</i>			
As for driver - - - - -	7 13 6	} 25 10	Two on each sleeve.
Four chevrons for tunic, extra - -	0 3 2		
<i>Necessaries.</i>			
As for driver - - - - -	4 7 9	19 15	On the right sleeve.
Two chevrons for jacket, extra - -	0 1 7	- -	
Total - - - - -	<u>13 15 10</u>	<u>54 14</u>	
BOMBARDIER.			
<i>Arms.</i>			
Sword - - - - -	0 19 0	4 11	
<i>Accoutrements.</i>			
As detailed for serjeant - - -	0 10 10	4 10	
<i>Clothing.</i>			
As for driver - - - - -	7 13 6	} 25 10	One on each sleeve.
Two chevrons for tunic, extra - -	0 1 7		
<i>Necessaries.</i>			
As for driver - - - - -	4 7 9	} 19 15	On the right sleeve.
Chevron for jacket, extra - - -	0 0 9 $\frac{1}{2}$		
Total - - - - -	<u>13 13 5</u>	<u>54 14</u>	

FIELD BRIGADES.

Description.	Cost.	Weight.	Remarks.
DRIVER.			
	<i>£ s. d.</i>	<i>lbs. oz.</i>	
<i>Arms.</i>			
Sword bayonet (with scabbard) -	0 16 0	2 7	
<i>Accoutrements.</i>			
Belt, waist, complete - - -	0 3 9	} 3 13	Frog and plate included.
Canteen, wooden, with strap - - -	0 2 6		
Havresack - - - - -	0 1 0		
Picker, hoof, with urnscrew - - -	0 0 4 $\frac{1}{4}$		
Spurs, steel - - - - - pair	0 1 9		
<i>Clothing.</i>			
Boots, Wellington - - - - pair	0 15 0	} 25 10	Issued every 4 years. To last 10 years.
" ancle - - - - - "	0 10 0		
Busby, with plume and ring - - -	0 10 6		
Cloak and cape - - - - -	3 2 6		
Gloves - - - - - pair	0 2 0		
Overalls, booted - - - - - "	1 1 0		
Trowsers - - - - - "	0 13 0		
Tunic - - - - -	0 19 6		Without bootings, 16s.
<i>Necessaries.</i>			
Articles detailed at page 57 - - -	3 12 5 $\frac{3}{4}$	} 19 15	Mounted kit.
Cap, forage - - - - -	0 1 9		
Jacket - - - - -	0 13 6		
Total - - - - -	<u>13 6 7</u>	<u>51 13</u>	
TRUMPETER.			
<i>Arms.</i>			
Sword (with scabbard) - - - -	0 19 0	4 11	
<i>Accoutrements.</i>			
As detailed for serjeant - - - -	0 10 10	} 8 0	Bugle and trumpet the same as for the horse brigade.
Bugle, with string - - - - -	1 3 0		
Trumpet, with string - - - - -	0 14 6		
<i>Clothing.</i>			
As for driver - - - - -	7 13 6	} 25 10	The badge is two trumpets crossed.
Badges, pair of, for tunic, extra -	0 0 11		
<i>Necessaries.</i>			
As for driver - - - - -	4 7 9	} 19 15	
Badge, for jacket, extra - - - -	0 0 6		
Total - - - - -	<u>15 10 0</u>	<u>58 4</u>	

PERSONAL EQUIPMENT.

MOUNTED ARTIFICERS.

Description.	Cost.	Weight.	Remarks.
FARRIER.			
<i>Arms and Accoutrements.</i>			
As serjeant - - - - -	1 9 10	9 5	
<i>Clothing and Necessaries.</i>			
As serjeant - - - - -	14 16 9	} 45 1	A horse-shoe.
Badges, extra - - - - -	0 1 10		
Total - - - - -	16 8 5	54 6	
SHOEING SMITH.			
<i>Arms and Accoutrements.</i>			
As detailed for serjeant - - - - -	1 9 10	9 5	For dismounted shoeing smiths, see further on.
<i>Clothing and Necessaries.</i>			
As driver - - - - -	12 1 3	} 45 9	A horse-shoe.
Badges, extra - - - - -	0 1 10		
Total - - - - -	13 12 11	54 - 4	

FIELD AND GARRISON BRIGADES.

Description.	Cost.	Weight.	Remarks.
STAFF SERJEANT.			
<i>Arms.</i>			
Sword (with scabbard) - - -	0 19 0	4 11	For brigade staff serjeants only. ^a Light cavalry pattern.
<i>Accoutrements.</i>			
As for mounted staff serjeants, <i>except</i> the spurs - - - - -	1 7 4	4 9	
<i>Clothing.</i>			
Boots, Wellington - - - pair	0 15 0	} 20 12	Issued every 4 years. To last 4 years. To last 3 years.
" " " " " "	0 10 0		
Busby, with plume and ring - -	0 12 0		
Great coat - - - - -	1 10 0		
Leggings - - - - - pair	0 3 4		
Trowsers, 2 pairs - each 1l. 8s. 6d.	2 17 0		
Tunic - - - - -	3 10 0		
<i>Necessaries.</i>			
Articles detailed at page 59 - -	2 14 8	} 18 12	Dismounted kit. Distinction of rank on each sleeve.
Cap, forage - - - - -	0 11 9		
Jacket - - - - -	2 7 0		
Total - - - - -	17 17 1	48 14	
SERJEANT.			
<i>Arms.</i>			
Sword-bayonet (with scabbard) -	0 16 0	2 7	In field batteries the carbine is usually carried on the gun limber. With cramp.
Carbine, with ramrod - - -	2 19 0	6 2	
Nipples for ditto, 3 - each 1½d.	0 0 5½	} 0 7	
Snap cap, with chain and eyelet -	0 0 1½		
Stopper - - - - -	0 0 2½		
Wrench and ball-drawer - - -	0 1 9		
<i>Ammunition.</i>			
Cartridges, ball (20) - - - -	- - -	} 1 13	To last 12 years. Frog and plate included.
Caps, percussion (30) - - - -	- - -		
<i>Accoutrements.</i>			
Belt, waist, complete, buff - -	0 3 9	} 5 6	To last 2 years. With gun ornament. Worn on the pouch belt. On the carbine.
Canteen, wooden, with strap - -	0 2 6		
Haversack - - - - -	0 1 0		
Belt, for pouch, buff - - - -	0 3 0		
For the { Pouch, ammunition, black-	0 4 6		
carbine { Pouch, for caps, buff - - -	0 1 0		
{ Sling, for carbine, buff - - -	0 0 10		

^a Battery staff serjeants are equipped the same as serjeants, with the exception noted at p. 33.

DISMOUNTED NON-COMMISSIONED OFFICERS AND MEN.

Description.	Cost.	Weight.	Remarks.
SERJEANT—cont.			
<i>Clothing.</i>			
Boots, Wellington - - - pair	0 15 0	} 20 15	Issued every 4 years. To last 4 years. To last 3 years.
" ankle - - - - "	0 10 0		
Busby, with plume and ring - -	0 12 0		
Great coat - - - - -	1 10 0		
Leggings - - - - -	0 3 4		
Trousers, 2 pairs - each 17s. 6d.	1 15 0		
Tunic - - - - -	2 5 6		
<i>Necessaries.</i>			
Articles detailed at page 59 - -	2 14 8	} 18 9	Dismounted kit.
Cap, forage - - - - -	0 11 9		
Jacket - - - - -	1 2 0		
Total - -	16 12 4	55 11	
CORPORAL.			
<i>Arms.</i>			
As gunner - - - - -	3 16 2	8 14	Carbine and sword-bayonet.
<i>Ammunition.</i>			
20 ball cartridges and 30 caps -	- - -	1 13	
<i>Accoutrements.</i>			
As gunner - - - - -	0 16 4	5 6	
<i>Clothing.</i>			
As for gunner - - - - -	5 14 4	} 21 4	Two on each arm.
Four chevrons for tunic, extra -	0 3 2		
<i>Necessaries.</i>			
As for gunner - - - - -	3 10 1	} 18 9	On the right arm.
Two chevrons for jacket, extra -	0 1 7		
Total - -	14 1 8	55 14	
BOMBARDIER.			
<i>Arms.</i>			
As gunner - - - - -	3 16 2	8 14	Carbine and sword-bayonet.

FIELD AND GARRISON BRIGADES.

Description.	Cost.	Weight.	Remarks.
BOMBARDIER—cont.			
<i>Ammunition.</i>			
20 ball cartridges and 30 caps - - -	- - -	1 13	
<i>Accoutrements.</i>			
As gunner - - - - -	0 16 4	5 6	
<i>Clothing.</i>			
As for gunner - - - - -	5 14 4	} 21 4	One on each arm.
Two chevrons for tunic, extra	0 1 7		
<i>Necessaries.</i>			
As for gunner - - - - -	3 10 1	} 18 9	On the right arm.
Chevron for jacket, extra - - -	0 0 9½		
Total - - -	<u>13 19 4</u>	<u>55 14</u>	
GUNNER.			
<i>Arms.</i>			
Sword bayonet, with scabbard - - -	0 16 0	2 7	
Carbine, with ramrod - - - - -	2 19 0	6 2	In field batteries the carbine is usually carried on the gun limber. Without cramp.
Snap-cap, with chain and eyelet - - -	0 0 1¼	} 0 5	
Stopper - - - - -	0 0 2¼		
Wrench, with ball drawer - - - - -	0 0 10		
<i>Ammunition.</i>			
20 ball cartridges and 30 caps - - -	- - -	1 13	
<i>Accoutrements.</i>			
Belt, waist, complete, buff - - -	0 3 9	} 5 6	To last 12 years.
Canteen, wooden, with strap - - -	0 2 6		Frog and plate included.
Haversack - - - - -	0 1 0	} 5 6	To last 2 years.
For the carbine. { Belt, pouch, buff - - -	0 3 0		With brass gun ornament. Worn on the pouch belt. On the carbine.
{ Pouch, ammunition, black - - -	0 4 3		
{ Pouch, for caps, buff - - -	0 1 0		
{ Sling, carbine, buff - - -	0 0 10		
<i>Clothing.</i>			
Boots, Wellington - - - pair	0 15 0	} 21 4	Issued every 4 years.
„ ankle - - - - -	0 10 0		To last 4 years.
Busby, with plume and ring - - -	0 10 6		To last 3 years.
Great coat - - - - -	1 10 0		
Leggings - - - - - pair	0 3 4		
Trowsers, 2 pairs - - - each 13s.	1 6 0		
Tunic - - - - -	0 19 6		

**DISMOUNTED NON-COMMISSIONED OFFICERS
AND MEN.**

Description.	Cost.	Weight.	Remarks.
GUNNER—cont.			
<i>Necessaries.</i>			
Articles detailed at page 59 - - -	2 14 8½	} 18 9	Dismounted kit.
Cap, forage - - - - -	0 1 10½		
Jacket - - - - -	0 13 6		
Total - - -	13 16 11	55 14	
TRUMPETER.			
<i>Arms.</i>			
Sword bayonet - - - - -	0 16 0	2 7	Trumpeters are never armed with carbines.
<i>Accoutrements.</i>			
Waistbelt, canteen, and havresack -	0 7 3	} 6 11	As for gunner. The trumpet and bugle are the same as for the horse brigades.
Bugle, with string - - - - -	1 3 0		
Trumpet, with string - - - - -	0 14 6		
<i>Clothing.</i>			
As for gunner - - - - -	5 14 4	} 21 4	The badge is two trumpets crossed.
Badges, pair of, for tunic, extra -	0 0 11		
<i>Necessaries.</i>			
As for gunner - - - - -	3 10 1	} 18 9	
Badge for jacket, extra - - - - -	0 0 6		
Total - - - - -	12 6 7	48 15	

FIELD AND GARRISON BRIGADES. DISMOUNTED ARTIFICERS.*

Description.	Cost.	Weight.	Remarks.
ARMOURER.			
<i>Arms and Accoutrements.</i>			
As serjeant - - - - -	4 14 1	16 3	Carbine and sword-bayonet, &c.
<i>Clothing and Necessaries.</i>			
As serjeant - - - - -	11 18 1	} 39 8	A hammer crossed with a pair of pincers.
Badges, extra - - - - -	0 3 0		
Total - - - - -	16 15 4	55 11	
SHOEING SMITH.			
<i>Arms and Accoutrements.</i>			
As gunner - - - - -	4 12 6	16 1	Carbine and sword-bayonet, &c.
<i>Clothing and Necessaries.</i>			
As gunner - - - - -	9 4 5	} 39 13	A horse-shoe.
Badges, extra - - - - -	0 1 10		
Total - - - - -	13 18 9	55 14	
COLLARMAKER.			
<i>Arms and Accoutrements.</i>			
As gunner - - - - -	4 12 6	16 1	A portmouth bit, and curb.
<i>Clothing and Necessaries.</i>			
As corporal* - - - - -	9 9 2	} 39 13	
Badges, extra - - - - -	0 2 0		
Total - - - - -	14 3 8	55 14	
WHEELER.			
<i>Arms and Accoutrements.</i>			
As gunner - - - - -	4 12 6	16 1	A wheel.
<i>Clothing and Necessaries.</i>			
As corporal* - - - - -	9 9 2	} 39 13	
Badges, extra - - - - -	0 2 10		
Total - - - - -	14 4 6	55 14	

* The farrier is always mounted, and has the clothing, &c. of a serjeant. The collar-makers and wheelers receive the same quality of clothing as the non-commissioned officers with whom they rank. In the above lists the clothing of a corporal is given for comparison.

MOUNTED KIT.

ESTABLISHMENT OF NECESSARIES FOR THE HORSE BRIGADES AND MOUNTED NON-COMMISSIONED OFFICERS OR MEN OF FIELD BRIGADES.

Description.	No. of Drawing.	Cost.	Weight.	Total No.	Remarks.
		£ s. d.	lbs. oz.		The prices are according to Cir. 853, 3 Mar. /64. To contain various articles.
Bags { *brush - - - - -		0 0 8½	0 3	1	
waterproof, with hook - - - - -		0 6 0½	1 2½	1	
shaving - - - - -		0 0 1¾	0 0½	1	
*stable - - - - -		0 0 10½	0 5½	1	
Blacking in case - - - - -		0 0 2½	0 7½	1	
Books { account - - - - -		0 0 6	0 1¾	1	
bible and prayer book - - - - -		See general list.		1	
Braces - - - - - pair		0 0 11	0 4	1	
Brass ball - - - - -		0 0 1½	0 4	1	
Brushes { brass or button clothes - - - - -		0 0 6¾	0 3	1	
hair - - - - -		0 0 10¾	0 4	1	
shaving - - - - -		0 0 11½	0 3	1	
shoe { blacking *hard - - - - -		0 0 4	0 5	1	
polishing - - - - -		0 0 10½	0 5	1	
Button brass - - - - -		0 0 1¾	0 2	1	
*Can, oil - - - - -		0 0 6½	0 3	1	
Cap, forage - - - - -		According to rank.		1	Two qualities.
Case for plume - - - - -		0 0 1¾	0 0½	1	
Comb - - - - -		0 0 2½	0 0½	1	
*Drawers, 5s. 1½d. per pair - pairs		0 10 3½	1 10	2	
Gloves, leather - - - - - pair		0 2 7	0 2½	1	
Holdall - - - - -		0 0 5	0 3	1	
Jacket, undress, cloth - - - - -		According to rank.		1	Three qualities.
Knife, fork, and spoon - the set		0 0 7½	0 5	1	
Knife, pocket - - - - -		0 0 7½	0 4¾	1	
†Mess tin with strap - - - - -		0 1 5½	1 2½	1	
Razor and cas - - - - -		0 0 4¾	0 2½	1	
*Rubber, horse - - - - -		0 0 8½	0 8	1	
Shirts { cotton, 4s. 3½d. each - - - - -		0 12 9½	2 11½	3	
flannel, 4s. 8½d. each - - - - -		0 9 5	1 2	2	
Socks, 1s. 0½d. each - - - - - pairs		0 3 0¾	0 13½	3	
Sponge, pipeclay - - - - -		0 0 9	0 0½	1	
Stock, leather - - - - -		0 0 5¾	0 2	1	
Towels, linen, 9¾d. each - - - - -		0 1 7	1 0	2	
†Valise, blue cloth - - - - -		0 10 5	2 6½	1	27" long, 6½" diameter.
Set of straps, for do. (3) - - - - -		0 1 8½	0 5	1	
Total - - - - -		3 12 5¾	17 10	45	

*The articles marked thus * do not form part of the kits of dismantled non-commissioned officers and men.

†The mess tin, overalls, and valise of mounted men correspond with the tin canteen, trowsers, and knapsack of dismantled men. Straps for the valise have hitherto been supplied with saddlery and harness, but are in future to accompany the valise and be kept up as part of the kit.—(R.A. Cir. Mem., 6/12/62.)

FIELD AND CAISSON BRIGADES. DISMOUNTED ARTIFICERS.*

Description.	Cost.	Weight.	Remarks.
ARMOURER.			
<i>Arms and Accoutrements.</i>			
As sergeant - - - - -	4 14 1	16 3	Carbine and sword-bayonet, &c.
<i>Clothing and Necessaries.</i>			
As sergeant - - - - -	11 18 1	} 39 8	A hammer crossed with a pair of pincers.
Badges, extra - - - - -	0 3 0		
Total - - - - -	16 15 4	55 11	
SHOEING SMITH.			
<i>Arms and Accoutrements.</i>			
As gunner - - - - -	4 12 6	16 1	Carbine and sword-bayonet, &c.
<i>Clothing and Necessaries.</i>			
As gunner - - - - -	9 4 5	} 39 13	A horse-shoe.
Badges, extra - - - - -	0 1 10		
Total - - - - -	13 18 9	55 14	
COLLARMAKER.			
<i>Arms and Accoutrements.</i>			
As gunner - - - - -	4 12 6	16 1	A portmouth bit, and curb.
<i>Clothing and Necessaries.</i>			
As corporal - - - - -	9 9 2	} 39 13	
Badges, extra - - - - -	0 2 0		
Total - - - - -	14 3 8	55 14	
WHEELER.			
<i>Arms and Accoutrements.</i>			
As gunner - - - - -	4 12 6	16 1	A wheel.
<i>Clothing and Necessaries.</i>			
As sergeant - - - - -	9 9 2	} 39 13	
Badges, extra - - - - -	0 2 10		
Total - - - - -	14 4 6	55 14	

* The above is always mounted, and has the clothing, &c. of a sergeant. The artificers receive the same quality of clothing as the mounted artificers. In the above list the clothing of a corporal is included.

PERSONAL EQUIPMENT

MOUNTED SET.

ESTABLISHMENT OF NECESSARIES FOR THE MOUNTED NON-COMMISSIONED OFFICERS OF THE BRIGADES.

Description.	No. of Drawings	Quantity	Value	Remarks		
Bags { *brush	-	-	-	The items are specified in the list of the mounted set.		
waterproof. with nose shaving	-	-	-			
*stable	-	-	-			
Blacking in case	-	-	-			
Books { account	-	-	-			
bible and prayer book	-	-	-			
Braces -	pair	-	-			
Brass ball	-	-	-			
Brushes {	-	-	-			
					brush or button clothes	
					hair	
shaving	-	-	-			
					shoe {	blacking
						*hard
polishing	-	-	-			
Button brass	-	-	-			
*Can, oil	-	-	-			
Cap, forage	-	-	-			
Case for plume	-	-	-			
Comb	-	-	-			
*Drawers, 5s. 1½d. per pair	pair	-	-			
Gloves, leather	pair	-	-			
Holdall	-	-	-			
Jacket, undress, cloth	-	-	-			
Knife, fork, and spoon	the set	-	-			
Knife, pocket	-	-	-			
†Mess tin with strap	-	-	-			
Razor and case	-	-	-			
*Rubber, horse	-	-	-			
Shirts {	-	-	-			
					cotton, 4s. 3½d. each	
flannel, 4s. 8½d. each	-	-	-			
Socks, 1s. 0½d. each	pair	-	-			
Sponge, pipeclay	-	-	-			
Stock, leather	-	-	-			
Towels, linen, 9½d. each	-	-	-			
†Valise, blue cloth	-	-	-			
Set of straps, for the (3)	-	-	-			

* The men.

† The approach

life.
b, hold-all,
time, jacket,
old batteries
and attached
conveyance

ARTILLERY.

MOUNTED KIT.

NOTES.

Spurs are now issued as accoutrements, and a large sponge as stable necessities; both these formed part of the kit until the year 1861.

Besides the above articles each mounted man is furnished with a blanket and waterproof cover, which are carried either round the valise or on the lids of the ammunition boxes. They are wrapped round the valises of all drivers, and of those ganners in the horse brigade who are carried on the limber boxes of the guns and wagons; for all other mounted men they are carried on the lids of the ammunition boxes.

The valise contains the following articles:—

Books (account, bible, and prayer book), brass ball, brushes (brass, cloth, hair, shaving), button brass, plume case, comb, drawers (one pair), holdall, jacket, knife, fork and spoon, overalls, razor and case, two cotton shirts, flannel shirt, two pairs of socks, and two towels.

The remaining articles are carried by means of the wallets attached to the saddles, or in the waterproof bags.

DISMOUNTED KIT.

ESTABLISHMENT OF NECESSARIES FOR EACH DISMOUNTED NON-COMMISSIONED OFFICER OR MAN OF THE FIELD AND GARRISON BRIGADES.

Description.	No. of Drawing.	Cost.	Weight.	Total No.	Remarks.
Bags { waterproof, with hook	- - -	£ 6 0 $\frac{1}{4}$	1 2 $\frac{1}{2}$	1	The prices are according to Cir. 853, 3 Mar. /64.
{ shaving - - -	- - -	0 0 1 $\frac{3}{4}$	0 0 $\frac{1}{2}$	1	
{ account - - -	- - -	0 0 2 $\frac{1}{4}$	0 7 $\frac{1}{2}$	1	
Books { bible and prayer	- - -	0 0 6	0 1 $\frac{3}{4}$	1	According to persuasion.
{ See general list.	- - -	- - -	- - -	1	
Braces - - -	- - -	0 0 11	0 4	1	Two qualities.
Brass ball - - -	- - -	0 0 1 $\frac{1}{2}$	0 4	1	
{ brass or button	- - -	0 0 6 $\frac{1}{2}$	0 3	1	
{ clothes - - -	- - -	0 0 10 $\frac{1}{2}$	0 4	1	
{ hair - - -	- - -	0 0 11 $\frac{1}{2}$	0 3	1	
Brushes { shaving	- - -	0 0 3 $\frac{1}{2}$	0 1	1	
{ shoe { blacking	- - -	0 0 4	0 5	1	
{ shoe { hard	- - -	0 0 10 $\frac{1}{4}$	0 5	1	
{ shoe { polishing	- - -	0 0 10	0 5	1	
Button brass - - -	- - -	0 0 1 $\frac{3}{4}$	0 2	1	
Canteen, tin, with cover and strap	- - -	0 1 10 $\frac{3}{4}$	1 3	1	
Cap, forage - - -	- - -	According to rank.		1	
Case for plume - - -	- - -	0 0 1 $\frac{3}{4}$	0 0 $\frac{1}{4}$	1	
Comb - - -	- - -	0 0 2 $\frac{1}{2}$	0 0 $\frac{1}{4}$	1	
Gloves, leather - - - pair	- - -	0 2 7	0 2 $\frac{1}{4}$	1	
Holdall - - -	- - -	0 0 5	0 3	1	
Jacket, cloth - - -	- - -	According to rank.		1	
Knapsack and pair of slings	- - -	0 6 1 $\frac{1}{4}$	3 12 $\frac{3}{4}$	1	
Knife, fork, and spoon - the set	- - -	0 0 7 $\frac{1}{4}$	0 5	1	
Knife, pocket - - -	- - -	0 0 7 $\frac{1}{4}$	0 4 $\frac{3}{4}$	1	
Razor and case - - -	- - -	0 0 4 $\frac{1}{2}$	0 2 $\frac{1}{4}$	1	
Shirts { cotton, 4s. 3 $\frac{1}{2}$ d. each	- - -	0 12 9 $\frac{1}{4}$	2 11 $\frac{1}{2}$	3	
{ flannel, 4s. 8 $\frac{1}{2}$ d. each	- - -	0 9 5	1 2	2	
Socks, 1s. 0 $\frac{1}{2}$ d. per pair	- - -	0 3 0 $\frac{3}{4}$	0 13 $\frac{1}{4}$	3	
Spunge, pipeclay - - -	- - -	0 0 9	0 0 $\frac{1}{2}$	1	
Stock, leather - - -	- - -	0 0 5 $\frac{1}{4}$	0 2	1	
Straps, great coat - - - pair	- - -	0 0 10	0 4 $\frac{3}{4}$	1	
Towels, linen, 9 $\frac{1}{2}$ d. each	- - -	0 1 7	1 0	2	
Total - - -	- - -	2 14 8 $\frac{1}{2}$	16 4	39	Three qualities.

The distribution of the entire kit on the march is as follows :

In wear,—braces, gloves, 1 flannel shirt, 1 cotton shirt, 1 pair of socks, stock, and pocket knife.

In the knapsack,—account book, bible, boots, 2 shoe brushes, canteen (outside), cap, comb, hold-all, knife, fork, and spoon, 1 cotton shirt, 1 flannel shirt, 2 pairs of socks, and trowsers.

In the bag,—blacking, 4 brushes (button, cloth, hair, and shaving), button brass, case for plume, jacket, razor and case, 1 cotton shirt, spunge, and 2 towels.

For active service each man is furnished with a blanket and waterproof cover, which in the field batteries are carried on the lids of the ammunition boxes.

The knapsack is carried by the men themselves when they are on siege or garrison duties, and attached to the guns and wagons when they are serving in field batteries; for the waterproof bag conveyance has always to be provided.

The great coat is folded on the back of the knapsack, and the canteen carried on the top.

ARTILLERY.

COMPARATIVE VALUE AND WEIGHT OF EQUIPMENTS FOR DIFFERENT RANKS.

Rank.	Horse Brigade.		Field and Garrison Brigades.									
			Mounted.		Dismounted.							
	Value.	Weight.	Value.	Weight.	Value.	Weight.						
OFFICERS.												
	£	s.	d.	lbs.	£	s.	d.	lbs.				
Field officer - - - -	100	0	0	260	87	0	0	260	—	—		
Captain - - - -	97	0	0	260	84	0	0	260	69	0	0	260
Lieutenant - - - -	92	14	6	260	79	8	0	260	64	7	6	260
Medical officer - - - -	87	4	6	260	69	16	0	260	54	15	0	260
NON-COMMISSIONED OFFICERS AND MEN.												
Staff serjeant - - - -	22	7	1	55	20	18	10	55	17	17	1	49
Serjeant - - - -	19	5	7	55	16	6	7	54	16	12	4	55½
Corporal - - - -	13	17	5	57	13	15	10	55	14	1	8	56
Bombardier - - - -	13	15	0	57	13	13	5	55	13	19	4	56
Gunner - - - -	13	12	8	57	-	-	-	-	13	16	11	56
Driver - - - -	13	12	8	57	13	6	7	52	—	—	—	—
Trumpeter - - - -	15	11	7	61	15	10	0	58	12	6	7	49
ARTIFICERS.												
Farrier - - - -	19	7	5	55	16	8	5	54	—	—	—	—
Armourer - - - -	18	8	7	55	-	-	-	-	16	15	4	55½
Shoeing smith - - - -	13	14	6	57	13	12	11	55	13	18	9	56
Collarmaker - - - -	13	19	5	57	-	-	-	-	14	3	8	56
Wheeler - - - -	14	0	3	57	-	-	-	-	14	4	6	56

NOTES.

The value assigned to officers' equipments applies to their uniforms only.
The weight includes 2 cwt. of baggage in addition to the uniform.
The details for all ranks are given in the preceding lists.

PERSONAL EQUIPMENT.

61

GENERAL LIST OF THE ARTICLES GIVEN IN THE PRECEDING LISTS UNDER THIS HEAD.

Name.	Price.	Weight.	Classed in the other Lists as	In what Proportion required.*	Remarks.		
Account book - - -	£ s. d.	lbs. oz.	Necessaries -	One for each kit.			
	0 0 6	0 1½					
	0 2 0	0 0½					
	0 19 0	0 1					
Badges, for (pairs) {	armourers -	0 1 3½	0 0½	Added to price of tunic or jacket.	One pair for each tunic and dress jacket; single one for each undress jacket.		
	assistant gun- nery instructors	0 1 2½	0 0½				
	collarmakers -	0 1 5	0 0½				
	farrriers and shoing smiths	0 15 0	0 0½				
	rough riders -	0 0 10½	0 0½				
	trumpet-majors	0 1 10½	0 0½				
	trumpeters -	0 0 9½	0 0½				
	wheelers -	0 0 8½	0 3				
good conduct -	0 6 0½	1 2	Necessaries -	For each mounted man.			
Bags {	brush -	0 0 1½	0 0½	Do. - - -	One for each kit.		
	waterproof, with hook shaving -	0 0 10½	0 5	Do. - - -	Do.		
	stable -	0 0 10½	0 5	Necessaries -	For each mounted man.		
for busby. See Busby.							
Ball-drawer. See Wrench	- - -	- - -	Arms - - -	- - -	The two are combined.		
Bayonet, sword, complete	0 16 0	1 10½	Do. - - -	} See p. 34.			
Scabbard for do. - - -	0 5 0	0 12½	Do. - - -				
Belt {	pouch {	gold lace (dress) -	3 0 0	0 9	Accoutrements	For all officers - - -	Medical officers excepted.
		white enamelled -	1 2 0	0 7	Do. - - -	For officers R.A. - -	Ditto.
		leather - - -	0 3 6	0 7	Do. - - -	Brigade staff serjeants -	Not used in horse bri- gades.
		buff - - -	0 3 0	0 9	Do. - - -	For serjeants - - -	} If armed with carbines. To carry a small case of instruments.
	shoulder, black (Army pattern).	0 3 0	0 9	Do. - - -	For rank and file - -		
	sword {	gold lace (dress) -	3 10 0	0 12	Do. - - -	For all officers.	
		black - - -	2 0 0	1 2	Do. - - -	For officers R.H.A.	
		white enamelled -	2 0 0	0 13	Do. - - -	For officers of R.A.	
		buff - - -	0 9 9	0 14	Do. - - -	Brigade staff serjeants -	Not used in horse bri- gades.
		billets for do., pair	0 4 3	1 6	Do. - - -	For mounted men - -	Drivers R.A. excepted.
waist, for sword-bayonet		0 0 8	0 4	Do. - - -	One pair for each belt -	Buckles included.	
authorized version -	0 2 0	0 9	Do. - - -	Dismounted men, and drivers R.A.	See also Plate and frog.		
Bible {	do., bound up with prayer book.	0 0 8½	0 8½	Necessaries -	One for each non-com- missioned officer and man, according to his religion.	Agreeably to circular from War Office, 25 Oct. 1861.	
	Roman Catholic, with prayer book.	0 1 4	- - -	Do. - - -			
	Presbyterian, with Psalms.	0 1 0	- - -	Do. - - -			
Billets, or buckling pieces -	0 0 10½	0 9	Do. - - -				
Blacking in case - - -	0 0 8	0 4	Accoutrements	See Belt, sword.			
Books. See Account book, Prayer book, Bible.	0 0 2½	0 7½	Necessaries -	One for each kit.			
Boots {	ancle, or cossack -	0 10 0	3 0	} Clothing and necessaries	} See page 36.		
	Wellington - - -	0 15 0	3 3				
Bootings - - -	0 5 0	1 3	Clothing -	For all mounted men -	Issued every 2 years.		
Braces - - - pairs	0 0 11	0 4	Necessaries -	One pair in each kit.			
Brass ball {	brass, or button -	0 0 1½	0 4	Do. - - -	One for each kit.		
	clothes - - -	0 0 6½	0 3	Do. - - -	Do.		
	hair - - -	0 0 10½	0 4	Do. - - -	Do.		
	shoing - - -	0 0 11½	0 3	Do. - - -	Do.		
Brushes {	shaving - - -	0 0 3½	0 1	Do. - - -	Do.		
	blacking - - -	0 0 4	0 5	Do. - - -	Do.		
	shoe { hard -	0 0 10½	0 5	Do. - - -	Do.		
	polishing - - -	0 0 10	0 5	Do. - - -	Do.		
Bugle. See also String	1 1 0	1 6	Accoutrements	One for each trumpeter	Carried by a string.		
Busbies {	horse artillery, with plume and ring -	7 10 0	0 12	Uniform -	For officers R.H.A.	Issued new every 4 years. Except as mentioned at p. 33. Issued new every 4 years. Ditto.	
	field and garrisonartil- lery, complete -	0 16 0	1 3	Clothing -	Serjeants R.H.A.		
		0 12 0	0 3	Do. - - -	Rank and file R.H.A. -		
		7 10 0	0 13	Uniform -	For officers R.A. - -		
	field and garrisonartil- lery, complete -	0 12 0	1 3	Clothing -	For serjeants R.A. - -		
0 10 6		1 3	Do. - - -	Rank and file R.A. - -			

* The letters R.A. refer to the field and garrison brigades in contradistinction to the Royal Horse Artillery.

ARTILLERY.

GENERAL LIST.

Name.	Price.	Weight.	Classed in the other Lists as	In what Proportion required.	Remarks.
Button brass - - -	£ 0 0 1½	lbs. oz. 0 2	Necessaries -	One for each kit.	
Can, oil - - -	0 0 6½	0 3	Do. - - -	For each mounted man.	
Canteen { tin - - -	0 0 10½	1 3	Do. - - -	For each dismounted do.	
{ wooden, with strap	0 2 6	1 12	Accoutrements	For all ranks - - -	Issued to officers for service in the field only.
Cap, forage - - -	1 15 0	0 5	Uniform - - -	For all officers.	
	0 11 9	0 5	Necessaries -	For all sergeants.	
	0 1 10½	0 5½	Do. - - -	For all rank and file. ^a	
Cap line. See Line.	- - -	- - -	- - -	- - -	- - -
Cap, percussion - - -	- - -	- - -	Ammunition -	30 to 20 cartridges.	
Cap pocket. See Pouch.	- - -	- - -	- - -	- - -	- - -
Cap, snap - - -	0 0 2½	0 0½	Arms - - -	One with every carbine	With chain and eyelet.
Carbine, with ramrod -	3 14 5	6 2	Arms - - -	See p. 34.	
Cartridge, ball - - -	- - -	0 1½	Ammunition -	20 for each carbine.	
Case, for plume - - -	0 0 1½	0 0½	Necessaries -	One for each kit.	
Chevron, gold - - -	0 0 9½	0 0½	Added to tunic or jacket.	For non-commissioned officers.	Issued yearly with clothing.
Cloak, cavalry pattern ^b -	6 10 0	6 3	Uniform - - -	For all officers.	
	3 2 6	9 5	Clothing - - -	For all mounted men -	To last 10 years.
Coat { great - - -	1 10 0	6 1	Do. - - -	Dismounted men -	To last 4 years.
{ driver's (obsolete)	1 3 7	6 11	Do. - - -	- - -	Lately disused.
	6 10 0	3 7	Do. - - -	All officers - - -	Worn only off parade.
Cocked hat - - -	4 10 0	0 12	Uniform - - -	For staff officers generally.	See also p. 33.
Comb - - -	0 0 2½	0 0½	Necessaries -	One for each kit.	
Cover for canteen - - -	0 0 5½	0 3½	Do. - - -	One for each tin canteen.	
Drawers - - - pair	0 5 1½	0 13	Do. - - -	Two for each mounted man.	
Feather for cocked hat -	- - -	- - -	- - -	See p. 33 - - -	Three different colours.
Figures for shoulder { gold -	0 0 5	- - -	{ Added to tunic or jacket.	{ All non-commissioned officers and men.	{ To show the brigade issued with clothing.
straps - - - { worsted	0 0 0½	- - -	- - -	- - -	- - -
Forage cap. See Cap.	- - -	- - -	- - -	- - -	- - -
Fork. See Knife	0 0 2	0 1	Necessaries -	One for each kit.	
Frock coat. See Coat.	- - -	- - -	- - -	- - -	- - -
Frog for waist belt - - -	0 1 3	0 3	Accoutrements	One for each waist belt	For the sword-bayonet.
Gloves, leather - - -	0 2 7	0 2½	Clothing and necessities.	All ranks - - -	One pair is issued annually to mounted men.
Great coat. See Coat.	- - -	- - -	- - -	- - -	- - -
Havresack - - -	0 1 0	0 10	Accoutrements	For all ranks - - -	Issued to officers for service in the field only.
Holder. See Button brass.	- - -	- - -	- - -	- - -	- - -
Holdall - - -	0 0 5	0 3	Necessaries -	One for each kit.	
Hoof picker. See Picker.	- - -	- - -	- - -	- - -	- - -
Hook for bag. See Bag.	0 0 0½	0 1	Do. - - -	One with each bag -	For hanging up the bag.
Jacket { horse artillery { dress - - -	16 16 0	4 0	Uniform - - -	For officers R.H.A. -	} Onedressjacketisissued annually.
	5 12 6	3 2½	Clothing - - -	Brigade staff sergeants -	
	4 12 6	3 1	Do. - - -	Sergeants - - -	
	0 19 0	2 14	Do. - - -	Rank and file - - -	
	2 7 0	2 3	Necessaries -	All staff sergeants -	Staff sergeants R.A. included.
	1 10 0	2 3	Do. - - -	Sergeants R.H.A. -	
	0 14 0	2 1	Do. - - -	Rank and file R.H.A. -	
stable, for officers - - -	5 10 0	1 15	Uniform - - -	All officers.	
Royal Artillery, undress or fatigue. {	1 2 0	2 0	Necessaries -	Sergeants R.A. -	
	0 13 6	2 0	Do. - - -	Rank and file R.A. -	
Jacket, flannel - - -	- - -	- - -	- - -	Obsolete - - -	Flannel shirts are used instead.
Jag, brass - - -	- - -	- - -	- - -	Do. - - -	The present ramrod answers the same purpose.
Knapsack, with slings -	0 6 1½	3 12½	Necessaries -	Each dismounted man.	
Knife { pocket - - -	0 0 7½	0 4½	Do. - - -	One for each kit.	
{ table, - - -	0 0 2½	0 2	Do. - - -	Do.	

^a Of a pattern approved 14th March 1861; it can be made from the skirts of a tunic.

^b Dark blue cloth, with sleeves and cape; the collar scarlet, buttons of regimental pattern. Non-commissioned officers have cloth chevrons to show their rank on both sleeves. Drivers are now furnished with these cloaks instead of coats. The great coat is of the same colours, but different pattern.

GENERAL LIST.

Name.	Prices.	Weight.	Classed in the other Lists as	In what Proportion required.	Remarks.
	£ s. d.	lbs. oz.			
Knot { gold	0 15 6	0 1	Accoutrements	All officers.	
{ buff { staff sergeants	0 1 3	0 1½	Do.	Do.	
{ rank and file	0 1 0	0 2	Do.	} One for each sword.	
Leggings, pair	0 3 4	0 10½	Clothing	Each dismounted man	Issued every 3 years.
Letters for houlder straps { gold -	0 0 5	- - }	Added to tunic	All non-commissioned officers and men.	To show the battery and brigade.
{ worsted	0 0 0½	- - }	or jacket.	Do.	Gold line.
Lines, for busbies, { officers	3 0 0	0 5	Uniform	One for each busby	Black line.
{ medical officers	1 0 0	0 2	Do.	Do.	Gold runners and acorns.
{ sergeants	0 13 6	0 3½	Clothing	Do.	All yellow worsted.
{ R.H.A. common	0 1 7	0 3½	Do.	Do.	
Mess tin	0 1 2½	1 1	Necessaries	For each mounted man.	
Nipple, spare	0 0 1½	0 0½	Arms	See p. 34	For general repairs.
Numerals. <i>See Figures.</i>					
Overalls { staff sergeants, pair	1 14 6	2 6	Clothing	Mounted non-commissioned officers and men.	Differ from trowsers in being strapped with cloth. Issued annually.
{ sergeants	1 1 0	2 7	Do.	Do.	
{ common	0 16 0	2 13	Do.	Do.	
Overalls, booted, &c. extra.					
Picker, hoof, with turscrew combined.	0 0 4½	0 2½	Accoutrements	For each mounted man	Issued every 3 years.
Plates for { staff sergeants	0 2 0	0 2½	Do.	Do.	Similar to officers.
waistbelts { sergeants	0 0 6	0 3	Do.	} One issued with each belt.	Gilding metal.
{ R.A. common	0 0 6	0 3	Do.	Do.	Brass.
Plumes, for { horse { officers	2 10 0	0 1	Uniform	One for each busby	Made of egret feathers.
{ artillery { sergeants	0 0 10	0 1½	Clothing	Do.	Of white horse hair.
{ common	0 0 10	0 1½	Do.	Do.	
{ field and { officers	0 7 6	0 1	Uniform	Do.	White horse hair.
{ garrison { sergeants	0 0 8½	0 2½	Clothing	Do.	Do., gilt ring.
{ artillery common	0 0 7	0 2½	Do.	Do.	Do., brass ring.
{ dress	4 10 0	0 13	Accoutrements	For all officers	} Except medical officers and veterinary surgeons.
Pouch { officers undress	1 0 0	0 12	Do.	Do.	
{ staff sergeants	0 9 0	0 12	Do.	Staff sergeants R.A.	
{ sergeants	0 4 6	1 1	Do.	Do.	
{ rank and file	0 4 3	1 1	Do.	} One for each carbine	To hold 20 rounds of ammunition.
Pouch, buff, for caps	0 1 0	0 2½	Do.	Do.	Usually bound up with the bible.
Prayer book	0 0 8	0 3	Necessaries	Each man a member of the Church of England.	
Razor and case	0 0 4½	0 2½	Do.	One for each kit.	
Rubber, horse	0 0 8½	0 8	Do.	For each mounted man.	
Sabretasche, { dress	11 0 0	2 2	Accoutrements	Do.	} All mounted officers.
{ with slings undress	2 0 0	1 5	Do.	Do.	} The undress slings are black for the horse artillery and white for the other brigades.
Scabbard. <i>See Sword, Bayonet.</i>					
Shirts { flannel	0 4 8½	0 9	Necessaries	Two for each kit.	Obsolete.
{ cotton { striped	- - -	- - -	Do.	Formerly used by mounted men.	
{ white	0 4 3½	0 14½	Do.	Three for each kit.	
Slings for carbines, buff	0 0 10	0 4	Accoutrements	One for each carbine.	
Snap cap. <i>See Cap.</i>					
Socks pair	0 1 0½	0 4½	Necessaries	Three pairs for each kit.	
Spoon	0 0 2½	0 2½	Do.	One for each kit.	
Spunge { large	- - -	- - -	- - -	- - -	Issued since 1861 with stable necessaries.
{ small, pipe-clay	0 0 9	0 0½	Necessaries	One for each kit.	
{ dress, yellow metal.	0 10 6	0 4½	Uniform	For all mounted officers.	
Spurs { officers { undress, steel	0 10 0	0 5	Do.	Do.	To last 5 years.
{ cavalry, steel	0 1 9	0 6	Accoutrements	All mounted men	
Stock { silk	0 3 6	0 1	Uniform	All officers.	
{ leather	0 0 5½	0 3	Necessaries	One for each kit.	
Stockings	- - -	- - -	- - -	- - -	Superseded by socks.
Stopper for carbine muzzle	0 0 2½	0 0½	Arms	One for each carbine.	
{ canteen	0 0 2½	0 1½	Necessaries	For each tin canteen.	
{ great coat pairs	0 0 10	0 4½	Do.	A pair for each coat.	
{ mess tin	0 0 5	0 1½	Do.	One for each mess tin.	
Straps { knapsack (slings)	0 1 4½	- - -	Do.	Do.	Included with knapsack.
{ valise, single	0 0 6½	0 6	Do.	For each mounted man.	
{ valise, double	0 3 9½	0 3	- - -	- - -	
{ strappings for { staff sergeants	0 0 10½	0 3	- - -	- - -	Issued only for alterations and repairs
{ sergeants	0 0 2½	0 4	- - -	- - -	
{ common	0 0 2½	0 4	- - -	- - -	
{ trowsers	0 3 0	0 5	Accoutrements	One with each.	
Strings for trumpet or bugle	3 10 0	3 2	Arms	All officers	Scabbard included.
Swords { officers	0 19 0	2 7	Do.	} All mounted non-commissioned officers and gunners.	
{ light common, complete-cavalry	0 5 0	2 4	Do.	Do.	

ARTILLERY.

GENERAL LIST.

Name.	Price.	Weight.	Classed in the other Lists as	In what Proportion required.	Remarks.	
Sword-bayonet. <i>See</i> Bayonet.	£ s. d.	lbs. oz.				
Towel, linen - - - - -	0 0 9½	0 9½	Necessaries -	Two for each kit.		
Trowsers { cloth {	officers { dress - - - - -	4 10 0	2 7	Uniform - - - - -	} All officers - - -	} Gold lace stripe. Red cloth stripe.
	undress - - - - -	2 10 0	2 5	Do. - - - - -		
	do. booted - - - - -	3 10 0	3 1	Do. - - - - -	All mounted officers.	
	staff serjeants - - - - -	1 8 6	2 0	Clothing - - - - -	} <i>See</i> p. 36 - - -	} <i>See also</i> Overalls.
	serjeants - - - - -	0 17 6	2 1	Do. - - - - -		
	common - - - - -	0 13 0	2 5	Do. - - - - -		
serge, non-commissioned officers and men.	0 7 0	1 9	Do. - - - - -	<i>See</i> p. 36 - - -	For hot climates only.	
Trumpet - - - - -	0 12 6	1 6	Accoutrements	One for each trumpeter	Carried by a string.	
Tunic - - - - -	7 10 0	2 13	Uniform - - - - -	All officers R.A.	} Issued annually.	
	3 10 0	2 11	Clothing - - - - -	Staff serjeants R.A.		
	2 5 6	2 12	Do. - - - - -	Serjeants R.A.		
	0 19 6	2 9	Do. - - - - -	Rank and file R.A.		
Valise, blue cloth - - - - -	0 10 5	2 6½	Necessaries -	All mounted men.		
Waistcoat (for mess) - - - - -	1 15 0	0 10	Uniform - - - - -	For all officers - - -	Approved 28/7/63.	
Wrench, nipple {	with cramp - - - - -	0 1 9	0 6½	Arms - - - - -	One for each serjeant armed with a carbine.	} With ball drawers.
	without cramp - - - - -	0 0 10	0 4½	Do. - - - - -	One for each man armed with a carbine.	

HORSE EQUIPMENT.

The term horse equipment is applied in these pages to express every- Application of thing required in connexion with the care and employment of artillery the term. horses. Most of the requisite articles are included in regulations and returns under the head of saddlery and harness ; the rest are either charged in accounts as camp equipage or included with the stores supplied to field carriages as part of their ordinary equipment.

The horses of a battery consist of riding, draught, and bāt horses, Equipments for with a proportion of spare horses not required for immediate use. The use. riding horses are equipped with saddlery and the draught horses with harness ; bāt horses (used only for the conveyance of officers' baggage in field campaigns) have pack saddles and bridles. Spare horses are furnished only with such articles as are necessary for their care in camp or quarters.

For breaking and training young horses there are longeing articles. Longeing a list of which is given at p. 72. Each battery has a rough rider articles. instructed in this duty.

The saddlery is of the "universal" pattern, used in the cavalry and Saddlery. other mounted services. It is made up in sets, and is of two descriptions, one for officers and one for all other ranks. The former has brass buckles instead of steel, and is generally of superior quality. The latter has a breast strap and traces (called breast harness) instead of the usual breast-plate, and some of the articles are charged under different names in consequence of being differently put together. Complete lists are given at pp. 68 and 69. The saddles are made on a principle which has been for some time in use by the cavalry, but has only lately been adopted for the artillery. The wooden trees of these saddles are kept in repair by the wheelers of the battery, the tools necessary for the purpose being added to the set hitherto supplied.

The saddle has two cases for horse shoes and two wallets (formerly holsters) attached to it ; it is also fitted with straps for securing the cloak in front and the valise behind. The complete bridle includes a headstall collar, to which a bridoon bit, with reins, is attached. The application of the collar to this purpose is a recent improvement.

The breast harness is to enable riding horses to be used on an emergency to help draught horses ; it has superseded the lassos which used to be provided in a small number to each battery, and which are still issued to cavalry. A lasso consists of a leather surcingle and a Lasso. long rope trace ; the surcingle can be girthed round a riding horse over the saddle, and the trace is attached to it, when in use, at one side. It has been found that riding horses, however unaccustomed to draw, are always tractable when harnessed with a lasso, and can be depended on for carrying off captured guns or assisting in any occasional draught work.

The harness for artillery horses is also the same as for other services. Harness. It includes a bridle, saddle, and the necessary draught articles. The latter consist of a pair of traces attached to iron hames in front, and supported on each side by two straps from the crupper ; the hames are fitted to a collar, and the collar is connected with the saddle by a buckling piece and strap over the wither. Wheel horses have shorter traces than lead horses, they have also breechings, by which the carriage can be stopped ; the off wheeler has in addition a back band with tugs to support the shafts.

Harness is made up in *double sets*, each of which comprises the articles for one pair of horses. The "off" set of each pair differs from the "near" set in having a luggage saddle* (on which the driver's valise is carried) instead of a riding saddle, and in having two additional reins (leading and side) on the bridle.

Change of pattern.

In many of the articles of saddlery and harness a change of pattern has lately been made. The new pattern saddlery is now being issued, but of the old pattern harness there is still a large stock, and consequently the details for both patterns are given in the following pages. The general effect of the change is to make more articles interchangeable with one another; many of them remain the same except in having double buckles substituted for single buckles and keepers.

Stable necessaries.

The term stable necessaries is applied only to the brushes, &c. shown under that head at p. 72, but all horses in stables require at least a head-stall collar, chain, and log, to fasten them up. Hoof pickers are now issued with accoutrements. An exercising bridle can be made by attaching a bridoon bit with T's and reins to the headstall. If there is no stabling the horses must be picketed by ropes or pins. The picket ropes are 28 yards long; the posts have until lately been 5 feet long, but a new post of half that length is now introduced. When 5 feet posts are used horses are fastened to the rope by the head collars and chains used in stables, but with short posts they are fastened by fetlock chains and straps; a few heel ropes are issued for further securing restive horses. When horses are not under shelter, blankets, with web surcingles and pads, are usually provided. All these articles are supplied from the Store Department at the Tower as a part of the camp equipage. (See p. 423.)

Picketing articles.

The picket lines and posts are carried on the wagons of the battery, and are included in the stores issued for home as well as for active service. The lines can sometimes be fastened to the wheels of the carriages, without using the posts. A space of at least 3 feet by 9 feet must be allowed for each horse.

Horse shoes.

Horse shoes are made in eight different patterns or sizes, which are distinguished by numbers. The first three numbers apply to the cavalry, the rest are for the Royal Artillery, the Military Train, and the Engineer Train; they are as follow:—Nos. 4 and 5, fore and hind shoes without calkin; No. 6, fore and hind shoes with calkin; Nos. 4 *a* and 5 *a*, hind shoes with calkin. The calkin is the projection, or part turned down, at the heel of the shoe to give a better hold on the ground.

SUPPLY.

The officers mounted on horses the property of the public (as specified at pp. 13, 15), are provided with saddlery and stable necessaries by Government; all other mounted officers have to purchase and keep up every article at their own expense. Pack saddles and bridles are in all cases provided by officers at their own cost.

The number of sets of saddlery and harness issued to a battery depends on the number of horses in use, but it includes a few spare sets; the exact number are shown in the details of strength at pp. 20–29. Materials for repairs are also provided.

Stable necessaries are issued periodically (see p. 72); other articles are expected to remain serviceable a fixed number of years, and if they

* In the new pattern harness the off wheel set will be the only one with a luggage saddle; the off lead sets will have riding saddles (without stirrups), but the valise will be carried upon them.

are worn out in less than that time the circumstances which occasioned it must be explained. The proper duration will be shown in a new circular about to be issued.

Once a year, between the 1st November and 1st January, a regimental board of officers is to survey the whole of the saddlery, harness, and tools for their repair. Such articles as may be reported repairable or unserviceable are afterwards examined by another board, composed of officers from some other mounted corps. If any are condemned as unfit for further use demands are made for new ones to replace them.

CONVEYANCE.

In marching order all the articles in each set of saddlery and harness are in wear; the extra sets are also worn by the spare horses; the stable necessaries are partly packed in the wallets and partly attached to the saddles; miscellaneous articles are carried in the store wagon. A proportion of shoes, ready made, is carried by each ammunition wagon, and charged among the battery stores.

For conveyance by sea, or when sent to batteries from the Store Packages. Department, the harness and saddlery are packed in vats or cases of various sizes. A case 2 ft. 6 ins. by 2 ft. 4 ins. by 2 ft. 2 ins. will hold one double set of harness; a ton vat 3 ft. 5 ins. high, and 3 ft. 3 ins. in its largest diameter, will hold three double sets. Each case should, if possible, have an inside wrapper of brown paper and oilcloth. Packages of harness and saddlery for all services are marked with a black horse-shoe.

Harness of the last century.

So long as the field artillery was organized by trains, and was not required to execute rapid movements, the harness was of a much simpler description than that which is now used. In Adye's MS. (1766), harness is included among the artillery stores, and is entered thus—

Horse harness for each gun	{	Traces, prs. for each horse, 1. Thills, with cart saddles, 1. Bit halters. Wantys.
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It would appear that all the articles required for the care and grooming of the horses were provided by some other department, or by the "conductors," who then marched on foot, and were only temporarily employed. Bit halters and wanties are still used for horses led by hand. Thiller is an old word for shaft, consequently the thills refer to the shaft horse only.

SADDLERY FOR OFFICERS.

Description.	No. of Drawing.	Cost.	Weight.	Total No.	Remarks.
DETAIL OF A SET.		£ s. d.	lbs. oz.		New pattern.
<i>Bridle, with Headstall, &c.</i>					
Bits	{				
bridoon, with T's, chains, and reins	- -	0 4 6	0 14½	1	
portmouth, with bridle head	- -		1 8½	1	Curb hooks included.
Chain, curb, for ditto	- -	0 10 0	0 2½	1	Charged separate.
Rein for ditto	- -		0 8½	1	Do.
Collar, headstall, with brow band and throat lash	- -	0 5 9	1 8	1	
Rein, chain	- -		1 2	1	
Strap, coupling, for ditto	- -	0 1 10	0 2	1	To join it to the collar.
<i>Saddle, with Wallets, &c.</i>					
Saddle, with pannels	- -	4 4 0	15 8	1	
Breastplate, with neck strap	- -	0 5 6	1 0½	1	
Cases, shoe, 2s. 3d. each	- -	0 4 6	0 14	2	To hold two horse shoes each, with nails.
Straps for ditto, 4½d. each	- -	0 0 9	0 2	2	
Crupper	- -	0 3 4	0 11	1	
Girths, blue web, 1s. 11d. each	- -	0 3 10	0 14	2	
Irons, stirrup, 2s. 4½d. each	- -	0 4 9	1 10	2	
Leathers, stirrup, 2s. 6d. each	- -	0 5 0	1 2	2	
Straps {					
cloak, centre	- -	0 0 6½	0 1½	1	Same as valise straps.
retaining	- -	0 1 4	0 4	1	
Surcingle	- -	0 3 6	0 10½	1	
Wallets, 6s. each	- -	0 12 0	1 12	2	
Straps {					
wallet, 6d. each	- -	0 1 0	0 2½	2	For the top of the wallets.
cloak and wallet, 8½d.	- -	0 1 5	0 5	2	For the bottom of do.
<i>Additional.</i>					
Numnah	- -	0 10 0	2 11	1	The same as for the men.
Skin, lamb, black	- -	3 8 0	4 3	1	
Valise	- -	1 15 0	2 1	1	
Straps for ditto	- -	0 1 7½	0 5½	3	Same as cloak, centre.
Total	- -	13 8 8	40½ lbs.	- -	

NOTES.

This list applies to all mounted officers. The cost and weight are for the total number of each article; that of the single articles is shown in the general list, pp. 73-75, but the cost being taken from contract prices, will be no guide to the prices charged to individuals.

Officers of the horse brigades have in addition to the above a shabraque and a dress lambskin, which are worn in review order only.

The valise contains articles of personal equipment according to discretion; the cloak and wooden canteen (when carried) are also attached to the saddle; the total weight carried by an officer's horse, with the rider included, is about fifteen stone.

In drill order the lamb-skin and chain rein are omitted.

SADDLERY, COMMON.

Description.	No. of Drawing.	Cost.	Weight.	Total No.	Remarks.
DETAIL OF A SET.		£ s. d.	lbs. oz.		New pattern.
<i>Bridle, with Headstall, &c.</i>					
Bit, bridoon, with T's, chains, and reins	- -	0 2 3	1 4	1	
Bridle, portmouth bit, with head, rein, curb, and hook	- -	0 7 1	2 7	1	
Collar, headstall, with brow band and throat lash	- -	0 4 2	1 13	1	
Rein, chain	- -	0 0 11	2 2	1	
<i>Saddle, Wallets, Straps, &c.</i>					
Saddle, with leather girth and tabs	- -	1 9 3	11 8½	1	
Pannels, pair of, for ditto	- -	0 10 10	4 0	1	
Cases, shoe, 1s. 10d. each	- -	0 3 8	1 2	2	To hold two horse shoes each, with nails.
Straps for ditto, 5d. each	- -	0 0 10	0 5	2	
Crupper	- -	0 2 0	0 11½	1	
Irons, stirrup, 1s. 6d. each	- -	0 3 0	1 9	2	
Leathers, stirrup, 1s. 4d. each	- -	0 2 8	0 15	2	
Strap, cloak, centre	- -	0 0 6	0 2½	1	
Surcingle	- -	0 2 5	0 14	1	
Wallets, pair of*	- -	0 8 2	2 7	1	United at the top. To secure the lower ends.
Straps, cloak and wallet	- -	0 1 8	0 10	2	
<i>Breast Harness.</i>					
Breast piece, leather	- -	0 16 11	2 11	1	Lient. Col. Mande's pattern.
Straps, supporting { front	- -		0 4	2	
{ rear	- -		0 4	1	
Traces, web	- -		3 8	2	
<i>Additional.</i>					
Log, iron	- -	0 0 4	1 2	1	
Numnah	- -	0 10 0	2 11	1	
Skin, sheep, black	- -	0 15 6	5 5	1	
Total	- -	6 2 2	47½ lbs.	—	
<i>For Farriers and Shoeing Smiths.</i>					
Churns*	- -	1 4 2	7 9	2	
Straps for ditto	- -	0 1 6	0 14	4	

* In place of wallets farriers have churns, which carry a hammer, rasp, drawing knife, pair of pincers, apron, &c.

NOTES.

This list applies, with the exception noted for wallets, to all men mounted on riding horses. The headstall collar, chain rein, log, bridoon bit, stirrups, surcingle, and numnah are equally applicable to the new pattern harness. Valise straps have been lately transferred to regimental necessaries.

In drill order the chain rein, log, and sheepskin are omitted.

In marching order, the following additional articles are carried:—nose bag, corn bag, stable necessaries, and the rider's kit complete. The wallets contain a part of the small articles.

The total weight carried by a riding horse, with the mounted man included, is about eighteen stone.

HARNESS, NEW PATTERN.

Description.	No. of Drawing.	Cost.	Weight.	Total No.	Remarks.
DOUBLE SET.*					Not yet in general use.
<i>Driving Bridles, with Head Stalls, &c.</i>		£ s. d.	lbs. oz.		
Bits { bridoon, with T's, chains, and reins, harness, with bridle head -		0 4 6	2 8	2	
Reins, bearing, for do. -		1 1 0	{ 4 14 1 2	2	
Collars, headstall, with brow band and throat lash -		0 8 4	3 10	2	
Reins { chain -		0 1 10	4 4	2	
Reins { leading -		0 2 3	0 9	1	} For the off horse.
Reins { side -		0 1 6	0 4½	1	
<i>Saddles, Wallets, Straps, &c.</i>					
*Saddles { luggage -		1 3 9	8 2	1	} For the shaft horse only.
*Saddles { pannels, pair of, for do. -		0 9 1	3 2	1	
*Saddles { driver's -		1 9 4	10 13	1	} Two of each with lead sets.
*Saddles { pannels, pair of, for do. -		0 11 6	4 2	1	
Cruppers -		0 6 8	1 11	2	
Straps for do. -		0 1 1	0 7	2	Similar to the flank straps.
Girths, leather -		0 7 0	2 0	2	
Straps, for do. -		0 3 4	0 12	8	Two on each side of each saddle.
Irons, stirrup -		0 3 0	1 9	2	
Leathers, stirrup -		0 2 8	0 15	2	} For the near horse.
Strap, cloak, centre -		0 0 6	0 2½	1	
Surcingles -		0 4 10	1 12	2	
Wallets, pairs (see p. 75, note) -		0 12 8	3 10	2	
Straps, wallet -		0 0 10	0 5	2	For the off horse.
" cloak and wallet -		0 1 8	0 10	2	" near horse.
<i>Draught Articles.</i>					
*Band, back and belly -		0 11 6	3 5	1	} For the shaft horse.
Tugs, for do. -		0 8 6	3 6	2	
*Breeching, off -		1 4 3	5 2	1	
" near -		1 3 4	4 3	1	} For the near wheeler.
Strap, for do, with hook -		-	1 0	1	
Collars, neck -		1 5 0	16 12	2	
Hames, iron, pairs -		0 13 6	14 2	2	
Straps, for do. -		0 0 10	0 6½	2	
Pieces, buckling -		0 2 0	0 9	2	To receive the wither strap.
Straps ^a { flank -		0 2 2	0 14	4	} Two for each horse.
Straps ^a { hip -		0 3 2	1 1	4	
Straps ^a { wither -		0 0 10	0 4½	2	Similar to the flank strap.
*Traces { lead -	pairs	2 6 0	31 0	2	Long.
*Traces { wheel -	"	2 6 0	29 12	2	Short.
<i>Additional.</i>					
Legging, driver's -		0 15 0	2 4½	1	Worn by the driver.
Logs, iron -		0 0 8	2 4	2	
Numnahs -		1 0 0	5 6	2	
Skin, sheep, driver's -		0 11 0	3 9	1	To cover the valise only.
Whip, driver's -		0 1 9½	0 7	1	Lash separable, wood handle.
Total { lead harness -		15 7 3½	140 lbs.		
Total { wheel harness -		18 6 10½	152 lbs.		

* For kicking straps, see p. 75.

NOTES.

This list applies equally (with the exceptions marked thus *) to lead and wheel horses. The number is for one pair of horses; in all cases where the number is two it implies one for each horse unless otherwise specified. The cost and weight refer to the entire number, they are shown for single articles in the general list, pp. 73-75.

The bridle and saddle are of a different pattern from those of riding horses, the wallets are smaller, and there are no shoe cases.

In drill order the chain reins and logs are omitted. In marching order the same additional articles are carried as by the riding horses, but they are distributed between the two horses.

HORSE EQUIPMENT.

HARNESS, OLD PATTERN.

Description.	No. of Drawing.	Cost.	Weight.	Total No.	Remarks.
DOUBLE SET.		<i>£ s. d.</i>	<i>lbs. oz.</i>		Now in use.
<i>Driving Bridles, with Headstalls, &c.</i>					
Bits, bridoon, with T's, chains, and reins	-	0 4 6	2 8	2	
Bridles, harness, bit and curb, complete	-	1 1 0	7 6	2	
Collars, headstall	-	0 8 4	3 10	2	
chain	-	0 1 10	4 10	2	
Reins { leading	-	0 2 3	0 9	1	} For the off horse.
side	-	0 1 6	0 4½	1	
<i>Saddles, &c.</i>					
Saddles, with pannels { luggage	-	1 7 1	10 4	1	} For the off horse.
driver's	-	2 13 0	16 13	1	
Cruppers	-	0 6 8	3 6	2	} With hip straps attached.
Girths, web	-	0 3 5	1 14	2	
Irons, stirrup	-	0 3 2	2 3	2	} For the riding saddle.
Leathers, stirrup	-	0 2 6	1 4	2	
Strap, cloak (centre)	-	0 0 6	0 2½	1	
Surcingles	-	0 4 5	2 1	2	
* Wallets	pairs	0 12 8	3 10	2	} Lately added.
Straps, wallet	-	0 0 10	0 5	2	} For the luggage saddle.
" cloak and wallet	-	0 1 8	0 10	2	} " riding "
<i>Draught Articles.</i>					
* Band, back and belly	-	0 11 6	2 12	1	} For the shaft horse.
Tugs for do.	-	0 10 2	2 14	2	
* Breeching, off	-	1 4 3	5 14	1	} For the near wheeler.
" near, with strap	-	1 3 4	7 5	1	
Collars, neck	-	1 5 0	16 12	2	
Hames, iron	pairs	0 14 6	14 2	2	
Straps for do.	-	0 0 10	0 5	2	
Pieces, buckling	-	0 2 0	0 7	2	} To receive the wither strap.
Straps { flank	-	0 2 5	0 12	4	} 2 for each horse.
wither	-	0 0 10	0 4	2	
Traces { lead	pairs	2 6 0	31 0	2	} Long. Short.
wheel	"	2 6 0	29 12	2	
<i>Additional.</i>					
As detailed for the new pattern	-	2 8 5½	13 14½		} The old pattern whip is black, with the handle and lash in one piece.
Total { lead harness	-	13 15 4½	140 lbs.		
wheel harness	-	17 4 7½	152½ lbs.		

* Wallets have lately been added to the riding and luggage saddles, and consequently 2 long cloak straps, and 2 straps for fastening currycombs to the saddles, are discontinued.

NOTES.

The articles marked thus * are omitted for lead horses. See also the notes on the last page. The difference between articles of the new and old patterns is not sufficient to prevent their being interchanged with one another except in the case of bridles, saddles, girths, cruppers, and breechings. The old girths are of web instead of leather. The old crupper has two hip straps, which are inseparable, but has no crupper strap. In the breechings a crank has been done away with. The old saddles were not made on the same principle as the cavalry saddles.

MISCELLANEOUS ARTICLES FOR HORSES.

Description.	No. of Drawing.	Cost.	Weight.	Remarks.
<i>Stable Necessaries.</i>				
		£ s. d.	lbs. oz.	<i>See also p. 66.</i>
Brush { harness (<i>issued yearly</i>)	- - -	0 0 10½	0 7½	1 for each pair of draught horses.
horse " "	- - -	0 3 4	0 10½	1 for each horse.
Comb, curry " "	- - -	0 0 4½	0 12	Do.
Scissors, pairs (<i>issued every 5 years</i>)	- - -	0 0 6	0 4	Do.
Sponge (<i>issued yearly</i>)	- - -	0 1 8	0 0½	1 for each riding horse, and 2 for each draught horse.
<i>Longeing Articles.</i>				
Bridle, mouthing, complete	- - -	0 8 7½	2 10	For rough riders.
Cavison, with cord	- - -	0 12 0	4 0	
Cross-tree, with straps, complete	- - -	3 6 0	16 4	
Whips { hand	- - -	0 2 6	0 4½	
longeing	- - -	0 8 0	1 1½	
<i>For Drill Purposes.</i>				
Bridle, snaffle, twisted bit	- - -	0 6 9	2 4	
<i>For Use in Camp.</i>				
Bag { corn, 2 bushel	- - -	0 1 6	1 2	In ordinary use.
nose -	- - -	0 1 9	1 5	
Blanket, horse	- - -	0 14 6	7 8	
Surcingle, web, for do., with pad	- - -	0 2 10	1 3	
Chain, fetlock	- - -	0 0 10	0 15	Used with the short pickets.
Strap for do.	- - -			
Cord, forage	- - -	0 0 6	0 10	
Cover, waterproof	- - -	0 5 3	1 12	For saddlery or harness.
Hobbles, ox hide	- - -	0 7 6	1 1	
Irons, picket	- - -	0 0 7	2 8	Used with heel ropes.
Posts, picket	- - -	- - -	5 0	Short pattern.
Ropes { picket	- - -	0 5 0	12 8	For restive horses.
heel	- - -	0 2 9	1 13	
<i>For Service in the Field.</i>				
Pack saddle and bridle, complete	- - -	- - -	- - -	Provided by officers, at their own expense, for bat horses.

GENERAL LIST OF ARTICLES IN USE.*

Name.	No. of Drawing.	Price.	Weight.	In what Proportion issued.	Remarks.	
Band, back and belly	{ N.P. O.P.	- - - -	£ s. d. lbs. oz.	For each shaft horse.		
Bag, corn, 3 bushel	- -	0 11 6 0 11 6	3 5 2 12	For each riding horse and each pair of draught horses.	There are also corn sacks holding 5 bushels.	
Bag, nose	- -	0 1 9	1 5	For all horses the property of the public.		
Bit	{ officers' common	- - - -	0 4 6 0 2 3	0 14½ 1 4	With each set of officer's saddlery. For each horse.	The T's are passed through the iron squares of the headstall collar, which then serves as a bridle.
Blanket, horse	- -	0 14 6	7 8	For all horses the property of the public.	For the protection of horses in camp.	
Breast harness, complete (Maude's).	- -	0 16 11	6 11	For each riding saddle	Breast piece, straps, and traces.	
Breastplate, officers'	- -	0 5 6	1 0½	1 for each officer's saddle.		
Breechings	{ near off	- - - -	1 3 4 1 4 3	4 3 5 2	For each pair of wheelers Do.	Strap charged separate.
Bridles.	{ harness, bit, and curb, O.P. portmouth bit, with head, reins, and curb. snaffle, twisted bit	- - - -	0 10 6 0 7 1	3 11 2 7	For each draught horse For each riding horse	Strap included. The new pattern is charged under <i>Bit</i> . The T-bit and reins form the snaffle.
Brushes	{ for pack-horses mouthing harness horse	- - - - - - - -	0 8 7½ 0 0 10½	2 10 0 7½	For each pack or bāt horse - 2 per battery - For each pair of draught horses.	Private property. For the use of rough riders.
Buckling piece. <i>See Piece.</i>	- -	- -	- -	- -	- -	
Cases, shoe	{ officers' common	- - - -	0 2 3 0 1 10	0 7 0 9	2 for each officer's saddle 2 for each riding saddle	} Straps charged separate.
Cavison, with cord	- -	- -	0 12 0	4 0	One or two per battery	
Chain	{ fetlock curb, officers	- - - -	0 0 10 -	0 15 0 2½	For all horses the property of the public. 1 with each bridle	One strap with each chain. Other curb chains are attached to the bit.
Collars	{ headstall neck	- - - -	0 5 9 0 4 2	1 8 1 13	For each set of saddlery. For each horse.	
Cord, forage	- -	0 0 4½	0 12	For all horses the property of the public.		
Corn bag. <i>See Bag.</i>	- -	0 0 6	0 10	For each riding and draught horse.		
Cover, waterproof	- -	0 5 3	1 12	<i>See p. 426.</i>		
Cross-tree. <i>See Tree.</i>	- -	- -	- -	- -	- -	
Crupper	{ officers' harness saddle, N.P. harness, O.P. riding saddle	- - - - - - - -	0 3 4 0 3 4 0 3 4 0 2 0	0 11 0 13½ 1 10 0 11½	For each officer's saddle. For each draught horse. For each riding horse. With each bridle.	Hip straps attached.
Fetlock chain. <i>See Chain.</i>	- -	- -	- -	- -	- -	
Girths	{ officers', web harness, leather	- - - -	0 1 11 0 3 6	0 7 1 0	2 for each set of saddlery. For each draught horse.	
Hobbles, oxhide	- -	0 7 6	1 1	10 per battery.		
Irons, stirrup	{ officers' common	- - - -	0 2 4½ 0 1 6	0 13 0 12½	2 for each officer's saddle. 2 for each riding horse and pair of draught horses.	

* The price and weight as shown in the list apply to the new pattern, but if the new and old articles are not interchangeable both patterns are entered.

ARTILLERY.

GENERAL LIST.

Name.	No. of Drawing.	Price.	Weight.	In what Proportion issued.	Remarks.	
		£ s. d.	lbs. oz.			
Lease				Discontinued -	To enable riding horses to carry off guns.	
Leathers, stirrup	officers' - common	0 2 6	0 9	2 for each officer's saddle.		
		0 1 4	0 7½	2 for each riding horse and pair of draught horses.		
Legging, driver's		0 15	2 4½	For each pair of draught horses.		
Log, iron		0 0 4	1 2	For all horses the property of the public.	For fastening up horses in stables.	
Numnah		0 10 0	2 11	For all horses the property of the public.	To guard against sore backs.	
Pack saddle. See Saddle.						
Pannel, for saddle				With each saddle	There is a different pannel for each sort of saddle.	
Picket {irons - posts - rope or line -				See Camp equipage, p. 426.		
Pickers, hoof						These are now supplied as accoutrements, and therefore form part of the personal equipment.
Piece, buckling		0 1 0	0 4½	For each draught horse.		
Plate, breast. See Breast-plate.						
Reins	bearing, N.P. bridle, officers'		0 9	For each draught horse.		
			0 8½	1 with each bridle	With common bridles they are sewn on.	
	chain {officers' - common -		0 1 10	1 2	For each set of officer's saddle.	
			0 0 11	2 2	For all horses the property of the public.	For fastening horses to picket lines, &c., worn also in marching order for use in case the leather reins should be cut.
leading		0 2 3	0 9	For each pair of draught horses.	Worn by the off horse. Reins for all bridles can be issued separately.	
side		0 1 6	0 4½	For each pair of draught horses.		
Ropes, picket and heel				See p. 426	Camp equipage.	
Sack, corn, 5 bushel		0 1 6	4 12	About 36 per battery	There are also corn bags to hold 2 bushels.	
Saddles, complete	officers'	4 4 0	15 8	For each officer mounted on a government horse.		
	harness {N.P. {driver's luggage - O.P. {luggage - riding -		2 0 10	14 15	For each draught horse, off wheeler excepted.	Pannels included.
			1 12 10	11 4	For each off wheeler.	
			1 7 1	10 4	For each near draught horse.	
	pack riding	2 13 0	16 13	For each off draught horse.		
Scissors, trimming	pair	2 0 1	15 8½	For each pack or bat horse.	Private property.	
Shabraque		0 0 6	0 4	For each riding horse	With girth and lads.	
Shoe, horse				For all horses.		
Shoe pocket. See Case.				Worn by officers of horse brigades only.	Worn in review order.	
Skin	{lamb's {dress - undress -			Worn by officers of horse brigades only.	Worn in review order.	
	{sheep's {common - drivers' -	3 8 0	4 3	For each officer's saddle	} Worn over the saddle, covering the valise and cloak.	
		0 15 6	5 5	For each riding horse		
		0 11 0	3 9	For each pair of draught horses.	To cover the valise only.	
Sponge		0 1 8	0 0½	1 for each riding horse, and 2 for each draught horse.		
Stirrups. See Irons, Leathers.						
Straps.	breast. See Breastpiece.					
	breeching, N.P.		1 0	For each near wheeler.		
	cloak, centre - {officers' - common -		0 0 6½	0 1½	For each officer's saddle	Same as valise straps.
			0 0 6	0 2½	For each driver's and riding saddle.	
	cloak and {officers' - wallet {common -		0 0 8½	0 2½	2 for each officer's saddle	} This strap secures both the cloak and wallet.
			0 0 10	0 5	2 for each riding saddle	
	churn		0 0 4½	0 3½	2 for each churn.	
	coupling collar chain			0 2	1 for each officer's headstall.	
	crupper, N.P.		0 0 6½	0 3½	1 for each draught horse	The same as the flank strap.
	fetlock chain				1 for each chain.	
flank		0 0 6½	0 3½	2 for each draught horse.		
girth, N.P.		0 0 5	0 1½	4 for each harness saddle.		
hames		0 0 5	0 3½	1 for each pair of hames.		
hip, N.P.		0 0 9½	0 4½	2 for each draught horse.		

HORSE EQUIPMENT.

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GENERAL LIST.

Name.	No. of Drawing.	Price.	Weight.	In what Proportion issued.	Remarks.
Straps.*	kicking	2 s. d.	lbs. oz.	About 6 per battery -	For occasional use.
	retaining	0 18 0	5 5	For each officer's saddle.	
	shoe case { officers'	0 1 4	0 4	} 1 for each shoe case	
	{ common	0 0 4½	0 1		
	supporting { front	0 0 5	0 2½	2 for each riding horse	
	{ rear	-	0 4	1 for each riding horse.	
	valise { officers'	0 0 6½	0 1½	3 for each officer's saddle	
	{ common†	0 0 9	0 6	3 for each valise.	
	wallet { officers'	0 0 6	0 1½	2 for each officer's saddle.	
	{ drivers'	0 0 5	0 2½	1 for each off horse	
wither	0 0 5	0 2½	1 for each draught horse.		
Surcingle	officers' common	0 3 6	0 10½	For each officer's saddle.	For each riding and draught horse.
	web, with pad-lead	0 2 10	1 3	1 for each horse blanket.	
Traces	rope { lead - pair	1 3 0	15 8	One pair for each lead horse.	12 pairs per battery. One pair for each wheel horse.
	{ short - "	1 0 0	5 6		
	{ wheel - "	1 3 0	14 14		
Tree, cross, complete with straps.	-	-	1 12	2 for each riding saddle	For Maude's breast harness.
Tugs, backband	-	3 6 0	16 4	One or two per battery	For training young horses.
Valise, officers'	-	0 4 3	1 11	2 for each shaft horse	To hold up the shafts.
Wallets	-	1 15 0	2 1	For each set of saddlery	Valises of non-commissioned officers and men are included with their necessaries. One strap with each wallet.
Whips	officers', single	0 6 0	0 14	2 for each officer's saddle	Luggage and riding.
	common, pair	0 8 2	2 7	2 for each riding saddle.	
Whips	drivers'†	0 6 4	1 13	2 for each harness saddle	} For the use of rough riders.
	hand	0 2 6	0 4½	About 4 per battery -	
	longeing	0 8 0	1 1½	About 2 per battery -	
	drivers' { O.P.	0 4 0	0 9	For each pair of draught horses.	
	{ short, N.P.	0 1 9½	0 7		

* Long cloak straps and currycomb straps, for harness saddles, have become obsolete by the introduction of wallets.
 † All future supplies of these straps are to be made as a part of the valise, and to be kept up as part of the kit. See R.A. Cir. Mem., 6/12/62.

‡ Wallets now issued to drivers are the same as those formerly issued with saddlery; they are smaller than the new pattern saddlery wallets. The pair for the luggage saddle differs from the pair for the riding saddle in having a shorter connecting strap.

Introductory Remarks.

Arrangement. The matériel of artillery consists of the pieces of ordnance approved for use, together with the carriages, platforms, ammunition, machines, and stores required in connexion with their employment. It includes also the materials and sets of tools required by artificers for the execution of repairs, though some of the latter are not peculiar to the artillery, but are likewise used in other branches of the service.

The effective application of ordnance being the main object of the whole establishment of matériel, the carriages, ammunition, and stores required for any particular piece may be considered as its equipment. Each piece is therefore described separately, and accompanied by lists of those articles, with some particulars as to their prices, weights, and dimensions. Similarly such carriages or machines as are subordinate to the pieces of ordnance, but form distinct units in a battery or train of artillery, are separately arranged, in order to show the proper equipment for each.

In the case of articles being issued in regular sets, they are described accordingly, and arranged in alphabetical order. Implements for preparing shells and fuzes, and tools or materials for the use of artificers, come under this head.

Order. A general, but necessarily concise description of the matériel in present use, with a few references to past stages of its development, precedes the lists of equipment, which are classed under *field*, *siege*, or *garrison service* respectively. This classification is necessary on account of the ordnance carriages and stores employed with a field force being different in many important respects from those selected for siege operations, whilst an armament or equipment for permanent fortifications is equally distinct from both. Further remarks are given in each class to explain the conditions which govern the selection of ordnance, and to describe any articles of equipment which are peculiar to that particular service. Carriages or machines are described under the head of the service for which they are most often employed; if they are used for more than one service, and any difference is made in their equipment, it is pointed out. Tools and materials are similarly treated.

Lists. There are various tables added for the sake of comparison or for convenience in estimating transport. A general list of the matériel in use is given after the tables.

Tables.

The order in which the lists are placed may be seen by referring to the abstract of contents at the beginning of the book.

In the equipment of each piece of ordnance the details are given in the following order:—

The *piece*, with its sights and appurtenances.

The *carriages* and *platforms* on which it may be mounted.

The *ammunition* suitable for it.

The *stores* required for its service.

Price and Weight.

To avoid unnecessary repetition, the lists which specify the price and weight of each article only include those stores which are adapted by their construction to suit the piece in question. The corresponding details for stores of uniform size or pattern are given in the general list. Similarly, if the number of articles is governed only by some

Introductory Remarks.

general rule, the proportion is not repeated for each piece ; but in the case of field guns and other carriages which have a fixed establishment of stores, a complete list of the whole equipment is added. In the lists of proportionate supply every article is inserted by alphabetical order, as being generally the most convenient for reference.

Pieces of Ordnance.

The pieces of ordnance in the British service are divided, according to their special construction and application, into six classes, viz., rifled guns, shot guns, shell guns, howitzers, carronades, and mortars; all except the first mentioned being bored smooth. In each class there are pieces with different calibres, and there are also many pieces of the same class and calibre which differ in other respects, so that a great number of varieties is produced. The "calibre" means the diameter of the bore. Classification.

The pieces are generally distinguished by names which express the weight, in pounds, of the solid iron shot, but if no such projectile is used, they express the calibre in inches. They are further distinguished, if necessary, by specifying the length and weight. This system of nomenclature is also observed (with some modifications) by the artillery of foreign countries, and has quite superseded the original practice of the 14th and 15th centuries. The early names were arbitrarily assigned, and though they were suggestive of the powers of artillery fire, they bore no reference to the size or properties of the individual piece. Nomenclature.

In England the new nomenclature began to be used about the end of the 17th century. At the period of the civil wars the guns were classed as *canons* or battering pieces ; *culverins*, for field and general service ; and *canon periors*, for stone projectiles or volleys of small shot. The canons were sometimes distinguished by their calibres, but were more commonly known as canons royal (or double), demy canons, and quarter canons ; minions and drakes were small varieties of the same class. The next class comprised double, ordinary, and demy culverins ; sakers, falcons, falconets, rabinets, and bases.* Perieras, portpieces (or stocke fowlers), and Portingall bases belonged to the canon periors, and there were several other varieties in each class, too numerous to be detailed, and long since obsolete.

All the various pieces now existing in the service, with their principal dimensions and a few particulars relative to their general employment, are shown in a general table at p. 370. Tables which give more complete information as to the peculiar construction of every variety, and the exact dimensions of every part, may be found in various works on Artillery, in the "Aide-Memorie to the Military Sciences," and in the "Encyclopædia Britannica" under the article Gunnery. In those tables the guns, howitzers, and carronades are given separately, but here they are arranged together, in order that pieces of the same calibre, and with only a slightly different construction may be more conveniently compared with one another. Tables.

The number of varieties as shown in the table amounts to 86, but many of these differ so very little from one another that they may practically be disregarded, and many may be overlooked on account of Varieties.

* Most of these names are derived characteristically from furious birds or venomous reptiles, (*faucon, sacre, couleuvre*) ; there were also a spica, or asps, dragons, and basilisks. The word artillery itself is a corruption, most probably, of the Italian *artiglio*, which means the talons of a bird's claw.

Ordnance.

having been introduced in small numbers for purposes of experiment rather than for permanent employment. Omitting these varieties, and disregarding those which do not affect the size of the projectile, or the charge of powder, the ordnance in the service may be considered to consist of 7 rifled shot guns, 22 smooth-bored shot guns, 3 shell guns, 7 howitzers, 7 carronades, and 7 mortars; total 53. Specimens of all these varieties may be found mounted in old armaments and stored up in depôts at home or abroad, but many of them are obsolete so far as future manufacture is concerned. The pieces most commonly used of late years are mentioned under the service (field, siege, or garrison) for which they have been employed.

Difference of application.

Various sorts of projectiles are fired from each kind of piece, but solid shot and live shells* are the most frequently used. There are also two modes of firing, independently of the projectile employed. The terms used to distinguish them are horizontal and vertical fire. The former applies to all guns, howitzers, and carronades, and the latter to mortars only. These pieces are always fired at an angle of about 45°, consequently the projectile moves upwards until its velocity is nearly expended, and then falls almost vertically. Shells are principally used. The classes of ordnance used for horizontal fire differ in their application as follows:—

Shot guns.

The distinctive character of shot guns is that they throw solid shot with large charges of powder, so as to combine the longest range with the greatest penetrating power; the rifled guns produce both in the highest degree.

Shell guns.

The shell guns (10-inch and 8-inch) are principally for throwing live spherical shells to long ranges, but they are loaded with empty shells when the battering power of a large projectile at a low velocity is likely to be effective. In this respect they bear the same relation to shot guns that "canons of batterie" did to culverins in the 16th and 17th centuries, the former being used to batter walls or revetments, and the latter "to pierce and cut out those ruins that the canons have loosened and shaken."† Being fired with smaller charges of powder than the shot guns they are made proportionately lighter.

Pieces for light charges.

Howitzers are used for firing shells at moderate ranges. Carronades fire solid shot but with very small charges; they are now used for flank defences only, as their range is very short. Their advantage is in their lightness and the small number of men required to work them; other advantages, which their construction formerly gave them, have been lost by the improvements made to guns and howitzers.

Shell firing from shot guns.

Although shot guns are especially used for such projectiles, they are equally capable of firing shells, and that with more effect than howitzers if they are being used against troops and the range is great. This is caused by the larger firing charge giving the shell a greater velocity at the moment of bursting, so that its splinters are carried forward at the same time that they spread laterally, instead of their being equally dispersed in all directions. Guns were first put to this use in 1779 at the defence of Gibraltar,‡ where some 5½-inch shells were fired for experiment from 24-pounder guns against a distant working party. The experiment proving successful it was continued throughout the siege, and its importance being confirmed by further trials the practice

* A live shell is a shell with its bursting charge already inserted.

† Norton's Gunner, pp. 51-56.

‡ Drinkwater's Siege, 3rd edn., p. 67; and Sir H. Douglas' Naval Gunnery, 3rd edn., p. 425.

Ordnance.

became universal. The common shell has, however, been superseded for employment against troops by a more effective projectile, called, after the officer who invented it, the Shrapnel shell. The effect of this shell is derived solely from the velocity given to it by the firing charge; the bursting powder being therefore reduced to the smallest amount capable of breaking it into splinters, the space thus gained is filled with bullets, every one of which is as capable of causing a casualty in the enemy's ranks as a piece of the shell itself.

The other kinds of projectiles occasionally discharged are detailed in the equipments and described under the head of Ammunition.

The 68-pounder, weighing 112 cwt. is the most powerful of the smooth-bored ordnance; its range, with 12 degrees of elevation, is nearly two miles, and its battering effect, at very short distances, is superior to that of the 110-pounder gun; the latter however throws a heavier shot, or shell, to a distance of $2\frac{1}{4}$ miles, with much greater accuracy. *Effect of fire.*

It is stated (Artillery Field Book, p. 299,) that under the most favourable circumstances 75 or 80 out of 100 shots from good smooth-bored guns would hit a large ship 1,500 yards off; 45 out of 100, if it were 2,000 yards; and only 11 or 12 per cent. from 68-pounders, and 8 or 9 from other guns, if it were at 3,000 yards distance. "Under similar circumstances and distances," it is remarked, "a large ship should never be missed by an Armstrong gun of any calibre." *Precision of fire.*

With regard to the rate of firing, six 110-pounder Armstrong shots can be fired in as many minutes by a smart strong detachment, or three by ordinary well-trained men; one round per minute can be fired from heavy smooth-bored guns well mounted and worked; on this calculation each gun in a coast battery might be fired five times at a ship moving past at 12 knots an hour, supposing the ship to be at 500 yards distance, when nearest to the battery, and the gun to traverse sixty degrees right and left of a line perpendicular to its course. If the course were oblique to the gun's direction, the ship would necessarily be longer under fire. (Service of heavy ordnance, 1860, p. 111.) *Rate of fire.*

Lighter ordnance can be fired quicker; two rounds per minute can be delivered from field guns with approximate accuracy; at this rate enemy's cavalry preparing to charge at 1,000 yards distance would be exposed to 10 or 14 rounds before they reached the battery; infantry advancing under fire over a similar distance would be exposed to 16 or 20 rounds. The 40-pounder Armstrong gun can be fired twice a minute, if it does not require to be laid for each round.

The principal difference between classes of ordnance, as regards their external appearance, is in their relative lengths and the position of the trunnions; the length in each class being differently proportioned to the diameter of the bore. Guns are 14 calibres and upwards in length, with trunnions near the middle, a little in front of the centre of gravity. Howitzers are from 5 to 10 calibres in length with trunnions similarly placed. Mortars are from 3 to 4 calibres long, with trunnions at the extreme end. Carronades are about 7 calibres long, without any trunnions, but with a loop underneath to serve the same purpose. *Distinction of appearance.*

The present rifled guns are on Sir William Armstrong's principle. They are from 14 to 24 calibres long, constructed of wrought iron, and being made to load at the breech are very different in appearance from the smooth-bored guns. The arrangement by which this is managed (except in the 70-pounder gun) consists of the following separable parts called the *appurtenances* or *fittings* of the gun. *Armstrong guns.*

Ordnance.

Vent piece, to close the breech end of the bore; it has two handles for all guns heavier than the 12-pounder, and a bow handle for smaller natures. It is inserted or withdrawn through a slot or vertical opening from the top of the gun.

Breech screw, to keep the vent piece in its place; it is turned by a handle called a *lever*, which comes in contact with a "*tappet ring*." In front of the tappet in the 110-pounder and 40-pounder guns there is also an *indicator ring*, to show that the vent piece is "home." The screw, tappet and indicator rings, and lever, are easily separated from one another; there are two *keep pins* also included with the breech screw.

The 70-pounder has a different apparatus for closing the breech end of the bore; it consists of a stopper which works in an aperture cut horizontally from one side to the other, and is fixed by a wedge arrangement.

Some of the guns have also an elevating eye, with a bolt, pin, and washer for the elevating screw, but these are not essential parts of the system. Other parts of the gun which are separable and occasionally require to be replaced, are the bouches (or bushes) in the vent, and the rings inserted at the contact of the vent piece with the bore, but these can be removed by artificers only.

Armstrong guns for field service are first polished and then browned; for use in garrisons or siege trains they are lacquered.

Armstrong gun sights.

Armstrong guns of the early patterns had two sets of sights, the ratchet and dispart for rapid firing, the tangent and trunnion for long ranges and great accuracy; the 110-pounder, 40-pounder, and 9-pounder had, however, only the latter pair, and by a recent alteration (notified in R. A. Cir. Mem. 2, 9/63) the former pair is entirely abolished. The pattern of each sight has also been modified. The new trunnion sight is "hog backed;" it is screwed into the trunnions of field pieces, but dropped into a plain hole in the 20-pounder and heavier guns. The corresponding tangent sight has a V notch, and is graduated with a scale of yards, as well as degrees and lengths of fuze. The tangent sight works either in a ring attached to the breech or (as in the 110-pounder and 9-pounder) in a hole cut through the gun itself. It has at the top a slide moving right and left, to allow for the shot's deflection from a straight line; both the upright and horizontal scale are furnished with verniers by which two minutes can be read. In future all Armstrong guns are to be sighted on each side in this manner.

The name of an Armstrong gun represents, approximately, the weight of its solid shot. The 12-pounder, a pattern of which was approved on 5 May 1860, was the first one adopted for the service; a rifled gun on Mr. Lancaster's principle was made in 1854, and tried at the siege of Sebastopol, but the piece, as then constructed, was not successful.

Lancaster gun.

Smooth-bored guns.

Smooth-bored guns are also distinguished by the weight of their solid shot, except the two-shell guns, from which solid shot are not fired. These pieces hold an intermediate place between guns and howitzers; they resemble the former in appearance, but have gomer chambers like the latter. They may be recognized by having only one annular moulding (instead of two) between the swell of the muzzle and the mouth of the bore.

Guns are constructed either of cast iron or a sort of bronze called gun metal; the latter was, originally, in most common use, but is now only employed for field artillery. The lengths of the iron pieces vary from 14 to 24 calibres, those of gun metal (more commonly called brass) are about 16 calibres long. Cast-iron ordnance are lacquered, brass

Ordnance.

ordnance are left untouched, but the effect of the atmosphere changes their original brightness to an uniform dark tint. Gun metal is a com- *Gun metal.*
 pound of tin and copper, in the proportion of 8 lbs. or 10 lbs. of the
 former to 100 lbs. of the latter, the larger proportion of tin is used for
 mortars, as they require a greater degree of hardness.

Howitzers are either of cast iron or gun metal ; they have chambers, *Howitzers.*
 and are usually distinguished by their calibres expressed in inches ; but
 there are three brass howitzers, 32-pr., 24-pr., and 12-pr., named after
 the guns whose bores have the same diameter. These three have been
 constructed expressly for field service since 1815, and differ from the
 rest in being about 9 calibres instead of 6 calibres in length. Howitzers
 were introduced for horizontal shell firing in the early part of the 18th
 century, and were the only pieces used for that purpose until the occa-
 sion above mentioned. Their chambers were originally cylindrical, or
 nearly so, but since 1815 all except the 5½-inch iron and 4¾-inch brass
 howitzers (which are but rarely used) have been re-constructed with
 gomer chambers.

The invention of howitzers is attributed to Germany or Holland, but *Their origin.*
 the only novelty about them in the 18th century was in their applica-
 tion to horizontal firing, pieces of similar construction having long been
 used for throwing shells and other projectiles at high elevations. Hauf-
 nits, afterwards altered into haubitz and haubitze, was one of the names
 given to such pieces in Germany, as being expressive of the bits of old
 iron and other rubbish occasionally fired from them.* Adye's MS.
 (1766) uses howitz in the singular and howitzes in the plural ; it
 mentions them as having been employed by the British artillery during
 the recent war in Canada. The howitzers of the last century were all
 made of brass.

Carronades are used to fire solid shot (though at very low charges), *Carronades.*
 and are therefore named by the shot's weight ; they are generally seven
 calibres long, and are made of cast iron, with cylindrical chambers. In
 addition to the peculiarity of being without trunnions they have a "flash
 rim" or enlargement of the bore at its mouth, and there is no swell at
 the muzzle ; the cascable has a horizontal as well as a vertical loop, and
 there is a dispart sight at the reinforce ring. They were introduced *Origin.*
 in 1779, and received their name from the Carron foundry in Scotland,
 where they were first made.

Mortars are always named by their calibres, they are of ancient use, *Mortars.*
 and have undergone no great changes in construction or appearance.
 They were always short chambered pieces, fired at an elevation of 45
 degrees or upwards. The form of the chamber has, however, been
 modified from time to time, the position of the trunnions has been altered,
 and pieces with large calibres are now made of iron instead of brass.

The chamber is a contraction of the bore at the part where the charge *Chambers.*
 of powder rests ; it causes a more useful effect to be obtained from the
 charge, and as the effect has been found to depend also on the form of the
 chamber, different constructions have been adopted at various periods
 and in various countries. The gomer chamber, so called from the French
 officer who invented it, was first used for English ordnance by General
 Millar, in 1820, and has been applied to all shell guns, howitzers, and

* See Conversations-Lexicon ; (Leipsic), vol. v. p. 118, which repudiates the
 derivation from an Italian named Obizzi. Howitzers were in fact identical with
 mortars, which, says Hexham, "are not only serviceable by shooting and casting of
 " great granadoes, but also by casting of fire-balles, stones, old rubbidge, and peeces
 " of yron," p. 28.

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mortars manufactured since that time ; the cylindrical chamber previously used still exists in carronades and the two howitzers before mentioned. The principal difference is that in the gomer chamber the sides diverge, like those of a cone, until they meet the bore, and in the other they are parallel like those of a cylinder.

Tertiating.

The existence of a chamber in a piece whose construction is not well known can only be ascertained by an examination of the bore ; it is sometimes indicated in old pieces by the exterior circumference being greater at the middle than it is at a point nearer the vent (as in the Coehorn howitzer), but in any case a careful measurement must be made to learn its exact form. This process was formerly called "tertiating," because there were three principal dimensions to be taken (the calibre, length of the bore, and thickness of metal at the breech)* before any unknown piece, which had fallen by capture or otherwise into the gunner's hands, could be used by him with safety and profit.

Relation of equipment to dimensions.

It is to these three dimensions that many articles of the equipment, or supply of ammunition and stores, have to be adapted. On the calibre depend the projectiles (with some modifications according to the class of ordnance), the rammer head and ladle used in loading, and other articles detailed in the following pages. On the calibre in conjunction with the form of chamber depends the shape of the sponge head and of the cartridge ; the charge of powder depends principally on the strength of the piece ; the sights must be fitted and graduated to the exterior dimensions ; the staves of the side arms must be proportioned to the length of the bore ; and the priming irons, punch, and spring spike adapted to the length of the vent.

Origin of varieties ;

It may be seen by the table that there are practically only 11 different calibres for all the smooth-bored pieces, 67 in number, which are used for horizontal firing, and that the immense variety which exists has been produced either by giving to the same calibre a greater or less length and thickness of metal, by decreasing the windage, by altering the distribution of the metal at various points, or by boring up old guns. A similar complication, so far as regards calibres, lengths, and weights, has prevailed in every other country, and may be traced back as far as the history of artillery extends.

in calibre,

That the calibre should be larger for some purposes than for others, followed naturally from the greater mechanical effect produced by the larger shot, and from the different circumstances under which ordnance were employed. The variation of length arose from gun-founders

in length,

observing that the range and accuracy of the shot's flight were considerably affected by the length of the bore, and constructing pieces on uncertain theories as to what the relative measurements of the diameter and length should be. The thickness of metal was nominally regulated

in thickness.

on the sound principle that it should be sufficient to bear the strain of the discharge, without giving any unnecessary weight to the piece, but in applying this principle there were various causes to produce a great diversity of practice ; the quantity of powder was not always the same, the quality of it was very uncertain, and the art of casting metals was not well understood ; consequently the rules of construction were finally determined by any "founder's opinions and selfe concepts."

Reinforced pieces.

About the year 1600 the manufacture of gunpowder was so much improved, and its strength so much increased by graining or corning it,

* Pietro Sardi proves the expressiveness of the term by various divisions of the main work into three branches, p. 58.

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that an increased thickness of metal had to be adopted. A fresh variety was consequently added to every gun then in use, and Robert Norton, "one of his Majesty's gunners and engineers," who wrote in 1628, remarks that "it would be too tedious, long, yea and almost impossible, to shew all the differences and inequalities in the weights and measures of severall peeces of one same kind and sort of ordnance that haue been cast or yet are at this time remaining in severall fortresses of England and other countries." These new pieces were called "reinforced," on the continent, (from the Italian word rinforzato), and "double fortified" in England; the latter term has long been obsolete here, but a double fortified brass 6-pounder was mentioned in an American newspaper with reference to an occurrence of the war in 1861.

After Norton's time the evil was diminished, and the casting of ordnance was brought under better control; inferior pieces were broken up to be recast in improved forms, and one entire class, described by him as "those ordnance that shoote no iron or leaden shot, but only lighter, as stone, murdering, or fire shot," was allowed to become obsolete. Reduction of varieties.

The tendency of the improvements being to attain greater accuracy of effect, and the mechanical skill of the period being unable to produce heavy pieces with sufficient strength and regularity, the large calibres fell for a time into disuse, or were confined to short and light descriptions of ordnance. Of late years, the advance in science and the improvement of machinery have enabled pieces of an increased size to be made with success, and the development of horizontal shell firing since 1815 has added to the importance of employing them. Decrease of calibres.

The more general use of shells also led to modifications being made in the pieces from which they were chiefly fired, in order that greater range and accuracy might be obtained; hence arose the substitution of long brass howitzers for short ones in batteries of field artillery, and the employment of shell guns instead of iron howitzers or carronades in siege and garrison service. Increase of calibres.

It was to carry out the same nature of change at the least possible expense that several hundreds of the guns in store were bored up to larger calibres about the year 1830. Changes for shell firing.

All the changes or improvements hitherto described were made on considerations connected with the *theory* of powder and projectiles, it remains to notice those which were suggested by the *practice* of gunnery. The former class aimed at attaining the greatest possible range and accuracy, with due regard to economy in the weight and expense of the piece; the latter have been directed to giving facility in its general management, and, although less interesting in themselves, have had an equal share in developing the powers of artillery fire. All the exterior fittings or projections come under this head. Boring up.

Of these superadded projections the trunnions were the earliest and the most useful. The original guns being mere tubes, rudely made and roughly strengthened with rings, were secured to their beds by hoops or fastenings at various points, and could only have their angles of elevation altered by a slow and clumsy process, and it was a century and a half before this important alteration was invented. The first pieces, "se pointant au moyen de leurs tourillons" were brought into the field by Charles VIII. of France, when he invaded Italy in 1495.* Exterior appliances.

Dolphins or handles, for the application of ropes and tackles, are found on pieces cast about the year 1500, and appear in various forms, Trunnions.

* Études sur l'Artillerie, lii. 206.

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as rings, fishes, and animals' heads. They have never been universally employed, and the only English ordnance which now have them are the 12-pounder and 9-pounder brass guns, and some of the old iron mortars. They received this name from resembling in curve and shape the "dolphin embowed" as it is represented in heraldry, and from being most frequently cut or moulded in direct imitation of it. They were also called ears, in accordance with the Italian term *orecchione*.

Cascable button.

The cascable was originally made flat, in order that it might rest against a piece of wood or hurter, which prevented any recoil of the gun on its carriage; after trunnions had been added this arrangement became unnecessary, and the cascable was either treated ornamentally or fitted with some projection for convenience in various manœuvres of the piece. Occasionally a third dolphin or a ring was fixed there, but a button was more commonly used and is still retained. In field pieces this button has been fitted to receive the head of the elevating screw, which is secured to it with a bolt and keeps the piece steady in moving over rough ground; in naval guns it is converted into a loop to receive the breeching rope which checks the recoil. This loop was originally between the button and the cascable, and appears for the first time in its present form on Mr. Monk's 32-pounder gun of 1838.

Cascable loop.

Vent patch.

The patch of metal at the vent originally served as a receptacle for the loose powder with which ordnance were primed; it was not however so much used with guns as with mortars, and was unnecessary when tubes were inserted in the vent; afterwards it was found useful in its present form as a means of attaching a flint or percussion lock for firing the piece. These locks having been superseded for land service by friction tubes the vent patch is again superfluous.

Locks.

Flint.

Percussion.

The flint lock above mentioned was similar in principle to those used for small arms, it was (temporarily) attached to the gun by two screws passing through the vent patch from side to side, and was fired by a lanyard. The percussion lock was similarly fixed, but required a special detonating tube; it was invented by Colonel Dundas, R.A., in 1846. The flint lock was introduced about 1820; in Sir Howard Douglas' *Naval Gunnery* (p. 390, 3rd ed.) there is a letter from Sir Alexander Dickson, R.A., on the importance of having gun locks, on account of the inconvenience he had experienced in the Peninsular war from being obliged to use lighted portfires, and the serious danger attending them in siege operations.

Cover.

Another arrangement at the vent or the remains of it may also be seen on some old pieces, and is illustrated at plate 42, vol. 3, of the Emperor Napoleon's *Work on Artillery*; it consisted of a cover turning on a hinge at one side, and secured by a padlock to a hasp on the other; it was to secure the vent from being injured by treachery or spiked by an assaulting party. Of late years the vent has been covered with a sheet of lead (called an apron) or stopped by a small plug for security against the weather only.

Rings.

The various rings which encircle the guns in present use may be referred for their origin to those which gave real strength to the ancient ordnance. Whether retained from being held to be still important or merely for the sake of relieving the simplicity of form is uncertain, but they appear on most of the guns constructed down to the last few years. In early times they were often highly enriched with ornamental mouldings.

Ornaments.

The style of ornament was generally adopted from the renaissance architecture of the period when this artistic treatment began, the barrel or chase being treated as the shaft of a column, the breech as its base,

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and the muzzle as its capital, or rather as the cornice.* It is to this practice that the rings and mouldings owe the architectural names of *astragal*, *fillet*, and *ogee* which they still bear ; the swell of the muzzle was once known as the cornice, a term which probably was dropped as inappropriate when the cluster of angular rings which composed it was altered to the present curved form. The practice of the present day is, however, to omit all these rings and projecting ornaments, as they are thought to interfere with the regularity of the casting, and thereby to impair the strength of the piece, besides adding in some degree to the expense of manufacture.

The royal badge, with which pieces of ordnance are still indulged, is engraved on the first reinforce; 32-pounder guns have the initials of the reigning sovereign with a crown over them ; 8-inch, 10-inch, and 68-pounder guns have no ornament. Pieces of brass ordnance, cast at the foundry in the Royal Arsenal, used to have the badge of the Master General of the Ordnance engraved on the chase until that office was discontinued in 1855. A broad arrow, the ancient mark of crown property, is applied generally to ordnance as well as to other articles which belong to the war department. A cross is put on any guns which are condemned as unserviceable, it frequently takes the form of four strokes of white paint on the face of the muzzle.

A distinguishing number will be seen on the reinforce of all guns proved since September 1857, and the year of proof below it ; this number refers to a register kept since that time in the office of the Inspector of Artillery ; in guns proved before that date the year is cut on the breech, and on the reinforce of some guns will be found a number which refers to the armament of some ship or fortress instead of the register.

The exact weight of the piece in cwts. qrs. and lbs. is shown upon it ; in old guns it is under the cascabe, but it is now cut on the upper surface.

The trunnions of iron ordnance are generally marked with the initials or name of the manufacturing firm which supplied the piece, together with the date of manufacture and a private distinguishing number. Armstrong guns are marked R.G.F. or E.O.C., according as they are made at the Royal Gun Factory or by the Elswick Ordnance Company. The letters A, B, or D, B, on the trunnions of a 110-pounder are explained in the remarks given with its equipment. C.V.T. on cast-iron ordnance stands for "copper vented through."

The various lines or notches cut on the base ring, the muzzle, and the trunnions are "sighting" or "visual" lines for laying the piece ; those on the top of the base ring and muzzle are for giving direction, and are called the line of sight or of metal ; those on the sides are for giving elevation, and are called quarter sights. The notch at the muzzle is cut on a level with the lowest notch at the breech, and by these the piece is laid point blank ; a scale of degrees and fractional parts is added to the latter for giving elevation. These sighting lines were added towards the end of the last century ; the axis or horizontal lines on the trunnions were ordered to be cut on all iron guns in 1860.

To avoid the inconvenience arising from the line of sight or metal not being parallel to the axis of the piece, a dispart, either fixed or moveable, is now always used. It is fixed to howitzers and brass guns at the muzzle, in carronades it is near the middle ; for other pieces it is moveable, and is included among the sights issued separately, The

* A very complete specimen is engraved in plate 33, vol. iii. of *Études sur l'Artillerie*, and others at plates 42 and 48. In the rotunda at Woolwich there is a particularly rich Hungarian piece, which is in the gothic style.

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dispart has been cast on the muzzles of howitzers for at least 50 years, and by order dated 2d November 1859 it is directed to be added to all existing field ordnance.

Sights.

A gun furnished with these visual lines is, to a certain extent, independent of any separate sights, but the mode of elevating by the quarter-sight is open to many objections and is unsuitable to rapid firing. Every gun or howitzer is therefore now fitted with a tangent scale (at the base ring) on which natural tangents of degrees are calculated and marked; this improvement was added to field ordnance at least half a century ago, but was not regularly applied to heavy guns until the introduction of steamships made quickness and precision of fire a matter of the first importance in coast batteries.

Tangent scales are made of brass or wood; the latter may be rested on the base ring and held by hand; the former slide up and down in a socket attached to the breech and are fixed by a screw. Brass ordnance have a hole cut through the breech instead of a socket. The brass tangent scales for iron ordnance are accompanied by disparts, and are known as Millar's sights.

Millar's.

Millar's sights (hind and fore) were introduced, about 1829, by the artillery officer whose name they bear; they were at first intended for naval service, and were for some time supplied to ships only, but they began to be issued for guns in coast batteries in 1847. The wooden tangent scales which accompany them were added by Colonel Hardinge, R.A. Each sight and scale is carefully fitted to a particular gun and marked with a corresponding number.

The hind sight consists of a brass scale, graduated to quarter degrees, working in a gun-metal block or socket, with a thumbcrew, also of gun metal, to clamp it. A piece of lead is interposed between the block and the gun, and the whole is fixed by two iron screws. The fore sight is in one piece, it is made of gun metal, and has a lead fitting, with two iron screws. The use of the lead is to adapt the sights to the gun, to bring the top of the fore sight on a level with the top of the scale in the hind sight, and to deaden the concussion produced by the discharge, which would otherwise break off the heads of the screws.

The hind sight being fixed behind the base ring, and the fore sight between the trunnions, the length of one degree in the brass scale depends on the distance between them; the length of the entire scale depends on the curve of the breech, with which the bottom of the scale (projecting below the socket) is liable to come in contact. Two of the scales (for the 9-pounder and 6-pounder iron guns) show in consequence only $3\frac{1}{2}$ degrees; some others show only 4 degrees; none of them show more than 5 degrees; because at higher elevations the swell of the muzzle appears above the fore sight. The breadth and thickness of the scale are always the same. For the block there are five different shapes, to suit various constructions of the breech; viz., one for the 10-inch guns, one for the 68-pounder guns, one for 56-pounder, 42-pounder, and 32-pounder guns; one for all guns of Sir Thomas Blomefield's pattern, and one for the 32-pounders of 25 cwt. Each block has two pins on which the wooden tangent scale rests when it is in use. The thumbcrew is the same for all the blocks; the fixing screws have hexagon heads for Blomefield pattern blocks and the fore sights, but round heads for all other blocks; the former sort must be fixed or removed with a wrench and the latter with a screw-driver; one or both of these articles are issued with the sights accordingly.

Wooden tangents.

The wooden tangent scales are of two patterns, and known as Nos. 1 and 2; the former is used with Millar's hind sight, and the latter inde-

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pendently ; both are made of walnut wood with brass fittings, and the degrees upon them are calculated to the full length of the gun. The graduation, which shows quarters, is carried up to eight degrees, and at each degree is marked the range of the piece at that elevation : the distinguishing number of the piece to which the scale belongs is stamped on the back, at the top.

No. 1 scale has at the back a brass staple, to receive the head of the scale in the hind sight ; inside the staple there is a V to keep the head exactly in the middle ; No. 2 scale, which is held by the hand, has its bottom slightly curved, to fit the base ring, and a projecting piece of brass in the middle to enter the notch of the line of metal. No. 1 scale is issued with every pair of Millar's sights ; No. 2 scale is for such guns as have landward ranges and are not likely to require accurate laying simultaneously with rapid firing.

In Norton's Practise of Artillerie, p. 76, there is an engraving almost exactly like the No. 2 scale above described, but with a plumb line in the centre, apparently to insure its being held perpendicularly on the base ring. The prototype of the tangent scale was however a common foot rule, on which the "industrious gunner, by arithmetically skill," might calculate the number of inches which would represent one degree for the gun in use, and "coyne the peece up or down" accordingly. When circumstances permitted, a quadrant like the present one was employed to give the elevation, but in field engagements the use of such an instrument required too much time, and as late as 1766, at least,* the elevation was left to be determined by trial and guess work. The direction was given in an equally vague manner, for, until the visual lines were cut on the base ring and muzzle (about 1790) there were no points to guide the eye, unless they were found for the occasion, with the help of a perpendicular, and roughly fixed by a chalk mark.*

Early sighting arrangements.

Considering that an artilleryman in early times had to contend with so many difficulties, arising from the faulty dimensions of the piece and projectile, the uncertain strength of powder, and the entire absence of sights, it is not surprising to read in the instructional works of the period that "a good shott made gaineth the gunner much loue and honour. Such a shott," say Norton and Uffano, "ought to be made knowne to the generall of the army, who should therefore liberally reward the gunner that made the same, not onely to encourage him, but others alsoe, afterwards to doe the like."† Nor were examples of this encouragement wanting, for at the siege of Sienna in 1557 the Marquis de Martinian, commander of the army, gave a chain of gold from his own neck to a gunner who had made one happy shot with important effect, and in 1601 the Marquis de Spinola personally rewarded a cannonier at the siege of Ostend.

Uncertainty of effect.

But if the effect was uncertain in the slow firing of a regular siege, it was still more so in field engagements on account of the clumsiness of the carriage, the imperfect arrangements for supplying or preparing ammunition, and the unwieldy size of some of the ordnance brought into position. The heavy pieces could only be discharged once or twice in the course of a battle, and the mischief they did depended far more on the enemy's ranks happening to be in the path of the shot, than on any power of directing the shot as circumstances required. "The shotte of greate ordnance in the fieelde," says the translator of Machiavelli,‡ "is not moche to bee feared of fotemme truc it is that the

* MS. volume of S. P. Adye, Lieut. R.A., at R.A. Institution.

† Norton, p. 110 ; also Hexham, Collado, &c.

‡ Peter Whitehorne, 1560, p. 49.

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“hackebutters and the field peeces doe moche more hurt.” At an assault of Padua, in 1509, four falconets (1-pounders) fired along a straight road at point-blank range and “did but little mischief beyond “killing a couple of horses;”* on the other hand, at the battle of Ravenna, in 1512, two thousand of the French infantry were killed by the cannons and hacquebuts (or arquebuses) before they came to close quarters; and, of the Spaniards, thirty-three men at arms were carried off by one cannon shot.*

The close masses in which troops were then drawn up, and the number of ranks preserved until long afterwards for line formations, rendered the loss of a dozen men at a single shot by no means unlikely, and several instances of it may be found in old military works and narratives. This power of overwhelming whole lines of men by an unseen blow gave to artillery a prestige and importance which no slowness or uncertainty of its own fire could neutralise, and with which no other engine of war could contend. It led chroniclers to stigmatize the invention as a curse of the devil, and it made soldiers fear the projectiles as thunderbolts from heaven.

Carriages.**Classes.**

The term carriage, when used in connexion with artillery matériel, generally refers to the carriage belonging to a piece of ordnance, but it also comprehends everything that has wheels and is used for conveyance. The carriages now in use consist of:—

Garrison carriages, for guns and howitzers, of which are three sorts viz., common standing (with four trucks), rear chock (with two trucks), and sliding (without any trucks), for dwarf and casemate traversing platforms. *Beds* for mortars may also be included among garrison carriages.

Travelling carriages for guns, howitzers, mortars, and rockets.

Transport carriages for ordnance; viz., sling wagons, sling carts, and platform wagons.

Wagons for carrying ammunition, and for miscellaneous services, viz., forge, store, general service, and flanders wagons.†

Truck or drug carriages.

Carts, viz., store, hand, and trench carts.

Construction.

All these carriages are constructed with as much simplicity as can be combined with the necessary strength, and, except in heavy gun carriages, the means of taking them to pieces so as to stow them in the smallest possible space. The carriages for ordnance differ in strength and size according to the piece for which they are intended; and those for howitzers are made proportionately stronger than for guns, on account of the discharge of short light pieces having a more destructive effect upon them. The ammunition wagon boxes are differently fitted for each gun, and there are two sizes of rocket carriages; for each sort of the other wagons and carts there is only one pattern. For a more particular description of carriages used in field service see pp. 127–130; and for the rest see pp. 270–272.

Iron.

All the various kinds of carriages are constructed at the carriage department of the Royal Arsenal. The materials are wood and iron; the use of the latter for entire carriages is restricted to saluting batteries and those fronts of fortifications which are not liable to sudden attacks or an enfilading fire; it is cheaper than wood, and

* Life of Bayard, translated by Kindersley, pp. 95, 178.

† Flanders wagons are no longer made, but there are several in use or in store.

Carriages.

lasts longer, but is objectionable on account of its greater weight and the mischief caused by its splinters when it is struck by a shot. The large mortar beds are made of iron, as the increased weight is no disadvantage, and they are but little exposed to the enemy's fire. The woods for ordinary service are oak, ash, elm, and fir; but for service in hot climates woods of tropical growth are found to be more durable than oak, and are therefore substituted for it. Teak, which grows in Malabar, Java, and Ceylon, is the most frequently used. Woods.

Oak is used for the trails and main parts of travelling and standing carriages, and for the spokes of wheels; elm for the naves of wheels, axletree beds of limbers and light wagons, and sides of limber boxes; ash for perches and beds of ammunition wagons, foot-boards, futchels, shafts, and splinterbars of limbers, and for the felloes of wheels; fir is used for the limber boxes, their sides excepted. The various bolts, chains, plates, &c., included in the construction of a carriage are called the iron-work, and are furnished in complete sets for the execution of repairs in the field.

Iron carriages were not made before the beginning of the present century. Sliding carriages, which are a modification of the naval carriage and slide, were introduced for land service about 1846. The common standing carriages were also of naval origin, and were not commonly used on shore until about 1700; spare ship carriages are included by Hexham (1642) in a list of matériel for a field train; but the illustrations to works of that period always represent the guns in permanent batteries as mounted on travelling carriages. Early carriages.

The field or travelling carriages have been gradually advanced from the rudest beginnings to their present effective state, and most of the different forms through which they have passed are illustrated in the *Études sur l'Artillerie*. The heavy ordnance were originally supported by trestles or fixed to blocks of wood. The very light pieces were carried in the 14th century on frames with wheels or small trucks;* but it was not until the end of the 15th that they were mounted on a bracket trail carriage with shafts attached to it; these shafts were fixed to the trail itself. It was nearly another hundred years before the addition of a separable limber completed the improvement, and enabled heavy guns to travel on the same carriage that served for their employment in action. The inconvenience attending the movement of guns before that time had been very great. It is mentioned in the life of Bayard that when the Emperor Maximilian marched into Italy in 1508 he had only enough transport carriages or wagons for half his artillery, so that one part had to be left under safe guard whilst the wagons returned for the other, "which was very vexatious." 1400. 1500. 1600.

In the course of the wars about the year 1600 the subject of field carriages was carefully considered, and exact proportions were assigned to their various parts. The rules for their construction, illustrated by drawings, are given by Uffano and other writers, and show that a gun carriage of 1620 differed but little in its main points from the bracket trail pattern of the present time. The names of the parts were also generally the same as they now bear. Norton and Hexham, indeed, apply the term limber to the sides or brackets of the trail, and fore carriage to the limber; but the list of a field train prepared in 1620 for service in the Palatinate, and given by Grose in his "Military Anti-quities," mentions "field carriages with faire† wheeles and lymmers fully compleate."

* These may be seen in the illustrations to Froissart.

† Query, four.

Carriages.

Such carriages had, however, axletrees of wood, and quoins instead of elevating screws; they carried no ammunition, and were very deficient in arrangements for conveying the necessary stores. The sponge, rammer, and ladle were lashed to the top of the gun, between the dolphins, when it was prepared for a march;* and the rest of the equipment was carried in wagons, which either belonged to the train or were levied for the purpose. Many of the improvements in those points were made during the seven years' war in Germany, and various modifications have been made at intervals down to the present time. The block trail, a valuable improvement which originally emanated from Sir W. Congreve, was introduced for field guns about 1792; it was adopted for 18-pounder guns shortly after the Crimean war, and extended to siege guns in 1860. The perch trail carriages for 8-inch and 10-inch howitzers were first made about 1820; the travelling carriages for mortars in 1860 and 1861. The standing beds for the latter have varied from time to time, but not in any important particular except the employment of iron instead of wood. In 1766 the wooden beds of the large mortars were of similar pattern to those of the present small ones, but with additional rings and bolts for strength and convenience.

1750.

Ammunition
wagons.

Cars.

Ammunition wagons made on the limber principle, and furnished with boxes that serve as seats, are an improvement on some two-wheeled ammunition cars introduced in 1802 to carry a part of the gun detachment. They carried six men each; and models of them may be seen in the Rotunda at Woolwich. There was a field battery, or brigade, as it was then called, experimentally equipped with cars of this kind for service in the Peninsula.† In the 17th century ammunition was carried in common country wagons, hired for the occasion. The small arm ammunition wagon was introduced in or about 1819; two-wheeled carts constructed for the purpose had been previously used.‡

Transporting
carriages.

Of the carriages for transporting heavy ordnance, the platform wagon is the most ancient, being but little altered from the block carriage described by the early writers. (See p. 353.) It probably received a fresh name from some modifications made to adapt it for carrying traversing platforms when they were introduced. It is mentioned by Adye in 1766 as the only carriage of that class used in the field, though there were sling wagons, sling carts, and drags employed for moving heavy ordnance in "the Warren" at Woolwich.

Forge.

The forge wagon was originally a cart; a rude specimen of one is shown in a plate of the *Études sur l'Artillerie*, among the carriages used by the French artillery in 1600–1650. The forge cart used by the English artillery in 1750 was fitted with the same arrangement of the hearth and bellows as it now has. The limber was added soon afterwards in consequence of the practical experience gained during the war between 1756 and 1763. It was partly to give the forge a steadier support than was afforded by the props under the shafts, and partly on account of the advantages which limber carriages have over carts for transport purposes being already perceived.§

Wagons and
carts.

Store wagons are mentioned in 1813 as "store carts with limbers" "according to a new construction."|| The store cart was formerly called a tumbrel, and is mentioned under that name by Adye, who describes it as being used to carry tools and sometimes the money of the army, but adds that it will likewise serve as an ammunition cart.§ Latterly the

* See Hexham and other illustrated works.

† Observations on Fire-arms, by Col. Chesney, R.A., 1852, p. 85.

‡ Aide Mémoire, 1853; Adye's M.S., 1766. § Adye's MS., 1766, pp. 83, 89.

|| Adye's Bombardier, p. 71.

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term has been applied by writers to ammunition wagons ; originally it meant a common farming cart, and is derived from an old French word *tumerel*.* Baggage wagons were more necessary to a train of artillery in the last century than they are to the present field batteries, as they had to convey the whole of the camp equipage and entrenching tools which are now distributed among the ammunition wagons. Officers' baggage was likewise carried by them instead of by *bât* animals, consequently in 1766 there were five wagons required for the officers and two for the men of each artillery company.† In 1813 there was one to each brigade of six pieces, but there were none in the first batteries of field artillery despatched to the East in 1854. The present pattern has been lately adopted as the best adapted for forage, baggage, or any general purpose.

The shafts of travelling carriages were at first adapted to single draught only ; they were called *thillers*, and were permanently fixed to the axletrees or fore parts of the carriages. Since the last century they have been made moveable, and can be fixed for double or single draught, as well as shifted in case of injury. They are also separate from one another, except for four-wheeled carriages without limbers, such as the platform, general service, and Flanders wagons. The off shaft, when the two are separate, is fixed for double draught to the end of the axletree arm, between the wheel and linchpin, and for single draught to an iron bolt of corresponding size in front of the limber bed. This bolt has a linchpin and washer, the former to secure the shaft, the latter to be put in place of it on the axletree arm. When the shafts are in the middle an extra horse can be attached by a swingle-tree on either flank, and some of the heavy carriages have on each side an arrangement for a similar purpose, called an outrigger ; it consists of a thin iron bar projecting about 18 inches beyond the splinter bar, and connected by an iron stay with a drag washer on the axletree ; it can be turned back and secured on the top of the splinterbar when not in use.

The 3-pounder gun carriage for mountain service has the shafts attached to the trail ; this manner of draught was antecedent to the invention of limbers, and has been retained in a few instances for light pieces. In 1750 there was a carriage without a limber, and rather like a cart, called a galloper ; it was used for 1½-pounder guns, but might serve for 3-pounders and 6-pounders, and was "thought by some "artillerists to be preferable to other field carriages."‡

The wheels of travelling carriages are of several diameters and weights, but each consists of a nave, 12 spokes,§ and six felloes shod with an iron tire. The nave is of elm, it is strengthened by two iron rings or nave hoops, and contains an iron pipe box in which the axletree works. The pipe box is so constructed that the axletree only bears on three inches of it at each end, and the intervening part is filled with grease. The spokes are of oak and are dished or inclined outwards from the carriage ; the felloes are of ash ; and the tire is in six lengths called streaks. A tire in a complete ring has been applied to light wheels, but it was disapproved in the Crimea and is no longer used. The width of each streak formerly depended in all cases on that of the felloe, but the heaviest wheels have now streaks of the usual width put on in pairs.

The wheel is kept in its place by a linchpin, which passes through the projecting end of the axletree, and is secured by a leather tie ;

* Johnson's and other dictionaries. † Adye's MS., p. 197. ‡ Adye's MS., p. 58.

§ The sling cart with 14 spokes, and the sling wagon hind wheel with 16, are the only exceptions.

Carriages.

between the pin and the wheel there is an iron ring, called a washer, to diminish the friction, and this ring has sometimes a projecting loop to receive the hook of a drag rope, it is then called a drag washer. Drag washers are used for the hind wheels of all carriages, for the fore wheels of such carriages as have outriggers, and for carts.

Axletree.

Axletrees for travelling carriages are made of wrought iron, and are sunk in a bed of oak, to which they are attached by iron bands and bolts; they are further secured by another iron band, called a yoke hoop, round each end of the axletree bed. That part of the axletree which passes through the wheel is called the arm.

The thickness of the axletree varies to a slight extent in order to give it a strength proportioned to the weight which it has to bear; the rule given in 1628 for the dimensions of wheels and axletrees, "as well for "gracefull shew as usefull service," was that the axletree (of wood) should be 1 calibre in diameter, the nave 3 calibres in diameter, and $3\frac{1}{2}$ calibres thick, the "spoakes or rayes" $\frac{1}{4}$ calibre square, and the height of the whole wheel about one half the length of the piece. The "fellows" were to be one calibre in breadth, the same in thickness, and "shod with yron strakes grasped and nayled with two or three "rankes of great head nayles."—(Practise of Artillerie, p. 131.)

Classification of wheels.

The various wheels and axletrees are classified so that each class may comprise the wheels that are fitted with the same pipe box and the axletrees that are made with the same dimensions at the arm. There are now four classes, distinguished as siege, field, general service, and naval service. The wheels and axletrees included in each class, with their respective dimensions and weights, so far as regards the artillery service, are shown in the table at p. 383. All wheels of the same class are interchangeable with one another.

Travelling carriages are provided with boxes to contain grease, and other articles which may be required on a march. They are also fitted with straps for attaching the intrenching tools and other stores. Some of these articles are issued with a "carriage complete," others have to be demanded separately. Lists of the former are given in the tables relating to carriages at pp. 376–380.

Platforms.

Platforms are required for the efficient working of all heavy ordnance, whether on siege or garrison service. Siege platforms are of wood, laid on the ground. Garrison platforms are of two sorts, ground and traversing; the former consist usually of a permanent stone pavement, and are provided by the engineers; the latter are of wood, and are portable, but they require special provision to be made for them when the battery is being built. The platforms supplied to siege trains are further described at p. 240, and the traversing platforms at p. 272.

Ammunition.

The term ammunition is applied to the various combustible compositions occasionally used, as well as to the powder and projectiles with which ordnance are loaded; it includes likewise everything which is combined with the powder and projectiles to increase their destructive power, or add, in any way, to their general efficiency.

Round of ammunition.

A "round of ammunition" comprehends the charge of powder, the projectile, and the priming. The powder is contained in a cartridge, and the priming consists of a tube; the projectile, if a shell, requires a

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bursting charge and fuze; the other component parts of one round depend on the nature of the ordnance in use.

With Armstrong guns a lubricator is added to the cartridge, and with some of the large guns primers, adapters, and tin cups are used. The projectile is either a shot, common shell, or segment shell; the shells are fitted with metal plugs. *For Armstrong guns.*

With smooth-bored guns and howitzers the projectiles are more various. There are three kinds of shot,—solid, case, and grape; two kinds of bursting shells,—common and shrapnel, (both fitted with metal plugs,) and two kinds of incendiary shells,—carcasses and Martin's shells; these two do not require a bursting charge or fuze. All kinds of spherical shells for guns and howitzers are fixed to wooden bottoms; solid round shot are also fixed to wooden bottoms for field guns, but with heavy guns they are put in the bore loose, and wads are used with them if necessary. *For guns and howitzers.*

With mortars a common shell (without a wooden bottom) is the projectile commonly employed, but carcasses, light balls, smoke balls, and volleys of iron shot are occasionally substituted for it. Wads are never used, and bottoms are necessary for the small shot only. *For mortars.*

The quantity of ammunition provided or estimated for any service is described by the number of rounds per gun; a table is therefore given at p. 398 to show the weight of one round, with every sort of projectile, including the necessary allowance for that of the packing cases. In addition to the number of rounds composed as above mentioned there are other articles, such as rockets, portfires, slow match, quick match, signal lights, &c. issued for occasional use.

Small arm ammunition does not properly form part of artillery matériel, but is always in charge of the artillery for the purpose of supply to infantry and cavalry in field operations. It will vary according to the small arms used in those branches of the service. *For small arms.*

The mark I. ↑ A. on articles of ammunition is the proof mark of the Inspector of Artillery, for such as have been furnished by contract; the greater part of the ammunition is manufactured in the Royal Laboratory at Woolwich. *Marks on ammunition.*

Packages containing combustible ammunition, for the supply of an army in the field, are marked with two red diamonds. A table of the packages commonly used, with their dimensions, weights, and contents, is given at p. 400. It is desirable that small articles, such as tubes, &c., should be demanded in proportions agreeing with the contents shown therein. *Packages.*

The various items of ammunition issued to artillery for service or conveyance are further described in their alphabetical order.

Adapters.

Adapters are collars of brass, screwed on Armstrong time fuzes to make them fit the fuze holes of the 20-pounder common, and all 40-pounder, and 110-pounder shells. These fuze holes being of uniform diameter, the adapters are also of uniform exterior dimensions, but those marked with an E. are fitted to the E. pattern fuze. Adapters, if not issued with the fuzes, are packed in cases containing 500 each.

Bottoms.

Wooden bottoms (occasionally called *sabôts*) are used with smooth-bored guns and howitzers; they are fixed to all shells fired from such

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pieces, and to the round shot fired from field guns, up to the 18-pounder inclusive. A table of them is given at p. 392.

The diameter of the bottom is adapted to the calibre, and the form to the end of the bore. If there is no chamber the bottom is cylindrical, but if there is a gomer chamber it is shaped like the frustrum of a cone. This form has been extended since 8th August 1860 to the guns which have the same calibres; this was done for sake of uniformity. The bottoms for 5½-inch and 4½-inch howitzers are cut into the form of a cup, on account of those cup-shaped pieces having cylindrical chambers.

Plank.

The bottoms for general service are cut out of pieces of 1½-inch plank, but those of round shot and shrapnel shell for field service are thicker; they reach nearly to the middle of the shell, and are encircled by a tin strap; the two kinds are distinguished as plank and end wood, they are made of elm or alder for ordinary service, and of teak for tropical climates.

End wood.

Bottoms were formerly secured to the shot or shell by tin straps; they are now fastened by a single rivet (*see rivets*). They are always fixed to shrapnel shell before being issued, and to other projectiles if intended for field service. The words "fixed" or "loose" are used to express whether they are ready riveted or separate. When bottoms are issued loose they are strung, 20 together, on iron rods which pass through the holes made for the rivets, and are secured by a nut; if less than 20 are sent together, the rod is shortened. One hundred and ten bottoms would be allowed for every 100 shells. Implements for fixing them to the shells are issued in sets; *see No. 2 Set* at page 361.

Wooden bottoms were originally called tamkins and tampions; they were in general use for field service in 1766, and had been occasionally used in the early stages of gunnery. In France they are called tampons and sabôts; in England the name tampion has been transferred to the wooden plug for protecting the bore.

For mortars.

Bottoms for firing *pound shots* are altogether different from those above described; they are hemispherical in form, and are used for firing vollies of 1 lb. shot or other small projectiles, from 8-inch, 10-inch, and 13-inch mortars; they are made in three sizes to suit those calibres.

Bursters.

Bursters are cylinders made of wrought iron, and filled with special F. G. powder, for bursting segment shells. They are used with the 6-pounder, 9-pounder, 12-pounder, and 20-pounder Armstrong guns only, the bursting powder for all other shells being made up in a calico cartridge.

Patterns.

The bursters of the latest pattern, adapted to the brass percussion fuze and marked B.P., are 2½", 3", 4¼", and 5½" long respectively; the 6-pounder burster is 1" in diameter at the top, and .79" at the bottom; the rest are 1" in diameter throughout; each burster has fire holes .4" in diameter, by which the flame of the fuze gets access to the powder.

The bursters used with the iron concussion fuze are of greater length but contain less powder; they are marked I.C., and are now obsolete.

Bursters are either issued in the shells to which they belong (accompanied by wood plugs) or packed in cases, as shown at p. 401.

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Caps, Percussion.

The percussion caps for all rifled muskets and carbines in the service are of the same size and pattern ; but since 7th May 1861 an improvement has been made in their manufacture. In the improved caps the detonating powder is increased in quantity and subjected to heavier pressure, which makes it less liable to suffer from damp ; packages which contain these caps are marked for distinction with the letters H.P. The composition of the powder is as follows :—

Fulminating mercury	-	-	80
Chlorate of potash	-	-	20
			100

Caps are always issued in excess of the number of cartridges ; the proportion is 150 to 100 for service ammunition, and 110 to 100 with ball or blank ammunition for practice. Caps are packed in zinc boxes when they are to be conveyed by small arm ammunition wagons (*see* p. 196), and in cylinders of various sizes (*see* p. 400) for other services ; they are also used to ignite signal lights, and are supplied to siege trains for that purpose. Special caps are used with revolving pistols.

The invention of firing small arms by a percussion lock and detonating powder dates from 1807, but the use of a copper cap to hold the powder is a comparatively recent modification of the original invention. The flint locks were retained in the British army until 1842, when muskets adapted to the percussion caps began to replace them.

Carcasses.

Carcasses are incendiary shells, made of iron and filled with composition ; they may be fired from guns, howitzers, or mortars, and are made in nine sizes, to suit any calibre from the 12-pounder or 4½-inch upwards. Each has three holes, which are covered over with canvas when the carcass is filled.

The composition burns from four to ten minutes, and remains alight even when under water ; it is ignited by the discharge of the piece, and requires no fuze. It consists of—

Saltpetre	-	-	50		Rosin	-	-	-	15
Sulphur	-	-	20		Tallow	-	-	-	5
Antimony	-	-	5		Turpentine	-	-	-	5

Carcasses are issued ready filled and packed in boxes ; they are also riveted to wooden bottoms if they are to be fired from guns or howitzers.

The carcass in its present form dates from about 1750, or perhaps earlier, but the composition has not always consisted of the same ingredients. A dye's MS. mentions a projectile called an oblong carcass, which combined the incendiary qualities of a carcass with something of a shell's destructive power. It consisted of an iron framework, covered with canvas, and containing a composition, in which were imbedded several pistol barrels loaded with bullets, or, in place of them, a number of small grenades. Two holes bored in the carcass and filled with fuze composition provided for the ignition of the contents. These oblong carcasses are further stated to have been the only ones used for some time, and to have been superseded by round ones, chiefly on account of their uncertain flight.

A still earlier form was the " wild fire ball," mentioned by Norton and other writers of the 17th century ; this was a canvas ball filled with composition ; it was sometimes pierced with barbed pins, whose points

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projected from it so as to adhere to the object which it struck. Prior to the use of hollow balls, tow had been employed as the vehicle for inflammable ingredients, and darts or arrows had been thus converted into incendiary missiles in the earliest stages of the art of war.

Cartridges.

Cartridges are bags made to hold charges of powder ; for ordnance they consist of service (or firing), exercising (or saluting), and bursting cartridges ; for small arms there are ball and blank cartridges, but the latter are not included in the reserves carried by the artillery.

Service cartridges.

Service cartridges are made of coarse flannel, called also serge, and vary in their dimensions, partly according to the weight of the charge, and partly according to the form of the powder chamber at the end of the bore ; their sizes are shown in a table at page 391. The preparation of a cartridge for service is called making up or filling it, and the closing of the mouth is called choking it ; the body of the cartridge when filled is bound round with worsted, this is called woolding it. At the bottom of each cartridge that is filled before being issued is stamped the initial letter of the station where it was made up.* Cartridges for field service were formerly fixed to projectiles by means of their wooden bottoms ; in 1766 this was done for all calibres, but latterly it has been restricted to the 3-pounder for mountain service.

Fixed cartridges.

Cartridges for Armstrong guns are bound with braid ; the 40-pounder and smaller cartridges have the lubricator inserted after the powder, before being choked ; the 70-pounder and 110-pounder have sockets, to which the lubricator is afterwards attached. The 20-pounder and 40-pounder cartridges have also a paper cylinder in the middle of the charge to make it exactly fill the powder chamber.

Manner of issue.

When service cartridges are issued empty they are packed in bales measuring about 1' 7" × 1' 6" × 1' 6" ; filled cartridges are issued in such manner as will be most convenient for further use, combined with keeping them perfectly dry and in good order. On field service the cartridges in charge of the artillery are packed in cartouches adapted to the ammunition boxes of the guns and wagons, and the reserves in charge of the store officers are carried in special boxes. For garrison service they are packed in barrels if the magazines are quite free from damp, but otherwise in wooden cases lined with metal. These cases are likewise used in siege operations, and appear in lists as Cases, metal lined. The metal lining has a circular opening, closed by a lid and secured with grease round the edge ; the exterior case has a square lid with hinges on one side and two screw fastenings on the other ; these fastenings are opened by a small gun-metal key with a wooden handle. The cases are made in three sizes ; the largest holds cartridges to the amount of 112 lbs. of powder, but the exact number depends on their dimensions ; for further particulars, *see* p. 402.

Metal-lined cases.

Improved barrels.

The barrels have hitherto been called improved powder barrels, the improvement consisting in a better construction and the insertion of a lid like that of the powder case, enabling the cartridges to be taken out without unheading the barrel. This name is now changed to Round Lid Barrel. They are in two sizes ; the first pattern whole barrel (approved 9/2, 60) had a square lid ; a later pattern, for both sizes, (approved 19/4, 63) has a teak top with a round lid, and requires no key.

Round lid.

* This practice was introduced in June 1863.

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Cartridges for field service are further secured by being enclosed in *Paper covers,* covers, made usually of common paper, but of waterproof paper if necessary for protection against damp. These covers are made in sixteen sizes, numbered for distinction from 4 to 19. A list of the sizes *Waterproof bags.* approved 24th March 1863, was promulgated in Circular 822, par. 729.

Bursting cartridges contain the bursting charges of shells and shell *Bursting cart-* rockets, except those of the 20-pounder and smaller segment shells, *ridges.* which are in iron cylinders described as bursters. For general service the bursting cartridges consist of common paper bags with calico covers, but if necessary they are made up in a waterproof form. If waterproof they are made up in two different ways. For common shells they are in waterproof calico cartridges without a paper bag; for shrapnel shells and rockets they are in waterproof paper bags with common calico covers.

As the cartridge merely secures the powder until it is required for loading the shell, its exact dimensions are unimportant. The size is governed by the quantity of powder it is required to hold, but one size serves for more than one charge. The waterproof paper bags are made in four sizes, numbered from 1 to 4, and the calico waterproof cartridges are in nine sizes, numbered from 5 to 13. There are also two additional sizes, numbered 14 and 15, the former to hold 10 lbs. and the latter 15 lbs. of powder, for any occasional purpose. The list of sizes and the charges for which they are used is given in circular 842, par. 794.

Bursting cartridges, when issued ready filled, are packed in a similar manner to service cartridges, but without any additional paper cover; if empty, they are made up into bales.

Exercising cartridges are made of serge, and contain the reduced *Exercising cartridges.* charges used for exercise or salutes; they are made up as required, and are not included in the equipments. Drill cartridges are in future to be made of blue, instead of white serge.

For the various firing, bursting, and saluting charges, *see pp. 388, 390.*

The ball and blank cartridges for artillery carbines are described *S.A. cartridges.* under personal equipment at p. 34. Ball cartridges for infantry small-arms (Enfield, Serjeants', and Lancaster rifles) are 3 inches long and $\frac{1}{10}$ ths of an inch in diameter; they contain $2\frac{1}{2}$ drams of powder. When in charge of the artillery, they are in boxes containing 440 each, and packed in wagons holding 39 boxes (17,160 cartridges), with the proper proportion of caps. Ball cartridges for the cavalry carbines contain only 2 drams of powder.

"Bagges of linnen, or greate papers," made to hold "the iuste charge *Original cart-* in poulver of every pece, in a reddines," are mentioned by Whitehorne *ridges.* in 1560; Norton, in his directions "how to loade a peece of ordnance "gunner like," (Practise of Artillerie, p. 101), confines his remarks to a charge of loose powder, but in a latter chapter, p. 127, he shows how to make "cartredges, wherewith in time of service any peece will bee "more speedily and certainly loaded." The cartridges were made of canvas, fustian, or other linen cloth, or else thick strong paper; Abye's MS. (p. 111) mentions them as being usually of paper for the navy, and always of flannel for field service. Cartridges fixed to the projectiles are said to have been first used by Gustavus Adolphus.

Compositions.

The compositions used in the manufacture of ammunition are *Valenciennes.* described with the articles to which they belong. The only composi-
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Composition,
incendiary.

tion issued in a separate form is "Valenciennes composition," which is sometimes substituted for a part of the bursting charge in common shells to give them a more incendiary effect. The composition is made into stars, weighing about $1\frac{1}{4}$ oz. each; the ingredients are,—

	lbs.	oz.
Saltpetre, pulverized	-	- 6 4
Sulphur, sublimated	-	- 2 8
Rosin, pounded	-	- 1 4
Antimony, pounded	-	- 0 10
Linseed oil	-	- 6 oz. 14 drs.

The charge for a shell is called a proportion; for an 8-inch shell it consists of 130 stars; the stars are wrapped in brown paper, by dozens, and packed usually in metal-lined cases. Five hundred "proportions" of this composition were furnished to the siege train for China in 1860, but by Cir. 855, par. 832 (17th March /64), its use is abolished.

This manner of using shells is mentioned by Captain Thomas Binning in 1689, (p. 158):—"In your granado you may put some little balls of unquenchable composition, that when the shell breaks and brings down the rubbish of a house, those little balls may raise fire afterwards." It appears however to have fallen into disuse, for it is not mentioned in Adye's MS., and the name Valenciennes, by which the composition has been distinguished since 1794, suggests that it was unknown to the English artillery when the Austrians used it at the siege of that place.*

Cups.

Tin cups are used with 110-pounder Armstrong guns; they are placed behind the cartridge to prevent the escape of gas at the breech. For the 110-pounders with copper breech rings they are made in two sizes, distinguished as high and low gauge; the larger is 7·280" in diameter, and the smaller 7·253" in diameter; the latter is the only one now issued for use. The cups are flat, with a flange ·32" deep and a central hole ·88" in diameter; they are issued in boxes containing 100 each. Tin cups will also be used with the 70-pounder and 40-pounder guns of the side loading pattern.

Cylinders.

Paper cylinders are put in the middle of certain Armstrong cartridges, to make them fill the powder chamber of the gun; the following are the names and dimensions of the cylinders in use:—

Light 110-pr. (10 lbs. charge)	4' 7" long,	4' 1" in diameter.
" 70-pr. (9 lbs. charge)	4' 5" "	2' 5" "
" 40-pr. (service charge)	4' 5" "	3' 25" "
" 20-pr. (do.)	4' 5" "	2' 5" "

The paper cylinders supplied with empty cartridges are issued in vats, *see* p. 401.

Fuzes.

Fuzes are an invention for igniting the bursting charge of a shell at any required moment; they have been constructed in various ways, but may be divided into two general classes, *time* fuzes, which com-

* This origin is assigned to the name in Adye's Bombardier, 1813, *article carcass*.

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municate the ignition at a certain time after the projectile is fired, and *percussion* fuzes,* which act when a shell strikes an object. The fuzes used in present artillery equipments are,—for spherical shells, Boxer's time and Pettman's percussion fuzes ; for Sir William Armstrong's shells, time and percussion fuzes of his own invention.†

The time fuzes of Lieutenant-Colonel Boxer's pattern, adopted in 1854, are cases of beech-wood, filled with a composition which burns 0'2" in one second. The top of the composition is primed with quick match, which takes fire at the discharge of the piece, from the flame escaping between the shell and the sides of the bore. If the fuze is inserted without preparation it will not ignite the bursting charge until the composition has burnt to the end, but it may be caused to do so at any earlier moment by providing an escape for the flame at a proportionate distance from the top. To facilitate this operation, holes are bored in the wood at regular intervals and stopped with putty, or, according to the present practice, with burnt clay : any one of these holes can be reopened with the greatest ease by the borer provided for the purpose.

Boxer's time fuzes.

The fuzes are fixed in the fuze holes by a few taps, given with a mallet and setter in garrison service, and by striking them against a carriage wheel, or any hard substance, in field operations. The fuzes are secured at the top by a moveable tin cap, and are made in the following sizes :—

For all shrapnel‡ shells the fuze is	2"	long, outside, and burns	5 seconds.
" common "	3½"	" "	10 "
For 5½-inch and 4½-inch mortars, the fuze is	4"	" "	15 "
For 8-inch and larger "	8"	" "	30 "

The mortar fuzes may be recognized by the holes above mentioned running in a spiral direction round the exterior instead of being in two straight lines.

These fuzes are issued as follows (*see* also p. 401). Shrapnel fuzes ; for field service, in tin boxes and canvas bags, painted blue ; the boxes are of three sizes, to hold 8, 10, or 12 ; the bags of two sizes, to hold 8 or 12. For garrison service, in zinc cylinders holding 50 each.

Common fuzes ; for field service, in tin boxes and canvas bags painted black ; both are of two sizes, the boxes to hold 8 or 10 ; and the bags to hold 10 or 16. For garrison service, in zinc cylinders holding 50 each. The tin boxes are made to be worn with a strap, and to hold the fuzes required for immediate use, they are therefore issued (empty) for garrison service. The zinc cylinders are packed for transport in wooden cases holding 10 each.

Mortar fuzes are issued in the metal-lined cases used for cartridges ; one case holds 330 8-inch fuzes.

* Certain fuzes of this class have also been called *concussion* fuzes. A rule to govern the future use of these two names is thus given in Circular 822, p. 7 : " A percussion fuze is one which is prepared to act by the shock of discharge, but put in action by the second shock on striking the object ; a concussion fuze is one which is put in action by the shock of discharge, but the effect of that action is restrained until it strikes the object."

† The 110-pounder shells are now being fired with a time fuze of Lieut.-Col. Boxer's construction. The lower part of this fuze resembles the time fuzes for spherical shells ; the upper part is fitted with an interior detonating arrangement on the same principle as the Armstrong time fuze. (*See* also p. 363.)

‡ Fuzes for the " improved " shrapnel, now obsolete, are smaller at the top, and their caps are painted red ; in other respects they are the same.

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Implements for preparing fuzes are issued in sets ; see pp. 208, 361.

The old time fuzes, superseded by the present pattern, were made of the same wood, contained the same composition, and acted on the same principle, but the construction provided no opening by which the flame could reach the bursting powder. The end of the fuze always had to be sawn off, so as to expose the composition, and frequently part of the composition had to be scraped out with an auger, to get the exact length suited to the range. The preparation of a fuze was consequently so slow a process that shrapnel shells were furnished with fuzes ready cut to various lengths. Time fuzes had been made in this manner for at least a hundred years. Fuze composition consists of saltpetre 46·4, sulphur 14·3, and mealed powder 39·3, by weight.

Percussion fuzes are made of metal, they act by an interior arrangement of detonating powder, ignited by some percussive agency. These fuzes are quite a recent invention, they have been but little used for land service, and are not adapted to shrapnel or mortar shells. Pettman's pattern, which was introduced in 1861, is 2" in length, $1\frac{1}{8}$ " in diameter at the top, and weighs $6\frac{3}{4}$ oz. ; it is screwed into the fuze hole by an iron key, which has been added to the set of fuze implements. These fuzes are issued in the proportion of 1 to 4 common shells, but can only be used with those shells whose fuze holes are adapted to receive them (*see* Shell) ; they are packed for issue in cases holding 100 each.

Pettman's percussion fuze.

Leather collars.

All metal fuzes are fitted with leather collars under the heads.

Armstrong's time fuze.

The Armstrong time fuze has a circular channel filled with composition, and communicating at one end with the inside of the shell. Above the channel there is a moveable cap, with an aperture through which the composition is ignited ; this aperture can be fixed by means of a key at any distance from the end of the channel, and the time of burning is regulated thereby. The ignition is effected by the action of a percussion pellet, inside the fuze, which is set in motion by the discharge of the gun, and immediately strikes on some detonating powder. This method is rendered necessary by the lead coating of the shell being driven so closely into the grooves of the bore that there is no space by which the flame from the cartridge can reach the fuze.

The time fuze is screwed into the fuze hole ; it is used with all Armstrong shells, but it requires an adapter to make it fit those that have large fuze holes (*see* Adapter). The latest pattern (E, approved 4th August 1862) is made of brass, and graduated in inches and tenths ; it burns 6 seconds. The first pattern (1860) was made of white metal, and graduated in degrees and minutes. Each time fuze is wrapped in a waterproof bag, made of india-rubber paper, and put into a tin box or canister, secured at the junction of the lid and body so as to be air-tight ; the canisters are then packed, bottom (marked top) uppermost, in quarter-sized metal-lined cases holding 125 each.

Armstrong's percussion.

Armstrong percussion fuzes, acting by a detonating arrangement, are made in two sizes, large and small.

The large or pillar percussion fuzes are screwed into the fuze holes, and are made only for the 20-pounder (common) and larger shells ; they are packed in cases containing 100 each. The present pattern was approved in 1861, but slight alterations have been made in the construction (*see* Changes in Matériel, Nos. 415 and 675) ; it is 2·03" long and 1·29" in diameter ; weight 10 oz.

The small or field service percussion, called until lately the concussion fuze, is used only with those segment shells which have iron

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bursting ; it is inserted between the burster and the fuze hole, and may be used in conjunction with the time fuze, in case the latter should fail. If it is used separately the metal plug must be replaced in the fuze hole. The present pattern, marked C, was approved in 1862 ; it is made of brass, 1" long, 1.46" in diameter, and weighs 3½ oz. ; the pattern of 1860 was of iron.

The small brass percussion fuzes are carried open and packed in cases containing 250 each ; the iron ones were secured in waterproof bags and tin boxes, in the same manner as the time fuzes.

Besides the fuzes in ordinary use for shells, as above described, there are time fuzes for grenades, which contain 1½ inch of composition ; they are issued, as demanded, in quarter-sized metal-lined cases or boxes. Shell rockets also have time-fuzes, but these are fixed inside them at their manufacture and not issued separate. *Grenade and rocket fuzes.*

Time fuzes had been in use at least a hundred and fifty years before it was discovered that the flame produced by the discharge of the piece was capable of igniting them. The original method was for the gunner to apply the lighted match in his linstock first to the fuze and then to the touch hole. Hence the firing of mortars was called in France the *tir à deux feux*, and it was practised there as late as 1766, long after the new method had been adopted in England.* If the shell's flight was short, and it was wanted to burst on reaching the ground, the gunner delayed the discharge of the piece for the proper number of seconds after lighting the fuze. In all cases, to prevent the flame of the fuze from reaching the powder and causing a premature discharge, a quantity of clay and earth was stuffed round the shell. If any accident caused the piece to hang fire until the fuze composition was burnt out the shell necessarily exploded in the bore. *Ignition of fuzes.*

The earliest mention of a fuze is in a description of the German artillery, as it existed in 1566, by an author named Fronsperger.† Norton (1628, p. 156) speaks of it as a "pype pryed with slowe receipt for time," and Captain Thomas Binning, in 1689, describes it under the name of *feusees* for *granados* or fire-balls.

Grenades.

Grenades are small shells, originally intended to be thrown by hand, and formerly carried by the grenadiers of infantry regiments. They are now rarely used, except when fired in volleys from mortars. A land service grenade weighs 1 lb. 13 oz. ; it is charged with 1½ oz. of powder, and has a small fuze with 1½ inch of composition. *Hand grenades.*

The name *granado* was formerly given to all shells, great or small, that were burst by means of a fuze (Norton, p. 156). Another sort of shell, or fire-pot, to be thrown by hand, or cast by a sling, was made of pottery, with two ears on the outside, by which a lighted match could be fastened to it. This shell broke when it struck against any hard substance, and its contents then caught fire from the burning match. *Fire pot.*

Light Balls.

Light balls, usually entered in lists as balls, light, are fired from mortars only, and are not manufactured for the 13-inch calibre ; they

* Adye's MS., p. 170.

† Quoted in *Études sur l'Artillerie*, vol. iii. p. 264.

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Common portfires, also distinguished as L.S. (long, small), are packed in cases containing 200 each; they are fixed to sticks about two feet long when required for use, and are lighted from a piece of a slow match when the firing begins. At the order to cease firing the burning end is cut off with a clipper, which is fixed to the trail of field gun carriages, and is issued separately for pieces otherwise mounted.

Linstock.

Portfires have been in use since the beginning of the last century; the original method of giving fire to ordnance was by a linstock, or linte stocke, "which is a matche fastened to the ende of a staffe of a yarde or "two yardes longe." (Whitehorne, 1560, p. 33.) The name porte-feu was applied in France to the quick match used in priming mortars (Études, vol. iii, p. 338).

Powder.

Various kinds. Powder is a granulated composition consisting of saltpetre (nitre) 75, sulphur 10, charcoal 15; the size of the grain varies for different purposes, and is expressed by the number of meshes in one inch of the sieve by which it is measured.

A 4, the largest size (4 to 8 meshes), has been introduced for the firing charges of Armstrong guns.

L. G. powder (large grained, 8 to 16 meshes) is used for the firing charges of smooth-bored ordnance, and the bursting charges of the following shells:—40-pounder and larger segment, all common, and all mortar shells.

F. G. powder (fine grained, 16 to 36 meshes) is used for the blank cartridges, and E. R. (Enfield rifle, 12 to 20 meshes) for the ball cartridges of small arms. A special F. G. powder, made with a finer grain (24 to 32 meshes), is now used instead of M. R. powder to fill the iron bursters of segment shells.

M. R., or medium rifle powder (44 to 72 meshes), is the smallest size; it is used for the bursting charges of shrapnel shells.

Powder barrels.

Powder made up in cartridges is issued in metal-lined cases or improved barrels, as shown at p. 402. Loose powder is issued in barrels made of beech, with several hoops, four of which are copper, and the rest ash; the barrels should be well seasoned, and as tight as possible. When the powder is required they are unheaded with instruments made of copper. They are in three sizes:—full, holding 100 lbs.; half, holding 50 lbs.; and quarter barrels, holding 25 lbs. The description of the powder, and the date at which it was stoved, are marked on the barrel in which it is contained. Red letters denote that the powder is of the best quality; white, that it is of inferior quality, such as may be used for salutes, &c. R. S. means restoved, or dried a second time in consequence of having been damp. For the classification of powder in magazines, see Circular 512, 9/12/59. Most of the powder is obtained from contractors, but some is made in the Government mills at Waltham Abbey.

Marks.**Early kinds of powder.**

Powder has always consisted of the present three ingredients, but they have been mixed in many different proportions, and as the strength is closely connected with the comparative quantity of each ingredient the early sorts of powder must have been almost worthless for projectile purposes.

Whitehorne's work on Artillery, published in 1560, gives 23 different compositions for powder, which may also be seen in Grose's Antiquities, vol. ii, p. 318. Norton, writing in 1621, speaks of the old powder as

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being "evilly receipted and slenderly wrought, the powder now being "double or treble more than it was in force of rarification and quickness;" and he explains this improvement partly by the greater care given to refining the ingredients, partly by the corning (or granulating) lately introduced. The granulation alone increased the strength by one-third, and the former charges of serpentine or mealed powder (equal in many cases to the weight of the shot) had to be reduced in proportion.* The principal change since that time has consisted in reducing to one uniform composition the different powders used for cannon, muskets, and pistols. In 1765 each was made in different proportions, and of each sort there were two qualities, strong and weak.† The service charge for battering pieces at that date was one-half the weight of the shot; it is now never more than one-third.

Corning.

Primers.

Primers or priming tubes serve as auxiliaries to friction tubes in carrying the fire to the cartridge; they are used only with the 40-pounder and 110-pounder Armstrong guns, in which they are required on account of the turn, combined with the length, of the vent.

They are made with a piece of paper or parchment, 1·9" in length, 0·3" in diameter, filled with tube composition and left open at each end. Three narrow strips of flannel are added to the outside to give it a hold of the vent. Primers are issued in paper covers and packed in zinc cylinders holding 100 each; 15 weigh 1 oz.

Rivets.

Rivets are used to fix wooden bottoms to shot and shells. Bottoms issued loose can be fixed with the hammer and punch contained among the shell implements. The rivets for them are packed with the spare plugs and wads. One rivet is supplied with each bottom; this allows 10 per cent. in excess of the number of shells. Rivets for shrapnel shells, from the 6-pounder to the 18-pounder, inclusive, are smaller than those used for the other shells. The dimensions are—

	Length.	Diameter.
Shrapnel rivets, 6-pounder to 18-pounder . .	·43 inch.	·310 inch.
Other shells and shot - - -	·51 "	·433 "

Rockets.

There are two kinds of rockets used in the artillery service, one is for signals, the other is used as a missile. Each kind consists of a case filled with composition, and a stick.

Signal rockets are of three sizes, 2 lb., 1 lb., and ½ lb. The case is of paper, with a copper socket at the side for fixing the stick; the head of the rocket contains stars or lumps of a different composition, which burns with great brilliancy. There is an iron tube or machine for firing them, but they can be used without it, and only require an upward direction to be given to them. The tube is about 9 feet long, and hollowed throughout; the top part is large enough to receive the rocket, and the lower is just wide enough for the stick. This tube is fitted with a percussion hammer and lanyard for detonating tubes; rockets fired without it are lighted with a portfire.

Signal rocket.

The rockets used as missiles are known as Congreve, war, or fire Congreve rocket.

* Practise of Artillerie, pp. 42, 53.

† Adye's MS., pp. 20, 104.

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rockets. The case is made of iron, and the head is constructed in two different ways ; with one head the rocket serves as a shot or shell, and with the other as a carcass. The opposite end of the case is closed by an iron plate, with a hole in it to receive the stick, and five vents for the escape of the gas. The sticks are of wood, with an iron screw at one end, by which they are fixed to the case.

Shell rocket. The shell head has an empty chamber, which can be filled with powder through a hole closed by a metal plug. To ignite the powder there is a fuze, between the chamber and the rocket composition, which can be bored to any length required. When the rocket is to be thus used implements are required, and a set of them is provided with each rocket equipment. The plugs and fuzes are not issued separately.

Carcass rocket. The carcass head is pointed at the end ; it is filled with carcass composition, and furnished with the necessary holes for the escape of the flame.

Congreve shell rockets are of four sizes, 3, 6, 12, and 24-pounders, the dimensions and weights of which are as follow ; the 12-pounder and 24-pounder rockets are also made with carcass heads, which add a few inches to the length, and also increase the weight :—

Shell Rockets.	Case.			Stick.		Tube.		Range.
	Diameter.	Length.	Weight.	Length.	Weight.	Length.	Weight.	
	ins.	ns.	lbs. oz.	ft. ins.	lbs. oz.	ft. ins.	lbs. oz.	yards.
3-pounder	1·6	10·2	3 12	5 0	1 2	- -	- -	1,900
6-pounder	2·0	13·85	8 8	7 0	2 6	9 0	61 8	2,500
12-pounder	2·6	17·9	14 4	9 0	4 3	9 0	79 8	3,400
24-pounder	3·86	23·8	29 6	11 7	8 5	- -	- -	3,400

The tube in the above table refers to the machine from which the rockets are fired. It is a tube of iron, supported on legs and fitted with an arrangement by which any elevation up to 45 degrees can be given to it. A friction tube or portfire is used to ignite the composition.* Rockets can also be fired from the ground in volleys by lengths of quick match, called leaders.

Packing. Congreve rockets are packed in boxes as shown at p. 405, and the sticks are tied up in bundles of corresponding numbers, viz., 6 24-pounder, 9 12-pounder, 16 6-pounder, and 30 3-pounder sticks per bundle.

Invention. The manufacture of rockets as a kind of firework appears to have been one of the earliest uses to which the ingredients of gunpowder were put, but the first application of them to offensive purposes dates only from 1805, when it was proposed by Sir William Congreve. They were used as incendiary missiles in the operations against Boulogne in 1806, and again at Copenhagen in 1807. In 1813 a half troop of English horse artillery was equipped, for experiment, with rockets to be fired as projectiles against troops, and was sent out to serve in the field with the allied armies in Germany. Being attached to the army of the North, under the Crown Prince of Sweden, there was no opportunity for trying the rockets in action until the battle of Leipsic ; in that engagement

* If the rocket composition is not in a perfectly safe state a Behenna fuze is used instead. See p. 193.

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they were used with success, and in February 1814 they were employed by the artillery of the Peninsular army at the passage of the Adour.*

The use of rockets was at first confined to a troop of horse artillery organized for the express purpose ; that system has given way to the present one of attaching a rocket carriage to every battery.

Shells.

Shells are iron projectiles made hollow in order to contain a charge of explosive ingredients or incendiary composition. For explosive shells the charge is of powder, it is ignited by a fuze and breaks the shell into splinters, each of which acts as a separate missile. There are, however, two kinds of these shells, the effect of one depends principally on the quantity of bursting powder, and that of the other on the number of missiles distributed in the course of its flight. Incendiary shells comprise carcasses and Martin's shells. The former contain an inflammable composition, and are provided with holes to permit the escape of the flame. The latter are charged with molten iron, and break by the force of concussion. Carcasses have already been described at p. 95 ; they are always entered under that head, and not as shells, in documents relating to stores.

Explosive shells are made in different ways to suit the different classes of ordnance, and there are consequently the following different patterns :—

For Armstrong guns,—common and segment shells.

For smooth-bored guns and howitzers,—common, shrapnel, and Martin's shells.

For mortars,—mortar shells.

A table of these shells, with their principal dimensions and other particulars, is given at p. 395.

Common Armstrong shells are simply hollow projectiles, with a fuze hole ; they are longer than shot of the same calibre, and are not issued to guns smaller than the 20-pounder. The fuze hole is 1·29" in diameter for all the calibres, and is closed by a metal screw plug. The bursting charge is of L. G. powder, made up in a paper bag with calico cover, or in a waterproof calico cartridge. The fuze may be either a time (with adapter) or large percussion fuze.

Segment shells consist of a series of iron segments held together by lead, and enclosed in a thin iron shell. They are supplied to every gun, and are a substitute for the shrapnel shells, case, and grape shot used with smooth-bored ordnance. The segments are disunited by the bursting charge. Their number varies from 30 up to 111, according to the size of the shell. There is a difference between the small segment shells, up to the 20-pounder, inclusive, and those of larger calibre, in the following respects :—The small ones have fuze holes 1·22-inch in diameter, and iron bursters filled with special F. G. powder ; they are fired with the time or the small percussion fuze, and have a wooden as well as a metal plug. The 40-pounder and larger segment shells have the same fuze holes, fuzes, and plugs as the common shells, and their bursting charges are similar except in the quantity of powder.

Armstrong shells are usually issued loose, but there are boxes for loaded shells, as shown at p. 404. The only implements required for their preparation are a key for removing the plug and a funnel for

* Congreve's Rocket System, p. 16.

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pouring the powder into the shell. They are coated with lead, and marked in the same manner as Armstrong shot.

Common spherical shells.

Common spherical shells are made to suit every calibre, from the 12-pounder, or 4½-inch up to the 10-inch. Their bursting charges are of L. G. powder, made up in paper bags with calico covers, or in waterproof calico cartridges. Their fuze holes are all 1·024 inch in diameter, and secured by a metal screw plug; the 12-pounder has a socket, inserted in the fuze hole and projecting inside, to give a better hold to the fuze. The fuze may be Boxer's time (common) or Pettman's percussion fuze; but the shells manufactured before the latter was introduced require the thread in the hole to be continued to the bottom. Shells that are fitted for this fuze are therefore distinguished by a cross cut on the plug. Common shells are fixed to plank bottoms before being fired, but are not always issued with them ready fixed.

Shrapnel shells.

Shrapnel shells are thin shells filled with bullets; they are made for all guns and howitzers, from the 6-pounder up to the 68-pounder, and may be recognized by their loading holes.

The original shrapnel shell* was invented by Major Shrapnel, R.A., about 1803, and was used in action for the first time at the battle of Vimiera, one of the first engagements fought in the Peninsular war. The first pattern was simply a common shell, made thinner than usual, and filled with bullets, among which the bursting charge was inserted. The quantity of powder was reduced to the smallest amount capable of separating the shell, and the effect of the bullets was derived from the velocity of the shell at the moment of bursting.

Improved shrapnel.

The shell, however, as originally constructed, being found liable to burst in the gun, from the shock of the discharge, an improved pattern was invented by Captain (now Lieut.-Col.) Boxer, R.A. In this shell the charge was kept separate, in a cylinder introduced at the fuze hole, and the interstices of the bullets were filled with melted rosin. It was adopted for the service in 1854, but has since been superseded by the diaphragm pattern invented by the same officer.

Diaphragm shrapnel.

In this pattern, which was adopted in 1856 and is now the only one in use, the bursting charge is separated from the bullets by a thin interior partition or diaphragm, and the breaking of the shell is assisted by four grooves along the interior surface. The chamber for the bursting powder communicates with a gun-metal socket in which the fuze is fixed. The bullets are made of lead hardened with antimony, and the interstices are filled with coal dust. Carbine bullets, 20 to the pound, are used for the 6-pounder, 9-pounder, and 12-pounder; and musket bullets, 16 to the pound, for all other shrapnel shells. Their number varies from 29 in the 6-pounder to 339 in the 68-pounder.

The bursting charge is of M. R. powder, issued in a paper bag with a calico cover; the bag is made of waterproof paper if necessary. The fuze is always Boxer's time fuze. The fuze hole is 1·024 inch in diameter, the same as in common shells. The plug is also similar, but it has a second plug of wood covered with serge attached to it; this prevents the bursting powder in the chamber from coming into the socket in such quantity as to cause inconvenience in fixing the fuze. The bursting powder is poured into the chamber through the loading

* It was for many years more commonly known as spherical case, but the name was inappropriate to a projectile thus constructed, and the inventor's name was restored about 1852. The term spherical case would properly apply to the case shot mentioned at p. 111.

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hole, which is closed by a screw plug. The loading hole is .6 inch for the 24-pounder and larger shells, but .5 inch for the 18-pounder and smaller.

Shrapnel shells are issued in boxes, with the wooden bottoms ready fixed; the end wood pattern is used for field service. The rivets and rivet holes are of two sizes. See Rivets.

Mortar shells are of three sizes, 8-inch, 10-inch, and 13-inch, the two last may be known from common shells by having two small lugs, ears, or (in future) lewis holes for lifting them. For the smaller mortars, 5½-inch and 4¾-inch, the 12-pounder and 24-pounder common shells are used. The bursting charges are of L. G. powder, made up in the same manner as for common shells; Boxer's 8-inch mortar fuze is used with the three large shells, and the special, or 5½-inch-fuze with the small ones. The fuze holes are 1.482 inch in diameter for the 13-inch and 10-inch shells, 1.410 inch for the 8-inch. Metal screw plugs were discontinued in 1860, and since that time the holes have been corked. Wooden bottoms are not used with mortar shells. Mortar shells.

Implements for preparing spherical shells for use, by fixing them to bottoms, if necessary, removing the plugs, inserting the bursting charge, and fixing the fuze, are issued in sets, as shown at pp. 208 and 361.

Martin's shells are made of iron lined with clay, and are loaded with molten iron. There are only two sizes, 8-inch and 10-inch, and they are not fired from mortars. They are fixed to wooden bottoms like other shells, but require no fuze, and the metal after being poured in hardens so quickly at the filling hole that no plug is necessary to retain it. There is, however, a metal plug issued in the filling hole to preserve it. Martin's shells.

These shells were adopted in 1860. A cupola furnace, with proper utensils and fuel, is provided for melting the iron (see page 351).

Boxes of empty shells sent to an army in the field are marked with one blue ball for the field artillery, and two blue balls for the siege train; but if the shells are filled with powder (live shells), they are marked with two red diamonds.

The term shell seems to have come into use in England at the beginning of the 18th century; in books of an earlier date hollow projectiles are described as granadoes and fireballs. They were certainly manufactured and discharged from mortars in the middle of the 16th century, but they were more often applied to setting fire to buildings with incendiary composition, than to destroying works by the mechanical effect of their fall or the explosive force of their bursting charge. During the last hundred and fifty years their use has been so much extended and developed that shells are now the most used, if not the most important, of artillery projectiles. Their course of development may be briefly described as follows. Progressive use of shells.

Long restricted to vertical fire from mortars, shells began to be used in horizontal fire about 1700; in this stage of their progress they were fired from howitzers with small charges of powder. The next improvement, suggested by a casual experiment in 1779, was to fire them from guns with large charges, and to combine with their other destructive powers the increased velocity thus obtained. Major Shrapnel's application of this principle to a new kind of shell in 1803 advanced the practice to a point at which it remained nearly stationary until the last few years. In the interval guns and howitzers were made on new constructions for the purpose of discharging shells, but the projectiles themselves remained unaltered. Since 1840 the introduction of per-

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cussion fuzes, and the general improvements introduced by Lieut.-Col. Boxer, have completed the development, and brought the practice of shell firing to its present effective state.

Shot.

There are three sorts of shot manufactured for the service ; case, grape, and solid shot ; hollow shot have not been made since 1859, shells of the same calibre being used as such. Case shot and grape shot are used with smooth-bored ordnance only, with Armstrong guns segment shells are employed to produce a corresponding effect.

Case shot.

A *case shot*, or canister shot, as it is also called, is a tin cylinder filled with cast-iron balls, and closed at the top with wood or iron ; wood is used for brass ordnance, and is cut cylindrical, conical, or cup shaped, according to the form of the bottom fixed to the other projectiles. The complete case is painted red for guns or carronades, and black for howitzers. One end is fitted with a rope handle.

Grape shot.

Grape shot is a projectile of the same nature as case shot, but the balls are fewer and weigh heavier ; it is not fired from howitzers nor from brass guns. The balls are generally arranged in three tiers round an iron pin. They used to be contained in a canvas bag, resting on a wooden bottom, and were bound or "quilted" with a cord to keep them in their places ; but the canvas being liable to wear out or spoil by damp, the shots have of late years been secured between iron plates. The plates have indentations to prevent the balls from shifting ; they are four in number, and are kept together by an iron pin with a nut screwed to the top. The two sorts are distinguished as quilted and tier, or Caffin's grape ; the latter is painted black.

Grape for carronades and for the 10-inch gun is prepared differently from the above. For this gun the balls are packed in an iron cylinder, at one end of which is an iron handle ; for all carronades they are in tin cylinders with iron tops, like case shot. Grape shot in tin or iron cases is painted red ; it is not fired from howitzers.

Both case and grape are issued in boxes made to suit their dimensions. For their various contents, &c., see the table at page 404.

Sand shot.

The iron balls are called *sand shot* ; there are fifteen sizes of them, the largest weighing 4 lbs., and the smallest $1\frac{1}{2}$ oz. 1 lb. shot are fired in vollies from mortars, and are issued in boxes, each containing the proper number for one charge, viz., 50 for 8-inch, and 100 for larger mortars. They are put in loose, but a wooden bottom is previously placed over the charge of powder.

Solid round shot.

Solid shot for smooth-bored guns are simple spheres of cast iron, with a diameter a little less than that of the gun ; the difference is called the windage and differs in various guns, but is seldom more than two-tenths of an inch. Shot are issued loose for garrison service or siege trains, but when supplied to field guns they are riveted to wooden bottoms of the "end wood" pattern. They are not fired from howitzers or from the 8-inch and 10-inch shell guns ; the 68-pounder shot is painted red to distinguish it from the old pattern 8-inch hollow shot, which is of the same diameter.

Solid round shot may be heated in a furnace and used for incendiary purposes ; the articles necessary to the operation are described at p. 348.

Solid Armstrong shot.

Solid shot for Armstrong guns are made of cast iron, coated with a mixture of lead and antimony. The coating is now attached by zinc solder, but at first it was attached by tinning and afterwards by grooves

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or ribs on the iron, called undercutting. The letters R.G.F., R.L., or E. O. C. show whether the shot was made at the Royal Gun Factory, Royal Laboratory, or by the Elswick Ordnance Company. L. A. denotes that the coating is of lead and antimony, and V. or Z. that it is attached by zinc or undercutting, as the case may be. Shells are coated and marked in a similar manner.

The dimensions of Armstrong shot are given at p. 395; there are boxes for packing them, but they are usually issued loose. Shot for drill purposes are reduced in diameter about one-tenth of an inch, by removing a portion of the lead coating, to enable them to pass freely through the bore.

Boxes containing shot sent to the field artillery of an army are marked with one blue ball, and to the siege artillery with two blue balls.

Of late years solid shot have been made exclusively of iron, but until the 16th century lead and stone were the materials employed. Stone shot especially were fired from a class of ordnance which was not made strong enough for heavier projectiles, and it was from this practice that howitzers in Germany were named after the weight of a stone shot fitted to the calibre. In England cannon periors and perieræes (names corrupted from the French pierre) were used for the purpose. Stone shot were also discharged from mortars, and were recommended to be substituted generally for iron shot, "where the marks were but "tender."* *Early kinds of shot.*

Small shot of various sizes, such as are now called sand shot, were classed together as murdering shot; they were mostly fired from a class of small light pieces, and "put up in bagges or lanthornes fitted to "their calibres." The lanthorne was made of wood, in the same shape as an ordinary lantern, but the projectile was practically the same as the present case shot. Another kind of case shot was made in a spherical form. It consisted of two hollow round plates like half bullets, filled "with pibble stones or musquet bullets, or square peeces of iron called "dice shot."† The name grape shot, afterwards given to the iron balls tied up in bags, was suggested by their resemblance to a bunch of grapes when the quilting line was drawn round them.

Red-hot shot were fired as early as the 16th century. The practice followed closely on the introduction of iron shot, but it does not appear to have been common, for it is passed over in silence by English writers of a much later date, whilst of other incendiary missiles, made with tow and inflammable composition, they describe several varieties. These light missiles, fired at short ranges and thrown amongst the wooden buildings of that period, were probably sufficiently effective, and could be prepared with less inconvenience. Illustrations to the sieges of Marlborough's time show the process of heating shot on large open gratings or braziers with fire underneath. *Red-hot shot.*

Balls of red-hot clay, thrown from slings, may be considered as the prototype of hot shot, and these were used by a native tribe to set fire to a Roman camp during Cæsar's war in Gaul.‡ In the 15th century stone shot rather smaller than the calibre were soaked in a mixture of

* Norton, pp. 56-59.

† Norton, p. 58; Ward, p. 360.

‡ "Ferventes fusili ex argillâ glandes fundis, et fervēfacta jacula, in cassas . . . jacere cœperunt." De Bello Gallico, book v. c. 43.

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melted pitch, sulphur, &c., and wound round with rags, also saturated with inflammable ingredients until they fitted the bore.*

Signal Lights.

Signal lights are cylindrical cases of paper, 1·78 inch in diameter, filled with composition; they are hollow to a depth of 2" at the base to receive a handle (10 inches long), on which they are fixed when required for use. They are fitted to receive a common percussion cap, which can be ignited by striking it against any hard substance.

These lights are made in two sizes; the small one, described in store lists as Light, signal, is 4" long, with 1·1" of composition, and burns one minute; the large size, described as Light, long, is 9½" long, with 6½" of composition, and burns five minutes. The composition consists of saltpetre 75·7, sulphur 18·9, and red orpiment 5·4, by weight; it burns with a white light.

Signal lights are issued in zinc cylinders containing eight each, for which number one handle would be a sufficient proportion.

Smoke Balls.

Smoke balls (balls, smoke) are paper shells filled with a composition which produces a great quantity of smoke; they are fired from mortars with reduced charges. They are made in five sizes to suit the calibres, and are issued in boxes, as shown at p. 405. The composition consists of sulphur 10, mealed powder 50, tallow 5, pitch 20, and sea coal 15, by weight. A hole is bored through the paper case and filled with fuze composition to convey the ignition. The 8-inch ball burns four minutes. Smoke balls have been used as a means of annoyance and impediment to working parties for at least a hundred years, and probably ever since the approaches of a siege have been conducted in a scientific manner.

Tubes.

Common tubes. Tubes are used for discharging all kinds of ordnance, and also for firing rockets. They are made of metal, paper, or the quills of small feathers. The lower part is always filled with mealed powder and spirits of wine, a clear channel being left down the middle, but the upper part is differently primed or constructed, according to the way in which it is to be ignited. The common way previous to 1846 was by applying a lighted portfire to it, but since that time the use of detonating powder inserted in the head of the tube has been more generally employed.

Detonating tubes. In the first detonating tubes the powder was contained in a small piece of quill put across the head of the tube, from which arrangement they were named *cross headed* tubes; they were ignited by a blow, and heavy guns were fitted with percussion locks constructed for the purpose. The present tubes, which were introduced in 1854, and are used for light as well as heavy ordnance, are also primed with detonating powder, but are ignited by *friction*, and the friction is produced by pulling out a piece of roughened copper fixed in the detonating composition. The copper piece projects from one side of the tube, it terminates in a ring, and is drawn out by a lanyard or string with a hook at the end. A dummy tube, on a similar plan, has lately been made for drill.

Friction tubes.

Galvanic tubes. There are also galvanic tubes ignited by electricity from a galvanic battery, but these are only used for the proof of ordnance.

Friction tubes are made of copper; cross headed tubes of quill (the top painted red and the rest black); and common tubes may be made of

* *Études sur l'Artillerie*, vol. iii. p. 362.

Ammunition.

quill, metal, or paper. The following table contains the dimensions of the tubes in most common use; friction tubes are issued for every round of ammunition and about 20 per cent. spare; brass tubes in the proportion of 1 to 10 friction tubes; all tubes are packed in zinc cylinders containing 100 each.

Name.	Total Length.	Size of Head.	Remarks.
Friction, copper -	Inches. 3·1	Inches. 1·1	A ring projects on one side; the whole is painted black. 100 weigh 30 oz.
Common {	brass	·86	The top is circular, and has paper wrapped round it. 100 weigh 39 oz.
	quill -	·5	Ditto. 100 weigh 6 oz.
	paper	·35	Coloured black.

The paper tubes can be easily made with saltpetre, powder, and spirits of wine, if there should be a deficiency of others. Match tubes are quill tubes with two inches of quick match projecting from their heads. An auxiliary tube used with the 110-pounder and 40-pounder Armstrong guns is called a primer, and described under that name. *Primers.*

Tubes have been universally adopted since the 17th century as the most convenient means of discharging ordnance. The first improvement upon filling the vent with loose powder was to pass a piece of quick match down it; the next was to facilitate the insertion by making tubes of tin with lengths of quick match ready fixed. These tubes were primed at the top with mealed powder and spirits of wine, and every piece of ordnance had a tube of the same length as its own vent. Tubes of this kind were in use in 1766. The present composition succeeded the quick match, and it was discovered in course of time that a tube two or three inches long was powerful enough to communicate flame to the cartridge, but this simplification was not adopted till after 1813. Brass was substituted for tin on account of the latter being subject to corrosion. *Original tubes.*

Wads.

There are four kinds of wads, viz., junk and grummet wads for smooth-bored guns, papier maché (lately gutta-percha) wads for spherical shells, and coaldust wads for cartridges. Lubricating wads were at first classed under this head, but are now called lubricators.

Grummet wads consist of a circle of rope to suit the calibre, with *Grummet wads.* two straight pieces tied across it; they are used with heavy guns, when loaded at low elevations with loose round shot, which are liable to roll out when the gun is being laid.

Junk wads must also fit the bore; they are made of oakum bound *Junk wads.* round with spun-yarn, and vary in thickness as well as diameter. Two of them are used when the piece is loaded with a hot shot or a shell containing molten iron, and are placed between the shot and the cartridge. For ordinary loading they have been superseded by grummet wads and wooden bottoms, but they were formerly an essential item of the ammunition, as appears from the following gunnery instructions in the *Practise of Artillerie*, p. 101. "Then shall he put the powder

"home softly, putting in a good wadd, and thrust it home to the

Ammunition.

“ powder, giving three or four hard strokes, which will gather the scattered powder together and drive close the same ; and then put in the shot, and afterwards another wadd of hay, grasse, weedes, okham, or such like.” Another work of the same date calls it a wad or wisp, and probably it was made up in any manner that was most convenient for the occasion. Waddings are mentioned in 1628 among the items of “ provision,” for which transport must be obtained.

Junk and grummet wads are packed in vats, in such numbers as may be demanded.

Papier maché
or gutta-percha
wads.

Papier maché wads are thin circular pieces of that material (lately substituted for gutta-percha) used for securing the fuze holes of common (spherical) and the loading holes of shrapnel shells after the bursting powder is put in. The same wads were formerly used for the fuze holes of shrapnel and mortar shells, but were discontinued by orders dated 22nd June 1860 and 4th May 1860 respectively.

The wads are fitted to the holes in which they are inserted, and are therefore made in three sizes. They are issued at the rate of 1 per shell.* In field equipments they are carried in the limber boxes, and for garrison service they are packed in common cases which contain proportions of wads and spare loading hole plugs for various numbers of shells.

Coaldust wads.

Wads for cartridges are serge bags formerly filled with sawdust, but now (since March 1862) with coaldust. They are put inside the cartridges of 8-inch shell guns if the service charge is reduced, in order to fill up the vacant space.

Sawdust wads.

Sawdust wads were formerly substituted for lubricators in the exercising cartridges of 12-pounder and 9-pounder Armstrong guns, but wooden lubricators are now used instead.

Stores.

Supply.

Some of the stores connected with the use of artillery are of a uniform pattern and size ; a few vary within certain limits, and the rest are required to fit the piece of ordnance with which they are used.

Proportion.

On field service there is a fixed number of stores for every carriage of a battery ; in siege and garrison service the supply is less definite, but it generally bears some conventional proportion to the number of pieces of ordnance.

Service.

Under the general head of stores are included a vast number of articles ; they are entered in lists by alphabetical order, unless they are provided in regular sets or issued for some specific purpose. The operations for which they are required may be classified as follows :—

1. For loading, laying, priming and firing,—such as rammers, sponges, ladles, wadhooks, handspikes, punches, priming irons, thumbstalls, lanyards, portfire sticks and clippers, linstocks, cartridge cases, &c.

2. For use in magazines, including the boxes and cases for packing ammunition, and the implements to prepare it for use. Furnaces for heating shot, and cupolas for melting iron to fill shells, require special stores to be used with them, and are, therefore, separately described.

3. For mounting or dismounting ordnance, and meeting any exigency which may occur in their service.

4. For use at drill (instead of the service articles) or for purposes of instruction.

* Hitherto a proportion of spare wads has been supplied, but the issue is discontinued. The tin boxes with red lids in which they were packed, together with spare plugs, for field service are also withdrawn.

Stores.

5. For keeping the equipments in proper working order, and for miscellaneous purposes,—such as grease, oil, tow, sponge cloths, spun-yarn, Hambro' line, marline, &c.

Batteries of field artillery are also provided with a proportion of camp equipage among the stores issued as their regular establishment.

Rammers and sponges are indispensable to the service of ordnance ; the former drive the charge into its place, and the latter free the bore from any impurities left by the discharge or any lighted fragments of the cartridge. Both are made of wood ; the head of the sponge is covered with skeepskin, and its form is adapted to that of the chamber or the end of the bore ; the rammer head is rather smaller than the bore, and its face is hollowed in the centre to prevent injuring the fuze, which projects a little from the surface of a shell. For long pieces of ordnance the two heads are on separate staves, but for short pieces they are both fixed to one staff, and are "charged" or entered in lists under the name of sponge. There are painted canvas caps issued with the sponge heads to keep them clean and in good order. Rammers for 110-pounder and 40-pounder Armstrong guns are club-shaped, and in one piece ; the sponges are also of a different pattern, and have "coatings" issued separate. Cleaning rods for these guns are plain wooden staves, with projecting iron pins at one end ; tow is wrapped round the pins when the rod is brought into use.

Ladles are long spoons of copper fixed to wooden staves ; they are not required unless the piece is to be loaded with loose powder, and are no longer issued to field ordnance. Wadhooks are used for "searching" the bore, and withdrawing from it anything that would impede the loading.

Handspikes are simply levers ; they are used to "run a gun up and back," or, in other words, to move the carriage backwards and forwards ; also to "traverse" it right and left, and to raise the breech when the elevation is being given. Heavy ordnance require about five handspikes, but for field pieces one is sufficient ; it is made in a different pattern, and being principally used for shifting the position of the trail, it is distinguished as a traversing handspike. It is slightly curved at the end, and is fixed to the trail by a ring and a pin when the gun is in action. The handspikes for working heavy ordnance are of several kinds and sizes, some of the patterns are more commonly termed levers. The *common handspikes* are made of ash, cut square at the bottom or "point," and rounded at the top or "small end ;" they are made 5, 6, or 7 feet long ; if they are 8 feet long they are called levers. *Bevelled handspikes* have part of the end shaved off, so as to present an edge instead of a square surface at the point. *Handcrow levers* are similarly formed, but have an iron shoe, split at the end, added to the point. *Shod levers* are about 4 feet long, and have a plain iron shoe. *Truck levers* are a sort of handspike furnished with two small gun-metal trucks at the lower end, and a piece of rope at the upper. Two of them are applied under each sliding carriage, to facilitate the running up. *Roller handspikes*, which have wide wooden rollers at the end, are used singly for a similar purpose when the gun is mounted on a rear chock carriage.

Punches serve to clear the vent, and priming irons to pierce the cartridge, so as to form a clear passage for the flame from the priming tube. The punches are made in nine lengths ; the priming irons are in two sets, each consisting of a pricker, a drift, and a bit ; the short set is issued for field ordnance, and the long one for siege or garrison

Stores.

- Thumbstalls.** service. Thumbstalls are worn to protect the thumb, which is pressed on the vent whilst a piece is being loaded, in case the metal has become heated by long continued firing.
- In loading mortars, hooks are required to lift the shell, and a sheepskin to wipe it before it is placed in the bore. The laying requires a plummet line and pointing rods. Ladles and wadhooks are not used.
- Cartridge cases.** Cartridge cases are leather cylinders with moveable tops and strap handles. They are required with large ordnance to protect the cartridge whilst it is being brought from the magazine to the mouth of the piece; small cartridges can be carried under a man's arm. The stores required to be used with particular kinds of ammunition, such as lanyards for friction tubes, linstocks for slow match, and sticks for portfires, have been mentioned in the previous pages.
- Magazine stores.** The barrels, metal-lined cases, boxes, and packing cases required for preserving ammunition have also been described under that head. For preparing ammunition there are measures, scales, and weights for distributing powder, needles, thread, worsted, knives, and scissors for making up cartridges; ring gauges to ascertain that the projectiles, &c., are of the proper size for the bore; and sets of implements for preparing shells and fuzes.
- For preparing ammunition.** In powder magazines, amongst other precautions taken against fire, all articles are excluded which would produce sparks by concussion or friction. Any metal implements which must be used are therefore made of copper or gun metal. Slippers are worn over the boots of any one who enters, and hair cloths are laid over the floor when any work is carried on. The ammunition is not made up in the magazines themselves, but in the shell rooms, or in laboratory tents (*see* p. 425) made and issued for the purpose. The situation and construction desirable for the security of magazines against the enemy's fire frequently render some artificial light necessary for working inside them. Lanterns may be used, but reflectors of bright corrugated metal are now frequently employed; by placing them at a proper angle near the entrance they throw in a sufficient amount of daylight for ordinary purposes.
- Lighting.** The class of stores mentioned third in order consists, for field service, of lifting-jacks, drag-ropes, couples for traces, and intrenching tools. The lifting-jack serves to raise a wheel that has sunk into soft ground, or to support the axletree whilst a wheel is shifted. The stores used with heavy ordnance depend on the nature of the operation and the means at hand; some account of them is given at page 357.
- Stores for moving and mounting ordnance.** Articles used at drill are generally the same as are used for service, but the cartridges are made of blue instead of white serge, and are filled with sawdust or some other substitute for the powder. Those for Armstrong guns contain wooden cylinders, and either a wooden lubricator or a socket to receive it. At the base of the cartridge there is a copper plate to protect it against the explosion of the tube. For all fuzes there are sections and drawings, or loose parts, in order to show the interior arrangement. For Armstrong guns the projectiles are reduced in diameter so as to pass freely through the bore, and have shell plugs with tarred lanyards 10 feet long.
- Stores for drill and instruction.** The successive changes in ordnance and ammunition have necessarily caused corresponding changes in many of the stores with which they are equipped. Wadhooks, for instance, were found necessary when cartridges (then made of paper or parchment) began to be commonly used, in order to extract the remnants which were apt to accumulate after frequent discharges; they were first called worms. Similarly,
- Stores in early use.**

Stores.

shell and fuze implements, portfire-sticks, and lanyards were introduced to accompany new varieties of ammunition ; but, on the other hand, several of the articles remain nearly the same as they were described to be in the earliest printed instructions for the management of ordnance. Sponges and rammers have always been like in general respects to the present patterns. A punch was also used to clear the vent before the loading began. The loose powder was kept in a "boudge barrell,* Budge barrel. " covered safe with some hide, garment, or cloath," and the proper charge was measured and loaded by means of the ordinary copper ladle. The touch hole was kept covered with the thumb, to prevent the loose powder from flying out, and afterwards it was primed with powder Powder horn. from a horn. If a cartridge was used, a vent was made through it with a " three-square sharpe prying iron ;" lastly, the gunner covered the touch hole with a dry sheepskin, and attended " the gentlemen of the " ordnance his command" before he gave fire.

Light was applied to the priming by a linstock, as described at p. 104, Linstock. and the linstock became so associated with the gunner's profession that it was adopted as part of his personal equipment (*see ante*, p. 18). Spring spikes, which can be dropped into the vent, so as to prevent a Spikes. piece of ordnance from being fired, and can be withdrawn by any one instructed in their use, were unknown as late as 1765, but common spikes or nails were kept ready for use on an emergency. Pietro Sardi (1621) describes various methods of disabling ordnance, and introduces them with the observation that it has always been held most honourable for a gunner to make his piece useless before abandoning it to the enemy. " Il rendere inutili i Pezzi d'Artiglieria al Nemico in tempo " del maggior bisogno é stata sempre riputata attione di grandissima " lode." (p. 125).

Among the stores for mounting heavy ordnance, and meeting exigencies which might occur with pieces on the march, there has been comparatively little change, the improvements have been confined to the patterns and details. General lists of miscellaneous stores for the equipment of trains may be found in most works on artillery.

The early use of the gyn, and the block or platform wagon, is noticed Machines. at pp. 353, 356 ; the manner of drawing guns up steep ascents by a capstan is also mentioned by the early writers. For less important operations, such as changing wheels, &c., there were lifting-jacks of two Lifting-jacks. kinds ; one was called a scalet or ladderet, and the other a martinet or winch.

The scalet (by corruption, scallet and eshellet) was constructed on the same lever principle as the present common lifting-jack, but in appearance it was very different. In the present pattern, as supplied Lever jack. to ammunition wagons, the lever is made of iron, 3½ feet long, and the fulcrum consists of a tapering block of wood about 5 inches square at the bottom, and terminating in a split iron head. This head, which has an opening about 2 inches wide, is pierced with holes and fitted with an iron pin ; the end of the lever fits into the opening and has a corresponding hole for the pin to pass through. In the original the lever was an iron crow, or shod handspike, and the fulcrum was provided by an iron bolt supported by two wooden posts fixed in a square Scalet.

* The present budge barrel, a common barrel furnished at the mouth with a leather bag instead of a flat wooden head. The prefix is corrupted from the old word bouget, a leather bag (now budget). Reserves of loose powder for the infantry were carried in " great bougets made of dry neat's leather" (*Animadversions of Warre*, p. 201).

Stores.

slab of oak. The bolt could be fixed at various heights, and the posts were as far apart as the sides of a ladder (scala), whence, apparently, the name was adopted. It was most used for extricating wheels from deep ruts and soft ground.

Martinet. The martinet, which Norton also calls a ginne, corresponded exactly in its principle of action, and almost as closely in pattern, to the screw-jack in recent use. It consisted of an oblong block of wood, in which there was an iron bar with teeth cut on its edge, worked up and down by a toothed wheel and projecting handle. This engine is described by Hexham (p. 10) as "of singular use for the heaving up of a peece of ordnance, carriage and all, let it be never so great : yea, it is of such great strength and force that it is able to overturne a house, and hath no neede but of one man to put it a worke." The screw-jack has only lately been superseded by the barrel-jack, in which the block is of rounder form, and the bar is constructed on a different principle. The improved bar is made like an elevating screw, with a projecting thread, and works in a female screw at the top of the barrel. It is turned by a ratchet lever and toothed wheel similar to those lately adopted for the elevating screws of heavy guns.

Man harness. If draught cattle could not be obtained, or circumstances prevented their employment, men were harnessed to carriages in a similar way to the present, viz., by long ropes used as traces, with loops attached to them at intervals of a few feet. The loops or neck lines were passed "scarff-wise" over the men's shoulders. The Spaniards are said to have drawn their artillery in this manner when they invaded and conquered Mexico in 1520.

Drag-ropes. Drag-ropes, which are used for any temporary application of man power, are now made plain, except that they have a hook at one end, and an eye at the other ; formerly they had wooden pins inserted to serve as handles.

Prolong. Prolongs differ from drag-ropes in having an iron ring inserted in the middle. They are made in this manner as being better adapted to their particular use, which is to move field guns backwards or forwards, when ready for action, without limbering up. Their introduction under this name is an alteration made during the present century, but ropes were used for the same purpose at a very early date.*

Tools and Materials.

Tools. Sets of tools for the following purposes are included in artillery equipments :—

For examining the condition of cast-iron ordnance.

For reventing smooth-bored ordnance.

For sighting ditto.

For renewing the facing rings or bushes in Armstrong guns.

For performing special operations connected with Armstrong guns and carriages.

For repairing carriages (smiths' and wheelers' tools).

For repairing harness (collarmakers' tools).

For repairing saddle-trees (included with wheelers' tools).

For shoeing horses and forging iron (farriers' tools).

The tools are supplied in complete sets, but can be furnished singly on application ; they are usually issued in boxes complete, with hinges

* See *Études sur l'Artillerie*, vol. iii. p. 327, and plate 54, where they are shown coiled round the chase of the gun, ready for a march.

Tools and Materials.

and locks, but some of those which are supplied to field artillery are packed in trays adapted to the limber boxes. The heavy tools for examining, sighting, and reventing ordnance are issued in rough packing cases. Facing tools for Armstrong guns are required to be different for each calibre, all the rest are of general application.

In order to keep up the proportion of articles required for actual use, **Materials.** the equipments include a reserve of spare articles to replace any that may become worn out or otherwise unfit for use ; there are also various materials, for repairing damages, which are provided in a more or less finished state. Splinter bars, axletrees, and the ironwork employed in the construction of carriages, are furnished ready made ; other parts, such as naves, spokes, felloes, &c., are roughly shaped, but not entirely completed. For harness and saddlery there are buckles, bits, curbs, and other metal fittings ready made, whilst leather hides, serge, and similar articles are supplied in pieces to be cut up as wanted. Nails, screws, thread, &c. accompany the raw materials.

For field service there are fixed proportions adapted to the requirements likely to occur, and the accommodation that can be made in the wagons of the battery. Siege trains have a supply calculated according to its strength and other considerations. On garrison service materials are demanded annually, or specially, if necessary, but no proportion is permanently maintained.

Care and Supply of Matériel.

The following are the general arrangements connected with the care and supply of the matériel of artillery.

In arsenals and large dépôts the ordnance may be placed in rows on iron rails or skids sufficiently high to keep them off the ground ; everything else should be kept in stores for protection from the weather. **Ordnance and carriages.** The moveable sights of the guns are taken off, and the appurtenances of Armstrong guns are packed in special boxes.

In coast batteries, guns, carriages, and traversing platforms are kept mounted in readiness for immediate service, but for inland works this is unnecessary. Sheds are generally provided for the carriages of a field battery ; they are not indispensable, for the boxes are constructed and fitted so as to keep the cartridges dry without such aid, but the equipment remains serviceable for a longer time if so protected. Canvas covers have been sometimes issued.

Shot and empty shells (without bottoms) may be arranged in piles ; a few of the shot are distributed in small piles near the guns with which they are to be used, the rest are collected in large piles at a convenient distance, safe if possible from the enemy's fire. **Ammunition and stores.** Iron frames called garlands are issued in various sizes for containing the bottom rows of these piles, but some foundation is also necessary, to prevent their sinking in the ground. **Garlands.**

Case shot, grape shot, shells fixed to their bottoms, and such items of ammunition as require some protection, but need not be particularly guarded against sparks of fire or the slightest damp, may be kept with the general stores.

Powder, filled cartridges, and inflammable compositions are kept in **Magazines.** magazines ; the filled cartridges are packed in the wooden cases lined metal or the round lid barrels described at p. 96 ; the latter are only suitable for magazines so free from damp as to render the perfect protection of the double case unnecessary. Besides a large magazine

Care and Supply.

to hold the main store of ammunition for one or more batteries, there should be small magazines near the guns to save time and labour in keeping up a supply of cartridges; these are of various capacities, from 20 to 60 barrels, or thereabouts; the latter size would contain 400 rounds for ten of the heaviest guns. The metal lined cases may be used as portable magazines for taking cartridges up to the battery. For the precautions to be adopted in magazines, *see* p. 116.

Magazines in permanent works are described by the number of full-sized barrels or metal-lined cases which they are capable of containing; the large ones are further distinguished by the letters A, B, C, &c., and the small or expense magazines by the figures 1, 2, 3, &c.

In siege operations similar magazines have to be constructed when the batteries are made; in field artillery they are represented by the gun limbers, the ammunition wagons, and the reserves.

*Store and shell
rooms.*

Besides the magazines, sheds or rooms for filling shells should be made in each permanent battery; they should be in proportion to the number of ordnance, and may contain, if large enough, the side-arms and stores required for the service of the guns. If these rooms are too small a separate store will be required in each battery for those articles, common handspikes only being ever left outside. Spare side-arms and stores not often required may be kept in a general store at a convenient distance. Every store should be well ventilated, there should be shelves for small stores, and for the side-arms there should be two battens or cross bars overhead, one of them capable of being raised and lowered when the articles are wanted for use.

In siege operations shell-filling rooms should be made at the batteries if possible; general stores are kept at the parks and the depôts in the most convenient way. In field batteries the side-arms and stores are kept packed in their places ready for a march.

Painting.

Ordnance are lacquered and painted every two years, or every year, if, by being on the sea faces of works, they suffer from exposure to salt spray. The colours are black for guns, and a grey or lead colour for carriages, platforms, and stores.* (*See also* page 268.)

All field carriages and their stores are painted once a year; in the spring at home stations, and at the end of summer abroad; for ammunition and stores not exposed to weather there is no fixed period.

The work is done under the orders of the commanding officer of artillery by the regimental artificers, if possible, assisted by competent gunners; working pay is allowed to the men employed upon it, unless they are wheelers of field artillery, who do it as a part of their ordinary duties.

The latest regulations connected with this service were published in the circulars, dated 5th April 1861 (No. 673), and 30th April 1862 (No. 755); the quantities of paint or anti-corrosion, and lacquer (for the bores) to be furnished for various ordnance were specified therein: a 68-pounder gun requires 3 lbs. of anti-corrosion for its surface and $\frac{1}{2}$ lb. of lacquer for its bore; its carriage 3 lbs. of lead colour paint, and a traversing platform about 9 lbs.; if other colours are used the quantities will differ. A 12-pounder Armstrong battery, with 30 carriages, requires 235 lbs. of zinc paint, 35 of putty, and $17\frac{1}{2}$ lbs. of composition

* It was directed in 1861 that green or stone colour should be used for mounted pieces and their carriages whenever it was desirable to render the armament less conspicuous to an enemy, or to make the woodwork less sensible to the rays of the sun, but this practice has since been ordered to be discontinued. (R.A. Cir. Mem. 6/12/62.)

Care and Supply.

for canvas work, besides a few ounces of white and red paint for marking the carriages and stores. (*See also* R. A. Cir. Mem. 6/12/62.)

The anti-corrosion used for the exterior of iron guns and carriages is a mixture of dry anti-corrosion with black, red lead, linseed oil, and turpentine; the lacquer is compounded of black and red leads, lamp black, and linseed oil. The two ends of Armstrong's shot and shells are coated with black paint, which is extended half an inch over the lead coating in the middle; $2\frac{1}{2}$ lbs. of paint suffice for one hundred 110-pounder projectiles. (*Circular 727, 12th December 1861.*)

To ensure the stores being kept in perfect efficiency, both as to number and quality, frequent inspections are made by the officers in charge of them. Inspections.

For the superintendence of matériel abroad there are officers of the Royal Artillery specially instructed and appointed, under the name of "Inspectors of warlike stores, and firemasters;" regulations for their guidance are contained in circular No. 498, 7th November 1859; in matters of manufacture or repair they act under general directions from the Director of Ordnance, otherwise they are under the orders of the commanding officer, Royal Artillery. At home the care of stores is chiefly committed to officers and men of the coast brigade, subject to the senior officer of artillery in the district.

All supplies of matériel are made under the authority of the Secretary of State for War; the Director of Ordnance is charged with the duty of advising him on this subject, and of checking the demands which are submitted for his approval. The demands are prepared by the Deputy Adjutant-General Royal Artillery, or by the officers commanding the Royal Artillery at separate stations, and they are forwarded to the War Office through the Commander-in Chief. Supply.

The first supply of ordnance and stores for any new equipment is specially considered, but, as soon as it has been given into the charge of the artillery, the Deputy Adjutant-General Royal Artillery (under the orders of the Commander-in-Chief) is responsible for making such demands as are necessary for its maintenance. This responsibility extends to the reserves which may be established for immediately replacing deficiencies in the proportion required for use. The occasions which call for new equipments are the construction or alteration of defensive works, and the fitting out of military expeditions.

When a permanent battery is to be supplied with a new armament the numbers and natures of the ordnance to be used, and the manner in which they are to be mounted, are proposed (through the Commander-in-Chief) in a joint report from the officers commanding Royal Artillery and Royal Engineers. When an expedition is ordered by Government, the natures and numbers of the ordnance to accompany it are determined by the Secretary of State for War, in conjunction with the Commander-in-Chief; in both cases the demands for the various articles required are prepared in the usual manner. Trains of artillery for siege operations are, in the first instance, delivered to the principal military store officer; afterwards the commanding officer of artillery specifies the guns, ammunition, and stores to be supplied for any operation, and receives them into his charge from the store department at the place where they are to be brought into use.

At home and colonial stations annual demands are made for such stores as are required to replace unserviceable ones, or for any other purpose; and returns are forwarded which show the state of each article, as well as what has been received, expended, or returned into Demands and returns.

Care and Supply.

store during the previous year ; these returns are made by captains of field batteries, and officers in command of permanent districts or stations. On active service captains of batteries make demands immediately after every engagement for ammunition to replace what they have expended.

If a gun carriage, or platform, "complete" is demanded, the following articles will be issued with it :—

Field carriage—limber, boxes, elevating screw, straps for side arms, drag shoe, and other articles which are detailed at pp. 376–380.

Garrison carriage—stool bed, quoins (one large and one small), compressor (if used), elevating screw, trucks, and lynch-pins.

Platform—steps and trucks.

Articles not issued in regular sets must be demanded separately. As there are many articles in the service which differ but little in name or description, care must be taken to prevent any mistake about the one which is meant ; either the pattern, materials, size, or intended purpose should therefore be specified. Any small articles (such as tubes) which are made up in fixed numbers should be demanded in those numbers to save the trouble of special packing.

Allowance of ammunition for practice and exercise.

For practice at a target, and exercise (without projectiles) at drill, a yearly allowance of ammunition is made to each battery. The latest regulations on this subject are contained in Circular 824, 26/5/63, in which the following scale is laid down :—

For practice with projectiles—300 rounds per battery.

For exercise { 900 rounds per battery field artillery.
60 " " garrison artillery.

The projectiles are to consist of shot and shell in the following proportions :—

Field artillery	{	with Armstrong guns,—200 solid shot, 100 segment shells. with smooth-bored ordnance,—180 solid shot, 100 shrapnel shell, 20 common shell.
Garrison artillery	{	Armstrong guns,—12 solid shot, 9 segment shell, 9 common shell. smooth-bored guns,—110 solid shot, 110 shrapnel and common shell. mortars,—50 shell.

If mortar practice cannot be carried on the number of solid shot and common shell for the smooth bores is increased to 135 each.

The above allowance is for regimental practice and exercise only ; an additional issue of ammunition for exercise at reviews or field days, when the artillery act with other troops, may be made at the discretion of the general officer in command.

Small-arm ammunition is issued annually, at the rate of 50 ball cartridges and 55 caps for each trained man. For each recruit there is a special allowance of ammunition, to be fired at dismissal from drill ; viz. :—

Gun ammunition—one round of solid shot and six rounds of saluting charges.

Small-arm ammunition { 20 rounds of blank cartridge with 22 percussion caps.
70 " " " 77 " "
20 percussion caps, for snapping.

Target.

When gun practice is carried on with landward ranges the targets are made of thin boards, 6 feet or 9 feet square ; with seaward ranges

Care and Supply.

floating targets have to be employed, and a pattern proposed by Col. Shuttleworth, with modifications by the Select Committee, has lately been approved for general service. It consists of a half-ton vat, painted white, and filled with cork shavings; a white staff, fitted with a red flag 3 feet square, projects 10 feet above the top, and two 10-inch shells are attached as ballast. The target is moored by a 28-lbs. anchor and 20 fathoms of tarred rope. An illustration of the target prepared for use is given in Cir. 842, s. 806; the weight, complete, is about 4 cwts.

Transport of Matériel.

In arranging for the transport of matériel by land, the whole amount is divided into such loads as will be suitable to the means employed. By land. With pack-horses the load must be adapted to the power of the animal; with wheeled carriages it will depend on the construction of the carriage and the strength of the team; in either case regard must be had to the state of the country and the number of relays. With railway trains the locomotive power of the engine determines the extent of the load; the general capability of the engine depends on the gradients in the line, as well as on its own construction; it is also liable to be affected by wetness of the rails and the state of the weather. Statistics and estimates on this point are given in the Royal Artillery Handbook, page 258.

When shipping is employed for the transport of matériel, the tonnage is estimated either by the gross weight or the measurement of the various articles, which are classed as heavy or light, accordingly. By water. Estimate by weight applies to pieces of ordnance, iron carriages, and shot or shells; measurement is applied to wooden carriages, platforms, and most kinds of stores. The distinction depends on whether the tonnage by weight comes to more or less than by measurement, 40 cubic feet being allowed by the latter, and 20 cwts. by the former, to one ton. Tonnage. Ball cartridges for small arms are classed as heavy, loose powder as light, at the rate of 4 feet per barrel.

Field Ordnance.

Selection of pieces.

Pieces of ordnance for field service consist of guns and howitzers ; they do not include mortars, because vertical fire is useless in field engagements, and if the attack of an intrenched position happened to render it desirable, the siege trains or reserves could supply the necessary pieces. Heavy guns and howitzers are generally the most effective in their fire, but the choice of pieces is practically confined to those which will be light enough for their work when fully equipped. It is in order to have the advantage of heavy pieces in pitched battles that batteries of position are organized separate from the rest. It is sufficient for them that they should be able to follow the movements of the army ; whereas field batteries must be capable of accompanying the manœuvres of infantry, and horse artillery must be competent of taking part in the rapid movements of cavalry. Artillery for colonial or mountain service is composed of pieces lighter still ; it is organized by batteries, according as circumstances may require.

The pieces which are applicable to field service are shown in the following table. The horse and field batteries contain 6 rifled guns or 4 smooth-bored guns and 2 howitzers. The batteries of position have only 4 guns, or 4 howitzers separately.

Name.	Nomi- nal Length.	Weight.	Range at 5°.*	Remarks.
<i>Rifled (Armstrong's).</i>				
6-pounder gun - -	5 0	3	1750	} Suitable for batteries of position.
9-pounder " - -	5 2	6	1850	
12-pounder " - -	7 0	8½	2100	
20-pounder " - -	8 0	16	1800	
40-pounder " - -	10 0	34½	2200	
<i>Smooth-bored.</i>				
3-pounder gun - -	3 0	2½	—	} Used for mountain service. Colonial do.
" " - -	4 0	3	—	
6-pounder " - -	5 0	6	1150	} For horse artillery. For field batteries.
9-pounder " - -	6 0	9½	1590	
12-pounder " - -	6 6	13	1600	} Rarely used of late years. For batteries of position.
18-pounder " - -	8 0	33	1850	
4½-inch howitzer -	1 10	2½	—	} Used with the 3-pounder for moun- tain or colonial service.
12-pounder " - -	3 9	6½	1150	
2½-pounder " - -	4 8	13	1350	} Combined with 9-pounder gun for field batteries and horse artil- lery.
32-pounder " - -	5 3	17½	1200	

* These are given in round numbers; point blank ranges are about 300 yards; the carriages admit of 5° depression and 13° elevation being given to the piece; but 5° elevation may be taken as a fair comparison, as being more frequently used.

Field Guns at various Dates.

The general practice with regard to field artillery previous to the year 1700, or thereabouts, was to unite in one train pieces of widely different powers. For instance, the army to be raised for the recovery

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Field Ordnance.

of the Palatinate in 1620, and consisting of 30,000 men, was to have a train of 20 pieces of ordnance, thus composed :—*

- 4 cannons of 7 inches (about equal to 42-pounders). 1620.
- 4 demi-cannons (32-pounders).
- 6 culverins (18-pounders).
- 4 demi-culverins (9-pounders).
- 2 sakers (6-pounders).
- Also 2 brass mortars.

The heavy pieces in trains thus organized were used in field engagements if they could be brought into position, as appears from two demi-cannon and two mortars being taken at Naseby,† and from balls of large calibre being found at Edgehill. Afterwards the heavy pieces were separately organized as battering trains, and finally the field pieces were formed into divisions of 6 each (*see* also p. 16). The proportion of howitzers in the Peninsular war was 1 in 6, but the long brass howitzers (12-pounder, 24-pounder, and 32-pounder) were not then in existence, and the 5½-inch howitzer was a very inferior piece. Shortly before the Crimean war the proportion was increased to 2 howitzers per battery.

The following notes, extracted from Colonel Chesney's work on fire-arms (pp. 122, 124), Napier's "Peninsular War," and other sources, will show what natures of field pieces have been used at intervals down to the present time.

In 1742, during the war in which Maria Theresa was assisted by 1742. England against France and Prussia, three companies of artillery, with 24 heavy 3-pounders (and probably some battering pieces), were attached to the army of 16,000 men sent by the British Government into Flanders.

In 1745 there were 4 companies and 47 pieces of artillery in Flan- 1745. ders, viz., 10 heavy 6-pounders, 27 heavy 3-pounders, 6 1½-pounders, and 4 8-inch howitzers.

The year 1748 was the last of this war. There were now 5 com- 1748. panies of artillery, and the pieces had been increased in still greater proportion; the strength of the infantry and cavalry remaining about the same. The pieces consisted of 6 heavy 12-pounders, 6 heavy 9-pounders, 58 6-pounders (14 heavy and 44 light), 2 8-inch howitzers, and 6 royal mortars.

In 1760, the fourth year of the seven years' war, the artillery with 1760. the allied army in Germany comprised 24 12-pounders (8 heavy, 10 medium, and 6 light), 30 light 6-pounders, 3 8-inch howitzers, and 6 royal mortars; total, 63 pieces.

At Rorica and Vimiera, the two first battles of the Peninsular war, 1808. the artillery consisted of 2 brigades (field batteries) of 6-pounders, and 1 of 9-pounders; total, 18 guns.

At Salamanca, 3 troops (horse artillery) of 6-pounders, 2 brigades 1812. of 9-pounders, and 2 of 12-pounders; 42 guns.

Waterloo, 10 troops of horse artillery, viz., 3 of 6-pounders, 5 of 1815. 9-pounders, 1 of 5½-inch howitzers, and 1 of rockets and 6-pounders; also 10 brigades of 9-pounders and 1 of 18-pounders; total, about 120 guns.

A force of 5,000 men sent to Portugal was accompanied by 4 com- 1826. panies of artillery with 12 guns; 3 were attached to brigades of

* Grose, vol. i. p. 366.

† Sprigg's *Anglia Rediviva*, 1647 (reprinted 1854), p. 45.

Field Ordnance.

9-pounder guns and 24-pounder howitzers (4 pieces in each); the other was equipped as a "ball cartridge brigade."

1855.

The artillery in the Crimea consisted of two troops or field batteries to each division of cavalry or infantry respectively. One troop was armed with 6-pounder guns and 12-pounder howitzers; all the rest had 9-pounder guns and 24-pounder howitzers. There were also two batteries of position, one equipped with 4 18-pounder guns, the other with the same number of 32-pounder howitzers.

1860.

Two field batteries of 12-pounder Armstrong guns (besides smooth-bored pieces) accompanied the expedition to China. This was the first employment of Armstrong guns on active service, but ordnance rifled on a different principle had been brought into the field by the French artillery during the Italian campaign of 1859.

Manner of Draught and Service.

Draught horses.

The number of draught horses allowed to a gun or wagon on taking the field is regulated by allowing one horse to about 600 pounds of load. This proportion seems large when compared with the loads drawn by carriers' and farmers' horses, but it has been found necessary to meet the requirements of a campaign.* The want of springs adds a little to the practical weight, but the most important point connected with draught is the surface or road on which the load moves. In a campaign it is often necessary that artillery should quit the regular tracks, in order to take up positions or accompany troops, the carriages must therefore have teams capable of traversing either a stiff clayey soil or a rough mountainous country. The roads themselves become heavy and difficult in bad weather, if they are used by long columns of troops. Allowance must also be made for the loss of horses in action or by disease, and for the falling off in their condition from irregular feeding, exposure to the weather, and long marches. The exact team for each gun and carriage is shown in the details of strength previously given; there is one driver to every pair of horses.

Drivers.

Gun detachments.

The working party or gun detachment allowed for the service of a field gun, including the supply of ammunition from the wagon, always contains nine men, of whom one is a non-commissioned officer and the rest may be gunners. A gun with its ammunition wagon form a subdivision, and to each subdivision there is a "marker" to mark points of formation. Two subdivisions form a division, and each division is superintended by a subaltern officer. A complete battery contains three divisions thus composed; there are also two staff serjeants and two trumpeters, to assist in the manœuvres, and a farrier or shoeing smith, with a few necessary tools. The lieutenants are posted with their own divisions; the second captain sees that the positions are properly taken up, and gives a general assistance to the senior captain, who commands the whole. The medical officer is required to be at hand.

Markers.

Officers.

Riding horses.

In a field battery, the eight gunners march on foot, but all the other officers and men are mounted. In the horse artillery four out of the eight gunners are carried on the gun and wagon limbers, whilst the other four are mounted on riding horses. This arrangement entails

* Double this number was formerly allowed. "Every couple of horses," says Hexham (p. 3), "must draw for their shares 600, yea 650 pound weight, if they be well putt to it." A dye (MS.) also estimates the draught power of a single horse for a long march, at only 300 pounds.

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the addition of two extra mounted men, to hold the gunners' horses when they dismount to serve the gun.

Allowing a team of six horses to each gun and wagon, the number of men and horses actually brought under fire will be,—

In a field battery,—

107 officers and men, or about 18 per gun.		
95 horses,	16	”
12 field carriages	2	”

Proportion of men and horses under fire.

In a horse artillery battery,—

119 officers and men, or about 20 per gun.		
131 horses,	22	”
12 field carriages,	2	”

With regard, however, to the horse artillery, the rapid movements which necessitate the gunners being mounted render it less necessary that the wagons should so closely accompany the guns, and they may conveniently be left behind for a short encounter.

The battery thus reduced will expose only,—

89 officers and men, or 15 per gun.		
95 horses,	14	”
6 field carriages,	1	”

Space occupied.

A field battery equipped with 31 carriages, and 252 horses, as shown at p. 21, occupies about 650 yards of road on the line of march, if the road will not admit of two or more carriages moving abreast. Six guns drawn up in line, with their wagons immediately behind, occupy a front of 95 and a depth of 34 yards, when there are six horses to each gun; with eight horses to the guns the front will be 115 and the depth 38 yards; and when the guns are unlimbered for action the depth is increased to 53 yards. Horse artillery require 10 yards more in depth when their mounted gun detachments are in front.

The interval left between guns in line is sufficient to allow of their filing off to either flank without being delayed by the want of sufficient distance; seven yards are allowed for a four-wheeled carriage with one pair of horses, and four yards more for each additional pair. Six guns and wagons occupy in column of route (one behind another) $2\frac{1}{2}$ times the distance of their front in line, this arises from the latter being equal to only five intervals, measured from the gun on the right to that on the left. Twenty-eight yards are left vacant between two different batteries or between a battery and other troops in the same line.

When a field battery encamps it requires the same space as it occupied in line, with 10 yards more for each line of horses, harness, or tents, according to their number.

Field Carriages.

A field carriage with four wheels generally consists of two parts, connected with one another by a hook and eye, which can be undone in a few moments; the part nearest the horses is called the “limber,” the other part is called the “carriage” when it bears a gun, and the “body” when it is part of a wagon.

Field Carriages.

The carriages thus constructed are the gun carriages, rocket carriages, and all wagons except the Flanders, general service, and platform wagons. The materials employed have been described at p. 89, and the shafts, wheels, and axletrees, which are made as uniform as possible throughout the service, have also been described in the same division of the work. Tables of the general dimensions of the principal parts are inserted further on. The usual length of a limber carriage is about 21 feet, the breadth $6\frac{1}{2}$ feet, and the track of the wheels 5 feet 3 inches.

Limbers.

Limber. A limber can be separated into the following parts :—Box (or boxes), bed, shafts, wheels, linchpins, and washers ; the bed alone measures about six feet by four feet.

Boxes. For guns and their ammunition wagons there are three boxes, for other wagons there is only one ; for smooth-bored guns the centre box of the three is very small, and contains only spare linch-pins, washers, and couples for traces ; the 12-pounder gun (but not its wagon) and 32-pounder howitzer are exceptions to the rule. For Armstrong guns the centre box is the same height as the others, but narrower ; it contains the fuzes.

The large boxes contain the ammunition and small stores, and serve also as seats for two of the gun detachment. They used to be lashed to the bed with rope, but are now buckled on with a broad leather strap. The lids are covered with painted canvas and have two straps at the top to secure the blankets and other articles which have to be placed upon them. The lids are fastened with spring locks and keys ; wooden partitions inside make such separations between the contents as are necessary for safe travelling.

Limber stores. All field limbers can be temporarily substituted for one another, and all are fitted outside with the following stores :—Spade and shovel, felling axe and pick axe, bill hook, tin box with 3 lbs. of grease, two water buckets, and a swingletree. Gun limbers carry, in addition to the above, a pair of drag ropes and a prolong ; their wagon limbers have a pair of drag ropes, picket line, and lifting-jack ; the same quantity of ammunition is carried by both.

Gun Carriages.

Trail. The principal part of a field gun carriage is called the trail ; it terminates in an eye, by which it is connected with the limber hook for draught. When it is “in action,” the trail rests on the ground, with which it makes an angle of 20 or 21 degrees. Two semicircular holes are made in it to receive the trunnions of the gun.

Bracket trail. The trail was formerly made of two pieces of wood, called brackets, but a single piece has long been used for field guns, and is now adopted for heavier pieces ; the constructions are distinguished as block trails and bracket trails.

Block trail.

Bracket trails were connected with the limber by a straight iron pin, which passed up through a transom at the end of the brackets ; with these trails no ammunition boxes could be used (a great objection for position guns), and a smaller wheel was required for the limber.

The gun is supported by two short brackets or side pieces, furnished with iron bands or capsquares, which can be keyed down over the trunnions to prevent their being jolted out.

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Field Carriages.

These brackets are attached to the block trail, and the trunnion holes are nearly over the axletree.

Heavy guns, such as the 12-pounder (smooth-bored) and upwards, have a second set of trunnion holes nearer the limber, and are shifted into them by a lever, roller, and drag ropes, when prepared for a march.

Field gun carriages have generally two axletree boxes, in which are **Boxes.** carried slow match, small stores, and sometimes projectiles; the 12-pounder smooth-bored gun has only one box, and the 18-pounder none; these boxes are fixtures, but can easily be taken off by an artificer. Elevating screws are let into the trail, and Armstrong carriages (except the 6-pounder and 9-pounder) are also provided with a traversing arrangement, by which the gun's direction can be delicately altered without shifting the trail; the carriages admit of 13° elevation and 5° depression.

A drag shoe, and chains for advancing the gun by the prolong **Stores.** without limbering up, are fixed to the carriage; under the axletree are hung two camp kettles, and on or about the trail are arranged the following stores: two handspikes, a pair of pincers, hammer, spanner, and portfire stick. Armstrong guns carry also a sponge, a sponge bucket, and a cleaning rod; smooth-bored guns have two sponges and a wadhook. Gun carriages which have two sets of trunnion holes have likewise a roller for shifting the piece from one to the other.

Rocket Carriage.

The rocket carriage has, instead of a trail, a long box for carrying rocket sticks, two moveable boxes for rockets attached to its sides, and two small boxes also attached to it for implements and slow match. The tube from which the rockets are fired (*see* page 106) is carried on the top, and there is a box for horseshoes underneath. Part of the rockets are packed in the limber boxes.

There are two sizes of these carriages, the 6-pounder and the 12-pounder; the former was until lately supplied to the horse artillery, but the 12-pounder equipment is now common to both. The size of the stick box makes the rocket carriage the most inconvenient of all for packing in a small compass.

As rockets can be fired without a tube, a proportion of the mounted **Rocket firing.** gunners in the horse artillery used to be furnished with the means of carrying them on horseback (rocket buckets). Three men, each having one rocket, formed a section; one of these laid and fired the rockets, another brought them to him, and the third held the horses of the other two. When the carriage is used there are two men mounted on the limber, who disengage and prepare the tube and afterwards unpack the rockets; for laying and firing them there is a section of three men as above.

In a field battery the horse holder is dispensed with, and one man is enough to take out the rockets and sticks, if the firing is not rapid. A few rockets may therefore always be fired by three men, but if the carriage (with eight horses and four drivers) is brought under fire the exposure of men and horses will be,

In the horse artillery, 9 men, 11 horses.
Field batteries, 7 „ 8 „

For the equipment, *see* pages 193–195.

10524.

I

Field Carriages.*Ammunition Wagons.*

The limbers of ammunition wagons are identical in construction with those for the guns to which they belong, the boxes contain similar ammunition but not so many small stores; the articles carried outside have already been mentioned.

Boxes. The other part of the wagon is called the body. For Armstrong guns the body has four large and two small boxes, identical with those on the limber; for other ordnance the body has only two, the fore and the hind box; they are adapted, like the limber boxes, for carrying men and kits, and are buckled to the body with straps in a similar manner. The 40-pounder Armstrong guns are at present supplied with 18-pounder wagons, slightly altered.

Stores. Besides ammunition the wagon body contains a proportion of hambro' line, and marline;* outside it carries four tents with poles and pins, six picket posts, a saw, and four reaping hooks; underneath are three boxes, each containing ten sets of horseshoes and nails, a box with 28 lbs. of grease in two tins or "magazines," a maul for driving pickets, and two camp kettles. Under the perch (which corresponds to the trail of a gun carriage) are lashed a proportion of the spare splinter-bars and shafts carried by the battery. A spare wheel is also carried on the perch, close in front of the body.† Armstrong wagons have grooves cut in the bed to allow air to pass under the boxes; they measure, with the boxes removed, 6 feet across the axletree, and 10 feet from the trail eye to the hind footboard, but the axletree arm belonging to the block for the spare wheel projects a few inches beyond the rear. Other wagons are about 9 ft. 6 in. by 6 ft.

Dimensions.

Small-arm ammunition wagons are constructed rather differently from the above: the cartridges which they contain being already packed in small wooden boxes, no interior partitions are necessary, and as the body of the wagon is not required for the conveyance of men it is made with moveable sides and a sloping top, instead of being fitted with the usual boxes. The limber is of the usual pattern, but is fitted with a frame and springs, to which the limber box is attached.

Additional Carriages.

This term is generally applied to all the carriages furnished to a battery, in addition to those hitherto described, to carry the tools and stores necessary for its maintenance in a state of efficiency. They can be dispensed with for a short expedition, and are never brought under fire.

They consist, in peace establishments, of a forge wagon, a store wagon, and a store cart; batteries on a war establishment have also two general service wagons, a spare gun carriage, and a hospital cart; but this cart is now in charge of the medical department. Batteries of position have a platform wagon in addition to the rest. The equipments of these carriages are given in the following pages.

* These and some other articles (such as saws, lifting jacks, tube pockets, sponge cloths, shell tongs, &c.) are supplied to only one wagon per gun when the battery is placed on a war establishment; in such cases the list of equipment specifies that they are for the "first line" of wagons only.

† Armstrong wagons have hitherto carried it behind the body, but that system is discontinued and the wagons so constructed are being altered

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Field Carriages.

Equipment of Carriages on various occasions.

The intrenching tools and stores attached to a field carriage are carried on all occasions; men's kits are added when the battery parades in review or in marching order; and tents are packed for marching order only. Blankets, with waterproof covers over them, are always put on the lids of the boxes to form seats for the men carried thereon; in marching order corn sacks are placed underneath them. In field batteries the knapsacks, with great coats, and tin canteens attached in the usual manner, are fastened to limber boxes at the back and to wagon boxes on the outer side. In the horse artillery valises are carried on the limber box lids inside the "guard irons;" the mess tins are fastened to the outside of the guard irons, and the cloaks are attached behind, with the wooden canteens hung under them. On the wagon bodies valises are carried like knapsacks.

Method of carrying stores, &c.

*Sleighs.**

Sleighs are substituted for wheeled carriages in Canada during the winter months. They consist of a platform 6 ft. 10 in. long, 3 ft. 10 in. wide, placed on runners 1 ft. 4 in. high and 3 ft. apart; those which carry guns are made with brackets for the purpose, and are furnished with two boxes which serve as seats, and are capable of containing about 30 rounds of ammunition; each sleigh has a drag chain.

Three sleighs form a subdivision corresponding to a gun and its wagon. The first sleigh carries the gun, its side-arms, slow-match box, portfire sticks, and portfire cutter; in marching order it is equipped with hammer, spanner, pincers, two drag (or fitting) ropes, and a swingletree, two of the men's swords are attached to it.

Equipment of gun sleigh.

The second (called No. 1 ammunition sleigh) carries the gun limber boxes and the front box of the wagon body; in marching order it is equipped with spare side-arms, two drag ropes, prolonge, two swingletrees, and four traces; four knapsacks, two carbines, and one sword are attached to it.

Ammunition sleighs.

The third (called No. 2 ammunition sleigh) carries the limber boxes and hind box of the wagon; it is equipped with a felling axe, pickaxe, four spades, two buckets, and two camp kettles; four knapsacks, two carbines, and one sword are attached to it.

When the tracks are good two horses are enough to draw a sleigh thus equipped, but for the sake of exercise four are generally put to the guns (though the lightest load of the three) and two to the rest. When the tracks are narrow it is sometimes necessary to change the horses from double to single draught, the near horse then becomes a leader, its traces are changed, and the driver remains mounted; the off horse, still in the shafts but attached to the middle of the sleigh, is driven with long reins by a man inside.

Manner of draught.

* Manual of Field Artillery Exercises, p. 181. Adye's MS. volume, p. 69 (in which they are called Slades), states that they were first applied to the transport of artillery during the war of 1759.

Ammunition for Field Guns.

Of the ammunition described under the general head of matériel (pp.92 to 114), the following descriptions are issued for field service :—

Cartridges.

Cartridges placed inside paper covers and packed in cartouches made to fit the partitions of boxes ; in Armstrong carriages they are in the middle, and the projectiles are placed round them. A few *empty* cartridges used to be issued but have lately been withdrawn.

Segment shells.

Projectiles.—For Armstrong 12-pounder and smaller guns segment shells only are supplied, as they are considered to combine sufficiently the peculiarities of other projectiles ; they are issued with their bursters and wood plugs inside, confined by the metal plug in the fuze hole. A proportion of shot and common shells are supplied with 20-pounder and 40-pounder batteries.

Spherical shot and shells.

For smooth-bored guns are issued shot, shrapnel shell, and case shot ; for howitzers, shell, shrapnel shell, case shot, and a few carcasses ; 18-pounder guns have common instead of shrapnel shells, and a few grape as well as case shot ; all the projectiles are riveted to wooden bottoms. The metal plugs of shells are in the holes to which they belong ; papier maché wads and a few spare loading hole plugs are in the boxes ; the bursters are carried with the cartridges in the cartouches.

Case shot are always in the limber boxes, convenient for immediate use ; carcasses in the wagon body. Separate partitions are filled with shot, or shell, and shrapnel shell, according to their proportions.

Boxer's fuzes.

Fuzes for common shells are issued in black boxes and bags ; shrapnel fuzes in blue boxes and bags ; for the box there is a strap by which it can be worn by one of the gun detachment when the battery is in action. *Armstrong time fuzes* are enclosed in tin canisters and packed in long tin boxes fitted with wood, which are carried in the centre boxes of limbers and wagons. *Percussion fuzes* are in the same boxes but not in canisters.

Armstrong's.**Friction tubes.
Brass do.**

Friction tubes are issued in tin boxes for Armstrong guns, and in zinc cylinders for smooth-bores. *Brass* tubes are always in zinc cylinders ; a cylinder holds 100 tubes. The proportion of friction tubes is in excess of the numbers of rounds, and there are 25 or 50 brass tubes for each subdivision.

Portfires and Slow match are carried in small proportions, about six of the former and three pounds of the latter to one subdivision. They are seldom required now that friction tubes are used to fire the guns. To rocket carriages 12 portfires and 2 lbs. of slow match are issued. 6-pounder rockets have also lengths of quick match called "leaders" for firing rockets in vollies.

Shell Rockets are issued for active service only. Behenna fuzes, in the proportion of 1 each, and 20 per cent. spare, are provided with them. Rocket sticks and cases are carried separately, and are screwed together for use. The bursting cartridges are packed in canvas cartouches.

*Number of Rounds brought into the Field.***First supply.**

A field gun or howitzer is always accompanied by one wagon ; but all the wagons are of uniform size, and therefore the exact number of rounds available for the piece depends upon its calibre. As the limber and wagon together do not carry so much ammu-

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Ammunition.

munition as might be required if an action lasted more than a few hours, extra wagons are added to each battery when it is equipped for active service; they form the "first reserve," and though not brought under fire are always near enough to the scene of action to replace those which become exhausted.* The second reserve is organized in separate batteries, and the third is in charge of the store department, one or two days' march in rear of the army. Ammunition should always be replaced as soon as possible after being expended.

The comparative numbers of rounds are as follow :—

	Limber.	Wagon.	Total.	No. of Reserve Wagons per Battery.	Total Supply of Ammunition.
<i>Armstrong Guns.</i>					
6-pounder - - -	29	52	81		
9-pounder - - -	30	90	120	3	165 rounds per gun.
12-pounder - - -	32	90	122	6	212 "
20-pounder - - -	16	48	64		
40-pounder - - -	10	30†	40	4	70 "
<i>Smooth-bored Guns.</i>					
6-pounder - - -	46	148	194	1	231 "
9-pounder - - -	32	96	128	2	176 "
12-pounder - - -	24	80	104		
18-pounder - - -	24	60	84	8	204 "
<i>Howitzers.</i>					
12-pounder - - -	36	100	136	2	236 "
24-pounder - - -	24	60	84	3	174 "
32-pounder - - -	14	54	68	4	122 "
<i>Rockets.</i>					
6-pounder - - -	—	—	216		
12-pounder - - -	—	—	100		

The proportions of the different projectiles for each gun, with one wagon, are as follow :—

	Common Shell.	Segment or Shrapnel.	Solid Shot.	Case Shot.	Car-casses.	Total.	Remarks.
20-pr. Armstrong gun -	16	32	16	—	—	64	Smaller Armstrong guns have only segment shells.
40-pr. " " -	20	10	10	—	—	40	
6-pr. smooth-bored gun	—	26	140	19	—	194	Also 6 grape shot.
9-pr. " " -	—	30	92	16	—	128	
12-pr. " " -	—	28	66	10	—	104	
18-pr. " " -	18	—	54	6	—	84	
12-pr. howitzer -	56	68	—	8	4	136	
24-pr. " " -	32	48	—	8	2	84	
32-pr. " " -	34	28	—	—	2	68	

Stores.

In explanation of the number of different stores supplied to each field gun and wagon, it may be remarked that they comprise every-

* The exhaustion of the artillery ammunition at Lützen, and the distance of the reserves, were the main cause of the Allies being unable to continue the battle on the following day. The action lasted about eight hours, and the French fired about 220 rounds per gun.—See Cathcart's History of the War in 1813; and Chesney on Fire-arms, &c.

† The wagons at present issued, converted from the 18-pounder pattern, only carry 28 rounds.

thing necessary to make a single subdivision complete in itself, able to overcome difficulties in the march without the help of other carriages, and to convey sufficient articles for encamping the men and horses belonging to it, without any aid from the transport department.

The general purposes for which stores are required have been described at p. 114, and the application of any article not specified in that description is mentioned in the general list at p. 409.

Tools and Materials.

Tools.

Each battery of field artillery is supplied with one or more sets of the following tools :—

Collar makers', arranged in trays in the store wagon limber.

Farriers' and shoeing smiths', in the forge wagon limber.

Smiths', in the forge wagon limber.

Wheelers' and saddletree makers', arranged in trays in the limber box of the spare gun carriage.

Each battery of Armstrong guns has in addition a set of *special* (carried in the forge limber) and *facing* tools ; the latter are different for each calibre. Lists of all these tools are given in the following pages.

Materials.

Shoes for horses are issued ready made in sufficient number to last about three months ; iron and steel are also provided for the use of smiths. For collarmakers, wheelers, and saddletree makers there are regular sets of materials calculated to last about one year ; wheels, shafts, splinterbars, and perches (for wagons) are provided ready for use. The appurtenances of Armstrong guns are generally in duplicate, and most of the iron fittings of a carriage are likewise furnished ready to be substituted for those that may get damaged.

The horse shoes are distributed amongst various carriages, in boxes holding ten sets each ; the iron is carried in the forge wagon. Wheelers', saddletree makers', and collarmakers' materials in the store wagon. Iron work is divided between the spare gun carriage and store wagon. The appurtenances of Armstrong guns, and the spare shafts, &c., are distributed amongst various carriages.

EQUIPMENT OF 6-POUNDER ARMSTRONG GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
		£ s. d.	lbs. oz.	
6-POUNDER GUN, OF 5 FT. AND 3 CWT.				
Range { 1° elevation, 600 yards - 10° " 2,800 " -				For colonial service.
<i>Gun.^a</i> Wrought iron, with copper bush ; calibre, 2·50 inches ; grooves, 32 ; twist, 1 turn in 6' 3" (30 calibres)			301 8	Pattern of 3 July 1861. Length of bore, 4' 5".
<i>Appurtenances.</i>				
Eye, elevating, complete - - -			1 8	With bolt, washer, and keep pin.
Piece, vent, with copper facing - -			8 6	
Screw, breech, consisting of { lever - - - pins, keep (4) - - - plug, oil hole - - - ring, tappet - - - screw - - -			10 0	Steel, with angle thread.
			0 1½	
			0 0½	
			5 0	
			23 0	
Sights ^b { dispart - - - point blank (see note ^a) - - - tangent { ring, with screw - - - slide - - - trunnion (hog-backed) - - -			0 3	Gun metal. Do. Screwed in.
			0 5	
			6 1	
			1 7	
			0 5	
<i>Carriage.^c</i>				
Travelling, { limber, 5½ cwt. - - - complete { carriage, 5½ cwt. - - -			11 cwts.	Carries 29 rounds of ammunition.
Box, tin, for fuzes - - - - -			1 5	} Adapted to the carriage boxes.
Cartouche, canvas - - - - -			3 6	
Holdall, leather - - - - -			0 2	
<i>Ammunition.</i>				
Firing charge, with shot or shell - -			0 12	A. 4. powder. Service charge. 7 drs. special F. G. powder.
Bursting charge, segment shell - -			0 0½	
Projectiles { shot, solid - - - shell, segment ^d - - -			6 3	5·3" long ; for practice only. 5" long ; 30 segments.
			5 7	
			0 3½	
Fuzes { percussion, small - - - time - - -			0 5½	Require portfires and slow match.
			0 0½	
Tubes { common, brass - - - friction, copper - - -			0 0½	2·5" long.
			0 0½	
Burster, iron, filled - - - - -			0 3½	
Cartridge, flannel, service charge - -			0 0½	For field service. Added if specially demanded. Choked in the filled cartridge.
Cover { paper, No. 8 - - - waterproof - - -			0 0½	
Lubricator - - - - -			0 3½	
<i>Stores.^e</i>				
Coating, sponge - - - - -			0 3½	
Sponge, with cap - - - - -			3 11	
Tompson - - - - -			1 3	
<i>Tools.</i>				
Set of facing tools, complete - - -			71 0	List at p. 212.

^a A later pattern, approved 1 January 1863 (Cir. 822, par. 718), embodies certain alterations adopted to assimilate it to the 12-pounder and 9-pounder guns. The following are its principal distinctive features, the general dimensions and weight remain the same :—

The vent piece has a projecting back. The thread of the breech screw is bevelled on the fore side. A moveable ratchet sight is substituted for the fixed point-blank sight. There are three preserving screws for the holes which receive the naval crutch and guide ring.

^b In future there will be a tangent and a trunnion sight (only) on each side of the gun.

^c Including the various items shown at page 376.

^d Small fuze hole.

^e Those here detailed are specially adapted to this gun ; for the rest, see the alphabetical list which follows.

EQUIPMENT OF 6-POUNDER ARMSTRONG GUNS.

NOTES.

The carriage has no traversing arrangement; the limber is adapted to single draught. The principal dimensions are as follow: length, 17' 7"; ditto, with the gun mounted, 18' 8"; width (at the axletree), 4' 6½". Wheels; height, 4' 2", track, 3' 10", weight, 1½ cwt. each. Boxes; limber, 29" x 13" x 10"; centre, 28" x 7" x 7½"; axletree, 13½" x 9" x 9". The limber boxes are placed lengthways, and are lashed to the bed. The near axletree box carries three shells.

The shafts are 9' 4" long, and can be substituted for one another by reversing the prop and breech loop.

One round of ammunition weighs about 7 lbs.; 29 rounds are carried by the gun carriage and 52 by the wagon, making a total of 81 rounds. The segment shell is the only projectile used on service.

The establishment of stores differs in several particulars from that of the 9-pounder and 12-pounder Armstrong guns.

The total weight of the gun, carriage, ammunition, and stores is about 16 cwt.

A carriage and limber of special construction for service in British Kaffraria have been lately approved (notified in Cir. 855, par. 833; 17/3/64). The limber is fitted for double draught, and the wheels are of different dimensions (*see* table of wheels). The carriage complete weighs 15 cwt., and carries 60 rounds of ammunition.

The following is a general list of the entire equipment for ordinary service.

ALPHABETICAL LIST OF EQUIPMENT FOR A 6-POUNDER (3 CWT.) ARMSTRONG GUN, CARRIAGE, AND LIMBER.

Boxes, tin	{ fuze* - - - - -	8	
	{ tube - - - - -	1	
Buckets	{ sponge - - - - -	1	
	{ water - - - - -	2	
*Burstera, iron, filled	- - - - -	29	
Can, lubricating	- - - - -	1	
*Cap, sponge	- - - - -	1	On the sponge.
*Carriage, gun, travelling, complete	- - - - -	1	
*Cartouches, travelling carriage, canvas	- - - - -	2	
*Cartridges, flannel, filled, 12 oz., with lubricators	- - - - -	29	In paper covers.
Cloths, sponge	- - - - -	12	
*Coating, sponge	- - - - -	1	
Couples for traces	- - - - -	2	
*Eye, elevating, with bolt, spare	- - - - -	1	
Fuzes	{ percussion, small - - - - -	29	
	{ time - - - - -	29	
Hammer, claw	- - - - -	1	
*Handspikes, traversing	- - - - -	2	
Hemp, undressed	- - - - -	-	3 lbs. per battery; a proportion in each box.
Holdall, leather	- - - - -	1	
Kettles, camp	- - - - -	2	
Keys	{ abell and fuze - - - - -	1	
	{ spring lock - - - - -	1	
Knife, laboratory, small	- - - - -	1	
Lanyards for friction tubes	- - - - -	3	
Locks, pad, iron, small, with keys	- - - - -	2	For axletree boxes.
Needles, laboratory, brass	- - - - -	2	
Oil, Lucca	- - - - - pints	2	In can.
Ordnance, iron, rifled, Armstrong, 6-pounder gun (3 cwt.), complete	- - - - -	1	Including 1 elevating eye, 1 breech screw, complete, 1 vent piece, and 4 sights (2 tangent, 2 trunnion) complete.
*Pieces, vent, spare	- - - - -	2	
Pincers, carpenters'	- - - - - pair	1	
Pins, spare	{ keep* - - - - -	2	
	{ lynch - - - - -	1	
Plugs	{ shell { metal, small - - - - -	29	In the shells.
	{ wood, covered with serge - - - - -	29	
	{ *sight, tangent - - - - -	2	In the gun.
Pocket, tube, leather	- - - - -	1	
Prolong, light	- - - - -	1	

EQUIPMENT OF 6-POUNDER ARMSTRONG GUNS.

*Rod, cleaning	-	-	-	-	-	1
Ropes, drag, light	-	-	-	-	pair	1
Scissors, laboratory, small	-	-	-	-	pair	1
*Shells, segment	-	-	-	-	-	29
Spanner, McMahon's	.	-	-	-	-	1
Spikes, common	-	-	-	-	-	2
*Sponge, with stave, field service	-	-	-	-	-	1
Strap, tube pocket	-	-	-	-	-	1
Tools, intrenching	{	axes,	{	felling	-	1
		helved		pick	-	1
		hook, bill		-	1	
		shovel		-	1	
		spade		-	1	
Tubes, friction, copper	-	-	-	-	-	100
Washer, drag, spare	-	-	-	-	-	1
Worsted	-	-	-	-	ozs.	2

* In demanding or describing separately the articles marked thus * it is necessary to specify that they are for the 6-pounder Armstrong gun.

EQUIPMENT OF A 6-POUNDER ARMSTRONG AMMUNITION WAGON.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
<i>Wagon, complete</i> ^a { limber, 5½ cwt. body, 6½ „ }		£ s. d.	12 cwts.	1	Tonnage, 34' 10".
<i>Ammunition, 52 rounds.</i>			lbs. oz.		
Bursters, iron, filled - - -			0 3¼	52	For further details see the equipment of the 6-pounder gun.
Cartridges, flannel, filled, with lubricators - - -			1 0	52	
Fuzes { percussion, small - - -			0 3¼	52	
{ time - - -			0 5¼	52	
Shells, segment, with plugs - - -			5 7	52	
Tubes, friction - - -			0 0½	100	
<i>Stores.</i> ^b					
Boxes, tin, for fuzes - - -			1 5	14	
Cartouches, canvas - - -			3 6	4	

^a Including the items detailed at page 376.

^b Those here detailed are specially adapted to this wagon ; for the rest, see the alphabetical list.

NOTES.

This wagon has the same limber and wheels as the gun carriage, and the body has the same boxes as the limber. A spare wheel is carried on the perch, and two tents on the body. The principal dimensions are as follow:—Length, 17' 7", breadth and track the same as the gun carriage ; height (including spare wheel), 5' 8". The total weight, when equipped for the march, is about 19 cwts.

The following is a general list of the entire equipment.

ALPHABETICAL LIST OF EQUIPMENT FOR THE AMMUNITION WAGON OF A 6-POUNDER (3 CWT.) ARMSTRONG GUN.

Axletrees, spare - - - - -	2 per battery. Carried on the spare gun carriage, when there is one.
Boxes, tin { fuze* - - - - -	14
{ tube - - - - -	2
Buckets, water - - - - -	2
*Bursters, iron, filled - - - - -	52
*Cartouches, travelling, carriage, canvas - - - - -	4
*Cartridges, flannel, filled, 12 oz., with lubricators - - - - -	52
Case, saw; leather - - - - -	1
Cloths, sponge - - - - -	12
Couples for traces - - - - -	2
Fuzes, metal { percussion, small - - - - -	52
{ time - - - - -	52
Grease, in magazines - - - - -	lbs. 7
Kettles, camp - - - - -	2
Keys { shell and fuze - - - - -	1
{ spring lock - - - - -	1

EQUIPMENT OF A 6-POUNDER ARMSTRONG AMMUNITION WAGON.

Perches, spare	-	-	-	-	-	1 per battery.	
Pin, lynch, spare	-	-	-	-	-	1	
Plugs, shell	{	metal, small	-	-	-	52	
		wood, covered with serge	-	-	-	52	
						In the shells.	
Pocket, tube, leather	-	-	-	-	-	1 1st line only.	
Ropes, drag, light	-	-	-	-	pair	1	
Saw, hand	-	-	-	-	-	1 1st line only.	
*Shafts, spare	{	near	-	-	-	-	
		off	-	-	-	-	
						2 per battery.	
*Shells, segment	-	-	-	-	-	52	
Shoes, horse, sets of 4, with nails	-	-	-	-	-	10 Three sets of nails to each set of shoes.	
Strap, tube pocket	-	-	-	-	-	1 1st line only.	
Tools, intrenching	{	axes, helved	{	fellling	-	-	
				pick	-	-	
		hook, bill	-	-	-	-	1
		shovel	-	-	-	-	1
		spade	-	-	-	1	
Tubes, friction, copper	-	-	-	-	-	100	
*Wagon, ammunition, complete	-	-	-	-	-	1	
Washer, drag, spare	-	-	-	-	-	1	
*Wheel, spare	-	-	-	-	-	1 1st line only.	

* In demanding the articles marked thus * it is necessary to specify that they are required for the 6-pounder Armstrong gun.

EQUIPMENT OF 9-POUNDER ARMSTRONG GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
9-POUNDER GUN,				
OF 5 FT. 2 IN. & 6 CWT.				
Range { 1° elevation, 600 yards.				The present pattern gun is No. 78, approved in place of No. 19
{ 10° " 3,000 "				
<i>Gun.</i>				
Wrought iron, with copper bush ; calibre, 3' 00 in. ; grooves, 38 ; twist, 1 turn in 9' 6" (38 calibres)			606 0	Length of bore, 53".
<i>Appurtenances.</i>				
Eye, elevating, complete - - -			4 10	With bolt, washer, and keep pin.
Piece, vent, with copper facing - - -			14 12	
Screw, breech, consisting of { lever - - -			18 4	
	{ pins, keep, 4 - - -		0 5	
{ ring, tappet - - -			9 4	
	{ screw (steel) - - -		35 0	
Screws, preserving, set of 3 - - -			0 1½	Barrel headed, with notch. Screwed in.
Sights { tangent (steel bar) 2 - - -			1 3	
{ trunnion (hog-backed) 2 - - -			0 6	
<i>Carriage.*</i>				
Travelling, { limber - - - 9¾ cwt. }			21 cwt.	Tonnage, 4 tons ; 19 feet 9 inches. Carries 30 rounds of ammunition.
{ carriage - - - 11¼ " }				
Box, tin, for fuzes - - - - -			2 1	} Adapted to the carriage.
Cartouches { canvas - - - - -			2 14	
{ leather - - - - -			1 5	
Holdall, leather - - - - -			0 9	
<i>Ammunition.</i>				
Firing charge { with shot or shell - - -			1 2	A. 4. powder, service charge. For exercise or salutes.
{ without do. - - - - -			1 0	
Bursting charge, segment shell - - -			0 0¾	12 drs. special F. G. powder. long ; for practice only.
Projectiles { shot, solid - - - - -			8 13	
{ shell, segment ^b - - - - -			8 15	5' 35" long ; 41 segments.
Fuzes { percussion, small - - - - -			0 3¾	Require portfires and slow match.
{ time - - - - -			0 5½	
Tubes { common, brass - - - - -			0 0¾	
{ friction, copper - - - - -			0 0¾	
Burster, iron, filled - - - - -			0 6	
Cartridge, flannel, service charge - - -			0 0½	
Cover { paper, No. 9 - - - - -			0 0¾	} For service cartridges.
{ waterproof - - - - -			0 0¾	
Lubricator - - - - -			0 4¾	Choked in the filled cartridges.
<i>Stores.^c</i>				
Coating, for sponge - - - - -			0 4	
Rod, cleaning - - - - -			6 2	
Sponge, with cap - - - - -			6 0	
Tompion - - - - -			1 13	
Tonga, for lifting shells - - - - -			1 2	
<i>Tools</i>				
Set of facing tools, complete - - - - -			107- 0	List at p. 212.

* Including the items shown at p. 377.

^b Small fuze hole.^c Those here detailed are specially adapted to this gun ; for the rest, see the alphabetical list.

EQUIPMENT OF 9-POUNDER ARMSTRONG GUNS.

NOTES.

The 9-pounder Armstrong gun, drawn by 6 horses, is now the ordinary piece for batteries of horse artillery ; it was adopted for this service in 1862. The latest pattern gun, fitted for sea as well as for land service, was approved 17 March 1863, Cir. 822. par. 717. The tangent sights are inclined at a fixed angle to the left to allow for the deflection caused by the twist of the rifling.

One round of ammunition weighs 11 lbs. 1 oz. ; the gun limber carries 30, and the wagon 90 rounds, making a total of 120 rounds ; on active service there are three additional wagons for the battery, and the number of rounds is consequently increased to 165 per gun. The segment shell is the only projectile employed in the field, but it can be used as a shot if necessary.

The carriage has no traversing arrangement, its length from the points of the shafts to the muzzle of the gun is 22½ feet ; its extreme width is 6 feet 6 inches ; when drawn by six horses it covers 15 yards of ground. The wheels are 5 ft. in diameter, and weigh 1 cwt. 3 qrs. 23 lbs. each.

The total weight of the gun, carriage, ammunition, and stores is 31½ cwt.

The following is a general list of the entire equipment.

ALPHABETICAL LIST OF EQUIPMENT FOR A 9-POUNDER (6 CWT.) ARMSTRONG GUN, CARRIAGE, AND LIMBER.

Boxes, tin	{ fuze*	-	-	-	-	5	
	{ tube	-	-	-	-	1	
Buckets	{ sponge	-	-	-	-	1	
	{ water	-	-	-	-	2	
*Bursting, iron, filled	-	-	-	-	-	30	
Cans, lubricating	-	-	-	-	-	2	
*Cap, sponge	-	-	-	-	-	1	On the sponge.
*Carriage, travelling, complete	-	-	-	-	-	1	
*Cartouches, travelling carriage	{ canvas	-	-	-	-	2	
	{ leather	-	-	-	-	2	
*Cartridges, flannel, filled, 1 lb. 2 oz., with lubricators	-	-	-	-	-	30	In paper covers.
Clipper, portfire	-	-	-	-	-	1	
Cloths, sponge	-	-	-	-	-	18	
*Coating, sponge	-	-	-	-	-	1	
Couples for traces	-	-	-	-	-	2	
*Eye, elevating, spare	-	-	-	-	-	1	
Fuzes	{ percussion, small	-	-	-	-	30	
	{ time	-	-	-	-	30	
Hammer, claw	-	-	-	-	-	1	
Handspikes, traversing	-	-	-	-	-	2	
Hemp, undressed	-	-	-	-	-	—	3 lbs. per battery ; a proportion in each box
*Holdalls, leather	-	-	-	-	-	2	
Kettles, camp	-	-	-	-	-	2	
Keys	{ shell and fuze	-	-	-	-	2	
	{ spring lock	-	-	-	-	1	
Knife, laboratory, small	-	-	-	-	-	1	
Lanyards, for friction tubes	-	-	-	-	-	3	
Locks, pad, iron, small, with keys	-	-	-	-	-	2	For axletree boxes.
Needles, laboratory, brass	-	-	-	-	-	2	
Oil, Lucca	-	-	-	-	pints	2	In cans.
Ordnance, iron, rifled, Armstrong, 9-pounder gun (6 cwt.), complete	-	-	-	-	-	1	Including 1 elevating eye, 1 breech screw, complete, 1 vent piece, and 4 sights (2 tangent and 2 trunnion), complete.
*Pieces, vent, spare	-	-	-	-	-	2	
Pincers, carpenters'	-	-	-	-	pair	1	
Pins, spare	{ keep*	-	-	-	-	2	
	{ lynch	-	-	-	-	1	
Plugs	{ shell { metal, small	-	-	-	-	30	In the shells.
	{ wood, covered with serge	-	-	-	-	30	
	{ *sight, tangent	-	-	-	-	2	
Pocket, tube, leather	-	-	-	-	-	1	
Prolong, light	-	-	-	-	-	1	

EQUIPMENT OF 9-POUNDER ARMSTRONG GUNS.

*Rod, cleaning	-	-	-	-	-	1		
Ropes, drag, light	-	-	-	-	pair	1		
Scissors, laboratory, small	-	-	-	-	pair	1		
*Shells, segment	-	-	-	-	-	30		
Spanner, McMahon's	-	-	-	-	-	1		
Spikes, common	-	-	-	-	-	2		
*Sponge, field service	-	-	-	-	-	1		
Stick, portfire	-	-	-	-	-	1		
Strap, tube pocket	-	-	-	-	-	1		
Swingletree	-	-	-	-	-	1		
Tonga, lifting shell	-	-	-	-	pair	1		
Tools, intrenching	{	axes,	{	helled	{	fellings	-	1
		pick		-		1		
		hook, bill	-	-	-	1		
		shovel	-	-	-	1		
		spade	-	-	-	1		
Tubes, friction, copper	-	-	-	-	-	100		
Washer, drag, spare	-	-	-	-	-	1		
Worsted	-	-	-	-	ozs.	2		

In addition to the above equipment, the following articles are carried on the march,—2 carbines, 2 blankets, with waterproof covers, 2 corn sacks, and 2 valises complete with necessaries.

* In demanding the articles marked thus * it is necessary to specify that they are for the 9-pounder Armstrong gun.

EQUIPMENT OF A 9-POUNDER ARMSTRONG AMMUNITION WAGON.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
		£ s. d.			
Wagon, complete ^a { limber, 9½ cwt. body, 13 ,, }			22¼ cwt.	1	Tonnage,
Ammunition, 90 rounds.			lbs. oz.		
Bursters, iron, filled - - -			0 6½	90	
Cartridges, flannel, filled - - -			1 7½	90	
Fuzes { percussion, small - - -			0 3½	90	
time - - - - -			0 5½	90	
Match, slow, piece of - - - - -			3 0	1	
Portfires - - - - -			0 5½	4	
Shells, segment - - - - -			8 15	90	
Tubes { brass - - - - -			0 0½	25	
friction - - - - -			0 0½	100	
Stores. ^b					
Boxes, tin, for fuzes - - - - -			2 1	15	} Adapted to the ammunition boxes.
Cartouches { canvas - - - - -			2 14	6	
leather - - - - -			1 5	2	

^a Including the items detailed at page 377.

^b Those here detailed are specially adapted to this wagon; for the rest, see the alphabetical list.

NOTES.

The length of the wagon, with its shafts, is about 21 feet; its breadth, 6½ feet; it is drawn by four horses on home service, and by six horses on active service; its total weight, with all its ammunition and stores, is 40½ cwt. Its wheels are the same as those of the gun.

The following list shows the entire equipment.

ALPHABETICAL LIST OF EQUIPMENT FOR THE AMMUNITION WAGON OF A 9-POUNDER (6 CWT.) ARMSTRONG GUN.

Axletrees, spare - - - - -	- - - - -	- - - - -	- - - - -	2 per battery. Carried on the spare gun carriage, when there is one.
Bars, splinter, spare - - - - -	- - - - -	- - - - -	- - - - -	4 per battery for war, and 2 for peace establishment.
Boxes, tin { fuze - - - - -	- - - - -	- - - - -	- - - - -	15
tube - - - - -	- - - - -	- - - - -	- - - - -	1
Buckets, water - - - - -	- - - - -	- - - - -	- - - - -	2
*Bursters, iron, filled - - - - -	- - - - -	- - - - -	- - - - -	90
*Cartouches, travelling carriage { canvas - - - - -	- - - - -	- - - - -	- - - - -	6
leather - - - - -	- - - - -	- - - - -	- - - - -	2
*Cartridges, flannel filled, 1 lb. 2 oz.. with lubricators	- - - - -	- - - - -	- - - - -	90 In paper covers.
Case, saw, leather - - - - -	- - - - -	- - - - -	- - - - -	1 1st line only.
Cloths, sponge - - - - -	- - - - -	- - - - -	- - - - -	18 1st line only.
Couples for traces - - - - -	- - - - -	- - - - -	- - - - -	2

EQUIPMENT OF A 9-POUNDER ARMSTRONG AMMUNITION WAGON.

Cylinder, zinc, for tubes	-	-	-	-	1		
Fuzes, metal	{	percussion, small	-	-	90		
		time	-	-	-	90	
Grease, in magazines	-	-	-	lbs.	28		
Kettles, camp	-	-	-	-	2		
Key, spring lock	-	-	-	-	1		
Line, Hambro'	-	-	-	-	skein	1 1st line only.	
Marline	-	-	-	-	skein	1 Do.	
Match, slow	-	-	-	-	lbs.	3 Do.	
Maul, wood	-	-	-	-	-	1	
Perches, spare	-	-	-	-	-	2 per battery.	
Pin, lynch, spare	-	-	-	-	-	1	
*Plugs, shell	{	metal, small	-	-	90	} In the shells.	
		wood, covered with serge	-	-	-		90
Pocket, tube, leather	-	-	-	-	1	1st line only.	
Portfires	-	-	-	-	4		
Posts, picket, short	-	-	-	-	6		
Rope, picket	-	-	-	-	1		
Ropes, drag, light	-	-	-	-	pair	1	
Saw, hand	-	-	-	-	1	1st line only.	
Shafts, spare	{	near	-	-	-	} 4 per battery for war, and 3 for peace establishment.	
		off	-	-	-		-
Shells, segment	-	-	-	-	90		
Shoes, horse, sets of 4, with nails	-	-	-	-	30	Three sets of nails to each set of shoes.	
Strap, tube pocket	-	-	-	-	1	1st line only	
Swingletree	-	-	-	-	1		
Tents, with poles, pins, and bags, complete	-	-	-	-	4		
Tongs, lifting shell	-	-	-	-	pair	1 1st line only.	
Tools, intrenching	{	axe, helved	{	felling	-	1	
				pick	-	-	1
		hook, bill	-	-	-	1	
		hooks, reaping	-	-	-	4	1st line only.
		shovel	-	-	-	1	
	spade	-	-	-	1		
Tubes	{	brass	-	-	-	25	
		friction, copper	-	-	-	100	
*Wagon, ammunition, complete	-	-	-	-	1		
Washer, drag, spare	-	-	-	-	1		
Wheel, spare	-	-	-	-	1	1st line only.	

In addition to the above equipment, the following articles are carried on the march,—2 carbines, 6 blankets, with waterproof covers, 6 valises complete with necessaries, and 2 corn sacks.

* In demanding the articles marked thus * it is necessary to specify that they are for the 9-pounder Armstrong gun.

MATÉRIEL FOR FIELD SERVICE.

EQUIPMENT OF 12-POUNDER ARMSTRONG GUNS.

145

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
12-POUNDER GUN, OF 7 FT. AND 8½ CWT.				
Range { 1° elevation, 600 yards. 10° " 3,300 "		£ s. d.	lbs. oz.	For the short 12-pounder gun, lately approved, <i>see</i> Cir. 855, par. 829, 17/3/64.
<i>Gun.</i>				
Wrought iron, with copper bush; calibre, 3·00 inches; grooves, 38; twist, one turn in 9' 6" (38 calibres)			887 0	Length of bore, 6' 1½".
<i>Appurtenances.*</i>				
Eye, elevating, complete - - -			5 0	With bolt, washer, and keep pin.
Piece, vent, with copper facing			15 0	
Screw, breech, consisting of { lever pins, keep, 4 plug, oil-hole ring, tappet screw (steel)			18 8	
			0 10	
			0 1	
			9 0	
			40 0	
Sights { dispart - - - ratchet - - - tangent { ring, with screw - slide - - - trunnion - - -			0 5	Gun metal. Do. Screwed in.
			0 7½	
			6 6	
			1 11½	
			0 9	
<i>Carriage.^b</i>				
Travelling, complete { limber - 10½ cwt. carriage - 12½ " }		78 17 7	22½ cwt.	Tonnage, 4 tons; 19' 5". Carries 32 rounds of ammunition.
Box, tin, for fuzes - - -			2 1	} Adapted to the carriage.
Cartouches { canvas - - - leather - - -			2 14	
Holdall, leather - - -			2 5	
			0 9	
<i>Ammunition.</i>				
Firing charge { with shot or shell - without " - - -			1 8	A. 4. powder. Service charge. For exercise and salutes.
Bursting charge, segment shell - - -			1 0	
Projectiles { shot, solid - - - shell, segment c - - -			0 0½	Special F. G. powder. 7' 05' long; for practice only. 6' 75" long; 48 segments.
			11 9	
Fuzes { percussion, small - - - time - - -			10 8	Require portfires and slow match.
			0 3½	
Tubes { common, brass - - - friction, copper - - -			0 5½	
			0 0½	
Burster, iron, segment shell, filled - - -			0 0½	
Cartridges, flannel { service charge - exercise " - - -			0 7½	} For service cartridges.
			0 1	
Cover { paper, No. 9 - - - waterproof - - -			0 1	} Choked in the filled cartridges.
			0 0½	
Lubricator - - -			0 4½	
<i>Stores.^d</i>				
Coating, for sponges - - -			0 9	
Rod, cleaning - - -			7 0	8' 3" long.
Sponge, with cap - - -			7 3	8' 4" long.
Tompion - - -			1 3	
Tongs, lifting shell - - - pair			1 2	
<i>Tools.</i>				
Set of facing tools, complete - - -			107 0	List at p. 212.

* The drip pan has lately been discontinued, and an additional tangent and trunnion sight are in future to be substituted for the dispart and ratchet. The trunnion sight will be altered to the hog-backed pattern.

^b Including the items shown at page 377; carriages for the shortened 12-pounder guns with thickened vent pieces require some modifications, as noted in Cir. 855, par. 835.

^c Small fuze hole.

^d Those here detailed are specially adapted to this gun; for the rest, *see* the general list which follows.
10524.

EQUIPMENT OF 12-POUNDER ARMSTRONG GUNS.

NOTES.

The 12-pounder Armstrong gun is supplied to field batteries ; it was adopted for the service in 1860.

One round of ammunition weighs 13 lbs. 2 oz. ; the gun carriage carries 32, and the wagon 90 rounds, making a total of 122 rounds ; on active service an additional wagon accompanies each gun, which has then 213 rounds ready for service. The segment shell is the only projectile carried in the field, it serves as a shot when no fuze is used.

The gun and carriage, when completely equipped, weigh about 37 cwt. Six horses are allowed for home and eight horses for active service. The wheels are 5 ft. in diameter and weigh 1 cwt. 3 qrs. 23 lbs. each.

The following list shows the entire equipment.

ALPHABETICAL LIS. OF EQUIPMENT FOR A 12-POUNDER ARMSTRONG GUN, CARRIAGE, AND LIMBER.

Boxes, tin	{ fuze	-	-	-	-	6	
	{ tube	-	-	-	-	1	
Buckets	{ sponge	-	-	-	-	1	
	{ water	-	-	-	-	2	
*Bursting, iron, filled	-	-	-	-	-	32	
Cans, lubricating	-	-	-	-	-	2	
*Cap, sponge (on the sponge)	-	-	-	-	-	1	
Carriage, travelling, complete	-	-	-	-	-	1	
*Cartouches, travelling carriage	{ canvas	-	-	-	-	2	
	{ leather	-	-	-	-	2	
*Cartridges, flannel, filled, 1 lb. 8 oz., with lubricators	-	-	-	-	-	32	In paper covers.
Clipper, portfire	-	-	-	-	-	1	
Cloths, sponge	-	-	-	-	-	18	
*Coating, sponge	-	-	-	-	-	1	
Couples for traces	-	-	-	-	-	2	
*Eye, elevating, spare	-	-	-	-	-	1	
Fuzes, metal	{ percussion, small	-	-	-	-	32	
	{ time	-	-	-	-	32	
Hammer, claw	-	-	-	-	-	1	
Handspikes, traversing	-	-	-	-	-	2	
Hemp, undressed	-	-	-	-	-	—	3 lbs. per battery ; a proportion in each box.
*Holdalls, leather	-	-	-	-	-	2	
Kettles, camp	-	-	-	-	-	2	
Keys	{ shell and fuze	-	-	-	-	2	
	{ spring lock	-	-	-	-	1	
Knife, laboratory, small	-	-	-	-	-	1	
Lanyards for friction tubes	-	-	-	-	-	3	
Lock, pad, iron, small, with keys	-	-	-	-	-	2	For axletree boxes.
Needles, laboratory, brass	-	-	-	-	-	2	
Oil, Lucca	-	-	-	-	pints	5	In cans.
Ordnance, iron, rifled, Armstrong 12-pounder gun (8 cwt.), complete	-	-	-	-	-	1	Including with the gun, 1 elevating eye, 1 breech screw, 1 vent piece, and 4 sights (2 tangent and 2 trunnion) complete.
*Pieces, vent, spare	-	-	-	-	-	2	
Pincers, carpenters'	-	-	-	-	pair	1	
Pins, spare	{ keep*	-	-	-	-	2	
	{ lynch	-	-	-	-	1	
Plugs	{ shell { metal, small	-	-	-	-	32	In the shells.
	{ wood, covered with serge	-	-	-	-	32	In the shells.
	{ *sight, tangent	-	-	-	-	2	
Pocket, tube, leather	-	-	-	-	-	1	
Prolong, light	-	-	-	-	-	1	
Rod, cleaning	-	-	-	-	-	1	

EQUIPMENT OF 12-POUNDER ARMSTRONG GUNS.

Ropes, drag, light	-	-	-	pair	1
Scissors, laboratory, small	-	-	-	pair	1
*Shells, segment	-	-	-	-	32
Spanner, McMahon's	-	-	-	-	1
Spikes, common	-	-	-	-	2
*Sponge, field service	-	-	-	-	1
Stick, portfire	-	-	-	-	1
Strap, tube pocket	-	-	-	-	1
Swingletree	-	-	-	-	1
Tongs, lifting shell	-	-	-	pair	1
Tools, intrenching	}	axes, { felling	-	-	1
		helved { pick	-	-	1
		hook, bill	-	-	1
		shovel	-	-	1
		spade	-	-	1
Tubes, friction, copper	-	-	-	-	100
Waaher, drag, spare	-	-	-	-	1
Worsted	-	-	-	ozs.	2

In addition to the above equipment, the following articles are carried on the march,—2 carbines, 2 blankets with waterproof covers, 2 corn sacks, and 2 knapsacks complete with necessaries.

* In demanding the articles marked thus * it is necessary to specify that they are for the 12-pounder Armstrong gun.

EQUIPMENT OF A 12-POUNDER ARMSTRONG AMMUNITION WAGON.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
<i>Wagon, complete</i> * { <i>limber, 10½ cwt.</i> <i>body, 14½ " }</i>		£ s. d. 69 5 0	24½ cwt.	1	Tonnage, 4 tons ; 19' 5".
<i>Ammunition, 90 rounds.</i>					
<i>Bursters, iron, filled</i> - - -			lbs. oz. 0 7½	90	
<i>Cartridges, flannel, filled</i> - - -			1 13½	90	
<i>Fuzes</i> { <i>percussion, small</i> - - -			0 3½	90	
{ <i>time</i> - - -			0 5½	90	
<i>Match, slow</i> - - - <i>piece of</i>			3 0	1	
<i>Portfires</i> - - -			0 5½	4	
<i>Shells, segment</i> - - -			10 8	90	
<i>Tubes</i> { <i>brass</i> - - -			0 0½	25	
{ <i>friction</i> - - -			0 0½	100	
<i>Stores.^b</i>					
<i>Boxes, tin, for fuzes</i> - - -			2 1	15	} Fitted to the ammunition boxes.
<i>Cartouches</i> { <i>canvas</i> - - -			2 14	6	
{ <i>leather</i> - - -			2 5	2	

* Including the articles shown at page 377.

^b Those here detailed are specially adapted to this wagon ; for the rest, *see* the alphabetical list which follows.

NOTES.

The weight of the wagon complete, with ammunition and stores, is about 43 cwts., being 6 cwts. more than that of the gun ; it is drawn by four horses on home, and six on active service. Its length, including the shafts, is 22 feet, and its breadth 6½ feet. Its wheels are the same as those of the gun.

The following list shows the entire equipment.

ALPHABETICAL LIST OF EQUIPMENT FOR THE AMMUNITION WAGON OF A 12-POUNDER (8 CWT.) ARMSTRONG GUN.

<i>Axletrees, spare</i> - - - - -	—	2 per battery. Carried on the spare gun carriage, when there is one.
<i>Bars, splinter, spare</i> - - - - -	—	4 per battery for war, and 2 for peace establishment.
<i>Boxes, tin</i> { <i>fuze</i> - - - - -	15	
{ <i>tube</i> - - - - -	1	
<i>Buckets, water</i> - - - - -	2	
* <i>Bursters, iron, filled</i> - - - - -	90	
* <i>Cartouches, travelling carriage</i> { <i>canvas</i> - - - - -	6	
{ <i>leather</i> - - - - -	2	
* <i>Cartridges, flannel, filled, 1 lb. 8 oz., with lubricators</i> 90		In paper covers.
<i>Case, saw, leather</i> - - - - -	1	} 1st line only.
<i>Cloths, sponge</i> - - - - -	18	
<i>Couples, for traces</i> - - - - -	2	
<i>Cylinder, zinc, for tubes</i> - - - - -	1	
<i>Fuzes, metal</i> { <i>percussion, small</i> - - - - -	90	
{ <i>time</i> - - - - -	90	
<i>Grease, in the magazines</i> - - - - -	lbs. 28	

EQUIPMENT OF A 12-POUNDER ARMSTRONG AMMUNITION WAGON.

Jack, lifting -	-	-	-	-	1	1st line only.
Kettles, camp -	-	-	-	-	2	
Key, spring lock -	-	-	-	-	1	
Line, Hambro' -	-	-	-	-	skein 1	} 1st line only.
Marline -	-	-	-	-	1	
Match, slow -	-	-	-	-	lbs. 3	
Maul, wood, common -	-	-	-	-	1	
Perches, spare -	-	-	-	-	—	2 per battery.
Pin, lynch, spare -	-	-	-	-	1	
Plugs, shells {	metal, small -	-	-	-	90	
	wood, covered with serge -	-	-	-	90	
Pocket, tube, leather -	-	-	-	-	1	1st line only.
Portfires -	-	-	-	-	4	
Posts, picket, short -	-	-	-	-	6	
Rope, picket -	-	-	-	-	1	
Ropes, drag, light -	-	-	-	-	pair 1	
Saw, hand -	-	-	-	-	1	1st line only.
Shafts, spare {	near -	-	-	-	—	} 4 per battery for war, and 3 for peace estab- lishment.
	off -	-	-	-	—	
*Shells, segment -	-	-	-	-	90	
Shoes, horse, sets of 4, with proportion of nails -	-	-	-	-	30	Three sets of nails to each set of shoes.
Strap, tube pocket -	-	-	-	-	1	1st line only.
Swingletree -	-	-	-	-	1	
Tents, with poles, pins, and bags, complete -	-	-	-	-	4	
Tongs, lifting shell -	-	-	-	-	pair 1	1st line only.
Tools, intrenching {	axes, helved {	felling -	-	-	1	
	pick -	-	-	-	1	
	hook, bill -	-	-	-	1	
	hooks, reaping -	-	-	-	4	1st line only.
	shovel -	-	-	-	1	
spade -	-	-	-	-	1	
Tubes {	brass -	-	-	-	25	
	friction, copper -	-	-	-	100	
*Wagon, ammunition, complete -	-	-	-	-	1	
Washer, drag, spare -	-	-	-	-	1	
Wheel, spare -	-	-	-	-	1	1st line only.

In addition to the above equipment, the following articles are carried on the march,—2 carbines, 6 blankets, with waterproof covers, 6 knapsacks complete with necessaries, and 2 corn sacks.

* In demanding the articles marked thus * it is necessary to specify that they are for the 12-pounder Armstrong gun.

EQUIPMENT OF 20-POUNDER ARMSTRONG GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
20 POUNDER GUN, OF 8 FT. AND 16 CWT.				
Range { 1° elevation, 450 yards. 10° " 3,300 "		£ s. d.	lbs. oz.	
<i>Gun.</i>				
Wrought iron, with copper bush ; calibre, 3.75 inches ; grooves, 44 ; twist, 1 turn in 11 feet 10½ inches (38 calibres) - - -			1,677 0	Length of bore, 7 feet.
<i>Appurtenances.</i>				
Eye, elevating, complete - - -			9 13	
Piece, vent, with copper facing - - -			27 12	With handles.
lever - - -			24 0	
Screw, breech, consisting of { lever - - - pins, keep, 4 - - - plug, oil hole - - - ring, tappet - - - screw (steel) - - -			0 11	
			0 1	
			13 0	
			83 0	
			0 5½	
Sights { ratchet - - - tangent { ring, with screw - - - slide - - - trunnion - - -			0 8	
			12 14	Gun metal.
			2 14	Do.
			0 10	Screwed in.
<i>Carriage.*</i>				
Travelling, { limber, 10½ cwt. } complete { body, 15½ " }		91 10 4	26 cwt.	Tonnage, 4 tons ; 37' 3". Carries 16 rounds of ammunition.
Box, tin, for fuzes - - -			2 1	} Fitted to the ammunition boxes.
Cartouche, canvas - - -			4 15	
Holdall, leather - - -			0 13	
<i>Ammunition.</i>				
Firing charge { with shot or shell - - - without " - - -			2 8	A. 4. powder. Service charge.
			1 8	For exercise and salutes.
Bursting " { common shell - - - segment " - - -			1 0	L.G. powder.
			0 1½	Sp. F.G. powder, in iron cylinder.
Projectiles { shot, solid - - - shells, with { common ^c - - - plugs { segment ^c - - -			21 0	8' 19" long.
			20 8	11' 25" long ; large fuzehole.
			19 10	8' 125" long ; 70 segments.
Fuzes { percussion { small - - - large - - -			0 3½	
			0 10	
Tubes { time - - - common, brass - - -			0 5½	
			0 0½	Require portfires and slow match.
Adapter, for time fuzes - - -			0 0½	
Burster, iron, segment shell, filled - - -			0 4	Used with the common shells.
Cartridges { calico, burster, common shell - - - do. waterproof - - - flannel, { service ^b - - - charge { exercise - - -			0 11	4' 25" long.
			0 0½	
			0 0½	No. 7.
			0 1	
Cover { paper, No. 10 - - - waterproof - - -			0 1	5" long.
			0 0½	} For service cartridges.
Cylinder, paper ^b - - -			0 0½	
Lubricator ^b - - -			0 2	4' 5" long, 2' 5" diameter.
			0 8½	

* Including the items, shown at p. 377.

^b A cylinder and lubricator are choked inside the service cartridge when filled.

^c The common shell has the large fuze hole, and the segment shell the small one

EQUIPMENT OF 20-POUNDER ARMSTRONG GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
<i>Stores.*</i>				
Coating for sponges - - -	-	£ s. d.	lbs. oz.	
Cover, slot - - - - -	-		0 11	
Rod, cleaning - - - - -	-		2 12	2½' long.
Sponge, with cap - - - -	-		8 0	6' 2" long.
Tompson - - - - -	-		9 10	
Tongs, lifting shell - - pair	-		3 8	
			2 8	
<i>Tools.</i>				
Set of facing tools, complete -	-		142 0	List at p. 212.

* Those here detailed are specially adapted to this gun ; for the rest, see the list which follows.

NOTES.

This gun, adopted in 1860, and then described as a 25-pounder, was ordered in August 1861 to be in future called a 20-pounder, as agreeing better with the weight of its projectiles.

One round of ammunition weighs 25½ lbs. with common shell, and 24 lbs. with segment shell or solid shot ; the gun carriage conveys 16 rounds ; the total weight of the gun when fully equipped is about 48¼ cwt., being rather less than the 32-pounder howitzer, but too heavy for any but position batteries. Its range is from 200 yards, point blank, to 3,500 with 11° of elevation.

The same carriage would do for siege service, but the limber boxes would be omitted. The wheels are 5 ft. in diameter, and weigh 2 cwt. 1 qr. 12 lbs. each.

The following list shows the entire equipment.

ALPHABETICAL LIST OF EQUIPMENT FOR A 20-POUNDER (16 CWT.) ARMSTRONG GUN, CARRIAGE, AND LIMBER.

Adapters, fuze - - - - -	-	-	-	2	
Boxes, tin { fuze - - - - -	-	-	-	3	
{ tube - - - - -	-	-	-	1	
Buckets { sponge - - - - -	-	-	-	1	
{ water - - - - -	-	-	-	2	
*Burstors, iron, filled - - - -	-	-	-	8	
Cans, lubricating - - - - -	-	-	-	2	
*Cap, sponge (on the sponge) -	-	-	-	1	
*Carriage, travelling, complete -	-	-	-	1	
*Cartouches, travelling carriage, canvas -	-	-	-	2	
*Cartridges, { burstors, calico, common shell, 1 lb. -	-	-	-	4	
{ charge, flannel, 2 lbs. 8 oz., with lubri-	-	-	-		
{ cators - - - - -	-	-	-	16	In paper covers.
Clipper, portfire - - - - -	-	-	-	1	
Cloths, sponge - - - - -	-	-	-	18	
*Coating, sponge - - - - -	-	-	-	1	
Couples for traces - - - - -	-	-	-	2	
*Cover, slot - - - - -	-	-	-	1	
*Eye, elevating, spare - - - - -	-	-	-	1	
Funnel, shell, common - - - - -	-	-	-	1	
Fuzes, metal { percussion { small - - - - -	-	-	-	8	
{ { large - - - - -	-	-	-	4	
{ time - - - - -	-	-	-	10	
Hammer, claw - - - - -	-	-	-	1	

EQUIPMENT OF 20-POUNDER ARMSTRONG GUNS.

Handspikes, traversing	-	-	-	-	2	
Hemp, undressed	-	-	-	-	-	3 lbs. per battery ; a proportion in each box.
Holdall, leather	-	-	-	-	1	
Kettles, camp	-	-	-	-	2	
Keys { shell and fuze	-	-	-	-	2	
Keys { spring lock	-	-	-	-	1	
Knife, laboratory, small	-	-	-	-	1	
Lanyards, for friction tubes	-	-	-	-	3	
Locks, pad, iron, small, with keys	-	-	-	-	2	For axletree boxes.
Needles, laboratory, brass	-	-	-	-	2	
Oil, Lucca	-	-	-	pints	5	In cans.
Ordnance, iron, rifled, Armstrong 20-pounder gun (16 cwt.) complete.	-	-	-	-	1	Including, with the gun, 1 elevating eye, 1 breech screw, complete, 1 vent piece, and 4 sights (2 tangent, 2 trunnion) complete.
*Pieces, vent, spare	-	-	-	-	2	
Pincers, carpenters'	-	-	-	-	1	
Pins, spare { keep*	-	-	-	-	2	
Pins, spare { lynch	-	-	-	-	1	
Plugs { oil hole, spare*	-	-	-	-	1	For every 2 guns.
	shell { metal { large	-	-	-	4	In the common shells.
		shell { metal { small	-	-	-	8
Plugs { wood, covered with serge	-	-	-	-	8	
Plugs { sight, tangent*	-	-	-	-	2	
Pocket, tube, leather	-	-	-	-	1	
Prolong, heavy	-	-	-	-	1	
*Rod, cleaning	-	-	-	-	1	
Ropes, drag, heavy	-	-	-	pair	1	
Scissors, laboratory, small	-	-	-	pair	1	
*Shells, empty { common	-	-	-	-	4	
*Shells, empty { segment	-	-	-	-	8	
*Shot, solid	-	-	-	-	4	
Spanner, McMahon's	-	-	-	-	1	
Spikes, common	-	-	-	-	2	
*Sponge, field service	-	-	-	-	1	
Stick, portfire	-	-	-	-	1	
Strap, tube pocket	-	-	-	-	1	
Swingletree	-	-	-	-	1	
Tomplon, with lanyard	-	-	-	-	1	
Tongs, lifting shell	-	-	-	pair	1	
Tools, intrenching { axes, helved { felling	-	-	-	-	1	
	Tools, intrenching { axes, helved { pick	-	-	-	1	
		Tools, intrenching { hook, bill	-	-	-	1
Tools, intrenching { shovel	-	-	-	-	1	
Tools, intrenching { spade	-	-	-	-	1	
Tubes, friction, copper	-	-	-	-	100	
Washer, drag, spare	-	-	-	-	1	
Worsted	-	-	-	ozs.	2	

* In demanding the articles marked thus * it is necessary to specify that they are for the 20-pounder Armstrong gun.

EQUIPMENT OF A 20-POUNDER ARMSTRONG AMMUNITION WAGON.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
<i>Wagon, complete</i> * { limber, 10½ cwt. body, 14½ cwt. }		£ s. d. 68 17 8	25 cwt.	1	Tonnage, 6 tons ; 17' 3".
<i>Ammunition, 48 rounds.</i>					
Adapters - - - -			lbs. oz. 0 4	6	
Bursters, iron, segment shell - - - -			0 11½	17	
Cartridges, { calico, bursters filled { flannel, charge			1 0	20	
			3 2	48	
Fuzes { percussion { small - time { large -			0 3½	24	
			0 10	12	
			0 5¼	30	
Match, slow - - - - piece of			3 0	1	
Portfires - - - -			0 5¼	4	
Shells, with plugs { common segment			20 8	12	
			19 10	24	
Shot, solid - - - -			21 0	12	
Tubes, friction - - - -			0 0½	100	
<i>Stores.</i> ^b					
Boxes, tin, for fuzes - - - -			2 1	7	
Cartouches, canvas - - - -			4 15	6	

* Including the articles shown at page 377.

^b Those here given are specially adapted to this wagon ; for the rest, see the alphabetical list which follows.

NOTES.

The length of the wagon, including the shafts, is about 22 feet ; the greatest breadth, 6½ feet. The total weight when equipped with all its ammunition and stores is about 38 cwt. The wheels are lighter than those of the gun carriage, but are interchangeable with them.

The following list shows the entire equipment.

ALPHABETICAL LIST OF EQUIPMENT FOR THE AMMUNITION WAGON OF A 20-POUNDER (16 CWT.) ARMSTRONG GUN.

Adapters, fuze - - - - -	6	
Axletrees, spare - - - - -	—	2 per battery. Carried on the spare gun carriage, when there is one.
Bars, splinter, spare - - - - -	—	4 per battery for war, and 2 for peace establishment.
Boxes, tin { fuze - - - - -	7	
{ tube - - - - -	1	
Buckets, water - - - - -	2	
*Bursters, iron, filled - - - - -	24	

ARTILLERY.

EQUIPMENT OF A 20-POUNDER ARMSTRONG AMMUNITION WAGON.

*Cartouches, travelling carriage, canvas	-	-	6	
*Cartridges, filled	{	burst, calico, common shell, 1 lb.	-	12
		charge, flannel, 2 lbs. 8 ozs., with lubricators	-	48
				In paper covers.
Case, saw, leather	-	-	-	1
				1st line only.
Cloths, sponge	-	-	-	18
Couples for traces	-	-	-	2
Funnel, shell, common	-	-	-	1
Fuses, metal	{	percussion	{	small
				24
				12
		time	-	30
Grease, in the magazines	-	-	-	lbs. 28
Jack, lifting	-	-	-	1
				1st line only.
Kettles, camp	-	-	-	2
Key, spring lock	-	-	-	1
Line, Hambro'	-	-	-	skein 1
Marline	-	-	-	skein 1
				lbs. 3
Match, slow	-	-	-	1
Maul, wood, common	-	-	-	1
Perches, spare	-	-	-	—
				2 per battery.
Pin, lynch, spare	-	-	-	1
Plugs, shell	{	metal	{	large
				12
		small	-	24
		wood, covered with serge	-	24
				For the common shells.
				For the segment shells.
Pocket, tube, leather	-	-	-	1
Portfires	-	-	-	4
				1st line only.
Posts, picket, short	-	-	-	6
Rope, picket	-	-	-	1
Ropes, drag, heavy	-	-	-	pair 1
Saw, hand	-	-	-	1
				1st line only.
Shafts, spare	{	near	-	—
		off	-	—
				4 per battery for war, and 3 for peace establishment.
*Shells, empty	{	common	-	12
		segment	-	24
Shoes, horse, sets of 4, with proportion of nails	-	-	-	30
				Three sets of nails to each set of shoes.
*Shot, solid	-	-	-	12
Strap, tube pocket	-	-	-	1
				1st line only.
Swingletree	-	-	-	1
Tongs, lifting shell, pair	-	-	-	1
				1st line only.
Tools, intrenching	{	axes, helved	{	felling
				1
				pick
				1
		hook, bill	-	1
		shovel	-	1
		spade	-	1
Tubes, friction, copper	-	-	-	100
				2nd line only.
*Wagon, ammunition, complete	-	-	-	1
Washer, drag, spare	-	-	-	1
Wheel, spare	-	-	-	1
				1st line only.

* In demanding the articles marked thus * it is necessary to specify that they are for the 20-pounder Armstrong gun.

EQUIPMENT OF 40-POUNDER ARMSTRONG GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.	
40-POUNDER GUN, OF 10 FT. AND 34½ CWT.		£ s. d.	lbs. oz.		
Range { 1° elevation, 600 yards. 10° " 3,650 "					
<i>Gun.</i>					
Wrought iron, with copper bush ; calibre, 4.75 inches ; grooves, 56 ; twist, 1 turn in 14 feet 5.37 inches (36½ calibres)			3,688 0	Length of bore, 8' 10".	
<i>Appurtenances.</i>					
Piece, vent, with copper facing	-		59 0	With handles.	
Screw, breech, con- sisting of	{ lever		73 0		
	{ pin, keep		0 7		
	{ ring, tappet		20 0		
	{ screw (iron)		162 0		
Sights { tangent	-		3 4		
	{ trunnion (hog-backed)	-	0 10	Removable.	
<i>Carriage.</i>					
Travelling, ^a { limber, 12 cwt.	-	96 12 10	39½ cwt.	Tonnage, 6 tons ; 7' 7".	
complete { body, 27½ "	-			Carries 10 rounds of ammunition.	
Box, tin, for fuzes	-			2 0	} Fitted to the ammunition boxes.
Cartouche, canvas	-			4 12	
Holdall, leather	-			0 13	
<i>Ammunition.</i>					
Firing charge { with shot or shell	-		5 0	A. 4. powder. Service charge.	
	{ without "	-	3 0		For exercise or salutes.
Bursting charge { common shell	-		2 8	} L G. powder.	
	{ segment "	-	0 10		
Projectiles { shot, solid	-		41 0	10' 16" long.	
	{ shells, ^d with { common plugs { segment	-	38 8	13' 87" long.	
			39 0	10' 585" long ; 72 segments.	
Fuzes { percussion, large	-		0 10		
	{ time	-	0 5½		
Tubes { common, brass	-		0 0½	Require portfires and slow match.	
	{ friction, copper	-	0 0½		
Adapter, for time fuzes	-		0 3½	Used with both kinds of shells.	
Car- tridges { calico, { common shell	-		0 1½		
	{ do. waterproof	-	0 1	No. 9.	
	{ bursters { segment shell	-	0 0½		
	{ do. waterproof	-	0 0½	No. 6.	
flannel, { service ^b	-		0 2		
	{ charge { exercise	-	0 1	6" long.	
Cover, paper { No. 11	-		0 1	} For service cartridges.	
	{ waterproof	-	0 1		
Cylinder, paper ^b	-		0 4	4.5" long, 3.25" in diameter.	
Lubricator ^b	-		0 14½		
Primer	-		0 0½	An auxiliary to the other tubes.	
<i>Stores.^c</i>					
Case, leather, for vent piece	-		2 15		
Coating, sponge	-		0 14		
Cover, slot	-		3 14	2' 9" long.	

^a Including the articles detailed at page 378.

^b A cylinder and lubricator are choked inside the service cartridge when filled.

^c Those here detailed are specially adapted to this gun ; the rest are given in the alphabetical list which follows.

^d With large fuze holes.

EQUIPMENT OF 40-POUNDER ARMSTRONG GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
<i>Stores—cont.</i>				
Rammer - - - -	-	£ s. d.	lbs. oz.	5' long. One for each projectile.
Rod, cleaning - - -	-		8 7	
Sponge, with stave and cap - - -	-		9 3	
Straps { lifting projectiles - - -	-		10 8	
vent piece case - - -	-		0 7	
Tompson, wood - - -	-		0 5	
<i>Tools.</i>				
Set of facing tools, complete -	-		5 0	
Set of facing tools, complete -	-		240 0	List at p. 212.

NOTES.

The 40-pounder Armstrong gun was approved in 1861, but several alterations, approved in May 1862 and notified in Circular 781, s. 526, have been made in the original pattern.

The present gun has a part of its surface flattened to receive the vent piece during the loading, it is sighted on both sides, and has its under side grooved (like the 110-pounder), to prevent the handspikes and quoins from slipping. The breech screw is fitted with an "indicator ring" to show whether the vent piece is in the right position when the loading is completed. The tangent and trunnion sights are let into slots cut in the sides of the gun, and are inclined at an angle, to allow for deflection, in the same manner as those of the 9-pounder; the dispart and ratchet sights are omitted. The old pattern 40-pounder was furnished with sights and other appurtenances similar to those of the 20-pounder and 12-pounder guns. Its weight is 6 cwt. less than the 18-pounder smooth-bored gun, for which it is substituted, but its carriage is heavier, and each round of ammunition weighs nearly half a hundredweight (48 lbs. with common shell, 47½ lbs. with solid shot, and 46½ lbs. with segment shell). The total weight of the gun and carriage, with the equipment of ammunition and stores, is 81½ cwt.

If used in siege trains it will have the same carriage, but the limber boxes will be removed; it will be equipped with stores in the proportions shown at p. 246.

The limber is fitted for draught by four horses abreast, it has therefore two pairs of shafts, and two swingletrees attached to "outriggers" projecting from the splinterbar. One pair of the shafts is of the "framed" pattern, both can be fitted for use with farmers' horses harnessed, in the country manner, with a cart saddle and a chain back band. The limber wheels belong to the heavy field class and are not interchangeable with those of the gun carriage.

The carriage has travelling trunnion holes, but, as the operation of shifting the gun causes a severe shock, they are not to be used except for long journeys over hilly roads. The wheels are of the siege class, 5 ft. in diameter and 4½ cwt. in weight.

Each projectile is fitted with an arrangement for lifting it out of the ammunition box. This arrangement consists of a strap fastened at each end to a disc on which the shell is set. A ring slides up and down on the strap, so as to keep the shell from falling off, but at the same time allow of its being removed without difficulty. The whole is made of leather.

ALPHABETICAL LIST OF EQUIPMENT FOR 40-POUNDER (34 CWT.) ARMSTRONG GUN, CARRIAGE, AND LIMBER.

Adapters, time fuze - - - -	-	-	-	12	
Boxes, tin { fuze - - - -	-	-	-	3	
tube - - - -	-	-	-	2	
Bucket, sponge - - - -	-	-	-	1	
Can, lubricating - - - -	-	-	-	1	
*Cap, sponge - - - -	-	-	-	1	On the sponge.
*Carriage, travelling, complete - - -	-	-	-	1	
*Cartouches, travelling carriage canvas -	-	-	-	2	

EQUIPMENT OF 40-POUNDER ARMSTRONG GUNS.

*Cartridges, filled	{	burstern,	{	common shell, 2½ lbs.	-	5	
				calico segment shell, 10 oz.	-	3	
				charge, flannel, 5 lbs., with lubricators	-	10	In paper covers.
*Case, leather, vent piece					-	1	
Clipper, portfire					-	1	
Cloths, sponge					-	18	
Couples for traces					-	-	In platform wagon.
*Cover	{	slot	-	-	-	1	
		screw jack	-	-	-	1	
Funnel, shell, common					-	1	
Fuzes,	{	percussion, large	-	-	-	12	
		time	-	-	-	8	
Hammer, claw					-	1	
Handspikes, common, 6 feet					-	5	
Hemp, undressed					-	-	3 lbs. per battery ; a proportion in each box.
Jack, screw, Clerk's					-	1	
Keys	{	shell and fuze	-	-	-	2	
		spring lock	-	-	-	1	
Knife, laboratory, small					-	1	
Lanyards for friction tubes					-	3	
Oil, Lucca					-	2	In can.
Ordnance, iron, rifled, Armstrong, 40-pounder gun (32 cwt.) complete					-	1	Including 1 breech screw, 1 vent piece, and 4 sights (2 tangent and 2 trunnion), complete.
*Pieces, vent, spare					-	2	
Pincers, carpenters'					-	1	pair
Pins, spare	{	keep*	-	-	-	2	
		linch	-	-	-	-	In platform wagon.
Plugs	{	sight*	{	tangen:	-	2	
				trunnion	-	2	
		shell, metal, large			-	8	In the shells.
Pockets, tube, leather					-	2	
Primers					-	50	
Prolong, heavy					-	1	
*Rammer					-	1	
*Rod, cleaning					-	1	
Roller, shifting					-	1	
Ropes, drag, heavy					-	1	pair
Scissors, laboratory, small					-	1	pair
*Shells, empty	{	common	-	-	-	5	
		segment	-	-	-	3	
*Shot, solid					-	2	
Spanner, McMahon's					-	1	
Spikes, common					-	2	
*Sponge, with stave					-	1	
Stick, portfire					-	1	
Straps	{	lifting projectiles*	-	-	-	10	
		tube pocket	-	-	-	2	
		vent piece case*	-	-	-	2	
Swingletrees					-	3	
*Tompson, with lanyard					-	1	
Tools, intrenching	{	axes, helved	{	felling	-	1	
				pick	-	1	
		hook, bill			-	1	
		shovel			-	1	
		spade			-	1	
Tubes	{	brass	-	-	-	25	
		friction, copper	-	-	-	100	
Washer, drag, spare					-	-	In platform wagon.

* In demanding the articles marked thus * it is necessary to specify that they are for the 40-pounder Armstrong gun.

EQUIPMENT OF A 40-POUNDER ARMSTRONG AMMUNITION WAGON.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
<i>Wagon, complete</i> ^a { limber, 12 cwt. body, 14 " }		£ s. d.	26 cwt.	1	Tonnage,
<i>Ammunition, 30 rounds.</i> ^b			lbs. oz.		
Adapters - - - - -			0 3½	14	} In the first line only.
Cartridges, { calico, { common shell - - - - - { bursters { segment shell - - - - - filled { flannel, charge - - - - -			2 8 0 10 5 4	14 8 30	
Fuzes { percussion, large - - - - - { time - - - - -			0 5½ 0 5¼	24 16	
Match, slow - pieces of 3 lbs. each			3 0	1	
Portfires - - - - -			0 5¼	4	
Primers - - - - -			0 0½	50	
Shells, with plugs { common - - - - - { segment - - - - -			38 8 39 0	14 8	
Shot, solid - - - - -			41 0	8	
<i>Stores.</i> ^c					
Boxes, tin, for fuzes - - - - -			2 0	5	
Cartouches, canvas - - - - -			4 12	6	

^a Including the articles detailed at page 378.

^b The wagon specially constructed for the 40-pounder gun will contain 30 rounds, but the converted one contains only 28 rounds; see alphabetical list below.

^c Those here detailed are specially adapted to this wagon; for the rest, see the general list which follows.

NOTES.

A number of the 18-pounder ammunition wagons have been adapted to carry the 40-pounder ammunition, and no others will be issued until these are used up. The following list of stores shows the equipment of both patterns; the total weight of each, when completely equipped, is about 35¼ cwt.

The wheels are lighter than those of the gun limber, but are interchangeable with them.

ALPHABETICAL LIST OF STORES FOR THE AMMUNITION WAGON OF A 40-POUNDER (34 CWT.) ARMSTRONG GUN.

Adapters, time fuze - - - - -	12
Bars, splinter, spare { limber, carriage - - - - - { wagon - - - - -	1 } 2 } per battery.
Boxes, tin { fuze - - - - - { tube - - - - -	5 1
Buckets, water - - - - -	2

EQUIPMENT OF A 40-POUNDER ARMSTRONG AMMUNITION WAGON.

*Cartouches, travelling carriage, canvas	-	-	6	4 for the converted wagon.			
*Cartridges, filled	{	burstern, { common shell, 2½ lbs.	-	14	13	"	"
		calico { segment shell, 10 ozs.	-	8	7	"	"
		charge, flannel, 5 lbs., with lubricators	-	30	28	"	"
		attached, and in paper covers	-				
Case, saw, leather	-	-	-	1			
Cloths, sponge	-	-	-	18		} 1st line only.	
*Coatings, sponge	-	-	-	2			
Couples for traces	-	-	-	4			
Funnel, shell, common	-	-	-	1			
Fuzes, metal	{	percussion, large	-	-	24		
		time	-	-	16		
Grease, in magazines	-	-	-	lbs.	28		
Jack, lifting	-	-	-	-	1		1st line only.
Kettles, camp, Flanders, large	-	-	-	-	2		
Key, spring lock	-	-	-	-	1		
Line, Hambro'	-	-	-	-	skein	1	} 1st line only.
Marline	-	-	-	-	"	1	
Match, slow	-	-	-	-	lbs.	3	
Maul, wood	-	-	-	-	-	1	
Needles, laboratory, brass	-	-	-	-	2		1st line only.
Perches, spare	-	-	-	-	-	2	per battery.
Pin, lynch, spare	-	-	-	-	1		
Plugs, shell, metal, large	-	-	-	-	22		20 for the converted wagon. In the shells.
Pocket, tube, leather	-	-	-	-	1		
Portfires	-	-	-	-	4		} 1st line only.
Primers	-	-	-	-	50		
Ropes, drag, heavy	-	-	-	-	pair	1	
Saw, hand	-	-	-	-	-	1	1st line only.
Shafts, spare, near and off	-	-	-	-	-	4	per battery.
*Shells, empty	{	common	-	-	14		13 for the converted wagon.
		segment	-	-	8		7
Shoes, horse, sets of 4, with nails	-	-	-	-	30		Three sets of "nails to each set of shoes.
*Shot, solid	-	-	-	-	8		
Straps	{	lifting projectiles	-	-	30		28 for the converted wagon.
		tube pocket	-	-	1		1st line only.
Swingletree	-	-	-	-	1		
Tools, intrenching	{	axes, helved	{	felling	-	1	
				pick	-	1	
		hook, bill	-	1			
		shovel	-	1			
		spade	-	1			
Tubes, friction, copper	-	-	-	-	50		2nd line (war establishment) only.
*Wagon, ammunition, complete	-	-	-	-	1		
Washers, drag, spare	-	-	-	-	1		
Wheel, spare	-	-	-	-	1		} 1st line only.
Worsted	-	-	-	-	ozs.	2	

* In demanding the articles marked thus * it is necessary to specify that they are for the 40-pounder Armstrong gun.

EQUIPMENT OF 6-POUNDER BRASS GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
LIGHT 6-POUNDER GUN, OF 5 FT. AND 6 CWT.		£ s. d.	lbs. oz.	Old, or ordinary pattern ; see notes.
Range { 1° elevation, 600 yards. 6° " 1,600 "				
<i>Gun.</i> Total length, 5' 5"; calibre, 3·668"; windage, 1 inch.			672 0	Length of bore, 4' 9½"; width across the trunnions, 15".
Sights { tangent scale, with screw - screw, spare, for ditto -			0 9 0 1	
<i>Carriage.*</i> Travelling, { limber, 9½ cwt. - complete { carriage, 10½ " - Cartouches, canvas, set of 4 -		59 1 0	20½ cwt. 12 0	Tonnage, 4 tons ; 21 feet ; carries 46 rounds of ammunition. Adapted to the limber boxes.
<i>Ammunition.</i> Firing charge { with shot or shell - without " - Bursting charge, shrapnel - Projectiles { shot { case - solid, fixed - shell, shrapnel, ^b fixed - Fuze, time, shrapnel - Tubes { common, brass - friction, copper - Bag, waterproof paper, No. 1 - Car- { calico, burster, shrapnel - tridges { flannel, { service - charge { exercise - Cover { paper, No. 12 - waterproof - Wad, loading hole, small -			1 8 1 0 0 0½ 9 0 6 4 5 2 0 0½ 0 0½ 0 0½ 0 0½ 0 0½ 0 0½ 0 0½ 0 0½ 0 0½ 0 0½ 0 0	L. G. powder. Service charge. For exercise or salutes. 10 drs. of M. R. powder. 7·6" long ; holds 41 ¾-oz. balls. Filled with 29 carbine bullets. Require portfires and slow match. For the shrapnel bursters. With common paper bag. } For service cartridges.
<i>Stores.^c</i> Head, spare { rammer - sponge - Punch for vent (No. 8) - Spike, spring - Sponge, with stave, rammer, and cap - Wadhook -			0 10 0 15 0 1 0 1 4 0 3 14	3' 25" long.

* Including drag shoe, elevating screw, and straps for securing side arms, &c., as detailed at p. 379.

^b With small loading hole.

^c Those here detailed are specially adapted to this gun ; for the rest, see the general list which follows.

NOTES.

The 6-pounder gun was until lately the one usually supplied to batteries of horse artillery, it has now given way to the 9-pounder Armstrong gun. It was called the light 6-pounder to distinguish it from other brass guns with the same calibre, of which there were, in 1813, no less than six patterns ; varying in length from 5 feet up to 8 feet, and in weight from 5½ cwts. to 19 cwts.—(Adye's "Bombardier," p. 203.) The present gun has three rings, two astragals with fillets, and a patch at the vent. The cascable is fitted to receive the elevating screw, and there is now a dispart added to the muzzle.

EQUIPMENT OF 6-POUNDER BRASS GUNS.

One round of ammunition weighs $7\frac{1}{2}$ lbs. with shrapnel shell ; $7\frac{1}{2}$ lbs. with solid shot ; and $10\frac{1}{2}$ lbs. with case shot. The gun limber holds 46 rounds, and the wagon carries 148 rounds, making a total of 194 rounds; the one additional ammunition wagon which each battery brings into the field on active service increases this number to an average of 231 rounds per gun.

The length of the carriage from the points of the shafts to the muzzle of the gun is 21 feet; the extreme breadth is 6 feet 6 inches ; when drawn by six horses it covers 15 yards of ground. The wheels are of the light field class, 5 feet in diameter, and 1 cwt. 3 qrs. 23 lbs. in weight.

The total weight, when the carriage is equipped for a march, is about $30\frac{1}{2}$ cwt.

The following list shows the entire equipment.

ALPHABETICAL LIST OF EQUIPMENT FOR THE CARRIAGE AND LIMBER OF A 6-POUNDER GUN.

Box, tin, fuze, blue	-	-	-	-	1	For 12 shrapnel fuzes.
Buckets, water	-	-	-	-	2	
*Caps, sponge	-	-	-	-	2	On the sponges.
*Carriage, travelling, complete	-	-	-	-	1	
*Cartouches, travelling carriage, canvas, limber	-	-	-	-	4	
*Cartridges, filled	{	calico, bursters, 10 drs.	-	-	8	
	{	flannel, charge, $1\frac{1}{2}$ lbs.	-	-	46	In paper covers.
Couples, for traces	-	-	-	-	2	
Cylinder, zinc, for tubes	-	-	-	-	1	
Fuzes, shrapnel	-	-	-	-	12	In a blue box.
Hammer, claw	-	-	-	-	1	
Handspikes, traversing	-	-	-	-	2	
*Heads, spare	{	rammer	-	-	1	
	{	sponge	-	-	1	
Implements, shell and fuze	{	No. 1 set, field service	-	-	1	For detail, see page 209.
	{	No. 2 set	-	-	1	
Irons, priming, field service	-	-	-	set	1	(1 pricker, 1 drift, 1 bit.)
Kettles, camp,	-	-	-	-	2	
Key, spring lock	-	-	-	-	1	
Knife, laboratory, small	-	-	-	-	1	
Lanyards for friction tubes	-	-	-	-	3	
Locks, pad, iron, small, with keys	-	-	-	-	2	
Needles, laboratory, brass	-	-	-	-	2	
Ordnance, brass, 6-pounder gun, of 5 feet and 6 cwt.	-	-	-	-	1	
Pincers, carpenters'	-	-	-	pair	1	
Pin, lynch, spare	-	-	-	-	1	
Plugs	{	fuze hole, shrapnel	-	-	-	Charged with the shells.
	{	loading hole, small, spare	-	-	-	5 per cent. for the number in the subdivision.
Pocket, tube, leather	-	-	-	-	1	
Prolong, light	-	-	-	-	1	
Punches for vent (No. 8)	-	-	-	-	2	
Ropes, drag, light	-	-	-	pair	1	
*Scale, tangent, brass	-	-	-	-	1	On the gun ; and 1 spare per battery.
Scissors, laboratory, small	-	-	-	pair	1	
Screws, copper, for tangent scale, spare	-	-	-	-	2	1 on the gun and 1 spare.
*Shells, shrapnel, fixed	-	-	-	-	8	With fuze hole and loading hole plugs.
*Shot	{	case	-	-	11	
	{	solid, fixed	-	-	27	
Spanner, McMahon's	-	-	-	-	1	
Spikes	{	common	-	-	2	
	{	spring	-	-	1	
*Sponges, field service	-	-	-	-	2	

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EQUIPMENT OF 6-POUNDER BRASS GUNS.

Sticks, portfire	-	-	-	-	-	2			
Straps	{	fuse box	-	-	-	-	1		
		tube pocket	-	-	-	-	-	1	
Swingletree	-	-	-	-	-	-	1		
Thumbstalls	-	-	-	-	-	-	2		
Tools, intrenching	{	axes, helved	{	felling	-	-	-	1	
				pick	-	-	-	-	1
		hook, bill	-	-	-	-	-	-	1
			shovel	-	-	-	-	-	1
			spade	-	-	-	-	-	1
Tubes, friction, copper	-	-	-	-	-	100	In a zinc cylinder.		
Wads, loading hole, small	-	-	-	-	-	-	1 for each shrapnel shell in the subdivision.		
*Wadhook, field service	-	-	-	-	-	-	1		
Washer, drag, spare	-	-	-	-	-	-	1		
Worsted	-	-	-	-	-	oz.	2		

In addition to the above equipment, the following articles are carried on the march:— 2 carbines ; 2 blankets, with waterproof covers ; 2 valises (or knapsacks), complete, with necessaries ; and 2 corn sacks.

* In demanding the articles marked thus * it is necessary to specify that they are for the light 6-pounder brass gun.

EQUIPMENT OF A 6-POUNDER AMMUNITION WAGON.

Case, saw, leather	-	-	-	-	1	1st line only
Couples for traces	-	-	-	-	2	
Cylinders, zinc, for tubes	-	-	-	-	3	The wagon in the 2nd line has only 2.
Fuzes, shrapnel	-	-	-	-	24	12 in a blue bag and 12 in a blue box.
Grease, in the magazines	-	-	-	lbs.	28	
Jack, lifting	-	-	-	-	1	1st line only.
Kettles, camp	-	-	-	-	2	
Key, spring lock	-	-	-	-	1	
Line, Hambro'	-	-	-	skein	1	} 1st line only.
Marline	-	-	-	"	1	
Match, slow	-	-	-	lbs.	3	
Maul, wood, common	-	-	-	-	1	
Perches, spare	-	-	-	-	—	2 per battery.
Pin, lynch, spare	-	-	-	-	1	
Plugs	{ fuze hole, shrapnel	-	-	-	—	} Charged with the shells.
	{ loading hole, small	-	-	-	—	
Pocket, tube, leather	-	-	-	-	1	1st line only.
Portfires	-	-	-	-	6	
Posts, picket, short	-	-	-	-	6	
Rope, picket	-	-	-	-	1	12½ fathoms of 3-inch tarred rope.
Ropes, drag, light	-	-	-	pair	1	
Saw, hand	-	-	-	-	1	1st line only.
Shafts, spare	{ near	-	-	-	—	} 4 per battery for war, and 3 for peace establishment.
	{ off	-	-	-	—	
*Shells, shrapnel, fixed	-	-	-	-	18	With fuze hole and loading hole plugs.
Shoes, horse, sets of 4, with nails	-	-	-	-	30	3 sets of nails to each set of shoes.
*Shot	{ case	-	-	-	8	
	{ solid, fixed	-	-	-	122	
Strap	{ fuze box	-	-	-	1	} 1st line only.
	{ tube pocket	-	-	-	1	
Swingletree	-	-	-	-	1	
Tents, with poles, pins, and bags complete	-	-	-	-	4	
Tools, trenching	{	axes, helved	{ felling	-	1	} 1st line only.
			{ pick	-	1	
		hook, bill	-	1		
		hooks, reaping	-	4		
		shovel	-	1		
		spade	-	1		
Tubes	{ brass	-	-	-	50	} The wagon in the 2nd line has 200 friction but no brass tubes.
	{ friction, copper	-	-	-	150	
*Wagon, ammunition, complete	-	-	-	-	1	
Washer, drag, spare	-	-	-	-	1	
Wheel, spare	-	-	-	-	1	1st line only.

In addition to the above equipment, the following articles are carried on the march:—2 carbines; 6 blankets, with waterproof covers; 6 valises (or knapsacks), complete with necessaries; and 2 corn sacks.

* In demanding the articles marked thus * it is necessary to specify that they are for the light 6-pounder brass gun.

EQUIPMENT OF 9-POUNDER BRASS GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.	
9-POUNDER GUN OF 6 FT. AND 13½ CWT.		£ s. d.	lbs. oz.	Similar in construction to the 6-pounder; but with dolphins.	
Range { 1° elevation, 700 yards. 6° " 1,760 "					
<i>Gun.</i>					
Total length, 6' 6"; calibre, 4·2 inches; windage, .1 inch -			1,512 0	Length of bore, 5' 7¼"; width across the trunnions, 18".	
Sights { tangent scale, with screw - screw for ditto, spare -			0 10 0 1		
<i>Carriage.^a</i>					
Travelling, { limber, 10 cwt. - complete { carriage, 12 " -		64 12 0	22 cwt.	Tonnage, 5 tons; 1 ft.; carries 32 rounds of ammunition.	
Cartouches, set of 4 -		0 15 9	11 10	Fitted to the ammunition boxes.	
<i>Ammunition.</i>					
Firing charge { with shot or shell - without " -			2 8 1 8	L. G. powder. Service charge. For exercise and salutes.	
Bursting charge, shrapnel -			0 1		
Projectiles { shot { case - solid, fixed -			13 12 9 6	18 (late 15) drs. of M. R. powder. 8·7" long; holds 41 5-oz. balls.	
	shell, shrapnel, ^b fixed -		7 13		
Fuze, time, shrapnel -			0 0½	Filled with 52 carbine bullets.	
Tubes { common, brass - friction, copper -			0 0½ 0 0½	Require portfires and slow match.	
	Bag, waterproof paper, No. 1 -		0 0½		
Cartridges { calico, burster, shrapnel - flannel, { service - charge { exercise -			0 0½ 0 0½ 0 0½	For shrapnel bursters.	
	Cover { paper No. 13 - waterproof -				0 0½ 0 0½
		Wad, loading hole, small -			0 0
<i>Stores.^c</i>					
Head, spare { rammer - sponge -		0 0 3½ 0 4 6	1 0 1 6	} For the service cartridges.	
	Punch, for vent (No. 7) -		0 1½		
Spike, spring -			0 1½		
Sponge, with stave, rammer, and cap -		0 6 4	4 12		
Wadhook -		0 8 5	4 0		

^a Including drag shoe, elevating screw, and other articles, as shown at page 379.

^b With small loading hole.

^c Those here detailed are specially adapted to this gun; for the rest, see the general list which follows.

NOTES.

Four 9-pounder guns with two 24-pounder howitzers were the pieces of ordnance used by all field batteries before the year 1861, and were occasionally supplied also to the horse artillery. They came into general use during the Peninsular war, to oppose the 8-pounder gun used in the French service, and were then accompanied by the heavy 5½-inch howitzer.

One round of ammunition with solid shot weighs 12 lbs., with shrapnel shell 10½ lbs., and with case shot 16 lbs. 5 oz. The limber holds 32 rounds, the wagon 96 rounds, each gun has therefore 128 rounds, and on active service the two extra wagons increase the average number per gun to 176 rounds.

The length from the points of the shafts to the muzzle of the gun is 22½ feet, the width 6½ feet; drawn by eight horses, as on active service, it covers 19 yards of ground; at home, with six horses, 15 yards. The wheels of the carriage are heavier than those of the limber, but they are interchangeable with one another.

The total weight of the gun and its whole equipment is about 40 cwt.

EQUIPMENT OF 9-POUNDER BRASS GUNS.

The following list shows the entire equipment.

ALPHABETICAL LIST OF EQUIPMENT FOR THE CARRIAGE AND LIMBER OF A 9-POUNDER GUN.

Box, tin, fuze, blue	-	-	-	-	1	For 8 shrapnel fuzes.
Buckets, water	-	-	-	-	2	
*Caps, sponge	-	-	-	-	2	On the sponges.
*Carriage, travelling, complete	-	-	-	-	1	
*Cartouches, travelling carriage, canvas, limber	-	-	-	-	4	
*Cartridges, filled	{	calico, bursters, 18 drms.	-	-	6	
	{	flannel, charge, 2½ lbs.	-	-	32	In paper covers.
Couples for traces	-	-	-	-	2	
Cylinder, zinc, for tubes	-	-	-	-	1	
Fuzes, shrapnel	-	-	-	-	8	In a blue box.
Hammer, claw	-	-	-	-	1	
Handspikes, traversing	-	-	-	-	2	
*Heads, spare	{	rammer	-	-	1	
	{	sponge	-	-	1	
Implements, shell and fuze	{	No. 1 set, field service	-	-	1	For detail, see page 208.
	{	No. 2 set	-	-	1	
Irons, priming, field service	-	-	-	set	1	(1 pricker, 1 drift, 1 bit.)
Kettles, camp	-	-	-	-	2	
Key, spring lock	-	-	-	-	1	
Knife, laboratory, small	-	-	-	-	1	
Lanyards for friction tubes	-	-	-	-	3	
Locks, pad, iron, small, with keys	-	-	-	-	2	For axletree boxes.
Needles, laboratory, brass	-	-	-	-	2	
Ordnance, brass, 9-pounder gun of 6 feet and 13 cwts.	-	-	-	-	1	
Pincers, carpenters'	-	-	-	pair	1	
Pin, lynch, spare	-	-	-	-	1	
Plugs	{	fuze hole, shrapnel	-	-	—	Charged with the shells.
	{	loading hole, small, spare	-	-	—	5 per cent. for the number in the subdivision.
Pocket, tube, leather	-	-	-	-	1	
Prolong, heavy	-	-	-	-	1	
Punches for vent (No. 7)	-	-	-	-	2	
Ropes, drag, light	-	-	-	pair	1	
*Scale, tangent, brass	-	-	-	-	1	On the gun, and 1 spare per battery.
Scissors, laboratory, small	-	-	-	pair	1	
Screws, copper, for tangent scale	-	-	-	-	2	1 spare.
*Shells, shrapnel, fixed	-	-	-	-	6	With fuze hole and loading hole plugs.
*Shot	{	case	-	-	8	
	{	solid, with bottoms	-	-	18	
Spanners, McMahon's	-	-	-	-	1	
Spikes	{	common	-	-	2	
	{	spring	-	-	1	
*Sponges, field service	-	-	-	-	2	
Sticks, portfire	-	-	-	-	2	
Straps	{	fuze box	-	-	1	
	{	tube pocket	-	-	1	
Swingletree	-	-	-	-	1	
Thumbstalls	-	-	-	-	2	
Tools, intrenching	{	axes, helved	{	felling	-	1
	{		{	pick	-	1
	{	hook, bill	-	-	-	1
	{	shovel	-	-	-	1
	{	spade	-	-	-	1
Tubes, friction, copper	-	-	-	-	100	In a zinc cylinder.
Wads, loading hole, small	-	-	-	-	—	1 for each shrapnel shell in the subdivision.
*Wadhook	-	-	-	-	1	
Washer, drag, spare	-	-	-	-	1	
Worsted	-	-	-	oz.	2	

In addition to the above equipment, the following articles are carried on the march:—2 carbines; 2 knapsacks (or valises), complete, with necessaries; 2 blankets with waterproof covers; and 2 corn sacks.

* In demanding the articles marked thus * it is necessary to specify that they are for the 9-pounder brass gun.

EQUIPMENT OF A 9-POUNDER AMMUNITION WAGON.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
<i>Wagon, complete</i> ^a { limber, 10 cwt. body, 11½ cwt. }		£ s. d. 58 14 8	21½ cwt.	1	Tonnage, 5 tons; 36 ft.
<i>Ammunition, 96 rounds.</i>					
Cartridges, { calico, bursters, 18 dra. filled { flannel, charge 2½ lbs. -			lbs. oz. 0 1 14	14	
Cartridges, empty, flannel - - -			2 9 96	96	
Fuzes, shrapnel - - -			0 1 100	100	
Match, slow - - - piece of			0 0½ 16	16	
Portfires - - -			3 0 1	1	
Shells, shrapnel, fixed ^b - - -			9 5½ 6	6	
Shot { case ^c - - -			7 13 14	14	
solid, fixed - - -			13 12 8	8	
Tubes { brass - - -			9 6 74	74	
friction - - -			0 0½ 50	50	
0 0½ 50				50	
<i>Stores.</i> ^d					
Cartouches, set of 9 - - -		1 2 7	27 0	1	Fitted to the ammunition boxes.

^a Including horse shoe boxes, grease magazines, straps for securing side-arms, &c.

^b Contains 52 carbine bullets.

^c Contains 41 5-oz. balls.

^d These are the only articles specially adapted to this wagon; for the rest, see the general list which follows.

NOTES.

The length of the wagon, with its shafts, is about 21 feet; its breadth 6 feet 6 inches; on active service it is drawn by six horses, at other times by four, and it covers 15 yards or 11 yards of ground accordingly. Its total weight, when packed, amounts to 38 cwt. The wheels are the same as those of the gun limber.

The following list shows the entire equipment.

ALPHABETICAL LIST OF EQUIPMENT FOR THE AMMUNITION WAGON OF A 9-POUNDER GUN.

Axletree, spare - - - - -	2 per battery. Carried on the spare gun carriage, when there is one.
Bag, for fuzes, blue - - - - -	1 For 8 shrapnel fuzes.
Bars, splinter, spare - - - - -	4 per battery for war, and 2 for peace establishment.
Box, tin, fuze, blue - - - - -	1 For 8 shrapnel fuzes.
Buckets, water - - - - -	2
*Cartouches, travelling carriage, canvas { limber - 4	
{ wagon body - 5	
*Cartridges, filled { calico, bursters, 18 drms. - 14	
{ flannel, charge, 2½ lbs. - 96	In paper covers.
Case, saw, leather - - - - -	1 1st line only.
Couples, for traces - - - - -	2
Cylinders, zinc, for tubes - - - - -	2 The 2nd line of wagons has 1 only.

EQUIPMENT OF A 9-POUNDER AMMUNITION WAGON.

Fuzes, shrapnel	-	-	-	-	16	8 in a blue bag and 8 in a blue box.	
Grease, in the magazines	-	-	-	-	lbs. 28		
Jack, lifting	-	-	-	-	1	1st line only.	
Kettles, camp	-	-	-	-	2		
Key, spring lock	-	-	-	-	1		
Line, Hambro'	-	-	-	-	skein 1	} 1st line only.	
Marline	-	-	-	-	" 1		
Match, slow	-	-	-	-	lbs. 3		
Maul, wood, common	-	-	-	-	1		
Perches, spare	-	-	-	-	-	2 per battery.	
Pin, lynch, spare	-	-	-	-	1		
Plugs	{	fuze hole, shrapnel	-	-	-	} Charged with the shells.	
		loading hole, small	-	-	-		
Pocket, tube, leather	-	-	-	-	1	1st line only.	
Portfires	-	-	-	-	6		
Posts, picket, short	-	-	-	-	6		
Rope, picket	-	-	-	-	1	12½ fathoms of 3-inch tarred rope.	
Ropes, drag, light	-	-	-	-	pair 1		
Saw, hand	-	-	-	-	1	1st line only.	
Shafts, spare	{	near	-	-	1	} 4 per battery for war, and 2 for peace estab- lishment.	
		off	-	-	-		
*Shells, shrapnel, fixed	-	-	-	-	14	With fuze hole and loading hole plugs.	
Shoes, horse, sets of 4, with nails	-	-	-	-	30	3 sets of nails to each set of shoes.	
*Shot	{	case	-	-	8	}	
		solid, fixed	-	-	74		
Strap	{	fuze box	-	-	1	} 1st line only.	
		tube, pocket	-	-	1		
Swingletree	-	-	-	-	1		
Tents, with poles, pins, and bags complete	-	-	-	-	4		
Tools, intrenching	{	axes, helved	{	felling	-	1	
				pick	-	1	
		hook, bill	-	-	-	1	
		hooks, reaping	-	-	-	4	1st line only.
		shovel	-	-	-	1	
		spade	-	-	1		
Tubes	{	brass	-	-	50	} The 2nd line of wagons has 100 friction and no brass tubes.	
		friction, copper	-	-	50		
*Wagon, ammunition, complete	-	-	-	-	1		
Washer, drag, spare	-	-	-	-	1		
Wheel, spare	-	-	-	-	1	1st line only.	

In addition to the above equipment, the following articles are carried on the march:—2 carbines; 6 blankets, with waterproof covers; 6 knapsacks (or valises), complete, with necessaries; and 2 corn sacks.

* In demanding the articles marked thus * it is necessary to specify that they are for the 9-pounder brass gun.

EQUIPMENT OF 12-POUNDER BRASS GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
MEDIUM 12-PR. GUN, OF 6 FT. 6 IN. & 18 CWT.				
Range { 1° elevation, 700 yards, 6° " 1,800 "		£ s. d.	lbs. oz.	Similar in construction to the 6-pounder; but with dolphins.
<i>Gun.</i>				
Total length, 7' 1"; calibre, 4.623 inches; windage, .1 inch -			2,016 0	Length of bore, 6' 2½"; width across the trunnions 19½".
Sights { tangent scale, with screw - screw for ditto, spare -			0 12 0 1	
<i>Carriage. a</i>				
Travelling, { limber, 10 cwt. - complete { carriage, 13 " -			23 cwt.	Tonnage, 5 tons; 33 ft.; carries 24 rounds of ammunition.
Cartouches, set of 3 -			12 5	Fitted to the ammunition boxes.
<i>Ammunition.</i>				
Firing charge { with shot or shell - without " -			4 0 3 0	L. G. powder. Service charge. For exercise and salutes.
Bursting charge, shrapnel -			0 1½	24 (late 20) drms. of M. R. powder.
Projectiles { shot { case - solid, fixed -			17 13 12 7	9.4" long; holds 41 6¼-oz. balls.
shell, shrapnel, b fixed -			10 6	Filled with 72 carbine bullets.
Fuzes, time, shrapnel -			0 0½	
Tubes, { common, brass - friction, copper -			0 0½ 0 0½	Require portfires and slow match.
Bags, waterproof paper, No. 2 -			0 0½	For shrapnel bursters.
Cartridges { calico, burster, shrapnel - flannel, { service - charge { exercise -			0 0½ 0 1½ 0 1	
Cover { paper, No. 6 - waterproof -			0 0½ 0 0½	} For service cartridges.
Wad, loading hole, small -			0 0	
<i>Stores. c</i>				
Head, spare { rammer - sponge -			1 3 1 15	
Punch, for vent (No. 6) -			0 1½	4.94" long.
Spike, spring -			0 1½	
Sponge, with stave, rammer, and cap			6 13	
Wadhook -			4 12	

a Including drag shoe, elevating screw, set of straps, &c., as shown at p. 379.

b With small loading hole.

c Those here detailed are specially adapted to this gun; for the rest, see the general list which follows.

NOTES.

The 12-pounder has been used as a gun of position, but its range is not superior to that of the 9-pounder, and it brings into the field only 104 rounds of ammunition instead of 128. In 1813 there were six brass 12-pounder guns, of which the present pattern was described as the "medium, new." The heaviest weighed 31½ cwts., and the lightest was only 8½ cwts.—(Adye's "Bombardier," p. 203.)

The limber contains 24 and the wagon 80 rounds; each round of solid shot weighs 16½ lbs., of shrapnel shell 14½ lbs., and of case shot 23 lbs. The total weight of the gun and its equipment is about 45½ cwt.

From the points of the shafts to the muzzle of the gun it measures 23½ feet, and drawn by eight horses it covers 20 yards of ground. The wheels are of the heavy field class, but are interchangeable with those of the ammunition wagon.

The centre box of the limber is wider than that of the wagon and holds six rounds of ammunition; this difference in the construction arises from the pintail being straight instead of crooked.

The carriage has travelling trunnion holes.

EQUIPMENT OF 12-POUNDER BRASS GUNS.

The following list shows the entire equipment.

ALPHABETICAL LIST OF EQUIPMENT FOR THE CARRIAGE AND LIMBER OF A 12-POUNDER GUN.

Box, tin, fuze, blue	-	-	-	-	1	For 12 shrapnel fuzes.	
Buckets, water	-	-	-	-	2		
*Caps, sponge	-	-	-	-	2	On the sponges.	
*Carriage, travelling, complete	-	-	-	-	1		
*Cartouches, travelling carriage, canvas, limber	-	-	-	-	3		
*Cartridges, filled { calico, bursters, 24 drms.	-	-	-	-	6		
flannel, charge, 4 lbs.	-	-	-	-	24	In paper covers.	
Couples, for traces	-	-	-	-	2		
Cylinder, zinc, for tubes	-	-	-	-	1		
Fuzes, shrapnel	-	-	-	-	12	In a blue box.	
Hammer, claw	-	-	-	-	1		
Handspikes, traversing	-	-	-	-	2		
*Heads, spare { rammer	-	-	-	-	—	} 1 of each is carried in the ammunition wagon.	
sponge	-	-	-	-	—		
Implements, shell and fuze { No. 1 set, field service	-	-	-	-	1	} For the details, see p. 208.	
No. 2 set	-	-	-	-	1		
Irons, priming, field service	-	-	-	set	1	(1 pricker, 1 drift, 1 bit).	
Kettles, camp	-	-	-	-	2		
Key, spring lock	-	-	-	-	1		
Knife, laboratory, small	-	-	-	-	1		
Lanyards for friction tubes	-	-	-	-	3		
Lock, pad, iron, small, with key	-	-	-	-	1	For axletree box.	
Needles, laboratory, brass	-	-	-	-	2		
Ordnance, brass, 12-pounder gun, of 6 feet 6 in. and 18 cwt.	-	-	-	-	1		
Pincers, carpenters'	-	-	-	pair	1		
Pin, lynch, spare	-	-	-	-	1		
Plugs { fuze hole, shrapnel	-	-	-	-	—	Charged with the shells.	
loading hole, small, spare	-	-	-	-	—	5 per cent. for the number in the subdivision.	
Pocket, tube, leather	-	-	-	-	1		
Prolong, heavy	-	-	-	-	1		
Punches for vent (No. 6.)	-	-	-	-	2		
Roller, shifting	-	-	-	-	1		
Ropes, drag, light	-	-	-	pair	1		
*Scales, tangent, brass	-	-	-	-	1	On the gun ; and 1 spare per battery.	
Scissors, laboratory, small	-	-	-	pair	1		
Screws, copper, for tangent scale	-	-	-	-	2	1 on the gun and 1 spare.	
*Shells, shrapnel, fixed	-	-	-	-	6	With fuze hole and loading hole plugs.	
*Shot { case	-	-	-	-	6		
solid, fixed	-	-	-	-	12		
Spanner, McMahon's	-	-	-	-	1		
Spikes { common	-	-	-	-	2		
spring	-	-	-	-	1		
*Sponges, field service	-	-	-	-	2		
Sticks, portfire	-	-	-	-	2		
Straps { fuze box	-	-	-	-	1		
tube pocket	-	-	-	-	1		
Swingletree	-	-	-	-	1		
Thumbstalls	-	-	-	-	2		
Tools, intrenching	{	axes, helved	{	falling	-	1	
				pick	-	1	
				hook, bill	-	1	
				shovel	-	1	
				spade	-	1	
Tubes, friction, copper	-	-	-	-	100	In a zinc cylinder.	
Wads, loading hole, small	-	-	-	-	—	1 for each shrapnel shell in the subdivision.	
*Wadhook	-	-	-	-	1		
Washer, spare, drag	-	-	-	-	1		
Worsted	-	-	-	oz.	2		

The usual number of carbines, blankets, knapsacks, and corn sacks are carried on the march.

* In demanding the articles marked thus * it is necessary to specify that they are for the 12-pounder brass gun.

EQUIPMENT OF A 12-POUNDER AMMUNITION WAGON.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
		£ s. d.			
Wagon, complete ^a { limber - 10 cwt. body - 11½ ,, }			21¾ cwt.	1	Tonnage,
<i>Ammunition, 80 rounds.</i>					
Cartridges, { calico, bursters, 24 drs. filled flannel, charge 4 lbs. -			lbs. oz.		
Fuzes, shrapnel -			0 1½	22	
Match, slow - - - piece of			4 1½	80	
Portfires - - - -			0 0½	24	
Shells, shrapnel, fixed ^b - - -			3 0	1	
Shot - { case ^c - - - - - solid, fixed - - - - -			0 5½	6	
Tubes { brass - - - - - friction - - - - -			10 6	22	
			17 13	4	
			12 7	54	
			0 0¾	50	
			0 0½	50	
<i>Stores.^d</i>					
Cartouches, set of 8 - - -			23 10	1	Fitted to the ammunition boxes.

^a Including horse shoe boxes, grease magazines, straps for securing side-arms, &c.
^b Filled with 72 carbine bullets. ^c Filled with 41 6½-oz. balls.
^d Those here detailed are specially adapted to the wagon ; for the rest, *see* the general list which follows.

NOTES.

The wagon for the 12-pounder gun corresponds in its construction with those for lighter pieces ; it weighs, when complete, with its stores, about 40 cwt. The wheels are of the light field class.

The following list shows the entire equipment.

ALPHABETICAL LIST OF EQUIPMENT FOR THE AMMUNITION WAGON OF A 12-POUNDER GUN.

Axletree, spare - - - - -	-	-	-	-	2 per battery. Carried on the spare gun carriage, when there is one.
Bag, for fuzes, blue - - - - -	-	-	-	1	For 12 shrapnel fuzes.
Bars, splinter, spare - - - - -	-	-	-	-	4 per battery for war and 2 for peace establishment.
Box, tin, fuze, blue - - - - -	-	-	-	1	For 12 shrapnel fuzes.
Buckets, water - - - - -	-	-	-	2	
*Cartouches, travelling carriage, canvas { limber - - - - - body - - - - -				4 4	
*Cartridges, filled { calico, bursters, 24 drms. - - - - - flannel, charge, 4 lbs. - - - - -				22 80	In paper covers.
Case, saw, leather - - - - -	-	-	-	1	1st line only.
Couples for traces - - - - -	-	-	-	2	
Cylinders, zinc, for tubes - - - - -	-	-	-	2	The 2nd line has only one.
Fuzes, shrapnel - - - - -	-	-	-	24	12 in a blue bag and 12 in a blue box.
Grease, in the magazines - - - - -	-	-	-	lbs. 28	

EQUIPMENT OF A 12-POUNDER AMMUNITION WAGON.

*Heads, spare	{ rammer	-	-	-	-	1	} 1st line only.
	{ sponge	-	-	-	-	1	
Jack, lifting	{ barrel	-	-	-	-	1	} 2nd line only.
	{ lever	-	-	-	-	1	
Kettles, camp	-	-	-	-	-	2	
Key, spring lock	-	-	-	-	-	1	
Line, Hambro'	-	-	-	-	-	skein	} 1st line only.
Marline	-	-	-	-	-	1	
Match, slow	-	-	-	-	-	lbs. 3	
Maul, wood, common	-	-	-	-	-	1	
Perches, spare	-	-	-	-	-	—	2 per battery.
Pin, lynch, spare	-	-	-	-	-	1	
Plugs	{ fuze hole, shrapnel	-	-	-	-	—	} Charged with the shells.
	{ loading hole, small	-	-	-	-	—	
Pocket, tube, leather	-	-	-	-	-	1	1st line only.
Portfires	-	-	-	-	-	6	
Posts, picket, short	-	-	-	-	-	6	
Rope, picket	-	-	-	-	-	1	12½ fathoms of 3-inch tarred rope.
Ropes, drag, light	-	-	-	-	-	pair 1	
Saw, hand	-	-	-	-	-	1	1st line only.
Shafts, spare	{ near	-	-	-	-	—	} 4 per battery for war, and 3 for peace estab- lishment.
	{ off	-	-	-	-	—	
*Shells, shrapnel, fixed	-	-	-	-	-	22	With fuze hole and loading hole plugs.
Shoes, horse, sets of 4, with nails	-	-	-	-	-	30	3 sets of nails to each set of shoes.
*Shot	{ case	-	-	-	-	4	}
	{ solid, fixed	-	-	-	-	54	
Strap	{ fuze box	-	-	-	-	1	} 1st line only.
	{ tube pocket	-	-	-	-	1	
Swingletree	-	-	-	-	-	1	
Tents, with poles, pins, and bags complete	-	-	-	-	-	4	
Tools, intrenching	{ axes, helved	{ felling	-	-	-	1	} 1st line only.
			{ pick	-	-	-	
		{ hook, bill	-	-	-	1	
		{ hooks, reaping	-	-	-	4	
		{ shovel	-	-	-	1	
	{ spade	-	-	-	1		
Tubes	{ brass	-	-	-	-	50	} The 2nd line of wagons has 100 friction, and no brass tubes.
	{ friction, copper	-	-	-	-	50	
*Wagon, ammunition, complete	-	-	-	-	-	1	
Washer, drag, spare	-	-	-	-	-	1	
Wheel, spare	-	-	-	-	-	1	1st line only.

Carbines, blankets, knapsacks, and corn sacks are carried in the same proportion as by the 9-pounder wagon.

* In demanding the articles marked thus * it is necessary to specify that they are for the 12-pounder brass gun.

EQUIPMENT OF 18-POUNDER IRON GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
18-POUNDER GUN, OF 8 FT. AND 38 CWT.		£ s. d.	lbs. oz.	Ordinary pattern.
Range { 1° elevation, 700 yards. 7° " 2,000 "				
<i>Gun.</i>				
Total length, 8' 10"; calibre, 5·292 inches; windage, ·193 inch -			4,256 0	Length of bore, 7' 5½"; diameter of base ring, 18' 02½".
Sights { fore, dispart, with 2 screws hind (brass scale and socket), with 2 screws - tangent scale, wood -			2 4 2 0 0 5	
<i>Carriage.</i> ^a				
Travelling, com- { limber - 10 cwt. plete, block trail { carriage, 24½ " } Cartouches, canvas, set of 2 -		85 18 9 0 10 4	34½ cwt. 11 4	Tonnage, 6 tons; 16 ft.; carries 24 rounds of ammunition. Fitted to the ammunition boxes.
<i>Ammunition.</i>				
Firing charge, with shot or shell - Bursting charge, common shell -			6 0 0 10	} L. G. powder; see also p. 320.
Projectiles { shot { case - grape - solid, fixed - shell, common, fixed -			19 4 19 8 18 9 12 8	10·1" long; holds 46 6-oz. balls. 6·8" long; holds 9 1½-lb. balls.
Fuzes { percussion, Pettman's - time, common -			0 7 0 1½	
Tubes { common, brass - friction, copper -			0 0½ 0 0½	
The other items are given with the garrison equipment.				
<i>Stores.</i> ^b				
Heads, spare { rammer - sponge -			1 9 2 10	
Punch, for vent (No. 4) -			0 2	
Rammer, with stave, spare -		0 3 0	8 0	
Spike, spring -			0 2	7·22" long.
Sponge, with stave, rammer, and cap -		0 10 7	11 0	
" with stave and cap -		0 9 0	9 0	
Wadhook -		0 5 5	10 0	

^a Including two pairs of shafts, elevating screw, drag shoe, straps for securing side-arms, &c.

^b Those here detailed are specially adapted to this gun; for the rest, see the general list which follows.

NOTES.

This piece, hitherto used for batteries of position (of four each), is now being replaced by the 40-pounder Armstrong gun; it was employed for field operations in the Crimea, and in the concluding campaigns of the Peninsular war. Its weight, when equipped (72 cwt. or 3½ tons), is nearly double that of an ordinary field carriage, and the gun alone (38 cwt.) is as heavy as a 9-pounder complete.

EQUIPMENT OF 18-POUNDER IRON GUNS.

It is drawn by 12 horses, harnessed four abreast; it has therefore two pairs of shafts, with outriggers, and occupies a space of 16 yards in depth by 4 yards in width. The carriage wheels belong to a different class from those of the limber and are consequently not interchangeable. They are both 5 feet in diameter, but the former weigh $4\frac{1}{2}$ cwt. each and the latter $2\frac{1}{2}$ cwt.

The limber carries 24 rounds, and the wagon 60 rounds. On service there would be three wagons for each gun, and consequently every piece would be supplied with 204 rounds.

One round of each projectile weighs as follows:—Solid shot, 24 lbs. 11 oz.; common shell, 19 lbs. 7 oz.; case, 25 lbs. 6 oz.; and grape, 25 lbs. 10 oz. Carcasses and shrapnel shell may be used, but are not issued for field service.

The gun is mounted on its carriage or dismounted by means of a gyn, one of which is furnished to each battery; it is shifted from the firing to the travelling trunnion holes by help of the lever and roller.

The general stores are, for the most part, the same as for field guns, but the traversing handspike is replaced by five common handspikes, and the spare sponge and rammer are on separate staves. A lifting jack (barrel-jack) extra is carried on the footboard. There is no prolong, as the gun is too heavy for its use, and the camp kettles, usually hung under the axletree, are omitted.

If this gun were supplied to a siege train, the limber boxes of the carriage would be removed, the cart-ridges would be packed in metal-lined cases, and the ammunition conveyed in the same manner as for other siege guns. The projectiles would be furnished in the same proportions as for the 24-pounder gun.

The following list shows the entire equipment.

ALPHABETICAL LIST OF EQUIPMENT FOR THE CARRIAGE AND LIMBER OF AN 18-POUNDER GUN.

Box, tin, fuze, black	-	-	-	1	For 8 common fuzes.
Buckets, water	-	-	-	2	
*Caps, sponge	-	-	-	2	With the sponges.
*Carriage, travelling, block trail, complete	-	-	-	1	
*Cartouches, travelling carriage, canvas, limber	-	-	-	2	
*Cartridges, filled { calico, bursters, 10 ozs.	-	-	-	6	
{ flannel, charge, 6 lbs.	-	-	-	24	In paper covers.
Couples for traces	-	-	-	4	
Cylinder, zinc, for tubes	-	-	-	1	
Fid	-	-	-	—	1 on the platform wagon.
Fuzes, common	-	-	-	8	In a black box.
Hammer, claw	-	-	-	1	
Handspikes, common 6-feet	-	-	-	5	Instead of 2 traversing handspikes.
*Heads, spare { rammer	-	-	-	—	} 1 of each in the ammunition wagon.
{ sponge	-	-	-	—	
Implements, shell and fuze { No. 1 set, field service	-	-	-	1	
{ No. 4 set	-	-	-	1	
Irons, priming, field service	-	-	-	set	1
Jack, barrel	-	-	-	-	1
Key, spring lock	-	-	-	-	1
Knife, laboratory, small	-	-	-	-	1
Lanyards, for friction tubes	-	-	-	-	3
Lever, wood, 8 feet	-	-	-	-	1
Needles, laboratory, brass	-	-	-	-	2
Ordnance, iron, 18 pounder gun, of 8 feet and 38 cwts.	-	-	-	-	1
Pincers, carpenters'	-	-	-	pair	1
Pin, lynch, spare	-	-	-	-	1
Plugs, fuze hole, common	-	-	-	-	—
Pocket tube, leather	-	-	-	-	1
Punches, for vent	-	-	-	-	2
Rammer, with stave, spare	-	-	-	-	1
Roller, shifting	-	-	-	-	1
Ropes, drag, heavy	-	-	-	pair	1
*Scale, tangent, wood	-	-	-	-	1
Scissors, laboratory, small	-	-	-	pair	1
Screws for sights { fixing	-	-	-	-	5
{ preserving	-	-	-	-	4
*Shells, common, fixed	-	-	-	-	6
*Shot { case	-	-	-	-	3
	{ grape	-	-	-	3
	{ solid, fixed	-	-	-	12
					With fuze hole plugs.

EQUIPMENT OF 18-POUNDER IRON GUNS.

*Sights, Millar's L.S.	{ fore, dispart	-	-	-	1				
	{ hind	-	-	-	1				
Spanner, McMahon's		-	-	-	1				
Spikes	{ common	-	-	-	2				
	{ spring	-	-	-	1				
*Sponge, with cap		-	-	-	1				
" with cap and rammer		-	-	-	1				
Sticks, portfire		-	-	-	2				
Straps	{ fuze box	-	-	-	1				
	{ tube pocket	-	-	-	1				
Swingletrees		-	-	-	3				
Thumbstalls		-	-	-	2				
Tools, intrenching	{ axes, helved	{ felling	-	-	-	1			
			{ pick	-	-	-	1		
				{ hook, bill	-	-	-	1	
				{ shovel	-	-	-	1	
	{ spade	-	-	-	1				
Tubes, friction		-	-	-	100	In a zinc cylinder.			
Wads, fuze hole		-	-	-	—	1 for each shell in the subdivision.			
*Wadhook		-	-	-	1				
Washers, drag, spare	{ carriage	-	-	-	1				
		{ limber	-	-	-	2			
Worsted		-	-	-	oz. 2				
Wrench, for sights		-	-	-	1				

* In demanding the articles marked thus * it is necessary to specify that they are for the 18-pounder iron gun.

EQUIPMENT OF AN 18-POUNDER AMMUNITION WAGON.

*Cartridges, filled	{ calico, bursters, 10 oz.	-	-	12		
	{ flannel, charge, 6 lbs.	-	-	60	In paper covers.	
Case, saw, leather	-	-	-	1	1st line only.	
Couples for traces	-	-	-	2		
Cylinders, zinc, for tubes	-	-	-	2		
Fuzes, common	-	-	-	16		
Grease, in the magazines	-	-	lbs.	28		
*Heads, spare	{ rammer	-	-	1		
	{ sponge	-	-	1		
Jack, lifting	-	-	-	1		
Kettles, camp	-	-	-	2		
Key, spring lock	-	-	-	1		
Line, Hambro'	-	-	-	1		
Marline	-	-	-	1	} 1st line only.	
Match, slow	-	-	lbs.	4		
Maul, wood, common	-	-	-	1		
Perches, spare	-	-	-	—	2 per battery.	
Pin, lynch, spare	-	-	-	1	For second class wh'els.	
Pocket, tubc, leather	-	-	-	1	1st line only.	
Portfires	-	-	-	6		
Posts, picket	-	-	-	4		
Rope, picket	-	-	-	1		
Ropes, drag, heavy	-	-	-	1		
Saw, hand	-	-	pair	1	1st line only.	
Shafts, spare	{ near	-	-	—	} 4 per battery.	
	{ off	-	-	—		
*Shells, common, fixed	-	-	-	12	With fuze hole plugs.	
Shoes, horse, sets of 4, with nails	-	-	-	30	3 sets of nails to each set of shoes.	
*Shot	{ case	-	-	3		
	{ grape	-	-	3		
	{ solid, fixed	-	-	42		
Strap	{ fuze box	-	-	1	} 1st line only.	
	{ tube pocket	-	-	1		
Swingletree	-	-	-	1		
Tents, with poles, pins, and bags complete	-	-	-	4		
Tools, intrenching	{ axes, helved	{ felling	-	1		
			{ pick	-	1	
		{ hook, bill	-	1		
			{ hooks, reaping	-	4	1st line only.
			{ shovel	-	1	
	{ spade	-	1			
Tubes	{ brass	-	-	10		
	{ friction, copper	-	-	50		
*Wagon, ammunition, complete	-	-	-	1		
Washer, drag, spare	-	-	-	1		
Wheel, spare	-	-	-	1	1st line only.	

* In demanding the articles marked thus * it is necessary to specify that they are for the 18-pounder iron gun.

EQUIPMENT OF 12-POUNDER BRASS HOWITZERS.

Description.	No. of Drawing.	Cost of each.		Weight of each.		Dimensions and Remarks.
		£	s. d.	lbs.	oz.	
12-POUNDER HOWITZER, OF 3 FT. 9 IN. & 6½ CWT.						Pattern described below.
Range { 1° elevation, 420 yards. 6° " 1,300 "						
<i>Howitzer.</i>						
Total length, 4' 3"; calibre, 4·58 in.; windage, ·126 inch				728	0	Length of bore, 3' 8"; width across the trunnions, 17 in., gomer chamber.
Sights { tangent scale, with screw screw, spare				0	9	
				0	1	
<i>Carriage.*</i>						
Travelling, } limber, 10 cwt. - complete } carriage, 11½ " -		61	14 0	21½	cwt.	Tonnage, 4 tons; 21 ft.; holds 36 rounds of ammunition.
Cartouches, set of 2 -		0	7 2	14	4	Fitted to the limber boxes.
<i>Ammunition.</i>						
Firing charge { with shot or shell - without " -				1	4	L.G. powder. Service charge For exercise or salute.
Bursting charge { common shell - shrapnel " -				0	6	
Projectiles { shells, fixed { common - shot, case - shrapnel ^b - carcasses, filled and fixed				8	6	Filled with 72 carbine bullets. 5" long; holds 50 2-oz. balls.
				10	6	
				7	5	
				9	14	
Fuzes, time { common - shrapnel -				0	1½	Require portfires and slow match.
Tubes { common, brass - friction, copper -				0	0½	
Bag, waterproof paper, No. 2				0	0½	
Cartridges { calico, { common shell - burstiers " waterproof - flannel, { shrapnel - charge { service - exercise -				0	0½	No. 5. With common paper bag.
				0	0½	
				0	0½	
				0	0½	
Cover { paper, No. 12 - waterproof -				0	0½	} For service cartridges.
				0	0	
Wads { fuse hole - loading hole, small -				0	0	
				0	0	
<i>Stores.^c</i>						
Heads, spare { rammer - sponge -		0	0 4	0	14	
		0	3 9	1	9	
Punch, for vent (No. 8)				0	1	
Spike, spring				0	1	
Sponge, with stave, rammer, and cap		0	5 7	4	8	3·56" long.
Wadhook		0	3 2	3	0	

* Including drag shoe, elevating screw, and straps for securing side arms, &c.

^b With small loading hole.

^c Those here detailed are specially adapted to this piece; for the rest, see the general list which follows.

NOTES.

The 12-pounder howitzer is used in conjunction with the 6-pounder gun; it was introduced by General Millar, in 1820, as an improvement on the 4½-inch howitzer, and was generally supplied to batteries of horse artillery until the Armstrong gun replaced it. It has four plain rings, and one astragal with fillets. There is a patch at the vent, a dispart at the muzzle, and the cascable is fitted for attaching the elevating screw.

One round of ammunition weighs 11½ lbs. with shrapnel shell; 10½ lbs. with common shell; and 8½ lbs. with case shot. The limber holds 36 rounds, the wagon 100 rounds, and as two additional wagons are used on active service, each of the howitzers is provided with 236 rounds of ammunition.

EQUIPMENT OF 12-POUNDER BRASS HOWITZERS.

The length of the carriage from the points of the shafts to the muzzle of the piece is about 20 feet 6 inches; greatest breadth, 6 feet 6 inches; when drawn by six horses it covers 15 yards of ground. The wheels are of the light field class, weighing 1 cwt. 3 qrs. 23 lbs. each.

The total weight, when equipped for the march, is 31½ cwt.

The following list shows the entire equipment.

ALPHABETICAL LIST OF EQUIPMENT FOR THE CARRIAGE AND LIMBER OF A 12-POUNDER HOWITZER.

Bags for fuzes	{	black	-	-	-	1	Containing 16 common fuzes.	
		blue	-	-	-	1	Containing 12 shrapnel fuzes.	
Boxes, tin, fuze	{	black	-	-	-	1	Containing 8 common fuzes.	
		blue	-	-	-	1	Containing 12 shrapnel fuzes.	
Buckets, water	-	-	-	-	-	2		
*Caps, sponge-	-	-	-	-	-	2	On the sponges.	
Carriage, travelling, complete	-	-	-	-	-	1		
*Cartouches, travelling carriage, canvas, limber	-	-	-	-	-	2		
*Cartridges, filled	{	calico, bursters	{	6 oz.	-	14	For common shell.	
				24 drs.	-	18	For shrapnel shell.	
		flannel, charge,	1¼ lbs.	-	36	In paper covers.		
Couples for traces	-	-	-	-	-	2		
Cylinder, zinc, for tubes	-	-	-	-	-	1		
Fuzes	{	common	-	-	-	24	8 in a black box; 16 in a black bag.	
		shrapnel	-	-	-	24	8 in a blue box; 16 in a blue bag.	
Hammer, claw	-	-	-	-	-	1		
Handspikes, traversing	-	-	-	-	-	2		
Heads, spare	{	rammer	-	-	-	1		
		sponge	-	-	-	-	1	
Implements, shell and fuze	{	No. 1 set, field service	-	-	-	1	For the detail, see page 209.	
		No. 4 set, "	-	-	-	1		
Irons, priming, field service	-	-	-	-	-	set	(1 pricker, 1 drift, 1 bit).	
Kettles, camp	-	-	-	-	-	2		
Key, spring lock	-	-	-	-	-	1		
Knife, laboratory, small	-	-	-	-	-	1		
Lanyards for friction tubes	-	-	-	-	-	3		
Locks, pad, iron, small, with keys	-	-	-	-	-	2	For axletree boxes.	
Needles, laboratory, brass	-	-	-	-	-	2		
Ordnance, brass, 12-pounder howitzer	-	-	-	-	-	1		
Pincers, carpenters'	-	-	-	-	-	pair	1	
Pin, lynch, spare	-	-	-	-	-	1		
Plugs	{	fuze hole	{	common	-	-	-	Charged with the shells.
			shrapnel	-	-	-	-	
		loading hole, small, spare	-	-	-	-	5 per cent. for the number in the subdivision.	
Pocket, tube, leather	-	-	-	-	-	1		
Prolong, light	-	-	-	-	-	1		
Punches for vent (No. 8)	-	-	-	-	-	2		
Ropes, drag, light	-	-	-	-	-	pair	1	
*Scale, tangent, brass	-	-	-	-	-	1	On the howitzer, and 1 spare per battery.	
Scissors, laboratory, small	-	-	-	-	-	pair	1	
Screws, for tangent scale	-	-	-	-	-	2	1 on the howitzer and 1 spare.	
*Shells	{	common, fixed	-	-	-	14	With fuze hole plugs.	
		shrapnel, do.	-	-	-	18	Fuze hole and loading hole plugs.	
*Shot, case	-	-	-	-	-	4		
Spanner, McMahon's	-	-	-	-	-	1		
Spikes	{	common	-	-	-	2		
		spring	-	-	-	-	1	
*Sponges, field service	-	-	-	-	-	2		
Sticks, portfire	-	-	-	-	-	2		
Straps	{	fuze box	-	-	-	1		
		tube pocket	-	-	-	-	1	
Swingletree	-	-	-	-	-	1		
Thumbstalls	-	-	-	-	-	2		

EQUIPMENT OF 12-POUNDER BRASS HOWITZERS.

Tools, intrenching	{	axes, helved	{	felling	-	-	1	
				pick	-	-	1	
		hook, bill			-	-	1	
		shovel			-	-	1	
		spade			-	-	1	
Tubes, friction, copper						-	100	In a zinc cylinder.
Wads	{	fuze hole			-	-	—	1 for each common shell in the subdivision.
		loading hole, small			-	-	—	1 for each shrapnel do. do.
*Wadhook, field service					-	-	1	
Washer, drag, spare					-	-	1	
Worsted							oz.	2

Carbines, blankets with covers, valises, and corn sacks are carried in the same proportion as by the 6-pounder gun carriage.

* In demanding the articles marked thus * it is necessary to specify that they are for the 12-pounder brass howitzer.

EQUIPMENT OF A 12-POUNDER HOWITZER AMMUNITION WAGON.

*Cartridges, filled	{ calico, bursters { 6 ozs. - 24 drams	-	-	42	For common shells.		
	{ flannel, charge, 1 1/4 lbs. -	-	-	50	For shrapnel shells.		
Case, saw, leather	-	-	-	100	In paper covers.		
Couples for traces	-	-	-	-	1st line only.		
Cylinders, zinc, for tubes	-	-	-	2			
Fuzes { common	-	-	-	2	The 2nd line of wagons has 1 only.		
{ shrapnel	-	-	-	48	Packed in 2 black bags and 2 black boxes.		
Grease, in the magazines	-	-	lbs.	60	Packed in 4 blue bags and 1 blue box.		
Jack, lifting	-	-	-	28			
Kettles, camp	-	-	-	1	1st line only.		
Key, spring lock	-	-	-	2			
Line, Hambro'	-	-	skein	1	} 1st line only.		
Marline	-	-	"	1			
Match, slow	-	-	lbs.	3			
Maul, wood, common	-	-	-	1			
Perches, spare	-	-	-	-	2 per battery.		
Pin, lynch, spare	-	-	-	1			
Plugs { fuze hole	{ common	-	-	-	} Charged with the shells.		
		{ shrapnel	-	-			
loading hole, small	-	-	-	-			
Pocket, tube, leather	-	-	-	1	1st line only.		
Portfires,	-	-	-	6			
Posts, picket, short	-	-	-	6			
Rope, picket	-	-	-	1	12 1/2 fathoms of 3-inch tarred rope.		
Ropes, drag, light	-	-	pair	1			
Saw, hand	-	-	-	1	1st line only.		
Shafts, spare { near	{ off	-	-	-	} 4 per battery for war, and 3 for peace estab- lishment.		
		-	-	-			
*Shells { common, fixed	-	-	-	42	With fuze hole plugs.		
{ shrapnel, do	-	-	-	50	Fuze hole and loading hole plugs.		
Shoes, horse, sets of 4, with nails	-	-	-	30	3 sets of nails to each set of shoes.		
*Shot, case	-	-	-	4			
Straps { fuze box	{ tube pocket	-	-	1	} 1st line only.		
		-	-	1			
Swingletree	-	-	-	1			
Tents, with poles, pins, and bags complete	-	-	-	4			
Tools, intrenching { axes, helved { felling	{ hook, bill	{ pick	-	-	1	} 1st line only.	
			{ hooks, reaping	-	-		1
			{ shovel	-	-		4
			{ spade	-	-		1
			-	-	-		1
Tubes { brass	-	-	-	50	} The 2nd line of wagons has 100 friction, but no brass tubes.		
{ friction, copper	-	-	-	50			
*Wagon, ammunition, complete	-	-	-	1			
Washer, drag, spare	-	-	-	1			
Wheel, spare	-	-	-	1	1st line only.		

Carbines, blankets with covers, valises, and corn sacks are carried in the same proportion as by the 6-pounder ammunition wagon.

* In demanding the articles marked thus * it is necessary to specify that they are for the 12-pounder brass howitzer.

EQUIPMENT OF 24-POUNDER BRASS HOWITZERS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.	
24-POUNDER HOWITZER, OF 4 FT. 8 IN. & 13 CWT.		£ s. d.	lbs. oz.	Similar in construction to the 12-pounder howitzer.	
Range { 1° elevation 500 yards - 6° " 1,600 " -					
<i>Howitzer.</i>					
Total length, 5' 3"; calibre, 5.72 inches; windage, .125 inch -			1,456 0	Length of bore (with Gomer chamber), 4' 7"; width across the trunnions, 20½ inches.	
Sights { tangent scale, with screw - screw, spare, for ditto -			0 12 0 1		
<i>Carriage. a</i>					
Travelling, { limber, 10 cwt. - complete { carriage, 14 cwt. -		67 16 6	24 cwt.	Tonnage, 5 tons; 6 ft.; carries 24 rounds of ammunition.	
Cartouches, set of 2 -		0 10 1	8 8	Fitted to the ammunition boxes.	
<i>Ammunition.</i>					
Firing charge { with shot or shell - without " -			2 8 1 8	L. G. powder. Service charge. For exercise and salutes.	
Bursting charge { common shell - shrapnel " -			0 13 0 2½	L. G. powder. M. R. powder (40 drams).	
Projectiles { shells, fixed { common - shrapnel b shot, case - carcass, filled and fixed -			16 9 21 0 14 2 19 12	Filled with 110 1-oz. bullets. 5.6" long; holds 100 2-oz. balls.	
	Fuzes, time { common - shrapnel -		0 1½ 0 0½		
	Tubes { common, brass - friction, copper -		0 0½ 0 0½		Require portfires and slow match.
Bag, waterproof paper, No. 2 -			0 0½	For shrapnel bursters.	
Cartridges { calico, { common shell - bursterns { " waterproof - shrapnel - flannel, { service - charge { exercise -			0 0½ 0 0½ 0 0½ 0 1 0 0½	No. 6. With common paper bag.	
	Cover { paper, No. 14 - waterproof -				0 0½ 0 0½
		Wads { fuze hole - loading hole, large -			
	<i>Stores. c</i>				
Heads, spare { rammer - sponge -		0 0 5 0 4 11	1 3 1 11		
	Punch, for vent (No. 7) -		0 1½		
Spike, spring -			0 1½	4.51" long.	
Sponge, with stave, rammer, and cap		0 5 7	6 0		
Wadhook -		0 3 5	3 14		

^a Including drag shoe, elevating screw, and straps for securing side arms, &c.

^b With large loading hole.

Those here detailed are specially adapted to this piece; for the rest, see the general list which follows.

NOTES.

The 24-pounder howitzer is used in conjunction with the 9-pounder gun. It was introduced as an improvement on the light and heavy 5½-inch brass howitzers at the same time with the 12-pounder howitzer, and was in general use for field batteries until the year 1861.

EQUIPMENT OF 24-POUNDER BRASS HOWITZERS.

One round of ammunition weighs 23½ lbs. with shrapnel shell ; 20 lbs. with common shell ; and 16½ lbs. with case shot ; the number of rounds brought into the field is, in the limber, 24, in the wagon 60, and with three extra wagons, on active service, 174 rounds for each howitzer.

The length of the carriage from the points of the shafts to the muzzle of the piece is about 22 feet ; breadth, 6½ feet ; drawn by six horses it covers 15 yards of ground, but on active service, when eight horses are used, it covers 4 yards more. The carriage has the heavy field wheel weighing 2½ cwt. ; and the limber has the light wheel of the same class weighing 1 cwt. 1 qr. 23 lbs. ; the two wheels are interchangeable with one another.

The total weight, when on the march, is about 41½ cwt.

The following list shows the entire equipment.

ALPHABETICAL LIST OF EQUIPMENT FOR THE CARRIAGE AND LIMBER OF A 24-POUNDER HOWITZER.

Bags, for fuzes, blue	-	-	-	2	Each containing 8 shrapnel fuzes.		
Boxes, tin, fuze	{	black	-	-	1	Containing 10 common fuzes.	
		blue	-	-	1	Containing 8 shrapnel fuzes.	
Buckets, water	-	-	-	-	2		
*Caps, sponge	-	-	-	-	2	On the sponges.	
*Carriage, travelling, complete	-	-	-	-	1		
*Cartouches, travelling carriage, canvas, limber	-	-	-	-	2		
*Cartridges, filled	{	calico, bursters	{	13 oz.	-	8	For common shells.
			{	40 drms.	-	12	For shrapnel shells.
		flannel, charge, 2½ lbs.	-	-	-	24	In paper covers.
Couples for traces	-	-	-	-	-	2	
Cylinder, zinc, for tubes	-	-	-	-	-	1	
Fuzes	{	common	-	-	-	10	In a black box.
		shrapnel	-	-	-	24	16 in blue bags, and 8 in a blue box.
Hammer, claw	-	-	-	-	-	1	
Handspikes, traversing	-	-	-	-	-	2	
*Heads, spare	{	rammer	-	-	-	1	
		sponge	-	-	-	1	
Implements, shell	{	No. 1 set, for field service	-	-	-	1	} For the detail, see page 209.
and fuze		No. 3 set, "	-	-	-	1	
Irons, priming, field service	-	-	-	set	1	(1 pricker, 1 drift, 1 bit).	
Kettles, camp	-	-	-	-	-	2	
Key, spring lock	-	-	-	-	-	1	
Knife, laboratory, small	-	-	-	-	-	1	
Lanyards, for friction tubes	-	-	-	-	-	3	
Locks, pad, iron, small, with keys	-	-	-	-	-	2	For axletree boxes.
Needles, laboratory, brass	-	-	-	-	-	2	
Ordnance, brass, 24-pounder howitzer	-	-	-	-	-	1	
Pincers, carpenters'	-	-	-	pair	1		
Pin, lynch, spare	-	-	-	-	-	1	
Plugs	{	fuze hole	{	common	-	-	} Charged with the shells.
			{	shrapnel	-	-	
		loading hole, large, spare	-	-	-	-	5 per cent. for the number in the subdivision.
Pocket, tube, leather	-	-	-	-	-	1	
Prolong, light	-	-	-	-	-	1	
Punches for vent (No. 7)	-	-	-	-	-	2	
Ropes, drag, light	-	-	-	pair	1		
*Scale, tangent, brass	-	-	-	-	-	1	On the howitzer ; also 1 spare per battery.
Scissors, laboratory, small	-	-	-	pair	1		
Screws, copper, for tangent scale	-	-	-	-	-	2	1 on the howitzer and 1 spare.
*Shells	{	common, fixed	-	-	-	8	With fuze hole plugs.
		shrapnel, do.	-	-	-	12	With fuze and loading hole plugs.
*Shot, case	-	-	-	-	-	4	
Spanner, McMahon's	-	-	-	-	-	1	
Spikes	{	common	-	-	-	2	
		spring	-	-	-	1	
*Sponges, field service	-	-	-	-	-	2	
Sticks, portfire	-	-	-	-	-	2	

EQUIPMENT OF 24-POUNDER BRASS HOWITZERS.

Straps	{	fuze box	-	-	-	-	-	1	
		tube pocket	-	-	-	-	-	1	
Swingletree	-	-	-	-	-	-	-	1	
Thumbstalls	-	-	-	-	-	-	-	2	
Tools, intrenching	{	axes, helved	{	felling	-	-	-	1	
				pick	-	-	-	1	
		hook, bill	-	-	-	-	1		
		shovel	-	-	-	-	1		
		spade	-	-	-	-	1		
Tubes, friction, copper	-	-	-	-	-	-	100		
Wads	{	fuze hole	-	-	-	-	-	—	1 for each common shell in the subdivision.
		loading hole, large	-	-	-	-	—	1 for each shrapnel do. do.	
Wadhook, field service	-	-	-	-	-	-	-	1	
Washer, spare, drag	-	-	-	-	-	-	-	1	
Worsted	-	-	-	-	-	-	oz.	2	

Carbines, blankets with covers, knapsacks, and corn sacks are carried in the same number as by the 9-pounder gun carriage.

* In demanding the articles marked thus * it is necessary to specify that they are for the 24-pounder brass howitzer.

EQUIPMENT OF A 24-POUNDER HOWITZER AMMUNITION WAGON.

*Cartridges, filled	{ calico, bursters	{ 13 oz. -	-	24	For common shells.	
		{ 40 drms. -	-	30	For shrapnel shells.	
		flannel, charge, 2½ lbs. -	-	60	In paper covers.	
Case, saw, leather	-	-	-	1	1st line only.	
Couples for traces	-	-	-	2		
Cylinders, zinc, for tubes	-	-	-	2	The 2nd line has only one.	
Fuzes { common	-	-	-	30	20 in black bags ; 10 in a black box.	
	{ shrapnel	-	-	32	24 in blue bags ; 8 in a blue box.	
Grease, in the magazines	-	-	lbs.	28		
Jack, lifting	-	-	-	1	1st line only.	
Kettles, camp	-	-	-	2		
Key, spring lock	-	-	-	1		
Line, Hambro'	-	-	skein	1	} 1st line only.	
Marline	-	-	"	1		
Match, slow	-	-	lbs.	3		
Maul, wood, common	-	-	-	1	2 per battery.	
Perches, spare	-	-	-	-		
Pin, linch, spare	-	-	-	1		
Plugs { fuze hole	{ common	-	-	-	} Charged with the shells.	
	{ shrapnel	-	-	-		
	loading hole, large	-	-	-		
Pocket, tube, leather	-	-	-	1	1st line only.	
Portfires	-	-	-	6		
Posts, picket, short	-	-	-	6		
Rope, picket	-	-	-	1	12½ fathoms of 3-inch tarred rope.	
Ropes, drag, light	-	-	pair	1		
Saw, hand	-	-	-	1	1st line only.	
Shafts, spare { near	-	-	-	-	} 4 per battery for war, and 3 for peace esta- blishment.	
	{ off	-	-	-		
*Shells { common, fixed	-	-	-	24	With fuze hole plugs.	
	{ shrapnel, do.	-	-	30	Fuze hole and loading hole plugs.	
Shoes, horse, sets of 4, with nails	-	-	-	30	3 sets of nails to each set of shoes.	
*Shot, case	-	-	-	4		
Straps { fuze box	-	-	-	1	} 1st line only.	
	{ tube pocket	-	-	1		
Swingletree	-	-	-	1		
Tents, with poles, pins, and bags complete	-	-	-	4		
Tools, intrenching	{ axes, helved	{ felling	-	1		
			{ pick	-	1	
		{ hook, bill	-	1		
			{ hooks, reaping	-	4	1st line only.
			{ shovel	-	1	
	{ spade	-	1			
Tubes { brass	-	-	-	50	} The 2nd and 3rd lines of wagons have 100 friction but no brass tubes.	
	{ friction, copper	-	-	50		
*Wagon, ammunition, complete	-	-	-	1		
Washer, drag, spare	-	-	-	1		
Wheels, spare	-	-	-	1	1st line only.	

Carbines, blankets with covers, knapsacks, and corn sacks are carried in the same number as by the 9-pounder wagon.

* In demanding the articles marked thus * it is necessary to specify that they are for the 24-pounder brass howitzer.

EQUIPMENT OF 32-POUNDER BRASS HOWITZERS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
32-POUNDER HOWITZER, OF 5 FT. 3 IN. & 17½ CWT.		£ s. d.	lbs. oz.	Similar in construction to the 12-pounder howitzer.
Range { 1° elevation, 500 yards. 6° " 1,400 "				
<i>Howitzer.</i>				
Total length, 5' 10"; calibre, 6·3 inches; windage, 123 inch			1,960 0	Length of bore (with Gomer chamber), 5' 1"; width across the trunnions, 22½ inches.
Sights { tangent scale, with screw screw, spare, for ditto			0 14 0 1	
<i>Carriage.^a</i>				
Travelling, { limber, 10¼ cwt. - complete { carriage, 14½ cwt. -		68 19 0	24¾ cwt.	Tonnage, 5 tons; 29 feet; carries 14 rounds of ammunition.
Cartouches, set of 5 -		0 10 0	14 10	Fitted to the ammunition boxes.
<i>Ammunition.</i>				
Firing charge { with shot or shell - without " -			3 0 2 0	L. G. powder. Service charge. For exercise and salutes.
Bursting charge { common shell - shrapnel " -			1 2 0 3	L. G. powder. M. R. " (50 drms.)
Projectiles { shells, { common - fixed shrapnel ^b - shot, case - carcass, filled and fixed -			22 13 28 9 23 0 27 5	Filled with 151 1-oz. bullets. 6·4" long; holds 105 ¾-oz. balls.
Fuzes, time { common - shrapnel -			0 1½ 0 0¾	
Tubes { common, brass - friction, copper -			0 0¾ 0 0¾	
Bag, waterproof paper, No. 3			0 0½	For shrapnel bursters.
Cartridges { calico, { common shell - bursterns { do. waterproof - shrapnel - flannel, { service - charge { exercise -			0 0¾ 0 0¾ 0 1 0 0½ 0 0½	No. 7. With common paper bag.
Cover { paper, No. 6 - waterproof -			0 0¾ 0 0¾	} For service cartridges.
Wads { fuze hole - loading hole, large -			0 0 0 0	
<i>Stores.^c</i>				
Heads, spare { rammer - sponge -		0 0 5 0 6 2	1 4 2 12	
Punch, for vent (No. 6)			0 1½	
Spike, spring			0 2	
Sponge, with stave, rammer, and cap		0 8 7	7 8	5·07" long.
Wadhook		0 3 5	4 0	

^a Including drag shoe, elevating screw, straps for securing side arms, &c.

^b With large loading hole.

^c Those here detailed are specially adapted to this piece; for the rest, see the general list which follows.

EQUIPMENT OF 32-POUNDER BRASS HOWITZERS.

NOTES.

The 32-pounder howitzer was originally intended to accompany the 12-pounder gun, but in the Crimean war it was used separately as a gun of position, in a battery of four pieces. It was introduced by Colonel Dundas about 1840.

The limber boxes of the carriage are different from those of the wagon; the centre one is larger than usual, and differently packed; this arises from the pintail being straight instead of crooked; the carriage has travelling trunnion holes.

One round of ammunition, with shrapnel shell, weighs 32 lbs.; with common shell, 27 lbs.; and with case, 26 lbs.; the limber carries 14 and the wagon 54 rounds; one additional wagon to each piece would make a total of 122 rounds.

The length of the carriage from the ends of the shafts to the muzzle of the piece is about 22 feet, the breadth 6½ feet; drawn by eight horses it covers 19 yards of ground. It is fitted with travelling trunnion holes. The cartiage and limber wheels are of the heavy field class.

The total weight of the piece equipped is 46¼ cwt.

The following list shows the entire equipment.

ALPHABETICAL LIST OF EQUIPMENT FOR THE CARRIAGE AND LIMBER OF A 32-POUNDER HOWITZER.

Boxes, tin, fuze	{ black	-	-	-	1	Containing 10 common fuzes.
	{ blue	-	-	-	1	Containing 12 shrapnel fuzes.
Buckets, water	-	-	-	-	2	
*Caps, sponge	-	-	-	-	2	On the sponges.
*Carriage, travelling, complete	-	-	-	-	1	
*Cartouches, travelling carriage, canvas, limber	-	-	-	-	5	
*Cartridges, filled	{ calico, bursters	{ 1 lb. 2 oz.	-	-	6	For common shell.
		{ 50 drams	-	-	6	For shrapnel shell.
		{ flannel, charge, 3 lbs.	-	-	14	In paper covers.
Couples for traces	-	-	-	-	2	
Cylinder, zinc, for tubes	-	-	-	-	1	
Fuzes	{ common	-	-	-	10	In a black box.
		{ shrapnel	-	-	-	12
Hammer, claw	-	-	-	-	1	
Handspikes, traversing	-	-	-	-	2	
Heads, spare	{ rammer	-	-	-	1	
		{ sponge	-	-	-	1
Implements, shell and fuze	{ No. 1 set, field service	-	-	-	1	For detail, see p. 209.
		{ No. 3 set	-	-	1	
Irons, priming, field service	-	-	-	set	1	(1 pricker, 1 drift, 1 bit).
Kettles, camp	-	-	-	-	2	
Key, spring lock	-	-	-	-	1	
Knife, laboratory, small	-	-	-	-	1	
Lanyards, for friction tubes	-	-	-	-	3	
Locks, pad, iron, small, with keys	-	-	-	-	2	For axletree boxes.
Needles, laboratory, brass	-	-	-	-	2	
Ordnance, brass, 32-pounder howitzer	-	-	-	-	1	
Pincers, carpenters'	-	-	-	pair	1	
Pin, lynch, spare	-	-	-	-	1	
Plugs	{ fuze hole	{ common	-	-	-	} Charged with the shells.
		{ shrapnel	-	-	-	
	{ loading hole, large, spare	-	-	-	-	5 per cent. for the number in the subdivision.
Pocket, tube, leather	-	-	-	-	1	
Prolong, heavy	-	-	-	-	1	
Punches, for vent (No. 5)	-	-	-	-	2	
Roller, shifting	-	-	-	-	1	
Ropes, drag, light	-	-	-	pair	1	
*Scale, tangent, brass	-	-	-	-	1	On the howitzer; also 1 spare per battery.
Scissors, laboratory, small	-	-	-	pair	1	
Screws, copper, for tangent scale	-	-	-	-	2	1 on the howitzer and 1 spare.
*Shells	{ common, fixed	-	-	-	6	With fuze hole plugs.
		{ shrapnel, do.	-	-	-	6

EQUIPMENT OF 32-POUNDER BRASS HOWITZERS.

*Shot, case	-	-	-	-	-	2	
Spanner, McMahon's	-	-	-	-	-	1	
Spikes	{	common	-	-	-	2	
		spring	-	-	-	1	
*Sponges, field service	-	-	-	-	-	2	
Sticks, portfire	-	-	-	-	-	2	
	-	fuze box	-	-	-	1	
Straps	{	tube pocket	-	-	-	1	
Swingletree	-	-	-	-	-	1	
Thumbstalls	-	-	-	-	-	2	
Tools, intrenching	{	axes, helved	{	felling	-	1	
				pick	-	1	
		hook, bill	-	-	-	1	
		shovel	-	-	-	1	
		spade	-	-	-	1	
Tubes, friction, copper	-	-	-	-	-	50	In a zinc cylinder.
Wads	{	fuze hole	-	-	-	-	1 for each common shell in the subdivision.
		loading hole, large	-	-	-	-	1 for each shrapnel „ „
*Wadhook, field service	-	-	-	-	-	1	
Waaher, drag, spare	-	-	-	-	-	1	
Worsted	-	-	-	-	oz.	2	

Carbines, blankets with covers, knapsacks, and corn sacks are carried in the usual manner.

* In demanding the articles marked thus * it is necessary to specify that they are for the 32-pounder brass howitzer.

EQUIPMENT OF A 32-POUNDER HOWITZER AMMUNITION WAGON.

*Cartridges, filled	{ calico, bursters	{ 1 lb. 2 oz.	-	28	For common shells.
		{ 50 drms.	-	22	For shrapnel shells.
	{ flannel, charge,	3 lbs.	-	54	In paper covers.
Case, saw, leather	-	-	-	1	1st line only.
Couples, for traces	-	-	-	2	
Cylinders, zinc, for tubes	-	-	-	2	
Fuzes	{ common	-	-	30	20 in black bags, and 10 in a black box.
	{ shrapnel	-	-	24	12 in a blue bag, and 12 in a blue box.
Grease, in the magazines	-	-	lbs.	28	
Jack, lifting	-	-	-	1	1st line only.
Kettles, camp	-	-	-	2	
Key, spring lock	-	-	-	1	
Line, Hambro'	-	-	skein	1	} 1st line only.
Marline	-	-	„	1	
Match, slow	-	-	lbs.	3	
Maul, wood, common	-	-	-	1	
Perches, spare	-	-	-	—	2 per battery.
Pin, lynch, spare	-	-	-	1	
Plugs	{ fuze hole	{ common	-	—	} Charged with the shells.
		{ shrapnel	-	—	
		{ loading hole, large	-	—	
Pocket, tube, leather	-	-	-	1	1st line only.
Portfires	-	-	-	6	
Posts, picket	-	-	-	4	
Rope, picket	-	-	-	1	12½ fathoms of 3-inch tarred rope.
Ropes, drag, light	-	-	pair	1	
Saw, hand	-	-	-	1	1st line only.
Shafts, spare	{ near	-	-	—	} 4 per battery for war, and 2 for peace estab- lishment.
		{ off	-	—	
*Shells	{ common, fixed	-	-	28	} With fuze hole plugs.
		{ shrapnel do.	-	22	
Shoes, horse, sets of 4, with nails	-	-	-	30	3 sets of nails to each set of shoes.
*Shot, case	-	-	-	2	
Straps	{ fuze box	-	-	1	} 1st line only.
		{ tube, pocket	-	1	
Swingletree	-	-	-	1	
Tents, with poles, pins, and bags complete	-	-	-	4	
Tools, intrenching	{ axes, helved	{ pick	-	1	
		{ hook, bill	-	1	
		{ hooks, reaping	-	4	1st line only.
		{ shovel	-	1	
		{ spade	-	1	
		{ felling	-	1	
		{ pick	-	1	
Tubes	{ brass	-	-	25	} The 2nd and 3rd lines of wagons have 50 friction but no brass tubes.
		{ friction, copper	-	50	
*Wagon, ammunition, complete	-	-	-	1	
Washer, drag, spare	-	-	-	1	
Wheel, spare	-	-	-	1	1st line only.

Carbines, blankets with covers, knapsacks, and corn sacks are carried in the usual manner.

* In demanding the articles marked thus * it is necessary to specify that they are for the 32-pounder brass howitzer.

EQUIPMENT OF A 12-POUNDER ROCKET CARRIAGE.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.	
<i>Carriag, complete.^a</i>		£ s. d.			Tonnage,	
Limber, with 2 boxes, 10 cwt. -	}	57 4 0	22 cwt.	1	Length of tube, 9' 1". For the limber box.	
Body, with 1 stick box, 2 rocket do., and 2 small store boxes, 11½ cwt. -			lbs. oz.			
12-pounder rocket tube, complete -			79 8	1		
Cartouches, canvas (charged extra) -			2 1	2		
<i>Ammunition.</i>						
Rockets shell, 12-pounder, filled -			14 4	100	18" long, 2½" diameter.	
Sticks for ditto -			3 12	100	9' long.	
Bursting charges (in calico bags) -			0 3½	100	3½ oz. of M. R. powder;	
Bags, waterproof paper for do., No. 3 -			0 0¼	—	Issued if necessary.	
Fuzes, Behenna's -			0 0¼	120	See p. 106, note.	
Match, slow - piece of			2 0	1		
Portfires -			0 5½	12		
<i>Stores.^b</i>						
Boxes, tin, for Behenna's fuzes -			1 14	2	Contain 60 or 70 each.	
Brush, Turk's head, with stave -		0 3 0	1 2	1	For the rocket tube.	
Implements, rocket, set of	}		Boring bits, steel - 2	7 0	1	
			Box, with grease (2 oz.) - 1			
			Brace, small - 1			
			Drivers, screw - 2			
			Funnels - 2			
			Instructions, printed 1			
			Scale, boxwood - 1			
					9·2" long, 6" square.	

^a Including also a horse shoe box, drag shoe, straps for securing side arms, &c.

^b Those here detailed are peculiar to rockets, the other stores are the same as are carried by field guns and wagons ; a list of them is given after the notes.

NOTES.

One rocket carriage (12-pounder or 6-pounder) accompanies each battery of field or horse artillery on active service. The 12-pounder carriage has been always supplied to the field batteries, and is now replacing the other for horse artillery ; it carries less than one-half the number of rockets (100 instead of 216), but is 3 cwt. lighter.

Each rocket is hollow, and has a fuze fixed inside it. If it is to be used as a shell the bursting powder can be put in at a hole closed by a screw plug, and the fuze can be bored out to any length required with the implements furnished for the purpose. The fuze is ignited when the composition of the rocket has burnt down to it. The boring bit and scale now issued are of an improved pattern, adopted in 1860. (Cir. 665, par. 164.) The scale is made hollow, to serve as a sheath for the bit, and is graduated differently on each side, so as to be available for any size of rocket from the 3-pounder to the 24-pounder. Formerly there were two scales, one for the 3-pounder and 6-pounder, the other for the 12-pounder and 24-pounder rockets.

The body is fitted with a stick box, two rocket boxes, and two small store boxes ; there is also a horse shoe box underneath. The stick box is in the middle ; it is 9' 3" long, 1' 3" wide, and 2' 3" deep in its largest dimensions. The rocket boxes, which rest on the axletree, are 2' 6" by 1' 3" by 2' ; each holds 28 rockets. The small boxes are attached to the sides of the stick box ; they are 1' 5" long by 6" wide ; one of them, which contains the slow match, is 10½" deep ; the other, which holds the implements, is 6½" deep. The tube, with its legs strapped down to the sides, is laid on the top of the carriage.

The limber is of the usual field pattern, and equipped with the same tools and stores ; it contains 44 rockets and 100 bursting charges ; all the boxes are moveable except the stick box of the body. The dimensions of the carriage complete are rather greater in length and height than those of an ammunition wagon. Six or eight horses are furnished for its draught. The wheels are of the light field class.

The ranges of 12-pounder rockets are from 700 yards, with 12 degrees, to 3,400 yards (nearly two miles) with 47 degrees of elevation.

EQUIPMENT OF A 12-POUNDER ROCKET CARRIAGE.

The following list shows the entire equipment.

ALPHABETICAL LIST OF EQUIPMENT FOR A 12-POUNDER OR 6-POUNDER ROCKET CARRIAGE.

Boxes, tin, for Behenna's fuzes	-	-	-	2	(4 for the 6-pounder).		
*Brush, Turk's head, with stave	-	-	-	1			
Buckets, water	-	-	-	2			
*Burnsters, rocket, filled	-	-	-	100	(216 for the 6-pounder).		
*Carriage, travelling, rocket, complete	-	-	-	1			
*Cartouches, travelling carriage, canvas	-	-	-	2			
Case, wood, for brass quadrant	-	-	-	1			
Couples for traces	-	-	-	2			
Fuzes, Behenna's	-	-	-	120	(250 for the 6-pounder).		
Implements, rocket	-	-	-	set 1	As per following detail.		
Bits	-	-	-	2			
Box, tin, small, to contain 2 oz. of grease	-	-	-	1			
Brace, small	-	-	-	1			
Drivers, screw	-	-	-	2			
Funnels	-	-	-	2			
Instructions	-	-	-	copy 1			
Scale, boxwood	-	-	-	1			
Kettles, camp	-	-	-	2			
Key, spring lock	-	-	-	1			
Leaders, rocket	-	-	-	12	(For the 6-pounder only).		
Locks, pad, iron, small, with keys	-	-	-	2	For the implement and match boxes.		
Match, slow	-	-	-	lbs. 2			
Pin, lynch, spare	-	-	-	1			
Portfires	-	-	-	12			
Quadrant, brass	-	-	-	1			
*Rockets, fire, shell	-	-	-	100	(216 for the 6-pounder).		
Ropes, drag, light	-	-	-	pair 1			
Shoes, horse, sets of 4, with proportion of nails	-	-	-	10	3 sets of nails to each set of shoes.		
Sticks { portfire	-	-	-	2			
{ rocket*	-	-	-	100	(216 for the 6-pounder).		
Swingletree	-	-	-	1			
Tools, intrenching {	axes, helved {	felling	-	-	1		
			pick	-	-	1	
				hook, bill	-	-	1
				shovel	-	-	1
			spade	-	-	1	
Washer, drag, spare	-	-	-	-	1		

* In demanding the articles marked thus * it is necessary to specify whether they are for a 12-pounder or a 6-pounder rocket equipment.

EQUIPMENT OF A 6-POUNDER ROCKET CARRIAGE.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
<i>Carriage, complete.^a</i>		£ s. d.			Tonnage, tons; ' ' .
Limber, with 3 boxes, 8½ cwt. -	}	56 19 0	20½ cwt. lbs. oz.	1	Length of tube, 9'. For the limber boxes.
Body, with 1 stick box, 2 rocket do., and 2 small store boxes, 11½ cwt. -					
6-pounder rocket tube, complete -					
Cartouches, canvas (charged extra) -					
<i>Ammunition.</i>					
Rockets, shell, 6-pounder, filled -			8 8	216	14" long, 2" in diameter.
Sticks for ditto -			2 6	216	7' long.
Bursting charges in calico bags -			0 1½	216	1½ oz. of M. R. powder.
Bags, waterproof paper for do., No. 2 -			0 0½	—	Issued if necessary.
Leaders, rocket -			0 10	12	Pieces of quick match
Fuses, Behenna's -			0 0½	250	
Match, slow - piece of -			2 0	1	
Portfires -			0 5½	12	
<i>Stores.^b</i>					
Brush, Turk's head, with stave -			1 0	1	
Implements, rocket, set of -			7 0	1	The same as for the 12-pr.

^a Including also a horse shoe box, straps for securing side arms, &c.

^b For the complete detail of stores, &c., see the 12-pounder rocket equipment.

NOTES.

The "leaders" are used for firing rockets in volleys. The 6-pounder rocket has a range of 600 yards with 10 degrees, and of 2,500 yards with 37 degrees of elevation.

The 12-pounder and 6-pounder rocket carriages are alike in general construction, but the latter has smaller boxes; their dimensions are—

Stick box - - - 7' 5" long, 1' 4" broad, 2' 1" deep.

Rocket boxes (to contain 64 each) 3' 3" " 1' 4" " 1' 7" "

The small store boxes are the same in both carriages. The length of the entire body for the 6-pounder is 7" less, but the tube projects over the rear, so as to occupy, when packed, the same space.

The limber has three boxes; the centre one contains couples and lynch pins; the other two hold 44 rockets and 108 bursters each.

The weight of the complete equipment is 38½ cwts.

(See also the notes to the 12-pounder equipment.)

EQUIPMENT OF A SMALL ARM AMMUNITION WAGON.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
<i>Wagon, complete.*</i>		£ s. d.			Tonnage, 4 tons; 36 ft.
Limber, with 1 box, 9½ cwt.	- }	58 5 0	20 cwt.	1	
Body, with sides and top, 10½ cwt.					
<i>Ammunition.</i>			lbs. oz.		
Cartridges, ball, 2½ drs. ^b	-		0 1¼	17,160	For Enfield rifles.
Caps, percussion (1lb. 13 oz. per 1,000) ^c	-			25,920	50 per cent. in excess.
<i>Stores. ^d</i>					
Boxes { wood, for cartridges	-		9 0	39	16" x 8" x 9".
{ zinc, for caps	-		0 12	39	
Ladders, pack-saddle	- complete		16 12	2	

* Including 1 horse shoe box, 1 grease box, 1 drag shoe, straps for securing stores, &c.

^b In wooden boxes, holding 440 each.

^c In zinc boxes, holding 660 each.

^d Those here detailed are peculiar to this wagon; for the rest, see the general list which follows.

NOTES.

The conveyance of ammunition, in sufficient quantity to keep the infantry and cavalry properly supplied, has always been intrusted to the artillery of the army. The first wheeled carriages used for the purpose were common wagons; special carts and limber wagons have successively replaced them.

In 1766 there were "powder carts," which held four barrels of powder, a proportion of flints, and a supply of musket balls, but no filled cartridges. They were supplied at the rate of one per battalion. (A dye's MS., p. 84.)

During the Peninsular war "ball cartridge carts" were in use. They held 12,000 rounds, but in the Waterloo campaign they were packed with only 10,000, and this number was found too heavy a load for one pair of horses to draw with proper quickness through deep roads. The carts were organized by "brigades," one of which was attached to each division of the army.

In 1819 it was recommended by a committee of artillery officers that the present kind of wagon, with 20,000 rounds and four horses, should be adopted. The reasons adduced in favour of the change are given at length in the "Aide Mémoire," vol. i., p. 484 (1853). The main points are as follow:—That the cart and its load were too much for one pair of horses, and not enough for two pairs; that the limber could be detached, if necessary, and sent forward with more rapidity than a cart, whilst the entire wagon would be able to move sufficiently well on any rough road; and that the general arrangements for draught, with regard to the size, number, and application of horses, would be found more convenient on the proposed plan.

The number of rounds was reduced from 20,000 to 17,280, in consequence of the change from spherical to elongated bullets; it has been again reduced to 17,160 on account of a change in the packing; until lately there were 36 boxes holding 480 rounds each, there are now 39 boxes containing 440 each. The general arrangements for the supply of the wagons on active service have been given at p. 13.

The body is fitted with a moveable top and sides; the limber is of the usual pattern, but has only one box, measuring (as lately altered) 4' 1" x 2' 4" x 1' 8"; the complete length, with the shafts, is 20'; the height, at the guard iron of the limber, is 5' 8". The wheels are of the light field class.

Of the cartridge boxes, 24 are packed in the body, and 15 in the limber. The zinc boxes are inside them. The limber box has a moveable partition, which is put in its place when only 10 boxes are packed inside.

The "ladders" are fittings for pack-saddles; they are used when cartridge boxes have to be forwarded to points inaccessible by wheeled carriages.

The carriage conveys a proportion of intrenching tools and stores, and weighs, when completely equipped, about 39½ cwt.

The following list shows the entire equipment.

EQUIPMENT OF A SMALL ARM AMMUNITION WAGON.

ALPHABETICAL LIST OF EQUIPMENT FOR A SMALL ARM AMMUNITION WAGON.

Boxes	{ wood, ammunition, small arm	-	-	39			
	{ zinc, for percussion caps	-	-	39			
Buckets, water	-	-	-	2			
Caps, percussion	-	-	-	25,740			
Cartridges, ball, 1853 pattern, 2½ drams	-	-	-	17,160			
Couples for traces	-	-	-	2			
Grease, in the magazines	-	-	-	lbs. 28			
Jack, lifting	-	-	-	1			
Kettles, camp	-	-	-	2			
Key, spring lock	-	-	-	1			
Ladders, pack-saddle, complete	-	-	-	pairs 2	In the wagon body.		
Maul, wood, common	-	-	-	1			
Pin, lynch, spare	-	-	-	1			
Posts, picket, short	-	-	-	6			
Rope, picket	-	-	-	1			
Ropes, drag, light	-	-	-	pair 1			
Shoes, horse, sets of 4, with proportion of nails	-	-	-	10	3 sets of nails to each set of shoes.		
Swingletree	-	-	-	1			
Tools, intrenching	{ axes, helved	{ felling	-	1			
			{ hook, bill	-	1		
				{ shovel	-	1	
					{ spade	-	1
Wagon, small-arm ammunition, complete	-	-	-	1			
Washer, drag, spare	-	-	-	1			
Wheel, spare	-	-	-	1			

EQUIPMENT OF A SPARE GUN CARRIAGE.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
<i>Carriage.</i>		£ s. d.	lbs. oz.		
For gun or howitzer, complete	-	- - -	- - -	1	According to the ordnance in use.
<i>General Stores.</i>					The exact details vary in different batteries.
Axletrees, with linch pins and washers, complete	-	- - -	133 0	2	Armstrong guns only.
Buckets { sponge water	- -	0 7 3	6 4	1	
Cans, oil, lubricating	-	- - -	3 0	2	
Couples for traces	-	0 0 0½	1 0	2	Do.
Handspikes, traversing	-	- - -	0 2½	2	
Key, spring lock	-	- - -	7 8	2	
Key, spring lock	-	- - -	0 2	1	
Kettles, camp	-	0 3 9	8 8	2	
Pin, linch, spare	-	0 0 8	0 9	1	
Ropes, drag, light	- pair	0 6 0	7 12	1	Without chains.
Shoes, drag (spare)	-	- - -	29 0	2	
Swingletree	-	0 5 9	5 12	1	
Tools, { axes, helved { felling pick intrench- { hook, bill ing. { shovel spade	-	0 4 0	6 0	1	
	-	0 2 3	8 8	1	
	-	0 2 0	1 12	1	
	-	0 2 9	4 12	1	
	-	0 2 9	6 0	1	
Washer, drag, spare	-	- - -	2 5	1	
Wrench, knock-up	-	- - -	6 15	1	
<i>Additional Articles carried in the Limber Box.</i>					
Iron work, part of, see p. 222	-	- - -	- - -	1	
Tools, wheelers', set of	-	- - -	435 0	1	

NOTES.

One spare gun carriage accompanies each battery of field or horse artillery on active service;* it is exactly like those on which the guns are mounted, except that it has only one large box on the limber, like the forge and store wagons. In this box are carried the wheeler's tools, and a part of the iron work furnished ready made for the general repairs of the battery.

The 18-pounder gun or 32-pounder howitzer carriage would be drawn by eight horses, the others by six. The total weights of the various spare gun carriages, with their equipments, are as follow :—

FOR ARMSTRONG GUNS.

6-pounder.	9-pounder.	12-pounder.	20-pounder.	40-pounder.
14½ cwt.	26½ cwt.	31 cwt.	34½ cwt.	45½ cwt.

FOR SMOOTH-BORED ORDNANCE.

6-pounder.	9-pounder.	12-pounder.	18-pounder.	32-pounder Howitzer.
24 cwt.	28 cwt.	28 cwt.	42 cwt.	32½ cwt.

* It is not included in the equipment of 40-pounder batteries as at present arranged.

EQUIPMENT OF A FORGE WAGON.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
<i>Wagon, complete.*</i>					
Limber, with 1 box, ^b 10½ cwt.	-		19½ cwt.	1	Tonnage, 5 tons; 38 ft. Total weight, 26 cwts. Value, 65l. 18" long, 9" high. 19" high.
Body, 9½ cwt.	-				
Anvil	-	1 4 3	124 0	1	
Block for ditto	-	0 6 10	2 3	1	
Bellows, with rock stave and hook	-	3 5 9	81 0	1	
Boxes, { coal	-			2	
file	-			1	
wood, { limber, inside	-			1	
vice	-			1	
Cover, canvas	-			1	
Frame, with hearth	-			1	
Hoops, bale	-			4	
Trough, water	-			1	2' 3" x 7" x 8".
<i>Stores.^c</i>					
Coals, bushels	-		84 0	2	
Vice, portable, small	-		22 8	1	
<i>Additional Articles packed in the Wagon.</i>					
Bushes, copper { breech	-			12	} For Armstrong guns.
vent piece, sets	-			12	
Rings, copper, vent piece	-			12	
Iron, supply of	-		196 0	1	
Steel, "	-		10 0	1	
Tools, or implements { facing	set			1	With Armstrong guns.
farriers' "	"		138 0	1	
smiths' "	"			1	
special "	"			1	With Armstrong guns only.

* Fitted also with 1 horse shoe box, 1 grease box (tin), a box with two grease magazines, and the usual straps.

^b Fitted with 2 partitions and 3 trays.

^c For the general stores, see the alphabetical list.

NOTES.

One forge wagon accompanies every battery of field artillery. It is equipped in the same manner for each battery, except that with smooth-bored ordnance the appurtenances and tools peculiar to Armstrong guns are omitted, and that with 40-pounder batteries (which have but 4 guns) there are fewer spare bushes, and copper rings. The forge is principally used for making horse shoes, but it is powerful enough to weld any piece of iron which a field carriage requires.

The limber is of the usual field pattern, but has one large box only; the body has a painted canvas cover, supported by four "bale hoops," and carries the forge arrangement, which is set up separate when required for use. The wheels are of the light field class.

The forge arrangement consists of a frame with four legs, a pair of bellows, and a hearth; there is a coal box on each side of the bellows, and a water trough at the end of the hearth. It includes likewise an anvil, with a wooden block, and a portable vice.

The frame, when erected, is 7' long, 4' wide, and 5' high. The entire carriage is 22' long and 7' high; it weighs, when fully equipped, 32 cwts.

Forge wagons are also supplied to siege trains. The cavalry have forge carts. A limber wagon was substituted for a cart in the artillery service during the seven years' war. (Adey's MS., p. 89.) The present arrangement of the forge on a separate frame has been introduced since the Crimean war. For mountain service there is a portable forge, which can be carried on a pack-saddle.

EQUIPMENT OF A FORGE WAGON.

The following list shows the entire equipment.

ALPHABETICAL LIST OF EQUIPMENT FOR THE FORGE WAGON OF A FIELD BATTERY.

Buckets, water	-	-	-	-	2				
Bushes, copper	{	<i>breech</i> *	-	-	12	} <i>For Armstrong guns.</i>			
		<i>vent piece</i>	-	-	sets 12				
Coals, bushels	-	-	-	-	2	Supplied on foreign service by Commissariat Department, and on home service by farrier of battery.			
Couples for traces	-	-	-	-	2				
Holdall, leather	-	-	-	-	1				
Implements, facing	-	-	-	set	1	<i>For Armstrong guns.</i>			
Iron, lbs.	{	bolt, $\frac{3}{8}$ -inch	-	-	-	28			
		flat { $1\frac{1}{2} \times \frac{1}{2}$ -inch	-	-	-	28			
			$1 \times \frac{1}{2}$ -inch	-	-	-	28		
		hoop, $1\frac{1}{4}$ -inch	-	-	-	-	28		
		square { 1-inch	-	-	-	-	56		
		$\frac{3}{8}$ -inch	-	-	-	28			
Kettles, camp	-	-	-	-	2				
Key, spring lock	-	-	-	-	1				
Lock, pad, iron, small	-	-	-	-	1	For vice box.			
Pin, lynch, spare	-	-	-	-	1				
Rings, copper, vent piece*	-	-	-	-	12	<i>For Armstrong guns.</i>			
Shoes, horse, sets of 4, with proportion of nails	-	-	-	-	10	3 sets of nails to 1 set of shoes.			
Steel, blister, flat, $2 \times \frac{1}{4}$ -inch	-	-	-	lbs.	10				
Swingletree	-	-	-	-	1				
Tools	{	artificers	farriers'	-	-	set 1	Forge and shoeing tools; provided on home service by the farrier.		
			smiths', general service	-	-	" 1			
		intrenching	special and additional	-	-	" 1	<i>For Armstrong guns.</i>		
			axes, helved {	falling	-	-	- 1		
					pick	-	-	- 1	
				hook, bill	-	-	-	1	
				shovel	-	-	-	1	
spade	-	-	-	-	1				
Vice, portable, small	-	-	-	-	1				
Wagon, forge, complete	-	-	-	-	1				
Washer, drag, spare	-	-	-	-	1				

* 2 per gun, consequently for 40-pounder batteries there are only 8.

EQUIPMENT OF A STORE WAGON.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
<i>Wagon, complete.</i>					
Limber, with 1 box, ^a 10½ cwt.	}	£ s. d.	22½ cwt.	1	Tonnage, 5 tons; 11 ft. Pattern approved 12/5/60.
Body, ^b with sides and top, 12½ cwt.					
<i>General Stores.</i>					
As for other field carriages. See alphabetical list.			lbs. oz.		
<i>Additional Articles packed with the Wagon.</i>					
Ironwork, part of set - -				1	
Lanterns, tin - - -			2 8	2	
Locks, spring, spare, with keys in case (set of 6) - - -			11 4	1	
Materials for { collarmakers' set				1	
artificers. { wheelers' - "				1	
Tools, collarmakers' - sets				3	2 in trays and 1 in a chest.

^a Fitted with 2 partitions, 3 trays, and an inside box.

^b Fitted with 1 partition, 1 grease box, and 3 horse-shoe boxes.

NOTES.

One store wagon accompanies every battery of field artillery, and is similarly equipped for each battery. Store wagons are also supplied to a siege train, in proportion to the number of the ordnance.

The limber is of the usual pattern, but has only one box, like the forge wagon. The body is 6' 7" high, but the top can be removed and the sides folded down when convenient; its length is 10' 4". The complete carriage is 21' long, and weighs, when fully packed, 42½ cwt. The wheels are of the light field class.

The following list shows the complete proportion of stores for field service.

ALPHABETICAL LIST OF EQUIPMENT FOR THE STORE WAGON OF A FIELD BATTERY.

Buckets, water - - - -	2	
Couples for traces - - - -	2	
Grease (in the magazines) - - - -	28	lbs.
Iron work, spare, part of set, according to detail, in limber - - - -	—	Remaining portion with spare gun carriage.
Kettles, camp - - - -	2	
Key, spring lock - - - -	1	
Lanterns, tin - - - -	2	
Locks { pad, iron, small, with keys - - - -	2	
{ spring, spare, with keys in case - - - -	6	
Materials for artificers { collarmakers - - - -	—	As per detailed lists, pp. 223, 226.
{ wheelers - - - -	—	

ARTILLERY.

EQUIPMENT OF A STORE WAGON.

Pin, 1/4 inch, spare	-	-	-	-	-	1		
Sampson, wheelers'	-	-	-	-	-	1	This is one of the wheelers' tools.	
Shoes, horse, sets of 4, with proportion of nails	-	-	-	-	-	30	3 sets of nails to each set of shoes.	
Swingletree	-	-	-	-	-	1		
Tools {	collarmakers'	-	-	-	sets*	3	2 sets in trays inside the limber box, the other in a chest outside.	
		-	-	-	-	-	-	
intrenching {	axes, helved {	felling	-	-	-	1		
			pick	-	-	-	1	
		hook, bill		-	-	-	1	
				shovel	-	-	-	1
		spade	-	-	-	-	1	
Wagon, store, complete	-	-	-	-	-	1		
Washer, drag, spare	-	-	-	-	-	1		

* 40-pounder batteries have one set of collarmakers' and one of wheelers' tools.

EQUIPMENT OF A GENERAL SERVICE WAGON.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
<i>Wagon, complete.^a</i>		£ s. d.			Tonnage, 3 tons, 20 ft. Pattern approved 19/2/62.
Body, with moveable sides, store box, &c. - - -	}	37 12 0	16½ cwt.	1	
Cover, canvas - - -					
Hoops for do. (6) - - -					
<i>Stores.^b</i>			lbs. oz.		
Axletree, spare, complete - - -	-	-	58 0	1	Entire length, 6' 3". 5' 8" long, 1' 5" wide.
Pin, linch, spare - - -	-	-	0 5	1	
Pulleys, wagon, pair - - -	-	-	45 0	1	
Washer, drag, spare - - -	-	-	0 10	1	
Wheel, spare - - -	-	-	60 0	1	

^a Including also a drag shoe, and 2 tin boxes for grease.

^b See also the alphabetical list.

NOTES.

The wagon now described by this name has been adopted as the most convenient for carrying forage, cases of ammunition, baggage, or any other load, up to a weight of 30 cwt. It has superseded the Flanders wagon for use in siege trains, to which it is supplied in the proportion of 1 to 2 pieces of ordnance. It is also used by the military train and other branches of the service.

It is of different construction from the other field carriages; there is no limber, but the body can be separated from the fore part, for packing on board ship. It has moveable sides, and a canvas cover supported by six bale hoops. There is a moveable box in front, which may be used as a seat, and a spare wheel is carried in front of the body.

The principal dimensions are as follow:—Carriage complete—length, 19' 6"; breadth, 6' 7"; height, 8'; track of wheels, 5' 9"; length of body, 10'; interior space, 8' 9" x 3' 11". The shafts are framed, and attached to a splinterbar 5' 2" long; the wheels are 4' 2" in diameter, and weigh 1 cwt., 1 qr., 10 lbs. each. They are not interchangeable with any of the other wheels of a field battery.

The following list shows the proportion of stores carried in field service.

ALPHABETICAL LIST OF EQUIPMENT FOR THE GENERAL SERVICE WAGON OF A FIELD BATTERY.

Axletree for general service wagon (with linch pins and washers complete), spare	-	-	-	-	1	
Buckets, water	-	-	-	-	2	
Couples for traces	-	-	-	-	2	
Kettles, camp	-	-	-	-	2	
Key, spring lock	-	-	-	-	1	
Maul, wood, common	-	-	-	-	1	
Pin, linch, spare	-	-	-	-	1	
Pulleys, wagon	-	-	-	pair	1	
Rope, lashing	-	-	-	-	1	
Shoes, horse, sets of 4, with nails	-	-	-	10	3 sets of nails to each set of shoes.	
Swingletree	-	-	-	-	1	
Tools, intrenching	} axes, helved	} felling	-	-	1	
			-	-	1	
			hook, bill	-	-	1
			shovel	-	-	1
			spade	-	1	
Wagon, general service complete	-	-	-	-	1	
Washer, drag, spare	-	-	-	-	1	
Wheel, spare, general service wagon	-	-	-	-	1	

EQUIPMENT OF A PLATFORM WAGON.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
<i>Wagon, complete.</i>		£ s. d.			Tonnage, 3 tons; 16 ft.
Body, with moveable sides, canvas cover, and 6 hoops, &c.*			22 cwt.		16 ft. pattern.
<i>Stores.</i>			lbs. oz.		
Couples for traces		0 0 0½	0 7	1	
Fid, wood			0 2½	20	
Gyn, complete, ^b 10½ cwt.			12 10	1	
Kettles, camp		0 3 9	8 8	2	
Ropes, drag, heavy	pair		21 0	1	
<i>Additional Articles carried on the March.</i>					
Spare axletrees, shafts, wheels, &c., as in the alphabetical list.					

* Including 2 pairs of framed shafts, 2 outriggers, 1 tin grease box, 1 canvas bag for small stores, and 1 drag shoe.

^b The gyn complete includes 4 levers, 2 slings, 1 fall, 2 blocks, and 3 trucks. See page 355.

NOTES.

The platform wagon is issued for field service only to batteries composed of 18-pounder or 40-pounder guns, which are too heavy to be mounted on their carriages or dismantled without a gyn. It is of the same construction as the one used in siege and garrison service.

Its length, including the shafts and the block for the spare wheel, is 21 feet; its height, with the cover on, is 8 feet; its extreme breadth 6 feet 6 inches. When it is packed for the march the end of the gyn projects about 3 feet from the rear. The entire weight is 56½ cwt.

The hind wheels are 5 ft. in diameter and weigh 3 cwt. The fore wheels are 4 ft. in diameter and weigh 2 cwt. each, but both are interchangeable with one another or with other wheels in the battery. The tires are 4 inches wide. The shafts are fitted for draught by four horses abreast, and there are outriggers and swingletrees as supplied to heavy limbers.

The gyn is the ordinary 16 feet triangle gyn. When an Armstrong gun is slung, the fid in the above list is put into one end of the bore, and the tompon (furnished with every gun) into the other.

The following list shows the complete establishment of stores for field service.

ALPHABETICAL LIST OF EQUIPMENT FOR THE PLATFORM WAGON OF A 40-POUNDER ARMSTRONG GUN BATTERY.

Axletrees, with linch pins and washers	{	siege carriage	-	1	
		9-pounder	-	2	
		platform wagon, fore	-	1	
Bolts, tire	{	heavy	-	30	
		light	-	48	
Couples for traces	-	-	-	20	16 for the guns (4 each), and 4 for the platform wagon.

EQUIPMENT OF A PLATFORM WAGON.

Faloes	{ heavy	-	-	-	-	-	2	
	{ light	-	-	-	-	-	4	
Fid, wood	-	-	-	-	-	-	1	
Gyn, 16 feet, complete	-	-	-	-	-	-	1	Including 4 levers, 2 slings, 1 fall, 2 blocks, and 3 trucks.
Handspikes, common	-	-	-	-	-	-	4	
Kettles, camp	-	-	-	-	-	-	2	
Nails, tire	-	-	-	-	-	lbs.	6	
Pin, linch, spare,	{ heavy	-	-	-	-	-	4	} Including 4 of each for the guns.
	{ light	-	-	-	-	-	5	
Ropes, drag, heavy	-	-	-	-	-	pair	1	
	{ looped	-	-	-	-	-	12	
Screws	1½ inch	{ round head	-	-	-	-	48	
		{ middling	-	-	-	-	48	
		{ fine	-	-	-	-	36	
	1 inch fine	-	-	-	-	-	24	
	¾ inch strong	-	-	-	-	-	48	
Shafts, spare, gun limber	-	-	-	-	-	pair	1	
Shoes, drag, without chain, spare	-	-	-	-	-	-	2	
Spokes, rough	{ heavy	-	-	-	-	-	4	
	{ light	-	-	-	-	-	5	
Staples, lashing	-	-	-	-	-	-	24	
Straps, side arm, spare	-	-	-	-	-	-	6	
Streaks for wheels	-	-	-	-	-	-	8	
Swingletrees	-	-	-	-	-	-	5	
Wagon, platform, complete	-	-	-	-	-	-	1	
Washer, drag, spare	{ heavy	-	-	-	-	-	4	} Including 4 of each for the guns.
	{ light	-	-	-	-	-	5	
Wheels, spare, for	{ gun carriage	-	-	-	-	-	1	Carried on a block fixed to the rear of the wagon.
	{ platform wagon, fore	-	-	-	-	-	1	Carried inside.

EQUIPMENT OF A STORE CART.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
Cart, complete* - - -		£ 33 5 0	11½ cwt.	1	Tonnage, 3 tons; 16 ft.
<i>General Stores.</i>			lbs. oz.		
Bucket, water - - -		0 7 3	3 2	1	
Couples, for traces - - -		0 0 0½	0 2½	2	
Kettle, camp - - -		0 3 9	8 8	1	
Pin, lynch, spare - - -		0 0 8	0 9	1	
Washer, drag, spare - - -			2 5	1	
<i>Additional Articles carried on the March.</i>					
Books, set of. See list at page 431.					The weight of the additional articles should not exceed 12 cwt.
Stationery, &c. - - -					

* Described below. A tin box for grease, and a wrench for removing the sides, are included with the cart complete.

NOTES.

The store cart is constructed to carry the books and stationery necessary for correspondence and accounts. It can also be used as an office, the sides being so made that the top can be raised high enough for a man to sit inside (4' 3" in the clear). The sides can also be turned down flat for transport.

The wheels are the same as for ammunition wagons; the shafts are the same as for field limbers. The length of the cart is 13 feet, and the height 6 feet 4 inches; it is drawn by two horses.

One store cart is included in the equipment of every battery of field artillery. Store carts are also supplied to siege trains, and to certain officers on the staff of artillery in the field.

The following list shows the establishment of stores for field service.

ALPHABETICAL LIST OF EQUIPMENT FOR A STORE CART.

Bucket, water - - - - -	1
Cart, store, complete - - - - -	1
Couples for traces - - - - -	2
Kettle, camp - - - - -	1
Pin, lynch, spare - - - - -	1
Swingletree - - - - -	1
Washer, spare - - - - -	1

EQUIPMENT OF A MEDICINE OR HOSPITAL CART.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
Cart, complete * - - -		£ s. d. 51 18 0	11½ cwts.	1	Tonnage, 3 tons; 0' 4". Height, with cover, 8' 3".
<i>General Stores.</i>			lbs. oz.		
Bucket, water - - -		0 7 3	3 0	1	
Couples, for traces - - -		0 0 0½	0 2½	2	
Pin, lynch, spare - - -		0 0 8	0 9	1	
Spanner - - -		0 12 0	3 7	1	
Spring, india-rubber, spare - - -			1 12	1	
Washer, spare - - -			2 5	1	
<i>Additional Articles carried on the March.</i>					
<i>Medical stores.</i>					

* Including a tin box for grease, a box for small stores, and the articles mentioned in the notes.

NOTES.

The medicine or hospital cart has been introduced within the last few years. It will hold four persons; the bed rests on india-rubber springs; the sides have cushions and straps to sustain sick men, and there are hooks to carry carbines or muskets. A stretcher and mattress also form part of the equipment, and the medical stores for the battery are carried in the cart. The wheels are of the third or general service class; the shafts are the same as for field limbers.

The cart has hitherto been supplied to batteries of field artillery as part of the ordinary equipment, but in future it will be in charge of the medical department.

The following list shows the establishment of stores for field service.

ALPHABETICAL LIST OF EQUIPMENT FOR A MEDICINE CART.

Bucket, water, - - -	-	-	-	-	1
Cart, medicine, complete - - -	-	-	-	-	1
Couples for traces - - -	-	-	-	-	2
Pin, lynch, spare - - -	-	-	-	-	1
Spanner - - -	-	-	-	-	1
Spring, suspension, india-rubber, spare - - -	-	-	-	-	1
Swingletree - - -	-	-	-	-	1
Washer, spare - - -	-	-	-	-	1

IMPLEMENTS FOR PREPARING FUZES AND SHELLS.

Description.	No. of Drawing.	Cost.	Weight.	Total No.	Dimensions and Remarks.
<i>No. 1 Set, for Fuzes.^a</i>					
		£ s. d.	lbs. oz.		
Bits - { long (for hook borer) -	-		0 4	6	Weight of the set un- packed, 3½ lbs.
Bits - { short (for hand borer) -	-		- -	6	
Borers { hand, in a canvas bag -	-		0 4	1	" with the Pett- man's key, 3½ lbs.
Borers { hook, ditto -	-		0 10	2	
Cylinders, wood, for bits (in bags) -	-		0 5	2	
Extractor, fuze -	-		1 8	1	
Instructions, printed papers of	-		- -	5	
Key for Pettman's fuzes (with 18- pounder guns only) -	-		0 9	1	
Sections of fuzes -	-		0 3	5	
Rough packing case -	-		3 8	—	14" x 7" x 5".
<i>No. 2 Set, for Shrapnel Shells, 6, 9, or 12-Pounders.^b</i>					
Drift, for shrapnel shells, small -	-		0 0½	1	Weight of the set, un- packed, 2½ lbs.
Funnel, for ditto -	-		0 1½	1	
Instructions, printed papers of	-		- -	2	
Keys, iron, for fuze-hole plug -	-		0 7	2	
Punch -	-		1 5	1	
Screwdriver, loading-hole, small -	-		0 3	1	
Rough packing case -	-		1 12	—	11" x 5" x 4".
<i>No. 3 Set, for Common Shells, and 32- Pounder or 24-Pounder Shrapnel Shells.^c</i>					
Drift, { common shells -	-		0 2	1	Weight of the set, un- packed, 2½ lbs.
Drift, { wood { shrapnel, large -	-		0 0½	1	
Funnel { common shells -	-		0 3	1	
Funnel { shrapnel, large -	-		0 2	1	
Instructions, printed papers of	-		- -	2	
Keys, iron, for fuze-hole plug -	-		0 7	2	
Punch -	-		1 5	1	
Screwdriver, loading-hole, large -	-		0 3½	1	
Rough packing case -	-		2 10	—	12" x 7" x 4".
<i>No. 4 Set, for Common and Shrapnel Shells.^d</i>					
Drift, { common shells -	-		0 2	1	Weight of the set, un- packed, 2½ lbs.
Drift, { wood { shrapnel, small -	-		0 0½	1	
Funnel { common shells -	-		0 3	1	
Funnel { shrapnel, small -	-		0 1½	1	
Instructions, printed papers of	-		- -	2	
Keys, iron, for fuze-hole plug -	-		0 7	2	
Punch -	-		1 5	1	
Screwdriver, loading-hole, small -	-		0 3	1	
Rough packing case -	-		2 10	—	12" x 7" x 4".

^a Issued to each smooth-bored gun and howitzer.

^b Issued to each smooth-bored gun, except the 18-pounder.

^c Issued to each 32-pounder or 24-pounder howitzer.

^d For each 12-pounder howitzer and 18-pounder gun.

IMPLEMENTS FOR PREPARING FUZES AND SHELLS.

NOTES.

No. 1 SET.—Every fuze (on Boxer's construction) that is required to act at a particular point must be bored before it is placed in the shell. For this purpose there are two *borers*, distinguished as *hand* and *hook*. The former can be used quicker than the latter, but it should only be trusted to practised men. One *bit* is required with each borer ; spare ones are kept in the wooden *cylinders*.

Sections of fuzes are introduced for instruction only ; a *mallet* and *setter* were, until lately, used for driving the fuze into the fuze hole of the shell, but they were withdrawn in September 1863. A few taps against a gun wheel or any convenient substance will answer the same purpose.

Before the fuze can be inserted the plug which closes the hole must be removed with the key in No. 2, 3, or 4 set. - Since the introduction of Pettman's fuzes another key has been required for guns supplied with them.

Nos. 2, 3, and 4 SETS.—Every shell must be loaded with a bursting charge, and these implements are furnished for the purpose.

The bursting powder is poured in with a *funnel* at the fuze hole of *common* shells and the loading hole of *shrapnel* ; the metal plugs which close these holes being first removed, the former with a *key*, the latter with a *screwdriver*. The loading holes being of two different diameters, and the fuze holes being larger than the loading holes, the funnels are issued in three sizes ; for a similar reason the screwdrivers are made in two sizes. Leather funnels, with copper spouts, were substituted for copper funnels in 1859.

The *drift* is only wanted when the shells are not to be fired immediately after being loaded, in which case they are "secured" by papier maché wads. The wad is thrust into the loading or fuze hole as far as the shoulder of the drift will allow, and the metal plug is screwed in over it. The difference in the holes renders necessary drifts of three sizes.

The *punch* is for fixing the rivet which fastens the wood bottom to the shell, in case it should become loose ; it is of one size only.

No. 2 set contains implements for shrapnel shells with small loading holes ; *No. 3 set* for common shells and shrapnel with large loading holes ; and *No. 4 set* for common shells and shrapnel with small loading holes, being in fact No. 2 set with an extra drift and funnel.

All these implements are carried loose in the gun limber boxes. The packing cases mentioned in the lists are only used for transport.

The implements for garrison service are issued in different sets, which contain more articles and are applicable to more various operations. Lists and descriptions are given at p. 361.

TOOLS.

Description.	No. of Drawing.	Cost.	Weight.	Total No.	Dimensions and Remarks.	
SET OF COLLARMAKERS' TOOLS.						
		£ s. d.	lbs. oz.			
Awls, blades	backing - - -	100 2 9	0 0½	6		
	drawing - - -	" 13 0	0 1½	2		
	panel, or seat, in two sizes	" 6 6	0 1½	4		
	garnishing do. - - -	" 3 6	0 1½	4		
	harness, five sizes - - -	" 2 6	0 1	18		
	buckling { large - - -	" 2 9	0 1½	3		
	{ small - - -	" 5 3	0 0½	3		
Bone, hollow - - -		0 2 6	0 2	1		
Chisels, cold, carpenter's, 8 in. x ¾ in.		0 1 0	0 14	1		
Claws, pair - - -		0 2 3	2 13	1		
Compasses, with sweeps - - -		0 2 6	0 8	1		
Creases	single - - -	0 0 6	0 1½	1		
	screw - - -	0 1 1	0 3	1		
Hammers, handled	saddler's - - -	0 1 9	0 9	1		
	rivetting { 1½ lb. - - -	0 1 6	1 15	1		
	{ ½ " - - -	0 0 10	0 15	1		
Handles, for awls, 1d. each	drawing - - -	0 0 4	0 8	4		
	harness - - -	0 0 4	0 6	4		
	seat - - -	0 0 4	0 6	4		
Irons	palm - - -	0 0 8	0 3	1		
	collar { 23-inch - - -	0 1 9	1 0	1		
		29 " - - -	0 2 3	1 7	1	
		34 " - - -	0 2 8	1 10	1	
	seat stuffing, 14-inch - - -	0 1 0	1 4	1		
	pricking, of sorts 6d. each	0 1 6	0 4½	3		
Knives	head - - -	0 0 6	0 1½	1		
	collar, half round - - -	0 1 9	0 4	1		
	hand straight, or laboratory small - - -	0 0 5	0 3½	1		
Lead, piece, to punch on - - -	0 2 0	8 0	1			
Mallets	boxwood, tanners - - -	0 0 9	1 6	1		
	collar - - -	0 1 9	3 6	1		
Marline-spike - - -	0 0 6	0 13	1			
Nail-claw - - -	0 0 7	0 2½	1			
Needles	assorted, saddler's - - -	- - -	- - -	100	} Weight of the whole number.	
	collar - - -	- - -	- - -	18		
	harness - - -	- - -	0 8	100		
	quilting, or darning, 4-inch stitching - - -	- - -	- - -	6		
Pincer, saddler's - - -	0 2 6	0 14	1			
Pliers, flat-nose, ½ inch - - -	0 1 6	0 5½	1			
Punches, oval	bridle, middle, No. 20 - - -	0 1 0	0 2½	2	6d. each.	
	do. large, or stirrup, No. 22 - - -	0 1 0	0 3	2	6d. each.	
	strap { large, No. 24 - - -	0 0 8	0 2	1		
		small, " 23 - - -	0 0 7	0 1½	1	
	shaft { large, " 31 - - -	0 1 4	0 5	1		
		small, " 30 - - -	0 1 2	0 4½	1	
trace { large, " 28 - - -	0 1 0	0 4½	1			
	small, " 27 - - -	0 1 8	0 6	2	10d. each.	
Rasps, shoemaker's - - -	0 1 9	0 9½	1			
Rule, two-foot, four-fold - - -	0 1 0	0 2	1			
Scissors, 9-inch, tailor's - - -	0 1 3	0 10	1			

TOOLS.

Description.	No. of Drawing.	Cost.	Weight.	Total No.	Dimensions and Remarks.
<i>Collarmakers' Tools—continued.</i>					
		£ s. d.	lbs. oz.		
Screwdrivers, 6-inch - - -		0 0 5	0 7½	1	38" x 11" x 6".
Spokehave, collarmaker's - - -		0 1 6	0 4½	1	
Steel, butcher's - - - - -		0 1 9	0 13	1	
Stone, rag - - - - -		0 0 2	1 9	1	
Thimbles, tailor's - ¼d. each		0 0 0½	0 0½	2	
Tools, edge, three sizes 4d. each		0 1 0	0 3½	3	
Chest, for packing* - - - - -		0 9 0	20 0	1	
Lock, pad, iron, small single - - -		0 0 7	0 6	1	
Total - - - - -		3 8 2½	71 9½		

* A later pattern, approved 6/2/63, has a trunk lock.

NOTES.

Three sets of collarmakers' tools are issued to each battery of field artillery (except the 18-pounder or 40-pounder batteries, which have only one set), two of them are arranged in trays inside the limber box of the store wagon, and the other is packed in a chest outside.

Sets of the same tools are also issued to siege trains in proportion to the number of ordnance, &c.

The establishment of tools as given above was approved 30th August 1858.

TOOLS.

Name.	6-pounder.			9-pounder and 12-pounder.			
	No.	Letter.	Weight.	No.	Letter.	Weight.	
FACING IMPLEMENTS FOR ARMSTRONG GUNS.			lbs. oz.			lbs. oz.	
Blocks	breech bush, copper	angle facing	- 1 L	2 3	1 I	3 6	
		finish boring*	- 1 K	1 6	{ 1 F ₁	2 8	
		screwing in	- 1 H	1 6	{ 1 F ₂	2 8	
		upsetting -	- 1 I	9 12	1 D	2 8	
	vent piece ring, angle facing	- 1 N	3 5	1 J	4 12		
Guard, wood, for vent piece	- -	- 1 Q	0 7	1 S	0 10		
Guides	in breech screw -	- -	- 2 D	4 11	2 M	6 2	
		in powder chamber*	- -	- 1 E	2 0	{ 1 N ₁	3 2
	wood, block, upsetting, two parts	- -	- 1 O	0 4	{ 1 N ₂	3 0	
Key, for fixing knives	- -	- 1 F	0 1	1 R	2 6		
Knives, † breech bush, copper	cutting out	- -	- 1 G	0 6	1 O	0 1	
		facing	- -	- 1 M	0 7	1 K	0 10
		„ projection	- -	- 1 M ₁	0 7	1 G ₁	0 11
		rough boring	- -	- 1 J	0 5	1 G ₂	0 10
Lever	- -	- 1 B	9 0	1 E	0 8		
Punch for pin in spindle	- -	- 1 R	0 1	1 B	10 7		
Spanner	- -	- 1 P	0 2	1 P	0 2		
Spindle	- -	- 1 A	8 10	1 Q	0 2		
Washers, stop	- -	- 2 C	1 9	2 A	13 12		
Box, for packing	- -	- 1 ^a —	24 0	2 L	2 6		
Lock, pad, with two keys	- -	- 1 —	0 2	1 ^b —	32 0		
Total	- -	-	2 qrs. 15 lbs.			3 qrs. 23 lbs.	

* 32" x 11" x 7".

b 36" x 11½ x 7¼".

* Diameters, 3·125 in. and 3·2 in. for the 9-pounder or 12-pounder; 3·875 and 3·94 for the 20-pounder.

† The knives marked M, G, J, are added for guns with projecting breech coppers; see Circ. 822, par. 745.

NOTES.

The facing implements supplied with Armstrong guns are for replacing the copper rings at the contact of the vent piece with the powder chamber. The old ones are cut out and others substituted for them; the surfaces of the new ones have then to be brought by a series of operations to such a form that they will accurately fit one another.

For this process there are various *knives* and *blocks*. To bring them to work on the breech-copper (the copper ring in the powder chamber) they have to be fixed on a *spindle*, which is turned by a *lever*, and kept in its place by three *guides*, one at each end of the breech screw and one in the powder chamber.

TOOLS.

20-pounder.			Name.	40-pounder.						
No.	Letter.	Weight.		No.	Letter.	Weight.				
		lbs. oz.			lbs. oz.					
1	K	5 12	Blocks	angle facing	- -	1	G	11 1		
{ 1	I ₁	4 0		cutting out	- -	1	D	12 5		
{ 1	I ₂	4 4		breech bush, copper	finish boring	4.91 in.	1	F ₁	12 6	
1	G	4 1				4.96 in.	1	F ₂	12 5	
1	M	21 0				screwing in	- -	1	E	9 11
1	L	6 11				upsetting	- -	1	M	39 8
1	P	0 11		vent piece ring, angle facing	- -	1	H	15 6		
2	C	12 0		Collar for feed motion	- - -	1	B	11 14		
{ 1	D ₁	4 12		Guides	in breech screw	- -	1	A	8 10	
{ 1	D ₂	5 0			in powder chamber	4.91 inch	-	1	C ₁	8 15
1	Q	0 7	4.96 inch			-	1	C ₂	8 14	
1	N	0 2	wood, block, upsetting, two parts		- -	1	N	0 14		
1	F	1 0	Handle to hold blocks in vent chamber	- -	1	P	1 1			
1	J	1 0	Lever	- - - -	1	J	14 12			
1	J ₁	1 1	Punch for	knives in blocks	- -	1	K	0 2		
1	H	0 12		pin in spindle	- -	1	L	0 2		
1	B	12 6	Spindle	- - - -	1	I	25 7			
1	R	0 2	Box, for packing (44" × 14" × 10½")	- -	1	—	50 0			
1	O	0 3	Lock, pad, with two keys	- -	1	—	0 2			
1	A	17 4								
2	E	4 0								
1 ^c	—	35 0								
1	—	0 2								
1 cwt. 1 qr. 2 lbs.			Total	- - -	2 cwt. 0 qrs. 16 lbs.					

^c 42" × 11½" × 7½".

NOTES.

The same guides, lever, and spindle serve for all the operations with each gun, but differ in size or pattern for each calibre; the blocks and knives are suitable to the various operations.

The ring can be removed from the vent piece without the aid of the spindle; to attach the new one the piece is fixed in its usual place, but reversed, so that the part to receive the ring is towards the breech; the ring is then pressed on, and its surface finished with the usual tools. A wooden guard is placed behind the vent piece in this operation.

The implements are packed in a box which is carried in the forge limber; one set is issued to each battery.

TOOLS.

Description.	No. of Drawing.	Cost.	Weight.	Total No.	Dimensions and Remarks.	
SET OF FARRIERS' AND SHOEING SMITHS' TOOLS.		£ s. d.	lbs. oz.			
Chest, for packing - - -		0 14 0	38 0	1	38" x 14" x 9".	
Lock, iron, pad, middling, single -		0 0 9	1 0	1		
Stones, rag - - - 2d. each		0 0 4	3 2	2		
Tools { forge, set, as below - shoeing, set, as below -		0 18 8 2 17 11	45 0 51 0	1 1		
Total - - -		4 11 8	138 2½			
<i>Forge Tools.</i>						
Chisels, hot - - - 10d. each		0 2 6	3 6	3	1s. 3d. each.	
Hammers { sledge, 9½ lbs. - turning, or hand, 3 lbs. -		0 2 9 0 2 6	9 8 7 0	1 2		
Handles for hammers { sledge hand, 5d. each		0 0 6 0 0 10	1 14 2 10	1 2		
Poker - - -		0 0 9	2 6	1		
Pritchels, all steel - - - 7d. each		0 2 4	4 8	4		
Slice - - -		0 0 6	3 0	1		
Stamps, all steel - - - 6d. each		0 1 0	1 6	2		
Tonga, pairs - - - 10d. "		0 5 0	9 6	6		
Total - - -		0 18 8	45 0			
<i>Shoeing Tools.</i>						
Bag, tool, leather - - -		0 5 6	2 7	1		
Buffers - - - 7d. each		0 2 4	2 12	4		
Hammers, { pointing 2s. 0d. " handled { shoeing 2s. 6d. "		0 2 0 0 10 0	1 12 3 8	2 4		
Irons, branding { set of five letters - set of nine figures -		0 4 2 0 6 9	4 6 8 0	1 1		
Knives { drawing - - - 6d. each searching - - - 6d. "		0 6 0 0 1 0	2 4 0 2½	12 2		
Pincers, pairs - - - 1s. 9d. "		0 7 0	9 0	4		
Rasps, 15-inch - - - 1s. 6d. "		0 12 0	15 18	8		
Stakes, pointing - - - 7d. "		0 1 2	1 12	2		
Total - - -		2 17 11	51 8			

NOTES.

Batteries of field artillery are always provided with these tools ; siege trains are also supplied with a few sets.

The chest is carried on the body of the forge wagon, but such of the tools as may be wanted to replace shoes cast during the march are divided among the farrier and the mounted shoeing smiths.

The veterinary instruments, which were formerly included with the farrier's tools, are now in charge of the veterinary surgeons and issued by the veterinary department.

The above list was approved 28th October 1859.

TOOLS.

Description.	No. of Drawing.	Cost.	Weight.	Total No.	Dimensions and Remarks.	
SET OF SMITHS' TOOLS.						
		£ s. d.	lbs. oz.			
Bits for braee { rimer { square -		0 0 6	0 4	1		
Bits for braee { rimer { half-round -		0 0 5	0 5	1		
Bits for braee { countersunk, rose -		0 0 3	0 2	1		
Blade, saw, slitting, 10-inch, spare -		0 1 4	0 1	1		
Bow, drill, steel, smith's -		0 3 3	1 0	1		
Boxes, drill, wood - 3d. each		0 0 6	0 1½	2		
Braze, iron, smith's -		0 3 6	2 1	1		
Callipers, 10 inch -		0 2 9	0 7	1		
Chisels -	cold, smith's -	0 1 0	2 3	1		
	hot, do. 10d. ea.	0 1 8	3 10	2		
	hand { 1 inch 1s. 3d. "	0 2 6	2 6	2		
	{ ¾ inch 1s. 0d. "	0 2 0	1 12	2		
Compasses, 10 inch, wing, with sweep		0 2 6	0 8	1		
Drills, smith's or armourer's -		0 0 1	0 1	5		
Files, bastard	14 inch 1s. ea.	0 10 0	15 0	10		
	flat - { 10 " 6d. "	0 3 0	3 12	6		
		{ 8 " 4d. "	0 1 4	1 4	4	
		{ 14 " 1s. "	0 4 0	5 8	4	
		{ 10 " 6d. "	0 2 0	2 0	4	
		{ 12 " 9d. "	0 3 0	2 8	4	
		{ 8 " 4d. "	0 0 8	0 5	2	
		{ rubbers, 16 " 2s. "	0 6 0	9 0	3	½ inch thick.
		{ square - { 10 " 5d. "	0 0 10	0 10	2	
		{ 8 " 4d. "	0 0 8	0 6	2	
	{ 3 square { 12 " -	0 0 9	1 2	1		
	{ 7 " -	0 0 3	0 3½	1		
Files, warding, { 5 inch, sharp point,		0 0 6	0 2	2		
assorted - { cut on both sides-						
	{ 3½ inch, sharp point,	0 0 4	0 0½	2		
	{ cut on one side -					
Hammers	sledge, 10 lbs. -	0 3 0	10 0	1		
	uphand, 7 lbs. -	0 2 0	7 0	1		
	hand, smith's, 3 lbs. -	0 1 3	3 0	1		
	do. or rivetting, 24 oz. -	0 1 6	1 8	1		
setting, smith's -	0 1 3	0 9	1			
Handles -	for files - { large -	} 5s. per 100	0 6	2		
			{ small -	0 8	4	
	for hammers { sledge -		0 0 6	1 13½	1	
			{ uphand -	0 0 10	2 10	2
	{ hand -	0 0 2	0 9	1		
Holdall, leather -	0 3 4	0 12	1			
Pincers, carpenter's - pair	0 1 6	1 1	1			
Plate, breast, smith's -	0 0 10	0 9	1			
Plate, screw, with 10 taps -	0 5 0	0 9	1			
Punches	hot, smith's { ½ inch -	0 0 9	1 2	1		
		{ " -	0 0 9	1 0	1	
		{ " -	0 0 8	1 0	1	
		{ cold { 1½ inch -	0 1 4	2 4	2	
	{ 7 " -	0 1 0	0 3	1		
Rule, two-foot, common -	0 1 0	0 12	1			
Saw, slitting, bow, 10-inch, complete	0 1 0	1 3	1			
Screwdrivers	15 inch -	0 1 0	1 3	1		
	6 " -	0 0 4	0 4	1		
Spanner, McMahon's patent, 15-inch	0 12 0	3 6	1			
Square, iron, figured -	0 1 2	1 6	1			
Stock, drill, smith's or armourer's -	0 2 3	0 2½	1			

TOOLS.

Description.	No. of Drawing.	Cost.	Weight.	Total No.	Dimensions and Remarks.
<i>Smiths' Tools—continued.</i>					
		£ s. d.	lbs. oz.		
Stocks and dies, with wrenches, intermediate size, Whitworth's pattern, complete, from $1\frac{1}{8}$ to $\frac{1}{4}$ inch*		23 17 6	69 0	1	
Stone, oil, without frame - - -		0 3 6	2 9	1	
Strings, drill, catgut, knots 1s. each		0 6 0	0 9	6	
Tongs - { forebit, oval handles - - -		0 1 3	4 1	1	
plyer, do. - - -		0 1 0	2 3	1	
hammer - - -		0 1 9	5 0	1	
hollowbit - - -		0 1 3	3 1	1	
bolt - - -		0 1 6	4 7	1	
close, 2 feet long - - -		0 1 0	3 6	1	
Vice - { standing, 36 lbs. - - -		0 14 3	36 0	1	
hand, 16 oz. - - -		0 2 3	1 0	1	
Chest, tool† - - -		0 14 0	47 8	1	
Lock, pad, iron, middling, single -		0 0 9	1 0	1	

* With 3 extra taps and dies, .875, .625, and .562 inch diameter, the whole set in a separate box.

† A later pattern, approved 6/2/63, has a trunk lock; it measures $3' 4\frac{1}{2}'' \times 1' 2\frac{1}{2}'' \times 1'$, and weighs 51 lbs.

NOTES.

One set of these tools is issued to each battery of field artillery, and carried in the forge limber; sets of them are also issued to siege trains. When the tools are carried in the limber no chest is required.

The above list is taken from a circular dated War Office, 8th October 1862.

The weight and dimensions of the chest are as follow:—

Weight complete	-	-	1 cwt. 3 qrs. 5 lbs.
Length	-	-	3 ft. 6 in.
Breadth	-	-	1 ft. $3\frac{1}{2}$ in.
Depth	-	-	1 ft. $0\frac{1}{2}$ in.

Those of the box containing Whitworth's stocks and dies are:—

Weight complete	-	-	55 lbs.
Length	-	-	2 ft. 7 in.
Breadth	-	-	$11\frac{1}{2}$ in.
Depth	-	-	$4\frac{3}{4}$ in.

TOOLS.

Description.	No. of Drawing.	Cost.	Weight.	Total No.	Dimensions and Remarks.
<i>Special and Additional Tools—</i> continued		<i>£ s. d.</i>	<i>lbs. oz.</i>		
Punches	brass { 7 inch - - -	0 1 4	0 3½	1	
	6 " - - -	0 1 3	0 2½	1	
	centre, steel - - -	0 0 11	0 3½	1	
	copper (5½ inch × ½ inch - - -	0 1 7	0 1	1	
	4 inch - - -	0 1 10	0 3½	1	
	steel { 6 " - - -	0 1 10	0 5½	1	
7 " - - -	0 1 10	0 9½	1		
13 " - - -	0 2 0½	0 8½	1		
Spanners	9 inch - - -	0 5 9	1 4	1	
	double-ended for sights - - -	0 4 0	2 5½	1	
Screwdrivers	5 inch - - -	0 0 6	0 5½	1	
	bent - - -	0 4 6	1 4½	1	
Tommies, steel	forked - - -	0 2 3	0 2½	1	
	plain - - -	0 1 0½	0 2	1	
<i>Box, for special tools, with lock</i> - - -		0 10 0	26 0	1	
The following materials are also supplied with the foregoing tools, viz. :—					
Cloth, emery, flour - sheets, ¾d. each		0 0 4½		6	
Cloths, sponge - " 3d. "		0 3 0		12	

NOTES.

These tools are for the use of smiths and armourers in repairing Armstrong guns and carriages in the field or in garrison. On field service they are carried in the forge limber.

The above list is taken from a circular dated War Office, 8th October 1862.

The weight and dimensions of the box are as follow :—

Weight complete	-	-	59 lbs.
Length	-	-	2 ft. 7 in.
Breadth	-	-	11½ in.
Depth	-	-	6½ in.

TOOLS.

Description.	No. of Drawing.	Cost.	Weight.	Total No.	Dimensions and Remarks.							
SET OF WHEELERS' TOOLS.												
Adze, wheelers' - - -	-	0 3 9	6 0	1	Saddletree makers' tools are to be combined with these, but the list is not yet approved (6th April 1864).							
Augurs, shell { $\frac{1}{2}$ inch - - -	-	0 0 10	0 11	1								
Augurs, shell { $\frac{3}{4}$ " - - -	-	0 1 0	0 14	1								
Augurs, shell { $\frac{1}{2}$ " - - -	-	0 1 0	1 2	1								
Augurs, shell { 1 " - - -	-	0 1 3	1 4	1								
Augurs, shell { $1\frac{1}{2}$ " - - -	-	0 1 6	1 12	1								
Augurs, shell { $1\frac{1}{2}$ " - - -	-	0 1 10	2 0	1								
Augurs, shell { $1\frac{1}{2}$ " - - -	-	0 2 0	2 2	1								
Augurs, shell { $1\frac{1}{2}$ " - - -	-	0 2 6	2 13	1								
Awls, brad (blades only)	-	0 0 6	0 4 $\frac{1}{2}$	24								
Axe, broad - - -	-	0 3 3	6 8	1								
Bag, tool - - -	-	0 1 3	1 13	1								
Bar, crow, hand, 7 lbs.	-	0 2 9	7 12	1								
Bevel, steel blade, 12 inch	-	0 2 0	0 8	1								
Brush, for glue - - -	-	0 0 4	0 2	1								
Buzzes { $\frac{1}{2}$ inch - - -	-	0 2 9	2 2	1								
Buzzes { $\frac{3}{4}$ " - - -	-	0 3 0	2 7	1								
Chisels { cold, hand { 8 inch x $\frac{3}{4}$ inch	-	0 1 0	0 14	1								
	Chisels { cold, hand { 8 " " 1 "	-	0 1 3	1 3		1						
		Chisels { firmer { $\frac{1}{2}$ " "	-	0 0 6		0 3	1					
			Chisels { firmer { 1 " "	-		0 0 7	0 4	1				
				Chisels { mortice { $1\frac{1}{2}$ " "		-	0 0 8	0 6	1			
						Chisels { mortice { $1\frac{1}{2}$ " "	-	0 1 0	0 14	1		
							Chisels { mortice { $1\frac{1}{2}$ " "	-	0 1 0	0 9	1	
								Chisels { mortice { $1\frac{1}{2}$ " "	-	0 1 0	0 14	1
					Chisels { sockets { $\frac{1}{2}$ " "				-	0 1 3	1 5	1
									Chisels { sockets { $\frac{1}{2}$ " "	-	0 0 9	0 12
Chisels { sockets { $\frac{1}{2}$ " "										-	0 0 10	0 14
	Chisels { sockets { $\frac{1}{2}$ " "									-	0 0 10	0 14
		Chisels { sockets { 1 " "								-	0 1 0	1 6
			Chisels { sockets { $1\frac{1}{2}$ " "							-	0 1 0	1 7
				Compasses { with sweep, 10 in. pair						-	0 2 6	0 8
						Compasses { common, 6 in. "				-	0 0 8	0 4
				Files { bastard { half round, 14 inch		-	0 2 0			2 12	2	1s. each.
						Files { bastard { round " "	-	0 1 0		0 12	1	
					Files { saw { hand, 5 $\frac{1}{2}$ inch "		-	0 4 6		2 4	18	3d. each.
							Files { saw { tenon, 4 " "	-	0 1 0	0 6	6	2d. "
Gauges { single - - -				-				0 0 5	0 4	1		
	Gauges { mortice - - -			-		0 1 6		0 6	1			
Gimlets { nail - - - 2d. each		-		0 1 4	0 6	8						
	Gimlets { spike, $\frac{1}{2}$ inch 3d. "	-	0 0 6	0 6	2							
Gimlets { " $\frac{3}{8}$ " 4d. "		-	0 0 8	0 8	2							
	Gouges { boxing { $1\frac{1}{2}$ inch - - -	-	0 2 6	2 1	1							
Gouges { boxing { 2 " - - -		-	0 2 9	2 10	1							
		Gouges { pecking, 1 inch - - -	-	0 0 10	1 4	1						
			Gouges { firmer, $\frac{1}{2}$ -inch - - -	-	0 0 6	0 2	1					
				Gouges { or { $\frac{1}{2}$ " - - -	-	0 0 6	0 3	1				
	Gouges { scribing { $\frac{1}{2}$ " - - -				-	0 0 7	0 3	1				
Hammers { sledge, 10 lbs. - - -					-	0 3 0	10 0	1				
		Hammers { hand, or rivetting, 24 oz. handled - - -			-	0 1 9	2 7	1				
			Hammers { small shoeing, handled - - -		-	0 3 0	5 13	1				

TOOLS.

Description.	No. of Drawing.	Cost.	Weight.	Total No.	Dimensions and Remarks.
<i>Whealers' Tools—continued.</i>		£ s. d.	lbs. oz.		
Handles, for	adze - - -	0 0 8	1 2	1	
	augurs 1d. each	0 0 4	1 8	4	
	awls - - -	- - -	0 1	6	
	axe - - -	0 0 7	1 1	1	
	hammer, sledge	0 0 6	1 14	1	
Knife, drawing	- - -	0 1 0	1 10	1	
Line, with chalk and reel	- - -	0 0 4	0 7	1	
Mallet, wood, carpenter's	- - -	0 1 0	2 12	1	
Pencils, black lead - 6d. per doz.	- - -	0 0 6	0 6	12	
Pincers, carpenter's	- - -	0 1 6	1 1	1	
Pins, drawbore, iron, short,	{ 16 inch	0 0 6	1 9	1	5d. each.
	{ 12 "	0 0 10	1 4	2	
Planes	bead, $\frac{3}{8}$ inch	0 2 3	1 0	1	
	jack, double-iron	0 3 6	5 0	1	
	smoothing, do.	0 2 9	2 4	1	
	trying, do.	0 4 3	7 0	1	
	plough, with 8 irons	0 14 0	4 6	1	
Pot, for glue, cast-iron, double	- - -	0 2 0	1 7	1	
Punches	{ 7 inch, large	0 3 6	6 2	1	
	{ do. small	0 0 8	1 2	1	
Rasp, 12 inch, $\frac{1}{2}$ round, coarse	- - -	0 0 10	1 0	1	
Rule, two-foot, common	- - -	0 1 0	0 3	1	
Sampson, wheeler's	- - -	1 16 0	73 0	1	
Saws	{ hand, 26 inch	0 3 6	1 15	1	
	{ tenon, 19 " iron back	0 3 0	2 7	1	
	{ turning, or compass	0 1 6	0 8	1	
Sawset, hand	- - -	0 0 8	0 3	1	
Screwdrivers	{ 14 inch	0 1 3	1 11	1	
	{ 6 "	0 0 5	0 8	1	
Shaves, spoke	{ 4 " 10d. each	0 1 8	0 12	2	
	{ 3 " 8d. "	0 1 4	0 8	2	
	Spanner, M'Mahon's patent, 15 inch	0 12 0	3 6	1	
Square	{ iron, figured, 24 inch	0 1 3	1 6	1	
	{ steel blade, 9 inch	0 1 3	0 10	1	
Stock, with 24 bits, viz. :-	centre bits - - - 7	} 0 8 9	2 5	1	
	countersunk - - - 2				
	dowling, sash, with collar 1				
	gouge - - - 5				
	nose - - - 6				
	rimer, square - - - 1				
	square - - - - -				
screwdriver - - - 1					
taper - - - 1					
Stones	{ rag - - -	0 0 2	1 9	1	
	{ grind, carpenter's, { 10 inch	0 14 6	22 0	1	
	{ 18 " - - -	0 18 6	92 8	1	
	{ oil, in frame	0 3 0	2 8	1	
Chest, for packing, 3' 4" x 1' 7" x 1' 3"	- - -	0 6 0	96 0	1	A later pattern, with trunk lock, was approved 6/2/63.
Lock, pad, iron, middling, single	- - -	0 0 9	1 0	1	
Total - - -	- - -	11 14 8 $\frac{1}{2}$	435 2 $\frac{1}{2}$		

NOTES.

One set of wheelers' tools is supplied to each battery of field artillery. If there is a spare gun carriage the tools are arranged in trays inside the limber box, otherwise they are packed in a chest and carried by the store wagon. The *Sampson* is always carried separate on the store wagon.

Sets of the same tools are supplied likewise to siege trains.

This list was approved 30th March 1860.

MATERIALS FOR REPAIRS.

Name.	Number per Battery.					Remarks.
	6-pr.	9-pr.	12-pr.	20-pr.	40-pr.	
SPARE PARTS FOR ARM-STRONG GUNS.						
Bushes, copper { breech - - -	12	12	12	12	8	} Packed in the forge wagon.
vent piece, sets - - -	6	6	6	6	4	
Coppers. See Ring.						
Eyes, elevating - - -	6	6	6	6	—	One with each gun.
Pieces, vent - - - -	12	12	12	12	8	Two with each gun.
Plug, oil-hole - - - -	—	—	3	3	—	One with every two guns.
Rings, copper, vent-piece	12	12	12	12	8	Packed in forge wagon.
Sights - - - - -						Hitherto 1 of each sort per gun, but in future each gun will be double sighted instead.

NOTES.

These parts vary in size for each description of gun.

The bushes and copper rings (for breech and vent-piece) in each gun are fixtures, and cannot be replaced without proper tools; the facing implements are provided for this purpose, and the serjeant-armourer is instructed in the process.

Smooth-bored guns and howitzers have each one spare screw for the tangent scale, and there is one spare tangent scale per battery for each nature of piece.

Description.	Number.	Remarks.
SPARE PARTS FOR CARRIAGES.		
Axletrees { field - - -	2	} With linch pins and washers.
general service - - -	1	
Bars, splinter - - - -	4	Only 2 for home service.
Ironwork, set of - - -	1	For active service only.
Locks, spring, with keys	6	Packed in the store wagon.
Perches, spare - - - -	2	For the ammunition wagons.
Pins, linch - - - - -	—	1 with each carriage and 2 with each spare axletree.
Screws { elevating - - -	2	} Included with ironwork.
traversing - - - - -	1	
Shafts, single { near - - -	4	} Only 3 for home service
off - - - - -	4	
Shoes, drag - - - - -	2	Issued with the spare gun carriage.
Splinter bar. See Bar.		
Washers - - - - -	—	1 with each carriage and 2 with each spare axletree.
Wheels { field - - - - -	6	Carried by the first line of wagons.
general service wagon -	1	

NOTES.

This list applies to all batteries except the 18-pounders and 40-pounders, which are supplied with different proportions.

The splinter bars, shafts, and perches are distributed among the ammunition wagons and lashed underneath them.

MATERIALS FOR REPAIRS.

Name.	Number.	Name.	Number.
SET OF IRONWORK FOR A FIELD BATTERY.		Pins, drift - - - -	2
Bands for axletree beds ^a - -	2	Plates { camp kettle - - - -	2
Bolts for carriages, screwed - -	11	{ jack { carriage - - - -	2
Bolts, of sorts - - - -	12	{ limber - - - -	2
Capsquares - - - -	2	{ locking - - - -	2
Chains { advance ^b - - - -	2	{ nose - - - -	1
{ skid - - - -	2	{ trunnion - - - -	2
Flange, for elevating screw - -	1	Plate for turning in fuzes - -	1
Handles, trail - - - -	2	Rivets for carriage bolts - -	4
Hooks { lanyard - - - -	1	Saddle, metal - - - -	1
{ limber - - - -	1	Screws { elevating - - - -	2
{ advance chain - - - -	1	{ nutheaded - - - -	2
{ skid chain - - - -	2	{ traversing, for saddle - -	1
Hoops, yoke - - - -	2	Screws and staples, of sorts, bag of	1
Irons { handspike - - - -	1	Screwdriver - - - -	1
{ sponge - - - -	1	Sockets { metal, for spare vent - -	1
Keys, for capsquares - - - -	4	{ portfire - - - -	1
Lever, for traversing screw - -	1	Stop, handspike - - - -	1
		Straps (iron), of sorts - - - -	12
		Trail-eye complete - - - -	1

^a The bands and yoke hoops secure the iron axletree to the wooden bed.

^b For advancing with a prolonge.

NOTES.

All these articles are carried in the spare gun carriage, except the following, which are packed in the limber box of the store wagon :—Bands (axletree), bolts, capsquares and keys, limber hook, spring locks and keys, trunnion plate, fuze plate, saddle, with traversing screw and lever, screwdriver, and socket for spare vent.

The trunnion plates and the saddle, with its traversing screw and lever, are peculiar to the Armstrong gun carriages.

The weight of a set of ironwork complete is about 3½ cwt. for an Armstrong 12-pounder battery.

MATERIALS FOR REPAIRS.

Description.	No. of Drawing.	Cost.	Weight.	Total No.	Dimensions and Remarks.		
SET OF MATERIALS FOR COLLARMAKERS.							
		£ s. d.	lbs. oz.		s. d.		
Basils, brown	-	1s. 9d. each	3 3 0	54 0	36		
Brushes, harness, hard	-	10½d. "	0 7 0	3 12	8		
Buckles*	brass, roller	¾ inch	0 0 10	0 4	12	0 10 per dozen.	
		1 inch	0 0 11½	0 5	12	0 11½ "	
	japanned iron, 1 inch	1 inch	0 1 5	0 8	12	1 5 "	
		1½ inch	0 1 11	0 13	12	1 11 "	
	polished roller, iron	¾ inch	0 0 8	0 15	24	4 0 per gross.	
		¾ inch	0 0 7½	0 5	36	0 2½ per dozen.	
		¾ inch	0 0 5	0 6	36		
		¾ inch	0 0 7½	0 12	36		
		¾ inch	0 0 9	1 0	36		
		¾ inch	0 1 6	2 13	72	0 3 "	
		1 inch	0 1 10	3 2	48	0 5½ "	
		1½ inch	0 2 0	4 0	36	0 8 "	
2½ inch	backband	0 0 8½	2 14	12	0 8½ "		
	bellyband	0 0 10	2 5	12	0 10 "		
Cord, whip	-	lbs.	0 1 5½	3 13	12	1 5½ "	
Curbs	-	2½d. each	0 1 2½	3 13½	12	1 2½ "	
Dubbing	-	lbs.	0 6 4	4 0	4	1 7 per lb.	
Duck, Russia	-	yards	0 2 9	3 0	12		
Hair	doe's	lbs.	-	14	0	14	
	horse	"	0 12 6	12 8	20	0 7½ per yard.	
Hames, iron, pairs	-	6s. 9d. each	0 7 0	28 0	28	0 3 per lb.	
	-	"	1 3 4	28 0	28	0 10 "	
Hides	brown	bridle	3 0 9	72 0	9		
		heavy	1 10 4	13 8	1		
		light	8 4 6	84 0	2		
		saddle seat	11 9 4	128 0	4		
	white, horse	trace	5 0 0	40 0	2		
		trace	6 14 4	64 8	3		
Nails, tack	No. 50	lbs.	0 15 0	15 0	1		
	" 51	"	0 2 8½	6 0	6	0 5½ per lb.	
	" 52	"	0 1 3½	2 0	2	0 7½ "	
	" 70	"	0 0 11½	2 0	2	0 5½ "	
	" 71	"	0 3 6	2 0	2	1 9 "	
	" 72	"	0 2 6	2 0	2	1 3 "	
	" 73	"	0 2 6	2 0	2	1 3 "	
Oil	Lucca	gallons	0 1 4	2 0	2	0 8 "	
	sweet	"	2 6 0	8 0	8	5 9 per gallon.	
Pans, tin, oil	-	-	1 16 3	9 0	10	3 7½ "	
Rings, snipe bill	-	-	-	5 7	6		
Rope	tarred, ¾ inch	fathoms	-	-	24		
	trace	"	-	5 7	12½	13 0 per coil.	
			-	1 2	6	£3 16 7½ per coil.	

* The buckles supplied are of the patterns required for the harness and saddlery in use.

ARTILLERY.

MATERIALS FOR REPAIRS.

Description.	No. of Drawing.	Cost.	Weight.	Total No.	Dimensions and Remarks.
<i>Materials for Collarmakers—cont.</i>		£ s. d.	lbs. oz.		s. d.
Serge, collarmakers' - - yards		2 11 3	16 4	20	2 6½ per yard.
Skins, sheep, black - 1s. 6d. each		6 6 0	48 0	12	
Thread {	black - - lbs.	0 2 2	1 0	1	2 2 per lb.
	collar - - "	0 6 6	6 0	6	1 1 "
	hemp - - "	2 5 6	12 0	12	2 5½ "
	whited brown - - "	0 2 6	1 0	1	2 6 "
Wax {	bees' - - - "	0 3 3	2 0	2	1 7½ "
	black - - - "	0 0 10	4 0	4	0 2½ "
Web {	diaper, 2 inch - yards	0 1 8	1 14	20	0 1 per yard.
	girth { 3½ inch - - "	0 9 2	8 2	20	0 5½ "
	4 " - - "	0 10 10	8 12	20	0 6½ "
Whips, spare - 1s. 9½d. each		0 10 9	2 7	6	
Total - - -			550 12		

NOTES.

This supply is estimated for one year's probable consumption ; it is carried in the store wagon of each field battery.

MATERIALS FOR REPAIRS.

Description.	No. of Drawing.	Cost.	Weight.	Total No.	Dimensions and Remarks.
IRON, FOR FARRIERS AND SMITHS.					
Hooks, curb, $\frac{1}{4}$ d. each - - -		2 1	3 2	100	
{ bolt, $\frac{3}{8}$ inch - - - lbs. }		2 6	28 0	28	} 10s. per cwt.
flat { 1 $\frac{1}{4}$ inch x $\frac{1}{4}$ inch ,,		2 6	28 0	28	
{ 1 ,, x $\frac{1}{4}$ inch ,,		2 6	28 0	28	
square { 1 ,,		5 0	56 0	56	
{ $\frac{1}{2}$,,		2 6	28 0	28	
Steel blister, flat, 2 inch x $\frac{1}{4}$ inch ,,		1 8	10 0	10	19s. per cwt.
Total - - -	- -	18 9	181 2		

NOTES.

This supply is issued to each battery and carried by the forge wagon, except the hooks, curb, which are in the store wagon.

MATERIALS FOR REPAIRS.

Description.	No. of Drawing.	Cost.	Weight.	Total No.	Dimensions and Remarks.	
SET OF MATERIALS FOR WHEELERS.						
		<i>s. d.</i>	<i>lbs. oz.</i>			
Bolts, tire, with collars, 1½ <i>d.</i> each -		0 8 4	25 0	67		
Cords, forage, for tent lashings, 6 <i>d.</i> each		0 18 0	26 10	36		
Felloes, ash, rough, of sorts, 1 <i>s.</i> 10½ <i>d.</i> each		0 11 3	111 0	6		
Glue - - - - - lbs.		0 3 6	6 0	6	<i>s. d.</i> 0 7 <i>per lb.</i>	
Grease - - - - -		0 5 3	84 0	84	7 0 <i>per cwt.</i>	
Nails -	brads	No 94	0 1 7½	4 0	4	0 4½ <i>per lb.</i>
		" 32	0 1 0	4 0	4	0 3 "
	clasp	" 33	0 1 3	6 0	6	0 2½ "
		" 39	0 1 0	6 0	6	0 2 "
	clout, chisel-pointed	" 56	0 0 10½	3 0	3	0 3½ "
		" 57	0 3 1½	12 0	12	0 3½ "
		" 58	0 1 7	9 0	9	0 2½ "
		" 59	0 2 4½	12 0	12	0 2½ "
		" 61	0 3 0	16 0	16	0 2½ "
		" 62	0 1 1¼	6 0	6	
tire	" 63	0 2 8	15 0	15	0 2½ "	
Rings, with starts, 3 <i>d.</i> each -		0 3 0	2 4	12		
looped, 1 <i>d.</i> each		0 1 0	1 8	12		
Screws, iron -	1½	207 -	0 0 1¼	1 10	24	0 7 <i>per gross.</i>
		226 -	0 0 4½		36	1 6 "
	1¼	206 -	0 0 2		48	0 6 "
	¾	203 -	0 0 1½		48	0 4 "
		242 -	0 0 2½		48	0 8 "
Spokes, oak, rough, 1 <i>s.</i> 6 <i>d.</i> each		0 13 6	83 4	9		
Staples, iron -	lashing	0 0 3	0 10	20	0 2 <i>per dozen.</i>	
	round	large	0 0 1¼	0 6	3	0 4½ "
		small	0 0 1½	0 2	9	0 1½ "
Straps, side arm, 7 <i>d.</i> each		0 3 6	2 4	6		
Tires for wheels, streaks, 2 <i>s.</i> 5½ <i>d.</i> each		0 14 9	96 0	6		
Turnbuckles, small, 9 <i>d.</i> each		0 4 6	1 2	6		
Total - - - - -		5 7 8¾	536 4			

NOTES.

Besides these materials there are spare parts of carriages issued ready made, lists of which have been previously given. The above articles are carried in the store wagon, unless there is a platform wagon with the battery, in which case part of them are packed therein.

GENERAL LIST OF ORDNANCE AND STORES FOR FIELD SERVICE.

NOTE.—Stores printed in *italics* are peculiar to smooth-bored ordnance.

Name.	Usual Proportion for Field Service.	Remarks.	
adapters - - - -	One for each time fuze, with such shells as have large fuze holes.	40-pounder and 20-pounder batteries only.	
burstlers, iron, filled - -	One for each 20-pounder and smaller segment shell.	Carried in the shells.	
<i>carcasses, with bottoms</i> -	<i>Various.</i> Packed in the wagon bodies.	<i>(Issued to howitzers only.)</i>	
cartridges, calico, burstlers	One for each 40-pounder and 20-pounder common shell.		
	One for each 40-pounder segment shell.		
	<i>One for each spherical common shell.</i>		
	<i>One for each shrapnel shell.</i>		
cartridges,* flannel, charge, filled.	One for each rocket.		
One for each projectile - -		Inclosed in paper covers and packed in cartouches.	
cylinders, paper - - -	One for each 20-pounder and 40-pounder flannel cartridge.	Inside the filled cartridges.	
fuzes, <i>Arm-</i> { <i>percussion</i> † -	One for each shell - - -	Not issued to 40-pounders.	
	<i>strong's</i> † { <i>time</i> -		One for each segment shell and three-fourths of the common shells.
,, <i>Boxer's</i> { <i>common shell</i>	<i>One per shell and some spare</i> - -	<i>In black bags and boxes.</i>	
	<i>shrapnel ditto</i> - - -	<i>Ditto ditto.</i> - - -	<i>In blue ditto ditto.</i>
,, <i>Behenna</i> - - -	1 for each rocket and 20 per cent. spare.		
leaders, rocket - - -	Twelve for each 6-pounder rocket carriage.	In the limber boxes.	
lubricators - - -	One for each round of Armstrong ammunition.	Choked inside the filled cartridges	
match, slow - - -	3 lbs. per subdivision ; 2 lbs. for the rocket carriage.	Carried in the first line of wagons.	
plugs, shell {	metal { † fuze hole	} <i>The spare ones loose, in the gun limbers, the rest in the shells.</i>	
	ditto		
	‡ loadinghole		One for each Armstrong shell - -
wood, covered with serge.	<i>One for each shrapnel shell, and 5 per cent. spare.</i>		
	One for each 20-pounder and smaller segment shell.	In the shells.	
portfires, L. S. - - -	From 4 to 6 per subdivision - -	In the wagon limbers, first line.	
primers - - -	12 for each rocket carriage - -	In the limber.	
	One per round, and some spare -	Issued to 40-pounders only.	
rockets, { 12-pounder or	100 per battery - - - -	} War establishment only.	
	6-pounder - 216 ditto - - - -		

* Cartridges filled with sawdust are issued for drill purposes.
 † These are only approximate proportions.
 ‡ In two sizes, large or small, according to the description of shell.

GENERAL LIST OF ORDNANCE AND STORES

Name.		Usual Proportion for Field Service.	Remarks.		
Ammunition, Artillery,	shells, Armstrong's.	common -	50 per cent. for 40-pounders	} Not issued to smaller guns.	
		segment -	25 " 20 "		25 " 40 "
			50 " 20 "		50 " 20 "
			100 " smaller guns.		100 " smaller guns.
			Various ; see p. 133		Various ; see p. 133
	shells, spherical, fixed to wooden bottoms.	common -	Various ; see p. 133	} Issued to 18-pounder guns and all howitzers. Issued to all field ordnance except the 18-pounder guns.	
		shrapnel	Ditto		
	Appurtenances,	shot, Armstrong's, solid -	25 per cent. for 40-pounders -	} Not issued to smaller guns.	
			25 " 20 "		
		shot, spherical	case -	Various	} Packed in the limber boxes. Issued to 18-pounders only. Not issued to howitzers.
grape -			3 in each limber		
solid, with bottoms			Various		
tubes		brass -	About 300 per battery.	} Carried in the gun or howitzer limbers.	
		friction -	One for each round of ammunition, and a proportion over.		
wads, papier maché		fuze hole	One for each common shell	} Charged with the wagon complete.	
		*loading hole	One for each shrapnel shell		
Anvil, with block			One for each forge wagon	Carried in the forge limber.	
Appurtenances,	bushes, copper, for vents	Two sets (of five each) spare per gun.	40-pounders excepted.		
	eyes, elevating	One in use and one spare per gun	} The number in use is 2 for the 9-pounder and 40-pounder ; 4 for the other guns.		
	pan, drip	Obsolete.			
	pieces, vent	One in use and two spare per gun.	} The 6-pounder has an oil-hole plug in use but none spare. Carried in the forge limber.		
	pins, keep	Two spare per gun			
	plugs, oil-hole	Three spare for each 20-pounder battery.			
	rings, copper, vent-piece	Two spare per gun			
	screw, breech, complete	One for each gun, but none spare.			
	sights	Two tangent and two trunnion per gun.			
	Axes, helved	felling	One for each field limber, and each general service wagon.	} Charged as " Tools, intrenching."	
pick		Ditto ditto			
Axletrees, spare†	field	Two per battery.	} Charged as " Tools, intrenching."		
	gen. ser.	One with each general service wagon.			
Bags, for fuzes	black	Various	} For common fuzes. For shrapnel ditto.		
	blue	Ditto			
Bars, splinter, spare†		Four per battery; war establishment	} Carried under the wagon bodies.		
		Two " " peace "			
Bills, hand, see Hooks, bill.					
Bouches, spare		See Appurtenances, bushes.			
Boxes, tin	fuzes	Armstrong's	Various	} Adapted to the carriages. For common fuzes. For shrapnel ditto.	
		Boxer's	black		Ditto
			blue		Ditto
	grease, half round	Two for each general service wagon; one for every other carriage; charged with carriage complete.	To hold 3 lbs. of grease, which is supplied from the grease magazines.		
	Behenna fuze	Two for each 12-pounder rocket equipment. Four for each 6-pounder ditto.	Carried in the limber.		

* In two sizes, large and small.

† Batteries of position (18-pounder and 40-pounder) are supplied with additional axletrees and splinter-bars.

FOR FIELD SERVICE.

Name.		Usual Proportion for Field Service.	Remarks.	
Boxes, tin	horse shoe nail - - -	One in each box for horse shoes -	Charged with carriage complete. Fitted to the carriage.	
	tubes - - -	One in each Armstrong ammunition limber.*		
	ammunition	{ Armstrong		Two on each limber, and four on each wagon.
		{ smooth bore		Two on each limber and two (of a larger size) on each wagon.
Boxes, wood †	axletree - - -	Two for each gun carriage, except the 40-pounder and 18-pounder. ‡	40-pounder Armstrong guns use an 18-pounder wagon. Contain small stores, &c.	
	centre	{ Armstrong -	One on each ammunition limber, and two on the wagon body.	Contains fuzes and tubes.
		{ smooth bore -	One on each ammunition limber -	
	grease magazine - - -	One to every two magazines - - -	Contains small stores. Underneath the wagon body. Each contains 10 sets of horse-shoes and a tin box with 30 sets of nails. Carried underneath the wagon body.	
	horseshoe - - -	Three for each ammunition and store wagon; one for each rocket carriage, forge, S.A. ammunition, and general service wagon.		
	limber, inside - - -	Two for each forge, and one for each store wagon.		
	S. A. ammunition - - -	Thirty-nine for each S.A. ammunition wagon.	Each contains 440 ball cartridges.	
Boxes, zinc, for percussion caps		Thirty-nine to each S.A. ammunition wagon.	Each box holds 660 caps.	
Brushes, Turk's head - - -	One for each rocket carriage - - -	Carried on the top. For cleaning carriages.		
„ water - - -	Eight or twelve per battery - - -			
Buckets, { sponge - - -	One for each Armstrong gun - - -	Hung under the trail.		
	leather { water, cavalry - - -		Two for each gun carriage and wagon, one for each cart.	
Burst. See Ammunition.				
Bushes. See Appurtenances.				
Camp kettles - - -		See Kettles		
Cans, tin, oil, lubricating - - -		One for each 40-pounder and 6-pounder; two for every other Armstrong gun.	To hold 2½ pints each; carried in the axletree boxes.	
Caps, percussion - - -		See Boxes, zinc.		
Caps, for sponges - - -		One per sponge - - -	On the sponges.	
Carcasses. See Ammunition.				
Carriages {	gun - - -	One per gun, and on war establishment, one spare per battery.	With limbers.	
	rocket - - -	One per battery; war establishment only.		
See also Wagon.				
Carts {	medicine or hospital - - -	One per battery, war establishment	In charge of medical department.	
	store - - -	Do.		
Cartouches, travelling carriage	{ canvas	One set for each ammunition limber and wagon body.	Do.	
	{ leather	Two for each 12-pounder and 9-pounder Armstrong ammunition limber.		
Cartridge, S.A. Ammunition - - -		See Boxes, wood.		
Case, quadrant, wood - - -		One for each rocket carriage.		
„ saw, leather - - -		One for each saw.		
„ vent piece, leather - - -		One for each 40-pounder gun.		

* The 40-pounder has three.

† The 12-pounder gun (smooth bore) has but one.

‡ All the wooden boxes except those for S. A. ammunition are charged with carriages complete.

GENERAL LIST OF ORDNANCE AND STORES

Name.	Usual Proportion for Field Service.	Remarks.
Clippers, portfire - - -	One for each Armstrong gun, 6-pounder excepted.	In the gun limbers.
Cloths, sponge - - -	Thirty-six for each Armstrong gun except the 6-pounder, which has twenty-four.	For cleaning the machinery; divided, for transport, between the gun and wagon limbers.
Coatings, for sponges - - -	One or two for each Armstrong gun.	In the axletree boxes.
Copper, breech. <i>See</i> Appurtenances, bush.		
Couples, for traces - - -	Two for each carriage.*	
Covers, canvas - - -	One with each forge, platform, and general service wagon.	Charged with carriage complete.
„ slot - - -	One for each 20-pounder and 40-pounder gun.	
Cutter, portfire. <i>See</i> Clipper.		
Cylinders, zinc, for tubes -	Various; according to the number of brass and friction tubes.	With Armstrong guns the brass tubes only are kept in these cylinders; they hold 100 each.
Drag ropes - - -	<i>See</i> Ropes.	
Drag shoes, spare - - -	<i>See</i> Shoe.	
Drag washer. <i>See</i> Washer.		
Elevating screw, spare - - -	Two per battery - - -	Carried by the spare gun carriage.
Eye, elevating. <i>See</i> Appurtenances.		
Fall, for gyn - - -	One with each gyn - - -	Charged with gyn complete.
Felling axe - - -	<i>See</i> Axe.	
Fid - - -	One for each platform wagon.	
Forge, complete with frame, &c.	One per battery - - -	Included with the forge wagon.
Funnels, shell, common - - -	One for each 20-pounder and 40-pounder ammunition limber.	For filling shells.
Fuze. <i>See</i> Ammunition.		
Grease - - -	14 lbs. in each grease magazine.	
Guns, Armstrong, complete - - -	Six per battery - - -	Only four, if 40-pounders.
„ smooth-bored - - -	Four per battery - - -	<i>See also</i> Howitzers.
Gyn, with tackle, trucks, &c. -	One for each 18-pounder and 40-pounder battery.	Carried in the platform wagon.
Hambro' line - - -	One skein for each subdivision -	In the first line of wagons.
Hammers, claw - - -	One per gun - - -	Attached to the gun carriage.
Handspikes, traversing - - -	Two per gun carriage - - -	On the trail.
„ common, 6-feet - - -	Five to each 18-pounder and each 40-pounder gun.	Ditto.
Heads, spare { rammer - - - } { sponge - - - }	One per gun or howitzer - - -	Usually in the gun carriage.
Hemp, undressed - - -	3 lbs. for each Armstrong battery -	For the cleaning rods.
Holdalls, leather - - -	One or two for each Armstrong gun.	To contain scissors, needles, common spikes, worsted, &c. Carried in the gun limbers.
Hooks, bill - - -	One for each field limber and each general service wagon.	Charged as "Tools, intrenching."
Hooks, reaping - - -	Four per subdivision; on the first line of wagons.	Charged as "Tools, intrenching;" carried on the wagon bodies.

* Carried by smooth-bore batteries in the middle limber boxes and by Armstrong batteries in various places.

FOR FIELD SERVICE.

Name.	Usual Proportion for Field Service.	Remarks.
Horseshoes (in sets of four, with nails).	<i>See Shoes.</i>	
<i>Howitzers</i> - - - -	<i>Two per battery</i> - - - -	<i>Accompanied by four guns; or, in the case of 32-pounders, four per battery, and no guns.</i>
<i>Implements for fuzes and shells, field service</i> {	No. 1 set -	<i>Carried loose in the gun or howitzer limbers.</i>
	No. 2 „ -	<i>For each gun, except the 18-pounder.</i>
	No. 3 „ -	<i>For each 24-pounder or 32-pounder howitzer.</i>
	No. 4 „ -	<i>For each 12-pounder howitzer and 18-pounder gun.</i>
<i>Implements for rockets</i> - - - -	<i>One set per rocket carriage</i> - - - -	<i>In a small box attached to the body.</i>
<i>See also Tools.</i>		
<i>Iron, for farriers</i> - - - -	<i>196 lbs. per battery</i> - - - -	<i>See Equipment of forge wagon.</i>
<i>Ironwork, set of</i> - - - -	<i>One per battery</i> - - - -	<i>Carried as shown at p. 222.</i>
<i>Irons, priming, field service</i> - - - -	<i>One set for each gun and howitzer</i> - - - -	<i>Consisting of 1 pricker, 1 drift, and 1 bit.</i>
<i>Jacks, lifting</i> - - - -	<i>One per subdivision†</i> - - - -	<i>On the limbers of the first line of wagons.</i>
„ <i>barrel</i> - - - -	<i>One for each 18-pounder gun</i> - - - -	<i>On the limber.</i>
„ <i>screw, Clerk's, with cap</i> - - - -	<i>One for each 40-pounder gun</i> - - - -	<i>The barrel jack improved.</i>
<i>Kettles, camp, flanders, large</i> - - - -	<i>Two for each gun carriage and wagon; one for each store cart.</i>	<i>Guns of position excepted; attached to the hind axletree.</i>
<i>Keys, for spring locks</i> - - - -	<i>One for each gun carriage, ammunition wagon, rocket carriage, general service, and store wagon.</i>	<i>Six spare locks and keys for the battery are also provided.</i>
„ <i>for shells and fuzes</i> - - - -	<i>Two for each Armstrong gun</i> - - - -	<i>In the gun limber.</i>
<i>Knives, laboratory</i> - - - -	<i>One for each gun</i> - - - -	<i>In the gun limber.</i>
<i>Ladders, packsaddle</i> - pairs	<i>Two with each S. A. ammunition wagon.</i>	<i>On the lid of the body.</i>
<i>Lanterns, tin</i> - - - -	<i>Two per battery</i> - - - -	<i>In the store wagon.</i>
<i>Lanyards, for friction tubes</i> - - - -	<i>Three per gun</i> - - - -	<i>In the gun limbers.</i>
<i>Leaders, rocket</i> - - - -	<i>Twelve for each 6-pounder rocket equipment.</i>	<i>In the limber.</i>
<i>Levers, wood</i> - - - -	<i>One for each 18-pounder gun</i> - - - -	<i>On the gun carriage.</i>
<i>Lifting jack. See Jack.</i>		
<i>Limbers, field, complete*</i> - - - -	<i>One for each gun and rocket carriage, and for each ammunition, S. A. ammunition, forge, and store wagon.</i>	<i>Each limber is equipped with a set of intrenching tools and a box (tin, half round) with 3 lbs. of grease.</i>
„ <i>heavy</i> - - - -	<i>One for each 18-pounder, or 40-pounder gun carriage.</i>	<i>Fitted with outriggers, and two pairs of shafts.</i>
<i>Linch-pin. See Pin.</i>		
<i>Line</i> {	<i>Hambro' - - - -</i>	<i>One skein per subdivision - - - -</i>
	<i>marline - - - -</i>	<i>Do. do. - - - -</i>
	<i>picket - - - -</i>	<i>See Rope.</i>
<i>Locks, with keys</i> {	<i>pad, iron, small - - - -</i>	<i>One for each axletree box, vice box (forge), match and implement boxes (rocket carriage).</i>
	<i>spring, spare - - - -</i>	<i>Six per battery - - - -</i>
<i>Lubricators</i> - - - -	<i>One for each round of Armstrong ammunition.</i>	<i>For ammunition boxes.</i>

* The term "ammunition limber" applies to a gun limber and to a gun ammunition wagon limber.
 † The S.A. ammunition wagons also carry one lifting jack each.

GENERAL LIST OF ORDNANCE AND STORES

Name.	Usual Proportion for Field Service.	Remarks.	
Magazines, grease - - -	Two for each ammunition, S. A. ammunition, and store wagon.	To contain 14 lbs. each, except for the 6-pounder Armstrong, which holds only 7 lbs. Packed in a wooden box, and charged with carriage complete.	
Marline - - - - -	One skein per subdivision - -	In the first line of wagons.	
Match, slow - - - - -	Three pounds per subdivision -	Do.	
Materials {	collarmakers' - - - - -	One set per battery; war establishment.	For repairs. Ironwork and spare parts of carriages, &c., are also issued.
	farriers' & smiths' - - - - -	Do. do.	
	wheelers' - - - - -	Do. do.	
Mauls, wood, common - - -	One for each ammunition, S.A. ammunition, and general service wagon.	For driving picket posts. Carried under the wagon bodies.	
Needles, laboratory, brass -	Two per gun - - - - -	In the gun limbers.	
Oil cans - - - - -	See Cans.		
Oil, Lucca - - - - -	Usually five pints per gun; issued in cans.	For Armstrong guns only, required for the machinery.	
Ordnance. See Guns; Howitzers.			
Outriggers - - - - -	Included with the platform wagon, and with heavy gun limbers.	For draught with 4 horses abreast.	
Padlocks. See Locks.			
Pan, drip - - - - -	Obsolete.		
Parts, spare, of {	guns - - - - -	See page 221.	Carried under the wagon bodies.
	carriages - - - - -	See page 221.	
Perches, spare - - - - -	Two per battery - - - - -	Charged as Tools, intrenching.	
Pickaxes - - - - -	See Axe - - - - -	Carried on the wagon bodies.	
Pickets, park* - - - - -	Four for each ammunition, small arm ammunition, and general service wagon.		
Picket lines - - - - -	One for each of the above wagons -	Carried on the wagon limbers.	
Pieces, vent. See Appurtenances.			
Pins {	Two spare ones per gun - - -	With the gun carriage.	
	keep. See Appurtenances. Do.		
Pincers, carpenters', large -	One for each carriage - - - -	With the couples for traces.	
Plugs {	One pair per gun - - - - -	On the gun carriage.	
	oil hole - - - - -	See Appurtenances.	
	shell - - - - -	See Ammunition.	
sight {	1 for each tangent sight - - -	For double-sighted guns.	
	trunnion - - - - -	2 for each 40-pounder gun.	
Pockets, tube (with straps, extra)	Two for each sub-division - - -	In the gun and wagon limbers.	
Poles. See Tents.			
Portfires. See Ammunition.			
Posts, picket,* short - - -	Six for each ammunition and S.A. ammunition wagon.†	Carried on the wagon bodies.	
Primers. See Ammunition.			
Prolongs, heavy or light ‡ -	One per gun - - - - -	Carried on the gun limber.	
Punches for vents - - - - -	Two per gun - - - - -	In the gun limbers.	
Quadrant, brass, with case -	One for each rocket carriage - -	On the top of the carriage.	

* Posts, picket, short, are now supplied instead of Pickets, park.

† 6-pounder Armstrong ammunition wagons excepted.

‡ The heavy prolong is used with the 9-pounder and heavier smooth-bore guns, the 32-pounder howitzer, and the 20-pounder and 40-pounder Armstrong guns.

FOR FIELD SERVICE.

Name.	Usual Proportion for Field Service.	Remarks.
Rammer - - - -	One for each 40-pounder Armstrong gun.	On the gun carriage.
Reaping hooks. (See Hooks) - Rings, copper. See Appurtenances.	Four per subdivision - - -	Charged as Tools, intrenching.
Rockets. See Ammunition.		
Rocket tube - - - -	One for each rocket carriage - -	Charged with the carriage complete; carried on the top.
Rod, cleaning - - - -	One for each Armstrong gun - -	On the gun carriage.
Rollers, shifting - - - -	One for each gun carriage with travelling trunnion holes.	Do.
Rope, picket - - - -	One for each ammunition* and S.A. ammunition wagon.	Carried on the limbers.
Ropes, drag, heavy or light, † pairs.	One for each ammunition limber, platform wagon, rocket carriage, and S.A. ammunition wagon.	
Saws, hand (cases charged extra)	One per subdivision - - -	On the wagon bodies, first line.
Scales, $\left\{ \begin{array}{l} \textit{brass} - - - \\ \textit{do. with socket} - - - \\ \textit{tangent} \left\{ \begin{array}{l} \textit{wood} - - - \\ \textit{do.} - - - \end{array} \right. \end{array} \right.$	One for each piece of brass ordnance One for each 18-pounder gun Do. do.	Also one spare per battery. Charged as Sights, Millar's.
Scissors, laboratory, small	One pair per gun - - -	In the gun limbers.
Screw, breech - - - -	One with each gun, but none spare.	
" elevating, spare - - -	Two per battery - - -	The one in use is charged with the carriage complete.
" traversing, spare - - -	One for each Armstrong battery, except the 9-pounder and 6-pounder.	Do. do.
Screws $\left\{ \begin{array}{l} \textit{for} \left\{ \begin{array}{l} \textit{Millar's} \left\{ \begin{array}{l} \textit{fixing} - - - \\ \textit{preserving} - - - \end{array} \right. \\ \textit{tangent scale} - - - \end{array} \right. \\ \textit{near} - - - \\ \textit{off} - - - \\ \textit{pairs, framed} - - - \end{array} \right.$	Five for each 18-pounder gun - Four " Two for each piece of brass ordnance Four per battery on war establishment, and three on peace ditto. Do. do.	One spare.
Shafts, spare $\left\{ \begin{array}{l} \textit{near} - - - \\ \textit{off} - - - \\ \textit{pairs, framed} - - - \end{array} \right.$	One per battery - - -	One in use and one spare. Carried underneath the wagon bodies.
Shells. See Ammunition.		
Shoes, drag, spare - - -	Two per battery; war establishment	With the spare gun carriage.
" horse (sets of 4 with nails).	Thirty sets in each ammunition and store wagon; ten sets in each rocket carriage, forge, S.A. ammunition, and general service wagon. In boxes of ten sets each.	The total number provided is enough to keep the horses of the battery properly shod for three months at least.
Shot. See Ammunition.		
Shovels - - - -	One for each limber and each general service wagon.	Charged as Tools, intrenching.
Sights, Armstrong's. See Appurtenances.		
Sights, Millar's, $\left\{ \begin{array}{l} \textit{fore} - - - \\ \textit{hind} - - - \end{array} \right.$	One for each 18-pounder gun. Do. do.	
Sling, for gyn - - - -	Two for each gyn complete - -	Of 6-inch rope; 11 feet long for 40-pounder guns.

* 6-pounder Armstrong ammunition wagons excepted.

† The heavy drag ropes are supplied only to the ammunition limbers of batteries of position and to platform wagons.

GENERAL LIST OF ORDNANCE AND STORES

Name.	Usual Proportion for Field Service.	Remarks.
Slow match	A few pounds per gun. <i>See</i> Ammunition, match.	
Spades	One spade is issued with each shovel	Charged as Tools, intrenching.
Spanners, M'Mahon's	One for each gun	On the gun carriages.
Spikes, common	Two per gun	In the gun limber.
" <i>spring</i>	One per gun or howitzer	Do.
Splinterbars, spare	Four per battery on war establishment; two on peace ditto.	Charged as Bars, splinter; carried under the wagon bodies.
Sponges	Two for each smooth-bore gun; one with each Armstrong gun.	On the gun carriages.
Steel, for farriers	10 lbs. per battery	In the forge wagon.
Sticks, portfire	One for each Armstrong gun; two for each smooth-bore gun.	On the gun carriages.
" rocket	One for each rocket.	
lifting projectiles	One for each 40-pounder projectile	With the projectiles.
Side arms and stores	Included with carriages.	
Straps, for tube pockets	One for each pocket.	
vent-piece case	One for each case.	
fuze boxes	Two for each subdivision	In the gun and wagon limbers.
Swingletrees	Three for each heavy limber; five for the platform wagon, and one for every other carriage.	Strapped to the splinter bars.
<i>Tangent Scales. See Scales.</i>		
Tents, with poles, &c., complete.	Each gun ammunition wagon carries four.	Each tent is in a valise, the pins and a mallet are in a bag, and the pole is carried loose, in two pieces.
Thumbstalls	Two per gun or howitzer.	
Tins. <i>See</i> Boxes.		
Tompion, with lanyard	One for each 40-pounder and 20-pounder Armstrong gun.	In the muzzle of the gun.
Tongs, for lifting Armstrong shells.	Two pairs for each subdivision	6-pounders and 40-pounders excepted. Carried in the gun and wagon limbers.
collarmakers'	Three sets per battery.	
Tools	facing - - - - - One set per battery. farriers' and shoeing smiths' - - - - - Ditto. smiths' (carriage) - - - - - Ditto. special - - - - - Ditto. wheelers' - - - - - Ditto	Saddletree makers' included.
Tools, intrenching.	axes, helved { felling - - - - - One of each to every limber and general service wagon, excepting the reaping hooks, four of which are issued to each ammunition wagon, first line only. hooks { bill - - - - - reaping - - - - - shovel - - - - - spade - - - - -	
Trays, wood (for tools)	Three for each forge and each store limber.	Charged with the wagon complete.
Trucks, wood, for gyns	Three for each gyn	Charged with gyn complete.
Tubes, brass, and friction. <i>See</i> Ammunition.		
Tube, for laying rockets	One for each rocket carriage	Charged with the carriages complete; carried outside.
Tube pockets	<i>See</i> Pocket.	
Vent-pieces	One in use and two spare for each gun.	
Veterinary instruments - sets		Supplied by the Veterinary Department.

FOR FIELD SERVICE.

Name.	Usual Proportion for Field Service.	Remarks.
Vice, portable, small - - -	One for each forge wagon.	
Wads. <i>See</i> Ammunition.		
Wad-hooks - - -	<i>One for each gun or howitzer.</i>	
{ gun ammunition - - -	One per gun on a peace establishment, with additional ones on a war establishment, according to the calibre.	The additional wagons are the "first reserve;" <i>see also</i> p. 133.
{ small arm ditto - - -	Six per battery, field brigades - - -	{ War establishment only; and not
{ forge - - -	One " horse " - - -	{ for reserve batteries.
{ general service - - -	One per battery.	
{ platform - - -	Two per battery; war establishment	No limber.
{ store - - -	One for each 18-pounder and 40-pounder battery.	No limber.
{ washers, drag, spare - - -	One per battery.	
{ washers, drag, spare - - -	One with each carriage.	
{ wheels,* for guns and wagons	One per subdivision - - -	Carried on the first line of wagons.
{ spare	Each general service wagon is provided with one.	
{ worsted, skeins of 2 oz. each - - -	One skein in each gun limber - - -	For making up cartridges.
{ wrench, knock up - - -	One with each spare gun carriage.	
{ " for Millar's sights - - -	One for each 18-pounder gun.	

* Batteries of position (18-pounder and 40-pounder) are supplied with additional wheels.

Pieces of Ordnance usually selected for Sieges.

Classes of Ordnance required. The regular attack of a fortified place generally entails the employment of more than one class of ordnance. Shot guns are necessary to destroy solid defences, disable the enemy's artillery, and to batter or make breaches in revetments. Shell guns or howitzers are less efficient for that nature of service, but are better adapted for ricochet fire, and for damaging earthen parapets. Mortars are particularly useful in destroying magazines and any other buildings or defences which are protected by their situation against horizontal fire.

Calibre and weight. In the early stages of a siege it is desirable to employ the most powerful pieces in each class, but when the operation is so far advanced that batteries can be established within short range of the enemy's works, smaller pieces may be substituted with advantage.

As quickness of movement is not essential in siege operations, the weight of the pieces of ordnance which may be used is limited only by the available means for transporting them to the scene of action. In the Crimea, for instance, where the trenches were only a few miles from a good harbour, 10-inch guns, 68-pounder guns, and 13-inch mortars were employed; whereas a battering train sent in 1860 to China, where the nature of the roads was almost unknown, and the distances to which it might have to be moved could not be foreseen, consisted of 8-inch guns, 24-pounder guns, and 8-inch mortars.

Selection. It rests with the Secretary of State for War* to determine the number and nature of the ordnance to be sent out, in readiness for any siege that may be undertaken, and with the Commander-in-Chief to draw up a detail of the ammunition and stores to be furnished with them. The whole of this matériel, or "siege train," is given into the charge of the principal military store officer with the army, and is afterwards issued to the commanding officer of artillery, at the place to be attacked, according as it is demanded by him. The detail should specify one proportion of ammunition and stores to accompany the guns, and another to be kept in reserve to replace the expenditure of the first.†

Pieces now employed. The guns which have lately been, or are likely to be, most commonly used are the following:—

* The Director of Ordnance is charged with the duty of advising the Secretary of State on these questions; he is also responsible for the due preparation of the ordnance and stores composing the train, and for the maintenance of such reserves as may be demanded by the Deputy Adjutant General, R.A. See Circular, 24th June 1862.

† The necessary demands for the matériel specified in the detail are prepared by the Deputy Adjutant General, R.A., and are examined by the Director-General of Ordnance before being finally approved.—*Ibid.*

MATÉRIEL FOR SIEGE TRAINS. 237

Siege Ordnance.

Name.	Nominal Length.	Weight.	Range.		Remarks.
			10°.	Extreme.	
	ft. in.	cwts.	yds.	yds.	
<i>Rifled (Armstrong's).</i>					
20-pounder - - -	8 0	16	3,250	4,000	} Also used as guns of position.
40-pounder - - -	10 0	34	3,800	4,000	
<i>Shot Guns.</i>					
18-pounder - - -	8 0	38	2,310	2,310	} Also used as guns of position.
24 " - - -	9 6	50	2,435	2,500	
32 " - - -	9 0	50	2,620	2,900	
<i>Shell Guns.</i>					
8-inch - - -	8 0	52	2,600	2,900	Recently substituted for howitzers.]
<i>Mortars.</i>					
13-inch - - -	3 3	36	—	2,900	} Used to annoy parties of men, and not to destroy works.
10-inch - - -	2 7	18	—	2,400	
8-inch - - -	2 1	9	—	2,000	
5½-inch, royal - - -	1 3	1½	—	600	
4½-inch, Coehorn - - -	1 1	½	—	600	

A complete detail for 105 pieces of smooth-bored ordnance, consisting of 45 shot guns, 30 shell guns, 15 large and 15 small mortars, has been drawn up in anticipation of any requirement, and may be seen at page 262, an abstract of it is also given at page 30. Such portion of it as might be needful for a siege would be forwarded by the Military Store Department to a "field arsenal" as near to the trenches as circumstances would permit; the rest would be kept at the base of operations or be established at intermediate reserve depôts. The field arsenal and all other depôts are in charge of the Store Department.

Train of 105 pieces.

Parks or field arsenals.

Guns mounted in trench batteries are placed not less than 18 feet apart; mortars may be within 15 feet of one another. Field pieces are sometimes kept in the trenches ready to be used against sorties of the garrison, &c., but they may be furnished from the field artillery.

Space.

Field pieces.

Siege Artillery at various dates.

Twenty-four pounders have been the most used as battering guns; they were sent to Holland in 1692,* were used at the siege of Menin in 1706,† and were included in all the trains sent from England to the Peninsula. They were adopted for the two first trains sent to the Crimea, but in 1855 they were replaced by 32-pounders for that particular occasion. For shell firing, 10-inch howitzers, 8-inch howitzers, and 68-pounder carronades were used in Spain,‡ and 8-inch guns in the Crimea.

Shot guns.

Shell guns.

At the great siege of Lille, by the Duke of Marlborough and Prince Eugene, there were 120 cannon and 80 mortars in position: § in 1813 three trains were sent up to the siege of St. Sebastian, each composed of 28 pieces, viz., fourteen 24-pounders, six 8-inch howitzers, four 68-pounder carronades, and four 8-inch mortars; six other 24-pounders were borrowed from the navy, and six 18-pounders were furnished by

Numbers.

1708.

1813.

* R. A. Institution papers.

† Marlborough's despatches.

‡ Sieges in Spain, by Sir John Jones, R.E.

§ Atlas der merkwürdigsten Schlachten, von Fr. v. Kausler.

Siege Ordnance.

1854. the field artillery ; the place was however taken without employing more than 59 at any one time. For the siege of Sebastopol four different trains, amounting to 178 pieces, were sent out from England ; as many more were supplied from the ships ; the French, whose forces were more numerous, contributed a proportionate number, and there were altogether 1,756 pieces employed against the place.

Artillerymen.

Proportion of men. The proportion of men attached to a siege train should allow three reliefs for working the guns, and additional men for making up ammunition, arranging or preparing stores, and various other duties. A siege train of 105 pieces as detailed above would therefore need—

For serving 90 heavy guns and mortars, at ten men for each piece, in three reliefs, -	2,700
Fifteen small mortars, three men each, three reliefs	135
Other duties - - - -	about 65
	2,900

26 batteries to 105 pieces. Twenty-six batteries of artillery with the establishment given at page 30 would furnish 2,964 non-commissioned officers and men for this service ; consequently they would include a reserve of 64, which is as little as ought to be allowed. At one period of the siege of Sebastopol there were 158 pieces of ordnance in position,* and only 30 batteries of artillery to work them ; consequently, when reduced in numbers by sickness and casualties, they could not furnish more than two complete reliefs,† and suffered in health from over work.

Care and Transport.

Embarkation and charge. The complete train, having been given into the charge of the Superintendent of Stores, is put on board ship for conveyance to the base of operations.

If the general in command think fit to transfer a portion of the train from the place of disembarkation to a more convenient dépôt, the officer commanding the artillery will furnish the Superintendent of Stores with a detailed proportion of the stores to be moved, and that officer will have them moved accordingly.

In like manner, if a siege is to be undertaken, the officer commanding the artillery will demand such guns, ammunition, and stores as he requires for immediate service, and these will be handed over to the artillery at such place, in the vicinity of the fortress to be attacked, as may be determined upon. The transport to that place will be intrusted to the Superintendent of Stores, and the conveyance thence to the trenches will be conducted by the artillery. If the nature of the country renders it necessary that experienced persons should accompany the train to extricate the heavy pieces of ordnance from difficulties which may occur on the march, working parties of artillerymen can be obtained by the Store Department, but the artillery officers will not have to take charge of any stores beyond what are required for immediate use in siege operations. The care and conveyance of the whole matériel from the place of disembarkation to the field arsenal will rest with the Principal Store Officer.

* Besides naval guns manned by sailors.

† Lectures on Artillery, p. 221.

Siege Ordnance.

The means of transport are organized at the scene of operations, and the cattle employed for the purpose are such as the resources of the country will afford. Nothing more than steady draught being required on the march, recourse may be had to mules, oxen, or any sort of animal that will draw; the team allowed to each load must be regulated by the state of the tracks, and the number of teams by the length of the journey; consequently any general estimate is impossible.* The removal from the parks to the trenches should be effected by military drivers and horses, as any want of discipline, skill, and training might cause serious delay in the execution, and perhaps endanger the success of the operation. Generally speaking, the horses and drivers belonging to the additional wagons of the field artillery serving with the covering force would be available for this service.

Transport.

On the march.

To the trenches.

To batteries advanced in front of the first parallel the guns and stores must in many cases be drawn by parties of men; fifty men may be allowed to a 24-pounder, on a travelling carriage, and, generally, twelve or fourteen men may be substituted for one pair of horses.

By men.

Siege Carriages.

Guns may be conveyed from the base of operations to the field arsenal, and thence to the batteries, by any carriages or means of transport that are most convenient, and when put into position they can be worked on common garrison carriages. But garrison carriages would themselves require some transport carriages to bring them to the trenches, and the use of them would entail additional labour in getting the pieces ready for action. It is therefore usual to mount pieces of ordnance for siege operations on carriages which serve equally for travelling and firing purposes.

These travelling carriages are of the same construction as the 40-pounder and 18-pounder for field service, but they are equipped only with the side arms and such stores as may be required for exigencies on the march; the limber boxes are removed as unnecessary, the ammunition being more carefully secured in magazines, for which the cases and boxes used in garrison service are better adapted. The carriage is of different size and strength for each nature of gun, but the same limber may be used for all. Block trails for siege gun carriages did not supersede bracket trails until 1860.

Travelling gun carriages.

Travelling carriages for mortars have been but lately introduced: the first of the kind, for the 8-inch, was sent on trial to China in December 1859, and the system was extended the following year to the 10-inch and 13-inch mortars. The 8-inch and 10-inch have a sort of trench cart as their limber, able to carry a proportion of shells; the 13-inch mortar, with its bed, is too heavy to allow of any additional weight being carried, it has, therefore, an ordinary siege limber. The carriage of each is a modified "bed," with an axletree for the wheels, and a trail to connect it with the limber; when the mortar is prepared for action the wheels and limber are removed. The 8-inch mortar, when limbered up, is turned over on its trunnions and pointed to the front, so as to throw the weight more between the wheels.

Mortar carriages.

* The Duke of Marlborough calculated that he should want 16,000 horses to convey the siege train to Lille; he seems to have generally estimated 20 horses for each 24-pounder gun, and three or four for each cartload of ammunition and stores. (See his despatches for the years 1708 and 1706.)

Carriages.

Shell cart
limber.

The limber fitted as a shell cart has moveable sides and two single reversible shafts, The interior space is 3' 8" by 2' 11", and there are five moveable cleats, any of which can be fixed to the bottom of the cart in such positions as will best adapt it for carrying projectiles of different calibres. The cleats not in use are strapped to the sides. The number of shells that can be carried and the number of cleats employed are as follow :—

13-inch, 1 cleat, 6 shells.		32-pounder, 4 cleats, 35 shells.
10-inch, 2 " 12 "		24-pounder, } 5 " 72 "
8-inch, 3 " 20 "		5½-inch - }

Small mortar
beds.

The Royal and Coehorn mortars, mounted on wooden beds, are light enough to be carried by hand for short distances, and may be placed on any convenient wagon or cart for further transport.

Howitzer car-
riages.

Howitzers having been superseded by shell guns for siege trains, their travelling carriages fall into disuse, but they are still occasionally to be met with. They differ from gun carriages in their construction. They are shorter, and have a perch trail, with two brackets; on each bracket there is a friction lever, which can be pressed on the nave of the wheel to check their recoil, and under the ends of the brackets there are two iron trucks, which keep the end of the trail off the ground and facilitate the running up of the carriage after firing. The howitzer carriages have no travelling trunnion holes.

Additional
carriages.

The additional carriages furnished to a siege train consist of carriages for the transport of dismounted ordnance, wagons and carts for the conveyance of ammunition, stores, and materials, and forges for executing repairs. The proportion in which they are supplied to a train of 105 pieces may be seen at p. 30.

From the experience at Sebastopol it appeared that the field forge was hardly adequate for keeping heavy gun carriages in repair, and that the trench cart, which is not well adapted for horse draught, is the only carriage strong enough to be much used for conveying 13-inch shells. The platform wagons also were found hardly substantial enough, and generally the means of transport, both in cattle and matériel, was insufficient throughout the siege.*

The various wheels and axletrees are shown at p. 383.

The various shafts are given at p. 382: for some of the carriages they are single and for others they are framed together. Shell cart limbers have single shafts made so as to be interchangeable with one another. "Bullock poles," adapted to the yokes by which oxen are usually harnessed, are furnished in case that manner of draught should be employed. The shafts of trench and hand carts are fixed to the beds, and battens of wood, called slats, can be placed across them for the more convenient application of man power. Small drug carriages have handles.

Platforms.

Platforms are absolutely necessary for working guns and mortars in siege batteries; without them the wheels or beds would soon sink into the ground, and the efficiency of the fire would be much impaired.

Common plat-
forms.

There are various kinds of portable siege platforms. The one described as the common platform consists of sleepers, planks, and the necessary fastenings. The sleepers are laid in the ground, and are of such length as the intended size of the platform requires. The planks,

* Official account of the artillery operations.

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Platforms.

which rest upon them, must be at least 2 inches thick for guns, and 3 inches thick for mortars ; they have a "riband" or strip of wood laid over their ends on each side, and are fastened to the sleepers, either by bolts and nails, or by racksticks and lashings. Gun platforms have also a piece of wood called a "hurter," to prevent the carriage wheels from running off the front of the platform.

Col. Alderson's platforms are made with baulks of wood, cut to certain dimensions, which serve both as sleepers and planks. When they are used as sleepers for gun platforms, two baulks are placed side by side, overlapping about 3 feet, so as to give the requisite length. The overlapping parts are fastened by two wooden dowells, and have also iron shoes screwed to them at the places where the dowells are inserted. The baulks used as planks are bolted down to those used as sleepers ; there are no ribands. Alderson's.

Lieut.-Col. Clerk's platforms are cut out of a log of fir and can be packed into that form for travelling. They consist of two side pieces, 17 feet long, to receive the wheels, and a centre piece for the trail, the whole resting on two transoms and two sleepers ; they weigh 13 cwt., and can be laid in a few minutes. Madras platforms consist also of side pieces, trail pieces, and separate transoms or blocks, but their construction is not so simple. In the Crimea they were found useless in wet weather from the difficulty of traversing them ; they are only suitable for a hard soil, and must be laid carefully, with much time and labour.* Clerk's.
Madras.

Details of the dimensions and weights of portable platforms are given at p. 386. The platforms included in the present detail for siege equipments are Lieut.-Col. Clerk's for guns, and Col. Alderson's for mortars.

Ammunition.

The ammunition for a siege is estimated at a certain number of rounds per gun, or rather for each piece of ordnance, according to the probable resistance that will be encountered. A proportion of this quantity is placed in the battery magazines before opening fire, an equal proportion is kept in the field arsenal to provide for the daily consumption in the batteries, and further reserves are organized according to convenience. The detail given at page 262 is founded on the supply of 500 rounds for each piece of ordnance. Proportion.

Cartridges issued to the batteries would be ready filled and packed in metal-lined cases, but whilst in charge of the Store Department they might be empty, the powder for them being kept in barrels. Shrapnel shells and any other projectiles riveted to wooden bottoms must be issued in the boxes provided for that purpose (see p. 404.) Any sort of projectile may be used, but the first supply consists of shot and shell, issued in the following proportions :—

	Shells.		Shot.			Total.
	Common.	Shrapnel.	Solid.	Case.	Grape.	
Shot guns (24-pounders)	65	65	300	35	35*	500
Shell guns (8-inch) -	200	85	85†	65	65	500
Mortars - - -	500	-	-	-	-	500

* Artillery operations.

† Common shells used as shot.

Ammunition.

Bottoms for the common shells are issued loose, strung on iron rods. Papier maché wads are also issued separate. Spare loading hole plugs are provided in the same proportion as for field service, viz., 5 per cent. Time fuzes are provided at the rate of 1 per shell, and 20 per cent. spare. There is also one percussion fuze to every three common shells. The friction tubes are 20 per cent. in excess of the number of rounds, and there is 1 common (brass) tube to 10 friction tubes.

Eight-inch and larger mortars have a few carcasses, light-balls, smoke-balls, and rounds of 1 lb. shot, in addition to the shells. There is also a proportion of loose powder, portfires, signal rockets, slow match, &c., as shown at page 262. 24-pounder shell and carcass rockets are sometimes employed.

Magazines.

The shelter necessary for 43 cases (holding enough cartridges for one day's heavy firing from five guns) may be provided by making a triangular lean-to magazine, 18 feet long, with a base and perpendicular of $6\frac{1}{2}$ feet; three tons of timber, and a working party of 15 men, would suffice for its construction.* Rooms in which shells can be filled under cover are always desirable, and are necessary if the battery is in an exposed position; boxes of projectiles can be kept in them.

Shell rooms.**Supply of batteries.**

The ammunition is sent from the parks to the trenches in wagons and carts drawn by horses, or by men if necessary. In the trenches hand carts and hand barrows are generally most convenient; in the absence of them, carrying straps, which can be made out of a raw hide, have been found very useful. General service wagons are best suited to boxes or cases, and trench carts to loose shot and shells; a common limber can easily be fitted to carry a few projectiles by removing its boxes and fitting some temporary sides to its bed. The "spouting" used in the Royal Arsenal for rolling spherical projectiles from one place to another may sometimes be found useful for transferring them short distances in siege operations. Twelve "lengths" were sent to China in 1859, each length consists of 12 feet and is supported at intervals of 12 feet (or 6 feet if the work is heavy) on posts gradually diminishing in height. If a road has to be crossed the spouting is brought down to a level with it and carried up again on the other side; men are stationed at intervals to send the projectiles along.

Quantity.

500 rounds per gun must be considered only as a basis for the first provision, or for the reserves by which the necessary supply is kept up. The total quantity will depend on the rate of fire and the length of the siege; iron guns may be fired upwards of a hundred times a day for some length of time without injury, and it has been calculated that ten 24-pounder guns, at 500 yards range, must fire 1,060 rounds each to make a practicable breach, 100 feet wide, in a good escarp. If the guns were on the crest of the glacis 106 rounds apiece would suffice, but they could not be advanced so close without previously reducing the fire of the place. The experiments made with smooth-bored and Armstrong guns against Martello towers, in 1860 and 1861, showed that the latter ordnance would produce at 1,000 yards range a far greater effect than the former, without expending more than one-third the same weight of projectiles, and one-fifth the quantity of powder.

Examples.

At the siege of Flushing, in 1809, the 24-pounders fired in one day and a half 205 rounds each; the *average consumption per gun*

* R. A. Field Book, page 207.

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Ammunition.

at the four principal sieges of the Peninsular war is stated to have been :—*

	Shells.		Shot.		Total.
	Common.	Shrapnel.	Round.	Grape.	
24-pounder gun - -	- -	400	726	500	1,626
18-pounder gun - -	- -	3	763	31	797
8-inch howitzer - -	} 162	45	- -	- -	207
68-pounder carronade - -		- -	- -	- -	
5½-inch howitzer - -	32	82	- -	- -	114
10-inch mortar - -	235	- -	- -	- -	235

The total number fired at Sebastopol was in proportion to the length of the siege and the vast number of ordnance employed; the expenditure for the guns served by the Royal Artillery only at the end of the first three days, before the firing began to slacken, was,—

24-pounders	- 8,204,	equal to 431 per gun.
8-inch guns	- 3,925	„ 280 „
10-inch mortars	552	„ 55 „
Total	- 12,681	„ 4,227 per day.

Rockets - - - 34

The fourth day increased the total expenditure from the 24-pounders to an average of 515 per gun, after that date the cannonade was considerably diminished in rapidity.

In course of the fifth bombardment, when the number of ordnance was much greater, 9,917 rounds were fired in one single day.†

Stores, Tools, and Materials.

The stores furnished to a siege train consist mainly of those which are required for the service of ordnance and preservation or transport of ammunition. They include also furnaces for heating shot, gyms for mounting and dismounting ordnance, and various articles for miscellaneous purposes: a few remarks on the importance they possess are given at page 277. Many of the articles are issued in proportion to the number of ordnance and quantity of ammunition, as may be seen at pages 246 and 254; for others there is no precise rule, and in either case the commanding officer of artillery would be guided by the immediate requirements of a siege, rather than any general rule, in making his demand on the Superintendent of Stores. Tools are issued for artificers (about six sets of each), and various materials are provided for repairs. Wood and raw materials are generally to be obtained in the country, but the Crimea furnished no such resources, and consequently the supply proved inadequate.

* R. A. Field Book, 1st edition, page 184.

† Artillery operations, official account.

EQUIPMENT OF A 24-POUNDER GUN ON A TRAVELLING CARRIAGE.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.	
<i>Gun.</i>		£ s. d.	cwts.qrs.lbs.		Given under the head of garrison service.	
24-pounder, of 9 feet 6 inches and 50 cwt. - - -			50 0 0	1		
Sights { fore (dispart), with 2 screws hind (brass scale, and socket), with 2 screws - tangent scale, wood -			0 0 2 0 0 2½ 0 0 0½	1 1 1		
<i>Carriage.</i>						Tonnage, 7 tons.
Block { limber, ^a 10 cwt. - - } trail { carriage, 25½ cwt. - }		80 17 6	35 1 14	1		
<i>Platform.</i>					Size, packed, 17' x 1' 8'' x 1' 4''; bulk, 40 cubic feet.	
Col. Clerk's pattern ^b - -		13 9 0	13 0 2	1		
<i>Ammunition.</i>			lbs. oz. *			
Bottoms, wooden, (loose) - -			0 9	70		
Carcasses, ^c filled, and fixed - -			19 4	—		
Cartridges ^d { calico, { common shell burstern { shrapnel, filled flannel, service charge, 8 lbs. - - -			0 0½ 0 2½ 0 2	65 65 500	M. R. powder.	
Fuzes { percussion (Pettman's) time { common - - - shrapnel - - -			0 7 0 1½ 0 0½	20 80 80		
Match, slow - - - lbs.			1 0	40		
Plugs, spare, loading hole, large -			0 0½	3		
Portfires - - - -			0 5½	65		
Powder, L G, loose - - lbs.			1 0	4053	For filling cartridges.	
Rivets, for bottoms - - -			0 2	70		
Shells, with plugs { common - - - shrapnel, ^e fixed - - -			16 0 20 11	65 65	Bursting charge, 13 oz. 40 dra.	
Shot { case ^f - - - - - grape ^g - - - - - solid - - - - -			25 7 26 0 24 0	35 35 300		10·9 inches long. 7·6 " "
Tubes { brass - - - - - friction - - - - - grummet - - - - -			0 0½ 0 0½ 0 5	60 600 225		
Wads { junk - - - - - papier { fuze hole - - - maché { loading hole, large			1 2 0 0 0 0	75 65 65		

^a The limber has no boxes.

^c 24-pounder carcasses are manufactured, but are not issued to this gun for siege operations.

^d Issued empty and filled when required.

^f Contains 46 balls, 8 oz. each.

^b A common or Madras platform may also be used.

^e Contains 110 musket bullets, 1 oz. each.

^g Contains 9 balls, 2 lbs. each.

* The numbers in this column show the proportionate supply for 500 rounds of ammunition; the principles on which they are estimated may be seen in the general alphabetical list which follows.

EQUIPMENT OF A 24-POUNDER GUN ON A TRAVELLING CARRIAGE.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
		£ s. d.	lbs. oz.		
<i>Stores.*</i>					
Boxes, wood { for 6 grape, or case -	-		26 8		21" x 13" x 11".
{ for 6 shells -	-		20 12		21" x 13" x 9½".
Case, leather, cartridge (No. 5)	-		3 5		
Fid, wood -	-		17 0		
Gauges, ring {	5·62 inch -	-	2 15		
	5·584 inch -	-	2 14		
	5·57 inch -	-	2 13		
	5·52 inch -	-	2 12		
Heads, spare {	rammer -	-	1 10		
	sponge -	-	3 5		
Ladle, copper, with 8½-foot staves	-		15 11		
Punch, for vent (No. 4)	-		0 1½		
Rammers, with 11-foot staves	-		8 8		
Scraper, shell -	-		0 9½		
Spike, spring -	-		0 1½		7·8 inches long.
Sponges, with caps -	-		10 3		
Stave, sponge, spare -	-		6 14		11 feet long.
Wadhook, with 9½-foot stave	-		9 0		

* Those here detailed are specially adapted to this gun ; for the entire supply, see the general list which follows.

NOTES.

The gun carriage conveys the side arms and handspikes, the rest of the stores are carried by the wagons. The gun and carriage complete weigh about 88 cwts., and may be drawn by cattle of the country in such teams as the state of the roads renders necessary. A bullock pole is provided, to be used with common yokes for oxen. A 5-foot wheel, weighing 4½ cwts., is used for the carriage, and a heavy field wheel for the limber. Thirty non-commissioned officers and men are estimated for the service of each gun ; allowing three reliefs of 1 non-commissioned officer and 9 men each.

The present block trail was substituted for the bracket trail in 1860 ; the latter weighed 36½ cwts., and its bulk for transport is 6 tons.

The platform of Col. Clerk's pattern (described at page 241) can be laid in a few minutes ; Madras and common platforms can also be used.

A metal-lined case holds the following number of filled cartridges, according to their contents :—14 of 8 lbs., 130 of 13 oz., and 950 of 30 drams. The total weight of one round of ammunition, according to the projectile employed, is as follows :—Shot, 32 lbs. 7 oz. ; hot shot, 32 lbs. 6 oz. ; common shell, 25 lbs. 12 oz. ; shrapnel shell, 29 lbs. 1 oz. ; carcass, 28 lbs. ; case, 33 lbs. 9 oz. ; grape, 34 lbs. 2 oz.

The gun can be mounted or dismounted from its carriage by a 16-foot gyn.

The following articles are essential for the service of the gun, others being only occasionally required :—Sights, side arms, priming irons, punch, cartridge case, fuze box, fuze and shell implements, lanyard and tube pocket. When hot shot are fired there must be a furnace, set of gauges, and tub ; when portfires are used, a linstock, clipper, and portfire stick have to be added.

EQUIPMENT OF A 24-POUNDER GUN ON A TRAVELLING CARRIAGE.

The general stores are not prescribed for siege service with the same minuteness as for field service, nor are they apportioned to particular carriages in the same systematic manner, but the following list will serve as a guide to the perfect equipment of any siege gun

Name.	Proportionate Number.	Remarks.
Barrels, budge - - -	1 to 2 guns - -	For carrying loose powder, &c.
Barrows { hand - - -	1 per gun - -	For carrying powder cases, &c.
{ intrenching - - -	1 to 2 guns.	
Baskets, half-bushel - - -	2 per gun.	
Blocks, tackle (various sizes) - - -	1 of each size to 10 guns -	For various operations.
Bottoms, wood, loose - - -	1 for each common shell, and 10 per cent. spare.	Implements are issued for fixing them; the shrapnel shells are ready fixed.
Boxes, tin fuze { black (common) - - -	1 per gun - -	} These are worn in serving the gun, a strap for each is charged separate.
{ blue (shrapnel) - - -	1 " - -	
Buckets, water, cavalry pattern - - -	3 " - -	One in use, the rest spare.
Candles - - - lbs.	3 " - -	Required in magazines.
Caps, sponge - - -	1 per sponge - -	For preserving the sponge head.
Capstans, crab - - -	1 to 10 guns.	
Carriages, gun, travelling, complete -	1 per gun and 10 per cent. spare.	Spare parts are issued in proportion to the number of carriages, as shown at the end of this list.
Carriages, drag, large and small - - -	1 of each to 10 guns - -	With a proportion of spare parts.
Carts, complete { hand - - -	1 to 5 pieces of ordnance	} With a proportion of spare parts for each.
{ store - - -	1 to 25 " "	
{ trench - - -	1 to 5 " "	
Cartouches, leather, large - - -	1 per gun.	
Cartridges { calico, { common - - -	1 per shell - -	} Issued empty, filled when required. These are always issued filled.
{ bursters, { shrapnel - - -	1 " - -	
{ flannel, charge - - -	1 for each round - -	Issued empty, filled when required.
Case, leather, cartridge - - -	1 per gun.	
Cases, metal-lined - - -	Indefinite - -	For filled cartridges.
Clippers, portfire - - -	1 to 3 guns.	
Cloths, hair - - -	1 per gun - -	Required in magazines.
Compasses, pairs, with sweeps - - -	1 to 8 guns.	
Fids, wood - - -	1 to 3 guns.	
Fleecy hosiery { coatings - - -	1 per gun - -	} For covering sponge heads.
{ for sponges { crowns - - -	3 to 2 guns - -	
Furnace, hot shot - - -	1 to 5 guns - -	For the necessary utensils, &c., see p. 348.
Fuzes { percussion, Pettman's - - -	1 to 3 common shells - -	} Used with common shells only. 3½ inches long; burn 10 seconds.
{ time { common - - -	} 1 per shell and 20 per cent. spare.	
{ shrapnel - - -		
Gauges, ring, shot or shell - - -	1 set to 10 guns - -	High and low gauges.
Gyns, triangle, 18-feet complete - - -	1 to 10 guns - -	2 spare levers and 1 spare truck per gyn; 1 spare windlass to 5 gyns.
Hammers { claw - - -	1 per gun.	
{ sledge, 12 lbs. - - -	1 to 10 guns.	
{ wrench, or spanner - - -	1 to 2 "	
Handspikes, common, 6-feet - - -	5 per gun and some spare.	
Harness, heavy, men's - sets	2 per gun.	
Heads, spare { rammer - - -	1 " - -	
{ sponge - - -	1 " - -	
Horns, powder - - -	1 to 4 guns.	
Implements, shell and fuze. { No. 1 set - - -	1 to 25 guns - -	For rectifying fuze holes, if damaged.
{ 2 " - - -	1 to 5 " - -	For fixing bottoms.
{ 3 " - - -	1 to 2 " - -	For filling shells.
{ 4 " - - -	1 to 2 " - -	For preparing fuzes.

EQUIPMENT OF A 24-POUNDER GUN ON A TRAVELLING CARRIAGE.

Name.	Proportionate Number.	Remarks.		
Irons, priming, garrison - sets	1 per gun - - -	1 pricker, 1 drift, 1 bit.		
Jacks { lifting - - -	1 per wagon.			
{ screw, Clerk's pattern - - -	1 per siege carriage.			
Keys, copper - - -	1 to 5 cases - - -	For metal-lined cases.		
Knives, laboratory, small - - -	1 to 3 guns.			
Ladles, copper - - -	1 to 3 " - - -	For loading with loose powder.		
Lanterns - - -	See p. 263.			
Lanyards, friction tube, garrison - - -	2 per gun - - -	Of tarred line, 8 feet long.		
Lever, wood, 8-feet - - -	1 " - - -			
Line, Hambro' - - -	1 skein per gun.			
Linstocks, with cocks - - -	1 to 3 guns - - -	For holding lighted slow match.		
Machine for venting guns - - -	1 for the whole train.			
Marline - - -	1 skein per gun.			
Match { slow - - -	56 lbs. per gun.			
{ quick - - -	1 lb. to 30 guns.			
Maids, wood - - -	1 to 2 guns.			
Measures, copper, sets (1 oz. to 4 lbs.)	1 set to 10 guns - - -	For measuring powder.		
Needles, brass, 4-inch - - -	1 to 2 guns - - -	For sewing up cartridges.		
Pickets, park - - -	2 per gun.			
Platforms, Clerk's pattern - - -	1 " - - -			
Planks - - -	2 per siege carriage.			
Plugs, metal, shell { fuze { common	} 1 in each shell - - -	{ The shrapnel plugs have wooden plugs attached.		
{ hole { shrapnel				
{ loading hole - - -	5 per cent. spare - - -	For shrapnel only ; large size.		
Pockets, tube - - -	2 per gun - - -	Strap charged separate.		
Portfires - - -	50 per gun.			
Powder, L.G. - - -	According to the number of firing and bursting charges.	Issued in barrels of 100 lbs. each.		
Prolongs, heavy - - -	1 for each gun carriage.			
Punches, for vents - - -	1 per gun - - -	In sizes distinguished by numbers.		
Rammers, with staves - - -	2 " - - -			
Rivets - - -	1 for each bottom - - -	See Bottoms.		
Roller, shifting - - -	1 per gun - - -	Charged with carriage complete.		
Rope { tarred, various sizes - - -	1 coil of each size to 50 guns - - -	} 1 coil is 113 fathoms.		
			{ white " - - -	{ ½ coil of each size to 50 guns - - -
Ropes, drag, heavy - - - pairs	1 per gun.			
Scales, copper - - -	1 to 10 guns - - -	For weighing powder.		
Scales, tangent, wood - - -	1 per gun, and some spare	Used when the elevation exceeds 5°.		
Scissors, laboratory - - - pairs	1 per gun - - -	For use in magazines.		
Scrapers, shell - - -	1 to 500 shells - - -	Different size for each calibre.		
Screws { fixing (sights) - - -	5 per gun - - -	Four in use and one spare.		
			{ preserving - - -	4 " - - -
Shells { common, loose - - -	13 per cent. } 57 per cent. }	} for shot guns.		
			{ shrapnel, with bottoms - - -	13 " " }
Shot { case - - -	7 " " }	} for shell guns.		
			{ grape - - -	13 " " }
			{ solid - - -	0 " " }
Sights, Millar's { fore - - -	1 per gun - - -	Fixed by screws, which are charged separate.		
{ hind - - -	1 " - - -			
Skidding, oak, pieces - - -	2 per gun.			
Spikes { common, for vents - - -	2 " - - -			
			{ marline - - -	1 to 15 guns.
{ spring, for vents - - -	1 per gun - - -	Different size for each nature of gun.		
Sponges, with staves and caps - - -	2 per gun - - -	The rammers are separate.		

EQUIPMENT OF A 24-POUNDER GUN ON A TRAVELLING CARRIAGE.

Name.	Proportionate Number.	Remarks.
Staves, spare - - -	1 per gun - - -	For sponge or rammer.
Sticks, portfire - - -	1 " - - -	
Straps { fuze box - - -	2 " - - -	One for each box.
{ tube pocket - - -	1 per pocket.	
{ securing side arms, spare - - -	5 per cent.	
Swingletrees, spare - - -	1 to 2 gun carriages.	
Tackles, luff, sets complete - - -	1 to 3 guns.	
Tarpaulins - - -	Indefinite - - -	For protecting ammunition.
Tents, laboratory - - -	About 1 to 20 guns - - -	Cartridges are filled inside these tents.
Thumbstalls - - -	2 per gun.	
Tools, artificers' - - -	1 set of each to 15 guns - - -	Issued in chests.
Tools, { axes, helved { felling - - -	1 to 2 guns.	
{ hatchets, hand { pick - - -	1 per gun.	
{ hooks, bill - - -	1 " - - -	
{ shovels - - -	1 " - - -	
{ spades - - -	1 " - - -	
Tubs, wad - - -	2 per furnace - - -	For soaking junk wads.
Tubes { common, brass - - -	1 to 10 friction tubes.	
{ friction - - -	20 per cent. spare - - -	In addition to 1 per round.
{ grummet - - -	3 to 4 solid shot.	
Wads { junk - - -	1 to 4 solid shot - - -	Used when hot shot are fired.
{ papier { fuze hole - - -	1 for each common shell.	
{ maché { loading hole, large - - -	1 for each shrapnel shell.	
Wadhooks - - -	1 per gun.	
Wadmiltills - - -	1 to 3 guns - - -	For protecting ammunition.
Wagons { forge - - -	1 to 12 pieces of ordnance	
{ general service - - -	1 to 2 " - - -	
{ platform - - -	1 to 2 guns " - - -	
{ sling - - -	1 to 15 " - - -	
{ store - - -	1 to 10 pieces of ordnance	
Weights, brass - - - sets	1 to 10 guns - - -	From 1 oz. to 8 lbs.
Worsted - - -	About 4 oz. per gun - - -	For sewing up cartridges.
Wrenches, sight - - -	1 per gun - - -	For fixing and removing sights.
Yarn, spun, tarred - - - lbs.	Indefinite.	
<i>Spare parts for Carriages.</i>		
Axletrees, iron - - -	1 to 5 carriages and limbers.	
Bars, splinter - - -	1 to 10 limbers.	
Beds, axletree - - -	1 to 5 carriages and limbers.	
Bolts, tire - - -	6 per " - - -	
Felloes - - -	1 per " - - -	
Ironwork, carriage and limber - - -	1 to 7 " - - -	
Keys for spring locks - - -	10 per cent.	
Nails tire - - -	6 per carriage - - -	3 heavy and 3 light.
Pins, lynch - - -	1 " - - -	
Poles, bullock - - -	1 to 3 " - - -	
Props, shaft - - -	1 to 5 " - - -	
Rings, with starts - - -	1 per " - - -	
Shafts - - -	1 to 10 " - - -	
Spokes - - -	3 per " - - -	2 per limber.
Straps, sidearm - - -	1 " - - -	
Streaks - - -	2 " - - -	
Washers - - -	1 " - - -	and limber.
Wheels - - -	1 to 3 " - - -	

EQUIPMENT OF A 32-POUNDER GUN ON A TRAVELLING CARRIAGE.

Description.	No. of Drawing.	Cost of each.	Weight of each.		Total No.	Dimensions and Remarks.
			£ s. d.	cwts. qrs. lbs.		
<i>Gun (Monk's A.)</i>						
32-pounder, of 9 feet and 50 cwt. -			50	0 0	1	Refer to the 32-pounder for garrison service (No. 4).
Sights { fore (dispart), with 2 screws hind (brass scale, and socket), with 2 screws - tangent scale, wood -			0	0 2½	1	
			0	0 2½	1	
			0	0 0½	1	
<i>Carriage.</i>						
Block trail { limber, ^a 10 cwt. - carriage, 25½ cwt. - }		80 12 3	35	3 14	1	Tonnage, 7 tons ; 5 feet 10 inches.
<i>Platform.</i>						
Col. Clerk's pattern ^b - -		13 9 0	13	0 2	1	Size, packed, 17' x 1' 8" x 1' 4"; bulk, 40 cubic feet.
<i>Ammunition.</i>						
Bottoms, wooden (loose) - -				0 13	70	
Carcasses, filled ^c and fixed -				26 12	-	
Cartridges ^d { calico, { common shell burstern { shrapnel, filled flannel, service charge, 8 lbs. - - - - -			0	3	65	M.R. powder.
			0	2	500	
Fuzes { percussion, Pettman's - time { common - - - - - shrapnel - - - - -			0	7	20	
			0	1½	80	
			0	0½	80	
Match, slow - - - - - lbs.			1	0	40	
Plugs, spare, loading hole, large -			0	0½	3	
Portfires - - - - -			0	5½	65	
Powder, L G, loose - - - - - lbs.			1	0	4073	For filling cartridges.
Rivets, for bottoms - - - - -			0	2	70	
Shells, with plugs { common shrapnel, ^e fixed -			22	0	65	Bursting charge, 18 oz. " " " 50 drs.
			28	12	65	
Shot - { case ^f - - - - - grape ^g - - - - - solid - - - - -			36	4	35	11·6 inches long. 8·7 " "
			36	4	35	
			32	0	300	
Tubes { brass - - - - - friction - - - - -			0	0½	60	
			0	0½	600	
Wads - { grummet - - - - - junk - - - - - papier { fuze hole - - - - - maché { loading hole, large			0	7	225	
			1	8	75	
			0	0	65	
			0	0	65	

^a The limber has no boxes.

^b A common or Madras platform may also be used.
^c 32-pounder carcasses are manufactured, but are not issued for siege operations.

^d Issued empty and filled when required.

^e Contains 152 musket bullets, 1 oz. each.

^f Contains 66 balls, 8 oz. each.

^g Contains 9 balls, 3 lbs. each.

* The numbers in this column show the proportionate supply for 500 rounds of ammunition; the principles on which they are estimated may be seen in the alphabetical list given with the 24-pounder equipment.

EQUIPMENT OF A 32-POUNDER GUN ON A TRAVELLING CARRIAGE.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.	
<i>Stores.*</i>		<i>£ s. d.</i>	<i>lbs. oz.</i>			
Boxes, wood { for 4 grape, or case -	-		21	1	29'' x 8'' x 12''.	
for 4 shells -	-		19	0		
Case, leather, cartridge (No. 5)	-		3	5	29'' x 9'' x 9½''	
Fid, wood -	-		21	5		
Gauges, ring { 6·207 inch -	-		3	4		
6·147 inch -	-		3	3		
6·087 inch -	-		3	2		
Heads, spare { rammer -	-		2	0		
sponge -	-		3	12		
Ladle, copper, with 8½-foot stave	-		18	0	8·36 inches long.	
Punch, for vent (No. 4)	-		0	2		
Rammers, with staves	-		8	9		
Scraper, shell	-		0	6½		
Spike, spring	-		0	2		
Sponges, with caps -	-		10	5		
Stave, sponge, spare	-		6	9		
Wadhook, with 9½-foot stave	-		9	0		
						10' 6'' long.

* Those here detailed are specially adapted to this gun; for the entire supply, see the alphabetical list given with the 24-pounder equipment.

NOTES.

Only the side arms and handspikes are carried by the gun carriage, the rest are carried by the platform wagon and other carriages of the siege train. The gun and carriage complete weigh about 4½ tons, and would be drawn by such number of horses or oxen as the state of the roads required. The carriage is of similar construction to the 24-pounder, and was adopted at the same time. The bracket trail pattern weighs 36½ cwts. and has a bulk equal to 6 tons.

The proportion of men is the same as for the 24-pounder gun, 30 non-commissioned officers and gunners.

The Madras or the common platform can be used instead of Col. Clerk's; their weights and dimensions are given at page 384.

The range of the 32-pounder with 8 lbs. of powder is rather greater than that of the 24-pounder; the accuracy of its fire is also superior; its weight is the same, and it can be supplied with ammunition, on an emergency, by the ships of war, which are no longer armed with 24-pounders. These advantages are of great importance, but the increased weight of its ammunition is an objection to its being employed in any difficult country. The 500 rounds of 32-pounder ammunition weigh 4,000 lbs. more than a similar quantity for the 24-pounder. A metal-lined case holds the following number of filled cartridges:—14 of 8 lbs.; 100 of 18 oz.; or 700 of 40 drams.

Carcasses can be fired from this gun, but are not supplied for siege operations; the other projectiles are issued in the following proportions:—solid shot 60 per cent., common and shrapnel shells 13 per cent., case and grape shot 7 per cent. The weight of one round with each kind of projectile is as follows:—shot, 40½ lbs.; common shells, 32½ lbs.; shrapnel shell, 37 lbs.; carcass, 35½ lbs.; case shot, 44½ lbs.; and grape shot, 44½ lbs.

The gun can be mounted and dismantled by a 16-foot gyn.

For the stores used in the service of the gun and an alphabetical list of every article required, with the proportion per gun in which they are supplied, see the remarks and list given with the 24-pounder equipment.

EQUIPMENT OF AN 8-INCH GUN ON A TRAVELLING CARRIAGE.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
<i>Gun.</i>					
8-inch, of 8 feet and 52 cwt. -		£ s. d.	cwts. qrs. lbs.		Refer to the gun under "garrison service" (No. 3).
Sights { fore (dispart), with 2 screws			52 0 0	1	
{ hind (brass scale, and socket), with 2 screws			0 0 2½	1	
{ tangent scale, wood -			0 0 2½	1	
{ tangent scale, wood -			0 0 0½	1	
<i>Carriage.</i>					
Block trail { limber, ^a 10 cwt. -		82 8 8	37 0 14	1	Tonnage, 7 tons ; 5 ft. 10 in.
{ carriage, 27 cwt. -					
<i>Platform.</i>					
Col. Clerk's pattern ^b -		13 9 0	13 0 2	1	Size, packed, 17' x 1' 8' x 1' 4"; bulk 40 cubic feet.
<i>Ammunition.</i>					
Bottoms, wooden (loose) -			lbs. oz.	*	
Carcasses, ^c filled, and fixed -			1 3	220	
Cartridges ^d { calico, { common shell			53 0	—	
{ bursters { shrapnel, filled			0 5	200	M.R. powder.
{ flannel, service charge, 8 lbs. -			8 2	85	
Fuzes { percussion, Pettman's -			0 7	500	
{ time { common -			0 1½	70	
{ shrapnel -			0 0½	240	
Match, slow -			0 0½	100	
Plugs, spare, loading hole, large -			0 0½	40	
Portfires -			0 5½	5	
Powder, L G -			1 0	65	
Rivets, for bottoms -			0 2	4450	For filling cartridges.
Shells, with plugs { common ^e -			46 0	220	Bursting charge, 2½ lbs. 80 drs.
{ shrapnel, ^f fixed -			60 5	85	
Shot { case ^g -			50 14	65	11·5 inches long.
{ grape ^h -			66 8	65	9·3 " "
Tubes { brass -			0 0½	60	
{ friction -			0 0½	600	
Wads { grummet -			0 10	85	
{ junk ^c -			3 0	—	
{ papier { fuze hole -			0 0	200	
{ maché { loading hole, large -			0 0	85	

^a The limber has no boxes.

^b A common or Madras platform may also be used.

^c 8-inch guns are not usually supplied with these for siege operations.

^d Issued empty, and filled when required.

^e 85 of these to be used as hollow shot.

^f Contains 339 musket balls.

^g Contains 90 balls, of 8 oz. each.

^h Contains 15 balls, of 3 lbs. each.

* The numbers in this column show the proportionate supply for 500 rounds of ammunition ; the principles on which they are estimated may be seen in the alphabetical list given with the 24-pounder equipment.

EQUIPMENT OF AN 8-INCH GUN ON A TRAVELLING CARRIAGE.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
<i>Stores.*</i>		£ s. d.	lbs. oz.		
Boxes, wood	for 1 shrapnel shell - for 2 common shells, or 2 case -	-	10 4		11½" x 10" x 11".
	for 2 grape -	-	16 6		20" x 10" x 11".
Case, leather, cartridge (No. 3)	-	-	20 12		20" x 10" x 13".
Fid, wood	-	-	5 2		
	-	-	39 11		
Gauges, ring	7·95 inch -	-	4 7		
	7·9 " -	-	4 6		
	7·82 " -	-	4 5		
	7·76 " -	-	4 5		
Heads, spare	rammer -	-	3 12		
	sponge -	-	5 1		
Ladle, copper, with 8½-foot stave	-	-	20 15		
Punch, for vent (No. 3)	-	-	0 2½		
Rammers, with staves	-	-	9 12		
Scraper, shell	-	-	0 9		
Spike, spring	-	-	0 2½		9·84 inches long.
Sponges, with caps	-	-	11 1		
Stave, sponge, spare	-	-	6 0		9' 6" long.
Wadhook, with 9½-foot stave	-	-	9 0		

* Those here detailed are specially adapted for this gun ; for the entire supply, see the alphabetical list given with the 24-pounder equipment.

NOTES.

The 8-inch gun of 52 cwt. has been substituted for the 8-inch howitzer as a piece of siege artillery ; it is nearly twice as heavy, but it is far superior in accuracy and length of range ; the importance of both pieces lies in the destructive power of the large shells which are fired from them.

The 8-inch siege gun, with its carriage and proportion of stores attached, weighs about 92 cwt., being 4 cwt. more than the 24-pounder siege gun. The two equipments are generally alike, and the remarks on the mode of draught, working party, &c. will apply to both. The block trail carriage was approved in 1860, its wheels are the same as those for the 24-pounder gun ; the bracket trail pattern weighs 40½ cwt., and measures, for transport, 6 tons.

Projectiles are furnished for siege service in the following proportions :—common shells, with bursting charges, 40 per cent. ; without charges (to be used as shot), 17 per cent. ; shrapnel shells, 17 per cent. ; case and grape (each), 13 per cent. In garrisons or coast batteries, carcasses, and Martin's molten iron shells are likewise used.

One metal-lined case holds the following number of filled cartridges :—14 of 8 lbs. ; 50 of 2½ lbs. ; or 500 of 60 drams.

One round of ammunition is of the following weight, according to the projectile ; common shell, 57 lbs. 13 oz. ; shrapnel shell, 62 lbs. 6 oz. ; case shot, 59 lbs. 1 oz. ; grape shot, 74 lbs. 11 oz.

The gun can be mounted or dismounted by a 16-foot gyn.

For the stores used in the service of the gun, and an alphabetical list of every article required, with the proportion per gun in which they are supplied, see the remarks and list given for the 24-pounder equipment.

EQUIPMENT OF A 13-INCH MORTAR ON A TRAVELLING CARRIAGE.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
<i>Mortar.</i>					
13-inch, of 36 cwt. - - -		£ s. d.	cwts. qrs. lbs.	1	Given under the head of garrison service.
<i>Carriage.</i>					
Block trail { limber,* 9½ cwt. - - - { carriage, 46 cwt. - - -		97 13 0	55 3 0	1	Tonnage, 7 tons ; 10 feet.
<i>Platform.</i>					
Col. Alderson's - - - - -			22 1 2	1	Tonnage, 1 ton ; 30 feet.
<i>Ammunition.</i>					
Bottoms, wooden, hemispherical - -			10 11	45	
Carcasses, filled - - - - -			234 0	10	
Cartridges ^b { calico, bursters, 10½ lbs. - - - { flannel, charge, 9 lbs. - - -			0 2½	500	
Fuzes, mortar - - - - -			0 4½	600	
Match, slow - - - - - lbs.			1 0	40	
Portfires - - - - -			0 5½	65	
Powder, L G - - - - - lbs.			1 0	9750	For filling the cartridges.
Shells, mortar - - - - -			194 0	500	Bursting charge, 10½ lbs.
Shot, 1 lb., rounds of 100 each - -			100 0	40	
Tubes { brass - - - - -			0 0½	60	
{ friction - - - - -			0 0½	600	
<i>Stores.^c</i>					
Boxes, wood { for 1 loaded shell - - -			23 12		16½" × 15" × 15".
{ for 100 1-lb. shots - - -			12 8		23" × 8" × 9".
Case, leather, cartridge (No. 1) - -			4 8		
Fid, wood - - - - -			67 11		
Heads, spare { rammer - - - - -			1 11		
{ sponge - - - - -			9 1		
Hooks, beam - - - - - pair			8 4		
Punch, for vent (No. 3) - - - - -			0 2½		
Scraper, shell - - - - -			1 7		
Spike, spring - - - - -			0 2½		8·8 inches long.
Sponges, with caps (and rammers) -			13 6		
Stave, sponge, spare - - - - -			2 10		4' 3" long.

* The limber as for siege gun carriage ; no boxes.

^b Issued empty and filled as required.

^c Those here detailed are specially adapted to this mortar ; for the entire supply, see the alphabetical list which follows.

* The numbers in this column show the proportionate supply for 500 rounds of ammunition ; the principles on which they are estimated may be seen in the alphabetical list which follows.

EQUIPMENT OF A 13-INCH MORTAR ON A TRAVELLING CARRIAGE.

NOTES.

The travelling carriage for the 13-inch mortar was introduced in 1861; its limber is the same as for siege guns, and it is equipped with similar stores; its total weight is about 93 cwt.; 1 cwt. more than that of the 8-inch siege gun. The wheels are the same as those for the 24-pounder gun. Thirty non-commissioned officers and men are required to furnish three reliefs, of one non-commissioned officer and 9 men each, to work the mortar in the trenches, and prepare it for action or travelling.

The extreme range of the 13-inch mortar is 2,900 yards, it is varied by reducing the charge, and occasionally by altering the elevation from 45° to 15° or 75°, by quoins provided for the purpose.

The projectiles for 500 rounds of ammunition consist entirely of shells, a few carcasses and rounds of pound shot being superadded to them. The shells are issued loose; as each round complete weighs 214 lbs., the whole supply amounts to about 50 tons. One metal-lined case holds 10 bursting charges.

When the mortar is required for use the bed is disconnected from the limber, and the wheels are removed; to replace the wheels and limber two detachments (2 non-commissioned officers and 18 men) are required; no machines or stores are employed except what are attached to the carriage. The mortar can also be mounted or dismounted from its bed with these stores, but for placing it on any transport carriage a gyn, or other means, must be employed.

Spare parts of the travelling carriages, and articles for use in magazines, &c., being supplied to mortars in about the same proportions as to guns the list given with the 24-pounder equipment may be referred to for those particulars, and it will be sufficient to detail here the ammunition and stores necessary for the service of any 13-inch, 10-inch, or 8-inch mortar.

Name.	Proportionate Number.	Remarks.
Balls (10-inch or 8-inch only) - { light - smoke	- - } 10 per mortar - -	In addition to the shells.
Bottoms, hemispherical - - -	- - - " - -	For firing vollies of pound shots, &c.
Boxes, for loaded shells - - -	- - - 4 per mortar.	
Caps, sponge - - - - -	- - - 1 per sponge - -	On the sponges.
Carcasses, filled - - - - -	- - - 10 per mortar - -	In addition to the shells.
Cartridges { calico, bursters - - - - -	- - - 1 for each shell - -	Issued empty, and filled when required.
{ flannel, charge - - - - -	- - - 1 " " - -	
Case, leather cartridge - - - - -	- - - 1 per mortar.	
Chalk and cord - - - - -	- - - 1 to 4 mortars - -	Required in laying mortars.
Clipper, portfire - - - - -	- - - 1 to 3 " - -	
Fid, wood - - - - -	- - - 1 " " - -	To fit the calibre.
Fuzes, mortar - - - - -	- - - 1 per shell, and 20 per cent. spare.	8 inches long; burn 30 seconds.
Handspikes, common, 6 feet - - -	- - - 5 per mortar.	
Heads, spare { rammer - - - - -	- - - 1 " " - -	For lifting the shells; a piece of cord serves for the 8-inch.
{ sponge - - - - -	- - - 1 " " - -	
Hooks { beam - - - - -	- - - 3 for each 13-inch mortar	
{ hand - - - - - pair	- - - 3 " 10-inch " - -	
Implements { No. 5 set - - - - -	- - - 1 to 25 mortars - -	For rectifying the fuze holes.
{ No. 6 set - - - - -	- - - 3 to 4 mortars - -	For preparing shells and fuzes.
Irons, priming, garrison - - - set	- - - 1 per mortar - -	1 pricker, 1 drift, 1 bit.
Lanyards, friction tube, garrison - - -	- - - 2 " " - -	Of tarred line, 8 feet long.
Linstocks, with cocks - - - - -	- - - 1 to 3 mortars - -	For holding lighted slow match.
Match, slow - - - - -	- - - 56 lbs. per mortar.	
Perpendiculars - - - - -	- - - 1 to 2 mortars.	
Platforms, Alderson's - - - - -	- - - 1 per mortar.	
Plummets, lead, with lines - - - - -	- - - 1 per mortar - -	Used in laying the mortar.
Pocket, tube - - - - -	- - - 1 per mortar - -	Worn with a strap, charged extra.
Portfires - - - - -	- - - 50 per mortar.	
Powder, L G - - - - - lbs.	- - - Sufficient to fill every service and bursting cartridge.	Issued in barrels of 100 lbs. each.
Punch, for vent - - - - -	- - - 1 per mortar.	

EQUIPMENT OF A 13-INCH MORTAR ON A TRAVELLING CARRIAGE.

Name.	Proportionate Number.	Remarks.
Quadrant, brass, with level -	- 1 to 4 mortars.	
Rods, pointing -	- 2 per mortar -	Used in laying the mortar.
Scraper, shell -	- 1 to 500 shells.	
Shells, mortar -	- 1 for each round of ammunition.	Small shells are sometimes fired in volleys.
Shot, pound { rounds of 100 each -	- 40 per mortar -	For 13-inch and 10-inch mortars.
" " 50 " -	- " -	For 8-inch mortars.
Skins, sheep, pieces -	- 1 per mortar.	
Spikes, common -	- 2 per mortar.	
Sponges, with rammers and caps -	- 2 " -	} The same size serves for the 10-inch and the 13-inch.
Stave, spare, sponge -	- 1 " -	
Stick, portfire -	- 1 " -	
Strap, tube pocket -	- 1 " -	
Thumbstalls -	- 2 " -	
Tubes { brass -	- 1 to 10 friction tubes.	} Besides 1 for each round.
" { friction -	- 20 per cent. spare -	

EQUIPMENT OF A 10-INCH MORTAR ON A TRAVELLING CARRIAGE.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
<i>Mortar.</i>		£ s. d.	cwts. qrs. lbs.		
10 inch, of 18 cwt. - - -	-	- - -	18 0 0	1	Given under the head of garrison service.
<i>Carriage.</i>					
Block trail { limber, ^a 8½ cwt. -	-	60 19 4	27 0 9	1	Tonnage, 4 tons; 5 feet 9 inches.
carriage, 18½ cwt. -	-				
<i>Platform.</i>					
Col. Alderson's - - -	-		10 0 22	1	Tonnage, 32 feet 6 inches.
<i>Ammunition.</i>					
Balls ^b { light - - -	-		63 10	10	14·1 inches long.
smoke - - -	-		21 8	10	
Bottoms, wooden, hemispherical - -	-		5 2	45	
Carcasses, filled - - -	-		105 0	10	
Cartridges ^c { calico, bursters, 5 lbs. -	-		0 2	500	For filling the cartridges. Bursting charge, 5 lbs.
flannel, charge, 4 lbs. -	-		0 2	500	
Fuzes, mortar - - -	-		0 4½	600	
Match, slow - - - lbs.	-		1 0	40	
Portfires - - -	-		0 5½	65	
Powder, L G - - - lbs.	-		1 0	4500	
Shells, mortar ^d - - -	-		86 0	500	
Shot, 1 lb., rounds of 100 each - -	-		100 0	40	
Tubes { brass - - -	-		0 0½	60	
friction - - -	-		0 0½	600	
<i>Stores.^e</i>					
Boxes, wood { for 2 light balls - - -	-		30 0		23" x 19" x 13".
for 2 smoke balls - - -	-		21 0		23" x 13" x 13".
for 100 1-lb. shots - - -	-		12 8		23" x 8" x 9".
for 1 loaded shell - - -	-		16 8		13½" x 12" x 13".
Case, leather, cartridge (No. 1) - -	-		4 8		
Fid, wood - - -	-		71 3		
Heads, spare { rammer - - -	-		1 11		6" diameter.
sponge - - -	-		9 1		
Hooks, hand - - - pair	-		2 0		
Punch, for vent (No. 5) - - -	-		0 1¾		
Scraper, shell - - -	-		0 12		
Spike, spring - - -	-		0 1½		7·5 inches long.
Sponges, with caps (and rammers) ^f -	-		13 6		5 feet long.
Stave, sponge, spare - - -	-		2 10		4' 3" long.

^a Shell cart limber.

^b These must be fired with reduced charges.

^c Issued empty, and filled as required.

^d Differ from 10-inch common shells in having lugs, and no rivet holes.

^e Those here detailed are specially adapted to this mortar; for the entire supply, see the alphabetical list given with the 13-inch equipment.

^f The same as for the 13-inch mortar.

* The numbers in this column show the proportionate supply for 500 rounds of ammunition; the principles on which they are estimated may be seen in the list which follows the 13-inch equipment.

EQUIPMENT OF A 10-INCH MORTAR ON A TRAVELLING CARRIAGE.**NOTES.**

The travelling carriage was introduced in 1861 ; a trench cart of modified pattern serves as its limber, and is capable of carrying 12 10-inch shells. With these and the usual stores carried by siege carriages it weighs only 45 cwt., which is little more than half the amount of the 13-inch equipage. The wheels are of the second or field service class ; they are 4 ft. 2 in. in diameter and weigh $1\frac{1}{2}$ cwt. each.

Its extreme range with 4 lbs. charge and 45° quoin is 2,400 yards ; 15 oz. charge would give 400 yards. Quoins of 15° and 75° are sometimes used for altering the range and effect of the fire.

The projectiles for 500 rounds, siege service, consist entirely of shells, with a few carcasses, light balls, and rounds of pound shot extra, each round of shell weighing $95\frac{1}{2}$ lbs., the whole proportion amounts to about 25 tons. One metal-lined case holds 22 filled bursting cartridges.

Thirty non-commissioned officers and men are necessary to form three reliefs of 1 non-commissioned officer and 9 men each, for working the mortar in the trenches and preparing it for action or for travelling, as described for the 13-inch mortar, under which the necessary information as to the stores is also given.

EQUIPMENT OF AN 8-INCH MORTAR ON A TRAVELLING CARRIAGE.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
<i>Mortar.</i>					
8-inch, of 9 cwt. - - -	-	£ s. d.	cwt.s.qrs.lbs.	1	Given under the head of garrison service.
<i>Carriage.</i>					
Block trail { limber, ^a 8½ cwt., carriage 12 cwt. - }	-	48 11 10	20 2 9	1	Tonnage, 3 tons ; 27 feet 7 inches.
<i>Platform.</i>					
Col. Alderson's ^b - - -	-	-	10 0 22	1	Tonnage, 32 ft. 6 in.
<i>Ammunition.</i>					
Balls ^c { light - - - - - smoke - - - - -	-	-	lbs. oz.	*	11·25 inches long.
	-	-	32 15	10	
Bottoms, wooden, hemispherical -	-	-	10 12	10	
Carcasses, filled - - - - -	-	-	2 10	45	
Cartridges ^d { calico, bursters, 2½ lbs. flannel, charge 2 lbs. -	-	-	53 0	10	
	-	-	0 1	500	
Fuzes, mortar - - - - -	-	-	0 1	500	
Match, slow - - - - - lbs.	-	-	0 4½	600	
Portfires - - - - -	-	-	1 0	40	
Powder, L G - - - - - lbs.	-	-	0 5½	65	
Shells, mortar - - - - -	-	-	1 0	2,125	For filling the cartridges.
Shot, 1 lb., rounds of 50 each -	-	-	46 0	500	Bursting charge, 2½ lbs.
	-	-	50 0	40	
Tubes { brass - - - - - friction - - - - -	-	-	0 0¾	60	
	-	-	0 0¾	600	
<i>Stores.^e</i>					
Boxes, wood { for 3 light balls - for 2 smoke balls - for 50 1-lb. shots - for 1 loaded shell -	-	-	24 0	-	27" x 14" x 10".
	-	-	15 8	-	18" x 10" x 12".
	-	-	6 8	-	16" x 8" x 7".
	-	-	10 4	-	11½" x 10" x 11".
Case, leather, cartridge - - - -	-	-	3 11	-	
Fid, wood - - - - -	-	-	39 11	-	
Heads, spare { rammer - - - - - sponge - - - - -	-	-	1 8	-	5" diameter.
	-	-	3 7	-	
Punch, for vent (No. 6) - - - -	-	-	0 1½	-	
Scraper, shell - - - - -	-	-	0 9	-	
Spike, spring - - - - -	-	-	0 1½	-	5·85 inches long.
Sponges, with caps (and rammers) -	-	-	7 7	-	3' 3" long.
Stave, sponge, spare - - - - -	-	-	2 8	-	4 feet long.

^a Shell cart limber.

^c Fired with reduced charges.

^e Those here detailed are specially adapted to this mortar ; for the rest, see the alphabetical list given with the 13-inch equipment.

^b Serves also for the 10-inch mortar.

^d Issued empty, and filled as required.

* The numbers in this column show the proportionate supply for 500 rounds of ammunition ; the principles on which they are estimated may be seen in the list which follows the 13-inch equipment.

EQUIPMENT OF AN 8-INCH MORTAR ON A TRAVELLING CARRIAGE.

NOTES.

The shell cart which forms the limber is the same as that used for the 10-inch mortar carriage ; it will hold 20 shells, and the weight of these added to the carriage and stores makes a total of about two tons. The wheels are the same as for the 10-inch mortar. The piece is turned over on its trunnions after being limbered up, in order to throw the weight between the wheels.

Quoins of 15° and 75° are sometimes used to alter the range and effect of the shell, but the former result is generally obtained by decreasing the charge ; the full charge gives a range of 2,000 yards ; 9½ oz. of powder give 400 yards.

One non-commissioned officer and 6 men are sufficient to work the 8-inch mortar ; two parties of this strength are required to replace its wheels and limber it up for travelling, and three reliefs are required for continuous service in the trenches.

The carcasses, light balls, and pound shot are in addition to the 500 shells issued for that number of rounds ; each round of shell weighs 50 lbs. 10 oz., and the proportion of ammunition weighs altogether about 13 tons. One metal-lined case holds 50 filled bursting cartridges.

For a complete detail of the stores for service, *see* that which is given for the 13-inch mortar.

EQUIPMENT OF A ROYAL MORTAR.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
<i>Mortar.</i>					
5½-inch, or Royal, of bronze; total length, 15·1 inches; width of trunnions, 15·1 inches; calibre, 5·62 inches		£ s. d.	lbs. oz.	1	Length of bore, 1 foot. Extreme range, 800 yards.
<i>Bed.</i>					
Wood, with capsquares, quoin, and grummet handles			122 0	1	33" x 15" x 10½"; bulk, 4 feet 1 inch.
<i>Platform.</i>					
None required.					
<i>Ammunition.</i>					
Balls ^a { light - - -			10 9	—	* Full charge, 7 oz. 7·6 inches long.
{ smoke - - -			4 8	—	
Carcasses, 24-pounders, filled			19 4	—	No. 6.
Cartridges ^b { calico, bursters - - -			0 0	500	
{ do. waterproof flannel, charge - - -			0 0½	500	
Cover { paper, for cartridge, No. 5 - - -			0 0½	—	} Used also for the Coehorn mortar.
{ do. waterproof - - -			0 0½	—	
Fuzes, special, mortar, 5½ inch			0 2	600	4" long; burns 15 sec.
Match, slow - - - lbs.			1 0	40	
Portfires - - -			0 5½	65	
Powder, L G - - - lbs.			1 0	625	For filling the cartridges.
Shells, 24-pounder, common			16 0	500	Bursting charge, 13 oz.
Tubes { brass - - -			0 0½	60	
{ friction - - -			0 0½	600	
<i>Stores.^c</i>					
Boxes, wood { for 6 light balls - - -			24 0	0	20" x 13" x 13".
{ for 6 smoke balls - - -			17 0	0	20" x 13" x 9".
{ for 6 loaded shells - - -			20 12	0	21" x 13" x 9½".
Case, leather, cartridge (No. 6)			2 11	0	
Gauges, ring { high - - -			2 14	0	5" 62 diameter.
{ low - - -			2 13	0	5" 57 "
Heads, spare, sponge			0 15	0	
Punch, for vent (No. 9)			0 0½	0	
Scraper, shell - - -			0 5½	0	
Spike, spring - - -			0 0½	0	2·75 inches long.
Sponges, with caps (and rammers)			4 4	0	
Stave, sponge, spare			2 8	0	

^a Fired with reduced charges.

^b To be filled when required.

^c Those here detailed are specially adapted to this mortar; see also remarks next page.

* The numbers in this column show the proportion of 500 rounds for siege service.

NOTES.

See after Coehorn Mortar.

EQUIPMENT OF A COEHORN MORTAR.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
<i>Mortar.</i>					
4½-inch, or Coehorn, of bronze; total length, 12¾"; width of trunnions, 12¾"; calibre, 4·52".		£ s. d.	lbs. oz.		Length of bore, 10¼ inches. Extreme range, 800 yards.
<i>Bed.</i>					
Wood, with quoin, capsquares, and grummet handles		- -	84 0	1	
<i>Ammunition.</i>					
Balls* { light - - - - -			5 2	—	6·25 inches long.
smoke - - - - -			2 1	—	
Carcasses, 12-pounders, filled			9 8	—	No. 5.
Cartridges ^b { calico, bursters - - - - -			0 0	500	
do. waterproof flannel, charge			0 0½	—	
Cartridges ^b { do. waterproof - - - - -			0 0½	500	
Cover { paper, for cartridge, No. 5 - - - - -			0 0½	—	
do. waterproof - - - - -			0 0½	—	
Fuzes, mortar, 5½ inch			0 2	600	4" long; burns 15 sec.
Match, slow			1 0	40	
Portfires			0 5½	65	
Powder, L G			1 0	344	
Shells, 12-pounder, common			8 0	500	For filling the cartridges.
Tubes { brass - - - - -			0 0¾	60	Bursting charge, 6 oz.
friction - - - - -			0 0¾	600	
<i>Stores.^c</i>					
Boxes, wood { for 12 light balls - - - - -			24 0		20" × 13" × 13".
for 12 smoke balls - - - - -			19 0		30" × 11" × 8".
for 12 loaded shells - - - - -			17 13		31" × 11" × 7½".
Case, leather, cartridge (No. 6)			2 11		
Gauges, ring { high - - - - -			2 2		4"·476 diameter.
low - - - - -			2 2		4"·432 "
Heads, spare, sponge			0 7		
Punch, for vent (No. 9)			0 0¾		
Scraper, shell			0 3½		
Spike, spring					None required.
Sponges, with caps (and rammers)			4 0		
Stave, sponge, spare			2 8		

* Fired with reduced charges.

^b To be filled when required.

^c Those here detailed are specially adapted to this mortar; see also remarks below.

* The numbers in this column show the proportion of 500 rounds for siege service.

NOTES.

The 5½-inch or Royal, and the 4½-inch or Coehorn, mortars are very useful both to assailants and defenders, in any regular siege, or the attack of an entrenched position, as they can be carried from place to place by four men, and used anywhere, without the necessity of laying platforms or preparing batteries. The mere loading and firing can be conducted by only three men, furnished with the following stores:—cartridge case, sheepskins, sponge, punch, set of priming irons, lanyard, tube-pocket, fuze box, and implements (sets 3 and 4) for preparing the shells and fuzes. If the mortar is to be accurately laid, the usual pointing plummet line, chalk and cord must be added; and if there is no magazine sufficiently near, a metal-lined case will be wanted for the filled cartridges.

The shells for these mortars are the common 24-pounder and 12-pounder shells, without wooden bottoms, but the fuzes are specially made, in order that they may fit the fuze hole, and at the same time allow for the longer time of flight. Light balls and smoke balls are manufactured for both these mortars, and carcasses of the same calibre can be used if necessary.

The 5½-inch mortar is the more commonly used of the two; 500 rounds of ammunition for it weigh about 2 tons: the same amount for the Coehorn mortar will weigh about 21 cwt. 8 oz. of powder will throw the 5½-inch shell 600 yards; 4 oz. will throw the 4½-inch shell a similar distance.

EQUIPMENT FOR 105 PIECES OF ORDNANCE.

Planks	-	-	180						
Platforms	{ Clerk's (gun)	-	75						
	{ Alderson's (mortar)	-	15						
Plugs, spare, loading hole, large	-	-	275						
Plummet, lead, with lines	-	-	30						
Pockets, tube	-	-	210						
Poles, bullock, spare	-	-	30						
Portfires, long, small	-	-	7,000						
Pots, glue, iron, double	-	-	6						
Powder	{ L.G., barrels of 100 lbs. each	-	3,985						
	{ M.R.,	-	1,100						
Prolongs, heavy	-	-	105						
Props, for shafts	-	-	60						
	-	spare	30						
Punches for vents	{ 8-inch gun (No. 3)	-	30						
	{ 24-pounder gun (No. 4)	-	45						
	{ 10-inch mortar (No. 3)	-	15						
	{ 5½-inch "	(No. 9)	15						
Quadrants, brass, with levels	-	-	8						
Rammers, with staves	{ 8-inch gun	-	60						
	{ 24-pounder gun	-	90						
Rings, with starts	-	-	36						
Rivets, common shell	-	-	9,900						
Rockets, signal, 1 lb.*	-	-	500						
Rods, pointing	-	-	60						
	{ 4¼-inch	fathoms	226						
	{ 4 "	"	226						
	{ 3 "	"	226						
	{ 2 "	"	226						
	{ 1 "	"	452						
	{ ¾ "	"	339						
	{ ½ "	"	113						
	{ ¼ "	"	113						
	{ 3 "	"	113						
	{ 2 "	"	113						
Ropes, drag, heavy	-	pairs	90						
Rules, box wood, 2-feet, common	-	-	20						
Saws	{ cross-cut, 6½-feet	-	4						
	{ hand, 26-inches	-	12						
	{ pit, 7-feet	-	4						
	{ tenon	-	36						
	{ copper, for weights	pairs	8						
Scales	{ tangent, wood	{ 8-inch	30						
		{ 24-pounder	45						
Scissors, laboratory	-	pairs	105						
Scrapers, shell	{ 10-inch	-	10						
	{ 8 "	-	10						
	{ 5½ "	-	20						
Screws, for sights	{ fixing	-	375						
	{ preserving	-	300						
		{ 1-inch	144						
		{ 1½ "	144						
		{ 2 "	144						
Sets, saw	{ hand	-	12						
	{ pit	-	8						
		{ general service wagon	5						
		{ platform "	8						
		{ sling "	4						
		{ siege limber	12						
		{ 9-pounder	16						
Shells	{ common, loose,	{ 8-inch	8,500 ^c						
	{ with plugs	{ 24-pounder ^d	10,500						
	{ shrapnel, fixed,	{ 8-inch	2,500						
	{ with plugs	{ 24-pounder	3,000						
	{ mortar, 10-inch	-	7,500						
Shoes, horse, sets of 4, with nails	-	-	1,500						
	{ case	{ 8-inch	2,000						
		{ 24-pounder	1,500						
	{ grape	{ 8-inch	2,000						
		{ 24-pounder	1,500						
	{ solid, 24-pounder	-	13,500						
	{ 1 lb., rounds (of 100 each)	-	600						
Sights, Millar's	{ fore	{ 8-inch	30						
		{ 24-pounder	45						
	{ hind	{ 8-inch	30						
		{ 24-pounder	45						
Skidding, oak, 9 in. by 6 in.	-	feet	200						
Skins, sheep	-	pieces	30						
	{ common	-	210						
	{ marline	-	6						
Spikes	{ 10-inch mortar	-	15						
	{ 5½ "	"	15						
	{ 8-inch gun	-	30						
	{ 24-pounder do.	-	45						
Spokes, spare	{ siege carriage	-	160						
	{ limber	-	280						
	{ general service wagon	-	40						
Sponges, with staves	{ 8-inch gun	-	60						
	{ 24-pounder gun	-	90						
and caps	{ 10-inch mortar	-	30						
	{ 5½ "	"	30						
	{ 8-inch gun	-	30						
Staves, sponge, spare	{ 24-pounder gun	-	45						
	{ 10 inch mortar	-	15						
	{ 5½ "	"	15						
Steel	{ blister	{ 3-inch by ½-inch	56						
		{ 2 " by ½ "	56						
	{ sheer	{ flat	{ 1½ " by ½ "	28					
			{ 2 " by ½ "	28					
		{ square, ¾ "	56						
Sticks	{ portfire	-	105						
	{ rocket, 1 lb., signal	-	500						
Stones, grind, 2½-feet, complete	-	-	3						
Straps	{ fuze box	-	210						
	{ tube pocket	-	80						
	{ side-arm, spare	-	80						
Streaks, tire	{ 3-inch	-	160						
	{ general service wagon	-	24						
	{ general service wagon	-	26						
Swingletrees	{ siege limber	-	50						
	{ 9-pounder	-	50						
Tackles, luff, complete	-	sets	25						
Tarpaulins	{ 30 feet by 15 feet	-	15						
	{ 20 " by 16 "	-	60						
	{ 14 " by 10 "	-	60						
Tents, laboratory, complete	-	-	4						

* A stick for each is charged separate.

^b These serve for the 5½-inch mortar as well as the 24-pounder gun.

^c 2,500 of the 8-inch shells are unprovided with bottoms or bursting charges, being intended to be used as shot.

^d 7,500 of these shells are for the 5½-inch mortars.

EQUIPMENT FOR 105 PIECES OF ORDNANCE.

Thread, pack, large	-	-	lbs.	10					
Thumbstalls	-	-	-	210					
Timber, deals	{	3-inch by 9-inch	-	20					
		1-inch by 9-inch	-	60					
Tools	artificers', in chests	carpenters'	-	6					
		collarmakers'	-	12					
		jobbing-smiths'	-	6					
		shoeing	-	6					
		wheelers'	-	6					
	coopers'	adzes, copper	-	5					
		drivers, shod with copper	-	5					
		hammers, riveting	-	10					
		vices	iron	-	5				
			metal	-	5				
	intrenching	axes	felling, 4½ lbs.	-	45				
			pick, 6½ "	-	90				
		hatchets, hand	-	90					
		hooks, bill	-	90					
		shovels	-	90					
spades	-	90							
Trucks, spare	{	iron, for drug	{ large	-	4				
		carriages	{ small	-	2				
		wood, for gyn	-	8					
Tubs, wad	-	-	-	20					
Tubes	{	brass	-	6,300					
		friction	-	63,000					
Wadhooks	{	8-inch gun	-	30					
		24-pounder	-	45					
Wadmitilts, large	-	-	-	40					
Wads	grummet	8-inch	-	2,500					
		24-pounder	-	10,000					
	junk, 24-pounder	-	3,500						
	papier maché	common	-	9,000					
loading hole, large		-	5,500						
Wagons	forge	-	-	8					
	general service	-	-	52					
	platform	-	-	35					
	sling	-	-	6					
	store	-	-	10					
Washers, spare	{	drug carriage	-	12					
		general service wagon	-	20					
		siege	carriage	-	80				
			limber	-	80				
Weights, brass,	8 lbs. piles	9-pounder	-	180					
		6	-	50					
		sets	-	8					
		carriage	-	20					
Wheels, spare	{	siege	limber	-	20				
			general service wagon	-	26				
		sling	-	2					
		platform	-	6					
Windlasses, spare	{	hand cart	-	10					
		trench cart	-	10					
		crab capstan	-	1					
Worsted, cartridge	-	gyn	-	2					
		sling wagon	-	1					
Wrenches, for sights	-	-	-	75					
Yarn, spun, tarred	-	-	-	512					
<i>Stores for Unloading Transports.</i>									
Anchors, small, 1½ cwt.	-	-	-	6					
Blocks, Bothway's	{	12-inch	treble	-	9				
			double	-	9				
		8-inch	single	-	9				
			double	-	9				
			single	-	9				
snatch, iron, 12-inch	-	-	-	9					
Capstans, crab, complete	-	-	-	3					
Chains, ¾ inch	-	-	-	9					
Posts, picket, 10 feet	-	-	-	40					
Rope	{	4-inch	-	-	fathoms	565			
			3½ "	-	-	"	113		
		2½ "	-	-	"	673			
			white, 6 inch	-	-	"	30		
Spars, 40 feet by 1 foot, with 4 sets of gear	-	-	-	12					

Ordnance for permanent Works.

- Various sorts.** It is hardly necessary to observe that any piece of artillery may be used in the defence of a fortified place, and that, consequently, all the 86 sorts of ordnance shown in the table at page 370 are available for garrison service; but successive improvements have caused most of them to fall into disuse, and though the inferior pieces may still remain in position at unimportant places, they have been replaced by others at the principal forts, and will not be used for any future armaments.
- Selection.** The choice of pieces for an armament is governed by general rules applied to the particular case under consideration.* Where it is desired to inflict loss upon an enemy at the greatest possible distance from the place, the heaviest guns are selected, because they combine the longest range with the greatest accuracy and the most destructive effect; if, however, the nature of the ground gives shelter to the enemy at comparatively short distances, or if a flanking fire is required to guard the face of a work, lighter pieces may with advantage be used. These also ought generally to have large calibres, but being fired with small charges of powder their weight can be diminished whilst the size of their projectiles is retained. The ordnance applied to this purpose may be called guns of *defence*; carronades, light howitzers, and guns bored to larger calibres than they were first intended to have, are examples of such pieces. The long range guns may be called guns of *offence*; in the last century 32-pounders were the most formidable of the shot guns, and howitzers were the only pieces used for firing large shells. Since then 42-pounders, 56-pounders, and 68-pounders have been successively constructed. Shell guns have been substituted for howitzers, and rifled guns of large calibre are now being introduced.
- Coast batteries.** When land batteries are constructed to oppose ships they require to be armed with guns which can be loaded and laid with great rapidity; length of range has not its usual importance, because there is so much practical difficulty in estimating the true distance of a ship in motion, but large calibres are specially desirable, because the explosion of a single 8-inch or 10-inch shell between decks is enough to inflict a terrible loss. Quickness of laying is more dependent on the manner in which a gun is mounted than on the weight of metal which it contains, but the difficulty of keeping up a rapid and continued fire is augmented according as the weight of the ammunition is increased. Of late years, the 10-inch and 8-inch guns, which are far more effective than howitzers, and are more manageable than the heavy shot guns, have been constructed particularly for coast service, and brought into very general use. This was partly on account of the reasons above mentioned, and partly because it was found that in firing against wooden ships large shots moving at low velocities were the most injurious. The new employment of armour plates for ships' sides will entail a re-consideration of the best method for arming coast batteries.
- The proportion which guns of different constructions should bear to one another in the same armament must be governed entirely by the

* Refer to p. 121 for further particulars.

Heavy Ordnance.

circumstances of the case ; it is desirable that they should not be intermingled in the same battery, unless necessary, because confusion may arise from the mixture of their different charges and projectiles.

Mortars, both large and small, are of the greatest use in permanent fortifications. A few field pieces are desirable to accompany a sortie or to repel an assault, but they do not form a regular part of the armament. *Mortars.*

The following table, showing the ordnance with which Gibraltar resisted the famous siege of 1783, and those with which it was armed in 1859, will give a general idea of the garrison and coast artillery employed at those periods. The third column shows the ordnance contained, a few years ago, in the forts which defend the western entrance to the Solent ; as some of those works are of quite recent construction they show a still greater proportion of heavy guns, and their armament has been increased since that date. *Examples.*

Ordnance.	Gibraltar.		Entrance to the Solent, 1859.
	* 1783.	1859.	
<i>Shot Guns.</i>			
68-pounder	- - - -	40	28
56 "	- - - -	—	—
42 "	- - - -	9	—
32 "	- - - -	77	37
24 "	- - - -	149†	—
18 "	- - - -	113	—
12 "	- - - -	74	—
9 "	- - - -	16	—
6 "	- - - -	31	—
4 "	- - - -	61	—
3 "	- - - -		
<i>Shell Guns.</i>			
10-inch	- - - -	- - - -	11
8 "	- - - -	72	44
<i>Howitzers.</i>			
10-inch	- - - -	19	—
8 "	- - - -	9	—
5½ "	- - - -	4	6
12-pounder	- - - -	- - - -	—
<i>Carronades.</i>			
68-pounder	- - - -	5	—
24 "	- - - -	47	—
12 "	- - - -	2	—
<i>Mortars.</i>			
13-inch	- - - -	29	—
10 "	- - - -	3	—
8 "	- - - -	13	—
"Mixed calibres"	- - - -	65	—

* From Drinkwater's history of the siege.

† Some of these were Spanish 26-pounders.

ARTILLERY.

Heavy Ordnance.

Ordnance.	Gibraltar.		Entrance to the Solent, 1859.
	1783.	1859.	
Abstract.			
Shot guns - - - -	521	487	65
Shell guns - - - -	—	72	55
Howitzers - - - -	32	57	6
Carronades - - - -	—	54	—
Mortars - - - -	110	29	—
Total - - - -	663*	699	126

Progressive
change in
calibres.

It must not be concluded from this comparison that the calibres of guns have always been increasing; on the contrary, the tendency of the first scientific improvements was to reduce them, and to sacrifice weight of projectile to more accurate firing and more easy carriage, as already mentioned at page 86. For instance, the largest shot gun, at present in our service, has a calibre of 8 inches (the 68-pounder); a table of "great ordnance" in 1574† contains a "Basiliske" with a bore of 8½ inches; and a weight of 9,000 lbs. (80 cwt.) It was loaded with a 60 lb. shot, and 60 lbs. of powder, but it must be borne in mind that the quality of the latter was then at a very low point. In Venice there were a series of cannons with calibres increasing from 6 inches up to 14 inches, the largest being charged with 232 lbs. of powder and a 348-pounder shot (Norton, p. 46). In 1743 the largest gun in use was a 32-pounder (Adye's M.S., pp. 13, 22). A similar change has taken place in mortars, the largest being now 13 inches in calibre, whereas in 1699 there were some of 18½ and 16½ inches; ‡ an 18-inch brass mortar cast in 1692, and used at the siege of Namur in 1695, may be seen at the Tower of London, § Larger mortars have occasionally been made of late years, but not with sufficient success to warrant their being adopted for regular service.

Care of Mounted Ordnance.

Protections.

Pieces of ordnance mounted on works are lacquered at fixed periods, as mentioned at page 120, and their vents (touch holes) and bores are kept closed up. The former used to be secured by putty, by plugs of gutta percha, or by pieces of thin cord with a lump of putty at the end; but there are now "vent plugs," made of india-rubber, with a leather stud at the end, specially provided for the purpose. For the bores of guns there are "tompions" of wood, with junk wads attached, and for mortars there are wooden caps which cover the whole muzzle. The tompions for Armstrong guns are covered with serge, as a better protection against damp, and the bores are coated with a mixture of white lead and tallow. The vent pieces are screwed tight into their places, a quantity of greased hemp or cotton is put into the slots round them, and the levers are taken off the breech screws to prevent

* 51 of the guns and 40 of the mortars were without carriages, so that only 572 were in position.

† Proceedings of the R.A. Institution, vol. ii. p. 354.

‡ Ibid., p. 376.

§ Ibid., p. 376.

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their being disturbed. Guns and howitzers are always depressed, or "laid under metal," to prevent water lodging inside, and they are "searched" or examined with a wadhook and punch at regular intervals, Inspections. to ascertain that the bore and vent are clear. Iron pieces should be inspected with a mirror after each day's firing, to see if there are any inside flaws or injury to the metal; and they undergo a strict examination once a year, whether they have been fired or not, the implements in the list at p. 365, being issued for this purpose; after the examination a report is made of the condition of each piece, accompanied by a return to show the number of rounds fired from it since the last report, and, if possible, since its first construction. When the vents have become enlarged by the effects of firing from .2 (their original size) to .25 inch throughout, they are to be re-vented. Guns found to be unfit for further service are marked with a cross in two places, one on the face of the muzzle, and another under the broad arrow which denotes that they are Government property.

The holes made in guns to receive the screws by which the sights are fastened to them, are protected by "preserving screws." Preserving screws. Armstrong guns have other holes to receive certain fittings which are required in the naval service only; these holes likewise are furnished with preserving screws when the pieces are issued for land batteries. Breech-loading guns require, on account of their machinery, more frequent cleaning and oiling than the ordinary kinds of ordnance.

Space occupied by Guns.

The intervals at which guns are placed in permanent batteries are settled by various considerations, such as the amount of fire to be brought to bear upon a particular point, the number of traverses required for protection against the enemy's fire, &c.; but in any case they must have space enough to allow of their being worked without inconvenience. The least interval for guns in open batteries is 18 feet; Open batteries. light pieces for flanking fire may be closer, but heavy guns on traversing platforms must have 35 feet between their pivots; this is exclusive of the space occupied by traverses. In the works most recently designed none of the guns in the batteries for direct fire are less than 40 feet apart; in the caponnières for flanking fire an interval of 14 feet is considered sufficient. When the battery is casemated Casemates. the walls must be from 14 feet to 20 feet apart (in the clear), according to the distance which the gun is required to traverse right and left, in order to command the requisite lateral range; they must be 9 feet high if the roof is flat, and if it is not they must be 5 feet or 6 feet to the spring of the arch, according as the roof has a circular or a flattened curve.

Mortars of the heaviest natures may be placed within a few feet of one another, if necessary, but they are usually about 25 feet apart. Mortars.

Gun Detachments.

The usual "working party" or "detachment" for a garrison gun is 1 non-commissioned officer and 9 men, and for the rapid firing required in coast batteries all that number should be artillerymen; but for the slow firing of a regular siege any other men could be taught and employed on some of the duties. For such points as preparing the ammunition, placing it in the bore, and laying the piece, trained gunners would always be necessary.

Garrison Carriages.

Gun carriages. As the guns supplied to garrisons are seldom moved from one place to another, they are mounted on carriages altogether different from those used for field service; these carriages are cheaper and more simple in their construction; they also occupy less space, but are not capable of being taken to pieces.

General description. Garrison carriages consist of two sides, cheeks, or brackets, connected by a transom (in front), two axletrees, and two bolts; a moveable piece called a "stoolbed" is supported by the rear axletree and one of the bolts, and on it are placed wedges or "quoins"* by which elevation is given to the gun. There are no capsquares, because the weight of the gun is sufficient to keep it from starting out of the trunnion holes. Iron elevating screws, turned by a ratchet lever, or handle, are now used with garrison carriages; they are fixed into the axletree, under the stoolbed, and when they are used there are not so many quoins required. To facilitate raising the breech of the gun when its elevation is to be altered, handspikes are applied under it as levers, and the sides of the carriage are cut into steps to afford them a convenient resting place or fulcrum. The carriages admit of the guns being elevated or depressed as much as is ordinarily required; if a depression of more than 15° is necessary, special "depressing" carriages are furnished.†

Varieties. So far as regards the above main points of their construction, all garrison carriages are alike, but their various parts are made of different patterns to suit the platforms on which they are placed.

Common standing. For ground platforms the "common standing" carriages have four iron trucks running on the axletrees, whose ends are rounded for the purpose, and pierced with holes (lined with copper)‡ for linchpins. They have lately (26/2/61) been ordered to be supplied with breaks or friction chocks, which are so contrived as to raise the trucks off the platform when the gun begins to recoil, and thus to prevent its running so far back. Howitzers, and sometimes guns, have only two wheels to the carriage in front, and the rear axletree is deepened so as to rest on the ground; such carriages are called "rear-chock."

Dimensions. The height of these carriages is nearly the same for all pieces of ordnance, and adapted to firing, with a depression of 5 degrees, through an embrasure, whose opening (genouillère) is 2½ feet above the platform.† The axletrees are about 4½ feet from point to point, and project 4 inches on each side beyond the trucks; the length of the cheeks, which are even with the trucks in front, but project 4 or 5 inches behind, differs to the extent of a few inches, according to the gun for which the carriage is made; in the 32-pounder it is about 6 feet. The fore trucks are larger than the hind ones; their diameters are 16 and 18 inches respectively, and the thickness of both is 4 inches.

On the old high traversing platforms the common garrison carriages were used, but the hind trucks were replaced by square blocks of wood. On the present traversing platforms "sliding carriages" are used;

* This word is also spelt *coin*: it is a corruption from *cugno*, a wedge, and its use is thus mentioned by Pietro Sardi, 1621, p. 130: "Per abbastare, o inalzare il pezzo " si mettono cugni sotto la Culatta." In the *Animadversions* of Warre, there is a corresponding passage: "The mounting or imbasing of a peece is performed by " putting in or drawing out of the quines as reason shall direct," p. 126.

† A table is being prepared for the next edition of the *Artillery Drill book*, which will show the exact height of every kind of gun above the ground level, according to the manner in which it is mounted; and also the amount of elevation or depression which can be given to it.

‡ Copper was substituted for iron in 1860 to avoid the effect of rust.

Garrison Carriages.

these have wooden blocks instead of common axletrees, and rest or slide upon them. In front, however, of the foremost blocks are two small gun-metal trucks; when the gun is to be moved forward or "run up," the trucks can be brought into play by raising the rear of the carriage with handspikes constructed for the purpose; these handspikes have also gun-metal trucks, so that by their application the sliding carriage is converted into a four-wheeled one. Thus prepared it runs forward with ease, and even requires a "preventor rope" to prevent it from striking too violently against the front of the platform. For running it back, tackles are applied to it. The blocks are deeper in the middle, between the parts which bear upon the platform, to prevent the carriage from slipping off. Carriages used on traversing platforms in casemates are similar to these sliding carriages, but rather lower; the height of the genouillère over which they will have to fire must be specified in demanding them. (R.A. Cir. Mem. 15/3/62.)

To check the recoil caused by firing the gun, which is apt, when large charges are used, to make it run off the rear of the platform, a compressor has lately been ordered to be supplied with 110-pounder, 10-inch, and 68-pounder sliding carriages. It consists of a block of wood in two parts, which can be separated, so as to bear against the sides of the platform, by means of a lever and eccentric disk of iron. It is fixed underneath the carriage; and as it renders the use of a preventor rope unnecessary under ordinary circumstances, the bolt to which this rope is applied will be discontinued.* (See Circular 815, par. 681, 696.)

Carriages for howitzers resemble those for guns, but are strengthened by having more iron, and, if on ground platforms, have only two trucks, as before mentioned. Carriages for carronades consist of block trails, with two trucks in front, and two small cast-iron cheeks on the top. A bolt passing through these cheeks, and the loop under the carronade, secures the piece to the carriage.

Iron carriages have been sometimes used instead of wood, especially in climates where the latter decay quickly (see page 88). Saluting guns are generally mounted upon them.

Carriages mounted on works are painted every two years (see page 120); they should be occasionally shifted on the platforms to ascertain that they move easily and to prevent their weight from making an impression on one point of the platform by remaining always in the same position. The elevating screws are removed when the guns are not being used, and wooden pedestals are substituted for them to keep the pieces laid "under metal."

Naval carriages may, in the absence of others, be used on shore, but form no part of the regular artillery equipment, and are rarely suitable to land batteries unless special provision is made for them. This arises from their being so much lower; the highest part of a ship's porthole (the upper port sill) being sometimes only 4 feet 4 inches above the deck, and the lowest part being usually 1 foot 11 inches, the gun adapted to a porthole is necessarily too low to fire through a common embrasure. The principal varieties of naval carriages are the common carriages, with four wooden trucks (corresponding to the standing garrison carriages); sliding carriages, made expressly for the "naval slide" (a sort of traversing platform), and "jamming" carriages, also used on slides peculiar to themselves.

* This order has since been cancelled.

Garrison Carriages.**Mortar beds.**

Mortars are mounted on "beds" made of iron or wood; the former material is used for the 8-inch, 10-inch, and 13-inch mortars (land service), the latter is used for the small (Royal and Coehorn) mortars, also for the sea service 10-inch and 13-inch mortars. There is a different sized bed for each nature of mortar; they have no wheels, but rest directly on the platform; the iron beds are cast in separate parts, but are not easily taken to pieces. Each bed has two bolts projecting from it on each side for the application of handspikes to run it up or back, it has also a notch under each end of both cheeks for "cross-lifting" or changing its direction right and left; the trunnion holes have capsquares, and a wooden quoin to give 45 degrees elevation is supplied with each bed. Until 1859 garrison mortar beds were used also for siege operations, but travelling carriages are now made for that service. The small mortar beds are merely oblong blocks of wood hollowed out enough to receive the mortar; they are furnished with capsquares, quoins, and grummet (rope) handles for carrying them.

For the heavy 13-inch sea service mortar a special bed and platform have been constructed, in order to overcome the difficulty of traversing it. The bed is of wood, and rests on an octagonal deck which is fixed to the platform by iron pins, with india-rubber rings to reduce the concussion. There is a pivot in the middle which passes through the bed, deck, and platform, and there are circular racers on the deck, so that by turning the bed the mortar can be brought to bear on any point required.

Transport carriages.

When guns or mortars, which are not on travelling carriages, have to be moved more than very short distances, recourse is had to the platform wagon, the sling wagon, or the sling cart, described at p. 351.

The trench cart can carry 10-inch or 8-inch mortars and their beds, but is not suitable to guns. Pieces of ordnance are transferred from one carriage to another by the machines, or stores, hereafter mentioned.

Platforms.**Ground.**

Common ground platforms in permanent batteries are usually made of stone pavement, they are about 15 feet long for guns, and have a slope to the front of 1 in 16; their breadth depends on the distance that the gun is required to traverse right and left; they are, however, principally used in flank positions where only a limited command of direction is required. Mortar platforms are ordered to be 12 feet square for 13-inch, and 9 feet square for 10-inch and 8-inch mortars.* Ground platforms are included in the construction of the work, and are not issued among the artillery stores, but timber for laying new ground platforms, if necessary, should be kept as a reserve in every battery exposed to sudden attacks.

Traversing.

Traversing platforms are moveable, and serve three purposes; they raise the gun to such a height that it can be fired over a parapet without any embrasure being made; they enable it to be traversed, or brought to bear upon different points, much quicker than if it were upon a common ground platform; and they allow it to sweep with its fire any required extent of ground. They were originally introduced for firing over high parapets, but have since been applied to embrasures in open and casemated works; the only necessary variation in their construction for either purpose is confined to their height, but until

* W. O. Circ., No. 639, par. 117

Traversing Platforms.

recently they differed from one another in other particulars. There have been three varieties invented, distinguished as *common* (of which no more will be made), *dwarf*, and *casemate* traversing platforms.

In the original or common traversing platforms, used with high parapets only, the gun is raised to the required height by supporting the platform on long legs, and the traversing is obtained by fitting the legs with trucks working on flat iron rails (called racers) laid in the ground. The racers are made of various lengths according to the extent of country which the gun is wanted to command; in a Martello tower they form a complete circle, and the gun can be brought to bear on any point within reach of its projectiles. The platform is kept in its place by a pivot, round which it turns; the pivot may be in different positions, and the racers must be curved to suit it.

The pivot being subject to a sudden and violent strain every time the gun recoils, and being apt to get loose and unserviceable in consequence of the shocks, the late Colonel Colquhoun, R.A., invented a method of dispensing with its use, and his plan has been recently adopted. By this new construction the racers, instead of being flat, have a raised convex surface, and the platform trucks are hollowed out so as to fit upon them; the shock is thus divided among four points instead of being concentrated at one, and is also distributed over the racers, instead of acting on the top of the pivot. The racers are still curved round a fixed centre which is called the "imaginary pivot," and may be at various points. The racers in existing works are ordered to be altered to this improved form when found to require it.

The length of the legs in the common traversing platform being found inconvenient for working the guns, the dwarf traversing platform was constructed as an improvement upon it; the latter is raised just high enough for the front trucks to be fixed underneath; it can be used with a common embrasure, and if it is required for firing over a parapet the racers are laid upon stone curbs of sufficient height to bring them within 4 feet 3 inches of the top. To facilitate laying and loading the gun when thus elevated it is directed that the space between the curbs and as far as 20 feet from the parapet should be filled up with earth to the level of the racers.

There is also a difference between common and dwarf traversing platforms in their upper parts, the former being intended for a common carriage running on trucks, the latter for a special carriage sliding on blocks. The following descriptions will explain the distinctive characters of the several patterns.

Common platforms (when made of wood) consist of two side pieces of timber, 16 feet long, 10 inches wide, and 14 inches thick, connected together by three cross pieces or transoms. Along the inside of each side piece there is a raised "riband" to prevent the trucks from running off, and between the centre and hind transoms there is a grating on which a man can stand when the gun is run to the front. The pivot works either in the front transom, in the centre, or in a loop attached to the rear transom. The side pieces have a slope of $\frac{1}{2}$ -inch in 1 foot; the legs might be made of any length required to suit the parapet, but the rear of the side pieces is usually 4 feet 8 inches, and the front 3 feet 6 inches above the ground.

Common traversing platforms have also been made of cast iron on account of its greater durability; they offer nearly the same general appearance, but are a few inches shorter and have a rather steeper

Traversing Platforms.

slope. Both iron and wood platforms of this pattern are obsolete so far as future manufacture is concerned.

Dwarf traversing.

The dwarf traversing platforms are so far like the others that they have two side pieces, three transoms or blocks, and a grating, but all these parts are of a different pattern from those in the common or original description. They have also a moveable plank or footboard attached to the outside of each side piece, and a "bollard" or cylindrical piece of wood projecting from the inside of the left-hand one, round which the preventor rope is passed when the gun is in use. The side pieces have flat streaks of metal to bear the carriage, but have no ribbands, because the carriage is kept by its own construction in the proper position. The sides are 12 inches wide by 12 inches thick, and are 21 inches apart, so as to be suitable for sea service as well as land service carriages. There are no legs, but the trucks work in metal flanges which are fixed to the side pieces in front and to the transom in rear; as this transom passes underneath the side pieces and is about a foot thick, the rear of the side pieces is raised accordingly, and the top of the platform has a slope to the front of 1 in 16. Spare flanges and trucks are issued in the proportion of five and ten per cent. respectively. The entire platform is 16 feet long, and 6 feet 2 inches wide at the rear transom. Its bulk for shipment is 2 tons, 25 feet.

Sizes.

Dwarf traversing platforms were formerly made in three sizes, one for the 68-pounder or 10-inch gun, one for the 8-inch or 32-pounder gun, and the other for the 24-pounder or 18-pounder gun; they are now made uniform in dimensions, but their trucks must be adapted to the imaginary pivot, which may be in five different positions, viz., front, centre, intermediate, (about three feet further back), and rear; when in rear it may be either before or behind the transom, its situation being then described as "rear before chock," or "rear behind chock." The front position is most commonly used for embrasures, and in batteries where the lateral range need not exceed 110° ; the centre one is adapted to salient angles of works when they are acute, and to lateral ranges as far as 150° ; the rear positions are for salient angles generally, and the intermediate one for all lateral ranges above 150° . The distance between the front and rear racers remaining the same, whatever may be the situation of the pivot, it is only necessary to alter each flange so that the axis of the truck may be perpendicular to the curve of the racer, and this can be done with the cross-handled wrenches, which are issued to each armament in proportion to the number of platforms.

Pivots.

Casemate traversing.

The height to which a gun is raised by the dwarf traversing platform (sufficient to fire over a parapet 4 feet 3 inches high) being unsuitable to the embrasures of casemates, metal rollers are substituted for the trucks and flanges in front, and the rear block is removed so that the flanges may be attached to the side pieces; this reduces the height by about one foot, and constitutes the only difference between the present patterns of dwarf and casemate platforms.* The previous ones were of nearly the same construction, but not available for pieces heavier than the 8-inch gun; the sliding carriages for casemates are 6 inches lower than those used in open batteries.

Remarks.

Guns mounted on sliding carriages and traversing platforms are worked by tackles and truck levers, as mentioned at page 271; the plat-

* An improved flange has been introduced for the casemate platforms, to obviate the difficulty of greasing the front trucks. (Cir. 835, par 768, 1863.)

Traversing Platforms.

forms, being moveable, form part of the artillery stores, but the racers, curbs, and pivots on which they work must be laid by the engineers. If the pivot is in front, indentations must be made in the parapet to admit the side pieces, which will otherwise jam against it when the platform is traversed.

Traversing platforms are mounted on their racers by triangle gyns Mounting and transporting. or by some of the stores used for similar operations with guns. They may be carried on the sling or platform wagons, but by a slight addition lately made to them,* on Lieutenant-Colonel Clerk's recommendation, they can be transported short distances without using any wagon, or even removing the gun carriage if there should be one already mounted. For this purpose two iron loops are fixed underneath Axle and limber. the side pieces, just behind the front transom, and an iron plate pierced with a hole is fixed between the side pieces about a foot from the rear ; the loops are intended to receive an iron axle with two wheels, 4 feet 2 inches in diameter, and the iron plate is for the pintail of a limber or "dilly," with wheels 2 feet 6 inches in diameter ; the platform can then be moved like any four-wheeled carriage. One axle, with wheels and a limber complete, are to be supplied for every ten platforms.

Traversing platforms, when mounted in batteries, are painted every Care. two years ; they should be traversed right or left at least once a week, to ascertain that they work freely and to guard against the racer sinking in consequence of the weight remaining too long at the same point. The carriages upon them should be frequently moved backwards or forwards, for a similar reason.

Machines for Mounting Ordnance.

The machine most commonly used for placing heavy guns on their Gyns. carriages, shifting them from one carriage to another, or dismounting them, is the triangle gyn, but as it stands too high to be used in case-mates another sort, called the Gibraltar gyn, is employed in those situations ; the necessary particulars relating to both of them are given at page 355.

When guns have to be placed on the top of a tower, or to be landed Sheers, &c. out of a boat, cranes, derricks, or sheers are temporarily put together for the purpose ; these are made of spars lashed together in various manners, and require a great quantity of ropes, blocks, handspikes, picket posts, and other stores for their construction and use. For taking guns Parbuckles. along routes where wheeled carriages could not be used, dragging them up steep slopes, and sometimes placing them on carriages, skids of wood and "parbuckling" ropes are employed ; the moving power is sometimes communicated, especially for steep ascents, by a crab capstan. In the absence of proper materials temporary capstans and cranes can be formed out of travelling gun carriages.

To bring guns from storekeepers' dépôts to fortifications (up to the distance of one mile) and to mount them in the batteries, are part of the ordinary duties of artillerymen ; directions for performing the service in various manners and with any materials at their disposal are embodied in the drill book of the regiment, and the stores therein mentioned as best fitted to different operations are extracted from it, and described at page 357 ; there is, however, no rule about such stores being supplied in regular proportions to permanent works.

* Approved 13th February 1861.

Ammunition for Permanent Batteries.

The whole of the ammunition described under that head at p. 94 being suitable to garrison service, only a few remarks need be added here. The charges and projectiles adapted to each piece are shown in the list of its equipment, and the general rules connected with the care and preservation of ammunition were given at page 119.

Coast batteries. The following table shows the proportions of ammunition for various guns in coast batteries according to the latest recommendations of a committee; for batteries with landward ranges the projectiles would probably be in the same ratio to one another as when the Martin's shells are omitted. These shells are only supplied to those coast batteries which have a cupola to prepare the iron for them:—

Smooth bores.

Proportion of 200 rounds.	10-inch Gun		8-inch Gun		68-pr. Gun		32-pr. Gun	
	with Cupola.	without Cupola.	with Cupola.	without Cupola.	with Cupola.	without Cupola.	A.*	B.
Cart-ridges { charge -	200	200	200	200	200	200	200	200
{ burs- common	150	180	140	165	50	65	15	25
{ ters { shrapnel	-	-	15	15	15	15	15	15
Cartridges, empty †	8	8	10	10	6	6	10	10
{ common	150	180	140	165	50	65	15	25
Shells ‡ { Martin's	30	-	25	-	25	-	-	-
{ shrapnel	-	-	15	15	15	15	15	15
Shot { solid	-	-	-	-	90	100	150	140
{ case and grape	20	20	20	20	20	20	20	20
Fuzes { percussion	For one quarter of the common shells.							
{ time { common	20 per cent. in excess of the number of shells.							
{ shrapnel								
Match, slow	Two pounds per gun.							
Portfires	In proportion to the common tubes.							
Powder, loose	One barrel (100 lbs.) per gun.							
Tubes { friction, copper	One for each round, and twenty per cent. spare.							
{ common, brass	One to ten friction tubes.							
Wads { grummet	One for each solid shot.							
{ junk	One to every three solid shot.							

Armstrong guns.

Magazine room.

The same number of rounds for a 110-pounder Armstrong gun is to consist of 70 common shell, 70 segment shell, and 60 solid shot.

The above amount of 200 rounds per gun should be as near as possible to the battery; if the armament consists of six 68-pounders a magazine 12 feet long by 11 feet 3 inches wide, 5 feet to the spring, and 11 feet to the key of the arch, will contain the whole of the cartridges. The shells are not as a general rule to be kept loaded, but it would be advantageous on some occasions to have three or four per gun ready for use, and "receptacles" or "recesses" for that proportion should be provided close to the pieces. Such of the projectiles as are issued in boxes are kept in the store room, the rest are piled outside.

* The proportion in column A. applies to batteries where there are also heavier shot or shell guns; the other (B.) to batteries composed of 32-pounders only.

† In proportion to the loose powder.

‡ Bottoms, rivets, plugs, and wads for shells are supplied agreeably to the usual practice. See those items, pp. 93 to 114.

Ammunition for Permanent Batteries.

If guns are fired from garrison carriages at any angle of depression between 15° and 30° , the charges are reduced by one half, and at any angle from 30° to 50° they are further reduced to one quarter of the service quantity ; this is to prevent the guns from being jerked out of the trunnion holes, as they are not secured by capsquares.

Heated Shot and Molten Iron Shells.

The practice of firing heated shot to set fire to ships or buildings has long been in use, and a furnace with the necessary utensils (given at page 348) is included in almost every armament. Permanent shot furnaces have been recommended to form part of the construction of batteries, but none have at present been made in that manner.

A plan for firing shells filled with molten iron was proposed at the beginning of this century, but it was not adopted into the service until 1860, when the shells invented for the purpose by Mr. Martin were found to produce satisfactory results.

The use of these shells entails the supply of a cupola to prepare the iron for filling them ; this machine is described at page 349, where other particulars relating to the process will also be found.

Stores for Garrison Guns.

The stores employed for various services connected with heavy or garrison artillery, embrace an enormous number of articles, some of them delicate in construction, others mere pieces of rough material ; some are required to be of accurate dimensions and in perfect working order, others may be replaced by any article of a similar nature which may happen to be at hand. To demand strict attention ; the experience or ingenuity of a good artilleryman may often remedy deficiencies of equipment, but it will do so at the expense of *time*, and at the moment of action time may be so valuable that serious results may ensue from the least delay. The mere fact of a sponge working too stiffly in the bore, of a handspike breaking, or a platform not traversing easily, may reduce the number of shots which might have been fired against a passing ship or an advancing enemy, and every shot in such cases has an importance which no figures can represent. According as the ranges become shorter, rapidity of firing becomes more desirable than accuracy ; and whereas accuracy depends chiefly on the gun, its sights, and its projectiles, rapidity can only be obtained in the highest degree by the perfect efficiency of every arrangement connected with the battery.

It may also depend upon the stores whether or not a gun is in position at all. At a critical period of the siege of Sebastopol the mounting of some 68-pounders and 10-inch guns was prevented by the want of good rope ; all the rope that remained at the disposal of the siege train was so old and worn that no skill could remedy its weakness, and an application to the fleet resulted in obtaining a coil of the right size but the wrong description, being *tarred* instead of *white* ; as this sort of rope will not run through blocks it was useless for the operation, in spite of all efforts, could not be completed.* The recent instance in which an American fort fired for a day and a half without causing any loss to its besiegers may be mentioned as another illustration of the importance possessed by this branch of the

* Artillery Operations of the Siege, p. 184.

Stores for Garrison Guns.

equipment ; the very trifling effect of the fire was said to be caused by the want of fuzes, tangent scales, and small stores,* an explanation which is sufficient to account for the failure, and is quite consistent with the circumstances of the case. In short, stores must be maintained at an efficient point to ensure the proper effect of artillery, and they require no less supervision and attention than are bestowed on the guns themselves.

Table of
angles.

Coast batteries should be provided with a table of the angles subtended by the vertical height of the battery at every 100 yards of distance (Gen. Reg. Order, 26/2/62). A table thus prepared, and used in conjunction with a spirit level by which the actual angle can be ascertained, is of great use in ascertaining the distance of any object in sight ; it also assists in determining the depression to be given to the gun in order to strike the object. A telescope is desirable in any battery which commands at distant ranges.

Telescope.

Collimator.

A new apparatus called a collimator has lately been introduced as an aid to laying guns ; it gives the means of performing that operation without using the sights, provided the gun has once been brought to bear upon the object in the usual manner. The collimator itself is a wooden tube with a glass at each end, it is placed behind the platform, clear of the recoil, and is adjusted by means of a telescope fixed to the top of the piece. A full description, accompanied by woodcuts, is given in Circular 822, pp. 13 to 17. The apparatus will be issued only on special demand ; it is packed in a box which measures 27" × 15" × 13", and weighs, complete, about 52 lbs.

The only remarks which need be made about the general description of stores have been given at page 114 ; the proportions required for service of garrison ordnance are detailed at pp. 298, 342.

Tools.

Tools and materials for artificers are issued if necessary, but not at regular periods nor in fixed proportions.

* See the account of the bombardment of Fort Sumter in the "Times" of 26 and 27 April 1861 ; and the description of a visit paid to the place within a few days afterwards.—*Ibid.*, 14 May 1861.

EQUIPMENT OF 110-POUNDER ARMSTRONG GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
(1.) 110-POUNDER GUN, OF 10 FT. & 82 CWT.		£ s. d.	cwt. qrs. lbs.	Pattern approved, 29 June 1861. Cir. 704, par. 269. See remarks next page.
Range { 1° elevation, 600 yards. 10° " 3,600 "				Length of bore, 8' 3½".
Gun. Wrought iron, with iron bush; calibre, 7 inches; grooves, 76; twist, 1 turn in 21' 7" (37 calibres)		-	74 2 26	" gun complete, Width across the trunnions,
<i>Appurtenances.</i>				
Piece, vent, with handles -			1 0 24	One spare for each gun.
Saddle, gun metal, with screws			0 2 2	
Screw, breech, { lever -			1 1 5	
consisting of { pins, keep, 2			0 0 1	
ring, tappet			0 2 3	
screw -			3 3 9	Iron, with steel ends.
Sights { tangent (1 on each side)			0 0 2	Gun metal, total length, 14½".
trunnion " "			0 0 2½	
<i>Carriages.</i>				
Sliding, for platforms { dwarf		-	16 2 10	Tonnage,
Compressor for do. - casemate		-	13 3 0	Tonnage,
Compressor for do. -			0 3 2	17" long.
<i>Platforms.</i>				
Traversing { dwarf		-	33 3 10	
casemate		-	27 0 0	
<i>Ammunition.</i>				
Firing charge { with shot or shell ^b			lbs. oz. 12 0	A. 4. powder. Service charge. For exercise and salutes.
without "				
Bursting charge { common shell			8 0	} L. G. powder.
segment "			3 0	
Projectiles { shot, solid			110 0	12' 3" long.
shells, with { common			98 0	18' 75" long.
plugs { segment			98 0	14' 3" long; 111 segments.
Fuzes ^c { percussion, large			0 10	
time, metal			0 5½	Burns 1 inch in 1.64 sec.
Primer			0 0½	An auxiliary to the other tubes.
Tubes { common, brass			0 0½	Require portfires and slow match
friction, copper			0 0½	
Adapter, for time fuzes			0 4	Used with both sorts of shells.
Cartridges { calico, { common shell			0 2	
do. waterproof			0 2	No. 12.
burststers { segment shell			0 1	
do. waterproof			0 1	No. 9.
flannel, charge			0 3	
Cover { paper, No. 19			0 3½	} For service cartridges.
do. waterproof			0 2	
Cup, tin			0 8	See p. 98.
Lubricator, with socket			2 3	

^a Sea-service guns have a guide ring, or fair leader, for the lanyard, screwed in near the vent slot, and a crutch at the vent to support the friction tube; the crutch is fastened by two small screws. See Cir. 815, par. 11, where these articles are illustrated.

^b The 14 lbs. charge for shot was discontinued in June 1863; light 110-pounders have a smaller charge.

^c For the wood time fuze, see Notes, page 99.

EQUIPMENT OF 110-POUNDER ARMSTRONG GUNS.

Description.	No. of Drawing.	Cost of each.		Weight of each.	Dimensions and Remarks.
		£	s. d.	lbs. oz.	
<i>Stores.^a</i>					
Bearer, shot or shell - - -	-			9 12	
Boxes, { for 1 common shell	-			16 2	11" x 9" x 20".
wood { for 1 segment shell or shot	-			13 13	
Case, leather, cartridge, No. 3 - -	-			3 15	11" x 9" x 16".
Coating, sponge - - -	-			1 2	
Cover, slot, tarpaulin - - -	-			7 8	3' long, 3' 10" wide in front.
Extractor, for tin cups - - -	-			0 5	
Fids { breech - - -	-			70 0	Appd. 18/2/63.
{ muzzle - - -	-			48 0	
Gauges, cartridge { high - - -	-				34" long ; appd. 11/5/63.
{ low - - -	-			8 0	
Lever, iron, for releasing vent piece -	-			4 6	
Pedestal { sliding carriage - - -	-				12 long.
{ casemate do. - - -	-			10 8	
Rammer - - -	-			12 0	
Rod, cleaning - - -	-				55" long, 2" thick.
Screws, preserving, set of 5 ^b - - -	-			12 0	
Sponge, with cap - - -	-			3 2	
Staves { lifting vent piece - - -	-			7 0	7 0
{ sponge, spare - - -	-			7 0	
Tompion - - -	-				364 0
Tools, facing - - - set	-				
(2.) LIGHT 110-PR. GUN, OF 9 FT. 10 IN. & 72 CWT.					Approved 3 Sept. 1861.
Range { 1° elevation, 600 yards. 10° " 3,300 "					
<i>Gun.</i>					
Barrel, 9' 10" long ; calibre, grooves, twist, and appurtenances the same as for the 82 cwt. gun.					} Length { A guns, 8' 3½". of bore { B guns, 8' 1½".
<i>Sights.</i>					
Tangent (steel, with barrel head) -	-			2 4	Total length, 14". Length, with screw, 7".
Trunnion, hog-backed - - -	-			2 5	
<i>Carriage.</i>					
Sliding - - - - -	-			15½ cwt.	Tonnage, 1 ton ; 38 feet.
<i>Ammunition.</i>					
Cartridge, flannel, service charge -	-			0 3	Firing charge, 10 lbs.
Cylinder, paper - - - - -	-			0 6	4' 5" long ; 4' 1" diameter.
Other articles of equipment are the same as for the 82 cwt. gun.					

^a Those here detailed are specially adapted to this calibre ; for the general supply, see the alphabetical list which follows.

^b One for the guide ring, and two (in each vent piece) for the crutch.

EQUIPMENT OF 110-POUNDER ARMSTRONG GUNS.

NOTES.

The 110-pounder gun was introduced for the service under the name of 100-pounder. Slight alterations have been made to the first pattern, and the new name was adopted in February 1862 as more in accordance with the weight of its heaviest projectile. It is at present (December 1862) the only Armstrong gun that has been supplied and equipped for garrison service. The working party, or gun detachment, is of the usual strength, viz., 10 men, of whom one should be a non-commissioned officer.

The light 110-pounders were approved in order that 70 guns which had been constructed on an early pattern with a less weight of metal might be made available for use. There are two classes of this pattern, one is 2 inches longer in the bore, but both are of the same total length; they are marked on the trunnions with the letters A and B respectively. The light 110-pounders may be recognized by the absence of a coil at the breech end.

The 110-pounder has a breech-loading arrangement on the usual principle, but differs from the rest in the following points. The vent piece has a projecting disc instead of a ring, and the "breech bush," or ring in the powder chamber, is of wrought iron instead of copper; the pattern of this bush being altered in 1863, by making it longer, a second bush was inserted in the guns already made; the pieces thus treated may be known by the letters DB on the trunnions. Besides the usual appurtenances there is a gun metal saddle, which forms a resting place for the vent piece during the loading, and serves to carry the sights. The barrel is grooved underneath to prevent the handspikes and quoins from slipping, and there is a pair of sights on each side, it being found that one side was liable to be obstructed by a narrow porthole or embrasure. The appurtenances are packed for conveyance in a box, whose dimensions and contents are given at page 405.

A round of ammunition weighs, with solid shot, 124½ lbs.; with common shell, 121 lbs.; and with segment shell, 116 lbs. The tin cups, used to prevent the escape of gas at the breech when the gun is fired, are peculiar to this calibre; they are left in the bore at the discharge of the piece, and are removed by extractors made for the purpose. The lubricators are issued separate (to save room in magazines) in boxes holding 24 each, and are screwed to a socket in the cartridge at the time of loading. A metal-lined case holds the following number of filled cartridges, according to the charge: 7 of 10 lbs. or 12 lbs.; 12 of 8 lbs.; or 36 of 3 lbs.

A time fuze made of wood, on Lieut.-Col. Boxer's construction, is now being tried with this gun, and implements of the same description as those used with the spherical shell fuzes, but of a special size, are required to prepare it. (See further, p. 363.)

The guns hitherto supplied to armaments are mounted on sliding carriages and traversing platforms; the carriage is furnished underneath with a compressor, consisting of two blocks of wood, which are brought to bear against the inside of the platform by means of a lever turning an eccentric disk of iron placed between them. With this arrangement, a preventor rope for checking the gun's motion when it is being run up, becomes unnecessary; it is however retained as an auxiliary.

The gun can be mounted or dismounted by an 18-foot gyn, or two 16-foot gynes; and transported, with its carriage, by a sling wagon or platform wagon.

The following list, drawn up in accordance with those given for field service, gives the description and number of the articles required for each 110-pounder gun, and will serve as a guide to the equipment of the 70-pounder and the 40-pounder guns for garrison service. The weights of such as are not adapted to the calibre will be found in the general list of matériel.

LIST of AMMUNITION and STORES for Garrison Service with Armstrong Guns.

Name.	Proportionate Number.	Remarks.
Adapters - - - -	1 for each time fuze -	To make it fit the large fuze hole.
Axle, transporting, with wheels - -	See Platforms.	
Bar, crow - - - -	Do.	
Barrels, round lid - - - -	In proportion to the filled cartridges.	If the magazines are not quite free from damp metal-lined cases are used.
Bearers, shot or shell - - - -	2 per gun, and 1 spare to every 6 guns.	Not required for 40-pounder guns.
Boxes, wood, for loaded shells - -	4 per gun - - -	2 for each kind of shell.
Buckets, leather, water - - - -	1 per gun - - -	The same pattern as for field service,
Bushes { copper, vent piece - - } { iron, breech - - - }	See table after this list.	
Can, tin, oil, lubricating - - - -	1 per gun.	
Candles - - - -	- - - -	Occasionally required in magazines.

EQUIPMENT OF 110-POUNDER ARMSTRONG GUNS.

Name.	Proportionate Number.	Remarks.	
Caps, sponge - - -	1 per sponge - -	On the sponges.	
Carriage (<i>sliding or casemate sliding</i>)	1 per gun - -	Complete with 1 stool bed, 1 large and 1 small quoin, 1 elevating screw, and 1 compressor.	
Cartouche, leather, large - -	1 to every 3 guns.		
Cartridges {	calico { common - -	Issued empty or filled, as circumstances may require.	
	burstern { segment - -		
	flannel, { service - -		
	charge { exercise - -		
Cases, leather, cartridge - -	2 per gun.		
„ wood, metal-lined - -	In proportion to the filled cartridges.	Keys for them are charged separate. See also Barrel.	
Clippers, portfire - - -	1 to every 3 guns - -	For cutting lighted portfires.	
Cloths, sponge - - -	36 per gun, and 24 spare - -	For cleaning the machinery.	
„ hair - - -	Indefinite - -	Required in magazines.	
Clothing, duck - - -	2 suits per gun - -	To be worn when cleaning the gun.	
Coatings, sponge - - -	4 per gun, and 1 spare for every 100 rounds of ammunition.		
Collimator, complete - - -	To be specially demanded.		
Compressor - - -	1 for each sliding carriage.	Charged with the carriage complete.	
Cover, for vent slot - - -	1 per gun.		
Cup, tin - - -	1 for each round - -	} Not used with the 40-pounders.	
Extractors, tin cup - - -	1 per gun - -		
Fids {	breech - - -	2 or 3 per battery - -	Required when the gun is slung under a wagon or gyn.
	muzzle - - -	- - -	For the traversing platforms.
Flanges, spare - - -	5 per cent. - -	- -	For filling shells.
Funnel, shell, common - - -	1 to every 5 guns - -	- -	„ cartridges.
„ copper - - -	- - -	- -	
Fuzes {	percussion, large - -	3 to 4 shells. - -	An adapter is issued with each.
	time - - -	Do. - - -	
Gauges, cartridge, high, low, and for length.	1 per magazine for each weight of charge.		
Grease - - -	Indefinite.		
Hammers {	claw, large - - -	1 for every 2 guns.	For opening powder barrels.
	copper - - -	Indefinite - -	
Handcrow, lever, 6 feet - -	1 for every 3 guns.		
Handspikes {	7 feet { common - -	2 per gun.	
	„ { truck lever - -	„	
	4 feet, iron shod - -	„	
Hemp, undressed - - -	28 lbs. per gun.		
Implements. See Tools.			
Keys {	copper, for metal-lined cases	Indefinite.	
	fuze and plug - - -	2 per gun.	
Knives, laboratory, small - -	1 to every 3 guns.		
Lanterns - - -	Indefinite - -	Required in magazines.	
Lanyards, friction tube, garrison	2 per gun.		
Lever, for releasing vent piece	1 „ - -	Required if the vent piece jams.	
Limber, with wheels - - -	See Platforms.		
Line, Hambro' - - -	1 skein to every 3 guns.		
Linstocks, with cocks - - -	1 to every 3 guns - -	For holding lighted slow match.	
Lubricators - - -	1 for each round of ammunition.	Issued separate for 110-pounders; in cases holding 24 each.	

EQUIPMENT OF 110-POUNDER ARMSTRONG GUNS.

Name.	Proportionate Number.	Remarks.	
Marline - - - -	1 skein to every 3 guns.		
Match, slow - - - -	2 lbs. per gun.		
Measures, copper - - - -	Indefinite - - - -	For measuring powder.	
Needles, laboratory, brass - - - -	Indefinite - - - -	For sewing up cartridges.	
Oil, Lucca - - - -	1 gallon per gun.		
Ordnance, iron, Armstrong, complete, painted.	- - - -	Including the appurtenances specified in the equipment of each gun.	
Pedestal, wood - - - -	1 per gun.		
Pieces, vent, spare - - - -	} See table, next page.		
Pins, keep, spare - - - -			
Platform, traversing, with steps and trucks (<i>dwarf or casemate</i>).		1 per gun - - - -	For every 10 platforms there are issued 1 axle with wheels, 1 bar, 1 limber, and 1 wrench; for transport purposes.
Flanges, spare, for do. - - - -	5 per cent.		
Trucks, spare, for do. - - - -	10 " - - - -		
Plugs, metal, fuze hole - - - -	1 per shell - - - -	Issued in the shells.	
Pockets, tube - - - -	2 per gun - - - -	1 for the friction tubes and 1 for the primers; a strap for each is charged separate.	
Portfires - - - -	4 to 100 rounds of ammunition.		
Powder, gun { A 4 - - - -	- - - -	For the service charges.	
{ L G - - - -	- - - -	For the bursting charges.	
Primers - - - -	1 for each round of ammunition, and 20 per cent. spare.	Not used with 70-pounders.	
Quoins - - - -	1 large and 1 small per gun	Charged with the carriage complete.	
Rammers - - - -	2 per gun.		
Rod, cleaning - - - -	1 " - - - -		
Rope, preventor - - - -	1 " - - - -		
Scales and weights - - - -	Indefinite - - - -	For weighing powder.	
Scissors, laboratory, small - - - -	1 to every 3 guns	For use in magazines.	
Scotches, wood - - - -	2 per gun - - - -	For keeping the platform steady.	
Screws, { breech, complete - - - -	} See table, next page.		
spare { fixing { saddle - - - -		2 per gun.	
{ tangent scale - - - -	1 " - - - -		
Screws, elevating (oscillating) - - - -	1 " - - - -	Charged with the carriage complete.	
" preserving - - - -	1 set per gun.		
Shells, with plugs { common - - - -	} 35 in 100 rounds - - - -	These are the proportions laid down for the 110-pounders, but they are subject to vary according to circumstances.	
{ segment - - - -			35 " - - - -
Shot, solid - - - -			30 " - - - -
Sights, spare { tangent - - - -	} See table, next page.		
{ trunnion - - - -		" - - - -	
Slippers, pairs - - - -	Indefinite - - - -	To be worn in magazines.	
Spanners, McMahon's - - - -	1 to every 3 guns.		
Sponges, with staves - - - -	1 per gun.		
Spikes, common - - - -	2 - - - -		
Staves { lifting vent piece - - - -	1 " - - - -	Peculiar to the 110-pounder gun.	
{ sponge, spare - - - -	1 " - - - -	These staves can also be used for the cleaning rods.	
Stick, portfire - - - -	1 " - - - -		
Straps, tube pocket - - - -	1 for each pocket.		
Tackles, luff, complete - - - -	1 double set per gun - - - -	For the composition of one set, see p. 360.	

ARTILLERY.

EQUIPMENT OF 110-POUNDER ARMSTRONG GUNS.

Name.	Proportionate Number.	Remarks.
Thread, pack - - -	1 lb. to every 4 guns.	
Tompions - - - -	2 per gun.	
Tools { facing - - - -	See table below.	
{ sighting - - - -		
{ smiths' - - - -		
" intrrenching - - -	Indefinite.	
Trucks, hollow soled, spare -	10 per cent.	For the platforms.
Tubes { common, brass - - -	1 to every 10 friction tubes	Fired with a portfire.
{ friction - - - -	1 for each round of ammunition, and 20 per cent. spare.	
Wadmitlits - - - -	Indefinite.	
Wrenches, cross handled - - -	See Platforms - - -	For altering the flanges, &c.
Worsted - - - -	2 ozs. per gun.	
Yarn, spun - - - -	Indefinite.	

The supply of tools and appurtenances estimated as necessary for maintaining 110-pounder guns in a state of efficiency varies in proportion to the number of the guns, and is detailed in the Instructions dated 1st December 1862, as follows :—

PROPORTION of STORES of a Special Nature to be supplied for Land Service with 110-pounder Guns.

Description.	Number of Guns.																													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
<i>In charge of Officer Commanding R. A. per Battery.</i>																														
Bushes { copper vent piece, sets -	3	4	6	6	8	8	10	10	12	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	40	40	40	40	40	40
{ iron, breech - - - -	3	4	6	6	8	8	10	10	12	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	40	40	40	40	40	40
Implements, sets { facing - - - -	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
{ sighting - - - -	*1	*1	*1	*1	*1	*1	*1	*1	*1	*1	*1	*1	*1	*1	*1	*1	*1	*1	*1	*1	*1	*1	*1	*1	*1	*1	*1	*1	*1	
Pieces, vent, spare - - - -	2	4	5	6	8	9	11	12	14	15	16	17	18	20	21	22	23	24	26	27	28	30	31	32	33	34	35	36	37	38
Pins, keep - - - -	2	3	6	8	10	12	14	16	16	18	18	18	18	18	18	20	20	20	20	20	20	22	22	22	24	26	26	26	26	
Screws, breech, complete - - -	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Sights, spare, single sets - - -	-	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	
Tools, smiths' general service, set -	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Tools, special and additional, set -	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
<i>Reserve in charge of Superintendent of Stores for District.</i>																														
Bushes { copper vent piece, sets -	-	2	3	4	5	6	8	8	10	10	12	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
{ iron, breech - - - -	-	2	3	4	5	6	8	8	10	10	12	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Implements, sets { facing - - - -	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
{ sighting - - - -	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Pieces, vent, spare - - - -	-	1	2	2	3	3	4	4	5	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	
Pins, keep - - - -	-	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	20	20	20	20	20	20	20	20	
Screws, breech, complete - - -	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	4	4	4	4	5	
Sights, spare, single sets - - -	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	4	4	4	4	4	5	
Tools, smiths' general service, sets -	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Tools, special and additional, sets -	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	

* Per District.

EQUIPMENT OF 70-POUNDER ARMSTRONG GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
70-POUNDER GUN, OF 7 FT. 8 IN. & 64 CWT.		£ s. d.	cwt. qrs. lbs.	Side-working principle; not yet adopted for the service in general.
Range { 1° elevation, yards. { 10° " "				
<i>Gun.</i>				
Barrel, of wrought iron; calibre, 6·4 inches; grooves, 70; twist, 1 turn in 24 feet (45 calibres) - -		- -	61 2 5	
<i>Appurtenances.</i>				
Bar, steel, stop, for wedge - -		-	0 0 2½	
Cover, brass, for vent, with fall - -		-	0 0 7	
Pin, brass, stop, for stopper - -		-	0 0 0½	
Plug, brass, for vent cover - -		-	0 0 0½	
Plugs, sights { breech, 6 - -		-	0 0 0¾	
{ trunnion - -		-	0 0 0¼	
Screws, fixing, for cover, 2 - -		-	0 0 0	
Sights { tangent (1 on each side) - -		-	0 0 3½	
{ trunnion do. - -		-	0 0 0¾	
Slide, brass, for vent - -		-	0 0 4¼	
Stopper, breech, for cup - -		-	0 1 25	
Wedge, iron, with handles - -		-	1 2 16	
<i>Carriages.</i>				
Sliding { dwarf - - - -		-	-	
{ casemate - - - -		-	-	
<i>Platforms.</i>				
Traversing { dwarf - - - -		-	33 3 10	
{ casemate - - - -		-	27 0 0	
<i>Ammunition.</i>			lbs. oz.	
Firing charge { with shot - - - -		-	10 0	A. 4. powder. Service charge.
{ with shell - - - -		-	9 0	Do. do.
{ without projectile - - - -		-		For exercise and salutes.
Bursting charge { common shell - - - -		-	4 12	} L. G. powder.
{ segment " - - - -		-	3 5	12·62" long.
Projectiles { shot, solid - - - -		-	70 0	15·65" long.
{ shells, with { common - - - -		-	64 0	13·9" long; segments.
{ plugs { segment - - - -		-	71 9	
Fuzes { percussion, large - - - -		-	0 5¼	
{ time - - - -		-	0 5¼	
Tubes { common, brass - - - -		-	0 0½	Require portfires and slow match.
{ friction, copper - - - -		-	0 0½	
Adapter, for time fuzes - - - -		-	0 4	Required with both sorts of shells.
Cartridges { calico, { common shell - - - -		-	2 12	
{ bursters { segment shell - - - -		-	1 13	Screwed to a socket.
{ flannel, { shot - - - -		-		Choked in the cartridge.
{ charge, { shell - - - -		-		
Cup, tin - - - -		-		
Lubricator - - - -		-		
Socket for do. - - - -		-		

EQUIPMENT OF 70-POUNDER ARMSTRONG GUNS.

Description.	No. of Drawing.	Cost of each.		Weight of each.	Dimensions and Remarks.
		£	s. d.	lbs. oz.	
<i>Stores.^a</i>					
Bearer, shot or shell	-	-	-	-	-
Boxes, wood	{	-	-	-	10½" x 9" x 16".
for 1 common shell	-	-	-	-	10½" x 9" x 17".
for 1 segment do.	-	-	-	-	10½" x 9" x 14".
for 1 shot	-	-	-	-	-
Case, leather, cartridge (No. 4)	-	-	-	3 6	-
Coating, sponge	-	-	-	-	-
Gauges, cartridge	{	-	-	-	-
high	-	-	-	-	-
low	-	-	-	-	-
Rammer	-	-	-	-	-
Rod, cleaning	-	-	-	-	-
Sponge	-	-	-	-	-
Stave, spare, 11 feet 10 inches	-	-	-	7 0	-
Tompson	-	-	-	-	-

^a See also page 281.

NOTES.

The 70-pounder resembles the other guns constructed by Sir William Armstrong inasmuch that it is rifled in the same manner, and the principle of loading at the breech end is retained, but it differs from them in the mode of closing the end of the bore.

Instead of a vent piece, inserted from the top, and driven into its place by a screw behind it, there is a wedge arrangement working in an aperture cut through the gun from one side to the other; consequently, all the appurtenances, (sights excepted) are entirely different from those of the other guns.

The ammunition and stores are of similar kind to those supplied with the 110-pounder gun.

EQUIPMENT OF 40-POUNDER ARMSTRONG GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
<i>Gun and Appurtenances.</i>				
See page 155 - - -		-	35 2 0	
<i>Carriages.</i>				
Standing - - -				
Sliding { dwarf - - - casemate - - -			10 1 18	Tonnage, 1 ton ; 27 feet.
<i>Platforms.</i>				
Traversing { dwarf - - - casemate - - -			33 3 10 27 0 0	
<i>Ammunition.</i>				
See page 155.				
<i>Stores.^a</i>				
Boxes, wood { for 1 common shell - for 1 segment shell - for 2 shot - - -			9 0 7 6 10 5	lbs. oz. 9" x 7" x 15½". 9" x 7" x 12½". 14" x 7" x 12½".
Case, leather, cartridge, No. 7 - - -			2 6	
Coating, sponge - - -			0 14	
Fid - - -			12 3	
Gauges, cartridge { high - - - low - - -				
Pedestal - - -				
Rammer - - -			8 7	
Rod, cleaning - - -			9 3	12' long.
Sponge, with stave and cap - - -			12 7	
Stave, spare (11 feet 10 inches) - - -			7 0	11' 10" long.
Tompion - - -			5 0	

^a See also the list at p. 281.

NOTES.

This gun being in more general use for artillery of position than for permanent batteries, has already been described under the head of field service.

EQUIPMENT OF 40-POUNDER ARMSTRONG GUNS.

For siege and garrison service the filled cartridges are kept in round lid barrels or in metal-lined cases, holding about 12 each. The working party consists, as usual, of 10 men.

The detached parts of the gun, except the breech screw, are packed for transport in a box described in the table at page 405. Preserving screws are kept in all the holes by which sights or other fittings are attached to the gun.

The gun can be mounted, dismounted, and transported by any of the carriages or gys in use. The facing tools for restoring the copper facings are given at page 213. No complete detail of stores for garrison service has been drawn up, but the proportions would be generally the same as those given for the 110-pounder gun.

EQUIPMENT OF 10-INCH GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
(1.) 10-INCH IRON GUN, OF 9 FT. 4 IN. & 86 CWT.		£ s. d.	cwt. qrs. lbs.	Col. Dundas' gun, first cast in 1846 ; it has a breeching loop, with a pin ; 3 plain rings ; a patch at the muzzle ; a patch at the vent, and a block for the hind sight.
Range { point blank, 300 yards. 10° elevation, 2,400 "				
<i>Gun.*</i>				
Total length, 10 ft. 8 in. ; calibre, 10 in. ; windage, '125 to '175 in. -			86 0 0	Length of bore, with gomer cham- ber, 9' 1" ; diameter of base ring, width across the trunnions, 36".
Sights { fore (dispart), with 2 screws hind (brass scale and socket), with 2 screws - tangent scale, wood -			0 0 3 0 0 3 0 0 0½	
<i>Carriages.</i>				
Rear chock ^b - - -		- -	16 3 0	Tonnage, 2 tons 13' 10"
Sliding { dwarf - - - casemate - - -		- -	15 1 0 14 3 0	" 1 " 34' 2".
Compressor for do. - - -		- -	0 3 21	2' 4½" long.
<i>Platforms.</i>				
Traversing { dwarf - - - casemate - - -		- -	33 3 10 27 0 0	
<i>Ammunition.*</i>				
Firing charges { shot, or common shell carcass - - - (L G powder) { Martin's shell for exercise - - -			lbs. oz. 12 0 8 0 8 0 8 0	Service charge. Lately reduced from 9 lbs. Formerly 6 lbs.
Bursting charges, common shell - {			5 0	For the old pattern.
Projectiles {	common { old pattern -		6 4	" naval "
	shell ^c { naval -		86 0	1' 646 in. thick.
	carcass, filled and fixed -		79 0	1' 35 " ; adopted 1862.
	Martin's shell, fixed -		106 9	9 lbs. of composition.
	case shot ^d -		71 7	Charge, 45 lbs. of molten iron.
Fuzes {	percussion, Pettman's -		86 6	7' 6" long, tin cylinder, rope handle.
	time, common - - -		83 6	8' 1" long, iron cylinder and handle.
Tubes {	common, brass - - -		0 7	
	friction, copper - - -		0 1	Require portfires and slow match.
Bottom, wooden (loose) - - -		- -	0 0½	
Cartridges {	calico, bursters, common -		1 7	Conical shape ; 3 rivet holes.
	do. waterproof, No. 11 -		0 1	
	flannel, { service -		0 1½	
	charge { exercise -		0 3	
Cover {	paper, for cartridge, No. 19 -		0 2	} For service cartridges.
	waterproof - - -		0 3½	
Rivet, for bottoms - - -		- -	0 2	

* There are a few 10-inch guns of 9' 4" and 84 cwt. ; they differ in being shorter, by ½ inch, behind the base ring, and in being 1' 15 inch less in diameter at the breech.

^b Used on ground platforms.

^c May be used also as hollow shot.

^d Holds 34 balls of 1 lb. and 50 of 13 oz. each.

^e Holds 24 balls of 3 lbs. each.

* The proportionate supply of ammunition for garrison service is given at p. 28C.

EQUIPMENT OF 10-INCH GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
		£ s. d.	lbs. oz.	
Wads { grummet - - -	-		1 3	Used with hollow shot.
junk - - -	-		4 10	Used with Martin's shell.
papier maché, fuze hole -	-		0 0	
<i>Stores.*</i>				
Boxes, wood { for 1 shell - - -	-		16 8	13½" x 12" x 13".
for 2 case or grape - - -	-		23 4	23½" x 12" x 13".
Cases, leather, cartridge (No. 1) -	-		4 8	11" deep.
Fid, wood - - -	-		71 3	
Garland, for 30 shells - - -	-		168 0	3' 3½" square; for other sizes, see the table.
Gauges, { case, grape, and shell, <i>high</i> - - -	-		5 4	9·88" diameter.
ring { shell, <i>low</i> - - -	-		5 3	9·82" "
case and grape, <i>low</i> - - -	-		5 2	9·76" "
Heads, spare { rammer - - -	-		4 0	
sponge - - -	-		10 7	
Ladle, copper, with 9 ft. stave - - -	-		30 5	
Pedestal - - -	-		5 2	
Punch, for vent (No. 2) - - -	-		0 2½	
Rammer, with 10½ ft. stave - - -	-		10 9	
Scraper, shell - - -	-		0 12	
Spike, spring, 11·4 in. long - - -	-		0 2½	
Sponge, with stave, and cap - - -	-		17 0	
Stave, spare, 10 ft. 6 in. - - -	-		6 9	
Tompson, with junk wad - - -	-		12 8	
Wadhook, with 9½ ft. stave - - -	-		9 0	

* These are adapted to the calibre; for the general supply, see the list at p. 298.

NOTES.

The 10-inch gun belongs to the class of pieces introduced by General Millar, R.A., about 1825, but the pattern in present use was introduced by Colonel Dundas, R.A., in 1846; it has superseded the gun of 9' 4" and 84 cwt. on Gen. Millar's construction, of which about 50 were manufactured between 1831 and 1840.

The first 10-inch guns were seven pieces of a shorter pattern ordered, for experiment only, in 1829, and not received into the service. Four were of 8' 4" and 63 cwt.; the rest were of 7' 6" and 57 cwt. A 12-inch gun of 8' 4" and 90 cwt. was proposed and made in 1828, but the manufacture was confined to a single specimen.

The 10-inch guns are most used (on land) in coast batteries; 10 of them were employed at the siege of Sebastopol. The range of the piece is from 300 yards point blank to 2,700 with 12 degrees of elevation; but at long distances its accuracy is uncertain.

One round of ammunition weighs, with a common shell, 105 lbs.; with molten iron, 134 lbs.; with a carcass, 116 lbs.; with case, 98½ lbs.; with grape, 95½ lbs.; and with hollow shot, 99½ lbs. A metal-lined case holds the following numbers of filled cartridges:—9 of 12 lbs.; 18 of 6½ lbs.; or 22 of 5 lbs. The wooden bottom is now made with three rivet holes, in order that the same pattern may serve for land and sea service shells.

The gun can be mounted or dismounted by an 18-foot gyn, or two 16-foot gyns; it can be moved, together with its carriage, by a sling wagon or platform wagon.

EQUIPMENT OF 8-INCH GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.	
(1.) 8-INCH IRON GUN, OF 9 FT. & 65 CWT.*		£ s. d.	cwts.qrs.lbs.	Gen. Millar's pattern ; it has a breeching loop, with a pin ; 3 plain rings ; a patch at the vent and muzzle ; and a block for the hind sight.	
Range { point blank, 340 yards. 10° elevation, 2,600 yards.					
<i>Gun.*</i>					
Total length, 10 ft. 3 in. ; calibre, 8·05 in. ; windage, ·125 inch			65 0 0	Length of bore (with gomer chamber), 8' 9¼" ; width across the trunnions, 33" ; diameter of base ring, 23·5".	
Sights { fore (dispart), with 2 screws hind (brass scale and socket), with 2 screws tangent scale, wood			0 0 2½ 0 0 2½ 0 0 0½		
<i>Carriages.</i>					
Common standing ^b			15 0 0	Tonnage, 2 ton ; 0 ft. 0 in.	
Rear chock ^b			14 0 7	" 1 " 31 " 6 "	
Sliding { dwarf casemate			14 3 12 13 3 9	" 1 " 14 " 10 "	
Iron, with trucks			25 1 10		
<i>Platforms.</i>					
Traversing { common dwarf casemate			25 1 2 33 3 10 27 0 0		
<i>Ammunition.†</i>					
Firing charges { service Martin's shell exercise			10 0 8 0 5 0	} L G powder.	
Bursting charges { common shell shrapnel			2 4 0 5		
Pro- jectiles { shells, { common with shrapnel, fixed plugs Martin's, shot { case (90 ½-lb. balls) grape (15 3-lb. ,,) carcase, filled and fixed			46 0 60 5 29 2 50 4 66 8 54 5	} 80 (late 60) drs. of M R powder. Containing 339 1-oz. bullets. Charge, 30 lbs. of molten iron. 11·5" long ; painted red. 9·3" long, tier pattern. 5 lbs. of composition.	
	Fuzes { percussion, Pettman's time { common shrapnel				0 7 0 1½ 0 0½
	Tubes { common, brass friction, copper				0 0½ 0 0½
	Bottom, wooden (loose)				1 2

* The weight is sometimes given as 63 cwt.

^b Ground platforms for these carriages are included in the construction of the battery.

* The lighter guns are described in succession, and any difference in their equipment is pointed out.
† The proportionate supply of ammunition for garrison service is given at p. 276.

EQUIPMENT OF 8-INCH GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.		
		£ s. d.	lbs. oz.			
Bag, waterproof paper, No. 3	-		0 0½	For shrapnel bursters.		
Cart-ridges {	calico, {	common shell -	0 0½	No. 8. With common paper bag.		
			do. waterproof		0 0½	
			shrapnel shell		0 0½	
			service -		0 2	
flannel, {	charge {	exercise -	0 1	} For service cartridges.		
		paper, No. 3	0 1½			
Cover {	waterproof -	-	0 1½			
Rivet, for bottoms	-	-	0 2			
Wads {	coal dust -	grummet -	0 0	For hollow shot.		
			junk -		0 10	
			papier {		0 0	" Martin's shells.
			maché {		0 0	" common shells.
	fuzee hole -	-	3 0	" shrapnel "		
	loading hole, large -	-				
<i>Stores.*</i>						
Boxes, wood {	for 1 shrapnel -	-	10 4	11½" x 10" x 11".		
			for 2 case, or shells -		16 6	20" x 10" x 11".
			for 2 grape -		20 12	20" x 10" x 13".
Case, leather, cartridge (No. 3)	-	-	5 2	19" deep.		
Fid, wood	-	-	39 11			
Garland, for 30 shells	-	-	140 0	2' 8" square; see also the table.		
Gauges, ring {	shot and shrap. shell, high shrapnel shell, low, and common shell, high case and grape, low	-	4 7	7·95" diameter.		
			4 6	7·9" "		
			4 5	7·82" "		
			4 5	7·76" "		
Heads, spare {	rammer -	-	3 12			
			sponge -		5 1	
Ladle, copper, with 8½ ft. stave	-	-	20 15			
Pedestals {	common carriage sliding " casemate "	-	3 2			
			4 6			
			3 5			
Punch, for vent (No. 2)	-	-	0 2½			
Rammer, with 10½ ft. stave	-	-	10 5			
Scraper, shell	-	-	0 9			
Spike, spring, 10·5 inches long ^b	-	-	0 2½			
Sponge, with stave ^b and cap	-	-	11 10			
Stave, spare (10 ft. 6 in.) ^b	-	-	6 9			
Tompson, with junk wad	-	-	9 3			
Wadhook, with 9½ ft. stave	-	-	9 0			
(2.) 8-INCH IRON GUN, OF 8 FT. 10 IN. & 60 CWT.				Similar in pattern to the 65 cwt. gun.		
<i>Gun.</i>						
Total length, 10 ft. 1 in.; calibre, 8·05 in.; windage, ·125 inch.				60 cwt. Length of bore, 8' 7¼". Diameter of base ring, 22·8".		
<i>Equipment.</i>						
The side arms have staves 10 feet long.				The other articles are the same as for the 65 cwt. gun.		

* Those here detailed are adapted to the 8-inch calibre; for the general supply, see p. 298.

^b The length depends on the construction of the gun, and is liable to vary in guns of the same calibre.

EQUIPMENT OF 8-INCH GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
<p>(3.) 8-INCH IRON GUN, OF 8 FT. & 52 CWT.^a</p> <p>Range { point blank - yards 10° elevation - " }</p> <p><i>Gun.</i></p> <p>Total length, 9 ft. 3 in. ; calibre, 8·05 in. ; windage, 125 inch -</p> <p><i>Carriages.</i></p> <p>Rear chock - - - - Sliding, dwarf - - - - Compressor, for do. - - - -</p> <p><i>Ammunition.</i></p> <p>The service charge is 8 lbs. Other items are the same as for the 65 cwt. gun.</p> <p><i>Stores.</i></p> <p>The spring spike is 9·84 inches long. The side arms have staves 9 ft. 6 in. long.</p>		<p>£ s. d.</p> <p>- -</p> <p>- -</p> <p>- -</p> <p>- -</p>	<p>52 cwt.</p> <p>14 cwt.</p> <p>13½ cwt.</p> <p>98 lbs.</p>	<p>Similar in pattern to the 65 cwt. guns.</p> <p>Length of bore, 7' 10"; diameter of base ring, 22·75".</p> <p>Tonnage, 1 ton; 31 ft. 6 in.</p> <p>1' 10" long.</p> <p>The other articles are the same as for the 65 cwt. gun.</p>
<p>(4.) 8-INCH IRON GUN, OF 6 FT. 8½ IN. & 50 CWT.^b</p> <p>For short ranges.</p> <p><i>Gun.</i></p> <p>Total length, 7 ft. 11 in. ; calibre, 8·125 inches ; windage, 125 inch</p> <p><i>Carriage.</i></p> <p>Common standing - - - -</p> <p><i>Ammunition.</i></p> <p>The service charge is 8 lbs. Other items are the same as for the 65 cwt. gun.</p> <p><i>Stores.</i></p> <p>The spring spike is 9·84 inches long. The side arms have staves 8 ft. long.</p>			<p>50 cwt.</p> <p>11 cwt.</p>	<p>This gun has a plain circular loop without a pin, but in general respects it is similar to the other patterns.</p> <p>Length of bore, 6' 8½"; width across the trunnions, 33½"; diameter of base ring, 22·8".</p> <p>The other articles are the same as for the 65 cwt. gun.</p>

^a This is the gun used in siege trains.

^b This is the earliest in date of the four patterns ; it was first cast in 1825.

EQUIPMENT OF 8-INCH GUNS.

NOTES.

The 8-inch gun belongs to the same class as the 10-inch gun ; of the several patterns that have been introduced, the largest is by far the most generally employed, as may be seen by the following comparison of the numbers of each construction ordered since 1828 :—

Gun of 9' and 65 cwt. ;	4,157	ordered between	1834 and 1862.
" 8' 10" and 60 cwt. ;	557	" "	1831 and 1860.
" 8' 6" and 60 cwt. ;	110	" "	1840 and 1846.
" 8' 0" and 52 cwt. ;	421	" "	1849 and 1856.
" 6' 9" and 50 cwt. ;	16	" "	1851 and 1856.

The 65 cwt. gun is mounted in coast batteries ; the 52 cwt. gun is used for siege trains and flank defences ; the intermediate size of 60 cwt. has been principally used in the navy ; the smallest of the kind was proposed as a substitute for the 68-pounder carronade, it may be recognized by the construction of the cascable loop, which is shaped like a ring and has no pin.

With the 65 cwt. and 60 cwt. guns charges of 10 lbs. are used, with the smaller ones 8 lbs. ; the ranges obtained with 12 degrees differ but little in either, and are each about 2,900 yards, but at point blank the 8 lbs. charge gives 290 yards, and the 10 lbs. charge 340 yards.

A metal-lined case holds the following numbers of filled cartridges :—11 of 10 lbs. ; 14 of 8 lbs. ; 50 of 2½ lbs. ; or 500 of 60 drams.

The gun can be mounted or dismantled by an 18-foot gyn ; two 16-foot gyns are required for the heaviest size ; it can be transported with its carriage on a sling or platform wagon.

EQUIPMENT OF 68-POUNDER GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
(1.) 68-PR. IRON GUN, OF 10 FT. 10 IN. & 112 CWT.*		£ s. d.	cwts.qrs.lbs.	Pattern of 1841; it has a breeching loop, with a pin; 3 plain rings; a patch at the vent, and a block for the hind sight.
Range { point blank - 400 yards 10° elevation - 3,100 "				
<i>Gun.</i>				
Total length, 12 ft. 4 in.; calibre, 8·12 inches; windage, ·2 inch -		-	112 0 0	Length of bore, 10' 3½"; width across the trunnions, 38"; diameter of base ring, 29·2".
Sights { fore (dispart), with 2 screws hind (brass scale and socket), with 2 screws - tangent scale, wood -			0 0 2½ 0 0 2½ 0 0 0¼	
<i>Carriages.</i>				
Sliding { dwarf - casemate -		-	16 0 26 15 1 16	Tonnage, 1 ton; 26 ft. 0 in.
Compressor, for do. -			0 3 21	2' 4½" long.
<i>Platforms.</i>				
Traversing { dwarf - casemate -		-	33 3 10 27 0 0	
<i>Ammunition.†</i>				
Firing charge { with shot or shell* - without - Martin's shell - hot shot -			lbs. oz. 18 0 8 0 10 0 13 8	L G powder. Service charge. For exercise and salutes.
Bursting charge { common shell - shrapnel " -			2 4 0 5	L G powder. M R powder; 80 (late 60) drams. Painted red.
Pro-jectiles { shot - { case (90 8-oz. balls) grape (15 3-lb. ") shells, common, loose - with { shrapnel, fixed - plugs Martin's, " - carcase, filled and fixed -			68 0 50 14 66 8 46 0 60 5 29 2 54 5	11·5" long; painted red. 9·3" long; tier pattern. Contains 339 musket bullets. Charge, 30 lbs. of molten iron. 5 lbs. of composition.
Fuzes { percussion, Pettman's - time { common - shrapnel -			0 7 0 1½ 0 0¼	
Tubes { common, brass - friction, copper -			0 0¼ 0 0¼	Require portfires and slow match.
Bottom, wooden (loose) -			1 2	Conical shape.
Bag, waterproof paper, No. 3 -			0 0¼	For shrapnel bursters.
Car-tridges { calico, { common shell - burstern { do. waterproof shrapnel shell - flannel, { service - charge { exercise -			0 0¼ 0 0¼ 0 0¼ 0 3¼ 0 2	No. 8. With common paper bag.
Cover { paper, No. 19 - waterproof -			0 3¼ 0 2	} For service cartridges.
Rivet, for bottoms -			0 2	

* The 68-pounders of lighter construction have smaller service charges.

* The lighter guns are described in succession, and any difference in their equipment pointed out.

† The proportionate supply of ammunition for garrison service is given at p. 276.

EQUIPMENT OF 68-POUNDER GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
		£ s. d.	lbs. oz.	
Wads { grummet - - - -			0 10	Used with solid shot.
{ junk - - - -			3 0	For hot shot and Martin's shells.
{ papier { fuze hole - - -			0 0	For securing common shells.
{ maché { loading hole, large			0 0	„ shrapnel „
<i>Stores.^a</i>				
Boxes, wood { for 1 shrapnel - - -			10 4	11½" x 10" x 11".
{ for 2 shells or case - -			16 6	20" x 10" x 11".
{ for 2 grape - - - -			20 12	20" x 10" x 13".
Case, leather, cartridge (No. 2) - -			5 2	17" deep.
Fid, wood - - - -			39 11	
Garland, for 30 shot - - - -			140 0	2' 8" sq.; for other sizes, see table.
Gauges, { all shot and sh. shell, high -			4 7	7·95" diameter.
ring { sol. shot and sh. shell low, -			4 6	7·9" „
{ and common shell high } -			4 5	7·82" „
{ common shell, low - - -			4 5	7·76" „
{ case and grape, low - - -			3 12	
Heads, spare { rammer - - - -			6 11	
{ sponge - - - -			25 11	
Ladle, copper, with 10 feet stave ^b -			4 6	
Pedestal, for { sliding carriage - - -			3 5	
{ casemate „ - - - -			0 2½	
Punch, for vent (No. 2) - - - -			11 4	
Rammer, with 12 feet stave - - - -			0 9	
Scraper, shell - - - -			0 2½	
Spike, spring, 10·9 inches long ^b -			14 3	
Sponge, with stave, and cap - - - -			7 8	
Stave, spare, 12 feet ^b - - - -			9 3	
Tompion, with junk wad - - - -			10 0	
Wadhook, with 11 feet stave - - -				
(2.) 68-PR. IRON GUN, OF 10 FT. & 95 CWT.				
Range { point blank - 310 yards				This gun is the one in most common use; it is similar in pattern to the 112 cwt. gun.
{ 10° elevation, 2,900 „				
<i>Gun.^c</i>				
Total length, 11 ft. 6 in.; calibre, 8·12 inches; windage, ·2 inch.			95 cwt.	Length of bore, 9' 6"; diameter of base ring, 27·76".
<i>Carriages.</i>				
Common standing - - - -			21½ cwt.	
Rear chock - - - -			16½ cwt.	
Sliding { dwarf - - - -			15½ cwt.	
{ casemate - - - -			14½ cwt.	

^a Those here detailed are specially adapted to this gun; for the general supply, see the alphabetical list which follows.

^b The length depends on the dimensions of the gun, and is liable to vary in guns of the same calibre.

^c The breeching loop of this gun was ordered to be strengthened in September 1860, and the weight is increased by 22 lbs. in consequence.

EQUIPMENT OF 68-POUNDER GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
<p><i>Ammunition.</i> The service charge is 16 lbs. The other items are the same as for the 112 cwt. gun.</p>		£ s. d.		12 lbs. charge with hot shot.
<p><i>Stores.</i> The spring spike is 10·1 inches long.</p>				The rest of the equipment is the same as for the 112 cwt. gun.
<p>(3.) 68-PR. IRON GUN, OF 9 FT. 6 IN. & 88 CWT.</p>				Similar in pattern to the 112 cwt. gun.
<p>Range { point blank - 300 yards 8° elevation - 2,450 "</p>				
<p><i>Gun.</i> Total length, 11 ft.; calibre 8·12 inches; windage, ·2 inch.</p>			88 cwt.	Length of bore, 9 ft.; diameter of base ring, 27·28".
<p><i>Ammunition.</i> The service charge is 14 lbs.</p>				10 lbs. 8 oz. with hot shot.
<p><i>Stores.</i> The spring spike is 9·89 inches long. The side arms are 11 feet long in the staves.</p>				The rest of the equipment is the same as for the 112 cwt. gun.

NOTES.

The 68-pounder gun, introduced by Col. Dundas, R.A., about 1840, is the most powerful smooth-bored gun in the service; it gives the longest ranges, throws the heaviest projectile, and is generally the most accurate in its fire, consequently it is mounted in salient angles of important works, or any other positions where such properties are most required. It is cast in three sizes, the intermediate size of 95 cwt. is the one recommended for coast armaments by the Committee of 1861; and is the only one of which any great number exists. 1,972 guns of this nature were made between 1841 and 1862; of the 112 cwt. pieces there appear to have been only 35, and of the 88 cwt. pieces only 31 manufactured down to 1855, since which time no more have been ordered. The three sizes are alike in everything but dimensions. Seven of the 95cwt. guns were employed at the siege of Sebastopol.

Among the ancient pieces of ordnance there was a "canon of 8," equal in calibre to the present 68-pr., and loaded with a solid shot weighing from 60 to 64 lbs. In a table of ordnance, dated 1574, its weight of metal is given as 7,000 lbs. (62½ cwt.); in a later table, given by Norton, 1628, it is called a "Canon Royall," and its weight is entered at 8,000 lbs. (71½ cwt.). In the following century the piece was obsolete.

Every kind of projectile may be fired from this gun, one round of each weighing as follows:—solid shot (16 lbs. charge), 85 lbs.; hot shot, 86½ lbs.; common shell, 66 lbs.; shrapnel shell, 77 lbs.; carcass, 70½ lbs.; molten-iron shell (with 10 lbs. charge), 75½ lbs.; case, 67 lbs.; and grape, 82½ lbs.

A metal-lined case holds the following numbers of filled cartridges:—5 of 18 lbs.; 6 of 16 lbs.; 8 of 14 lbs.; 50 of 2½ lbs.; or 500 of 60 drams. The shot are painted red to distinguish them from hollow shot of the same calibre.

The gun can be mounted or dismounted by one 18-foot or two 16-foot gys, and transported, with its carriage, by a sling wagon or platform wagon.

EQUIPMENT OF 68-POUNDER GUNS.

The complete equipment of a gun for garrison service is not fixed so definitely as for field service, but the proportions in which the various articles should be demanded are shown in the following list. For a description of the stores, and the services to which they are applied, see pp. 114 and 277.

LIST AND PROPORTION OF AMMUNITION AND STORES FOR GARRISON SERVICE WITH SMOOTH-BORE GUNS.

Name.	Proportionate Number.	Remarks.
Axle, transporting, with wheels	1 to every 10 traversing platforms.	If the magazines are not quite free from damp, metal-lined cases are used instead.
Bar, crow		
Barrels, improved or round lid		
Bottoms, wood, loose	1 for each loose shell, and 10 per cent. spare.	The only shells issued loose are common shells.
Boxes, tin, fuze { black (common) blue (shrapnel) " wood, for projectiles	1 per gun	} A strap for each is charged separate. For carrying loaded shells.
	Ditto	
	2 for each shot gun, and 3 for each shell gun.	
Buckets, leather, water	1 per gun.	
Can, or feeder, for oil	Indefinite.	
Candles	Ditto	Occasionally required in magazines.
Caps, sponge	1 per sponge	On the sponges.
Carcasses, with bottoms	Indefinite	Issued in boxes.
Carriage (common standing, rear chock, sliding, or casemate sliding).	1 per gun	Complete with 1 stoolbed, 1 large and 1 small quoin, 1 elevating screw, and 1 compressor (if used).
Cartouche, leather, large	1 to every 3 guns.	
Cartridges { calico, common burstlers, shrapnel flannel, service charge, exercise	1 per shell	} Issued empty or filled, as circumstances may require.
	Ditto	
	1 for each round	
	As required	
Cases, leather, cartridge	2 per gun	In various sizes, distinguished by numbers.
" wood, metal-lined	In proportion to the filled cartridges.	Keys for them are charged separate; see also Barrel.
Clippers, portfire	1 to every 3 guns	For cutting lighted portfires.
Cloths, hair	Indefinite	Required in magazines.
Collimator, complete	To be specially demanded.	
Compressor	1 for each 10-inch or 68-pr. sliding carriage.	Charged with the carriage complete.
Cupola	1 per battery, if Martin's shells are issued.	See p. 349 for further particulars.
Fids	1 for each calibre.	
Flanges, spare	5 per cent.	For the traversing platforms.
Funnels, copper	Indefinite	For filling cartridges.
Furnace, for heating shot	One or more in each coast battery.	See p. 348 for further particulars.
Fuzes { percussion, Pettman's time { common shrapnel	1 to 4 common shells.	} To hold a pile of 30 shot or shells. A table of their sizes is given at p. 404. A different set for each calibre. For the axletrees of carriages, &c.
	1 per shell, and 20 per cent. spare.	
	1 per gun	
Garlands { square other sizes	As required	
Gauges, ring, shot or shell	1 set per battery	
Grease	Indefinite	
Hammers, claw	1 to every 2 guns.	
" copper	Indefinite	For opening powder barrels.
Handcrow, lever	1 to every 3 guns.	

For the weights of such articles as are of uniform size for all calibres, see the general list of matériel; for those which vary with the calibre, see the equipment of each piece of ordnance.

EQUIPMENT OF 68-POUNDER GUNS.

Name.	Proportionate Number.	Remarks.																			
Handspikes <i>No. per gun</i>	<table border="0"> <tr> <td rowspan="4" style="vertical-align: middle;"> <table border="0"> <tr> <td rowspan="4" style="font-size: 3em; vertical-align: middle;">{</td> <td>common, 6 ft. (or 7 ft.)</td> <td>-</td> <td>5 with a common carriage.</td> <td rowspan="4" style="font-size: 3em; vertical-align: middle;">}</td> </tr> <tr> <td>truck lever</td> <td>-</td> <td>2 with a sliding or rear chock carriage.</td> </tr> <tr> <td>iron shod, 4 feet</td> <td>-</td> <td>2 with a sliding carriage.</td> </tr> <tr> <td>roller</td> <td>-</td> <td>1 with a rear chock carriage.</td> </tr> </table> </td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	<table border="0"> <tr> <td rowspan="4" style="font-size: 3em; vertical-align: middle;">{</td> <td>common, 6 ft. (or 7 ft.)</td> <td>-</td> <td>5 with a common carriage.</td> <td rowspan="4" style="font-size: 3em; vertical-align: middle;">}</td> </tr> <tr> <td>truck lever</td> <td>-</td> <td>2 with a sliding or rear chock carriage.</td> </tr> <tr> <td>iron shod, 4 feet</td> <td>-</td> <td>2 with a sliding carriage.</td> </tr> <tr> <td>roller</td> <td>-</td> <td>1 with a rear chock carriage.</td> </tr> </table>	{	common, 6 ft. (or 7 ft.)	-	5 with a common carriage.	}	truck lever	-	2 with a sliding or rear chock carriage.	iron shod, 4 feet	-	2 with a sliding carriage.	roller	-	1 with a rear chock carriage.					<p>7-ft. handspikes are used with the heaviest natures of guns, or with rear chock carriages.</p> <p>For the use of these, see p. 271.</p>
<table border="0"> <tr> <td rowspan="4" style="font-size: 3em; vertical-align: middle;">{</td> <td>common, 6 ft. (or 7 ft.)</td> <td>-</td> <td>5 with a common carriage.</td> <td rowspan="4" style="font-size: 3em; vertical-align: middle;">}</td> </tr> <tr> <td>truck lever</td> <td>-</td> <td>2 with a sliding or rear chock carriage.</td> </tr> <tr> <td>iron shod, 4 feet</td> <td>-</td> <td>2 with a sliding carriage.</td> </tr> <tr> <td>roller</td> <td>-</td> <td>1 with a rear chock carriage.</td> </tr> </table>	{			common, 6 ft. (or 7 ft.)	-	5 with a common carriage.		}	truck lever	-	2 with a sliding or rear chock carriage.	iron shod, 4 feet	-	2 with a sliding carriage.	roller	-	1 with a rear chock carriage.				
				{	common, 6 ft. (or 7 ft.)	-			5 with a common carriage.	}											
					truck lever	-			2 with a sliding or rear chock carriage.												
		iron shod, 4 feet	-		2 with a sliding carriage.																
roller	-	1 with a rear chock carriage.																			
Heads, spare	<table border="0"> <tr> <td rowspan="2" style="font-size: 3em; vertical-align: middle;">{</td> <td>rammer</td> <td>-</td> <td>1 per gun.</td> </tr> <tr> <td>sponge</td> <td>-</td> <td>Ditto.</td> </tr> </table>	{	rammer	-	1 per gun.	sponge	-	Ditto.													
{	rammer		-	1 per gun.																	
	sponge	-	Ditto.																		
Horns, powder	-	-	Indefinite			For priming guns; seldom required.															
Implements, shell and fuze	<table border="0"> <tr> <td rowspan="4" style="font-size: 3em; vertical-align: middle;">{</td> <td>No. 1 set</td> <td>-</td> <td>1 set to every 50* guns</td> <td rowspan="4" style="font-size: 3em; vertical-align: middle;">}</td> </tr> <tr> <td>2 "</td> <td>-</td> <td>" 10* "</td> </tr> <tr> <td>3 "</td> <td>-</td> <td>" 5* "</td> </tr> <tr> <td>4 "</td> <td>-</td> <td>" 2† "</td> </tr> </table>	{	No. 1 set	-	1 set to every 50* guns	}	2 "	-	" 10* "	3 "	-	" 5* "	4 "	-	" 2† "				For rectifying fuze holes, if damaged. For fixing bottoms. For filling shells. For preparing fuzes.		
{	No. 1 set		-	1 set to every 50* guns	}																
	2 "		-	" 10* "																	
	3 "		-	" 5* "																	
	4 "	-	" 2† "																		
Irons, priming, garrison sets	-	-	1 per gun			1 pricker, 1 drift, 1 bit.															
Keys, for metal-lined cases	-	-	Indefinite.																		
Knives, laboratory, small	-	-	1 to every 3 guns			For magazines.															
Ladles, copper, with staves	-	-	1 to every 3 guns			Not issued to howitzers.															
Lanterns	-	-	Indefinite			For magazines, &c.															
Lanyards, friction tube, garrison	-	-	2 per gun			Of tarred line, 8 feet long.															
Lever, see Handcrow and Handspike.																					
Limber, with wheels, for moving platforms.	-	-	1 to every 10 traversing platforms.																		
Line, Hambro'	-	-	1 skein to every 3 guns.																		
Linstocks, with cocks	-	-	1 to every 3 guns			For holding lighted slow match.															
Magazine, portable	-	-	Indefinite			Required when there are no expense magazines, but metal-lined cases will serve the same purpose.															
Marline	-	-	1 skein to every 3 guns.																		
Match, slow	-	-	2 lbs. per gun.																		
Measures, copper	-	-	Indefinite			For measuring powder.															
Needles, laboratory, brass	-	-	Ditto			For sewing up cartridges.															
Oil	-	-	Ditto			For cleaning stores.															
Ordnance	-	-	-			Sights, tangent scales, and screws for each gun or howitzer are charged separate. †															
Pedestal, wood	-	-	1 per gun.																		
Platform, traversing§ (<i>dwarf or casemate</i>).	-	-	1 per gun			If the gun is on a standing or a rear chock carriage it will have a <i>ground</i> platform, which is not taken on charge as one of the stores.															
" Flanges, spare for do.	-	-	5 per cent.																		
" Trucks, spare for do.	-	-	10 "																		
Plugs, loading hole, spare	-	-	5 "			For shrapnel only.															
Plugs, india-rubber, vent	-	-	1 per gun			To protect the vent.															
Pockets, tube	-	-	1 per gun, and 50 per cent. spare.																		

* And 1 set spare.

† And 25 per cent. spare.

‡ The sights are, however, carefully fitted to each gun, and marked with the nature, weight, and distinguishing number of the gun to which they belong.

§ With every 10 platforms are issued 1 axle with wheels, 1 limber, 1 bar, and 1 wrench, for transport purposes.

EQUIPMENT OF 68-POUNDER GUNS.

Name.	Proportionate Number.	Remarks.
Portfires - - - -	4 to 100 rounds of ammunition.	
Powder, loose, L G* - - -	1 barrel per gun.	
Punch, for vent - - - -	1 per gun - - -	In various sizes, distinguished by numbers.
Quoins - - - - -	2 per gun (1 large, 1 small).	Charged with the carriage complete.
Rammers, with staves - - -	2 per gun - - -	1 for use, and 1 spare.
Rivets, for bottoms - - -	1 for each loose shell, and 10 per cent. spare.	
Rope, preventor - - - -	1 per gun - - -	Used with sliding carriages only.
Scales, tangent { wood - - -	1 per gun - - -	Used when the elevation exceeds 5°.
{ brass - - -	1 for each howitzer	Used instead of Millar's sights.
Scales and weights - - - -	Indefinite - - -	For weighing powder.
Scissors, laboratory, small, pairs -	1 to every 3 guns	For use in magazines.
Scotches, wood - - - -	2 per gun - - -	For keeping traversing platforms steady.
Scrapers, shell - - - -	1 to every 3 guns	A different size for each calibre.
Screws {	copper, for tangent scale	1 for each howitzer.
	elevating	1 per gun - - -
	iron { fixing (sights)	5 " - - -
	preserving	4 " - - -
Shells {	common, loose	See p. 276.
	Martin's (molten iron)	Ditto - - -
	shrapnel, with bottoms	Ditto - - -
Shot {	case	Ditto - - -
	grape	Ditto - - -
	solid	Ditto.
Side arms - - - - -	- - - - -	The sponge, rammer, wadhook, and ladle are included in this term.
Sights, † Millar's { fore - - -	1 per gun - - -	Screws for fixing them are charged separate; see also Scales, tangent.
	hind - - -	
Slippers - - - - -	Indefinite - - -	To be worn in magazines.
Spanners, M'Mahon's - - -	1 to every 3 guns.	
Spikes {	common - - -	2 per gun - - -
	spring - - -	1 " - - -
Sponges, with staves - - -	2 " - - -	For disabling guns, permanently.
Staves, spare - - - -	1 " - - -	1 for use and 1 spare.
Sticks, portfire - - - -	1 " - - -	For side arms.
Straps {	fuze box - - -	2 " - - -
	tube pocket - - -	1 for each pocket.
Tackles, luff, complete - - -	1 double set per gun - - -	This proportion applies to heavy guns on sliding carriages only.
Thread, pack - - - -	1 lb. to every 4 guns.	
Thumbstalls - - - -	2 per gun.	
Tompions - - - - -	1 " - - -	To protect the bore.
Tools {	artificers' - - -	As required.
	intrenching - - -	Ditto.
Trucks, hollow soled, spare - - -	10 per cent. - - -	For the traversing platforms.
Tube, wad - - - - -	2 with each furnace - - -	For soaking junk wads.
Tubes {	common, brass - - -	See p. 276.
	friction, copper - - -	
Wads {	papier { fuze hole	1 for each common shell.
	maché { loading hole	1 for each shrapnel shell.

* If the cartridges are not filled a proportionate quantity of loose powder is issued in barrels.

† With each sight is issued a piece of lead, attached to it by the fixing screws; for further particulars, see p. 87.

EQUIPMENT OF 68-POUNDER GUNS.

Name.	Proportionate Number.	Remarks.
Wads { grummet - - junk - -	1 for each solid shot. 1 to every 3 shot -	2 are required with every hot shot and Martin's shell.
Wadhooks - -	1 „ 3 guns -	For drawing charges, &c.
Wadmitilts - -	Indefinite.	
Worsted - -	2 oz. per gun - -	For sewing up cartridges, &c.
Wrenches { for sights - - cross handled - -	1 for 10 guns. 1 to every 10 traversing platforms.	For altering the flanges, &c.
Yarn, spun - -	Indefinite.	

EQUIPMENT OF 56-POUNDER GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
(1.) 56-PR. IRON GUN, OF 11 FT. & 98 CWT.*		£ s. d.	cwts.qrs.lbs.	Pattern of 1838; it has 3 plain rings, a patch at the vent, and a block for the hind sight; the cascable has a plain button.
Range { point blank - 380 yards 8° elevation - 2,700 "				
Gun. ^a				Length of bore, 10' 5"; width across the trunnions, 35½"; diameter of base ring, 28".
Total length, 12 ft. 3 in.; calibre, 7.65 inches; windage, .175 inch		- -	98 0 0	
Sights { fore, dispart, with 2 screws hind (brass scale and socket), with 2 screws - tangent scale, wood -			0 0 2½ 0 0 2¼ 0 0 0¼	
Carriages.				
Common, standing ^b - - -		- -	20 1 0	
Sliding, dwarf - - -		- -	15 2 22	
Platforms.				
Traversing { dwarf - - - casemate - - -		- -	33 3 10 27 0 0	
Ammunition.†				
Firing charges { with shot or shell - without " - with hot shot -			lbs. oz. 14 0 8 0 10 8	L. G. powder. Service charge. For exercise and salutes.
Bursting charges { common shell - shrapnel " -			2 0 0 4½	L. G. powder. M. R. powder; 70 (late 55) drams.
Projectiles { shot { solid - case (50 1-lb. balls) - grape (12 4-lb. balls) - shells, { common, loose - with shrapnel, fixed - plugs } carcass, filled and fixed -			56 0 55 11 68 0 39 0	13.2" long; painted red. 10.2" long; tier pattern.
Fuzes { percussion, Pettman's - time { common - shrapnel -			0 7 0 1½ 0 0½	lbs. of composition.
Tubes { common, brass - friction, copper -			0 0¼ 0 0½	
Bottom, wooden, loose - - -			1 1	Cylindrical shape.

^a Sometimes described as 97 cwt.

^b Ground platforms for these carriages are included in the construction of the battery.

* The lighter guns are described in succession, and any difference in the equipment pointed out.

† The proportion of ammunition for garrison service is given at p. 276.

EQUIPMENT OF 56-POUNDER GUNS.

NOTES.

The 56-pounder gun was constructed by Mr. Monk in 1838. It was intended to be employed in the positions for which 68-pounders are now used, but as the latter piece was successfully introduced three years afterwards, the manufacture of 56-pounders was soon discontinued. Of the 87-cwt. guns there appear to be only 21 in existence, which were ordered in 1844; of the 98-cwt. guns 85 were ordered between 1838 and 1855.

The two sizes are alike in pattern and have a plain button on the cascable; they are of nearly the same weight as the 68-pounders of 95 cwt. and 88 cwt. In the 16th century there was a "canon serpentine," which threw a 52 lbs. shot; its length was $11\frac{1}{2}$ ft., weight 7,000 lb. (66 cwts.), calibre $7\frac{1}{4}$ inches, and windage $\frac{3}{4}$ inch.

The 56-pounder was recommended in 1844 for positions requiring very distant ranges, and was mounted in several of the batteries which defend the harbour entrance at Portsmouth. One round of shot weighs $70\frac{1}{2}$ lbs.; of hot shot, 72 lbs.; of common shell, $56\frac{1}{2}$ lbs.; of case, 70 lbs.; and of grape, 82 lbs. The metal-lined case holds the following numbers of filled cartridges:—8 of 14 lbs.; 55 of 2 lbs.; or 500 of 55 drams.

The gun can be mounted or dismounted by one 18-foot, or two 16-foot, gyns, and transported at the same time with its carriage by a sling wagon, or separately by a sling cart.

EQUIPMENT OF 42-POUNDER GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.	
(1.) 42-PR. IRON GUN, OF 10 FT. & 84 CWT.*		£ s. d.	cwts.qrs.lbs.	Pattern of 1839; it has 3 plain rings, a breeching loop with a pin; a patch at the vent; and a block for the hind sight.	
Range { point blank, 400 yards. 8° elevation, 2,600 "					
<i>Gun. *</i>					
Total length, 11 ft. 3 in.; calibre, 6·97 inches; windage, ·2 inch -		- -	84 0 0	Length of bore, 9' 6"; width across the trunnions, 34"; diameter of base ring, 26·42".	
Sights { fore (dispart), with 2 screws hind (brass scale and socket), with 2 screws - tangent scale, wood -			0 0 2½ 0 0 2½ 0 0 0½		
<i>Carriages.</i>					
Common, standing ^b - - -		- -	16 3 13		
Rear chock ^b - - -		- -	- - -		
Sliding - - -		- -	16 2 0		
<i>Platforms.</i>					
Traversing { common - - - dwarf - - - casemate - - -		- - - - - -	- - - 33 3 10 27 0 0		
<i>Ammunition. †</i>					
Firing charges { with shot or shell ^c - without " - with hot shot -			lbs. oz. 14 0 8 0 10 8	L. G. powder. Service charge. For exercise and salutes.	
Bursting charges { common shell - shrapnel " -			1 6 0 3½	L. G. powder. M. R. powder; 60 (late 50) drams.	
Projectiles { shot { solid - - - case (85 8-oz. balls) grape (9 4-lb. balls)			42 0 46 12 48 0	12·8" long; painted red. 9·7" long; tier pattern.	
	{ shells, with plugs { common, loose - shrapnel, fixed -		28 0 39 0		
	{ carcass, filled and fixed -		30 8		
Fuzes { percussion, Pettman's - time { common - - - shrapnel - - -		- - - - - -	0 7 0 1½ 0 0½	lbs. of composition.	
Tubes { common, brass - - - friction, copper - - -		- - - -	0 0½ 0 0½		
Bottom, wooden, loose - - -		- -	0 13	Cylindrical shape.	
Bag, waterproof paper, No. 3 - - -		- -	0 0½	For shrapnel bursters.	
Cartridges { calico, { common shell - - - burstern { do. waterproof - - - shrapnel shell - - - flannel, service - - - charge { exercise - - -		- - - - - - - - - -	0 0½ 0 0½ 0 0½ 0 3 0 2	No. 7. With common paper bag.	
	Cover { paper, No. 17 - - - waterproof - - -		- - - -	0 1½ 0 1½	} For service cartridges.

* Also described as 85 cwt.

^b Ground platforms for these carriages are included in the construction of the battery.

^c The 42-pounders of lighter construction have smaller service charges.

* The lighter guns are described in succession, and any differences in their equipment pointed out.

† The proportionate supply of ammunition for garrison service is given at p. 276.

EQUIPMENT OF 42-POUNDER GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
Rivet, for bottoms - - -		£ s. d.	lbs. oz.	
Wads { grummet - - -			0 2	
{ junk - - -			0 7½	
{ papier { fuze hole - - -			2 0	
{ maché { loading hole, large -				
<i>Stores.*</i>				
Boxes, wood { for 4 case or grape - - -			30 8	31" × 9" × 13".
{ for 4 shell - - -			21 4	31" × 9" × 9½".
{ for 1 shrapnel - - -			7 7	10" × 9" × 9½".
Case, leather, cartridge (No. 2) - - -			5 12	17" deep.
Fid, wood - - -			25 11	
Garland, for 30 shot - - -			96 0	2' 4" square; see also table.
Gauges, { all shot and shells, high - - -			3 14	6·795" diameter.
{ solid shot and shells, low - - -			3 13	6·735" "
{ case and grape, low - - -			3 12	6·675" "
Heads, spare { rammer - - -			2 13	
{ sponge - - -			4 4	
Ladle, copper, with 9½-foot stave - - -			19 6	
Pedestal - - -			5 2	
Punch, for vent (No.) - - -			0 2½	
Rammer, with 11-foot stave ^b - - -			9 11	
Scraper, shell - - -			0 7	
Spike, spring, 10·1 inches long ^b - - -			0 1½	
Sponge, with stave and cap ^b - - -			11 2	
Stave, spare, 11 feet ^b - - -			6 14	
Tompson, with junk wad - - -			5 12	
Wadhook, with 11-foot stave - - -			10 0	
(2.) 42-PR. IRON GUN, OF 10 FT. & 75 CWT.				First cast in 1845; similar in pattern to the 84-cwt. gun.
Range { point blank, 350 yards. { 8° elevation, 2,600 yards.				
<i>Gun.</i>				
Total length, 11 ft. 3 in.; calibre, 6·97 inches; windage, ·2 inch.				75 cwt. Length of bore, 9' 6"; diameter of base ring, 24·96".
<i>Carriage.</i>				
Common, standing - - -				14½ cwt.
<i>Ammunition.</i>				
The service charge is 12 lbs.				9 lbs. charge with hot shot.
The rest of the equipment is the same as for the 84-cwt. gun.				

* See also the list at p. 298.

^b The length depends on the construction of the gun, and is liable to vary in guns of the same

EQUIPMENT OF 42-POUNDER GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
<p>(3.) 42-PR. IRON GUN, OF 9 FT. 6 IN. & 67 CWT.</p> <p>Range { point blank, 300 yards. 8° elevation, 2,500 yards.</p> <p><i>Gun.</i></p> <p>Total length, 10 ft. 8 in.; calibre, 6·93 inches; windage, ·2 inch.</p> <p><i>Carriages.</i></p> <p>Common, standing - - - Sliding, dwarf - - - Iron, with trucks - - -</p> <p><i>Ammunition.</i></p> <p>The service charge is 10½ lbs.</p> <p><i>Stores.</i></p> <p>The side arms are 11 feet long in the staves. The spring spike is 9 inches long.</p>		<p>£ s. d.</p>	<p>lbs. oz.</p> <p>67 cwt.</p> <p>14¼ cwt. 16 cwt. 26¼ cwt.</p>	<p>First cast in 1846; similar in pattern to the 84-cwt. gun.</p> <p>Length of bore, 9' 0¾"; diameter of base ring, 24·375".</p> <p>7 lbs. 14 oz. charge with hot shot.</p> <p>The rest of the equipment is the same as for the 84-cwt. gun.</p>

NOTES.

The 42-pounder guns of the present pattern date from 1839 and 1846, but guns of the same nature are included in lists of the ordnance in use during the last century. In 1766 there were two 42-pounders; one was an iron ship gun of 10 ft. and 55 cwt.; the other was a brass battering piece of 10 ft. and 61½ cwt. (Adye's MS.), both appear to have then been recently added to the service. In 1813 there were two iron 42-pounders, one of 10 ft. and 67 cwt., and the other of 9 ft. 6 in. and 65 cwt.

The three sizes are alike in pattern. The smallest was introduced in 1846, a few years after the rest; it was constructed by Col. Dundas, and was the best of three ordered to be made for experiment with the same length and weight. The other guns were designed by Mr. Monk. The manufacture of the 42-pounders has now ceased; 134 of the 84 cwt. size were ordered between 1839 and 1854; 30 of the 75 cwt. size were ordered in 1845, and 50 of the 67 cwt. size in 1846.

For the three sizes there are three different charges; with the largest, one round of shot, hot or cold, weighs 56½ lbs.; common shell, 44½ lbs.; shrapnel shell, 53½ lbs.; carcass, 45½ lbs.; case, 61 lbs.; and grape, 62½ lbs. The metal-lined case holds the following numbers of filled cartridges:—8 of 14 lbs.; 9 of 12 lbs.; 10 of 10½ lbs.; or 600 of 50 drams.

The gun must be mounted, dismounted, or transported by the same means as the 56-pounder gun.

EQUIPMENT OF 32-POUNDER GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
(1.) 32-PR. IRON GUN, OF 9 FT. 7 IN. & 63 CWT.*		£ s. d.	cwts.qrs.lbs.	Gen. Millar's pattern (1829); it has a breeching loop, with a pin; 3 plain rings; a patch at the vent; and a block for the hind sight.
Range { point blank, 390 yards. 10° elevation, 3,000 yards.				
<i>Gun.</i>				
Total length, 10 ft. 8 in.; calibre, 6.41 in.; windage, .233 inch -		- -	63 0 0	Length of bore, 9' 2½'.
Sights {	fore (dispart), with 2 screws		0 2½	
	hind (brass scale and socket), with 2 screws -		0 2½	
	tangent scale, wood -		0 0½	
<i>Carriages.</i>				
Common, standing ^b - - -		- -	14 3 0	
Sliding {	dwarf - - -		14 2 0	
	casemate - - -			
Iron, with trucks - - -		- -	23 2 0	
<i>Platforms.</i>				
Traversing {	common - - -		23 0 0	
	dwarf - - -		33 3 10	
	casemate - - -		27 0 0	
<i>Ammunition.†</i>				
Firing charges ^c {	with shot or shell -		10 0	L. G. powder. Service charge.
	without " -		6 0	For exercise and salutes.
	with hot shot -		7 8	
Bursting charges {	common shell -		1 2	L. G. powder.
	shrapnel " -		0 3	M. R. powder; 50 (late 40) drams.
	solid - - -		32 0	
Projectiles {	shot {	case (66 ½-lb. balls)	36 4	11.6" long; painted red.
		grape (9 3-lb. balls)	36 4	8.7" long; tier pattern.
	shells, with plugs {	common, loose -	22 0	
		shrapnel, fixed -	28 12	Containing 152 musket bullets.
	carcass, filled and fixed -	26 12	2½ lbs. of composition.	
Fuzes {	percussion, Pettman's -		0 7	
	time {	common -	0 1½	
		shrapnel -	0 0¾	
Tubes {	common, brass -		0 0¾	Require portfires and slow match.
	friction, copper -		0 0¾	
Bottom, wooden (loose) - - -		- -	0 10	Conical shape.

* Sometimes described as 64 cwt.

^b Ground platforms for these carriages are included in the construction of the battery.

^c These charges apply to the 63-cwt., 58-cwt., and 56-cwt. guns; the proper charges for lighter 32-pounders are specified under the description of the gun to which they belong.

* The lighter guns are described in succession, and any difference in their equipment is pointed out.

† For the proportionate supply of ammunition, see page 276.

EQUIPMENT OF 32-POUNDER GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
Bag, waterproof paper, No. 3 -		£ s. d.	lbs. oz.	
			0 0½	For shrapnel bursters.
Cartridges {	calico, common shell -		0 0½	No. 7. With common paper bag.
		do. waterproof shrapnel shell -	0 0½	
		flannel, service -	0 2½	
		charge exercise -	0 2	
Cover {	paper, No. 7 -		0 2	} For service cartridges.
	waterproof -		0 1	
Rivets, for bottoms -			0 2	
			0 7	Used with solid shot.
Wads {	grummet -		1 8	" red hot shot.
	junk -		0 0	For securing common shells.
	papier { fuze hole -		0 0	" shrapnel "
	maché { loading hole, large -		0 0	
<i>Stores.*</i>				
Boxer, wood {	for 4 grape or case -		21 1	28½" x 8" x 12".
	for 4 shell -		19 0	29" x 9" x 9½".
Case, leather, cartridge (No. 4) -			3 6	16" deep.
Fid, wood -			21 5	
Garland, for 30 shot -			94 0	2' 1¼" square; for other sizes, see the table.
Gauges, ring {	all shot and shells, high -		3 4	6' 207" diameter.
	solid shot and shells, low -		3 3	6' 147" "
	case and grape, low -		3 2	6' 087" "
Heads, spare {	rammer -		2 0	
	sponge -		3 12	
Ladle, copper, with 8½-ft. stave -			18 0	
Pedestal {	standing carriage -		3 2	
	sliding " -		4 6	
Punch, for vent (No. 4) -			0 2	
Rammer, with stave ^b -			8 14	
Scraper, shell -			0 6½	
Spike, spring, 8' 48 in. long ^b -			0 2	
Sponge, with stave, and cap ^b -			10 10	
Stave, spare, 11 feet ^b -			6 14	
Tompson, with junk wad -			4 10	
Wadhook, with 9¼-feet stave -			9 0	
(2.) 32-PR. IRON GUN, OF 9 FT. 6 IN. & 58 CWT.				
<i>Gun.</i>				
Total length, 10 ft. 7 in.; calibre, 6.375 in.; windage, .198 inch.			58 cwt.	Col. Dundas' pattern (1847); it is similar in external form to the 63-cwt. gun.
<i>Carriages.</i>				
Common, standing -			14½ cwt.	
" for platforms -			13½ cwt.	
Sliding, dwarf -			14 cwt.	

* Those here detailed are adapted to this gun. For the general supply, see the alphabetical list given with the 68-pounder gun.

^b The length depends on the construction of the gun, and is not the same for all the 32-pounders.

EQUIPMENT OF 32-POUNDER GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
<i>Ammunition and Stores.</i>				
As for the 63-cwt. gun.				
(3.) 32-PR. IRON GUN, OF 9 FT. 6 IN. & 56 CWT.				
<i>Gun.</i>				
Total length, 10 ft. 5 in.; calibre, 6·41 in.; windage, ·233 inch.			56 cwt.	Sir T. Blomefield's pattern; it has 3 rings and 2 astragals with fillets. There is a patch at the vent, and the cascable has a button, with the breeching loop above the neck.
<i>Carriages.</i>				
As for the 58-cwt. gun.				
<i>Ammunition and Stores.</i>				
The spring spike is 8·1 in. long.				
(4.) 32-PR. IRON GUN, OF 9 FT. & 50 CWT.				
Range { point blank, 340 yards. 8° elevation, 2,780 yards.				
<i>Gun.</i>				
Total length, 10 ft.; calibre, 6·375 inches; windage, ·198 inch.			50 cwt.	Length of bore, 8' 7"; width across the trunnions, 29½"; diameter of base ring, 22·48".
<i>Carriages.</i>				
Common standing - - -			14½ cwt.	
Common, for platforms - - -			14 cwt.	
<i>Ammunition.</i>				
The service charge is 8 lbs. The exercising charge, 5 lbs. Other items are the same as for the 63-cwt. gun.				
<i>Stores.</i>				
The cartridge case is No. 5. The side arms have staves 10 ft. 6 in. long. The spring spike is 8·36 in. long.				
(5.) 32-PR. IRON GUN, OF 9 FT. & 46 CWT.				
<i>Gun.</i>				
Total length, 9 ft. 10 in.; calibre, 6·35 inches; windage, ·173 inch.			46 cwt.	Bored up from the 24-pounder gun of 9 ft. and 48 cwt.; similar in external form to the 56-cwt. gun (3). Length of bore, 8' 6½"; diameter of base ring, 20·9".

EQUIPMENT OF 32-POUNDER GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
<p><i>Ammunition.</i> Service charge, 6 lbs. Exercising charge, 4 lbs.</p>		<p>£ s. d.</p>		<p>4 lbs. 8 oz. charge with hot shot.</p>
<p>(6.) 32-PR. IRON GUN, OF 8 FT. & 48 (OR 50) CWT.</p>				<p>Similar in form to the 56-cwt. gun (3) of Blomefield's pattern.*</p>
<p><i>Gun.</i> Total length, 9 ft. ; calibre, 6·41 in. ; windage, ·233 inch.</p>			<p>48 cwt.</p>	<p>Length of bore, 7' 5½"; diameter of base ring, 20·95".</p>
<p><i>Carriages.</i> Common standing - - - -</p>			<p>14½ cwt.</p>	
<p><i>Ammunition.</i> Service charge, 8 lbs. Exercising charge, 5 lbs. Other items as for the 63-cwt. gun.</p>				<p>6 lbs. charge with hot shot.</p>
<p><i>Stores.</i> The cartridge case is No. 5. The side arms have staves 9 ft. 6 in. long. The spring spike is 7·94 in. long. The other articles are the same as for the 63-cwt. gun.</p>				
<p>(7.) 32-PR. IRON GUN, OF 8 FT. 6 IN. & 45 CWT.</p>				<p>Mr. Monk's B pattern (1858) ; similar to the 50-cwt. gun (4).</p>
<p>Range { point blank, 320 yards. 8° elevation, 2,680 yards.</p>				
<p><i>Gun.</i> Total length, 9 ft. 6 in. ; calibre, 6·35 in. ; windage, ·173 inch.</p>			<p>45 cwt.</p>	<p>Length of bore, 8' 1½"; diameter of base ring, 21·97".</p>
<p><i>Carriages.</i> Common standing - - - -</p>			<p>14½ cwt.</p>	
<p><i>Ammunition.</i> Service charge, 7 lbs. Exercising charge, 5 lbs. Other items as for the 63-cwt. gun.</p>				<p>4 lbs. 12 oz. charge with hot shot.</p>
<p><i>Stores.</i> The cartridge case is No. 5. The side arms have staves 10 feet long. The spring spike is 8·22 inches long. Other articles as for the 63-cwt. gun.</p>				

* There appears to have been another gun of 8 ft. and 48 cwt. made on Gen. Millar's construction.

EQUIPMENT OF 32-POUNDER GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
<i>Ammunition.</i>				
Service charge, 6 lbs. Exercising " 4 " Other items as for the 63-cwt. gun.		£ s. d.		
<i>Stores.</i>				
The cartridge case is No. 5. The side arms have staves 9 feet long. The spring spike is 8·35 inches long. Other articles as for the 63-cwt. gun.				
(11.) 32-PR. IRON GUN, OF 7 FT. 6 IN. & 39 CWT.				
<i>Gun.</i>				
Total length, 8 ft. 6 in.; calibre, 6·375 inches; windage,			39 cwt.	Bored up from a 24-pounder iron gun; similar in form to the 56-cwt. gun (3). Length of bore, 7' 0 $\frac{1}{2}$ " ; diameter of base ring 20·9".
<i>Carriages.</i>				
Common, standing - - -			13 $\frac{1}{2}$ cwt.	
<i>Ammunition and Stores.</i>				
Spring spike, 7·41 in.; other items as for the gun of 7 ft. 6 in. and 40 cwt.				
(12.) 32-PR. IRON GUN, OF 6 FT. 6 IN. & 32 CWT. For flank defences.				
<i>Gun.</i>				
Total length, 7 ft. 6 in.; calibre, 6·3 inches; windage, 123 inch.			32 cwt.	Bored up from the 24-pounder gun of 33 cwt. Length of bore, 6 ft.; width across the trunnions, 27 $\frac{1}{2}$ " ; diameter of base ring, 18·6".
<i>Carriage.</i>				
Common, standing - - -			11 $\frac{1}{2}$ cwt.	
<i>Ammunition.</i>				
Service charge, 5 lbs. Exercising " 3 " Other items as for the 63-cwt. gun.				3 lbs. 12 oz. with hot shot.
<i>Stores.</i>				
The cartridge case is No. 6. The side arms have staves 8 feet long. The spring spike is 7·1 inches long. Other articles as for the 63-cwt. gun.				

EQUIPMENT OF 32-POUNDER GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
(13.) 32-PR. IRON GUN, OF 6 FT. & 25 CWT.*		£ s. d.	lbs. oz.	This gun (Millar's pattern, 1829) has a breeching loop, with a pin, and also a horizontal loop, or eye. There are 3 plain rings, a patch at the vent, and a block for the hind sight.
For flank defences.				
<i>Gun.</i> Total length, 6 ft. 9 in.; calibre, 6·3 inches; windage, ·123 inch.			25 cwt.	Length of bore, 5' 7 $\frac{1}{4}$ "; width across the trunnions, 24 $\frac{1}{2}$ "; diameter of base ring, 18·62".
<i>Carriages.</i> Common, standing - - - Rear chock - - -			8 $\frac{1}{4}$ cwt. 6 cwt.	
<i>Ammunition.</i> Service charge, 4 lbs. Exercising „ 2 $\frac{1}{4}$ „ Other items as for the 63-cwt. gun.				
<i>Stores.</i> The cartridge case is No. 6. The side arms have staves 7 feet 6 inches long. The spring spike is 6·46 inches long. Other articles as for the 63-cwt. gun.				
(14.) 32-PR. IRON GUN, OF 5 FT. 4 IN. & 25 CWT.†				Similar in pattern to the last gun.
<i>Gun.</i> Total length, 6 ft. 7 in.; calibre, 6·3 inches; windage, ·123 inch.			25 cwt.	Length of bore, 5' 4"; diameter of base ring, 17·68".
<i>Carriage.</i> Common, standing - - -			8 $\frac{1}{4}$ cwt.	
<i>Ammunition.</i> Service charge, 4 lbs. Exercising „ 2 $\frac{1}{4}$ „ Other items as for the 63-cwt. gun.				
<i>Stores.</i> The cartridge case is No. 6. The side arms have staves 6 feet 6 inches long. The spring spike is 6·46 inches long. Other articles as for the 63-cwt. gun.				

* There is another 32-pounder of 6 ft. and 25 cwt., constructed by Col. Dundas in 1845; its calibre and windage are the same as in this pattern.

† In 1836 there were some guns ordered of the same length but less weight, 55 were of 22 cwt. and .16 were of 20 cwt.

EQUIPMENT OF 32-POUNDER GUNS.

NOTES.

32-pounders have been more generally used both on land and sea than any other heavy ordnance, and during the last century they were the most effective pieces for any distant ranges; 42-pounders were already in the service, but appear to have been seldom mounted in fortified places.

The earliest kind of 32-pounder was the demi-canon of 10½ ft. and 50 cwt., existing in 1574, and retained under that name until the nomenclature of ordnance was changed; its calibre was 6½ inches, and its shot weighed from 30 to 32 pounds. In 1766 there was an iron 32-pounder of 9 ft. 6 in. and 54 cwt.; and a brass battering piece of 9 ft. 6 in. and 55½ cwt. In 1813 there were two iron guns and one brass piece with weights and dimensions different from the above, and all the guns in present use are of still later date.

Some of the existing patterns, which are fourteen in number, were introduced to improve the capabilities of the gun for distant ranges and battering purposes, but their great variety is mainly due to the calibre happening to be well adapted for the use of common shells as well as solid shot; whilst, at the same time, there were no howitzers or light pieces which could use the same ammunition. Consequently fresh pieces were made with the same calibre, but with such different proportions of length and weight, that although they were called guns, they partook more of the nature of shell guns or howitzers. Five of the light natures were originally cast as 24-pounders or 18-pounders, and were bored up to the 32-pounder calibre to save the expense of casting new pieces. Two of the light pieces were, however, specially constructed to be mounted in the flanks of any batteries where heavy 32-pounders are employed for long ranges.

The manufacture of 32-pounders since 1850 has been confined to the guns of 9 ft. 6 in. and 58 cwt.; 9 ft. and 50 cwt.; of 8 ft. and 42 cwt.; and of 6 ft. and 25 cwt. The 56-cwt. gun is much used in batteries commanding long ranges, especially where hot shot are to be used; and the 50-cwt. gun. may be employed with advantage in siege trains as a substitute for the 24-pounder.

For the various constructions there are charges in proportion to their strength, from 10 lbs. down to 4 lbs. A metal-lined case holds the following numbers of filled cartridges:—11 of 10 lbs.; 14 of 8 lbs.; 16 of 7 lbs.; 19 of 6 lbs.; 22 of 5 lbs.; 27 of 4 lbs. (firing charges); 100 of 18 oz.; or 700 of 40 drams, bursting charges. The proportion of ammunition kept ready for service in coast batteries is shown at page 276. The weight of one round, including the packing cases, is given in the table at p. 398.

The 32-pounder of 56 cwt. and all guns of less weight can be transported singly by the sling cart, and with their carriages by the sling wagon, or platform wagon; they can be mounted or dismounted by one 16-foot gyn.

EQUIPMENT OF 24-POUNDER GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
(1.) 24 PR. IRON GUN, OF 9 FT. 6 IN. & 50 CWT.*		£ s. d.	cwts.qrs.lbs.	Old, or ordinary pattern ; it has 3 rings and 2 astragals with fillets ; there is a patch at the vent, and the cascable has a button with the breeching loop above the neck.
Range { 1° elevation, 760 yards. 10° " 2,450 "				Length of bore, 8' 11½"; width across the trunnions, 28"; diameter of base ring, 19·25".
<i>Gun.*</i>				
Total length, 10 ft. 5 in. ; calibre, 5·823 inches ; windage, ·211 inch		-	50 0 0	
Sights { fore (dispart), with 2 screws hind (brass scale and socket), with 2 screws - tangent scale, wood -		-	0 0 2 0 0 2 0 0 0½	
<i>Carriages.</i>				
Common standing ^b -		-	13 3 0	
Common, for platforms ^b -		-	12 3 0	
Sliding, dwarf -		-	12 3 0	
Iron, with trucks -		-	21 3 0	
<i>Platforms.</i>				
Traversing { common - dwarf - casemate -		-	19 0 0 33 3 10 27 0 0	
<i>Ammunition.†</i>			lbs. oz.	
Firing charge ^c { with shot or shell - without " - with hot shot -		-	8 0 5 0 6 0	L. G. powder. Service charge. For exercise and salutes.
Bursting charge { common shell - shrapnel " -		-	0 13 0 2½	L. G. powder. M. R. powder ; 40 (late 30) drams.
Projectiles { shot { solid - case (46 ¼-lb. balls) - grape (9 2-lb. balls) - shells, with { common, loose plugs { shrapnel, fixed carcass, filled and fixed -		-	24 0 25 7 26 0 16 0 20 11 19 4	10·9" long ; painted red. 7·6" long ; tier pattern. Containing 110 musket bullets. 1¼ lb. of composition.
Fuzes { percussion, Pettman's - time { common - shrapnel -		-	0 7 0 1½ 0 0½	
Tubes { common, brass - friction, copper -		-	0 0½ 0 0¼	
Bottom, wooden (loose) -		-	0 7½	Conical shape.

* This gun is used also in siege trains.

^b Ground platforms for these carriages are included in the construction of the battery.

^c These charges apply also to the 48-cwt. gun ; for the lighter 24-pounders there are smaller charges.

* The lighter guns are described in succession, and any difference in their equipment is pointed out.

† The proportionate supply of ammunition would depend on various circumstances.

EQUIPMENT OF 24-POUNDER GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
Bag, waterproof paper, No. 2	-	£ s. d.	lbs. oz.	For shrapnel bursters.
Cartridges {	calico, { common shell -	-	0 0 $\frac{1}{2}$	No. 6. With common paper bag.
		do. waterproof	0 0 $\frac{1}{2}$	
		shrapnel " -	0 0 $\frac{1}{2}$	
		flannel, { service -	0 2	
Cover {	charge { exercise -	-	0 1	} For service cartridges.
		paper, No. 16 -	0 1 $\frac{1}{4}$	
Rivet, for bottoms	-	-	0 1 $\frac{1}{2}$	
Wads {	grummet -	-	0 2	
		junk -	0 5	
		papier { fuze hole -	1 2	
maché {	loading hole, large -	-	0 0	
		-	0 0	
<i>Stores.*</i>				
Boxes, wood {	for 6 grape or case -	-	26 8	21" x 13" x 10 $\frac{1}{2}$ ".
Case, leather, cartridge (No. 5)	for 6 shells -	-	20 12	21" x 13" x 9 $\frac{1}{2}$ ".
	-	-	3 5	12" deep.
Fid, wood	-	-	17 0	
Garland, for 30 shot	-	-	76 0	1' 11" square ; see also table.
Gauges, {	ring { shell, high -	-	2 15	5·62" diameter.
		solid shot, low -	2 14	5·584" "
		shell, low -	2 13	5·557" "
		case and grape, low -	2 12	5·52" "
Gauge for hot shot, 5·758"	-	-	-	With two handles ; width, 25".
Heads, spare {	rammer -	-	1 10	
		sponge -	3 5	
Ladle, copper, with 8 $\frac{1}{2}$ -feet stave	-	-	15 11	
Pedestal, for standing carriage	-	-	3 0	
Punch, for vent (No. 4)	-	-	0 2	
Rammer, with 10 $\frac{1}{2}$ -feet stave ^b	-	-	8 3	
Scraper, shell	-	-	0 5 $\frac{1}{2}$	
Spike, spring, 7·8 inches long ^b	-	-	0 2	
Sponge, with stave and cap ^b	-	-	10 3	
Stave, spare, 10 $\frac{1}{2}$ feet ^b	-	-	6 9	
Tompson, with junk wad	-	-	4 3	
Wadhook, with 9 $\frac{1}{2}$ -feet stave	-	-	9 0	
(2.) 24-PR. IRON GUN, OF 9 FT. & 48 CWT.				Similar in pattern to the 50-cwt. gun.
<i>Gun.</i>				48 cwt.
Total length, 9 ft. 10 in.; calibre, 5·823 inches; windage, ·211 inch.				Length of bore, 8' 5 $\frac{1}{2}$ "; diameter of base ring, 20·9".
<i>Carriages and Ammunition.</i>				
As for the 50-cwt. gun.				
<i>Stores.</i>				
The side arms have staves 10 feet 6 inches long.				The other articles are the same as for the 50-cwt. gun.
The spring spike is 7·65 inches long.				

* The articles here detailed are adapted to this gun ; the general list of stores required is given at p. 298.
^b The length depends on the construction of the gun, and is not the same for all the 24-pounders.

EQUIPMENT OF 24-POUNDER GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
		£ s. d.	lbs. oz.	
<p>(3.) 24-PR. IRON GUN, OF 7 FT. 6 IN. & 41 CWT.</p> <p>Range { 1° elevation, 600 yards. 10° " " "</p> <p><i>Gun.</i> Total length, 8 ft. 5 in.; calibre, 5·823 inches; windage, ·173 inch.</p> <p><i>Ammunition.</i> Service charge, 6 lbs. Exercising charge, 4 lbs. Other items as for the 50-cwt. gun.</p> <p><i>Stores.</i> The side arms have staves 9 feet long.</p>			<p>41 cwt.</p>	<p>Congreve's pattern; the construction of the muzzle resembles that of a carronade, and there is a dispart sight at the ring beyond the trunnions. The cascable has a button with a wide neck, which is pierced to receive a breaching rope.</p> <p>Length of bore, 7'; width across the trunnions, 29"; diameter of base ring, 20·45".</p> <p>4 lbs. 8 oz. with hot shot.</p> <p>Other articles as for the 50-cwt. gun.</p>
<p>(4.) 24-PR. IRON GUN, OF 6 FT. 6 IN. & 33 CWT.</p> <p><i>Gun.</i> Total length, 7 ft. 3 in.; calibre, 5·823 inches; windage, ·211 inch.</p> <p><i>Carriage.</i> Common standing, 7½ cwt.</p> <p><i>Ammunition.</i> Service charge, 4 lbs. Exercising charge, 3 lbs. Other items as for the 50-cwt. gun.</p> <p><i>Stores.</i> The side arms have staves 8 feet long. The spring spike is 7·38 inches long.</p>			<p>33 cwt.</p>	<p>Old, or ordinary pattern, similar in exterior form to the 50-cwt. gun.</p> <p>Length of bore, 6'; width across the trunnions, 27½"; diameter of base ring, 18·6".</p> <p>Other articles as for the 50-cwt. gun.</p>
<p>(5.) 24-PR. IRON GUN, OF 6 FT. & 20 CWT.</p> <p><i>Gun.</i> Total length, 6 ft. 9 in.; calibre, 5·823 inches; windage, ·139 inch.</p>			<p>20 cwt.</p>	<p>Bored up from the 12-pounder of 6 ft. and 21 cwt., similar in form to the 50-cwt. gun.</p> <p>Length of bore, 5' 6½"; diameter of base ring, 16·95".</p>

EQUIPMENT OF 24-POUNDER GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
		£ s. d.	lbs. oz.	
<i>Carriages.</i>				
Common, standing - - -			4½ cwt.	
Rear chock - - -			8½ "	
Sliding, dwarf - - -			4½ "	
<i>Ammunition.</i>				
Charge (service and exercise), 2½ lbs.				
Other items as for the 50-cwt. gun.				
<i>Stores.</i>				
The cartridge case is No. 6.				
The side arms have staves 7 feet 6 inches long.				
The spring spike is 5·95 inches long.				
Other articles as for the 50-cwt. gun.				

NOTES.

The 24-pounder guns correspond in weight and calibre to the "whole culvefins" of the 16th and 17th centuries, but they throw a heavier shot. In 1766 there were four 24-pounders of which only one was an iron piece. In 1813 there were three of iron and four of brass. These brass pieces were for field and siege service, they have all become obsolete, and the iron constructions have changed from time to time. The present patterns include one gun that has been bored up from a 12-pounder, and two of a light construction. The ordinary 24-pounders have been generally used in siege trains as battering guns; in fortifications they have, of late years, been restricted to those fronts which command the land approaches; the light 24-pounders have been mounted in casemates and flank defences as substitutes for the 24-pounder carronade.

The Committee of 1844 reported the guns of 50 cwt. and 48 cwt. as little inferior to the 32-pounders for long ranges, and recommended the gun of 20 cwt. to be used for flank defence in batteries where the heavier descriptions were mounted.

There are four different service charges to suit the various constructions; the weights of one round of ammunition with each nature of projectile have been given at page 245. A metal-lined case holds the following numbers of filled cartridges; 14 of 8 lbs.; 19 of 6 lbs.; 27 of 4 lbs.; or 44 of 2½ lbs. (service charges); 130 of 13 oz.; or 950 of 30 drams, bursting charges.

The gun can be mounted by a 16-foot gyn, and transported by any one of the usual carriages.

EQUIPMENT OF 18-POUNDER GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
(1.) 18-PR. IRON GUN, OF 9 FT. & 42 CWT.*		£ s. d.	cwts.qrs.lbs.	Old, or ordinary pattern; it has 3 rings and 2 astragals with fillets; there is a patch at the vent, and the cascable has a button with the breeching loop above the neck.
Range { point blank, 330 yards. 10° elevation, 2,300 yards.				
<i>Gun.</i>				
Total length, 9 ft. 10 in.; calibre, 5.292 inches; windage, .193 inch.			42 0 0	Length of bore, 8' 5½"; width across the trunnions, 26"; diameter of base ring, 18.03".
Sights { fore (dispart) with 2 screws hind (brass scale and socket), with 2 screws - tangent scale, wood -			0 0 2½ 0 0 2 0 0 0¼	
<i>Carriages.</i>				
Common standing - - -		- - -	12 3 1	
Sliding - - - - -		- - -	9 1 6	
Iron, with trucks - - -		- - -	19 0 0	
<i>Platforms.</i>				
Traversing { common - - - dwarf, old pattern - - - casemate, old pattern - - -		- - - - - - - - -	19 0 0 24 2 21 21 0 17	
<i>Ammunition.†</i>				
Firing charges* { with shot or shell without " - with hot shot - -			lbs. oz. 6 0 4 0 4 8	L. G. powder. Service charge. For exercise and salutes.
Bursting charges { common shell - shrapnel " - -			0 10 0 2 18 0	L. G. powder. M. R. powder; 30 (late 25) drams.
Pro-jectiles { shot { solid - - - case (46-2 oz. balls) grape (91-½ lb. balls) shells, with { common, loose plugs { shrapnel, fixed carcass, filled and fixed -			19 4 19 8 12 0 15 11 14 12	10.1" long; painted red. 6.8" long; tier pattern. Contains 75 musket bullets. ^b lbs. of composition.
Fuzes { percussion, Pettman's - time { common - - - shrapnel - - - -			0 7 0 1½ 0 0½ 0 0½	
Tubes { common, brass - - - friction, copper - - -			0 0½ 0 7	Cylindrical shape. For shrapnel bursters.
Bottom, wooden (loose) - - -			0 0½	
Bag, waterproof paper, No. 2 -			0 0½	
Cart-ridges { calico, { common shell bursters { do. waterproof shrapnel " - - - flannel, { service - - - charge { exercise - - -			0 0½ 0 0½ 0 2 0 1	No. 6. With common paper bag.

* These charges are also used for the 38-cwt. gun, but not for the smaller natures. ^b Small loading hole.

lighter guns are described in succession, and any difference in their equipment pointed out. proportion of ammunition depends on the circumstances under which the gun is employed.

EQUIPMENT OF 18-POUNDER GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
		<i>£ s. d.</i>	<i>lbs. oz.</i>	
Cover { paper, No. 15 - - -			0 1½	} For service cartridges.
waterproof - - -			0 0½	
Rivet, for bottoms - - -			0 2	
grummet - - -			0 4	
junk - - -			0 14	
Wads { papier { fuze hole - - -			0 0	
maché { loading hole, small			0 0	
<i>Stores.^a</i>				
Boxes, wood { for 8 grape or case -			18 10	25" x 12" x 10".
for 8 shells - - -			20 12	24½" x 12" x 8".
Case, leather, cartridge (No. 7) -			2 6	11" deep.
Fid, wood - - -			13 5	
Garland, for 30 shot - - -			72 0	1' 9" square; for other sizes, see the table.
Gauges, { all shot and shells, <i>high</i> -			2 6	5' 124" diameter.
ring { solid shot and shells, <i>low</i> -			2 5	5' 074" "
case and grape, <i>low</i> - - -			2 4	5' 024" "
Heads, spare { rammer - - -			1 9	
sponge - - -			2 10	
Ladle, copper, with 8½-foot stave -			15 0	
Pedestal, for standing carriage - -			3 0	
Punch, for vent (No. 4) - - -			0 2	
Rammer, with 10½-foot stave ^b - -			8 2	
Scraper, shell - - -			0 4	
Spike, spring, 7' 38 inches long ^b -			0 2	
Sponge, with stave and cap ^b - - -			9 3	
Stave, spare, 10 feet 6 inches ^b - -			6 9	
Tompson, with junk wad - - -			2 15	
Wadhook, with 9½-foot stave - - -			9 0	
 (2.) 18-PR. IRON GUN, OF 8 FT. & 38 CWT.				
<i>Gun.^c</i>				
Total length, 8 ft. 10 in; calibre, 5.292 inches; windage, .193 inch.			38 cwt.	Similar in pattern to the 42-cwt gun. Length of bore, 7' 5½"; diameter of base ring, 18.02".
<i>Carriages and Ammunition.</i>				
As for the 42-cwt. gun.				
<i>Stores.</i>				
The side arms have staves 9 ft. 6 in. long; the spring spike is 7.22 in.				Other articles as for the 42-cwt. gun.

^a The articles here detailed are adapted to this gun; for the general list and proportionate supply, see p. 298.

^b The length depends on the construction of the gun, and is not the same for all 18-pounders.

^c This is the gun which is used for field service in batteries of position.

EQUIPMENT OF 18-POUNDER GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
<p>(3.) 18-PR. IRON GUN, OF 7 FT. & 22 CWT. For short ranges.</p> <p><i>Gun.</i> Total length, 7 ft. 8 in.; calibre, 5·17 inches; windage, ·071 inch.</p> <p><i>Ammunition.</i> Charge (service and exercise), 3 lbs. Other items as for the 42-cwt. gun.</p> <p><i>Stores.</i> The side arms have staves 8 feet 6 inches long. The spring spike is inches long. Other articles as for the 42-cwt gun.</p>		<p>£ s. d.</p>	<p>lbs. oz.</p> <p>22 cwt.</p>	<p>Bored up from the 9-pounder of 7 ft. and 25 cwt.; similar in pattern to the 42-cwt. gun.</p> <p>Length of bore, 6' 7½"; width across the trunnions, 21½"; diameter of base ring, 15·42".</p>
<p>(4.) 18-PR. IRON GUN, OF 6 FT. & 20 CWT.</p> <p><i>Gun.</i> Total length, 6 ft. 8 in.; calibre, 5·17 inches; windage, ·071 inch.</p> <p><i>Ammunition.</i> Charge (service and exercise), 3 lbs. Other items as for the 42-cwt. gun.</p> <p><i>Stores.</i> The side arms have staves 7 feet 6 inches long. The spring spike is 6 inches long. Other articles as for the 42-cwt. gun.</p>			<p>20 cwt.</p>	<p>Bored up from the 12-pounder of 6 ft. and 21 cwt.; similar in pattern to the 42-cwt. gun.</p> <p>Length of bore, 5' 7½"; diameter of base ring, 15·92".</p>
<p>(5.) 18-PR. IRON GUN, OF 5 FT. 5 IN. & 15 CWT.</p> <p><i>Gun.</i> Total length, 6 ft. 2 in.; calibre, 5·17 inches; windage, ·071 inch.</p> <p><i>Ammunition.</i> Charge (service and exercise), 2 lbs. Other items as for the 42-cwt. gun.</p> <p><i>Stores.</i> The side arms have staves 7 feet long. The spring spike is inches long. Other articles as for the 42-cwt. gun.</p>			<p>15 cwt.</p>	<p>Bored up from an old 9-pounder gun.</p> <p>Length of bore, 5' 1½"; diameter of base ring, 14·6".</p>

EQUIPMENT OF 18-POUNDER GUNS.

NOTES.

The 18-pounder gun has the same calibre and weight of metal as the "ordinary culverin" mentioned at p. 77 among the pieces of ancient ordnance. The calibre has been preserved to the present time, but the construction has undergone the usual succession of changes. Brass 18-pounders were in use as late as 1813. The two heavy guns now in the service are on the ordinary construction, and the three light natures are bored-up guns; only 288, of all sizes, have been ordered since 1828.

The 18-pounder gun has lately been employed principally as a gun of position, and as a battering gun in countries where the 24-pounder could not be conveniently transported; formerly it was considered useful in fronts of fortifications where rapid firing might be wanted to check advancing boats or columns of troops. The Committee of 1844 recommended the gun of 42 cwt. to be selected for such positions, and the lighter one of 20 cwt. to be associated with it for the flank defences.

The equipment of an 18-pounder for batteries of position (field service) has been given at page 173; for siege trains it would have the same carriage, with its limber boxes removed, and the usual stores for siege service substituted for the field supply.

A metal-lined case holds the following numbers of filled cartridges:—19 of 6 lbs.; 37 of 3 lbs.; or 55 of 2 lbs. (firing charges); 170 of 10 oz.; or 950 of 25 drams, bursting charges. One complete round of ammunition weighs, with shot, $24\frac{1}{2}$ lbs.; with common shell, $19\frac{1}{2}$ lbs.; shrapnel shell, 22 lbs.; carcass, $21\frac{1}{2}$ lbs.; case or grape shot, $25\frac{1}{2}$ lbs. There is no specified proportion for garrison service.

The gun is worked by the usual party of 10 men, and can be mounted or dismounted by a 16-foot gyn.

EQUIPMENT OF 12-POUNDER GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
(1.) 12-PR. IRON GUN, OF 9 FT. & 34 CWT.*		£ s. d.	cwts.qrs.lbs.	Old or ordinary pattern; it has 3 rings, 2 astragals with fillets; there is a patch at the vent, and the cascable has a button with the breeching loop above the neck.
Ranges { point blank, 200 yards. 10° elevation, "				
<i>Gun.</i>				Length of bore, 8' 6¼"; width across the trunnions, 23½"; diameter of base ring, 16·35".
Total length, 9 ft. 9 in.; calibre, 4·623 in.; windage, '096 inch -		-	34 0 0	
Sights { fore (dispart), with 2 screws hind (brass scale, with socket), with 2 screws - tangent scale, wood -				
<i>Carriage.</i>				
Common standing - - -		-	10 3 0	
Iron, with trucks - - -		-	17 0 0	
<i>Ammunition.†</i>				
Firing charge { with shot or shells - without " -			lbs. oz. 4 0 3 0	L. G. powder. Service charge. For exercise and salutes.
Bursting charge { common shell - shrapnel " -			0 6 0 1½	L. G. powder. M. R. powder; 24 (late 20) drs.
Projectiles { shot { solid - case (41 6½-oz. balls) grape (9 1-lb. balls)			12 0 17 13 13 0	9·4" long; painted red. 6·1" long; tier pattern.
shells, with { common, loose plugs { shrapnel, fixed carcass, filled and fixed -			8 0 8 1	Containing 72 carbine bullets,* lbs. of composition.
Fuzes { percussion, Pettman's - time { common - shrapnel -			0 7 0 1½ 0 0½	
Tubes { common, brass - friction, copper -			0 0½ 0 0½	
Bottom, wooden, loose - - -			0 4½	Conical shape.
Bag, waterproof paper, No. 2 -			0 0½	For shrapnel bursters.
Cart-ridges { calico, { common shell - burstern { do. waterproof shrapnel shell -			0 0½ 0 0½ 0 0½	No. 5. With common paper bag.
flannel, { service - charge { exercise -			0 1 0 1	
Cover { paper, No. 6 - waterproof -			0 0½ 0 0½	} For service cartridges.
Rivet, for bottoms - - -			0 2	
Wads { grummet - junk -			0 3 0 12	
paper { fuze hole - maché { loading hole, small			0 0 0 0	

* Small loading hole.

* The lighter guns of this calibre are given on the next page.

† The proportion of ammunition depends on the circumstances under which the gun is employed.

EQUIPMENT OF 12-POUNDER GUNS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
<i>Stores.*</i>				
Boxes, wood		£ s. d.	lbs. oz.	
{ for 12 case - - -	-		24 7	31" x 11" x 12".
{ for 12 grape - - -	-		21 10	31" x 11" x 9".
{ for 12 shell - - -	-		17 13	31" x 11" x 7½".
Case, leather, cartridge, No. 7	-		2 6	11" deep.
Fid, wood	-		9 8	
Garland, for 30 shot	-		53 0	1' 6½" square; see also table.
Gauges, ring				
{ solid shot, low - - -	-		2 3	4.505" diameter.
{ shell, high - - -	-		2 2	4.476 "
{ shell, low - - -	-		2 1	4.432 "
{ case and grape, low - - -	-		2 0	4.388 "
Heads, spare				
{ rammer - - -	-		1 3	
{ sponge - - -	-		1 15	
Ladle, copper, with 8¼-ft. stave	-		11 1	
Pedestal, wood	-		3 0	
Punch, for vent (No. 5)	-		0 1½	
Rammer, with 10-ft. stave ^b	-		7 7	
Scraper, shell	-		0 3½	
Spike, spring, ^b 6.61 in. long	-		0 1	
Sponge, with stave ^b and cap	-		8 3	
Stave, spare, 10 ft. ^b	-		6 4	
Tompion, with junk wad	-		2 6	
Wadhook, with 9-ft. stave	-		8 4	
12-POUNDER GUNS, OF 8 FT. 6 IN. & 33 CWT.				All similar in pattern to the 34-cwt. gun, and with the same windage.
7 " 6 " 29 "				
6 " 0 " 21 "				
These guns have side arms with staves 9½ ft., 8½ ft., and 7 ft. long respectively.				

* These articles are adapted to the calibre; for the general supply, see p. 298.

^b The length depends on the construction of the gun, and is liable to vary in guns of the same calibre.

NOTES.

The 12-pounder gun of 9 ft. and 34 cwt. was recommended by the Committee of 1844 as an occasional substitute for the 18-pounder in those batteries where a quick fire might be requisite against storming parties or boat attacks; and it has been mounted in such positions within the last few years. The next size, of 8½ ft. and 33 cwt., has been recommended for occasional use in siege trains, as being sufficiently powerful to dismount artillery, and requiring less ammunition than would be expended by 18-pounder or 24-pounder guns.

The same ammunition, with the addition of common shells and grapeshot, is used for this gun as for the brass 12-pounder employed in field service. A metal-lined case holds the following numbers of filled cartridges:—27 of 4 lbs.; 280 of 6 oz.; or 1,300 of 20 drams. The working party is of the usual strength, and the 16-ft. gyn is necessary for mounting and dismounting the piece.

EQUIPMENT OF 9-POUNDER AND 6-POUNDER GUNS,
FOR SALUTING.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions, &c.
9-PR. IRON GUN, OF 8 FT. 6 IN. & 28½ CWT.*		£ s. d.	cwts. qrs. lbs.		Old, or ordinary, pattern.
<i>Gun.</i>					
Total length, 9 ft. 2 in.; calibre, 4·52 inches; windage, ·12 inch	-	-	28 2 0		Length of bore, 8' 0½"; width across the trunnions, 21¾"; diameter of base ring, 15·37".
<i>Carriages.</i>					
Iron	-	-	14 3 0		
Wood	-	-	10 1 0		
<i>Ammunition.</i>					
Flannel cartridge, with 2 lbs. charge	-	-	2 1		L. G. powder.
Friction tube	-	-	0 0½		
<i>Stores.</i>					
Side arms ^a { rammer, with 10-ft. stave			7 4	1	
{ sponge, "			7 10	1	
{ wadhook, with 9-ft. stave			8 0	1	
Bucket, leather, water	-	-	3 8	1	
Case, leather, cartridge (No. 7)	-	-	2 6	2	
Handspike, common, 6 feet	-	-	12 0	5	
Irons, priming	-	set	0 9	1	
Lanyard, friction tube	-	-	0 1	1	
Pocket, tube, with strap	-	-	0 11	1	
Punch, for vent (No. 6)	-	-	0 1½	1	
Tompson, with junk wad	-	-	2 2	1	
6-PR. IRON GUN, OF 7 FT. 6 IN. & 21 CWT.†					Old, or ordinary, pattern.
<i>Gun.</i>					
Total length, 8 ft. 2 in.; calibre, 3·668 in.; windage, ·118 inch.			21 cwt.		Length of bore, ; width across the trunnions, 18½"; diameter of base ring, 13·95".
<i>Carriages.</i>					
Iron	-	-	14½ cwt.		
Wood	-	-	9½ "		
<i>Ammunition.</i>					
Flannel cartridge, with 1½ lb. charge	-	-	1 9		L. G. powder.
Friction tube	-	-	0 0½		
<i>Stores.</i>					
Side arms, with staves { rammer	-		6 4	1	
{ sponge	-		5 15	1	
{ wadhook	-		7 12	1	
Tompson, with junk wad	-	-	1 10	1	
The rest as for the 9-pounder gun.					

^a The sponge and rammer staves for the smaller guns are 9 ft.; 8 ft. 6 in.; and 7 ft. respectively.

^b The sponge and rammer staves for the smaller guns are 8 ft. 6 in. and 7 ft. 6 in. respectively.

* There are also 9-pounders of 7 ft. 6 in. and 26 cwt.; of 7 ft. and 25 cwt.; and of 5 ft. 6 in. and 17 cwt.

† There are also 6-pounders of 7 ft. and 20 cwt., and of 6 ft. and 17 cwt.

**EQUIPMENT OF 9-POUNDER AND 6-POUNDER GUNS,
FOR SALUTING.**

NOTES.

These guns may occasionally be found in the flanks of old fortifications, but their ordinary use is confined to firing salutes ; for this service one non-commissioned officer and four men to each gun are sufficient, and several of the usual stores may be dispensed with ; iron carriages are generally employed.

The details of ammunition are the same as for brass guns of the same calibres, except that the solid shot are issued loose, and that junk or grummet wads are supplied. Grape shot may be fired, and the shrapnel shells are fixed to plank, instead of end wood bottoms.

A platform wagon is the most convenient transport carriage for these guns ; a small gyn is sufficient to mount and dismount them.

EQUIPMENT OF 10-INCH HOWITZERS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
10-IN. IRON HOWITZER, OF 5 FT. & 42 CWT.		£ s. d.	cwts.qrs.lbs.	Gen. Millar's construction; it has 3 plain rings, a dispart patch at the muzzle, a block behind the base ring, and a button at the cascabe.
Ranges { point blank, 300 yards. 8° elevation, 1,850 yards.				
<i>Howitzer.</i>				
Total length, 6 ft.; calibre, 10 inches; windage, 16 inch - - -		- -	42 0 0	Length of bore, with gomer chamber, 4' 9 $\frac{1}{4}$ "; width across the trunnions, 34 $\frac{1}{2}$ "; diameter of base ring, 23·24".
Sights { fore (dispart) ^a - - - hind (brass tangent scale, with screw) - - -			0 0 1	
<i>Carriages.</i>				
Common, standing - - -		- -	16 0 0	
Perch trail - - - - -		- -	31 2 10	
Rear chock - - - - -		- -	15 0 9	
Sliding - - - - -		- -	14 1 0	
<i>Platforms.</i>				
Traversing { common - - - dwarf - - - casemate - - -			33 3 10	
			27 0 0	
<i>Ammunition.</i>				
Firing charges { with projectiles - - - without " - - -			lbs. oz.	L. G. powder. Service charge. For exercise and salutes. For the old pattern.
			7 0	
Bursting charge, common shell - {			4 0	" naval " " " "
			5 0	
Projectiles { common { old pattern - - - shell { naval " - - - carcass, filled and fixed case shot (170 8-oz. balls)			6 4	1' 646" thick. " 1' 35" thick. 9 lbs. of composition. 13·7" long; painted black.
			86 0	
			79 0	
			106 9	
Fuzes { percussion, Pettman's - - - time, common - - -			106 0	
			0 7	
Tubes { common, brass - - - friction, copper - - -			0 1	
			0 0 $\frac{1}{2}$	
Bottom, wooden, loose - - -			0 0 $\frac{1}{2}$	Conical shape.
			1 7	
Cart-ridges { calico, burster, common shell do. waterproof, No. 11 flannel, { service - - - charge { exercise - - -			0 1	} For service cartridges.
			0 1 $\frac{1}{2}$	
			0 2	
Cover { paper, No. 17 - - - waterproof - - -			0 1	
			0 1 $\frac{1}{2}$	
Rivet, for bottoms - - - - -		- -	0 2	
Wad, papier maché, fuze hole - - -		- -	0 0	
<i>Stores.^b</i>				
Boxes, wood { for 1 shell - - - for 2 case shot			16 8	13 $\frac{1}{2}$ " x 12" x 13".
			23 4	23 $\frac{1}{2}$ " x 12" x 12".
Case, leather, cartridge (No. 1)			4 8	11" deep.

^a Cast with the piece.^b Those here detailed are adapted to the calibre; for the general supply, see page 298.

EQUIPMENT OF 10-INCH HOWITZERS.

Description.	No. of Drawing.	Cost of each.		Weight of each.	Dimensions and Remarks.	
		£	s.	d.		lbs.
Fid, wood - - -	-				71 3	
Garland, for 30 shells - - -	-				168 0	3' 3½" square; see also table.
Gauges, { case shot and shells, <i>high</i>	-				5 4	9·88" diameter.
{ shells, <i>low</i> - - -	-				5 3	9·82" "
{ case shot, <i>low</i> - - -	-				5 2	9·76" "
ring - - -	-				1 8	
Heads, spare { rammer - - -	-				9 1	
{ sponge - - -	-				3 7½	
Pedestal, wood - - -	-				0 2½	
Punch, for vent (No. 3) - - -	-				0 12	
Scraper, shell - - -	-				0 2½	
Spike, spring, 9·16 inches long - - -	-				14 5	
Sponge, with stave, rammer, and cap - - -	-				3 12	
Stave, spare, 6 feet - - -	-				12 8	
Tompson, with junk wad - - -	-				12 14	
Tongs, loading - - - pair	-				7 1	
Wadhook, with 5¼-ft. stave - - -	-					

NOTES.

The present 10-inch iron howitzer was introduced by General Millar in 1825; previous pieces of this nature had been made of brass, with chambers of a nearly cylindrical form. In 1813 there was a 10-inch howitzer of 3' 11½" and 25¼ cwt.; in 1766 there was one of 4' 2½" and 31½ cwt.

The 10-inch howitzer being much lighter than the 10-inch gun is placed in batteries where the explosive power of the shell is important, without a long range being required. It was formerly much used for ricochet fire in siege operations, and the perch trail carriage, on which it is sometimes found, was supplied, with a limber, for that service.

One round of shell weighs 100 lbs.; of carcass, 114 lbs.; and of case shot, 101½ lbs. A metal-lined case will hold the following numbers of filled cartridges:—16 of 7 lbs.; 18 of 6 lbs. 4 oz.; or 22 of 5 lbs.

The howitzer can be mounted or dismounted by a 16-foot gyn; it can be conveyed, with its carriage, by a sling or platform wagon, and separately by a sling cart.

EQUIPMENT OF 8-INCH HOWITZERS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
		£ s. d.	cwts. qrs. lbs.	
8-IN. IRON HOWITZER, OF 4 FT. & 21 CWT.				Gen. Millar's construction ; similar in pattern to the 10-inch howitzer
Ranges { point blank, yards. 8° elevation, "				
<i>Howitzer.</i>				
Total length, 4 ft. 10 in. ; calibre, 8 inches ; windage, 14 inch			21 0 0	Length of bore, with gomer chamber, 3' 9½" ; width across the trunnions, 28" ; diameter of base ring, 18' 6".
Sights { fore (dispart) ^a - - hind (brass tangent scale, with screw) - -			0 0 0½	
<i>Carriages.</i>				
Common, standing - - -			15 2 0	
Perch trail - - -			24 0 0	
Rear chock - - -			12 2 0	
Sliding - - -			12 2 0	
<i>Platforms.</i>				
Traversing { common - - dwarf - - casemate - -			33 3 10 27 0 0	
<i>Ammunition.</i>				
Firing charge { with projectiles - without " -			4 0 3 0	L. G. powder. Service charge. For exercise and salutes.
Bursting charge { common shell - shrapnel " -			2 4 0 5	L. G. powder. M. R. powder ; 80 (late 60) drams.
Projectiles { shells, with { common, loose plugs { shrapnel, fixed carcass, filled and fixed - case shot (258 2-oz. balls)			46 0 60 5 54 5 38 0	Contains 339 musket bullets. 5 lbs. of composition. 9" long ; painted black.
Fuzes { percussion, Pettman's - time { common - shrapnel -			0 7 0 1½ 0 0½	
Tubes { common, brass - friction, copper -			0 0½ 0 0½	
Bottom, wooden, loose - - -			1 2	Conical shape.
Bag, waterproof paper, No. 3 - - -			0 0½	For shrapnel bursters.
Cart-ridges { calico, { common shell - bursterns { do. waterproof - shrapnel shell - flannel, { service - charge { exercise -			0 0½ 0 0½ 0 0½ 0 1½ 0 1 0 1	No. 8. With common paper bag.
Cover { paper, No. 16 - waterproof -			0 1½ 0 1½	} For service cartridges.
Rivet, for bottoms - - -			0 2	
Wads, { fuze hole -			0 0	
papier maché { loading hole, large -			0 0	

^a Cast on the piece.

EQUIPMENT OF 8-INCH HOWITZERS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
<i>Stores.*</i>		£ s. d.	lbs. oz.	
Box, wood, for 2 shells or case -	-		16 6	20" × 10" × 11".
Case, leather, cartridge (No. 2) ^b -	-		3 11	
Fid, wood -	-		39 11	
Garland, for 30 shells -	-		140 0	2' 8" square; for other sizes, see the table.
Gauges, ring {	case and sh. shell, high -		4 7	7·95" diameter.
	do. low, and common shell, high -		4 6	7·9" "
	common shell, low -		4 5	7·82" "
	case shot, low -		4 5	7·76" "
Heads, spare {	rammer -		1 8	
	sponge -		4 12	
Pedestal -	-		3 7½	
Punch, for vent (No. 4) -	-		0 2	
Scraper, shell -	-		0 9	
Spike, spring, 7·4 in. long -	-		0 2	
Sponge, with stave, rammer, and cap -	-		9 10	
Stave, spare, 5 feet 4 inches -	-		3 6	
Tompson, with junk wad -	-		9 3	
Tongs, loading - pair	-		9 12	
Wadhook, with 4½-feet stave -	-		6 9	

* These are adapted to the calibre ; for the general supply, see page 298.

^b An obsolete pattern.

NOTES.

The present 8-inch iron howitzer was introduced by General Millar, about 1825. The same calibre had been in use ever since the first employment of this class of ordnance, but the earlier pieces were made of brass, and their chambers were nearly cylindrical. In 1766 the service pattern was 3' 1½" long, and weighed 12½ cwt. ; in 1813 it was 3' 1" long and weighed 12½ cwt.

The remarks on the present application and transport of 10-inch howitzers, and the manner of transporting them, will equally apply to this calibre. The 8-inch howitzer has, however, been more generally used, and in the latter part of the Peninsular war it was equipped to accompany the army as a gun of position. (See Artillery Field Book ; 1st edition, pp. 20, 84, where the detail of the stores is given.)

Each round of ammunition weighs 4 lbs. less than for the 8-inch gun, except with case shot, when it is 17 lbs. less. The metal-lined case holds 37 filled cartridges of 4 lbs. each ; 50 of 2½ lbs. ; or 500 of 60 drams.

EQUIPMENT OF 5½-INCH HOWITZERS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
5½-IN. IRON HOWITZER, OF 3 FT. 5 IN. & 15 CWT. For short ranges only.		£ s. d.	cwts.qrs.lbs.	Constructed in 1800; it has a dispart at the muzzle, a vent patch, and a block behind the base ring; the cascabe has a plain button; there are no rings except at the base and muzzle, and the vent is perpendicular.
<i>Howitzer.</i>				
Total length, 4 ft.; calibre, 5.68 inches; windage, .085 inch -		- -	15 0 0	Length of bore, with cylindrical chamber, 3' 0½"; width across the trunnions, 25"; diameter at base ring, 17.14".
Sights { fore (dispart) " -				
{ hind (brass tangent scale and screw) -				
<i>Carriage.</i>				
Rear chock - - - -		- -	7 3 0	
<i>Platform.</i>				
Ground, permanent.				
<i>Ammunition.</i>				
			lbs. oz.	
Firing charge (service or exercise) -			2 0	L. G. powder.
Bursting charge { common shell -			0 13	L. G. " "
{ shrapnel " -			0 2½	M. R. " " ; 40 drams.
Projec- { shells, with { common, loose			16 0	
tiles { plugs { shrapnel, fixed			20 10	Contains 110 musket bullets.
{ carcass, filled and fixed -			19 4	1½ lbs. of composition.
{ case shot, (100 2-oz. balls)			14 1	5.6" long; painted black.
Fuzes { percussion, Pettman's -			0 7	
{ time { common -			0 1½	
{ shrapnel -			0 0½	
Tubes { common, brass -			0 0½	
{ friction, copper -			0 0½	
Bottom, wooden, loose -			0 6½	Cup shaped.
Bag, waterproof paper, No. 2 -			0 0½	For shrapnel bursters.
Cart- { calico, { common shell -			0 0½	
ridges { bursters { do. waterproof			0 0½	No. 6.
{ flannel, charge -			0 1	With common paper bag.
Cover { paper, No. 14 -			0 0½	
{ waterproof -			0 0½	} For service cartridges.
Rivet, for bottoms -			0 2	
Wads, { fuze hole -				
papier maché { loading hole, large -				
<i>Stores. ^b</i>				
Box, wood, for 6 shells or case -			20 12	21" x 13" x 9½".
Cases, leather, cartridge (No. 7) -			2 6	
Fid, wood -			17 0	
Garland, for 30 shells -			76 0	1' 11" square; see also table.
Gauges, { shells, high -			2 15	5.62" diameter.
{ " low -			2 13	5.57" "
ring { case shot, low -			2 12	5.52" "

* Cast on the piece.

^b These are adapted to the calibre; for the general supply, see page 298.

EQUIPMENT OF 5½-INCH HOWITZERS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
		£ s. d.	lbs. oz.	
Heads, spare { rammer - -			1 3	
{ sponge - -			1 11	
Pedestal - - - -			3 2	
Punch, for vent (No. 5) - -			0 1½	
Scraper, shell - - - -			0 5½	
Spike, spring, 6·22 in. long -			0 1¼	
Sponge, with stave, rammer, and cap			6 0	
Stave, spare, 5 feet - - - -			3 2	
Tompion, with junk wad - - -			4 3	

NOTES.

The 5½-inch iron howitzer is of older date than those constructed by General Millar, and has consequently a cylindrical instead of a gomer chamber. The existing pattern was first cast in 1800, but there were 5½-inch brass howitzers from the seven years' war until the peace of 1815; those pieces were used for field service, and have been superseded by the 24-pounder howitzer described at p. 183.

The 5½-inch howitzer is almost obsolete, but a few may still be found in the flanks of old fortified places. Pieces of this class and calibre were also included in armaments on account of their being so easily moved to any threatened point. Four 5½-inch howitzers on travelling carriages were part of the armament of Gibraltar in 1783.

The calibre (5·68 inches) is so nearly the same as that of the 24-pounder gun (5·82 inches) that the same shells and carcasses are used for both; the case shot is shorter, and consequently lighter. A metal-lined case holds 55 filled cartridges of 2 lbs. each; 130 of 13 oz.; or 950 of 30 drams.

EQUIPMENT OF CARRONADES.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions* and Remarks.
68-PR. CARRONADE.		£ s. d.	cwt. qrs. lbs.	Ordinary pattern, described at p. 81.
Range { point blank - 270 yards. 10° elevation - 1,260 "				
<i>Carronade.</i>				
Length, 4 ft. 10 in. ; calibre, 8·05 in. ; windage, ·125 in. - - -			36 2 0	Length of bore, 5' 1 $\frac{3}{4}$ "; total length, 6' 10"; diameter of base ring, 21 $\frac{3}{4}$ ".
<i>Carriage.</i>				
Wood, block trail - - -			17 2 25	
<i>Platform.</i>				
Ground, permanent - - -				
<i>Ammunition.</i>				
Cartridge, flannel - - -			lbs. oz. 0 2	Service charge, 5 lbs.
Shot { case (90 8-oz. balls) - - -			49 8	13 $\frac{1}{2}$ " long.
{ grape (15 3-lb. balls) - - -			55 10	10' 6" long } Each in a tin cylinder, 11" long } painted red.
For all other items, see 68-pounder gun, p. 295.				
<i>Stores.</i>				
Box, wood, for 2 case or grape - - -			16 6	20" x 10" x 11".
Case, leather, cartridge (No. 6) - - -			2 11	
Head { rammer - - - - -			2 14	
{ sponge - - - - -				
Punch, for vent (No. 4) - - - - -			0 2	
Spike, spring - - - - -			0 2	8' 08" long.
Sponge, with rammer, and cap - - -				
Stave, for sponge - - - - -				
Wadhook - - - - -				
The garlands, gauges, and other stores adapted to the calibre are the same as for the 68-pr. gun.				
42-PR. CARRONADE.			cwt. qrs. lbs.	Ordinary pattern.
Range { point blank - 230 yards. 5° elevation - 1,200 "				
<i>Carronade.</i>				
Length, 4 ft. 2 in. ; calibre, 6' 84 in. ; windage, ·078 in. - - -			22 0 0	Length of bore, 4' 4"; total length, 5' 10"; diameter of base ring, 18 $\frac{1}{2}$ ".

* The length of the bore, as here given, includes the chamber and the flash rim.

EQUIPMENT OF CARRONADES.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
<i>Carriage.</i>				
Wood, block trail - - -			cwt qrs. lbs. 10 1 21	
<i>Platform.</i>				
Ground, permanent - - -				
<i>Ammunition.</i>				
Cartridge, flannel - - -			lbs. oz. 0 1½	Service charge, 3 lbs. 11¾" long.
Shot { case (66 8-oz. balls) - - -				} Each in a tin cylinder, 9' 6" long } painted red. 10' 3" long }
Shot { grape (9 4-lb. balls) - - -				
For all other items, see the 42-pounder gun, p. 305.				
<i>Stores.</i>				
Boxes, wood { for 4 case shot - - -			21 4	31" x 9" x 9½". 31" x 9" x 13".
Boxes, wood { " 4 grape " - - -			30 8	
Case, leather, cartridge (No. 6) - - -			2 11	
Head { rammer - - -				
Head { sponge - - -				
Punch, for vent - - -				
Spike, spring - - -				
Sponge, with rammer, and cap - - -				
Stave, sponge - - -				
Wadhook - - -				
The garlands, gauges, and other stores adapted to the calibre are the same as for the 42-pr. gun.				
32-PR. CARRONADE.				
Range { point blank - 220 yards.			cwt. qrs. lbs.	Ordinary pattern.
Range { 5° elevation - 1,100 "				
<i>Carronade.</i>				
Length, 3 ft. 9 in ; calibre, 6.25 in. ; windage, .073 in. - - -			17 0 0	Length of bore, 3' 11¾' ; total length, 5' 6" ; diameter at base ring, 17".
<i>Carriage.</i>				
Wood, block trail - - -			8 3 24	
Iron - - -			11 3 0	
<i>Platform.</i>				
Ground, permanent - - -				
<i>Ammunition.</i>				
Cartridge, flannel - - -			lbs. oz. 20 1½	Service charge, 2 lbs. 11 oz. 11¼" long. 7' 2" long } Each in a tin cylinder, 9" long } painted red.
Shot { case (40 8-oz. balls) - - -			31 15	
Shot { grape (9 3-lb. balls) - - -			32 8	
For all other items, see the 32-pounder gun, p. 308.				

EQUIPMENT OF CARRONADES.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
		£ s. d.	lbs. oz.	
<i>Stores.</i>				
Box, wood { for 4 case shot -	-		19 0	29" x 9" x 9½".
Box, wood { " 4 grape " -	-		21 1	
Case, leather, cartridge (No. 6) -	-		2 11	28½" x 8" x 12".
Head { rammer -	-		2 0	
Head { sponge -	-		3 8	
Punch, for vent (No. 5) -	-		0 1½	6" 3" long.
Spike, spring -	-		0 1½	
Sponge, with rammer, and cap -	-		8 3	
Stave, sponge -	-		3 4	
Wadhook -	-			
The garlands, gauges, and other stores adapted to the calibre are the same as for the 32-pr. gun.				
24-PR. CARRONADE.				
<i>Ordinary pattern.</i>				
Range { point blank - 200 yards.			Ordinary pattern.	
Range { 5° elevation - 1,120 "			Ordinary pattern.	
<i>Carronade.</i>				
Length, 3 ft. 5 in. ; calibre, 5·68 in. ; windage, ·068 in. -			13 0 0	Length of bore, 3' 7¼"; total length, 5' 1"; diameter at base ring, 15¼".
<i>Carrriage.</i>				
Wood, block trail -			7 3 21	
Iron -			10 3 20	
<i>Platform.</i>				
Ground, permanent -				
<i>Ammunition.</i>				
Cartridge, flannel -			lbs. oz.	Service charge, 2 lbs.
Shot { case (32 8-oz. balls) -			0 1	Each in a tin cylinder, painted red.
Shot { grape (9 2-lb. balls) -			17 10	
Shot { grape (9 2-lb. balls) -			26 0	
For all other items, see the 24-pounder gun, p. 316.				
<i>Stores.</i>				
Box, wood, for 6 case or grape -			20 12	21" x 13" x 9½".
Case, leather, cartridge (No. 7) -			2 6	
Head { rammer -			1 12	5' 69" long.
Head { sponge -			2 12	
Punch, for vent (No. 6) -			0 1½	
Spike, spring -			0 1½	
Sponge, with rammer, and cap -			6 10	
Stave, sponge -			2 14	
Wadhook -			5 12	
The garlands, gauges, and other stores adapted to the calibre are the same as for the 24-pr. gun.				

EQUIPMENT OF CARRONADES.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
18-PR. CARRONADE.				
Range { point blank - 180 yards. 5° elevation - 1,050 "		£ s. d.	cwt. qrs. lbs.	Ordinary pattern.
<i>Carronade.</i>				
Length, 3 ft. 1 in. ; calibre, 5·16 in. ; windage, ·061 in. - - -			10 0 0	Length of bore, 3' 3¼" ; total length, 4' 8" ; diameter at base ring, 13¾"
<i>Carriage.</i>				
Wood, block trail - - -			6 3 20	
Iron - - - - -			9 2 10	
<i>Platform.</i>				
Ground, permanent - - -				
<i>Ammunition.</i>				
Cartridge, flannel - - -			lbs. oz.	Service charge, 1½ lbs.
Shot { case (31 6-oz. balls) - - -			0 1	9" long.
grape (9 1¼-lb. balls) - - -			12 13	6' 2" long } Each in a tin cylinder,
			16 8	7' 3" long } painted red.
For other items, see the 18-pounder gun, p. 320.				
<i>Stores.</i>				
Box, wood, for 8 case or grape - - -			20 12	24¼" x 12" x 8¼".
Case, leather, cartridge (No. 7) - - -			2 6	
Head { rammer - - - - -			1 12	
sponge - - - - -			2 12	
Punch, for vent (No. 6) - - - - -			0 1½	
Spike, spring - - - - -			0 1½	5' 28" long.
Sponge, with rammer, and cap - - -			5 10	
Stave, sponge - - - - -			2 12	
Wadhook - - - - -			4 14	
The garlands, gauges, and other stores adapted to the calibre are the same as for the 18-pr. gun.				
12-PR. CARRONADE.				
Range { point blank - 150 yards. 5° elevation - 970 "			cwt. qrs. lbs.	Ordinary pattern.
<i>Carronade.</i>				
Length, 2 ft. 6 in. ; calibre, 4' 52 in. ; windage, ·056 in. - - -			6 0 0	Length of bore, 2' 8¼" ; total length, 4' 1" ; diameter at base ring, 12¼"
<i>Carriage.</i>				
Wood, block trail - - - - -			6 1 0	
Iron - - - - -			8 1 12	
<i>Platform.</i>				
Ground, permanent - - - - - 10524.				

EQUIPMENT OF CARRONADES.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.			
<i>Ammunition.</i>		£ s. d.	lbs. oz.	Service charge, 1 lb.			
Cartridge, flannel - - - Shot { case (32 4-oz. balls) - grape (9 1-lb. balls) - For other items, see the 12-pounder gun, p. 324.	0 0½ 8 14 11 4			7½" long. 5'6" long } Each in a tin cylinder, 6'5" long } painted red.			
<i>Stores.</i>				31" x 11" x 9".			
Box, wood, for 12 case or grape - Case, leather, cartridge (No. 7) - Head { rammer - - - sponge - - - Punch, for vent - - - Sponge, with rammer, and cap - Stave, sponge - - - Wadhook - - -	21 10 2 6 1 0 1 11 0 1½ 3 14 2 4 3 6						
The garlands, gauges, and other stores adapted to the calibre are the same as for the 12-pr. gun.							
6-PR. CARRONADE.							Ordinary pattern.
Range { point blank - yards. ° elevation - "	cwt. qrs. lbs.						
<i>Carronade.</i>							Length of bore, 2' 9"; total length, 4'; diameter at base ring, 11".
Length, 2 ft. 7 in.; calibre, 3' 6 in.; windage, .05 in. - - -	4 3 0						
<i>Carriage.</i>							
Wood, block trail - - -							
<i>Platform.</i>							
Ground, permanent - - -							
<i>Ammunition.</i>				Service charge, 10 oz.			
Cartridge, flannel - - - Shot { case (30 2-oz. balls) - grape (9 ½-lb. balls) -	0 0½ 4 5 5 11			6" long. 4'8" long } Each in a tin cylinder, 5'2" long } painted red.			
For other items, see the 6-pounder gun, p. 162.							
<i>Stores.</i>				No dimensions given in the table.			
Box, wood, for case or grape - Case, leather, cartridge (No. 7) - Head { rammer - - - sponge - - - Sponge, with rammer, and cap - Stave, sponge - - - Wadhook - - -	- - 2 6 2 14 2 0 2 14						
The garlands, ganges, and other stores adapted to the calibre are the same as for the 6-pr. gun.							

EQUIPMENT OF CARRONADES.

NOTES.

The distinctive features of carronades, as compared with other classes of ordnance, have already been given at p. 81 ; they were introduced in 1779 for ships of war, but they have likewise been used in siege operations on land, and for garrison service.

They were required to be short and light because they were intended to throw their shot only to the short distances at which ships used then to engage. The weight taken off the piece made them easier to work, and allowed a greater number of shot to be carried instead ; but the great advantage which they originally possessed arose from their having only one half the usual windage. This alteration improved the range and accuracy so much that a very small charge was sufficient, and the weight of metal being reduced in proportion, the carronade became the most accurate as well as the most easily managed piece for firing solid shot at short ranges.

The original pieces have been succeeded by others with some modifications of construction ; in Adye's *Bombardier* (1813), p. 88, the list of carronades includes 2 68-prs., 1 42-pr., 1 32-pr., 2 24-prs., 2 18-prs., and 1 12-pr., none of which have the same length assigned to them as those now in use. The flank defence of permanent works is the only service to which carronades are now applied, and no sights are issued with them.

A carronade carriage consists of a trail, with an axletree and two iron trucks. If the trail is of wood it is in one piece and rests on a block at the rear end ; the upper part is fitted in front with a pair of iron loops and a bolt, by which the piece is secured to it. There are also iron carriages with bracket trails, the rear of which rests on the ground.

The case and grape shot fired from carronades are manufactured expressly for them ; the solid shot and shells are the same as for the guns of corresponding calibres. The number of filled cartridges which a metal-lined case will contain is shown in the table prepared for that purpose.

EQUIPMENT OF 13-INCH MORTARS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
SEA SERVICE 13-IN. IRON MORTAR.^a		£ s. d.	cwts.qrs.lbs.	Constructed in 1810; it has dolphins, 2 rings (one of which has fillets), and a vent patch. The chamber is of the gomer form, but is only 9 $\frac{3}{4}$ " in diameter at the mouth; the bottom is hemispherical. The vent is perpendicular.
Extreme range, 4,400 yards.				
<i>Mortar.</i>				
Total length, 4 ft. 5 in.; width of the trunnions, 4 ft. 4 in.; calibre, 13 inches; windage, .16 inch		- -	100 0 0	Length of the bore, 3' 3", including the chamber, which is 15" deep; diameter at the muzzle, 34·525".
<i>Bed.</i>				
Wood		- -	60 2 4	
Iron		- -	81 1 6	
<i>Platform.</i>				
Ground, permanent ^b		- -		
Octagonal deck		- -	54 1 14	
<i>Ammunition.</i>				
Firing charges { shell (L. G. powder) (extreme) { carcass			20 0	Full service charge.
Bursting charge { shell, empty			16 0	
Projectiles { carcass, filled			10 8	
1-lb. shots (100)			194 0	
Fuze, mortar			234 0	
Tubes { common, brass			100 0	8" long; burns 30 sec.
friction, copper			0 4 $\frac{1}{2}$	
Bottom, wooden, hemispherical			0 0 $\frac{3}{8}$	
Cartridges { calico, burster			0 0 $\frac{1}{4}$	For charges of small shot.
do. waterproof, No. 13			10 11	
flannel, charge			0 2 $\frac{1}{2}$	
Covers { paper, No. 18			0 4	23 $\frac{3}{4}$ " long.
waterproof			0 3	
<i>Stores.^c</i>				
Box, for { 100 1-lb. shots			12 8	23" x 8" x 9".
1 shell			23 12	
Cap, canvas, for muzzle			3 15	16 $\frac{1}{2}$ " x 15" x 15 $\frac{1}{2}$ ".
Case, leather, cartridge ^d			5 8	
Fid, wood			67 11	
Garland, for 30 shells			196 0	4' 2 $\frac{1}{2}$ " square.
Gauges, ring { high			6 5	
low			6 4	12·68" diameter.
Heads, spare { rammer			1 11	
sponge			9 1	12·8" "
Hooks, beam	pair		8 4	
Punch, for vent (No. 1)			0 3	
Scraper, shell			1 7	
Spike, spring, 13·55 inches long			0 3	
Sponge, with stave, rammer, and cap			14 8	
Stave, spare, 6 feet			3 12	

^a A new pattern, with a bore 49·2 inches long, was approved 3rd Feb. 1862; it has no dolphins or other projections.

^b Included in the construction of the battery.

^c Those here detailed are adapted to the calibre; for the general supply, see the alphabetical list which follows.

^d Special size, for 20 lb. charges.

EQUIPMENT OF 13-INCH MORTARS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
LAND SERVICE 13-IN. IRON MORTAR.		£ s. d.	lbs. oz.	This mortar has a vent patch and 2 plain rings, but no dolphins; the chamber is of the gomer form, and meets the sides of the bore.
Extreme range, 2,900 yards.				
<i>Mortar.</i>			36 cwt.	
Total length, 3 ft. 3 in.; width of the trunnions, 3 ft. 4 in.; calibre, 13 inches; windage, 16 inch -				Length of bore, 2' 8½"; diameter at the muzzle, 25·35".
<i>Bed.</i>				
Iron, complete - - -			32½ cwt.	6' 1" x 3' 3" x 2' 1".
<i>Platform.</i>				
Ground, permanent ^a - - -				
<i>Ammunition.</i>				Full charge, 9 lbs. L. G. powder.
Cartridge, flannel, charge - - -				15" long, 19½" wide.
Cover { paper, No. 19 - - - waterproof - - -			0 3½ 0 2	} For flannel cartridges.
The other items as for the sea service mortar.				
<i>Stores.</i>				Other articles as for the sea service mortar.
Cap, for muzzle - - -			3 12	
Case, leather, cartridge (No. 1) - - -			4 8	
Punch, for vent (No. 3) - - -			0 2½	
Spike, spring, 8·8 inches long - - -			0 1½	
Sponge, with stave, rammer, and cap - - -			13 6	
Stave, spare, 5 feet 3 inches - - -			2 10	

^a Included in the construction of the battery.

NOTES.

13-inch mortars are mentioned amongst other pieces of ordnance detailed for the formation of a train of artillery in 1691; a list dated a few years earlier (1669) shows none with exactly this calibre, but it mentions mortars of 18½, 16½, and 13½ inches, together with nine more of smaller calibres. (R. A. Institution Papers, pp. 134, 376.) In 1766 there were five mortars, with calibres corresponding to those which are now in the service, but they were all made of brass. The 13-inch and 10-inch mortars of that date were made of increased dimensions and strength for long ranges, and had been named sea service mortars on account of being most required in naval bombardments.

Iron mortars had begun to be cast in 1780, but the large brass mortars remained in the service as late as 1813. The 13-inch s. s. mortar in brass weighed 82 cwt., and the first pattern in iron was of the same weight; but the patterns of 1810 and of 1862 are nearly one ton heavier.

To facilitate the use of such heavy pieces a special bed and platform have been constructed. This bed has a pivot on which it turns, instead of being traversed in the usual manner, and its motion takes place on a wooden "deck" laid above the platform. The bed is octagonal in shape; it has flat circular racers on its upper surface, and is fixed to the platform by pins fitted with india-rubber rings to lessen the concussion

EQUIPMENT OF 13-INCH MORTARS.

when the piece is fired. The pivot, or pintail, passes through the bed, deck, and platform; it is secured underneath by a nut, which may have to be screwed up afresh after every eight or ten rounds. Drawings of this bed and platform have been lithographed at the Royal Carriage Department.

The sea service 13-inch mortar was recommended by the Committee of 1861 to be adopted for the armaments of coast batteries, and was employed at the latter part of the siege of Sebastopol; its working party consists of 10 men. The land service 13-inch mortar has a similar working party; it is used in siege operations as well as permanent batteries, and is provided with a travelling carriage for its transport in siege trains.

With regard to the quantity of ammunition for fortresses there is no definite rule. A metal-lined case holds 5 filled service cartridges of 20 lbs. each; or 10 bursting cartridges of 10½ lbs. each.

The mortar and its bed can be carried separately by a sling wagon or platform wagon; the latter is generally used; a 16-feet gyn is required to place it thereon.

The muzzle of mounted mortars should be covered with a cap, and the vent closed by a plug to keep the wet from lodging inside.

The following list shows the proportion of stores required for garrison service with any heavy mortar, so far as the loading and laying are concerned; for such articles as are required in the magazines, see the list at p. 298.

PROPORTION of Ammunition and Stores for Garrison Service with Mortars.

Name.	Proportionate Number.	Remarks.
Balls { light - - -	Indefinite - - -	} Not made for the 13-inch calibre.
smoke - - -	" - - -	
Bed, iron - - -	1 per mortar - - -	} Complete with 2 capsquares and 1 quoin. For firing volleys of small shells or shot.
Bottoms, hemispherical - - -	Indefinite - - -	
Boxes, for loaded shells - - -	2 per mortar.	
Cap, for the muzzle - - -	1 per mortar - - -	To keep the bore dry.
Caps, sponge - - -	1 per sponge - - -	On the sponges.
Carcasses - - -	Indefinite.	
Cartridges { calico, bursters - - -	1 per shell.	
flannel, charge - - -	" - - -	
Cases, leather, cartridge - - -	2 per mortar - - -	In various sizes, distinguished by numbers.
Chalk and cord - - -	1 cord and 2 lbs. of chalk to every 4 mortars.	Required in laying mortars.
Clipper, portfire - - -	1 to every 3 mortars.	
Fid, wood - - -	" - - -	
Fuzes, mortar - - -	1 per shell, and 20 per cent. spare.	8 inches long, burn 30 seconds.
Garland, square, for 30 shells - - -	1 per mortar.	
Hammer, claw, large - - -	1 for 2 mortars.	
Handspikes, common 6 feet - - -	4 per mortar.	
Heads, spare { rammer - - -	1 - - -	
sponge - - -	1 - - -	
Hooks { beam - - -	1 for each 13-inch mortar - - -	} For lifting the shells; a piece of cord serves for the 8-inch.
hand - - - pair	1 for each 10-inch mortar - - -	
Implements, { No. 5 set - - -	1 to 50 (or fewer) mortars, and 1 set spare.	For rectifying the fuze holes, if damaged.
shell and fuze { No. 6 set - - -	1 to every 2 mortars, and 25 per cent. spare.	For preparing shells and fuzes.
Irons, priming, garrison sets - - -	1 per mortar - - -	1 pricker, 1 drift, and 1 bit.
Lanyards, friction tube, garrison - - -	2 - - -	8 feet long.
Linstocks, with cocks - - -	1 to every 3 mortars - - -	For holding lighted slow-match.

For the weights of such articles as are of uniform size for all calibres, see the general list, p. 409; for those which vary with the calibre, see the equipment of each mortar.

EQUIPMENT OF 13-INCH MORTARS.

Name.	Proportionate Number.	Remarks.
Match, slow - - -	2 lbs. per mortar.	
Perpendiculars - - -	1 to every 4 mortars.	
Platform - - - - -	1 per mortar - - -	Not charged as one of the artillery stores.
Plugs, vent - - - - -	1 " - - - - -	
Plummets, lead, with lines - - -	1 " - - - - -	Used in laying the mortar.
Pocket, tube - - - - -	1 " - - - - -	Worn with a strap, charged separate.
Portfire - - - - -	4 to every 100 rounds of ammunition.	
Powder, L G. - - - lbs.	- - - - -	For the service and bursting charges.
Punch, for vent - - - - -	1 per mortar.	
Quadrant, brass, with level - - -	1 to every 4 mortars.	
Quoins - - - - -	- - - - -	1 quoin to give 45° elevation is issued with each bed; quoins for 15° and 75° are also sometimes provided.*
Rods, pointing † - - - - -	2 per mortar - - -	Used in laying the mortar.
Scrapers, shell - - - - -	1 to every 2 mortars - - -	A different size for each calibre.
Shells, mortar - - - - -	1 for each round of ammunition.	Shells of small calibre are sometimes provided for firing volleys.
Shot, pound { rounds of 100 each - - -	Indefinite - - -	For 13-inch and 10-inch mortars.
" " 50 " - - - - -	" - - - - -	For 8-inch mortars.
Skins, sheep, pieces - - - - -	1 per mortar - - -	For wiping the shell.
Spanner, M. Mahon's - - - - -	1 to 3 mortars.	
Spikes { common - - - - -	2 per mortar.	
" spring - - - - -	1 " - - - - -	
Sponges, with rammers and caps - - -	2 " - - - - -	} The same size serves for the 10-inch and the 13-inch.
Staves, spare, sponge - - - - -	1 " - - - - -	
Sticks, portfire - - - - -	1 " - - - - -	
Strap, tube pocket - - - - -	1 " - - - - -	
Thumbstalls - - - - -	2 " - - - - -	Required when the vent is hot.
Tubes { common, brass - - - - -	1 to 10 friction tubes.	
" friction, copper - - - - -	20 per cent. spare.	

* Formerly the elevation of mortars was altered, like that of guns, to suit the required range. "If you find your mortar-peece will shoot a bullet or fire-ball, 700 paces at 45 degrees of the quadrant, and that the marke is but 500 paces, then you will find it must be mounted to 63 degrees of the quadrant to hit that marke." Animadversions of Warre, 1639.

† Made of iron, 2 feet long, $\frac{3}{8}$ inch thick; when the parapet is of earth they can be stuck into it, but when it is of masonry they must be fixed upright in a plank, which is usually 4 feet long, 1 foot wide, and 2 inches thick. A later pattern consists of a teak plank, 4' x 8" x 2 $\frac{1}{2}$ ", with a handle at one end; the rods are 14" long and $\frac{1}{2}$ " thick.

EQUIPMENT OF 10-INCH MORTARS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
		£ s. d.	cwts.qrs.lbs.	
SEA SERVICE 10-INCH IRON MORTAR.				First cast in 1790; it is of exactly the same construction as the sea service 13-in. already described.
Extreme range, 3,500 yards.				
<i>Mortar.</i>				
Total length, 3 ft. 10 in.; width of the trunnions, 3 ft. 4 in.; calibre, 10 inches; windage, .16 inch -		- -	52 0 0	Length of bore, 2' 11"; depth of chamber, 11 $\frac{1}{2}$ "; diameter at the muzzle, 26 $\frac{3}{4}$ ".
<i>Bed.</i>				
Wood, complete - - -				
<i>Platform.</i>				
Ground, permanent ^a - - -				
<i>Ammunition.</i>				
Firing charges { service - - - (extreme) { light ball - - - { smoke ball - - -			lbs. oz. 9 8 2 0	L. G. powder.
Bursting charge - - -			5 0	
Projectiles { shell, empty - - - { carcass, filled - - - { light ball - - - { smoke ball - - - { 1-lb. shot (100) - - -			86 0 105 0 63 10 21 8 100 0	14·1" long.
Fuze, mortar - - -			0 4 $\frac{1}{2}$	8" long; burns 30 sec.
Tubes { common, brass - - - { friction, copper - - -				
Bottom, wooden, hemispherical - - -			5 2	For charges of small shot.
Cartridges { calico, burster - - - { do. waterproof, No. 10 - - - { flannel, charge - - -			0 1 0 1 $\frac{1}{2}$ 0 2 $\frac{1}{2}$	18 $\frac{3}{4}$ " long.
Cover { paper, No 17 - - - { waterproof - - -			0 1 $\frac{1}{2}$ 0 1 $\frac{1}{2}$	} For flannel cartridges.
<i>Stores.^b</i>				
Boxes, wood, for { 2 light balls - - - { 2 smoke balls - - - { 100 1-lb. shots - - - { 1 loaded shell - - -			30 0 21 0 12 8 16 8	23" x 19" x 13". 23" x 13" x 13". 23" x 8" x 9". 13 $\frac{1}{2}$ " x 12" x 13".
Cap, canvas, for muzzle - - -			3 10	
Case, leather, cartridge (No. 1) - - -			4 8	
Fid, wood - - -			71 3	
Garland, for 30 shells - - -			168 0	3' 3 $\frac{1}{2}$ " square.
Gauges, ring { high - - - { low - - -			5 4 5 3	9' 88" diameter. 9' 82" ,,
Heads, spare { rammer - - - { sponge - - -			1 11 9 1	
Hooks, hand - - - pair			2 0	
Punch, for vent (No. 5) - - -			0 1 $\frac{1}{2}$	
Scraper, shell - - -			0 12	
Spike, spring, 10·6 inches long - - -			0 2	
Sponge, with stave, rammer, and cap - - -			14 1	
Stave, spare, 5 feet 4 inches - - -			3 5	

^a Included in the construction of the battery.

^b See also the list at p. 342.

EQUIPMENT OF 10-INCH MORTARS.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Dimensions and Remarks.
LAND SERVICE 10-INCH IRON MORTAR.* Extreme range, 2,400 yards.		£ s. d.	lbs. oz.	First cast in 18 ; it has two plain rings and a vent patch ; the chamber is of the gomer form, with an elliptical bottom.
<i>Mortar.</i> Total length, 2 ft. 7 in. ; width of trunnions, 2 ft. 6 in. ; calibre, 10 inches ; windage, 16 inch - -			18 cwt.	Length of bore, 25'' ; diameter at the muzzle, 20''.
<i>Bed.</i> Iron, complete - - -			17½ cwt.	4' 4'' x 3' 1'' x 1' 7'',
<i>Platform.</i> Ground, permanent * - -				
<i>Ammunition.</i> Cartridge, flannel, charge - - (Other items are the same as for the 52-cwt. mortar.		- -	0 2	Full charge, 4 lbs. 12'' long.
<i>Stores.</i> Cap, for muzzle - - - Spike, spring, 7.5 in. long - - Sponge, with stave, rammer, and cap Stave, spare, 4 feet 3 inches -		- -	2 8 0 2 13 6 2 10	Other articles as for the sea service mortar.

* Included in the construction of the battery.

* There is an older pattern of 17 cwt., which may be recognized by its dolphins, and by the rings having fillets. The chamber is flattened at the end, and the vent is perpendicular ; the length of the bore is only 20 inches.

NOTES.

10-inch mortars appear to have been introduced at the same time as the 13-inch mortars, and to have undergone the same succession of changes in material and construction. The large or sea service piece has been but little employed of late years, the other is a serviceable piece for siege trains.

The working party is 1 non-commissioned officer and 9 men. There is no definite proportion of ammunition for garrison service. A metal-lined case holds 22 filled bursting cartridges.

The mortar and its bed can be carried singly by the sling cart. Both can be carried by a platform wagon, and the sling wagon will convey the bed with the mortar already mounted upon it.

EQUIPMENT OF 8-INCH MORTARS.

Description.	No. of Drawing.	Cost of each.		Weight of each.	Dimensions and Remarks.
		£	s. d.		
8-INCH IRON MORTAR.*					
Extreme range, 2,000 yards.					
<i>Mortar.</i>					
Total length, 2 feet 1 inch; width of trunnions, 2 feet; calibre, 8 inches; windage, .14 inch		-	-	9 0 0	Similar in pattern to the 10-inch L.S. mortar; it has two plain rings and a vent patch. The chamber is of gomer form, with an elliptically shaped bottom. Length of bore, 20 ^h ; diameter at the muzzle, 16".
<i>Bed.</i>					
Iron, complete		-	-	8 1 3	3' 3" x 3' 1" x 1' 3".
<i>Platform.</i>					
Ground, permanent ^a		-	-		
<i>Ammunition.</i>					
				lbs. oz.	
Firing charges { service -				2 0	L. G. powder.
(extreme) { light ball -				1 14	
{ smoke ball -					
Bursting charge				2 4	
Projectiles { shell, empty -				46 0	11.25" long.
{ carcass, filled -				53 0	
{ light ball -				32 15	
{ smoke ball -				10 12	
{ 1-lb. shot (50) -				50 0	
Fuze, mortar				0 4½	8" long; burns 30 sec.
Tubes { common, brass -				0 0½	
{ friction, copper -				0 0½	
Bottom, wooden, hemispherical				2 10	
Cartridges { calico, burster -				0 0½	} For flannel cartridges.
{ do. waterproof, No. 8				0 0½	
{ flannel, charge				0 1	
Cover { paper, No. 14 -				0 0½	
{ waterproof -				0 0½	
<i>Stores.^b</i>					
Boxes, wood, for { 3 light balls -				24 0	27" x 14" x 10".
{ 2 smoke balls -				15 8	18" x 10" x 12".
{ 50 1-lb. shots -				6 8	16" x 8" x 7".
{ 1 loaded shell -				10 4	11½" x 10" x 11".
Cap, canvas, for muzzle				1 15	
Case, leather, cartridge				3 11	
Fid, wood				39 11	
Garland, for 30 shells				140 0	2' 8" square; see also the table.
Gauges, ring { high -				4 6	7.9" diameter.
{ low -				4 5	7.82" "
Heads, spare { rammer -				1 8	
{ sponge -				3 7	
Punch, for vent (No. 6)				0 1½	
Scraper, shell				0 9	
Spike, spring, 7.55 inches long				0 1½	
Sponge, with stave, rammer, and cap				7 7	
Stave, spare, 4 feet				2 8	

* Included in the construction of the battery.

^b See also the list at p. 342.

* There is an older pattern of 8½ cwt.; it may be recognized by the rings having fillets; it has no dolphins, but in the rest of its construction it resembles the old 10-inch mortar of 17 cwt. The bore is 16 inches long.

EQUIPMENT OF 8-INCH MORTARS.

NOTES.

The 8-inch mortar was originally made of brass, it has undergone several modifications in pattern, but has never been constructed with increased dimensions for sea service. It can be worked by 7 men, three less than the number required by those of larger calibre. The full charge of 2 lbs. powder gives a range of 2,000 yards; a reduced charge of $9\frac{1}{2}$ ozs. will give 400 yards.

There is no settled proportion of ammunition for garrisons. One metal-lined case will hold the bursting and service charges for 21 rounds.

The most convenient carriage for transporting these pieces is the platform wagon, on which two 8-inch mortars, with their beds, can be conveyed at one time. The sling cart and sling wagon may also be used, the former for the mortar and bed singly, the latter for both together.

FURNACE FOR HEATING SHOT.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
<i>Furnace.</i>					
Service pattern - - -	-	£ - -	13 2 0		Described below.
Cover, painted canvas - - -	-	- - -	- - -		
<i>Fuel.</i>					
Coal, or coke, and wood ^a - - -	-	- - -	- - -		
<i>Utensils.^b</i>					
Bearer, hot shot, Addison's ^c - - -	-		0 9½	1	
Bench ^d - - - - -	-		3 25	1	
Poker - - - - -	-		0 11	1	
Rake - - - - -	-		0 4½	1	
Scraper ^e - - - - -	-		0 6	1	
Tongs ^f - - - - - pair	-		0 16	2	
Total weight 1½ cwt.					
<i>Stores.^b</i>					
Buckets, leather, water - - -	-		0 3½	2	According to the calibre of the gun in use.
Gauge, for shot ^g - - - - -	-			1	
Tubs ^h - - - - -	-		3 13	2	

^a ½ bushel coal, 2½ bushels coke, and wood shavings, are required to heat the furnace.

^b The utensils are issued with each "furnace complete," the stores are required in addition to them.

^c To carry the hot shot to the gun.

^d To hold the shot when they are being scraped.

^e To scrape the heated shot.

^f For taking out the shot.

^g To ensure that the shot is not too much enlarged by the heating.

^h To soak wads, and cool the tongs.

NOTES.

Every coast battery, and every armed place, or siege train, should be supplied with a furnace for heating shot.

The ordinary furnace is a sort of double iron box 3½ feet long, 2½ feet wide, and 2½ feet high, with a chimney, in two separable parts, rising 6 feet above it. It stands on three low trucks, which can be removed at pleasure, and has a handle for drawing it from place to place.

One non-commissioned officer and three men are required to attend it. It will hold fifteen 32-pounder shot, eighteen 24-pounder shot, or twenty-one 18-pounder shot at once, and heat them in about 40 minutes, provided the fire has had 20 minutes to become well ignited. After the first hour it heats them in less time if the fire is well managed, and the draught sufficiently strong. The latter depends very much on the wind.

Patent fuel, to give no smoke, is sometimes desirable, to prevent the operation from attracting notice, and was used with advantage on a certain occasion at the siege of Sebastopol. (Artillery Operations, p. 57, 5th March 1855.)

At the siege of Gibraltar, in 1782, the furnaces being found insufficient to supply the required quantities of hot shot, some kilns like small lime kilns were made for the purpose; they were capable of heating 100 shot in 1½ hour. In the early part of that siege a gunner was killed by a heated shot igniting the cartridge and prematurely discharging the gun. (Drinkwater's History.)

To guard against this nature of accident two junk wads are now placed between the cartridge and the shot, and one of them is damped. The charge is reduced by one-fourth, to lessen the danger arising from the size of the shot being increased. The expansion is from .001 to .0125 of the diameter.

CUPOLA FOR MELTING IRON.

Description.	No. of Drawing.	Cost of each.		Weight of each.	Total No.	Dimensions and Remarks.
		£	s. d.	cwts. qr. lbs.		
<i>Cupola.</i>						
With brick lining ^a - - -	- - -	-	-	61 0 0	-	} See the remarks below.
Driving apparatus - - -	- - -	-	-	10 0 0	-	
Cover, tarpaulin - - -	- - -	-	-	-	-	
<i>Fuel.</i>						
Coal, coke, and wood - - -	- - -	-	-	-	-	
Iron, for melting ^b - - -	- - -	-	-	-	-	
<i>Utensils.^c</i>						
				qrs. lbs.		
Bars, tapping - - -	- - -	-	-	0 10	2	
Funnels ^d - - -	- - -	-	-	0 3	2	
Hammer, sledge ^e - - -	- - -	-	-	0 15	1	
Hangers - - -	- - -	-	-	0 12	2	
Hooks, clearing - - -	- - -	-	-	0 10½	2	
Ladles - - -	- - -	-	-	1 10	2	
Plates, clearing - - -	- - -	-	-	3 22	1	
Rakes - - -	- - -	-	-	0 2½	2	
Spanner, 9 inch - - -	- - -	-	-	0 1½	1	
<i>Stores.^f</i>						
Bearers, hot shot, Addison's - - -	- - -	-	-	0 9½	2	
Ladders - - -	- - -	-	-	-	2	
Ropes, drag, light - - - pairs	- - -	-	-	0 6	2	
<i>Ammunition, composition of 1 round.</i>						
For 10-inch guns:—				lbs. oz.		
Cartridge, filled, 8 lbs. charge	- - -	-	-	8 3		
Shell { empty, with bottom and rivet, 71 lbs. 7 oz. - - -	}	-	-	116 7		
molten iron, 45 lbs. - - -		-	-	-	-	
Wads, junk, 1 damp, 1 dry - - -	- - -	-	-	9 4		
Friction tube - - -	- - -	-	-	0 0½		
For 8-inch, or 68-pounder guns:—						
Cartridge, filled { 10 lbs. ^g - - -	}	-	-	10 4		
8 " ^h - - -		-	-	8 3		
Shell { empty, with bottom and rivet, 29 lbs. 2 oz. - - -	}	-	-	59 5		
molten iron, 30 lbs. - - -		-	-	-	-	
Wads, junk, 1 damp, 1 dry - - -	- - -	-	-	6 0		
Friction tube - - -	- - -	-	-	0 0½		

^a Without the brick lining it is 22 cwt.

^c These are furnished with the cupola complete.

^e For breaking up iron, &c.

^f For the 68-pounder.

^b In small lumps.

^d For filling shells.

^g These are required in addition to the utensils.

^h For the 8-inch.

NOTES.

The molten iron shells submitted by Mr. Martin were adopted in February 1860, and a cupola for melting the iron was approved in November of the same year. (War Office Circular, No. 665, s. 170.)

The cupola is a cylindrical shell of wrought iron, lined with fire brick, mounted on a frame with four wheels of two feet diameter, and furnished with a blast fan for creating a draught; it stands 9 ft. 4 in. high, and is about 9 ft. long by 6 ft. wide.

CUPOLA FOR MELTING IRON.

The fan may be worked by steam power, such as an agricultural engine, if available; otherwise it is turned by a separate apparatus which must be worked by men. The turning or driving apparatus is also mounted on wheels or trucks; it is connected with the cupola, when brought into use, by two tie rods 11½ feet long, and requires a working party of 18 men, who must be relieved at short intervals. The trucks of the apparatus are 12 inches in diameter, and the extreme width when in use, with the handle attached, is 8 feet 10 inches.

The metal will begin to run in 20 minutes after being put in, or 40 minutes after the fire is lighted. One ton can then be completely melted in 30 minutes, and shells may be filled at the following rate:—

8-inch shells	-	-	140 per hour.
10-inch „	-	-	96 „

These shells are expressly made for this service, and hold 30 lbs. and 45 lbs. respectively. After being filled they are rivetted to wooden bottoms (like common shells), and the filling hole is closed by giving a few taps with a hammer to the heated metal at the mouth. Junk wads are used with them, as with hot shot.

They are intended to burst, and scatter the iron, in a liquid form, when they enter a ship's side; but after being filled 15 minutes their contents become solid, and they ought not to be fired in less than four minutes, because they are then liable to burst in the gun. Whilst, however, the metal is solidifying the shell is becoming gradually red hot, and it retains its inflammatory power for some time.*

The furnace is charged from the top, the ladders being furnished to enable men to mount up for the purpose; the iron may be obtained by breaking up unserviceable shot and shell when there are any at the station. The lumps should be as small as possible, and none larger than 6 or 8 inches square should be admitted into the furnace.

The shells are issued in boxes, the 10-inch singly, and the 8-inch two together. They should be carefully examined before being filled, to ascertain that they are perfectly dry inside.

Cupolas are painted periodically with the anti-corrosion used for guns; and such parts as are affected by the heat of the furnace should be re-coated every time that the cupola is used. 3 lbs. of composition are allowed for the latter service, and 5½ lbs. for covering the whole surface. They are to be protected from the weather, and tarpaulin covers must be put over them, if no better shelter is available.

* See report, in circular dated Horse Guards, 31st August 1860.

CARRIAGES FOR TRANSPORTING ORDNANCE AND STORES.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
<i>Stores.^a</i>					
Hammer, wrench - - -			0 0 2	1	
Handspikes, common, 6-ft. - -		0 2 2	0 0 12	4	
Ropes, drag, heavy - - - pair			0 0 21	1	
Skidding, pieces - - -		0 6 6	0 2 20	2	4½' long by 6" square.
 Sling Cart.					
<i>Cart complete.</i>					
Body, with windlass, ^b and shafts - }		38 10 0	18 0 0		
Wheels, 5½ feet, with drag washers - }				4	As for the sling wagon.
Levers, with ropes - - -		0 5 2	0 0 15	2	Ditto.
Pawls, wood - - -		0 2 0	0 0 6	1	The prypole is 6' long.
Prypole, with 3 fathoms of 2½-in. rope.		0 7 4	0 1 2	2	
Sling (5-inch white rope) - - -			0 0 20	1	} The same as for the sling wagon.
Tie for ditto - - -			0 0 0½	1	
Thimbles for trunnions { large - - - small - - -			0 0 2½ 0 0 2	2 2	
 <i>Stores.^a</i>					
Handspikes, common, 6-ft. - - -		0 2 2	0 0 12	2	
Skidding - - - - - piece		0 6 6	0 2 20	1	4½' long by 6" square.
Swingletree - - - - -		0 5 9	0 0 5½	1	Attached to a bar projecting from the near shaft.
 Hand Cart.					
<i>Cart complete.</i>					
Bed, ^c with moveable sides - - - }		11 12 10	4 3 0		Bulk, 1 ton 10 ft.
Wheels, 4' 2", with drag washers - }			0 0 1½	2	Length, 12' 6"; width, 5' 2".
Slats ^d - - - - -					Height, 5' 3".
					Interior space, 5' 3" by 3' 3".
 Trench Cart.					
<i>Cart complete.</i>					
Bed, ^c with moveable sides - - - }		14 3 2	5 2 13	1	Bulk, 1 ton 23 ft.
Wheels, 4' 2", with drag washers - }				2	Length, 12' 3"; width, 6' 6".
Slats ^c - - - - -			0 0 1½		Height, 4' 2".
					Interior space, 5' 3" by 3' 6".

^a These are generally required in the operations for which this transport carriage is used.

^b The windlass is the same as for the sling wagon; the shafts are a continuation of the sides of the body.

^c The shafts are fixtures; the slats are battens of wood placed across them when the cart is to be drawn by men.

CARRIAGES FOR TRANSPORTING ORDNANCE AND STORES.

Description.	No. of Drawing.	Cost of each.	Weight of each.	Total No.	Dimensions and Remarks.
Drug Carriages.					
<i>Large carriage complete.</i>					
Bed, with pair of shafts (framed) and four trucks with lynch pins, ties, and washers.	}	£ 24 8 4	cwts. 17 1 24	1	Bulk, 2 tons, 7 feet. Length, with shafts, 19' 6". Width, 3' 9". Height, with stancheons, 5'. The bed is 9' by 3'; the trucks are 24" in diameter. About 2' 6" high.
Stancheons, or pins, iron (4)					
<i>Small carriage complete.</i>					
Bed, with iron handle, and four trucks, with lynch pins, ties, and washers.		£ 8 7 0	7 3 3	1	Bulk, 1 ton, 2 ft. Length, with handle, 12'. Width, 3½'; height, 2'. The bed is 6' long by 2¾' wide; the trucks are 18' in diameter.

NOTES.

Flanders wagons are employed in carrying light stores, powder barrels, metal-lined cases, and boxes of projectiles, but the general service wagon being equally applicable to these purposes no more *Flanders wagons* will be made.

The *platform wagon* is the best carriage for conveying heavy ordnance, platforms, gyns, and such like stores, when they have to be moved long distances; it will carry at once a gun and its carriage, a 10-inch mortar and its bed, or two 8-inch mortars and beds; a 13-inch mortar and bed must be carried separately. It is furnished with cleats or brackets to suit any one of these loads.

Platform wagons are supplied to siege trains in the proportion of 4 to 10 pieces of ordnance, and are furnished with the following spare parts:—axletrees, shafts, and wheels; for garrison service they are issued without the canvas cover, hoops, and sides; for field service, in batteries of position, they are equipped as shown at p. 204.

"Block wagons" very similar to these are described in the Art Military* as of "singular use and accommodation for the drawing of a peece of ordnance . . . because the peece lieth more steddie, and is not subject to so much wrenching aside in durtie and ruttie waies, then upon its proper carriage."

The *sling wagon* is a limber carriage with a straight pintail; it is used for raising and moving heavy ordnance with their carriages; traversing platforms may also be conveyed by it; the wagon complete comprises such stores as are most necessary for using it. The present pattern, with the improved windlass, was introduced in 1860. The new windlass has two projecting sockets, by which it is worked, and two sets of ratchet wheels; it is also pierced with mortise holes in case the sockets should become unserviceable.

A gun is slung underneath the body, and its carriage placed on the frame above it; 10-inch and 8-inch mortars are slung with their beds, without being dismantled; a 13-inch mortar and its bed require two wagons; platforms are slung bottom upwards.

In the equipment of siege trains one sling wagon is allowed to about 15 pieces of ordnance and one or two spare wheels and windlasses are allowed in addition; the working party for it is 1 non-commissioned officer and 8 men.

The sling wagon was introduced about 1845, and superseded the Devil carriage which was similarly constructed, except that it had no windlass.

The *sling cart* is not supplied to siege trains, it is only suitable to hard level roads, and does not bear a heavier weight than 65 cwt. It may be used for 8-inch or 10-inch mortars, or their beds; all 8-inch guns, 32-pounders, Armstrong 40-pounders, and all other guns of smaller calibres. The windlass for raising mortar beds is a little different from that for the guns, being square in the middle and round at each end, but the latter may be used; the working party consists of 7 men, being 2 less than for the sling wagon.

* Part 3, p. 5, 2nd edition, 1642.

CARRIAGES FOR TRANSPORTING ORDNANCE AND STORES.

The present pattern was introduced in 1860, it differs from the old one in the improvement of the windlass and in the arrangement for attaching the swingletree. Sling carts and Devil carriages (large and small) are included among the "Park carriages" in use in 1813.

The *hand cart* and *trench cart* are used for carrying ammunition and stores, especially in the supply of advanced batteries, which wagons cannot conveniently approach. The trench cart can also be used for carrying 10-inch or smaller mortars, and their beds; it is smaller than the hand cart, but is stronger built and is painted red instead of the usual grey or lead colour. Both carts have shafts, but, as it is often necessary they should be drawn by men, two slats, or slips of wood, to be placed across the shafts, are furnished with each cart. Four carts of each kind, with spare axletrees, axletree beds, and wheels, are issued for every 10 pieces of ordnance in siege trains.

The *drag* or *truck carriages* are used for moving pieces of ordnance or heavy weights in positions where the size of a platform wagon would be inconvenient. The large carriage has shafts, but the small one has only an iron handle; four of each accompany a siege train of 105 pieces of ordnance. "Sleds with trucks" are mentioned in the *Practise of Artillerie* (1628) as occasional substitutes for block wagons.

GYNS.

Description.	No. of Drawing.	Cost of each.			Weight of each.			Total No.	Dimensions and Remarks.
		£	s.	d.	cwts.	qrs.	lbs.		
Triangle Gyms.									
<i>18-foot Gyn complete.</i>									
Gyn, large (including cheeks, pry-pole, windlass, bars, bolt, and shackle).		18	18	10	11	3	0	1	Tonnage, 1 ton 23 ft. The cheeks are 18' long; the windlass is 6' 9" long. As for the sling wagon. } Measured from bight to bight. Described next page.
Levers, with ropes - - -		0	5	2	0	0	15	4	
Slings (6-inch rope) { 11 feet -					0	1	0	1	
{ 10 feet -					0	0	24	1	
Tackle, complete - - -					1	1	25	1	
Trucks, wood - - -					0	0	8½	3	
Total weight, 14½ cwt.									
<i>16-foot Gyn complete.</i>									
Gyn, small (as above) - - -		16	19	6	8	1	0	1	Cheeks, 16' long; windlass, . } 12" in diameter; 3¼" thick.
Levers, with ropes - - -		0	5	2	0	0	15	4	
Slings (6-inch rope) { 11 feet -					0	1	0	1	
{ 10 feet -					0	0	24	1	
Tackle, complete - - -					1	1	0	1	
Trucks, wood - - -		0	1	6	0	0	8½	3	
<i>Stores.</i>									
Fid, wood (for gyms) - - -								1	According to the calibre.
Hammer, heavy - - -								1	
Handspikes, common, 6 feet		0	2	2	0	0	12	4	According to the calibre. 1½ fathom, and 1 fathom long.
Ropes, drag, heavy - - - pair					0	0	21	1	
Skidding, piece of (for mortars)								1	
Spun yarn, pieces - - -								2	
Gibraltar Gyn.									
<i>Gyn, complete.</i>									
Gyn, with iron trucks (14½ cwts.) -		-	-	-	-	-	-	-	Bulk, 1 ton, 28 ft. 5 in. 8' long; 8' high. 7 fathoms long. Described next page.
Slings (2½-inch tarred rope) -					0	0	9½	2	
Tackle, complete - - -					0	2	14	1	
<i>Stores.</i>									
Handspikes, common, 6 feet -		0	2	2	0	0	12	4	
Ropes, drag, heavy - - - pair					0	0	21	1	

NOTES.

The *triangle gyn* or *gin* is the machine most commonly used for mounting heavy pieces of ordnance on their carriages, shifting them from one carriage to another, and placing them on platform wagons. It is also used for placing traversing platforms in batteries, or putting them on wagons for transport.

One non-commissioned officer and 12 men can work it and carry it short distances, but it is generally moved from the depot or store to the battery in a hand cart, and for a march it is carried on a platform wagon.

There are two sizes, the larger is furnished to siege trains in the proportion of 1 to 9 pieces of heavy ordnance, the smaller is furnished to each battery of position. The 18-foot gyn will raise guns of any

GYNS.

weight, the 16-foot gyn is not suitable for weights above 56 cwt.; but two may be used, if the 18-foot gyn is not available, for mounting the 10-inch, 8-inch (of 60 cwt. and 65 cwt.), 68-pounder, 56-pounder, 42-pounder guns, and the heavier natures of 32-pounder guns. The 18-foot gyn has been adopted within the last few years in place of a larger size of 20 feet; in 1813 there were gyms of 18 ft. 6 in. and 16 ft. 4 in.

The gyn consists of the following parts, which are put together when it is required for use; two cheeks and a prypole united at the top by a bolt and shackle; two iron cross bars for connecting the cheeks with one another, and a windlass, similar in pattern to that of the sling wagon and sling cart. The shackle is for receiving the hook of the treble block. A gyn "complete" includes also the articles detailed on the last page.

The *levers*, also called gyn handspikes, are for turning the windlass; they are 6 feet 9 inches long and fitted, at the small end, with $2\frac{1}{2}$ fathoms of 2-inch tarred rope.

The *slings* are of 6-inch rope, with the ends fastened together; they are issued in two lengths, 10 feet and 11 feet, to suit different guns. Mortars are slung by lashing $2\frac{1}{2}$ -inch rope round them.

The *tackle* is composed of two 12-inch blocks, and a fall of $3\frac{1}{2}$ -inch white rope (16 fathoms long for the large gyn and 12 fathoms for the small one); one of the blocks is double and one treble for ordinary weights, but for the heaviest weights, such as 68-pounder and 10-inch guns, two treble blocks are employed; the blocks are now always of Bothway's pattern.

The *trucks* are round pieces of wood, pierced in the middle; they are put under the legs of the gyn to prevent them from slipping.

Spare levers, trucks, and windlasses are supplied with gyms for siege operations.

The word gyn is perhaps a corruption of guindall (from guinder, to wind), the name under which this machine is described in the "Practise of Artillerie," published in 1628. In the "Principles of the Art Military"* (1642) it is called a "Fearne or ghyenne, in French, a guindall,"† and there is an engraving which shows that in construction it was the same as the one now used; it differed only in the rudeness of its general pattern and details. The notice of it begins thus,—“The carriage being placed in a readinesse, you are then to hoise up your peece into it, which in regard of the weight of it, be it a canon or any other great peece of ordnance, cannot well be done without the ingenious help of the *fearne* or *ghyenne*, ropes, a goat's foot, or an yron crow, leavers to wind up the rouler, &c.” The goat's foot was merely a handspike shod with a piece of forked iron, and corresponded with the present handerow lever.

A still ruder specimen, dating from 1400 or 1450, is shown in Plate 7, vol. 3, of the Emperor Napoleon's work on artillery.

The *Gibraltar gyn* is used in garrison service for mounting ordnance on *standing* carriages, and dismounting them from such, in low covered batteries and other situations where a triangle gyn could not conveniently be used; it will support three tons safely, and is worked by 1 non-commissioned officer and 6 men.

It consists of a horizontal bar, supported by two uprights about 8 feet high; in the middle of the bar there are sheaves, so that only one block is required for the tackle. Instead of a windlass and levers there is a small toothed wheel, working into a large one, and turned by a handle. The *tackle* consists of one treble 12-inch block, with 8 fathoms of $3\frac{1}{2}$ -inch white rope; the block is of iron with brass sheaves, and has an iron bar, $2\frac{1}{2}$ feet long, attached to it. The gun, instead of being slung, is lashed to this bar.

The gyn is mounted on four small truck wheels, and can be dragged short distances by its working party.

Bell's gyn is similar in form to the Gibraltar gyn, but the gun is lifted by an iron bar, which has a hook at the lower end and teeth cut on one of its sides; this bar passes through the middle of the horizontal beam, and is moved up or down by a toothed wheel with four handles; it is not strong enough to bear more than 30 cwt.

* Part 3, p. 9, 2nd edition.

† It is now called a chèvre.

STORES FOR MOVING OR MOUNTING HEAVY ORDNANCE.*

Name.	Description and Service.
Anchors - - -	Anchors, besides being necessary for operations where boats or rafts are employed, give a good hold for capstans, &c.
Axes, pick - - -	For making holes in the ground, which are sometimes required ; as, for instance, in shifting a gun from a garrison to a travelling carriage, or a platform wagon, with a plank and rollers.
Blocks - - - 6-inch, &c., double or treble.	Blocks are elliptical shaped blocks of wood, or frames of metal, with one or more pulleys or sheaves inside them ; they are distinguished as 6-inch, 8-inch, &c., according to their length, and are termed single, double, or treble, according to the number of sheaves they contain. They are usually strapped or bound outside from top to bottom with a piece of rope, to which a hook is attached. If there is no hook, and the strap is continued so as to form a loop, the block is called a tail or jigger block.
Jigger - - -	
Bothway's - - -	Bothway's blocks are strapped inside with iron, and have swivel hooks ; snatch blocks are metal blocks which are made to open on one side, so that a rope may be rove without having to begin at one end.
Snatch - - -	Blocks and ropes together form "tackles," which are very frequently used in artillery operations, and are of different descriptions. A single block is also frequently used to change the direction of a rope, it is then called a "leading" block. See Tackles, for further details.
Leading - - -	
Capstan - - -	A crab capstan consists of a windlass, 4 feet high, supported in a vertical position by a frame, and turned by two long levers passing through it, so as to project equally on each side. The lower part of the windlass is shaped like the frustrum of a cone ; the frame is nearly triangular in plan and elevation ; it is 5 feet long, and at the large end it is 3½ feet wide by 3 feet high. The levers are called capstan bars, they are 16 feet long, and should have pieces of rope attached to their ends long enough for three men to haul by ; 24 men can then be employed together upon them. A capstan "complete" includes the frame, windlass, bars, and a stopper rope (see rope) ; it is used to draw guns up steep ascents and to raise heavy weights ; for the latter it is combined with sheers, derricks, &c. A substitute for it can be made out of a limber with a straight pintail, and sometimes the windlass of a gyn can be employed instead. Crab capstans complete, with a proportion of spare bars and windlasses, are issued to siege trains in the proportion of 1 to 10 pieces of heavy ordnance.
Crowbars - - -	Required when the ground is rocky, and sometimes for masonry where wooden pickets cannot be driven.
Derrick - - -	A derrick is a sort of crane ; it can be made with two spars (25 feet or 30 feet long), a slab of wood, and the necessary stores and tackle for working it. One spar, called the main beam, is passed through the slab of wood, and is sunk some feet into the ground ; the other (the derrick) has its lower end resting on the slab, and the upper supported by tackles, from the head of the main beam, at any angle required. There are five guys from the ground to the top of the upright beam to keep it firm, and two to the highest point of the derrick for traversing it to the right or left. The weight is raised by a gyn tackle whose fall is passed round a crab capstan. Thirteen men form the working party. (See Manual of Artillery Exercises, p. 235.)
Dragropes - - -	Dragropes are four or five fathoms long, and have a hook at one end. They are used for hauling moderate weights, but principally for steadying a gun when it is suspended in the air by tackles.
Fall - - -	This term is applied to any rope which is passed through blocks, so as to form part of a tackle ; its length and thickness vary according to circumstances.
Fulcrum - - -	Frequently required when a long lever is applied ; pieces of elm (2 feet by 1 foot, and 7 inches thick) are furnished for the purpose, but any convenient piece of timber may be used.

* The stores alphabetically arranged in this list are taken from the Artillery Drill Book, they are used only when the nature of the work prevents the use of a transport carriage and a gyn.

STORES FOR MOVING OR MOUNTING HEAVY ORDNANCE.

Name.	Description and Service.
Gasket - - -	A flat plaited cord used for "stoppering the fall," <i>i.e.</i> , fastening it in such a manner as will stop it from running through the blocks when the weight remains at one end but the power is no longer applied at the other.
Guy - - -	Guys are ropes applied to steadying the heads of spars, &c. Each pair of sheers has two guys, back and fore, by which, with the help of luff tackles, its head can be raised, lowered, or brought to bear over any point in the same vertical plane; they are made fast at the bottom to pickets driven into the ground or to any convenient object. In derricks, the upright spar has four or five guys, to steady it, and the sloping one has two, to traverse it from one side to the other.
Gyns - - -	Described last page but one.
Hammers - - -	Heavy hammers are required when crowbars are substituted for pickets; wrench hammers are used in dismounting mortars from their beds.
Handspikes - - -	Used generally as levers; they are 6 feet or 7 feet long, and some of them are bevelled at the point or square end. When a gun is being moved on rollers it is kept steady by two handspikes placed across it, the end of each passing through a rope strap attached to the trunnion on the opposite side. When a limber is made into a capstan, four handspikes are attached to the wheel to turn it.
Lashings - - -	Lashings (usually of 2-inch rope in various lengths) are used for fastening together the spars used as sheers, &c., and for securing them to the pickets, by which their feet are kept steady. Lashings are also generally employed when large or heavy articles have to be safely fastened together.
Lever - - -	A lever is larger than a handspike, being 8, 10, or 12 feet long; it is put into the bore of a gun when the muzzle has to be raised or lowered, and is applied generally wherever this description of power has to be exerted with more force than can be applied with a common handspike.
Lever sheers. <i>See Sheers.</i>	
Limber - - -	A limber, if it has a straight pintail, can be converted into a capstan. The bed is put on the ground and secured by pickets; one of the wheels, with four handspikes lashed to its spokes, is then put on the pintail with its "dish" uppermost, so that the chief part of the nave is underneath; the fall of the tackle is passed round the nave, which acts like the drum of the capstan, and the wheel is turned by means of the handspikes lashed to it.
Maul - - -	For driving pickets.
Parbuckles - - -	Usually of 4-inch ropes; they are used in connexion with skids for "parbuckling" guns on to their carriages or up steep slopes. In the former case they are 12 fathoms long, and one end is fixed to the carriage; in the latter case they must be at least twice the length of the ascent, and one end is made fast to some convenient point at the top.
Pickaxes - - -	Occasionally required to break ground.
Pickets - - -	Pickets are made of ash, hooped at the top to prevent their splitting, and shod with an iron point at the bottom; they are driven into the ground to furnish points where ropes can be securely fastened, or to which the blocks of tackles can be attached; also to secure capstans, the feet of sheers, &c. When the ground is too hard to allow of their being driven, crowbars are used instead.
Planks - - -	Usually of 3-inch deal, 10 feet long and 17 inches wide, with a bolt passing through each end to prevent it from splitting. When rollers are used to shift a gun from one carriage to another, these planks form a smooth hard surface for them to move upon. When sheers are erected above an embrasure, 14 planks are laid as a flooring over it.
Post. <i>See Picket.</i>	
Props - - -	Pieces of oak, 2½ to 3½ feet long, and 5 inches square, put underneath carriages, &c. to prevent their tilting over, or to give them additional strength.
Quoins - - -	The common quoins of gun carriages; they are sometimes used as fulcrums or as short inclined planes.

STORES FOR MOVING OR MOUNTING HEAVY ORDNANCE.

Name.	Description and Service.								
Raft	A raft is necessary when guns have to be raised from under water ; it is made of two or more pontoons, or boats, with a platform upon them, and a gyn is erected upon it. The flooring of the platform must be so laid that part of it can be taken up when the gyn is at work, so as to allow room for the gun to pass through.								
Rammers, earth	Occasionally required when earth has been dug out and is to be solidly replaced.								
Rollers	Rollers are employed in sets of three for moving dismantled guns, two are always under the gun and the third kept ready to be placed under it, according as the motion requires, each roller advancing over on ly one-half the distance which is traversed by the gun itself. They are al hollowed out a little in the middle, and the largest are hooped at the ends with iron and fitted with grummet handles. They are sometimes pierced at each end with two holes, crossing one another at right angles, in which iron levers can be inserted for turning them. Rollers can only be used on a smooth hard surface ; this is sometimes provided by planks, especially in shifting guns from one carriage to another. The three largest sets are intended for use on the ground.								
<table border="0"> <tr> <td>1st set, 6' long, 10"</td> <td rowspan="7" style="vertical-align: middle; text-align: center;">} Diameter.</td> </tr> <tr> <td>2nd ,, 4' ,, 7½"</td> </tr> <tr> <td>3rd ,, 3' ,, 7½"</td> </tr> <tr> <td>4th ,, 2½' ,, 5"</td> </tr> <tr> <td>5th ,, 2' ,, 5"</td> </tr> <tr> <td>6th ,, 1' 8" ,, 5"</td> </tr> <tr> <td>7th ,, 1' 2" ,, 5"</td> </tr> </table>	1st set, 6' long, 10"	} Diameter.	2nd ,, 4' ,, 7½"	3rd ,, 3' ,, 7½"	4th ,, 2½' ,, 5"	5th ,, 2' ,, 5"	6th ,, 1' 8" ,, 5"	7th ,, 1' 2" ,, 5"	
1st set, 6' long, 10"	} Diameter.								
2nd ,, 4' ,, 7½"									
3rd ,, 3' ,, 7½"									
4th ,, 2½' ,, 5"									
5th ,, 2' ,, 5"									
6th ,, 1' 8" ,, 5"									
7th ,, 1' 2" ,, 5"									
<p>Rope</p> <p><i>Bowsing ropes.</i> <i>Hauling "</i> <i>Stopper "</i> <i>Breech and muzzle ropes.</i> <i>Preventor ropes.</i></p>	Rope is issued in coils of 113 fathoms (678 feet) each ; different sizes of it are distinguished by the circumference in inches. When liable to be exposed to wet, it should be tarred ; when not tarred, it is called white rope. Most of the sizes can be had in either form, <i>see</i> Cordage, p. 409. Ropes applied in various operations to the same purposes generally have special names, such as falls, guys, lashings, parbuckles, slings, &c., and they are described in this list under those heads. Bowsing or hauling ropes are those which are for moving a weight by simply hauling upon them. Stopper ropes are pieces of rope (usually 3¼-inch) about 2 fathoms long, applied to the same purpose as a gasket (<i>see</i> Gasket). Breech and muzzle ropes are any ropes attached for the time to those parts of a gun. Preventor ropes are used to check any motion which is liable to become too rapid. <i>See also</i> Tackles.								
Scantling	Scantling is a term used to express the dimensions of timber.								
Scotches	Wedge-shaped pieces of wood, about 9 inches long, 5 inches broad, and 4 inches thick, placed under guns and wheels to prevent their moving forwards or backwards.								
Selvagees	Made of rope yarns ; they are used as straps, also to receive the hooks of tackle blocks, &c.								
Sheers	Sheers consist of two spars, 30 or 40 feet long, lashed together at the top, separated about 20 feet at the bottom, and supported on each side by ropes called guys. The guys are so arranged that the head of the sheers can be moved backwards and forwards, even when a weight is suspended from it ; they are fitted with luff tackles for the purpose. The sheers are put together on the ground and then raised by the guys ; their feet are secured by being lashed to picket posts. The gun is lifted by an ordinary gyn tackle, suspended from the head, which may be worked either by a crab capstan, by luff tackles, or by the windlass of a gyn. In the last case some extra spars are lashed horizontally across the sheers, and the gyn, with its prypole removed, is attached to them (<i>see</i> Manual of Exercises, p. 213). A gyn, with its prypole removed, and two guys substituted for it, may sometimes be used as sheers.								
<i>Lever Sheers</i>	Lever sheers consist of two pieces of skidding, about 12 feet long, lashed together like sheers, combined with a long spar, one end of which rests on the ground, and the other is supported at the point where the sheers cross. The necessary tackle for lifting the weight is fixed to the upper part of this spar or lever, beyond the sheers, and the lower part is kept steady by loading it with sandbags, by securing it with ropes or pickets, or by any other convenient means.								
Skids	Skids are pieces of oak with their ends bevelled and fitted with grummet handles for moving them ; they are used for mounting and dismantling								

STORES FOR MOVING OR MOUNTING HEAVY ORDNANCE.

Name.	Description and Service.
<i>Sizes</i> { 20' long, 8'' square. 14' " 7'' " 10' " 4'' "	guns; also for parbuckling guns without carriages up steep ascents; they are of different dimensions for different operations; fir planks well bolted together to a sufficient thickness may be substituted for them. Skids are always used in pairs, and when mortars or mortar beds are rested upon them they must be kept within a few inches of one another by iron bolts with shoulders and keys.
<i>Skidding</i> - - - <i>Sizes</i> { 3' long, 9'' by 6''. 2' 8'' long, 3'' square. &c. &c.	Short skids, or pieces of skidding, also fitted with grummet handles, and sometimes bevelled at the ends, are used as supports for planks, &c.; they are laid across the cheeks of a garrison carriage to bear the gun when it is raised out of the trunnion holes, and are required in various sizes, for most of the operations connected with heavy ordnance.
Slab of wood - - -	A slab 6 feet long by 3 feet wide, and 7 inches thick, is used in the construction of a derrick; small slabs of wood are sometimes required to prevent sheers sinking into soft ground.
Sledges - - -	Sometimes used for dragging guns over marshes and shingle, or, with rollers underneath, over hard ground. They are made of two beams, 10½ feet long, 6 inches wide, and 10 inches thick; placed 17 inches apart, and connected by wooden transoms. A sledge of this kind, and used for the same purpose, is described and shown in Pietro Sardi's work, anno 1621.
Sling - - -	The rope attached to a gun, (when raised by a tackle), to receive the hook of the lower block, is called the sling; it is of 4-inch or 6-inch white rope. In the latter case its two ends are spliced together, and it supports the gun by passing under the cascabe at one end, and under a fid of wood projecting from the bore at the other. With sheers there is a second sling, passed over the point where they are lashed together, this is to receive the hook of the upper block. <i>See also Gyn, p. 353.</i>
Sling wagon and cart - - -	Described at p. 353.
Spades - - -	Required to be at hand in case holes should have to be dug in the ground.
Spars - - -	Spars are used in the construction of sheers, lever sheers, and derricks; they must be at least 25 feet long.
Spun yarn - - -	Used for making selvagees, for fastening or "seizing" together two pieces of rope, and for other similar purposes.
Straps - - -	The straps used in the manoeuvres of heavy ordnance are short pieces of rope, generally applied to posts, ropes, &c. to receive the hooks of tackle blocks; selvagees answer the same purpose.
Tackles - - -	This term expresses the combination of a rope, in any convenient length or thickness, with one or more moveable blocks; the rope is called the fall of the tackle. Tackles are distinguished by different names, according to the single, double, or treble blocks of which they are composed. The size of the blocks, as expressed in inches, depends on that of the rope which is to be rove, or passed through them, but the description of block (single, double, &c.) depends on the amount of power to be exerted. Tarred rope is unsuitable for tackles, because it will not run freely through the blocks.
<i>Whip</i> - - -	A single moveable block is called a "whip," another single block applied to the fall converts it into a "whip upon whip."
<i>Gun</i> - - -	Two single blocks, one fixed and the other moveable, make a "gun tackle."
<i>Luff</i> - - -	A single and a double block, the former fixed and the latter moveable, make a "luff tackle." The luff tackles commonly used in the service of heavy ordnance consist of 8-inch blocks, and 15 fathoms (90 feet) of 2½-inch rope.
<i>Gyn</i> - - -	A treble and a double block, the former fixed and the latter moveable, are called a "gyn tackle;" for the heaviest weights two treble blocks are used.
<i>Runner</i> - - -	A runner tackle is merely a luff tackle applied to the end of a large rope rove through a single block.
Twine - - -	Twine is tied round the ends of a rope to prevent their opening out; this is called "whipping" it.
Wedges - - -	Wedges, or scotches, are about 9 inches long, 5 inches broad, and 4 inches thick.
Yarn. <i>See Spun yarn.</i>	

IMPLEMENTS FOR PREPARING SHELLS AND FUZES.

Description.	No. of Drawing.	Cost.	Weight.	Total No.	Dimensions and Remarks.	
No. 1 Set.						
<i>For rectifying the Fuze Holes of Common and Shrapnel Shells.^a</i>						
Blocks, wood		£ s. d.	lbs. oz.		Weight, complete, about 200 lbs.	
{ 10-inch - - -	-		1 2	1		
{ 8-inch - - -	-		1 4	1		
{ 32-pounder - - -	-		1 8	1		
Extractor, fuze - - -	-		1 8	1		
Gauge for fuze hole - - -	-		0 8	1		
Holder, shell - - -	-		142 0	1		
Instructions, printed paper of - - -	-		0 0	1		
Key for fuze hole plug - - -	-		0 3½	1		
" for Pettman's fuzes - - -	-		0 9	1		
Lever for key, rimer, and screw tap - - -	-		1 4	1		
Rimer - - -	-		0 7	1		
Screws, coach (for the shell holder) - - -	-		5 0	4		
Tap, screw (see explanations) - - -	-		0 8	1		
Cases, grey, with hinges and hasps. { large - - -	-		38 8	1	39" × 14" × 13".	
{ small - - -	-		2 8	1		
Locks, pad, with keys { brass - - -	-		0 2	1		
{ iron - - -	-		0 4	1		
No. 2 Set.						
<i>For rectifying the Rivet Holes and fixing the Wooden Bottoms.^b</i>						
Block, wood - - -	-		6 0	1	Weight, complete, 17 lbs.	
Hammer - - -	-		1 4	1		
Instructions, printed papers of - - -	-		0 0	10		
Pricker - - -	-		0 1	1		
Punch - - -	-		1 5	1		
Rectifier - - -	-		0 3	1		
Wrench, box - - -	-		0 6	1		
Case, grey, with hinges and hasps - - -	-		7 8	1		16" × 10" × 7".
Lock, pad, brass, with key - - -	-		0 2	1		
No. 3 Set.						
<i>For filling Common and Shrapnel Shells.^c</i>						
Drifts, { common shells - - -	-		0 2	1		Weight, complete, 5 lbs.
wood { shrapnel { 8-inch to 24-pr. - - -	-		0 0½	1	For fuze holes. For loading holes, Ditto, smaller size.	
{ shrapnel { 18-pr. to 6-pr. - - -	-		0 0½	1		
{ common shells - - -	-		0 2½	1		
Funnel { common shells - - -	-		0 2½	1	} For loading hole plugs. 10" × 8" × 6".	
{ shrapnel { 8-inch to 24-pr. - - -	-		0 2	1		
{ shrapnel { 18-pr. to 6-pr. - - -	-		0 1	1		
Instructions, printed papers of - - -	-		0 0	5		
Key, iron, for fuze hole plug - - -	-		0 3½	1		
Screw drivers { 8-inch to 24-pr. - - -	-		0 3½	1		
for shrapnel { 18-pr. to 6-pr. - - -	-		0 3	1		
Case, grey, with hinges and hasps - - -	-		3 10	1		
Lock, pad, brass, with key - - -	-		0 2	1		

^a One set for every 50 or less number of guns, and one set spare.

^b One set to every 10 or less number of guns, and one set spare.

^c One set to every five or less number of guns, and one set spare.

IMPLEMENTS FOR PREPARING SHELLS AND FUZES.

Description.	No. of Drawing.	Cost.	Weight.	Total No.	Dimensions and Remarks.
No. 4 Set.					
<i>For preparing Common and Shrapnel Fuzes.^a</i>		£ s. d.	lbs. oz.		Weight, complete, 7 lbs.
Bits					
{ long, for hook borer -	-		0 0½	6	
{ short, for hand borer -	-		0 0½	6	
Borers					
{ hand -	-		0 4	1	
{ hook -	-		0 5	1	
Cylinder, wood, for bits	-		0 2½	1	
Instructions, printed papers of	-		0 0	5	
Keys, iron, for fuze hole plugs	-		0 7	2	¾ oz. each.
Mallet	-		0 10	1	
Sections of fuzes	-		0 2½	5	
Setter	-		0 5	1	
Case, red, with hinge and hasps	-		4 5	1	12" × 8" × 5".
Lock, pad, brass, with key	-		0 2	1	
No. 5 Set.					
<i>For rectifying the Fuze Holes of Mortar Shells.^b</i>					Weight, complete, about 200 lbs.
Blocks, wood					
{ 13-inch -	-		1 0	1	
{ 10-inch -	-		1 2	1	
{ 8-inch -	-		1 4	1	
Extractor, fuze	-		4 8	1	
Gauge for fuze hole	-		1 8	1	
Holder, shell	-		142 0	1	The same as for No. 1 set.
Instructions, printed paper of	-		0 0	1	
Lever, for rimer and screw tap	-		1 4	1	
Rimer	-		1 4	1	
Screws, coach	-		5 0	4	The same as for No. 1 set.
Tap, screw	-		1 0	1	
Cases, grey, with hinges and hasps.					39" × 14" × 13".
{ large -	-		38 8	1	
{ small -	-		2 8	1	
Locks, pad, with keys					
{ brass -	-		0 2	1	
{ iron -	-		0 4	1	
No. 6 Set.					
<i>For filling Mortar Shells and preparing their Fuzes.^c</i>					Weight, complete, 9 lbs.
Bits, for brace	-		0 3	12	¼ oz. each.
Brace	-		0 11	1	
Cylinders for bits	-		0 4	2	2 oz. each.
Funnel	-		0 6	1	
Instructions, printed papers of	-		0 0	5	
Mallet	-		1 0	1	
Sections of fuzes	-		0 10	5	2 oz. each.
Setter	-		0 7½	1	
Case, red, with hinge and hasps	-		5 6	1	14" × 9" × 6".
Lock, pad, brass, with key	-		0 2	1	

^a One set to every two guns, and 25 per cent. spare.

^b One set to every 50 or less number of mortars, and one set spare.

^c One set for every two mortars, and 25 per cent. spare.

IMPLEMENTS FOR PREPARING SHELLS AND FUZES.

EXPLANATIONS.

No. 1 SET.

These implements are used when there is any defect in the fuze hole which may prevent the fuze from being properly fixed. The wooden *block* is for the shell to rest upon in the *holder* until the jaws of the latter, one of which is moveable and worked by a screw, have taken a firm hold of it. The four coach *screws* are for securing the holder to a bench or table. The *rimmer* brings the fuze hole to the size required, the *gauge* tests the correctness of the dimensions, and the *tap* finishes up the thread of the screw inside the fuze hole. The original tap has been ordered to be replaced by one adapted to a longer fuze hole, suitable to preparing shells for Pettman's fuzes. A key for these fuzes has also been added to the implements. Circular 815, p. 22.

No. 2 SET.

This set is principally for fixing the wooden bottoms to those shells which have been issued loose. The *block* supports the shell, the *pricker* removes the beeswax with which its rivet hole is filled, the *wrench* unscrews the nut at the end of the bar on which the wooden bottoms are strung, the *punch* and *hammer* fix the rivet by which the bottom is fastened to the shell.

If the rivet hole of the bottom is jagged or rough the *rectifier* is passed through it.

No. 3 SET.

No. 3 set combines the various sized implements which form Nos. 2, 3, and 4 sets for field service (except the punch); the use of them is explained at page 209.

No. 4 SET.

The same fuzes being used in garrison as in field service, the same implements are required to prepare them. This set corresponds accordingly with No. 1 set of field implements, and the explanation given at page 209 applies to both. The extractor in No. 1 (field) set is omitted from this, because it is only occasionally required, and is contained in No. 1 garrison set, but a key for the fuze hole plug is added.

No. 5 SET.

This set corresponds with No. 1 (garrison) set already described, but the implements, except the holder and its screws, are of different dimensions to suit the different construction of the shells. The key is omitted because the fuze holes do not have metal screw plugs. The smaller implements of each set are in a box packed inside the large one.

Mortar shells have no rivet holes or wooden bottoms, and therefore do not require implements corresponding with No. 2 set.

No. 6 SET.

This one set combines the implements for preparing mortar fuzes and filling the shells. They were in two sets (No. 6 for filling shells and No. 7 for preparing fuzes), until January 1861, when the metal screw plugs for the fuze holes and the gutta-percha wads being discontinued, the wooden drifts, wrench (for the plug), and printed instructions were no longer required; the funnel was therefore transferred to No. 7 set, which was renumbered as 6, and the original No. 6 was omitted from the series.

Note.—The adoption of wooden time fuzes on Lieut.-Col. Boxer's principle for 110-pounder shells entails the supply of a special set of implements for preparing them.

The fuze hole being cylindrical, and the fuze conical, an adapter becomes necessary; this adapter is screwed in with a *key*, and a papier maché wad is driven into it with a *drift* to protect the bursting charge from any accidental explosion when the fuze hole plug is removed. The fuze composition is bored or pierced with a *bradawl*, and the fuze is fixed in the adapter with a *mallet* and *setter*. There is also an *extractor* for removing fuzes after they have been fixed.

TOOLS.

Description.	No. of Drawing	Cost.	Weight.	Total No.	Dimensions and Remarks.
SET OF FACING IMPLEMENTS FOR 110-POUNDER ARMSTRONG GUNS.		£ s. d.	lbs. oz.		Corrected to 1st January 1864.
Blocks {	breech cutting out, &c. G.	- - -	37 0	1	
	bush, screwing in F.*	- - -	22 0	1	
	iron vent piece, angle facing K.	- - -	38 8	1	
Box wrench, for trunnion sights	Q.	- - -	3 13	1	
Guard, wood, for vent piece	- O.	- - -	1 2	1	
Guides {	in breech screw - C.	- - -	46 0	2	
	in powder chamber - D.†	- - -	21 0	1	
Handle, to hold blocks in vent chamber	- P.	- - -	1 2	1	
Knives, cutting out {	thick iron - E ₂ .	- - -	1 6	2	11 oz. each.
	breech bush thin iron - E ₁ .	- - -	1 2	2	9 oz. "
Lever	- B.	- - -	34 12	1	
Punch, for pin in spindle	- N.	- - -	0 3	1	
Spanner, for stop washer	- M.	- - -	0 4	1	
Spindle	- A.	- - -	88 0	1	
Washers, stop	J. {	- - -	9 13	1	
		- - -	9 12	1	
Total number of articles	- - -	- - -	- - -	19	
Case, packing	- - -	- - -	80 0	- - -	{ The case is 5¼' long by 1¼' broad, and 1' deep.
Lock, pad, with two keys	- - -	- - -	- - -	- - -	
Total weight	- - -	- - -	3½ cwts.		

* Replaced by F₁ } See Circular 822, ¶ 745. 29/5/63.
 † Replaced by D₁ }

NOTES.

The general application of these tools has been described at page 212; they are issued to districts in the proportions specified at page 284.

TOOLS.

Description.	No. of Drawing.	Cost of each Set.	Weight of each Set.	Total No.	Dimensions and Remarks.
SET OF INSTRUMENTS FOR EXAMINING ORDNANCE.		£ s. d.	lbs. oz.		Corrected to 1st January 1864.
Bit, vent	-		0 2	1	
Brushes { hard, round	-		43 0*	10	
Turk's head { large	-		0 14	1	
small	-		0 7	1	
Callipers, brass, sliding, with case	-		8 0	1	
Drill, vent	-		0 3	1	
Gauges, vent	- set of		0 13	1	
Instruments for taking impressions of vents	-		24 0	1	
Knives for cleaning ordnance	-		71 0†	20	
Lamp, tin, with rod‡	-		2 8	1	
Pot, for softening gutta percha	-		9 5	1	
Prickers, common §	-		7 0	2	
Rimer, vent	-		0 3	1	
Scale, diagonal, brass	-		0 5	1	For measuring dimensions.
balloon	-		14 5	3	For chambers only.
Scrapper { fore-right	-		8 12	3	For the bottom of the bore.
half-round	-		8 0	3	For the curve at the end of the bore.
vent	-		0 2	2	
Searchers, spring { 8 prong	-		13 0	1	
6-prong	-		9 0	1	
4-prong	-		7 0	1	
Springs for knives { 10 and 8 inch	-		27 0	3	
42 and 32 prs.	-		25 0	2	
24 and 18 prs.	-		25 0	2	
12 and 9 prs.	-		19 0	2	
6-pr.	-		18 0	1	
Tongs for grinding scrapers	-		4 0	1	
Tool for grinding searcher points	-		0 5	1	
Wrenches for scrapers	-		2 6	3	
Swords, old	-		3 0	2	For scraping the exterior.
Cases packing	-		351 10	64	
Total weight	-		178 0	-	One case is 13' 2" x 1' 2" x 1' 1". The other is 2' 5" x 1' 10" x 1' 4"; both are mere rough boxes.
			4½ cwt.		

* There is one for each calibre, from the 10-inch to the 6-pr.; the largest weighs 11 lbs. 12 ozs.; the smallest 1 lb. 5 ozs.

† Two for each calibre; the largest weighs 8 lbs. 14 ozs.; the smallest, 15 ozs.

‡ For examining the bore; a mirror may be used instead.

§ To the pricker is attached a composition of beeswax, two parts, treacle, one, and soft soap, one, boiled together; in order to take the impressions of holes.

TOOLS.

NOTES.

These instruments are issued for making the annual examination of cast-iron ordnance referred to in previous pages. Instructions on the subject have been promulgated in the War Office Circulars, No. 506, 22nd November 1859, and No. 676, 8th April 1861.

A careful inspection is mentioned by Norton, in 1628, as "the principall thing that a gunner ought to looke unto, when hee is to take many peeces of ordnance into his charge . . . to search and examine, how they are fortified, and whether they be sound and safely serviceable." He directs that the bore should be examined for cracks or holes with "a common search, upon a staffe, having two or three round pease poynted springs that beare out, unlesse they be forced close;"* also, with a looking glass, or a bright sword, or a candle "upon the end of a cane, staffe or halfe pyke." If any flaws were discovered the gunner might "assure himselfe" that the piece was dangerous, and be careful accordingly, but nothing is said about condemning it as unserviceable, or about ascertaining the state of the vent.

* This is similar to the searcher still used.

TOOLS.

Description.	No. of Drawing.	Cost of each Set.	Weight of each Set.	Total No.	Dimensions and Remarks.
		£ s. d.	lbs. oz.		Approved 12th October 1861.
SET OF TOOLS FOR RE-VENTING SMOOTH-BORED ORDNANCE.					
Bar, iron, with spring and collar -			163 0	1	
Braces { armourer's -			2 0	1	
{ drilling, large -			15 0	1	
Brush, turk's head, with stave -			6 0	1	
Burnishers -			1 8	3	
Chisels, hand, flat -			6 0	6	
Collars, cast-iron, for muzzles of guns			119 0	7	In seven sizes.
Cutters, or knives, for heads -			15 0	15	
Drifts, for taking out old vents -			7 8	4	
Drills { hollow -			2 0	2	
{ for venting guns -			13 14	6	
File, bastard, flat, taper, 16 inch			3 0	1	
Frame, iron, with adjusting bar and extenders *			192 0	1	
Gauge, vent, 22 inch -			0 4	1	
Gravers, hand -			1 14	3	
Hammers, hand { large -			7 0	1	
{ small -			2 0	1	
Heads, metal, for cutters -			204 0	8	In eight sizes.
Instrument for taking impressions of vents -			28 0	1	
Levers, iron, for bar -			31 0	2	
Machine for drilling and venting, with chain, complete -			90 0	1	
Rimers for { cones -			6 0	2	
{ vents -			1 2	3	
Saw, 14-inch, blade and frame -			3 0	1	
Taps, venting -			24 0	8	5 with new thread; 3 with old thread.
Vents, copper †			-	-	
Wax, for taking impressions lbs.			2 0	2	
Wrenches, for { cutters, or knives -			1 0	1	
{ taps -			19 0	1	
{ vents -			19 0	1	
,, socket -			1 0	1	
Cases, packing -			979 2	87	No. 1 case is 6' 8" x 2' 7" x 1' 9" deep. No. 2 case is 12' 9" x 1' x 1'; both are mere rough boxes.
Total weight -			489 0	2	
			13½ cwts.		

* For cutting of the ends of vents.

† Two for each piece of iron ordnance when the tools are issued to siege trains.

TOOLS.

NOTES.

Tools for reventing smooth-bored ordnance are issued to garrisons and coast batteries in such proportion as may be required, and one set is supplied with every complete train of siege artillery ; the work is done by regimental artificers, who have been taught the process. A series of photographs, showing ten different stages of the operation, were executed at the Royal Arsenal in 1861.

Pieces of ordnance in garrison armaments are revented when the vents measure $\cdot 25$ inch (instead of $\cdot 2$ inch) throughout ; it is estimated that the iron vents are enlarged $\cdot 1$ inch, and copper vents $\cdot 05$ inch, by every hundred rounds that are fired. The vents of several 32-pounder guns lent to the French at the siege of Sebastopol were enlarged to diameters varying from 1 to 2 inches,* and Captain Hexham (1642) says, " I have seene in Ostend, upon the West Bulwark, that some touch-holes of canon were blowne so great " with often and continuall shooting, that I have put my fist into them. Now, such a touch-hole," he continues, " being blowne some three or foure inches,† maye easely be remedied. For if yow bore the " hole round, and driue in a screw of yron into it as thick as your finger, and in the midst of the screw " aboue said bore a small touch-hole in yt, yow shall finde this to last longer unblowne then any other " way." He proceeds to say that the new ordnance have such vents screwed in at their first manufacture, and that they last longer than brass or copper touch-holes, which is contrary to recent experience.

The reventing of Armstrong guns with moveable vent pieces can be done with the special tools.

* Artillery Operations, p. 225.

† This should apparently be tenths of an inch, to agree with the size of the screw afterwards mentioned ; the author appears to mean that the injury may be remedied if the hole is not too large for an ordinary screw to be fitted into it.

TOOLS.

Description.	No. of Drawing.	Cost of each Set.	Weight of each Set.	Total No.	Dimensions and Remarks.
SET OF TOOLS FOR SIGHTING SMOOTH-BORED ORDNANCE.		<i>£ s. d.</i>	<i>lbs. oz.</i>		Corrected to 1st March 1863.
Braces { armourer's - - -	-		3 8	1	} These two are in a wooden case.
hand, small - - -	-		14 0	2	
Battens, wood { inside - - -	-		53 0	2	
outside - - -	-		30 0	2	
Case, wood, for spirit levels - - -	-		1 14	1	
Chisels, flat - - -	-		2 0	2	
Drills, for sighting guns - - -	-		1 11	9	
Gravers, hand - - -	-		4 2	6	
Hammers, hand - - -	-		2 0	1	
Levels { wood, for trunnion - - -	-		12 0	2	
spirit { angular - - -	-		0 8	1	
with bar - - -	-		3 10	1	
Machine, for sighting guns, with chain, complete - - -	-		73 0	1	
Plummets { lead bob - - -	-		1 0	1	
brass - - -	-		1 2	2	
Punches, steel - - -	-		2 0	2	
Scriber - - -	-		0 2	1	
Taps, for fixing screws - - -	-		2 13	9	
Uprights, steel, or perpendicular - - -	-		5 0	2	
Upright, for drilling, with chain V set - - -	-		63 0	1	
Wrench { for taps - - -	-		3 8	1	
socket - - -	-		1 8	1	
			1 0	1	
<i>Cases, packing</i> - - -	-	-	282 6	52	No. 1 case is 12¼' x 11" x 9". No. 2 case is 3' x 2' x 6"; both are mere rough boxes.
			112 0	2	
Total weight - - -	-	-	3½ cwt.		

NOTES.

These tools are used for cutting and renewing the visual or sighting lines on pieces of ordnance ; also for determining the exact positions of the moveable sights and for drilling holes to receive the screws by which the sights are fixed.

RIFLED ORDNANCE.

GENERAL TABLE OF ORDNANCE.

Note.—The pieces of ordnance in each class (rified, smooth-bored, or mortar) are arranged together according to their calibres. The rified pieces are of wrought iron, the rest are of cast iron, unless otherwise expressed. The *calibre* is allowed to vary slightly from the given size, the limit being fixed at .025 inch for mortars, howitzers, and brass guns, .033 inch for iron guns, and .05 inch for carronades. The *nominal length* is measured from the end of the breech coil in Armstrong guns, and from the base ring in smooth-bored ordnance; it does not, therefore, include the projecting part of the breech screw in the former, nor the cascable in the latter; it extends to the end of the muzzle in all pieces except carronades, where it stops short at the “flash rim” or enlargement of the bore; the *total length* includes the parts thus omitted. The length of the *bore*, as given in this table, comprehends the chamber and the flash rim; the length of the *vent* in smooth-bored is from the top of the vent patch to the upper surface of the bore, it is therefore liable to vary from the bore not being exactly in the centre of the piece; the limit of error allowed in this respect is .025 inch in mortars, howitzers, and brass ordnance, .05 inch in carronades, and .25 inch in iron guns. The direction of the vent, in a few mortars and howitzers of old construction, is at right angles to the axis of the bore; it was formerly made thus for all pieces of ordnance, but during the last century it has been sloped towards the rear at various inclinations; in carronades it is nearly vertical; in old 32-pounders it makes an angle of 8°, and in 10-inch guns an angle of 17° with the perpendicular. In Armstrong breech-loading guns the vent is altogether different, the lower part coincides with the axis of the piece, and the upper part is cut vertically down through the centre of the vent piece.

The dimensions of the Armstrong guns have been obtained from the Royal Gun Factory, those of the smooth-bored are taken from Col. Boxer's diagrams and the tables which accompany them; the exterior dimensions are not permitted to vary more than .05 inch in carronades, mortars, and brass howitzers; .1 inch in 10-inch and 8-inch howitzers; .2 inch in brass guns, and .3 inch in iron guns (Artillerist's Manual). The true weight of any piece is marked upon it, and is generally within 2 per cent. of that which is assigned to it.

Calibre inches.	Name and Length.	Wt. cwt.	Dimensions.			Service Charge.	Projectiles.	Where employed.	Range. yards.
			Total Length.	Length of Bore.	Length of Vent.				
7.0	110-pr. gun, 10'	82	10 0	8 3½	14.09	12 0	Shot; common and segment shells.	Garrison service	200 to 4,000
6.4	70-pr. gun, 7' 8"	73	9 10	7 11¼	14.09	10 0	Shot; common and segment shells.	<i>Experimental.</i>	
4.75	40-pr. gun, 10' ^b	34½	10 1	8 10½	10.4	5 0	Shot; common and segment shells.	Garrison, siege, and field service.	200 to 4,000
3.75	20-pr. gun, 8' ^b	16	8 0	7 0	8.08	2 8	Shot; common and segment shells.	Siege and field service	200 to 4,000
3.0	12-pr. gun, 7' ^b	8½	7 0½	6 1½	6.65	1 8	Shot and segment shell	Field batteries	200 to 3,500
3.0	9-pr. gun, 5' 2"	6	5 2	4 5	6.65	1 2	Segment shell	Horse artillery	200 to 3,000
2.5	6-pr. gun, 5'	3	5 0½	4 5	5.25	0 12	Shot and segment shell	Colonial service	200 to 2,500

ARTILLERY.

SMOOTH-BORED ORDNANCE.

TABLE OF ORDNANCE—continued.
Smooth-bored Ordnance (Guns, Howitzers, and Carronades)—continued.

Calibre	Name and Length.	Weight	Dimensions.			Service Charge.	Ammunition.	Where employed.	Range.
			Total Length.	Length of Bore.	Length of Vent.				
6.25	32-pr. carronade, 3' 9"	cwts. 17	ft. in. 5 6	ft. in. 3 11½	inches. 5.35	lbs. oz. 2 11	Solid shot; case, and grape	Flank defences	yards. 220 to 1,100
5.823	24-pr. guns, 5 sizes, 7' 6" - 6' 0"	48	9 10	8 5½	8.0	8 0	Solid shot; common and shrapnel shells; case, grape, and carcasses.	Garrison service generally the 24-pounder of 50 cwt. for siege trains.	360 to 2,450
5.72	24-pr. brass howitzer, 4' 8"	20	6 9	5 6½	6.2	2 8	Common and shrapnel shells, case shot and carcasses.	Field batteries and horse artillery.	270 to 1,600
5.68	5½-inch howitzer, 3' 4"	15	4 0	3 0½	6.0	2 0	Common and shrapnel shells, case and carcasses.	Flank defences.	200 to 1,100
5.68	24-pr. carronade, 3' 5"	13	5 1	3 7½	4.5	2 0	Solid shot, case, and grape - case shot and carcasses.	-	200 to 1,100
5.292	18-pr. guns, 5 sizes, 7' - 6' - 5' 5"	42	8 10	8 5½	6.8	6 0	Solid shot; common and shrapnel shell; case, grape, and carcasses.	Garrisons, and the 38 cwt. gun for batteries of position and siege trains.	330 to 2,300
5.17		38	7 8	6 7½	5.0				
"	18-pr. carronade, 3' 1"	25	6 8	5 7½	6.5	2 0	Solid shot, case and grape - Solid shot, shrapnel shell, and case.	Flank defences	180 to 1,050
5.16		20	6 2	5 1½	5.3				
4.623	12-pr. brass gun, 6' 6"	18	7 1	6 2½	5.5	4 0	Solid shot, shrapnel shell, and case.	Field batteries	300 to 1,800
"	12-pr. iron guns, 8' - 6' - 6"	34	9 9	8 6½	6.5	4 0	Solid shot; common and shrapnel shells; case and grape.	Garrison service.	200 to 1,350
4.62		33	6 9	5 6½	6.8				
"	12-pr. brass howitzer, 3' 9"	29	3 3	8 0½	6.5	1 4	Common and shrapnel shells, case, and carcasses.	Batteries of horse artillery	200 to 1,300
4.58		33	8 3	7 0½	6.6				
4.52	12 pr. carronade, 2' 6"	6	4 1	2 8½	3.0	1 0	Solid shot, case, and grape	Flank defences	150 to 970
4.52	Coehorn howitzer, 1' 10"	28½	2 2	1 10"	3.0	0 8	Common shell and case shot	Mountain service.	
4.2	9-pr. iron guns, 7' 6" - 7' 0" - 6' 6"	26	8 2	7 0½	6.0	3 0	Solid shot; shrapnel shell; case, and grape.	In garrisons; for salutes only.	
		25	7 8	6 6½	5.8				

TABLES OF MATÉRIEL.

ORDNANCE—MORTARS.

No.	Calibre	Length	Weight	Range	Shot	Case	Grapes	Remarks
3-668	6-pr. iron guns	7' 6" - 7' 0"	21 - 20	5-5	2	0	0	artillery. In garrisons; for salutes only.
3-668	6-pr. brass gun,	5' -	6	3-0	1	8	0	Batteries of horse artillery - 300 to 1,600
3-6	6-pr. carronade,	2' 7" -	4½	2-35	0	10	0	Flank defences.
2-91	3-pr. brass guns	4' - 3' -	4 - 2½	0 12 0 10	0	12 10	0	Colonial and mountain service.
MORTARS.								
13-0	13-inch	sea service*	100	13-29	20	0	0	Garrisons, and sometimes sieges.
10-0	10-inch	land service	36	8-4	9	0	0	Garrisons - 2,900 "
8-0	8-inch	sea service	52	10-14	9	8	0	Garrisons and sieges - 3,500 "
5-62	Royal, or 5½-inch brass		18	7-2	4	0	0	Ditto - 2,400 "
4-52	Cochorn, or 4½-inch do.		9	5-8	2	0	0	Ditto - 2,000 "
			14	2-23	0	7	0	Ditto - 800 "
			0½	2-13	0	5	0	Ditto - 800 "

* A new 13-inch sea service mortar, of the same weight but of different external dimensions, was approved on 3rd February 1862.

ABSTRACT OF THE ABOVE LIST.

11 Rifled guns, viz. - Two 110-pounders; 70-pounder; two 40-pounders; two 20-pounders; two 12-pounders; 9-pounder, and 6-pounder.
 54 Smooth-bored guns, 48 iron, }
 5 brass. } Two 10-inch; four 8-inch; three 68-pounders; two 56-pounders; three 42-pounders; fourteen 32-pounders; five 24-pounders; five 18-pounders; five 12-pounders; five 9-pounders; four 6-pounders; and two 3-pounders.
 7 Howitzers, 3 iron, 4 brass - 10-inch, 8-inch, 5½-inch, iron; 32-pounder, 24-pounder, and 12-pounder, brass.
 7 Carronades, iron - 68-pounder, 42-pounder, 32-pounder, 24-pounder, 18-pounder, 12-pounder, and 6-pounder.
 7 Mortars, 5 iron, 2 brass - 13-inch, two sizes; 10-inch, two sizes; 8-inch, 5½-inch, brass, and 4½-inch, brass.
 86 pieces of ordnance.

CARRIAGES (SIEGE AND GARRISON).

NOTE.—The weights of the garrison carriages refer to those made of oak; teak is generally lighter by about one-tenth; great latitude must however be allowed to the nominal weights of all wooden carriages. The * shows that there is no carriage of that description. The table is compiled from the Artillery Field Book, the Aide Mémoire, and other sources.

Ordnance for Siege or Garrison Service.	Travel- ling Car- riage.	Garrison Carriages.				
		Common Standing.	Rear Chock.	Sliding.	Casemate Sliding.	Iron.
RIFLED GUNS (ARMSTRONG'S).						
110-pounder, of { 82 cwt. - - - -	*	*	*	16½	13¾	*
73 " - - - -	*	*	*	15½		*
70-pounder - - - -	*	*	*			*
40-pounder, of 35 cwt. - - - -	37	*	*	10½		*
20-pounder, of 16 " - - - -	26¾	*	*	*	*	*
SMOOTH-BORED GUNS (IRON).						
10-inch - - - -	*		16¾	15½	14¾	*
8-inch, of { 65 cwt. - - - -	*	15*	14	14½	13¾	25½
	60 " - - - -	*			12½	
	52 " - - - -	37¼ ^c		14	13¾	
50 " - - - -	*	11				
68-pounder, of { 112 cwt. - - - -	*			16½	15½	*
95 " - - - -	*	21½	16¾	15½	14¾	*
56-pounder - - - -	*	20½		15½		*
42-pounder, of { 85 cwt. - - - -	*			16½		26½
	75 " - - - -	*	14½			
	67 " - - - -	*	14½	16		
	63 cwt. - - - -	*	14½	14½		23½
	58 " - - - -	*	14½ ^b	14		
56 " - - - -	*					
50 " - - - - (A.)	35¾ ^e	14½ ^c		14		
50 " - - - -	*					
32-pounder, of { 45 " - - - - (B.)	*	14½				
	42 " - - - - (C.)	*	14½			
	39 " - - - -	*	13½			
	32 " - - - -	*	11½			
	25 " - - - -	*	8½	6		
24 " - - - -	*	8½				
24-pounder, of { 50 cwt. and 48 cwt. - - - -	35½ ^o	13¾ ^d		12¾		21½
33 " - - - -	*	7½				
20 " - - - -	*	4½	8½	4½		
42 cwt. - - - -	*	12½		9½		18¾
18-pounder, of { 38 " - - - -	34½ ^o	12½		9½		
22 " - - - -	*					
12-pounder, of { 34 cwt. - - - -	*	10¾				16½
33 " - - - -	*					
9-pounder, of { 28 cwt. - - - -	*	10½				14½
26 " - - - -	*	9½				
23 cwt. - - - -	*	10				14
6-pounder, of { 22 " - - - -	*	9½				
21 " - - - -	*	8½				

^a The same pattern adapted to the old common traversing platforms weighs 14½ cwts.

^b " " " " " 13¾ "

^c " " " " " 14 "

^d " " " " " 12¾ "

^e The weight refers to the block trail carriage, but the bracket trail may for practical purposes be estimated at the same.

CARRIAGES (SIEGE AND GARRISON).

Ordnance for Siege or Garrison Service.	Travel- ling Car- riage.	Garrison Carriages.				
		Common Standing.	Rear Chock.	Sliding.	Casemate Sliding.	Iron.
HOWITZERS (IRON).						
inch - - - - -	41 $\frac{3}{4}$	16	15	14 $\frac{1}{4}$		25 $\frac{1}{4}$
inch - - - - -	34	15 $\frac{1}{2}$	12 $\frac{1}{2}$	12 $\frac{1}{2}$		18 $\frac{1}{4}$
inch - - - - -			7 $\frac{1}{4}$			15 $\frac{1}{4}$
CARRONADES.						
pounder - - - - -	*	*	17 $\frac{3}{4}$			
pounder - - - - -	*	*	10 $\frac{1}{2}$			
pounder - - - - -	*	*	9			11 $\frac{3}{4}$
pounder - - - - -	*	*	8			11
pounder - - - - -	*	*	7			9 $\frac{1}{4}$
pounder - - - - -	*	*	6			8 $\frac{1}{4}$
MORTARS.						
inch, of { 100 cwt. - - - - -	*	Bed				Bed.
inch, of { 36 " - - - - -	55 $\frac{3}{4}$	60 $\frac{1}{2}$	*	*	*	81 $\frac{1}{4}$
inch, of { 52 cwt. - - - - -	*		*	*	*	32 $\frac{1}{4}$
inch, of { 18 cwt. - - - - -	27		*	*	*	17 $\frac{3}{4}$
inch - - - - -	20 $\frac{1}{2}$		*	*	*	8 $\frac{1}{4}$
inch (brass) - - - - -	*	1 $\frac{1}{8}$	*	*	*	*
inch (brass) - - - - -	*		*	*	*	*

CARRIAGES (TRAVELLING).

Ordnance.	Travelling Carriages.		Miscellaneous.	Travelling Carriages.
	Carriage.	Ammuni- tion Wagon.		
<i>For Field Service.</i>	cwts.	cwts.	<i>Rocket Carriages.</i>	cwts.
			12-pounder, with limber - - -	22
			6-pounder, do. - - -	20 $\frac{1}{2}$
			<i>Wagons and Carts.</i>	
pounder Armstrong gun - - -	11	12	Flanders wagon - - -	16 $\frac{1}{2}$
pounder " " - - -	21	22 $\frac{1}{2}$	Forge " - - -	19 $\frac{1}{2}$
-pounder " " - - -	22 $\frac{3}{4}$	24 $\frac{1}{4}$	General service wagon - - -	16 $\frac{1}{2}$
-pounder " " - - -	26	25	Platform wagon - - -	22
-pounder " " - - -	39 $\frac{1}{4}$	26	Sling wagon - - -	33 $\frac{1}{2}$
pounder brass gun - - -	20 $\frac{1}{4}$	21	Small arm ammunition wagon -	20
pounder " " - - -	22	21 $\frac{3}{4}$	Store wagon - - -	22 $\frac{1}{2}$
-pounder " " - - -	23	21 $\frac{3}{4}$	Hand cart - - -	4 $\frac{1}{2}$
-pounder iron gun - - -	34 $\frac{1}{4}$	21 $\frac{3}{4}$	Maltese cart † - - -	4 $\frac{1}{2}$
-pounder brass howitzer - -	21 $\frac{1}{4}$	20 $\frac{1}{4}$	Medicine cart - - -	11 $\frac{3}{4}$
-pounder " " - - -	24	21 $\frac{3}{4}$	Sling " - - -	19
-pounder " " - - -	24 $\frac{3}{4}$	21 $\frac{3}{4}$	Store " - - -	11 $\frac{3}{4}$
			Trench " - - -	5 $\frac{1}{2}$
			Water " - - -	6 $\frac{1}{2}$
<i>For Mountain Service.</i>			Drug carriages { large - - -	17 $\frac{1}{2}$
pounder brass gun - - -	5	*	{ medium - - -	10 $\frac{1}{2}$
inch brass howitzer - - -	3	*	{ small - - -	7 $\frac{1}{2}$

† Approved 19th February 1862 ; Circular 793, p. 623.

CARRIAGES (TRAVELLING).

ARTICLES ISSUED WITH A 6-POUNDER ARMSTRONG GUN AND WAGON COMPLETE.

Name.	Gun Carriage.			Ammunition Wagon.			Remarks.		
	Carriage.	Limber.	Total.	Body.	Limber.	Total.			
Boxes, {	wood {	ammunition	-	2	2	2	4	To hold 7 lbs.	
		axletree	-	2	-	-	-		
		centre	-	1	1	1	1		2
		horse shoe	-	-	-	1	-		1
		grease magazine	-	-	-	1	-		1
	tin {	grease, half round	-	1	1	-	1		1
horse-shoe nail		-	-	-	1	-	1		
Carriage, body only {	gun	-	1	-	-	-	-		
	wagon	-	-	-	1	-	1		
Lashings, with toggles	-	2	-	2	-	2	2		
Limber (frame only)	-	-	1	1	-	1	1		
Magazine, tin, grease	-	-	-	1	-	1			
Pins, linch	-	2	2	4	2	2	4		
Screw, elevating	-	1	-	1	-	-	-		
Shafts, single, with props, pair	-	-	1	1	-	1	1		
Straps, {	axes {	felling	-	1	1	-	1	1	
		pick	-	1	1	-	1	1	
	boxes, grease, tin	-	-	1	1	-	1	1	
	drag, or picket ropes	-	-	2	2	-	2	2	
	handspikes	-	2	-	2	-	-	-	
	hook, bill	-	-	1	1	-	1	1	
	kettles, camp	-	4	-	4	-	4	4	
	poles, tent	-	-	-	8	-	8	8	
	shovel and spade	-	-	4	4	-	4	4	
	sponges	-	3	-	3	-	-	-	
Ties, leather	-	2	2	4	2	2	4		
Washers, {	drag	-	2	2	4	2	-	2	
	plain	-	-	-	-	2	2		
Wheels (general service class)	-	2	2	4	2	2	4		

CARRIAGES (TRAVELLING).

ARTICLES ISSUED WITH A 9-POUNDER, 12-POUNDER, OR 20-POUNDER ARMSTRONG GUN AND WAGON COMPLETE.

Name.	Gun Carriage.			Ammunition Wagon.			Remarks.		
	Carriage.	Limber.	Total.	Carriage.	Limber.	Total.			
Boxes, {	wood {	ammunition	-	2	2	4	2	6	
		axletree	-	2	2	-	-	-	
		centre	-	1	1	2	1	3	
		horse shoe	-	-	-	3	-	3	
	tin {	grease magazine	-	-	-	1	-	1	
		grease, half round	-	1	1	-	1	1	
	horse shoe nails	-	-	-	3	-	3		
Carriage, body only {	gun	1	-	1	-	-	-		
	wagon	-	-	-	1	-	1		
Limber (frame only)	-	1	1	-	1	1			
Magazines, tin, grease	-	-	-	2	-	2			
Pins, linch	-	2	3	5	2	3	5	To hold 14 lbs. each. The extra linch pin is for fixing the off shaft under the limber.	
Screws {	elevating	-	1	-	1	-	-		
	traversing	-	1	-	1	-	-	Not furnished to the 9-pounder.	
Shafts, single, with props, pair	-	1	1	-	1	1			
Shoe, drag, with chain	-	1	-	1	1	-	1		
axes {	felling	-	-	1	1	-	1	1	
	pick	-	-	1	1	-	1	1	
	blankets	-	-	4	4	8	4	12	Two to each ammunition box.
boxes {	ammunition and	-	-	3	3	6	3	9	One to each box.
	centre	-	-	1	1	-	1	1	
	grease, tin	-	-	2	2	-	2	2	
carbines	-	-	2	2	-	2	2		
drag, or picket ropes	-	-	2	2	-	2	2		
band	-	-	2	2	4	2	6	One for each ammunition box.	
handspikes	-	2	-	2	-	-	-		
hook, bill	-	-	1	1	-	1	1		
kettles, camp	-	4	-	4	4	-	4		
knapsacks	-	-	4	4	8	4	12	Two for each ammunition box.	
maul	-	-	-	-	2	-	2		
poles, tent	-	-	-	-	8	-	8		
posts, picket	-	-	-	-	4	-	4		
shoe, drag	-	-	-	-	1	-	1		
shovel and spade	-	-	2	2	-	2	2		
sponges	-	3	-	3	-	-	-		
swingletrees	-	-	2	2	-	2	2		
swords	-	-	2	2	-	2	2		
wheel, spare	-	-	-	-	2	-	2		
Ties, leather	-	2	3	5	2	3	5	One for each linch pin.	
Washers {	drag	-	2	-	2	-	2		
	plain	-	-	2	2	-	2		
Wheels {	heavy, field	-	2	-	2	-	-		
	light, „	-	-	2	2	2	2	4	

ARTILLERY.

CARRIAGES (TRAVELLING).

ARTICLES ISSUED WITH A 40-POUNDER ARMSTRONG GUN AND WAGON COMPLETE.

Name.	Gun Carriage.			Ammunition Wagon.			Remarks.
	Carriage.	Limber.	Total.	Carriage.	Limber.	Total.	
Bolt, shaft	—	1	1	—	—	—	The wagons converted from 18-prs. have only two boxes on the wagon body.
Boxes { wood	—	2	2	4	2	6	
	—	1	1	2	1	3	
	—	—	—	3	—	3	
	—	—	—	1	—	1	
Boxes { tin	—	1	1	—	1	1	
	—	—	—	3	—	3	
Carriage, body only { gun wagon	1	—	1	—	—	—	To hold 14 lbs. each.
Limber (frame only)	—	1	1	1	1	1	
Magazines, tin, grease	—	—	—	2	—	2	
Outriggers	—	2	2	—	—	—	
Pins, linch	2	2	4	2	3	5	The extra linch pin is for fixing the off shaft under the limber.
Screws { elevating	1	—	1	—	—	—	Oscillating pattern.
	—	—	—	—	—	—	
Shafts { traversing	1	—	1	—	—	—	
	—	1	1	—	—	—	
Shoos { framed, pair	1	—	1	—	—	—	
	—	1	1	1	—	1	
Shoe, drag, with chain	1	—	1	—	—	—	
	—	1	1	—	1	1	
axes { felling	—	1	1	—	1	1	Two to each ammunition box.
	—	1	1	—	1	1	
blankets	—	4	4	8	4	12	
boxes { ammunition and	—	3	3	8	3	11	One to each box.
	—	1	1	—	1	1	
carbines	—	2	2	—	2	2	
drag, or picket ropes	—	2	2	—	2	2	
gun	2	—	2	—	—	—	
handspikes	2	—	2	—	—	—	
hook, bill	—	1	1	—	1	1	
jack, lifting	2	—	2	—	—	—	
kettles, camp	5	—	5	4	—	4	Two for each ammunition box.
knapesacks	—	4	4	8	4	12	
maul	—	—	—	2	—	2	
outriggers	—	2	2	—	—	—	
poles, tent	—	—	—	8	—	8	
rammers, club	2	—	2	—	—	—	
roller	1	—	1	—	—	—	
screw, elevating { handle	1	—	1	—	—	—	
	—	1	1	—	—	—	
shoe, drag	—	—	—	1	—	1	
shovel and spade	—	2	2	—	2	2	
sponges	4	—	4	—	—	—	
swingletrees	—	2	2	—	2	2	
swords	—	2	2	—	2	2	
wheel (spare)	—	—	—	2	—	2	
Ties, leather	2	2	4	2	3	5	One for each linch pin.
Washers { drag	2	2	4	2	—	2	
Washers { plain	—	—	—	—	2	2	
Wheels - { carriage	2	—	2	—	—	—	Siege class. Heavy field do.
Wheels - { limber	—	2	2	2	2	4	

CARRIAGES (TRAVELLING).

ARTICLES ISSUED WITH A SMOOTH-BORED GUN CARRIAGE AND AMMUNITION WAGON COMPLETE.

Name.	Gun Carriage.			Ammunition Wagon.			Remarks.						
	Carriage.	Limber.	Total.	Body.	Limber.	Total.							
Boxes {	wood {	ammunition {	limber	body -	-	2	2	Except the 12-pr. and 18-pr. guns.					
		axletree -							-	-	2	-	2
		centre -							-	-	1	-	1
	tin {	horse shoe	-	-	-	3	-		3				
		grease maga-	-	-	-	-	-		-				
		zine -	-	-	-	1	-		1				
Carriage, {	grease, half round	-	-	-	1	-	1	To hold 14 lbs. each.					
	horse shoe nail	-	-	-	3	-	3						
body only {	gun or howitzer	1	-	1	-	-	-	The extra linch pin is for fixing the off shaft under the limber.					
	ammunition wagon	-	-	-	1	-	1						
Limber (frame only)	-	1	1	-	1	1							
Magazines, tin, grease	-	-	-	2	-	2							
Pins, linch	2	3	5	2	3	5							
Screw, elevating	1	-	1	-	-	-							
Shafts, single, with props	pair	1	1	-	1	1	The 18-pr. has an extra pair, framed.						
Shoe, drag, with chain	1	-	1	1	-	1							
axes {	felling	-	1	1	-	1	1	Two to each ammunition box.					
	pick	-	1	1	-	1	1						
blankets	-	4	4	8	4	12	One to each box.						
boxes {	ammunition	-	2	2	4	2	6	One to each ammunition box.					
	grease, tin	-	1	1	-	1	1						
carbines	-	2	2	-	2	2							
drag or picke tropes	-	2	2	-	2	2							
hand	-	2	2	4	2	6	One to each ammunition box.						
handspikes	2	-	2	-	-	-							
hook, bill	-	1	1	-	1	1							
kettles, camp	4	-	4	4	-	4							
knapsacks	-	4	4	8	4	12	Two to each ammunition box.						
maul	-	-	-	2	-	2							
poles, tent	-	-	-	8	-	8							
posts, picket	-	-	-	6	-	6							
roller	1	-	1	-	-	-	When a roller is carried.						
shoe, drag	-	-	-	1	-	1							
shovel and spade	-	2	2	-	2	2							
sponges	2	-	2	-	-	-							
swingletrees	-	2	2	-	2	2							
swords	-	2	2	-	2	2							
wheel, spare	-	-	-	-	-	-	* Secured by a rope lashing.						
Ties, leather	2	3	5	2	3	5							
Washers {	drag	2	-	2	-	2							
	plain	-	2	2	-	2							
Wheels -	heavy, field	2	-	2	-	2	} The 6-pr. gun and 12-pr. howitzer have four light wheels.						
	light, " -	-	2	2	2	2							

CARRIAGES (TRAVELLING).

ARTICLES ISSUED WITH A SIEGE GUN OR MORTAR CARRIAGE,
COMPLETE.

Name.	Guns.			13-inch Mortar.			10-inch and 8-inch Mortars.		
	Carriage.	Limber.	Total.	Carriage.	Limber.	Total.	Carriage.	Limber.	Total.
Bed, travelling, mortar - - -	—	—	—	1	—	1	1	—	1
Bolt, shaft - - - - -	—	2	2	—	—	—	—	—	—
Box, tin, grease, half round	—	1	1	—	1	1	—	1	1
Carriage (body only) - - -	1	—	1	—	—	—	—	—	—
Cart, shell, for limber - - -	—	—	—	—	—	—	—	1	1
Limber (frame only) - - - -	—	1	1	—	1	1	—	—	—
Outriggers - - - - -	—	2	2	—	2	2	—	2	2
Pins, lynch - - - - -	2	2	4	2	2	4	2	2	4
Screw, elevating, with handle	1	—	1	—	—	—	—	—	—
Shafts, single, with props - -	2	2	2	—	2	2	—	2	2
Shoe, drag, with chain - - -	1	—	1	1	—	1	1	—	1
Sides, for shell cart limber -	—	—	—	—	—	—	—	4	4
Straps, for {	box, grease, half-round - -	—	1	1	—	1	1	—	1
	drag ropes - - - - -	—	2	2	—	2	2	—	2
	handspikes - - - - -	4	—	4	4	—	4	4	—
	jack, lifting - - - - -	—	2	2	—	2	2	—	2
	outriggers - - - - -	—	2	2	—	2	2	—	2
	roller - - - - -	1	—	1	—	—	—	—	—
	shoe, drag - - - - -	—	—	—	1	—	1	1	—
	side arms - - - - -	2	—	2	2	—	2	—	2
	swingletrees - - - - -	—	3	3	—	3	3	—	3
	Ties, leather - - - - -	2	2	4	2	2	4	2	2
Washers, drag - - - - -	2	2	4	2	2	4	2	2	
Wheels { carriage (siege class) -	2	—	} 4	{ 2	—	} 4	{ 2	—	} 4
limber (heavy field do.) -	—	2			2			2	

CARRIAGES (TRAVELLING).

TABLE OF VARIOUS PARTS OF TRAVELLING CARRIAGES.

Name.	Dimensions.*	Weight.	Remarks.	
<i>Wooden Boxes.*</i>				
	' feet. " inches.	lbs.		
Limber	side - - -	23" long, 22" wide, 17" deep-	85	9-pr. and larger Armstrong guns and wagons.
		17" " 26" " 16" " -	70	12-pr. smooth-bore gun and 32-pr. howitzer; carriages only.
	centre - - -	24½" " 22" " 19" " -	90	Other smooth-bore guns and wagons.
		21" " 5" " 17" " -	24	9-pr. and larger Armstrong guns and wagons.
		17" " 17" " 16½" " -	43	12-pr. smooth-bore gun and 32-pr. howitzer; carriages only.
	single - - -	10" " 6" " 6" " -	4	Other smooth-bore guns and wagons.
		41" " 27" " 26" " -	141	S.A. ammunition wagon.
		49½" " 28" " 19½" " -	164	Do. as lately altered.
		50½" " 24" " 19½" " -	175	Forge and store wagons.
		46" " 18" " 19" " -	97	General service wagon.
Carriage, axletree - - -	13½" " 9" " 10" " -	20	Armstrong 12-pr. and 20-pr. guns.	
	15" " 12" " 12" " -	19	Smooth-bored ordnance, for match.	
Wagon body	15" " 12" " 8" " -	15	Do. for small stores.	
	side - - -	23" " 22" " 17" " -	85	9-pr. and larger Armstrong wagons.
	centre - - -	18" " 5" " 17" " -	18	Do. do.
Grease magazine box	front and rear - - -	31½" " 22" " 20½" " -	112	Smooth-bored ordnance.
	- - -	31" " 9½" " 6" " -	15	Armstrong ammunition wagons.
Horse shoe boxes	26½" " 9½" " 6" " -	10	Smooth-bore do.	
	long - - -	31" " 9½" " 6" " -	15	Armstrong ammunition wagons.
	short - - -	28" " 9½" " 6" " -	12	Smooth-bore do.
	26½" " 9½" " 6" " -	10	All ammunition wagons.	
<i>Tin Boxes.</i>				
Grease	half round, 3 lbs. -	6½" " 6½" " 5" " -	0½	Strapped to the axletree bed.
	magazine, 14 lbs. -	12" " 8" " 5" " -	3	Placed inside wooden boxes.
Nails	- - -	8" " 3" " 3" " -	0¼	With the horse-shoe boxes.
<i>Miscellaneous Articles.</i>				
Elevating screw†	large -	18" long - - - -	30	Field ordnance generally.
	small -	12" " - - - -	5	3-pounder gun.

* The dimensions of boxes refer to the outside; they are only approximately correct, as some of the boxes differ to the extent of one or two inches, but are sufficiently accurate to express the comparative sizes and weights of the principal varieties. The dimensions of boxes peculiar to particular carriages are given with the equipments. The wood of ammunition boxes is about ¼ inch thick, which diminishes the interior space by nearly 2 inches; the guard iron projects 6 inches above the box, but is ordered by Circular 793, par. 619 (30/8/62), to be in future made with a hinge, so as to turn down for stowage. The "heart iron" to which the lifting handles are attached is ordered by Circular 665, par. 171 (16/11/60), to be extended underneath the box, and an improved lock and key was approved, provisionally, 27th Aug. 1860; Circular 639, par. 115.

† All elevating screws of field ordnance are now attached to the guns by means of an eye and bolt; this was formerly restricted to the lighter natures. Heavy pieces, for batteries of position or siege service, have oscillating screws of the garrison pattern, with loose handles.

CARRIAGES (TRAVELLING).

TABLES OF VARIOUS PARTS OF TRAVELLING CARRIAGES—*continued.*

Name.		Dimensions.				Weight.	Remarks.	
		' feet.	" inches.			lbs.		
Shafts	single {	near *	9' 8" long	-	-	-	31	} Field carriages generally.
		off †	10'	-	-	-	47	
		reversible-	9' 6" "	-	-	-	38	} Shell cart limbers.
		slings wagon	9'	-	-	-	42	} Fixed inside the wheels.
						45		
	pairs, framed	{		7' 6" "	-	-	-	49
			6' 10" "	-	-	-	67	} Heavy limbers, and platform wagon.

* A prop has been added to the near shaft by order dated 21st June 1862 ; Circular 781, par. 547.

† The new off-shaft of Lieut.-Col. Brandling's pattern, which may be known by the iron extending from the axletree to the splinter bar, was approved 23/4/60 ; Circular 639, par. 101.

CARRIAGES (TRAVELLING).

TABLE AND CLASSIFICATION OF WHEELS.

Diameter.	Weight.	Description.	Remarks.
ft. in.	cwts. qrs. lbs.	<i>First or Siege Class.</i>	
7 0	5 3 6	Sling wagon, <i>hind</i> (16 spokes).	Width of tire, 6 inches. Length of nave, 16 inches. Weight of drag shoe 67 lbs.
5 6	4 2 20	Sling cart (14 spokes).	
5 0	4 1 5	Carriages of the 40-pr. rifled, 8-inch 32-pr., 24-pr., and 18-pr. smooth-bored guns; of 10-inch and 8-inch howitzers; and of the 13-inch mortar.	
		<i>Second or Field Class.</i>	
		Carriages of the 20-pr. rifled, 12 pr. and 9-pr. smooth-bored guns; and of the 32-pr. and 24-pr. howitzers.	Width of tire, 3 inches. Length of nave, 13 inches. Weight of drag shoe, 29 lbs.
5 0	^a 2 1 2	Limbers of the <i>siege</i> gun, howitzer, and mortar carriages; of the 20-pr. rifled and 12-pr. smooth-bored gun; of the 32-pr. howitzer; and of the sling wagon.	
5 0	3 0 0	Platform wagon, <i>hind</i> - - -	} The tires of these wheels are 4 inches wide.
4 0	2 0 9	" " <i>fore</i> - - -	
3 10	2 0 0	Limbers of bracket trail <i>siege</i> carriages -	
		Carriages of 12-pr. rifled, 9-pr. rifled, and 6-pr. smooth-bored guns; of the 12-pr. howitzer, and of rocket carriages.	
5 0	^b 1 3 23	Limbers of 12-pr. and 9-pr. rifled, and of 9-pr. and 6-pr. smooth-bored guns; of 24-pr. and 12-pr. howitzers; and of rocket carriages.	
		Ammunition wagons (gun and small arm) fore and store wagons; Flanders wagon, <i>hind</i> , and store carts.	
4 2	1 2 26	10-inch and 8-inch mortar carriages and shell carts; Flanders wagon, <i>fore</i> , Trench carts.	
		<i>Third or General Service Class.</i>	
4 2	1 1 0	General service wagon; carriages, limbers, and ammunition wagons of 6-pr. rifled, and 3-pr. (of 4 feet) smooth-bored guns.	Width of tire, 3 inches. Length of nave, 9 inches. Weight of drag shoe, 22 lbs.
5 0	1 2 5	Special carriage and limber for 6-pr. rifled gun; engineer carts, &c.	See page 136.

^a Called the heavy wheel.

^b Called the light wheel.

ARTILLERY.

CARRIAGES (TRAVELLING).

TABLE OF AXLETREES, &c. FOR THE ABOVE WHEELS.

Distance between the Shoulders.	Weight.	Description.	Remarks.
ft. in.	cwts. qrs. lbs.	<i>Siege Class.</i>	Length of each arm, 16 $\frac{1}{2}$ in.
4 4 $\frac{1}{2}$	2 0 3	Sling wagon, <i>hind.</i>	Diameter* of do. - { 3 $\frac{1}{2}$ "
3 8	1 3 8	Sling cart.	Weight of lynch pin, 15 oz.
3 4 $\frac{1}{2}$	1 3 9	Carriages of the siege guns, howitzers, and mortar above mentioned.	Washer { common, 1 lb. 10 oz. drag - 2 " 12 "
		<i>Field Class.</i>	Length of each arm, 14 in.
3 8	a 1 0 17	Limbers of siege carriages. Carriages, limbers, and ammunition wagons of 20-pr. and 12-pr. rifled; 12-pr. and 9-pr. smooth-bored guns; and of 32-pr. and 24-pr. howitzers.	Diameter* of do. - { 3 $\frac{1}{2}$ " 2 $\frac{1}{2}$ "
3 9	1 0 22	12 pr. rocket carriage, and platform wagon, <i>hind.</i>	Weight of lynch pin, 9 oz.
4 2 $\frac{1}{2}$	1 1 17	Platform wagon, <i>fore</i> ; and limbers of bracket trail siege carriages.	Washer { drag - 2 lbs. 5 oz. common, 1 " 9 "
3 8	b 0 3 16	Limber of sling wagon. Carriages, limbers, and ammunition wagons of 9-pr. rifled and 6-pr. smooth-bored guns; and of the 12-pr. howitzer.	
2 9 $\frac{1}{2}$	0 3 20	6-pr. rocket carriage, S.A. ammunition, forge and store wagons; store cart.	
3 0	0 2 17	Carriages and shell carts of 10-inch and 8-inch mortars.	
3 9	0 3 23	Trench cart.	
3 8	0 3 19	Flanders wagon, <i>fore.</i> " " <i>hind.</i>	
		<i>General Service Class.</i>	Length of each arm - 9 $\frac{3}{4}$ in.
4 2	0 2 2	General service wagon.	Diameter* of do. - { 2 $\frac{1}{2}$ " 1 $\frac{1}{2}$ "
2 9 $\frac{1}{2}$	0 1 15	Carriages, limbers, and ammunition wagons of 6-pr. rifled and 3-pr. (of 4 feet) smooth-bored guns.	Weight of lynch pin 4 oz.
3 5 $\frac{1}{2}$	0 1 21	Hand cart.	Washer { drag - 12 " common - 7 "

a Heavy axletree.

b Light axletree.

* The diameters are taken at the shoulder and at the lynch-pin hole.

CARRIAGES (GARRISON).

TABLE OF VARIOUS PARTS.

NOTE.—The pedestals are charged separate, the other articles are included with carriages complete.

Name.	Dimensions.	Weight.	Remarks.
	' feet. " inches.	lbs. ozs.	
Compressors, wood, ^a for sliding carriages - -	28½" long, 21" wide, 4" thick	105 0	68-pr. or 10-inch } Approved 8-inch of 52 cwt. } 17/10/62.
	22" " do. do.	98 0	
Linchpins, iron, for standing and rear-chock carriages - - - -	17" " do. do.	86 0	110-pr. Approved 30/12/61.
	12½" long - - - -	2 15	10-inch or 68-pr.
	10" " - - - -	2 8	8-in. or 32-pr.
Pedestals, wood, for all wood carriages - -	8½" " - - - -	1 4	Smaller natures.
	18" long - - - -	5 10	10-inch and 68-pr. } sliding.
	17" " - - - -	4 10	8-inch and 32-pr. }
	13" " - - - -	4 6	110-pr. - }
Quoins, wood { large ^b - - - -	12" " - - - -	4 4	Standing or rear-chock.
	2½" long, 10" wide, 6" thick -	30 0	
Screws, elevating, with ratchet lever handle ^c - - - -	17" " 5" " 4" " -	3 4	Included with the carriages complete.
	16" " - 2½" " -	25 11	
Stool beds { beds - - - -	16" " - 2¼" " -	23 11	110-pr., 10-inch, and 68-pr. guns. 8-inch, 32-prs., and smaller natures.
	34" " 10" " 4½" " -	52 0	
Trucks, iron, for standing and rear-chock carriages - {	17" " 5" " 9" " -	52 0	The bed rests in front on an iron bar, and the block under it rests on the hind axletree.
	19" diam., 6½" thick ; hole, 7"		
	19" " 5" " " 6½"		
	18" " 4½" " " 5½"		
	16" " 5" " " 7"		
	16" " 4½" " " 6½"		
fore - - - -	16" " 3½" " " 6½"	178 0	8-inch, 42-pr., and 32-prs.
	19" " 5" " " 6½"	139 0	24-prs. to 9-prs.
hind - - - -	18" " 4½" " " 5½"	100 0	6-prs.
	16" " 5" " " 7"	114 0	8-inch, 42-prs., and 32-prs.
16" " 4½" " " 6½"	87 0	24-prs. to 9-prs.	
	16" " 3½" " " 6½"	73 0	6-prs.

^a Made of elm, with two iron plates on each side to bear upon the platform ; the handle attached to the middle is of iron, 34" long. Their use is explained at p. 271, the dimensions and weights were notified in Circular 815, par. 681.

^b They differ slightly in various carriages, and taper towards the front ; there is a notch on each side at the large end to facilitate moving it, and an iron plate is fixed to one of the broad and one of the narrow sides for the breech of the gun to rest upon ; this saves the quoin from being dented by the discharge.

^c The screw complete consists of an iron screw, handle, and brass socket ; the handle (29" long) is the same for both sizes ; the teeth at the top of the screw are now cut on the side instead of the upper surface. (Circular 639, par. 112 ; 10/8/60.)

^d The dimensions vary, to the extent of one or two inches, for various guns.

PORTABLE GROUND PLATFORMS.

Description.	Length, Breadth, and Thickness.	Weight.	Remarks.
ALDERSON'S.		' feet. " inches.	
<i>Materials.</i>			Invented by Lieut.-Col. Alderson, R.E.
Baulks of fir - - - - -	{ 10' x 5" x 3½" 9' x 5" x 3½"	0 0 46	} For sleepers and planks.
Dowell, wood, ¾-inch diameter - - -		0 0 27	
Eyebolt, iron do. - - - - -	2½" long	0 0 0	} For baulks used as sleepers.
Shoe, iron - - - - -	16" "	0 0 3	
Screw for do. ¾-inch diameter - - -	3" long	0 0 3	
		0 0 0	
<i>Platforms, complete.*</i>			
Gun platform* (58 10-foot baulks, 188 dowels, 10 eyebolts, 20 shoes, and 40 screws.	20' x 10'	24 2 23	15 of the baulks are for sleepers, 1 for hurter, and 42 for planks. Tonnage, 2 tons.
Ditto † (46 9-foot baulks, 188 dowels, 9 eyebolts, 10 shoes, and 20 screws).	15' x 9'	15 2 14	10 of the baulks are laid as sleepers and 36 as planks.
Mortar platform* (24 10-foot baulks, 68 dowels, and 12 eyebolts).	10' x 7' 6" †	10 0 22	6 of the baulks are laid as sleepers and 18 as planks. Tonnage, 32 feet 6 inches.
13-inch mortar do.* (54 10-foot baulks, 196 dowels, and 26 eyebolts).	10' square †	22 1 2	6 of the baulks are laid as sleepers and 48 as planks. Tonnage, 1 ton, 30 feet.
CLERK'S.*			Invented by Lieut.-Col. Clerk, R.A. It is cut out of a log of fir, 17' x 20" x 16" and packs into its original shape for travelling.
<i>Gun platform.</i>			These pieces are cut like wedges, so as to give the upper surface a slope of 3°.
2 side pieces, 12" wide, with ribbings	17' long	7 1 1	} Total weight 13 0 2
2 transoms { front, with spikes	7' x 16" x 4"	1 3 2	
	rear - - - - -	1 0 2	
2 sleepers { front - - - - -	7' x 4" x 2½"	0 0 16	
	rear - - - - -	0 0 18	
1 trail piece, with spikes - - - - -	17' x 16" x 4"	2 2 19	
Total weight - - - - -		13 0 2	Tonnage 40 feet 1 inch.
COMMON.			
<i>Gun platform, 18' by 12'.</i>			As constructed at the Royal Carriage Department; all oak. Enough to cover 216 superficial feet.
5 sleepers - - - - -	18' x 5" x 5"	} 38 1 10	
Planks§ - - - - -	12' x - - 3"		
2 ribands - - - - -	18' x 4" x 4"		
1 hurter - - - - -	12' x 6" x 6"		
5 bolts - - - - -	16" long		
355 6-inch spike nails - - - - -			
32 7-inch do. - - - - -			
Total weight - - - - -		39 2 4	Tonnage, 2 tons, 33 feet 9 inches.
<i>Armstrong gun platform, 16' by 10'.</i>			As constructed at the Royal carriage Department; all oak. Enough to cover 160 superficial feet.
5 sleepers - - - - -	16' x 5" x 5"	} 29 2 20	
Planks§ - - - - -	10' x - - 3"		
2 ribands - - - - -	16' x 4" x 4"		
1 hurter - - - - -	10' x 6" x 6"		
5 bolts - - - - -	16" long		
170 6-inch spike nails - - - - -			
18 7-inch do. - - - - -			
Total weight - - - - -		29 1 19	Tonnage, 2 tons, 21 feet 1 inch.

* As constructed at the Royal Carriage Department.

† From the Aide-Mémoire, 1853, vol. i. p. 146.

‡ It is directed by Circular 639, par. 117, that platforms for 13-inch mortars shall be 12 feet square, and for 10-inch or 8-inch mortars 9 feet square; the former weigh 19 cwt. 2 qrs. 25 lbs.; the latter 9 cwt. 3 qrs. 25 lbs.

§ The planks may be any convenient width, and consequently their number will vary.

PORTABLE GROUND PLATFORMS.

Description.	Length, Breadth, and Thickness.	Weight.	Remarks.	
	' feet. " inches.	cwts. qrs. lbs.		
<i>Gun platform, 15' by 10½'.</i>			As given in the R. A. Field Book, p. 206.	
5 sleepers (101 lbs. each) - - -	15' x 5" x 5"	4 2 0		
20 planks (45 lbs. each) - - -	10½' x 9" x 2"	8 0 0		
2 ribands - - - - -	15' x 4" x 4"	1 0 14		
10 racksticks and lashings - - -	1¼'	0 0 14		
Total weight - - -		13 3 0		
<i>Mortar platform, 7½' by 6½'.</i>			As given in the Artillerist's Manual, 1862, p. 258.	
7 sleepers - - - - -	7½' x 6" x 6"	3 3 7		
10 oak planks - - - - -	6½' x 9" x 3"	5 1 22		
2 ribands - - - - -	7½' x 5" x 4"	0 2 10		
10 racksticks and lashings - - -	1¼'	0 0 14		
Total weight - - -		9 3 25		
<i>or,</i>				
7 sleepers and 2 ribands as above -		4 1 17		
8 fir planks - - - - -	6½' x 11¼" x 4"	4 2 18		
8 racksticks and lashings - - -		0 0 12		
Total weight - - -		9 0 19		
MADRAS.				
<i>Materials.</i>			As constructed at the Royal Carriage Department.	
Blocks	No. 1	6' x 15" x 5½"		0 3 16
	" 2	6' x 12" x 7½"		1 0 9
	" 3	6' x 12" x 9½"		1 2 0
	" 4	6' x 20" x 15"		2 0 0
	trail piece - - - - -	2½' x 17" x 8½"		0 2 21
Side pieces (near and off)		16' x 11" x 10½"		4 4 0
Trail pieces do - - - - -		Various.		
Dismounting chocks (2) - - - - -		6' x 11¼" x 7"		1 0 11
Step - - - - -		4' x 15" x 3½"		0 1 13
<i>Platforms complete.</i>				
Blocks, sidepieces, chocks, and step, as above.		12 2 14	For bracket trail gun carriage.	
Trail pieces, near and off - - -	14½' x 6" x 3½"	1 2 8		
Total weight - - -		14 0 22	Tonnage, 2 tons, 5 inches.	
Blocks, side pieces, chocks, and step, as above.		12 2 14		
Trail pieces, near and off - - -	15¼' x 4½" x 3½"	1 2 0		
Total weight - - -		14 0 14	Tonnage, 2 tons, 5 inches.	
Blocks, side pieces, and chocks, as above.		12 1 1	For 8-inch howitzer carriage.	
Trail pieces, near and off - - -	16½' x 8" x 6"	3 0 0		
Total weight - - -		15 1 1	Tonnage, 2 tons, 10 inches.	
Blocks, side pieces, and chocks, as above.		12 1 1	For 32-pounder howitzer carriage (block trail).	
Trail piece (single) - - - - -	14' x 12½" x 5½"	2 0 0		
Total weight - - -		14 1 1	Tonnage, 2 tons.	

ARTILLERY.

AMMUNITION.

TABLE OF SERVICE CHARGES FOR ALL ORDNANCE.

Those marked thus * are used for Armstrong guns, and then consist of A. 4 powder; the rest consist of L G powder.

The cartridges to contain these charges are given in the table at page 391.

Charge.	Ordnance.	Charge.	Ordnance.
lbs. oz.		lbs. oz.	
20 0	13-inch sea service mortar.	4 12	<i>Reduced from 7 lbs. for hot shot.</i>
18 0	68-pounder gun of 112 cwt.	4 8	<i>Reduced from 6 lbs. for hot shot.</i>
	68-pounder gun of 95 cwt.		32-pounder guns of 25 cwt.; 24-pounder gun of 33 cwt.; 12-pounder guns, iron and brass.
16 0	13 inch sea service mortar with carcasses.	4 0	8-inch iron howitzer.
14 0	68-pounder gun of 88 cwt.; 56-pounder guns; 42-pounder gun of 84 cwt.		10-inch mortar.
13 8	<i>Reduced from 18 lbs. for hot shot.</i>	3 12	<i>Reduced from 5 lbs. for hot shot.</i>
	10-inch gun; 42-pounder gun of 75 cwt.	3 8	42-pounder carronade.
*12 0	110-pounder Armstrong gun.		18-pounder guns of 22 and 20 cwts.; 9-pounder iron guns.
	<i>Reduced from 16 lbs. for hot shot.</i>	3 0	32-pounder brass howitzer.
10 8	42-pounder gun of 67 cwt.	2 11	32-pounder carronade.
	<i>Reduced from 14 lbs. for hot shot.</i>		24-pounder gun of 20 cwt.; 9-pounder brass gun.
*10 0	Light 110-pounder gun; 70-pounder Armstrong gun <i>with shot</i> ; 68-pounder gun <i>with Martin's shell</i> .	*2 8	24-pounder brass howitzer.
	8-inch guns of 65 cwt. and 60 cwt.; 32-pounder guns of 63, 58, and 56 cwts.		20-pounder Armstrong.
9 8	10-inch sea service mortar.		18-pounder gun of 15 cwt.; 6-pounder iron guns.
	70-pounder Armstrong gun <i>with shell</i> .	2 0	5½-inch iron howitzer.
*9 0	13-inch mortar.		24-pounder carronade.
	<i>Reduced from 12 lbs. with hot shot.</i>		8-inch mortar.
	8-inch guns of 52 and 50 cwts.; 32-pounder guns of 50 and 48 cwts.; 24-pounder guns of 50 and 48 cwts.	*1 8	6-pounder brass gun.
8 0	10-inch gun <i>with carcasses</i> .		18-pounder carronade.
	8-inch & 10-inch guns <i>with Martin's shell</i> .	1 4	12-pounder Armstrong gun.
7 14	<i>Reduced from 10½ lbs. with hot shot.</i>	1 2	12-pounder brass howitzer.
7 8	<i>Reduced from 10 lbs. for hot shot.</i>	1 0	9-pounder Armstrong gun.
7 0	32-pounder gun of 45 cwt.		12-pounder carronade.
	10-inch iron howitzer.	*0 12	6-pounder Armstrong gun.
	32-pounder guns of 46, 42, 41, 40, and 39 cwts.; 24-pounder gun of 41 cwt.; 18-pounder guns of 42 and 38 cwts.		3-pounder brass gun of 3 cwt.
6 0	<i>Reduced from 8 lbs. for hot shot.</i>	0 10	6-pounder carronade.
	32-pounder of 32 cwts.		3-pounder brass gun of 2¼ cwt.
*5 0	40-pounder Armstrong.	0 8	4½-inch brass howitzer.
	68-pounder carronade.	0 7	5½-inch (Royal) mortar.
		0 5	4½-inch (Coehorn) mortar.

NOTES.

The same charge is used for shot, shell, and shrapnel shell, except with the 70-pounder Armstrong guns. Until June 1860 the common shells had been fired from the 68, 56, and 42-pounder guns with only 10 lbs. of powder; at that date the service charge for shot was ordered to be used instead.

In guns of the same calibre but of different construction the charges vary, to a certain extent, with the weight of the piece, thus:—

For the four 8-inch guns there are 2 charges.

“	three 68-pounders	“	3	“
“	three 42-pounders	“	3	“
“	thirteen 32-pounders	“	6	“

For the five 24-pounders there are 4 charges.

“	five 18-pounders	“	3	“
“	two 3-pounders (brass)	“	2	“

AMMUNITION.

Iron 9-pounder and 6-pounder guns are fired with $\frac{1}{2}$ lb. more powder than brass guns of the same calibre.

Charges used at exercise or for firing salutes are generally less by one-third than the service charges; a list of them is given in the next page; in the following pieces, however, there is no diminution made:—

- Guns, 3 pounder brass.
- Howitzers, 5 $\frac{1}{2}$ -inch (iron), 24-pounder and 12-pounder (brass).
- Carronades, all calibres.

Reduced charges are used with hot shot, Martin's shells, light balls, and occasionally with carcasses, also in firing from carriages without capsquares at an angle of depression exceeding 15°. When the charges of chambered pieces are thus reduced, the powder is replaced by coal dust, inclosed in a serge bag and choked in the cartridge. (Circular 781, par. 544.)

TABLE OF BURSTING CHARGES FOR SHELLS.

LARGE-GRAINED POWDER.		SMALL-GRAINED, OR MEDIUM RIFLE POWDER.	
lbs.	oz.	oz.	
10	8	1·23	20-pounder segment shell.
8	0	·98	12-pounder ditto.
6	4	·68	9-pounder ditto.
5	0	·41	6-pounder ditto.
4	12		
3	5	drs.	oz. drs.
3	0	80 = 5 0	8-inch or 68-pounder shrapnel shell.
2	8	70 = 4 6	56-pounder ditto.
2	4	60 = 3 12	42-pounder ditto.
2	0	50 = 3 2	32-pounder ditto.
1	6	40 = 2 8	24-pounder shrapnel shell.
1	2	30 = 1 14	18-pounder ditto.
1	0	24 = 1 8	12-pounder ditto.
13		18 = 1 2	9-pounder ditto.
10		10	6-pounder ditto.
8 $\frac{3}{4}$			
6			
3 $\frac{3}{4}$			
2			
1 $\frac{1}{2}$			

* And such 10-inch common shells as are of the old land service pattern.

The bursting charges are in paper bags covered with calico, except those for the 20-pounder, and smaller segment shells, which are in iron cylinders. The powder, if in a bag, is poured into the shells through a funnel, the metal plug for the fuze hole, or loading hole, being first removed with the key, or screw-driver, provided for the purpose.

The bursting charges of the diaphragm shells have been recently increased to the quantities shown above; the former charges were, 8-inch, or 68-pounder, 60 drams; 56-pounder, 55 drams; 42-pounder, 50 drams; 32-pounder, 40 drams; 24-pounder, 30 drams; 18-pounder, 25 drams; 12-pounder, 20 drams; and 9-pounder, 15 drams. The 6-pounder has not been changed. (See R.A. Cir. Mem. 12/7/64.)

ARTILLERY.

AMMUNITION.

TABLE OF BLOWING CHARGES FOR COMMON AND MORTAR SHELLS.

4 oz.	All common and mortar shells from the 13-inch down to the 32-pounder.	3 oz.	24-pounder, 18-pounder, and 12-pounder common shells.
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These charges are used at practice in situations where it may be dangerous to use the full quantity of powder, or whenever it may be considered undesirable to burst the shells. They are sufficient to show whether the fuze takes proper effect.

The above Table was approved 7th October 1862, and notified in Circular 815, par. 676.

TABLE OF CHARGES FOR EXERCISE AND SALUTES WHEN PROJECTILES ARE NOT FIRED.

Charge.	Ordnance.	Charge.	Ordnance.
lbs. oz.		lbs. oz.	
8 0	10-inch gun; 68-pounder, 56-pounder, and 42-pounder guns.	2 11	32-pounder carronade.
6 0	32-pounder guns of 63 cwt., 58 cwt., and 56 cwt.	2 8	32-pounders of 25 cwt.; 24-pounder of 20 cwt.; 12-pounder of 21 cwt.
5 0	All 8-inch guns; 32-pounder guns of 50, 48, and 45 cwts.; 24-pounder guns of 50 and 48 cwts.	2 0	18-pounder of 15 cwt.; 9-pounders (iron). 5½-inch iron howitzer; 32-pounder brass howitzer.
4 0	68-pounder carronade. 32-pounders of 46, 42, 41, 40, and 39 cwts.; 24-pounder of 41 cwt.; 18-pounders of 42 and 38 cwt.	1 8	24-pounder carronade. 20-pounder gun; all 6-pounder iron guns; 9-pounder brass gun. 24-pounder brass howitzers.
3 8	10-inch iron howitzer. 42-pounder carronade.	1 0	24-pounder carronade. 12-pounder and 9-pounder Armstrong guns; 6-pounder brass gun. 12-pounder brass howitzer.
3 0	40-pounder gun; 32-pounder of 32 cwt.; 24-pounder of 33 cwt.; 18-pounders of 22 and 20 cwts.; 12-pounders (iron) of 34, 33, and 29½ cwt. 12-pr. brass, and 8-inch iron howitzer.	0 12	12-pounder carronade. Brass 3-pounder gun of 3 cwt.
		0 10	Brass 3-pr. gun of 2½ cwt.; 6-pr. carronade.
		0 4	4½-inch brass howitzer.

NOTES.

Mortars are never fired without projectiles.

The exercising and service charges are the same for carronades of all calibres, for the 3-pounder brass guns, and the 5½-inch (iron), 24-pounder, and 12-pounder howitzers.

AMMUNITION.

TABLE OF CARTRIDGES FOR SERVICE CHARGES.

NOTE.—The cartridges are arranged according to their lengths, and those marked thus * are wider than they are long.

Dimensions (when sewed).			Piece of Ordnance, and Charge.
Length.	Width.		
	Top.	Bottom.	
inches.	inches.	inches.	
25·75	18'0	10'5	13-inch sea-service mortar, 20 lbs. charge.†
23·0	11'12	-	68-pounder gun, 18 lbs. charge.
21·5	10'06	-	42-pounder gun, 14 lbs. charge.
21·0	11'12	-	68-pounder gun, 16 lbs. charge.
19·5	11'12	-	" " 14 lbs. charge.
19·0	11'37	-	56-pounder of 98 cwt., 14 lbs. charge.
19·0	10'37	-	" of 87 cwt.,
19·0	10'12	-	42-pounder, 12 lbs. charge. "
18·75	12'0	9'0	10-inch sea-service mortar.†
18·0	12'5	8'6	8-inch gun, 8 or 10 lbs. charge.†
17·75	10'6	-	110-pounder Armstrong gun, 14 lbs. charge (<i>obsolete</i>).
17·0	9'12	-	32-pounder gun, 10 lbs. charge.
17·0	7'75	-	18-pounder gun, 6 lbs. charge.
16·75	10'6	-	110-pounder Armstrong gun, 12 lbs. charge.
16·5	8'37	-	24-pounder gun, 8 lbs. charge.
16·0	14'0	11'0	10-inch gun, 12 lbs. charge.†
15·85	7'25	-	40-pounder Armstrong gun, 5 lbs. charge.
*15·0	19'75	11'0	13-inch mortar, 9 lbs.†
15·0	9'12	-	32-pounder gun, 8 lbs.
14·75	5'9	-	20-pounder Armstrong gun, 2½ lbs.
14·0	9'12	-	32-pounder gun, 7 lbs.
13·75	6'62	-	12-pounder gun, iron or brass, 4 lbs.
13·5	10'87	-	68-pounder carronade, 5 lbs.†
13·0	9'12	-	32-pounder gun, 6 lbs.
*12·5	13'5	11'0	10-inch howitzer, 7 lbs.†
12·5	5'6	-	9-pounder iron gun, 3 lbs.
*12·0	15'0	8'5	10-inch mortar, 4 lbs.†
12·0	11'0	7'0	8-inch howitzer, 4 lbs.†
11·75	9'0	-	42-pounder carronade, 3 lbs.†
11·5	6'62	-	32-pounder howitzer, 3 lbs.†
11·25	8'75	-	32-pounder carronade, 2 lbs.†
11·0	6'0	-	9-pounder brass gun, 2½ lbs.
10·5	7'75	-	24-pounder carronade, 2 lbs.†
10·1	4'5	-	12-pounder Armstrong gun, 1½ lb.
10·0	8'5	6'0	24-pounder howitzer, 2½ lbs.†
10·0	5'37	-	6-pounder brass gun, 1½ lb.
10'0	4'0	6'0	5½-inch (24-pounder) iron howitzer, 2 lbs.†
*9·0	12'0	6'5	8-inch mortar, 2 lbs.†
9·0	7'37	-	18-pounder carronade, 1½ lb.†
8·7	4'75	-	9-pounder Armstrong gun, 1 lb. 2 oz.
8·6	3'9	-	6-pounder " " 12 oz.
8·0	3'25	-	4½-inch (Coehorn) brass howitzer, 8 oz.†
7·75	6'75	-	12-pounder carronade, 1 lb.†
7·75	4'0	-	3-pounder brass gun, 12 oz.
6·75	4'5	2'87	5½-inch (royal) brass mortar.†
6'0	4'75	-	6-pounder carronade, 3 oz.†
5·75	4'0	2'0	4½-inch (Coehorn) brass mortar.†
*5·5	7'0	4'12	12-pounder brass howitzer.†

† Gomer chamber.

‡ Cylindrical chamber.

The above dimensions are extracted from the R. A. Field Book, 3rd edition, p. 144. The Armstrong cartridges are bound with blue worsted braid, .3 inch broad, approved 25/8/62; Cir. 793, par. 636.

TABLES OF MATÉRIEL.

AMMUNITION.

OF CARTRIDGES FOR SERVICE CHARGES.

are arranged according to their lengths, and those marked thus * are wider than they are long.

hen sewed).		Piece of Ordnance, and Charge.
Width.		
Top.	Bottom.	
ches.	inches.	
8'0	10'5	13-inch sea-service mortar, 20 lbs. charge.†
11'12	-	68-pounder gun, 18 lbs. charge.
10'06	-	42-pounder gun, 14 lbs. charge.
11'12	-	68-pounder gun, 16 lbs. charge.
11'12	-	14 lbs. charge.
11'37	-	56-pounder of 98 cwt., 14 lbs. charge.
10'37	-	of 87 cwt., "
10'12	-	42-pounder, 12 lbs. charge.
12'0	9'0	10-inch sea-service mortar†
12'5	8'6	8-inch gun, 8 or 10 lbs. charge.†
10'6	-	110-pounder Armstrong gun, 14 lbs. charge (shoulder).
9'12	-	32-pounder gun, 10 lbs. charge.
7'75	-	18-pounder gun, 6 lbs. charge.
10'6	-	110-pounder Armstrong gun, 12 lbs. charge.
8'37	-	24-pounder gun, 8 lbs. charge.
14'0	11'0	10-inch gun, 12 lbs. charge.†
7'25	-	40-pounder Armstrong gun, 5 lbs. charge.
19'75	11'0	13-inch mortar, 9 lbs.†
9'12	-	32-pounder gun, 8 lbs.
5'9	-	20-pounder Armstrong gun, 2½ lbs.
9'12	-	32-pounder gun, 7 lbs.
6'62	-	12-pounder gun, iron or brass, 4 lbs.
10'87	-	68-pounder carronade, 5 lbs.†
9'12	-	32-pounder gun, 6 lbs.
13'5	11'0	10-inch howitzer, 7 lbs.†
5'6	-	9-pounder iron gun, 3 lbs.
15'0	8'5	10-inch mortar, 4 lbs.†
11'0	7'0	8-inch howitzer, 4 lbs.†
9'0	-	42-pounder carronade, 3 lbs.†
6'62	-	32-pounder howitzer, 3 lbs.†
8'75	-	32-pounder carronade, 2 lbs.†
6'0	-	9-pounder brass gun, 2 lbs.†
7'75	-	24-pounder carronade, 2 lbs.†
4'5	-	12-pounder Armstrong gun, 1½ lbs.†
8'5	-	24-pounder howitzer, 1½ lbs.†
5'37	6'0	6-pounder brass gun, 1½ lbs.†
0	6'0	5½-inch (24-pounder) gun, 1½ lbs.†
0	6'5	8-inch mortar, 1½ lbs.†
0	-	18-pounder gun, 1½ lbs.†
7	-	9-pounder gun, 1½ lbs.†
6	-	6-pounder gun, 1½ lbs.†
1'0	-	4½-inch (12-pounder) gun, 1½ lbs.†
7'75	6'75	12-pounder gun, 1½ lbs.†
7'75	4'0	12-pounder gun, 1½ lbs.†
6'75	4'5	12-pounder gun, 1½ lbs.†
5'75	4'75	12-pounder gun, 1½ lbs.†

* Including the bursting charge, fuze, &c.
 † The lengths are taken from Circular 739, par. 405.
 ‡ Since 23rd Aug. 1862 10-inch land service shells have been
 quence only 79 lbs., and contain a larger bursting charge. (Circular 730, §
 § Increased to 6 lbs. 4 oz.; Circular 815, par. 672.

AMMUNITION

AMMUNITION

Quantity	Weight	Volume	Remarks
100	100	100	
200	200	200	
300	300	300	
400	400	400	
500	500	500	
600	600	600	
700	700	700	
800	800	800	
900	900	900	
1000	1000	1000	

The above are for the use of the various services and are subject to change without notice. The weight of the shells is given in pounds and the volume in cubic feet. The shells are packed in boxes and the boxes are packed in cases. The shells are packed in boxes and the boxes are packed in cases. The shells are packed in boxes and the boxes are packed in cases.

AMMUNITION

Quantity	Weight of Cannon	Weight of Shot	Weight of Shot included	Remarks
100	100	100	100	Plank bottoms, when issued loose are strung on iron rods, called mandrels; 20 thus packed measure from 30 to 32 inches in length; the rod to hold them weighs 22 oz.
200	200	200	200	
300	300	300	300	
400	400	400	400	
500	500	500	500	
600	600	600	600	
700	700	700	700	
800	800	800	800	
900	900	900	900	
1000	1000	1000	1000	
1100	1100	1100	1100	
1200	1200	1200	1200	
1300	1300	1300	1300	
1400	1400	1400	1400	
1500	1500	1500	1500	
1600	1600	1600	1600	The end wood bottoms are always issued ready fixed.
1700	1700	1700	1700	
1800	1800	1800	1800	
1900	1900	1900	1900	
2000	2000	2000	2000	

NOTES.

Bottoms are for the solid shot and shrapnel shells of field service guns and howitzer shells, the all common shells, Martin's shell, and carcasses; also for such shrapnel shells as are used in service. The hemispherical bottoms are for firing pound shots from mortars.

TABLES OF MATÉRIEL.

AMMUNITION—SHELLS.

TABLES OF PROJECTILES FOR ALL ORDNANCE.

Name.	Dimensions, outside.	Weight.		Contents.		Remarks.
		Empty.	Com- plete.*	Bursting Charge.	Bullets, or Segments.	
SHELLS.						
Common Armstrong's †	110-pounder	18.75 in. long; by 7.09 in. diameter	98 0	106 10	8 0	Fuze hole 1.29 inch diameter; fuze, Armstrong's time (with adapter) or percussion fuze.
	70 "	15.65 "	64 0	69 6	4 12	
	40 "	13.87 "	38 8	41 7	2 8	
	20 "	11.25 "	20 8	22 2	1 0	
	10-inch	9.85 in. diameter	† 86 0	92 10	5 0‡	
Common smooth-bore.	8 "	7.86 "	46 0	49 10	2 4	Fuze hole 1.024 inch in diameter; Boxer's common time or Pettman's percussion fuze may be used. Rivet holes .433 inch. The 12-pounder shell has a metal socket in the fuze hole.
	68-pounder	7.48 "	39 0	42 10	2 0	
	42 "	6.76 "	28 0	30 15	1 6	
	32 "	6.17 "	22 0	24 5	1 2	
	24 "	5.59 "	16 0	17 8	0 13	
Common shells for mortars	5½-inch	5.09 "	12 0	13 2	0 10	Fuze hole 1.492 } Boxer's } mortar Fuze hole 1.41 inch. } fuze.
	18-pounder	4.45 "	8 0	9 0	0 6	
	4½-inch	13.84 "	194 0	204 12	10 8	
	13 "	9.85 "	86 0	91 5	5 0	
	10 "	7.86 "	46 0	48 9	2 4	
Martin's shells, for molten iron.	8 "	9.85 "	70 0	116 13	None	45 lbs. of iron
	8 "		28 0	59 3	None	

* Including the bursting charge, fuze, wooden bottom, and rivet. The bursting charge is of L G powder for common shells.

† The lengths are taken from Circular 799, par. 405; the weights from Circular 793, par. 602.

‡ Since 23rd Aug. 1863 10-inch land service shells have been reduced to the same thickness as those for naval service; they weigh in consequence only 79 lbs., and contain a larger bursting charge. (Circular 793, par. 603).

§ Increased to 6 lbs. 4 oz.; Circular 815, par. 672.

ARTILLERY.

AMMUNITION—SHELLS.

TABLES OF PROJECTILES FOR ALL ORDNANCE—continued.

Name.	Dimensions, outside.	Weight.		Contents.		Remarks.
		Empty.	Complete.*	Bursting Charge.†	Bullets, or Segments.	
SHELLS.						
{ 110-pounder Segment shells, Armstrong's. †	14·3 in. long; by 7·09 in. diameter -	lbs. oz.	lbs. oz.	lbs. oz.		Fuze holes 1·29 inch for 40-pounder and larger shells; 1·22 for 20-pounder and smaller; time and percussion fuzes are used; the former require adapters for the large fuze holes, the latter are in two sizes.
	18·90 " " " " " "	98 0	101 5	3 0	111 segments	
	10·585 " " " " " "	71 6	75 0	3 5	"	
	8·125 " " " " " "	39 0	40 0	0 10	72 "	
	6·75 " " " " " "	19 10	20 0	0 1·93	70 "	
	5·85 " " " " " "	10 8	10 4	0 0·98	48 "	
6 " " " " " "	8 15	9 4	0 0·68	41 "		
	5·0 " " " " " "	5 7	5 12	0 0·41	30 "	
{ 8-inch 68-pounder } 56 " " 42 " " 32 " " 24 " " 18 " " 12 " " 9 " " 6 " "	7·92 in. diameter -	36 12	60 12	80 drams	339	Fuze holes 1·024 inch in diameter. Boxer's shrapnel time fuze is always used. Loading holes ·6 inch for 24-pounder and larger shells, ·5 inch for 18-pounder and smaller; rivet holes ·433 inch for 24-pounder and larger, ·31 inch for 18-pounder and smaller shells.
	7·48 " " " " " "	19 11	39 5½	70 "	musket bullets,	
	6·76 " " " " " "	17 8	28 12	50 "	one ounce each.	
	6·17 " " " " " "	12 13	20 14	40 "	152	
	5·59 " " " " " "	9 12	15 14	30 "	110	
	5·09 " " " " " "	6 2	10 6	24 "	75	
	4·45 " " " " " "	4 9	7 13	18 "	carbine bullets,	
	4·08 " " " " " "	3 6	5 2	10 "	72	
	3·55 " " " " " "				20 to 29	
					the lb.	

* Including the bursting charge, fuze, wooden bottom, and rivet.
 † Of fine-grained powder for the 20-pounder and smaller segment shells and of medium rifle powder for shrapnel shells.
 ‡ From Circulars 789, par. 405, and 793, par. 602.

AMMUNITION—CASE SHOT.

TABLE OF PROJECTILES FOR ALL ORDNANCE—continued.

Name.	Dimensions.	Weight.		Filled with	Remarks.
		Empty.	Complete.		
SHOT—continued.		os. oz.	lbs. oz.		
10-inch	7·6 inches long, 9·8 inches diam.	11 6	86 6	{ 34 balls, 1 lb. each 50 " 13½ oz. "	} 84 balls altogether. This is also used for the 68-pounder.
8-inch	7·8 "	5 14	50 14	90 balls, 8 oz. "	
56 "	7·4 "	5 11	55 11	50 " 1 lb. "	
42 "	6·7 "	3 4	46 12	85 " 8 oz. "	
32 "	6·1 "	2 7	36 4	66 " 8 oz. "	
24 "	5·5 "	2 0	25 7	46 " 8 oz. "	
18 "	5·0 "	1 2	17 13	46 " 6 oz. "	
12 "	4·4 "	0 15	13 12	41 " 6½ oz. "	
9 "	4·0 "	0 11	9 0	41 " 5 oz. "	
6 "	3·5 "	0 6	4 4	41 " 3½ oz. "	
3 "	2·8 "			41 " 1½ oz. "	} In cases with wooden bottoms when issued for brass ordnance. See page 110.
10-inch	9·8 "	9 7	94 7	170 " 8 oz. "	
8 "	7·8 "	5 12	38 0	258 " 2 oz. "	
32 "	6·1 "	1 11	23 0	105 " 3½ oz. "	
24 "	5·6 "	1 9	14 1	100 " 2 oz. "	
12 "	4·4 "	1 0	7 4	50 " 2 oz. "	
68-pounder	10·6 "	4 8	49 8	90 " 8 oz. "	
42 "	9·6 "	2 9	35 9	66 " 8 oz. "	
32 "	7·2 "	1 15	21 15	40 " 8 oz. "	
24 "	6·9 "	1 10	17 10	32 " 8 oz. "	
18 "	6·3 "	1 3	12 13	31 " 6 oz. "	
12 "	5·6 "	0 14	8 14	32 " 4 oz. "	
6 "	4·8 "	0 9	4 5	30 " 2 oz. "	
Case shot, <i>guzs</i> , (painted red).					
Case shot, <i>howitzers</i> , (black).					
Case shot, <i>carrollades</i> , (red).					

TABLES OF MATÉRIEL.

AMMUNITION—CARCASSES, ETC.

	8-1 inches long, 9-8 inches diam.	11 6	83 6	24 balls	3 lbs. each	In an iron cylinder.	
{ 10-inch or 8-inch 56-pounder } Grape shot, (for iron guns only).	9-3	21 8	66 8	15 "	3 lbs. "	Tier pattern.	
	10-2	20 0	68 0	12 "	4 lbs. "		
	9-7	12 8	48 8	9 "	4 lbs. "		
	8-7	9 4	36 4	9 "	3 lbs. "		
	7-6	8 0	26 0	9 "	2 lbs. "		
	6-8	6 0	19 8	9 "	1½ lb. "		
	6-1	4 0	13 0	9 "	1 lb. "		
	5-7	3 1	10 7	9 "	13 oz. "		
	3-5	2 0	6 8	9 "	8 oz. "		
	11-0	10 10	55 10	15 "	3 lbs. "		
{ 10-inch or 8-inch 32-pounder } Grape shot, carronades.	10-3	6 8	42 8	9 "	4 lbs. "	In tin cylinders like those of case shot, but with iron handles.	
	9-0	5 8	32 8	9 "	3 lbs. "		
	7-9	4 0	22 0	9 "	2 lbs. "		
	7-3	3 0	16 8	9 "	1½ lb. "		
	6-5	2 4	11 4	9 "	1 lb. "		
	5-2	1 3	5 11	9 "	0½ lb. "		
	13-inch	12-84 inches in diameter	220 0	234 0	14 lbs. of composition		Carcasses fired from guns and howitzers are fixed to wooden bottoms. See also p. 95.
	10 "	9-85 "	96 0	106 9	9 "		
	8 "	7-86 "	48 0	54 5	9 "		
	56-pounder	7-48 "					
42 "	6-76 "		30 8				
32 "	6-17 "	24 4	26 12	4½ "			
24 "	5-59 "	15 0	19 4	" "			
18 "	5-09 "		14 12	" "			
12 "	4-45 "	8 0	9 8	1½ "			
{ 10 inch } LIGHT BALLS	9-37 inches diam., 14-1 inches long	31 8	63 10	Luminous composition, see p. 104.	Elliptical in shape; fired from mortars with reduced charges. See also p. 102.		
	7-50 "	16 8	32 15				
	5-40 "	1 12	10 9				
	4-12 "	1 4	5 2				

* A few 13-inch light balls have been made and issued, but they are not commonly used (Fraser).

ARTILLERY.

AMMUNITION—CASE SHOT.

TABLE OF PROJECTILES FOR ALL ORDNANCE—continued.

Name.	Dimensions.		Weight.		Filled with	Remarks.
			Empty.	Complete.		
<i>Sturt—continued.</i>						
10-inch	7.6 inches long, 9.8 inches diam.	11 6	lbs. oz. 86 6	1 lb. each	} 84 balls altogether. This is also used for the 68-pounder. } In cases with wooden bottoms when issued for brass ordnance. See page 110.	
8-inch	7.8 "	5 14	50 14	34 balls, 1 lb. each		
66 "	7.4 "	5 11	55 11	50 " 13½ oz. "		
48 "	6.7 "	4 4	46 12	90 balls, 1 lb. "		
82 "	6.1 "	3 4	36 4	80 " 8 oz. "		
24 "	6.5 "	2 7	26 7	66 " 8 oz. "		
16 "	5.0 "	2 0	19 4	46 " 6 oz. "		
12 "	4.4 "	1 2	17 13	41 " 6½ oz. "		
9 "	4.0 "	0 15	13 12	41 " 5 oz. "		
6 "	3.5 "	0 11	9 0	41 " 3½ oz. "		
3 "	2.8 "	0 6	4 4	41 " 1½ oz. "		
10-inch	9.8 "	9 7	94 7	170 " 8 oz. "		
8 "	7.8 "	5 12	38 0	268 " 2 oz. "		
32 "	6.1 "	1 11	23 0	105 " 3¼ oz. "		
24 "	5.6 "	1 9	14 1	100 " 2 oz. "		
18 "	5.0 "	1 0	7 4	50 " 2 oz. "		
68-pounder	7.8 "	4 8	49 8	90 " 8 oz. "		
48 "	6.7 "	2 9	35 9	66 " 8 oz. "		
82 "	6.1 "	1 15	31 15	40 " 8 oz. "		
24 "	5.5 "	1 10	17 10	32 " 8 oz. "		
18 "	5.0 "	1 3	12 13	31 " 6 oz. "		
13 "	4.4 "	0 14	8 14	32 " 4 oz. "		
6 "	3.5 "	0 9	4 5	30 " 2 oz. "		
Case shot, <i>Howitzers</i> , (black).						
10-inch	13.7 "	9 7	94 7	170 " 8 oz. "		
8 "	9.0 "	5 12	38 0	268 " 2 oz. "		
32 "	6.4 "	1 11	23 0	105 " 3¼ oz. "		
24 "	5.6 "	1 9	14 1	100 " 2 oz. "		
18 "	5.0 "	1 0	7 4	50 " 2 oz. "		
68-pounder	10.6 "	4 8	49 8	90 " 8 oz. "		
48 "	9.6 "	2 9	35 9	66 " 8 oz. "		
82 "	7.2 "	1 15	31 15	40 " 8 oz. "		
24 "	6.9 "	1 10	17 10	32 " 8 oz. "		
18 "	6.2 "	1 3	12 13	31 " 6 oz. "		
13 "	5.6 "	0 14	8 14	32 " 4 oz. "		
6 "	4.8 "	0 9	4 5	30 " 2 oz. "		
Case shot, <i>carronades</i> , (red).						
10-inch	13.7 "	9 7	94 7	170 " 8 oz. "		
8 "	9.0 "	5 12	38 0	268 " 2 oz. "		
32 "	6.4 "	1 11	23 0	105 " 3¼ oz. "		
24 "	5.6 "	1 9	14 1	100 " 2 oz. "		
18 "	5.0 "	1 0	7 4	50 " 2 oz. "		
68-pounder	10.6 "	4 8	49 8	90 " 8 oz. "		
48 "	9.6 "	2 9	35 9	66 " 8 oz. "		
82 "	7.2 "	1 15	31 15	40 " 8 oz. "		
24 "	6.9 "	1 10	17 10	32 " 8 oz. "		
18 "	6.2 "	1 3	12 13	31 " 6 oz. "		
13 "	5.6 "	0 14	8 14	32 " 4 oz. "		
6 "	4.8 "	0 9	4 5	30 " 2 oz. "		

TABLES OF MATÉRIEL.

AMMUNITION—CARCASSES, ETC.

	10-inch or 8-inch	8-1 inches long, 9-8 inches diam.	11 6	83 6	24 balls	3 lbs. each	In an iron cylinder.	
Grape shot, (for iron guns only).	56-pounder	9-3	21 8	66 8	15 "	3 lbs. "	Tier pattern.	
	42 "	10-2	20 0	68 0	12 "	4 lbs. "		
	32 "	9-7	12 8	48 8	9 "	4 lbs. "		
	24 "	8-7	9 4	36 4	9 "	3 lbs. "		
	18 "	7-6	8 0	26 0	9 "	2 lbs. "		
	12 "	6-8	6 0	19 8	9 "	1½ lb. "		
	9 "	6-1	4 0	13 0	9 "	1 lb. "		
	6 "	5-7	3 1	10 7	9 "	13 oz. "		
	68 "	5-5	2 0	6 8	9 "	8 oz. "		
	42 "	11-0	10 10	55 10	15 "	3 lbs. "		
Grape shot, cannonades.	32 "	10-3	6 8	42 8	9 "	4 lbs. "	In tin cylinders like those of case shot, but with iron handles.	
	24 "	9-0	5 8	32 8	9 "	3 lbs. "		
	18 "	7-9	4 0	22 0	9 "	2 lbs. "		
	12 "	7-3	3 0	16 8	9 "	1½ lb. "		
	6 "	6-5	2 4	11 4	9 "	1 lb. "		
	6 "	5-2	1 3	5 11	9 "	0½ lb. "		
	13-inch	13-84 inches in diameter	220 0	234 0	14 lbs. of composition			Carcasses fired from guns and how- itzers are fixed to wooden bottoms. See also p. 95.
	10 "	9-85 "	96 0	106 9	9 "			
	8 "	7-86 "	48 0	54 5	5 "			
	56-pounder	7-48 "						
42 "	6-76 "							
32 "	6-17 "		30 8					
24 "	5-59 "	24 4	26 12					
18 "	5-09 "	15 0	19 4	4½ "				
12 "	4-45 "	8 0	14 12					
			9 8	1½ "				
*LIGHT BALLS	10 inch	9-37 inches diam., 14-1 inches long	31 8	68 10	Luminous composi- tion, see p. 104.	Elliptical in shape; fired from mor- tars with reduced charges. See also p. 102.		
	8 "	7-50 "	16 8	32 15				
	5½ "	5-40 "	1 12	10 9				
	4½ "	4-12 "	1 4	5 2				

* A few 13-inch light balls have been made and issued, but they are not commonly used (Fraser).

AMMUNITION.

COMPARATIVE WEIGHTS OF ONE ROUND OF AMMUNITION FOR THE VARIOUS PIECES OF ORDNANCE.

NOTE.—This table is introduced for convenience in calculating the weight of ammunition for transport in siege operations, in field reserves, or in the supply of permanent batteries, and therefore the weight assigned to each round includes an allowance for the necessary packing cases and boxes.

Ordnance.	With Shells.		With Shot.			Remarks.
	Common.	Segment and Shrapnel.	Case.	Grape.	Solid.	
	lbs.	lbs.	lbs.	lbs.	lbs.	
ARMSTRONG GUNS.						
110-pounder - - - - -	145	137	—	—	147	Service pattern. Light pattern, 10 lbs. charge. Details incomplete.
	141	133	—	—	145	
70-pounder - - - - -	60	57	—	—	56	
40-pr. - - - - -	31	38	—	—	29	
20-pr. - - - - -	—	16	—	—	17½	
12-pr. - - - - -	—	13½	—	—	12½	
9-pr. - - - - -	—	8½	—	—	8½	
6-pr. - - - - -	—	8½	—	—	8½	
SMOOTH-BORES.						
10-inch gun - - - - -	129½	—	105½	112½	103½*	
10-inch howitzer - - - - -	122	—	116	—	—	
68-pr. gun { 112 cwt. - - - - -	87	99	87	105	96½	18 lbs. charge.
{ 95 " - - - - -	83½	95½	83½	101½	93	16 " "
{ 88 " - - - - -	79½	91½	79½	97½	89	14 " "
68-pr. carronade - - - - -	66½	—	65	71	76	
8-inch gun { 65 cwt. - - - - -	74	85½	73½	91½	61*	10 lbs. charge.
{ 52 cwt. - - - - -	71	82½	70½	88½	58*	8 " "
8-inch howitzer - - - - -	65	76	52	—	—	
56-pr. gun - - - - -	71½	—	84½	96½	77	
42-pr. gun { 84 cwt. - - - - -	59	65	74½	76	63	14 lbs. charge.
{ 75 cwt. - - - - -	56½	62½	72	73½	61½	12 " "
{ 67 cwt. - - - - -	54½	60½	70	71½	59½	10½ lbs. "
42-pr. carronade - - - - -	44	—	46	55½	47½	
32-pr. gun { 63 cwt. - - - - -	44½	48½	56	56	47	10 lbs. charge.
{ 50 " - - - - -	41½	45½	53	53	44	8 " "
{ 45 " - - - - -	41	45	52½	52½	43½	7 " "
{ 42 " - - - - -	38½	42½	50	50	41	6 " "
{ 32 " - - - - -	37½	41½	49	49	40	5 " "
{ 25 " - - - - -	36	40	47½	47½	38½	4 " "
32-pr. carronade - - - - -	34	—	30½	41½	36½	
32-pr. howitzer - - - - -	34	38	32½	—	—	
24-pr. gun { 50 cwt. - - - - -	33½	36	41½	42	36	8 lbs. charge.
{ 41 " - - - - -	29½	32	37½	38	32	
{ 33 " - - - - -	28	30½	36	36½	30½	
{ 20 " - - - - -	25½	28	33½	34	28	
24-pr. carronade - - - - -	24½	—	24	28½	27½	
24-pr. howitzer - - - - -	25½	28	21	—	—	Field service.
5½-inch howitzer - - - - -	25	27½	20½	—	—	Garrison service.
18-pr. gun { 42 cwt. - - - - -	25	27½	30	30½	30†	6 lbs. charge.
{ 22 " - - - - -	20½	23	25½	26	22½	3 " "
{ 15 " - - - - -	19½	22	24½	25	21½	2 " "

* With the common shell used as a shot.

† Including the wooden bottom, &c., as issued for field service.

AMMUNITION.

COMPARATIVE WEIGHTS OF ONE ROUND—*continued.*

Ordnance.	Shells.		Shot.			Remarks.
	Common.	Segment and Shrapnel.	Case.	Grape.	Solid.	
18-pr. carronade	lbs. 18½	lbs. —	lbs. 17½	lbs. 21	lbs. 20½	} For field service. 12 oz. charge. 10 " "
12-pr. gun	17	16	25	20½	20*	
12-pr. carronade	12½	—	12½	14½	13½	
12-pr. howitzer	13	14	11	—	—	
9-pr. brass gun	—	13½	19½	—	14½	
6-pr. brass gun	—	9½	9½	—	12½	
3-pr. brass gun { 3 cwt.	—	—	6	—	4½	
	2¼ " "	—	5½	—	4½	
Coehorn howitzer	11½	—	10	—	—	

* Including the wooden bottom, &c., as issued for field service.

MORTARS.

Calibre.	Weight of one Round.	Calibre.	Weight of one Round.	Remarks.
18-inch { 20 lbs. charge	245 lbs. - -	8-inch -	52½ lbs. -	} The carcasses and other projectiles fired from mortars are not included in the number of rounds for any particular service.
9 " "	222 " - -	5½-inch -	18½ lbs. -	
10-inch { 9½ " "	107 " - -	4¾-inch -	9½ lbs. -	
4 " "	99 " - -			

ARTILLERY.

AMMUNITION.

TABLE OF BARRELS, BOXES, AND CASES FOR AMMUNITION ; WITH THE CONTENTS OF EACH.

NOTE.—The measurement allows for the grummet handles and cleats at the ends of the cases.

Description.	Dimensions.	Weight.	Contents.	Total Weight.	
BARRELS.^a					
	inches.	lbs. oz.			
Whole barrel - - -	15 & 17 × 21	30 0	100 lbs. of powder - -	130 lbs.	
Half barrel - - -	12½ & 13½ × 17	18 0	50 lbs. of powder - -	68 "	
			or 1,800 blank S.A. cartridges and 1,980 caps.	65 "	
Quarter barrel - - -	9½ & 10½ × 14	11 8	750 artillery ball cartridges and 1,125 caps.	78½ "	
Round lid barrels { whole - - -	15 & 17 × 21	31 0	Filled cartridges as in following table.	about 130 lbs.	
{ half - - -	12½ & 13½ × 7	19 0	As convenient.		
BOXES.					
Tin ^b {	for fuzes { blue - - -	5¼ × 2¼ × 2¼	0 7	12 shrapnel fuzes - -	17 oz.
		4¼ × 2¼ × 3¼	0 6	10 " " - -	14 "
	black - - -	4 × 2¼ × 2¼	0 5	8 " " - -	11 "
		5 × 2 × 3½	0 7	10 common fuzes - -	19 "
	for plugs and wads - - -	4 × 2½ × 2½	0 6	8 " " - -	16 "
		4¼ × 3¼ × 2½	0 6	The number varies according to circumstances.	—
for tubes - - -	4¼ × 2 × 2	0 5	100 copper friction tubes -	2¼ lbs.	
ammunition - - -	4¼ × 3¼ × 3½	0 6	Filled cartridges, as in the following table.	about 70 lbs.	
	33 × 11 × 10	21 0	440 Enfield rifle or artillery carbine cartridges, and box with 660 caps.	45 "	
Wood {	S.A. ammunition ^c - - -	16 × 8 × 9	9 0	See the table following next but one.	
	projectiles - - -	Various - - -			
Zinc ^c {	war rockets - - -		0 11	660 percussion caps - -	1 lb.
CASES.					
Iron, for railways - - -	16½ diam.; 18½ deep	65 0	1 half barrel.		
	14½ " 15½ "	50 0	1 quarter barrel.		
Wood, metal-lined {	whole - - -	21 × 17 × 17½	48 0	Filled cartridges, as in the following table.	about 160 lbs.
				or 330 8-inch mortar fuzes	132 "
	half - - -	17 × 14 × 14	30 0	or 1,000 5½ inch " -	136 "
				or 25 lbs. of quick match " -	73 "
quarter - - -	14 × 10 × 11	18 4	Filled cartridges, as in the following table.	about 80 lbs.	
			125 Armstrong time fuzes -	81 "	
CYLINDERS ; Zinc.					
For caps ^d {	No. 4 - - -	4 diam. ; 12 deep	1 2	1,980 percussion caps -	4½ lbs.
		5 " 4½ "	0 11	1,050 " " -	2½ "
	No. 2 - - -	6 " 4½ "	1 0	50 common fuzes - -	4½ "
		5½ " 6½ "	0 13	50 shrapnel " - -	3½ "

^a The dimensions given for barrels refer to the diameter at either end, the diameter at the bulge and the depth ; the quarter barrel was increased in diameter ½ inch in 1860 (Circular 590, par. 52).

^b These are the tin boxes issued with the equipments.

^c These are the boxes carried by the S. A. ammunition wagon ; they were approved in 1860 (Circular 90, pars. 49, 50, 51).

^d There are other sizes varying according to the nature and number of cartridges for which the caps are issued.

BOXES AND CASES FOR AMMUNITION.

Description.	Dimensions.	Weight.	Contents.	Total Weight.
CYLINDERS—cont.				
	inches.	lbs. oz.		
For lights - - -	6 diam.; 10 deep	1 6	8 long lights - -	8½ lbs.
	6 " 5 "	0 15	8 signal " - -	3½ "
" primers - - -	4 " 5 "	0 9	100 primers - -	1 "
	4 " 6 "	0 10	100 brass tubes - -	3 "
" tubes - - -	4 " 4 "	0 8	100 copper friction - -	2½ "
	4 " 4 "	0 8	100 common quill - -	0½ "
	3 " 3 "	0 5	100 cross-headed quill - -	0½ "
COMMON PACKING CASES.				
For adapters - - -	19 x 15 x 10	15 1	500 adapters - -	141 lbs.
	16 x 13 x 8	10 8	100 20-pounder bursters - -	78 "
" bursters, iron - -	16 x 13 x 7	9 9	100 12-pounder " - -	55 "
	13 x 13 x 7	7 0	100 9-pounder " - -	47 "
" cups, tin - - -	16 x 13 x 9	11 3	200 6-pounder " - -	52 "
	23 x 19 x 10	19 0	100 110-pounder cups - -	73 "
	17 x 8 x 7	6 12	250 small percussion fuzes - -	63 "
For fuzes ^a { metal - - -	16 x 8 x 8	6 12	100 pillar " - -	68 "
	14 x 10 x 8	7 1	100 Pettman's " " - -	51 "
	31 x 13 x 10	21 6	500 common fuzes - -	68 "
	32 x 14 x 7	17 6	500 shrapnel " - -	54 "
	28 x 16 x 15	34 0	24 110-pounder lubricators - -	87 "
For lubricators - - -	26 x 17 x 13	31 0	66 40-pounder " - -	90 "
	27 x 16 x 13	31 0	99 20-pounder " - -	89 "
	27 x 14 x 13	30 0	156 12-pounder or 9-pounder lubricators.	93 "
	27 x 15 x 15	38 0	260 6-pounder lubricators - -	102 "
	18 x 9 x 5	7 8	Proportion for 500 common shells.	31 "
For plugs and wads ^b - -	9 x 7 x 4	2 4	Proportion for 100 ditto	7 "
	9 x 7 x 4	2 4	" " 500 shrapnel	7 "
	16 x 10 x 7	7 0	280 shrapnel fuze hole plugs	50 "
For portfires - - -	16 x 9 x 5	6 8	150 " "	29 "
	22 x 13 x 10	20 0	200 L. S. portfires - -	94 "
	24 x 22 x 14	33 12	50 2-lb. signal rockets - -	157 "
For rockets, signal ^c { cases - - -	48 x 18 x 11	41 7	100 1-lb. " - -	183 "
	52 x 13 x 13	44 5	150 ½-lb. " - -	160 "
	10½ x 10 x 5	—	50 2-lb. sticks - -	65 "
	8½ x 9 x 6	—	100 1-lb. " - -	67 "
	6½ x 7 x 4	—	100 ½-lb. " - -	38 "
VATS.				
¾ ton vat - - -	40 x 35 x 35	64 0	300 110-pounder cylinders - -	170 "
			490 40-pounder " - -	192 "
			2,500 paper covers, No. 5 - -	137 "
			800 " No. 7 - -	163 "
½ ton vat - - -	40 x 30 x 30	53 0	4,000 " No. 4 - -	114 "
			1,200 " No. 6 - -	136 "
¼ ton vat - - -	32 x 26 x 26		600 20-pounder cylinders - -	128 "
			2,000 sockets for lubricators	245 "

^a For other fuzes, refer to Cases, metal-lined.

^b Since this table was prepared the proportion of spare plugs and wads has been altered.

^c For war rockets, refer to Table of boxes for projectiles.

NOTES.

The packing cases are marked on the top or at one end with the exact contents, and the date of packing or of the last examination. When sent to an army in the field they are further distinguished by the signs notified in Circular 732, viz., one blue ball for field ordnance, two blue balls for siege ordnance, and two red diamonds if they contain powder or inflammable materials.

BOXES AND CASES FOR AMMUNITION.

TABLE TO SHOW THE NUMBER OF FILLED CARTRIDGES WHICH EACH METAL-LINED CASE, ROUND LID BARREL, OR BOX WILL CONTAIN.

Description.	Whole Case.	Round lid Barrel.	Half Case.	Ammuni- tion Box.	Remarks.
Dimensions { length -	21 inches	- -	17 inches	33 inches	
breadth -	17 "	17 inches	14 "	11 "	
depth -	17½ "	21 "	14 "	10 "	
Average { empty -	48 lbs. -	33 lbs. -	30 lbs. -	21 lbs. -	
weight { filled -	160 "	130 "	80 "	70 "	
<i>Cartridges.</i>					
lbs. oz.					
20 0 - -	5	5	- -	- -	13-inch S.S. mortar.
18 0 - -	5	5	- -	- -	68 pounder gun.
16 0 - -	6	6	3	- -	Do.
14 0 - -	8	7	4	- -	68-pounder, 56-pounder, and 42-pounder guns.
12 0 - -	6	5	2	- -	110-pounder gun (now disused).
10 8 - -	9	8	4	- -	10-inch and 42-pounder guns.
	7	6	3	- -	110-pounder gun.
	10	8	4	- -	42-pounder gun, 13-inch burster.
10 0 - -	11	9	5	- -	8-inch and 32-pounder guns.
	7	6	3	- -	110-pounder gun.
9 8 - -	- -	9	- -	- -	10-inch S.S. mortar.
9 0 - -	- -	10	- -	- -	13-inch mortar.
8 0 - -	14	12	6	- -	8-inch, 32-pounder, and 24-pounder guns.
7 0 - -	12	10	6	- -	110-pounder burster.
6 4 - -	16	14	7	- -	32-pounder gun, 10-inch howitzer.
6 0 - -	18	15	8	- -	10-inch burster (naval pattern).
	19	16	8	- -	32-pounder, 24-pounder, and 18-pounder guns.
5 0 - -	22	19	11	10	32-pounder gun, 68-pounder carronade, 10-inch burster.
	15	11	5	- -	40-pounder gun, without lubricators.
	14	11	5	- -	Ditto, but with paper covers.
	12	10	5	4	40-pounder gun, with lubricators.
4 0 - -	27	24	13	12	32-pounder, 24-pounder, and 12-pounder guns, 8-inch howitzer.
3 8 - -	- -	22	- -	- -	10-inch mortar.
	31	27	15	14	42-pounder carronade.
	37	32	17	16	18-pounder and 9-pounder guns.
2 0 - -	- -	- -	- -	- -	32-pounder howitzer.
	36	28	16	- -	110-pounder segment burster.
2 11 - -	40	36	20	16	32-pounder carronade.
	44	38	20	18	24-pounder gun, 9-pounder brass gun, and 24-pounder howitzer.
2 8 - -	- -	- -	- -	- -	40-pounder common burster.
	40	36	20	21	20-pounder gun, with lubricators.
	25	19	12	10	

BOXES AND CASES FOR AMMUNITION.

TABLE TO SHOW NUMBER OF FILLED CARTRIDGES, &c.—*cont.*

Cartridge.	Whole Case.	Round lid Barrel.	Half Case.	Ammunition Box.	Remarks.
lbs. oz.					
2 4	50	40	24	-	8-inch burster.
	55	48	26	24	24-pounder carronade, 56-pounder burster.
2 0	55	48	25	25	18-pounder and 6-pounder guns, 8-inch mortar.
	73	64	35	30	6-pounder brass gun.
	73	64	34	30	18-pounder carronade.
1 8	50	42	25	-	12-pounder Armstrong, with lubricators.
	50	42	24	21	Ditto, with paper covers in addition.
1 6	80	66	37	-	42-pounder burster.
1 4	88	76	40	36	12-pounder brass howitzer.
	100	80	45	-	32-pounder burster.
	70	60	32	-	9-pounder Armstrong, with lubricators.
1 2	60	59	28	30	Ditto, with paper covers in addition.
1 0	110	96	51	45	12-pounder carronade.
	100	90	48	54	20-pounder burster.
0 13	130	110	60	-	24-pounder burster.
	-	120	-	65	3-pounder brass gun.
	100	86	48	-	6-pounder Armstrong, with lubricators.
0 12	96	78	45	49	Ditto, with paper covers in addition.
	190	160	80	74	40-pounder segment burster.
	170	145	80	74	6-pounder carronade, 18-pounder burster.
	-	145	-	74	3-pounder brass gun.
0 8	-	-	-	90	Coehorn howitzer.
0 7	-	-	-	100	Royal mortar.
0 6	280	240	130	-	12-pounder common burster.
0 5	-	-	-	140	Coehorn mortar.
60 drams	500	-	220	-	8-inch shrapnel burster.
55 "	500	-	240	-	56-pounder "
50 "	600	-	260	-	42-pounder "
40 "	700	-	320	-	32-pounder "
30 "	950	-	440	-	24-pounder "
25 "	950	-	440	-	18-pounder "
20 "	1,300	-	630	-	12-pounder "
15 "	1,500	-	725	-	9-pounder "
10 "	2,000	-	970	-	6-pounder "

NOTES.

The metal-lined cases afford the best protection from damp, and are therefore the most commonly used ; the round lid barrels are only suited to magazines which are perfectly dry ; the half case is convenient for small supplies or to occupy spaces for which the whole case would be too large. The ammunition boxes are only for temporary transport. When the addition of a paper cover or a small quantity of powder makes a great difference in the contents, it is caused by a whole row or tier being lost in consequence.

BOXES AND CASES FOR AMMUNITION.

TABLE OF BOXES FOR PROJECTILES.*

Ordnance.	No. of Box.	Dimensions.	Weight.	Contents.	Total Weight.
ARMSTRONG'S.					
		inches.	lbs. oz.		lbs. oz.
110-pounder gun	1	11 x 9 x 20	16 2	1 common shell -	112 0
	2	11 x 9 x 16	13 13	1 segment shell -	111 12
				1 shot -	123 13
40-pounder gun	3	9 x 7 x 15	9 0	1 common shell -	46 10
	4	9 x 7 x 12½	7 6	1 segment shell -	46 15
	5	14 x 7 x 12½	10 5	2 shot -	92 11
20-pounder gun	6	12 x 6 x 10½	6 12	2 segment shell -	49 4
	7	12 x 6 x 13	7 6	2 shot -	
				2 common shell -	47 12
12-pounder gun	8	11¼ x 10 x 9½	11 5	4 segment shell -	53 1
				4 shot -	
9-pounder gun	9	19 x 9 x 8	12 8	8 segment shell -	78 0
				8 shot -	
6-pounder gun	10	19 x 10 x 7½	13 12	15 segment shell -	97 3
				15 shot -	107 8
70-pounder gun	11	10½ x 9 x 16	12 15	1 segment shell -	88 0
	12	10½ x 9 x 17	11 4	1 common shell -	75 4
	13	10½ x 9 x 14	12 5	1 shot -	91 5
SMOOTH-BORED.					
13-inch mortar	1	16½ x 15 x 15½	23 12	1 shell -	228 4
10-inch gun	2	13½ x 12 x 13	16 8	1 common shell -	109 10†
				1 Martin's shell -	82 8
10-inch gun or howitzer	3	23½ x 12 x 12	23 4	2 grape -	190 0
				2 case for gun -	196 0
				2 case for howitzer -	212 2
8-inch or 68-pr. gun	4	11½ x 10 x 11	10 4	1 shrapnel shell -	70 8
				2 common shells -	111 0
8-inch gun or howitzer	5	20 x 10 x 11	16 6	2 Martin's shells -	71 6
68-pounder carronade				2 case, for gun -	118 2
				2 case, for howitzer -	92 7
				2 case, for carronade -	84 15
				2 grape, carronade -	85 5
8-inch gun	6	20 x 10 x 13	20 12	2 grape -	153 12
56-pounder gun	7	19½ x 10 x 14	16 15	2 grape -	152 15
				2 case -	128 5
42-pounder gun and carronade	8	31 x 9 x 13	30 8	4 case, gun -	217 8
				4 grape, gun -	226 8
				4 grape, carronade -	200 8
				4 shot -	190 4
42-pounder gun and carronade	9	31 x 9 x 9½	21 4	4 shell -	139 8
				4 case, carronade -	163 8
42-pounder gun	10	10 x 9 x 9½	7 7	1 common shell -	37 0
32-pounder gun and carronade	11	28½ x 8 x 12	21 1	4 grape, gun -	166 1
				4 case, gun -	166 1
				4 grape, carronade -	151 1
				4 shot -	147 12
32-pounder gun, howitzer and carronade	12	29 x 9 x 9½	19 0	4 common shell -	111 4
				4 shrapnel -	134 2
				4 case, carronade -	106 12
				4 case howitzer -	111 0
24-pounder gun	†	21 x 13 x 10½	26 8	6 grape -	182 8
	‡			6 case -	179 2

* Promulgated in the War Office Circular No. 759, par. 494 ; approved 10 January 1862.

† This will be 103 lbs. with the 10-inch shell now used.

‡ No. 13 is for a 32-pounder naval shell.

BOXES AND CASES FOR AMMUNITION.

TABLE OF BOXES FOR PROJECTILES—*continued.*

Ordnance.	No. of Box.	Dimensions.	Weight.	Contents.	Total Weight.		
					lbs. oz.		
		inches.	lbs. oz.		lbs. oz.		
24-pounder gun, carronade, and howitzer; 5½-inch howitzer -	15	21 x 13 x 9½	20 12	6 shrapnel shell -	146 0		
				6 common shell -	125 12		
				6 shot -	165 11		
				6 grape, carronade -	152 12		
				6 case, carronade -	126 8		
				6 case, howitzer -	105 2		
18-pounder gun -	16	25 x 12½ x 10	18 10	6 case, 5½-inch howitzer -	125 12		
				6 case, 5½-inch howitzer -	105 2		
				8 grape -	174 10		
				8 case -	172 10		
18-pounder gun and carronade -	17	24½ x 12 x 8	20 12	8 shrapnel shell -	147 12		
				8 common shell -	118 12		
				8 shot -	168 12		
12-pounder gun -	18	31 x 11 x 12	24 7	8 grape, carronade -	152 12		
				8 case, carronade -	123 4		
12-pounder gun, carronade, and howitzer; 4¾-inch howitzer -	19	31 x 11 x 9	21 10	12 case -	237 10		
				12 grape, gun -	177 10		
				12 grape, carronade -	156 10		
				12 case, carronade -	128 2		
				12 case, howitzer -	108 10		
12-pounder gun and 4¾-inch howitzer -	20	31 x 11 x 7½	17 13	12 case, 4¾-inch howitzer -	119 2		
				12 shrapnel shell -	182 12		
				12 common shell -	120 9		
9-pounder gun -	21	29 x 10 x 11	22 12	12 shot -	196 9		
				12 4¾-inch shells -	138 9		
"	22	29 x 10 x 8½	17 6	12 case -	187 12		
"	23	28½ x 10 x 7	18 4	12 grape -	142 10		
6-pounder gun -	24	26 x 9 x 12	23 8	12 shrapnel shell -	115 0		
				12 shot -	129 10		
"	25	24½ x 9 x 10	14 14	24 shrapnel shell -	145 12		
"	26	24½ x 9 x 8	13 10	24 shot -	173 2		
3-pounder gun -	27	32 x 10 x 9½	18 0	12 case -	122 14		
				12 grape -	91 10		
"	28	32 x 10 x 10½	21 16	30 case -	145 8		
For 1 lb. shots	—	23½ x 8½ x 9	12 8	60 shot -	198 0		
				16 x 8 x 7	6 8	60 grape -	171 12
				33 x 13 x 11	25 6	100 pound shots -	112 8
For war rockets	—	25½ x 10 x 12½	19 2	50 " -	56 8		
				9 12 " " -	76 2		
				16 6 " " -	155 10		
				30 3 " " -	131 14		
				24 x 14 x 9½	19 6	6 24-pounder rockets -	181 10
Light balls -	—	23 x 19 x 13	30 0	9 12 " " -	76 2		
				27 x 14 x 10	24 0	2 10-inch light balls -	158 0
				20 x 13 x 13	24 0	3 8-inch " -	123 0
				20 x 13 x 13	24 0	6 5½-inch " -	88 0
				16 x 15 x 16	23 12	12 4¾-inch " -	85 8
				23 x 13 x 13	21 0	1 13-inch smoke ball -	73 12
Smoke balls	—	18 x 10 x 12	15 8	2 10-inch " -	64 0		
				20 x 13 x 9	17 0	2 8-inch " -	37 0
				30 x 11 x 8	19 0	6 5½-inch " -	44 0
						12 4¾-inch " -	44 0

GARLANDS FOR SHOT AND SHELLS.

TABLE OF GARLANDS FOR HOLDING SPHERICAL SHOT AND SHELL.

Calibre.	Dimensions.		Number of Projectiles.		Shape.
	Long Side.	Short Side.	In the Bottom Course.	In the whole Pile.	
13-inch (mortars)	ft. in.	ft. in.			
	4 2½	- -	4 rows of 4 each	30	Square.
10-inch	7 6	5 1¼	9 " 6 "	154	Rectangular.
	3 3½	- -	4 " 4 "	30	Square.
	8 0	4 8	12 " 7 "	280	Rectangular.
	6 1	5 5	9 " 8 "	240	"
8-inch, or 68 - pounder, (7 sizes.)	6 0	4 0½	9 " 6 "	154	"
	5 5	4 9	8 " 7 "	168	"
	4 8½	4 0¼	7 " 6 "	112	"
	4 8½	- -	28 altogether	84	Triangular.
	2 8	- -	4 rows of 4 each	30	Square.
	6 11½	4 5	11 " 7 "	252	Rectangular.
56-pounder, (3 sizes)	3 9½	- -	21 altogether	56	Triangular.
	2 6	- -	4 rows of 4 each	30	Square.
42-pounder	5 1	3 5½	9 " 6 "	154	Rectangular.
	2 3½	- -	4 " 4 "	30	Square.
	4 9	3 6½	9 " 7 "	196	Rectangular.
	4 9	3 2	9 " 6 "	154	"
32-pounder, (5 sizes)	4 2	- -	8 " 8 "	204	Square.
	3 8	- -	7 " 7 "	140	"
	2 1	- -	4 " 4 "	30	"
24-pounder	4 5	2 10	9 " 6 "	154	Rectangular.
	1 11	- -	4 " 4 "	30	Square.
	7 0	3 6½	16 " 8 "	492	Rectangular.
18-pounder, (4 sizes)	5 8	3 0½	13 " 7 "	308	"
	3 10	2 6½	9 " 6 "	154	"
	1 9	1 9	4 " 4 "	30	Square.
12-pounder	4 5	3 5	12 " 8 "	348	Rectangular.
	1 6½	- -	4 " 4 "	30	Square.

NOTES.

For each piece of ordnance there is issued one square garland for holding 30 shot or shells, that number being quite sufficient for any immediate and casual requirement; the other sizes are issued if necessary.

Of triangular garlands there are only two; among the various oblong sizes there is one for holding 154 projectiles which is made for ordnance of six different calibres, viz., 10-inch, 8-inch (or 68-pounder), 42-pounder, 32-pounder, 24-pounder, and 18-pounder.

Garlands required of any size not included in this table can be made of wood by the artificers at the station; all the above are of iron.

(See General Regimental Order, 26/2/62).

TABLE OF BOXES TO HOLD THE DETACHED PARTS OF ARMSTRONG GUNS.

The breech screw is not packed in these boxes.

—	110-pounder.	40-pounder.	20-pounder.	12-pounder and 9-pounder.	6-pounder.	
<i>Dimensions, in feet and inches.</i>						
Length - - - -	3 1½	2 6	1 6	2 0	1 2½	
Width - - - -	1 4½	0 16¼	0 16	0 11	0 10	
Depth - - - -	2 1	0 18	0 13	0 11	0 10	
<i>Contents.</i>						
Eye, elevating - - -	—	—	1	12-pr. 1	9-pr. —	1
Lever and keep pins - - -	1	1	1	1	1	1
Pieces, vent - - - -	2	2	2	2	2	2
Plugs { oil-hole - - - -	—	—	1	1	—	1
{ sight hole - - - -	—	2	—	—	2	—
Rings { indicator - - - -	—	1	—	—	—	—
{ tappet - - - -	1	1	1	1	1	1
{ tangent slide - - - -	—	—	1	1	—	1
Saddle - - - -	1	—	—	—	—	—
Slides for sights { dispart - - - -	—	—	1	1	—	1
{ ratchet - - - -	—	—	1	1	—	1
{ tangent - - - -	2	1	1	1	1	1
{ trunnion - - - -	2	1	1	1	1	1
<i>Weight.</i>						
Packed, complete - - -	cwts. qrs. lbs. 6 0 0	cwts. qrs. lbs. 2 2 2	cwts. qrs. lbs. 1 1 5	lbs. 98	lbs. 93	lbs. 58

NOTES.

These boxes were approved 13th September 1861, and the contents of each were notified in Circular 724, par. 351, but the latter have since been altered in consequence of changes in the sights and appurtenances of some of the guns.

The 40-pounder box was slightly altered in 1862 to receive the lever and handle complete, the handle having previously been detached before packing, Circular 793, par. 627.

The above list has been corrected at the Royal Gun Factory up to 14th April 1863.

TABLE OF LEATHER CARTRIDGE CASES (OR CYLINDERS) USED IN THE SERVICE OF ORDNANCE.

Description.	Dimensions, in Inches.	Weight.	Ordnance.
No. 1 - -	9 diameter, 11 deep	lbs. oz. 4 8	10-inch gun, 10-inch howitzer, 13-inch and 10-inch mortars.
No. 2 - -	9 " 17 "	5 12	68-pr., 56-pr., and 42-pr. guns.
No. 3 - -	8 " 19 "	5 2	110-pr. and 8-inch guns.
No. 4 - -	7 " 16 "	3 6	70-pr. guns, and 32-pr. guns from 63 cwt. to 56 cwt.
No. 5 - -	7 " 12 "	3 0	{ 32-pr. guns from 50 cwt. to 39 cwt. 24-pr. guns from 50 cwt. to 33 cwt.

ARTILLERY.

TABLE OF LEATHER CARTRIDGE CASES.

Description.	Dimensions, in Inches.	Weight.		Ordnance.
		lbs. oz.		
No. 6 - -	7 diameter ; 9 deep	2	11	32-pr. guns of 32 and 25 cwts. 23-pr. gun of 20 cwt. Royal and Coehorn mortars. 40-pr. and smaller Armstrong guns. 18-pr. and smaller smooth-bored guns. 13-inch S.S. mortar. 8-inch mortar and 8-inch howitzer.
No. 7 - -	6½ " 11 "	2	6	
Mortar - -	9½ " 15 "	5	8	
No. 2, old pattern - }	- - -	3	11	

TABLE OF SPRING SPIKES AND PUNCHES.

Punch.		Spring Spike, Length.	Ordnance.	Punch.		Spring Spike, Length.	Ordnance.
Weight.	No. and Length.			Weight.	No. and Length.		
oz.	inches.	inches.		oz.	inches.	inches.	
3	No. 1, 14	13·51	13-inch mortar of 100 cwt.			7·65	24-pr. gun of 48 cwt.
		11·4	10-in gun of 86 cwt.			7·5	10-inch mortar.
		10·9	68-pr. gun of 112 cwt.			7·41	32-pr. gun of 39 cwt.
		10·65	10-inch mortar of 52 cwt.			7·40	8-inch howitzer.
2½	No. 2, 12·75	10·5	8-inch guns of 60 and 63 cwt.			7·38	18-pr. gun of 42 cwt.
		10·45	56-pr. gun of 98 cwt.			7·22	18-pr. gun of 38 cwt.
		10·35	56-pr. gun of 85 cwt.			7·13	10-inch mortar of old pattern.
		10·10	68-pr. gun of 95 cwt.; 42-pr. gun of 84 cwt.			7·10	32-pr. gun of 32 cwt.
		9·89	68-pr. gun of 88 cwt.			6·8	12-pr. gun of 29 cwt.
		9·84	8-inch guns of 50 and 52 cwt.	1½	No. 5, 7·5	6·61	12-pr. gun of 33 cwt.
2¼	No. 3, 10·6	9·4	13-inch mortar of old pattern.			6·55	9-pr. gun of 26 cwt.
		9·16	10-inch howitzer.			6·46	32-pr. gun of 25 cwt.
		9·0	42-pr. gun of 67 cwt.			6·3	32-pr. carronade.
		8·8	13-inch mortar of present pattern.			6·22	5½-inch howitzer.
		8·48	32-pr. gun of 63 cwt.			6·13	8-inch mortar of old pattern.
		8·42	32-pr. gun of 58 cwt.	1½	No. 6, 6·5	6·0	18-pr. gun of 20 cwt.
		8·36	32-pr. gun of 50 cwt.; Monk's A.			5·95	24-pr. gun of 20 cwt.
		8·35	32-pr. gun of 40 cwt.; Congreve's.			5·85	8-inch mortar of old pattern.
		8·22	32-pr. gun of 45 cwt.; Monk's B.	1¼	No. 7, 4·75	5·75	6-pr. gun of 17 cwt. and 21 cwt.
		8·14	32-pr. gun of 42 cwt.; Monk's C.			5·69	24-pr. carronade.
		8·10	32-pr. gun of 56 cwt.			5·28	18-pr. carronade.
2	No. 4, 9·0	8·08	68-pr. carronade.	1¼	No. 8, 4·0	5·07	32-pr. brass howitzer.
		7·94	32-pr. gun of 48 cwt.			4·94	12-pr. brass gun.
		7·8	24-pr. gun of 50 cwt.	1	No. 9, 3·0	4·51	24-pr. brass howitzer.
						4·49	9-pr. brass gun.
						3·56	12-pr. brass howitzer.
						3·40	Coehorn howitzer.
						3·25	6-pr. brass gun.
						2·80	3-pr. brass gun.
						2·75	5½-inch brass mortar.
						2·70	3-pr. brass gun for mountain service.

NOTES.

The lengths given for the punches and spikes are exclusive of the handle in the former, which is about ¾-inch long, and of the spike in the latter, which is about 2½ inches long; the weight of each spring spike may practically be taken as the same as that of the corresponding punch.

GENERAL LIST.

Note.—This list is intended for a guide to the names and descriptions of articles issued as matériel of Artillery; the tools used only by artificers and the materials issued for repairs are not entered in it, neither are many small stores which are included with carriages or other articles issued *complete*, but reference to all these is given in the general index.

Name.	No. of Drawing.	Value.	Weight.	Service.	Remarks.
		£ s. d.	lbs. oz.		
A.					
Adapter - - -			0 3 $\frac{3}{4}$	Armstrong time fuzes	To make them fit the large fuze holes.
Ammunition wagons -			various	Field equipments -	Table at p. 375.
Anchor - - -			168 0	For unloading transports, &c.	See page 357.
Apparatus, Manby's* -				Communicating with stranded vessels.	
Apron, tarpaulin -			various	See cover, vent slot.	
„ lead, for vents -		- - -	8 4	Smooth-bored guns.	1' long; 10" wide.
Axes, helved { felling -		0 4 0	6 0	} General service -	Charged as tools, in-trenching.
„ { pick -		0 2 3	8 8		
Axle, iron, transporting, with wheels.			437 0	Moving traversing platforms.	Approved 13 Feb. 1861. Described at p. 275.
B.					
Bag, for fuzes - - -			0 2	For Boxer's fuzes -	Described at p. 100.
Balls, light - - -			various	} Siege and garrison.	
„ smoke - - -			do.		
Bar, capstan - - -			39 0	Part of crab capstan.	
Barrel, budge - - -			10 0	Carrying powder, &c.	See p. 117.
Barrels, common and improved.			various	For powder and cartridges.	See table, p. 402.
Barrel jack. See Jack.					
Barrow, hand - - -		0 9 9	19 8	Carrying barrels, &c.	5' 3" by 2'.
Barrow, { single - - -			56 0	} Carrying powder.	
„ { double - - -			140 0		
powder* { covered - - -			168 0		
Barrow, wheel - - -		0 15 3	66 0	General service.	
Basket, half bushel -				Do.	
Beam-hooks - - -			8 4	13-inch mortars -	For lifting the shells.
Bearers, for hot shot -			9 8	Loading hot shot.	
„ for 110 lbs. shot -			9 11	Armstrong 110-pr. gun	Pattern approved 4th March 1862.
Beds, { iron - - -			various	Heavy mortars -	} See table, p. 375.
„ { mortar { wood - - -			do.	Light mortars -	
Bench for furnace -			110 0	Hot shot furnace.	
Bill, hand, or billhook -		0 2 0	1 12	Intrenching tool -	Charged as hook, bill.
Bits, for borers - - -			0 0 $\frac{1}{2}$	Boring fuzes -	Shell implements.

* Occasionally in charge of the artillery at coast stations. For list of articles see Circular 793, par. 633.

* A shoulder strap for powder barrows was approved 12 June 1862; it is made of 2-inch stout web, and weighs from 1 to 2 oz.; Circular 781, par. 554.

ARTILLERY.

GENERAL LIST.

Name.	No. of Drawing.	Value.	Weight.	Service.	Remarks.
Bits, for boring rockets -		£ s. d.	lbs. oz.	Rocket implement.	
„ braces -			0 1½	Shell implement.	
Blanket -		0 5 6	3 12	Field equipments -	Carried on ammunition boxes of field carriage. See lists.
Block, shell -			various	Shell implement -	The 15-in. and 14-in. blocks were adopted in 1861. Circular 704. par. 285.
Blocks for tackle.	{	15-in.* { treble -	108 0	} Moving heavy ordnance.	} See page 357.
		„ { double -	72 0		
		14-in.* { single -	-		
		„ { treble -	52 0		
		12-in.* { double -	39 0		
		„ { single -	23 0		
		8-in.* { double -	12 0		
		„ { single -	10 0		
		8-in. { double -	9 0		
		strapped { single -	6 0		
15-in., iron strapped, snatch.		37 0			
Borer { hand -		0 4	For common and shrapnel fuzes.		
„ { hook -		0 5	„ „	See table, p. 392.	
Bottoms, wooden			various	Spherical projectiles -	See pp. 381, 400.
Boxes, tin, wood, and zinc			do.	do.	
Brace (fuze implement)			0 11	Boring mortar fuzes.	
„ rocket implement			0 13	Boring rocket fuzes.	
Breech-screw -			various	Armstrong guns.	
Brush, Turk's head -		0 3 0	1 2	Rocket equipments.	
„ water -		0 1 9	0 13	Cleaning field carriages.	
Bucket, leather, sponge -			6 4	Armstrong guns -	11½" diam. at top; 10" deep.
„ water † -		0 7 3	3 0	Field equipments -	Holds 1½ gallons.
Bursters, iron -				20-pounder and smaller segment shells.	
C.					
Camp kettle -		0 3 9	8 8	Field equipments -	Part of camp equipage.
Can, tin, oil, lubricating -			various	Armstrong guns.	
Cap, percussion -				S.A. ammunition and signal lights.	Weight 29 ounces per 1,000.
„ wood, for mortar -			various	To keep the bore dry.	
„ canvas, for sponge -			do.	To protect the sponge head.	Different size for each sponge.
Capstan, crab (complete)		9 1 7	4 cwt.	Moving heavy ordnance. See p. 357.	
Carcasses -			various		See table at page 397
Carriages {	{	garrison -	do.	} Short ranges -	} See table of ordnance.
		travelling -	do.		
		miscellaneous -	do.		
Carronades -			do.		See table, page 375.
Carts -			do.	Packing cartridges in ammunition boxes.	Issued in sets, with the carriages complete.
Cartouches, canvas -			do.		

* Bothway's pattern.

† Cavalry pattern.

GENERAL LIST.

Name.	No. of Drawing.	Value.	Weight.	Service.	Remarks.	
Cartouches, leather -		£ s. d.	lbs. oz. various	For Armstrong limbers.	Different size for each nature of gun.	
Cartridges. { " " large			5 4	Field and siege.		
{ ball, 2½ drs. -			0 1½	Ammunition reserves	Carried by the artillery.	
{ calico -			various	For bursting charges	See page 97.	
{ flannel, or serge -			do.	For service charges -	} See table, page 391.	
{ with wads -			do.	Armstrong field guns		
Case, leather, cartridge -			do.	Loading heavy guns -	See table, page 407.	
Case, wood, metal-lined.			48 0	For filled cartridges-	See p. 402.	
Case, for vent piece, leather.			2 15	40-pounder Armstrong gun, field service.		
Chain, ⅝-inch -			105 0	Siege ; unloading transports.	In lengths of 5 fathoms each.	
Chalk and cord -			1 0	For laying mortars.		
Clipper, portfire -			0 12	Cutting portfires -	Pattern approved 11th Nov. 1859.	
Cloth, hair -			40 0	For magazines -	Pattern of 7/1/62.	
" sponge -			0 2	For cleaning Armstrong guns.	Pattern of 11/11/59.	
Coating, for sponges -			various	Armstrong sponges -	Issued loose.	
Coin. See p. 270, note.						
Collimator, complete -			52 0	Laying guns -	See page 278.	
Composition, Valenciennes.			—	Incendiary purposes	See page 98.	
Compressor -			various	Sliding carriages -	See page 271.	
Copper, breech -			do.	Armstrong guns -	Part of the gun ; also issued spare.	
Cordage, per fathom.	6-inch, white		7 15	Slinging heavy guns.	12½ fathoms form a picket line.	
			4½ " tarred	4 6		Hauling ropes, &c.
			4 " "	3 7		Parbuckles, &c.
			4 " white	3 7		Sheers and gys.
			3½ " "	2 10		Fall of gyn.
			3 " tarred	1 15		Lashings of sheers, &c.
			2½ " "	1 6		Moving heavy guns.
			2 " "	1 0		Do.
			1½ " "			Lashings, box handles.
			1 " "			Lashings.
			¾ " "			Do. - -
			Hambro' line, skein	3 0		General service.
			marline "	1 0		Do.
			spun yarn, coil -	59 0		Do.
twine, ball -	0 8	Do.				
Cord, piece of -	0 2	Lifting 8-inch shells.				
Couple, for traces -	0 0 0½	Field equipments.				
Cover, canvas, for carriages.*		various	Do.			
" for vent slot -		do.	Armstrong guns -	20-pr. and larger guns.		
" paper -		do.	Packing cartridges -	See p. 97.		
Crab-capstan. See Capstan.						

* Covers for Armstrong gun carriages are discontinued ; Circular 793, par. 630 ; 7th Aug. 1862.

ARTILLERY.

GENERAL LIST.

Name.	No. of Drawing.	Value.	Weight.	Service.	Remarks.	
Holdall, leather - -	-	£ s. d.	lbs. oz.	Armstrong field guns	Pattern of 5/5/60.	
Holder, shell - -	-		various	Shell implement -	See Nos. 1 and 5 sets.	
Hook, bill - -	-	0 2 0	1 12	Field equipments -	Part of camp equipage.	
" reaping - -	-	0 1 3	1 0	Do. - -	Do.	
Hooks, beam - -	-		8 4	Lifting 13-inch shells	} For mortars.	
" hand - pair	-		2 0	" 10-inch "		
Hoops, bale - -	-		4 0	For covers of wagons	Part of forge wagon, &c.	
Horn, powder - -	-			For priming guns.		
Horse-shoes - -	-		6 0	Field equipments -	In sets of 4 with nails.	
Hospital, or medicine, cart	-	51 18 0	11½ cwt.	Do.		
Howitzers - -	-		various	Shell firing - -	See table of ordnance.	
I.						
Implements.	{	Boxer's (shell and fuze).		various	Preparing shells and fuzes.	See lists at pages 208 and 361.
		rocket - -		7 0	Preparing rocket shells	See list at page 193.
		facing; special, &c. for examining ordnance.		various	Armstrong guns -	See pp. 212, 217.
		Ironwork, set of -		3¼ cwt.	Garrison - -	See list at page 364.
Iron, for farriers and smiths.	-		various	Field repairs - -	See list at page 222.	
Irons, { garrison set -	-		do.	Do. - -	See pp. 225, 263.	
priming* { field do. -	-		0 9	Heavy ordnance.		
			0 8	Light do.		
J.						
Jack, lifting	{	barrel -		71 0	Siege and position batteries.	With improved ratchet lever. See Cir. 639, par. 112.
		common scre -		0 10 6	Field equipments. Obsolete.	
K.						
Kettle, camp, Flanders -	-	0 3 9	8 8	Field equipments -	Part of camp equipage.	
Key, for fuze hole plugs	-		0 3½	Shell implement.		
" powder cases -	-		0 2	Opening cases and improved barrels.		
" shells (Armstrong's).	-		0 6	Removing fuze hole plugs.	Pattern approved 8th Jan. 1862.	
Knife, laboratory -	-		0 3½	Field equipments, &c.		

* The garrison set contains 1 bit, 11" long; 1 pricker, 11" long; and 1 drift 10½" long.
The field set " 1 do. 7½" " 1 do. 7½" " and 1 do. 5½" "
The lengths being exclusive of the ring or handle at the end of each.

GENERAL LIST.

Value.	Weight.	Service.	Remarks.
<i>l. s. d.</i>	<i>lbs. oz.</i>		
	154 0	Used in magazines -	Length 14 feet; approved 22/10/62.
	16 12	<i>See p. 196</i> -	Issued in pairs.
	various	Loading guns -	For loose powder.
0 2 0	2 4	General purposes.	
		For magazines.	
0 1 0	1 12	General purposes.	
	2 3	Do.	
	0 1	Firing friction tubes.	
	0 10	For firing vollies -	Made of quick match.
0 1 10	0 6½	Field carriages -	For mounted men to hold on by.
		Siege and garrison.	
	7 8	} Exercise of heavy	4 feet long.
	25 4	} guns. <i>See p. 115.</i>	
	8 0	110-pounder guns.	
0 6 0	20 0	Field, siege, and garrison.	
0 5 3	15 0	For gyn, sling cart, and sling wagon.	6' 9" long.
	0 4½	Siege equipments -	<i>See page 102.</i>
	various	For mortars -	<i>See table, p. 397.</i>
	do.	Travelling carriages -	<i>See table, p. 128.</i>
	280 0	Traversing platforms	<i>See p. 275.</i>
	various	Travelling and garrison carriages.	<i>See table, p. 384.</i>
0 2 11	3 0	General service.	
	1 0	Do.	
	12 8	Field equipments -	<i>See rope, picket, p. 424</i>
	3 0	Holding slow match.	
0 0 9	1 0	Tool chests, &c.	
0 0 7	0 6		
	1 5	For ammunition boxes.	
		Firing detonating tubes.	Out of use.
	various	Armstrong guns.	<i>See table, p. 392.</i>
	86 0	Siege and garrison -	For ammunition.
	3 2	Field carriages -	<i>See p. 381.</i>
	0 11	Fixing fuzes -	<i>See lists of implements.</i>
		Siege and garrison -	No service pattern.

" for heavy guns. Tarred line substituted for white line in 1862, Circular

5" in diameter, 2" thick, and with a track of 5".
 and 1' 9" wide, with a sloping lid covered with canvas : it is furnished ; its extreme height is 2' 10", and the width at the axletree is 3' 4".

ARTILLERY.

GENERAL LIST.

Name.	No. of Drawing.	Value.	Weight.	Service.	Remarks.
Marline, skein of -		£ s. d.	lbs. oz.	General service.	
Match, quick { 4-thread			1 0		
{ 6 "			-	Igniting powder, &c. -	5½ yards (6-thread)
{ 10 "			-	Lighting portfires -	weigh about 1 oz.
" slow -				Driving pickets, &c. -	See p. 102.
Maul, wood -		0 2 4	10 5	Measuring powder.	From 1 oz. to 4 lbs.
Measures, copper, set of			6 8	Vertical fire -	See table of ordnance.
Mortars -			various		
N.					
Needle, laboratory, brass		-	-	Sewing up cartridges.	Pattern of 7/11/60.
O.					
Oil can -			various	Armstrong guns.	
Ordnance { carronades			do.	See table, p. 370.	
{ guns					
{ howitzers					
{ mortars					
P.					
Pawl -		0 2 0	6 0	Sling cart or wagon -	Two with each.
Pedestal -			various	Garrison carriages -	See table, p. 385.
Pick-axe* -		0 2 3	8 8	General service.	
Picket, park (see also post).		0 3 6	11 0	Operations with heavy guns.	
Picket line, or rope -		0 17 9	12 8	Picketing horses -	12½ fathoms long.
Piece, vent -			various	Appurtenance of Armstrong guns.	See the lists of equipment.
Pin, lynch -			do.	Travelling and garrison carriages.	
Pincers, carpenters' -		0 1 6	1 1	General service -	Part of field equipments
Plank { 4' by 8" -			23 0	For pointing rods -	See p. 343, note.
{ 12' by 1" -		0 10 0	70 0	Siege travelling carriages.	Placed under the wheels on soft ground
{ 10' by 17" -				Moving heavy guns -	See page 358.
Platform, siege { Alderson's -		13 9 0	various	Guns and mortars.	
{ Clerk's -			13 cwt.	Guns only.	
{ Common -			various	Guns and mortars.	
{ Madras -			do.	Guns only.	See table, p. 366.

* Usually entered as axe, pick ; and charged with tools, intrenching.

GENERAL LIST.

Name.	No. of Drawing.	Value.	Weight.	Service.	Remarks.					
		£ s. d.								
Plugs, for shells	Platform, traversing			casemate { new - - - 27 cwt.	All guns.					
				casemate { old - - - 21 "	8-inch to 18-pr. guns.					
				common - - -	Obsolete.					
				dwarf { new pattern - - - 33½ "	All guns.					
					dwarf { old pattern. - - - 32½ "	68-pounder or 10-inch guns.				
				fuze-hole, metal	Armstrong's			24½ "	8-inch to 18-pounder guns.	
								0 4	Common Armstrong shells.	Also for large segment shells.
				loading hole, metal-wood, covered with serge.	common - - -			0 3	20-pounder and smaller segment do.	
								0 2½	Common spherical do.	
				Plug, metal, with lanyard	shrapnel - - -			0 2½	Shrapnel shells - - -	Wood plug attached.
0 0½	Do. - - -	Two sizes.								
Plug, for vents - - -				0 7	Forsegment shells with iron bursters.					
Plummet (with silk line)				0 0½	Armstrong shells - - -	For drill purposes.				
Pocket, leather, for tubes, with strap.				1 1	Preserving ordnance.	Adopted 25/9/61.				
Pointing rods, with plank		0 5 9	23 0	0 11	For laying mortars.					
Pole, bullock, (10 feet 10 inches long).			43 0	0 11	Field, siege, and garrison.	Worn round the waist ; pattern of 19/3/62.				
Pole, tent, (in two pieces)			12 0	0 11	For laying mortars.	Two iron rods fixed upright in a board.				
Portfire	common L.S.			0 5½	See page 343.					
				0 3	Siege carriages - - -	Approved 8 Aug. 1860. Circular 639, par. 111.				
Post, picket	slow, blue - - -			5 0	Camp equipage - - -	For field equipments.				
				59 0	Firing common tubes, &c.	Described p. 104.				
Powder	A 4 - - -			0 3	Do. - - -					
				57 0	Picketing horses - - -	New pattern 21/12/61.				
				55 8	Service charges of Armstrong guns.	The weight is per cubic foot.				
Powder barrel - - -	fine grained (FG) - - -			57 0	20-pr. and smaller segment shells.	Special sized grain.				
				55 8	Service charges of ordnance.	Also for bursting shell.				
" case - - -	large grained (LG) - - -			55 8	Bursting charges of shrapnel shells.					
Powder horn - - -	Medium (MR) - - -			- - -	For powder, &c. - - -	See table, page 402.				
" measures - - -				6 8	Priming guns.					
Preventor rope - - -				17 4	See Measures.					
Pricker, for rivet holes - - -				0 1	Traversing platforms.					
" for guns - - -				0 2	Shell implement - - -	See page 361.				
Primer - - -				0 0½	Included with priming irons.					
Priming-irons. See Irons.				0 0½	See page 105.					
Prolonge { heavy - - -	light - - -	0 12 0	8 8	13 0	Light ordnance - - -	3-inch rope.				
				8 8	Heavy ditto - - -	2½-inch rope.				
Prypole, with rope - - -		0 7 4	30 0	0 0	Part of sling cart.					
" 18 feet, or 16 feet			- - -	0 0	Part of triangle gyn.					
Punch, for vent - - -				various	Clearing vents - - -	See table, p. 408.				
" for bottoms - - -				1 6	For riveting shells - - -	Shell implement.				

D D

ARTILLERY.

GENERAL LIST.

Name.	No. of Drawing.	Value.	Weight.	Service.	Remarks.
		£ s. d.	lbs. oz.		
Q.					
Quadrant, brass, with case			5 12	Laying rocket tubes, &c.	One with each rocket carriage.
" spirit level -		14 0 0			
Quick-match -				Igniting powder, &c.	See p. 102.
Quill-tube -			0 0	Priming ordnance -	See tubes, p. 112.
Quoins { gun -			various	Garrison carriages -	Large and small.
{ mortar -			do.	Mortar beds -	Fixed to the beds.
R.					
Rammers, for smooth-bore guns, with staves.			do.	Smooth-bored ordnance.	} See lists of equipment.
Rammers, club -			do.	Armstrong guns -	
Rammer, earth -			9 8	Moving heavy ordnance.	See page 359.
Ratline, coil of -			34 0	Do.	
Reaping hook -		0 1 3	1 0	Field equipments -	Charged with tools, intrenching.
Rectifier, for rivet hole -			0 3	Shell implement -	No. 2 set.
Reflector, metal -				Lighting magazines -	Not charged as an artillery store.
Rimer for fuze holes -			various	Shell implement -	Two sizes. See p. 361.
Rings, breech, ventpiece, tappet, &c.			do.	Parts of Armstrong guns.	
Rivets for bottoms -			0 2	Spherical projectiles.	
Rockets { fire, or war -			various	General service -	} See table, p. 106.
{ signal -			do.	Occasional service -	
Rods, iron, pointing -			0 8	Laying mortars. See page 343.	
Rod, cleaning -			various	Armstrong guns -	See p. 115 and lists of equipment. Patterns approved 27/3/62.
Roller, wood, shifting -		0 4 7	10 0	Field equipments -	9" long, 6" diameter.
" " 3 feet -		0 5 1	39 0	Siege and garrison -	See page 359.
" " 4 feet -		0 6 5	62 0	Do. do.	
Rope, drag { heavy, pair -			21 0	Heavy guns -	Of 3-inch rope.
{ light " -		0 6 0	7 12	Light do. -	2-inch rope.
" preventor -			17 4	Traversing platforms.	
" picket -			12 8	Picketing horses -	See p. 424.
" See also Cordage.					
S.					
Sack, corn -		0 1 6	4 12	Field equipments -	Part of camp equipage.
Saddle, metal -				110-pounder Armstrong guns.	Described at p. 281.
Sandbag { common -			0 10	} Used with sheers, &c.	
{ tarred -			1 12		
Saw, hand, with case -		0 11 6	3 5	Field equipments -	Part of camp equipage.
Scale, boxwood, or brass			0 3	Boring rockets -	Described at p. 193.
" tangent. See Sights.					

MATÉRIEL.

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GENERAL LIST.

Name.	No. of Drawing.	Value.	Weight.	Service.	Remarks.
Scales, for weighing powder, &c.		£ s. d.	lbs. oz.	Preparing ammunition.	
			8 6		
Scissors { laboratory -		0 0 6	0 4	Field equipments.	Small size.
gun metal, 9½ inch.				Magazines - -	Approved 17/10/61.
Scraper, for shells (copper)			various	Cleaning shells -	See lists of equipment.
" for shot			0 6	Cleaning hot shot.	
Screw, breech - -			various	Appurtenance of the Armstrong gun.	See lists of equipment.
" elevating - -			do.	Gun carriages - -	} See table, pp. 381, 383.
" traversing - -			do.	Armstrong ditto - -	
" for sights { fixing			0 2	Millar's sights.	
preserving			0 0½	Do.	
" for tangent scales			0 1	All howitzers and brass field guns.	One spare screw for each piece
Screwdriver - -			various	Shell and rocket implements.	
Screw jack. See Jack.					
Sections of fuzes - -			do.	For instruction.	
Serge* - - - -				For service cartridges.	
Setter for fuzes - -				Fuze implement - -	In two sizes. See p. 362.
Shaft { near - - - -		0 14 10	40 0	Field and siege carriages.	See also p. 382.
single { off { new pattern		1 11 10	52 0	Do. do.	
old "		1 12 9		Do. do.	
Shafts, pairs, framed -			various	Platform wagons, &c.	See table, p. 382.
{ oblong			do.	Armstrong guns - -	} See table of dimensions, weights, and contents, p. 393.
{ common { spherical.			do.	Guns and howitzers -	
Shells { Martin's			do.	Shell guns - - - -	
mortar - - - -			do.	Large mortars - - -	
segment			do.	Armstrong guns - -	
shrapnel - - - -			do.	Guns and howitzers -	
Shell cart - - - -			961 0	8-inch and 10-inch mortar carriages.	Forms the limber.
Shoe, drag - - - -			various	Travelling carriages -	See table, p. 381.
Shoes, horse (in sets of 4, with nails).		0 1 10	6 0	Field equipments - -	In boxes containing 10 sets each.
Shoes, magazine, pair -			1 12	For magazines - - -	Pattern of 7/7/60.
{ case or canister -			various	Guns, howitzers, and carronades.	} See table of dimensions and weights at page 395.
Shot { grape - - - -			do.	Guns and carronades	
hollow - - - -			do.	Shell guns - - - -	
solid { oblong - - -			do.	Armstrong guns - -	
spherical - - - -			do.	Guns and carronades	
sand - - - - - -			do.	Filling case and grape shot.	15 sizes, from 1½ oz. to 4 lbs.
Shot bearer { spherical -			9 8	For carrying hot shot.	
Armstrong			9 11	110-pounder gun - -	Pattern of 4/3/62.
Shovel - - - - - -		0 2 9	4 12	General service - -	Charged with tools, in-trenching.

* A blue serge for Armstrong drill cartridges, 41 inches wide, and weighing 10½ oz. per yard, was approved 25th Aug. 1862, Circular 793, par. 636.

ARTILLERY.

GENERAL LIST.

Name.	No. of Drawing.	Value.	Weight.	Service.	Remarks.		
		£ s. d.	lbs. oz.				
Shovel, copper - - -				In magazines.			
Sights. {	Arm- strong's {		various	} Armstrong guns -	} See pp. 80, 86, and the lists of equip- ment.		
						dispart - - -	do.
						ratchet - - -	do.
						tangent - - -	do.
						trunnion - - -	do.
						do.	do.
} Millar's {	fore - - -		do.	} Siege and garrison guns.	} See pp. 80, 86, and the lists of equip- ment.		
						hind - - -	do.
						brass - - -	do.
						wood - - -	do.
				Field ordnance.			
				Siege and garrison guns.			
Signal light - - -			0 4½	Siege and garrison -	Described at page 112.		
Sleighs, artillery - - -			various	Field guns in Canada -	Described at page 131.		
Slide, hexagon - - -			do.	Part of tangent sight.			
" for carronades - - -			do.	Garrison - - -	See table of carriages.		
Sling - - -			do.	Mounting heavy ord- nance.	See lists for triangle gyn and sling wagon.		
Sling cart - - -		38 10 0	18 cwt.	Transporting heavy ordnance.			
Sling wagon - - -			33½ "	Do.			
Slippers, magazine, pair - - -			1 12	Garrison - - -	See also Shoes.		
Slow match - - -				Lighting portfires.			
Smoke balls - - -			various	Fired from mortars -	Described at p. 112.		
Socket, for lubricators - - -				70-pr. and 110-pr. Armstrong guns.	To fix the lubricating wad to the cartridge.		
Spade - - -		0 2 9	6 0	General service -	Charged with tools, in- trenching.		
Spanner, {	15-inch - - -	0 12 0	3 7	} Do. - - -	} Substituted for the wrench hammer.		
						9 "	
Spike, common - - -			0 1½	Disabling ordnance.			
" marline - - -		0 0 6	0 13	Making splices, &c.			
" spring - - -			various	Temporarily disabling ordnance.	See p. 408.		
Sponges - - -			do.	All ordnance- - -	See lists of equipment.		
Sponge coating - - -			do.	Armstrong guns -	Issued loose.		
" cloth - - -			0 2	Do.	For cleaning machin- ery, &c.		
Spunge. See Sponge.							
Spun yarn, coil of - - -			59 0	See p. 360.			
Stand, for hot shot - - -			110 0	For shot furnaces.			
Stave, for side arms - - -			various	Issued spare - - -	See p. 115, and lists of equipment.		
" vent piece - - -			3 2	110-pounder gun.			
Stick, {	26-in. long - - -		0 9	} Holding portfires.	} Approved 18/11/62.		
						19-in. " - - -	0 7
Stick, rocket - - -			various	Do. (new pattern)	See table, p. 106.		
Stoolbed - - -			do.	For rockets - - -	See table, p. 385.		
				Part of garrison gun carriage.			
Store cart - - -		33 5 0	11½ cwt.	Field and siege.			
Store wagon - - -		51 12 0	22½ "	Do. do.			
Strap for fuze box - - -			0 6	Worn round the waist.			
" for projectiles - - -			0 7	Field equipments -	40-pounder Armstrong gun only. See p. 154.		
" for side arms, &c. - - -			various	Field carriages -	See pp. 376-380.		
" for tube pocket - - -			0 6	Worn round the waist	3' 8" long.		
Swingletree - - -		0 5 9	5 12	Travelling carriages -	2' 4" long.		

GENERAL LIST.

Name.	No. of Drawing.	Value.	Weight.	Service.	Remarks.
		£ s. d.	lbs. oz.		
T.					
Tackles - - -		- -	various	Moving heavy guns -	See page 360.
Tallow - - -				Used in boring rockets.	
Tampion, or Tompion - -			various	Preserving ordnance -	Placed in the bores.
Tangent scale - - -			do.	Laying ordnance -	See lists of equipment.
Tap, screw, for fuze holes			do.	Shell implement -	See lists.
Tappet ring - - -			do.	Armstrong guns -	See lists of equipment.
Target, floating - - -			4 cwts.	For gun practice -	Described at p. 123.
Tarpaulins - - -			various	Siege -	For covering stores.
Tent, circular, linen, complete.		3 15 0	70 0	Field equipments -	Part of camp equipage. See p. 425.
Thumbstall - - -			0 0½	Loading guns -	See p. 115.
Ties for lynch pins, per doz.		0 0 4	0 3	Field equipments.	
„ for sling - - -			0 2	Sling cart and wagon.	
Tompion - - -			various	Preserving ordnance -	Described at p. 272.
Tongs, iron - - -			0 16	Hot shot furnace.	
„ lifting shell { 12-pr.			1 2	Armstrong field	For Armstrong guns.
„ „ { 20-pr.			2 8	equipments.	Introduced 7/8/61.
„ loading - - -			various	For howitzers.	
Tools, intrenching* - -			do.	General service.	
Trench cart - - -		14 3 2	629 0	Carrying stores, &c.	
Trucks { wood - - -		0 1 6	8 8	For feet of gyn	Three to a set.
Trucks { iron - - -			various	Gun carriages -	See table, p. 385.
Trucks { iron, hollow-soled.			91 0	Dwarf traversing platforms.	For raised racers.
Tub - - -			97 0	With hot shot -	For wetting wads.
Tubes { common, brass -			0 0½	Firing ordnance -	} Described at p. 112.
Tubes { friction, copper -			0 0½	Do. -	
Tube, rocket - - -			various	Firing rockets -	See p. 106.
Tube pocket, with strap			0 11	Worn round the waist	
Twine† - - -			- -	Choking cartridges. See also p. 360.	
U.					
Utensils, for furnace - -			- -	Preparing hot shot -	See page 348.
V.					
Vat (various sizes) - -			various	For packing stores.	
Vent piece - - -			do.	Armstrong guns -	See lists of equipment.
W.					
Wads { coal dust - - -			various	With reduced charges of chambered pieces.	} See p. 113, and lists of equipment.
Wads { papier maché - -			do.	Spherical shells -	
Wads { grummet - - -			do.	Iron guns with shot -	
Wads { junk - - -			do.	Red hot shot -	

* Under this head are generally included axes (felling and pick), spades, shovels, billhooks, reaping hooks, and saws.

† Twine for choking cartridges is in balls containing about 160 yards, and weighing ½ lb.; Circular 793, par. 637; approved 28th Aug. 1862.

ARTILLERY.

GENERAL LIST.

Name.	No. of Drawing.	Value.	Weight.	Service.	Remarks.
Wadhook - -	-	£ s. d.	lbs. oz.	Smooth-bored guns -	See lists of equipment.
Wadmiltilt - -	-		33 0	For covering powder.	
Wagons - -	-		various	Carrying ammunition and stores.	
Washer, common, or drag			do.	Travelling carriages -	See table of carriages, p. 375.
Weights, set of - -	-		do.	For weighing powder.	
Wheels, wood - -	-	-	do.	Travelling carriages -	See table at page 383.
Wheelbarrow - -	-	0 15 3	66 0	General service.	
Worsted - -	-		0 6	Making up cartridges.	
Wrench, box - -	-		14 10	Shell implement.	Pattern approved 15th Feb. 1861.
" cross-handled -	-		0 8	For traversing plat- forms.	
" " sights -	-		0 8	For Millar's sights.	
Y.					
Yarn, spun, coil of -	-		59 0	See p. 360.	

CAMP EQUIPAGE.*

Camp equipage comprises the various articles necessary for the accommodation of men and horses in camp; it therefore comprehends tents, blankets with their waterproof covers, camp kettles, buckets, corn sacks, articles for picketing horses, and all kinds of intrenching tools. Pack saddles are included under the same heading, on account of being only required for service in the field. Wooden canteens and canvas havresacks formerly belonged to the camp equipage, and have hitherto been retained in lists under that heading, but they are now issued to troops in barracks, and regularly worn as part of the personal equipment.

The following pages contain a list of the articles supplied to artillery, and the various proportions in which they are issued. Packages containing camp equipage are generally marked with two black triangles; but intrenching tools are distinguished by a black square, and pack saddles by one horse shoe.

LIST OF ARTICLES FOR ARTILLERY SERVICE.

Name.	Price.	Weight.	Remarks.	
Axe, felling, with handle -	£ s. d. 0 4 0	lbs. ozs. 6 0	A case containing 50 measures 3' 0" by 2' 1" by 1' 6", and weighs 353 lbs.	
Axe, pick, " -	0 2 3	8 8	Issued loose. Length, 3'.	
Bag, corn, two-bushel -	0 1 6	1 2	A bale of 100 measures 2' 3" by 1' 6" by 1' 1", and weighs 120 lbs.	
Bag, nose, canvas -	0 1 9	1 5	A bale of 100 measures 2' 1" by 1' 7" by 1' 5", and weighs 145 lbs.	
Barrow, wheel -	0 15 3	66 0		
Blankets {	field service (grey), for men.	0 5 6	3 12	Size, 7' 2" by 5'. A bale of 25 measures 2' 7" by 1' 8" by 1' 5", and weighs 104 lbs.
	horse or saddle (white)	0 14 6	7 8	Size, 7' 8" by 6' 4". A bale of 25 measures 2' 8" by 2' 2" by 1' 9", and weighs 196 lbs.
Bucket, leather, for water (cavalry pattern).	0 7 3	3 0	Diameter at top, 10"; at bottom, 7"; depth, 10"; contents, 6 quarts. Issued by twentys, fixed one into another, and covered with matting.	
Canteen, wooden (latest pattern, 24th December 1861).	0 1 3	1 6	Diameter, 7"; depth, 4"; contents, 3 pints. A case containing 50 measures 3' 4" by 1' 11" by 1' 5", and weighs 126 lbs.	
Cart, water -	16 5 0	720 0		
Chain, fetlock, with double strap (latest pattern, 7/10/62; Circular 815).	0 0 10	0 15	Length of chain, 21'. Issued unpacked.	
Colours, {	flag (red shalloon) -	0 0 6	0 1½	8' long.
	poles -	0 1 3	2 12	
	camp { cases (ticken) -	0 0 3	0 1½	
Cord, forage -	0 0 6	0 10	Length, 21". A bale of 250 measures 2' 1" by 1' 11" by 1' 8", and weighs 168 lbs.	
Covers, waterproof {	blanket -	0 5 6	2 2	Of vulcanized india-rubber, with six eyelet holes. Size, 6' 6" by 3'. A bale of 25 measures 1' 10" by 10" by 10", and weighs 60 lbs. (Approved 21/1/62.)
	horse or saddle -	0 5 3	1 12	Of blue camlet, waterproof. Size, 4' 3" by 3' 5". A bale of 25 measures 1' 7" by 1' 4" by 0' 10", and weighs 49 lbs. (Approved 22/10/61.)
File, for cross-cut saw -	0 0 6½	0 8½	9" long.	
Forage cord. See Cord.	-	-		
Handles, spare, for intrenching tools.	-	-	Tied together in bundles, and issued as required.	
Hatchet, hand, American -	0 2 3	2 0	A case containing 100 measures 2' 5" by 1' 6" by 1' 3", and weighs 234 lbs.	

* From Circular 869, 6th July 1864, and information supplied by the Military Store department.

ARTILLERY.

CAMP EQUIPAGE.

LIST OF ARTICLES FOR ARTILLERY SERVICE—*continued.*

Name.	Price.	Weight.	Remarks.
	£ s. d.	lbs. oss.	
Havresack, canvas - - -	0 1 0	0 10	A bale of 250 measures 2' 1" by 1' 7" by 1' 5", and weighs 161 lbs.
Hobbles, ox hide - - -	0 7 6	1 1	Pattern provisionally approved 1/8/61, Cir. 724.
bill - - -	0 2 0	1 12	A case containing 50 measures 1' 8" by 1' 3" by 1' 0", and weighs 108 lbs.
Hooks { reaping (<i>see next page</i>)	0 1 3	1 0	A case containing 100 measures 2' 2" by 1' 9" by 1' 5", and weighs 134 lbs.
Iron, picketing - - -	0 0 7	2 8	2' long, with a ring.
Kettle, camp, Flanders, large -	0 3 9	8 8	Diameter at top, 12"; at bottom, 11"; depth 12"; contents, 12 quarts. Issued in sets of five fixed one into another and secured by wooden "cradles." One set thus packed measures 2' 6" in length by 1' 2" in diameter, and weighs 49 lbs.
Lantern { horn - - -	0 2 0	2 4	
red - - -	1 0 0	2 14	
Mallets, wood { for picket posts -	0 2 6	8 0	Issued unpacked. Length with handle, 3'.
for tent pins -	0 0 6	2 0	Issued with the pins.
Nets, forage - - - pair	0 2 0	2 0	A bale of 100 single nets measures 2' 4" by 1' 6" by 1' 6", and weighs 112 lbs.
Pins, tent { large - per 100	0 8 0	112 0	A proportion of pins, containing the number required for use and a few spare, is issued with each tent complete.
small - - - "	0 2 6	22 0	
Poles, tent - - -		various	<i>See description of tents.</i>
Posts, picket { long - - -	0 3 0	9 0	5' long, 3" in diameter } Issued unpacked.
short - - -		5 0	2½ " 3 " } <i>See next page.</i>
Ropes, heel, cotton - - -	0 2 9	1 13	A bale of 50 measures 2' 0" by 1' 6" by 1' 6", and weighs 102 lbs.
Rope, picket, 3-inch tarred* -	0 5 0	12 8	A piece 500 feet long, as issued, measures 3' in length by 1' 1" in diameter, and weighs 84 lbs.
Sack, corn, five-bushel - - -	0 1 6	4 12	A bale of 25 measures 2' 6" by 1' 4" by 1' 3", and weighs 117 lbs.
(<i>See also Bag.</i>)			
Saddle, pack, complete - - -	5 2 6	64 0	Including baggage straps and leading bridles. Issued in cases containing two each, and measuring 3' 6" by 2' 9" by 2' 7"; marked with a black horse shoe.
Saw, cross-cut, 6½ feet long -	0 7 6	9 1	
Sheet, ground, waterproof. <i>See Cover.</i>			
Shovel, with handle - - -	0 2 9	4 12	3½' long. Issued unpacked.
Sickle (<i>see next page</i>) - - -	0 0 10	0 10	A case containing 200 measures 2' 2" by 1' 9" by 1' 5", and weighs 157 lbs.
Spade, with handle - - -	0 2 9	6 0	
Stone, whet or rag - - -	0 0 2	1 0	
Stove - - -			Used in standing camps only.
Strap, buff leather, for canteen -	0 1 3	0 5	Issued as required. A ¼-ton vat will hold 500 6' 1" long.
Surcingle, web, with pad, artillery pattern. (<i>Approved 5 9.62.</i>)	0 2 10	1 3	Worn with the blankets.
Tents, { hospital marquee - - -	28 0 0	500 0	} <i>See description next page.</i>
officers' " - - -	10 0 0	180 0	
laboratory - - -	11 10 0	250 0	
circular, single - - -	3 15 0	70 0	
Tools, intrenching - - -			The various tools are given separately.
Vases, large and small - - -		various	For tent poles. Issued with the tents complete.
Waterdeck. <i>See Cover, horse.</i>			

* The picket ropes furnished ready for use are each 25 yards long; Cir. 759 par. 513.

CAMP EQUIPAGE.

LIST OF ARTICLES FOR ARTILLERY SERVICE—*continued.*

The *hospital marquee*, which is used also as a mess tent, consists of a double roof, a wall five feet high, a ridge pole, and three upright poles. The wall is in eight separate lengths, and each of the poles in two pieces. The width inside is 15 feet, and the extreme length is 30 feet, the ends being semi-circular. A bottom or floor of painted canvas, in four pieces, is issued in addition when the tent is used as a hospital.

The *officers' marquee* has a double roof, (of linen duck outside and ticken inside,) a double wall of similar materials, a ridge pole, two upright poles, and two door poles; the outside wall and each of the poles are in two pieces.

The *laboratory tent* is circular, and has a separate wall in two pieces. The single *circular* or bell tent has only a roof, with a curtain at the bottom a few inches wide. There is a wooden flooring, made in four quadrant-shaped pieces, for use in permanent camps.

Tents are now made of linen duck, and the cotton ones will be obsolete when the present stock is worn out. Double circular tents, with two roofs of linen, or one of cotton and one of linen, are occasionally issued. The various tents, when ready for transport, consist of the following packages:—

Tents as packed.		Dimensions.			Weight.
		ft. ins.	ft. ins.	ft. ins.	lbs.
Hospital marquee. (Pattern approved 15th June 1861, Cir. 704.)	valise, containing roof and wall - -	4 2	by 2 2	by 1 6	356
	bag, containing 4 large pins, 180 small pins, and 2 mallets.	1 9	„ 1 6	„ 1 6	56
	bundle of poles - - - -	7 6	„ 0 10	„ 0 9	121
	bottom - - - - -	9 0	„ 1 0	„ 0 10	191
Officers' marquee	valise, containing roof and wall - - -	3 0	„ 1 4	„ 1 4	108
	bag, containing 4 large pins, 96 small pins, and 2 mallets.	1 9	„ 1 2	„ 1 2	34
	bundle of poles - - - - -	4 7	„ 0 8	„ 0 8	44
Laboratory tent	valise, containing roof and wall - - -	3 6	„ 1 7	„ 1 4	152
	bag, containing 4 large pins, 98 small pins, and 2 mallets.	1 9	„ 1 2	„ 1 2	35
	pole, in two pieces - - - - -	9 4	„ 0 9	„ 0 5	66
Circular single	valise, containing the roof, and also a bag with 42 pins and 2 mallets.	2 8	„ 1 4	„ 1 0	62
	pole, in two pieces - - - - -	5 5	„ 0 4	„ 0 2	12

Picket posts.—The short picket posts have been lately introduced to replace the long ones; with the latter the rope was stretched a few feet above the ground, and the horses were secured to it by the head collar and chain used in ordinary stables. With the short posts the ropes lie on the ground, and the horses are fastened to it by the fetlock chain issued for the purpose. Restive horses are further secured by heel ropes, which are supplied in the proportion of about 10 per cent.

Sickle and reaping hook.—The sickle is used for cutting corn, and the reaping hook for gorse or brush-wood. They are generally alike in appearance, but the sickle is lighter and has a serrated edge.

ARTILLERY.

CAMP EQUIPAGE.

PROPORTION OF CAMP EQUIPAGE FOR ARTILLERY ATTACHED TO SIEGE TRAINS.

Article.	Rate of Issue.	Article.	Rate of Issue.
Axes, helved { felling - pick -	2 per battery.	Saws, cross-cut -	1 per battery, if required.
Blankets, grey - -	1 for each non-commissioned officer and man.	Shovels - -	2 per battery.
Buckets, leather - -	1 with each pack saddle.	Spades - -	2 "
Colours, camp, complete	1 per battery and 2 for guards.	Stones, whet -	1 "
Files, saw - - -	1 per battery, if required.	Tents, complete, circular.	2 for each regimental field officer. 1 for each battery officer. 2 for staff serjeants. 1 for every 15 non-commissioned officers and men.
Hatchets, hand - -	2 } to every 15 non-commissioned officers and men.		
Hooks, bill - - -	1 }	Tents, hospital marquee.	1 per brigade.
Kettles, camp - - -	1 to every 5 non-commissioned officers and men.		
Lanterns { horn - - -	2 per brigade.		
red - - -	1 for each hospital marquee.		
Mallets, tent - - -	5 per cent. spare on the number of tents supplied.		
Pins, " - - -			
Poles, " - - -			
Saddles, pack, complete.	1 for paymaster. 1 for adjutant. 1 per brigade for quartermaster's stores. 1 per brigade for intrenching tools.		

PROPORTION OF CAMP EQUIPAGE FOR FIELD ARTILLERY IN STANDING CAMPS.

Article.	Rate of Issue.	Article.	Rate of Issue.
Barrows, wheel - -	3 per battery.	Tents, complete, circular ^a (per battery.)	1 per officer.
Blankets { grey - - -	2 for each non-commissioned officer and man. ^a		1 to every 2 staff serjeants.
horse - - -	1 per horse.		1 to every 12 non-commissioned officers and men.
Brooms, heath - - -	9 per battery, horse brigades.		3 for guards.
6 " " field " "	6 " " field " "		2 for officers' servants.
Carts, water - - -	2 per battery.		1 for mess servants, &c.
Chains, fetlock - -	1 per horse, and 7 per cent. spare.		1 for orderly room.
Colours, camp - - -	4 per battery.		1 for surgery.
Covers, horse, waterproof	1 per horse (or 2 per horse). ^b		1 for veterinary surgery.
Hammers and wedges -	2 sets per battery.		1 for quartermaster's store.
Hobbles, ox hide - -	10 per battery.	3 for workshops.	
Lanterns - - -	2 "	6 for harness. ^b	
Ropes, heel - - -	20 "	Tents, marquee, hospital.	1 per 2 batteries for officers' mess.
Stoves - - -	1 per battery for officers' mess. 1 per 2 batteries for serjeants' mess.		1 per 2 batteries for serjeant's mess.
		1 per battery for heating water for veterinary surgeon.	1 per battery for hospital.
Surcingles and pads -	1 per horse.	Tubs, wood, small, for washing.	1 for each non-commissioned officer's and men's tent.

^a Including those already in possession of the battery.

^b If tents are not provided for the harness an additional cover per horse is issued instead.

CAMP EQUIPAGE.

LIST OF ARTICLES FOR ARTILLERY SERVICE—*continued.*

NOTES.

The necessary intrenching tools and picketing articles, with a proportion of tents, are included in the ordinary equipment of field artillery, and no further supply is necessary for active service with a moving force. If, however, horse blankets are provided the web surcingles and pads worn with them must likewise be issued.

MEDICAL EQUIPMENT.*

The following lists contain an abstract of the various cases of instruments, chests of medicines, and other stores issued for brigades or batteries of artillery. These articles are in charge of the medical officers.

LIST OF ARTICLES.

Description.	Price.	Weight.	Remarks.
	£ s. d.	lbs. oz.	
Box, for books, stationery, and instruments -	3 6 0	129 0	
Canteens, containing plates, cutlery, cooking utensils, and various articles of hospital furniture	12 1 4	230 0	Marked A. and B.; issued for service with an army in the field only.
Cupping instruments, in a mahogany case, 8½" long, 4½" broad, 4¼" deep.	2 10 0	2 14	
Fracture and dislocation apparatus, in a box, 42" long, 12" broad, and 12" deep.	14 10 0	87 0	
Medical comforts, in two boxes -	9 5 2	199 0	For service in the field only.
Medical field companion, containing a selection of medicines and appliances, 13" long, 6¼" broad, and 8¼" deep.	6 2 4	17 10	
Medicine chests. { regimental size, 38" long, 26" wide, and 27" deep.	37 3 2	319 5	
{ detachment size, 34" long, 25¼" wide, and 27¾" deep.	34 4 0	312 10	
Medicine panniers, pair of, each 27" long, 14½" wide, and 16½" deep, complete, with slinging irons.	8 6 6	89 9	Carried on a pack saddle; the two panniers together form an operating table.
Post mortem instruments, in a mahogany case, 12½" long, 6" wide, and 2¼" deep.	2 14 0	3 14	
Stomach pump and enema apparatus, in a mahogany case, 10" long, 6½" wide, and 2½" deep.	2 8 6	3 8	
Surgical instruments. { full set, in a mahogany case -	25 12 11	25 8	Provided by surgeons at their own expense.
{ detachment set, in a mahogany case, 18" long, 8¼" wide, and 3¼" deep	14 19 0	10 8	
{ pocket set, in leather case -	3 6 0	0 7	} Provided by every medical officer at his own expense.
{ lancets, in leather case -	0 7 0	0 0¼	
{ extracting, in a leather roll case, length, 8", diameter, 4".	5 10 6	3 6	
Tooth instruments. { scaling and stopping, in a small box, 6¼" long, 4" wide, and ½" deep.	1 18 6	0 10	

* Extracted from Part VII. of the Army Equipment (compiled by Captain Martin Petrie, Topographical Staff), which contains all the details belonging to that branch of the subject.

ARTILLERY.

MEDICAL EQUIPMENT.

PROPORTIONATE SUPPLY.

Description.	Brigade.		Per Battery.			Remarks.
	Garrison Service.	Field Service.	Garrison Service.	Field Service.		
				A.	B.	
<i>Medical and hospital articles.</i>						
Box, for books, stationery, and instruments - - -	1	1	1	1	—	A. and B.
Canteens, with hospital utensils, &c. - - -	—	—	—	—	2	
Cupping instruments, sets - - -	2	2	1	1	1	Provided in pairs.
Fracture and dislocation apparatus - - -	1	1	1	1	1	
Medical comforts, boxes of - - -	—	—	—	—	2	
Medical field companion - - -	2	2	2	1	1	
Medicine chests { regimental - - -	1	1	—	—	—	
{ detachment - - -	1	1	1	1	1	
Medicine panniers, pair ^a - - -	—	1	—	1	1	
Post mortem instruments - - -	2	2	1	1	1	
Stomach pump and enema apparatus - - -	2	2	1	1	1	
Surgical instruments { full set - - -	1	1	—	—	—	
{ detachment - - -	1	1	1	1	1	
Tooth instruments { extracting - - -	2	2	1	1	1	
{ stopping - - -	2	2	1	1	1	
<i>Carriages, with harness, &c.</i>						
Ambulance wagon - - -	—	—	—	—	1	For sick patients.
Medical store cart - - -	—	—	—	—	1	For stores.
<i>Camp equipage.</i>						
Pack saddle, with bridle - - -	—	1	—	1	1	For the medicine panniers.
Tents { marquee - - -	—	—	—	—	1	For hospital.
{ circular - - -	—	—	—	—	1	For surgery.
Tools, intrenching - - -	—	—	—	—	—	Issued with medical cart.

^a Packed when required for use, with a selection of medicines, surgical instruments, and hospital utensils.

NOTES.

The proportion in column A. is supplied to every battery when it is equipped for service in the field, but a part of the supply would be left at the base of operations or any convenient depôt if the battery were attached to a moving force, and the equipment would consist of the articles shown in column B. The various items are then divided for transport between the panniers, the ambulance wagon, and the store cart, and the proportion to be carried by each will be specified in Part VII. of the Army Equipment, but is not yet finally arranged. The necessary horses and drivers are provided by the Quartermaster-General's department.

The medical equipment as above given is provided by two departments; the Medical department provides medicines, medical appliances, and surgical instruments or apparatus; the Purveyors department furnishes the medical comforts, and is the medium of application for hospital stores of all kinds, camp equipage, books, and stationery.

The marks used to denote packages of this description are one red cross for medicines and instruments; one black cross for medical comforts; and two black crosses for hospital stores.

BOOKS.

LIST OF THE BOOKS REQUIRED BY EACH BATTERY OF ARTILLERY.

Those in *italics* are required by batteries of field artillery only.

Name.	Price.	No. of Copies.	Remarks.
Articles of War and Mutiny Act -	£ s. d. —	1	In one small volume, supplied annually by Government.
Arms and accoutrements, account of -	0 5 6	1	
Day and memorandum book -	0 1 6	1	For accounts.
Defaulters' and court-martial book -	0 12 6	1	For records of punishments.
Description of soldiers -	0 12 6	1	
" " <i>horses</i> -	0 4 0	1	
Ledger for soldiers' accounts -	0 7 6	1	
" " savings' bank do. -	0 1 6	1	
Letters received (guard book for) -	0 6 0	1	
" sent (copies of) -	0 6 0	1	
Manual of Artillery Exercises -	0 2 6	1	Latest edition 1st January 1860.
" " for Field Artillery -	0 2 6	1	" edition 1st August 1861.
Orders, daily -	0 3 6	1	
" particular -	0 5 6	1	
Regulations for dress, Royal Artillery -	0 0 6	1	Latest edition 1st March 1860.*
" " <i>finance</i> -		1	
" " trumpet and bugle sounds -		1	
" " <i>veterinary</i> -		1	
Returns (guard book) -	0 6 0	1	
Store ledger -	0 9 0	1	
Stores, demands for -		1	
" returns of -		1	

* Fresh editions are supplied by the Adjutant-General, R.A., at the public expense.

The above books are kept up at the expense of officers commanding batteries; they are carried in the store carts of field batteries on the march or on service, and in any convenient manner by other batteries. Any necessary stationery is similarly provided and carried with the books.

Each officer is also required to be in possession of the following books:—*The Queen's Regulations, Royal Artillery Dress Regulations*, and the two *Manuals of Artillery Exercises*.

LIST OF MARKS FOR PACKAGES AND STORES.

The following method of marking stores and packages sent to an army in the field, in order to facilitate their collection, arrangement, and delivery, was approved in 1861, and notified in Circular 732, 21/12/61; most of the articles for which the different marks are adopted are included in the general equipment of an artillery force.

Mark.	Class of Stores.
Balls { one blue ball - - -	Ordnance, carriages, shot of all kinds, empty shells, and general stores <i>for field service</i> .*
two ditto - - -	Similar articles <i>for siege service</i> .
one red ball - - -	Small arms, accoutrements, and the implements or materials for their repair.
Crosses { one red cross - - -	Medicines and medical instruments.
one black cross - - -	Medical comforts.
two " - - -	Hospital and barrack stores.
Diamonds* (two red diamonds)	Ammunition for artillery or small arms, including live shells and combustible stores.
Heart (one black heart)	Clothing and necessaries.
Horse shoes { one black horse shoe - - -	Harness and saddlery; pack-saddles included.
two " - - -	Wagons and carts for transport of stores.
Squares { one black square - - -	Intrenching tools, nails, &c.
two " - - -	Materials for hutting or building (except nails).
Triangles { one red triangle - - -	Miscellaneous stores.
two black " - - -	Camp equipage, (except intrenching tools and pack saddles).
Trefoil (one green trefoil or club)	Food, forage, fuel, and light.

* Ordnance carriages and stores for *naval service* are marked with a blue ball and a red diamond.

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* In the "Aide-Mémoire," and in some other military works, many of the articles included here in the term Ammunition are described under the head of Pyrotechny.

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Addendum. 1 October 1864.

The distribution proposed by the heads of the various departments having necessitated the printing of a large number of fresh copies, the opportunity is taken to point out certain alterations and additions which have been notified since the completion of the work.

Personal Equipment.

- p. 32. Distinctions of staff officers.
The "orderly officers" of districts are to wear the cocked hat and feather.
- p. 33. Distinctions of non-commissioned officers.
Serjeant-conductors of Stores are allowed to have four chevrons, worn above the elbow.
- pp. 34, 62. Carbine.
The weight of the new pattern carbine, 1861, as given in a descriptive table lately prepared by the Superintendent of the factory at Enfield, is 7 lb. 8 oz.
- p. 35. Spurs and hoofpickers.
It is considered unnecessary that recruits and detachments proceeding to India should take these articles.
- p. 37. Dress (last line).
The sword belt is now worn over the frock coat. (Corrected in the reprint.)
- p. 61. Bugle.
The present price is 14s.
- p. 64. Trumpet.
The present price is 12s.

Horse Equipment.

- pp. 68, 69, 70. Notes (drill order).
The numnah is now ordered to be worn on all occasions. (Corrected in the reprint.)

Matériel.

- p. 77. Nomenclature of ordnance.
Rifled guns of 7 inches calibre and upwards are now to be named according to their calibres; the names of smaller rifled guns and of smooth-bored pieces remain the same; but the weight of the gun is also to be specified. The complete description of the light 110-pounder will be "7-inch breech-loading wrought-iron gun of 73 cwt. R." (R. A. Circ. Mem. 12/7/64.)
- pp. 86, 87. Wooden tangent scales.
These scales being found liable to split at the top, a small plate of brass is in future to be screwed on at the back.
- pp. 99, 100. Time fuzes.
Lieut.-Col. Boxer's wooden time fuze with a special adapter, is provisionally adopted for use with the 7-inch (110-pounder), the 70-pounder, and the 40-pounder Armstrong guns, in place of the E pattern Armstrong time fuze, which will be used with the 20-pounder and smaller guns only. The implements (when finally approved) will be issued at the rate of 1 set to every 2 guns and 25 per cent. spare, for garrison service, and 1 set to each gun in 40-pounder batteries of position. Papier maché wads will be used with these fuzes. (See also p. 363.)

p. 101. Percussion fuze.

An improvement to the C pattern fuze proposed by Major Dyer, R.A., with a view to increased security, has been adopted for the manufacture of further supplies.

p. 120. Painting.

A new circular has been issued from the War Office, dated 30th April 1864, No. 859, to replace Nos. 673 and 755.

p. 121. Inspections.

Ammunition and laboratory stores which are considered sufficiently good for practice, but not in good enough condition to be issued for service, are ordered to be distinguished by a yellow line drawn across each article. If such a line cannot be drawn on the article itself (as in the case of percussion caps), it is to be drawn on the case in which the article is packed.

p. 227. Fuzes, Armstrong.

12-pounder, 9-pounder, and 6-pounder batteries are to have one time fuze and one percussion fuze for each shell.

p. 232. Oil.

The allowance for Armstrong batteries is four gallons of sweet oil and three of Lucca oil per quarter of a year.

pp. 277, 348. Shot furnace.

The improved pattern furnace, and the addition of a fan to the present furnace, having never been actually adopted for the service, the remarks about them are struck out of the reprint.

p. 389. Bursting charges of diaphragm shrapnel shells.

These charges have lately been increased as follow. The 6-pounder remains the same.

68-pr. from 60 drs. to 80 drs.	24-pr. from 30 drs. to 40 drs.
56-pr. " 55 " 70 "	18-pr. " 25 " 30 "
42-pr. " 50 " 60 "	12-pr. " 20 " 24 "
32-pr. " 40 " 50 "	9-pr. " 15 " 18 "

(In the reprint the new charges are inserted throughout.)

p. 406. 8-inch garland, triangular.

The number of projectiles in the bottom course is 28 instead of 36, and in the whole pile 84 instead of 120. (Corrected in the reprint.)

p. 412. Drift, screw, vent.

A special *bit* has been substituted for this drift.

Camp Equipage.

p. 423. Note.

The latest regulations are now to be found in Circular 869, 6th July 1864.

p. 426. Proportion for siege trains.

Insert Hooks, bill, 1 to every 15 non-commissioned officers and men.

p. 426. Proportion for field artillery.

Insert Lanterns, 2 per battery.

Stoves, 1 per battery for heating water for veterinary surgeon.

Tents, circular { 3 per battery for Guards.
1 " " veterinary surgery.

Tubs, wood, small, for washing, 1 for each non-commissioned officer's and men's tent.

Omit Tents, marquee, 3 per battery for Guards.

(These corrections are made in the reprint.)

ARTILLERY.

Medical Equipment.

- p. 428. Supply of camp equipage.
For the supply in standing camps at home, see Circular 869, p. 15.

Miscellaneous.

- p. 429. Books.
The Dress Regulations, Trumpet and Bugle Sounds, and Standing Orders are now published in one volume price 5s., and every officer is to have a copy in his possession.

Errata.

- p. 31. The "1 store cart," opposite Lieut.-Col. R.A., should be struck out.
p. 38. The words "except for drivers" in the 8th and 9th lines from the top should be struck out.
p. 223. The price of hides should be *per lb.*, and not *per hide*.

(Corrected in the reprint.)

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[7323.—400—10/64.]

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